FOREWORD

This repair manual has been prepared to provide essential information on body panel repair methods (including cutting and welding operations, but excluding painting) for the TOYOTA PRIUS.

Applicable models: NHW 20 series

This manual consists of body repair methods, exploded diagrams and illustrations of the body components and other information relating to body panel replacement such as handling precautions, etc. However, it should be noted that the front fenders of the TOYOTA model is bolted on and require no welding.

When repairing, don't cut and join areas that are not shown in this manual. Only work on the specified contents to maintain body strength.

Body construction will sometimes differ depending on specifications and country of destination. Therefore, please keep in mind that the information contained herein is based on vehicles for general destinations.

For the repair procedures and specifications other than collision-damaged body components of the TOYOTA PRIUS refer to the repair manuals.

If you require the above manuals, please contact your TOYOTA Dealer.

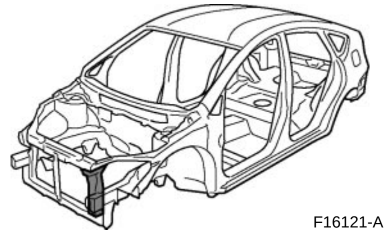
All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without prior notice.

TOYOTA MOTOR CORPORATION

NOTE: The Vehicle Lift and Support Locations sections and For Vehicles Equipped With SRS Airbag and Seat Belt Pretensioner sections refer to the TOYOTA PRIUS Repair Manual.

RADIATOR SIDE SUPPORT (ASSY)

REPLACEMENT
With the radiator upper support removed.



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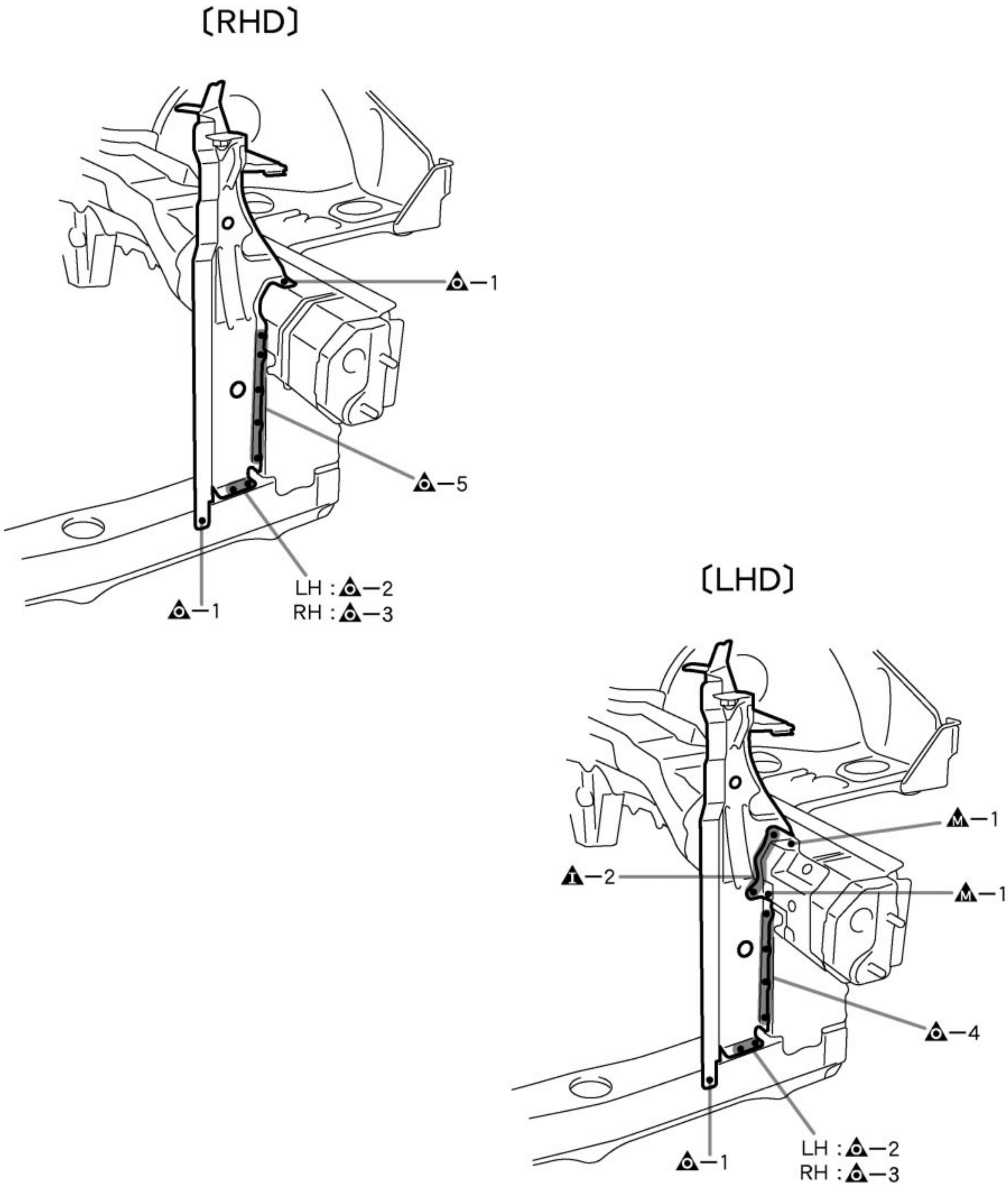
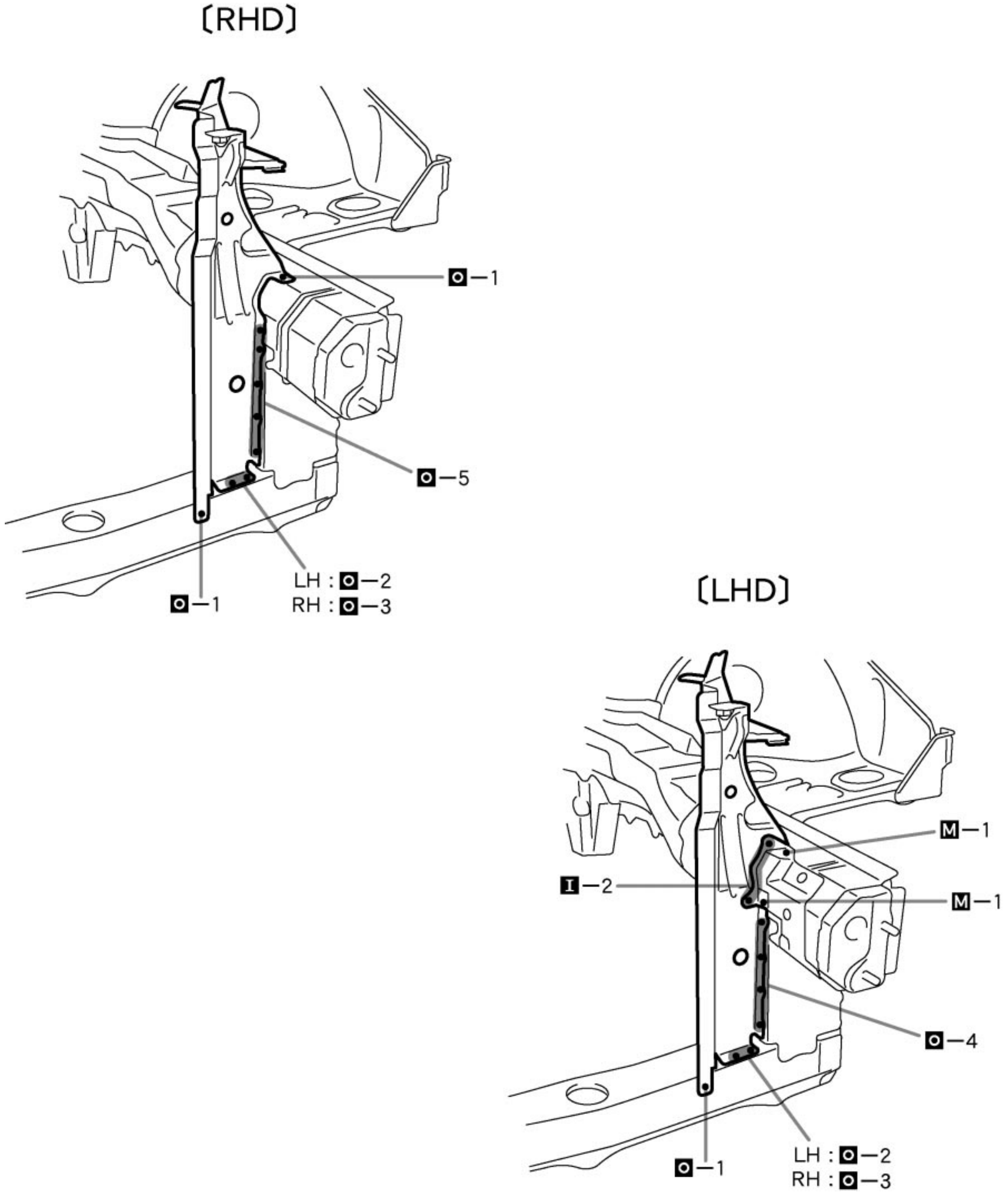
REMOVAL



F16123

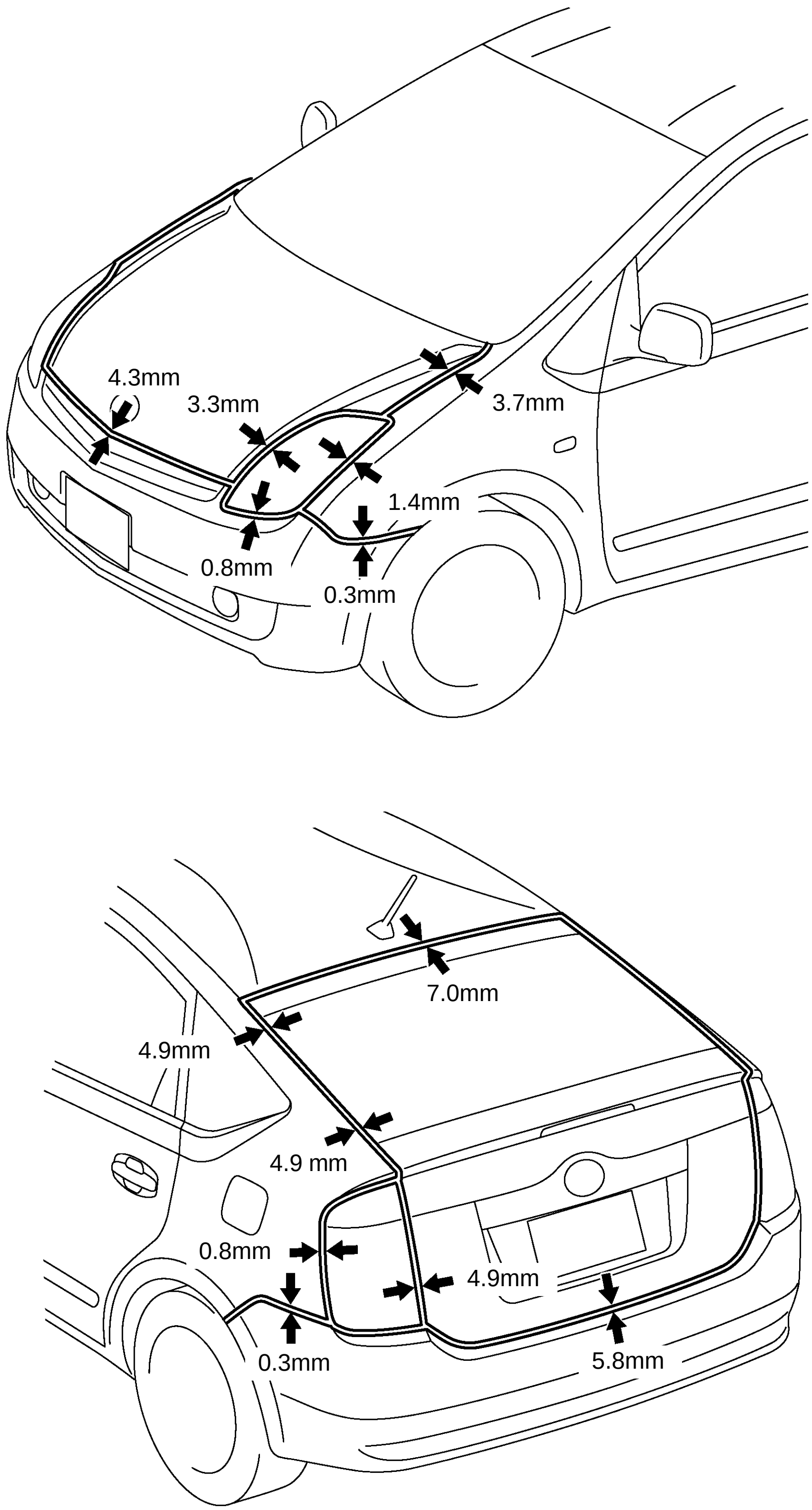
INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



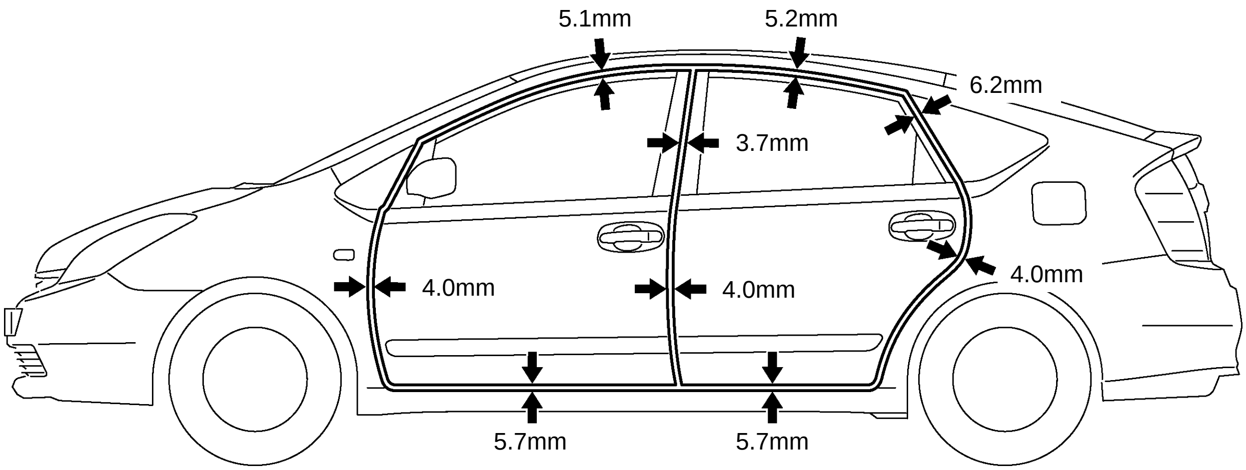
F16124

FIT STANDARDS



F16115

0.3mm (0.01in.)	0.8mm (0.03in.)	1.4mm (0.06in.)
3.3mm (0.13in.)	3.7mm (0.15in.)	4.3mm (0.17in.)
4.9mm (0.19in.)	5.8mm (0.23in.)	7.0mm (0.28in.)

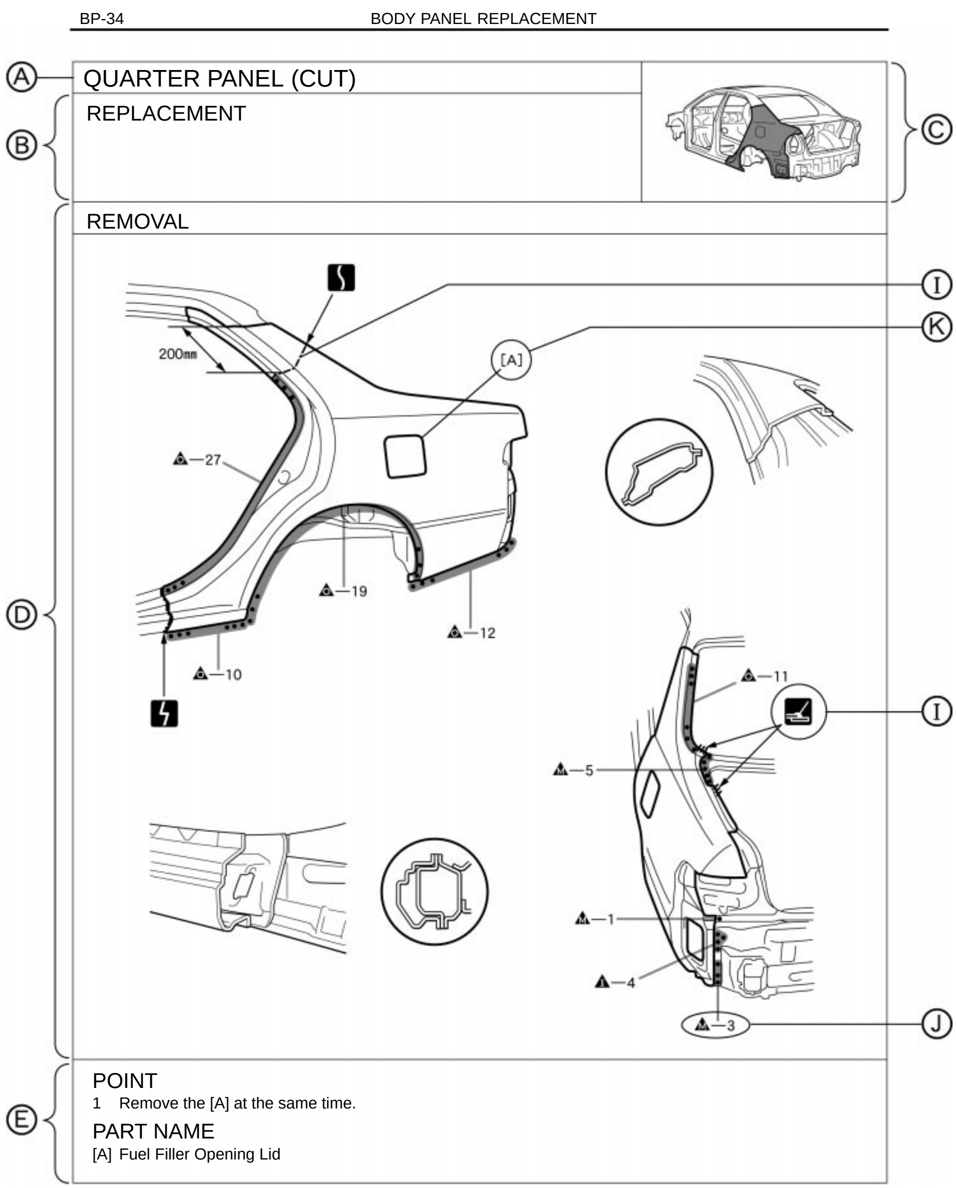


F16116

3.7mm (0.15in.)	4.0mm (0.16in.)	5.1mm (0.20in.)
5.2mm (0.20in.)	5.7mm (0.22in.)	—

HOW TO USE THIS MANUAL

1. BODY PANEL REPLACEMENT THIS MANUAL



Ⓐ : REPLACEMENT PART AND METHOD

QUARTER PANEL (CUT)

Replacement method
(ASSY) ... Assembly replacement
(CUT) ... Major cutting (less than 1/2 of part used)
(CUT-H) ... Half cutting (about 1/2 of part used)
(CUT-P) ... Partial cutting (most of part used)

Replacement part

Ⓑ : REMOVAL CONDTIONS

Ⓒ : PART LOCATION

Ⓓ : REMOVAL DIAGRAM
Describes in detail removal of the damaged part involving repair by cutting.

Ⓔ : REMOVAL GUIDE
Provides additional information to more efficiently help you perform the removal.

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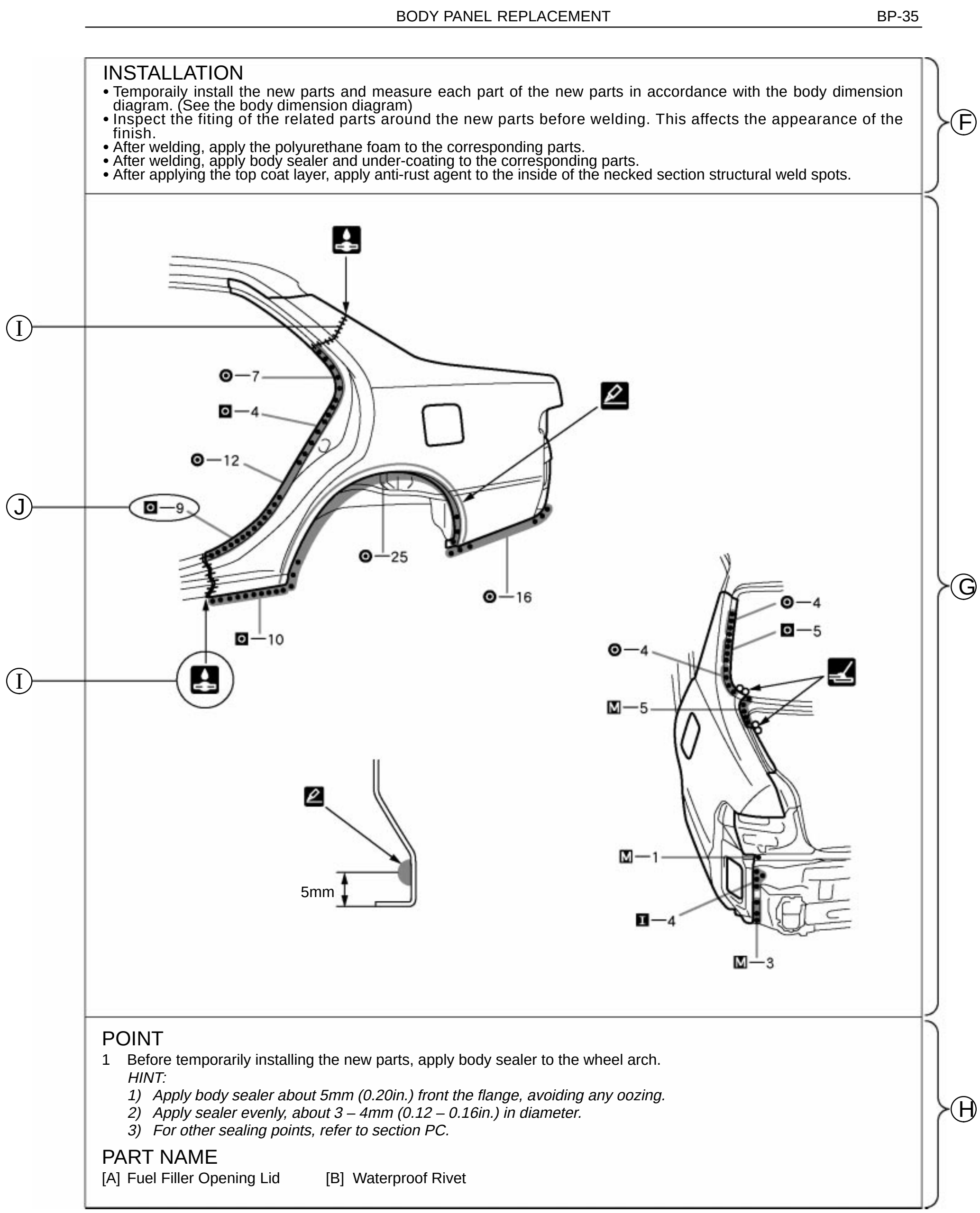


BODY PANEL REPLACEMENT BP-35

INSTALLATION
- Temporaily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fiting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.

POINT
1 Before temporarily installing the new parts, apply body sealer to the wheel arch.
HINT:
1) Apply body sealer about 5mm (0.20in.) front the flange, avoiding any oozing.
2) Apply sealer evenly, about 3 – 4mm (0.12 – 0.16in.) in diameter.
3) For other sealing points, refer to section PC.

PART NAME
[A] Fuel Filler Opening Lid [B] Waterproof Rivet

(F) : INSTALLATION CONDITIONS

(G) : INSTALLATION DIAGRAM
Describes in detail installation to the new part involving repair by welding and / or cutting, but excluding painting.

(H) : INSTALLATIOLN GUIDE
Provides additional information to more efficiently help you perform the installation.

(I) : SYMBOLS
(See page IN-7)

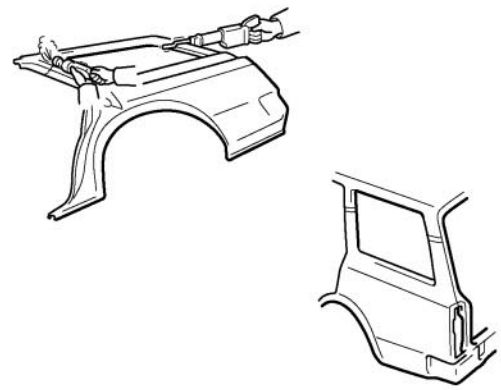
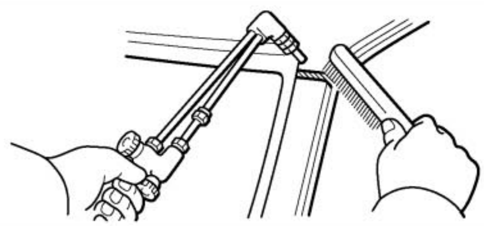
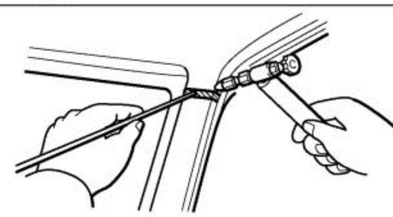
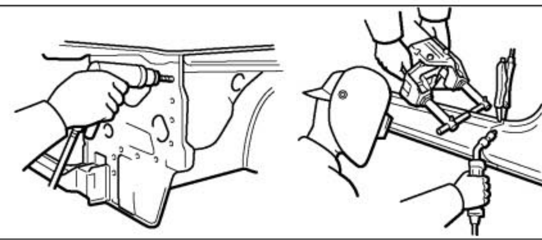
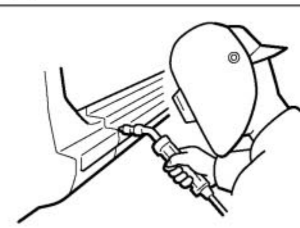
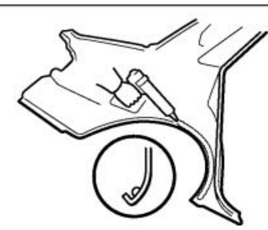
(J) : ILLUSTRATION OF WELD POINTS
Weld method and panel position symbols (See page IN-9)

(K) : PART NAME

F13891A

2. SYMBOLS

The following symbols are used in the welding diagrams in section BP of this manual to indicate cutting areas and the types of weld required.

SYMBOLS		MEANING	ILLUSTRATION
— - — - — - —		CUT AND JOIN LOCATION (SAW CUT)	
		CUT AND JOIN LOCATION (Cut Location for Supply Parts)	
		CUT LOCATION	
		CUT WITH DISC SANDER, ETC.	
/////		BRAZE (Removal)	
OOOO		BRAZE (Installation)	
●●●●●●	—	WELD POINTS	
O M I O M I O M I	—	SPOT WELD OR MIG PLUG WELD (See Page IN-9)	
┼┼┼┼		CONTINUOUS MIG WELD (BUTT WELD)	
		CONTINUOUS MIG WELD (TACK WELD)	
		BODY SEALER	

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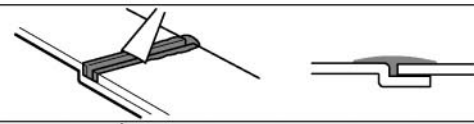
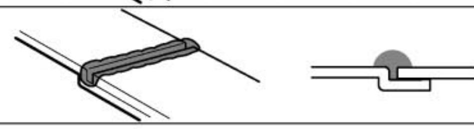
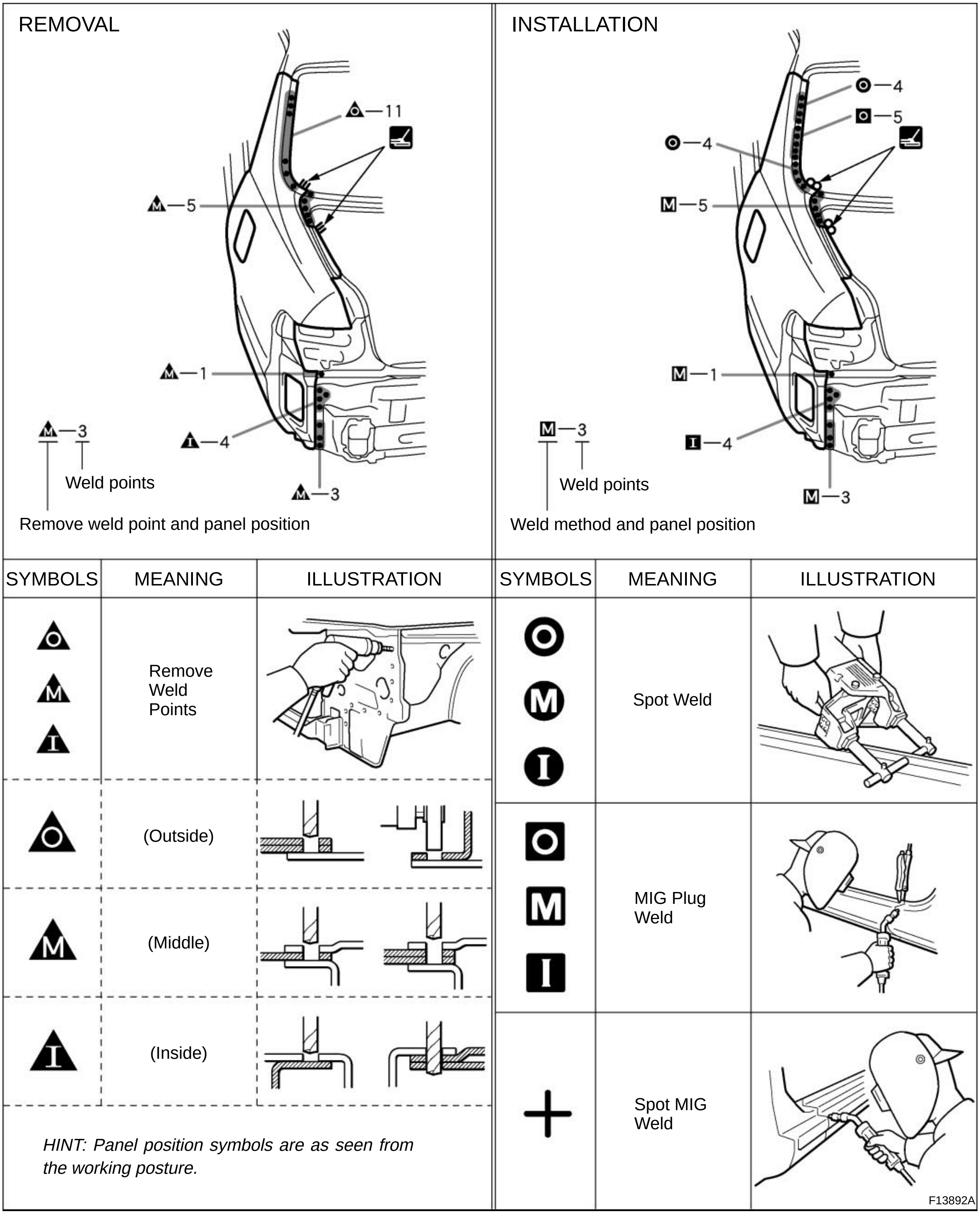
SYMBOLS		MEANING	ILLUSTRATION
—		Assembly Mark	
	—	BODY SEALER (Flat Finishing)	
	—	BODY SEALER (No flat Finishing)	

F13894A

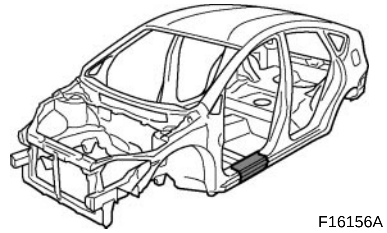
3. ILLUSTRATION OF WELD POINT SYMBOLS

EXAMPLE:



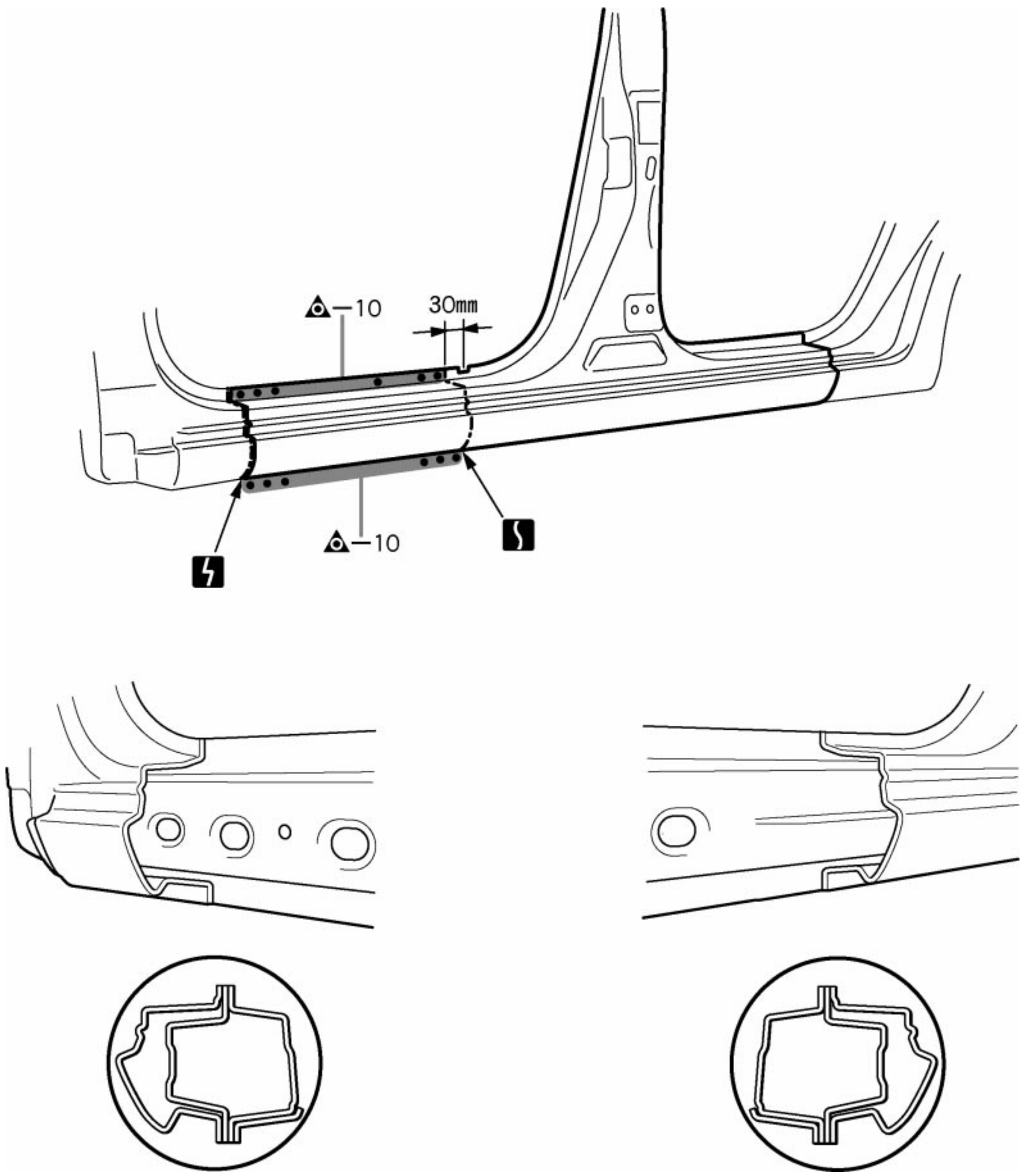
ROCKER OUTER PANEL (CUT-H)

REPLACEMENT



F16156A

REMOVAL

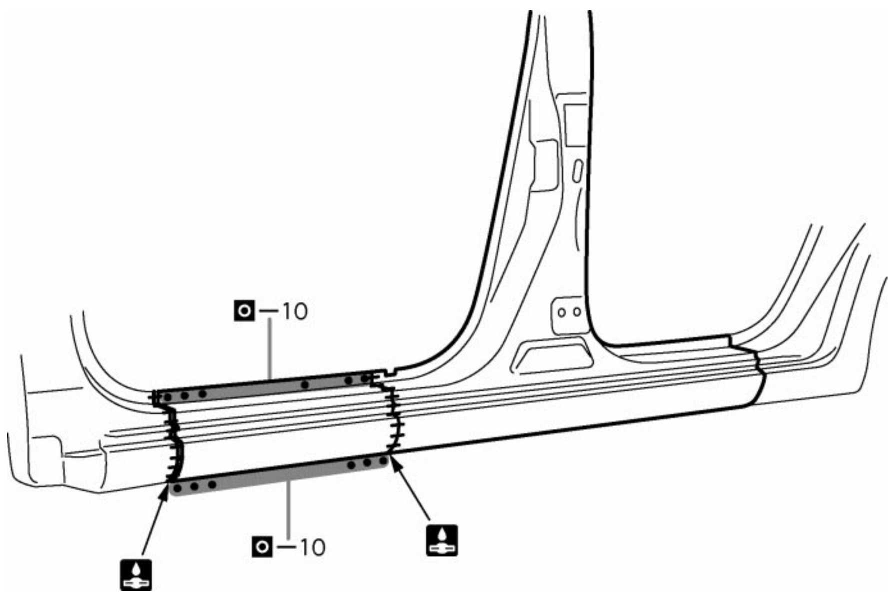


F16156

30mm (1.18in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



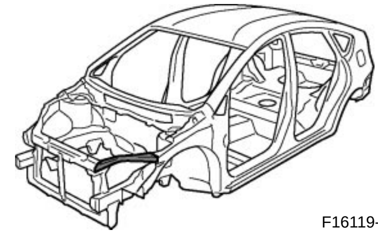
F16157

POINT

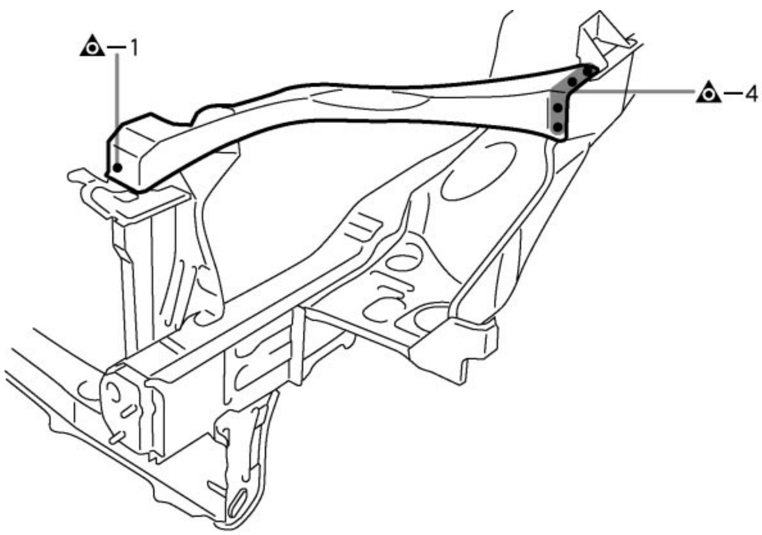
1 Inspect the fitting of the front door, etc., before welding, since this affects the appearance of the finish.

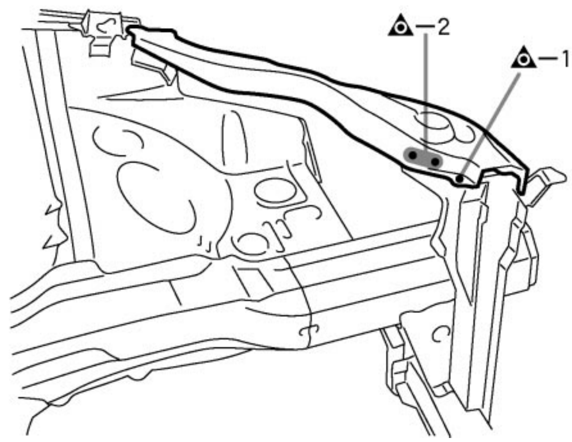
RADIATOR UPPER SUPPORT (ASSY)

REPLACEMENT


F16119-A

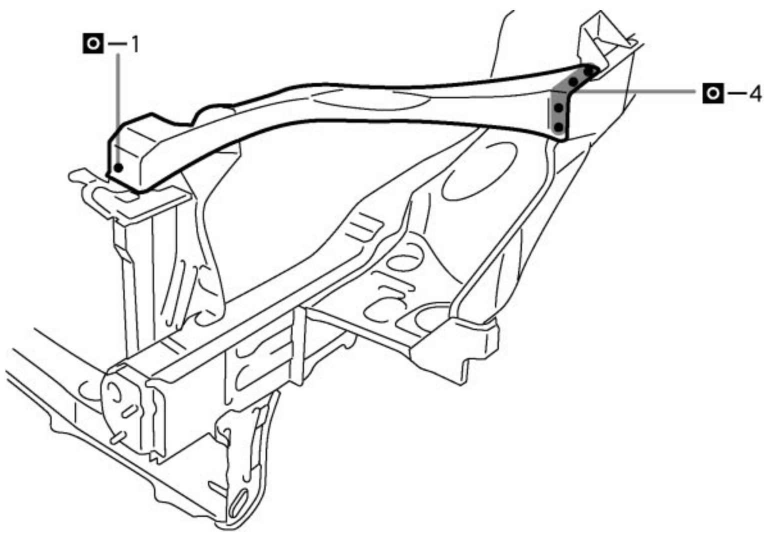
REMOVAL

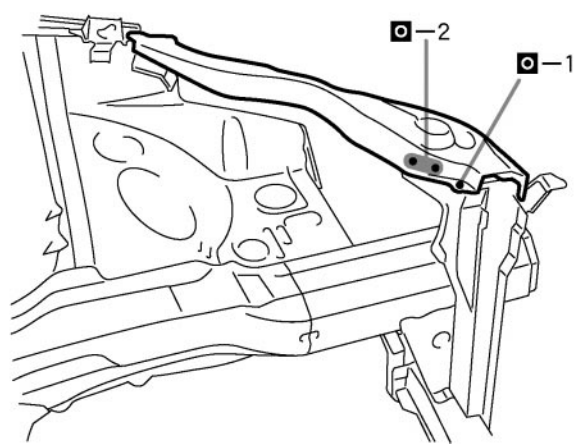




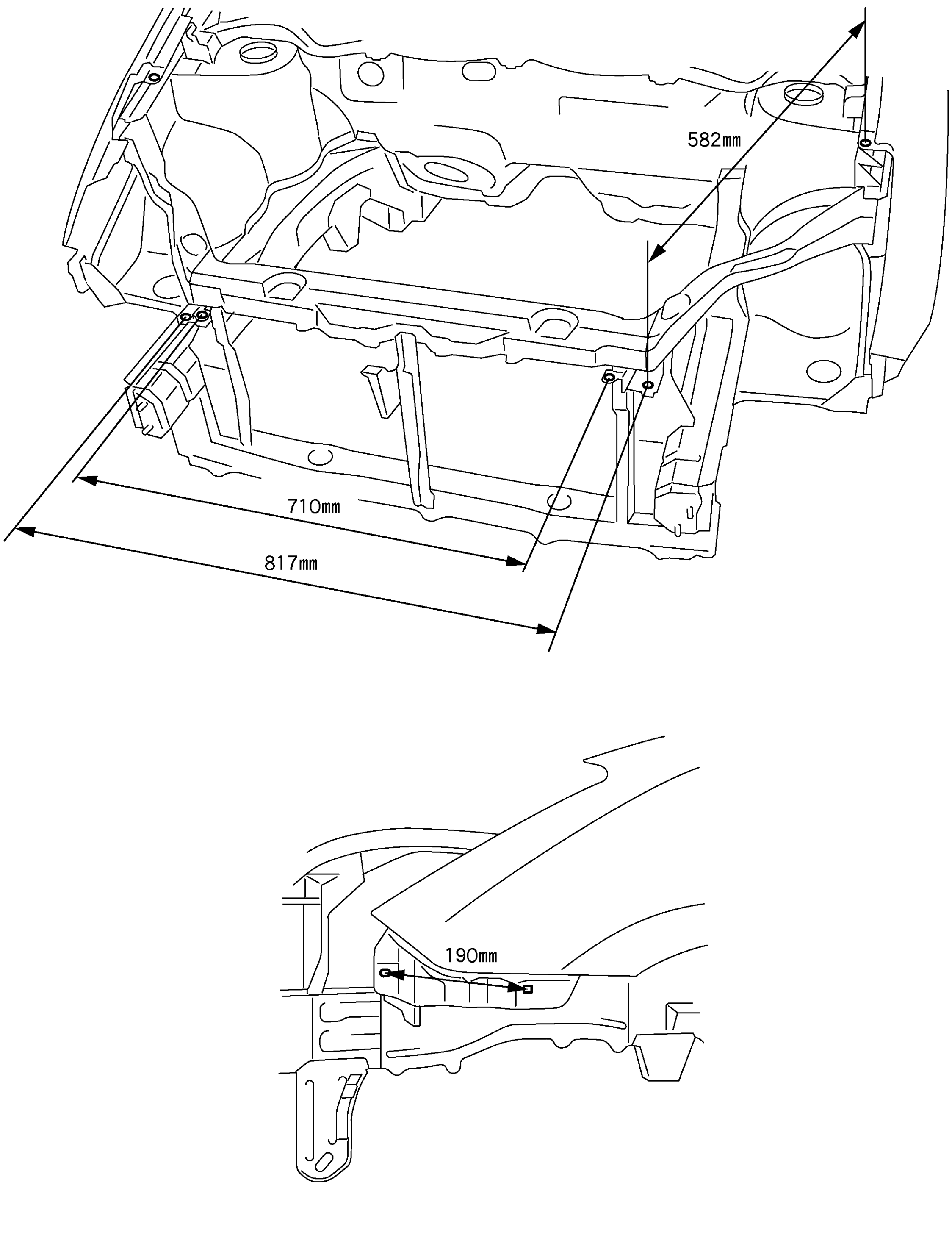
F16119

INSTALLATION
- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.





F16120



POINT

1 Measure the dimensions before installing headlights.

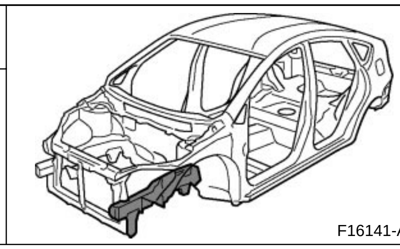
2 These values are reference values.

190mm (7.48in.) 582mm (22.91in.) 710mm (27.95in.) 817mm (32.17in.)

FRONT SIDE MEMBER (ASSY)

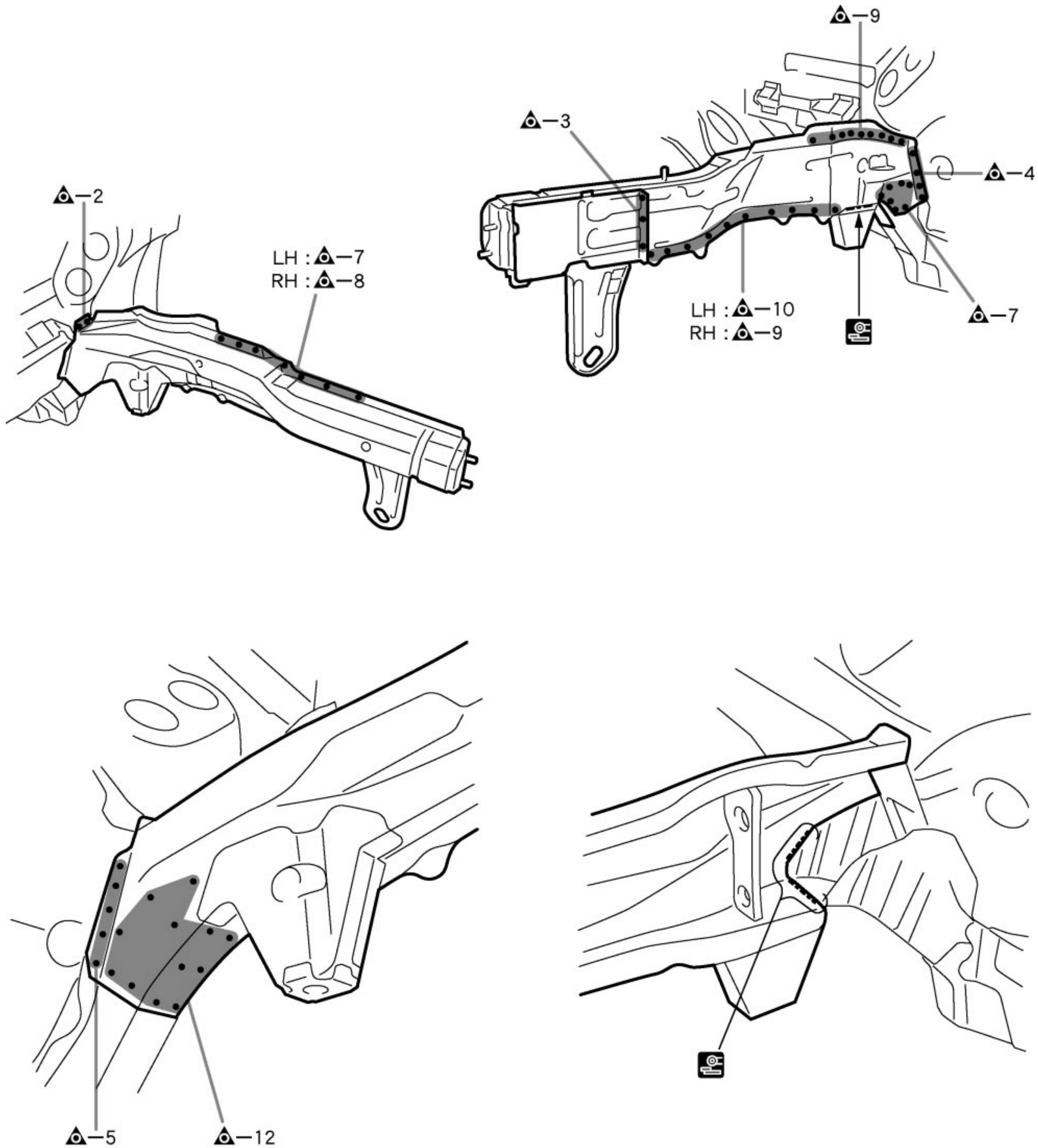
REPLACEMENT

With the radiator side support, front crossmember and front fender apron removed.



F16141-A

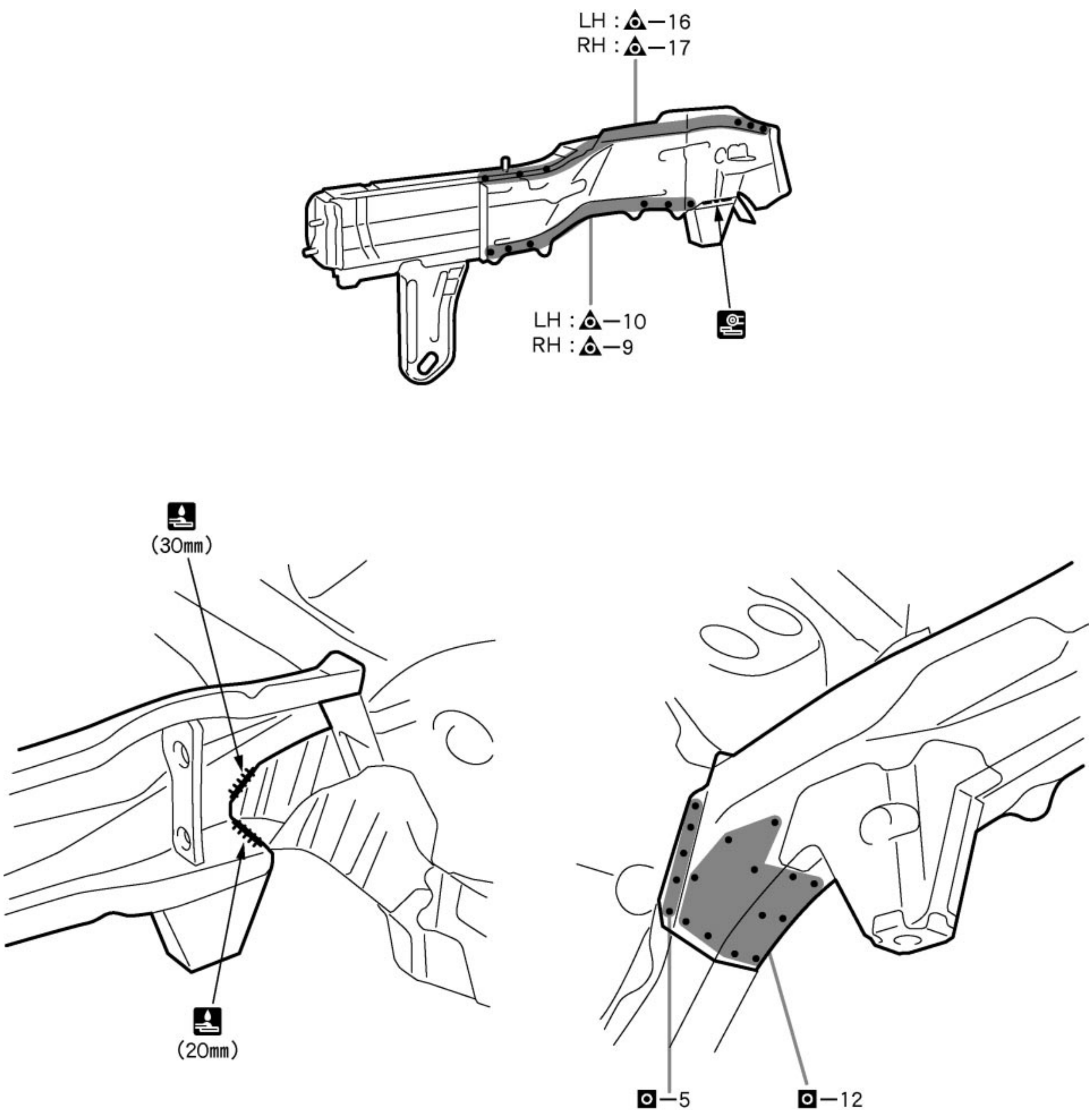
REMOVAL



F16141

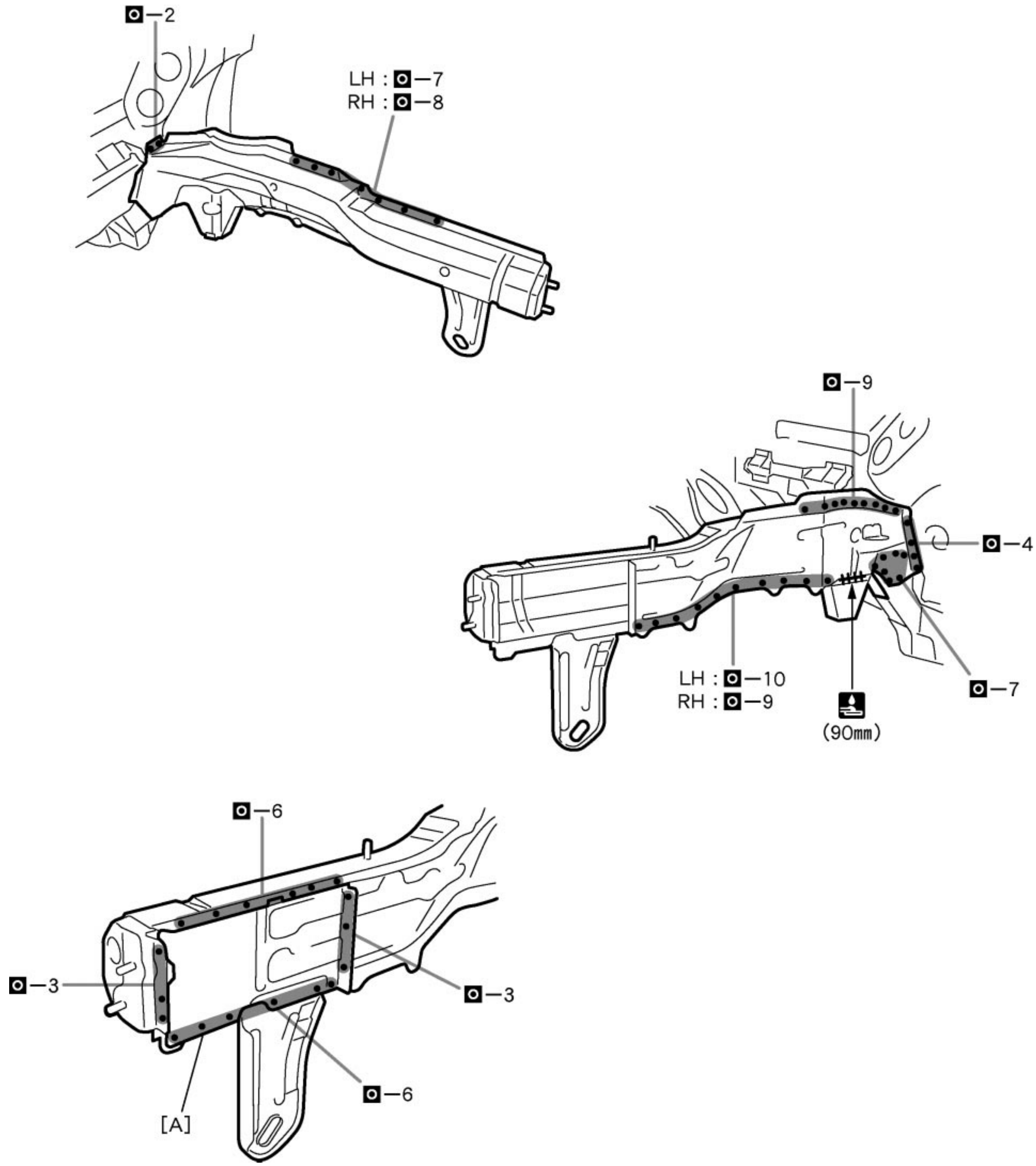
INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16142

20mm (0.79in.) 30mm (1.18in.)



POINT

1 Make sure each measurement is correct, as this parts affects the front wheel alignment.

PART NAME

[A] Front Sidemember Extension

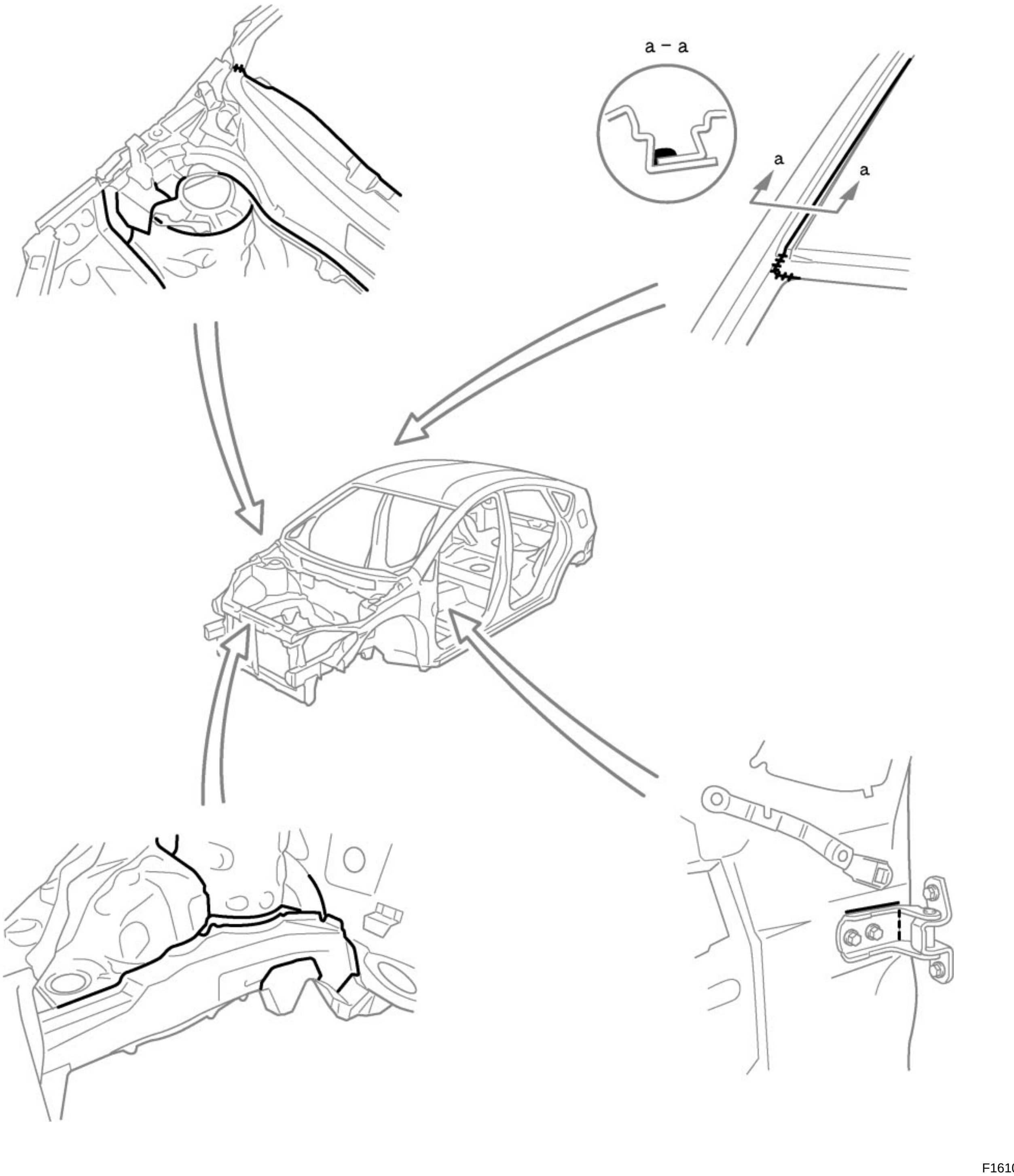
90mm (3.54in.)

BODY PANEL SEALING AREAS

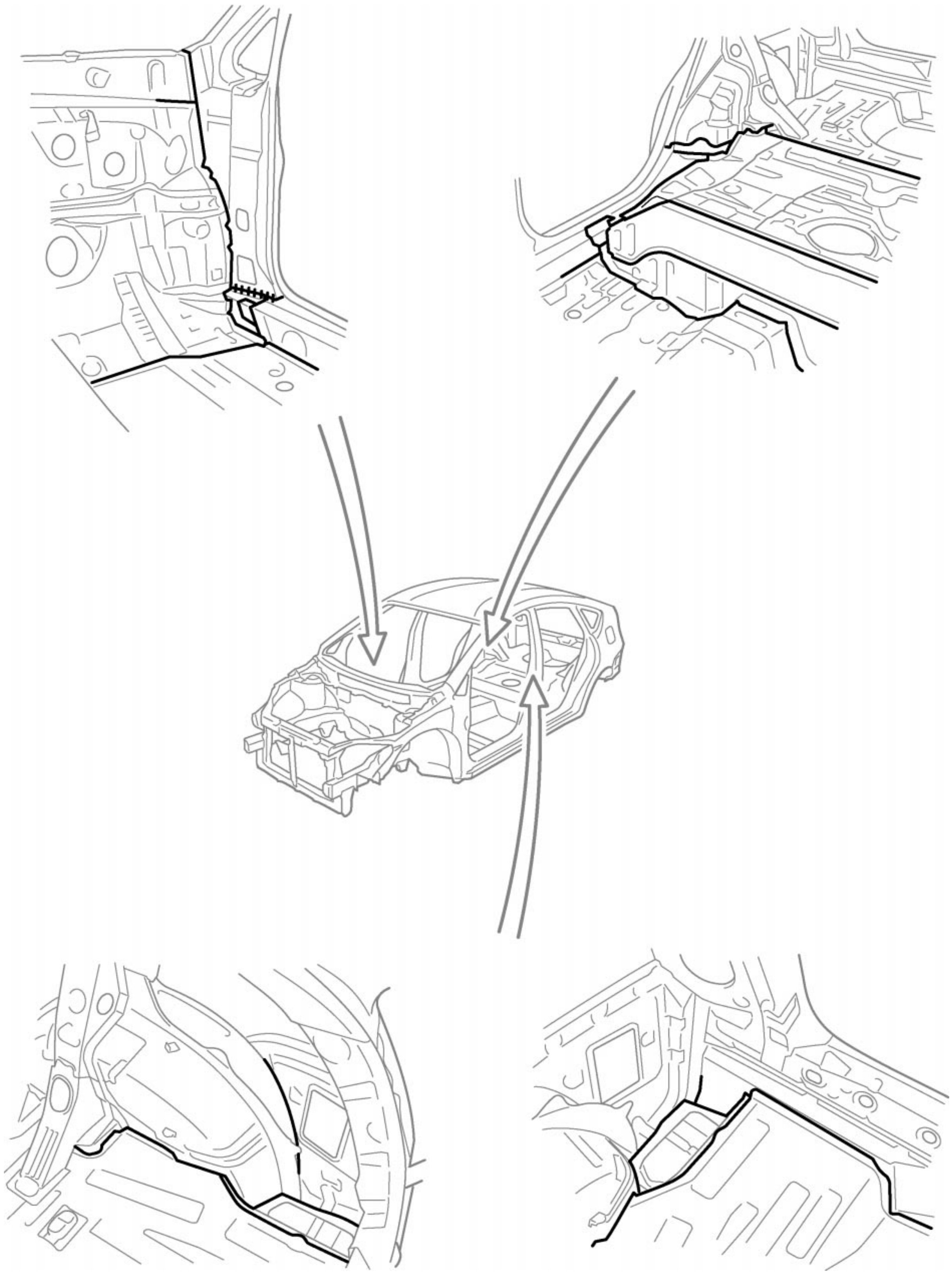
HINT:
1) Prior to applying body sealer, clean the area with a rag soaked in grease,wax and silicone remover.
2) If weld-through primer was used, first wipe off any excess and coat with anti-corrosion primer before applying body sealer.
3) Wipe off excess body sealer with a rag soaked in a grease, wax and silicone remover.
4) If body sealer is damaged by peeling, cracks, etc., be sure to repair as necessary.

++++++++++	Flat Finishing	———	No Flat Finishing

1. ENGINE COMPARTMENT

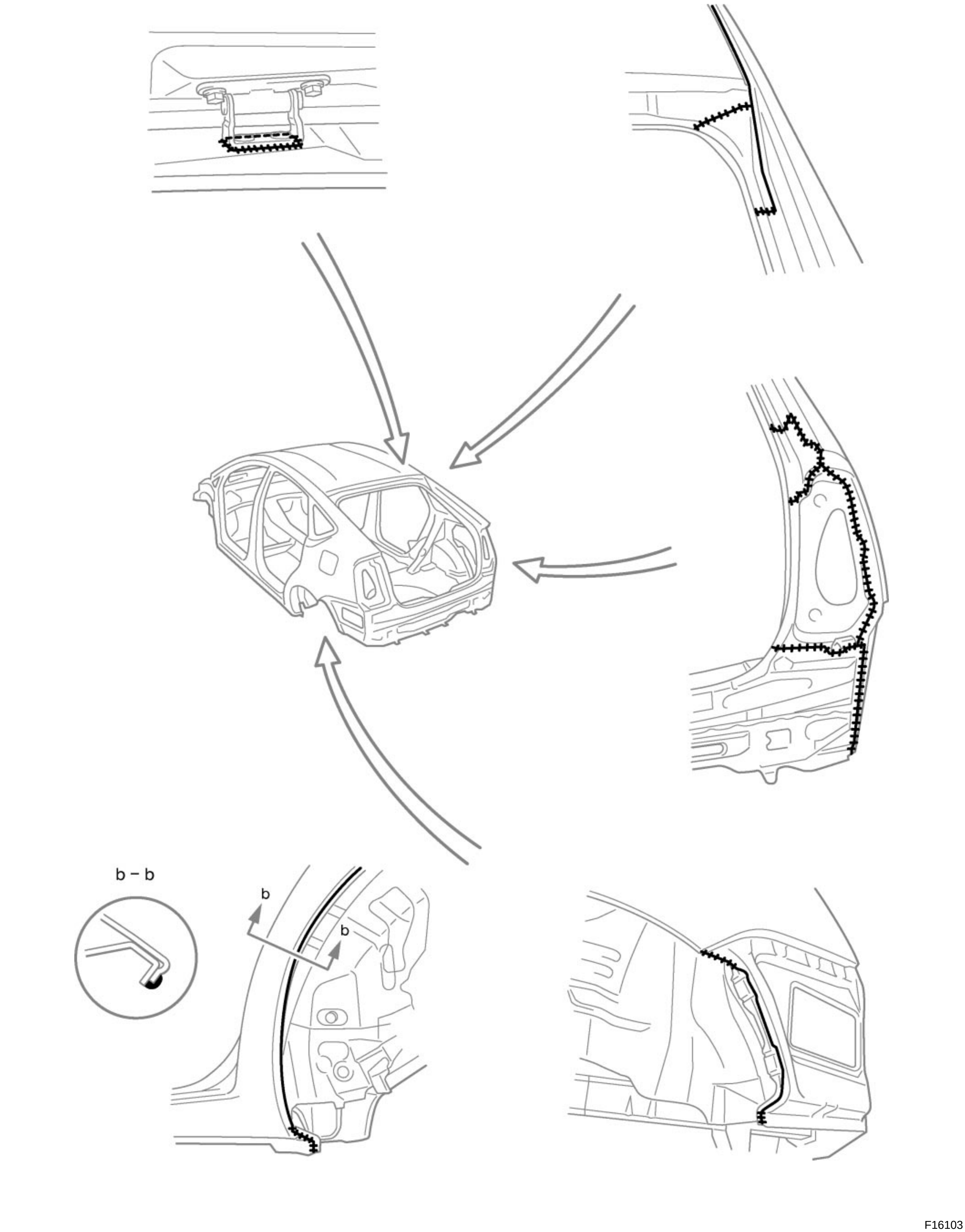


2. INSIDE

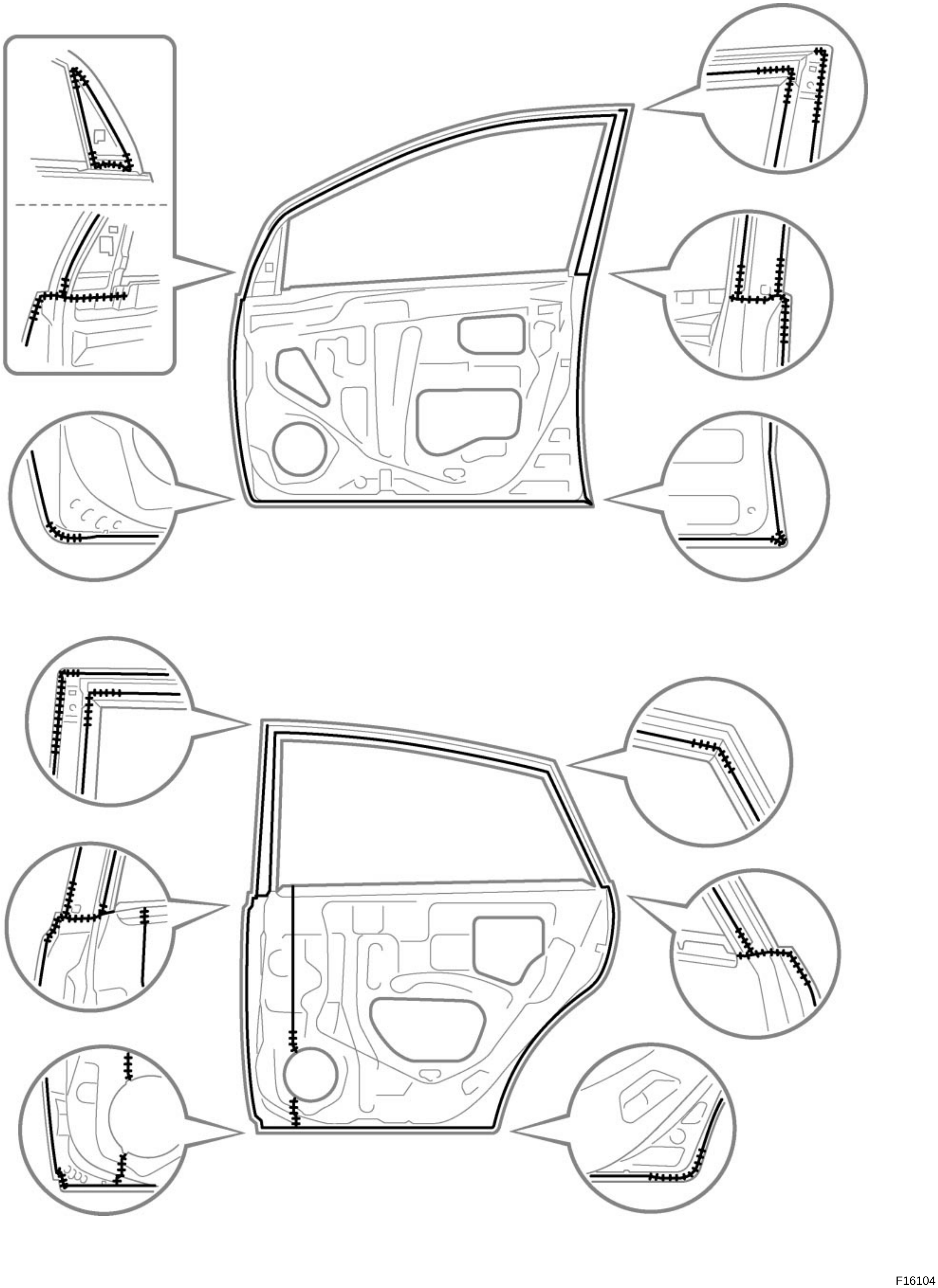


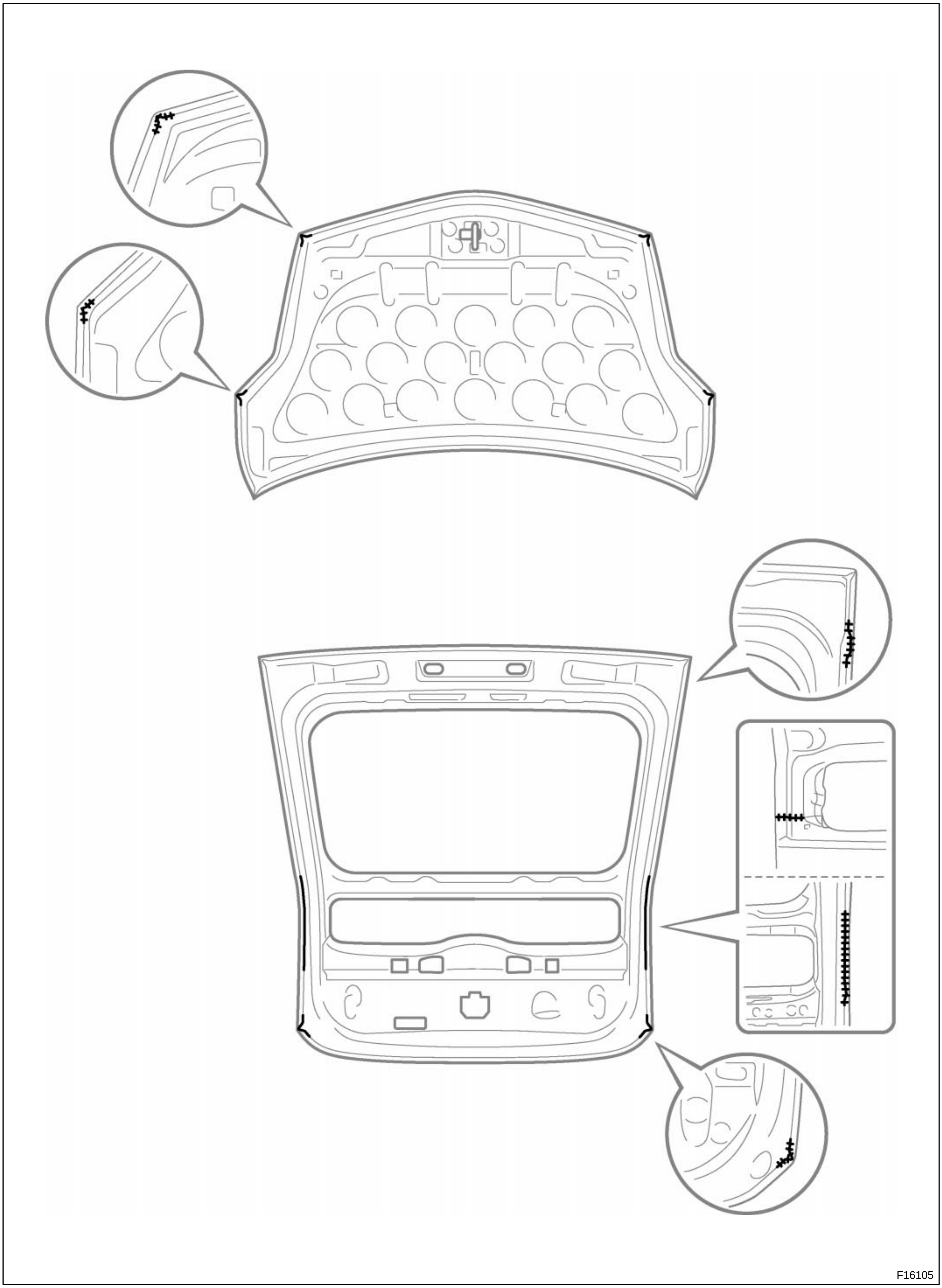
F16102

3. REAR LUGGAGE COMPARTMENT



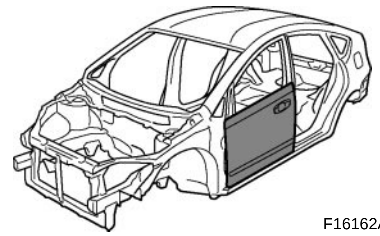
4. DOOR PARTS




F16105

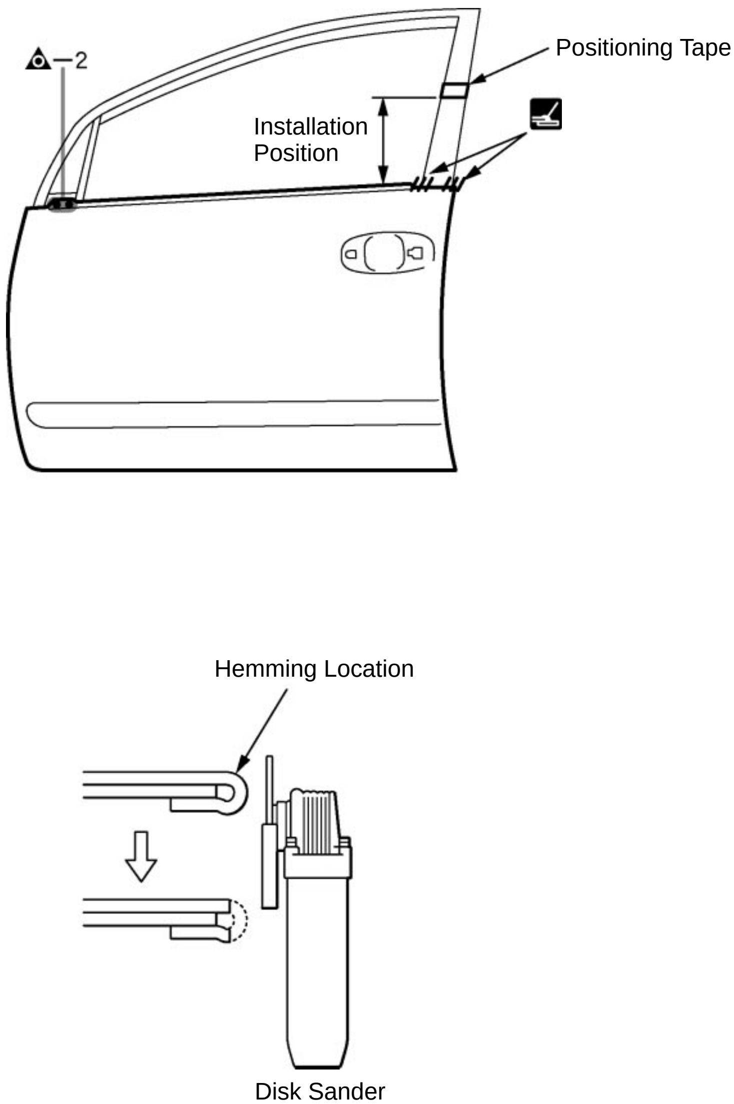
FRONT DOOR OUTER PANEL (ASSY)

REPLACEMENT



F16162A

REMOVAL

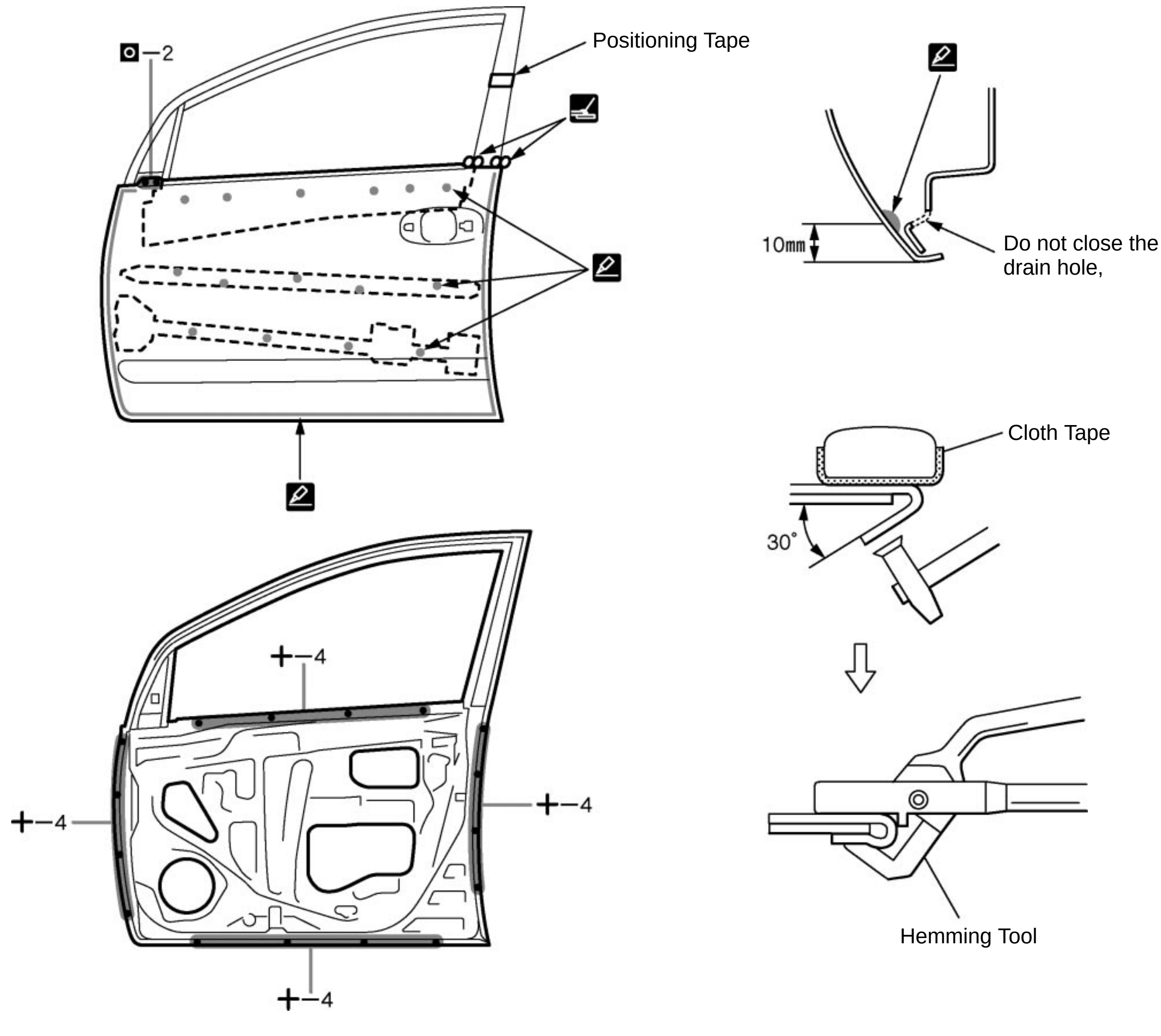


F16162

POINT

1 Before removing the outer panel, make the installation position with a tape.
2 After grinding off the hemming location, remove the outer panel.

INSTALLATION
- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16163

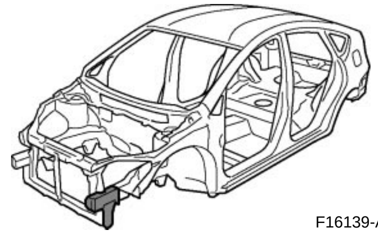
POINT

1 Before temporarily installing the new parts, apply body sealer to the reinforcement, side impact protection beam and back side of the new parts.
HINT:
1) Apply sealer evenly about 10mm (0.39in.) from the flange and 3mm (0.12in.) in diameter to the outer panel and apply just enough sealer for the reinforcement and side impact protection beam to make contact.

2 Bend the flange hem about 30° with a hammer and dolly, then fasten tightly with a hemming tool.
HINT:
1) Perform hemming in three steps, being careful not to warp the panel.
2) If a hemming tool cannot be used, hem with a hammer and dolly.

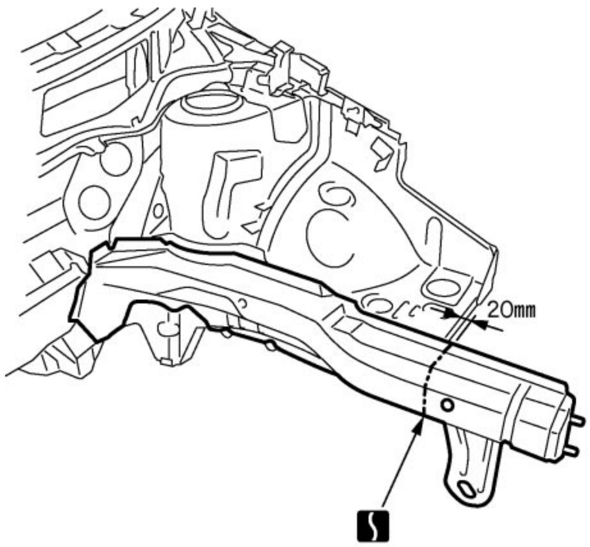
FRONT SIDE MEMBER (CUT-P)

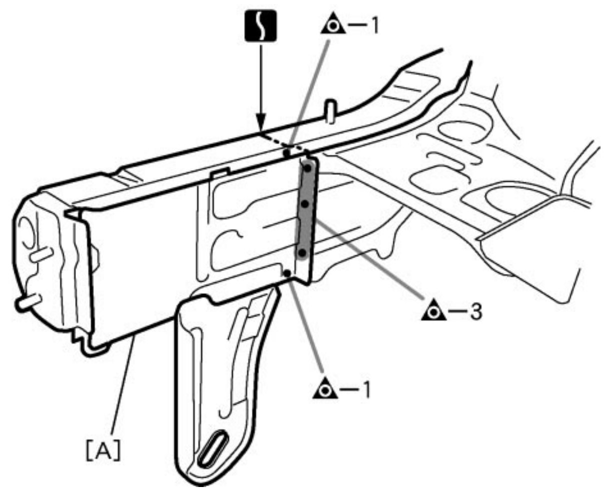
REPLACEMENT
With the radiator side support and front crossmember removed.



F16139-A

REMOVAL





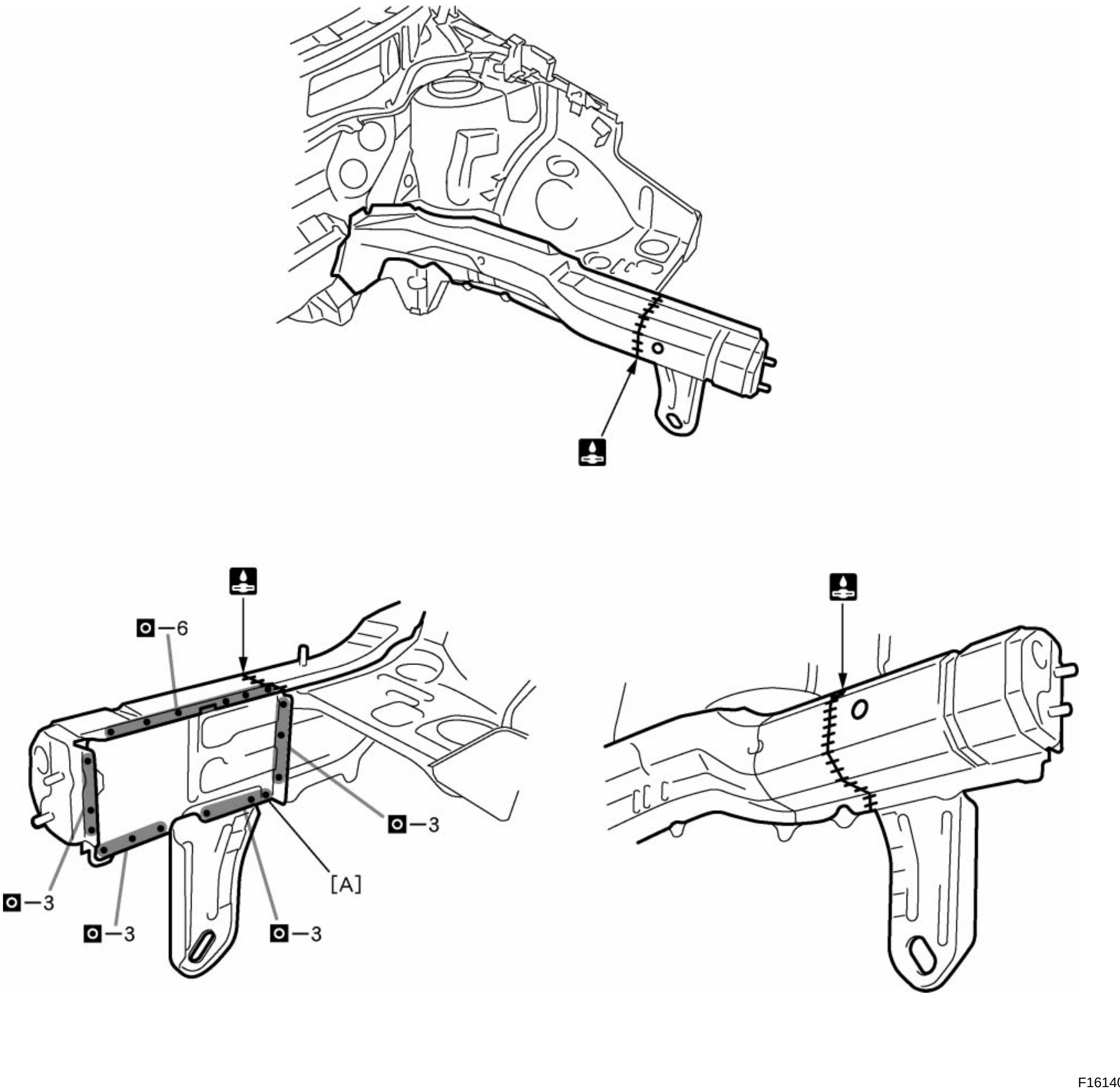
F16139

POINT
1 Rmove the [A] at the same time.

PART NAME
[A] Front Sidememeber Extension
20mm (0.79in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.

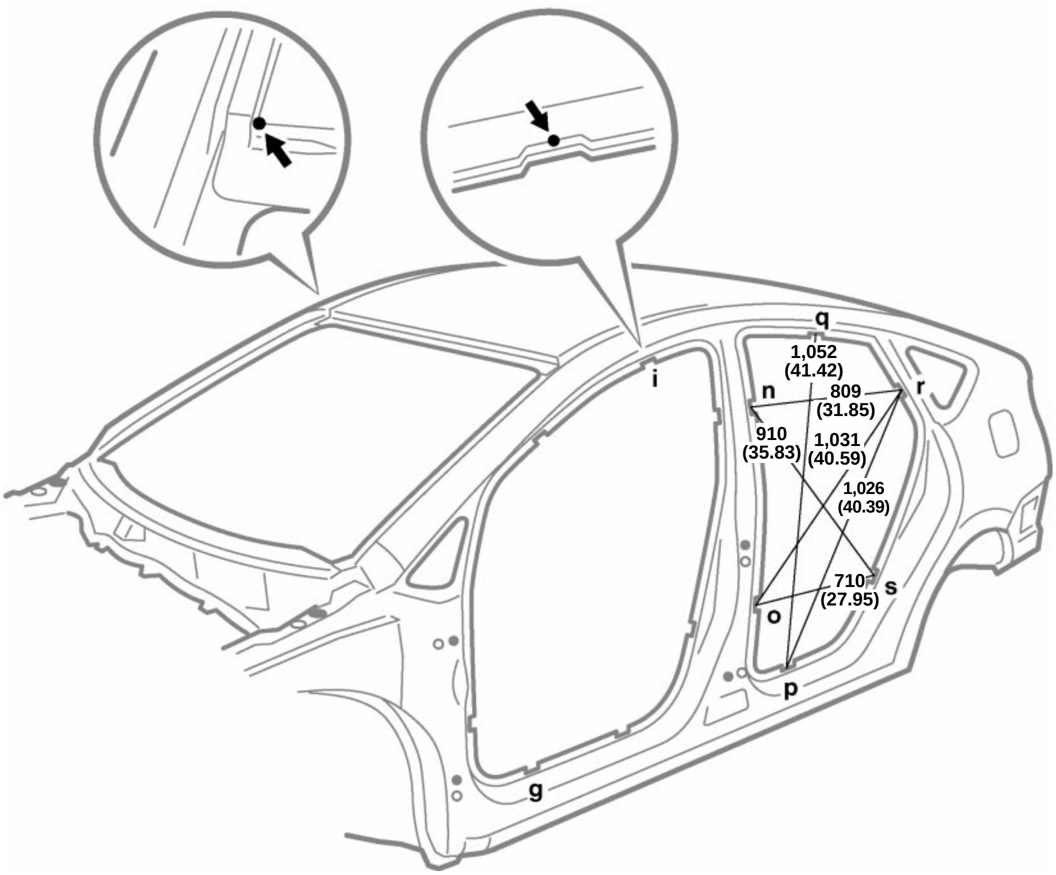


PART NAME

[A] Front Sidememeber Extension

BODY OPENING AREAS (Side View: Rear)

(Three-Dimensional Distance)



Vehicle Dimensions Left ↔ Right

N-n	O-o	P-p	Q-q	R-r	S-s
1,337 (52.64)	1,426 (56.14)	1,434 (56.46)	1,147 (45.16)	1,295 (50.98)	1,427 (56.18)

G-p or g-P	I-q or i-Q	N-r or n-R	N-s or n-S	O-s or o-S	P-q or p-Q	R-s or r-S
1,756 (69.13)	1,390 (54.72)	1,544 (60.79)	1,654 (65.12)	1,593 (62.72)	1,659 (65.31)	1,492 (58.74)

HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

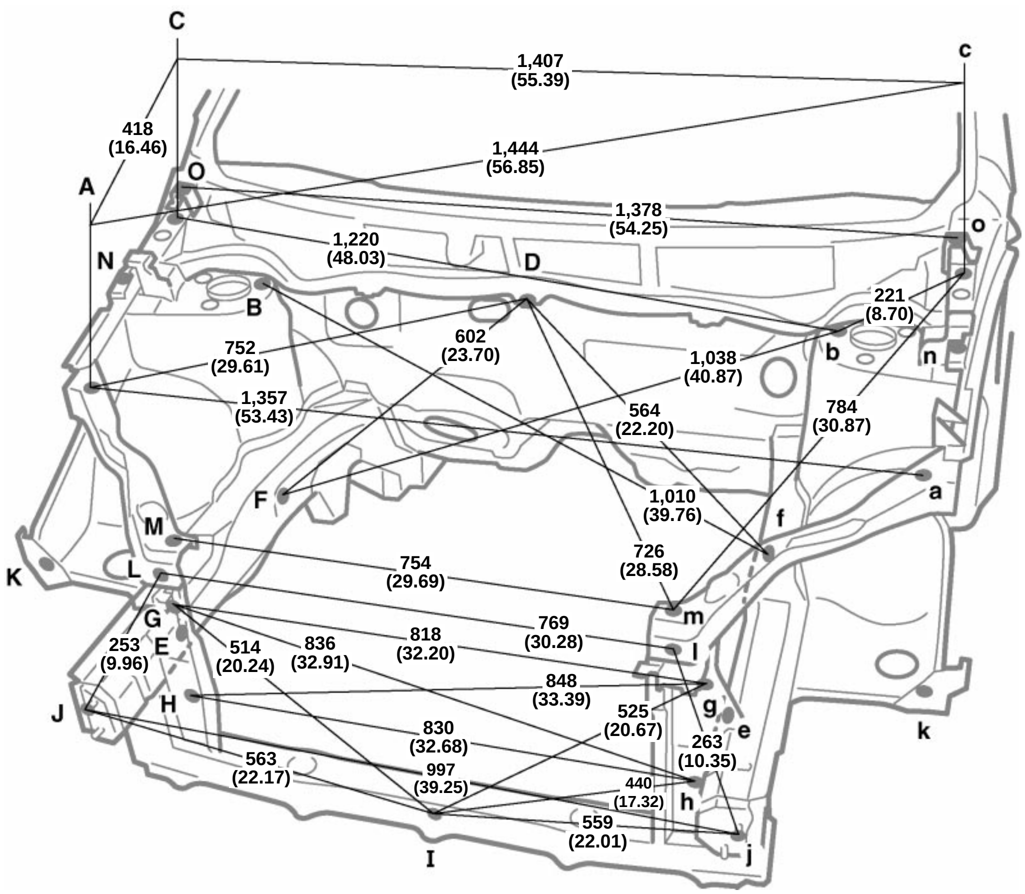
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
G, g	Rocker panel assembly mark	—	P, p	Rocker panel assembly mark	—
I, i	Roof side rail assembly mark	—	Q, q	Roof side rail assembly mark	—
N, n	Center body pillar assembly mark	—	R, r	Quarter panel assembly mark	—
O, o	Center body pillar assembly mark	—	S, s	Quarter panel assembly mark	—

BODY DIMENSION DRAWINGS

ENGINE COMPARTMENT

(Three-Dimensional Distance)



Height from Imaginary Standard Line

A, a	C, c	M, m
692 (27.24)	825 (32.48)	623 (24.53)

Vehicle Dimensions

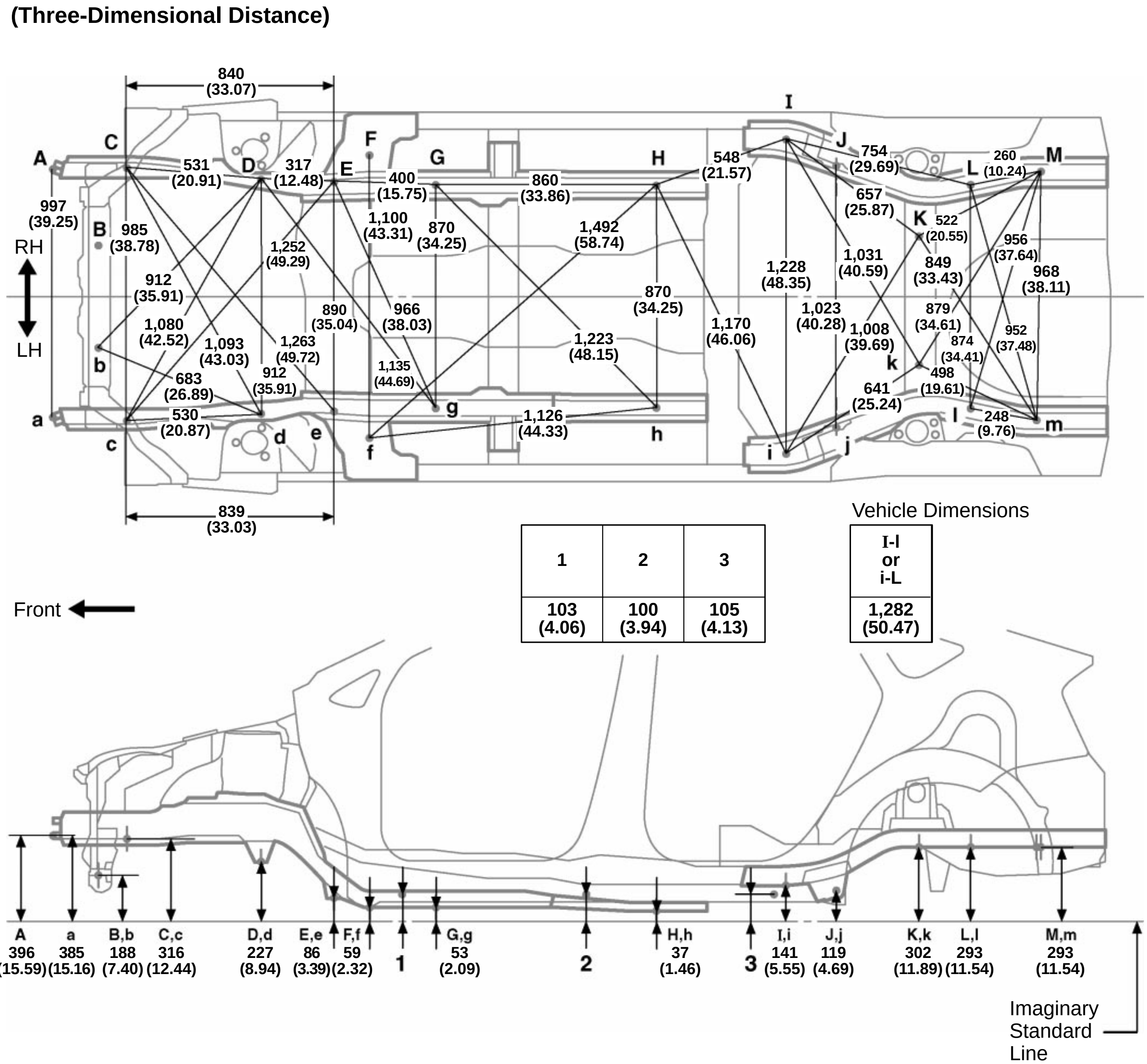
B-b	B-D or b-D	C-m or c-M	D-E	D-e	K-k	N-n	N-O or n-o	N-o or n-O
1,023 (40.28)	513 (20.20)	1,294 (50.94)	826 (32.52)	810 (31.89)	1,437 (56.57)	1,409 (55.47)	232 (9.13)	1,413 (55.63)

HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Radiator upper support standard hole	10 (0.39)	H, h	Radiator support standard hole	15 (0.59)
B, b	Front spring support hole-inner	11 (0.43)	I	Hood lock support installation nut	6 (0.24) nut
C, c	Hood hinge installation nut	8 (0.31) nut	J, j	Front bumper reinforcement installation bolt	8 (0.31) bolt
D	Cowl top outer panel installation nut	6 (0.24) nut	K, k	Front fender extension standard hole	7 (0.28)
E, e	Front side member standard hole	18 (0.71)	L, l	Radiator upper center support installation nut	6 (0.24) nut
F	Front side member standard hole	12 (0.47)	M, m	Radiator upper center support installation nut	6 (0.24) nut
f	Engine mounting installation nut	10 (0.39) nut	N, n	Front fender installation nut	6 (0.24) nut
G, g	Radiator support standard hole	10 (0.39)	O, o	Front fender installation nut	6 (0.24) nut

UNDER BODY



1	2	3
103 (4.06)	100 (3.94)	105 (4.13)

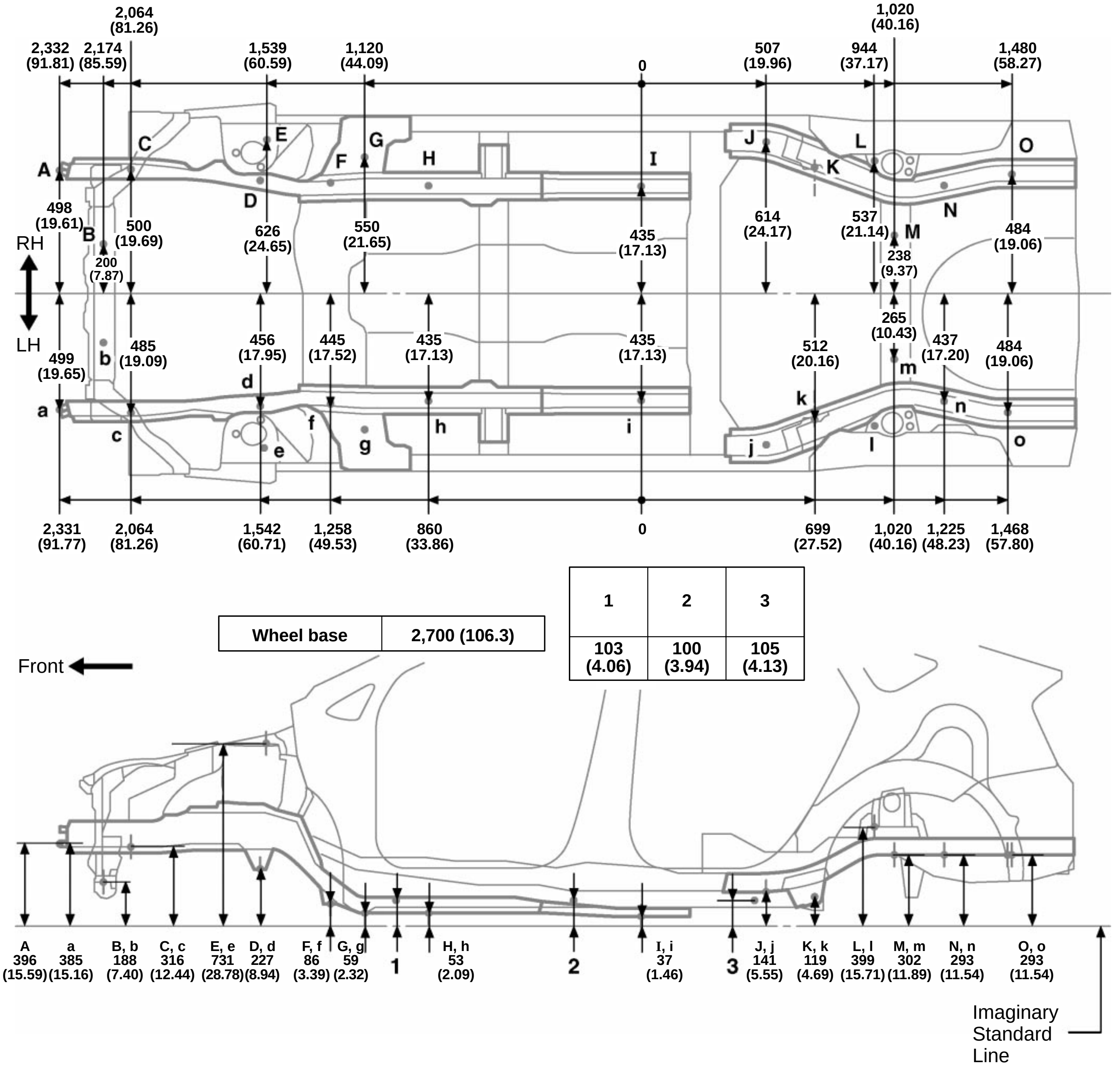
I-l or i-L
1,282 (50.47)

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front bumper reinforcement installation bolt	8 (0.31) bolt	H, h	Center member floor No.5 reinforcement standard hole	10 (0.39)
B, b	Radiator lower support standard hole	10 (0.39)	I, i	Rear floor side member standard hole	25 (0.98)
C, c	Front side member standard hole	18 (0.71)	J, j	Trailing arm installation hole inner	13 (0.51)
D, d	Front suspension crossmember installation nut	14 (0.55) nut	K, k	Rear floor No.2 crossmember standard hole	10 (0.39)
E, e	Front suspension crossmember installation nut	14 (0.55) nut	L, l	Rear floor side member standard hole	16 (0.63)
F, f	Torque box front standard hole	25 (0.98)	M, m	Rear floor side member standard hole	18 (0.71)
G, g	Front side member standard hole	18 (0.71)	—	—	—

UNDER BODY

(Three-Dimensional Distance)



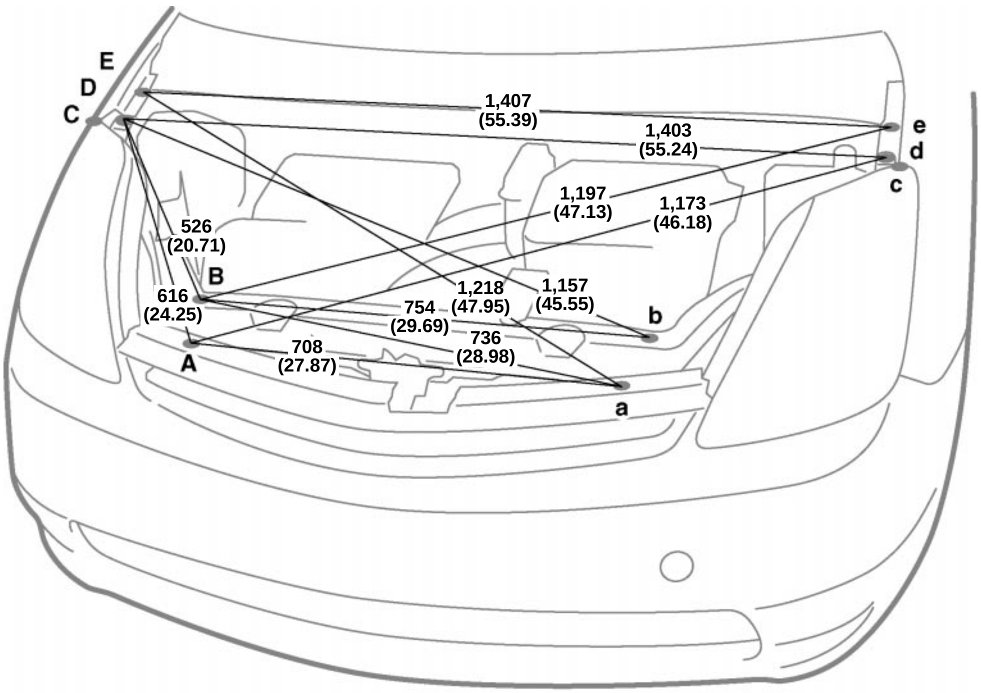
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front bumper reinforcement installation bolt	8 (0.31) bolt	I, i	Center member floor No.5 reinforcement standard hole	10 (0.39)
B, b	Radiator lower support standard hole	10 (0.39)	J, j	Rear floor side member standard hole	25 (0.98)
C, c	Front side member standard hole	18 (0.71)	K, k	Trailing arm installation hole inner	13 (0.51)
D, d	Front suspension crossmember installation nut	14 (0.55)nut	L, l	Rear spring bracket installation hole-front	12 (0.47)
E, e	Front spring support hole-outer	11 (0.43)	M, m	Rear floor No.2 crossmember standard hole	10 (0.39)
F, f	Front suspension crossmember installation nut	14 (0.55)nut	N, n	Rear floor side member standard hole	16 (0.63)
G, g	Torque box front standard hole	25 (0.98)	O, o	Rear floor side member standard hole	18 (0.71)
H, h	Front side member standard hole	18 (0.71)	—	—	—

REFERENCE VALUE

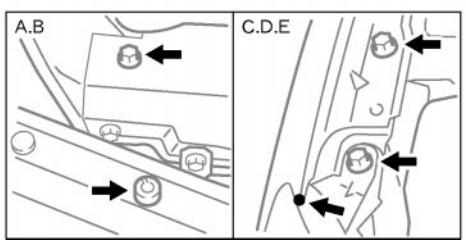
ENGINE COMPARTMENT

(Three-Dimensional Distance)



Vehicle Dimensions

A-B or a-b	A-E or a-e	C-c
96 (3.78)	698 (27.48)	1,449 (57.05)



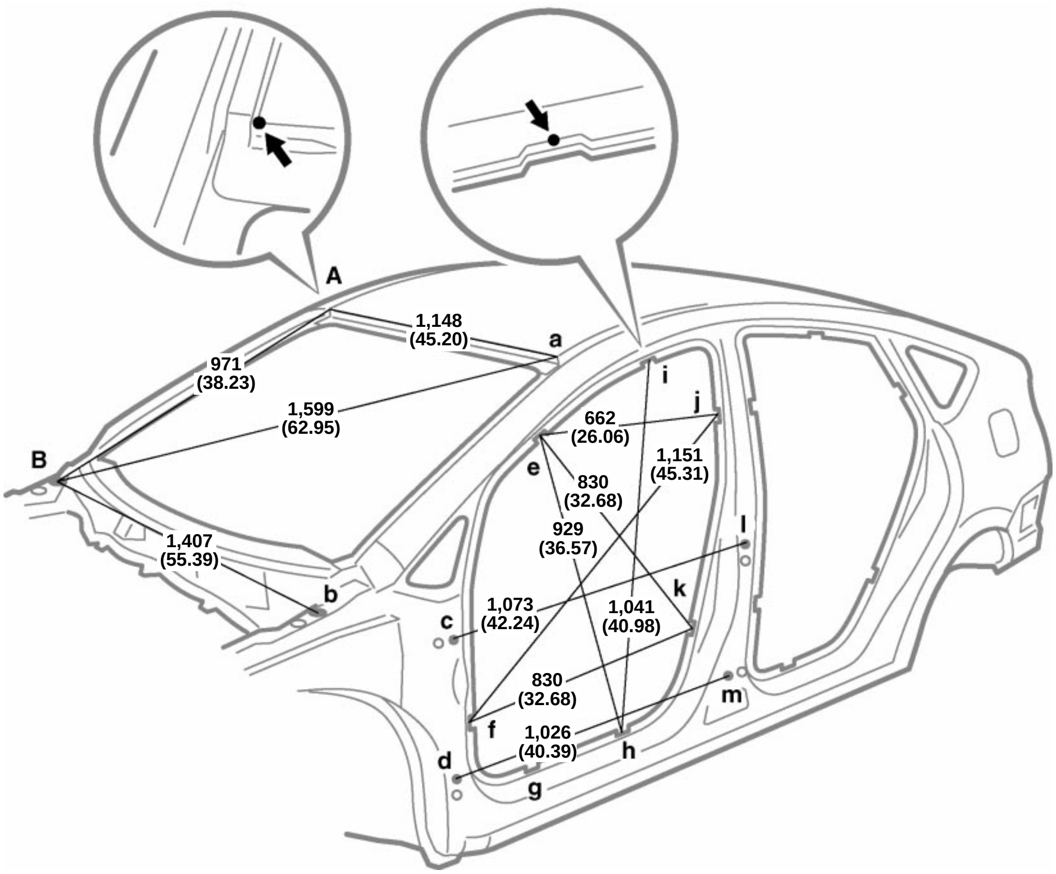
HINT: These values are actual measurements made on this model.
Use these reference values.

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Front bumper installation screw	—	D, d	Headlight installation screw	—
B, b	Radiator upper support installation bolt	—	E, e	Front fender installation bolt	—
C, c	Front end of front fender	—	—	—	—

BODY OPENING AREAS (Side View: Front)

(Three-Dimensional Distance)



Vehicle Dimensions Left ↔ Right

E-e	F-f	G-g	H-h	I-i	J-j	K-k
1,282 (50.47)	1,430 (56.30)	1,434 (56.46)	1,435 (56.50)	1,171 (46.10)	1,331 (52.40)	1,431 (56.34)

E-f or e-F	E-h or e-H	E-j or e-J	F-j or f-J	F-k or f-K	H-i or h-I	J-k or j-K
1,544 (60.79)	1,644 (64.72)	1,464 (57.64)	1,797 (70.75)	1,654 (65.12)	1,663 (65.47)	1,509 (59.41)

HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

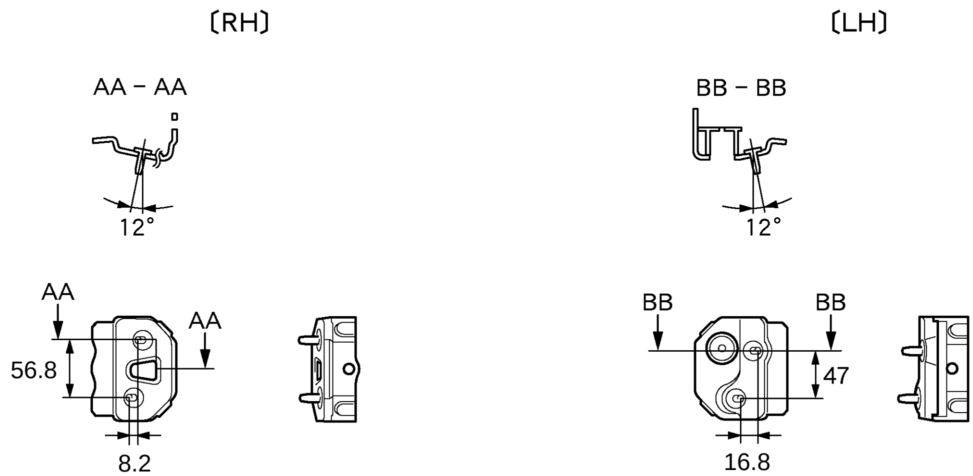
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Roof panel corner	—	H, h	Rocker panel assembly mark	—
B, b	Hood hinge installation nut-rear	8 (0.31) nut	I, i	Roof side rail assembly mark	—
C, c	Front door hinge installation nut	8 (0.31) nut	J, j	Center body pillar assembly mark	—
D, d	Front door hinge installation nut	8 (0.31) nut	K, k	Center body pillar assembly mark	—
E, e	Front body pillar assembly mark	—	L, l	Rear door hinge installation nut	8 (0.31) nut
F, f	Front body pillar assembly mark	—	M, m	Rear door hinge installation nut	8 (0.31) nut
G, g	Rocker panel assembly mark	—	—	—	—

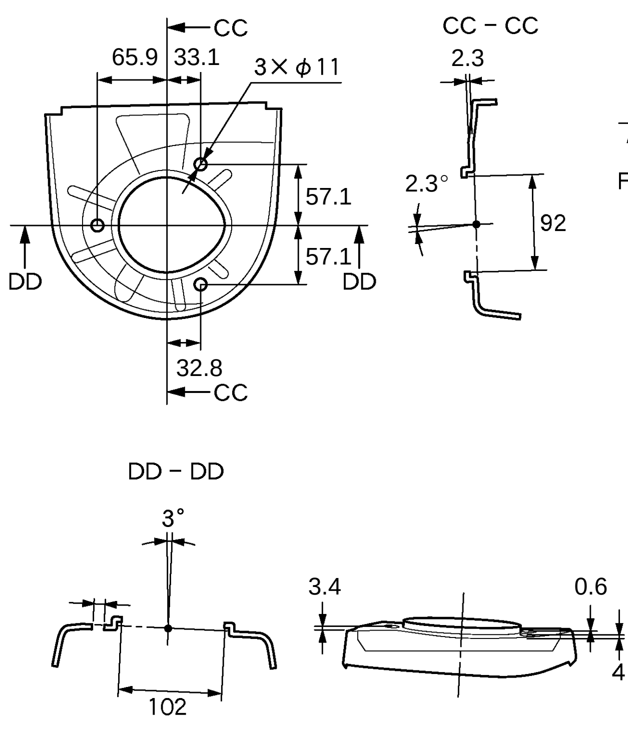
UNDER BODY

(Two-Dimensional Distance)

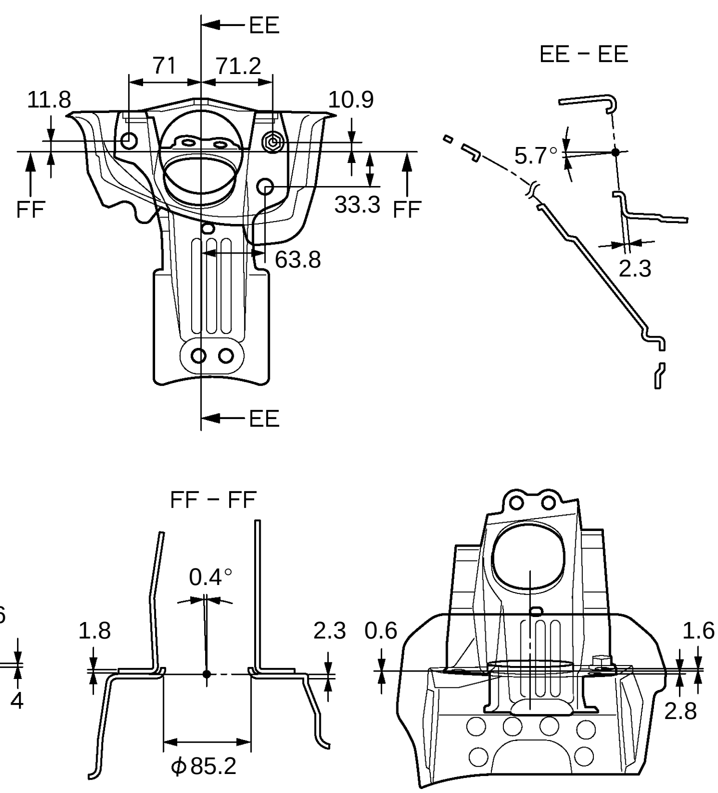
Front bumper reinforcement



Front spring support



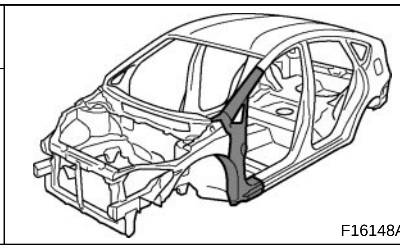
Rear spring support



mm

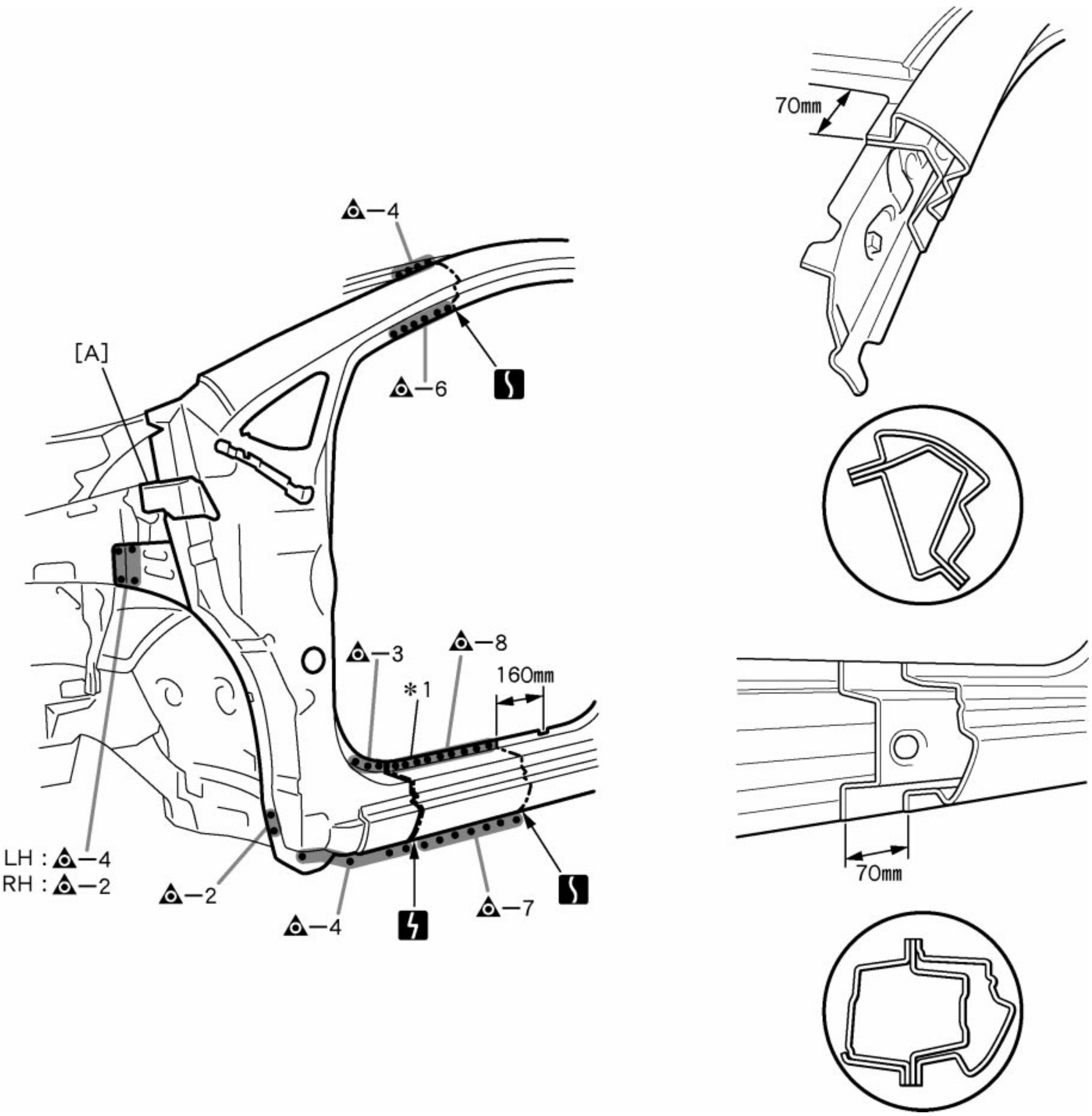
FRONT BODY PILLAR (CUT)

REPLACEMENT
With the cowl top side panel and cowl top inner side panel removed.



F16148A

REMOVAL

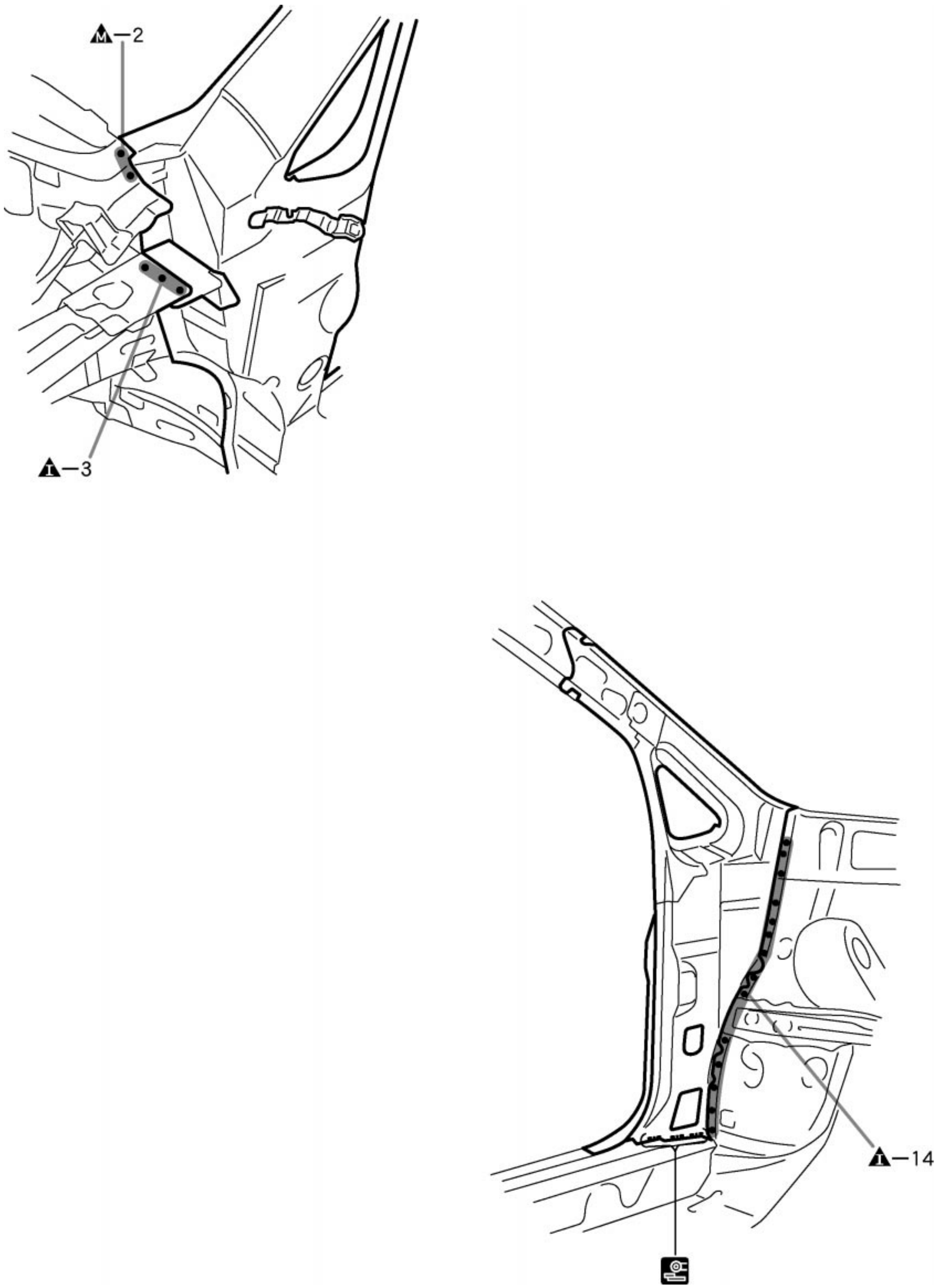


F16148

POINT
1 *1 : This part of the outer panel is reused, because the rocker panel section is cut off at the rear position behind the supplied parts cut position of the outer panel.
2 Replace the [A] at the same time.

PART NAME
[A] Cowl Top Side Reinforcement

70mm (2.76in.) 160mm (6.30in.)



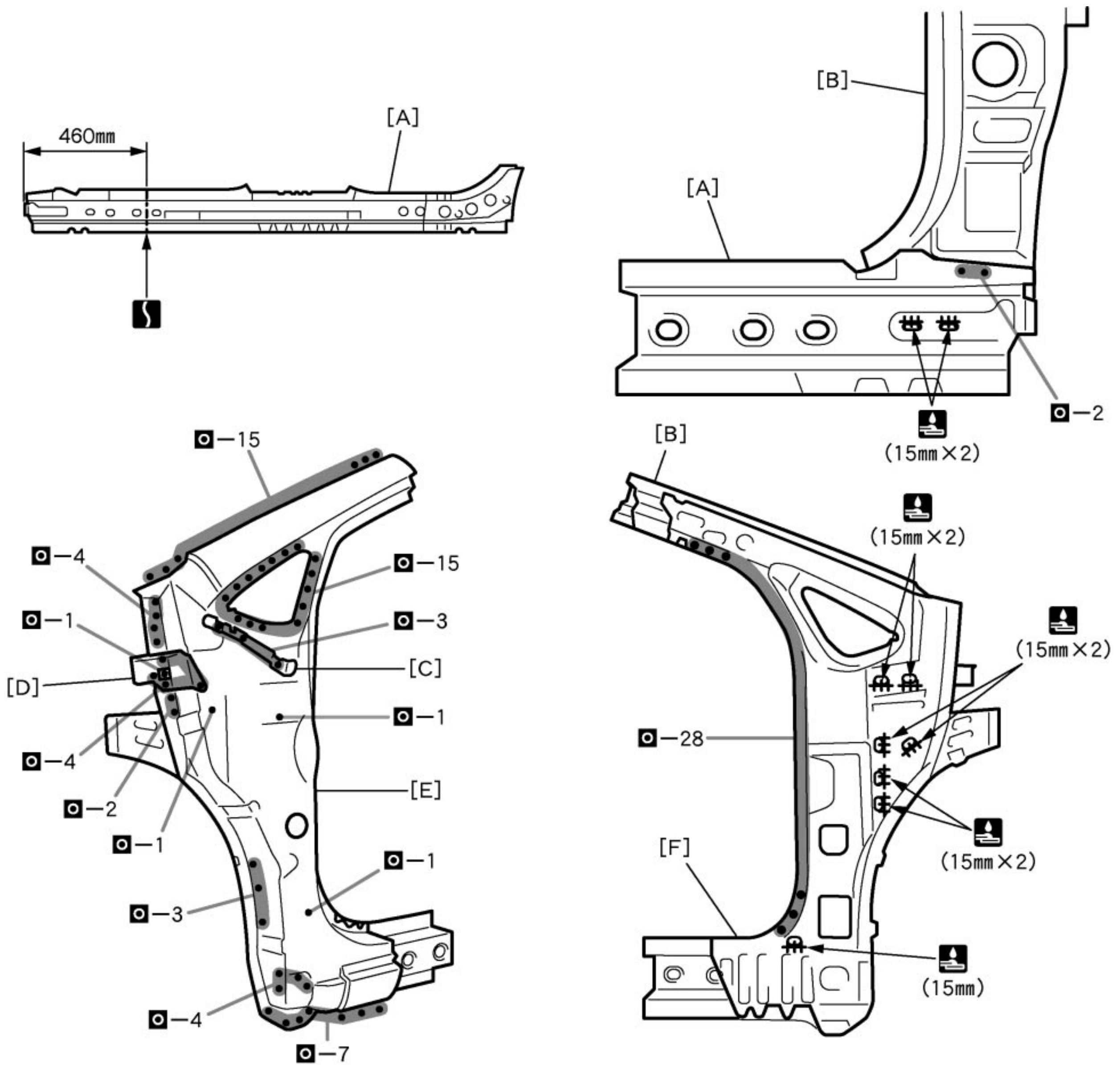
F16149

POINT

1 Remove the remaining foamed from the vehicles side.

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16150

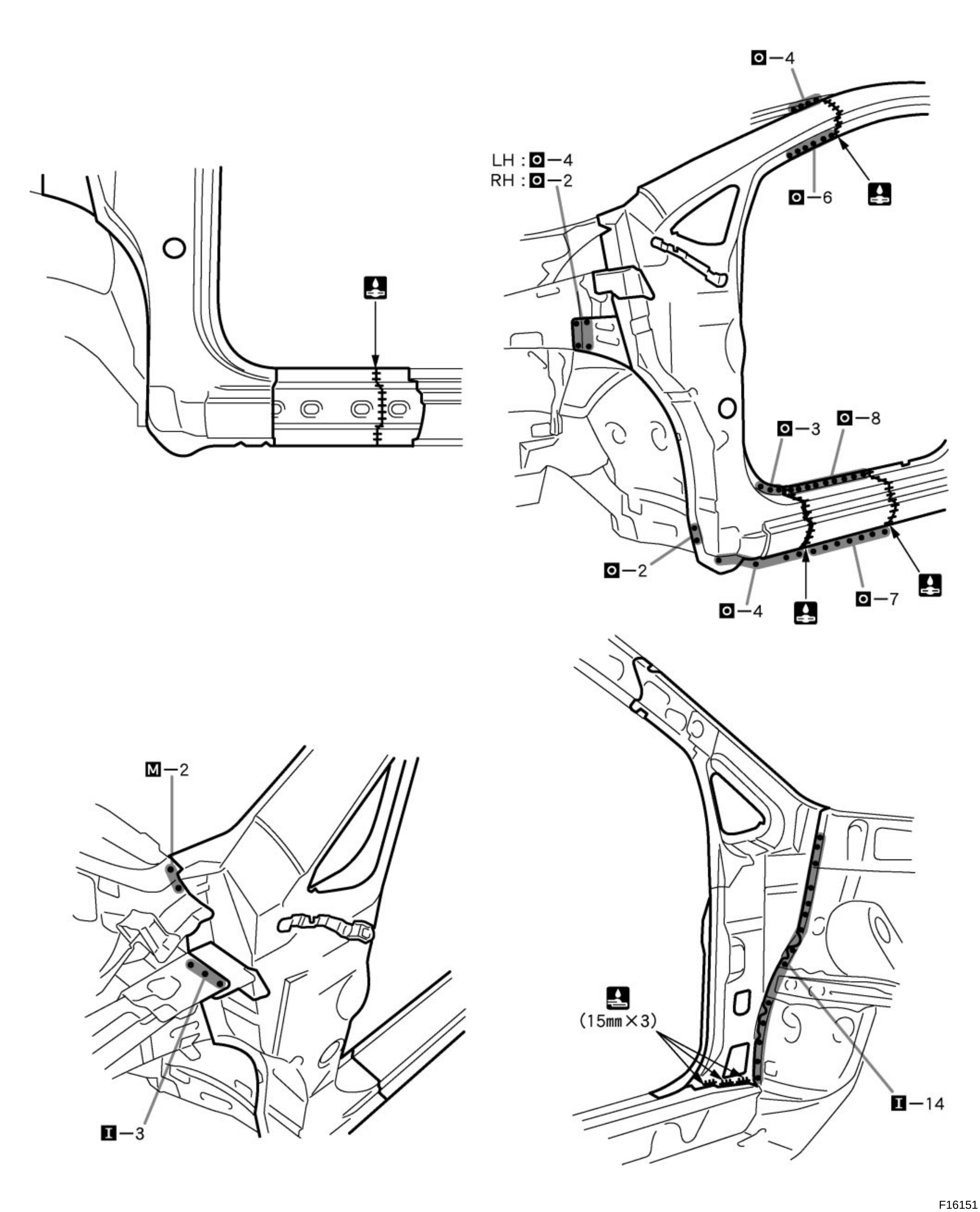
POINT

1 Before temporarily installing the new parts, weld the [A], [B], [C], [D], [E], and [F] with standard points.

PART NAME

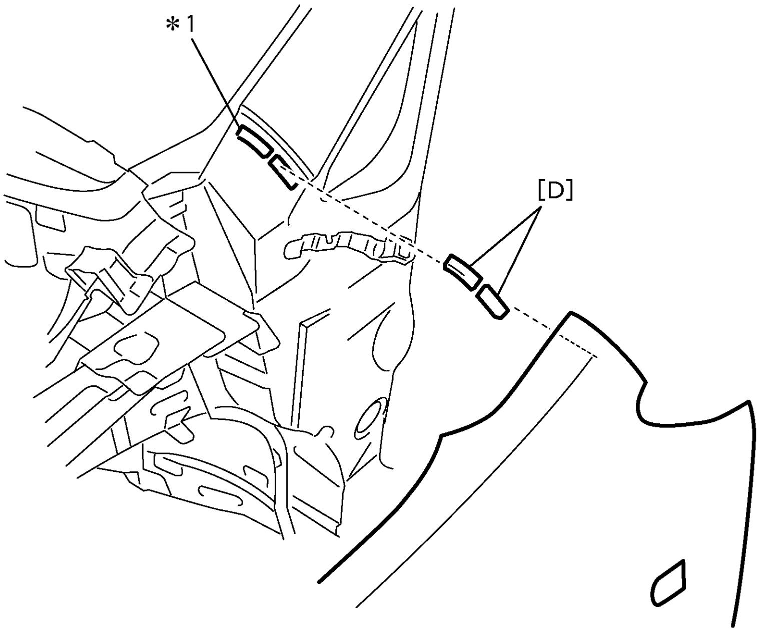
[A] Rocker Outer Reinforcement [B] Front Body Pillar Lower Reinforcement
[C] Front Fender Rear No, 2 Bracket [D] Cowl Top Side Reinforcement [E] Outer Pillar
[F] Front Body Upper Inner Pillar

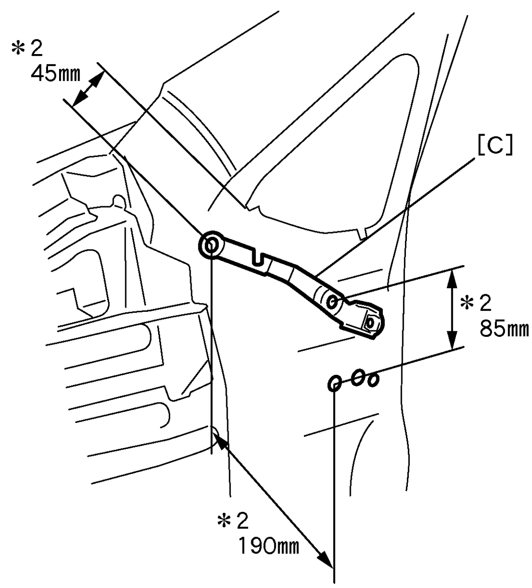
460mm (18.11in.) 15mm (0.59in.)



POINT

1 Inspect the fitting of the front door, front fender and windshield glass, etc., before welding, since this affects the appearance of the finish.





POINT

1 *1: Area where [D] is to be installed. *2: Reference value

2 Place the front fender. For installation of [D], measure the distance between the front fender and *1. Select a thickness of [D] from 7mm, 7.5mm and 8mm.

3 Fit the front fender, pushing down the attached [D], and checking that it does not rattle.

HINT:

1) If having wobbles, change the [D] to the thicker one. Also, check the alignment of the front fender again.

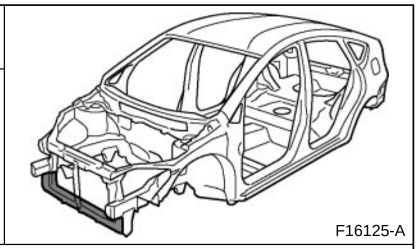
PART NAME

[C] Front Fender Rear No.2 Bracket [D] Front Fender Spacer

7mm (0.28in.) 7.5mm (0.30in.) 8mm (0.31in.) 45mm (1.77in.) 85mm (3.35in.) 190mm (7.48in.)

FRONT CROSSMEMBER (ASSY)

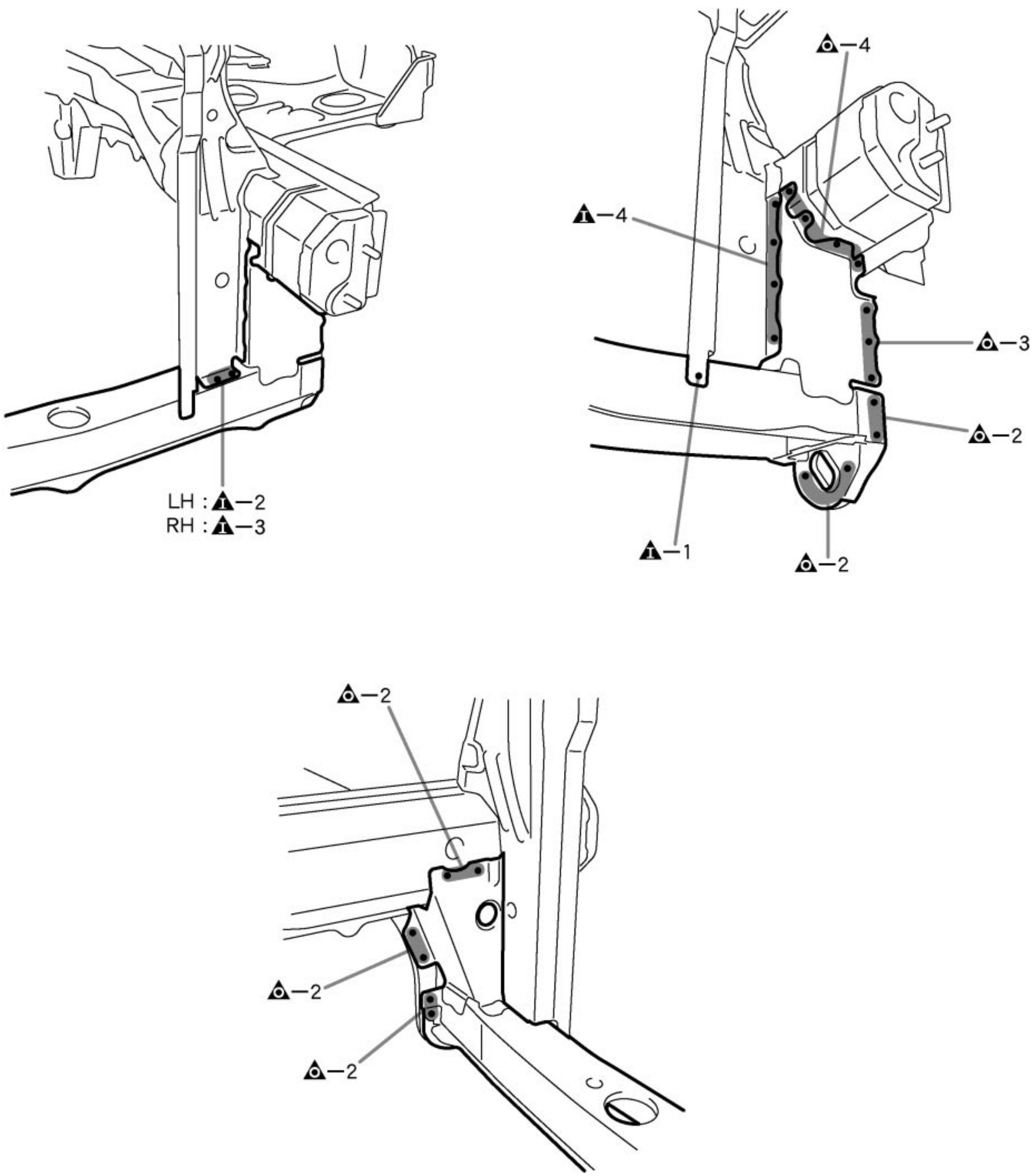
REPLACEMENT



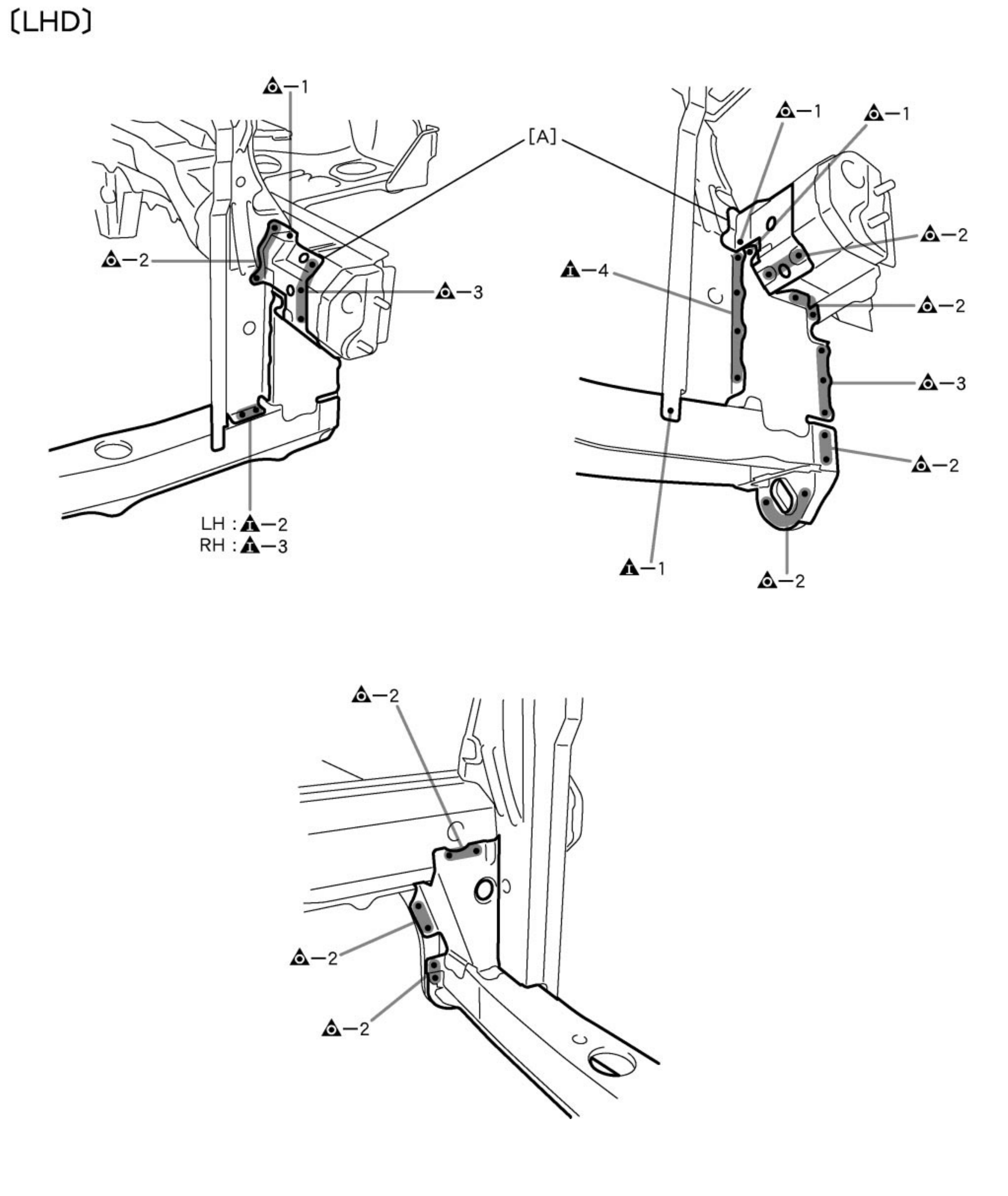
F16125-A

REMOVAL

〔RHD〕



F16125



POINT

1 Remove the [A] at the same time.

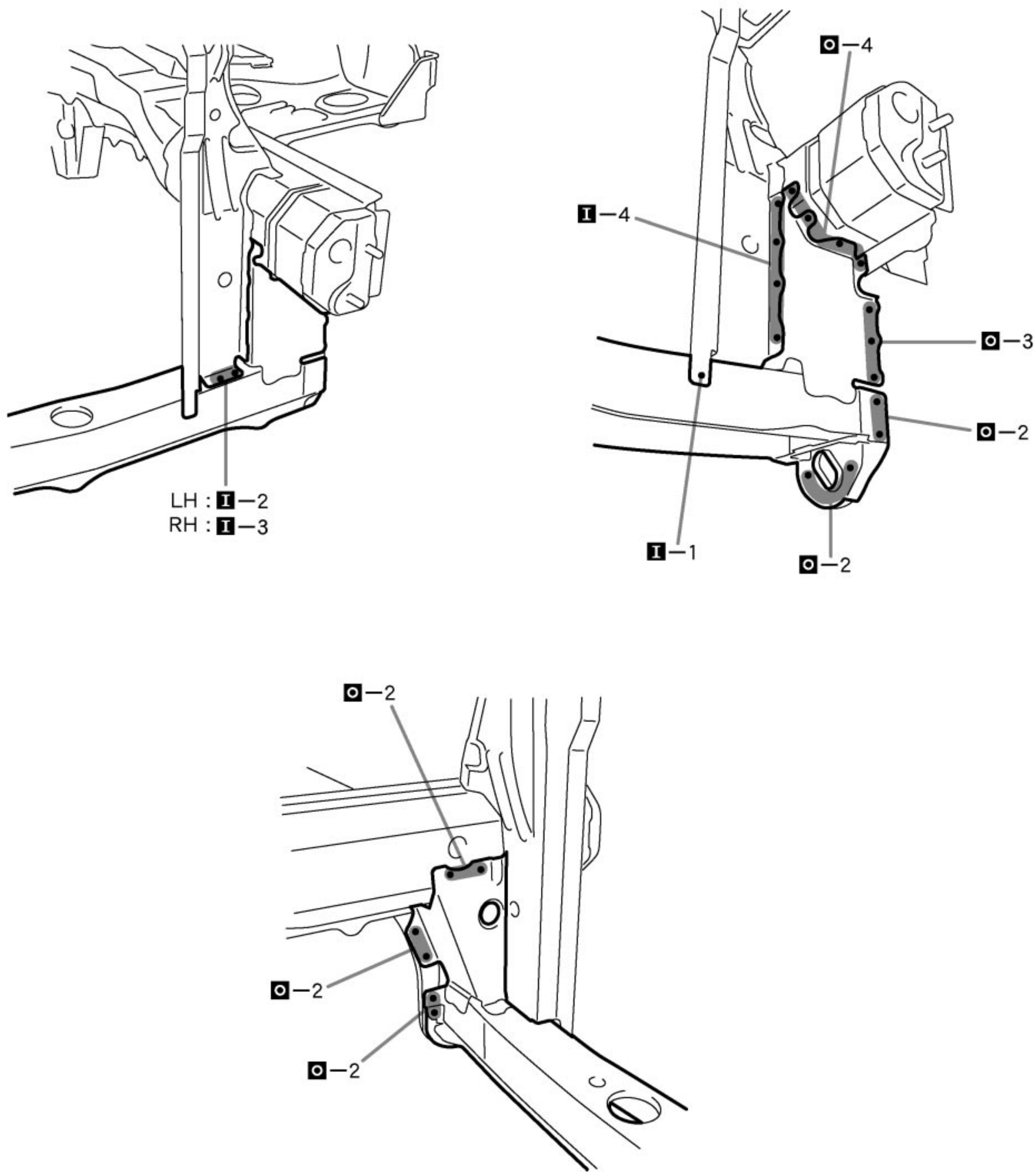
PART NAME

[A] Front Sidemember Support

INSTALLATION

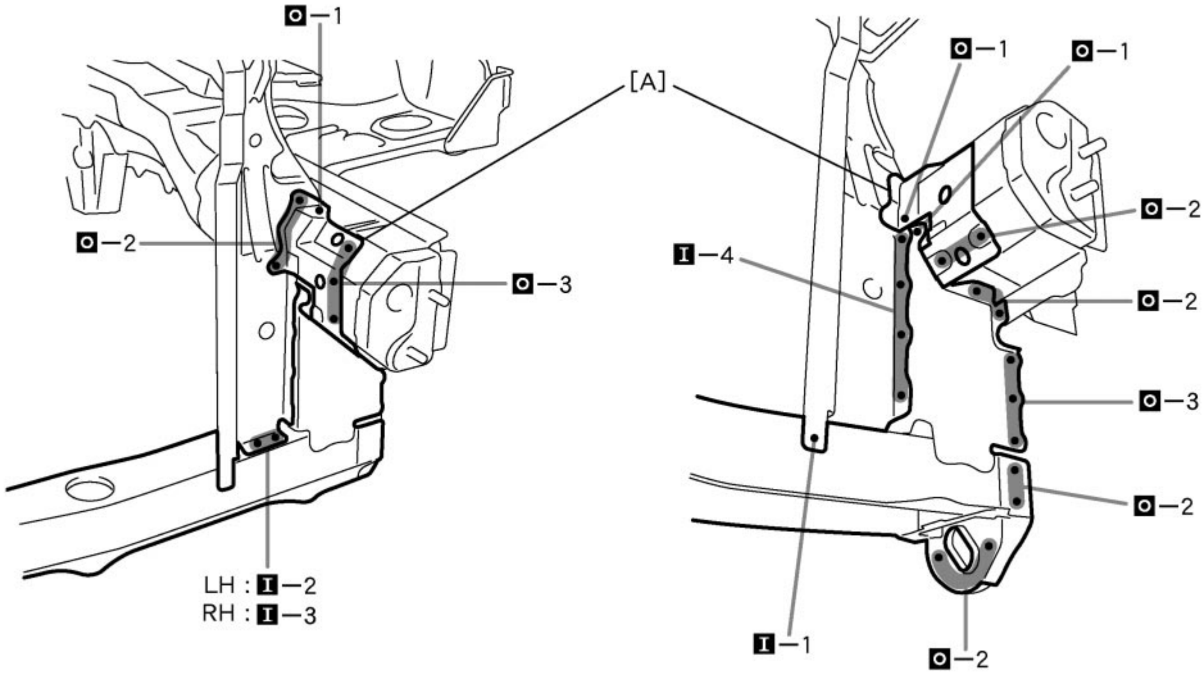
- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.

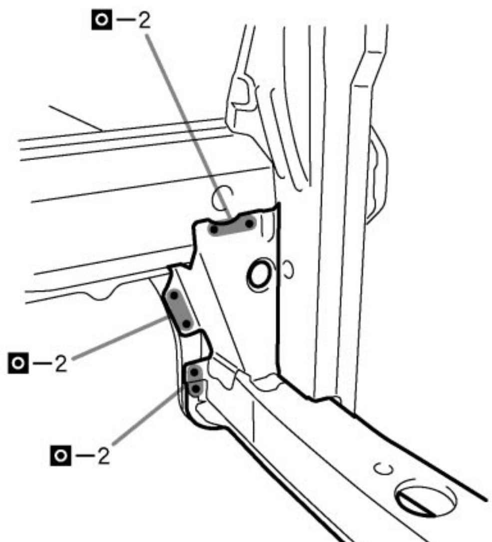
〔RHD〕



F16127

〔LHD〕



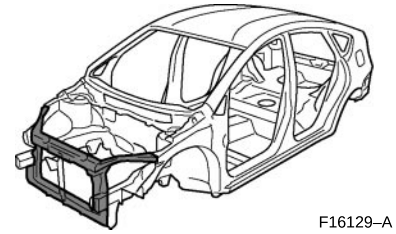


F16128

PART NAME
[A] Front Sidemember Support

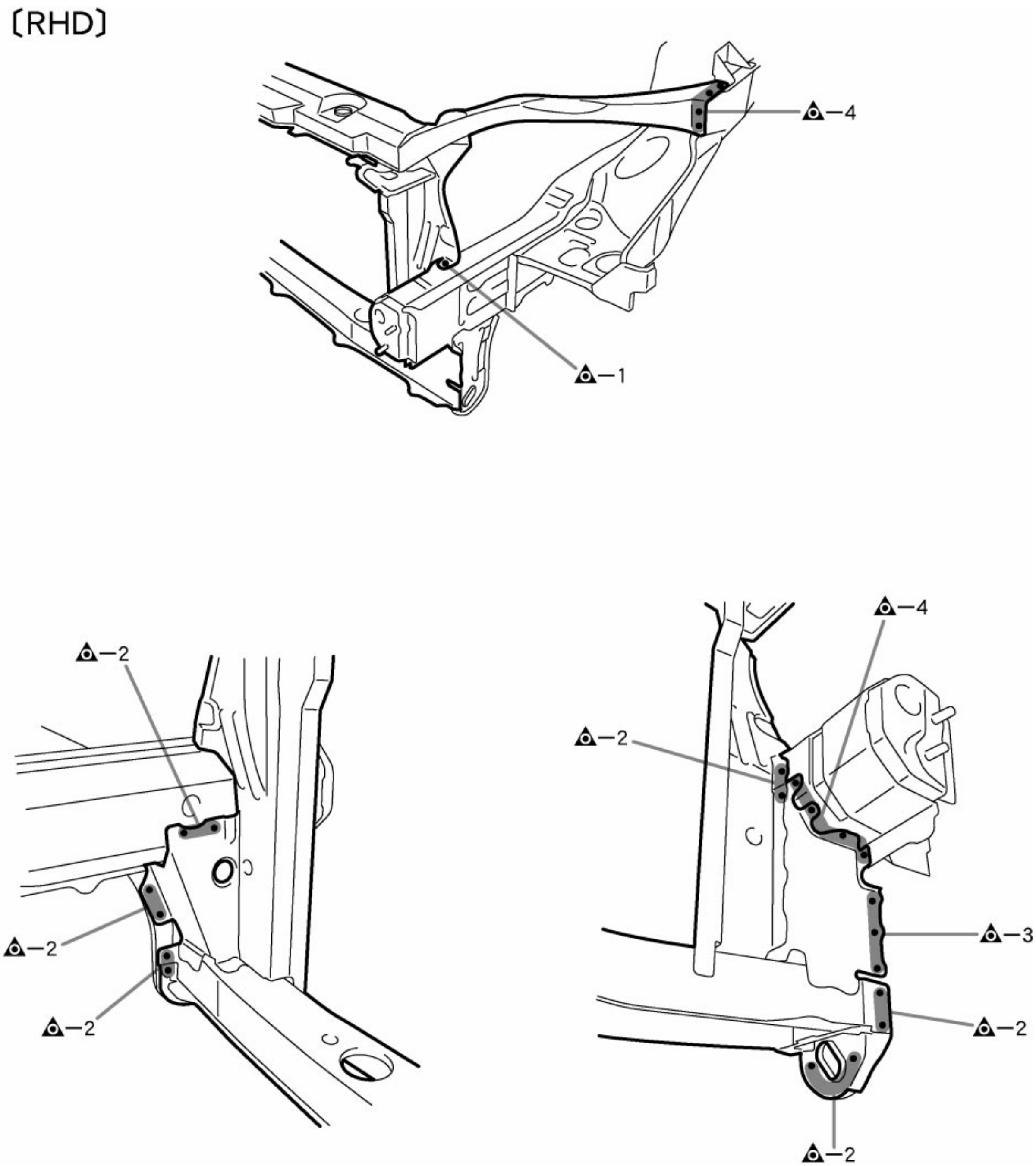
RADIATOR SUPPORT (ASSY)

REPLACEMENT

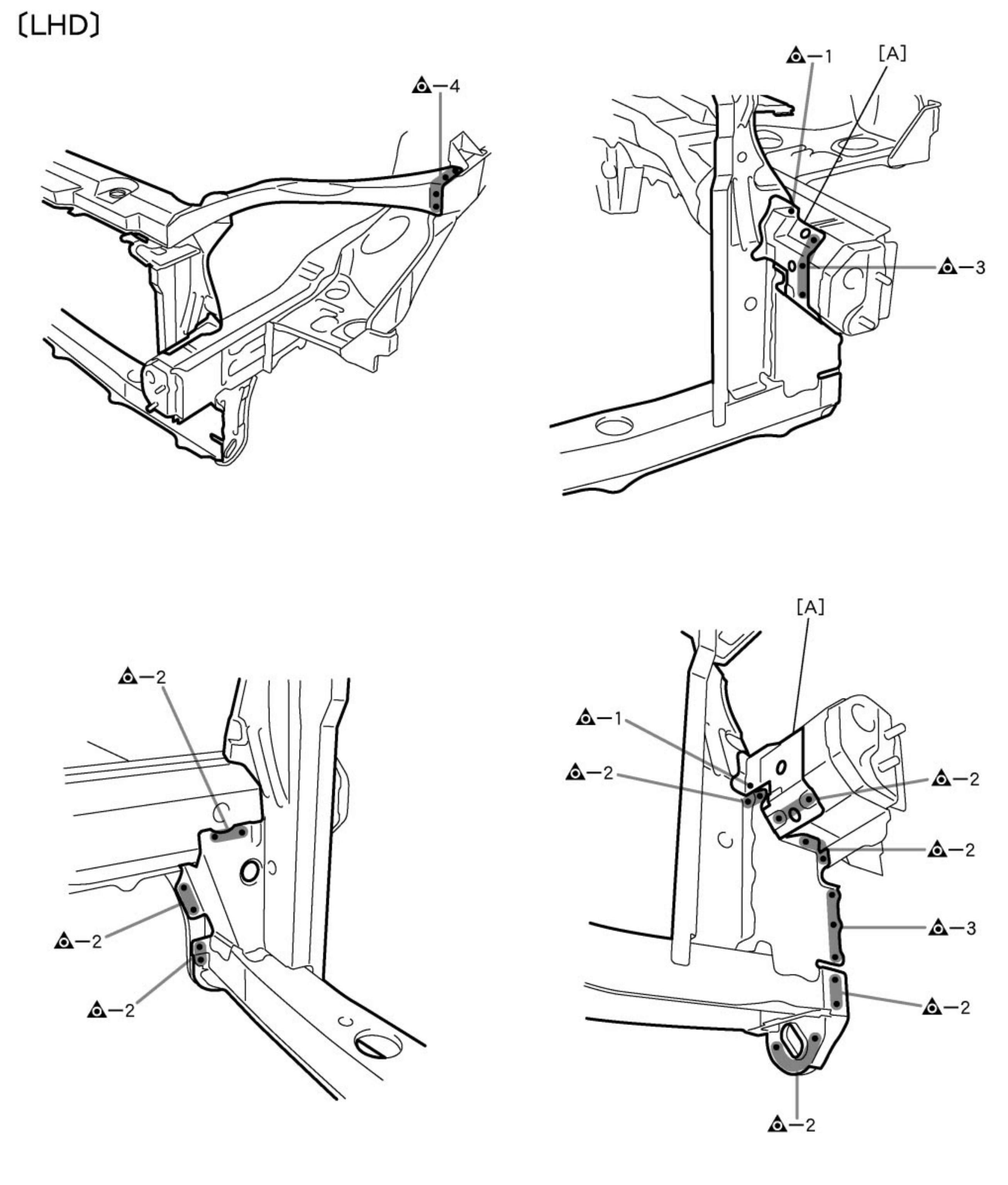


F16129–A

REMOVAL



F16129



F16130

POINT

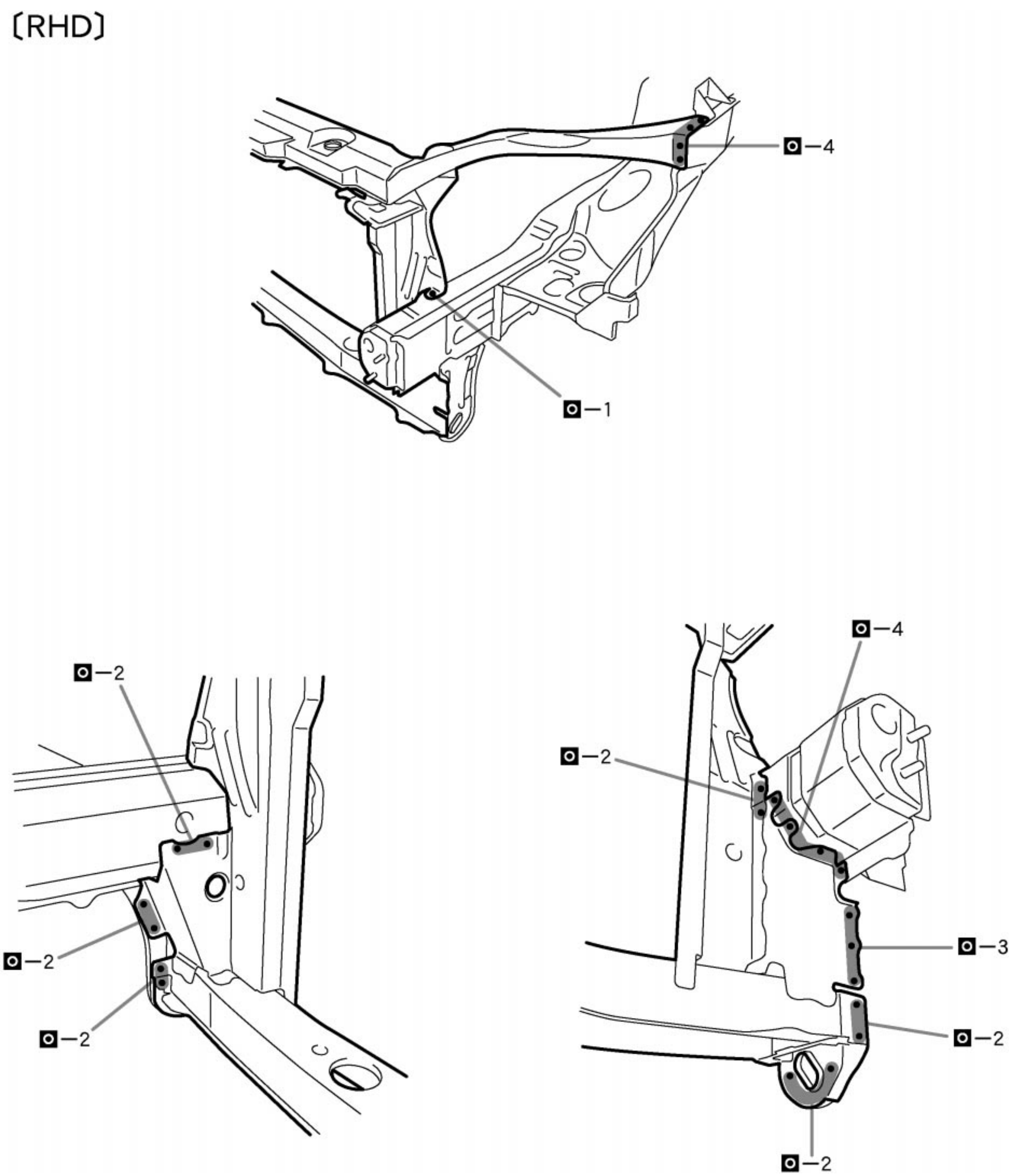
1 Remove the [A] at the same time.

PART NAME

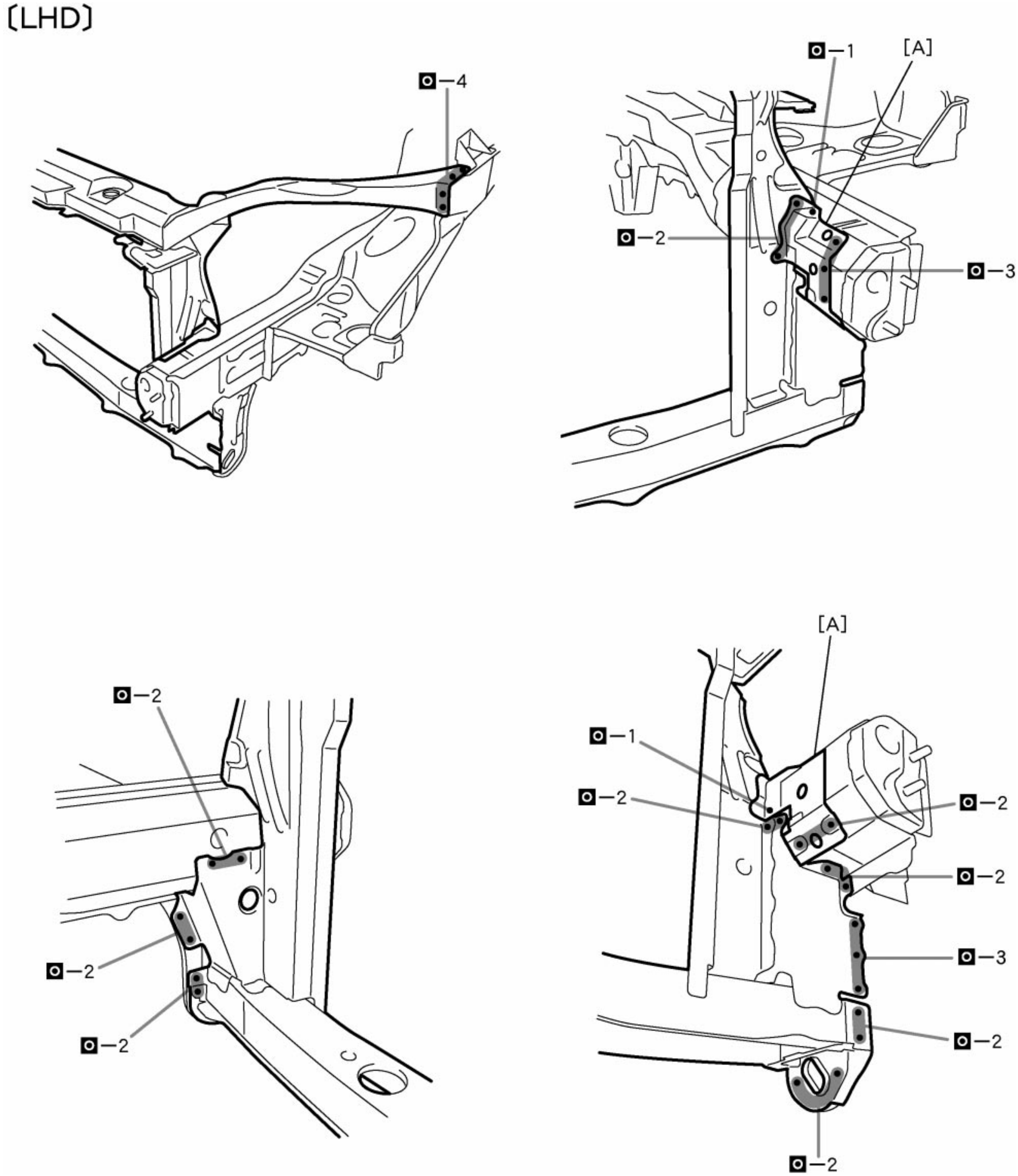
[A] Front Sidemember Support

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16131



F16132

PART NAME
[A] Front Sidemember Support

COLLISION REPAIR INFORMATION

FOR THE TOYOTA DEALER

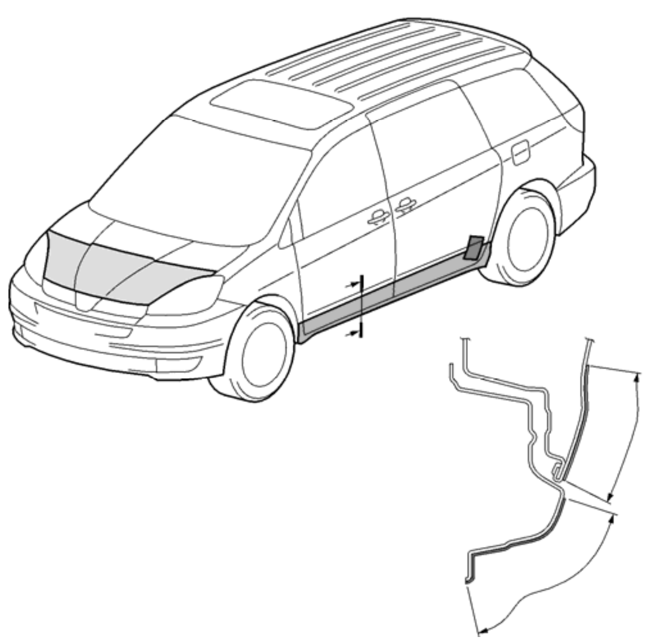
TITLE:	CHIP RESISTANT COATINGS
SECTION:	EXTERIOR — BULLETIN # 141
MODELS:	ALL TOYOTA & LEXUS
DATE:	OCTOBER 2004

BACKGROUND

During collision repair and refinishing operations it may be necessary to restore corrosion protection and chip resistant coatings to repaired and/or replacement panels. PVC chip guard and chip resistant primer is typically applied to lower body panel and wheel opening exposures, and chip resistant primer is typically applied to wheel opening areas and the leading exposures of hoods and fenders. Follow model specific recommendations supplied in Repair Manuals For Collision Damage for restoring chip resistant coatings. An example is provided. It is also recommended to apply a suitable epoxy primer to bare metal before body filler application to ensure corrosion protection and improve adhesion. Paint vendors listed on this bulletin have supplied product information to help collision repair professionals identify available products. Consult paint manufacturer for product technical data and for specific mixing and application information.

Example: Sienna

- Anti-Chipping Primer
- PVC
- Anti-Chipping Tape



PLEASE ROUTE THIS BULLETIN TO YOUR COLLISION REPAIR CENTER MANAGER AND COLLISION REPAIR TECHNICIANS

Chip Resistant Coatings, and Roll-on Primer Recommendations by Paint System

	Roll-On Primer	PVC Chip Guard	Chip Resistant Primer
Glasurit	285-60 & 285-81	1109-1240/4	285-60***
RM	R-M DP21 & DP200	*	R-M DP 21***
DuPont	**	220S	2340S
Nexa Autocolor	P565-510	*	P565-779
PPG	SX1060	DX54	DP or SX1056
Sherwin Williams	**	Spectraprime-Spectraseal	Spectraprime-Spectraseal
Sikkens	Autosurfacer EP	OTO Bodycoat	Colorbuild w/Elasto-O-Actif
Spies-Hecker	**	Permahyd Stone Chip Protector 7100	Permacron Vario Surfacer 859 w/Elastic Additive 9050
Standox	**	Standohyd Stone Chip Primer	2K Nonstop Primer Filler W/2K Plasticizer

Note: All refinish systems strongly recommend following product-specific technical instructions for product use.

* Recommends compatible chip guard product from local vendors.

** Product recommendation not available at time of printing.

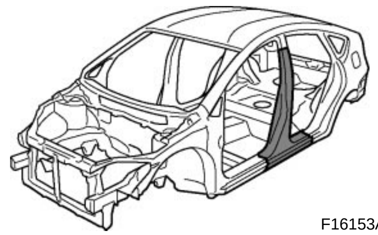
*** Has special product application recommendation.

If you should have any further questions about the listed chip resistant coatings consult paint system technical hotline or local representative.

PLEASE ROUTE THIS BULLETIN TO YOUR COLLISION REPAIR CENTER MANAGER AND COLLISION REPAIR TECHNICIANS

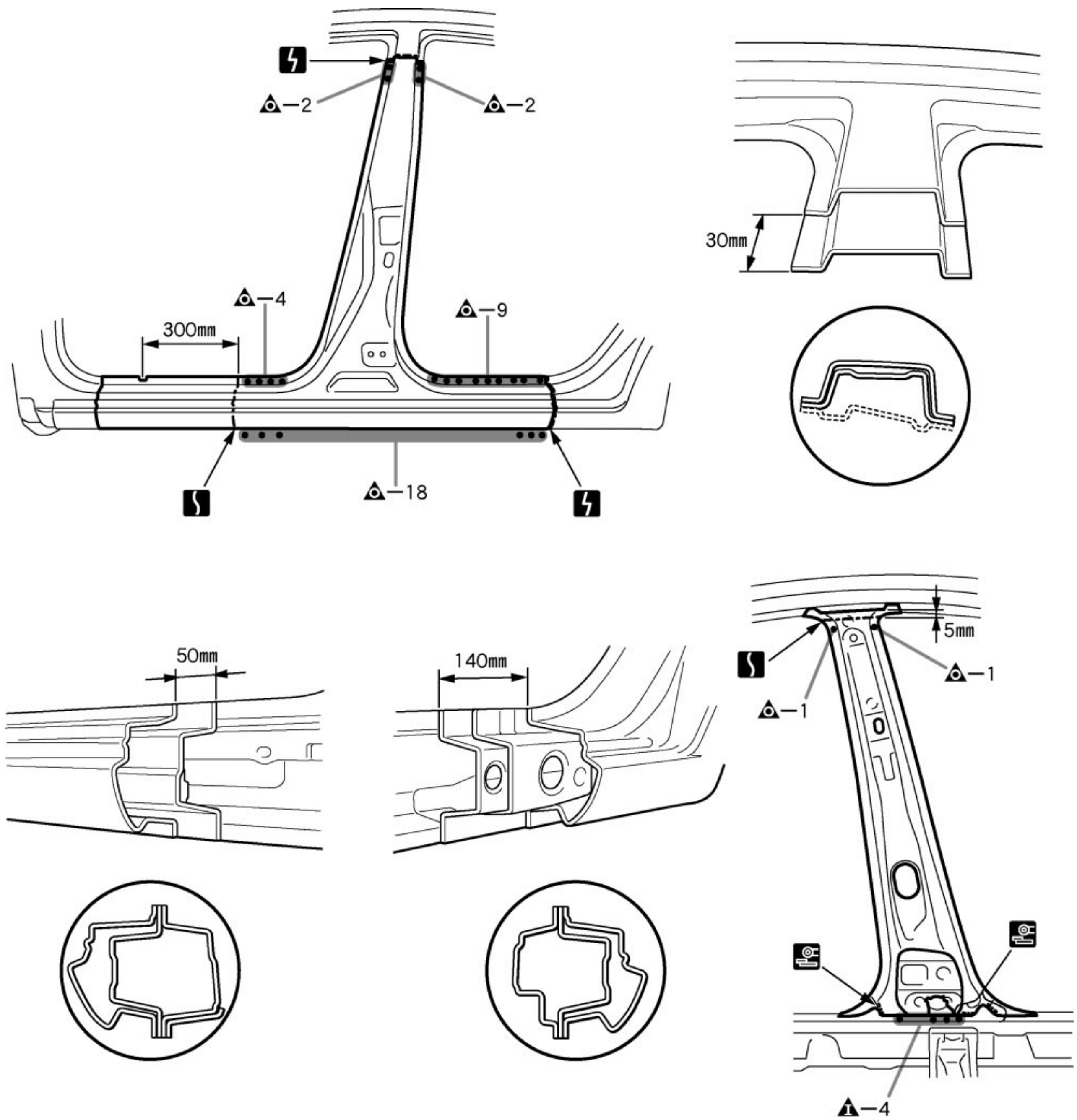
CENTER BODY PILLAR (CUT)

REPLACEMENT



F16153A

REMOVAL

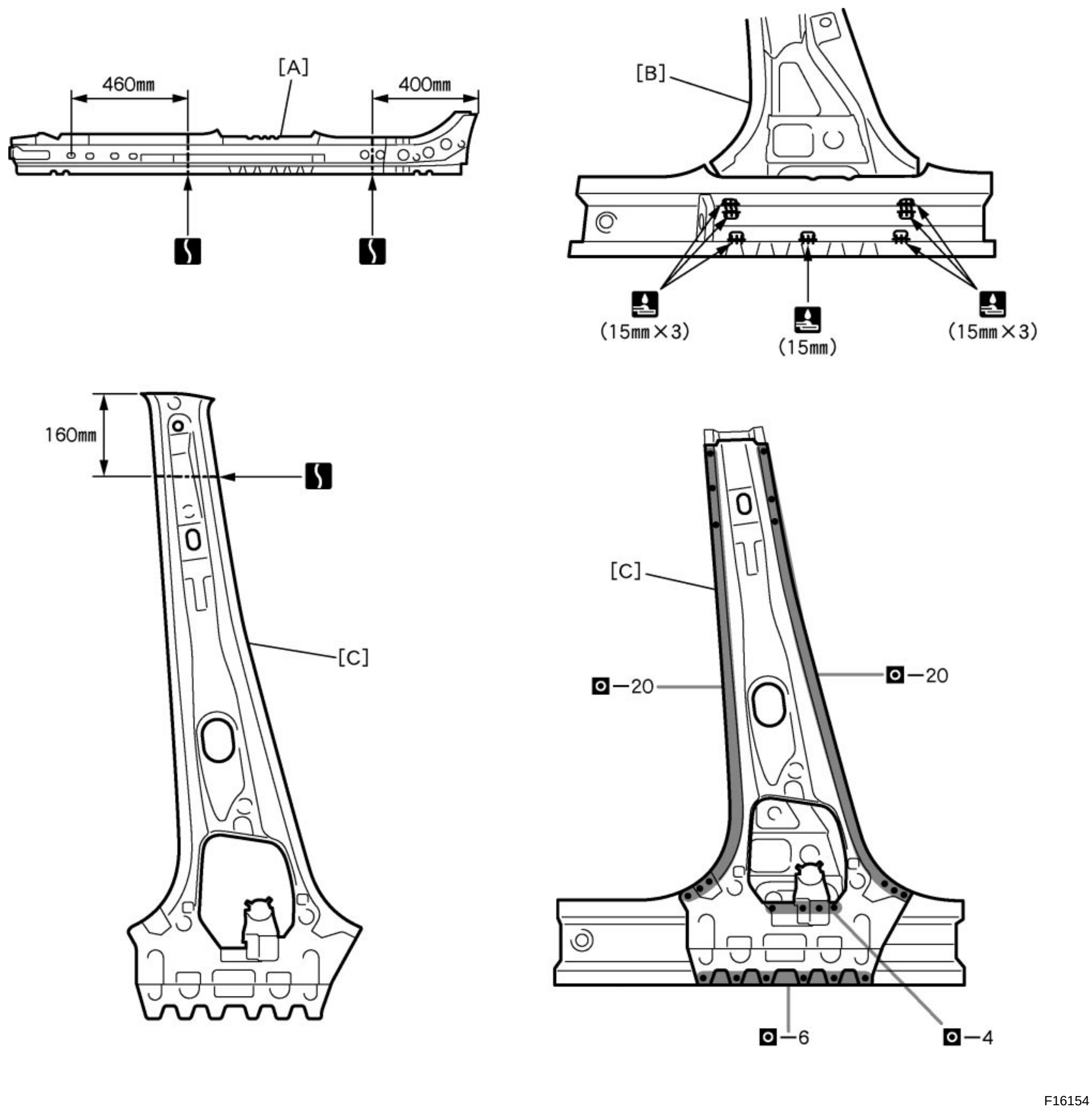


F16153

5mm (0.20in.) 30mm (1.18in.) 50mm (1.97in.) 140mm (5.51in.) 300mm (11.81in.)

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



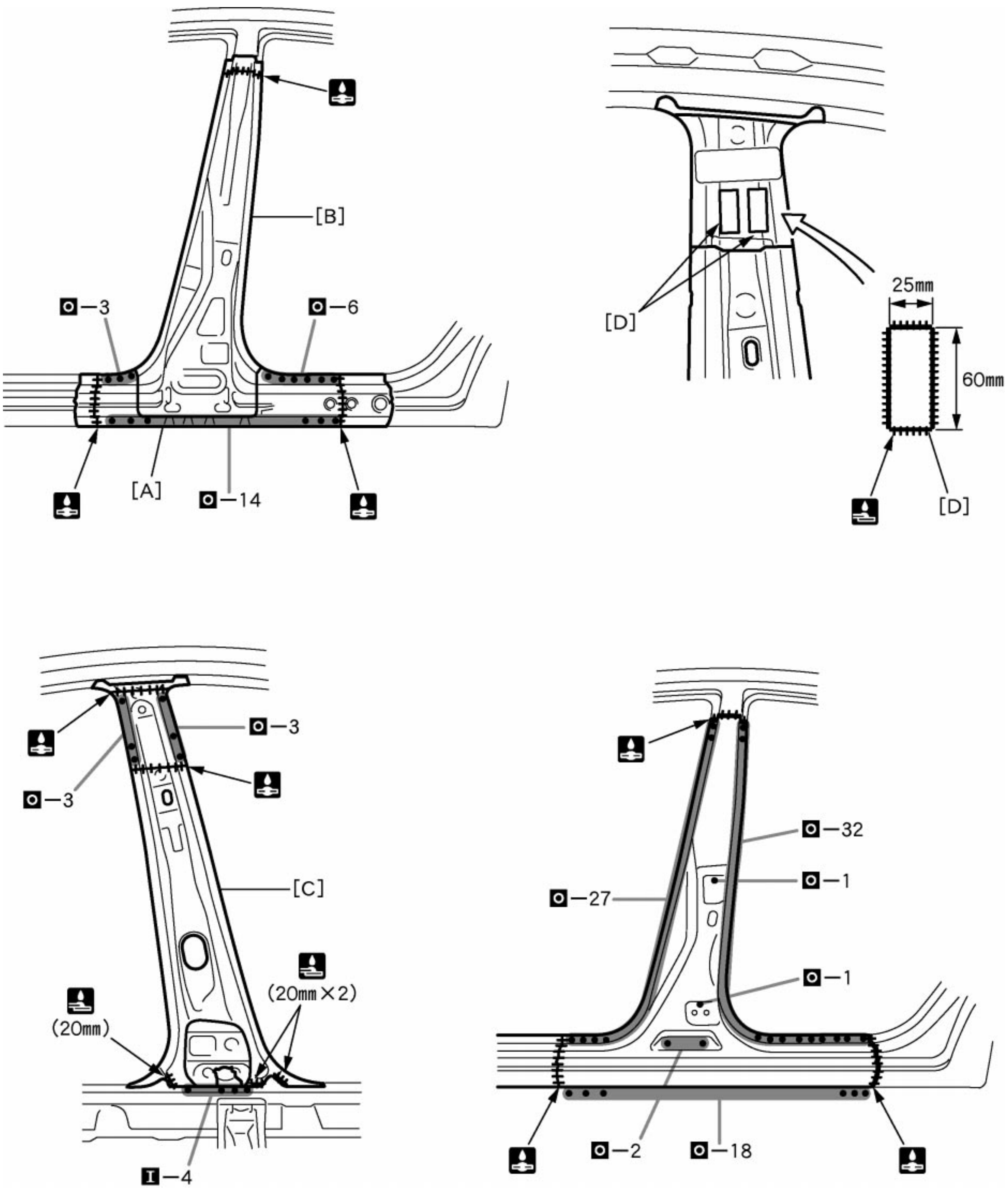
POINT

1 Before temporarily installing the new parts, weld the [A], [B], and [C] with standard points.

PART NAME

[A] Rocker Outer Reinforcement [B] Center Body Pillar Reinforcement [C] Center Body Inner Pillar

15mm (0.59in.) 160mm (6.30in.) 400mm (15.75in.) 460mm (18.11in.)



POINT

1 Inspect the fitting of the front door and rear door, etc., before welding, since this affects the appearace of the finish.
2 Weld the [D] from inside of the butted portion.
Hint:
1) Make the [D] from the remainder of new parts.
3 After welding the reinforcement to the vehicle, install the outer pillar.

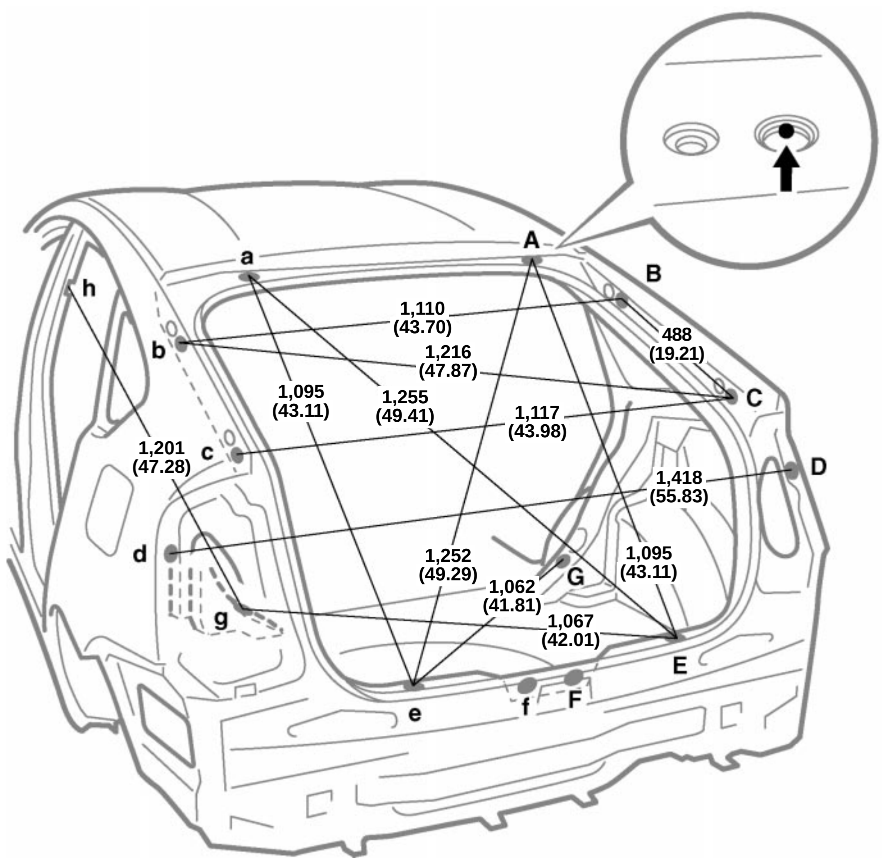
PART NAME

[A] Rocker Outer Reinforcement [B] Center Body Pillar Reinforcement [C] Center Body Inner Pillar
[D] Stiffener

20mm (0.79in.) 25mm (0.98in.) 60mm (2.36in.)

BODY OPENING AREAS (Rear View)

(Three-Dimensional Distance)



Vehicle Dimensions

E-G	e-g	F-G	F-g
775 (30.51)	776 (30.55)	873 (34.37)	929 (36.57)

f-G	f-g	G-g	G-h or g-H
926 (36.46)	882 (34.72)	898 (35.35)	1,626 (64.02)

HINT: For symbols, capital letters indicate right side of vehicle, small letters indicate left side of vehicle (Seen from rear).

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A, a	Back door hinge installation hole-outer	15 (0.59)	F, f	Body lower back panel reinforcement working hole	8 (0.31)
B, b	Back door damper stay installation nut	6 (0.24) nut	G, g	Back door lock striker installation nut	6 (0.24) nut
C, c	Back door cushion installation nut	6 (0.24) nut	H, h	Rear absorber mounting bracket standard hole	13 (0.51)
D, d	Quarter panel standard hole	13 (0.51)	I, i	Center body pillar assembly mark	—
E, e	Deck trim side board installation hole	8.5 (0.335)	—	—	—

ABBREVIATIONS USED IN THIS MANUAL

For convenience, the following abbreviations are used in this manual.

ABS	Antilock Brake System
A/C	Air Conditioner
assy	assembly
ECT	Electronic Controlled Transmission
ECU	Electronic Control Unit
e.g.	Exempli Gratia (for Example)
Ex.	Except
FWD	Front Wheel Drive Vehicles
2WD	Two Wheel Drive Vehicles
4WD	Four Wheel Drive Vehicles
in.	inch
LH	Left-hand
LHD	Left-hand Drive
MIG	Metal Inert Gas
M/Y	Model Year
PPS	Progressive Power Steering
RH	Right-hand
RHD	Right-hand Drive
SRS	Supplemental Restraint System
SSM	Special Service Materials
w/	with
w/o	without

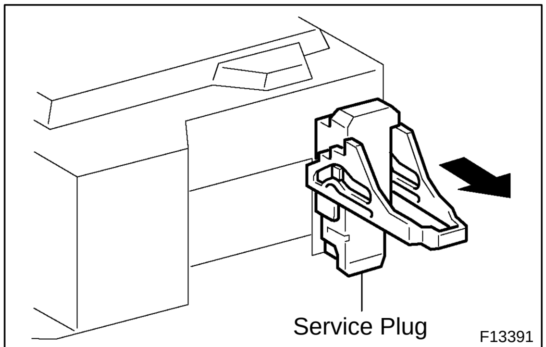
FOR ALL OF VEHICLES

PRECAUTION

1. PRECAUTIONS FOR HIGH-VOLTAGE CIRCUIT INSPECTION AND SERVICE

(a) Engineer must undergo special training for high-voltage system inspection and servicing.

(b) All high-voltage wire harness connectors are colored orange. The HV battery and other high-voltage components have ”High Voltage” caution labels. Do not carelessly touch these wires and components.



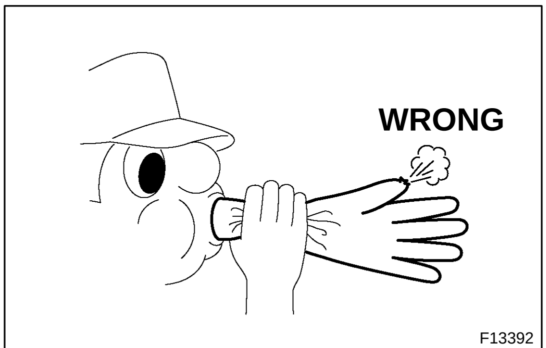
F13391

(c) Before inspecting or servicing the high-voltage system, be sure to follow safety measures, such as wearing insulated gloves and removing the service plug to prevent electrocution. Carry the removed service plug in your pocket to prevent other technicians from reinstalling it while you are servicing vehicle.

(d) After removing the service plug, wait 5 minutes before touching any of the high-voltage connectors and terminals.

HINT:
5 minutes are required to discharge the high-voltage condenser inside the inverter.

(e) Be sure install the service plug before starting the hybrid system. Starting the hybrid system with the service plug removed may damage the vehicle.

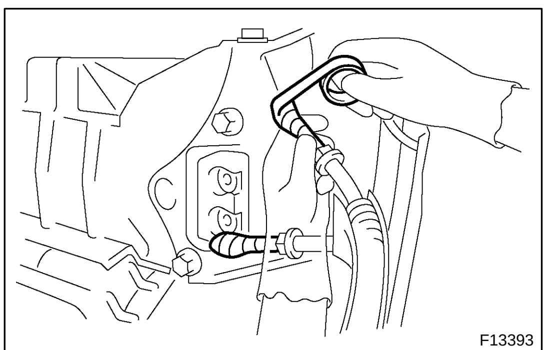


F13392

(f) Before wearing insulated gloves, make sure that they are not cracked, ruptured, torn, or damaged in any way. Do not wear wet insulated gloves.

(g) When servicing the vehicle, do not carry metal objects like mechanical pencils or scales that can be dropped accidentally and cause a short circuit.

(h) Before touching a bare high-voltage terminal, wear insulated gloves and use an electrical tester to ensure that the terminal is not charged with electricity (approximately 0 V).


F13393

(i) After disconnecting or exposing a high-voltage connector or terminal, insulate it immediately using insulation tape.

(j) The screw of a high-voltage terminal should be tightened firmly to the specified torque. Both insufficient and excessive torque can cause failure.

(k) Use the ”CAUTION: HIGH VOLTAGE. DO NOT TOUCH DURING OPERATION” sign to notify other engineers that a high-voltage system is being inspected and/or repaired.

(l) Do not place the battery upside down while removing and installing it.

(m) After servicing the high-voltage system and before reinstalling the service plug, check again that you have not left a part or tool inside, that the high-voltage terminal screws are firmly tightened, and that the connectors are correctly connected.

CAUTION:
HIGH VOLTAGE. DO
NOT TOUCH DURING
OPERATION.

Person in charge:____________

CAUTION:
HIGH VOLTAGE. DO
NOT TOUCH DURING
OPERATION.

Person in charge:____________

Copy this page and put it after folding on the roof of the vehicle in service.

F13394

2. ACTIONS TO BE TAKEN FOR VEHICLE DAMAGED BY IMPACT

(a) Items to be prepared or operation at the site of the accident

- Protective clothing (insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- ABC fire extinguisher (effective against both oil flames and electrical flames)
- Shop rags (for wiping off the electrolyte)
- Vinyl tape (for insulating cable)
- Electrical tester

(b) Actions to be taken at the place of accident

(1) Wear insulated or rubber gloves, goggles and safety shoes.

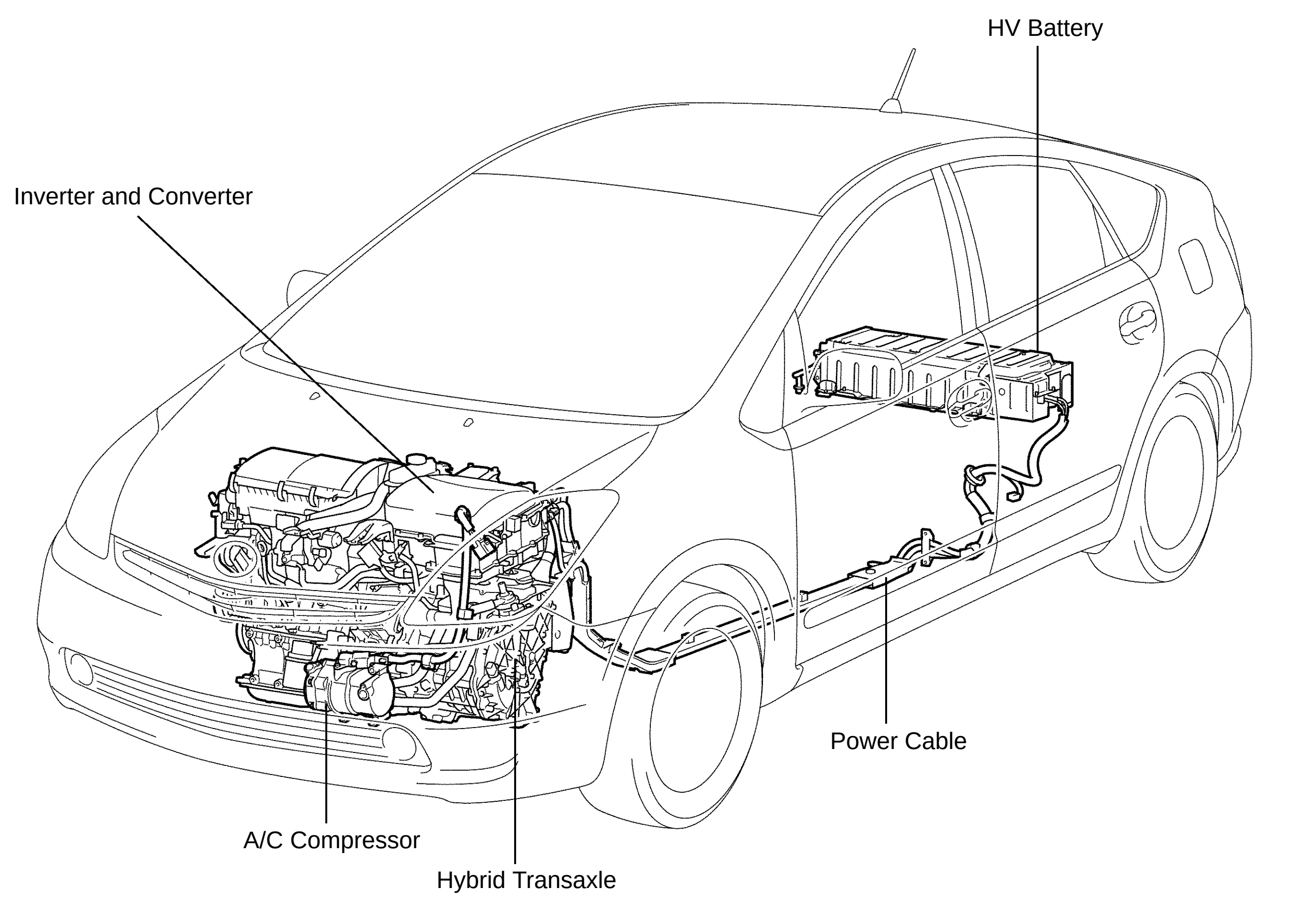
(2) Do not touch a bare cable that could be a high voltage cable. If the cable must be touched or if accidentalcaontact is unavoidable, follow these instructions: 1) wear insulated or rubber gloves and goggles, 2) measure the voltage between the cable and the body ground using an electrical tester, and 3) insulate the cable using vinyl tape.

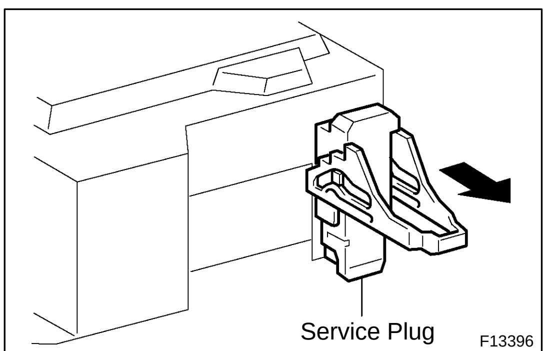
(3) If the vehicle catches fire, use an ABC fire extinguisher to extinguish the fire. Trying to extinguish a fire using only a small amount of water can be more dangerous than effective. Use a substantial amount of water or wait for firefighters.

(4) Check the HV battery and immediate area for any electrolyte leakage. Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, and then apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized before wiping. Neutralize the liquid using the following procedures:
1) apply saturated boric acid solution to the liquid, and 2) reapply red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue. Then wipe the neutralized liquid with a shop rag.

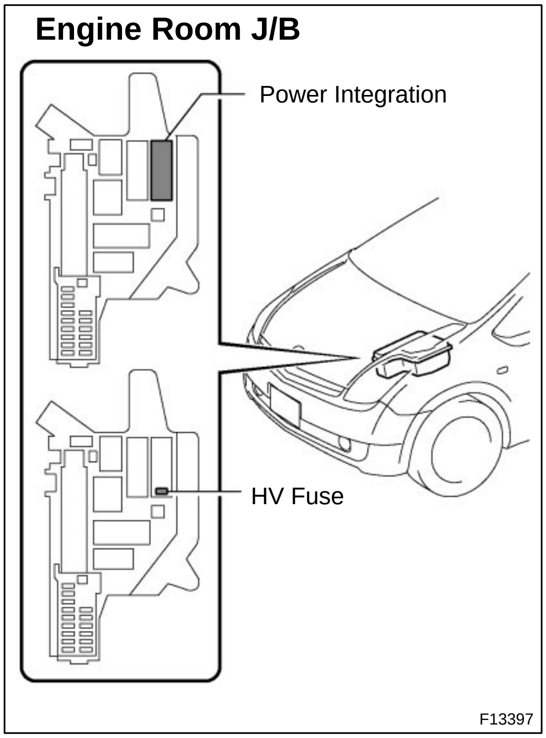
(5) If a damage to any of the high-voltage components and cables is suspended, cut the high-voltage circuit using the procedure on the following pages.

High–voltage part and Wiring





- Push the shift switch to the P position and engage the parking brake.
- Remove the key from the key slot. Then disconnect the power cable from the negative (–) terminal of the auxiliary battery.
- Remove the service plug while wearing insulated gloves. If the service plug cannot be removed due to damage to the rear portion of the vehicle, remove the HV fuse instead.
- Do not turn the power switch on whicle removing the service plug.

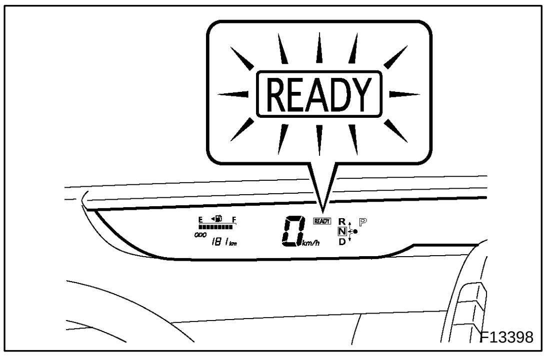


If the service plug cannot be removed due to damage to the rear portion of the vehicle, remove the HV fuse instead.

(c) Moving the damaged vehicle

HINT:
If any of the following applies, tow the vehicle away using a tow truck.

- One or more of the high-voltage components and cables are damaged.
- The driving, traction, or fuel system is damaged.



- The READY lamp is not illuminated when you turn.

NOTICE:

- **Before towing the vehicle away using a tow truck, disconnect the cable from the negative (–) terminal of the auxiliary battery and remove the service plug.**
  Only if none of the above applies and there are no problems that might affect driving, drive the vehicle away from the place of accident to a safe, nearby place.
- **Perform the procedure below if the READY lamp turns off, or there are abnormal noises, unusual smells, or strong vibrations while driving:**
  (1) Park the vehicle in a safe place.
  (2) Push the selector lever to the P position and engage the parking brake.
  (3) Disconnect the power cable from the negative (–) terminal of the auxiliary battery.
  (4) Remove the service plug while wearing insulated gloves.

(d) Actions required after moving the damaged vehicle
If you see any liquid on the road surface, it could be highly alkaline electrolyte leakage.
Wear rubber gloves and goggles, and apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized befor wiping. Neutralize the liquid using the following procedures: 1) apply saturated boric acid solution to the liquid, and 2) reapply red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue. Then wipe the neutralized liquid with a shop rag.

(e) Items to be prepared (when repairing damaged vehicles)

- Protective clothing (Insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- Shop rags (for wiping off the electrolyte)
- Vinyl tape (for insulating cable)
- Electrical tester

(f) Precautions to be observed when servicing the damaged vehicle:

(1) Wear insulated or rubber gloves, goggles, and safety shoes.

(2) Do not touch a bare cable that could be a high voltage cable. If the cable must be touched or if accidental contact is unavailable, follow these instructions: 1) wear insulated or rubber gloves and goggles, 2) measure the voltage between the cable and the body ground using an electrical tester, and 3) insulate the cable using vinyl tape.

(3) Check the HV battery and immediate area for any electrolyte leakage. Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, and then apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized before wiping. Neutralize the liquid using the following procedures:
1) apply saturated boric acid solution to the liquid, and 2) reapply red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue, Then wipe the neutralized liquid with a shop rag.

(4) If the electrolyte adheres to your skin, wash the skin immediately using saturated boric acid solution or a large amount of water. If the electrolyte adheres to an article of clothing, take it off immediately.

(5) If the electrolyte comes in contact with your eyes, call out loudly for help. Do not rub your eyes. Wash them with the large amount of water and seek medical care.

(6) If damage to any of the high-voltage components and cables is suspected, cut the high-voltage circuit using the procedure below.

- Push the selector lever to the P position and engage the parking brake.
- Remove the key from the key slot. Then disconnect the power cable from the negative (–) terminal of the auxiliary battery.

- Wear insulated gloves, and then remove the service plug.
- If you connot remove the service plug due to damage to the rear portion of the vehicle, remove the HV fuse or IGCT relay instead.

(g) Precautions to be taken when disposing of the vehicle
When scrapping the vehicle, remove the HV battery from the vehicle and return it to the location specified by the manufacturer. The same applies to any damaged HV battery.

(h) After removing the battery, keep it away from water. Water may heat the battery, which results in fire.

(i) Precautions to be observed when towing
Tow the damaged vehicle with its front wheels or its front and rear wheels lifted off the ground.

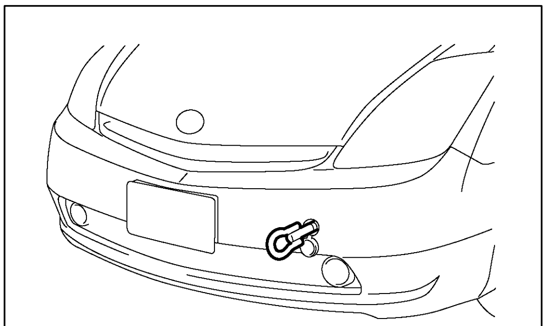
NOTICE:

Towing the damaged vehicle with its front wheels on the ground may cause the motor to generate electricity. This electricity could, depending on the nature of the damage, leak and cause a fire.

(j) Towing with 4 wheels on the ground

NOTICE:

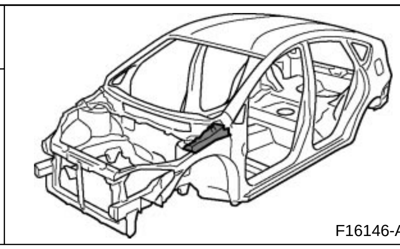
- **If the damaged vehicle needs to be towed using a rope, do not exceed 30 km/h and tow only for very short distances. For example, towing from the accident site to a nearby tow truck is permissible.**
- **Set the power switch on and selector lever to the N position.**
- **If any abnormalityis present in the damaged vehicle during the towing, stop towing immediately.**


F13399

(k) Towing eyelet
(1) Install the hook.
(2) Hook a rope on to the illustrated area for towing.

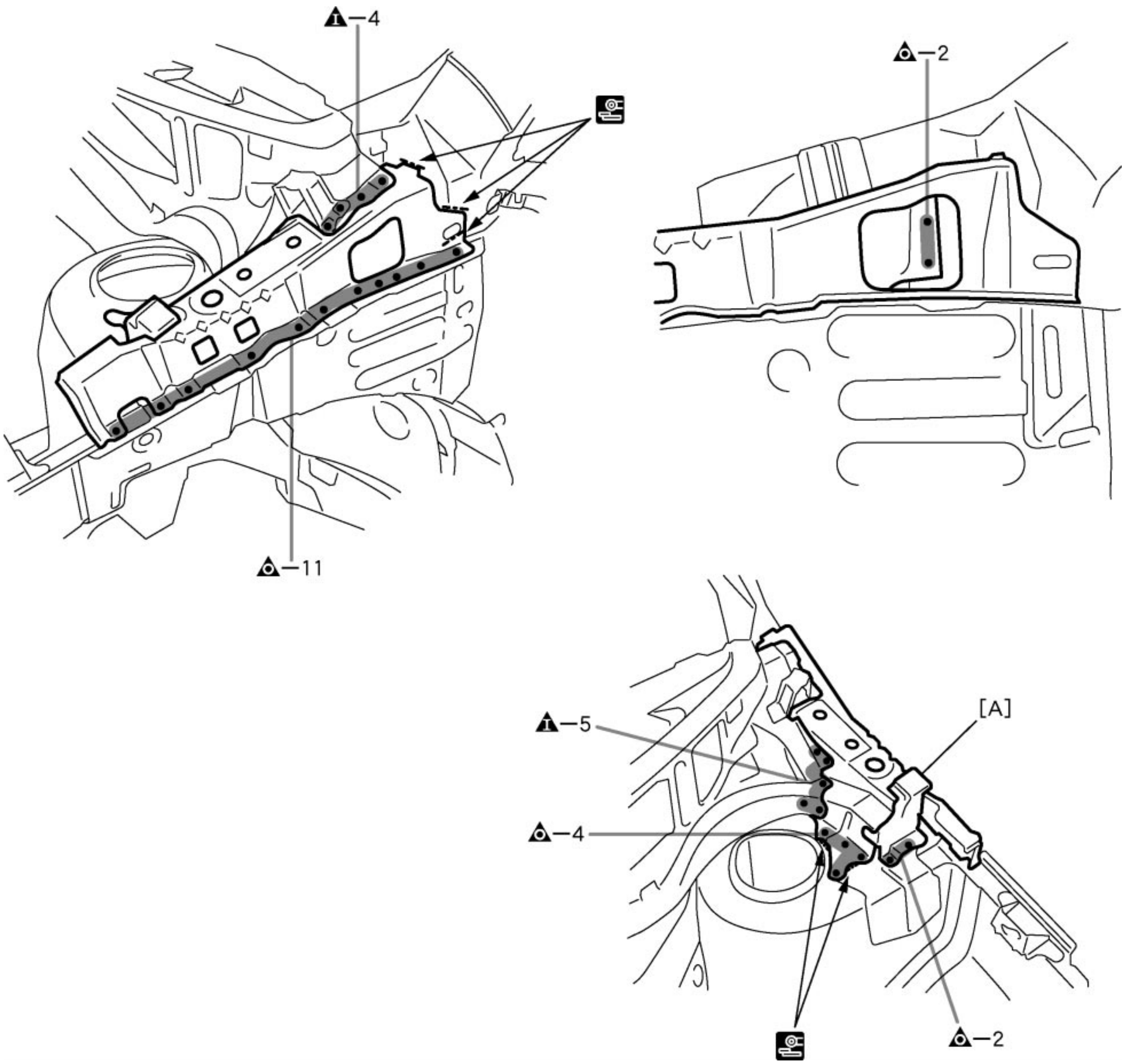
COWL TOP INNER SIDE PANEL (ASSY)

REPLACEMENT



F16146-A

REMOVAL



F16146

POINT

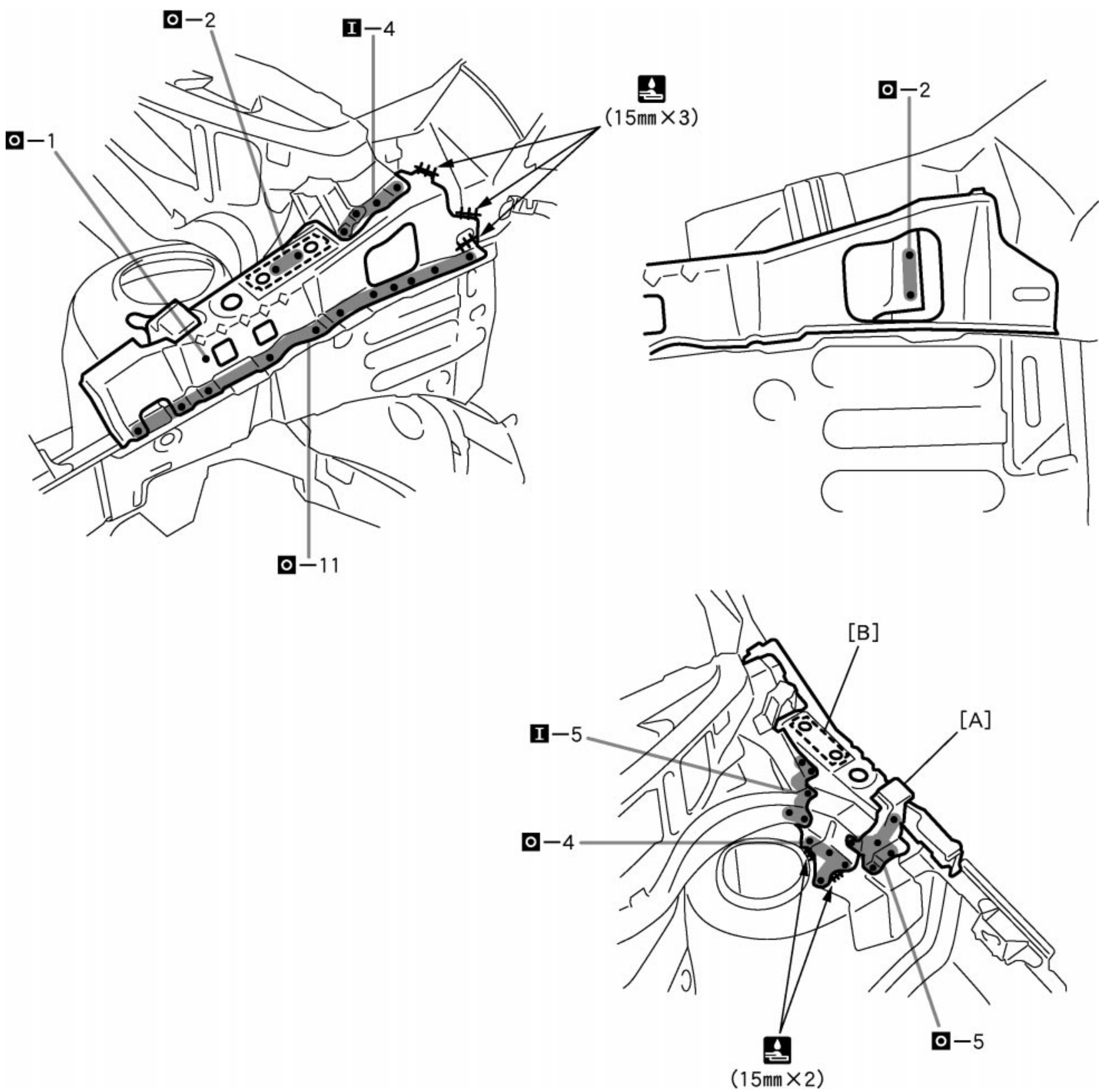
1 Remove the [A] the same time.

PART NAME

[A] Front Apron To Cowl Sidemember Plate

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



F16147

POINT

1 Inspect the fitting of the front fender and hood, etc., before welding, since this affects the appearance of the finish.

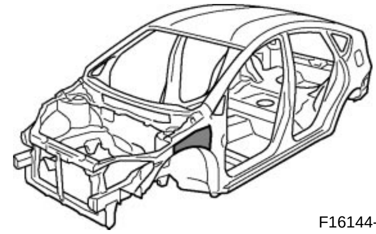
PART NAME

[A] Front Apron To Cowl Sidemember Plate [B] Hood Damper Mounting Bracket

15mm (0.59in.)

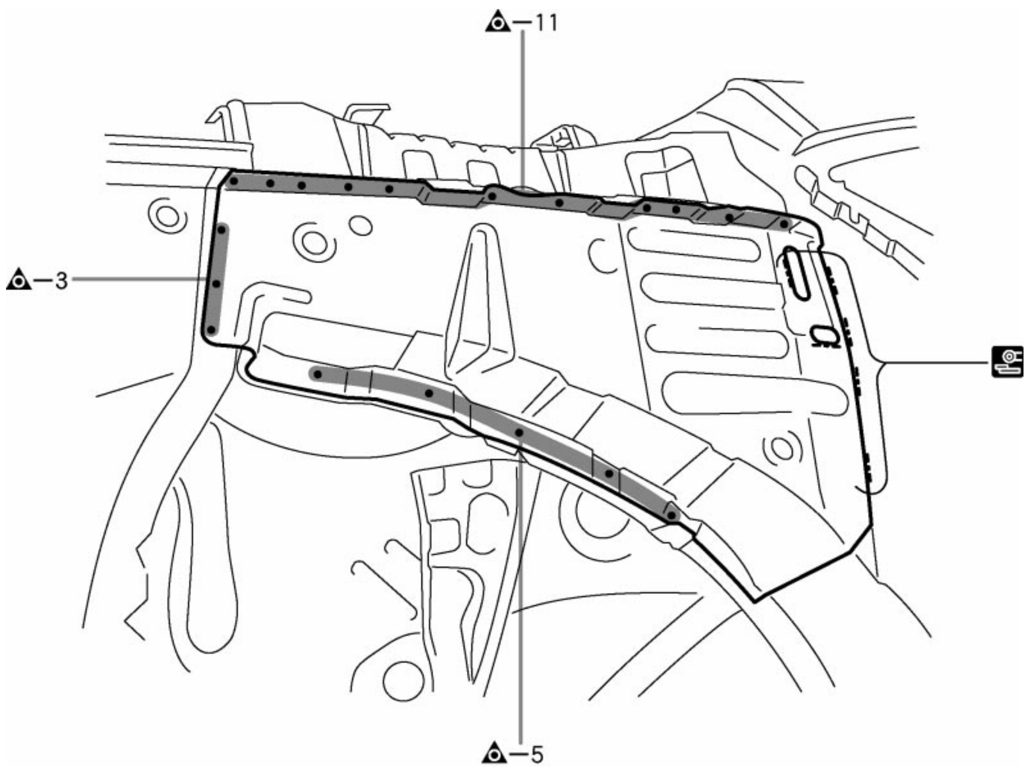
COWL TOP SIDE PANEL (ASSY)

REPLACEMENT

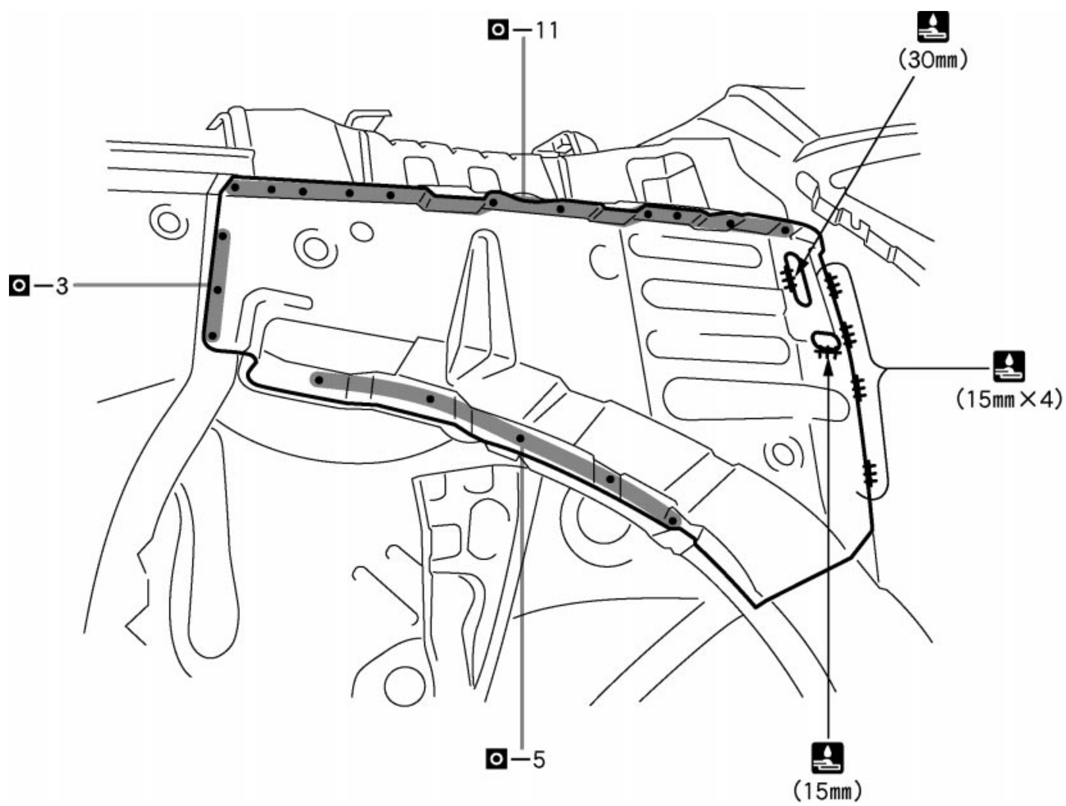


F16144-A

REMOVAL



F16144



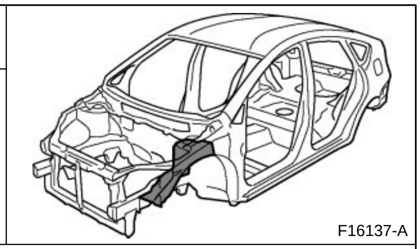
F16145

15mm (0.59in.) 30mm (1.18in.)

FRONT FENDER APPON (ASSY)

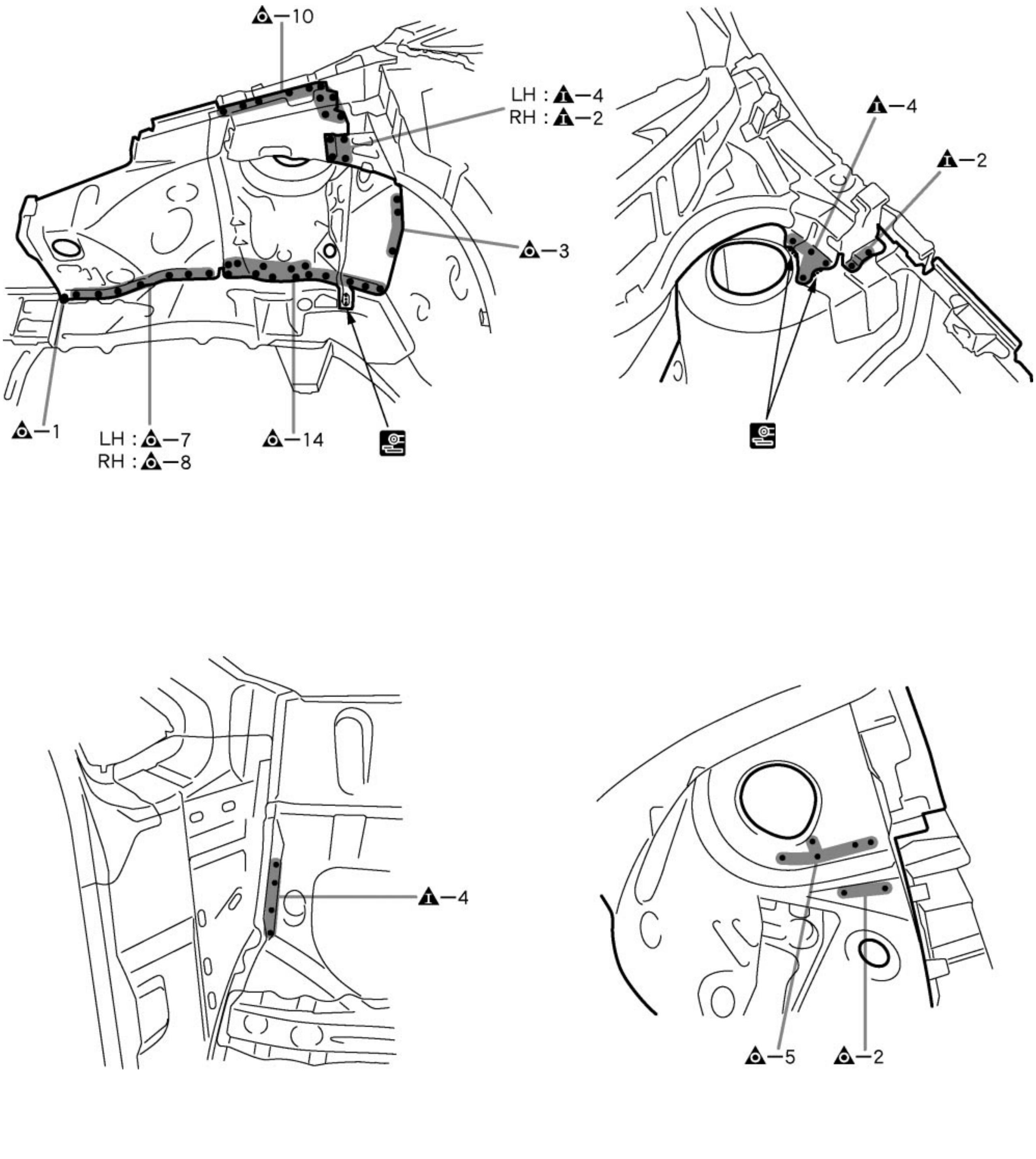
REPLACEMENT

With the radiator upper support and cowl top side panel removed.



F16137-A

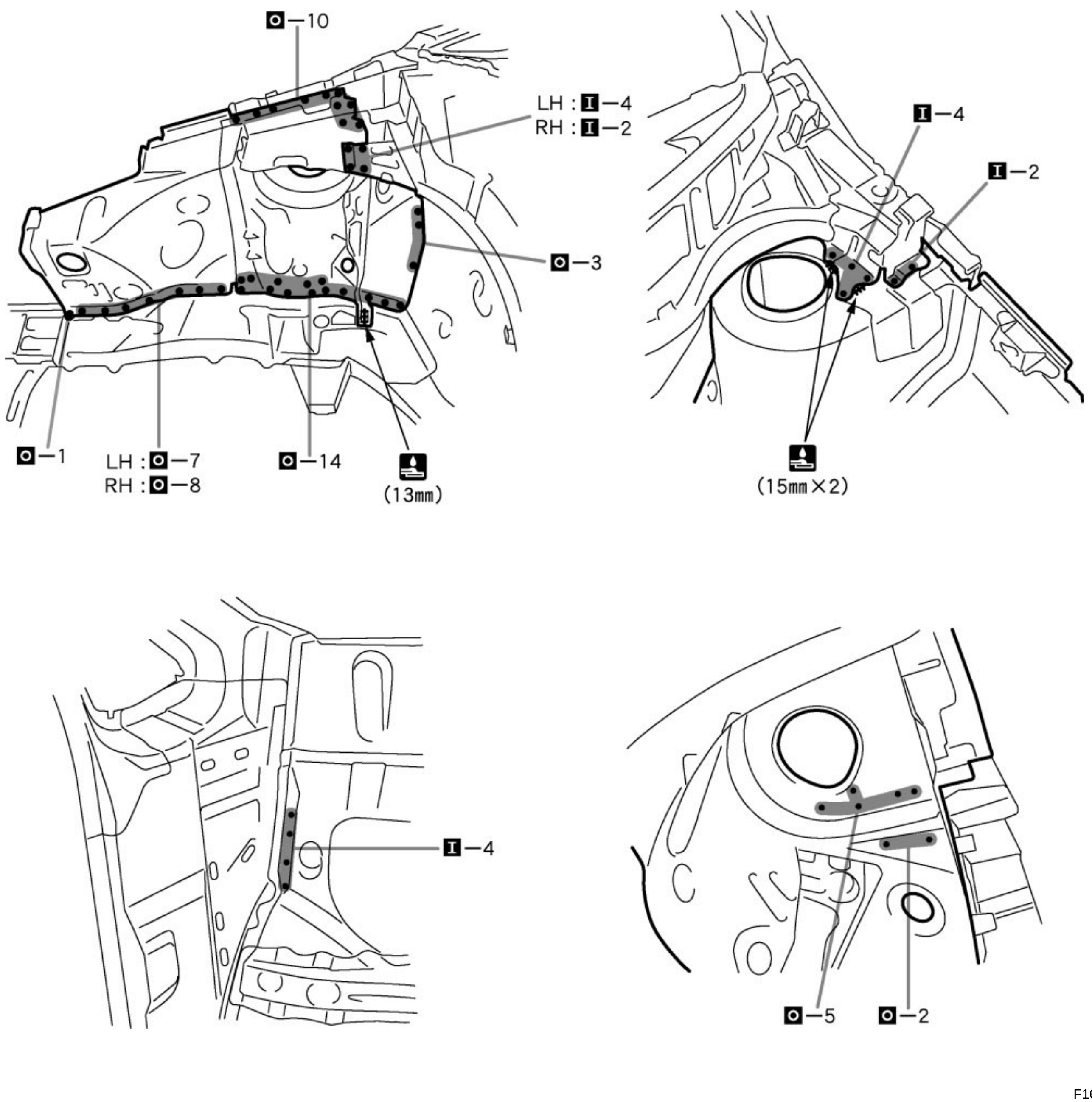
REMOVAL



F16137

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.



POINT

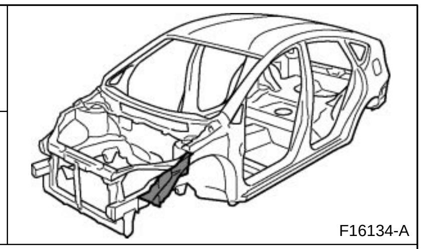
1 Make sure each measurement is correct, as this parts affects the front wheel alignment.
2 Inspect the fitting of the front fender and hood, etc., before welding, since this affects the appearance of the finish.

13mm (0.51in.) 15mm (0.59in.)

FRONT FENDER APRON FRONT WITH SUPPORT (ASSY)

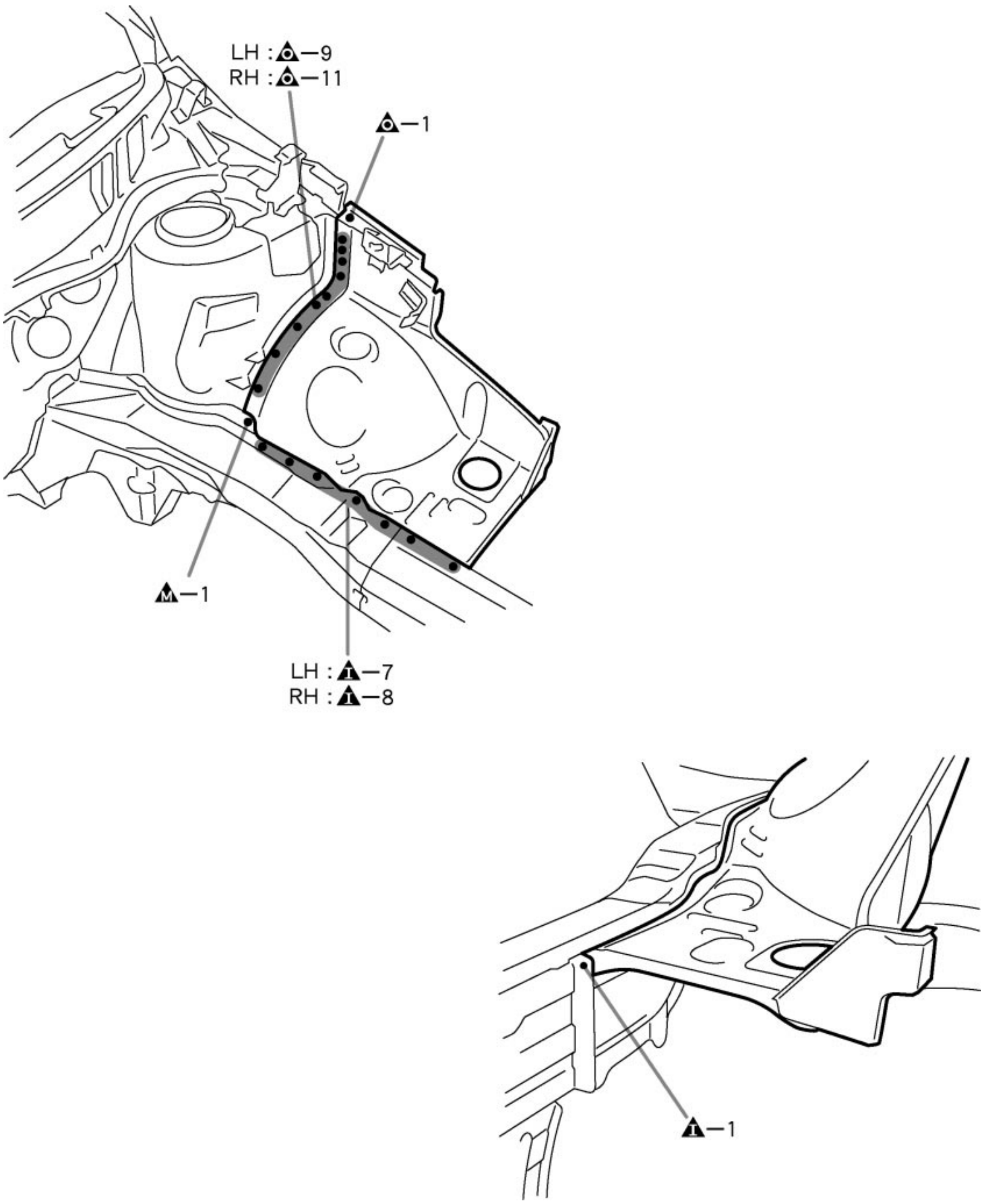
REPLACEMENT

With the radiator upper support removed.



F16134-A

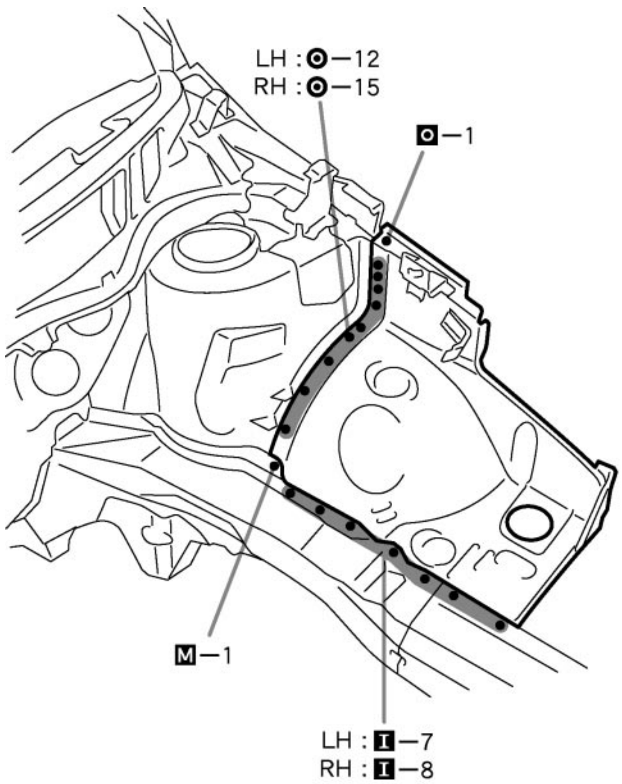
REMOVAL

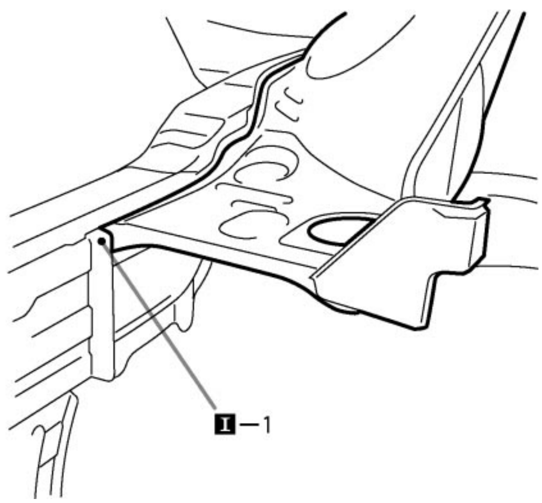


F16134

INSTALLATION

- Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)
- Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.
- After welding, apply the polyurethane foam to the corresponding parts.
- After welding, apply body sealer and under-coating to the corresponding parts.
- After applying the top coat layer, apply anti-rust agent to the inside of the necked section structural weld spots.

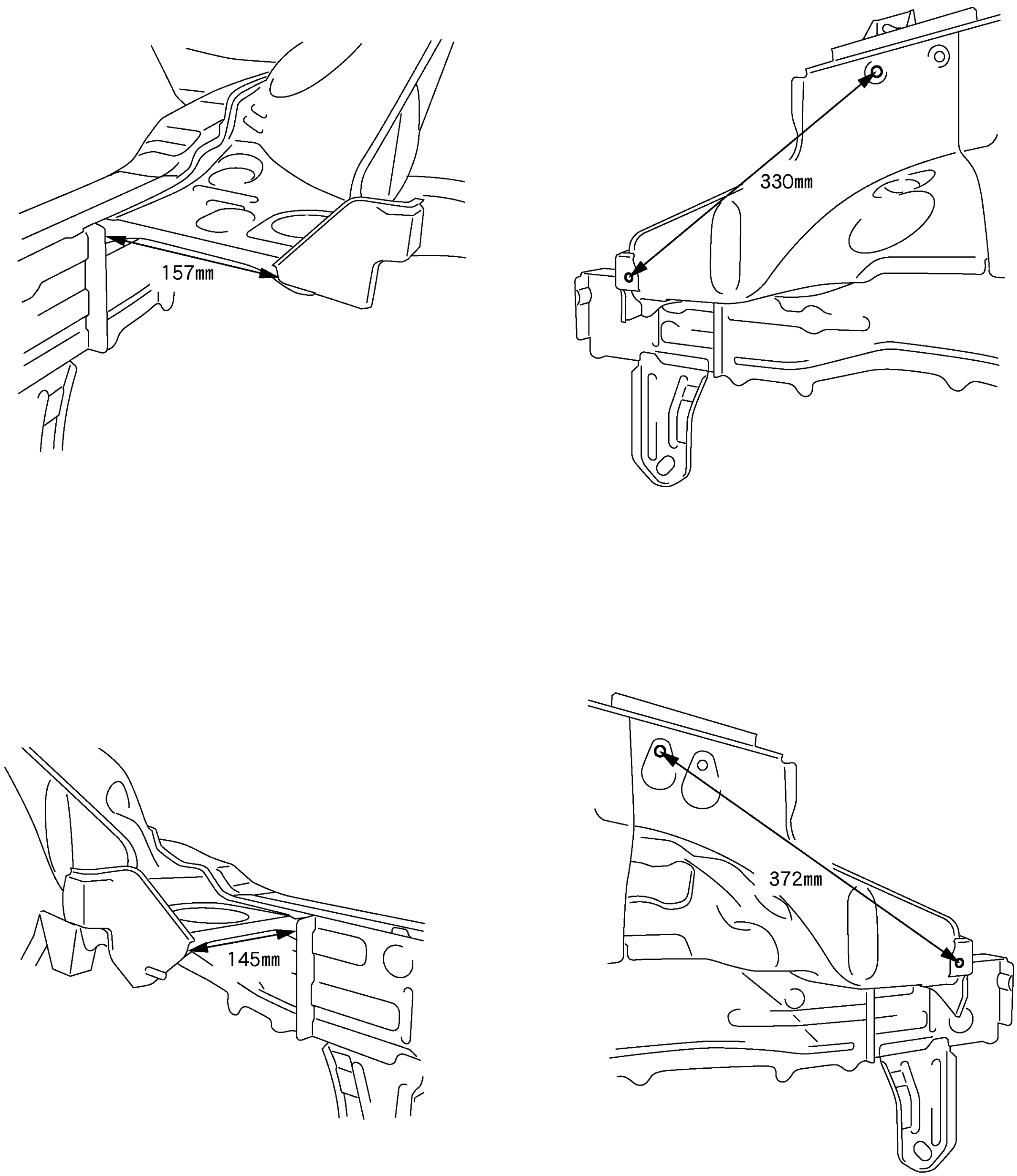




F16135

POINT

1 Inspect the fitting of the front fender and hood, etc., before welding, since this affects the appearance of the finish.

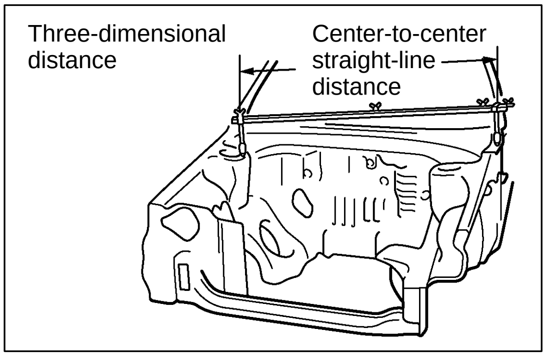


F16136

POINT

1 These values are reference values.

145mm (5.71in.) 157mm (6.18in.) 330mm (12.99in.) 372mm (14.65in.)



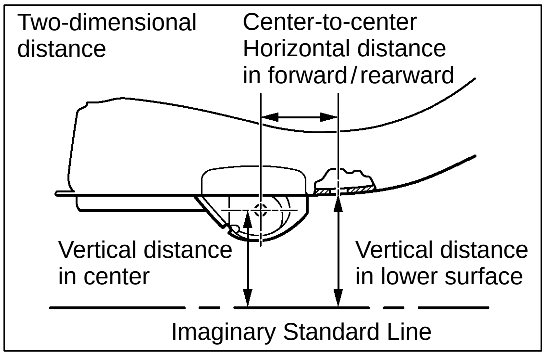
GENERAL INFORMATION

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.

(1) (Three-dimensional distance)

- Straight-line distance between the centers of two measuring points.

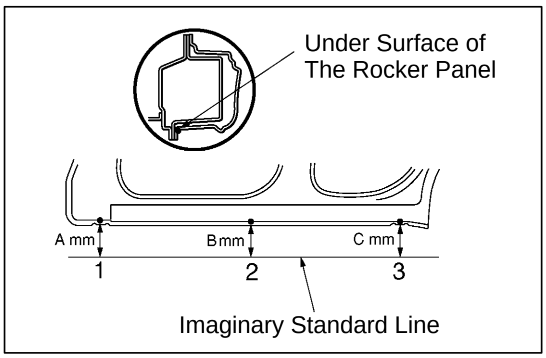


(2) (Two-dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
- The height from an imaginary standard line.

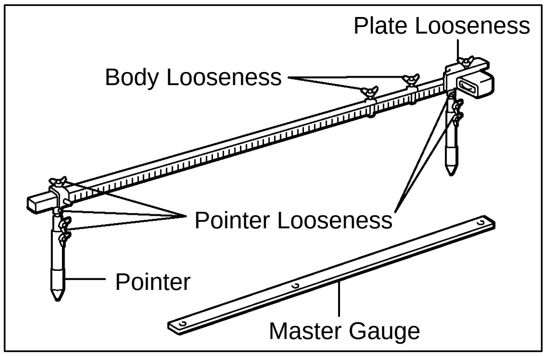
(b) In cases in which only one dimension is given, left and right are symmetrical.

(c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.



(d) The line that connects the places listed below is the imaginary standard line when measuring the height. (The dimensions are printed in the text.)

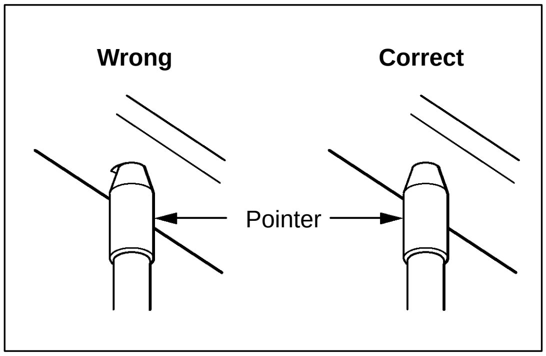
SYMBOL	Name
1	The place that was lowered A mm from the under surface of the rocker panel centered on the front jack up point.
2	The place that was lowered B mm from the under surface of the rocker panel centered between 1 and 3.
3	The place that was lowered C mm from the under surface of the rocker panel centered on the rear jack up point.



2. MEASURING

(a) Basically, all measurements are to be done with a tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.

(b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.



HINT:

1) The height of the left and right pointers must be equal.

2) Always calibrate the tracking gauge before measuring or after adjusting the pointer height.

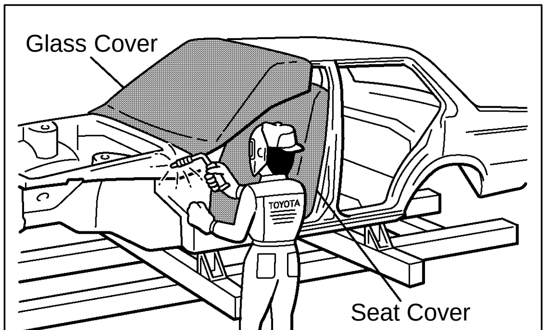
3) Take care not to drop the tracking gauge or otherwise shock it.

4) Confirm that the pointers are securely in the holes.

(c) When using a tape measure, avoid twists and bends in the tape.

GENERAL REPAIR INSTRUCTIONS

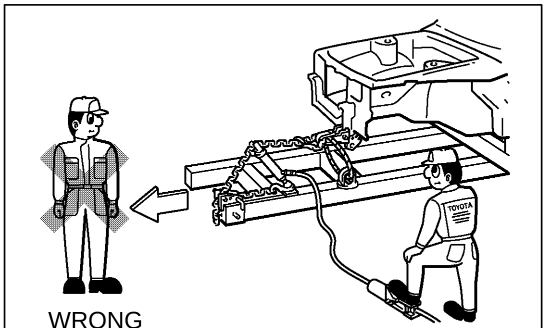
1. WORK PRECAUTIONS



F10001A

(a) VEHICLE PROTECTION

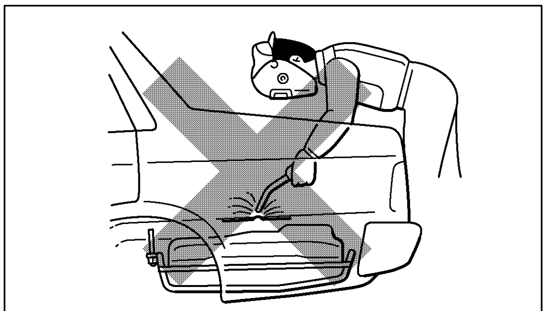
(1) When welding, protect the painted surfaces, windows, seats and carpet with heat resistant, fire-proof covers.



F10002A

(b) SAFETY

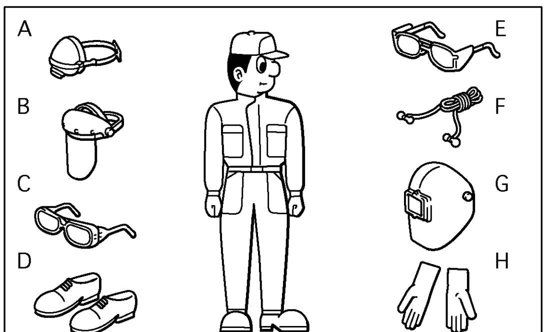
(1) Never stand in direct line with the chain when using a puller on the body or frame, and be sure to attach a safety cable.



F10003A

(2) Before performing repair work, check for fuel leaks. If a leak is found, be sure to close the opening totally.

(3) If it is necessary to use a flame in the area of the fuel tank, first remove the tank and plug the fuel line.



F10004

(c) SAFETY WORK CLOTHES

(1) In addition to the usual mechanic's wear, cap and safety shoes, the appropriate gloves, head protector, glasses, ear plugs, face protector, dust-prevention mask, etc. should be worn as the situation demands.

Code	Name
A	Dust-Prevention Mask
B	Face Protector
C	Eye Protector
D	Safety Shoes
E	Welder's Glasses
F	Ear Plugs
G	Head Protector
H	Welder's Gloves

2. HANDLING PRECAUTIONS OF PLASTIC BODY PARTS

(1) The repair procedure for plastic body parts must conform with the type of plastic material.

(2) Plastic body parts are identified by the codes in the following table.

(3) When repairing metal body parts adjoining plastic body parts (by brazing, frame cutting, welding, painting etc.), consideration must be given to the property of the plastic.

Code	Material name	Heat* resistant temperature limit °C (°F)	Resistance to alcohol or gasoline	Notes
AAS	Acrylonitrile Acrylic Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ABS	Acrylonitrile Butadiene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
AES	Acrylonitrile Ethylene Styrene	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
ASA	Acrylonitrile Styrene Acrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
CAB	Cellulose Acetate	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
EPDM	Ethylene Propylene	100 (212)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
FRP	Fiber Reinforced Plastics	180 (356)	Alcohol and gasoline are harmless.	Avoid alkali.
EVA	Ethylene Acetate	70 (158)	Alcohol is harmless if applid only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid gasoline and organic or aromatic solvents.
PA	Polyamide (Nylon)	80 (176)	Alcohol and gasoline are harmless.	Avoid battery acid.
PBT	Polybutylene Terephthalate	160 (320)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PC	Polycarbonate	120 (248)	Alcohol is harmless.	Avoid gasoline brake fluid, wax, wax removers and organic solvents. Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

Code	Material name	Heat* resistant temperature limit °C (°F)	Resistance to alcohol or gasoline	Notes
PE	Polyethylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PET	Polyethylene Terephthalate	75 (167)	Alcohol and gasoline are harmless.	Avoid dipping in water.
PMMA	Polymethyl Methacrylate	80 (176)	Alcohol is harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
POM	Polyoxymethylene (Polyacetal)	100 (212)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PP	Polypropylene	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
PPO	Modified Polyphenylene Oxide	100 (212)	Alcohol is harmless.	Gasoline is harmless if applied only for quick wiping to remove grease.
PS	Polystyrene	60 (140)	Alcohol and gasoline are harmless if applied only for short time in small amounts.	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PUR	Polyurethane	80 (176)	Alcohol is harmless if applied only for very short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
PVC	Polyvinylchloride (Vinyl)	80 (176)	Alcohol and gasoline are harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
SAN	Styrene Acrylonitrile	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents etc.
TPO	Thermoplastic Olefine	80 (176)	Alcohol is harmless. Gasoline is harmless if applied only for short time in small amounts.	Most solvents are harmless but avoid dipping in gasoline, solvents, etc.
TPU	Thermoplastic Polyurethane	80 (176)	Alcohol is harmless if applied only for short time in small amounts (e.g., quick wiping to remove grease).	Avoid dipping or immersing in alcohol, gasoline, solvents, etc.
TSOP	TOYOTA Super Olefine Polymer	80 (176)	Alcohol and gasoline are harmless.	Most solvents are harmless.
UP	Unsaturated Polyester	110 (233)	Alcohol and gasoline are harmless.	Avoid alkali.

*Temperatures higher than those listed here may result in material deformation during repair.

3. LOCATION OF PLASTIC BODY PARTS

Parts Name	Code
Radiator Grille	TSOP
Front Bumper Cover	TSOP
Headlight	PP/PC
Front Foglight	PC
Side Turn Signal Light	ABS/PMMA
Outer Rear View Mirror	ABS
Door Outside Handle	PC/PBT
Window Frame Moulding	ASA
Rear Door Rear Guide Seal	AES
Side Mudguard	TSOP
Rear Spoiler	ABS
High Mount Stop Light	ABS/PMMA
Back Door Outside Garnish	ABS
Rear Combination Light	ASA/PMMA
Rear Bumper Cover	TSOP
Rear No.1 Spoiler	PP/EPDM
Rear Side Spoiler	PP/EPDM
License Plate Light	PC

• Resin material differs with model.
/ Made up of 2 or more kinds of materials.

HANDLING PRECAUTIONS ON RELATED COMPONENTS

1. BRAKE SYSTEM

The brake system is one of the most important safety components. Always follow the directions and notes given in brake (32) of the repair manual for the relevant model when handling brake system parts.

NOTICE: When repairing the brake master cylinder or TRAC system, bleed the air out of the TRAC system.

2. DRIVE TRAIN AND CHASSIS

The drive train and chassis are components that can have great effects on the running performance and vibration resistance of the vehicle. After installing components in the sections listed in the table below, perform alignments to ensure correct mounting angles and dimensions. Particularly accurate repair of the body must also be done to ensure correct alignment.

HINT: Correct procedures and special tools are required for alignment. Always follow the directions given in the repair manual for the relevant model during alignment and section DI of this section.

Component to be aligned	Section of repair manual for relevant model
Front Wheels	Front Suspension (26) section
Rear Wheels	Rear Suspension (27) section

3. COMPONENTS ADJACENT TO THE BODY PANELS

Various types of component parts are mounted directly on or adjacently to the body panels. Strictly observe the following precautions to prevent damaging these components and the body panels during handling.

- Before repairing the body panels, remove their components or apply protective covers over the components.
- Before prying components off using a screwdriver or a scraper, etc., attach protective tape to the tool tip or blade to prevent damaging the components and the body paint.
- Before removing components from the outer surface of the body, attach protective tape to the body to ensure no damage to painted areas.

  HINT: Apply touch-up paint to any damaged paint surfaces.
- Before drilling or cutting sections, make sure that there are no wires, etc. on the reverse side.

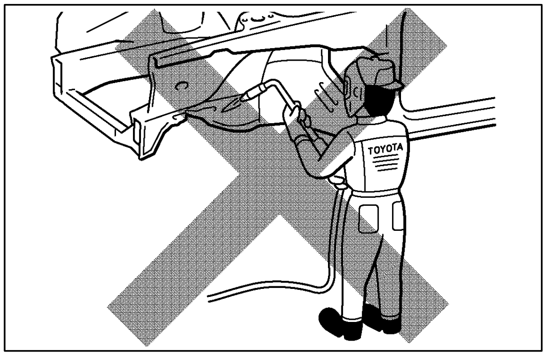
4. ECU (ELECTRONIC CONTROL UNIT)

Many ECUs are mounted in this vehicle.
Take the following precautions during body repair to prevent damage to the ECUs.

- Before starting electric welding operations, disconnect the negative (–) terminal cable from the battery.
  When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.
  When the vehicle has tilt and telescopic steering, power seat and outside rear view mirror, which are all equipped with memory function, it is not possible to make a record of the memory contents.
  So when the operation is finished, it will be necessary to explain this fact to the customer, and request the customer to adjust the features and reset the memory.
- Do not expose the ECUs to ambient temperatures above 80°C (176°F).

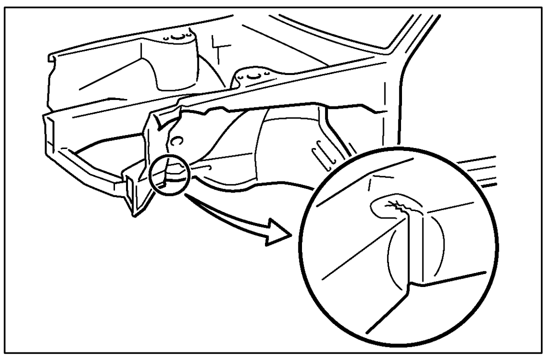
  NOTICE: If it is possible the ambient temperature may reach 80°C (176°F) or more, remove the ECUs from the vehicle before starting work.
- Be careful not to drop the ECUs and not to apply physical shocks to them.

PRECAUTIONS FOR REPAIRING BODY STRUCTURE PANELS



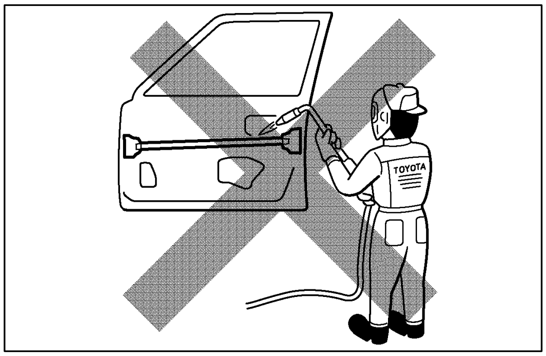
1. HEAT REPAIR FOR BODY STRUCTURE PANELS

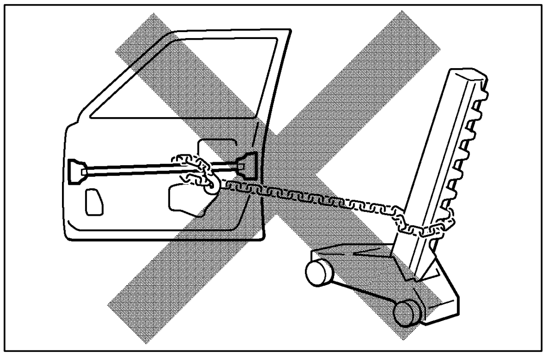
Toyota prohibits the use of the heat repair method on body structure panels when repairing a vehicle damaged in a collision.
Panels that have high strength and rigidity, as well as a long life span for the automobile body are being sought after.
At Toyota, in order to fulfill these requirement, we use high tensile strength steel sheets and rust preventive steel sheets on the body.
High tensile steel sheets are made with alloy additives and a special heat treatment in order to improve the strength.
To prevent the occurrence of rust for a long period of time, the surface of the steel is coated with a zinc alloy.
If a body structure parts are heat repaired with an acetylene torch or other heating source, the crystalline organization of the steel sheet will change and the strength of the steel sheet will be reduced.
The ability of the body to resist rust is significantly lowered as well since the rust resistant zinc coating is destroyed by heat and the steel sheet surface is oxidized.



2. STRUCTURE PANEL KINKS

A sharp deformation angle on the panel that cannot be returned to its original shape by pulling or hammering is called a kink.
Since structure parts were designed to exhibit a 100% performance when they were in their original shape, if they are deformed in an accident, or if the deformed parts are repaired and reused, they become unable to exhibit the same performance as intended in the design.
It is necessary to replace the part where the kink has occurred.



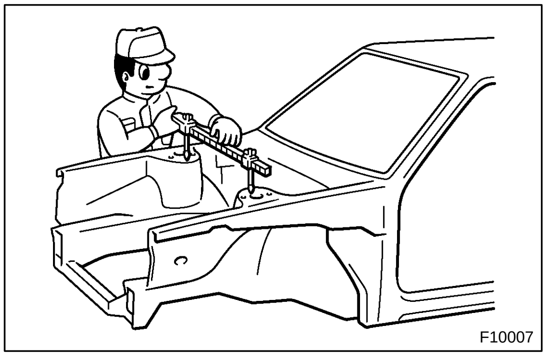


3. IMPACT BEAM REPAIR

The impact beam and bracket are necessary and important parts in maintaining a survival space for passengers in a side collision.
For impact beam, we use special high tensile strength steel.
The high tensile strength steel maintains its special crystalline organization by heat treatment or alloy additives.
Since these parts were designed to exhibit a 100% performance when they were in their original shape, if they are deformed in an accident, or if the deformed parts are repaired and reused, they become unable to exhibit the same performance as intended in the design.
It is necessary to replace the door assembly when impact beam or bracket is damaged.

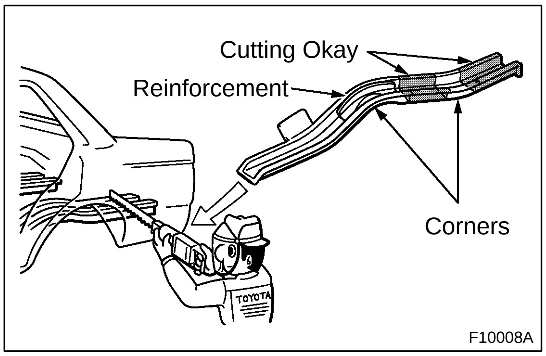
PROPER AND EFFICIENT WORK PROCEDURES

1. REMOVAL



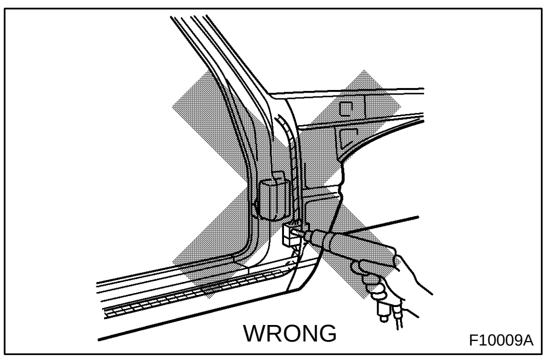
(a) PRE-REMOVAL MEASURING

(1) Before removal or cutting operations, take measurements in accordance with the dimension diagram. Always use a puller to straighten a damaged body or frame.



(b) CUTTING AREA

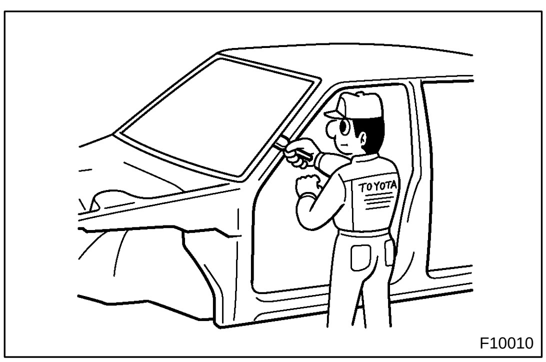
(1) Always cut in a straight line and avoid reinforced area.



(c) PRECAUTIONS FOR DRILLING OR CUTTING

(1) Check behind any area to be drilled or cut to insure that there are no hoses, wires, etc., that may be damaged.

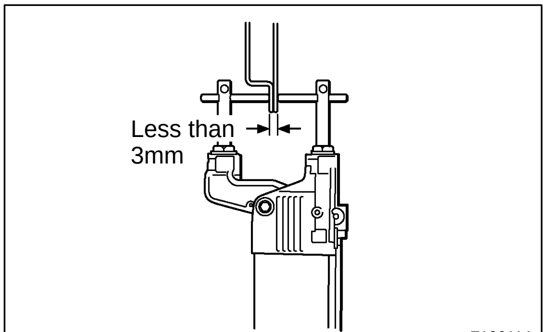
HINT: See "Handling Precautions on Related Components" on page IN-15.



(d) REMOVAL OF ADJACENT COMPONENTS

(1) When removing adjacent components, apply protective tape to the surrounding body and your tools to prevent damage.

HINT: See "Handling Precautions on Related Components" on page IN-15.



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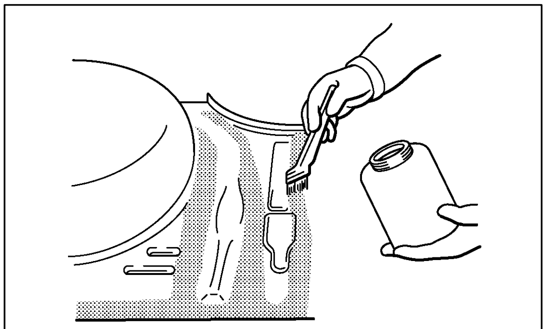
2. PREPARATION FOR INSTALLATION

(a) SPOT WELD POINTS

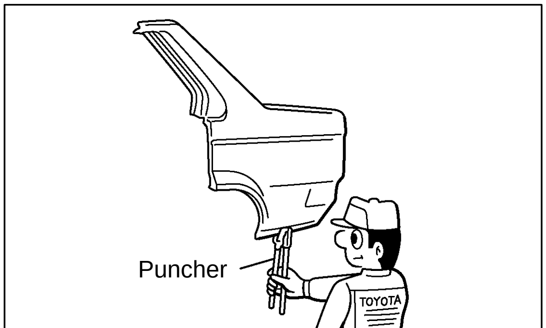
(1) When welding panels with a combined thickness of over 3mm (0.12in.), use a MIG (Metal Inert Gas) welder for plug welding.

HINT: Spot welding will not provide sufficient durability for panels over 3mm (0.12in.) thick.


F10012

(b) APPLICATION OF WELD-THROUGH PRIMER (SPOT SEALER)

(1) Remove the paint from the portion of the new parts and body to be welded, and apply weld-through primer.



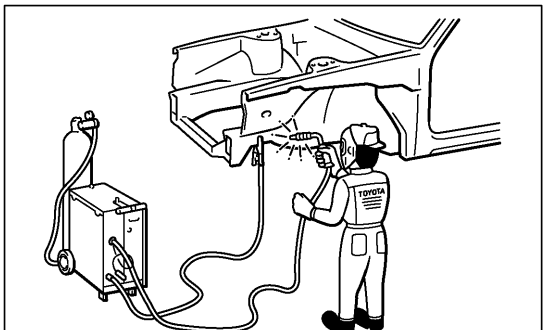
F10013A

(c) MAKING HOLES FOR PLUG WELDING

(1) For areas where a spot welder cannot be used, use a puncher or drill to make holes for plug welding.

REFERENCE: mm (in.)

Thickness of welded portion	Size of plug hole
1.0 (0.04) under	5 (0.20) ø over
1.0 (0.04) – 1.5 (0.06)	6.4 (0.26) ø over
1.5 (0.06) over	8 (0.31) ø over

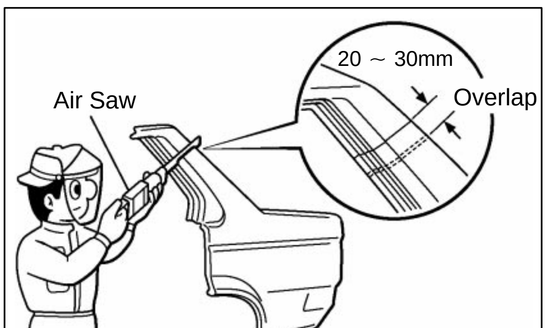


F10014

(d) SAFETY PRECAUTIONS FOR ELECTRICAL COMPONENTS

(1) When welding, there is a danger that electrical components will be damaged by the electrical current flowing through the body.

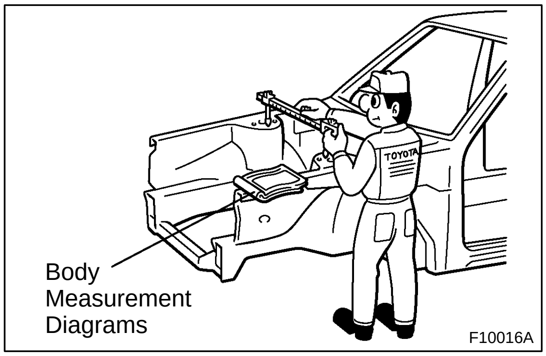
(2) Before starting work, disconnect the negative terminal of the battery and ground the welder near the welding location of the body.



F10015A

(e) ROUGH CUTTING OF JOINTS

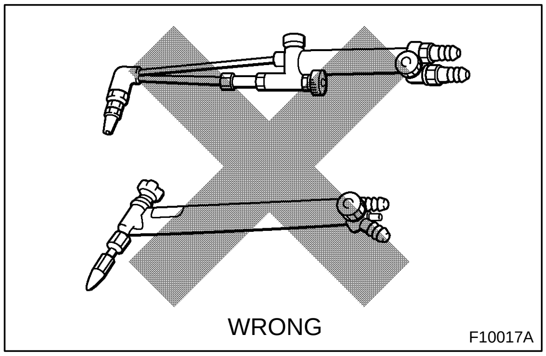
(1) For joint areas, rough cut the new parts, leaving 20 – 30mm (0.79 – 1.18in.) overlap.



3. INSTALLATION

(a) PRE-WELDING MEASUREMENTS

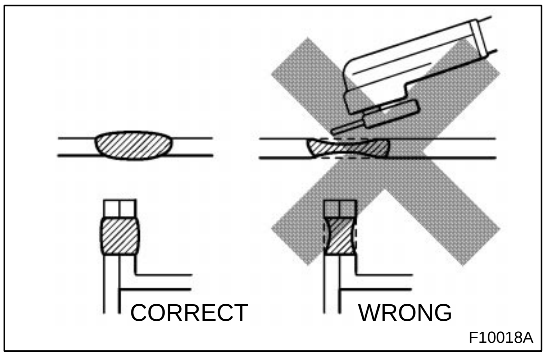
(1) Always take measurements before installing underbody or engine components to insure correct assembly. After installation, confirm proper fit.



(b) WELDING PRECAUTIONS

(1) The number of welding spots should be as follows.
Spot weld: 1.3 X No. of manufacturer's spots.
Plug weld: More than No. of manufacturer's plugs.

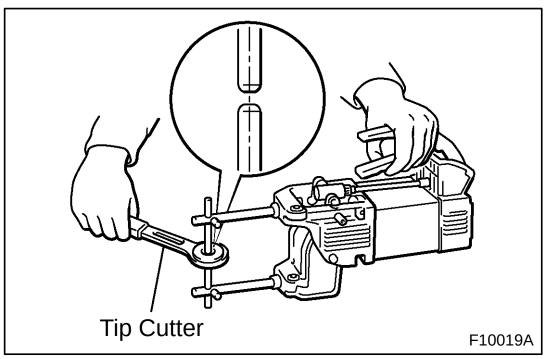
(2) Plug welding should be done with a MIG (Metal Inert Gas) welder. Do not gas weld or braze panels at areas other than specified.



(c) POST-WELDING REFINISHING

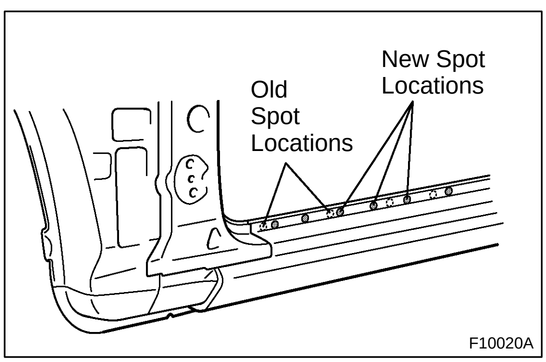
(1) Always check the welded spots to insure they are secure.

(2) When smoothing out the weld spots with a disc grinder, be careful not to grind off too much as this would weaken the weld.



(d) SPOT WELD LOCATIONS

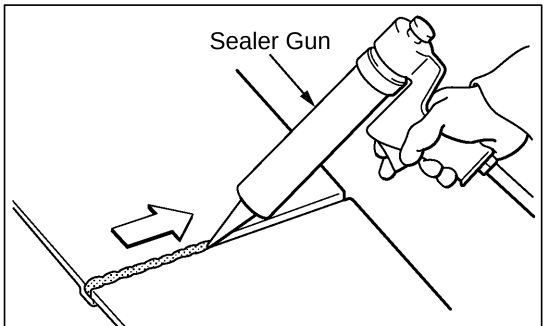
(1) Try to avoid welding over previous spots.



(e) SPOT WELDING PRECAUTIONS

(1) The shape of the welding tip point has an effect on the strength of the weld.

(2) Always insure that the seams and welding tip are free of paint.

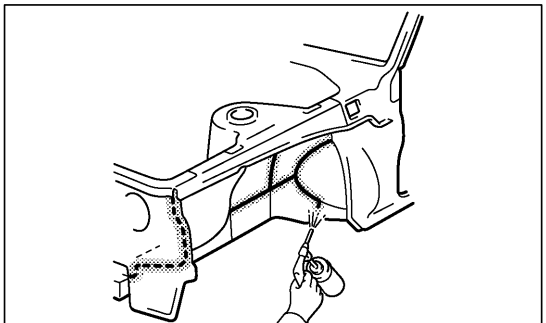


F10021A

4. ANTI-RUST TREATMENT

(a) BODY SEALER APPLICATION

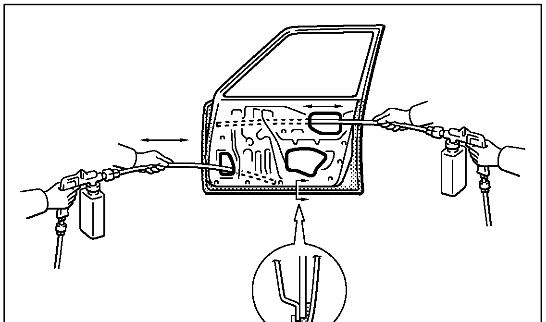
(1) For water-proofing and anti-corrosion measures, always apply the body sealer to the body panel seams and hems of the doors, hoods, etc.



F10022

(b) UNDERCOAT APPLICATION

(1) To prevent corrosion and protect the body from damage by flying stones, always apply sufficient undercoat to the bottom surface of the under body and inside of the wheel housings.



F10023

5. ANTI-RUST TREATMENT AFTER PAINTING PROCESS

(a) ANTI-RUST AGENT (WAX) APPLICATION

(1) To preserve impossible to paint areas from corrosion, always apply sufficient anti-rust agent (wax) to the inside of the hemming areas of the doors and hoods, and around the hinges, or the welded surfaces inside the boxed cross-section structure of the side member, body pillar, etc.

6. ANTI-RUST TREATMENT BY PAINTING

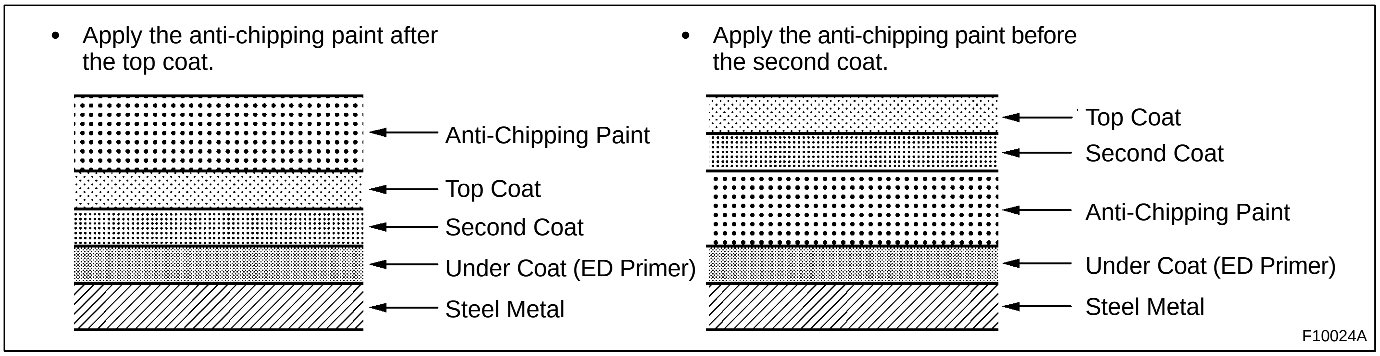
REFERENCE:

Painting prevents corrosion and protect the sheet metal from damage. In this section, anti-chipping paint only for anti-corrosion purpose is described.

(a) ANTI-CHIPPING PAINT

(1) To prevent corrosion and protect the body from damage by flying stones, etc., apply anti-chipping paint to the rocker panel, wheel arch areas, balance panel, etc.

HINT:
Depending on the model or the application area, there are cases where the application of anti-chipping paint is necessary before the second coat or after the top coat.



VIEWS OF THIS TEXT

Scope of the repair work explanation

- This text explains the welding panel replacement instructions from the vehicle's white body condition. We have abbreviated the explanations of the removal and reinstallation of the equipment parts up to the white body condition and of the installation, inspection, adjustment and final inspection of equipment parts after replacing the weld panel.

Section categories

- Each section has been divided as shown below.

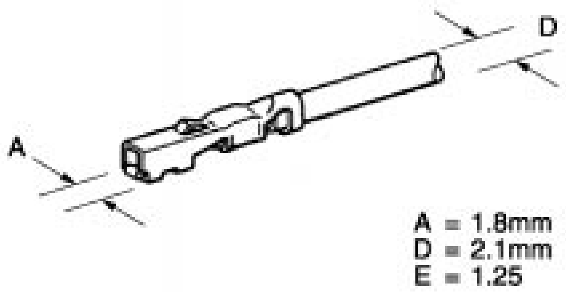
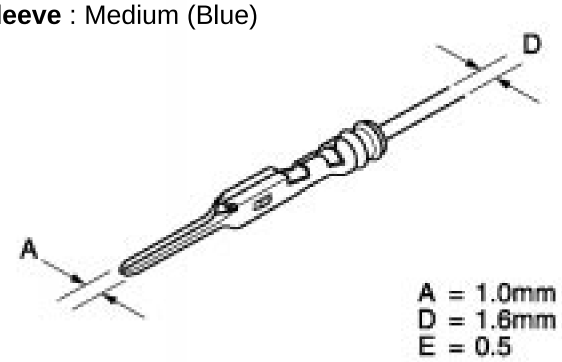
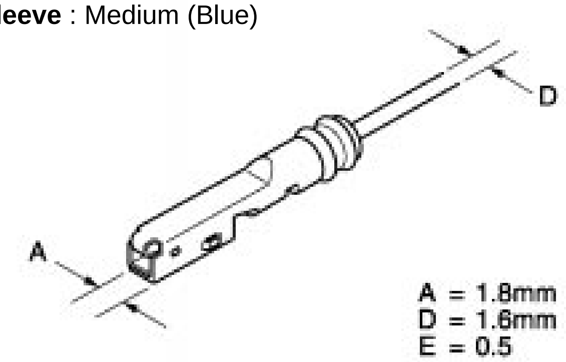
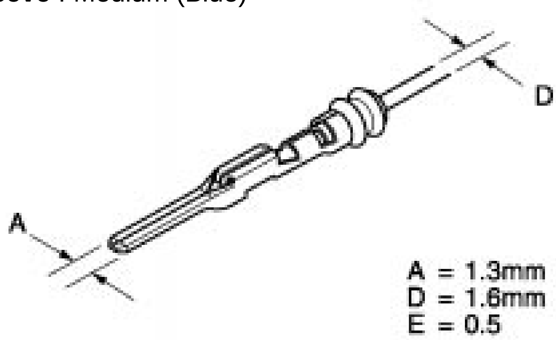
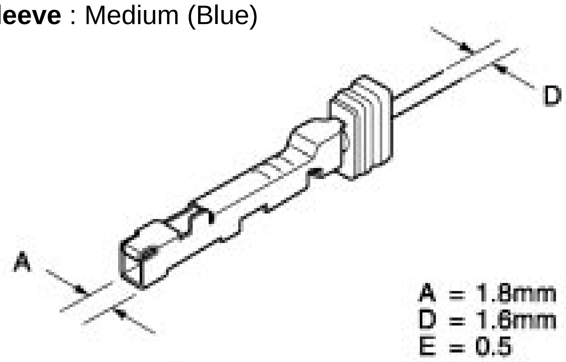
Section Title	Contents	Examples
INTRODUCTION	Explanation of general body repair. Views of weld panel replacement instructions.	Cautionary items. Views of weld panel replacement instructions.
BODY PANEL REPLACEMENT	Instructions for replacing the weld panels from the white body condition, from which bolted parts have been removed, with individual supply parts.	Front side member replacement. Quarter panel replacement.
BODY DIMENSIONS	Body aligning measurements.	Dimension diagrams.
PAINT • COATING	Scope and type of anti-rust treatment, etc. together with weld panel replacement.	Under coat. Body sealer.

Abbreviation of contents in this text.

- The following essential procedures have been abbreviated. When actually working, conduct this work properly.
  (1) Jack and lift operations.
  (2) Clean and wash removed parts, if necessary.
  (3) Visual inspection.

NOTE: The Vehicle Lift and Support Locations sections and For Vehicles Equipped With SRS Airbag and Seat Belt Pretensioner sections refer to the TOYOTA PRIUS Repair Manual.

Repair Wire (Waterproof Type)

Type	**1.0II**	
	Male	Female
		
P/N		82998–24060
Type	**1.0III**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12710	82998–12720 82998–12730*
Type	**1.3**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12630	82998–12650

Repair Wire (Waterproof Type)

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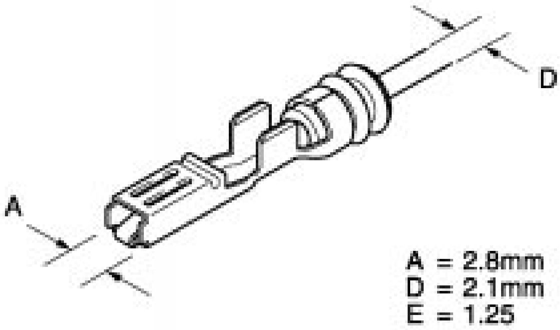
		Sleeve : Medium (Blue) 
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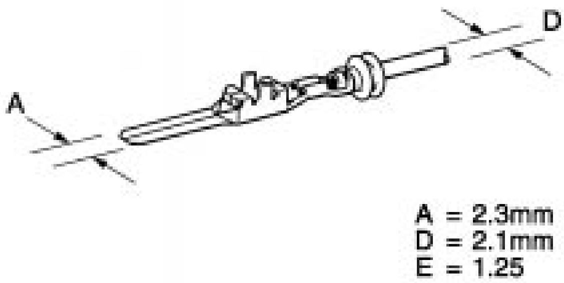
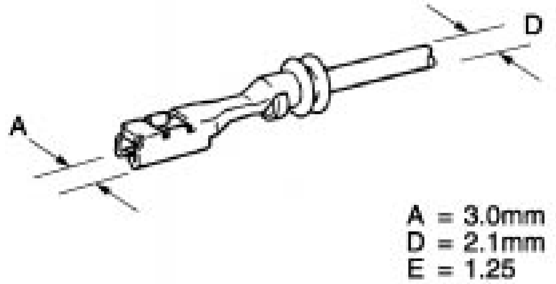
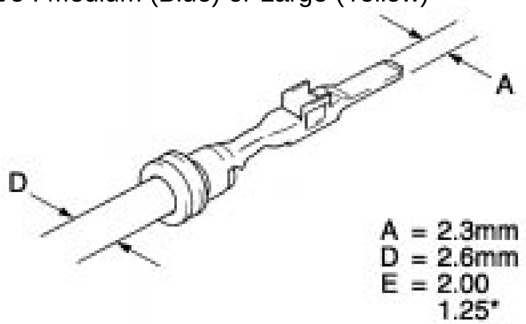
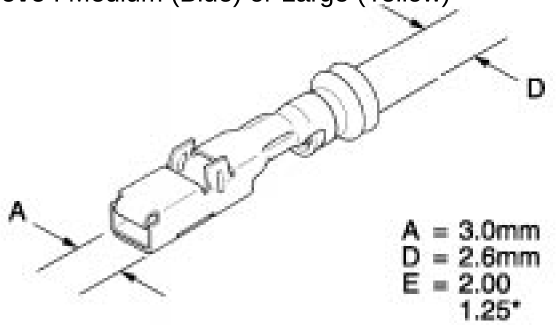
Type	**2.3**	
	Male	Female
	Sleeve : Medium (Blue)  	**Sleeve** : Medium (Blue) 
P/N	82998–12260 82998–24070*	82998–12270(160mm) 82998–12600(500mm) 82998–24080*
Type	**2.3II (6mm Pitch Type)**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow)  	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12430 82998–12450*	82998–12440(160mm) 82998–12590(500mm) 82998–12460*

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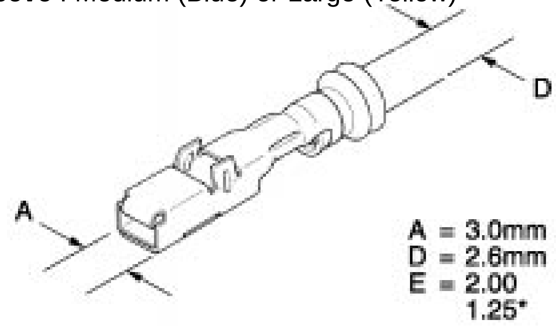
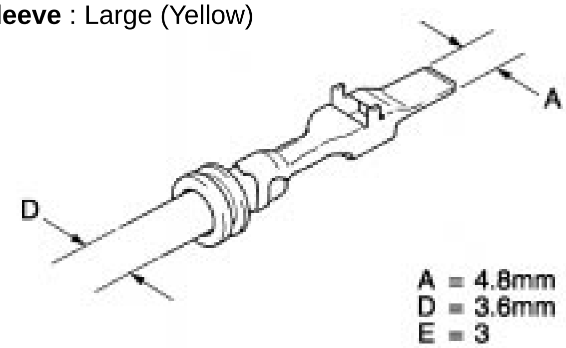
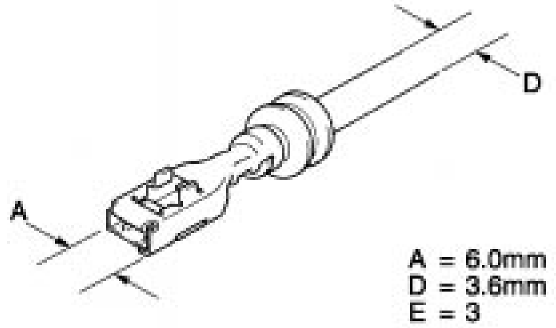
Repair Wire (Waterproof Type)

Type	**2.3II (5mm Pitch Type)**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–12790 82998–12780*
Type	**4.8**	
	Male	Female
	Sleeve : Large (Yellow) 	
P/N	82998–12470	82998–12480
Type	**6.3**	
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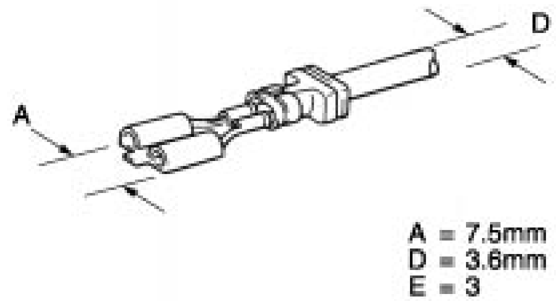
	—	
P/N		82998–12540

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Repair Wire (Waterproof Type)

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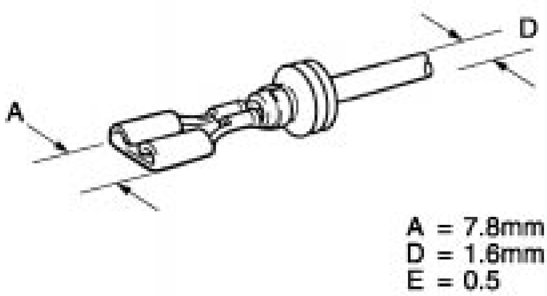
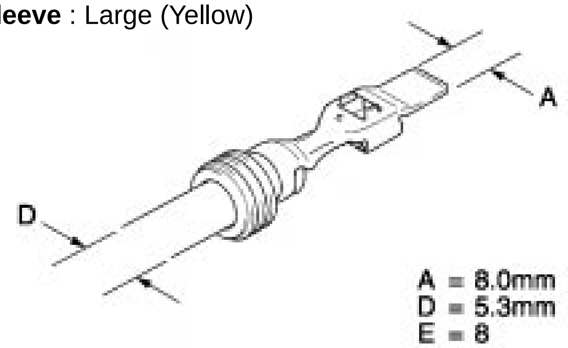
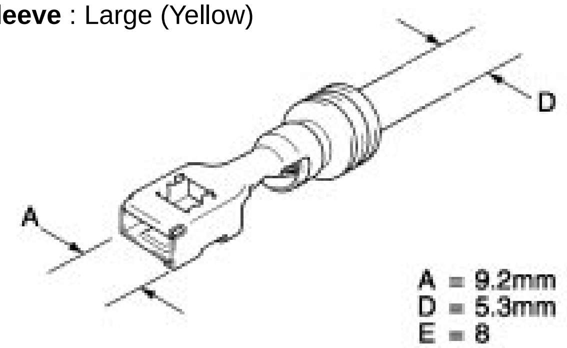
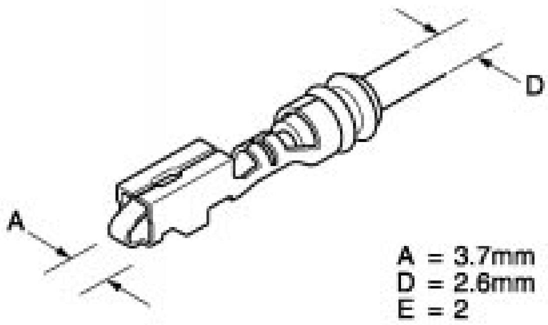
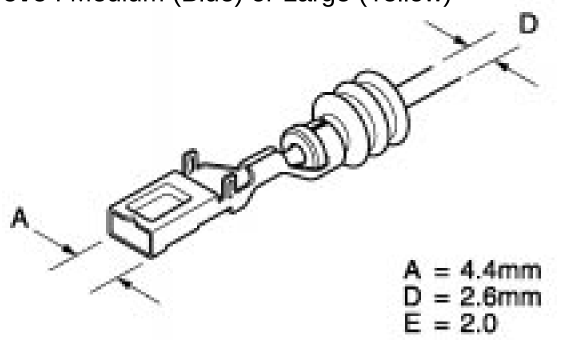
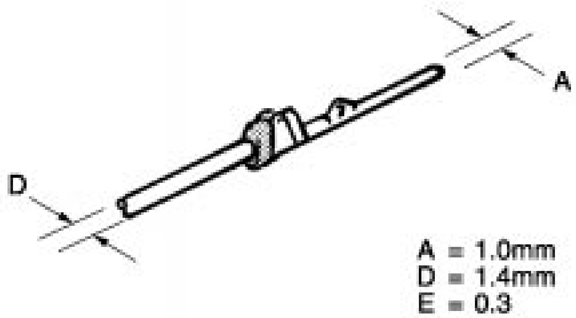
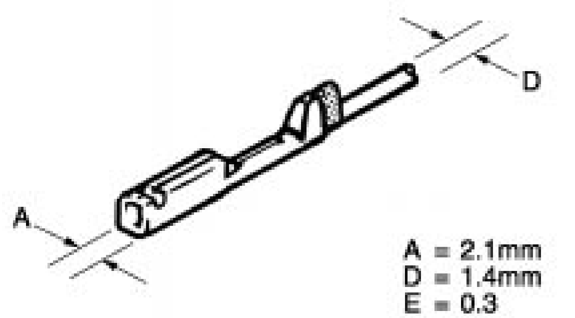
	—	**Sleeve** : Medium (Blue) 
P/N		82998–24160
Type	**8.0**	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12490	82998–12500
Type	**HEAD LAMP**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–24150(160mm) 82998–24190(500mm)

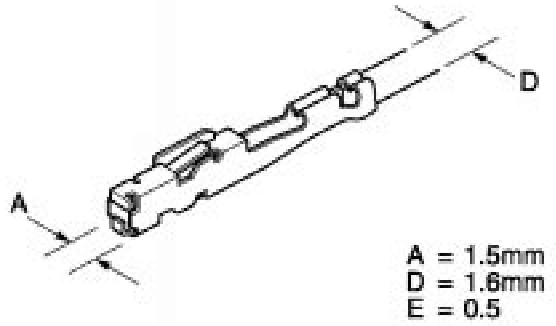
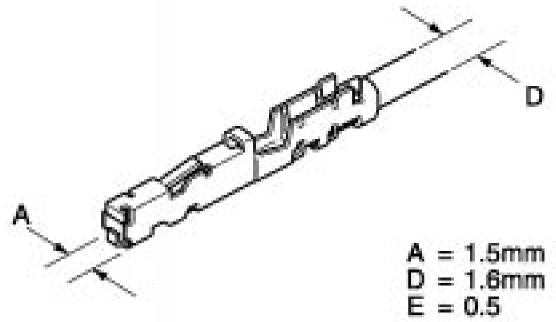
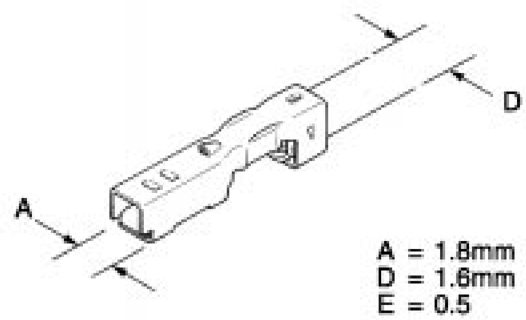
F

Repair Wire (Waterproof Type)

Type	**HB3, HB4**	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–12550(160mm) 82998–12610(500mm)
Type	**TLC**	
	Male	Female
	Sleeve : Small (Red)  	**Sleeve** : Small (Red) 
P/N	82998–12280	82998–12290

F

Repair Wire (Non–waterproof Type)

Type	**0.64**	
	Male	Female
	—	**Sleeve** : Medium (Blue) 
P/N		82998–12750 82998–12760*
Type	**0.64 IDC**	
	Male	Female
	—	**Sleeve** : Medium (Blue) 
P/N		82998–12770
Type	**1.0**	
	Male	Female
	—	
P/N		82998–12310 82998–12320*

Repair Wire (Non–waterproof Type)

<table>
<tr><td>Type</td><td colspan="2">1.0II</td></tr>
<tr><td></td><td>Male</td><td>Female</td></tr>
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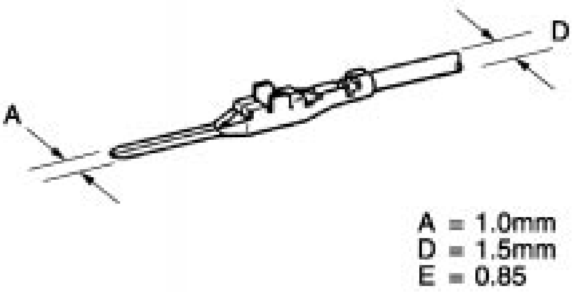
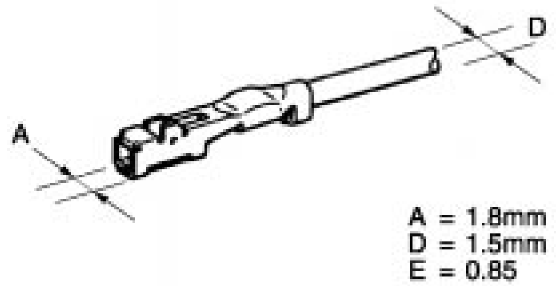

</td><td>Sleeve : Medium (Blue)
Size : S

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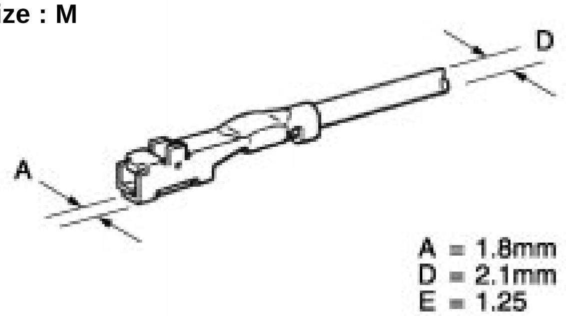
<tr><td>P/N</td><td>82998–24010</td><td>82998–24020
82998–24110*</td></tr>
<tr><td>Type</td><td colspan="2">1.0II</td></tr>
<tr><td></td><td>Male</td><td>Female</td></tr>
<tr><td></td><td></td><td>Sleeve : Medium (Blue)
Size : M

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<tr><td>P/N</td><td></td><td>82998–24120*</td></tr>
<tr><td>Type</td><td colspan="2">1.0III</td></tr>
<tr><td></td><td>Male</td><td>Female</td></tr>
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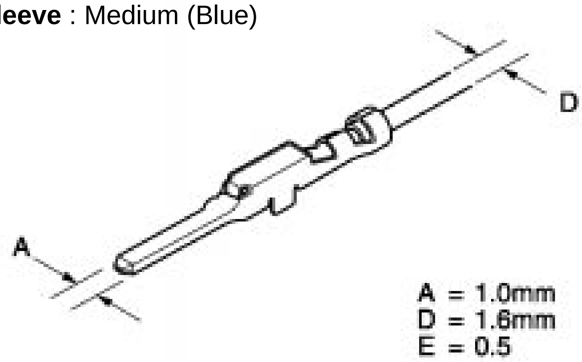
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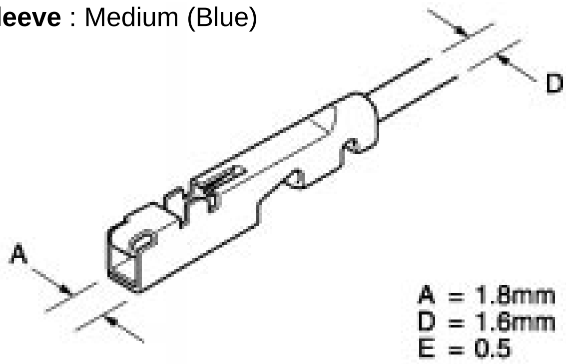
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<tr><td>P/N</td><td>82998–12670
82998–12680*</td><td>82998–12690
82998–12700*</td></tr>
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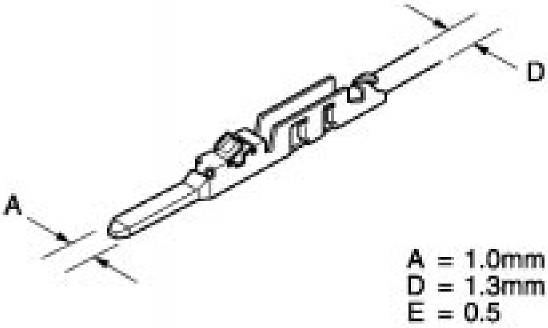
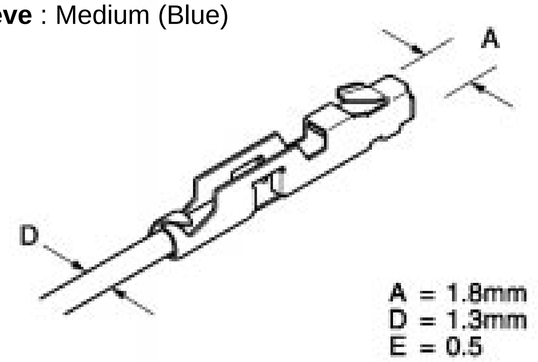
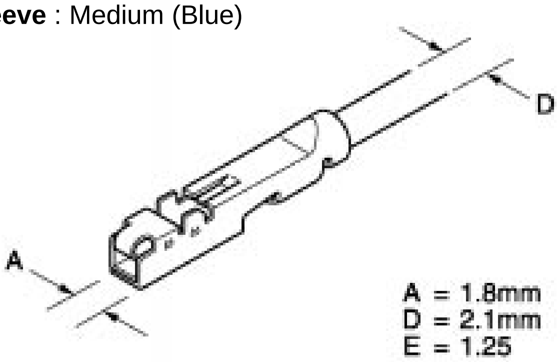
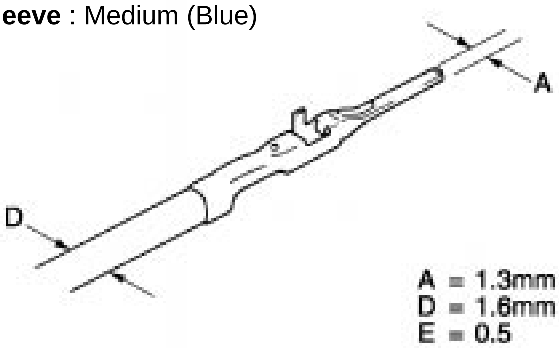
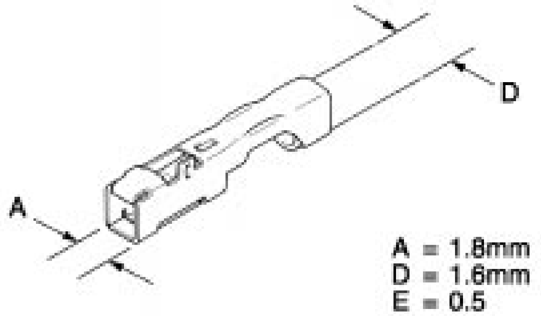
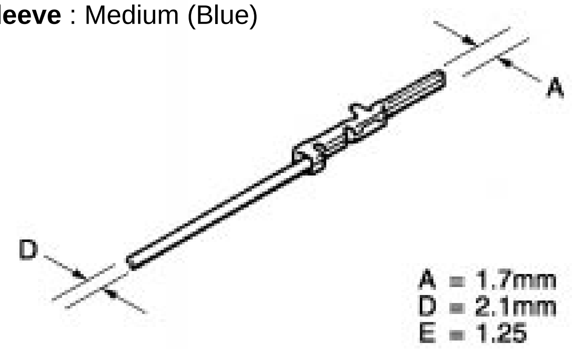
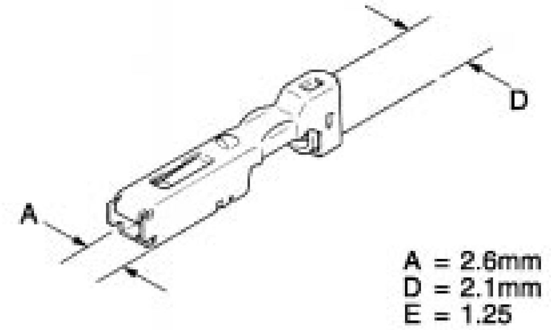
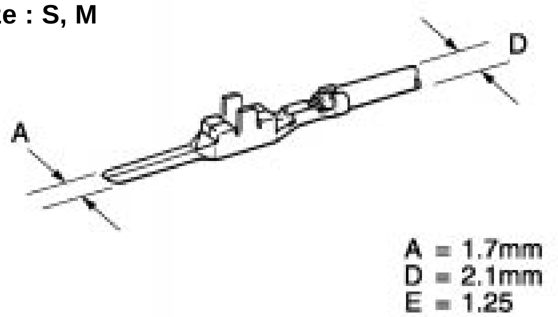
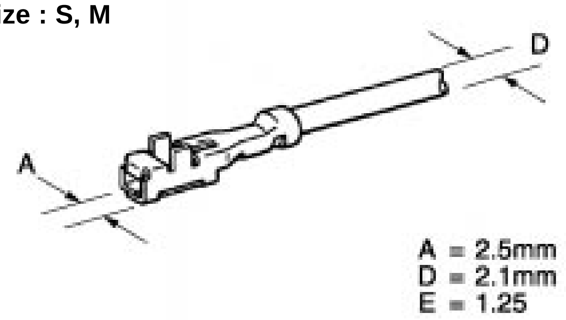
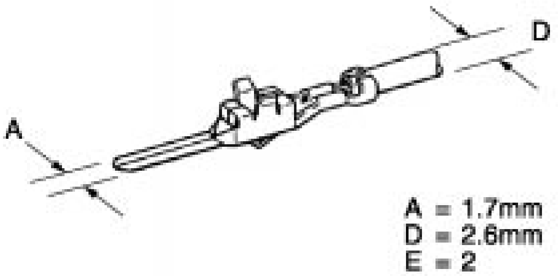
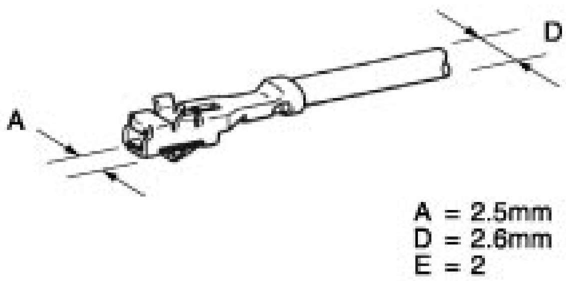
F

Repair Wire (Non–waterproof Type)

Type	**1.0III IDC**	
	Male	Female
	Sleeve : Medium (Blue)  	**Sleeve** : Medium (Blue) 
P/N	82998–12660	82998–12640
Type	**1.0IV**	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12740
Type	**1.3**	
	Male	Female
	Sleeve : Medium (Blue)  	**Sleeve** : Medium (Blue) 
P/N	82998–12410	82998–12420

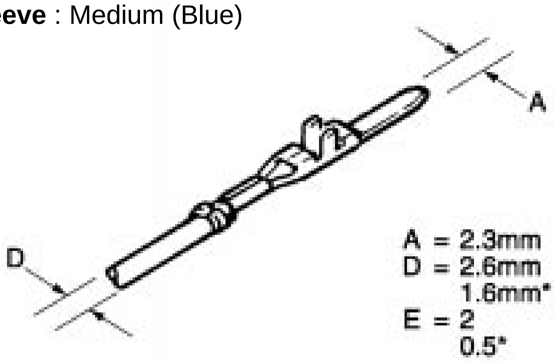
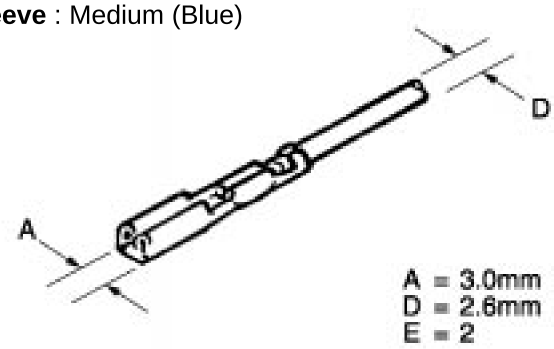
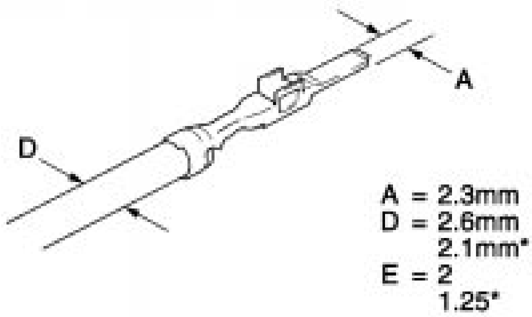
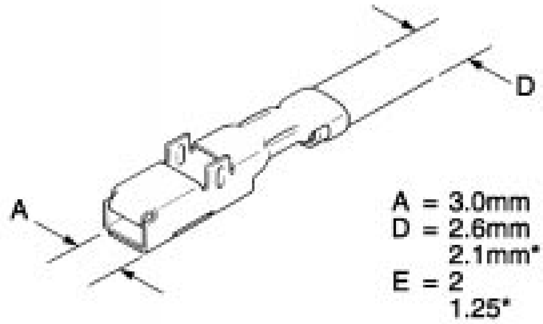
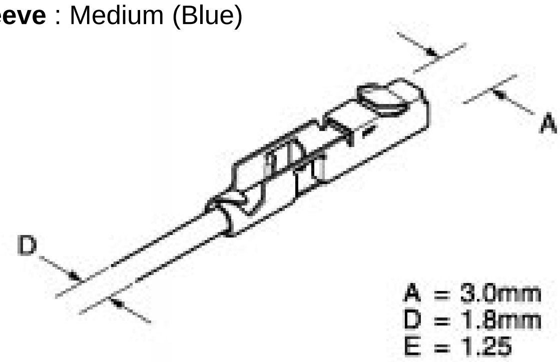
F

Repair Wire (Non–waterproof Type)

Type	1.8	
	Male	Female
	Sleeve : Medium (Blue)  	**Sleeve** : Medium (Blue) 
P/N	82998–12180	82998–12190 82998–12300*
Type	1.8II	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) **Size : S, M**  	**Sleeve** : Medium (Blue) or Large (Yellow) **Size : S, M** 
P/N	82998–24090 82998–24130*	82998–24100
Type	1.8II	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) **Size : L**  	**Sleeve** : Medium (Blue) or Large (Yellow) **Size : L** 
P/N	82998–24030	82998–24040

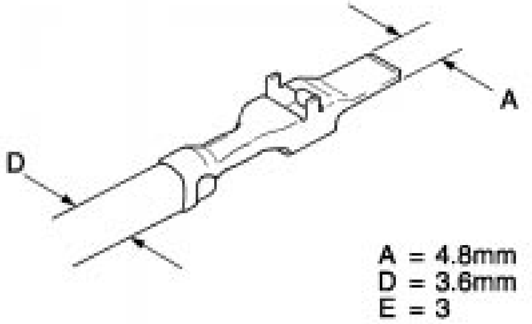
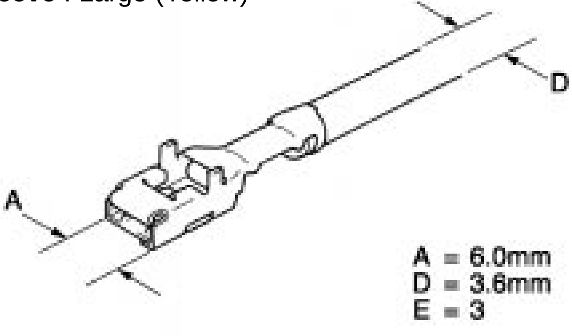
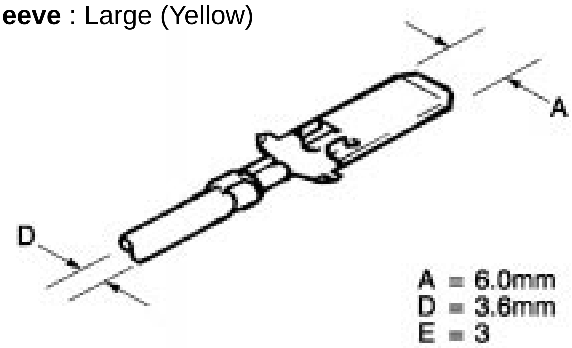
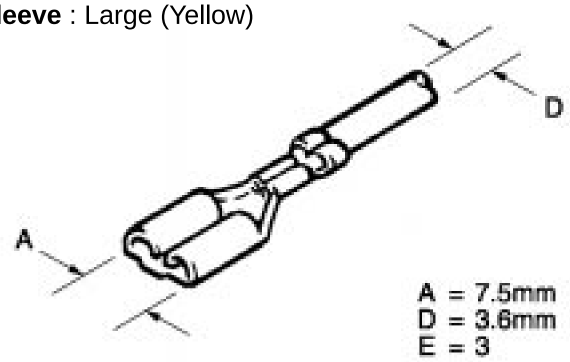
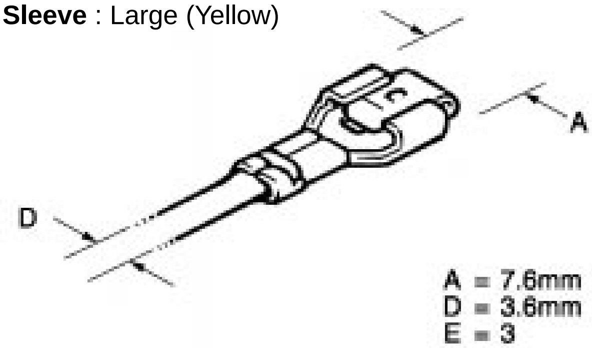
F

Repair Wire (Non–waterproof Type)

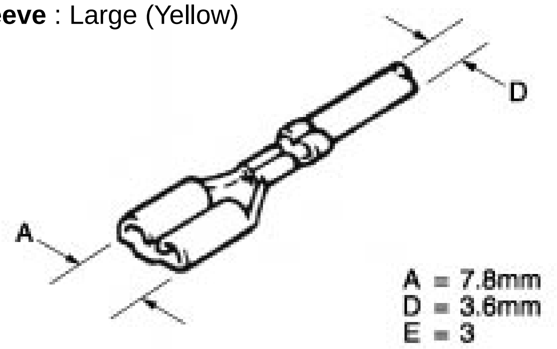
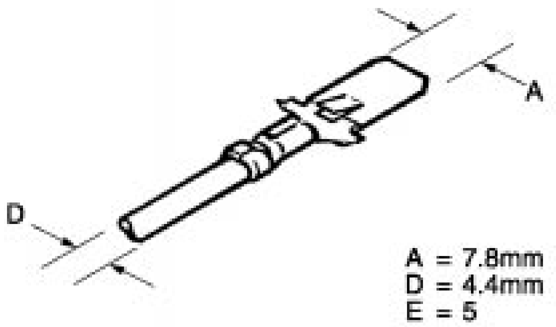
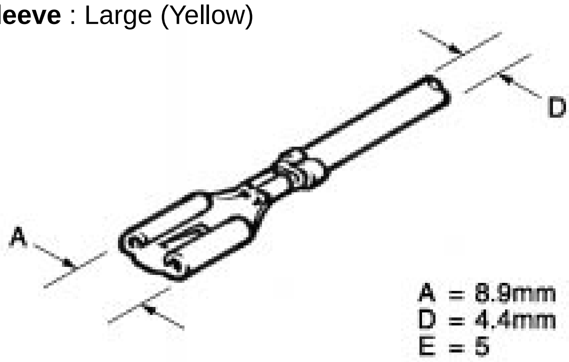
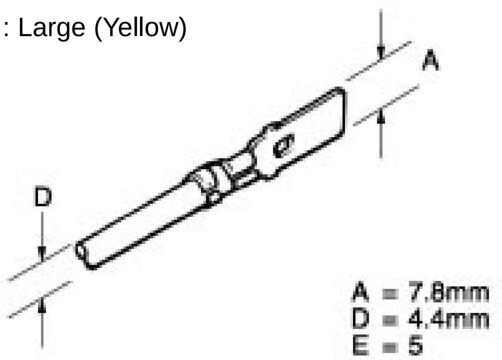
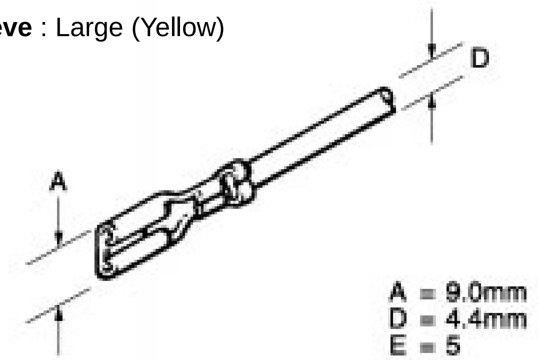
Type	**2.3**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12160 82998–24050*	82998–12170
Type	**2.3II**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12330 82998–12350*	82998–12340 82998–12360*
Type	**2.3II IDC**	
	Male	Female
	—	**Sleeve** : Medium (Blue) 
P/N		82998–24220

F

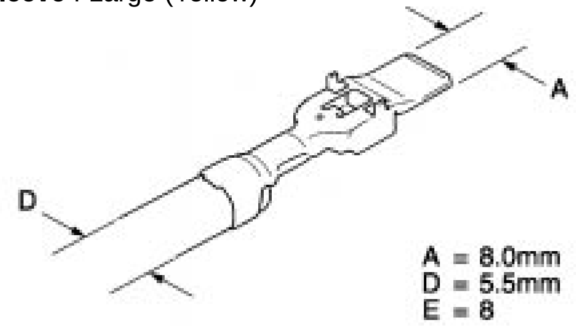
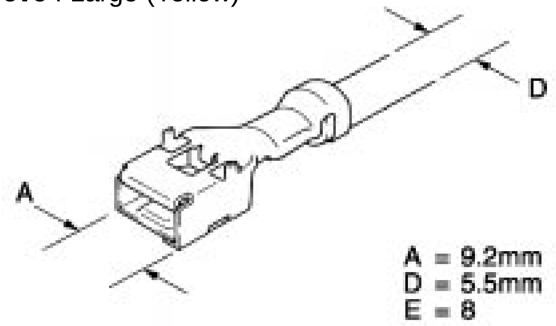
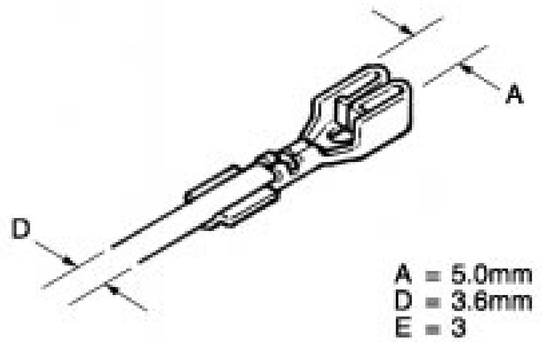
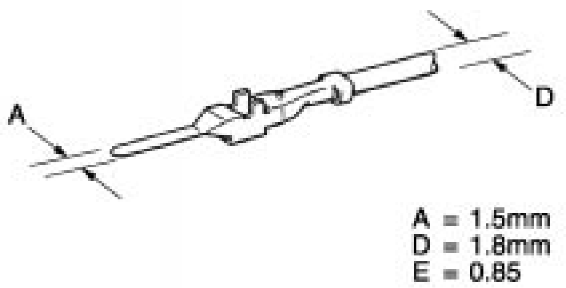
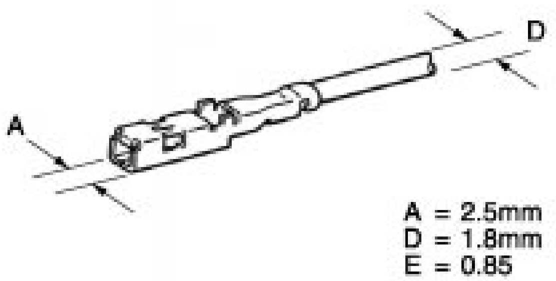
Repair Wire (Non–waterproof Type)

Type	4.8	
	Male	Female
	Sleeve : Large (Yellow)  	**Sleeve** : Large (Yellow) 
P/N	82998–12370	82998–12380
Type	6.3	
	Male	Female
	Sleeve : Large (Yellow)  	**Sleeve** : Large (Yellow) 
P/N	82998–12050	82998–12060(160mm) 82998–12580(500mm)
Type	6.3	
	Male	Female
	—	**Sleeve** : Large (Yellow) 
P/N		82998–12070

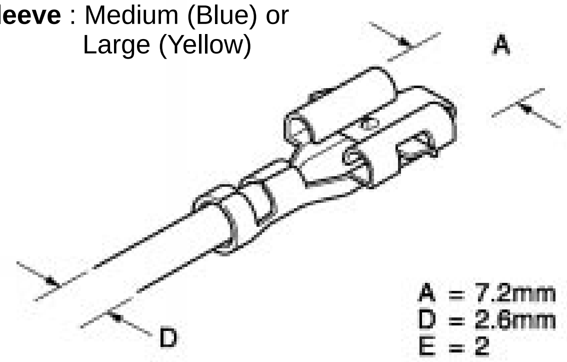
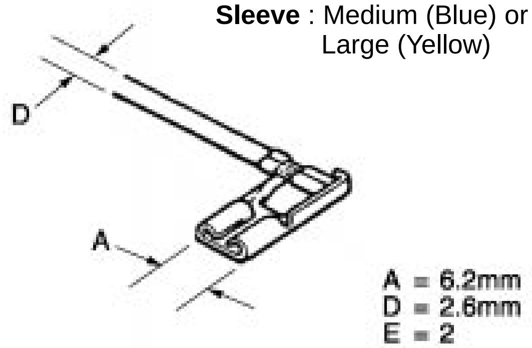
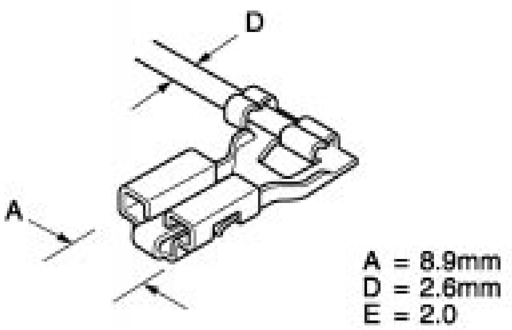
Repair Wire (Non–waterproof Type)

Type	**6.3II**	
	Male	Female
		Sleeve : Large (Yellow) 
P/N		82998–24170
Type	**7.7 Terminal Lance**	
	Male	Female
	Sleeve : Large (Yellow)  	**Sleeve** : Large (Yellow) 
P/N	82998–12010	82998–12020
Type	**7.7 Housing Lance**	
	Male	Female
	Sleeve : Large (Yellow)  	**Sleeve** : Large (Yellow) 
P/N	82998–12030	82998–12040

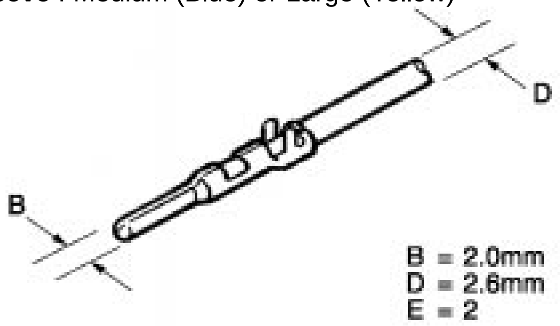
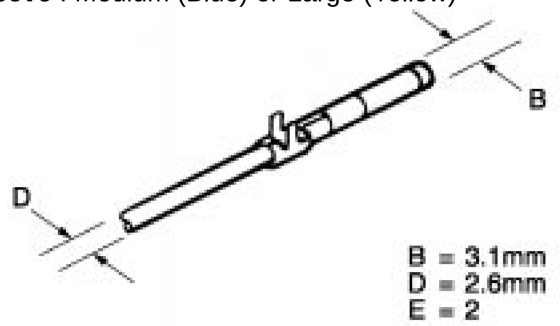
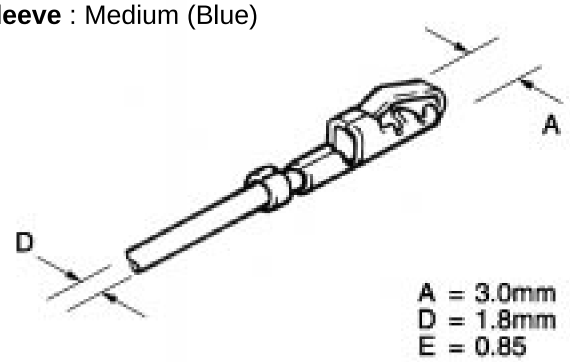
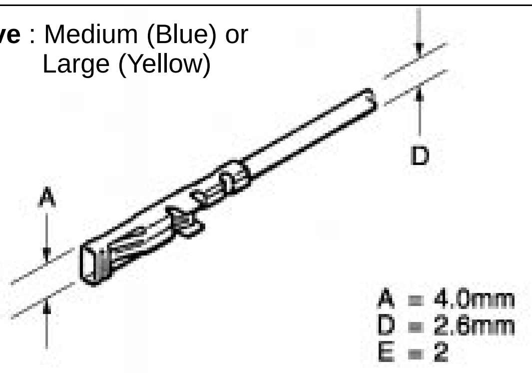
Repair Wire (Non–waterproof Type)

Type	**8.0**	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12390	82998–12400
Type	**BLADE FUSE**	
	Male	Female
		
P/N		82998–12140
Type	**C–Type**	
	Male	Female
		
P/N	82998–12560	82998–12570

Repair Wire (Non–waterproof Type)

Type	**FOG–LP**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–24210
Type	**FTC**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–12510
Type	**HEAD LAMP**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–24140(160mm) 82998–24200(500mm)

Repair Wire (Non–waterproof Type)

Type	LAC	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow)  	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12100	82998–12110
Type	MFPC	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12150
Type	MIC	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–12120

Repair Wire (Non–waterproof Type)

<table>
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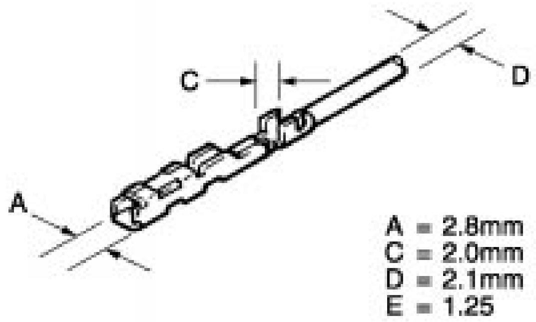
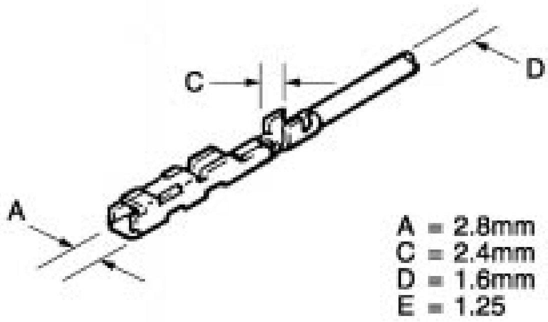
<tr><td></td><td>Female (Power)</td><td>Female (Signal)</td></tr>
<tr><td></td><td>
</td><td>
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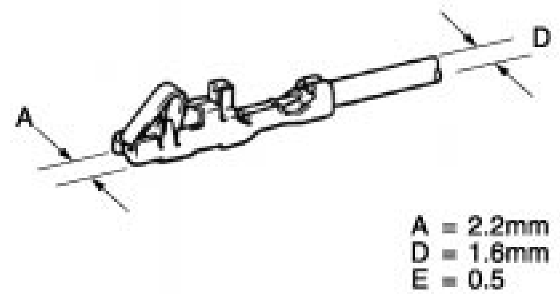
<tr><td>P/N</td><td>82998–12200</td><td>82998–12210</td></tr>
<tr><td>Type</td><td colspan="2">SFPC</td></tr>
<tr><td></td><td>Male</td><td>Female</td></tr>
<tr><td></td><td></td><td>Sleeve : Medium (Blue)

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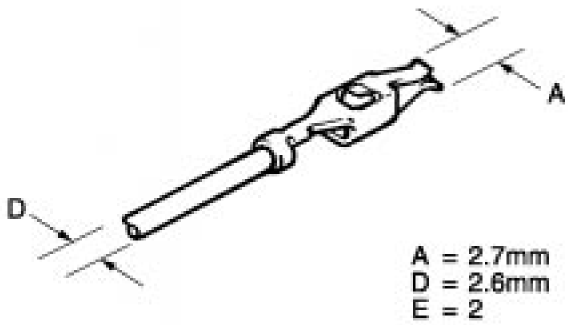
<tr><td>P/N</td><td></td><td>82998–24180</td></tr>
<tr><td>Type</td><td colspan="2">SL</td></tr>
<tr><td></td><td>Male</td><td>Female</td></tr>
<tr><td></td><td></td><td>Sleeve : Medium (Blue) or Large (Yellow)

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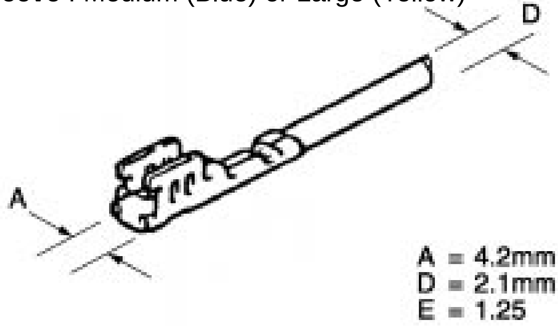
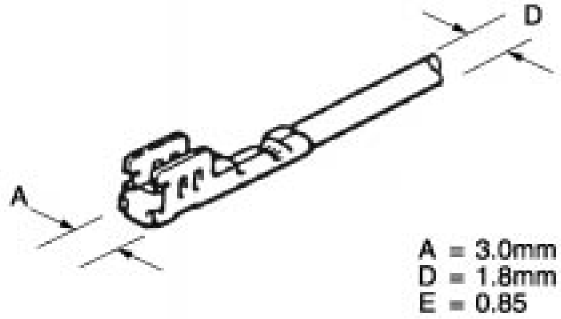
Repair Wire (Non–waterproof Type)

Type	SP	
	Female (Power)	Female (Signal)
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
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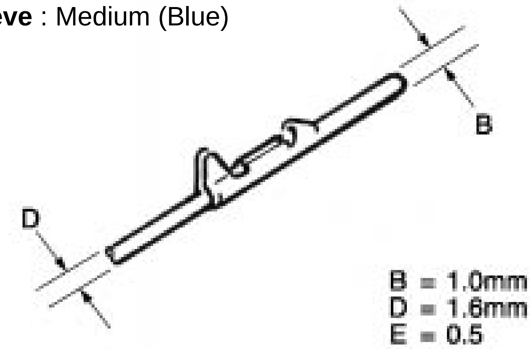
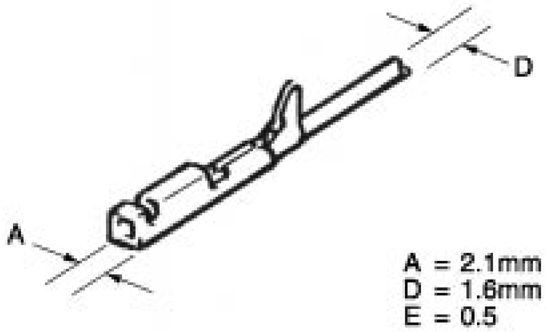
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
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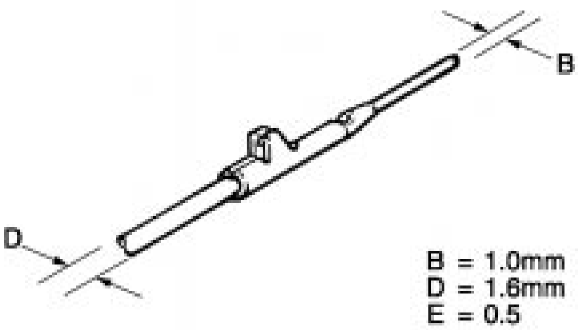
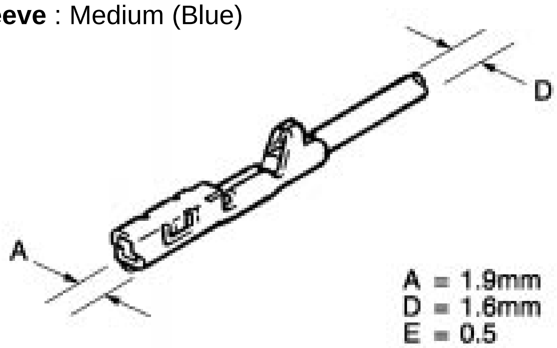
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
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Repair Wire (Non–waterproof Type)

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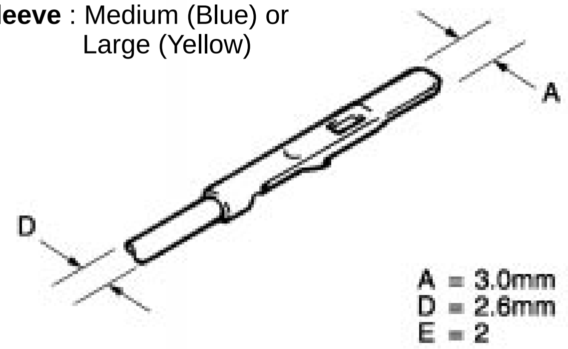
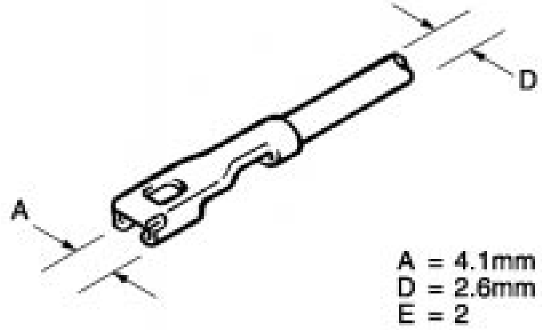
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
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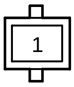
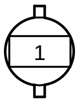
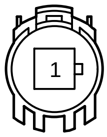
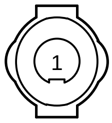
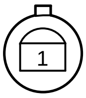
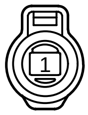
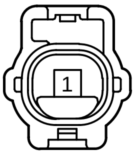
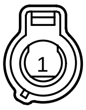
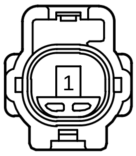
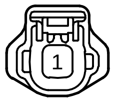
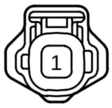
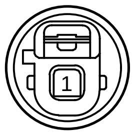
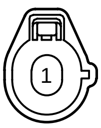
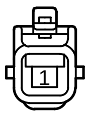
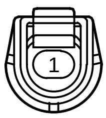
 90980–10090	 90980–10115	 90980–10197	 90980–10201
 90980–10241	 90980–10247 90980–10705	 90980–10439	 90980–10837
 90980–10893	 90980–10983	 90980–11007	 90980–11166
 90980–11184	 90980–11243	 90980–11252	 90980–11271
 90980–11282	 90980–11363	 90980–11400	 90980–11428

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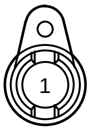
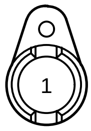
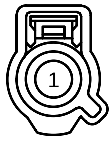
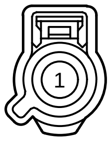
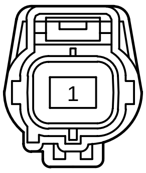
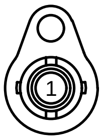
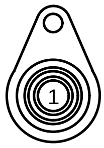
<FEMALE> 1P Waterproof Type

 90980–11941	 90980–11942	 90980–11943	 90980–11944
 90980–11963	 90980–12125	 90980–12129 90980–12136	

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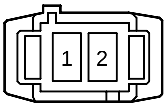
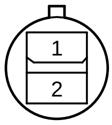
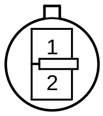
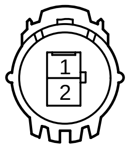
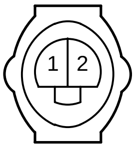
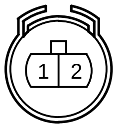
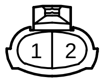
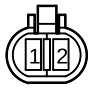
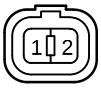
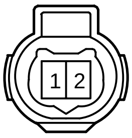
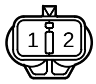
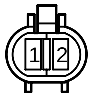
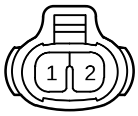
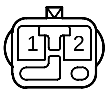
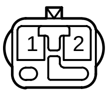
 90980–10092	 90980–10123	 90980–10157	 90980–10184
 90980–10193	 90980–10243	 90980–10474	 90980–10496
 90980–10498 90980–10706	 90980–10532	 90980–10534	 90980–10556
 90980–10567	 90980–10572	 90980–10576	 90980–10578
 90980–10581	 90980–10583	 90980–10593	 90980–10595

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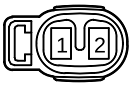
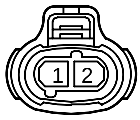
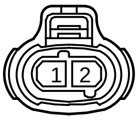
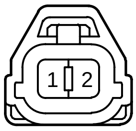
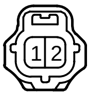
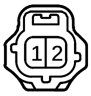
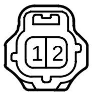
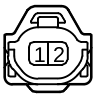
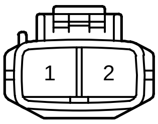
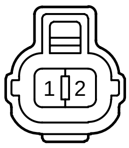
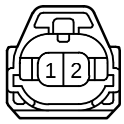
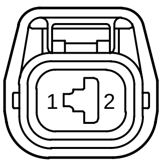
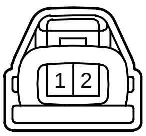
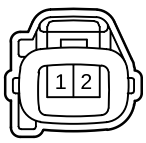
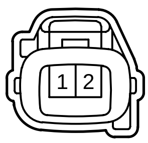
<FEMALE> 2P Waterproof Type

 90980–10598	 90980–10609	 90980–10617	 90980–10622
 90980–10623	 90980–10626	 90980–10702	 90980–10720
 90980–10734	 90980–10735	 90980–10736	 90980–10737
 90980–10748 90980–10846	 90980–10839	 90980–10843	 90980–10847
 90980–10853	 90980–10887	 90980–10899	 90980–10901

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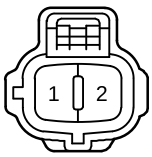
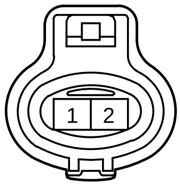
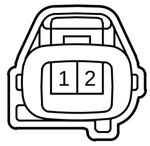
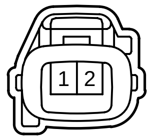
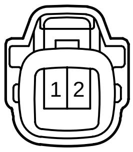
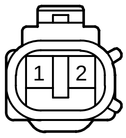
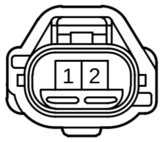
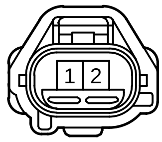
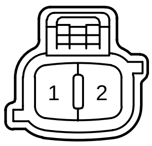
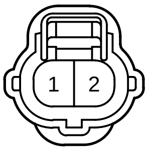
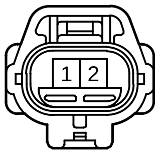
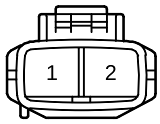
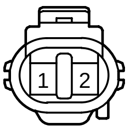
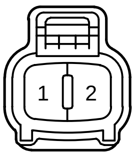
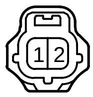
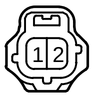
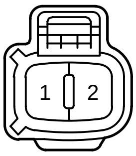
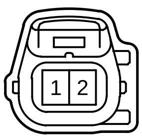
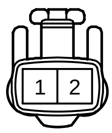
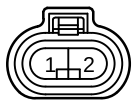
<FEMALE> 2P Waterproof Type

 90980–10923	 90980–10928	 90980–10947	 90980–10949
 90980–10974	 90980–11003	 90980–11005	 90980–11009
 90980–11019	 90980–11025 90980–11401	 90980–11030	 90980–11032
 90980–11038	 90980–11051	 90980–11061	 90980–11062
 90980–11068	 90980–11070	 90980–11075	 90980–11095

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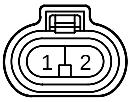
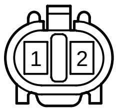
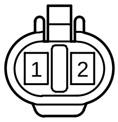
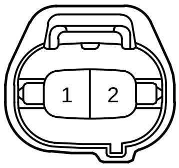
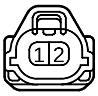
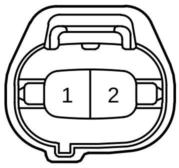
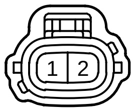
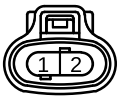
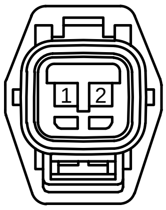
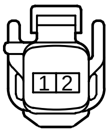
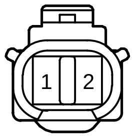
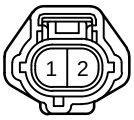
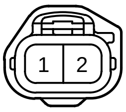
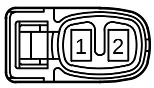
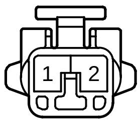
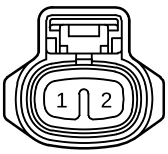
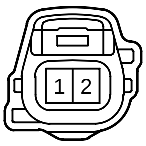
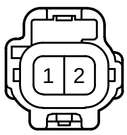
 90980–11096	 90980–11140	 90980–11142	 90980–11149
 90980–11153	 90980–11154 90980–11284	 90980–11156	 90980–11162
 90980–11163	 90980–11176	 90980–11189	 90980–11207
 90980–11235	 90980–11237	 90980–11246	 90980–11248
 90980–11250	 90980–11255	 90980–11273	 90980–11285

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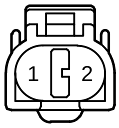
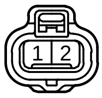
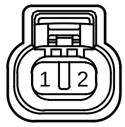
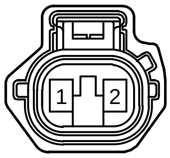
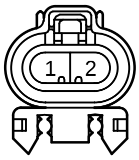
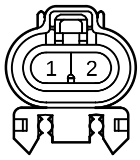
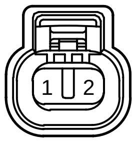
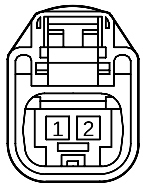
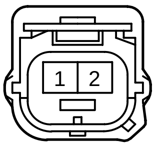
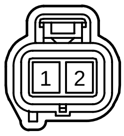
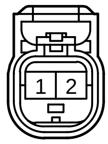
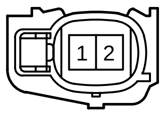
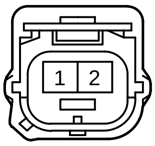
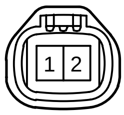
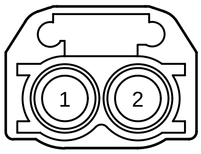
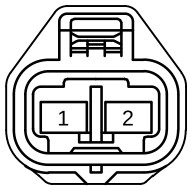
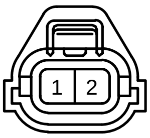
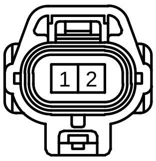
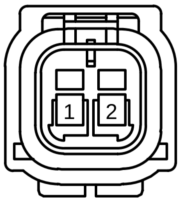
 90980–11286	 90980–11410	 90980–11448	 90980–11467
 90980–11659	 90980–11660	 90980–11773	 90980–11790
 90980–11856	 90980–11859	 90980–11864	 90980–11875
 90980–11898	 90980–11900	 90980–12028	 90980–12068
 90980–12117	 90980–12188	 90980–12195	

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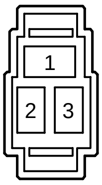
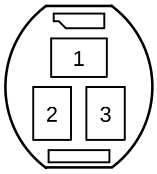
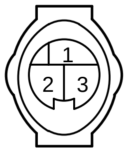
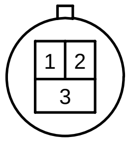
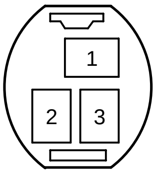
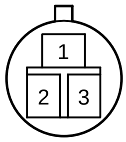
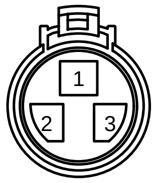
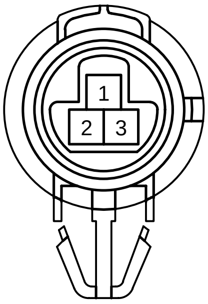
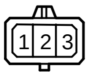
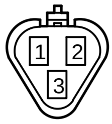
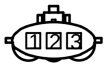
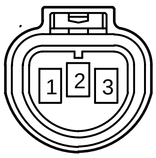
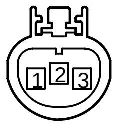
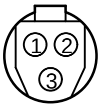
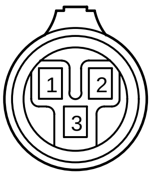
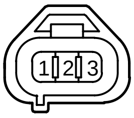
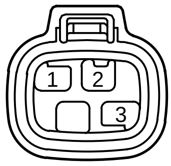
 90980–10088	 90980–10110	 90980–10191	 90980–10199
 90980–10239	 90980–10245	 90980–10249	 90980–10341 90980–11491
 90980–10353	 90980–10395	 90980–10494	 90980–10501
 90980–10554	 90980–10574	 90980–10579	 90980–10629
 90980–10683	 90980–10690 90980–11157	 90980–10695	 90980–10834

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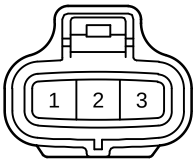
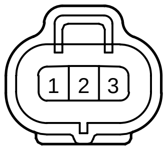
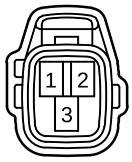
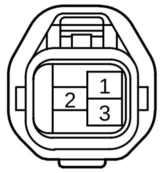
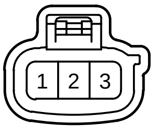
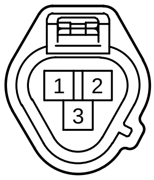
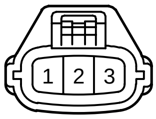
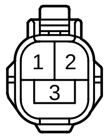
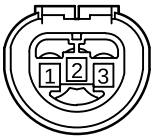
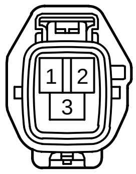
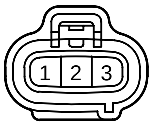
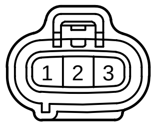
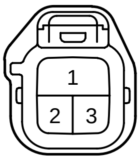
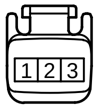
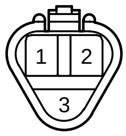
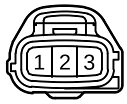
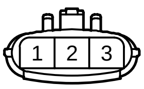
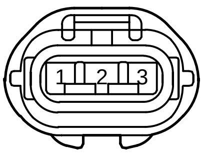
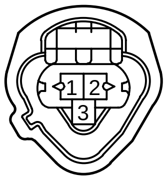
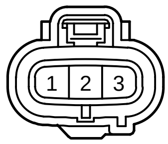
 90980–10841	 90980–10845	 90980–10902	 90980–10919
 90980–10981	 90980–11016	 90980–11020	 90980–11045
 90980–11108	 90980–11132	 90980–11143	 90980–11145
 90980–11161	 90980–11170	 90980–11245	 90980–11261
 90980–11294	 90980–11349	 90980–11451	 90980–11860

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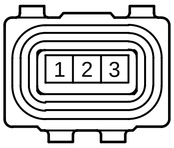
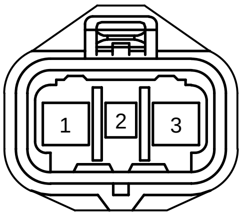
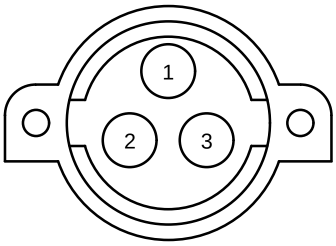
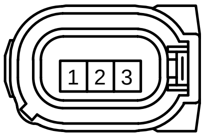
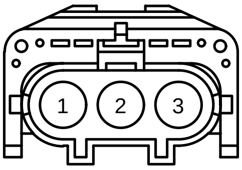
 90980–11907	 90980–12058	 90980–12095	 90980–12168
 90980–12228			

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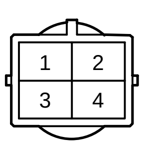
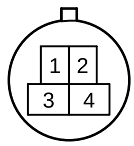
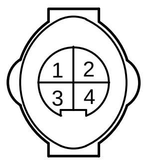
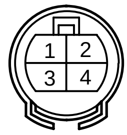
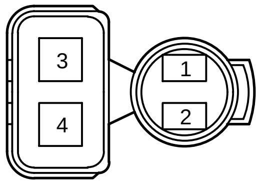
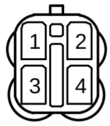
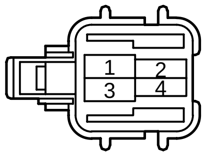
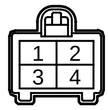
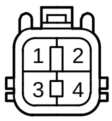
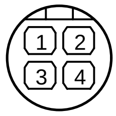
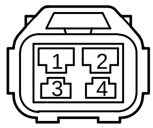
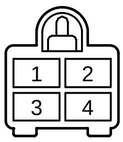
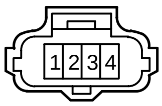
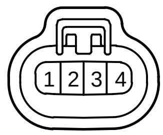
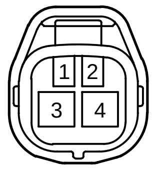
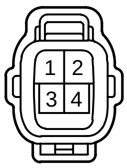
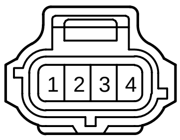
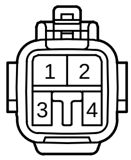
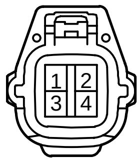
<FEMALE> 4P Waterproof Type

 90980–10095	 90980–10140 90980–10220	 90980–10203	 90980–10218
 90980–10373	 90980–10476	 90980–10549	 90980–10551
 90980–10591	 90980–10649	 90980–10663 90980–10664	 90980–10685
 90980–10701	 90980–10711	 90980–10831	 90980–10844
 90980–10869	 90980–10929	 90980–10940	 90980–10942

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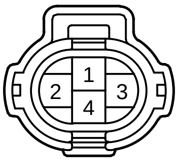

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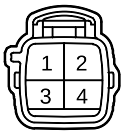

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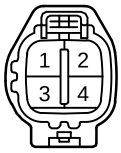

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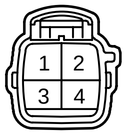

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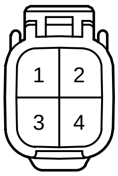

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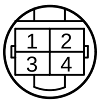

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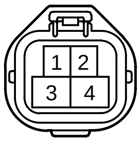
90980–11066



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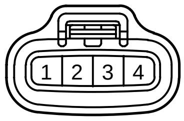

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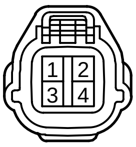

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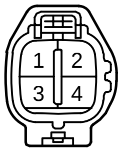

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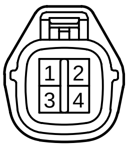

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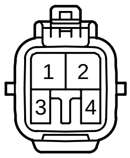

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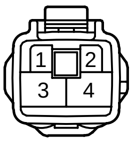

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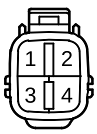

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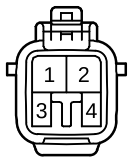

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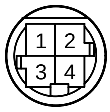

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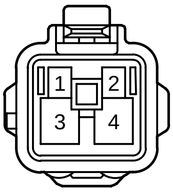

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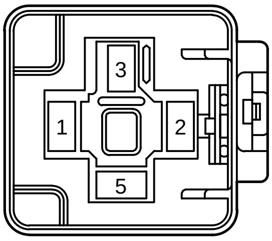

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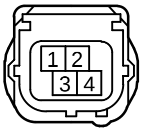

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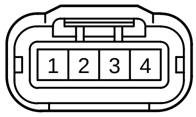
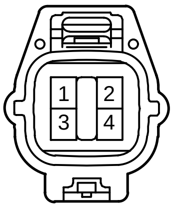
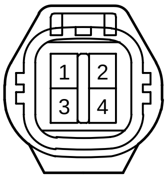
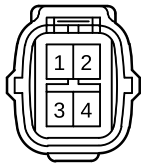
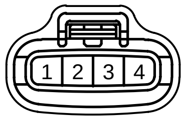
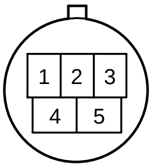
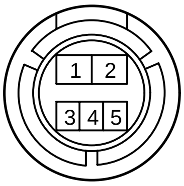
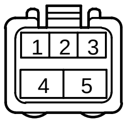
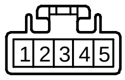
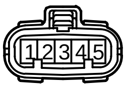
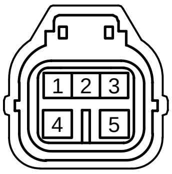
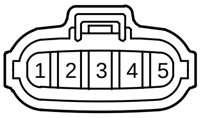
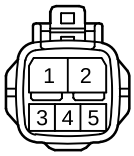
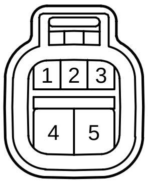
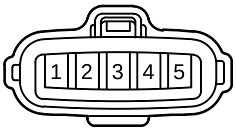
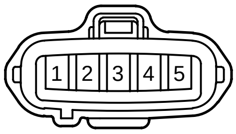
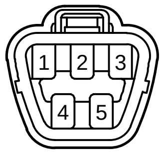
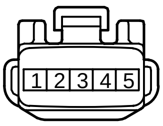
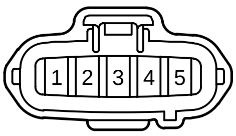
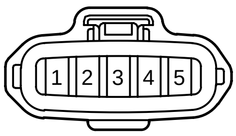
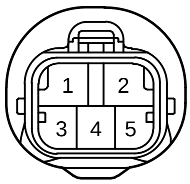
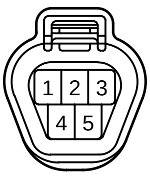
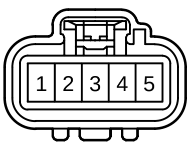
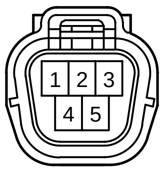


90980–11885

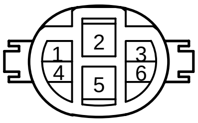
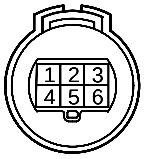
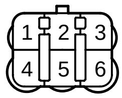
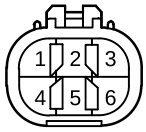
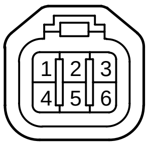
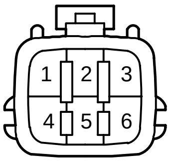
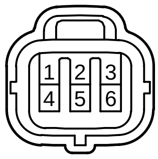
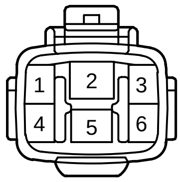
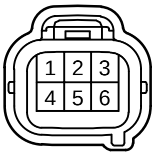
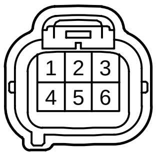
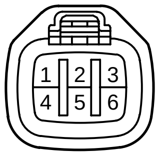
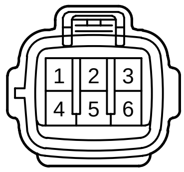
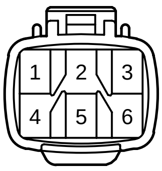
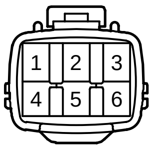
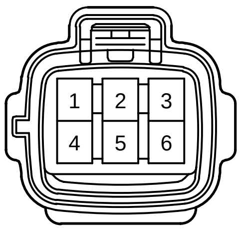
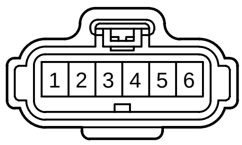
<FEMALE> 4P Waterproof Type

 90980–11930	 90980–11964	 90980–12005	 90980–12057

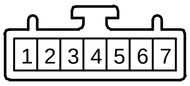
<FEMALE> 5P Waterproof Type

 90980–10162	 90980–10393	 90980–10550	 90980–10558
 90980–10624	 90980–10710	 90980–10712	 90980–10946
 90980–11022	 90980–11024	 90980–11049	 90980–11077
 90980–11182	 90980–11232	 90980–11317	 90980–11413
 90980–11599	 90980–11904	 90980–11960	

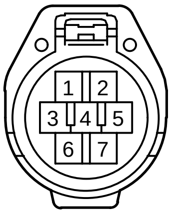
<FEMALE> 6P Waterproof Type

 90980–10097	 90980–10195	 90980–10478	 90980–10597
 90980–10643	 90980–10651	 90980–10854	 90980–10939
 90980–10988	 90980–11034	 90980–11144	 90980–11194
 90980–11197	 90980–11290	 90980–11663	 90980–11858

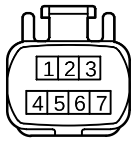
<FEMALE> 7P, 8P Waterproof Type



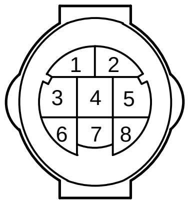
90980–10628



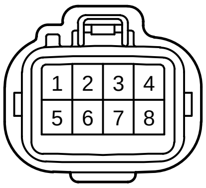
90980–10931



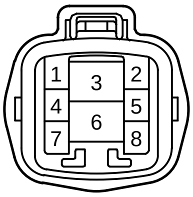
90980–11172



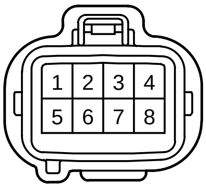
90980–10205



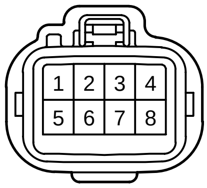
90980–10891



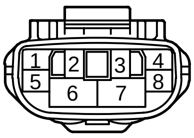
90980–10895



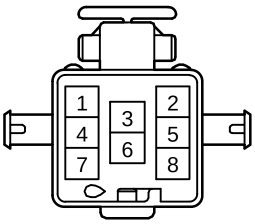
90980–10897



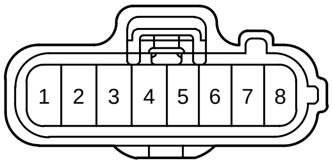
90980–11190



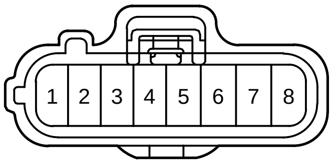
90980–11242



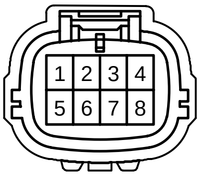
90980–11461



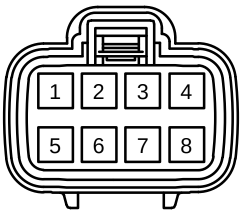
90980–11592



90980–11593

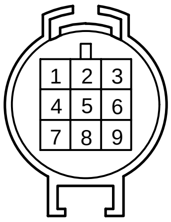
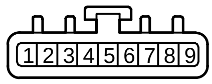
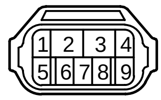
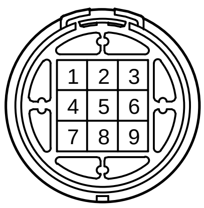
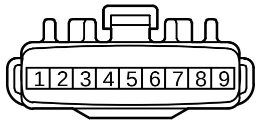
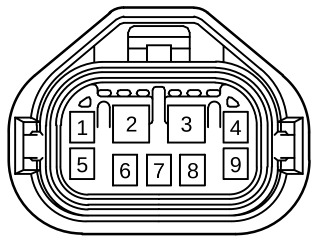
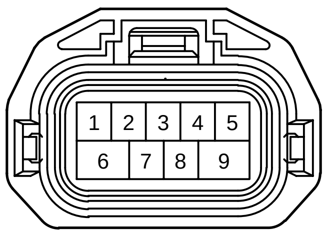


90980–12080

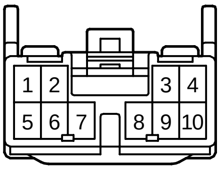


90980–12164

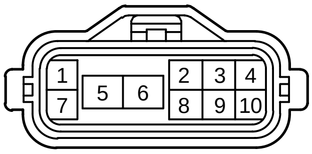
<FEMALE> 9P Waterproof Type

 90980–10380 90980–10381	 90980–10678	 90980–10686
 90980–10776	 90980–11192	 90980–11643
 90980–11784		

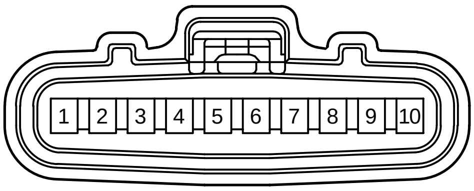
<FEMALE> 10P Waterproof Type



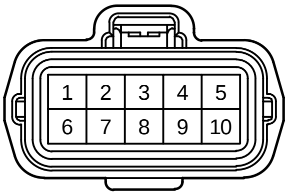
90980–11231



90980–11332

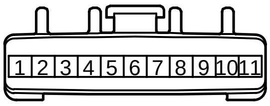


90980–11653

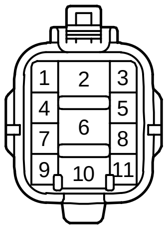


90980–11658

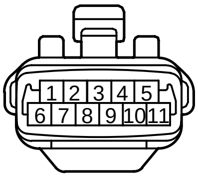
<FEMALE> 11P Waterproof Type



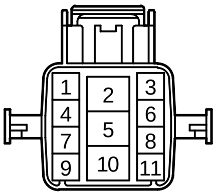
90980–11174



90980–11240

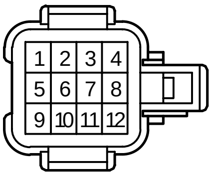


90980–11257

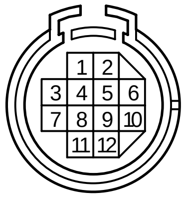


90980–11612

<FEMALE> 12P Waterproof Type

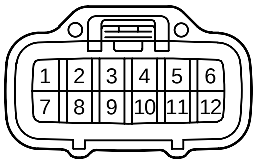


90980–10548

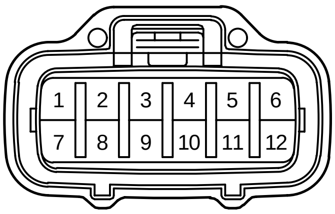


90980–10569

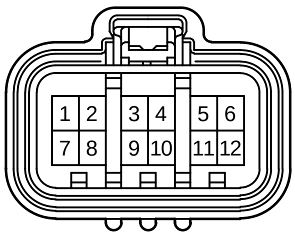
90980–11087



90980–11151

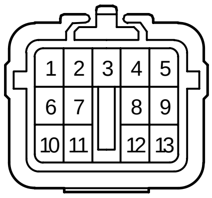
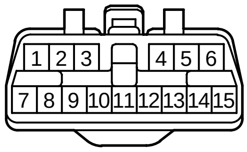
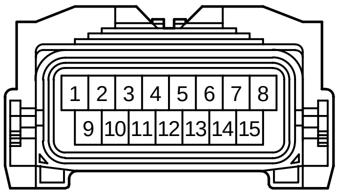


90980–11664

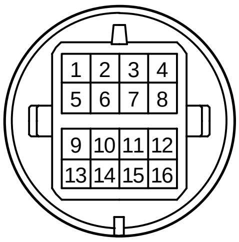


90980–11698

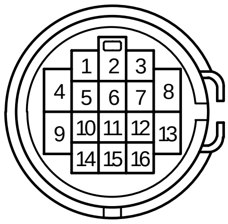
<FEMALE> 13P, 15P Waterproof Type

 90980–10654	 90980–11089
 90980–11677	

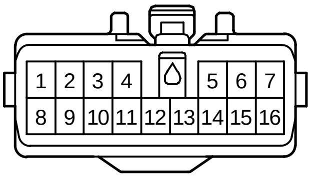
<FEMALE> 16P, 17P, 23P Waterproof Type



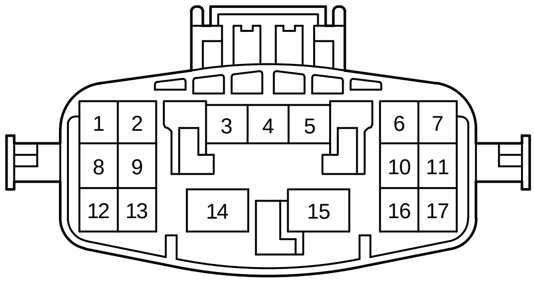
90980–10101



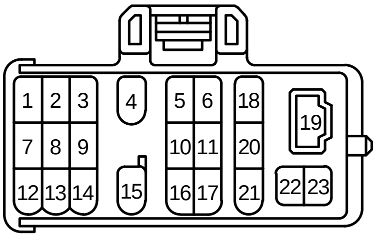
90980–10288



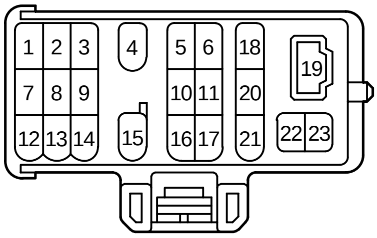
90980–11463



90980–11601

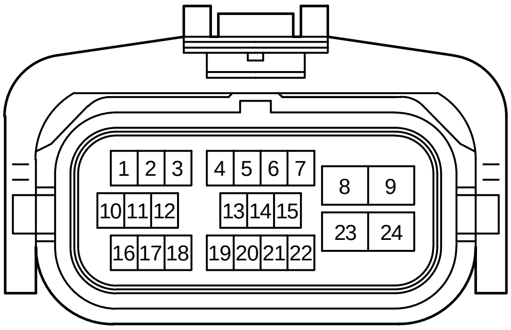


90980–11195

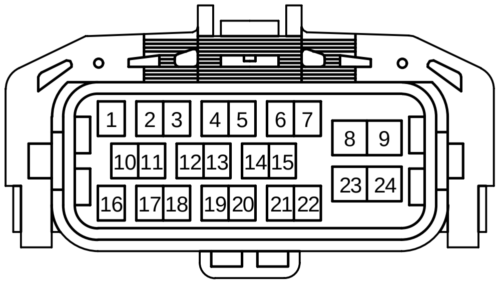


90980–11323

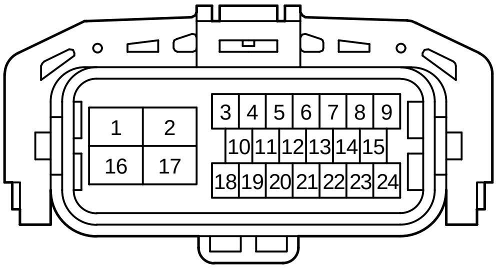
<FEMALE> 24P, 25P Waterproof Type



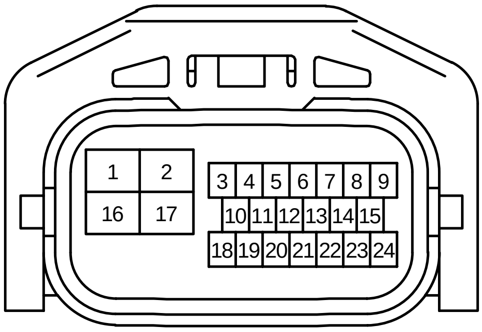
90980–11851



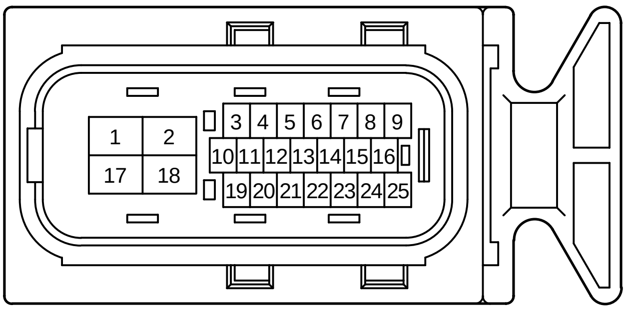
90980–11882



90980–11893

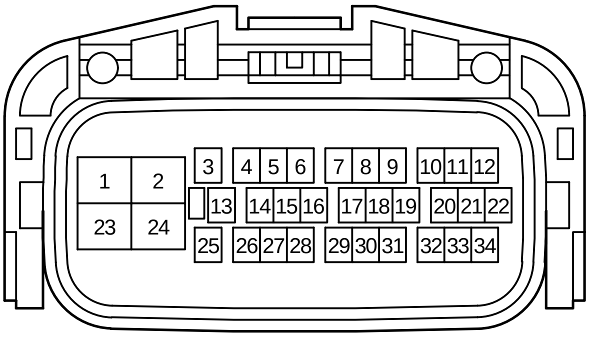


90980–12116

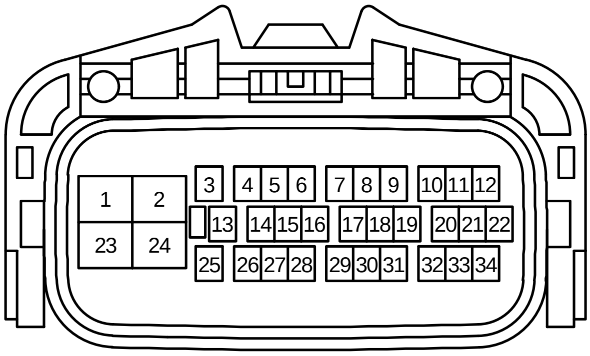


90980–11861

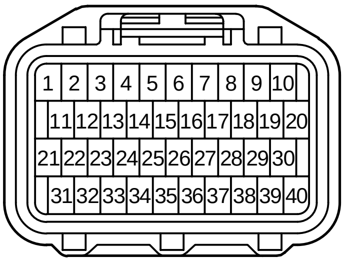
<FEMALE> 34P, 40P Waterproof Type



90980–12020



90980–12021
90980–12022



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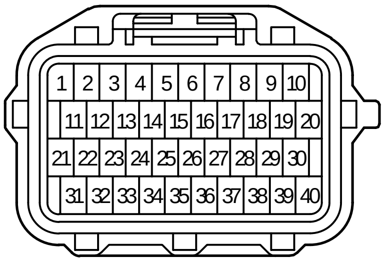
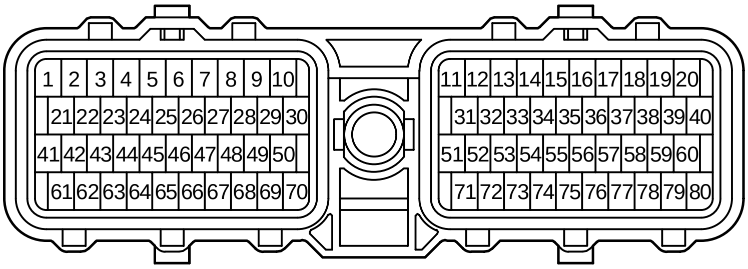


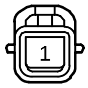
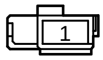
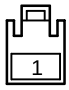
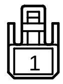
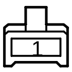
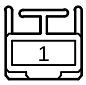
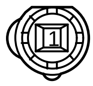
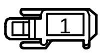
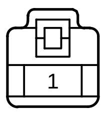
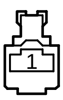
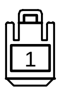
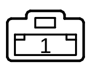
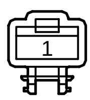
90980–11566

<FEMALE> 80P Waterproof Type

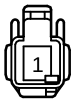
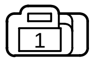
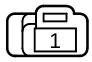
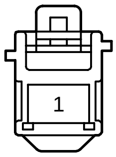
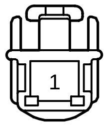
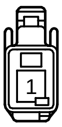
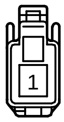
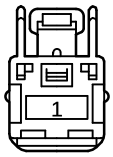
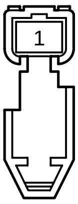
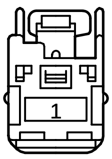


90980–11214

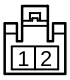
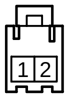
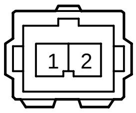
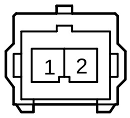
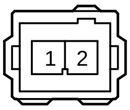
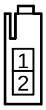
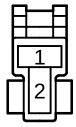
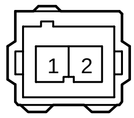
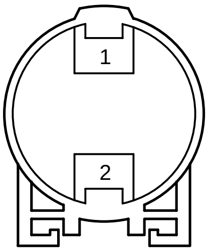
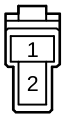
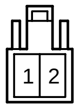
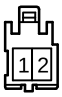
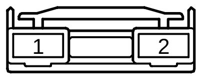
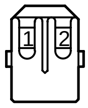
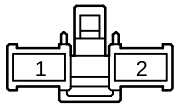
<FEMALE> 1P Non–waterproof Type

 90980–10165	 90980–10179	 90980–10183	 90980–10229
 90980–10250	 90980–10252	 90980–10254	 90980–10332
 90980–10343	 90980–10359	 90980–10363	 90980–10398
 90980–10435	 90980–10619	 90980–10652	 90980–10688
 90980–10703	 90980–10782	 90980–10786	 90980–10792

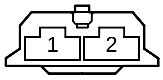
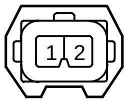
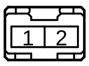
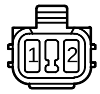
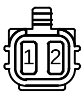
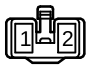
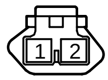
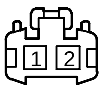
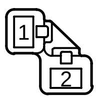
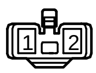
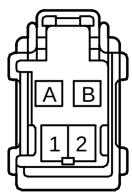
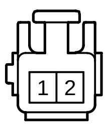
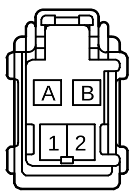
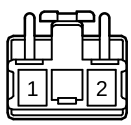
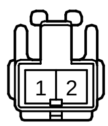
<FEMALE> 1P Non–waterproof Type

 90980–10871	 90980–10911	 90980–10912	 90980–10913
 90980–10914	 90980–10995	 90980–11147	 90980–11259
 90980–11315	 90980–11703	 90980–11738	 90980–11775
 90980–11853	 90980–11881		

<FEMALE> 2P Non–waterproof Type

 90980–10012	 90980–10039	 90980–10069	 90980–10108
 90980–10109	 90980–10121	 90980–10124	 90980–10141
 90980–10185	 90980–10214	 90980–10256	 90980–10298
 90980–10320	 90980–10333	 90980–10345	 90980–10348
 90980–10355	 90980–10357	 90980–10362	 90980–10385

<FEMALE> 2P Non–waterproof Type

 90980–10423	 90980–10425	 90980–10426	 90980–10465
 90980–10481	 90980–10482	 90980–10491	 90980–10511
 90980–10512	 90980–10559	 90980–10621	 90980–10637
 90980–10679	 90980–10760	 90980–10783	 90980–10823
 90980–10825	 90980–10835	 90980–10850	 90980–10855

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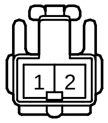
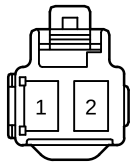
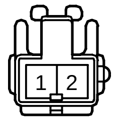
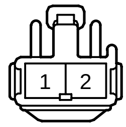
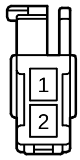
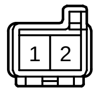
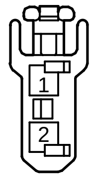
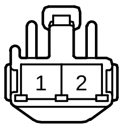
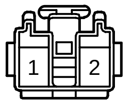
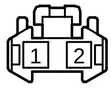
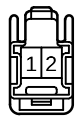
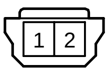
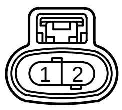
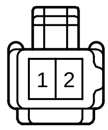
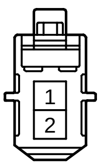
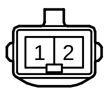
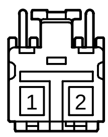
 90980–10860	 90980–10903	 90980–10906	 90980–10916
 90980–10935	 90980–10960	 90980–10962	 90980–11080
 90980–11094	 90980–11098	 90980–11148	 90980–11212
 90980–11227	 90980–11278	 90980–11306	 90980–11369
 90980–11386	 90980–11388	 90980–11396	 90980–11429

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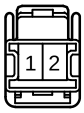
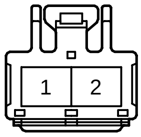
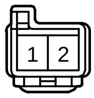
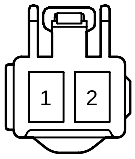
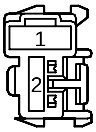
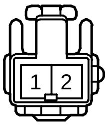
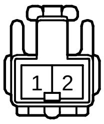
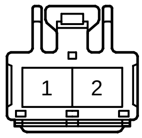
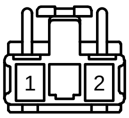
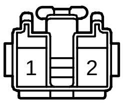
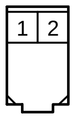
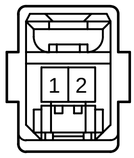
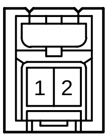
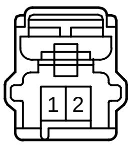
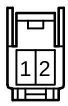
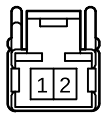
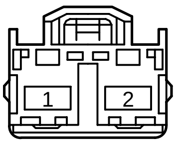
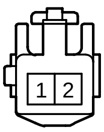
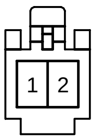
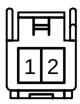
 90980–11436	 90980–11579	 90980–11608	 90980–11684
 90980–11687	 90980–11736	 90980–11769	 90980–11824
 90980–11839	 90980–11840	 90980–11862	 90980–11884
 90980–11886	 90980–11890	 90980–11918	 90980–11919
 90980–11996	 90980–12014	 90980–12039	 90980–12063

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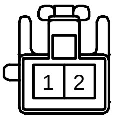
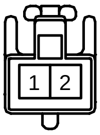
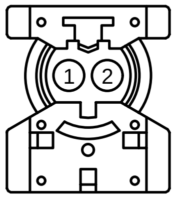
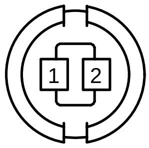
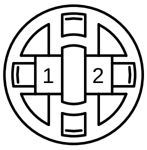
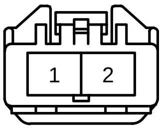
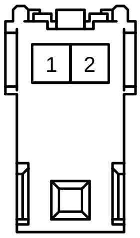
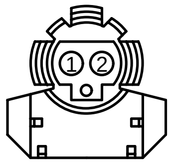
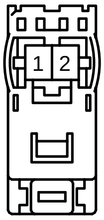
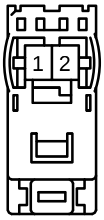
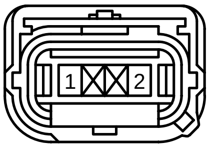
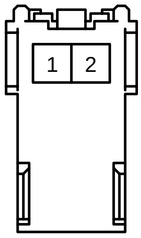
 90980–12088	 90980–12089	 90980–12109	 90980–12110
 90980–12111	 90980–12120	 90980–12138	 90980–12191
 90980–12219 90980–12242	 90980–12224 90980–12243	 90980–12241	 90980–12253

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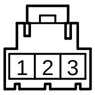
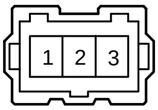
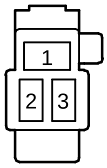
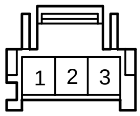
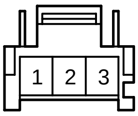
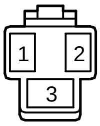
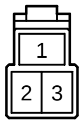
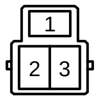
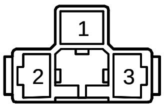
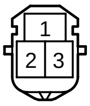
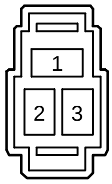
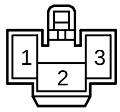
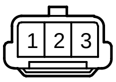
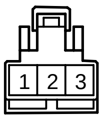
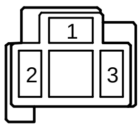
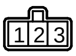
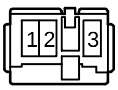
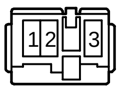
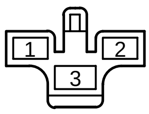
 90980–10056	 90980–10070	 90980–10072	 90980–10111
 90980–10143	 90980–10189	 90980–10216	 90980–10222
 90980–10228	 90980–10232	 90980–10234	 90980–10258
 90980–10365	 90980–10420	 90980–10428	 90980–10464
 90980–10483	 90980–10489	 90980–10490	 90980–10618

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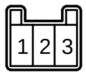
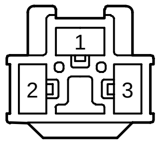
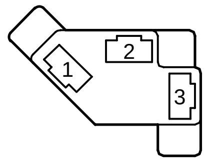
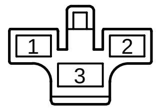
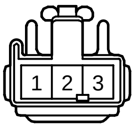
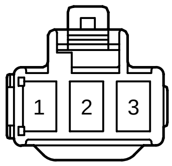
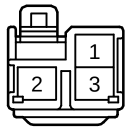
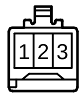
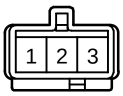
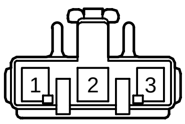
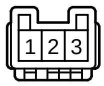
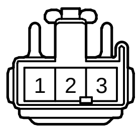
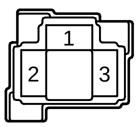
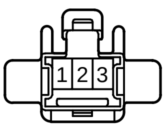
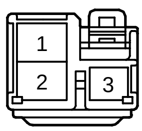
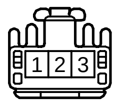
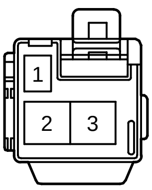
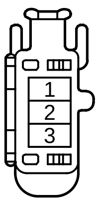
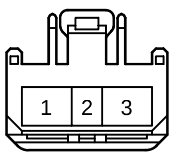
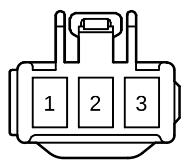
 90980–10638 90980–10660	 90980–10704	 90980–10747	 90980–10784
 90980–10908	 90980–10956	 90980–10980	 90980–11053
 90980–11071	 90980–11079	 90980–11251	 90980–11296
 90980–11314	 90980–11336	 90980–11387	 90980–11471
 90980–11485	 90980–11490	 90980–11667	 90980–11685

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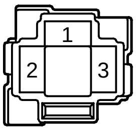
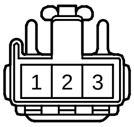
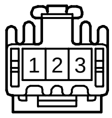
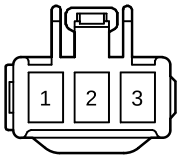
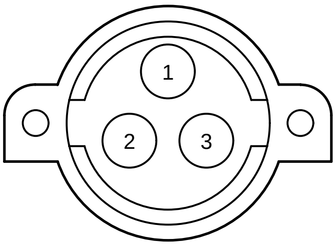
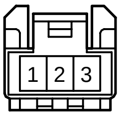
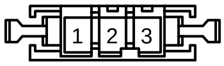
 90980–11731	 90980–11764	 90980–11777	 90980–11880
 90980–11938	 90980–11987	 90980–12197	

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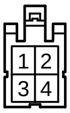
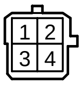
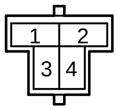
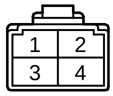
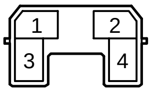
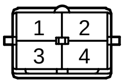
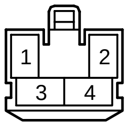
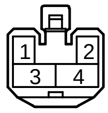
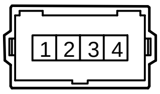
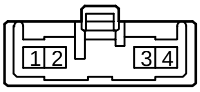
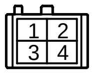
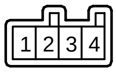
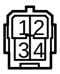
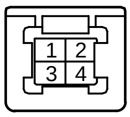
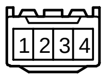
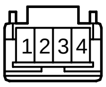
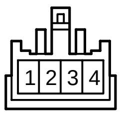
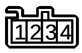
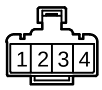
 90980–10002	 90980–10127	 90980–10142	 90980–10171
 90980–10196	 90980–10221	 90980–10260	 90980–10307
 90980–10378	 90980–10400	 90980–10467	 90980–10484
 90980–10504	 90980–10514	 90980–10515	 90980–10601
 90980–10645	 90980–10692	 90980–10716	 90980–10717

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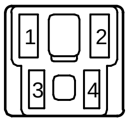
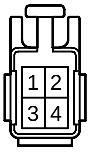
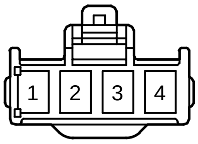
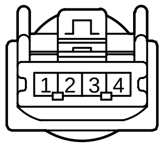
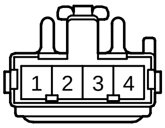
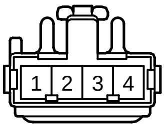
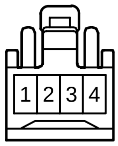
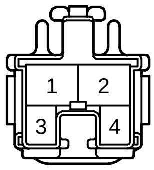
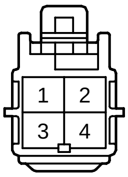
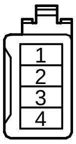
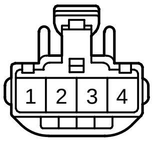
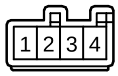
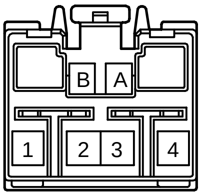
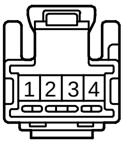
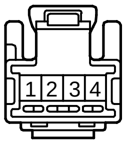
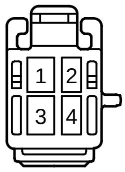
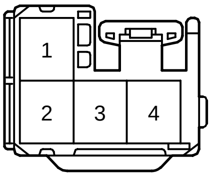
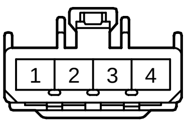
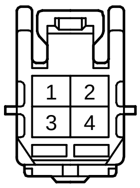
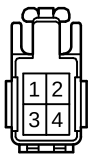
 90980–10759	 90980–10795	 90980–10867	 90980–10904
 90980–11013	 90980–11090	 90980–11107	 90980–11118
 90980–11136	 90980–11187	 90980–11313	 90980–11398
 90980–11427	 90980–11494	 90980–11495	 90980–11606
 90980–11662	 90980–11676	 90980–11742	 90980–11766

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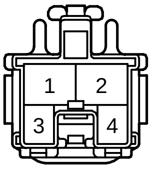
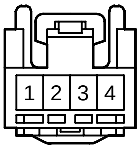
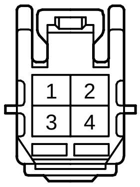
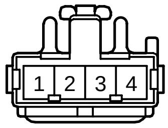
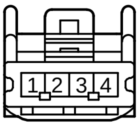
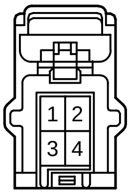
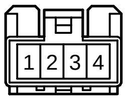
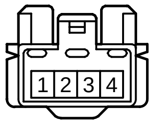
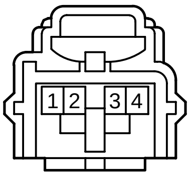
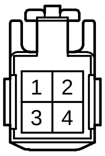
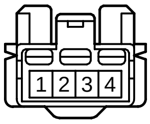
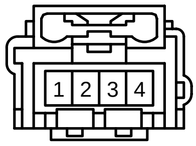
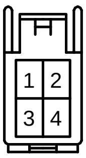
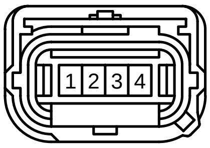
 90980–11771	 90980–11792	 90980–11799	 90980–11841
 90980–11842	 90980–11892	 90980–11950	 90980–11988
 90980–12017	 90980–12018	 90980–12019	 90980–12160
 90980–12211	 90980–12225		

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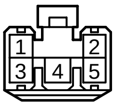

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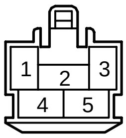

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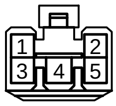

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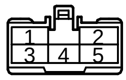

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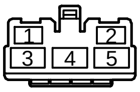

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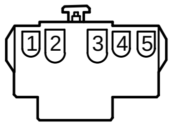

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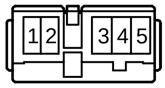

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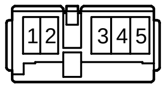

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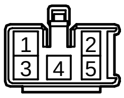

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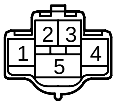

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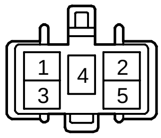

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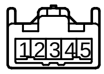

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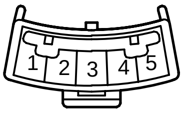

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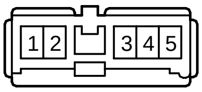

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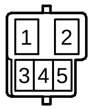

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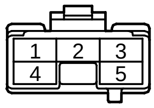

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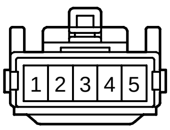

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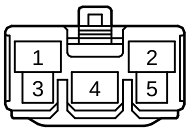

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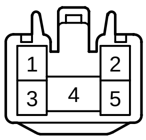

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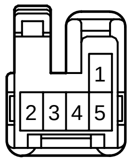

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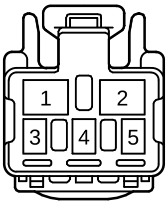
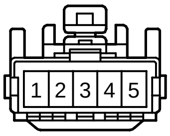
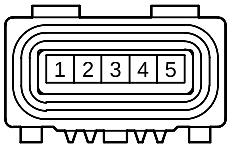
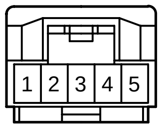
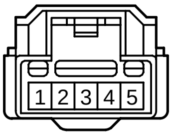
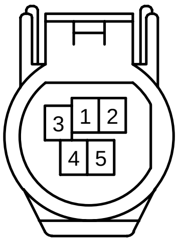
 90980–11603	 90980–11772	 90980–11908	 90980–11909
 90980–11921	 90980–12190		

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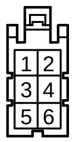
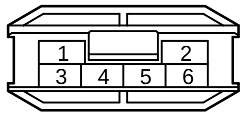
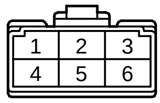
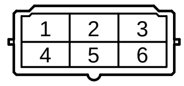
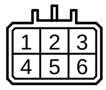
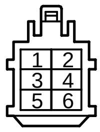
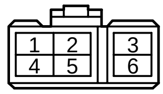
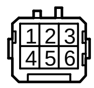
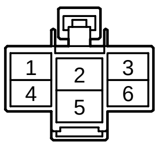
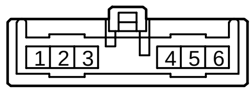
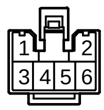
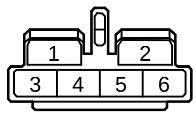
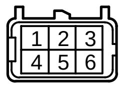
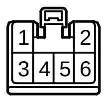
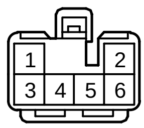
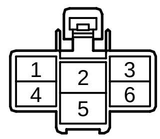
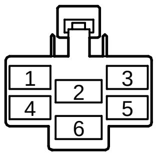
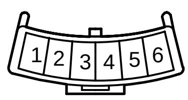
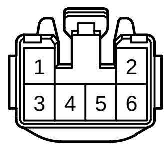
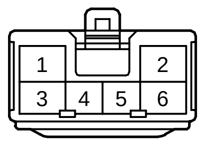
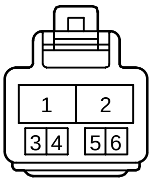
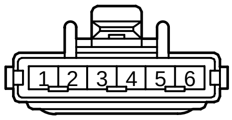
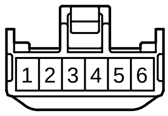
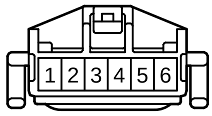
 90980–10004	 90980–10029	 90980–10173	 90980–10224
 90980–10313	 90980–10334	 90980–10335	 90980–10367
 90980–10382	 90980–10402	 90980–10414	 90980–10447
 90980–10604	 90980–10605	 90980–10672	 90980–10673
 90980–10766	 90980–10785	 90980–10797	 90980–10889

<FEMALE> 6P Non–waterproof Type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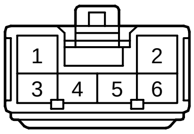	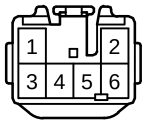	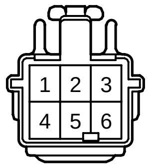	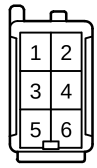
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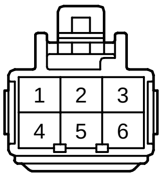	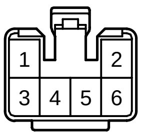	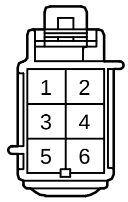	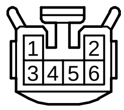
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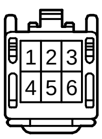	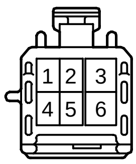	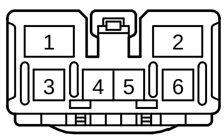	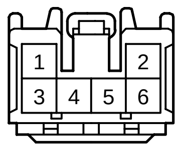
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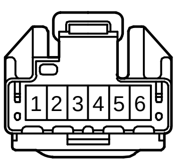	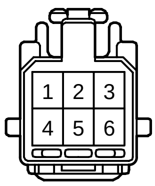	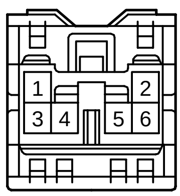	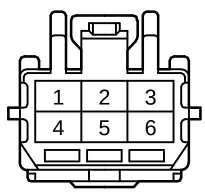
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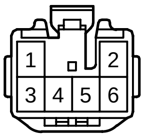
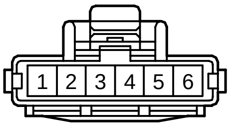
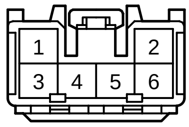
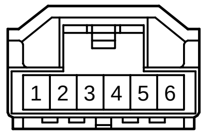
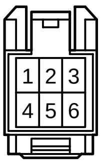
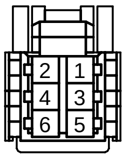
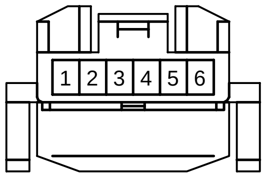
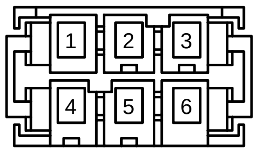
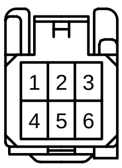
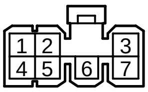
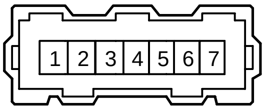
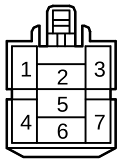
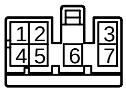
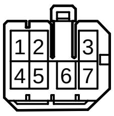
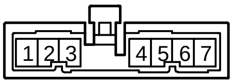
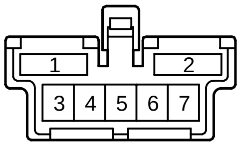
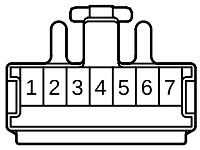
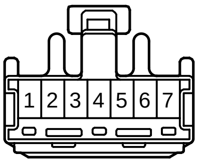
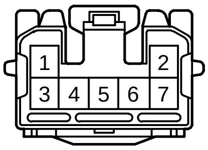
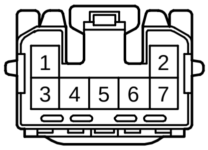
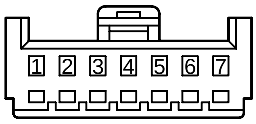
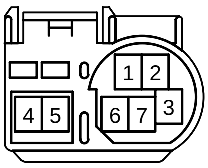
<FEMALE> 6P Non–waterproof Type

 90980–11780	 90980–11820	 90980–11879	 90980–11986
 90980–12012	 90980–12056	 90980–12067	 90980–12199
 90980–12209			

<FEMALE> 7P Non–waterproof Type

 90980–10043	 90980–10071	 90980–10264	 90980–10311
 90980–10452	 90980–10460	 90980–10729 90980–10772	 90980–11165
 90980–11340	 90980–11529	 90980–11740	 90980–11794
 90980–12060			

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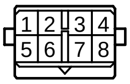

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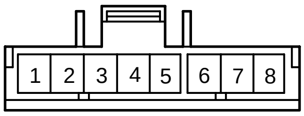

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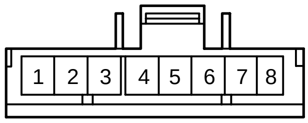

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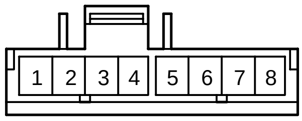

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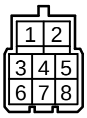

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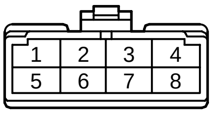

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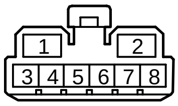

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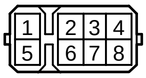

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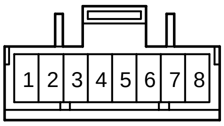

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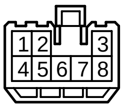

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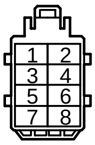

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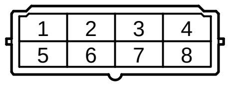

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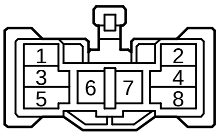

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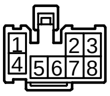

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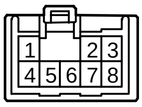

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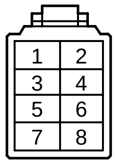

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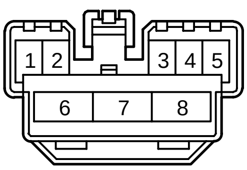

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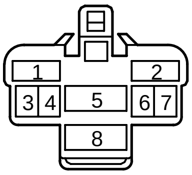

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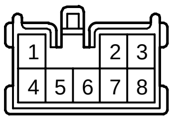

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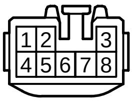
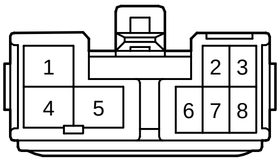
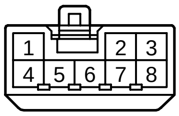
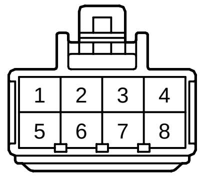
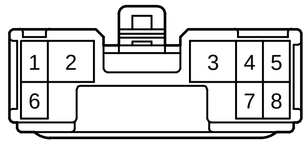
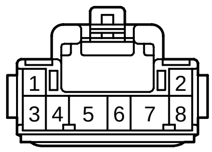
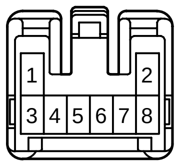
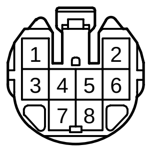
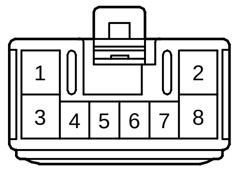
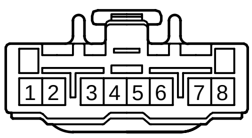
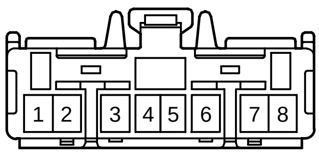
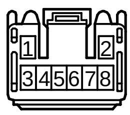
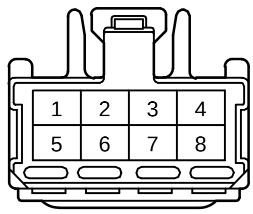
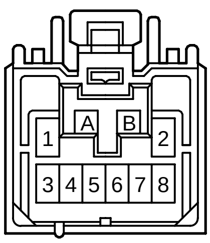
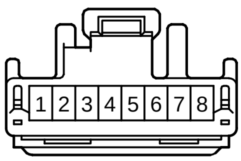
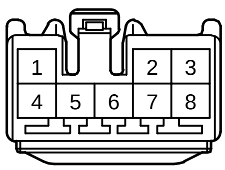
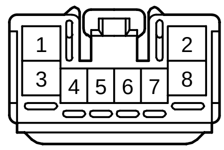
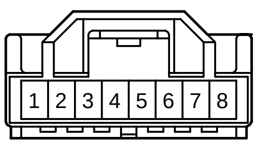
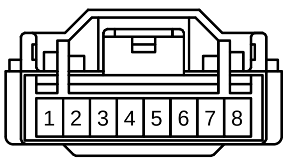
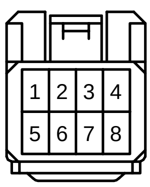
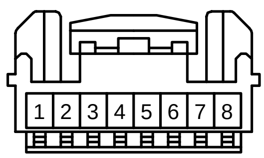
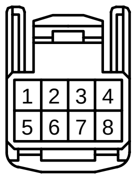


90980–10799

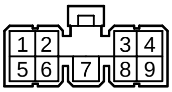
<FEMALE> 8P Non–waterproof Type

 90980–10877 90980–11439	 90980–10926	 90980–11092	 90980–11130
 90980–11279	 90980–11321	 90980–11354	 90980–11362
 90980–11397	 90980–11459	 90980–11533	 90980–11615
 90980–11630	 90980–11633	 90980–11686	 90980–11701
 90980–11989	 90980–12091	 90980–12113	 90980–12217

<FEMALE> 8P Non–waterproof Type

 90980–12221			

<FEMALE> 9P Non–waterproof Type



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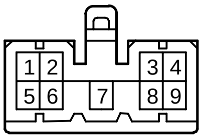

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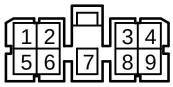

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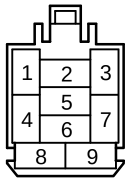

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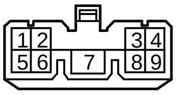

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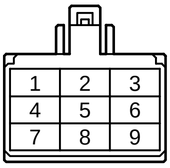

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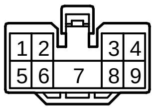

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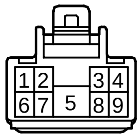

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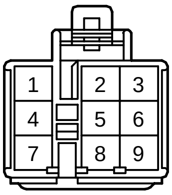

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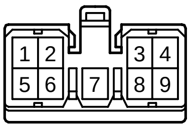

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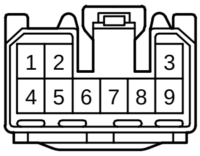

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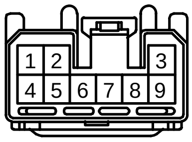

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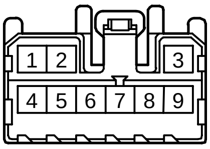
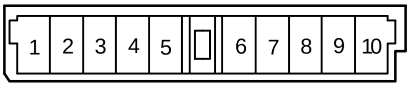
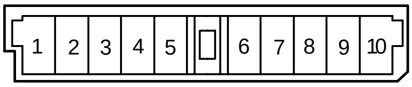
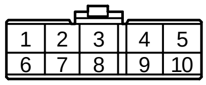
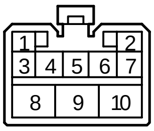
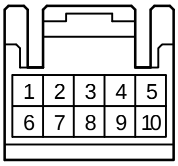
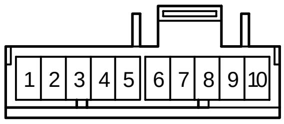
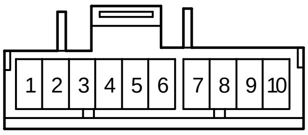
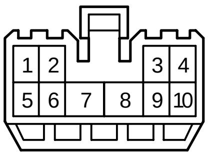
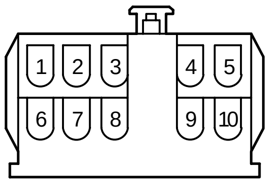
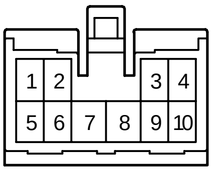
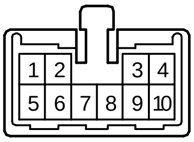
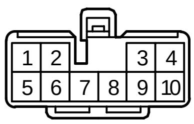
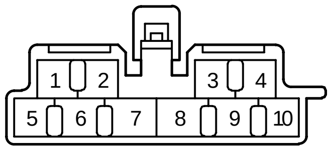


90980–12026

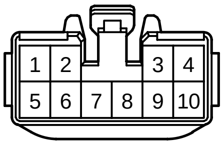
<FEMALE> 10P Non–waterproof Type

 90980–10158	 90980–10159	 90980–10177
 90980–10282	 90980–10294	 90980–10302
 90980–10304	 90980–10322	 90980–10377
 90980–10469	 90980–10528	 90980–10669

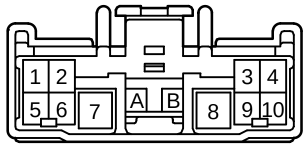
<FEMALE> 10P Non–waterproof Type



90980–10721



90980–10801



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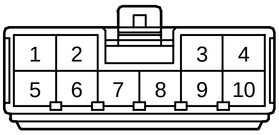

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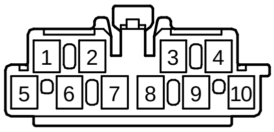

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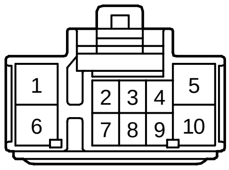

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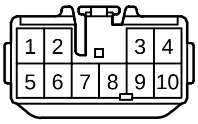

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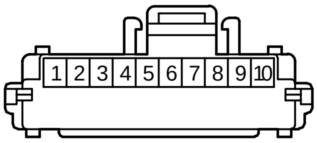

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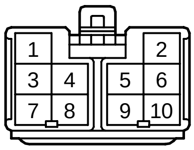
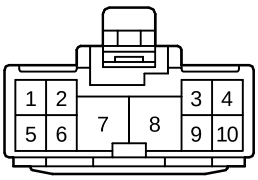


90980–11276



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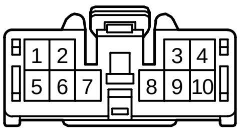
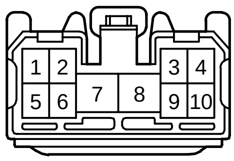
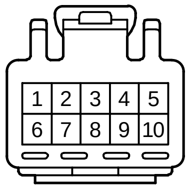
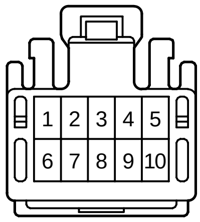
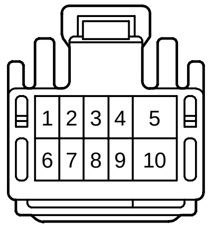
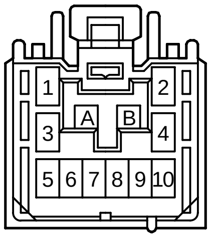
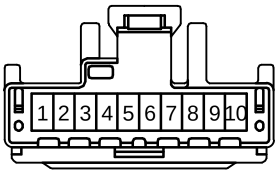
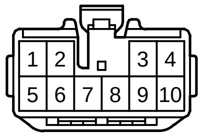
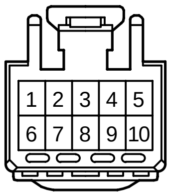
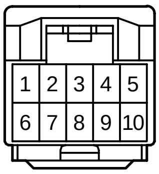
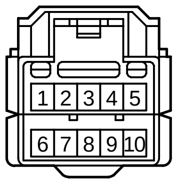
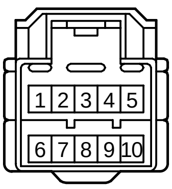
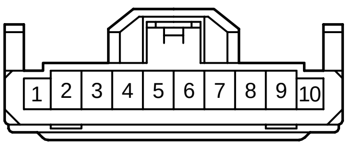
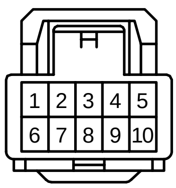


90980–11450

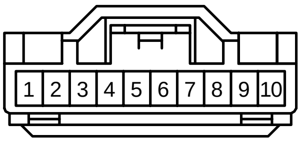
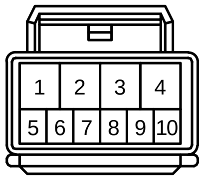
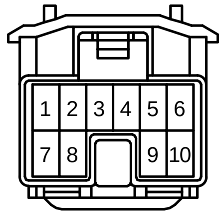


90980–11527

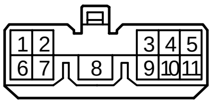
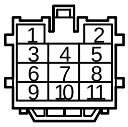
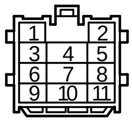
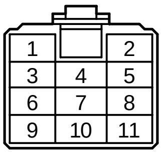
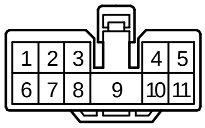
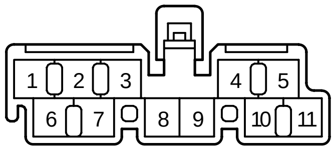
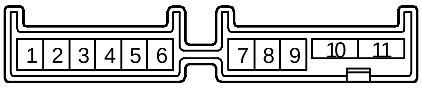
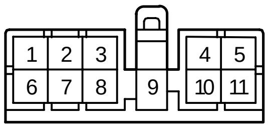
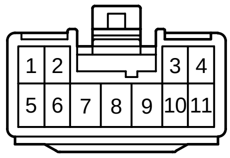
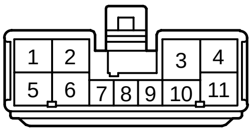
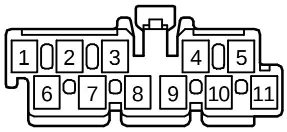
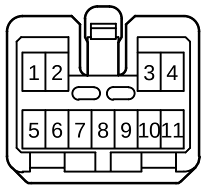
<FEMALE> 10P Non–waterproof Type

 90980–11537	 90980–11581	 90980–11614
 90980–11642	 90980–11657	 90980–11781
 90980–11817	 90980–11923	 90980–11924
 90980–11948	 90980–12008	 90980–12135

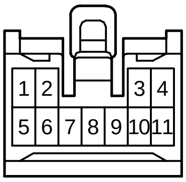
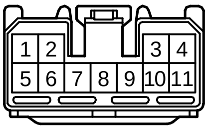
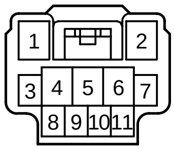
<FEMALE> 10P Non–waterproof Type

 90980–12162	 90980–12226	 90980–12272

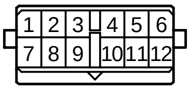
<FEMALE> 11P Non–waterproof Type

 90980–10319	 90980–10337	 90980–10338
 90980–10450	 90980–10537	 90980–10723
 90980–10727	 90980–10781	 90980–10830
 90980–10873	 90980–10966	 90980–11041

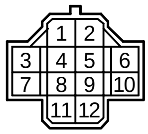
<FEMALE> 11P Non–waterproof Type

 90980–11083	 90980–11539	 90980–12003

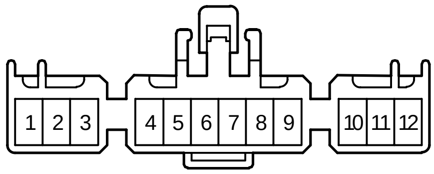
<FEMALE> 12P Non–waterproof Type



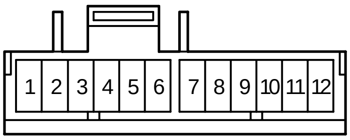
90980–10006



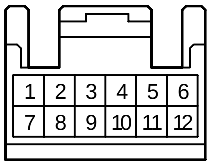
90980–10150



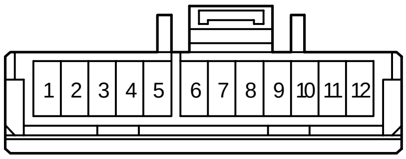
90980–10153



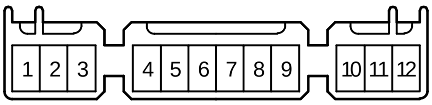
90980–10303



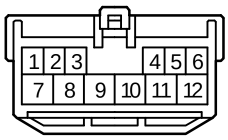
90980–10351



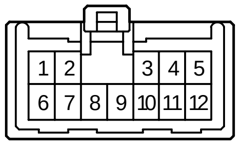
90980–10372



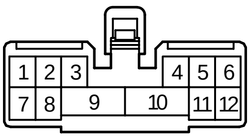
90980–10397



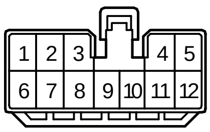
90980–10406



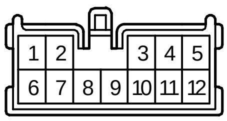
90980–10408



90980–10421

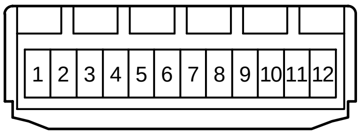


90980–10432

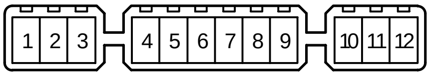


90980–10524

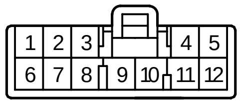
<FEMALE> 12P Non–waterproof Type



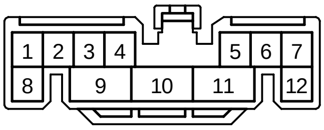
90980–10565



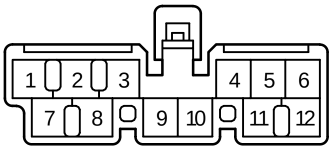
90980–10632



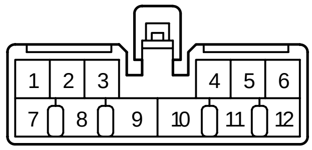
90980–10658



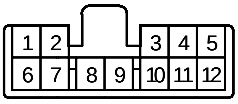
90980–10714



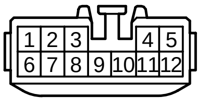
90980–10724



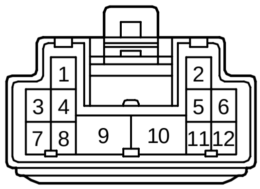
90980–10725



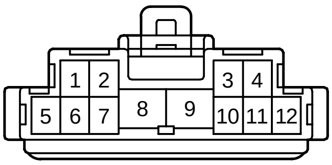
90980–10743



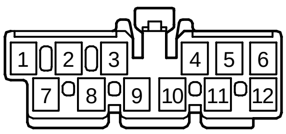
90980–10803



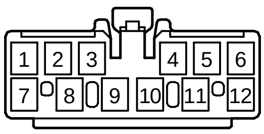
90980–10879



90980–10932

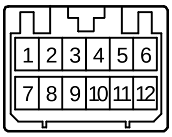


90980–10967

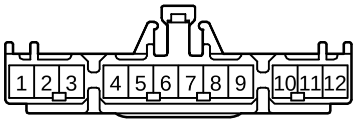


90980–10968

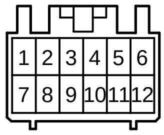
<FEMALE> 12P Non–waterproof Type



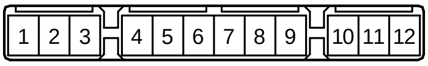
90980–10973



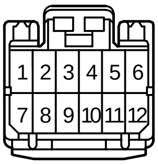
90980–11121



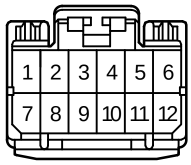
90980–11129



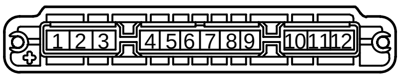
90980–11311



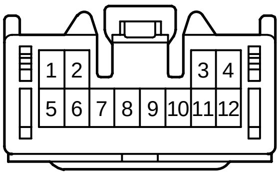
90980–11408



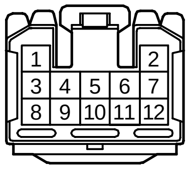
90980–11424



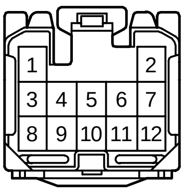
90980–11453



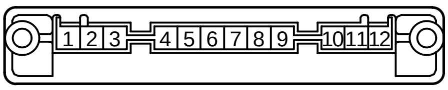
90980–11475



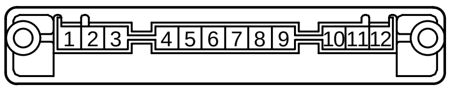
90980–11531



90980–11626

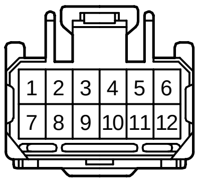


90980–11649

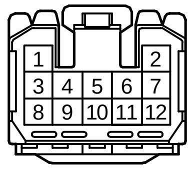


90980–11656

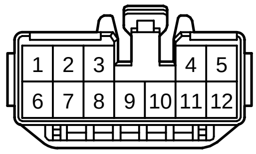
<FEMALE> 12P Non–waterproof Type



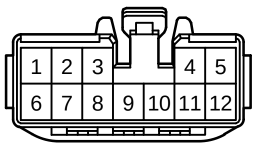
90980–11661



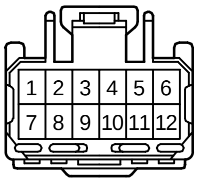
90980–11693



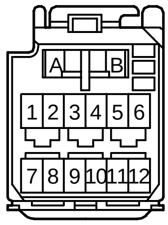
90980–11720



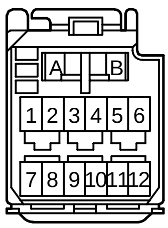
90980–11782



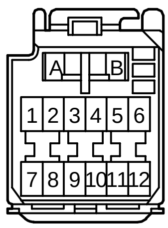
90980–11847



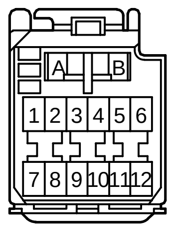
90980–11867



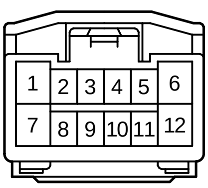
90980–11869



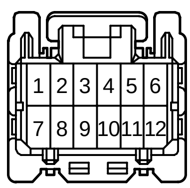
90980–11871



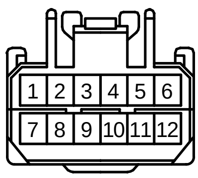
90980–11873



90980–11947

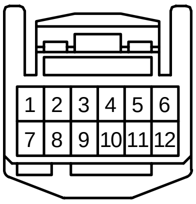
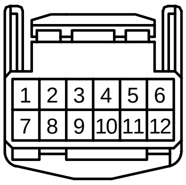
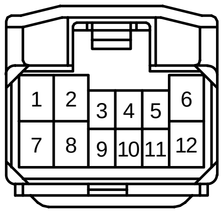


90980–12032

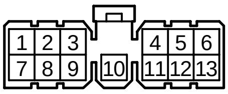


90980–12090

<FEMALE> 12P Non–waterproof Type

 90980–12183	 90980–12222	 90980–12273

<FEMALE> 13P Non–waterproof Type



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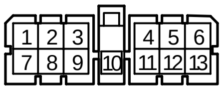

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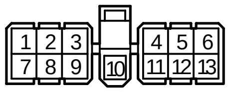

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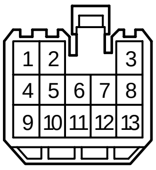

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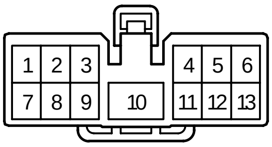

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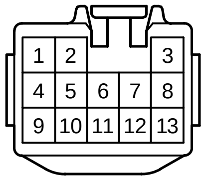

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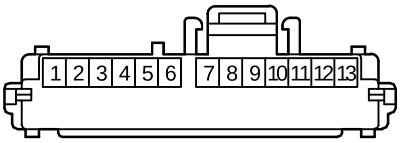

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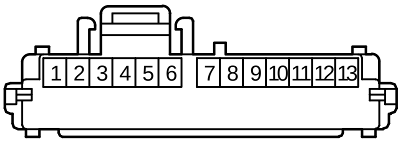

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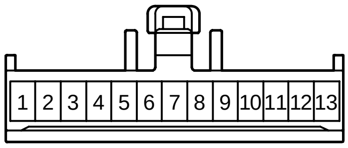

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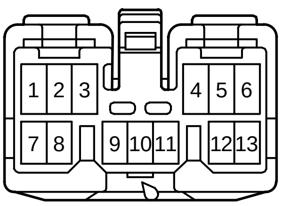
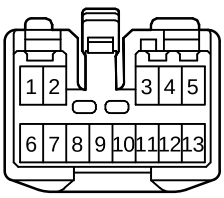


90980–11350



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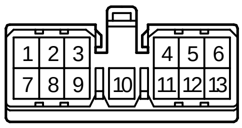
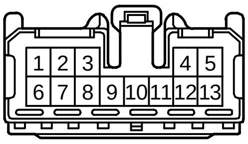
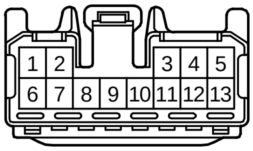


90980–11478

<FEMALE> 13P Non–waterproof Type



90980–11542



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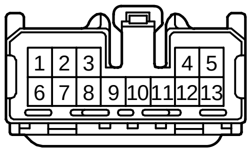

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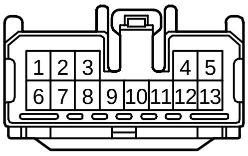

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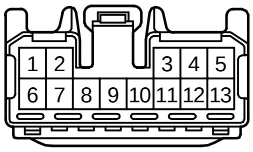

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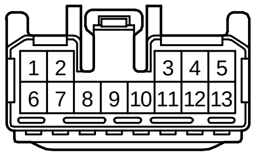

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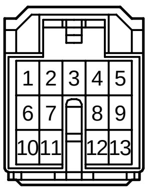

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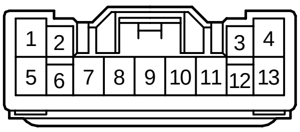

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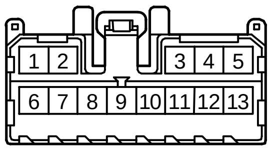
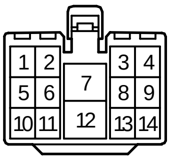


90980–12027

<FEMALE> 14P Non–waterproof Type



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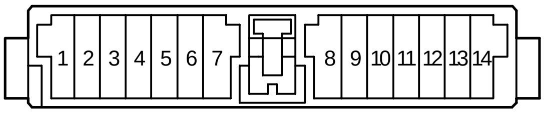

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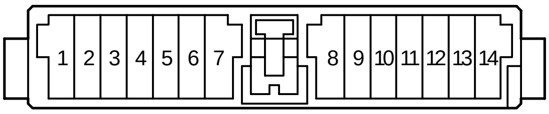

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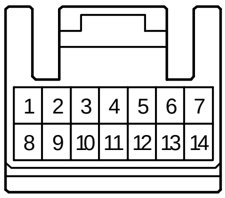

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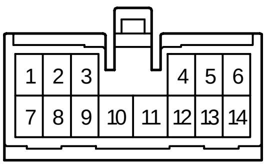

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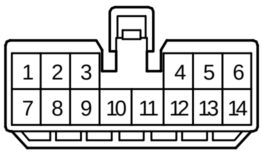
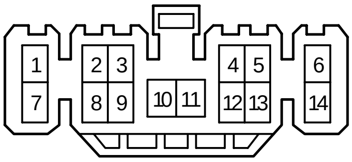


90980–10507

<FEMALE> 14P Non–waterproof Type



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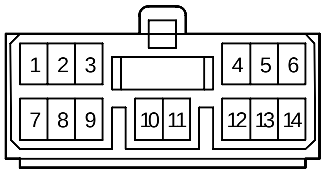

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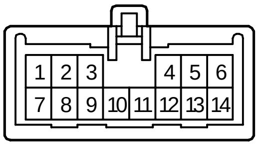

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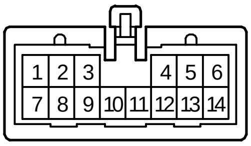

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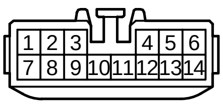
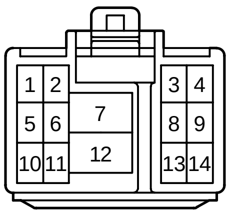
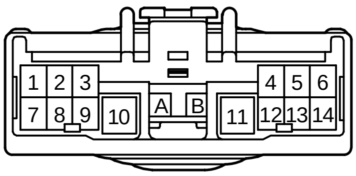


90980–10807
90980–11437



90980–10813

<FEMALE> 14P Non–waterproof Type



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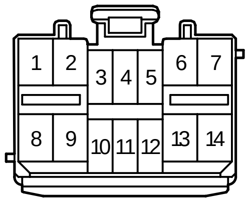
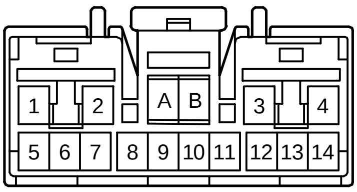


90980–11225



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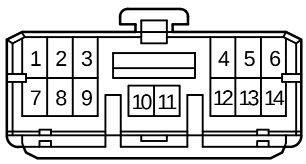

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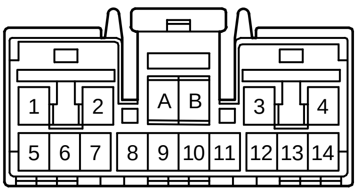

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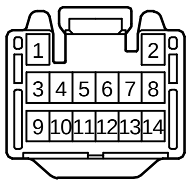
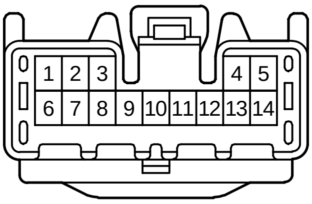


90980–11511

<FEMALE> 14P Non–waterproof Type



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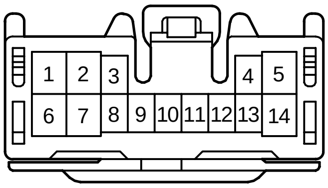
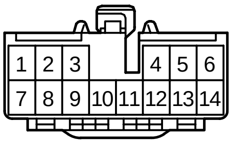
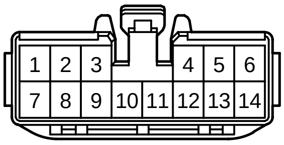


90980–11591



90980–11791



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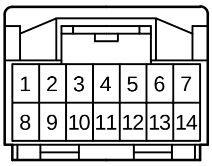
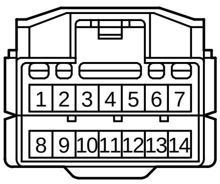
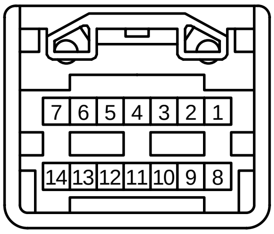


90980–11911



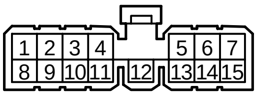
90980–11925

<FEMALE> 14P Non–waterproof Type

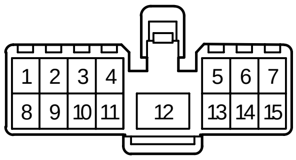


90980–12082

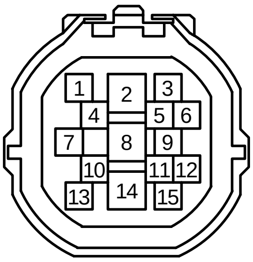
<FEMALE> 15P Non–waterproof Type



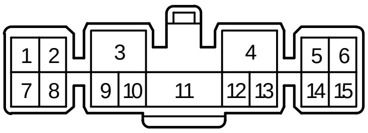
90980–10066



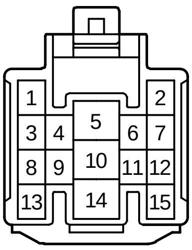
90980–10331



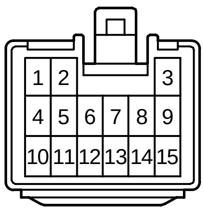
90980–10443



90980–10563

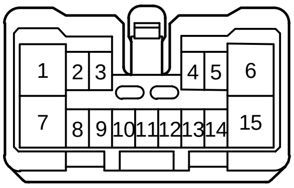


90980–10815

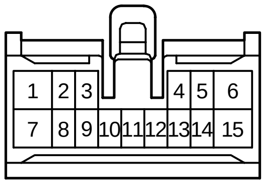


90980–10828

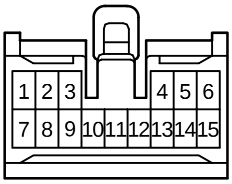
<FEMALE> 15P Non–waterproof Type



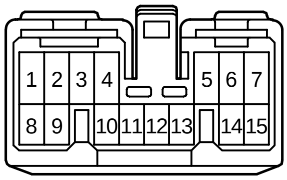
90980–11042



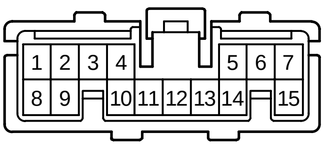
90980–11056



90980–11179

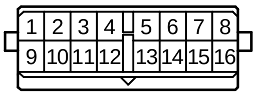


90980–11264

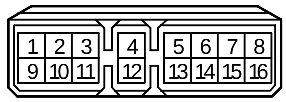


90980–11372

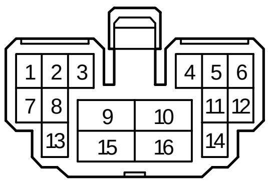
<FEMALE> 16P Non–waterproof Type



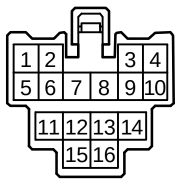
90980–10008



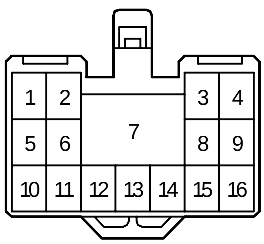
90980–10028



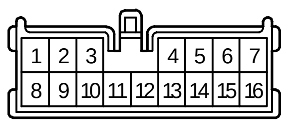
90980–10454



90980–10486

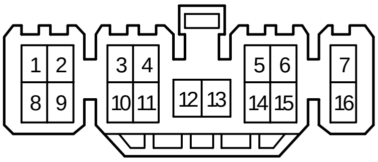


90980–10522

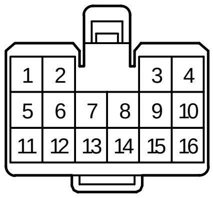


90980–10525

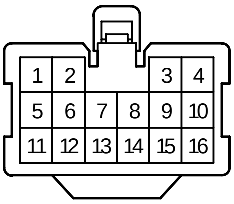
<FEMALE> 16P Non–waterproof Type



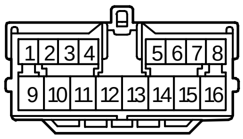
90980–10539



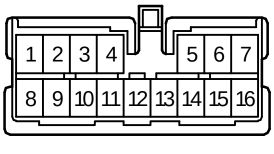
90980–10543



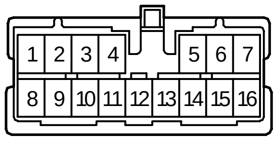
90980–10561



90980–10611

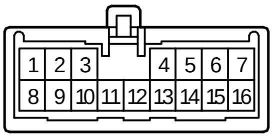


90980–10613

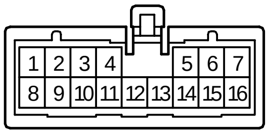


90980–10614

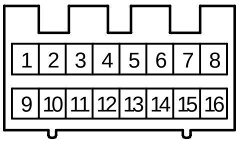
<FEMALE> 16P Non–waterproof Type



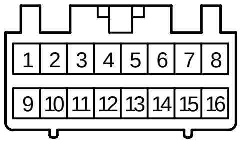
90980–10635



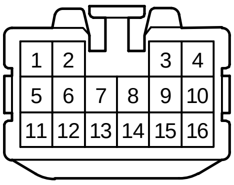
90980–10636



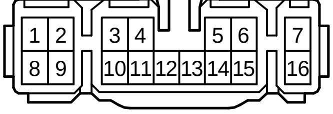
90980–10740



90980–10764

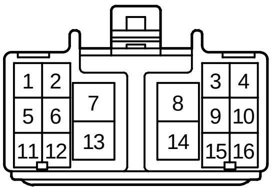


90980–10809
90980–11445

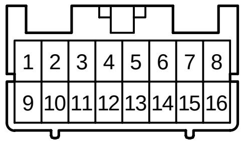


90980–10848

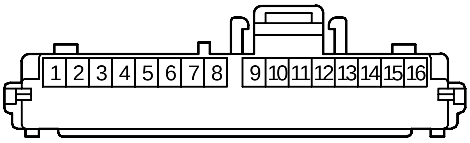
<FEMALE> 16P Non–waterproof Type



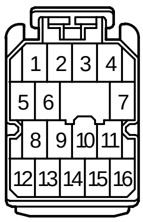
90980–10885



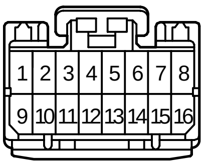
90980–11082



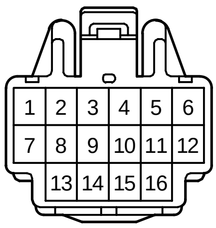
90980–11113



90980–11219

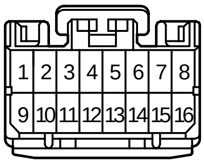


90980–11391

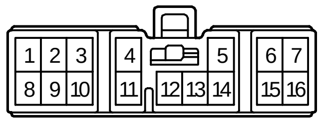


90980–11416

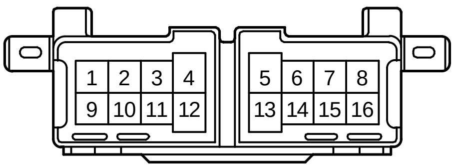
<FEMALE> 16P Non–waterproof Type



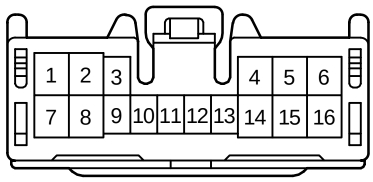
90980–11425



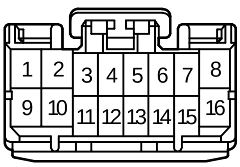
90980–11435



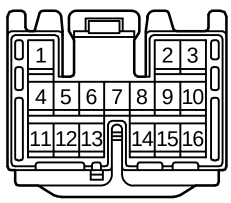
90980–11547



90980–11562

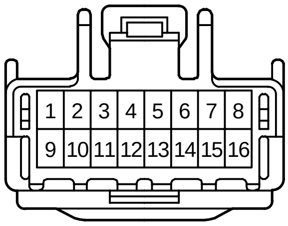


90980–11565

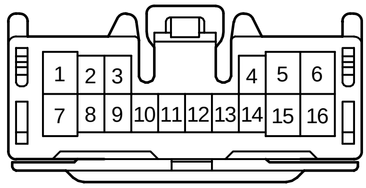


90980–11574

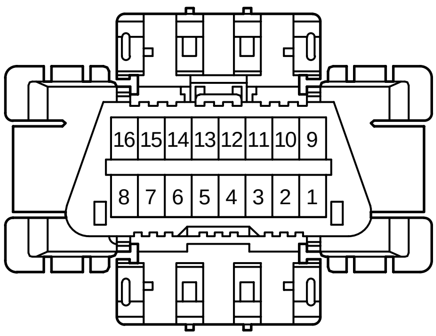
<FEMALE> 16P Non–waterproof Type



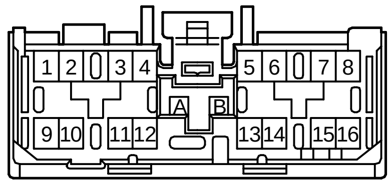
90980–11648



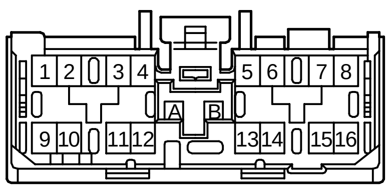
90980–11652



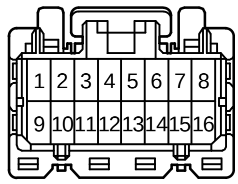
90980–11665
90980–11978



90980–11681

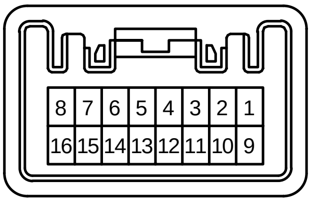


90980–11683

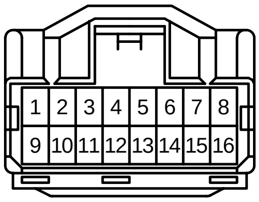


90980–11787

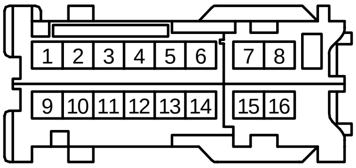
<FEMALE> 16P Non–waterproof Type



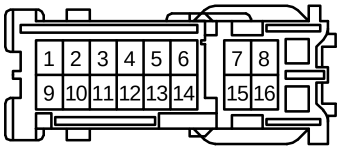
90980–12093



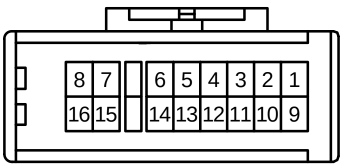
90980–12094



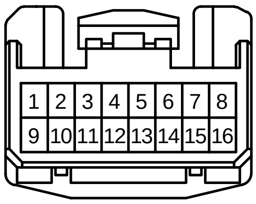
90980–12101



90980–12104

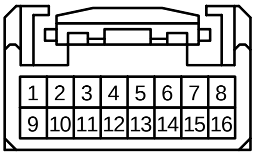


90980–12105



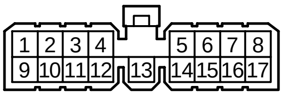
90980–12155

<FEMALE> 16P Non–waterproof Type

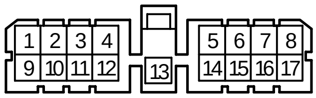


90980–12156

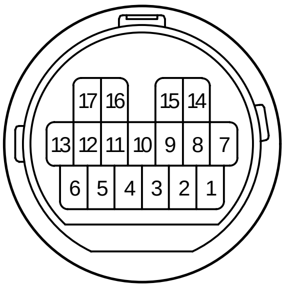
<FEMALE> 17P Non–waterproof Type



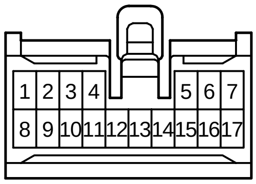
90980–10031



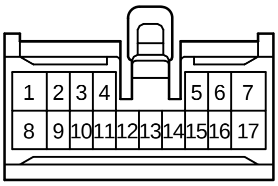
90980–10037



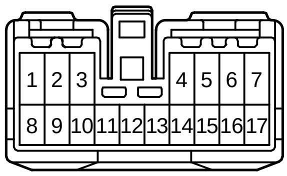
90980–10731
90980–11417
90980–11420



90980–11203

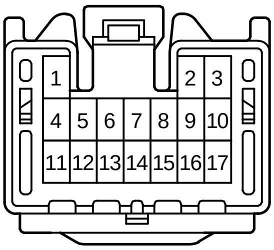


90980–11310

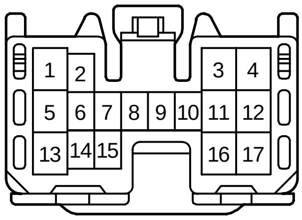


90980–11335

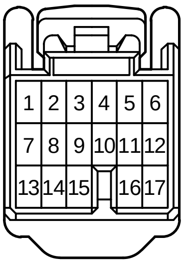
<FEMALE> 17P Non–waterproof Type



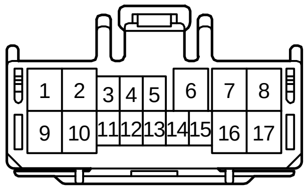
90980–11506



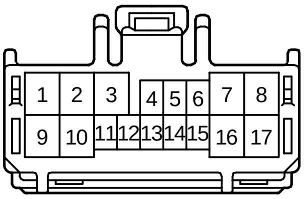
90980–11560



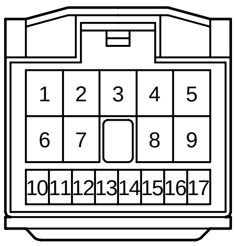
90980–11586



90980–11671

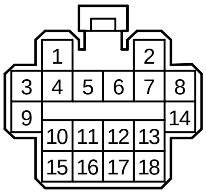


90980–11672

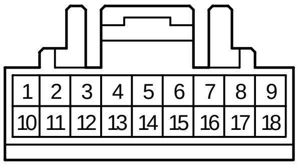


90980–11954

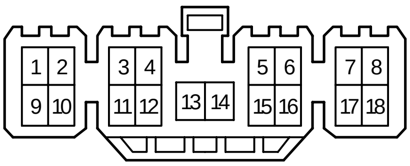
<FEMALE> 18P Non–waterproof Type



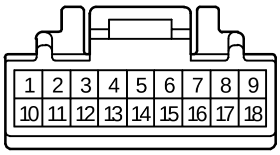
90980–10285



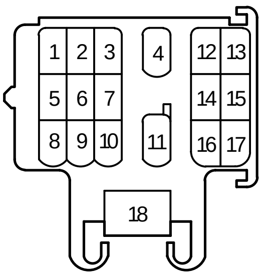
90980–10295



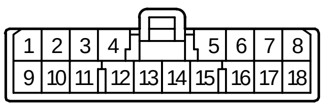
90980–10326



90980–10350

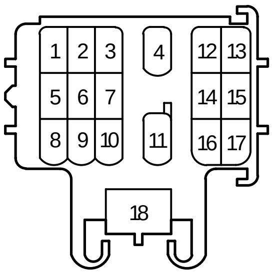


90980–10530

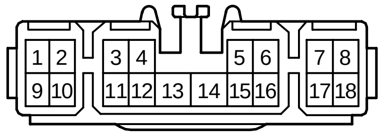


90980–10656

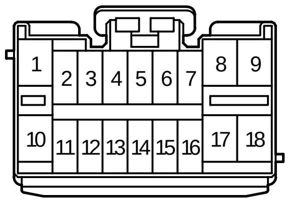
<FEMALE> 18P Non–waterproof Type



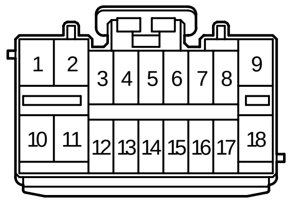
90980–10778



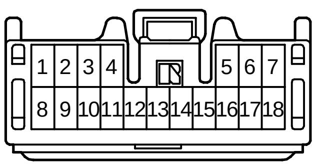
90980–10819



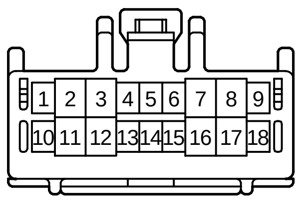
90980–11224



90980–11226

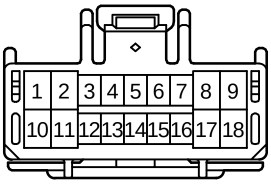


90980–11497

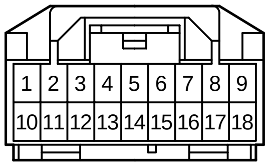


90980–11594

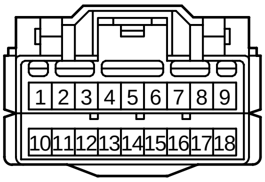
<FEMALE> 18P Non–waterproof Type



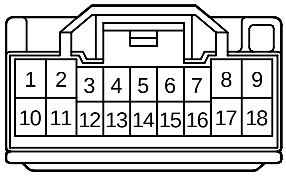
90980–11595



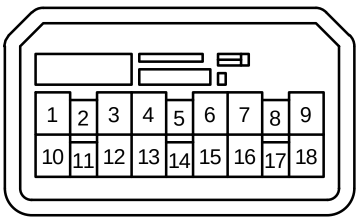
90980–11913



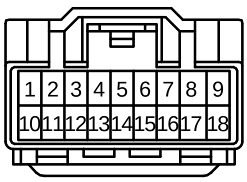
90980–11914



90980–11973

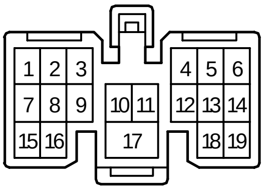


90980–12122

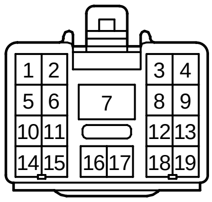


90980–12174

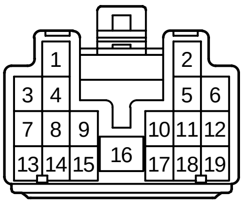
<FEMALE> 19P Non–waterproof Type



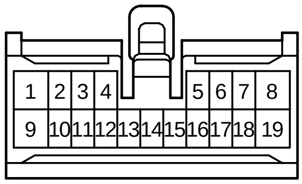
90980–10675



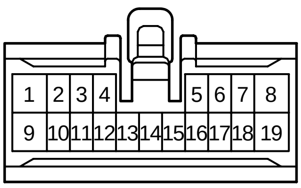
90980–10857



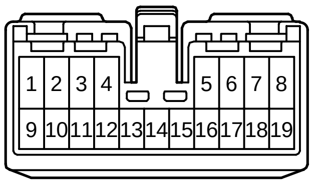
90980–10883



90980–11205

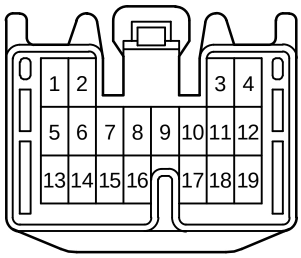


90980–11308

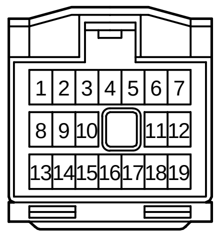


90980–11377

<FEMALE> 19P Non–waterproof Type

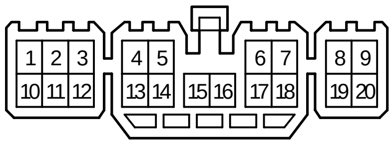


90980–11571

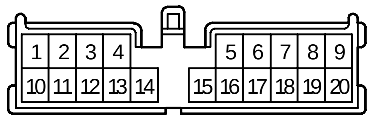


90980–11955

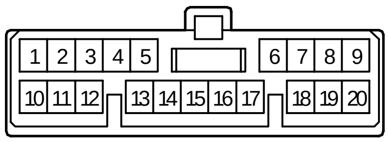
<FEMALE> 20P Non–waterproof Type



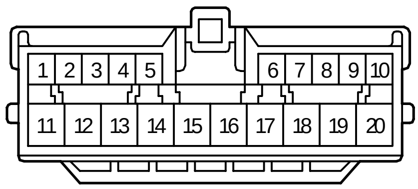
90980–10327



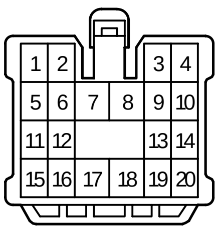
90980–10589



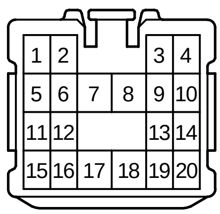
90980–10607



90980–10612

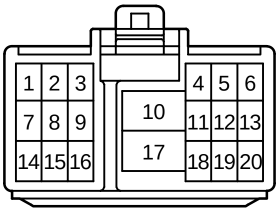


90980–10640

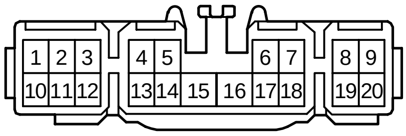


90980–10811
90980–11441

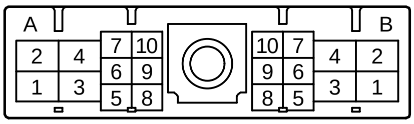
<FEMALE> 20P Non–waterproof Type



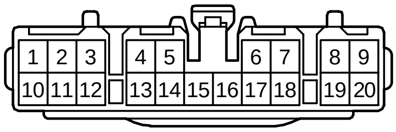
90980–10817



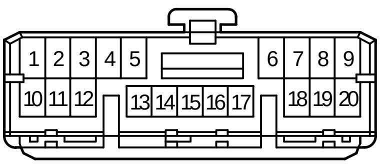
90980–10821



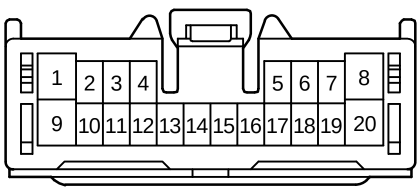
90980–10952



90980–11260

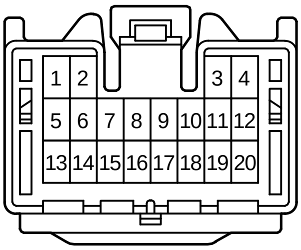


90980–11432

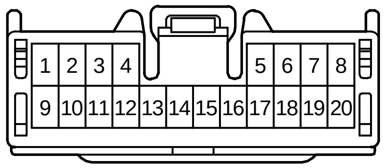


90980–11469

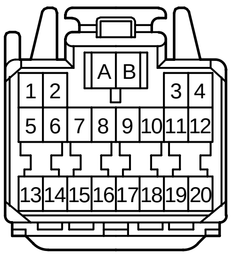
<FEMALE> 20P Non–waterproof Type



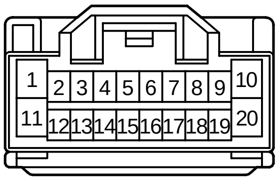
90980–11499



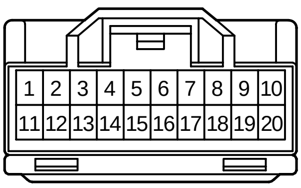
90980–11558



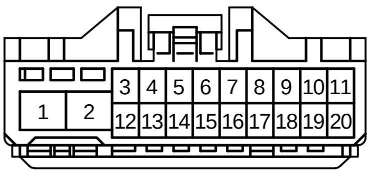
90980–11868



90980–11971

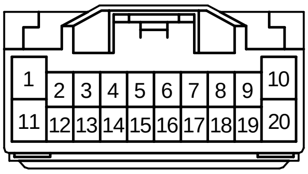


90980–11974

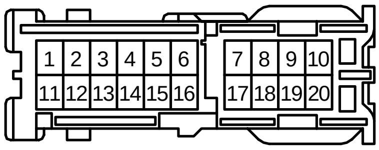


90980–12034

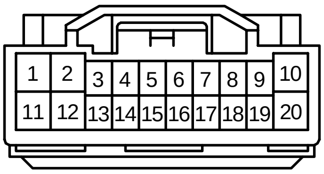
<FEMALE> 20P Non–waterproof Type



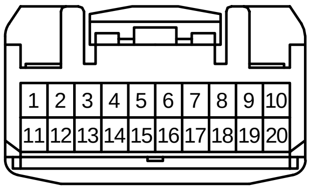
90980–12038



90980–12106

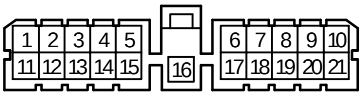


90980–12166

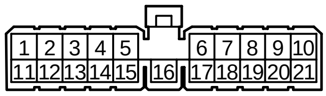


90980–12259

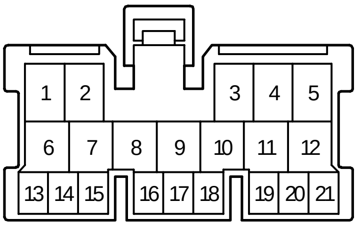
<FEMALE> 21P Non–waterproof Type



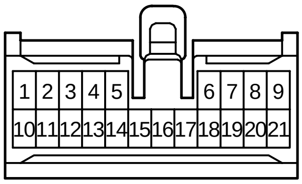
90980–10064



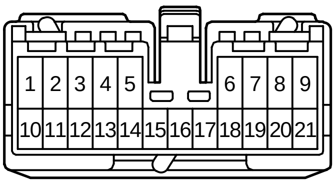
90980–10207



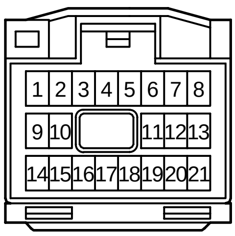
90980–10473



90980–11125

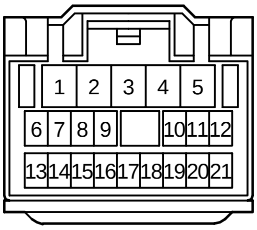


90980–11379



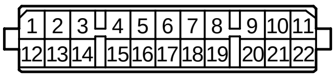
90980–11956

<FEMALE> 21P Non–waterproof Type

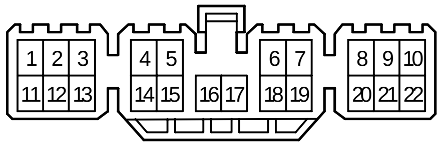


90980–11957

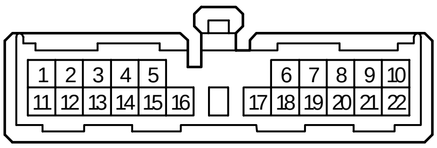
<FEMALE> 22P Non–waterproof Type



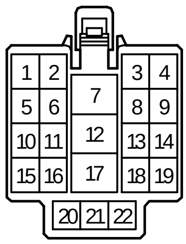
90980–10010



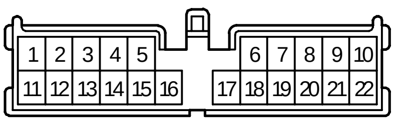
90980–10328



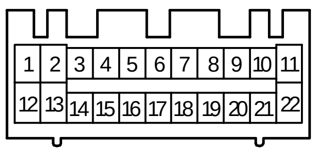
90980–10456



90980–10458

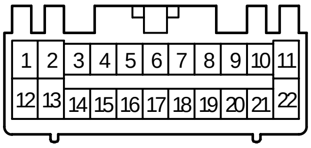


90980–10526

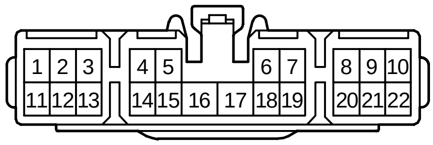


90980–10741

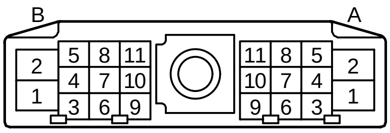
<FEMALE> 22P Non–waterproof Type



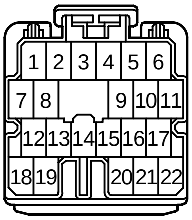
90980–10765



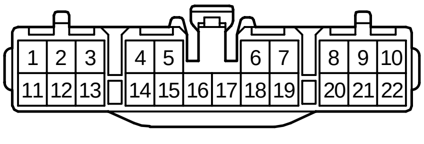
90980–10875



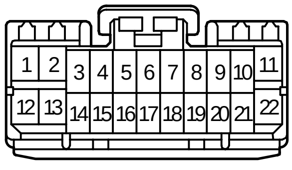
90980–10953



90980–11220

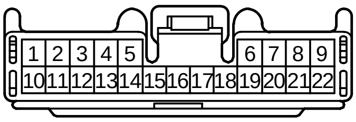


90980–11238

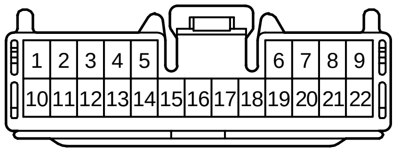


90980–11392

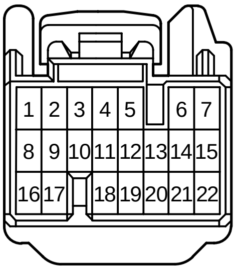
<FEMALE> 22P Non–waterproof Type



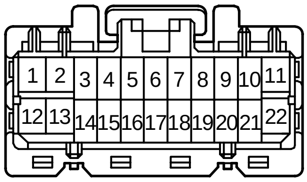
90980–11502



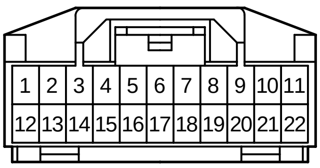
90980–11628



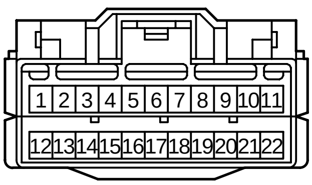
90980–11638



90980–11788

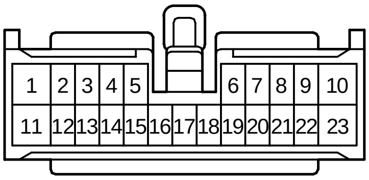


90980–11915

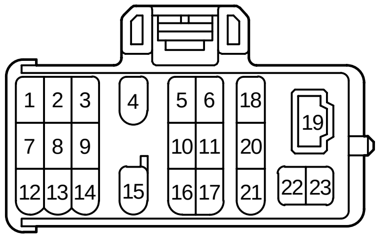


90980–11927

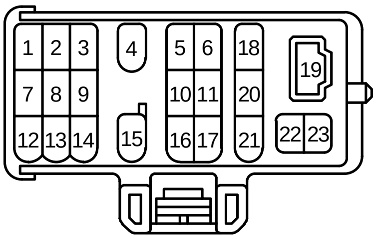
<FEMALE> 23P Non–waterproof Type



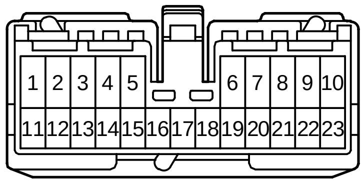
90980–10921



90980–11195

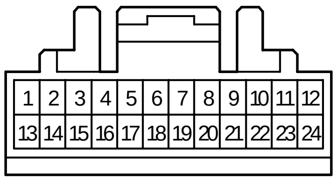


90980–11323

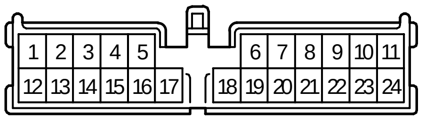


90980–11381

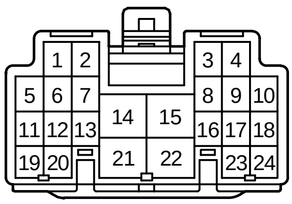
<FEMALE> 24P Non–waterproof Type



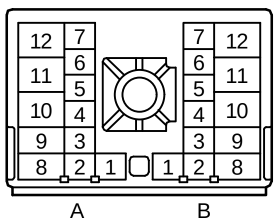
90980–10296



90980–10585

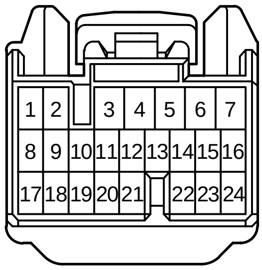


90980–10881

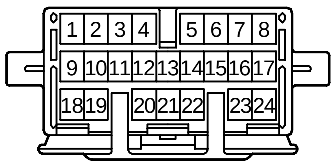


90980–10955

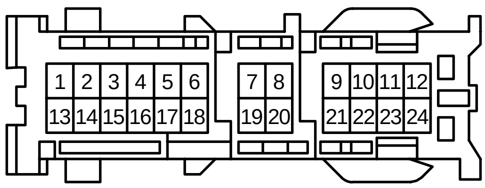
<FEMALE> 24P Non–waterproof Type



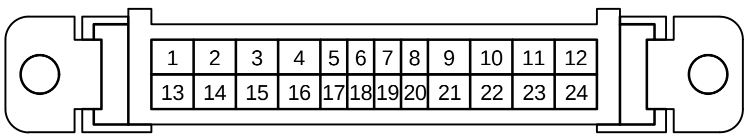
90980–11476



90980–11509

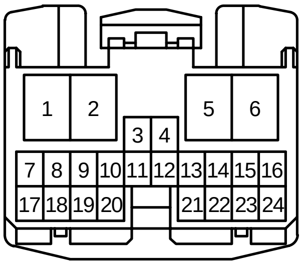


90980–12070

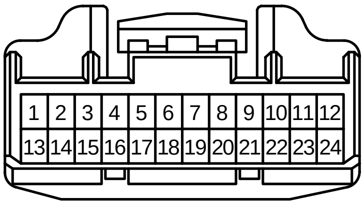


90980–12079

<FEMALE> 24P Non–waterproof Type

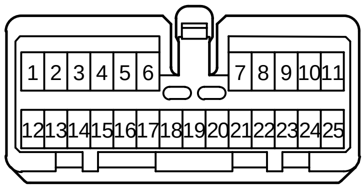


90980–12149

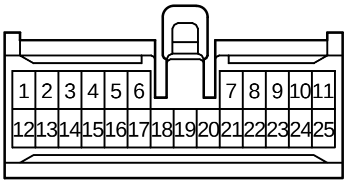


90980–12200

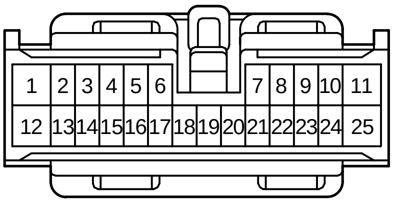
<FEMALE> 25P Non–waterproof Type



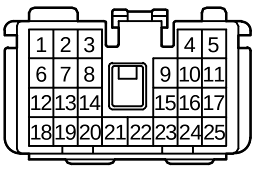
90980–11043



90980–11055

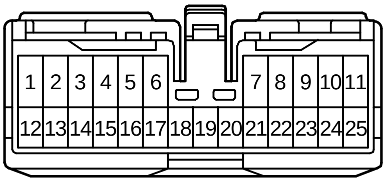


90980–11058

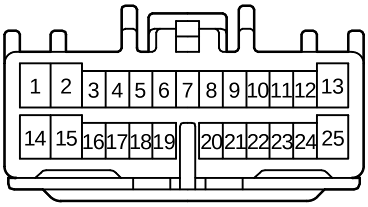


90980–11375

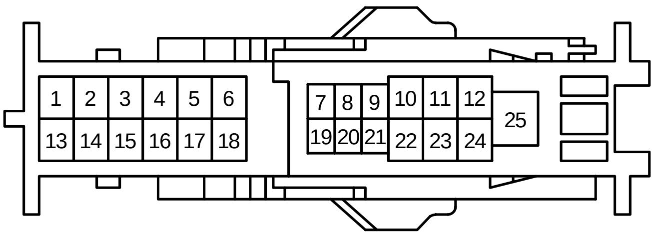
<FEMALE> 25P Non–waterproof Type



90980–11404

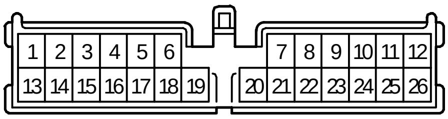


90980–11877

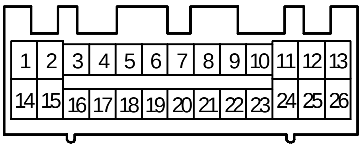


90980–12278

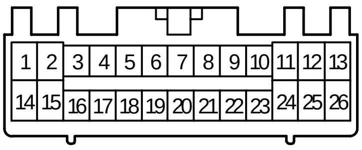
<FEMALE> 26P Non–waterproof Type



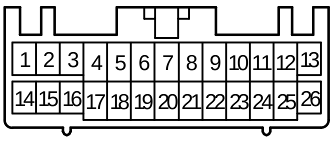
90980–10587



90980–10739

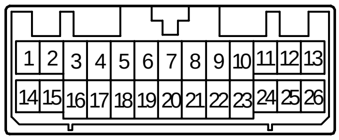


90980–10763

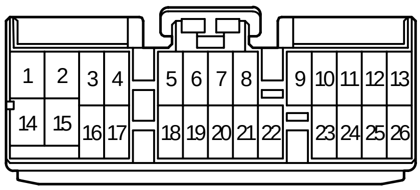


90980–10918

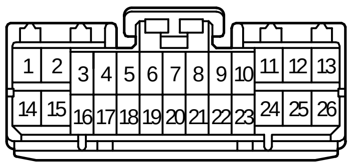
<FEMALE> 26P Non–waterproof Type



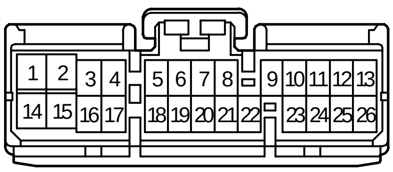
90980–10925



90980–11234

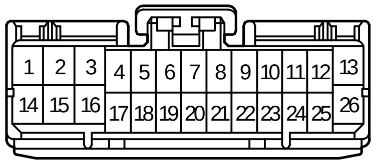


90980–11390

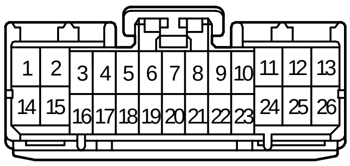


90980–11406

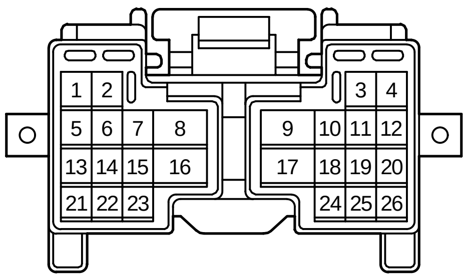
<FEMALE> 26P Non–waterproof Type



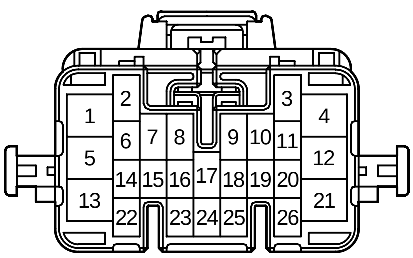
90980–11422



90980–11423

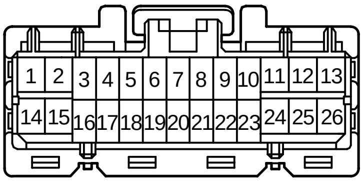


90980–11611

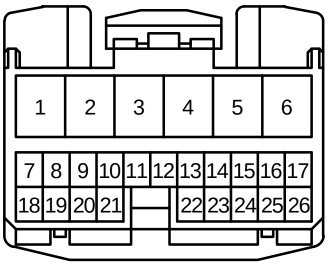


90980–11632

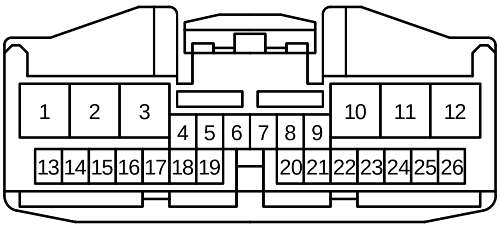
<FEMALE> 26P Non–waterproof Type



90980–11786

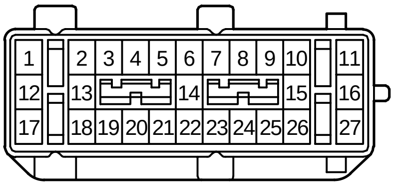


90980–12150



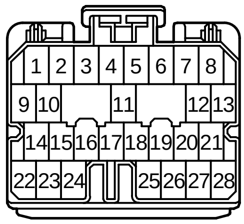
90980–12203

<FEMALE> 27P Non–waterproof Type

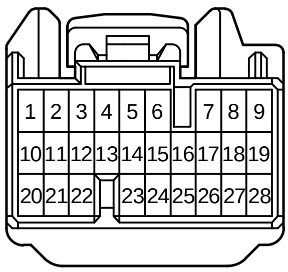


90980–11670

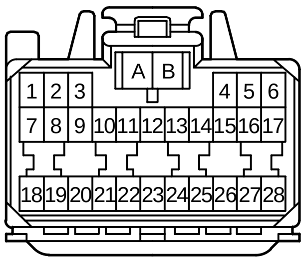
<FEMALE> 28P Non–waterproof Type



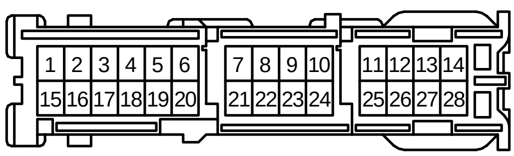
90980–11218



90980–11637

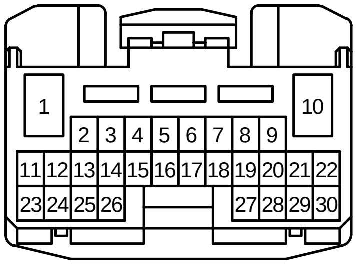


90980–11872

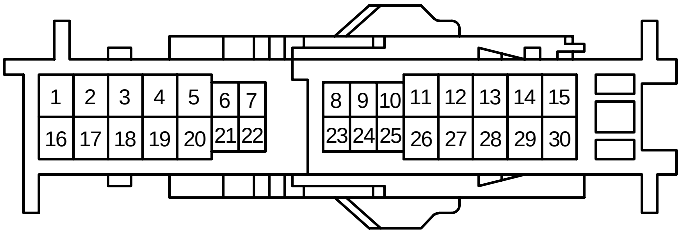


90980–12102

<FEMALE> 30P Non–waterproof Type

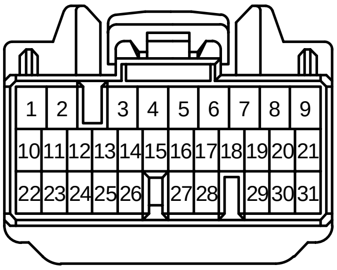


90980–12151

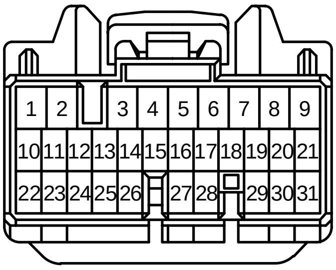


90980–12277

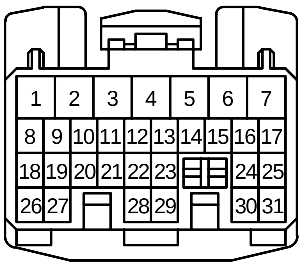
<FEMALE> 31P Non–waterproof Type



90980–11421

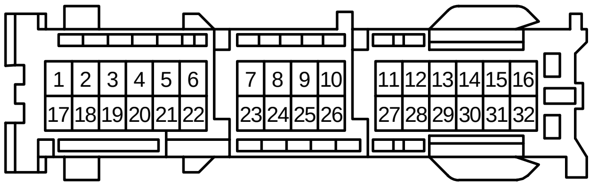


90980–11935

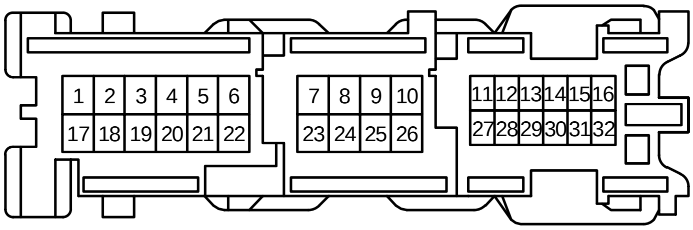


90980–12142

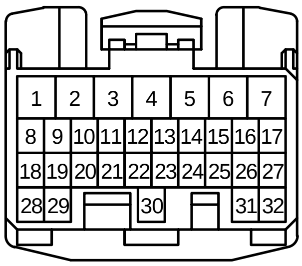
<FEMALE> 32P Non–waterproof Type



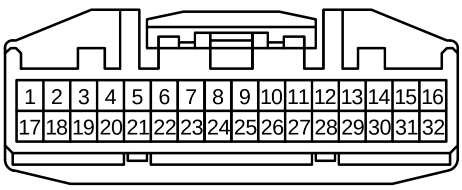
90980–12071



90980–12096

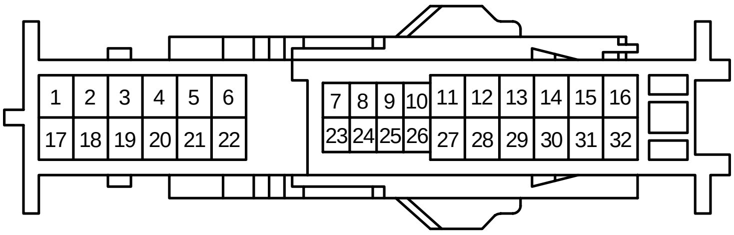


90980–12143



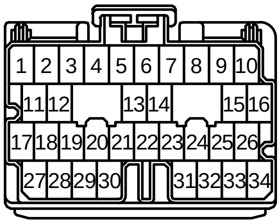
90980–12153

<FEMALE> 32P Non–waterproof Type

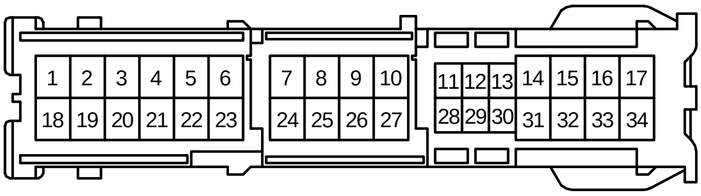


90980–12275

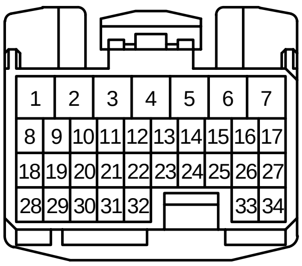
<FEMALE> 34P Non–waterproof Type



90980–11221

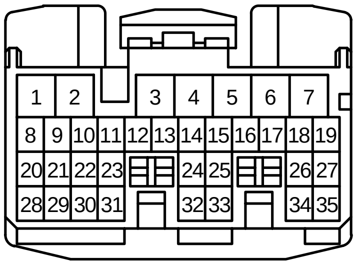


90980–12114

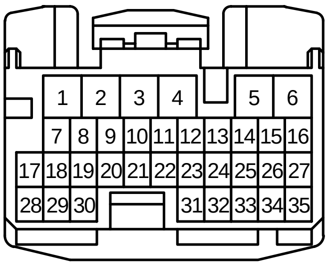


90980–12144

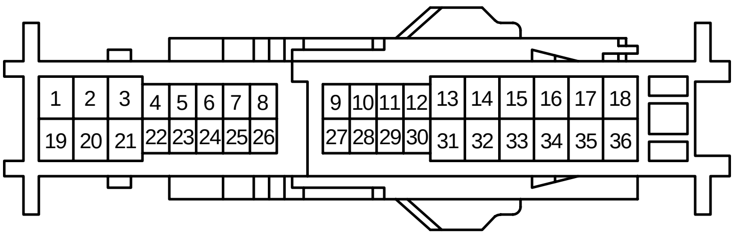
<FEMALE> 35P, 36P Non–waterproof Type



90980–12145

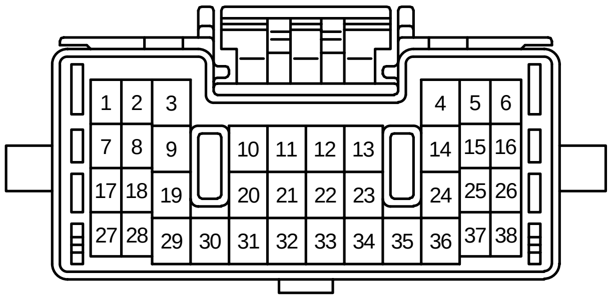


90980–12146

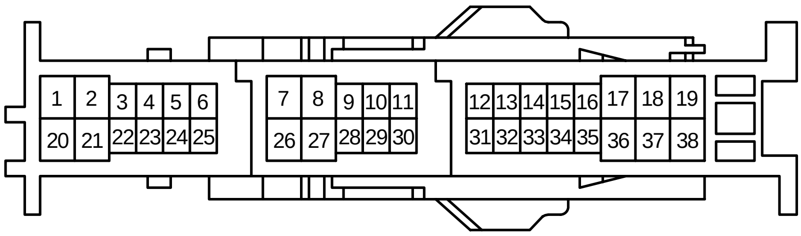


90980–12274

<FEMALE> 38P Non–waterproof Type

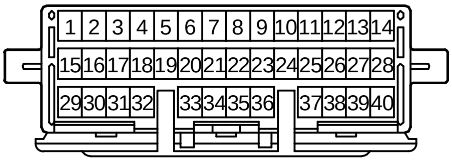


90980–11555

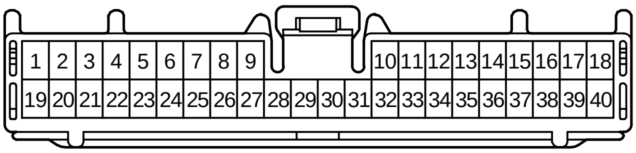


90980–12276

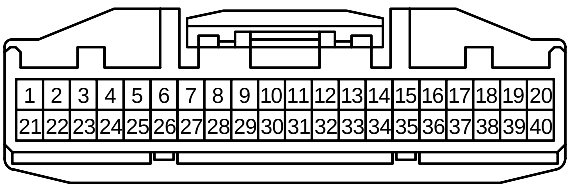
<FEMALE> 40P Non–waterproof Type



90980–11508

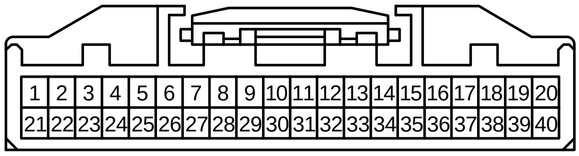


90980–11618



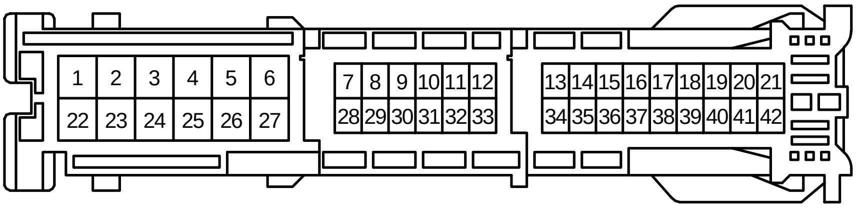
90980–12169

<FEMALE> 40P Non–waterproof Type

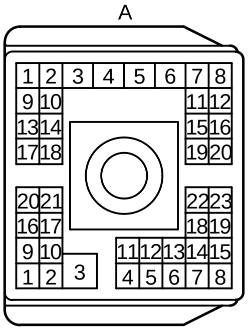


90980–12170

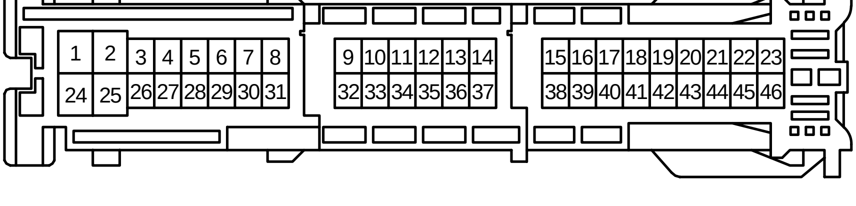
<FEMALE> 42P, 43P, 46P Non–waterproof Type



90980–12184

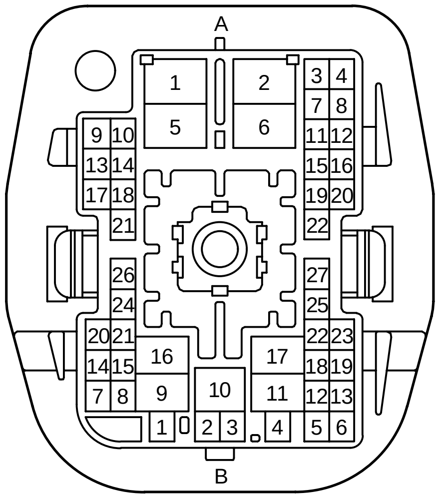


90980–11360

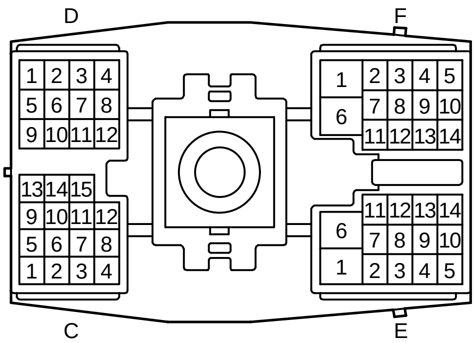


90980–12179

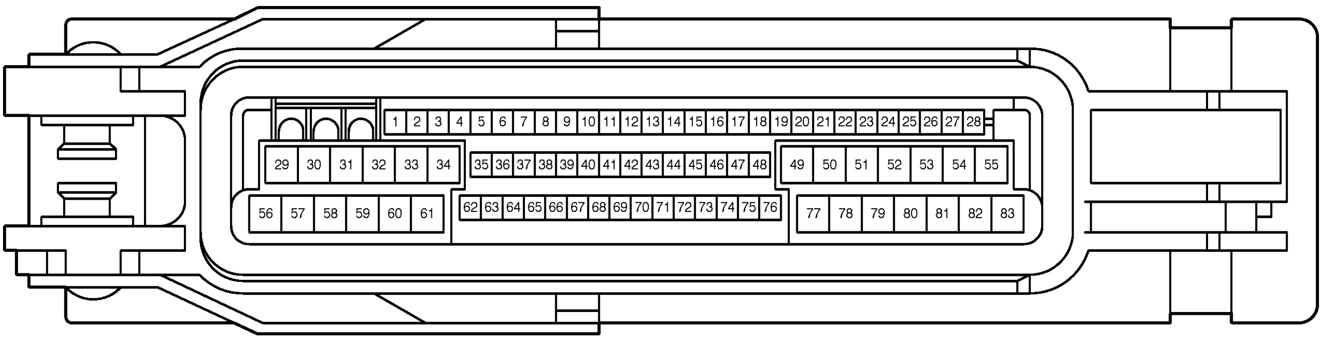
<FEMALE> 49P, 55P, 83P Non–waterproof Type



90980–11431

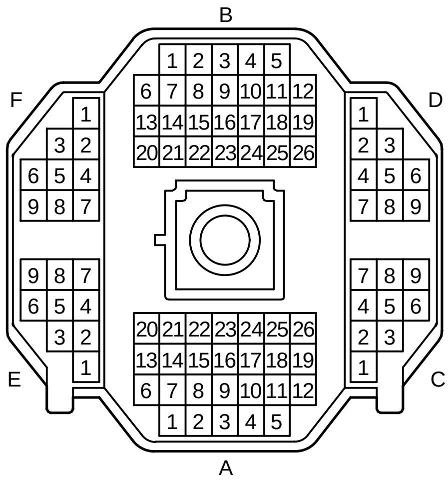


90980–11359



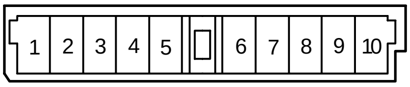
90980–11906

<FEMALE> 88P Non–waterproof Type

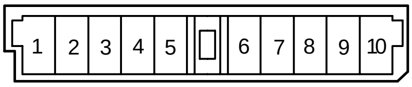


90980–10950

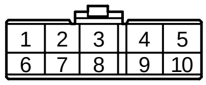
<FEMALE> 10P Non–waterproof Type



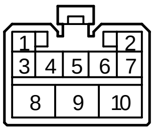
90980–10158



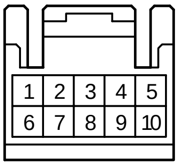
90980–10159



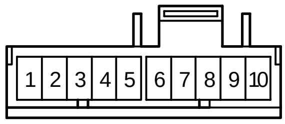
90980–10177



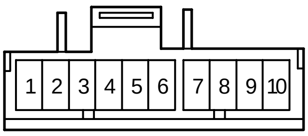
90980–10282



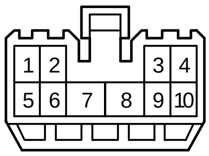
90980–10294



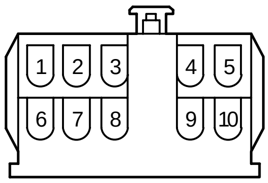
90980–10302



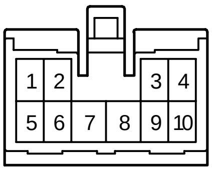
90980–10304



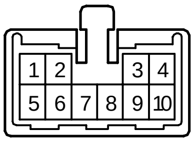
90980–10322



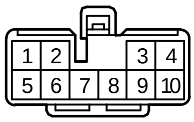
90980–10377



90980–10469

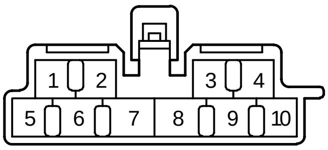


90980–10528

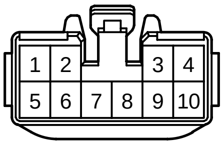


90980–10669

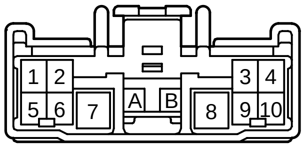
<FEMALE> 10P Non–waterproof Type



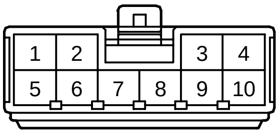
90980–10721



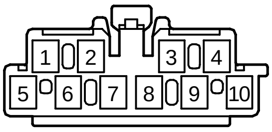
90980–10801



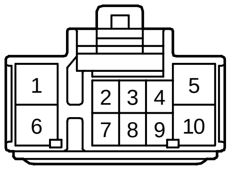
90980–10822



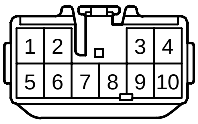
90980–10862



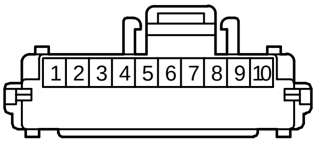
90980–10965



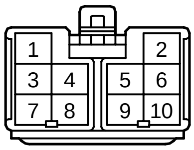
90980–10993



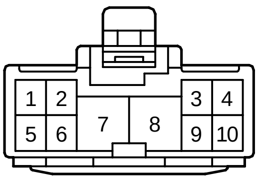
90980–10997



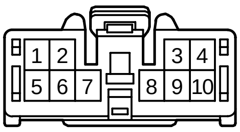
90980–11116



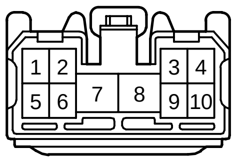
90980–11276



90980–11366

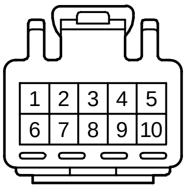


90980–11450

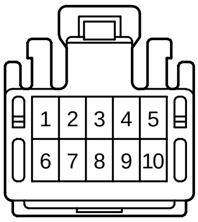


90980–11527

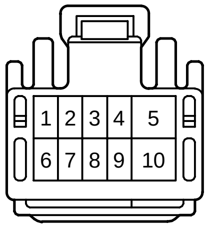
<FEMALE> 10P Non–waterproof Type



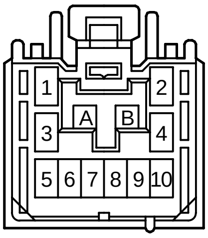
90980–11537



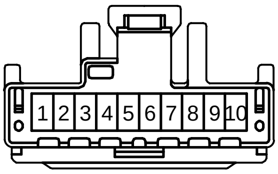
90980–11581



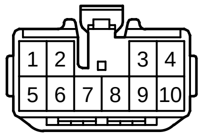
90980–11614



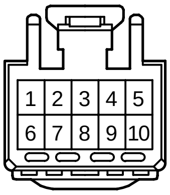
90980–11642



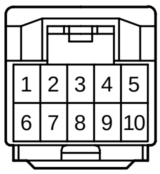
90980–11657



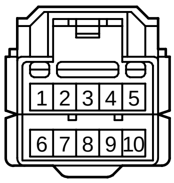
90980–11781



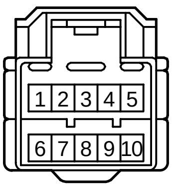
90980–11817



90980–11923



90980–11924



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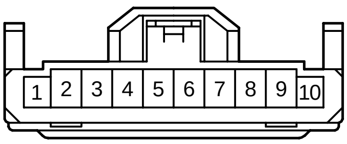
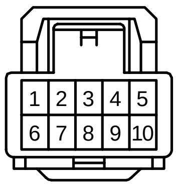
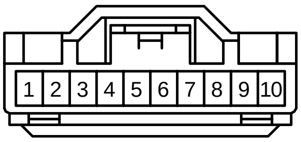
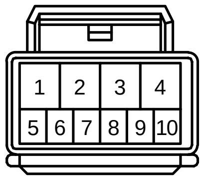
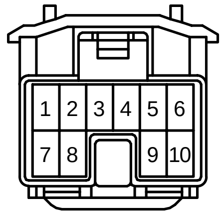


90980–12008

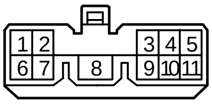


90980–12135

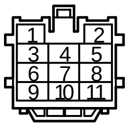
<FEMALE> 10P Non–waterproof Type

 90980–12162	 90980–12226	 90980–12272

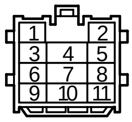
<FEMALE> 11P Non–waterproof Type



90980–10319



90980–10337



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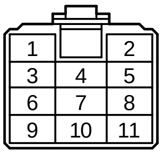
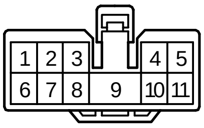


90980–10450



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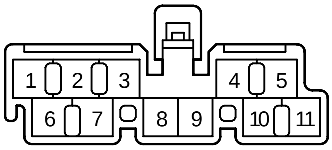
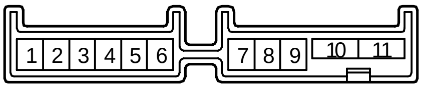
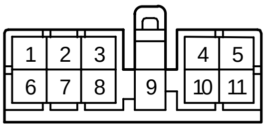


90980–10723



90980–10727



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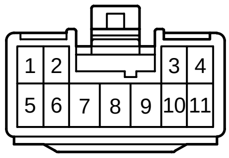

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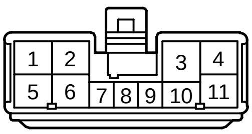

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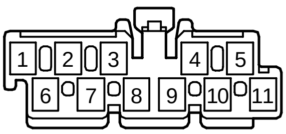
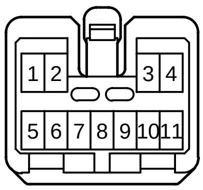
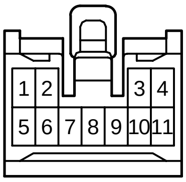
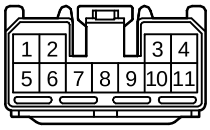
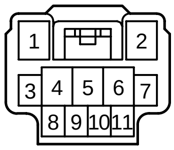


90980–10966

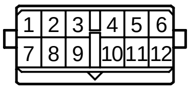


90980–11041

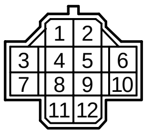
<FEMALE> 11P Non–waterproof Type

 90980–11083	 90980–11539	 90980–12003

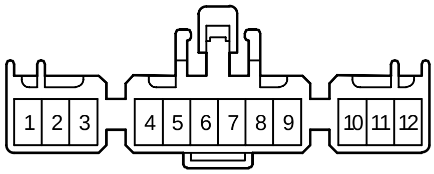
<FEMALE> 12P Non–waterproof Type



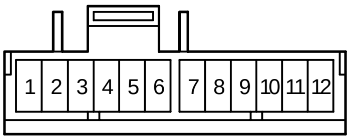
90980–10006



90980–10150



90980–10153



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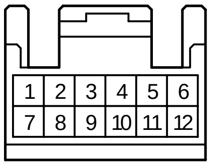

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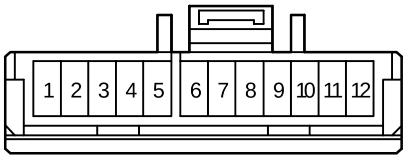
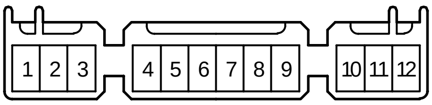
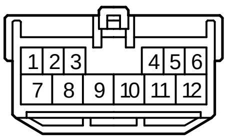


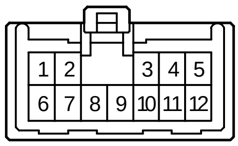
90980–10372



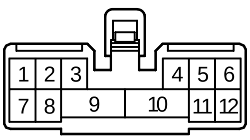
90980–10397



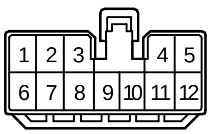
90980–10406



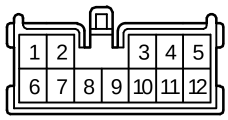
90980–10408



90980–10421

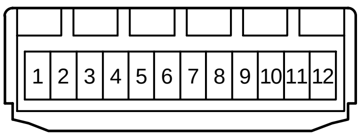


90980–10432

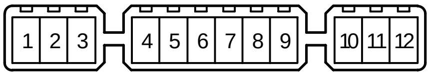


90980–10524

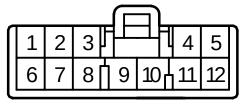
<FEMALE> 12P Non–waterproof Type



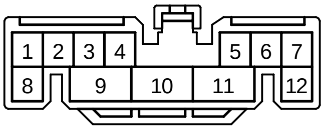
90980–10565



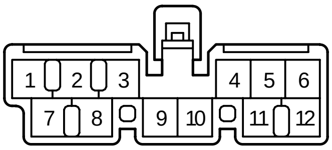
90980–10632



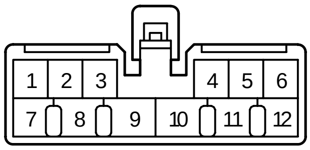
90980–10658



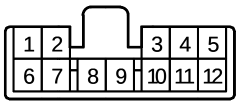
90980–10714



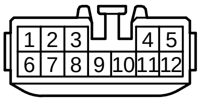
90980–10724



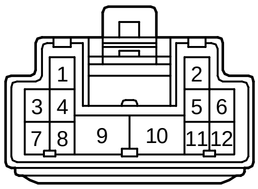
90980–10725



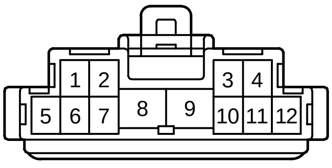
90980–10743



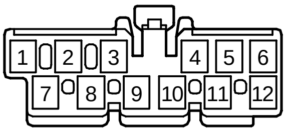
90980–10803



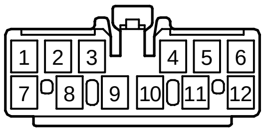
90980–10879



90980–10932

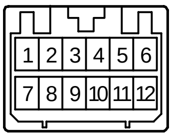
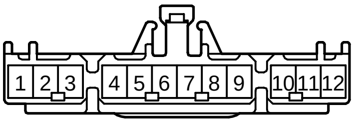
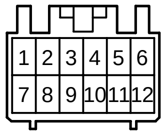
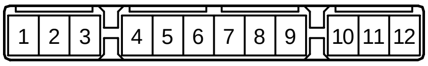
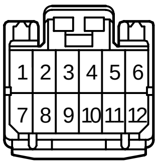
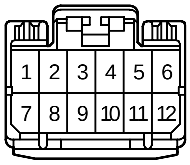
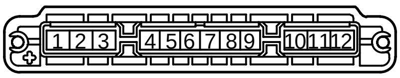
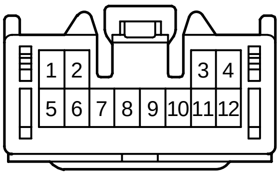
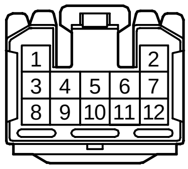
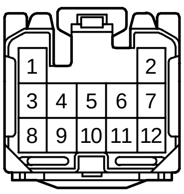
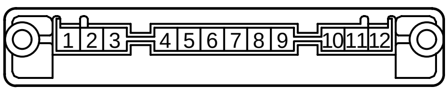
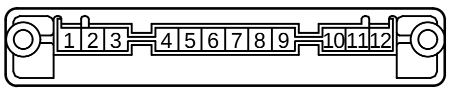


90980–10967

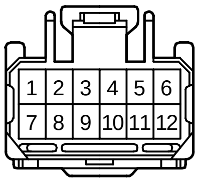
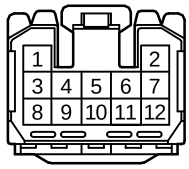
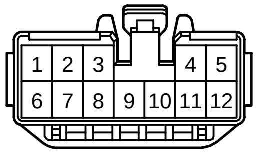
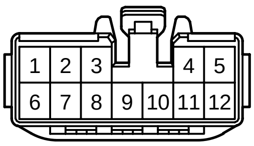
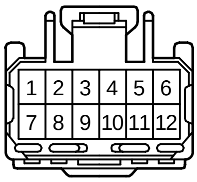
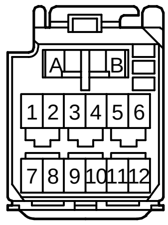
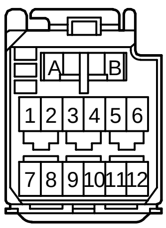
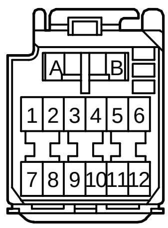
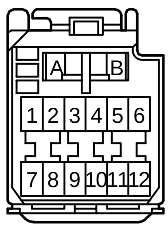
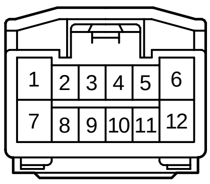
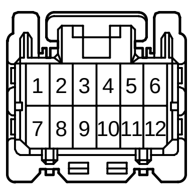
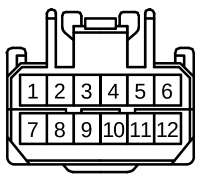


90980–10968

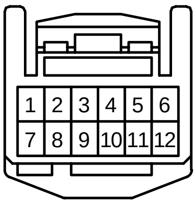
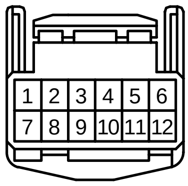
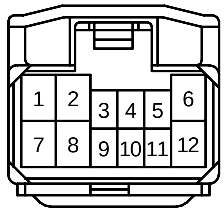
<FEMALE> 12P Non–waterproof Type

 90980–10973	 90980–11121	 90980–11129
 90980–11311	 90980–11408	 90980–11424
 90980–11453	 90980–11475	 90980–11531
 90980–11626	 90980–11649	 90980–11656

<FEMALE> 12P Non–waterproof Type

 90980–11661	 90980–11693	 90980–11720
 90980–11782	 90980–11847	 90980–11867
 90980–11869	 90980–11871	 90980–11873
 90980–11947	 90980–12032	 90980–12090

<FEMALE> 12P Non–waterproof Type

 90980–12183	 90980–12222	 90980–12273

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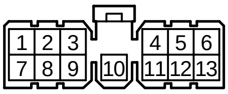
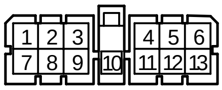
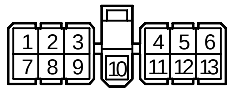
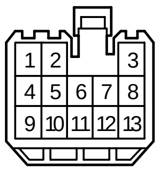
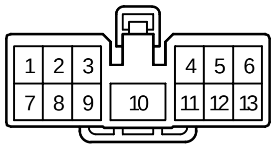
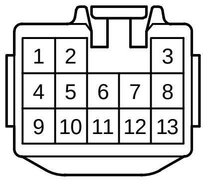
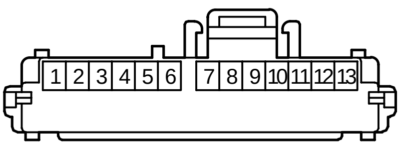
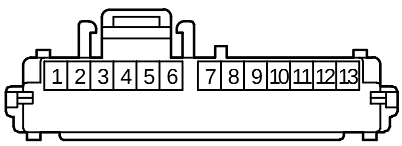
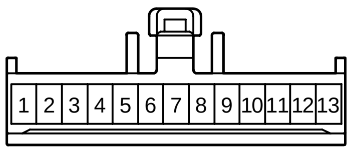
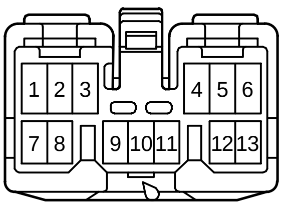
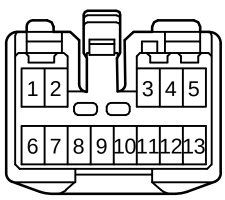
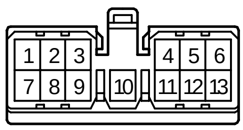
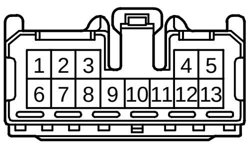
 90980–10033	 90980–10062	 90980–10132
 90980–10324	 90980–10480	 90980–10805
 90980–11114	 90980–11115	 90980–11199
 90980–11350	 90980–11394	 90980–11478

<FEMALE> 13P Non–waterproof Type



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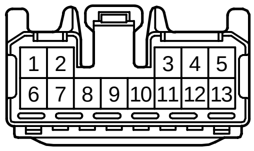

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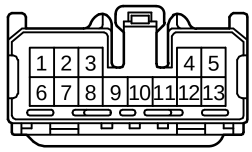

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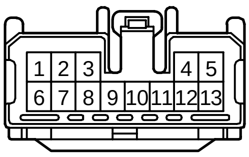

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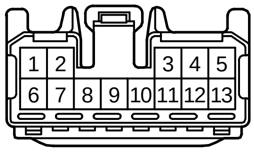

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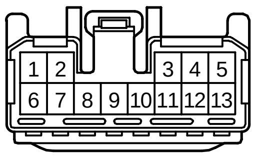

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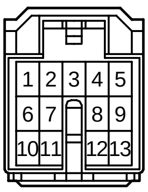

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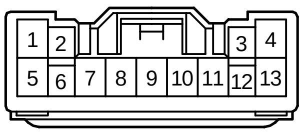

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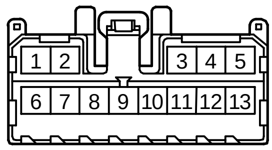
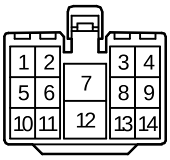


90980–12027

<FEMALE> 14P Non–waterproof Type



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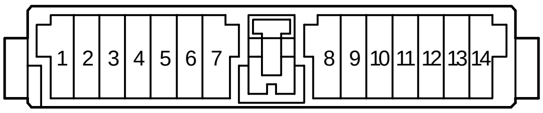

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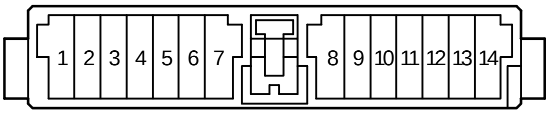

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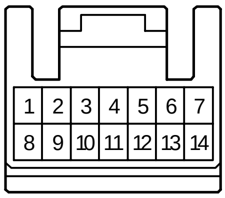

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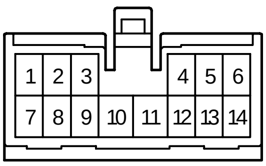

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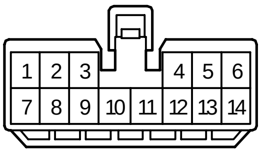
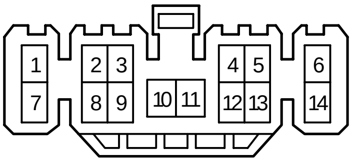
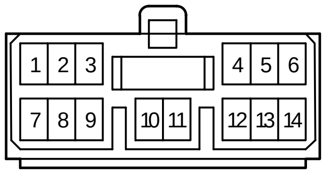


90980–10507

<FEMALE> 14P Non–waterproof Type



90980–10538



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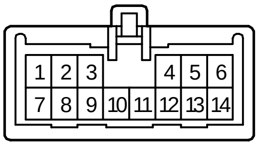

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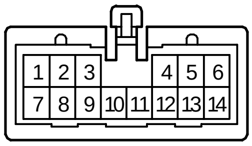

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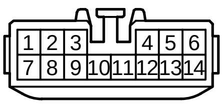
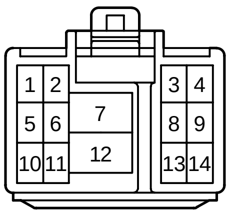
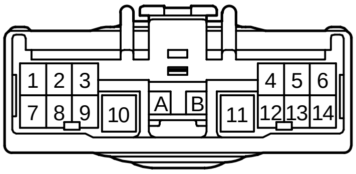


90980–10807
90980–11437

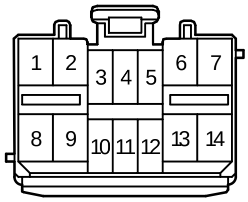


90980–10813

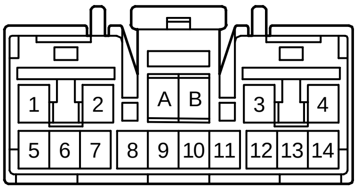
<FEMALE> 14P Non–waterproof Type



90980–10852



90980–11225



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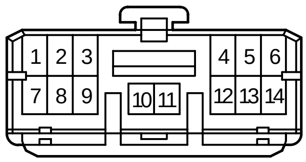

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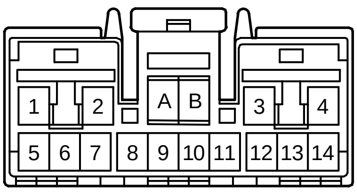

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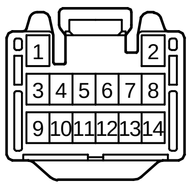
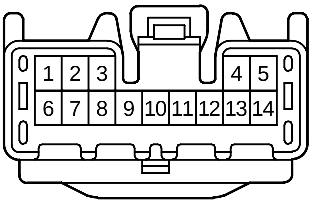
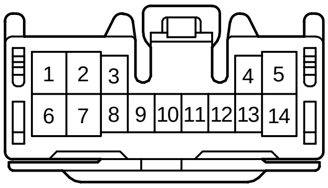


90980–11511

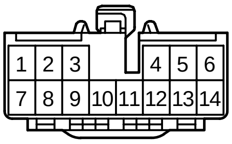
<FEMALE> 14P Non–waterproof Type



90980–11556



90980–11591



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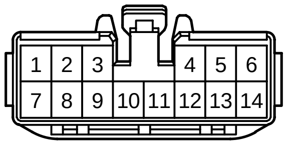

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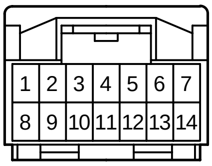

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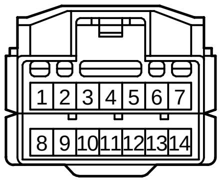
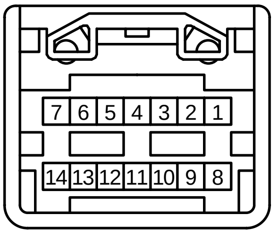


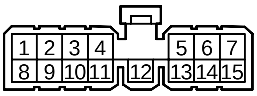
90980–11925

<FEMALE> 14P Non–waterproof Type

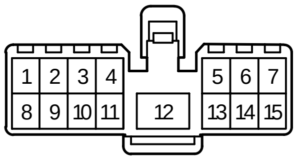


90980–12082

<FEMALE> 15P Non–waterproof Type



90980–10066



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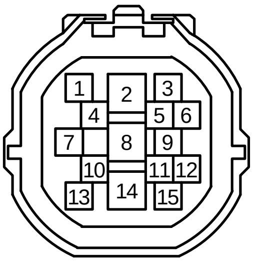

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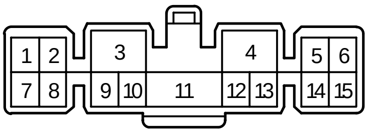

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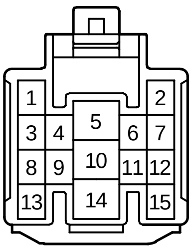
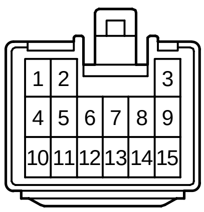
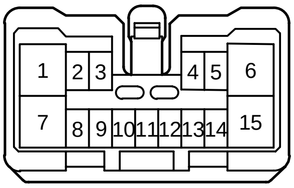


90980–10815



90980–10828

<FEMALE> 15P Non–waterproof Type



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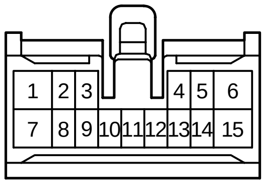
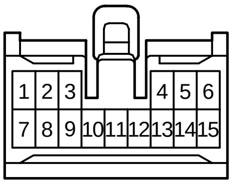
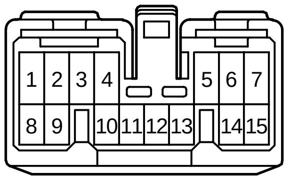


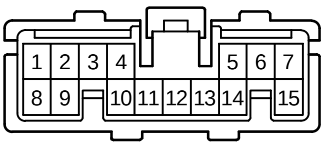
90980–11056



90980–11179

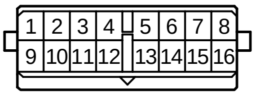


90980–11264

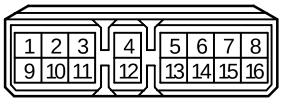


90980–11372

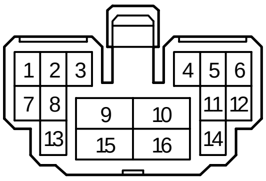
<FEMALE> 16P Non–waterproof Type



90980–10008



90980–10028



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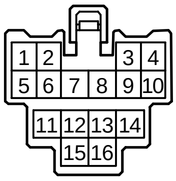

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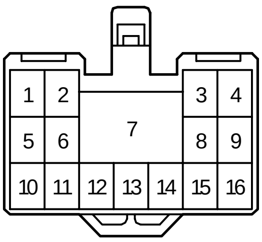

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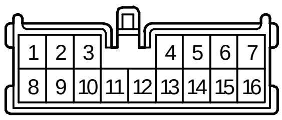
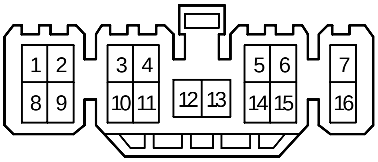


90980–10525

<FEMALE> 16P Non–waterproof Type



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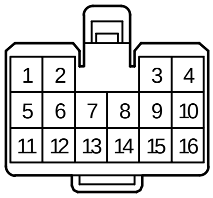

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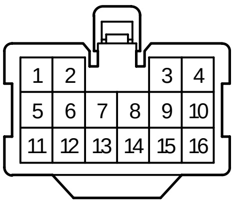

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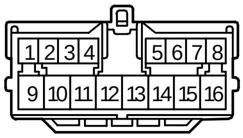

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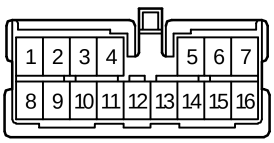

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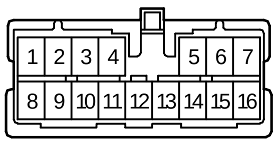
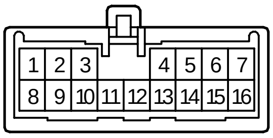


90980–10614

<FEMALE> 16P Non–waterproof Type



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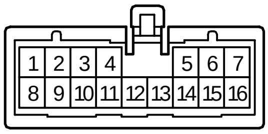

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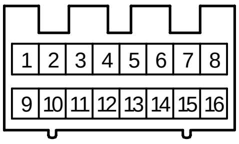

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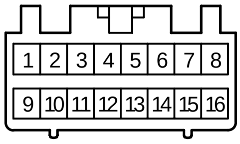
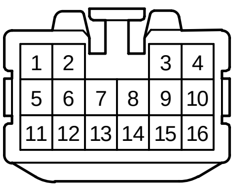
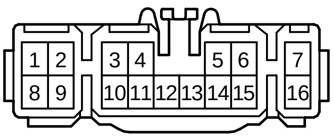


90980–10764

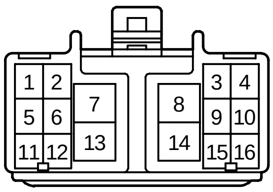


90980–10809
90980–11445

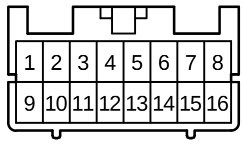


90980–10848

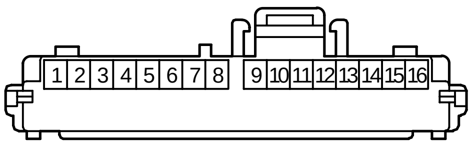
<FEMALE> 16P Non–waterproof Type



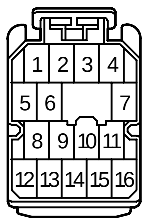
90980–10885



90980–11082



90980–11113



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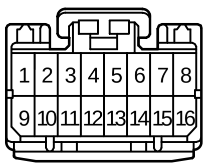
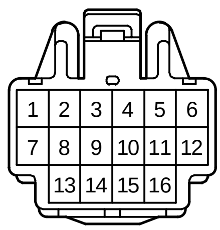
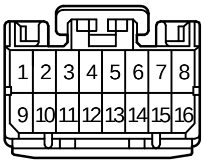


90980–11391

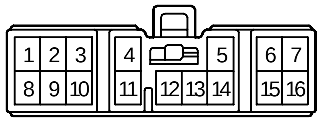


90980–11416

<FEMALE> 16P Non–waterproof Type



90980–11425



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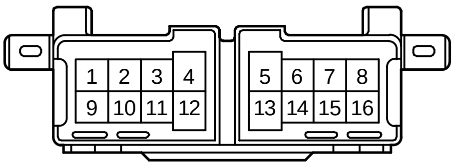

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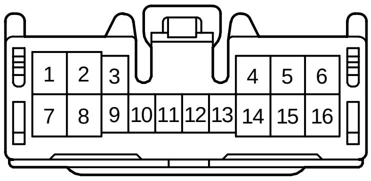

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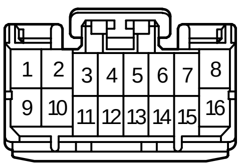
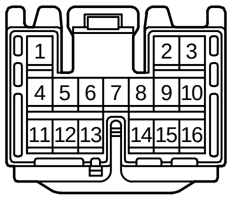
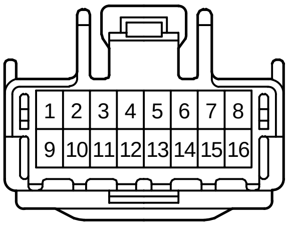


90980–11565

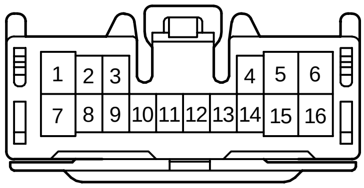


90980–11574

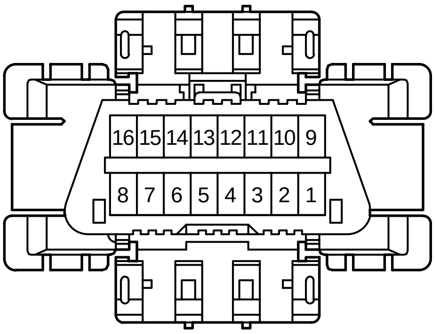
<FEMALE> 16P Non–waterproof Type



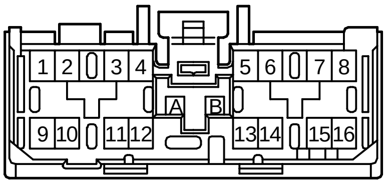
90980–11648



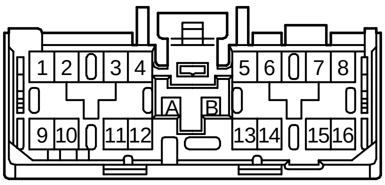
90980–11652



90980–11665
90980–11978



90980–11681



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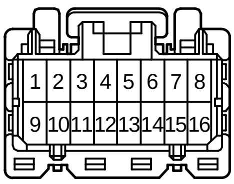
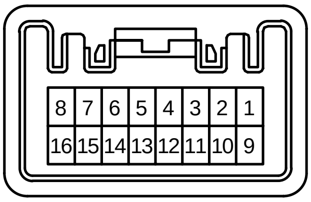


90980–11787

<FEMALE> 16P Non–waterproof Type



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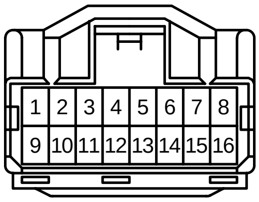

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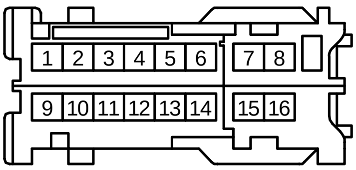

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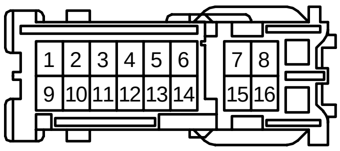

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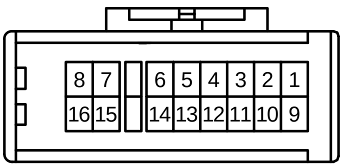

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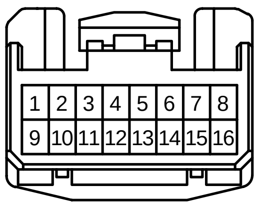
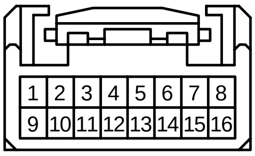


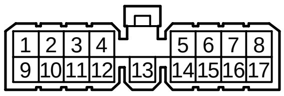
90980–12155

<FEMALE> 16P Non–waterproof Type

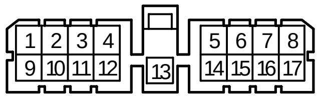


90980–12156

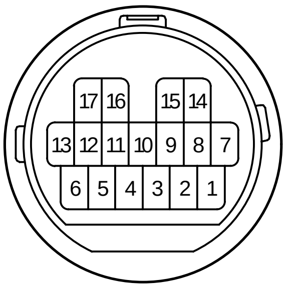
<FEMALE> 17P Non–waterproof Type



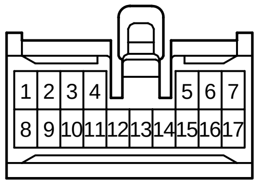
90980–10031



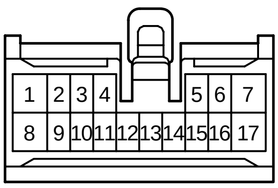
90980–10037



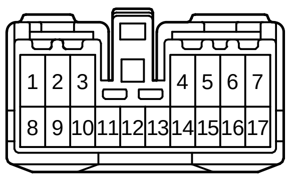
90980–10731
90980–11417
90980–11420



90980–11203

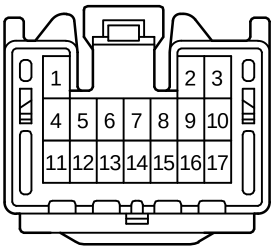


90980–11310

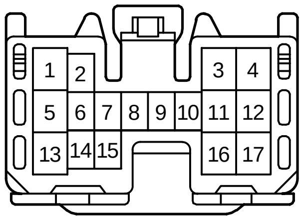


90980–11335

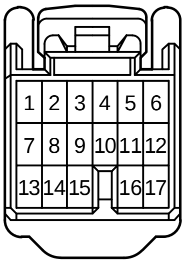
<FEMALE> 17P Non–waterproof Type



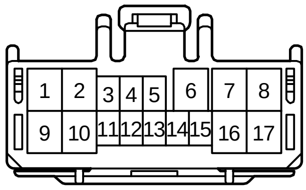
90980–11506



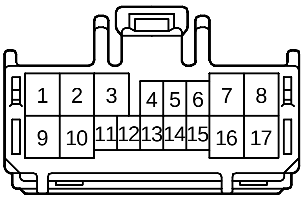
90980–11560



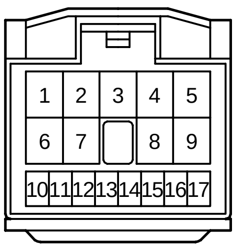
90980–11586



90980–11671

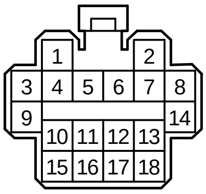


90980–11672

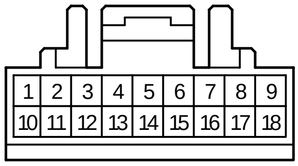


90980–11954

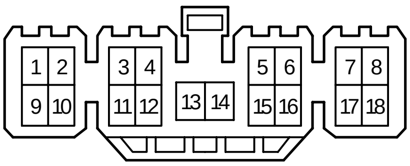
<FEMALE> 18P Non–waterproof Type



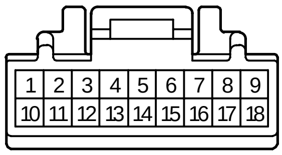
90980–10285



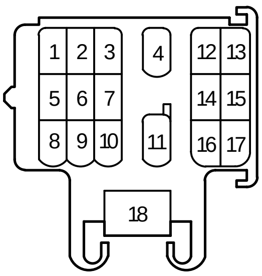
90980–10295



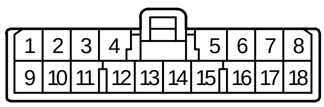
90980–10326



90980–10350

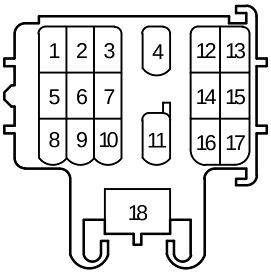
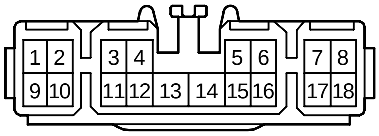
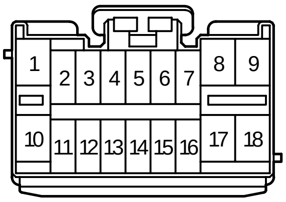
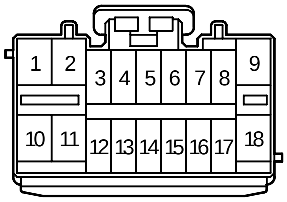
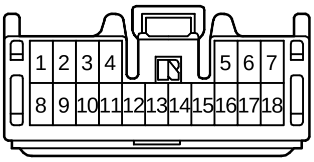
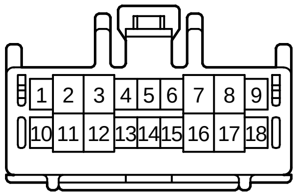


90980–10530

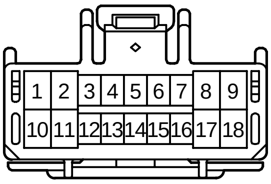


90980–10656

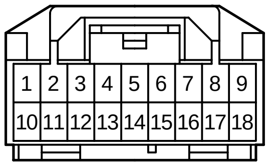
<FEMALE> 18P Non–waterproof Type

 90980–10778	 90980–10819
 90980–11224	 90980–11226
 90980–11497	 90980–11594

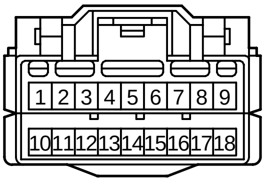
<FEMALE> 18P Non–waterproof Type



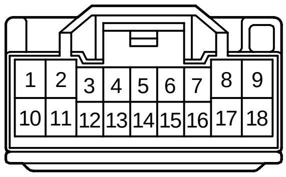
90980–11595



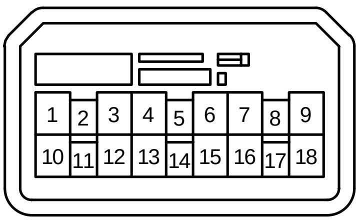
90980–11913



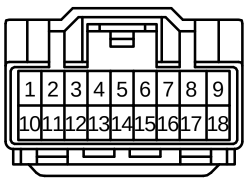
90980–11914



90980–11973

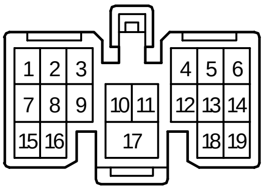


90980–12122

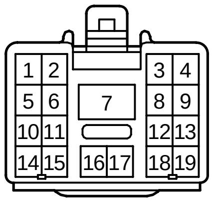


90980–12174

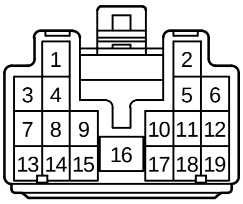
<FEMALE> 19P Non–waterproof Type



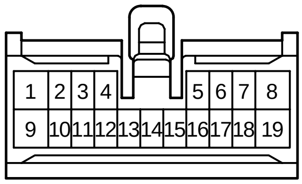
90980–10675



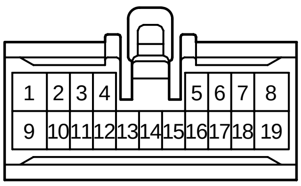
90980–10857



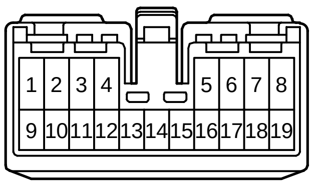
90980–10883



90980–11205

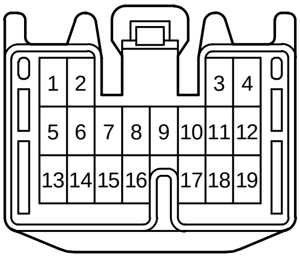


90980–11308

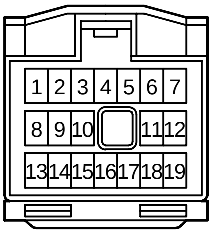


90980–11377

<FEMALE> 19P Non–waterproof Type

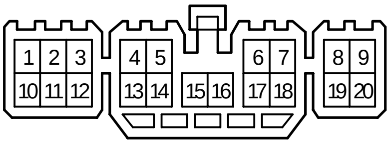


90980–11571

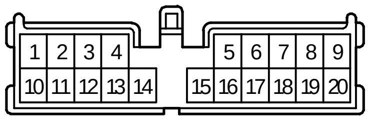


90980–11955

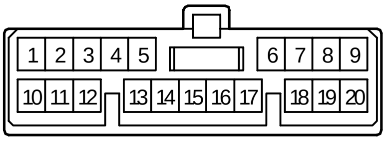
<FEMALE> 20P Non–waterproof Type



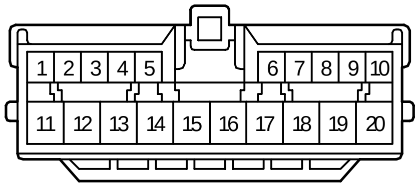
90980–10327



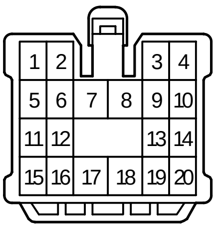
90980–10589



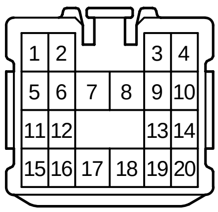
90980–10607



90980–10612

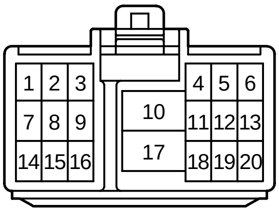


90980–10640

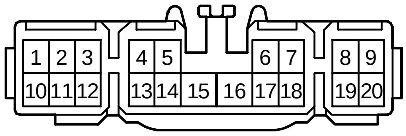


90980–10811
90980–11441

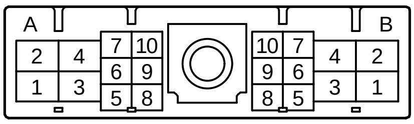
<FEMALE> 20P Non–waterproof Type



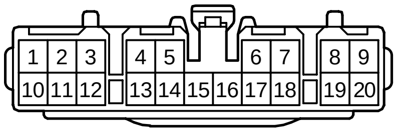
90980–10817



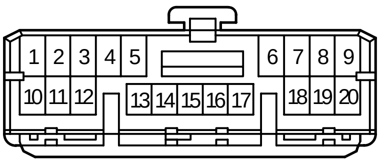
90980–10821



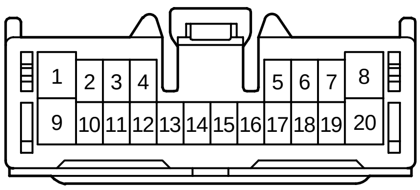
90980–10952



90980–11260

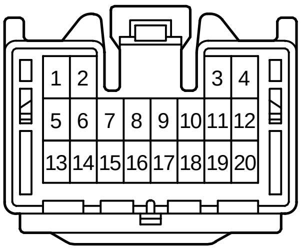


90980–11432

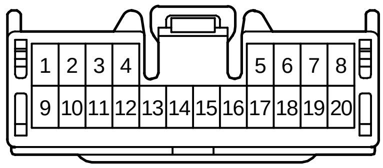


90980–11469

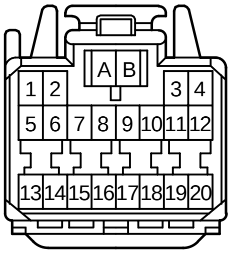
<FEMALE> 20P Non–waterproof Type



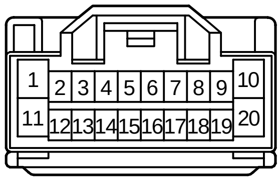
90980–11499



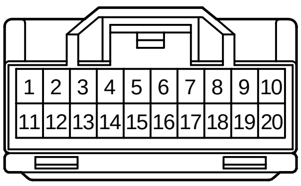
90980–11558



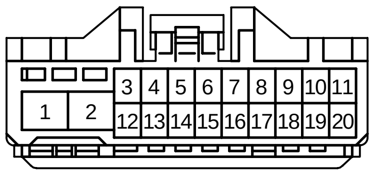
90980–11868



90980–11971

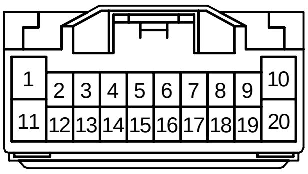


90980–11974

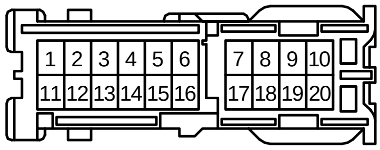


90980–12034

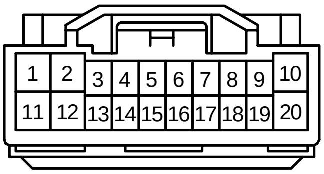
<FEMALE> 20P Non–waterproof Type



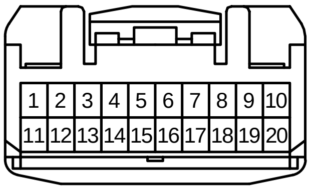
90980–12038



90980–12106

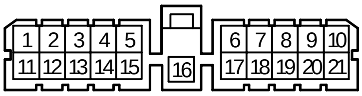


90980–12166

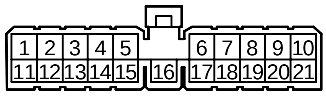


90980–12259

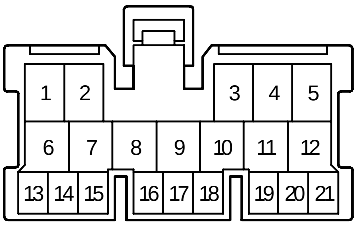
<FEMALE> 21P Non–waterproof Type



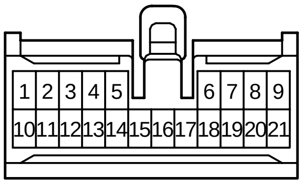
90980–10064



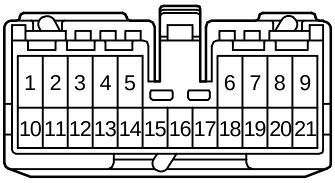
90980–10207



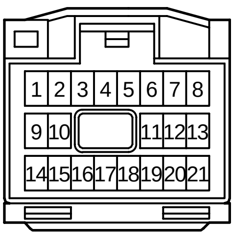
90980–10473



90980–11125

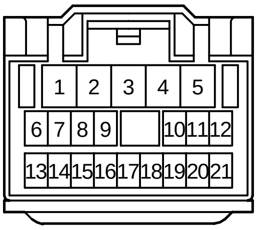


90980–11379



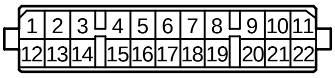
90980–11956

<FEMALE> 21P Non–waterproof Type

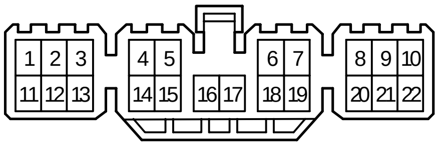


90980–11957

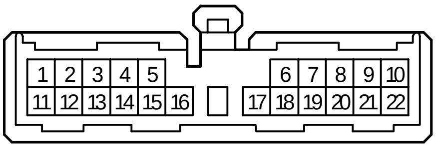
<FEMALE> 22P Non–waterproof Type



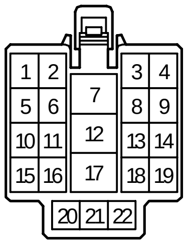
90980–10010



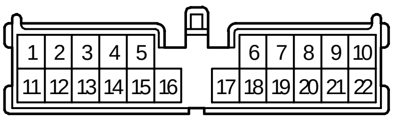
90980–10328



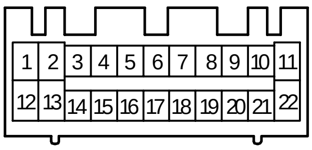
90980–10456



90980–10458

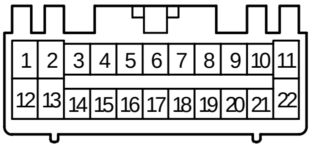


90980–10526

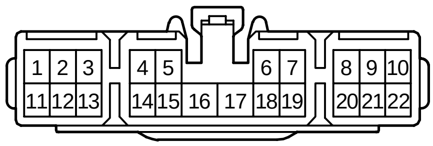


90980–10741

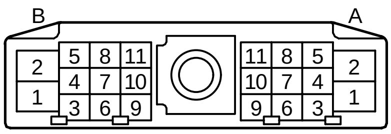
<FEMALE> 22P Non–waterproof Type



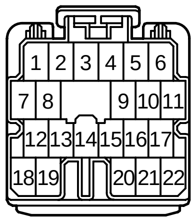
90980–10765



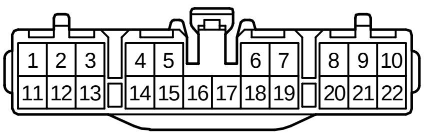
90980–10875



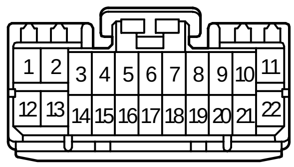
90980–10953



90980–11220

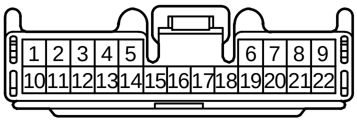


90980–11238

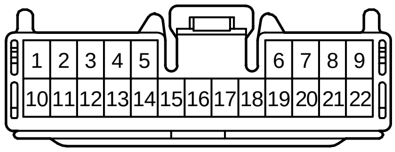


90980–11392

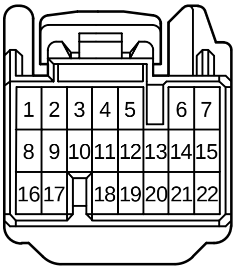
<FEMALE> 22P Non–waterproof Type



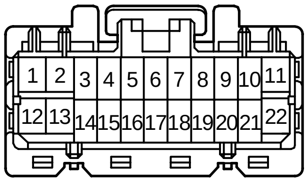
90980–11502



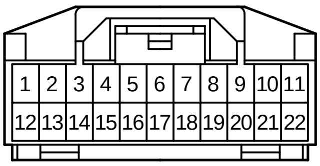
90980–11628



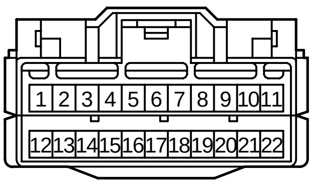
90980–11638



90980–11788

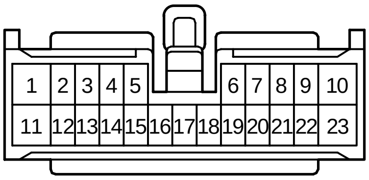


90980–11915

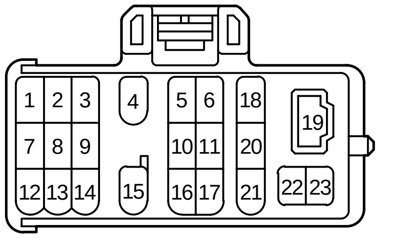


90980–11927

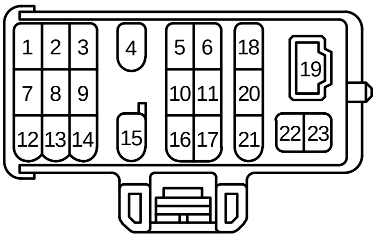
<FEMALE> 23P Non–waterproof Type



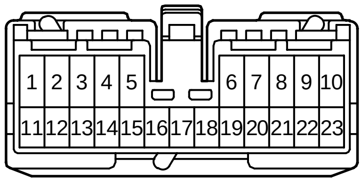
90980–10921



90980–11195

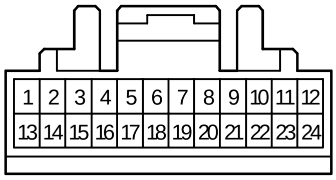


90980–11323

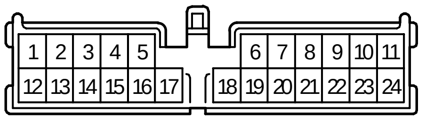


90980–11381

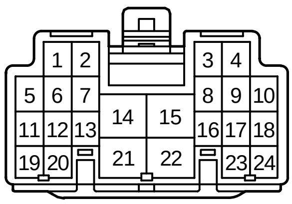
<FEMALE> 24P Non–waterproof Type



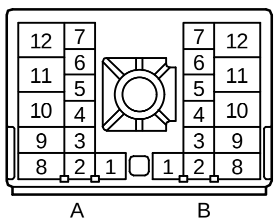
90980–10296



90980–10585

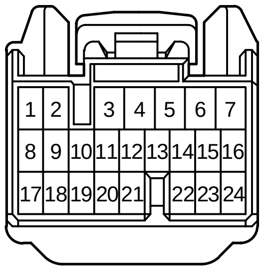


90980–10881

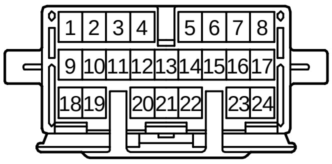


90980–10955

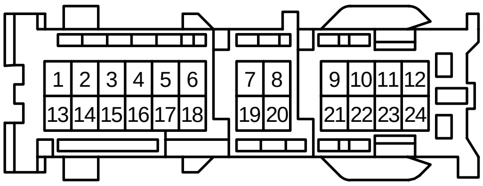
<FEMALE> 24P Non–waterproof Type



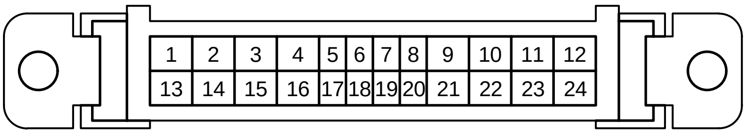
90980–11476



90980–11509

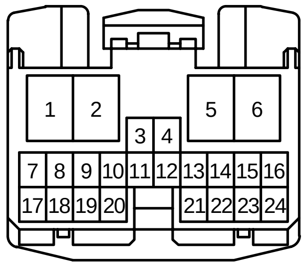


90980–12070

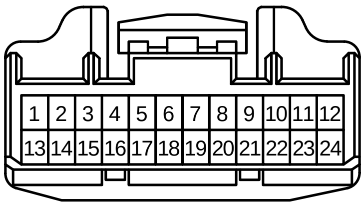


90980–12079

<FEMALE> 24P Non–waterproof Type

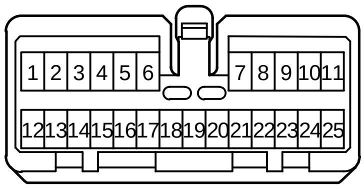


90980–12149

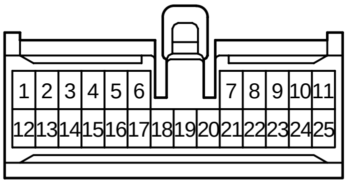


90980–12200

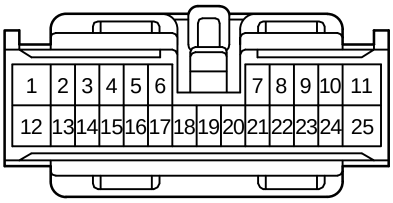
<FEMALE> 25P Non–waterproof Type



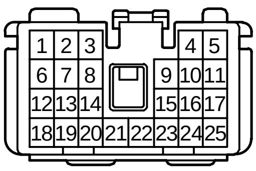
90980–11043



90980–11055

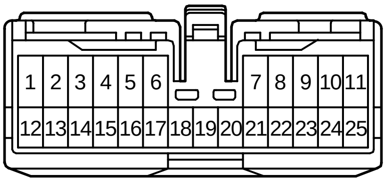


90980–11058

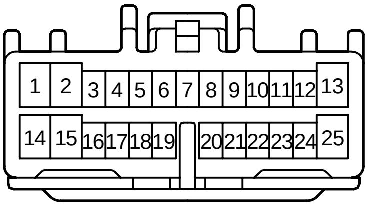


90980–11375

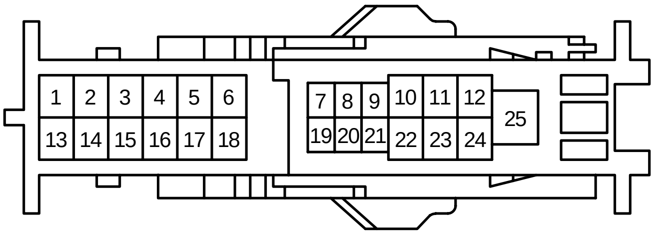
<FEMALE> 25P Non–waterproof Type



90980–11404

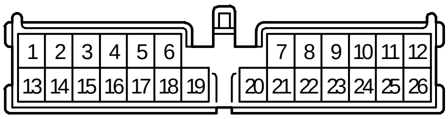


90980–11877

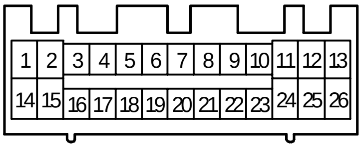


90980–12278

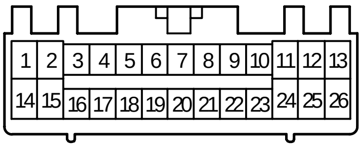
<FEMALE> 26P Non–waterproof Type



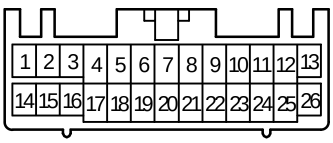
90980–10587



90980–10739

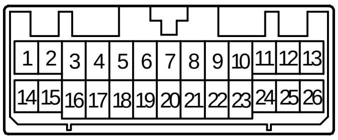


90980–10763

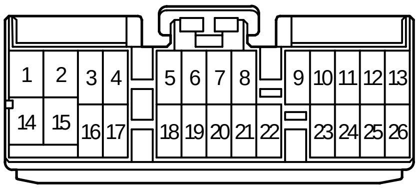


90980–10918

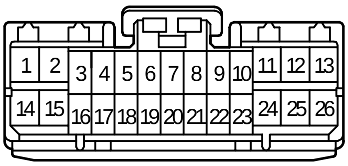
<FEMALE> 26P Non–waterproof Type



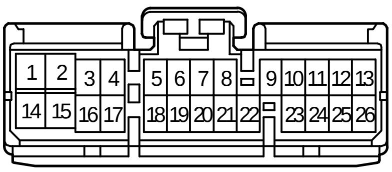
90980–10925



90980–11234

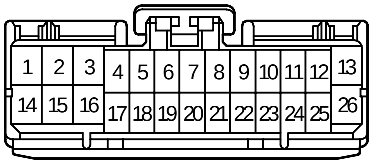


90980–11390

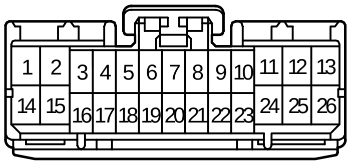


90980–11406

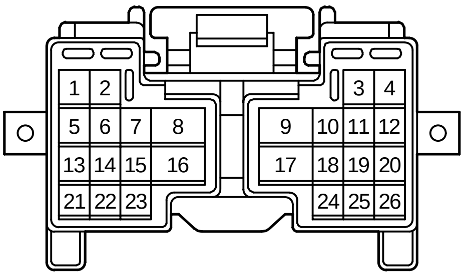
<FEMALE> 26P Non–waterproof Type



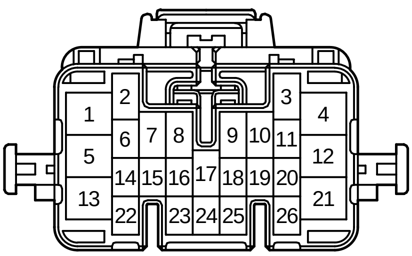
90980–11422



90980–11423

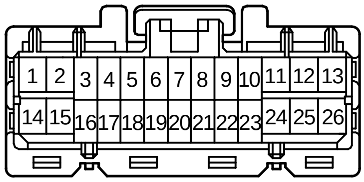


90980–11611

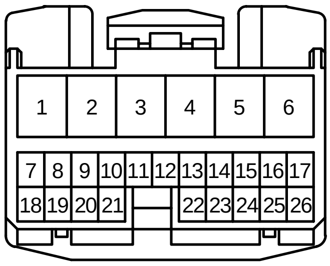


90980–11632

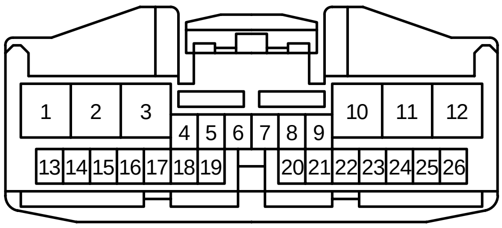
<FEMALE> 26P Non–waterproof Type



90980–11786

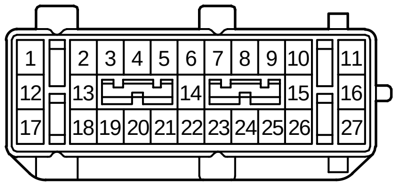


90980–12150



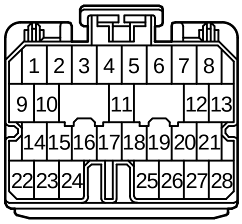
90980–12203

<FEMALE> 27P Non–waterproof Type

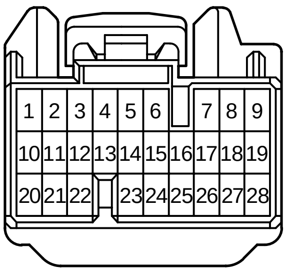


90980–11670

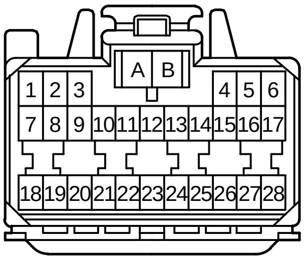
<FEMALE> 28P Non–waterproof Type



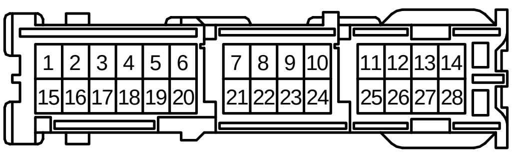
90980–11218



90980–11637

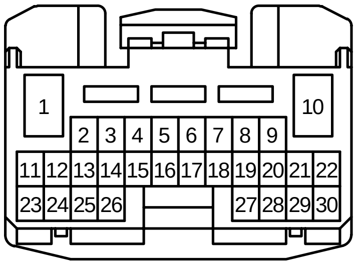


90980–11872

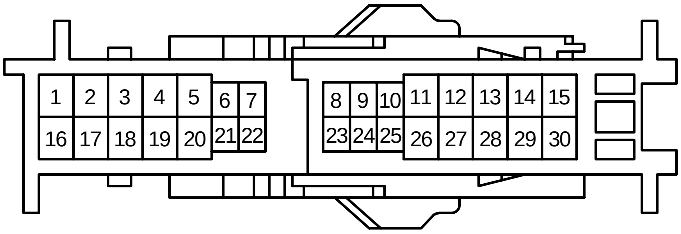


90980–12102

<FEMALE> 30P Non–waterproof Type

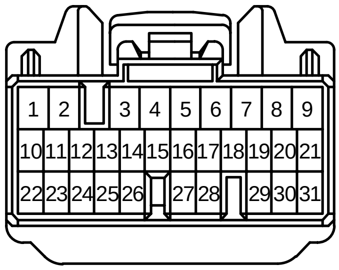


90980–12151

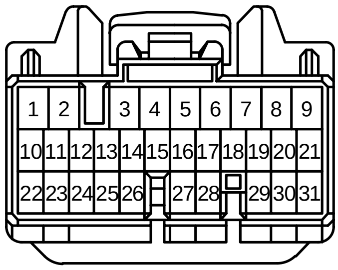


90980–12277

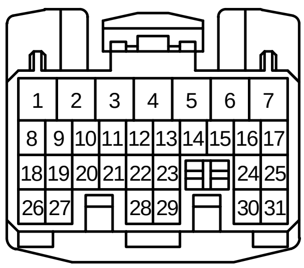
<FEMALE> 31P Non–waterproof Type



90980–11421

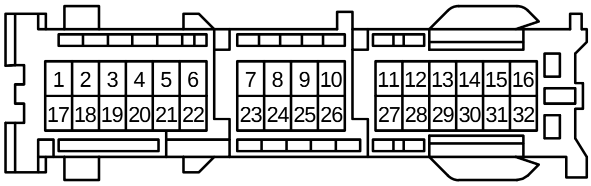


90980–11935

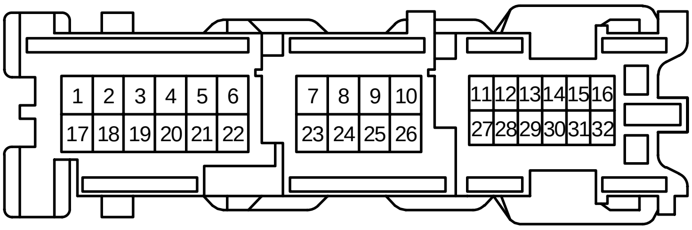


90980–12142

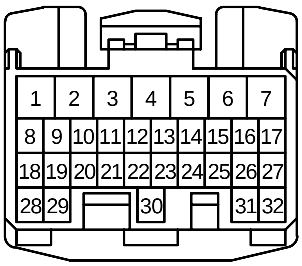
<FEMALE> 32P Non–waterproof Type



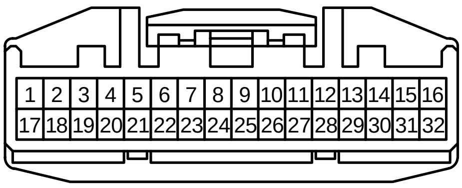
90980–12071



90980–12096

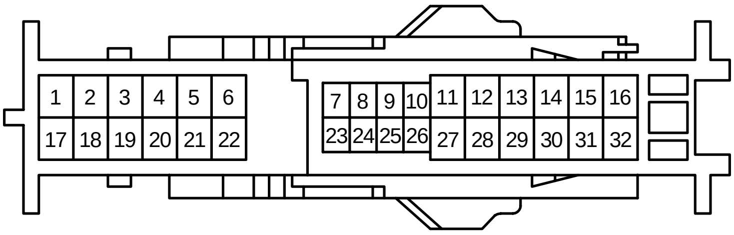


90980–12143



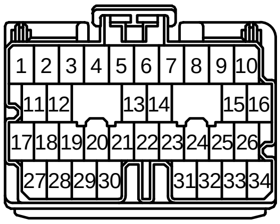
90980–12153

<FEMALE> 32P Non–waterproof Type

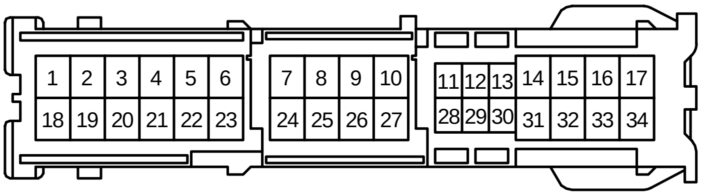


90980–12275

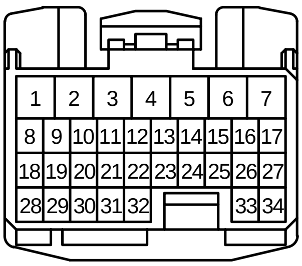
<FEMALE> 34P Non–waterproof Type



90980–11221

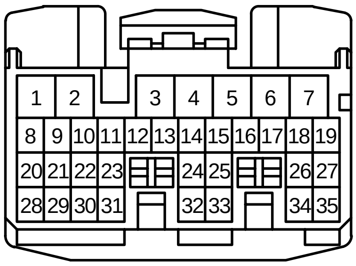


90980–12114

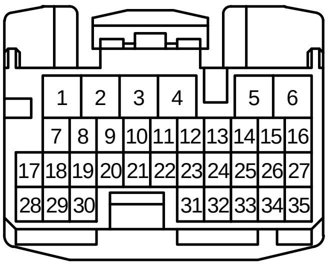


90980–12144

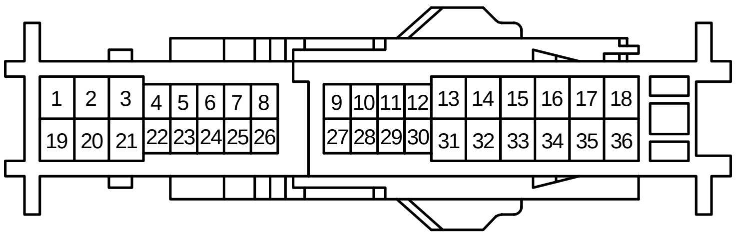
<FEMALE> 35P, 36P Non–waterproof Type



90980–12145

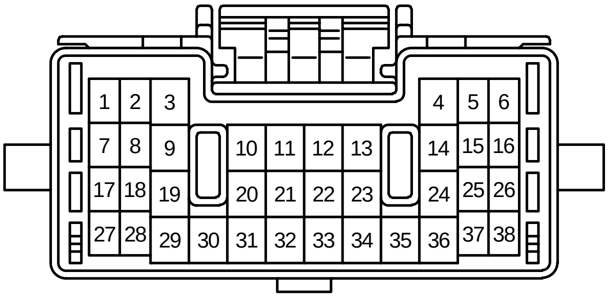


90980–12146

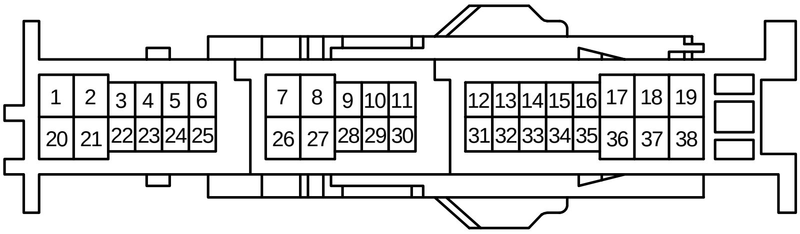


90980–12274

<FEMALE> 38P Non–waterproof Type

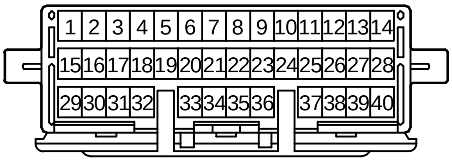


90980–11555

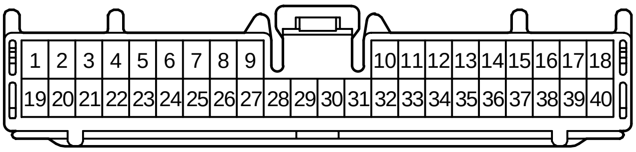


90980–12276

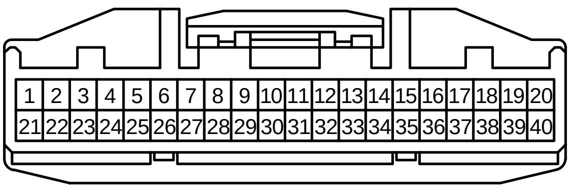
<FEMALE> 40P Non–waterproof Type



90980–11508

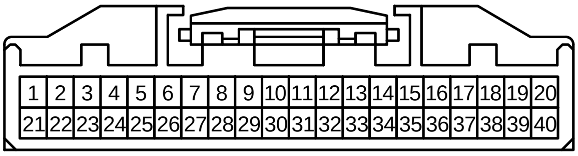


90980–11618



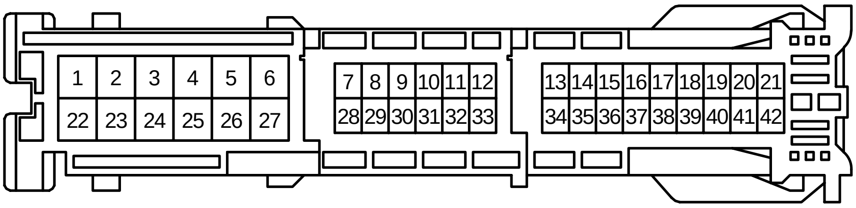
90980–12169

<FEMALE> 40P Non–waterproof Type

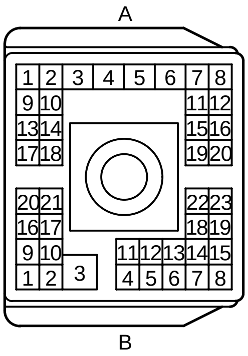


90980–12170

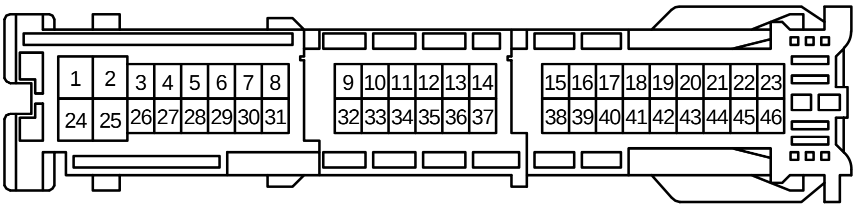
<FEMALE> 42P, 43P, 46P Non–waterproof Type



90980–12184

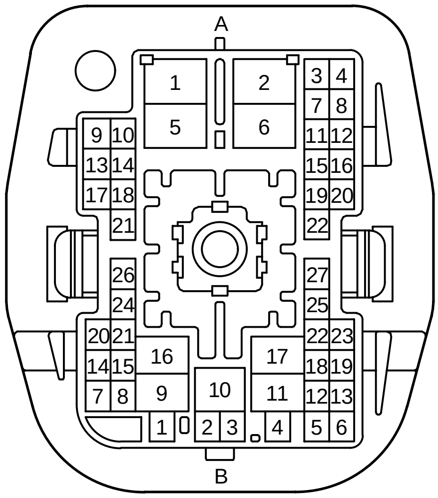


90980–11360

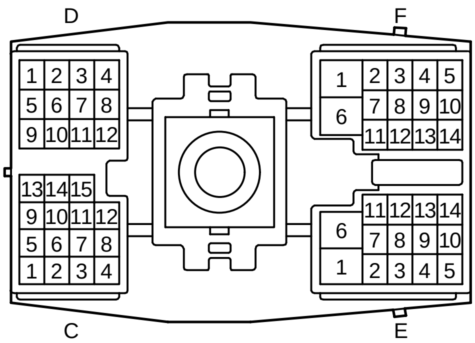


90980–12179

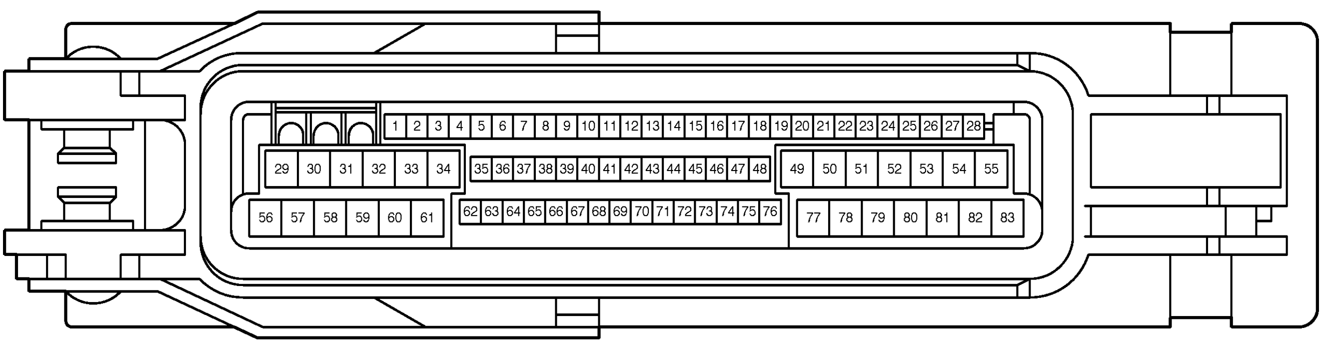
<FEMALE> 49P, 55P, 83P Non–waterproof Type



90980–11431

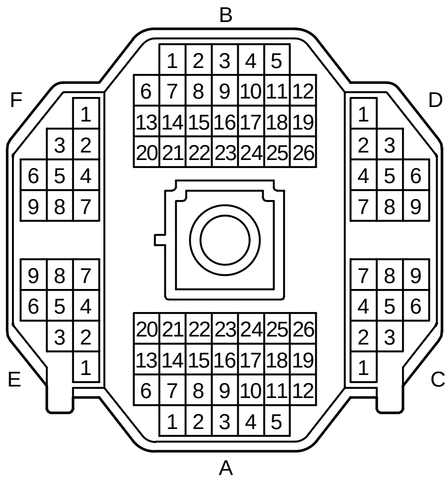


90980–11359



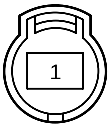
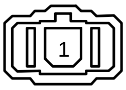
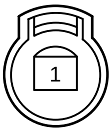
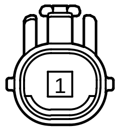
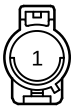
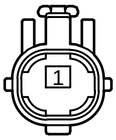
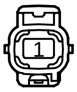
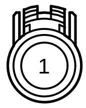
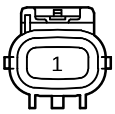
90980–11906

<FEMALE> 88P Non–waterproof Type

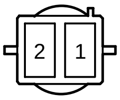
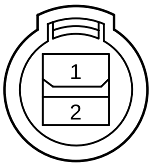
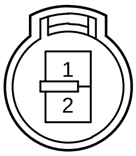
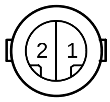
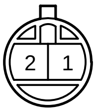
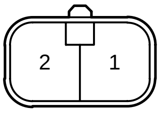
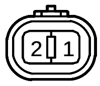
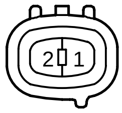
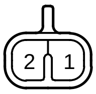
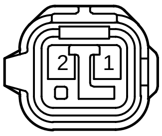
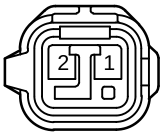
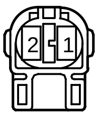
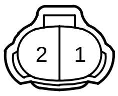
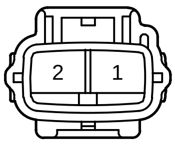


90980–10950

<MALE> 1P Waterproof Type

 90980–10114	 90980–10125	 90980–10200	 90980–10240
 90980–10246	 90980–10438	 90980–10836	 90980–10892
 90980–10982	 90980–11006	 90980–11183	 90980–11270
 90980–11962			

<MALE> 2P Waterproof Type

 90980–10091	 90980–10122	 90980–10156 90980–10412	 90980–10192
 90980–10242	 90980–10374	 90980–10495	 90980–10497
 90980–10533	 90980–10555 90980–10707	 90980–10566	 90980–10571
 90980–10575	 90980–10580	 90980–10582	 90980–10592
 90980–10594	 90980–10625 90980–10788	 90980–10665	 90980–10838

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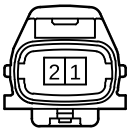
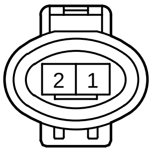
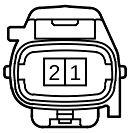
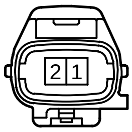
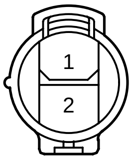
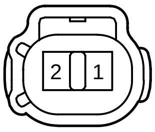
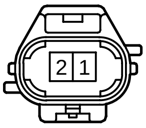
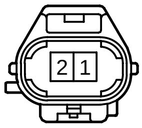
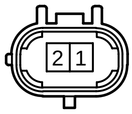
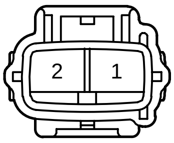
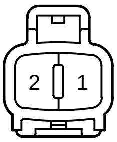
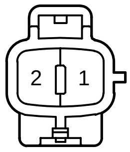
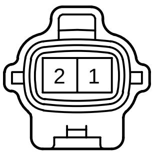
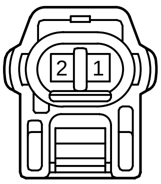
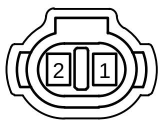
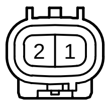
 90980–10842	 90980–10886	 90980–10898	 90980–10900
 90980–10927	 90980–10948	 90980–10959	 90980–10970
 90980–11002	 90980–11004	 90980–11008	 90980–11029
 90980–11031	 90980–11050	 90980–11069	 90980–11072
 90980–11073 90980–11074	 90980–11137	 90980–11141	 90980–11155

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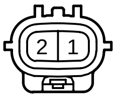
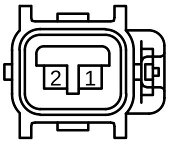
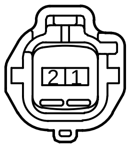
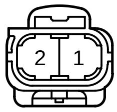
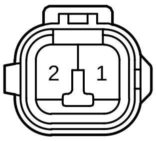
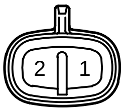
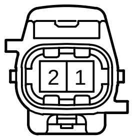
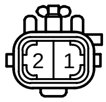
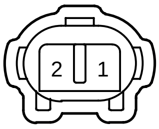
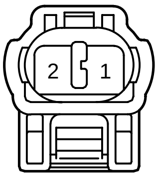
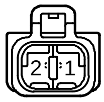
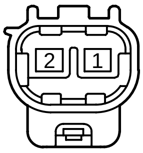
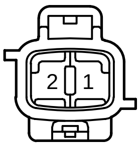
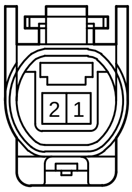
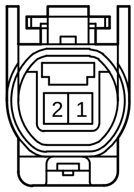
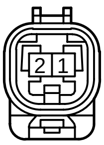
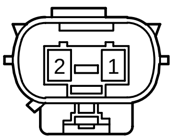
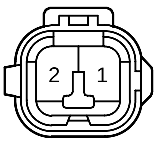
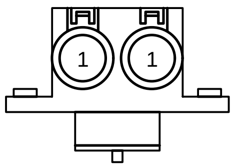
 90980–11168	 90980–11175	 90980–11188	 90980–11236
 90980–11247	 90980–11249	 90980–11254	 90980–11272
 90980–11303	 90980–11322	 90980–11409	 90980–11447
 90980–11466	 90980–11486	 90980–11789	 90980–11854
 90980–11863	 90980–11865	 90980–11901	 90980–11945

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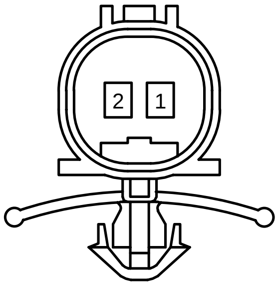 90980–12194			

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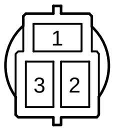
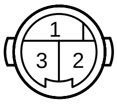
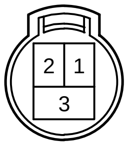
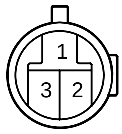
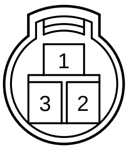
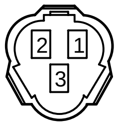
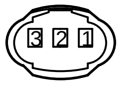
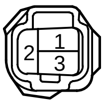
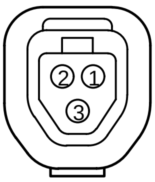
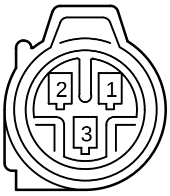
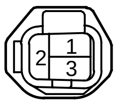
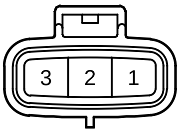
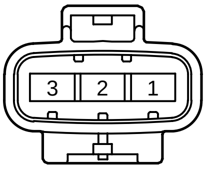
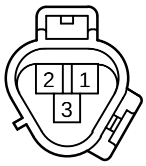
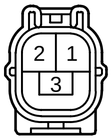
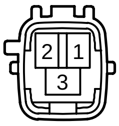
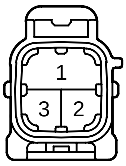
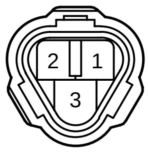
 90980–10093	 90980–10190	 90980–10235	 90980–10244
 90980–10248 90980–10347	 90980–10394 90980–10444	 90980–10492 90980–10493 90980–10774 90980–10787	 90980–10500
 90980–10553 90980–10577 90980–10777	 90980–10682	 90980–10689	 90980–10698
 90980–10840	 90980–10944	 90980–11015	 90980–11044
 90980–11131	 90980–11160	 90980–11169	 90980–11244 90980–11295 90980–11407

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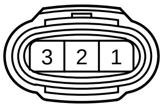
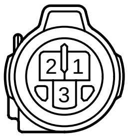
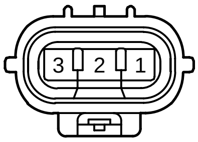
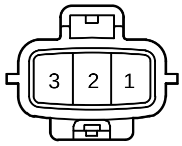
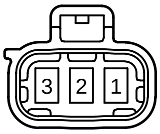
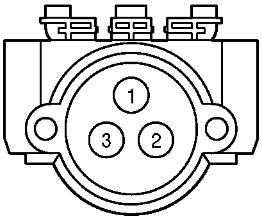
 90980–11293	 90980–11341	 90980–11348	 90980–11607
 90980–11622	 90980–12131		

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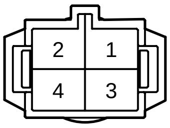
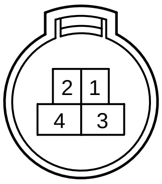
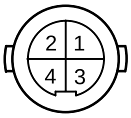
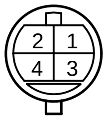
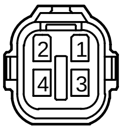
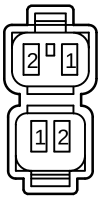
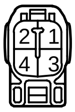
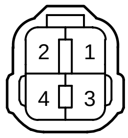
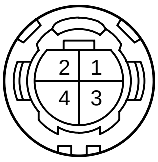
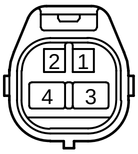
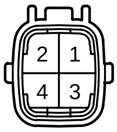
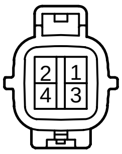
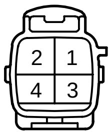
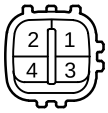
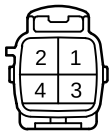
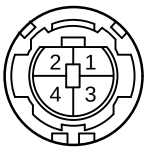
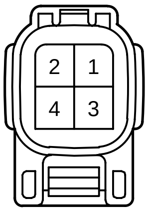
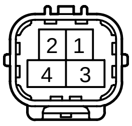
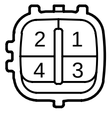
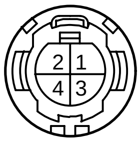
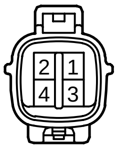
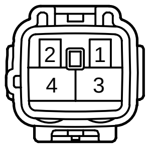
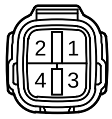
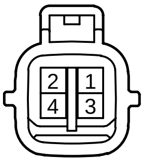
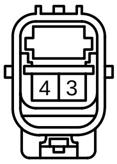
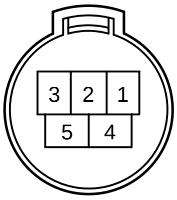
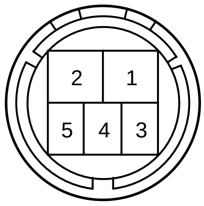
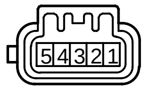
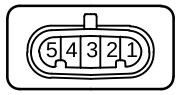
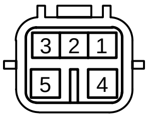
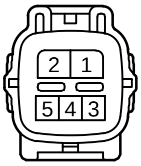
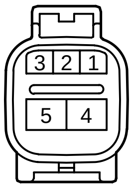
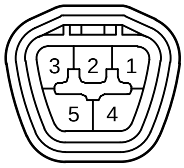
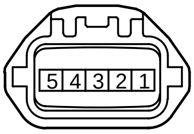
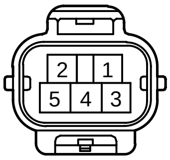
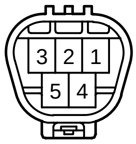
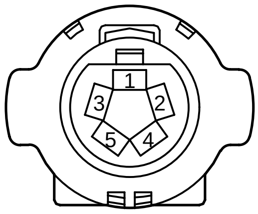
 90980–10094	 90980–10139	 90980–10202	 90980–10217
 90980–10475	 90980–10510 90980–11076	 90980–10590	 90980–10648
 90980–10662	 90980–10749	 90980–10751 90980–10768	 90980–10868
 90980–10941	 90980–10989	 90980–11027	 90980–11035
 90980–11063 90980–11064	 90980–11122	 90980–11138	 90980–11177

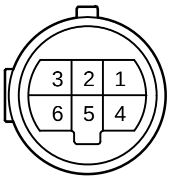
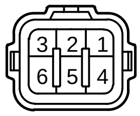
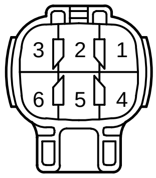
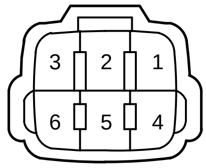
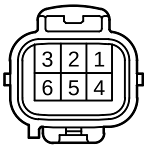
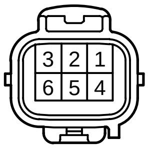
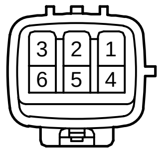
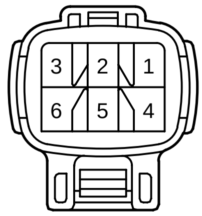
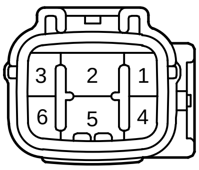
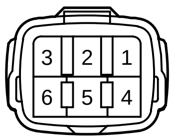
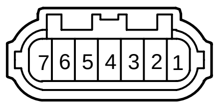
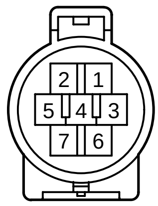
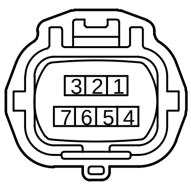
<MALE> 4P Waterproof Type

 90980–11262 90980–11328	 90980–11268	 90980–11287	 90980–11291
 90980–11929	 90980–12177		

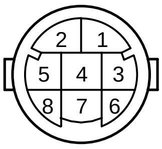
<MALE> 5P Waterproof Type

 90980–10161	 90980–10392	 90980–10557 90980–10570	 90980–10642
 90980–10709	 90980–10945	 90980–11021	 90980–11078
 90980–11181	 90980–11412	 90980–11598	 90980–11689

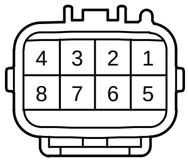
<MALE> 6P, 7P Waterproof Type

 90980–10194	 90980–10477	 90980–10596	 90980–10650 90980–10984
 90980–10987	 90980–11033	 90980–11193	 90980–11196
 90980–11267	 90980–11289	 90980–10627	 90980–10930
 90980–11171			

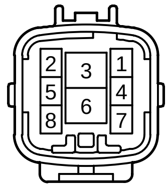
<MALE> 8P, 9P Waterproof Type



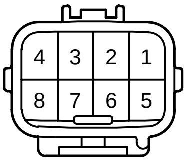
90980–10204



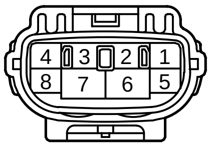
90980–10890



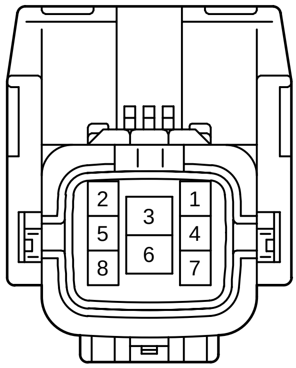
90980–10894



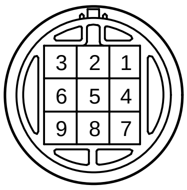
90980–10896



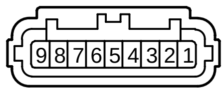
90980–11241



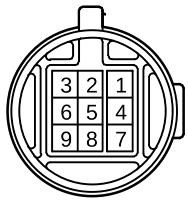
90980–11460



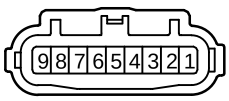
90980–10379



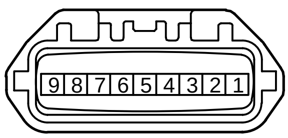
90980–10677



90980–10775

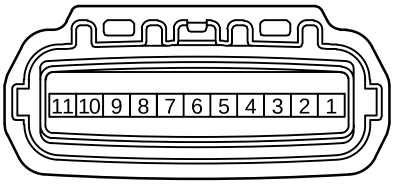


90980–10826

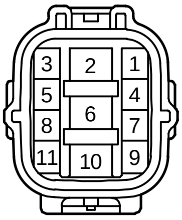


90980–11191

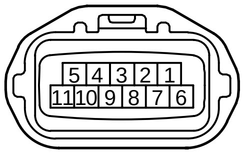
<MALE> 11P, 12P, 13P, 15P Waterproof Type



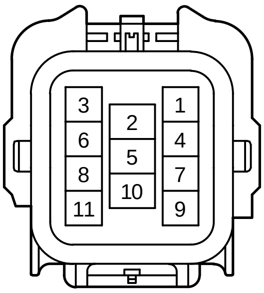
90980–11173



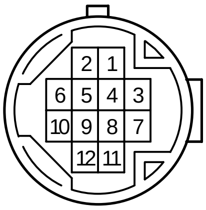
90980–11239



90980–11256

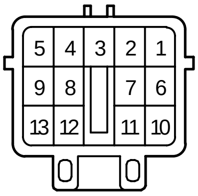


90980–11609

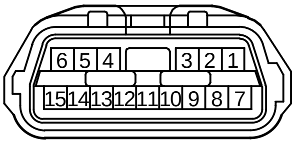


90980–10568

90980–11086

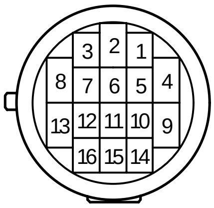


90980–10653

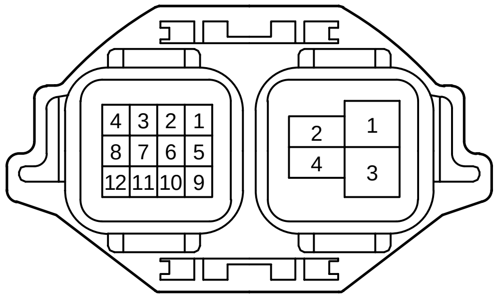


90980–11088

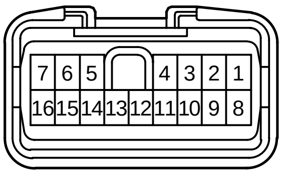
<MALE> 16P, 17P Waterproof Type



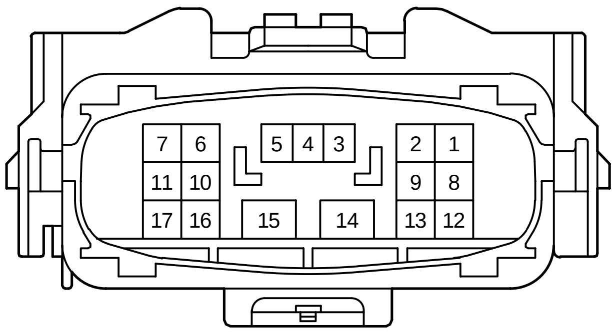
90980–10287



90980–10547

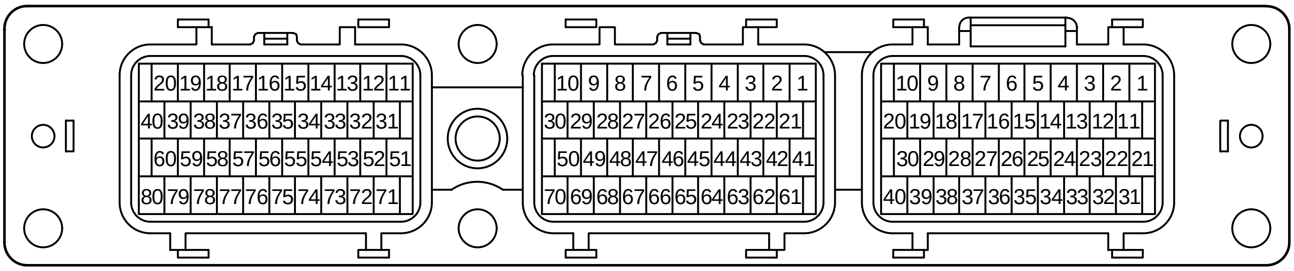


90980–11462



90980–11600

<MALE> 120P Waterproof Type



90980–11213

<MALE> 1P Non–waterproof Type

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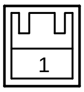
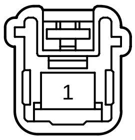
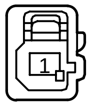
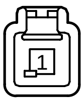
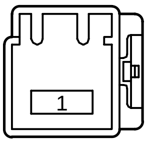
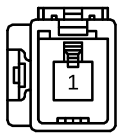
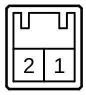
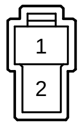
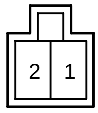
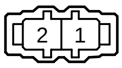
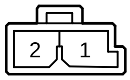
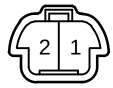
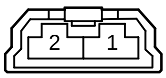
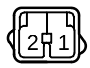
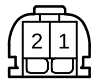
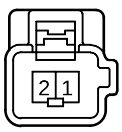
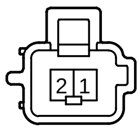
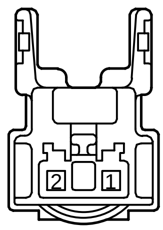
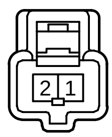
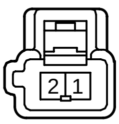
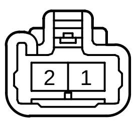
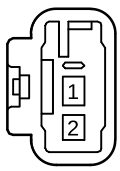
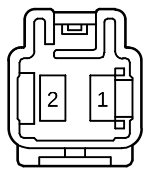
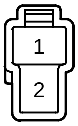
 90980–10253	 90980–10342	 90980–10396	 90980–10433 90980–10434
 90980–10870 90980–11026 90980–11097	 90980–10994	 90980–11146	 90980–11258
 90980–11737	 90980–11774	 90980–12041	

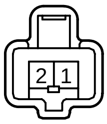
<MALE> 2P Non–waterproof Type

 90980–10011	 90980–10038	 90980–10213 90980–10305	 90980–10255
 90980–10286	 90980–10297	 90980–10344 90980–10346	 90980–10354 90980–10437
 90980–10356	 90980–10424	 90980–10620	 90980–10687
 90980–10824	 90980–10833 90980–11299	 90980–10849	 90980–10859
 90980–10905	 90980–10915	 90980–10934	 90980–10958

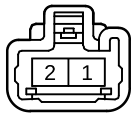
<MALE> 2P Non–waterproof Type



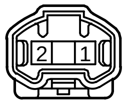
90980–11014



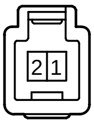
90980–11060



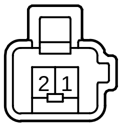
90980–11093



90980–11159

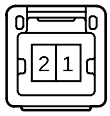


90980–11211



90980–11300

90980–11305



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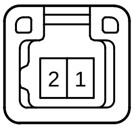

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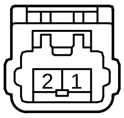

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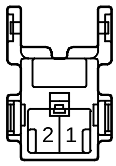
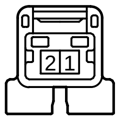
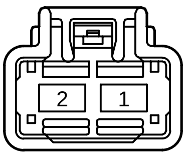


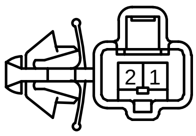
90980–11545



90980–11589



90980–11655



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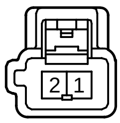
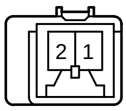
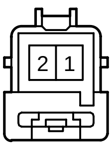


90980–11735



90980–11883



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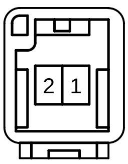

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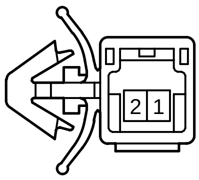
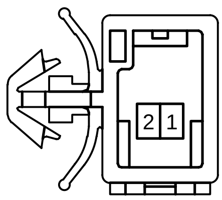
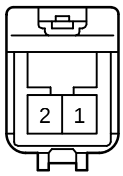
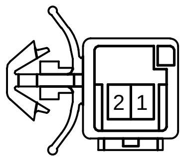


90980–11933

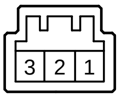
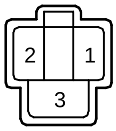
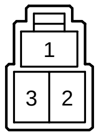
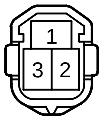
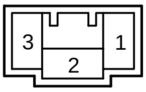
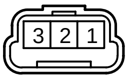
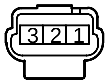
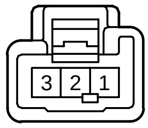
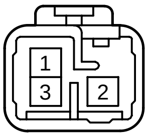
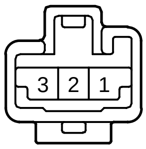
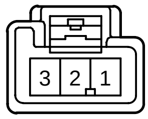
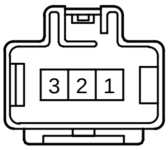
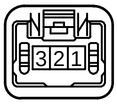
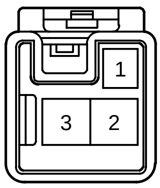
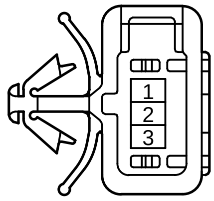
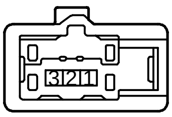
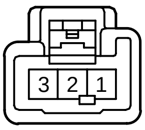
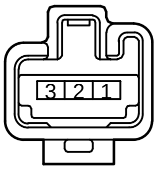
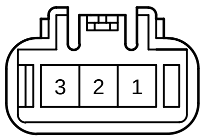


90980–11967

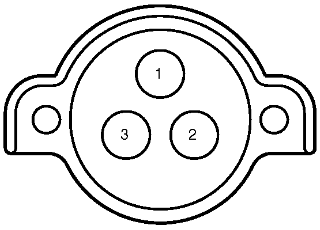
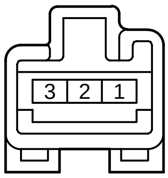
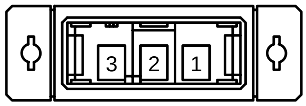
<MALE> 2P Non–waterproof Type

 90980–11992	 90980–12062		

<MALE> 3P Non–waterproof Type

 90980–10055 90980–10163	 90980–10188	 90980–10215 90980–10283 90980–10299	 90980–10231
 90980–10257 90980–10300 90980–10410	 90980–10364 90980–10573	 90980–10544	 90980–10907
 90980–10979	 90980–11052	 90980–11229	 90980–11298
 90980–11385	 90980–11470	 90980–11484	 90980–11489
 90980–11620	 90980–11763	 90980–11874	 90980–11936

<MALE> 3P Non–waterproof Type

 90980–11937	 90980–11994	 90980–12196	

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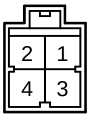
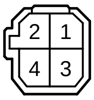
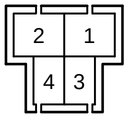
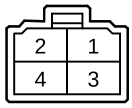
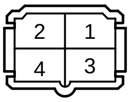
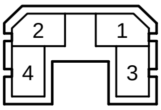
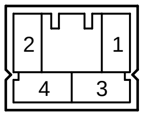
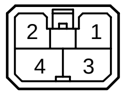
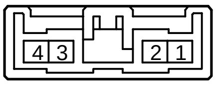
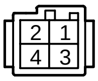
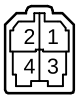
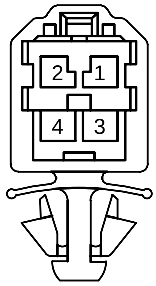
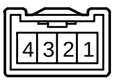
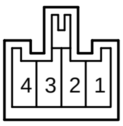
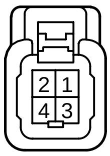
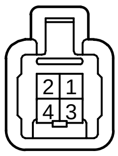
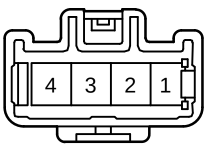
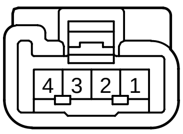
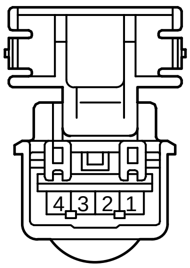
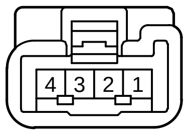
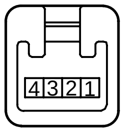
 90980–10001	 90980–10126	 90980–10144	 90980–10170
 90980–10219	 90980–10237	 90980–10259	 90980–10306
 90980–10399	 90980–10466	 90980–10502	 90980–10503
 90980–10600	 90980–10691	 90980–10794	 90980–10858
 90980–10866	 90980–11012	 90980–11023	 90980–11100

<MALE> 4P Non–waterproof Type



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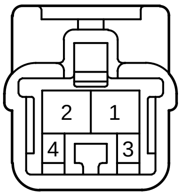

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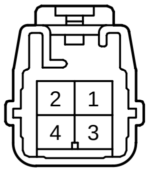

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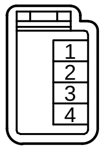

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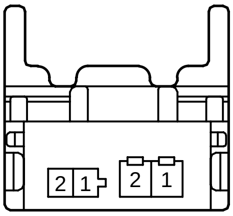

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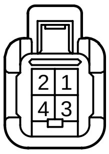

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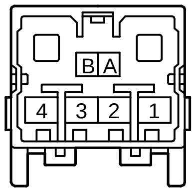

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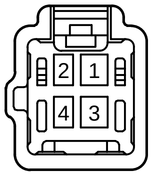

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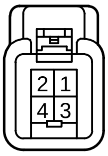

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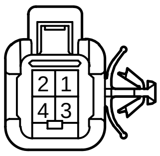

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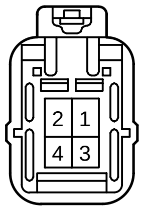

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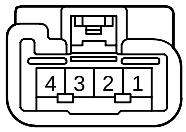

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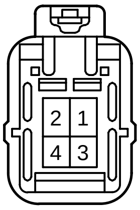

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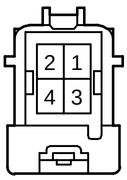

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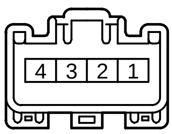

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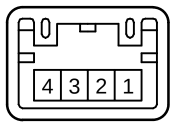

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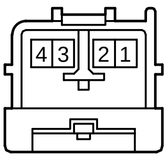

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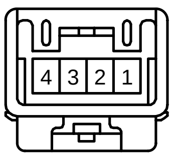

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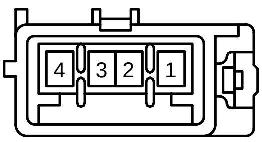

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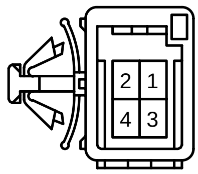

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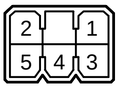
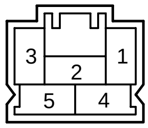
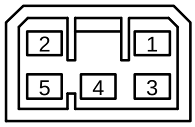
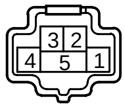
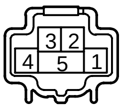
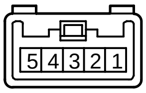
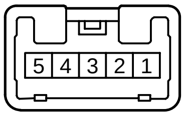
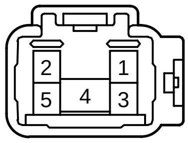
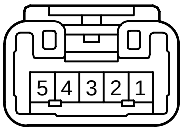
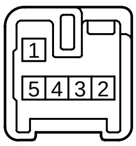
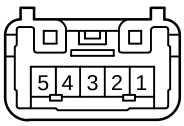
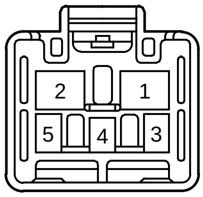
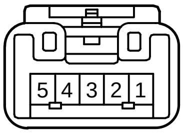
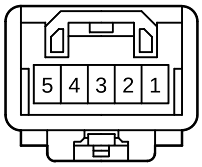
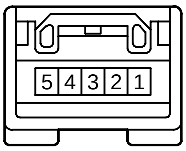
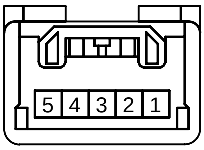
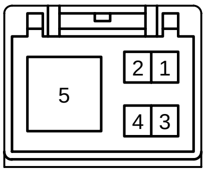
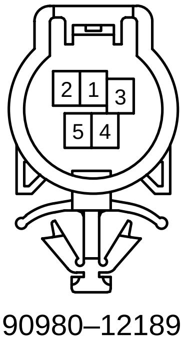
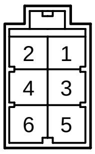
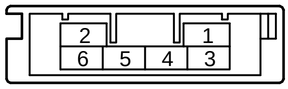
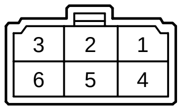
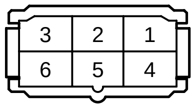
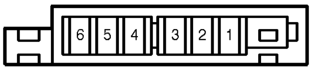
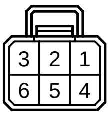
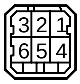
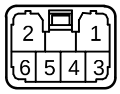
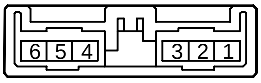
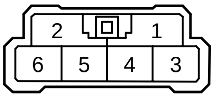
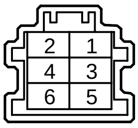
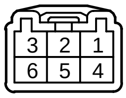
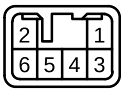
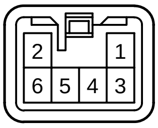
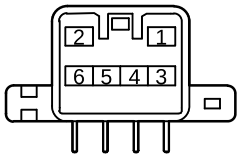
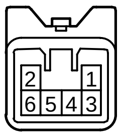
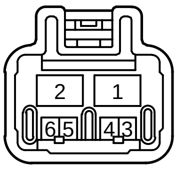
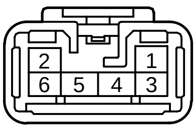
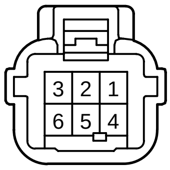
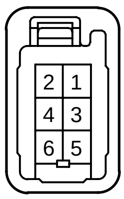
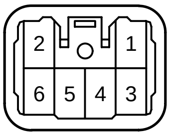
<MALE> 5P Non–waterproof Type

 90980–10040	 90980–10261	 90980–10308	 90980–10518
 90980–10519	 90980–10762	 90980–10790	 90980–10985
 90980–11085	 90980–11318	 90980–11327	 90980–11602
 90980–11843	 90980–11920	 90980–11968	 90980–12036
 90980–12050	 90980–12189		

<MALE> 6P Non–waterproof Type

 90980–10003	 90980–10027	 90980–10172	 90980–10223
 90980–10289	 90980–10312	 90980–10366 90980–10505	 90980–10384 90980–10416 90980–10641
 90980–10401	 90980–10446	 90980–10602	 90980–10603
 90980–10671	 90980–10694	 90980–10793	 90980–10796
 90980–10909	 90980–10975	 90980–10998	 90980–11010

<MALE> 6P Non–waterproof Type



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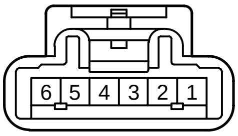

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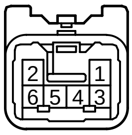

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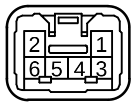

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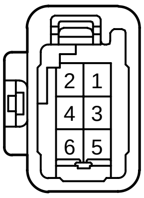

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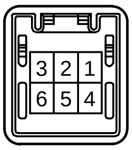

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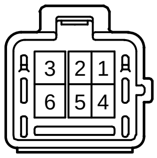

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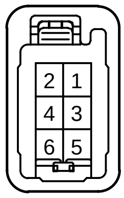

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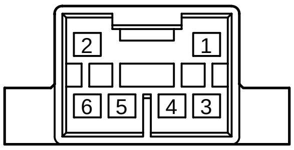

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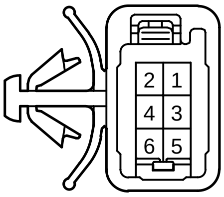

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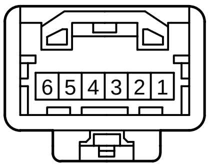

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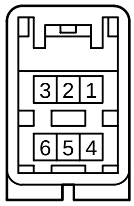

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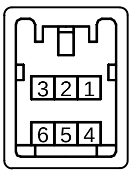

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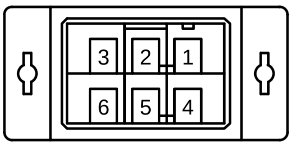

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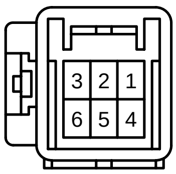
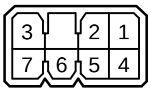


90980–12204

<MALE> 7P Non–waterproof Type



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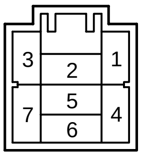

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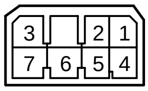

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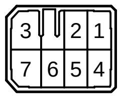

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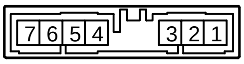

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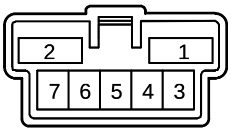
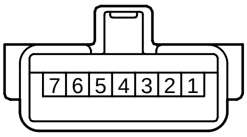


90980–10728
90980–10771



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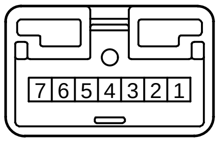

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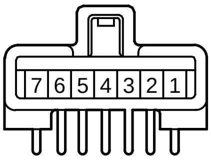

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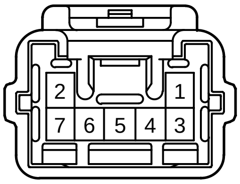

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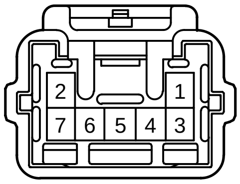
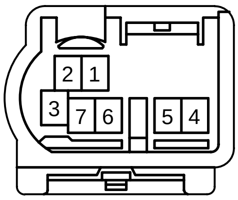


90980–11739



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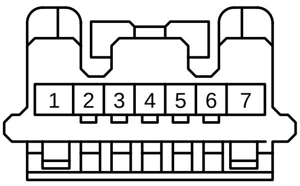
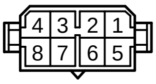
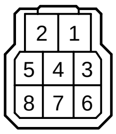


90980–12092

<MALE> 8P Non–waterproof Type



90980–10018



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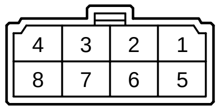
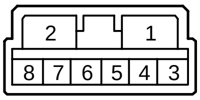
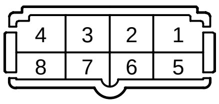


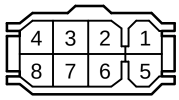
90980–10174



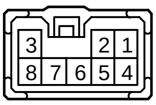
90980–10208
90980–10210
90980–10383
90980–10411



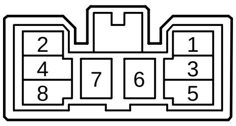
90980–10225



90980–10279



90980–10360



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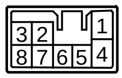

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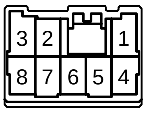
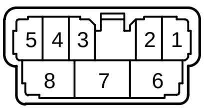


90980–10430
90980–10546



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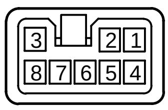
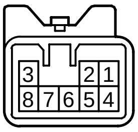
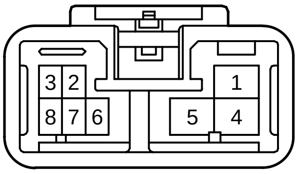
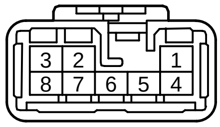
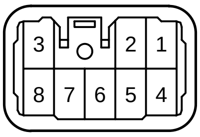
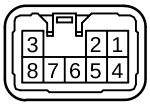
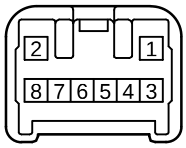
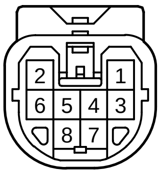
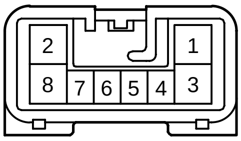
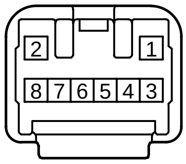
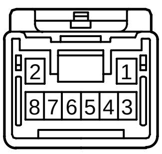
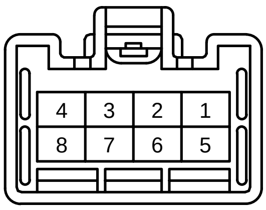
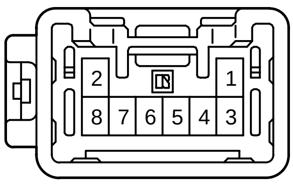
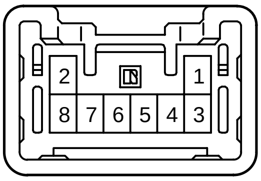


90980–10769

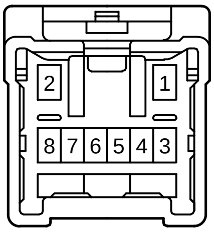
<MALE> 8P Non–waterproof Type

 90980–10798	 90980–10876 90980–11438	 90980–10963
 90980–11123	 90980–11134	 90980–11320
 90980–11353	 90980–11361	 90980–11389
 90980–11532	 90980–11551	 90980–11582

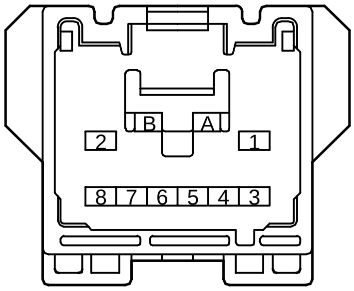
<MALE> 8P Non–waterproof Type



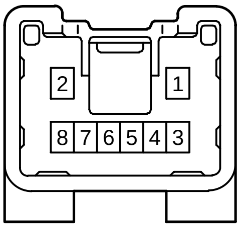
90980–11588



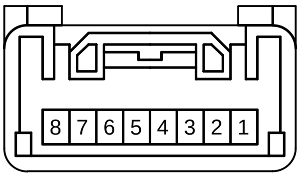
90980–11623



90980–11629



90980–11636



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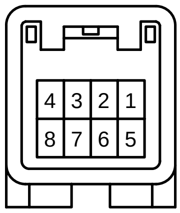

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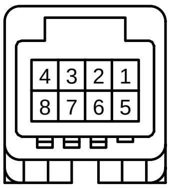
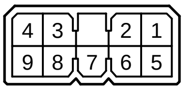
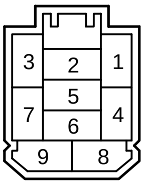
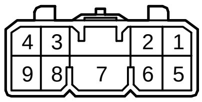
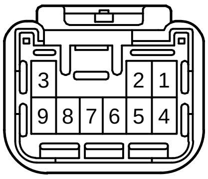
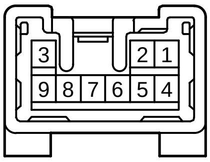
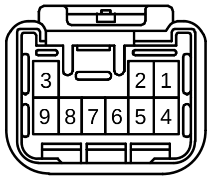
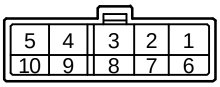
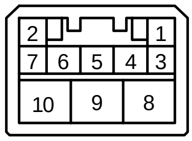
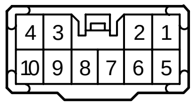
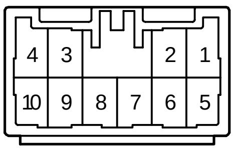
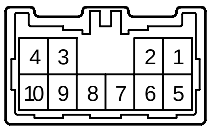
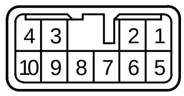
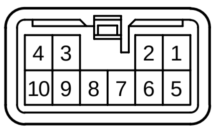
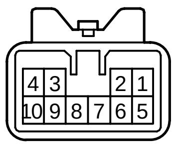
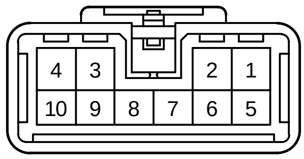
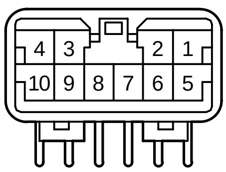
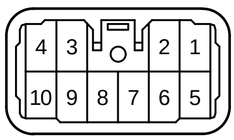
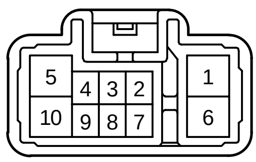


90980–12220

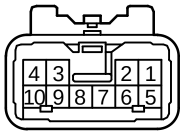
<MALE> 9P Non–waterproof Type

 90980–10044	 90980–10265	 90980–10317
 90980–11534	 90980–11543	 90980–11709

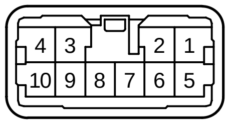
<MALE> 10P Non–waterproof Type

 90980–10176	 90980–10281	 90980–10375 90980–10417 90980–10427 90980–10516
 90980–10468	 90980–10527 90980–10719	 90980–10666
 90980–10693	 90980–10800	 90980–10861
 90980–10865 90980–11419	 90980–10961	 90980–10992

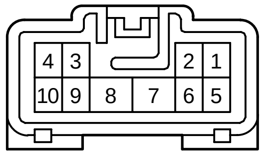
<MALE> 10P Non–waterproof Type



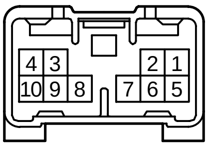
90980–11102



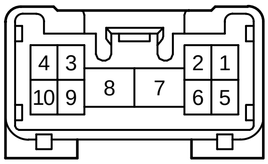
90980–11325
90980–11331



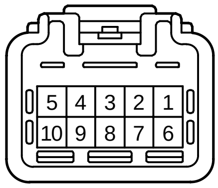
90980–11365



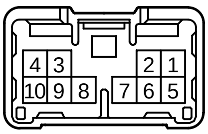
90980–11449



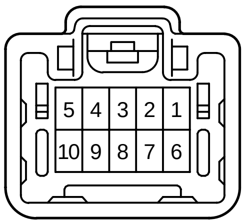
90980–11526



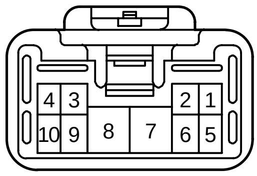
90980–11536



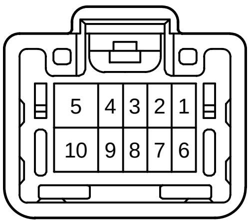
90980–11544



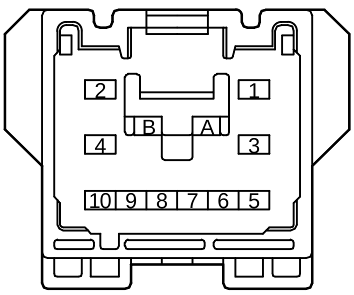
90980–11580



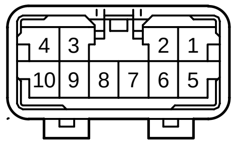
90980–11596



90980–11613

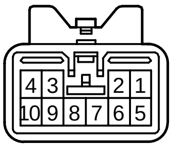


90980–11641

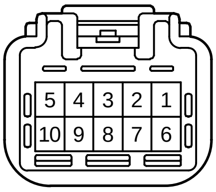


90980–11752

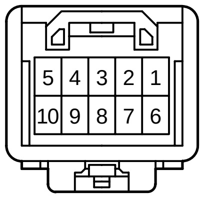
<MALE> 10P Non–waterproof Type



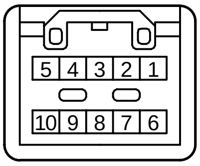
90980–11757



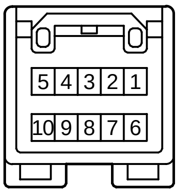
90980–11823



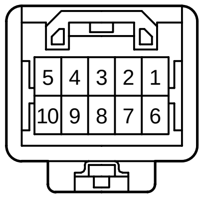
90980–11922



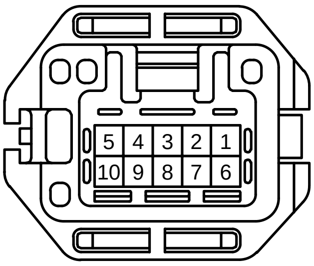
90980–11993



90980–12009

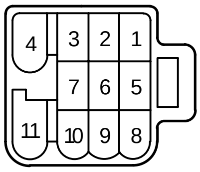


90980–12023

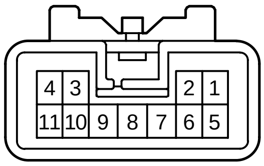


90980–12249

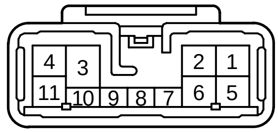
<MALE> 11P Non–waterproof Type



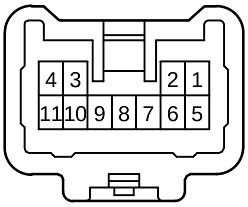
90980–10531



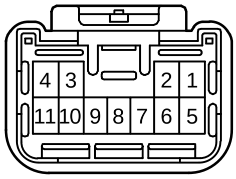
90980–10829



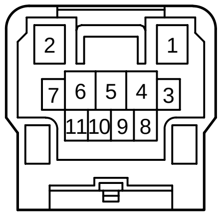
90980–10872



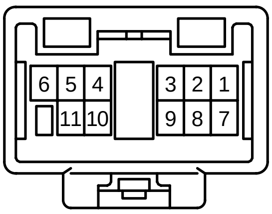
90980–11200



90980–11538

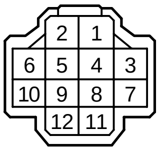


90908–12002

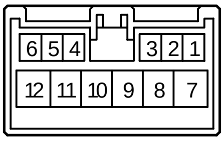


90980–12250

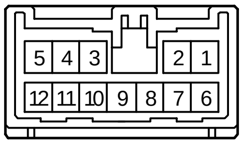
<MALE> 12P Non–waterproof Type



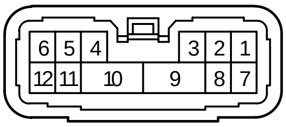
90980–10149



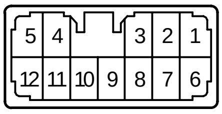
90980–10405



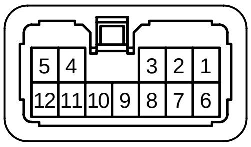
90980–10407
90980–10529



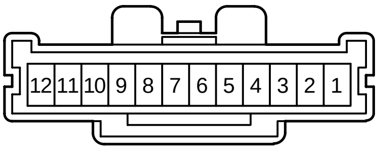
90980–10415



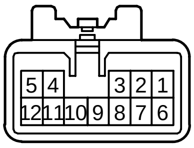
90980–10436
90980–10440



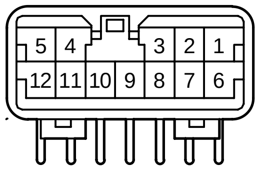
90980–10513



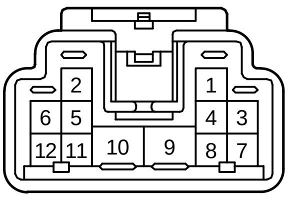
90980–10564



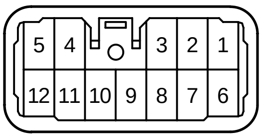
90980–10802



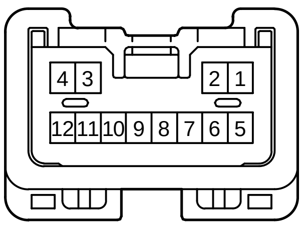
90980–10864



90980–10878

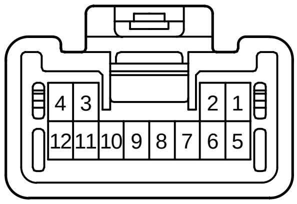
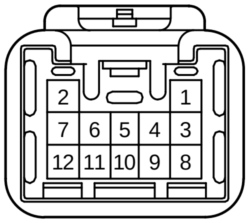
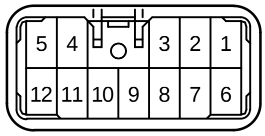


90980–10938
90980–11105

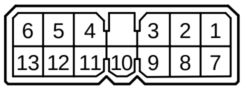


90980–11474

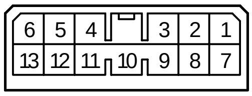
<MALE> 12P Non–waterproof Type

 90980–11500	 90980–11530	 90980–11747

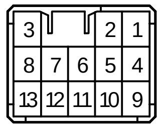
<MALE> 13P Non–waterproof Type



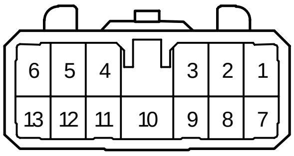
90980–10032



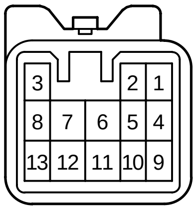
90980–10061



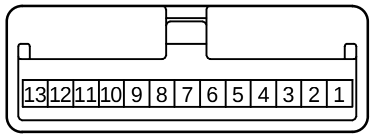
90980–10323



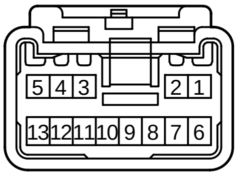
90980–10479



90980–10804



90980–11198



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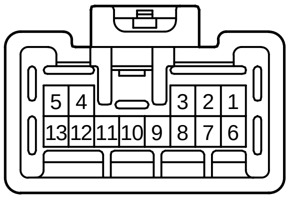
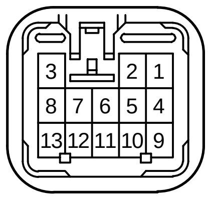
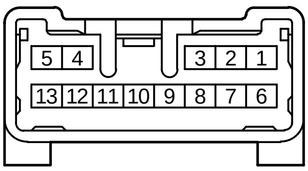


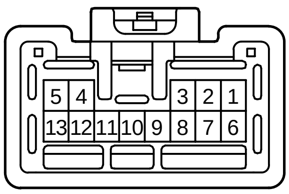
90980–11541



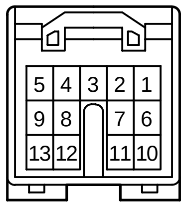
90980–11568



90980–11635

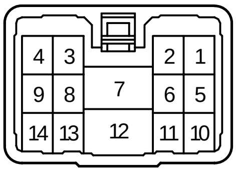


90980–11694



90980–11951

<MALE> 14P Non–waterproof Type



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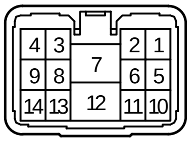

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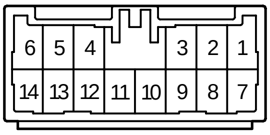
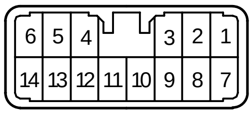
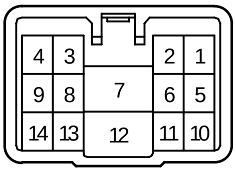


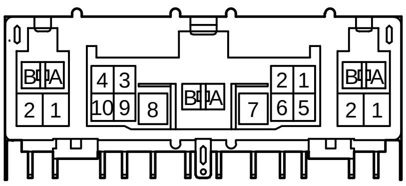
90980–10470



90980–10506
90980–10715

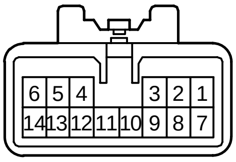


90980–10545

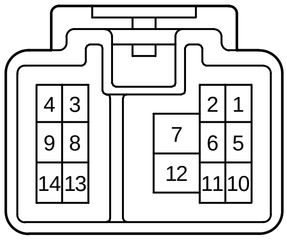


90980–10767

<MALE> 14P Non–waterproof Type



90980–10806



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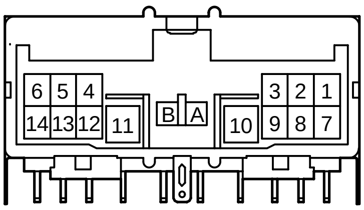

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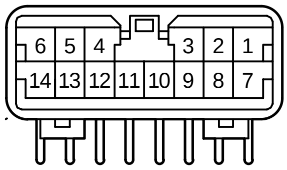
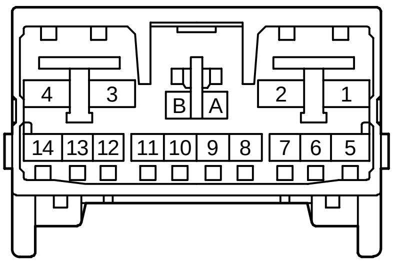
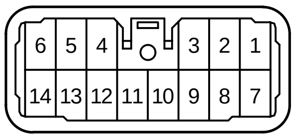


90980–10971
90980–11265



90980–11312



90980–11337

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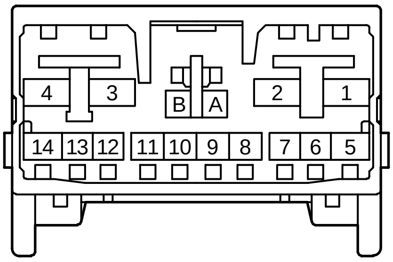
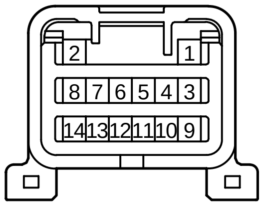
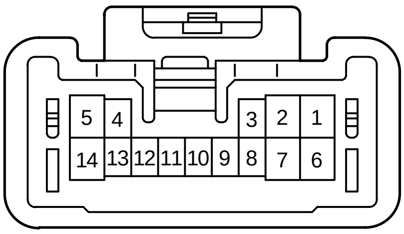


90980–11464



90980–11510



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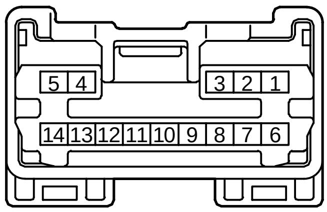
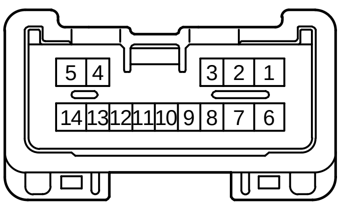


90980–11644
90980–11743
90980–11744



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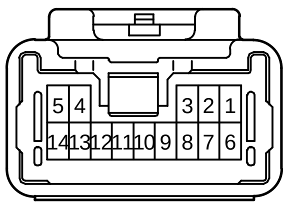
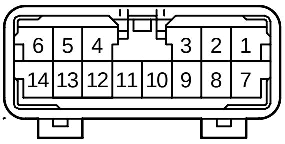
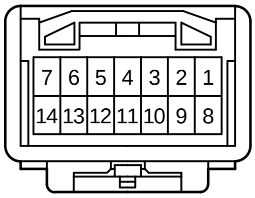
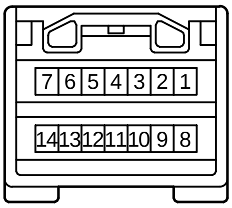


90980–11654

<MALE> 14P Non–waterproof Type

 90980–11753	 90980–11910
 90980–11969 90980–12015	

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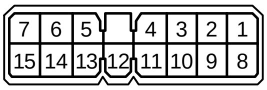

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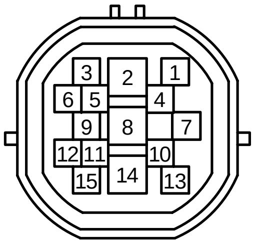

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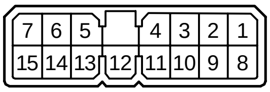

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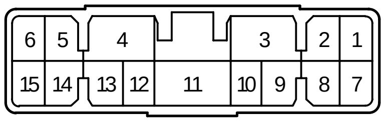

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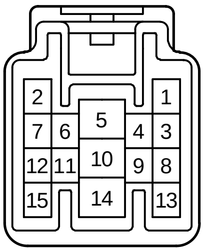

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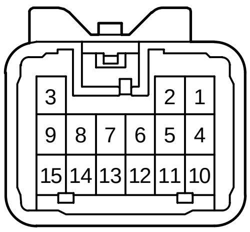

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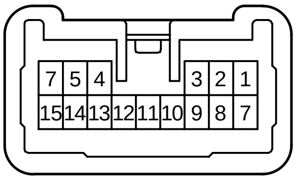
<MALE> 15P Non–waterproof Type



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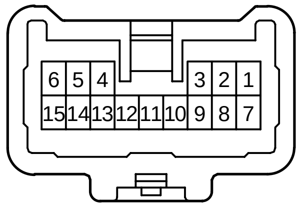

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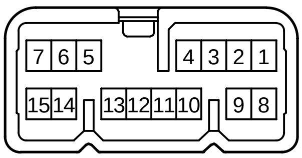
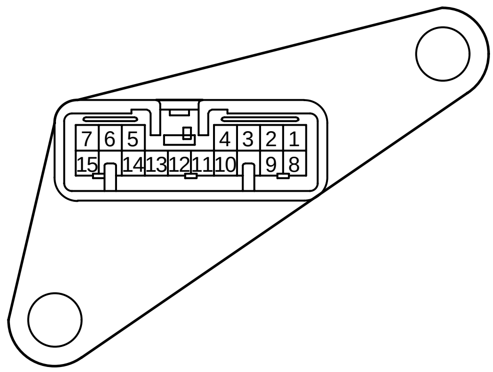


90980–11263



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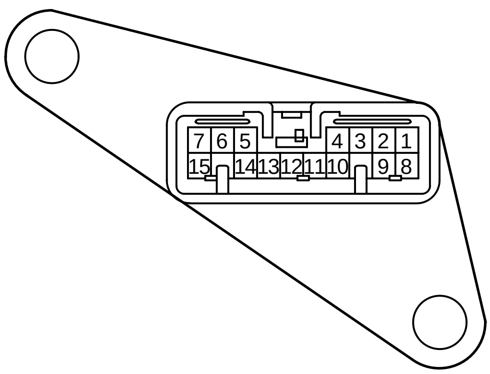
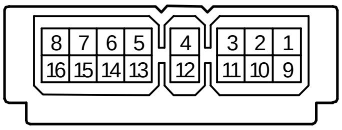


90980–11371

<MALE> 16P Non–waterproof Type



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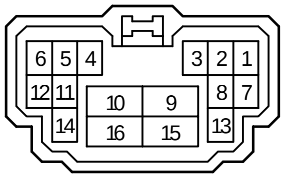

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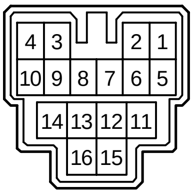

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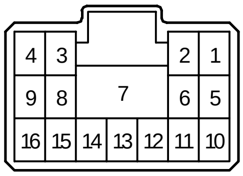
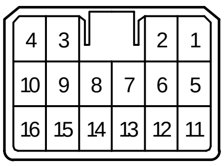
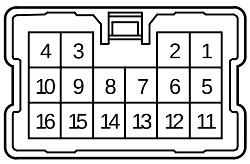


90980–10521

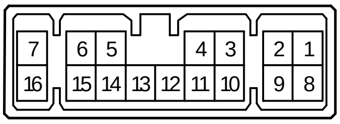


90980–10542

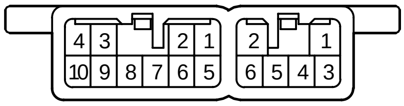


90980–10560

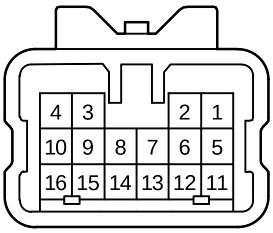
<MALE> 16P Non–waterproof Type



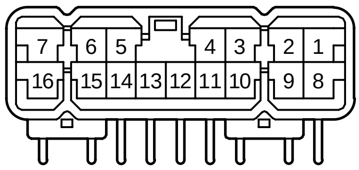
90980–10744



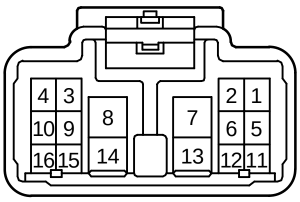
90980–10753



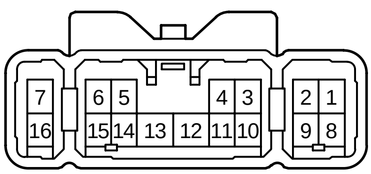
90980–10808
90980–11444



90980–10874

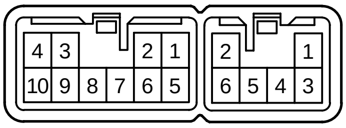


90980–10884

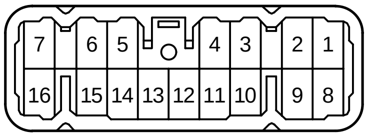


90980–11167

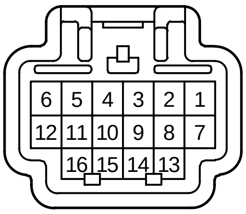
<MALE> 16P Non–waterproof Type



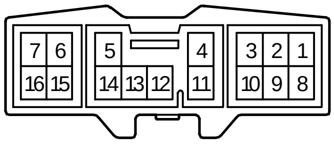
90980–11324



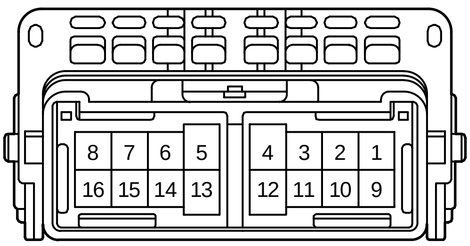
90980–11351



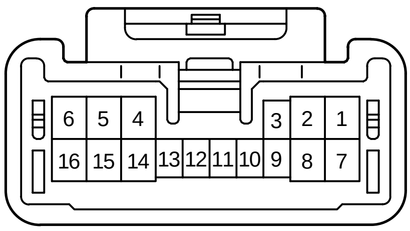
90980–11415



90980–11434

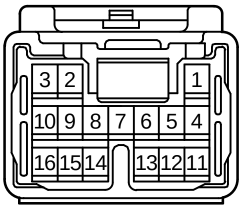


90980–11546

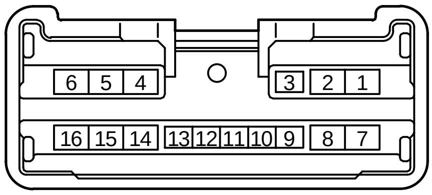


90980–11561

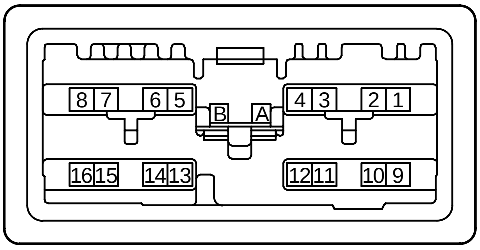
<MALE> 16P Non–waterproof Type



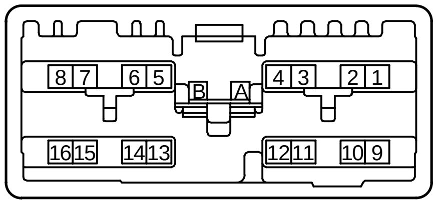
90980–11573



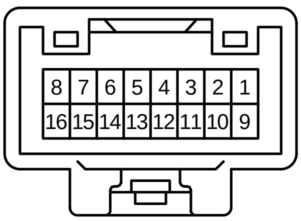
90980–11624



90980–11680

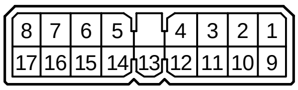


90980–11682

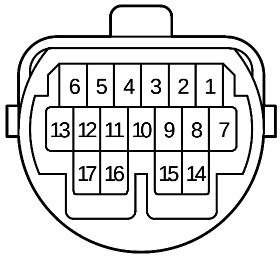


90980–12192

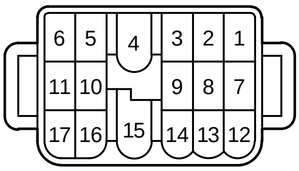
<MALE> 17P Non–waterproof Type



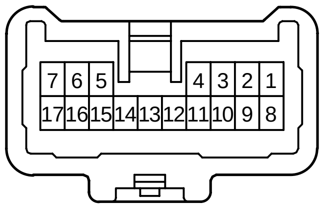
90980–10030



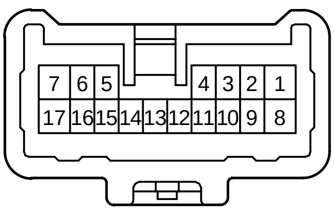
90980–10730



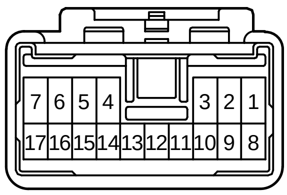
90980–11046



90980–11202

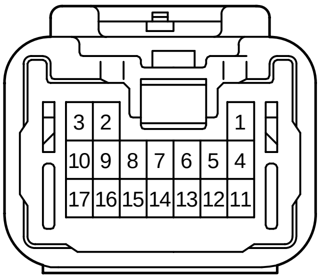
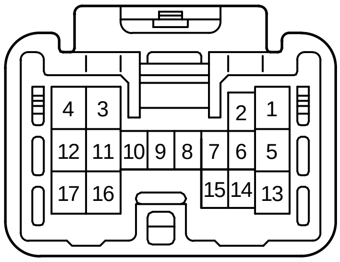
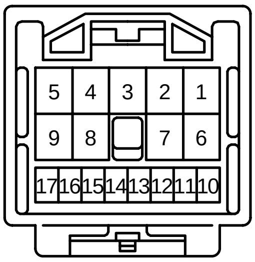


90980–11309

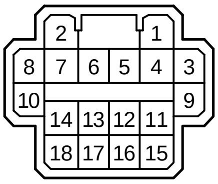


90980–11334

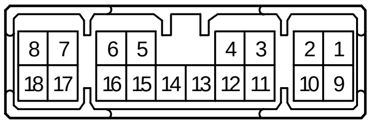
<MALE> 17P Non–waterproof Type

 90980–11505	 90980–11559
 90980–12161	

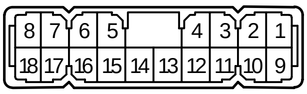
<MALE> 18P Non–waterproof Type



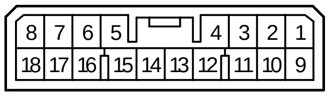
90980–10284



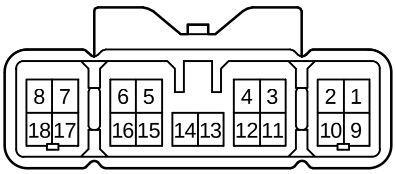
90980–10325



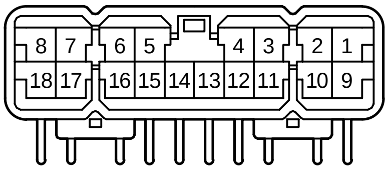
90980–10441



90980–10655
90980–11017

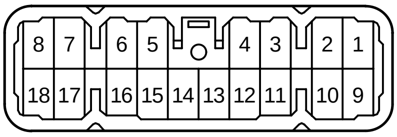


90980–10818

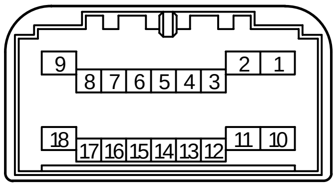


90980–10863

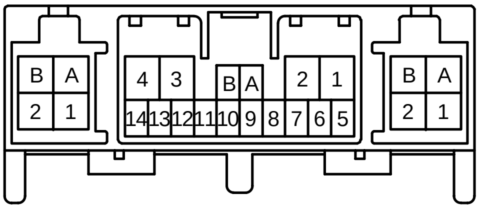
<MALE> 18P Non–waterproof Type



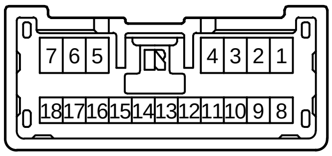
90980–10937
90980–11127



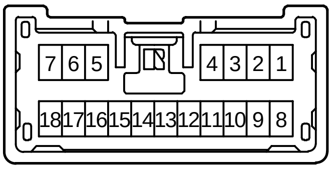
90980–11223



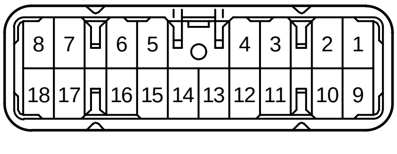
90980–11382



90980–11496

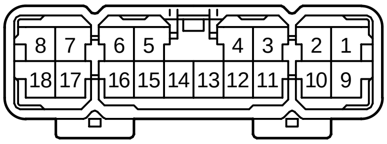


90980–11745

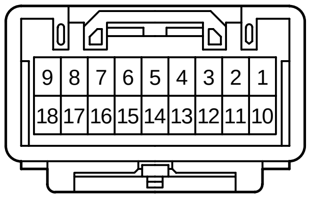


90980–11748

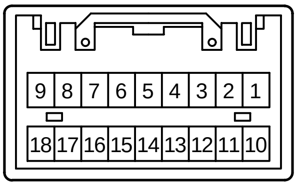
<MALE> 18P Non–waterproof Type



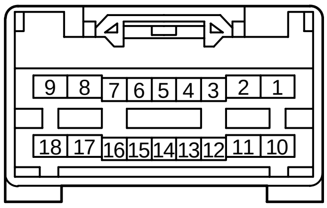
90980–11751



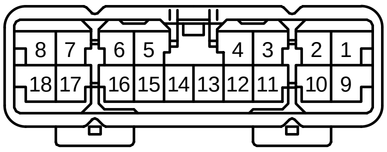
90980–11912



90980–11949

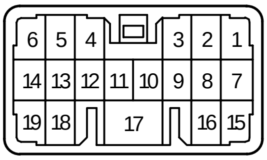


90980–12010

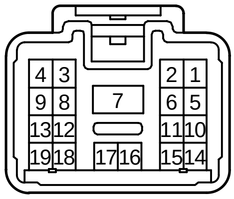


90980–12108

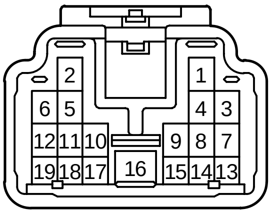
<MALE> 19P Non–waterproof Type



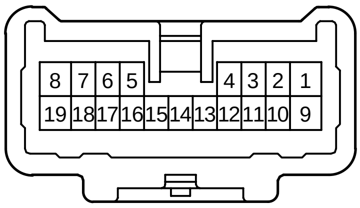
90980–10674



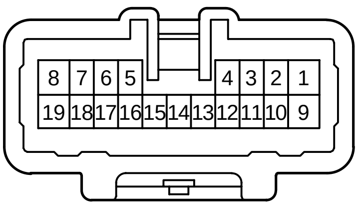
90980–10856



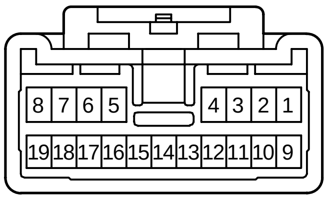
90980–10882



90980–11204

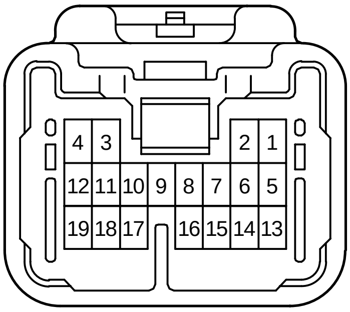


90980–11307



90980–11376

<MALE> 19P Non–waterproof Type



90980–11570

Waterproof Type [1]

(Cont. next page)

	1	2				3		4	5	6	7	8	9	10	11
1.0															
1.0 III		M:11863	F:11856												
1.3		M:11188 F:11189				M:11169 F:11170		M:11063 F:11065	M:11181 F:11182		M:11171 F:11172		M:11191 F:11192		M:11173 F:11174
								M:11064 F:11066							
1.8		F:10737						F:10711							
		F:11062													
2.3		M:10495 F:10496	M:10580	F:10609				M:10475 F:10476		M:10650					
		F:10474	M:10592	F:10532				M:10590							
		M:10575	F:10598	F:10572				M:10648							
2.3 II	M:10892 F:10893	M:10842 F:10843	M:11486 F:11019	M:11247 F:11248	F:11207	M:11015 F:11016	F:11143	M:10868 F:10869	M:11078 F:11077	M:10987 F:10988	M:10930 F:10931	M:10890 F:10891		F:11231	
	M:11006 F:11007	M:10886 F:10887	M:11029 F:11030	M:11272 F:11273	F:11235	M:11131 F:11132	F:11145	M:10941 F:10942	F:11024	M:11033 F:11034		M:10890 F:11190			
	M:11270 F:11271	M:10898 F:10899	M:11137 F:11038	F:10974	F:11246	M:11244 F:11245	F:11261	M:11027 F:11028	F:11049	M:11193 F:11194		M:10896 F:10897			
	F:11166	M:10900 F:10901	M:11050 F:11051	F:11025	F:11250	M:11295 F:11245	F:11294	M:11122 F:11037	F:11232	M:11196 F:11197					
	F:11243	M:11072 F:10923	M:11069 F:11070	F:11068	F:11255	F:10834	F:11349	M:11177 F:11178	F:11317	M:11289 F:11290					
	F:11363	M:10959 F:10947	M:11073 F:11075	F:11140	F:11285	F:10845	M:11348	M:11291 F:11292	F:11599	F:10854					
	F:11428	M:10948 F:10949	M:11074 F:11075	F:11149	F:12028	F:10902		F:10943		F:11144					
	F:11252	M:11002 F:11003	M:11141 F:11142	F:11153		F:10919		F:11150		F:11858					
		M:11004 F:11005	M:11155 F:11156	F:11154		F:10981		F:11152							
		M:11008 F:11009	M:11168 F:11162	F:11163		F:11020									

M : Male F : Female

Waterproof Type [1] (Cont'd)

	12	15	40	80											
1.0			F:11215	F:11214											
1.0 III															
1.3	F:11698	M:11088 F:11089													
1.8															
2.3															
2.3 II	M:11086 F:11087														
	F:11151														

M : Male F : Female

Waterproof Type [2]

	1	2		3		4	5	6	8	9	10	11	23	34	
4.8	M:10982 F:10983	M:10927 F:10928		M:10840 F:10841		M:10989 F:10990									
	F:11400	F:11237		M:10944 F:10841		M:11035 F:11036									
6.3	M:10246 F:10247	M:10156 F:10157		M:10347 F:10249											
7.7	M:10114 F:10115														
8.0	M:10836 F:10837	M:10838 F:10839													
	M:11183 F:11184	M:11031 F:11032													
HB3		F:11095	F:11659												
HB4		F:11096	F:11660												
PIN		M:11945													
TLC				F:10554	M:10577										
TODC	M:10240 F:10241			M:10244	F:10353										
1.0 III+4.8														F:12020	F:12021
2.3+6.3										F:10686					
2.3 II+4.8				M:11160 F:11161		M:10749 F:10844	M:10945 F:10946	F:10939	M:10894 F:10895	F:11643	F:11332	M:11239			
						F:10940	M:11021 F:11022			F:11784					
							M:11412 F:11413								
2.3 II+6.3 II													F:11195		
													F:11323		
2.3 II+8.0									M:11241 F:11242						
4.8+8.0				M:11044 F:11045		M:11138 F:11139									

M : Male F : Female

Non–waterproof Type [1]

(Cont. next page)

	1	2			3	4	5	6		7	8		9	10	11
1.0															
1.0 II															
1.0 III		M:11967 F:11919				F:11988	F:11921							F:11924	
							F:11909							F:11948	
1.3		M:11211 F:11212			M:11052 F:11053	M:11186 F:11187	F:11319	F:11616		F:11165	M:11532 F:11533	M:11623		F:11450	F:11041
		M:11368 F:11369			F:11471	F:11107					F:10630			F:11642	F:11083
		F:11436				F:11494								F:11657	
1.8															
1.8 II															
2.3		M:10437 F:10355			M:10573 F:10365	F:10504		M:10384 F:10414	F:10672					F:10322	
						F:10601								F:10669	
2.3 II	M:10870 F:10871	M:10824 F:10825	M:10905 F:10906	F:11080	M:10907 F:10908	M:10794 F:10795		M:10796 F:10797	F:10957	M:11528 F:11529	M:10798 F:10799		M:11534 F:11535	M:10800 F:10801	M:10829 F:10830
	M:11026 F:10871	M:10833 F:10825	M:10934 F:10935	F:11098	F:11071	M:10858 F:10795		M:11110 F:10797	F:10964					M:11102 F:10997	M:11538 F:11539
	M:11097 F:10871	M:11299 F:10825	M:11159 F:11148	F:11227	F:11079	M:11399 F:10795		M:11099 F:10933	F:11280					M:11536 F:11537	F:10966
	M:11146 F:11147	M:11300 F:10825	F:10823	F:11278		M:11012 F:11013		M:11101 F:10996						F:10822	
		M:10849 F:10850	F:10835	F:11608		M:11023 F:10904		M:10998 F:11001						F:10965	
		M:10859 F:10860	F:10855			M:11100 F:11090		M:11010 F:11011							
		M:11060 F:10860	F:10962			M:11085 F:10789		M:11587 F:11011							

M : Male F : Female

Non–waterproof Type [1] (Cont'd)

	12		13	14	15	16	17	18	19	20	21	22	25	28	34
1.0	F:11129					F:10764									
1.0 II	F:11408					F:11219						F:11220		F:11218	F:11221
						F:11391									
1.0 III				F:11925				F:11914				M:11962 F:11927			
				F:11911				F:11913				M:11926 F:11915			
1.3				M:11654 F:11556	F:11179	M:11573 F:11574			M:11570 F:11571		F:11125	M:11503 F:11502	M:11133 F:11055		
					F:11264							F:11628	F:11043		
1.8	F:10658	F:10973		F:10697				F:10656		F:10696					M:10722
	F:10743														
1.8 II	F:11424			F:11433											
2.3	M:10513 F:10432							M:10325 F:10326							
2.3 II	M:10802 F:10803		M:10804 F:10805	M:10806 F:10807	M:10827 F:10828	M:10808 F:10809	F:11417	M:10818 F:10819		M:10810 F:10811		M:10977 F:10875			
	M:11530 F:11531		M:11541 F:11542	F:10852		M:11167 F:10848				M:10820 F:10821		F:11552			
	F:10967		F:11604												
	F:10968														
	F:11121														
	F:11661														

M : Male F : Female

Non–waterproof Type [2]

	1	2	3	4	5	6		8	9	10	12	13	14	17	22
4.8	M:11258 F:11259	M:10915 F:10916	F:10980	M:11135 F:11136		M:10975 F:10976	F:11778	M:10963 F:10926		M:10861 F:10862					
	F:10911	M:11093 F:11094		M:11878 F:11742		F:11091		F:11092							
	F:10912					F:11583		F:11615							
								F:11686							
6.3	M:10178 F:10179	M:10213 F:10214	M:10283 F:10216			M:10172 F:10173		M:10174 F:10175		M:10176 F:10177					
	F:10619														
	F:10786														
	F:10792														
7.7		M:10356 F:10357													
8.0	M:10994 F:10995	M:10958 F:10903	F:10956	M:10866 F:10867											
		M:11655 F:11579	F:11314												
		F:11684	F:11685												
FOG–LP		F:10481													
FTC			F:10489		F:10487										
			F:10490		F:10488										
HEAD–LANP			F:10428												
LAC									F:10133			F:10132			M:10131
LC						M:10289									
MFPC				F:10645				F:10301		F:10302	F:10303		F:10369		
										F:10304	F:10372				

M : Male F : Female

Non–waterproof Type [3]

(Cont. next page)

	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16
MIC				F:10378					F:10152			F:10062			
OBD II															F:11665
PULSE LOCK										F:10294	F:10351		F:10371		
SFPC										F:11116		F:11114			F:11113
												F:11115			
SL			F:10070				F:10071								
SP		F:10362			F:10376										
TLC						M:10401 F:10402				M:10719 F:10528					F:10635
TNS				M:10466 F:10467									M:10470 F:10471		
TODC	M:10182 F:10183				M:10040 F:10274				M:10044 F:10045						
1.0+1.8															
1.0 II+1.8 II													F:11225		F:11565
1.0 III+2.3 II															
1.3+2.3 II										M:11613				F:11042	
														F:11056	
2.3+6.3								F:10463							

M : Male F : Female

Non–waterproof Type [3] (Cont’d)

	17	18		20	22	23	24	25	26		32				
MIC	F:10037														
OBD II															
PULSE LOCK		F:10295					F:10296								
		F:10350													
SFPC															
SL															
SP															
TLC															
TNS					M:10552 F:10526				M:10599 F:10587						
TODC															
1.0+1.8					F:10765				F:10925	F:10918					
									F:10763						
1.0 II+1.8 II		M:11223 F:11226	M:11223 F:11224		F:11392				F:11390	F:11423	M:11222				
1.0 III+2.3 II								F:11877							
1.3+2.3 II	F:11671	F:11594		F:11469		M:10920 F:10921		M:11158 F:11058							
		F:11595		M:11504 F:11469		M:11208 F:10921									
2.3+6.3															

M : Male F : Female

Non–waterproof Type [4]

	4	5	6	8	10	11	12	14	15	16	19	20	24	26	
2.3 II+4.8	M:11126 F:11118	M:10985 F:10986		M:10876 F:10877	M:11596 F:11527	M:10872 F:10873	M:10878 F:10879	M:10812 F:10813	M:10814 F:10815	M:10884 F:10885	M:10882 F:10883	M:10816 F:10817	M:10880 F:10881	M:11631	
				F:11130	F:10993		F:10932								
				F:11279											
				F:11701											
2.3 II+8.0			M:10909 F:10910								M:10856 F:10857				
4.8+8.0		F:10888	F:10889												
6.3+7.7			F:10447												

M : Male F : Female

List of equivalent for the gold and tin–plated repair wire

Repair Wire Part No.	
Tin–plated (Sn)	Gold–plated (Au)
82998–12160 (2.3.M.U)	82998–24050
–12190 (1.8.F.U)	–12300
–12260 (2.3.M.S)	–24070
–12270 (2.3.F.S)	–24080
–12310 (1.0.F.U)	–12320
–12330 (2.3II.M.U)	–12350
–12340 (2.3II.F.U)	–12360
–12430 (2.3II.M.S)	–12450
–12440 (2.3II.F.S)	–12460
–12790 (2.3II.F.S)	–12780
–12670 (1.0III.M.U)	–12680
–12690 (1.0III.F.U)	–12700
–12720 (1.0III.F.S)	–12730
–24020 (1.0II.F.U)	–24110
–24090 (1.8II.M.U)	–24130

E

HOUSING PART NUMBER LIST

* Example : 82998–24050 indicates the gold–plated 82998–12160.

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10001	X	BHC	M	4	U	–	–	–	
10002	X	BHC	F	4	U	–	–	–	
10003	X	BHC	M	6	U	–	–	–	
10004	X	BHC	F	6	U	–	–	–	
10006	X	BHC	F	12	U	–	–	–	
10008	X	BHC	F	16	U	–	–	–	
10010	X	BHC	F	22	U	–	–	–	
10011	X	BHC	M	2	U	–	–	–	
10012	X	BHC	F	2	U	–	–	–	
10018	X	BHC	M	8	U	–	–	–	
10019	X	BHC	F	8	U	–	–	–	
10026	X	TODC	M	16	U	12080	–	L,Y	
10027	X	6.3 7.7	M	6 6	U	– 12010	– –	– Y	
10028	X	TODC	F	16	U	12090	–	L,Y	
10029	X	6.3 7.7	F	6 6	U	– 12020	– –	– Y	
10030	X	TODC	M	17	U	12080	–	L,Y	
10031	X	TODC	F	17	U	12090	–	L,Y	
10032	X	TODC	M	13	U	12080	–	L,Y	
10033	X	TODC	F	13	U	12090	–	L,Y	
10037	O	MIC	F	17	U	12120	–	L,Y	
10038	X	TODC	M	2	U	12080	–	L,Y	
10039	X	TODC	F	2	U	12090	–	L,Y	
10040	O	TODC	M	5	U	12080	–	L,Y	
10041	X	TODC	F	5	U	12090	–	L,Y	
10042	X	TODC	M	7	U	12080	–	L,Y	
10043	X	TODC	F	7	U	12090	–	L,Y	
10044	O	TODC	M	9	U	12080	–	L,Y	
10045	O	TODC	F	9	U	12090	–	L,Y	
10055	X	TODC	M	3	U	12080	–	L,Y	
10056	X	TODC	F	3	U	12090	–	L,Y	
10057	X	–	–	–	–	–	–	–	
10061	X	MIC	M	13	U	–	–	–	PCB
10062	O	MIC	F	13	U	12120	–	L,Y	
10063	X	MIC	M	21	U	–	–	–	PCB
10064	X	MIC	F	21	U	12120	–	L,Y	

E

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10065	X	TODC	M	15	U	12080	–	L,Y	
10066	X	TODC	F	15	U	12090	–	L,Y	
10068	X	TODC	M	9	U	–	–	–	PCB
10069	X	SL	F	2	U	12130	–	L,Y	
10070	O	SL	F	3	U	12130	–	L,Y	
10071	O	SL	F	7	U	12130	–	L,Y	
10072	X	6.3	F	3	U	12060	12580	Y	
10087	X	TODC	M	9	U	12080	–	L,Y	
10088	X	6.3	F	3	S	–	–	–	
10090	X	6.3	F	1	S	–	–	–	
10091	X	6.3	M	2	S	–	–	–	
10092	X	6.3	F	2	S	–	–	–	
10093	X	6.3	M	3	S	–	–	–	
10094	X	6.3	M	4	S	–	–	–	
10095	X	6.3	F	4	S	–	–	–	
10096	X	TODC	M	6	S	–	–	–	
10097	X	TODC	F	6	S	–	–	–	
10100	X	TODC	M	16	S	–	–	–	
10101	X	TODC	F	16	S	–	–	–	
10106	X	TODC	M	9	U	–	–	–	PCB
10108	X	SL	F	2	U	12130	–	L,Y	
10109	X	SL	F	2	U	12130	–	L,Y	
10110	X	6.3	F	3	S	–	–	–	
10111	X	FPC	F	3	U	–	–	–	
10112	X	FPC	F	8	U	–	–	–	
10113	X	FPC	F	8	U	–	–	–	
10114	O	7.7	M	1	S	–	–	–	
10115	O	7.7	F	1	S	–	–	–	
10116	X	6.3	F	2	S	–	–	–	
10117	X	TODC	M	5	U	12080	–	L,Y	
10119	X	FPC	F	8	U	–	–	–	
10121	X	TODC	F	2	U	12090	–	L,Y	
10122	X	7.7	M	2	S	–	–	–	
10123	X	7.7	F	2	S	–	–	–	
10124	X	6.3	F	2	U	–	–	–	
10125	X	TODC	M	1	S	–	–	–	
10126	X	TODC	M	4	U	12080	–	L,Y	
10127	X	TODC	F	4	U	12090	–	L,Y	
10130	X	TODC	M	5	U	–	–	–	PCB

E

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10131	X	LAC	M	22	U	12100	–	L,Y	
10132	O	LAC	F	13	U	12110	–	L,Y	
10133	X	LAC	F	9	U	12110	–	L,Y	
10138	X	MIC	M	13	U	–	–	–	PCB
10139	X	6.3	M	4	S	–	–	–	
10140	X	6.3	F	4	S	–	–	–	
10141	X	SL	F	2	U	12130	–	L,Y	
10142	X	6.3	F	4	U	–	–	–	
10143	X	FPC	F	3	U	–	–	–	
10144	X	6.3	M	4	U	–	–	–	
10145	X	6.3 7.7	M	3 3	U	– 12010	– –	– Y	
10146	X	6.3 7.7	F	2 1	U	– 12040	– –	– Y	
10147	X	TODC	M	8	U	12080	–	L,Y	
10148	X	TODC	F	8	U	12090	–	L,Y	
10149	X	TODC	M	12	U	12080	–	L,Y	
10150	X	TODC	F	12	U	12090	–	L,Y	
10151	X	MIC	M	22	U	–	–	–	PCB
10152	O	MIC	F	9	U	12120	–	L,Y	
10153	X	2.3	F	12	U	12170	–	L	
10154	X	6.3 7.7	M	3 3	U	– –	– –	– –	
10156	O	6.3	M	2	S	–	–	–	w/o Clamp
10157	O	6.3	F	2	S	–	–	–	
10158	X	FPC	F	10	U	–	–	–	
10159	X	FPC	F	10	U	–	–	–	
10160	X	7.7	M	1	U	12010	–	Y	
10161	X	6.3	M	5	S	–	–	–	w/o Clamp
10162	O	6.3	F	5	S	–	–	–	
10163	X	TODC	M	3	U	12080	–	L,Y	
10164	X	TODC	F	3	U	12090	–	L,Y	
10165	X	7.7	F	1	U	12020	–	Y	
10170	X	6.3	M	4	U	12050	–	Y	w/o Clamp
10171	O	6.3	F	4	U	12060	12580	Y	
10172	O	6.3	M	6	U	12050	–	Y	
10173	O	6.3	F	6	U	12060	12580	Y	
10174	O	6.3	M	8	U	12050	–	Y	
10175	O	6.3	F	8	U	12060	12580	Y	

E

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10176	O	6.3	M	10	U	82998– 12050	82998– –	Y	
10177	O	6.3	F	10	U	12060	12580	Y	
10178	O	6.3	M	1	U	12050	–	Y	
10179	O	6.3	F	1	U	12060	12580	Y	
10182	O	TODC	M	1	U	12080	–	L,Y	
10183	O	TODC	F	1	U	12090	–	L,Y	
10184	X	TODC	F	2	S	–	–	–	
10185	X	7.7	F	2	U	12040	–	Y	
10186	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10187	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10188	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10189	X	6.3 7.7	F	2 1	U	12060 12040	12580 –	Y Y	
10190	X	EJ	M	3	S	–	–	–	
10191	X	EJ	F	3	S	–	–	–	
10192	X	EJ	M	2	S	–	–	–	
10193	X	EJ	F	2	S	–	–	–	
10194	X	TODC	M	6	S	–	–	–	
10195	X	TODC	F	6	S	–	–	–	
10196	X	6.3	F	4	U	12060	12580	Y	
10197	X	TODC	F	1	S	–	–	–	
10198	X	6.3 7.7	M	2 1	S	– –	– –	– –	
10199	X	6.3 7.7	F	2 1	S	– –	– –	– –	
10200	X	EJ	M	1	S	–	–	–	
10201	X	EJ	F	1	S	–	–	–	
10202	X	EJ	M	4	S	–	–	–	
10203	X	EJ	F	4	S	–	–	–	
10204	X	EJ	M	8	S	–	–	–	
10205	X	EJ	F	8	S	–	–	–	
10206	X	TODC	M	13	U	–	–	–	PCB
10207	X	TODC	F	21	U	12090	–	L,Y	
10208	X	6.3 TODC	M	8 8	U	– 12080	– –	– L,Y	w/ Flange

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10209	X	6.3 TODC	F	2 6	U	12060 12090	12580 –	Y L,Y	
10210	X	6.3 TODC	M	2 6	U	12050 12080	– –	Y L,Y	w/o Clamp
10211	X	TODC	M	7	U	12080	–	L,Y	
10212	X	TODC	M	13	U	12080	–	L,Y	
10213	O	6.3	M	2	U	12050	–	Y	w/o Clamp
10214	O	6.3	F	2	U	12060	12580	Y	
10215	X	6.3	M	3	U	12050	–	Y	w/o Clamp
10216	O	6.3	F	3	U	12060	12580	Y	
10217	X	TODC	M	4	S	–	–	–	
10218	X	TODC	F	4	S	–	–	–	
10219	X	6.3	M	4	U	12050	–	Y	
10220	X	6.3	F	4	S	–	–	–	
10221	X	6.3	F	4	U	12060	12580	Y	
10222	X	6.3	F	3	U	12060	12580	Y	
10223	X	6.3	M	6	U	12050	–	Y	
10224	X	6.3	F	6	U	12060	12580	Y	
10225	X	6.3	M	8	U	12050	–	Y	
10228	X	HEAD-LAMP	F	3	U	24140	24200	L,Y	
10229	X	6.3	F	1	U	12060	12580	Y	
10231	X	6.3	M	3	U	12050	–	Y	
10232	X	6.3	F	3	U	12060	12580	Y	
10233	X	6.3 TODC	M	25 25	U	12050 12080	– –	Y L,Y	
10234	X	6.3	F	3	U	–	–	–	
10235	X	6.3 7.7	M	2 1	S	– –	– –	– –	
10236	X	6.3 7.7	F	2 1	S	– –	– –	– –	
10237	X	6.3	M	4	U	12050	–	Y	
10238	X	7.7	F	2	U	12020	–	Y	
10239	X	6.3	F	3	S	–	–	–	
10240	O	TODC	M	1	S	–	–	–	
10241	O	TODC	F	1	S	–	–	–	
10242	X	TODC	M	2	S	–	–	–	
10243	X	TODC	F	2	S	–	–	–	
10244	O	TODC	M	3	S	–	–	–	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10245	X	TODC	F	3	S	–	–	–	
10246	O	6.3	M	1	S	–	–	–	
10247	O	6.3	F	1	S	–	–	–	
10248	X	6.3	M	3	S	–	–	–	w/o Clamp
10249	O	6.3	F	3	S	–	–	–	
10250	X	6.3	F	1	U	12060	12580	Y	
10251	X	6.3	M	1	U	12050	–	Y	w/o Clamp
10252	X	6.3	F	1	U	12060	12580	Y	
10253	X	6.3	M	1	U	12050	–	Y	
10254	X	6.3	F	1	U	12060	12580	Y	
10255	X	6.3	M	2	U	12050	–	Y	
10256	X	6.3	F	2	U	12060	12580	Y	
10257	X	6.3	M	3	U	12050	–	Y	w/o Clamp
10258	X	6.3	F	3	U	12060	12580	Y	
10259	X	6.3	M	4	U	12050	–	Y	
10260	X	6.3	F	4	U	12060	12580	Y	
10261	X	6.3	M	5	U	12050	–	Y	
10262	X	6.3	F	5	U	12060	12580	Y	
10263	X	6.3	M	7	U	12050	–	Y	
10264	X	6.3	F	7	U	12060	12580	Y	
10265	X	6.3	M	9	U	12050	–	Y	
10266	X	6.3	F	9	U	12060	12580	Y	
10267	X	MIC	M	9	U	–	–	–	PCB
10272	X	LC	M	8	U	–	–	–	
10273	X	LC	F	8	U	–	–	–	
10274	O	TODC	F	5	U	12090	–	L,Y	
10275	X	TODC	M	7	U	12080	–	L,Y	
10276	X	6.3	M	5	U	12050	–	Y	
10277	X	6.3	M	7	U	12050	–	Y	
10278	X	6.3	M	9	U	12050	–	Y	
10279	X	TODC	M	8	U	12080	–	L,Y	
10280	X	TODC	F	8	U	12090	–	L,Y	
10281	X	6.3 TODC	M	3 7	U	12050 12080	– –	Y L,Y	
10282	X	6.3 TODC	F	3 7	U	12060 12090	12580 –	Y L,Y	
10283	O	6.3	M	3	U	12050	–	Y	w/ Clamp
10284	X	TODC	M	18	U	12080	–	L,Y	
10285	X	TODC	F	18	U	12090	–	L,Y	

E

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10286	X	TODC	M	2	U	12080	–	L,Y	
10287	X	TODC	M	16	S	–	–	–	
10288	X	TODC	F	16	S	–	–	–	
10289	X	LC	M	6	U	–	–	–	
10290	X	LC	F	6	U	–	–	–	
10291	X	LC	M	14	U	–	–	–	
10292	X	LC	F	14	U	–	–	–	
10293	X	PULSE LOCK	M	52	U	–	–	–	PCB
10294	O	PULSE LOCK	F	10	U	12200	–	L,Y	
10295	O	PULSE LOCK	F	18	U	12210	–	L	
10296	O	PULSE LOCK	F	24	U	12210	–	L	
10297	X	TODC	M	2	U	12080	–	L,Y	
10298	X	TODC	F	2	U	12090	–	L,Y	
10299	X	6.3	M	3	U	12050	–	Y	
10300	X	6.3	M	3	U	12050	–	Y	w/ Flange
10301	X	MFPC	F	8	U	12150	–	L	
10302	O	MFPC	F	10	U	12150	–	L	
10303	O	MFPC	F	12	U	12150	–	L	
10304	X	MFPC	F	10	U	12150	–	L	
10305	X	6.3	M	2	U	12050	–	Y	w/ Clamp
10306	X	6.3 TODC	M	2 2	U	12050 12080	– –	Y L,Y	
10307	X	6.3 TODC	F	2 2	U	12060 12090	12580 –	Y L,Y	
10308	X	MIC	M	5	U	–	–	–	PCB
10309	X	MIC	F	5	U	12120	–	L,Y	
10310	X	MIC	M	7	U	–	–	–	PCB
10311	X	MIC	F	7	U	12120	–	L,Y	
10312	X	TODC	M	6	U	12080	–	L,Y	
10313	X	TODC	F	6	U	12090	–	L,Y	
10314	X	TODC	M	5	U	12080	–	L,Y	
10315	X	MODU	M	26	U	–	–	–	
10316	X	MODU	F	26	U	–	–	–	
10317	X	6.3 TODC	M	1 8	U	12050 12080	– –	Y L,Y	

E

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10318	X	6.3 TODC	F	1 8	U	12060 12090	12580 –	Y L,Y	
10319	X	6.3 TODC	F	1 10	U	12060 12090	12580 –	Y L,Y	
10320	X	2.3	F	2	U	12170	–	L	
10321	X	2.3	F	8	U	12170	–	L	
10322	O	2.3	F	10	U	12170	–	L	
10323	X	2.3	M	13	U	12160*	–	L	
10324	X	2.3	F	13	U	12170	–	L	
10325	O	2.3	M	18	U	12160*	–	L	
10326	O	2.3	F	18	U	12170	–	L	
10327	X	2.3	F	20	U	12170	–	L	
10328	X	2.3	F	22	U	12170	–	L	
10329	X	2.3 6.3	M	12 2	U	12160* 12050	– –	L Y	
10330	X	2.3 6.3	F	12 2	U	12170 12060	– 12580	L Y	
10331	X	2.3 6.3	F	14 1	U	12170 12060	– 12580	L Y	
10332	X	7.7	F	1	U	12040	–	Y	
10333	X	6.3	F	2	U	12060	12580	Y	
10334	X	6.3	F	6	U	12060	12580	Y	
10335	X	6.3	F	6	U	12060	12580	Y	
10336	X	6.3	F	8	U	12060	12580	Y	
10337	X	6.3	F	11	U	12060	12580	Y	
10338	X	6.3	F	11	U	12060	12580	Y	
10339	X	6.3 7.7	F	4 1	U	12060 12040	12580 –	Y Y	
10340	X	6.3 7.7	F	2 3	U	12060 12040	12580 –	Y Y	
10341	X	6.3	F	3	S	12540	–	Y	
10342	X	7.7	M	1	U	12030	–	Y	
10343	X	7.7	F	1	U	12040	–	Y	
10344	X	6.3	M	2	U	12050	–	Y	w/o Clamp
10345	X	6.3	F	2	U	12060	12580	Y	
10346	X	6.3	M	2	U	12050	–	Y	w/ Clamp
10347	O	6.3	M	3	S	12050	–	Y	w/ Clamp
10348	X	6.3	F	2	U	12060	12580	Y	

E

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10349	X	PULSE LOCK	M	30	U	–	–	–	PCB
10350	X	PULSE LOCK	F	18	U	12200	–	L,Y	
10351	O	PULSE LOCK	F	12	U	12200	–	L,Y	
10352	X	TODC	F	2	S	–	–	–	
10353	O	TODC	F	3	S	–	–	–	
10354	X	2.3	M	2	U	12160*	–	L	w/o Clamp
10355	O	2.3	F	2	U	12170	–	L	
10356	O	7.7	M	2	U	12030	–	Y	
10357	O	7.7	F	2	U	12040	–	Y	
10358	X	6.3	F	8	U	12060	12580	Y	
10359	O	6.3	F	1	U	12060	12580	Y	
10360	X	2.3	M	8	U	12160*	–	L	
10361	X	2.3	M	20	U	12160*	–	L	
10362	O	SP	F	2	U	12530	–	L,Y	
10363	X	5.2	F	1	U	–	–	–	
10364	X	2.3	M	3	U	12160*	–	L	w/o Clamp
10365	O	2.3	F	3	U	12170	–	L	
10366	O	2.3	M	6	U	12160*	–	L	w/o Clamp
10367	O	2.3	F	6	U	12170	–	L	
10368	X	MFPC	F	14	U	12150	–	L	
10369	O	MFPC	F	14	U	12150	–	L	
10370	X	PULSE LOCK	M	42	U	–	–	–	PCB
10371	O	PULSE LOCK	F	14	U	12210	–	L	
10372	X	MFPC	F	12	U	12150	–	L	
10373	X	7.7 TODC	F	2 2	S	– –	– –	– –	
10374	X	7.7	M	2	S	–	–	–	
10375	X	2.3	M	10	U	12160*	–	L	w/o Flange
10376	X	SP SP	F	5 5	U	12520 12530	– –	L,Y L,Y	
10377	X	SP	F	10	U	12530	–	L,Y	
10378	O	MIC	F	4	U	12120	–	L,Y	
10379	X	TODC	M	9	S	–	–	–	
10380	X	TODC	F	9	S	–	–	–	w/o Clamp
10381	X	TODC	F	9	S	–	–	–	w/ Clamp

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10382	X	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10383	X	6.3 TODC	M	2 6	U	– 12080	– –	– L,Y	w/ Flange
10384	O	2.3	M	6	U	12160*	–	L	w/o Flange
10385	X	7.7	F	2	U	12040	–	Y	
10386	X	6.3	F	9	U	12060	12580	Y	
10392	X	TLC TODC	M	3 2	S	12280 –	– –	R –	
10393	X	TLC TODC	F	3 2	S	12290 –	– –	R –	
10394	X	TLC	M	3	S	12280	–	R	w/ Clamp
10395	X	TLC	F	3	S	12290	–	R	
10396	X	TLC	M	1	U	12220	–	L	
10397	X	2.3	F	12	U	12170	–	L	
10398	X	TLC	F	1	U	12230	–	L	
10399	O	TLC	M	4	U	12220	–	L	
10400	X	TLC	F	4	U	12230	–	L	
10401	O	TLC	M	6	U	12220	–	L	
10402	O	TLC	F	6	U	12230	–	L	
10403	X	TLC TODC	M	6 2	U	12220 12080	– –	L L,Y	
10404	X	TLC TODC	F	6 2	U	12230 12090	– –	L L,Y	
10405	X	2.3 TLC	M	6 6	U	12160* 12220	– –	L L	
10406	X	2.3 TLC	F	6 6	U	12170 12230	– –	L L	
10407	X	TLC	M	12	U	12220	–	L	
10408	X	TLC	F	12	U	12230	–	L	
10410	X	6.3	M	3	U	12050	–	Y	w/ Clamp
10411	X	6.3 TODC	M	2 6	U	12050 12080	– –	Y L,Y	w/ Clamp
10412	X	6.3	M	2	S	–	–	–	w/ Clamp
10413	X	2.3	M	18	U	12160*	–	L	
10414	O	2.3	F	6	U	12170	–	L	
10415	X	2.3 6.3	M	10 2	U	12160* 12050	– –	L Y	
10416	X	2.3	M	6	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10417	X	2.3	M	10	U	–	–	–	PCB
10418	X	2.3 TODC	M	6 2	U	12160* 12080	– –	L L,Y	
10419	X	2.3 TODC	F	6 2	U	12170 12090	– –	L L,Y	
10420	X	2.3	F	3	U	12170	–	L	
10421	X	2.3 6.3	F	10 2	U	12170 12060	– 12580	L Y	
10422	X	2.3 6.3	M	12 2	U	12160* 12050	– –	L Y	
10423	X	MIC	F	2	U	12120	–	L,Y	
10424	X	6.3	M	2	U	12050	–	Y	
10425	X	6.3	F	2	U	12060	12580	Y	
10426	X	MIC	F	2	U	12120	–	L,Y	
10427	X	2.3	M	10	U	12160*	–	L	w/ Flange
10428	O	HEAD-LAMP	F	3	U	24140	24200	L,Y	
10429	X	PULSE LOCK	M	24	U	–	–	–	PCB
10430	X	TLC	M	8	U	12220	–	L	
10431	X	TLC	F	8	U	12230	–	L	
10432	O	2.3	F	12	U	12170	–	L	
10433	X	2.3	M	1	U	12160*	–	L	w/o Clamp
10434	X	2.3	M	1	U	12160*	–	L	w/ Clamp
10435	X	2.3	F	1	U	12170	–	L	
10436	X	2.3	M	12	U	–	–	–	PCB
10437	O	2.3	M	2	U	12160*	–	L	w/ Clamp
10438	X	2.3	M	1	S	12260*	–	L	
10439	X	2.3	F	1	S	12270*	12600	L	
10440	X	2.3	M	12	U	–	–	–	PCB
10441	X	2.3	M	18	U	–	–	–	PCB
10442	X	1.8 6.3	M	12 3	U	12180 12050	– –	L Y	
10443	X	1.8 6.3	F	12 3	U	12190* 12060	– 12580	L Y	
10444	X	TLC	M	3	S	12280	–	R	w/o Clamp
10445	X	TODC	M	13	U	–	–	–	PCB
10446	X	6.3 7.7	M	4 2	U	12050 12030	– –	Y Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10447	O	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10448	X	6.3 II	M	4	U	–	–	–	
10449	X	6.3 II	F	8	U	24170	–	Y	
10450	X	6.3 II	F	11	U	24170	–	Y	
10451	X	6.3	M	7	U	12050	–	Y	
10452	X	6.3	F	7	U	12060	12580	Y	
10453	X	2.3 6.3	M	12 4	U	12160* 12050	– –	L Y	
10454	X	2.3 6.3	F	12 4	U	12170 12060	– 12580	L Y	
10455	X	TLC	M	22	U	12220	–	L	
10456	X	TLC	F	22	U	12230	–	L	
10457	X	2.3 6.3	M	19 3	U	12160* 12050	– –	L Y	
10458	X	2.3 6.3	F	19 3	U	12170 12060	– 12580	L Y	
10459	X	TLC	M	7	U	–	–	–	PCB
10460	X	TLC	F	7	U	12230	–	L	
10461	X	TODC	M	15	U	12080	–	L,Y	
10462	X	2.3 6.3	M	5 3	U	12160* 12050	– –	L Y	
10463	O	2.3 6.3	F	5 3	U	12170 12060	– 12580	L Y	
10464	X	TODC	F	3	U	12090	–	L,Y	
10465	X	2.3	F	2	U	12170	–	L	
10466	X	TNS	M	4	U	12240	–	L	
10467	O	TNS	F	4	U	12250	–	L	
10468	X	TNS	M	10	U	12240	–	L	
10469	X	TNS	F	10	U	12250	–	L	
10470	O	TNS	M	14	U	12240	–	L	
10471	O	TNS	F	14	U	12250	–	L	
10472	X	2.3 TNS	M	12 9	U	12160* 12240	– –	L L	
10473	X	2.3 TNS	F	12 9	U	12170 12250	– –	L L	
10474	O	2.3	F	2	S	12270*	12600	L	
10475	O	2.3	M	4	S	12260*	–	L	
10476	O	2.3	F	4	S	12270*	12600	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10477	X	2.3	M	6	S	12260*	–	L	
10478	X	2.3	F	6	S	12270*	12600	L	
10479	X	2.3 6.3	M	12 1	U	12160* 12050	– –	L Y	
10480	X	2.3 6.3	F	12 1	U	12170 12060	– 12580	L Y	
10481	O	6.3	F	2	U	12060	12580	Y	
10482	X	2.3	F	2	U	12170	–	L	
10483	X	2.3	F	3	U	12170	–	L	
10484	X	2.3	F	4	U	12170	–	L	
10485	X	2.3 TODC	M	10 6	U	12160* 12080	– –	L L,Y	
10486	X	2.3 TODC	F	10 6	U	12170 12090	– –	L L,Y	
10487	O	FTC	F	5	U	12510	–	L,Y	
10488	O	FTC	F	5	U	12510	–	L,Y	
10489	O	FTC	F	3	U	12510	–	L,Y	
10490	O	FTC	F	3	U	12510	–	L,Y	
10491	X	MIC	F	2	U	12120	–	L,Y	
10492	X	2.3	M	3	S	12260*	–	L	w/o Clamp
10493	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10494	X	2.3	F	3	S	12270*	12600	L	
10495	O	2.3	M	2	S	12260*	–	L	
10496	O	2.3	F	2	S	12270*	12600	L	
10497	X	2.3	M	2	S	12260*	–	L	
10498	O	2.3	F	2	S	12270*	12600	L	
10499	X	6.3	M	1	U	12050	–	Y	w/ Clamp
10500	X	2.3	M	3	S	12260*	–	L	
10501	X	2.3	F	3	S	12270*	12600	L	
10502	X	2.3	M	4	U	12160*	–	L	
10503	X	2.3	M	4	U	12160*	–	L	
10504	O	2.3	F	4	U	12170	–	L	
10505	X	2.3	M	6	U	12160*	–	L	w/ Clamp
10506	X	2.3	M	14	U	–	–	–	PCB
10507	X	2.3	F	14	U	12170	–	L	
10508	X	2.3	M	20	U	–	–	–	PCB
10509	X	TODC	F	5	U	12090	–	L,Y	
10510	X	TNS	M	4	S	–	–	–	w/o Clamp
10511	X	TNS	F	2	U	12250	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10512	X	TNS	F	2	U	12250	–	L	
10513	O	2.3	M	12	U	12160*	–	L	
10514	X	2.3 6.3	F	2 2	U	12170 12060	– 12580	L Y	
10515	X	2.3	F	4	U	12170	–	L	
10516	X	2.3	M	10	U	–	–	–	PCB
10517	X	2.3 6.3 7.7	F	4 2 2	U	12170 12060 12040	– 12580 –	L Y Y	
10518	X	2.3 6.3	M	4 1	U	12160* 12050	– –	L Y	
10519	X	2.3 6.3	M	4 1	U	12160* 12050	– –	L Y	
10520	X	2.3 6.3	F	4 1	U	12170 12060	– 12580	L Y	
10521	X	2.3 7.7	M	15 1	U	12160* 12030	– –	L Y	
10522	X	2.3 7.7	F	15 1	U	12170 12040	– –	L Y	
10523	X	TNS	F	8	U	12250	–	L	
10524	X	TNS	F	12	U	12250	–	L	
10525	X	TNS	F	16	U	12250	–	L	
10526	O	TNS	F	22	U	12250	–	L	
10527	X	TLC	M	10	U	–	–	–	PCB
10528	O	TLC	F	10	U	12230	–	L	
10529	X	TLC	M	12	U	–	–	–	PCB
10530	X	2.3 6.3	F	17 1	U	12170 12060	– 12580	L Y	
10531	X	2.3	M	11	U	12160*	–	L	
10532	O	2.3	F	2	S	12270*	12600	L	
10533	X	2.3	M	2	S	12260*	–	L	
10534	X	2.3	F	2	S	12270*	12600	L	
10535	X	2.3	M	3	U	–	–	–	PCB
10536	X	2.3 6.3	F	8 1	U	12170 12060	– 12580	L Y	
10537	X	2.3 6.3	F	10 1	U	12170 12060	– 12580	L Y	
10538	X	2.3	F	14	U	12170	–	L	
10539	X	2.3	F	16	U	12170	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10542	X	2.3	M	16	U	12160*	–	L	
10543	X	2.3	F	16	U	12170	–	L	
10544	X	2.3	M	3	U	12160*	–	L	
10545	X	2.3 6.3	M	12 2	U	12160* 12050	– –	L Y	
10546	X	TLC	M	8	U	12220	–	L	
10547	X	2.3 6.3 7.7	M	12 2 2	S	12260* – –	– – –	L – –	
10548	X	2.3	F	12	S	12270*	12600	L	
10549	X	6.3 7.7	F	2 2	S	– –	– –	– –	
10550	X	2.3 6.3	F	3 2	S	12270* –	12600 –	L –	
10551	X	6.3	F	4	S	–	–	–	
10552	O	TNS	M	22	U	12240	–	L	
10553	X	TLC	M	3	S	12280	–	R	w/ Clamp
10554	O	TLC	F	3	S	12290	–	R	
10555	X	2.3	M	2	S	12260*	–	L	
10556	X	2.3	F	2	S	12270*	12600	L	
10557	X	TLC	M	5	S	12280	–	R	w/ Clamp
10558	X	TLC	F	5	S	12290	–	R	
10559	X	7.7	F	2	U	12040	–	Y	
10560	X	2.3	M	16	U	12160*	–	L	
10561	X	2.3	F	16	U	12170	–	L	
10562	X	2.3 6.3 7.7	M	12 2 1	U	12160* 12050 12030	– – –	L Y Y	
10563	X	2.3 6.3 7.7	F	12 2 1	U	12170 12060 12040	– 12580 –	L Y Y	
10564	X	1.8	M	12	U	12180	–	L	
10565	X	1.8	F	12	U	12190*	–	L	
10566	X	6.3	M	2	S	–	–	–	
10567	X	6.3	F	2	S	12540	–	Y	
10568	X	TODC	M	12	S	–	–	–	
10569	X	TODC	F	12	S	–	–	–	
10570	X	TLC	M	5	S	12280	–	R	w/o Clamp
10571	X	2.3	M	2	S	12260*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10572	O	2.3	F	2	S	12270*	12600	L	
10573	O	2.3	M	3	U	12160*	–	L	w/ Clamp
10574	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
10575	O	2.3	M	2	S	12260*	–	L	
10576	X	2.3	F	2	S	12270*	12600	L	
10577	O	TLC	M	3	S	12280	–	R	w/ Clamp
10578	X	2.3	F	2	S	12270*	12600	L	
10579	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
10580	O	2.3	M	2	S	12260*	–	L	
10581	X	2.3	F	2	S	12270*	12600	L	
10582	X	2.3	M	2	S	12260*	–	L	
10583	X	2.3	F	2	S	12270*	12600	L	
10584	X	TNS	M	38	U	–	–	–	PCB
10585	X	TNS	F	24	U	12250	–	L	
10586	X	TNS	M	26	U	–	–	–	PCB
10587	O	TNS	F	26	U	12250	–	L	
10588	X	TNS	M	20	U	–	–	–	PCB
10589	X	TNS	F	20	U	12250	–	L	
10590	O	2.3	M	4	S	12260*	–	L	
10591	X	2.3	F	4	S	12270*	12600	L	
10592	O	2.3	M	2	S	12260*	–	L	
10593	X	2.3	F	2	S	12270*	12600	L	
10594	X	2.3	M	2	S	12260*	–	L	
10595	X	2.3	F	2	S	12270*	12600	L	
10596	X	2.3	M	6	S	12260*	–	L	
10597	X	2.3	F	6	S	12270*	12600	L	
10598	O	2.3	F	2	S	12270*	12600	L	
10599	O	TNS	M	26	U	12240	–	L	
10600	X	2.3	M	4	U	12160*	–	L	
10601	O	2.3	F	4	U	12170	–	L	
10602	X	2.3	M	6	U	12160*	–	L	
10603	X	2.3	M	6	U	12160*	–	L	
10604	X	2.3	F	6	U	12170	–	L	
10605	X	2.3	F	6	U	12170	–	L	
10606	X	1.8	M	34	U	12180	–	L	
10607	X	1.8	F	20	U	12190*	–	L	
10608	X	1.8	F	14	U	12190*	–	L	
10609	O	2.3	F	2	S	12270*	12600	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10610	X	2.3	F	1	U	12170	–	L	
		TNS		4		12250	–	L	
10611	X	2.3	F	8	U	12170	–	L	
		TNS		8		12250	–	L	
10612	X	2.3	F	10	U	12170	–	L	
		TNS		10		12250	–	L	
10613	X	TNS	F	16	U	12250	–	L	
10614	X	TNS	F	16	U	12250	–	L	
10615	X	TODC	M	7	U	–	–	–	PCB
10616	X	6.3	F	4	S	12540	–	Y	
10617	X	2.3	F	2	S	12270*	12600	L	
10618	X	6.3	F	2	U	12060	12580	Y	
		7.7		1		12040	–	Y	
10619	O	6.3	F	1	U	12060	12580	Y	
10620	X	TLC	M	2	U	12220	–	L	
10621	X	TLC	F	2	U	12230	–	L	
10622	X	2.3	F	2	S	12270*	12600	L	
10623	X	2.3	F	2	S	12270*	12600	L	
10624	X	2.3	F	5	S	12270*	12600	L	
10625	X	2.3	M	2	S	12260*	–	L	w/ Clamp
10626	X	2.3	F	2	S	12270*	12600	L	
10627	X	TLC	M	7	S	12280	–	R	
10628	X	TLC	F	7	S	12290	–	R	
10629	X	2.3	F	3	S	12270*	12600	L	
10630	X	2.3	M	18	U	–	–	–	PCB
10631	X	2.3	F	5	U	12170	–	L	
10632	X	2.3	F	12	U	12170	–	L	
10633	X	TLC	F	14	U	12230	–	L	
10634	X	TLC	F	14	U	12230	–	L	
10635	X	TLC	F	16	U	12230	–	L	
10636	X	TLC	F	16	U	12230	–	L	
10637	X	2.3	F	2	U	12170	–	L	
10638	X	2.3	F	3	U	12170	–	L	
10639	X	2.3	M	20	U	12160*	–	L	
10640	X	2.3	F	20	U	12170	–	L	
10641	X	2.3	M	6	U	12160*	–	L	w/ Flange
10642	X	2.3	M	5	S	–	–	–	PCB
10643	X	2.3	F	6	S	12270*	12600	L	
10644	X	2.3	F	5	U	12170	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10645	O	MFPC	F	4	U	12150	–	L	
10646	X	6.3	M	4	S	–	–	–	
10647	X	6.3	M	5	S	–	–	–	w/ Clamp
10648	O	2.3	M	4	S	12260*	–	L	
10649	X	2.3	F	4	S	12270*	12600	L	
10650	O	2.3	M	6	S	12260*	–	L	w/ Clamp
10651	X	2.3	F	6	S	12270*	12600	L	
10652	X	7.7	F	1	U	12040	–	Y	
10653	X	1.8	M	13	S	–	–	–	
10654	X	1.8	F	13	S	12620	–	L	
10655	X	1.8	M	18	U	–	–	–	PCB
10656	X	1.8	F	18	U	12190*	–	L	
10657	X	1.8	M	30	U	–	–	–	PCB
10658	O	1.8	F	12	U	12190*	–	L	
10659	X	FTC	F	5	U	12510	–	L,Y	
10660	X	2.3	F	3	U	12170	–	L	
10661	X	TNS	M	14	U	–	–	–	PCB
10662	X	TNS	M	4	S	–	–	–	
10663	X	TNS	F	4	S	–	–	–	Outer
10664	X	TNS	F	4	S	–	–	–	Inner
10665	X	2.3	M	2	S	12260*	–	L	
10666	X	2.3	M	10	U	–	–	–	PCB
10667	X	2.3	M	10	U	–	–	–	PCB
10668	X	2.3	M	10	U	–	–	–	PCB
10669	O	2.3	F	10	U	12170	–	L	
10670	X	2.3	M	6	U	–	–	–	PCB
10671	X	2.3	M	6	U	–	–	–	PCB
10672	O	2.3	F	6	U	12170	–	L	
10673	X	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10674	X	2.3 6.3	M	18 1	U	12160* 12050	– –	L Y	
10675	X	2.3 6.3	F	18 1	U	12170 12060	– 12580	L Y	
10676	X	TLC	M	7	S	12280	–	R	
10677	X	TLC	M	9	S	12280	–	R	
10678	X	TLC	F	9	S	12290	–	R	
10679	O	2.3	F	2	U	12170	–	L	
10680	X	TLC	M	10	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10681	X	TNS	M	20	U	–	–	–	PCB
10682	X	TNS	M	3	S	–	–	–	
10683	X	TNS	F	3	S	–	–	–	
10684	X	TNS	F	3	S	–	–	–	
10685	X	2.3 6.3	F	2 2	S	12270* 12540	12600 –	L Y	
10686	O	2.3 6.3	F	7 2	S	12270* 12540	12600 –	L Y	
10687	X	2.3	M	2	U	12160*	–	L	
10688	X	5.2	F	1	U	–	–	–	
10689	X	2.3	M	3	S	12260*	–	L	
10690	X	2.3	F	3	S	12270*	12600	L	
10691	X	TNS	M	4	U	–	–	–	PCB
10692	X	TNS	F	4	U	12250	–	L	
10693	X	2.3	M	10	U	12160*	–	L	
10694	X	2.3	M	6	U	12160*	–	L	
10695	X	2.3	F	3	S	12270*	12600	L	
10696	O	1.8	F	20	U	12190*	–	L	
10697	O	1.8	F	14	U	12190*	–	L	
10698	X	TLC	M	3	S	12280	–	R	
10699	X	TLC	M	10	U	–	–	–	PCB
10700	X	6.3	M	2	U	12050	–	Y	
10701	X	6.3	F	4	S	12540	–	Y	
10702	O	2.3	F	2	S	12270*	12600	L	
10703	X	6.3	F	1	U	12060	12580	Y	
10704	X	6.3	F	3	U	12060	12580	Y	
10705	X	6.3	F	1	S	–	–	–	
10706	O	2.3	F	2	S	12270*	12600	L	
10707	X	2.3	M	2	S	12260*	–	L	
10708	X	6.3	F	3	S	–	–	–	
10709	X	2.3 TLC	M	2 3	S	12260* 12280	– –	L R	
10710	X	2.3 TLC	F	2 3	S	12270* 12290	12600 –	L R	
10711	O	1.8	F	4	S	12620	–	L	
10712	X	2.3	F	5	S	12270*	12600	L	
10713	X	6.3 7.7	F	3 2	U	12060 12040	12580 –	Y Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10714	X	2.3 6.3	F	9 3	U	12170 12060	– 12580	L Y	
10715	X	2.3	M	14	U	12160*	–	L	
10716	X	2.3	F	4	U	12170	–	L	
10717	X	2.3	F	4	U	12170	–	L	
10718	X	6.3	F	5	U	12060	12580	Y	
10719	O	TLC	M	10	U	12220	–	L	
10720	O	2.3	F	2	S	12270*	12600	L	
10721	X	2.3	F	10	U	12170	–	L	
10722	X	1.8	M	34	U	12180	–	L	
10723	X	2.3	F	11	U	12170	–	L	
10724	X	2.3	F	12	U	12170	–	L	
10725	X	2.3	F	12	U	12170	–	L	
10726	X	PULSE LOCK	M	30	U	–	–	–	PCB
10727	X	2.3 6.3	F	9 2	U	12170 12060	– 12580	L Y	
10728	X	2.3 6.3	M	5 2	U	– –	– –	– –	PCB
10729	X	2.3 6.3	F	5 2	U	12170 12060	– 12580	L Y	
10730	X	2.3	M	17	U	12160*	–	L	
10731	X	2.3	F	17	U	12170	–	L	
10732	X	TNS	M	14	U	–	–	–	PCB
10733	X	TNS	M	20	U	–	–	–	PCB
10734	X	1.8	F	2	S	12620	–	L	
10735	X	1.8	F	2	S	12620	–	L	
10736	X	1.8	F	2	S	12620	–	L	
10737	O	1.8	F	2	S	12620	–	L	
10738	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10739	X	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10740	X	1.0	F	16	U	12310*	–	L	
10741	X	1.8 1.0	F	6 16	U	12190* 12310*	– –	L L	
10742	X	1.8	M	42	U	–	–	–	PCB
10743	O	1.8	F	12	U	12190*	–	L	
10744	X	2.3	M	16	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10745	X	2.3	M	6	U	–	–	–	PCB
10747	X	8.0	F	3	U	12400	–	Y	
10748	X	2.3	F	2	S	12270*	12600	L	
10749	O	4.8 2.3 II	M	2 2	S	12470 12430*	– –	Y L,Y	
10750	X	TNS	M	26	U	12240	–	L	
10751	X	2.3	M	4	S	12260*	–	L	w/ Clamp
10752	X	1.8	M	30	U	–	–	–	PCB
10753	X	2.3	M	16	U	–	–	–	PCB
10758	X	6.3	M	4	U	12050	–	Y	w/ Clamp
10759	X	6.3 7.7	F	2 2	U	12060 12040	12580 –	Y Y	
10760	X	5.2 6.3	F	1 1	U	– 12060	– 12580	– Y	
10761	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10762	X	2.3	M	5	U	12160*	–	L	
10763	O	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10764	O	1.0	F	16	U	12310*	–	L	
10765	O	1.8 1.0	F	6 16	U	12190* 12310*	– –	L L	
10766	X	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10767	X	2.3 II	M	14	U	–	–	–	PCB
10768	X	2.3	M	4	S	12260*	–	L	w/o Clamp
10769	X	2.3	M	8	U	–	–	–	PCB
10770	X	PULSE LOCK	M	24	U	–	–	–	PCB
10771	X	2.3 6.3	M	5 2	U	– –	– –	– –	PCB
10772	X	2.3 6.3	F	5 2	U	12170 12060	– 12580	L Y	
10773	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10774	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10775	X	TODC	M	9	S	–	–	–	
10776	X	TODC	F	9	S	–	–	–	
10777	X	TLC	M	3	S	12280	–	R	w/ Clamp

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10778	X	2.3 2.3 6.3	F	2 15 1	S U	12270* 12170 12060	12600 – 12580	L L Y	
10779	X	TNS	M	24	U	12240	–	L	
10780	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10781	X	MIC	F	11	U	12120	–	L,Y	
10782	X	7.7	F	1	U	12040	–	Y	
10783	X	7.7	F	2	U	12040	–	Y	
10784	X	6.3 7.7	F	2 1	U	12060 12040	12580 –	Y Y	
10785	X	2.3	F	6	U	12170	–	L	
10786	O	6.3	F	1	U	12070	–	Y	
10787	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10788	X	2.3	M	2	S	12260*	–	L	w/ Clamp
10789	O	2.3 II	F	5	U	12340*	–	L,Y	
10790	X	2.3 II	M	5	U	–	–	–	PCB
10791	X	2.3 6.3	M	2 2	U	12160* 12050	– –	L Y	
10792	O	6.3	F	1	U	12060	12580	Y	
10793	X	2.3 II	M	6	U	–	–	–	PCB
10794	O	2.3 II	M	4	U	12330*	–	L,Y	
10795	O	2.3 II	F	4	U	12340*	–	L,Y	
10796	O	2.3 II	M	6	U	12330*	–	L,Y	
10797	O	2.3 II	F	6	U	12340*	–	L,Y	
10798	O	2.3 II	M	8	U	12330*	–	L,Y	
10799	O	2.3 II	F	8	U	12340*	–	L,Y	
10800	O	2.3 II	M	10	U	12330*	–	L,Y	
10801	O	2.3 II	F	10	U	12340*	–	L,Y	
10802	O	2.3 II	M	12	U	12330*	–	L,Y	
10803	O	2.3 II	F	12	U	12340*	–	L,Y	
10804	O	2.3 II	M	13	U	12330*	–	L,Y	
10805	O	2.3 II	F	13	U	12340*	–	L,Y	
10806	O	2.3 II	M	14	U	12330*	–	L,Y	
10807	O	2.3 II	F	14	U	12340*	–	L,Y	
10808	O	2.3 II	M	16	U	12330*	–	L,Y	
10809	O	2.3 II	F	16	U	12340*	–	L,Y	
10810	O	2.3 II	M	20	U	12330*	–	L,Y	
10811	O	2.3 II	F	20	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10812	O	4.8 2.3 II	M	2 12	U	12370 12330*	– –	Y L,Y	
10813	O	4.8 2.3 II	F	2 12	U	12380 12340*	– –	Y L,Y	
10814	O	4.8 2.3 II	M	3 12	U	12370 12330*	– –	Y L,Y	
10815	O	4.8 2.3 II	F	3 12	U	12380 12340*	– –	Y L,Y	
10816	O	4.8 2.3 II	M	2 18	U	12370 12330*	– –	Y L,Y	
10817	O	4.8 2.3 II	F	2 18	U	12380 12340*	– –	Y L,Y	
10818	O	2.3 II	M	18	U	12330*	–	L,Y	
10819	O	2.3 II	F	18	U	12340*	–	L,Y	
10820	O	2.3 II	M	20	U	12330*	–	L,Y	
10821	O	2.3 II	F	20	U	12340*	–	L,Y	
10822	O	2.3 II	F	10	U	12340*	–	L,Y	
10823	O	2.3 II	F	2	U	12340*	–	L,Y	
10824	O	2.3 II	M	2	U	12330*	–	L,Y	
10825	O	2.3 II	F	2	U	12340*	–	L,Y	
10826	X	TLC	M	9	S	12280	–	R	
10827	O	2.3 II	M	15	U	12330*	–	L,Y	
10828	O	2.3 II	F	15	U	12340*	–	L,Y	
10829	O	2.3 II	M	11	U	12330*	–	L,Y	
10830	O	2.3 II	F	11	U	12340*	–	L,Y	
10831	X	2.3	F	4	S	12270*	12600	L	
10833	O	2.3 II	M	2	U	12330*	–	L,Y	w/ Clamp
10834	O	2.3 II	F	3	S	12440*	12590	L,Y	
10835	O	2.3 II	F	2	U	12340*	–	L,Y	
10836	O	8.0	M	1	S	12490	–	Y	
10837	O	8.0	F	1	S	12500	–	Y	
10838	O	8.0	M	2	S	12490	–	Y	
10839	O	8.0	F	2	S	12500	–	Y	
10840	O	4.8	M	3	S	12470	–	Y	
10841	O	4.8	F	3	S	12480	–	Y	
10842	O	2.3 II	M	2	S	12430*	–	L,Y	
10843	O	2.3 II	F	2	S	12440*	12590	L,Y	
10844	O	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10845	O	2.3 II	F	3	S	12440*	12590	L,Y	
10846	X	2.3	F	2	S	12270*	12600	L	
10847	X	2.3	F	2	S	12270*	12600	L	
10848	O	2.3 II	F	16	U	12340*	–	L,Y	
10849	X	2.3 II	M	2	U	12330*	–	L,Y	
10850	O	2.3 II	F	2	U	12340*	–	L,Y	
10851	X	2.3 II	M	14	U	–	–	–	PCB
10852	O	2.3 II	F	14	U	12340*	–	L,Y	
10853	X	2.3 II	F	2	S	12440*	12590	L,Y	
10854	O	2.3 II	F	6	S	12440*	12590	L,Y	
10855	O	2.3 II	F	2	U	12340*	–	L,Y	
10856	O	2.3 II 8.0	M	18 1	U	12330* 12390	– –	L,Y Y	
10857	O	2.3 II 8.0	F	18 1	U	12340* 12400	– –	L,Y Y	
10858	O	2.3 II	M	4	U	12330*	–	L,Y	
10859	O	2.3 II	M	2	U	12330*	–	L,Y	
10860	O	2.3 II	F	2	U	12340*	–	L,Y	
10861	O	4.8	M	10	U	12370	–	Y	
10862	O	4.8	F	10	U	12380	–	Y	
10863	X	2.3 II	M	18	U	–	–	–	PCB
10864	O	2.3 II	M	12	U	–	–	–	PCB
10865	X	2.3 II	M	10	U	–	–	–	PCB
10866	O	8.0	M	4	U	12390	–	Y	
10867	O	8.0	F	4	U	12400	–	Y	
10868	O	2.3 II	M	4	S	12430*	–	L,Y	
10869	O	2.3 II	F	4	S	12440*	12590	L,Y	
10870	O	2.3 II	M	1	U	12330*	–	L,Y	w/o Clamp
10871	O	2.3 II	F	1	U	12340*	–	L,Y	
10872	O	4.8 2.3 II	M	7 4	U	12370 12330*	– –	Y L,Y	
10873	O	4.8 2.3 II	F	7 4	U	12380 12340*	– –	Y L,Y	
10874	O	2.3 II	M	16	U	–	–	–	PCB
10875	O	2.3 II	F	22	U	12340*	–	L,Y	
10876	O	4.8 2.3 II	M	3 5	U	12370 12330*	– –	Y L,Y	
10877	O	4.8 2.3 II	F	3 5	U	12380 12340*	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
10878	O	4.8 2.3 II	M	2 10	U	12370 12330*	– –	Y L,Y	
10879	O	4.8 2.3 II	F	2 10	U	12380 12340*	– –	Y L,Y	
10880	O	4.8 2.3 II	M	4 20	U	12370 12330*	– –	Y L,Y	
10881	O	4.8 2.3 II	F	4 20	U	12380 12340*	– –	Y L,Y	
10882	O	4.8 2.3 II	M	1 18	U	12370 12330*	– –	Y L,Y	
10883	O	4.8 2.3 II	F	1 18	U	12380 12340*	– –	Y L,Y	
10884	O	4.8 2.3 II	M	4 12	U	12370 12330*	– –	Y L,Y	
10885	O	4.8 2.3 II	F	4 12	U	12380 12340*	– –	Y L,Y	
10886	O	2.3 II	M	2	S	12430*	–	L,Y	
10887	O	2.3 II	F	2	S	12440*	12590	L,Y	
10888	O	4.8 8.0	F	2 3	U	12380 12400	– –	Y Y	
10889	O	4.8 8.0	F	4 2	U	12380 12400	– –	Y Y	
10890	O	2.3 II	M	8	S	12430*	–	L,Y	
10891	O	2.3 II	F	8	S	12440*	12590	L,Y	
10892	O	2.3 II	M	1	S	12430*	–	L,Y	
10893	O	2.3 II	F	1	S	12440*	12590	L,Y	
10894	O	4.8 2.3 II	M	2 6	S	12470 12430*	– –	Y L,Y	
10895	O	4.8 2.3 II	F	2 6	S	12480 12440*	– 12590	Y L,Y	
10896	O	2.3 II	M	8	S	12430*	–	L,Y	
10897	O	2.3 II	F	8	S	12440*	12590	L,Y	
10898	O	2.3 II	M	2	S	12430*	–	L,Y	
10899	O	2.3 II	F	2	S	12440*	12590	L,Y	
10900	O	2.3 II	M	2	S	12430*	–	L,Y	
10901	O	2.3 II	F	2	S	12440*	12590	L,Y	
10902	O	2.3 II	F	3	S	12440*	12590	L,Y	
10903	O	8.0	F	2	U	12400	–	Y	
10904	O	2.3 II	F	4	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10905	O	2.3 II	M	2	U	12330*	–	L,Y	
10906	O	2.3 II	F	2	U	12340*	–	L,Y	
10907	O	2.3 II	M	3	U	12330*	–	L,Y	
10908	O	2.3 II	F	3	U	12340*	–	L,Y	
10909	O	2.3 II 8.0	M	4 2	U	12330* 12390	– –	L,Y Y	
10910	O	2.3 II 8.0	F	4 2	U	12340* 12400	– –	L,Y Y	
10911	O	4.8	F	1	U	12380	–	Y	
10912	O	4.8	F	1	U	12380	–	Y	
10913	X	6.3	F	1	U	12060	12580	Y	
10914	X	6.3	F	1	U	12060	12580	Y	
10915	O	4.8	M	2	U	12370	–	Y	
10916	O	4.8	F	2	U	12380	–	Y	
10917	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
10918	X	1.8 1.0	F	8 18	U	12190* 12310*	– –	L L	
10919	O	2.3 II	F	3	S	12440*	12590	L,Y	
10920	O	1.3 2.3 II	M	19 4	U	12410 12330*	– –	L L,Y	
10921	O	1.3 2.3 II	F	19 4	U	12420 12340*	– –	L L,Y	
10923	O	2.3 II	F	2	S	12440*	12590	L,Y	
10924	X	1.8 1.0	M	16 10	U	– –	– –	– –	PCB
10925	O	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10926	O	4.8	F	8	U	12380	–	Y	
10927	O	4.8	M	2	S	12470	–	Y	
10928	O	4.8	F	2	S	12480	–	Y	
10929	X	1.8	F	4	S	12620	–	L	
10930	O	2.3 II	M	7	S	12430*	–	L,Y	
10931	O	2.3 II	F	7	S	12440*	12590	L,Y	
10932	O	4.8 2.3 II	F	2 10	U	12380 12340*	– –	Y L,Y	
10933	O	2.3 II	F	6	U	12340*	–	L,Y	
10934	O	2.3 II	M	2	U	12330*	–	L,Y	
10935	O	2.3 II	F	2	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10936	X	2.3 II	M	20	U	–	–	–	PCB
10937	X	2.3 II	M	18	U	–	–	–	PCB
10938	X	2.3 II	M	12	U	–	–	–	PCB
10939	O	4.8 2.3 II	F	2 4	S	12480 12440*	– 12590	Y L,Y	
10940	O	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
10941	O	2.3 II	M	4	S	12430*	–	L,Y	
10942	O	2.3 II	F	4	S	12440*	12590	L,Y	
10943	O	2.3 II	F	4	S	12440*	12590	L,Y	
10944	O	4.8	M	3	S	12470	–	Y	
10945	O	4.8 2.3 II	M	2 3	S	12470 12430*	– –	Y L,Y	
10946	O	4.8 2.3 II	F	2 3	S	12480 12440*	– 12590	Y L,Y	
10947	O	2.3 II	F	2	S	12440*	12590	L,Y	
10948	O	2.3 II	M	2	S	12430*	–	L,Y	
10949	O	2.3 II	F	2	S	12440*	12590	L,Y	
10950	X	2.3 II	F	88	U	12340*	–	L,Y	
10951	X	2.3 II	M	52	U	12330*	–	L,Y	
10952	X	4.8 8.0	F	12 8	U	12380 12400	– –	Y Y	
10953	X	4.8 8.0	F	18 4	U	12380 12400	– –	Y Y	
10954	X	4.8 8.0	M	18 6	U	12370 12390	– –	Y Y	
10955	X	4.8 8.0	F	18 6	U	12380 12400	– –	Y Y	
10956	O	8.0	F	3	U	12400	–	Y	
10957	O	2.3 II	F	6	U	12340*	–	L,Y	
10958	O	8.0	M	2	U	12390	–	Y	
10959	O	2.3 II	M	2	S	12430*	–	L,Y	
10960	X	MIR-ROR	F	2	U	–	–	–	
10961	X	2.3 II	M	10	U	–	–	–	PCB
10962	O	2.3 II	F	2	U	12340*	–	L,Y	
10963	O	4.8	M	8	U	12370	–	Y	
10964	O	2.3 II	F	6	U	12340*	–	L,Y	
10965	O	2.3 II	F	10	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10966	O	2.3 II	F	11	U	12340*	–	L,Y	
10967	O	2.3 II	F	12	U	12340*	–	L,Y	
10968	O	2.3 II	F	12	U	12340*	–	L,Y	
10969	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
10970	X	7.7	M	2	S	–	–	–	
10971	X	2.3 II	M	14	U	–	–	–	PCB
10972	X	1.8 1.0	M	22 32	U	– –	– –	– –	PCB
10973	O	1.8	F	12	U	12190*	–	L	
10974	O	2.3 II	F	2	S	12440*	12590	L,Y	
10975	O	4.8	M	6	U	12370	–	Y	
10976	O	4.8	F	6	U	12380	–	Y	
10977	O	2.3 II	M	22	U	12330*	–	L,Y	
10978	O	1.8 1.0	M	16 10	U	– –	– –	– –	PCB
10979	X	4.8	M	3	U	12370	–	Y	
10980	O	4.8	F	3	U	12380	–	Y	
10981	O	2.3 II	F	3	S	12440*	12590	L,Y	
10982	O	4.8	M	1	S	12470	–	Y	
10983	O	4.8	F	1	S	12480	–	Y	
10984	X	2.3	M	6	S	12260*	–	L	w/o Clamp
10985	O	4.8 2.3 II	M	1 4	U	12370 12330*	– –	Y L,Y	
10986	O	4.8 2.3 II	F	1 4	U	12380 12340*	– –	Y L,Y	
10987	O	2.3 II	M	6	S	12430*	–	L,Y	
10988	O	2.3 II	F	6	S	12440*	12590	L,Y	
10989	O	4.8	M	4	S	12470	–	Y	
10990	O	4.8	F	4	S	12480	–	Y	
10991	X	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
10992	X	4.8 2.3 II	M	4 6	U	– –	– –	– –	PCB
10993	O	4.8 2.3 II	F	4 6	U	12380 12340*	– –	Y L,Y	
10994	O	8.0	M	1	U	12390	–	Y	
10995	O	8.0	F	1	U	12400	–	Y	
10996	O	2.3 II	F	6	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10997	O	2.3 II	F	10	U	12340*	–	L,Y	
10998	O	2.3 II	M	6	U	12330*	–	L,Y	
11001	O	2.3 II	F	6	U	12340*	–	L,Y	
11002	O	2.3 II	M	2	S	12430*	–	L,Y	
11003	O	2.3 II	F	2	S	12440*	12590	L,Y	
11004	O	2.3 II	M	2	S	12430*	–	L,Y	
11005	O	2.3 II	F	2	S	12440*	12590	L,Y	
11006	O	2.3 II	M	1	S	12430*	–	L,Y	
11007	O	2.3 II	F	1	S	12440*	12590	L,Y	
11008	O	2.3 II	M	2	S	12430*	–	L,Y	
11009	O	2.3 II	F	2	S	12440*	12590	L,Y	
11010	O	2.3 II	M	6	U	12330*	–	L,Y	
11011	O	2.3 II	F	6	U	12340*	–	L,Y	
11012	O	2.3 II	M	4	U	12330*	–	L,Y	
11013	O	2.3 II	F	4	U	12340*	–	L,Y	
11014	X	6.3	M	2	U	12050	–	Y	
11015	O	2.3 II	M	3	S	12430*	–	L,Y	
11016	O	2.3 II	F	3	S	12440*	12590	L,Y	
11017	X	1.8	M	18	U	–	–	–	PCB
11018	X	1.8	M	42	U	–	–	–	PCB
11019	O	2.3 II	F	2	S	12440*	12590	L,Y	
11020	O	2.3 II	F	3	S	12440*	12590	L,Y	
11021	O	4.8	M	2	S	12470	–	Y	
		2.3 II		3		12430*	–	L,Y	
11022	O	4.8	F	2	S	12480	–	Y	
		2.3 II		3		12440*	12590	L,Y	
11023	O	2.3 II	M	4	U	12330*	–	L,Y	
11024	O	2.3 II	F	5	S	12440*	12590	L,Y	
11025	O	2.3 II	F	2	S	12440*	12590	L,Y	
11026	O	2.3 II	M	1	U	12330*	–	L,Y	w/ Clamp
11027	O	2.3 II	M	4	S	12430*	–	L,Y	
11028	O	2.3 II	F	4	S	12440*	12590	L,Y	
11029	O	2.3 II	M	2	S	12430*	–	L,Y	
11030	O	2.3 II	F	2	S	12440*	12590	L,Y	
11031	O	8.0	M	2	S	12490	–	Y	
11032	O	8.0	F	2	S	12500	–	Y	
11033	O	2.3 II	M	6	S	12430*	–	L,Y	
11034	O	2.3 II	F	6	S	12440*	12590	L,Y	
11035	O	4.8	M	4	S	12470	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11036	O	4.8	F	4	S	12480	–	Y	
11037	O	2.3 II	F	4	S	12440*	12590	L,Y	
11038	O	2.3 II	F	2	S	12440*	12590	L,Y	
11039	X	1.8 1.0	M	16 18	U	– –	– –	– –	PCB
11040	X	1.3 2.3 II	M	47 4	U	– –	– –	– –	PCB
11041	O	1.3	F	11	U	12420	–	L	
11042	O	1.3 2.3 II	F	11 4	U	12420 12340*	– –	L L,Y	
11043	O	1.3	F	25	U	12420	–	L	
11044	O	4.8 8.0	M	2 1	S	12470 12490	– –	Y Y	
11045	O	4.8 8.0	F	2 1	S	12480 12500	– –	Y Y	
11046	X	2.3 II	M	17	U	12330*	–	L,Y	
11049	O	2.3 II	F	5	S	12440*	12590	L,Y	
11050	O	2.3 II	M	2	S	12430*	–	L,Y	
11051	O	2.3 II	F	2	S	12440*	12590	L,Y	
11052	O	1.3	M	3	U	12410	–	L	
11053	O	1.3	F	3	U	12420	–	L	
11054	X	1.3 2.3 II	M	55 8	U	– –	– –	– –	PCB
11055	O	1.3	F	25	U	12420	–	L	
11056	O	1.3 2.3 II	F	11 4	U	12420 12340*	– –	L L,Y	
11057	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11058	O	1.3 2.3 II	F	21 4	U	12420 12340*	– –	L L,Y	
11059	X	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
11060	O	2.3 II	M	2	U	12330*	–	L,Y	
11061	X	1.8	F	2	S	12620	–	L	
11062	O	1.8	F	2	S	12620	–	L	
11063	O	1.3	M	4	S	12630	–	L	Outer
11064	O	1.3	M	4	S	12630	–	L	Inner
11065	O	1.3	F	4	S	12650	–	L	Outer
11066	O	1.3	F	4	S	12650	–	L	Inner

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11067	X	2.3 II	M	6	U	–	–	–	PCB
11068	O	2.3 II	F	2	S	12440*	12590	L,Y	
11069	O	2.3 II	M	2	S	12430*	–	L,Y	
11070	O	2.3 II	F	2	S	12440*	12590	L,Y	
11071	O	2.3 II	F	3	U	12340*	–	L,Y	
11072	O	2.3 II	M	2	S	12430*	–	L,Y	
11073	O	2.3 II	M	2	S	12430*	–	L,Y	w/o Clamp
11074	O	2.3 II	M	2	S	12430*	–	L,Y	w/ Clamp
11075	O	2.3 II	F	2	S	12440*	12590	L,Y	
11076	X	TNS	M	4	S	–	–	–	w/ Clamp
11077	O	2.3 II	F	5	S	12440*	12590	L,Y	
11078	O	2.3 II	M	5	S	12430*	–	L,Y	
11079	O	2.3 II	F	3	U	12340*	–	L,Y	
11080	O	2.3 II	F	2	U	12340*	–	L,Y	
11081	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11082	X	1.0	F	16	U	12310*	–	L	
11083	O	1.3	F	11	U	12420	–	L	
11084	X	1.3 2.3 II	M	30 4	U	– –	– –	– –	PCB
11085	O	2.3 II	M	5	U	12330*	–	L,Y	
11086	O	2.3 II	M	12	S	12430*	–	L,Y	
11087	O	2.3 II	F	12	S	12440*	12590	L,Y	
11088	O	1.3	M	15	S	12630	–	L	
11089	O	1.3	F	15	S	12650	–	L	
11090	O	2.3 II	F	4	U	12340*	–	L,Y	
11091	O	4.8	F	6	U	12380	–	Y	
11092	O	4.8	F	8	U	12380	–	Y	
11093	O	4.8	M	2	U	12370	–	Y	
11094	O	4.8	F	2	U	12380	–	Y	
11095	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11096	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11097	O	2.3 II	M	1	U	12330*	–	L,Y	w/ Clamp
11098	O	2.3 II	F	2	U	12340*	–	L,Y	
11099	O	2.3 II	M	6	U	12330*	–	L,Y	
11100	O	2.3 II	M	4	U	12330*	–	L,Y	
11101	O	2.3 II	M	6	U	12330*	–	L,Y	
11102	O	2.3 II	M	10	U	12330*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11103	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
11104	X	2.3 II	M	20	U	–	–	–	PCB
11105	X	2.3 II	M	12	U	–	–	–	PCB
11106	X	1.3	M	4	U	–	–	–	PCB
11107	O	1.3	F	4	U	12420	–	L	
11108	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
11110	O	2.3 II	M	6	U	12330*	–	L,Y	
11111	O	–	–	–	–	–	–	–	
11113	O	SFPC	F	16	U	24180	–	L	
11114	O	SFPC	F	13	U	24180	–	L	
11115	O	SFPC	F	13	U	24180	–	L	
11116	O	SFPC	F	10	U	24180	–	L	
11117	X	2.3 II	M	20	U	–	–	–	PCB
11118	O	4.8 2.3 II	F	2 2	U	12380 12340*	– –	Y L,Y	
11119	X	1.3	M	21	U	–	–	–	PCB
11120	X	1.3 2.3 II	M	19 4	U	– –	– –	– –	PCB
11121	O	2.3 II	F	12	U	12340*	–	L,Y	
11122	O	2.3 II	M	4	S	12430*	–	L,Y	
11123	X	2.3 II	M	8	U	–	–	–	PCB
11124	X	1.8	M	30	U	–	–	–	PCB
11125	O	1.3	F	21	U	12420	–	L	
11126	O	4.8 2.3 II	M	2 2	U	12370 12330*	– –	Y L,Y	
11127	O	2.3 II	M	18	U	–	–	–	PCB
11128	X	1.8 1.0	M	16 60	U	– –	– –	– –	PCB
11129	O	1.0	F	12	U	12310*	–	L	
11130	O	4.8 2.3 II	F	2 6	U	12380 12340*	– –	Y L,Y	
11131	O	2.3 II	M	3	S	12430*	–	L,Y	
11132	O	2.3 II	F	3	S	12440*	12590	L,Y	
11133	O	1.3	M	25	U	12410	–	L	
11134	O	2.3 II	M	8	U	–	–	–	PCB
11135	O	4.8	M	4	U	12370	–	Y	
11136	O	4.8	F	4	U	12380	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11137	O	2.3 II	M	2	S	12430*	–	L,Y	
11138	O	4.8 8.0	M	2 2	S	12470 12490	– –	Y Y	
11139	O	4.8 8.0	F	2 2	S	12480 12500	– –	Y Y	
11140	O	2.3 II	F	2	S	12440*	12590	L,Y	
11141	O	2.3 II	M	2	S	12430*	–	L,Y	
11142	O	2.3 II	F	2	S	12440*	12590	L,Y	
11143	O	2.3 II	F	3	S	12440*	12590	L,Y	
11144	O	2.3 II	F	6	S	12440*	12590	L,Y	
11145	O	2.3 II	F	3	S	12440*	12590	L,Y	
11146	O	2.3 II	M	1	U	12330*	–	L,Y	
11147	O	2.3 II	F	1	U	12340*	–	L,Y	
11148	O	2.3 II	F	2	U	12340*	–	L,Y	
11149	O	2.3 II	F	2	S	12440*	12590	L,Y	
11150	O	2.3 II	F	4	S	12440*	12590	L,Y	
11151	O	2.3 II	F	12	S	12440*	12590	L,Y	
11152	O	2.3 II	F	4	S	12440*	12590	L,Y	
11153	O	2.3 II	F	2	S	–	12790*	L,Y	
11154	O	2.3 II	F	2	S	–	12790*	L,Y	
11155	O	2.3 II	M	2	S	12430*	–	L,Y	
11156	O	2.3 II	F	2	S	12440*	12590	L,Y	
11157	X	2.3 II	F	3	S	12440*	12590	L,Y	
11158	O	1.3 2.3 II	M	21 4	U	12410 12330*	– –	L L,Y	
11159	O	2.3 II	M	2	U	12330*	–	L,Y	
11160	O	4.8 2.3 II	M	1 2	S	12470 12430*	– –	Y L,Y	
11161	O	4.8 2.3 II	F	1 2	S	12480 12440*	– 12590	Y L,Y	
11162	O	2.3 II	F	2	S	12440*	12590	L,Y	
11163	O	2.3 II	F	2	S	12440*	12590	L,Y	
11164	X	1.3	M	7	U	–	–	–	PCB
11165	O	1.3	F	7	U	12420	–	L	
11166	O	2.3 II	F	1	S	12440*	12590	L,Y	
11167	O	2.3 II	M	16	U	12330*	–	L,Y	
11168	O	2.3 II	M	2	S	12430*	–	L,Y	
11169	O	1.3	M	3	S	12630	–	L	
11170	O	1.3	F	3	S	12650	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11171	O	1.3	M	7	S	12630	–	L	
11172	O	1.3	F	7	S	12650	–	L	
11173	O	1.3	M	11	S	12630	–	L	
11174	O	1.3	F	11	S	12650	–	L	
11175	O	2.3 II	M	2	S	12430*	–	L,Y	
11176	O	2.3 II	F	2	S	12440*	12590	L,Y	
11177	O	2.3 II	M	4	S	12430*	–	L,Y	
11178	O	2.3 II	F	4	S	12440*	12590	L,Y	
11179	O	1.3	F	15	U	12420	–	L	
11180	X	1.3	M	15	U	–	–	–	PCB
11181	O	1.3	M	5	S	12630	–	L	
11182	O	1.3	F	5	S	12650	–	L	
11183	O	8.0	M	1	S	12490	–	Y	
11184	O	8.0	F	1	S	12500	–	Y	
11186	O	1.3	M	4	U	12410	–	L	
11187	O	1.3	F	4	U	12420	–	L	
11188	O	1.3	M	2	S	12630	–	L	
11189	O	1.3	F	2	S	12650	–	L	
11190	O	2.3 II	F	8	S	12440*	12590	L,Y	
11191	O	1.3	M	9	S	12630	–	L	
11192	O	1.3	F	9	S	12650	–	L	
11193	O	2.3 II	M	6	S	12430*	–	L,Y	
11194	O	2.3 II	F	6	S	12440*	12590	L,Y	
11195	O	2.3 II 2.3 II 6.3 II	F	22 22 1	S U S	12440* 12340* 24160	12590 – –	L,Y L,Y L	
11196	O	2.3 II	M	6	S	12430*	–	L,Y	
11197	O	2.3 II	F	6	S	12440*	12590	L,Y	
11198	X	1.3	M	13	U	–	–	–	PCB
11199	X	1.3	F	13	U	12420	–	L	
11200	X	1.3	M	11	U	12410	–	L	
11201	X	1.3	M	15	U	12410	–	L	
11202	X	1.3	M	17	U	12410	–	L	
11203	X	1.3	F	17	U	12420	–	L	
11204	X	1.3 2.3 II	M	15 4	U	12410 12330*	– –	L L,Y	
11205	X	1.3 2.3 II	F	15 4	U	12420 12340*	– –	L L,Y	
11206	X	1.3	M	21	U	12410	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11207	O	2.3 II	F	2	S	82998– 12440*	82998– 12590	L,Y	
11208	O	1.3 2.3 II	M	19 4	U	12410 12330*	– –	L L,Y	
11211	O	1.3	M	2	U	12410	–	L	
11212	O	1.3	F	2	U	12420	–	L	
11213	X	1.0	M	120	S	–	–	–	PCB
11214	O	1.0	F	80	S	–	–	–	
11215	O	1.0	F	40	S	–	–	–	
11216	O	–	–	–	–	–	–	–	
11217	X	1.0 II	M	100	U	–	–	–	PCB
11218	O	1.0 II	F	28	U	24020*	–	L	
11219	O	1.0 II	F	16	U	24020*	–	L	
11220	O	1.0 II	F	22	U	24020*	–	L	
11221	O	1.0 II	F	34	U	24020*	–	L	
11222	O	1.0 II 1.8 II 1.8 II	M	18 14 14	U	24010 24030 24090	– – –	L L,Y L,Y	
11223	O	1.0 II 1.8 II 1.8 II	M	12 6 6	U	24010 24030 24090	– – –	L L,Y L,Y	
11224	O	1.0 II 1.8 II 1.8 II	F	12 6 6	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11225	O	1.0 II 1.8 II 1.8 II	F	6 8 8	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11226	O	1.0 II 1.8 II 1.8 II	F	12 6 6	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11227	O	2.3 II	F	2	U	12340*	–	L,Y	
11228	O	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
11229	X	2.3 II	M	3	U	–	–	–	PCB
11230	X	2.3 II	M	5	U	–	–	–	PCB
11231	O	2.3 II	F	10	S	12440*	12590	L,Y	
11232	O	2.3 II	F	5	S	12440*	12590	L,Y	
11233	X	1.8 1.0	M	4 22	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11234	X	1.8 1.0	F	4 22	U	12190* 12310*	– –	L L	
11235	O	2.3 II	F	2	S	12440*	12590	L,Y	
11236	X	4.8	M	2	S	12470	–	Y	
11237	O	4.8	F	2	S	12480	–	Y	
11238	X	2.3 II	F	22	U	12340*	–	L,Y	
11239	O	4.8 2.3 II	M	3 8	S	12470 12430*	– –	Y L,Y	
11240	O	4.8 2.3 II	F	3 8	S	12480 12440*	– 12590	Y L,Y	
11241	O	2.3 II 8.0	M	6 2	S	12430* 12490	– –	L,Y Y	
11242	O	2.3 II 8.0	F	6 2	S	12440* 12500	12590 –	L,Y Y	
11243	O	2.3 II	F	1	S	12440*	12590	L,Y	
11244	O	2.3 II	M	3	S	12430*	–	L,Y	w/ Clamp
11245	O	2.3 II	F	3	S	12440*	12590	L,Y	
11246	O	2.3 II	F	2	S	12440*	12590	L,Y	
11247	O	2.3 II	M	2	S	12430*	–	L,Y	
11248	O	2.3 II	F	2	S	12440*	12590	L,Y	
11249	X	2.3 II	M	2	S	12430*	–	L,Y	
11250	O	2.3 II	F	2	S	12440*	12590	L,Y	
11251	X	2.3 II	F	3	U	12340*	–	L,Y	
11252	O	2.3 II	F	1	S	12440*	12590	L,Y	
11253	X	1.0 III 1.0 III	M	5 52	U	– –	– –	– –	PCB
11254	X	2.3 II	M	2	S	12430*	–	L,Y	
11255	O	2.3 II	F	2	S	12440*	12590	L,Y	
11256	X	1.3	M	11	S	12630	–	L	
11257	X	1.3	F	11	S	12650	–	L	
11258	O	4.8	M	1	U	12370	–	Y	
11259	O	4.8	F	1	U	12380	–	Y	
11260	X	2.3 II	F	20	U	12340*	–	L,Y	
11261	O	2.3 II	F	3	S	12440*	12590	L,Y	
11262	X	1.3	M	4	S	12630	–	L	Outer
11263	X	1.3	M	15	U	–	–	–	PCB
11264	O	1.3	F	15	U	12420	–	L	
11265	X	2.3 II	M	14	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11266	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11267	X	4.8 2.3 II	M	2 4	S	12470 12430*	– –	Y L,Y	
11268	X	2.3 II	M	4	S	12430*	–	L,Y	
11269	X	2.3 II	F	4	S	12440*	12590	L,Y	
11270	O	2.3 II	M	1	S	12430*	–	L,Y	
11271	O	2.3 II	F	1	S	12440*	12590	L,Y	
11272	O	2.3 II	M	2	S	12430*	–	L,Y	
11273	O	2.3 II	F	2	S	12440*	12590	L,Y	
11274	O	–	–	–	–	–	–	–	
11276	X	4.8	F	10	U	12380	–	Y	
11277	X	4.8 2.3 II	F	1 8	U	12380 12340*	– –	Y L,Y	
11278	O	2.3 II	F	2	U	12340*	–	L,Y	
11279	O	4.8 2.3 II	F	2 6	U	12380 12340*	– –	Y L,Y	
11280	O	2.3 II	F	6	U	12340*	–	L,Y	
11281	X	1.0 III 1.0 IV	M	98 24	U	– –	– –	– –	PCB
11282	X	2.3 II	F	1	S	12440*	12590	L,Y	
11283	X	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
11284	O	2.3 II	F	2	S	–	12790*	L,Y	
11285	O	2.3 II	F	2	S	–	12790*	L,Y	
11286	X	2.3 II	F	2	S	12440*	12590	L,Y	
11287	X	2.3 II 8.0	M	2 2	S	12430* 12490	– –	L,Y Y	
11288	X	2.3 II 8.0	F	2 2	S	12440* 12500	12590 –	L,Y Y	
11289	O	2.3 II	M	6	S	12430*	–	L,Y	
11290	O	2.3 II	F	6	S	12440*	12590	L,Y	
11291	O	2.3 II	M	4	S	12430*	–	L,Y	
11292	O	2.3 II	F	4	S	12440*	12590	L,Y	
11293	X	2.3 II	M	3	S	12430*	–	L,Y	
11294	O	2.3 II	F	3	S	12440*	12590	L,Y	
11295	O	2.3 II	M	3	S	12430*	–	L,Y	w/ Clamp
11296	X	2.3 II	F	3	U	12340*	–	L,Y	
11297	X	4.8	F	6	U	12380	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11298	X	2.3 II	M	3	U	12330*	–	L,Y	
11299	O	2.3 II	M	2	U	12330*	–	L,Y	w/ Clamp
11300	O	2.3 II	M	2	U	12330*	–	L,Y	
11301	X	2.3 II	M	4	U	12330*	–	L,Y	
11302	X	4.8	F	9	U	12380	–	Y	
11303	X	2.3 II	M	2	S	12430*	–	L,Y	
11304	O	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
11305	X	1.3	M	2	U	12410	–	L	
11306	X	1.3	F	2	U	12420	–	L	
11307	X	1.3 2.3 II	M	15 4	U	12410 12330*	– –	L L,Y	
11308	X	1.3 2.3 II	F	15 4	U	12420 12340*	– –	L L,Y	
11309	X	1.3 2.3 II	M	13 4	U	12410 12330*	– –	L L,Y	
11310	X	1.3 2.3 II	F	13 4	U	12420 12340*	– –	L L,Y	
11311	O	2.3 II	F	12	U	12340*	–	L,Y	
11312	X	2.3 II	M	14	U	–	–	–	PCB
11313	X	2.3 II	F	4	U	12340*	–	L,Y	
11314	O	HEAD-LAMP	F	3	U	24140	24200	L,Y	
11315	X	2.3 II	F	1	U	12340*	–	L,Y	
11316	X	2.3 II 6.3 II	M	20 1	U	12330* –	– –	L,Y –	
11317	O	2.3 II	F	5	S	12440*	12590	L,Y	
11318	X	1.3	M	5	U	–	–	–	PCB
11319	O	1.3	F	5	U	12420	–	L	
11320	X	1.3	M	8	U	–	–	–	PCB
11321	X	1.3	F	8	U	12420	–	L	
11322	X	2.3 II	M	2	S	12430*	–	L,Y	
11323	O	2.3 II 2.3 II 6.3 II	F	22 22 1	S U S	12440* 12340* 24160	12590 – –	L,Y L,Y L	
11324	X	2.3 II	M	16	U	–	–	–	PCB
11325	X	2.3 II	M	10	U	–	–	–	PCB
11326	X	2.3 II	F	6	U	12340*	–	L,Y	
11327	X	2.3 II	M	5	U	12330*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11328	X	1.3	M	4	S	12630	–	L	Inner
11329	X	1.3	F	4	S	12650	–	L	Outer
11330	X	1.3	F	4	S	12650	–	L	Inner
11331	X	2.3 II	M	10	U	–	–	–	PCB
11332	O	4.8 2.3 II	F	2 8	S	12480 12440*	– 12590	Y L,Y	
11333	X	1.8 1.0	M	4 22	U	12180 –	– –	L –	
11334	X	1.3	M	17	U	12410	–	L	
11335	X	1.3	F	17	U	12420	–	L	
11336	X	1.3	F	3	U	12420	–	L	
11337	X	2.3 II	M	14	U	–	–	–	PCB
11338	X	1.0	M	80	S	–	–	–	
11339	X	1.3	M	7	U	–	–	–	PCB
11340	X	1.3	F	7	U	12420	–	L	
11341	X	2.3 II	M	3	S	12430*	–	L,Y	
11342	X	1.0	M	40	U	–	–	–	
11343	X	1.0	M	28	U	–	–	–	PCB
11344	X	1.0	M	16	U	–	–	–	
11345	X	1.0	M	22	U	–	–	–	
11346	X	1.0	M	34	U	–	–	–	
11347	X	LA	F	40	U	–	–	–	
11348	O	2.3 II	M	3	S	12430*	–	L,Y	
11349	O	2.3 II	F	3	S	12440*	12590	L,Y	
11350	X	1.3	F	13	U	12420	–	L	
11351	X	2.3 II	M	16	U	–	–	–	PCB
11352	X	1.0 II 1.8 II	M	60 16	U	– –	– –	– –	PCB
11353	X	2.3 II	M	8	U	12330*	–	L,Y	
11354	X	2.3 II	F	8	U	12340*	–	L,Y	
11355	X	4.8 2.3 II 8.0	M	4 38 1	U	12370 12330* 12390	– – –	Y L,Y Y	
11356	X	4.8 2.3 II	M	4 24	U	12370 12330*	– –	Y L,Y	
11357	X	2.3 II	M	27	U	12330*	–	L,Y	
11359	X	4.8 2.3 II	F	4 51	U	12380 12340*	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11360	X	4.8 2.3 II 8.0	F	4 38 1	U	12380 12340* 12400	– – –	Y L,Y Y	
11361	X	4.8 2.3 II	M	4 4	U	– –	– –	– –	PCB
11362	X	4.8 2.3 II	F	4 4	U	12380 12340*	– –	Y L,Y	
11363	O	2.3 II	F	1	S	12440*	12590	L,Y	
11364	O	1.0 III 1.0 IV	M	81 24	U	– –	– –	– –	PCB
11365	X	4.8 2.3 II	M	2 8	U	– –	– –	– –	PCB
11366	X	4.8 2.3 II	F	2 8	U	12380 12340*	– –	Y L,Y	
11367	X	1.3	M	2	U	12410	–	L	
11368	O	1.3	M	2	U	12410	–	L	
11369	O	1.3	F	2	U	12420	–	L	
11370	X	2.3 II	M	15	U	12330*	–	L,Y	
11371	X	2.3 II	M	15	U	12330*	–	L,Y	
11372	X	2.3 II	F	15	U	12340*	–	L,Y	
11373	X	2.3 II	M	25	U	12330*	–	L,Y	
11374	X	2.3 II	M	25	U	12330*	–	L,Y	
11375	X	2.3 II	F	25	U	12340*	–	L,Y	
11376	X	1.3	M	19	U	12410	–	L	
11377	X	1.3	F	19	U	12420	–	L	
11378	X	1.3	M	21	U	12410	–	L	
11379	X	1.3	F	21	U	12420	–	L	
11380	X	1.3	M	23	U	12410	–	L	
11381	X	1.3	F	23	U	12420	–	L	
11382	X	2.3 II	M	14	U	–	–	–	PCB
11383	X	2.3 II	F	14	U	12340*	–	L,Y	
11384	X	1.3	M	13	U	–	–	–	PCB
11385	X	8.0	M	3	U	12390	–	Y	
11386	X	8.0	F	2	U	12400	–	Y	
11387	X	4.8 8.0	F	1 2	U	12380 12400	– –	Y Y	
11388	X	2.3 II	F	2	U	12340*	–	L,Y	
11389	X	1.3	M	8	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11390	O	1.0 II 1.8 II	F	16 10	U	24020* 24100*	– –	L L,Y	
11391	O	1.0 II	F	16	U	24020*	–	L	
11392	O	1.0 II 1.8 II	F	16 6	U	24020* 24100*	– –	L L,Y	
11393	X	1.3	M	13	U	12410	–	L	
11394	X	1.3	F	13	U	12420	–	L	
11395	X	2.3 II	M	2	U	12330*	–	L,Y	
11396	X	2.3 II	F	2	U	12340*	–	L,Y	
11397	X	2.3 II	F	8	U	12340*	–	L,Y	
11398	X	2.3 II	F	4	U	12340*	–	L,Y	
11399	O	2.3 II	M	4	U	12330*	–	L,Y	
11400	O	4.8	F	1	S	12480	–	Y	
11401	X	2.3 II	F	2	S	12440*	12590	L,Y	
11402	X	1.3	M	7	U	–	–	–	PCB
11403	X	1.3	M	25	U	12410	–	L	
11404	X	1.3	F	25	U	12420	–	L	
11405	X	1.8 1.0 II 1.8 II	M	12 32 10	U	– – –	– – –	– – –	PCB
11406	X	1.0 II 1.8 II	F	22 4	U	24020* 24100*	– –	L L,Y	
11407	X	2.3 II	M	3	S	12430*	–	L,Y	w/o Clamp
11408	O	1.0 II	F	12	U	24020*	–	L	
11409	X	4.8	M	2	S	12470	–	Y	
11410	O	4.8	F	2	S	12480	–	Y	
11411	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11412	O	4.8 2.3 II	M	3 2	S	12470 12430*	– –	Y L,Y	
11413	O	4.8 2.3 II	F	3 2	S	12480 12440*	– 12590	Y L,Y	
11414	X	SL	F	3	S	–	–	–	
11415	X	2.3 II	M	16	U	12330*	–	L,Y	
11416	X	2.3 II	F	16	U	12340*	–	L,Y	
11417	O	2.3 II	F	17	U	12340*	–	L,Y	
11418	X	1.8 1.0 II 1.8 II	M	12 16 10	U	– – –	– – –	– – –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11419	X	2.3 II	M	10	U	–	–	–	PCB
11420	X	2.3	F	17	U	12170	–	L	
11421	O	1.0 III	F	20	U	12690*	–	L	
		1.0 IV		11		12740	–	L	
11422	X	1.0 II	F	18	U	24020*	–	L	
		1.8 II		8		24100*	–	L,Y	
11423	O	1.0 II	F	16	U	24020*	–	L	
		1.8 II		10		24100*	–	L,Y	
11424	O	1.8 II	F	12	U	24100*	–	L,Y	
11425	X	1.0 II	F	16	U	24020*	–	L	
11426	X	2.3 II	M	4	U	–	–	–	PCB
11427	X	2.3 II	F	4	U	12340*	–	L,Y	
11428	O	2.3 II	F	1	S	12440*	12590	L,Y	
11429	X	2.3 II	F	2	U	12340*	–	L,Y	
11430	X	4.8	M	4	U	12370	–	Y	
		2.3 II		40		12330*	–	L,Y	
		8.0		5		12390	–	Y	
11431	X	4.8	F	4	U	12380	–	Y	
		2.3 II		40		12340*	–	L,Y	
		8.0		5		12400	–	Y	
11432	X	1.8 II	F	20	U	24100*	–	L,Y	
11433	O	1.8 II	F	14	U	24040	–	L,Y	
		1.8 II		14		24100*	–	L,Y	
11434	X	C–TYPE	M	16	U	12560	–	L	
11435	X	C–TYPE	F	16	U	12570	–	L	
11436	O	1.3	F	2	U	12420	–	L	
11437	X	2.3 II	F	14	U	12340*	–	L,Y	
11438	X	4.8	M	3	U	12370	–	Y	
		2.3 II		5		12330*	–	L,Y	
11439	X	4.8	F	3	U	12380	–	Y	
		2.3 II		5		12340*	–	L,Y	
11440	X	2.3 II	M	20	U	12330*	–	L,Y	
11441	X	2.3 II	F	20	U	12340*	–	L,Y	
11442	X	2.3 II	M	20	U	12330*	–	L,Y	
11443	X	2.3 II	F	20	U	12340*	–	L,Y	
11444	O	2.3 II	M	16	U	12330*	–	L,Y	
11445	X	2.3 II	F	16	U	12340*	–	L,Y	
11447	X	2.3 II	M	2	S	12430*	–	L,Y	
11448	X	2.3 II	F	2	S	12440*	12590	L,Y	

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11449	X	1.3	M	10	U	–	–	–	PCB
11450	O	1.3	F	10	U	12420	–	L	
11451	O	2.3 II	F	3	S	–	12790*	L,Y	
11452	X	2.3 II	M	6	U	12330*	–	L,Y	
11453	X	2.3 II	F	12	U	12340*	–	L,Y	
11459	X	2.3 II	F	8	U	12340*	–	L,Y	
11460	X	4.8 2.3 II	M	2 6	S	12470 12430*	– –	Y L,Y	
11461	X	4.8 2.3 II	F	2 6	S	12480 12440*	– 12590	Y L,Y	
11462	X	1.3	M	16	S	12630	–	L	
11463	X	1.3	F	16	S	12650	–	L	
11464	X	2.3 II	M	14	U	–	–	–	PCB
11465	X	2.3 II	F	14	U	12340*	–	L,Y	
11466	X	2.3 II	M	2	S	12430*	–	L,Y	
11467	O	2.3 II	F	2	S	12440*	12590	L,Y	
11468	X	1.3	M	22	U	–	–	–	PCB
11469	O	1.3 2.3 II	F	16 4	U	12420 12340*	– –	L L,Y	
11470	X	1.3	M	3	U	12410	–	L	
11471	O	1.3	F	3	U	12420	–	L	
11472	X	1.3 2.3 II	M	30 4	U	– –	– –	– –	PCB
11473	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11474	X	1.3	M	12	U	–	–	–	PCB
11475	O	1.3	F	12	U	12420	–	L	
11476	O	1.0 III 1.0 IV	F	17 7	U	12690* 12740	– –	L L	
11477	X	LAC	M	22	U	12100	–	L,Y	
11478	X	LAC	F	13	U	12110	–	L,Y	
11479	X	LAC	F	9	U	12110	–	L,Y	
11483	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11484	X	2.3 II 8.0	M	1 2	U	12330* 12390	– –	L,Y Y	
11485	X	2.3 II 8.0	F	1 2	U	12340* 12400	– –	L,Y Y	
11486	O	2.3 II	M	2	S	12430*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11487	X	1.3	M	6	U	12410	–	L	
11488	X	1.3	F	6	U	12420	–	L	
11489	X	1.3	M	3	U	12410	–	L	
11490	O	1.3	F	3	U	12420	–	L	
11491	X	6.3	F	3	S	12540	–	Y	
11492	X	1.3 2.3 II	M	4 2	U	12410 12330*	– –	L L,Y	
11493	X	1.3 2.3 II	F	4 2	U	12420 12340*	– –	L L,Y	
11494	O	1.3	F	4	U	12420	–	L	
11495	X	1.3	F	4	U	12420	–	L	
11496	X	1.3	M	18	U	–	–	–	PCB
11497	X	1.3	F	18	U	12420	–	L	
11498	X	1.3	M	20	U	12410	–	L	
11499	X	1.3	F	20	U	12420	–	L	
11500	X	1.3	M	12	U	12410	–	L	
11501	O	1.3 2.3 II	M	16 4	U	– –	– –	– –	PCB
11502	O	1.3	F	22	U	12420	–	L	
11503	O	1.3	M	22	U	12410	–	L	
11504	O	1.3 2.3 II	M	16 4	U	12410 12330*	– –	L L,Y	
11505	X	1.3	M	17	U	12410	–	L	
11506	X	1.3	F	17	U	12420	–	L	
11507	X	1.3	M	64	U	–	–	–	PCB
11508	X	1.3	F	40	U	12420	–	L	
11509	X	1.3	F	24	U	12420	–	L	
11510	X	1.3	M	14	U	–	–	–	PCB
11511	X	1.3	F	14	U	12420	–	L	
11512	X	ABS	F	2	U	–	–	–	
11514	X	ABS	F	32	U	–	–	–	
11517	X	ABS	F	6	S	–	–	–	
11519	X	ABS	F	2	S	–	–	–	
11520	X	ABS	F	2	S	–	–	–	
11522	X	ABS	F	4	S	–	–	–	
11524	X	ABS	F	12	U	–	–	–	
11526	X	4.8 2.3 II	M	2 8	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11527	O	4.8 2.3 II	F	2 8	U	12380 12340*	– –	Y L,Y	
11528	O	2.3 II	M	7	U	12330*	–	L,Y	
11529	O	2.3 II	F	7	U	12340*	–	L,Y	
11530	O	2.3 II	M	12	U	12330*	–	L,Y	
11531	O	2.3 II	F	12	U	12340*	–	L,Y	
11532	O	1.3	M	8	U	12410	–	L	
11533	O	1.3	F	8	U	12420	–	L	
11534	O	2.3 II	M	9	U	12330*	–	L,Y	
11535	O	2.3 II	F	9	U	12340*	–	L,Y	
11536	O	2.3 II	M	10	U	12330*	–	L,Y	
11537	O	2.3 II	F	10	U	12340*	–	L,Y	
11538	O	2.3 II	M	11	U	12330*	–	L,Y	
11539	O	2.3 II	F	11	U	12340*	–	L,Y	
11540	X	2.3 II	F	2	S	12440*	12590	L,Y	
11541	O	2.3 II	M	13	U	12330*	–	L,Y	
11542	O	2.3 II	F	13	U	12340*	–	L,Y	
11543	X	2.3 II	M	9	U	–	–	–	PCB
11544	O	1.3	M	10	U	–	–	–	PCB
11545	X	2.3 II	M	2	U	12330*	–	L,Y	
11546	X	4.8 2.3 II	M	4 12	U	12370 12330*	– –	Y L,Y	
11547	X	4.8 2.3 II	F	4 12	U	12380 12340*	– –	Y L,Y	
11548	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
11549	X	1.8 II 1.8 II	M	34 34	U	24030 24090	– –	L,Y L,Y	
11550	X	1.8	M	12	U	–	–	–	PCB
11551	X	4.8	M	8	U	12370	–	Y	
11552	O	1.3 2.3 II	F	16 22	U	12420 12340*	– –	L L,Y	
11553	X	1.3	M	5	U	–	–	–	PCB
11554	X	1.3 2.3 II	M	16 22	U	12410 12330*	– –	L L,Y	
11555	X	1.3 2.3 II	F	16 22	U	12420 12340*	– –	L L,Y	
11556	O	1.3	F	14	U	12420	–	L	
11557	X	1.3	M	60	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11558	X	1.3	F	20	U	82998– 12420	82998– –	L	
11559	X	1.3 2.3 II	M	8 9	U	12410 12330*	– –	L L,Y	
11560	X	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11561	X	1.3 2.3 II	M	6 10	U	12410 12330*	– –	L L,Y	
11562	X	1.3 2.3 II	F	6 10	U	12420 12340*	– –	L L,Y	
11563	O	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11564	O	1.0 II 1.8 II	M	26 16	U	– –	– –	– –	PCB
11565	O	1.0 II 1.8 II	F	10 6	U	24020* 24100*	– –	L L,Y	
11566	X	1.0 II	F	40	S	24060	–	L	
11567	X	1.0 II	M	40	S	–	–	–	PCB
11568	X	2.3 II	M	13	U	12330*	–	L,Y	
11569	X	2.3 II 8.0	F	2 2	S	12440* 12500	12590 –	L,Y Y	
11570	O	1.3	M	19	U	12410	–	L	
11571	O	1.3	F	19	U	12420	–	L	
11572	O	1.3	M	52	U	–	–	–	PCB
11573	O	1.3	M	16	U	12410	–	L	
11574	O	1.3	F	16	U	12420	–	L	
11575	O	1.8 1.0	M	22 32	U	– –	– –	– –	PCB
11576	O	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
11577	O	1.8 1.0	M	16 60	U	– –	– –	– –	PCB
11578	O	1.0	M	100	U	–	–	–	PCB
11579	O	8.0	F	2	U	12400	–	Y	
11580	X	1.3	M	10	U	12410	–	L	
11581	X	1.3	F	10	U	12420	–	L	
11582	X	1.3	M	8	U	12410	–	L	
11583	O	4.8	F	6	U	12380	–	Y	
11585	X	2.3 II	M	16	U	–	–	–	PCB
11586	X	1.0 III	F	17	U	12640	–	L	IDC

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11587	O	2.3 II	M	6	U	12330*	–	L,Y	
11588	X	1.3	M	8	U	12410	–	L	
11589	X	1.3	M	2	U	–	–	–	PCB
11590	X	1.3 2.3 II	M	8 6	U	12410 12330*	– –	L L,Y	
11591	X	1.3 2.3 II	F	8 6	U	12420 12340*	– –	L L,Y	
11592	O	2.3 II	F	8	S	12440*	12590	L,Y	
11593	X	2.3 II	F	8	S	12440*	12590	L,Y	
11594	O	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11595	O	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11596	O	4.8 2.3 II	M	2 8	U	12370 12330*	– –	Y L,Y	
11597	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11598	O	2.3 II	M	5	S	12430*	–	L,Y	
11599	O	2.3 II	F	5	S	12440*	12590	L,Y	
11600	O	4.8 2.3 II 8.0	M	3 12 2	S	12470 12430* 12490	– – –	Y L,Y Y	
11601	X	4.8 2.3 II 8.0	F	3 12 2	S	12480 12440* 12500	– 12590 –	Y L,Y Y	
11602	X	4.8 2.3 II	M	2 3	U	12370 12330*	– –	Y L,Y	
11603	X	4.8 2.3 II	F	2 3	U	12380 12340*	– –	Y L,Y	
11604	O	2.3 II	F	13	U	12340*	–	L,Y	
11605	X	1.3 2.3 II	M	2 2	U	12410 12330*	– –	L L,Y	
11606	X	1.3 2.3 II	F	2 2	U	12420 12340*	– –	L L,Y	
11607	X	2.3 II	M	3	S	12430*	–	L,Y	
11608	O	2.3 II	F	2	U	12340*	–	L,Y	
11609	X	4.8 2.3 II	M	3 8	S	12470 12430*	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11610	X	4.8 2.3 II	M	4 22	U	12370 12330*	– –	Y L,Y	
11611	X	4.8 2.3 II	F	4 22	U	12380 12340*	– –	Y L,Y	
11612	X	4.8 2.3 II	F	3 8	S	12480 12440*	– 12590	Y L,Y	
11613	O	1.3 2.3 II	M	8 2	U	12410 12330*	– –	L L,Y	
11614	X	1.3 2.3 II	F	8 2	U	12420 12340*	– –	L L,Y	
11615	O	4.8	F	8	U	12380	–	Y	
11616	O	1.3	F	6	U	12420	–	L	
11617	X	2.3 II	F	6	U	12340*	–	L,Y	
11618	X	1.3	F	40	U	12420	–	L	
11619	X	1.0 II 1.8 II	M	16 18	U	– –	– –	– –	PCB
11620	X	1.3	M	3	U	–	–	–	PCB
11621	X	1.3	M	22	U	–	–	–	PCB
11622	O	2.3 II	M	3	S	12430*	–	L,Y	
11623	O	1.3	M	8	U	12410	–	L	
11624	X	1.3 2.3 II	M	6 10	U	– –	– –	– –	PCB
11625	X	1.3 4.8 2.3 II	M	5 2 17	U	– – –	– – –	– – –	PCB
11626	X	2.3 II	F	12	U	12340*	–	L,Y	
11627	X	1.3	M	20	U	12410	–	L	
11628	O	1.3	F	22	U	12420	–	L	
11629	O	1.3	M	8	U	–	–	–	PCB
11630	O	1.3	F	8	U	12420	–	L	
11631	O	4.8 2.3 II	M	6 20	U	12370 12330*	– –	Y L,Y	
11632	X	4.8 2.3 II	F	6 20	U	12380 12340*	– –	Y L,Y	
11633	X	1.3	F	8	U	12420	–	L	
11634	X	1.3	M	12	U	–	–	–	PCB
11635	X	1.3	M	13	U	–	–	–	PCB
11636	X	1.3	M	8	U	–	–	–	PCB
11637	O	1.0 III	F	28	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11638	O	1.0 III 1.0 IV	F	16 6	U	12690* 12740	– –	L L	
11639	X	–	–	–	–	–	–	–	
11640	X	6.3 II	F	4	S	24160	–	L	
11641	O	1.3	M	10	U	–	–	–	PCB
11642	O	1.3	F	10	U	12420	–	L	
11643	O	4.8 2.3 II	F	2 7	S	12480 12440*	– 12590	Y L,Y	
11644	X	1.3	M	14	U	–	–	–	PCB
11645	X	1.3 2.3 II	M	60 10	U	– –	– –	– –	PCB
11646	X	1.3 2.3 II	M	36 16	U	– –	– –	– –	PCB
11647	X	1.3 2.3 II	M	20 16	U	– –	– –	– –	PCB
11648	X	1.3	F	16	U	12420	–	L	
11649	O	2.3 II	F	12	U	12340*	–	L,Y	
11650	X	1.8 1.0	M	22 32	U	– –	– –	– –	PCB
11651	X	1.3 2.3 II	M	8 6	U	– –	– –	– –	PCB
11652	X	1.3 2.3 II	F	10 6	U	12420 12340*	– –	L L,Y	
11653	O	2.3 II	F	10	S	12440*	12590	L,Y	
11654	O	1.3	M	14	U	12410	–	L	
11655	O	8.0	M	2	U	12390	–	Y	
11656	O	2.3 II	F	12	U	12340*	–	L,Y	
11657	O	1.3	F	10	U	12420	–	L	
11658	O	2.3 II	F	10	S	12440*	12590	L,Y	
11659	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11660	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11661	O	2.3 II	F	12	U	12340*	–	L,Y	
11662	X	8.0	F	4	U	12400	–	Y	
11663	X	2.3 II	F	6	S	12440*	12590	L,Y	
11664	X	2.3 II	F	12	S	12440*	12590	L,Y	
11665	O	OBD II	F	16	U	–	–	–	
11666	X	–	–	–	–	–	–	–	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11667	X	4.8 8.0	F	1 2	U	12380 12400	– –	Y Y	
11669	X	2.3 II	M	27	U	12330*	–	L,Y	
11670	X	2.3 II	F	27	U	12340*	–	L,Y	
11671	O	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11672	X	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11676	X	8.0	F	4	U	12400	–	Y	
11677	X	2.3 II	F	15	S	12440*	12590	L,Y	
11680	X	1.3	M	16	U	12410	–	L	
11681	X	1.3	F	16	U	12420	–	L	
11682	X	1.3	M	16	U	12410	–	L	
11683	X	1.3	F	16	U	12420	–	L	
11684	O	8.0	F	2	U	12400	–	Y	
11685	O	8.0	F	3	U	12400	–	Y	
11686	O	4.8	F	8	U	12380	–	Y	
11687	X	6.3	F	2	U	12060	12580	Y	
11688	X	1.3	M	5	S	12630	–	L	
11689	X	1.3	M	5	S	12630	–	L	
11690	X	1.3	F	5	S	12650	–	L	Outer
11691	X	1.3	F	5	S	12650	–	L	Inner
11693	X	2.3 II	F	12	U	12340*	–	L,Y	
11694	X	2.3 II	M	13	U	12330*	–	L,Y	
11695	X	2.3 II	F	13	U	12340*	–	L,Y	
11696	X	1.5	M	6	U	–	–	–	PCB
11697	X	1.5	F	6	U	–	–	–	
11698	O	1.3	F	12	S	12650	–	L	
11700	X	1.0 II 1.8 II	M	32 10	U	– –	– –	– –	PCB
11701	O	4.8 2.3 II	F	4 4	U	12380 12340*	– –	Y L,Y	
11703	X	2.3 II	F	1	U	12340*	–	L,Y	
11709	X	2.3 II	M	9	U	12330*	–	L,Y	
11710	X	2.3 II	F	9	U	12340*	–	L,Y	
11714	X	2.3 II	F	13	U	12340*	–	L,Y	
11716	X	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11720	X	2.3 II	F	12	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11724	X	2.3 II	M	2	U	82998– 12350*	82998– –	L,Y	
11731	X	HEAD-LAMP	F	3	U	24140	24200	L,Y	
11733	O	1.8 1.0 1.0 II 1.8 II	M	22 16 16 22	U	– – – –	– – – –	– – – –	PCB
11735	X	2.3 II	M	2	U	12330*	–	L,Y	
11736	O	2.3 II	F	2	U	12340*	–	L,Y	
11737	X	2.3 II	M	1	U	12330*	–	L,Y	
11738	X	2.3 II	F	1	U	12340*	–	L,Y	
11739	X	2.3 II	M	7	U	12330*	–	L,Y	
11740	X	2.3 II	F	7	U	12340*	–	L,Y	
11742	O	4.8	F	4	U	12380	–	Y	
11743	X	1.3	M	14	U	–	–	–	PCB
11744	X	1.3	M	14	U	–	–	–	PCB
11745	X	1.3	M	18	U	–	–	–	PCB
11746	X	1.3	M	22	U	–	–	–	PCB
11747	X	2.3 II	M	12	U	–	–	–	PCB
11748	X	2.3 II	M	18	U	–	–	–	PCB
11749	X	2.3 II	M	20	U	–	–	–	PCB
11750	X	2.3 II	M	20	U	–	–	–	PCB
11751	X	2.3 II	M	18	U	–	–	–	PCB
11752	X	2.3 II	M	10	U	–	–	–	PCB
11753	X	2.3 II	M	14	U	–	–	–	PCB
11757	X	2.3 II	M	10	U	12330*	–	L,Y	
11763	X	2.3 II	M	3	U	12330*	–	L,Y	
11764	O	2.3 II	F	3	U	12340*	–	L,Y	
11765	X	2.3 II	M	4	U	12330*	–	L,Y	
11766	X	2.3 II	F	4	U	12340*	–	L,Y	
11767	X	2.3 II	M	1	U	12330*	–	L,Y	
11769	X	2.3 II	F	2	U	12340*	–	L,Y	
11771	X	4.8 2.3 II	F	2 2	U	12380 12340*	– –	Y L,Y	
11772	X	2.3 II	F	5	U	12340*	–	L,Y	
11773	X	2.3 II	F	2	S	12440*	12590	L,Y	
11774	X	9.5	M	1	U	–	–	–	
11775	X	9.5	F	1	U	–	–	–	
11777	X	1.3	F	3	U	12420	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11778	O	4.8	F	6	U	12380	–	Y	
11779	O	2.3 II	M	4	U	12330*	–	L,Y	
11780	O	2.3 II	F	6	U	12340*	–	L,Y	
11781	X	2.3 II	F	10	U	12340*	–	L,Y	
11782	X	2.3 II	F	12	U	12340*	–	L,Y	
11784	O	4.8	F	2	S	12480	–	Y	
		2.3 II		7		12440*	12590	L,Y	
11785	X	1.0 J	M	48	U	–	–	–	PCB
		1.8 J		16		–	–	–	
11786	X	1.0 J	F	16	U	–	–	–	
		1.8 J		10		–	–	–	
11787	X	1.0 J	F	16	U	–	–	–	
11788	X	1.0 J	F	16	U	–	–	–	
		1.8 J		6		–	–	–	
11789	X	1.0 III	M	2	S	12710	–	L	
11790	X	1.0 III	F	2	S	12720*	–	L	
11791	X	2.3 II	F	14	U	12340*	–	L,Y	
11792	X	2.3 II	F	4	U	12340*	–	L,Y	
11794	X	VH	F	7	U	–	–	–	
11797	X	2.3 II	F	5	U	12340*	–	L,Y	
11799	X	4.8	F	4	U	12380	–	Y	
11800	X	2.3 II	F	10	U	12340*	–	L,Y	
11805	X	2.3 II	F	14	U	12340*	–	L,Y	
11809	X	4.8	M	4	U	12370	–	Y	
11812	X	2.3 II	M	4	U	12330*	–	L,Y	
11814	X	2.3 II	M	6	U	12330*	–	L,Y	
11817	X	2.3 II	F	10	U	12340*	–	L,Y	
11820	X	2.3 II	F	6	U	12340*	–	L,Y	
11823	X	2.3 II	M	10	U	12330*	–	L,Y	
11824	X	8.0	F	2	U	12400	–	Y	
11827	X	2.3 II	F	13	U	12340*	–	L,Y	
11839	X	2.3 II	F	2	U	12340*	–	L,Y	
11840	X	2.3 II	F	2	U	12340*	–	L,Y	
11841	X	2.3 II	F	4	U	12340*	–	L,Y	
11842	X	2.3 II	F	4	U	12340*	–	L,Y	
11843	X	2.3 II	M	5	U	12330*	–	L,Y	
11847	X	2.3 II	F	12	U	12340*	–	L,Y	
11848	X	2.3 II	F	13	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
11851	X	4.8 2.3 II	F	4 20	S	12480 –	– 12790*	Y L,Y	
11853	X	6.3	F	1	U	12060	12580	Y	
11854	X	1.0 III	M	2	S	12710	–	L	
11856	O	1.0 III	F	2	S	12720*	–	L	
11857	X	1.0 III	F	4	S	12720*	–	L	
11858	O	2.3 II	F	6	S	12440*	12590	L,Y	
11859	X	2.3 II	F	2	S	12440*	12590	L,Y	
11860	X	2.3 II	F	3	S	12440*	12590	L,Y	
11861	X	4.8 1.5	F	25 25	S	12480 –	– –	Y –	
11862	O	PAI 1	F	2	U	–	–	–	
11863	X	1.0 III	M	2	S	12710	–	L	
11864	X	1.0 III	F	2	S	12720*	–	L	
11865	X	1.0 III	M	2	S	12710	–	L	
11866	X	1.0 III	M	44	U	–	–	–	PCB
11867	X	1.0 III	F	12	U	12690*	–	L	
11868	X	1.0 III	F	20	U	12690*	–	L	
11869	X	1.0 III	F	12	U	12690*	–	L	
11870	X	1.0 III	M	52	U	–	–	–	PCB
11871	X	1.0 III	F	12	U	12690*	–	L	
11872	X	1.0 III	F	28	U	12690*	–	L	
11873	X	1.0 III	F	12	U	12690*	–	L	
11874	X	2.3 II	M	3	U	–	–	–	PCB
11875	O	2.3 II	F	2	S	–	12790*	L,Y	
11876	X	1.0 III 2.3 II	M	19 6	U	– –	– –	– –	PCB
11877	O	1.0 III 2.3 II	F	19 6	U	12690* 12340*	– –	L L,Y	
11878	O	4.8	M	4	U	12370	–	Y	
11879	X	4.8	F	6	U	12380	–	Y	
11880	X	8.0	F	3	U	12400	–	Y	
11881	X	9.5	F	1	U	–	–	–	
11882	X	4.8 2.3 II	F	4 20	S	12480 –	– 12790*	Y L,Y	
11883	X	1.0 III	M	2	U	12670*	–	L	
11884	X	1.0 III	F	2	U	12690*	–	L	
11885	O	2.3 II	F	4	S	–	12790*	L,Y	
11886	O	1.0 III	F	2	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11889	X	1.0 III	M	2	U	12670*	–	L	
11890	X	1.0 III	F	2	U	12690*	–	L	
11891	X	1.0 III	M	4	U	12670*	–	L	
11892	X	1.0 III	F	4	U	12690*	–	L	
11893	X	4.8 2.3 II	F	4 20	S	12480 –	– 12790*	Y L,Y	
11898	X	1.0 III	F	2	S	12720*	–	L	
11899	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
11900	X	2.3 II	F	2	S	–	12790*	L,Y	
11901	X	2.3 II	M	2	S	12430*	–	L,Y	
11902	O	1.8 1.0	M	6 32	U	– –	– –	– –	PCB
11903	X	1.0 III 1.0 III	M	5 44	U	– –	– –	– –	PCB
11904	X	1.0 III	M	5	S	12710	–	L	
11905	X	1.3 2.3 II	M	16 4	U	– –	– –	– –	PCB
11906	X	SL	F	83	U	12130	–	L,Y	
11907	X	SL	F	3	S	–	–	–	
11908	X	SL	F	5	U	12130	–	L,Y	
11909	O	1.0 III	F	5	U	12690*	–	L	
11910	X	1.0 III	M	14	U	12670*	–	L	
11911	O	1.0 III	F	14	U	12690*	–	L	
11912	X	1.0 III	M	18	U	12670*	–	L	
11913	O	1.0 III	F	18	U	12690*	–	L	
11914	O	1.0 III	F	18	U	12640	–	L	IDC
11915	O	1.0 III	F	22	U	12690*	–	L	
11916	X	1.0 III	M	40	U	–	–	–	PCB
11917	X	1.0 III	M	2	U	12670*	–	L	
11918	O	1.0 III	F	2	U	12690*	–	L	
11919	O	1.0 III	F	2	U	12640	–	L	IDC
11920	O	1.0 III	M	5	U	12670*	–	L	
11921	O	1.0 III	F	5	U	12640	–	L	IDC
11922	X	1.0 III	M	10	U	12670*	–	L	
11923	O	1.0 III	F	10	U	12690*	–	L	
11924	O	1.0 III	F	10	U	12640	–	L	IDC
11925	O	1.0 III	F	14	U	12640	–	L	IDC
11926	O	1.0 III	M	22	U	12670*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11927	O	1.0 III	F	22	U	12640	–	L	IDC
11928	X	1.0 III	M	54	U	–	–	–	PCB
11929	X	2.3 II	M	4	S	12430*	–	L,Y	
11930	X	2.3 II	F	4	S	12440*	12590	L,Y	
11933	X	1.0 III	M	2	U	12670*	–	L	
11934	X	1.0 III 1.0 IV	M	81 24	U	– –	– –	– –	PCB
11935	X	1.0 III 1.0 IV	F	20 11	U	12690* 12740	– –	L L	
11936	X	8.0	M	3	U	12390	–	Y	
11937	X	INVERT-ER	M	3	U	–	–	–	
11938	X	INVERT-ER	F	3	U	–	–	–	
11939	O	–	–	–	–	–	–	–	
11940	X	PIN	M	2	S	–	–	–	
11941	X	LA	F	1	S	–	–	–	
11942	O	LA	F	1	S	–	–	–	
11943	X	SOCK-ET	F	1	S	–	–	–	
11944	O	SOCK-ET	F	1	S	–	–	–	
11945	O	PIN	M	2	S	–	–	–	
11946	X	1.0 III	M	5	U	–	–	–	PCB
11947	X	1.0 III 2.3 II	F	8 4	U	12690* 12340*	– –	L L,Y	
11948	O	1.0 III	F	10	U	12640	–	L	IDC
11949	X	1.0 III	M	18	U	–	–	–	PCB
11950	X	1.0 III	F	4	U	12690*	–	L	
11951	X	1.0 III	M	13	U	–	–	–	PCB
11952	X	1.0 III	F	13	U	12690*	–	L	
11953	X	1.0 III 2.3 II	M	64 14	U	– –	– –	– –	PCB
11954	X	1.0 III 2.3 II	F	8 9	U	12690* 12340*	– –	L L,Y	
11955	X	1.0 III	F	19	U	12690*	–	L	
11956	X	1.0 III	F	21	U	12690*	–	L	
11957	X	1.0 III 2.3 II	F	16 5	U	12690* 12340*	– –	L L,Y	
11960	X	2.3 II	F	5	S	12440*	12590	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11961	X	1.0 III 1.0 III	M	5 28	U	– –	– –	– –	PCB
11962	X	9.5	M	1	S	–	–	–	
11963	X	9.5	F	1	S	–	–	–	
11964	O	2.3 II	F	4	S	12440*	12590	L,Y	
11965	X	8.0	M	4	U	–	–	–	PCB
11966	X	1.0 II	M	22	U	–	–	–	PCB
11967	O	1.0 III	M	2	U	12670*	–	L	
11968	X	1.0 III	M	5	U	–	–	–	PCB
11969	X	1.0 III	M	14	U	–	–	–	PCB
11970	X	1.0 III 2.3 II	M	16 4	U	– –	– –	– –	PCB
11971	X	1.0 III 2.3 II	F	16 4	U	12690* 12340*	– –	L L,Y	
11972	X	1.0 III 2.3 II	M	49 14	U	– –	– –	– –	PCB
11973	O	1.0 III 2.3 II	F	10 8	U	12690* 12340*	– –	L L,Y	
11974	X	1.0 III	F	20	U	12690*	–	L	
11976	O	–	–	–	–	–	–	–	
11978	X	OBD II	F	16	U	–	–	–	
11985	X	1.0 III	M	4	U	–	–	–	PCB
11986	O	1.0 III	F	6	U	12690*	–	L	
11987	X	1.0 III	F	3	U	12690*	–	L	
11988	O	1.0 III	F	4	U	12640	–	L	IDC
11989	X	1.0 III	F	8	U	12690*	–	L	
11990	X	1.0 III 2.3 II	M	37 18	U	– –	– –	– –	PCB
11992	X	1.0 III	M	2	U	12670*	–	L	
11993	X	1.0 III	M	10	U	–	–	–	PCB
11994	X	2.3 II	M	3	U	–	–	–	PCB
11995	O	–	–	–	–	–	–	–	
11996	X	9.5	F	2	U	–	–	–	
12002	X	1.0 III 2.3 II	M	6 5	U	12670* 12330*	– –	L L,Y	
12003	X	1.0 III 2.3 II	F	6 5	U	12690* 12340*	– –	L L,Y	
12004	X	1.0	M	6	U	–	–	–	IDC
12005	X	2.3 II	F	4	S	–	12790*	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12006	O	–	–	–	–	–	–	–	
12007	X	1.0 III 2.3 II	F	4 9	U	12690* 12340*	– –	L L,Y	
12008	O	1.0 III 2.3 II	F	2 8	U	12690* 12340*	– –	L L,Y	
12009	X	1.0 III	M	10	U	–	–	–	PCB
12010	X	1.0 III 2.3 II	M	10 8	U	– –	– –	– –	PCB
12011	X	1.0 III	M	18	U	–	–	–	PCB
12012	X	1.0 III	F	6	U	12690*	–	L	
12013	X	1.0 III	M	6	U	–	–	–	PCB
12014	X	2.3 II	F	2	U	12340*	–	L,Y	
12015	X	1.0 III	M	14	U	–	–	–	PCB
12016	X	1.0 III	M	4	U	12670*	–	L	
12017	X	1.0 III	F	4	U	12690*	–	L	
12018	X	2.3 II	F	4	U	12340*	–	L,Y	
12019	X	1.0 III	F	4	U	12640	–	L	IDC
12020	O	4.8 1.0 III	F	4 30	S	12480 12720*	– –	Y L	
12021	O	4.8 1.0 III	F	4 23	S	12480 12720*	– –	Y L	
12022	X	4.8 1.0 III	F	4 16	S	12480 12720*	– –	Y L	
12023	X	1.0 III	M	10	U	12660	–	L	IDC
12024	X	1.0 III	M	22	U	12670*	–	L	
12025	X	1.0 III 2.3 II	M	16 4	U	12670* 12330*	– –	L L,Y	
12026	X	2.3 II	F	9	U	24220	–	L	IDC
12027	X	2.3 II	F	13	U	24220	–	L	IDC
12028	O	2.3 II	F	2	S	12440*	12590	L,Y	
12029	X	1.0	M	2	U	–	–	–	
12030	X	1.0 III	M	22	U	–	–	–	PCB
12031	X	1.0 J 1.8 J	M	60 16	U	– –	– –	– –	PCB
12032	X	1.0 J	F	12	U	–	–	–	
12033	X	4.8 1.0 III	M	2 18	U	– –	– –	– –	PCB
12034	X	4.8 1.0 III	F	2 18	U	12380 12690*	– –	Y L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
12035	X	1.0 III 2.3 II	M	41 6	U	– –	– –	– –	PCB
12036	X	1.0 III	M	5	U	–	–	–	PCB
12037	X	1.0 III 2.3 II	M	16 4	U	– –	– –	– –	PCB
12038	O	1.0 III 2.3 II	F	16 4	U	12690* 12340*	– –	L L,Y	
12039	X	VH	F	2	U	–	–	–	
12041	X	HFC	M	1	U	–	–	–	
12050	X	1.0 III	M	5	U	–	–	–	PCB
12055	X	1.0 III 1.0 IV	M	100 22	U	– –	– –	– –	PCB
12056	X	0.64	F	6	U	–	–	–	
12057	X	2.3 II	F	4	S	12440*	12590	L,Y	
12058	X	4.8 8.0	F	1 2	S	12480 12500	– –	Y Y	
12059	X	1.0 III	M	7	U	12670*	–	L	
12060	X	1.0 III	F	7	U	12690*	–	L	
12061	X	1.0 III	M	8	U	–	–	–	PCB
12062	X	1.0 III	M	2	U	12670*	–	L	
12063	X	1.0 III	F	2	U	12690*	–	L	
12064	X	1.0 III	M	6	U	–	–	–	PCB
12067	X	1.0 III	F	6	U	12690*	–	L	
12068	X	8.0	F	2	S	12500	–	Y	
12070	X	2.3 II	F	24	U	12340*	–	L,Y	
12071	X	2.3 II	F	32	U	12340*	–	L,Y	
12079	X	B TO J	F	24	U	–	–	–	
12080	X	1.0 III	F	8	S	12720*	–	L	
12081	X	1.0 III	M	29	U	12670*	–	L	
12082	X	1.0 III	F	14	U	12690*	–	L	
12087	X	1.0 III	M	20	U	–	–	–	PCB
12088	O	2.3 II	F	2	U	12340*	–	L,Y	
12089	X	2.3 II	F	2	U	12340*	–	L,Y	
12090	X	2.3 II	F	12	U	12340*	–	L,Y	
12091	X	1.0 III	F	8	U	12690*	–	L	
12092	O	0.64 1.0 IV	F	5 2	U	– 12740	– –	– L	
12093	X	1.0 III	M	16	U	–	–	–	PCB
12094	X	1.0 III	F	16	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12095	X	M6 NUT	F	3	S	–	–	–	
12096	X	1.0 III 2.3 II	F	12 20	U	12690* 12340*	– –	L L,Y	
12101	X	2.3 II	F	16	U	12340*	–	L,Y	
12102	X	2.3 II	F	28	U	12340*	–	L,Y	
12104	X	2.3 II	F	16	U	12340*	–	L,Y	
12105	X	2.3 II	M	16	U	12330*	–	L,Y	
12106	X	2.3 II	F	20	U	12340*	–	L,Y	
12108	X	2.3 II	M	18	U	–	–	–	PCB
12109	X	PAI 1	F	2	U	–	–	–	
12110	X	VALVE	F	2	U	–	–	–	
12111	X	VALVE	F	2	U	–	–	–	
12112	X	1.0 III	M	8	U	–	–	–	PCB
12113	X	1.0 III	F	8	U	12690*	–	L	
12114	X	1.0 III 2.3 II	F	6 28	U	12690* 12340*	– –	L L,Y	
12116	O	4.8 1.0 III	F	4 20	S	12480 12720*	– –	Y L	
12117	X	2.3 II	F	2	S	–	12790*	L,Y	
12118	X	8.0	M	2	U	–	–	–	PCB
12119	X	8.0	M	2	U	–	–	–	PCB
12120	X	8.0	F	2	U	12400	–	Y	
12122	X	1.0 III 2.3 II	F	6 12	U	12690* 12340*	– –	L L,Y	
12123	X	1.0 III	M	4	U	12670*	–	L	
12125	X	LA	F	1	S	–	–	–	
12129	X	LA	F	1	S	–	–	–	
12131	X	BUS–BAR	M	3	S	–	–	–	
12134	X	1.0 III	M	10	U	–	–	–	PCB
12135	X	1.0 III	F	10	U	12690*	–	L	
12136	X	LA	F	1	S	–	–	–	
12137	X	1.0 III 2.3 II	M	14 6	U	– –	– –	– –	PCB
12138	O	PAI 1	F	2	U	–	–	–	
12140	X	1.0 II 1.8 II	M	48 16	U	– –	– –	– –	PCB
12141	X	0.64 1.0 IV	M	133 34	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
12142	X	0.64 1.0 IV	F	24 7	U	12750* 12740	– –	L L	
12143	X	0.64 1.0 IV	F	25 7	U	12750* 12740	– –	L L	
12144	X	0.64 1.0 IV	F	27 7	U	12750* 12740	– –	L L	
12145	X	0.64 1.0 IV	F	28 7	U	12750* 12740	– –	L L	
12146	X	0.64 1.0 IV	F	29 6	U	12750* 12740	– –	L L	
12147	X	0.64 2.3 II	M	68 12	U	– –	– –	– –	PCB
12148	X	0.64 2.3 II	M	40 10	U	– –	– –	– –	PCB
12149	X	0.64 2.3 II	F	20 4	U	12750* 12340*	– –	L L,Y	
12150	X	0.64 2.3 II	F	20 6	U	12750* 12340*	– –	L L,Y	
12151	X	0.64 2.3 II	F	28 2	U	12750* 12340*	– –	L L,Y	
12152	X	0.64	M	32	U	–	–	–	PCB
12153	X	0.64	F	32	U	12750*	–	L	
12155	X	0.64	F	16	U	12750*	–	L	
12156	X	0.64	F	16	U	12770	–	L	IDC
12157	X	0.64	M	16	U	–	–	–	PCB
12159	X	1.0 III	M	4	U	12670*	–	L	
12160	X	1.0 III	F	4	U	12690*	–	L	
12161	X	1.0 III 2.3 II	M	8 9	U	12670* 12330*	– –	L L,Y	
12162	X	1.0 III	F	10	U	12690*	–	L	
12163	X	2.3 II	M	8	S	12430*	–	L,Y	
12164	X	2.3 II	F	8	S	12440*	12590	L,Y	
12165	O	–	–	–	–	–	–	–	
12166	X	1.0 III 2.3 II	F	14 6	U	12690* 12340*	– –	L L,Y	
12167	X	1.0 III	M	8	U	–	–	–	PCB
12168	X	1.0 III	F	3	S	12720*	–	L	
12169	X	0.64	F	40	U	12750*	–	L	
12170	X	0.64	F	40	U	12770	–	L	IDC

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12171	X	0.64	M	40	U	–	–	–	PCB
12174	X	1.0 II	F	18	U	24020*	–	L	IDC
12176	O	2.3 II	F	4	S	–	12790*	L,Y	
12177	X	2.3 II	M	4	S	–	–	L,Y	
12179	X	1.0 III 2.3 II	F	42 4	U	12690* 12340*	– –	L L,Y	
12182	X	0.64	M	12	U	–	–	–	PCB
12183	X	0.64	F	12	U	12750*	–	L	
12184	X	1.0 III 2.3 II	F	30 12	U	12690* 12340*	– –	L L,Y	
12188	X	2.3 II	F	2	S	12440*	12590	L,Y	
12189	X	1.0 III	M	5	U	12670*	–	L	
12190	X	1.0 III	F	5	U	12690*	–	L	
12191	X	PAI 1	F	2	U	–	–	–	
12192	X	0.64	M	16	U	–	–	–	
12193	X	0.64	M	24	U	–	–	–	
12194	X	1.0 III	M	2	S	12710	–	L	
12195	X	1.0 III	F	2	S	12720*	–	L	
12196	X	D–3	M	3	U	–	–	–	
12197	X	D–3	F	3	U	–	–	–	
12198	X	D–3	M	6	U	–	–	–	
12199	X	D–3	F	6	U	–	–	–	
12200	X	0.64	F	24	U	12750*	–	L	
12202	X	0.64 2.3 II	M	20 6	U	– –	– –	– –	PCB
12203	X	0.64 2.3 II	F	20 6	U	12750* 12340*	– –	L L,Y	
12204	X	1.0 III	M	6	U	12670*	–	L	
12205	X	2.3 II	M	12	U	–	–	–	PCB
12206	X	2.3 II	M	16	U	–	–	–	PCB
12207	X	1.0 III 2.3 II	M	26 8	U	– –	– –	– –	PCB
12208	X	1.0 III	M	6	U	–	–	–	PCB
12209	O	1.0 III	F	6	U	12690*	–	L	
12210	X	1.0 III	M	4	U	–	–	–	PCB
12211	O	1.0 III	F	4	U	12690*	–	L	
12212	X	1.0 III	M	4	U	12670*	–	L	
12213	X	0.64	M	40	U	–	–	–	PCB
12214	X	0.64	M	24	U	–	–	–	PCB

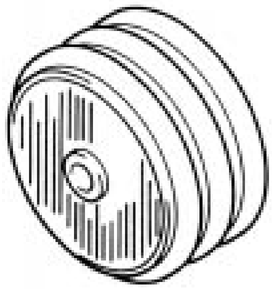
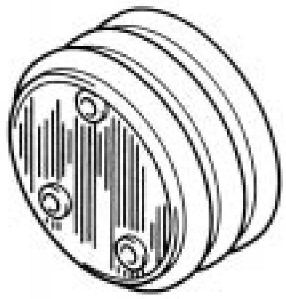
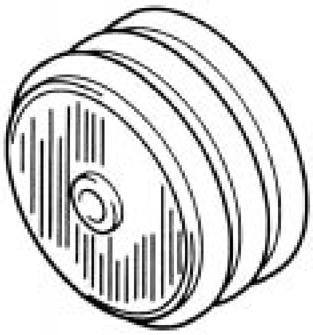
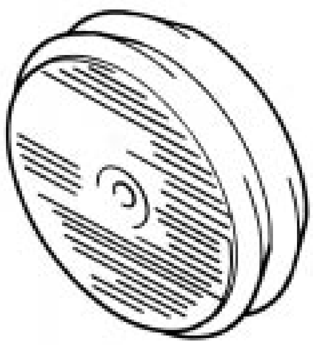
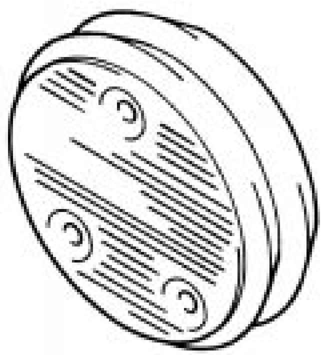
HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12215	X	0.64	M	24	U	–	–	–	PCB
12216	X	0.64	M	8	U	–	–	–	PCB
12217	X	0.64	F	8	U	12750*	–	L	
12218	X	PAI 1	M	2	U	–	–	–	
12219	X	PAI 1	F	2	U	–	–	–	
12220	X	0.64	M	8	U	–	–	–	PCB
12221	X	0.64	F	8	U	12750*	–	L	
12222	X	0.64	F	12	U	12750*	–	L	
12223	X	PAI 1	M	2	U	–	–	–	
12224	X	PAI 1	F	2	U	–	–	–	
12225	X	0.64	F	4	U	12750*	–	L	Splash Proof
12226	X	1.0 III 2.3 II	F	6 4	U	12690* 12340*	– –	L L,Y	
12227	X	9.5	M	3	S	–	–	–	
12228	X	9.5	F	3	S	–	–	–	
12230	X	LA	F	1	S	–	–	–	
12231	X	LA	F	1	S	–	–	–	
12232	X	0.64 1.0 IV	M	108 27	U	– –	– –	– –	PCB
12233	X	0.64 2.3 II	M	20 6	U	– –	– –	– –	PCB
12234	X	4.8	M	3	S	12470	–	Y	
12237	X	4.8	F	3	S	12480	–	Y	
12241	X	0.64	F	2	U	12750*	–	L	Splash Proof
12242	X	PAI 1	F	2	U	–	–	–	
12243	X	PAI 1	F	2	U	–	–	–	
12249	X	2.3 II	M	10	U	12330*	–	L,Y	
12250	X	0.64	M	11	U	–	–	–	
12251	X	0.64	F	11	U	12750*	–	L	
12252	X	0.64	M	16	U	–	–	–	
12253	O	PAI 1	F	2	U	–	–	–	
12258	X	0.64	M	20	U	–	–	–	PCB
12259	X	0.64	F	20	U	12750*	–	L	
12260	X	0.64	M	24	U	–	–	–	PCB
12269	X	0.64	M	12	U	–	–	–	PCB
12270	X	0.64	M	24	U	–	–	–	PCB
12271	X	1.0 III 2.3 II	F	20 6	U	12690* 12340*	– –	L L,Y	
12272	X	1.0 III	F	10	U	12690*	–	L	

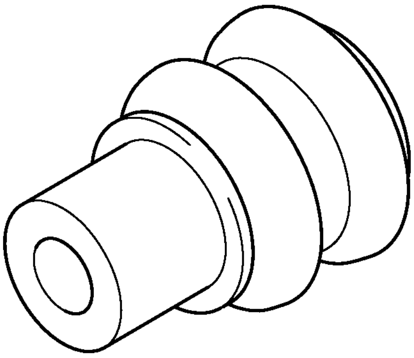
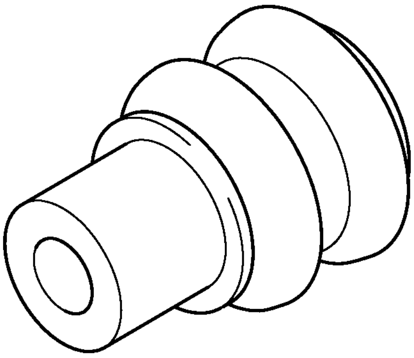
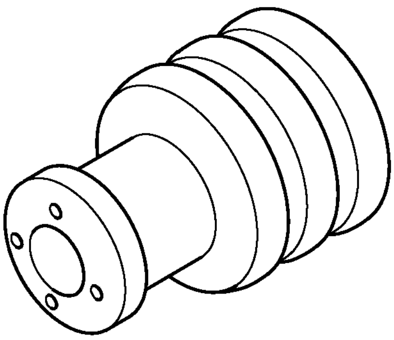
HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire 160 mm Type	Part No. of Repair Wire 500 mm Type	Sleeve Color	Memo
90980–						82998–	82998–		
12273	X	1.0 III 2.3 II	F	6 6	U	12690* 12340*	– –	L L,Y	
12274	X	1.0 III 2.3 II	F	18 18	U	12690* 12340*	– –	L L,Y	
12275	X	1.0 III 2.3 II	F	8 24	U	12690* 12340*	– –	L L,Y	
12276	X	1.0 III 2.3 II	F	24 14	U	12690* 12340*	– –	L L,Y	
12277	X	1.0 III 2.3 II	F	10 20	U	12690* 12340*	– –	L L,Y	
12278	X	4.8 1.0 III 2.3 II	F	1 6 18	U	12380 12690* 12340*	– – –	Y L L,Y	
12291	X	1.0 III	M	39	U	–	–	–	PCB
12296	X	0.64	F	3	U	12750*	–	L	

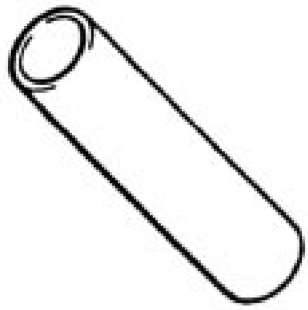
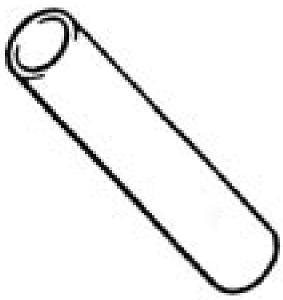
Terminal Packing

Type	**6.3**	
Cav. No.	1	3
		
P/N	90980–09210	90980–09211
Type	**7.7**	
Cav. No.	1	
		—
P/N	90980–09380	
Type	**TODC**	
Cav. No.	1	3
		
P/N	90980–09378	90980–09379

Terminal Packing

Type	**2.3**	
Cav. No.	1	
		
P/N	90980–09148, 09151, 09149	
Type	**2.3II**	
Cav. No.	1	
		
P/N	90980–09451	
Type	**HB3, HB4**	
Cav. No.	1	
		
P/N	90980–09396	

Press Sleeve

Color	**YELLOW**	**BLUE**
		
P/N	82999–12030	82999–12020
Color	**RED**	
		
P/N	82999–12010	

BRAKE

030FQ-05

SERVICE DATA

Brake pedal height (from asphalt sheet)		138 to 148 mm (5.433 to 5.827 in.)
Brake pedal stroke sensor	Standard value:	0.8 to 1.2 V
Brake pedal freeplay	Pedal free play:	0.5 to 4 mm (0.02 to 0.16 in.)
Stop lamp switch clearance		0.5 to 2.4 mm (0.02 to 0.095 in.)
Pedal reserve distance from asphalt sheet at 196 N (20 kgf, 44.1 lbf)		More than 104 mm (4.1 in.)
Front brake pad thickness	Standard thickness: Minimum thickness:	11.0 mm (0.433 in.) 1.0 mm (0.039 in.)
Front brake disc thickness	Standard thickness: Minimum thickness:	22.0 mm (0.866 in.) 20.0 mm (0.787 in.)
Front brake disc runout	Maximum disc runout:	0.05 mm (0.0020 in.)
Rear brake drum inside diameter	Standard inside diameter: Minimum inside diameter:	200.0 mm (7.874 in.) 201.0 mm (7.913 in.)
Rear drum brake shoe lining thickness	Standard thickness: Minimum thickness:	4.0 mm (0.157 in.) 1.0 mm (0.039 in.)
Brake drum to brake shoe clearance	Clearance:	0.6 mm (0.024 in.)

030FR-06

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Brake line union nut	15	155	11
Bleeder plug	8.4	86	74 in.·lbf
Brake booster clevis lock nut	26	265	19
Stop lamp lock nut	26	265	19
Brake stroke sensor assy set bolt	9.3	95	82 in.·lbf
Brake pedal sub-assy set bolt	37	375	27
Brake pedal support assy x Body	13	130	9
Brake pedal support assy x Reinforcement	24	241	18
Brake master cylinder union No.1 set screw	1.8	18	16 in.·lbf
Brake master cylinder x Bracket	13	127	9
Brake actuator bracket x Tube bracket	5.0	51	44 in.·lbf
Cowl top panel sub-assy outer front	6.4	65	57 in.·lbf
Engine room R/B No.2 x Body	8.4	86	74 in.·lbf
Brake stroke simulator stud bolt	5.0	51	44 in.·lbf
Brake stroke simulator x Bracket	6.0	61	53 in.·lbf
Brake stroke simulator Bracket x Body	8.5	87	75 in.·lbf
Brake stroke simulator x Brake actuator tube assy	8.5	87	75 in.·lbf
Wheel nut	103	1,050	76
Front brake cylinder mounting x Steering knuckle	109	1,114	81
Front brake cylinder x Front brake cylinder mounting	34	347	25
Front brake cylinder x Flexible hose	33	337	24
Rear drum brake wheel cylinder x Backing plate	9.8	100	87 in.·lbf
Brake actuator assy x Brake actuator bracket No.2	18	184	13
Brake actuator assy x Gusset assy	7.5	76	66 in.·lbf
Brake actuator assy x Bracket	18	184	13
Brake actuator assy x Brake actuator damper	18	184	13
Brake actuator w/ gusset assy x Body	20	200	15
Brake actuator assy x Brake tube clamp bracket	5.0	51	44
Brake actuator x Brake actuator tube assy	8.5	87	75 in.·lbf
Brake actuator bracket x Front brake tube No.5 bracket	5.0	51	44 in.·lbf
Front speed sensor x Steering knuckle	8.0	82	71 in.·lbf
Front speed sensor wire harness clamp x Body Bolt A:	8.0	82	71 in.·lbf
Front speed sensor wire harness clamp x Shock absorber Bolt B:	19	192	14
Skid control ECU assy x Body	5.0	51	44 in.·lbf
Brake control power supply assy x Body	19	194	14
Yawrate sensor x Body	19	194	14

COOLING

031LQ-02

SERVICE DATA

Thermostat Valve opening temperature Valve lift	 at 95°C (205°F)	 80 to 84°C (176 to 183°F) 8.5 mm (0.335 in.) or more
Radiator cap sub-assy Standard opening pressure Minimum opening pressure		 74 to 103 kPa (0.75 to 1.05 kgf/cm2, 10.7 to 14.9 psi) 59 kPa (0.6 kgf/cm^2, 8.5 psi)
Cooling fan Standard amperage		 9.2 to 11.0 A
Cooling fan relay Specified condition Cooling fan relay No.2 Specified condition	 Between terminals 3 and 5 Between terminals 3 and 5 Between terminals 3 and 4 Between terminals 3 and 5 Between terminals 3 and 5	 10 kΩ or higher Below 1 Ω (Apply battery voltage to terminals 1 and 2) Below 1 Ω 10 kΩ or higher Below 1 Ω (Apply battery voltage to terminals 1 and 2)
Integration relay Specified condition	 Between terminals B1 and B4 Between terminals B1 and B4	 10 kΩ or higher Below 1 Ω (Apply battery voltage to terminals 1 and 2)

DRIVE SHAFT / PROPELLER SHAFT / AXLE

031UL-01

SERVICE DATA

Front axle hub bearing: Backlash	Maximum: 0.05 mm (0.0020 in.)
Front axle hub sub-assy: Deviation	Maximum: 0.05 mm (0.0020 in.)
Rear axle hub & bearing assy: Backlash	Maximum: 0.05 mm (0.0020 in.)
Rear axle hub & bearing assy: Deviation	Maximum: 0.07 mm (0.0028 in.)

031UM-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Front wheel set nut	103	1,050	76
Rear wheel set nut	103	1,050	76
transaxle x drain plug	39	398	29
Tie rod end sub-assy x Steering knuckle	49	500	36
Suspension arm sub-assy lower No.1 x Steering knuckle	89	908	66
Flexible hose and speed sensor front x Shock absorber assy front	29	300	22
Speed sensor front x Steering knuckle	8.0	82	71 in.·lbf
Front axle hub nut	216	2,200	159
Front axle assy x Shock absorber assy front	153	1,560	113
Front disc brake caliper assy x Steering knuckle	109	1,114	81
Rear axle hub & bearing assy x Rear axle beam	61	622	45
Steering knuckle x Lower ball joint assy	71	724	52
Steering knuckle x Front axle hub	56	571	41

CALIBRATION

1. INITIALIZATION OF TORQUE SENSOR ZERO POINT CALIBRATION SIGNAL

NOTICE:

Under the following conditions, perform torque sensor zero point calibration after initializing the torque sensor zero point calibration signal in the ECU:

- **The steering column assy (containing the torque sensor) has been replaced.**
- **The power steering ECU assy has been replaced.**
- **The steering wheel has been replaced.**
- **The steering gear assy has been replaced.**
- **There is a difference in steering effort between right and left.**

(a) Center the steering wheel and align the front wheels straight ahead.

(b) Connect the hand-held tester to the DLC3.

(c) Turn the power switch on (IG) and then initialize the torque sensor zero point calibration signal by following the tester screen.

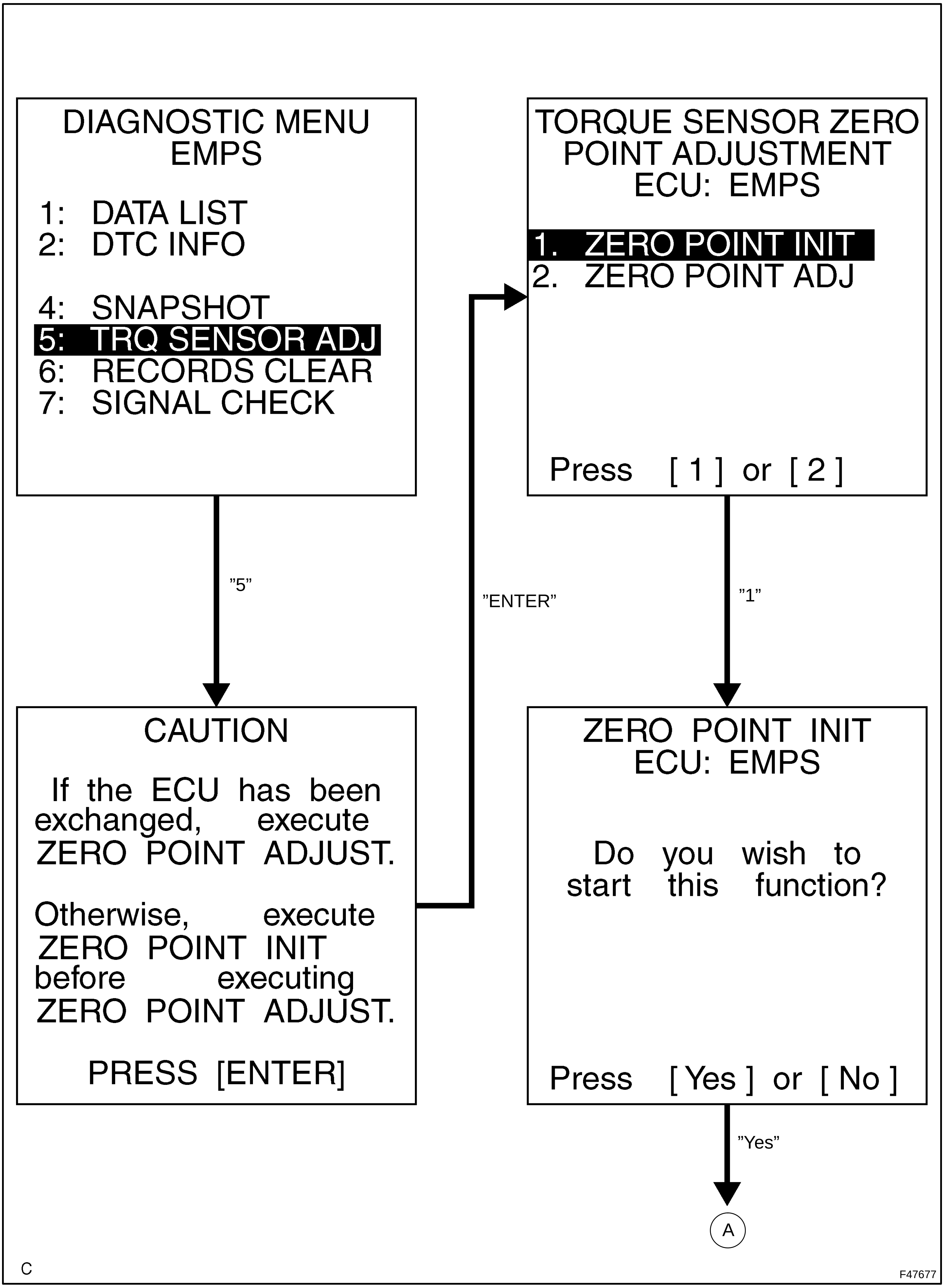
NOTICE:

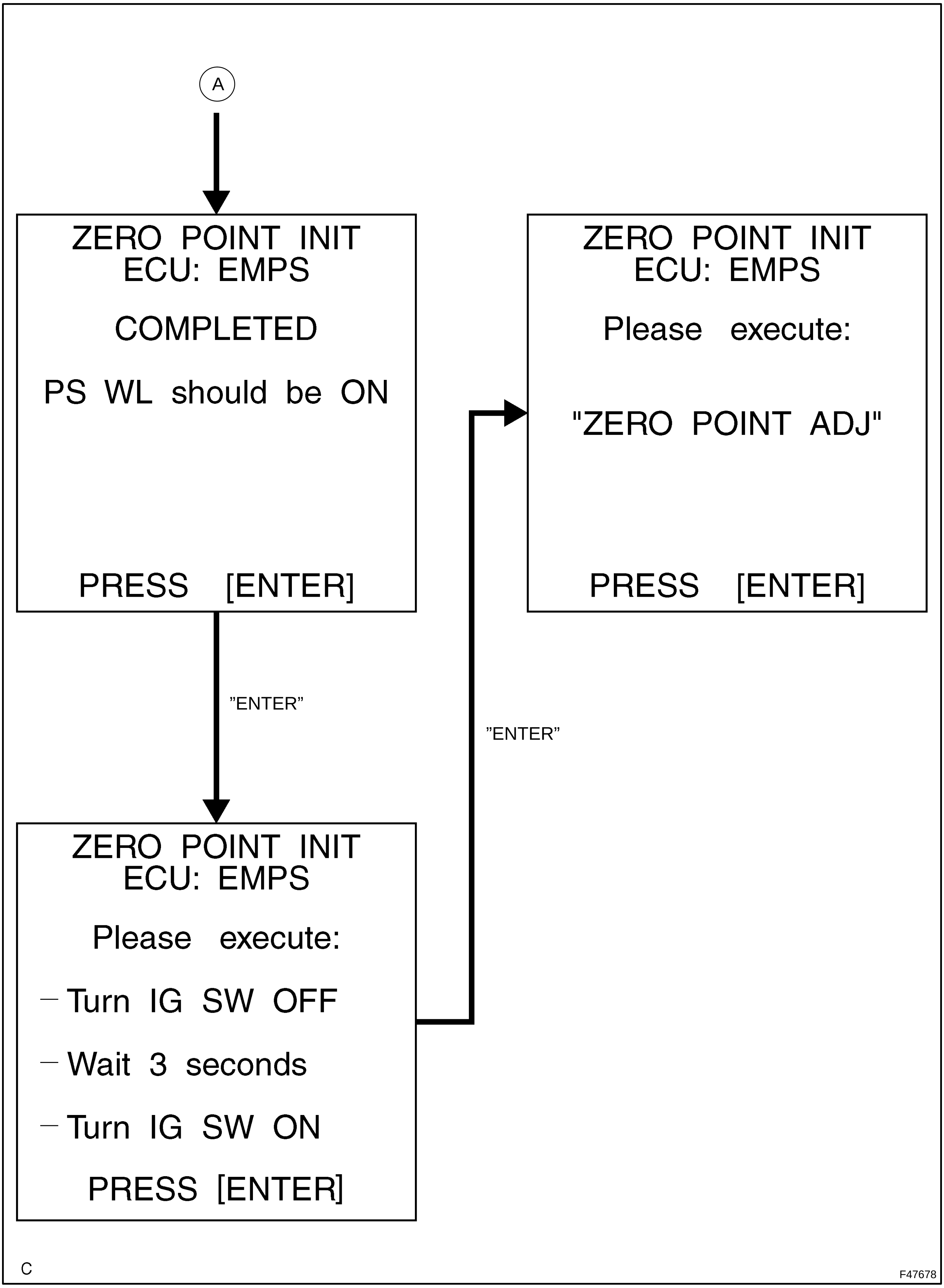
Do not turn the steering wheel while initializing the zero point calibration signal.

(d) Perform steering zero point calibration after turning the power switch off.

NOTICE:

Zero point calibration cannot be carried out with the power switch on (IG) after initialization of the zero point calibration signal is completed.


DIAGNOSTIC MENU
EMPS
1: DATA LIST
2: DTC INFO
4: SNAPSHOT
5: TRQ SENSOR ADJ
6: RECORDS CLEAR
7: SIGNAL CHECK
"5"
CAUTION
If the ECU has been exchanged, execute ZERO POINT ADJUST.
Otherwise, execute ZERO POINT INIT before executing ZERO POINT ADJUST.
PRESS [ENTER]
"ENTER"
TORQUE SENSOR ZERO POINT ADJUSTMENT
ECU: EMPS
1. ZERO POINT INIT
2. ZERO POINT ADJ
Press [1] or [2]
"1"
ZERO POINT INIT
ECU: EMPS
Do you wish to start this function?
Press [Yes] or [No]
"Yes"
A
C
F47677


A
ZERO POINT INIT
ECU: EMPS
COMPLETED
PS WL should be ON
PRESS [ENTER]
"ENTER"
ZERO POINT INIT
ECU: EMPS
Please execute:
– Turn IG SW OFF
– Wait 3 seconds
– Turn IG SW ON
PRESS [ENTER]
"ENTER"
ZERO POINT INIT
ECU: EMPS
Please execute:
"ZERO POINT ADJ"
PRESS [ENTER]
C
F47678

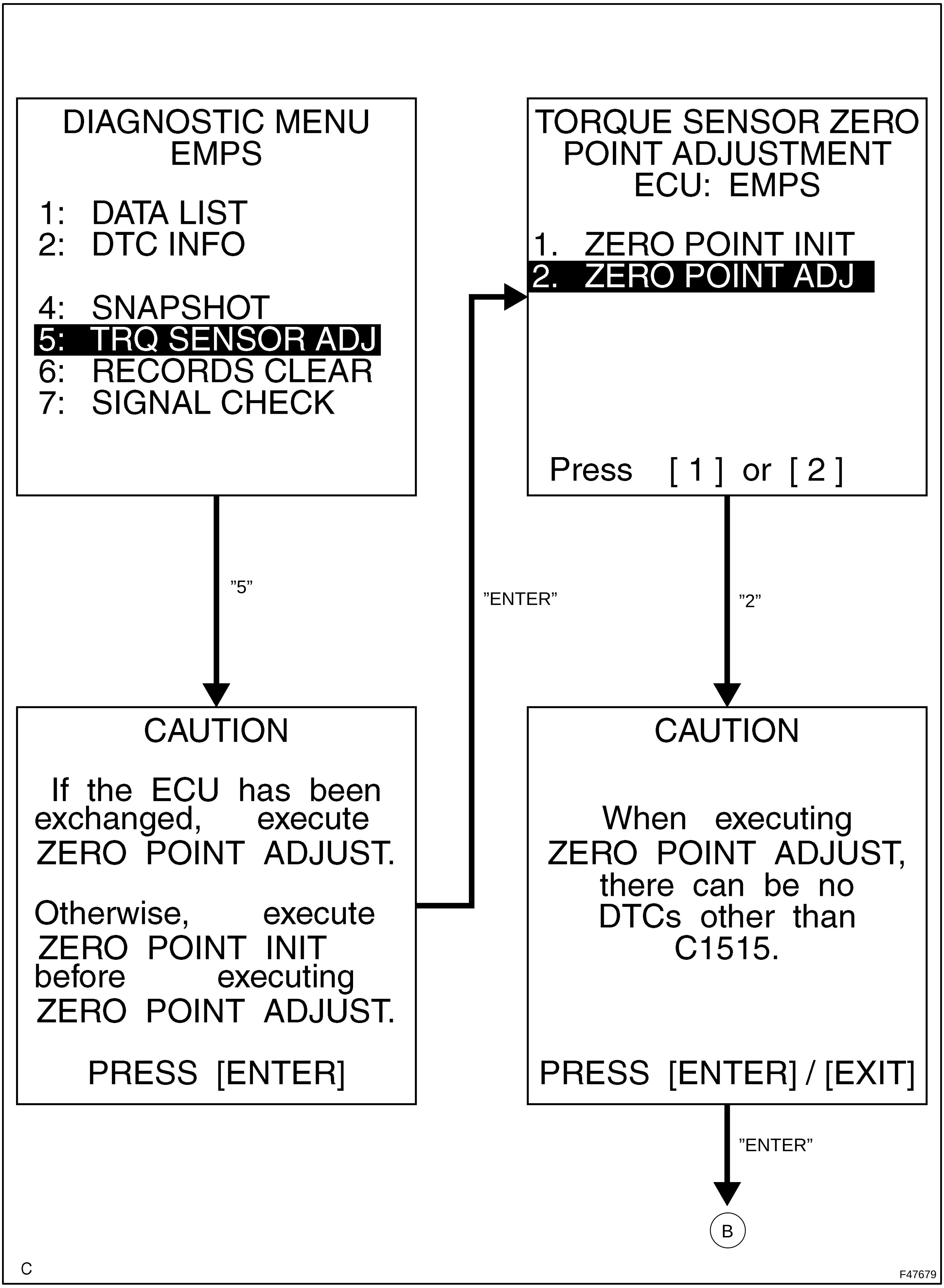
2. TORQUE SENSOR ZERO POINT CALIBRATION

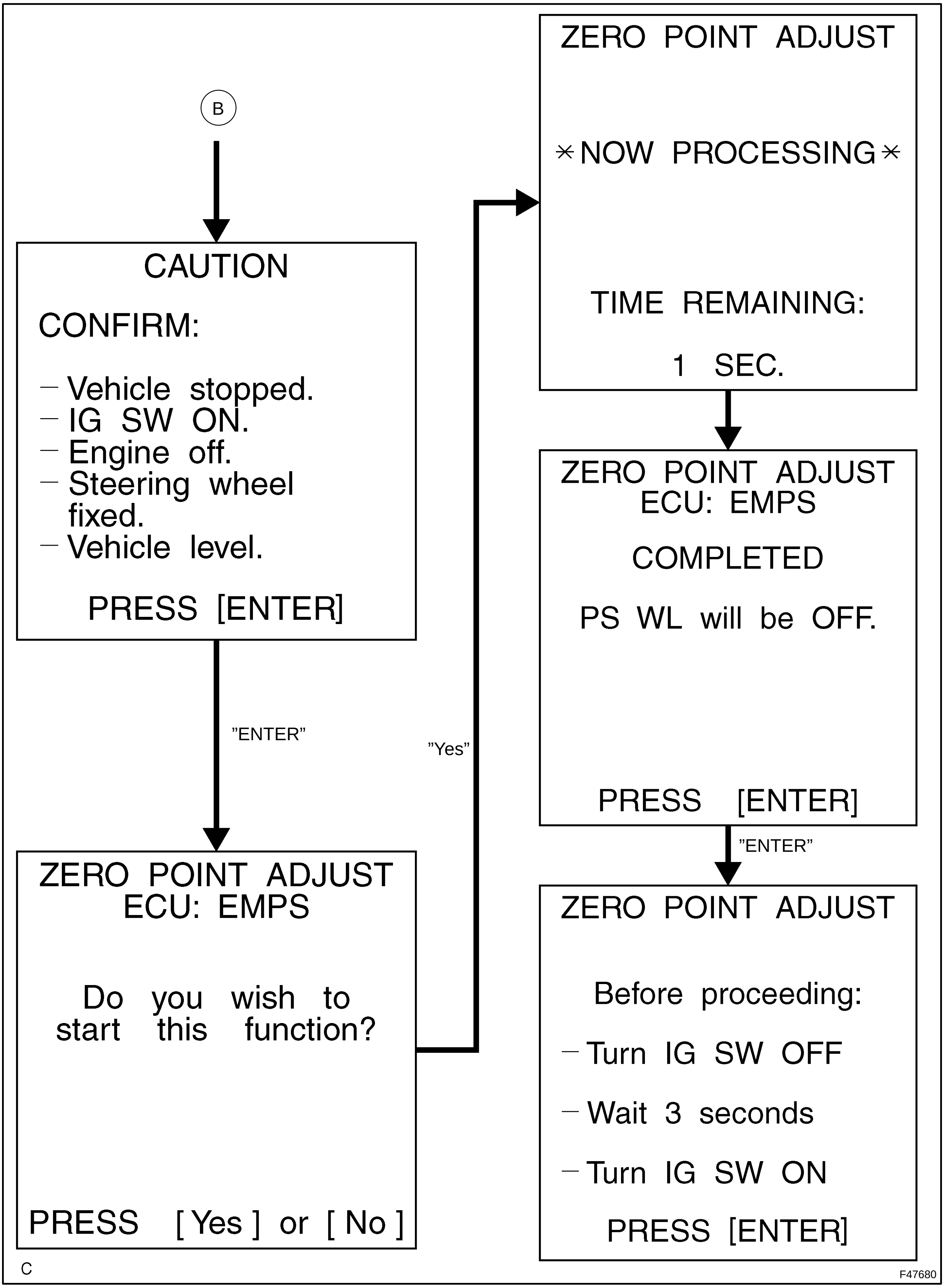
(a) Center the steering wheel and align the front wheels straight ahead.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the power switch on (IG) and then perform the zero point calibration by following the tester screen.

NOTICE:

- **The vehicle is stopped.**
- **Do not start the engine. (Do not turn the power switch on (READY).)**
- **Do not turn the steering wheel.**
- **The vehicle is on level ground.**

(d) Confirm that no DTCs are output after completing the operation.
  (1) When DTC C1515 is output, see page 05-1230 .
  (2) When DTC C1516 is output, see page 05-1231 .
  (3) When DTC C1534 is output, see page 05-1234 .


DIAGNOSTIC MENU
EMPS
1: DATA LIST
2: DTC INFO
4: SNAPSHOT
5: TRQ SENSOR ADJ
6: RECORDS CLEAR
7: SIGNAL CHECK
"5"
CAUTION
If the ECU has been exchanged, execute ZERO POINT ADJUST.
Otherwise, execute ZERO POINT INIT before executing ZERO POINT ADJUST.
PRESS [ENTER]
"ENTER"
TORQUE SENSOR ZERO POINT ADJUSTMENT
ECU: EMPS
1. ZERO POINT INIT
2. ZERO POINT ADJ
Press [1] or [2]
"2"
CAUTION
When executing ZERO POINT ADJUST, there can be no DTCs other than C1515.
PRESS [ENTER] / [EXIT]
"ENTER"
B
C
F47679


B
CAUTION
CONFIRM:
– Vehicle stopped.
– IG SW ON.
– Engine off.
– Steering wheel fixed.
– Vehicle level.
PRESS [ENTER]
"ENTER"
ZERO POINT ADJUST
ECU: EMPS
Do you wish to start this function?
PRESS [Yes] or [No]
"Yes"
ZERO POINT ADJUST
NOW PROCESSING
TIME REMAINING:
1 SEC.
ZERO POINT ADJUST
ECU: EMPS
COMPLETED
PS WL will be OFF.
PRESS [ENTER]
"ENTER"
ZERO POINT ADJUST
Before proceeding:
– Turn IG SW OFF
– Wait 3 seconds
– Turn IG SW ON
PRESS [ENTER]
C
F47680

05IP8-02

CUSTOMER PROBLEM ANALYSIS CHECK

EPS Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
Vehicle Model		**Licence Plate No.**	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ / (Engine ☐ Cold ☐ Warmed up)
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Steering is heavy.
	☐ Steering effort differs between right and left or is uneven.
	☐ While driving, steering effort does not change in accordance with vehicle speed.
	☐ The steering wheel does not return properly.
	☐ The steering wheel vibrates or abnormal noise comes from the steering column.
	☐ When a problem occurs: ☐ While turning the wheel around the center ☐ When turning the wheel with the vehicle stopped ☐ Always
	☐ Others

Master Warning Light Status	☐ ON	☐ OFF
Indication on Multi-display	☐ PS warning is indicated	☐ PS warning is not indicated

DTC Check	**1st Time**	☐ Normal System Code	☐ Trouble Code (Code)
	2nd Time	☐ Normal System Code	☐ Trouble Code (Code)
Freeze Frame Data When any DTCs are output during the 1st time, record the freeze frame data as well as the DTCs.			

05IPG-02

DATA LIST/ACTIVE TEST

1. DATA LIST

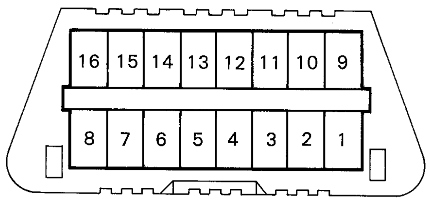
(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch on (IG).
(c) Operate the hand-held tester according to the steps on the display and select "DATA LIST".

Item	Item Description	Inspection Condition	Reference Value
TRQ1	Torque sensor 1 output value/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
TRQ2	Torque sensor 2 output value/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
TRQ3	Torque value for assist control/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
SPD	Vehicle speed from meter/ Min.: 0 km/h, Max.: 255 km/h	1. Vehicle is stopped 2. Vehicle is driven at a constant speed	1. 0 km/h 2. No significant fluctuation
MOTOR ACTUAL	Amount of current to motor/ Min.: -128 A, Max.: 127 A	-	-
COMMAND VALUE	Demanded amount of current to motor/ Min.: -128 A, Max.: 127 A	-	-
THERMISTOR TEMP	ECU substrate temperature/ Min.: -50 °C, Max.: 205 °C	Power switch is on (IG)	-
PIG SUPPLY	Power source voltage to activate motor/ Min.: 0 V, Max.: 25.5 V	Power steering is in operation	10 to 16 V
IG SUPPLY	ECU power source voltage/ Min.: 0 V, Max.: 25.5 V	-	10 to 16 V
TRQ1 ZERO VAL	Zero point value of torque sensor 1/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V
TRQ2 ZERO VAL	Zero point value of torque sensor 2/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V
TRQ3 ZERO VAL	Zero point value of torque sensor for assist control/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V
MTR TERMINAL (+)	Motor terminal M1 voltage/ Min.: 0 V, Max.: 25.5 V	1. Turning steering wheel to right 2. Turning steering wheel to left	1. 10 to 16 V 2. Below 1 V
MTR TERMINAL (-)	Motor terminal M2 voltage/ Min.: 0 V, Max.: 25.5 V	1. Turning steering wheel to right 2. Turning steering wheel to left	1. Below 1 V 2. 10 to 16 V
MTR OVERHEAT	Continuous overheat prevention control record/ REC/UNREC	-	-

Item	Item Description	Inspection Condition	Reference Value
MTR LOW POWER	PIG power source voltage drop record/ REC/UNREC	-	-
CONTROL MODE	Codes indicating DTC detection timing during ECU control are displayed in hexadecimal	-	-
IG ON/OFF TIMES	Number of times power switch is turned on (IG) after DTC detection/ Min.: 0 time, Max.: 255 times	-	-
# CODES	Number of detected DTCs when freeze frame data is stored/ Min.: 0 time, Max.: 255 times	-	-
ASSIST MAP	Selected assist map	-	-
ECU I.D.	ECU identification information	-	-
TEST MODE STAT	Selected mode/ NORMAL MODE/TEST MODE	-	-
READY STATUS	HV system ”READY”/ OFF/ON	HV system ”READY” ⇔ Not ”READY”	ON ⇔ OFF

05IPC-02

DIAGNOSIS SYSTEM



C52361

1. CHECK THE DLC3

(a) Check the DLC3:

The power steering ECU assy uses CAN and ISO 9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus ”+” line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	HIGH-level CAN bus line	Power switch off	54 to 67 Ω
CANH (6) - Battery positive	HIGH-level CAN bus line	Power switch off	1 MΩ or higher
CANH (6) - CG (4)	HIGH-level CAN bus line	Power switch off	3 KΩ or higher
CANL (14) - Battery positive	LOW-level CAN bus line	Power switch off	1 MΩ or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Power switch off	3 KΩ or higher

HINT:

If the display shows ”UNABLE TO CONNECT TO VEHICLE” after connecting the hand-held tester cable to the DLC3 and turning the ignition switch to the ON position, there is a problem either with the vehicle or the tester.

- If communication is normal when connecting the tester to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tester to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester’s operator’s manual.

2. WARNING LIGHT

(a) When a problem occurs in the electric power steering system, the PS warning is indicated on the multi-display and the master warning light on the combination meter comes on to inform the driver of the problem.

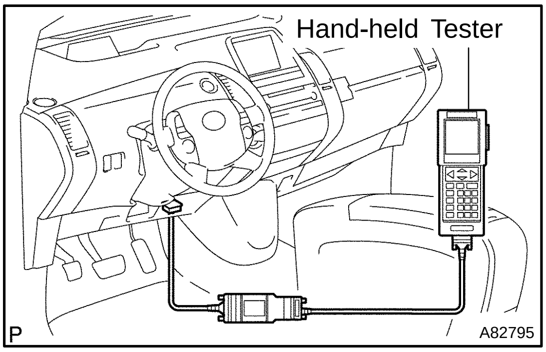
05IPH-02

DIAGNOSTIC TROUBLE CODE CHART

HINT:
If a trouble code is displayed during the DTC check, inspect the circuit listed for that code. For details of each code, refer to the "See page" under respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C1511 (05-1226)	Torque sensor abnormal	• Steering column assy (Torque sensor) • Power steering ECU assy
C1512 (05-1226)	Torque sensor abnormal	• Steering column assy (Torque sensor) • Power steering ECU assy
C1513 (05-1226)	Torque sensor abnormal	• Steering column assy (Torque sensor) • Power steering ECU assy
C1514 (05-1226)	Torque sensor power supply abnormal	• Steering column assy (Torque sensor) • Power steering ECU assy
C1515 (05-1230)	Torque sensor zero point adjustment undone	-
C1516 (05-1231)	Torque sensor zero point adjustment incomplete	-
C1517 (05-1226)	Torque hold abnormal	• Steering column assy (Torque sensor) • Power steering ECU assy
C1524 (05-1232)	Motor abnormal	• Power steering motor • Power steering ECU assy
C1531 (05-1234)	ECU abnormal	Power steering ECU assy
C1532 (05-1234)	ECU abnormal	Power steering ECU assy
C1533 (05-1234)	ECU abnormal	Power steering ECU assy
C1534 (05-1234)	ECU abnormal	Power steering ECU assy
C1551 (05-1235)	IG power source voltage abnormal	• ECU-IG fuse • IG power source circuit • Power steering ECU assy
C1552 (05-1237)	PIG power supply voltage abnormal	• EPS fuse • PIG power source circuit • Power steering ECU assy
C1554 (05-1237)	Power supply relay failure	• EPS fuse • PIG power source circuit • Power steering ECU assy
C1555 (05-1237)	Motor relay welding failure	• EPS fuse • PIG power source circuit • Power steering ECU assy
C1581 (05-1239)	Assist map number un-writing	Power steering ECU assy
U0073 (05-1240)	Control module communication bus off	-
U0121 (05-1240)	Lost communication with anti-lock brake system (ABS) control module	-

DTC CHECK/CLEAR



1. CHECK FOR DTCs

(a) Check for DTCs.

(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch on (IG).

(3) Read the DTCs by following the display on the hand-held tester.

HINT:

Refer to the hand-held tester operator's manual for further details.

2. CLEAR THE DTCs

(a) Clear the DTCs from the memory.

(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch on (IG).

(3) Clear the DTCs by following the display on the hand-held tester.

HINT:

Refer to the hand-held tester operator's manual for further details.

FAIL-SAFE CHART

When a problem occurs in the electronic motor power steering system, the PS warning is indicated on the multi-display , the master warning light on the combination meter comes on, and steering power assist is stopped, fixed at a particular point, or decreased simultaneously to protect the system.

DTC No.	Malfunction	Fail-safe
C1511 C1512 C1513 C1514 C1517	Torque sensor malfunction	Power assist stops.
C1524	Motor malfunction	Power assist stops.
C1531 C1532	Power steering ECU malfunction	Power assist stops.
C1533	Temperature sensor malfunction in power steering ECU	Amount of power assist is limited.
C1551	IG power source voltage error	Power assist stops.
C1552	PIG power source voltage error	Power assist stops.
C1554	Power source relay malfunction	Power assist stops.
C1555	Motor relay malfunction	Power assist stops.
U0073	CAN bus malfunction	Amount of power assist is fixed for a speed of 43 mph (70 km/h).
U0121	ABS (ECB) ECU communication error	Amount of power assist is fixed for a speed of 43 mph (70 km/h).
-	Extremely high temperature in ECU	Amount of power assist is limited until ECU temperature goes down.
-	Power source voltage drop	Power assist is interrupted, but normal power assist is resumed when voltage returns.

HINT:
Amount of power assist may be decreased to prevent the motor and ECUs from overheating if the steering wheel is continuously turned when the vehicle is either stopped or driven at a low speed, or if the steering wheel is kept at either full lock position for a long time. In that case, amount of power assist returns to normal if the steering wheel is not turned for approximately 10 minutes with the engine idling.

05IPE-02

FREEZE FRAME DATA

NOTICE:

- **It is difficult to show the specified values (judgement values) clearly because freeze frame data values significantly change due to differences in measurement conditions, surroundings or vehicle conditions. Because of this reason, there may be a problem even when the values are within specifications.**
- **Turn the power switch on (IG) and park the vehicle on level ground to check the freeze frame data by using the hand-held tester.**

(b) Connect the hand-held tester to the DLC3.

(c) Turn the power switch on (IG) and check the freeze frame data by following the prompts on the display on the hand-held tester.

Item	Item Description	Inspection Condition	Reference Value
TRQ1	Torque sensor 1 output value/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
TRQ2	Torque sensor 2 output value/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
TRQ3	Torque value for assist control/ Min.: 0 V, Max.: 5 V	1. Steering wheel is not turned (without load) 2. Turning steering wheel to right with vehicle stopped 3. Turning steering wheel to left with vehicle stopped	1. 2.3 to 2.7 V 2. 2.5 to 4.7 V 3. 0.3 to 2.5 V
SPD	Vehicle speed from meter/ Min.: 0 km/h, Max.: 255 km/h	1. Vehicle is stopped 2. Vehicle is driven at a constant speed	1. 0 km/h 2. No significant fluctuation
MOTOR ACTUAL	Amount of current to motor/ Min.: -128 A, Max.: 127 A	-	-
COMMAND VALUE	Demanded amount of current to motor/ Min.: -128 A, Max.: 127 A	-	-
THERMISTOR TEMP	ECU substrate temperature/ Min.: -50 °C, Max.: 205 °C	Power switch is on (IG)	-
PIG SUPPLY	Power source voltage to activate motor/ Min.: 0 V, Max.: 25.5 V	Power steering is in operation	10 to 16 V
IG SUPPLY	ECU power source voltage/ Min.: 0 V, Max.: 25.5 V	-	10 to 16 V
TRQ1 ZERO VAL	Zero point value of torque sensor 1/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V
TRQ2 ZERO VAL	Zero point value of torque sensor 2/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V
TRQ3 ZERO VAL	Zero point value of torque sensor for assist control/ Min.: 0 V, Max.: 5 V	Steering wheel is not turned (without load)	2.3 to 2.7 V

Item	Item Description	Inspection Condition	Reference Value
MTR TERMINAL (+)	Motor terminal M1 voltage/ Min.: 0 V, Max.: 25.5 V	1. Turning steering wheel to right 2. Turning steering wheel to left	1. 10 to 16 V 2. Below 1 V
MTR TERMINAL (-)	Motor terminal M2 voltage/ Min.: 0 V, Max.: 25.5 V	1. Turning steering wheel to right 2. Turning steering wheel to left	1. Below 1 V 2. 10 to 16 V
# CODES	Number of detected DTCs when freeze frame data is stored/ Min.: 0 time, Max.: 255 times	-	-
READY STATUS	HV system ”READY”/ OFF/ON	HV system ”READY” ⇔ Not ”READY”	ON ⇔ OFF

05IP7-02

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting according to the following flowchart.

HINT:

- For further details, see the page given.
- The hand-held tester can be used at steps 3, 4, 7, 10 and 13.

1	**VEHICLE BROUGHT TO WORKSHOP**

2	**CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05-1209)**

3	**CHECK DTC AND FREEZE FRAME DATA (SEE PAGE 05-1219)**

(a) Record DTCs and freeze frame data.

4	**CLEAR DTC AND FREEZE FRAME DATA (SEE PAGE 05-1219)**

5	**PROBLEM SYMPTOM CONFIRMATION**

SYMPTOM DOES NOT OCCUR (GO TO STEP 6)

SYMPTOM OCCURS (GO TO STEP 7)

6	**SYMPTOM SIMULATION (SEE PAGE 01-37)**

7	**CHECK DTC (SEE PAGE 05-1219)**

(a) Recheck for DTCs.

HINT:

- Refer to the diagnostic trouble code chart when any DTCs are output.
- When any CAN communication system DTCs are output, perform troubleshooting on the CAN communication system first (see page 05-2620).
- When communication to the power steering ECU assy is not established through the hand-held tester, inspect terminals SIL of the DLC3 and power steering ECU assy and inspect the IG circuit of the power steering ECU assy.

NORMAL SYSTEM CODE IS OUTPUT: GO TO STEP 8

TROUBLE CODE IS OUTPUT: GO TO STEP 9

8	PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1216)

9	DTC CHART (SEE PAGE 05-1225)

10	CIRCUIT INSPECTION (SEE PAGE 05-1226 TO 05-1240)

11	IDENTIFICATION OF PROBLEM

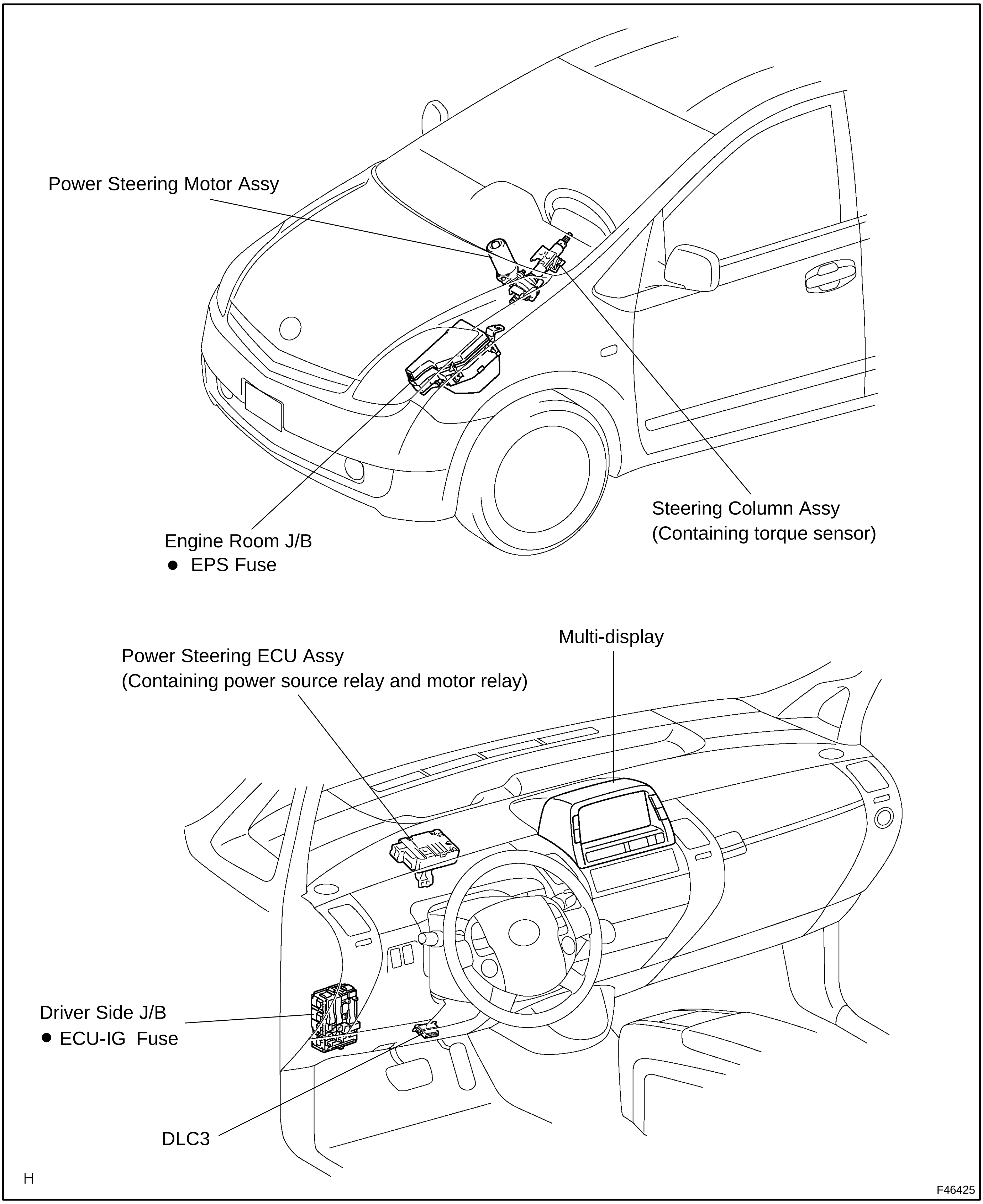
12	REPAIR OR REPLACE

13	CONFIRMATION TEST

END

05IP4-02

LOCATION



ELECTRIC POWER STEERING SYSTEM

05IP3-02

PRECAUTION

1. PRECAUTION

NOTICE FOR INITIALIZATION:

When the negative (-) battery terminal is disconnected, initialize the following system after the terminal is reconnected.

System Name	See page
Power Window Control System	01-28

NOTICES FOR HYBRID SYSTEM ACTIVATION:

- **When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.**
- **With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.**

2. HANDLING PRECAUTIONS

(a) When handling the electronic parts:

(1) Avoid any impact to electronic parts such as ECUs and relays. Replace with new ones if dropped or subjected to a severe blow.

(2) Do not expose any electronic parts to high temperature and humidity.

(3) Do not touch the connector terminals in order to prevent deformation or malfunctions due to static electricity.

(4) When the power steering ECU assy has been replaced with a new one, perform steering zero point calibration (see page 05-1210).

(b) When handling the steering column assy:

(1) Avoid any impact to the steering column assy, especially to the motor or torque sensor. Replace with new parts if dropped or subjected to a severe blow.

(2) Do not pull on the wire harness when moving the steering column assy.

(3) When the steering column assy has been replaced, perform steering zero point calibration after initializing the steering zero point calibration signal (see page 05-1210).

(c) When disconnecting and reconnecting the connectors:

(1) When disconnecting the connector related to the electric power steering system, turn the power switch on (IG), center the steering wheel, turn the power switch off, and then disconnect the connector.

(2) When reconnecting the connector related to the electric power steering system, ensure that the power switch is off. Center the steering wheel and then turn the power switch on (IG).

NOTICE:

Do not turn the power switch on (IG) when the steering wheel is not centered.

(3) If the above operations are not carried out properly, the steering center point (zero point) will deviate, which may lead to a difference in steering effort between right and left. If there is a difference in steering effort between right and left, perform steering zero point calibration (see page 05-1210).

3. PRECAUTIONS FOR CAN COMMUNICATION

(a) CAN communication is used to receive information from the skid control ECU (ECB ECU) and to transmit warnings to the meter and the multi-display. When there are any problems in the CAN communication lines, DTCs indicating the communication line malfunctions are output.

(b) Perform troubleshooting for the communication line problems when the CAN communication DTCs are output. Be sure to start troubleshooting on the electronic motor power steering system when data communication is normal.

(c) Temporary fix or repair with bypass wiring, etc. is impossible because the length and path of each CAN communication line is specified.

05IPA-02

PROBLEM SYMPTOMS TABLE

If the problem still occurs even after the normal system code was displayed during the DTC check, check the components for each problem symptom in the order given in the following table and proceed to the relevant troubleshooting page.

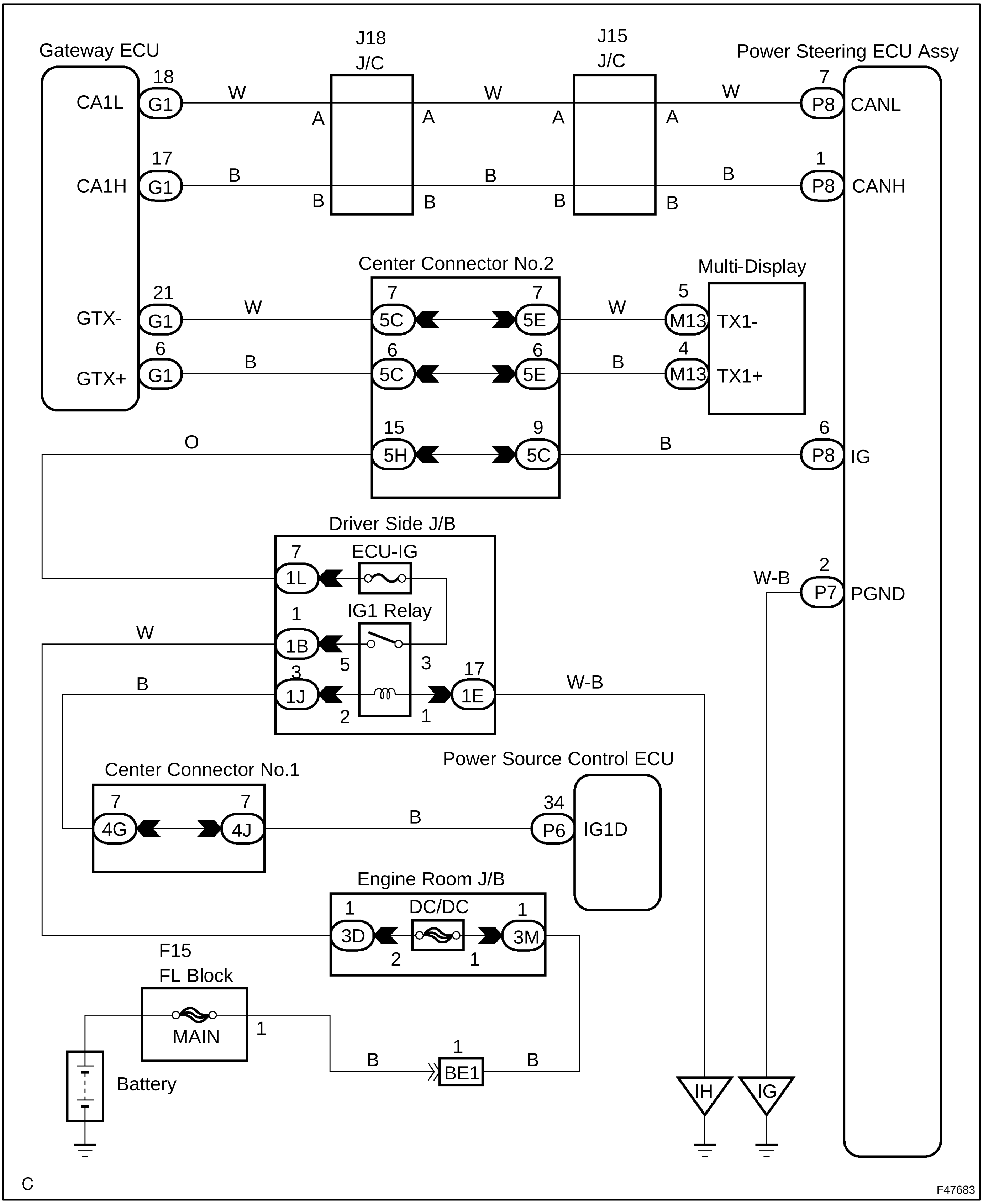
Symptom	Suspected Area	See page
Steering is heavy	1. Front tires (Improperly inflated, unevenly worn) 2. Front wheel alignment (Incorrect) 3. Front suspension (Lower ball joint) 4. Steering gear assy 5. Torque sensor (built into steering column) 6. Steering column assy 7. Power steering motor 8. Battery and power source system 9. Power source voltage of power steering ECU assy 10.Power steering ECU assy	28-1 26-6 26-22 51-6 50-8 50-8 50-8 - 01-37 01-37
Steering effort differs between right and left or is uneven	1. Steering center point (zero point) is not recorded completely 2. Front tires (Improperly inflated, unevenly worn) 3. Front wheel alignment (Incorrect) 4. Front suspension (Lower ball joint) 5. Steering gear assy 6. Torque sensor (built into steering column) 7. Steering column assy 8. Power steering motor 9. Power steering ECU assy	05-1210 28-1 26-6 26-22 51-6 50-8 50-8 50-8 01-37
While driving, steering effort does not change in accordance with vehicle speed or steering wheel does not return properly	1. Front suspension 2. Speed sensor 3. Skid control ECU 4. Engine speed detection circuit 5. ECM 6. Torque sensor (built into steering column) 7. Power steering motor 8. Power steering ECU assy 9. Controlling CAN communication system	- 32-62 32-68 - 10-24 50-8 50-8 01-37 05-2594
Clunking sound occurs when turning steering wheel back and forth while power steering is in operation	1. Front suspension 2. Steering intermediate shaft 3. Steering gear assy	- - 51-6
Friction sound occurs when turning steering wheel during low speed driving	1. Power steering motor 2. Steering column assy	50-8 50-8
High-pitched sound (squeaking) occurs when turning steering wheel slowly with vehicle stopped	Power steering motor	50-8
Steering wheel vibrates and noise occurs when turning steering wheel with the vehicle stopped	1. Power steering motor 2. Steering column assy	50-8 50-8
PS warning is always indicated on multi-display	Refer to flowchart	05-1242

PS WARNING IS ALWAYS SHOWN ON MULTI-DISPLA Y

CIRCUIT DESCRIPTION

Troubleshooting procedure for a situation when no DTCs are output but PS warning is always indicated is specified here. The PS warning remains on when there is an open in the IG circuit inputting power source voltage to the power steering ECU assy.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR

(a) Check the indication condition of the PS warning while by wiggling the power steering ECU assy connector and wire harness up and down, and right and left.

OK:

PS warning indication does not change.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

2	INSPECT CAN COMMUNICATION SYSTEM

(a) Using the hand-held tester, check for DTCs and confirm that there are no problems in the CAN communication system.

OK:

DTCs are not output.

NG → **GO TO CAN COMMUNICATION SYSTEM (SEE PAGE 05-2620)**

OK

3	INSPECT MULTIPLEX COMMUNICATION SYSTEM(BEAN)

(a) Using the hand-held tester, check for DTCs and confirm that there are no problems in the multiplex communication system (BEAN).

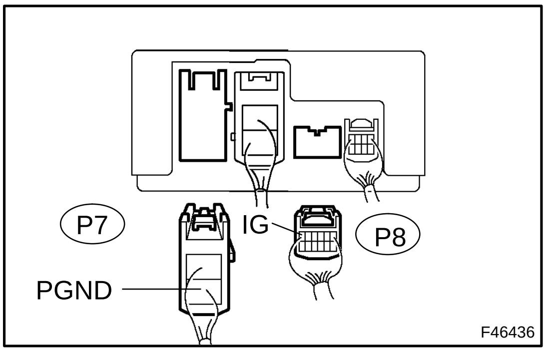
OK:

DTCs are not output.

NG → **GO TO MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2541)**

OK

4	INSPECT POWER STEERING ECU ASSY



(a) Disconnect the "P7" and "P8" connectors from the power steering ECU assy.
(b) Turn the power switch on (IG).
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
P8-6 (IG) - P7-2 (PGND)	Power switch is on (IG)	10 to 16 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5	REPLACE POWER STEERING ECU ASSY (SEE PAGE 50-16)

6	CHECK PS WARNING ON MULTI DISPLAY

(a) Check for the PS warning indication on the multi-display.
OK:
The PS warning is not indicated.

OK → **END**

NG

REPLACE MULTI DISPLAY (SEE PAGE 67-7)

SYSTEM DESCRIPTION

1. DESCRIPTION

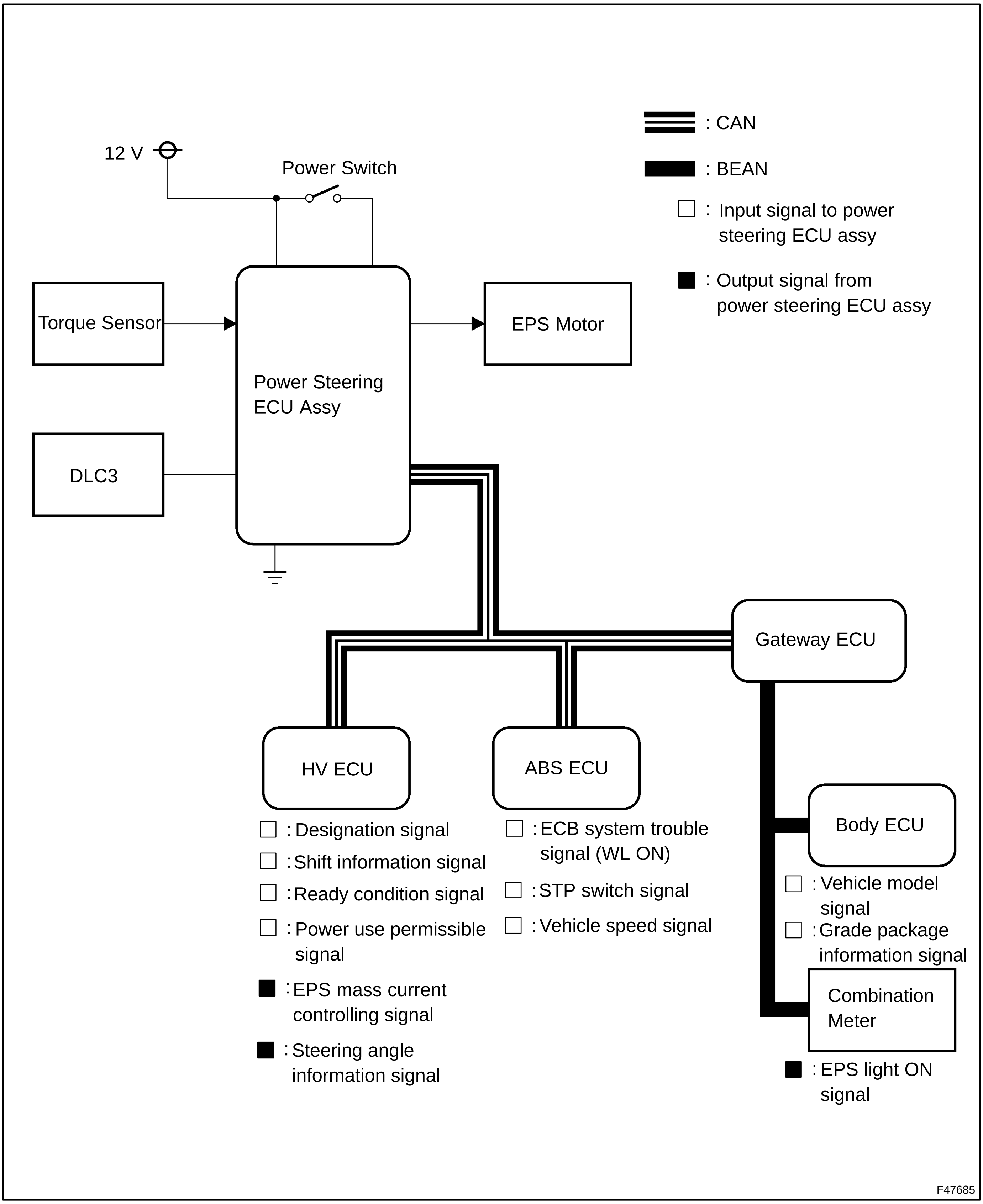
(a) The EPS system generates torque through the operation of the motor and the reduction gear installed on the column shaft in order to assist steering effort.
Directions and amount of assisting power are determined by signals from the torque sensor built into the steering column assy and by the power steering ECU assy, and controlled in accordance with vehicle speed. As a result, steering effort is controlled to be light during low speed driving and moderately high during high speed driving.

(1) Power steering ECU assy:
The power steering ECU assy calculates assisting power based on a steering torque signal from the torque sensor and a vehicle speed signal from the skid control ECU. It generates specified assisting torque by controlling current to the motor.

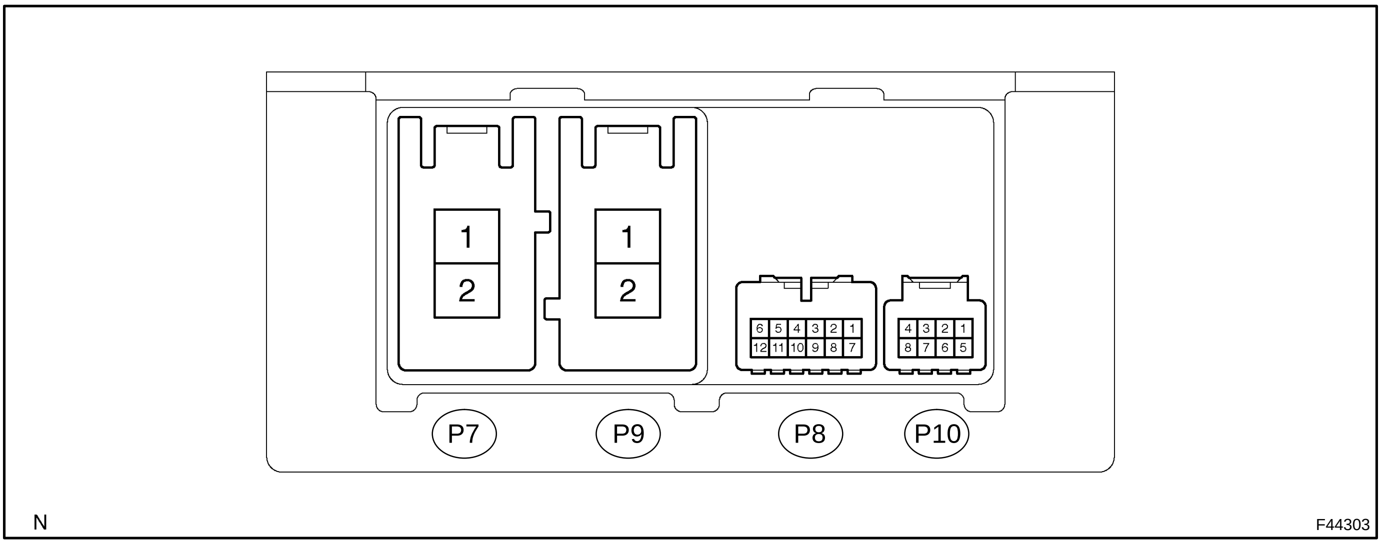
(2) Torque sensor:
The torque sensor detects steering effort generated when the steering wheel is turned and converts it to an electrical signal.

(3) EPS motor:
The EPS motor is activated by the current from the power steering ECU assy and generates torque to assist steering effort.

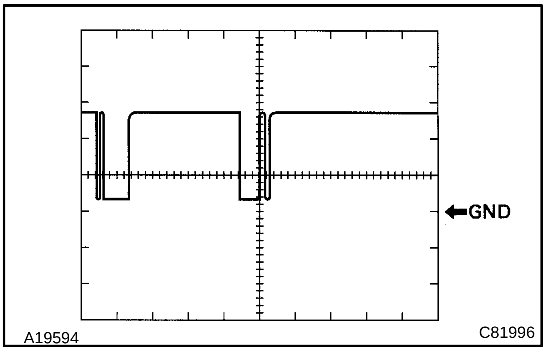
SYSTEM DIAGRAM



TERMINALS OF ECU



Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
PIG (P7-1) - PGND (P7-2)	W - W-B	EPS fuse	Always	10 to 16 V
PGND (P7-2) - Body ground	W-B - Body ground	Body ground	Always	Below 1 Ω
M1 (P9-1) - PGND (P7-2)	R - W-B	Power steering motor	• With power switch on (IG), turn the steering wheel to left • With power switch on (IG), turn the steering wheel to right	Below 1 V 10 to 16 V
M2 (P9-2) - PGND (P7-2)	B - W-B	Power steering motor	• With power switch on (IG), turn the steering wheel to left • With power switch on (IG), turn the steering wheel to right	10 to 16 V Below 1 V
CANH (P8-1) - CANL (P8-7)	B - W	CAN BUS	Power switch is off	108 to 132 Ω
SIL (P8-2) - PGND (P7-2)	W - W-B	DLC3	Communication is established by connecting the intelligent tester II to the DLC3	Pulse generation (See waveform 1)
IG (P8-6) - PGND (P7-2)	B - W-B	ECU-IG fuse	Power switch is on (IG)	10 to 16 V
TRQ1 (P10-5) - PGND (P7-2)	B - W-B	Torque sensor	With power switch on (IG), turn the steering wheel to left and right	0.3 to 4.7 V
TRQV (P10-6) - PGND (P7-2)	Y - W-B	Torque sensor	Power switch is on (IG)	7.5 to 8.5 V
TRQ2 (P10-7) - PGND (P7-2)	R - W-B	Torque sensor	With power switch on (IG), turn the steering wheel to left and right	0.3 to 4.7 V
TRQG (P10-8) - PGND (P7-2)	W - W-B	Torque sensor	Always	Below 1 Ω



Waveform 1

Reference:

Terminal	SIL - Body ground
Tool setting	5 V/DIV, 1 ms/DIV
Condition	Communication is established by connecting the intelligent tester II to the DLC3

ABS WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

INSPECTION PROCEDURE

1 INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)

(a) Is the DTC output for CAN communication system?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR CAN COMMUNICATION SYSTEM (SEE PAGE 05-2611)**

A

2 INSPECT MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2541)

(a) Is the DTC output for Multiplex communication system?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2550)**

A

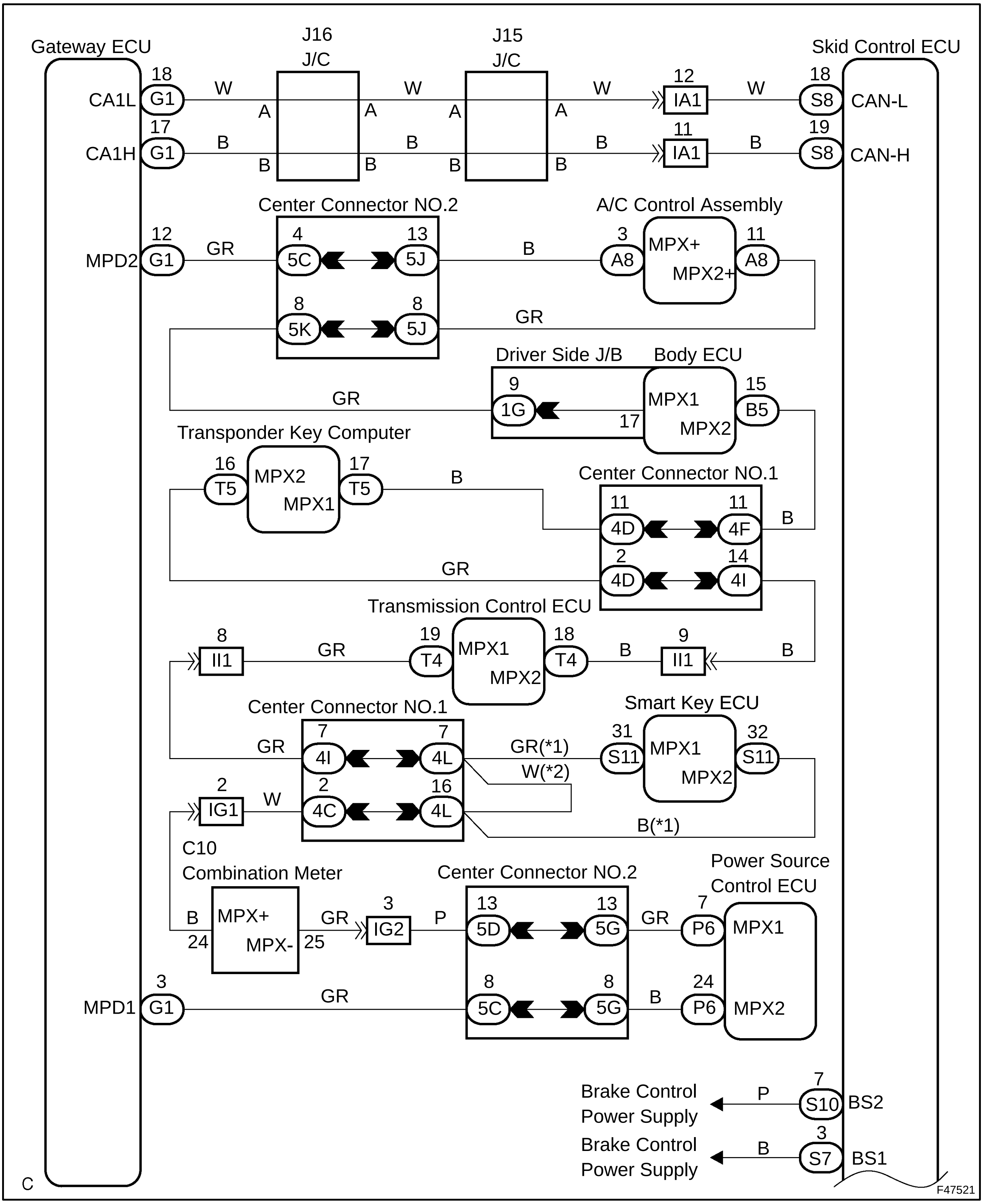
REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)

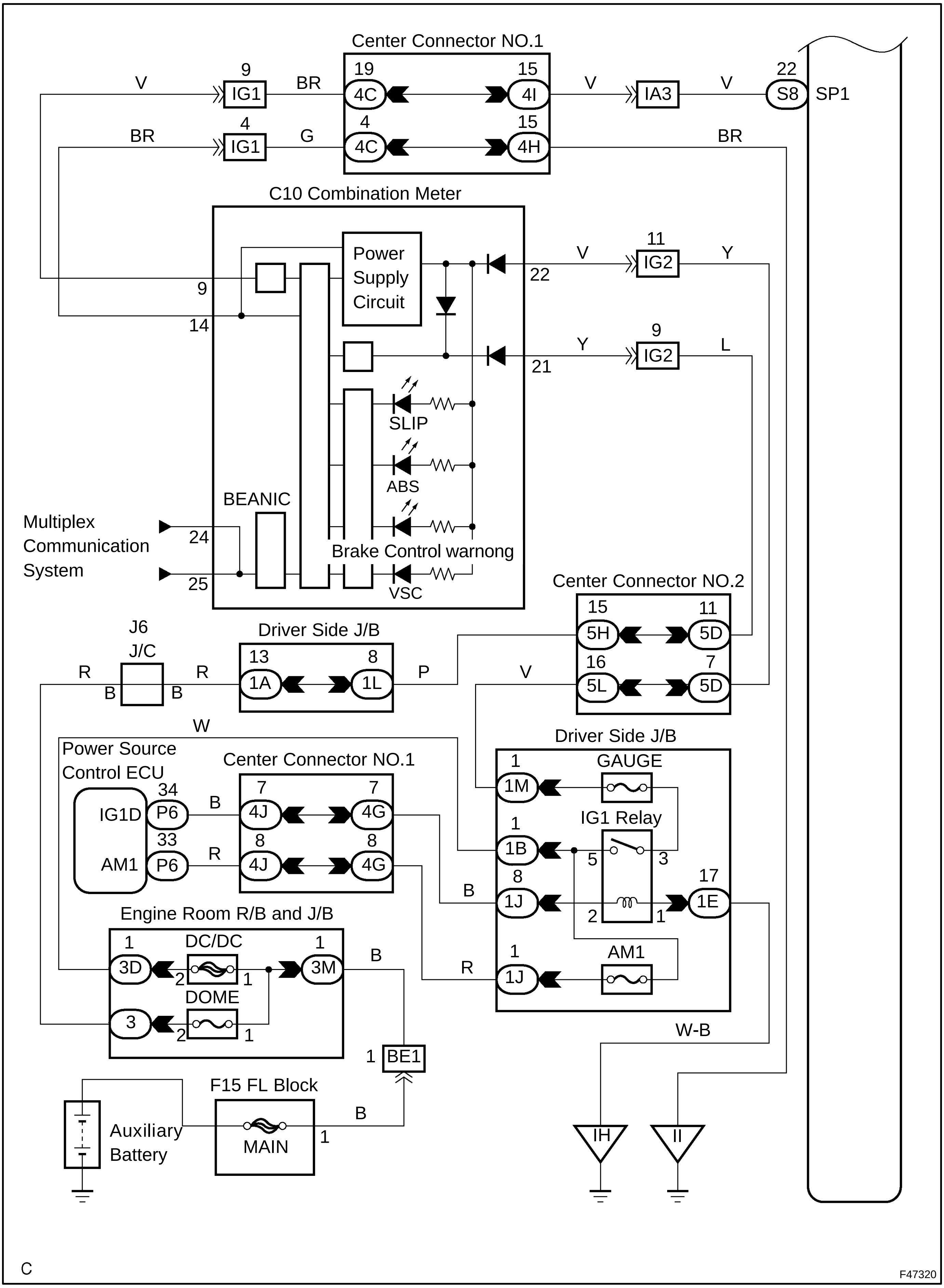
ABS WARNING LIGHT CIRCUIT (REMAINS ON)

CIRCUIT DESCRIPTION

Inform the driver that there is trouble with ABS by illuminating the ABS warning light.
When DTC output is normal and the ABS warning lamp remains on, perform troubleshooting as indicated below.

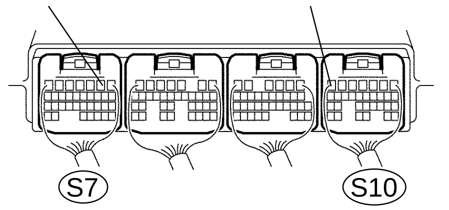
WIRING DIAGRAM




Center Connector NO.1
9
IG1
V
BR
19
4C
15
4I
V
IA3
V
22
S8
SP1
BR
4
IG1
G
4
4C
15
4H
BR
C10 Combination Meter
Power
Supply
Circuit
9
14
22
V
11
IG2
Y
21
Y
9
IG2
L
SLIP
ABS
BEANIC
Multiplex
Communication
System
24
25
Brake Control warnong
VSC
Center Connector NO.2
15
5H
11
5D
16
5L
7
5D
J6
J/C
R
B
B
R
Driver Side J/B
13
1A
8
1L
P
V
W
Power Source
Control ECU
IG1D
AM1
34
P6
33
P6
B
R
Center Connector NO.1
7
4J
7
4G
8
4J
8
4G
Driver Side J/B
1
1M
GAUGE
IG1 Relay
1
1B
5
3
8
1J
B
2
1
17
1E
1
1J
R
AM1
Engine Room R/B and J/B
1
3D
DC/DC
2
1
1
3M
B
DOME
3
2
1
W-B
1
BE1
F15 FL Block
B
1
MAIN
Auxiliary
Battery
IH
II
C
F47320

INSPECTION PROCEDURE

1 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE (BS1, BS2)



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Specified Condition
S7-3 (BS1) - Body ground	10 to 14 V
S10-7 (BS2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 PERFORM ACTIVE TEST BY HAND-HELD TESTER(ABS WARNING LIGHT)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the item "ABS WARN LIGHT" in the ACTIVE TEST and operate the ABS warning light on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter

(d) Check that "ON" and "OFF" of the ABS warning light can be shown on the combination meter by the hand-held tester.

OK:

The ABS warning light turns on or off in accordance with the hand-held tester.

NG → **REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

BRAKE CONTROL WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

INSPECTION PROCEDURE

1 INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)

(a) Is the DTC output for CAN communication system?
Result:

DTC is not output	A
DTC is output	B

B → **REPAIR CAN COMMUNICATION SYSTEM (SEE PAGE 05-2611)**

A ↓

2 INSPECT MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2541)

(a) Is the DTC output for Multiplex communication system?
Result:

DTC is not output	A
DTC is output	B

B → **REPAIR MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2550)**

A ↓

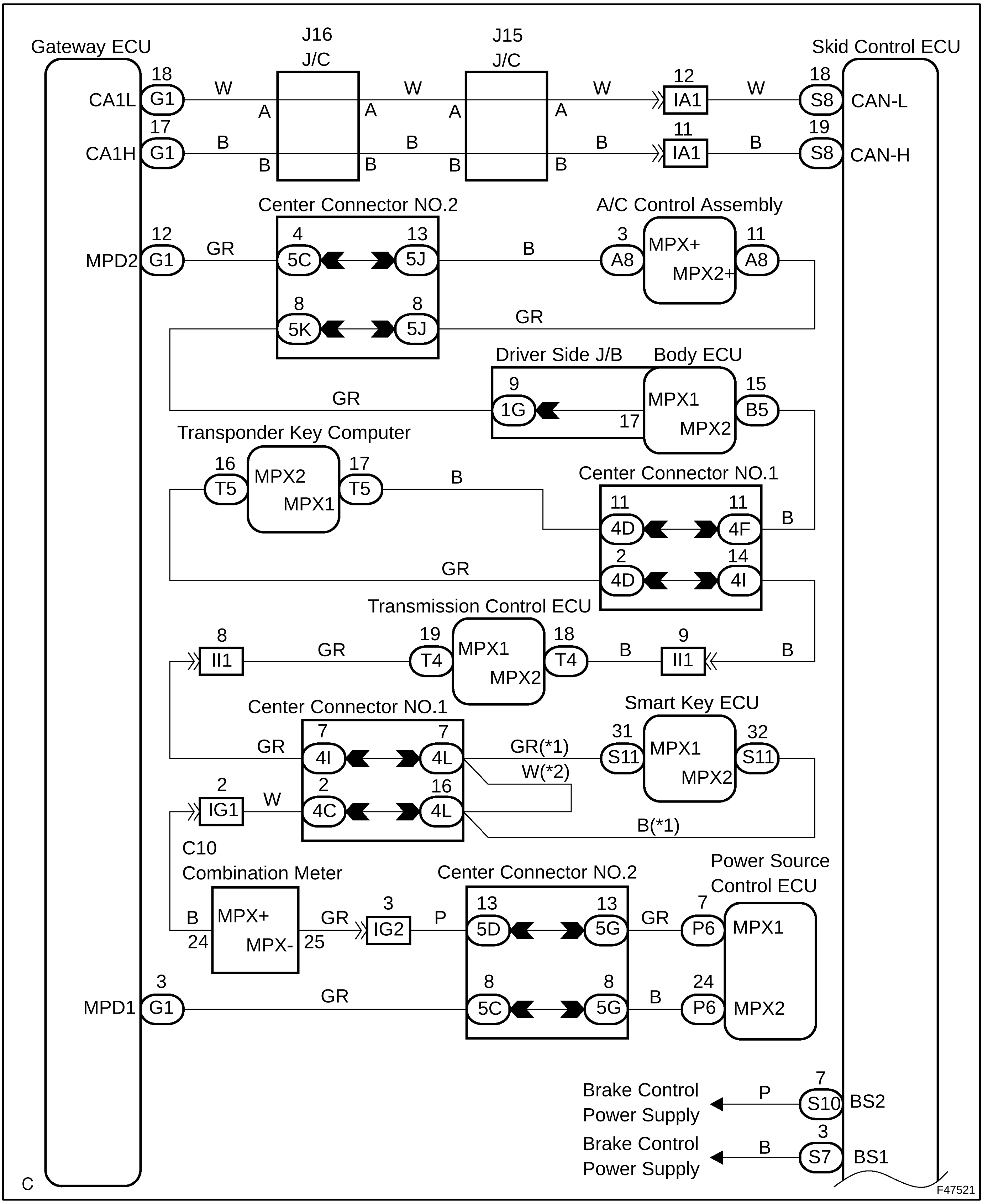
REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)

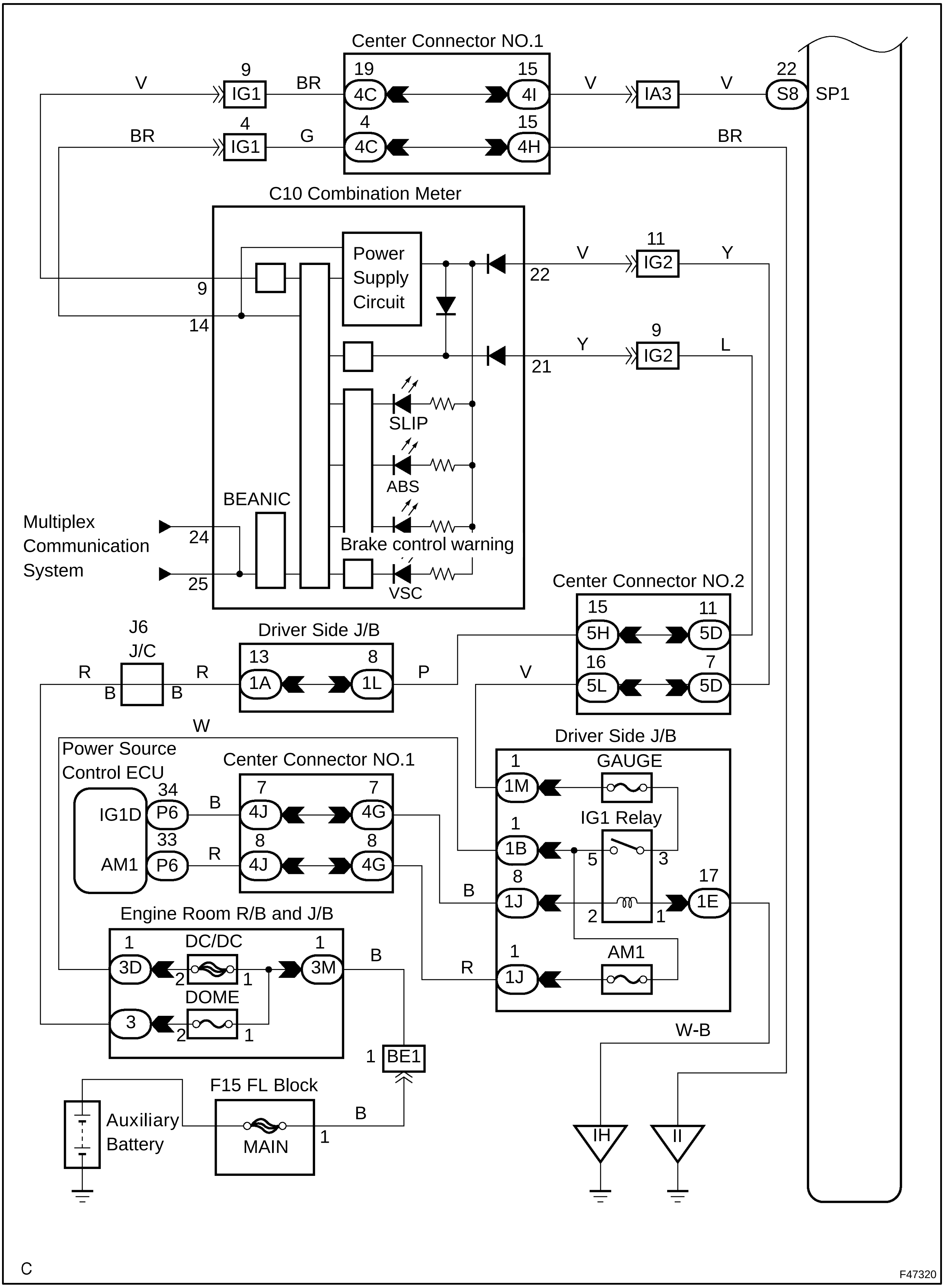
BRAKE CONTROL WARNING LIGHT CIRCUIT (REMAINS ON)

CIRCUIT DESCRIPTION

The skid control ECU is connected to the combination meter via CAN and Multiplex communications.
Informs the driver when there is trouble with ECB or a problem with the brake system that has no influence on driving, by turning on.

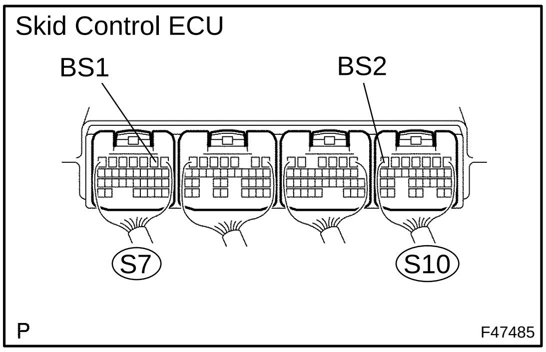
WIRING DIAGRAM




Center Connector NO.1
9
IG1
V
BR
19
4C
15
4I
V
IA3
V
22
S8
SP1
BR
4
IG1
G
4
4C
15
4H
BR
C10 Combination Meter
Power Supply Circuit
9
14
22
V
11
IG2
Y
21
Y
9
IG2
L
SLIP
ABS
BEANIC
Brake control warning
VSC
Multiplex Communication System
24
25
Center Connector NO.2
15
5H
11
5D
16
5L
7
5D
J6
J/C
R
B
B
R
Driver Side J/B
13
1A
8
1L
P
V
W
Power Source Control ECU
IG1D
AM1
34
P6
33
P6
B
R
Center Connector NO.1
7
4J
7
4G
8
4J
8
4G
Driver Side J/B
1
1M
GAUGE
1
1B
IG1 Relay
5
3
8
1J
B
2
1
17
1E
1
1J
R
AM1
Engine Room R/B and J/B
1
3D
DC/DC
2
1
1
3M
B
DOME
3
2
1
W-B
1
BE1
F15 FL Block
Auxiliary Battery
MAIN
B
1
IH
II
C
F47320

INSPECTION PROCEDURE

1	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE (BS1, BS2)



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Specified Condition
S7-3 (BS1) - Body ground	10 to 14 V
S10-7 (BS2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	PERFORM ACTIVE TEST BY HAND-HELD TESTER (BRAKE CONTROL WARNING LIGHT)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the item "ECB INDI LIGHT" in the ACTIVE TEST and operate the Brake Control warning light on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
ECB INDI LIGHT	Turns Brake Control warning light ON / OFF	Observe combination meter

(d) Check that "ON" and "OFF" of the Brake Control warning light are indicated on the combination meter when using the hand-held tester.

OK:
The Brake Control warning light turns on or off in accordance with the hand-held tester.

NG → **REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

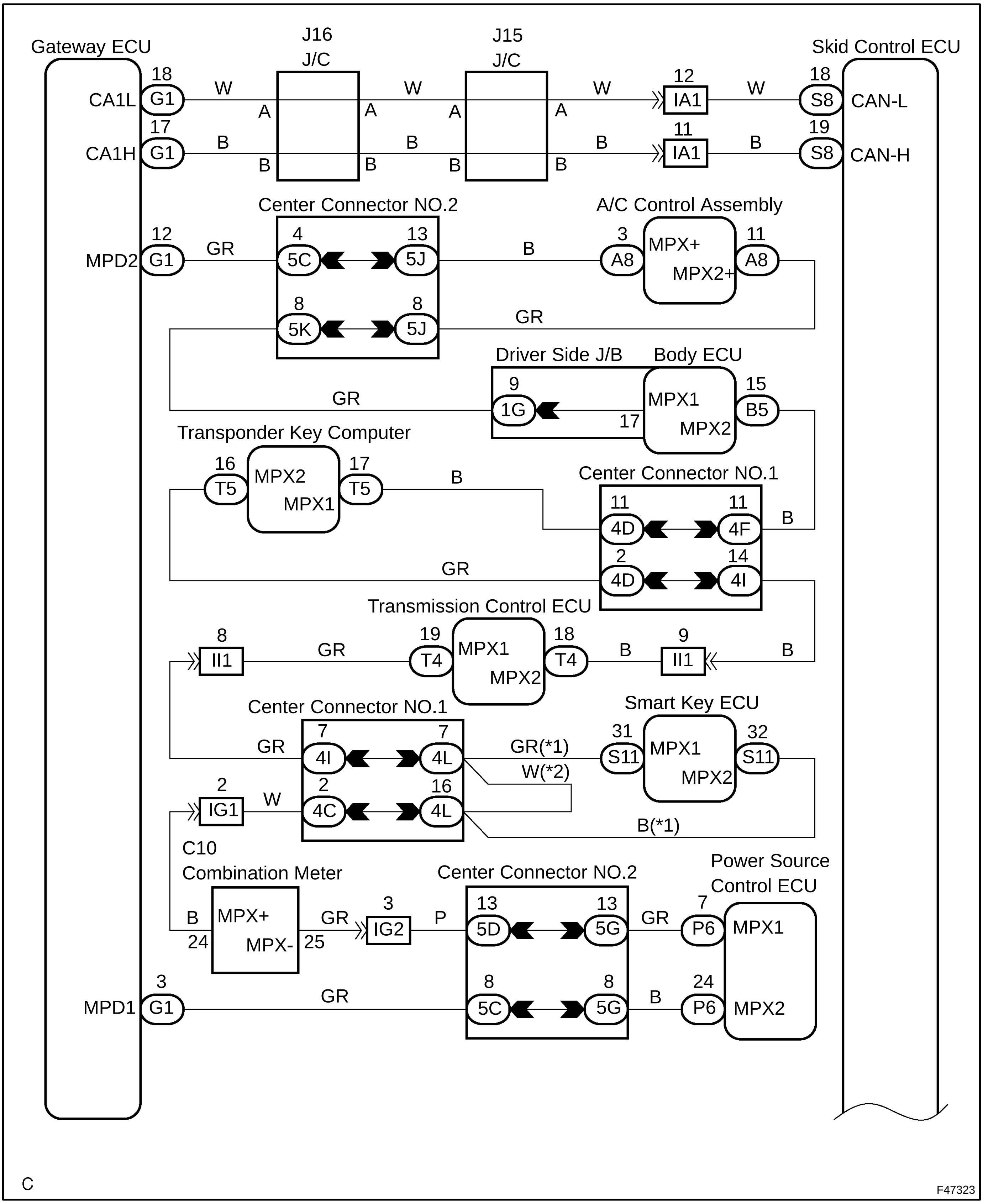
NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

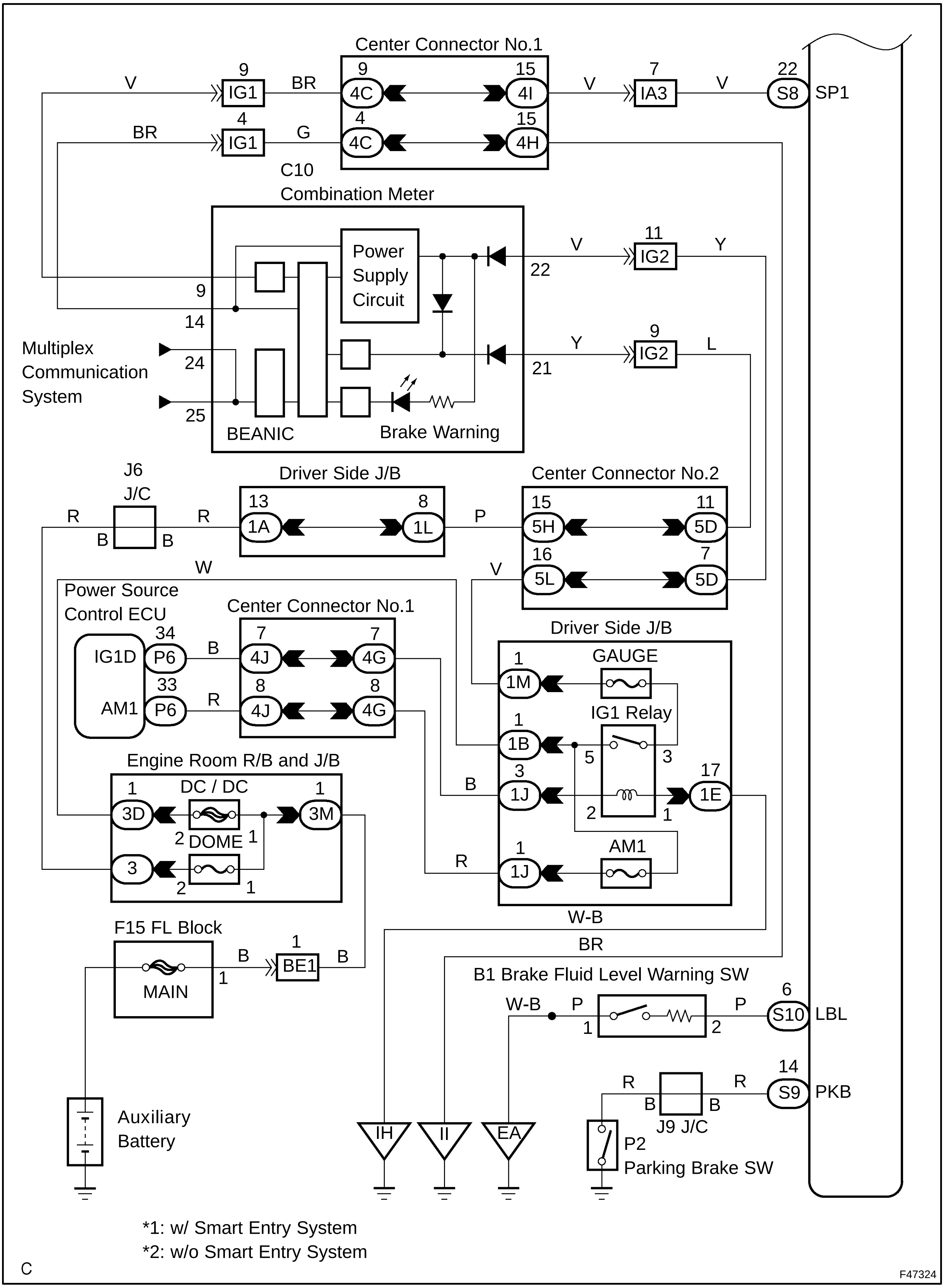
BRAKE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The BRAKE warning light comes on when the brake fluid is insufficient or the parking brake is applied. The skid control ECU is connected to the combination meter via CAN and Multiplex communications. When DTC is normal and BRAKE warning light remains on, perform troubleshooting as indicated below.

WIRING DIAGRAM




Center Connector No.1
IG1
4C
4I
IA3
S8
SP1
4H
C10
Combination Meter
Power Supply Circuit
IG2
Multiplex Communication System
BEANIC
Brake Warning
J6 J/C
Driver Side J/B
1A
1L
Center Connector No.2
5H
5D
5L
Power Source Control ECU
IG1D
AM1
P6
4J
4G
GAUGE
IG1 Relay
1M
1B
1J
1E
Engine Room R/B and J/B
DC / DC
DOME
3D
3M
AM1
F15 FL Block
MAIN
BE1
B1 Brake Fluid Level Warning SW
S10
LBL
S9
PKB
J9 J/C
P2
Parking Brake SW
Auxiliary Battery
IH
II
EA
*1: w/ Smart Entry System
*2: w/o Smart Entry System
C
F47324

INSPECTION PROCEDURE

1 CHECK BRAKE FLUID LEVEL IN RESERVOIR

(a) Check that the brake fluid level is sufficient.

HINT:

- If the fluid level drops, check for a fluid leak, and repair if found.
- If no leaks exist, add and adjust fluid and then check that the trouble code is not output again.

OK:

Brake fluid level is proper.

NG → **ADD BRAKE FLUID**

OK

2 CHECK DTC FOR ABS

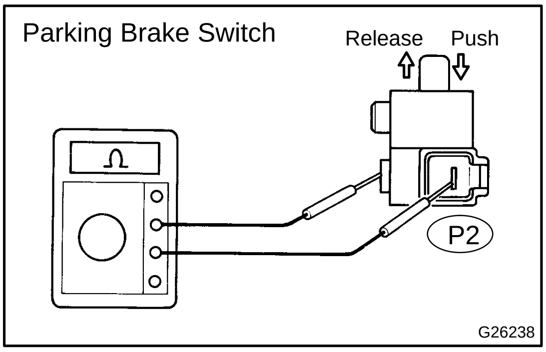
Are the DTCs recorded? (see page 05-973)

NO → **Go to step 3**

YES

REPAIR CIRCUIT INDICATED BY OUTPUT CODE

3 INSPECT PARKING BRAKE SWITCH ASSY



(a) Remove the parking brake switch connector.

(b) Measure the resistance according to the value(s) in the table below.

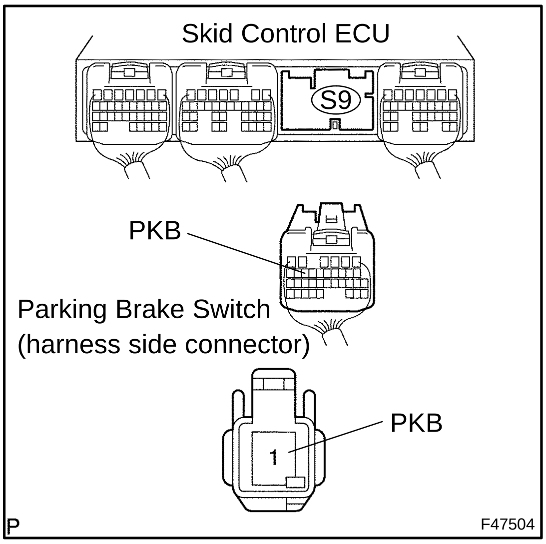
Standard:

Tester Connection	Switch Condition	Specified Condition
P2-1 - Ground part	Released	Below 1 Ω
P2-1 - Ground part	Pushed in	10 kΩ or higher

NG → **REPLACE PARKING BRAKE SWITCH ASSY**

OK

4 CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU - PARKING BRAKE SWITCH)



(a) Disconnect the skid control ECU connector and the parking brake switch connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S9-14 (PKB) - P3-1 (PKB)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

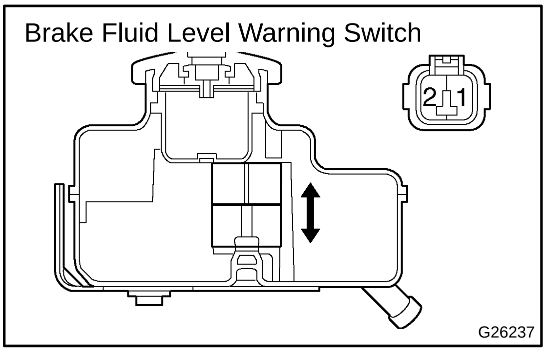
Standard:

Tester Connection	Specified Condition
S9-14 (PKB) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT BRAKE FLUID LEVEL WARNING SWITCH



(a) Remove the reservoir tank cap and strainer.

(b) Disconnect the brake fluid level warning switch connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Fluid Level	Specified Condition
(B1-1) - (B1-2)	Proper	1.8 to 2.16 kΩ
(B1-1) - (B1-2)	Below min.: level	Below 1 Ω

NG → **REPLACE BRAKE FLUID LEVEL WARNING SWITCH**

OK

6 INSPECT SKID CONTROL ECU CONNECTOR

(a) Check the skid control ECU connector's connecting condition.

OK:

The connector should be securely connected.

NG → **CONNECT CONNECTOR TO ECU CORRECTLY**

OK

7 PERFORM ACTIVE TEST BY HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the item "ABS WARN LIGHT" in the ACTIVE TEST and operate the ABS Warning light on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
BRAKE WARN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

(d) Check that "ON" and "OFF" of the VSC warning light are indicated on the combination meter when using the hand-held tester.

OK:

The ABS warning light turns on or off in accordance with the hand-held tester.

NG → **REPAIR OR REPLACE COMBINATION METER ASSY**

A

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

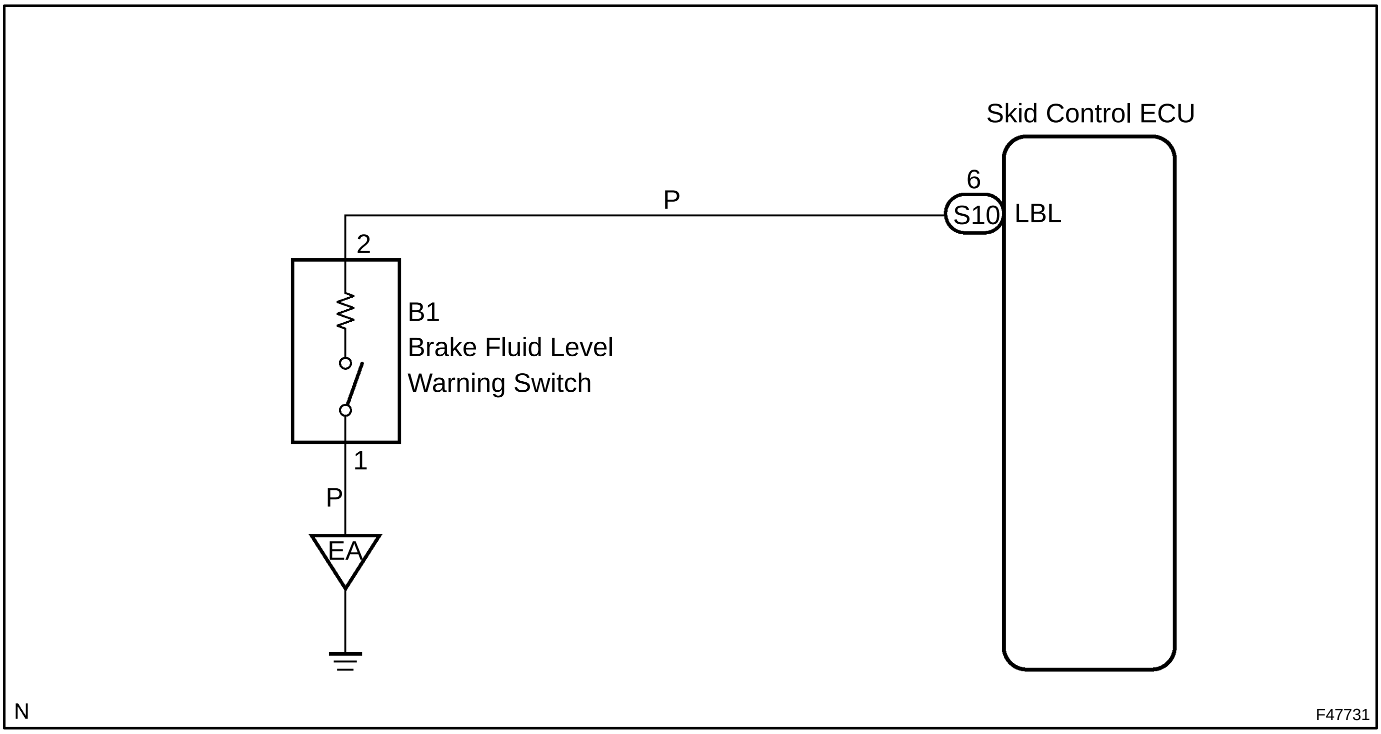
NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC | C1202/68 | BRAKE FLUID LEVEL LOW

CIRCUIT DESCRIPTION

When a fluid level drop in the master cylinder reservoir is detected, the signal is input to the skid control ECU. When the DTC for the fluid level drop is memorized, the warning is canceled if the fluid level returns to normal and the other DTCs are not input.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1202/68	511	• Pump motor operates for specified period when reservoir level drops • Brake operation signal is input when the reservoir level is abnormal and the power switch is on.	• Brake fluid level • Brake fluid level warning switch • Harness or connector • Skid control ECU
C1202/68	512	SW signal circuit is open for 2 sec. or more.	• Brake fluid level switch • Harness or connector • Skid control ECU



INSPECTION PROCEDURE

HINT:
When releasing the parking brake, set the chocks to hold the vehicle for safety.

1 CHECK BRAKE FLUID LEVEL IN RESERVOIR

(a) Check that the brake fluid level is sufficient.

HINT:

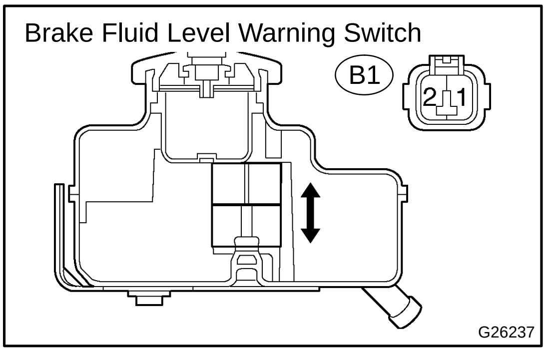
- If the fluid level drops, check for a fluid leak, and repair if found.
- If no leaks exist, add and adjust fluid and then check that the trouble code is not output again.

OK:
Brake fluid level is proper.

NG → **ADD BRAKE FLUID**

OK

2 INSPECT BRAKE FLUID LEVEL WARNING SWITCH



(a) Remove the reservoir tank cap and strainer.
(b) Disconnect the brake fluid level warning switch connector.
(c) Measure the resistance according to the value(s) in the table below.

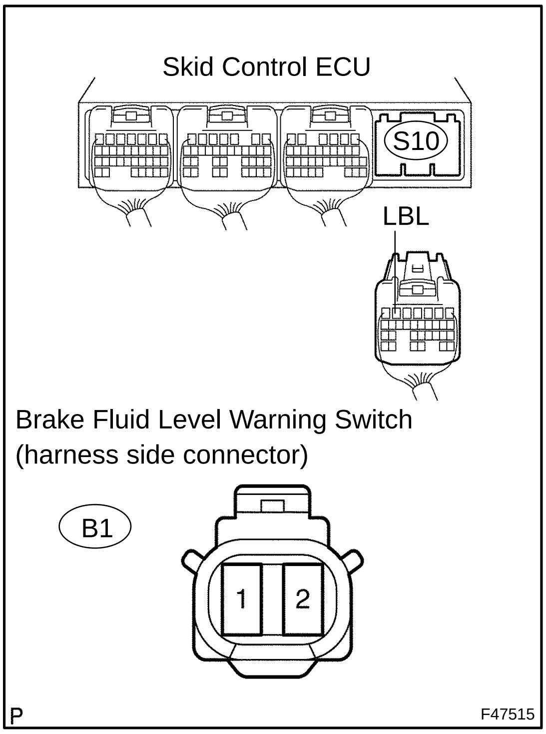
Standard:

Tester Connection	Fluid Level	Specified Condition
(B1-1) - (B1-2)	Proper	1.8 to 2.16 kΩ
(B1-1) - (B1-2)	Below min.: level	Below 1 Ω

NG → **REPLACE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSY**

OK

3 CHECK HARNESS AND CONNECTOR



(a) Disconnect the skid control ECU connector and the brake fluid level warning switch connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S10-6 (LBL) - (B1-2)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S10-6 (LBL) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 RECONFIRM DTC

(a) Clear the DTCs (see page 05-973).

(b) Turn the power switch ON (READY).

(c) Check the same DTCs are recorded (see page 05-973).

Result:

DTC is output	A
DTC is not output	B

B → **END**

HINT:
This DTC may be memorized due to a malfunction in the connector terminal connection, etc.

A

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC C1203/95 ENGINE CONTROL SYSTEM COMMUNICATION CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1203/95	• No stored information for destination. • No stored information whether VSC is in operation or not. • Destination information from HV-ECU does not match with stored value.	• Skid control ECU

INSPECTION PROCEDURE

1 CHECK DTC (HYBRID CONTROL SYSTEM(SEE PAGE 05-420))

(a) Is DTC output for HYBRID CONTROL SYSTEM ?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR HYBRID CONTROL SYSTEM (SEE PAGE 05-440)**

A

2 CHECK DTC (ELECTRONICALLY CONTROLED BRAKE SYSTEM)

(a) Check if C1300/- is output.

Result:

C1300/- is not output	A
C1300/- is output	B

B → **GO TO DTC C1300/- (SEE PAGE 05-1056)**

A

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of the linear solenoid valve and calibration (see page 05-956).

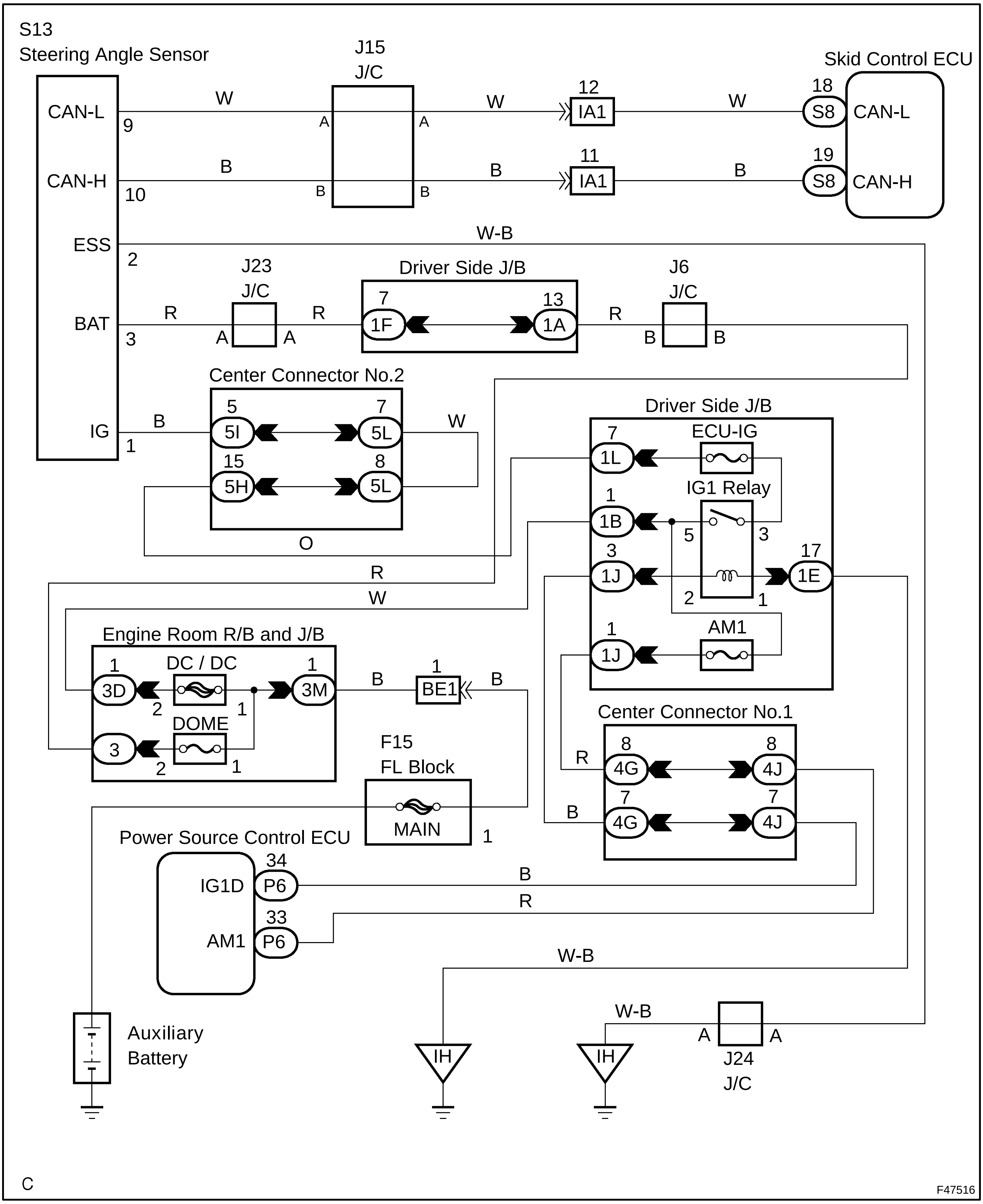
DTC	C1231/31	MALFUNCTION IN STEERING ANGLE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

The skid control ECU inputs the steering sensor signal through the CAN communication. When a malfunction occurs in the communication line with the steering sensor, DTC U0126/63 (malfunction in communication with steering angle sensor) is output.

DTC No.	DTC Detecting Condition	Trouble Area
C1231/31	• Steering angle sensor malfunction signal is received when data transmission is valid (internal malfunction is detected at sensor self-check). • A signal of +B open in steering angle sensor is received when communication with sensor is valid.	• Steering angle sensor • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- When U0126 is output together with C1231/31, inspect and repair the trouble areas indicated by U0126/63 first.
- When the speed sensor or the yaw rate (deceleration) sensor has trouble, DTCs for the steering angle sensor may be output even when the steering angle sensor is normal. When DTCs for the speed sensor or yaw rate sensor are output together with other DTCs for the steering angle sensor, inspect and repair the speed sensor and yaw rate (deceleration) sensor first, and then inspect and repair the steering angle sensor.

1	CHECK HARNESS AND CONNECTOR(MOMENTARY INTERRUPTION)

(a) Using the hand-held tester, check for any momentary interruption in the wire harness and connectors between the skid control ECU and steering angle sensor (see page 05-954).

Item	Measurement Item / Range (Display)	Normal Condition
STEERING SEN	Steering sensor open detection	NORMAL : Normal condition

OK:
There are no momentary interruptions.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
STEERING ANG	Steering sensor/ Min.: -1152 deg, Max.: 1150.875 deg	Left turn: Increase Right turn: Decrease

(d) Check that the steering angle sensor value of the steering angle sensor observed in the hand-held tester changes when the steering wheel is moved.

OK:
Steering angle value should change.

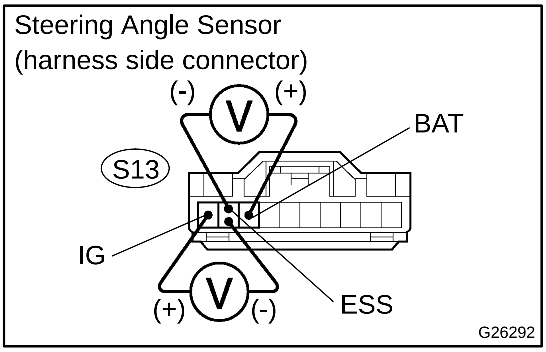
NG → **Go to step 3**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

3 CHECK TERMINAL VOLTAGE(STEERING ANGLE SENSOR CONNECTOR)



(a) Remove the steering wheel and the column lower cover.
(b) Disconnect the steering angle sensor connector.
(c) Turn the power switch ON (READY).
(d) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S13-1 (IG) - S13-2 (ESS)	10 to 14 V

(e) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S13-3 (BAT) - S13-2 (ESS)	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE STEERING ANGLE SENSOR (SEE PAGE 32-71)

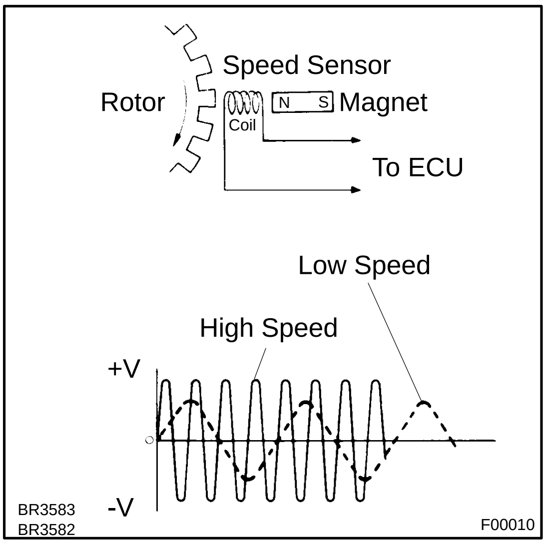
DTC	C1235/35	FOREIGN MATTER IS ATTACHED ON TIP OF RIGHT FRONT SENSOR

DTC	C1236/36	FOREIGN MATTER IS ATTACHED ON TIP OF LEFT FRONT SENSOR

DTC	C1238/38	FOREIGN MATTER IS ATTACHED ON TIP OF RIGHT REAR SENSOR

DTC	C1239/39	FOREIGN MATTER IS ATTACHED ON TIP OF LEFT REAR SENSOR

CIRCUIT DESCRIPTION

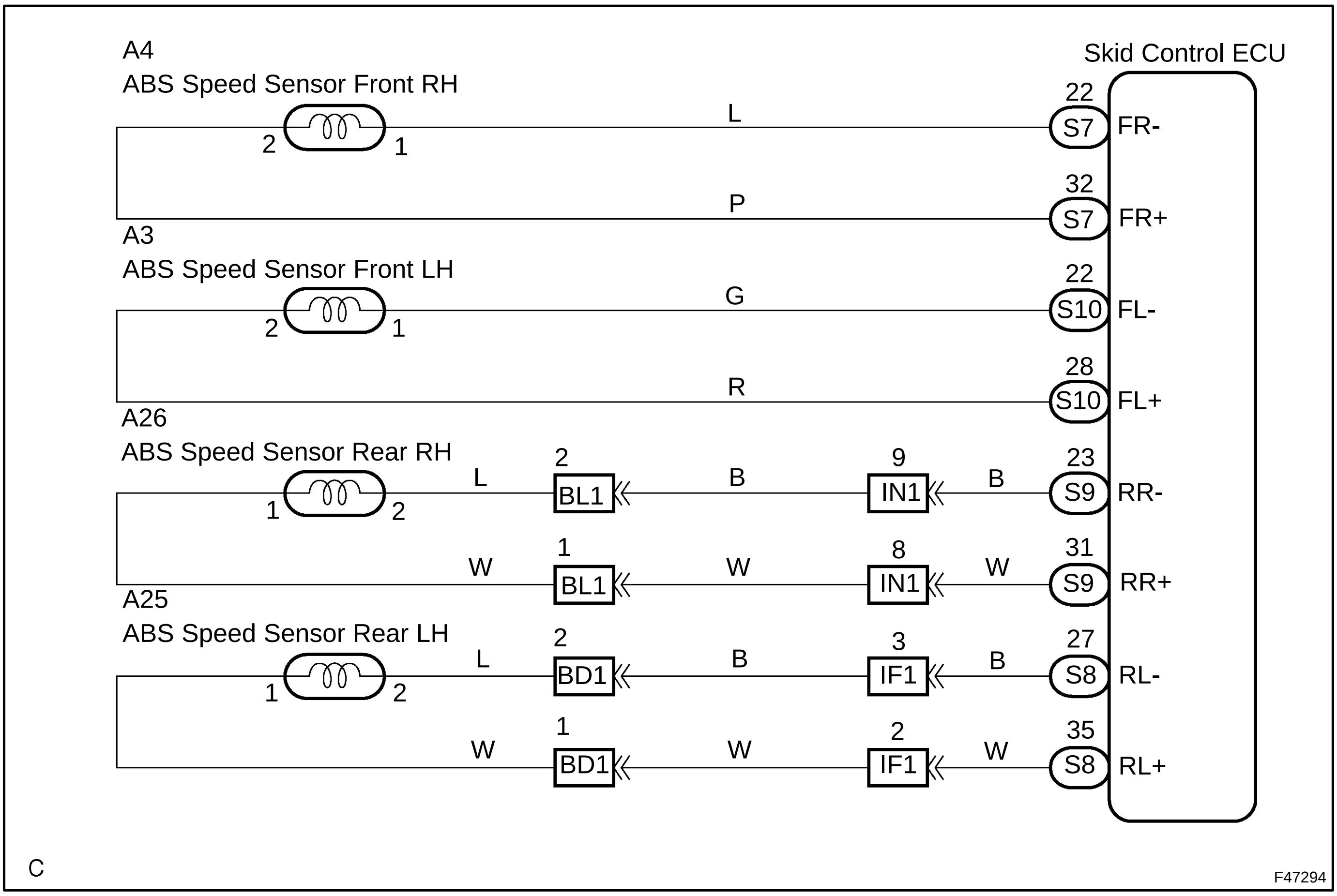


The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS control system. The front and rear rotors have 48 serrations respectively.
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.
When foreign matter adheres to the speed sensor tip or sensor rotor, or the rotor teeth are chipped, these DTCs are output. An abnormal waveform input from the sensor determines these conditions.
These DTCs may be detected when a malfunction occurs in the connector terminals or wire harness of the speed sensor circuit.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1235/35	-	Pulse waveform of speed sensor signal is abnormal for at least 5 sec. when vehicle speed is 12 mph (20 km/h) or more.	• Right front speed sensor • Each speed sensor circuit • Sensor installation • Skid control ECU
C1236/36	303	Pulse waveform of speed sensor signal is abnormal for at least 5 sec. when vehicle speed is 12 mph (20 km/h) or more.	• Left front speed sensor • Each speed sensor circuit • Sensor installation • Skid control ECU
C1238/38	304	Pulse waveform of speed sensor signal is abnormal for at least 5 sec. when vehicle speed is 12 mph (20 km/h) or more.	• Right rear speed sensor • Each speed sensor circuit • Skid control ECU
C1239/39	305	Pulse waveform of speed sensor signal is abnormal for at least 5 sec. when vehicle speed is 12 mph (20 km/h) or more.	• Left rear speed sensor • Each speed sensor circuit • Skid control ECU

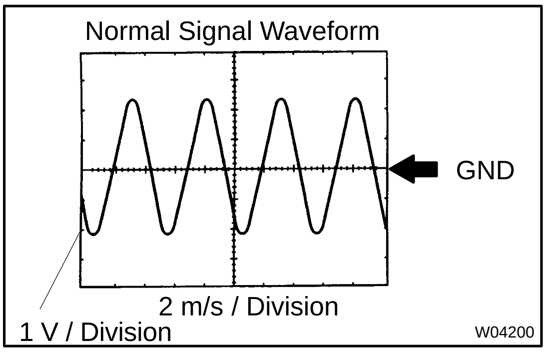
HINT:
- DTC C1235/35 is for the right front speed sensor.
- DTC C1236/36 is for the left front speed sensor.
- DTC C1238/38 is for the right rear speed sensor.
- DTC C1239/39 is for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminal FR+ - FR- or FL+ - FL- of the skid control ECU.

(b) Drive the vehicle at approximately 19 mph (30 km/h), and check the signal waveform.

OK:

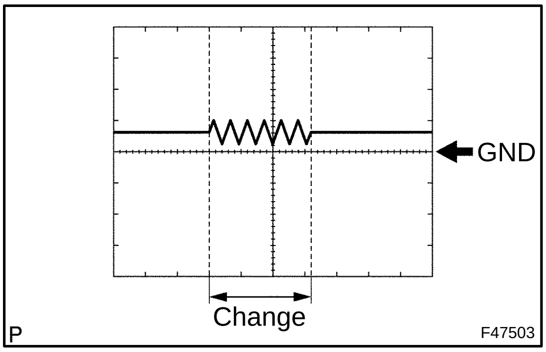
A waveform as shown in a figure should be output.

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

NG	Go to step 4

OK

2	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminal FR+ - FR- or FL+ - FL- of the skid control ECU.

(b) Check if the oscilloscope has any change when the wire harness connector is subject to vibration while the vehicle is stopped and the ignition switch is on.
(If the connector is poorly connected, vibration of the wire harness connector may cause a temporary stop in current flow.)

OK:

There is no change in a waveform.

Result:

OK	No Change	A
NG	Change	B

B	REPAIR OR REPLACE HARNESS OR CONNECTOR

A

3 RECONFIRM DTC

(a) Clear the DTCs (see page 05-973).
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded (see page 05-973).

Result:

DTC is not output	A
DTC is output	B

B → **REPLACE SKID CONTROL ECU ASSY**

A ↓

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-964)

4 INSPECT SPEED SENSOR TIP

(a) Remove the front axle hub and front speed sensor.
(b) Check the sensor tip.

OK:

No scratches or foreign matter on the sensor tip.

NOTICE:

Check the speed sensor signal after the replacement (see page 05-959).

NG → **CLEAN OR REPLACE SPEED SENSOR**

OK ↓

5 INSPECT SPEED SENSOR ROTOR

(a) Remove the front axle hub and front speed sensor rotor.
(b) Check the sensor rotor serrations.

OK:

No scratches, missing teeth or foreign matter on the rotors.

HINT:

If there is foreign matter in the rotor, remove it and check the output waveform after reassembly.

NOTICE:

Check the speed sensor signal after the replacement (see page 05-959).

NG → **CLEAN OR REPLACE SPEED SENSOR ROTOR**

OK ↓

REPLACE SPEED SENSOR

DTC	C1241/41	LOW BATTERY POSITIVE VOLTAGE OR ABNORMALLY HIGH BATTERY POSITIVE VOLTAGE

DTC	C1242/42	IG2 POWER SOURCE CIRCUIT

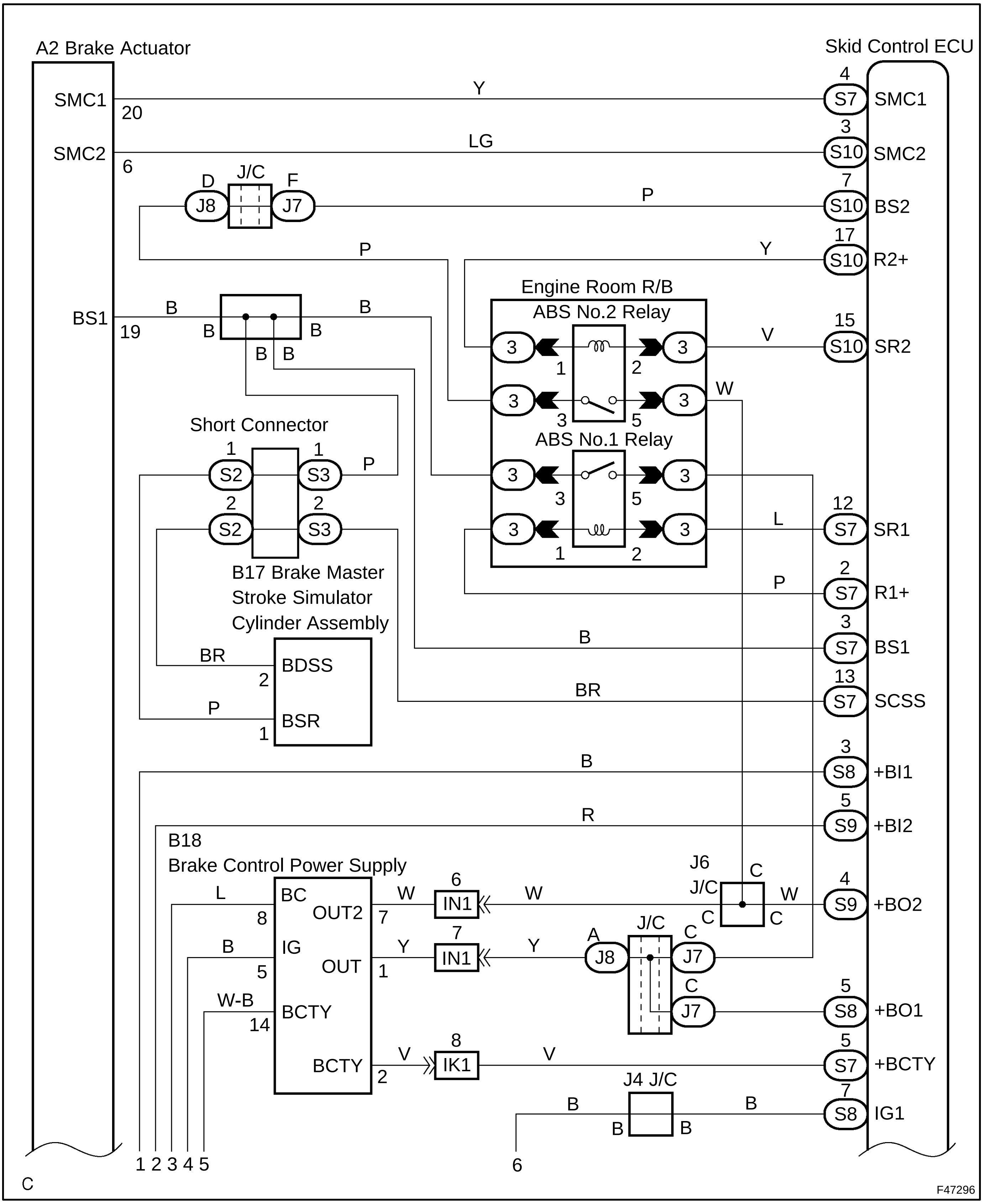
CIRCUIT DESCRIPTION

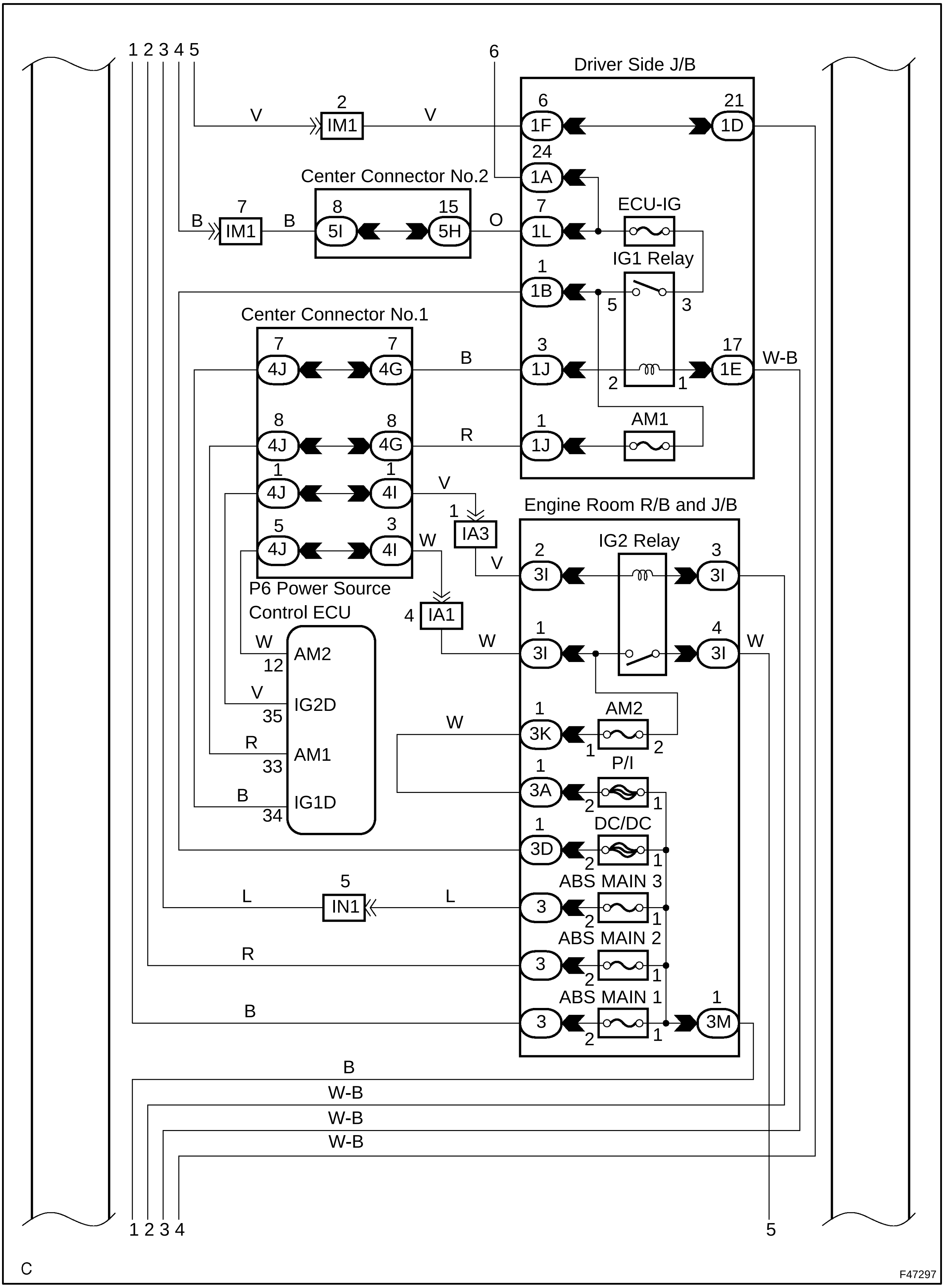
These codes are memorized when the power source voltage for the skid control ECU drops or the voltage for the ABS No.1, ABS No.2 relay operation drops.
Codes may be memorized when the voltage of the auxiliary battery temporarily drops.
When the power source voltage is too high, the skid control ECU stops functioning and outputs no DTCs, and the ABS and BRAKE warning light remain on.
HINT:
DTC C1256/56 (accumulator low voltage malfunction) may be memorized if the power source voltage drops.

DTC No.	Detailed Code	DTC Condition	Trouble Area
C1241/41	81	System 1 is under the following conditions when READY is on: • Linear solenoid cannot receive enough current (brake is applied). • BS voltage is less than 8.9 V for at least 3 sec. (brake is not applied). • 12 V-power source voltage inside ECU is less than 8.5 V when main relay is opened or VCM voltage is less than 4.7 V or 5 V or more for at least 0.05 sec.	• ABS No.1 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system
C1241/41	82	System 2 is under the following conditions when READY is on: • Linear solenoid cannot receive enough current (brake is applied). • BS voltage is less than 8.9 V for at least 3 sec. (brake is not applied). • 12 V-power source voltage inside ECU is less than 8.5 V when main relay is opened or VCM voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• ABS No.2 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system
C1241/41	83	Capacitor mode signal is received from brake control power supply for 3 sec. or more when READY is on.	• Brake control power supply assy • Brake control power supply • Hybrid control system
C1241/41	84	ABS is requested to operate when the power source voltage of the main relay system is dropping.	• ABS No.1 relay • ABS No.2 relay • Harness and connector

DTC No.	Detailed Code	DTC Condition	Trouble Area
C1242/42	87	Voltage is applied to IG2 terminal, but not applied to IG1 terminal for at least 4 sec.	• ABS No.1 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system
C1242/42	88	Voltage is applied to IG 1 terminal, but not applied to IG 2 terminal for at least 4 sec.	• ABS No.2 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system

WIRING DIAGRAM




1 2 3 4 5
6
Driver Side J/B
V
2
IM1
V
6
1F
21
1D
24
1A
Center Connector No.2
B
7
IM1
B
8
5I
15
5H
O
7
1L
ECU-IG
IG1 Relay
1
1B
5
3
Center Connector No.1
7
4J
7
4G
B
3
1J
2
1
17
1E
W-B
8
4J
8
4G
R
1
1J
AM1
1
4J
1
4I
V
1
IA3
Engine Room R/B and J/B
5
4J
3
4I
W
V
IG2 Relay
2
3I
3
3I
P6 Power Source
Control ECU
4
IA1
W
1
3I
4
3I
W
AM2
12
V
IG2D
35
W
1
3K
AM2
1
2
R
AM1
33
1
3A
P/I
2
1
B
IG1D
34
1
3D
DC/DC
2
1
5
L
IN1
L
3
ABS MAIN 3
2
1
R
3
ABS MAIN 2
2
1
B
3
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2
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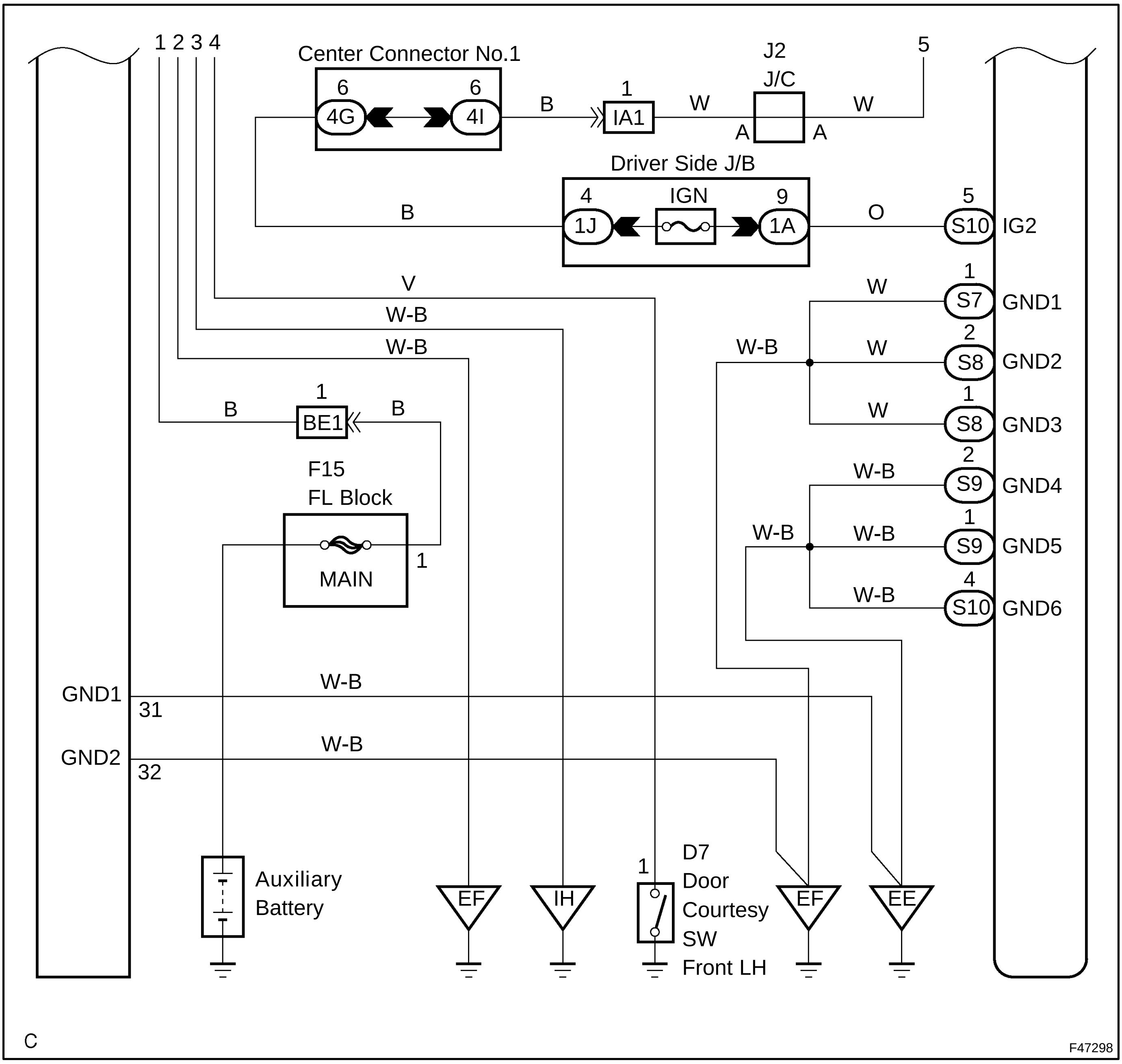
3M
B
W-B
W-B
W-B
1 2 3 4
5
C
F47297


1 2 3 4
Center Connector No.1
6
4G
6
4I
B
1
IA1
W
J2
J/C
A
A
W
5
Driver Side J/B
4
1J
IGN
9
1A
B
O
5
S10
IG2
V
W-B
W-B
W
1
S7
GND1
W-B
W
2
S8
GND2
W
1
S8
GND3
1
B
BE1
B
W-B
2
S9
GND4
F15
FL Block
MAIN
1
W-B
W-B
1
S9
GND5
W-B
4
S10
GND6
GND1
31
W-B
GND2
32
W-B
Auxiliary
Battery
EF
IH
1
D7
Door
Courtesy
SW
Front LH
EF
EE
C
F47298

INSPECTION PROCEDURE

1 CHECK DTC(HYBRID CONTROL SYSTEM)

(a) Is DTC output for HYBRID CONTROL SYSTEM?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR HYBRID CONTROL SYSTEM (SEE PAGE 05-440)**

A

2 CHECK AUXILIARY BATTERY VOLTAGE

(a) Check the auxiliary battery voltage.

Standard:

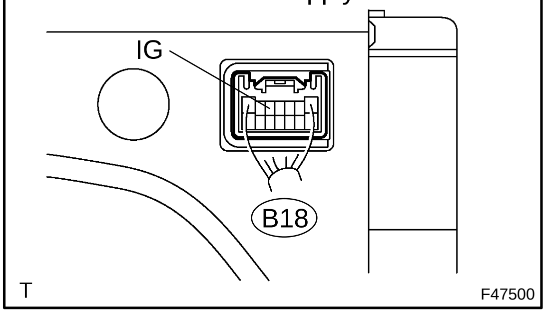
10 to 14 V

NG → **CHARGE OR REPLACE AUXILIARY BATTERY**

OK

3 CHECK BRAKE CONTROL POWER SUPPLY

Brake Control Power Supply



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage behind the connector with the connector connected.

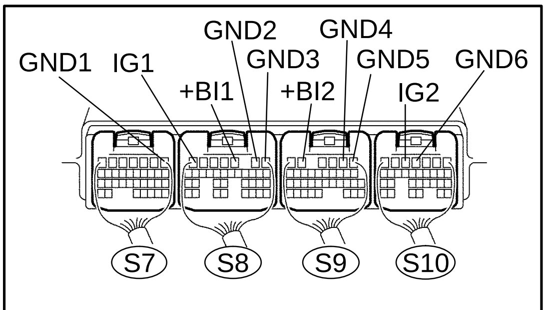
Standard:

Tester Connection	Specified Condition
B18-5 (IG) - Body ground	10 to 14 V

NG → **CHARGE OR REPLACE BRAKE CONTROL POWER SUPPLY**

OK

4	CHECK HARNESS AND CONNECTOR



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Specified Condition
S8-7 (IG1) - Body ground	10 to 14 V
S10-5 (IG2) - Body ground	10 to 14 V
S8-3 (+BI1) - Body ground	10 to 14 V
S9-5 (+BI2) - Body ground	10 to 14 V

(b) Measure the resistance according to the value(s) in the table below.

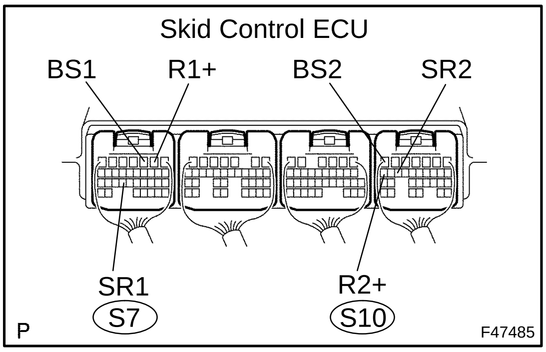
Standard:

Tester Connection	Specified Condition
S7-1 (GND1) - Body ground	Below 1 Ω
S8-2 (GND2) - Body ground	Below 1 Ω
S8-1 (GND3) - Body ground	Below 1 Ω
S9-2 (GND4) - Body ground	Below 1 Ω
S9-1 (GND5) - Body ground	Below 1 Ω
S10-4 (GND6) - Body ground	Below 1 Ω

NG — **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Condition	Specified Condition
S7-2 (R1+) - Body ground	Power switch ON (READY)	8 to 13 V
S10-17 (R2+) - Body ground	Power switch ON (READY)	8 to 13 V
S7-12 (SR1) - Body ground	Power switch ON (READY)	Below 1.5 V
S10-15 (SR2) - Body ground	Power switch ON (READY)	Below 1.5 V
S7-3 (BS1) - Body ground	Power switch ON (READY)	10 to 14 V
S10-7 (BS2) - Body ground	Power switch ON (READY)	10 to 14 V

Result:

All OK	A
NG (R1+, R2+)	B
NG (SR1, SR2, BS1, BS2)	C

B → **REPLACE SKID CONTROL ECU ASSY**

C → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A

6 RECONFIRM DTC

(a) Clear the DTCs.
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded (see page 05-973).

Result:

DTC is not output	A
DTC is output	B

B → **REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)**

A

END (DTC MAY BE STORED DUE TO TEMPORARY POWER SOURCE VOLTAGE DROP)

DTC C1246/46 MALFUNCTION IN MASTER CYLINDER PRESSURE SENSOR

DTC C1364/61 MALFUNCTION IN W/C PRESSURE SENSOR

CIRCUIT DESCRIPTION

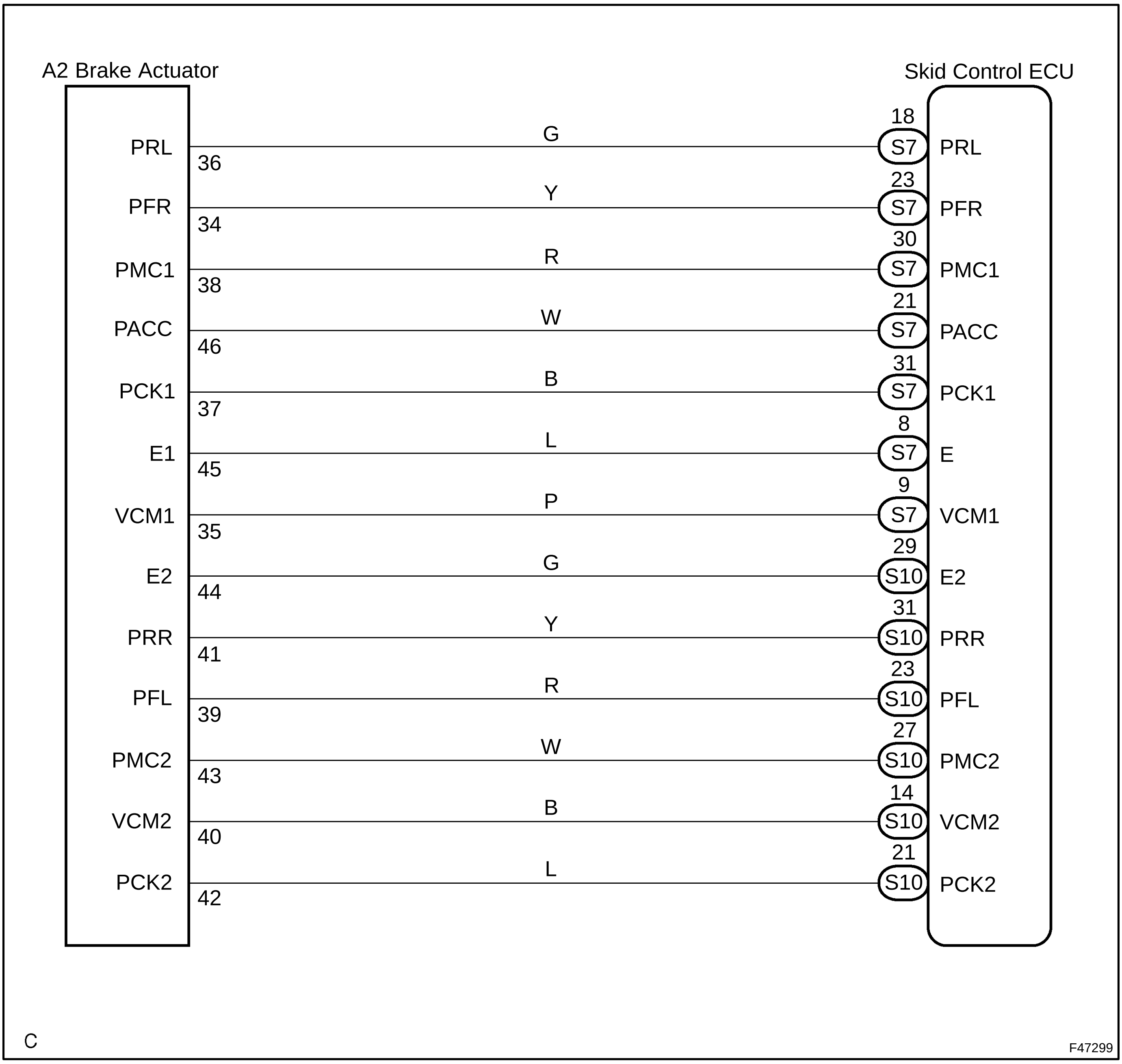
The master cylinder pressure sensor and the wheel cylinder pressure sensor are built into the brake actuator, and measure the master cylinder pressure and the wheel cylinder pressure send to the skid control ECU.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1246/46	191	Sensor power source 1 (VMC1) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	192	Ratio of master pressure sensor output voltage 1 (PMC1) to sensor power source (VMC1) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	194	Sensor power source 2 (VMC2) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	195	Ratio of master pressure sensor output voltage 2 (PMC2) to sensor power source (VMC2) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	197	Master pressure sensor output voltage 1 (PMC1) is abnormal.	• Brake actuator assy • Skid control ECU
C1246/46	198	Master pressure sensor output voltage 2 (PMC2) is abnormal.	• Brake actuator assy • Skid control ECU
C1246/46	199	Master pressure sensor output 1 (PMC1) is not approx. 0 Mpa when not braking.	• Brake actuator assy • Skid control ECU • Harness and connector • Stop input signal
C1246/46	200	Master pressure sensor output 2 (PMC2) is not approx. 0 Mpa when not braking.	• Brake actuator assy • Skid control ECU • Harness and connector • Stop input signal
C1246/46	201	PMC1 and PMC2 voltages are different when braking.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	202	Master pressure sensor 1 data (PMC1) is invalid.	• Brake actuator assy • Skid control ECU • Harness and connector
C1246/46	205	Master pressure sensor 2 data (PMC2) is invalid.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	221	Sensor power source 1 (VMC1) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Harness and connector • Skid control ECU
C1364/61	222	Raio of FR right sensor output voltage (PFR) to sensor power source (VCM1) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1364/61	224	• FR right sensor output (PFR) is not approx. 0 Mpa when not braking. • FR right sensor (PFR) zero point malfunction. • Open or short in FR right sensor (PFR) circuit.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	225	Ratio of FR right sensor output voltage (PFR) to sensor power source (VCM1) is less than 90.5% for at least 0.1 sec. when self-diagnosis signal is output.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	227	Sensor power source 2 (VMC2) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	228	Ratio of FR lefr sensor output voltage (PFL) to sensor power source (VCM2) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	230	• FR left sensor (PFL) is not approx. 0 Mpa when not braking. • FR left sensor (PFL) zero point malfunction • Open or short in FR right sensor (PFL) circuit.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	231	Ratio of FR left sensor output voltage (PFL) to sensor power source (VCM2) is less than 90.5% for at least 0.1 sec. when self-diagnosis signal is output.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	233	Sensor power source 2 (VCM2) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	234	Ratio of RR right sensor output voltage (PRR) to sensor power source (VCM2) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	236	• RR right sensor output voltage (PRR) is not approx. 0 Mpa when not braking. • RR right sensor (PRR) zero point malfunction. • Open or short in RR sensor (PRR) circuit.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	237	Ratio of RR right sensor output voltage (PRR) to sensor power source (VCM2) is less than 90.5% for at least 0.1 sec. when self-diagnosis signal is output.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	239	Sensor power source (VMC1) voltage is less than 4.7 V or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	240	Ratio of RR left sensor output voltage (PRL) to sensor power source (VCM1) is less than 5% or 90.5% or more for at least 0.05 sec.	• Brake actuator assy • Skid control ECU • Harness and connector

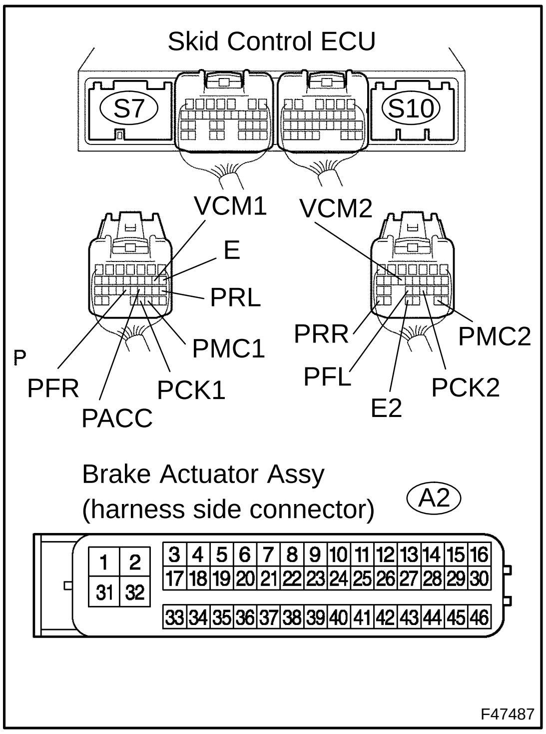
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1364/61	226	Voltage difference before and after changing the pull-up resistance in the sensor signal input circuit is 0.3 V or more (poor connection).	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	232	Voltage difference before and after changing the pull-up resistance in the sensor signal input circuit is 0.3 V or more (poor connection).	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	238	Voltage difference before and after changing the pull-up resistance in the sensor signal input circuit is 0.3 V or more (poor connection).	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	242	• RR left sensor output (PRL) is not approx. 0 Mpa when not braking. • RR left sensor (PRL) zero point malfunction. • Open or short in RR left sensor (PRL) circuit.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	243	• Ratio of RR left sensor output voltage (PRL) to sensor power source (VCM1) is less than 90.5% for at least 0.1 sec. when sel-diagnosis signal is output.	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61	244	Voltage difference before and after changing the pull-up resistance in the sensor signal input circuit is 03 V or more (poor connection).	• Brake actuator assy • Skid control ECU • Harness and connector

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR



(a) Disconnect the skid control ECU connector and brake actuator connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-8 (E) - A2-45 (E1)	Below 1 Ω
S7-9 (VCM1) - A2-35 (VCM1)	Below 1 Ω
S7-18 (PRL) - A2-36 (PRL)	Below 1 Ω
S7-21 (PACC) - A2-46 (PACC)	Below 1 Ω
S7-23 (PFR) - A2-34 (PFR)	Below 1 Ω
S7-30 (PMC1) - A2-38 (PMC1)	Below 1 Ω
S7-31 (PCK1) - A2-37 (PCK1)	Below 1 Ω
S10-14 (VCM2) - A2-40 (VCM2)	Below 1 Ω
S10-21 (PCK2) - A2-42 (PCK2)	Below 1 Ω
S10-23 (PFL) - A2-39 (PFL)	Below 1 Ω
S10-27 (PMC2) - A2-43 (PMC2)	Below 1 Ω
S10-29 (E2) - A2-44 (E2)	Below 1 Ω
S10-31 (PRR) - A2-41 (PRR)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

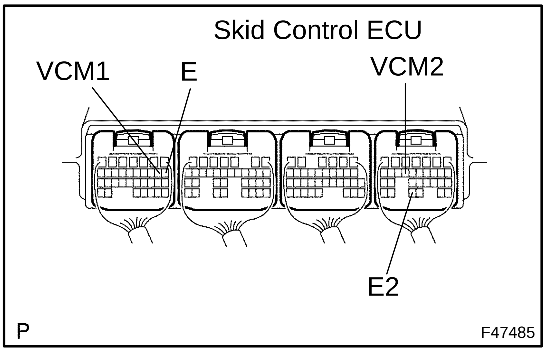
Standard:

Tester Connection	Specified Condition
S7-8 (E) - Body ground	10 kΩ or higher
S7-9 (VCM1) - Body ground	10 kΩ or higher
S7-18 (PRL) - Body ground	10 kΩ or higher
S7-21 (PACC) - Body ground	10 kΩ or higher
S7-23 (PFR) - Body ground	10 kΩ or higher
S7-30 (PCM1) - Body ground	10 kΩ or higher
S7-31 (PCK1) - Body ground	10 kΩ or higher
S10-14 (VCM2) - Body ground	10 kΩ or higher
S10-21 (PCK2) - Body ground	10 kΩ or higher
S10-27 (PMC2) - Body ground	10 kΩ or higher
S10-29 (E2) - Body ground	10 kΩ or higher
S10-31 (PRR) - Body ground	10 kΩ or higher

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Condition	Specified Condition
S7-9 (VCM1) - Body ground	Power switch ON (READY)	4.75 to 5.25 V
S10-14 (VCM2) - Body ground	Power switch ON (READY)	4.75 to 5.25 V

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-8 (E) - Body ground	Below 1 Ω
S10-29 (E2) - Body ground	Below 1 Ω

NG **REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)**

OK

3 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
MAS CYL PRS 1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
MAS CYL PRS 2	Master cylinder pressure sensor 2 reading / min.: o V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V

(c) Check the output value of the master cylinder pressure sensor on the hand-held tester display.

OK:

When the pedal is depressed, displayed voltage on the hand-held tester increase.

NG **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

4 READ VALUE OF HAND-HELD TESTER

(a) Connect the pedal effort gauge.
(b) Install the LSPV gauge (SST) and bleed air (see page 32-4).
SST 09709-29018
(c) Connect the hand-held tester to the DLC3.
(d) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
FR PRESS SENS	Front Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
FL PRESS SENS	Front Left pressure sensor / min. 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
RR PRESS SENS	Rear Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
RL PRESS SENS	Rear Left pressure sensor / min. 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V

(e) Check the output value of the wheel cylinder pressure sensor at each fluid pressure during the ECB control.
Standard:

Fluid Pressure MPa (kgf/cm^2, psi)	FR PRESS SENS (DATA-LIST)	FL PRESS SENS (DATA-LIST)	RR PRESS SENS (DATA-LIST)	RL PRESS SENS (DATA-LIST)
1 (10.2, 145.0)	0.65 to 0.75 V	0.65 to 0.75 V	0.65 to 0.75 V	0.65 to 0.75 V
3 (30.6, 435.2)	1.05 to 1.2 V	1.05 to 1.2 V	1.05 to 1.2 V	1.05 to 1.2 V
7 (71.4, 1015.5)	1.8 to 2.05 V	1.8 to 2.05 V	-	-
10 (102.0, 1450.7)	2.4 to 2.7 V	2.4 to 2.7 V	-	-

NG → **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC C1247/47 MALFUNCTION IN STROKE SENSOR

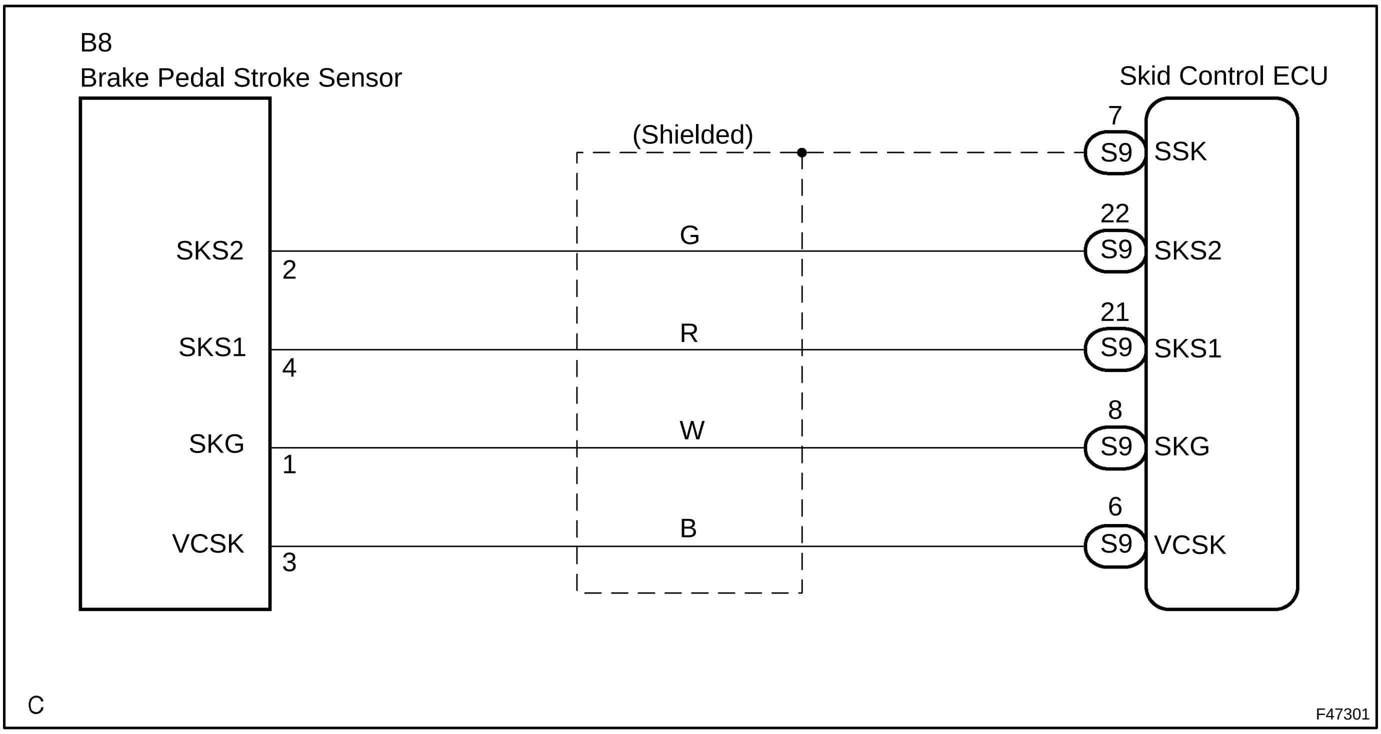
DTC C1392/48 UN-CORRECTION OF A ZERO POINT OF THE STROKE SENSOR

CIRCUIT DESCRIPTION

The stroke sensor inputs the pedal stroke into the skid control ECU.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1247/47	171	Sensor power source voltage (VCSK) is 3.6 V or less or 4.95 V or more for at least 1.2 sec.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	172	Ratio of sensor output voltage 1 (SKS1) to sensor power source voltage (VCSK) is less than 3% or 97% or more for at least 1.2 sec.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	173	Ratio of sensor output voltage 2 (SKS2) to sensor power source voltage (VCSK) is less than 3% or 97% or more for at least 1.2 sec.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	174	Sensor output 1 (SKS1) calculation value becomes 20 mm or more for at least 1.2 sec. at an interval of 0.006 sec. (changes due to interference).	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	175	Sensor output 2 (SKS2) calculation value becomes 20 mm or more for at least 1.2 sec. at an interval of 0.006 sec. (changes due to interference).	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	176	Zero point stored value (ratio to power source voltage) of sensor output 1 (SKS1) is 0.46 or more or 0.03 or less.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	177	Zero point stored value (ratio to power source voltage) of sensor output 2 (SKS2) is 0.97 or more or 0.48 or less.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	179	• Sum of SKS1/VSCK and SKS2/VSCK is 1.155 or more or 0.845 or less for at least 1 sec. • Difference between sensor output 1 (SKS1) and sensor output 2 (SKS2) is excessively large for at least 0.2 sec.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1247/47	180	• Difference between zero point output value and stored value is 0.5 or more for at least 0.05 sec. • Short between SKS1 and SKS2 output line.	• Brake pedal stroke sensor • Skid control ECU • Harness and connector
C1392/48	178	Zero point calibration of stroke sensor is unfinished.	• Brake pedal stroke sensor zero point calibration undone (initialization of linear solenoid valve and calibration undone) • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**CHECK BRAKE PEDAL**

(a) Check that the brake pedal and the brake pedal stroke sensor are properly installed and that the pedal can be operated normally.
(b) Check the brake pedal height.
OK:
- **The brake pedal is securely installed.**
- **The pedal height is within the specified range (see page 32-16).**

NG → **ADJUST BRAKE PEDAL (SEE PAGE 32-16)**

OK

2	**READ VALUE OF HAND-HELD TESTER**

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal condition
PEDAL STROKE	Stroke sensor / min.:0 V, max.: 5 V	When brake pedal is released: 0.7 to 1.3 V
PEDAL STROKE 2	Stroke sensor 2 / min.: 0 V, max.: 5 V	When brake pedal is released: 3.7 to 4.3 V

(d) Read the pedal stroke sensor voltage value on the hand-held tester screen.
OK:
The Normal condition value displayed on the hand-held tester.

NG → **ADJUST BRAKE PEDAL STROKE SENSOR ASSY**

OK

3	**PERFORM INITIALIZATION OF LINEAR SOLENIOID VALVE AND CALIBRATION (SEE PAGE 05-956)**

NEXT

4 RECONFIRM DTC

(a) Clear the DTCs (see page 05-973).
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded.

Result:

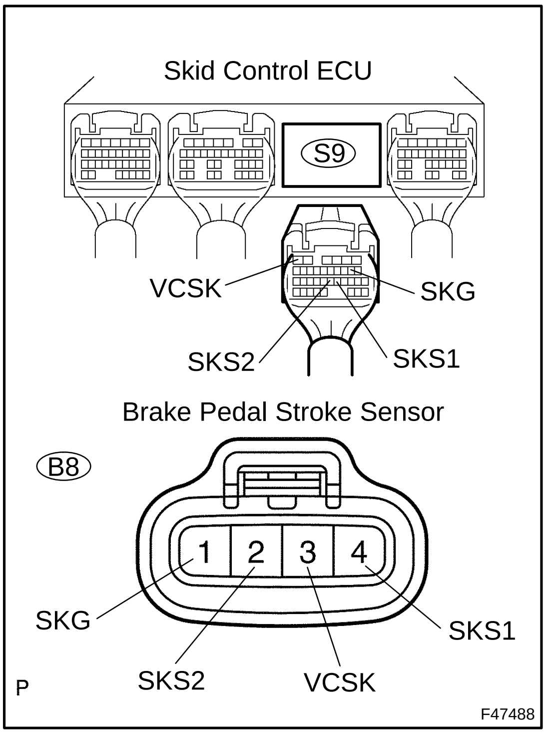
DTC is output	A
DTC is not output	B

B → **END**

HINT:
This DTC may be memorized due to a malfunction in the connector terminal connection, etc.

A

5 CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU - BRAKE PEDAL STROKE SENSOR)



(a) Disconnect the skid control ECU connector and brake pedal stroke sensor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S9-6 (VCSK) - B8-3 (VCSK)	Below 1 Ω
S9-8 (SKG) - B8-1 (SKG)	Below 1 Ω
S9-21 (SKS1) - B8-4 (SKS1)	Below 1 Ω
S9-22 (SKS2) - B8-2 (SKS2)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

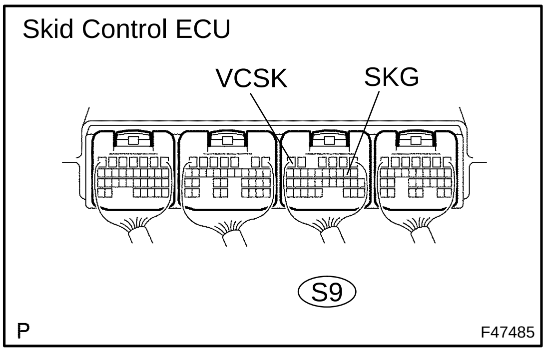
Standard:

Tester Connection	Specified Condition
S9-6 (VCSK) - Body ground	10 kΩ or higher
S9-8 (SKG) - Body ground	10 kΩ or higher
S9-21 (SKS1) - Body ground	10 kΩ or higher
S9-22 (SKS2) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(VCSK, SKG TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

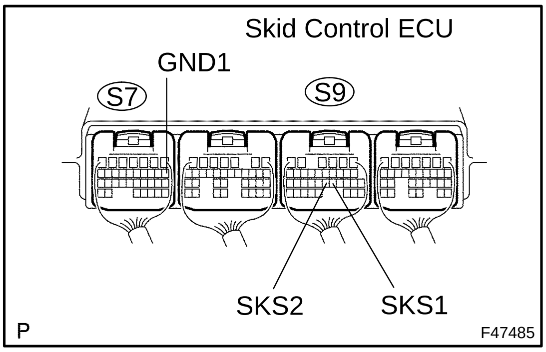
Standard:

Tester Connection	Specified Condition
S9-6 (VCSK) - S9-8 (SKG)	3.6 to 4.95 V

NG → **REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)**

OK

7 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(SKS1, SKS2 TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:

- Measure the voltage from behind the connector with the connector connected to the skid control ECU.
- Slowly depress the brake pedal and check if the voltage between the skid control ECU terminal changes in accordance with the pedal operation.

Standard:

Tester Connection	Specified Condition
S9-21 (SKS1) - S7-1 (GND1)	1.8 to 3.1 V
S9-22 (SKS2) - S7-1 (GND1)	1.8 to 3.1 V

NG → **REPLACE BRAKE PEDAL STROKE SENSOR ASSY**

OK

REPLACE SKID CONTROL ECU ASSY(SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

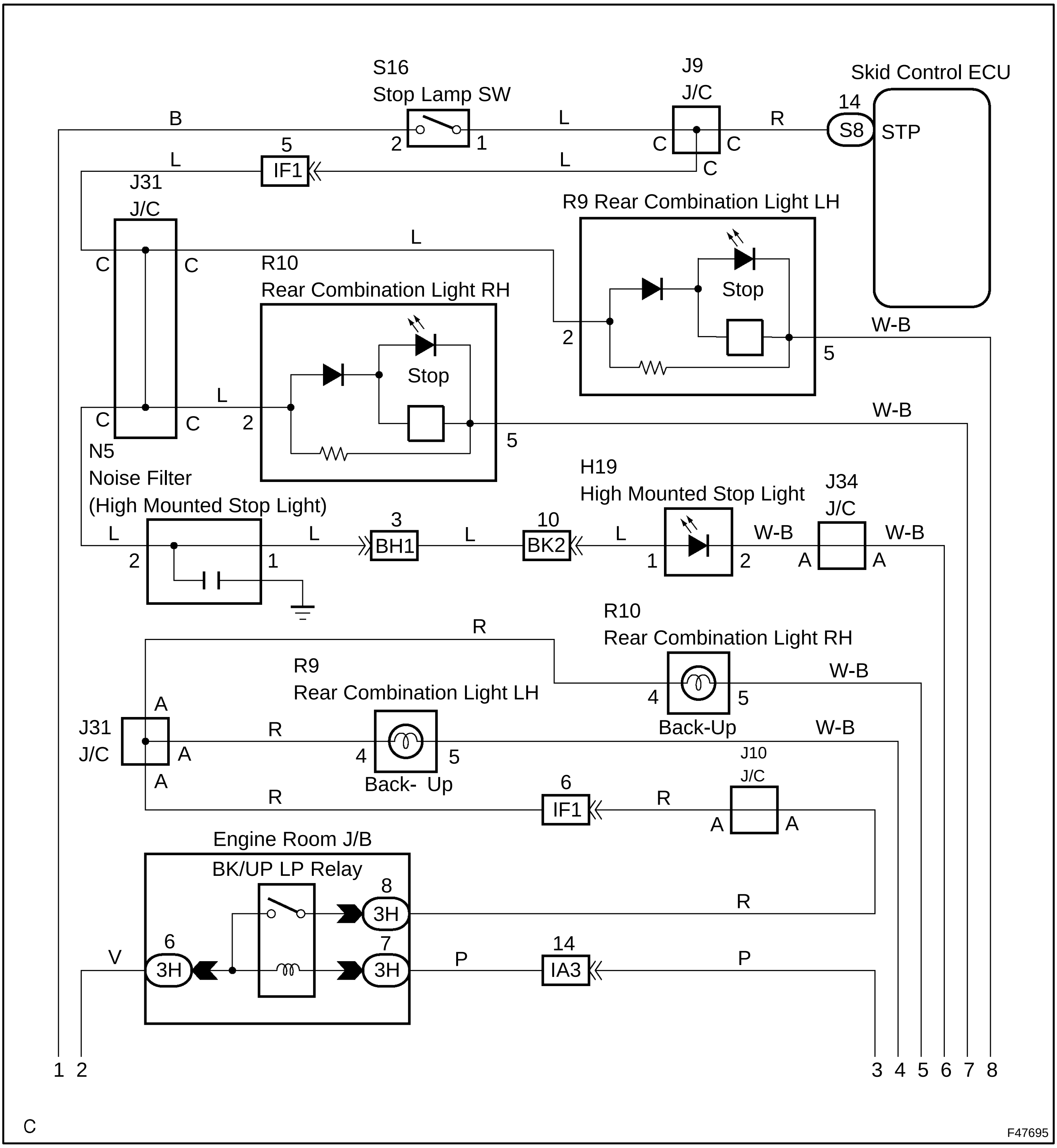
DTC C1249/49 OPEN CIRCUIT IN STOP LIGHT SWITCH CIRCUIT

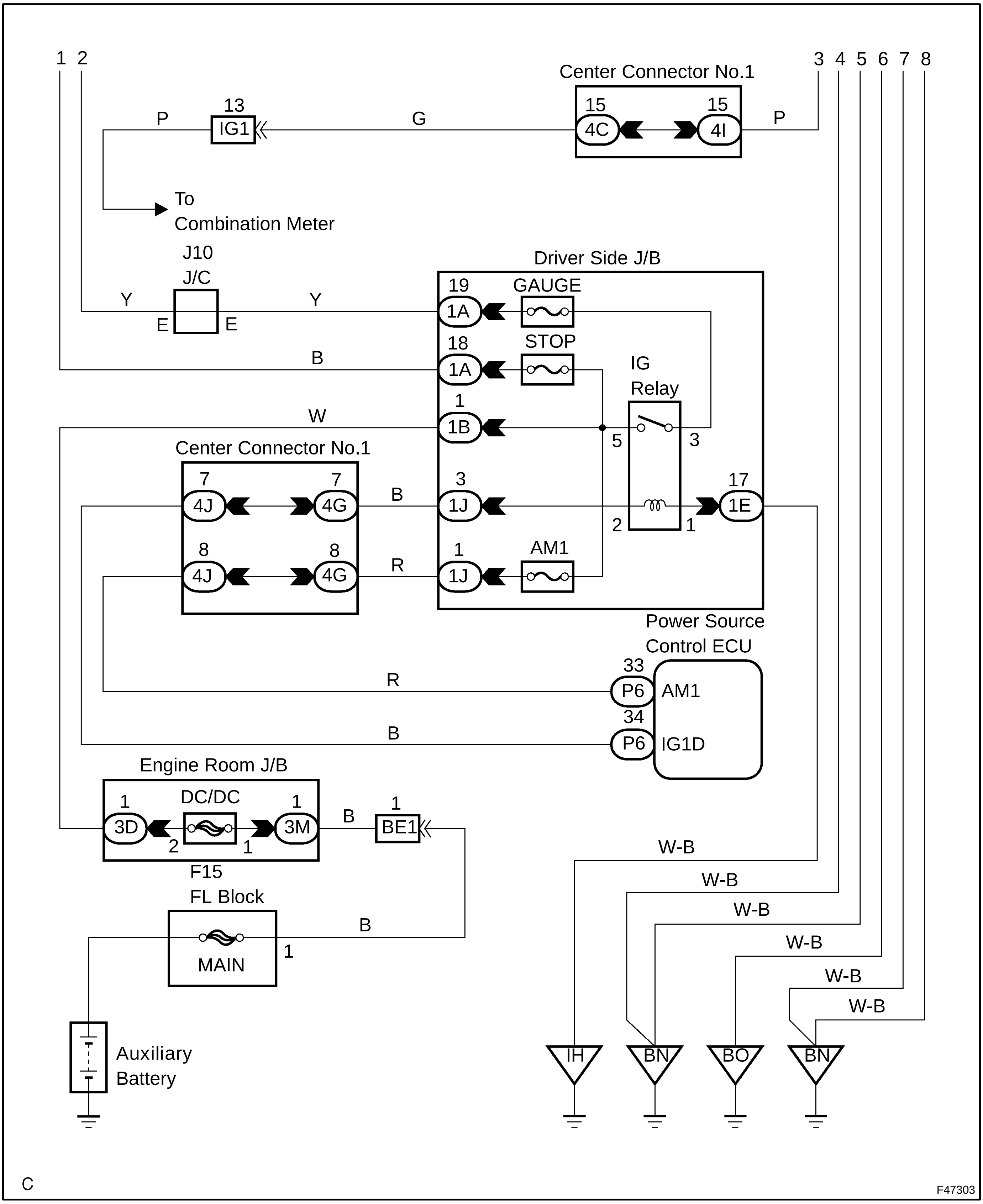
CIRCUIT DESCRIPTION

The skid control ECU inputs the stop lamp switch signal and detects braking condition.
The skid control ECU has a circuit for open detection inside. The skid control ECU outputs the DTC if it detects an open in the stop lamp signal input line when the stop lamp switch is off or an open in the stop lamp circuit (GND side).

DTC No.	Detailed Code	DTC Detected Condition	Trouble Area
C1249/49	520	Stop lamp switch circuit is open for at least 10 sec. when IG1 terminal voltage is between 9.5 V and 17.02 V.	• Stop lamp switch • Stop lamp switch circuit • Stop lamp bulb

WIRING DIAGRAM




1 2
3 4 5 6 7 8
Center Connector No.1
P
13
IG1
G
15
4C
15
4I
P
To
Combination Meter
J10
J/C
Driver Side J/B
Y
E
E
Y
19
1A
GAUGE
B
18
1A
STOP
IG
Relay
W
1
1B
5
3
Center Connector No.1
7
4J
7
4G
B
3
1J
17
1E
2
1
8
4J
8
4G
R
1
1J
AM1
Power Source
Control ECU
R
33
P6
AM1
B
34
P6
IG1D
Engine Room J/B
DC/DC
1
3D
1
3M
2
1
B
1
BE1
F15
FL Block
B
MAIN
1
W-B
W-B
W-B
W-B
W-B
W-B
Auxiliary
Battery
IH
BN
BO
BN
C
F47303

INSPECTION PROCEDURE

1 CHECK STOP LAMP SWITCH OPERATION

(a) Check that the stop light comes on when the brake pedal is depressed and turns off when the brake pedal is released.

OK:

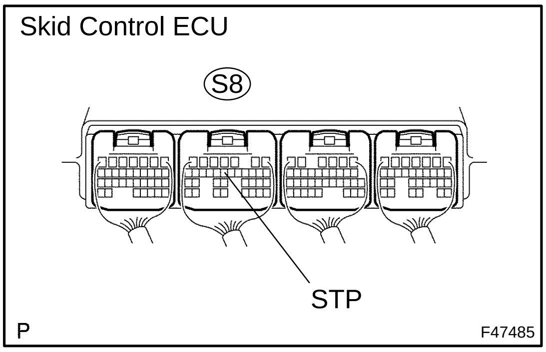
Pedal Condition	Illumination Condition
Brake pedal depressed	ON
Brake pedal released	OFF

NG → **Go to step 4**

HINT:
Check the stop lamp bulb as it may have burnt out.

OK

2 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Switch Condition	Specified Condition
S8-14 (STP) - Body ground	Brake pedal depressed	8 to 14 V
S8-14 (STP) - Body ground	Brake pedal released	Below 1 V

NG → **Go to step 4**

OK

3 RECONFIRM DTC

(a) Clear the DTCs (see page 05-973).
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded (see page 05-973).

Result:

DTC is not output	A
DTC is output	B

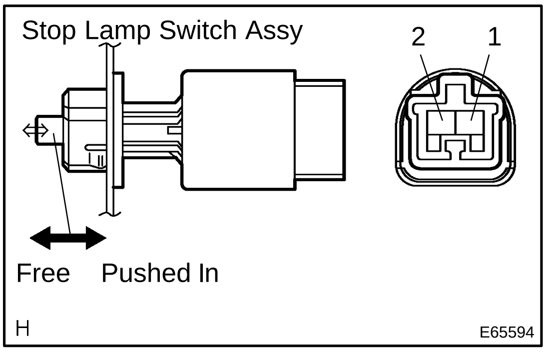
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-964)**

A

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

4 INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Measure the resistance according to the value(s) in the table below.

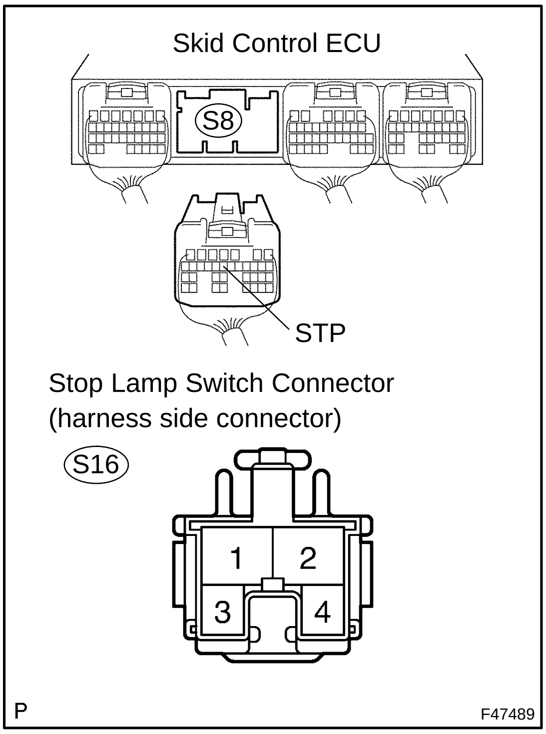
Standard:

Switch Condition	Tester Connection	Specified Condition
Switch pin free	1 - 2	Below 1 Ω
Switch pin pushed in	1 - 2	10 kΩ or higher

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

5 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH - SKID CONTROL ECU)



(a) Disconnect the stop lamp switch connector and skid control ECU connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-14 (STP) - S16-1	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C1252/52	BRAKE BOOSTER PUMP MOTOR ON TIME ABNORMALLY LONG

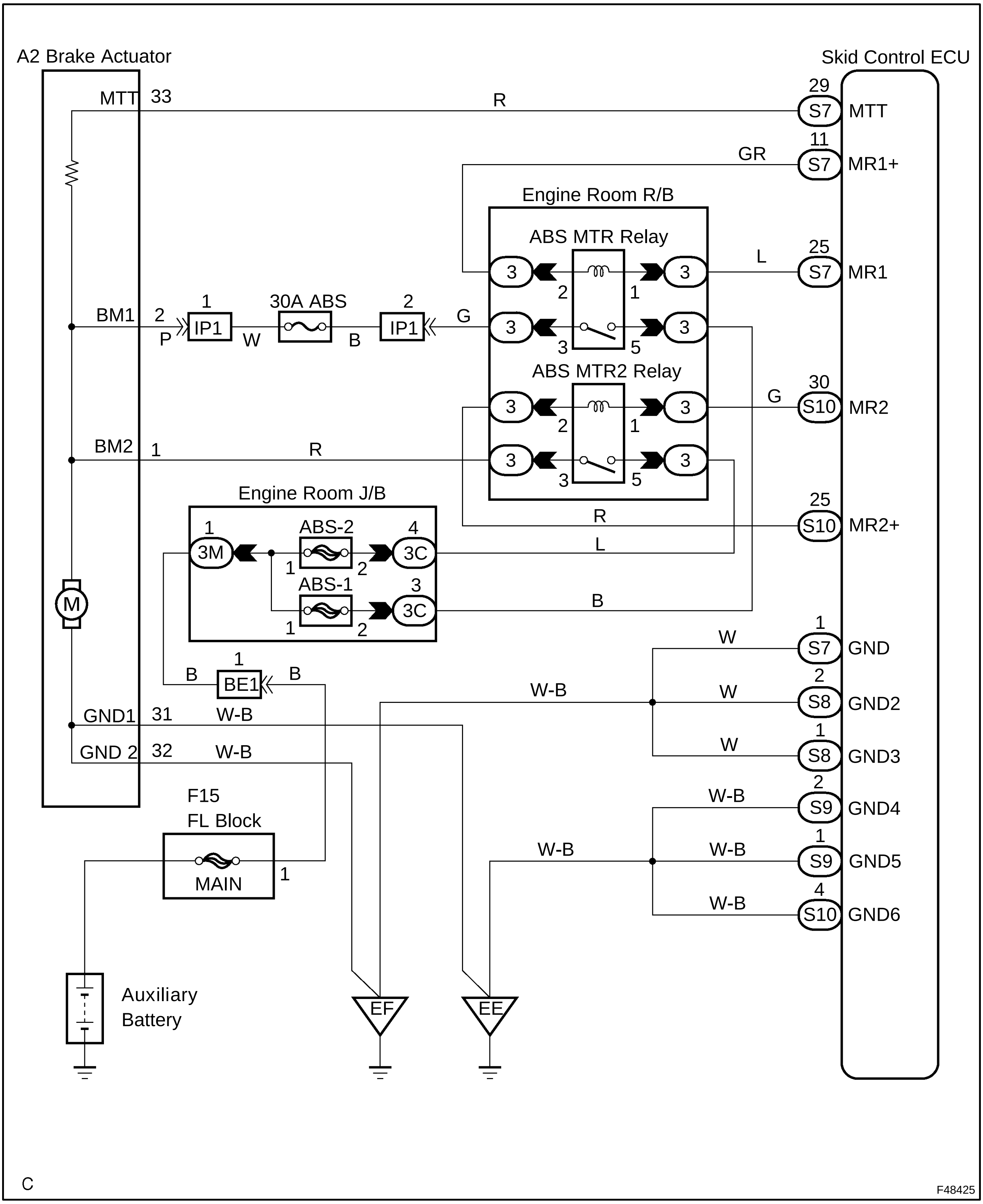
DTC	C1253/53	BRAKE BOOSTER PUMP MOTOR CIRCUIT

CIRCUIT DESCRIPTION

The skid control ECU detects decreases in the accumulator pressure according to the data from the accumulator pressure sensor, and then starts and stops the pump motor by operating the motor relay.
The skid control ECU usually drives the motor relay 1 for ECB control, and the motor relay 2 for ABS control. If either is malfunctioning, the other substitutes.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1252/52	130	Motor relay is ON for at least 5 min.	• Brake actuator assy
C1253/53	132	Motor relay 1 coil (monitor) is energized for at least 1 sec. when main relay 1 monitor (BS1) is 9.5 V or more and motor relay 1 is off.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	133	Motor relay 1 coil (monitor) is not energized for at least 1 sec. when main relay 1 monitor (BS1) is 9.5 V or more and motor relay 1 is on.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	134	MTT input is 3.5 V or less for at least 0.2 sec. when main relay 1 monitor (BS1) is 9.5 V or more and motor relay 1 is on.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	136	Motor relay 2 coil (monitor) is energized for at least 1 sec. when main relay 2 monitor (BS2) is 9.5 V or more and motor relay 2 is off.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	137	Motor relay 2 coil (monitor) is not energized for at least 1 sec. (0.2 sec. during initial check) when main rely 2 monitor (BS2) is 9.5 V or more and motor relay 2 is on.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	138	MTT input is 3.5 V or less for at least 1 sec. (0.2 sec. during initial check) when main relay 1 monitor (BS1) is 9.5 V or more and motor relay 2 is on.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1253/53	140	MTT input is 3.5 V or more for at least 2 sec. when motor relay 1 and 2 are off.	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy

WIRING DIAGRAM



INSPECTION PROCEDURE

1	PERFORM ACTIVE TEST BY HAND-HELD TESTER(ABS MOTOR RELAY OPERATION)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the ACTIVE TEST mode on the hand-held tester.
(d) Check the operation sound of the ABS motor individually when operating it with the hand-held tester.

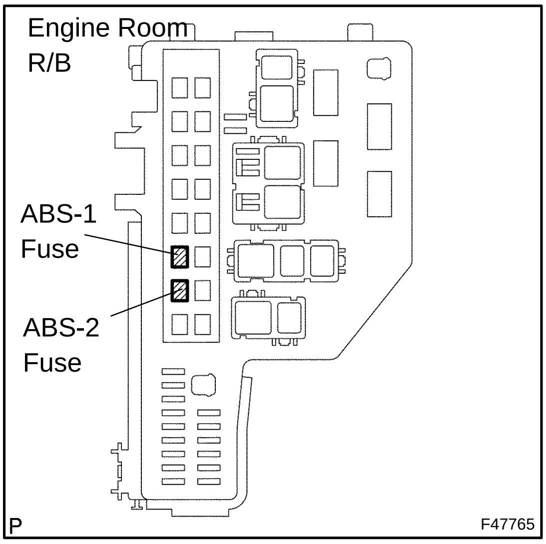
Item	Measurement Item / Range (Display)	Normal Condition
MOTOR RELAY 1	Turns MOTOR RELAY 1 ON / OFF	Operation of solenoid (clicking sound) can be heard
MOTOR RELAY 2	Turns MOTOR RELAY 2 ON / OFF	Operation of solenoid (clicking sound) can be heard

OK:
The operation sound of the ABS motor should be heard.

NG → **Go to step 6**

OK

2	INSPECT FUSE(ABS-1, ABS-2 FUSE)



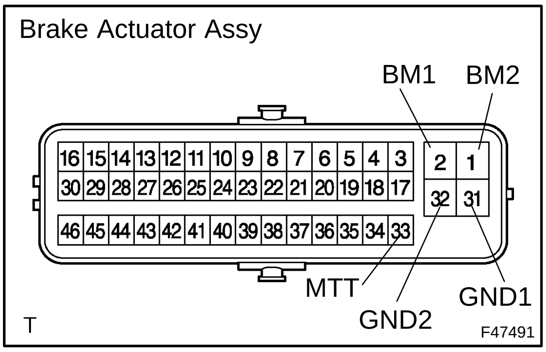
(a) Remove the ABS-1 and ABS-2 fuse from the engine room R/B
(b) Measure the resistance according to the value(s) in the table below.
Standard:

ABS-1	Below 1 Ω (Continuity)
ABS-2	Below 1 Ω (Continuity)

NG → **CHECK FOR SHORT IN ALL HARNESS AND CONNECTOR CONNECTED TO FUSE AND REPLACE FUSE**

OK

3 INSPECT BRAKE ACTUATOR ASSY



(a) Disconnect the brake actuator assy connector.

(b) Measure the resistance according to the value(s) in the table below.

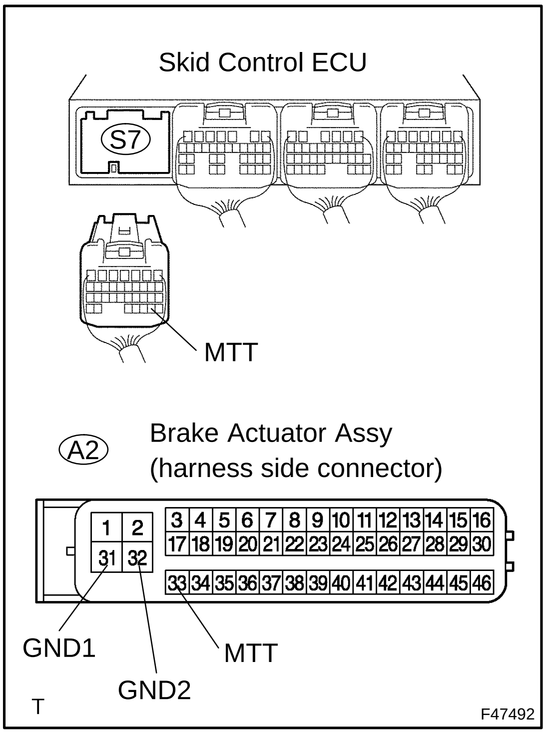
Standard:

Tester Connection	Specified Condition
1 (BM2) - 31 (GND1)	Below 10 Ω
2 (BM1) - 31 (GND1)	Below 10 Ω
1 (BM2) - 2 (BM1)	Below 1 Ω
31 (GND1) - 32 (GND2)	Below 1 Ω
1 (BM2) - 33 (MTT)	About 33 Ω
2 (BM1) - 33 (MTT)	About 33 Ω

NG → **REPLACE BRAKE ACTUATOR ASSY**

OK

4 CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU - BRAKE ACTUATOR ASSY)



(a) Disconnect the skid control ECU connector and brake actuator assy connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-29 (MTT) - A2-33 (MTT)	Below 1 Ω
A2-31 (GND1) - Body ground	Below 1 Ω
A2-32 (GND2) - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DTA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
ACC PRESS SENS 1	Accumulator pressure sensor 1 / min.: 0 V, max.: 5 V	Specified value: 3.2 to 4.0 V

(d) Depress the brake pedal 4 or 5 times to operate the pump motor, and check the output value on the hand-held tester with the motor stopped (not braking).
OK:
Accumulator (ACC) pressure sensor voltage does not drop.

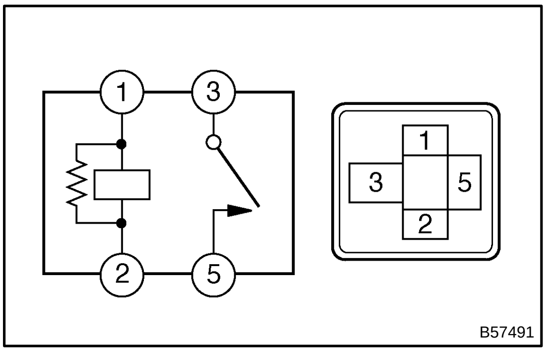
NG **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

6 INSPECT ABS MOTOR RELAY



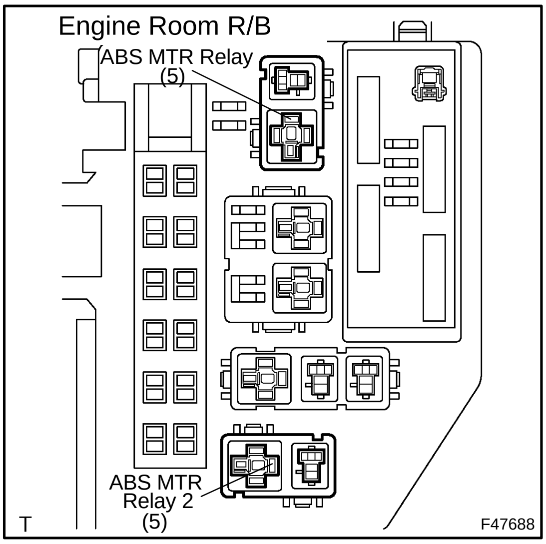
(a) Remove the ABS motor relay and ABS motor relay 2.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Connection	Specified Resistance
3 - 5	Always	10 kΩ or higher (No continuity)
3 - 5	Apply B+ between terminal 1 and 2	Below 1 Ω

NG **REPLACE ABS MOTOR RELAY**

OK

7	CHECK HARNESS AND CONNECTOR



(a) Remove the ABS motor relay and ABS motor relay 2.

(b) Measure the voltage according to the value(s) in the table below.

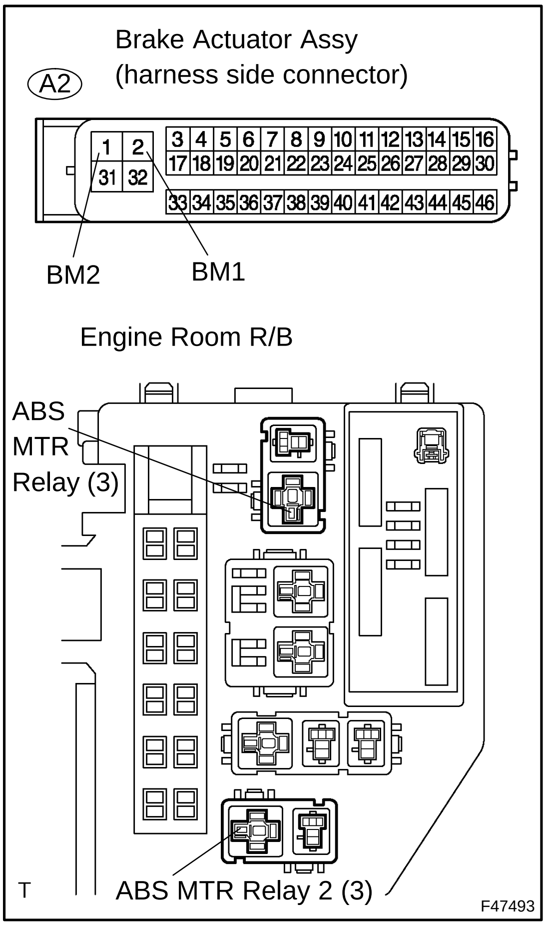
Standard:

Tester Connection	Specified Condition
ABS Motor Relay (5) - Body ground	10 to 14 V
ABS Motor Relay 2 (5) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8 CHECK HARNESS AND CONNECTOR(ENGINE ROOM R/B - BRAKE ACTUATOR)



(a) Disconnect the brake actuator assy connector.

(b) Remove the ABS MTR Relay and ABS MTR Relay 2.

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
A2-1 (BM2) - ABS MTR Relay 2 (3)	Below 1 Ω
A2-2 (BM1) - ABS MTR Relay (3)	Below 1 Ω

(d) Measure the resistance according to the value(s) in the table below.

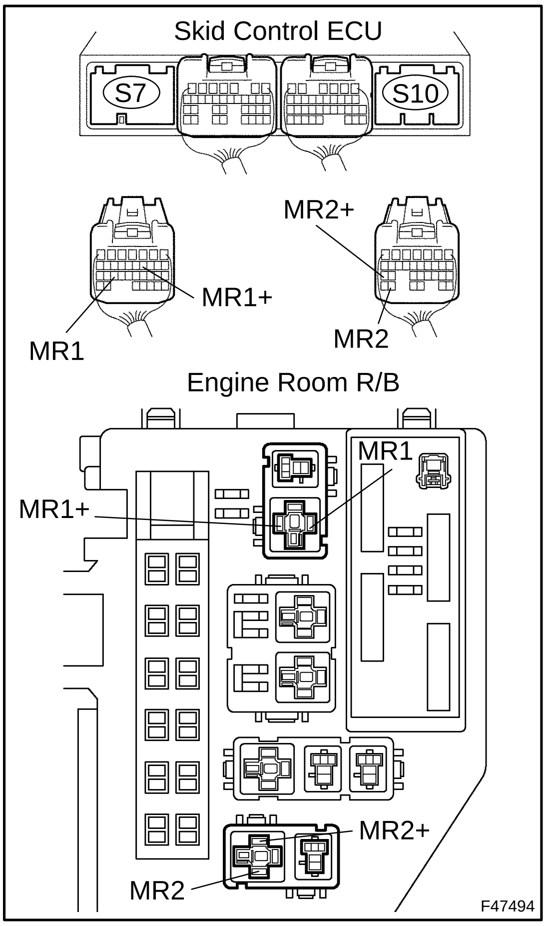
Standard:

Tester Connection	Specified Condition
A2-1 (BM2) - Body ground	10 kΩ or higher
A2-2 (BM1) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9	CHECK HARNESS AND CONNECTOR(ENGINE ROOM R/B - SKID CONTROL ECU)



(a) Disconnect the skid control ECU connector.
(b) Remove the ABS MTR Relay and ABS MTR Relay 2.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-11 (MR1+) - ABS MTR Relay (2)	Below 1 Ω
S7-25 (MR1) - ABS MTR Relay (1)	Below 1 Ω
S10-25 (MR2+) - ABS MTR 2 Relay (2)	Below 1 Ω
S10-30 (MR2) - ABS MTR 2 Relay (1)	Below 1 Ω

(d) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-11 (MR1+) - Body ground	10 kΩ or higher
S7-25 (MR1) - Body ground	10 kΩ or higher
S10-25 (MR2+) - Body ground	10 kΩ or higher
S10-30 (MR2) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC C1256/57 ACCUMULATOR LOW PRESSURE

CIRCUIT DESCRIPTION

The accumulator pressure sensor is built into the actuator and detects the accumulator pressure.
The skid control ECU turns on the Brake Control warning lamp and sounds the skid control buzzer if it senses a decrease in the accumulator pressure.

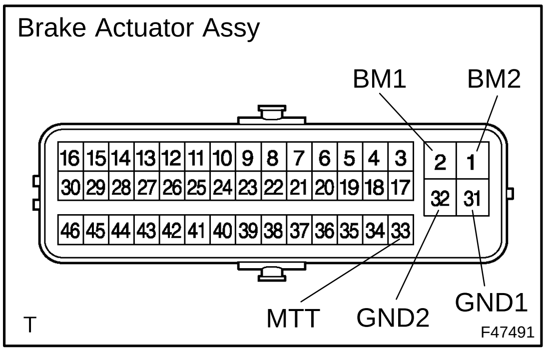
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1256/57	141	• Braking operation is input when accumulator pressure is less than 12.45 MPa and vehicle speed is input (detected value changes if accumulator pressure is low after system start). • Accumulator pressure is less than 14.62 MPa for 120 sec. (changes according to power source voltage) after system start (stores the DTC after the conditions are met, and drives buzzer).	• Brake actuator assy (accumulator pressure, accumulator pressure sensor, pump motor)
C1256/57	143	• Any of the wheel cylinder pressure sensor value is lower than the target value for at least 0.5 sec. when accumulator pressure is less than 14.62 MPa and vehicle speed is input. • Accumulator pressure changes little when accumulator pressure is less than 14.62 MPa for at least 1 sec. without braking (pump motor is operating). • Accumulator pressure is less than 14.62 MPa for at least 0.5 sec. when motor relay is malfunctioning.	• Brake actuator assy (accumulator pressure, accumulator pressure sensor, pump motor)

INSPECTION PROCEDURE

HINT:

DTCs may be output if the accumulator pressure drops due to frequent braking (this is not a malfunction).

1 INSPECT BRAKE ACTUATOR ASSY



(a) Disconnect the brake actuator assy connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
1 (BM2) - 31 (GND1)	Below 10 Ω
2 (BM1) - 31 (GND1)	Below 10 Ω
1 (BM2) - 2 (BM1)	Below 1 Ω
31 (GND1) - 32 (GND2)	Below 1 Ω
1 (BM2) - 33 (MTT)	About 10 Ω
2 (BM1) - 33 (MTT)	About 10 Ω

NG **REPLACE BRAKE ACTUATOR ASSY**

OK

2 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.

(b) Turn the power switch ON (READY).

(c) Select the DATA LIST mode on the hand-held tester.

Item	**Measurement Item / Range (Display)**	**Normal condition**
ACC PRESS SENS 1	Accumulator pressure sensor 1 / min.: 0 V, max.: 5 V	Specified value: 3.2 to 4.0 V

(d) Depress the brake pedal 4 or 5 times to operate the pump motor, and check the output value on the hand-held tester with the motor stopped (not braking).

OK:

ACC pressure sensor's output voltage does not drop.

NG **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C1259/58	HV SYSTEM REGENERATIVE MALFUNCTION

DTC	C1310/51	MALFUNCTION IN HV SYSTEM

CIRCUIT DESCRIPTION

The skid control ECU communicates with the hybrid control ECU and controls braking force according to the motor’s regenerative force.

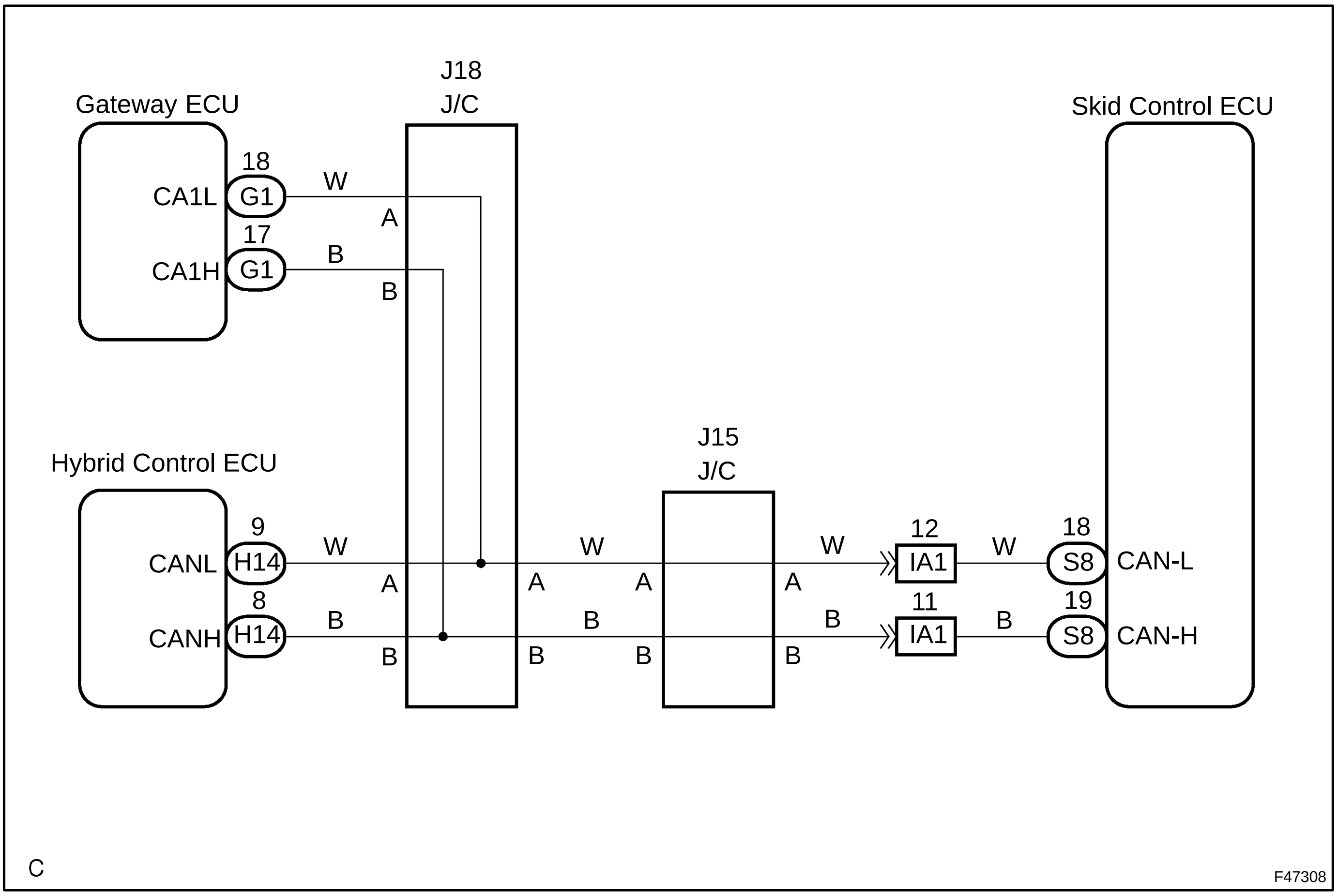
The skid control ECU sends Enhanced VSC signal to the hybrid control ECU and inputs operating signal from the hybrid control ECU.

The skid control ECU uses CAN communication for communication with the hybrid control ECU. If a communication malfunction is memorized, the skid control ECU prohibits Enhanced VSC operation and a part of ECB control by fail safe function.

C1259/59 is stored if the power switch ON (READY) with the HV battery service plug disconnected.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1259/58	150	The regeneration malfunction signal is input for at least 0.02 sec. when IG2 terminal voltage is 9.5 V or more for at least 2 sec. and communication with hybrid control computer is valid.	• Hybrid control system
C1310/51	156	The traction control prohibition signal is received for at least 0.07 sec. when IG2 terminal voltage is 10.5 V or more for at least 1.5 sec. and communication with hybrid control computer is valid.	• Hybrid control system (Enhanced VSC)

WIRING DIAGRAM



HINT:
This DTC is output from the skid control ECU when the hybrid control ECU sends a malfunction signal to the skid control ECU.

INSPECTION PROCEDURE

CHECK HYBRID CONTROL SYSTEM (SEE PAGE 05-440).

DTC C1300/- MALFUNCTION IN ECU

CIRCUIT DESCRIPTION

The skid control ECU outputs this DTC if malfunctions are found in the circuit inside the computer by self-diagnosis.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1300/-	-	Malfunction in skid control ECU	Skid control ECU

INSPECTION PROCEDURE

1 CHECK DTC

(a) Clear the DTCs (see page 05-973).
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded.

Result:

DTC is output	A
DTC is not output	B

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-964)**

A

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC C1311/11 OPEN CIRCUIT IN MAIN RELAY 1

DTC C1312/12 SHORT CIRCUIT IN MAIN RELAY 1

DTC C1313/13 OPEN CIRCUIT IN MAIN RELAY 2

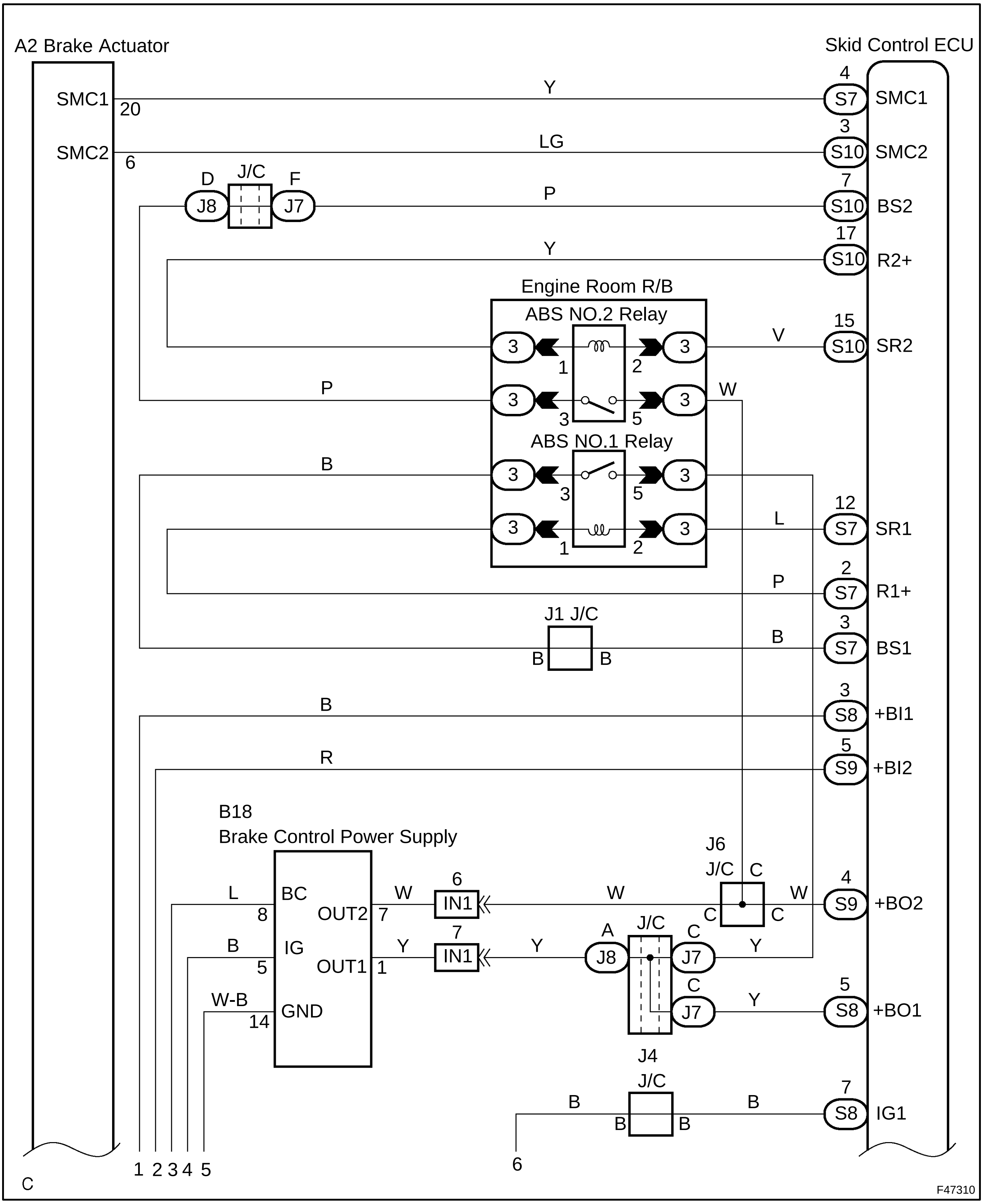
DTC C1314/14 SHORT CIRCUIT IN MAIN RELAY 2

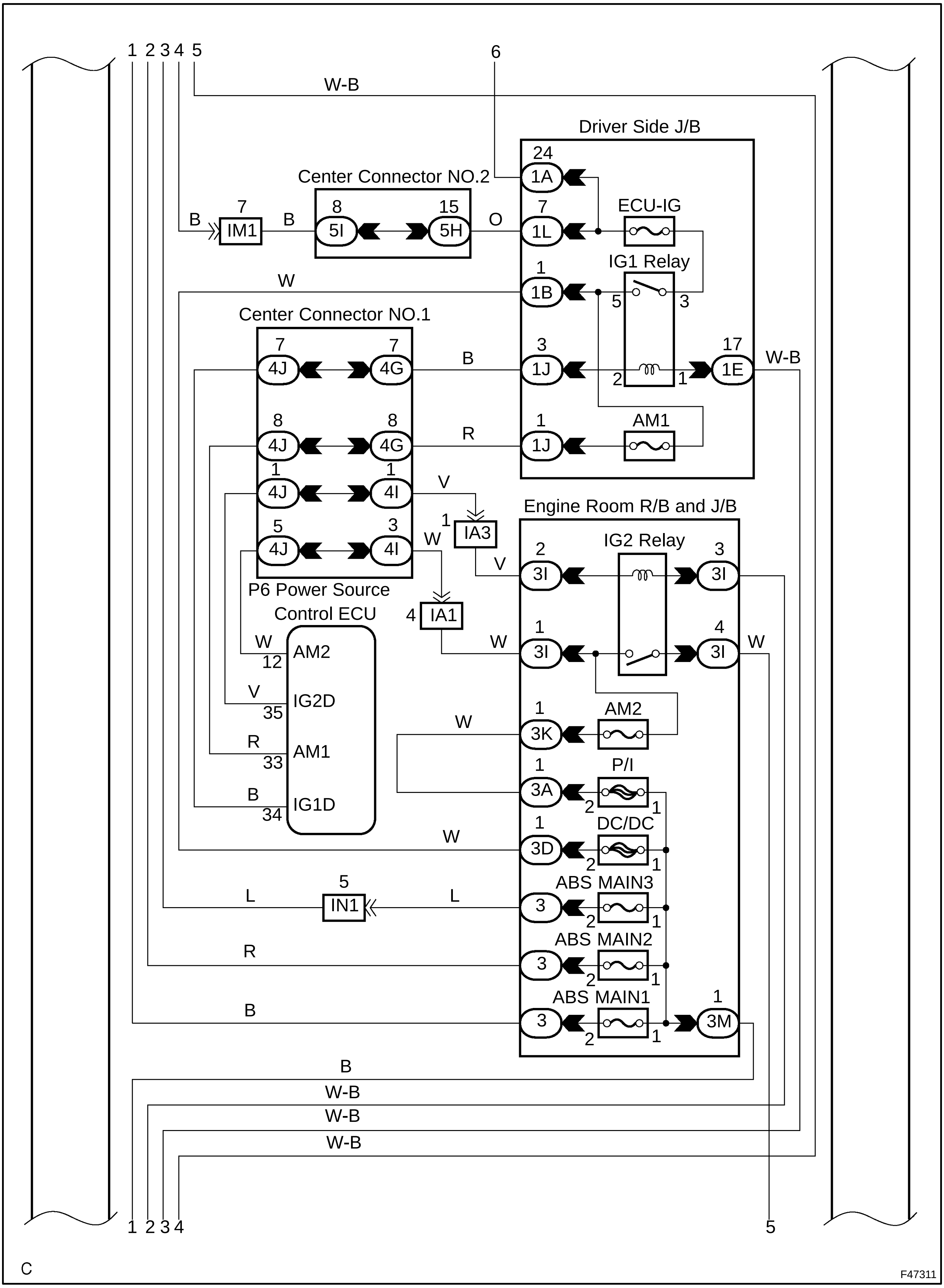
CIRCUIT DESCRIPTION

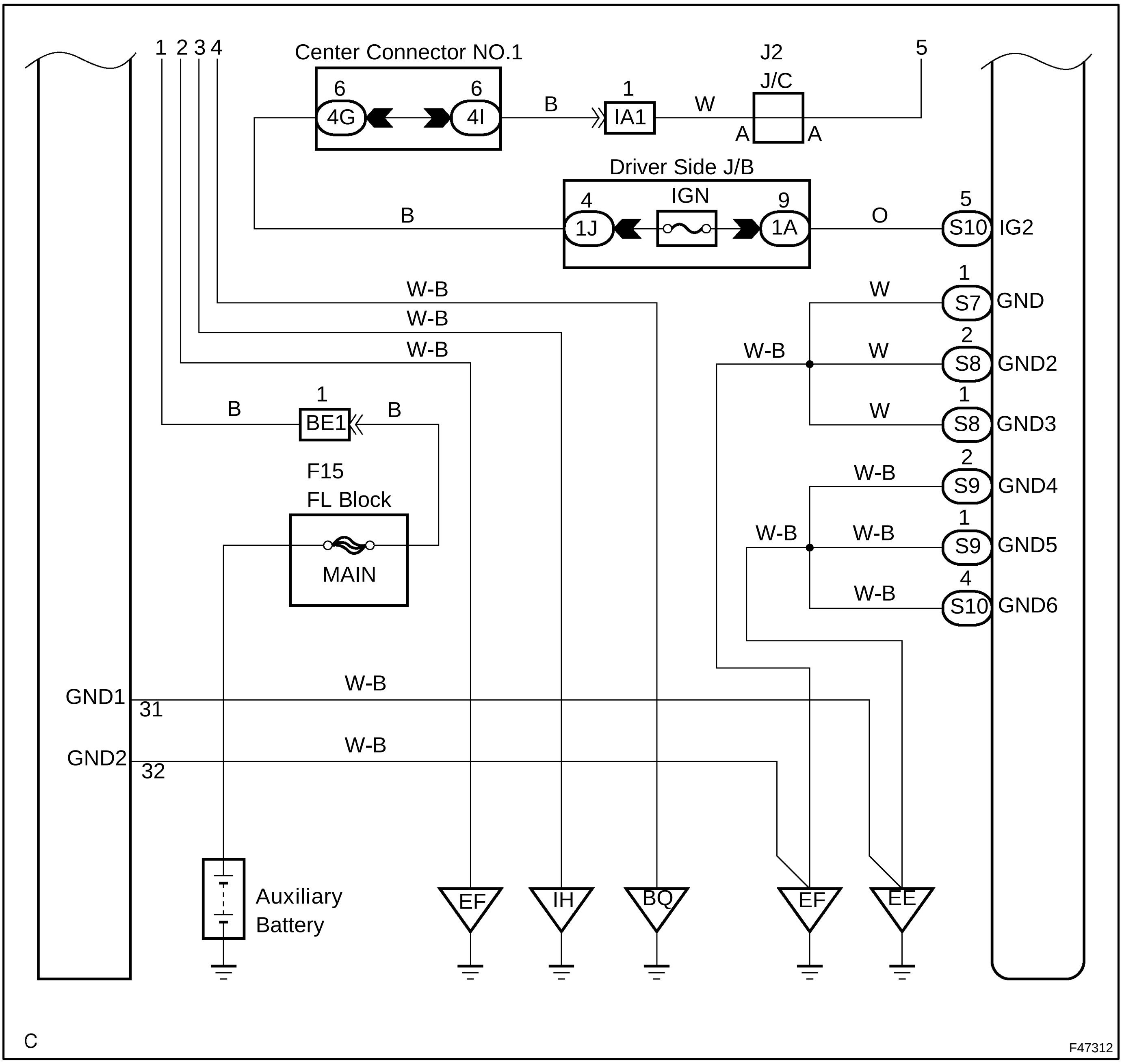
ABS main relay 1 (ABS No.1 relay) supplies power to the changeover solenoid and the linear solenoid. ABS main relay 2 (ABS No.2 relay) goes on for approximately 5 seconds after the power switch is turned off and the braking effort signal input is terminated. ABS main relay 2 (ABS No.2 relay) supplies electricity and maintains operating condition for the brake system when the power switch is off.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1311/11	1	• Relay contact is off (BS 1 terminal is less than 3.5 V) for at least 0.2 sec. when R1+ terminal voltage is 9.5 V or more and main relay 1 is on. • R1+ terminal voltage is less than 9.5 V and main relay 1 cannot be on for at least 0.2 sec. when main relay 1 is turned on (BS 1 terminal is 3.5 V or more).	• ABS main relay 1 (ABS No.1 relay) • Skid control ECU • Harness and connector
C1312/12	3	Relay contact is on for at least 4 sec. when main relay 1 is off.	• ABS main relay 1 (ABS No.1 relay) • Skic control ECU • Harness and connector
C1313/13	4	• Relay contact is off (BS2 terminal is less than 3.5 V) for at least 0.2 sec. when R2+ terminal voltage is 9.5 V or more and main relay 2 is on. • R2+ terminal voltage is less than 9.5 V and main relay 2 cannot be on for at least 2 sec. when main relay 2 is turned on (BS 1 terminal is 3.5 V or more).	• ABS main relay 2 (ABS No.2 relay) • Skid control ECU • Harness and connector
C1314/14	6	Relay contact is on for at least 4 sec. when main relay 2 is off.	• ABS main relay 2 (ABS No.2 relay) • Skid control ECU • Harness and connector

WIRING DIAGRAM




1 2 3 4 5
6
W-B
Driver Side J/B
Center Connector NO.2
24
1A
B
7
IM1
8
5I
15
5H
O
7
1L
ECU-IG
IG1 Relay
W
1
1B
5
3
Center Connector NO.1
7
4J
7
4G
B
3
1J
2
1
17
1E
W-B
8
4J
8
4G
R
1
1J
AM1
1
4J
1
4I
V
1
IA3
5
4J
3
4I
W
Engine Room R/B and J/B
IG2 Relay
2
3I
V
3
3I
P6 Power Source
Control ECU
4
IA1
1
3I
W
4
3I
W
W
12
AM2
V
35
IG2D
1
3K
AM2
W
R
33
AM1
1
3A
P/I
B
34
IG1D
1
3D
DC/DC
W
5
IN1
L
L
3
ABS MAIN3
R
3
ABS MAIN2
B
3
ABS MAIN1
1
3M
B
W-B
W-B
W-B
1 2 3 4
5
C
F47311


1 2 3 4
Center Connector NO.1
6 4G
6 4I
B
1 IA1
W
J2
J/C
A
A
5
Driver Side J/B
4 1J
IGN
9 1A
B
O
5 S10 IG2
W-B
W-B
W-B
W
1 S7 GND
W-B
W
2 S8 GND2
B
1 BE1
B
W
1 S8 GND3
F15
FL Block
MAIN
W-B
2 S9 GND4
W-B
W-B
1 S9 GND5
W-B
4 S10 GND6
GND1
31
W-B
GND2
32
W-B
Auxiliary
Battery
EF
IH
BQ
EF
EE
C
F47312

INSPECTION PROCEDURE

1	PERFORM ACTIVE TEST BY HAND-HELD TESTER(ABS NO.1 RELAY, ABS NO.2 RELAY OPERATION)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the ACTIVE TEST mode on the hand-held tester.
(d) Check the operation sound of the ABS No.1, ABS No.2 relay.

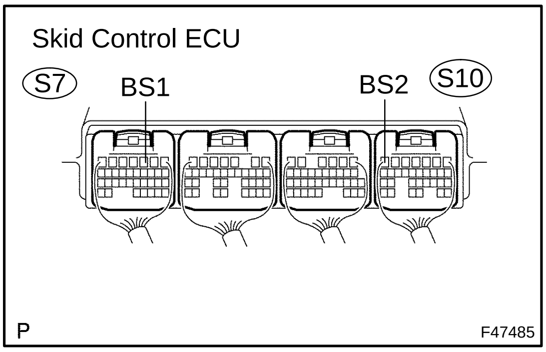
Item	Vehicle Condition / Test Details	Diagnostic Note
MAIN RELAY 2	Turns MAIN RELAY 1 ON / OFF	Operation of solenoid (clicking sound) can be heard
MAIN RELAY 1	Turns MAIN RELAY 2 ON / OFF	Operation of solenoid (clicking sound) can be heard

OK:
Operation sound of ABS No.1 relay and ABS No.2 relay should be heard.

NG → **Go to step 3**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(BS1, BS2 TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Specified Condition
S7-3 (BS1) - Body ground	10 to 14 V
S10-7 (BS2) - Body ground	10 to 14 V

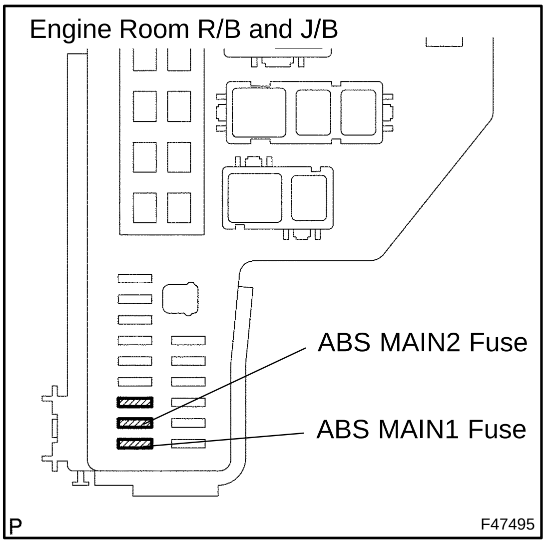
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

3	INSPECT FUSE (ABS MAIN 1, ABS MAIN 2 FUSE)



(a) Remove the ABS MAIN 1 and ABS MAIN 2 fuse.

(b) Measure the resistance according to the value(s) in the table below.

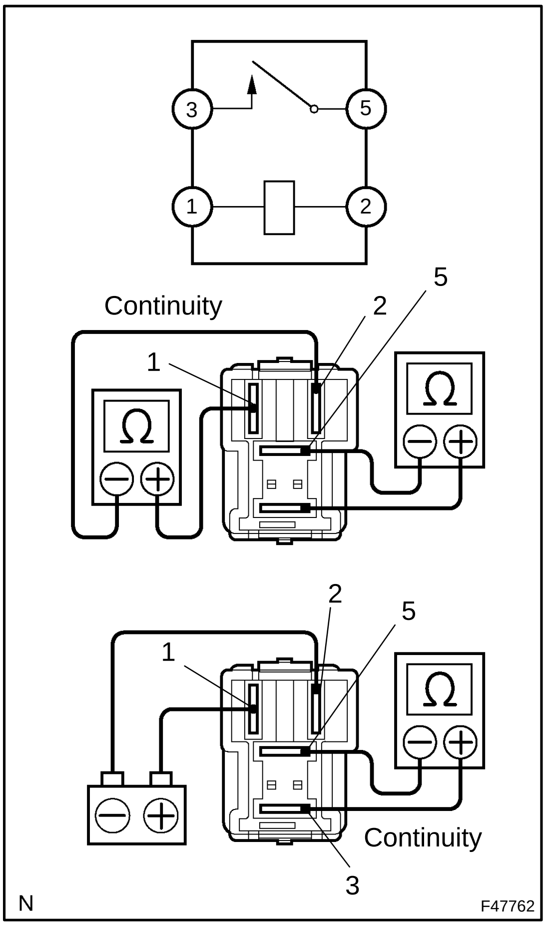
Standard:

ABS MAIN 1 Fuse	Below 1 Ω (Continuity)
ABS MAIN 2 Fuse	Below 1 Ω (Continuity)

NG → **CHECK FOR SHORT IN ALL HARNESS AND CONNECTOR CONNECTED TO FUSE AND REPLACE FUSE**

OK

4	INSPECT ABS RELAY(ABS MAIN RELAY 1, ABS MAIN RELAY 2)



(a) Remove the ABS main relay 1 (ABS No.1 relay) and ABS main relay 2 (ABS No.2 relay).

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
Terminal 1 - Terminal 2	100 Ω
Terminal 3 - Terminal 5	10 kΩ or higher (No Continuity)

(c) Apply battery voltage between terminals 1 and 2.

(d) Measure the resistance according to the value(s) in the table below.

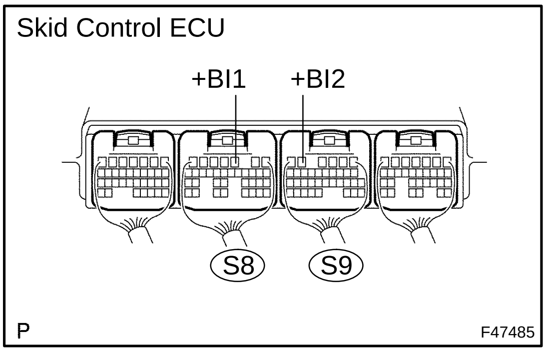
Standard:

Tester Connection	Specified Condition
Terminal 3 - Terminal 5	Below 1 Ω (Continuity)

NG → **REPLACE ABS RELAY**

OK

5 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(+BI1, +BI2 TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

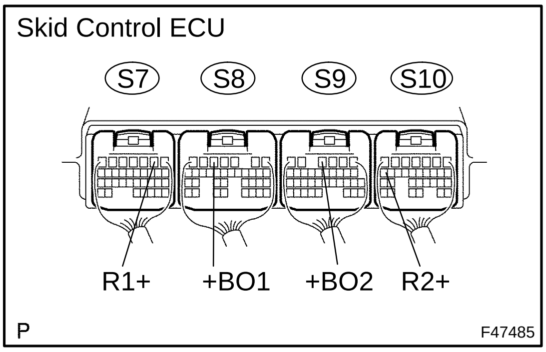
Standard:

Tester Connection	Specified Condition
S8-3 (+BI1) - Body ground	10 to 14 V
S9-5 (+BI2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(+BO1, +BO2, R1+, R2+ TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

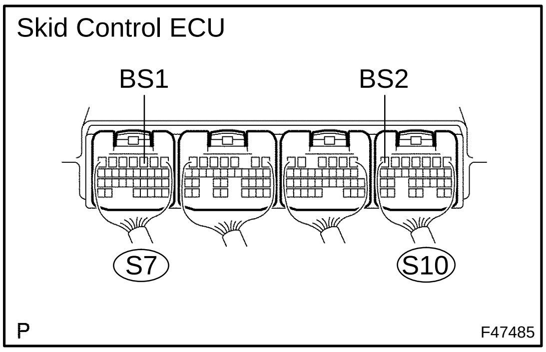
Standard:

Tester Connection	Specified Condition
S7-2 (R1+) - Body ground	10 to 14 V
S8-5 (+BO1) - Body ground	10 to 14 V
S9-4 (+BO2) - Body ground	10 to 14 V
S10-17 (R2+) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(BS1, BS2 TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

Standard:

Tester Connection	Specified Condition
S7-3 (BS1) - Body ground	10 to 14 V
S10-7 (BS2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C1315/31	CHANGEOVER SOLENOID MALFUNCTION (SMC1)

DTC	C1316/32	CHANGEOVER SOLENOID MALFUNCTION (SMC2)

DTC	C1352/21	INCREASING PRESSURE SOLENOID MALFUNCTION (FR)

DTC	C1353/23	INCREASING PRESSURE SOLENOID MALFUNCTION (FL)

DTC	C1354/25	INCREASING PRESSURE SOLENOID MALFUNCTION (RR)

DTC	C1355/27	INCREASING PRESSURE SOLENOID MALFUNCTION (RL)

DTC	C1356/22	DECREASING PRESSURE SOLENOID MALFUNCTION (FR)

DTC	C1357/24	DECREASING PRESSURE SOLENOID MALFUNCTION (FL)

DTC	C1358/26	DECREASING PRESSURE SOLENOID MALFUNCTION (RR)

DTC	C1359/28	DECREASING PRESSURE SOLENOID MALFUNCTION (RR)

CIRCUIT DESCRIPTION

Each solenoid adjusts pressure which affects each wheel cylinder according to signals from the skid control ECU and controls the vehicle.

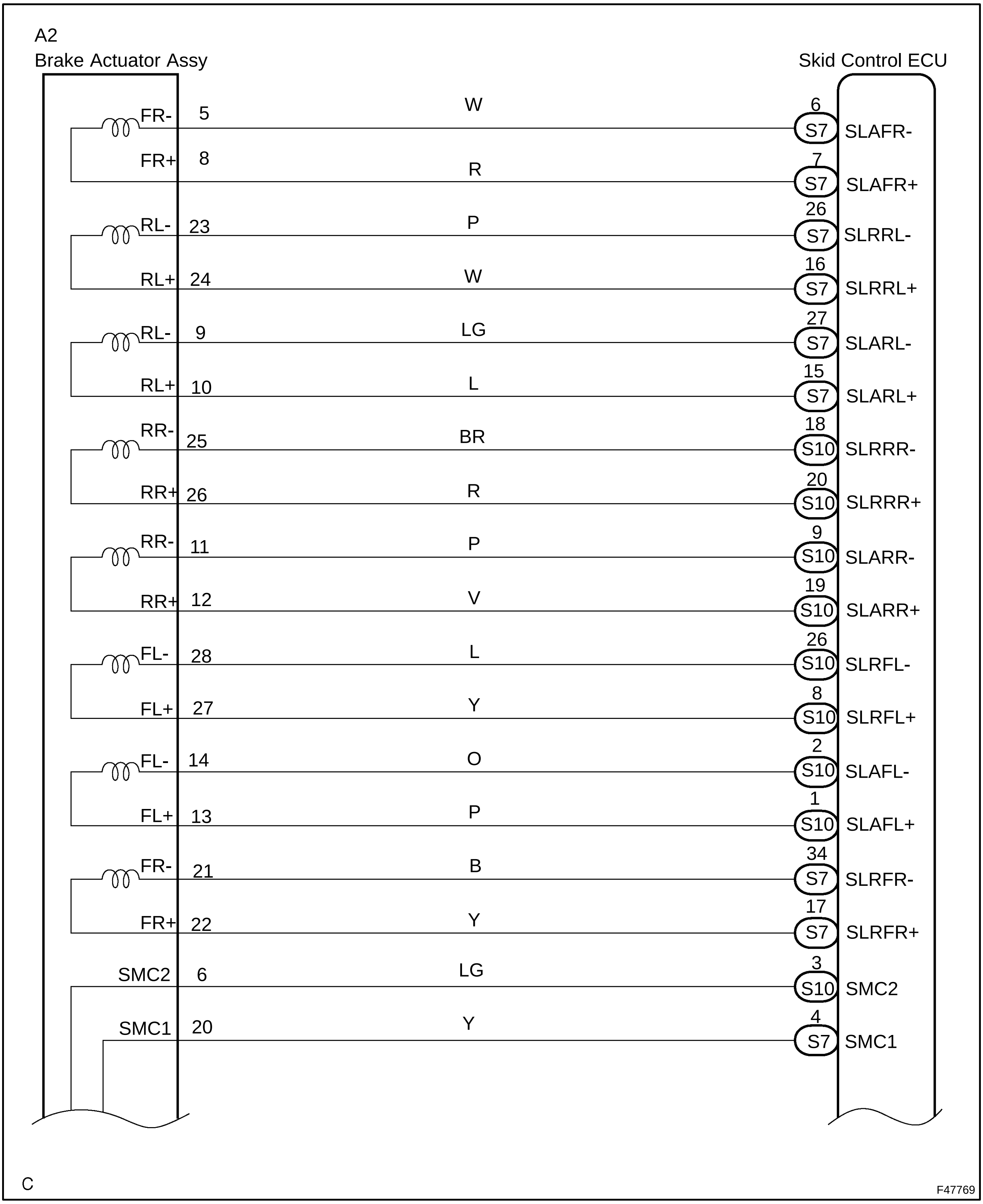
The master cut solenoid (SMC 1/2) is closed and blocks the master cylinder pressure from the ECB control pressure when the system is normal. The master cut solenoid is open and sends the master cylinder fluid pressure to the non-assisted brake wheel cylinders during the fail safe due to system malfunction.

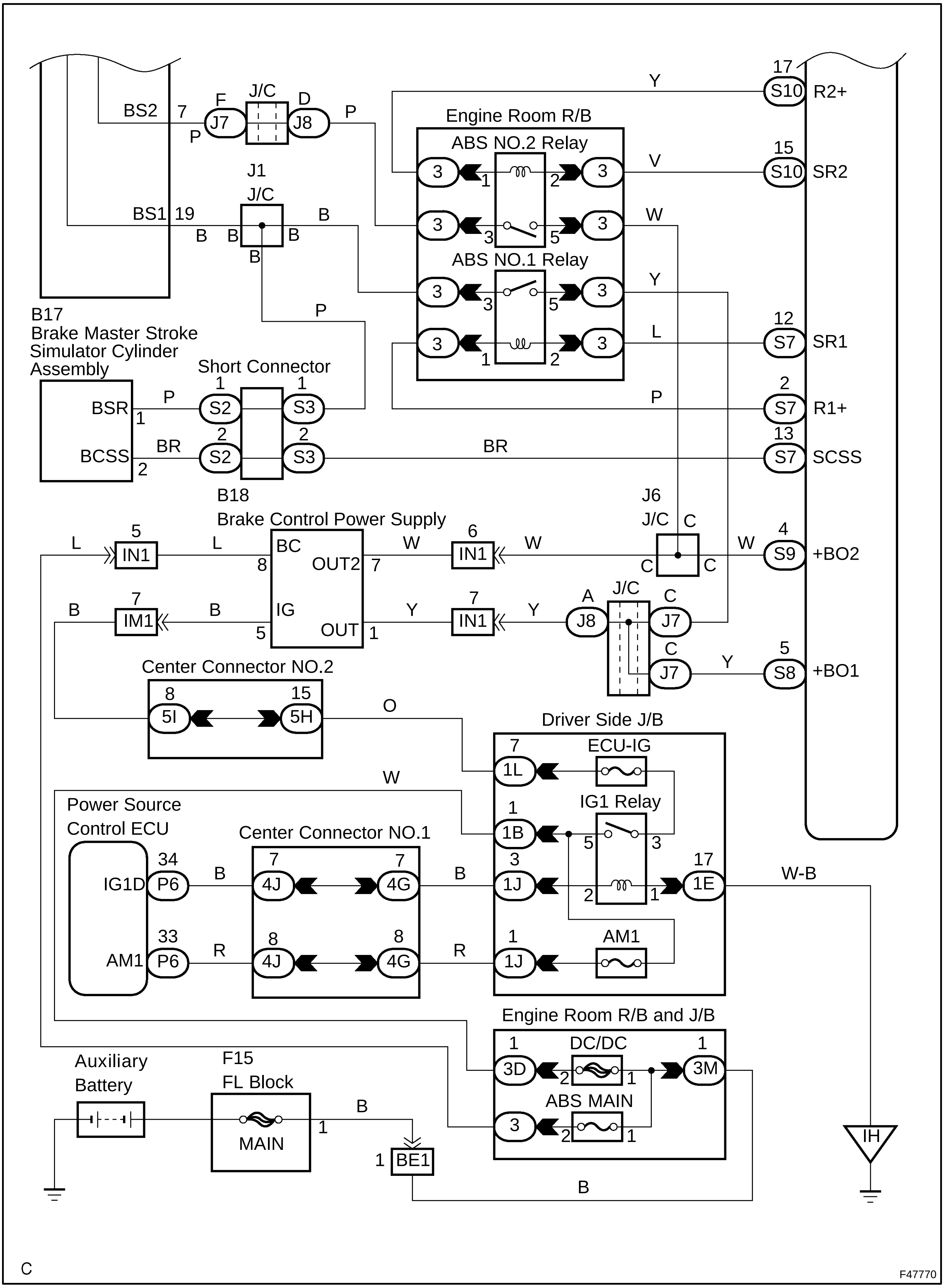
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1315/31	61	• SMC1 drive circuit is malfunctioning for 0.05 sec. or more. • Short to +B.	• Brake actuator assy (SMC1) • Skid control ECU • Harness and connector
C1315/31	62	Open circuit in SMC1 continues for 0.05 sec. or more when SMC1 is off	• Brake actuator assy (SMC1) • Skid control ECU • Harness and connector
C1315/31	63	Open circuit in SMC1 continues for 0.05 sec. or more when SMC1 is off.	• Brake actuator assy (SMC1) • Skid control ECU • Harness and connector
C1315/31	64	Over current in SMC1 continues for 0.05 sec. or more.	• Brake actuator assy (SMC1) • Skid control ECU • Harness and connector
C1316/32	66	• SMC1 driver circuit is malfunctioning for 0.05 sec. or more. • Short to +B.	• Brake acutator assy (SMC2) • Skid control ECU • Harness and connector
C1316/32	67	Open circuit in SMC2 continues for 0.05 sec. or more when SMC2 is off.	• Brake acutator assy (SMC2) • Skid control ECU • Harness and connector
C1316/32	68	Open circuit in SMC2 continues for 0.05 sec. or more.	• Brake acutator assy (SMC2) • Skid control ECU • Harness and connector
C1316/32	69	Over current in SMC2 continues for 0.05 sec. or more.	• Brake acutator assy (SMC2) • Skid control ECU • Harness and connector
C1352/21	11	Open circuit in SLAFR continues for 0.05 sec. or more when SLAFR is off.	• Brake actuator assy • Skid control ECU • Harness and connector
C1352/21	12	Open circuit in SLAFR continues for 0.05 sec. or more when SLAFR is on.	• Brake actuator assy • Skid control ECU • Harness and connector
C1352/21	13	Short to +B or voltage leak in SLAFR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1352/21	14	Over current in SLAFR continues for 0.05 sec. or more	• Brake actuator assy • Skid control ECU • Harness and connector
C1353/23	21	Open circuit in SLAFL continues for 0.05 sec. or more when SLAFL is off.	• Brake acutator assy • Skid control ECU • Harness and connector
C1353/23	22	Open circuit in SLAFL continues for 0.05 sec. or more when SLAFL is on.	• Brake acutator assy • Skid control ECU • Harness and connector
C1353/23	23	Short to +B or voltage leak in SLAFL continues for 0.05 sec. or more.	• Brake acutator assy • Skid control ECU • Harness and connector
C1353/23	24	Over current in SLAFL continues for 0.05 sec. or more.	• Brake acutator assy • Skid control ECU • Harness and connector
C1354/25	31	Open circuit in SLARR continues for 0.05 sec. or more when SLARR is off	• Brake actuator assy • Skid control ECU • Harness and connecotor

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1354/25	32	Open circuit in SLARR continues for 0.05 sec. or more when SLARR is on.	• Brake actuator assy • Skid control ECU • Harness and connecotor
C1354/25	33	Short to +B or voltage leak in SLARR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connecotor
C1354/25	34	Over current in SLARR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connecotor
C1355/27	41	Open circuit in SLARL continues for 0.05 sec. or more when SLARL is off.	• Brake acutator assy • Skid control ECU • Harness and connector
C1355/27	42	Open circuit in SLARL continues for 0.05 sec. or more when SLARL is on.	• Brake acutator assy • Skid control ECU • Harness and connector
C1355/27	43	Short to +B or voltage leak in SLARL continues for 0.05 sec. or more.	• Brake acutator assy • Skid control ECU • Harness and connector
C1355/27	44	Over current in SLARL continues for 0.05 sec. or more.	• Brake acutator assy • Skid control ECU • Harness and connector
C1356/22	16	Open circuit in SLRFR continues for 0.05 sec. or more when SLRFR is off.	• Brake actuator assy • Skid control ECU • Harness and connector
C1356/22	17	Open circuit in SLRFR continues for 0.05 sec. or more when SKRFR is on.	• Brake actuator assy • Skid control ECU • Harness and connector
C1356/22	18	Short to +B or voltage leak in SLRFR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1356/22	19	Over current in SLRFR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1357/24	26	Open circuit in SLRFL continues or 0.05 sec. or more when SLRFL is off.	• Brake actuator assy • Skid control ECU • Harness and connector
C1357/24	27	Open circuit in SLRFL continues for 0.05 sec. or more when SLRFL is on.	• Brake actuator assy • Skid control ECU • Harness and connector
C1357/24	28	Short to +B or voltage leak in SLRFL continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1357/24	29	Over current in SLRFL continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1358/26	36	Open circuit in SLRRR continues for 0.05 sec. or more when SLRRR is off.	• Brake actuator assy • Skid control ECU • Harness and connector
C1358/26	37	Open circuit in SLRRR continues for 0.05 sec. or more when SLRRR is on.	• Brake actuator assy • Skid control ECU • Harness and connector
C1358/26	38	Short to +B or voltage leak in SLRRR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1358/26	39	Over current in SLRRR continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1359/28	46	Open circuit in SLRRL continues for 0.05 sec. or more when SLRRL is off.	• Brake actuator assy • Skid control ECU • Harness and connector
C1359/28	47	Open circuit in SLRRL continues for 0.05 sec. or more when SLRRL is on.	• Brake actuator assy • Skid control ECU • Harness and connector
C1359/28	48	Short to +B or voltage leak in SLRRL continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector
C1359/28	49	Over current in SLRRL continues for 0.05 sec. or more.	• Brake actuator assy • Skid control ECU • Harness and connector

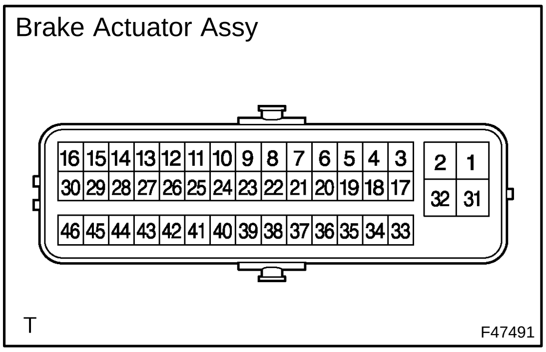
WIRING DIAGRAM




BS2
7
F
J/C
D
J7
J8
P
P
J1
J/C
BS1
19
B
B
B
B
B
Engine Room R/B
ABS NO.2 Relay
ABS NO.1 Relay
Y
17
S10
R2+
V
15
S10
SR2
W
Y
L
12
S7
SR1
B17
Brake Master Stroke
Simulator Cylinder
Assembly
Short Connector
BSR
BCSS
S2
S3
B18
P
2
S7
R1+
BR
13
S7
SCSS
Brake Control Power Supply
BC
OUT2
IG
OUT
IN1
IM1
J6
J/C
W
4
S9
+BO2
J8
J7
5
S8
+BO1
Center Connector NO.2
5I
5H
O
Driver Side J/B
ECU-IG
IG1 Relay
AM1
1L
1B
1J
1E
W-B
Power Source
Control ECU
IG1D
AM1
P6
Center Connector NO.1
4J
4G
B
R
Engine Room R/B and J/B
DC/DC
ABS MAIN
3D
3M
Auxiliary
Battery
F15
FL Block
MAIN
BE1
IH
C
F47770

INSPECTION PROCEDURE

1 INSPECT BRAKE ACTUATOR ASSY



(a) Disconnect the brake actuator connector.
(b) Measure the resistance according to the value(s) in the table below.

HINT:
Check the brake actuator assy when it is cooled down.

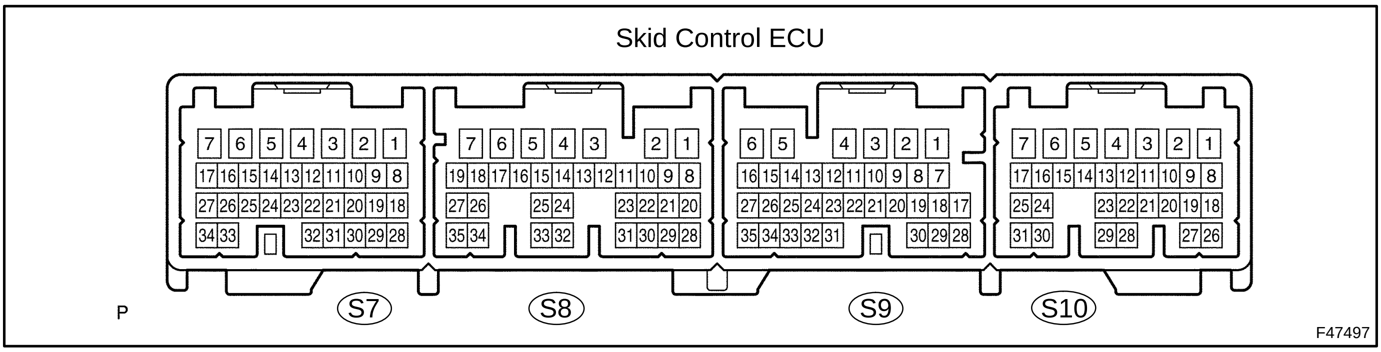
Standard:

Tester Connection	Specified Condition
20 (SMC1) - 7 (BS2)	14.6 to 24.6 Ω
6 (SMC2) - 19 (BS1)	14.6 to 24.6 Ω
8 (FR+) - 5 (FR-)	3.5 to 4.3 Ω
22 (FR+) - 21 (FR-)	3.5 to 4.3 Ω
13 (FL+) - 14 (FL-)	3.5 to 4.3 Ω
27 (FL+) - 28 (FL-)	3.5 to 4.3 Ω
12 (RR+) - 11 (RR-)	3.5 to 4.3 Ω
10 (RL+) - 9 (RL-)	3.5 to 4.3 Ω

NG → **REPLACE BRAKE ACTUATOR ASSY**

OK

2 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.
Standard:

Tester Connection	Condition	Specified Condition
S7-4 (SMC1) - Body ground	Power switch ON (READY) Brake pedal release	Below 10 to 14 V
S10-3 (SMC2) - Body ground	Power switch ON (READY) Brake pedal release	Below 10 to 14 V
S7-7 (SLAFR+) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S7-6 (SLAFR-) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S10-1 (SLAFL+) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S10-2 (SLAFL-) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S10-19 (SLARR+) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)

Tester Connection	Condition	Specified Condition
S10-9 (SLARR-) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S7-15 (SLARL+) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S7-27 (SLARL-) - Body ground	Power switch ON (READY) Brake pedal release	Pulse generation (see waveform 5) (see page 05-966)
S7-17 (SLRFR+) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S10-8 (SLRFL+) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S10-20 (SLRRR+) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S7-16 (SLRRL+) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S7-34 (SLRFR-) - Body ground	Power switch ON (READY)	Below 1.5 V
S10-26 (SLRFL-) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S10-18 (SLRRR-) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V
S7-26 (SLRRL-) - Body ground	Power switch ON (READY) Brake pedal release	Below 1.5 V

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

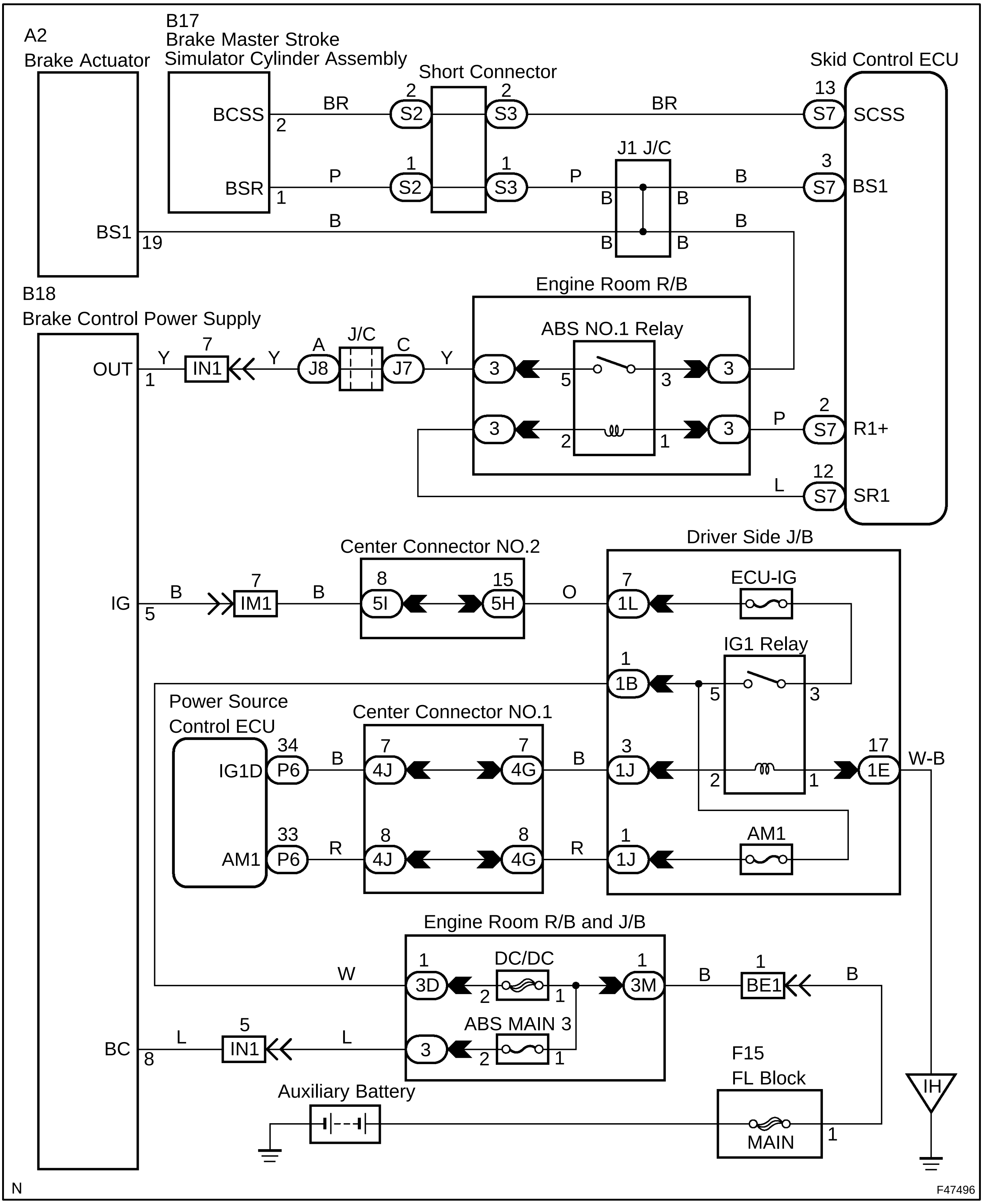
DTC C1319/35 CHANGEOVER SOLENOID MALFUNCTION

CIRCUIT DESCRIPTION

The stroke simulator solenoid (SCSS) generates pedal reactive effort during ECB control. If one of the 4 wheels loses brake booster function, the stroke simulator operation is prohibited.

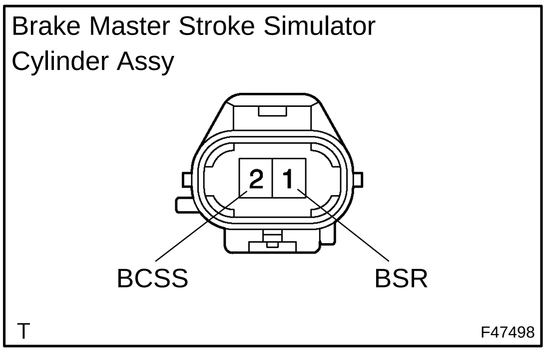
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1319/35	71	• SCSS drive circuit is malfunctioning for 0.05 sec. or more. • Short to +B in SCSS.	• Stroke simulator • Skid control ECU • Harness and connector
C1319/35	72	Current leaks for 0.05 sec. or more when SCSS is off.	• Stroke simulator • Skid control ECU • Harness and connector
C1319/35	73	Open circuit in SCSS continues for 0.05 sec. or more.	• Stroke simulator • Skid control ECU • Harness and connector
C1319/35	74	Over current in SCSS continues for 0.05 sec. or more.	• Stroke simulator • Skid control ECU • Harness and connector

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT BRAKE MASTER STROKE SIMULATOR CYLINDER ASSY



(a) Disconnect brake master stroke simulator cylinder assy connector.

(b) Measure the resistance according to the value(s) in the table below.

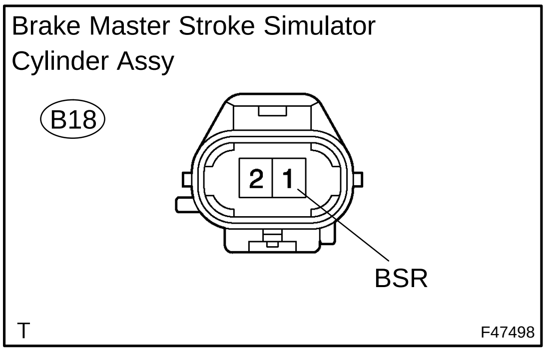
Standard:

Tester Connection	Specified Condition
1 (BSR) - 2 (BCSS)	22.3 to 38 Ω

NG **REPLACE BRAKE MASTER STROKE SIMULATOR CYLINDER ASSY**

OK

2 INSPECT BRAKE MASTER STROKE SIMULATOR CYLINDER ASSY(BSR TERMINAL VOLTAGE)



(a) Connect the brake master stroke simulator cylinder assy connector.

(b) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from the behind the connector with the connector connected.

Standard:

Tester Connection	Condition	Specified Condition
B17-1 (BSR) - Body ground	Power switch ON (READY)	10 to 14 V

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

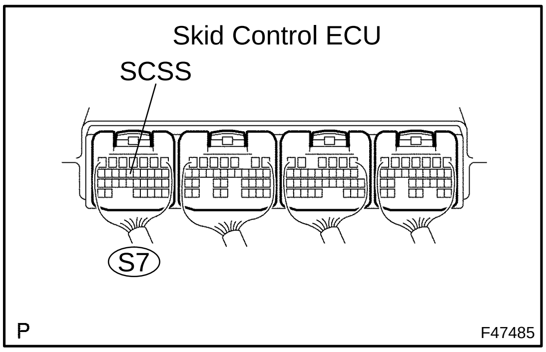
OK

3 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(SCSS TERMINAL)

(a) Connect the hand-held tester to the DLC3.
(b) Select the ACTIVE TEST mode on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
ACC PATTERN	Stroke simulator cut valve pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard

(c) Using hand-held tester, turn the stroke simulator cylinder assy ON/OFF.



(d) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Condition	Specified Condition
S7-13 (SCSS) - Body ground	Brake Master Stroke Simulator Cylinder assy ON	Below 1.5 V
S7-13 (SCSS) - Body ground	Brake Master Stroke Simulator Cylinder assy OFF	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C1341/62	MALFUNCTION IN HYDRAULIC SYSTEM (FR)

DTC	C1342/63	MALFUNCTION IN HYDRAULIC SYSTEM (FL)

DTC	C1343/64	MALFUNCTION IN HYDRAULIC SYSTEM (RR)

DTC	C1344/65	MALFUNCTION IN HYDRAULIC SYSTEM (RL)

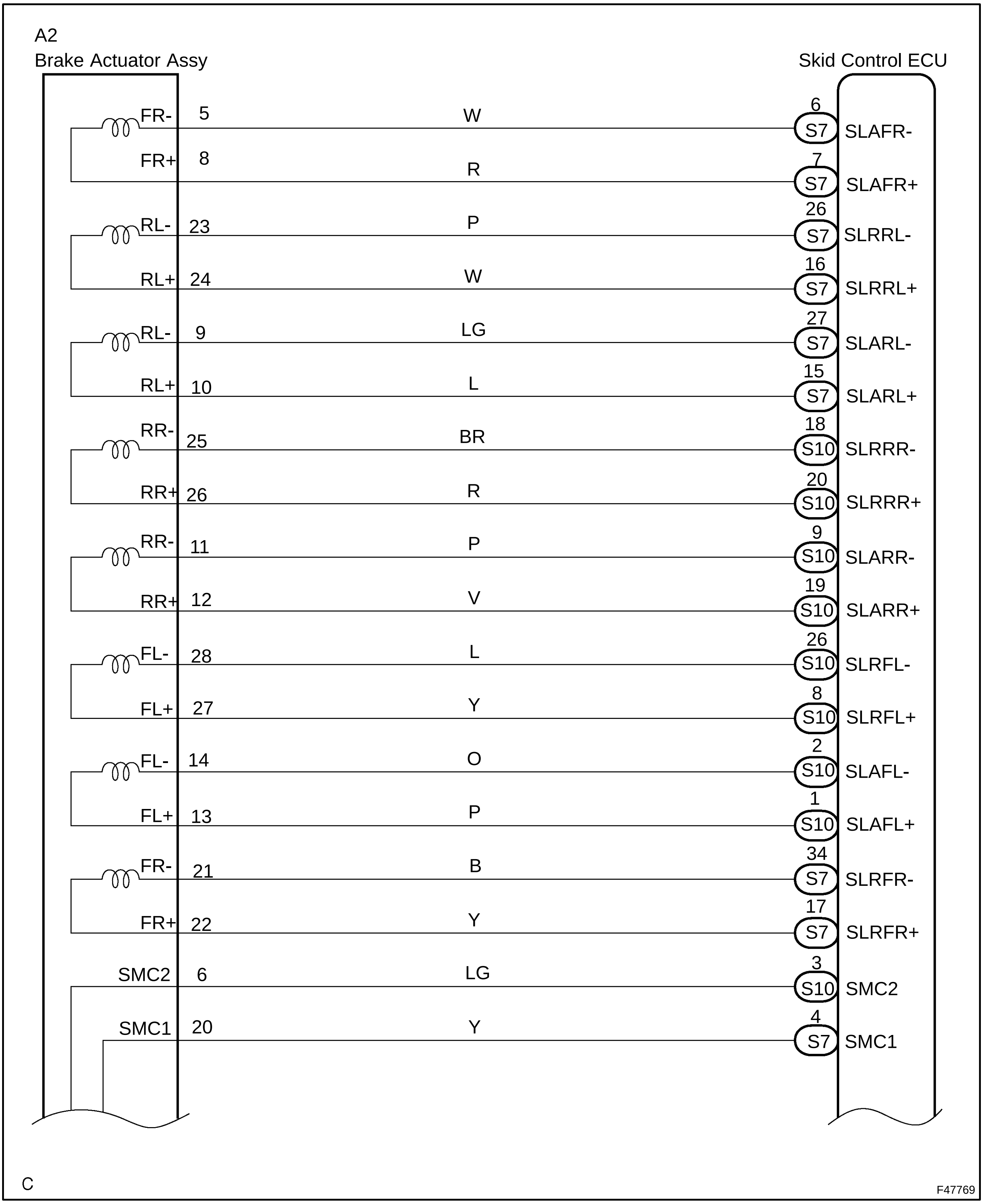
CIRCUIT DESCRIPTION

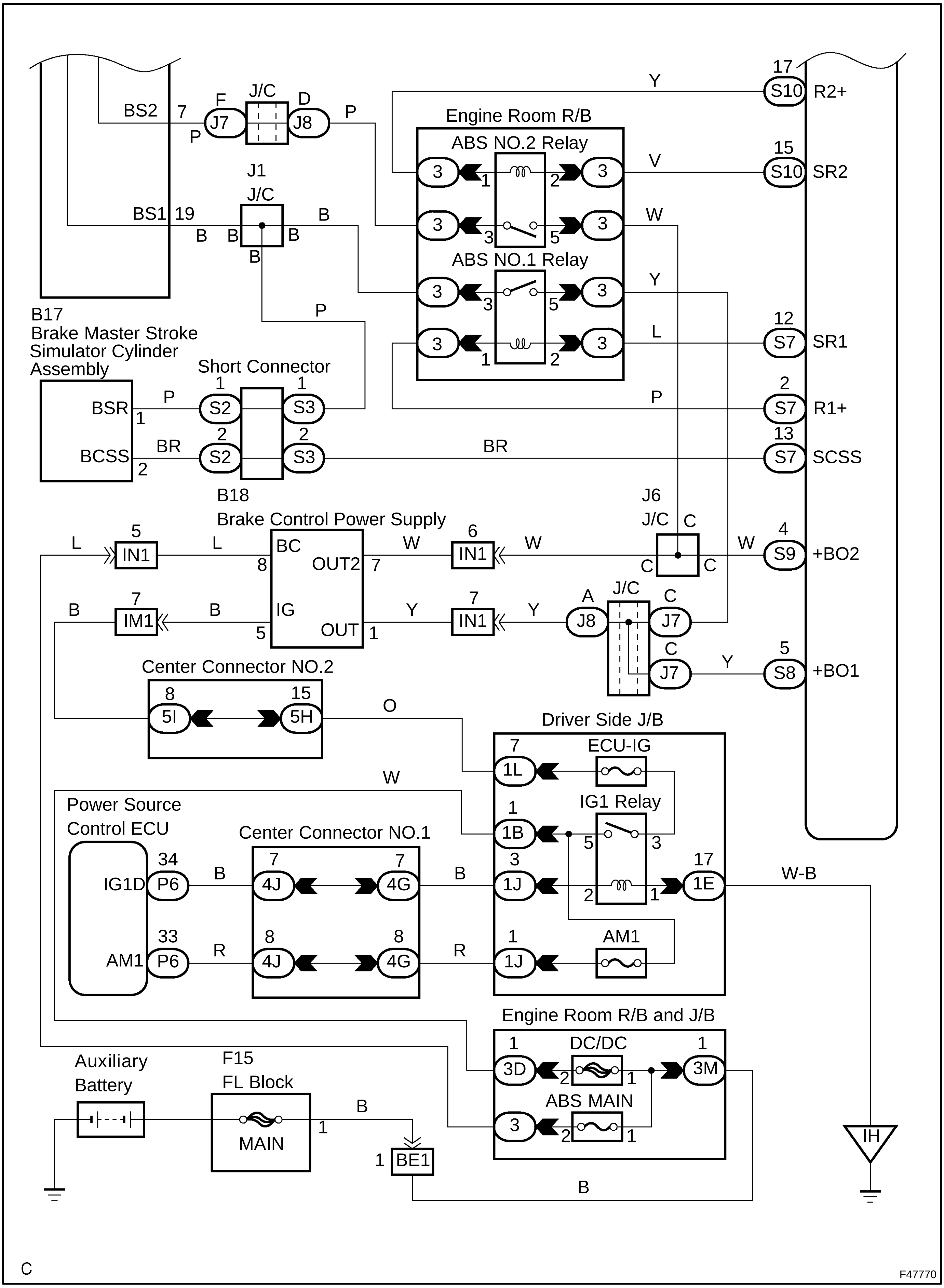
The skid control ECU controls braking force according to the hybrid system regenerative braking force and inputs the fluid pressure necessary for operating each wheel cylinder according to the wheel cylinder pressure sensor.
DTCs may be stored if brake fluid leaks, wheel cylinder vibrates due to uneven wear of the brake disc rotor, or foreign matter enters the solenoid valve.
DTCs may be stored if the line pressure drops during air bleeding.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1341/62	551	Hydraulic pressure control on FR wheel has deteriorated.	• Fluid leakage • Brake actuator assy
C1341/62	552	Hydraulic pressure control on FR wheel has deteriorated.	• Fluid leakage • Brake actuator assy
C1341/62	553	There is a malfunction, such as leakage in the pressure increase control valve of FR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1341/62	554	There is a malfunction, such as leakage in the pressure decrease control valve of FR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1341/62	555	There is a malfunction, such as leakage in the pressure decrease control valve of FR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1342/63	561	Hydraulic pressure control on FL wheel has deteriorated.	• Fluid leakage • Brake actuator
C1342/63	562	Hydraulic pressure control on FL wheel has deteriorated.	• Fluid leakage • Brake actuator
C1342/63	563	There is a malfunction, such as leakage in pressure increase control valve of FL wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1342/63	564	There is a malfunction, such as leakage in pressure decrease control valve of FL wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1342/63	565	There is a malfunction, such as leakage in pressure decrease control valve of FL wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1343/64	571	Hydraulic pressure control on RR wheel has deteriorated.	• Fluid leakage • Brake actuator
C1343/64	572	Hydraulic pressure control on RR wheel has deteriorated.	• Fluid leakage • Brake actuator

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1343/64	573	There is a malfunction, such as leakage in pressure increase control valve of RR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1343/64	574	There is a malfunction, such as leakage in pressure decrease control valve of RR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1343/64	575	There is a malfunction, such as leakage in pressure decrease control valve of RR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1344/65	581	Hydraulic pressure control on RL wheel has deteriorated.	• Fluid leakage • Brake actuator
C1344/65	582	Hydraulic pressure control on RL wheel has deteriorated.	• Fluid leakage • Brake actuator
C1344/65	583	There is a malfunction, such as leakage in pressure increase control valve of RR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1344/65	584	There is a malfunction, such as leakage in pressure decrease control valve of RR wheel.	• Fluid leakage • Brake actuator assy • Disc rotor
C1344/65	585	There is a malfunction, such as leakage in pressure decrease control valve of RL wheel.	• Fluid leakage • Brake actuator assy • Disc rotor

WIRING DIAGRAM




BS2
7
F
J/C
D
P
J7
J8
P
Engine Room R/B
ABS NO.2 Relay
J1
J/C
BS1
19
B
ABS NO.1 Relay
B17
Brake Master Stroke
Simulator Cylinder
Assembly
Short Connector
BSR
BCSS
S2
S3
B18
Brake Control Power Supply
BC
OUT2
IG
OUT
IN1
IM1
J6
J/C
R2+
SR2
SR1
R1+
SCSS
+BO2
+BO1
S10
S7
S9
S8
Center Connector NO.2
5I
5H
Driver Side J/B
ECU-IG
IG1 Relay
1L
1B
1J
1E
AM1
Power Source
Control ECU
Center Connector NO.1
IG1D
AM1
P6
4J
4G
W-B
Engine Room R/B and J/B
DC/DC
ABS MAIN
3D
3M
Auxiliary
Battery
F15
FL Block
MAIN
BE1
IH
C
F47770

INSPECTION PROCEDURE

HINT:
When C1364/61 is output together with C1341/62, C1342/63, C1343/64 and C1344/65, inspect and repair the trouble areas indicated by C1364/61 first.

1	CHECK BRAKE FLUID LEAKAGE

(a) Check that there is no fluid leakage in the brake line between the brake actuator and the wheel cylinder which is the cause of DTCs.
(b) Check that the brake is not dragging.
OK:
There is no fluid leakage or dragging.

NG → **REPAIR OR REPLACE APPLICABLE PART**

OK

2	PERFORM AIR BLEED (SEE PAGE 32-4)

(a) Bleed the air out of the front and rear systems (see page 32-4).

3	RECONFIRM DTC

(a) Clear the DTCs.
(b) Turn the power switch ON (READY).
(c) Check the same DTCs are recorded (see page 05-973).
Result:

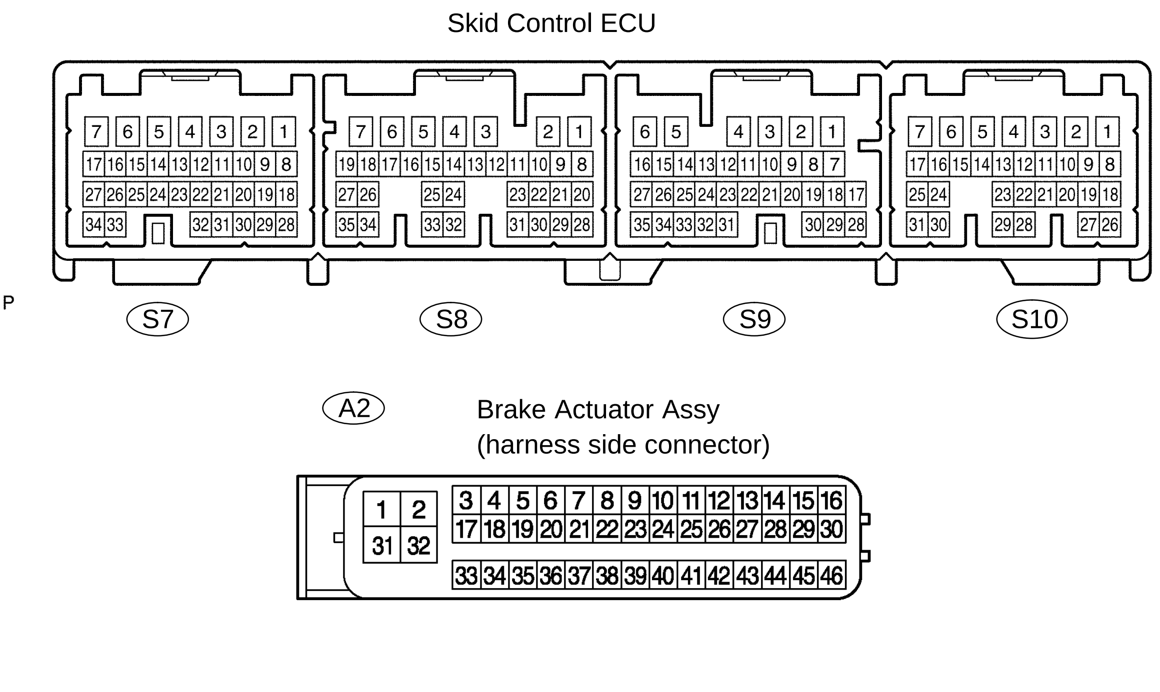
DTC is output	A
DTC is not output	B

B → **END**

HINT:
DTC may be stored if foreign matter or air enters the solenoid valve.

A

4	CHECK HARNESS AND CONNECTOR(SKID CONTROL ECU - BRAKE ACTUATOR ASSY)



(a) Disconnect the skid control ECU connectors and brake actuator connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
S7-6 (SLAFR-) - A2-5 (FR-)	Below 1 Ω
S7-7 (SLAFR+) - A2-8 (FR+)	Below 1 Ω
S7-15 (SLARL+) - A2-10 (RL+)	Below 1 Ω
S7-16 (SLRRL+) - A2-24 (RL+)	Below 1 Ω
S7-17 (SLRFR+) - A2-22 (FR+)	Below 1 Ω
S7-26 (SLRRL-) - A2-23 (RL-)	Below 1 Ω
S7-27 (SLARL-) - A2-9 (RL-)	Below 1 Ω
S7-34 (SLRFR-) - A2-21 (FR-)	Below 1 Ω
S10-1 (SLAFL+) - A2-13 (FL+)	Below 1 Ω
S10-2 (SLAFL-) - A2-14 (FL-)	Below 1 Ω
S10-8 (SLRFL+) - A2-27 (FL+)	Below 1 Ω
S10-9 (SLARR-) - A2-11 (RR-)	Below 1 Ω
S10-18 (SLRRR-) - A2-25 (RR-)	Below 1 Ω
S10-19 (SLARR+) - A2-12 (RR+)	Below 1 Ω
S10-20 (SLRRR+) - A2-26 (RR+)	Below 1 Ω
S10-26 (SLRFL-) - A2-28 (FL-)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Tester Connection	Specified Condition
S7-6 (SLAFR-) - Body ground	10 kΩ or higher
S7-7 (SLAFR+) - Body ground	10 kΩ or higher
S7-15 (SLARL+) - Body ground	10 kΩ or higher
S7-16 (SLRRL+) - Body ground	10 kΩ or higher
S7-17 (SLRFR+) - Body ground	10 kΩ or higher
S7-26 (SLRRL-) - Body ground	10 kΩ or higher
S7-27 (SLARL-) - Body ground	10 kΩ or higher
S7-34 (SLRFR-) - Body ground	10 kΩ or higher
S10-1 (SLAFL+) - Body ground	10 kΩ or higher
S10-2 (SLAFL-) - Body ground	10 kΩ or higher
S10-8 (SLRFL+) - Body ground	10 kΩ or higher
S10-9 (SLARR-) - Body ground	10 kΩ or higher
S10-18 (SLRRR-) - Body ground	10 kΩ or higher
S10-19 (SLARR+) - Body ground	10 kΩ or higher
S10-20 (SLRRR+) - Body ground	10 kΩ or higher
S10-26 (SLRFL-) - Body ground	10 kΩ or higher

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 READ VALUE OF HAND-HELD TESTER

(a) Connect the pedal effort gauge.
(b) Install the LSPV gauge (SST) and bleed air (see page 32-4).
SST 09709-29018
(c) Connect the hand-held tester to the DLC3.
(d) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
FR PRESS SENS	Front Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
FL PRESS SENS	Front Left pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
RR PRESS SENS	Rear Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V
RL PRESS SENS	Rear Left pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V

(e) Check the output value of the wheel cylinder pressure at each fluid pressure during the ECB control.
Standard:

Fluid Pressure MPa (kgf/cm, psi)	FR PRESS SENS (DATA-LIST)	FL PRESS SENS (DATA-LIST)	RR PRESS SENS (DATA-LIST)	RL PRESS SENS (DATA-LIST)
1 (10.2, 145.0)	0.65 to 0.75 V	0.65 to 0.75 V	0.65 to 0.75 V	0.65 to 0.75 V
3 (30.6, 435.2)	1.05 to 1.2 V	1.05 to 1.2 V	1.05 to 1.2 V	1.05 to 1.2 V
7 (71.4, 1015.5)	1.8 to 2.05 V	1.8 to 2.05 V	-	-
10 (102.0, 1450.7)	2.4 to 2.7 V	2.4 to 2.7 V	-	-

NG **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

6 CHECK BRAKE DISC

(a) Disconnect the brake pedal stroke sensor connector.
(b) Carry out the running and braking test according to freeze frame data or customer problem analysis. Check the brake line pressure vibration caused due to uneven wear of the disc according to brake pedal vibration.
OK:
Brake pedal is not vibrates during braking.

HINT:
- The brake pedal does not kick back due to wheel cylinder piston vibration during ECB control.
- If the brake pedal stroke sensor connector is disconnected, the fail-safe function prohibits ECB control.
- The active test does not prohibit ECB control when the vehicle is running, so disconnect the stroke sensor connector and carry out inspection.
- Disc wear can be checked by measuring the disc thickness.

NG → **REPLACE BRAKE DISC**

OK

REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C1345/66	NOT LEARNING LINEAR VALVE OFF SET ABNORMALITY

DTC	C1368/67	LINER VALVE OFFSET MALFUNCTION

CIRCUIT DESCRIPTION

The skid control ECU stores and corrects the difference in each individual part such as the stroke sensor, actuator solenoids, and stroke simulator solenoid. Perform initialization of linear solenoid valve and calibration if these parts are replaced.

The skid control ECU inputs the shift position P signal.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1345/66	501	Value of initialization of linear solenoid valve and calibration for the FR wheel is not stored.	• Initialization of linear solenoid valve and calibration undone
C1345/66	502	Value of initialization of linear solenoid valve and calibration for the FL wheel is not stored.	• Initialization of linear solenoid valve and calibration undone
C1345/66	503	Value of initialization of linear solenoid valve and calibration for the RR wheel is not stored.	• Initialization of linear solenoid valve and calibration undone
C1345/66	504	Value of initialization of linear solenoid valve and calibration for the RL wheel is not stored.	• Initialization of linear solenoid valve and calibration undone
C1368/67	505	Value of initialization of linear solenoid valve and calibration is not within the brake actuator's standard value.	• Initialization of linear solenoid valve and calibration undone • Skid control ECU

INSPECTION PROCEDURE

1	PERFORM INITIALIZATION OF LINEAR SOLENOID VALVE AND CALIBRATION (SEE PAGE 05-956)

2	RECONFIRM DTC

(a) Clear the DTCs.

(b) Turn the power switch ON (READY).

(c) Check the same DTCs are recorded (see page 05-973).

Result:

DTC is not output	A
DTC is output	B

B → **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

A

END

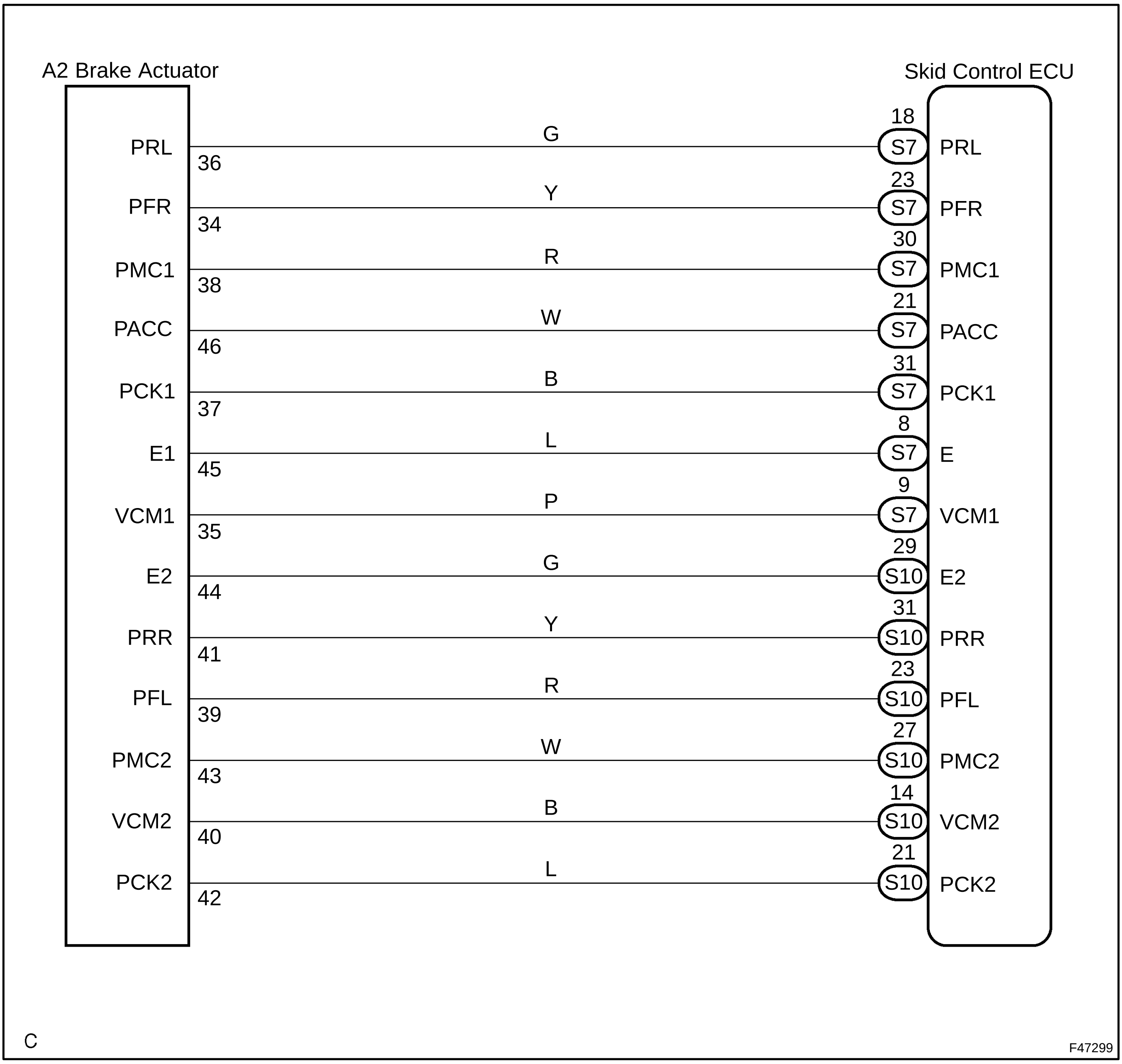
DTC C1365/54 MALFUNCTION IN ACC PRESSURE SENSOR

CIRCUIT DESCRIPTION

The accumulator (ACC) pressure sensor is built into the brake actuator.
The skid control ECU detects the accumulator pressure from the data sent from the accumulator pressure sensor, and then runs and stops the pump motor by operating the motor relay.
DTCs may be output if the accumulator pressure drops due to frequent braking (this is not a malfunction).

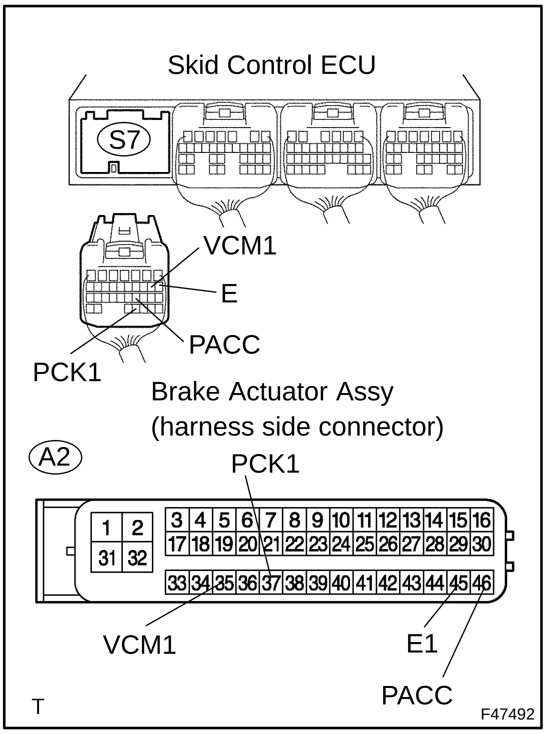
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1365/54	211	Sensor power 1 (VCM1) voltage is 4.7 V or less or 5.3 V or more for at least 0.05 sec.	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU
C1365/54	212	Ratio of accumulator pressure sensor output voltage (PACC) to sensor power 1 (VCM1) voltage is 5% or less or 90.5% or more for at least 0.05 sec.	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU
C1365/54	214	Total wheel cylinder pressure sensor exceeds 12 MPa after depressing brake pedal, but accumulator pressure sensor output voltage (PACC) changes less than 0.5 MPa for at least 0.5 sec.	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU
C1365/54	215	Ratio of accumulator pressure sensor output voltage (PACC) to sensor power 1 (VCM1) voltage is 90.5% or less for at least 0.1 sec. during self-diagnosis.	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU
C1365/54	216	Voltage difference is 0.3 V or more before and after changing the pull up resistance in sensor signal input circuit (loose contact).	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR



(a) Disconnect the skid control ECU connector and brake actuator connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-8 (E) - A2-45 (E1)	Below 1 Ω
S7-9 (VCM1) - A2-35 (VCM1)	Below 1 Ω
S7-21 (PACC) - A2-46 (PACC)	Below 1 Ω
S7-31 (PCK1) - A2-37 (PCK1)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

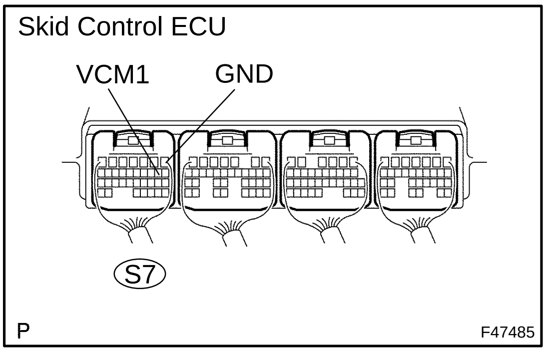
Standard:

Tester Connection	Specified Condition
S7-8 (E) - Body ground	10 kΩ or higher
S7-9 (VCM1) - Body ground	10 kΩ or higher
S7-21 (PACC) - Body ground	10 kΩ or higher
S7-31 (PCK1) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(VCM1 - GND)



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

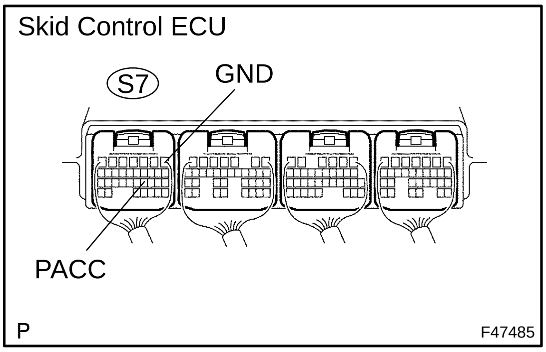
Standard:

Tester Connection	Condition	Specified Condition
S7-9 (VCM1) - S7-1 (GND)	Power switch ON (READY)	4.75 to 5.25 V

NG → **REPLACE SKID CONTROL ECU ASSY** **(SEE PAGE 32-54)**

OK

3 INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(PACC - GND)



(a) Check the auxiliary battery voltage.
Standard: 10 to 14 V
(b) Depress the brake pedal to operate the pump motor, and then check that the pump motor stops.
(c) Measure the voltage according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
S7-21 (PACC) - S7-1 (GND)	3.3 to 4.7 V

NOTICE:
- **Do not depress the brake until after the pump motor stops and the voltage check is finished in order to keep the accumulator pressure.**
- **Check from behind the connector with the connector connected to the skid control ECU.**
- **Do not use a DATA LIST, as the sensor itself must be checked.**

NG → **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

4 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
ACC PRESS SENS 1	Accumulator pressure sensor 1 / min.: 0 V, max.: 5 V	Specified value: 3.2 to 4.0 V

(d) Depress the brake pedal 4 or 5 times to operate the pump motor, and check the output value on the hand-held tester with the motor stopped (no braking).
OK:
Accumulator (ACC) pressure sensor voltage does not drop.

NG → **REPLACE BRAKE ACTUATOR ASSY (SEE PAGE 32-54)**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

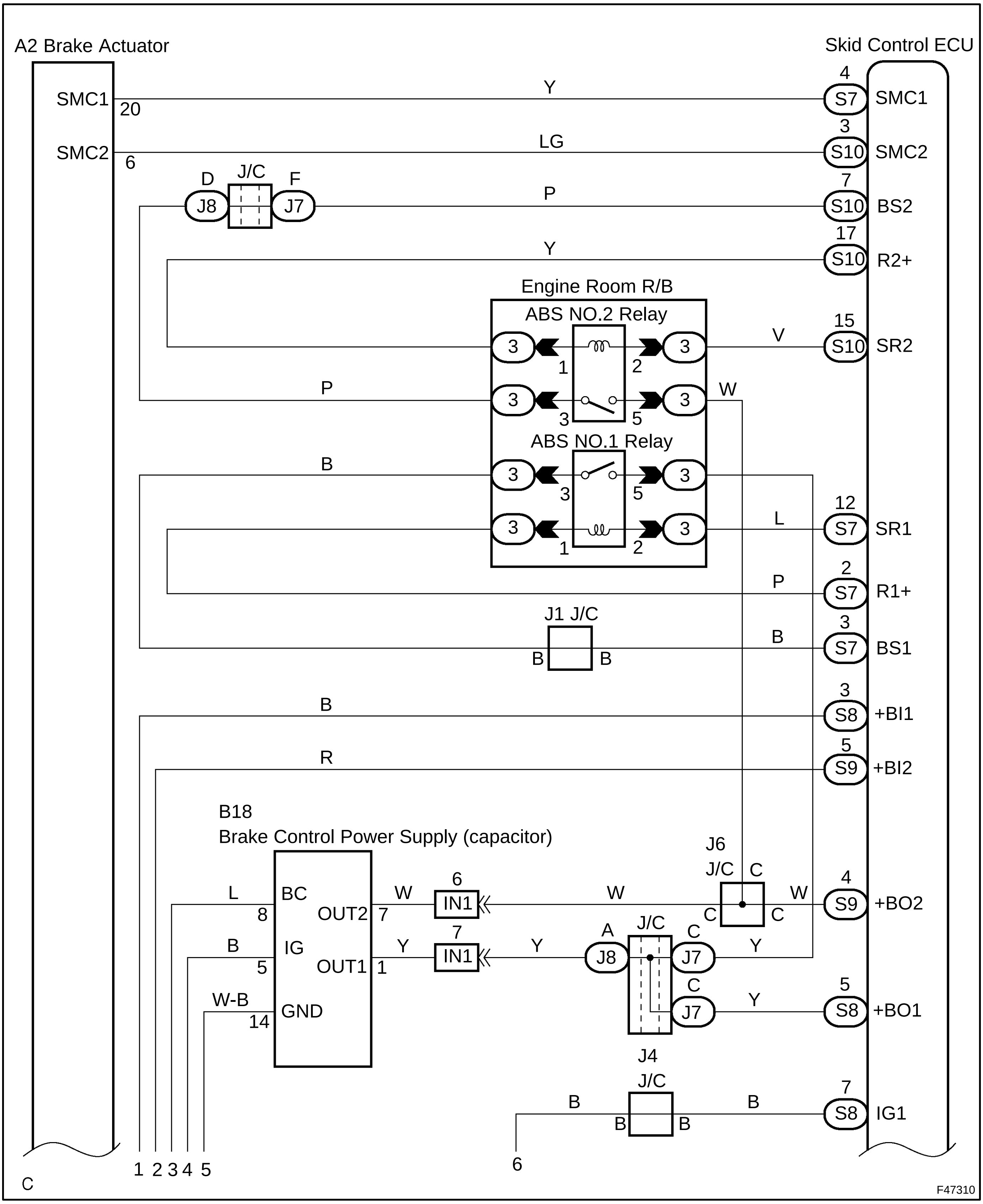
DTC C1377/43 CAPACITOR MALFUNCTION

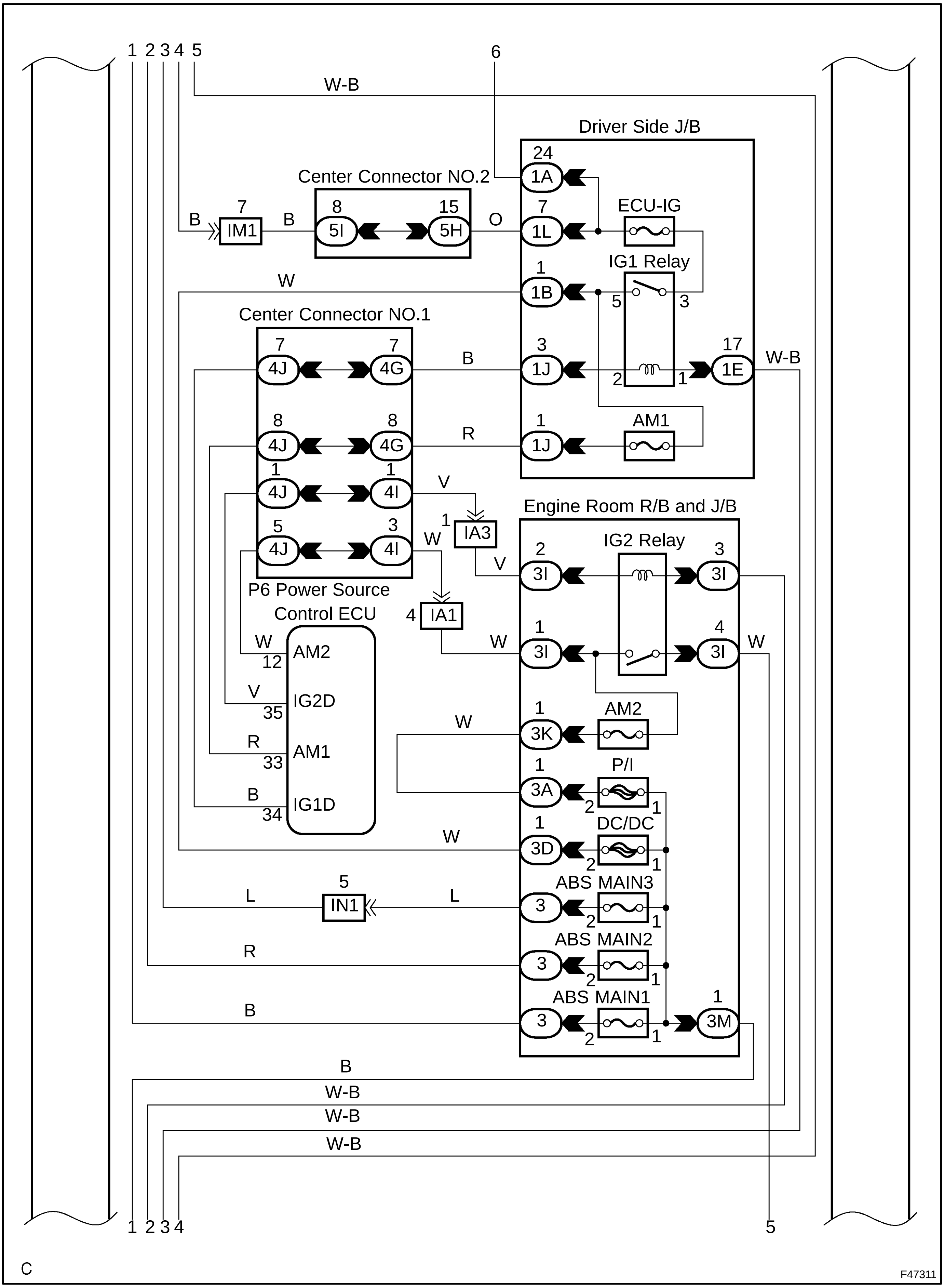
CIRCUIT DESCRIPTION

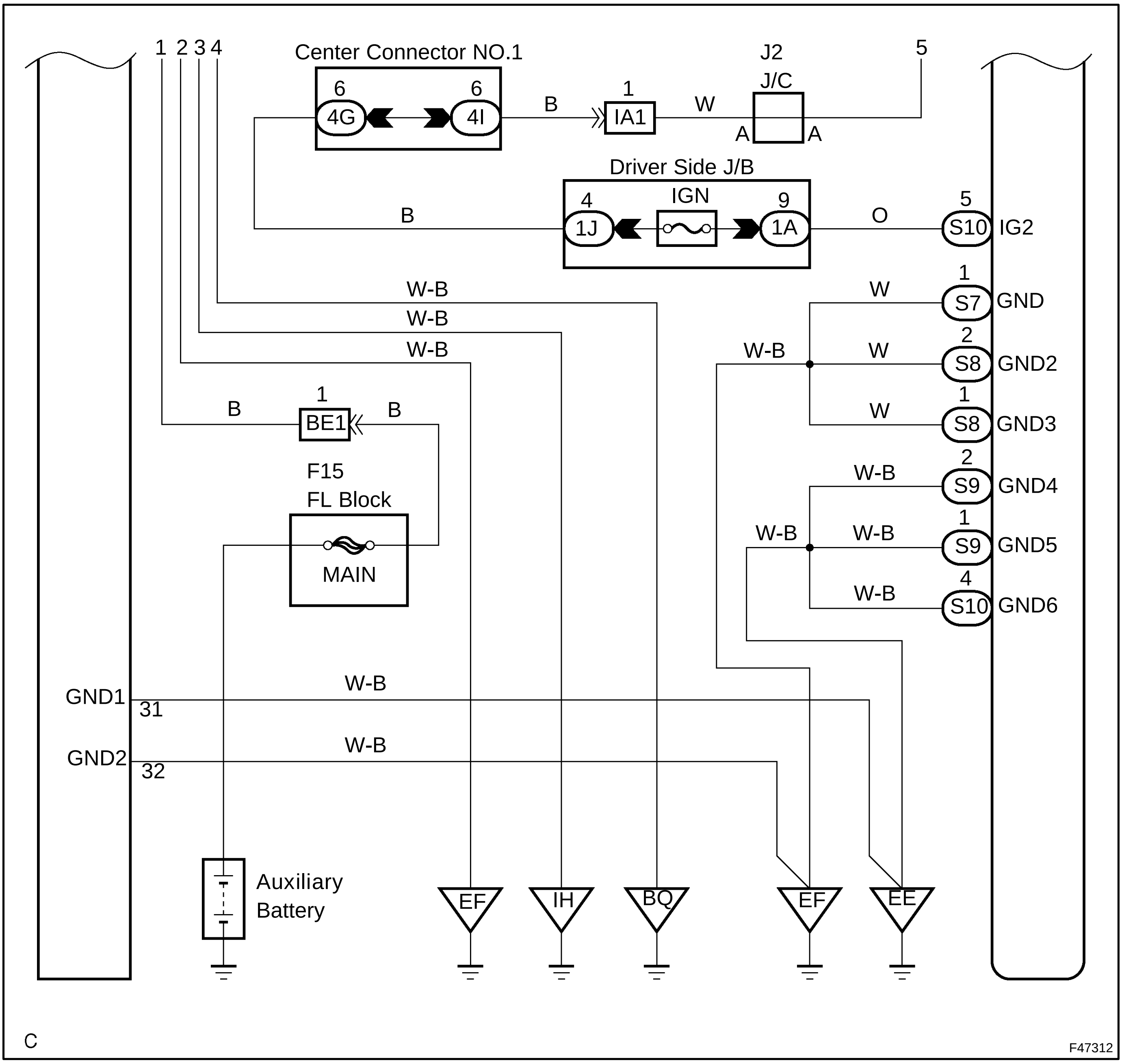
The brake control power supply assy (capacitor) provides auxiliary power for brake control when an auxiliary battery (12 V) voltage drops.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1377/43	101	Brake control power supply assy is deteriorated (indicates a need to replace).	• Brake control power supply
C1377/43	102	Self-discharge (current leak) is excessive (internal malfunction).	• Brake control power supply
C1377/43	103	Input voltage from the auxiliary battery (12 V) to the brake control power supply is 16.4 V or more for at least 10 sec.	• Brake control power supply
C1377/43	105	Circuit inside the power back up unit (charge) is malfunctioning.	• Brake control power supply
C1377/43	106	Circuit inside the power back up unit (back up output circuit) is malfunctioning.	• Brake control power supply
C1377/43	108	Circuit inside the power back up unit (voltage monitor circuit) is malfunctioning.	• Brake control power supply
C1377/43	109	Open circuit between auxiliary battery (12 V) and brake control power supply power input (+BC terminal).	• Harness and connector • ABS No.3 fuse
C1377/43	110	• Open or short circuit between auxiliary battery (12 V) and brake control power supply output 1 (OUT 1). • Open or short circuit between auxiliary battery (12 V) and brake control power supply output 2 (OUT 2)	• Harness and connector • ABS No.1 fuse • ABS No.2 fuse

WIRING DIAGRAM

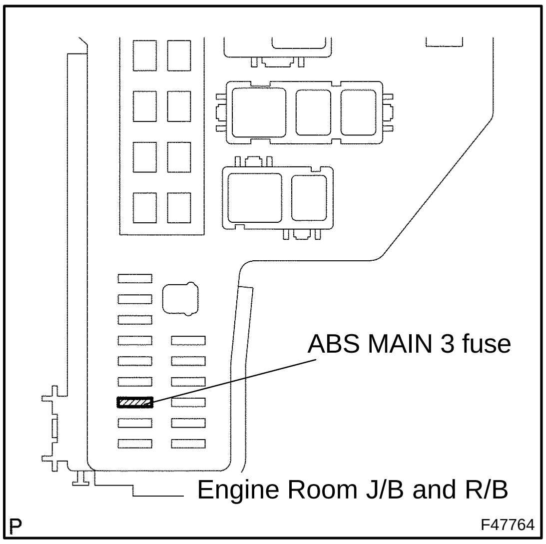



Driver Side J/B
Center Connector NO.2
ECU-IG
IG1 Relay
Center Connector NO.1
AM1
Engine Room R/B and J/B
IG2 Relay
P6 Power Source
Control ECU
AM2
IG2D
AM1
IG1D
AM2
P/I
DC/DC
ABS MAIN3
ABS MAIN2
ABS MAIN1
IM1
5I
5H
1A
1L
1B
1J
1E
4J
4G
4I
IA3
IA1
3I
3K
3A
3D
3M
IN1
W-B
B
O
W
R
V
L
C
F47311


1 2 3 4
Center Connector NO.1
6
4G
6
4I
B
1
IA1
W
J2
J/C
A
A
5
Driver Side J/B
4
1J
IGN
9
1A
B
O
5
S10
IG2
W-B
W-B
W-B
W
1
S7
GND
W-B
W
2
S8
GND2
1
BE1
B
B
W
1
S8
GND3
F15
FL Block
MAIN
W-B
2
S9
GND4
W-B
W-B
1
S9
GND5
W-B
4
S10
GND6
GND1
31
W-B
GND2
32
W-B
Auxiliary
Battery
EF
IH
BQ
EF
EE
C
F47312

INSPECTION PROCEDURE

1 INSPECT FUSE(ABS MAIN3 FUSE)



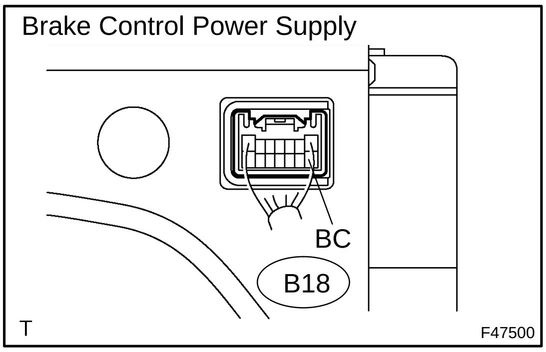
(a) Remove the ABS MAIN3 fuse from the engine room J/B and R/B.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

ABS MAIN3 fuse	Below 1 Ω (Continuity)

NG → **CHECK FOR SHORT IN ALL HARNESS AND CONNECTOR CONNECTED TO FUSE AND REPLACE FUSE**

OK

2 INSPECT BRAKE CONTROL POWER SUPPLY(BC TERMINAL VOLTAGE)



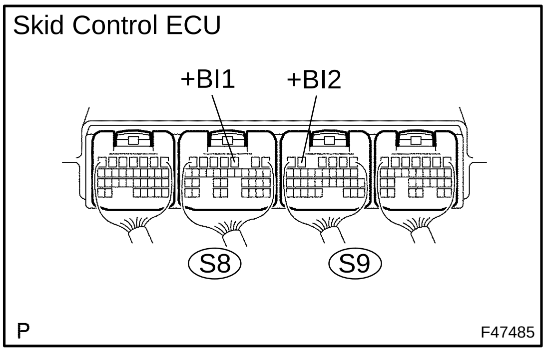
(a) Measure the voltage according to the value(s) in the table below.
HINT:
Measure the voltage from behind the connector with the connector connected.
Standard:

Tester Connection	Specified Condition
B18-8 (BC) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

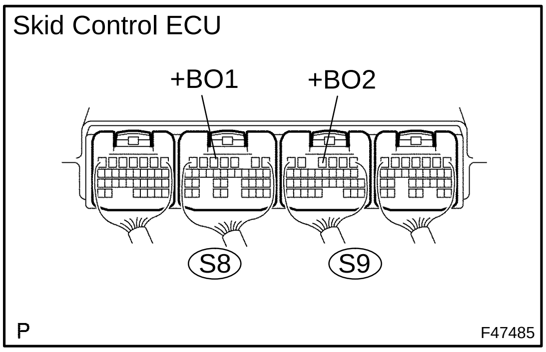
Standard:

Tester Connection	Specified Condition
S8-3 (+BI1) - Body ground	10 to 14 V
S9-5 (+BI2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE



(a) Measure the voltage according to the value(s) in the table below.

HINT:

Measure the voltage from behind the connector with the connector connected to the skid control ECU.

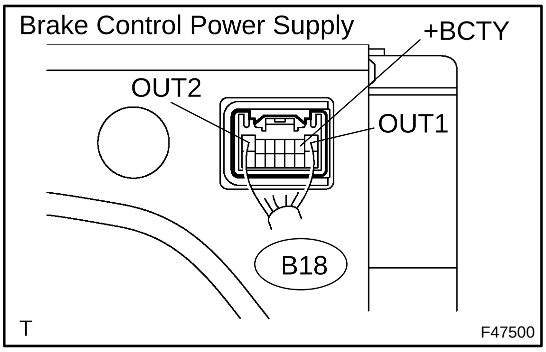
Standard:

Tester Connection	Specified Condition
S8-5 (+BO1) - Body ground	10 to 14 V
S9-4 (+BO2) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT BRAKE CONTROL POWER SUPPLY



(a) Turn the power switch ON (READY).
(b) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected.

Standard:

Tester Connection	Condition	Specified Condition
B18-1 (OUT1) - Body ground	Power switch ON (READY)	9 to 13 V
B18-2 (+BCTY) - Body ground	Power switch ON (READY)	9 to 13 V
B18-7 (OUT2) - Body ground	Power switch ON (READY)	9 to 13 V

NG → **REPLACE BRAKE CONTROL POWER SUPPLY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

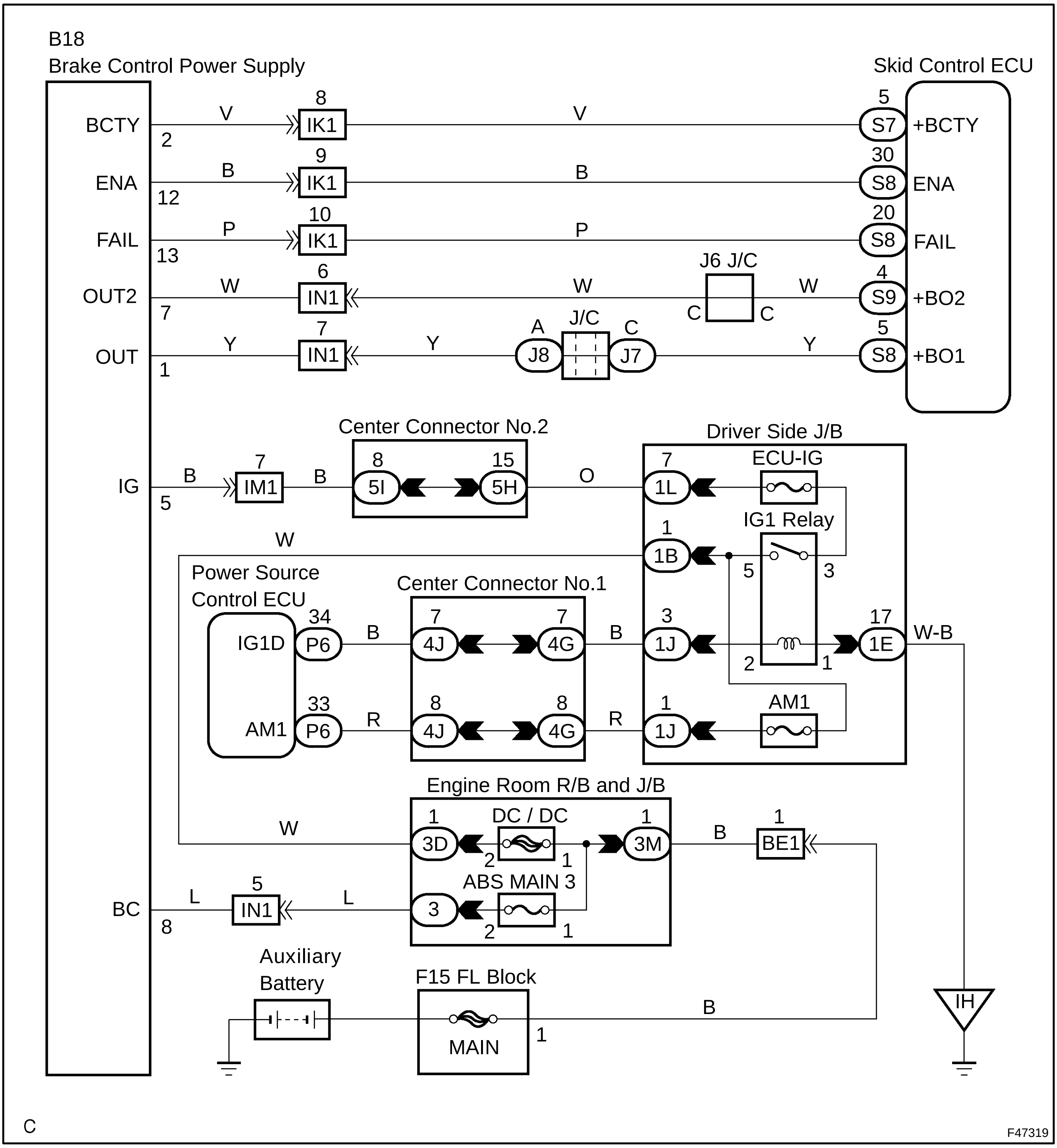
DTC	C1378/44	CAPACITOR COMMUNICATION CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The brake control power supply assy (capacitor) provides auxiliary power for brake control when an auxiliary battery (12 V) voltage drops.
The FAIL and ENA line are placed between the skid control ECU and the brake control power supply assy.
Signals indicating that the brake control power supply is in auxiliary mode are sent to the skid control ECU through the FAIL line.
Charge permit prohibition signals are sent to the brake control power supply through the ENA line.

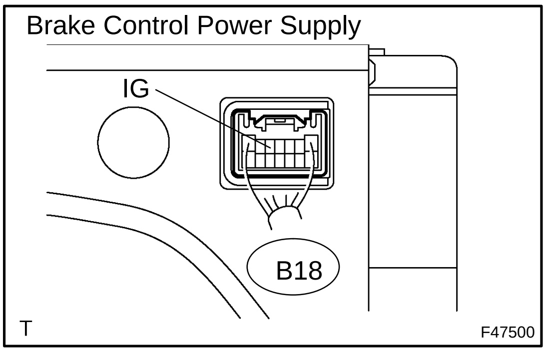
DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1378/44	112	• Open or short in FAIL line. • Malfunction inside the power back up unit.	• Harness and connector • Skid control ECU
C1378/44	113	• Open or short in ENA line • Malfunction inside the skid control ECU (circuit for communication with the capacitor)	• Harness and connector • Skid control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT BRAKE CONTROL POWER SUPPLY TERMINAL VOLTAGE (IG TERMINAL)



(a) Measure the voltage according to the value(s) in the table below.

HINT:
Measure the voltage from behind the connector with the connector connected to the skid control ECU.

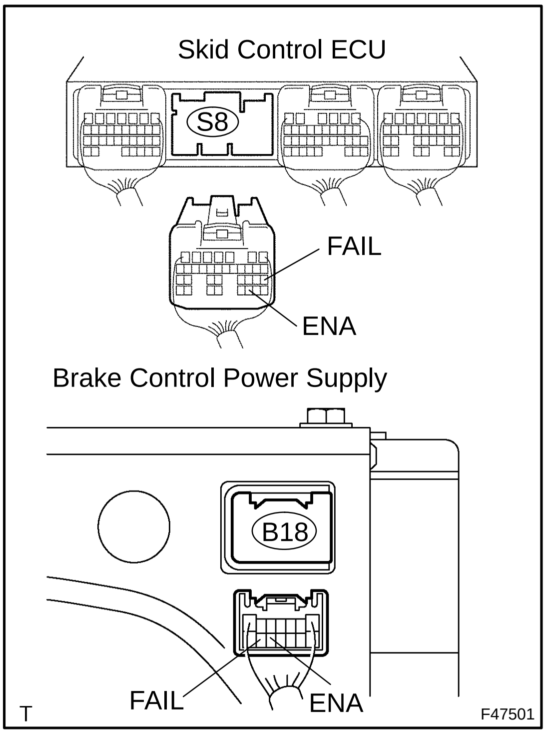
Standard:

Tester Connection	Condition	Specified Condition
B18-5 (IG) - Body ground	Power switch ON (READY)	10 to 14 V

NG → **REPLACE HARNESS OR CONNECTOR**

OK

2	INSPECT SKID CONTROL ECU TERMINAL VOLTAGE(FAIL, ENA TERMINAL)



(a) Turn the power switch OFF.
(b) Disconnect the skid control ECU connector and brake control power supply connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-30 (ENA) - B18-12 (ENA)	Below 1 Ω
S8-20 (FAIL) - B18-13 (FAIL)	Below 1 Ω

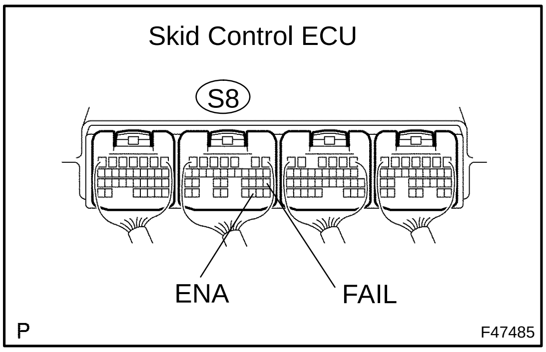
(d) Measure the resistance according to the value(s) in the table below.

Tester Connection	Specified Condition
S8-30 (ENA) - Body ground	10 kΩ or higher
S8-20 (FAIL) - Body ground	10 kΩ or higher

NG → **REPLACE BRAKE CONTROL POWER SUPPLY**

OK

3	INSPECT SKID CONTROL ECU ASSY

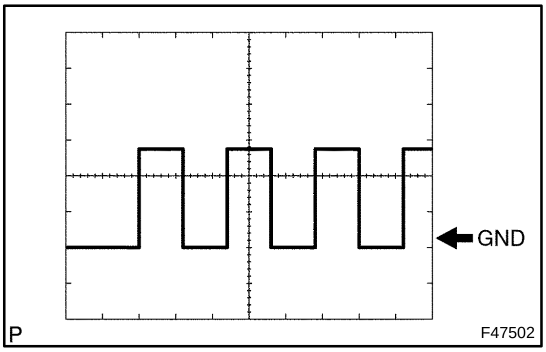


(a) Check the waveform between terminal S8-20 (FAIL) and the ground of the skid control ECU using an oscilloscope.

(b) Check the waveform between terminal S8-30 (ENA) and the ground of the skid control ECU using an oscilloscope.

OK:

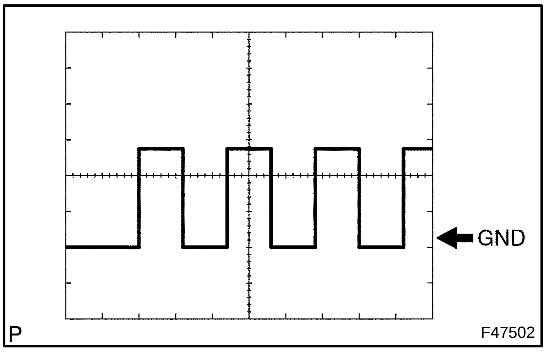
Waveform is output as shown in the illustration.



(1) Oscilloscope waveform (FAIL)

HINT:

- Terminals FAIL ⇔ GND
- Instrument 5 V / DIV, 200 ms / DIV
- Condition READY is displayed on the meter



(2) Oscilloscope waveform (ENA)

HINT:

- Terminals ENA ⇔ GND
- Instrument 5 V / DIV, 100 ms / DIV
- Condition READY is displayed on the meter

Result:

A	Both waveforms are normal
B	Waveform (ENA) is abnormal
C	Waveform (FAIL) is abnormal

B → **REPLACE BRAKE CONTROL POWER SUPPLY**

C → **REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)**

A

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC C1391/69 ABNORMAL LEAK OF ACC PRESS

CIRCUIT DESCRIPTION

The DTC is stored if a brake fluid, internal or other leak is detected due to improper sealing in the actuator. Internal leakage is suspected if the pump motor operates frequently without braking.

DTC No.	Detailed Code	DTC Detecting Condition	Trouble Area
C1391/69	591	Accumulation performance is deteriorated (improper sealing inside the actuator, gas pressure drop inside the accumulator, leak in each pressure boosting valve).	• Fluid leakage • Brake actuator assy

INSPECTION PROCEDURE

1 CHECK BRAKE FLUID LEAKAGE

(a) Check that there is no fluid leakage in the brake line between the brake actuator and the wheel cylinder which is the cause of DTCs.
(b) Check that the brake is not dragging.
OK:
There is no fluid leakage or dragging.

NG → **REPAIR OR REPLACE APPLICABLE PART**

OK

2 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
ACC PRESS SENS 1	Accumulator pressure sensor 1 / min.: 0 V, max.: 5 V	Specified value: 3.2 to 4.0 V

(d) Depress the brake pedal 4 or 5 times to operate the pump motor, and check the output value on the hand-held tester with the motor and check the output value on the hand-held tester with the motor stopped (no braking).
OK:
Accumulator (ACC) pressure sensor voltage does not drop.

NG → **REPLACE BRAKE ACTUATOR ASSY**

OK

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

05IZ0-01

CALIBRATION

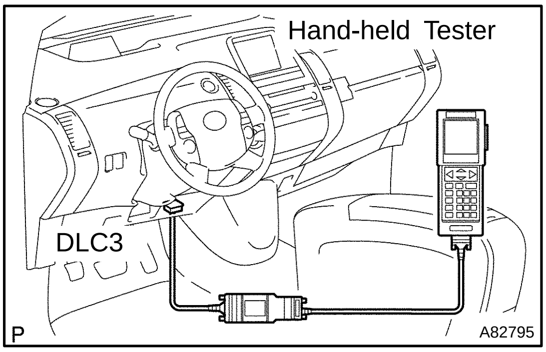
1. DESCRIPTION

(a) Zero point calibration is not performed until the data is cleared when the zero point is once stored. Zero point calibration should be performed after the zero point is cleared if the yaw rate (deceleration) sensor is replaced.

(b) Steering sensor zero point calibration is automatically performed with the vehicle driving straight.

(c) Follow the chart to perform calibration.

Replacing Parts	Necessary Operation
Skid Control ECU	Yaw rate (deceleration) sensor zero point calibration.
Yaw Rate (deceleration) sensor	2. Clearing zero point calibration data. 3. Yaw rate sensor and deceleration sensor zero point calibration.



2. CLEAR ZERO POINT CALIBRATION

(a) Clearing the DTCs.
  (1) Connect the hand-held tester to the DLC3.
  (2) Turn the power switch ON (READY).
  (3) Operate the hand-held tester to erase the codes.

HINT:
Refer to the hand-held tester Operator's Manual for further details.

3. PERFORM ZERO POINT CALIBRATION OF YAW RATE SENSOR AND DECELERATION SENSOR

NOTICE:

- **While obtaining the zero point, do not vibrate the vehicle by tilting, moving or shaking it and keep it in a stationary condition. (Do not start the engine.)**
- **Be sure to do this on a level surface (with an inclination less than 1 degree).**

(a) Check that the steering wheel is in the straight-ahead position and move the shift lever to the P position.

(b) Connect the hand-held tester to the DLC3.

(c) Turn the power switch ON (READY).

(d) Operate the hand-held tester to test mode.

(e) Obtain the zero point of the yaw rate sensor and deceleration sensor.
  (1) Keep the vehicle in the stationary condition on a level surface for 2 seconds or more.
  (2) Check that the VSC warning light blinks.

HINT:

- If the VSC warning light does not blink, perform the zero point calibration again.
- The zero point calibration is performed only once after the system enters the test mode.
- Calibration cannot be performed again until the stored data is cleared once.

(f) Turn the power switch OFF.

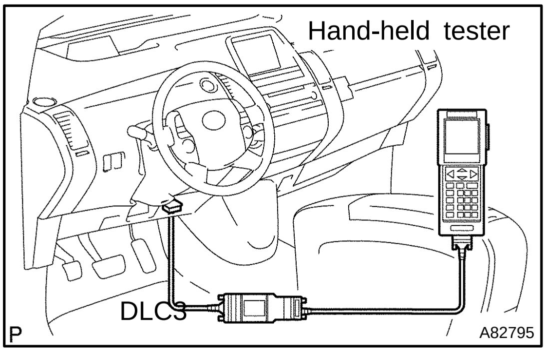
05IZ2-01

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

HINT:

A momentary interruption (open circuit) in the connectors and/or wire harness between the sensors and ECUs can be detected in the ECU data monitor function of the hand-held tester.



(a) Turn the power switch off and connect the hand-held tester to the DLC3.

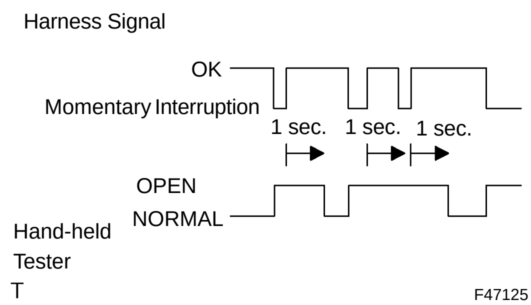
(b) Turn the ignition switch on. Follow the on-screen directions on the hand-held tester to display the DATA LIST and select areas where momentary interruption should be monitored.

HINT:

A momentary interruption (open circuit) cannot be detected for 3 seconds after the ignition switch is turned on (initial check).

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
SPD SEN FR	FR speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition	-
SPD SEN FL	FL speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition	-
SPD SEN RR	RR speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition	-
SPD SEN RL	RL speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition	-
TAWRATE SEN	Yaw rate sensor open detection	NORMAL : Normal condition	-
DECELE SEN	G sensor open detection	NORMAL : Normal condition	-
STEERING SEN	Steering sensor open detection	NORMAL : Normal condition	-
M/C SEN 1	Master Cylinder pressure sensor 1 open detection	NORMAL : Normal condition	-
M/C SEN 2	Master Cylinder pressure sensor 1 open detection	NORMAL : Normal condition	-
STROKE SEN 1	Pedal stroke 1 open	NORMAL : Normal condition	-
FR W/C SEN	FR Wheel cylinder open	NORMAL : Normal condition	-
FL W/C SEN	FR Wheel cylinder open	NORMAL : Normal condition	-
RR W/C SEN	FR Wheel cylinder open	NORMAL : Normal condition	-
RL W/C SEN	FR Wheel cylinder open	NORMAL : Normal condition	-

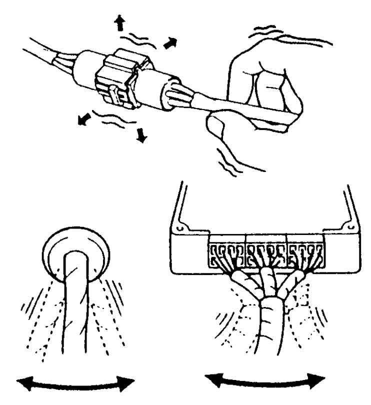
Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
HV COM	HV communication open detection	NORMAL : Normal condition	-
ACC SEN	Accumulator pressure sensor open detection	NORMAL : Normal condition	-



F47125

HINT:
- If the status remains on, check the continuity between the ECU and the sensors, or between ECUs.
- The OPEN display on the hand-held tester remains on for 1 second after the harness signal changes from momentary interruption (open circuit) to normal condition.

(c) While observing the screen, gently jiggle the connector or wire harness between the ECU and sensors, or between ECUs.
Result: Open-screen display does not change.

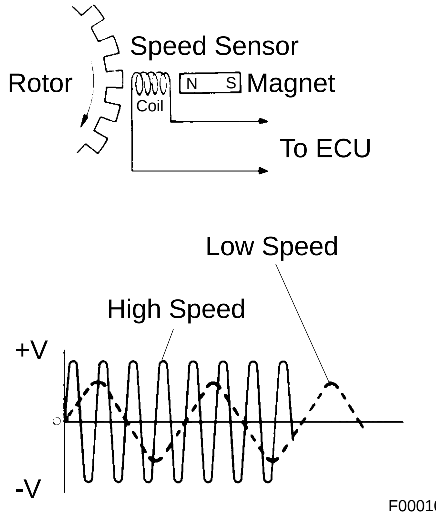

F47126

HINT:
- The connector and/or wire harness will be in momentary interruption (open circuit) if the chart fluctuates. Repair or replace connector and/or wire harness as one of them is faulty.

DTC	C0200/31	RIGHT FRONT SPEED SENSOR CIRCUIT

DTC	C0205/32	LEFT FRONT SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION



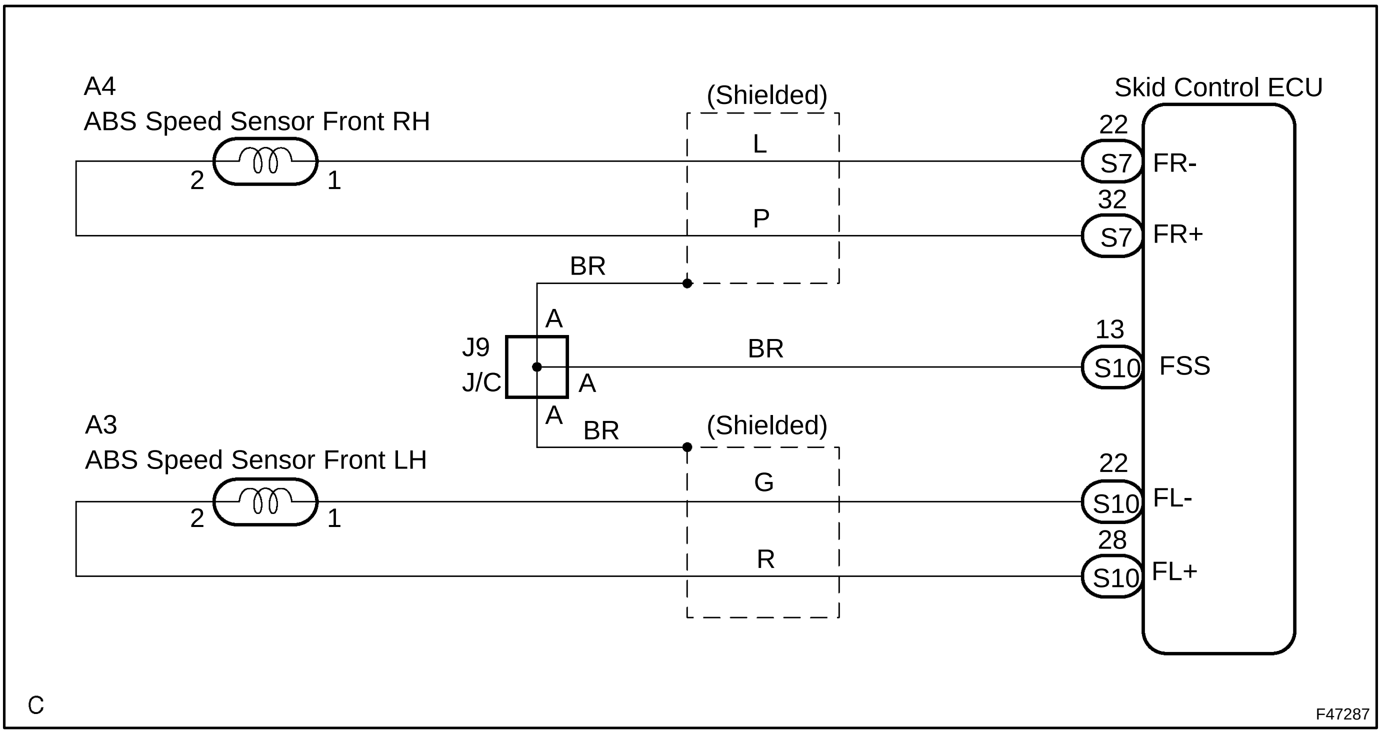
BR3583
BR3582
F00010

The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS control system. The front and rear rotors have 48 serrations, respectively.
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	• Speed of a malfunctioning wheel is 0 mph (0 km/h) for at least 15 sec. when vehicle speed is 6 mph (10 km/h) or more. • Speed of the slowest wheel is less than 1/7th of the 2nd slowest wheel for at least 15 sec. when vehicle speed is 6 mph (10 km/h) or more. • Abnormal high wheel speed pulse is input for at least 15 sec. • Abnormal high wheel speed pulse is input at least 7 times when ECU is on. • Speed sensor pulse signal is instantly cut 7 times or more. • Speed sensor signal line is open for at least 0.5 sec.	• Right front and left front speed sensor • Each speed sensor circuit • Sensor rotor • Sensor installation

HINT:
- DTC C0200/31 is for the right front speed sensor.
- DTC C0205/32 is for the left front speed sensor.
- The BRAKE warning light comes on when speed sensor malfunctions are detected in two or more wheels.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR(MOMENTARY INTERRUPTION)

(a) Using the hand-held tester, check for any momentary interruption in the wire harness and connector corresponding to a DTC (see page 05-954).

Item	Measurement Item / Range (Display)	Normal Condition
SPD SEN FR	FR speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition
SPD SEN FL	FL speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition

OK:

There are no momentary interruptions.

HINT:

Perform the above inspection before removing the sensor and connector.

NG → **Go to step 5**

OK

2 READ VALUE OF HAND-HELD TESTER(FRONT SPEED SENSOR)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed

(d) Check that there is no difference between the speed value output from the speed sensor displayed on the hand-held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference from the displayed speed value.

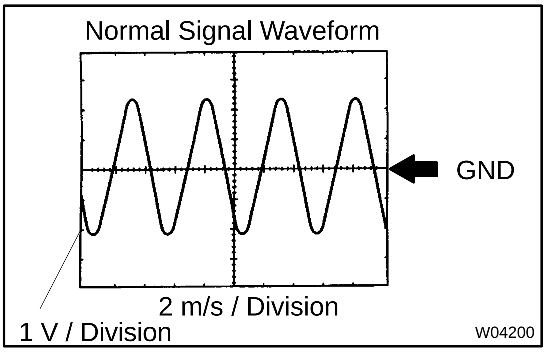
HINT:

There is tolerance of ± 10 % in the speedometer indication.

NG → **Go to step 4**

OK

3	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminal FR+ - FR- or FL+ - FL- of the skid control ECU.

(b) Drive the vehicle at approximately 19 mph (30 km/h), and check the signal waveform.

OK:

A waveform as shown in a figure should be output.

HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

NG	Go to step 6

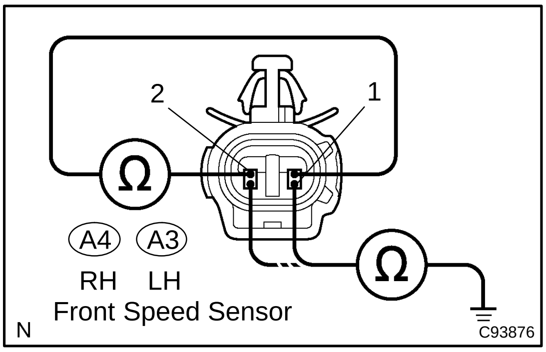
OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

4 INSPECT FRONT SPEED SENSOR



(a) Make sure that there is no looseness at the connector's locking part and connecting part of the connector A3 or A4.

(b) Disconnect the speed sensor connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A3-2 (FL+) - A3-1 (FL-)	1.4 to 1.8 kΩ

RH:

Tester Connection	Specified Condition
A4-2 (FR+) - A4-1 (FR-)	1.4 to 1.8 kΩ

(d) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A3-1 (FL-) - Body ground	10 kΩ or higher
A3-2 (FL+) - Body ground	10 kΩ or higher

RH:

Tester Connection	Specified Condition
A4-1 (FL-) - Body ground	10 kΩ or higher
A4-2 (FL+) - Body ground	10 kΩ or higher

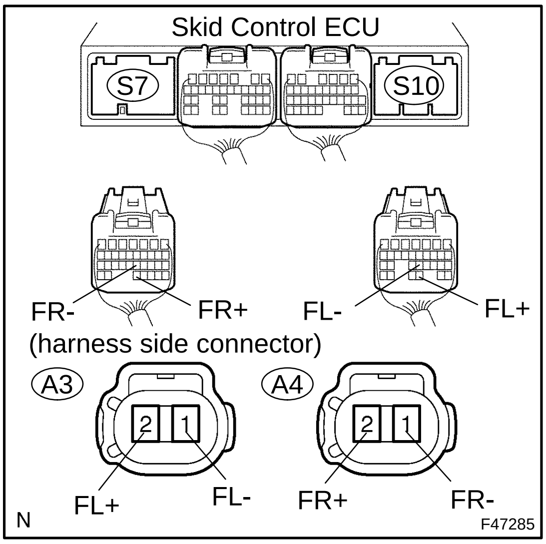
NOTICE:

Check the speed sensor signal after replacement (see page 05-959).

NG — **REPLACE FRONT SPEED SENSOR (SEE PAGE 32-62)**

OK

5	CHECK HARNESS AND CONNECTOR(FRONT SPEED SENSOR - SKID CONTORL ECU)



(a) Disconnect the skid control ECU connector and the front speed sensor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A3-1 (FL-) - S10-22 (FL-)	Below 1 Ω
A3-2 (FL+) - S10-28 (FL+)	Below 1 Ω

RH:

Tester Connection	Specified Condition
A4-1 (FR-) - S7-22 (FR-)	Below 1 Ω
A4-2 (FR+) - S7-32 (FR+)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A3-2 (FL+) - Body ground	10 kΩ or higher
A3-1 (FL-) - Body ground	10 kΩ or higher

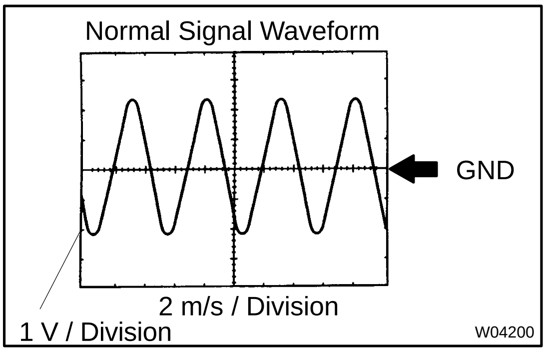
RH:

Tester Connection	Specified Condition
A4-2 (FR+) - Body ground	10 kΩ or higher
A4-1 (FR-) - Body ground	10 kΩ or higher

NG — **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminals FR+ - FR- or FL+ - FL- of the skid control ECU.

(b) Drive the vehicle at approximatery 19mph (30 km/h), and check the signal waveform.

OK:

A waveform as shown in a figure should be output.

HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

NG → **Go to step 7**

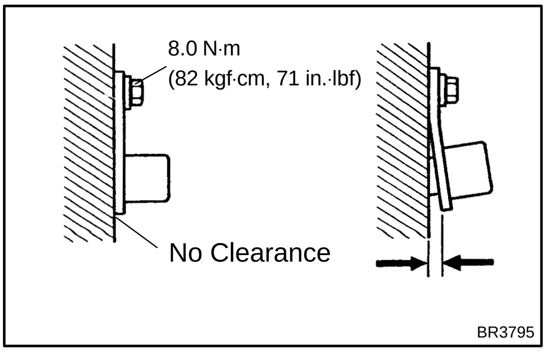
OK

REPAIR OR REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

7	INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.

OK:

- **There is no clearance between the sensor and front steering knuckle.**
- **The installation bolt is tightened properly.**

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NOTICE:

Check the speed sensor signal after the replacement (see page 05-959).

NG → **REPLACE FRONT SPEED SENSOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

DTC	C0210/33	RIGHT REAR SPEED SENSOR CIRCUIT

DTC	C0215/34	LEFT REAR SPEED SENSOR CIRCUIT

CIRCUIT DESCRIPTION

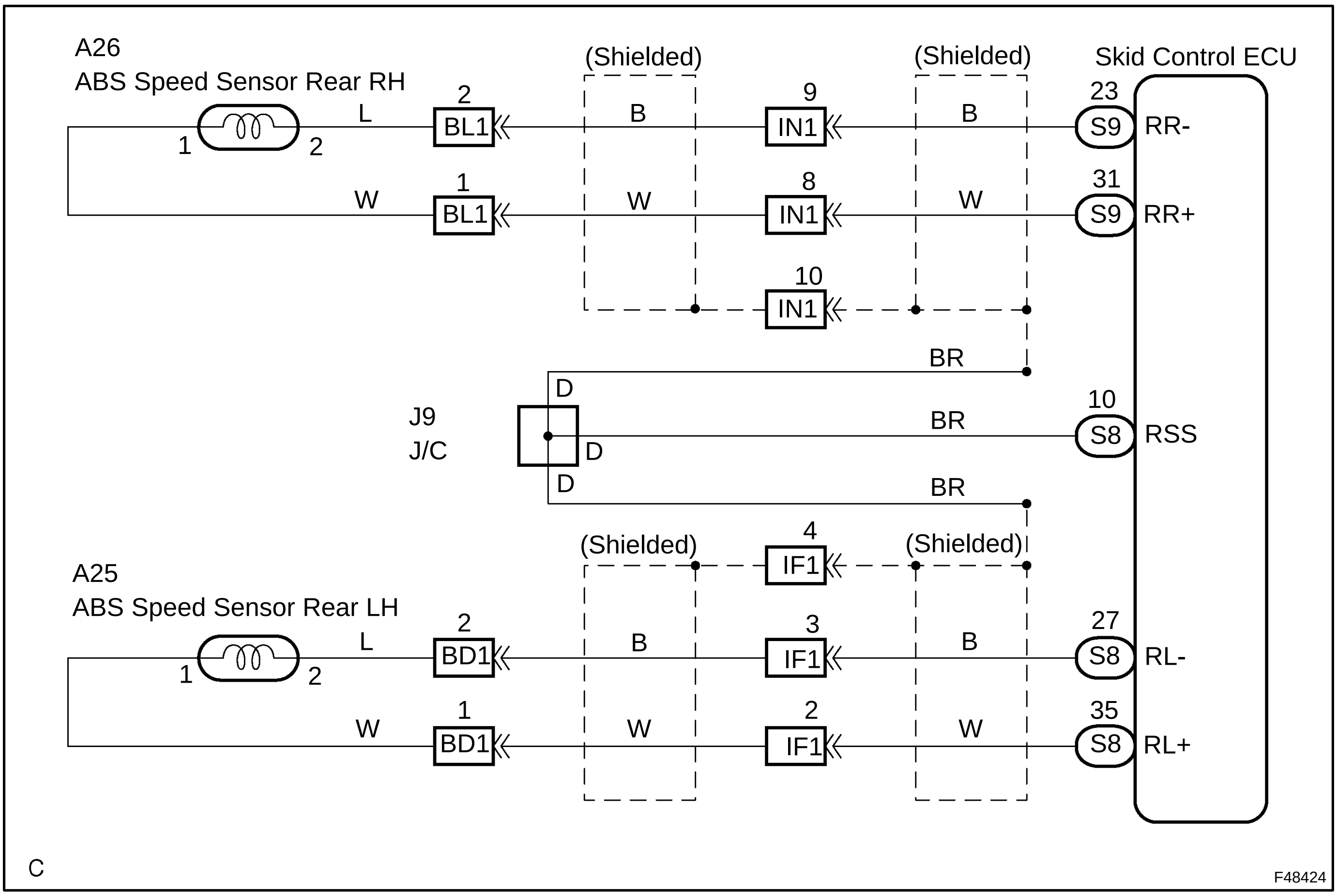
Refer to DTC C0200/31, C0205/32 on page 05-989 .

DTC No.	DTC Detecting Condition	Trouble Area
C0210/33 C0215/34	• Speed of a malfunctioning wheel is 0 mph (0 km/h) for at least 15 sec. when vehicle speed is 6 mph (10 km/h) or more. • Speed of the slowest wheel is less than 1/7th of the 2nd slowest wheel for at least 15 sec. when vehicle speed is 6 mph (10 km/h) or more. • Abnormal high wheel speed pulse is input for at least 15 sec. • Abnormal high wheel speed pulse is input at least 7 times when ECU is on. • Speed sensor pulse signal is instantly cut 7 times or more. • Speed sensor signal line is open for at least 0.5 sec.	• Right rear and left rear speed sensor • Each speed sensor circuit • Sensor rotor • Sensor installation • Skid control ECU

HINT:

- DTC C0210/33 is for the right rear speed sensor.
- DTC C0215/34 is for the left rear speed sensor.
- The BRAKE warning light comes on when speed sensor malfunctions are detected in two or more wheels.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR(MOMENTARY INTERRUPTION)

(a) Using the hand-held tester, check for any momentary interruption in the wire harness and connector corresponding to a DTC (see page 05-954).

Item	Measurement Item / Range (Display)	Normal Condition
SPD SEN RR	RR speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition
SPD SEN RL	RL speed sensor open detection / OPEN or NORMAL	NORMAL : Normal condition

OK:

There are no momentary interruption.

HINT:

Perform the above inspection before removing the sensor and connector.

NG → **Go to step 5**

OK

2	READ VALUE OF HAND-HELD TESTER(REAR SPEED SENSOR)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Select the DATA LIST mode on the hand-held tester.

Item	Measurement Item / Range (Display)	Normal Condition
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed

(d) Check that there is no difference between the speed value output from the speed sensor displayed by the hand-held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference in the displayed speed value.

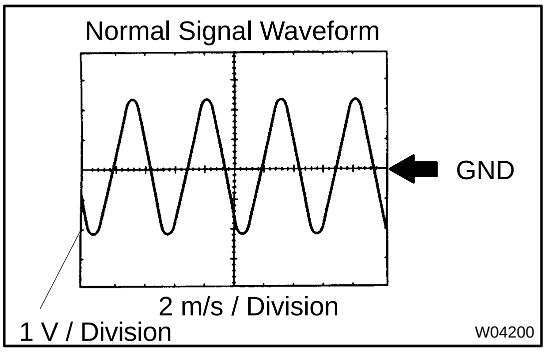
HINT:

There is tolerance of ± 10 % in the speedometer indication.

NG → **Go to step 4**

OK

3	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminals RR+ - RR- or RL+ - RL- of the skid control ECU.

(b) Drive the vehicle at approximately 19 mph (30 km/h), and check the signal waveform.

OK:

A waveform as shown in a figure should be output.

HINT:

- As the vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

NG → **Go to step 7**

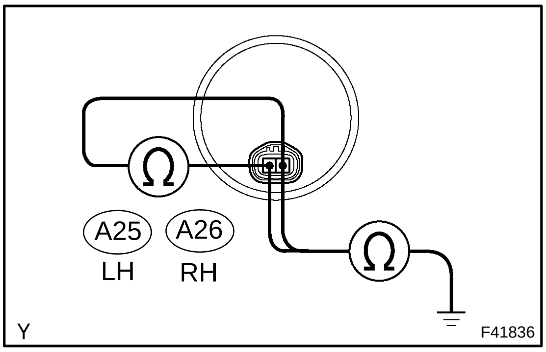
OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

4 INSPECT REAR SPEED SENSOR



(a) Disconnect the rear speed sensor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
1 - 2	1.04 to 1.30 kΩ

(c) Measure the resistance according to the value(s) in the table below.

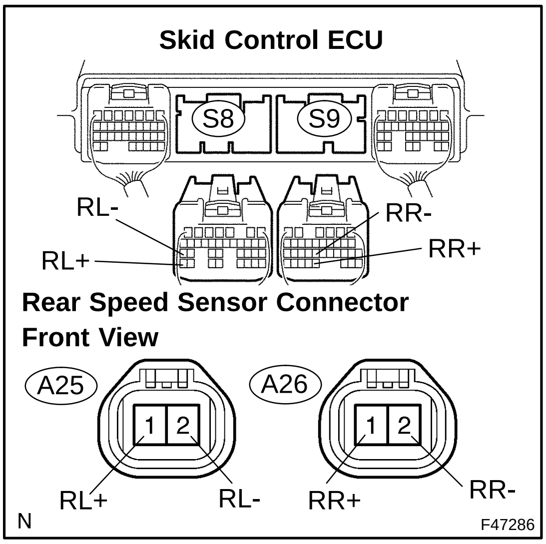
Standard:

Tester Connection	Specified Condition
1 - Body ground	10 kΩ or higher
2 - Body ground	10 kΩ or higher

NG **REPLACE REAR SPEED SENSOR**

OK

5 CHECK HARNESS AND CONNECTOR(REAR SPEED SENSOR - SKID CONTORL ECU)



(a) Disconnect the skid control ECU connector and rear speed sensor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A25-1 (RL+) - S8-35 (RL+)	Below 1 Ω
A25-2 (RL-) - S8-27 (RL-)	Below 1 Ω

RH:

Tester Connection	Specified Condition
A26-1 (RR+) - S10-31 (RR+)	Below 1 Ω
A26-2 (RR-) - S10-23 (RR-)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Standard:

LH:

Tester Connection	Specified Condition
A25-1 (RL+) - Body ground	10 kΩ or higher
A25-2 (RL-) - Body ground	10 kΩ or higher

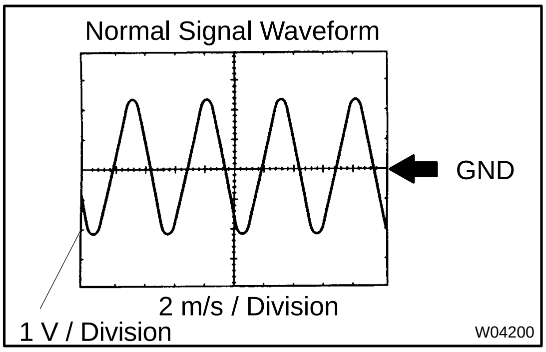
RH:

Tester Connection	Specified Condition
A26-1 (RR+) - Body ground	10 kΩ or higher
A26-2 (RR-) - Body ground	10 kΩ or higher

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



INSPECTION USING OSCILLOSCOPE

(a) Connect the oscilloscope to terminals RR+ - RR- or RL+ - RL- of the skid control ECU.

(b) Drive the vehicle at approximateiy 19 mph (30 km/h), and check the signal waveform.

OK:

A waveform as shown in a figure should be output.

HINT:

- As vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

NG → **Go to step 7**

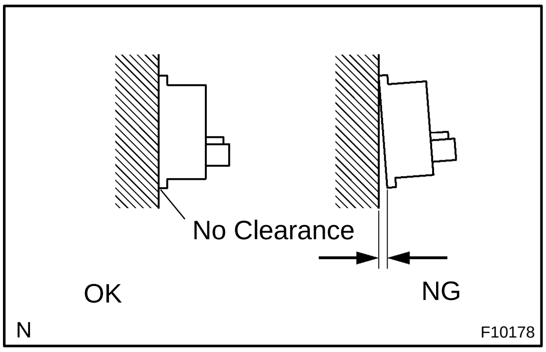
OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

7	INSPECT REAR SPEED SENSOR INSTALLATION



(a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

NOTICE:

Check the speed sensor signal after the replacement (see page 05-959).

NG → **REPLACE REAR SPEED SENSOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

05IYY-01

CUSTOMER PROBLEM ANALYSIS CHECK

ABS & EBD Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuously ☐ Intermittently (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	☐ BA does not operate.	
	Brake Control Warning Light Abnormal	☐ Remains ON ☐ Does not Come On
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Come On
	Brake Warning Light Abnormal (PKB released)	☐ Remains ON ☐ Does not Come On

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	STOP LIGHT SW	☐ ON ☐ OFF
	SYSTEM	☐ NO SYS ☐ ABS ☐ BA ☐ FAIL SF
	#IG ON	
	VEHICLE SPD	km/h MPH

Enhanced VSC Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ TRAC does not operate. (Wheels spin when starting rapidly.)	
	☐ Enhanced VSC does not operate. (Wheels sideslip at the time of sharp turning.)	
	Brake Control Warning Light Abnormal	☐ Remains ON ☐ Does not Come On
	VSC Warning Indicator Abnormal	☐ Displays ☐ Does not Display
	SLIP Indicator Light Abnormal	☐ Remains ON ☐ Does not Come On
	Skid Control Buzzer Abnormal	☐ Sounds ☐ Does not Sound

Check Item	**ABS Warning Light**	☐ Normal ☐ Malfunction Code (Code)
	Malfunction Indicator Light	☐ Normal ☐ Malfunction Code (Code)

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

Freeze Frame Data	VSC/TRAC OFF SW	☐ ON ☐ OFF
	SYSTEM	☐ VSC/TRC
	SHIFT POSITION	☐ P,N ☐ 2 ☐ R ☐ 3 ☐ D ☐ 4 ☐ L ☐ FAIL
	STEERING ANGLE	deg
	YAW RATE	deg/s
	MAS CYL PRESS	V
	THROTTLE	deg
	MAS PRESS GRADE	MPa/s
	G (RIGHT & LEFT)	G
	G (BACK & FORTH)	G

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:
With the hand-held tester connected to the DLC3 and the power switch in the ON position, the ECB, ABS, and Enhanced VSC data list can be displayed. Follow the prompts on the tester screen to access the DATA LIST.

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
YAW RATE	Yaw rate sensor / Min.: -128 deg/s, Max.: 128 deg/s	Min.: -128 deg/s Max.: 128 deg/s	-
YAW ZERO VALUE	Memorized zero value / Min.: -128 deg/s, Max.: 128 deg/s	Min.: -128 degs Max.: 128 deg/s	-
STEERING ANG	Steering sensor / Min.: -1152 deg, Max.: 1150.875 deg	Left turn: Increase Right turn: Decrease	-
1 SYS BRAKE	1 system brake / OPERATE or BEFORE	OPERATE: During operation	-
REGEN CO OPRT	Regenerate co operation / OPERATE or BEFORE	OPERATE: During operation	-
AIR BLD SUPPORT	Air bleed availability / SUPPORT or NOT SUP	SUPPORT: During support	-
PKB SW	Parking brake switch / ON or OFF	ON: Parking brake applied OFF: Parking brake released	-
STOP LIGHT SW	Stop lamp switch / ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	-
TEST MODE	Test mode / NORMAL or TEST	NORMAL: Normal mode TEST: During test mode	-
RESERVOIR SW	Reservoir level warning switch / ON or OFF	ON: Reservoir level Normal NG: Reservoir level Low	-
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual wheel speed	Similar speed as indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual wheel speed	Similar speed as indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual wheel speed	Similar speed as indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual wheel speed	Similar speed as indicated on speedometer
VEHICLE SPD	Maximum wheel speed sensor reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual vehicle speed	Speed indicated on speedometer
IG VOLTAGE	ECU power supply voltage TOO HIGH / TOO LOW / NORMAL	TOO HIGH: 9.5 V or over NORMAL: 9.5 V TOO LOW: Below 9.5 V	-

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
DECELERAT SENS	Deceleration sensor 1 reading / min.: -1.869 G, max.: 1.869 G	Approximately 0 ± 0.13 G at still condition	Reading changes when vehicle is bounced
DECELERAT SENS2	Deceleration sensor 2 reading / min.: -1.869 G, max.: 1.869 G	Approximately 0 ± 0.13 G at still condition	Reading changes when vehicle is bounced
MAS CYL PRS 1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	Reading increases when brake pedal is depressed
MAS CYL PRS 2	Master cylinder pressure sensor 2 reading / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	Reading increases when brake pedal is depressed
SLAFR CUR	Current of SLAFR solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLAFL CUR	Current of SLAFL solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLARR CUR	Current of SLARR solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLARL CUR	Current of SLARL solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLRFR CUR	Current of SLAFR solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLRFL CUR	Current of SLAFL solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLRRR CUR	Current of SLARR solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
SLRRL CUR	Current of SLARL solenoid / min.: 0 A, max.: 3 A	When brake pedal is released: 0 A	-
PEDAL STROKE	Stroke sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.7 to 1.3 V	-
PEDAL STROKE 2	Stroke sensor 2 / min.: 0 V, max.: 5 V	When brake pedal is released: 3.7 to 4.3 V	-
MC 2	MC2 / ON or OFF	ON: Operate	-
MC 1	MC1 / ON or OFF	ON: Operate	-
SSC	SSC / ON or OFF	ON: Operate	-
PATTERN	A pattern drive is under enforcement / ON or OFF	ON: Operate	-
MAIN RELAY 2	Main relay 2 for ECB / ON or OFF	ON: Operate	-
MAIN RELAY 1	Main relay 1 for ECB / ON or OFF	ON: Operate	-
ACC PRESS SENS 1	Accumulator pressure sensor 1 / min.: 0 V, max.: 5 V	Specified value: 3.2 to 4.0 V	-
FR PRESS SENS	Front Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	-
FL PRESS SENS	Front Left pressure sensor / min. 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	-
RR PRESS SENS	Rear Right pressure sensor / min.: 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	-
RL PRESS SENS	Rear Left pressure sensor / min. 0 V, max.: 5 V	When brake pedal is released: 0.3 to 0.9 V	-
MOTOR RELAY 2	Motor relay 2 / ON or OFF	ON: Motor relay ON	-
MOTOR RELAY 1	Motor relay 1 / ON or OFF	ON: Motor relay ON	-
VSC	Existance of VSC / WITH or WITHOUT	WITH: WITH Enhanced VSC System	-

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
2 FRAMES	There is two or more frame for freeze frame data / YES or NO	YES: There are two or more freeze frame data	-
REGEN TORQ FR	Regenerative request torque (FR) / min.: 0 N·m, max.: 4080 N·m	ECB is not operate: 0 N·m	-
REGEN TORQ FL	Regenerative request torque (FL) / min.: 0 N·m, max.: 4080 N·m	ECB is not operate: 0 N·m	-
REGEN TORQ RR	Regenerative request torque (RR) / min.: 0 N·m, max.: 4080 N·m	-	-
REGEN TORQ RL	Regenerative request torque (RL) / min.: 0 N·m, max.: 4080 N·m	-	-
SPD SEN FR	FR speed sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
SPD SEN FL	FL speed sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
SPD SEN RR	RR speed sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
SPD SEN RL	RL speed sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
YAW RATE SEN	Yaw rate sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
DECELE SEN	Deceleration sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
STEERING SEN	Steering sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
M/C SEN 1	Master cylinder pressure sensor 1 open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
M/C SEN 2	Master cylinder pressure sensor 2 open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
STROKE SEN 1	Stroke sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
FR W/C SEN	FR wheel cylinder pressure sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
FL W/C SEN	FL wheel cylinder pressure sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
RR W/C SEN	RR wheel cylinder pressure sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
RL W/C SEN	FR wheel cylinder pressure sensor open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
HV COM	HV communication open detection / OPN-DET or NORMAL	NORMAL: Normal condition	-
ACC SEN	Accumulator pressure sensor open detection	NORMAL: Normal condition	-
BUZZER	Buzzer / ON or OFF	ON: Operate	-
RESERVOIR SW	Reservoir level warning switch / ON or OFF	ON: Operate	-
SHIFT POSITION	Shift position / FAIL / L / 2 / 3 / 4 / D (M) / R / P.N	-	
VSC/TRC OFF SW	TRAC control switch / ON or OFF	ON: TRAC control switch ON	-
STOP LIGHT SW	Stop light switch / ON or OFF	ON: Operate	-
SYSTEM	SYSTEM / ABS / VSC (TRAC) / BA / HAB / FAIL SAFE / PB / NOSYS	-	-
# IG ON	# IG ON / 0 - 31	0	-
STEERING ANG	Steering sensor / Min.: -1152 deg, Max.: 1150.875 deg	Left turn: Increase Right turn: Decrease	-
YAW RATE	Yaw rate sensor/ Min.: -128 deg/s, Max.: 128 deg/s	Min.: -128 deg/s Max.: 128 deg/s	-
MAS CYL PRESS	Master cylinder pressure / min.: 0 V, max.: 5 V	When brake pedal is released : 0.3 to 0.9 V	Reading increases when brake pedal is depressed
PEDAL STROKE	Stroke sensor / min.: 0 V, max.: 5 V	When brake pedal is released (SKS1): 0.7 to 1.5 V When brake pedal is released (SKS2): 3.7 to 4.3 V	-
THROTTLE	Throttle position sensor / min.: 0 deg, max.: 125 deg	Release accelerator pedal: Approx. 0 deg. Depress accelerator pedal: Approx. 90 deg.	-
MAS PRESS GRADE	Master pressure sensor grade / min.: -30Mpa/s, max.: 225 Mpa/s	When brake pedal is released: 0 MPa	-
G (RIGHT & LEFT)	Right and left G / min.: -1.869 G, max.: 1.869 G	Approximately 0 ± 0.13 G at still condition	-
G (BACK & FORTH)	Back and forth G / min.: -1.869 G, max.: 1.869 G	Approximately 0 ± 0.13 G at still condition	-
SPD GRADE	Vehicle speed grade /min.: -1.869 G, max.: 1.869 G	Approximately 0 ± 0.13 G at still condition	-
# CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 39	-

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay and actuator, etc. to operate without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the hand-heldt tester to the DLC3.

(b) Turn the power switch ON (READY).

(c) According to the display on the tester, perform the "ACTIVE TEST".

HINT:

Ignition switch must be turned to the ON position to proceed to the Active Test using the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter
BRAKE WARN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter
VSC/BR WARN BUZ	Turns VSC / BRAKE warning buzzer ON / OFF	Buzzer can be heard
ECB INDI LIGHT	Turns Brake Control warning light ON / OFF	Observe combination meter
MAIN RELAY 1	Turns MAIN RELAY 1 ON / OFF	Operation of solenoid (clicking sound) can be heard
MAIN RELAY 2	Turns MAIN RELAY 2 ON / OFF	Operation of solenoid (clicking sound) can be heard
MC 1	Turns Master cut valve 1 activation ON / OFF	Operation of solenoid (clicking sound) can be heard
MC 2	Turns Master cut valve 2 activation ON / OFF	Operation of solenoid (clicking sound) can be heard
MOTOR RELAY 1	Turns MOTOR RELAY 1 ON / OFF	Operation of solenoid (clicking sound) can be heard
MOTOR RELAY 2	Turns MOTOR RELAY 2 ON / OFF	Operation of solenoid (clicking sound) can be heard
ECB INVALID	Turns ECB invalid ON / OFF	Operation of solenoid (clicking sound) can be heard
ACC PATTERN	Actuator air bleeding pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard
SCC PATTERN	Stroke simulator cut valve pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard
POWER SUPPLY 1	Power supply air bleeding pattern activation 1 ON / OFF	Operation of solenoid (clicking sound) can be heard
POWER SUPPLY 2	Power supply air bleeding pattern activation 2 ON / OFF	Operation of solenoid (clicking sound) can be heard

Item	Vehicle Condition / Test Details	Diagnostic Note
RL AIR BLEEDING	RL wheel air bleeding pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard
RR AIR BLEEDING	RR wheel air bleeding pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard
ZERO DOWN	Accumulator zero down activation ON / OFF	Operation of solenoid (clicking sound) can be heard
PUMP PATTERN	Pump check pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard
DRAIN PATTERN	Drain system air bleeding pattern activation ON / OFF	Operation of solenoid (clicking sound) can be heard

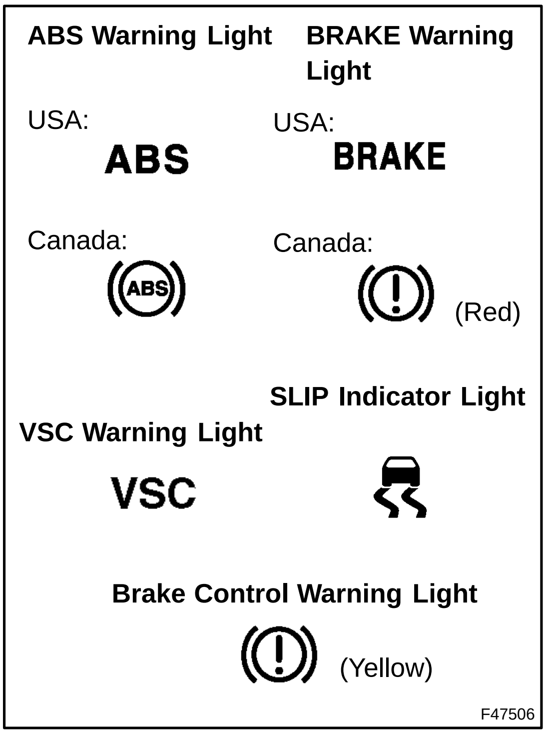
05IZ5-01

DIAGNOSIS SYSTEM

1. DIAGNOSIS FUNCTION

On the combination meter, the BRAKE warning light (Red), BRAKE warning light ((Yellow) Brake Control warning light), ABS warning light or VSC warning light come on to inform the driver if trouble occurs in the skid control ECU input signal or actuator system.

If there is trouble in the oil pressure source (pump motor, accumulator) or the vehicle power supply is insufficient, the skid control buzzer sounds to warn the driver.



ABS Warning Light	Comes on when a failure in ABS, EBD or Enhanced VSC occurs
VSC Warning Light	Comes on when a failure in Enhanced VSC occurs
SLIP Indicator Light	Comes on while operating ABS or Enhanced VSC
BRAKE Warning Light ((Yellow) Brake Control warning light)	Comes on when a minor failure that does not affect normal driving occurs in the brake control system
BRAKE Warning Light (Red)	Comes on when a failure in the brake control system Comes on when the parking brake is applied or the brake fluid level is low.

2. DIAGNOSIS DISPLAY FUNCTION

DTCs detected by the ECU can be read by connecting the hand-held tester and performing the read command. The DTC has a detailed code that can be checked on the freeze frame data screen.

3. BRAKE SYSTEM DISPLAY INITIAL CHECK

Turn the power switch ON (READY) and check that the ABS warning light, VSC warning light, Brake Control warning light, BRAKE warning light and SLIP indicator light come on, and then go off after approximately 3 seconds.

If any of the lights do not come on, check the bulb and the multiplex communication diagnosis.

05IZA-01

DIAGNOSTIC TROUBLE CODE CHART

HINT:
If a malfunction code is displayed during the DTC check, check the circuit indicated by the DTC. For details of each code, turn to the page for the respective "DTC No." in the DTC chart.

DTC chart of ABS:

DTC No. (See page)	Detection Item	Trouble Area
C0200/31 (05-989)	Right front wheel speed sensor signal malfunction	• Right front speed sensor • Speed sensor circuit • Sensor rotor • Sensor installation
C0205/32 (05-989)	Left front wheel speed sensor signal malfunction	• Left front speed sensor • Speed sensor circuit • Sensor rotor • Sensor installation
C0210/33 (05-996)	Right rear wheel speed sensor signal malfunction	• Right rear speed sensor • Speed sensor circuit • Sensor rotor • Sensor installation
C0215/34 (05-996)	Left rear wheel speed sensor signal malfunction	• Left rear speed sensor • Speed sensor circuit • Sensor rotor • Sensor installation
C1235/35 (05-1014)	Metal stick to speed sensor (FR)	• Right front speed sensor • Speed sensor circuit • Sensor installation
C1236/36 (05-1014)	Metal stick to speed sensor (FL)	• Left front speed sensor • Speed sensor circuit • Sensor installation
C1238/38 (05-1014)	Metal stick to speed sensor (RR)	• Right rear speed sensor • Speed sensor circuit • Sensor installation
C1239/39 (05-1014)	Metal stick to speed sensor (RL)	• Left rear speed sensor • Speed sensor circuit • Sensor installation
C1243/43 (05-1005)	Malfunction in deceleration sensor (constant output)	• Yaw rate (deceleration) sensor • Skid control ECU
C1244/44 (05-1005)	Open or short circuit in deceleration sensor circuit	• Yaw rate (deceleration) sensor • Yaw rate (deceleration) sensor installation • Zero point calibration not done • Skid control ECU
C1245/45 (05-1005)	Malfunction in deceleration sensor	• Yaw rate (deceleration) sensor • Zero point calibration not done • Skid control ECU
C1381/97 (05-1005)	Malfunction in power supply voltage of yaw/deceleration sensor	• Yaw rate (deceleration) sensor circuit • Harness and connector • Skid control ECU

(1) Drive the vehicle at the vehicle speed of 31 mph (50 km/h) and keep depressing the brake pedal strongly for approximately 3 seconds.
(2) Repeat the above operation 3 times or more and check that the ABS warning light goes off.
(3) Clear the DTC (see page 05-973).

HINT:
In some cases, the hand-held tester cannot be used when ABS warning light remains on.

DTC chart of Enhanced VSC:

DTC No. (See page)	Detection Item	Trouble Area
C1210/36 (05-1005)	Zero point calibration of yaw rate sensor undone	• Zero point calibration undone (Perform zero point calibration and check DTC. If DTC is not output again, the sensor is normal.)
C1231/31 (05-1010)	Malfunction in steering angle sensor	• Steering angle sensor • Skid control ECU
C1232/32 (05-1005)	Malfunction in deceleration sensor	• Yaw rate (deceleration) sensor • Skid control ECU
C1234/34 (05-1005)	Malfunction in yaw rate sensor	• Yaw rate (deceleration) sensor
C1310/51 (05-1054)	Malfunction in HV system	• Hybrid control system (Enhanced VSC, TRAC system)
C1336/39 (05-1005)	Zero point calibration of deceleration sensor undone	• Zero point calibration undone (Perform zero point calibration and check DTC. If DTC is not output again, the sensor is normal.)

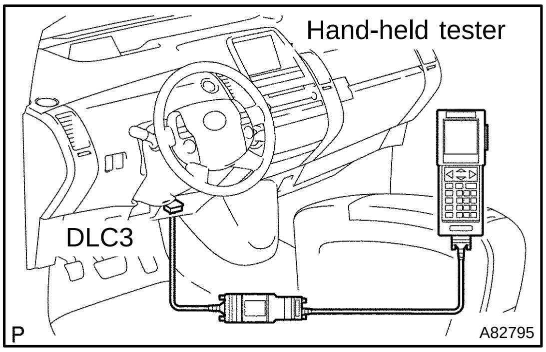
DTC chart of ECB:

DTC No. (See page)	Detection Item	Trouble Area
C1202/68 (05-1001)	Brake fluid level low / Open circuit in brake fluid level warning switch circuit	• Brake fluid level • Brake fluid level warning switch • Harness and connector • Skid control ECU
C1203/95 (05-1004)	Engine control system communication circuit malfunction	• Skid control ECU
C1241/41 (05-1018)	Low battery positive voltage or abnormally high battery positive voltage	• ABS No.1 relay • ABS No.2 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system
C1242/42 (05-1018)	Open circuit in IG2 circuit	• ABS No.1 relay • ABS No.2 relay • Harness and connector • Skid control power supply circuit • Brake control power supply assy • Hybrid control system
C1246/46 (05-1026)	Malfunction in master cylinder pressure sensor	• Brake actuator assy • Skid control ECU • Harness and connector
C1247/47 (05-1033)	Malfunction in stroke sensor	• Brake pedal stroke sensor • Skid control ECU • Harness and connector

C1249/49 (05-1038)	Open circuit in stop light switch circuit	• Stop lamp switch • Stop lamp switch circuit • Stop lamp bulb
C1252/52 (05-1044)	Hydro-booster pump motor malfunction	• Brake actuator assy
C1253/53 (05-1044)	Hydro-booster pump motor relay malfunction	• ABS MTR relay • ABS MTR2 relay • Harness and connector • Brake actuator assy
C1256/57 (05-1052)	Accumulator low pressure malfunction	• Brake actuator assy (accumulator pressure, accumulator pressure sensor, pump motor)
C1259/58 (05-1054)	HV system regenerative malfunction	• Hybrid control system
C1300/- (05-1056)	Malfunction in ECU	• Skid control ECU
C1311/11 (05-1057)	Open circuit in main relay 1	• ABS No.1 relay • Skid control ECU • Harness and connector
C1312/12 (05-1057)	Short circuit in main relay 1	• ABS No.1 relay • Skid control ECU • Harness and connector
C1313/13 (05-1057)	Open circuit in main relay 2	• ABS No.2 relay • Skid control ECU • Harness and connector
C1314/14 (05-1057)	Short circuit in main relay 2	• ABS No.2 relay • Skid control ECU • Harness and connector
C1315/31 (05-1065)	Changeover solenoid malfunction(SMC1)	• Brake actuator assy (SMC1) • Skid control ECU • Harness and connector
C1316/32 (05-1065)	Changeover solenoid malfunction(SMC2)	• Brake actuator assy (SMC2) • Skid control ECU • Harness and connector
C1319/35 (05-1073)	Changeover solenoid malfunction(SCSS)	• Stroke simulator • Skid control ECU • Harness and connector
C1341/62 (05-1077)	Malfunction in hydraulic system(FR)	• Fluid leakage • Brake actuator assy • Disc rotor
C1342/63 (05-1077)	Malfunction in hydraulic system(FL)	• Fluid leakage • Brake actuator assy • Disc rotor
C1343/64 (05-1077)	Malfunction in hydraulic system(RR)	• Fluid leakage • Brake actuator assy • Disc rotor
C1344/65 (05-1077)	Malfunction in hydraulic system(RL)	• Fluid leakage • Brake actuator assy • Disc rotor
C1345/66 (05-1086)	Not learning linear valve offset abnormality	• Initialization of linear solenoid valve and calibration undone
C1352/21 (05-1065)	Increasing pressure solenoid malfunction(FR)	• Brake actuator assy • Skid control ECU • Harness and connector

C1353/23 (05-1065)	Increasing pressure solenoid malfunction(FL)	• Brake actuator assy • Skid control ECU • Harness and connector
C1354/25 (05-1065)	Increasing pressure solenoid malfunction(RR)	• Brake actuator assy • Skid control ECU • Harness and connector
C1355/27 (05-1065)	Increasing pressure solenoid malfunction(RL)	• Brake actuator assy • Skid control ECU • Harness and connector
C1356/22 (05-1065)	Decreasing pressure solenoid malfunction(FR)	• Brake actuator assy • Skid control ECU • Harness and connector
C1357/24 (05-1065)	Decreasing pressure solenoid malfunction(FL)	• Brake actuator assy • Skid control ECU • Harness and connector
C1358/26 (05-1065)	Decreasing pressure solenoid malfunction(RR)	• Brake actuator assy • Skid control ECU • Harness and connector
C1359/28 (05-1065)	Decreasing pressure solenoid malfunction(RL)	• Brake actuator assy • Skid control ECU • Harness and connector
C1364/61 (05-1026)	Malfunction in W/C pressure sensor	• Brake actuator assy • Skid control ECU • Harness and connector
C1365/54 (05-1087)	Malfunction in ACC pressure sensor	• Brake actuator assy (accumulator pressure sensor) • Skid control ECU
C1368/67 (05-1087)	Linear valve offset malfunction	• Initialization of linear solenoid valve and calibration undone • Skid control ECU
C1377/43 (05-1091)	Capacitor malfunction	• Brake control power supply • Harness and connector • ABS No.1 fuse • ABS No.2 fuse • ABS No.3 fuse • Apply high voltage
C1378/44 (05-1098)	Capacitor communication circuit malfunction	• Harness and connector • Skid control ECU
C1391/69 (05-1102)	Abnormal leak of ACC PRESS	• Fluid leakage • Brake actuator assy
C1392/48 (05-1033)	Un-correction of a zero point of the stroke sensor	• Brake pedal stroke sensor zero point calibration undone (initialization of linear solenoid valve and calibration undone) • Skid control ECU

DTC CHECK/CLEAR



1. DTC CHECK (USING HAND-HELD TESTER)

(a) Checking DTCs.

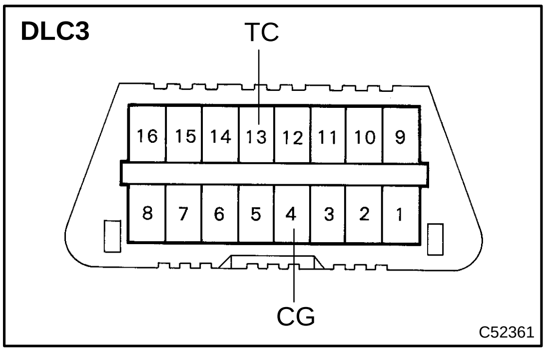
(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch ON (READY).

(3) Read the DTCs following the prompts on the tester screen.

HINT:

Refer to the hand-held tester operator's manual for further details.



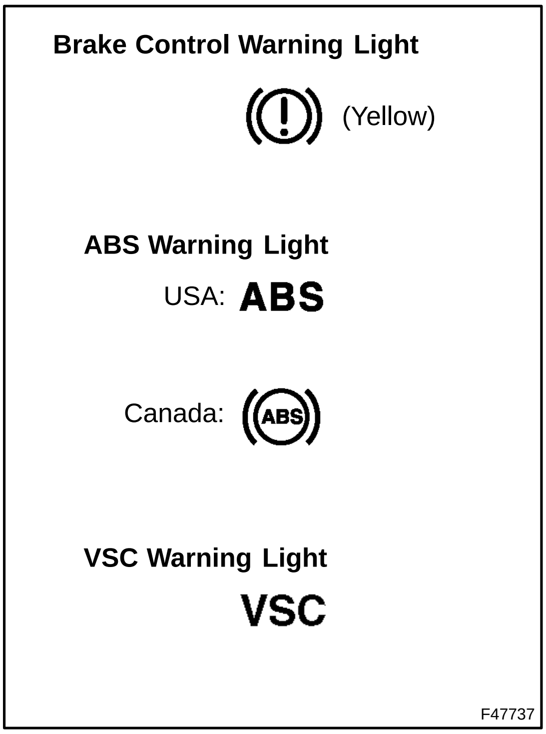
2. DTC CHECK (USING SST CHECK WIRE)

(a) Check DTCs.

(1) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

(2) Turn the power switch ON (READY).



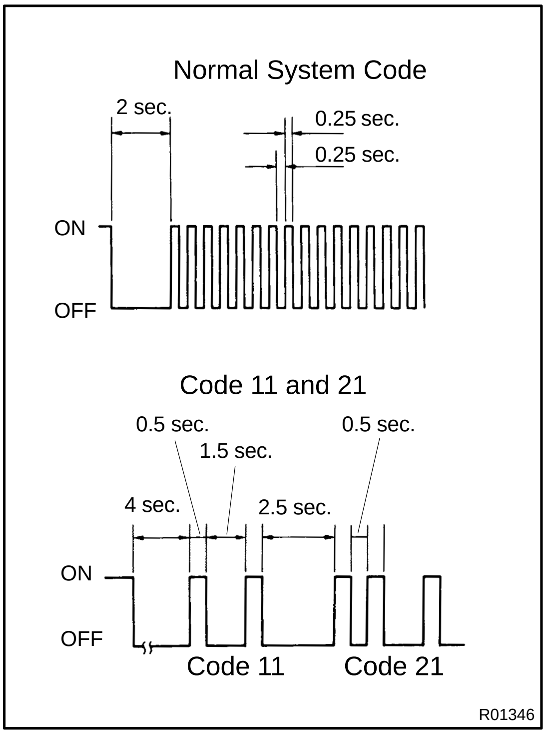
(3) Read the DTC from the Brake Control warning light, ABS warning light and VSC warning light on the combination meter.

Brake Control warning light	DTC of ECB system
ABS warning light	DTC of ABS system
VSC warning light	DTC of Enhanced VSC system

HINT:

- If no code appears, inspect the diagnostic circuit or ABS warning light circuit.

Trouble Area	See page
TC and CG terminal circuit	05-1131
Brake Control warning light circuit	05-1103
ABS warning light circuit	05-1108
VSC warning light circuit	05-1113

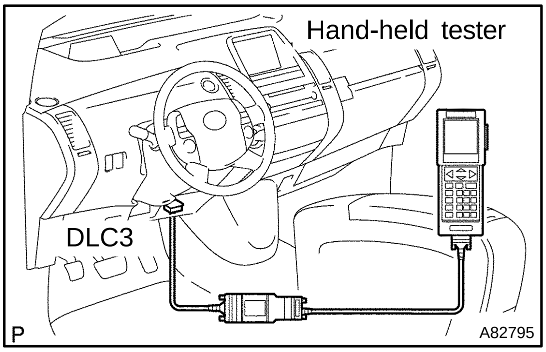


- As an example, the blinking patterns for a normal system code and trouble codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page 05-985 .

(5) After completing the check, disconnect terminals TC and CG of the DLC3, and turn off the display.

If 2 or more DTCs are detected at the same time, the DTCs will be displayed in ascending order.



3. CLEAR DTC (USING HAND-HELD TESTER)

(a) Clearing the DTCs.

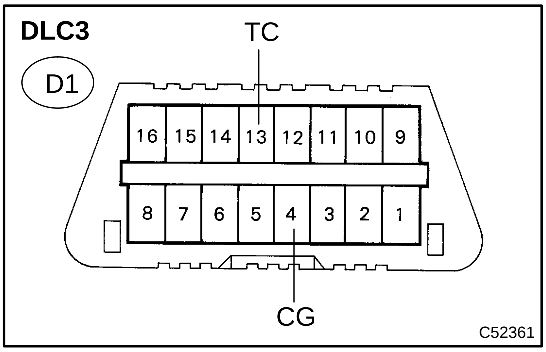
(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch ON (READY).

(3) Operate the hand-held tester to clear the codes.

HINT:

Refer to the hand-held tester operator's manual for further details.



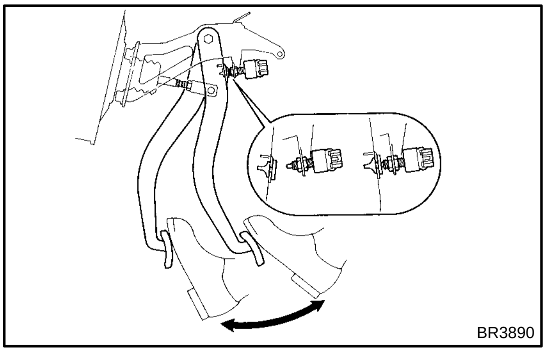
4. CLEAR DTC (USING SST CHECK WIRE)

(a) Clear the DTCs using the SST check wire.

(1) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

(2) Turn the power switch ON (READY).



(3) Clear the DTCs stored in the ECU by depressing the brake pedal 8 times or more within 5 seconds.

(4) Check that the warning light indicates a normal system code.

(5) Remove the SST.

HINT:

Clearing the DTCs cannot be performed by removing the battery cable or the ECU-IG fuse.

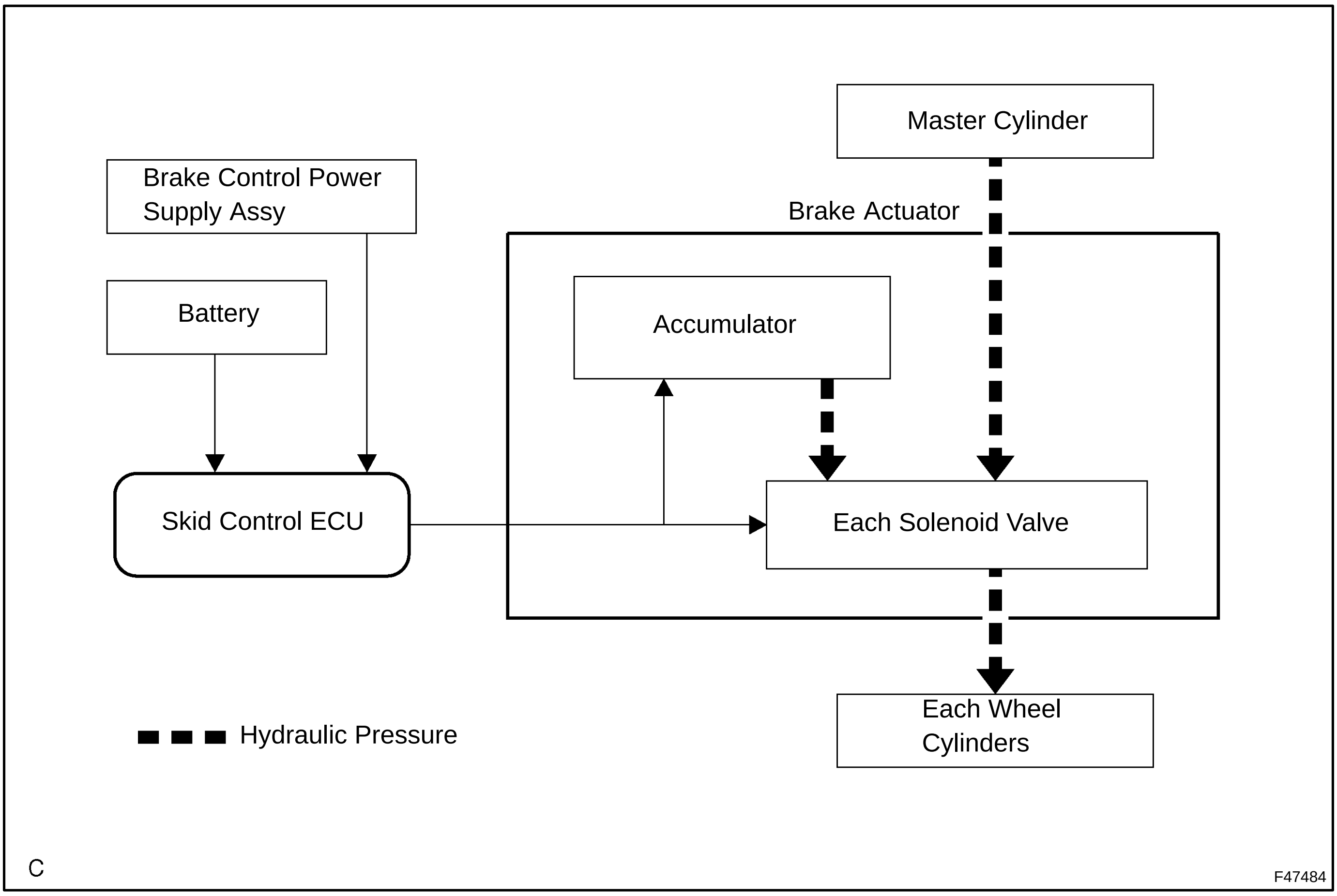
5. END OF CHECK/CLEAR

(a) Turn the power switch ON (READY).

(b) Check that the Brake Control warning light, ABS warning light and VSC warning light go off within approximately 3 seconds.

05IZ8-01

FAIL-SAFE CHART



1. FAIL-SAFE FUNCTION

(a) If a malfunction occurs in the skid control ECU, sensor signal, or actuator, rest normally operating parts will maintain brake control.

(b) If the brake control is stopped under such conditions as when trouble occurs with a hydraulic pressure source, the pressure generated in the master cylinder by the driver is applied to the wheel cylinder to ensure braking force.

(c) A power back-up unit is built in as an additional power source to supply stable power to the system.

(d) If the regenerative brake alone does not operate under such conditions as a communication error with the HV ECU, control is switched so that all braking force is generated with the hydraulic pressure brake.

Trouble area	Generated braking force
Skid control ECU	Normally operating parts will control brake and generate braking force
Hydraulic pressure controlling parts	Normally operating parts will control brake and generate braking force
Hydraulic pressure source	Braking force generated by the driver

05IZ7-01

FREEZE FRAME DATA OF ABS

1. FREEZE FRAME DATA

HINT:

- Whenever a DTC is detected or the ABS operates, the skid control ECU stores the current vehicle (sensor) state as freeze frame data.
- The skid control ECU stores the number of times (maximum: 31) the power switch has been turned from off to the On position since the last time ABS was activated. However, if the vehicle was stopped or at low speed (4.3 mph (7 km/h) or less), or if a DTC is detected, the skid control ECU will not count the number since then.
- Freeze frame data at the time the ABS operates:
  The skid control ECU stores and updates data whenever the ABS system operates.
  When the ECU stores data at the time a DTC is detected, the data stored when the ABS operated is erased.
- Freeze frame data at the time a DTC is detected:
  When the skid control ECU stores data at the time a DTC is detected, no updates will be performed until the data is cleared.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) From the display on the tester, select the "FREEZE FRAME DATA".

Hand-held tester display	Measurement Item	Reference Value
BUZZER	Buzzer	Buzzer ON: ON, OFF: OFF
RESERVOIR SW	Reservoir level warning switch	Reservoir level warning switch ON: ON, OFF: OFF
PKB SW	PKB sw	PKB switch ON: ON, OFF: OFF
SHIFT POSITION	Shift SFT Position	• Fail • P, N • R • D (M) • 4 • 3 • 2 • L
VSC/TRC OFF SW	VSC OFF switch	VSC OFF switch ON: ON, OFF: OFF
STOP LIGHT SW	Stop light switch	Stop light switch ON: ON, OFF: OFF
SYSTEM	SYSTEM	• ABS • VSC (TRC) • BA • HAB • FAIL SAFE • PBA • PB • NO SYS
# IG ON	# IG ON	0 - 31
VEHICLE SPD	Vehicle speed	Speed indicated on speedometer
STEERING ANG	Steering sensor	• Left turn: Increase • Right turn: Drop (Deceleration)
YAW RATE	Yaw rate sensor	-128 to 127
MAS CYL PRESS	Master cylinder pressure	0 to 5 V
PEDAL STROKE	Stroke sensor	0 to 5.1 V
THROTTLE	Throttle position sensor	Release accelerator pedal: Approx. 0 deg. Depress accelerator pedal: Approx. 125 deg.
MAS PRESS GRADE	Master pressure sensor grade	30 tp 225 Mpa/s

Hand-held tester display	Measurement Item	Reference Value
G (RIGHT & LEFT)	Right and left G	-1869 to 1869
G (BACK & FORTH)	Back and forth G	-1869 to 1869
SPD GRADE	Vehicle speed grade	-1869 to 1869
FR W/C SENS	FR wheel cylinder pressure sensor	0 to 5 V
FL W/C SENS	FL wheel cylinder pressure sensor	0 to 5 V
RR W/C SENS	RR wheel cylinder pressure sensor	0 to 5 V
RL W/C SENS	RL wheel cylinder pressure sensor	0 to 5 V
ACCUM PRESS	Accumulator Pressure Sensor	0 to 5 V
MAS CYL PRESS 2	Master cylinder pressure sensor 2	0 to 5 V
PEDAL STROKE 2	Stroke sensor 2	0 to 5 V
MTT	MTT	0 to 5 V
IG1 VOLTAGE	Voltage value of IG1	0 to 20 V
IG2 VOLTAGE	Voltage value of IG2	0 to 20 V
BS1	BS1	0 to 20 V
BS2	BS2	0 to 20 V
VM1	VM1	0 to 20 V
VM2	VM2	0 to 20 V
+B1	+B1	0 to 5 V
+B2	+B2	0 to 5 V
FR TARGET OIL	Target oil pressure (FR)	0 to 20 V
FL TARGET OIL	Target oil pressure (FL)	0 to 20 V
RR TARGET OIL	Target oil pressure (RR)	0 to 20 V
RL TARGET OIL	Target oil pressure (RL)	0 to 20 V
SLAFR CUR	Current of SLAFR solenoid	0 to 1.5 A
SLAFL CUR	Current of SLAFL solenoid	0 to 1.5 A
SLARR CUR	Current of SLARR solenoid	0 to 1.5 A
SLARL CUR	Current of SLARL solenoid	0 to 1.5 A
SLRFR CUR	Current of SLRFR solenoid	0 to 1.5 A
SLRFL CUR	Current of SLRFL solenoid	0 to 1.5 A
SLRRR CUR	Current of SLRRR solenoid	0 to 1.5 A
SLRRL CUR	Current of SLRRL solenoid	0 to 1.5 A
WHEEL SPD FR	Front Right Wheel speed	0 to 255 km/h
WHEEL SPD FL	Front Left Wheel speed	0 to 255 km/h
WHEEL SPD RR	Rear Right Wheel speed	0 to 255 km/h
WHEEL SPD RL	Rear Left Wheel speed	0 to 255 km/h
CAPA MODE	Capacitor mode	ON: ON, OFF: OFF
SCSS	SCSS	ON: ON, OFF: OFF
SMC2	SMC2	ON: ON, OFF: OFF
SMC1	SMC1	ON: ON, OFF: OFF
MOTOR RELAY 2	Motor relay 2	ON: ON, OFF: OFF
MOTOR RELAY 1	Motor relay 1	ON: ON, OFF: OFF
MAIN RELAY 2	Main relay 2 for ECB	ON: ON, OFF: OFF
MAIN RELAY 1	Main relay 1 for ECB	ON: ON, OFF: OFF
DETAILED CODE	Detailed code for freeze DTC	0 to 65535

05IYX-01

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 6, 9, 12.

1	Vehicle Brought to Workshop

2	Customer Problem Analysis (SEE PAGE 05-952)

3	Check and Clear DTCs and Freeze Frame Data (SEE PAGE 05-973)

4	Problem Symptom Confirmation

Symptom does not occur: Go to step 5

Symptom occur: Go to step 6

5	Symptom Simulation (SEE PAGE 01-47)

6	DTC Check (SEE PAGE 05-973)

There is no output: Go to step 7

There is output: Go to step 8

7	Problem Symptoms Table (SEE PAGE 05-964)

Check for fluid leakage and Go to step 10

8	DTC Chart (SEE PAGE 05-985)

9	Circuit Inspection (SEE PAGE 05-989 to 05-1 135)

10	Identification of Problem

11	Repair

12	Confirmation Test

End

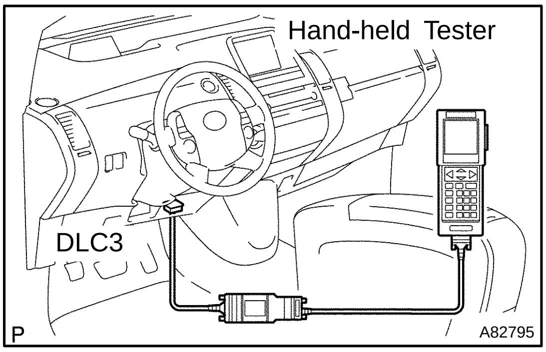
05IYZ-01

INITIALIZATION

1. INITIALIZATION OF LINEAR SOLENOID VALVE AND CALIBRATION

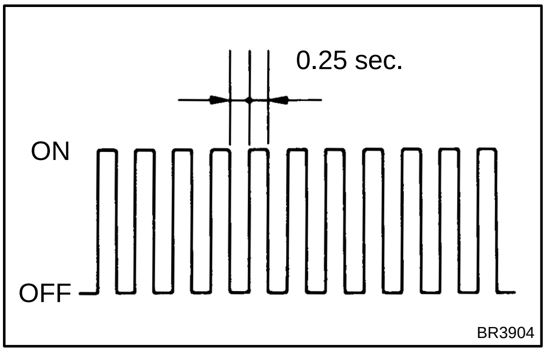
HINT:

- Perform initialization of linear solenoid valve and calibration when the skid control ECU, brake actuator or brake pedal stroke sensor is replaced.
- First perform the pedal stroke sensor zero point calibration and then initialization of linear solenoid valve and calibration when the brake stroke sensor is removed/installed or the brake pedal height is adjusted(see page 32-16).
- First bleed air and then perform initialization of linear solenoid valve and calibration when the brake actuator is replaced.
- Initialization of linear solenoid valve and calibration cannot be performed again once it is stored unless the data is cleared or damaged. Perform initialization of linear solenoid valve and calibration after the stored value is initialized, except when replacing the skid control ECU.
- DTC C1259/59 is stored and ECB control is partly prohibited when the power switch is turned ON (READY) while the service plug grip of the HV battery is removed, preventing initialization of linear solenoid valve and calibration from being normally performed. In this case, connect the service plug grip with the power switch OFF and turn the power switch ON (READY) again to cancel the warning (ECB control prohibition).
- If there is a problem with auxiliary battery (12V) voltage, initialization of linear solenoid valve and calibration cannot be completed normally. Make sure to check battery voltage before performing initialization of linear solenoid valve and calibration.
- If the actuator's temperature is high, initialization of linear solenoid valve and calibration may not be completed normally. In that case, wait until the temperature decreases and then perform initialization of linear solenoid valve and calibration.
- Do not depress the brake pedal during the initialization of linear solenoid valve and calibration procedure.



(a) Clear stored value of "initialization of linear solenoid valve and calibration".
  (1) Connect the hand-held tester to the DLC3 with the power switch off.
  (2) Turn the power switch ON (READY) with the brake pedal released.
  (3) Check that the "P" position switch indicator (P) is on.
  (4) Turn the hand-held tester power switch on and clear the stored value of initialization of linear solenoid valve and calibration following the screen.

(b) Perform "initialization of linear solenoid valve and calibration".
  (1) Connect the hand-held tester to the DLC3 with the power switch off.
  (2) Turn the power switch ON (READY) with the brake pedal released.
  (3) Check that the main switch (parking switch) indicator (P) is on.



(4) Turn the power switch ON (READY) with the brake pedal depressed to display the "READY ON" indicator on the meter.

(5) Select the SIGNAL CHECK following the hand-held tester screen.

(6) Leave the vehicle stationary without depressing the brake pedal for 1 to 2 minutes. Check that the interval between blinks of the Brake Control warning light (BRAKE warning (Yellow)) changes from 1 second to 0.25 second.

NOTICE:

- **Leave the meter's "READY" indicator on during the initialization of linear solenoid valve and calibration. Do not drive the vehicle or depress the brake pedal.**
- **A DTC that indicates trouble with initialization of linear solenoid valve and calibration is stored if entering the TEST MODE with the shift lever in any position other than P.**

HINT:

- The time needed to complete initialization of linear solenoid valve and calibration varies depending on battery voltage.
- The Brake Control warning light (BRAKE warning (Yellow)) blinks at 1 second intervals during the initialization of linear solenoid valve and calibration and changes to the TEST MODE display when it is completed.
- The Brake Control warning light (BRAKE warning (Yellow)) blinks at 0.25 second intervals if the TEST MODE is normal.

(7) Check that DTC C1346/66 that indicates trouble with stroke sensor zero point learning is not output when the Brake Control warning light changes to the TEST MODE display upon initialization of linear solenoid valve and calibration completion.

(8) Enter the NORMAL MODE from the SIGNAL CHECK following the hand-held tester screen.

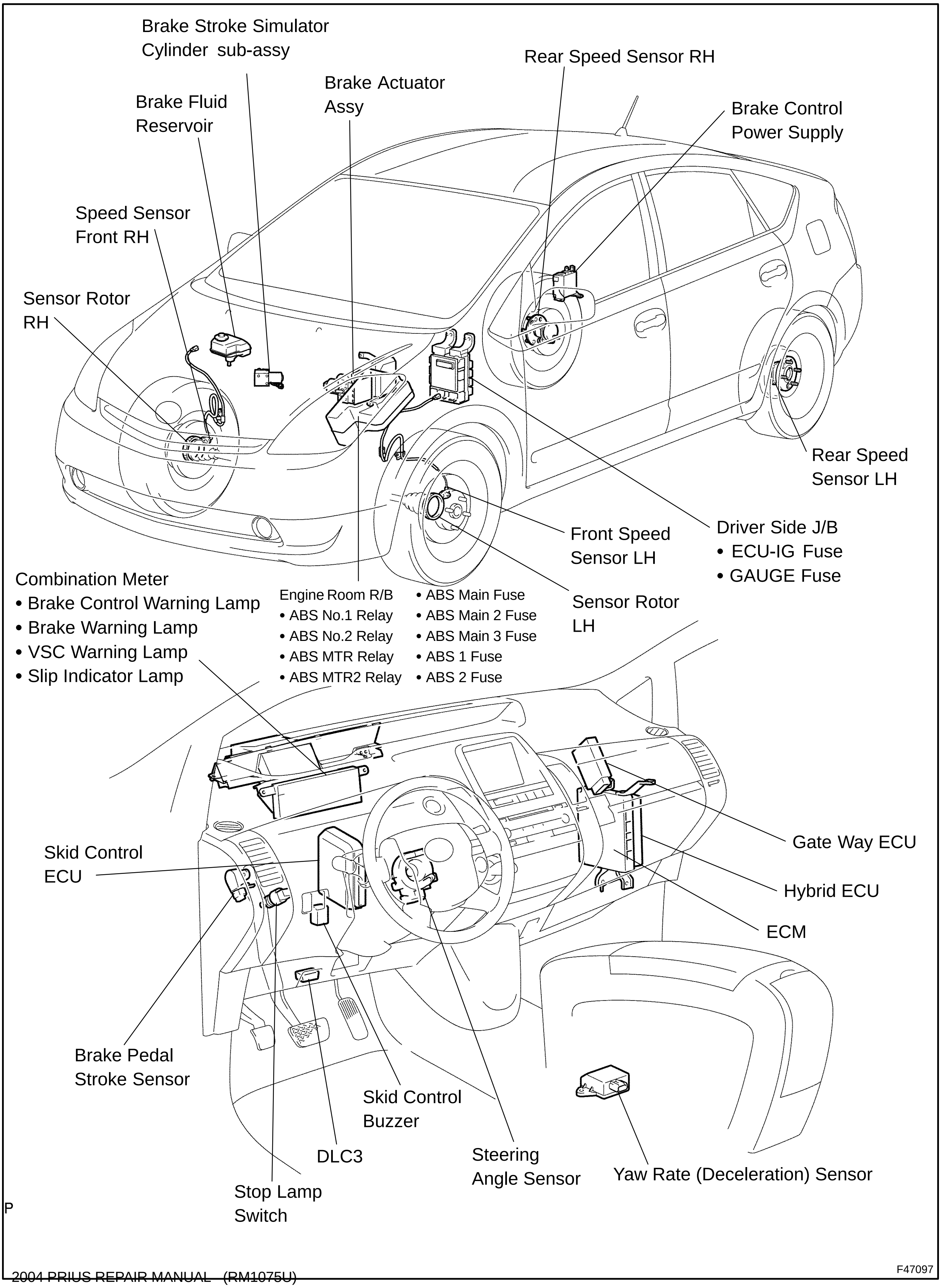
2. YAW RATE SENSOR/DECELERATION SENSOR INITIALIZATION

HINT:

The zero point data of the yaw rate/deceleration sensor stored in the skid control ECU must be cleared when the yaw rate/deceleration sensor is replaced (see page 05-958).

05IYV-01

LOCATION



ELECTRONICALLY CONTOROLLED BRAKE SYSTEM

05IYU-01

PRECAUTION

1. TROUBLESHOOTING PRECAUTIONS

(a) When there is a malfunction with terminal contact points or part installation problems, removal and installation of the suspected problem parts may return the system to the normal condition either completely or temporarily.

(b) In order to determine the malfunctioning area, be sure to check the conditions at the time the malfunction occurred, such as DTC output and the freeze frame data, and record it before disconnecting each connector or removing and installing parts.

(c) Since the system may be influenced by malfunctions in systems other than the brake control system, be sure to check for DTCs in other systems.

2. HANDLING PRECAUTIONS

(a) Do not remove or install the Enhanced VSC or Electronically Controlled Brake (ECB) parts such as the steering sensor, yaw rate sensor or brake pedal stroke sensor except when required, as they cannot be adjusted correctly after removal or installation.

(b) Be sure to perform preparation before work and confirmation after work is completed by following the direction in the repair manual when working on the Enhanced VSC or ECB system.

(c) Be sure to remove and install the ECU, actuator, each sensor, etc. with the power switch off unless it is not specified in the inspection procedure.

(d) Be sure to remove the 2 main relays before removal and installation, or replacement of the Enhanced VSC or ECB parts.

(e) The removal or installation of the actuator, master cylinder or stroke simulator as well as some other procedures can cause the fluid level to drop below the fluid reservoir port. If this happens when performing such work, be sure to remove the 2 motor relays until the bleeding of the air in the pipeline is completed.

HINT:

- When the pump motor is operated with the air in the brake actuator hose, bleeding the air becomes difficult due to air in the actuator.
- The skid control ECU may operate the stroke simulator and drive the pump motor even when the power switch is off.
- The ECB system has its own auxiliary power source. This system can be operated after disconnecting the negative terminal from the auxiliary battery (12V) until the discharge is completed.
- With the power switch off, the skid control ECU can be operated for 2 minutes after the brake operation is finished.

(f) Removal of the main relay and motor relay

(1) Wait for 2 minutes after turning the power switch off, stopping the brake pedal operation and closing the driver door before removing the 2 relays.

HINT:

When the pump motor operates to prepare for the next operation just before the brake control system turns off.

(g) When removing and installing the ECU, actuator and each sensor, be sure to check that the normal display is output in test mode inspection and in DTC output inspection after installing all the parts.

3. DTC PRECAUTION

(a) Warnings for some DTCs cannot be cleared only by repairing the malfunctioning parts. If the warning is displayed after repair work, the DTC should be cleared after turning the power switch off.

NOTICE:

The DTC for a malfunctioning part that repeats after clearing the code is stored again.

4. FAIL SAFE FUNCTION

(a) When a trouble occurs in the brake control systems, the skid control ECU lights up the warning lights (ECB, ABS, Enhanced VSC and BRAKE) corresponding to the malfunctioning systems and prohibits ABS, Enhanced VSC and brake assist operation.

(b) The control of the ECB can be continued by the normal parts except the malfunctioning parts according to the malfunction.

HINT:

- If control of the ECB for any of the 4 wheels is prohibited, that wheel loses brake booster function or braking ability.
- If one of the 4 wheels loses brake booster function, the feel when depressing brake pedal changes as the stroke simulator (pedal reactive force generating solenoid) operation is prohibited.
- If control of the ECB for all wheels is prohibited, the 2 front wheels lose brake booster function.

5. DRUM TESTER PRECAUTION

(a) When using the drum tester, be sure to follow the procedures below to prohibit the Enhanced VSC operation.

NOTICE:

- **Make sure that the Enhanced VSC warning light is blinking (move to TEST MODE)**
- **Secure the vehicle with the lock chain for safety**

6. CAN COMMUNICATION SYSTEM PRECAUTION

(a) The CAN communication system is used for the data communication between the skid control ECU, the steering sensor, the yaw rate sensor (deceleration sensor included) and other ECUs. If there is trouble with the CAN communication line, corresponding DTCs in the communication line are output.

(b) If the DTC in the CAN communication line is output, repair the malfunction in the communication line and troubleshoot the Enhanced VSC system while data communication is normal.

(c) Since the CAN communication line has its own length and route, it cannot be repaired temporarily with the bypass wire, etc.

NOTICE:

When disconnecting the negative (-) battery terminal, initialize the following system after the terminal is reconnected.

System Name	See Page
Power Window Control System	01-28

NOTICES FOR HYBRID SYSTEM ACTIVATION:

- **When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.**
- **With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.**

PROBLEM SYMPTOMS TABLE

If there are no DTCs output but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Suspect Areas	See page
ABS does not operate BA does not operate EBD does not operate	1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit and ground circuit. 3. Speed sensor circuit 4. Check the brake actuator with a hand-held tester. (Check brake actuator operation using the active test function.) If abnormal, check the hydraulic circuit for leakage. 5. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1018 05-989 05-996 32-50
ABS does not operate efficiently BA does not operate efficiently EBD does not operate efficiently	1. Check the DTC again and make sure that the normal code is output. 2. Speed sensor circuit 3. Stop lamp switch circuit 4. Check the brake actuator with a hand-held tester. If abnormal, check the hydraulic circuit for leakage. 5. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-989 05-996 05-1038 32-50
ABS warning light abnormal	1. ABS warning light circuit 2. Skid control ECU	05-1108 or 05-1112 -
DTC of ABS check cannot be done	1. Check the DTC again and make sure that the normal code is output. 2. TC terminal circuit 3. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1131
Sensor signal check cannot be done	1. TS terminal circuit 2. Skid control ECU	05-1135 -
VSC does not operate	1. Check the DTC again and make sure that the normal code is output. 2. IG power source circuit and ground circuit. 3. Check the hydraulic circuit for leakage. 4. Speed sensor circuit 5. Yaw rate/Deceleration sensor circuit 6. Steering sensor circuit 7. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1018 - 05-989 05-996 05-1005 05-1010
SLIP indicator light abnormal	1. SLIP indicator light circuit 2. Skid control ECU	05-1127 -

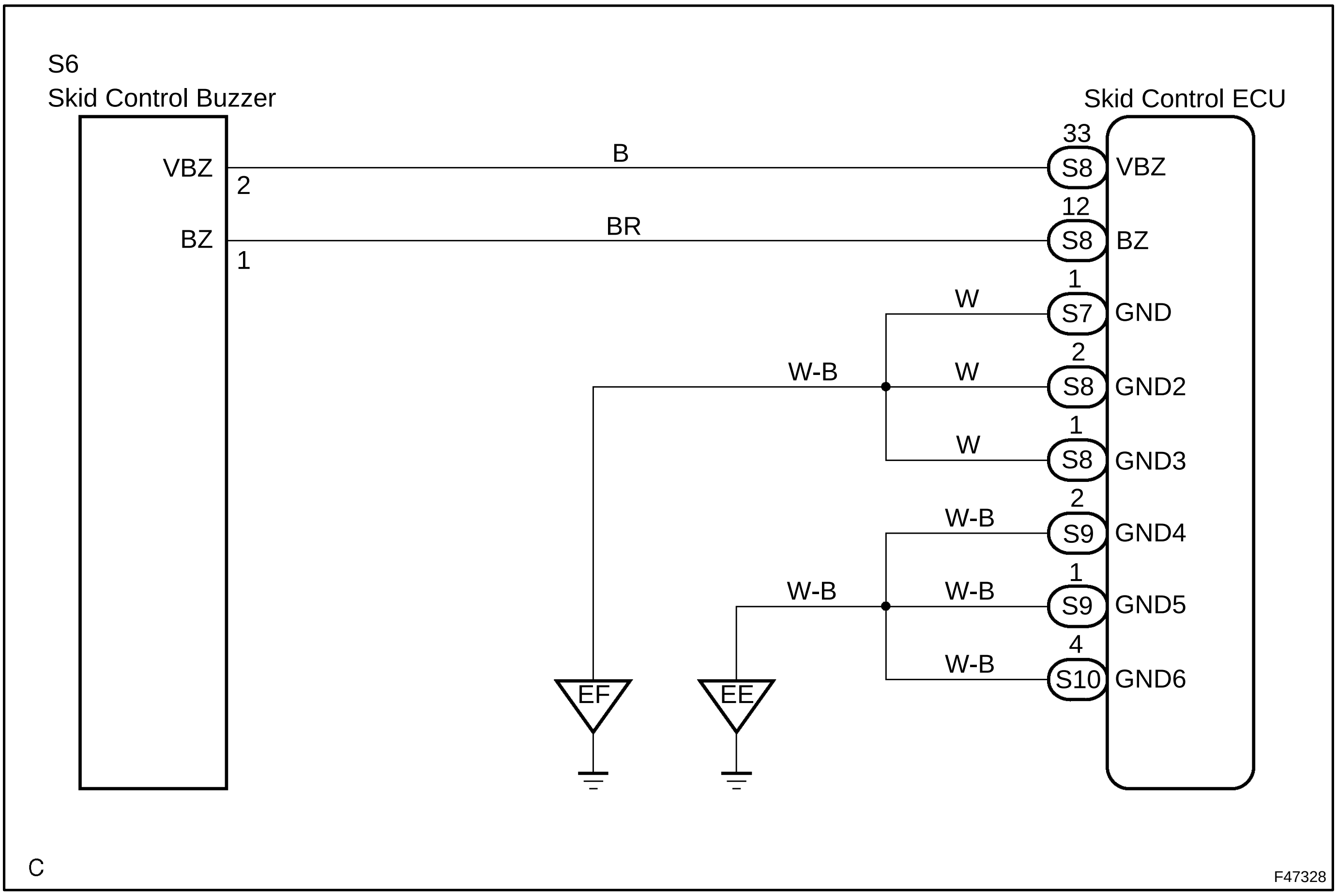
Symptoms	Suspect Areas	See page
DTC of VSC check cannot be done	1. Check the DTC again and make sure that the normal code is output. 2. TC terminal circuit 3. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1131
VSC warning light abnormal	1. Check the DTC again and make sure that the normal code is output. 2. VSC warning circuit 3. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1113 or 05-1117
Brake Control warning light abnormal	1. Check the DTC again and make sure that the normal code is output. 2. Brake Control warning circuit 3. If the symptoms still occur even after the above circuits in suspect areas are inspected and proved to be normal, replace the skid control ECU.	05-973 05-1103 or 05-1107

SKID CONTROL BUZZER CIRCUIT

CIRCUIT DESCRIPTION

The skid control buzzer sounds and VSC warning lamp comes ON during Enhanced VSC operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 PERFORM ACTIVE TEST BY HAND-HELD TESTER(SKID CONTROL BUZZER)

(a) Connect the hand-held tester to the DLC3.
(b) Turn power switch ON (READY).
(c) Select the item "VSC/BR WARN BUZ" in the ACTIVE TEST and operate the skid control buzzer on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
VSC / BR WARN BUZ	Turns VSC / BRAKE warning buzzer ON / OFF	Buzzer can be heard

(d) Check that skid control buzzer sounds by operating with the hand-held tester.
OK:
The skid control buzzer sounds in accordance with operation of the hand-held tester.

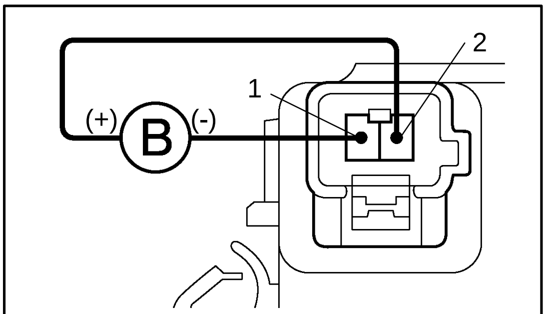
NG → **Go to step 2**

OK

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

2 INSPECT SKID CONTROL BUZZER ASSY



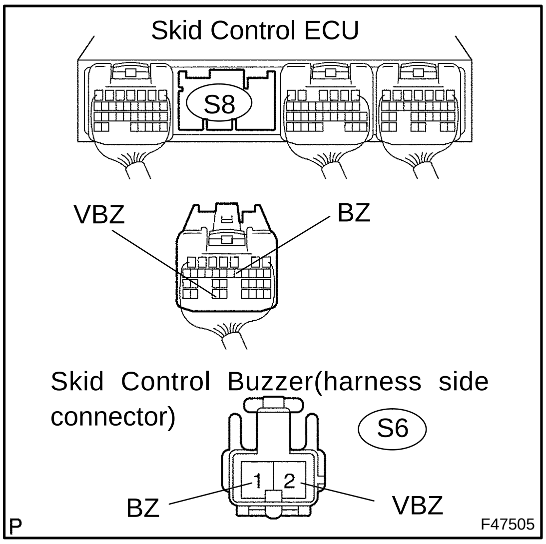
Skid Control Buzzer
F02192

(a) Disconnect the skid control buzzer connector.
(b) Apply a battery positive voltage to terminals 1 and 2 of the skid control buzzer connector, and check that the buzzer sounds.
OK:
The skid control buzzer sound should be heard.

NG → **REPLACE SKID CONTROL BUZZER ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(SKID CONTROL BUZZER - SKID CONTROL ECU)



(a) Disconnect the skid control buzzer connector and the skid control ECU connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-33 (VBZ) - S6-2 (VBZ)	Below 1 Ω
S8-12 (BZ) - S6-1 (BZ)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

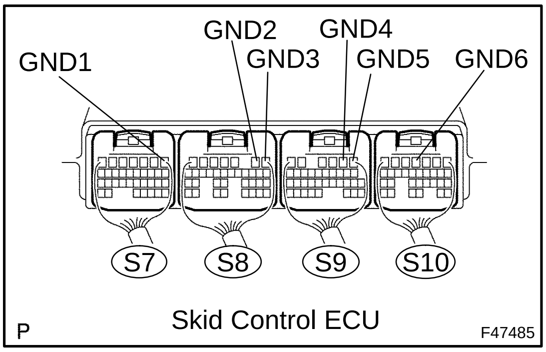
Standard:

Tester Connection	Specified Condition
S8-33 (VBZ) - Body ground	10 kΩ or higher
S8-12 (BZ) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(GND - BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S7-1 (GND1) - Body ground	Below 1 Ω
S8-2 (GND2) - Body ground	Below 1 Ω
S8-1 (GND3) - Body ground	Below 1 Ω
S9-2 (GND4) - Body ground	Below 1 Ω
S9-1 (GND5) - Body ground	Below 1 Ω
S10-4 (GND6) - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

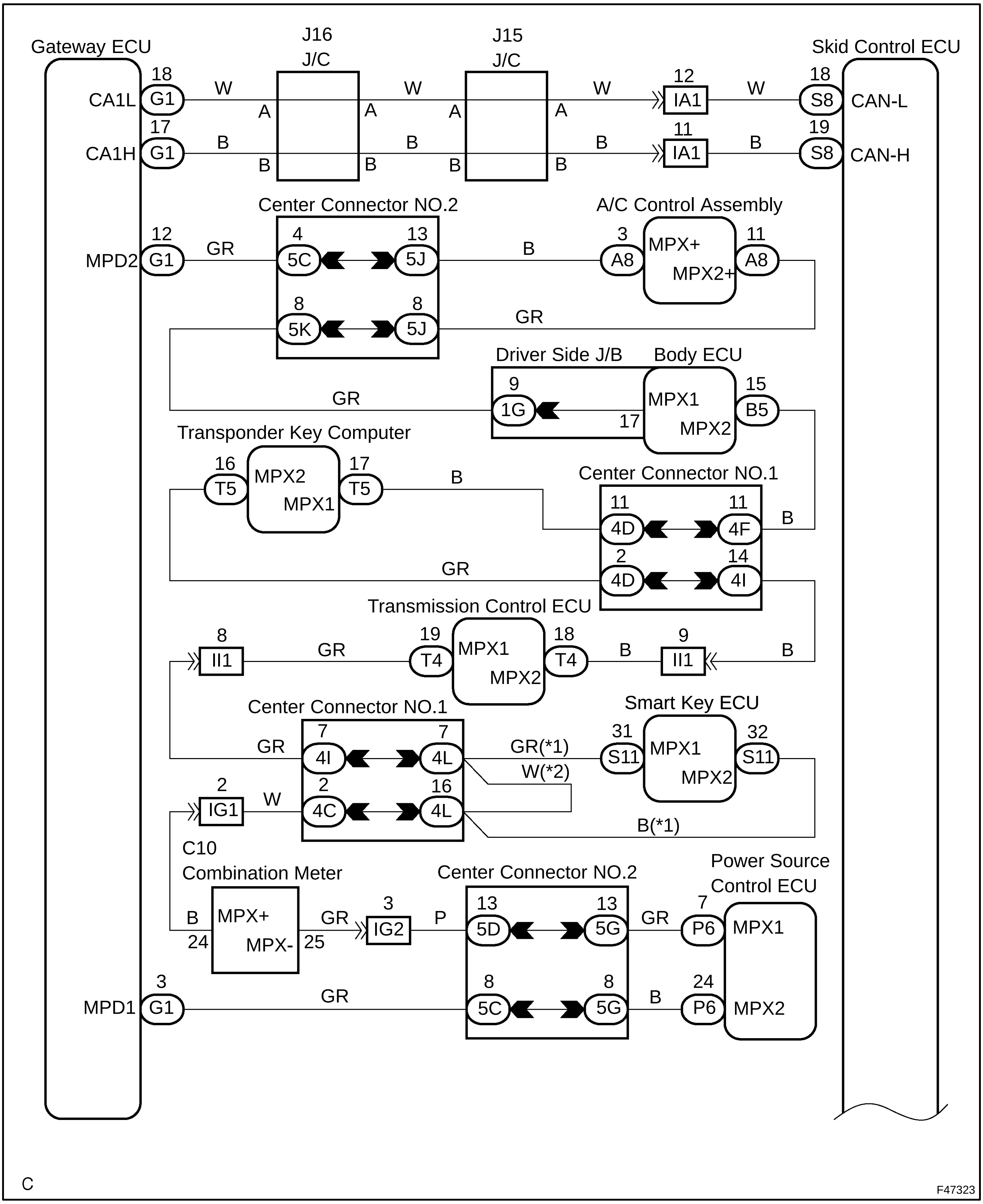
NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

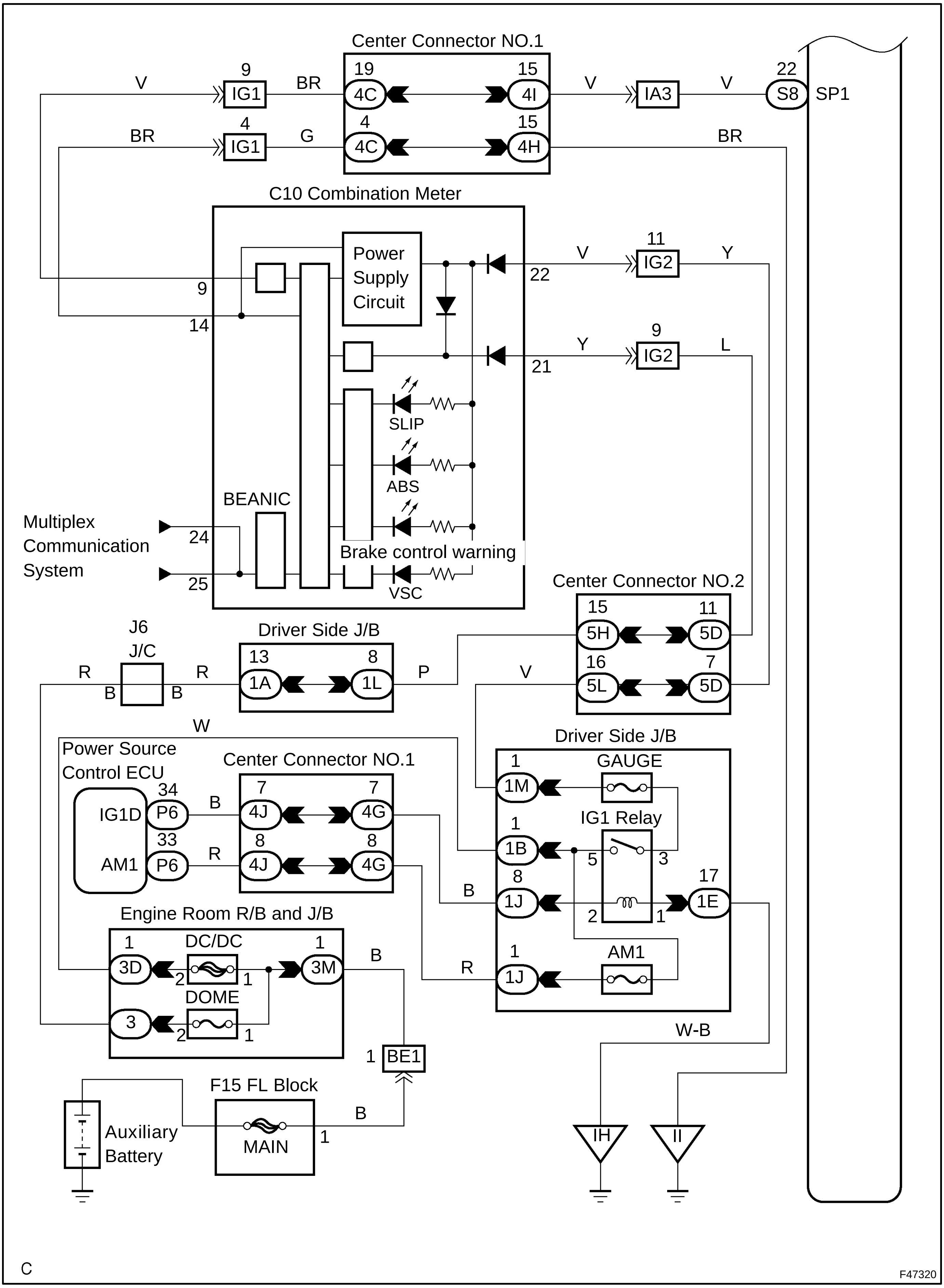
SLIP INDICATOR LIGHT CIRCUIT

CIRCUIT DESCRIPTION

The SLIP indicator blinks during Enhanced VSC operation.
The skid control ECU is connected to the combination meter via CAN and Multiplex communications.

WIRING DIAGRAM




Center Connector NO.1
V
9
IG1
BR
19
4C
15
4I
V
IA3
V
22
S8
SP1
BR
4
IG1
G
4
4C
15
4H
BR
C10 Combination Meter
Power
Supply
Circuit
9
14
22
V
11
IG2
Y
21
Y
9
IG2
L
SLIP
ABS
BEANIC
Multiplex
Communication
System
24
25
Brake control warning
VSC
Center Connector NO.2
15
5H
11
5D
16
5L
7
5D
J6
J/C
R
B
B
R
Driver Side J/B
13
1A
8
1L
P
V
W
Power Source
Control ECU
IG1D
34
P6
AM1
33
P6
B
R
Center Connector NO.1
7
4J
7
4G
8
4J
8
4G
Driver Side J/B
1
1M
GAUGE
IG1 Relay
1
1B
5
3
8
1J
B
2
1
17
1E
1
1J
AM1
R
Engine Room R/B and J/B
1
3D
DC/DC
2
1
1
3M
B
3
DOME
2
1
1
BE1
W-B
F15 FL Block
Auxiliary
Battery
MAIN
B
1
IH
II
C
F47320

INSPECTION PROCEDURE

1 PERFORM ACTIVE TEST BY HAND-HELD TESTER (SLIP INDICATOR LIGHT)

(a) Connect the hand-held tester to the DLC3.
(b) Turn power switch ON (READY).
(c) Select the item "SLIP INDI LIGHT" in the ACTIVE TEST and operate the SLIP indicator light on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter

(d) Check that "ON" and "OFF" of the SLIP indicator light are indicated on the combination meter when using the hand-held tester.
OK:
Turn the SLIP indicator light on or off in accordance with the hand-held tester.

NG → **Go to step 2**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

2 INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)

(a) Is the DTC output for CAN communication system?
Result:

DTC is not output	A
DTC is output	B

B → **REPAIR CAN COMMUNICATION SYSTEM (SEE PAGE 05-261 1)**

A

3 INSPECT MULTIPLEX COMMUNCATION SYSTEM (SEE PAGE 05-2541)

(a) Is the DTC output for Multiplex communication system?
Result:

DTC is not output	A
DTC is output	B

B → **REPAIR MULTIPLEX COMMUNCATION SYSTEM (SEE PAGE 05-2550)**

A

REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)

05J09-01

SYSTEM DESCRIPTION

1. COMPONENTS AND FUNCTION

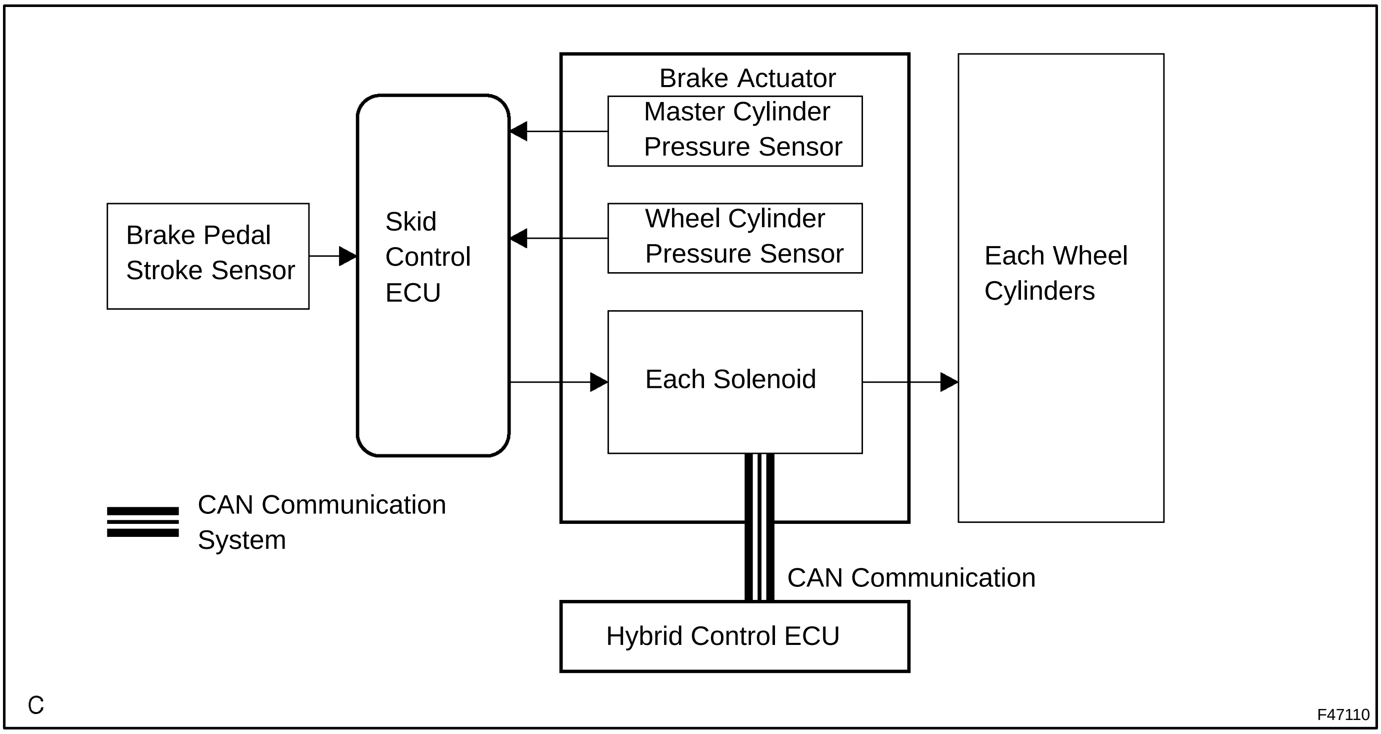
Skid Control ECU (*)	Calculates brake control in accordance with sensor/ECU signals or communication with the hybrid ECU.
Brake Control Power Supply Assy (*)	Charges the capacitor inside the unit and supplies power source to the system by discharging when the voltage of the vehicle's power source drops.
Speed sensor	Detects speed of each wheel and inputs the data into the skid control ECU.
Pedal stroke sensor (*)	Detects brake pedal stroke and inputs the data into the skid control ECU.
Yaw rate/deceleration sensor (*)	Detects forward/rearward and lateral acceleration, and then inputs the data into the skid control ECU
Steering sensor	Detects steering wheel angle and steering wheel direction, and then inputs the data into the skid control ECU.
Accumulator	Accumulates fluid pressure generated by the pump.
Accumulator pressure sensor (PACC)	Detects accumulator pressure and inputs the data into the skid control ECU.
Master cylinder	Generates pressure according to pedal effort.
Brake fluid reservoir	Stores master cylinder system/power supply system brake fluid. The brake fluid level warning switch built into the reservoir detects decrease of brake fluid.
Stroke simulator	Generates smooth pedal stroke in accordance with pedal effort during system control.
Stroke simulator cut valve (SCSS)	Changes intake/cutoff of brake fluid from master cylinder to stroke simulator. Sends oil pressure generated in master cylinder to stroke simulator during system control. Cuts brake fluid flow from master cylinder to stroke simulator when system is not controlling.
Master cylinder pressure sensor 1, 2 (PMC1, PMC2)	Detects fluid pressure inside the master cylinder and inputs the data into the skid control ECU.
Relief valve	Releases brake fluid into the reservoir and prevents excessively high power supply system pressure when the pump operates continuously due to malfunctions in parts such as accumulator oil pressure sensor.
Wheel cylinder pressure sensor	Detects the pressure in each wheel cylinder and inputs the data into the skid control ECU.
ABS No.1 relay ABS No.2 relay	Supplies power to each solenoid according to the skid control ECU signals. Supplies power to the skid control ECU. Stores power source after turning the power source off.
ABS MTR1 relay ABS MTR2 relay	Supplies power to each motor according to the skid control ECU signals. Drives relay1 under normal condition and drives relay 2 under the ABS operation. Substitutes relay operation when one relay malfunctions.
Changeover solenoid valve (SMC1, SMC2)	The changeover solenoid valve switches the brake hydraulic pressure passage depending on whether the system is in operation or not operation.
Linear solenoid valve (SLA##, SLR##)	Controls wheel cylinder hydraulic pressure according to regenerative braking force in order to generate braking force required by the driver under normal brake operation. Controls the hydraulic pressure of each wheel cylinder under ABS, VSC brake operation. SLA## adjusts the pressure increase level. SLR## adjusts the pressure decrease level.
Stop lamp switch	Illuminates the brake light when the brake pedal is depressed. (Sends brake ON signal to skid control ECU)
BRAKE warning light (Red)	Informs the driver that there is trouble with the ECB (normal brake) by turning on. Informs the driver when the parking brake is applied and brake fluid level drops by turning on.
BRAKE warning light ((Yellow) Brake Control warning light)	Informs the driver when there is trouble with ECB or a problem with the brake system that has no influence on driving, by turning on.
ABS warning light	Informs the driver that there is trouble with ABS by illuminating the light.
VSC warning light	Informs the driver that there is trouble with Enhanced VSC by illuminating the light.
SLIP indicator	Informs the driver that Enhanced VSC and ABS are operating by blinking the light.
Skid control buzzer	Informs the driver when there is trouble with the hydraulic pressure source or power source by continuous buzzer sound. Informs that Enhanced VSC is operating by an intermittent buzzer sound.

*: The initialization of linear solenoid valve and calibration must be initialized when the skid control ECU, actuator, stroke sensor, yaw rate (deceleration) sensor, brake control power supply assy, and steering sensor are replaced (see page 05-956).
It is necessary to perform zero point calibration of yaw rate (deceleration) sensor (see page 05-958).

2. OPERATION DESCRIPTION

ECB (Electronically Controlled Brake):

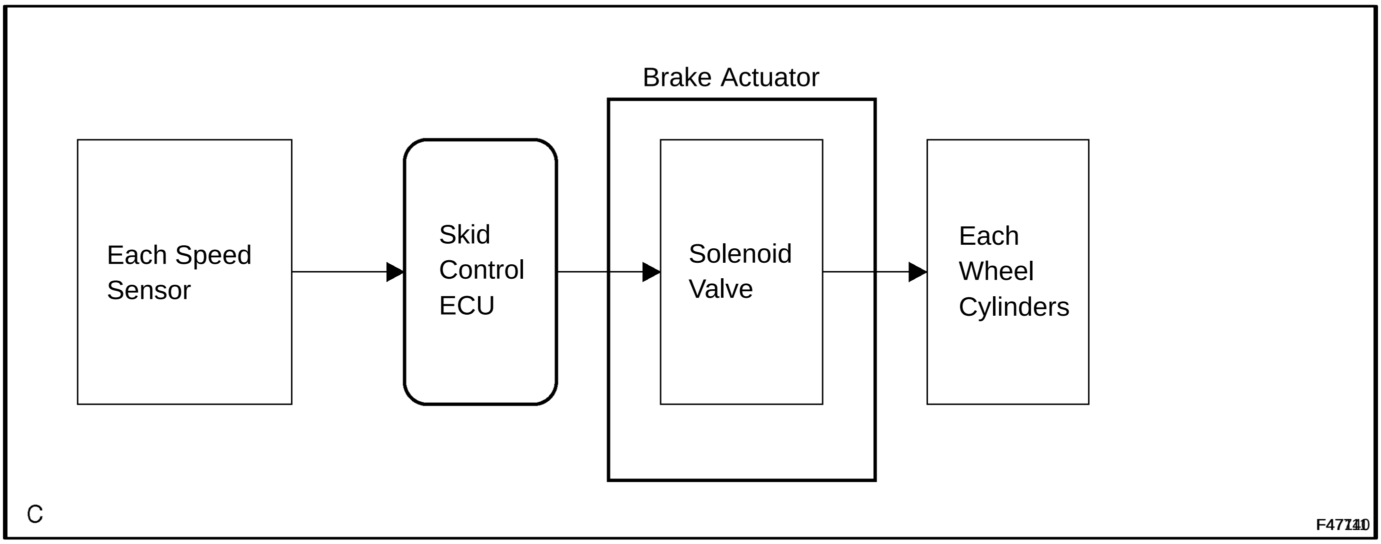
The skid control ECU receives signals from the pedal stroke sensor, master cylinder sensor and wheel cylinder pressure sensor. Based on these signals, the skid control ECU calculates necessary braking force for each wheel. The necessary hydraulic pressure braking force signal is sent to the Hybrid Control ECU via CAN communication. The skid control ECU receives a braking force (regenerative braking force) signal from the Hybrid Control motor via CAN communication. The ECU calculates the necessary hydraulic pressure braking force based on the necessary braking force and regenerative braking force.
Necessary hydraulic pressure is supplied to each wheel by adjusting the brake accumulator (hydraulic pressure source) pressure with each solenoid valve.
If there is a problem with braking function, rest normally operating parts will maintain brake control as a fail-safe.



ABS with EBD & Enhanced VSC:

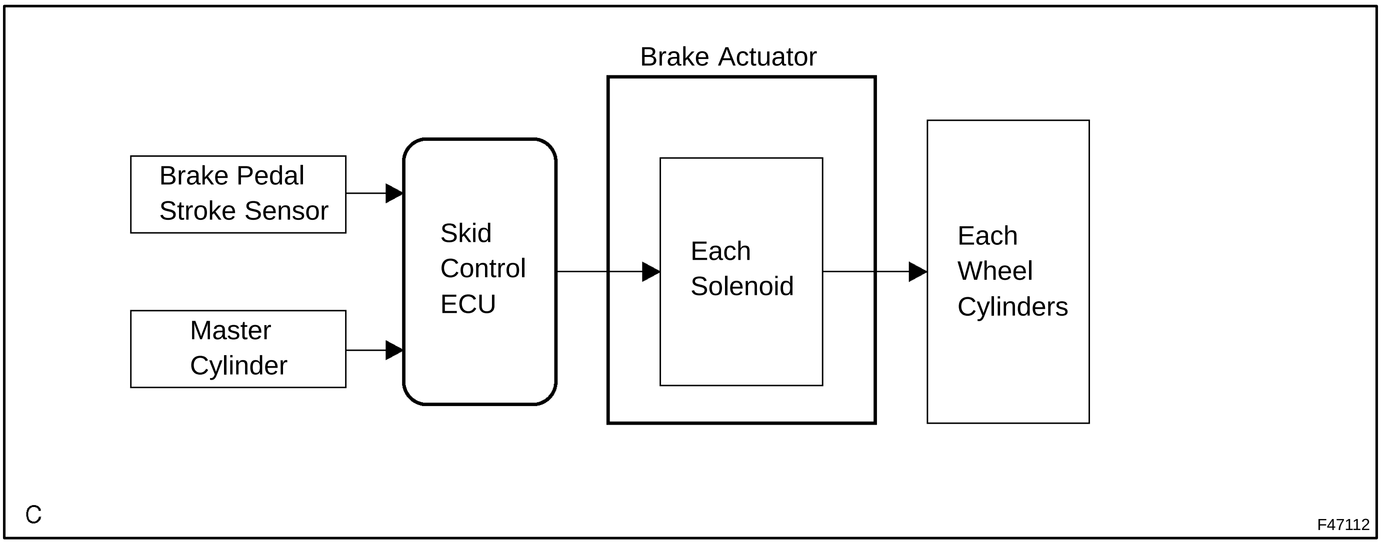
The skid control ECU receives a vehicle speed signal from each speed sensor and detects wheel's slip condition and then sends a control signal to the solenoid.

The solenoid valve controls each wheel cylinder's hydraulic pressure and optimizes hydraulic pressure allocation to each wheel cylinder.

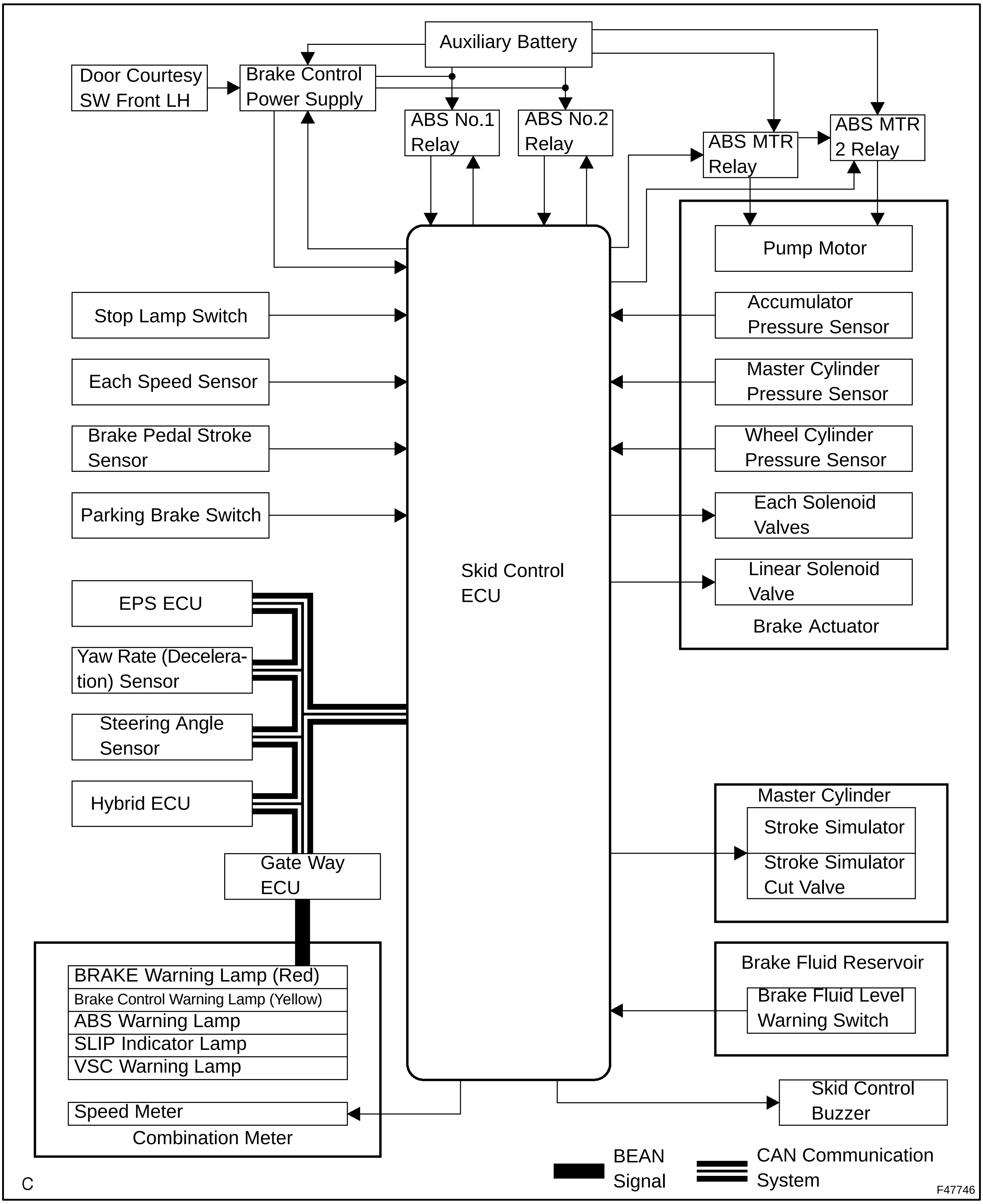


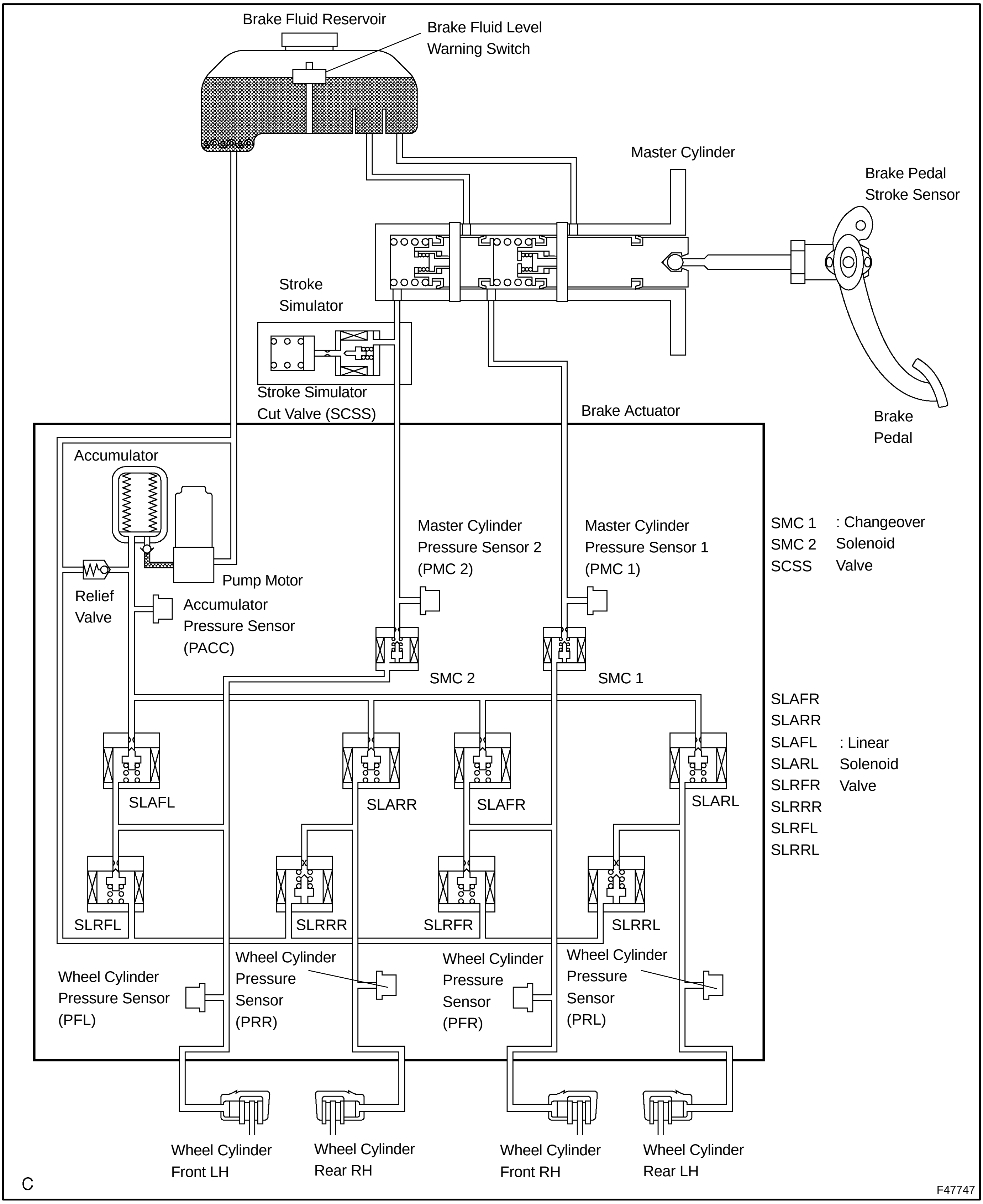
BA (Brake Assist):

The skid control ECU receives the brake pedal stroke sensor signal and hydraulic pressure signal from the master cylinder pressure sensor and determines whether brake assist operation is necessary or not. If it is determined that brake assist operation is necessary, the ECU changes target hydraulic pressure applied to each wheel.



SYSTEM DIAGRAM




Brake Fluid Reservoir
Brake Fluid Level Warning Switch
Master Cylinder
Brake Pedal Stroke Sensor
Stroke Simulator
Stroke Simulator Cut Valve (SCSS)
Brake Actuator
Brake Pedal
Accumulator
Master Cylinder Pressure Sensor 2 (PMC 2)
Master Cylinder Pressure Sensor 1 (PMC 1)
SMC 1
SMC 2
SCSS
: Changeover Solenoid Valve
Pump Motor
Relief Valve
Accumulator Pressure Sensor (PACC)
SMC 2
SMC 1
SLAFR
SLARR
SLAFL
SLARL
SLRFR
SLRRR
SLRFL
SLRRL
: Linear Solenoid Valve
SLAFL
SLARR
SLAFR
SLARL
SLRFL
SLRRR
SLRFR
SLRRL
Wheel Cylinder Pressure Sensor (PFL)
Wheel Cylinder Pressure Sensor (PRR)
Wheel Cylinder Pressure Sensor (PFR)
Wheel Cylinder Pressure Sensor (PRL)
Wheel Cylinder Front LH
Wheel Cylinder Rear RH
Wheel Cylinder Front RH
Wheel Cylinder Rear LH
C
F47747

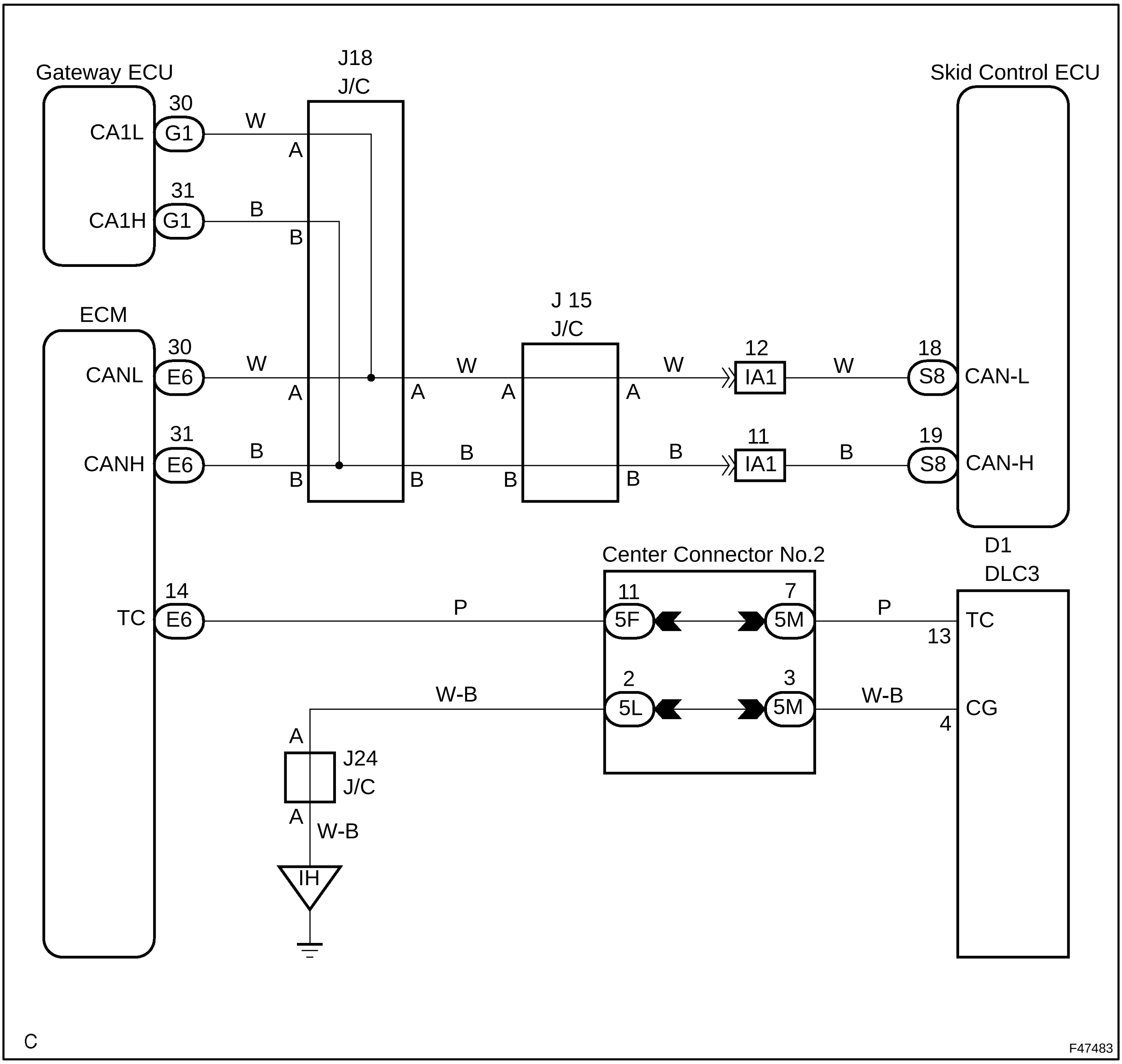
Transmitting ECU	Receiving ECU	Signal name	Communication line
Skid control ECU	Gateway ECU	Warning signal	CAN communication
Skid control ECU	Hybrid Control ECU	Vehicle wheel lock signal	CAN communication
Skid control ECU	Hybrid Control ECU	Vehicle wheel speed sensor signal	CAN communication
Skid control ECU	Hybrid Control ECU	Enhanced VSC, torque control signal	CAN communication
Skid control ECU	Hybrid Control ECU	ABS operation signal	CAN communication
Skid control ECU	Hybrid Control ECU	Cruise control cancel demand signal	CAN communication
Skid control ECU	Hybrid Control ECU	Communication error signal (from HV to ECB)	CAN communication
Skid control ECU	Hybrid Control ECU	Demand drive torque signal	CAN communication
Skid control ECU	Hybrid Control ECU	Braking torque signal	CAN communication
Skid control ECU	Hybrid Control ECU	Regeneration performing demand signal	CAN communication
Skid control ECU	Hybrid Control ECU	STP SW signal	CAN communication
Skid control ECU	Hybrid Control ECU	STP SW open signal	CAN communication
Skid control ECU	Hybrid Control ECU	Parking brake signal	CAN communication
Skid control ECU	Yaw rate (deceleration) sensor	Yaw rate (deceleration) signal	CAN communication
Skid control ECU	EPS ECU	Steering signal	CAN communication
Hybrid Control ECU	Skid control ECU	Regeneration prohibit signal	CAN communication
Hybrid Control ECU	Skid control ECU	Regeneration deterioration notice signal	CAN communication
Hybrid Control ECU	Skid control ECU	Regeneration error signal	CAN communication
Hybrid Control ECU	Skid control ECU	Performing torque recognition signal	CAN communication
Hybrid Control ECU	Skid control ECU	Performing torque recognition signal	CAN communication
Hybrid Control ECU	Skid control ECU	Destination signal	CAN communication
Hybrid Control ECU	Skid control ECU	Throttle opening angle signal	CAN communication
Hybrid Control ECU	Skid control ECU	Accelerator information signal (Idle SW)	CAN communication
Hybrid Control ECU	Skid control ECU	Communication error signal (from ECB to HV)	CAN communication
Hybrid Control ECU	Skid control ECU	Wheel lock braking start signal	CAN communication
Hybrid Control ECU	Skid control ECU	Shift information signal	CAN communication
Hybrid Control ECU	Skid control ECU	Ready condition signal	CAN communication
Hybrid Control ECU	Skid control ECU	Braking torque demand signal	CAN communication
Hybrid Control ECU	Skid control ECU	SLIP indicator ON demand signal	CAN communication

TC AND CG TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

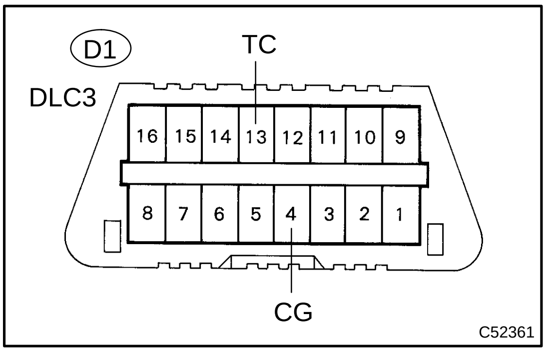
Connecting terminals TC and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT DLC3 TERMINAL VOLTAGE(TC TERMINAL)



(a) Turn the ignition switch to the ON position.

(b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
D1-13 (TC) - D1-4 (CG)	10 to 14 V

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
D1-4 (CG) - Body ground)	Below 1 Ω

NG → **Go to step 3**

OK

2 INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)

(a) Is the DTC output for CAN communication system?

Result:

DTC is not output	A
DTC is output	B

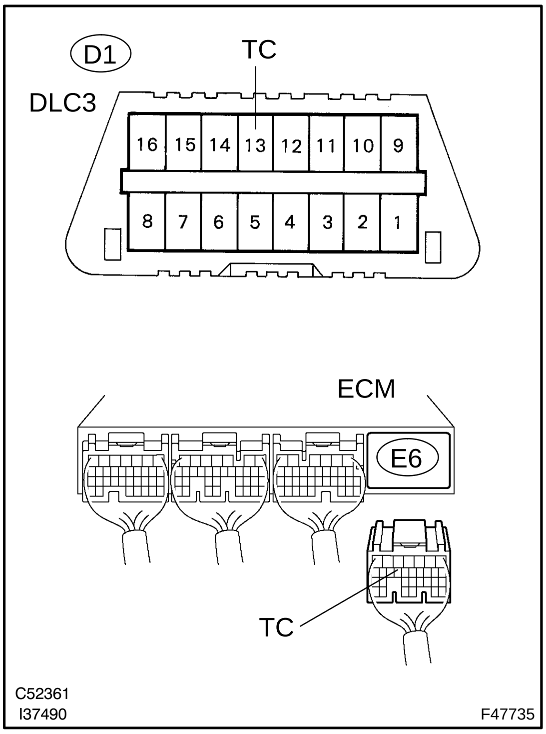
B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (SEE PAGE 05-261 1)**

A

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

3 INSPECT HARNESS AND CONNECTOR (SKID CONTROL ECU - ECM)



(a) Disconnect the slid control ECU connector.
(b) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
D1-13 (TC) - E6-14 (TC)	Below 1 Ω

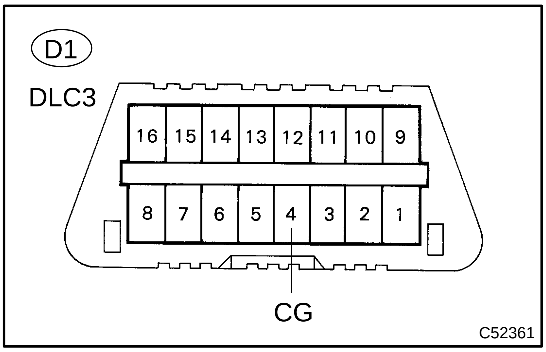
(c) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
D1-13 (TC) - Body ground	10 kΩ or higher

B → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT HARNESS AND CONNECTOR (DLC3 - BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.
Standard:

Tester Connection	Specified Condition
D1-4 (CG) - Body ground)	Below 1 Ω

B → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	**INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)**

(a) Is the DTC output for CAN communication system?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (SEE PAGE 05-261 1)**

A

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

NOTICE:

When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

TERMINALS OF ECU

1. CHECK BATTERY VOLTAGE

(a) Measure the battery voltage.

Standard: 10 to 14 V

2. SKID CONTROL ECU ASSY INSPECTION

(a) Measure the voltage between each terminal or between each terminal and the body ground.

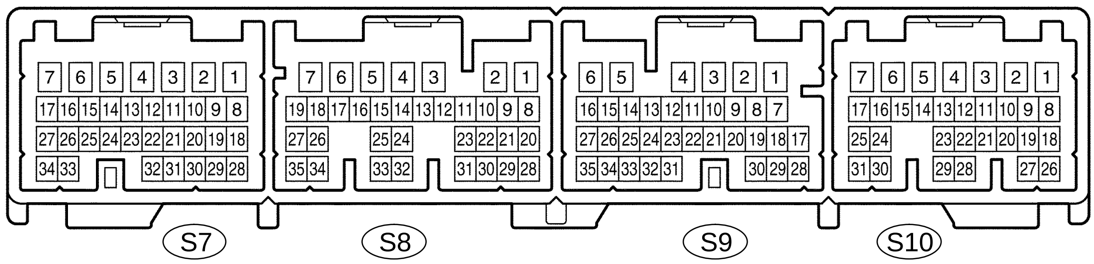
(b) Connect the hand-held tester to the DLC3, and check the communication condition with the skid control ECU.

(c) Using an oscilloscope, check that the pulse generates between each terminal or between each terminal and the body ground.

NOTICE:

- **Inspection should be performed from the back of the connector with the connector connected to the skid control ECU.**
- **The voltage between terminals of the brake actuator assy may become 0 V due to the fail safe function when the ECB warning light comes on (malfunctioning).**

SKID CONTROL ECU



HINT: Inspect the ECU from the wire harness side while the connector is connected.

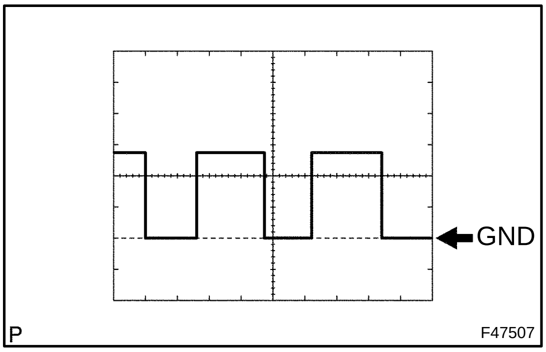
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
R1+ (S7-2) - GND (S7-1)	P - W	Main relay power 1	Push start switch ON (READY)	9.1 to 13.6 V
BS1 (S7-3) - GND (S7-1)	B - W	Battery source 1	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	8.8 to 14 V
SMC1 (S7-4) - GND (S7-1)	Y - W	Master cut solenoid 1 output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
+BCTY (S7-5) - GND (S7-1)	V - W	Courtesy power input	Driver door open → close	Approx. 5 sec. 8 to 16 V → Below 1 V
SLAFR- (S7-6) - GND (S7-1)	W - W	FR solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
SLAFR+ (S7-7) - GND (S7-1)	R - W	FR solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
E (S7-8) - GND (S7-1)	L - W	Pressure sensor ground	Push start switch OFF	Below 1 Ω
VCM1 (S7-9) - GND (S7-1)	P - W	Pressure sensor power	Push start switch ON (READY)	4.75 to 5.25 V

MR1+ (S7-11) - GND (S7-1)	GR - W	Motor relay power 1	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	8.8 to 14 V
SR1 (S7-12) - GND (S7-1)	L - W	Main relay output 1	Push start switch ON (READY) Approx. 1.5 sec. or more after pushing start switch ON (READY)	Below 1 V
SCSS (S7-13) - GND (S7-1)	BR - W	Stroke simulator cut solenoid output	Push start switch ON (READY) Brake pedal depressed	Below 1.5 V
SLARL+ (S7-15) - GND (S7-1)	L - W	RL solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
SLRRL+ (S7-16) - GND (S7-1)	W - W	RL solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
SLRFR+ (S7-17) - GND (S7-1)	Y - W	FR solenoid (+) output	Push start switch ON (READY) After approx. 1.5 sec., brake pedal depressed → released	Pulse generation (see waveform 2)
PRL (S7-18) - GND (S7-1)	G - W	RL pressure sensor input	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V
SG1 (S7-20) - GND (S7-1)	BR - W	Pressure sensor shield ground 1	Push start switch OFF	Below 1 Ω
PACC (S7-21) - GND (S7-1)	W - W	Accumulator pressure sensor input	Push start switch ON (READY) After pump motor operates and stops by pedal operation	3.3 to 4.7 V
FR- (S7-22) - GND (S7-1)	L - W	FR sensor (-) input	Push start switch OFF	Below 1 Ω
PFR (S7-23) - GND (S7-1)	Y - W	FR pressure sensor input	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V
MR1 (S7-25) - GND (S7-1)	L - W	Motor relay output 1	Push start switch ON (READY) Pump motor is operating	Below 1.5 V
SLRRL- (S7-26) - GND (S7-1)	P - W	RL solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
SLARL- (S7-27) - GND (S7-1)	LG - W	RL solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
MTT (S7-29) - GND (S7-1)	R - W	Motor test input	Push start switch ON (READY) Pump motor is operating	3.5 V or higher
PMC1 (S7-30) - GND (S7-1)	R - W	Master pressure sensor input 1	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V
PCK1 (S7-31) - GND (S7-1)	B - W	Pressure sensor check output 1	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	4.75 to 5.25 V
FR+ (S7-32) - GND (S7-1)	P - W	FR sensor (+) input	Vehicle speed input	Pulse generation (see waveform 3)
SLRFR- (S7-34) - GND (S7-1)	B - W	FR solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
+BI1 (S8-3) - GND (S8-1, 2)	B - W	Main relay power input 1	Push start switch OFF	10 to 14 V
+BO1 (S8-5) - GND (S8-1, 2)	Y - W	Main relay power output 1	Push start switch ON	8.8 to 14 V
IG1 (S8-7) - GND (S8-1, 2)	B - W	IG1 power	Push start switch ON	10 to 14 V

RSS (S8-10) - GND (S8-1, 2)	BR - W	Speed sensor shield ground	Push start switch OFF	Below 1 Ω
BZ (S8-12) - GND (S8-1, 2)	BR - W	Warning buzzer output	Push start switch ON (READY) Buzzer is operating	Below 1 V
STP (S8-14) - GND (S8-1, 2)	R - W	Stop light switch signal input	Push start switch ON (READY) Brake pedal depressed → released	10 to 12 V → Below 1.5 V
CAN-L (S8-18) - GND (S8-1, 2)	W - W	CAN communication (Send and receive-)	Check DTC using hand-held tester	CAN communication's DTC is not output
CAN-H (S8-19) - GND (S8-1, 2)	B - W	CAN communication (Send and receive+)	Check DTC using hand-held tester	CAN communication's DTC is not output
FAIL (S8-20) - GND (S8-1, 2)	P - W	Capacitor communication (Receive)	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 5)
SP1 (S8-22) - GND (S8-1, 2)	V - W	Speed meter output	Vehicle speed input	Pulse generation (see waveform 4)
RL- (S8-27) - GND (S8-1, 2)	B - W	RL sensor (-) input	Push start switch OFF	Below 1 Ω
D/G (S8-28) - GND (S8-1, 2)	W - W	Diagnosis output	Push start switch ON (READY)	9.1 to 13.6 V
ENA (S8-30) - GND (S8-1, 2)	B - W	Capacitor communication (Send)	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 6)
TS (S8-32) - GND (S8-1, 2)	L - W	Sensor diagnosis check input	Push start switch ON (READY)	Below 1.5 V → 9.1 to 13.6 V
VBZ (S8-33) - GND (S8-1, 2)	B - W	Warning buzzer power	Push start switch ON (READY)	9.1 to 13.6 V
RL+ (S8-35) - GND (S8-1, 2)	W - W	RL sensor (+) input	Vehicle speed input	Pulse generation (see waveform 3)
+BO2 (S9-4) - GND (S9-1, 2)	W - W-B	Main relay power output 2	Push start switch ON (READY)	8.8 to 14 V
+BI2 (S9-5) - GND (S9-1, 2)	R - W-B	Main relay power input 2	Push start switch OFF	10 to 14 V
VCSK (S9-6) - GND (S9-1, 2)	B - W-B	Stroke sensor power	Push start switch ON (READY)	3.75 to 4.95 V
SSK (S9-7) - GND (S9-1, 2)	Shielded - W-B	Stroke sensor shield ground	Push start switch OFF	Below 1 Ω
SKG (S9-8) - GND (S9-1, 2)	W - W-B	Stroke sensor ground	Push start switch OFF	Below 1 Ω
PKB (S9-14) - GND (S9-1, 2)	R - W-B	Parking brake signal input	Parking brake applied → released	Below 1.5 V → 9.1 to 13.6 V
SKS1 (S9-21) - GND (S9-1, 2)	R - W-B	Stroke sensor signal input 1	Push start switch ON (READY) Brake pedal released	0.46 to 1.35 V
SKS2 (S9-22) - GND (S9-1, 2)	G - W-B	Stroke sensor signal input 2	Push start switch ON (READY) Brake pedal released	2.56 to 4.35 V
RR- (S9-23) - GND (S9-1, 2)	B - W-B	RR sensor (-) input	Push start switch OFF	Below 1 Ω
RR+ (S9-31) - GND (S9-1, 2)	W - W-B	RR sensor (+) input	Vehicle speed input	Pulse generation (see waveform 3)
SLAFL+ (S10-1) - GND (S10-4)	P - W-B	FL solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
SLAFL- (S10-2) - GND (S10-4)	O - W-B	FL solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
SMC2 (S10-3) - GND (S10-4)	LG - W-B	Master cut solenoid 2 output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V

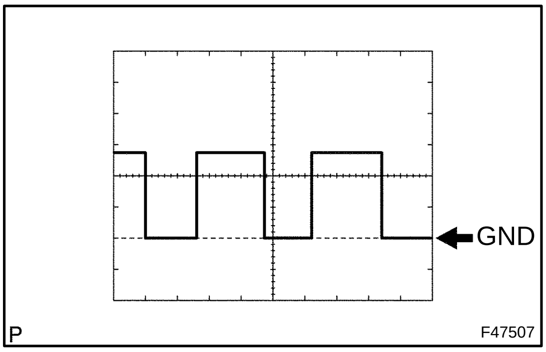
IG2 (S10-5) - GND (S10-4)	O - W-B	IG2 power	Push start switch ON (READY)	10 to 14 V
LBL (S10-6) - GND (S10-4)	P - W-B	Brake fluid level switch input	Reservoir level switch OFF → ON	4 to 4.65 → Below 1.5 V
BS2 (S10-7) - GND (S10-4)	P - W-B	Battery source 2	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	8.8 to 14 V
SLRFL+ (S10-8) - GND (S10-4)	Y - W-B	FL solenoid (+) output	Push start switch ON (READY) After approx. 1.5 sec., brake pedal depressed → released	Pulse generation (see waveform 2)
SLARR- (S10-9) - GND (S10-4)	P - W-B	RR solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
SG2 (S10-12) - GND (S10-4)	Shielded - W-B	Pressure sensor shield ground 2	Push start switch OFF	Below 1 Ω
FSS (S10-13) - GND (S10-4)	BR - W-B	Speed sensor shield ground	Push start switch OFF	Below 1 Ω
VCM2 (S10-14) - GND (S10-4)	B - W-B	Pressure sensor power 2	Push start switch ON (READY)	4.75 to 5.25 V
SR2 (S10-15) - GND (S10-4)	V - W-B	Main relay output 2	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1 V
R2+ (S10-17) - GND (S10-4)	Y - W-B	Main relay power 2	Push start switch ON (READY)	9.1 to 13.6 V
SLRRR- (S10-18) - GND (S10-4)	BR - W-B	RR solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
SLARR+ (S10-19) - GND (S10-4)	V - W-B	RR solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
SLRRR+ (S10-20) - GND (S10-4)	R - W-B	RR solenoid (+) output	Push start switch ON (READY) Brake pedal depressed approx. 1.5 sec. after pushing start switch ON (READY)	Pulse generation (see waveform 1)
PCK2 (S10-21) - GND (S10-4)	L - W-B	Pressure sensor check output 2	Push start switch ON (READY)	4.75 to 5.25 V
FL- (S10-22) - GND (S10-4)	G - W-B	FL sensor (-) input	Push start switch OFF	Below 1 Ω
PFL (S10-23) - GND (S10-4)	R - W-B	FL pressure sensor input	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V
MR2+ (S10-25) - GND (S10-4)	R - W-B	Motor relay power 2	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	8.8 to Below 14 V
SLRFL- (S10-26) - GND (S10-4)	L - W-B	FL solenoid (-) output	Push start switch ON (READY) Approx. 1.5 sec. after pushing start switch ON (READY)	Below 1.5 V
PMC2 (S10-27) - GND (S10-4)	W - W-B	Master pressure sensor input 2	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V
FL+ (S10-28) - GND (S10-4)	R - W-B	FL sensor (+) input	Vehicle speed input	Pulse generation (see waveform 3)
E2 (S10-29) - GND (S10-4)	G - W-B	Pressure sensor ground 2	Push start switch OFF	Below 1 Ω

MR2 (S10-30) - GND (S10-4)	G - W-B	Motor relay output 2	Push start switch ON (READY) Pump motor is operating	Below 1.5 V
PRR (S10-31) - GND (S10-4)	Y - W-B	RR pressure sensor input	Push start switch ON (READY) Brake pedal released	0.3 to 0.8 V



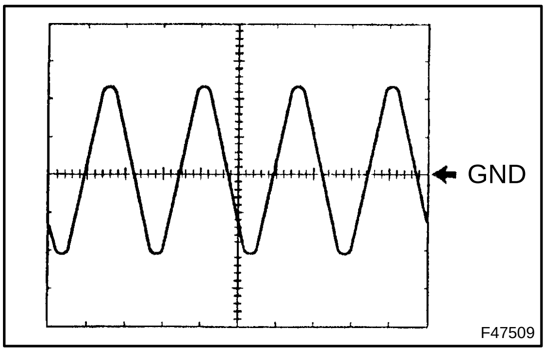
F47507

Waveform 1
NOTICE:
Normal waveform is output only when BS 1 and 2 voltages are normal (10 to 14 V).
HINT:
- While driving at approximately 12 mph (20 km/h).
- 5V/DIV, 200 ms/DIV.
- Brake pedal depressed.



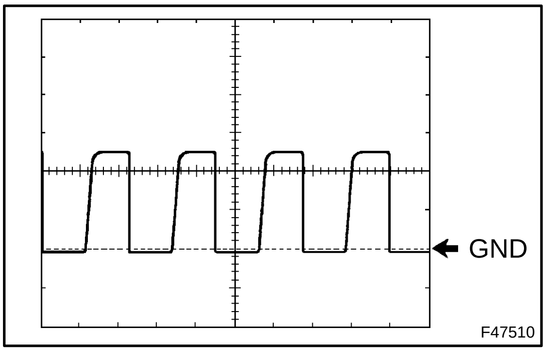
F47507

Waveform 2
NOTICE:
Normal waveform is output only when BS 1 and 2 voltages are normal (10 to 14 V).
HINT:
- While driving at approximately 12 mph (20 km/h).
- 5V/DIV, 200 ms/DIV.
- Brake pedal depress → released



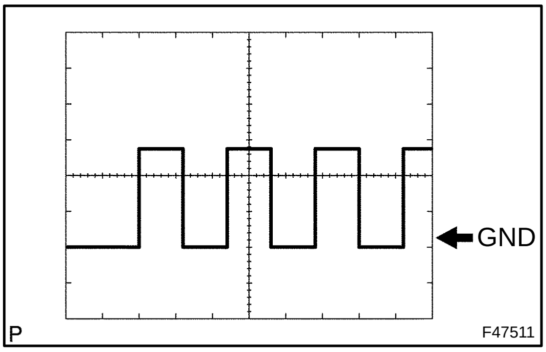
F47509

Waveform 3
NOTICE:
As the vehicle speed (tire rotating speed) becomes faster the cycle becomes shorter and the output voltage larger.
HINT:
- 1V/DIV, 2 ms/DIV.
- While driving at approximately 18 mph (30 km/h).

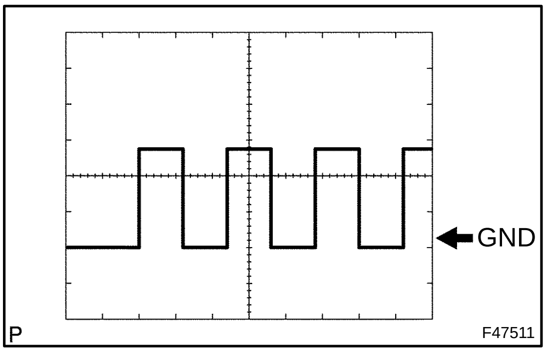


F47510

Waveform 4
NOTICE:
As the vehicle speed (tire rotating speed) becomes faster the cycle becomes shorter.
HINT:
- 5V/DIV, 50 ms/DIV.
- While driving at approximately 12 mph (20 km/h).



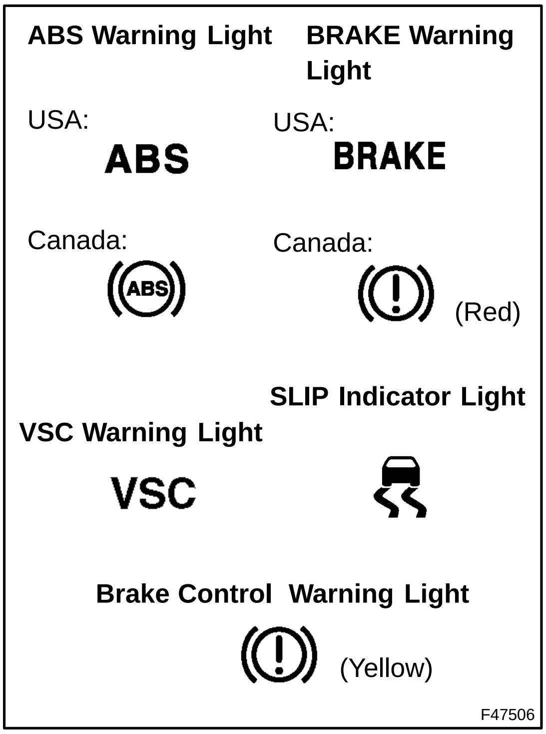
Waveform 5
HINT:
- 5V/DIV, 200 ms/DIV.
- Power switch ON (READY)



Waveform 6
HINT:
- 5V/DIV, 100 ms/DIV.
- Power switch ON (READY)

05IZ1-01

TEST MODE PROCEDURE



1. WARNING LIGHT AND INDICATOR LIGHT CHECK

(a) Release the parking brake pedal.

NOTICE:

When releasing the parking brake, move the ”P” position switch into the P position to hold the vehicle for safety.

HINT:

When the parking brake is applied or the level of the brake fluid is low, the BRAKE warning light comes on.

(b) When the power switch ON (READY) check that the ABS warning light, VSC warning light, BRAKE warning light, Brake Control warning light and SLIP indicator light come on for approximately 3 seconds.

HINT:

If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit, VSC warning light circuit, BRAKE warning light circuit, Brake Control warning light circuit or SLIP indicator light circuit.

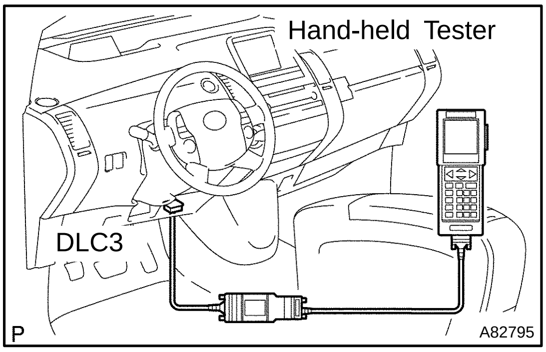
If the indicator remains on, proceed to troubleshooting for the light circuit below.

Trouble area	See Page
ABS warning light circuit	05-1108
VSC warning light circuit	05-1113
BRAKE warning light circuit	05-1118
Brake Control warning light circuit	05-1103
SLIP indicator light circuit	05-1127

2. SENSOR SIGNAL CHECK BY TEST MODE

HINT:

- Set the vehicle in the TEST MODE and perform the following procedures to check operation of the deceleration sensor, master cylinder pressure sensor, speed sensor and yaw rate sensor.
- Check results are indicated by DTCs output only in the TEST MODE.
- Perform the following procedures (a) to (e) as a set.
- When entering the test mode, the skid control ECU once records all the test mode codes and clears the codes judged to be normal.
- The Enhanced VSC function does not operate independent of whether the sensor check is normal or abnormal during test mode.
- When the mode returns to the normal mode, all the test mode codes are cleared.
- The ABS warning lamp and VSC warning light comes on if the sensor has a malfunction.



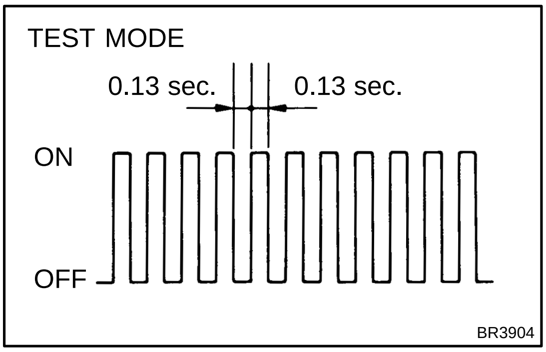
(a) PROCEDURES FOR TEST MODE

(1) Turn the power switch OFF.

(2) Connect the hand-held tester to the DLC3.

(3) Check that the steering wheel is in the straight-ahead position and move the shift lever to the P position.

(4) Turn the power switch ON (READY).



(5) Select the SIGNAL CHECK following the hand-held tester screen.

(6) Check that the ABS warning light and VSC warning light indicates TEST MODE .

HINT:

If the ABS warning light and VSC warning light do not blink, inspect the ABS warning light circuit and VSC warning light circuit.

Trouble area	See Page
ABS warning light circuit	05-1108
VSC warning light circuit	05-1113

(7) Start the engine.

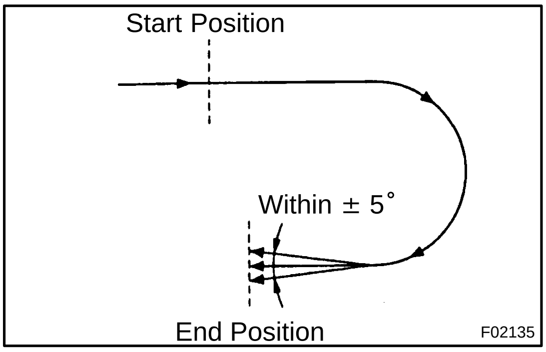
(b) DECELERATION SENSOR CHECK

(1) Check that the ABS warning light is blinking in TEST MODE.

(2) Keep the vehicle in the stationary condition on a level surface for 1 second or more.

HINT:

The blinking pattern of the ABS warning light and VSC warning light do not change. When the sensor is normal and in the test mode, if the above conditions are met, the check is completed.



(c) YAW RATE SENSOR CHECK

(1) Shift the shift lever to the D range and drive the vehicle at the vehicle speed of approx. 3 mph (5 km/h), turn the steering wheel either to left or right 90° or more, and maintain 180° circular drive for the vehicle.

NOTICE:

- **The vehicle direction at the beginning and the end should be 180 ± 5 degrees or less.**
- **While turning do not move the shift lever to the P position. Do not turn the ignition switch off.**

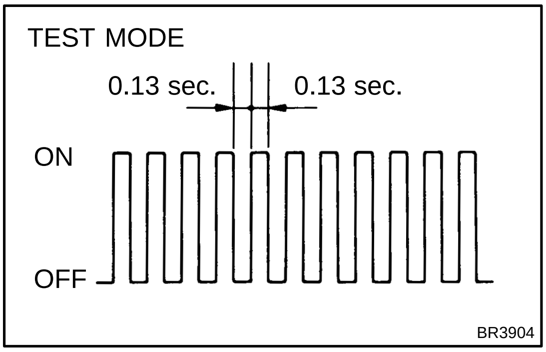
HINT:

- The turning direction is not important.

- Turning should be completed within 2.0 seconds. However, it is possible to change the vehicle speed, stop or more backward.
  - (2) Stop the vehicle and move the shift lever to the P position, check that the skid control buzzer sounds for 3 sec.

HINT:

- If the skid control buzzer sounds, the sensor check is completed normally.
- If the skid control buzzer does not sound, check the skid control buzzer circuit (see page 05-1 124), then perform the sensor check again.
- If the skid control buzzer still won't sound, there is a malfunction in the Enhanced VSC sensor, so check the DTC.
- Drive the vehicle in a 180° circle. At the end of the turn, the direction of the vehicle should be within 180° ± 5° of its start position.
- Do not spin the wheels.



(d) MASTER CYLINDER PRESSURE SENSOR CHECK

(1) Check that the ABS warning light is blinking in TEST MODE.

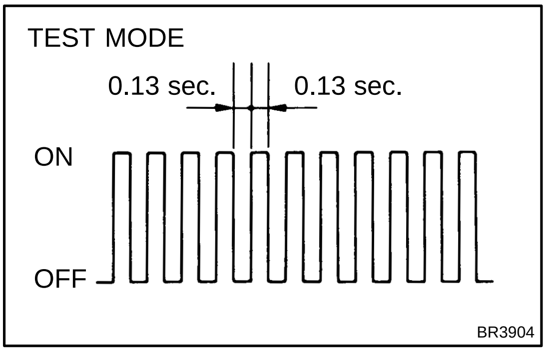
(2) Leave the vehicle in a stationary condition and the brake pedal in free condition for 1 second or more, and quickly depress the brake pedal with a force of 98 N (10 kgf, 22 lbf) or more for 1 second or more.

(3) While the vehicle is stopped, release the brake pedal.

(4) While the vehicle is stopped, quickly depress the brake pedal once or more and check the ABS warning light is lit for 3 seconds.

HINT:

- While the ABS warning light is lit, maintain the condition a brake pedal load of approximately 98 N or more is applied.
- During the test mode, the ABS warning light comes on for 3 seconds every time the above pedal operation.
- If the master cylinder pressure sensor check is not completed, randomly depressing the brake pedal will cause the negative pressure to decrease further and the sensor check will be difficult to be completed.
- If the negative pressure is insufficient, the master cylinder pressure sensor check may not be completed. In this case, turn the engine idle to make the negative pressure sufficient.
- Strongly depress the brake pedal when the negative pressure is insufficient the brake warning lamp may come on with the fail-safe function.



(e) SPEED SENSOR CHECK

(1) Check the ABS warning light is blinking of TEST MODE.

(2) Start the sensor signal check.

(3) Drive the vehicle straight forward.
Drive the vehicle at a speed of 28 to 50 mph (45 to 80 km/h) or higher for several seconds and check that the ABS warning light goes off.

Vehicle Speed	Test	Check
0 to 28 mph (0 to 45 km/h)	Low speed test	Response of sensors
28 to 50 mph (45 to 80 km/h)	Middle speed test	Deviations of sensor signal

NOTICE:

- **Before the speed sensor check, the yaw rate sensor, deceleration sensor and master cylinder pressure sensor checks should be completed.**
- **If the sensor check begins with the steering wheel turned or the wheel spin, the speed sensor check may not be completed.**
- **After the warning lamp goes off, driving at 50 mph (80 km/h) or more will cause the test mode codes to be recorded again, before the speed reaches at 50 mph (80 km/h), decelerate and stop the vehicle.**
- **If the sensor check is not completed, the ABS warning lamp blinks even while driving and the ABS does not operate.**

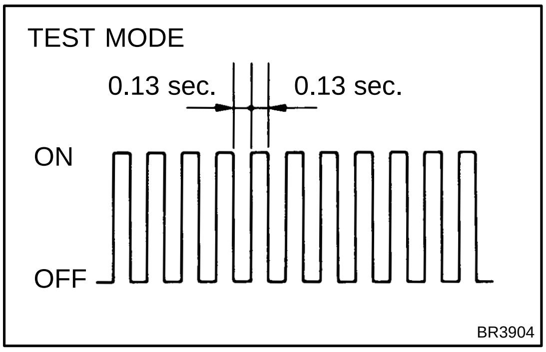
HINT:
If the speed sensor check is completed, the ABS warning lamp does not come on while driving and blinks at test mode when the vehicle stops.

(f) END OF SENSOR CHECK

(1) If the sensor check is completed, the ABS warning lamp blinks (test mode) when the vehicle stops and the warning lamp is off when the vehicle is driving.

NOTICE:

- **When the yaw rate sensor, deceleration sensor, speed sensor and master cylinder pressure sensor checks are completed, the sensor check is completed.**
- **If the sensor check is not completed, the ABS warning lamp blinks even while the vehicle is driving and the ABS does not operate.**
- **If the DTC is detected during the test mode, the ABS warning lamp and VSC warning lamp comes on.**



(g) READ TEST MODE CODE

(1) Using hand-held tester, check the DTCs in the test mode. (Refer to the step h)

NOTICE:

- **If only the DTCs are displayed, repair the malfunction area and clear the DTC. Check if the ABS warning lamp and VSC warning lamp are normal.**
- **If only the test mode codes are displayed, perform the test mode again.**
- **If the DTCs or test mode codes are displayed, repair the malfunction area, clear the DTCs and perform the test mode inspection.**

HINT:

- The test mode codes and DTCs are displayed.
- If the ABS is normal, the ABS warning lamp comes on for 0.25 seconds and goes off for 0.25 seconds repeatedly.

(h) DTC of TEST MODE:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor
C1279/79	Deceleration sensor is faulty	• Yaw rate (Deceleration) sensor • Sensor installation
C1281/81	Master cylinder pressure sensor output signal is faulty	Master cylinder pressure sensor
C0371/71	Signal malfunction	Yaw rate sensor (Deceleration sensor)

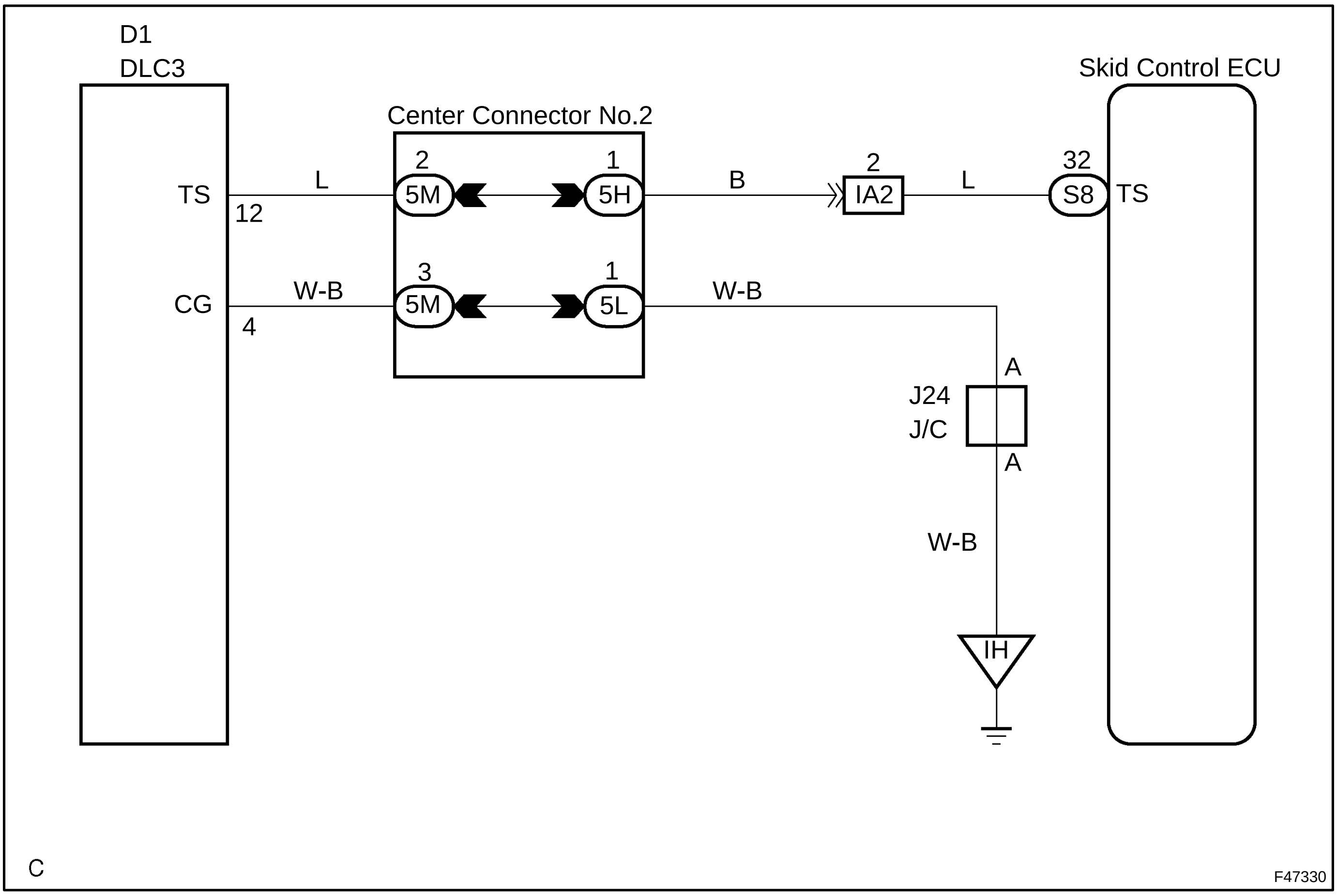
HINT:
The code in this table are output only in TEST MODE.

TS AND CG TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

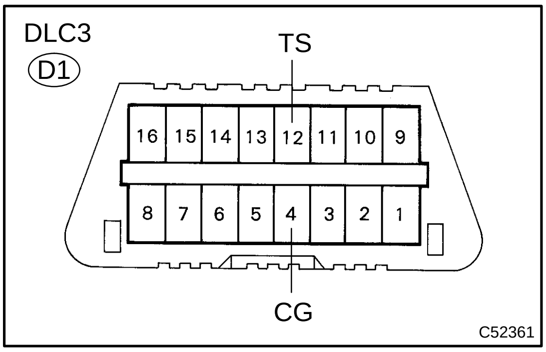
In the sensor check mode, a malfunction of the speed sensor that cannot be detected when the vehicle is stopped is detected while driving.
Transition to the sensor check mode can be performed by connecting terminals TS and CG of the DLC3 and turning the ignition switch from off to the ON position.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT DLC3 TERMINAL VOLTAGE(TS TERMINAL)



(a) Turn the ignition switch to the ON position.

(b) Measure the voltage according to the value(s) in the table below.

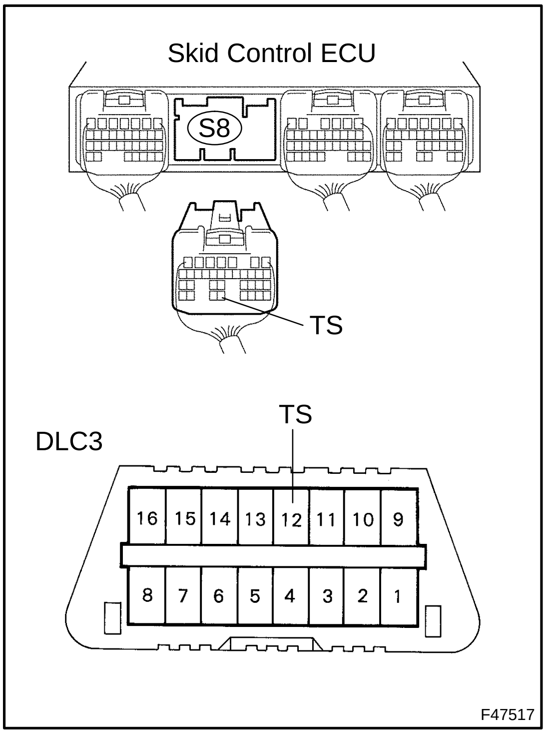
Standard:

Tester Connection	Specified Condition
D1-12 (TS) - D1-4 (CG)	10 to 14 V

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR(DLC3 - SKID CONTROL ECU)



(a) Disconnect the skid control ECU connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-32 (TS) - D1-12 (TS)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-32 (TS) - Body ground	10 kΩ or higher

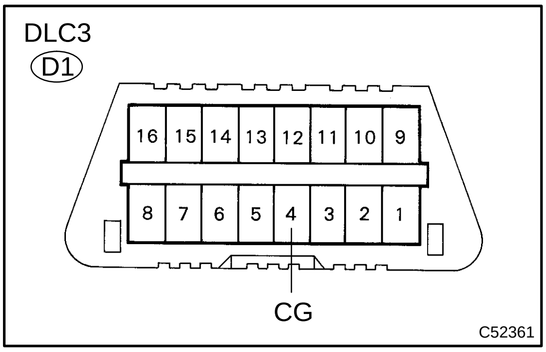
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

3 CHECK HARNESS AND CONNECTOR(DLC3 - BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.

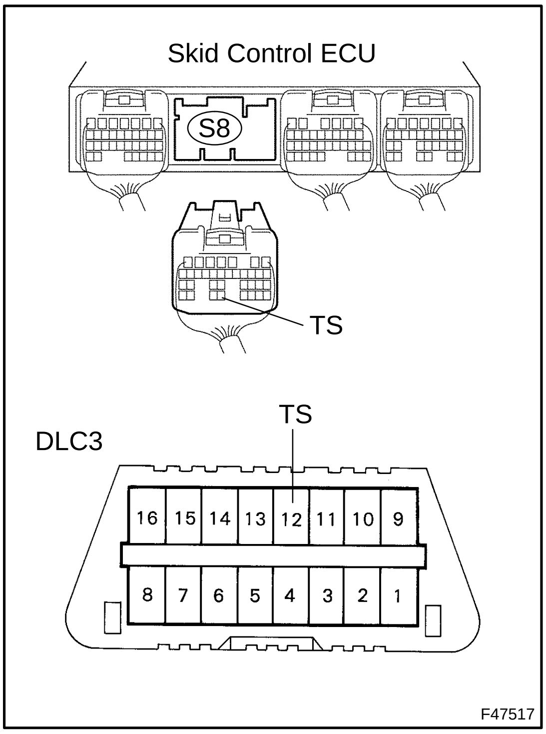
Standard:

Tester Connection	Specified Condition
D1-4 (CG) - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(DLC3 - SKID CONTROL ECU)



(a) Disconnect the skid control ECU connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-32 (TS) - D1-12 (TS)	Below 1 Ω

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
S8-32 (TS) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE SKID CONTROL ECU ASSY (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

VSC WARNING LIGHT CIRCUIT (DOES NOT LIGHT UP)

INSPECTION PROCEDURE

1 INSPECT CAN COMMUNICATION SYSTEM (SEE PAGE 05-2597)

(a) Is the DTC output for CAN communication system?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR CAN COMMUNICATION SYSTEM (SEE PAGE 05-2611)**

A ↓

2 INSPECT MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2541)

(a) Is the DTC output for Multiplex communication system?

Result:

DTC is not output	A
DTC is output	B

B → **REPAIR MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2550)**

A ↓

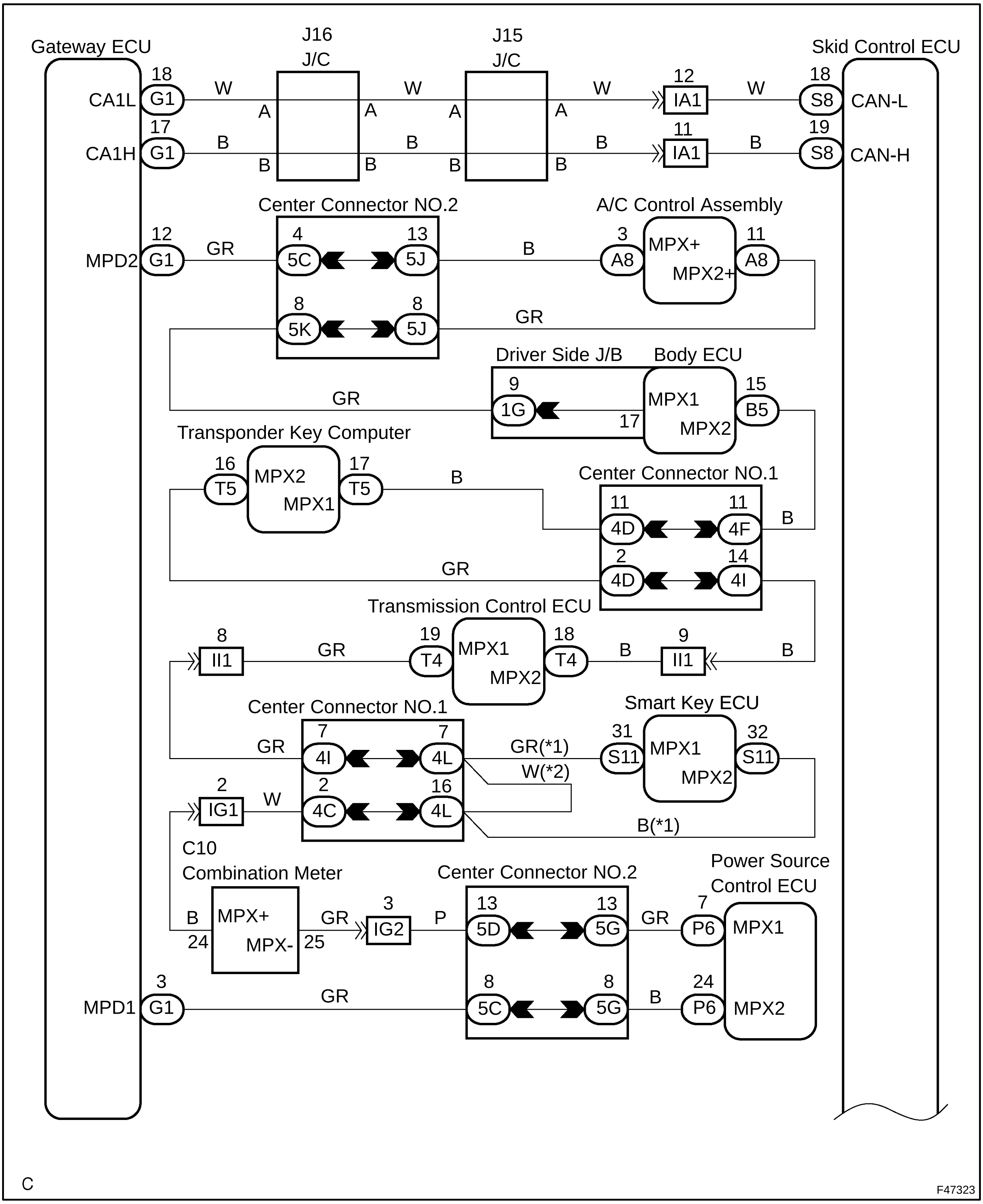
REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)

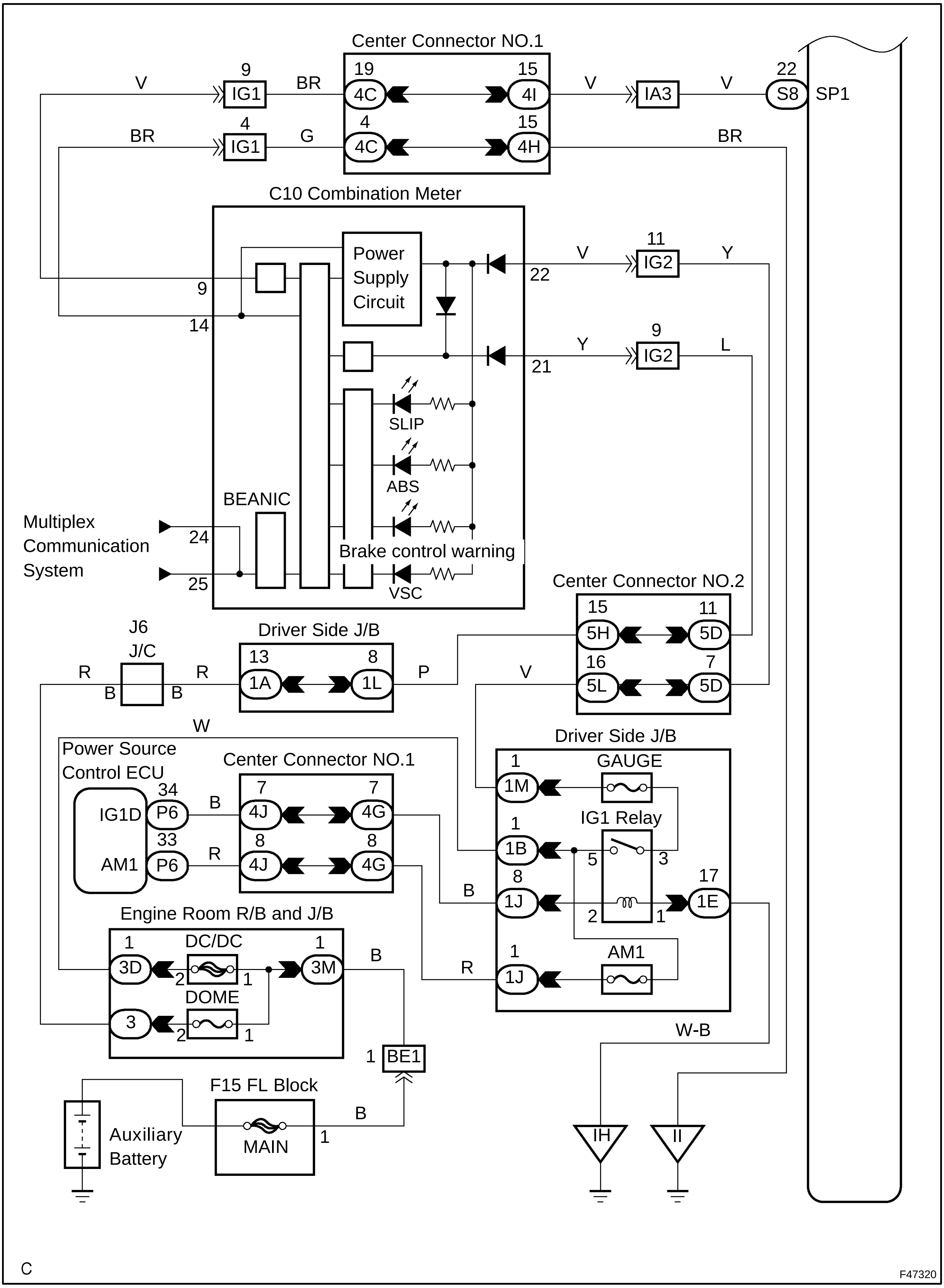
VSC WARNING LIGHT CIRCUIT (REMAINS ON)

CIRCUIT DESCRIPTION

Inform the driver that there is trouble with Enhanced VSC by illuminating the VSC warning light.
When DTC output is normal and the VSC warning lamp remains on, perform troubleshooting as indicated below.

WIRING DIAGRAM




Center Connector NO.1
V
9
IG1
BR
19
4C
15
4I
V
IA3
V
22
S8
SP1
BR
4
IG1
G
4
4C
15
4H
BR
C10 Combination Meter
Power
Supply
Circuit
22
V
11
IG2
Y
9
14
21
Y
9
IG2
L
SLIP
ABS
BEANIC
Multiplex
Communication
System
24
25
Brake control warning
VSC
Center Connector NO.2
15
5H
11
5D
16
5L
7
5D
J6
J/C
R
B
B
R
Driver Side J/B
13
1A
8
1L
P
V
W
Power Source
Control ECU
IG1D
AM1
34
P6
33
P6
B
R
Center Connector NO.1
7
4J
7
4G
8
4J
8
4G
Driver Side J/B
1
1M
GAUGE
IG1 Relay
1
1B
5
3
8
1J
17
1E
2
1
1
1J
AM1
B
R
Engine Room R/B and J/B
1
3D
DC/DC
2
1
1
3M
B
DOME
3
2
1
W-B
1
BE1
F15 FL Block
MAIN
B
1
Auxiliary
Battery
IH
II
C
F47320

INSPECTION PROCEDURE

1	INSPECT SKID CONTROL ECU CONNECTOR

(a) Check the skid control ECU connector's connecting condition.
OK:
The connector should be securely connected.

NG → **CONNECT CONNECTOR TO ECU CORRECTLY**

OK

2	PERFORM ACTIVE TEST BY HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (READY).
(c) Select the item "VSC WARN LIGHT" in the ACTIVE TEST and operate the VSC Warning light on the hand-held tester.

Item	Vehicle Condition / Test Details	Diagnostic Note
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter

(d) Check that "ON" and "OFF" of the VSC warning light are indicated on the combination meter when using the hand-held tester.
OK:
The VSC warning light turns on or off in accordance with the hand-held tester.

NG → **REPAIR OR REPLACE COMBINATION METER ASSY (SEE PAGE 05-1985)**

OK

REPLACE SKID CONTROL ECU (SEE PAGE 32-68)

NOTICE:
When replacing the skid control ECU assy, perform initialization of linear solenoid valve and calibration (see page 05-956).

EMISSION CONTROL

031UR-01

SERVICE DATA

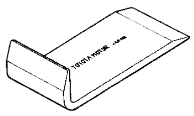
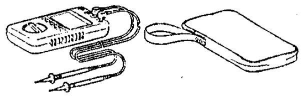
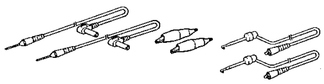
Air-fuel ratio sensor		
Voltage	E5-23 (A1A+) - E5-28 (E1)	3.0 to 3.6 V
	E5-22 (A1A-) - E5-28 (E1)	2.7 to 3.3 V
Resistance	1 (HT) - 2 (+B)	1.8 to 3.9 Ω at 20°C (68°F)
	2 (+B) - 4 (AF-)	10 kΩ or higher
Vapor pressure sensor		
Voltage	1 - 3	4.5 to 5.5 V
	2 - 3	3.0 to 3.6 V
Vacuum switching valve assy No. 2		
Resistance	1 - 2	26 to 30 Ω at 20°C (68°F)
Charcoal canister vacuum switching valve		
Resistance	1 - 2	36 to 42 Ω at 20°C (68°F)
Trap w/ outlet valve canister assy		
Resistance (VSV for CCV (canister closed valve))	1 - 2	25 to 30 Ω at 20°C (68°F)
		32 to 40 Ω at 100°C (212°F)
Heated oxygen sensor		
Resistance	1 (HT) - 2 (+B)	11 to 16 Ω at 20°C (68°F)
	1 (HT) - 4 (E)	10 kΩ or higher

ENGINE CONTROL SYSTEM

023FY-01

PREPARATION

Recommended Tools

	09070-20010	Moulding Remover	ECM(1NZ-FXE)
	09082-00040	TOYOTA Electrical Tester	SFI SYSTEM(1NZ-FXE)
	(09083-00150)	Test Lead Set	SFI SYSTEM(1NZ-FXE) ENGINE COOLANT TEMPERATURE SENSOR(1NZ-FXE)

Equipment

Deep socket wrench 19 mm	
Ohmmeter	
Radiator cap tester	
Service wire harness	
Torque wrench	

ENGINE CONTROL SYSTEM

031VG-01

SERVICE DATA

Camshaft timing oil control valve assy Resistance	 1 (+) - 2 (-)	 6.9 to 7.9 Ω at 20°C (68°F)
Mass air flow meter Resistance	 4 (THA) - 5 (E2)	 13.6 to 18.4 kΩ at -20°C (-4°F) 2.21 to 2.68 kΩ at 20°C (68°F) 0.493 to 0.667 kΩ at 60°C (140°F)
Engine coolant temperature sensor Resistance	 1 (E2) - 2 (THW)	 2.32 to 2.59 kΩ at 20°C (68°F) 0.310 to 0.326 kΩ at 80°C (176°F)
Throttle w/ motor body assy Throttle valve opening percentage Idle speed Resistance (Throttle control motor) Resistance (Throttle position sensor)	 1 (M+) - 2 (M+) 1 (VC) - 4 (E2)	 60 % or more 950 to 1,050rpm 0.3 to 100 Ω at 20°C (68°F) 1.25 to 2.35 Ω at 20°C (68°F)
Knock sensor Resistance	 1 (Ground) - 2 (Output)	 120 to 280 kΩ at 20°C (68°F)
EFI Relay Resistance	 B5 - B8	 10 kΩ or higher Below 1 Ω (Apply battery voltage to terminal B6 and B7)
Circuit opening relay Resistance	 B5 - B8	 10 kΩ or higher Below 1 Ω (Apply battery voltage to terminal B6 and B7)

ENGINE MECHANICAL

SERVICE DATA

031LO-02

New drive belt deflection Pressing force: 98 N (10 kgf, 22lbf) Used drive belt deflection Pressing force: 98 N (10 kgf, 22lbf)		9.0 to 12.0 mm (0.35 to 0.47 in.) 11.0 to 15.0 mm (0.43 to 0.59 in.)
New drive belt tension Used drive belt tension		392 to 588 N (40 to 60 kgf, 88 to 132 lb) 196 to 392 N (20 to 40 kgf, 44 to 88 lb)
Ignition timing		8 to 12 ° BTDC
Idle speed		950 ± 1050 rpm
Compression pressure		882 kPa (9.0 kgf/cm^2 128 psi)
Minimum pressure		686 kPa (7.0 kgf/cm^2 99 psi)
Difference between each cylinder		98 kPa (1.0kgf/cm^2 14 psi)
Valve clearance (cold)	Intake Exhaust	0.17 to 0.23 mm (0.007 to 0.009 in.) 0.27 to 0.33 mm (0.011 to 0.013 in.)
Chain elongation chain length at 16 links	Maximum	124.2 mm (4.890 in.)
Camshaft timing gear diameter (w / chain)	Minimum	96.2 mm (3.787 in.)
Camshaft timing sprocket diameter (w / chain)	Minimum	96.2 mm (3.787 in.)
Chain tensioner slipper wear	Maximum	1.0 mm (0.039 in.)
Chain vibration damper wear	Maximum	1.0 mm (0.039 in.)
Cylinder head bolt length	Standard Maximum	142.8 to 144.2 mm (5.622 to 5.677 in.) 147.1 mm (5.791 in.)
Cylinder head warpage	Maximum Cylinder block side Intake manifold side Exhaust manifold side	0.05 mm (0.0020 in.) 0.10 mm (0.0039 in.) 0.10 mm (0.0039 in.)
Intake valve overall length Intake valve stem diameter Intake valve margin thickness	Standard Minimum Standard Minimum	89.25 mm (3.5138 in.) 88.95 mm (3.5020 in.) 4.970 to 4.985 mm (0.1957 to 0.1963 in.) 1.0 mm (0.039 in.) 0.7 mm (0.028 in.)
Exhaust valve overall length Exhaust valve stem diameter Exhaust valve margin thickness	Standard Minimum Standard Minimum	87.90 mm (3.4606 in.) 87.60 mm (3.4488 in.) 4.965 to 4.980 mm (0.1955 to 0.1961 in.) 1.15 mm (0.0453 in.) 0.85 mm (0.0335 in.)
Valve spring free length Valve spring deviation Valve spring angle (reference) Valve spring installed tension at 32.5 mm (1.280 in.) Valve spring working tension at 25.1 mm (0.988 in.)	 Maximum Maximum Maximum	59.77 mm (2.3531 in.) 1.6 mm (0.063 in.) 2° 140 to 154 N (14.2 to 15.7 kgf, 31.5 to 34.6 lbf) 180 to 198 N (18.4 to 20.2 kgf, 40.5 to 44.5 lbf)
Bushing inside diameter Valve guide bushing oil clearance Valve guide bush diameter Bushing Protrusion height	 Standard Intake Exhaust Maximum Intake Exhaust Standard O/S 	5.010 to 5.030 mm (0.1972 to 0.1980 in.) 0.025 to 0.060 mm (0.0010 to 0.0024 in.) 0.030 to 0.065 mm (0.0012 to 0.0026 in.) 0.08 mm (0.0031 in.) 0.10 mm (0.0039 in.) 9.685 to 9.706 mm (0.3813 to 0.3821 in.) 9.735 to 9.755 mm (0.3833 to 0.3841 in.) 9.0 to 9.4 mm (0.354 to 0.370 in.)
Lifter diameter Lifter bore diameter Oil clearance	 Standard Maximum	30.966 to 30.976 mm (1.2191 to 1.2195 in.) 31.009 to 31.025 mm (1.2208 to 1.2215 in.) 0.033 to 0.059 mm (0.0013 to 0.0023 in.) 0.10 mm (0.0039 in.)

Camshaft circle runout	Maximum	0.03 mm (0.0012 in.)
Camshaft cam lobe height	Standard	42.310 to 42.410 mm (1.6657 to 1.6697 in.)
	Minimum	42.16 mm (1.6598 in.)
Camshaft No. 1 journal diameter		34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Camshaft other journals diameter		22.949 to 22.965 mm (0.9035 to 0.9041 in.)
No. 2 camshaft circle runout	Maximum	0.03 mm (0.0012 in.)
No. 2 camshaft cam lobe height	Standard	44.046 to 44.146 mm (1.7341 to 1.7380 in.)
	Minimum	43.90 mm (1.7283 in.)
No. 2 camshaft No. 1 journal diameter		34.449 to 34.465 mm (1.3563 to 1.3569 in.)
No. 2 camshaft other journals diameter		22.949 to 22.965 mm (0.9035 to 0.9041 in.)
Camshaft thrust clearance	Standard	0.040 to 0.095 mm (0.0016 to 0.0037 in.)
	Maximum	0.11 mm (0.0043 in.)
Camshaft oil clearance	Standard	0.040 to 0.095 mm (0.0016 to 0.0037 in.)
	Maximum	0.115 mm (0.0045 in.)
Camshaft bearing cap setting ring pin protrusion height		8.5 to 9.5 mm (0.335 to 0.374 in.)
Connecting rod thrust clearance	Standard	0.16 to 0.36 mm (0.0063 to 0.0142 in.)
	Maximum	0.36 mm (0.0142 in.)
Connecting rod oil clearance	Standard	0.016 to 0.040 mm (0.0006 to 0.0016 in.)
	Maximum	0.06 mm (0.0024 in.)
Crankshaft thrust clearance	Standard	0.09 to 0.19 mm (0.0035 to 0.0075 in.)
	Maximum	0.30 mm (0.0118 in.)
Cylinder block warpage	Maximum	0.05 mm (0.0020 in.)
Cylinder bore diameter	Standard	75.000 to 75.133 mm (2.9528 to 2.9580 in.)
Connecting rod out-of alignment	Maximum	0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
Connecting rod twist	Maximum	0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
Piston diameter		74.941 to 74.979 mm (2.9504 to 2.9519 in.)
Piston pin hole diameter at 20°C (68°F)		18.013 to 18.016 mm (0.7092 to 0.7093 in.)
Piston pin diameter		18.001 to 18.004 mm (0.7087 to 0.7088 in.)
Oil clearance	Standard	0.009 to 0.015 mm (0.0004 to 0.0006 in.)
	Maximum	0.050 mm (0.0020 in.)
Piston clearance	Standard	0.045 to 0.068 mm (0.0018 to 0.0027 in.)
	Maximum	0.08 mm (0.0032 in.)
Connecting rod inside diameter		17.965 to 17.985 mm (0.7073 to 0.7081 in.)
Piston ring groove clearance	No. 1	0.02 to 0.07 mm (0.0008 to 0.0028 in.)
	No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
	Oil	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Piston ring end gap	Standard No. 1	0.20 to 0.30 mm (0.0079 to 0.0118 in.)
	No. 2	0.30 to 0.45 mm (0.0118 to 0.0177 in.)
	Oil	0.10 to 0.40 mm (0.0039 to 0.0158 in.)
	Maximum No. 1	0.61 mm (0.0240 in.)
	No. 2	1.20 mm (0.0472 in.)
	Oil	1.15 mm (0.0453 in.)
Connecting rod bolt diameter	Standard	6.6 to 6.7 mm (0.260 to 0.264 in.)
	Maximum	6.4 mm (0.252 in.)
Crankshaft circle runout	Maximum	0.03 mm (0.0012 in.)
Main journal diameter		45.988 to 46.000 mm (1.8106 to 1.8110 in.)
Main journal taper and out-of-round	Maximum	0.02 mm (0.0008 in.)
Crank pin diameter		39.992 to 40.000 mm (1.5745 to 1.5748 in.)
Crank pin taper and out-of-round	Maximum	0.02 mm (0.0008 in.)
Crankshaft timing sprocket diameter (w/ chain)	Standard	51.72 mm (2.0362 in.)
	Maximum	50.5 mm (1.988 in.)
Crankshaft bearing cap set bolt diameter	Standard	7.3 to 7.5 mm (0.287 to 0.295 in.)
	Minimum	7.3 mm (0.287 in.)
Crankshaft oil clearance	Standard	0.01 to 0.023 mm (0.0004 to 0.0009 in.)
	Maximum	0.07 mm (0.0028 in.)
End plate straight pin protrusion		11.5 to 12.5 mm (0.453 to 0.492 in.)
Oil pan straight pin protrusion		8.5 to 9.5 mm (0.335 to 0.374 in.)
Cylinder head set straight pin protrusion		8.5 to 9.5 mm (0.335 to 0.374 in.)

Chain tensioner straight pin protrusion	18.5 to 19.5 mm (0.728 to 0.768 in.)
Oil pump set ring pin protrusion	3.5 to 4.5 mm (0.138 to 0.177 in.)

EXHAUST

SERVICE DATA

031TF-01

Compression spring (Exhaust pipe assy front x Exhaust manifold) Free length	Minimum	40.5 mm (1.594 in.)
Compression spring (Exhaust pipe assy tail x Exhaust pipe assy front) Free length	Minimum	38.5 mm (1.516 in.)

FRONT SUSPENSION

031QM-01

SERVICE DATA

Front wheel alignment	Vehicle height		
		A-B:	95 mm (3.74 in.)
		D-C:	62 mm (2.40 in.)
	Toe-in (total)		0° ± 12' (0° ± 0.2°), 0 ± 2 mm (0 ± 0.08 in.)
		Rack end length difference	1.5 mm (0.059 in.) or less
	Wheel angle		
		Inside wheel	40°35' (38°35' – 42°35') 40.58° (38.58° – 42.58°)
		Outside wheel: Reference	34°15' 34.25°
	Camber		-0 °35' ± 45' (-0.58° ± 0.75°)
		Right-left error	45' (0.75°) or less
	Caster		3°10' ± 45' (3.17° ± 0.75°)
		Right-left error	45' (0.75°) or less
	Steering axis inclination		12°35' ± 45' (12.58° ± 0.75°)
		Right-left error	45' (0.75°) or less
Front suspension	Lower ball joint turning torque		0.98 to 4.90 N·m (10 to 50 kgf·cm, 9 to 43 in.·lbf)
Front suspension	Stabilizer link turning torque		0.05 to 1.96 N·m (0.5 to 20 kgf·cm, 0.4 to 17.4 in.·lbf)

A: Ground clearance of front wheel center
B: Ground clearance of lower arm No.1 set bolt center
C: Ground clearance of rear axle carrier bush set bolt center
D: Ground clearance of rear wheel center

031QN-01

TORQUE SPECIFICATION

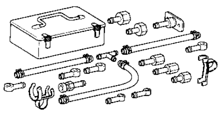
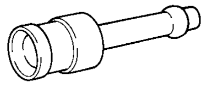
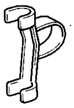
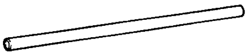
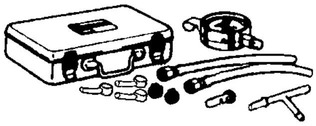
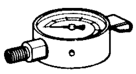
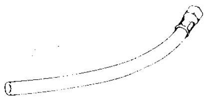
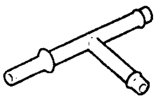
Part Tightened	N·m	kgf·cm	ft·lbf
Tie rod end lock nut	74	749	54
Steering knuckle x Shock absorber	153	1,560	113
Front wheel hub nut	103	1,050	76
Suspension support x Piston rod	47	479	35
Suspension support x Body	39	398	29
ABS speed sensor wire harness bracket set bolt	19	192	14
Steering gear assy x Suspension cross member	58	591	43
Stabilizer link assy x Shock absorber with coil spring	74	755	55
Steering knuckle x Lower ball joint	71	724	52
Lower suspension arm x Suspension cross member	137	1,400	101
Stabilizer bracket No.1 x Suspension cross member	19	194	14

FUEL

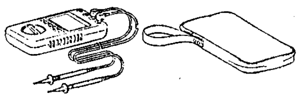
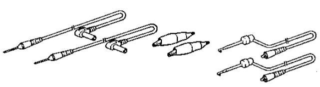
023FX-01

PREPARATION

SST

	09268-41047	Injection Measuring Tool Set	FUEL SYSTEM(1NZ-FXE)
	(09268-41 110)	Adaptor	FUEL SYSTEM(1NZ-FXE)
	(09268-41300)	Clamp	FUEL SYSTEM(1NZ-FXE)
	(95336-08070)	Hose	FUEL SYSTEM(1NZ-FXE)
	09268-45014	EFI Fuel Pressure Gauge	FUEL SYSTEM(1NZ-FXE)
	(09268-41200)	Gauge	FUEL SYSTEM(1NZ-FXE)
	(09268-41220)	Hose	FUEL SYSTEM(1NZ-FXE)
	(09268-41250)	T Joint	FUEL SYSTEM(1NZ-FXE)
	09842-30080	Wire ”H” EFI Inspection	FUEL SYSTEM(1NZ-FXE)

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	FUEL SYSTEM(1NZ-FXE)
	(09083-00150)	Test Lead Set	FUEL SYSTEM(1NZ-FXE)

Equipment

Clip	
Cutter knife	

Graduated cylinder	
Ohmmeter	
Plastic-faced hammer	
Service wire harness	
Stop watch	
Torque wrench	
Vernier calipers	
Vinyl bag	
Voltmeter	
Wire brush	
Wooden block	

SSM

08826-00080 Seal Packing Black or equivalent (FIPG)	FUEL INJECTOR ASSY(1NZ-FXE)

FUEL

SERVICE DATA

031VE-01

Fuel pressure	at idle	304 to 343 kPa (3.1 to 3.5 kgf/cm^2, 44 to 50 psi)
	5 minutes after the engine has stopped	147 kPa (1.5 kgf/cm^2, 21 psi) or more
Fuel injector assy		
Resistance	1 - 2	13.45 to 14.15 Ω at 21°C (68°F)
Injection volume	Standard	36 to 46 cm^3 (2.1 to 2.8 cu in.)
	Difference between each fuel injector	10 cm^3 (0.6 cu in.) or less
Leakage	Standard	1 drop or less per 12 minutes
Fuel tank assy (fuel pump)		
Resistance	3 - 7	0.2 to 3.0 Ω at 20°C (68°F)
Compression spring (Exhaust pipe assy front x Exhaust manifold)		
Free length	Minimum	40.5 mm (1.594 in.)
Compression spring (Exhaust pipe assy front x Exhaust pipe assy tail)		
Free length	Minimum	38.5 mm (1.516 in.)

HEATER & AIR CONDITIONER

031W1-01

SERVICE DATA

Refrigerant charge volume	Standard: 450 ± 30 g (15.9 ± 1.1 oz.)

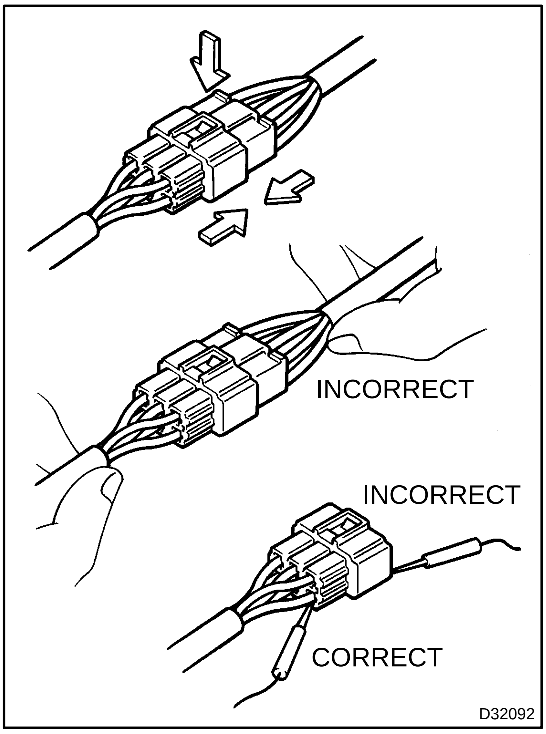
010S5-01

ELECTRONIC CIRCUIT INSPECTION PROCEDURE

1. BASIC INSPECTION

(a) RESISTANCE MEASURING CONDITION OF ELECTRONIC PARTS

(1) Unless stated, all resistance is measured at an ambient temperature of 20°C (68°F). Resistances measured may be outside the specifications if measured at high temperatures, i.e. immediately after the vehicle has been running. Measurements should be made after the engine has cooled down.



(b) HANDLING CONNECTORS

(1) When disconnecting a connector, first squeeze the mating halves tightly together to release the lock, then press the lock claw and separate the connector.

(2) When disconnecting a connector, do not pull on the harnesses. Grasp the connector directly and separate it.

(3) Before connecting the connector, check that there are no deformed, damaged, loose or missing terminals.

(4) When connecting a connector, press firmly until you hear the lock close with a ”click” sound.

(5) If checking the connector with a TOYOTA electrical tester, check it from the backside (harness side) of the connector using a mini test lead.

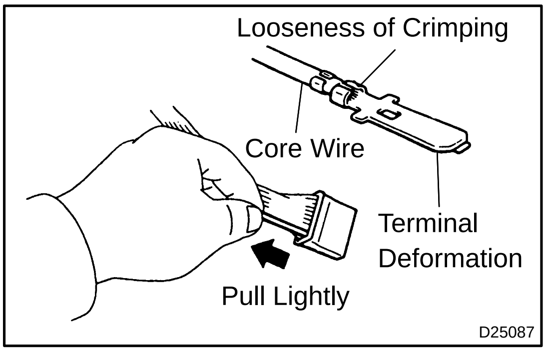
NOTICE:

- **As a waterproof connector cannot be checked from the backside, check by connecting a sub-harness.**
- **Do not damage the terminals by moving the inserted tester needle.**

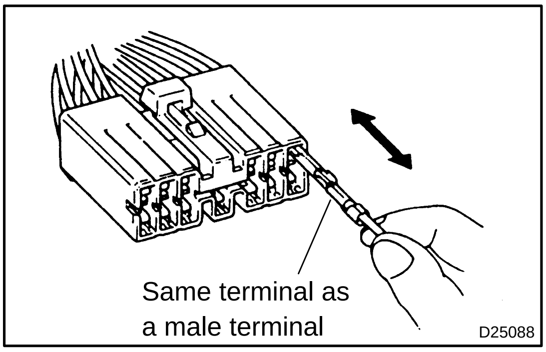
(c) CHECKING CONNECTORS

(1) Checking when the connector is connected:
Squeeze the connector together to confirm that it is fully inserted and locked.

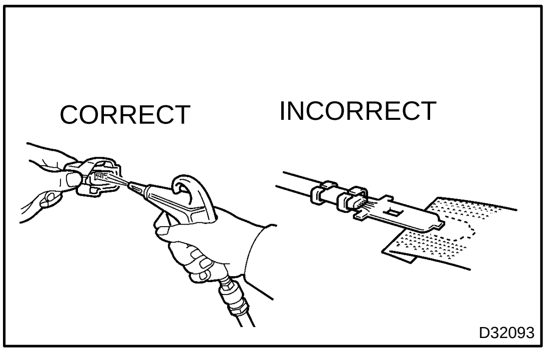
(2) Checking when the connector is disconnected:
Check by pulling the wire harness lightly from the backside of the connector. Look for unlatched terminals, missing terminals, loose crimps or broken conductor wires.
Check visually for corrosion, metallic or foreign objects and water; and bent, rusted, overheated, contaminated, and deformed terminals.



NOTICE:
When testing a gold-plated female terminal, always use a gold-plated male terminal.



(3) Checking the contact pressure of the terminal: Prepare a spare male terminal. Insert it into a female terminal, and check for good tension when inserting and after full engagement.

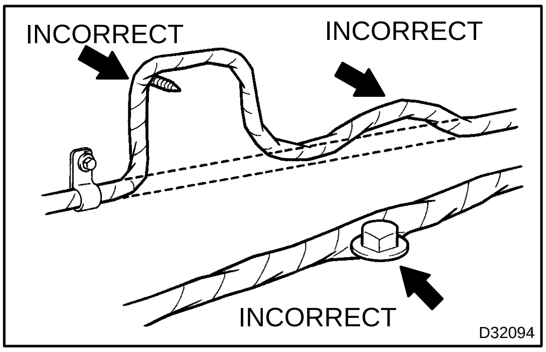


(d) REPAIR METHOD OF CONNECTOR TERMINAL

(1) If there is any dirt on the terminal, clean the contact point using an air gun or shop rag. Never polish the contact point using sandpaper as the platings may come off.

(2) If there is abnormal contact pressure, replace the female terminal. If the male terminal is gold-plated (gold color), use a gold-plated female terminal; if it is silver-plated (silver color), use a silver-plated female terminal.

(3) Damaged, deformed, or corroded terminals should be replaced. If the terminal will not lock into the housing, the housing may have to be replaced.



(e) HANDLING OF WIRE HARNESS

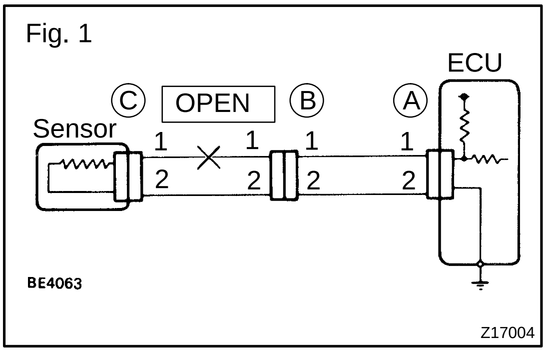
(1) If removing a wire harness, check the wiring and clamping before proceeding so that it can be restored in the same way.

(2) Never twist, pull or slacken the wire harness more than necessary.

(3) Never make the wire harness come into contact with a high temperature part, rotating, moving, vibrating or sharp-edged parts. Avoid panel edges, screw tips and similar sharp items.

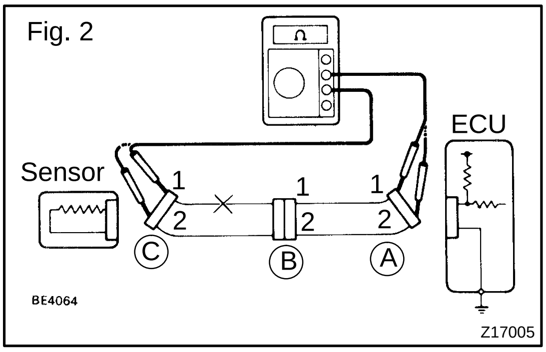
(4) When installing parts, never pinch the wire harness.

(5) Never cut or break the cover of the wire harness. If it is cut or broken, replace it or securely repair it with vinyl tape.



2. CHECK OPEN CIRCUIT

(a) For an open circuit in the wire harness in Fig. 1, perform a resistance check (step b) or a voltage check (step c).



(b) Check the resistance.

(1) Disconnect connectors A and C and measure the resistance between them.

Resistance: Below 1 Ω

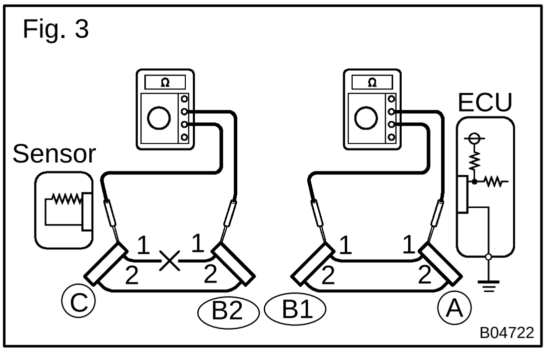
HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.

Fig. 2:

Tester Connection	Specified Condition
Connector A terminal 1 - Connector C terminal 1	10 kΩ or higher
Connector A terminal 2 - Connector C terminal 2	Below 1 kΩ

If your results match the examples above, an open circuit exists between terminal 1 of connector A and terminal 1 of connector C.

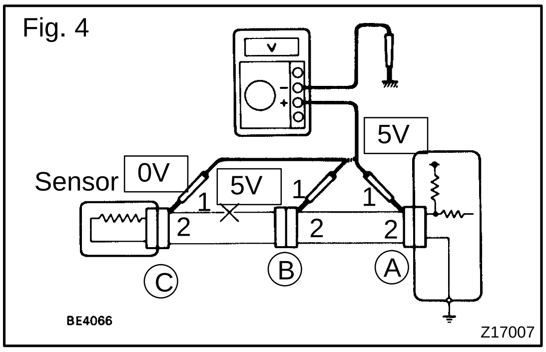


(2) Disconnect connector B and measure the resistance between the connectors.

Fig. 3:

Tester Connection	Specified Condition
Connector A terminal 1 - Connector B1 terminal 1	Below 1 kΩ
Connector B2 terminal 1 - Connector C terminal 1	10 kΩ or higher

If your results match the examples above, an open circuit exists between terminal 1 of connector B2 and terminal 1 of connector C.



(c) Check the voltage.

(1) In a circuit in which voltage is applied to the ECU connector terminal, an open circuit can be checked by conducting a voltage check.

Fig. 4:

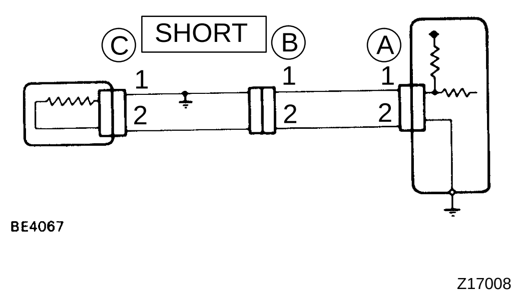
With each connector still connected, measure the voltage between the body ground these terminals (in this order): 1) terminal 1 of connector A at the ECU 5V output terminal, 2) terminal 1 of connector B, and 3) terminal 1 of connector C.

(2) Example results:

Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	5 V
Connector B terminal 1 - Body ground	5 V
Connector C terminal 1 - Body ground	0 V

If your results match the examples above, an open circuit exists in the wire harness between terminal 1 of B and terminal 1 of C.

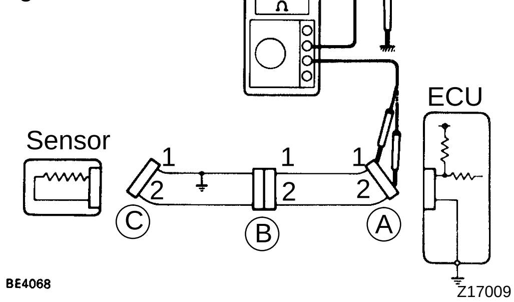
Fig. 5



3. CHECK SHORT CIRCUIT

(a) If the wire harness is ground shorted (Fig. 5), locate the section by conducting a resistance check with the body ground (below).

Fig. 6



(b) Check the resistance with the body ground.

(1) Disconnect connectors A and C and measure the resistance between terminals 1 and 2 of connector A and the body ground.

Resistance: 10 kΩ or higher

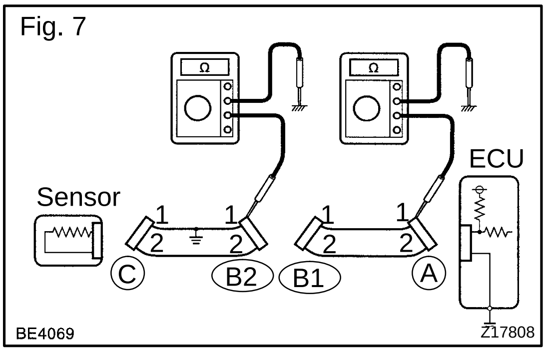
HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.

Fig. 6:

Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	Below 1 kΩ
Connector A terminal 2 - Connector C terminal 2	10 kΩ or higher

If your results match the examples above, a short circuit exists between terminal 1 of connector A and terminal 1 of connector C.



(2) Disconnect connector B and measure the resistance between terminal 1 of connector A and the body ground, and terminal 1 of connector B2 and the body ground.

Fig. 7:

Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	10 kΩ or higher
Connector B2 terminal 1 - Body ground	Below 1 kΩ

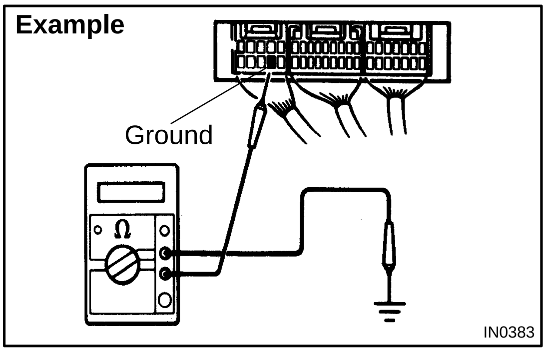
If your results match the examples above, a short circuit exists between terminal 1 of connector B2 and terminal 1 of connector C.

4. CHECK AND REPLACE ECU

NOTICE:

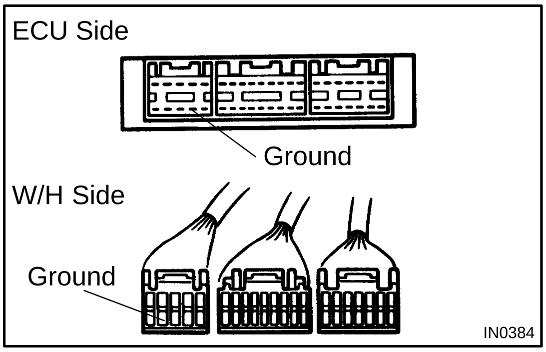
- **The connector should not be disconnected from the ECU. Perform the inspection from the backside of the connector on the wire harness side.**
- **When no measuring condition is specified, perform the inspection with the engine stopped and the ignition switch ON.**
- **Check that the connectors are fully seated. Check for loose, corroded or broken wires.**

(a) First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty. Replace the ECU with a normal functioning one and check if the symptoms occur. If the trouble symptoms stop, replace the ECU.



(1) Measure the resistance between the ECU ground terminal and body ground.

Resistance: Below 1 Ω



(2) Disconnect the ECU connector. Check the ground terminals (on the ECU side and wire harness side) for evidence of bending, corrosion or foreign material. Lastly check the contact pressure of the female terminals.

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

GENERAL INFORMATION

010S3-01

A large number of ECU controlled systems are used in the PRIUS. In general, ECU controlled systems are considered to be very intricate, requiring a high level of technical knowledge to troubleshoot. However, most problem checking procedures only involve inspecting the ECU controlled system's circuits one by one. An adequate understanding of the system and a basic knowledge of electricity is enough to perform effective troubleshooting, accurate diagnoses and necessary repairs. Detailed information and troubleshooting procedures on major ECU controlled systems in this vehicle are outlined below:

FOR USING OBD II SCAN TOOL OR HAND-HELD TESTER

- Before using the scan tool or tester, the scan tool's instruction book or tester's operator manual should be read thoroughly.
- If the scan tool or tester cannot communicate with the ECU controlled systems when you have connected the cable of the tester to the DLC3 with the power switch and tester turned ON, there is a problem on the vehicle side or tester side.
  (1) If communication is normal when the tester is connected to another vehicle, inspect the diagnosis data link line (Bus⊕line) or ECU power circuit of the vehicle.
  (2) If communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Perform the Self Test procedures outlined in the Tester Operator's Manual.

010S4-01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
Carry out troubleshooting in accordance with the procedures below. Only a basic procedure is shown. Details in the Diagnostic Section show the most effective methods for each circuit. Confirm the troubleshooting procedures for the relevant circuit before beginning troubleshooting.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS

(a) Ask the customer about the conditions and environment when the problem occurred.

3	SYMPTOM CONFIRMATION AND DTC (AND FREEZE FRAME DATA) CHECK

(a) Check the auxiliary battery voltage.
Standard: 11 to 14 V (Engine stopped)
(b) Visually check the wire harness, connectors and fuses for open and short circuits.
(c) Warm up the engine to the normal operating temperature.
(d) Confirm the problem symptoms and conditions, and check for DTCs according to the related chart.

OK → **Go to step 5**

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4	DTC CHART

(a) Check the results obtained in step 3, then confirm the inspection procedures for the system or part using the DTC chart.

→ **Go to step 6**

5	PROBLEM SYMPTOMS CHART

(a) Check the results obtained in step 3. Confirm the inspection procedures for the system or part using the problem symptoms table.

6	CIRCUIT INSPECTION OR PARTS INSPECTION

(a) Confirm the circuit in the system or the part that should be checked using the problem symptoms table or the results obtained in step 4.

7	REPAIR

(a) Repair the affected system or part according to the instructions in step 6.

8	CONFIRMATION TEST

(a) After completing repairs, confirm that the problem has been solved. If the problem does not recur, perform a confirmation test under the same conditions and in the same environment as when it occurred the first time.

END

CUSTOMER PROBLEM ANALYSIS

HINT:

- In troubleshooting, the problem symptoms must be confirmed accurately. Preconceptions should be discarded in order to give an accurate judgement. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.
- As much information as possible should be gathered for reference. Past problems that seem unrelated may also help in some cases. In the Diagnostic section, a customer problem analysis table is provided for each system.
- 5 items are important points in the problem analysis:

Important Points with Customer Problem Analysis

- What ----- Vehicle model, system name
- When ----- Date, time, occurrence frequency
- Where ----- Road conditions
- Under what conditions? ----- Running conditions, driving conditions, weather conditions
- How did it happen? ----- Problem symptoms

(Sample) Supplemental Restraint System check sheet

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name

Customer's Name		**VIN**	
		Production Date	/ /
		License Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]

SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE

HINT:

The diagnostic system in the PRIUS has various functions.

- The first function is the Diagnostic Trouble Code (DTC) check. A DTC is a code stored in the ECU memory whenever a malfunction in the signal circuits to the ECU occurs. In a DTC check, a previous malfunction's DTC can be checked by a technician during troubleshooting.
- Another function is the Input Signal Check, which checks if the signals from various switches are sent to the ECU correctly.
  By using these functions, the problem areas can be narrowed down and troubleshooting is more effective. Diagnostic functions are incorporated in the following systems in the PRIUS:

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
SFI System	✓ (with Check Mode)	✓	✓
Hybrid Control System	✓		✓
Hybrid Battery System	✓		✓
Electronically Controlled Brake System	✓	✓	✓
Shift Control System (Parking Lock Control)	✓		
Electronic Power Steering System	✓	✓	
Air Conditioning System	✓		✓
Supplemental Restraint System	✓	✓	
Audio System	✓	✓	
Navigation System		✓	
Power Window Control System	✓		✓
Power Door Lock Control System	✓		✓
Smart Entry System			✓
Wireless Door Lock Control System	✓		✓
Engine Immobilizer System	✓		✓
Push Button Start System	✓		✓
Multiplex Communication System	✓		
CAN Communication System	✓		✓
Cruise Control System	✓		✓

- In the DTC check, it is very important to determine whether the problem indicated by the DTC is: 1) still occurring, or 2) occurred in the past but has since returned to normal. In addition, the DTC should be compared to the problem symptom to see if they are related. For this reason, DTCs should be checked before and after confirmation of symptoms (i.e., whether or not problem symptoms exist) to determine current system conditions, as shown in the table below.
  Never skip the DTC check. Failure to check DTCs may, depending on the case, result in unnecessary troubleshooting for systems operating normally or lead to repairs not pertinent to the problem. Follow the procedures listed in the fiow chart in the correct order.
- A flow chart showing how to proceed with troubleshooting using the DTC check is shown below. Directions from the flow chart will indicate how to proceed either to DTC troubleshooting or to the troubleshooting of the problem symptoms.

1	DTC CHECK

2	MAKE A NOTE OF DTCS DISPLAYED AND THEN CLEAR THE MEMORY

3	SYMPTOM CONFIRMATION

¿	Symptoms exist
¿	No symptoms exist

a → Go to step 5

b

4	SIMULATION TEST USING SYMPTOM SIMULATION METHODS

5	DTC CHECK

¿	DTC displayed
¿	No DTC displayed

a → TROUBLESHOOTING OF PROBLEM INDICATED BY DTC

b

6	SYMPTOM CONFIRMATION

¿	No symptoms exist
¿	Symptoms exist

If a DTC was displayed in the initial DTC check, the problem may have occurred in a wire harness or connector in that circuit in the past. Check the wire harness and connectors (see page 01-47).

a → SYSTEM NORMAL

b

TROUBLESHOOTING OF EACH PROBLEM SYMPTOM

The problem is still occurring in a place other than the diagnostic circuit (the DTC displayed first is either for a past problem or a secondary problem).

SYMPTOM SIMULATION

HINT:

The most difficult case in troubleshooting is when no problem symptoms occur. In such cases, a thorough customer problem analysis must be carried out. A simulation of the same or similar conditions and environment in which the problem occurred in the customer's vehicle should be carried out. No matter how much skill or experience a technician has, troubleshooting without confirming the problem symptoms will lead to important repairs being overlooked and mistakes or delays.

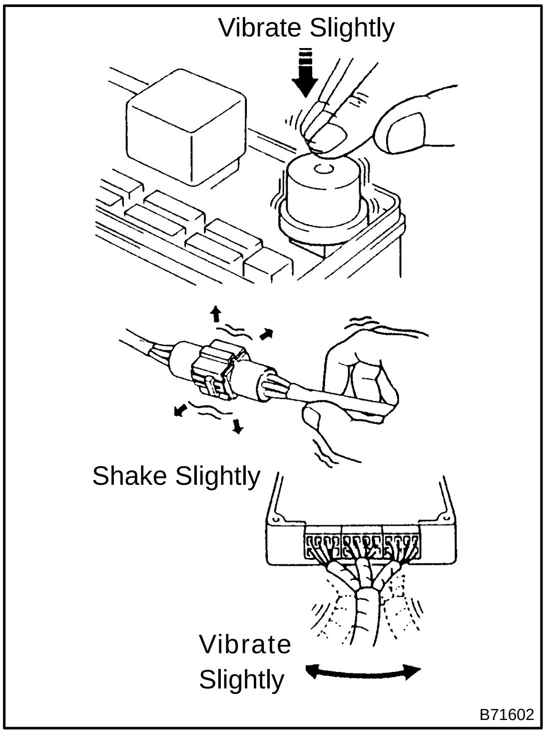
For example:

With a problem that only occurs when the engine is cold or occurs as a result of vibration caused by the road during driving, the problem can never be determined if the symptoms are being checked on a stationary vehicle or a vehicle with a warmed-up engine.

Vibration, heat or water penetration (moisture) is difficult to reproduce. The symptom simulation tests below are effective substitutes for the conditions and can be applied on a stationary vehicle.

Important points in the symptom simulation test:

In the symptom simulation test, the problem symptoms as well as the problem area or parts must be confirmed. First, narrow down the possible problem circuits according to the symptoms. Then, connect the tester and carry out the symptom simulation test, judging whether the circuit being tested is defective or normal. Also, confirm the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes.



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1. VIBRATION METHOD: When vibration seems to be the major cause.

(a) PART AND SENSOR

(1) Apply slight vibration with a finger to the part of the sensor considered to be the cause of the problem and check whether or not the malfunction occurs.

HINT:

Applying strong vibration to relays may open relays.

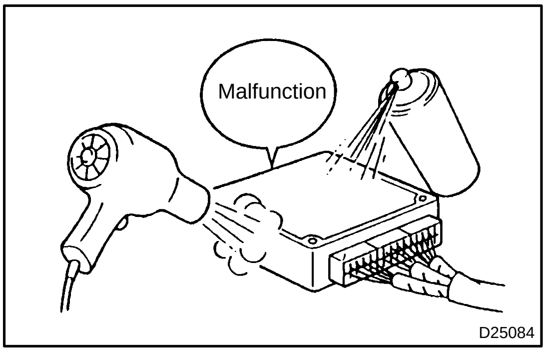
(b) CONNECTORS

(1) Slightly shake the connector vertically and horizontally.

(c) WIRE HARNESS

(1) Slightly shake the wire harness vertically and horizontally.

The connector joint and fulcrum of the vibration are the major areas that should be checked thoroughly.



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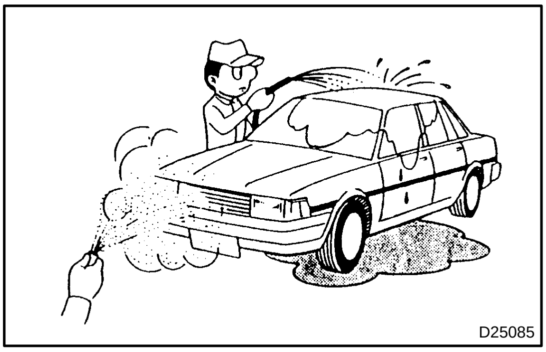
2. HEAT METHOD: If the problem seems to occur when the area in question is heated.

(a) Heat the component that is the possible cause of the malfunction with a hair dryer or similar device. Check if the malfunction occurs.

NOTICE:

- **Do not heat the component to more than 60 °C (140 °F). Exceeding this temperature may cause damage.**
- **Do not apply heat directly to the parts in the ECU.**



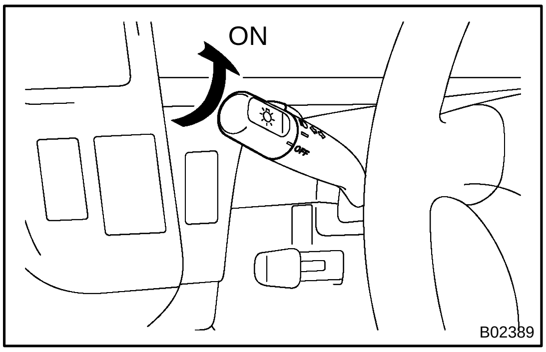
3. WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in high humidity.

(a) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE:

- **Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by applying water spray onto the front of the radiator.**
- **Never apply water directly onto electronic components.**

HINT:
If the vehicle has or had a water leakage problem, the leakage may have damaged the ECU or connections. Look for evidence of corrosion or shorts. Proceed with caution during water tests.



4. HIGH ELECTRICAL LOAD METHOD: When a malfunction seems to occur when electrical load is excessive.

(a) Turn on the heater bower, headlights, rear window defogger and all other electrical loads. Ckeck if the malfunction reoccurs.

DIAGNOSTIC TROUBLE CODE CHART

Use Diagnostic Trouble Codes (DTCs) (from the DTC checks) in the table below to determine the trouble area and proper inspection procedure. The Supplemental Restraint System (SRS) DTC chart is shown below as an example.

- DTC No.
  Indicates the DTC.
- Page or Instructions
  Indicates the page where the inspection procedures for each circuit is to be found, or gives instructions for checking and repairs.

- Trouble Area
  Indicates the suspected areas of the problem.

- Detection Item
  Indicates the system or details of the problem.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

DTC No. (See page)	Detection Item	Trouble Area	SRS Warning Lamp
B0100/13 (05-119)	• Short in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
B0101/14 (05-124)	• Open in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
B0102/11 (05-128)	• Short in D squib circuit (to ground)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
B0103/12 (05-132)	• Short in D squib circuit (to B+)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
B0105/53 (05-136)	• Short in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Wire harness	ON
B0106/54	• Open in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Wire harness	
	b circuit (to Ground)	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Wire harness	

PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot when, during a DTC check, a "Normal" code is displayed but the problem is still occurring. Numbers in the table show the inspection order in which the circuits or parts should be checked.

HINT:

In some cases, the problem is not detected by the diagnostic system even though a problem symptom is present. It is possible that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a completely different system.

- Page
  Indicates the page where the flow chart for each circuit is located.

- Circuit Inspection, Inspection Order
  Indicates the circuit which needs to be checked for each problem symptom. Check in the order indicated by the numbers.

- Problem Symptom

- Circuit or Part Name
  Indicates the circuit or part which needs to be checked.

PROBLEM SYMPTOMS TABLE

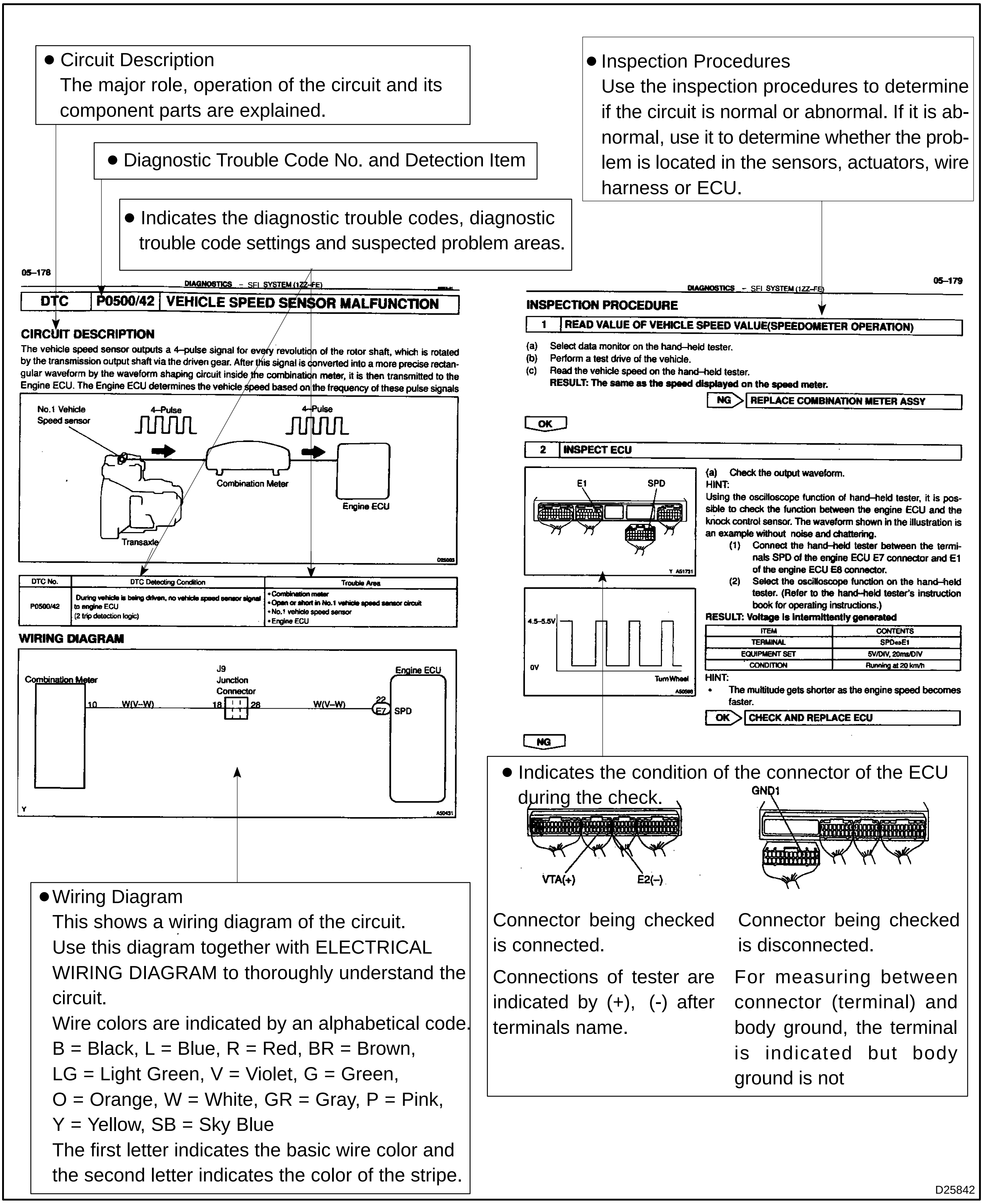
HINT:

Inspect the "Fuse" and "Relay" before confirming the suspected area in the charts below (See page 68-1).

Symptom	Suspected Area	See Page
Black screen	1. Power source circuit (multi-display assy) 2. Multi-display	05-1267 67-7
Screen cannot be dimmer in night time	1. SRS warning light circuit (multi-display assy) 2. Multi-display assy	05-1277 67-7
A navigation system cannot be operated	1. Steering pad switch circuit 2. AVC-LAN circuit (radio receiver assy-multi-display assy) 3. Radio receiver assy 4. Multi-display assy	05-1183 05-1303 67-5 67-7

CIRCUIT INSPECTION

How to read and use each page is shown below.



HOW TO USE THIS MANUAL

010RX-01

GENERAL INFORMATION

1. GENERAL DESCRIPTION

(a) This manual is written in accordance with SAE J2008.

(b) Repair operations can be separated into 3 main processes:
1. Diagnosis
2. Removing/Installing, Replacing, Disassembling/Reassembling, Checking and Adjusting
3. Final Inspection

(c) This manual explains the ”Diagnosis” (found in the ”Diagnostics” section) and ”Removing and Installing, Replacing, Disassembling, Installing and Checking, and Adjusting”. ”Final Inspection” is omitted.

(d) The following essential operations are not written in this manual. However, these operations must be performed in actual situations.
(1) Operations with a jack or lift
(2) Cleaning of a removed part when necessary
(3) Visual check

(e) The ”< >” marks highlight the part’s name in the Parts Catalog.

2. INDEX

(a) An alphabetical INDEX section is provided at the end of the book as a reference to help you find the item to be repaired.

3. PREPARATION

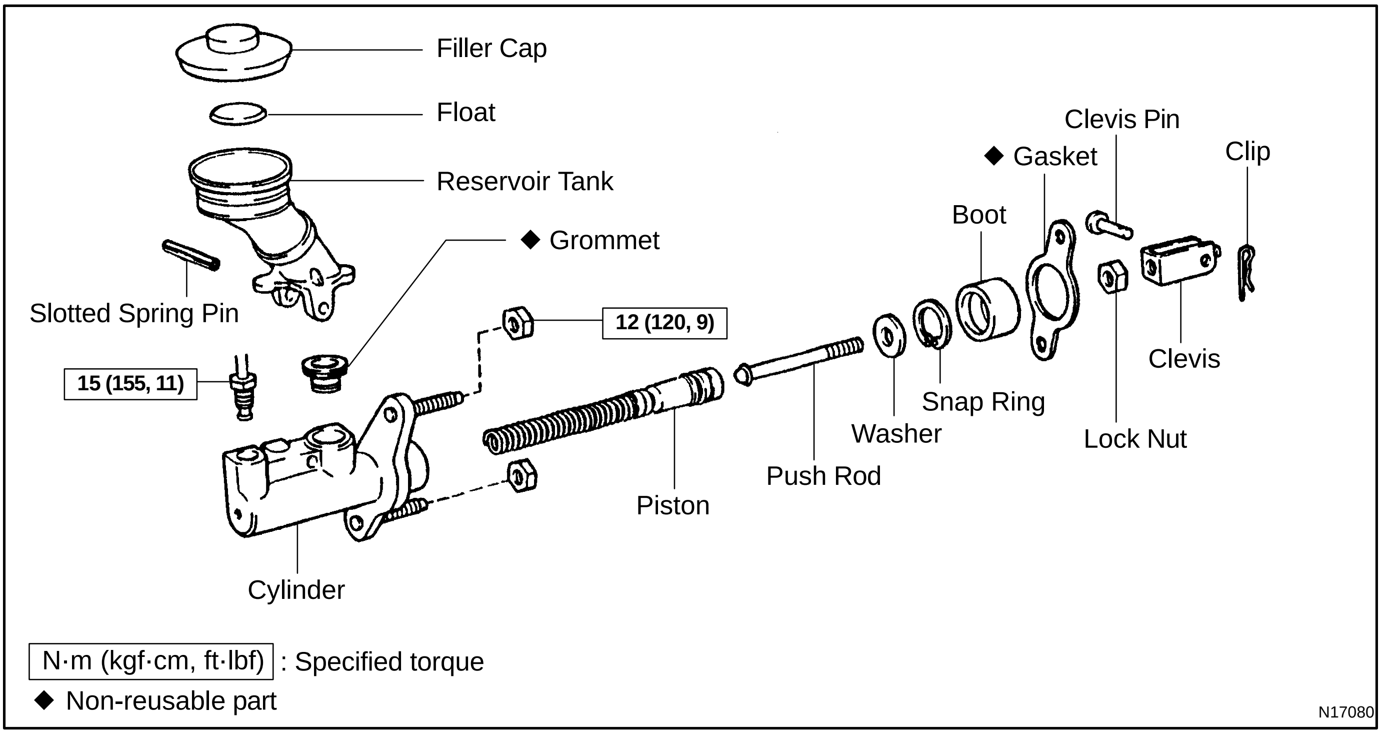
(a) Use of Special Service Tools (SST) and Special Service Materials (SSM) may be required, depending on the repair situation. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the Preparation section of this manual.

4. REPAIR PROCEDURES

(a) A component illustration is placed under the title where necessary.

(b) Non-reusable parts, grease application areas, precoated parts and torque specifications are noted in the component illustrations.

Example:



(c) Torque specifications, grease application areas, and non-reusable parts are emphasized in the procedures.

NOTICE:
There are cases where such information can only be explained by using an illustration. In these cases, all the information such as torque, oil, etc. are described in the illustration.

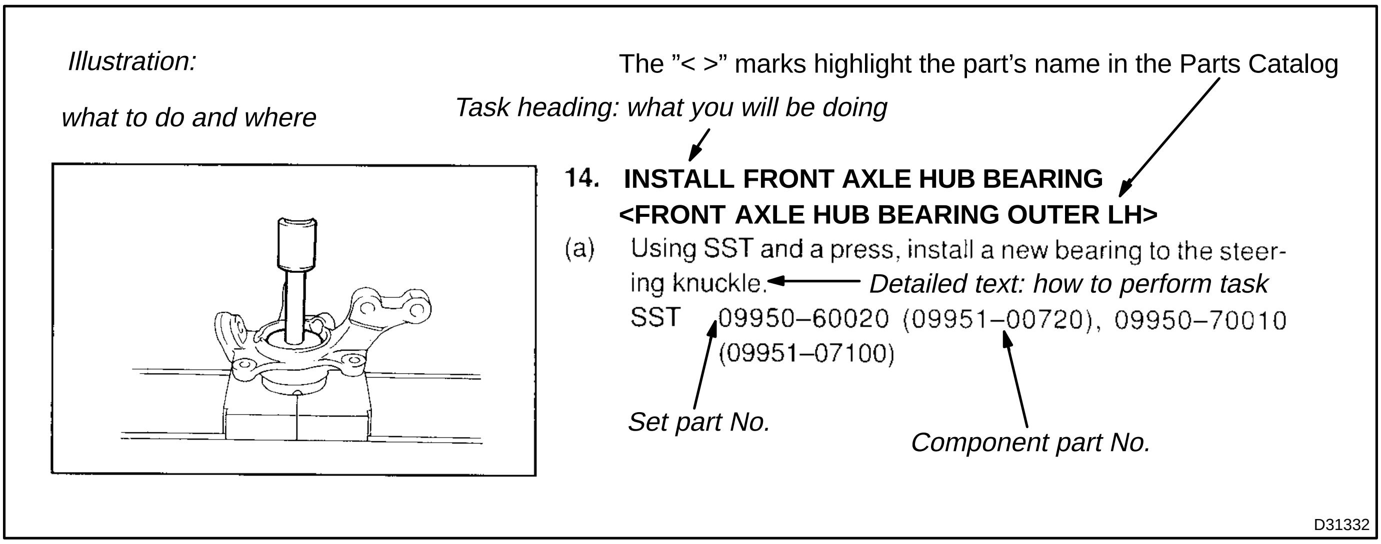
(d) The installation procedures are the removal procedures in reverse order. However, only installation procedures requiring additional information are included.

(e) Only items with key points are described in the text. What to do and other details are placed in illustrations next to the text. Both the text and illustrations are accompanied by standard values and notices.

(f) Illustrations of similar vehicle models are sometimes used. In those cases, specific details may be different from the actual vehicle.

(g) Procedures are presented in a step-by-step format:
 (1) The illustration shows what to do and where to do it.
 (2) The task heading tells what to do.
 (3) The explanation text tells how to perform the task. It also has information such as specifications and warnings.

Example:



HINT:
This format provides an experienced technician with a FAST TRACK to the necessary information. The task headings are easy to read and the text below the task heading provides detailed information. Important specifications and warnings are always written in bold type.

5. SERVICE SPECIFICATIONS

(a) SPECIFICATIONS are presented in bold-faced text throughout the manual. The specifications are also found in the Service Specifications section for quick reference.

6. TERMS DEFINITION

CAUTION	Possibility of injury to you or other people.
NOTICE	Possibility of damage to the components being repaired.
HINT	Provides additional information to help you perform repairs.

7. SI UNIT

(a) The units used in this manual comply with the SI UNIT (International System of Units) standard. Units from the metric system and the English system are also provided.

Example:

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

05J8I-01

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

(a) Perform a simulation test (see page 01-37).

(1) In the simulation test, reproduce the driving condition at the trouble occurrence according to the customer's comments and freeze frame data recorded with DTCs.

(b) Check the connector(s) and terminal(s) (see page 01-47).

(c) Wiggle the harness and connector(s) (see page 01-47).

05J8H-01

CUSTOMER PROBLEM ANALYSIS CHECK

Prius Problem Check Sheet

Name of Dealer	Person in Charge at Headquarters	Person in Charge at Dealer
Office		

Please fill in the blanks within bold frame

Vehicle Specifications

Model Code	NHW 20 -AHE	Problem Occurrence Date	. .	Odometer Reading	miles km
Licence No.		Service Entry Date	. .	Production date	. .
VIN		Option	☐ Navigation (☐equipped by manufacturer ☐dealer) ☐ Cold climate specifications ☐ others ( )		

Interview Results

Contents of complaint (Status when and before/after occurring in the order of events as correct as possible)	Characteristics of Customer	
	Vehicle used before	
	Main use area	☐ city area ☐ suburbs ☐ mountain area ☐ other ( )
	Frequency in use	☐ every day ☐ ____times/week or month

Driving Condition	Road Condition	Vehicle Condition			
Vehicle Speed ________mph ________km/h ☐ when starting ☐ when accelerating ☐ when normal driving ☐ when decelerating ☐ when braking ☐ when stopping ☐ when parking ☐ when turning ☐ when ABS actuating ☐ cruise control driving ☐ others ( )	☐ level road ☐ up hill or down hill ☐ dry paved road ☐ wet paved road ☐ rough paved road ☐ unpaved road ☐ snowy or frozen road ☐ bump or curb ☐ others ( )	☐ Power switch ON (not getting ready) ☐ when starting ☐ right after starting ☐ until____minute after starting ☐ until____minute after starting of driving ☐ when stopping system Status of engine ☐ while stopping engine ☐ when revolving engine HV battery indication ☐____/8 segments ☐ unidentified A/C status ☐ ON ☐ OFF ☐ unidentified	Power switch indicator ☐ illumination (orange or green) ☐ blink ☐ no illumination Shift position (indication) ☐ P ☐ R ☐ N ☐ D ☐ B ☐ when operating _____ → _____ ☐ no indication ☐ blink ☐ unidentified P position switch status ☐ illumination ☐ blink ☐ no illumination ☐ unidentified	Warning lamp ☐ ⚠ ☐ engine ☐ charge ☐ PS ☐ HV battery ☐ HV ☐ brake (yellow or red) ☐ ABS ☐ VSC ☐ slip ☐ coolant ☐ other warning ( ) ☐ no warning lamp LLC maintenance record ( ) Frequency in use ☐ every day ☐____times/week or month	Brake operation ☐ brake slowly ☐ brake suddenly ☐ operation with a left foot ☐ not operating Accelerator pedal operation ☐ when depressing ☐ when releasing ☐ when getting a foot off from the pedal Frequency in occurrence ☐ always ☐_____ times/ week or month ☐ only once
Weather: ________ Temperature: ______°F °C Fuel level ____/10 segments	☐ unidentified ☐ unidentified ☐ unidentified				

Vehicle Verification Results

Diagnostic trouble code

HV ★				Brake ★	
INF				INF	
SFI ★		Power Source control		Gate way	
Battery ★		A/C		Smart	
Transmission Control ★		SRS		Immobilizer	
EPS ★		Body		Theft Deterrent	
				Navigation	

★: Indicates that the system has a function to store the freeze frame data. If DTCs have been set, please attach the freeze frame data.

Vehicle Inspection Results (Verification items, reason to identify/presume the cause parts, etc.)	Duplication Status
	☐ always ☐ sometimes conditions when the malfunction occurred ( ) ☐ no reproduction

Replacement Parts	Confirmation Results After Repair
Problem parts: No/Yes (Sending date: . .)	☐ normal ☐ reproduction ☐ other ( )

05J8P-01

DATA LIST/ACTIVE TEST

1. DATA LIST

NOTICE:

- **The DATA LIST values may vary significantly if there are slight differences in measurement, differences in the environment in which the measurements are obtained, or the aging of the vehicle. Thus, definite standards or judgment values are unavailable. Therefore, there may be a malfunction even if a measured value is within the reference range.**
- **In the event of intricate symptoms, collect sample data from another vehicle of the same model operating under identical conditions, in order to reach an overall judgment by comparing all the items of DATA LIST.**

HINT:

Using the DATA LIST displayed on the hand-held tester, you can read the values including those of the switches, sensors, actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method to shorten diagnostic time.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV BATTERY / DATA LIST.
(e) Check the results by referring to the following table.

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
MIL status	MIL status/ ON or OFF	MIL ON: ON	Constant ON: Repair in accordance with detected DTCs
DRIVING MILEAGE	Accumulated driving mileage after the malfunction occurrence/ Min.: 0 km, Max.: 65,535 km	—	—
BATTERY SOC	Battery state of charge/ Min.: 0 %, Max: 100 %	Always: 0 to 100 %	—
DELTA SOC	Difference between maximum and minimum values of SOC/ Min.: 0 %, Max.: 100 %	READY lamp ON, engine stopped and no electrical load: 0 to 60 %	—
IB BATTERY	Current value of battery pack/ Min.: -327.68 A, Max.: 327.67 A	• Instant soon after a full-load acceleration with the engine stopped: Maximum 140 A (room temperature) • When shifting into N position 1 second has elapsed after automatically engine started with P position, engine stopped, head lamp ON, A/C fan high, and READY lamp ON: Maximum 30 A	—
BATT INSIDE AIR	Temperature of inhalation ambient air into battery pack/ Min.: -327.68°C, Max.: 327.67°C	Undisturbed for 1 day: same as ambient air temperature	—
VMF FAN VOLTAGE	Battery blower motor monitoring voltage/ Min.: -25.6 V, Max.: 25.4 V	Fan mode 1 with READY lamp ON and P position: 9.5 to 11.5 V	—
AUX. BATT V	Auxiliary battery voltage/ Min.: 0 V, Max.: 25.4 V	Equivalent to auxiliary battery voltage	—
WIN	Charge control wattage which is sent from battery ECU to HV control ECU/ Min.: -64 kW, Max.: 0 kW	-25 kW or more	—

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
WOUT	Discharge control wattage which is sent from battery ECU to HV control ECU/ Min.: 0 kW, Max.: 63.5 kW	21 kW or less	—
COOLING FAN SPD	Battery blower motor actuation mode / Min.: 0, Max.: 6	Stopped: 0 Low to high speed actuation: 1 to 6	—
ECU CTRL MODE	ECU control mode/ Min.: 0, Max.: 4	—	—
SBLW RQST	Battery blower motor stop control request (standby blower)	ON/OFF	—
BATT TEMP 1 to 3	Temperature of HV battery/ Min.: -327.68°C, Max.: 327.67°C	Undisturbed for 1 day: Same as ambient air temperature	—
NUM OF BATT	The number of battery blocks/ Min.: 0, Max.: 255	Always: 14	—
BAT BLOCK MIN V	Battery block minimum voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 50 to 60 %: 12 V or more	—
MIN BAT BLOCK #	Battery block number with minimum voltage	One of numbers 0 to 13	—
BAT BLOCK MAX V	Battery block maximum voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 55 to 60 %: 23 V or less	—
MAX BAT BLOCK #	Battery block number with maximum voltage	One of numbers 0 to 13	—
V1 to V14 BATT BLOCK	Battery block voltage/ Min.: -327.68 V, Max.: 327.67 V	SOC 60 %: 12 to 20 V	—
1 to 14 INTNL RESIST	Internal resistance of each battery block/ Min.: 0 Ω, Max.: 0.255 Ω	Always: 0.01 to 0.1 Ω	—
REGULATION	Compliance regulation	OBD2 (CARB)	—
#CODES	The number of emission related powertrain DTCs/ Min.: 0, Max.: 127	—	—
DTC	The number of stored DTCs/ Min.: 0, Max.: 255	—	—

2. ACTIVE TEST

NOTICE:

Beware that if the connector to the hand-held tester becomes disconnected or a communication error occurs during the ACTIVE TEST, the vehicle could become inoperative (READY lamp OFF).

HINT:

Performing an ACTIVE TEST using the hand-held tester enables components including the relay, VSV, and actuator, to be operated without removing any parts. Performing an ACTIVE TEST as the first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display items in the DATA LIST during the ACTIVE TEST.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV BATTERY / ACTIVE TEST.
(e) According to the display on the tester, perform ACTIVE TEST.

Hand-held Tester Display	Purpose	Test Details	Test Condition
COOLING FAN SPD	To check the operation and the speed of the battery blower motor	Stops the battery blower motor in mode 0 or operates it in modes 1 to 6	Disabled when a DTC is detected

DEFINITION OF TERMS

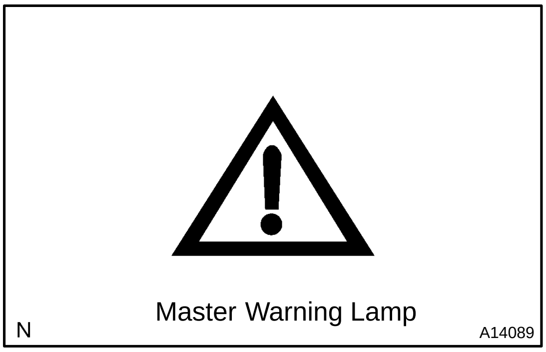
1. Definition of terms

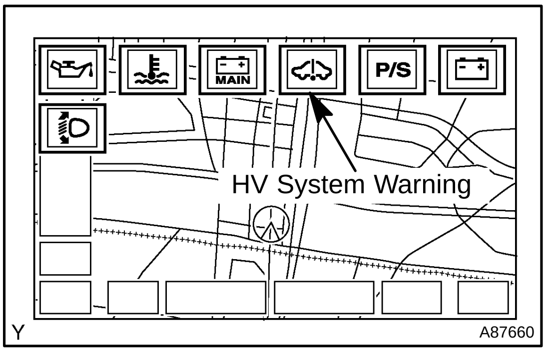
Each monitor description follows a standardized format using these terms:

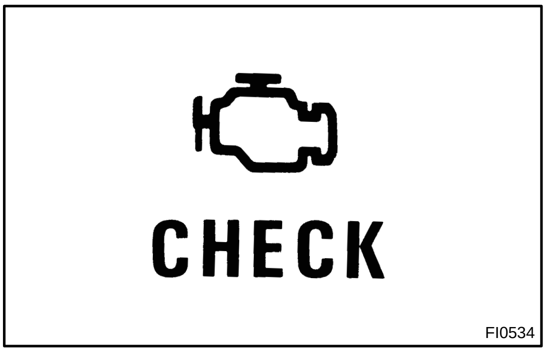
Term	Definition
Duration	The minimum time that the battery ECU must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met
Frequency of operation	The number of times that the battery ECU checks for malfunction per driving cycle ”Once per driving cycle” means that the battery ECU detects malfunction only one time during a single driving cycle ”Continuous” means that the battery ECU detects malfunction every time when enabling condition is met
MIL operation	MIL illumination timing after a defect is detected ”Immediately” means that the battery ECU illuminates the MIL the instant the battery ECU determines that there is malfunction ”2 driving cycles” means that the battery ECU illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle
Monitor description	Description of what the battery ECU monitors and how it detects malfunction (monitoring purpose and its details)
Related DTCs	A group of DTCs that is classified by a system and a troubleshooting procedure
Required sensor/components	The sensors and components that are used by the battery ECU to detect malfunction
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded
Typical enabling condition	Preconditions that allow the battery ECU to detect malfunction With all preconditions satisfied, the battery ECU sets the DTC when the monitored value(s) exceeds the malfunction threshold(s)
Typical malfunction thresholds	Beyond this value, the battery ECU will conclude that there is malfunction and set a DTC

05J8K-01

DIAGNOSIS SYSTEM







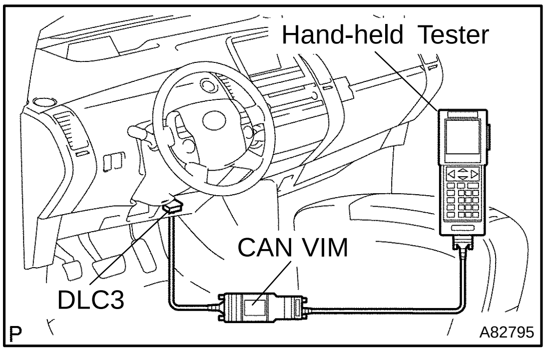
1. DESCRIPTION

- The battery ECU has a self-diagnosis system. If the computer, HV battery system or the components are not working properly, the ECU carries out a diagnosis to detect the malfunction, and illuminates the master warning lamp in the combination meter together with the HV system warning indicator on the multi-information display.

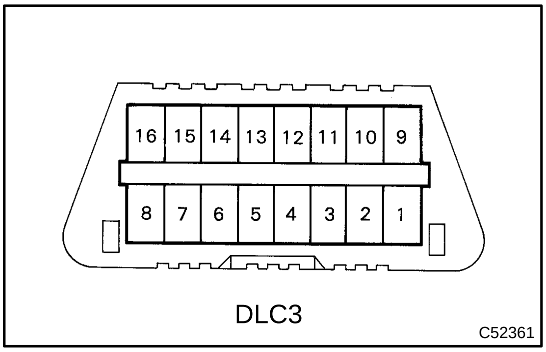
HINT:
The master warning lamp illuminates when HV battery system fails and it blinks when in inspection mode.

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the OBD II scan tool complying with SAE J1978 or the hand-held tester to the vehicle, and read various data output from the vehicle's ECUs.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) in the instrument panel when the computer detects a malfunction in: 1) the emission control systems/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computers. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the battery ECU memory (see page 05-891).

If the malfunction does not recur in 3 consecutive trips, the MIL will go off automatically. However the DTCs remain recorded in the battery ECU memory.



- To check the DTCs, connect the hand-held tester to the Data Link Connector 3 (DLC3) with the CAN vehicle interface module (CAN VIM). Or, connect the OBD II scan tool to the DLC3. The hand-held tester or OBD II scan tool also enables you to erase DTCs and check the freeze frame data and various forms of the HV battery system data (for operating instructions, refer to their respective instruction manuals). The DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set by a manufacturer within the prescribed limits (see the DTC chart on page 05-891).
- Freeze frame data:
  The freeze frame data record the driving condition when malfunction is detected. When troubleshooting, it can help determine if the vehicle was moving, braking, stationary, or reversing.



2. CHECK DLC3

The battery ECU uses the ISO 9141-2 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - LOW-level CAN bus line	54 to 69 Ω	Power switch OFF
CANH	6	HIGH-level CAN bus line	16 - Battery positive	1 MΩ or higher	Power switch OFF
CANH	6	HIGH-level CAN bus line	4 - Chassis ground	1 kΩ or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	16 - Battery positive	1 MΩ or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	4 - Chassis ground	1 kΩ or higher	Power switch OFF

HINT:
If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand-held tester or the OBD II scan tool to the DLC3, turned the power switch ON and operated the tester, there is a problem on the vehicle side or tester side.

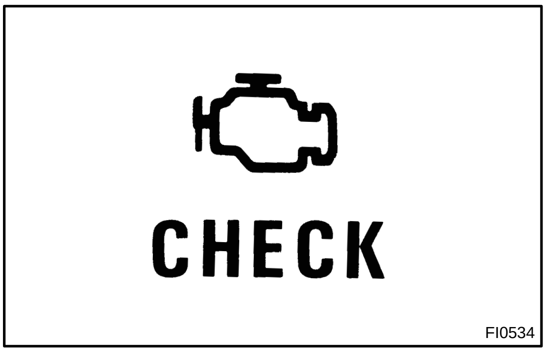
- If communication is normal when the tester or scan tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tester or scan tool is connected to another vehicle, the problem is probably in the tester or scan tool itself, so consult the Service Department listed in its instruction manual.

3. INSPECT AUXILIARY BATTERY

(a) Measure the voltage of the auxiliary battery.

Voltage: 11 to 14 V

(b) Inspect the auxiliary battery, fuses, fusible links, wiring harness, connectors and ground.



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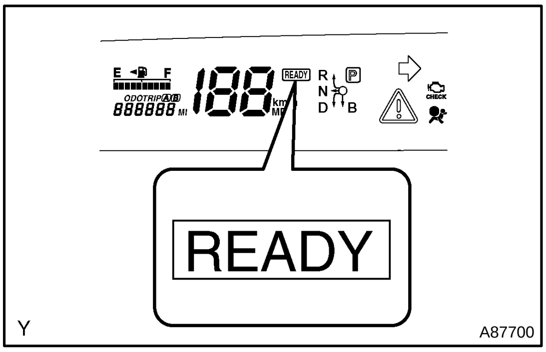
4. CHECK MIL

(a) The MIL illuminates when the power switch is turned ON and the ”READY” lamp is OFF.

If the MIL is not illuminated, troubleshoot the MIL circuit (see page 05-381).



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(b) When the ”READY” turns on, the MIL should turn off.

If the MIL remains on, the diagnosis system has detected a malfunction or abnormality in the system.

05J8Q-01

DIAGNOSTIC TROUBLE CODE CHART

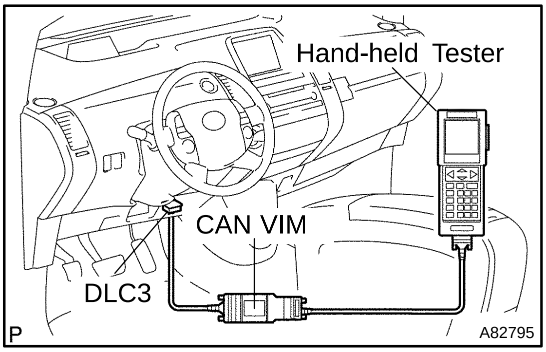
DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3	Memory
P0560 (05-893)	System Voltage	• Wire harness or connector • HEV fuse • Battery ECU	○	○	• HV system	○
P0A1F (05-897)	Battery Energy Control Module	• Battery ECU	○	○	• HV system	○
P0A7F (05-898)	Hybrid Battery Pack Deterioration	• HV battery assembly • Battery ECU	○	○	• HV system	○
P0A80 (05-900)	Replace Hybrid Battery Pack	• HV battery assembly • Battery ECU	○	○	• HV system	○
P0A81 (05-902)	Hybrid Battery Pack Cooling Fan 1	• Quarter vent duct (blower motor controller) • Battery ECU	X	○	• HV system	○
P0A82 (05-904)	Hybrid Battery Pack Cooling Fan 1	• Quarter vent duct • Quarter vent duct No. 2 • Quarter vent duct inner No. 2 • Ventilator inner duct • Battery blower assembly • Battery ECU	X	○	• HV system	○
P0A85 (05-906)	Hybrid Battery Pack Cooling Fan 1	• Wire harness or connector • BATT FAN fuse • Battery blower relay No. 1 • Battery blower assembly • Quarter vent duct (blower motor controller) • Battery ECU	X	○	• HV system	○
P0A95 (05-915)	High Voltage Fuse	• High voltage fuse • Service plug grip • Battery plug • Battery ECU	X	○	• HV system	○
P0A9B (05-918)	Hybrid Battery Temperature Sensor Circuit	• HV battery assembly (battery temperature sensor) • Battery ECU	○	○	• HV system	○
P0AAC (05-921)	Hybrid Battery Pack Air Temperature Sensor "A" Circuit	• HV battery assembly (intake air temperature sensor) • Battery ECU	○	○	• HV system	○
P3011 (05-924)	Battery Block 1 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3012 (05-924)	Battery Block 2 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3013 (05-924)	Battery Block 3 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3014 (05-924)	Battery Block 4 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3015 (05-924)	Battery Block 5 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3016 (05-924)	Battery Block 6 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3017 (05-924)	Battery Block 7 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3018 (05-924)	Battery Block 8 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3019 (05-924)	Battery Block 9 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3020 (05-924)	Battery Block 10 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3	Memory
P3021 (05-924)	Battery Block 11 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3022 (05-924)	Battery Block 12 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3023 (05-924)	Battery Block 13 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3024 (05-924)	Battery Block 14 Becomes Weak	• HV battery assembly • Battery ECU	○	○	• HV system	○
P3030 (05-927)	Disconnection between Battery and ECU	• Junction block assembly (busbar module) • Frame wire No. 2 (busbar and wire harness) • Battery ECU	○	○	• HV system	○
P3056 (05-934)	Battery Current Sensor Circuit Malfunction	• HV battery assembly (wire harness or connector) • Battery current sensor • Battery ECU	○	○	• HV system	○
U0100 (05-939)	Lost Communication with ECM/ PCM ”A”	• CAN communication system	○	○	• HV system	○
U0293 (05-939)	Lost Communication with Hybrid Vehicle Control System	• CAN communication system	○	○	• HV system	○

*1: ”○” ... MIL is illuminated, ”X” ... MIL is not illuminated.
*2: ”○” ... Master warning lamp is illuminated, ”X” ... Master warning lamp is not illuminated.
*3: Warning on the multi-information display.

05J8L-01

DTC CHECK/CLEAR



1. CHECK DTC (HV BATTERY)

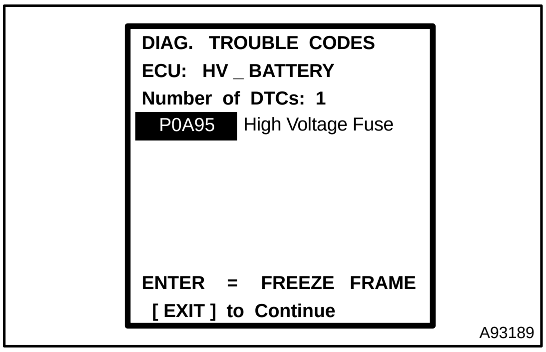
(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

(b) Turn the power switch ON (IG).

(c) Turn the hand-held tester or the OBD II scan tool ON.

(d) Using the hand-held tester or the OBD II scan tool, check the DTCs and freeze frame data and then write them down. For the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.

(e) See page 05-891 to confirm the details of the DTCs.



2. CHECK FREEZE FRAME DATA

(a) If a DTC is present, select that DTC in order to display its freeze frame data.

(b) Read freeze frame data recorded when the DTC was set.

3. CHECK DTC (SYSTEMS OTHER THAN HV BATTERY)

HINT:
The battery ECU maintains mutual communication with the computers, including the ECM, HV control ECU and others. Therefore, if the battery ECU outputs a warning, it is necessary to check and record the DTCs of all the systems.

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

(b) Turn the power switch ON (IG).

(c) Turn the hand-held tester or the OBD II scan tool ON.

(d) For the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / CODES (All).
For the OBD II scan tool, see its instruction manual.

(e) If DTCs output, check the relevant system.

HINT:
If DTCs for the CAN communication system are present in addition to other DTCs, first troubleshoot and repair any malfunctions in the CAN communication (see page 05-2594).

4. CLEAR DTC

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

(b) Turn the power switch ON (IG).

(c) Turn the hand-held tester or the OBD II scan tool ON.

(d) Check that the shift position is in the P position.

(e) Clear DTCs and freeze frame data with the hand-held tester or the OBD II scan tool.

For the hand-held tester:

(1) Enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / CLEAR CODES.

(2) Press YES.

For the OBD II scan tool, see its instruction manual.

05J8O-01

FAIL-SAFE CHART

1. FAIL-SAFE CHART

DTC No.	Detection Item	Driving Condition
P0560	System Voltage	Turns on READY and drives normally
P0A1F	Battery Energy Control Module	Turns on READY and drives in fail-safe mode
P0A7F	Hybrid Battery Pack Deterioration	Turns on READY and drives normally
P0A80	Replace Hybrid Battery Pack	Turns on READY and drives normally
P0A81	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A82	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A85	Hybrid Battery Pack Cooling Fan 1	Turns on READY and drives normally
P0A95	High Voltage Fuse	Turns on READY and drives in fail-safe mode (while the engine is running) Turns off READY and stops the HV control system (while the engine stops)
P0A9B	Hybrid Battery Temperature Sensor Circuit	Turns on READY and drives normally
P0AAC	Hybrid Battery Pack Air Temperature Sensor ”A” Circuit	Turns on READY and drives normally
P3011	Battery Block 1 Becomes Weak	Turns on READY and drives in fail-safe mode
P3012	Battery Block 2 Becomes Weak	Turns on READY and drives in fail-safe mode
P3013	Battery Block 3 Becomes Weak	Turns on READY and drives in fail-safe mode
P3014	Battery Block 4 Becomes Weak	Turns on READY and drives in fail-safe mode
P3015	Battery Block 5 Becomes Weak	Turns on READY and drives in fail-safe mode
P3016	Battery Block 6 Becomes Weak	Turns on READY and drives in fail-safe mode
P3017	Battery Block 7 Becomes Weak	Turns on READY and drives in fail-safe mode
P3018	Battery Block 8 Becomes Weak	Turns on READY and drives in fail-safe mode
P3019	Battery Block 9 Becomes Weak	Turns on READY and drives in fail-safe mode
P3020	Battery Block 10 Becomes Weak	Turns on READY and drives in fail-safe mode
P3021	Battery Block 11 Becomes Weak	Turns on READY and drives in fail-safe mode
P3022	Battery Block 12 Becomes Weak	Turns on READY and drives in fail-safe mode
P3023	Battery Block 13 Becomes Weak	Turns on READY and drives in fail-safe mode
P3024	Battery Block 14 Becomes Weak	Turns on READY and drives in fail-safe mode
P3030	Disconnection between battery and ECU	Turns on READY and drives normally
P3056	Battery Current Sensor Circuit Malfunction	Turns on READY and drives normally
U0100	Lost Communication with ECM/PCM ”A”	Turns on READY and drives normally
U0293	Lost Communication with Hybrid Vehicle control System	Turns on READY and drives normally

FREEZE FRAME DATA

1. FREEZE FRAME DATA

HINT:

The freeze frame data record the operating conditions of the HV battery system and components when the DTC was set. It is used for estimating or simulating the condition of the vehicle when the malfunction occurred.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
(e) Select a DTC in order to display its freeze frame data.
(f) Check the freeze frame data of the DTC that has been detected.

Freeze frame data

Hand-held Tester Display	Measurement Item/Range	Suspected Vehicle Status When Malfunction Occurs
BATTERY SOC	Battery state of charge/ Min.: 0 %, Max: 100 %	State of charge of HV battery
DELTA SOC	Difference between maximum and minimum values of SOC at every battery block/ Min.: 0 %, Max.: 100 %	SOC variance
IB BATTERY	Current value of battery pack/ Min.: -327.68 A, Max.: 327.67 A	Charging/discharging condition of HV battery • Discharging amperage indicated by a positive value • Charging amperage indicated by a negative value
BATT INSIDE AIR	Temperature of inhalation ambient air into battery pack/ Min.: -327.68°C, Max.: 327.67°C	Temperature of inhalation ambient air into battery pack
VMF FAN VOLTAGE	Battery blower motor voltage/ Min.: 0 V, Max.: 25.4 V	Actuation condition of battery blower motor
AUX. BATT V	Auxiliary battery voltage/ Min.: 0 V, Max.: 25.4 V	Condition of auxiliary battery
WIN	Charge control wattage which is sent from battery ECU to HV control ECU/ Min.: -64 kW, Max.: 0 kW	Charge wattage of HV battery
WOUT	Discharge control wattage which is sent from battery ECU to HV control ECU/ Min.: 0 kW, Max.: 63.5 kW	Discharge wattage of HV battery
COOLING FAN SPD	Battery blower motor drive mode/ Min.: 0, Max.: 6	Stopped: 0 Low to high speed actuation: 1 to 6
ECU CTRL MODE	ECU control mode/ Min.: 0, Max.: 4	Operating condition of HV battery
SBLW RQST	Battery blower motor stop control request (standby blower)	Presence of stop control request to battery blower motor
BATT TEMP 1 to 3	Temperature of HV battery/ Min.: -327.68°C, Max.: 327.67°C	Temperature of HV battery
V1 to V14 BATT BLOCK	Battery block voltage/ Min.: -327.68 V, Max.: 327.67 V	Voltage variance among battery blocks

05J8G-01

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 8.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05-876)

3	CONNECT HAND-HELD TESTER OR OBD II SCAN TOOL TO DLC3

HINT:
If the display indicates a communication fault in the tester, inspect the DLC3.

4	CHECK AND RECORD DTC AND FREEZE FRAME DATA (See page 05-884)

HINT:
If a DTC related to the CAN communication system malfunction is output, first troubleshoot and repair the CAN communication (see page 05-2594).

5	CLEAR DTC (See page 05-884)

6	PROBLEM SYMPTOM CONFIRMATION

(a) When the malfunction does not occur, go to A.
(b) When the malfunction occurs, go to B.

B → **Go to step 8**

A

7	SYMPTOM SIMULATION

8	CHECK DTC (See page 05-884)

9	DTC CHART (See page 05-891)

10	CIRCUIT INSPECTION

11	IDENTIFICATION OF PROBLEM

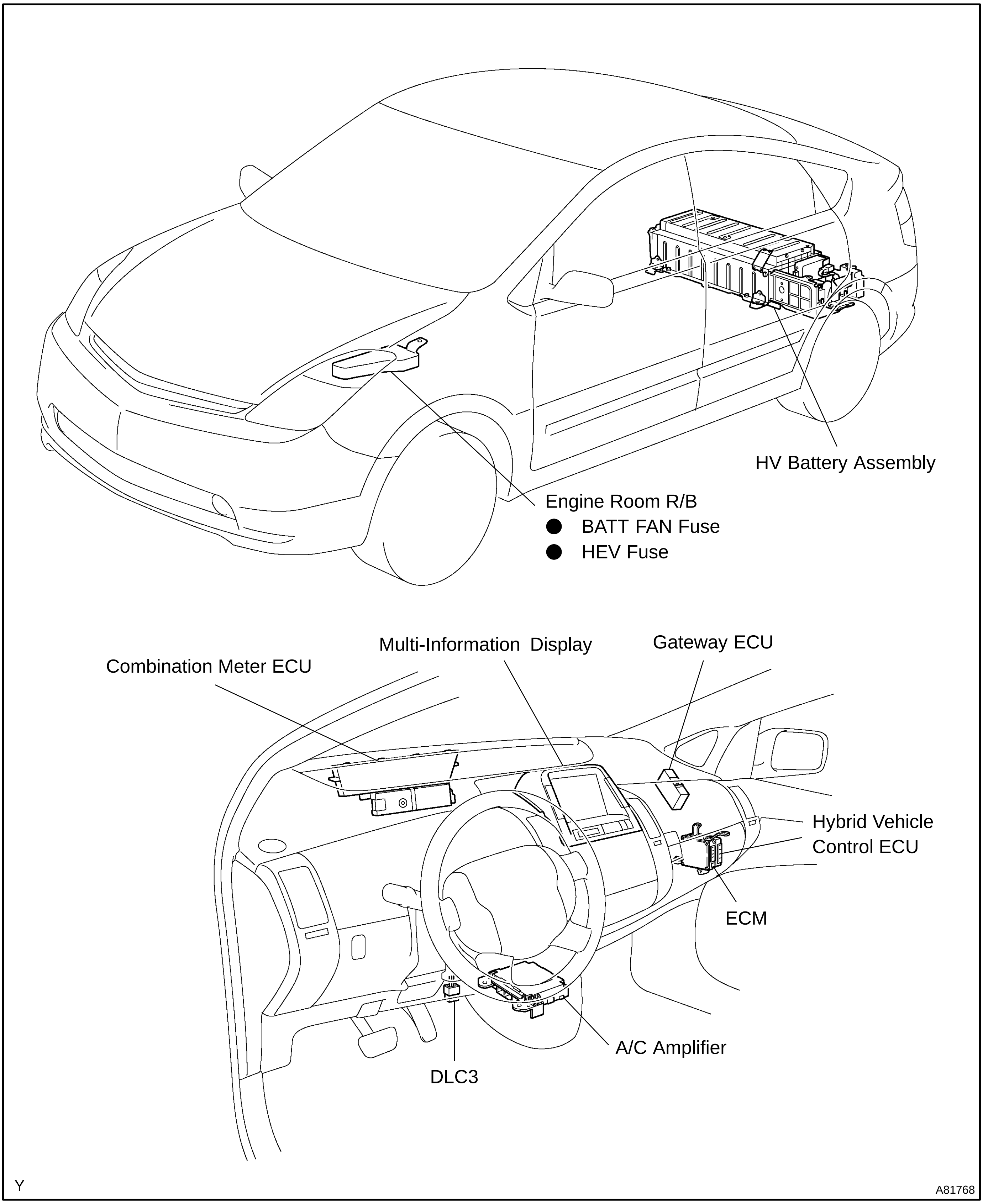
12	ADJUSTMENT AND/OR REPAIR

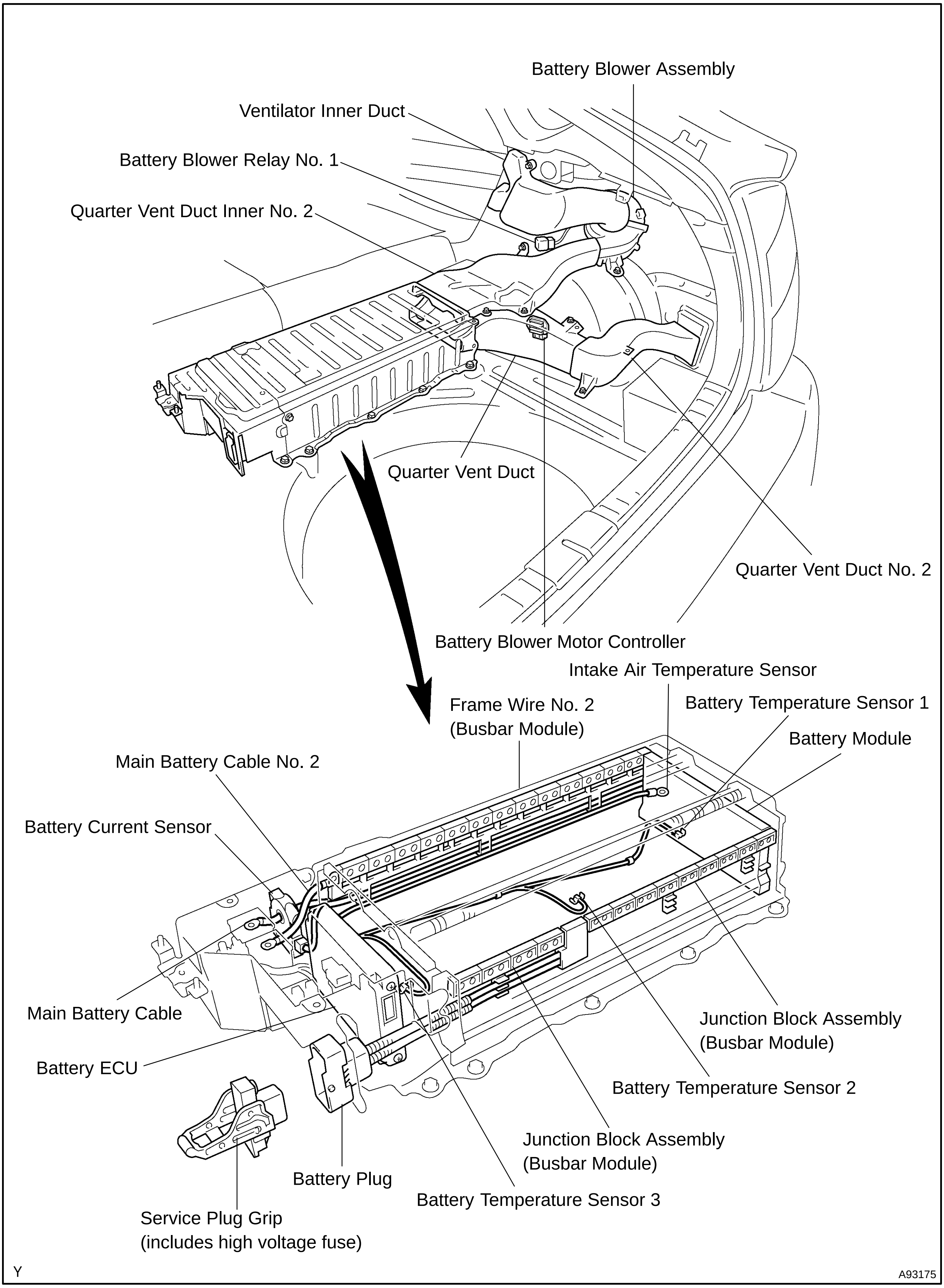
13	CONFIRMATION TEST

END

05J8D-01

LOCATION




Battery Blower Assembly
Ventilator Inner Duct
Battery Blower Relay No. 1
Quarter Vent Duct Inner No. 2
Quarter Vent Duct
Quarter Vent Duct No. 2
Battery Blower Motor Controller
Intake Air Temperature Sensor
Frame Wire No. 2
(Busbar Module)
Battery Temperature Sensor 1
Battery Module
Main Battery Cable No. 2
Battery Current Sensor
Main Battery Cable
Battery ECU
Junction Block Assembly
(Busbar Module)
Battery Temperature Sensor 2
Junction Block Assembly
(Busbar Module)
Battery Plug
Battery Temperature Sensor 3
Service Plug Grip
(includes high voltage fuse)
Y
A93175

DTC	**P3011**	**BATTERY BLOCK 1 BECOMES WEAK**

DTC	**P3012**	**BATTERY BLOCK 2 BECOMES WEAK**

DTC	**P3013**	**BATTERY BLOCK 3 BECOMES WEAK**

DTC	**P3014**	**BATTERY BLOCK 4 BECOMES WEAK**

DTC	**P3015**	**BATTERY BLOCK 5 BECOMES WEAK**

DTC	**P3016**	**BATTERY BLOCK 6 BECOMES WEAK**

DTC	**P3017**	**BATTERY BLOCK 7 BECOMES WEAK**

DTC	**P3018**	**BATTERY BLOCK 8 BECOMES WEAK**

DTC	**P3019**	**BATTERY BLOCK 9 BECOMES WEAK**

DTC	**P3020**	**BATTERY BLOCK 10 BECOMES WEAK**

DTC	**P3021**	**BATTERY BLOCK 11 BECOMES WEAK**

DTC	**P3022**	**BATTERY BLOCK 12 BECOMES WEAK**

DTC	**P3023**	**BATTERY BLOCK 13 BECOMES WEAK**

DTC	**P3024**	**BATTERY BLOCK 14 BECOMES WEAK**

CIRCUIT DESCRIPTION

Refer to DTC P0A80 on page 05-908 .

DTC No.	DTC Detection Condition	Trouble Area
P3011 P3012 P3013 P3014 P3015 P3016 P3017 P3018 P3019 P3020 P3021 P3022 P3023 P3024	Presence of a malfunctioning block is determined based on the voltages from the battery blocks (1 trip detection logic)	• HV battery assembly • Battery ECU

MONITOR DESCRIPTION

If there is an abnormal internal resistance or electromotive voltage in the battery blocks, the battery ECU determines that a malfunction has occurred. When the malfunction detection condition is satisfied, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P3011 to P3024: HV battery/Rationality
Required sensor/components	HV battery
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

HV battery	Abnormal

COMPONENT OPERATING RANGE

HV battery	DTCs P3011 to P3024 are not detected

WIRING DIAGRAM

Refer to DTC P0A80 on page 05-908 .

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

2	CHECK BATTERY BLOCK VOLTAGE

(a) Depress the brake pedal and turn the POWER switch ON.
(b) Depress the brake pedal and accelerator pedal to charge with the HV battery.
(c) Read the battery block voltage by DATA LIST. Select from the hand-held tester's menus: DIAGNOSTICS, OBD/MOBD, HV BATTERY and DATA LIST. Read the values of "V1 BATT BLOCK" to "V14" BATT BLOCK".
(d) Compare the voltage as listed below:
- V1 BATT BLOCK and V2 BATT BLOCK
- V3 BATT BLOCK and V4 BATT BLOCK
- V5 BATT BLOCK and V6 BATT BLOCK
- V7 BATT BLOCK and V8 BATT BLOCK
- V9 BATT BLOCK and V10 BATT BLOCK
- V11 BATT BLOCK and V12 BATT BLOCK
- V13 BATT BLOCK and V14 BATT BLOCK

Result: All of the battery voltage differences are 0.3 V or more.

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC P3030 DISCONNECTION BETWEEN BATTERY AND ECU

CIRCUIT DESCRIPTION

Refer to DTC P0A80 on page 05-900 .

DTC No.	DTC Detection Condition	Trouble Area
P3030	Either of the following conditions occurs (1 trip detection logic) • Voltage at a battery blocks is below 2V • Voltage of all the battery block is between -24 V and 2 V	• Junction block assembly (busbar module) • Frame wire No. 2 (busbar and wire harness) • Battery ECU

MONITOR DESCRIPTION

The battery ECU monitors a voltage of the battery blocks to detect an open malfunction in internal battery voltage sensor circuits of the battery ECU and the wire harness between each battery block and battery ECU. If a voltage at one of the battery blocks is below a standard level or of all the battery blocks is within a specified range, the battery ECU judges that there is an open in the internal sensor circuit(s) or wire harness. The battery ECU then illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P3030: Battery voltage sensor/Range check
Required sensor/components	The wire harness from each battery block to the battery ECU
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

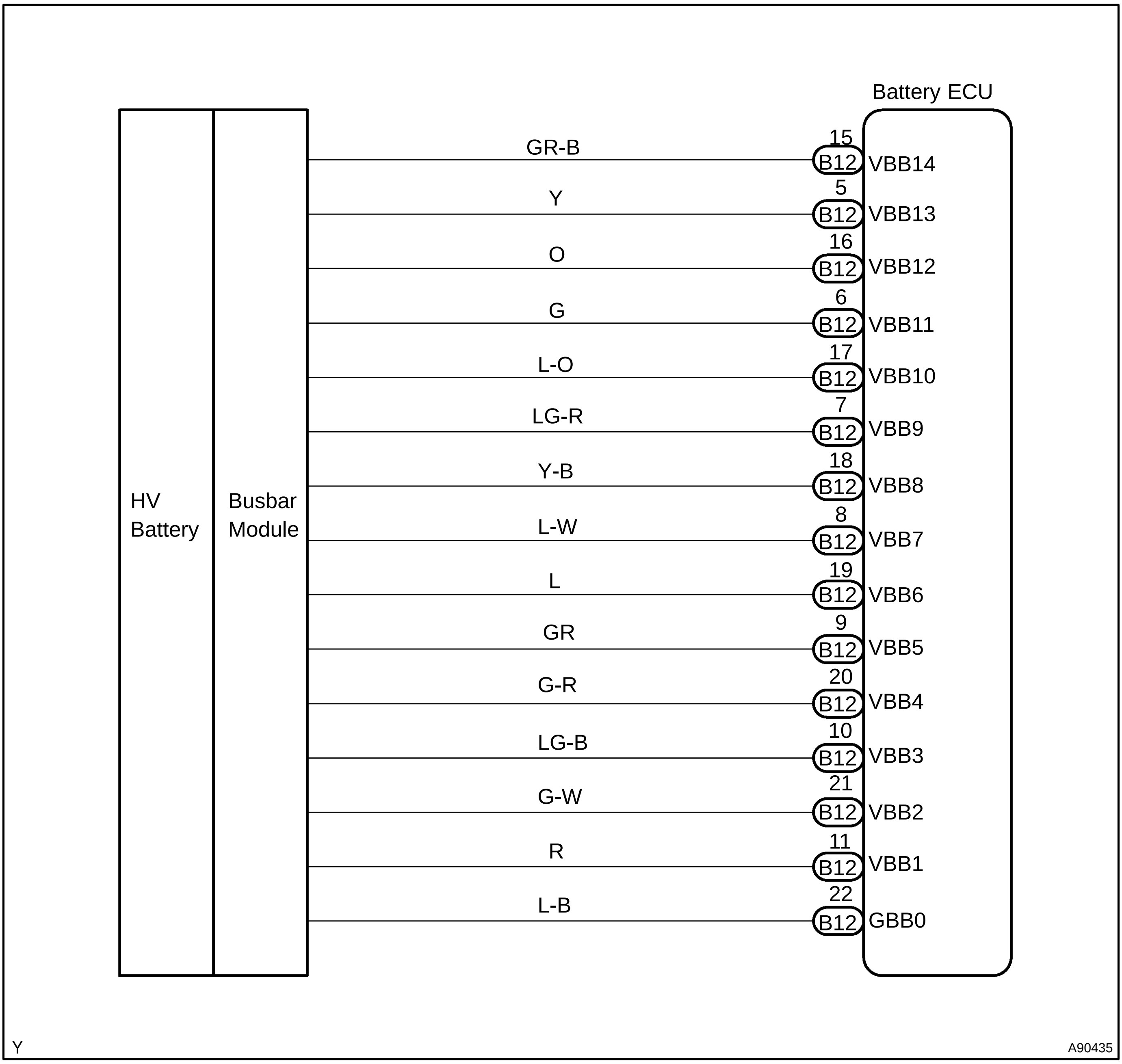
TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is satisfied:	(a) or (b)
(c) Voltage at single battery block	Below 2 V
(d) Voltage of all battery blocks	Between -24 V and 2 V

COMPONENT OPERATING RANGE

Battery ECU	No open malfunction

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.**
- **After disconnecting the service plug grip, wait for at least 5 minutes before touching any of the high-voltage connectors or terminals.**

HINT:
At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

Hand-held tester:

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

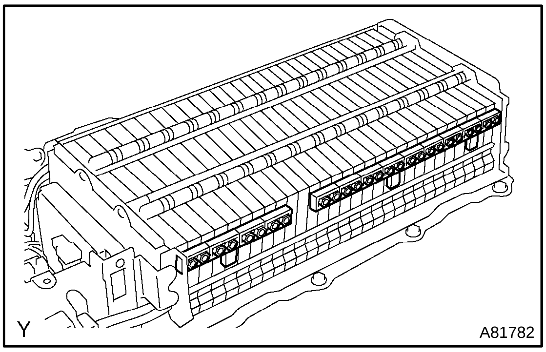
2	READ VALUE OF HAND-HELD TESTER(V1 TO V14 BATT BLOCK)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DATA LIST.
(e) Read the V1 to V14 BATTERY BLOCK on the hand-held tester.
Standard: 2 V or more

OK → **Go to step 5**

NG

3	CHECK JUNCTION BLOCK ASSY(BUSBAR MODULE)

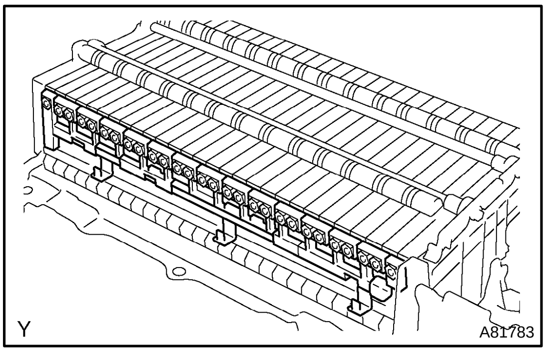


CAUTION:
Wear insulated gloves and goggles before performing the following operation.
(a) Remove the HV battery assembly (see page 21-54).
(b) Remove the battery cover (see page 21-54).
(c) Check that the nuts retaining the junction block assembly are tightened to the specified torque.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

4	CHECK FRAME WIRE NO.2(BUSBAR MODULE)



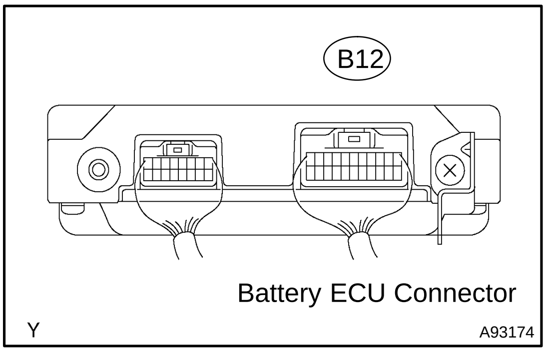
CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Check that the nuts retaining frame wire No. 2 are tightened to the specified torque.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG → TIGHTEN THEM TO SPECIFIED TORQUE

OK

5	CHECK CONNECTION OF FRAME WIRE NO. 2 CONNECTOR



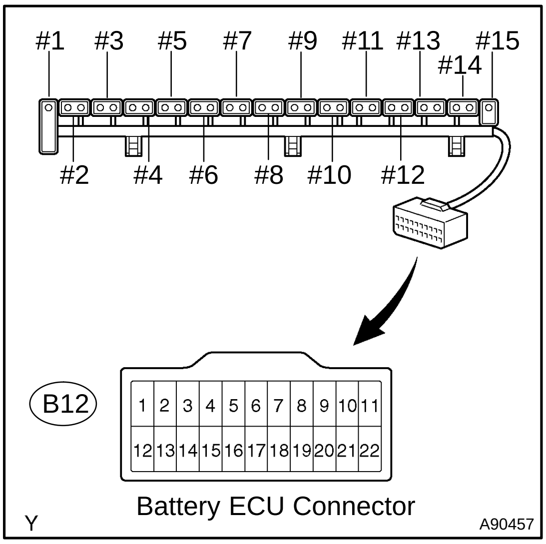
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check the connection condition of the B12 battery ECU connector.
OK: Connector has been connected securely and there is no poor connection.

NG → CONNECT SECURELY

OK

6	INSPECT FRAME WIRE NO.2(BUSBAR MODULE)



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Remove the frame wire No. 2 (see page 21-74).

(b) Check the resistance between each connector of frame wire No. 2 and the metal portion.

Standard (Check for open):

Tester Connection	Specified Condition
GBB0 (B12-22) - #1	Below 1 Ω
VBB1 (B12-11) - #2	Below 1 Ω
VBB2 (B12-21) - #3	Below 1 Ω
VBB3 (B12-10) - #4	Below 1 Ω
VBB4 (B12-20) - #5	Below 1 Ω
VBB5 (B12-9) - #6	Below 1 Ω
VBB6 (B12-19) - #7	Below 1 Ω
VBB7 (B12-8) - #8	Below 1 Ω
VBB8 (B12-18) - #9	Below 1 Ω
VBB9 (B12-7) - #10	Below 1 Ω
VBB10 (B12-17) - #11	Below 1 Ω
VBB11 (B12-6) - #12	Below 1 Ω
VBB12 (B12-16) - #13	Below 1 Ω
VBB13 (B12-5) - #14	Below 1 Ω
VBB14 (B12-15) - #15	Below 1 Ω

(c) Reinstall the frame wire No. 2.

NG → **REPLACE FRAME WIRE NO.2 (See page 21-74)**

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

OBD II scan tool (excluding hand-held tester):

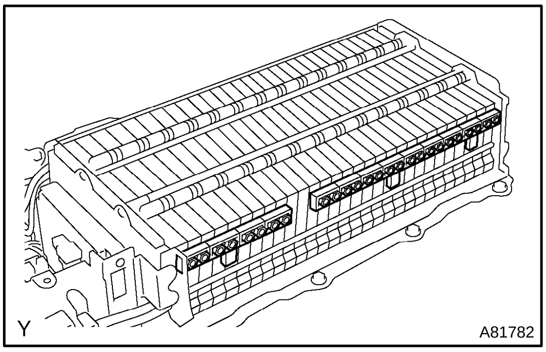
1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY** **(See page 21-98)**

NO

2	CHECK JUNCTION BLOCK ASSY(BUSBAR MODULE)

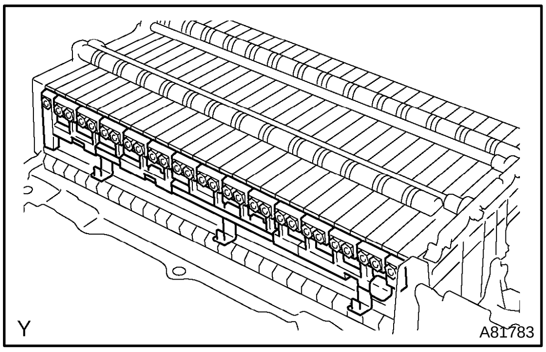


CAUTION:
Wear insulated gloves and goggles before performing the following operation.
(a) Remove the HV battery assembly (see page 21-54).
(b) Remove the battery cover (see page 21-54).
(c) Check that the nuts retaining the junction block assembly are tightened to the specified torque.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

3	CHECK FRAME WIRE NO.2(BUSBAR MODULE)

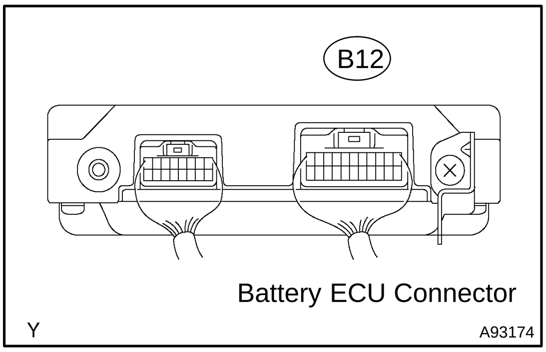


CAUTION:
Wear insulated gloves and goggles before performing the following operation.
(a) Check that the nuts retaining frame wire No. 2 are tightened to the specified torque.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

4 CHECK CONNECTION OF FRAME WIRE NO. 2 CONNECTOR



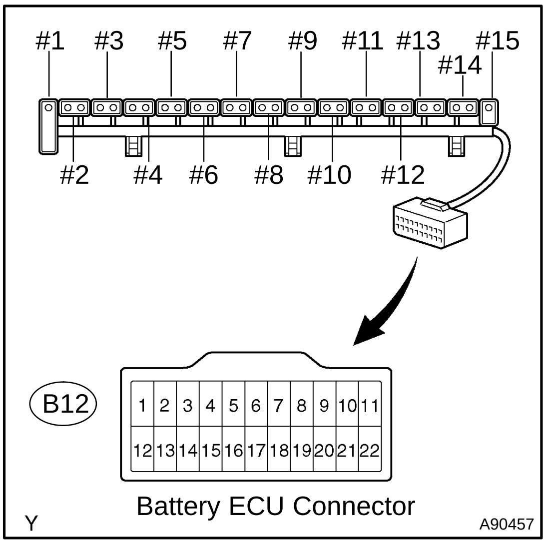
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check the connection condition of the B12 battery ECU connector.
OK: Connector has been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

5 INSPECT FRAME WIRE NO.2(BUSBAR MODULE)



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Remove the frame wire No. 2 (see page 21-74).
(b) Check the resistance between each connector of frame wire No. 2 and the metal portion.
Standard (Check for open):

Tester Connection	Specified Condition
GBB0 (B12-22) - #1	Below 1 Ω
VBB1 (B12-11) - #2	Below 1 Ω
VBB2 (B12-21) - #3	Below 1 Ω
VBB3 (B12-10) - #4	Below 1 Ω
VBB4 (B12-20) - #5	Below 1 Ω
VBB5 (B12-9) - #6	Below 1 Ω
VBB6 (B12-19) - #7	Below 1 Ω
VBB7 (B12-8) - #8	Below 1 Ω
VBB8 (B12-18) - #9	Below 1 Ω
VBB9 (B12-7) - #10	Below 1 Ω
VBB10 (B12-17) - #11	Below 1 Ω
VBB11 (B12-6) - #12	Below 1 Ω
VBB12 (B12-16) - #13	Below 1 Ω
VBB13 (B12-5) - #14	Below 1 Ω
VBB14 (B12-15) - #15	Below 1 Ω

(c) Reinstall the frame wire No. 2.

NG → **REPLACE FRAME WIRE NO.2 (See page 21-74)**

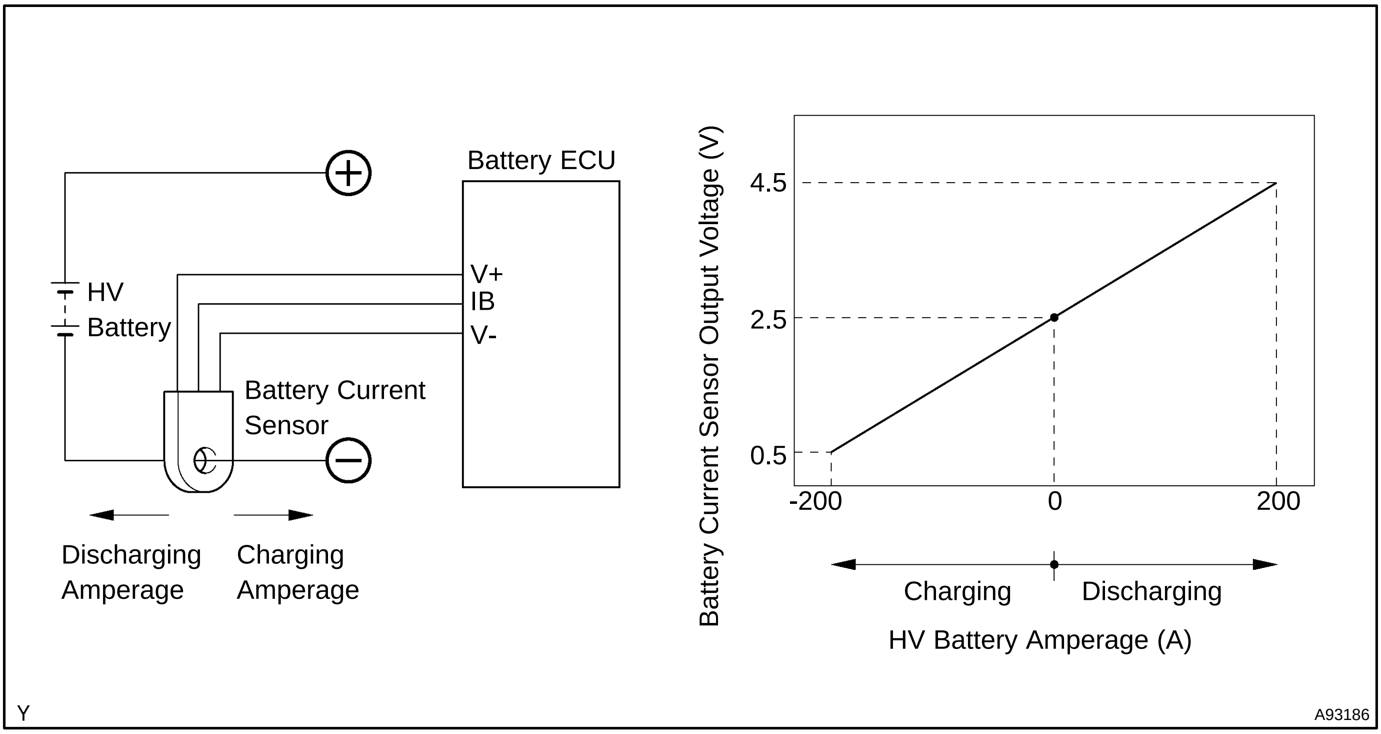
OK

REPLACE BATTERY ECU ASSY (See page 21-98)

DTC	P3056	BATTERY CURRENT SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

The battery current sensor, which is mounted on the negative cable side of the HV battery assembly, detects the amperage that flows into the HV battery. The battery current sensor inputs a voltage (which varies between 0 to 5 V in proportion to the amperage) into the IB terminal of the battery ECU. An output voltage of the battery current sensor below 2.5 V indicates that the HV battery assembly is being charged, and above 2.5 V indicates that the HV battery assembly is being discharged.
The battery ECU determines the charging and discharging amperage of the HV battery assembly based on the signals that are input to its IB terminal, and calculates the SOC (state of charge) of the HV battery through the estimation of the amperage.



DTC No.	DTC Detection Condition	Trouble Area
P3056	Malfunction in battery current sensor (1 or 2 trip detection logic)	• HV battery assembly (wire harness or connector) • Battery current sensor • Battery ECU

MONITOR DESCRIPTION

If the battery ECU detects malfunction in the battery current sensor, it will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P3056: Battery current sensor/Range check Battery current sensor/Rationality
Required sensor/components	Battery current sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Rationality: Immediately Range check: Immediately or 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

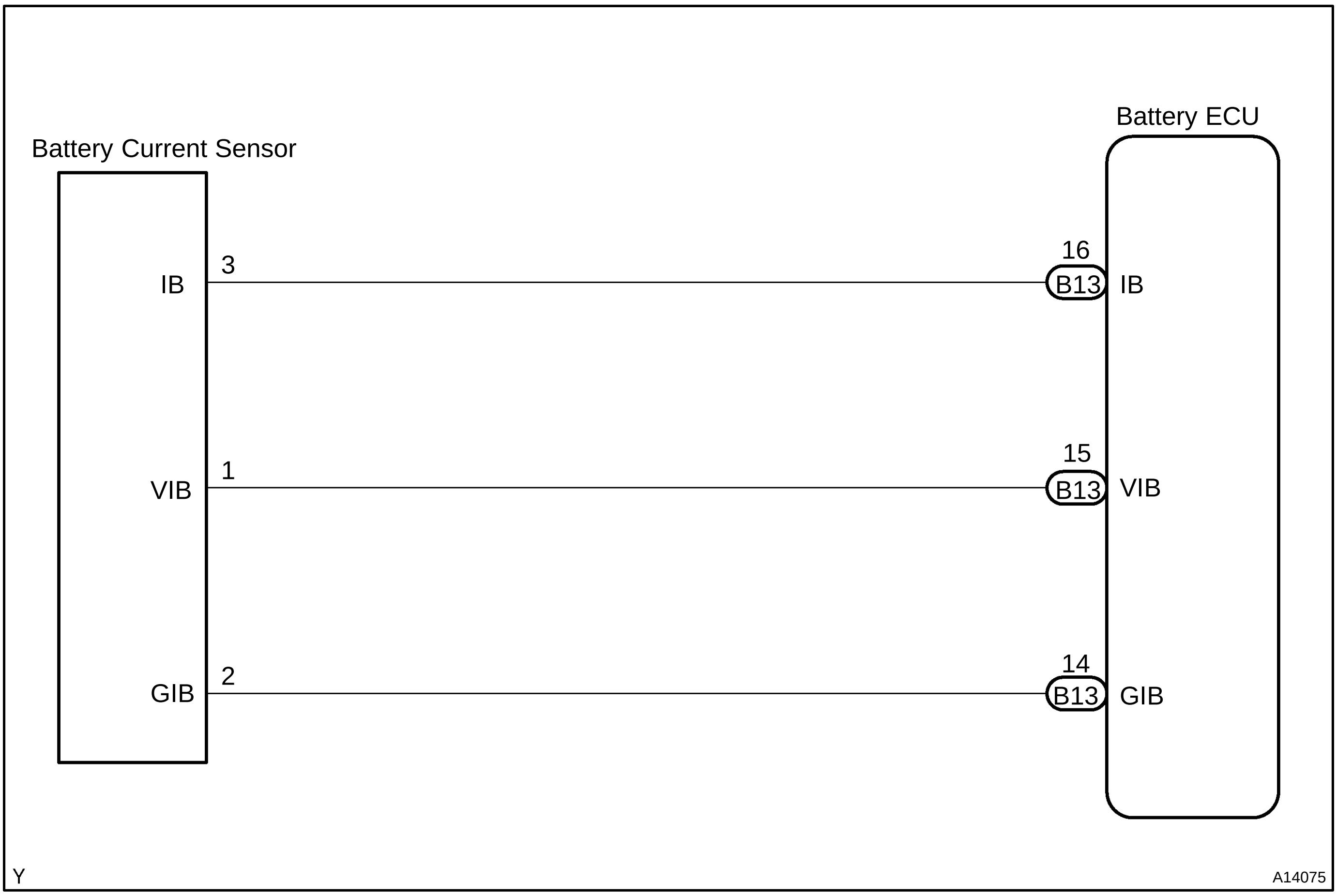
TYPICAL MALFUNCTION THRESHOLDS

Battery current sensor	Abnormal

COMPONENT OPERATING RANGE

Battery current sensor	DTC P3056 is not detected

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.**
- **After disconnecting the service plug grip, wait for at least 5 minutes before touching any of the high-voltage connectors or terminals.**

HINT:
At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

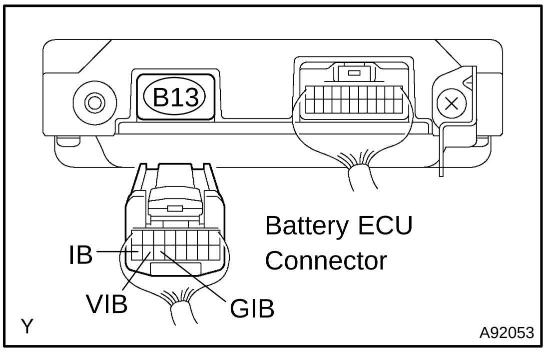
1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

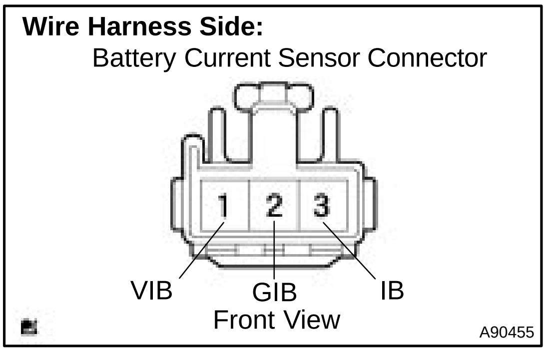
(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY**
(See page 21-98)

NO

2	CHECK HARNESS AND CONNECTOR(BATTERY ECU - BATTERY CURRENT SENSOR)





CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Remove the service plug grip (see page 21-1 16).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Disconnect the B13 battery ECU connector.

(d) Disconnect the battery current sensor connector.

(e) Turn the power switch ON (IG).

HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with the service plug grip removed.

(f) Measure the voltage between the terminals of the B13 battery ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
IB (B13-16) - Body ground	Below 1 V
GIB (B13-14) - Body ground	Below 1 V
VIB (B13-15) - Body ground	Below 1 V

(g) Turn the power switch OFF.

(h) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IB (B13-16) - battery current sensor (3)	Below 1 Ω
GIB (B13-14) - battery current sensor (2)	Below 1 Ω
VIB (B13-15) - battery current sensor (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IB (B13-16) or battery current sensor (3) - Body ground	10 kΩ or higher
GIB (B13-14) or battery current sensor (2) - Body ground	10 kΩ or higher
VIB (B13-15) or battery current sensor (1) - Body ground	10 kΩ or higher

(i) Reconnect the battery current sensor connector.

(j) Reconnect the battery ECU connector.

(k) Reinstall the service plug grip (see page 21-1 16).

HINT:
Since the wire harness is not available as a unit and if it is impossible to repair, replace the entire HV battery assembly.

NG	REPAIR HARNESS OR CONNECTOR, OR REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

OK

3	**REPLACE BATTERY CURRENT SENSOR**

(a) Replace battery current sensor (see page 21-95).
(b) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(c) Turn the power switch ON (IG).
(d) Turn the hand-held tester or the OBD II scan tool ON.
(e) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / CLEAR CODES.
For the OBD II scan tool, see its instruction manual.
(f) Perform a simulation test.

HINT:
Some of the steps involve the detection of 2 trips. Therefore, after performing a simulation test, turn the power switch OFF, and perform the simulation test again.

GO

4	**READ OUTPUT DTC(DTC P3056 IS NOT OUTPUT AGAIN)**

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P3056 is not output again

NO → **REPLACE BATTERY ECU ASSY (See page 21-98)**

YES

SYSTEM OK

05J8C-01

PART AND SYSTEM NAME LIST

1. PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA name	Definition
Toyota HCAC system	HC adsorptive three-way catalytic converter
Hydrocarbon absorptive catalyst (HCAC) system	HC adsorptive three-way catalytic converter
HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable valve timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Oil control valve for variable valve timing, OCV for VVT, VVT OCV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Engine speed sensor	Crankshaft position sensor
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control	Idle speed control
CCV, Canister closed valve	Evaporative emissions canister vent valve
VSV for EVAP	Evaporative emissions canister purge valve
VSV for bypass valve, VSV for vapor pressure sensor	Evaporative emission pressure switching valve
Vapor pressure sensor	Fuel tank pressure sensor
Charcoal canister, Canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic transmission
Intermediate shaft speed sensor "A"	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid

TOYOTA name	Definition
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

2. ABBREVIATIONS LIST IN THIS MANUAL

Abbreviations	Meaning
AC	Alternating Current
A/C	Air Conditioning
A/D	Analog/Digital Converter
ACM	Active Control Engine Mount
AFS	Air Fuel Ratio Sensor
AP	Accelerator Pedal
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
Ave.	Average
B+	Battery Positive Voltage
BARO	Barometric Pressure
CAN	Controller Area Network
CL	Closed Loop
Calif.	California
CCV	Charcoal Canister Vent
CPU	Central Processing Unit
DC	Direct Current
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3
DTC	Diagnostic Trouble Code
DTM	Diagnostic Test Mode
ECM	Engine Control Module
ECT	Engine Coolant Temperature
ECU	Electronic Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EPS	Electric Power Steering
ETCS	Electronic Throttle Control System
EVAP	Evaporative Emissions
F/B	Feedback
FC	Fan Control
Fed.	Federal
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory
FEPROM	Flash Erasable Programmable Read Only Memory
Fr	Front
FTP	Fuel Tank Pressure
GND	Ground
GSA	Gear Shift Actuator
HC	Hydrocarbons
HPU	Hydraulic Power Unit
HV	Hybrid Vehicle
IAC	Idle Air Control
IAT	Intake Air Temperature
INF	Information
ISC	Idle Speed Control
J/B	Junction Block

Abbreviations	Meaning
J/C	Junction Connector
LH	Left-Hand
MG1	Motor Generator No. 1
MG2	Motor Generator No. 2
MIL	Malfunction Indicator Lamp
Min.	Minute(s)
MY	Model Year
No.	Number
NVRAM	Non-Volatile Random Access Memory
OBD	On-Board Diagnostic
OCV	Oil Control Valve
O/D	Overdrive
OP	Open Loop
PCM	Powertrain Control Module
PNP	Park/Neutral Position
PROM	Programmable Read Only Memory
PS, P/S	Power Steering
PSP	Power Steering Pressure
PWM	Pulse Width Modulation
RAM	Random Access Memory
R/B	Relay Block
Rev.	Revolutions
RH	Right-Hand
RM	Relay Module
ROM	Read Only Memory
RPM	Revolution Per Minutes (RPM)
Rr	Rear
SAE	Society of Automotive Engineers Inc.
Sec.	Second(s)
SMR	System Main Relay
SMT	Sequential Manual Transmission
SOC	State Of Charge
SRI	Service Reminder Indicator
SRT	System Readiness Test
ST	Scan Tool
STD	Standard
SW	Switch
TCM	Transmission Control Module
THA	Intake Air Temperature
THS	TOYOTA Hybrid System
TR	Transmission Range
TWC	Three-Way Catalytic Converter
VIN	Vehicle Identification Number
VM	Voltage Monitor
VR	Voltage Regulator
VSS	Vehicle Speed Sensor
VSV	Vacuum Switching Valve
VVT	Variable Valve Timing (System)
VVTL	Variable Valve Timing and Lift (System)
w/	With
w/o	Without

DTC P0560 SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

The battery power is constantly supplied to the AM terminal of the battery ECU for the purpose of maintaining the DTCs and freeze frame data in memory. This voltage is supplied as a backup even if the power switch is turned OFF.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in auxiliary battery power supply system while battery power is supplied to terminal IGCT (1trip detection logic)	• Wire harness or connector • HEV fuse • Battery ECU

MONITOR DESCRIPTION

If 1 or more seconds have elapsed with a voltage of 1 V or less at the AM terminal at the battery ECU, the battery ECU will determine that malfunction has occurred in the back-up power supply system, illuminate the MIL, and set a DTC.

MONITOR STRATEGY

Related DTCs	P0560: Battery ECU/Range check
Required sensor/components	Main: Back-up power source circuit Sub: Battery ECU
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate after next power switch ON (IG)
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

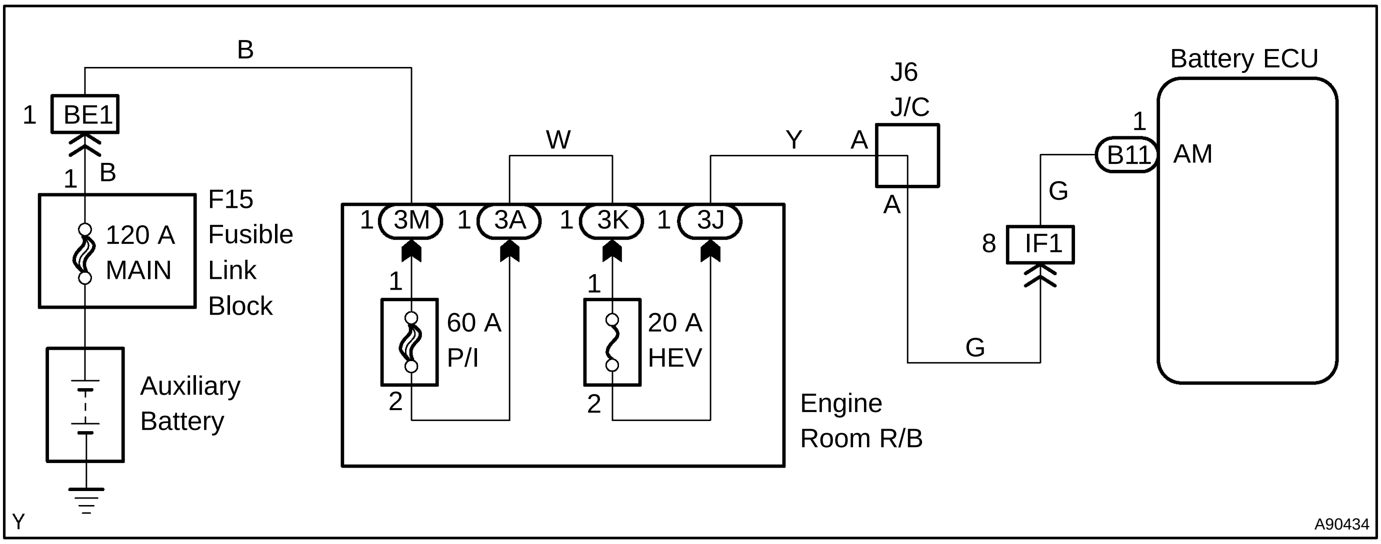
TYPICAL MALFUNCTION THRESHOLDS

Stand-by RAM back-up voltage	1 V or less

COMPONENT OPERATING RANGE

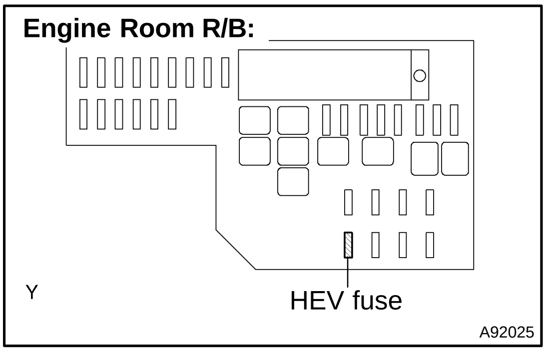
Auxiliary battery voltage	Between 9 V and 14 V

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(HEV 20 A)



(a) Remove the HEV fuse from the engine room R/B.

(b) Check the resistance in the HEV fuse.

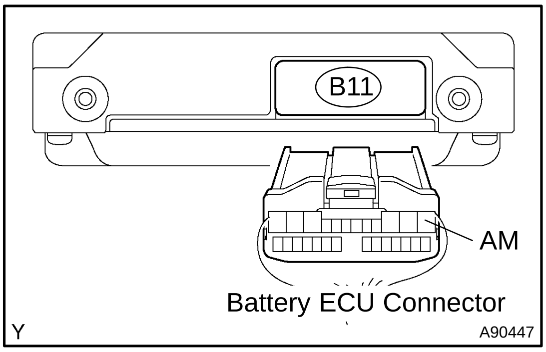
Standard: Below 1 Ω

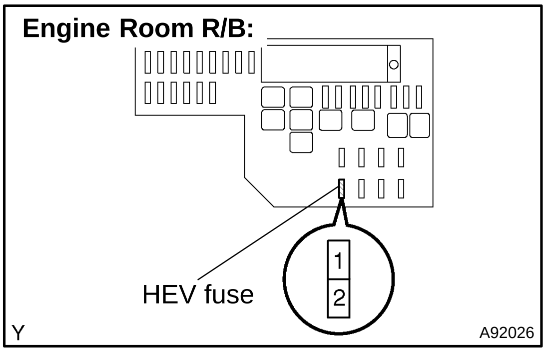
(c) Reinstall the HEV fuse.

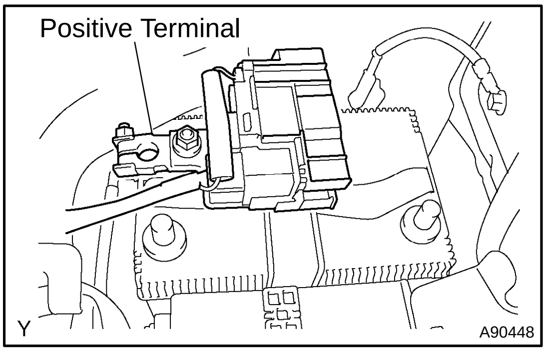
NG	Go to step 3

OK

2 CHECK HARNESS AND CONNECTOR(BATTERY ECU - AUXILIARY BATTERY)







(a) Disconnect the negative auxiliary battery terminal.
(b) Disconnect the positive auxiliary battery terminal.
(c) Remove the HEV fuse from the engine room R/B.
(d) Disconnect the B11 battery ECU connector.
(e) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
AM (B11-1) - HEV fuse (2)	Below 1 Ω

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HEV fuse (1) - positive auxiliary battery terminal	Below 1 Ω

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

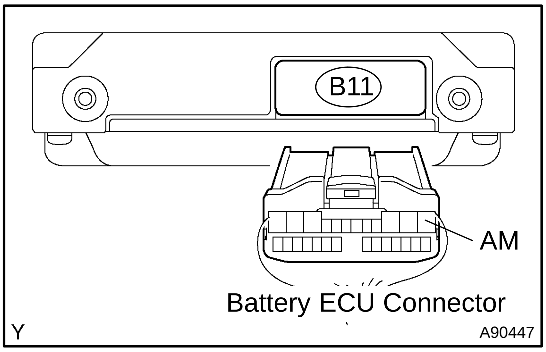
(g) Reconnect the battery ECU connector.
(h) Reinstall the HEV fuse.
(i) Reconnect the positive auxiliary battery terminal.
(j) Reconnect the negative auxiliary battery terminal.

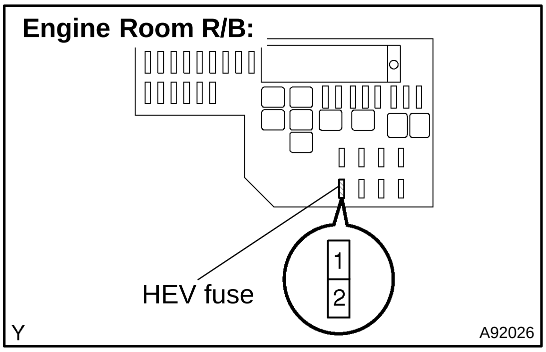
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR CONNECTOR CONNECTION

3	CHECK HARNESS AND CONNECTOR(BATTERY ECU - HEV FUSE)





(a) Disconnect the B11 battery ECU connector.
(b) Remove the HEV fuse from the engine room R/B.
(c) Check the resistance between the wire harness side connector and body ground.

Standard (Check for short):

Tester Connection	Specified Condition
AM (B11-1) or HEV fuse (2) - Body ground	10 kΩ or higher

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(d) Reconnect the battery ECU connector.
(e) Reinstall the HEV fuse.

NG → **AFTER REPAIRING OR REPLACING HARNESS OR CONNECTOR, REPLACE FUSE (HEV 20A)**

OK

REPLACE FUSE (HEV 20 A)

DTC	P0A1F	BATTERY ENERGY CONTROL MODULE

CIRCUIT DESCRIPTION

For the purpose of calculating the SOC (state of charge) of the HV battery and ensuring safety in the event of malfunction in the HV battery assembly, the battery ECU provides the following control functions:

- SOC calculation
  The battery ECU calculates the SOC by estimating the charging and discharging amperage and monitoring other values.
- Cooling fan control
  The battery ECU controls the battery blower assembly in order to protect the HV battery assembly from the heat that is generated during charging and discharging. By maintaining a stable temperature, it promotes the effective operation of the HV battery assembly.
- HV battery assembly malfunction monitoring
  If the battery ECU detects malfunction, it protects the HV battery assembly by limiting or stopping the charging or discharging of the HV battery in accordance with the temperature or voltage of the HV battery assembly.

DTC No.	DTC Detection Condition	Trouble Area
P0A1F	Battery ECU internal error (1 trip detection logic)	• Battery ECU

MONITOR DESCRIPTION

If the battery ECU detects an internal malfunction in the ECU itself, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A1F: Battery ECU/Rationality
Required sensor/components	Battery ECU
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

Battery ECU	Abnormal

COMPONENT OPERATING RANGE

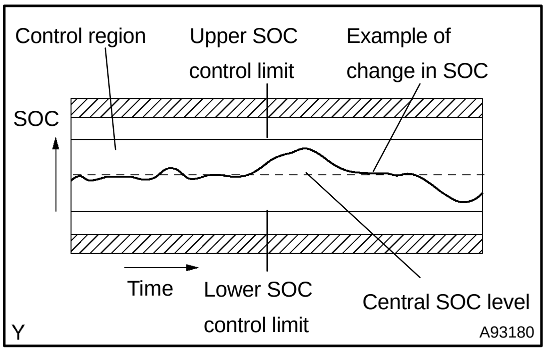
Battery ECU	DTC P0A1F is not detected

INSPECTION PROCEDURE

REPLACE BATTERY ECU ASSY (See page 21-98)

DTC P0A7F HYBRID BATTERY PACK DETERIORATION

CIRCUIT DESCRIPTION



The battery ECU calculates the SOC (state of charge) of the HV battery by estimating the amperage that flows into the HV battery and monitoring other values.
The battery ECU sends the calculated SOC to the HV control ECU. The HV control ECU charges and discharges the HV battery depending on driving patterns based on the information sent by the battery ECU.

DTC No.	DTC Detection Condition	Trouble Area
P0A7F	• Resistance of HV battery assembly is higher than standard (1 trip detection logic) • When the capacity difference between battery modules exceeds the specified value (2 trip detection logic)	• HV battery assembly • Battery ECU

MONITOR DESCRIPTION

The battery ECU calculates the resistance of the HV battery through amperage and voltage, and uses this resistance to determine the extent of deterioration of the HV battery. If the battery ECU detects that the resistance of the HV battery has exceeded the standard, it determines that malfunction has occurred. In addition, the battery ECU monitors the SOC, and if the difference between the maximum and minimum SOC values exceeds the standard, it determines that malfunction has occurred. When either of the malfunction detection conditions is met, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A7F: HV battery/Rationality
Required sensor/components	Main: Battery voltage sensor inside battery ECU, battery current sensor Sub: Battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately or 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

Either of the following condition	(1) or (2)
(1) Internal resistance	Exceeds the standard level
(2) The difference between the maximum SOC and the minimum SOC	Exceeds the standard level

COMPONENT OPERATING RANGE

TOYOTA's intellectual property	-

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-124)**

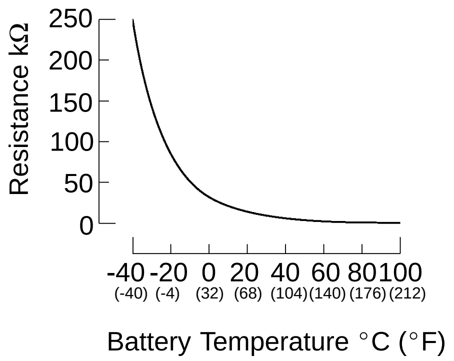
NO

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P0A9B	HYBRID BATTERY TEMPERATURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

Reference:
Sensor Characteristic Diagram



A93185

Three battery temperature sensors are located on the bottom of the HV battery assembly. The resistance of the thermistor, which is enclosed in each battery temperature sensor, changes in accordance with the changes in the temperature of the HV battery assembly. The lower the battery temperature, the higher the resistance of the thermistor. Conversely, the higher the temperature, the lower the resistance.

The battery ECU uses the battery temperature sensors to detect the temperature of the HV battery assembly. Based on the results of this detection, the battery ECU controls the battery blower assembly. (Thus, the blower fan starts when the HV battery temperature rises to a predetermined level.)

DTC No.	DTC Detection Condition	Trouble Area
P0A9B	• Temperature detected by battery temperature sensors is lower than standard (open), or higher than standard (short) (1 trip detection logic) • Malfunction in battery temperature sensor characteristics (1 trip detection logic)	• HV battery assembly (HV battery temperature sensor) • Battery ECU

HINT:
After confirming DTC P0A9B, confirm BATT TEMP 1 to 3 in DIAGNOSIS / OBD/MOBD / HV BATTERY / DATA LIST using the hand-held tester or the OBD II scan tool.

Temperature Displayed	Malfunction
-45°C (-49°F) or less	Open or +B short circuit
95°C (203°F) or more	GND short circuit

MONITOR DESCRIPTION

If the temperature indicated by the battery temperature sensors is lower than the standard level (open), or is higher than the standard level (short), the battery ECU interprets this as a sensor malfunction. If the battery ECU detects that HV battery temperature is out of a normal range or its value is abnormal, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A9B: Battery temperature sensor/Range check Battery temperature sensor/Rationality
Required sensor/components	Battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

Range check:

Resistance of battery temperature sensor	1.108 kΩ or less or 247.7 kΩ or more

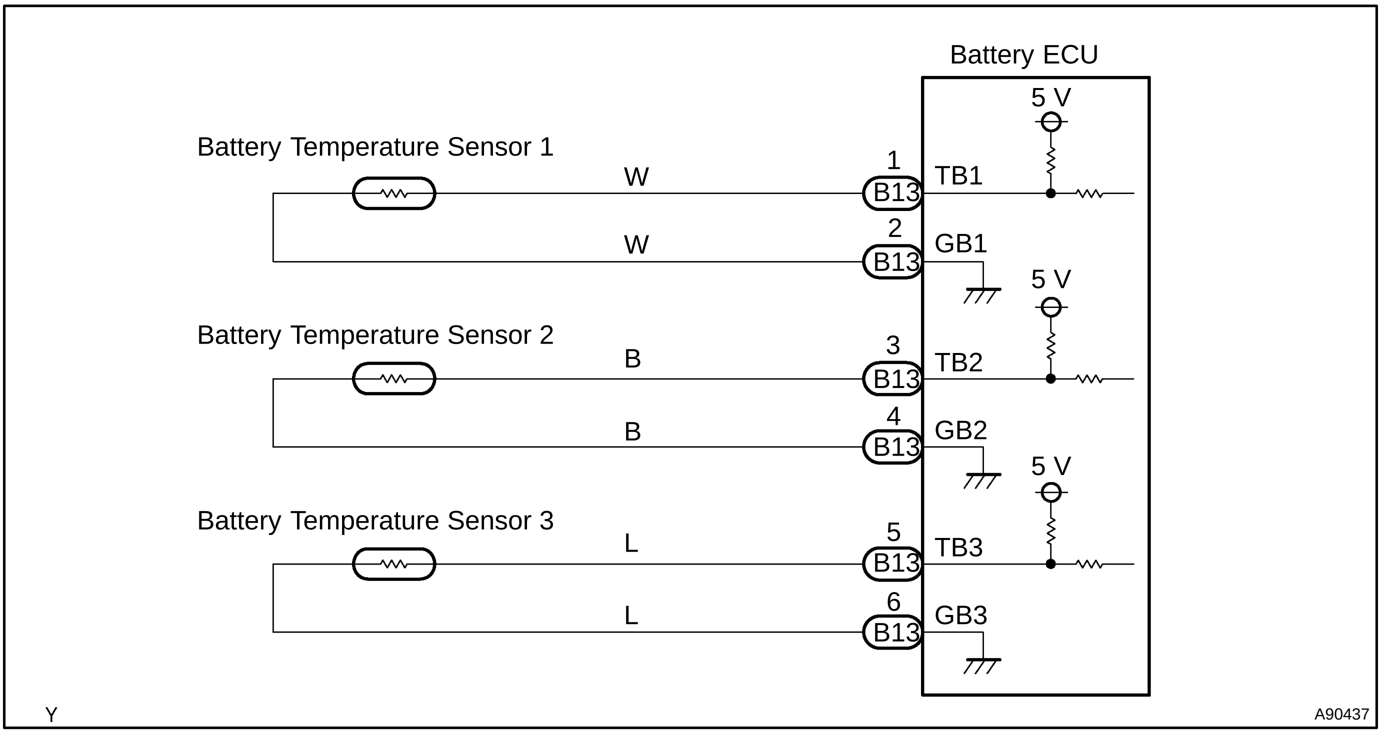
Rationality:

Temperature deviation among batteries (Maximum temperature - Minimum temperature)	Exceeds the standard level

COMPONENT OPERATING RANGE

Battery temperature sensor	9 to 11 kΩ (at 25°C (77°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.**
- **After disconnecting the service plug grip, wait for at least 5 minutes before touching any of the high-voltage connectors or terminals.**

HINT:
At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

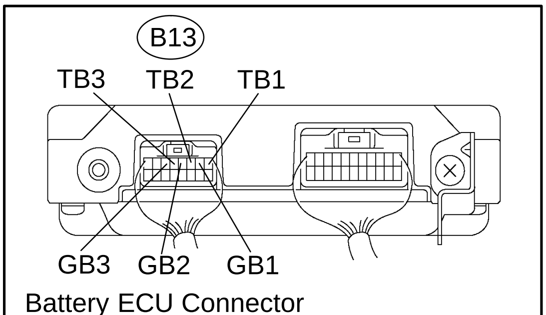
YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

2	CHECK CONNECTION OF BATTERY TEMPERATURE SENSOR CONNECTOR

CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21-1 16).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Check the connection condition of the B13 battery ECU connector.
OK: Connector has been connected securely and there is no poor connection.

HINT:
Since the battery temperature sensor is not available as a unit and if replacement is required, replace the entire HV battery assembly.



Battery ECU Connector

NG → **CONNECT SECURELY**

OK

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P0AAC	HYBRID BATTERY PACK AIR TEMPERATURE SENSOR ”A” CIRCUIT

CIRCUIT DESCRIPTION

The intake air temperature sensor is provided on the HV battery assembly. Its resistance value varies with the changes in the intake air temperature. The characteristics of the intake air temperature sensor are the same as the battery temperature sensors (see page 05-918 for details).

The battery ECU uses the signals from the intake air temperature sensor for adjusting the air flow speed of the battery blower assembly.

DTC No.	DTC Detection Condition	Trouble Area
P0AAC	Temperature detected by intake air temperature sensor is lower than standard (open) or higher than standard (short) (1 trip detection logic)	• HV battery assembly (intake air temperature sensor) • Battery ECU

HINT:

After confirming DTC P0AAC, confirm BATT INSIDE AIR in DIAGNOSIS / OBD/MOBD / HV BATTERY / DATA LIST using the hand-held tester or the OBD II scan tool.

Temperature Displayed	Malfunction
-45°C (-49°F) or less	Open or +B short circuit
95°C (203°F) or more	GND short circuit

MONITOR DESCRIPTION

If the temperature indicated by the intake air temperature sensor is lower than the standard level (open), or is higher than the standard level (short), the battery ECU determines that a malfunction has occurred. If the battery ECU detects an abnormal intake air temperature, it will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0AAC: Intake cooling air temperature sensor/Range check
Required sensor/components	Intake air temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA’s intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA’s intellectual property
Other conditions belong to TOYOTA’s intellectual property	-

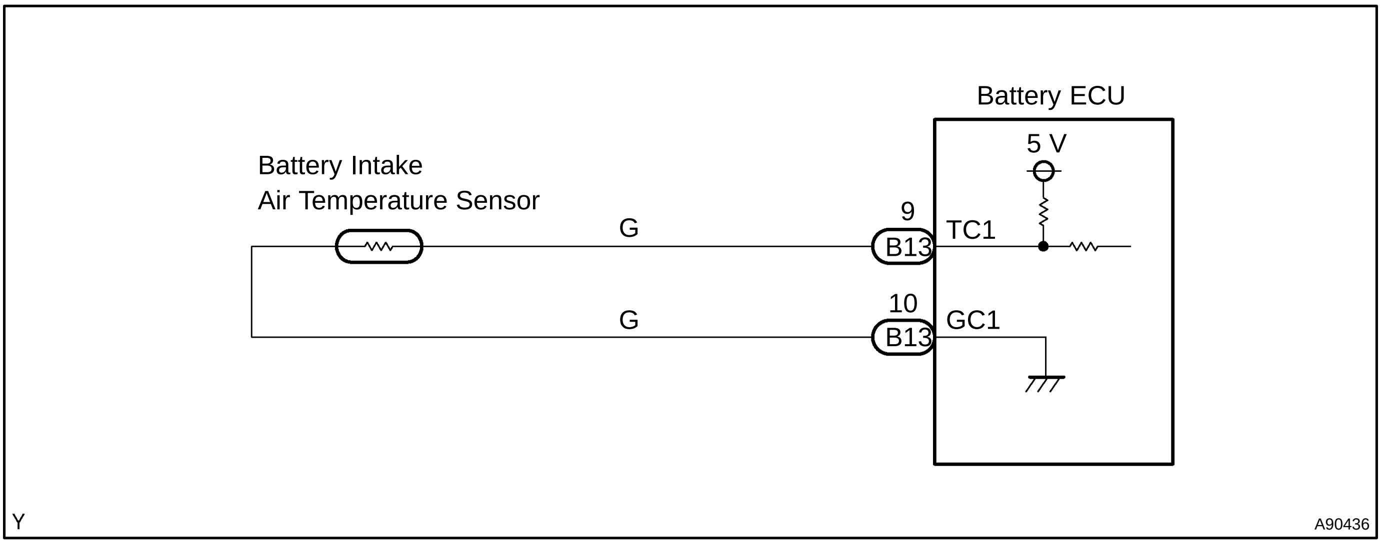
TYPICAL MALFUNCTION THRESHOLDS

Resistance of intake air temperature sensor	1.108 kΩ or less or 247.7 kΩ or more

COMPONENT OPERATING RANGE

Intake air temperature sensor	9 to 11 kΩ (at 25°C (77°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.**
- **After disconnecting the service plug grip, wait for at least 5 minutes before touching any of the high-voltage connectors or terminals.**

HINT:
At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

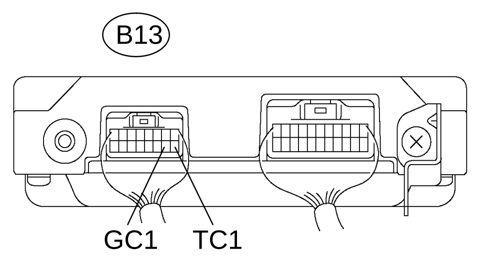
1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

2	CHECK CONNECTION OF INTAKE AIR TEMPERATURE SENSOR CONNECTOR



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Remove the service plug grip (see page 21-1 16).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Check the connection condition of the B13 battery ECU connector.

OK: Connector has been connected securely and there is no poor connection.

HINT:
Since the intake air temperature sensor is not available as a unit and if replacement is required, replace the entire HV battery assembly.

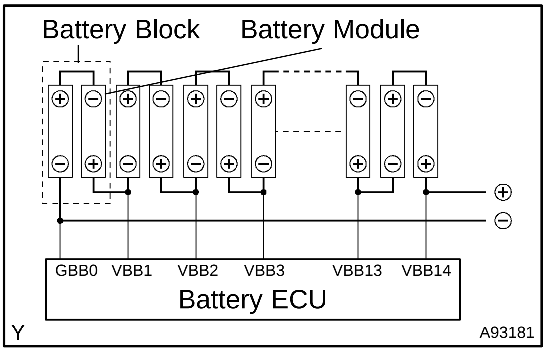
NG → **CONNECT SECURELY**

OK

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P0A80	REPLACE HYBRID BATTERY PACK

CIRCUIT DESCRIPTION



The HV battery assembly consists of nickel hydride batteries. Nickel hydride batteries do not require external charging. The SOC (state of charge) of the HV battery is maintained at a constant voltage level by the HV control ECU while the vehicle is being driven. In the HV battery assembly, 28 modules are connected in series, and each module has six 1.2 V cells that are connected in series. Thus, the HV battery assembly contains a total of 168 cells which produce 201.6 V.

The battery ECU, which monitors two modules as a single battery block, detects the battery block voltage at a total of 14 locations.

DTC No.	DTC Detection Condition	Trouble Area
P0A80	Voltage difference between battery blocks is higher than standard (2 trip detection logic)	• HV battery assembly • Battery ECU

MONITOR DESCRIPTION

The battery ECU, which monitors the voltage of the battery blocks, determines that malfunction has occurred if a voltage difference between the battery blocks exceeds the standard. When the malfunction detection condition is satisfied, the battery ECU illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0A80: HV battery/Rationality
Required sensor/components	Main: Battery voltage sensor inside battery ECU Sub: Battery current sensor, battery temperature sensor
Frequency of operation	Continuous
Duration	TOYOTA's intellectual property
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

Battery voltage difference	Exceeds the standard level

COMPONENT OPERATING RANGE

TOYOTA's intellectual property	-

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

REPLACE HV SUPPLY BATTERY ASSY (See page 21-54)

DTC	P0A81	HYBRID BATTERY PACK COOLING FAN 1

CIRCUIT DESCRIPTION

Refer to DTC P0A85 on page 05-906 .

DTC No.	DTC Detection Condition	Trouble Area
P0A81	Voltage at motor is out of predetermined range in proportion to target control voltage (1 trip detection logic)	• Quarter vent duct (blower motor controller) • Battery ECU

WIRING DIAGRAM

Refer to DTC P0A85 on page 05-906 .

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0A81	A
P0A81 and P0A1F	B
P0A81 and P0A85	C

B → **REPLACE BATTERY ECU ASSY (See page 21-98)**

C → **GO TO DTC P0A85 CHART (See page 05-906)**

A

2	REPLACE QUARTER VENT DUCT(BATTERY BLOWER MOTOR CONTROLLER)

(a) Replace the quarter vent duct (blower motor controller).
(b) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(c) Turn the power switch ON (IG).
(d) Turn the hand-held tester or the OBD II scan tool ON.
(e) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / CLEAR CODES.
For the OBD II scan tool, see its instruction manual.
(f) Perform a simulation test.

GO

3	READ OUTPUT DTC(DTC P0A81 IS OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A81 is output again

YES → **REPLACE BATTERY ECU ASSY**
(See page 21-98)

NO

SYSTEM OK

DTC	P0A82	HYBRID BATTERY PACK COOLING FAN 1

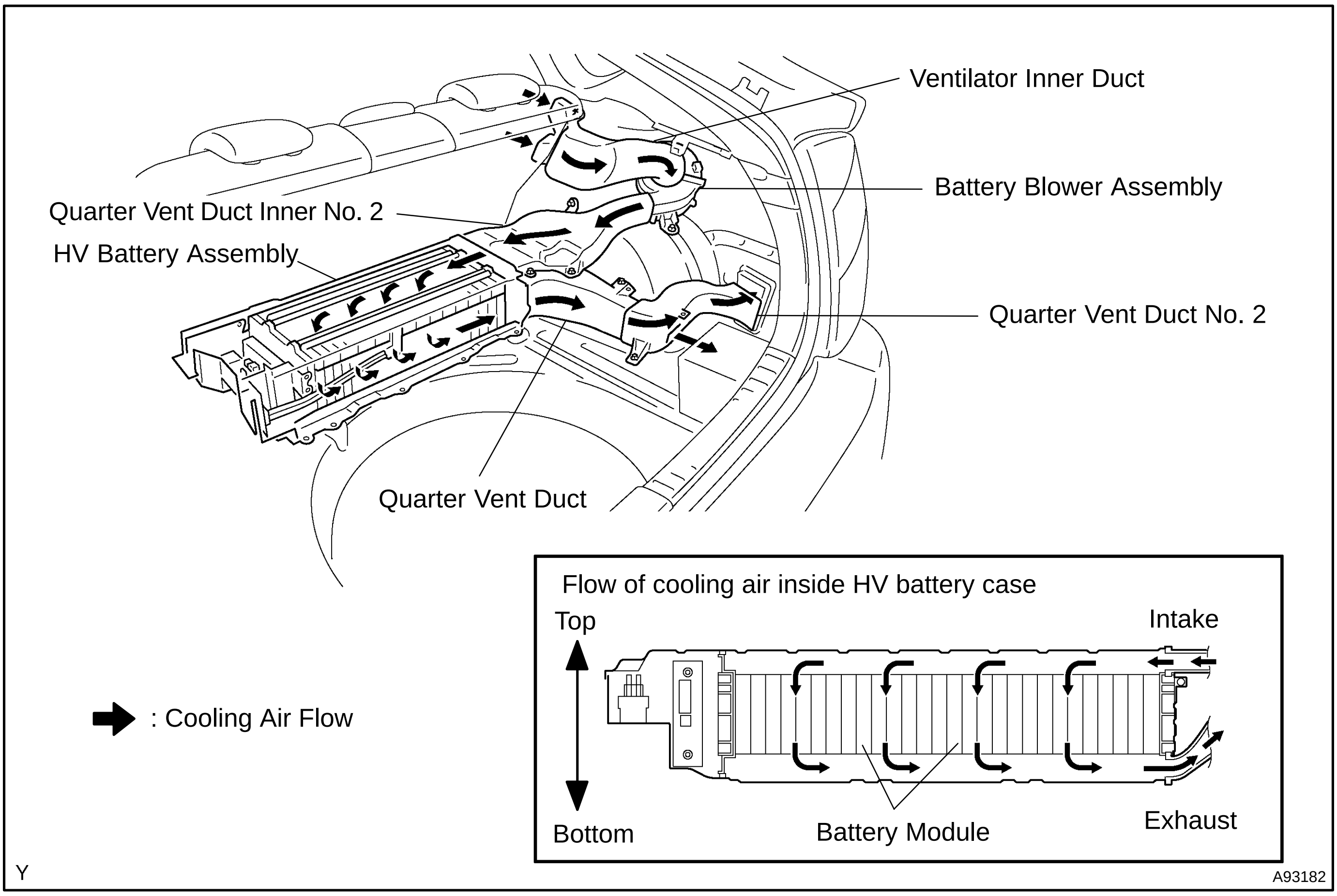
CIRCUIT DESCRIPTION

The cooling air flows into the inlet on the right of the rear seat and travels through an intake duct to the battery blower assembly on the right surface of the luggage compartment. Furthermore, the cooling air travels through an intake duct (which connects the battery blower assembly to the upper right surface of the HV battery assembly) and flows to the HV battery assembly.

The cooling air flows from the top to the bottom between the HV battery modules. After it has cooled the modules, it is discharged from the bottom right surface of the HV battery assembly.

The exhaust air travels through an exhaust duct on the right surface of luggage compartment and is discharged into the cabin as well as outside of the vehicle.

The battery ECU uses battery temperature sensors in order to detect the temperature of the HV battery assembly. Based on the results of this detection, the battery ECU controls the battery blower assembly. (Thus, the battery blower assembly starts when the HV battery temperature rises to a predetermined level.)



DTC No.	DTC Detection Condition	Trouble Area
P0A82	Difference between estimated battery temperature based on blower fan cooling performance and actual temperature is excessive (2 trip detection logic)	• Quarter vent duct • Quarter vent duct No. 2 • Quarter vent duct inner No. 2 • Ventilator inner duct • Battery blower assembly • Battery ECU

INSPECTION PROCEDURE

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY (See page 21-98)**

NO

2	CHECK DUCT AND BLOWER

(a) Check the ducts and the blower listed below for disconnection and damage. Also, check if they have not clogged up with foreign substances.
(1) Quarter vent duct
(2) Quarter vent duct No. 2
(3) Quarter vent duct inner No. 2
(4) Ventilator inner duct
(5) Battery blower assembly

NG → **REMOVE FOREIGN SUBSTANCES OR REPLACE AFFECTED PARTS**

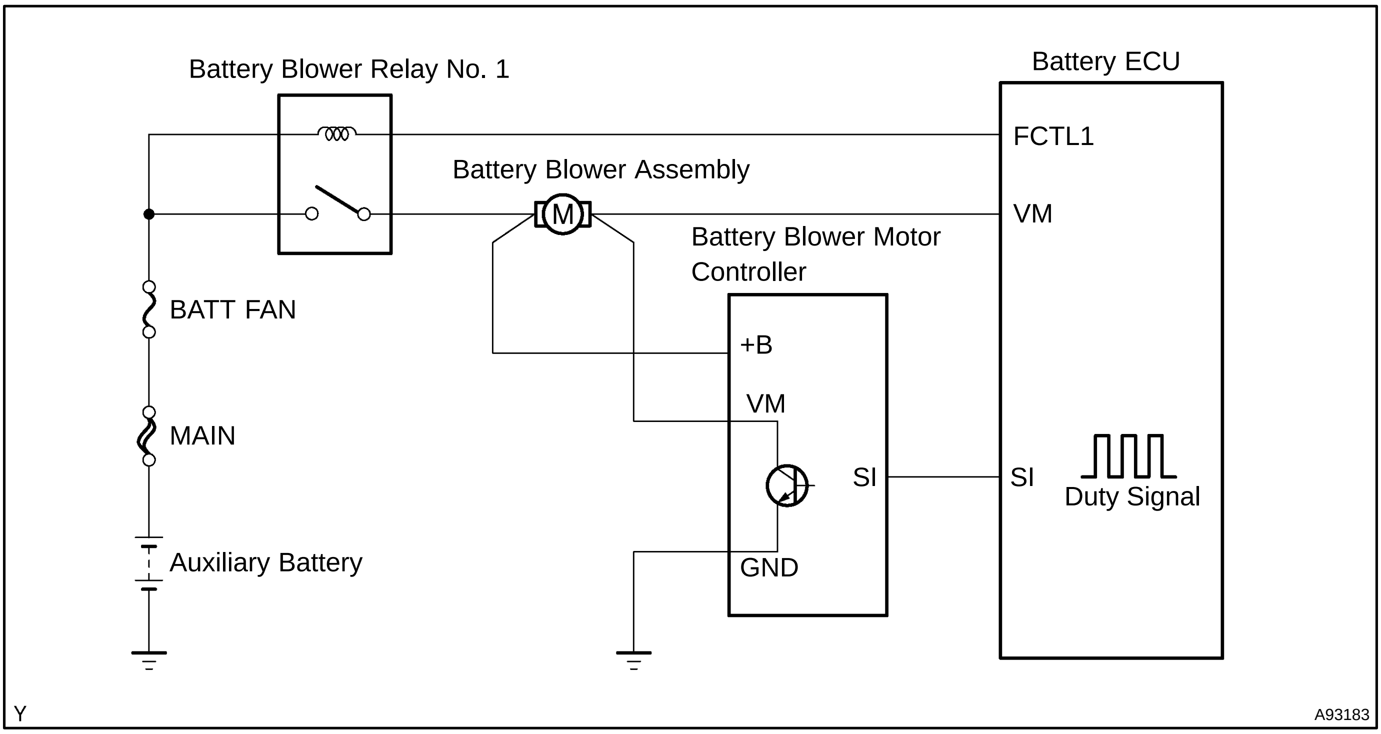
OK

REPLACE BATTERY ECU ASSY (See page 21-98)

DTC | P0A85 | HYBRID BATTERY PACK COOLING FAN 1

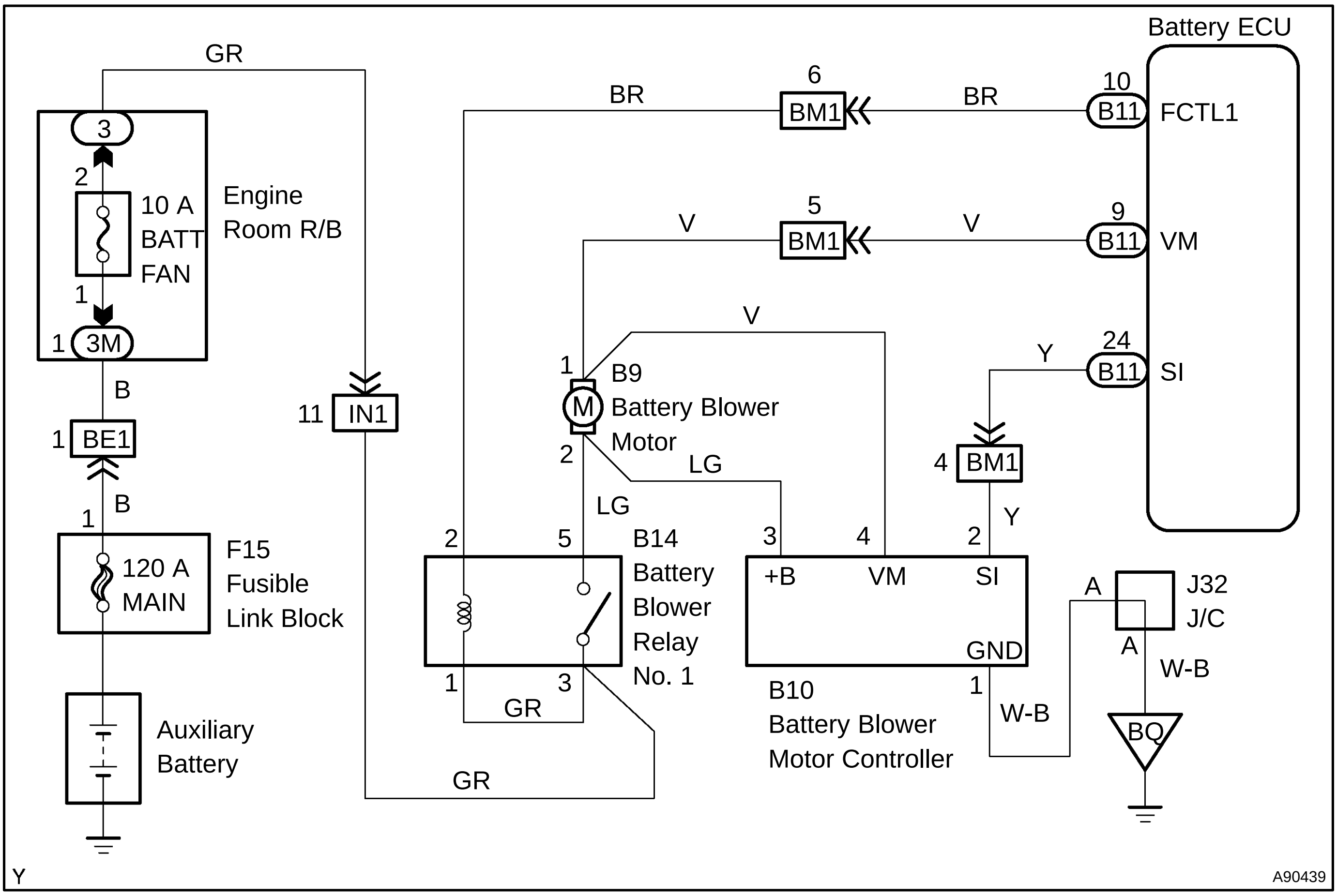
CIRCUIT DESCRIPTION

The blower motor controller regulates the voltage of the battery blower assembly. The blower motor controller has fins made of aluminum. The exhaust air from the HV battery assembly that flows through the quarter vent duct cools the blower motor controller, which is installed in the quarter vent duct.
The current flows from the FCTL1 terminal of the battery ECU to the relay coil of the battery blower relay No. 1 and as the contact point of the relay closes, the power is supplied to the battery blower assembly.
When a fan actuation signal is transmitted from the battery ECU, the blower motor controller adjusts voltage (VM) which is applied to the battery blower assembly in order to get the requested fan speed. The adjusted voltage is also transmitted to the VM terminal of the battery ECU in the form of a monitoring signal. The blower motor controller corrects the voltage at the blower motor by monitoring voltage at the +B terminal of the battery blower assembly.



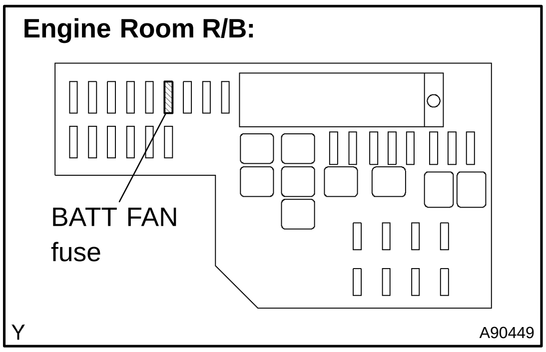
DTC No.	DTC Detection Condition	Trouble Area
P0A85	At a constant vehicle speed, the voltage at the blower motor is out of the predetermined range in proportion to the target control voltage for more than 10 seconds (1 trip detection logic)	• Wire harness or connector • BATT FAN fuse • Battery blower relay No. 1 • Battery blower assembly • Quarter vent duct (battery blower motor controller) • Battery ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(BATT FAN 10 A)

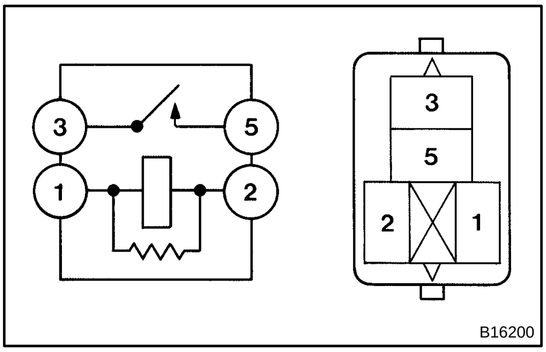


(a) Remove the BATT FAN fuse from the engine room R/B.
(b) Check the resistance in the BATT FAN fuse.
Standard: Below 1 Ω
(c) Reinstall the BATT FAN fuse.

NG **Go to step 13**

OK

2 INSPECT BATTERY BLOWER RELAY NO.1



(a) Remove the battery blower relay No. 1.

(b) Check the resistance between the terminals of the relay.

Standard:

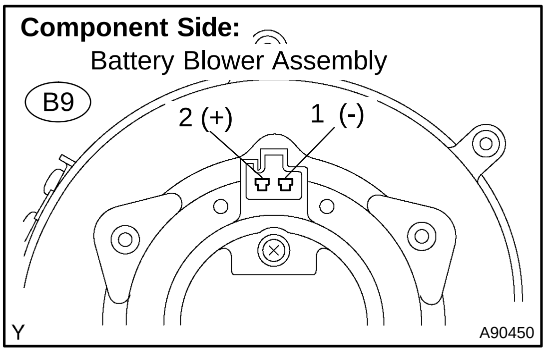
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the battery blower relay No. 1.

NG → **REPLACE BATTERY BLOWER RELAY NO.1**

OK

3 INSPECT BATTERY BLOWER ASSY



(a) Disconnect the B9 battery blower assembly connector.

(b) Connect the positive terminal of the battery to terminal 2 of the battery blower assembly connector, and the negative battery terminal to terminal 1 of the connector.

(c) Check that the blower fan rotates when voltage is applied.

OK: Blower fan rotates

NG → **REPLACE BATTERY BLOWER ASSY**

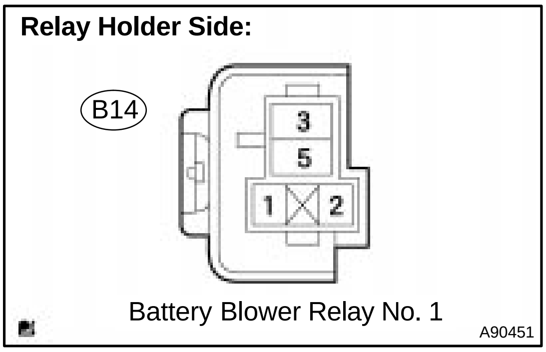
OK

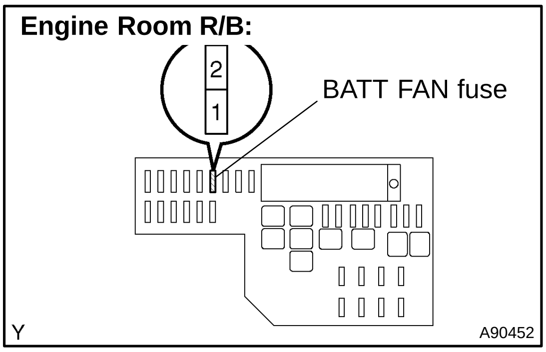
4 CHECK BATTERY BLOWER MOTOR CONTROLLER (See page 21-36)

NG → **REPLACE QUARTER VENT DUCT (BATTERY BLOWER MOTOR CONTROLLER)**

OK

5 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 - BATT FAN FUSE)





(a) Remove the B14 battery blower relay No. 1.
(b) Remove the BATT FAN fuse from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-1 and 3) - BATT FAN fuse (2)	Below 1 Ω

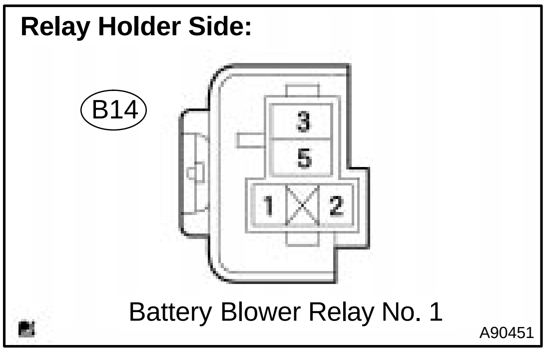
NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

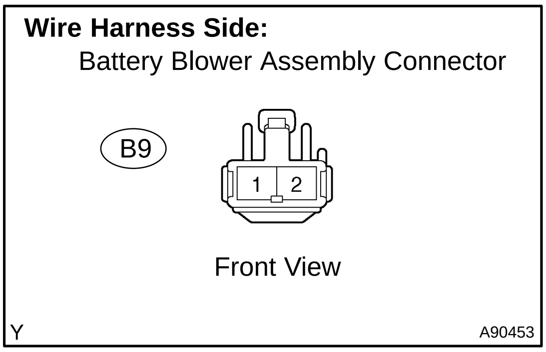
(d) Reinstall the battery blower relay No. 1.
(e) Reinstall the BATT FAN fuse.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 - BATTERY BLOWER ASSY)





(a) Remove the B14 battery blower relay No. 1.
(b) Disconnect the B9 battery blower assembly connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-5) - battery blower assembly (B9-2)	Below 1 Ω

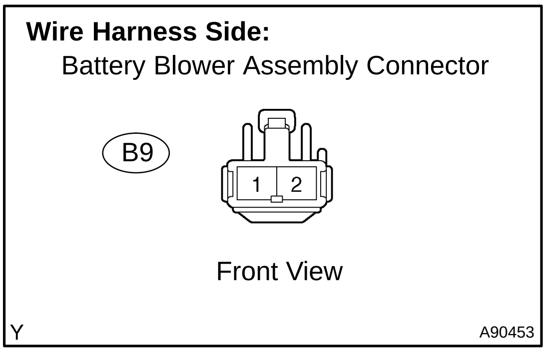
NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

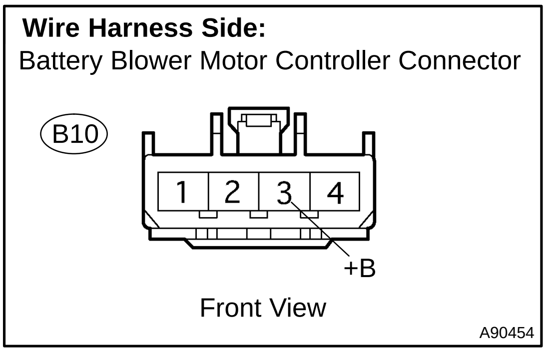
(d) Reinstall the battery blower relay No. 1.
(e) Reconnect the battery blower assembly connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY - BATTERY BLOWER MOTOR CONTROLLER)





(a) Disconnect the B9 battery blower assembly connector.
(b) Disconnect the B10 battery blower motor controller connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

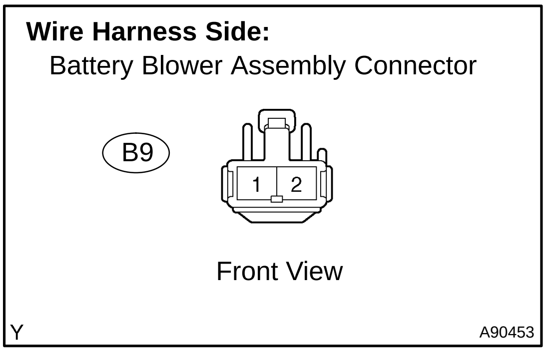
Tester Connection	Specified Condition
Battery blower assembly (B9-2) - +B (B10-3)	Below 1 Ω

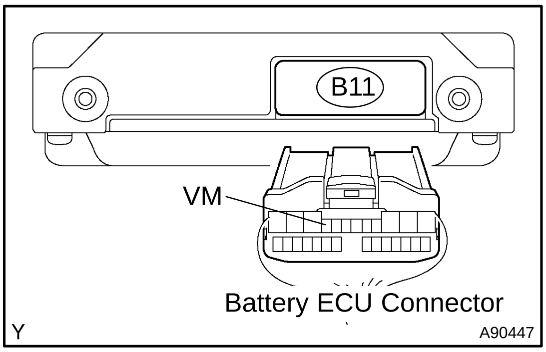
(d) Reconnect the battery blower assembly connector.
(e) Reconnect the battery blower motor controller connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

8 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY - BATTERY ECU)





(a) Disconnect the B9 battery blower assembly connector.
(b) Disconnect the B11 battery ECU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower assembly (B9-1) - VM (B11-9)	Below 1 Ω

Standard (Check for short):

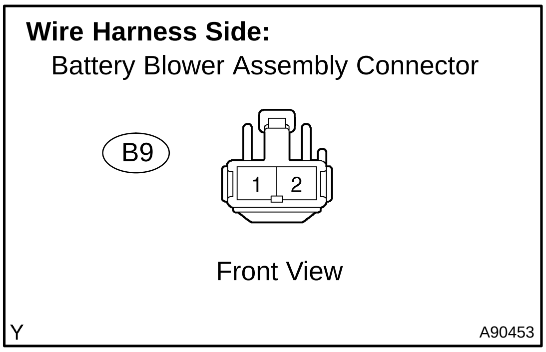
Tester Connection	Specified Condition
Battery blower assembly (B9-1) or VM (B11-9) - Body ground	10 kΩ or higher

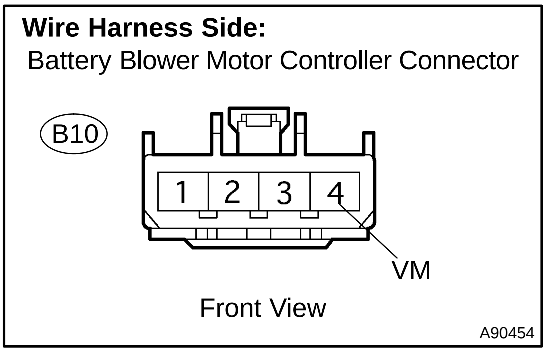
(d) Reconnect the battery blower assembly connector.
(e) Reconnect the battery ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9	CHECK HARNESS AND CONNECTOR(BATTERY BLOWER ASSY - BATTERY BLOWER MOTOR CONTROLLER)





(a) Disconnect the B9 battery blower assembly connector.
(b) Disconnect the B10 battery blower motor controller connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower assembly (B9-1) - VM (B10-4)	Below 1 Ω

Standard (Check for short):

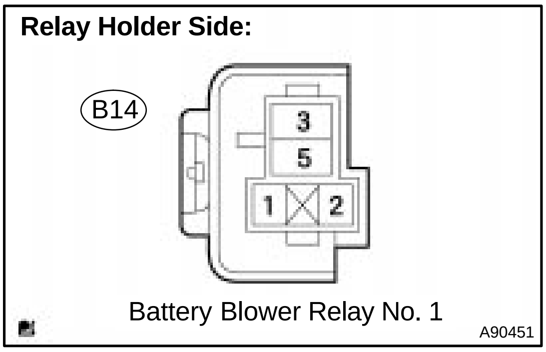
Tester Connection	Specified Condition
Battery blower assembly (B9-1) or VM (B10-4) - Body ground	10 kΩ or higher

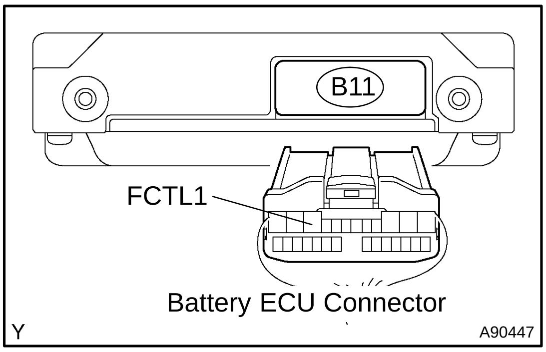
(d) Reconnect the battery blower assembly connector.
(e) Reconnect the battery blower motor controller connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 - BATTERY ECU)





(a) Remove the B14 battery blower relay No. 1.
(b) Disconnect the B11 battery ECU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-2) - FCTL1 (B11-10)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-2) or FCTL1 (B11-10) - Body ground	10 kΩ or higher

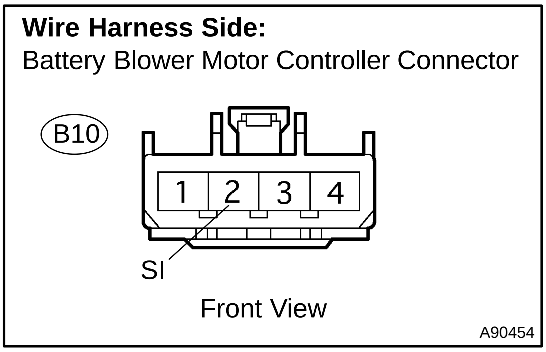
NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

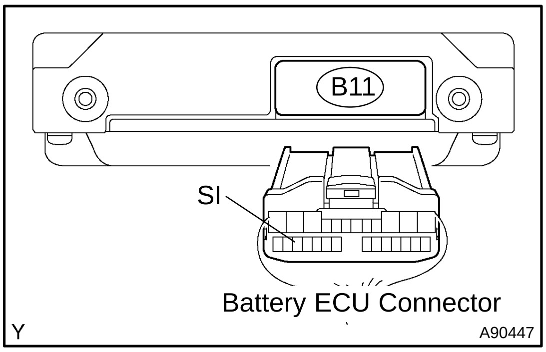
(d) Reinstall the battery blower relay No. 1.
(e) Reconnect the battery ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

11	CHECK HARNESS AND CONNECTOR(BATTERY BLOWER MOTOR CONTROLLER - BATTERY ECU)





(a) Disconnect the B10 battery blower motor controller connector.

(b) Disconnect the B11 battery ECU connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
SI (B10-2) - SI (B11-24)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
SI (B10-2) or SI (B11-24) - Body ground	10 kΩ or higher

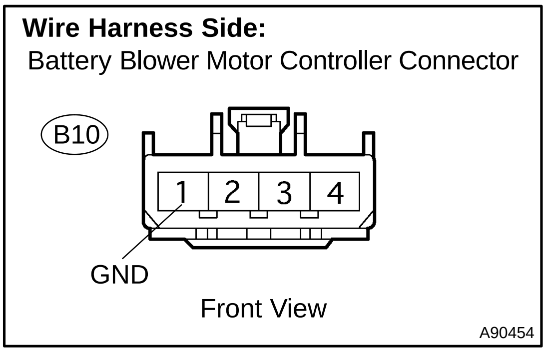
(d) Reconnect the battery blower motor controller connector.

(e) Reconnect the battery ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

12	CHECK HARNESS AND CONNECTOR(BATTERY BLOWER MOTOR CONTROLLER - BODY GROUND)



(a) Disconnect the B10 battery blower motor controller connector.

(b) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
GND (B10-1) - Body ground	Below 1 Ω

(c) Reconnect the battery blower motor controller connector.

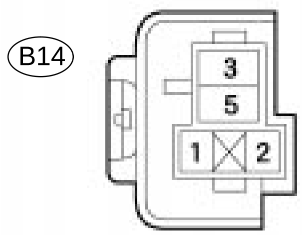
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

13	CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 - BATT FAN FUSE)

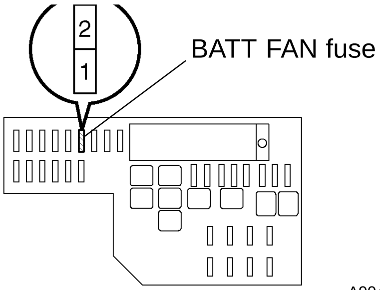
Relay Holder Side:



Battery Blower Relay No. 1

A90451

Engine Room R/B:



A90452

(a) Remove the B14 battery blower relay No. 1.
(b) Remove the BATT FAN fuse from the engine room R/B.
(c) Check the resistance between the wire harness side connector and body ground.

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-3) or BATT FAN fuse (2) - Body ground	10 kΩ or higher

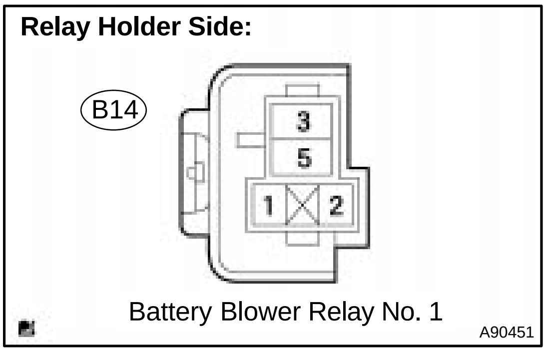
NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

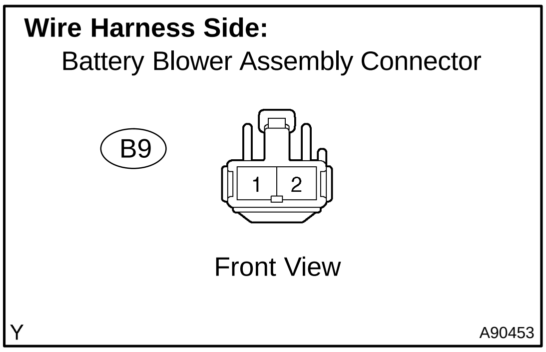
(d) Reinstall the battery blower relay No. 1.
(e) Reinstall the BATT FAN fuse.

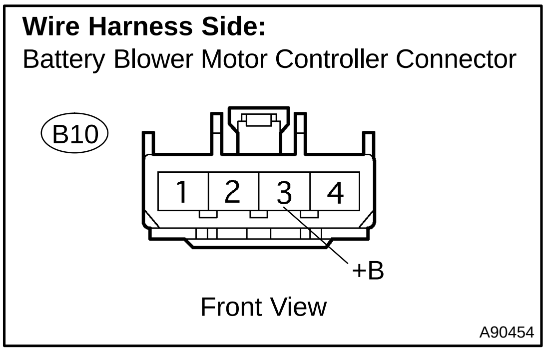
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR AND REPLACE FUSE (BATT FAN)

OK

14 CHECK HARNESS AND CONNECTOR(BATTERY BLOWER RELAY NO. 1 - BATTERY BLOWER ASSY)







(a) Remove the B14 battery blower relay No. 1.
(b) Disconnect the B9 battery blower assembly connector.
(c) Disconnect the B10 battery blower motor controller connector.
(d) Check the resistance between the wire harness side connector and body ground.

Standard (Check for short):

Tester Connection	Specified Condition
Battery blower relay No. 1 (B14-5), battery blower assembly (B9-2) or +B (B10-3) - Body ground	10 kΩ or higher

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(e) Reinstall the battery blower relay No. 1.
(f) Reconnect the battery blower assembly connector.
(g) Reconnect the battery blower motor controller connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR AND REPLACE FUSE (BATT FAN)**

OK

15 CHECK BATTERY BLOWER MOTOR CONTROLLER (See page 21-36)

NG → **REPLACE QUARTER VENT DUCT (BATTERY BLOWER MOTOR CONTROLLER)**

OK

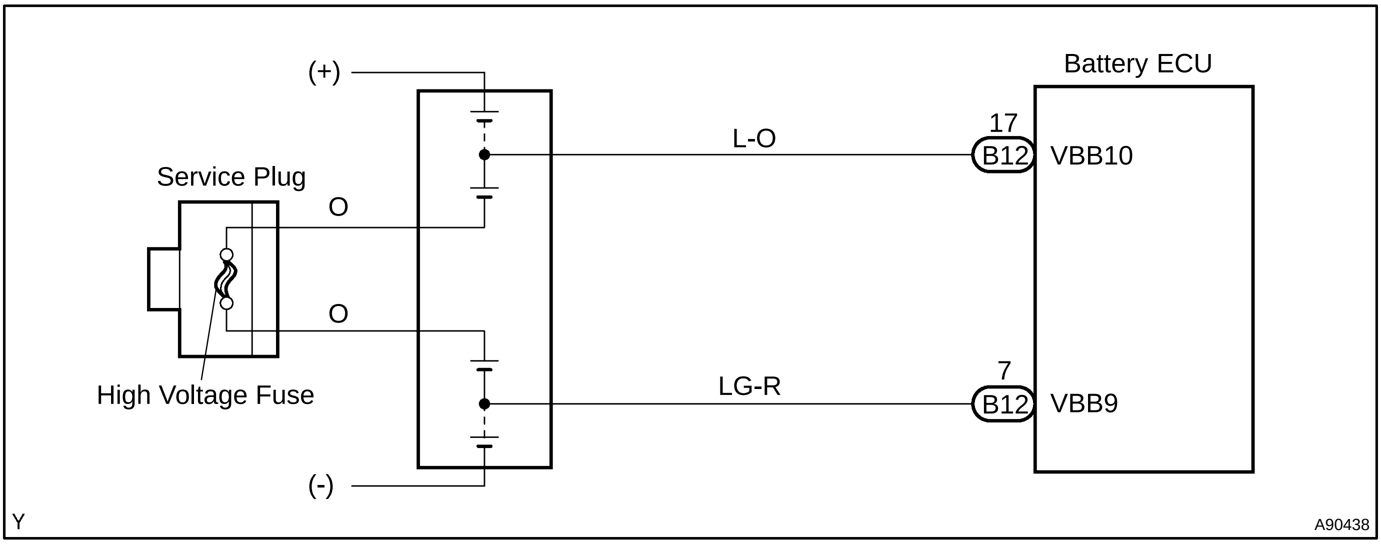
REPLACE BATTERY ECU ASSY (See page 21-98)

DTC	P0A95	HIGH VOLTAGE FUSE

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0A95	Voltage between VBB9 and VBB10 terminals is below standard in spite of interlock switch being engaged (1 trip detection logic)	• High voltage fuse • Service plug grip • Battery plug • Battery ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.**
- **After disconnecting the service plug grip, wait for at least 5 minutes before touching any of the high-voltage connectors or terminals.**

HINT:
At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

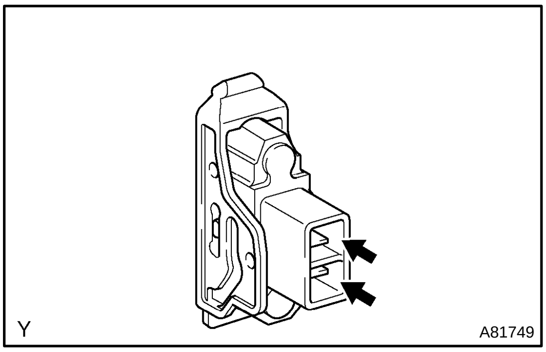
1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV BATTERY / DTC INFO / TROUBLE CODES.
For the OBD II scan tool, see its instruction manual.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **REPLACE BATTERY ECU ASSY** **(See page 21-98)**

NO

2	INSPECT SERVICE PLUG GRIP



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

(b) Remove the service plug grip (see page 21-1 16).

NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

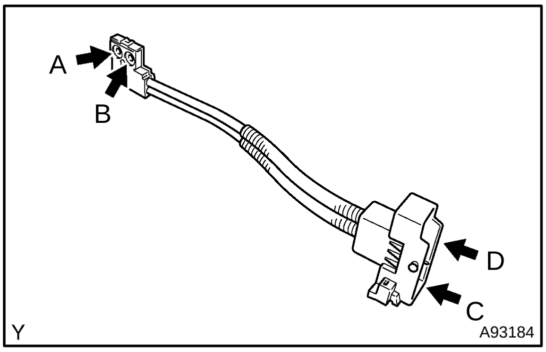
(c) Check the resistance between the terminals of the service plug grip.

Standard: Below 1 Ω

NG → **Go to step 4**

OK

3	INSPECT BATTERY PLUG



CAUTION:
Wear insulated gloves and goggles before performing the following operation.

(a) Remove the HV battery assembly (see page 21-54).

(b) Remove the battery plug (see page 21-77).

(c) Check the resistance between the terminals of the battery plug.

Standard:

Tester Connection	Specified Condition
A - C	Below 1 Ω
B - D	Below 1 Ω

(d) Reinstall the battery plug (see page 21-77).

(e) Reinstall the HV battery assembly (see page 21-54).

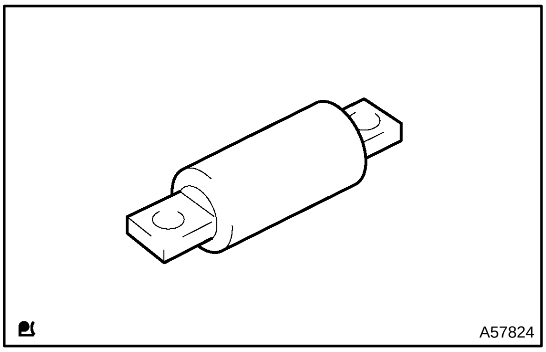
NG → **REPLACE BATTERY PLUG**

OK

REPLACE BATTERY ECU ASSY (See page 21-98)

4	INSPECT HIGH VOLTAGE FUSE

CAUTION:
Wear insulated gloves before performing the following operation.



(a) Remove the high voltage fuse (see page 21-1 16).

HINT:
The high voltage fuse is enclosed in the service plug grip.

(b) Check the resistance between the terminals of the high voltage fuse.
Standard: Below 1 Ω

(c) Reinstall the high voltage fuse.

NG → **REPLACE HIGH VOLTAGE FUSE**

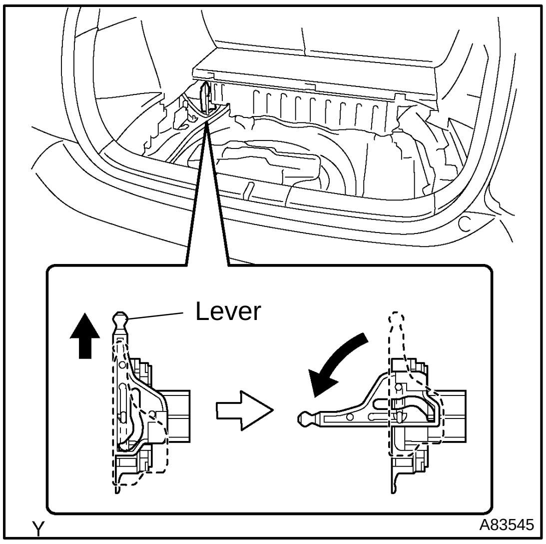
OK

REPLACE SERVICE PLUG GRIP

HYBRID BATTERY SYSTEM

05J89-01

PRECAUTION



1. Precautions for inspecting the hybrid battery system

(a) Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip (see page 01-5). After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.

NOTICE:

Turning the power switch ON (READY) with the service plug grip removed could cause a malfunction. Therefore, do not turn the power switch ON (READY) unless instructed by the repair manual.

(b) After disconnecting the service plug grip, wait for at least 5 minutes before touching any of high-voltage connectors or terminals.

HINT:

At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

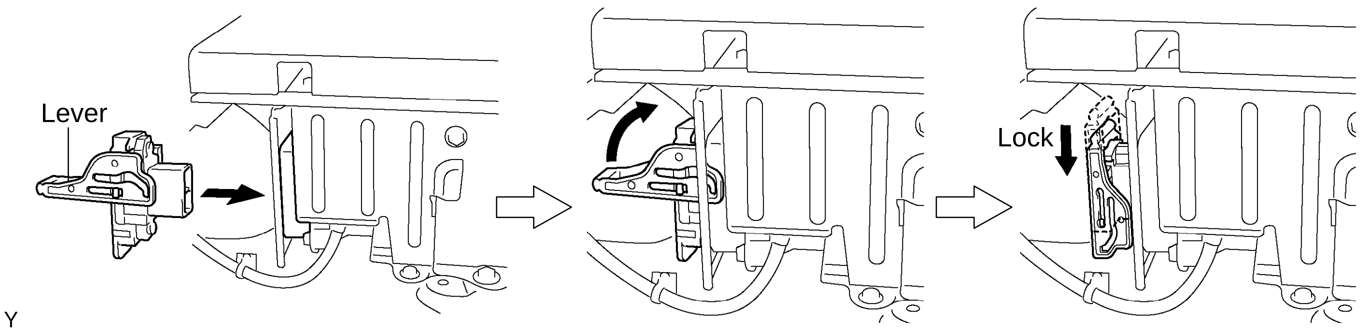
(c) Since liquid leakage may occur, wear protective goggles when checking inside the HV battery.

(d) Wear insulated gloves, turn the power switch OFF, and disconnect the negative terminal of the auxiliary battery before touching any of the orange-colored wires of the high-voltage system.

(e) Turn the power switch OFF before performing a resistance check.

(f) Turn the power switch OFF before disconnecting or reconnecting any connector.

(g) To install the service plug grip, the lever must be flipped and locked downward. Once it is locked in place, it turns the interlock switch ON. Make sure to lock it securely because if you leave it unlocked, the system will output a DTC pertaining to the interlock switch system.



A89219

2. NOTICE FOR INITIALIZATION

When disconnecting the negative (-) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See Page
Power Window Control System	05-2027

3. NOTICE FOR HYBRID SYSTEM ACTIVATION

- **When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first attempt. If so, press the power switch again.**
- **With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.**

SYSTEM DESCRIPTION

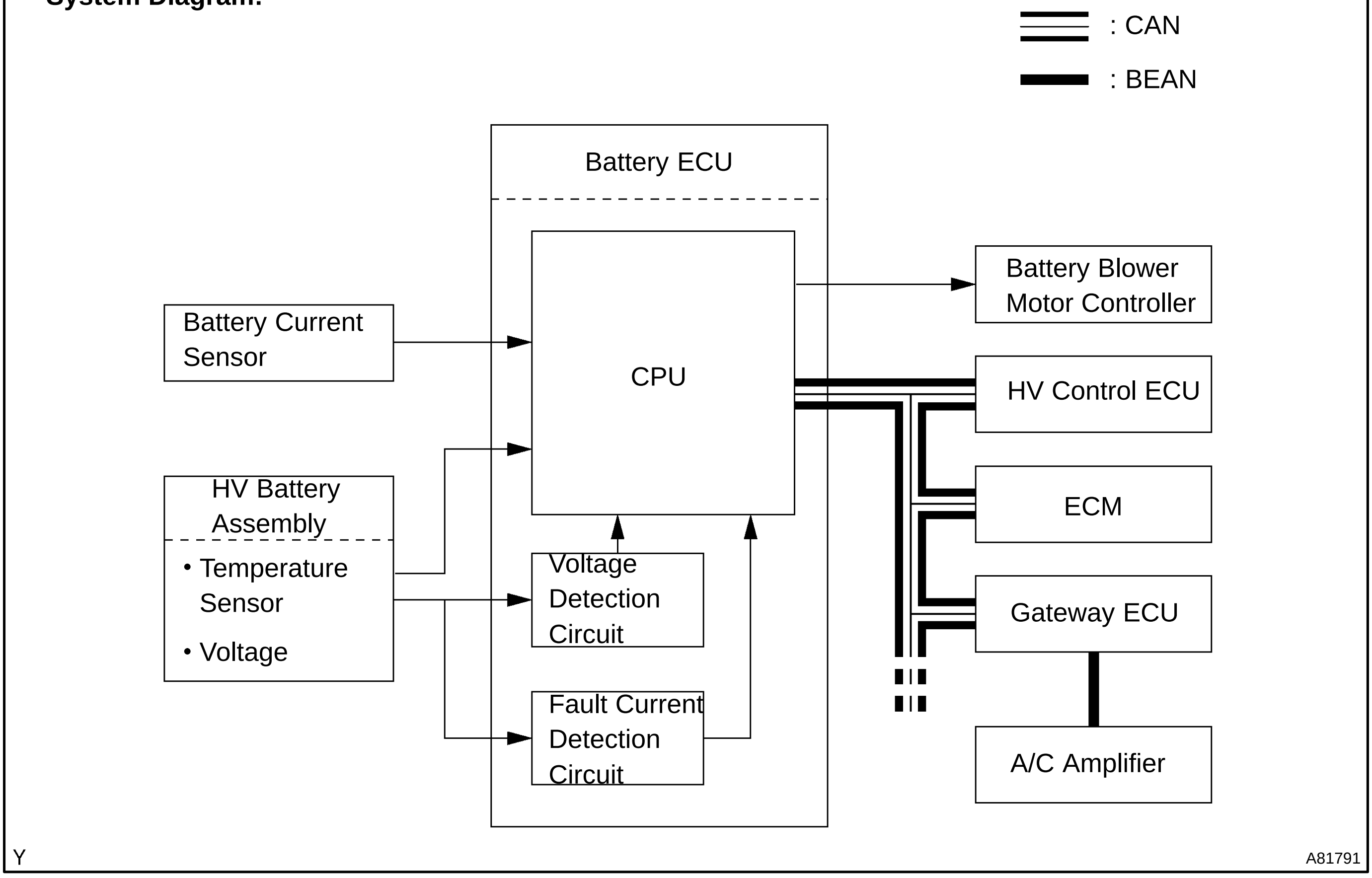
1. OUTLINE

The principal role of the hybrid battery system is to monitor the condition of the HV battery assembly through the use of the battery ECU and transmit this information to the HV control ECU. Furthermore, this system controls the battery blower motor controller in order to maintain a proper temperature at the HV battery assembly.

The battery ECU uses CAN (Controller Area Network) to maintain communication with the following devices: the HV control ECU, ECM, and A/C amplifier.*

*: Because it is connected to BEAN (Body Electronics Area Network), data is transmitted via the gateway ECU.

System Diagram:



2. CONTROL DESCRIPTION

(a) HV battery assembly management and fail-safe function.

(1) The battery assembly is repeatedly discharged at acceleration and charged by regenerating brakes at deceleration while driving. The battery ECU calculates SOC (state of charge) of the HV battery based on voltage, current, and temperature, and then sends the results to the HV control ECU. As a result, charge and discharge control is performed in the HV control ECU depending on the SOC.

(2) If malfunction occurs, the battery ECU performs a fail-safe function and protects the HV battery assembly in accordance with the extent of the malfunction.

(b) Battery blower motor control.

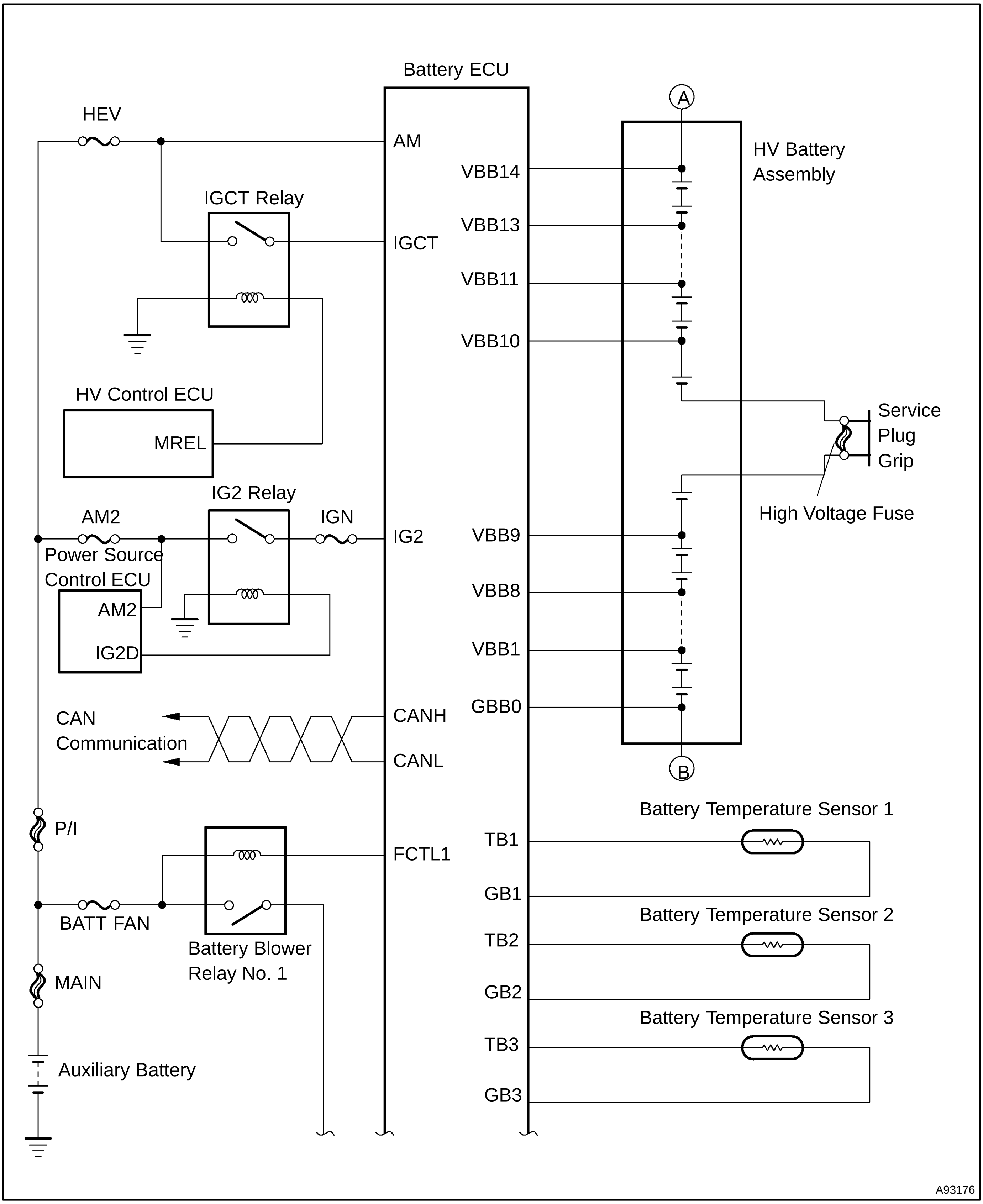
(1) To control an increase in the temperature of the HV battery assembly while the vehicle is being driven, the battery ECU determines and controls the operating mode of the battery blower assembly in accordance with the temperature of the HV battery assembly.

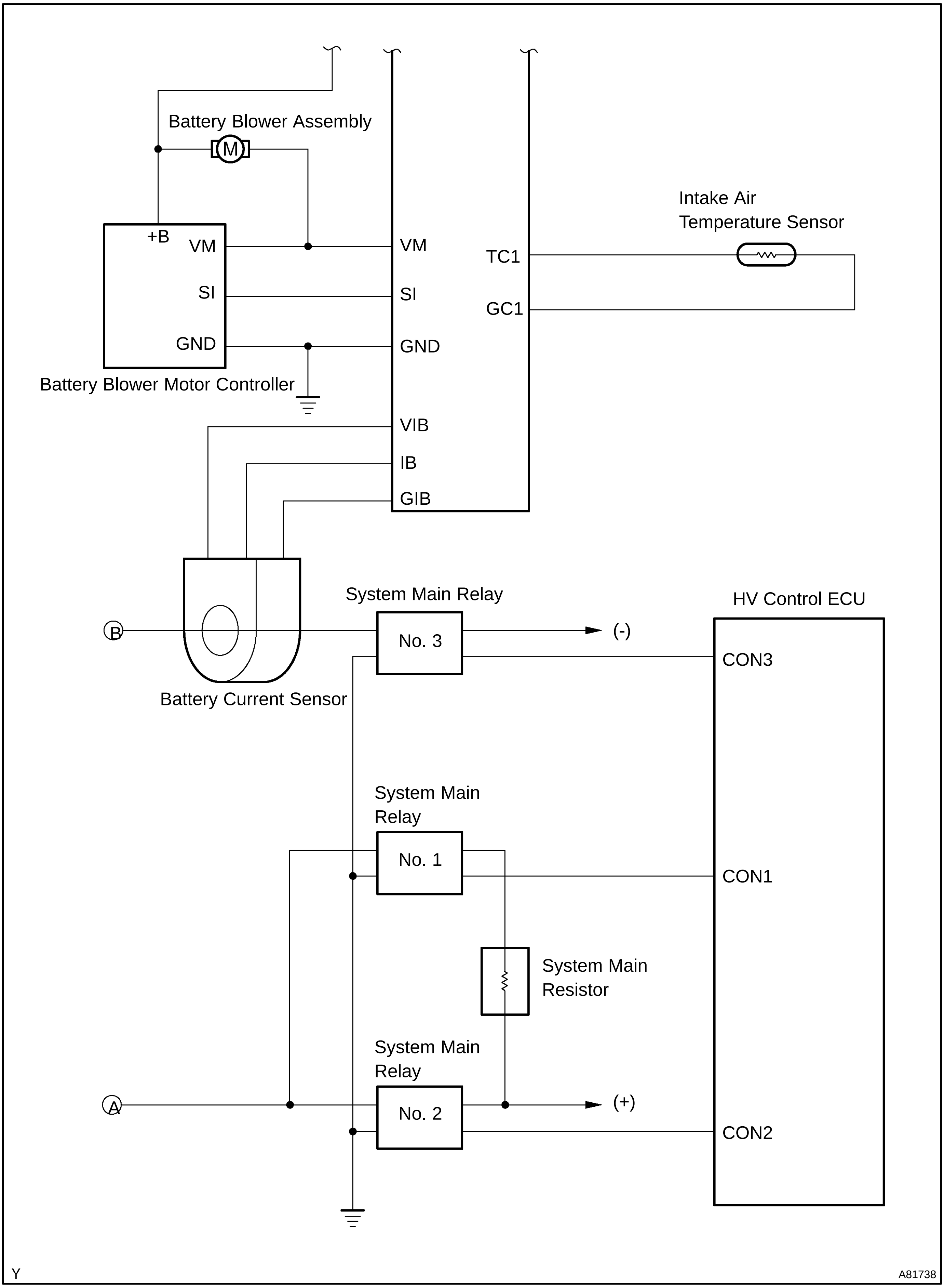
(c) MIL illumination control.

(1) If the battery ECU detects malfunction that affects the exhaust gas emissions, it will transmit an MIL (malfunction indicator lamp) illumination request to the HV control ECU. (The battery ECU does not directly illuminate the MIL.)

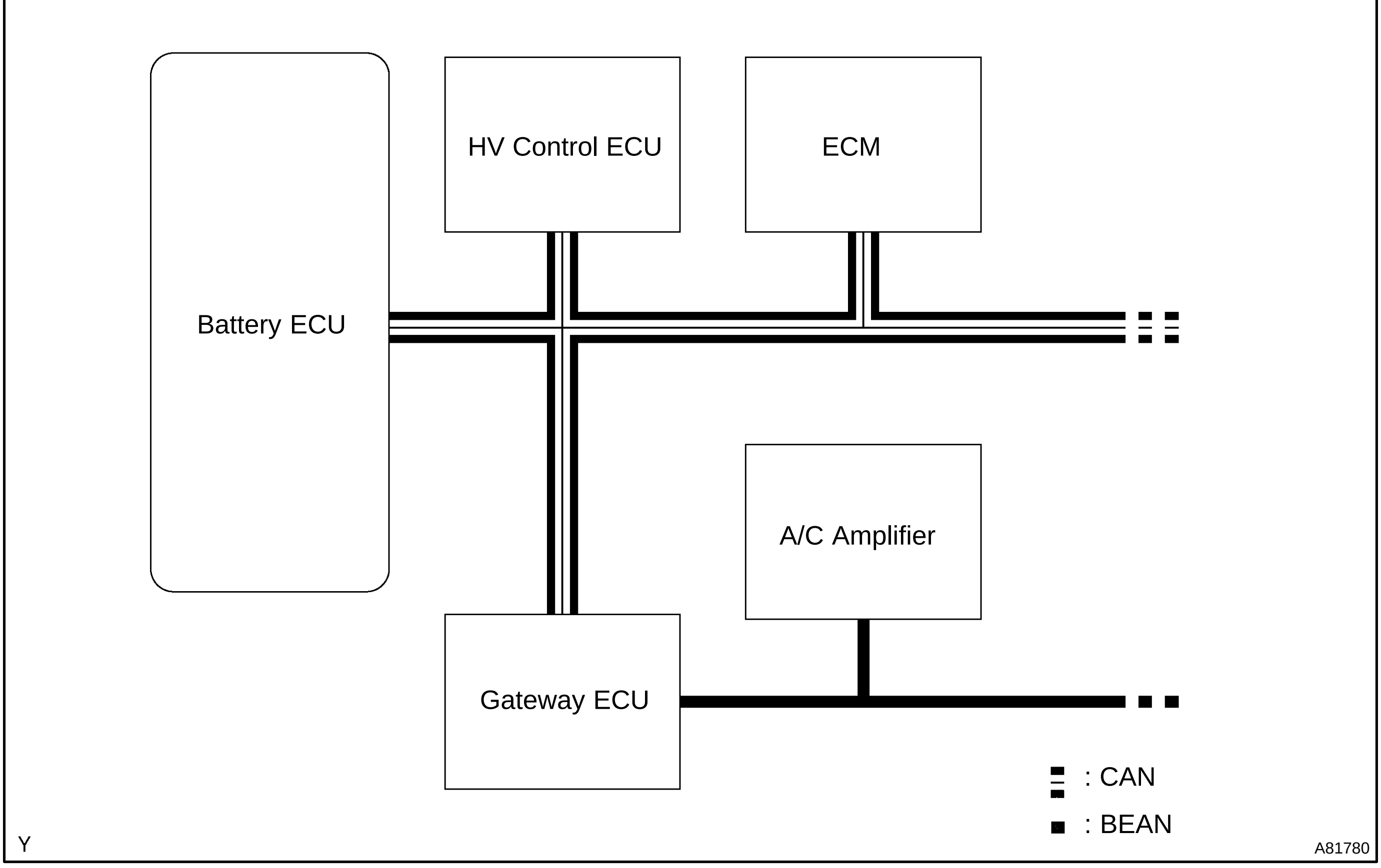
05J8E-01

SYSTEM DIAGRAM

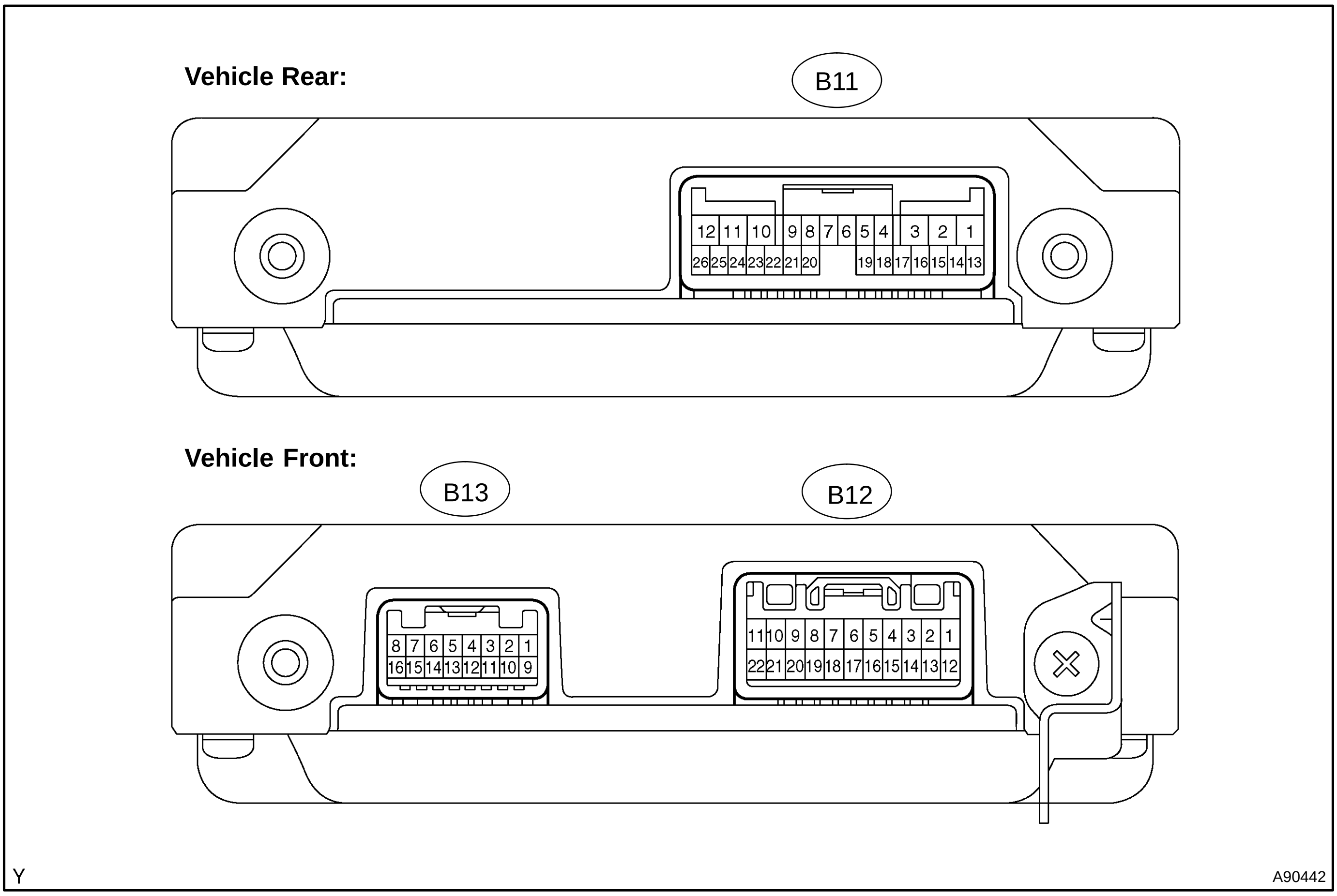



Battery Blower Assembly
M
+B
VM
SI
GND
Battery Blower Motor Controller
VM
SI
GND
VIB
IB
GIB
TC1
GC1
Intake Air
Temperature Sensor
B
Battery Current Sensor
System Main Relay
No. 3
(-)
HV Control ECU
CON3
System Main
Relay
No. 1
CON1
System Main
Resistor
System Main
Relay
A
No. 2
(+)
CON2
Y
A81738

Communication System Diagram:



TERMINALS OF ECU



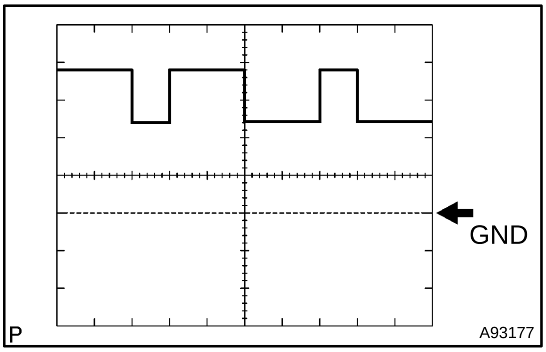
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
AM (B11 - 1) - GND (B11 - 12)	G - W-B	Auxiliary battery (for measuring the battery voltage and for the battery ECU memory)	Always	9 to 14
IGCT (B11 - 2) - GND (B11 - 12)	L - W-B	Control signal	Power switch ON (READY)	9 to 14
VM (B11 - 9) - GND (B11 - 12)	V - W-B	Battery blower motor monitoring signal	Battery blower motor mode 1 actuation (at low speed)	10 to 14
VM (B11 - 9) - GND (B11 - 12)	V - W-B	Battery blower motor monitoring signal	Battery blower motor mode 6 actuation (at high speed)	2 to 6
FCTL1 (B11 - 10) - GND (B11 - 12)	BR - W-B	Battery blower relay No. 1	Battery blower motor actuation	Below 1
IG2 (B11 - 13) - GND (B11 - 12)	O - W-B	IG signal	Power switch ON (IG)	9 to 14
CANH (B11 - 18) - GND (B11 - 12)	B - W-B	HIGH-level CAN bus line	Power switch ON (IG)	Pulse generation (See waveform 1)
CANL (B11 - 19) - GND (B11 - 12)	W - W-B	LOW-level CAN bus line	Power switch ON (IG)	Pulse generation (See waveform 2)
SI (B11 - 24) - GND (B11 - 12)	Y - W-B	Battery blower motor actuation signal	Battery blower motor modes 1 to 6 actuation	Pulse generation (See waveform 3)
TB1 (B13 - 1) - GB1 (B13 - 2)	W - W	HV battery temperature sensor 1	HV battery temperature: -40 to 90°C (-40 to 194°F)	4.8 to 1.0
TB2 (B13 - 3) - GB2 (B13 - 4)	B - B	HV battery temperature sensor 2	HV battery temperature: -40 to 90°C (-40 to 194°F)	4.8 to 1.0

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
TB3 (B13 - 5) - GB3 (B13 - 6)	L - L	HV battery temperature sensor 3	HV battery temperature: -40 to 90°C (-40 to 194°F)	4.8 to 1.0
TC1 (B13 - 9) - GC1 (B13 - 10)	G - G	Intake air temperature sensor	Intake air temperature: -40 to 90°C (-40 to 194°F)	4.8 to 1.0
VIB (B13 - 15) - GIB (B13 - 14)	—	Power source of battery current sensor (a specific voltage)	Power switch ON (IG)	4.5 to 5.5
IB (B13 - 16) - GIB (B13 - 14)	—	Battery current sensor	Power switch ON (READY)	0.5 to 4.5
GND (B11 - 12) - Body ground	W-B - Body ground	Ground	Always (resistance check)	Below 6 Ω

1. Oscilloscope waveforms

HINT:

The following waveforms are provided for informational purposes. Noise and fluttering waveforms have been omitted.

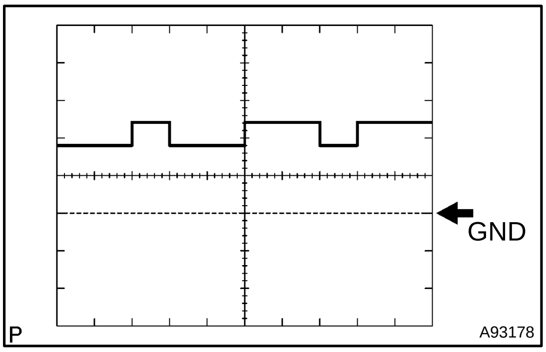


(a) Waveform 1 (HIGH-level CAN bus line)

Item	Contents
Terminal	CANH - GND
Equipment Setting	1 V/Division, 2 μs/Division
Condition	Power switch ON (IG)

HINT:

The waveform varies depending on the contents of the communication.

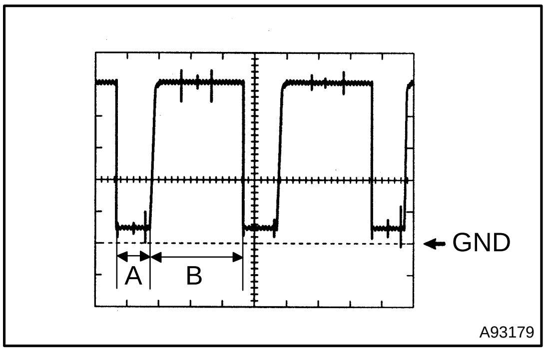


(b) Waveform 2 (LOW-level CAN bus line)

Item	Contents
Terminal	CANH - GND
Equipment Setting	1 V/Division, 2 μs/Division
Condition	Power switch ON (IG)

HINT:

The waveform varies depending on the contents of the communication.



(c) Waveform 3 (battery blower motor actuation signal)

Item	Contents
Terminal	SI - GND
Equipment Setting	1 V/Division, 50 µs/Division
Condition	During vehicle stop

HINT:
Amplitude A and B in the diagram vary by mode.

Mode	A	B
1	44.4 µs	155.6 µs
2	44.4 µs	155.6 µs
3	51.6 µs	148.4 µs
4	59.0 µs	141.0 µs
5	59.0 µs	141.0 µs
6	146.4 µs	53.6 µs

DTC	U0100	LOST COMMUNICATION WITH ECM/PCM ”A”

DTC	U0293	LOST COMMUNICATION WITH HYBRID VEHICLE CONTROL SYSTEM

CIRCUIT DESCRIPTION

The battery ECU receives signals from the HV control ECU, ECM, and gateway ECU via CAN (Controller Area Network) communication.

DTC No.	DTC Detection Condition	Trouble Area
U0100	CAN communication malfunction (no signal reception) with ECM	• CAN communication system
U0293	CAN communication malfunction (no signal reception) with HV control ECU	• CAN communication system

MONITOR DESCRIPTION

If the battery ECU detects malfunction in the CAN communication with the ECM or HV control ECU, it illuminates the MIL and sets a DTC.

MONITOR STRATEGY

U0100:

Related DTCs	U0100: Communication between ECM and battery ECU/Non-received check
Required sensor/components	Main: ECM Sub: CAN bus line
Frequency of operation	Continuous
Duration	0.68 second or more
MIL operation	Immediately
Sequence of operation	None

U0293:

Related DTCs	U0293: Communication between hybrid vehicle control and battery ECU/Non-received check
Required sensor/components	Main: Hybrid vehicle control ECU Sub: CAN bus line
Frequency of operation	Continuous
Duration	0.68 second or more
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
Other conditions belong to TOYOTA's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

Receiving data	No reception

COMPONENT OPERATING RANGE

ECM	DTC U0100 is not detected
Hybrid vehicle control ECU	DTC U0293 is not detected

INSPECTION PROCEDURE

1	READ OUTPUT DTC(CODES ALL)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / CODES (All).
For the OBD II scan tool, see its instruction manual.
(e) Read and record DTCs.

HINT:
When DTCs other than CAN communication malfunction DTCs are output simultaneously, first correct the CAN communication problem, and then perform troubleshooting for other DTCs.

GO

GO TO CAN COMMUNICATION SYSTEM (See page 05-2594)

05J82-01

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

(a) Perform a simulation test (see page 01-37).

(1) In the simulation test, reproduce the driving condition at the trouble occurrence according to the customer's comments and freeze frame data recorded with DTCs, such as an opening angle of the accelerator pedal, SOC, engine coolant temperature, engine rpm, and MG1/MG2 rpm and torque.

(b) Check the connector(s) and terminal(s) (see page 01-47).

(c) Wiggle the harness and connector(s) (see page 01-47).

05J81-01

CUSTOMER PROBLEM ANALYSIS CHECK

Prius Problem Check Sheet

Name of Dealer	Person in Charge at Headquarters	Person in Charge at Dealer
Office		

Please fill in the blanks within bold frame

Vehicle Specifications

Model Code	NHW 20 -AHE	Problem Occurrence Date	. .	Odometer Reading	miles km
Licence No.		Service Entry Date	. .	Production date	. .
VIN		Option	☐ Navigation (☐equipped by manufacturer ☐dealer) ☐ Cold climate specifications ☐ others ( )		

Interview Results

Contents of complaint (Status when and before/after occurring in the order of events as correct as possible)	Characteristics of Customer	
	Vehicle used before	
	Main use area	☐ city area ☐ suburbs ☐ mountain area ☐ other ( )
	Frequency in use	☐ every day ☐ ____times/week or month

Driving Condition	Road Condition	Vehicle Condition				
Vehicle Speed ________mph ________km/h ☐ when starting ☐ when accelerating ☐ when normal driving ☐ when decelerating ☐ when braking ☐ when stopping ☐ when parking ☐ when turning ☐ when ABS actuating ☐ cruise control driving ☐ others ( )	☐ level road ☐ up hill or down hill ☐ dry paved road ☐ wet paved road ☐ rough paved road ☐ unpaved road ☐ snowy or frozen road ☐ bump or curb ☐ others ( )	☐ Power switch ON (not getting ready) ☐ when starting ☐ right after starting ☐ until____minute after starting ☐ until____minute after starting of driving ☐ when stopping system Status of engine ☐ while stopping engine ☐ when revolving engine HV battery indication ☐____/8 segments ☐ unidentified	Power switch indicator ☐ illumination (orange or green) ☐ blink ☐ no illumination Shift position (indication) ☐ P ☐ R ☐ N ☐ D ☐ B ☐ when operating _____ → _____ ☐ no indication ☐ blink ☐ unidentified	Warning lamp ☐ ⚠ ☐ engine ☐ charge ☐ PS ☐ HV battery ☐ HV ☐ brake (yellow or red) ☐ ABS ☐ VSC ☐ slip ☐ coolant ☐ other warning ( ) ☐ no warning lamp	Brake operation ☐ brake slowly ☐ brake suddenly ☐ operation with a left foot ☐ not operating Accelerator pedal operation ☐ when depress-ing ☐ when releasing ☐ when getting a foot off from the pedal Frequency in occurrence ☐ always ☐____ times/ week or month ☐ only once	
Weather: ________ Temperature: ______°F °C Fuel level ____/10 segments	☐ unidentified ☐ unidentified ☐ unidentified	A/C status ☐ ON ☐ OFF ☐ unidentified	P position switch status ☐ illumination ☐ blink ☐ no illumination ☐ unidentified	LLC maintenance record ( ) Frequency in use ☐ every day ☐____times/week or month		

Vehicle Verification Results

Diagnostic trouble code

HV ★				Brake ★	
INF				INF	
SFI ★		Power Source control		Gate way	
Battery ★		A/C		Smart	
Transmission Control ★		SRS		Immobilizer	
EPS ★		Body		Theft Deterrent	
				Navigation	

★: Indicates that the system has a function to store the freeze frame data. If DTCs have been set, please attach the freeze frame data.

Vehicle Inspection Results (Verification items, reason to identify/presume the cause parts, etc.)	Duplication Status
	☐ always ☐ sometimes conditions when the malfunc-tion occurred ( ) ☐ no reproduction

Replacement Parts	Confirmation Results After Repair
Problem parts: No/Yes (Sending date: . .)	☐ normal ☐ reproduction ☐ other ( )

05J8B-01

DATA LIST/ACTIVE TEST

1. DATA LIST

NOTICE:

- **The DATA LIST values may vary significantly if there are slight differences in measurement, differences in the environment in which the measurements are obtained, or the aging of the vehicle. Thus, definite standards or judgment values are unavailable. Therefore, there may be a malfunction even if a measured value is within the reference range.**
- **In the event of intricate symptoms, collect sample data from another vehicle of the same model operating under identical conditions, in order to reach an overall judgment by comparing all the items of DATA LIST.**

HINT:

Using the DATA LIST displayed on the hand-held tester, you can read values including those of the switches, sensors, actuators, without removing any parts . Reading the DATA LIST as the first step of troubleshooting is one method to shorten diagnostic time.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV ECU / DATA LIST.
(e) Check the results by referring to the following table.

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
COOLANT TEMP	Engine coolant temperature/ Min.: -40°C, Max.: 140°C	After warming up: 80 to 100°C (176 to 212°F)	• If the value is -40°C (-40°F): Open in sensor circuit • If the value is 140°C (284°F): Short in sensor circuit
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	—
ENG RUN TIME	Elapsed time after starting engine Min.: 0 s, Max.: 65,535 s	—	—
+B	Auxiliary battery voltage/ Min.: 0 V, Max.: 65.535 V	Constant: Auxiliary battery voltage ±3 V	—
ACCEL POS #1	Accelerator pedal position sensor No. 1/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	—
ACCEL POS #2	Accelerator pedal position sensor No. 2/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	—
AMBIENT TEMP	Ambient air temperature/ Min.: -40°C, Max.: 215°C	Power switch ON (IG): Same as ambient air temperature	—
INTAKE AIR TEMP	Intake air temperature/ Min.: -40°C, Max.: 140°C	Constant: Same as ambient air temperature	—
DTC CLEAR WARM	The number of times engine is warmed up after clearing DTCs/ Min.: 0, Max.: 255	MIL OFF, engine coolant temperature increases from below 22°C (71.6°F) before starting the engine to above 70°C (158°F) after starting the engine: Increases once	—
DTC CLEAR RUN	Drive distance after clearing DTCs/ Min.: 0 km, Max.: 65,535 km	—	—
DTC CLEAR MIN	Elapsed time after clearing DTCs/ Min.: 0 min, Max.: 65,535 min	—	—
MIL ON RUN DIST	Drive distance after malfunction occurrence/ Min.: 0 km, Max.: 65,535 km	—	—

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
MIL ON ENG TIME	Elapsed time after starting engine with MIL ON/ Min.: 0 min, Max.: 65,535 min	—	—
MIL Status	MIL status/ ON or OFF	MIL ON: ON	Constant ON: Repair in accordance with detected DTCs
MG2 REV	MG2 revolution/ Min.: -16,383 rpm, Max.: 16,383 rpm	—	—
MG2 TORQ	MG2 torque/ Min.: -500 Nm, Max.: 500 Nm	—	—
MG2 TRQ EXC VAL	MG2 torque execution value/ Min.: -512 Nm, Max.: 508 Nm	After full-load acceleration with READY lamp ON and engine stopped: Less than ±20 % of MG2 TORQ	—
MG1 REV	MG1 revolution/ Min.: -16,383 rpm, Max.: 16,383 rpm	—	—
MG1 TORQ	MG1 torque/ Min.: -500 Nm, Max.: 500 Nm	—	—
MG1 TRQ EXC VAL	MG1 torque execution value/ Min.: -512 Nm, Max.: 508 Nm	1 second has elapsed after the engine was started automatically with READY lamp ON, engine stopped, A/C fan Hi, head lamp ON and the P position: Less than ±20 % of MG1 TORQ	—
REGEN EXEC TORQ	Regenerative brake execution torque/ Min.: 0 Nm, Max.: 186 Nm	—	—
REGEN RQST TORQ	Regenerative brake request torque/ Min.: 0 Nm, Max.: 186 Nm	Vehicle speed 30 km/h (19 mph) and master cylinder hydraulic pressure -200 Nm: Changes with brake pedal pressure	—
MG1 INVERT TEMP	MG1 inverter temperature/ Min.: -50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is -50°C (-58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit
MG2 INVERT TEMP	MG2 inverter temperature/ Min.: -50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is -50°C (-58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit
MOTOR2 TEMP	Transaxle fluid temperature/ Min.: -50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is -50°C (-58°F): Open or +B short in sensor circuit • If the value is 205°C (401°F): GND short in sensor circuit
MOTOR1 TEMP	MG2 motor temperature/ Min.: -50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is -50°C (-58°F): Open or +B short in sensor circuit • If the value is 205°C (401°F): GND short in sensor circuit

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
CONVERTER TEMP	Boost converter temperature/ Min.: -50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 60°C (77 to 140°F)	• If the value is -50°C (-58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit
ACCEL DEG	Accelerator pedal depressed angle/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	—
POWER RQST	Engine power output request value/ Min.: 0 W, Max.: 320,000 W	—	—
TARGET ENG SPD	Target engine speed/ Min.: 0 rpm, Max.: 8,000 rpm	—	—
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 8,000 rpm	Idling*: 950 to 1,050 rpm	—
VEHICLE SPD	Resolver vehicle speed/ Min.: -256 km/h, Max.: 254 km/h	Driving at 40 km/h (25 mph): 40 km/h (25 mph)	—
MCYL CTRL POWER	Braking torque that is equivalent to the master cylinder hydraulic pressure/ Min.: -512 Nm, Max.: 508 Nm	Brake pedal depressed: Changes with brake pedal pressure	—
SOC	Battery state of charge/ Min.: 0 %, Max.: 100 %	Constant: 0 to 100 %	—
WOUT CTRL POWER	Discharge control power value/ Min.: 0 W, Max.: 81,600 W	21,000 W or less	—
WIN CTRL POWER	Charge control power value/ Min.: -40,800 W, Max.: 0 W	-25,000 W or more	—
DCHG RQST SOC	Discharge request to adjust SOC/ Min.: -20,480 W, Max.: 20,320 W	• Uniform on-board charging: -4,400 W • Usually: 0 W	—
PWR RESOURCE VB	HV battery voltage/ Min.: 0 V, Max.: 510 V	READY lamp ON and P position: 150 to 300 V	—
PWR RESOURCE IB	HV battery current/ Min.: -256 A, Max.: 254 A	—	—
VL	High voltage before it is boosted/ Min.: 0 V, Max.: 510 V	Power switch ON (READY): Practically the same as the HV battery voltage	• If the value is 0 V: Open or GND short in sensor circuit • If the value is 510 V: +B short in sensor circuit
VH	High voltage after it is boosted/ Min.: 0 V, Max.: 765 V	Engine revved up in P position: HV battery voltage to 500 V	• If the value is 0 V: Open or GND short in sensor circuit • If the value is 765 V: +B short in sensor circuit
RAIS PRES RATIO	Boost ratio/ Min.: 0 %, Max.: 100 %	The pre-boost voltage and the post-boost voltage are equal: 0 to 10 %	—
DRIVE CONDITION	Drive condition ID/ Min.: 0, Max.: 6	• Engine stopped: 0 • Engine about to be stopped: 1 • Engine about to be started: 2 • Engine operated or operating: 3 • Generating or loading movement: 4 • Revving up with P position: 6	—

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
M SHIFT SENSOR	Output voltage of the shift position sensor (main)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 2.0 to 3.0 V • Shifting into R position: 4.0 to 4.8 V • Shifting into B or D position: 0.2 to 1.0 V	—
S SHIFT SENSOR	Output voltage of the shift position sensor (sub)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 2.0 to 3.0 V • Shifting into R position: 4.0 to 4.8 V • Shifting into B or D position: 0.2 to 1.0 V	—
SM SHIFT SENSOR	Output voltage of the select position sensor (main)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 0.5 to 2.0 V • Shifting into R, N or D position: 3.0 to 4.85 V	—
SS SHIFT SENSOR	Output voltage of the select position sensor (sub)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 0.5 to 2.0 V • Shifting into R, N or D position: 3.0 to 4.85 V	—
SHIFT POSITION	Shift position	P, R, N, D or B	—
A/C CONSMPT PWR	A/C consumption power/ Min.: 0 kW, Max.: 5 kW	—	—
DRIVE CONDITION	Driving condition	• MG1 load: MG1 • MG2 load: MG2	—
SHORT WAVE HIGH	Waveform voltage in leak detection circuit in battery ECU/ Min.: 0 V, Max.: 5 V	READY lamp is left ON for 2 minutes, and the pre-boost voltage and the post-boost voltage are equal: 4 V or more	—
ECU TYPE	Type of ECU	HV ECU	—
CURRENT DTC	The number of current DTCs/ Min.: 0, Max.: 255	—	—
HISTORY DTC	The number of history DTCs/ Min.: 0, Max.: 255	—	—
CHECK MODE	Check mode/ ON or OFF	—	—
ENG STOP RQST	Engine stop request/ NO or RQST	Requesting engine stop: RQST	—
IDLING REQUEST	Engine idling request/ NO or RQST	Requesting idle: RQST	—
HV BATT CH RQST	HV battery charging request/ NO or RQST	Requesting HV battery charging: RQST	—
AIRCON REQUEST	Engine starting request from A/C amplifier/ NO or RQST	Requesting engine start from A/C amplifier: RQST	—
ENG WARM UP RQT	Engine warm-up request/ NO or RQST	Requesting engine warm-up: RQST	—
SMR CONT1	Operating condition of system main relay No. 1/ ON or OFF	Power switch ON (READY): OFF	—
SMR CONT2	Operating condition of system main relay No. 2/ ON or OFF	Power switch ON (READY): ON	—
SMR CONT3	Operating condition of system main relay No. 3/ ON or OFF	Power switch ON (READY): ON	—
MG1 GATE	MG1 gate status/ ON or OFF	ON	—
MG2 GATE	MG2 gate status/ ON or OFF	Shutting down motor inverter: ON	—

Hand-held Tester Display	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
CNV GATE	Boost converter gate status/ ON or OFF	Shutting down boost converter: ON	—
A/C GATE	A/C gate status/ ON or OFF	Shutting down A/C inverter: ON	—
SMART KEY	Electronic key ID code check status/ ON or OFF	When electronic key ID code corresponds to ID code registered in ECU: ON	—

*: If no conditions are specifically stated for ”Idling”, it means the engine for inspection mode, the shift position is in P, the A/C switch is OFF, and accelerator pedal is not depressed.

2. ACTIVE TEST

NOTICE:

Beware that if the connector to the hand-held tester becomes disconnected or a communication error occurs during the ACTIVE TEST, the vehicle could become inoperative (READY lamp OFF).

HINT:

Performing an ACTIVE TEST using the hand-held tester enables components including the relay, VSV, and actuator, to be operated without removing any parts. Performing an ACTIVE TEST as the first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display items in the DATA LIST during the ACTIVE TEST.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV ECU / ACTIVE TEST.
(e) According to the display on the tester, perform ACTIVE TEST.

Hand-held Tester Display	Purpose	Test Details	Test Condition
INSPECTION MOD1 *1, *2	• To check its operation while the engine is running • To disable traction control while performing a speedometer test or the like	• Runs the engine continuously with the P position • Cancels the traction control that is effected when the rotational difference between the front and rear wheels is excessive other than the P position	Power switch ON (IG), HV system normal, not in inspection mode, and other active tests not being executed
INSPECTION MOD2 *1, *2	To disable traction control while performing a speedometer test or the like	Cancels the traction control that is effected when the rotational difference between the front and rear wheels is excessive other than the P position	Power switch ON (IG), HV system normal, not in inspection mode, and other active tests not being executed
INVERTER STOP *1	To determine if there is an internal leak in the inverter or the HV control ECU	Keeps the inverter power transistor actuation signal ON	Power switch ON (IG), P position, HV system normal, inverter actuation not being disabled, shutting down inverter, and other active tests not being executed
CRANKING RQST *1, *3, *4	To crank the engine continuously in order to measure the compression	Allows the engine to continue cranking by activating the generator continuously	Power switch ON (IG), HV system normal, not in cranking mode, and other active tests not being executed

NOTICE:

***1: The hand-held tester displays a communication error and the vehicle's READY lamp turns OFF when the ACTIVE TEST is completed. Therefore, in order to use the tester again, turn the power switch OFF, and restart by turning it ON.**

***2: After turning on INSPECTION MOD1 or MOD2, push the power switch, depressing the brake pedal.**

***3: After turning on CRANKING RQST, push the power switch, depressing the brake pedal. To stop engine cranking, push the power switch again.**

***4: CRANKING RQST may not be activated depending on the condition of the engine or the HV battery.**

DEFINITION OF TERMS

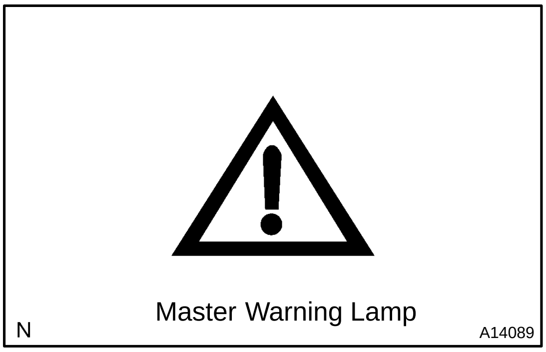
1. Definition of terms

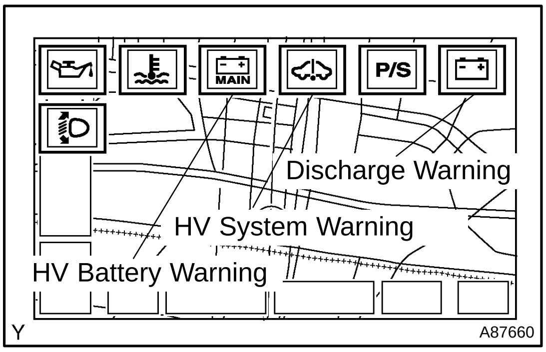
Each monitor description follows a standardized format using these terms:

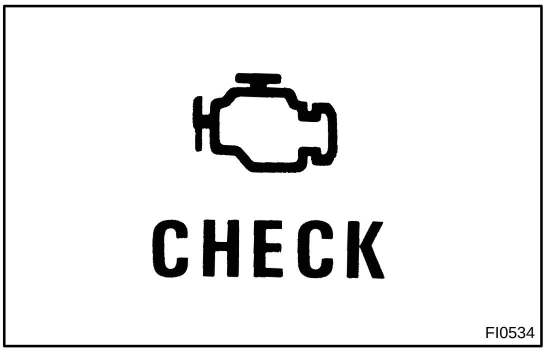
Term	Definition
Duration	The minimum time that the HV control ECU must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met
Frequency of operation	The number of times that the HV control ECU checks for malfunction per driving cycle ”Once per driving cycle” means that the HV control ECU detects malfunction only one time during a single driving cycle ”Continuous” means that the HV control ECU detects malfunction every time when enabling condition is met
MIL operation	MIL illumination timing after a defect is detected ”Immediately” means that the HV control ECU illuminates the MIL the instant the HV control ECU determines that there is malfunction ”2 driving cycles” means that the HV control ECU illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle
Monitor description	Description of what the HV control ECU monitors and how it detects malfunction (monitoring purpose and its details)
Related DTCs	A group of DTCs that is classified by a system and a troubleshooting procedure
Required sensor/components	The sensors and components that are used by the HV control ECU to detect malfunction
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded
Typical enabling condition	Preconditions that allow the HV control ECU to detect malfunction With all preconditions satisfied, the HV control ECU sets the DTC when the monitored value(s) exceeds the malfunction threshold(s)
Typical malfunction thresholds	Beyond this value, the HV control ECU will conclude that there is malfunction and set a DTC

05J84-01

DIAGNOSIS SYSTEM







1. DESCRIPTION

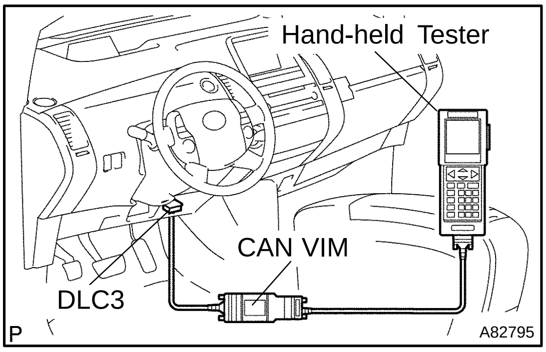
(a) The HV control ECU has a self-diagnosis system. If the computer, hybrid vehicle control system or the components are not working properly, the ECU carries out a diagnosis to detect the malfunction, and illuminates the master warning lamp in the combination meter together with any of indicators on the multi-information display, the HV system warning, the HV battery warning or the discharge warning.

HINT:

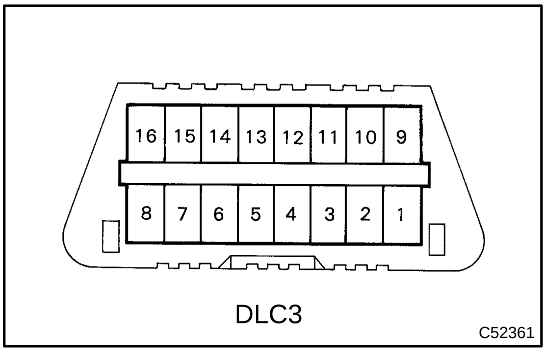
The master warning lamp illuminates when THS II fails and it blinks when in inspection mode.

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the OBD II scan tool complying with SAE J1978 or the hand-held tester to the vehicle, and read various data output from the vehicle's ECUs.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) in the instrument panel when the computer detects a malfunction in: 1) the emission control systems/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computers. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the HV control ECU memory (see page 05-440).

If the malfunction does not recur in 3 consecutive trips, the MIL will go off automatically. However the DTCs remain recorded in the HV control ECU memory.



- To check the DTCs, connect the hand-held tester to the Data Link Connector 3 (DLC3) with the CAN vehicle interface module (CAN VIM). Or, connect the OBD II scan tool to the DLC3. The hand-held tester or OBD II scan tool also enables you to erase the DTCs and check the freeze frame data and various forms of THS II data (for operating instructions, refer to their respective instruction manuals). The DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set by a manufacturer within the prescribed limits (see the DTC chart on page 05-440).
- Freeze frame data:
  The freeze frame data record the driving condition when malfunction is detected. When troubleshooting, it can help determine if the vehicle was moving, braking, stationary, or reversing.



2. CHECK DLC3

The HV control ECU uses the ISO 9141-2 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - LOW-level CAN bus line	54 to 69 Ω	Power switch OFF
CANH	6	HIGH-level CAN bus line	16 - Battery positive	1 MΩ or higher	Power switch OFF
CANH	6	HIGH-level CAN bus line	4 - Chassis ground	1 kΩ or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	16 - Battery positive	1 MΩ or higher	Power switch OFF
CANL	14	LOW-level CAN bus line	4 - Chassis ground	1 kΩ or higher	Power switch OFF

HINT:
If the display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the hand-held tester or the OBD II scan tool to the DLC3, turned the power switch ON and operated the tester, there is a problem on the vehicle side or tester side.

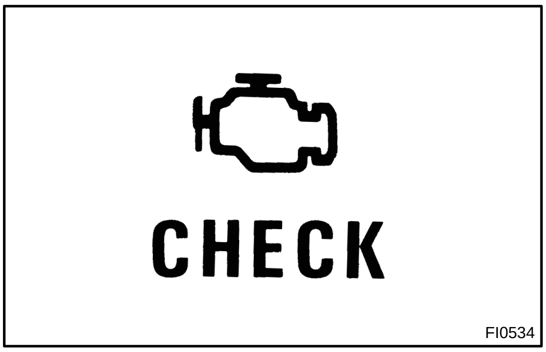
- If communication is normal when the tester or scan tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tester or scan tool is connected to another vehicle, the problem is probably in the tester or scan tool itself, so consult the Service Department listed in its instruction manual.

3. INSPECT AUXILIARY BATTERY

(a) Measure the voltage of the auxiliary battery.

Voltage: 11 to 14 V

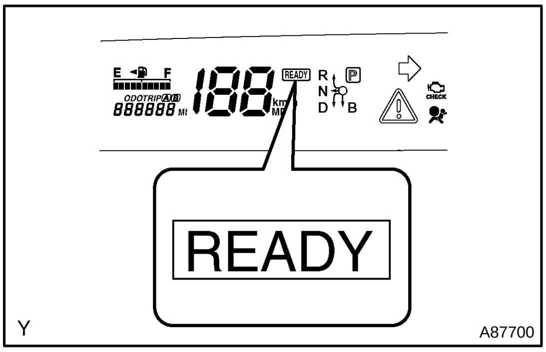
(b) Inspect the auxiliary battery, fuses, fusible links, wiring harness, connectors and ground.



4. CHECK MIL

(a) The MIL illuminates when the power switch is turned ON and the "READY" lamp is OFF.

If the MIL is not illuminated, troubleshoot the MIL circuit (see page 05-381).

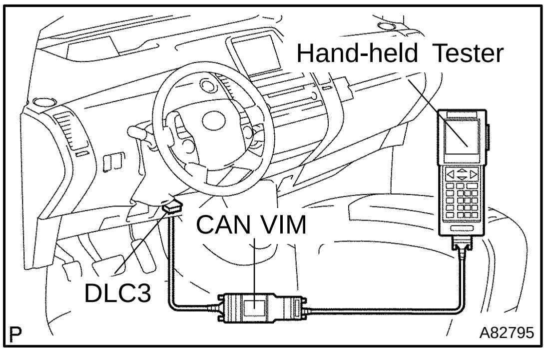


(b) When the "READY" turns on, the MIL should turn off.

If the MIL remains on, the diagnosis system has detected a malfunction or abnormality in the system.

05J85-01

DTC CHECK/CLEAR



1. CHECK DTC (HV ECU)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

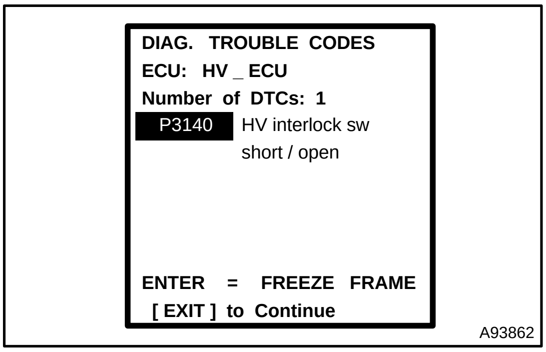
(b) Turn the power switch ON (IG) and turn the hand-held tester or the OBD II scan tool ON.

(c) Using the hand-held tester or the OBD II scan tool, check the DTCs and freeze frame data and then write them down.

For the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV ECU / DTC INFO / CURRENT CODES.

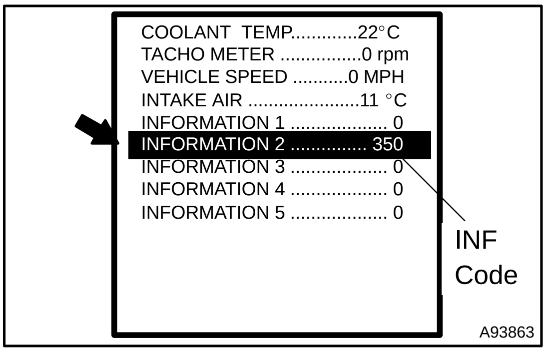
For the OBD II scan tool, see its instruction manual.

(d) See page 05-440 to confirm the details of the DTCs.



2. CHECK FREEZE FRAME DATA AND INFORMATION

(a) If a DTC is present, select that DTC in order to display its freeze frame data.



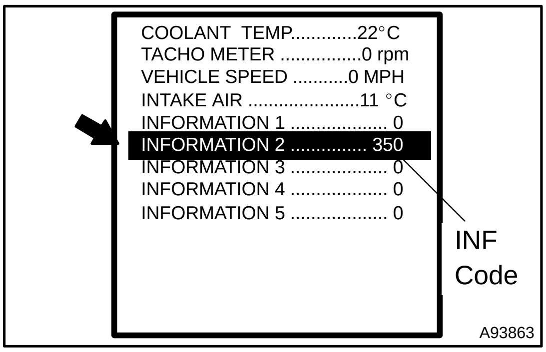
(b) Read freeze frame data recorded when the DTC was set.

NOTICE:

An information code (INF code) is displayed in one of the INFORMATION lines 1 to 5. Check the details by following the procedures in the following steps.

HINT:

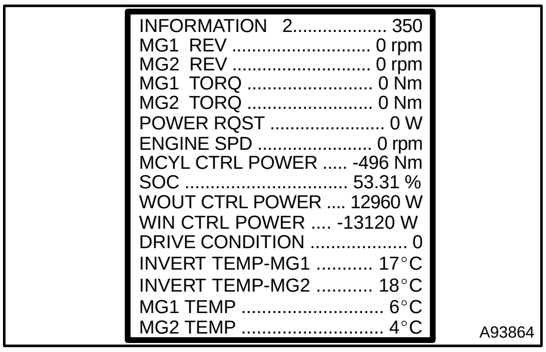
In the case shown in the illustration, refer to troubleshooting for DTC P3140 and INF code 350.



(c) Read the information.

(1) Select the item that has an INF code from among INFORMATION 1 to 5 on the freeze frame data screen.

(2) Press ENTER.



(3) Information is displayed as shown in the illustration.

3. CHECK DTC (SYSTEMS OTHER THAN HV ECU)

HINT:

The HV control ECU maintains mutual communication with the computers, including the ECM, battery ECU, skid control ECU, power steering ECU and others. Therefore, if the HV control ECU outputs a warning, it is necessary to check and record the DTCs of all the systems.

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

(b) Turn the power switch ON (IG) and turn the hand-held tester or the OBD II scan tool ON.

(c) For the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / CODES (All).
For the OBD II scan tool, see its instruction manual.

(d) If DTCs are present, check the relevant systems.

HINT:

If DTCs for the CAN communication system are present in addition to other DTCs, first troubleshoot and repair any malfunctions in the CAN communication (see page 05-2594).

4. CLEAR DTC

NOTICE:

Clearing the DTCs will also clear the freeze frame data, information (see page 05-422) and operation history data (see page 05-426).

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.

(b) Turn the power switch ON (IG) and turn the hand-held tester or the OBD II scan tool ON.

(c) Check that the shift position is in the P position.

(d) Clear DTCs and freeze frame data with the hand-held tester or the OBD II scan tool.
For the hand-held tester:
(1) Enter the following menus: DIAGNOSIS / OBD/ MOBD / HV ECU / DTC INFO / CLEAR CODES.
(2) Press YES.
For the OBD II scan tool, see its instruction manual.

05J88-01

FAIL-SAFE CHART

1. FAIL-SAFE CHART

DTC No.	Detection Item	INF Code	Driving Condition
B2799	Immobilizer malfunction	539	Impossible to drive
B2799	Immobilizer malfunction	540	Impossible to drive
B2799	Immobilizer malfunction	541	Impossible to drive
B2799	Immobilizer malfunction	542	Impossible to drive
B2799	Immobilizer malfunction	543	Impossible to drive
B2799	Immobilizer malfunction	544	Impossible to drive
P0336	Crankshaft Position Sensor ”A” Circuit Range/Performance	137	Normal driving
P0338	Crankshaft Position Sensor ”A” Circuit High Input	600	Normal driving
P0340	Camshaft Position Sensor ”A” Circuit	532	Normal driving
P0343	Camshaft Position Sensor ”A” Circuit High Input	601	Normal driving
P0500	Vehicle Speed Sensor ”A”	352	Cruise control driving impossible
P0560	System Voltage	117	Normal driving
P0571	Brake Switch ”A” Circuit	115	Cruise control driving impossible
P0607	Control Module Performance	116	Cruise control driving impossible
P0705	Transmission Range Sensor Circuit	571	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	572	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	573	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	574	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	575	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	576	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	577	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	578	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	595	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0705	Transmission Range Sensor Circuit	596	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0851	Park/Neutral Switch Input Circuit Low	579	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0852	Park/Neutral Switch Input Circuit High	580	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P0A08	DC/DC Converter Status Circuit	264	Normal driving
P0A09	DC/DC Converter Status Circuit Low Input	265	Normal driving
P0A09	DC/DC Converter Status Circuit Low Input	591	Normal driving
P0A0F	Engine Failed to Start	204	Limited driving
P0A0F	Engine Failed to Start	205	Limited driving
P0A0F	Engine Failed to Start	238	Limited driving
P0A0F	Engine Failed to Start	533	Limited driving
P0A0F	Engine Failed to Start	534	Limited driving
P0A10	DC/DC Converter Status Circuit High Input	263	Normal driving
P0A10	DC/DC Converter Status Circuit High Input	592	Normal driving
P0A1D	Hybrid Powertrain Control Module	134	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	135	Impossible to drive

DTC No.	Detection Item	INF Code	Driving Condition
P0A1D	Hybrid Powertrain Control Module	139	Normal driving
P0A1D	Hybrid Powertrain Control Module	140	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	141	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	142	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	143	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	144	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	145	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	148	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	149	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	150	Limited driving
P0A1D	Hybrid Powertrain Control Module	151	Limited driving
P0A1D	Hybrid Powertrain Control Module	152	Limited driving
P0A1D	Hybrid Powertrain Control Module	155	Limited driving
P0A1D	Hybrid Powertrain Control Module	156	Limited driving
P0A1D	Hybrid Powertrain Control Module	158	Limited driving
P0A1D	Hybrid Powertrain Control Module	159	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	160	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	163	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	164	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	165	Limited driving
P0A1D	Hybrid Powertrain Control Module	166	Normal driving
P0A1D	Hybrid Powertrain Control Module	167	Limited driving
P0A1D	Hybrid Powertrain Control Module	168	Limited driving
P0A1D	Hybrid Powertrain Control Module	177	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	178	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	180	Limited driving
P0A1D	Hybrid Powertrain Control Module	181	Limited driving
P0A1D	Hybrid Powertrain Control Module	182	Limited driving
P0A1D	Hybrid Powertrain Control Module	183	Limited driving
P0A1D	Hybrid Powertrain Control Module	184	Limited driving
P0A1D	Hybrid Powertrain Control Module	185	Limited driving
P0A1D	Hybrid Powertrain Control Module	186	Limited driving
P0A1D	Hybrid Powertrain Control Module	187	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	188	Limited driving
P0A1D	Hybrid Powertrain Control Module	189	Limited driving
P0A1D	Hybrid Powertrain Control Module	192	Limited driving
P0A1D	Hybrid Powertrain Control Module	193	Limited driving
P0A1D	Hybrid Powertrain Control Module	195	Limited driving
P0A1D	Hybrid Powertrain Control Module	196	Limited driving
P0A1D	Hybrid Powertrain Control Module	197	Limited driving
P0A1D	Hybrid Powertrain Control Module	198	Normal driving
P0A1D	Hybrid Powertrain Control Module	199	Limited driving
P0A1D	Hybrid Powertrain Control Module	200	Limited driving
P0A1D	Hybrid Powertrain Control Module	390	Limited driving
P0A1D	Hybrid Powertrain Control Module	392	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	393	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	511	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	512	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	564	Limited driving
P0A1D	Hybrid Powertrain Control Module	565	Limited driving
P0A1D	Hybrid Powertrain Control Module	567	Impossible to drive

DTC No.	Detection Item	INF Code	Driving Condition
P0A1D	Hybrid Powertrain Control Module	568	Limited driving
P0A1D	Hybrid Powertrain Control Module	569	Limited driving
P0A1D	Hybrid Powertrain Control Module	570	Impossible to drive
P0A1D	Hybrid Powertrain Control Module	615	Limited driving
P0A1F	Battery Energy Control Module	123	Limited driving
P0A1F	Battery Energy Control Module	129	Limited driving
P0A1F	Battery Energy Control Module	593	Normal driving
P0A2B	Drive Motor "A" Temperature Sensor Circuit Range/ Performance	248	Normal driving
P0A2B	Drive Motor "A" Temperature Sensor Circuit Range/ Performance	250	Normal driving
P0A2C	Drive Motor "A" Temperature Sensor Circuit Low	247	Normal driving
P0A2D	Drive Motor "A" Temperature Sensor Circuit High	249	Normal driving
P0A37	Generator Temperature Sensor Circuit Range/Performance	258	Normal driving
P0A37	Generator Temperature Sensor Circuit Range/Performance	260	Normal driving
P0A38	Generator Temperature Sensor Circuit Low	257	Normal driving
P0A39	Generator Temperature Sensor Circuit High	259	Normal driving
P0A3F	Drive Motor "A" Position Sensor Circuit	243	Limited driving
P0A40	Drive Motor "A" Position Sensor Circuit Range/Performance	500	Limited driving
P0A41	Drive Motor "A" Position Sensor Circuit Low	245	Limited driving
P0A4B	Generator Position Sensor Circuit	253	Limited driving
P0A4C	Generator Position Sensor Circuit Range/Performance	513	Limited driving
P0A4D	Generator Position Sensor Circuit Low	255	Limited driving
P0A51	Drive Motor "A" Current Sensor Circuit	174	Limited driving
P0A60	Drive Motor "A" Phase V Current	288	Limited driving
P0A60	Drive Motor "A" Phase V Current	289	Limited driving
P0A60	Drive Motor "A" Phase V Current	290	Limited driving
P0A60	Drive Motor "A" Phase V Current	292	Limited driving
P0A60	Drive Motor "A" Phase V Current	294	Limited driving
P0A60	Drive Motor "A" Phase V Current	501	Limited driving
P0A63	Drive Motor "A" Phase W Current	296	Limited driving
P0A63	Drive Motor "A" Phase W Current	297	Limited driving
P0A63	Drive Motor "A" Phase W Current	298	Limited driving
P0A63	Drive Motor "A" Phase W Current	300	Limited driving
P0A63	Drive Motor "A" Phase W Current	302	Limited driving
P0A63	Drive Motor "A" Phase W Current	502	Limited driving
P0A72	Generator Phase V Current	326	Limited driving
P0A72	Generator Phase V Current	327	Limited driving
P0A72	Generator Phase V Current	328	Limited driving
P0A72	Generator Phase V Current	330	Limited driving
P0A72	Generator Phase V Current	333	Limited driving
P0A72	Generator Phase V Current	515	Limited driving
P0A75	Generator Phase W Current	334	Limited driving
P0A75	Generator Phase W Current	335	Limited driving
P0A75	Generator Phase W Current	336	Limited driving
P0A75	Generator Phase W Current	338	Limited driving
P0A75	Generator Phase W Current	341	Limited driving
P0A75	Generator Phase W Current	516	Limited driving

DTC No.	Detection Item	INF Code	Driving Condition
P0A78	Drive Motor ”A” Inverter Performance	266	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	267	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	272	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	278	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	279	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	280	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	282	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	283	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	284	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	285	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	286	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	287	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	304	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	305	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	306	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	308	Impossible to drive
P0A78	Drive Motor ”A” Inverter Performance	503	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	504	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	505	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	506	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	507	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	508	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	510	Normal driving
P0A78	Drive Motor ”A” Inverter Performance	523	Limited driving
P0A78	Drive Motor ”A” Inverter Performance	586	Limited driving
P0A7A	Generator Inverter Performance	309	Limited driving
P0A7A	Generator Inverter Performance	321	Normal driving
P0A7A	Generator Inverter Performance	322	Limited driving
P0A7A	Generator Inverter Performance	323	Normal driving
P0A7A	Generator Inverter Performance	324	Limited driving
P0A7A	Generator Inverter Performance	325	Limited driving
P0A7A	Generator Inverter Performance	342	Limited driving
P0A7A	Generator Inverter Performance	343	Limited driving
P0A7A	Generator Inverter Performance	344	Limited driving
P0A7A	Generator Inverter Performance	517	Limited driving
P0A7A	Generator Inverter Performance	518	Limited driving
P0A7A	Generator Inverter Performance	519	Limited driving
P0A7A	Generator Inverter Performance	520	Limited driving
P0A7A	Generator Inverter Performance	522	Normal driving
P0A90	Drive Motor ”A” Performance	239	Limited driving
P0A90	Drive Motor ”A” Performance	240	Limited driving
P0A90	Drive Motor ”A” Performance	241	Limited driving
P0A90	Drive Motor ”A” Performance	242	Limited driving
P0A90	Drive Motor ”A” Performance	251	Limited driving
P0A90	Drive Motor ”A” Performance	509	Limited driving
P0A90	Drive Motor ”A” Performance	602	Limited driving
P0A90	Drive Motor ”A” Performance	604	Limited driving
P0A90	Drive Motor ”A” Performance	605	Limited driving
P0A92	Hybrid Generator Performance	261	Limited driving
P0A92	Hybrid Generator Performance	521	Limited driving
P0A92	Hybrid Generator Performance	606	Limited driving

DTC No.	Detection Item	INF Code	Driving Condition
P0A92	Hybrid Generator Performance	607	Limited driving
P0A93	Inverter Cooling System Performance	346	Normal driving
P0A93	Inverter Cooling System Performance	347	Normal driving
P0A94	DC/DC Converter Performance	442	Limited driving
P0A94	DC/DC Converter Performance	545	Limited driving
P0A94	DC/DC Converter Performance	546	Limited driving
P0A94	DC/DC Converter Performance	547	Limited driving
P0A94	DC/DC Converter Performance	548	Limited driving
P0A94	DC/DC Converter Performance	549	Limited driving
P0A94	DC/DC Converter Performance	550	Limited driving
P0A94	DC/DC Converter Performance	551	Limited driving
P0A94	DC/DC Converter Performance	552	Limited driving
P0A94	DC/DC Converter Performance	553	Limited driving
P0A94	DC/DC Converter Performance	554	Limited driving
P0A94	DC/DC Converter Performance	555	Limited driving
P0A94	DC/DC Converter Performance	556	Limited driving
P0A94	DC/DC Converter Performance	557	Limited driving
P0A94	DC/DC Converter Performance	558	Normal driving
P0A94	DC/DC Converter Performance	559	Limited driving
P0A94	DC/DC Converter Performance	560	Normal driving
P0A94	DC/DC Converter Performance	561	Limited driving
P0A94	DC/DC Converter Performance	583	Normal driving
P0A94	DC/DC Converter Performance	584	Normal driving
P0A94	DC/DC Converter Performance	585	Normal driving
P0A94	DC/DC Converter Performance	587	Limited driving
P0A94	DC/DC Converter Performance	588	Limited driving
P0A94	DC/DC Converter Performance	589	Normal driving
P0A94	DC/DC Converter Performance	590	Normal driving
P0AA1	Hybrid Battery Positive Contactor Circuit Stuck Closed	224	Normal driving
P0AA1	Hybrid Battery Positive Contactor Circuit Stuck Closed	226	Impossible to drive
P0AA1	Hybrid Battery Positive Contactor Circuit Stuck Closed	231	Impossible to drive
P0AA1	Hybrid Battery Positive Contactor Circuit Stuck Closed	233	Impossible to drive
P0AA2	Hybrid Battery Positive Contactor Circuit Stuck Open	225	Normal driving
P0AA2	Hybrid Battery Positive Contactor Circuit Stuck Open	227	Impossible to drive
P0AA4	Hybrid Battery Negative Contactor Circuit Stuck Closed	228	Impossible to drive
P0AA4	Hybrid Battery Negative Contactor Circuit Stuck Closed	232	Limited driving
P0AA5	Hybrid Battery Negative Contactor Circuit Stuck Open	229	Impossible to drive
P2120	Throttle/Pedal Position Sensor/Switch ”D” Circuit	111	Limited driving
P2121	Throttle/Pedal Position Sensor/Switch ”D” Circuit Range/Performance	106	Limited driving
P2121	Throttle/Pedal Position Sensor/Switch ”D” Circuit Range/Performance	114	Limited driving
P2122	Throttle/Pedal Position Sensor/Switch ”D” Circuit Low Input	104	Limited driving

DTC No.	Detection Item	INF Code	Driving Condition
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	105	Limited driving
P2125	Throttle/Pedal Position Sensor/Switch "E" Circuit	112	Limited driving
P2126	Throttle/Pedal Position Sensor/Switch "E" Circuit Range/Performance	109	Limited driving
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	107	Limited driving
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	108	Limited driving
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	110	Limited driving
P3000	Battery Control System Malfunction	123	Limited driving
P3000	Battery Control System Malfunction	125	Limited driving
P3000	Battery Control System Malfunction	388	Limited driving
P3000	Battery Control System Malfunction	389	Limited driving
P3000	Battery Control System Malfunction	603	Limited driving
P3004	High Voltage Power Resource Malfunction	131	Impossible to drive
P3004	High Voltage Power Resource Malfunction	132	Normal driving
P3004	High Voltage Power Resource Malfunction	133	Limited driving
P3009	High Voltage Power Short Circuit	526	Normal driving
P3009	High Voltage Power Short Circuit	611	Normal driving
P3009	High Voltage Power Short Circuit	612	Normal driving
P3009	High Voltage Power Short Circuit	613	Normal driving
P3009	High Voltage Power Short Circuit	614	Normal driving
P3102	Transmission Control ECU Malfunction	524	Impossible to drive
P3102	Transmission Control ECU Malfunction	525	Impossible to drive
P3102	Transmission Control ECU Malfunction	581	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P3102	Transmission Control ECU Malfunction	582	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P3102	Transmission Control ECU Malfunction	597	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P3102	Transmission Control ECU Malfunction	598	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P3102	Transmission Control ECU Malfunction	599	If shift position cannot be fixed: Impossible to drive If shift position is being fixed: Normal driving
P3107	Lost Communication with Airbag System Control Module	213	Normal driving
P3107	Lost Communication with Airbag System Control Module	214	Normal driving
P3107	Lost Communication with Airbag System Control Module	215	Normal driving
P3108	Lost Communication with A/C System Control Module	535	Normal driving
P3108	Lost Communication with A/C System Control Module	536	Normal driving
P3108	Lost Communication with A/C System Control Module	537	Normal driving
P3108	Lost Communication with A/C System Control Module	538	Normal driving
P3108	Lost Communication with A/C System Control Module	594	Normal driving
P3110	HV Main Relay Malfunction	223	Normal driving
P3110	HV Main Relay Malfunction	527	Impossible to drive

DTC No.	Detection Item	INF Code	Driving Condition
P3137	Collision Sensor Low Input	348	Normal driving
P3138	Collision Sensor High Input	349	Normal driving
P3140	HV Interlock Switch Operation	350	Normal driving
P3143	HV Interlock Switch Open/Short	351	Normal driving
P3211	Drive Motor ”A” Inverter Temperature Sensor Circuit Range/Performance	276	Normal driving
P3211	Drive Motor ”A” Inverter Temperature Sensor Circuit Range/Performance	277	Normal driving
P3212	Drive motor ”A” Inverter Temperature Sensor Circuit Range/Performance	275	Normal driving
P3213	Drive Motor ”A” Inverter Temperature Sensor Circuit High	274	Normal driving
P3221	Generator Inverter Temperature Sensor Circuit Range/Performance	314	Normal driving
P3221	Generator Inverter Temperature Sensor Circuit Range/Performance	315	Normal driving
P3222	Generator Inverter Temperature Sensor Circuit High/Low	313	Normal driving
P3223	Generator Inverter Temperature Sensor Circuit High	312	Normal driving
P3226	DC/DC (Boost) Converter Temperature Sensor Malfunction	562	Normal driving
P3226	DC/DC (Boost) Converter Temperature Sensor Malfunction	563	Normal driving
U0100	Lost Communication with ECM/PCM ”A”	211	Limited driving
U0100	Lost Communication with ECM/PCM ”A”	212	Limited driving
U0100	Lost Communication with ECM/PCM ”A”	530	Limited driving
U0111	Lost Communication with Battery Energy Control Module ”A”	208	Limited driving
U0111	Lost Communication with Battery Energy Control Module ”A”	531	Limited driving
U0129	Lost Communication with Brake System Control Module	220	Regenerative brake ineffective
U0129	Lost Communication with Brake System Control Module	222	Regenerative brake ineffective
U0129	Lost Communication with Brake System Control Module	528	Regenerative brake ineffective
U0129	Lost Communication with Brake System Control Module	529	Regenerative brake ineffective
U0131	Lost Communication with Power Steering Control Module	433	Normal driving
U0131	Lost Communication with Power Steering Control Module	434	Normal driving
U0146	Lost Communication with Gateway ”A”	435	Normal driving

05J80-01

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 8.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05-406)

3	CONNECT HAND-HELD TESTER OR OBD II SCAN TOOL TO DLC3

HINT:
If the display indicates a communication fault in the tester, inspect the DLC3.

4	CHECK AND RECORD DTC AND FREEZE FRAME DATA (See page 05-420)

HINT:
If a DTC related to the CAN communication system malfunction is output, first troubleshoot and repair the CAN communication (see page 05-2594).

5	CLEAR DTC (See page 05-420)

6	PROBLEM SYMPTOM CONFIRMATION

(a) When the malfunction does not occur, go to A.
(b) When the malfunction occurs, go to B.

B → **Go to step 8**

A

7	SYMPTOM SIMULATION

8	CHECK DTC (See page 05-420)

9	DTC CHART (See page 05-440)

10	CIRCUIT INSPECTION

11	IDENTIFICATION OF PROBLEM

12	ADJUSTMENT AND/OR REPAIR

13	CONFIRMATION TEST

END

05J86-01

INFORMATION/FREEZE FRAME DATA

1. FREEZE FRAME DATA

HINT:

The freeze frame data record the driving conditions when the DTC was set. It is used for estimating or simulating the condition of the vehicle when the malfunction occurred. To check the details of the hybrid vehicle control system, check the detailed information for the DTC (Information).

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the following menu items: DIAGNOSIS / OBD/MOBD / HV ECU / DTC INFO / CURRENT CODES.
(e) Select a DTC in order to display its freeze frame data.
(f) Check the freeze frame data of the DTC that has been detected.
(g) Check information of the DTC (see next page).

Freeze frame data:

Hand-held Tester Display	Measurement Item/Range (Display)	Suspected Vehicle Status When Malfunction Occurs
FREEZE DTC	DTC corresponding to displayed freeze frame data	—
COOLANT TEMP	Engine coolant temperature/ Min.: -40°C, Max.: 140°C	Cold or warm engine
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Stopped, or driving (low, medium, and high speeds)
ENG RUN TIME	Elapsed time after starting engine Min.: 0 s, Max.: 65,535 s	Elapsed time from engine start
+B	Auxiliary battery voltage/ Min.: 0 V, Max.: 65.535 V	Condition of auxiliary battery
ACCEL POS #1	Accelerator pedal position sensor No. 1/ Min.: 0 %, Max.: 100 %	Idling, accelerating, or decelerating
ACCEL POS #2	Accelerator pedal position sensor No. 2/ Min.: 0 %, Max.: 100 %	Idling, accelerating or decelerating (For comparison with above to detect failure of accelerator pedal position sensor No .1)
AMBIENT TEMP	Ambient air temperature/ Min.: -40°C, Max.: 215°C	Ambient air temperature
INTAKE AIR TEMP	Intake air temperature/ Min.: -40°C, Max.: 140°C	Ambient air temperature
DTC CLEAR WARM	The number of times engine is warmed up after clearing DTCs/ Min.: 0, Max.: 255	Frequency of the malfunction recurrence after clearing DTCs
DTC CLEAR RUN	Drive distance after clearing DTCs/ Min.: 0 km, Max.: 65,535 km	Frequency of the malfunction recurrence after clearing DTCs
DTC CLEAR MIN	Elapsed time after clearing DTCs/ Min.: 0 min, Max.: 65,535 min	Frequency of the malfunction recurrence after clearing DTCs
ECU TYPE	Type of ECU	—
INFORMATION 1 to 5	Information code	—

2. INFORMATION

HINT:

Similar to freeze frame data, information records operating condition of the HV system and components at the time of detection of a DTC.

(a) Select one which has an INF code from among INFORMATION 1 to 5.

(b) Check the information of the DTC.

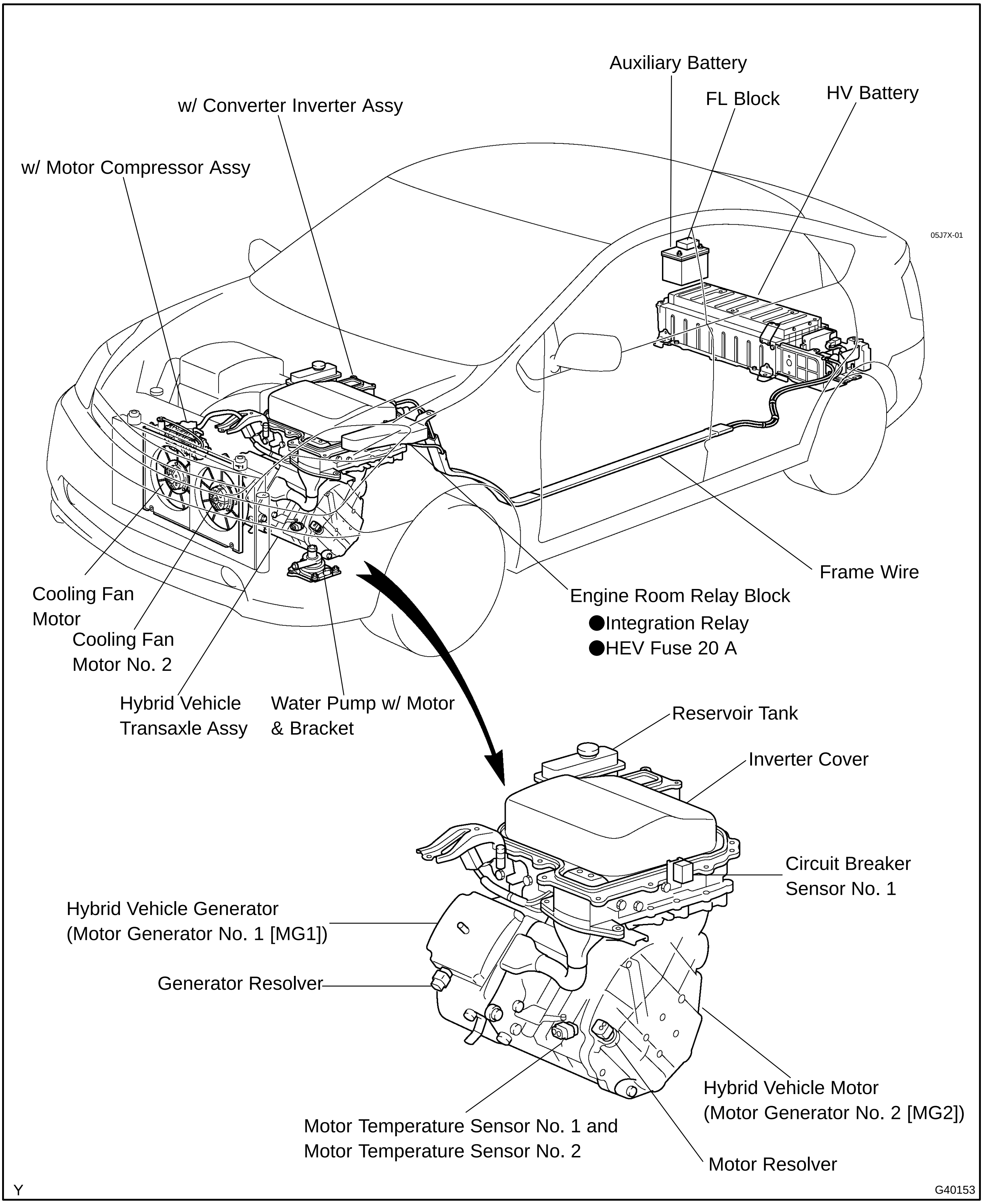
Information:

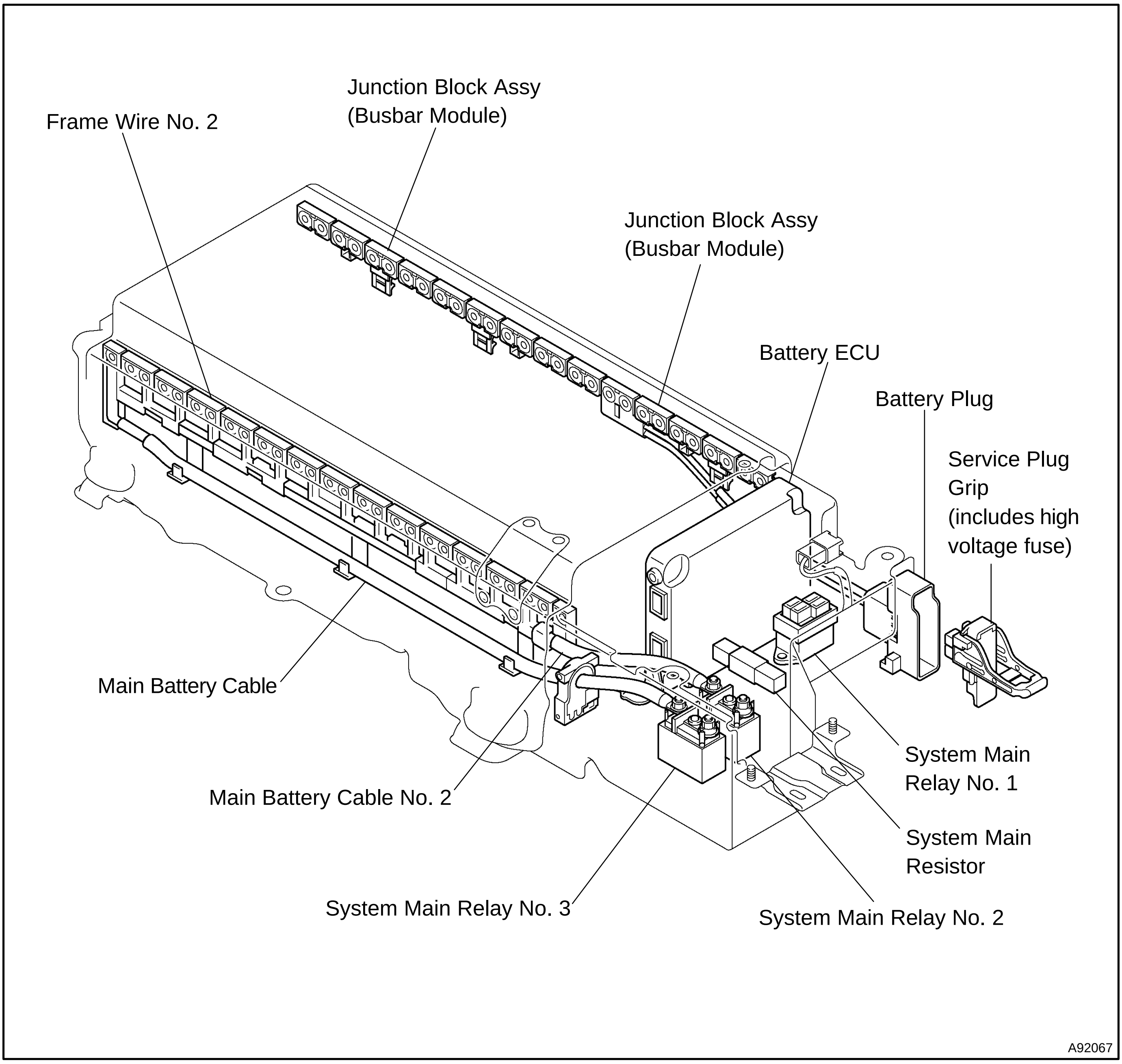
Hand-held Tester Display	Measurement Item/Range (Display)	Suspected Vehicle Status When Malfunction Occurs
INFORMATION N	Information code	Indication of system with malfunction
MG1 REV	MG1 revolution/ Min.: -16,384 rpm, Max.: 16,256 rpm	MG1 speed • Forward rotation appears as ”+” • Backward rotation appears as ”-”
MG2 REV	MG2 revolution/ Min.: -16,384 rpm, Max.: 16,256 rpm	MG2 speed (proportionate to vehicle speed) • Forward rotation appears as ”+” • Backward rotation appears as ”-” Moving direction of vehicle • Forward direction appears as ”+” • Backward direction appears as ”-”
MG1 TORQ	MG1 torque/ Min.: -512 Nm, Max.: 508 Nm	When MG1 rotation in + direction: • Torque appears as ”+” while MG1 discharges • Torque appears as ”-” while MG1 charges When MG1 rotation in - direction: • Torque appears as ”-” while MG1 discharges • Torque appears as ”+” while MG1 charges
MG2 TORQ	MG2 torque/ Min.: -512 Nm, Max.: 508 Nm	When MG2 rotation in + direction: • Torque appears as ”+” while MG2 discharges • Torque appears as ”-” while MG2 charges When MG2 rotation in - direction: • Torque appears as ”-” while MG2 discharges • Torque appears as ”+” while MG2 charges
INVERT TEMP-MG1	MG1 inverter temperature/ Min.: -50°C, Max.: 205°C	MG1 inverter temperature
INVERT TEMP-MG2	MG2 inverter temperature/ Min.: -50°C, Max.: 205°C	MG2 inverter temperature
MG2 TEMP (No2)	Transaxle fluid temperature/ Min.: -50°C, Max.: 205°C	Transaxle fluid temperature
MG2 TEMP (No1)	MG2 temperature/ Min.: -50°C, Max.: 205°C	MG2 temperature
POWER RQST	Request engine power/ Min.: 0 W, Max.: 255 kW	Engine power output requested to ECM
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,320 rpm	Engine speed
MCYL CTRL POWER	Master cylinder control torque/ Min.: -512 Nm, Max.: 508 Nm	Brake force requested by driver
SOC	Battery state of charge/ Min.: 0 %, Max.: 100 %	State of charge of HV battery
WOUT CTRL POWER	Power value discharge control/ Min.: 0 W, Max.: 81,600 W	Discharge amount of HV battery
WIN CTRL POWER	Power value charge control/ Min.: -40,800 W, Max.: 0 W	Charge amount of HV battery
DRIVE CONDITION	Drive condition ID • Engine stopped: 0 • Engine about to be stopped: 1 • Engine about to be started: 2 • Engine operated or operating: 3 • Generating or loading movement: 4 • Revving up with P position: 6	Engine operating condition

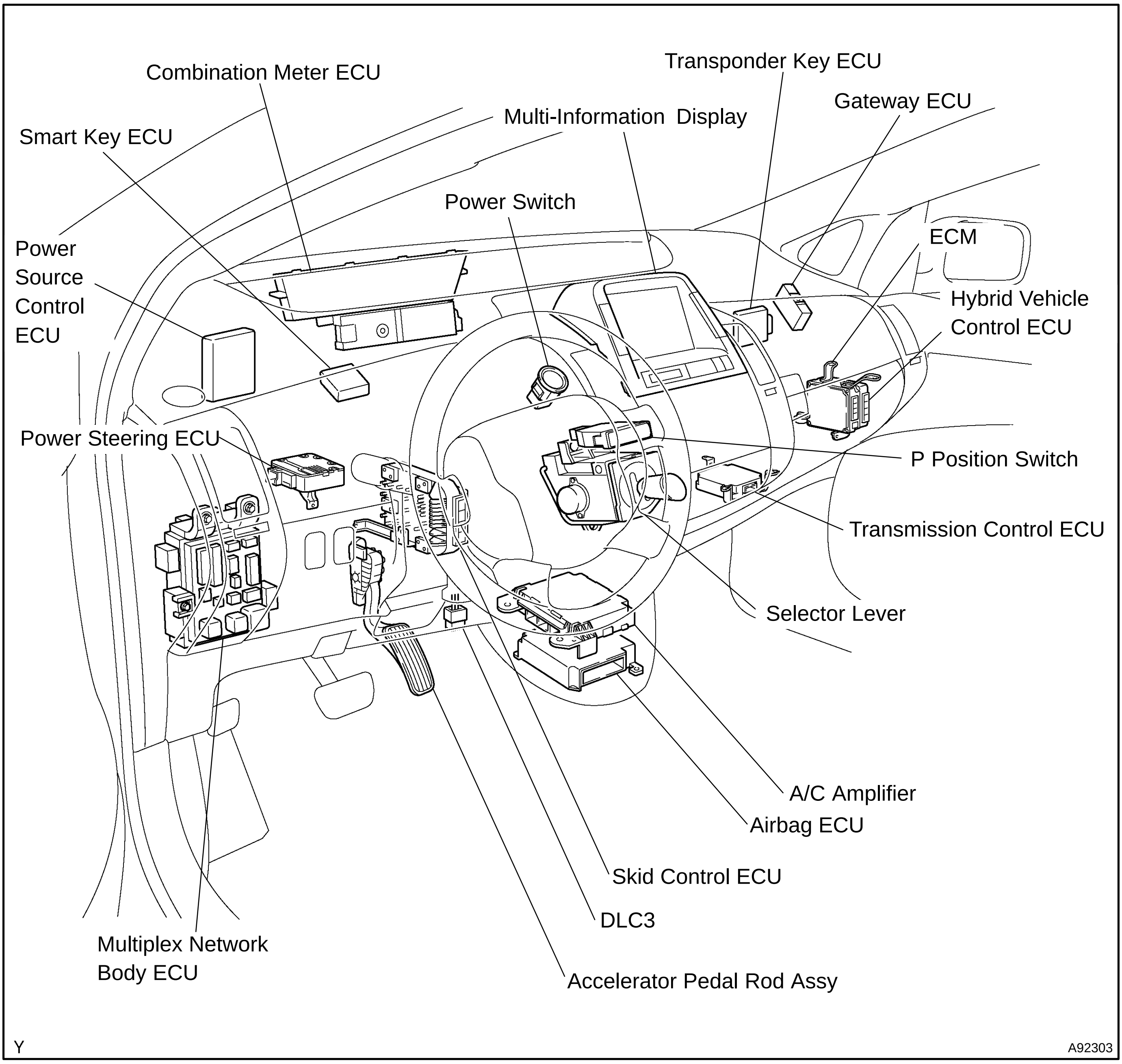
Hand-held Tester Display	Measurement Item/Range (Display)	Suspected Vehicle Status When Malfunction Occurs
PWR RESOURCE VB	HV battery voltage/ Min.: 0 V, Max.: 510 V	HV battery voltage
PWR RESOURCE IB	HV battery current/ Min.: -256 A, Max.: 254 A	Charging/discharging state of HV battery • Discharging amperage indicated by a positive value • Charging amperage indicated by a negative value
SHIFT POSITION	Shift position (P, R, N, D or B position) P: 0, R: 1, N: 2, D: 3, B: 4	Shift position
ACCEL SENSOR M	Accelerator pedal position sensor main/ Min.: 0 %, Max.: 100 %	Idling, accelerating, or decelerating
AUX. BATT V	Auxiliary battery voltage/ Min.: 0 V, Max.: 20 V	State of auxiliary battery
CONVERTER TEMP	Boost converter temperature/ Min.: -50°C, Max.: 205°C	Boost converter temperature
VL	High voltage before it is boosted/ Min.: 0 V, Max.: 510 V	High voltage level before it is boosted
VH	High voltage after it is boosted/ Min.: 0 V, Max.: 765 V	High voltage level after it is boosted
IG ON TIME	The time after power switch ON (IG)/ Min.: 0 min, Max.: 255 min	Time elapsed with power switch ON (IG)
VEHICLE SPD-MAX	Maximum vehicle speed/ Min.: -256 km/h, Max.: 254 km/h	Maximum vehicle speed
A/C CONSMPT PWR	A/C consumption power/ Min.: 0 kW, Max.: 5 kW	A/C load
ENG STOP RQST	Engine stop request/ NO or YES	Presence of engine stop request
IDLING REQUEST	Engine idling request/ NO or YES	Presence of idle stop request
ENGINE FUEL CUT	Engine fuel cut request/ NO or YES	Presence of fuel cut request
HV BATT CH RQST	HV battery charging request/ NO or YES	Presence of HV battery charging request
ENG WARM UP RQT	Engine warming up request/ NO or YES	Presence of engine warm-up request
STOP SW COND	Stop lamp switch ON condition/ NO or YES	Brake pedal depressed or released
CRUISE CONTROL	Cruise control active condition/ NO or YES	Operation under cruise control ON or OFF
EXCLUSIVE INFO 1 to 7	Exclusive information (in form of numerical data)	Exclusive Information linked to Information
OCCURENCE ORDER	Occurrence sequence of information	Occurrence sequence of information
INVT TMP-MG1 IG	MG1 inverter temperature after power switch ON (IG)/ Min.: -50°C, Max.: 205°C	MG1 inverter temperature soon after power switch ON (IG)
INVT TMP-MG2 IG	MG2 inverter temperature after power switch ON (IG)/ Min.: -50°C, Max.: 205°C	MG2 inverter temperature soon after power switch ON (IG)
MG2 TEMP IG	MG2 temperature after power switch ON (IG)/ Min.: -50°C, Max.: 205°C	MG2 temperature soon after power switch ON (IG)
CONVRTR TEMP IG	Boost converter temperature after power switch ON (IG)/ Min.: -50°C, Max.: 205°C	Boost converter temperature soon after power switch ON (IG)
SOC IG	Battery state of charge after power switch ON (IG)/ Min.: 0 %, Max.: 100 %	Battery state of charge soon after power switch ON (IG)
INVT TMP-MG1MAX	MG1 inverter maximum temperature/ Min.: -50°C, Max.: 205°C	Overheating state of MG1 inverter
INVT TMP-MG2MAX	MG2 inverter maximum temperature/ Min.: -50°C, Max.: 205°C	Overheating state of MG2 inverter
MG2 TEMP MAX	MG2 maximum temperature/ Min.: -50°C, Max.: 205°C	Overheating state of MG2
CONVRTR TMP MAX	Boost converter maximum temperature/ Min.: -50°C, Max.: 205°C	Overheating state of boost converter

Hand-held Tester Display	Measurement Item/Range (Display)	Suspected Vehicle Status When Malfunction Occurs
SOC MAX	Maximum status of charge/ Min.: 0 %, Max.: 100 %	Over-charging of HV battery
SOC MIN	Minimum status of charge/ Min.: 0 %, Max.: 100 %	Over-discharging of HV battery

LOCATION


Auxiliary Battery
FL Block
HV Battery
w/ Converter Inverter Assy
w/ Motor Compressor Assy
05J7X-01
Frame Wire
Engine Room Relay Block
●Integration Relay
●HEV Fuse 20 A
Cooling Fan Motor
Cooling Fan Motor No. 2
Hybrid Vehicle Transaxle Assy
Water Pump w/ Motor & Bracket
Reservoir Tank
Inverter Cover
Circuit Breaker Sensor No. 1
Hybrid Vehicle Generator (Motor Generator No. 1 [MG1])
Generator Resolver
Hybrid Vehicle Motor (Motor Generator No. 2 [MG2])
Motor Temperature Sensor No. 1 and Motor Temperature Sensor No. 2
Motor Resolver
Y
G40153


Junction Block Assy
(Busbar Module)
Frame Wire No. 2
Junction Block Assy
(Busbar Module)
Battery ECU
Battery Plug
Service Plug
Grip
(includes high
voltage fuse)
Main Battery Cable
System Main
Relay No. 1
Main Battery Cable No. 2
System Main
Resistor
System Main Relay No. 3
System Main Relay No. 2
A92067

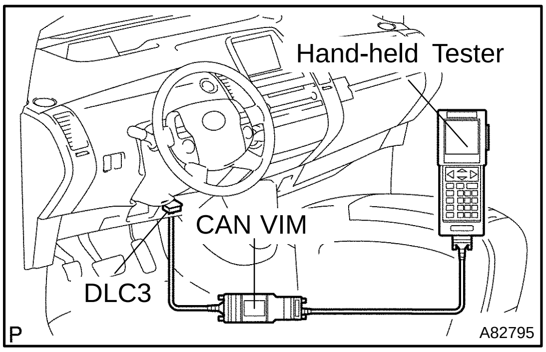

Combination Meter ECU
Transponder Key ECU
Gateway ECU
Multi-Information Display
Smart Key ECU
Power Switch
ECM
Power
Source
Control
ECU
Hybrid Vehicle
Control ECU
Power Steering ECU
P Position Switch
Transmission Control ECU
Selector Lever
A/C Amplifier
Airbag ECU
Skid Control ECU
DLC3
Multiplex Network
Body ECU
Accelerator Pedal Rod Assy
Y
A92303

05J87-01

OPERATION HISTORY DATA

1. OPERATION HISTORY DATA

HINT:
The operation history data records the special operations performed by the driver and the number of abnormal conditions that have been input into the HV control ECU.



(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / HV ECU / DATA LIST.
(e) Select the menu to view the number of special operations or controls that have been effected.

HINT:
- LATEST OPER: Among the past occurrences, the number of special operations or controls that have been effected during the most recent 1 trip detection.
- LATEST TRIP: The number of trips after the occurrence of LATEST OPER.
- BEF LATST OPER: The number of occurrences 1 previously from the LATEST OPER.
- BEF LATST TRIP: The number of trips after the occurrence of BEF LATST OPER.

Operation history data:

Hand-held Tester Display	Count Condition
SHIFT BEF READY	Selector lever moved with READY lamp blinking
N RANGE CTRL 2	N position control effected due to frequent shifting operation
STEP ACCEL IN N	Accelerator pedal depressed in N position
AUX. BATT LOW	Auxiliary battery voltage below 9.5 V
HV INTERMITTENT	Instantaneous open at IGSW terminal of HV control ECU
MG2 (NO1) TEMP HI	Motor temperature rose above 174°C (345°F)
MG2 (NO2) TEMP HI	Transaxle fluid temperature rose above 162°C (324°F)
MG2 INV TEMP HI	Motor inverter temperature rose above 111°C (232°F)
MG1 INV TEMP HI	Generator inverter temperature rose above 111°C (232°F)
MAIN BATT LOW	Battery state of charge dropped below 30 %
RESIST OVR HEAT	Limit resistor forecast temperature rose above 120°C (248°F)
COOLANT HEAT	Inverter coolant forecast temperature rose above 65°C (149°F)
CONVERTER HEAT	Boost converter temperature rose above 111°C (232°F)
SHIFT P IN RUN	Shifted to P while driving
BKWRD DIR SHIFT	Shifted to R while moving forward or to D or B while moving in reverse
PREVENT STAYING	Engine speed stays in resonance frequency band

05J7W-01

PART AND SYSTEM NAME LIST

1. PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA name	Definition
Toyota HCAC system	HC adsorptive three-way catalytic converter
Hydrocarbon absorptive catalyst (HCAC) system	HC adsorptive three-way catalytic converter
HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable valve timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Oil control valve for variable valve timing, OCV for VVT, VVT OCV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Engine speed sensor	Crankshaft position sensor
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control	Idle speed control
CCV, Canister closed valve	Evaporative emissions canister vent valve
VSV for EVAP	Evaporative emissions canister purge valve
VSV for bypass valve, VSV for vapor pressure sensor	Evaporative emission pressure switching valve
Vapor pressure sensor	Fuel tank pressure sensor
Charcoal canister, Canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic transmission
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid

TOYOTA name	Definition
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

2. ABBREVIATIONS LIST IN THIS MANUAL

Abbreviations	Meaning
AC	Alternating Current
A/C	Air Conditioning
A/D	Analog/Digital Converter
ACM	Active Control Engine Mount
AFS	Air Fuel Ratio Sensor
AP	Accelerator Pedal
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
Ave.	Average
B+	Battery Positive Voltage
BARO	Barometric Pressure
CAN	Controller Area Network
CL	Closed Loop
Calif.	California
CCV	Charcoal Canister Vent
CPU	Central Processing Unit
DC	Direct Current
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3
DTC	Diagnostic Trouble Code
DTM	Diagnostic Test Mode
ECM	Engine Control Module
ECT	Engine Coolant Temperature
ECU	Electronic Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EPS	Electric Power Steering
ETCS	Electronic Throttle Control System
EVAP	Evaporative Emissions
F/B	Feedback
FC	Fan Control
Fed.	Federal
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory
FEPROM	Flash Erasable Programmable Read Only Memory
Fr	Front
FTP	Fuel Tank Pressure
GND	Ground
GSA	Gear Shift Actuator
HC	Hydrocarbons
HPU	Hydraulic Power Unit
HV	Hybrid Vehicle
IAC	Idle Air Control
IAT	Intake Air Temperature
INF	Information
ISC	Idle Speed Control
J/B	Junction Block

Abbreviations	Meaning
J/C	Junction Connector
LH	Left-Hand
MG1	Motor Generator No. 1
MG2	Motor Generator No. 2
MIL	Malfunction Indicator Lamp
Min.	Minute(s)
MY	Model Year
No.	Number
NVRAM	Non-Volatile Random Access Memory
OBD	On-Board Diagnostic
OCV	Oil Control Valve
O/D	Overdrive
OP	Open Loop
PCM	Powertrain Control Module
PNP	Park/Neutral Position
PROM	Programmable Read Only Memory
PS, P/S	Power Steering
PSP	Power Steering Pressure
PWM	Pulse Width Modulation
RAM	Random Access Memory
R/B	Relay Block
Rev.	Revolutions
RH	Right-Hand
RM	Relay Module
ROM	Read Only Memory
RPM	Revolution Per Minutes (RPM)
Rr	Rear
SAE	Society of Automotive Engineers Inc.
Sec.	Second(s)
SMR	System Main Relay
SMT	Sequential Manual Transmission
SOC	State Of Charge
SRI	Service Reminder Indicator
SRT	System Readiness Test
ST	Scan Tool
STD	Standard
SW	Switch
TCM	Transmission Control Module
THA	Intake Air Temperature
THS	TOYOTA Hybrid System
TR	Transmission Range
TWC	Three-Way Catalytic Converter
VIN	Vehicle Identification Number
VM	Voltage Monitor
VR	Voltage Regulator
VSS	Vehicle Speed Sensor
VSV	Vacuum Switching Valve
VVT	Variable Valve Timing (System)
VVTL	Variable Valve Timing and Lift (System)
w/	With
w/o	Without

DTC P0560/117 SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

Since the ECU back-up power source is used for DTCs and freeze frame data memory, the back-up power source (BATT) continues to be supplied to the HV control ECU even though the power switch is turned OFF.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0560	117	HV control ECU back-up power source circuit malfunction	• Wire harness or connector • HEV fuse

MONITOR DESCRIPTION

If 3 or more seconds have elapsed with a voltage of 3.3 V or less at the BATT terminal at the HV control ECU, the HV control ECU will determine that a malfunction has occurred in the back-up power supply system, and set a DTC. It will illuminate the MIL the next time the engine is started.

MONITOR STRATEGY

Related DTCs	P0560 (INF 117): Battery signal malfunction
Required sensor/components	Main: Back-up power source circuit Sub: Hybrid vehicle control ECU
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	Immediate after next power switch ON (IG)
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	TOYOTA's intellectual property
A/D converter	Normal
Auxiliary battery voltage	9.5 V or more

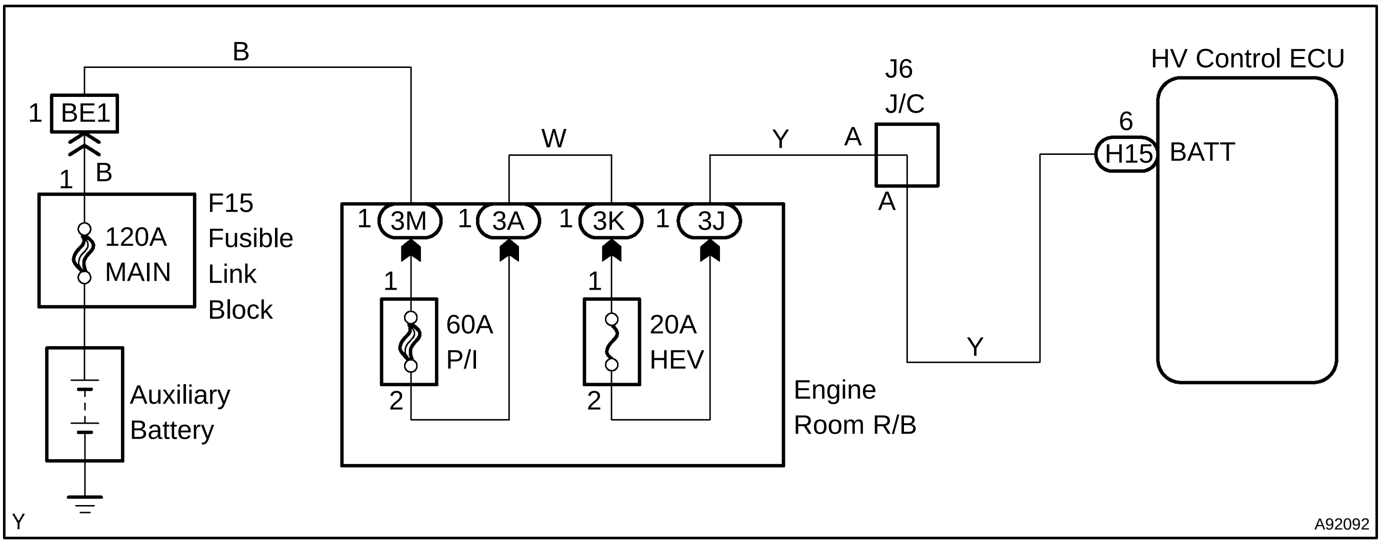
TYPICAL MALFUNCTION THRESHOLDS

Condition (a) or (b) is met	-
(d) Input voltage for BATT signal	Less than 2.5 V
(e) Abnormal flag for SRAM	ON

COMPONENT OPERATING RANGE

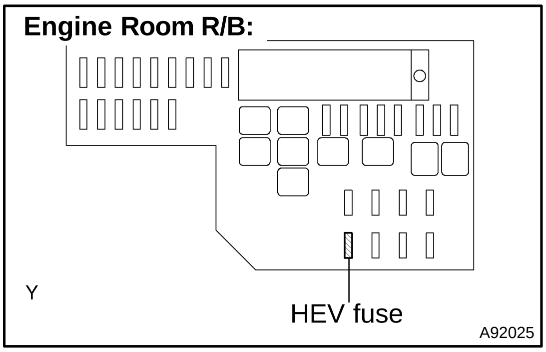
Auxiliary battery voltage	Between 9 and 14 V

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FUSE(HEV 20 A)



(a) Remove the HEV fuse from the engine room R/B.

(b) Check the resistance in the HEV fuse.

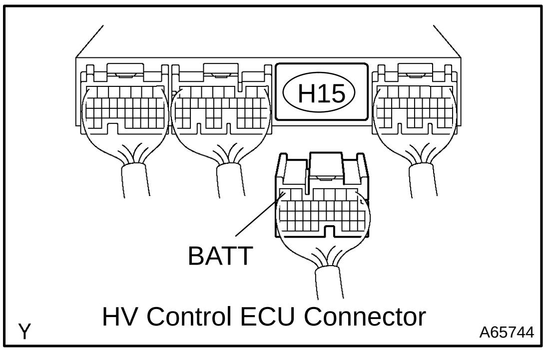
Standard: Below 1 Ω

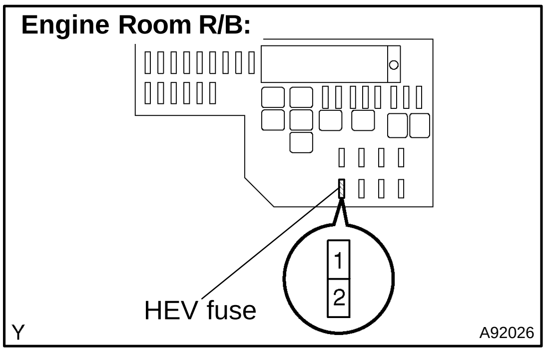
(c) Reinstall the HEV fuse.

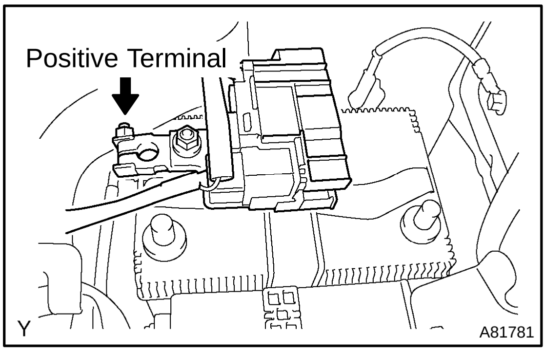
NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU - AUXILIARY BATTERY)







(a) Disconnect the negative auxiliary battery terminal.
(b) Disconnect the positive auxiliary battery terminal.
(c) Remove the HEV fuse from the engine room R/B.
(d) Disconnect the H15 HV control ECU connector.
(e) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
BATT (H15-6) - HEV fuse (2)	Below 1 Ω

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HEV fuse (1) - positive auxiliary battery terminal	Below 1 Ω

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

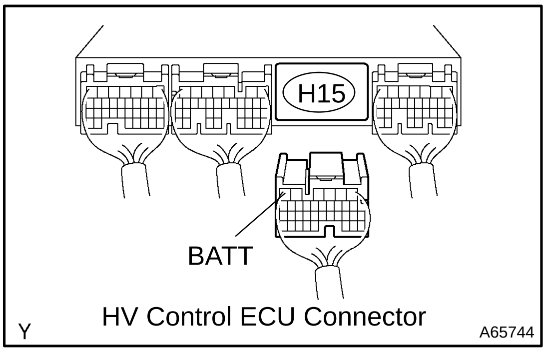
(g) Reconnect the HV control ECU connector.
(h) Reinstall the HEV fuse.
(i) Reconnect the positive auxiliary battery terminal.
(j) Reconnect the negative auxiliary battery terminal.

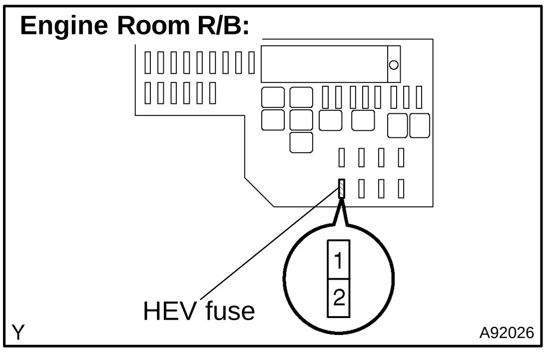
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR CONNECTOR CONNECTION

3	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU - HEV FUSE)





(a) Disconnect the H15 HV control ECU connector.
(b) Remove the HEV fuse from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for short):

Tester Connection	Specified Condition
BATT (H15-6) or HEV fuse (2) - Body ground	10 kΩ or higher

NOTICE:
When taking a measurement with a tester, do not apply excessive force to the tester probe to avoid damaging the holder.

(d) Reinstall the HEV fuse.
(e) Reconnect the HV control ECU connector.

NG → **AFTER REPAIRING OR REPLACING HARNESS OR CONNECTOR, REPLACE FUSE (HEV 20A)**

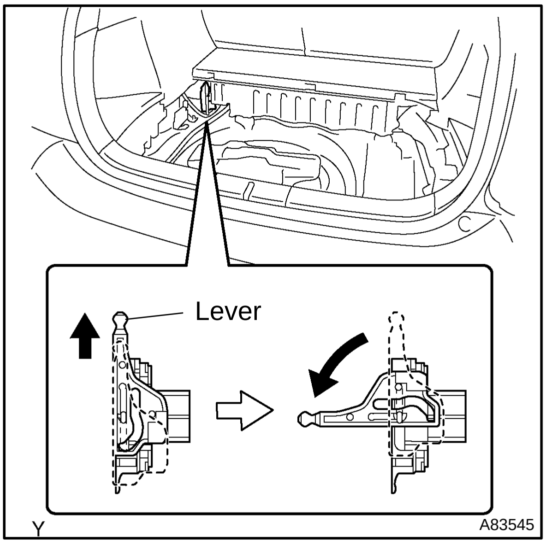
OK

REPLACE FUSE (HEV 20 A)

HYBRID CONTROL SYSTEM

05J7U-01

PRECAUTION



1. Precautions for inspecting the hybrid control system

(a) Before inspecting the high-voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip (see page 01-5). After removing the service plug grip, put it in your pocket to prevent other technicians from reconnecting it while you are servicing the high-voltage system.

NOTICE:

Turning the power switch ON (READY) with the service plug grip removed could cause a malfunction. Therefore, do not turn the power switch ON (READY) unless instructed by the repair manual.

(b) After disconnecting the service plug grip, wait for at least 5 minutes before touching any of high-voltage connectors or terminals.

HINT:

At least 5 minutes is required to discharge the high-voltage condenser inside the inverter.

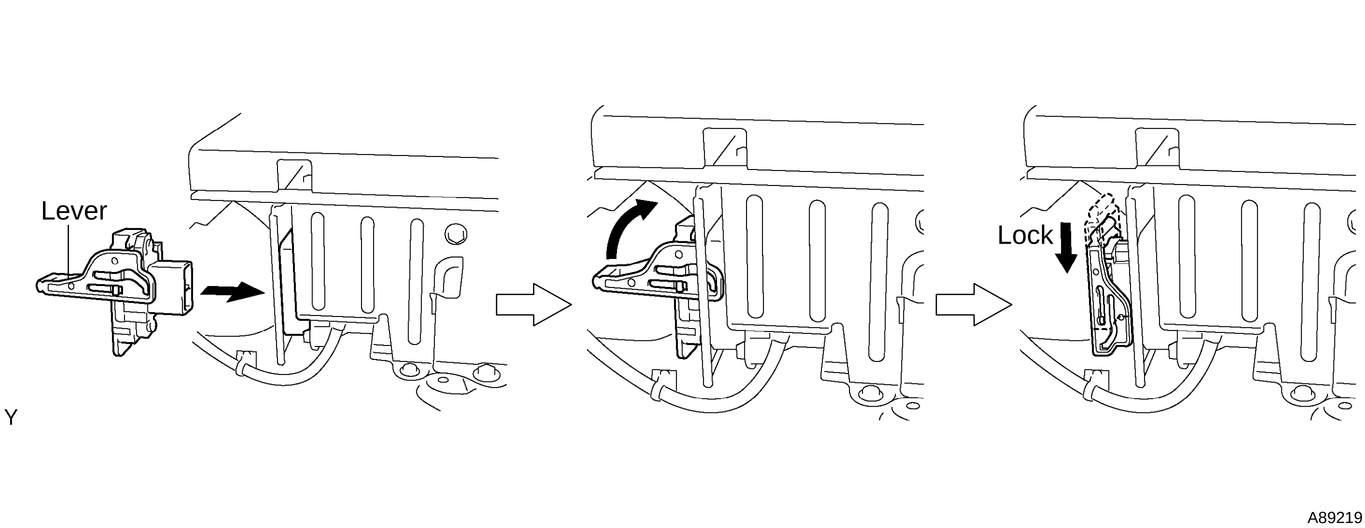
(c) Since liquid leakage may occur, wear protective goggles when checking inside the HV battery.

(d) Wear insulated gloves, turn the power switch OFF, and disconnect the negative terminal of the auxiliary battery before touching any of the orange-colored wires of the high-voltage system.

(e) Turn the power switch OFF before performing a resistance check.

(f) Turn the power switch OFF before disconnecting or reconnecting any connector.

(g) To install the service plug grip, the lever must be flipped and locked downward. Once it is locked in place, it turns the interlock switch ON. Make sure to lock it securely because if you leave it unlocked, the system will output a DTC pertaining to the interlock switch system.



2. NOTICE FOR INITIALIZATION

When disconnecting the negative (-) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See Page
Power Window Control System	05-2027

3. NOTICE FOR HYBRID SYSTEM ACTIVATION

- **When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first attempt. If so, press the power switch again.**
- **With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.**

05J8M-01

DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	539	Immobilizer malfunction	• Immobilizer system	X	X	-
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	540	Immobilizer malfunction	• Immobilizer system	X	X	-
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	541	Immobilizer malfunction	• Immobilizer system	X	X	-
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	542	Immobilizer malfunction	• Immobilizer system	X	X	-
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	543	Immobilizer malfunction	• Immobilizer system	X	X	-
B2799 (05-2369) *4 (05-2414) *5	Immobilizer Malfunction	544	Immobilizer malfunction	• Immobilizer system	X	X	-
P0336 (05-458)	Crankshaft Position Sensor "A" Circuit Range/Performance	137	Engine speed sensor deviation malfunction (CAN communication)	• Wire harness or connector • Crankshaft position sensor • Camshaft position sensor • HV control ECU	X	○	• HV system
P0338 (05-461)	Crankshaft Position Sensor "A" Circuit High Input	600	NEO signal circuit malfunction	• Wire harness or connector • HV control ECU	X	○	• HV system
P0340 (05-458)	Camshaft Position Sensor "A" Circuit	532	Engine speed sensor deviation malfunction (pulse signal)	• Wire harness or connector • Crankshaft position sensor • Camshaft position sensor • HV control ECU	X	○	• HV system
P0343 (05-461)	Camshaft Position Sensor "A" Circuit High Input	601	GO signal circuit malfunction	• Wire harness or connector • HV control ECU	X	○	• HV system
P0500 (05-2698)	Vehicle Speed Sensor "A"	352	No input of vehicle speed signal during cruise control driving	• Cruise control system	X	X	-
P0560 (05-463)	System Voltage	117	HV control ECU back-up power source circuit malfunction	• Wire harness or connector • HEV fuse	○	○	• HV system
P0571 (05-2702)	Brake Switch "A" Circuit	115	Open or short in stop lamp switch circuit	• Cruise control system	X	X	-
P0607 (05-2707)	Control Module Performance	116	When STP signal of HV control ECU is inconsistent with that of skid control ECU, with cruise control indicator ON	• Cruise control system	X	X	-
P0705 (05-467)	Transmission Range Sensor Circuit	571	Open or GND short in shift main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	572	+B short in shift main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	573	Open or GND short in shift sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0705 (05-467)	Transmission Range Sensor Circuit	574	+B short in shift sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	575	Open or GND short in select main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	576	+B short in select main sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	577	Open or GND short in select sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	578	+B short in select sub sensor circuit	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	595	Difference between shift main sensor value and shift sub sensor value is large	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0705 (05-467)	Transmission Range Sensor Circuit	596	Difference between select main sensor value and select sub sensor value is large	• Wire harness or connector • Selector lever • HV control ECU	X	○	• HV system
P0851 (05-478)	Park/Neutral Switch Input Circuit Low	579	GND short in P position switch circuit	• Wire harness or connector • P position switch • HV control ECU	X	○	• HV system
P0852 (05-478)	Park/Neutral Switch Input Circuit High	580	Open or +B short in P position switch circuit	• Wire harness or connector • P position switch • HV control ECU	X	○	• HV system
P0A08 (05-481)	DC/DC Converter Status Circuit	264	DC/DC converter malfunction	• Auxiliary battery • FL block • HV control ECU • Fuse (for 12 V electrical equipment) • Engine room R/B • Inverter cooling hose • Water w/ motor and bracket pump assy • Cooling fan motor • Cooling fan motor No. 2 • Wire harness or connector • w/ Converter inverter assembly (DC/DC converter)	X	○	• HV system • Discharge
P0A09 (05-490)	DC/DC Converter Status Circuit Low Input	265	Open or GND short in NODD signal circuit of DC/DC converter	• Wire harness or connector • w/ converter inverter assembly	X	○	• HV system • Discharge
P0A09 (05-492)	DC/DC Converter Status Circuit Low Input	591	Open or GND short in VLO signal circuit of DC/DC converter	• Wire harness or connector • w/ converter inverter assembly	X	○	• HV system • Discharge
P0A0F (05-494)	Engine Failed to Start	204	Abnormal signal input from ECM (abnormal engine output)	• ECM • SFI system	X	○	• HV system
P0A0F (05-494)	Engine Failed to Start	205	Abnormal signal input from ECM (engine is unable to start)	• ECM • SFI system	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A0F (05-495)	Engine Failed to Start	238	Engine does not start even though cranking it (transaxle input malfunction [engine system])	• Engine assembly • HV transaxle assembly (shaft or gear) • Transmission input damper • Wire harness or connector • HV control ECU	X	○	• HV system
P0A0F (05-494)	Engine Failed to Start	533	Abnormal signal input from ECM (abnormal engine output by running out of fuel)	• ECM • SFI system	X	○	• HV system
P0A0F (05-494)	Engine Failed to Start	534	Abnormal signal input from ECM (engine is unable to start by running out of fuel)	• ECM • SFI system	X	○	• HV system
P0A10 (05-490)	DC/DC Converter Status Circuit High Input	263	+B short in NODD signal circuit of DC/DC converter	• Wire harness or connector • w/ converter inverter assembly	X	○	• HV system • Discharge
P0A10 (05-492)	DC/DC Converter Status Circuit High Input	592	+B short in VLO signal circuit of DC/DC converter	• Wire harness or connector • w/ converter inverter assembly	X	○	• HV system • Discharge
P0A1D (05-500)	Hybrid Powertrain Control Module	134	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-500)	Hybrid Powertrain Control Module	135	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-501)	Hybrid Powertrain Control Module	139	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-502)	Hybrid Powertrain Control Module	140	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-503)	Hybrid Powertrain Control Module	141	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-504)	Hybrid Powertrain Control Module	142	ST signal of HV control ECU is ON with power switch OFF	• Wire harness or connector • Power source control ECU	○	○	• HV system
P0A1D (05-507)	Hybrid Powertrain Control Module	143	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-508)	Hybrid Powertrain Control Module	144	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-508)	Hybrid Powertrain Control Module	145	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-509)	Hybrid Powertrain Control Module	148	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-509)	Hybrid Powertrain Control Module	149	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	150	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	151	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	152	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	155	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	156	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	158	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-512)	Hybrid Powertrain Control Module	159	HV control ECU internal error	• HV control ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A1D (05-512)	Hybrid Powertrain Control Module	160	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-513)	Hybrid Powertrain Control Module	163	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-513)	Hybrid Powertrain Control Module	164	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-514)	Hybrid Powertrain Control Module	165	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-515)	Hybrid Powertrain Control Module	166	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-515)	Hybrid Powertrain Control Module	167	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-514)	Hybrid Powertrain Control Module	168	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-516)	Hybrid Powertrain Control Module	177	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-516)	Hybrid Powertrain Control Module	178	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	180	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	181	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	182	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	183	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	184	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	185	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-517)	Hybrid Powertrain Control Module	186	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-519)	Hybrid Powertrain Control Module	187	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	188	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	189	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	192	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	193	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	195	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	196	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-515)	Hybrid Powertrain Control Module	197	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-514)	Hybrid Powertrain Control Module	198	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-514)	Hybrid Powertrain Control Module	199	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-515)	Hybrid Powertrain Control Module	200	HV control ECU internal error	• HV control ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A1D (05-522)	Hybrid Powertrain Control Module	390	Charge control malfunction	• HV control ECU	○	○	• HV system
P0A1D (05-516)	Hybrid Powertrain Control Module	392	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-523)	Hybrid Powertrain Control Module	393	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-513)	Hybrid Powertrain Control Module	511	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-513)	Hybrid Powertrain Control Module	512	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-510)	Hybrid Powertrain Control Module	564	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-520)	Hybrid Powertrain Control Module	565	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-516)	Hybrid Powertrain Control Module	567	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-524)	Hybrid Powertrain Control Module	568	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-524)	Hybrid Powertrain Control Module	569	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-500)	Hybrid Powertrain Control Module	570	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1D (05-526)	Hybrid Powertrain Control Module	615	HV control ECU internal error	• HV control ECU	○	○	• HV system
P0A1F (05-527)	Battery Energy Control Module	123	Abnormal signal input from battery ECU (ROMRAM malfunction)	• HV battery system • Battery ECU	○	○	• HV system
P0A1F (05-528)	Battery Energy Control Module	129	HV battery voltage circuit malfunction	• HV battery voltage circuit • Service plug grip • High voltage fuse • Battery plug • Battery ECU	○	○	• HV system
P0A1F (05-532)	Battery Energy Control Module	593	IG2 signal circuit of battery ECU malfunction	• Wire harness or connector • Battery ECU	○	○	• HV system
P0A2B (05-535)	Drive Motor "A" Temperature Sensor Circuit Range/ Performance	248	Motor temperature sensor No. 1 malfunction	• Hybrid vehicle motor	X	○	• HV system
P0A2B (05-535)	Drive Motor "A" Temperature Sensor Circuit Range/ Performance	250	Motor temperature sensor No. 1 performance problem	• Hybrid vehicle motor	X	○	• HV system
P0A2C (05-536)	Drive Motor "A" Temperature Sensor Circuit Low	247	GND short in motor temperature sensor No. 1 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	X	○	• HV system
P0A2D (05-536)	Drive Motor "A" Temperature Sensor Circuit High	249	Open or +B short in motor temperature sensor No. 1 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	X	○	• HV system
P0A37 (05-542)	Generator Temperature Sensor Circuit Range/Performance	258	Motor temperature sensor No. 2 malfunction	• Hybrid vehicle motor	X	○	• HV system
P0A37 (05-543)	Generator Temperature Sensor Circuit Range/Performance	260	Motor temperature sensor No. 2 performance problem	• Hybrid vehicle motor • Transaxle fluid leakage • HV transaxle assembly	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A38 (05-544)	Generator Temperature Sensor Circuit Low	257	GND short in motor temperature sensor No. 2 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	X	○	• HV system
P0A39 (05-544)	Generator Temperature Sensor Circuit High	259	Open or +B short in motor temperature sensor No. 2 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	X	○	• HV system
P0A3F (05-549)	Drive Motor "A" Position Sensor Circuit	243	Interphase short in motor resolver circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	○	○	• HV system
P0A40 (05-549)	Drive Motor "A" Position Sensor Circuit Range/Performance	500	Motor resolver output is out of normal range	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	○	○	• HV system
P0A41 (05-549)	Drive Motor "A" Position Sensor Circuit Low	245	Open or short in motor resolver circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU	○	○	• HV system
P0A4B (05-554)	Generator Position Sensor Circuit	253	Interphase short in generator resolver circuit	• Wire harness or connector • Hybrid vehicle generator • HV control ECU	○	○	• HV system
P0A4C (05-554)	Generator Position Sensor Circuit Range/Performance	513	Generator resolver output is out of normal range	• Wire harness or connector • Hybrid vehicle generator • HV control ECU	○	○	• HV system
P0A4D (05-554)	Generator Position Sensor Circuit Low	255	Open or short in generator resolver circuit	• Wire harness or connector • Hybrid vehicle generator • HV control ECU	○	○	• HV system
P0A51 (05-558)	Drive Motor "A" Current Sensor Circuit	174	HV control ECU internal error	• HV control ECU	X	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	288	Phase V current sub sensor of motor inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	289	Open in phase V current sub sensor circuit of motor inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	290	Phase V current main sensor of motor inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	292	Open in phase V current main sensor circuit of motor inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	294	Phase V current main and sub sensors of motor inverter current sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A60 (05-559)	Drive Motor "A" Phase V Current	501	Phase V current main and sub sensors of motor inverter current sensor offset malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A63 (05-559)	Drive Motor "A" Phase W Current	296	Phase W current sub sensor of motor inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A63 (05-559)	Drive Motor "A" Phase W Current	297	Open in phase W current sub sensor circuit of motor inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A63 (05-559)	Drive Motor "A" Phase W Current	298	Phase W current main sensor of motor inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A63 (05-559)	Drive Motor "A" Phase W Current	300	Open in phase W current main sensor circuit of motor inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A63 (05-559)	Drive Motor "A" Phase W Current	302	Phase W current main and sub sensors of motor inverter current sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A63 (05-559)	Drive Motor "A" Phase W Current	502	Phase W current main and sub sensors of motor inverter current sensor offset malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	326	Phase V current sub sensor of generator inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	327	Open in phase V current sub sensor circuit of generator inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	328	Phase V current main sensor of generator inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	330	Open in phase V current main sensor circuit of generator inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	333	Phase V current main and sub sensors of generator inverter current sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A72 (05-564)	Generator Phase V Current	515	Phase V current main and sub sensors of generator inverter current sensor offset malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	334	Phase W current sub sensor of generator inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	335	Open in phase W current sub sensor circuit of generator inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	336	Phase W current main sensor of generator inverter current sensor malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	338	Open in phase W current main sensor circuit of generator inverter current sensor	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	341	Phase W current main and sub sensors of generator inverter current sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A75 (05-564)	Generator Phase W Current	516	Phase W current main and sub sensors of generator inverter current sensor offset malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-569)	Drive Motor "A" Inverter Performance	266	Open or GND short in inverter voltage (VH) signal circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A78 (05-569)	Drive Motor "A" Inverter Performance	267	+B short in inverter voltage (VH) signal circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system
P0A78 (05-578)	Drive Motor "A" Inverter Performance	272	Abnormality in motor PWM circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-581)	Drive Motor "A" Inverter Performance	278	+B short in motor inverter over-voltage (OVH) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-584)	Drive Motor "A" Inverter Performance	279	Motor inverter over-voltage (OVH) signal detection (over-voltage by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-581)	Drive Motor "A" Inverter Performance	280	Open or GND short in motor inverter over-voltage (OVH) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-593)	Drive Motor "A" Inverter Performance	282	Motor inverter over voltage (OVH) signal detection (circuit malfunction)	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-597)	Drive Motor "A" Inverter Performance	283	+B short in motor inverter fail (MFIV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-600)	Drive Motor "A" Inverter Performance	284	Motor inverter fail (MFIV) signal detection (inverter overheating)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-597)	Drive Motor "A" Inverter Performance	285	Open or GND short in motor inverter fail (MFIV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-608)	Drive Motor "A" Inverter Performance	286	Motor inverter fail (MFIV) signal detection (circuit malfunction)	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-611)	Drive Motor "A" Inverter Performance	287	Motor inverter fail (MFIV) signal detection (over current by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-618)	Drive Motor "A" Inverter Performance	304	Open or +B short in motor gate shutdown (MSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-618)	Drive Motor "A" Inverter Performance	305	GND short in motor gate shutdown (MSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-621)	Drive Motor "A" Inverter Performance	306	Failure in monitoring MG2 torque performance	• Hybrid vehicle motor • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-624)	Drive Motor "A" Inverter Performance	308	Collision signal input from airbag ECU or circuit breaker sensor No. 1	• Supplemental restraint system • Circuit breaker sensor No. 1	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A78 (05-584)	Drive Motor "A" Inverter Performance	503	Motor inverter over-voltage (OVH) signal detection (over-voltage by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-584)	Drive Motor "A" Inverter Performance	504	Motor inverter over-voltage (OVH) signal detection (over-voltage by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-611)	Drive Motor "A" Inverter Performance	505	Motor inverter fail (MFIV) signal detection (over current by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-611)	Drive Motor "A" Inverter Performance	506	Motor inverter fail (MFIV) signal detection (over current by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-618)	Drive Motor "A" Inverter Performance	507	Open in motor gate shutdown (MSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-625)	Drive Motor "A" Inverter Performance	508	Motor gate shutdown (MSDN) signal malfunction	• Wire harness or connector • HV control ECU	○	○	• HV system
P0A78 (05-628)	Drive Motor "A" Inverter Performance	510	Motor inverter gate malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-630)	Drive Motor "A" Inverter Performance	523	Inverter voltage (VH) sensor offset malfunction	• System main relay • w/ converter inverter assembly	○	○	• HV system
P0A78 (05-632)	Drive Motor "A" Inverter Performance	586	Inverter voltage (VH) sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-635)	Generator Inverter Performance	309	Abnormality in generator PWM circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-638)	Generator Inverter Performance	321	+B short in generator inverter fail (GFIV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-641)	Generator Inverter Performance	322	Generator inverter fail (GFIV) signal detection (inverter overheating)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-638)	Generator Inverter Performance	323	Open or GND short in generator inverter fail (GFIV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-649)	Generator Inverter Performance	324	Generator inverter fail (GFIV) signal detection (circuit malfunction)	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A7A (05-652)	Generator Inverter Performance	325	Generator inverter fail (GFIV) signal detection (over current by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-659)	Generator Inverter Performance	342	Open or +B short in generator gate shutdown (GSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-659)	Generator Inverter Performance	343	GND short in generator gate shutdown (GSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-662)	Generator Inverter Performance	344	Failure in monitoring MG1 torque performance	• Hybrid vehicle generator • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-652)	Generator Inverter Performance	517	Generator inverter fail (GFIV) signal detection (over current by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-652)	Generator Inverter Performance	518	Generator inverter fail (GFIV) signal detection (over current by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-659)	Generator Inverter Performance	519	Open in generator gate shutdown (GSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A7A (05-665)	Generator Inverter Performance	520	Generator gate shutdown (GSDN) signal malfunction	• Wire harness or connector • HV control ECU	○	○	• HV system
P0A7A (05-668)	Generator Inverter Performance	522	Generator inverter gate malfunction	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A90 (05-670)	Drive Motor "A" Performance	239	HV transaxle input malfunction (shaft damaged)	• Engine assembly • HV transaxle assembly (shaft or gear) • Transmission input damper • Wire harness or connector • HV control ECU	○	○	• HV system
P0A90 (05-676)	Drive Motor "A" Performance	240	Generator locked	• Hybrid vehicle generator	○	○	• HV system
P0A90 (05-670)	Drive Motor "A" Performance	241	HV transaxle input malfunction (torque limiter slipping)	• Engine assembly • HV transaxle assembly (shaft or gear) • Transmission input damper • Wire harness or connector • HV control ECU	○	○	• HV system
P0A90 (05-677)	Drive Motor "A" Performance	242	Planetary gear locked	• HV transaxle assembly	○	○	• HV system
P0A90 (05-678)	Drive Motor "A" Performance	251	MG2 magnetic force deterioration or same phase short circuit	• Hybrid vehicle motor	○	○	• HV system
P0A90 (05-680)	Drive Motor "A" Performance	509	MG2 system malfunction	• Hybrid vehicle motor • w/ converter inverter assembly	○	○	• HV system
P0A90 (05-670)	Drive Motor "A" Performance	602	HV transaxle output malfunction	• Engine assembly • HV transaxle assembly (shaft or gear) • Transmission input damper • Wire harness or connector • HV control ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A90 (05-683)	Drive Motor "A" Performance	604	MG2 power balance malfunction (small power balance)	• Battery current sensor • Hybrid vehicle motor	○	○	• HV system
P0A90 (05-683)	Drive Motor "A" Performance	605	MG2 power balance malfunction (large power balance)	• Battery current sensor • Hybrid vehicle motor	○	○	• HV system
P0A92 (05-686)	Hybrid Generator Performance	261	MG1 magnetic force deterioration or same phase short circuit	• Hybrid vehicle generator	○	○	• HV system
P0A92 (05-688)	Hybrid Generator Performance	521	MG1 system malfunction	• Hybrid vehicle generator • w/ converter inverter assembly	○	○	• HV system
P0A92 (05-691)	Hybrid Generator Performance	606	MG1 power balance malfunction (small power balance)	• Battery current sensor • Hybrid vehicle generator	○	○	• HV system
P0A92 (05-691)	Hybrid Generator Performance	607	MG1 power balance malfunction (large power balance)	• Battery current sensor • Hybrid vehicle generator	○	○	• HV system
P0A93 (05-694)	Inverter Cooling System Performance	346	Inverter cooling system malfunction (water pump system malfunction)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	○	○	• HV system
P0A93 (05-694)	Inverter Cooling System Performance	347	Inverter cooling system malfunction (electric cooling fan system malfunction)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-698)	DC/DC Converter Performance	442	Abnormal voltage execution value	• w/ converter inverter assembly	○	○	• HV system
P0A94 (05-700)	DC/DC Converter Performance	545	Open or GND short in boost converter over-voltage (OVL) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-700)	DC/DC Converter Performance	546	+B short in boost converter over-voltage (OVL) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-703)	DC/DC Converter Performance	547	Boost converter over voltage (OVL) signal detection (over voltage by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-703)	DC/DC Converter Performance	548	Boost converter over voltage (OVL) signal detection (over voltage by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-703)	DC/DC Converter Performance	549	Boost converter over voltage (OVL) signal detection (over voltage by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A94 (05-711)	DC/DC Converter Performance	550	Boost converter over-voltage (OVL) signal detection (circuit malfunction)	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-714)	DC/DC Converter Performance	551	Open or GND short in boost converter fail (FCV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-714)	DC/DC Converter Performance	552	+B short in boost converter fail (FCV) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-717)	DC/DC Converter Performance	553	Boost converter fail (FCV) signal detection (boost converter overheating)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-726)	DC/DC Converter Performance	554	Boost converter fail (FCV) signal detection (over current by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-726)	DC/DC Converter Performance	555	Boost converter fail (FCV) signal detection (over current by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-726)	DC/DC Converter Performance	556	Boost converter fail (FCV) signal detection (over current by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-734)	DC/DC Converter Performance	557	Boost converter fail (FCV) signal detection (circuit malfunction)	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-737)	DC/DC Converter Performance	558	GND short in boost converter gate shutdown (CSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-737)	DC/DC Converter Performance	559	Open or +B short in boost converter gate shutdown (CSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-737)	DC/DC Converter Performance	560	Open in boost converter gate shutdown (CSDN) signal circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-740)	DC/DC Converter Performance	561	Abnormal boost converter gate shutdown (CSDN) signal	• Wire harness or connector • HV control ECU	○	○	• HV system
P0A94 (05-743)	DC/DC Converter Performance	583	Open or GND short in boost converter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system
P0A94 (05-743)	DC/DC Converter Performance	584	+B short in boost converter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P0A94 (05-750)	DC/DC Converter Performance	585	Boost converter voltage (VL) sensor performance problem	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-753)	DC/DC Converter Performance	587	Difference between voltages from HV battery voltage (VB) sensor and boost converter voltage (VL) sensor is large	• Wire harness or connector • w/ converter inverter assembly • Service plug grip • High voltage fuse • Battery ECU	○	○	• HV system
P0A94 (05-758)	DC/DC Converter Performance	588	Abnormality in boost converter PWM circuit	• Wire harness or connector • w/ converter inverter assembly	○	○	• HV system
P0A94 (05-761)	DC/DC Converter Performance	589	Open or GND short in boost converter voltage (VL) signal circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system
P0A94 (05-761)	DC/DC Converter Performance	590	+B short in boost converter voltage (VL) signal circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	○	○	• HV system
P0AA1 (05-767)	Hybrid Battery Positive Contactor Circuit Stuck Closed	224	Open or +B short in system main relay No. 1 circuit	• Wire harness or connector • System main relay No. 1 • HV control ECU	X	○	• HV system
P0AA1 (05-770)	Hybrid Battery Positive Contactor Circuit Stuck Closed	226	Open or +B short in system main relay No. 2 circuit	• Wire harness or connector • System main relay No. 2 • HV control ECU	X	○	• HV system
P0AA1 (05-772)	Hybrid Battery Positive Contactor Circuit Stuck Closed	231	System main relay terminal of HV battery positive side stuck closed	• System main relay No. 1 • System main relay No. 2	X	○	• HV system
P0AA1 (05-773)	Hybrid Battery Positive Contactor Circuit Stuck Closed	233	System main relay terminals of HV battery positive and negative sides stuck closed	• System main relay No. 1 • System main relay No. 2 • System main relay No. 3	X	○	• HV system
P0AA2 (05-767)	Hybrid Battery Positive Contactor Circuit Stuck Open	225	GND short in system main relay No. 1 circuit	• Wire harness or connector • System main relay No. 1 • HV control ECU	X	○	• HV system
P0AA2 (05-770)	Hybrid Battery Positive Contactor Circuit Stuck Open	227	GND short in system main relay No. 2 circuit	• Wire harness or connector • System main relay No. 2 • HV control ECU	X	○	• HV system
P0AA4 (05-774)	Hybrid Battery Negative Contactor Circuit Stuck Closed	228	Open or +B short in system main relay No. 3 circuit	• Wire harness or connector • System main relay No. 3 • HV control ECU	○	○	• HV system
P0AA4 (05-777)	Hybrid Battery Negative Contactor Circuit Stuck Closed	232	System main relay terminal of HV battery negative side stuck closed	• System main relay No. 3	○	○	• HV system
P0AA5 (05-774)	Hybrid Battery Negative Contactor Circuit Stuck Open	229	GND short in system main relay No. 3 circuit	• Wire harness or connector • System main relay No. 3 • HV control ECU	X	○	• HV system
P2120 (05-778)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	111	Accelerator pedal position main sensor value does not change while its sub sensor value changes	• Accelerator pedal rod assembly	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P2121 (05-778)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	106	Internal error of accelerator pedal position main sensor	• Accelerator pedal rod assembly	X	○	• HV system
P2121 (05-778)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	114	Accelerator pedal not smoothly returning to its original position	• Accelerator pedal rod assembly	X	○	• HV system
P2122 (05-779)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	104	Open or GND short in accelerator pedal position main sensor circuit	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU	X	○	• HV system
P2123 (05-779)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	105	+B short in accelerator pedal position main sensor circuit	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU	X	○	• HV system
P2125 (05-778)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	112	Accelerator pedal position sub sensor value does not change while its main sensor value changes	• Accelerator pedal rod assembly	X	○	• HV system
P2126 (05-778)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Range/Performance	109	Internal error of accelerator pedal position sub sensor	• Accelerator pedal rod assembly	X	○	• HV system
P2127 (05-779)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	107	Open or GND short in accelerator pedal position sub sensor circuit	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU	X	○	• HV system
P2128 (05-779)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	108	+B short in accelerator pedal position sub sensor circuit	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU	X	○	• HV system
P2138 (05-778)	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	110	Difference between main sensor value and sub sensor value is large	• Accelerator pedal rod assembly	X	○	• HV system
P3000 (05-784)	Battery Control System Malfunction	123	Abnormal signal input from battery ECU (HV battery system malfunction)	• HV battery system • Battery ECU	○	○	• HV system
P3000 (05-784)	Battery Control System Malfunction	125	Abnormal signal input from battery ECU (High voltage fuse blown out)	• HV battery system • Battery ECU	○	○	• HV system
P3000 (05-785)	Battery Control System Malfunction	388	Abnormal signal input from battery ECU (discharge inhibition control malfunction)	• HV control system • Fuel shortage • HV battery assembly	X	○	• HV battery
P3000 (05-787)	Battery Control System Malfunction	389	Abnormal signal input from battery ECU (drop of high voltage)	• HV control system • HV battery assembly	X	○	• HV battery
P3000 (05-784)	Battery Control System Malfunction	603	Abnormal signal input from battery ECU (HV battery cooling system malfunction)	• HV battery system • Battery ECU	○	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P3004 (05-788)	High Voltage Power Resource Malfunction	131	High voltage fuse has blown out, service plug grip is disconnected or limiter resistance is cut off	• HV battery system • System main resistor • System main relay No. 1 • System main relay No. 3 • Main battery cable • Main battery cable No. 2 • Frame wire • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3004 (05-795)	High Voltage Power Resource Malfunction	132	Inverter voltage sensor malfunction, or limiter resistance increases	• HV control system • System main resistor • System main relay No. 1 • System main relay No. 3 • Main battery cable • Main battery cable No. 2 • Frame wire • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3004 (05-801)	High Voltage Power Resource Malfunction	133	Abnormal signal input from battery ECU	• HV battery system • Battery ECU	X	X	-
P3009 (05-802)	High Voltage Power Short Circuit	526	Insulation resistance of high voltage circuit and body is low	• Frame wire • System main relay • System main resistor • HV battery assembly • w/ motor compressor assembly • Battery ECU • HV transaxle assembly • w/ converter inverter assembly • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly	X	○	• HV system
P3009 (05-802)	High Voltage Power Short Circuit	611	Insulation resistance of A/C compressor motor or A/C inverter is low	• w/ motor compressor assembly • w/ converter inverter assembly	X	○	• HV system
P3009 (05-802)	High Voltage Power Short Circuit	612	Insulation resistance of HV battery, battery ECU, system main relay, or system main resistor is low	• HV battery assembly • Battery ECU • System main relay • System main resistor • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly	X	○	• HV system
P3009 (05-802)	High Voltage Power Short Circuit	613	Insulation resistance of HV transaxle or motor and generator inverters is low	• HV transaxle assembly • w/ converter inverter assembly	X	○	• HV system
P3009 (05-802)	High Voltage Power Short Circuit	614	Insulation resistance of motor and generator inverters, A/C inverter, system main relay, system main resistor, or frame wire is low	• Frame wire • System main relay • System main resistor • HV battery assembly • w/ converter inverter assembly • Main battery cable • Main battery cable No. 2 • Battery plug • Frame wire No. 2 • Junction block assembly	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P3102 (05-820)	Transmission Control ECU Malfunction	524	BEAN communication problem of transmission control ECU	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	525	Transmission control ECU IG OFF command malfunction	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	581	Transmission control ECU malfunction	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	582	P position (PPOS) signal is logically inconsistent	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	597	GND short in P position (PPOS) signal circuit	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	598	+B short in P position (PPOS) signal circuit	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3102 (05-820)	Transmission Control ECU Malfunction	599	P position (PPOS) signal malfunction (output pulse is abnormal)	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU	X	○	• HV system
P3107 (05-824)	Lost Communication with Airbag System Control Module	213	GND short in communication circuit between airbag ECU and HV control ECU	• Wire harness or connector • Airbag ECU	X	○	• HV system
P3107 (05-824)	Lost Communication with Airbag System Control Module	214	Open or +B short in communication circuit between airbag ECU and HV control ECU	• Wire harness or connector • Airbag ECU	X	○	• HV system
P3107 (05-824)	Lost Communication with Airbag System Control Module	215	Abnormal communication signals between airbag ECU and HV control ECU	• Wire harness or connector • Airbag ECU	X	○	• HV system
P3108 (05-826)	Lost Communication with A/C System Control Module	535	Serial communication malfunction	• Wire harness or connector • w/ converter inverter assembly	X	X	-
P3108 (05-826)	Lost Communication with A/C System Control Module	536	A/C inverter malfunction	• Wire harness or connector • w/ converter inverter assembly	X	X	-
P3108 (05-828)	Lost Communication with A/C System Control Module	537	A/C amplifier malfunction	• A/C amplifier	X	X	-
P3108 (05-826)	Lost Communication with A/C System Control Module	538	Open in STB signal circuit	• Wire harness or connector • w/ converter inverter assembly	X	X	-

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P3108 (05-829)	Lost Communication with A/C System Control Module	594	CAN communication malfunction	• CAN communication system	X	X	-
P3110 (05-830)	HV Main Relay Malfunction	223	IGCT relay is always closed	• Wire harness or connector • Integration relay (IGCT relay)	X	○	• HV system
P3110 (05-830)	HV Main Relay Malfunction	527	IG2 logical inconsistency	• Wire harness or connector • Integration relay (IG2 relay)	X	○	• HV system
P3137 (05-832)	Collision Sensor Low Input	348	GND short in circuit breaker sensor No. 1 circuit	• Wire harness or connector • Circuit breaker sensor No. 1	X	○	• HV system
P3138 (05-832)	Collision Sensor High Input	349	Open or +B short in circuit breaker sensor No. 1 circuit	• Wire harness or connector • Circuit breaker sensor No. 1	X	○	• HV system
P3140 (05-834)	HV Interlock Switch Operation	350	Operating safety devices with vehicle stopped (ILK signal is ON)	• Service plug grip installation • Inverter cover installation	X	○	• HV system
P3143 (05-835)	HV Interlock Switch Open/Short	351	Open in interlock signal circuit while vehicle is running	• Wire harness or connector • Battery plug (interlock switch No. 2) • w/ converter inverter assembly (interlock switch No. 1)	X	○	• HV system
P3211 (05-838)	Drive Motor "A" Inverter Temperature Sensor Circuit Range/Performance	276	Sudden change in motor inverter temperature sensor output	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system
P3211 (05-838)	Drive Motor "A" Inverter Temperature Sensor Circuit Range/Performance	277	Motor inverter temperature sensor output deviation	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system
P3212 (05-843)	Drive Motor "A" Inverter Temperature Sensor Circuit High/Low	275	Open or GND short in motor inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3213 (05-843)	Drive Motor "A" Inverter Temperature Sensor Circuit High	274	+B short in motor inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3221 (05-849)	Generator Inverter Temperature Sensor Circuit Range/ Performance	314	Sudden change in generator inverter temperature sensor output	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system
P3221 (05-849)	Generator Inverter Temperature Sensor Circuit Range/ Performance	315	Generator inverter temperature sensor output deviation	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
P3222 (05-854)	Generator Inverter Temperature Sensor Circuit High/ Low	313	Open or GND short in generator inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3223 (05-854)	Generator Inverter Temperature Sensor Circuit High	312	+B short in generator inverter temperature sensor circuit	• Wire harness or connector • w/ converter inverter assembly • HV control ECU	X	○	• HV system
P3226 (05-860)	DC/DC (Boost) Converter Temperature Sensor Malfunction	562	Sudden change in boost converter temperature sensor output	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system
P3226 (05-860)	DC/DC (Boost) Converter Temperature Sensor Malfunction	563	Boost converter temperature sensor output deviation	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly	X	○	• HV system
U0100 (05-865)	Lost Communication with ECM/ PCM "A"	211	CAN communication problem between ECM and HV control ECU (no signal input)	• CAN communication system	○	○	• HV system
U0100 (05-865)	Lost Communication with ECM/ PCM "A"	212	CAN communication problem between ECM and HV control ECU (transmission error)	• CAN communication system	○	○	• HV system
U0100 (05-865)	Lost Communication with ECM/ PCM "A"	530	CAN communication problem between ECM and HV control ECU (CAN communication system malfunction)	• CAN communication system	○	○	• HV system
U0111 (05-865)	Lost Communication with Battery Energy Control Module "A"	208	CAN communication problem between battery ECU and HV control ECU (no signal input)	• CAN communication system	○	○	• HV system
U0111 (05-865)	Lost Communication with Battery Energy Control Module "A"	531	CAN communication problem between battery ECU and HV control ECU (CAN communication system malfunction)	• CAN communication system	○	○	• HV system
U0129 (05-865)	Lost Communication with Brake System Control Module	220	CAN communication problem between skid control ECU and HV control ECU (no signal input)	• CAN communication system	X	○	• HV system
U0129 (05-865)	Lost Communication with Brake System Control Module	222	CAN communication problem between skid control ECU and HV control ECU (CAN communication system malfunction)	• CAN communication system	X	○	• HV system
U0129 (05-865)	Lost Communication with Brake System Control Module	528	CAN communication problem between skid control ECU and HV control ECU (transmission error)	• CAN communication system	X	○	• HV system

DTC No. (See Page)	Detection Item	INF Code	Detection Condition	Trouble Area	MIL *1	Master Warning Lamp *2	Warning *3
U0129 (05-865)	Lost Communication with Brake System Control Module	529	CAN communication problem between skid control ECU and HV control ECU (regenerative torque malfunction)	• CAN communication system	X	○	• HV system
U0131 (05-865)	Lost Communication with Power Steering Control Module	433	CAN communication problem between power steering ECU and HV control ECU (no signal input)	• CAN communication system	X	X	-
U0131 (05-865)	Lost Communication with Power Steering Control Module	434	CAN communication problem between power steering ECU and HV control ECU (CAN communication system malfunction)	• CAN communication system	X	X	-
U0146 (05-865)	Lost Communication with Gateway "A"	435	CAN communication problem between gateway ECU and HV control ECU (no signal input)	• CAN communication system	X	○	• HV system

*1: "○" ... MIL is illuminated, "X" ... MIL is not illuminated.
*2: "○" ... Master warning lamp is illuminated, "X" ... Master warning lamp is not illuminated.
*3: Warning on the multi-information display
*4: w/ smart entry system
*5: w/o smart entry system

HYBRID CONTROL SYSTEM

031RY-01

SERVICE DATA

Inverter	Power switch ON (IG)	
Standard	A2 (GIVA) - A16 (GINV)	Approximately 0 V
	A3 (GIVB) - A16 (GINV)	Approximately 0 V
	A4 (GUU) - A16 (GINV)	Approximately 14 to 16 V
	A5 (GVU) - A16 (GINV)	Approximately 14 to 16 V
	A6 (GWU) - A16 (GINV)	Approximately 14 to 16 V
	A7 (MIVA) - A16 (GINV)	Approximately 0 V
	A8 (MIVB) - A16 (GINV)	Approximately 0 V
	A9 (MUU) - A16 (GINV)	Approximately 14 to 16 V
	A10 (MVU) - A16 (GINV)	Approximately 14 to 16 V
	A11 (MWU) - A16 (GINV)	Approximately 14 to 16 V
	A12 (VH) - A16 (GINV)	Approximately 0.5 V
	A13 (CPWM) - A32 (GCNV)	Approximately 0 V
	A14 (GSDN) - A32 (GCNV)	Approximately 2 to 4.5 V
	A15 (VL) - A32 (GCNV)	Approximately 0.5 V
	A16 (GINV) - C2 (GND)	Approximately 0 V
	A18 (GIWA) - A16 (GINV)	Approximately 0 V
	A19 (GIWB) - A16 (GINV)	Approximately 0 V
	A20 (CT) - A16 (GINV)	Approximately 0 V
	A21 (GIVT) - A16 (GINV)	Approximately 2 to 4.5 V
	A22 (GFIV) - A16 (GINV)	Approximately 5 to 8 V
	A23 (MIWA) - A16 (GINV)	Approximately 0 V
	A24 (MIWB) - A16 (GINV)	Approximately 0 V
	A25 (MSDN) - A16 (GINV)	Approximately 0 V
	A26 (MIVT) - A16 (GINV)	Approximately 2 to 4.5 V
	A27 (MFIV) - A16 (GINV)	Approximately 5 to 8 V
	A28 (OVH) - A16 (GINV)	Approximately 5 to 8 V
	A29 (CSDN) - A32 (GCNV)	Approximately 0 V
	A30 (FCV) - A32 (GCNV)	Approximately 13.5 to 16.5 V
	A31 (OVL) - A32 (GCNV)	Approximately 13.5 to 16.5 V
	A32 (GCNV) - C2 (GND)	Approximately 0 V
	B1 (ILK) - body ground	Below 1 Ω
	C1 (IGCT) - C2 (GND)	Approximately 8 to 16 V
	C2 (GND) - body ground	Below 1 Ω
Converter		
Operation	”READY” lamp	Auxiliary battery voltage
	ON	14 V
	OFF	12 V
Out put current		Approximately 80A or less
Speed sensor (resolver)		
Standard	A1 (GCS) - A4 (GCSG)	12.6 to 16.8 Ω
	A2 (GSN) - A5 (GSNG)	12.6 to 16.8 Ω
	A3 (GRF) - A6 (GRFG)	7.65 to 10.2 Ω
	B1 (MRF) - B4 (MRFG)	7.65 to 10.2 Ω
	B2 (MSN) - B5 (MSNG)	12.6 to 16.8 Ω
	B3 (MCS) - B6 (MCSG)	12.6 to 16.8 Ω
Temperature sensor		
Standard	C1 (MMT) - C4 (MMTG)	87.3 to 110.5 kΩ at 10°C (50°F)
		23.8 to 28.5 kΩ at 40°C (104°F)
	C3 (OMT) - C6 (OMTG)	87.3 to 110.5 kΩ at 10°C (50°F)
		23.8 to 28.5 kΩ at 40°C (104°F)

Integration relay (IGCT Relay)		
HEV fuse (20A)		
Standard		Below 1 Ω
IGCT relay		
Standard	7J-1 - 7J-4	10 kΩ or higher
		Below 1 Ω (Battery voltage is added between terminals 7J-2 and 7J-3)
	7J-1 - 7K-1	Below 1 Ω
		Below 1 Ω (Battery voltage is added between terminals 7J-2 and 7J-3)
	7J-2 - 7J-3	Below 1 Ω
	7J-4 - 7K-1	No continuity
Battery plug		
Standard		No continuity
	Install the service plug grip	Continuity
System main relay No. 1		
Continuity		
Standard	Positive terminal - Negative terminal	10 kΩ or higher
	A1 (CONT1) - Terminal 5	Below 1 Ω (Apply voltage between the positive and negative terminals)
	A2 (CONT2) - B1 (CONT2)	Below 1 Ω
	A3 (CONT3) - C1 (CONT3)	Below 1 Ω
	B1 (GND) - GND terminal	Below 1 Ω
	C2 (GND) - GND terminal	Below 1 Ω
Resistance		
Standard	A1 (CONT1) - Terminal 5	70 to 160 Ω
System main relay No. 2 and 3		
Continuity		
Standard	Positive terminal - Negative terminal	10 kΩ or higher
		Below 1 Ω (Apply voltage between the connector terminals)
Rosistance		
Standard	Connector terminals	20 to 50 Ω
Battery current sensor		
Standard	Positive probe to terminal 1 (VIB) Negative probe to terminal 2 (GIB)	3.5 to 4.5 kΩ
	Positive probe to terminal 2 (GIB) Negative probe to terminal 1 (VIB)	5 to 7 kΩ
	Positive probe to terminal 1 (VIB) Negative probe to terminal 3 (IB)	3.5 to 4.5 kΩ
	Positive probe to terminal 3 (IB) Negative probe to terminal 1 (VIB)	5 to 7 kΩ
	2 (GIB) - 3 (IB)	0.2 kΩ or less
System main resistor		
Standard		18 to 22 Ω
Battery blower relay No. 1		
Standard	3 - 5	10 kΩ or higher
		Below 1 Ω (When battery voltage is applied to terminals 1 and 2)

05J7Z-01

SYSTEM DESCRIPTION

1. GENERAL

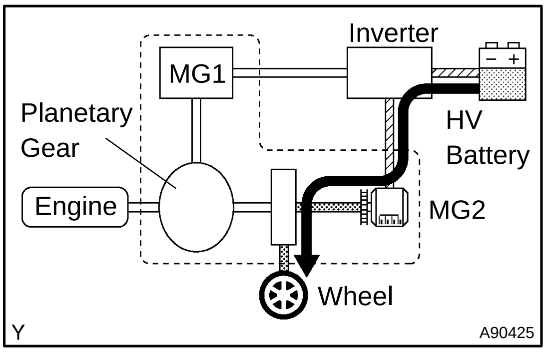
The THS-II control system consists of the following controls.

Item	Outline
HV control ECU Control	• The HV control ECU controls the MG1, MG2, engine, regenerative brake control and HV battery SOC. These factors are determined by the shift position, accelerator pedal position and vehicle speed. • The HV control ECU monitors the SOC and temperature of the HV battery, MG1 and MG2, in order to optimally control these items. • When the shift position is in N, the HV control ECU effects shutdown control to electrically stop the MG1 and MG2. • If there is no traction at the drive wheels, the HV control ECU performs a motor traction control function which restrains the rotation of MG2, in order to protect the planetary gear unit and prevent MG1 from generating excessive electricity. • To protect the circuit from high voltage and to ensure circuit shutdown reliability, the HV control ECU effects SMR control using 3 relays to connect and shut down the high-voltage circuit.
ECM Control	The ECM receives the demand power value and the target rpm, which were sent from the HV control ECU, and controls the ETCS-i system, fuel injection volume, ignition timing and VVT-i system.
Inverter Control	• In accordance with the signals provided by the HV control ECU, the inverter converts a direct current (HV battery) into an alternating current (MG1 and MG2), or vice versa. In addition, the inverter supplies the AC (MG1) power to the AC (MG2). However, when electricity is supplied from MG1 to MG2 , the electricity is converted into DC inside the inverter. • The HV control ECU sends the signal to the power transistor in the inverter for switching the U, V and W phase of the MG1 and MG2 in order to drive the MG1 and MG2. • The HV control ECU shuts down if it receives an overheating, over-current, or fault voltage signal from the inverter.
Boost Converter Control	• In accordance with the signals provided by the HV control ECU, the boost converter boosts the nominal voltage of DC 201.6 V (for HV battery) up to the maximum voltage of DC 500 V. • The maximum voltage of AC 500 V generated by the MG1 or MG2 is converted into a direct current by the inverter, the boost converter reduces the direct current to DC 201.6 V (for HV battery) based on the signals from the HV control ECU.
Converter Control	• The DC/DC converter reduces the nominal voltage of DC 201.6 V to DC 12 V in order to supply electricity to body electrical components, as well as to recharge the auxiliary battery (DC 12 V). • This converter maintains a constant voltage at the terminals of the auxiliary battery.
A/C Inverter Control	A/C inverter converts the nominal voltage of the HV battery from DC 201.6 to AC 201.6 V and supplies power to operate the electric compressor of the A/C system.
MG1 and MG2 Main Control	• MG1, which is rotated by the engine, generates high voltage (maximum voltage of AC 500 V) in order to operate the MG2 and charge the HV battery. Also, it functions as a starter to start the engine. • MG2 primarily provides additional power to the engine in order to increase the overall drive force. During braking, or when the accelerator pedal is not depressed, it generates electricity to recharge the HV battery (regenerative brake system). • Speed sensors detect the speed and position of the MG1 and MG2 and output them to the HV control ECU. • A temperature sensor mounted on the MG2 detects a MG2 temperature and transmits it to the HV control ECU.
Skid Control ECU Control	During braking, the skid control ECU calculates the total braking force and transmits a regenerative brake force request to the HV control ECU. Upon receiving this signal, the HV control ECU calculates the magnitude of regeneration brake force required and transmits it to the skid control ECU. Based on this, the skid control ECU calculates and executes the required hydraulic pressure brake force.
Battery ECU Control	The battery ECU monitors the condition of the HV battery and controls the cooling fan to keep the HV battery at a predetermined temperature. Thus, it optimally controls these components.

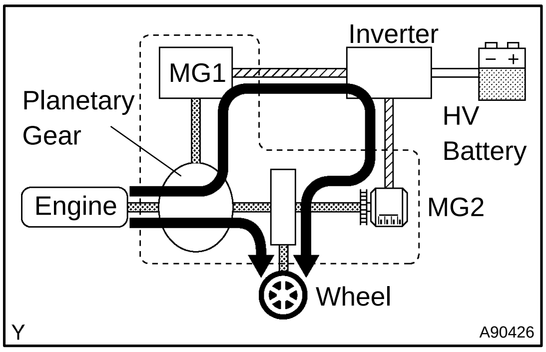
Item	Outline
Shift Control	• The HV control ECU detects the shift position (P, R, N, D, or B) in accordance with the signal provided by the shift position sensor, and controls the MG1, MG2, and engine, in order to create the driving conditions that suit the selected shift position. • The transmission control ECU detects that the driver has pressed the P position switch through a signal provided by the HV control ECU. The transmission control ECU then operates the shift control actuator in order to mechanically lock the transaxle.
During Collision Control	At the time of a collision, if the HV control ECU receives an airbag deployment signal from the airbag ECU or an actuation signal from the circuit breaker sensor located in the inverter, it turns OFF the SMR and power switch in order to shut off the entire power supply.
Cruise Control System Operation Control	When the cruise control ECU built into the HV control ECU receives a cruise control switch signal, it calculates the cruise control request value, and calculates the motive forces of the engine, MG1, and MG2 to achieve an optimal combination.
Indicator and Warning Lamp Illumination Control	Illuminates or blinks the lamps to inform the driver of the vehicle condition or a system malfunction.
Diagnosis	When the HV control ECU detects a malfunction, the HV control ECU diagnoses and stores values corresponding to the failure.
Fail-Safe	When the HV control ECU detects a malfunction, the HV control ECU stops or controls the actuator and ECUs according to the data already stored in its memory.

2. BASIC OPERATION

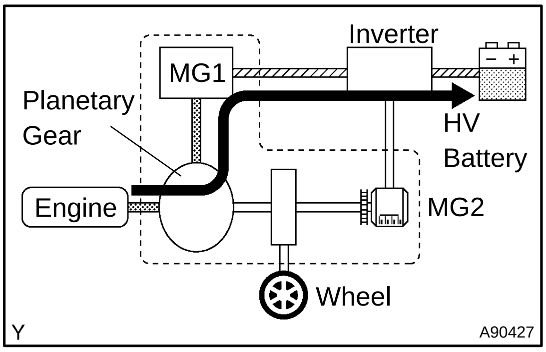
(a) This system controls the following modes in order to achieve the most efficient operations to match the driving conditions:



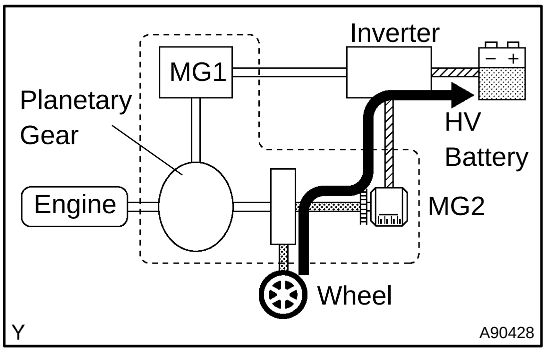
(1) Supply of electrical power from the HV battery to MG2 provides force to drive the wheels.



(2) While the wheels are being driven by the engine via the planetary gear, MG1 is rotated by the engine via the planetary gears, in order to supply the generated electricity to MG2.



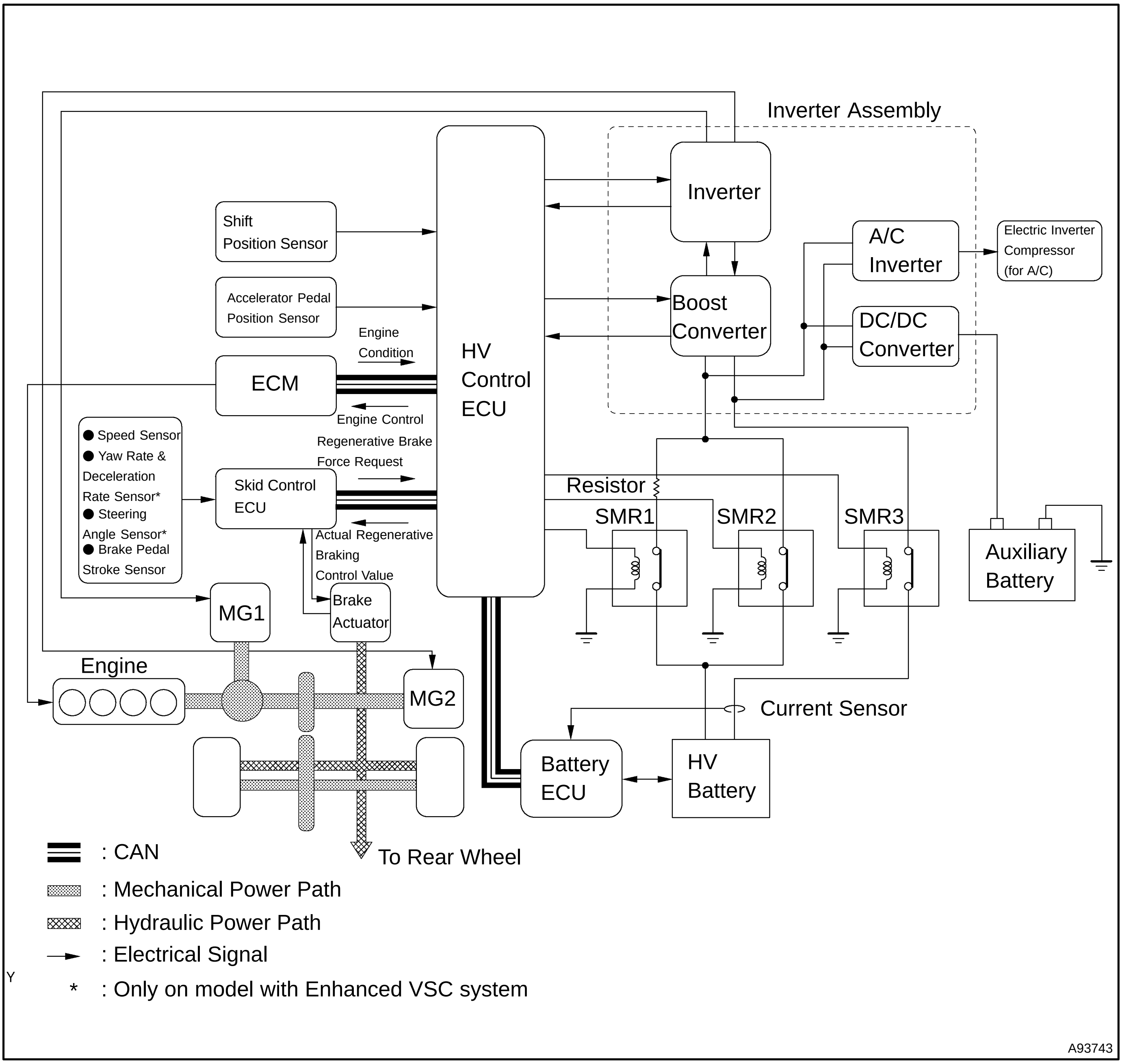
(3) MG1 is rotated by the engine via the planetary gear, in order to charge the HV battery.



(4) When the vehicle is decelerating, kinetic energy from the wheels is recovered and converted into electrical energy and used to recharge the HV battery by means of MG2.

(b) The HV control ECU switches between these modes ((1), (2), (3), (1) + (2) + (3), or (4)) according to the driving condition. However, when the SOC (State of Charge) of the HV battery is low, the HV battery is charged by the engine by turning MG1.
As a result, it achieves far greater fuel economy compared to conventional gasoline engine vehicles, at a reduced level of exhaust gas emissions. Furthermore, this revolutionary power-train has eliminated the constraints that are associated with electric vehicles (such as their short cruising range or their reliance on external recharging units).

3. SYSTEM DIAGRAM



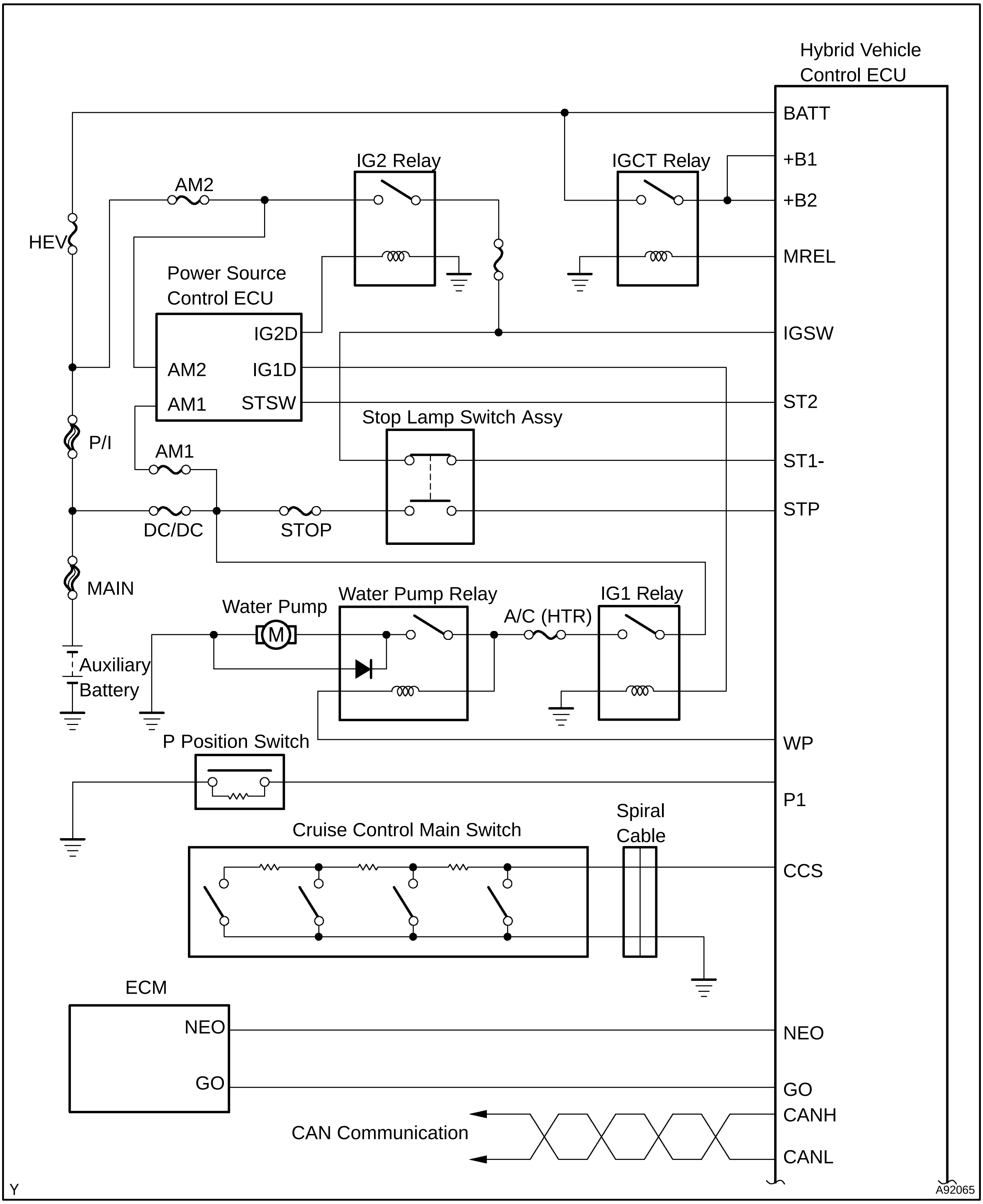
4. FUNCTION OF MAIN COMPONENTS

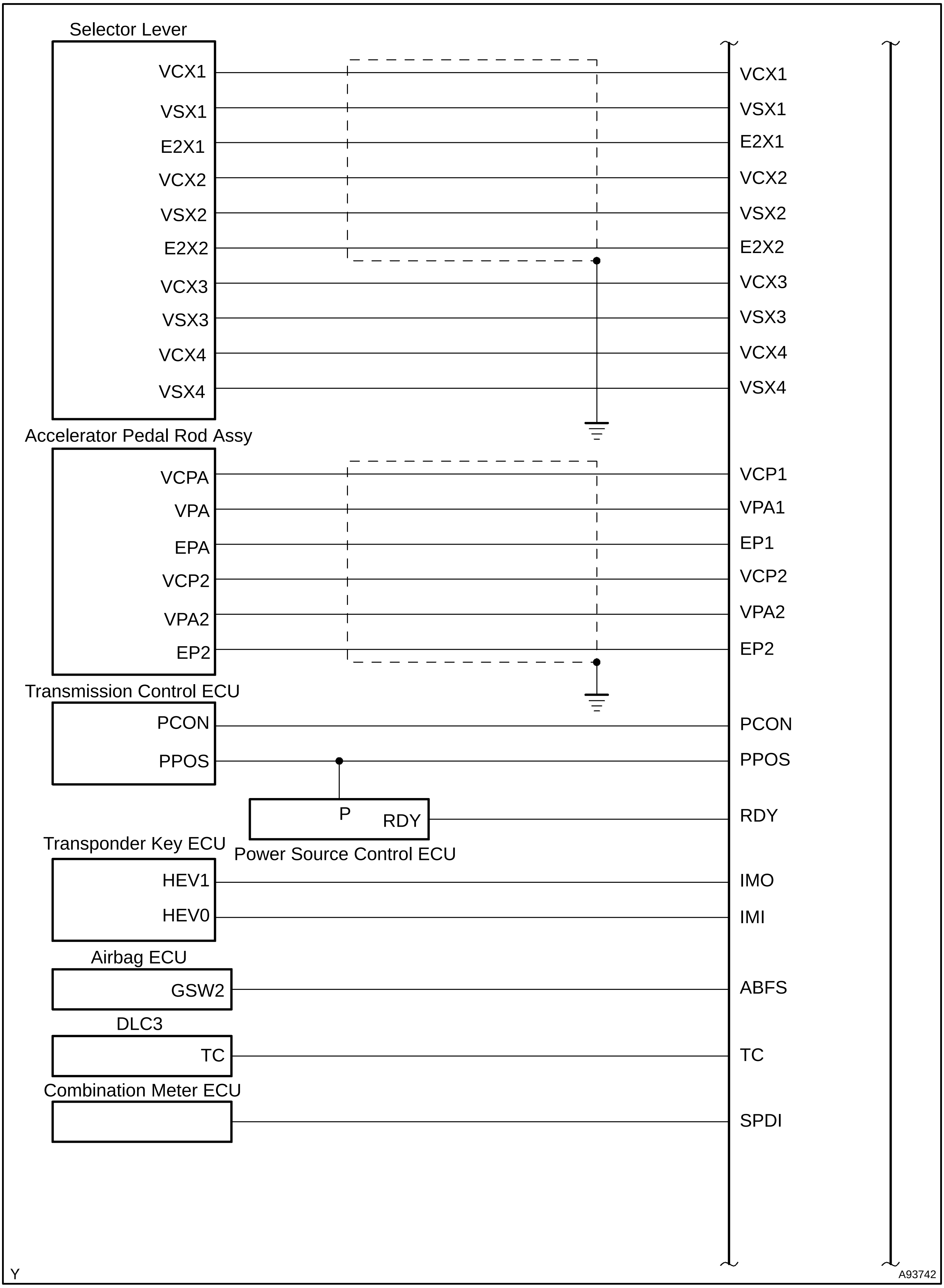
Item	Outline
MG1	MG1, which is rotated by the engine, generates high-voltage electricity in order to operate the MG2 or charge the HV battery. Also, it functions as a starter to start the engine.
MG2	• Driven by electrical power from the MG1 or HV battery, and generates motive force for the vehicle. • During braking, or when the accelerator pedal is not depressed, it generates electricity to re-charge the HV battery (regenerative brake control).
Planetary Gear Unit	Distributes the engine's drive force as appropriate to directly drive the vehicle as well as the generator.
HV Battery	Supplies electric power to the MG2 during start-off, acceleration, and uphill driving. Recharged during braking or when the accelerator pedal is not depressed.
Inverter	Converts the high-voltage DC (HV battery) into AC (MG1 and MG2) and vice versa (converts AC into DC).
Boost Converter	Boosts the nominal voltage of the HV battery from DC 201.6 to DC 500 V and vice versa (reduces voltage from DC 500 V to DC 201.6 V).
DC/DC Converter	Reduces the nominal voltage of DC 201.6 V to DC 12 V in order to supply electricity to body electrical components, as well as to recharge the auxiliary battery (DC 12 V).
A/C Inverter	Converts the nominal voltage of DC 201.6 V of the HV battery to AC 201.6 V and supplies power to operate the electric inverter compressor of the A/C system.
HV Control ECU	Receives information from each sensor as well as from the ECUs (ECM, Battery ECU, skid control ECU, and EPS ECU), and based on this the information, torque and output power calculates the required. Sends the calculated result to the ECM, inverter assembly, battery ECU and skid control ECU.
ECM	Activates the ETCS-i (Electronic Throttle Control System-intelligent) in accordance with the target engine speed and required engine motive force received from the HV control ECU.
Battery ECU	Monitors the charging condition of the HV battery.
Skid Control ECU	Controls the regenerative brake that is effected by the MG2 and the hydraulic brake so that the total braking force equals that of a conventional vehicle that is equipped only with hydraulic brakes. Also, performs the brake system control (ABS with EBD, Brake Assist, and Enhanced VSC *) conventionally.
Accelerator Pedal Position Sensor	Converts the accelerator pedal position angle into an electrical signal and outputs it to the HV control ECU.
Shift Position Sensor	Converts the shift position into an electrical signal and outputs it to the HV control ECU.
SMR (System Main Relay)	Connects and disconnects the high-voltage power circuit between the battery and the inverter assembly, using a signal from the HV control ECU.
Interlock Switch (for Inverter Cover and Service Plug Grip)	Verifies that the cover of both the inverter and the service plug grip have been installed.
Circuit Breaker Sensor	The high-voltage circuit is interrupted if a vehicle collision has been detected.
Service Plug Grip	Shuts off the high-voltage circuit of the HV battery when this plug is removed for vehicle inspection or maintenance.

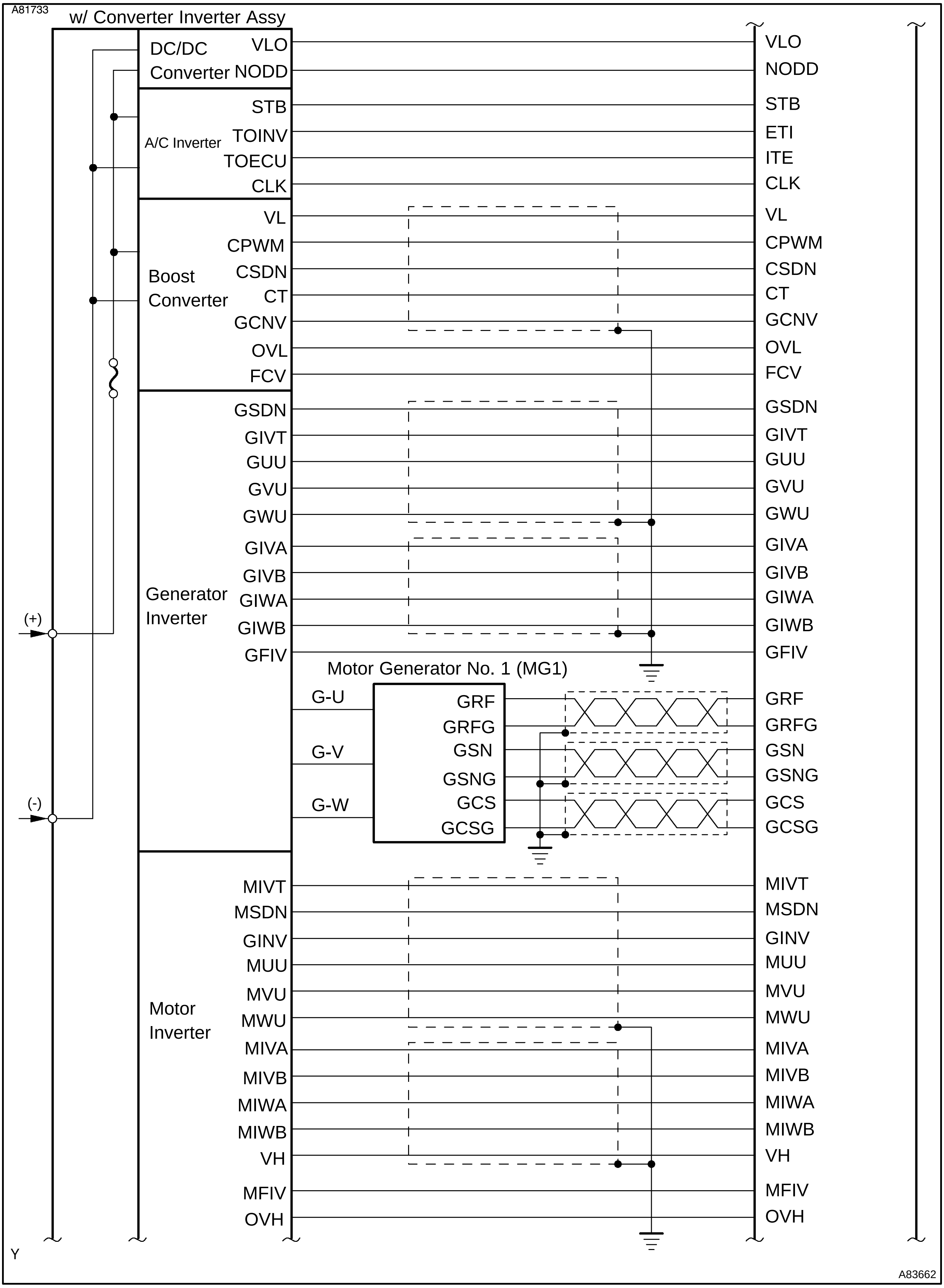
*: Only on model with Enhanced VSC System

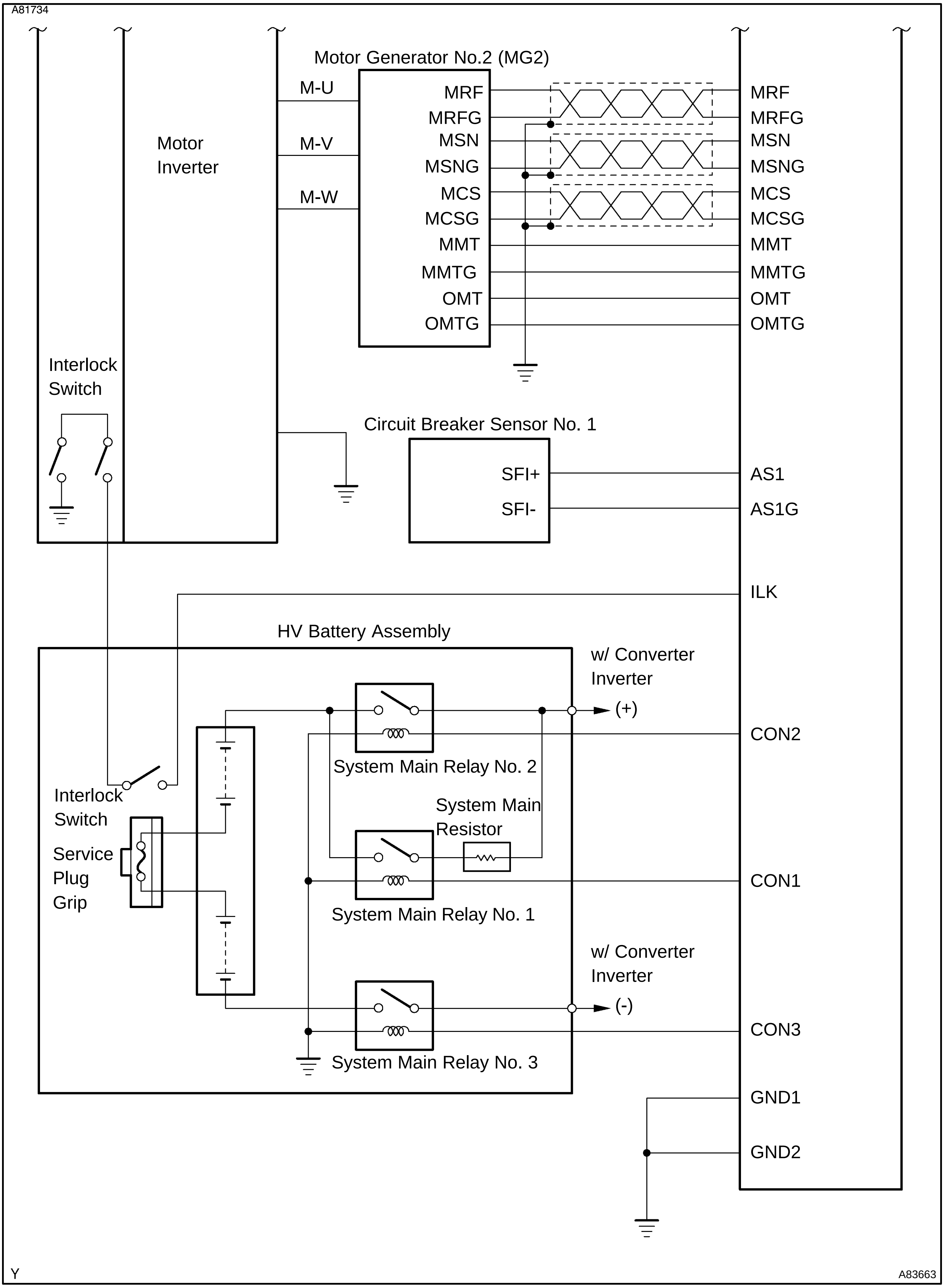
05J7Y-01

SYSTEM DIAGRAM

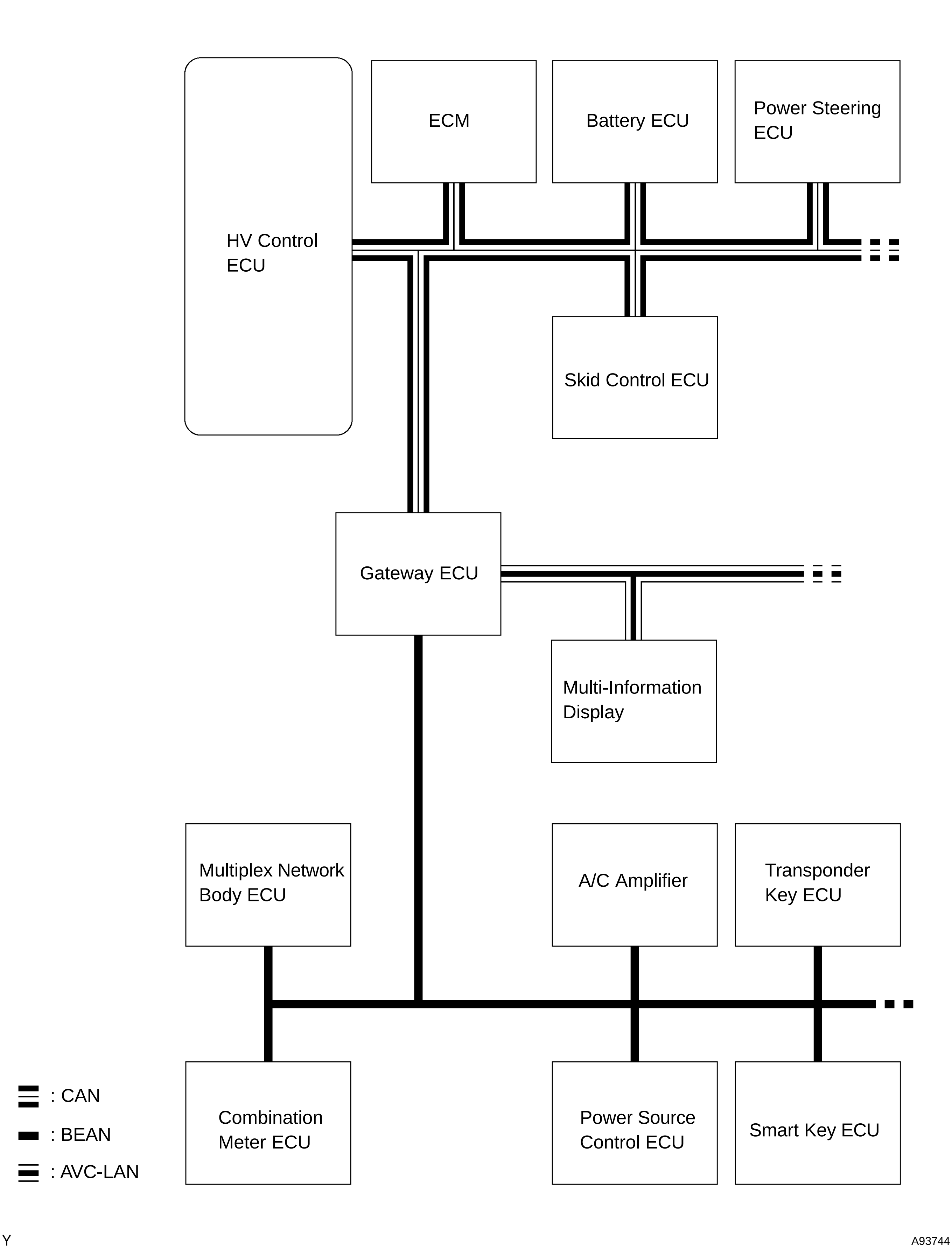



Selector Lever
VCX1
VSX1
E2X1
VCX2
VSX2
E2X2
VCX3
VSX3
VCX4
VSX4
Accelerator Pedal Rod Assy
VCPA
VPA
EPA
VCP2
VPA2
EP2
Transmission Control ECU
PCON
PPOS
P
RDY
Power Source Control ECU
Transponder Key ECU
HEV1
HEV0
Airbag ECU
GSW2
DLC3
TC
Combination Meter ECU
VCX1
VSX1
E2X1
VCX2
VSX2
E2X2
VCX3
VSX3
VCX4
VSX4
VCP1
VPA1
EP1
VCP2
VPA2
EP2
PCON
PPOS
RDY
IMO
IMI
ABFS
TC
SPDI
Y
A93742


A81733
w/ Converter Inverter Assy
DC/DC Converter
VLO
NODD
A/C Inverter
STB
TOINV
TOECU
CLK
Boost Converter
VL
CPWM
CSDN
CT
GCNV
OVL
FCV
Generator Inverter
GSDN
GIVT
GUU
GVU
GWU
GIVA
GIVB
GIWA
GIWB
GFIV
(+)
(-)
Motor Generator No. 1 (MG1)
G-U
G-V
G-W
GRF
GRFG
GSN
GSNG
GCS
GCSG
Motor Inverter
MIVT
MSDN
GINV
MUU
MVU
MWU
MIVA
MIVB
MIWA
MIWB
VH
MFIV
OVH
VLO
NODD
STB
ETI
ITE
CLK
VL
CPWM
CSDN
CT
GCNV
OVL
FCV
GSDN
GIVT
GUU
GVU
GWU
GIVA
GIVB
GIWA
GIWB
GFIV
GRF
GRFG
GSN
GSNG
GCS
GCSG
MIVT
MSDN
GINV
MUU
MVU
MWU
MIVA
MIVB
MIWA
MIWB
VH
MFIV
OVH
Y
A83662

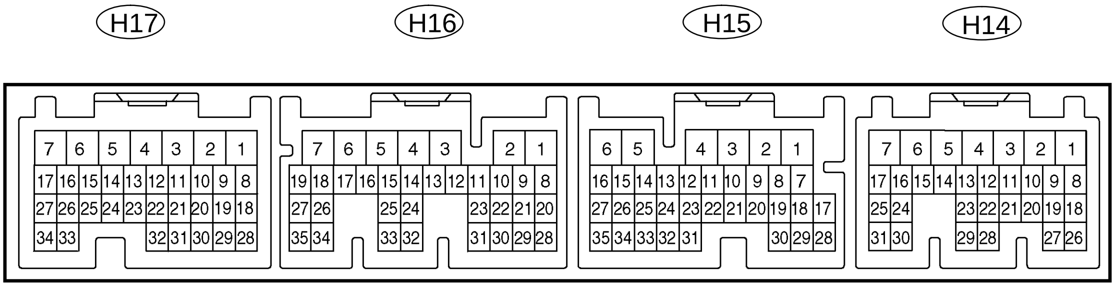

A81734
Motor Generator No.2 (MG2)
M-U
M-V
M-W
Motor
Inverter
MRF
MRFG
MSN
MSNG
MCS
MCSG
MMT
MMTG
OMT
OMTG
MRF
MRFG
MSN
MSNG
MCS
MCSG
MMT
MMTG
OMT
OMTG
Interlock
Switch
Circuit Breaker Sensor No. 1
SFI+
SFI-
AS1
AS1G
ILK
HV Battery Assembly
w/ Converter
Inverter
(+)
CON2
System Main Relay No. 2
System Main
Resistor
Interlock
Switch
Service
Plug
Grip
CON1
System Main Relay No. 1
w/ Converter
Inverter
(-)
CON3
System Main Relay No. 3
GND1
GND2
Y
A83663

Communication Diagram:



05J83-01

TERMINALS OF ECU



Y

A66714

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
ST2 (H14-5) - GND1 (H14-1)	Y - W-B	Starter signal	Power switch ON (READY)	9 to 14
IGSW (H14-7) - GND1 (H14-1)	O - W-B	IG signal	Power switch ON (IG)	9 to 14
BATT (H15-6) - GND1 (H14-1)	Y - W-B	Auxiliary battery (for measuring the battery voltage and for the HV control ECU memory)	Always	9 to 14
+B1 (H16-7) - GND1 (H14-1)	L - W-B	Power source of HV control ECU	Power switch ON (IG)	9 to 14
+B2 (H16-6) - GND1 (H14-1)	L - W-B	Power source of HV control ECU	Power switch ON (IG)	9 to 14
MREL (H16-4) - GND1 (H14-1)	O - W-B	Main relay	Power switch ON (IG)	9 to 14
CANH (H14-8) - GND1 (H14-1)	B - W-B	HIGH-level CAN bus line	Power switch ON (IG)	Pulse generation (see waveform 1)
CANL (H14-9) - GND1 (H14-1)	W - W-B	LOW-level CAN bus line	Power switch ON (IG)	Pulse generation (see waveform 2)
NEO (H16-12) - GND1 (H14-1)	LG - W-B	Engine speed signal	Engine running	Pulse generation (see waveform 3)
GO (H16-13) - GND1 (H14-1)	Y - W-B	G signal	Engine running	Pulse generation (see waveform 4)
SPDI (H14-19) - GND1 (H14-1)	V - W-B	Vehicle speed signal	Driving at approximately 12 mph (20 km/h)	Pulse generation (see waveform 5)
VPA1 (H16-26) - EP1 (H16-27)	L - B	Accelerator pedal position sensor (for the HV system)	Power switch ON (IG), accelerator pedal released	0.5 to 1.1
VPA1 (H16-26) - EP1 (H16-27)	L - B	Accelerator pedal position sensor (for the HV system)	Power switch ON (IG), engine stopped in P position, accelerator pedal fully depressed	2.6 to 4.5
VPA2 (H16-34) - EP2 (H16-35)	W - R	Accelerator pedal position sensor (for the sensor malfunction detection)	Power switch ON (IG),accelerator pedal fully depressed	1.2 to 2.0
VPA2 (H16-34) - EP2 (H16-35)	W - R	Accelerator pedal position sensor (for the sensor malfunction detection)	Power switch ON (IG), engine stopped in P position, accelerator pedal released	3.4 to 5.3
VCP1 (H16-25) - EP1 (H16-27)	Y - B	Power source of accelerator pedal position sensor (for VPA1)	Power switch ON (IG)	4.5 to 5.5

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
VCP2 (H16-33) - EP2 (H16-35)	G - R	Power source of accelerator pedal position sensor (for VPA2)	Power switch ON (IG)	4.5 to 5.5
VSX1 (H14-25) - E2X1 (H14-15)	B - R	Shift position sensor (main)	Power switch ON (IG), selector lever home position	2.0 to 3.0
VSX1 (H14-25) - E2X1 (H14-15)	B - R	Shift position sensor (main)	Power switch ON (IG), selector lever moved to R position	4.0 to 4.8
VSX1 (H14-25) - E2X1 (H14-15)	B - R	Shift position sensor (main)	Power switch ON (IG), selector lever moved to B or D position	0.2 to 1.0
VSX2 (H14-24) - E2X2 (H14-14)	L - Y	Shift position sensor (sub)	Power switch ON (IG), selector lever home position	2.0 to 3.0
VSX2 (H14-24) - E2X2 (H14-14)	L - Y	Shift position sensor (sub)	Power switch ON (IG), selector lever moved to R position	4.0 to 4.8
VSX2 (H14-24) - E2X2 (H14-14)	L - Y	Shift position sensor (sub)	Power switch ON (IG), selector lever moved to B or D position	0.2 to 1.0
VCX1 (H14-17) - E2X1 (H14-15)	W - R	Power source of shift position sensor (for VSX1)	Power switch ON (IG)	4.5 to 5.5
VCX2 (H14-16) - E2X2 (H14-14)	G - Y	Power source of shift position sensor (for VSX2)	Power switch ON (IG)	4.5 to 5.5
VSX3 (H14-23) - GND1 (H14-1)	BR - W-B	Select position sensor (main)	Power switch ON (IG), selector lever home position	0.5 to 2.0
VSX3 (H14-23) - GND1 (H14-1)	BR - W-B	Select position sensor (main)	Power switch ON (IG), selector lever moved to R, N or D position	3.0 to 4.85
VSX4 (H14-30) - GND1 (H14-1)	SB - W-B	Select position sensor (sub)	Power switch ON (IG), selector lever home position	0.5 to 2.0
VSX4 (H14-30) - GND1 (H14-1)	SB- W-B	Select position sensor (sub)	Power switch ON (IG), selector lever moved to R, N or D position	3.0 to 4.85
VCX3 (H14-21) - GND1 (H14-1)	W - W-B	Power source of select position sensor (for VSX3)	Power switch ON (IG)	9 to 14
VCX4 (H14-31) - GND1 (H14-1)	P - W-B	Power source of select position sensor (for VSX4)	Power switch ON (IG)	9 to 14
NODD (H16-24) - GND1 (H14-1)	V - W-B	DC/DC movement monitor or stop request signal	When converter is in normal operation	5 to 7
NODD (H16-24) - GND1 (H14-1)	V - W-B	DC/DC movement monitor or stop request signal	When converter is improper	2 to 4
NODD (H16-24) - GND1 (H14-1)	V - W-B	DC/DC movement monitor or stop request signal	When converter is required to stop	0.1 to 0.5
VLO (H16-31) - GND1 (H14-1)	L - W-B	Two-stage selector signal	Converter switching to 14 V output	13 to 14
VLO (H16-31) - GND1 (H14-1)	L - W-B	Two-stage selector signal	Converter switching to 13.5 V output	Below 0.5
TC (H14-6) - GND1 (H14-1)	P - W-B	Terminal TC of DLC3	Power switch ON (IG)	9 to 14
STP (H15-3) - GND1 (H14-1)	L - W-B	Stop lamp switch	Brake pedal depressed	9 to 14
STP (H15-3) - GND1 (H14-1)	L - W-B	Stop lamp switch	Brake pedal released	2 to 3
ABFS (H14-20) - GND1 (H14-1)	L - W-B	Airbag deployment signal	Power switch ON (READY) (2 seconds after ACC ON)	Pulse generation (see waveform 6 to 8)
AS1 (H16-15) - AS1G (H16-16)	Y - W	Circuit breaker sensor No. 1	Satellite signal system normal	2.5 to 2.9
ILK (H15-1) - GND1 (H14-1)	V - W-B	Interlock switch	Power switch ON (IG), inverter cover and service plug grip installed normally	Below 1

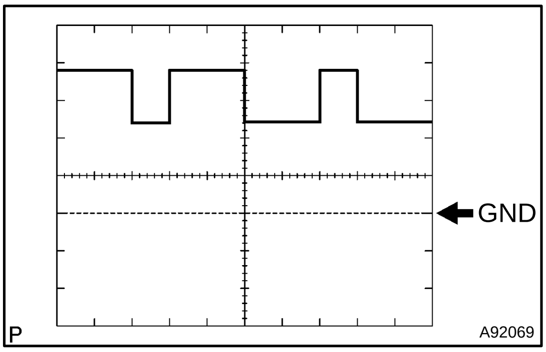
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
ILK (H15-1) - GND1 (H14-1)	V - W-B	Interlock switch	Power switch ON (IG), inverter cover or service plug grip detached	9 to 14
CON1 (H16-1) - GND1 (H14-1)	R - W-B	System main relay No. 1	Power switch OFF to ON (READY)	Pulse generation (see waveform 9)
CON2 (H16-2) - GND1 (H14-1)	G - W-B	System main relay No. 2	Power switch OFF to ON (READY)	Pulse generation (see waveform 9)
CON3 (H16-3) - GND1 (H14-1)	Y - W-B	System main relay No. 3	Power switch OFF to ON (READY)	Pulse generation (see waveform 9)
VH (H15-26) - GINV (H15-23)	Y - W-B	Inverter condenser voltage monitor	Power switch ON (READY)	1.6 to 3.8
GUU (H15-15) - GINV (H15-23)	B - Y	Generator switch U signal	Power switch ON (IG)	Pulse generation (see waveform 10)
GVU (H15-14) - GINV (H15-23)	G - Y	Generator switch V signal	Power switch ON (IG)	Pulse generation (see waveform 10)
GWU (H15-13) - GINV (H15-23)	Y - Y	Generator switch W signal	Power switch ON (IG)	Pulse generation (see waveform 10)
GIVA (H15-34) - GINV (H15-23)	W - Y	Generator V phase current	Power switch ON (IG)	Approximately 0
GIVB (H15-33) - GINV (H15-23)	B - Y	Generator V phase current	Power switch ON (IG)	Approximately 0
GIWA (H15-32) - GINV (H15-23)	R - Y	Generator W phase current	Power switch ON (IG)	Approximately 0
GIWB (H15-31) - GINV (H15-23)	G - Y	Generator W phase current	Power switch ON (IG)	Approximately 0
GIVT (H15-27) - GINV (H15-23)	W - Y	Generator inverter temperature sensor	Power switch ON (IG)	2 to 4.5
GSDN (H15-16) - GINV (H15-23)	R - W-B	Generator shutdown signal	Power switch ON (READY), N position	0.2 to 0.7
GSDN (H15-16) - GINV (H15-23)	R - W-B	Generator shutdown signal	Power switch ON (READY), P position	5.1 to 13.6
GFIV (H15-35) - GINV (H15-23)	GR - W-B	Generator inverter fail signal	Power switch ON (IG), inverter normal	5.4 to 7.4
GFIV (H15-35) - GINV (H15-23)	GR - W-B	Generator inverter fail signal	Power switch ON (IG), inverter abnormal	2 to 3
GRF (H17-27) - GRFG (H17-26)	B - W	Generator resolver signal	Generator resolver stopped or rotating	Pulse generation (see waveform 11, 12)
GSN (H17-22) - GSNG (H17-21)	R - G	Generator resolver signal	Generator resolver stopped or rotating	Pulse generation (see waveform 11, 12)
GCS (H17-23) - GCSG (H17-24)	Y - BR	Generator resolver signal	Generator resolver stopped or rotating	Pulse generation (see waveform 11, 12)
OMT (H17-30) - OMTG (H17-29)	B - G	Motor temperature sensor No. 2	Refer to DATA LIST on page 05-434	-
MUU (H15-9) - GINV (H15-23)	B - Y	Motor switch U signal	Power switch ON (IG)	Pulse generation (see waveform 13)
MVU (H15-10) - GINV (H15-23)	W - Y	Motor switch V signal	Power switch ON (IG)	Pulse generation (see waveform 13)
MWU (H15-11) - GINV (H15-23)	R - Y	Motor switch W signal	Power switch ON (IG)	Pulse generation (see waveform 13)
MIVA (H15-30) - GINV (H15-23)	G - Y	Motor V phase current	Power switch ON (IG)	Approximately 0
MIVB (H15-21) - GINV (H15-23)	W - Y	Motor V phase current	Power switch ON (IG)	Approximately 0
MIWA (H15-29) - GINV (H15-23)	R - Y	Motor W phase current	Power switch ON (IG)	Approximately 0

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
MIWB (H15-20) - GINV (H15-23)	B - Y	Motor W phase current	Power switch ON (IG)	Approximately 0
MIVT (H15-19) - GINV (H15-23)	L - Y	Motor inverter temperature sensor	Power switch ON (IG)	2 to 4.5
MSDN (H15-8) - GINV (H15-23)	G - W-B	Motor shutdown signal	Power switch ON (READY), N position	0.2 to 0.7
MSDN (H15-8) - GINV (H15-23)	G - W-B	Motor shutdown signal	Power switch ON (READY), P position	5.1 to 13.6
OVH (H15-22) - GINV (H15-23)	BR - W-B	Motor inverter over voltage signal	Power switch ON (IG), inverter normal	5.3 to 7.3
OVH (H15-22) - GINV (H15-23)	BR - W-B	Motor inverter over voltage signal	Power switch ON (IG), inverter abnormal	1.9 to 2.9
MFIV (H15-18) - GINV (H15-23)	G - W-B	Motor inverter fail signal	Power switch ON (IG), inverter normal	5.4 to 7.4
MFIV (H15-18) - GINV (H15-23)	G - W-B	Motor inverter fail signal	Power switch ON (IG), inverter abnormal	2 to 3
MRF (H17-34) - MRFG (H17-33)	L - P	Motor resolver signal	Motor resolver stopped or rotating	Pulse generation (see waveform 11, 12)
MSN (H17-20) - MSNG (H17-19)	G - R	Motor resolver signal	Motor resolver stopped or rotating	Pulse generation (see waveform 11, 12)
MCS (H17-32) - MCSG (H17-31)	Y - BR	Motor resolver signal	Motor resolver stopped or rotating	Pulse generation (see waveform 11, 12)
MMT (H17-18) - MMTG (H17-28)	B - R	Motor temperature sensor No. 1	Refer to DATA LIST on page 05-434	-
VL (H16-30) - GCNV (H16-8)	Y - G	Boost converter input voltage	Power switch ON (READY)	1.9 to 3.4
OVL (H16-22) - GCNV (H16-8)	B - G	Boost converter over voltage signal	Power switch ON (IG), boost converter normal	5.3 to 7.7
OVL (H16-22) - GCNV (H16-8)	B - G	Boost converter over voltage signal	Power switch ON (IG), boost converter abnormal	1.9 to 3.0
FCV (H16-20) - GCNV (H16-8)	W - G	Boost converter fail signal	Power switch ON (IG), boost converter normal	5.3 to 7.7
FCV (H16-20) - GCNV (H16-8)	W - G	Boost converter fail signal	Power switch ON (IG), boost converter abnormal	1.9 to 3.0
CT (H16-21) - GCNV (H16-8)	R - G	Boost converter temperature sensor	Power switch ON (IG)	2.0 to 4.5
CPWM (H16-10) - GCNV (H16-8)	B - G	Boost converter PWM switch signal	Power switch ON (READY), parking brake ON, D position, brake pedal and accelerator pedal depressed	Pulse generation (see waveform 14)
CSDN (H16-9) - GCNV (H16-8)	W - G	Boost converter shutdown signal	Power switch ON (IG)	5.6 or higher
CSDN (H16-9) - GCNV (H16-8)	W - G	Boost converter shutdown signal	Power switch ON (READY)	Below 0.7
ST1- (H15-2) - GND1 (H14-1)	G - W-B	Stop lamp switch (opposite to STP)	Power switch ON (IG) and brake pedal depressed	Below 0.5
ST1- (H15-2) - GND1 (H14-1)	G - W-B	Stop lamp switch (opposite to STP)	Power switch ON (IG) and brake pedal released	9 to 14
CCS (H14-13) - GND1 (H14-1)	V - W-B	Cruise control switch	Cruise control system - Terminal of ECU - CCS terminal (see page 05-2682)	-
IMI (H14-18) - GND1 (H14-1)	W - W-B	Immobilizer communication	Immobilizer communicating	Pulse generation (see waveform 15)
IMO (H14-26) - GND1 (H14-1)	R - W-B	Immobilizer communication	Immobilizer communicating	Pulse generation (see waveform 15)
P1 (H15-17) - GND1 (H14-1)	Y - W-B	P position switch	Power switch ON (IG), P position switch ON	3 to 5

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
P1 (H15-17) - GND1 (H14-1)	Y - W-B	P position switch	Power switch ON (IG), P position switch OFF	7 to 12
PCON (H17-9) - GND1 (H14-1)	LG - W-B	P position control signal	Power switch ON (IG)	Pulse generation (see waveform 16)
PPOS (H17-10) - GND1 (H14-1)	W - W-B	P position signal	Power switch ON (IG)	Pulse generation (see waveform 16)
RDY (H14-28) - GND1 (H14-1)	R - W-B	READY control signal	Power switch ON (IG)	Pulse generation (see waveform 17)
RDY (H14-28) - GND1 (H14-1)	R - W-B	READY control signal	Power switch ON (READY)	Pulse generation (see waveform 18)
CLK (H16-17) - GND1 (H14-1)	G - W-B	A/C communication	Power switch ON (IG), A/C operating	Pulse generation (see waveform 19)
ITE (H16-14) - GND1 (H14-1)	Y - W-B	A/C communication	Power switch ON (IG), A/C operating	Pulse generation (see waveform 19)
ETI (H15-24) - GND1 (H14-1)	R - W-B	A/C communication	Power switch ON (IG), A/C operating	Pulse generation (see waveform 19)
STB (H15-25) - GND1 (H14-1)	W - W-B	A/C communication	Power switch ON (IG), A/C operating	Pulse generation (see waveform 19)
WP (H16-5) - GND1 (H14-1)	O - W-B	Water pump relay control	Power switch ON (IG), A/C operating	Below 2
GND1 (H14-1) - Body ground	W-B - Body ground	Ground	Always (resistance check)	Below 5 Ω
GND2 (H14-4) - Body ground	W-B - Body ground	Ground	Always (resistance check)	Below 5 Ω

1. Oscilloscope waveforms

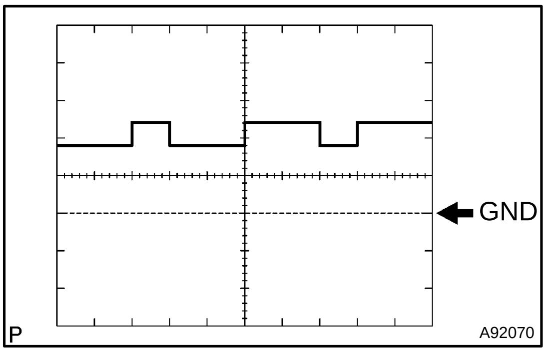
HINT:
In the oscilloscope waveform samples, which are provided here for informational purposes. Noise and fluttering waveforms have been omitted.



(a) Waveform 1 (HIGH-level CAN bus line)

Item	Contents
Terminal	CANH - GND1
Equipment Setting	1 V/Division, 2 μs/Division
Condition	Power switch ON (IG)

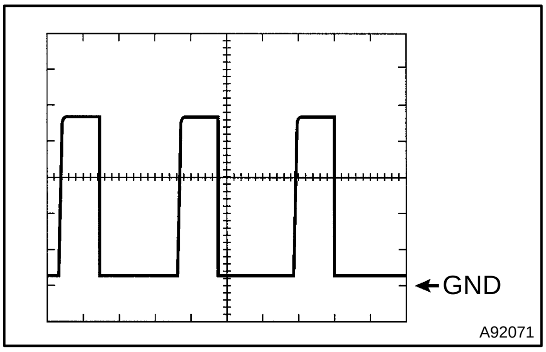
HINT:
The waveform varies depending on the contents of communication.



(b) Waveform 2 (LOW-level CAN bus line)

Item	Contents
Terminal	CANL - GND1
Equipment Setting	1 V/Division, 2 μs/Division
Condition	Power switch ON (IG)

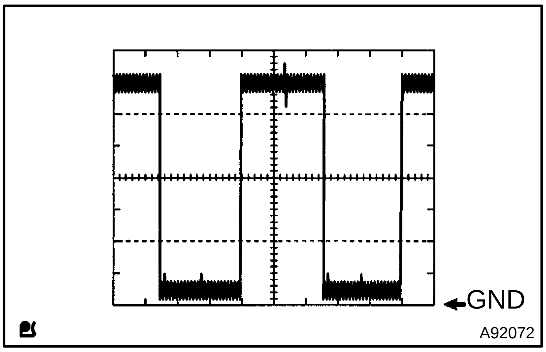
HINT:
The waveform varies depending on the contents of communication.



(c) Waveform 3 (engine speed signal)

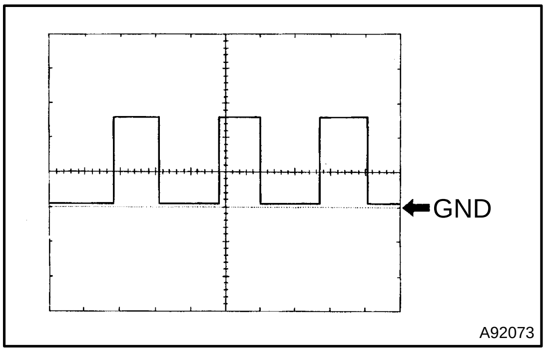
Item	Contents
Terminal	NEO - GND1
Equipment Setting	1 V/Division, 2 ms/Division
Condition	Engine idling

HINT:
The pulse cycle becomes shorter as the engine speed increases.



(d) Waveform 4 (G signal)

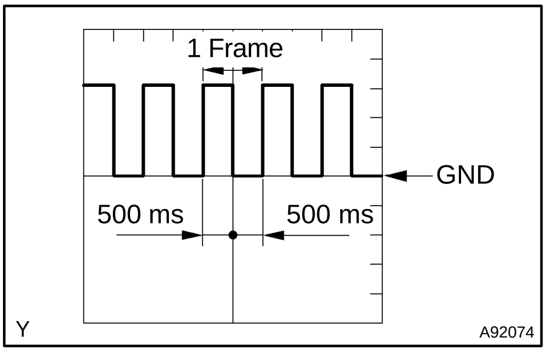
Item	Contents
Terminal	GO - GND1
Equipment Setting	2 V/Division, 20 ms/Division
Condition	Engine idling



(e) Waveform 5 (vehicle speed signal)

Item	Contents
Terminal	SPDI - GND1
Equipment Setting	2 V/Division, 20 ms/Division
Condition	Driving at approximately 20 km/h (12 mph)

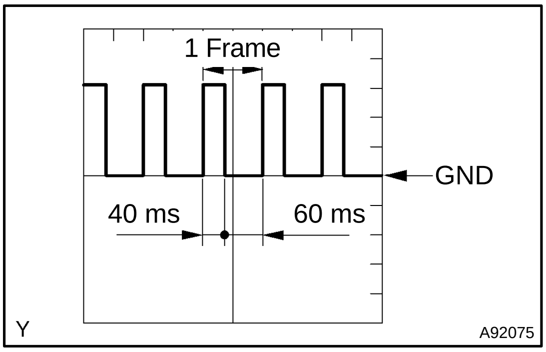
HINT:
The higher the vehicle speed, the shorter the cycle and higher the voltage.



(f) Waveform 6 (airbag deployment signal)

Item	Contents
Terminal	ABFS - GND1
Equipment Setting	1 V/Division, 500 ms/Division
Condition	Power switch ON (READY) (2 seconds after ACC ON) Airbag system normal

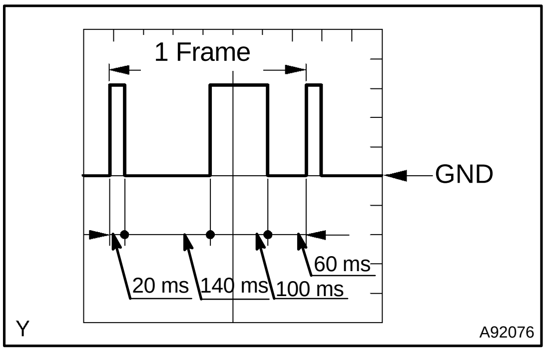
HINT:
The waveform on the left is repeated when the airbag system is normal.



(g) Waveform 7 (airbag deployment signal)

Item	Contents
Terminal	ABFS - GND1
Equipment Setting	1 V/Division, 50 ms/Division
Condition	Power switch ON (READY) (2 seconds after ACC ON) Airbag system abnormal

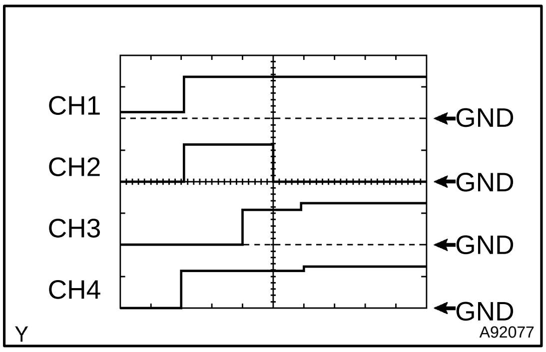
HINT:
The waveform on the left is repeated when the airbag system is abnormal.



(h) Waveform 8 (airbag deployment signal)

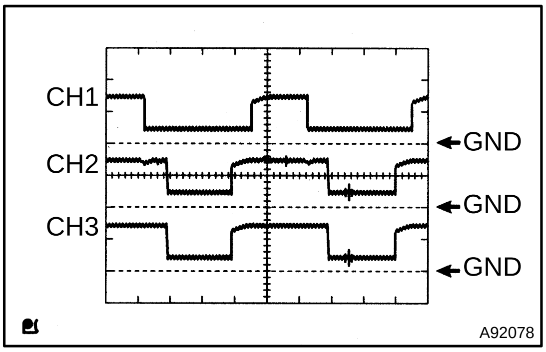
Item	Contents
Terminal	ABFS - GND1
Equipment Setting	1 V/Division, 50 ms/Division
Condition	Power switch ON (READY) (2 seconds after ACC ON) Airbag system deployed (during collision)

HINT:
When the airbag system is deployed, after 1 frame of transmission indicating a normal condition is completed, the waveform on the left is repeated for 50 frames. After that, normal transmission returns.



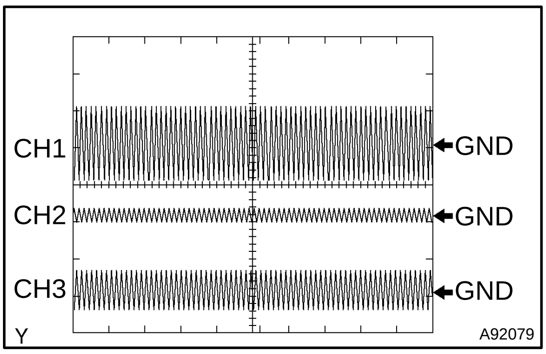
(i) Waveform 9 (system main relay signal)

Item	Contents
Terminal	CH1: IGSW - GND1 CH2: CON1 - GND1 CH3: CON2 - GND1 CH4: CON3 - GND1
Equipment Setting	10 V/Division, 100 ms/Division
Condition	Power switch OFF to ON (READY)



(j) Waveform 10 (generator switch U, V, and W signal)

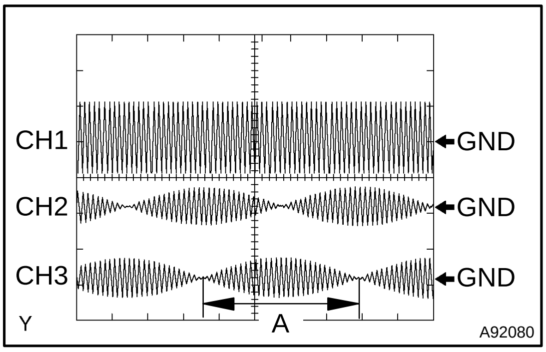
Item	Contents
Terminal	CH1: GUU - GINV CH2: GVU - GINV CH3: GWU - GINV
Equipment Setting	10 V/Division, 20 μs/Division
Condition	Power switch ON (IG)



(k) Waveform 11 (generator or motor resolver)

Item	Contents
Terminal (Generator Resolver)	CH1: GRF - GRFG CH2: GSN - GSNG CH3: GCS - GCSG
Terminal (Motor Resolver)	CH1: MRF - MRFG CH2: MSN - MSNG CH3: MCS - MCSG
Equipment Setting	CH1: 10 V/Division, 1 ms/Division CH2, 3: 5 V/Division, 1 ms/Division
Condition	Generator or motor stopped

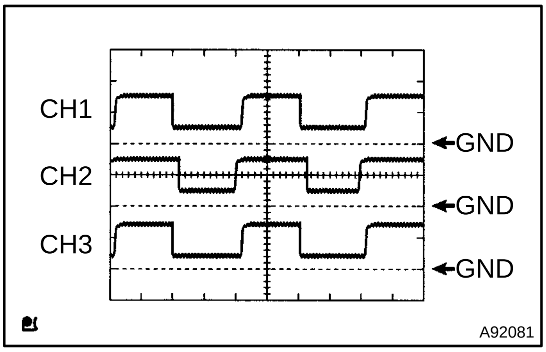
HINT:
The phases and the waveform height of the GSN and GCS, or the MSN and MCS change depending on the stopped position of rotor.



(l) Waveform 12 (generator or motor resolver)

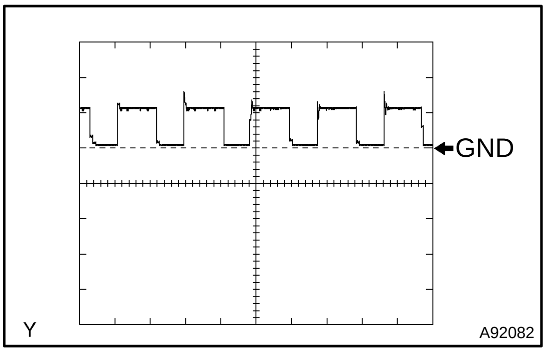
Item	Contents
Terminal (Generator Resolver)	CH1: GRF - GRFG CH2: GSN - GSNG CH3: GCS - GCSG
Terminal (Motor Resolver)	CH1: MRF - MRFG CH2: MSN - MSNG CH3: MCS - MCSG
Equipment Setting	CH1: 10 V/Division, 1 ms/Division CH2, 3: 5 V/Division, 1 ms/Division
Condition	Generator or motor is rotating

HINT:
Distance ”A” in the diagram becomes shorter as the rotor speed increases.



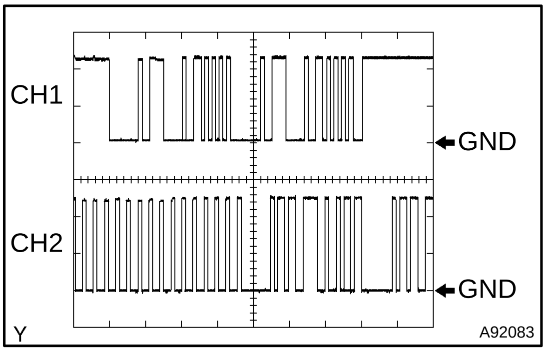
(m) Waveform 13 (motor switch U, V, and W signal)

Item	Contents
Terminal	CH1: MUU - GINV CH2: MVU - GINV CH3: MWU - GINV
Equipment Setting	10 V/Division, 50 μs/Division
Condition	Power switch ON (IG)



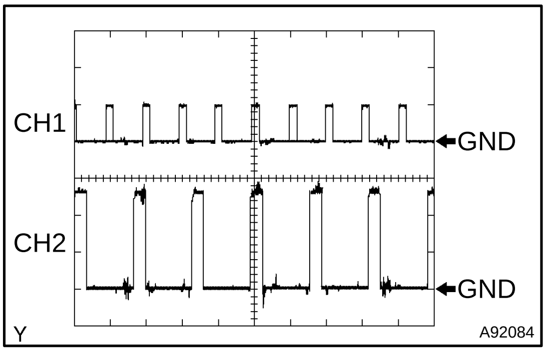
(n) Waveform 14 (boost converter PWM switch signal)

Item	Contents
Terminal	CPWM - GCNV
Equipment Setting	10 V/Division, 50 μs/Division
Condition	Power switch ON (READY), parking brake ON, D position, brake pedal and accelerator pedal depressed



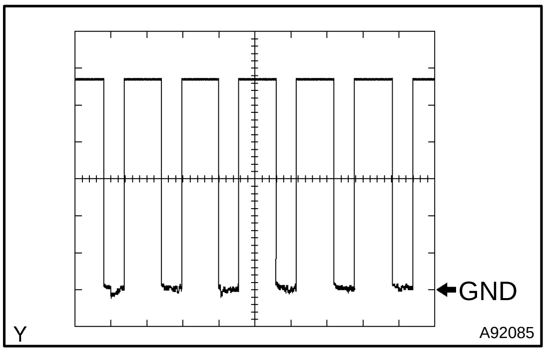
(o) Waveform 15 (immobilizer communication)

Item	Contents
Terminal	CH1: IMO - GND1 CH2: IMI - GND1
Equipment Setting	5 V/Division, 200 ms/Division
Condition	Immobilizer communicating



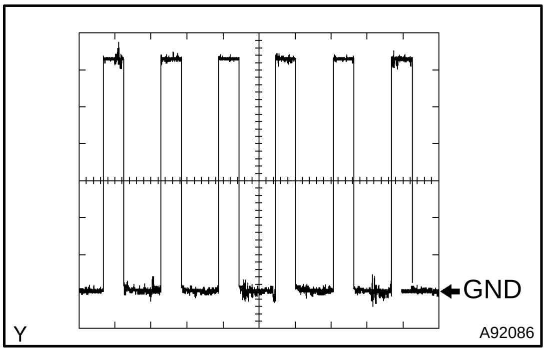
(p) Waveform 16 (P position control signal, P position signal)

Item	Contents
Terminal	CH1: PCON - GND1 CH2: PPOS - GND1
Equipment Setting	5 V/Division, 20 ms/Division
Condition	Power switch ON (IG)



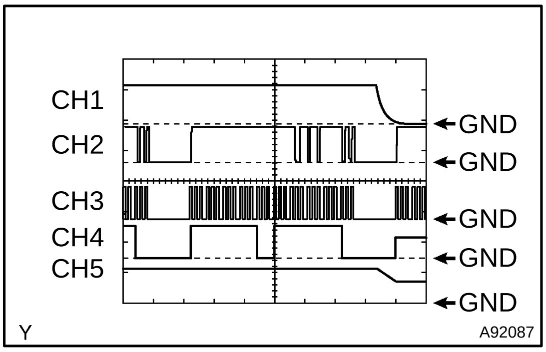
(q) Waveform 17 (READY control signal)

Item	Contents
Terminal	RDY - GND1
Equipment Setting	2 V/Division, 20 ms/Division
Condition	Power switch ON (IG)



(r) Waveform 18 (READY control signal)

Item	Contents
Terminal	RDY - GND1
Equipment Setting	2V/Division, 20ms/Division
Condition	Power switch ON (READY)



(s) Waveform 19 (A/C communication)

Item	Contents
Terminal	CH1: IGSW - GND1 CH2: ITE - GND1 CH3: CLK - GND1 CH4: ETI - GND1 CH5: STB- GND1
Equipment Setting	10 V/Division, 50 ms/Division
Condition	Power switch ON (IG) and A/C operating

HYBRID TRANSAXLE

SERVICE DATA

031TO-01

Differential case side bearing preload	
(Starting torque)	New bearing: 0.98 to 1.57 N·m (9.99 to 16.01 kgf·cm, 8.67 to 13.90 in.·lbf) Reused bearing: 0.49 to 0.78 N·m (5.00 to 7.95 kgf·cm, 4.43 to 6.90 in.·lbf)
(Turning torque 20 rpm)	0.61 to 1.35 N·m (6.2 to 13.77 kgf·cm, 5.4 to 11.95 in.·lbf)
Differential preload adjusting shim thickness	
Mark 1	1.80 mm (0.0709 in.)
Mark 2	1.83 mm (0.0720 in.)
Mark 3	1.86 mm (0.0732 in.)
Mark 4	1.89 mm (0.0744 in.)
Mark 50	1.92 mm (0.0756 in.)
Mark 51	1.94 mm (0.0764 in.)
Mark 52	1.96 mm (0.0772 in.)
Mark 53	1.98 mm (0.0780 in.)
Mark 54	2.00 mm (0.0787 in.)
Mark 55	2.02 mm (0.0795 in.)
Mark 56	2.04 mm (0.0803 in.)
Mark 57	2.06 mm (0.0811 in.)
Mark 58	2.08 mm (0.0819 in.)
Mark 59	2.10 mm (0.0827 in.)
Mark 60	2.12 mm (0.0835 in.)
Mark 61	2.14 mm (0.0843 in.)
Mark 62	2.16 mm (0.0850 in.)
Mark 63	2.18 mm (0.0858 in.)
Mark 64	2.20 mm (0.0866 in.)
Mark 65	2.22 mm (0.0874 in.)
Mark 66	2.24 mm (0.0882 in.)
Mark 67	2.26 mm (0.0890 in.)
Mark 68	2.28 mm (0.0898 in.)
Mark 69	2.30 mm (0.0906 in.)
Mark 70	2.32 mm (0.0913 in.)
Mark 19	2.34 mm (0.0921 in.)
Mark 20	2.37 mm (0.0933 in.)
-	2.40 mm (0.0945 in.)
Mark 22	2.43 mm (0.0957 in.)
Mark 23	2.46 mm (0.0969 in.)
Input shaft shim thickness	
Mark 1	1.00 mm (0.0394 in.)
Mark 2	1.20 mm (0.0472 in.)
Mark 3	1.40 mm (0.0551 in.)
Mark 4	1.60 mm (0.0630 in.)
Mark 5	1.80 mm (0.0709 in.)
Mark 6	2.00 mm (0.0787 in.)
Mark 7	2.20 mm (0.0866 in.)
Mark 8	2.40 mm (0.0945 in.)
Mark 9	2.60 mm (0.1024 in.)
Mark 10	2.80 mm (0.1102 in.)
Mark 11	3.00 mm (0.1181 in.)
Mark 12	3.20 mm (0.1260 in.)

Counter drive gear shim thickness		
	Mark A	2.20 mm (0.0866 in.)
	Mark B	2.25 mm (0.0886 in.)
	Mark C	2.30 mm (0.0906 in.)
	Mark D	2.35 mm (0.0925 in.)
	Mark E	2.40 mm (0.0945 in.)
	Mark F	2.45 mm (0.0965 in.)
	Mark G	2.50 mm (0.0984 in.)
	Mark H	2.55 mm (0.1003 in.)
	Mark J	2.60 mm (0.1024 in.)
	Mark K	2.65 mm (0.1043 in.)
	Mark L	2.70 mm (0.1063 in.)
	Mark M	2.75 mm (0.1083 in.)
	Mark N	2.80 mm (0.1102 in.)
Differential oil seal LH and RH drive in depth		2.7 ± 0.5 mm (0.11 ± 0.02 in.)
Oil pressure		9.8 kPa (0.1 kgf/cm^2, 1.4 pst)
Differential side gear backlash	Standard	0.05 to 0.20 mm (0.0020 - 0.0079 in.)
Differential side gear washer thickness		0.95 mm (0.0374 in.)
		1.00 mm (0.0394 in.)
		1.05 mm (0.0414 in.)
		1.10 mm (0.0433 in.)
		1.15 mm (0.0453 in.)
		1.20 mm (0.0472 in.)
Sun gear bush diameter	Standard	25.525 to 25.546 mm (1.00492 to 1.00575 in.)
	Maximum	25.596 mm (1.00771 in.)

IGNITION

031VC-01

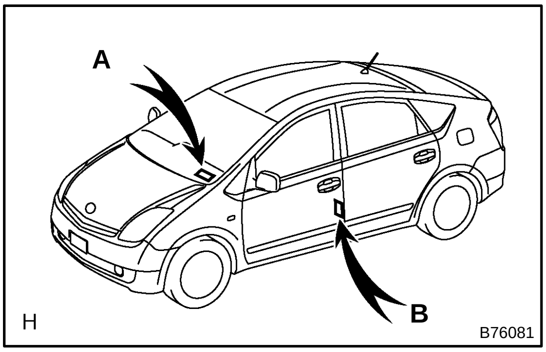
SERVICE DATA

Spark plug		
Recommended spark plug	DENSO	SK16R11
	NGK	IFR5A11
Electrode gap	Standard	1.0 to 1.1 mm (0.039 to 0.043 in.)
	Maximum	1.2 mm (0.047 in.)
Camshaft position sensor		
Resistance	1 (G+) - 2 (G-)	1,630 to 2,740 Ω (Hot) 2,065 to 3,225 Ω (Cold)
Crankshaft position sensor		
Resistance	1 (NE+) - 2 (NE-)	985 to 1,600 Ω (Hot) 1,265 to 1,890 Ω (Cold)

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION AND SERIAL NUMBERS

010RY-01

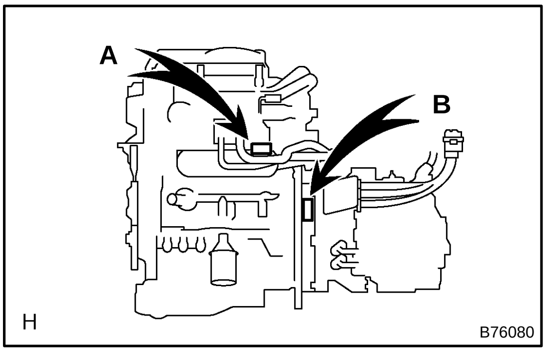


1. VEHICLE IDENTIFICATION NUMBER

(a) The vehicle identification number is stamped on the vehicle identification number plate and certification label, as shown in the illustration.

A: Vehicle Identification Number Plate

B: Certification Label



2. ENGINE SERIAL NUMBER AND MOTOR SERIAL NUMBER

(a) The engine serial number is stamped on the engine block, as shown in the illustration.

A: Engine Serial Number

(b) The motor serial number is stamped on the motor as shown in the illustration.

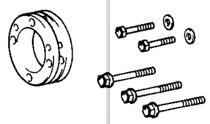
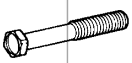
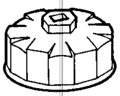
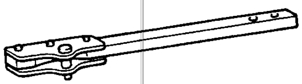
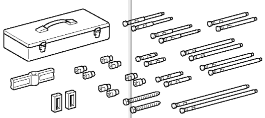
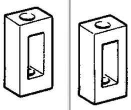
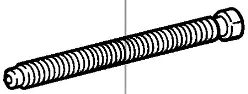
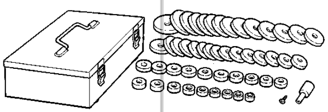
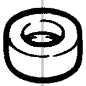
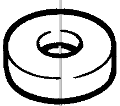
B: Motor Serial Number

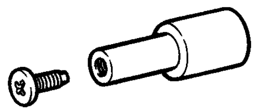
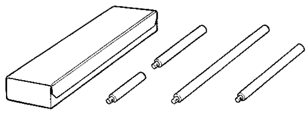
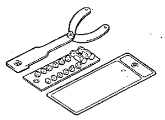
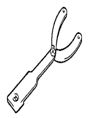
LUBRICATION

PREPARATION

023GI-01

SST

	09213-58013	Crankshaft Pully Holding Tool	OIL PUMP ASSY(1NZ-FXE)
	(91111-50845)	Bolt	OIL PUMP ASSY(1NZ-FXE)
	09228-06501	Oil Filter Wrench	OIL FILTER SUB-ASSY(1NZ-FXE)
	09330-00021	Companion Flange Holding Tool	OIL PUMP ASSY(1NZ-FXE)
	09950-50013	Puller C Set	OIL PUMP ASSY(1NZ-FXE)
	(09951-05010)	Hanger 150	OIL PUMP ASSY(1NZ-FXE)
	(09952-05010)	Slide Arm	OIL PUMP ASSY(1NZ-FXE)
	(09953-05020)	Center Bolt 150	OIL PUMP ASSY(1NZ-FXE)
	(09954-05021)	Claw No.2	OIL PUMP ASSY(1NZ-FXE)
	09950-60010	Replacer Set	OIL PUMP ASSY(1NZ-FXE)
	(09951-00250)	Replacer 25	OIL PUMP ASSY(1NZ-FXE)
	(09951-00380)	Replacer 38	OIL PUMP ASSY(1NZ-FXE)

	(09952-06010)	Adapter	OIL PUMP ASSY(1NZ-FXE)
	09950-70010	Handle Set	OIL PUMP ASSY(1NZ-FXE)
	(09951-07100)	Handle 100	OIL PUMP ASSY(1NZ-FXE)
	09960-10010	Variable Pin Wrench Set	OIL PUMP ASSY(1NZ-FXE)
	(09962-01000)	Variable Pin Wrench Arm Assy	OIL PUMP ASSY(1NZ-FXE)
	(09963-00600)	Pin 6	OIL PUMP ASSY(1NZ-FXE)

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	OIL PUMP ASSY(1NZ-FXE)
	08826-00100	”Seal Packing 1282B,” THREE BOND 1282B or equivalent (FIPG)	OIL PUMP ASSY(1NZ-FXE)

Equipment

Belt tension gauge	
Feeler gauge	
Precision straight edge	
Radiator cap tester	
Torque wrench	
Wooden block	

Lubricant

Item		Capacity	Classification
Oil grade		-	API grade SL, Energy-Conserving or ILSAC, multi-grade engine oil
Drain and refill	w/ oil filter change w/o oil filter change	3.7 liters (3.9 US qts, 3.3 lmp. qts) 3.4 liters (3.6 US qts, 3.0 lmp. qts)	-
Dry fill		4.1 liters (4.3 US qts, 3.6 lmp. qts)	-

LUBRICATION

SERVICE DATA

031LS-02

Oil pressure	at idle speed	59 kPa (0.6 kgf/cm^2, 4.2 psi) or more
	at 2,500 rpm	150 to 550 kPa (1.5 to 56 kgf·cm^2, 22 to 80 psi)
Oil pump tip clearance	Standard	0.060 to 0.180 mm (0.0024 to 0.0071 in.)
	Maximum	0.28 mm (0.0110 in.)
Oil pump body clearance	Standard	0.250 to 0.325 mm (0.0098 to 0.0128 in.)
	Maximum	0.425 mm (0.01673 in.)

PARKING BRAKE

031Q4-01

SERVICE DATA

Parking brake pedal travel at 300 N (31 kgf, 68.3 lbf):	6 - 9 clicks

POWER STEERING

030EH-04

SERVICE DATA

STEERING WHEEL		
Steering effort	(Reference)	5.5 N·m (56 kgf·cm, 49 in.·lbf)
Steering wheel freeplay	Maximum	30 mm (1.18 in.)
POWER STEERING GEAR		
Tie rod end sub-assy total preload	(Turning)	2.0 N·m (20.4 kgf·cm, 18 in.·lbf) or less
Steering gear assy total preload	(Turning)	0.6 - 1.2 N·m (6.1 - 12.2 kgf·cm, 5 - 11 in.·lbf)
Steering rack boot clamp clearance		3.0 mm (0.12 in.) or less

030EI-04

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
STEERING WHEEL			
Steering wheel set nut	50	510	37
POWER STEERING GEAR			
Power steering rack x Steering rack end sub-assy	60 (83)	612 (846)	44 (61)
Tie rod assy lock nut	74	749	54
Steering gear assy set bolt	58	591	43
Steering intermediate shaft x Steering gear assy	35	360	26
Front stabilizer bracket No.1	19	194	14
Front stabilizer link assy set nut	74	755	55
Steering sliding yoke sub-assy set bolt	35	360	26
Tie rod end sub-assy set nut	74	749	54
Hub nut	103	1,050	76

( ): For use without SST

REAR SUSPENSION

031WH-01

SERVICE DATA

Rear wheel alignment	Toe-in (total)	0°18' ± 15' (0.30° ± 0.25°, 3.0 ± 2.5 mm, 0.12 ± 0.10 in.)
	Camber	-1 °30' ± 30' (-1.50° ± 0.5°)
	Right-left error	30' (0.5°) or less

031WI-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Hub nut	103	1,050	76
Piston rod set nut	56	571	41
Shock absorber with coil spring x Body	80	816	59
Shock absorber with coil spring x Rear axle beam	80	816	59
Parking brake cable set bolt	5.4	55	48 in.·lbf
Rear axle hub set bolt	61	622	45
Skid control sensor wire set bolt	5.0	51	44 in.·lbf
Rear axle beam x Body	85	867	63
Stabilizer bar x Rear axle beam	149	1,520	110

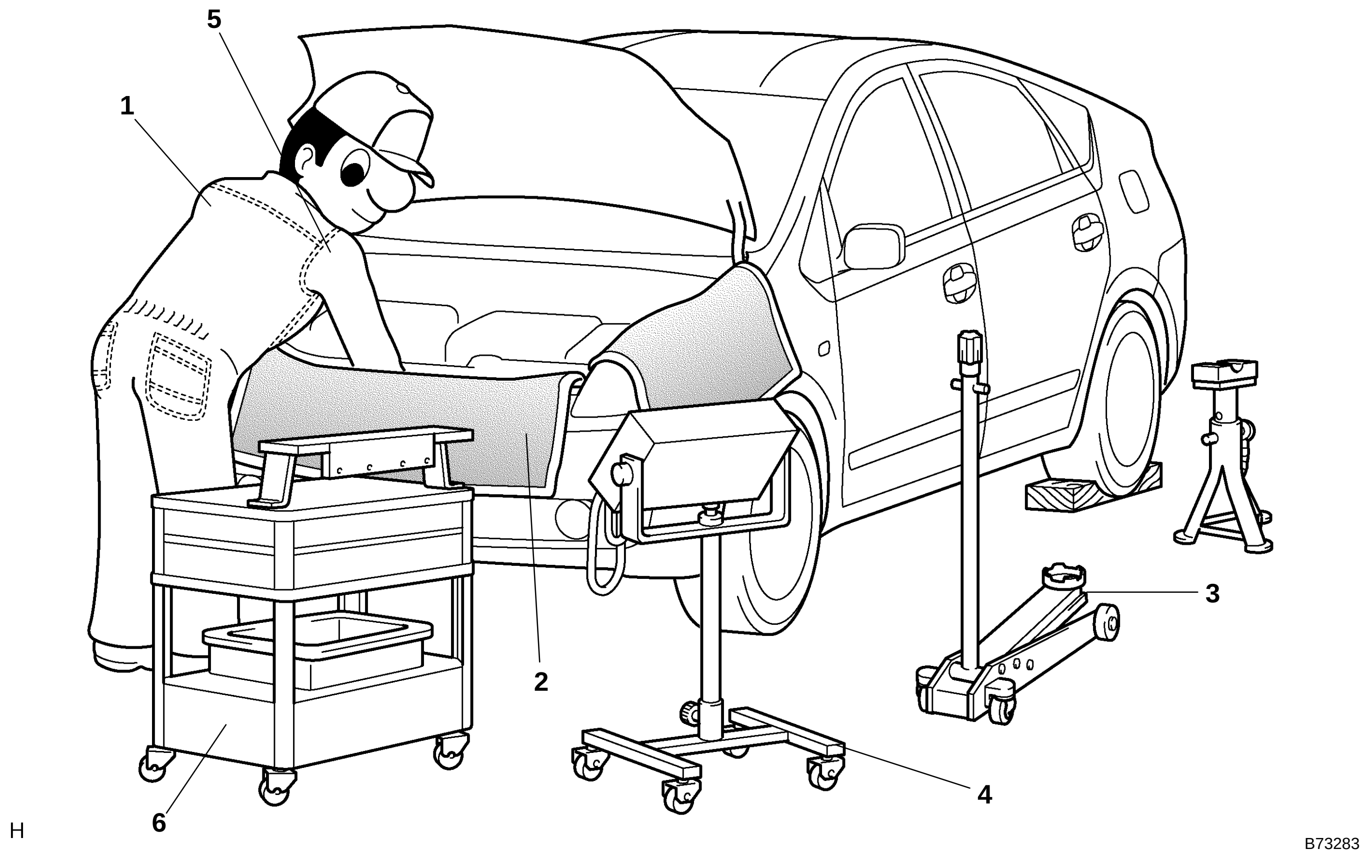
REPAIR INSTRUCTION

010RZ-01

PRECAUTION

1. BASIC REPAIR HINT

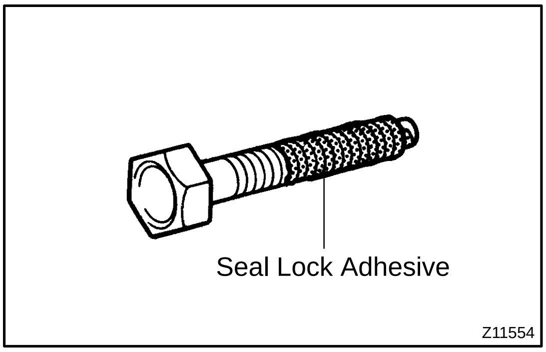
(a) HINTS ON OPERATIONS



1	Looks	• Always wear a clean uniform. • A hat and safety shoes must be worn.
2	Vehicle protection	• Prepare a grille cover, fender cover, seat cover and floor mat before starting the repairs.
3	Safe operation	• When working with 2 or more persons, be sure to check safety for one another. • When working with the engine running, make sure to provide ventilation for exhaust fumes in the workshop. • If working on high temperature, high pressure, rotating, moving, or vibrating parts, wear appropriate safety equipment and take extra care not to injure yourself or others. • When jacking up the vehicle, be sure to support the specified location with a safety stand. • When lifting up the vehicle, use appropriate safety equipment.
4	Preparation of tools and measuring gauge	• Before starting operation, prepare a tool stand, SST, gauge, oil, shop rag and parts for replacement.
5	Removal and installation, disassembly and assembly operations	• Diagnose with a thorough understanding of proper procedures and of the reported problem. • Before removing the parts, check the general condition of the assembly and for deformation and damage. • When the assembly is complicated, take notes. For example, note the total number of electrical connections, bolts, or hoses removed. Add matchmarks to insure re-assembly of components in the original positions. Temporarily mark hoses and their fittings, if needed. • Clean and wash the removed parts if necessary and assemble them after a thorough check.
6	Removed parts	• Place the removed parts in a separate box to avoid mixing them up with the new parts or contaminating the new parts. • For non-reusable parts such as a gasket, O-ring, and self-locking nut, replace them with new ones following the instructions in this manual. • Retain the removed parts for customer inspection, if requested.

(b) JACKING UP AND SUPPORTING VEHICLE

(1) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (see page 01-36).



(c) PRECOATED PARTS

(1) Precoated parts are bolts and nuts that are coated with a seal lock adhesive at the factory.

(2) If a precoated part is retightened, loosened or moved in anyway, it must be recoated with the specified adhesive.

(3) When reusing precoated parts, clean off the old adhesive and dry the part with compressed air. Then apply new seal lock adhesive appropriate to the bolts and nuts.

NOTICE:

Perform the torque with the lower limit value of the torque tolerance.

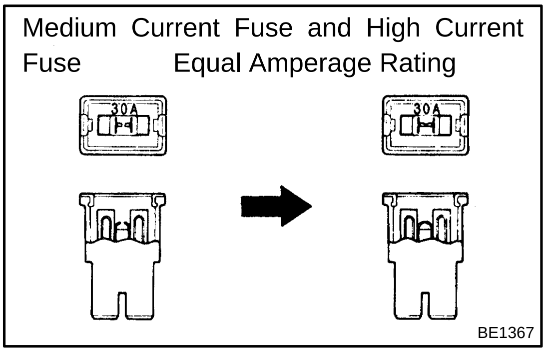
(4) Some seal lock agents harden slowly. You may have to wait for the seal lock agent to harden.

(d) GASKETS

(1) When necessary, use a sealer on gaskets to prevent leaks.

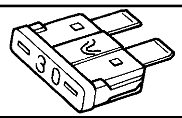
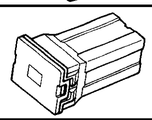
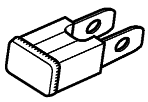
(e) BOLTS, NUTS AND SCREWS

(1) Carefully follow all the specifications for tightening torques. Always use a torque wrench.



(f) FUSES

(1) When replacing fuses, be sure that the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M-FUSE
 D27353	 IN0367	HIGH CURRENT FUSE	H-FUSE

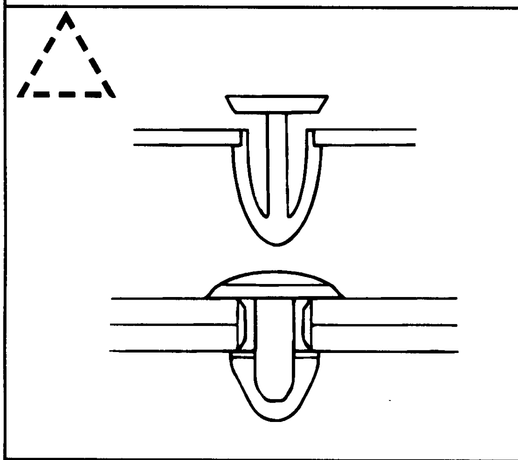
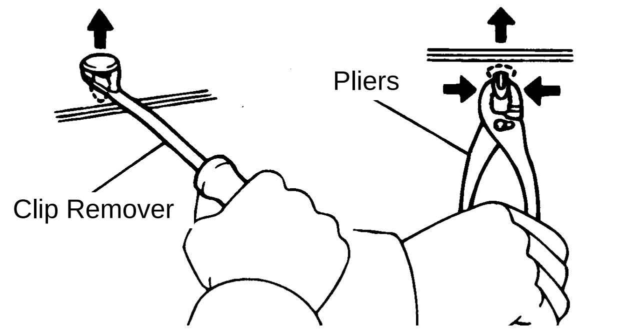
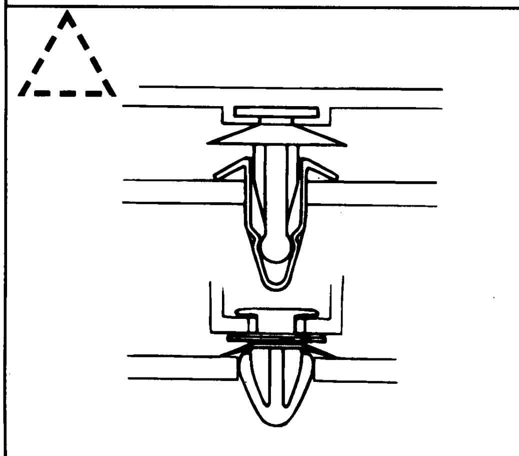
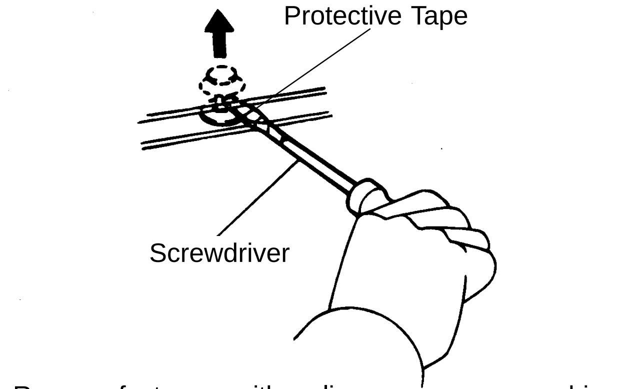
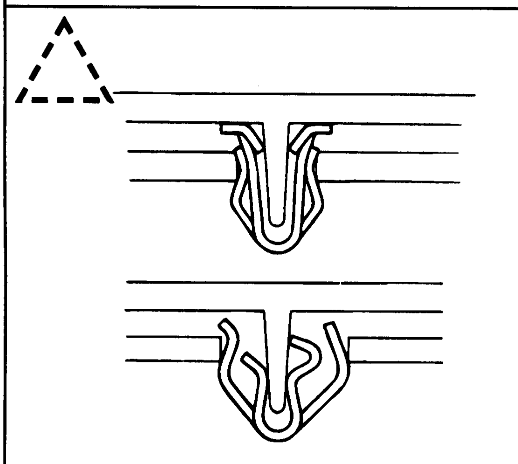
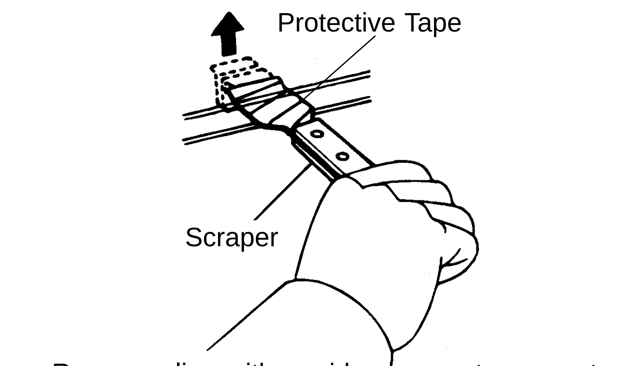
V35002

(g) CLIPS

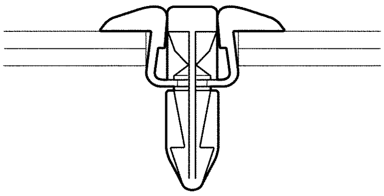
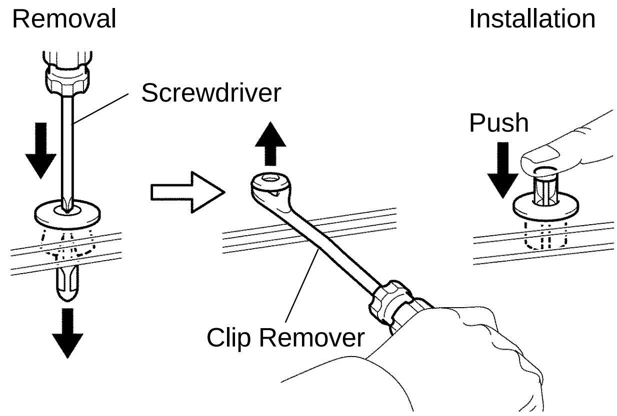
(1) The removal and installation methods of typical clips used in body parts are shown in the table below.

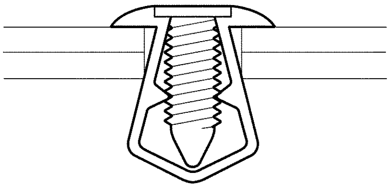
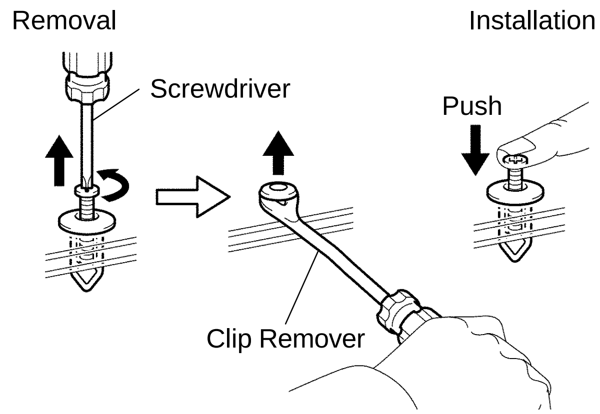
HINT:

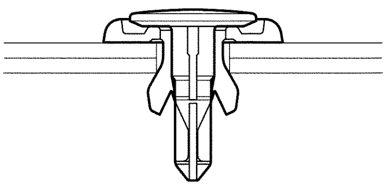
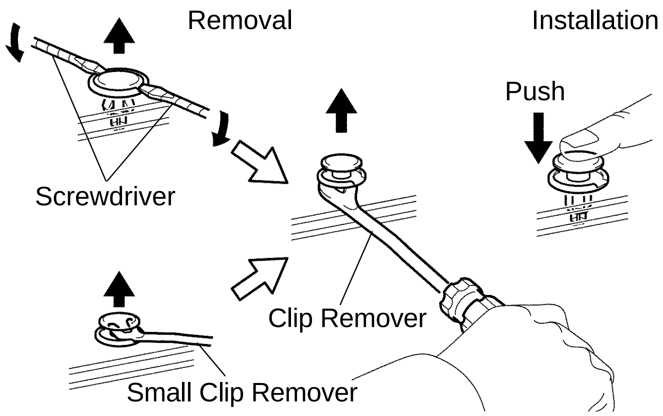
If clips are damaged during a procedure, always replace the damaged clip with a new clip.

Shape (Example)	Removal/Installation
	 Remove clips from front or rear using clip remover or pliers.
	 Remove fasteners with a clip remover or screwdriver.
	 Remove clips with a wide scraper to prevent panel damage.

D25786

<table>
<tr><th>Shape (Example)</th><th>Removal/Installation</th></tr>
<tr><td></td><td>

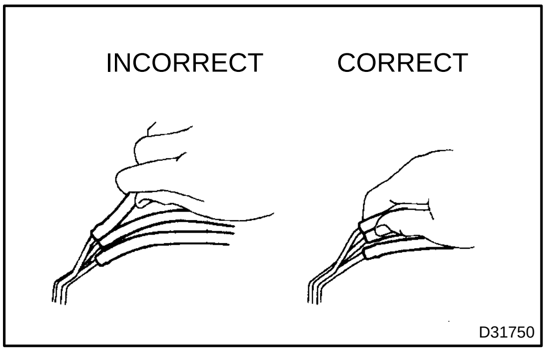
Remove rivet by pushing the center pin through and prying out the rivet shell.</td></tr>
<tr><td></td><td>

Remove rivet by unscrewing the center pin and prying out the rivet shell.</td></tr>
<tr><td></td><td>

Remove rivet by prying out the pin and then prying out the rivet shell.</td></tr>
</table>

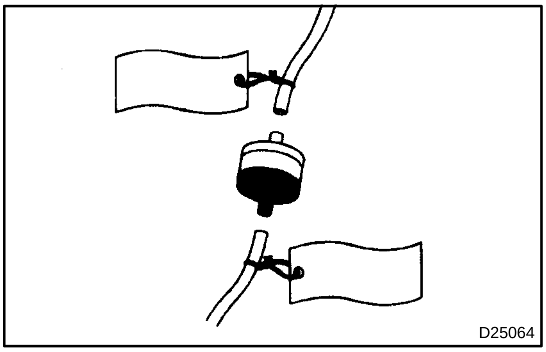
P

V35006



(h) REMOVAL AND INSTALLATION OF VACUUM HOSES

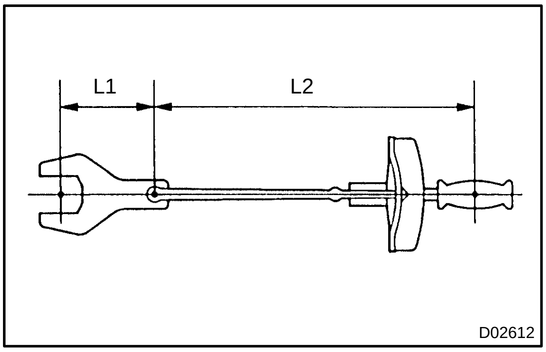
(1) To disconnect vacuum hoses, pull and twist from the end of the hose. Do not pull from the middle of the hose as this may cause damage.



(2) When disconnecting vacuum hoses, use tags to identify where they should be reconnected.

(3) After completing the job, double check that the vacuum hoses are properly connected. The label under the hood shows the proper layout.

(4) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter for adjustment. Once a hose has been stretched, it may leak air.

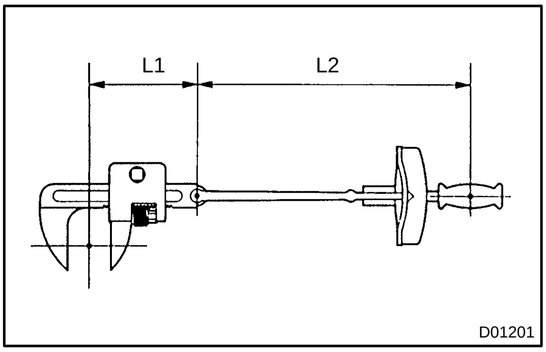


(i) TORQUE WHEN USING TORQUE WRENCH WITH EXTENSION TOOL

(1) If SST or an extension tool is combined with the torque wrench to extend its length, do not tighten the torque wrench to the specified torque values in this manual. The resulting torque will be excessive.

(2) Use the formula below to calculate special torque values for situations where SST or an extension tool is combined with the torque wrench.

(3) Formula: T' = T x L2/(L1 + L2)

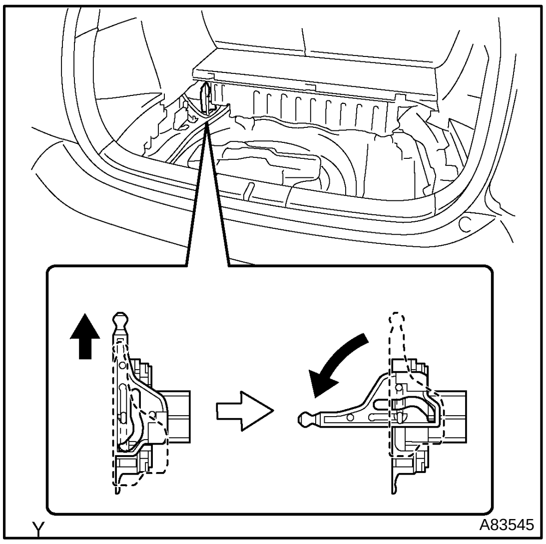


T'	Reading of torque wrench {N·m (kgf·cm, ft·lbf)}
T	Torque {N·m (kgf·cm, ft·lbf)}
L1	Length of SST or extension tool (cm)
L2	Length of torque wrench (cm)

2. PRECAUTIONS FOR HIGH-VOLTAGE CIRCUIT INSPECTION AND SERVICE

(a) Engineer must undergo special training to be able to perform high-voltage system inspection and servicing.

(b) All high-voltage wire harness connectors are colored orange. The HV battery and other high-voltage components have ”High Voltage” caution labels. Do not carelessly touch these wires and components.



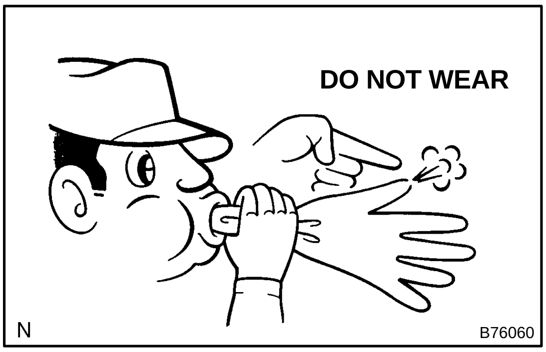
(c) Before inspecting or servicing the high-voltage system, be sure to follow safety measures, such as wearing insulated gloves and removing the service plug to prevent electrocution. Carry the removed service plug in your pocket to prevent other technicians from reinstalling it while you are servicing the vehicle.

(d) After removing the service plug, wait 5 minutes before touching any of the high-voltage connectors and terminals.

HINT:

5 minutes are required to discharge the high-voltage condenser inside the inverter.

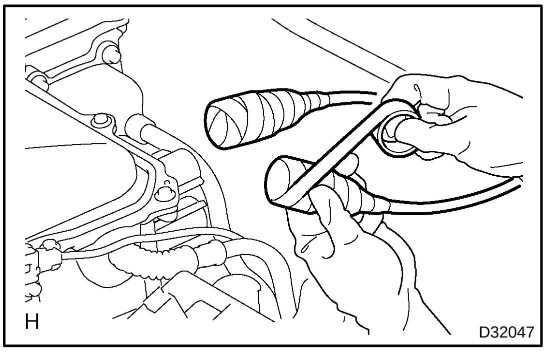
(e) Be sure to install the service plug before starting the hybrid system. Starting the hybrid system with the service plug removed may damage the vehicle.



(f) Before wearing insulated gloves, make sure that they are not cracked, ruptured, torn, or damaged in any way. Do not wear wet insulated gloves.

(g) When servicing the vehicle, do not carry metal objects like mechanical pencils or scales that can be dropped accidentally and cause a short circuit.

(h) Before touching a bare high-voltage terminal, wear insulated gloves and use an electrical tester to ensure that the terminal is not charged with electricity (approximately 0 V).



(i) After disconnecting or exposing a high-voltage connector or terminal, insulate it immediately using insulation tape.

(j) The screw of a high-voltage terminal should be tightened firmly to the specified torque. Both insufficient and excessive torque can cause failure.

(k) Use the ”CAUTION: HIGH VOLTAGE. DO NOT TOUCH DURING OPERATION” sign to notify other engineers that a high-voltage system is being inspected and/or repaired.

(l) Do not place the battery upside down while removing and installing it.

(m) After servicing the high-voltage system and before reinstalling the service plug, check again that you have not left a part or tool inside, that the high-voltage terminal screws are firmly tightened, and that the connectors are correctly connected.

CAUTION:
HIGH VOLTAGE. DO
NOT TOUCH DURING
OPERATION.
Person in charge:______________

CAUTION:
HIGH VOLTAGE. DO
NOT TOUCH DURING
OPERATION.

Person in charge:______________

Copy this page and put it after folding on the roof of the vehicle in service.

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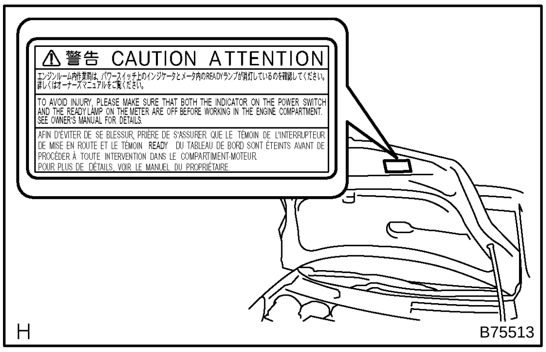


3. PRECAUTIONS TO BE OBSERVED WHEN INSPECTING OR SERVICING ENGINE COMPARTMENT

The PRIUS automatically turns the engine ON and OFF when the READY light on the instrument panel is ON. To avoid injury, remove the key from the key slot before inspecting or servicing the engine compartment.

4. ACTIONS TO BE TAKEN WHEN BATTERIES ARE DEPLETED

(a) Perform this procedure when the auxiliary battery is fully depleted.

HINT:

The following problems indicate that the auxiliary battery is depleted:

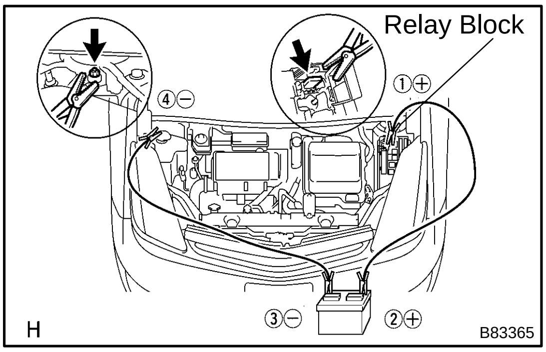
- No display appears on the instrument panel when the power switch's power mode is set to ON (IG).
- The hybrid system does not start.
- The headlights are dim.
- The sound from the horn is weak.

NOTICE:

Never use a quick charger.

(1) Push the "P" position switch, and engage the parking brake.

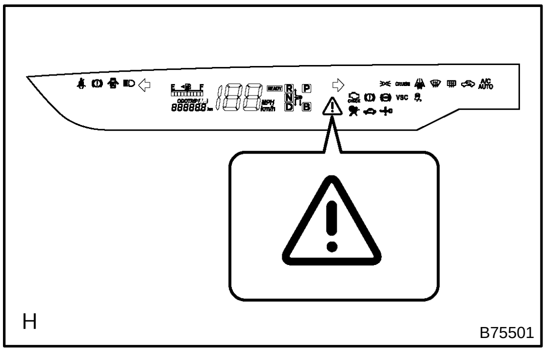
(2) Remove the key from the key slot.



(3) Using a booster cable, connect the rescue vehicle's 12 V battery positive (+) lead to the stalled vehicle's relay block positive (+) terminal and the negative (-) lead to the suspension support's nut on the right side.

(4) Start the engine of the rescue vehicle and run the engine at a speed slightly higher than the idling speed for 5 minutes to charge the auxiliary battery of the stalled vehicle.

(5) Depress the brake pedal and push the power switch to start the hybrid system.



If the hybrid system fails to start and the master lamp turns ON, the HV battery may be depleted.

(6) Disconnect the booster cable in the reverse order of the connection procedure.

NOTICE:

If the auxiliary battery needs to be replaced, replace it only with a 12 V battery specially designed for use with the PRIUS.

(b) Perform this procedure when the HV battery is depleted.

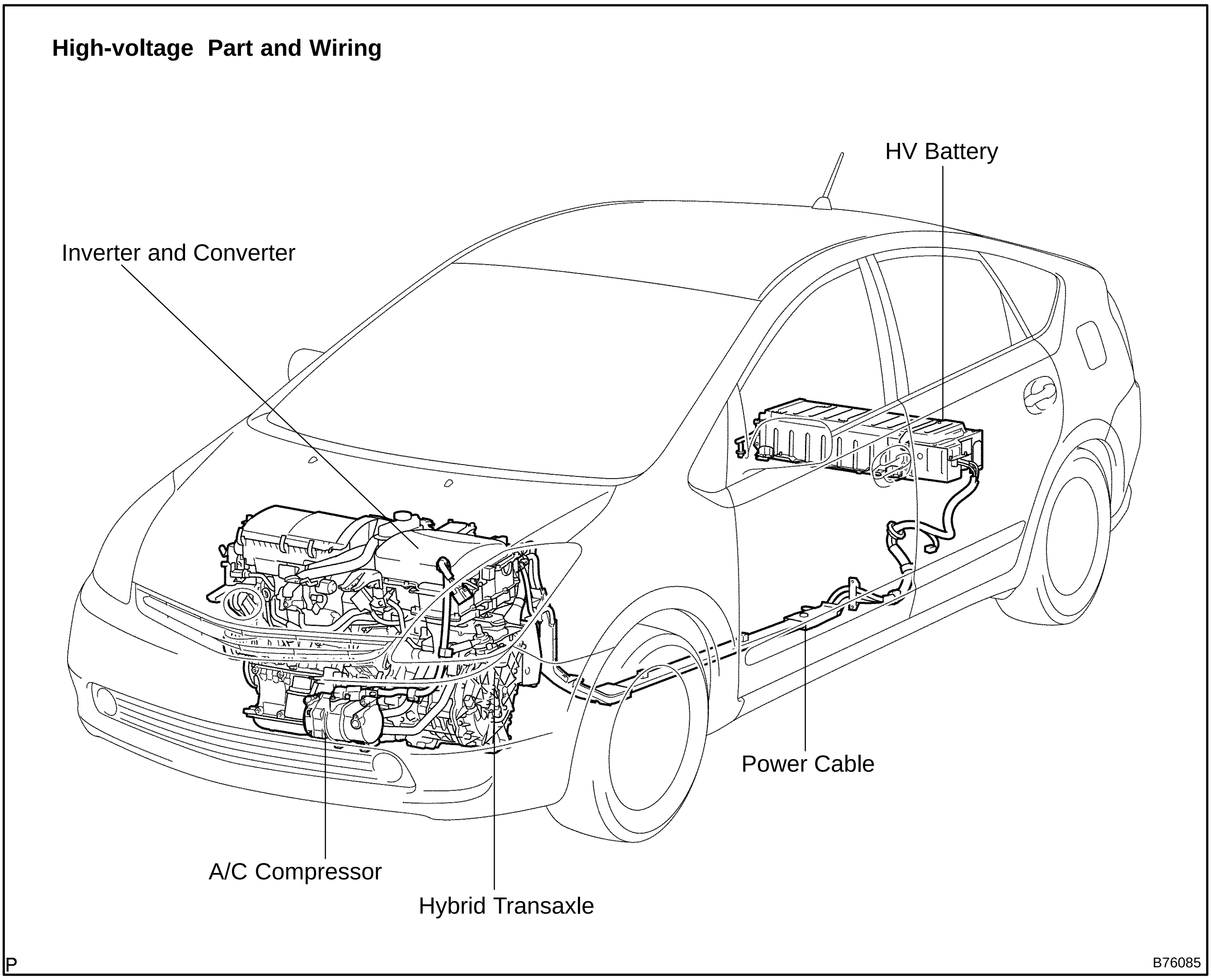
NOTICE:
Leaving the vehicle untouched for 2 to 3 months may deplete the HV battery. If the battery is fully depleted, replace the HV battery.

5. ACTIONS TO BE TAKEN FOR VEHICLE DAMAGED BY IMPACT

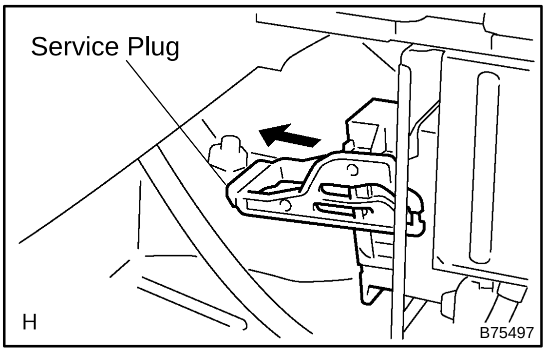
(a) Items to be prepared or operation at the site of the accident
- Protective clothing (insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- ABC fire extinguisher (effective against both oil flames and electrical flames)
- Shop rags (for wiping off the electrolyte)
- Vinyl tape (for insulating cable)
- Electrical tester

(b) Actions to be taken at the place of accident
(1) Wear insulated or rubber gloves, goggles and safety shoes.
(2) Do not touch a bare cable that could be a high voltage cable. If the cable must be touched or if accidental contact is unavoidable, follow these instructions: 1) wear insulated or rubber gloves and goggles, 2) measure the voltage between the cable and the body ground using an electrical tester, and 3) insulate the cable using vinyl tape.
(3) If the vehicle catches on fire, use an ABC fire extinguisher to extinguish the fire. Trying to extinguish a fire using only a small amount of water can be more dangerous than effective. Use a substantial amount of water or wait for firefighters.
(4) Visually check the HV battery and immediate area for any electrolyte leakage. Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, and then apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized before wiping. Neutralize the liquid using the following procedures:
1) apply saturated boric acid solution to the liquid, and 2) reapply red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue. Then, wipe the neutralized liquid with a shop rag.

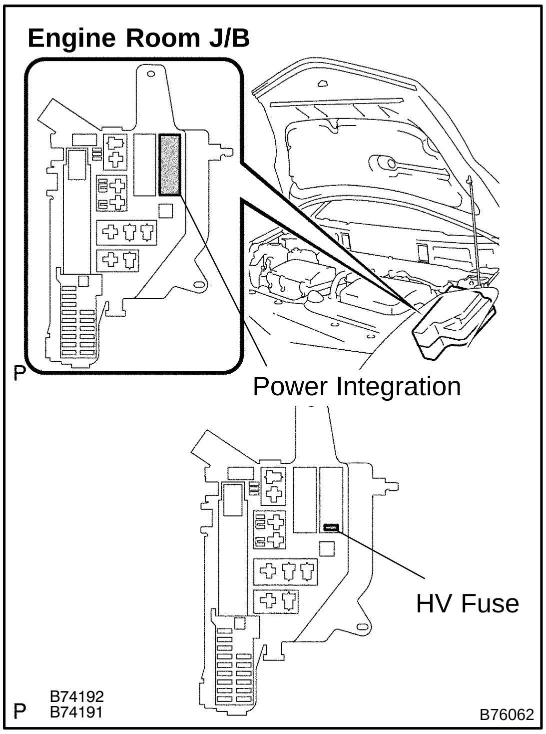
(5) If damage to any of the high-voltage components and cables is suspected, cut the high-voltage circuit using the procedure on the following pages.



- Push the "P" position switch and engage the parking brake.
- Remove the key from the key slot. Then disconnect the negative (-) terminal of the auxiliary battery.



- Remove the service plug while wearing insulated gloves.
- Do not turn the power switch on while removing the service plug.



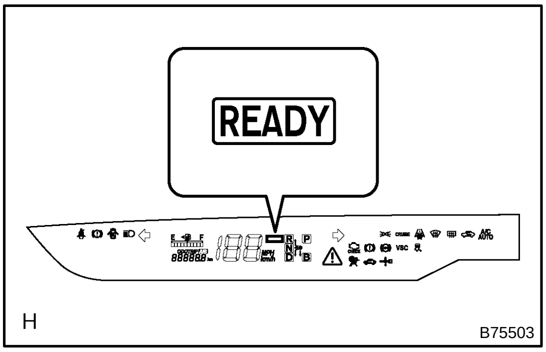
- If the service plug cannot be removed due to damage to the rear portion of the vehicle, remove the HV fuse or power integration (IGCT Relay) instead.

(c) Moving the damaged vehicle

HINT:

If any of the following applies, tow the vehicle away using a tow truck.

- One or more of the high-voltage components and cables are damaged.
- The driving, traction, or fuel system is damaged.



- The READY lamp is not illuminated when you turn.

NOTICE:

- **Before towing the vehicle away using a tow truck, disconnect the cable from the negative (-) terminal of the auxiliary battery and remove the service plug.**
  Only if none of the above applies and there are no problems that might affect driving, drive the vehicle away from the place of accident to a safe, nearby place.
- **Perform the procedure below if the READY lamp turns off, or there are abnormal noises, unusual smells, or strong vibrations while driving:**
  (1) Park the vehicle in a safe place.
  (2) Push the ”P” position switch and engage the parking brake.
  (3) Disconnect the power cable from the negative (-) terminal of the auxiliary battery.
  (4) Remove the service plug while wearing insulated gloves.

(d) Actions required after moving the damaged vehicle

If you see any liquid on the road surface, it could be highly alkaline electrolyte leakage.

Wear rubber gloves and goggles, and apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized before wiping. Neutralize the liquid using the following procedures: 1) apply saturated boric acid solution to the liquid, and 2) red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue. Then wipe the neutralized liquid with a shop rag.

(e) Items to be prepared (when repairing damaged vehicles)
- Protective clothing (Insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- Shop rags (for wiping off the electrolyte)
- Vinyl tape (for insulating cable)
- Electrical tester

(f) Precautions to be observed when servicing the damaged vehicle
- (1) Wear insulated or rubber gloves, goggles, and safety shoes.
- (2) Do not touch a bare cable that could be a high voltage cable. If the cable must be touched or if accidental contact is unavailable, follow these instructions: 1) wear insulated or rubber gloves and goggles, 2) measure the voltage between the cable and the body ground using an electrical tester, and 3) insulate the cable using vinyl tape.
- (3) Check the HV battery and immediate area for any electrolyte leakage. Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, and then apply red litmus paper to the leak. If the paper turns blue, the liquid must be neutralized before wiping. Neutralize the liquid using the following procedures:
  1) apply saturated boric acid solution to the liquid, and 2) reapply red litmus paper and make sure it does not turn blue. Repeat steps 1 and 2 above until the paper does not turn blue, Then wipe the neutralized liquid with a shop rag.
- (4) If the electrolyte adheres to your skin, wash the skin immediately using saturated boric acid solution or a large amount of water. If the electrolyte adheres to an article of clothing, take it off immediately.
- (5) If the electrolyte comes in contact with your eyes, call out loudly for help. Do not rub your eyes. Wash them with a large amount of water and seek medical care immediately.
- (6) If damage to any of the high-voltage components and cables is suspected, cut the high-voltage circuit using the procedure below.
  - Push the ”P” position switch and engage the parking brake.
  - Remove the key from the key slot. Then disconnect the power cable from the negative (-) terminal of the auxiliary battery.

- Wear insulated gloves, and then remove the service plug.
- If you cannot remove the service plug due to damage to the rear portion of the vehicle, remove the HV fuse or IGCT relay instead.

(g) Precautions to be taken when disposing of the vehicle
When scrapping the vehicle, remove the HV battery from the vehicle and return it to the location specified by the manufacturer. The same applies to any damaged HV battery.

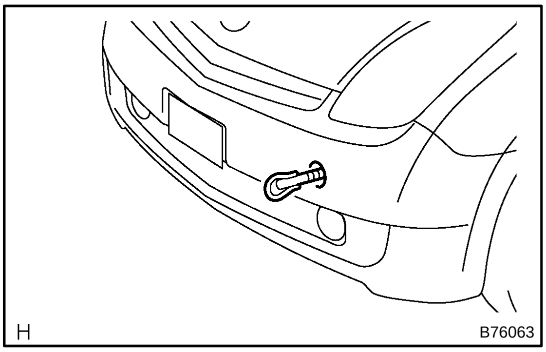
(h) After removing the battery, keep it away from water. Water may heat the battery, which results in fire.

(i) Precautions to be observed when towing
Tow the damaged vehicle with its front wheels or its front and rear wheels lifted off the ground.

NOTICE:
Towing the damaged vehicle with its front wheels on the ground may cause the motor to generate electricity. This electricity could, depending on the nature of the damage, leak and cause a fire.

(j) Towing with 4 wheels on the ground

NOTICE:
- **If the damaged vehicle needs to be towed using a rope, do not exceed 30 km/h and tow only for very short distances. Foe example, towing from the accident site to a nearby tow truck is permissible.**
- **Change the power switch's power mode to ON (IG) and shift the selector lever to the N position.**
- **If any abnormality is present in the damaged vehicle during towing, stop towing immediately.**



(k) Towing eyelet
(1) Install the hook.
(2) Hook a rope on to the illustrated area for towing.

6. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

HINT:
The PRIUS is equipped with a Supplemental Restraint System (SRS) and seat belt pretensioner.
Failure to carry out the service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing and lead to serious injury.
Furthermore, if a mistake is made when servicing the SRS, it is possible that the SRS may fail to operate properly. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following section carefully.

(a) GENERAL NOTICE

(1) As the malfunction symptoms of the SRS are difficult to confirm the Diagnostic Trouble Codes (DTCs) become the most important source of information when troubleshooting. When troubleshooting the SRS, always check the DTCs before disconnecting the battery (see page 05-1409).

(2) Work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.
(The SRS is equipped with a back-up power source. If work is started within 90 seconds after turning the ignition switch to lock and disconnecting the negative (-) terminal cable from the battery, the SRS may deploy).
When the negative (-) terminal cable is disconnected from the battery, clock and audio system memory is erased. Before starting work, make a note of the settings of each memory system. When work is finished, reset the clock and audio systems as before.

CAUTION:
Never use the back-up power source (battery or other) to try to keep the system memory from being erased. The back-up power source may inadvertently power the SRS, and cause it to deploy.

(3) In minor collisions where the SRS does not deploy, the horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly, curtain shield airbag assembly and seat belt pretensioner should be inspected before further use of the vehicle (see pages 60-22 , 60-34 , 60-43 , 60-48 and 61-1 1).

(4) Never use SRS parts from another vehicle. When replacing parts, use new parts.

(5) Before repairs, remove the airbag sensor if impacts are likely to be applied to the sensor during repairs.

(6) Never disassemble and repair the airbag sensor assembly, horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly, curtain shield airbag assembly or seat belt pretensioner.

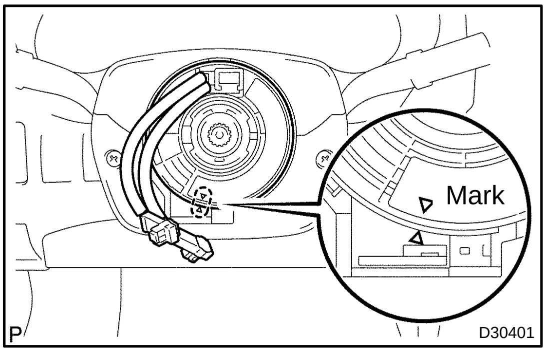
(7) Replace the center airbag sensor assembly, side airbag sensor assembly, horn button assembly or the instrument panel passenger airbag assembly, front seat airbag assembly or curtain shield airbag assembly if: 1) damage has occurred from being dropped, or 2) cracks, dents or other defects in the case, bracket or connector are present.

(8) Do not directly expose the airbag sensor assembly, horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly, curtain shield airbag assembly or seat belt pretensioner to hot air or flames.

(9) Use a voltmeter/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting electrical circuits.

(10) Information labels are attached to the SRS components. Follow the instructions on the labels.

(11) After work on the SRS is completed, check the SRS warning lamp (see page 05-1404).



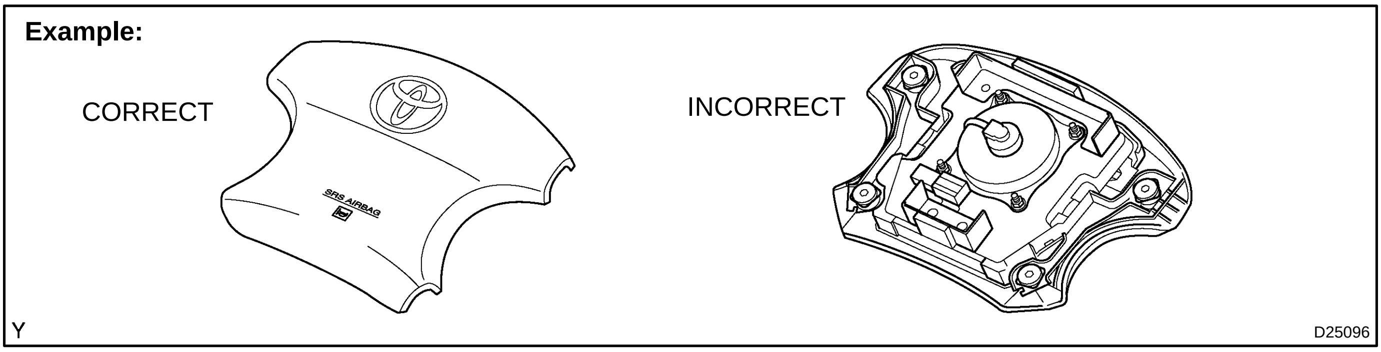
(b) SPIRAL CABLE (in Combination Switch)

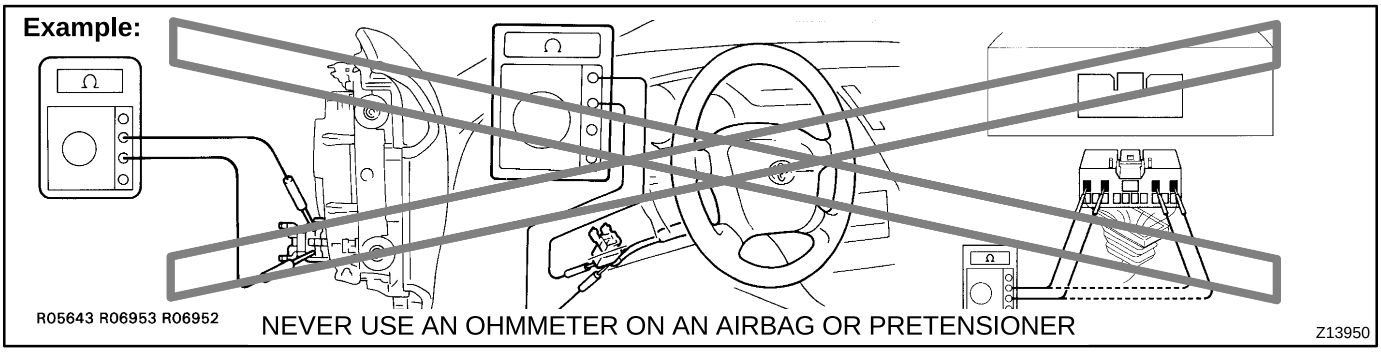
(1) The steering wheel must be fitted correctly to the steering column with the spiral cable in the neutral position, otherwise cable disconnection and other problems may occur. Refer to page 60-29 for information about correct installation of the steering wheel.

(c) HORN BUTTON ASSEMBLY (with Airbag)

(1) When removing the horn button assembly or handling a new horn button, it should be placed with the pad surface facing up. See the illustration below.
Placing the horn button with the pad surface facing down may lead to a serious accident if the airbag accidently inflates. Also, do not place anything on top of the horn button.

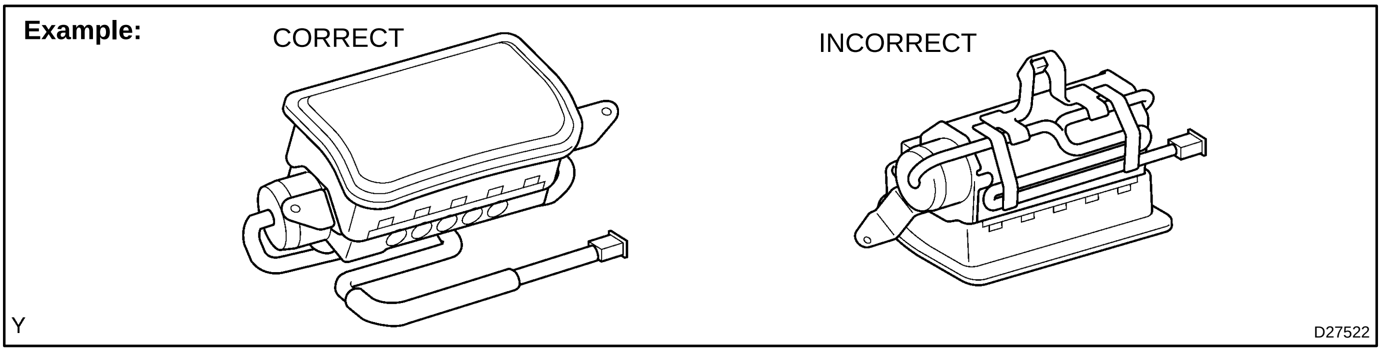
(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.
(3) Grease or detergents of any kind should not be applied to the steering wheel pad.
(4) Store the horn button assembly in an area where the ambient temperature is below 93˚C (200˚F), the humidity is not high and electrical noise is not nearby.
(5) When using electric welding anywhere on the vehicle, disconnect the airbag sensor (ECU) connectors (4 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag or seat belt pretensioner deploying due to currents entering the squib wiring.
(6) When disposing of the vehicle or the horn button assembly by itself, the airbag should be inflated using an SST before disposal (see page 60-22). Perform the operation in a safe place away from electrical noise.

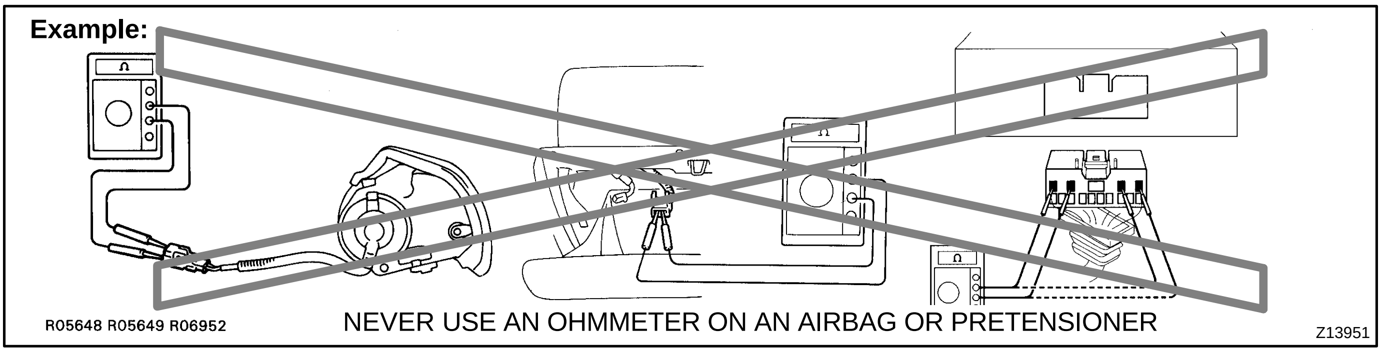




(d) INSTRUMENT PANEL PASSENGER AIRBAG ASSY
(1) Always place a removed or new instrument panel passenger airbag assembly with the airbag inflation direction facing upward.
Placing the airbag assembly with the airbag inflation direction facing downward could cause a serious accident if the airbag inflates.
(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.
(3) Grease or detergents of any kind should not be applied to the instrument panel passenger airbag assembly.
(4) Store the airbag assembly in an area where the ambient temperature is below 93˚C (200˚F), the humidity is not high and electrical noise is not nearby.
(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (4 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the airbag assembly unit by itself, the airbag should be deployed using SST before disposal (see page 60-34).
Activate in a safe place away from electrical noise.





(e) CURTAIN SHIELD AIRBAG ASSEMBLY

(1) Always place the removed or new curtain shield airbag assembly in a clear plastic bag, and keep it in a safe place.

NOTICE:

Plastic bag is not re-useable.

CAUTION:

Never disassemble the curtain shield airbag assembly.

(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.

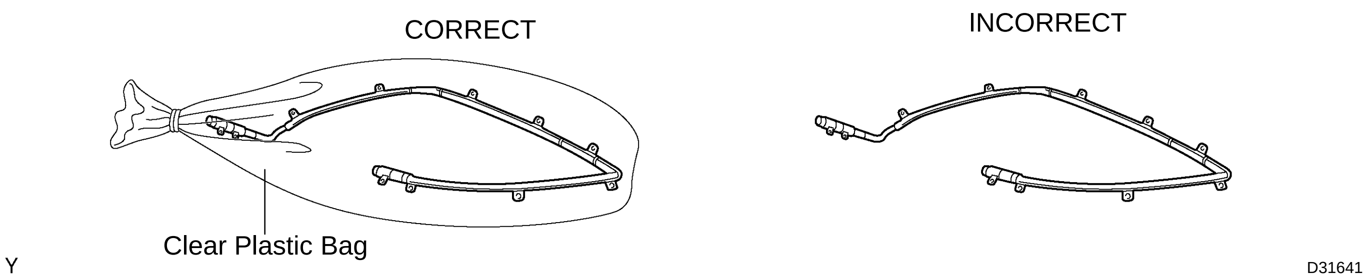
(3) Grease or detergents of any kind should not be applied to the curtain shield airbag assembly.

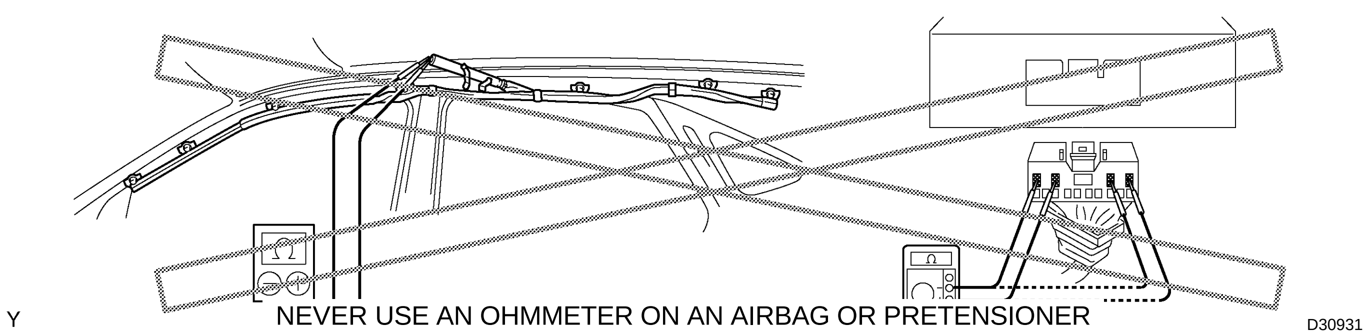
(4) Store the airbag assembly in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag sensor (ECU) connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the curtain shield airbag assembly unit by itself, the airbag should be deployed using SST before disposal (see page 60-43).
Activate in a safe place away from electrical noise.

Example:





(f) FRONT SEAT AIRBAG ASSEMBLY

(1) Always place a removed or new front seat airbag assembly with the airbag inflation direction facing up.
Placing the airbag assembly with the airbag inflation direction facing downward could cause a serious accident if the airbag deploys.

(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.

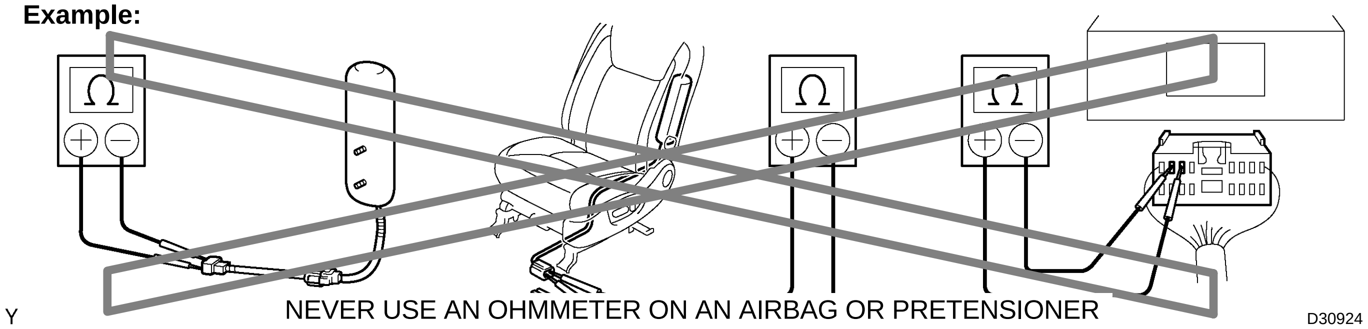
(3) Grease should not be applied to the front seat airbag assembly, and the airbag door should not be cleaned with detergents of any kind.

(4) Store the airbag assembly in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the airbag assembly unit by itself, the airbag should be deployed using SST before disposal (see page 60-48).
Activate in a safe place away from electrical noise.

Example:



(g) SEAT BELT PRETENSIONER

(1) Never measure the resistance of the seat belt pretensioner. This may cause the seat belt pretensioner to activate, which could cause serious injury.

(2) Never disassemble the seat belt pretensioner.

(3) Never install the seat belt pretensioner on another vehicle.

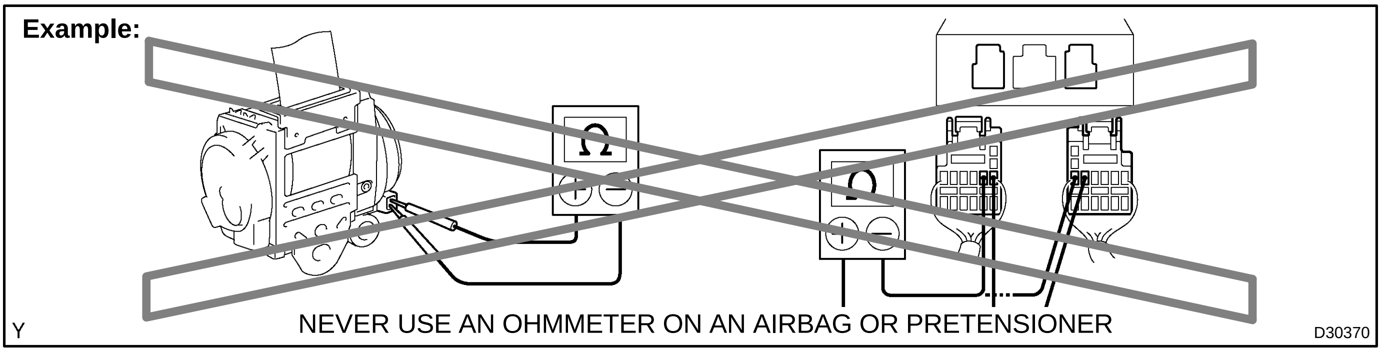
(4) Store the seat belt pretensioner in an area where the ambient temperature is below 80°C (176°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag sensor (ECU) connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the seat belt pretensioner unit by itself, the seat belt pretensioner should be activated before disposal (see page 61-1 1). Activate in a safe place away from electrical noise.

(7) As the seat belt pretensioner is hot after being activated, allow some time for it to cool down sufficiently before disposal. Never apply water to try to cool down the seat belt pretensioner.

(8) Grease, detergents, oil or water should not be applied to the front seat outer belt.



(h) AIRBAG SENSOR ASSEMBLY (ECU)

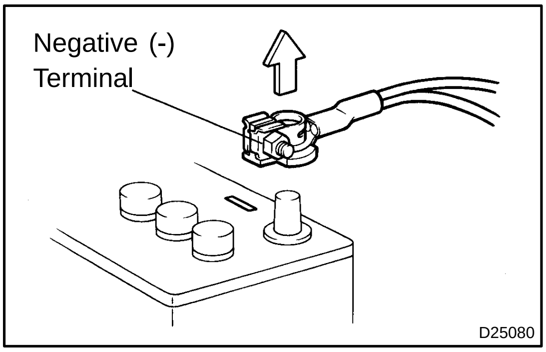
(1) Never reuse an airbag sensor assembly that has been involved in a collision where the SRS has deployed.

(2) The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the airbag sensor assembly is not mounted to the floor, the SRS may activate.

(3) Work must be started at least 90 seconds after the power switch's power mode is changed to OFF and the negative (-) terminal cable is disconnected from the battery, even if only loosening the set bolts of the airbag sensor assembly.

(i) WIRE HARNESS AND CONNECTOR

(1) The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken, repair or replace it.



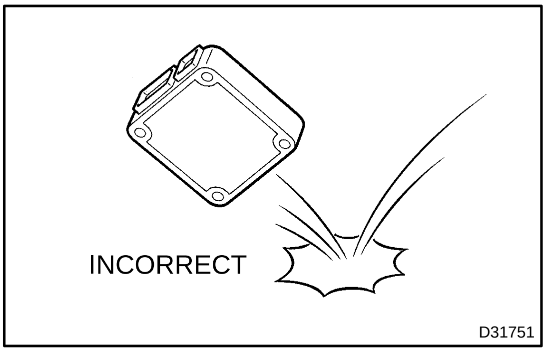
7. ELECTRONIC CONTROL

(a) REMOVAL AND INSTALLATION OF BATTERY TERMINAL

NOTICE:

After disconnecting the negative (-) terminal, it is necessary to perform the initialization of certain systems. (see page 01-29)

(1) Before performing electronic work, disconnect the battery negative (-) terminal cable beforehand to prevent component and wire damage caused by accidental short circuits.
(2) When disconnecting the terminal cable, turn the ignition switch and lighting switch OFF and loosen the terminal nut completely. Perform these operations without twisting or prying the terminal. Remove the battery cable from the battery post.
(3) Clock settings, radio settings, DTCs and other data are erased when the battery cable is removed. Before removing the battery cable, record any necessary data.

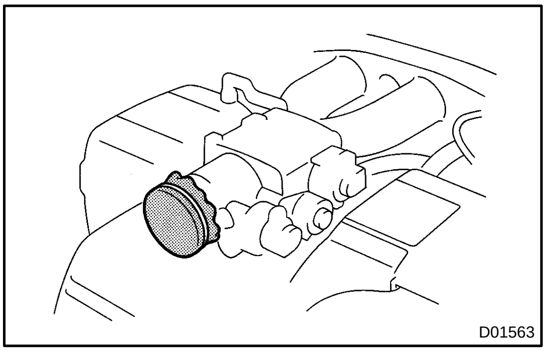


(b) HANDLING OF ELECTRONIC PARTS
(1) Do not open the cover or case of the ECU unless absolutely necessary. If the IC terminals are touched, the IC may be rendered inoperative by static electricity.
(2) To disconnect electronic connectors, pull the connector itself, not the wires.
(3) Be careful not to drop electronic components, such as sensors or relays. If they are dropped on a hard surface, they should be replaced.
(4) When cleaning the engine with steam, protect the electronic components, air filter and emission-related components from water.
(5) Never use an impact wrench to remove or install temperature switches or temperature sensors.
(6) When checking the resistance of a wire connector, insert the tester probe carefully to prevent terminals from bending.

8. REMOVAL AND INSTALLATION OF FUEL CONTROL PARTS

(a) PLACE FOR REMOVING AND INSTALLING OF FUEL SYSTEM PARTS
(1) Work in a place with good air ventilation that does not have welders, grinders, drills, electric motors, stoves, or any other ignition sources.
(2) Never work in a pit or near a pit as vaporized fuel will collect in those places.

(b) REMOVING AND INSTALLING OF FUEL SYSTEM PARTS
(1) Prepare a fire extinguisher before starting operation.
(2) To prevent static electricity, install a ground on the fuel changer, vehicle and fuel tank, and do not spray the area with water. The work surface will become slippery. Do not clean up spills with water as this will spread and gasoline and create a fire hazard.
(3) Avoid using electric motors, working lights and other electric equipment that can cause sparks or high temperatures.
(4) Avoid using iron hammers as they may create speaks.
(5) Dispose of fuel-contaminated shop rags separately using a fire resistant container.

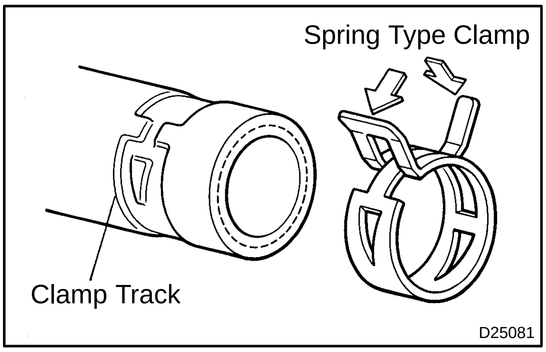


9. REMOVAL AND INSTALLATION OF ENGINE INTAKE PARTS

(a) If any metal particle enters the inlet pass, this may damage the engine.

(b) When removing and installing the inlet system parts, cover the openings of the removed parts and engine openings. Use clean shop rags, gummed tape, or other suitable materials.

(c) When installing the inlet system parts, check that no metal particles have entered the engine or the installed part.



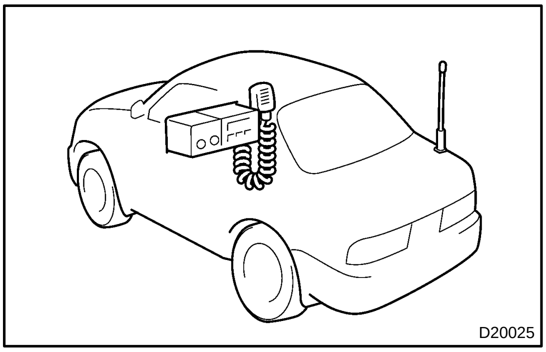
10. HANDLING OF HOSE CLAMPS

(a) Before removing the hose, check the clamp position so that it can be reinstalled in the same position.

(b) Replace deformed or dented clamps with a new one.

(c) When reusing a hose, attach the clamp on the clamp track portion of the hose.

(d) For a spring type clamp, you may want to spread the tabs slightly after installation by pushing in the direction of the arrow marks as shown in the illustration.



11. FOR VEHICLES EQUIPPED WITH MOBILE COMMUNICATION SYSTEMS

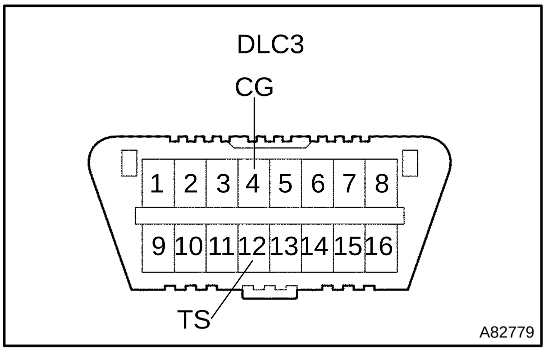
(a) Install the antenna as far away from the ECU and sensors of the vehicle electronic systems as possible.

(b) Install an antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle electronic systems. For details of the ECU and sensors locations, refer to the section on applicable components.

(c) Keep the antenna and feeder separate from other wirings as much as possible. This will prevent signals from the communication equipment from affecting vehicle equipment and vice-versa.

(d) Check that the antenna and feeder are correctly adjusted.

(e) Do not install high-powered mobile communication systems.



12. FOR VEHICLES EQUIPPED WITH VEHICLE STABILITY CONTROL (Enhanced VSC) SYSTEM

(a) NOTICES WHEN USING DRUM TESTER

(1) Before beginning testing, disable the Vehicle Skid Control (Enhanced VSC) system. To disable the Enhanced VSC, change the power switch's power mode to OFF and connect SST to terminals TS and CG of the DLC3.

SST 09843-18040

NOTICE:

- **Confirm that the VSC warning lamp is blinking.**
- **The Enhanced VSC system will be reset when the engine is restarted.**
- **For safety, secure the vehicle with restraint chains when using a wheel dynamometer.**

(b) NOTICES OF RELATED OPERATIONS TO Enhanced VSC
  (1) Do not make unnecessary installations and removals as this may affect the adjustment of Enhanced VSC related parts.
  (2) Be sure to follow the Enhanced VSC system's instructions for work preparation and final confirmation of proper operation.

13. FOR VEHICLES EQUIPPED WITH CATALYTIC CONVERTER

CAUTION:

If a large amount of unburned gasoline or gasoline vapors flow into the converter, this may cause overheating and create a fire hazard. To prevent this, observe the following precautions.

(a) Use only unleaded gasoline.

(b) Avoid prolonged idling.
Avoid idling the engine for more than 20 minutes.

(c) Avoid a spark jump test.
  (1) Perform a spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
  (2) While testing, never rev the engine.

(d) Avoid a prolonged engine compression measurement.
Engine compression measurements must be performed as rapidly as possible.

(e) Do not run the engine when the fuel tank is nearly empty. This may cause the engine to misfire and create an extra load on the converter.

010S1-01

CUSTOMIZE PARAMETERS

HINT:

The following can be customized.

NOTICE:

- **After confirming whether the items of the customer's request are applicable or not for the customized items, perform the customize operation.**
- **Be sure to record the current value before customizing.**
- **In case of performing the troubleshooting, pay attention as there is a possibility that the function is OFF by customizing. (Example: In case of the symptom in which "The wireless operation does not function"is displayed, check that the wireless operation is not OFF by customizing, then perform the troubleshooting.)**

AIR CONDITIONER

DISPLAY(ITEM)	DEFAULT	CONTENTS	SETTING
SET TEMP SHIFT (Set Temperature Shift)	NORMAL	To control with the shifted temperature against the display temperature.	+2C / +1C / NORMAL -1C / -2C
AIR INLET MODE (Air Inlet Mode)	AUTO	In case of turning the A/C ON when you desire to make the compartment cool down quickly, this is the function to change the mode automatically to RECIRCULATED mode.	MANUAL / AUTO
COMPRESSOR MODE (Compressor Mode)	AUTO	Function to turn the A/C ON automatically by pressing the AUTO button when the blower is ON and the A/C is OFF.	MANUAL / AUTO
COMPRS/DEF OPER (Compressor/Air inlet DEF operation)	LINK	Function to turn the A/C ON automatically linking with the FRONT DEF button when the A/C is OFF.	NORMAL / LINK
FOOT/DEF MODE (Foot/DEF auto mode)	ON	Function to turn the air flow from FOOT/DEF to ON automatically when AUTO MODE is ON.	OFF / ON
AUTO BLOW UP (Foot/DEF automatic blow up function)	ON	Function to switch the blower level automatically when the defroster is ON.	OFF / ON
FOOT AIR LEAK (Foot air leak)	ON	Function to cut off the airstream felt underfoot while the vehicle is moving	OFF / ON
AMBINT TMP SFT (Ambient Temperature Shift)	NORMAL	To control with the shifted ambient temperature against the display ambient temperature.	+3C / +2C / +1C NORMAL / -1C / -2C / -3C

ILLUMINATED ENTRY

DISPLAY (ITEM)	DEFAULT	CONTENTS	SETTING
LIGHTING TIME	15 s	Changes the lighting time after closing the doors (the light quickly fades out when the ignition switch is turned on).	7.5 s / 15 s / 30 s
I/L AUTO OFF	ON	Function to turn off the interior light automatically after specified time for prevent the battery loss when the interior light switch is "DOOR" position and the door is open.	ON / OFF
I/L ON/UNLOCK	ON	Function to light the interior light, etc. when the door is unlocked with a transmitter, door key or door lock control switch.	ON / OFF
I/L ON/ACC OFF	ON	Illuminates the interior light when the ignition switch is turned from the ACC to LOCK position.	ON / OFF

LIGHT CONTROL

DISPLAY (ITEM)	DEFAULT	CONTENTS	SETTING
SENSITIVITY	NORMAL	To adjust the sensitivity of the lighting illumination. Refer to the *1 illustration.	LIGHT2 / LIGHT1 / NORMAL / DARK1 / DARK2
DISP EX ON SEN	NORMAL	Changes the brightness when lowering lights such as the combination meter indicator lamp, A/C indicator lamp, and clock lamp. Refer to the illustration *2.	LIGHT2 / LIGHT1 / NORMAL / DARK1 / DARK2

DISP EX OFF SEN	NORMAL	Changes the brightness when lowering lights such as the combination meter indicator lamp, A/C indicator lamp, and clock. Refer to the illustration *3.	LIGHT2 / LIGHT1 / NORMAL / DARK1 / DARK2
DRL FUNCTION (★)	ON	ON/OFF of the DRL function.	ON / OFF

★: w/ Daytime Running Light for U.S.A.

Illustration of *1

Brightness of lowering the lights	**Dark** ⟷ **Bright**
Setting	DARK2 — DARK1 — NORMAL — LIGHT1 — LIGHT2

Illustration of *2

Brightness when canceling the lowering of the lights	**Dark** ⟷ **Bright**
Setting	DARK2 — DARK1 — NORMAL — LIGHT1 — LIGHT2

Illustration of *3

Lighting brightness	**Dark** ⟷ **Bright**
Setting	DARK2 — DARK1 — NORMAL — LIGHT1 — LIGHT2

BUZZER CANCEL SETTING

The buzzer cancel setting, which is a setting of the buzzer function of the combination meter, can disable the driver's seat belt buzzer, front passenger's seat belt buzzer and back-up warning buzzer (A/T reverse buzzer).

NOTICE:

Basically, these buzzers should be set on for safety driving. However, only if it is necessary to set the buzzer off for some reason, perform the following procedures.

PROCEDURE:

Steps	Back-up Warning Buzzer	Driver's Seat Belt Buzzer	Front Passenger's Seat Belt Buzzer
1	Turn the POWER switch ON.	Turn the POWER switch ON.	Turn the POWER switch ON.
2	Press the ODO / TRIP switch until the odometer displays "ODO".	Press the ODO / TRIP switch until the odometer displays "ODO".	Press the ODO / TRIP switch until the odometer displays "ODO".
3	Turn the POWER switch OFF.	Turn the POWER switch OFF.	Turn the POWER switch OFF.
4	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY").	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY").	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY").
5	Press the ODO / TRIP switch, immediately (within 6 seconds) and hold it down for 10 seconds or more.	Press the ODO / TRIP switch, immediately (within 6 seconds) and hold it down for 10 seconds or more.	Sit in the front passenger seat. Press the ODO / TRIP switch, immediately (within 6 seconds after turning the power switch ON) and hold it down for 10 seconds or more.
6	Continue holding down the ODO / TRIP switch, move the shift lever to "R" and press the P switch.	Continue holding down the ODO / TRIP switch, fasten the driver's seat belt.	Continue holding down the ODO / TRIP switch, fasten the front passenger's seat belt.
7	Check that the odometer displays either "b-on" or "b-off". *	Check that the odometer displays either "b-on" or "b-off". *	Check that the odometer displays either "b-on" or "b-off". *
8	Press the ODO / TRIP switch to change the display to "b-off".	Press the ODO / TRIP switch to change the display to "b-off".	Press the ODO / TRIP switch to change the display to "b-off".
9	Turn the POWER switch OFF.	Turn the POWER switch OFF.	Turn the POWER switch OFF.
10	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY".	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY".	Turn the POWER switch ON while depressing the brake pedal (Check that the combination meter displays "READY".
11	Check that no buzzer sounds when the shift lever is in "R".	Check that no buzzer sounds.	Check that no buzzer sounds when sitting on the front passenger's seat.

*: "b-off" indicates that the buzzer is OFF. "b-on" indicates that the buzzer is ON. The buzzer cancel setting will be finished (the odometer will display "ODO") if the ODO / TRIP switch is not operated for 10 seconds or more. In this case, perform step 11 to check that buzzer cancel setting is complete. If it is not complete, start from step 1 again.

NOTICE:

When either the battery cable or the combination meter connector is disconnected, these buzzers are set on.

SMART ENTRY SYSTEM

Display (Item)	Default	Contents	Setting
SMART WARN 1 (Warn key is taken from D-door with P position)	ON	Function that warns driver that key is taken out from driver's door when shift position is in P and power switch is not OFF	ON/OFF
SMART WARN 2 (Warn key is taken from D-door without P position)	ON	Function that warns driver that key is taken out from driver's door when shift position is not in P and power switch is not OFF	ON/OFF
SMART WARN 3 (Warn key is taken out by other passengers)	ON	Function that warns driver that key is taken out from any door except driver's door by passenger when power switch is not OFF	ON/OFF
SMART BUZ NUM (Setting number of warning buzzer sounds)	3 TIMES	Function that sets number of warning buzzer sounds when key is taken out of vehicle	OFF/ 3TIMES/5TIMES/7TIMES
SMART WARN 4 (Warn locking door when Engine is idling)	2s	Function that sets warning time for locking doors while engine is idling	OFF/1s/2s
SMART WARN 5 (Warn when key is left in vehicle)	2s	Function that sets warning time for locking doors while key is inside vehicle	OFF/1s/2s
SMART WARN 6 (Warn starting E/G when key is out of detection range)	ON	Function that warns driver that smart ignition control is being attempted to be activated while key is out of detection range	ON/OFF
KEY LOW-BATT WRN (Warn when key battery becomes weak)	ON	Function that warns driver that key's battery power is low	ON/OFF
SMART UNLOCK (Smart door unlock mode)	EACH	Function that makes smart unlock operation available.	AKK/EACH/D-door
TRANSMIT INTVAL (Transmission interval)	300ms	Function that sets smart signal transmission intervals when vehicle is stopped and key is outside vehicle	150ms/300ms/450ms/ 600ms
PARK WAIT TIME (Wait time to permit opening door after locking)	3.0s	Function that sets waiting time to permit opening door after door is locked with smart lock function	0.5s/1.5s/2.5s/5s
SMART BACK DOOR (Backdoor opening operation when vehicle is locked)	LONG	Function that enables back door to open when key is inside luggage compartment	LONG/TWICE/OFF

WIRELESS DOOR LOCK: w/ Smart Entry System

Display (item)	Default	Contents	Setting
OPEN DOOR WARN (Open door warning)	ON	If door is not completely closed and transmitter LOCK switch is pressed, this function makes buzzer sound for 10 seconds.	ON/OFF
WIRLS BUZZ OPER (Buzzer answer-back of wireless)	ON	Function that makes wireless buzzer sound for answer-back when transmitter lock/unlock switch is pressed.	ON/OFF
WIRELESS OPER (Wireless door lock control function)	ON	Function that turns wireless door lock function ON/OFF.	ON/OFF
ALARM FUNCTION (Panic function)	ON	Function that operates theft deterrent system when transmitter panic switch on transmitter is held for 0.8 seconds.	ON/OFF
UNLOCK/2OPER (2 times operation wireless unlock)	ON	Function that unlocks driver side door when unlock switch on transmitter is pressed once, and unlocks all doors when pressed twice. If on OFF setting, pressing unlock switch once makes all doors unlock.	ON/OFF
AUTO LOCK DELAY (Auto lock time)	30s	This function controls amount of time from unlocking doors to automatic re-locking function.	30s/60s
HAZARD ANS BACK (Hazard answer-back of wireless)	ON	When lock switch on transmitter is pressed, this function illuminates all hazard warning lamps once. when unlock switch is pressed, all hazard warning lamps illuminate twice.	ON/OFF

WIRELESS DOOR LOCK w/o Smart Entry System

Display (item)	Default	Contents	Setting
OPEN DOOR WARN (Open door warning)	ON	If door is not completely closed and transmitter LOCK switch is pressed, this function makes buzzer sound for 10 seconds.	ON/OFF
WIRELESS OPER (Wireless door lock control function)	ON	Function that turns wireless door lock function ON/OFF.	ON/OFF
ALARM FUNCTION (Panic function)	ON	Function that operates theft deterrent system when transmitter panic switch on transmitter is held for 0.8 seconds.	ON/OFF
UNLOCK/2OPER (2 times operation wireless unlock)	ON	Function that unlocks driver side door when unlock switch on transmitter is pressed once, and unlocks all doors when pressed twice. If on OFF setting, pressing unlock switch once makes all doors unlock.	ON/OFF
AUTO LOCK DELAY (Auto lock time)	30s	This function controls amount of time from unlocking doors to automatic re-locking function.	30s/60s
HAZARD ANS BACK (Hazard answer-back of wireless)	ON	When lock switch on transmitter is pressed, this function illuminates all hazard warning lamps once. when unlock switch is pressed, all hazard warning lamps illuminate twice.	ON/OFF

Theft deterrent system

DISPLAY (ITEM)	DEFAULT	CONTENTS	SETTING
PASSIVE MODE (Passive arming mode)	OFF	PASSIVE MODE is a function that switches theft deterrent system from arming preparation state to armed state 30 seconds after key is removed from key slot and all doors is closed, even if doors are not locked by wireless or door key lock operation In PASSIVE MODE, theft deterrent system will judge that a theft is taking place and switch to alarm sounding state if one of the following operations are not performed within 14 seconds (see ENTRY DELAY below) after door is opened: • Unlock any door by key or wireless operation • Reconnect battery • Insert key into key slot and turn the power switch ON (IG).	ON/OFF
WARN BY HORN (Warning by horn)	ON	Function that allows vehicle horn and theft deterrent horn to be able to be used as a warning device	ON/OFF
ENTRY DELAY (Entry delay time)	14 s	Function that changes entry delay time (time before warning starts)	0 s/14 s/30 s
WARN BY GLS SEN (Warning by glass broken sensor)	ON	Function that turns glass broken sensor ON/OFF	ON/OFF

010S0-01

INITIALIZATION

NOTICE:

When disconnect the negative (-) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See Step No.
Power Window Control System	Step 1

1. RESET (INITIALIZE) POWER WINDOW REGULATOR MOTOR (DRIVER SIDE)

NOTICE:

- **Resetting the power window regulator motor (initializing the pulse sensor) is necessary if: 1) the battery terminal cable is disconnected; 2) the power window regulator master switch assembly, wire harness, power window regulator switch, power window regulator assembly and power window regulator motor are replaced or removed/installed; or 3) the POWER fuse, FR Door fuse, GAUGE fuse and ECU-IG fuses are replaced. If resetting is not performed, the master switch assembly will not be able to operate the AUTO operation function, jam protection function and remote operation function.**
- **Whenever disconnecting the battery terminal cable, reset all the other systems besides the power window control system.**

(a) Change the power mode to ON (IG) by pushing the power switch.
(b) Open the power window halfway by pressing the power window switch.
(c) Fully pull up on the switch until the power window is fully closed and continue to hold the switch for at least 1 second.
(d) Check that the AUTO UP/DOWN function operates normally.

If the AUTO UP/DOWN function operates normally, reset operations have been completed. If abnormal, follow steps (e) to (g) below.

(e) Disconnect the negative battery terminal cable for 10 seconds.
(f) Connect the battery terminal cable.
(g) Perform the above steps (a) to (d) again.

010S2-01

VEHICLE LIFT AND SUPPORT LOCATIONS

1. NOTICE ABOUT VEHICLE CONDITION WHEN JACKING UP

(a) The vehicle must be unloaded before jacking up the vehicle. Never jack up/lift up a heavily loaded vehicle.

(b) When removing heavy equipment such as the engine and transmission, the center of gravity of the vehicle may shift. To stabilize the vehicle: place a balance weight in a location where it will not roll or shift; or use a mission jack to hold the jacking support.

2. NOTICE FOR USING 4 POST LIFT

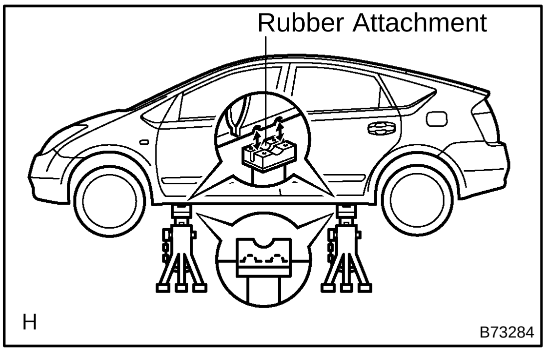
(a) Follow the safety procedures outlined in its instruction manual.

(b) Use precautionary measures to prevent the free beam from damaging tires or wheels.

(c) Use wheel clocks to secure the vehicle.

3. NOTICE FOR USING JACK AND SAFETY STAND

(a) Work in a flat area using wheel chocks at all times.



(b) Use a safety stand with a rubber attachment, as shown in the illustration.

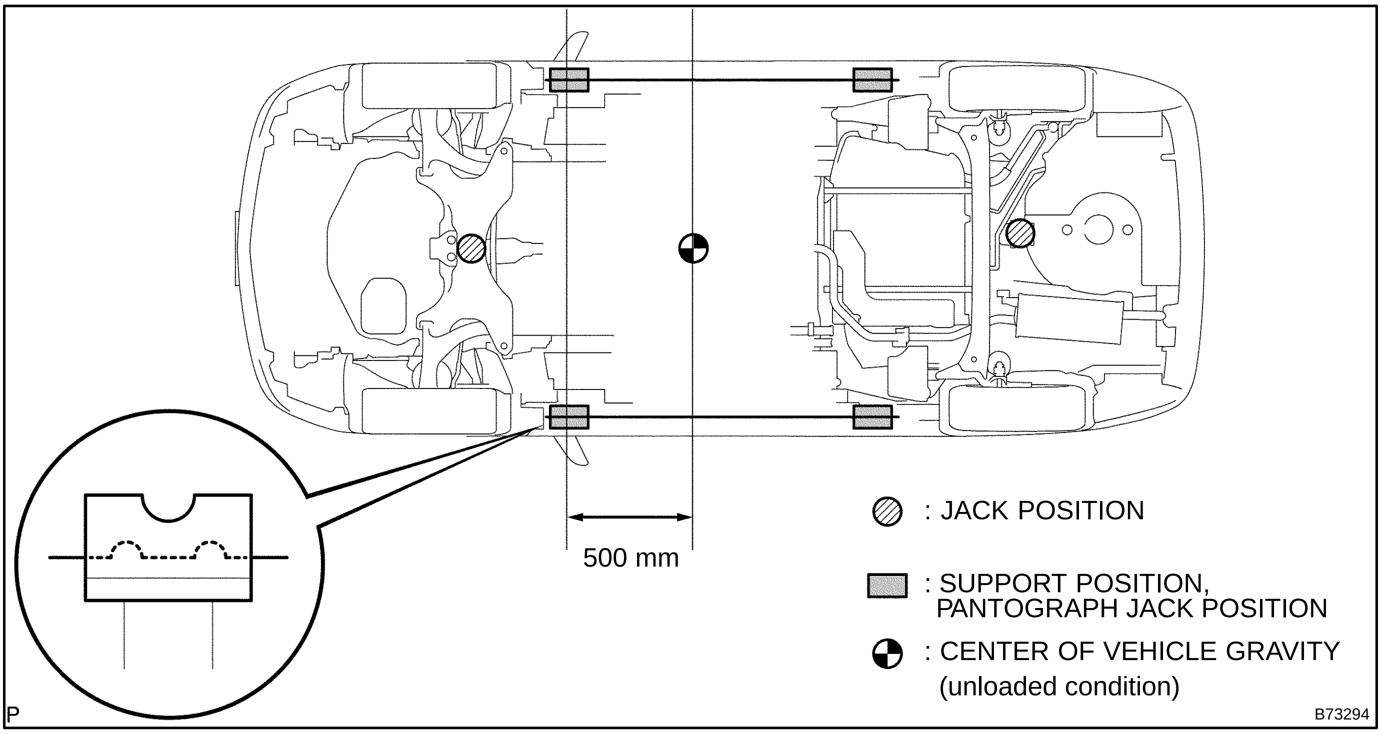
(c) Apply the jack and rigid rack to the specified location on the vehicle.

(d) When jacking up the front wheels, release the parking brake and place wheel chocks only behind the rear wheels. When jacking up the rear wheels, place wheel chocks only in front of the front wheels.

(e) The jack should not be used without the rigid rack.

(f) When jacking up only the front wheels or only the rear wheels, place wheel chocks on both sides of the wheels touching the ground.

(g) When lowering the vehicle with its front wheels jacked up, release the parking brake and place wheel chocks only in front of the rear wheels. When lowering a vehicle with its rear wheels jacked up, place wheel chocks only behind the front wheels.



4. NOTICE FOR USING SWING ARM TYPE LIFT

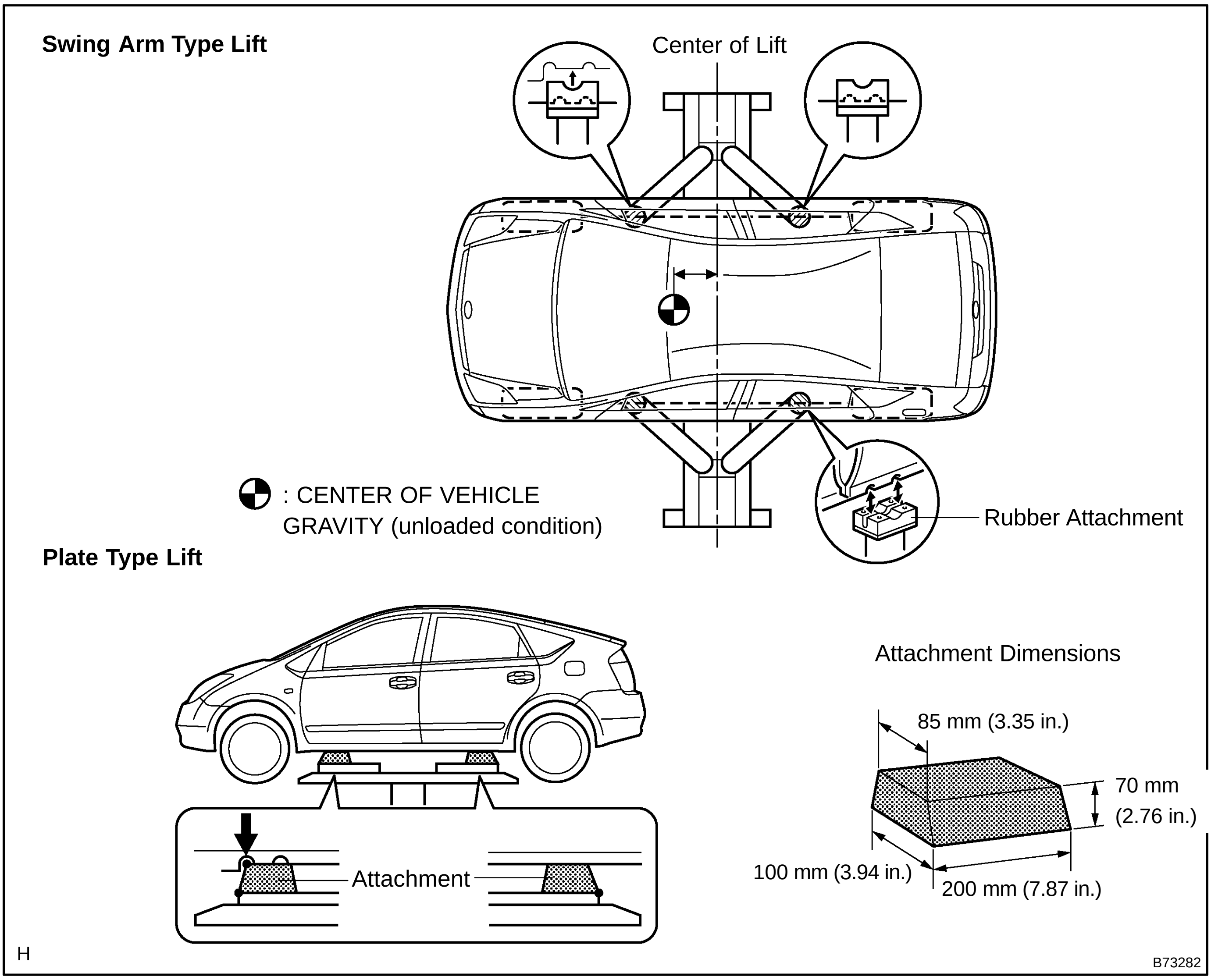
(a) Follow the safety procedures outlined in its instruction manual.
(b) Use swing arms equipped with rubber attachments, as shown in the illustration.
(c) When using the lift, its center should be as close to the vehicle's center of gravity as possible.
(d) Set the vehicle on the lift as level as possible. Then match the groove of the lift to the rigid rack support location.
(e) Be sure to lock the swing arms before lifting and during work (if equipped with arm locks).
(f) Lift the vehicle up off the ground. Stand at a safe distance and shake the vehicle to check its stability.

5. NOTICE FOR USING PLATE TYPE LIFT

(a) Follow the safety procedures outlined in its instruction manual.
(b) Use plate lift attachments (rubber lifting blocks) on top of the plate surface.
(c) Refer to the table below to determine how to properly set the vehicle.

Right and left set position	Place the vehicle over the center of the lift.
Front and rear set position	Place the attachments at the ends of the rubber plate surface, under the vehicle lift pad (A and C in the illustration). Raise the plate slightly and reposition the vehicle so the top of the attachment (B in the illustration) is aligned with the front side notch in the vehicle rocker flange.

(d) Lift the vehicle up off the ground, and shake it to make sure that it is stable.



HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05-16)

3	CONNECT HAND-HELD TESTER TO DLC3

HINT:
If the display indicates a communication fault in the tester, inspect DLC3.

4	CHECK DTC AND FREEZE FRAME DATA (See page 05-41)

HINT:
Record or print DTCs and freeze frame data, if needed.

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05-41)

6	VISUAL INSPECTION

7	SETTING CHECK MODE DIAGNOSIS (See page 05-45)

8	PROBLEM SYMPTOM CONFIRMATION

HINT:
If the engine does not start, perform steps 10 and 12 first.

Malfunction does not occur	A
Malfunction occurs	B

B	GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05-41)

Malfunction code	A
No code	B

B → GO TO STEP 12

A

11	DTC CHART (See page 05-55)

GO TO STEP 14

12	BASIC INSPECTION (See page 05-18)

Wrong parts not confirmed	A
Wrong parts confirmed	B

B → GO TO STEP 17

A

13	PROBLEM SYMPTOMS TABLE (See page 05-33)

Wrong circuit confirmed	A
Wrong parts confirmed	B

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05-366)

15	CIRCUIT INSPECTION

Malfunction not confirmed	A
Malfunction confirmed	B

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

GO TO STEP 18

17	PARTS INSPECTION

18	IDENTIFICATION OF PROBLEM

19	ADJUSTMENT AND/OR REPAIR

20	CONFIRMATION TEST

END

05J2R-01

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and power switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-33**

OK

3	CHECK IF ENGINE STARTS

NG → **GO TO STEP 6**

OK

4	CHECK AIR FILTER

(a) Visually check if the air filter is not contaminated dirt or oil.

NG → **REPLACE**

OK

5	CHECK IDLE SPEED (See page 14-1)

NG → **PROCEED TO PAGE 14-1 AND CONTINUE TO TROUBLESHOOT**

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-33

6	CHECK FUEL PRESSURE (See page 11-7)

NG → **PROCEED TO PAGE 18-3 AND CONTINUE TO TROUBLESHOOT**

OK

7	CHECK FOR SPARK (See page 18-6)

NG → **PROCEED TO PAGE 18-3 AND CONTINUE TO TROUBLESHOOT**

OK

PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-33

CHECK FOR INTERMITTENT PROBLEMS

HINT:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect when the ECM is in test mode with a hand-held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default) using 2 trip detection logic.

(a) Clear the DTCs (see page 05-41).
(b) Switch the hand-held tester from normal mode to check mode (see page 05-45).
(c) Perform a simulation test (see page 01-37).
(d) Check the connector(s) and terminal(s) (see page 01-37).
(e) Wiggle the harness(s) and connector(s) (see page 01-37).

05DJ5-03

CHECKING MONITOR STATUS

1. INTRODUCTION

The purpose of the monitor result (mode 6) is to allow access to the results for on-board diagnostic monitoring tests of specific components/systems that are not continuously monitored. Examples are catalyst, EVAP and thermostat.

The monitor result allows the OBD scan tool to display the monitor status, test value, minimum test limit and maximum test limit. The monitor status indicates whether the component is functioning normally or not (PASS or FAIL). The test value is the value that was used to determine the monitor status. When the test value is between the test limits, the ECM determines the component is functioning normally (PASS). If not, the ECM determines the component is malfunctioning (FAIL).

A problem in these components/systems can be found by comparing the test value and test limits. The monitor result information is included under the "MONITOR RESULT" in the DTC sections.

2. PROCEDURE

NOTICE:

The monitor result and test value are cleared when the ignition switch (POWER switch) is turned OFF.

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Clear the DTCs.
(d) Run the vehicle in accordance with the applicable drive pattern described in READINESS MONITOR

DRIVE PATTERN (see page 05-27).

(e) Select from the tester menus: DIAGNOSIS, ENHANCED OBD II, MONITOR INFO and MONITOR RESULT. The monitor result appears after the component name.
INCMP: The component has not been monitored yet.
PASS: The component is functioning normally.
FAIL: The component is malfunctioning.

(f) Confirm that the component is set to either PASS or FAIL.

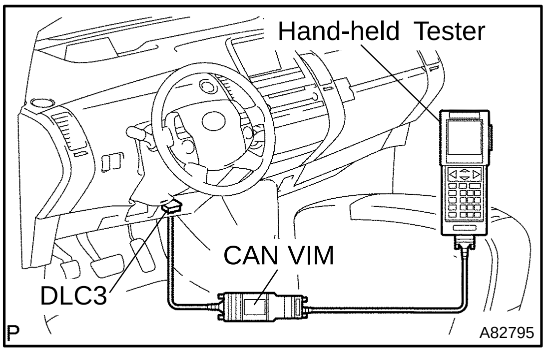
(g) Select the component and press ENTER. The accuracy test value appears when the monitor result is either PASS or FAIL.

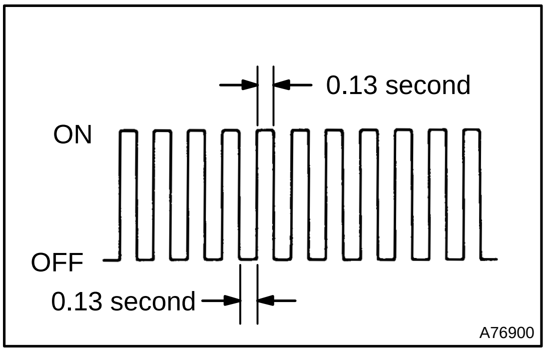
(h) Compare the test value with the test limits (MIN and MAX). If the test value is between the test limits, the component is functioning normally. If not, the component is malfunctioning. The test value is usually significantly higher or lower than the test limits. If the test value is on the borderline of the test limit, there is a potential malfunction in the component.

HINT:
The monitor result might on rare occasions be PASS even if the MIL is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

CHECK MODE PROCEDURE

HINT:
Hand-held tester only:
Compared to normal mode, check mode has more sensing ability to detect malfunction. Furthermore, the same diagnostic items which are detected in normal mode can also be detected in check mode.





1. CHECK MODE PROCEDURE(Using the hand-held tester)

(a) Check the initial conditions.
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Shift position in the P or N
  (4) A/C switched OFF

(b) Connect the hand-held tester to the DLC3.
(c) Turn the power switch ON (IG).
(d) Change the ECM to check mode using the hand-held tester. Make sure the MIL flashes as shown in the illustration.

NOTICE:
All DTCs and freeze frame data recorded will be erased if: 1) the hand-held tester is used to change the ECM from normal mode to check mode or vice-versa, or 2) during check mode, the power switch is switched from ON to ACC or OFF.

(e) Start the HV main system (READY ON). The MIL should turn off after the system starts.
(f) Simulate the condition of the malfunction described by the customer.
(g) After simulating the malfunction conditions, check DTCs, freeze frame data and other data using the tester.
(h) After checking DTCs, inspect applicable circuits.

2. CLEAR DTC

(a) Connect the OBD II scan tool or hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) On the OBD II scan tool (complying with SAE J1978) or the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES.
(d) Erase DTCs and freeze frame data by pressing the YES button on the tester. For the OBD II scan tool, see its instruction manual.

05289-26

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name ____________________

Customer's Name		VIN	
License Plate No.		Production Date	
Date Vehicle Brought in		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other ____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other ____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other ____
	☐ Others	

Data Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other ____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other ____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp. ☐ Other ____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other ____

Condition of malfunction indicator lamp (MIL)		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre-check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05CRK-08

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using the hand-held tester DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading DATA LIST early in troubleshooting is one way to shorten labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Turn the power switch ON (READY) and warm up the engine.
(b) Turn the power switch OFF.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the power switch ON (IG).
(e) Turn the hand-held tester ON.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on the tester, read items in DATA LIST.

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1 to 3 ms (Inspection mode)	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: -64 deg., Max.: 63.5 deg.	Idling: BTDC 7 to 15° (Inspection mode)	—
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	• Idling: 10 to 20 % (Inspection mode) • Running without load (1,500 rpm): 10 to 20 %	—
MAF	Air flow rate from MAF meter/ Min.: 0 g/s, Max.: 655 g/s	Idling: 3 to 7 g/s (1,500 rpm)	If the value is approximately 0.0 g/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value is 160.0 g/s or more: • E2G circuit open
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling 1,000 rpm (when putting the engine in inspection mode)	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
COOLANT TEMP	Engine coolant temperature/ Min.: -40°C, Max.: 140°C	After warming up: 80 to 100°C (176 to 212°F)	• If the value is -40°C (-40°F): sensor circuit is open • If the value is 140°C (284°F): sensor circuit is shorted
INTAKE AIR	Intake air temperature/ Min.: -40°C, Max.: 140°C	Equivalent to ambient air temperature	• If the value is -40°C (-40°F): sensor circuit is open • If the value is 140°C (284°F): sensor circuit is shorted
AIR-FUEL RATIO	Air-fuel ratio: Min.: 0, Max.: 1.999	During idling: 1,500 rpm 0.8 to 1.2	—
AMBIENT TEMP	Ambient air temperature/ Min.: -40°C, Max.: 215°C	Equivalent to ambient air temperature	• If the value is -40°C: sensor circuit is open • If the value is 215°C: sensor circuit is shorted

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
EVAP VAPOR PRES	EVAP vapor pressure/ Min.: -8192 Pa, Max.: 8191 Pa	Fuel tank cap removed: 0 Pa	—
PURGE DENSITY	Learning value of purge density/ Min.: -50, Max.: 350	-40 to 0 % Idling (Inspection mode)	Service data
PURGE FLOW	Purge flow/ Min.: 0 %, Max.: 102.4 %	Idling: 0 to 100 %	—
EVAP PURGE VSV	EVAP (Purge) VSV control duty/ Min.: 0 %, Max.: 100 %	0 to 100 % During idling: 1,500 rpm	Order signal from ECM
VAPOR PRESS	Vapor pressure/ Min.: -4.125 kPa, Max.: 2.125 kPa	Fuel tank cap removed: 0 kPa	Pressure inside fuel tank is monitored by the vapor pressure sensor
KNOCK CRRT VAL	Correction learning value of knocking/ Min.: -64 CA, Max.: 1,984 CA	0 to 22 °CA Driving: 44 mph (70 km/h)	Service data
KNOCK FB VAL	Feedback value of knocking/ Min.: -64 CA, Max.: 1,984 CA	-22 to 0 °CA Driving: 44 mph (70 km/h)	Service data
ACCEL IDL POS	Whether or not accelerator pedal position sensor is detecting idle/ ON or OFF	Idling: ON (inspection mode)	—
THRTL LEARN VAL	Throttle valve fully closed (learned value) Min.: 0 V, Max.: 5 V	0.4 to 0.8 V	—
FAIL #1	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
FAIL #2	Whether or not fail safe function is executed/ ON or OFF	ETCS has failed: ON	—
ST1	Starter signal/ ON or OFF	Cranking: ON	—
SYSGUARD JUDGE	System guard/ ON or OFF	—	ETCS service data
OPN MALFUNCTION	Open side malfunction/ ON or OFF	—	ETCS service data
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	• Throttle fully closed: 10 to 24 % • Throttle fully open: 64 to 96 %	Read the value with intrusive operation (active test)
THROTTL IDL POS	Whether or not throttle position sensor is detecting idle/ ON or OFF	Idling: ON (inspection mode)	—
THRTL REQ POS	Throttle requirement position/ Min.: 0 V, Max.: 5 V	Idling: 0.5 to 1.0 V (Inspection mode)	—
THROTTLE POS	Throttle sensor positioning/ Min.: 0 %, Max.: 100 %	Idling 10 to 18 % (Inspection mode)	Calculated value based on VTA1
THROTTLE POS #2	Throttle sensor positioning #2/ Min.: 0 %, Max.: 100 %	—	Calculated value based on VTA2
THROTTLE POS #1	Throttle position sensor No. 1 output voltage/ Min.: 0 V, Max.: 4.9 V	—	ETCS service data
THROTTLE POS #2	Throttle position sensor No.2 output voltage/ Min.: 0 V, Max.: 4.9 V	—	ETCS service data
THROTTLE POS #1	Throttle position No. 1/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 0.5 to 1.2 V • Throttle fully opened : 3.2 to 4.8 V	—

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
THROTTLE POS #2	Throttle position No. 2/ Min.: 0 V, Max.: 5 V	• Throttle fully closed: 2.0 to 2.9 V • Throttle fully open: 4.6 to 5.5 V	Read the value with intrusive operation (active test)
THRTL COMND VAL	Throttle position command value/ Min.: 0 V, Max.: 4.98 V	0.5 to 4.8 V	ETCS service data
THROTTLE SSR #1	Throttle sensor opener position No. 1/ Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE SSR #2	Throttle sensor opener position No. 2/ Min.: 0 V, Max.: 4.98 V	2.2 to 2.6 V	ETCS service data
THRTL SSR #1 AD	Throttle sensor opener position No.1 (AD)/ Min.: 0 V, Max.: 4.98 V	0.6 to 0.9 V	ETCS service data
THROTTLE MOT	Whether or not throttle motor control is permitted/ ON or OFF	Idling: ON (Inspection mode)	Read the value with the power switch ON (Do not start engine)
THROTTLE MOT	Throttle motor current Min.: 0 A, Max.: 80 A	Idling: 0 to 3.0 A (Inspection mode)	—
THROTTLE MOT	Throttle motor Min.: 0 %, Max.: 100 %	Idling: 0.5 to 40 % (Inspection mode)	—
THROTTLE MOT	Throttle motor current/ Min.: 0 A, Max.: 19.92 A	Idling: 0 to 3.0 A	—
THROTL OPN DUTY	Throttle motor opening duty ratio/ Min.: 0 %, Max.: 100 %	During idling: 0 to 40 %	When accelerator pedal is depressed, duty ratio is increased
THROTL CLS DUTY	Throttle motor closed duty ratio/ Min.: 0 %, Max.: 100 %	During idling: 0 to 40 %	When accelerator pedal is released quickly, duty ratio is increased
THRTL MOT (OPN)	Throttle motor duty ratio (open)/ Min.: 0 %, Max.: 100 %	—	ETCS service data
THRTL MOT (CLS)	Throttle motor duty ratio (close)/ Min.: 0 %, Max.: 100 %	—	ETCS service data
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving 44 mph (70 km/h): 0.1 to 0.9 V	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
AFS B1 S1	A/F sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 7.999 V	Idling 2.8 to 3.8 V (Inspection mode)	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
TOTAL FT #1	Total fuel trim of bank 1: Average value for fuel trim system of bank 1/ Min.: -0.5, Max.: 1,496	Idling: -0.2 to 0.2 (Inspection mode)	—
SHORT FT #1	Short-term fuel trim of bank 1/ Min.: -100 %, Max.: 99.2%	0 ± 20 %	This item is the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
LONG FT #1	Long-term fuel trim of bank 1/ Min.: -100 %, Max.: 99.2 %	0 ± 20 %	This item is the overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central value

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
FUEL SYS #1	Fuel system status (Bank1) / OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CL (Inspection mode)	• OL (Open Loop): Has not yet satisfied conditions to go closed loop • CL (Closed Loop): Using heated oxygen sensor as feedback for fuel control. • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but heated oxygen sensor, which is used for fuel control is malfunctioning
O2FT B1 S2	Short-term fuel trim associated with the bank 1 sensor 2/ Min.: -100 %, Max.: 99.2 %	0 ± 20 %	Same as SHORT FT #1
AF FT B1 S1	Short-term fuel trim associated with the bank 1 sensor 1/ Min.: 0, Max.: 1.999	• Value less than 1 (0.000 to 0.999) = Lean • Stoichiometric air-fuel ratio=1 • Value greater than 1 (1.001 to 1.999) = RICH	—
CAT TEMP B1S1	Catalyst temperature (Bank 1, Sensor 1)/ Min.: -40, Max.: 6,513.5 °C	—	—
CAT TEMP B1S2	Catalyst temperature (Bank 1, Sensor 2)/ Min.: -40, Max.: 6,513.5 °C	—	—
INI COOL TEMP	Initial engine coolant temperature/ Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INI INTAKE TEMP	Initial intake air temperature/ Min.: -40°C, Max.: 140°C	Close to ambient air temperature	Service data
INJ VOL	Injection volume (cylinder 1)/ Min.: 0 ml, Max.: 2.048 ml	0 to 0.5 ml	Quantity of fuel injection volume for 10 times
ENG OIL PRES SW	Engine oil pressure switch signal/ 0: OFF / 1: ON	Indicating ON while engine is running	—
+BM	Whether or not electric throttle control system power is inputted/ ON or OFF	Idling: ON (inspection mode)	—
+BM VOLTAGE	+BM voltage/ Min.: 0, Max.: 19.92	Idling: 10 to 15 V	ETCS service data
BATTERY VOLTAGE	Battery voltage/ Min.: 0 V, Max.: 65.535 V	Idling: 9 to 14 V (Inspection mode)	—
ACTUATOR POWER	Actuator power supply/ ON or OFF	Idling ON (Inspection mode)	ETCS service data
EVAP (Purge) VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
FUEL PUMP / SPD	Fuel pump/speed status/ ON or OFF	Idling: ON (Inspection mode)	—
VVT CTRL B1	VVT control status/ ON or OFF	—	Support for VVT active test
FAN MOTOR	Electric fan motor/ ON or OFF	—	Support for fan motor active test

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
TANK BYPASS VSV	Tank bypass VSV/ ON or OFF	—	Support for tank bypass VSV active test
CAN CTRL VSV	Canister control VSV/ ON or OFF	—	Support for canister control VSV active test
TC/TE1	TC and TE1 terminal of DLC3/ ON or OFF	—	—
VVTL AIM ANGL #1	VVT aim angle (bank 1)/ Min.: 0 %, Max.: 100 %	Idling: 0 %	VVT duty signal value during intrusive operation
VVT CHNG ANGL #1	VVT change angle/ Min.: 0°FR, Max.: 60°FR	Idling: 0 to 5 °FR	Displacement angle during intrusive operation
VVT OCV DUTY B1	VVT OCV operation duty/ Min.: 0 %, Max.: 100 %	Idling: 0 %	Requested duty value for intrusive operation
FC IDL	Fuel cut idle/ ON or OFF	Fuel cut operation: ON	FC IDL = "ON" when throttle valve fully closed and engine speed is over 2,800 rpm
FC TAU	Fuel cut TAU: Fuel cut during very light load/ ON or OFF	Fuel cut operating: ON	The fuel cut is being performed under very light load to prevent the engine combustion from becoming incomplete
IGNITION	Ignition counter/ Min.: 0, Max.: 800	0 to 800	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1 to 4/ Min.: 0, Max.: 255	0 %	This item is displayed in only idling
CYL ALL	All cylinders misfire rate/ Min.: 0, Max.: 255	0 to 35	—
MISFIRE RPM	Engine RPM for first misfire range/ Min.: 0 rpm, Max.: 6,375 rpm	Misfire 0: 0 rpm	—
MISFIRE LOAD	Engine load for first misfire range/ Min.: 0 g/rev, Max.: 3.98 g/rev	Misfire 0: 0 g/rev	—
MISFIRE MARGIN	Misfire monitoring/ MIn.: -100 %, Max.: 99.22 %	-100 to 99.2 %	Misfire detecting margin
#CODES	#Codes/ Min.: 0, Max.: 255	—	Number of detected DTCs
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	See page 05-45
MIL	MIL status/ ON or OFF	MIL ON: ON	—
MIL ON RUN DIST	MIL ON Run Distance/ Min.: 0 second, Max.: 65,535 seconds	Distance after DTC is detected	—
MIL ON RUN TIME	Running time from MIL ON/ Min.: 0 minute, Max.: 65,535 minutes	Equivalent to running time after MIL was ON	—
ENG RUN TIME	Engine run time/ Min.: 0 second, Max.: 65,535 seconds	Time after engine start	Service data
TIME DTC CLEAR	Time after DTC cleared/ Min.: 0 minute, Max.: 65,535 minutes	Equivalent to time after DTCs were erased	—
DIST DTC CLEAR	Distance after DTC cleared/ Min.: 0 km/h, Max.: 65535 km/h	Equivalent to drive distance after DTCs were erased	—
WU CYC DTC CLEAR	Warm-up cycle after DTC cleared/ Min.: 0, Max.: 255	—	Number of warm-up cycles after DTC is cleared

Hand-Held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
CYLINDER NUMBER	Cylinder number/ Min.: 0, Max.: 255	—	Identifying the cylinder number
MODEL YEAR	Model year/ Min.: 0, Max.: 255	—	Identifying the model year
REQ ENG TRQ	Requested engine torque/ Min.: 0 kW, Max.: 16383.75 kW	0 to 57 kw	Flag information for hybrid vehicle
HV TRGT ENG SPD	HV target engine speed/ Min.: 0 rpm, Max.: 6375 rpm	0 to 5000 rpm	Flag information for hybrid vehicle
ACT ENGINE TRQ	Actual engine torque/ Min.: -128 Nm, Max.: 127 Nm	-128 to 127 Nm	Flag information for hybrid vehicle
EST ENGINE TRQ	Estimated engine torque/ Min.: 0 Nm, Max.: 510 Nm	0 to 120 Nm	Flag information for hybrid vehicle
ENGINE RUN TIME	Engine run time/ Min.: 0 second, Max.: 255 seconds	0 to 255 seconds	Flag information for hybrid vehicle
ENGINE RUN TIME	Request engine run time/ Min.: 0 second, Max.: 25.5 seconds	0 to 25.5 seconds	Flag information for hybrid vehicle
IGNITION TIME	Judgment time for ignition of engine/ Min.: 0 second, Max.: 25.5 seconds	0 to 25.5 seconds	Flag information for hybrid vehicle
OUTPUT TIME	Judgment time for engine output/ Min.: 0 second, Max.: 25.5 seconds	0 to 25.5 seconds	Flag information for hybrid vehicle
EST PORT TEMP	Estimated intake port temperature/ Min.: -40°C, Max.: 215°C	80 to 100°C	Flag information for hybrid vehicle
FUEL LEVEL	Fuel level/ 0: EMPTY/1: NOT EMP	—	Flag information for hybrid vehicle
FUEL CUT	Fuel cut for engine stop request/ 0: OFF/1: ON	—	Flag information for hybrid vehicle
INDPNDNT OPR	Engine independently operation/ 0: NOT OPR/1: OPERATE	—	Flag information for hybrid vehicle
RACING	Rev-up operation/ 0: NOT OPR/1: OPERATE	—	Flag information for hybrid vehicle
WARM UP	Request warm-up/ 0: NOT REQ/1: REQUEST	—	Flag information for hybrid vehicle
INDPNDNT CNTRL	Engine independently control operation/ 0: NOT OPR/1: OPERATE	—	Flag information for hybrid vehicle
TANK WATER TEMP	CHS tank outlet temperature sensor output/ Max: 215 °C, Min: -40 °C	—	• If the value is -40°C: sensor circuit is open • If the value is 215°C: sensor circuit is shorted
WATER FLW VLV	Water valve position signal/ Max: 4.98 V, Min: 0 V	0.45 to 4.6 V	Voltage varies based on valve position
ISC LEARN VAL	ISC learning value/ Max: 19.92 L/s, Min: 0 L/s	—	Flag information for hybrid vehicle

*: If no condition is specifically stated for ”ldling”, it means the transaxle position is in the N or P, the A/C switch is OFF and all accessory switches are OFF.

2. ACTIVE TEST

HINT:

Performing ACTIVE TEST using the hand-held tester or the OBD II scan tool allows the relay, VSV, actuator and so on to operate without parts removal. Performing ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display DATA LIST during ACTIVE TEST.

(a) Turn the power switch ON (READY) and warm up the engine.
(b) Turn the power switch OFF.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the power switch ON (IG).
(e) Turn the hand-held tester ON.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on the tester, perform items in ACTIVE TEST.

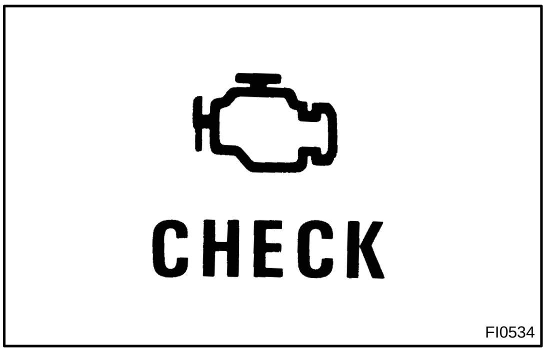
Hand-held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: -12 %, Max.: 25 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once • Injection volume is gradually changed between -12 and 25 %
A/F CONTROL	[Test Details] Control the injection volume -12.5 or 25 % (Change the injection volume -12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor To display the graph, enter ACTIVE TEST / A/F CONTROL / USER DATA, then select "AFS B1S1 and O2S B1S2" or "AFS B2S1 and O2S B2S2" by pressing "YES" button and followed by "ENTER" button and then pressing "F4" button
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP controL ON or OFF	(See page 05-202)
TANK BYPASS VSV	[Test Details] Activate the VSV for tank bypass ON or OFF	(See page 05-202)
CAN CTRL VSV	[Test Details] Activate the VSV for canister control ON or OFF	(See page 05-202)
VVT CTRL B1	[Test Details] Activate the VVT system (Bank 1) ON or OFF	• ON: Rough idle or engine stall • OFF: Normal engine speed (See page 05-63)
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	—
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	—
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	—
COOLING FAN	[Test Details] Control the electric cooling fan ON or OFF	—
ETCS OPEN/CLOSE SLOW	[Test Details] Control the ETCS opening/closing slow speed ON or OFF	Throttle valve intrusive operation

Hand-held Tester Display	Test Details	Diagnostic Note
ETCS OPEN/CLOSE FAST	[Test Details] Control the ETCS opening/closing fast speed ON or OFF	Throttle valve intrusive operation
FUEL CUT #1	[Test Details] Control the cylinder #1 fuel cut ON or OFF (Inspection mode)	Cylinder No. 1 fuel cut for power balance
FUEL CUT #2	[Test Details] Control the cylinder #2 fuel cut ON or OFF (Inspection mode)	Cylinder No. 2 fuel cut for power balance
FUEL CUT #3	[Test Details] Control the cylinder #3 fuel cut ON or OFF (Inspection mode)	Cylinder No. 3 fuel cut for power balance
FUEL CUT #4	[Test Details] Control the cylinder #4 fuel cut ON or OFF (Inspection mode)	Cylinder No. 4 fuel cut for power balance
VVT B1	[Test Details] Control the VVT (bank 1) Min.: -128 %, Max.: 127 %	—
WATER PUMP	[Test Details] Activate the water pump ON or OFF	Coolant heat storage water pump
WATER FLW VLV1	[Test Details] Activate the water valve ON or OFF	Unused
WATER FLW VLV2	[Test Details] Activate the water valve ON or OFF	Unused
WATER FLW VLV3	[Test Details] Activate the water valve ON or OFF	Water valve intrusive valve operation (position when engine is in pre-heat mode) (See page 05-284)
WATER FLW VLV4	[Test Details] Activate the water valve ON or OFF	Water valve intrusive valve operation (position when hot coolant recovering) (See page 05-284)
WATER FLW VLV5	[Test Details] Activate the water valve ON or OFF	Water valve intrusive valve operation (position when engine is in normal operation) (See page 05-284)

05CRG-08

DIAGNOSIS SYSTEM

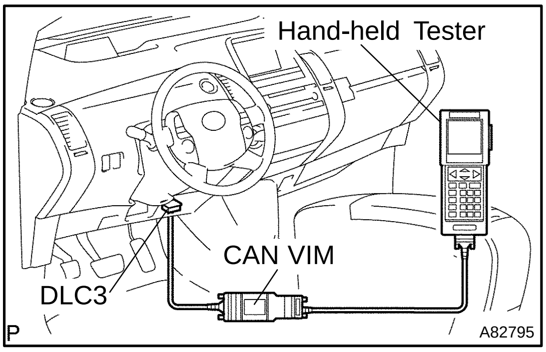
1. DESCRIPTION



- When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (in compliance with SAE J1978) or the hand-held tester. Various data output from the vehicle's ECM can then be read.
- OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator lamp (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system / components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (see page 05-55).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.

- To check DTCs, connect the hand-held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand-held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (see the instruction manual for the OBD II scan tool or the hand-held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (see the DTC chart on page 05-55).



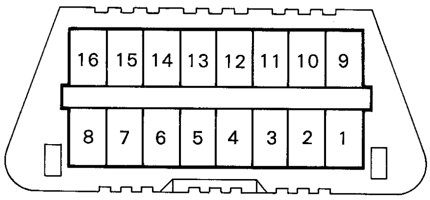
- In order to enhance OBD function on vehicles and develop the Off-Board diagnosis system, CAN communication is introduced in this system (CAN: Controller Area Network). It minimizes a gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows a high speed communication between the systems and to simplify the wire harness connection.
  Since the CAN communication is equipped in this system, CAN VIM (VIM: Vehicle Interface Module) connecting with hand-held tester is necessary to display any information from the ECM on the tester. (Also the communication between the hand-held tester and the ECM uses CAN communication signal) When confirm the DTCs and any data of the ECM, connect the CAN VIM between the DLC3 and the hand-held tester.
- The diagnosis system operates in normal mode during normal vehicle use. In "normal mode", 2 trip detection log-

ic* is used to ensure accurate detection of malfunctions. A ”check mode”, is also available to technicians as an option. In ”check mode”, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (hand-held tester only)
(see page 05-55).

- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the power switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate (2nd trip).
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Priorities for troubleshooting:
If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these priorities should be followed.
If no instructions are given, perform troubleshooting for those DTCs according to the following priorities.

(a) DTCs other than fuel trim malfunction (DTCs P0171 and P0172) and misfire (DTCs P0300 to P0304).
(b) Fuel trim malfunction (DTCs P0171 and P0172).
(c) Misfire (DTCs P0300 to P0304).



2. CHECK DLC3

The vehicle's ECM uses the ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	9 to 14 V	Always
CANH	6	CAN "High" line	CANL	54 to 69 Ω	Power switch OFF
CANH	6	CAN "High" line	Battery positive	1 MΩ or higher	Power switch OFF
CANH	6	CAN "High" line	CG	1 kΩ or higher	Power switch OFF
CANL	4	CAN "Low" line	Battery Positive	1 MΩ or higher	Power switch OFF
CANL	4	CAN "Low" line	CG	1 kΩ or higher	Power switch OFF

HINT:

When you use the hand-held tester II or the OBD scan tool, first connect its cable to the DLC3. Next, turn ON the main power of the PRIUS by pushing the power switch (IG ON). Finally turn the tester or the scan tool ON. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in its instruction manual.

3. INSPECT BATTERY VOLTAGE

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

4. CHECK MIL

(a) The MIL comes on when the power switch is turned ON (IG) and the HV main system is not in operation.

HINT:

If the MIL is not illuminated, troubleshoot the MIL circuit (see page 05-381).

(b) When the HV main system is activated (READY ON), the MIL should turn off. If the MIL illuminates gain, the diagnosis system has detected malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE CHART

HINT:
Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors.¿
If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to "See Page" under the respective "DTC No." in the this chart.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (05-63)	Camshaft Position "A" Actuator Circuit (Bank 1)	• Open or short in oil control valve circuit • Oil control valve • ECM	○	○
P0011 (05-69)	Camshaft Position "A" -Timing Over-Advanced or System Performance (Bank 1)	• Valve timing • Oil control valve • Camshaft timing gear assembly • ECM	○	○
P0012 (05-69)	Camshaft Position "A" -Timing Over- Retarded (Bank 1)	• Same as DTC P0011	○	○
P0016 (05-77)	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM	○	○
P0031 (05-79)	Oxygen (A/F) Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • EFI M relay (Integration relay) • ECM	○	○
P0032 (05-79)	Oxygen (A/F) Sensor Heater Control Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of A/F sensor • A/F sensor heater • EFI M relay (Integration relay) • ECM	○	○
P0037 (05-84)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	• Open or short in heater circuit of the heated oxygen sensor • Heated oxygen sensor heater • EFI M relay (integration relay) • ECM	○	○
P0038 (05-84)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Short in heater circuit of the heated oxygen sensor • Heated oxygen sensor heater • EFI M relay (integration relay) • ECM	○	○
P0100 (05-89)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (05-96)	Mass or Volume Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0102 (05-89)	Mass or Volume Air Flow Circuit Low Input	• Open in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0103 (05-89)	Mass or Volume Air Flow Circuit High Input	• Short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0110 (05-98)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0112 (05-98)	Intake Air Temperature Circuit Low Input	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0113 (05-98)	Intake Air Temperature Circuit High Input	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0115 (05-103)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05-108)	Engine Coolant Temperature Circuit Range/Performance Problem	• Engine coolant temperature sensor	○	○
P0117 (05-103)	Engine Coolant Temperature Circuit Low Input	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0118 (05-103)	Engine Coolant Temperature Circuit High Input	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0120 (05-110)	Throttle/Pedal Position Sensor/ Switch "A" Circuit	• Open or short in throttle position sensor circuit • Throttle position sensor (built in throttle body) • ECM	○	○
P0121 (05-117)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor (built in throttle body)	○	○
P0122 (05-110)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Throttle position sensor • Open in VTA1 circuit • Open in VC circuit (when the VC circuit is open, DTCs P0222 and P2135 are also output simultaneously) • ECM	○	○
P0123 (05-110)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor (built in throttle body) • Open in VTA circuit • Open in E2 circuit • VC and VTA circuits are short-circuited • ECM	○	○
P0125 (05-119)	Insufficient Coolant Temperature for Closed Loop Fuel Control	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0128 (05-122)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM	○	○
P0136 (05-125)	Oxygen Sensor Circuit Malfunction (Bank 1 sensor 2)	• Heated oxygen sensor	○	○
P0137 (05-125)	Oxygen Sensor Circuit Low Voltage (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI M relay (integration relay)	○	○
P0138 (05-125)	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)	• Short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0171 (05-143)	System Too Lean (Bank 1)	• Air induction system • Injector has blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater (bank 1 sensor 1) • EFI M relay (integration relay) • PCV valve and hose • PCV hose connection • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0172 (05-143)	System Too Rich (Bank 1)	• Injector has leakage or blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater (bank 1 sensor 1) • EFI M relay (integration relay) • ECM	○	○
P0220 (05-110)	Throttle/Pedal Position Sensor/ Switch "B" Circuit	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0222 (05-110)	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low Input	• Throttle position sensor • Open in VTA2 circuit • Open in VC circuit (when the VC circuit is open, DTCs P0122 and P2135 are also output simultaneously)	○	○
P0223 (05-110)	Throttle/Pedal Position Sensor/ Switch "B" Circuit High Input	• Throttle position sensor	○	○
P0300 (05-157)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire harness • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM	○*2	○
P0301 (05-157)	Cylinder 1 Misfire Detected	• Same as DTC P0300	○*2	○
P0302 (05-157)	Cylinder 2 Misfire Detected	• Same as DTC P0300	○*2	○
P0303 (05-157)	Cylinder 3 Misfire Detected	• Same as DTC P0300	○*2	○
P0304 (05-157)	Cylinder 4 Misfire Detected	• Same as DTC P0300	○*2	○
P0325 (05-172)	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECM	○	○
P0327 (05-172)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Short in knock sensor circuit • Knock sensor • ECM	○	○
P0328 (05-172)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open in knock sensor circuit • Knock sensor • ECM	○	○
P0335 (05-177)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0340 (05-181)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM	○	○
P0341 (05-181)	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	• Same as DTC P0340	○	○
P0351 *3 (05-185)	Ignition Coil "A" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT1 circuit between ignition coil with igniter and ECM • No.1 ignition coil with igniter • ECM	○	○
P0352 *3 (05-185)	Ignition Coil "B" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT2 circuit between ignition coil with igniter and ECM • No.2 ignition coil with igniter • ECM	○	○
P0353 *3 (05-185)	Ignition Coil "C" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT3 circuit between ignition coil with igniter and ECM • No.3 ignition coil with igniter • ECM	○	○
P0354 *3 (05-185)	Ignition Coil "D" Primary/Secondary Circuit	• Ignition system • Open or short in IGF or IGT4 circuit between ignition coil with igniter and ECM • No.4 ignition coil with igniter • ECM	○	○
P0420 (05-195)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • A/F sensor (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 2) • Three-way catalytic converter (Exhaust manifold)	○	○
P0441 (05-202)	Evaporative Emission Control System Incorrect Purge Flow	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6) and (7) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank is cracked or damaged • Charcoal canister is cracked or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P0442 (05-231)	Evaporative Emission Control System Leak Detected (small leak)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose cracks is blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6) and (7) in Fig. 1 of the circuit description) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank is cracked or damaged • Charcoal canister is cracked or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0446 (05-202)	Evaporative Emission Control System Vent Control Circuit	• Same as DTC P0441	○	○
P0451 (05-255)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0452 (05-255)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	• Same as DTC P0451	○	○
P0453 (05-255)	Evaporative Emission Control System Pressure Sensor/Switch High Input	• Same as DTC P0451	○	○
P0455 (05-231)	Evaporative Emission Control System Leak Detected (gross leak)	• Same as DTC P0442		
P0456 (05-231)	Evaporative Emission Control System Leak Detected (very small leak)	• Same as DTC P0442	○	○
P0505 (05-261)	Idle Air Control System	• Open or short in idle speed control (ISC) valve circuit • Idle speed control (ISC) valve has stuck closed • ECM • Air induction system • PCV valve and hose	○	○
P0560 (05-264)	System Voltage	• Open in back up power source circuit • ECM	○	○
P0604 (05-268)	Internal Control Module Random Access Memory (RAM) Error	• ECM	○	○
P0606 (05-268)	ECM/PCM Processor	• ECM	○	—
P0607 (05-268)	Control Module Performance	• ECM	○	○
P0657 (05-268)	Actuator Supply Voltage Circuit/ Open	• ECM	○	○
P1115 (05-270)	Coolant Temperature Sensor Circuit For Coolant Heat Storage System	• Coolant heat storage tank outlet temperature sensor • Open or short in temperature sensor circuit • ECM	○	○
P1116 (05-275)	Coolant Temperature Sensor Circuit Stuck For Coolant Heat Storage System	• Coolant heat storage tank outlet temperature sensor • Cooling system (clogging)	○	○
P1117 (05-270)	Coolant Temperature Sensor Circuit Low For Coolant Heat Storage System	• Coolant heat storage tank outlet temperature sensor • Short in temperature sensor circuit • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P1118 (05-270)	Coolant Temperature Sensor Circuit High For Coolant Heat Storage System	• Coolant heat storage tank outlet temperature sensor • Open in temperature sensor circuit • ECM	○	○
P1120 (05-277)	Coolant Flow Control Valve Position Sensor Circuit	• Open or short in water valve position sensor circuit • Water valve (Coolant flow control valve) • ECM	○	○
P1121 (05-284)	Coolant Flow Control Valve Position Sensor Circuit Stuck	• Water valve (Coolant flow control valve) • Cooling system (clogging)	○	○
P1122 (05-277)	Coolant Flow Control Valve Position Sensor Circuit Low	• Water valve (Coolant flow control valve) • Short in WBAD (valve position signal) circuit • Open in VC circuit • ECM	○	○
P1123 (05-277)	Coolant Flow Control Valve Position Sensor Circuit High	• Water valve (Coolant flow control valve) • Open in E2 circuit • VC and WBAD circuits are short-circuited • Open in WBAD circuit • ECM	○	○
P1150 (05-290)	Coolant Path Clog Up For Coolant Heat Storage System	• Coolant heat storage tank outlet temperature sensor • Water valve (Coolant flow control valve) • Cooling system (clogging) • Heat storage tank • ECM	○	○
P1151 (05-297)	Coolant Heat Storage Tank	• Heat storage tank	○	○
P1455 (05-299)	Vapor Reducing Fuel Tank System Malfunction	• Fuel Tank	○	○
P2102 (05-301)	Throttle Actuator Control Motor Circuit Low	• Open or short in throttle control motor circuit • Throttle control motor • ECM	○	○
P2103 (05-301)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assembly • ECM	○	○
P2111 (05-305)	Throttle Actuator Control System Stuck Open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2112 (05-305)	Throttle Actuator Control System Stuck Closed	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2118 (05-308)	Throttle Actuator Control Motor Current Range/Performance	• Open in ETCS power source circuit • ETCS fuse • ECM	○	○
P2119 (05-312)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • ECM	○	○
P2135 (05-110)	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	• VTA and VTA2 circuits are short-circuited • Open in VC circuit • Throttle position sensor	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P2195 (05-314)	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater • Integration relay • A/F sensor heater and relay circuit • Air induction system • Fuel pressure • Injector • PCV hose connection • ECM	○	○
P2196 (05-314)	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)	• Same as DTC P2195	○	○
P2238 (05-327)	Oxygen Sensor Pumping Current Circuit Low (for A/F sensor Bank 1 sensor 1)	• Open or short in A/F sensor (bank 1 sensor 1) • A/F sensor (bank 1 sensor 1) • A/F sensor heater • EFI M relay (integration relay) • A/F sensor heater and relay circuit • ECM	○	○
P2239 (05-327)	Oxygen Sensor Pumping Current Circuit High (for A/F sensor Bank 1 sensor 1)	• Same as DTC P2238	○	○
P2252 (05-327)	Oxygen Sensor Reference Ground Circuit Low (for A/F sensor Bank 1 sensor1)	• Same as DTC P2238	○	○
P2253 (05-327)	Oxygen Sensor Reference Ground Circuit High (for A/F sensor Bank 1 sensor1)	• Same as DTC P2238	○	○
P2601 (05-333)	Coolant Pump Control Circuit Range/Performance	• CHS water pump • CHS water pump relay • Open or short in CHS water pump circuit • ECM	○	○
P2610 (05-344)	ECM/PCM Internal Engine Off Timer Performance	• ECM	○	○
P2A00 (05-345)	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater • EFI M relay (integration relay) • A/F sensor heater and relay circuit • Air induction system • Fuel pressure • Injector • PCV hose connection • ECM	○	○
P3190 (05-357)	Poor Engine Power	• Air induction system • Throttle body • Fuel pressure • Engine • Air flow meter • Lack of fuel • Engine coolant temperature sensor • Crankshaft position sensor • Camshaft position sensor • ECM	○	○

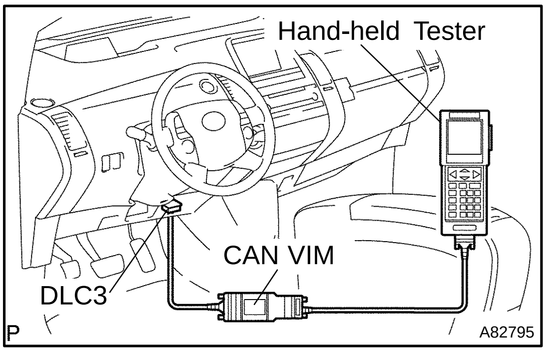
DTC No. (See Page)	Detection Item	Trouble Area	MIL*1	Memory
P3191 (05-357)	Engine Does Not Start	• Air induction system • Throttle body • Fuel pressure • Engine • Air flow meter • Lack of fuel • Engine coolant temperature sensor • Crankshaft position sensor • Camshaft position sensor • ECM	○	○
P3193 (05-357)	Fuel Run Out	• Lack of fuel • ECM	○	○
U0293 (05-364)	Lost Communication With HV ECU	• Wire harness • HV ECU • ECM	○	○

*1: "○" ... MIL illuminates, "—" ... MIL does not illuminate.
*2: MIL illuminates or blinks
*3: This DTC indicates malfunction related to the primary circuit.

05J2U-01

DTC CHECK/CLEAR

NOTICE:
- **If no DTC appears in normal mode:**
  On the OBD II scan tool or the hand-held tester, check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979).
- **When the diagnosis system is changed from normal mode to check mode or vice-versa, all DTCs and freeze frame data recorded in normal mode will be erased. Before changing modes, always check and make a note of DTCs and freeze frame data.**



1. CHECK DTC (Using the OBD II scan tool or hand-held tester)

(a) Connect the OBD II scan tool or hand-held tester to the DLC3.

(b) Turn the power switch ON (IG).

(c) Check DTCs and freeze frame data using the scan tool or the tester, and then write them down. For the hand-held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
For the OBD II scan tool, see its instruction manual.

(d) See page 05-55 to confirm the details of the DTCs.

NOTICE:
- **When simulating a symptom with the OBD II scan tool (excluding hand-held tester) to check the DTCs, use normal mode. For DTCs subject to "2 trip detection logic", perform either of the following actions.**
- **Turn the HV main system OFF (IG OFF) after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated again, the MIL illuminates and the DTCs are recorded in the ECM.**
- **Check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool.**

2. CLEAR DTC

(a) Connect the OBD II scan tool or the hand-held tester to the DLC3.

(b) Turn the power switch ON (IG).

(c) Erase DTCs and freeze frame data using the OBD II scan tool or the hand-held tester.

For the hand-held tester:

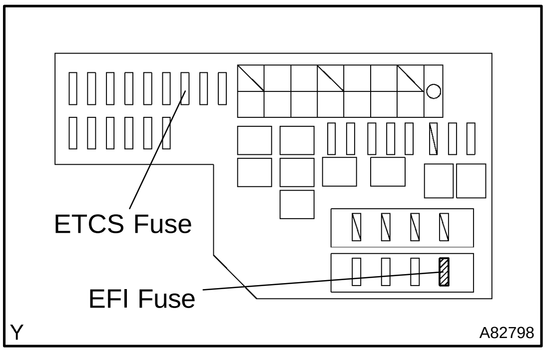
(1) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES.

(2) Press YES.

(d) For the OBD II scan tool, see its instruction manual.

NOTICE:

Clearing the DTCs will also clear the freeze frame data, detailed information and operation history data.



3. CLEAR DTC (Not using the OBD II scan tool or hand-held tester)

(a) Remove the EFI and ECTS fuses from the engine room R/B for more than 60 seconds, or disconnecting the battery cable for more than 60 seconds.

NOTICE:

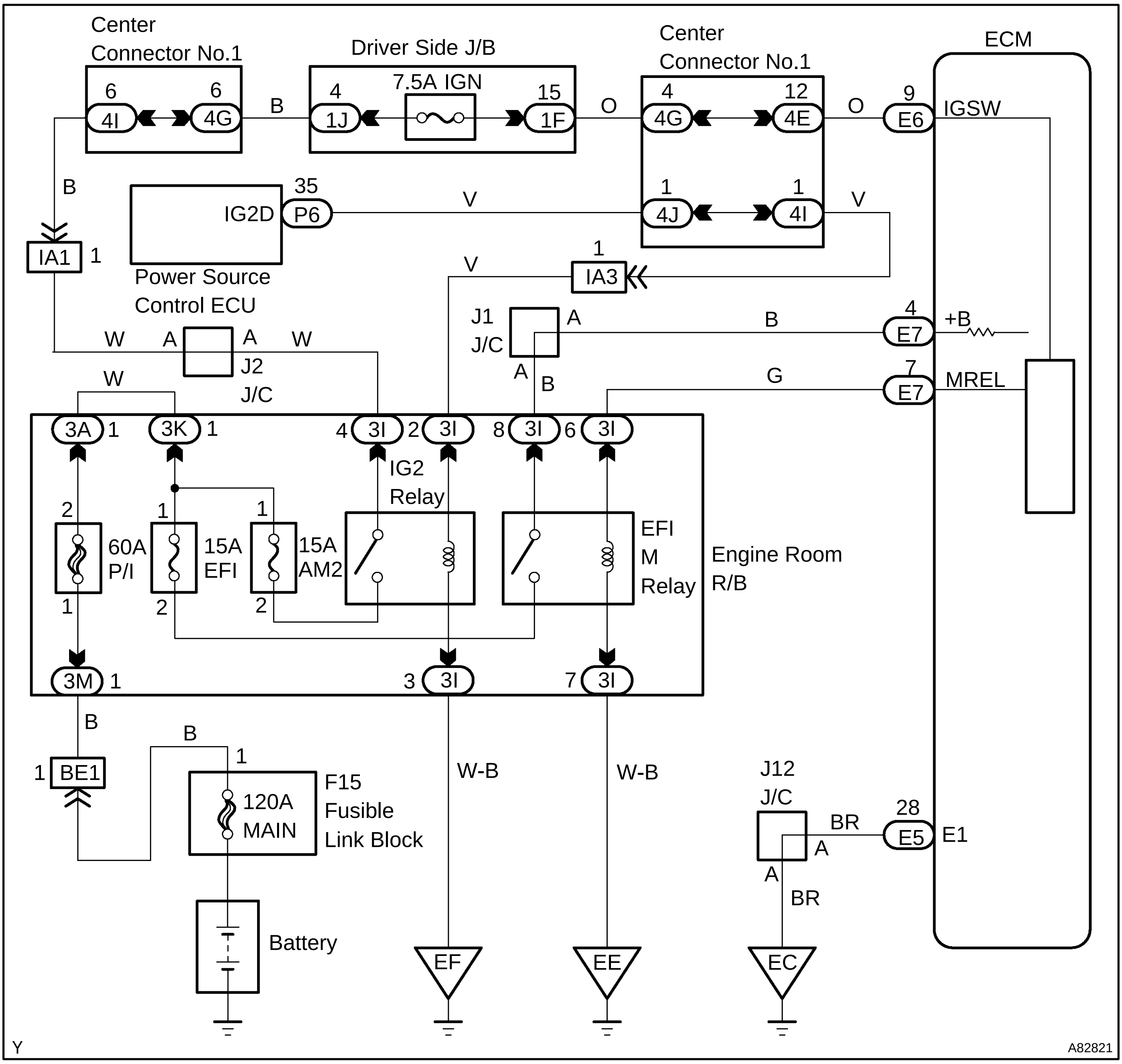
When disconnecting the battery cable, perform the ”INITIALIZE” procedure (see page 01-28).

ECM POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

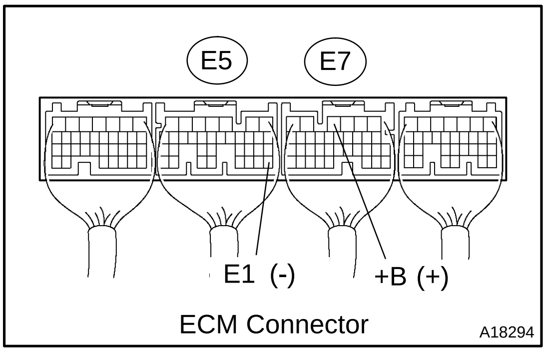
The power source circuit of the hybrid system differs from the conventional power source circuit in the method in which the battery voltage is supplied to IGSW terminal of the ECM. The hybrid system has adopted one relay to serve as an ignition switch, which is controlled by the power source control ECU.
When the HV system is turned ON, the power source control ECU actuates the IG2 relay, which applies the battery voltage to IGSW terminal of the ECM. This causes the MREL terminal to transmit a signal to the EFI M relay. Then, the current that passes through the contact points of the EFI M relay (which is actuated by the MREL signal) flows to the +B terminal of the ECM.
When the power switch is turned OFF, the ECM keeps the EFI M relay ON for a maximum of 2 seconds, in order to initialize the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



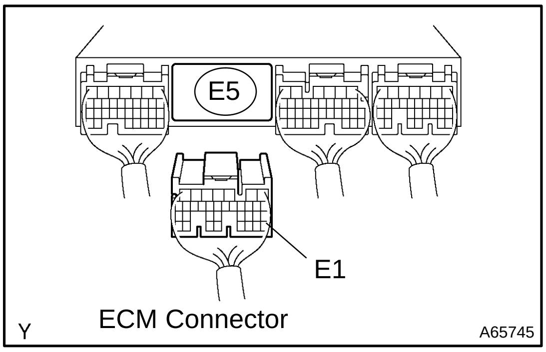
(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E5 and E7 ECM connectors.
Standard:

Tester Connection	Specified Condition
+B (E7-4) - E1 (E5-28)	9 to 14 V

OK — **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(See page 05-33)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM - BODY GROUND)



(a) Disconnect the E5 ECM connector.
(b) Check the resistance between the wire harness side connectors.
Standard (Check for open):

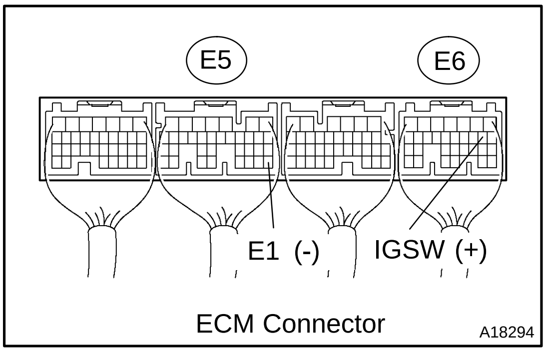
Tester Connection	Specified Condition
E1 (E5-28) - Body ground	Below 1 Ω

(c) Reconnect the ECM connector.

NG — **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT ECM(IGSW VOLTAGE)



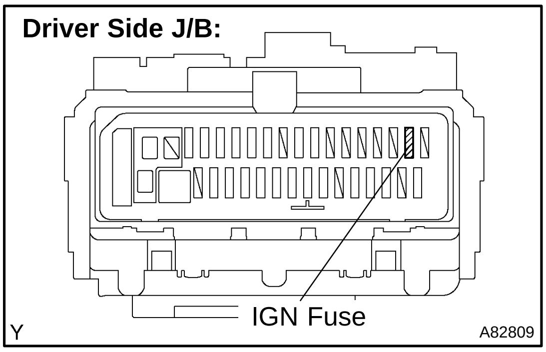
(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E5 and E6 ECM connectors.
Standard:

Tester Connection	Specified Condition
IGSW (E6-9) - E1 (E5-28)	9 to 14 V

OK — **Go to step 7**

NG

4 CHECK FUSE(IGN FUSE)

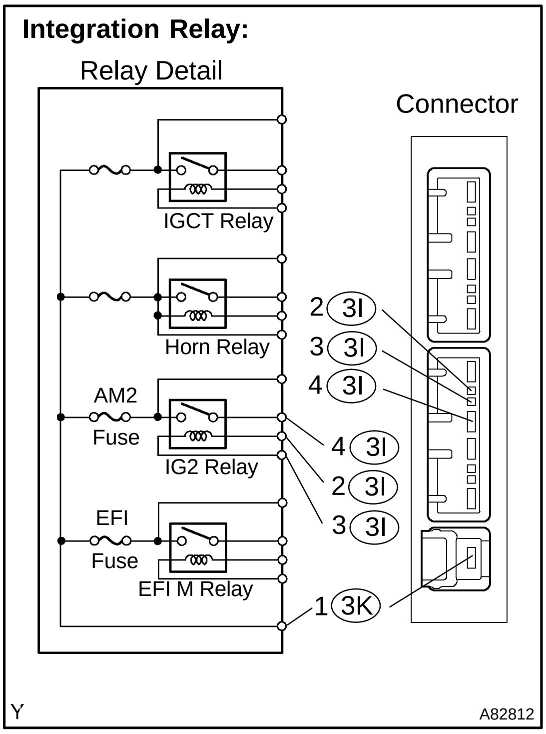


(a) Remove the IGN fuse from the driver side J/B.
(b) Check the resistance of the IGN fuse.
Standard: Below 1 Ω
(c) Reinstall the IGN fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED TO FUSE**

OK

5 INSPECT INTEGRATION RELAY(IG2 RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the IG2 relay.
Standard:

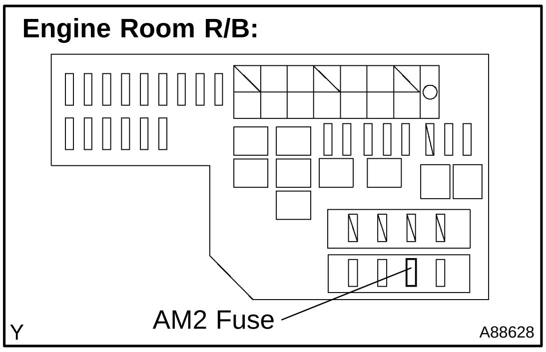
Tester Connection	Specified Condition
(3K-1) - (3I-4)	10 kΩ or higher
(3K-1) - (3I-4)	Below 1 Ω (Apply battery voltage to terminals 3I-2 and 3I-3)

(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

6 CHECK FUSE(AM2 FUSE)



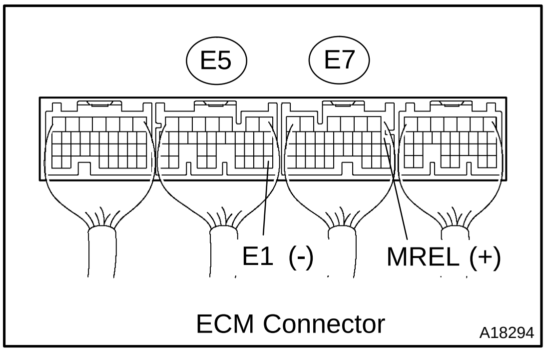
(a) Remove the AM2 fuse from the engine room R/B.
(b) Check the resistance of the AM2 fuse.
Standard: Below 1 Ω
(c) Reinstall the AM2 fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED TO FUSE**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR(BATTERY - IG2 RELAY, IG2 RELAY - ECM)

7 INSPECT ECM(MREL VOLTAGE)



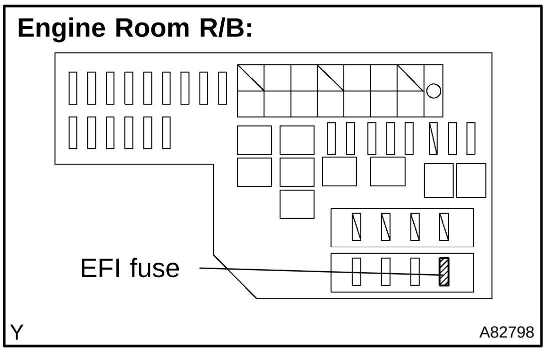
(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E5 and E7 ECM connectors.
Standard:

Tester Connection	Specified Condition
MREL (E7-7) - E1 (E5-28)	9 to 14 V

NG → **REPLACE ECM (See page 10-24)**

OK

8 CHECK FUSE(EFI FUSE)

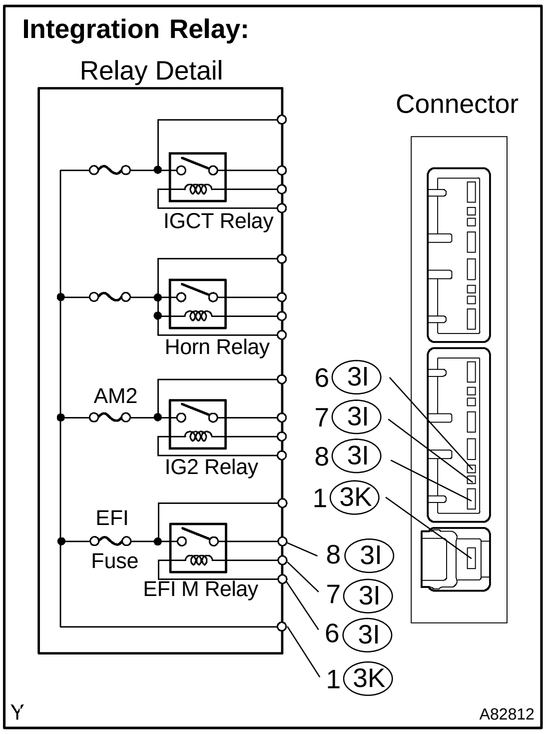


(a) Remove the EFI fuse from the engine room R/B.
(b) Check the resistance of the EFI fuse.
Standard: Below 1 Ω
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED TO FUSE**

OK

9	INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.

(b) Inspect the EFI M relay.

Standard:

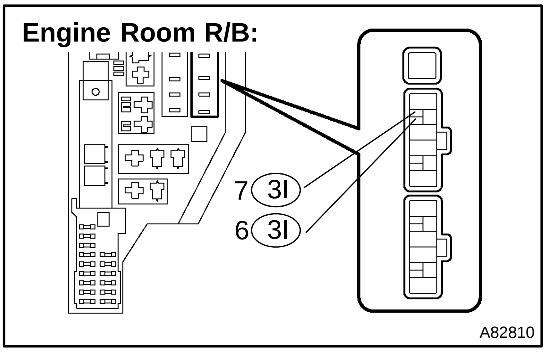
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

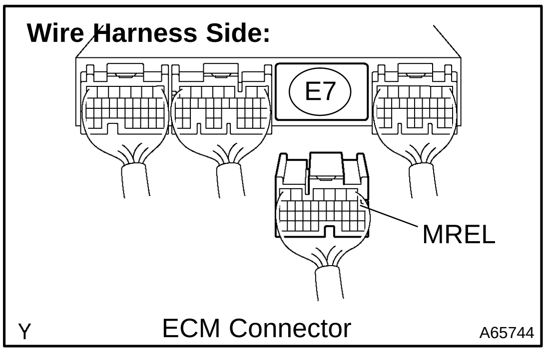
(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

10 CHECK HARNESS AND CONNECTOR(EFI M RELAY - ECM, EFI M RELAY - BODY GROUND)





(a) Check the harness and connectors between the EFI M relay and ECM connector.
(1) Remove the integration relay from the engine room R/B.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EFI M relay (3I-6) - MREL (E7-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI M relay (3I-6) or MREL (E7-7) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the EFI M relay and the body ground.
(1) Remove the integration relay from the engine room R/B.
(2) Check the resistance between the wire harness side connector and the body ground.

Standard (Check for open):

Tester Connection	Specified Condition
EFI M relay (3I-7) - Body ground	Below 1 Ω

(3) Reinstall the integration relay.

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM - BATTERY POSITIVE TERMINAL)

05CRL-08

FAIL-SAFE CHART

If any of the following codes are recorded, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0031 P0032 P0037 P0038	Heater is turned OFF	Power switch OFF
P0100 P0102 P0103	Ignition timing is calculated from engine speed and throttle angle	"Pass" condition detected
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	"Pass" condition detected
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°C (176°F)	"Pass" condition detected
P0120 P0122 P0123	Fuel cut intermittently	Power switch OFF
P0121	Fuel cut intermittently	"Pass" condition detected and power switch OFF
P0325	Maximum ignition timing retardation	Power switch OFF
P0351 P0352 P0353 P0354	Fuel cut	"Pass" condition detected
P657	VTA is fixed at about 16 % and fuel cut intermittently	"Pass" condition detected and power switch OFF
P1115 P1117 P1118	Engine coolant temperature is fixed at 80°C (176°F)	"Pass" condition detected
P1120 P1122 P1123	Water valve position is fixed at position when DTC is detected	"Pass" condition detected
P2102 P2103	VTA is fixed at about 16 % and fuel cut intermittently	Power switch OFF
P2119	VTA is fixed at about 16 % and fuel cut intermittently	"Pass" condition detected and power switch OFF

05J2V-01

FREEZE FRAME DATA

DESCRIPTION

The freeze frame data records the engine condition (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when malfunction is detected. When troubleshooting, it can help determine if the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was LEAN or RICH and other data. at the time of the malfunction occurred.

HINT:

If it is impossible to replicate the problem even though a DTC is detected, confirm the freeze frame data.

LIST OF FREEZE FRAME DATA

LABEL (Hand-Held-T ester Display)	Measure Item/Range	Diagnostic Note
CALC LOAD	Calculate load	Calculated load by ECM
COOLANT TEMP	Engine coolant temperature	If the value is -40°C, sensor circuit is open If the value is 140°C, sensor circuit is shorted
SHORT FT #1	Short-term fuel trim	Short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio
LONG FT #1	Long-term fuel trim	Overall fuel compensation carried out in long-term to compensate a continual deviation of the short-term fuel trim from the central valve
ENGINE SPD	Engine speed	—
VEHICLE SPD	Vehicle speed	Speed indicated on speedometer
IGN ADVANCE	Ignition advance	—
INTAKE AIR	Intake air temperature	If the value is -40°C, sensor circuit is open If the value is 140°C, sensor circuit is shorted
MAF	Mass air flow volume	If the value is approximately 0.0 g/s: • Mass air flow meter power source circuit • VG circuit open or short If the value is 160.0 g/s or more: • E2G circuit open
THROTTLE POS	Throttle position	Read the value with power switch ON (Do not start engine)
O2S B1 S2	Heated oxygen sensor output	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
O2FT B1 S2	Fuel trim at heated oxygen sensor	Same as SHORT FT #1
ENG RUN TIME	Accumulated engine running time	—
AF FT B1 S1	Fuel trim at A/F sensor	—
AFS B1 S1	A/F sensor output	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check voltage output of the sensor
EVAP PURGE VSV	EVAP purge VSV duty ratio	—
WU CYC DTC CLEAR	Warm-up cycle after DTC cleared	—
DIST DTC CLEAR	Accumulated distance from DTC cleared	—
EVAP VAPOR PRES	EVAP vapor pressure	—
CAT TEMP B1 S1	Catalyst temperature	—
CAT TEMP B1 S2	Catalyst temperature	—
BATTERY VOLTAGE	Battery voltage	—
AIR-FUEL RATIO	Air-fuel ratio	—
THROTTLE POS	Throttle sensor positioning	Read the value with the power switch ON (Do not start engine)
AMBIENT TEMP	Ambient air temperature	If the value is -40°C, sensor circuit is open If the value is 140°C, sensor circuit is shorted
THROTTLE POS #2	Throttle sensor positioning #2	—

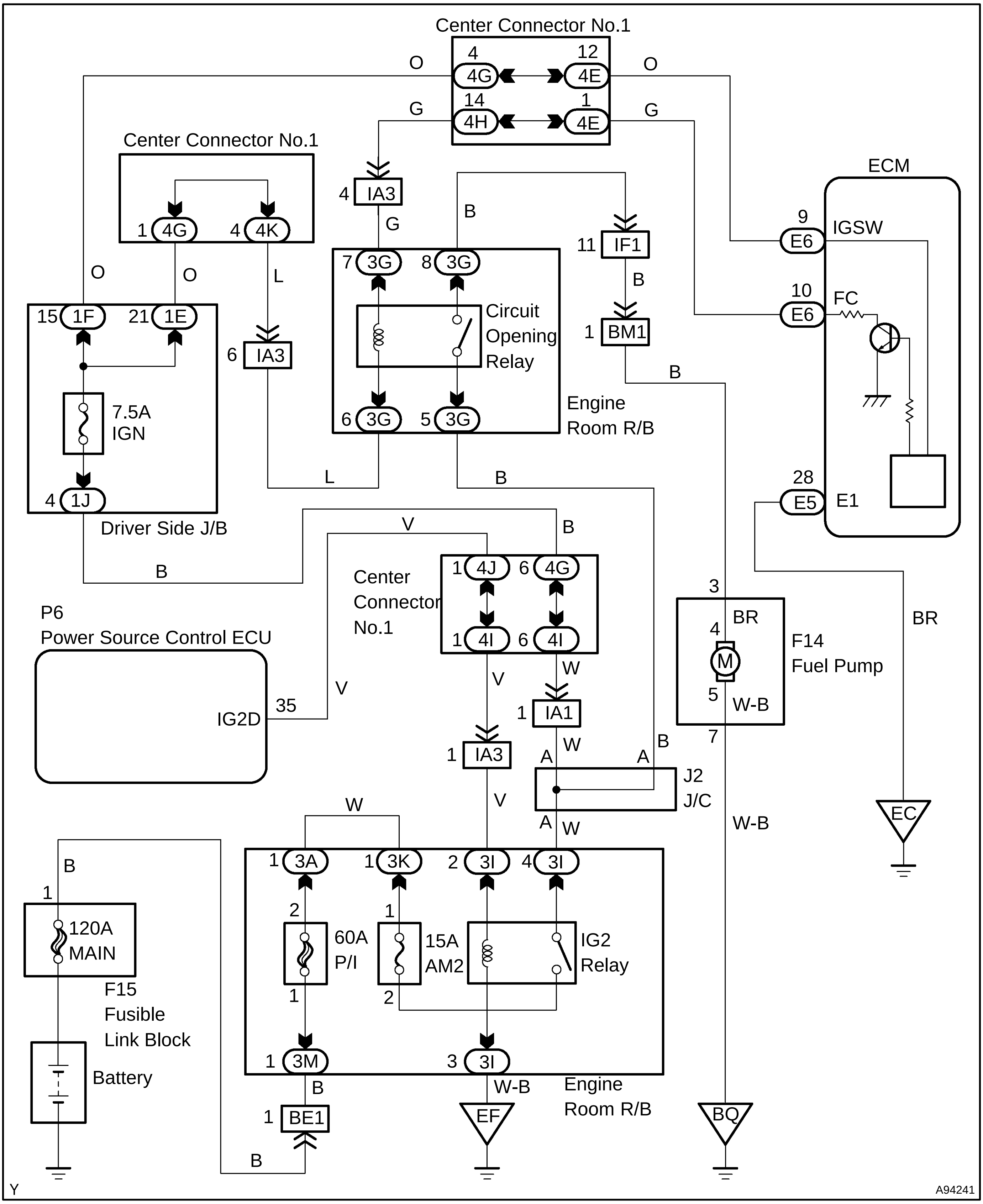
LABEL (Hand-Held-T ester Display)	Measure Item/Range	Diagnostic Note
THROTTLE MOT	Throttle motor	—
TIME DTC CLEAR	Cumulative time after DTC cleared	—
KNOCK CRRT VAL	Correction learning value of knocking	—
KNOCK FB VAL	Feedback value of knocking	—
PURGE DENSITY	Learning value of purge density	—
PURGE FLOW	Purge flow	—
FC IDL	Idle fuel cut	ON: when throttle valve fully closed and engine speed is over 1,500 rpm
FC TAU	FC TAU	The fuel cut is being performed under very light load to prevent the engine combustion from becoming incomplete
VVTL AIM ANGL #1	VVT aim angle	—
VVT CHNG ANGL #1	VVT change angle	—
VVT OCV DUTY B1	VVT OCV operation duty	—
EVAP VSV	EVAP purge VSV	VSV for EVAP is controlled by the ECM (ground side duty control)
FUEL PUMP / SPD	Fuel pump speed status	—
VVT CTRL B1	VVT control status	—
FAN MOTOR	Electric fan motor	—
TANK BYPASS VSV	Tank bypass VSV	VSV for purge flow controlled by ECM (ground side control)
CAN CTRL VSV	Canister control VSV	VSV for canister close is controlled by ECM (ground side control)
INI COOL TEMP	Initial engine coolant temperature	—
INI INTAKE TEMP	Initial intake air temperature	—
INJ VOL	Injection volume	—
INJECTOR	Injector	—
TOTAL FT #1	Total fuel trim	—
MISFIRE RPM	Misfire RPM	—
MISFIRE LOAD	Misfire load	—
CYL #1	Cylinder #1 misfire rate	Displayed in only idling
CYL #2	Cylinder #2 misfire rate	Displayed in only idling
CYL #3	Cylinder #3 misfire rate	Displayed in only idling
CYL #4	Cylinder #4 misfire rate	Displayed in only idling
CYL ALL	All cylinder misfire rate	Displayed in only idling
IGNITION	Ignition	—
MISFIRE MARGIN	MIsfire monitoring	—
VAPOR PRESS	Vapor pressure	Pressure inside of fuel tank as read by the vapor pressure sensor
ENG OIL PRES SW	Engine oil pressure switch signal	Always ON while engine is running

FUEL PUMP CONTROL CIRCUIT

CIRCUIT DESCRIPTION

The fuel pump is operated by the ECM according to the vehicle running condition. After the ECM receives the engine start requirement signal from the HV control ECU, an NE signal comes in immediately when the engine is cranked by MG1 (basically, the fuel pump can operate while the NE signal is generated).
The ECM grounds the FC terminal line after receiving NE signal. It causes to energize the coil in the circuit opening relay, and the current flows to the fuel pump.
When the signal to stop the engine comes from the HV control ECU to the ECM, or when the fuel cut operation is performed such as decelerating by the engine brake, the fuel pump is stopped.

WIRING DIAGRAM



INSPECTION PROCEDURE

Hand-held tester:

1	PERFORM ACTIVE TEST BY HAND-HELD TESTER(OPERATE CIRCUIT OPENING RELAY)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP/SPD.
(e) Check the relay operation while operating it using the hand-held tester.
Standard: Operating noise can be heard from the relay.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE**

NG

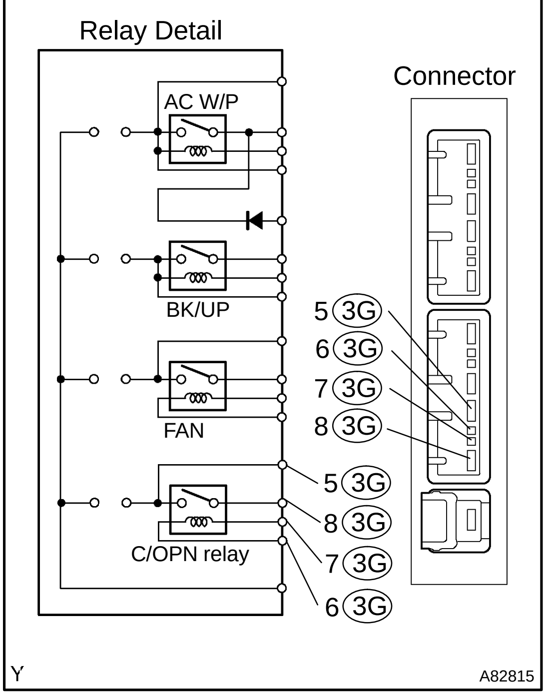
2	INSPECT POWER SOURCE CIRCUIT (See page 05-366)

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT COMPONENTS**

OK

3	INSPECT INTEGRATION RELAY(C/OPN RELAY)

Integration Relay:



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the circuit opening relay.
Standard:

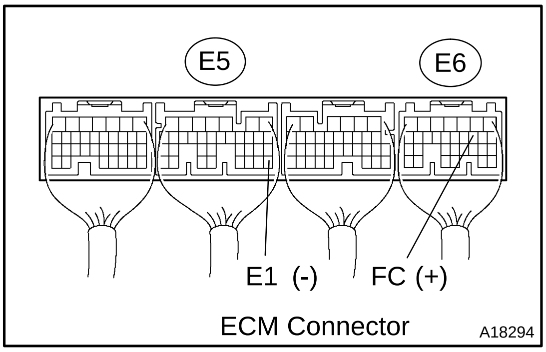
Tester Connection	Specified Condition
(3G-5) - (3G-8)	10 kΩ or higher
(3G-5) - (3G-8)	Below 1 Ω (Apply battery voltage to terminals 3G-6 and 3G-7)

(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

4 INSPECT ECM(FC VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E5 and E6 ECM connectors.
Standard:

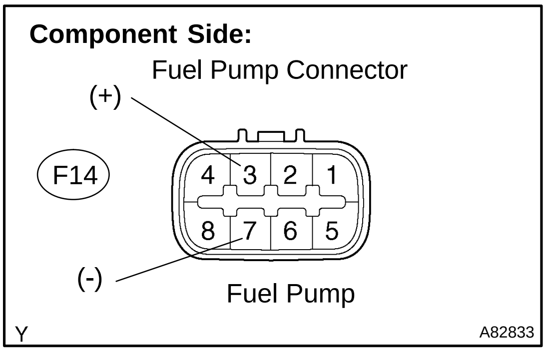
Tester Connection	Specified Condition
FC (E6-10) - E1 (E5-28)	9 to 14 V

OK → **Go to step 5**

NG

CHECK AND REPAIR HARNESS OR CONNECTOR

5 INSPECT FUEL PUMP



(a) Disconnect the F14 fuel pump connector.
(b) Inspect the fuel pump resistance.
(1) Measure the resistance between terminals 3 and 7.
Standard:

Tester Connection	Specified Condition
3 - 7	0.2 to 3.0 Ω at 20 °C (68 °F)

(c) Inspect the fuel pump operation
(1) Apply battery voltage to the fuel pump terminals. Check that the pump operates.

NOTICE:

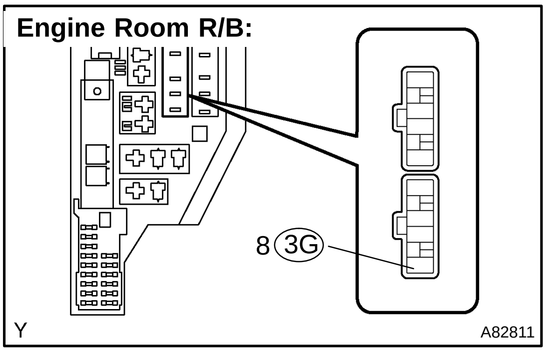
- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

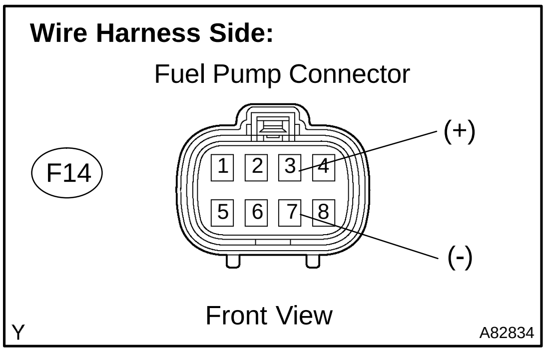
(d) Reconnect the fuel pump connector.

NG → **REPAIR OR REPLACE FUEL TANK ASSY**

OK

6	CHECK HARNESS AND CONNECTOR(C/OPN RELAY - FUEL PUMP, FUEL PUMP - BODY GROUND)





(a) Check the harness and the connectors between the circuit opening relay and the fuel pump connector.

(1) Remove the integration relay from the engine room R/B.

(2) Disconnect the F14 fuel pump connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3G-8) - Fuel pump (F14-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3G-8) or Fuel pump (F14-3) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.

(5) Reconnect the fuel pump connector.

(b) Check the harness and the connectors between the fuel pump connector and the body ground.

(1) Disconnect the F14 fuel pump connector.

(2) Check the resistance between the wire harness side connector and the body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14-7) - Body ground	Below 1 Ω

(3) Reconnect the fuel pump connector.

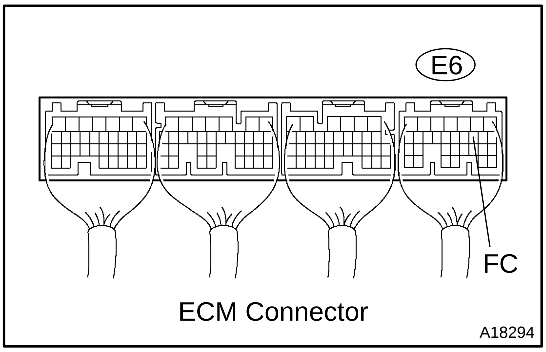
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

OBD II scan tool (excluding hand-held tester):

1	CHECK FUEL PUMP OPERATION



(a) When the terminal FC of the ECM connector and the body ground are connected, check the relay operation.

Standard:

Operating noise can be heard from the circuit opening relay.

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05-33)**

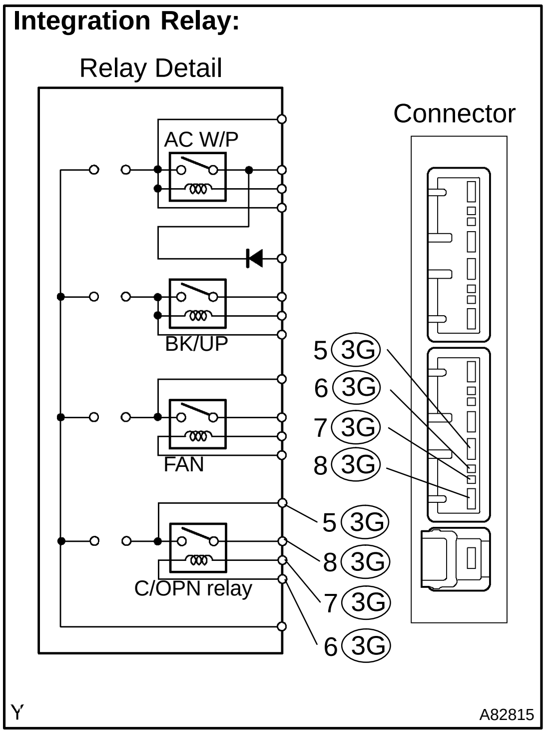
NG ↓

2	CHECK FOR ECM POWER SOURCE CIRCUIT (See page 05-366)

NG → **REPAIR OR REPLACE POWER SOURCE CIRCUIT COMPONENTS**

OK ↓

3	INSPECT INTEGRATION RELAY(C/OPN RELAY)



(a) Remove the integration relay from the engine room R/B.

(b) Inspect the circuit opening relay.

Standard:

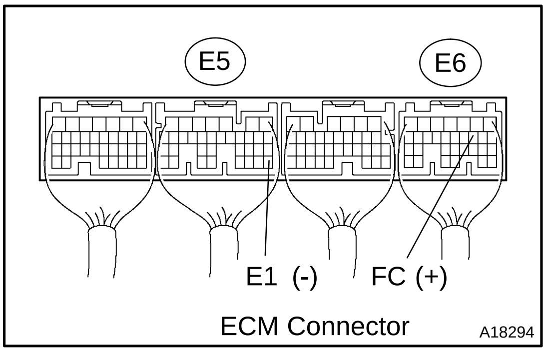
Tester Connection	Specified Condition
(3G-5) - (3G-8)	10 kΩ or higher
(3G-5) - (3G-8)	Below 1 Ω (Apply battery voltage to terminals 3G-6 and 3G-7)

(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK ↓

4 INSPECT ECM(FC VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E5 and E6 ECM connectors.

Standard:

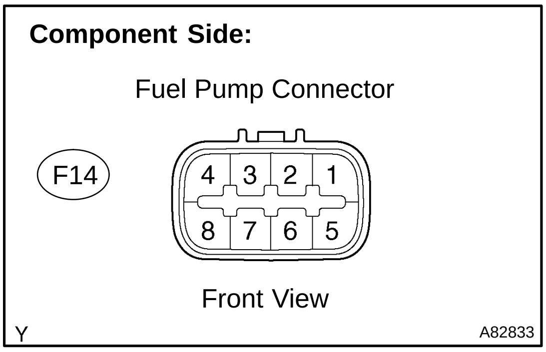
Tester Connection	Specified Condition
FC (E6-10) - E1 (E5-28)	9 to 14 V

OK → **Go to step 5**

NG

CHECK AND REPAIR HARNESS OR CONNECTOR

5 INSPECT FUEL PUMP



(a) Disconnect the F14 fuel pump connector.
(b) Inspect the fuel pump resistance.
(1) Measure the resistance between terminals 3 and 7.

Standard:

Tester Connection	Specified Condition
3 - 7	0.2 to 3.0 Ω at 20 °C (68 °F)

(c) Inspect the fuel pump operation
(1) Apply battery voltage to the fuel pump terminals. Check that the pump operates.

NOTICE:

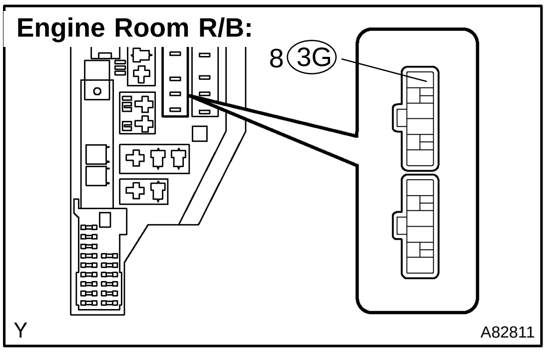
- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

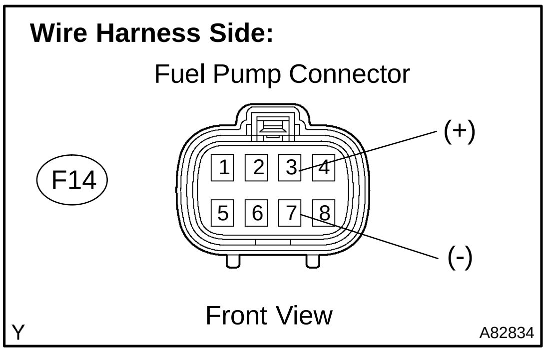
(d) Reconnect the fuel pump connector.

NG → **REPLACE FUEL TANK ASSY**

OK

6	CHECK HARNESS AND CONNECTOR(C/OPN RELAY - FUEL PUMP, FUEL PUMP - BODY GROUND)





(a) Check the harness and the connectors between the circuit opening relay and the fuel pump connector.

(1) Remove the integration relay from the engine room R/B.

(2) Disconnect the F14 fuel pump connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Circuit opening relay (3G-8) - Fuel pump (F14-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Circuit opening relay (3G-8) or Fuel pump (F14-3) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.

(5) Reconnect the fuel pump connector.

(b) Check the harness and the connectors between the fuel pump connector and the body ground.

(1) Disconnect the F14 fuel pump connector.

(2) Check the resistance between the wire harness side connector and the body ground.

Standard (Check for open):

Tester Connection	Specified Condition
Fuel pump (F14-7) - Body ground	Below 1 Ω

(3) Reconnect the fuel pump connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

05J2T-01

LIST OF DISABLE A MONITOR

HINT:
The table below shows the ECM monitoring status for the components listed in the top of the table when the DTCs on the left of the table are set.
As for the "X" mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction: Fault code	Fault code	Component/ system	Monitor disablement (X - disabled): P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
	Fault code		P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
		Component/ system	VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Snesor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Snesor - Sensor3	Fuel system	Misfire
P0010,P0020	P0010,P0020	VVT VSV1,2																				X					X	
P0011	P0011	VVT System1 - Advance				X		X														X					X	
P0012	P0012	VVT System1 - Retard				X		X														X					X	
P0016,P0018	P0016,P0018	VVT System - Misalignment																										
P0021	P0021	VVT System2 - Advance			X	X																X					X	
P0022	P0022	VVT System2 - Retard			X																	X					X	
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X	
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X	
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X		
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X		
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X
P0128	P0128	Thermostat																										
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X		
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X	
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																										
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																										
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X		
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X		
P0325,P0330	P0325-P0333	Knock sensor																										X
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X
P0340-P0346	P0340-P0346	VVT sensor1,2																				X						
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X						
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X
P0401	P0401	EGR system (closed)																				X					X	
P0402	P0402	EGR system (open)																				X	X	X	X	X	X	
P0405,P0409	P0405-P0409	Lift sensor																									X	
P0420,P0430	P0420,P0430	Catalyst																										
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X		
P0450,P0451	P0450-P0453	EVAP press sensor																										

C A21570

Monitor detected malfunction

			Monitor disablement (X - disabled)																									
Fault code			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
	Fault code		P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308
		Component/ system	VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Snesor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Snesor - Sensor3	Fuel system	Misfire
P0500	P0500	VSS																				X	X	X	X	X	X	X
P0511	P0511	IAC valve																					X					
P0510	P0510	Idle switch												X		X						X	X		X	X	X	X
P0560	P0560	System Voltage																										
P0617	P0617	Starter signal																										
P0705	P0705	Shift lever position switch																										
P0710	P0710-P0713	Trans fluid temp sensor																										
P0720-P0793	P0720-P0793	Output speed sensor																										
P0715-P0717	P0715-P0717	Input speed sensor																										
P0724	P0724	Stop lamp switch																										
P0741-P0796	P0741-P0796	Trans solenoid (function)																										
P0748-P0798	P0748-P0799	Trans solenoid (range)																										
P0850	P0850	PNP switch																										X
P1010,P1020	P1010,P1020	VVTL																				X					X	
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X					X	
P1126	P1126	Electronic magnet clutch																										
P1129	P1129	Electronic throttle system																										
P1430	P1430	HC adsorber ACT press sensor																										
P2004,6	P2004,6	Intake Manifold Runner Control																										
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																										
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																										
P2102,P2103	P2102,P2103	Throttle motor																										
P2120-P2138	P2120-P2138	Accel position sensor																										
P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X		
P2226	P2226	BARO sensor																					X		X	X		
P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X		
P2423,24	P2423,24	HC Absorption Catalyst																										
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																										
P2431	P2431	AIR Pressure Sensor(Rationality)																										
P2440	P2440	AIR control valve stuck open																					X	X	X	X	X	
P2441	P2441	AIR control valve stuck close																					X	X	X	X	X	
P2444	P2444	AIP stuck On																					X	X	X	X	X	
P2445	P2445	AIP stuck Off																					X	X	X	X	X	
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X		

C A21571

Monitor disablement (X - disabled)

Monitor detected malfunction: Fault code	Fault code	Component/ system	P0325,P0330 / P0325-P0333 / Knock sensor	P0335 / P0335 / CKP sensor	P0340,P0341 / P0340,P0341 / CMP sensor	P0340-P0346 / P0340-P0346 / VVT sensor1,2	P0351-P0358 / P0351-P0358 / Ignitor	P0385 / P0385 / CKP sensor 2	P0401 / P0401 / EGR system (closed)	P0402 / P0402 / EGR system (open)	P0405 / P0405,P0406 / EGR Lift sensor	P0409 / P0409 / EGR Lift sensor	P0420,P0430 / P0420,P0430 / Catalyst	P0440-P0446 / P0440-P0446 / EVAP system	P0450,P0451 / P0450-P0453 / EVAP press sensor	P0500 / P0500 / VSS(ECT2sensor)	P0500 / P0500 / VSS(ECT1sensor, non-ECT)	P0500 / P0500 / VSS(M/T)	P0511 / P0511 / IAC valve	P0510 / P0510 / Idle switch	P0560 / P0560 / System Voltage	P0617 / P0617 / Starter signal	P0705 / P0705 / Shift lever position switch	P0710 / P0710-P0713 / Trans fluid temp sensor	P0720-P0793 / P0720-P0793 / Output speed sensor	P0715-P0717 / P0715-P0717 / Input speed sensor	P0724 / P0724 / Stop lamp switch	P0741-P0796 / P0741-P0796 / Trans solenoid (function)*1
P0010,P0020	P0010,P0020	VVT VSV1,2																										X
P0011	P0011	VVT System1 - Advance							X	X			X	X					X									
P0012	P0012	VVT System1 - Retard							X	X			X	X					X									
P0016,P0018	P0016,P0018	VVT System - Misalignment																										
P0021	P0021	VVT System2 - Advance							X	X			X	X					X									
P0022	P0022	VVT System2 - Retard							X	X			X	X					X									
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X						X									X
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X						X									
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X															
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																										
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X				X	X									X
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X				X	X									X
P0110	P0110-P0113	IAT sensor							X	X				X														X
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X				X	X									X
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X			X		X									X
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X				X	X									X
P0128	P0128	Thermostat																										
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X	X					X									X
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X						X									X
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X															
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																										
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X					X									X
P0300-P0308	P0300-P0308	Misfire											X	X					X									X
P0325,P0330	P0325-P0333	Knock sensor							X	X																		X
P0335	P0335	CKP sensor							X	X			X	X					X									X
P0340, P0341	P0340, P0341	CMP sensor							X	X			X	X					X									X
P0340-P0346	P0340-P0346	VVT sensor1,2																										
P0351-P0358	P0351-P0358	Ignitor							X	X			X	X					X									X
P0385	P0385	CKP sensor 2							X	X			X	X					X									
P0401	P0401	EGR system (closed)											X															X
P0402	P0402	EGR system (open)											X	X					X									X
P0405,P0409	P0405-P0409	Lift sensor																										
P0420,P0430	P0420,P0430	Catalyst																										
P0442-P0456	P0442-P0456	EVAP system																	X									
P0450,P0451	P0450-P0453	EVAP press sensor												X														

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A21572

Monitor disablement (X - disabled)

Monitor detected malfunction

Fault code			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	Fault code		P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
		Component/ system	Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1
P0500	P0500	VSS							X	X			X	X					X						X	X		X
P0511	P0511	IAC valve																										
P0510	P0510	Idle switch								X			X	X					X									X
P0560	P0560	System Voltage																										
P0617	P0617	Starter signal																										
P0705	P0705	Shift lever position switch																										
P0710	P0710-P0713	Trans fluid temp sensor																										
P0720-P0793	P0720-P0793	Output speed sensor																										X
P0715-P0717	P0715-P0717	Input speed sensor																										
P0724	P0724	Stop lamp switch																										
P0741-P0796	P0741-P0796	Trans solenoid (function)																										
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X
P0850	P0850	PNP switch																	X									X
P1010,P1020	P1010,P1020	VVTL																										
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X									
P1126	P1126	Electronic magnet clutch																										
P1129	P1129	Electronic throttle system																										
P1430	P1430	HC adsorber ACT press sensor												X	X													
P2004,6	P2004,6	Intake Manifold Runner Control																										
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																										
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																										
P2102,P2103	P2102,P2103	Throttle motor																										
P2120-P2138	P2120-P2138	Accel position sensor																										
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X
P2226	P2226	BARO sensor																										X
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X
P2423,24	P2423,24	HC Absorption Catalyst																										
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																										
P2431	P2431	AIR Pressure Sensor(Rationality)																										
P2440	P2440	AIR control valve stuck open							X	X			X															
P2441	P2441	AIR control valve stuck close							X	X			X															
P2444	P2444	AIP stuck On							X	X			X															
P2445	P2445	AIP stuck Off							X	X			X															
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X

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A21573

	Fault code			Monitor disablement (X - disabled)																								
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
		Fault code		P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,6	P2009,10	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
			Component/ system	Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Absorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
Monitor detected malfunction	P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X		
	P0011	P0011	VVT System1 - Advance																				X	X	X	X		
	P0012	P0012	VVT System1 - Retard																				X	X	X	X		
	P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X		
	P0021	P0021	VVT System2 - Advance																				X	X	X	X		
	P0022	P0022	VVT System2 - Retard																				X	X	X	X		
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X		
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X		X
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X								
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X								
	P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X		X
	P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X		X
	P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X		X
	P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X		X
	P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X		X
	P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X		X
	P0128	P0128	Thermostat																									
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X		
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X		X
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X								
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X								
	P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X		X
	P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X		X
	P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X		
	P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X		X
	P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X		X
	P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X		
	P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X		
	P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X		X
	P0401	P0401	EGR system (closed)																	X								
	P0402	P0402	EGR system (open)														X		X	X			X	X	X	X		X
	P0405,P0409	P0405-P0409	Lift sensor																									
	P0420,P0430	P0420,P0430	Catalyst																									
	P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X		X
	P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X		

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A21575

				Monitor disablement (X - disabled)																								
	Fault code			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
		Fault code		P0741-P0796	P0748-P0999	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,6	P2009,10	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
			Component/ system	Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Absorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
Monitor detected malfunction	P0500	P0500	VSS	×													×		×	×			×	×	×	×		×
	P0511	P0511	IAC valve														×		×									×
	P0510	P0510	Idle switch														×		×	×								×
	P0560	P0560	System Voltage																									
	P0617	P0617	Starter signal																									
	P0705	P0705	Shift lever position switch																									
	P0710	P0710-P0713	Trans fluid temp sensor																									
	P0720-P0793	P0720-P0793	Output speed sensor																									
	P0715-P0717	P0715-P0717	Input speed sensor																									
	P0724	P0724	Stop lamp switch																									
	P0741-P0796	P0741-P0796	Trans solenoid (function)																									
	P0748-P0798	P0748-P0799	Trans solenoid (range)	×																								
	P0850	P0850	PNP switch																									
	P1010,P1020	P1010,P1020	VVTL																				×	×	×	×		
	P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				×	×	×	×		×
	P1126	P1126	Electronic magnet clutch																									
	P1129	P1129	Electronic throttle system																									
	P1430	P1430	HC adsorber ACT press sensor																									
	P2004,6	P2004,6	Intake Manifold Runner Control																									
	P2009,10	P2009,10	Intake Manifold Runner Control Circuit																									
	P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																									
	P2102,P2103	P2102,P2103	Throttle motor																									
	P2120-P2138	P2120-P2138	Accel position sensor																									
	P2196,P2198	P2196,P2198	A/F sensor (rationality)																	×			×	×	×	×		×
	P2226	P2226	BARO sensor														×		×				×	×	×	×		×
	P2237,P2240	P2237,P2240	A/F sensor (open)																	×			×	×	×	×		×
	P2423,24	P2423,24	HC Absorption Catalyst																									
	P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																			×	×	×	×	×		
	P2431	P2431	AIR Pressure Sensor(Rationality)																				×	×	×	×		
	P2440	P2440	AIR control valve stuck open														×		×	×								×
	P2441	P2441	AIR control valve stuck close														×		×	×								×
	P2444	P2444	AIP stuck On														×		×	×								×
	P2445	P2445	AIP stuck Off														×		×	×								×
	P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																									
	P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																	×			×	×	×	×		

C

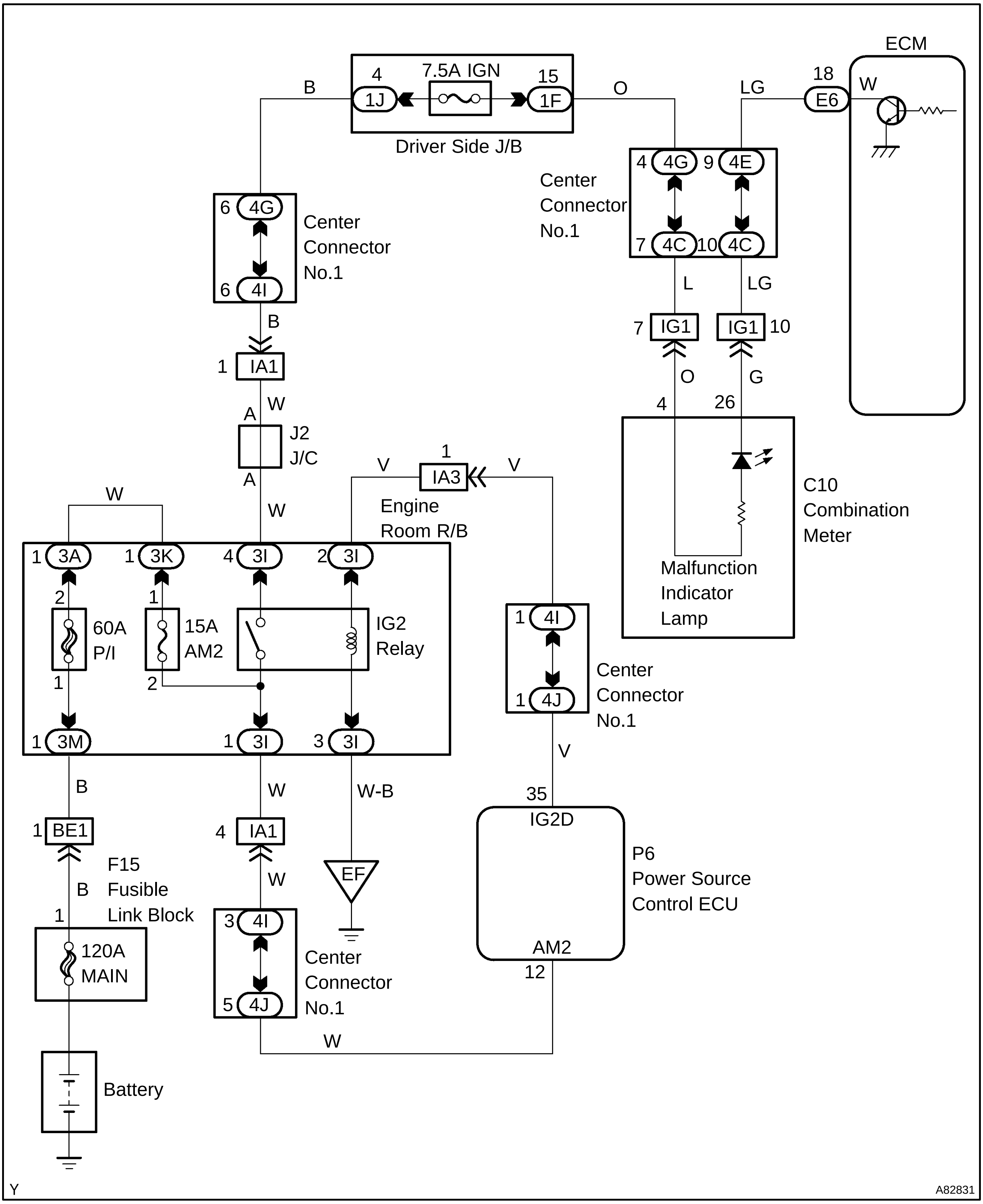
A21576

MIL CIRCUIT

CIRCUIT DESCRIPTION

The IG2 relay energized by the power source control ECU applies the battery voltage to the malfunction indicator lamp (MIL) in the combination meter while the main system is turned ON.
When it is neccesary, the ECM grounds the W terminal line and illuminates the MIL.
In order to perform functional check visually, the MIL is illuminated when the power switch is first turned ON. If the MIL is ON or OFF all of the time, use the procedure below to troubleshoot it. The MIL is used to indicate vehicle malfunction which was detected by the ECM. Follow this procedure using the hand-held tester or the OBD II scan tool to determine cause of the problem and to check the MIL.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below .

MIL remains on	Start inspection from step 1
MIL is not illuminated	Start inspection from step 3

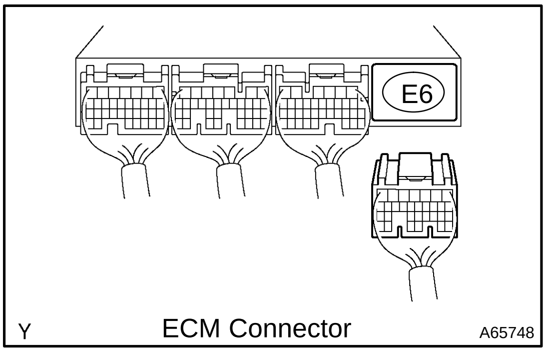
1 CLEAR DTC

(a) Connect the hand-held tester or the OBD II scan tool to the DLC 3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) Read DTCs (See page 05-41).
(e) Clear the DTCs (See page 05-41).
(f) Check that MIL is not illuminated.
Standard: MIL is not illuminated.

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05-55)**

NG

2 CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



ECM Connector

(a) Disconnect the E6 ECM connector.
(b) Turn the power switch ON (IG).
(c) Check that MIL is not illuminated.
Standard: MIL is not illuminated.
(d) Reconnect the ECM connector.

OK → **REPLACE ECM (See page 10-24)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER - ECM)

3 CHECK THAT MIL IS ILLUMINATED

(a) Check that MIL is illuminated when the power switch is turned ON (IG).
Standard: MIL is illuminated.

OK → **SYSTEM OK**

NG

4	INSPECT COMBINATION METER ECU (MIL CIRCUIT)

(a) See the combination meter troubleshooting on page 05-1985 .

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER - ECM)

DTC	P2A00	A/F SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

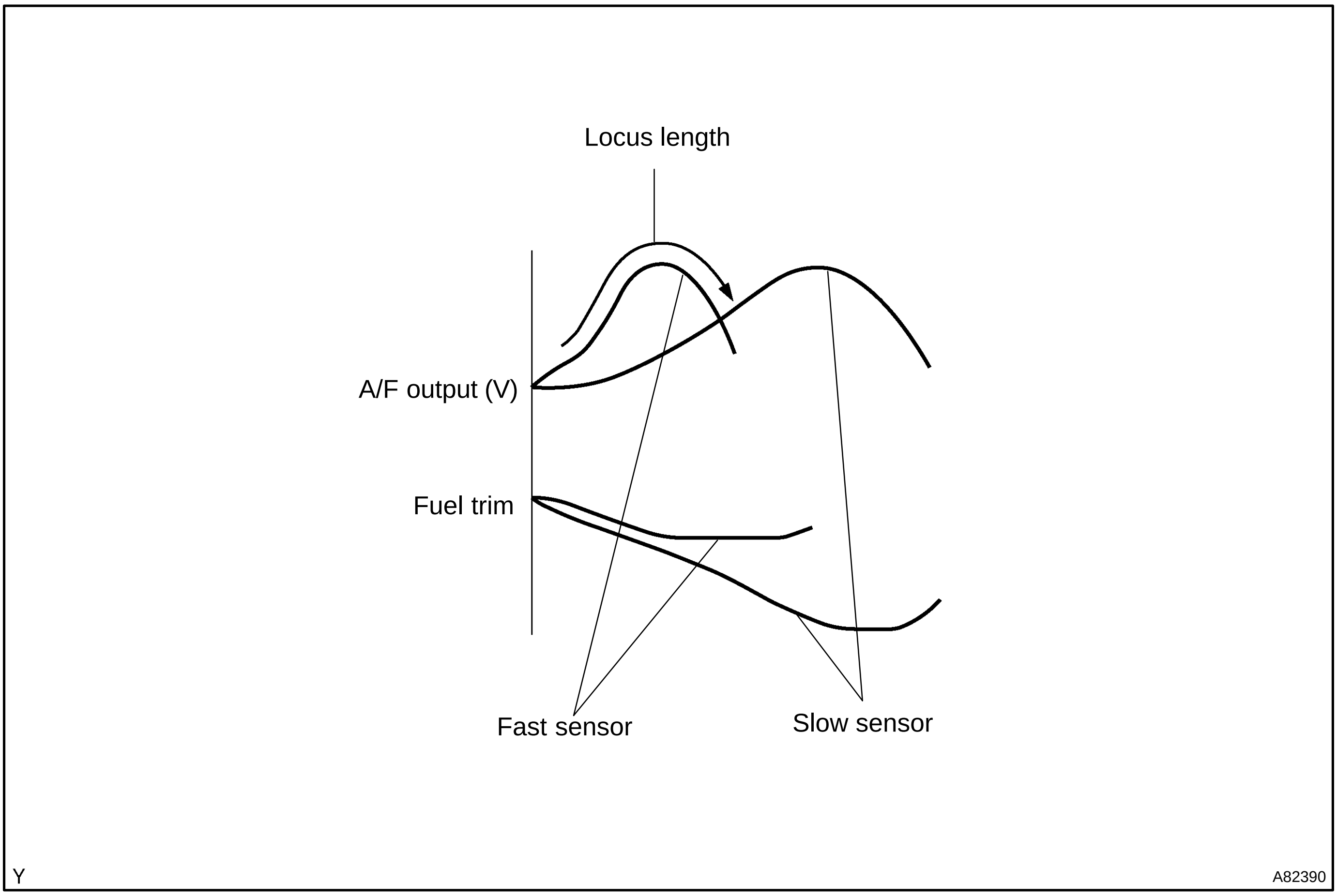
CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05-313 .

DTC No.	DTC Detection Condition	Trouble Area
P2A00	When A/F sensor output voltage change is below compared to fuel trim change, ECM judges that A/F sensor circuit response is slow if conditions (a), (b) and (c) are met (2 trip detection logic): (a) After engine is warmed up (b) Engine speed is 1,100 rpm or more (c) Vehicle speed 37.5 mph (60 km/h) or more	• Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • Air induction system • Fuel pressure • Injector • PCV hose connection • ECM

HINT:
Sensor 1 refers to the sensor mounted before the TWC and is located near the engine assembly.

MONITOR DESCRIPTION



The air fuel-ratio (A/F) sensor varies its output voltage in proportion to the air-fuel ratio. Based on the output voltage, the ECM determines if the air-fuel ratio is RICH or LEAN and adjusts the stoichiometric air-fuel ratio. The ECM also checks the fuel injection volume compensation value to check if the A/F sensor is deteriorating or not. The output voltage variation, known as locus length, should be high when the air-fuel ratio fluctuates. When the A/F sensor response rate has deteriorated, the locus length should be short.
The ECM concludes that there is malfunction in the A/F sensor when the locus length is short and the response rate has deteriorated.

MONITOR STRATEGY

Related DTCs	P2A00: A/F sensor circuit slow response
Required sensors/components	Main: A/F sensor Related: Engine speed sensor, vehicle speed sensor
Frequency of operation	Once per driving cycle
Duration	40 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine	Running
Time after first engine start	120 seconds
Fuel system status	Closed-loop
A/F sensor status	Activated
Idle	OFF
Time after idle off	2 seconds
Engine speed	1,100 rpm or more, and 3,400 rpm or less
Vehicle speed	37.5 mph (60 km/h) or more, and 75 mph (120 km/h) or less
Fuel cut	OFF
Time after fuel cut is off	3 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Response rate deterioration level	8 or more

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

A/F Sensor Bank 1

MID	TID	Scaling	Description of Test Value
$01	$8E	Multiply by 0.0003 (no dimension)	Response rate deterioration level

WIRING DIAGRAM

Refer to DTC P2195 on page 05-313 .

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble area are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand-held tester to the DLC3 on the vehicle.
(2) Turn the power switch ON (IG).
(3) Put the engine in inspection mode (see page 01-27).
(4) Warm up the engine by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(5) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(6) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

-12.5 % → lean output: More than 3.35 V

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: More than 0.55 V

-12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Extremely RICH or LEAN actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of both A/F sensor and heated oxygen sensor.
To display the graph, enter ACTIVE TEST / A/F CONTROL / USER DATA, select ”AFS B1S1 and O2S B1S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

- DTC P2A00 may be also detected, when the air-fuel ratio stays RICH or LEAN.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high A/F sensor voltage could be caused by a RICH air-fuel mixture. Check the conditions that would cause the engine to run with the RICH air-fuel mixture.
- A low A/F sensor voltage could be caused by a LEAN air-fuel mixture. Check the conditions that would cause the engine to run with the LEAN air-fuel mixture.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO A/F SENSOR DTC)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display (DTC Output)	Proceed to
P2A00	A
P2A00 and other DTCs	B

HINT:
If any other code besides P2A00 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-54)

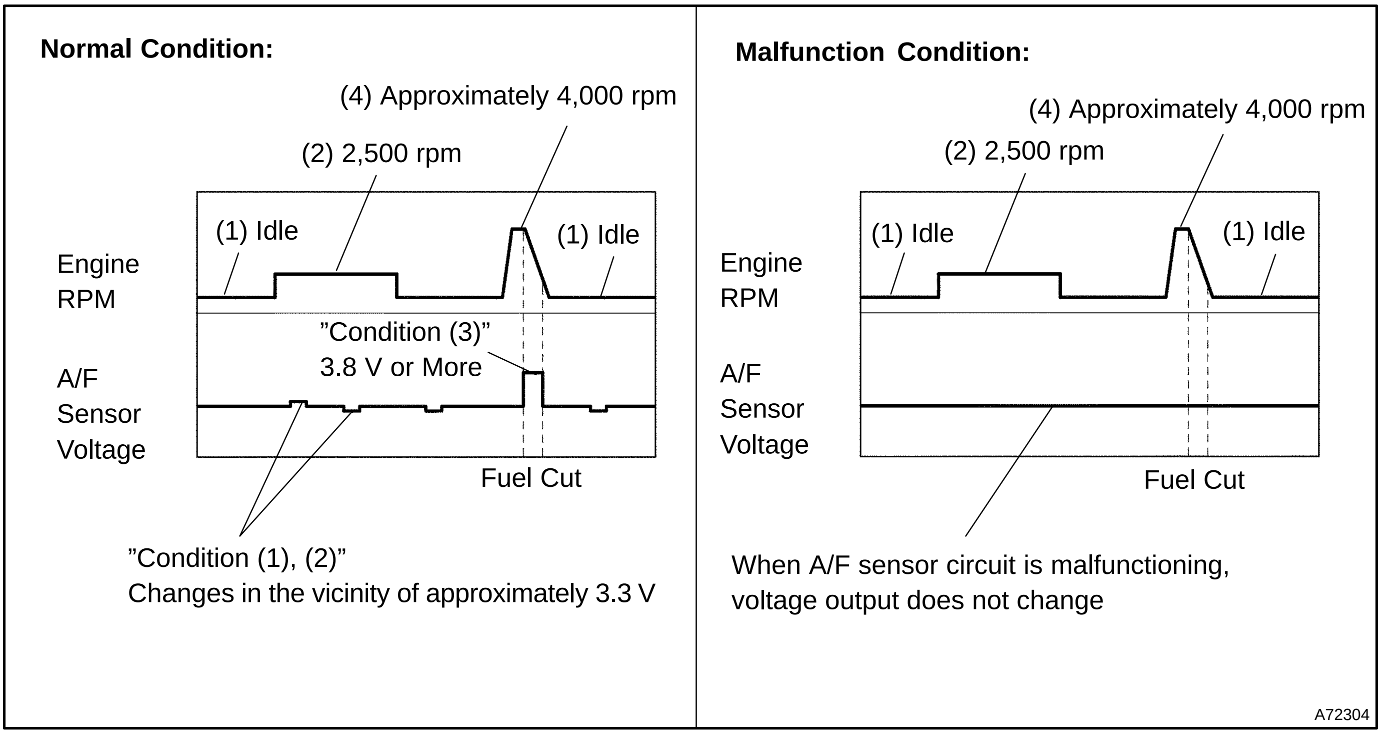
A

2 READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(OUTPUT VOLTAGE OF A/F SENSOR)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC 3.
(b) Put the engine in inspection mode (see page 01-27).
(c) Warm up the A/F sensors (bank 1 sensor 1) by running the engine at 2,500 rpm, depressing the accelerator pedal more than 60 % for approximately 90 seconds.
(d) Read A/F sensor voltage output on the OBD II scan tool or the hand-held tester.
(e) Hand-held tester only:
On the hand-held tester, enter the menus: ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA.
(f) Select "AFS B1 S1/ENGINE SPD" and press button "YES".
(g) Monitor the A/F sensor voltage carefully.
(h) Check the A/F sensor voltage output under the following conditions:
  (1) Put the engine in inspection mode and allow the engine to idle for 30 seconds.
  (2) Put the engine in inspection mode and running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % (where engine RPM is not suddenly changed).
  (3) Deactivate the inspection mode and drive the vehicle with shift position "B" range.
  (4) Accelerate the vehicle to 44 mph (70 km/h) and quickly release the accelerator pedal so that the throttle valve fully close.

CAUTION:
- **Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.**

Standard:
Condition (1) and (2)
Voltage changes in the vicinity of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (4)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration (when fuel cut) as shown in the illustration.
***: Voltage when using the OBD II scan tool.**



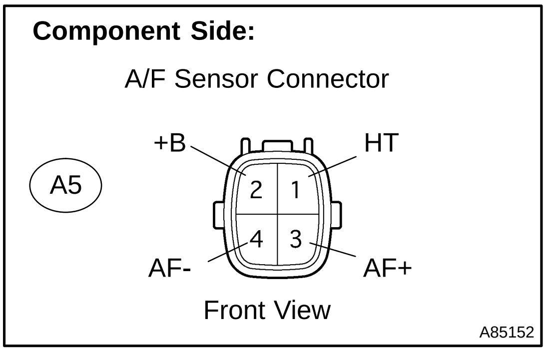
HINT:
- Whenever the output voltage of the A/F sensor remains at approximately 3.3 V (0.660 V)* (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have an open-circuit. (This will happen also when the A/F sensor heater has an open-circuit.)
- Whenever the output voltage of the A/F sensor remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have a short-circuit.
- The ECM will stop fuel injection (fuel cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor voltage output.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery terminal was reconnected, the vehicle must be driven over 10 mph (16 km/h) to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speeds with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

*: Voltage when using the OBD II scan tool.

OK → Go to step 14

NG

3 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A5 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.

Standard:

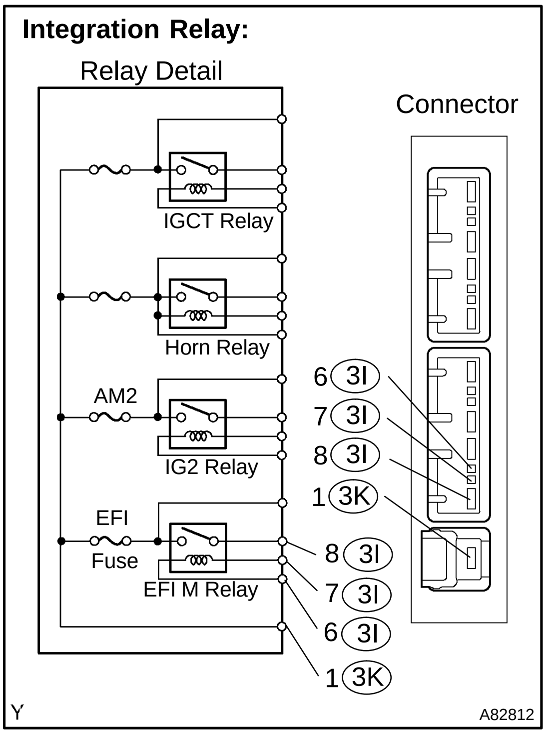
Tester Connection	Resistance
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)

(c) Reconnect the A/F sensor connector.

NG → REPLACE AIR FUEL RATIO SENSOR

OK

4 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.

Standard:

Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

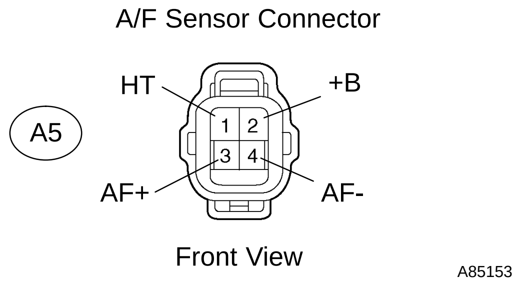
(c) Reinstall the integration relay.

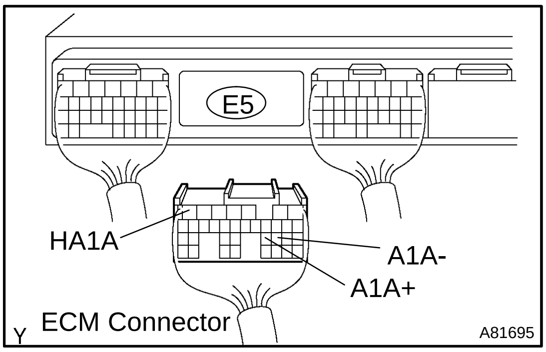
NG → REPLACE INTEGRATION RELAY

OK

5 CHECK HARNESS AND CONNECTOR(A/F SENSOR - ECM)

Wire Harness Side:





(a) Disconnect the A5 A/F sensor connector.

(b) Disconnect the E5 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
AF+ (A5-3) - A1A+ (E5-23)	Below 1 Ω
AF- (A5-4) - A1A- (E5-22)	Below 1 Ω
HT (A5-1) - HA1A (E5-7)	Below 1 Ω

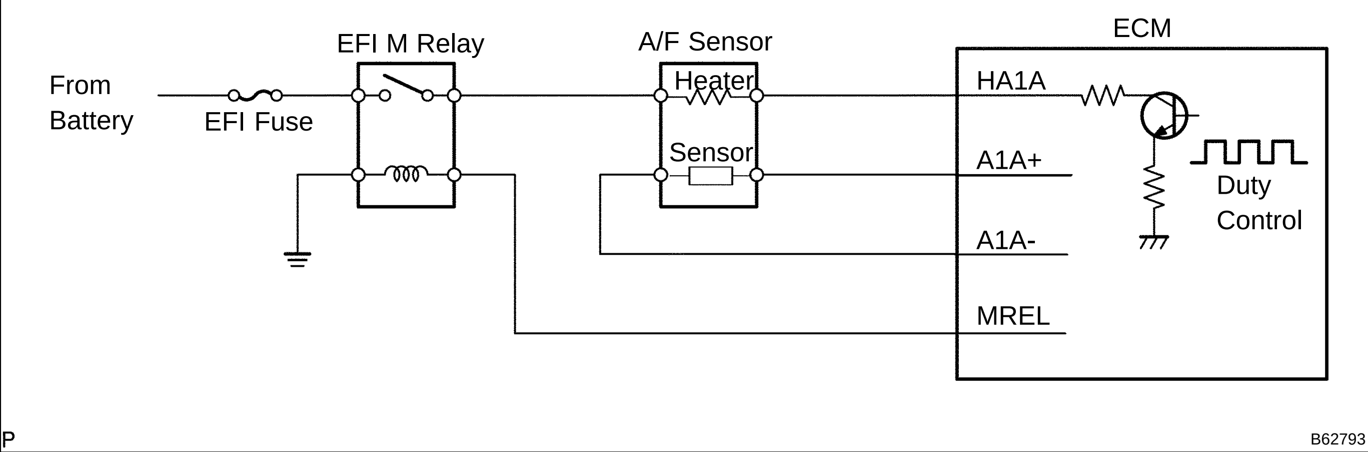
Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A5-3) or A1A+ (E5-23) - Body ground	10 kΩ or higher
AF- (A5-4) or A1A- (E5-22) - Body ground	10 kΩ or higher
HT (A5-1) or HA1A (E5-7) - Body ground	10 kΩ or higher

(d) Reconnect the A/F sensor connector.

(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.
OK: There is no leakage in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7	CHECK CONNECTION OF PCV HOSE

OK: PCV hose is connected correctly and PCV hose has no damage.

NG → REPAIR OR REPLACE PCV HOSE

OK

8	CHECK FUEL PRESSURE (See page 11-7)

OK:
Fuel pressure: 304 to 343 kPa (3.1 to 3.5 kgf/cm^2, 44 to 50 psi)

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

9	INSPECT FUEL INJECTOR ASSY (See page 11-12)

(a) Check the injector injection (high or low fuel injection quantity or poor injection pattern).
OK:
Injection volume: 36 to 46 cm^3 (2.1 to 2.8 cu in.) per 15 seconds.

NG → REPLACE FUEL INJECTOR ASSY (See page 11-12)

OK

10	REPLACE AIR FUEL RATIO SENSOR

GO

11	PERFORM CONFIRMATION DRIVING PATTERN (See page 05-313)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (see page 05-313).

GO

12	READ OUTPUT DTC(SEE IF A/F SENSOR DTC IS OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display (DTC output)	Proceed to
No output	A
P2A00 again.	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05-313)**

A

13	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

OK: Vehicle has run out of the fuel in the past.

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

14	PERFORM CONFIRMATION DRIVING PATTERN (See page 05-313)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (see page 05-313).

GO

15	READ OUTPUT DTC(SEE IF A/F SENSOR DTC IS OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display (DTC output)	Proceed to
P2A00	A
No output	B

B → **Go to step 19**

A

16 REPLACE AIR FUEL RATIO SENSOR

GO

17 PERFORM CONFIRMATION DRIVING PATTERN (See page 05-313)

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (see page 05-313).

GO

18 READ OUTPUT DTC(SEE IF A/F SENSOR DTC IS OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display (DTC output)	Proceed to
No output	A
P2A00	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN (See page 05-313)**

A

19 CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

OK: Vehicle has run out of the fuel in the past.

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTC IS CAUSED BY RUNNING OUT OF FUEL

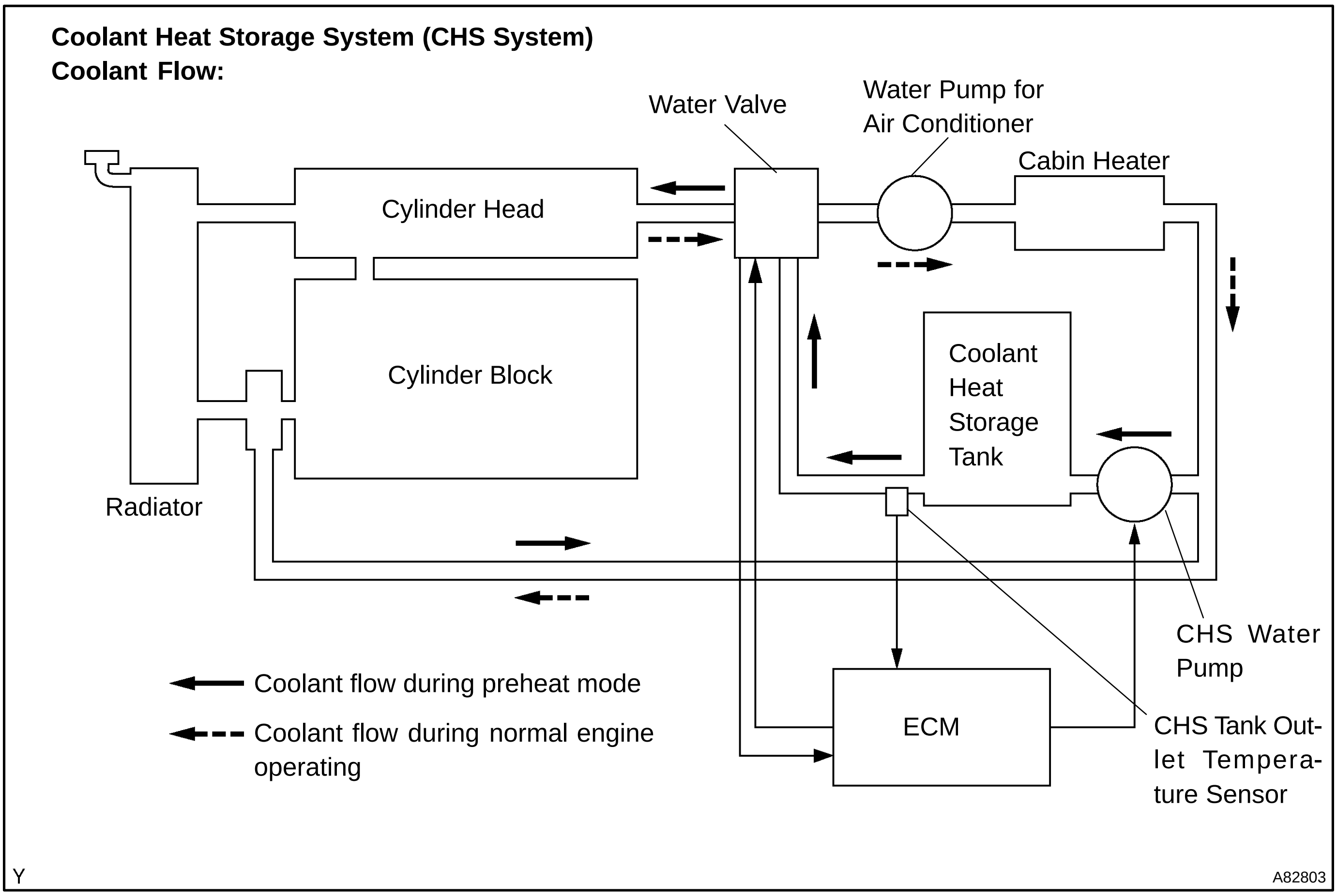
DTC	P1115	COOLANT TEMPERATURE SENSOR CIRCUIT FOR COOLANT HEAT STORAGE SYSTEM

DTC	P1117	COOLANT TEMPERATURE SENSOR CIRCUIT LOW FOR COOLANT HEAT STORAGE SYSTEM

DTC	P1118	COOLANT TEMPERATURE SENSOR CIRCUIT HIGH FOR COOLANT HEAT STORAGE SYSTEM

HINT:
Although each DTC title says ”Coolant Temperature Sensor”, these DTCs are related to the coolant heat storage tank outlet temperature sensor.

CIRCUIT DESCRIPTION



This system uses an electric pump to supply hot coolant stored in the coolant heat storage tank into the cylinder head of the engine, in order to optimize engine starting combustion and reduce the amount of unburned gas that is discharged while the engine is started. Before the engine starts, the ECM operates the electric water pump to direct the hot coolant in the heat storage tank into the engine, in order to heat the cylinder head (this process is called "preheat mode"). The duration of the operation of the electric water pump is variable, depending on the temperature of the cylinder head. During the normal operation of the engine, the water valve opens the passage between the cylinder head and the heater and closes the passage between the cylinder head and the tank. During preheat mode in which the cylinder head is heated, the water valve opens the passage between the tank and the cylinder head, in order to allow the coolant to flow from the tank to the cylinder head. At this time, in order to warm up the intake port quickly before the engine is started, the coolant flows in the reverse direction.
The sensor for the system, which is provided at the tank outlet, is constructed similarly to the engine coolant temperature sensor and is connected to the ECM. The CHS tank outlet temperature sensor has a built in thermistor, whose resistance varies with the coolant temperature.
HINT:
If the ECM detects the DTC P0115, P0117 or P0118, it operates the fail-safe function in which the engine coolant temperature is assumed to be 80°C (176°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P1115	Step 1	Open or short in CHS tank outlet temperature sensor circuit for 0.5 second	• Open or short in CHS tank outlet temperature sensor circuit • CHS tank outlet temperature sensor • ECM
P1117	Step 4	Short in CHS tank outlet temperature sensor circuit.	• Short in CHS tank outlet temperature sensor circuit • CHS tank outlet temperature sensor • ECM
P1118	Step 2	Open in CHS tank outlet temperature sensor circuit	• Open or short in CHS tank outlet temperature sensor circuit • CHS tank outlet temperature sensor • ECM

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to control the coolant heat storage (CHS) system properly. If the sensor output voltage deviates from the normal operating range, the ECM determines that the CHS tank outlet temperature sensor circuit has malfunctioned, and outputs a DTC.
Example:
A sensor output voltage of -40°C (-40°F) or 140°C (284°F) is determined to be malfunction.

MONITOR STRATEGY

Related DTCs	P1115: Coolant temperature sensor circuit for coolant heat storage system P1117: Coolant temperature sensor circuit low for coolant heat storage system P1118: Coolant temperature sensor circuit high for coolant heat storage system
Required sensors / components	Coolant heat storage tank outlet temperature sensor
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P1115:

Sensor resistance (coolant temperature at CHS tank outlet)	Less than 79 Ω or more than 156 kΩ (more than 140°C (284°F) or -40°C (-40°F) or less)

P1117:

Sensor resistance (coolant temperature at CHS tank outlet)	Less than 79 Ω (more than 140°C (284°F))

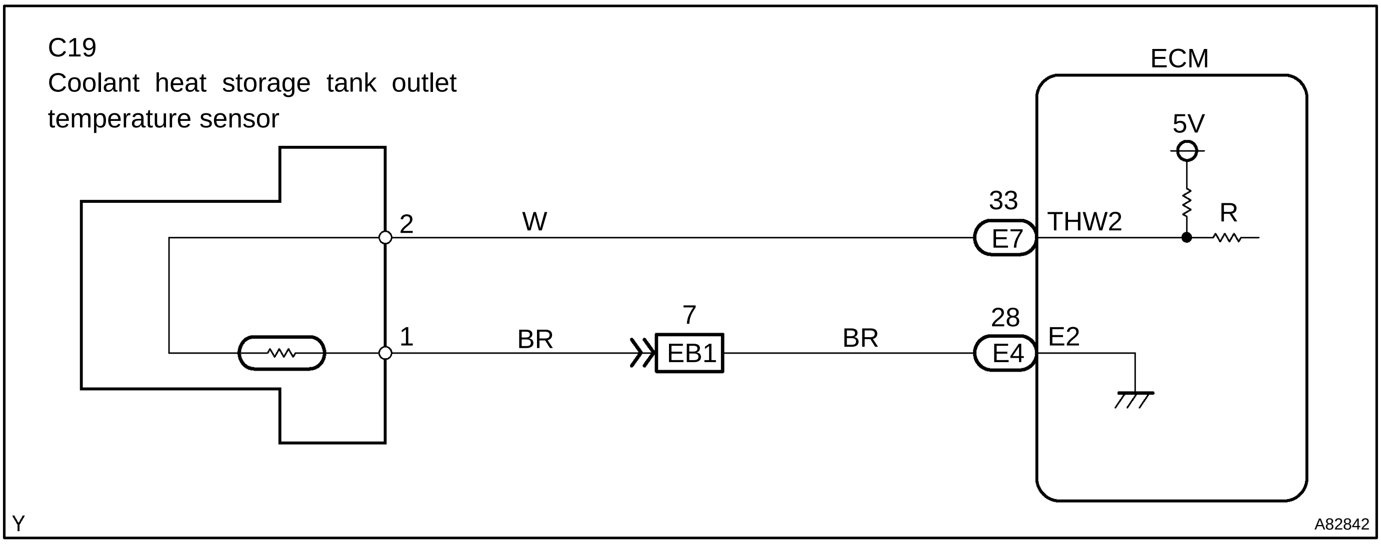
P1118:

Sensor resistance (coolant temperature at CHS tank outlet)	More than 156 kΩ (-40 °C (-40°F) or less)

COMPONENT OPERATING RANGE

Sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (-40°C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

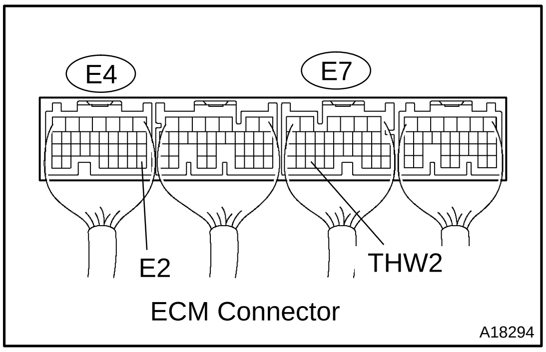
CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine is cold.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ECM(THW2 - E2 VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure voltage between the terminals THW2 and E2 of the ECM E4 and E7 connector.

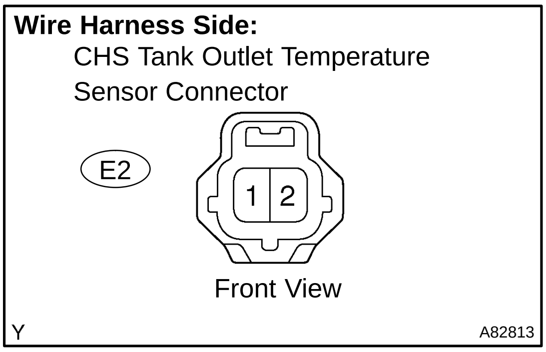
Standard:

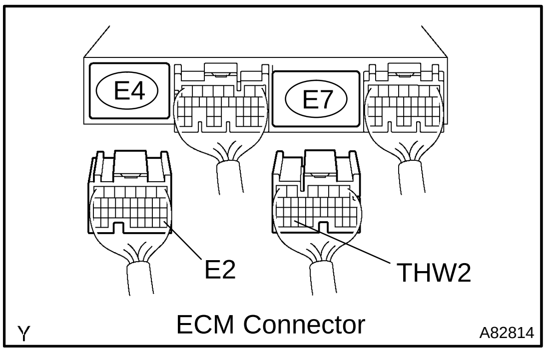
Water Temperature °C (°F)	Voltage
20 (68)	0.5 to 3.4 V
60 (140)	0.2 to 1.0 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

NG

2	CHECK HARNESS AND CONNECTOR(CHS TANK OUTLET TEMPERATURE SENSOR - ECM)





(a) Check the harness and the connectors between the coolant heat storage tank outlet temperature sensor and the ECM connectors.
(1) Disconnect the E2 engine coolant heat storage tank outlet temperature sensor connector.
(2) Disconnect the E4 and E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CHS temperature sensor (E2-2) - THW2 (E7-33)	Below 1 Ω
CHS temperature sensor (E2-1) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

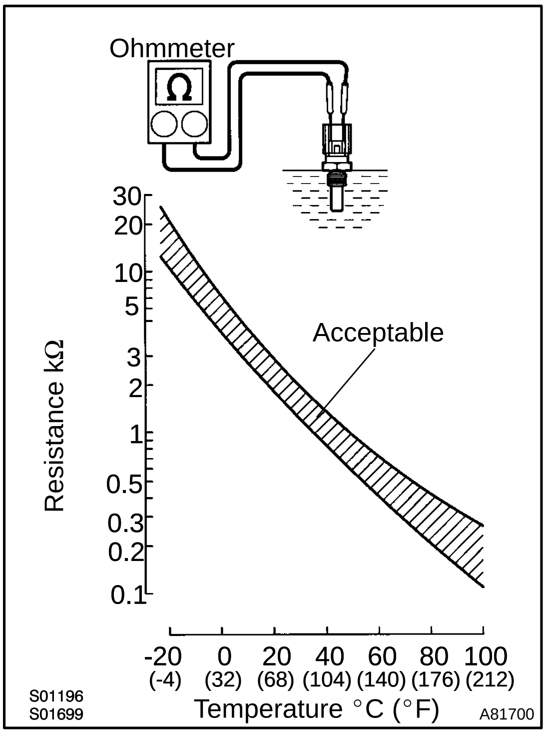
Tester Connection	Specified Condition
CHS temperature sensor (E2-2) or THW2 (E7-33) - Body ground	10 kΩ or higher

(4) Reconnect the coolant heat storage tank outlet temperature sensor connector.
(5) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	INSPECT TEMPERATURE SENSOR(CHS TANK OUTLET TEMPERATURE SENSOR)



(a) Remove the coolant heat storage (CHS) tank outlet temperature sensor.

(b) Measure the resistance between the terminals.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:
In case of checking the CHS tank outlet temperature sensor in the water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed CHS tank outlet temperature sensor and read the resistance. Use an infrared thermometer to measure the CHS tank outlet temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the coolant heat storage tank outlet temperature sensor.

NG → **REPLACE TEMPERATURE SENSOR**

OK

REPLACE ECM (See page 10-24)

DTC	P1116	COOLANT TEMPERATURE SENSOR CIRCUIT STACK FOR COOLANT HEAT STORAGE SYSTEM

CIRCUIT DESCRIPTION

Refer to DTC P1115 on page 05-270 .

DTC No.	Detection Condition	Trouble Area
P1116	• Temperature change during hot coolant recovering: 1°C (1.8 °F) or less • Difference between CHS tank outlet temperature and engine coolant temperature during hot coolant recovering: 25°C (45°F) or more	• Coolant heat storage tank outlet temperature sensor • Cooling system (clogging)

MONITOR DESCRIPTION

The coolant heat storage (CHS) tank outlet temperature sensor is used for monitoring coolant temperature in the vicinity of the outlet port of the heat storage tank of the CHS system. The resistance of the sensor increases when the CHS tank outlet temperature is low, and conversely, the resistance decreases when the temperature is high. The changes in resistance are reflected in the voltage that is output by the sensor. The ECM monitors the sensor voltage and uses this value to control CHS system properly.
If the sensor output voltage deviates from the normal operating range, the ECM determines that the CHS tank outlet temperature sensor circuit has malfunctioned, and sets a DTC.
Examples:
1) No changes occur in the CHS tank outlet temperature sensor signal (over 1°C [1.8 °F]) after a predetermined length of time has elapsed from the start of the coolant recovering.
2) A significant difference (over 25°C [45 °F]) exists between the engine coolant temperature signal and the CHS tank outlet temperature sensor signal after a predetermined length of time has elapsed from the start of the coolant recovering.

MONITOR STRATEGY

Related DTCs	P1116 : Coolant temperature sensor circuit range check (stuck)
Required sensors/components	Main: Coolant heat storage tank outlet temperature sensor Related: Engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	45 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
Coolant heat recovering	ON
Difference between engine coolant temperature and CHS tank outlet temperature	More than 30°C (54 °F)

TYPICAL MALFUNCTION THRESHOLDS

Temperature variation of CHS tank outlet during hot coolant recovery	1°C or less
Difference between temperatures of CHS tank outlet and engine coolant during hot coolant recovery	More than 25°C (45 °F)

WIRING DIAGRAM

Refer to DTC P1115 on page 05-270

INSPECTION PROCEDURE

CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine is cold.

HINT:

- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1116)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P1116	A
P1116 and other DTCs	B

HINT:

If any other codes besides P1116 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2 CHECK COOLING SYSTEM(CHECK FOR CLOGGING IN THE COOLANT SYSTEM)

OK: Coolant passage has no blockage.

NG → **REPAIR OR REPLACE COOLING SYSTEM**

OK

REPLACE TEMPERATURE SENSOR (CHS TANK OUTLET TEMPERATURE SENSOR)

DTC	P1120	COOLANT FLOW CONTROL VALVE POSITION SENSOR CIRCUIT

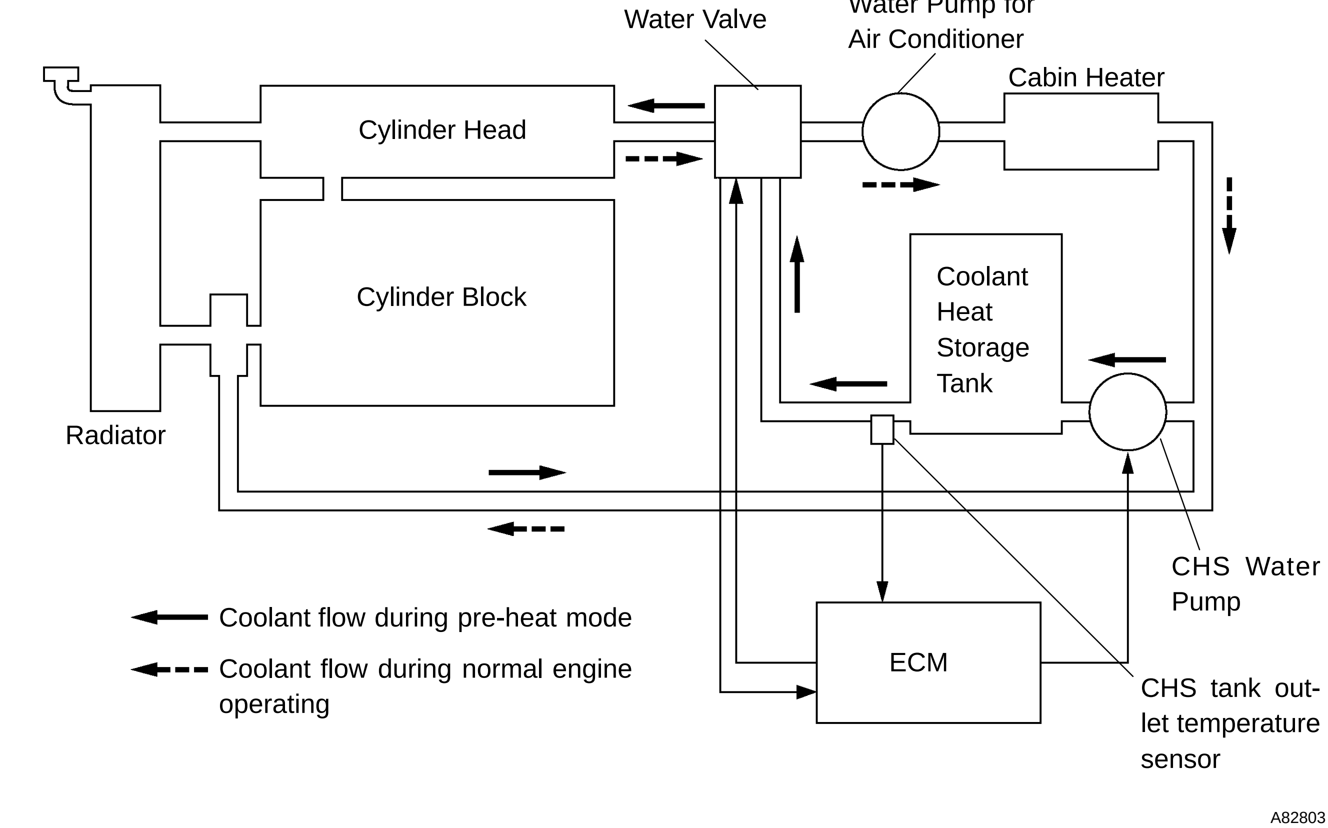
DTC	P1122	COOLANT FLOW CONTROL VALVE POSITION SENSOR CIRCUIT LOW

DTC	P1123	COOLANT FLOW CONTROL VALVE POSITION SENSOR CIRCUIT HIGH

HINT:
Although each DTC title says "Coolant Flow Control Valve", these DTCs are related to the water valve.

CIRCUIT DESCRIPTION

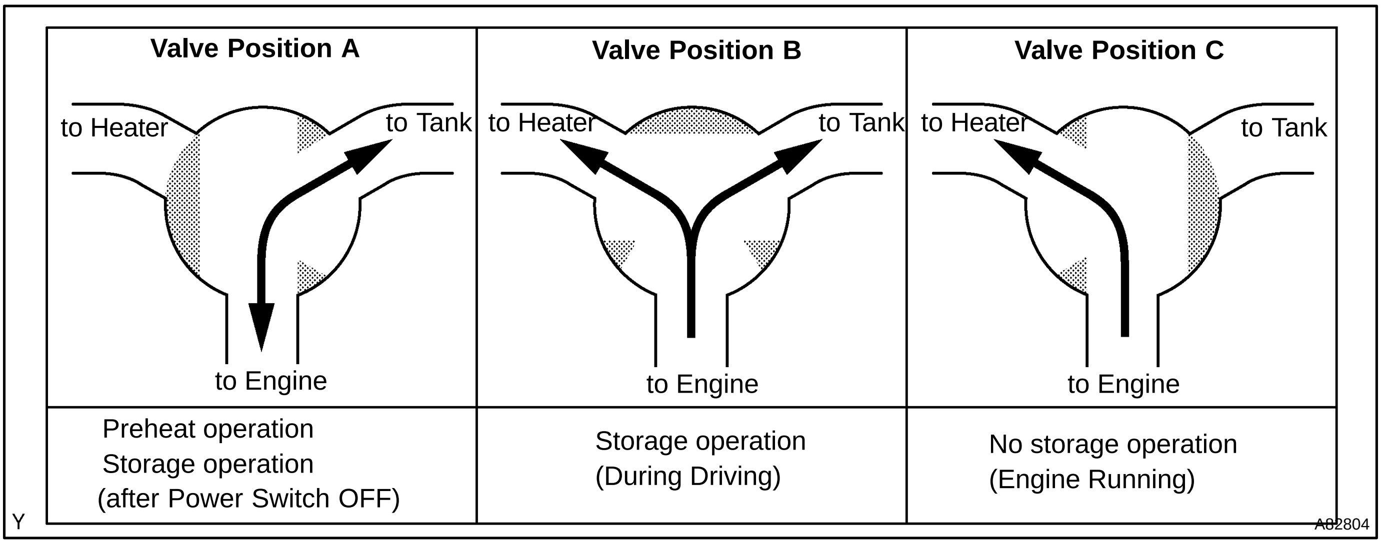
Coolant Heat Storage System (CHS System)
Coolant Flow:



This system uses an electric pump to supply hot coolant stored in the heat storage tank into the cylinder head of the engine, in order to optimize engine starting combustion and reduce the amount of unburned gas that is discharged while the engine is started. Before the engine starts, the ECM operates the electric water pump to direct the hot coolant in the heat storage tank into the engine, in order to heat the cylinder head (this process is called ”preheat mode”). The duration of the operation of the electric water pump is variable, depending on the temperature of the cylinder head. During the normal operation of the engine, the water valve opens the passage between the cylinder head and the heater and closes the passage between the cylinder head and the tank. During preheat mode in which the cylinder head is heated, the water valve opens the passage between the tank and the cylinder head, in order to allow the coolant to flow from the tank to the cylinder head. At this time, in order to warm up the intake port quickly before the engine is started, the coolant flows in the reverse direction.
The water valve for the coolant heat storage (CHS) system, which is located at the heater hoses, controls the coolant passages to the engine, heater core, and the CHS tank in accordance with the operating conditions of the system.
The water valve consists of a water valve, valve position sensor, and valve control motor. The potentiometer, which is coupled coaxially to the water valve, converts the valve position into voltage and transmits it to the ECM in the form of a position signal.

DTC No.	Detection Condition	Trouble Area
P1120	Water valve position sensor voltage is less than 0.2V or more than 4.8V	• Open or short in water valve position sensor circuit • Water valve (Coolant flow control valve) • ECM
P1122	Water valve position sensor voltage stays less than 0.2V for 2 seconds or more	• Water valve (Coolant flow control valve) • Short in WBAD circuit • Open in VC circuit • ECM
P1123	Water valve position sensor voltage stays more than 4.8V for 2 seconds or more	• Water valve (Coolant flow control valve) • Open in WBAD circuit • Open in E2 circuit • VC and WBAD circuits are short-circuited • ECM

MONITOR DESCRIPTION



A potentiometer is provided in the coolant heat storage (CHS) system. The ECM uses the valve position signal output by the water valve for effecting control that is appropriate for the operating condition of the engine. The water valve effects control in three steps as indicated below, and the ECM determines the position of the valve according to the voltage of the respective step.
If the signal output by the water valve exceeds the normal range, the ECM determines that a malfunction has occurred in the water valve position sensor circuit and outputs a DTC.

Water Valve Operation

System Condition	Valve Position	Coolant Flow
Normal engine operation	C	Engine to Cabin heater
Preheat mode	A	Coolant heat storage tank to Engine
Coolant recovering (after engine stop)	A	Engine to Coolant heat storage tank
Coolant recovering (while engine is running)	B	Engine to Cabin heater and Coolant heat storage tank
Soak mode	A	Coolant heat storage tank to Engine

MONITOR STRATEGY

Related DTCs	• P1120: Coolant flow control valve (Water valve) position sensor circuit range check (fluttering) • P1122: Coolant flow control valve (Water valve) position sensor circuit range check (low voltage) • P1123: Coolant flow control valve (Water valve) position sensor circuit range check (high voltage)
Required sensors / components	Water valve position sensor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P1120:

Water valve position signal	Less than 0.2V or more than 4.8V

P1122:

Water valve position signal	Less than 0.2V

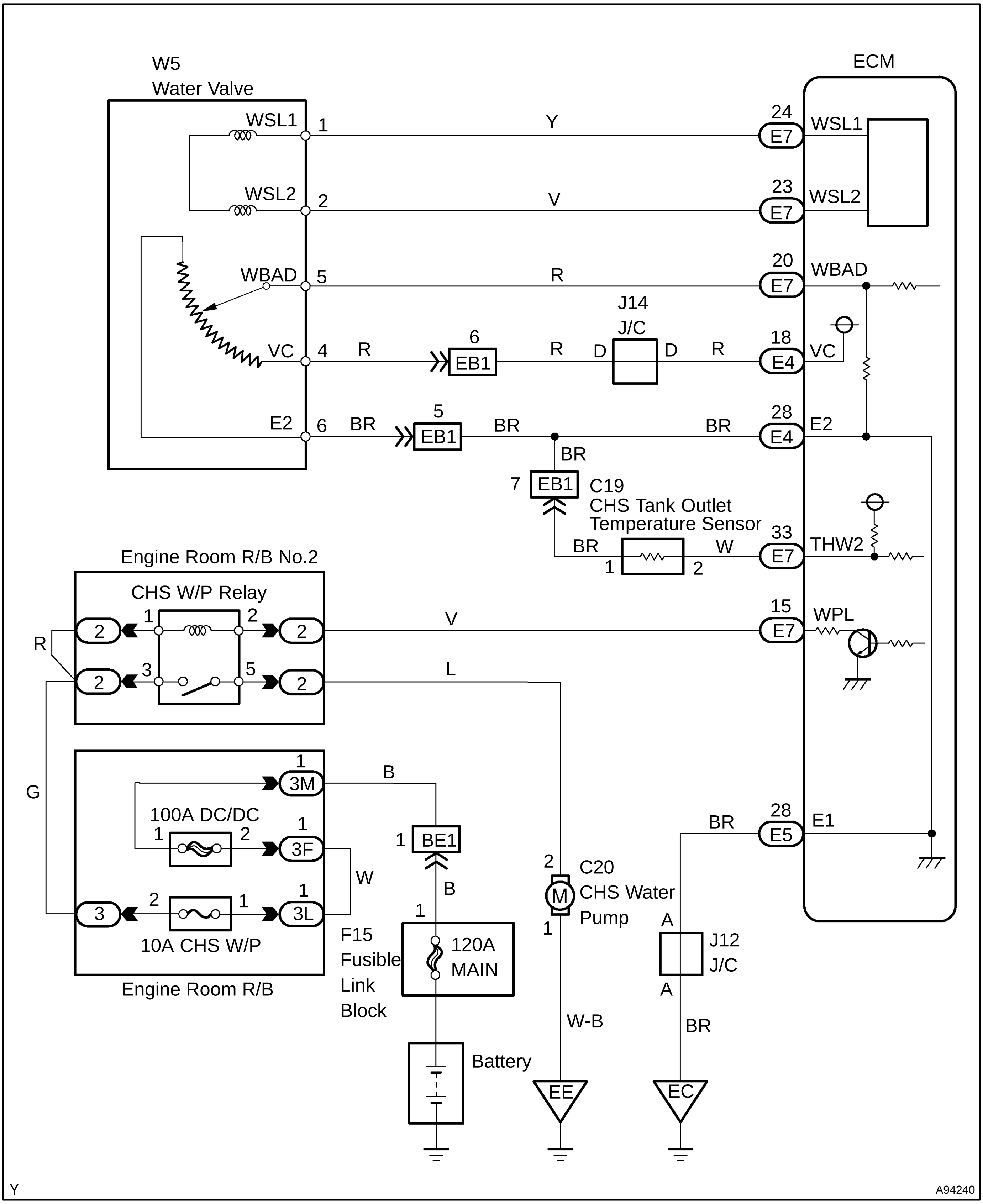
P1123:

Water valve position signal	More than 4.8V

COMPONENT OPERATING RANGE

Water valve position signal	0.4 to 2.2V

WIRING DIAGRAM



INSPECTION PROCEDURE

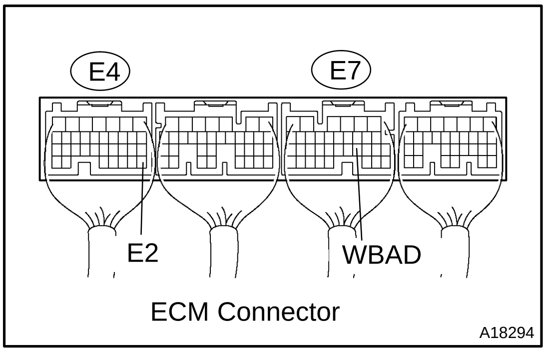
CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine is cold.

HINT:

- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	INSPECT ECM (WBAD - E2 VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure voltage between the terminals WBAD and E2 of the E4 and E7 ECM connectors.

Standard:

Water Valve	Voltage V
Valve position "A" (Preheat mode)	Approximately 2.5 V
Valve position "B" (Recovering mode)	Approximately 3.5 V
Valve position "C" (Normal Operation)	Approximately 4.5 V

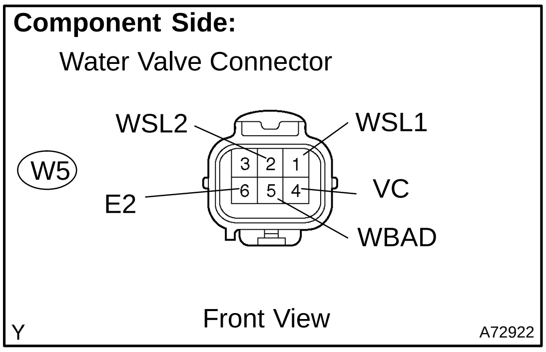
HINT:

After the HV main system is turned OFF (READY to IG OFF condition), the valve position will be set to position A.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

NG

2	INSPECT WATER W/BRACKET VALVE ASSY



(a) Disconnect the W5 water valve connector.

(b) Measure resistance between terminals WSL1 and WSL2 of the water valve connector.

(c) Measure resistance between terminals WBAD and E2 of the water valve connector.

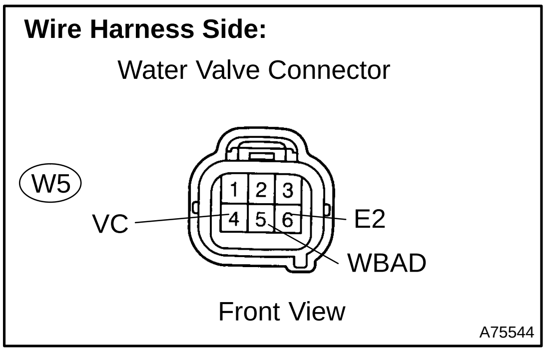
RESISTANCE:

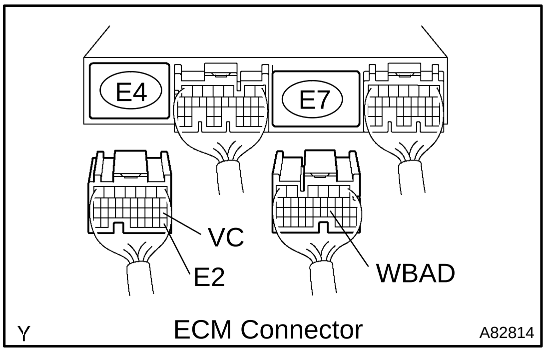
Terminals	Condition	Resistance kΩ
1 - 2	Motor resistance	Approximately 0.04
5 - 6	Sensor resistance	0.2 to 5.7

NG → **REPLACE WATER W/BRACKET VALVE ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(WATER VALVE - ECM)





(a) Disconnect the W5 water valve connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Water valve (W5-5) - WBAD (E7-20)	Below 1 Ω
Water valve (W5-4) - VC (E4-18)	Below 1 Ω
Water valve (W5-6) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Water valve (W5-5) or WBAD (E7-20) - Body ground	10 kΩ or higher

(d) Reconnect the water valve connector.
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

DTC	P1121	COOLANT FLOW CONTROL VALVE POSITION SENSOR CIRCUIT STUCK

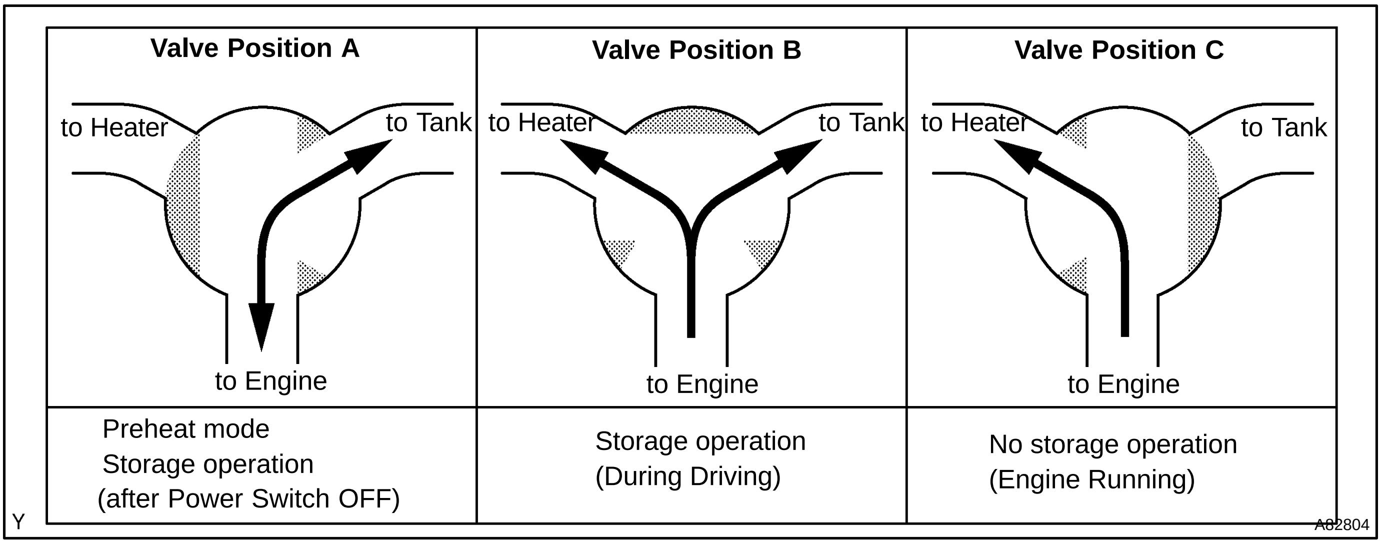
HINT:
- Although each DTC title says "Coolant Flow Control Valve", these DTCs are related to the water valve.
- CHS stands for Coolant Heat Storage.

CIRCUIT DESCRIPTION

Refer to DTC P1120 on page 05-277 .

DTC No.	Detection Condition	Trouble Area
P1121	• Water valve position sensor output voltage: No change despite the ECM sending a valve control signal or slow response • CHS tank outlet temperature sensor output: 60°C (140°F) or more (when hot coolant recovering starts) • CHS tank outlet temperature sensor output: No change despite the hot coolant is recovered	• Water valve • Cooling system (clogging) • ECM

MONITOR DESCRIPTION



The ECM monitors the position of the water valve based on the valve position signal that is output by the water valve position sensor (potentiometer), which is coupled coaxially to the valve. The water valve effects control in three steps as indicated above, and the ECM determines the position of the valve according to the voltage of the respective step.

In order to ensure the proper monitoring of the water valve, the ECM checks for malfunctions with the combination of the output of the potentiometer and CHS tank outlet temperature sensor.

If no changes occur in the valve position signal that is being input into the ECM or if the response signal from the water valve is very slow, despite of the ECM commanding the water valve motor to operate the ECM determines that malfunction has occurred in the water valve position sensor circuit, and sets a DTC.

MONITOR STRATEGY

Potentiometer detection

Related DTCs	P1121: Coolant flow control valve position sensor circuit stuck
Required sensors/components	Main: Water valve Related: CHS tank outlet temperature sensor
Frequency of operation	Once per driving cycle
Duration	20 seconds
MIL operation	1 driving cycle
Sequence of operation	None

Tank outlet coolant temperature detection

Related DTCs	P1121: Coolant flow control valve position sensor circuit stuck
Required sensors/components	Main: Water valve Related: CHS tank outlet temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Potentiometer detection

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
Battery voltage	10 V or more
Engine coolant temperature	0°C (32°F) or more
Water valve operation	Commanded
Response time of valve movement	Time under calculation with valve position

Tank outlet coolant temperature detection

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
Battery voltage	10 V or more
System status	During recovering
CHS tank outlet temperature difference between preheating start and engine start	20°C (36 °F) or more
Difference between engine coolant temperature and CHS tank outlet temperature	30°C (54 °F) or more

TYPICAL MALFUNCTION THRESHOLDS

Potentiometer detection

Either of the following conditions is met:	(a) or (b)
(a) Potentiometer output difference [D divided C] C: Difference between previous and current target D: Difference between potentiometer output and previous target	10 % or more
(b) Potentiometer output deviation from target	0.1 V or more

Tank outlet coolant temperature detection

Either of the following conditions is met:	(a) or (b)
(a) Heat storage tank outlet coolant temperature when recover starts	60°C (108 °F) or more
(b) Heat storage tank outlet coolant temperature difference during water valve check	Less than 3°C (5.4 °F)

WIRING DIAGRAM

Refer to DTC P1120 on page 05-277 .

INSPECTION PROCEDURE

CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine is cold.

HINT:

- If DTCs P1121 and P1150 are detected simultaneously, there may be malfunction in the water valve system.
- If DTC P1121 is detected, coolant passages may be clogged.
- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held tester:

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1121)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

Display (DTC Output)	Proceed to
P1121	A
P1121 and other DTCs	B

HINT:
If any other codes besides P1121 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2	PERFORM ACTIVE TEST BY HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Put the engine in inspection mode (see page 01-27).
(e) Start the engine and warm it up.
(f) Select the items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / WATER FLW VLV3, WATER FLW VLV4 or WATER FLW VLV5.
(g) Measure the voltage between terminals WBAD and E2 of the ECM connector.

Standard:

Tester Operation	Specified Condition
"WATER FLW VLV 3" ON	Approximately 2.5 V
"WATER FLW VLV 4" ON	Approximately 3.5 V
"WATER FLW VLV 5" ON	Approximately 4.5 V

NG → **REPLACE WATER W/BRACKET VALVE ASSY**

OK

3	CHECK COOLING SYSTEM(CHECK FOR CLOGGING IN THE COOLANT SYSTEM)

OK: Coolant passages are not clogged.

NG → **REPAIR OR REPLACE COOLING SYSTEM**

OK

REPLACE ECM (See page 10-24)

OBD II scan tool (excluding hand-held tester):

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1121)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.
Result:

Display (DTC Output)	Proceed to
P1121	A
P1121 and other DTCs	B

HINT:
If any other codes besides P1121 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

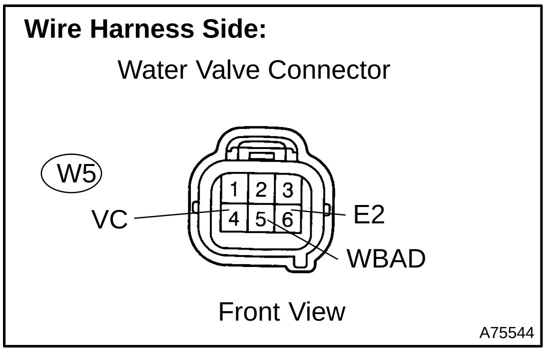
2	CHECK COOLING SYSTEM(CHECK FOR CLOGGING IN THE COOLANT SYSTEM)

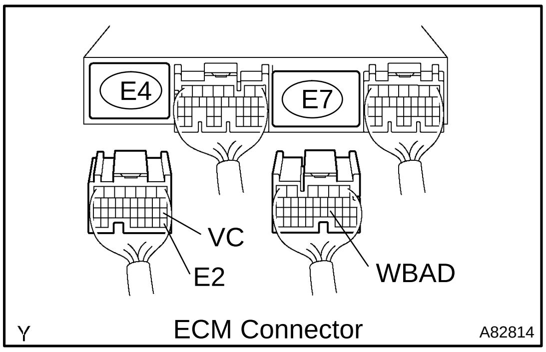
OK: Coolant passages are not clogged.

NG → **REPAIR OR REPLACE COOLING SYSTEM**

OK

3	CHECK HARNESS AND CONNECTOR(WATER VALVE - ECM)





(a) Disconnect the W5 water valve connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.
Standard (Check for open):

Tester Connection	Specified Condition
Water valve (W5-5) - WBAD (E7-20)	Below 1 Ω
Water valve (W5-4) - VC (E4-18)	Below 1 Ω
Water valve (W5-6) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Water valve (W5-5) or WBAD (E7-20) - Body ground	10 kΩ or higher

(d) Reconnect the water valve connector.
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	REPLACE WATER W/BRACKET VALVE ASSY

GO

5	PERFORM SIMULATION TEST

(a) Put the engine in inspection mode and start the engine.
(b) Warm up the engine until the engine coolant temperature reaches more than 90°C (185°F).
(c) Cool the engine down completely.
(d) Perform the processes (a) to (c) twice.

GO

6	CHECK IF DTC OUTPUT RECURS

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
No output	A
P1121	B

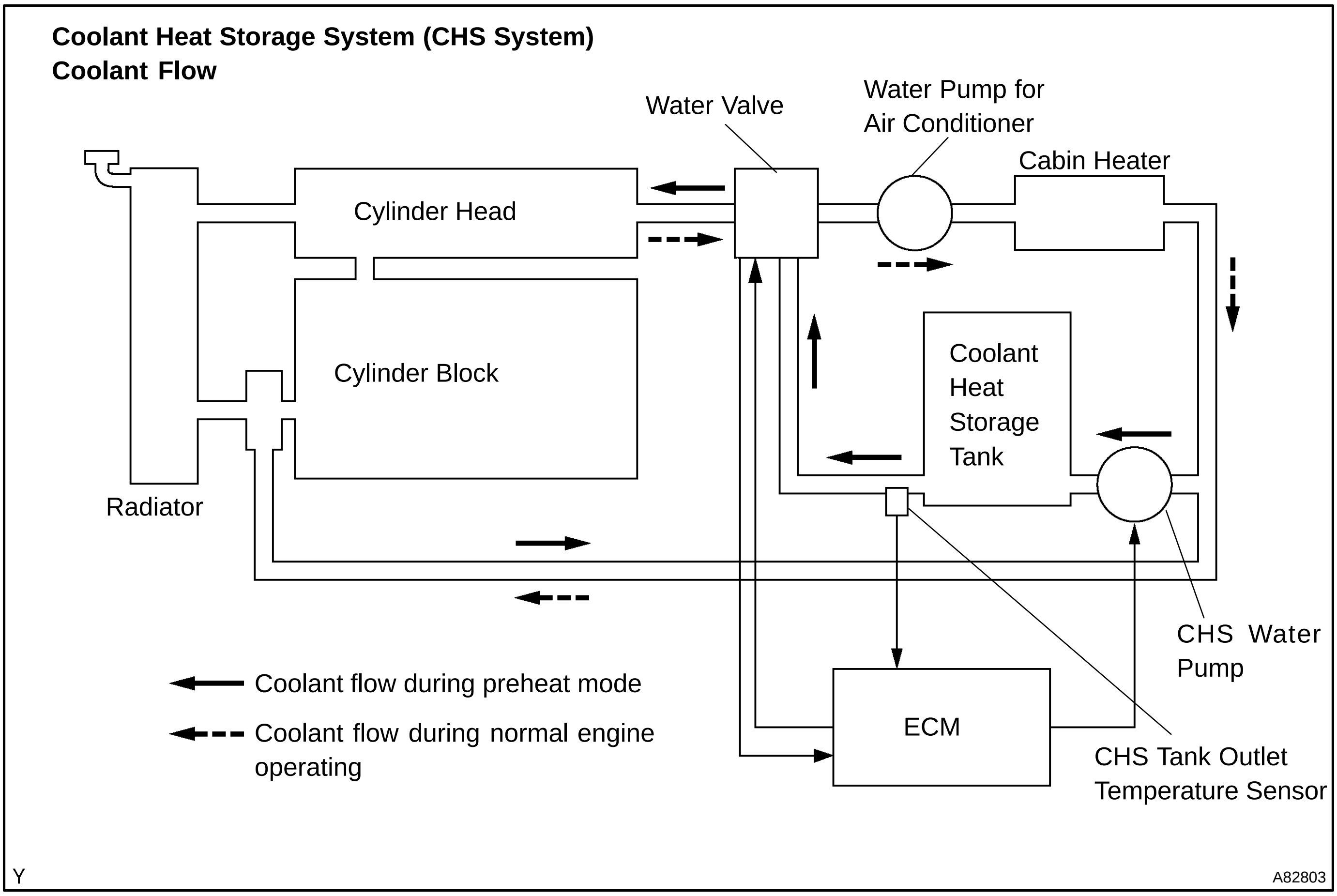
B → REPLACE ECM (See page 10-24)

A

SYSTEM OK

DTC	P1150	COOLANT PATH CLOG UP FOR COOLANT HEAT STORAGE SYSTEM

CIRCUIT DESCRIPTION



This system uses an electric pump to supply hot coolant stored in the coolant heat storage (CHS) tank into the cylinder head of the engine, in order to optimize engine starting combustion and reduce the amount of unburned gas that is discharged while the engine is started. Before the engine starts, the ECM operates the electric water pump to direct the hot coolant in the CHS tank into the engine, in order to heat the cylinder head (this process is called "preheat mode"). The duration of the operation of the electric water pump is variable, depending on the temperature of the cylinder head. During normal operation of the engine, the water valve opens the passage between the cylinder head and the heater and closes the passage between the cylinder head and the tank. During the preheat mode in which the cylinder head is heated, the water valve opens the passage between the tank and the cylinder head, in order to allow the coolant to flow from the tank to the cylinder head. At this time, in order to warm up the intake port quickly before the engine is started, the coolant flows in the reverse direction.
This system consists of the CHS tank, CHS water pump, CHS tank outlet temperature sensor, water valve, and a soak timer that is built in the ECM.

DTC No.	Detection Condition	Trouble Area
P1150	Following conditions are met: • Change in CHS tank outlet temperature and engine coolant temperature after water pump is ON during preheat mode: below 2°C (3.6 °F) • Change in CHS tank outlet temperature as water valve is opened to tank, on a warm engine: below 3°C (5.4 °F)	• CHS tank outlet temperature sensor • Water valve (Coolant flow control valve) • Cooling system (clogging) • ECM

MONITOR DESCRIPTION

The ECM detects malfunction in the coolant heat storage (CHS) system with the CHS tank outlet temperature signal, the position of the water valve and the engine running condition. In order to ensure the reliable malfunction detection, the ECM detects coolant passage clogging malfunction in two ways. Thus, when the following two detection conditions are met, the ECM determines that the coolant passage has clogged and sets a DTC.

- When starting the engine, a variation in the CHS tank outlet temperature and engine coolant temperature before and after preheating is below 2 °C (3.6 °F).
- After the engine is warmed up, a variation in the CHS tank outlet temperature when the ECM opens the water valve is below 3°C (5.4 °F).

MONITOR STRATEGY

Related DTCs	P1150: Coolant path clog up for coolant heat storage system
Required sensors/components	CHS tank outlet temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
Coolant heat storage water pump operation time	3 seconds or more
Variation in CHS tank coolant temperature and engine coolant temperature before and after preheating	2°C (3.6°F) or less
Engine coolant temperature	65°C (149°F) or more

TYPICAL MALFUNCTION THRESHOLDS

Variation in CHS tank coolant temperature during passage clogging check	Less than 3°C (5.4°F)

WIRING DIAGRAM

Refer to DTC P1115 on page 05-270 .

INSPECTION PROCEDURE

CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine and the radiator are cold.

HINT:

- The detection of this DTC may indicate that the coolant heat storage (CHS) tank outlet water temperature sensor stuck or the water valve stuck.
- If DTC P1121 is detected, coolant passages may be clogged.
- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand-held tester:

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1150)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

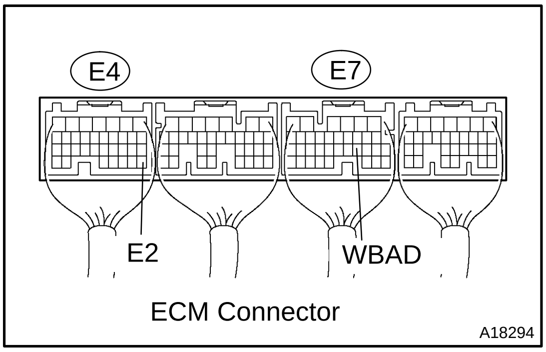
Display (DTC Output)	Proceed to
P1150	A
P1150 and other DTCs	B

HINT:
If any other codes besides P1150 are output, perform troubleshooting for those DTCs first.

B **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2 PERFORM ACTIVE TEST BY HAND-HELD TESTER



(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Put the engine in inspection mode (see page 01-27).
(e) Start the engine and warm it up.
(f) Select the items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / WATER FLW VLV3, WATER FLW VLV4 and WATER FLW VLV5.
(g) Measure the voltage between terminals WBAD and E2 of the ECM connector.

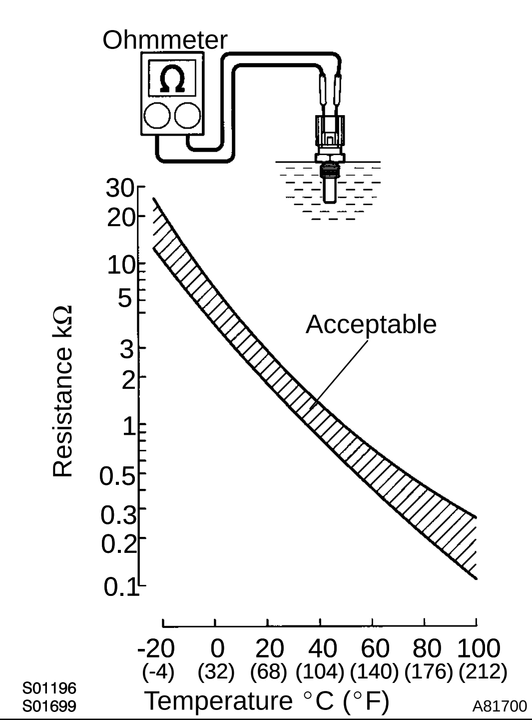
Standard:

Tester Operation	Specified Condition
"WATER FLW VLV 3" ON	Approximately 2.5 V
"WATER FLW VLV 4" ON	Approximately 3.5 V
"WATER FLW VLV 5" ON	Approximately 4.5 V

NG **REPLACE WATER W/BRACKET VALVE ASSY**

OK

3	INSPECT TEMPERATURE SENSOR



(a) Remove the CHS tank outlet temperature sensor.
(b) Measure the resistance between the terminals.
Resistance:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:
In case of checking the CHS tank outlet temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed CHS tank outlet temperature sensor and read the resistance. Use an infrared thermometer to measure the CHS tank outlet temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the CHS tank outlet temperature sensor.

NG → **REPLACE TEMPERATURE SENSOR**

OK

CHECK COOLING SYSTEM (CHECK FOR CLOGGING IN THE COOLING SYSTEM)

OBD II scan tool (excluding hand-held tester):

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1150)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.

Result:

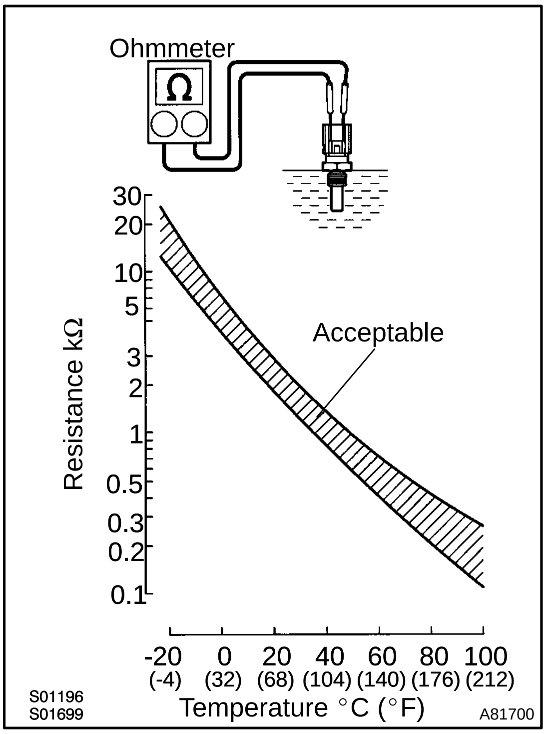
Display (DTC Output)	Proceed to
P1150	A
P1150 and other DTCs	B

HINT:
If any other codes besides P1150 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-55)

A

2	INSPECT TEMPERATURE SENSOR



(a) Remove the CHS tank outlet temperature sensor.
(b) Measure the resistance between the terminals.

Resistance:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:
In case of checking the CHS tank outlet temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

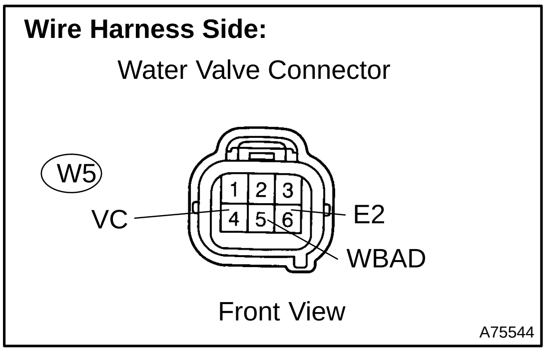
HINT:
Alternate procedure: Connect an ohmmeter to the installed CHS tank outlet temperature sensor and read the resistance. Use an infrared thermometer to measure the CHS tank outlet temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

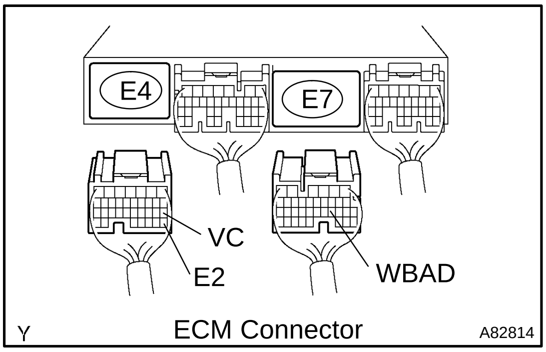
(c) Reinstall the CHS tank outlet temperature sensor.

NG → **REPLACE TEMPERATURE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR





(a) Disconnect the W5 water valve connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Water valve (W5-5) - WBAD (E7-20)	Below 1 Ω
Water valve (W5-4) - VC (E4-18)	Below 1 Ω
Water valve (W5-6) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Water valve (W5-5) or WBAD (E7-20) - Body ground	10 kΩ or higher

(d) Reconnect the water valve connector.
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK COOLING SYSTEM(CHECK FOR CLOGGING IN THE COOLING SYSTEM)

OK: Coolant passages are not clogged.

NG → **REPAIR OR REPLACE COOLING SYSTEM**

OK

5 REPLACE WATER W/BRACKET VALVE ASSY

GO

6 PERFORM SIMULATION TEST

(a) Put the engine in inspection mode and start the engine.
(b) Warm up the engine until the engine coolant temperature reaches more than 85°C (185 °F).
(c) Cool the engine down completely.
(d) Perform the steps (a) to (c) twice.

GO

7	READ OUTPUT DTCS

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
No output	A
DTC P1150	B

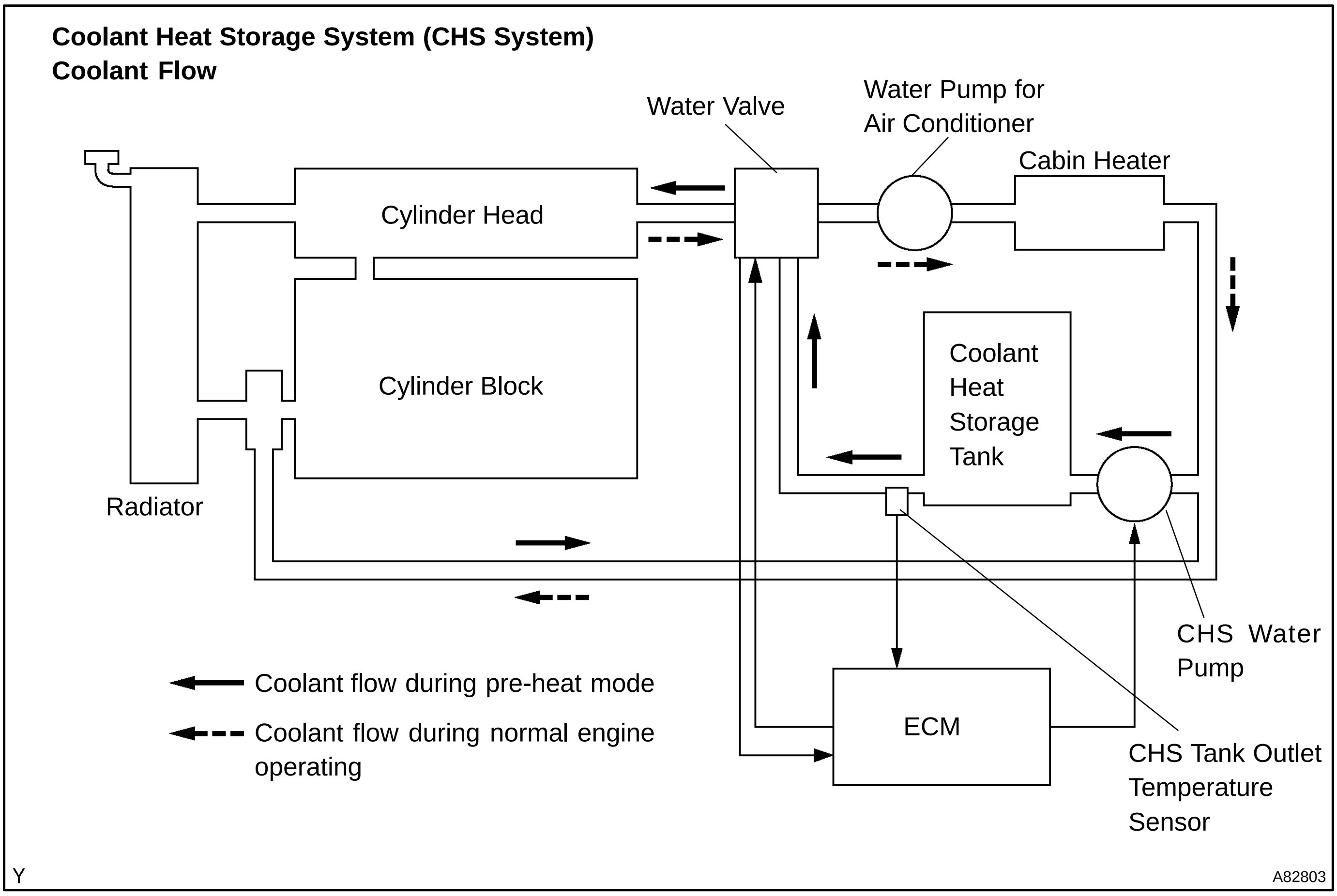
B → **REPLACE ECM (See page 10-24)**

A

SYSTEM OK

DTC	P1151	COOLANT HEAT STORAGE TANK

CIRCUIT DESCRIPTION



This system uses an electric pump to supply hot coolant stored in the coolant heat storage (CHS) tank into the cylinder head of the engine, in order to optimize engine starting combustion and reduce the amount of unburned gas that is discharged while the engine is started. Before the engine starts, the ECM operates the electric water pump to direct the hot coolant in the CHS tank into the engine, in order to heat the cylinder head (this process is called "preheat mode"). The duration of the operation of the electric water pump is variable, depending on the temperature of the cylinder head. During normal operation of the engine, the water valve opens the passage between the cylinder head and the heater and closes the passage between the cylinder head and the tank. During the preheat mode in which the cylinder head is heated, the water valve opens the passage between the tank and the cylinder head, in order to allow the coolant to flow from the tank to the cylinder head. At this time, in order to warm up the intake port quickly before the engine is started, the coolant flows in the reverse direction.
This system consists of the CHS tank, CHS water pump, CHS tank outlet temperature sensor, water valve, and a soak timer that is built in the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1151	Following conditions are successively met: • CHS tank outlet temperature during preheating: below 50°C (122°F) (2 trip detection condition) • CHS tank outlet temperature during soaking: 30 °C (54 °F) or more lower than during coolant recovering	• Coolant heat storage tank

MONITOR DESCRIPTION

The ECM detects malfunction in the coolant heat storage (CHS) system with the CHS tank coolant temperature, the position of the water valve, the running condition of the engine and the operating condition of the soak timer. The soak timer built in the ECM prompts the ECM to actuate the water pump 5 hours after the HV main system has been turned OFF by using the power switch. The ECM then checks the heat retention condition of the CHS tank. In order to ensure the reliable malfunction detection, the ECM detects the CHS tank heat retention malfunction in two ways. thus, when the following two detection conditions are consecutively met, the ECM determines that the heat retention has deteriorated and sets a DTC.

(1) During preheating, the CHS tank outlet water temperature is below 50°C (122°F) (2 trip detection logic).

(2) During soaking, the CHS tank outlet temperature is more than 30°C (86°F) lower than that during the got coolant recovery.

MONITOR STRATEGY

Related DTCs	P1151: Coolant heat storage tank
Required sensors/components	CHS tank outlet temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
Coolant heat storage water pump operation time	3 seconds or more
Storage coolant temperature	More than 75°C (167°F)

TYPICAL MALFUNCTION THRESHOLDS

Difference storage coolant temperature and heat storage tank outlet coolant temperature	30°C (54 °F) or more

INSPECTION PROCEDURE

CAUTION:

Be careful when replacing any part in the system or changing the coolant because the coolant in the heat storage tank is hot even if the engine and the radiator are cold.

NOTICE:

If air breeding is not performed completely, this DTC may be detected after changing the coolant.

HINT:

- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE COOLANT HEAT STORAGE TANK

DTC	P1455	VAPOR REDUCING FUEL TANK SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

Using the heated oxygen sensor and VSV for purge flow switching valve (bypass VSV), the ECM detects fuel leaks from inside a bladder tank the fuel tank.
Based on signals from the heated oxygen sensor while the VSV for purge flow switching valve is ON, the ECM judges if fuel is leaked from the bladder tank or not.

DTC No.	DTC Detection Condition	Trouble Area
P1455	When VSV for purge flow switching valve is ON, vapor density of air which flows from EVAP VSV into intake manifold is high	• Hose and pipe for EVAP system • Fuel system • ECM

MONITOR DESCRIPTION

The ECM detects leakage of evaporative emissions from the bladder membrane by using the heated oxygen sensor and VSV for the purge switching valve. By opening the EVAP VSV and then closing the VSV for purge flow switching valve, air in the outer tank is drawn into the intake manifold.
The ECM checks concentration of hydrocarbon (HC) molecules in the air drawn from the bladder membrane area. Also, the ECM checks the sensor output before and after closing the VSV for purge switching valve. If there is change in the HC concentration when the VSV is opened or closed, the ECM will conclude that the bladder membrane is leaking. The ECM will illuminates the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P1455: Vapor reducing fuel tank system leak detected (small leak) monitor
Required sensors/components	Fuel tank, heated oxygen sensor, VSV for purge flow switching valve
Frequency of operation	Once per driving cycle
Duration	None
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine coolant temperature at engine start compared with intake air temperature	-7 °C (19°F) or more, and 11°C (52°F)
Engine coolant temperature at engine start	10°C (50°F) or more, and 35°C (95°F)
Intake air temperature at engine start	10°C (50°F) or more, and 35°C (95°F)
Intake air temperature	10°C (50°F) or more

TYPICAL MALFUNCTION THRESHOLDS

Vapor concentration in purge air	Less than -7 to -4 %/% (depending on intake air temperature)
FAF smoothing value	Less than 5 %
VSV for purge flow switching valve	No malfunction
Purge air volume after purge flow switching valve monitoring	2 g

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

EVAP - Bladder Tank System

MID	TID	Scaling	Description of Test Value
$3D	$D6	Multiply by 0.01 (%/%)	Test value of bladder tank leak: Determined by fuel vapor concentration in outer fuel tank

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1455)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using hand-held tester or OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
P1455	A
P1455 and other DTCs	B

HINT:
If any other codes besides P1455 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-54)**

A

2 INSPECT FUEL TANK ASSY

(a) Remove the fuel tank (see page 11-21).
(b) Drain fuel from the tank and turn it upside down.

OK:
Fuel does not come out from anywhere except the main fuel hose.

OK → **REPLACE ECM (See page 10-24)**

NG

REPLACE FUEL TANK ASSY

DTC	P2102	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC	P2103	THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver inputs.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty is 80 % or more (b) Throttle control motor current is 0.5 A or less	• Open in throttle control motor circuit • Throttle control motor • ECM
P2103	Following conditions are met. • Throttle control motor current is 10 A or more (0.6 second) • Hybrid IC current limiter port: Fail When electric throttle actuator is ON (i.e. actuator power ON or actuator power supply voltage is 8 V or more)	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assembly • ECM

MONITOR DESCRIPTION

The ECM monitors the flow of electrical current through the electronic throttle motor, and detects malfunction or open circuits in the throttle motor based on the value of the electrical current. When the current deviates from the standard values, the ECM concludes that there is a fault in the throttle motor. Or, if the throttle valve is not functioning properly (for example, stuck ON), the ECM concludes that there is a fault in the throttle motor and turns on the MIL and a DTC is set.
Example:
When the current is more than 10A. Or, the current is less than 0.5A when the motor driving duty ratio is more than 80%. The ECM concludes that the current is deviated from the standard values, turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue to drive.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the power switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Case 1

Related DTCs	P2102: Throttle actuator control motor current (low current)
Required sensors/components	Throttle actuator motor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediately
Sequence of operation	None

Case 2

Related DTCs	P2103: Throttle actuator control motor current (high current)
Required sensors/components	Throttle actuator motor
Frequency of operation	Continuous
Duration	0.6 second
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Case 1

P2102: Throttle actuator control motor current (low current)

The monitor will run whenever the following DTCs are not present	See page 05-20
Throttle motor	ON
Difference between motor current of present and 0.016 second ago	Less than 0.2 A

Case 2

P2103: Throttle actuator control motor current (high current)

The monitor will run whenever the following DTCs are not present	See page 05-20
Throttle motor	ON

TYPICAL MALFUNCTION THRESHOLDS

Case 1

P2102: Throttle actuator control motor current (low current)

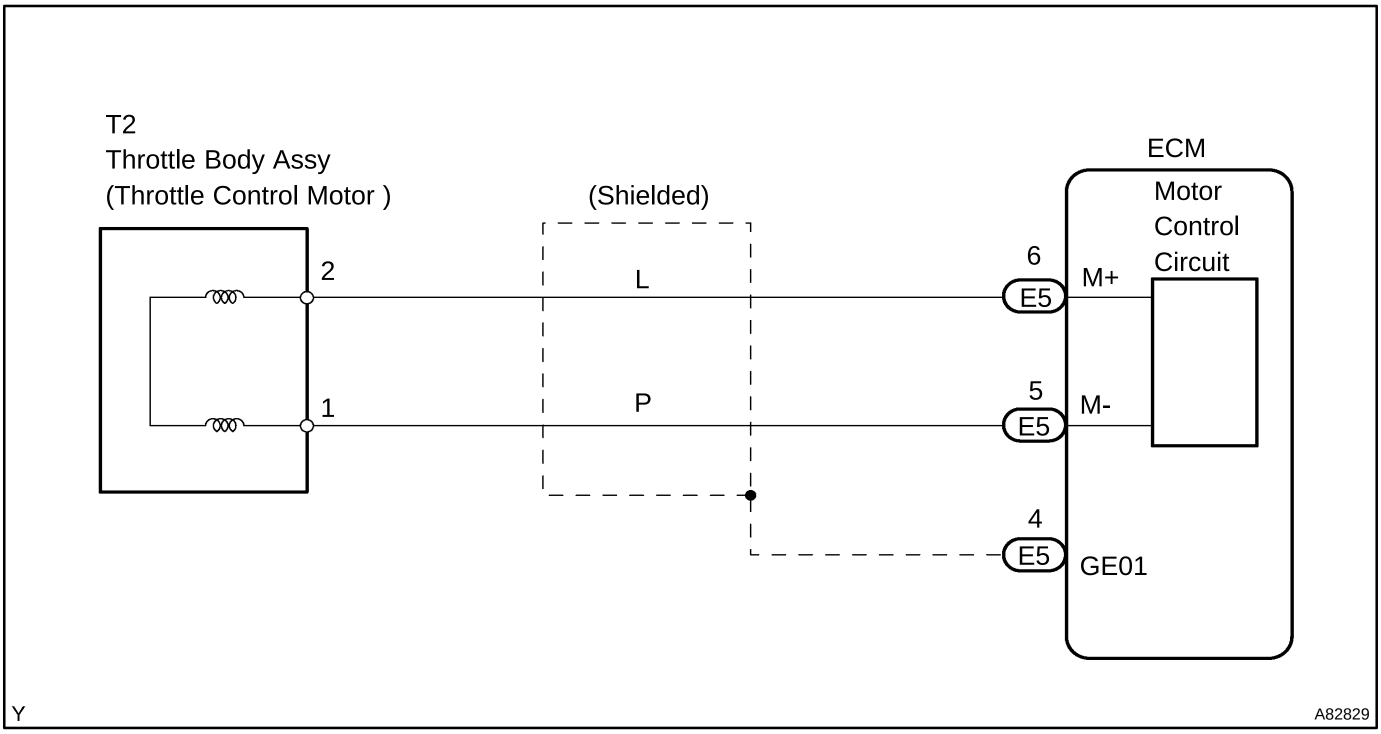
Throttle motor current	Less than 0.5 A (when motor drive duty is 80 % or more)

Case 2

P2103: Throttle actuator control motor current (high current)

Hybrid IC	Fail

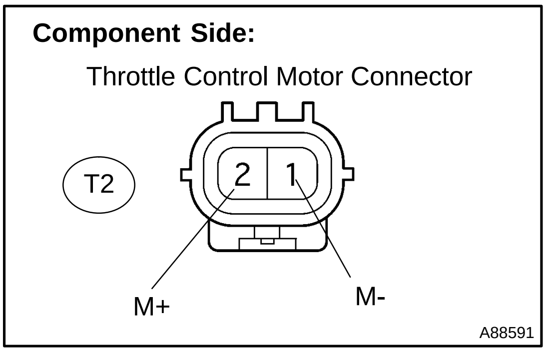
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT THROTTLE W/MOTOR BODY ASSY(THROTTLE CONTROL MOTOR)



(a) Disconnect the throttle control motor connector.
(b) Using an ohmmeter, measure the motor resistance between terminals 1 (M-) and 2 (M+).

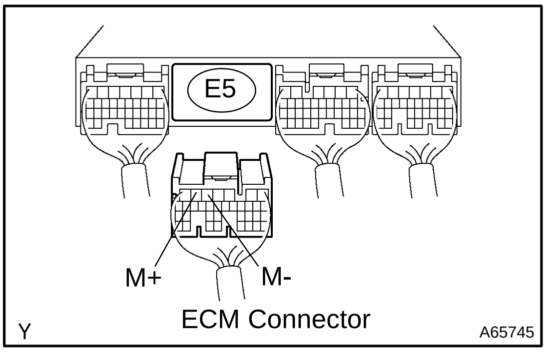
Standard:

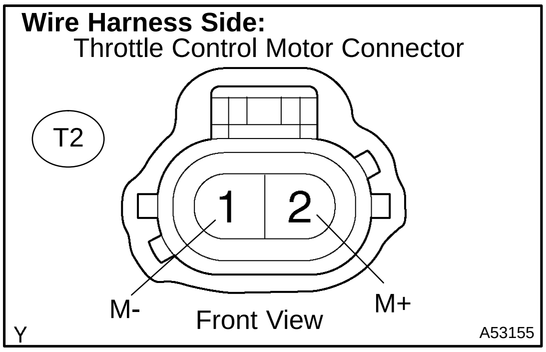
Tester Connection	Specified Condition
M- (1) - M+ (2)	0.3 to 100 Ω at 20 °C (68 °F)

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10-13)**

OK

2	CHECK HARNESS AND CONNECTOR(ECM - THROTTLE CONTROL MOTOR)





(a) Disconnect the E5 ECM connector.
(b) Disconnect the throttle control motor connector.
(c) Check the resistance between the wire harness side connectors.

Standard: (check for open)

Tester Connection	Specified Condition
Throttle control motor (2) - M+ (E5 -6)	Below 1 Ω
Throttle control motor (1) - M- (E5 -5)	Below 1 Ω

Standard: (check for short)

Tester Connection	Specified Condition
Throttle control motor (2) or M+ (E5-6) - Body ground	10 kΩ or higher
Throttle control motor (1) or M- (E5-5) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector and the throttle control motor connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT THROTTLE W/MOTOR BODY ASSY

(a) Visually check between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

OK: The throttle valve is not contaminated by foreign objects and can move smoothly.

NG → **REMOVE FOREIGN OBJECT AND CLEAN THROTTLE BODY**

OK

REPLACE ECM (See page 10-24)

DTC	P2111	THROTTLE ACTUATOR CONTROL SYSTEM - STUCK OPEN

DTC	P2112	THROTTLE ACTUATOR CONTROL SYSTEM - STUCK CLOSED

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides to ECM with feedback to control the throttle motor and set the throttle valve angle in response to driver input.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle motor locked during ECM orders to open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve
P2112	Throttle motor locked during ECM orders to close	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve

MONITOR DESCRIPTION

The ECM concludes that there is malfunction of the ETCS when the throttle valve remains at a fixed angle despite high drive current supplying from the ECM. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue to drive.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the power switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111: Throttle motor actuator lock (open) P2112: Throttle motor actuator lock (closed)
Main sensors/components	Throttle actuator motor
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2111:

The monitor will run whenever the following DTCs are not present	See page 05-20
Throttle motor current	2 A or more
Throttle motor duty to open	80 % or more

P2112:

The monitor will run whenever the following DTCs are not present	See page 05-20
Throttle motor current	2 A or more
Throttle motor duty to close	80 % or more

TYPICAL MALFUNCTION THRESHOLDS

Difference between throttle position sensor output voltage of present and 16 milliseconds ago	Less than 0.1 V

WIRING DIAGRAM

Refer to DTC P2102 on page 05-301 .

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2111 AND/OR P2112)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
P2111 or P2112	A
P2111 or P2112, and other DTCs	B

HINT:
If any other codes besides P2111 and/or P2112 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2	INSPECT THROTTLE W/MOTOR BODY ASSY (VISUALLY CHECK THROTTLE VALVE)

(a) Check for contamination between the throttle valve and the housing. If necessary, clean the throttle body. And check that the throttle valve moves smoothly.

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY**

OK

3	CHECK IF DTC OUTPUT RECURS (DTC P2111 AND/OR P2112)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) Clear the DTC.
(e) Put the engine in inspection mode (see page 01-27).
(f) Start the engine, and depress and release the accelerator pedal quickly (fully open and fully close).
(g) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(h) Start the engine, and depress and release the accelerator pedal quickly (fully open and fully close).
(i) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
No output	A
P2111 and/or P2112	B

B → **REPLACE ECM (See page 10-24)**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

DTC P2118 THROTTLE ACTUATOR CONTROL MOTOR CURRENT RANGE/PERFORMANCE

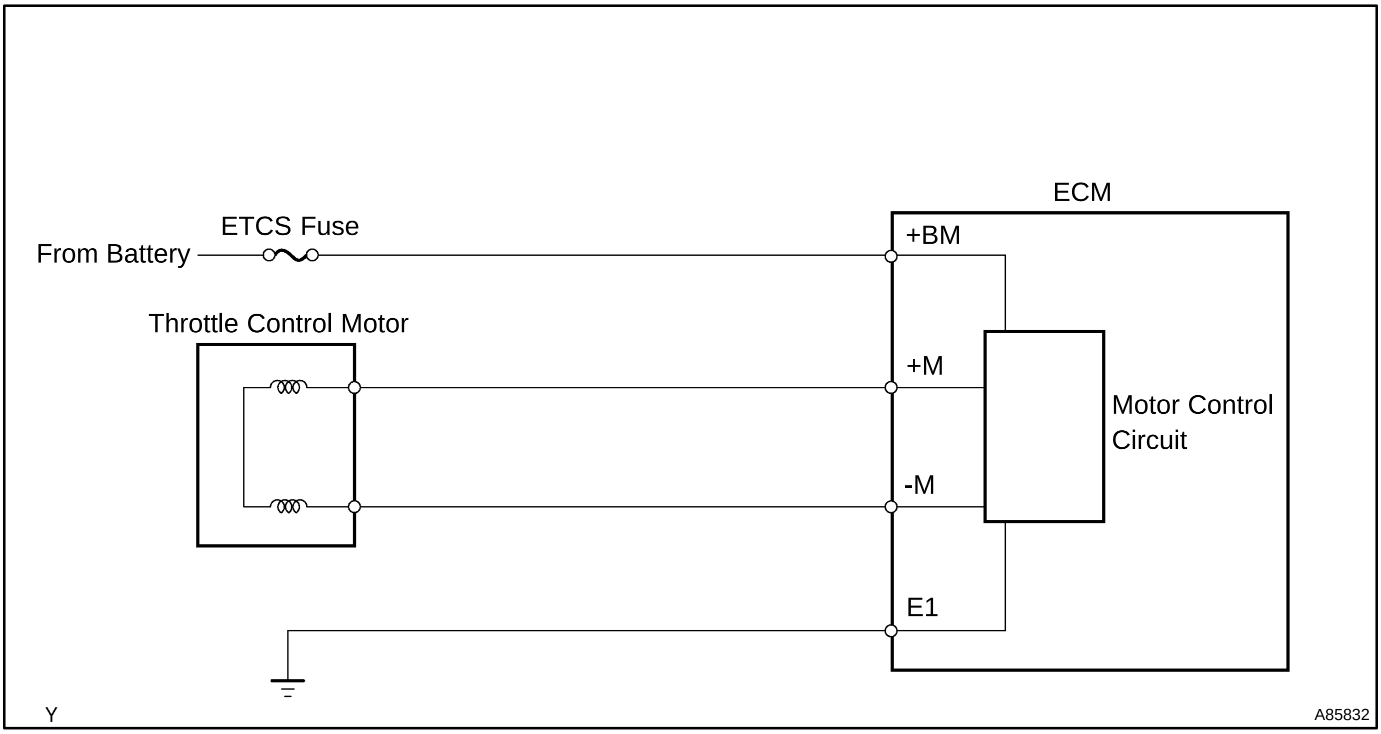
CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.

When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, the current to the motor is cut. If repairs are made and the system has returned to normal, turn the power switch OFF. The ECM then allows current to flow to the motor and the motor can be restarted.

HINT:

This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit	• Open in ETCS power source circuit • ETCS fuse • ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor. When the power supply voltage drops below the threshold, the ECM concludes that there is an open in the power supply circuit. A DTC is set and the MIL is turned on.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue to drive.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the power switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2118: Throttle actuator motor power supply line range check (low voltage)
Required sensors/components	Throttle actuator motor
Frequency of operation	Continuous
Duration	0.8 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Actuator power	ON
Battery voltage	8 V or more

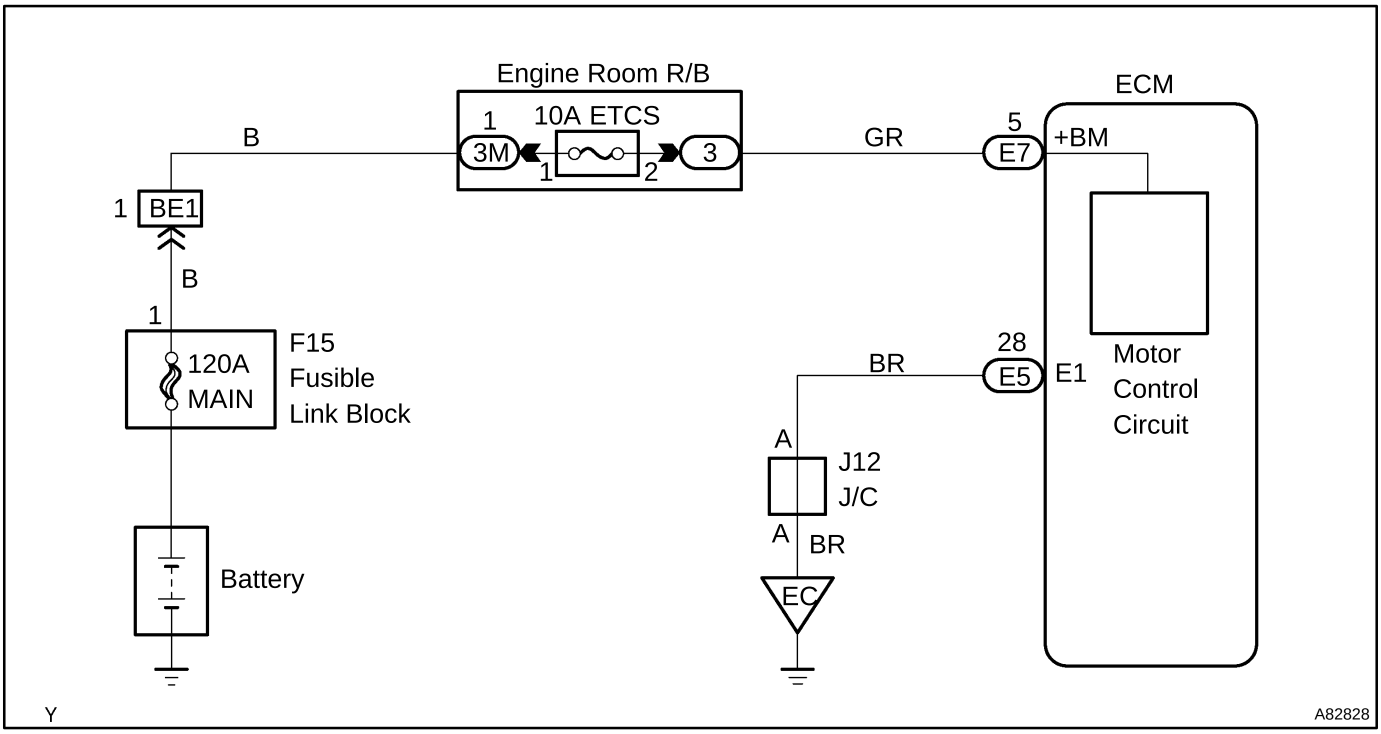
TYPICAL MALFUNCTION THRESHOLDS

Throttle actuator motor power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Throttle actuator motor power supply voltage	9 to 14 V

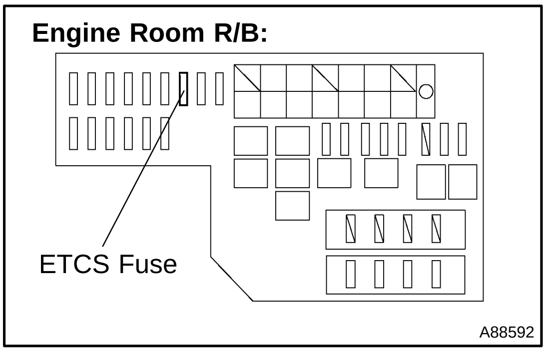
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK FUSE(ETCS FUSE)

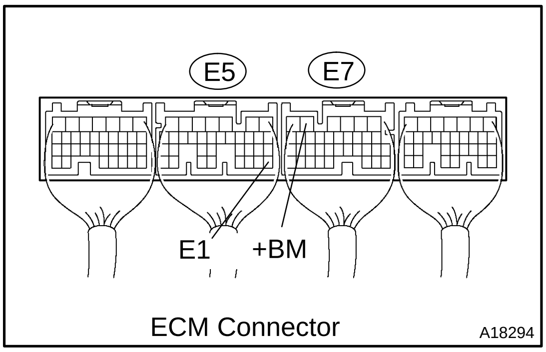


(a) Remove the ETCS fuse from the engine room R/B.
(b) Check the resistance of the ETCS fuse.
Standard: Below 1 Ω
(c) Reinstall the ETCS fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED FUSE**

OK

2 INSPECT ECM(+BM VOLTAGE)



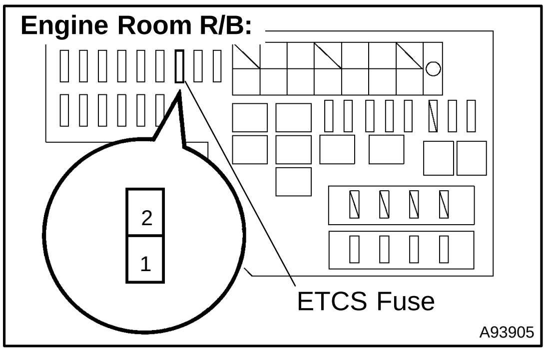
(a) Measure the voltage between the specified terminals of the E5 and E7 ECM connectors.
Standard:

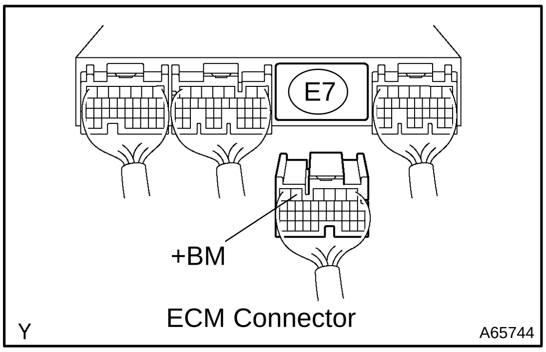
Tester Connection	Specified Condition
+BM (E7-5) - E1 (E5-28)	9 to 14 V

OK → **REPLACE ECM (See page 10-24)**

NG

3	CHECK HARNESS AND CONNECTOR(ECM - ETCS FUSE, ETCS FUSE - BATTERY)





(a) Check the harness and the connectors between the ETCS fuse and the ECM connector.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ETCS fuse (2) - +BM (E7-5)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ETCS fuse (2) or +BM (E7-5) - Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the ETCS fuse and the battery.
(1) Remove the ETCS fuse from the engine room R/B.
(2) Disconnect the positive battery terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal - ETCS fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or ETCS fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the ETCS fuse.
(5) Reconnect the positive battery terminal.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE FUSIBLE LINK BLOCK ASSY

DTC	P2119	THROTTLE ACTUATOR CONTROL THROTTLE BODY RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.
The ECM operates the throttle motor to position the throttle valve for proper response to driver inputs. The throttle position sensor, mounted on the throttle body, provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detection Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from its target angle	• Electric throttle control system • ECM

MONITOR DESCRIPTION

The ECM determines the "actual" throttle valve angle based on the throttle position sensor signal. The "actual" throttle valve position is compared to the "target" throttle valve position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS system. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue to drive.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the power switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119: Electronic throttle control system failure
Required sensors/components	Main: Throttle actuator motor Related: Throttle position sensor
Frequency of operation	Continuous
Duration	Within 1 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

Difference between commanded throttle valve position and current throttle valve position	0.3 V or more

COMPONENT OPERATING RANGE

Commanded throttle valve position	Same as current throttle valve position

WIRING DIAGRAM

Refer to DTC P2102 on page 05-301 .

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2119)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.
Result:

Display (DTC Output)	Proceed to
P2119	A
P2119 and other DTCs	B

HINT:
If any other codes besides P2119 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05-41).
(b) Allow the engine to idle for 15 seconds.
(c) Securely apply the parking brake, and place the shift position in D.
(d) Depress the brake pedal securely and the accelerator pedal fully for 5 seconds.
(e) Read DTCs.

HINT:
Actual throttle position (TP) sensor voltage can be confirmed using the hand-held tester [DATA LIST / USER DATA /THROTTLE POS #1].
Standard: No DTC output.

OK → **SYSTEM OK**

NG

REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10-13)

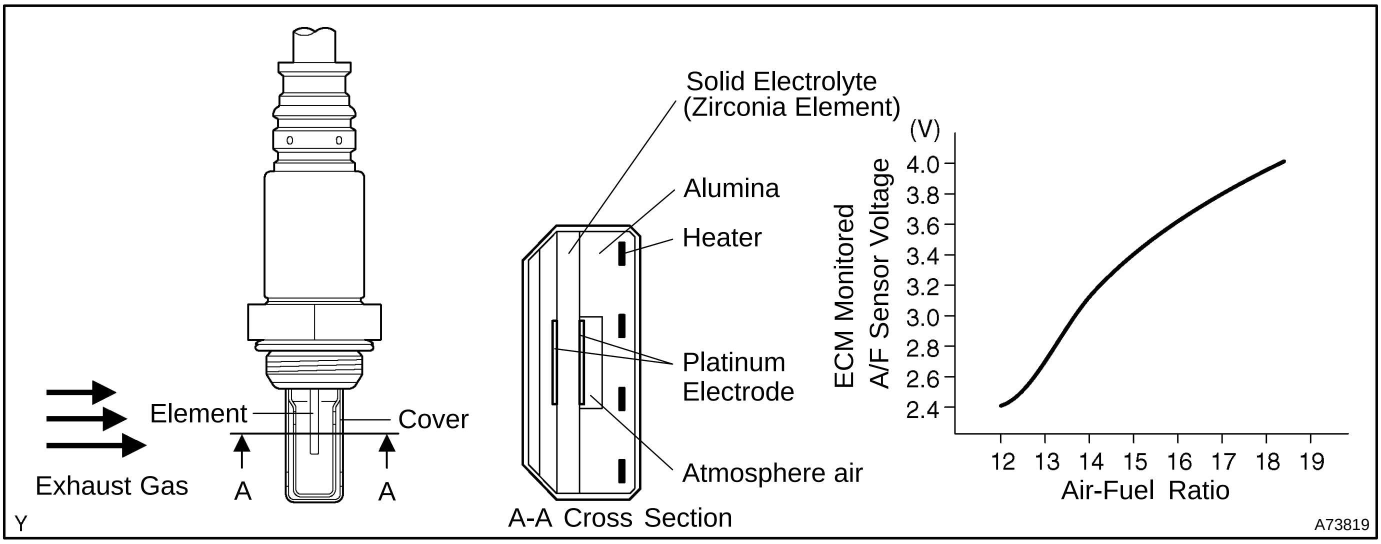
DTC	P2195	OXYGEN (A/F) SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN (A/F) SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

HINT:
Although each DTC title says ”oxygen sensor”, these DTCs are related to the A/F sensor.

CIRCUIT DESCRIPTION

The air-fuel ratio (A/F) sensor provides output voltage* which is almost equal to the existing air-fuel ratio. The A/F sensor output voltage is used to provide feedback for the ECM to control the air-fuel ratio.
With the A/F sensor output, the ECM can determine deviation from the stoichiometric air-fuel ratio and control proper injection time. If the A/F sensor is malfunctioning, the ECM is unable to accurately control the air-fuel ratio.
The A/F sensor is equipped with a heater which heats the zirconia element. The heater is also controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater to heat the sensor to facilitate detection of accurate oxygen concentration.
The A/F sensor is a planar type. Compared to a conventional type, the sensor and heater portions are narrower. Because the heat of the heater is conducted through the alumina to zirconia (of the sensor portion), sensor activation is accelerated.
To obtain a high purification rate of carbon monoxides (CO), hydrocarbons (HC) and nitrogen oxides (NOx) components of the exhaust gas, a three-way catalytic converter is used. The converter is most efficient when the air-fuel ratio is maintained near the stoichiometric air-fuel ratio.
*: The voltage value changes inside the ECM only.



DTC No.	DTC Detecting Condition	Trouble Area
P2195	Conditions (a) and (b) continue for 2 seconds or more : (a) A/F sensor voltage is more than 3.8 V (b) Rear oxygen sensor voltage is 0.15 V or more	• Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater • Integration relay • A/F sensor heater and relay circuit • Air induction system • Fuel pressure • Injector • PCV hose connection • ECM
P2196	Conditions (a) and (b) continue for 2 seconds or more : (a) A/F sensor voltage is less than 2.8 V (b) Rear oxygen sensor voltage is less than 0.85 V	• Open or short in A/F sensor (bank 1 sensor 1) circuit • A/F sensor (bank 1 sensor 1) • A/F sensor heater • Integration relay • A/F sensor heater and relay circuit • Air induction system • Fuel pressure • Injector • PCV hose connection • ECM

HINT:

- Sensor 1 refers to the sensor closest to the engine assembly.
- After confirming DTC P2195 and P2196, use the OBD II scan tool or the hand-held tester to confirm voltage output of A/F sensor (AFS B1 S1) from the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY.”
- The A/F sensor’s output voltage and the short-term fuel trim value can be read using the OBD II scan tool or the hand-held tester.
- The ECM controls the voltage of the A1A+, and A1A- terminals of the ECM to a fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without the OBDII scan tool or the hand-held tester.
- The OBD II scan tool (excluding hand-held tester) displays the one fifth of the A/F sensor output voltage which is displayed on the hand-held tester.

MONITOR DESCRIPTION

Under the air-fuel ratio feedback control, if the voltage output of the A/F sensor indicates RICH or LEAN for a certain period of time or more, the ECM concludes that there is a fault in the A/F sensor system. The ECM will turn on the MIL and a DTC is set.
If the A/F sensor voltage output is less than 2.8 V (indicates very RICH) 10 seconds even though voltage output of the heated oxygen sensor output voltage is less than 0.85 V, the ECM sets DTC P2196 Also, if the heated oxygen sensor output voltage is 0.15 V or more, but the A/F sensor voltage output is more than 3.8 V (indicates very LEAN) for 10 seconds, DTC P2195 or is set.

MONITOR STRATEGY

Related DTCs	P2195: A/F sensor signal stuck lean P2196: A/F sensor signal stuck rich
Required sensors/components	Main: A/F sensor Related: Heated oxygen sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Time after first engine start	30 seconds or more
A/F status	Activated
A/F sensor admittance	0.014 1/Ω
Fuel system status	Closed-loop
Engine	Running
Sub-feedback status	Executing
Heated oxygen sensor voltage	P2195: 0.15 V or more P2196: Less than 0.95 V

TYPICAL MALFUNCTION THRESHOLDS

Case 1

P2195: A/F sensor signal stuck lean

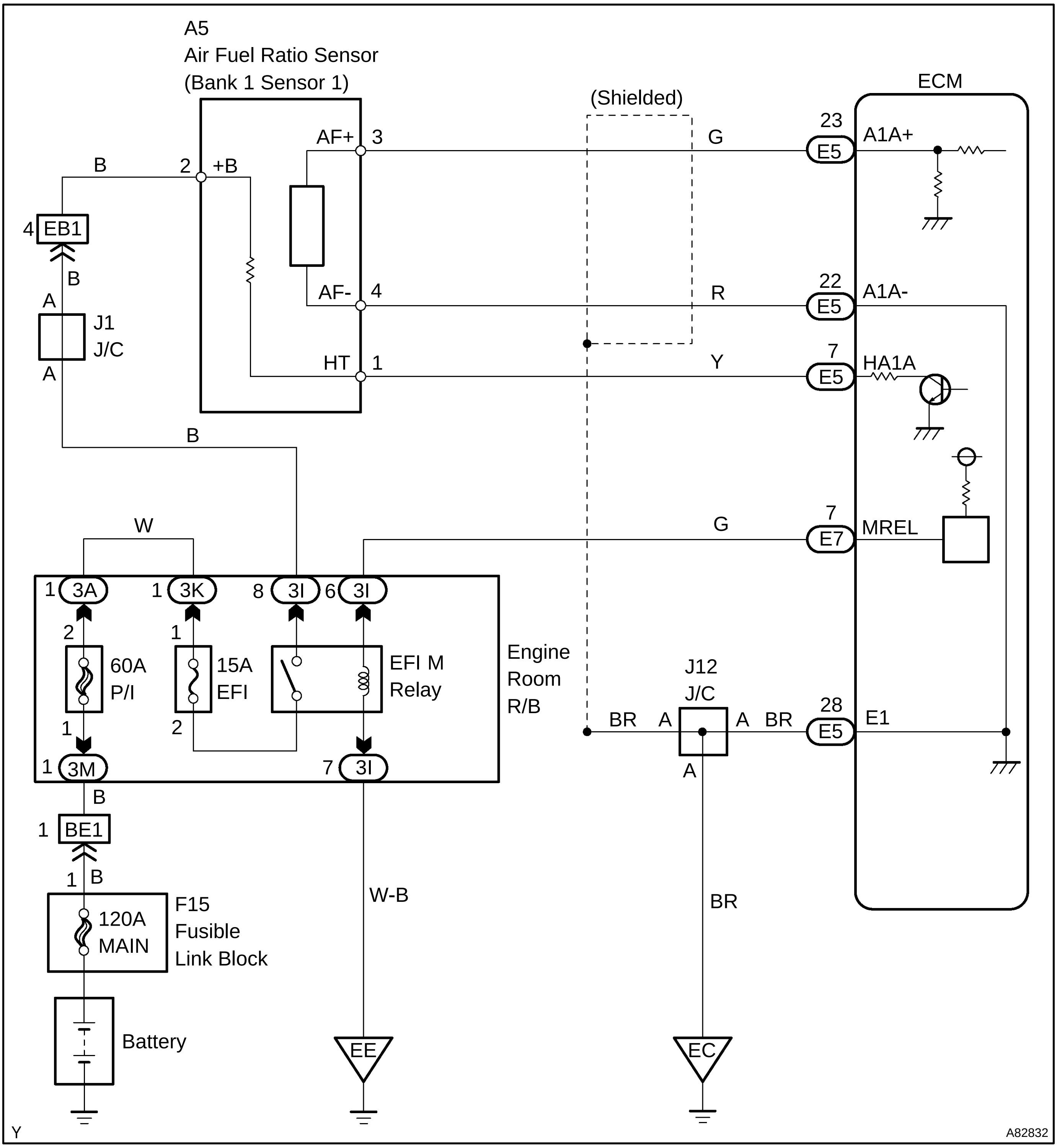
Time while the following condition is met	2 seconds or more
A/F output voltage	More than 3.8 V

Case 2

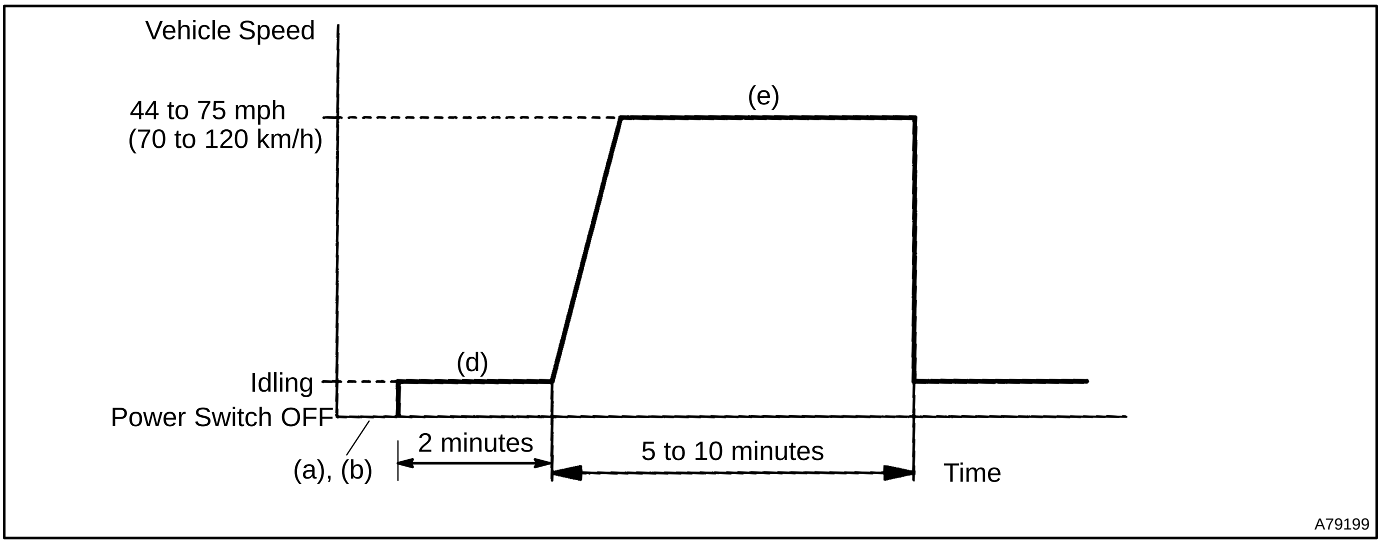
P2196: A/F sensor signal stuck rich

Time while the following condition is met	2 seconds or more
A/F output voltage	Less than 2.8 V

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand-held tester to the DLC3.
(b) Switch the ECM from normal mode to check mode using the hand-held tester (see page 05-45).
(c) Put the engine in inspection mode (see page 01-27).
(d) Start the engine and warm it up with all the accessory switches OFF.
(e) Deactivate the inspection mode and drive the vehicle at 44 to 75 mph (70 to 120 km/h) for 5 to 10 minutes (the engine must be run during monitoring).

HINT:
If malfunction exists, the MIL will be illuminated during step (d).

NOTICE:
- **If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the hand-held tester, turn the power switch OFF after performing steps (d) and (e), then perform steps (d) and (e) again.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.**

INSPECTION PROCEDURE

HINT:
Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble area are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:
The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand-held tester to the DLC3 on the vehicle.
(2) Turn the power switch ON (IG).
(3) Put the engine in inspection mode (see page 01-27).
(4) Warm up the engine by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(5) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(6) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:
A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
-12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
-12.5 % → lean output: Less than 0.4 V

NOTICE:
The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0 V OK	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V OK	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V OK	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0V OK	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Extremely RICH or LEAN actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of both A/F sensor and heated oxygen sensor.
To display the graph, enter ACTIVE TEST / A/F CONTROL / USER DATA, select "AFS B1S1 and O2S B1S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

- Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high A/F sensor voltage could be caused by a RICH air-fuel mixture. Check the conditions that would cause the engine to run with the RICH air-fuel mixture.
- A low A/F sensor voltage could be caused by a LEAN air-fuel mixture. Check the conditions that would cause the engine to run with the LEAN air-fuel mixture.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO A/F SENSOR DTCS)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display	Proceed to
A/F sensor circuit DTC	A
A/F sensor circuit DTCs and other DTCs	B

HINT:
If any other codes besides A/F sensor DTCs are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-55)

A

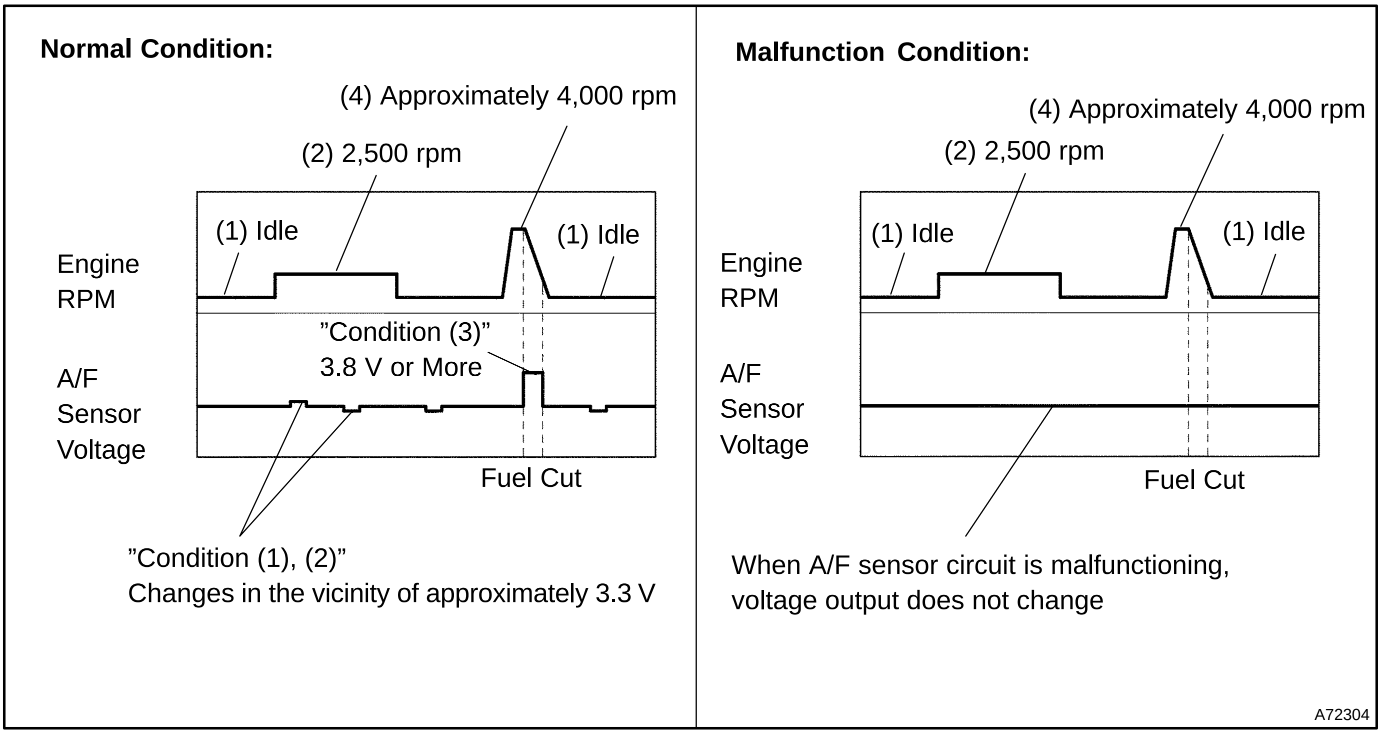
2	READ VALUE OF OBD II SCAN TOOL OR HAND-HELD TESTER(OUTPUT VOLTAGE OF A/F SENSOR)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC 3.
(b) Put the engine in inspection mode (see page 01-27).
(c) Warm up the A/F sensors (bank 1 sensor 1) by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(d) Read A/F sensor voltage output on the OBD II scan tool or the hand-held tester.
(e) Hand-held tester only:
On the hand-held tester, enter the menus: ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA.
(f) Select ”AFS B1 S1/ENGINE SPD” and press button ”YES”.
(g) Monitor the A/F sensor voltage carefully.
(h) Check the A/F sensor voltage output under the following conditions:
(1) Put the engine in inspection mode and allow the engine to idle for 30 seconds.
(2) Put the engine in inspection mode and running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % (where engine RPM is not suddenly changed).
(3) Deactivate the inspection mode and drive the vehicle with shift position ”B” range.
(4) Accelerate the vehicle to 44 mph (70 km/h) and quickly release the accelerator pedal so that the throttle valve is fully closed.

CAUTION:

- **Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.**

Standard:
Condition (1) and (2)
Voltage changes in the vicinity of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (4)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration (when fuel cut) as shown in the illustration.
***: Voltage when using the OBD II scan tool.**



HINT:

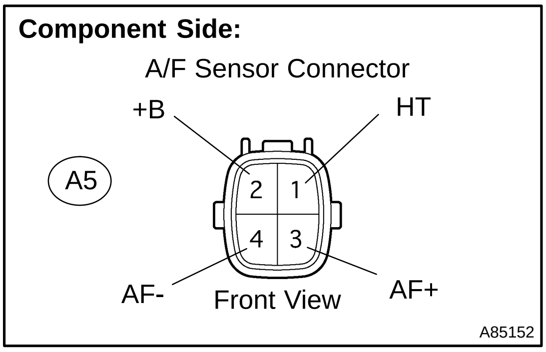
- Whenever the output voltage of the A/F sensor remains at approximately 3.3 V (0.660 V)* (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have an open-circuit. (This will happen also when the A/F sensor heater has an open-circuit.)
- Whenever the output voltage of the A/F sensor remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have a short-circuit.
- The ECM will stop fuel injection (fuel cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor voltage output.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery terminal was reconnected, the vehicle must be driven over 10 mph to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

*: Voltage when using the OBD II scan tool.

OK → Go to step 13

NG

3 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A5 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.
Resistance:

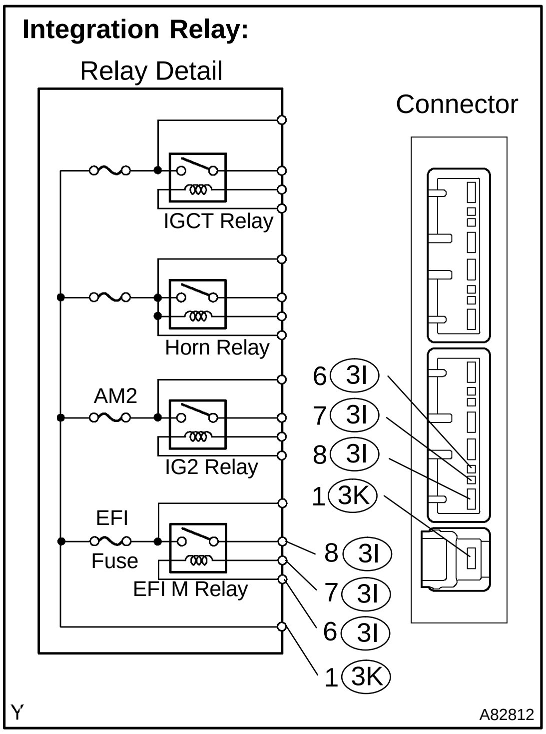
Tester Connection	Resistance
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)

(c) Reconnect the A/F sensor connector.

NG → REPLACE AIR FUEL RATIO SENSOR

OK

4 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.
Standard:

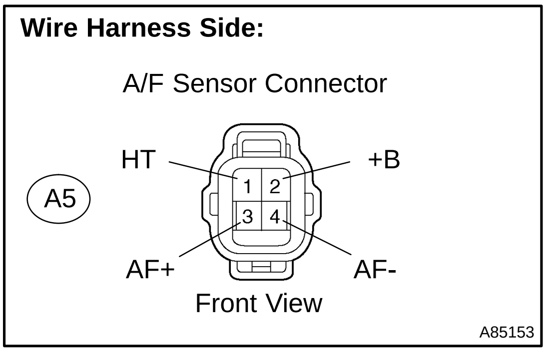
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

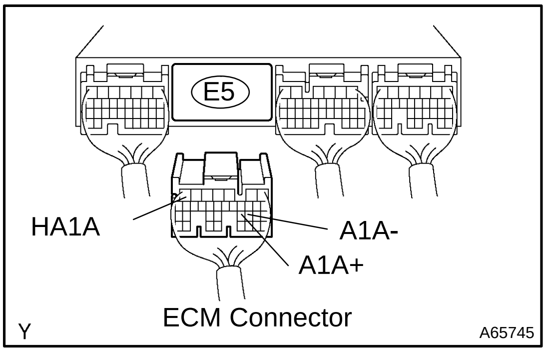
(c) Reinstall the integration relay.

NG → REPLACE INTEGRATION RELAY

OK

5 CHECK HARNESS AND CONNECTOR(A/F SENSOR - ECM)





(a) Disconnect the A5 A/F sensor connector.

(b) Disconnect the E5 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

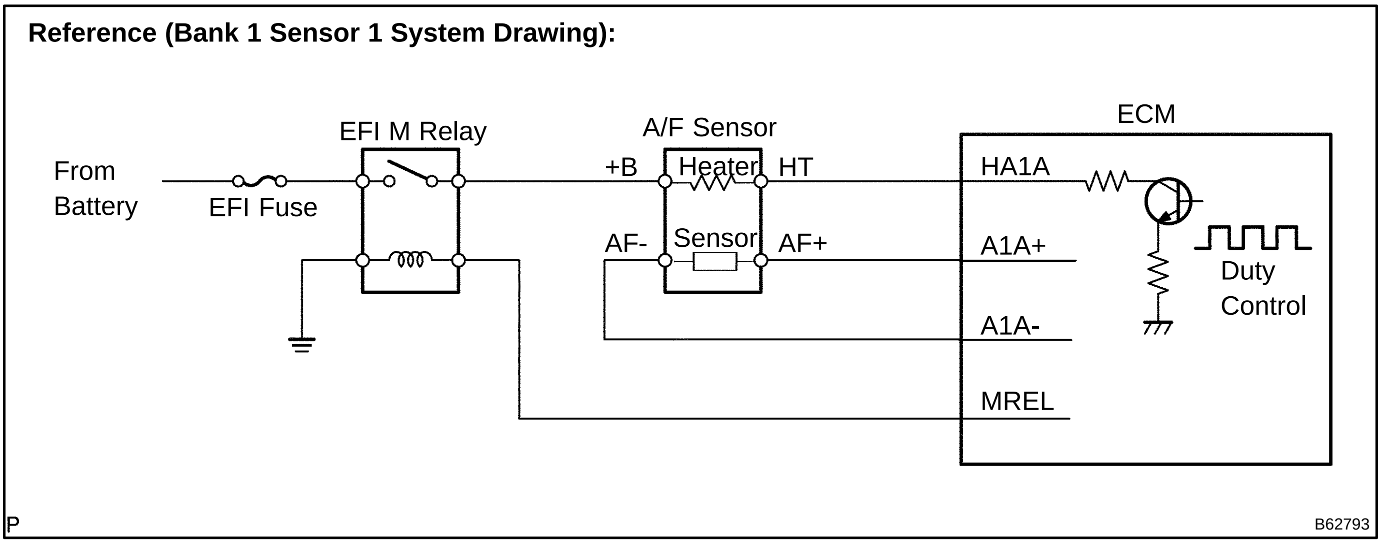
Tester Connection	Specified Condition
AF+ (A5-3) - A1A+ (E5-23)	Below 1 Ω
AF- (A5-4) - A1A- (E5-22)	Below 1 Ω
HT (A5-1) - HA1A (E5-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A5-3) or A1A+ (E5-23) - Body ground	10 kΩ or higher
AF- (A5-4) or A1A- (E5-22) - Body ground	10 kΩ or higher
HT (A5-1) or HA1A (E5-7) - Body ground	10 kΩ or higher

(d) Reconnect the A/F sensor connector.

(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.
OK: No leakage in the air induction system.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

7	CHECK FUEL PRESSURE (See page 11-7)

OK:
Fuel pressure: 304 to 343 kPa (3.1 to 3.5 kgf/cm^2, 44 to 50 psi)

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

8	INSPECT FUEL INJECTOR ASSY (See page 11-9)

(a) Check injector injection (high or low fuel injection quantity or poor injection pattern).
OK:
Injection volume: 36 to 46 cm^3 (2.1 to 2.8 cu in.) per 15 seconds.

NG → REPLACE FUEL INJECTOR ASSY (See page 11-15)

OK

9	REPLACE AIR FUEL RATIO SENSOR

GO

10	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

11	READ OUTPUT DTCS(SEE IF A/F SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display	Proceed to
No output	A
A/F sensor circuit DTCs	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN**

A

12	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

OK: Vehicle has run out of fuel in past.

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTCS ARE CAUSED BY RUNNING OUT OF FUEL

13	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

14	READ OUTPUT DTCS(SEE IF A/F SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display	Proceed to
A/F sensor circuit DTCs	A
No output	B

B → **Go to step 18**

A

15 REPLACE AIR FUEL RATIO SENSOR

GO

16 PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

17 READ OUTPUT DTCS(SEE IF A/F SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result :

Display	Proceed to
No output	A
A/F sensor circuit DTCs	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN**

A

18 CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

OK: Vehicle has run out of fuel in past.

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTCS ARE CAUSED BY RUNNING OUT OF FUEL

DTC	P2238	OXYGEN SENSOR PUMPING CURRENT CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2239	OXYGEN SENSOR PUMPING CURRENT CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2252	OXYGEN SENSOR REFERENCE GROUND CIRCUIT LOW (FOR A/F SENSOR)(BANK 1 SENSOR 1)

DTC	P2253	OXYGEN SENSOR REFERENCE GROUND CIRCUIT HIGH (FOR A/F SENSOR)(BANK 1 SENSOR 1)

HINT:
Although the each DTC title says ”oxygen sensor”, these DTCs are related to the A/F sensor.

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05-314 .

DTC No.	DTC Detection Condition	Trouble Area
P2238	• Conditions (a) or (b) continues for 5 seconds or more : (a) AF+ is 0.5 V or less (b) (AF+) - (AF-) is 0.8 V or more • A/F sensor admittance: Less than 0.022 1/Ω	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2239	• Condition (a) continues for 5.0 seconds or more : (a) AF+ is more than 4.5 V (b) (AF+) - (AF-) is more than 0.8 V	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2252	AF- is 0.5 V or less for 5.0 seconds or more	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM
P2253	AF- is more than 4.5 V for 5.0 seconds or more	• Open or short in A/F sensor circuit • A/F sensor • A/F sensor heater • EFI M relay • A/F sensor heater and relay circuit • ECM

MONITOR DESCRIPTION

The air fuel ratio (A/F) sensor has a characteristic that it varies its voltage output in proportion to the air-fuel ratio. If impedance (alternating current resistance) or voltage output of the sensor extraordinarily deviates from the standard range, the ECM determines to detect an open or short malfunction in the A/F sensor circuit.

MONITOR STRATEGY

Related DTCs	P2238: A/F sensor pumping current circuit low P2239: A/F sensor pumping current circuit high P2252: A/F sensor reference ground circuit low P2253: A/F sensor reference ground circuit high
Required sensors/components	Main: A/F sensor Related: Engine speed sensor, vehicle speed sensor, engine coolant temperature sensor
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

”General precondition” is defined as follows:

Battery voltage	10.5 V or more
Power switch	ON
Time after power switch from OFF to ON	5 seconds or more

”A/F sensor admittance precondition” is defined as follows:

Engine coolant temperature	30°C (86 °F) or more
Engine	Running
Time after first engine start	20 seconds or more
Time after A/F sensor heating	20 seconds or more

Case 1

P2238: A/F sensor pumping current circuit low
(AF+, AF- open)

The monitor will run whenever the following DTCs are not present	See page 05-20
Time while A/F sensor admittance precondition is met	20 seconds or more

Case 2

P2238: A/F sensor pumping current circuit low
(AF+, AF- short)

General precondition	Met

Case 3

P2238: A/F sensor pumping current circuit low
(AF+, GND short)

General precondition	Met

Case 4

P2239: A/F sensor pumping current circuit high

General precondition	Met

Case 5

P2252: A/F sensor reference ground circuit low

General precondition	Met

Case 6

P2253: A/F sensor reference ground circuit high

General precondition	Met

TYPICAL MALFUNCTION THRESHOLDS

Case 1

P2238: A/F sensor pumping current circuit low
(AF+, AF- open)

A/F sensor admittance	Less than 0.022 1/Ω

Case 2

P2238: A/F sensor pumping current circuit low
(AF+, AF- short)

AF+ terminal voltage	Less than 0.1 V

Case 3

P2238: A/F sensor pumping current circuit low
(AF+, GND short)

Difference between voltage of terminals AF+ and AF-	Less than 0.5 V

Case 4

P2239: A/F sensor pumping current circuit high

AF+ terminal voltage (AF+ and +B, or AF+ and VCC short)	More than 4.5 V

Case 5

P2252: A/F sensor reference ground circuit low

AF- terminal voltage (AF- and GND short)	0.5 V or less

Case 6

P2253: A/F sensor reference ground circuit high

AF- terminal voltage (AF- and +B, or AF- and VCC short)	More than 4.5 V

WIRING DIAGRAM

Refer to DTC P2195 on page 05-314 .

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble area are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand-held tester to the DLC3 on the vehicle.
(2) Turn the power switch ON (IG).
(3) Put the engine in inspection mode (see page 01-27).
(4) Warm up the engine by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(5) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(6) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: Less than 3.0 V

-12.5 % → lean output: More than 3.35 V

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:

+25 % → rich output: More than 0.55 V

-12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

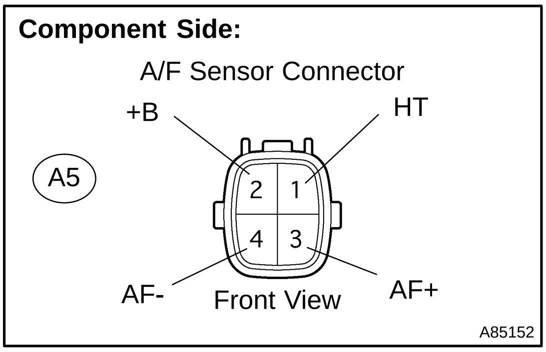
	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0 V OK	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V OK	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V OK	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0V OK	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Injection volume +25 % -12.5 % Output voltage Almost no reaction NG	Extremely RICH or LEAN actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of both A/F sensor and heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, select "AFS B1S1 and O2S B1S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high A/F sensor voltage could be caused by a RICH air-fuel mixture. Check the conditions that would cause the engine to run with the RICH air-fuel mixture.
- A low A/F sensor voltage could be caused by a LEAN air-fuel mixture. Check the conditions that would cause the engine to run with the LEAN air-fuel mixture.

1 INSPECT AIR FUEL RATIO SENSOR(RESISTANCE OF A/F SENSOR HEATER)



(a) Disconnect the A5 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.

Standard:

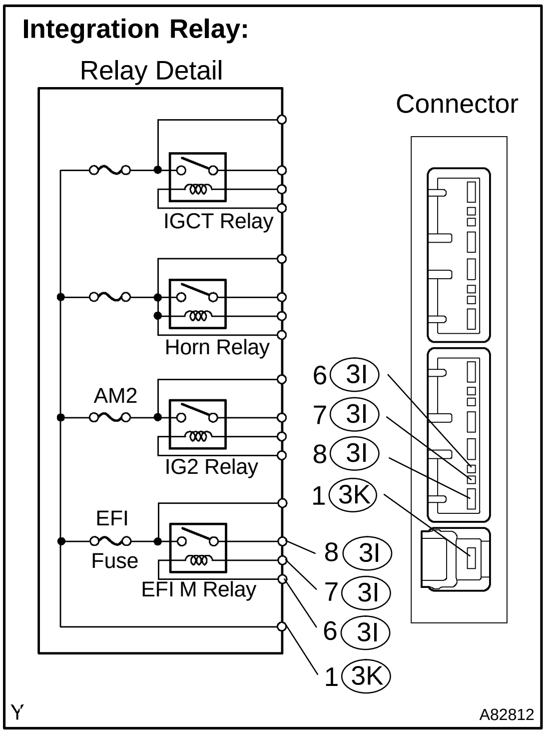
Tester Connection	Resistance
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.

Standard:

Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

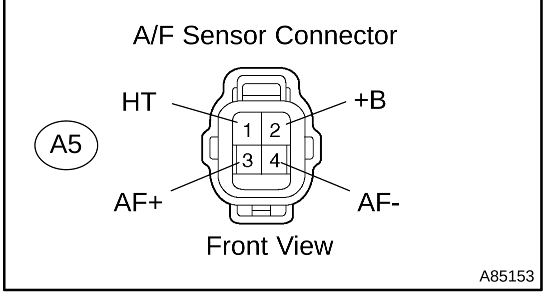
(c) Reinstall the integration relay.

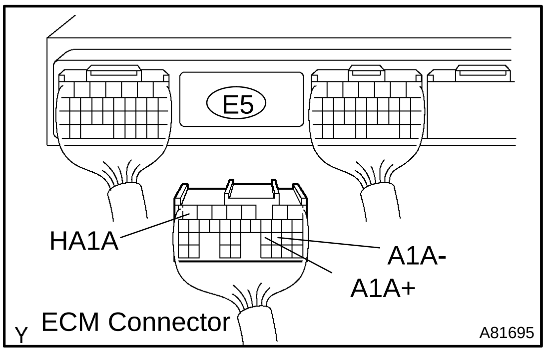
NG → **REPLACE INTEGRATION RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(A/F SENSOR - ECM)

Wire Harness Side:





(a) Disconnect the A5 A/F sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

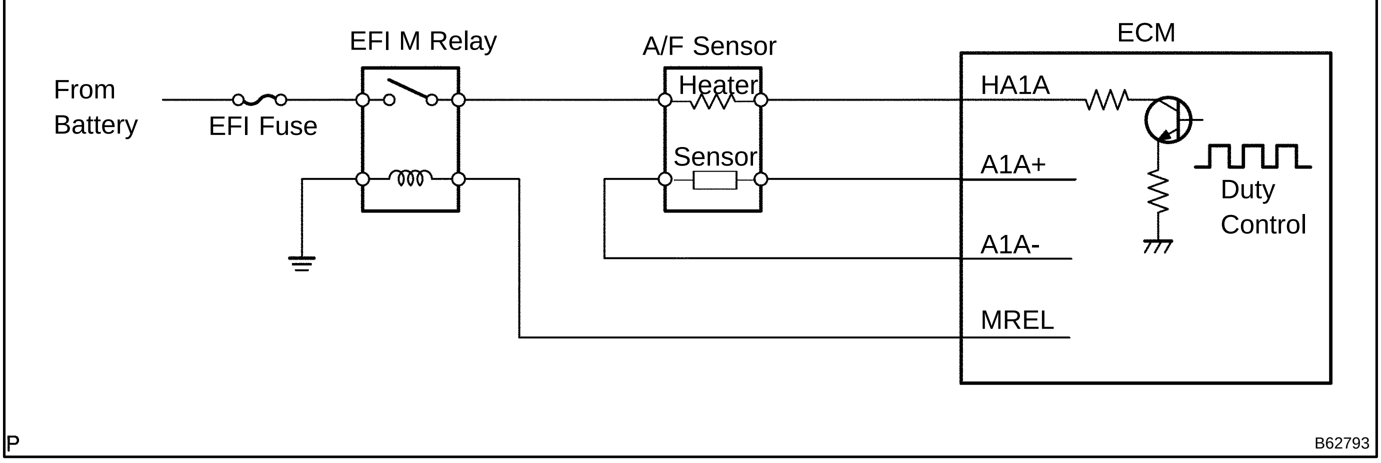
Tester Connection	Specified Condition
AF+ (A5-3) - A1A+ (E5-23)	Below 1 Ω
AF- (A5-4) - A1A- (E5-22)	Below 1 Ω
HT (A5-1) - HA1A (E5-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A5-3) or A1A+ (E5-23) - Body ground	10 kΩ or higher
AF- (A5-4) or A1A- (E5-22) - Body ground	10 kΩ or higher
HT (A5-1) or HA1A (E5-7) - Body ground	10 kΩ or higher

(d) Reconnect the A/F sensor connector.
(e) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Diagram):



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (See page 10-24)

DTC P2601 COOLANT PUMP CONTROL CIRCUIT RANGE/PERFORMANCE

HINT:
- CHS stands for Coolant Heat Storage.
- Although the DTC title says ”Coolant Pump”, this DTC is related to the CHS water pump.

CIRCUIT DESCRIPTION

The coolant heat storage system uses an electric pump to supply hot coolant stored in the CHS tank into the cylinder head of the engine, in order to optimize engine starting combustion and reduce the amount of unburned gas that is discharged while the engine is started. Before the engine starts, the ECM operates the electric water pump to direct the hot coolant in the CHS tank into the engine, in order to heat the cylinder head (this process is called ”preheat mode”). This system consists of the CHS tank, CHS water pump, CHS tank outlet temperature sensor, water valve, and a soak timer that is built in the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P2601	Following conditions are successively met: • Difference in CHS tank outlet water temperature and engine coolant temperatures before and after starting preheating: below 2°C (3.6 °F) • Change in CHS tank outlet water temperature during soaking: Within 1°C (1.8 °F) of its temperature before CHS water pump is ON	• CHS water pump • CHS water pump relay • Open or short in CHS water pump circuit • ECM

MONITOR DESCRIPTION

The ECM detects malfunction in the coolant heat storage (CHS) system with the CHS tank coolant temperature, the position of the water valve, the running condition of the engine and the operating condition of the soak timer.

The soak timer built in the ECM prompts the ECM to actuate the water pump 5 hours after the HV system has been turned OFF by using the power switch. The ECM then checks the HV main system based on variations in the CHS tank outlet temperature (soak mode).

In order to ensure the reliable malfunction detection, the ECM detects the CHS water pump malfunction DTC in two ways. Thus, when the following two detection conditions are consecutively met, the ECM determines that there is malfunction in the water pump circuit and sets the DTC.

(1) Difference in the CHS tank outlet temperature and the engine coolant temperature before and after starting preheating at engine start (system start) is below 2 °C (3.6 °F).

(2) Variation in the CHS tank outlet temperature during soak mode is within 1 °C (1.8 °F) of its temperature before the CHS water pump was ON.

MONITOR STRATEGY

Related DTCs	P2601: Coolant pump control circuit range/performance
Required sensors/components	Coolant heat storage tank outlet temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Coolant heat storage system malfunction	Not detected
CHS water pump operation time	3 seconds or more
Variation in CHS tank outlet temperature and engine coolant temperature before and after preheating	2°C (3.6°F) or less
Storage coolant temperature	More than 75°C (167°F)

TYPICAL MALFUNCTION THRESHOLDS

Difference in CHS tank outlet coolant temperature before and after CHS water pump ON	Less than 1°C (1.8°F)

WIRING DIAGRAM

Refer to DTC P1120 on page 05-277 .

INSPECTION PROCEDURE

CAUTION:

Be careful when replacing any part in the CHS system or changing the coolant because the coolant in the CHS tank is hot even if the engine and the radiator are cold.

NOTICE:

If air breeding is not performed completely, this DTC may be detected after changing the coolant.

HINT:

- The detection of this DTC indicates a malfunction in both the CHS water pump and the CHS W/P relay. Therefore, make sure to also check the relay when this DTC is output.
- To check the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand-held tester:

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2601)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
P2601	A
P2601 and other DTCs	B

HINT:
If any other codes besides P2601 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-55)

A

2	PERFORM ACTIVE TEST BY HAND-HELD TESTER(OPERATE WATER PUMP)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / WATER PUMP.
(e) Check that the CHS W/P relay operates and the operating sounds of the water pump occurs.

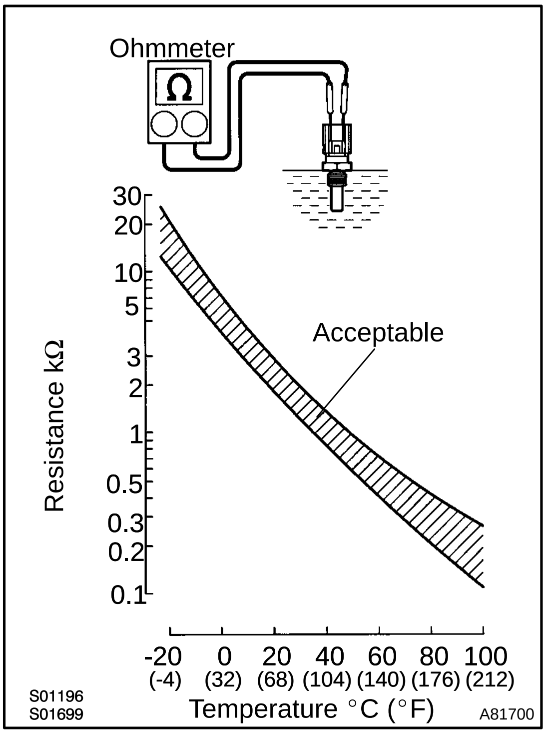
Standard:

Tester Operation	Specified Condition
WATER PUMP ON	CHS W/P relay and water pump operates

NG → **Go to step 5**

OK

3	INSPECT TEMPERATURE SENSOR (CHS TANK OUTLET TEMPERATURE SENSOR)



(a) Remove the coolant heat storage (CHS) tank outlet temperature sensor.

(b) Measure the resistance between the terminals.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:

In case of checking the CHS tank outlet temperature sensor in the water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

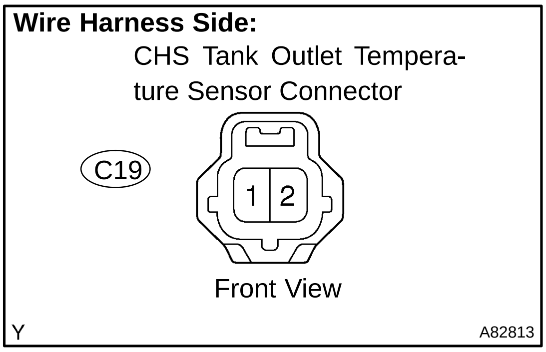
Alternate procedure: Connect an ohmmeter to the installed CHS tank outlet temperature sensor and read the resistance. Use an infrared thermometer to measure the CHS tank outlet temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine coolant temperature (warm up or allow to cool down) and repeat the test.

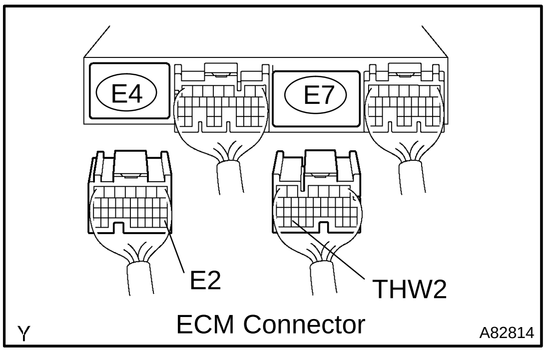
(c) Reinstall the CHS tank outlet temperature sensor.

NG	REPLACE TEMPERATURE SENSOR

OK

4	CHECK HARNESS AND CONNECTOR(ECM - CHS TANK OUTLET TEMPERATURE SENSOR)





(a) Check the harness and the connectors between the CHS tank outlet temperature sensor connector and the ECM connector.

(1) Disconnect the C19 CHS tank outlet temperature sensor connector.

(2) Disconnect the E5 and E7 ECM connectors.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CHS tank outlet temperature sensor (C19-2) - THW2 (E7-33)	Below 1 Ω
CHS tank outlet temperature sensor (E2-1) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CHS tank outlet temperature sensor (C19-2) or THW2 (E7-33)- Body ground	10 kΩ or higher

(4) Reconnect the CHS tank outlet temperature sensor connector.

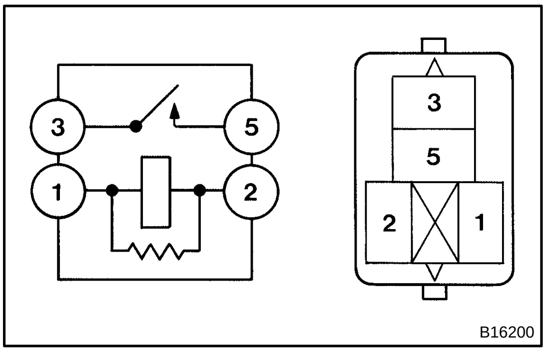
(5) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

5	INSPECT CHS W/P RELAY(CHS WATER PUMP RELAY)



(a) Remove the CHS W/P relay from the engine room R/B No.2.

(b) Inspect the CHS W/P relay.

Standard:

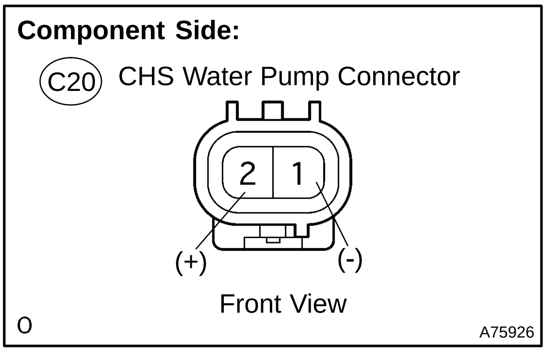
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the CHS W/P relay.

NG → **REPLACE CHS W/P RELAY**

OK

6	INSPECT WATER W/MOTOR & BRACKET PUMP ASSY



(a) Disconnect the C20 CHS water pump connector.

(b) Measure the resistance between the terminals of the water pump.

Standard:

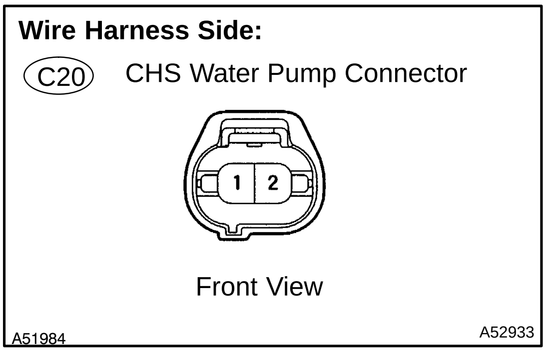
Tester Connection	Specified Condition
1 - 2	0.3 to 100 Ω

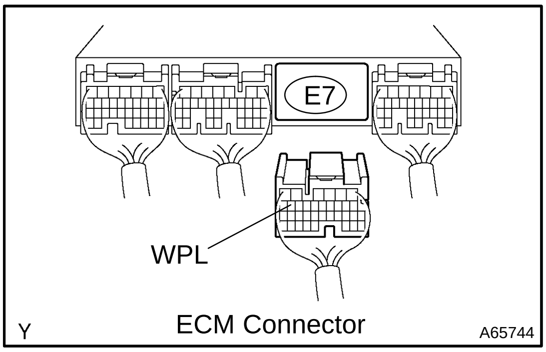
(c) Reconnect the CHS water pump connector.

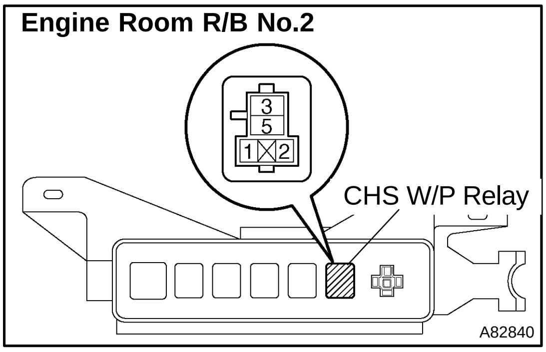
NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(ECM - CHS W/P RELAY, CHS W/P RELAY - WATER PUMP, WATER PUMP - GROUND)







(a) Check the harness and the connectors between the CHS water pump connector and the ECM connector.
(1) Remove the CHS W/P relay from the engine room R/B No.2.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
WPL (E7-15) - CHS W/P relay (2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CHS W/P relay (2) or WPL (E7-15) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the CHS water pump connector and the CHS W/P relay.
(1) Disconnect the CHS water pump connector.
(2) Remove the CHS W/P relay from the engine room R/B No.2.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CHS water pump (2) - CHS W/P relay (5)	Below 1 Ω
CHS water pump (1) - Body ground	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CHS water pump (2) or CHS W/P relay (5) - Body ground	10 kΩ or higher

(4) Reconnect the CHS water pump connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

OBD II scan tool (excluding hand-held tester):

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2601)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read the DTCs using the OBD II scan tool.

Result:

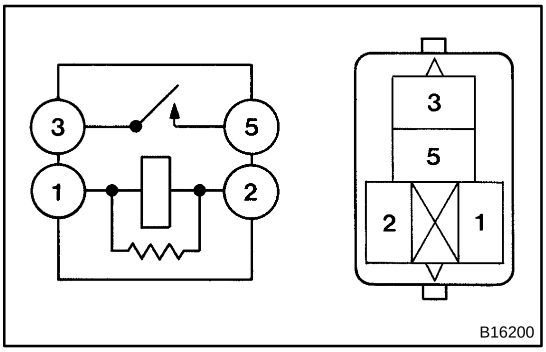
Display (DTC Output)	Proceed to
P2601	A
P2601 and other DTCs	B

HINT:
If any other codes besides P2601 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2	INSPECT CHS W/P RELAY(CHS WATER PUMP RELAY)



(a) Remove the CHS W/P relay from the engine room R/B No.2.
(b) Inspect the CHS W/P relay.

Standard:

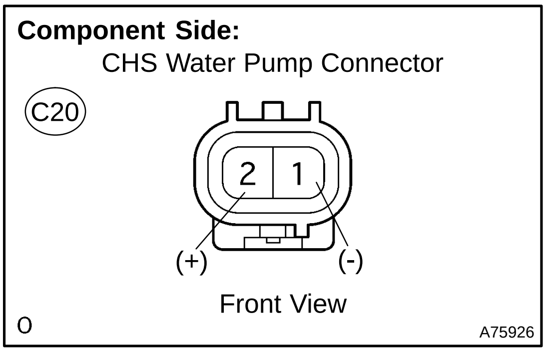
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

(c) Reinstall the CHS W/P relay.

NG → **REPLACE CHS W/P RELAY**

OK

3	INSPECT PUMP ASSY, WATER W/MOTOR & BRACKET



(a) Disconnect the C20 CHS water pump connector.
(b) Measure the resistance between the terminals of the water pump.

Standard:

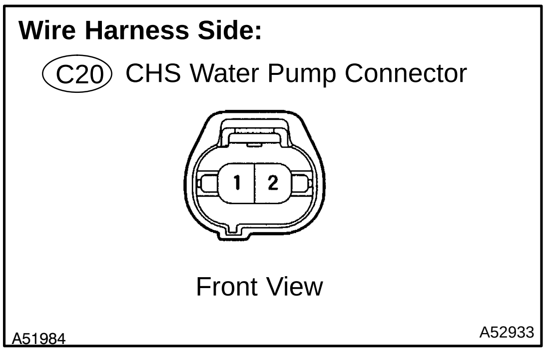
Tester Connection	Specified Condition
1 - 2	0.3 to 100 Ω

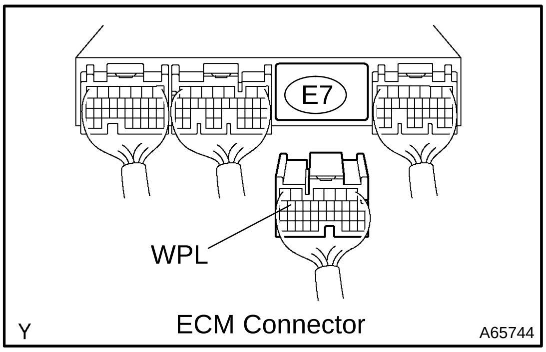
(c) Reconnect the CHS water pump connector.

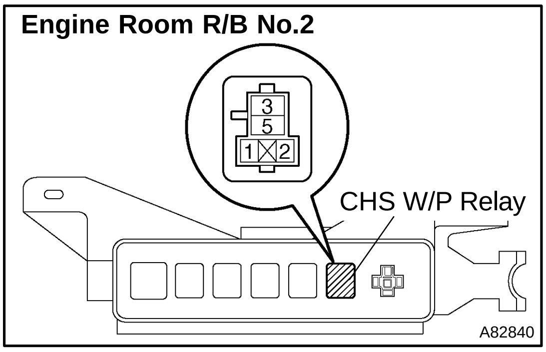
NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

4 CHECK HARNESS AND CONNECTOR(ECM - CHS W/P RELAY, CHS W/P RELAY - WATER PUMP, WATER PUMP - GROUND)







(a) Check the harness and the connectors between the CHS water pump connector and the ECM connector.
   (1) Remove the CHS W/P relay from the engine room R/B No.2.
   (2) Disconnect the E7 ECM connector.
   (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
WPL (E7-15) - CHS W/P relay (2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CHS W/P relay (2) or WPL (E7-15) - Body ground	10 kΩ or higher

   (4) Reinstall the integration relay.
   (5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the water pump connector and the CHS W/P relay.
   (1) Disconnect the CHS water pump connector.
   (2) Remove the CHS W/P relay from the engine room R/B No.2.
   (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CHS Water pump (2) - CHS W/P relay (5)	Below 1 Ω
CHS Water pump (1) - Body ground	Below 1 Ω

Standard (Check for short):

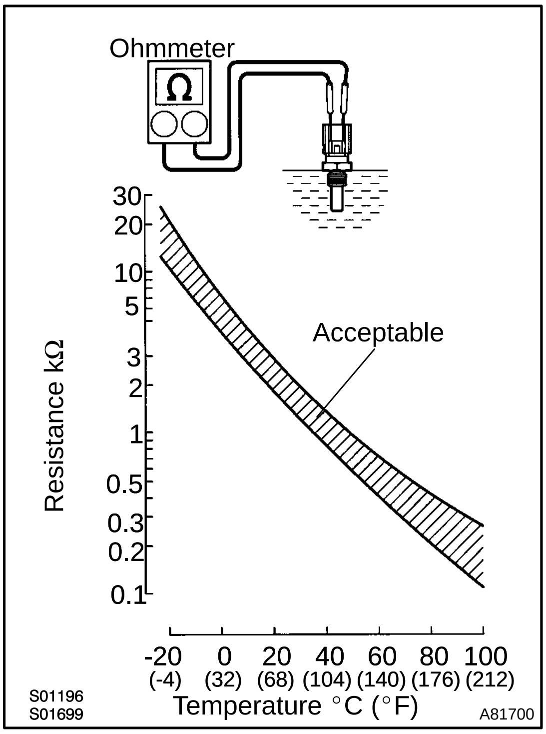
Tester Connection	Specified Condition
CHS Water pump (2) or CHS W/P relay (5) - Body ground	10 kΩ or higher

   (4) Reconnect the CHS water pump connector.
   (5) Reinstall the CHS W/P relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	INSPECT TEMPERATURE SENSOR (CHS TANK OUTLET TEMPERATURE SENSOR)



(a) Remove the coolant heat storage (CHS) tank outlet temperature sensor.

(b) Measure the resistance between the terminals.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:

In case of checking the CHS tank outlet temperature sensor in the water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

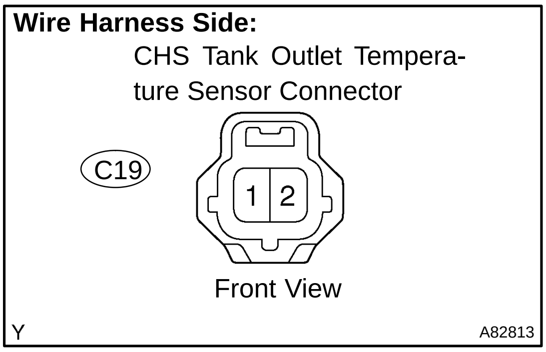
Alternate procedure: Connect an ohmmeter to the installed CHS tank outlet temperature sensor and read the resistance. Use an infrared thermometer to measure the CHS tank outlet temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine coolant temperature (warm up or allow to cool down) and repeat the test.

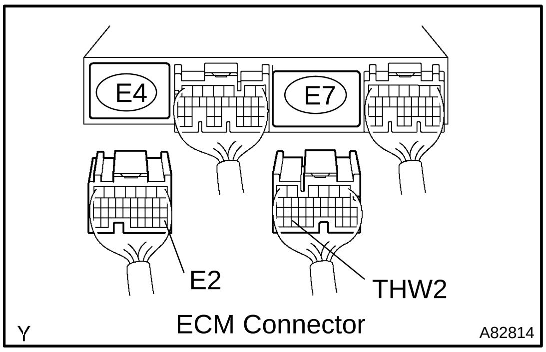
(c) Reinstall the CHS tank outlet temperature sensor.

NG	REPLACE TEMPERATURE SENSOR

OK

6	CHECK HARNESS AND CONNECTOR(ECM - CHS TANK OUTLET TEMPERATURE SENSOR)





(a) Check the harness and the connectors between the CHS tank outlet temperature sensor connector and the ECM connector.
(1) Disconnect the C19 CHS tank outlet temperature sensor connector.
(2) Disconnect the E4 and E7 ECM connectors.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CHS tank outlet temperature sensor (C19-2) - THW2 (E7-33)	Below 1 Ω
CHS tank outlet temperature sensor (C19-1) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CHS tank outlet temperature sensor (C19-2) or THW2 (E7-33) - Body ground	10 kΩ or higher

(4) Reconnect the CHS tank outlet temperature sensor connector.
(5) Reconnect the ECM connectors.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (See page 10-24)

DTC	P2610	ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE

MONITOR DESCRIPTION

To check the heat retention of the tank in the coolant heat storage (CHS) system, the ECM may cause the water pump of the CHS system to operate 5 hours after the power switch has been turned OFF.
A timer and a clock are contained in the ECM internal circuit, and the timer starts when the ignition switch is turned OFF (this process is called the ”soak mode”).
When the HV main system is started at the power switch, the ECM monitors its internal circuit. If the ECM detects a deviation between the clock and the timer, or an abnormal condition during a comparison between the starting history and the length of time the HV main power has been turned OFF, the ECM determines that its internal circuit has malfunction and sets a DTC

DTC No.	DTC Detection Condition	Trouble Area
P2610	ECM internal error	• ECM

MONITOR STRATEGY

Related DTCs	P2610: ECM internal engine off timer performance
Required sensors/components	ECM
Frequency of operation	Once per driving cycle
Duration	600 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Time internal engine off timer clock reads when CPU clock has elapsed 600 seconds	780 seconds

Case 2

Presens of history that ECM had woken up by internal engine off timer	YES
Time period vehicle has been soaked	Less than programmed period

Case 3

Presens of history that ECM had woken up by internal engine off timer	NO
Time period vehicle has been soaked	More than or equal to programmed period

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE ECM (See page 10-24)

DTC	P3190	POOR ENGINE POWER

DTC	P3191	ENGINE DOES NOT START

DTC	P3193	FUEL RUN OUT

CIRCUIT DESCRIPTION

From the HV ECU, the ECM receives data such as power output required for the engine (required output), estimated torque produced by the engine (estimated torque), engine RPM of control target (target RPM), whether the engine is in start mode or not. Then, based on the required output and target RPM, the ECM calculates a target torque that is to be produced by the engine and compares it with the estimated torque. If the estimated torque is very low compared with the target torque, or the engine start mode continues for the specific duration calculated by water temperature, an abnormal condition is detected.

DTC No.	DTC Detection Condition	Trouble Area
P3190	Following conditions continue at a fixed engine RPM or a fixed length of time: • Communication with HV ECU is normal • Engine RPM is a fixed value or more • Engine start mode is not active • Target torque is a fixed value • Ratio of estimated torque against target torque is less than 20 %	• Air induction system • Throttle body • Fuel pressure • Engine • Mass Air flow meter • Out of fuel • Engine coolant temperature sensor • Crankshaft position sensor • Camshaft position sensor • ECM
P3191	Following conditions continue at a fixed engine RPM or a fixed length of time: • Communication with HV ECU is normal • Engine RPM is a fixed value or more • Engine start mode is active	• Air induction system • Throttle body • Fuel pressure • Engine • Mass Air flow meter • Out of fuel • Engine coolant temperature sensor • Crankshaft position sensor • Camshaft position sensor • ECM
P3193	Following conditions are met: • Fuel low level signal input into ECM • Detection condition for P3190 or P3191 is satisfied	• Out of fuel • ECM

MONITOR DESCRIPTION

The ECM and HV control ECU are connected by a communication line called CAN. The ECM sends information on the engine speed and other data to the HV control ECU while the HV control ECU sends the information such as a requirement for the engine power to the ECM using tha CAN communication line.
When the communication between the ECM and HV control ECU is normal and the following items becomes specific condition, the ECM will illuminates the MIL and sets a DTC.

(a) Engine speed
(b) Power switch
(c) Target torque
(d) Ratio of target torque against estimated torque
(e) Fuel level

MONITOR STRATEGY

Related DTCs	P3190: Poor engine power P3191: Engine does not start P3193: Fuel run out
Required sensors/components	Main sensors: Crankshaft position sensor Related sensors: HV control ECU
Frequency of operation	Continuous
Duration	100 engine revolutions and 6 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Fuel cut operation	Not operated
Engine speed	800 rpm or more (varies with engine coolant temperature)

TYPICAL MALFUNCTION THRESHOLDS

Case1: P3190

Time for low engine torque	100 engine revolutions or more, and 6 seconds or more (varies with engine coolant temperature)
Fuel level	Not empty

Case2: P3191

Engine start no-determination time (receive from HV ECU)	100 engine revolutions or more, and 6 seconds or more (varies with engine coolant temperature)
Fuel level	Not empty

Case3: P3193

Time for low engine torque or Engine start no-determination time	100 engine revolutions or more, and 6 seconds or more (varies with engine coolant temperature)
Fuel level	Empty

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P3190, P3191 AND/OR P3193)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P3190, P3191 and/or P3193	A
P3190, P3191 and/or P3193, and other DTCs	B

HINT:
If any other codes besides P3190, P3191 and/or P3193 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-55)**

A

2	CHECK SHORTAGE OF FUEL

NG → **REFILL FUEL**

OK

3	CHECK AIR INDUCTION SYSTEM

OK: The air induction system has no leakage and blockages.

NG → **REPAIR OR REPLACE AIR INDUCTION SYSTEM**

OK

4	CHECK FOR UNUSUAL NOISE OR VIBRATION WHEN STARTING ENGINE OR REVVING UP

OK: Unusual noise and vibration do not occur.

NG → **REPAIR OR REPLACE**

OK

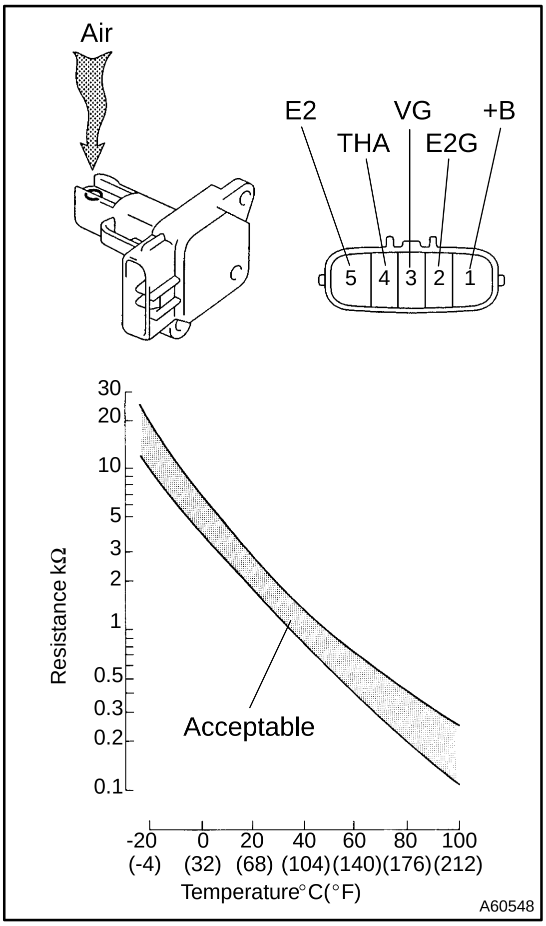
5 CHECK FUEL PRESSURE (See page 11-9)

OK:
Fuel pressure: 304 to 343 kPa (3.1 to 3.5 kgf/cm^2, 44 to 50 psi)

NG > **CHECK AND REPAIR FUEL SYSTEM**

OK

6 INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.
(b) Inspect output voltage.
(1) Apply battery voltage across terminals +B and E2G.
(2) Connect the positive (+) tester prove to terminal VG, and negative (-) tester prove to terminal E2G.
(3) Blow air into the mass air flow meter, and check that the voltage fluctuates.

Standard:

Tester Connection	Specified Condition
VG (3) - E2G (2)	Sensor output voltage fluctuates between 0.3 V and 4.8 V

(c) Inspect resistance.
(1) Measure the resistance between the terminals of the mass air flow meter.

Standard:

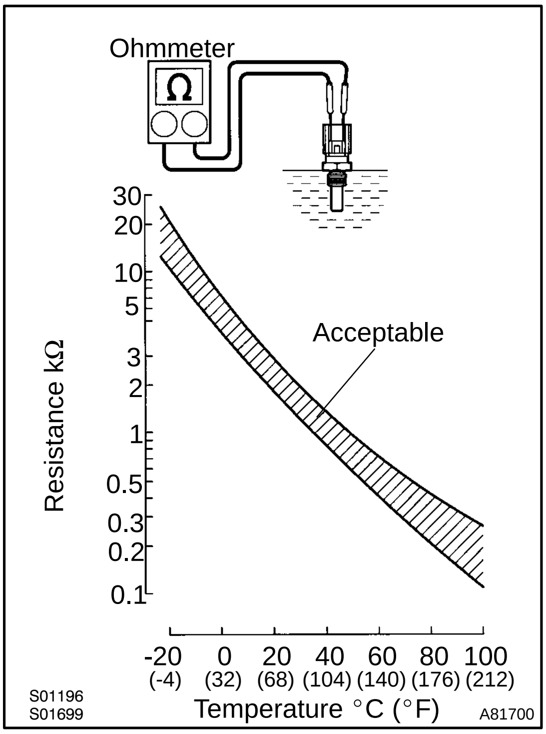
Tester Connection	Specified Condition
THA (4) - E2 (5)	13.6 to 18.4 kΩ at -20°C (-4°F)
THA (4) - E2 (5)	2.21 to 2.69 kΩ at 20°C (68°F)
THA (4) - E2 (5)	0.49 to 0.67 kΩ at 60°C (140°F)

(d) Reinstall the mass air flow meter.

NG > **REPLACE MASS AIR FLOW METER**

OK

7	INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.

(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:

In case of checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

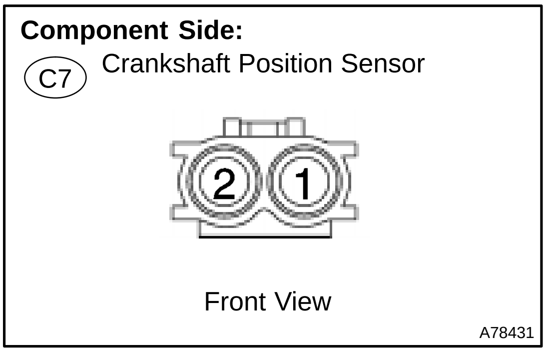
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the engine coolant temperature sensor.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

8	INSPECT CRANKSHAFT POSITION SENSOR



(a) Disconnect the C7 crankshaft position sensor connector.

(b) Measure the resistance between the terminals of the crankshaft position sensor connector.

Standard:

Tester Connection	Specified Condition
1 - 2	985 to 1,600 Ω at cold
1 - 2	1,265 to 1,890 Ω at hot

(c) Reconnect the crankshaft position sensor connector.

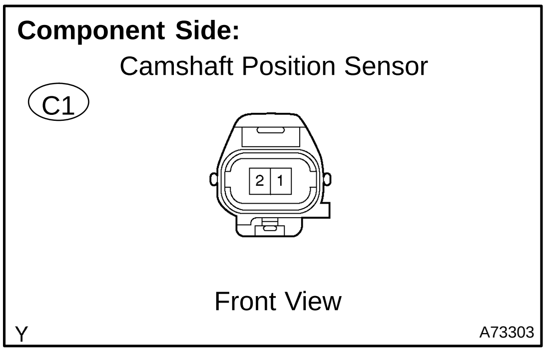
NOTICE:

Terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C to 50°C (14°F to 122°F). "Hot" means approximately 50°C to 100°C (122°F to 212°F).

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

9 INSPECT CAMSHAFT POSITION SENSOR



(a) Disconnect the C1 camshaft position sensor connector.

(b) Measure the resistance between the terminals of camshaft position sensor connector.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
1 - 2	2,065 to 3,225 Ω at hot

(c) Reconnect the camshaft position sensor connector.

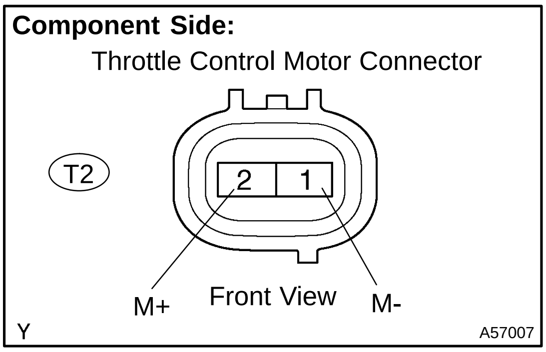
NOTICE:

Terms ”cold” and ”hot” refer to the temperature of the coils. ”Cold” means approximately -10°C to 50°C (14°F to 122°F). ”Hot” means approximately 50°C to 100°C (122°F to 212°F).

NG **REPLACE CAMSHAFT POSITION SENSOR**

OK

10 INSPECT THROTTLE CONTROL MOTOR



(a) Disconnect the throttle control motor connector.

(b) Using an ohmmeter, measure the motor resistance between terminals 1 (M-) and 2 (M+).

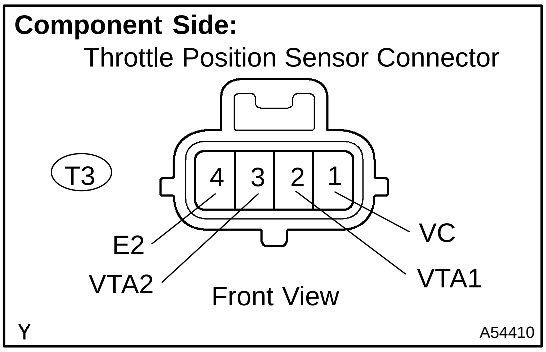
Standard:

Tester Connection	Specified Condition
1 - 2	0.3 to 100 Ω at 20 °C (68 °F)

NG **REPLACE THROTTLE CONTROL MOTOR**

OK

11	INSPECT THROTTLE POSITION SENSOR



(a) Disconnect the throttle position sensor connector.

(b) Measure the resistance between the terminals of the throttle position sensor.

Standard:

Throttle position sensor terminal	Resistance
VC (1) - E2 (4)	1.2 to 3.2 kΩ at 20°C (68°F)
VTA1 (2) - E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)
VTA2 (3) - E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)

NG → **REPLACE THROTTLE POSITION SENSOR**

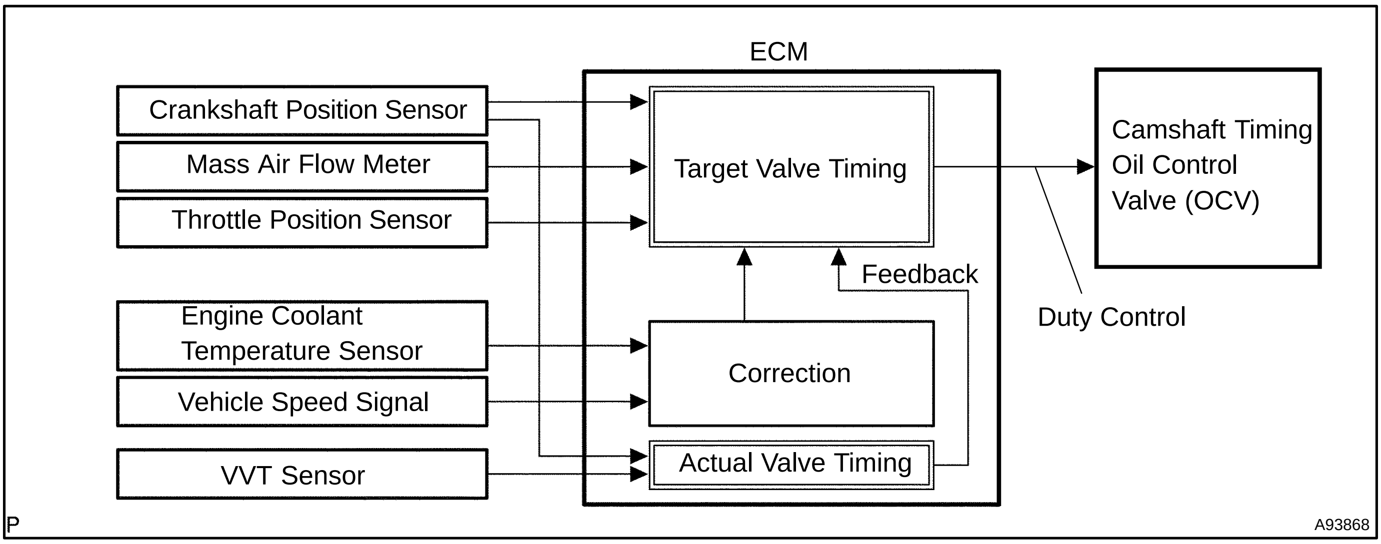
OK

REPLACE ECM (See page 10-24)

DTC	P0010	CAMSHAFT POSITION ”A” ACTUATOR CIRCUIT (BANK 1)

CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target ”duty-cycle” control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. Camshaft timing control is performed based on engine operation condition such as intake air volume, throttle position and engine coolant temperature.
The ECM controls the OCV based on the signals from several sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As result, the relative position between the camshaft and the crankshaft is optimized, the engine torque and fuel economy improve, and exhaust emissions decrease. The ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor. The ECM performs feedback control and verifies target valve timing.



DTC No.	DTC Detection Condition	Trouble Area
P0010	Open or short in oil control valve circuit	• Open or short in oil control valve circuit • Oil control valve • ECM

MONITOR DESCRIPTION

After the ECM sends the "target" duty-cycle signal to the OCV, the ECM monitors the OCV current to establish an "actual" duty-cycle. The ECM detects malfunction and sets a DTC when the actual duty-cycle ratio varies from the target duty-cycle ratio.

MONITOR STRATEGY

Related DTCs	P0010: VVT oil control valve range check
Required sensors/components	OCV
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more, and less than 13 V
Target duty ratio	less than 70 %
Starter	OFF
Current cut status	Not cut

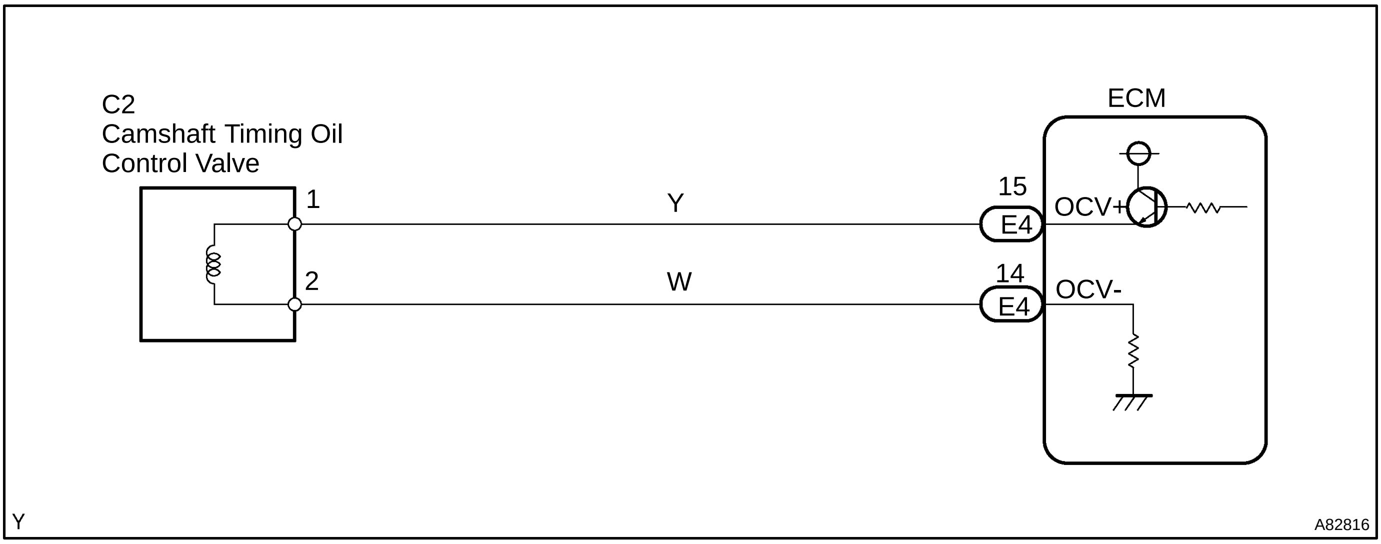
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty for OCV	Output duty is 3 % or less despite the ECM supplying the current to the OCV or Output duty is 100 %

COMPONENT OPERATING RANGE

Output signal duty for OCV	More than 3 % and less than 100 %

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand-held tester:

1	PERFORM ACTIVE TEST BY HAND-HELD TESTER(OPERATE OCV)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Put the engine in inspection mode (see page 01-27).
(e) Start the engine and warm it up.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.
(g) Using the hand-held tester, operate the OCV and check the engine speed.

Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

NG

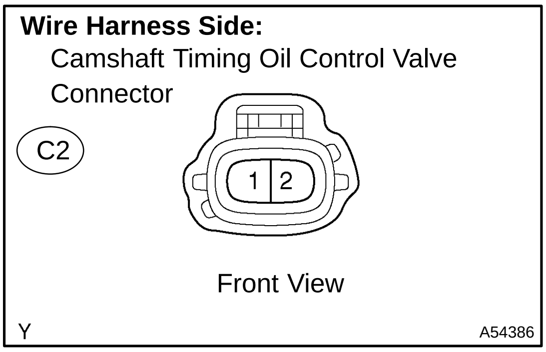
2	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10-5)

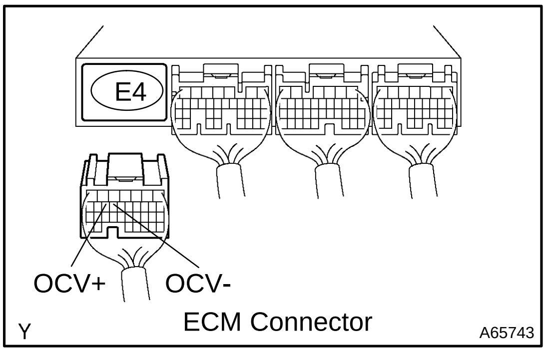
OK: OCV has no contamination and moves smoothly.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

3	CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) - ECM)





(a) Disconnect the C2 camshaft timing oil control valve connector.

(b) Disconnect the E4 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Oil control valve (C2-1) - OCV+ (E4-15)	Below 1 Ω
Oil control valve (C2-2) - OCV- (E4-14)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Oil control valve (C2-1) or OCV+ (E4-15) - Body ground	10 kΩ or higher
Oil control valve (C2-2) or OCV- (E4-14) - Body ground	10 kΩ or higher

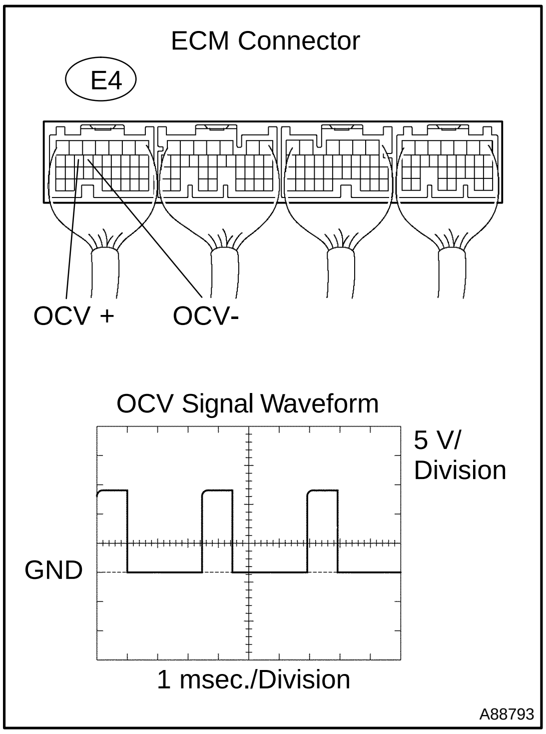
(d) Reconnect the camshaft timing oil control valve connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT ECM(OCV SIGNAL)



(a) Put the engine in inspection mode.

(b) Start the engine and warm it up.

(c) During idling, check the waveform between the specified terminals of the E4 ECM connector using an oscilloscope.

Standard:

Tester Connection	Specified Condition
OCV+ (E4-15) - OCV- (E4-14)	Correct waveform is as shown

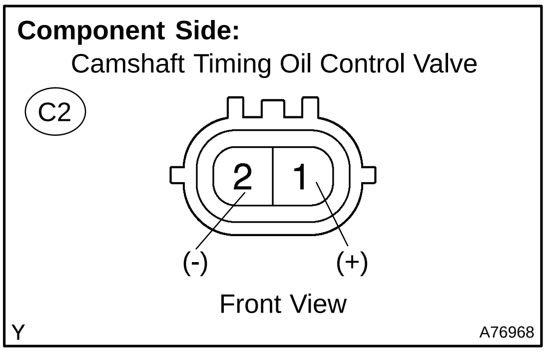
NG → **REPLACE ECM (See page 10-24)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

OBDII scan tool (excluding hand-held tester):

1	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OPERATE OCV)



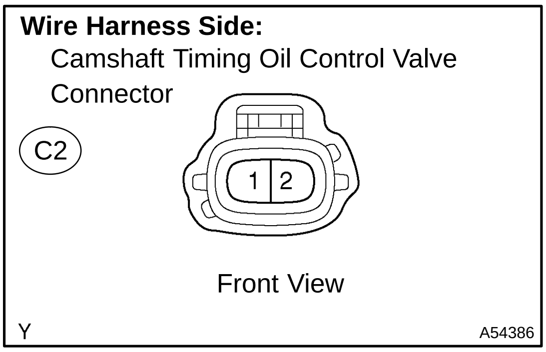
(a) Disconnect the C2 camshaft timing oil control valve connector.
(b) Put the engine in inspection mode (see page 01-27).
(c) Apply positive battery voltage between the terminals of the camshaft timing oil control valve.
(d) Check the engine speed.
OK:
Engine speed is rough idle or engine stalls.
(e) Reconnect the camshaft timing oil control valve connector.

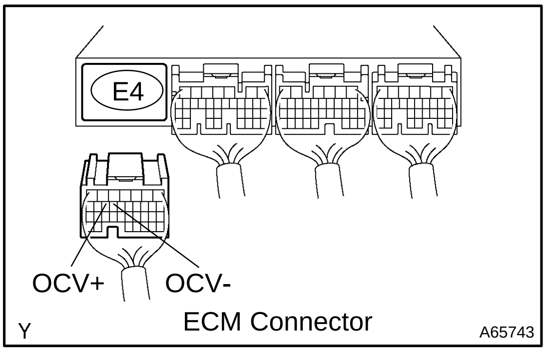
NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

NG → **REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

OK

2	CHECK HARNESS AND CONNECTOR(CAMSHAFT TIMING OIL CONTROL VALVE (OCV) - ECM)





(a) Disconnect the C2 camshaft timing oil control valve connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Oil control valve (C2-1) - OCV+ (E4-15)	Below 1 Ω
Oil control valve (C2-2) - OCV- (E4-14)	Below 1 Ω

Standard (Check for short):

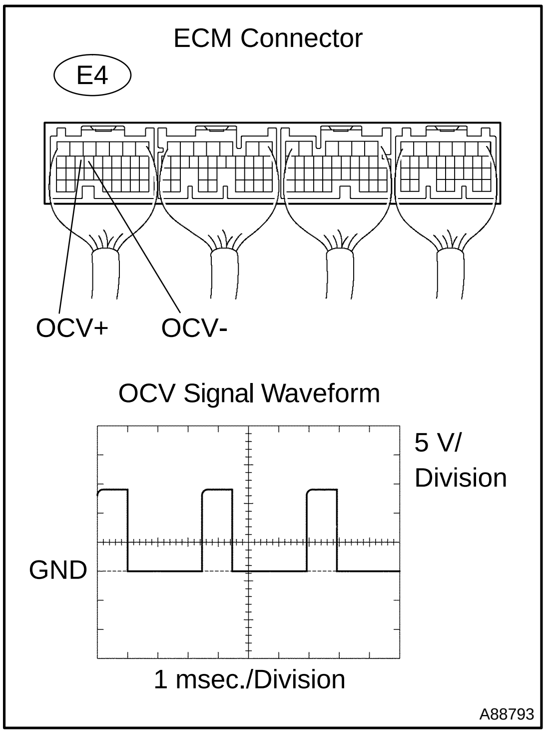
Tester Connection	Specified Condition
Oil control valve (C2-1) or OCV+ (E4-15) - Body ground	10 kΩ or higher
Oil control valve (C2-2) or OCV- (E4-14) - Body ground	10 kΩ or higher

(d) Reconnect the camshaft timing oil control valve connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ECM(OCV SIGNAL)



(a) Put the engine in inspection mode.
(b) Start the engine and warm it up.
(c) During idling, check the waveform between the specified terminals of the E4 ECM connector using an oscilloscope.
Standard:

Tester Connection	Specified Condition
OCV+ (E4-15) - OCV- (E4-14)	Correct waveform is as shown

NG → **REPLACE ECM (See page 10-24)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

DTC	P0011	CAMSHAFT POSITION ”A” -TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC	P0012	CAMSHAFT POSITION ”A” -TIMING OVER-RETARDED (BANK 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page 05-63 .

DTC No.	DTC Detection Condition	Trouble Area
P0011 P0012	After engine is warmed up, condition (a) or (b) continues at engine speed of 900 to 5,000 rpm: (a) Valve timing does not change from current valve timing (b) Current valve timing is fixed	• Valve timing • Oil control valve • Camshaft timing gear assembly • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target ”duty-cycle” control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.

Example:

A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and this condition continues for more than 4.5 seconds; or 2) the OCV is forcibly activated 63 times or more.

Advanced cam DTCs are subject to ”1 trip” detection logic.

Retarded cam DTCs are subject to ”2 trip” detection logic.

MONITOR STRATEGY

Related DTCs	P0011: VVT system advance (bank 1) P0012: VVT system retard (bank 1)
Required sensors/components	Main sensors: Camshaft position sensor Related sensors: Engine coolant temperature sensor Crankshaft position sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	P0011: Immediately P0012: 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more
Engine speed	900 rpm or more, and 5,000 rpm or less
Engine coolant temperature	75°C (167°F) or more, and 100°C (212°F) or less

TYPICAL MALFUNCTION THRESHOLDS

Duration time of the following condition (a) and (b) are met	4.5 seconds or more
(a) Following conditions are met:	1 & 2
1. VVT control status	Feedback
2. Deviation of valve timing (Target valve timing - Actual valve timing)	More than 5°CA
(b) Response of valve timing	1 sec/°CA or more

WIRING DIAGRAM

Refer to DTC P0010 on page 05-63 .

INSPECTION PROCEDURE

HINT:

Advanced timing over standard level (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

- If DTC P0011 or P0012 is displayed, check the VVT system circuit.
- Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand-held tester:

1	**CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14-6)**

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

NG → **ADJUST VALVE TIMING (See page 14-6)**

OK

2 PERFORM ACTIVE TEST BY HAND-HELD TESTER(OPERATE OCV)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) Put the engine in inspection mode (see page 01-27).
(e) Start the engine and warm it up.
(f) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.
(g) Using the hand-held tester, operate the OCV and check the engine speed.
Standard:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

NG → **Go to step 4**

OK

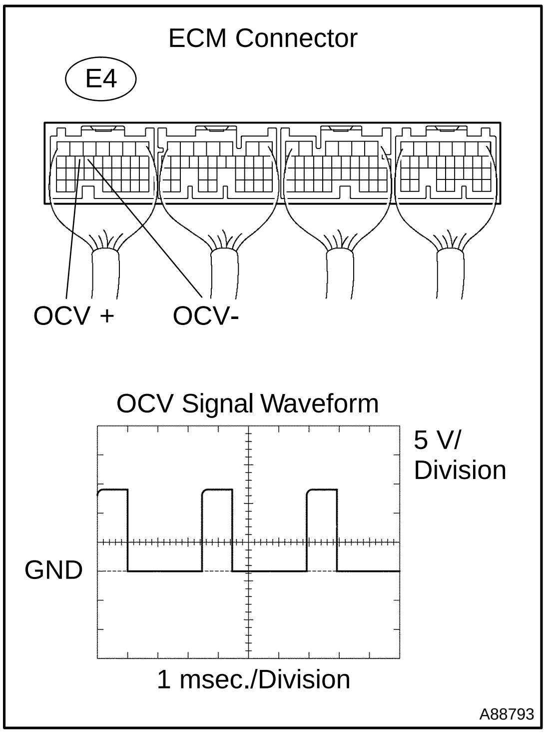
3 CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05-41).
(b) Start the HV main system and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the hand-held tester.
Standard: No DTC output.
HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



(a) During idling, check the waveform between the specified terminals of the E4 ECM connector using an oscilloscope.

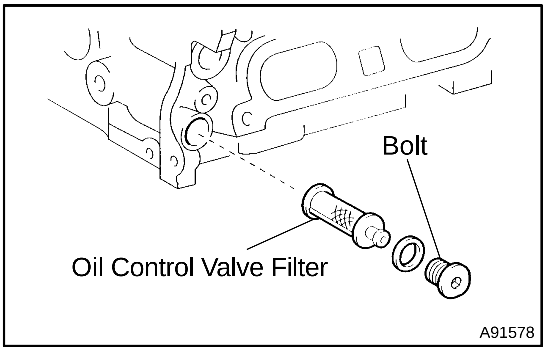
Standard:

Tester Connection	Specified Condition
OCV+ (E4-15) - OCV- (E4-14)	Correct waveform is as shown

NG → **REPLACE ECM (See page 10-24)**

OK

5	INSPECT OIL CONTROL VALVE FILTER (See page 14-124)



(a) Remove the air cleaner inlet, bolt and oil control valve filter.

(b) Check for blockages in the oil control valve filter.

(c) Reinstall the filter, bolt and air cleaner inlet.

NOTICE:

If necessary, clean the filter.

OK: The filter has not clogged.

NG → **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10-5)

OK: OCV has no contamination and moves smoothly.

OK → **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14-95)

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05-41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the hand-held tester.

OK: No DTC output.

HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

REPLACE ECM (See page 10-24)

OBDII scan tool (excluding hand-held tester):

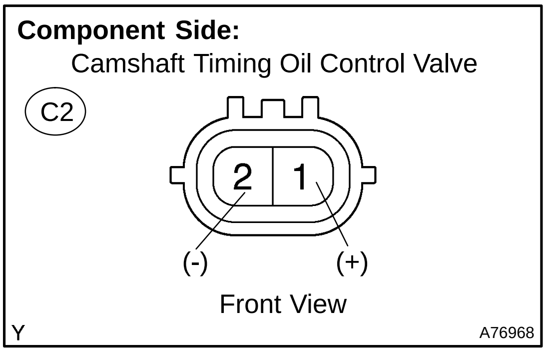
1	CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14-6)

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

OK → **ADJUST VALVE TIMING (See page 14-6)**

NG

2	CHECK OPERATION OF OCV



(a) Put the engine in inspection mode.
(b) Start the engine.
(c) Check the engine speed under conditions (1) and (2) below.
  (1) Disconnect the C2 camshaft timing oil control valve connector.
  (2) Apply the positive battery voltage between the terminals of the camshaft timing oil control valve.

Result:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Other than above	Other than above

(d) Reconnect the camshaft timing oil control valve connector.

B → **Go to step 4**

A

3	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05-41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the OBD II scan tool.

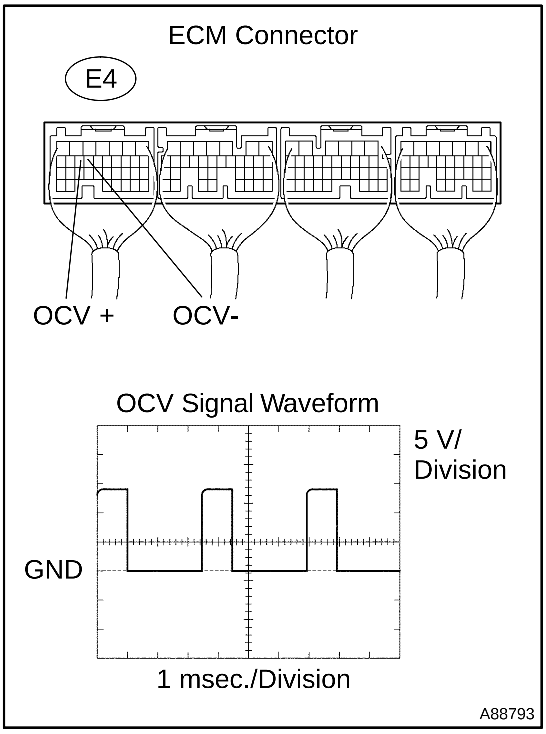
OK: No DTC output.

HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

4	INSPECT ECM(OCV SIGNAL)



(a) Put the engine in inspection mode.
(b) Start the engine and warm it up.
(c) During idling, check the waveform between the specified terminals of the E4 ECM connector using the oscilloscope.

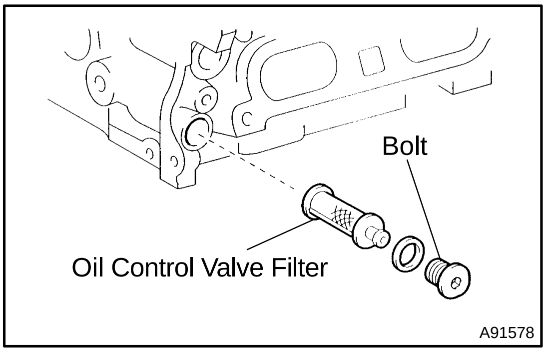
Standard:

Tester Connection	Specified Condition
OCV+ (E4-15) - OCV- (E4-14)	Correct waveform is as shown

NG **REPLACE ECM (See page 10-24)**

OK

5	INSPECT OIL CONTROL VALVE FILTER (See page 14-124)



(a) Remove the air cleaner inlet, bolt and oil control valve filter.
(b) Check for blockages in the oil control valve filter.
(c) Reinstall the filter, bolt and air cleaner inlet.

NOTICE:
If necessary, clean the filter.

OK: The filter has not clogged.

NG **REPLACE OIL CONTROL VALVE FILTER**

OK

6	INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV) (See page 10-5)

OK: OCV has no contamination and moves smoothly.

OK **Go to step 8**

NG

7	REPLACE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(OCV)

GO

8	INSPECT CAMSHAFT TIMING GEAR ASSY (See page 14-95)

OK: The camshaft timing gear rotate smoothly when applying pressure.

OK → **Go to step 10**

NG

9	REPLACE CAMSHAFT TIMING GEAR ASSY

GO

10	CHECK IF DTC OUTPUT RECURS

(a) Clear the DTCs (see page 05-41).
(b) Start the HV system, and warm the engine up.
(c) Drive the vehicle with the shift position in B at vehicle speed of more than 44 mph (70 km/h) approximately for 10 minutes or more.
(d) Read output DTCs using the OBD II scan tool.

OK: No DTC output.

HINT:
*: DTC P0011 or P0012 is output when a foreign object in engine oil is caught in some part of the system. These codes will stay registered even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT SYSTEM OK ***

NG

REPLACE ECM (See page 10-24)

DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page 05-177 .

DTC No.	DTC Detection Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and VVT sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain stretched) • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the Variable Valve Timing (VVT) system to control the intake valve camshaft. The VVT system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target "duty-cycle" control signal to the OCV. This control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine speed is idling. The ECM closes the OCV to retard the cam. The ECM stores this valve as "VVT learned value" (when the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory).
If the learned value meets both of the following conditions ("a" and "b"), the ECM interprets this as a defect in the VVT system and sets a DTC.
(a) VVT learning value is less than 30°CA (CA: Crankshaft Angle), or more than 46°CA.
(b) Above condition continues for more than 18 second.

MONITOR STRATEGY

Related DTCs	P0016: Deviation in crankshaft position sensor signal and VVT sensor signal
Required sensors/components	Crankshaft position sensor, camshaft position sensor
Frequency of operation	Once per driving cycle
Duration	60 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
VVT feedback mode	ON
Engine speed	900 rpm or more, and 5,000 rpm or less

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:	(a) or (b)
(a) VVT learned value	Less than 30°CA
(b) VVT learned value	More than 46°CA

WIRING DIAGRAM

Refer to DTC P0335 on page 05-177 .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**CHECK VALVE TIMING(CHECK FOR LOOSE AND A JUMPED TOOTH OF TIMING CHAIN) (See page 14-6)**

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

NG → **ADJUST VALVE TIMING (See page 14-6) (REPAIR OR REPLACE TIMING CHAIN)**

OK

REPLACE ECM (See page 10-24)

DTC	P0031	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

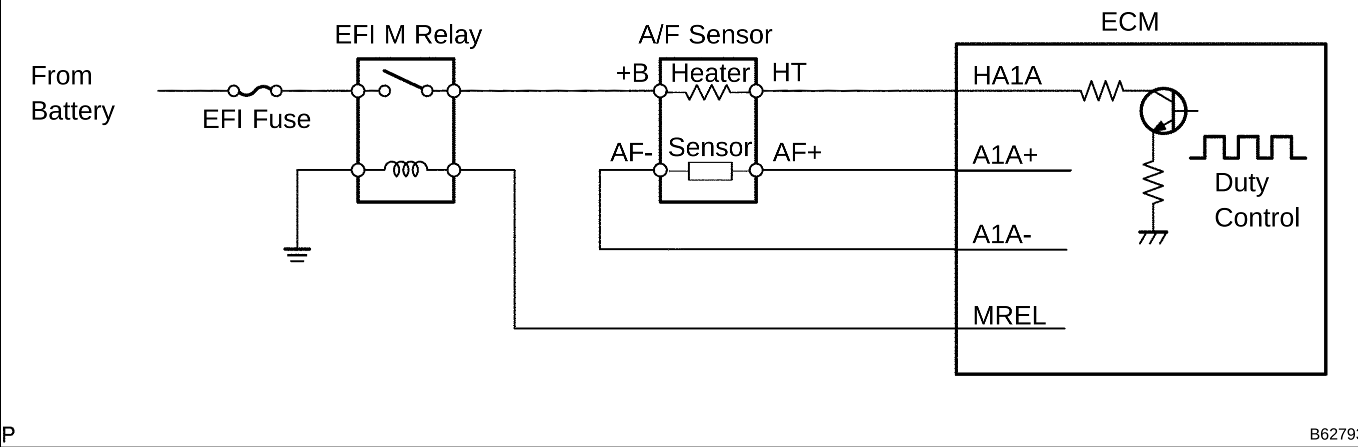
DTC	P0032	OXYGEN (A/F) SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

HINT:
Although each DTC title says "oxygen sensor," these DTCs are related to the air-fuel ratio sensor (A/F sensor).

CIRCUIT DESCRIPTION

Refer to DTC P2195 on page 05-313 .
HINT:
The ECM provides a pulse width modulated control circuit to adjust current through the heater. The A/F sensor heater circuit uses a relay on the +B side of the circuit.

Reference (Bank 1 Sensor 1 System Diagram):



DTC No.	DTC Detection Condition	Trouble Area
P0031	Heater current is 0.8 A or less when the heater operates (1 trip detection logic)	• Open or short in heater circuit of A/F sensor • A/F sensor heater • EFI M relay (integration relay) • ECM
P0032	Heater current exceeds 10 A when the heater operates (1 trip detection logic)	• Short in heater circuit of A/F sensor • A/F sensor heater • EFI M relay (integration relay) • ECM

HINT:
- Sensor 1 refers to the sensor mounted before the TWC and is located near the engine assembly.
- Sensor 2 refers to the sensor mounted after the TWC and is located far from the engine assembly.

MONITOR DESCRIPTION

The ECM uses the Air-Fuel Ratio (A/F) sensor information to regulate the air-fuel ratio close to the stoichiometric ratio. This maximizes the catalytic converter's ability to purify exhaust gases. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.
The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to the exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The zirconia element generates a small voltage when there is a large difference between the oxygen concentrations of the exhaust and the outside air. The platinum coating amplifies the voltage generation. When heated, the sensor becomes very efficient. If the temperature of the exhaust is low, the sensor will not generate useful voltage signals without supplemental heating. The ECM regulates the supplemental heating using a duty-cycle approach to regulate the average current in the heater element. If the heater current is out of the normal range, the sensor output signals will be inaccurate and the ECM can not regulate the air-fuel ratio properly.
When the heater current is out of the normal operating range, the ECM interprets this as malfunction of the sensor and sensor circuit and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0031: A/F sensor heater current (low current) P0032: A/F sensor heater current (high current)
Required sensors/components	A/F sensor, ECM
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	10.5 V or more
Heater duty ratio-cycle	P0031: 50 % or more P0032: More than 0 %
Time after engine start	10 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

P0031:

A/F sensor heater current	Less than 0.8 A

P0032:

A/F sensor heater current	More than 10 A

COMPONENT OPERATING RANGE

A/F sensor heater current	1.8 to 3.4 A (at 20°C [68°F])

WIRING DIAGRAM

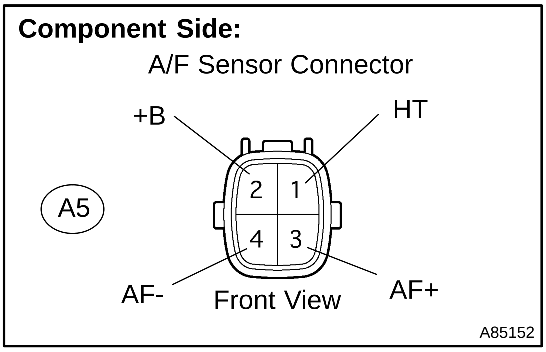
Refer to DTC P2195 on page 05-313 .

INSPECTION PROCEDURE

HINT:

- When DTC P0032 is detected, proceed to step 4 if the heater resistance is in normal range.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT AIR FUEL RATIO SENSOR(HEATER RESISTANCE)



(a) Disconnect the A5 A/F sensor connector.

(b) Measure the resistance between the terminals of the A/F sensor connector.

Standard:

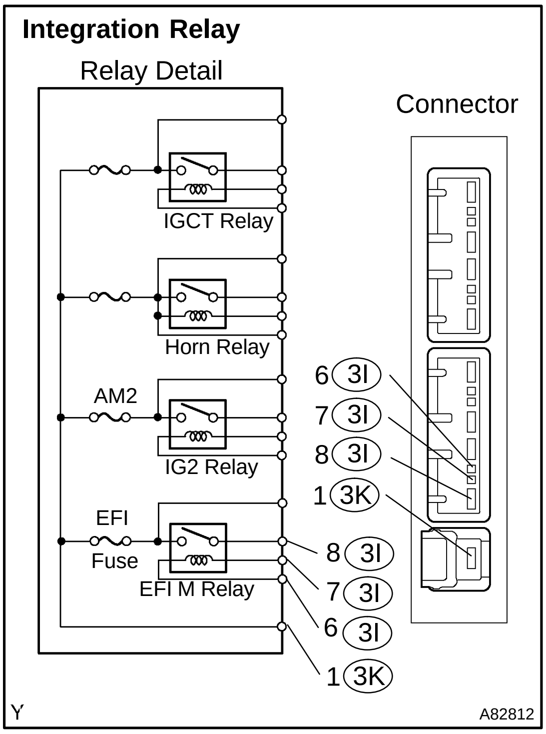
Tester Connection	Resistance
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68°F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

2	INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.

(b) Inspect the EFI M relay.

Standard:

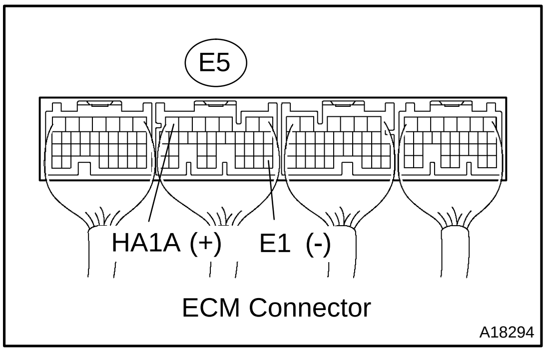
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

3	INSPECT ECM(HA1A VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the applicable terminals of the E5 ECM connector.

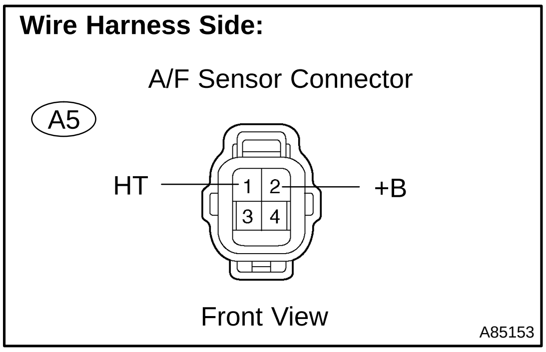
Standard:

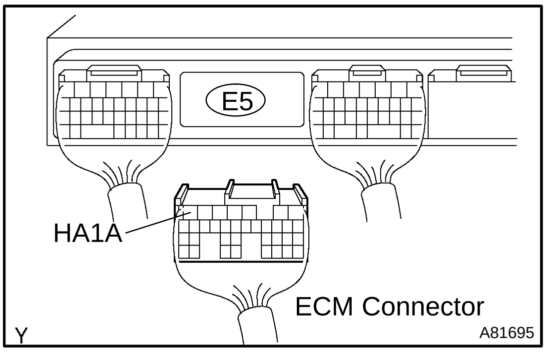
Tester Connection	Specified Condition
HA1A (E5-7) - E1 (E5-28)	9 to 14 V

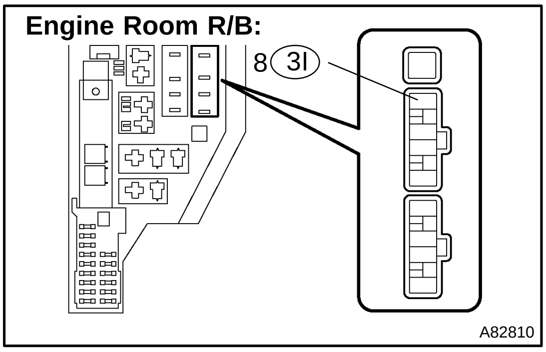
OK — **REPLACE ECM (See page 10-24)**

NG

4	CHECK HARNESS AND CONNECTOR(A/F SENSOR - ECM, A/F SENSOR - EFI M RELAY)







(a) Check the harness and the connectors between the ECM and the A/F sensor connectors.
(1) Disconnect the A5 A/F sensor connector.
(2) Disconnect the E5 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HT (A5-1) - HA1A (E5-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
HT (A5-1) or HA1A (E5-7) - Body ground	10 kΩ or higher
HT (A5-1) - +B (A5-2)	10 kΩ or higher

(4) Reconnect the A/F sensor connector.
(5) Reconnect the ECM connector.

(b) Check the harness and connectors between the A/F sensor connector and the EFI M relay.
(1) Disconnect the A5 A/F sensor connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (A5-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (A5-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the A/F sensor connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

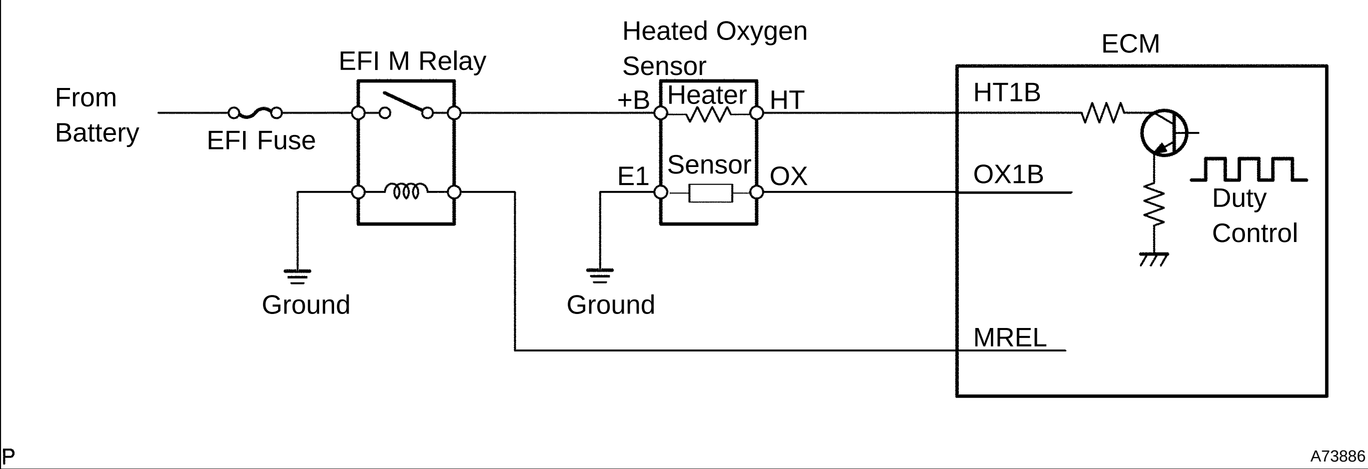
CIRCUIT DESCRIPTION

Refer to DTC P0136 on page 05-124 .

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the +B side of the circuit.

Reference (Bank 1 Sensor 2 System Diagram):



DTC No.	DTC Detection Condition	Trouble Area
P0037	Heater current is 0.25 A or less when the heater operates with +B greater than 11.5 V (1 trip detection logic)	• Open or short in heater circuit of the heated oxygen sensor • Heated oxygen sensor heater • EFI M relay (integration relay) • ECM
P0038	When the heater operates, heater current exceeds 2 A (1 trip detection logic)	• Short in heater circuit of the heated oxygen sensor • Heated oxygen sensor heater • EFI M relay (integration relay) • ECM

HINT:

- Sensor 1 refers to the sensor mounted before the TWC and is located near the engine assembly.
- Sensor 2 refers to the sensor mounted after the TWC and is located far from the engine assembly.

MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust gas. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surfaces of sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0037: Heated oxygen sensor heater current bank 1 sensor 2 (low current) P0038: Heated oxygen sensor heater current bank 1 sensor 2 (high current)
Required sensors/components	Heated oxygen sensor
Frequency of operation	Continuous
Duration	0.3 second
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0037:

The monitor will run whenever the following DTCs are not present	See page 05-20
Either of the following conditions is met:	A or B
A. Following conditions are met:	1, 2, 3, 4 and 5
1. Time after engine start	250 seconds or more, and 500 seconds or less
2. Battery voltage	More than 10.5 V
3. Vehicle speed	Less than 55.9 mph (90 km/h)
4. Misfire	Not detected
5. Pass/Fail detection in this driving cycle	Not detected
B. Following conditions are met:	1, 2, 3, 4 and 5
1. Time after engine start	500 seconds or more
2. Battery voltage	More than 10.5 V
3. Vehicle speed	24.8 mph (40 km/h) or more
4. Misfire	Not detected
5. Pass/Fail detection in this driving cycle	Pass and fail detection has not occurred yet

P0038:

The monitor will run whenever the following DTCs are not present	See page 05-20
Intrusive heating	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0037:

Heated oxygen sensor heater current	Less than 0.25 A (at 0.3 second after heater is turned ON)

P0038:

Heated oxygen sensor heater current	More than 2 A (while supplemental heating is OFF)

COMPONENT OPERATING RANGE

Heated oxygen sensor heater current (after engine is warmed up)	0.4 to 1.0 A (at idle and battery voltage 11 to 14 V)

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

HO2S Heater Bank 1 Sensor 2

MID	TID	Scaling	Description of Test Value
$42	$90	Multiply by 0.001 (A)	Maximum sensor heater current

WIRING DIAGRAM

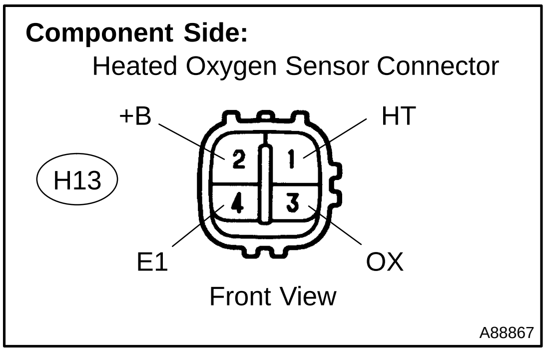
Refer to DTC P0136 on page 05-124 .

INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When DTC P0038 is detected, proceed to step 4 if the heater resistance is in normal range.

1	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H13 heated oxygen sensor connector.

(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard (Bank 1 sensor 2):

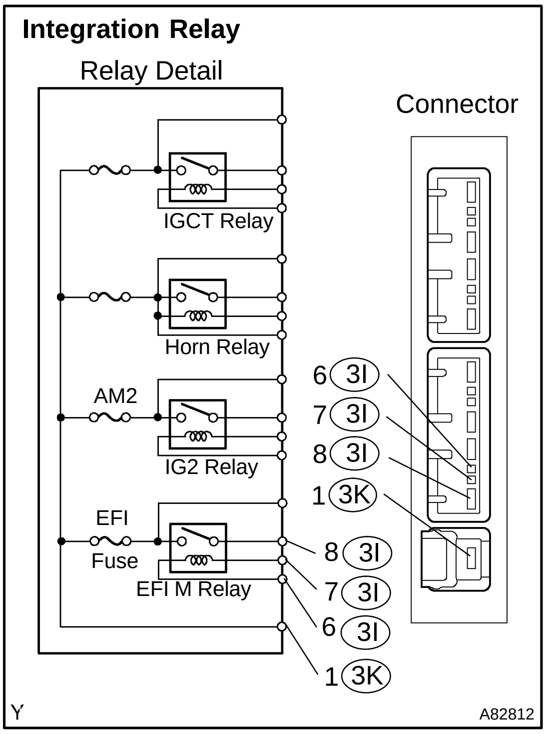
Tester Connection	Resistance
HT (H13-1) - +B (H13-2)	11 to 16 Ω at 20°C (68°F)
HT (H13-1) - E1 (H13-4)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2	**INSPECT INTEGRATION RELAY(EFI M RELAY)**



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.
Standard:

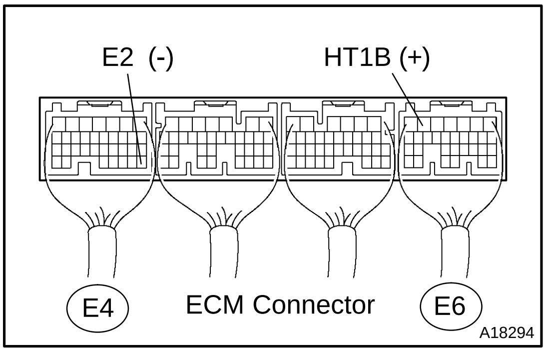
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

3	**INSPECT ECM(HT1B VOLTAGE)**



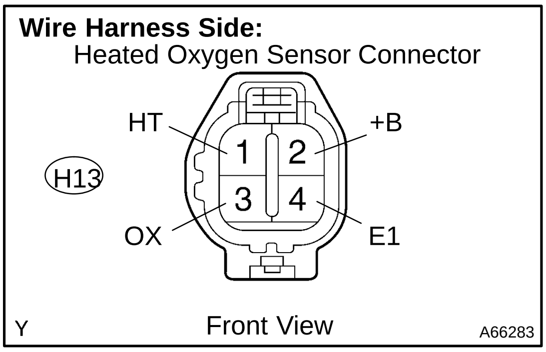
(a) Turn the power switch ON (IG).
(b) Measure the voltage between the applicable terminals of the E4 and E6 ECM connectors.
Standard:

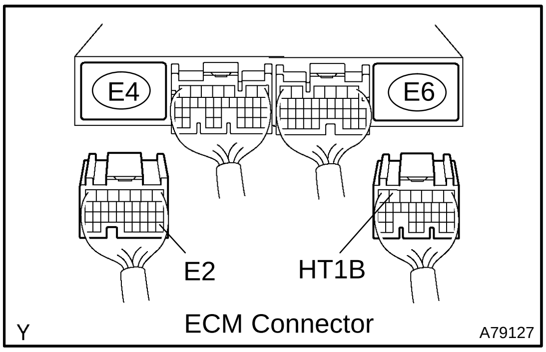
Tester Connection	Specified Condition
HT1B (E6-6) - E2 (E4-28)	9 to 14 V

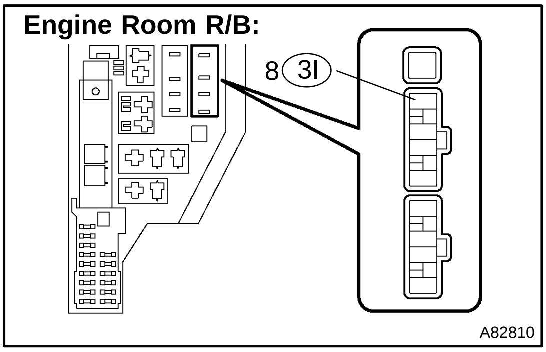
OK → **REPLACE ECM (See page 10-24)**

NG

4	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR - ECM, HEATED OXYGEN SENSOR - EFI M RELAY)







(a) Check the harness and the connectors between the ECM and the heated oxygen sensor connectors.

(1) Disconnect the H13 heated oxygen sensor connector.

(2) Disconnect the E4 and E6 ECM connectors.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
HT (H13-1) - HT1B (E6-6)	Below 1 Ω
E1 (H13-4) - E2 (E4-28)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
HT (H17-2) or HT1B (E6-6) - Body ground	10 kΩ or higher
HT (H13-1) - +B (H13-2)	10 kΩ or higher

(4) Reconnect the heated oxygen sensor connector.

(5) Reconnect the ECM connectors.

(b) Check the harness and the connectors between the heated oxygen sensor connector and the EFI M relay.

(1) Disconnect the H13 heated oxygen sensor connector.

(2) Remove the integration relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (H13-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (H13-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the heated oxygen sensor connector.

(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

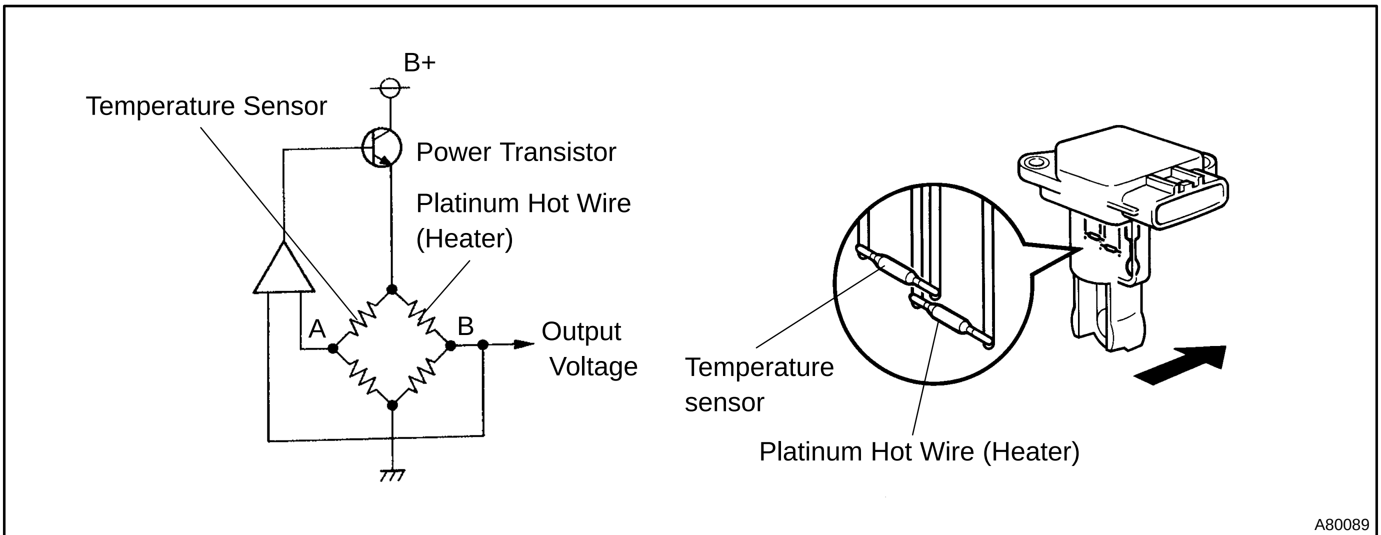
DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provides a proper air-fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.
By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flowing through the sensor. The ECM interprets this voltage as the intake air amount.
The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, and the power transistor is controlled so that the potential of A and B remains equal to maintain the set temperature.



DTC No.	DTC Detection Condition	Trouble Area
P0100	When the mass air flow meter circuit has an open or a short for more than 3 seconds	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	When the mass air flow meter circuit has an open for more than 3 seconds	• Open in mass air flow meter circuit • Mass air flow meter • ECM
P0103	When the mass air flow meter circuit has a short for more than 3 seconds	• Short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC P0100, P0102 or P0103, confirm the mass air flow ratio in DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY using the hand-held tester or the OBD II scan tool.

Air Flow Rate (gm/s)	Malfunction
Approximately 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• E2G circuit open

MONITOR DESCRIPTION

If there is a defect in the sensor or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

When the sensor voltage output is less than 0.2 V or more than 4.9 V and if either condition continues for more than 3 seconds.

MONITOR STRATEGY

Related DTCs	P0100: Mass air flow meter circuit range check (fluttering) P0102: Mass air flow meter circuit range check (low voltage) P0103: Mass air flow meter circuit range check (high voltage)
Required sensors/components	Mass air flow meter
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	Immediately (when engine speed is less than 4,000 rpm) 2 driving cycles (when engine speed is 4,000 rpm or more)
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P0100:

Mass air flow meter voltage	Less than 0.2 V or more than 4.9 V

P0102:

Mass air flow meter voltage	Less than 0.2 V

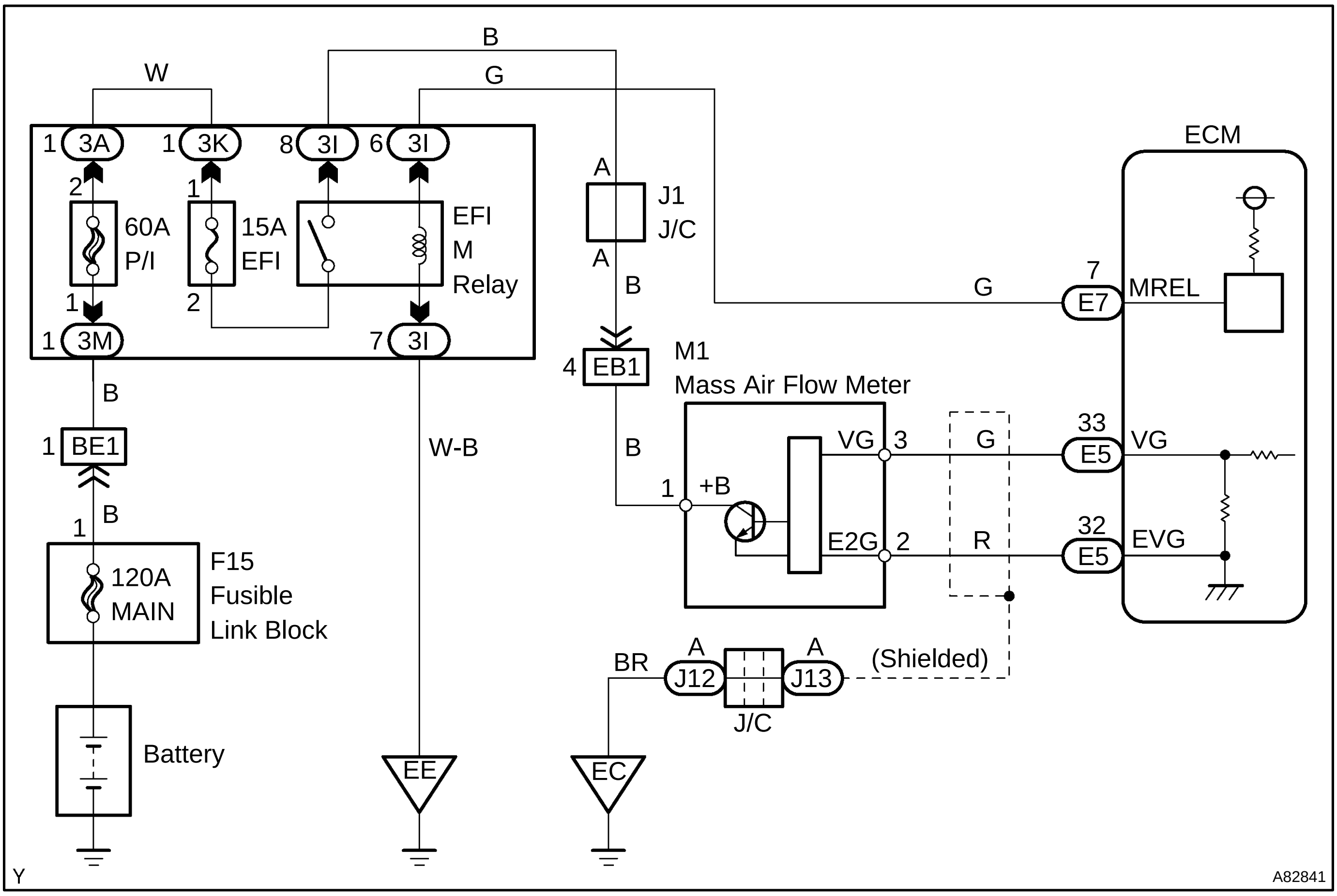
P0103:

Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Mass air flow meter voltage	0.4 to 2.2 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(MASS AIR FLOW RATE)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Put the engine in inspection mode (see page 01-27).
(c) Start the engine.
(d) Turn the hand-held tester or the OBD II scan tool ON.
(e) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / MAF.
(f) Read its value using the hand-held tester or the OBD II scan tool.

Result:

Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

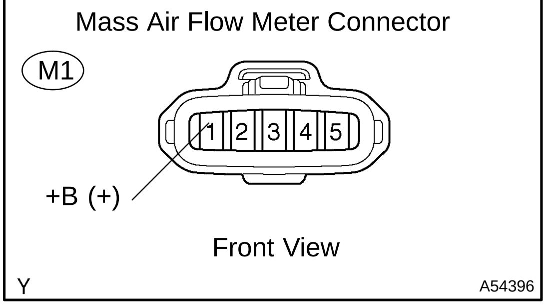
B → **Go to step 6**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

A

2 INSPECT MASS AIR FLOW METER(POWER SOURCE)

Wire Harness Side:



(a) Turn the power switch ON (IG).
(b) Disconnect the M1 mass air flow meter connector.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

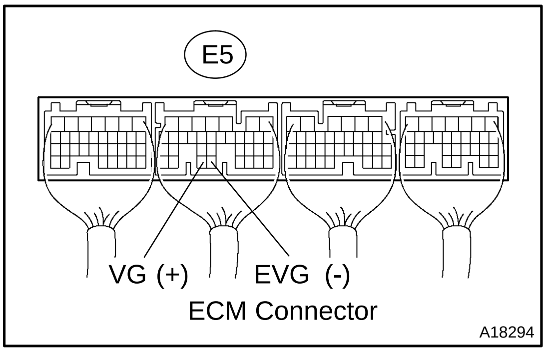
Tester Connection	Specified Condition
+B (M1-1) - Body ground	9 to 14 V

(d) Reconnect the mass air flow meter connector.

NG → **Go to step 5**

OK

3	INSPECT ECM(VG VOLTAGE)



(a) Put the engine in inspection mode (see page 01-27).
(b) Start the engine.
(c) Measure the voltage between the specified terminals of the E5 ECM connector.

HINT:
The A/C switch should be turned OFF.

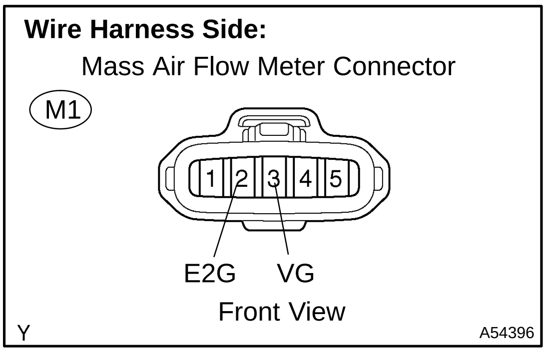
Standard:

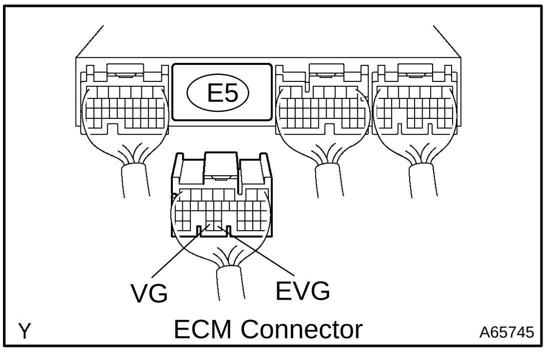
Tester Connection	Condition	Specified Condition
VG (E5-33) - EVG (E5-32)	Engine is idling	0.5 to 3.0 V

OK → **REPLACE ECM (See page 10-24)**

NG ↓

4	CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER - ECM)





(a) Disconnect the M1 mass air flow meter connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (M1-3) - VG (E5-33)	Below 1 Ω
E2G (M1-2) - EVG (E5-32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VG (M1-3) or VG (E5-33) - Body ground	10 kΩ or higher

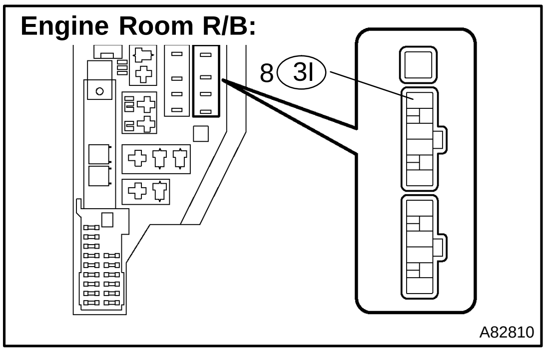
(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ↓

REPLACE MASS AIR FLOW METER

5	CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER - EFI M RELAY)



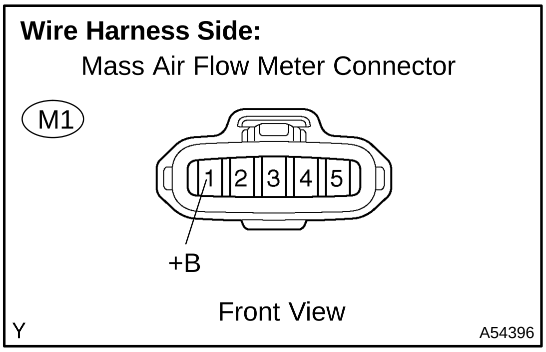
(a) Remove the integration relay from the engine room R/B.
(b) Disconnect the M1 mass air flow meter connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (M1-1) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (M1-1) or EFI M relay (3I-8) - Body ground	10 kΩ or higher



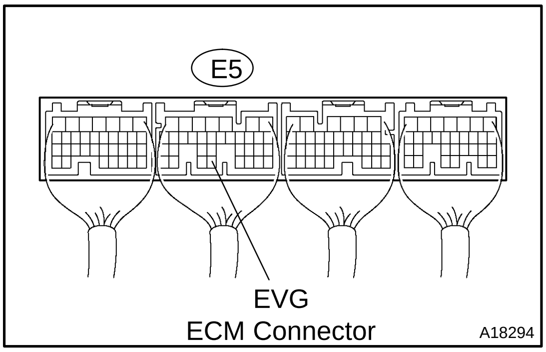
(d) Reconnect the mass air flow meter connector.
(e) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05-366)

6	INSPECT ECM(SENSOR GROUND)



(a) Check the resistance between the specified terminal of the E5 ECM connector and the body ground.

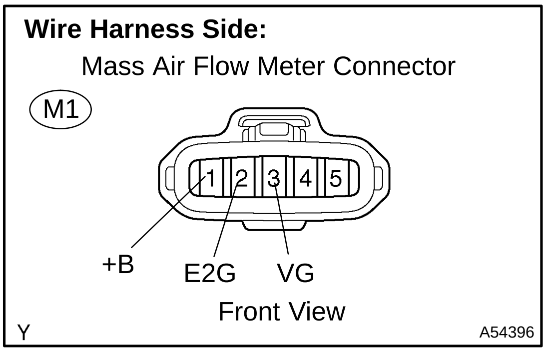
Standard:

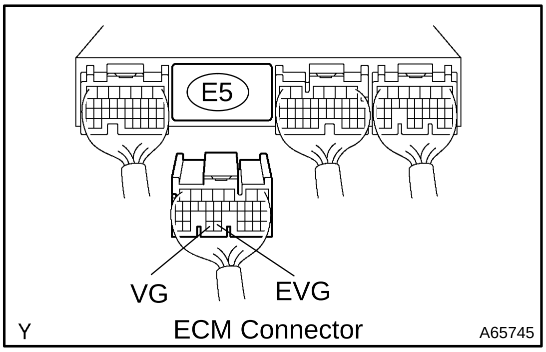
Tester Connection	Specified Condition
EVG (E5-32) - Body ground	Below 1 Ω

NG → **REPLACE ECM (See page 10-24)**

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER - ECM)





(a) Disconnect the M1 mass air flow meter connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (M1-3) - VG (E5-33)	Below 1 Ω
E2G (M1-2) - EVG (E5-32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VG (M1-3) - +B (M1-1)	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW METER

DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05-89 .

DTC No.	DTC Detection Condition	Trouble Area
P0101	After the engine is warmed up, conditions (a), (b), (c) and (d) continue for more than 10 seconds (2 trip detection logic): (a) Throttle valve is fully closed (b) Voltage output of the mass air flow meter is more than 2.2 V (c) Engine coolant temperature is more than 70°C (158°F) (d) Engine speed is less than 900 rpm	• Mass air flow meter
P0101	Conditions (a) and (b), or (a) and (c) continue for more than 6 seconds (2 trip detection logic): (a) Throttle position sensor output voltage is more than 0.1V (b) Voltage output of the mass air flow meter is less than 0.4 V when engine speed is less than 1,500 rpm (c) Voltage output of the mass air flow meter is less than 1.0 V when engine speed is 1,500 rpm or more	• Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter is a sensor that helps the ECM calculates the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air-fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the sensor and the ECM interprets this voltage as the intake air amount. If there is a defect in the sensor or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example: If the voltage is more than 2.2 V at idle or less than 0.4 V at idle off, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter rationality
Required sensors/components	Main sensors: Mass air flow meter Related sensors: Engine speed sensor, engine coolant temperature sensor, throttle position sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

CASE1: Mass air flow meter rationality

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine speed	Less than 900 rpm
Idle	ON
Engine coolant temperature	70°C (158°F) or more

CASE2: Mass air flow meter rationality

Engine speed	0 rpm or more
Throttle position sensor output	0.1 V or more

TYPICAL MALFUNCTION THRESHOLDS

CASE1: Mass air flow meter rationality

Mass air flow meter voltage (high voltage)	More than 2.2 V

CASE2: Mass air flow meter rationality

Mass air flow meter voltage (low voltage)	Less than 0.4 V at engine speed of less than 1,500 rpm Less than 1.0 V at engine speed of 1,500 rpm or more

WIRING DIAGRAM

Refer to DTC P0100 on page 05-89 .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0101)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
P0101	B

HINT:

If any other codes besides P0101 are output, perform troubleshooting for those DTCs first.

B → **REPLACE MASS AIR FLOW METER**

A

GO TO RELEVANT DTC CHART (See page 05-55)

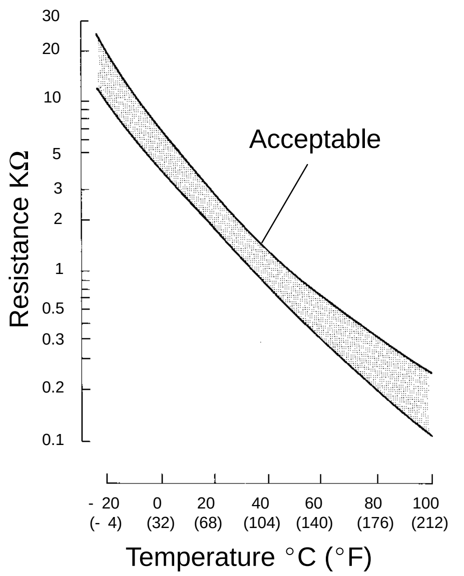
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Figure 1)



A94266

The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected as voltage changes to the ECM terminal (see Figure 1).
The intake air temperature sensor is connected to the ECM (see wiring diagram). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 second	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 second	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 second	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM

HINT:
After confirming DTC P0110, P0112 or P0113, confirm the intake air temperature in DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY using the hand-held tester or the OBD II scan tool.

Temperature Displayed	Malfunction
-40 °C (-40°F)	Open circuit
140°C (284°F)	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT sensor and sets a DTC.
Example:
When the sensor voltage output is equal to -40°C (-40°F), or more than 140°C (284°F), and either condition continues for 0.5 second or more.

MONITOR STRATEGY

Related DTCs	P0110: Intake air temperature sensor range check (fluttering) P0112: Intake air temperature sensor range check (low resistance) P0113: Intake air temperature sensor range check (high resistance)
Required sensors/components	Intake air temperature sensor
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P0110: Intake air temperature sensor range check (fluttering)

Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω or more than 156 kΩ (More than 140°C (284°F) or -40°C (-40°F) or less)

P0112: Intake air temperature sensor range check (low resistance)

Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω (More than 140°C (284°F))

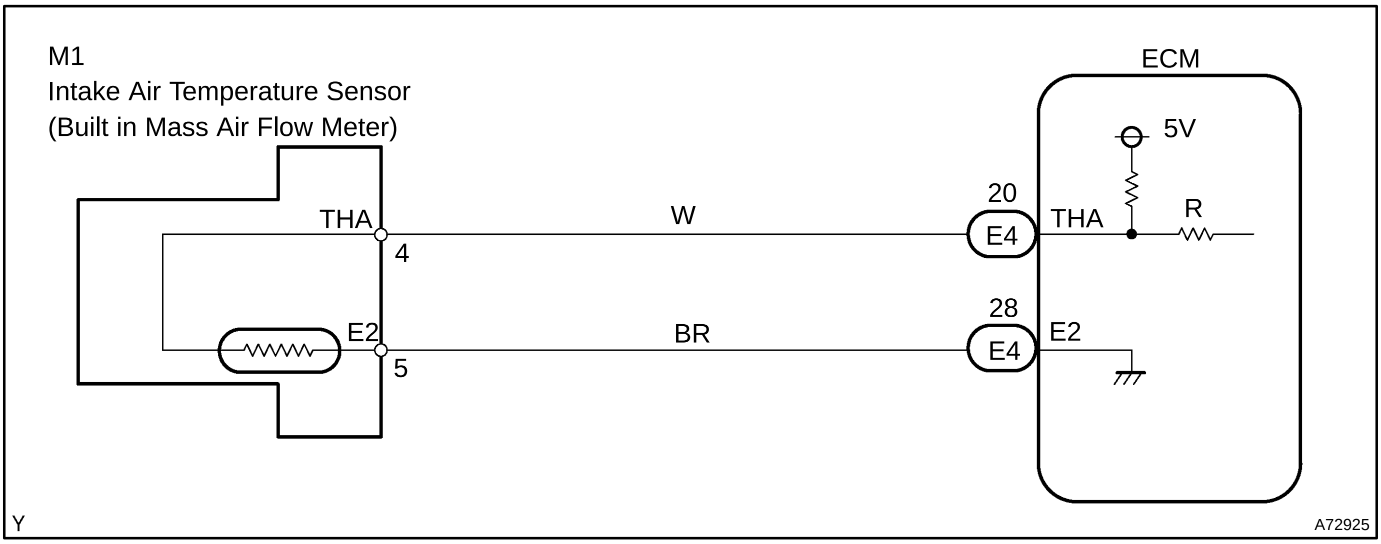
P0113: Intake air temperature sensor range check (high resistance)

Intake air temperature sensor resistance (Intake air temperature)	More than 156 kΩ (-40 °C (-40°F) or less)

COMPONENT OPERATING RANGE

Intake air temperature sensor resistance	98.5 Ω (140°C (284°F)) to 156 kΩ (-40 °C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select tha item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
(e) Read the value using the hand-held tester or the OBD II scan tool.
Temperature value: Same as the ambient air temperature.
Result:

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F)	B
OK (Same as ambient air temperature)	C

HINT:

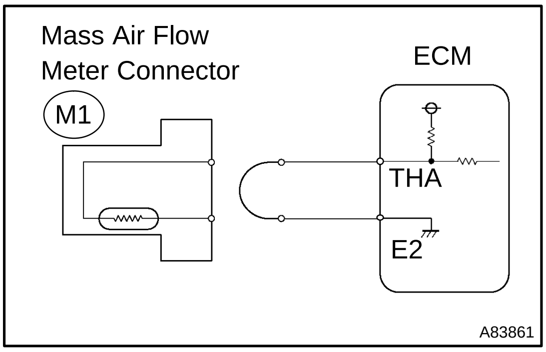
- If there is an open circuit, the hand-held tester or the OBD II scan tool indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester or the OBD II scan tool indicates 140°C (284°F).

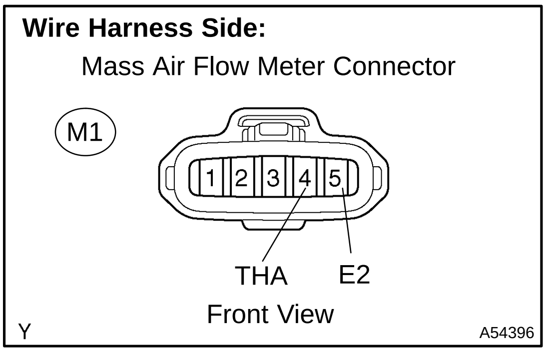
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

A

2	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



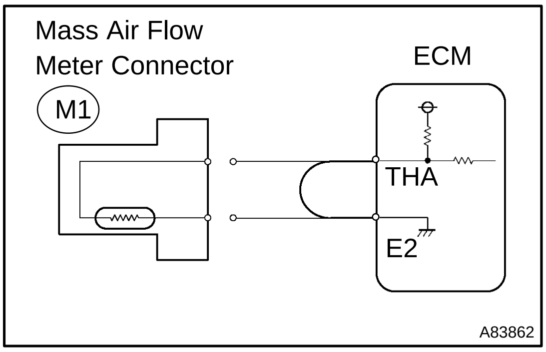


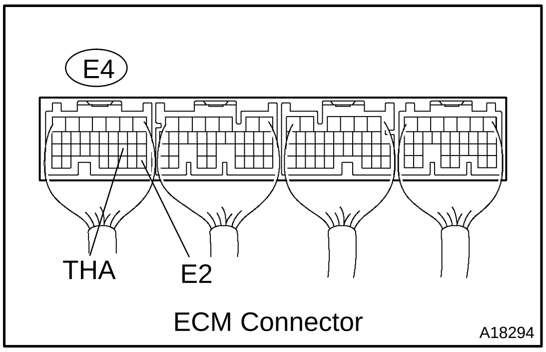
(a) Disconnect the M1 mass air flow meter connector.
(b) Connect terminals THA and E2 of the mass air flow meter wire harness side connector.
(c) Turn the power switch ON (IG).
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR. Read the value.
OK:
Temperature value: 140°C (284°F)
(e) Reconnect the mass air flow meter connector.

OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW SENSOR

NG

3	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)





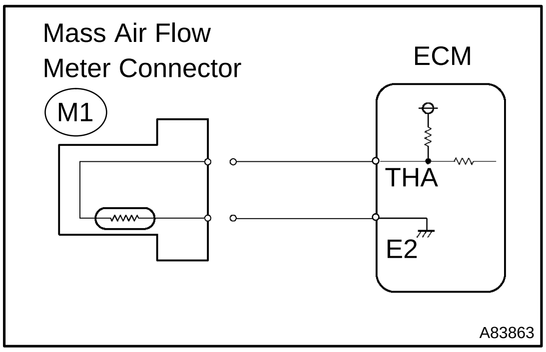
(a) Disconnect the M1 mass air flow meter connector.
(b) Connect terminals THA and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check for the ECM connector.
(c) Turn the power switch ON (IG).
(d) On the hand-held tester, select tha item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR. Read the value.
OK:
Temperature value: 140°C (284°F)
(e) Reconnect the mass air flow meter connector.

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-24)

4	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

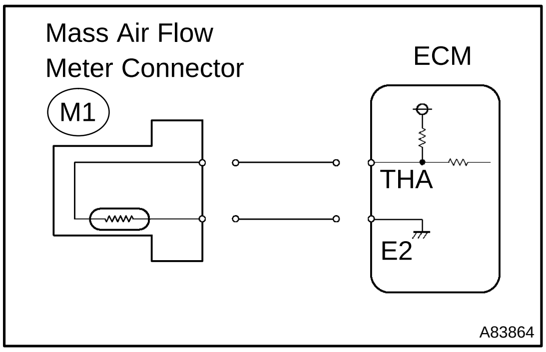


(a) Disconnect the M1 mass air flow meter connector.
(b) Turn the power switch ON (IG).
(c) On the hand-held tester, select tha item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR. Read the value.
OK:
Temperature value: -40°C (-40°F)
(d) Reconnect the mass air flow meter connector.

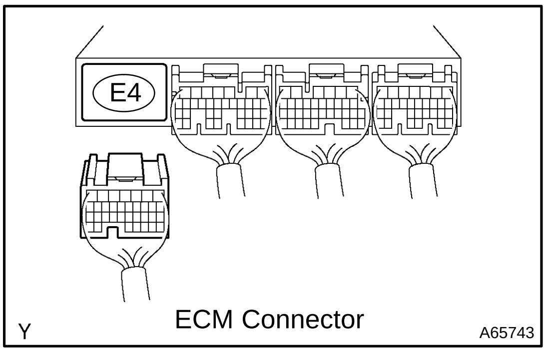
OK → **REPLACE MASS AIR FLOW METER**

NG

5	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the power switch ON (IG).
(c) On the hand-held tester, select tha item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR. Read the value.
OK:
Temperature value: -40°C (-40°F)
(d) Reconnect the ECM connector.



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10-24)

DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the engine coolant temperature sensor and changes its resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.
HINT:
If the ECM detects DTC P0115, P0117 or P0118, it operates the fail-safe function in which the engine coolant temperature is assumed to be 80 °C (176 °F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 second	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 second	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 second	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

HINT:
After confirming DTC P0115, P0117 or P0118, confirm the engine coolant temperature from DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY using the hand-held tester or the OBD II scan tool.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F)	Short circuit

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.
Example:
When the ECM calculates that the ECT is -40°C (-40°F), or more than 140°C (284°F), and if either condition continues for 0.5 second or more, the ETC will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115: Engine coolant temperature sensor range check (fluttering) P0117: Engine coolant temperature sensor range check (low resistance) P0118: Engine coolant temperature sensor range check (high resistance)
Required sensors/components	Engine coolant temperature sensor
Frequency of operation	Continuous
Duration	0.5 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P0115:

Engine coolant temperature sensor resistance (coolant temperature)	Less than 79 Ω or more than 156 kΩ (More than 140°C (284°F) or -40°C (-40°F) or less)

P0117:

Engine coolant temperature sensor resistance (coolant temperature)	Less than 79 Ω (More than 140°C (284°F))

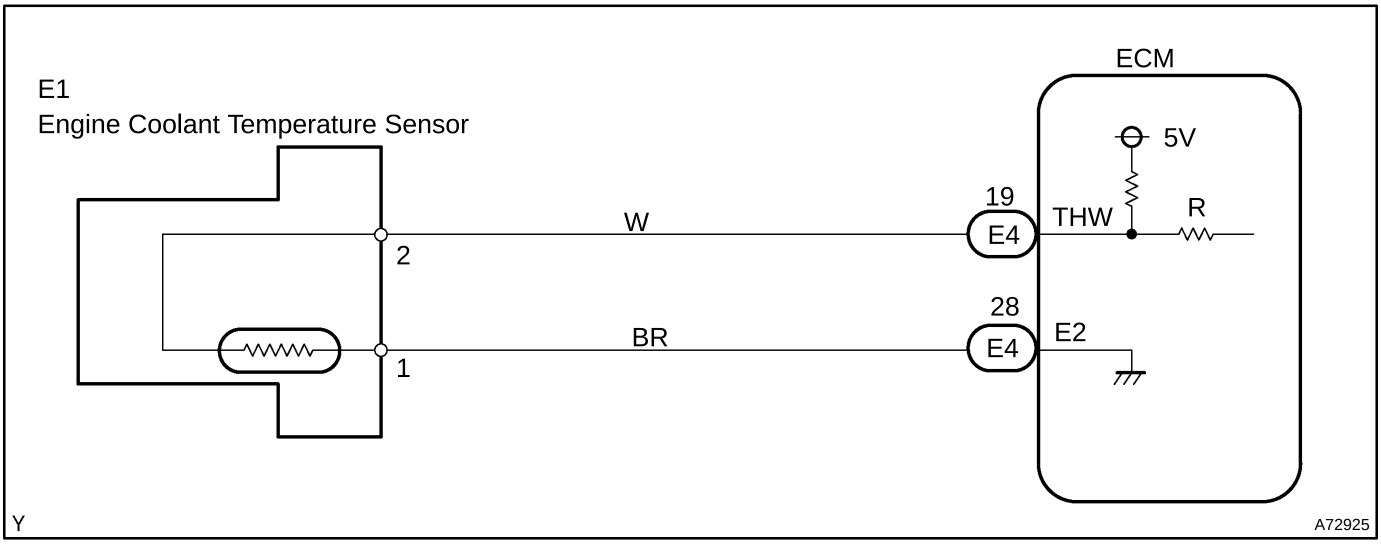
P0118:

Engine coolant temperature sensor resistance (coolant temperature)	More than 156 kΩ (-40 °C (-40°F) or less)

COMPONENT OPERATING RANGE

Engine coolant temperature sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (-40 °C (-40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(e) Read the value using the hand-held tester or the OBD II scan tool.
(f) Measure the coolant temperature using a thermometer and compare the value with the value displayed on the hand-held tester or the OBD II scan tool.

Temperature value: Almost same as the actual engine coolant temperature.

Result:

Temperature Displayed	Proceed to
-40 °C (-40°F)	A
140°C (284°F)	B
OK (Same as actual engine coolant temperature)	C

HINT:

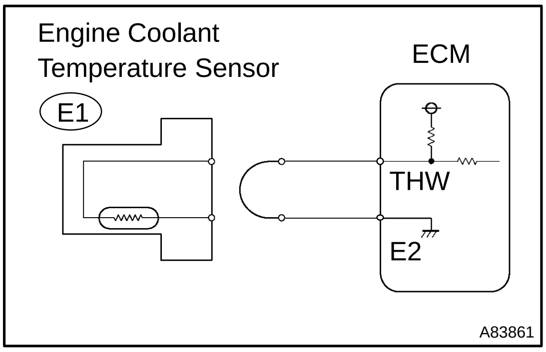
- If there is an open circuit, the hand-held tester or the OBD II scan tool indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester or the OBD II scan tool indicates 140°C (284°F).

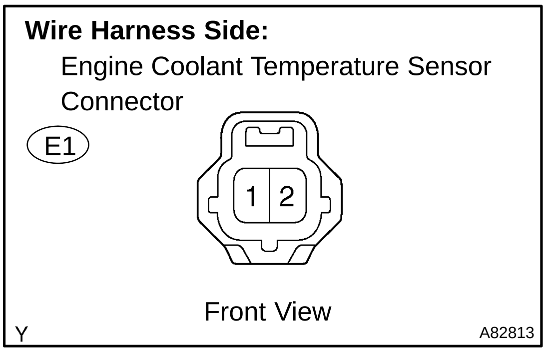
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

A

2	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN WIRE HARNESS)



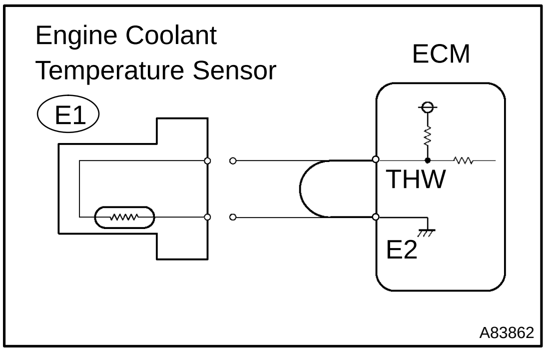


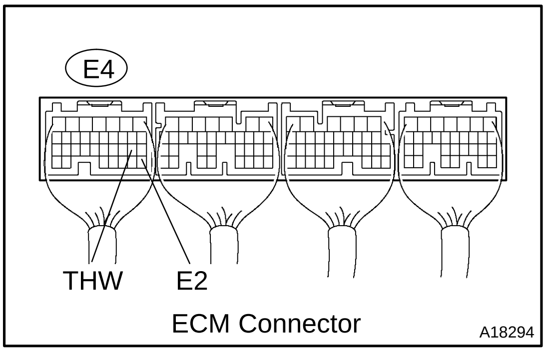
(a) Disconnect the E1 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Turn the power switch ON (IG).
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP. Read the value.
OK:
Temperature value: 140°C (284°F)
(e) Reconnect the engine coolant temperature sensor connector.

OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMP. SENSOR**

NG

3	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR OPEN IN ECM)





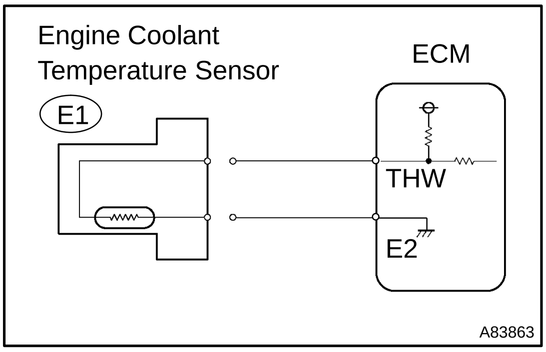
(a) Disconnect the E1 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E4 ECM connector.
HINT:
Before checking, do a visual and contact pressure check on the ECM connector.
(c) Turn the power switch ON (IG).
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP. Read the value.
OK:
Temperature value: 140°C (284°F)
(e) Reconnect the engine coolant temperature sensor connector.

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-24)

4	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN WIRE HARNESS)

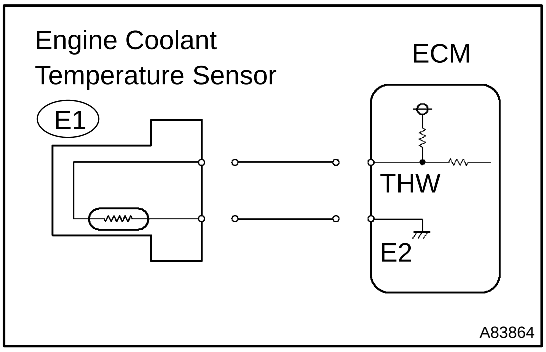


(a) Disconnect the E1 engine coolant temperature sensor connector.
(b) Turn the power switch ON (IG).
(c) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP. Read the value.
OK:
Temperature value: -40°C (-40°F)
(d) Reconnect the engine coolant temperature sensor connector.

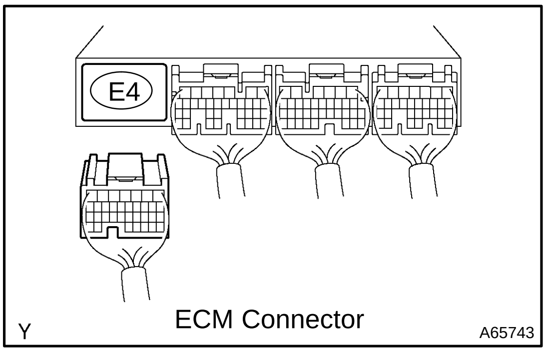
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM connector.
(b) Turn the power switch ON (IG).
(c) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP. Read the value.
OK:
Temperature value: -40°C (-40°F)
(d) Reconnect the ECM connector.



OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10-24)

DTC P0116 ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05-103 .

DTC No.	DTC Detection Condition	Trouble Area
P0116	If the engine coolant temperature (ECT) was between 35°C (95°F) and 60°C (140°F) when starting the engine, and conditions (a) and (b) are met (2 trip detection logic): (a) Vehicle is driven at varying speeds (acceleration and deceleration) for more than 250 seconds (b) ECT remains within 3°C (5.4°F) of the engine starting temperature	• Engine coolant temperature sensor
P0116	If the engine coolant temperature was more than 60 °C (140 °F) at engine start, and conditions (a) and (b) are met (6 trip detection logic): (a) Vehicle is driven at varying speeds (under acceleration and deceleration) (b) Engine coolant temperature remains within 1 °C (1.8 °F) of the engine starting temperature, and this is successively recorded 6 times	• Engine coolant temperature sensor

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

1) Upon starting the engine, the coolant temperature (ECT) was between 35°C (95°F) and 60°C (140°F). If after driving for 250 seconds, the ECT still remains within 3°C (5.4°F) of the staring temperature, a DTC will be set (2 trip detection logic).

2) Upon starting the engine, the coolant temperature (ECT) was over 60°C (140°F). If, after driving for 250 seconds, the ECT still remains within 1°C (1.8°F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116: Engine coolant temperature sensor range check (stuck)
Required sensors/components	Main sensors: Engine coolant temperature sensor Related sensors: Intake air temperature sensor, crankshaft position sensor,mass air flow meter
Frequency of operation	Continuous
Duration	250 seconds
MIL operation	2 driving cycles: when temperature is fixed between 35°C (95°F) and 60°C (140°F) 6 driving cycles: when temperature is fixed at 60°C (140°F) or more
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Case 1

The monitor will run whenever the following DTCs are not present	See page 05-20
Cumulative idle off period	250 seconds or more
Speed increase by ≧ 19 mph (30 km/h)	10 times or more
Engine coolant temperature	35°C (95°F) or more, and less than 60°C (140°F)
Intake air temperature	-6.7 °C (20°F) or more

Case 2

Engine coolant temperature	60°C (140°F) or more
Intake air temperature	-6.7 °C (20°F) or more
Stop and go	Stop for 20 seconds or more and accelerate to more than 43.5 mph (70 km/h)
44 mph (70 km/h) in less than 40 seconds	Decelerate from 40.4 mph (65 km/h) to 1.86 mph (3 km/h) within 35 seconds and stop for 10seconds

TYPICAL MALFUNCTION THRESHOLDS

Case 1

When temperature is fixed between 35°C (95°F) and 60°C (140°F)

Change of engine coolant temperature value	Less than 3°C (5.4°F)

Case 2

When temperature is fixed at 60°C (140°F) or more

Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Engine coolant temperature	Changing with the actual engine coolant temperature

WIRING DIAGRAM

Refer to DTC P0115 on page 05-103 .

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform troubleshooting on DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0120	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT

DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT

DTC	P0220	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT

DTC	P0222	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT

DTC	P0223	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT

DTC	P2135	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION

CIRCUIT DESCRIPTION

HINT:

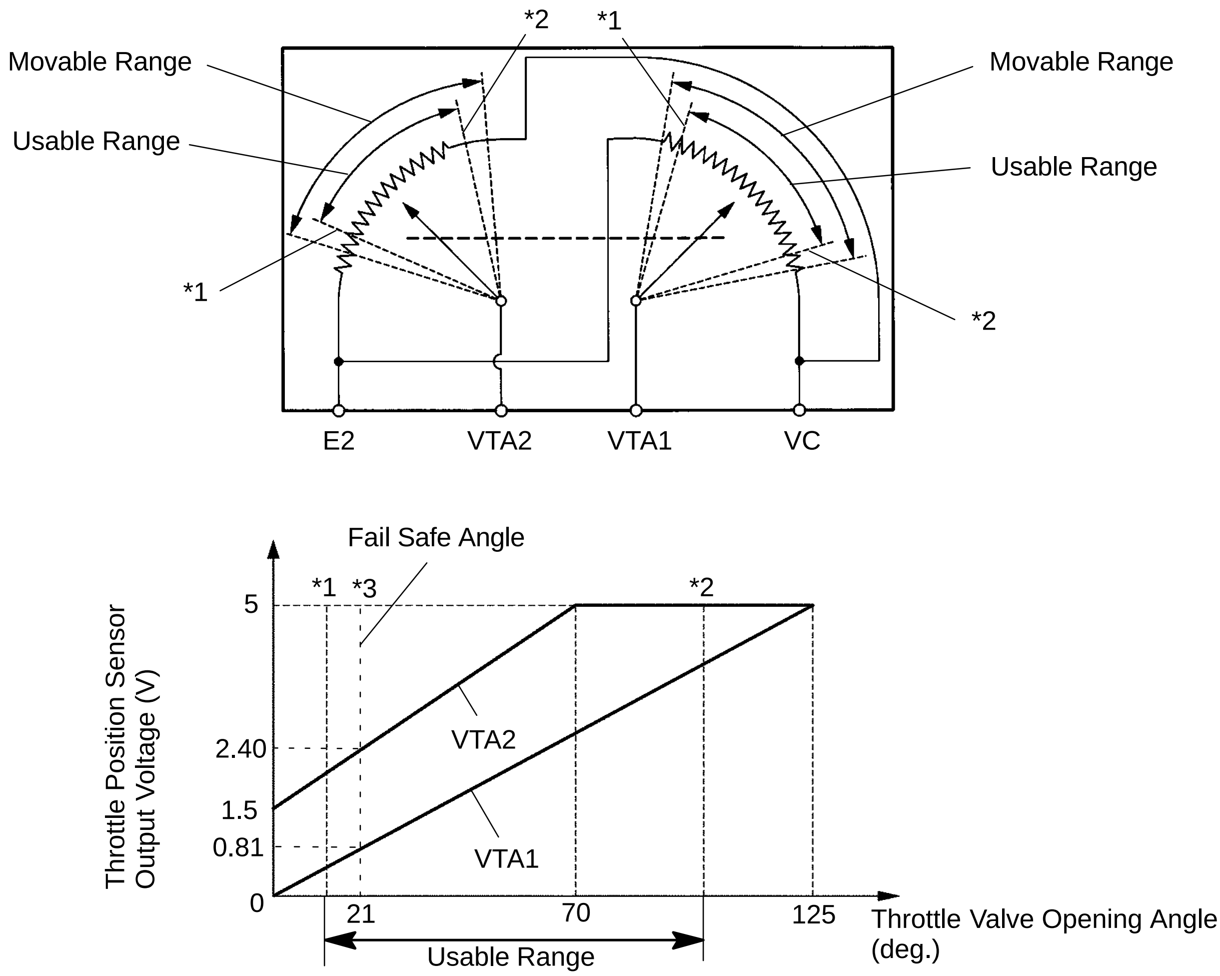
- This electrical throttle system does not use a throttle cable.
- This is the troubleshooting procedure of the throttle position sensor.

The throttle position sensor is mounted on the throttle body and it has 2 sensor terminals to detect the throttle opening angle and malfunction of the throttle position sensor itself.

The voltage applied to terminals VTA and VTA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the throttle valve. The VTA is a signal to indicate the actual throttle valve opening angle which is used for the engine control, and the VTA2 is a signal to indicate the information about the opening angle which is used for detecting malfunction of the sensor.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to the driving condition.

When malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the power switch is turned OFF.



*1: Throttle Valve Fully Closed (13.5˚), VTA1 is 0%

*2: Throttle Valve Fully Open (97.5˚), VTA1 is approx 100 %

*3: Fail Safe Angle (16.5˚), VTA1 is 3.5%

Note: Throttle valve opening angle detected by the sensor terminal of VTA is expressed as percentage.

A02395 A02396 A71013

DTC No.	DTC Detection Condition	Trouble Area
—	Conditions of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 seconds or more when Idle is ON	—
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA is 0.2V or less, or 4.8 V or more	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM
P0122	VTA is 0.2 V or less	• Short in throttle position sensor circuit • Throttle position sensor • ECM
P0123	VTA is 4.8 V or more	• Open in throttle position sensor circuit • Throttle position sensor • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) and (b) are satisfied (a) VTA2 is 0.5 V or less, or VTA2 is 4.8 V or more (b) VTA is 0.2 V or more and 1.8 V or less	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM
P0222	VTA2 is 0.5 V or less	• Short in throttle position sensor circuit • Throttle position sensor • ECM
P0223	VTA2 is 4.8 V or more when VTA is 0.2 or more and 1.8 V or less	• Open in throttle position sensor circuit • Throttle position sensor • ECM
P2135	Condition (a) continues for 0.5 seconds or more, or condition (b) continues for 0.4 seconds or more: (a) Difference between VTA and VTA2 is 0.02 V or less (b) VTA is 0.2 V or less and VTA2 is 0.5 V or less	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

DTC No.	Main Trouble Area
P0122	• Throttle position sensor • Open in VTA1 circuit • VC circuit open (when the VC circuit is open, DTCs P0222 and P2135 are also output simultaneously) • ECM
P0123	• Throttle position sensor (built in throttle body) • Open in VTA circuit • Open in E2 circuit • VC and VTA circuits are short-circuited • ECM
P0222	• Throttle position sensor • Open in VTA2 circuit • VC circuit open (when the VC circuit is open, DTCs P0122 and P2135 are also output simultaneously)
P0223	• Throttle position sensor
P2135	• VTA1 and VTA2 circuits are short-circuited • Open in VC circuit • Throttle position sensor

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the power switch is turned OFF.

HINT:

- After confirming DTCs, confirm condition of the throttle valve opening angle (THROTTLE POS) and the closed throttle position switch (THROTTLE POS #2) using the hand-held tester or the OBD II scan tool.
- THROTTLE POS means the VTA1 signal (expressed as percentage), and THROTTLE POS#2 means the VTA2 signal (expressed as volts).
  Reference (Normal condition):

Tester display	Accelerator pedal released	Accelerator pedal depressed
THROTTLE POS	8 to 20 %	64 to 96 %
THROTTLE POS #2	1.5 to 2.9 V	3.5 to 5.5 V

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.

(a) There is a specific voltage difference between VTA1 and VTA2 for each throttle opening angle.
(b) VTA1 and VTA2 each have a specific voltage operating range.
(c) VTA1 and VTA2 should never be close to the same voltage level.

If the difference between VTA1 and VTA2 is incorrect (a), the ECM interprets this as a fault and will set a DTC.
If VTA1 or VTA2 is out of the normal operating range (b), the ECM interprets this as a fault and will set a DTC.
If VTA1 is within 0.02 V of VTA2 (c), the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0120: Throttle position sensor (sensor 1) range check (fluttering) P0122: Throttle position sensor (sensor 1) range check (low voltage) P0123: Throttle position sensor (sensor 1) range check (high voltage) P0220: Throttle position sensor (sensor 2) range check (fluttering) P0222: Throttle position sensor (sensor 2) range check (low voltage) P0223: Throttle position sensor (sensor 2) range check (high voltage) P2135: Throttle position sensor range check (correlation)
Required sensors/components	Throttle position sensor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

P0120:

VTA1 voltage	0.2 V or less or 4.8 V or more

P0122:

VTA1 voltage	0.2 V or less

P0123:

VTA1 voltage	4.8 V or more

P0220:

VTA2 voltage	0.5 V or less or 4.8 V or more

P0222:

VTA2 voltage	0.5 V or less

P0223:

VTA2 voltage	4.8 V or more

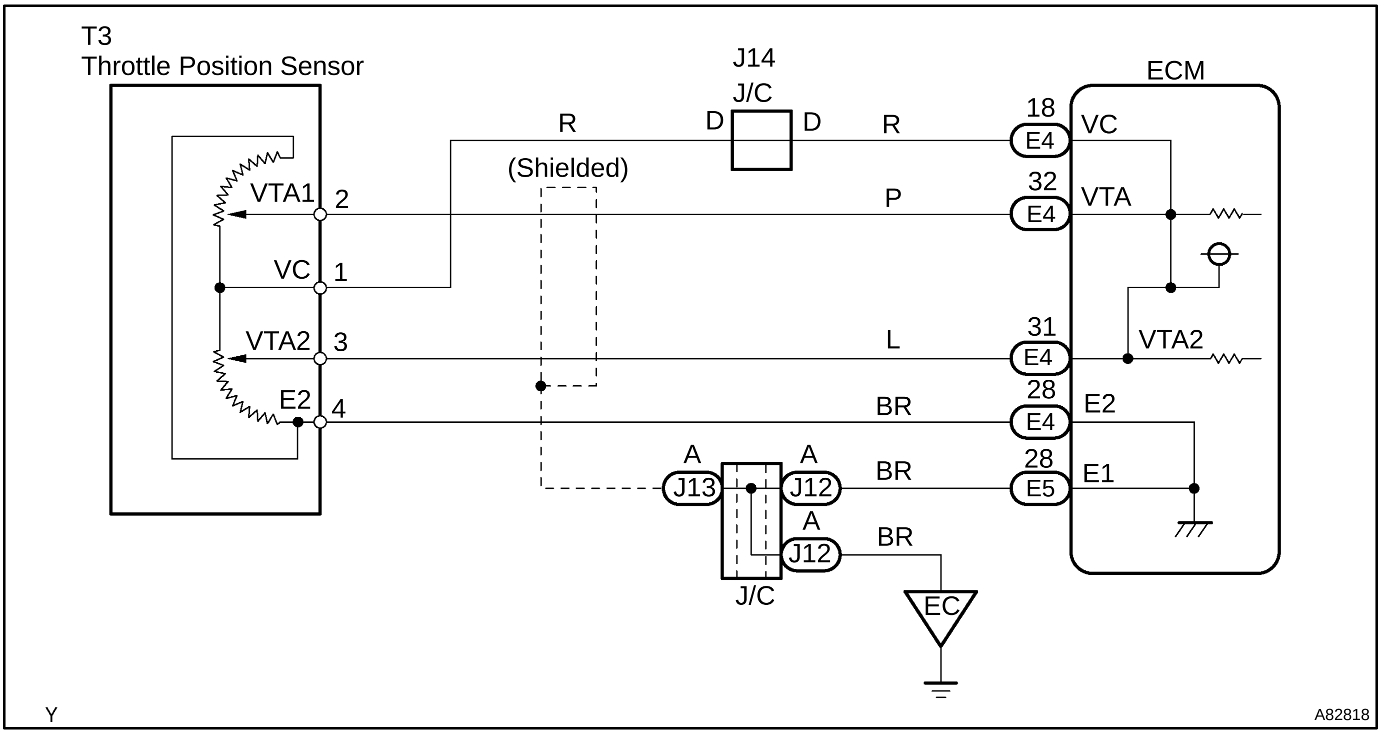
P2135:

Different between VTA1 and VTA2 voltage	0.02 V or less
Both of the following conditions are met:	(a) and (b)
(a) VTA1 voltage	0.2 V or less
(b) VTA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

Throttle position sensor VTA1 voltage	0.6 to 3.96 V
Throttle position sensor VTA2 voltage	2.25 to 5.0 V

WIRING DIAGRAM

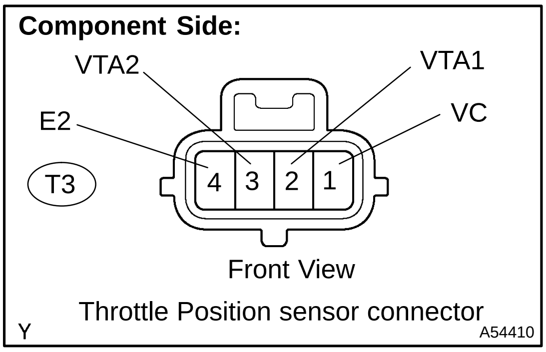


INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 INSPECT THROTTLE POSITION SENSOR(RESISTANCE)



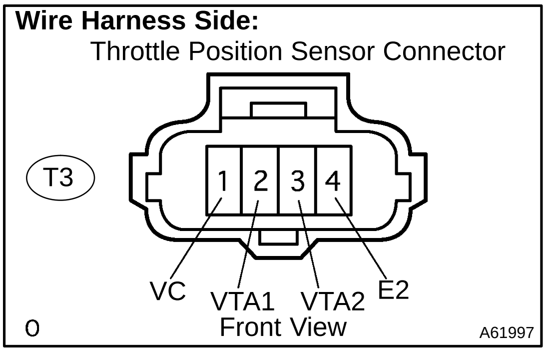
(a) Disconnect the T3 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.
Standard:

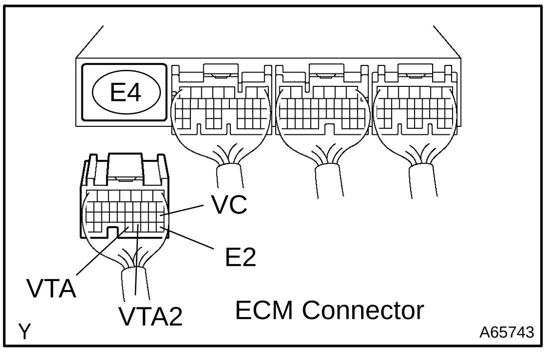
Throttle Position Sensor Terminal	Resistance
VC (1) - E2 (4)	1.2 to 3.2 kΩ at 20°C (68°F)
VTA1 (2) - E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)
VTA2 (3) - E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY** **(See page 10-13)**

OK

2 CHECK HARNESS AND CONNECTOR(ECM - THROTTLE POSITION SENSOR)





(a) Disconnect the T3 throttle position sensor connector.
(b) Disconnect the ECM E4 connector.
(c) Check the resistance between the wire harness side connectors.
Standard: Check for open

Tester Connection	Specified Condition
VC (T3-1) - VC (E4-18)	Below 1 Ω
VTA1 (T3-2) - VTA (E4-32)	Below 1 Ω
VTA2 (T3-3) - VTA2 (E4-31)	Below 1 Ω
E2 (T3-4) - E2 (E4-28)	Below 1 Ω

Standard: Check for short

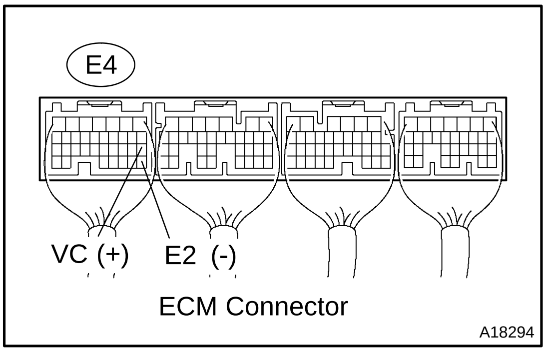
Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	10 kΩ or higher
VTA (E4-32) - E2 (E4-28)	10 kΩ or higher
VTA2 (E4-31) - E2 (E4-28)	10 kΩ or higher

(d) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ECM(VC - E2)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between terminals VC and E2 of the ECM connector.
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG **REPLACE ECM (See page 10-24)**

OK

REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10-13)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page 05-110.

HINT:

This is the purpose of troubleshooting the throttle position sensor.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Difference between VTA1 and VTA2 is out of threshold for 2 seconds	• Throttle position sensor

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.

This sensor has two signals, VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunction in VTA1. There are several checks that the ECM confirms proper operation of the throttle position sensor and VTA1.

There is a specific voltage difference between VTA1 and VTA2 for each throttle opening angle.

If VTA1 or VTA2 is out of the normal operating range, the ECM interprets this as a fault and will set a DTC.

If VTA1 is within 0.02 V of VTA2, the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

If the voltage output difference of the VTA1 and VTA2 deviates from the normal operating range, the ECM interprets this as malfunction of the throttle position sensor. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue to drive.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the power switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121: Throttle position sensor rationality
Required sensors/components	Throttle position sensor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
VTA2 voltage	Less than 4.6 V

TYPICAL MALFUNCTION THRESHOLDS

Different between VTA1 and VTA2 [VTA1 - (VTA2 × 0.8 to 1.2)]* *: Corrected by learning value	Less than 0.8 V and more than 1.6 V

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE THROTTLE BODY ASSY (See page 10-13)

DTC	P0125	INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05-103 .

DTC No.	DTC Detection Condition	Trouble Area
P0125	When ECT or IAT was less than -6.6°C (20°F) when starting engine, ECT sensor value is 20°C (68°F) or less even if 20 minutes or more has passed after engine start (2 trip detection logic)	• Cooling system • Engine coolant temperature sensor • Thermostat
P0125	If ECT and IAT was between -6.6°C (20°F) and 10°C (50°F) when starting engine, ECT sensor value is 20°C (68°F) or less even if more than 5 minutes has passed after engine start (2 trip detection logic)	• Cooling system • Engine coolant temperature sensor • Thermostat
P0125	If ECT and IAT were higher than 10°C (50°F) when starting engine, ECT sensor value is 20°C (68°F) or less even if more than 2 minutes has passed after engine start	• Cooling system • Engine coolant temperature sensor • Thermostat

HINT:
ECT represents engine coolant temperature, and IAT represents intake air temperature.

MONITOR DESCRIPTION

The engine coolant temperature (ECT) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual engine coolant temperature. The ECM applies voltage to the sensor and the varying resistance of the sensor causes the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start-up. If, after sufficient time has passed, the sensor still reports that the engine is not warm enough for closed-loop fuel control, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.
Example:
The engine coolant temperature was 0°C (32°F) at engine start. After driving 5 minutes, the ECT sensor still indicates that the engine is not warm enough to begin the air-fuel ratio feedback control. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Case 1

Related DTCs	P0125: Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main: Engine coolant temperature sensor, cooling system, thermostat Related: Mass air flow meter
Frequency of operation	Continuous
Duration	2 minutes (engine starting temperature is 10°C (50°F) or more)
MIL operation	2 driving cycles
Sequence of operation	None

Case 2

Related DTCs	P0125: Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main: Engine coolant temperature sensor, cooling system, thermostat Related: Mass air flow meter
Frequency of operation	Continuous
Duration	5 minutes (engine starting temperature is -6.6°C (20°F) to 10°C (50°F))
MIL operation	2 driving cycles
Sequence of operation	None

Case 3

Related DTCs	P0125: Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main: Engine coolant temperature sensor, cooling system, thermostat Related: Mass air flow meter
Frequency of operation	Continuous
Duration	20 minutes (engine starting temperature is less than -6.6°C (20°F))
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Intake air amount per second	0.1 g/sec or more
Fuel cut	OFF

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Time until monitored engine coolant temperature reaches feedback start temperature

Engine starting temperature is 10°C (50°F) or more	Engine coolant temperature is less than ”closed-loop enabling temperature” even if 2 minutes or more passed after engine start

Case 2

Time until monitored engine coolant temperature reaches feedback start temperature

Engine starting temperature is -6.6°C (20°F) to 10°C (50°F)	Engine coolant temperature is less than ”closed-loop enabling temperature” even if 5 minutes or more passed after engine start

Case 3

Time until monitored engine coolant temperature reaches feedback start temperature

Engine starting temperature is -6.6°C (20°F) or less	Engine coolant temperature is less than ”closed-loop enabling temperature” even if 20 minutes or more passed after engine start

WIRING DIAGRAM

Refer to DTC P0115 on page 05-103 .

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, engine coolant temperature sensor circuit may be open or short. Perform troubleshooting on DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0125)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.
Result:

Display (DTC output)	Proceed to
P0125	A
P0125 and other DTCs	B

HINT:
If any other codes besides P0125 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART** **(See page 05-55)**

A

2 INSPECT THERMOSTAT (See page 16-4)

(a) Check the valve opening temperature of the thermostat.
OK:
Thermostat valve begins to open at temperature of 80 to 84°C (176 to 183°F).

HINT:
Also check that the valve is completely closed below temperature shown above.

NG → **REPLACE THERMOSTAT** **(See page 16-18)**

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR **(See page 10-5)**

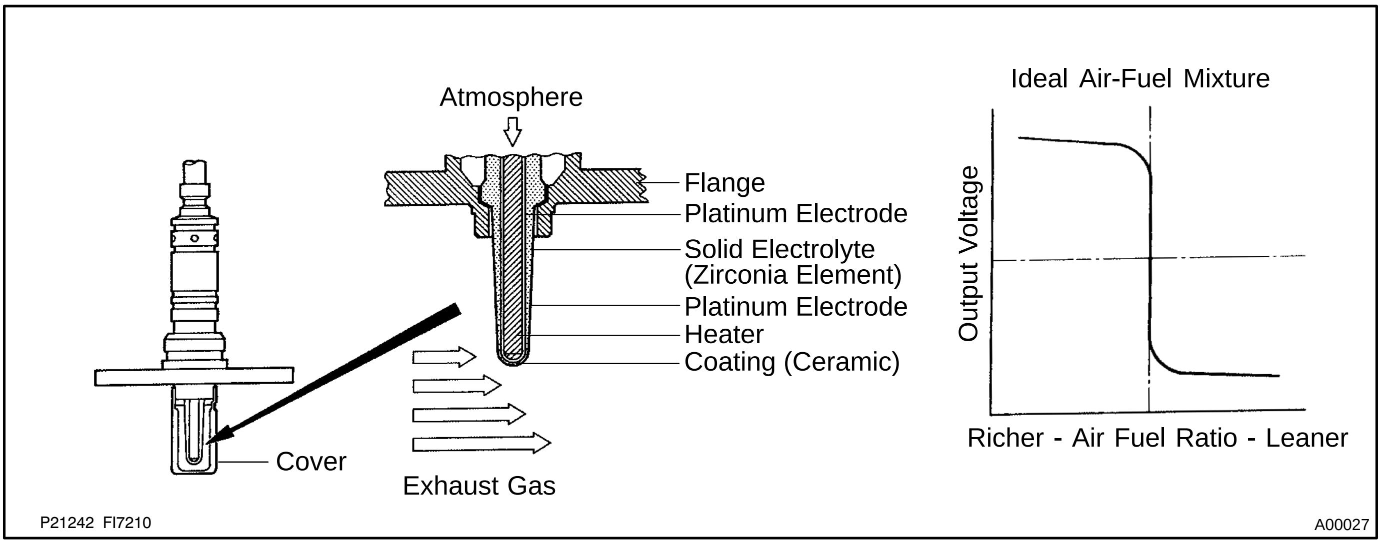
DTC	P0136	OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

DTC	P0137	OXYGEN SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC	P0138	OXYGEN SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

CIRCUIT DESCRIPTION

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air-fuel mixture must be maintained near the ideal "stoichiometric" ratio. The oxygen sensor output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air-fuel ratio is nearly stoichiometric ratio.
When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. The heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).
When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio, the oxygen will be vanished from the exhaust gas. The heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V).
The heated oxygen sensor includes a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low), current flows to the heater in order to heat the sensor for the accurate oxygen concentration detection.



DTC No.	DTC Detection Condition	Trouble Area
P0136	One of the following conditions is met: • Sensor impedance is less than 5 Ω when ECM presumes the sensor warmed-up as well as operated normally • Under active air-fuel ratio control, either of (a) and (b) is met: (a) Sensor output voltage is 0.2 V or more (b) Sensor output voltage is 0.6 V or less • Under active air-fuel ratio control, either of (a) and (b) is met: (a) Sensor output voltage is 0.25 V or more when OSC is 0.88 g or more and target air-fuel ratio is RICH (b) Sensor output voltage is 0.59 V or less when OSC is 0.88 g or more and target air-fuel ratio is LEAN	• Open or short in heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Heated oxygen sensor heater (bank 1 sensor 2) • EFI M relay
P0137	Either of the following conditions is met: • Sensor impedance is more than 15 kΩ for more than 55 seconds when ECM presumes the sensor warmed-up as well as operated normally • Under active air-fuel ratio control, all of the following conditions are met: (a) Sensor output voltage is less than 0.25 V (b) Target air-fuel ratio is RICH (c) OSC is 0.88 g or more	• Open in heated oxygen sensor (bank 1 sensor 2) circuit • EFI M relay • Heated oxygen sensor (bank 1 sensor 2) • Heated oxygen sensor heater (bank 1 sensor 2)
P0138	One of the following conditions is met: • Sensor short is detected even if sensor output voltage is 1.2 V or more for 30 seconds • Under active air-fuel ratio control, all of the following conditions are met: (a) Sensor output voltage is 0.59 V or more (b) Target air-fuel ratio is LEAN (c) OSC is 0.88 g or more • Sensor output voltage is more than 1.2 V for 10 seconds	• Short in heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Heated oxygen sensor heater (bank 1 sensor 2) • EFI M relay

MONITOR DESCRIPTION

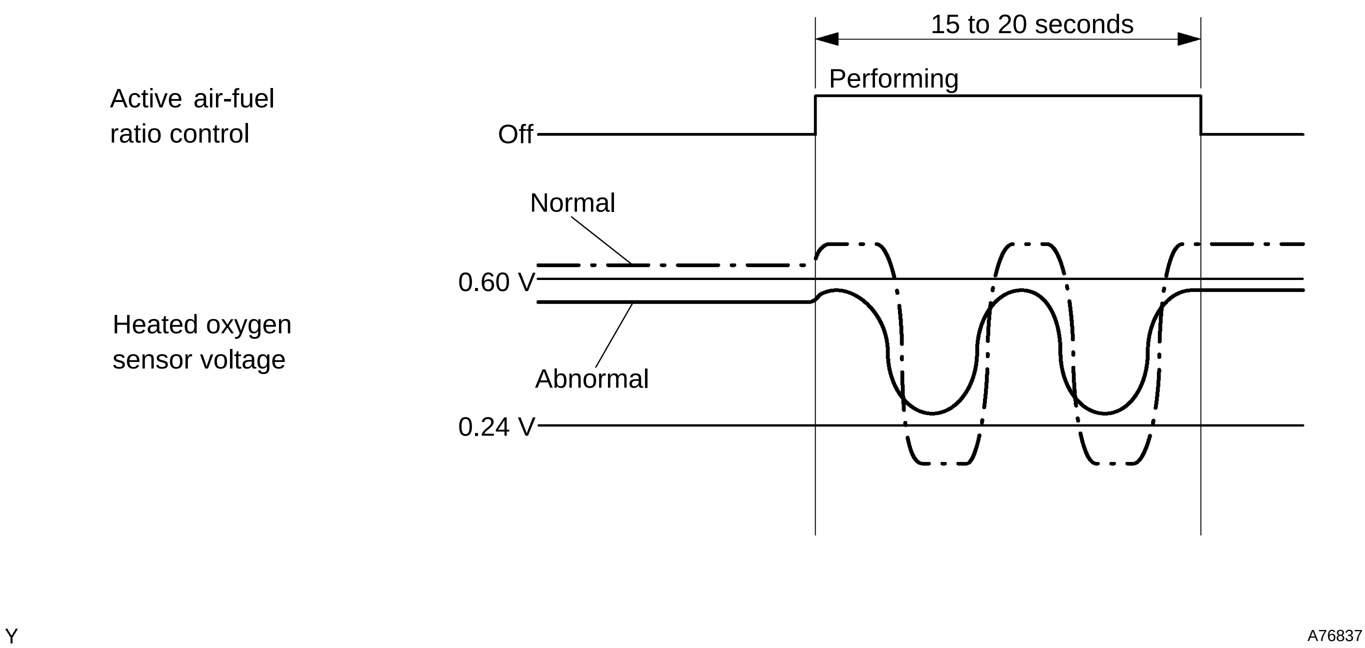
Active Air-Fuel Ratio Control

Usually the ECM performs the air-fuel ratio control so that the A/F sensor output indicates a near stoichiometric air-fuel ratio. This vehicle includes ”active air-fuel ratio control” besides the regular air-fuel ratio control. The ECM performs the ”active air-fuel ratio control” to detect deterioration in a catalyst and the heated oxygen sensor malfunction. (Refer to the diagram below)
The ”Active air-fuel ratio control” is performed for approximately 15 to 20 seconds during a vehicle driving with a warm engine. Under the ”active air-fuel ratio control”, the air-fuel ratio is forcibly regulated to go LEAN or RICH by the ECM.
If the ECM detects malfunction, it is recorded in the following DTCs: DTC P0136 (Abnormal Voltage Output), DTC P0137 (Circuit Open) and P0138 (Circuit Short).

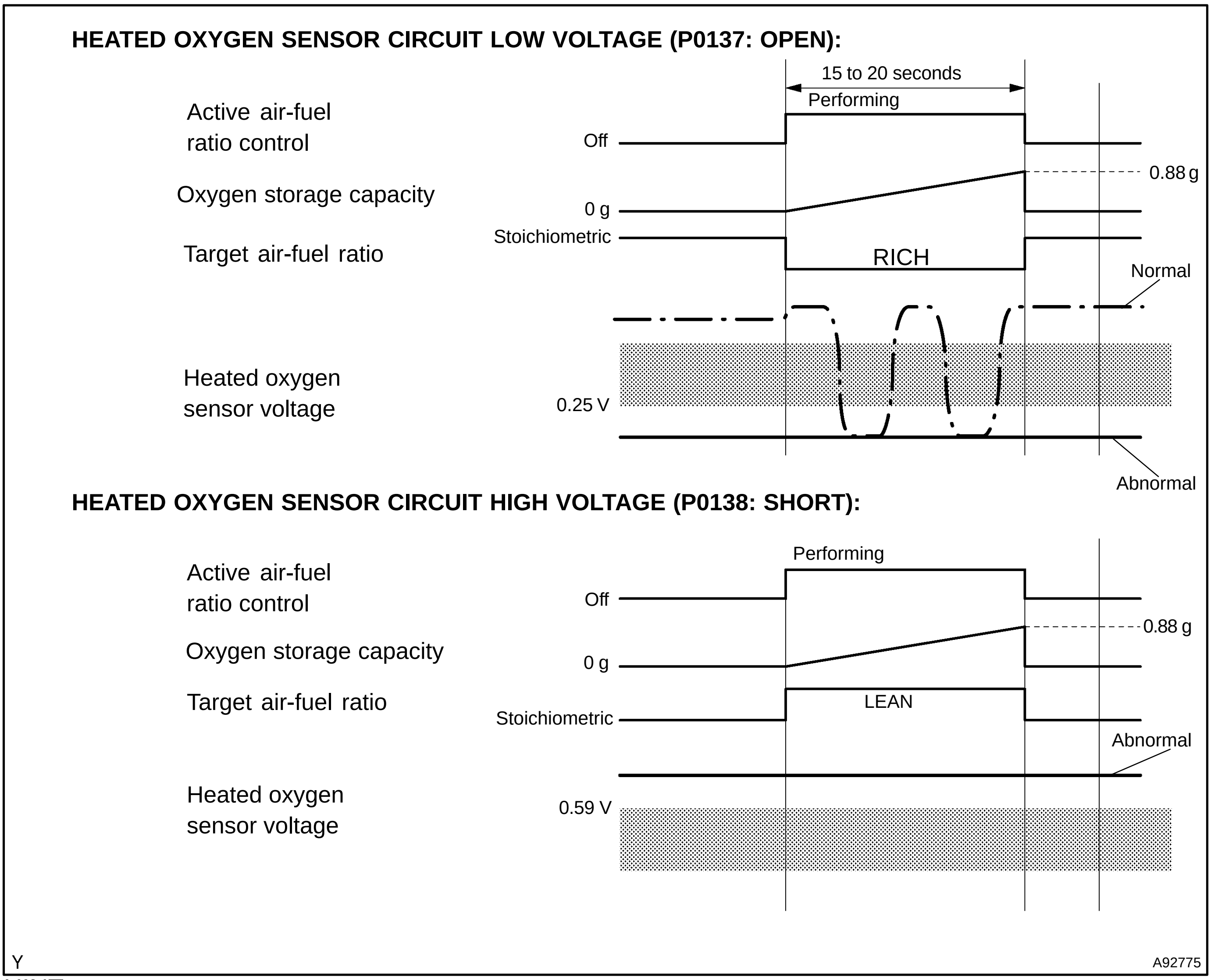
Abnormal Voltage Output of Heated Oxygen Sensor (DTC P0136)

As the ECM is performing the ”active air-fuel ratio control”, the air-fuel ratio is forcibly regulated to go RICH or LEAN. If the sensor is not functioning properly, the voltage output variation is smaller.
Under the ”active air-fuel ratio control”, if the maximum voltage output of the heated oxygen sensor is less than 0.6 V, or the minimum voltage output is 0.24 V or more, the ECM determines that it is abnormal voltage output of the sensor (DTC P0136).

HEATED OXYGEN SENSOR CIRCUIT MALFUNCTION (P0136: ABNORMAL VOLTAGE):



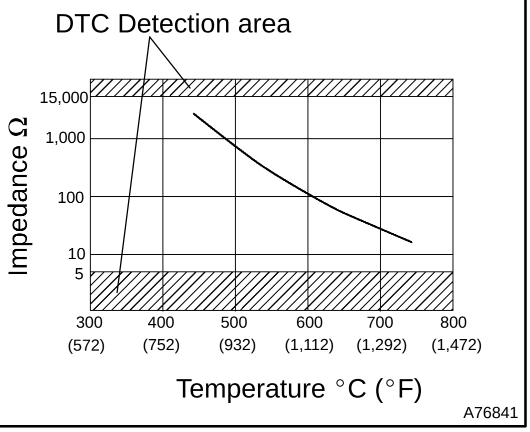
Oxygen Storage Capacity Detection in the Heated Oxygen Sensor Circuit (P0136, P0137 or P0138)
Under "active air-fuel ratio control", the ECM calculates the Oxygen Storage Capacity (OSC)* in the catalyst by forcibly regulating the air-fuel ratio to go RICH (or LEAN).
If the heated oxygen sensor has an open or short, or the voltage output by the sensor noticeably decreases, the OSC will indicate extraordinary high value. Even if the ECM attempts to continue regulating the air-fuel ratio to go RICH (or LEAN), the heated oxygen sensor output does not change.
When the value of OSC calculated by the ECM reaches 0.88 gram under the active air-fuel ratio control, although the targeted air-fuel ratio is RICH but the voltage output of the heated oxygen sensor is 0.25 V or less (LEAN), the ECM determines that it is an abnormal low voltage (DTC P0137). Also, the targeted air-fuel ratio is LEAN but the voltage output is 0.59 V or more (RICH), it is determined that the voltage output of the sensor is abnormally high (DTC P0138).
In addition to the OSC detection, if the fluctuation of the sensor voltage output is in a specific narrow range (more than 0.25 V and less than 0.59) despite the ECM ordering the air-fuel ratio to go RICH or LEAN while the OSC is above 0.88 gram, the ECM interprets this as a malfunction in the heated oxygen sensor circuit (DTC P0136).
*Oxygen Storage Capacity (OSC): A catalyst has a capability for storing oxygen. The OSC and the emission purification capacity of the catalyst are mutually related. The ECM judges if the catalyst has deteriorated based on the calculated OSC value. (See page 05-194)



HINT:
DTC P0138 is also set if the voltage output from the heated oxygen sensor is more than 1.2 V for 10 seconds or more.

Heated oxygen sensor impedance

Interrelation between temperature of the element and impedance:



During normal feedback control of the air-fuel ratio, there are small variations in the exhaust gas oxygen concentration. In order to continuously monitor the slight variation of the signal from the oxygen sensor while the engine is running, the impedance* of the sensor is measured by the ECM. The ECM detects that there is malfunction in the sensor when the measured impedance deviates from the standard range.

*: The effective resistance in an alternating current electrical circuit.

HINT:

- The impedance can not be measured with an ohmmeter.
- DTC P0136 indicates deterioration of the heated oxygen sensor. The ECM sets the DTC by calculating the impedance of the sensor after the typical enabling conditions are satisfied (1 driving-cycle).
- DTC P0137 indicates an open or short circuit in the heated oxygen sensor system (1 driving-cycle). The ECM sets this DTC when the impedance of the sensor exceeds the threshold 15 kΩ.

MONITOR STRATEGY

Related DTCs	P0136: Heated oxygen sensor output voltage P0137: Heated oxygen sensor output voltage (Low) P0138: Heated oxygen sensor output voltage (High)
Required sensors/components	Main: Heated oxygen sensor Related: Mass air flow meter, vehicle speed sensor
Frequency of operation	Active air-fuel ratio control detection : Once per driving cycle Impedance detection: Continuous
Duration	Impedance detection: P0136, P0138: 30 seconds, P0137: 155 seconds Active air-fuel ratio control detection: P0136, P0137, P0138: 15 to 20 seconds Output voltage (short-circuited) P0138: 10 seconds
MIL operation	Impedance detection: Immediately OSC detection with active air-fuel ratio control: Immediately Output voltage detection (only P0136): 2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Case 1: Impedance detection

P0136:

The monitor will run whenever the following DTCs are not present	See page 05-20
Following condition is met	30 seconds or more
Estimated sensor temperature	Less than 750°C (1382 °F)

P0137:

The monitor will run whenever the following DTCs are not present	See page 05-20
Following conditions are met	55 seconds or more
Estimated sensor temperature	450°C (842 °F) or more
Intake air amount per second	More than 0 g/sec

P0138:

The monitor will run whenever the following DTCs are not present	See page 05-20

Case 2: Output voltage and OSC detection

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine	Running
Battery voltage	10.5 V
Precondition of ”Active air-fuel ratio control”	Met

”Active air-fuel ratio control”

Battery voltage	11.5 V
Engine coolant temperature	75 °C (167 °F)
Continuous time of IDL ON status	Less than 1000 seconds
Engine speed	Less than 3200 rpm
A/F sensor status	Activated
Sub-feedback control	Executing
Delay time after fuel cut is OFF	10 seconds or more
Engine load	10 % or more, and less than 70 %
All of following conditions are met:	—
Intake air amount	5 g/sec or more, and less than 30 g/sec (vary with vehicle speed)
Upstream catalyst	430 °C (806 °F)or more, and less than 800 °C (1472 °F) (vary with vehicle speed)
Downstream catalyst	290 °C (554 °F) or more, and less than 675 °C (1247 °F) (vary with vehicle speed)

TYPICAL MALFUNCTION THRESHOLDS

Case 1: Impedance detection

P0136:

Heated oxygen sensor impedance	Less than 5 Ω

P0137:

Heated oxygen sensor impedance	15 kΩ or more

P0138:

Output voltage of heated oxygen sensor	1.2 V or more

Case 2: Output voltage detection

P0136:

Either of the following conditions A or B is met:	2 times or more
A. Following conditions are met	(a) and (b)
(a) Active air-fuel ratio control	Executing
(b) Sensor output voltage	Less than 0.6 V, and 0.59 V or more
B. Following conditions are met	(a) and (b)
(a) Active air-fuel ratio control	Executing
(b) Sensor output voltage	0.24 V or more, and 0.25 V or less

Case 3: OSC detection

P0136:

Active air-fuel ratio control	Executing
Either of the following conditions A or B is met:	A or B
A. Following conditions are met	(a), (b) and (c)
(a) Target air-fuel ratio	RICH
(b) Sensor output voltage	0.25 V or more
(c) OSC	0.88 g or more
B. Following conditions are met	(a), (b) and (c)
(a) Target air-fuel ratio	LEAN
(b) Sensor output voltage	0.59 V or less
(c) OSC	0.88 g or more

P0137:

Active air-fuel ratio control	Executing
Following conditions are met:	(a), (b) and (c)
(a) Target air-fuel ratio	Rich
(b) Sensor output voltage	Less than 0.25 V
(c) OSC	0.88 g or more

P0138:

Either of the following conditions 1 or 2 is met:	1 or 2
1. Active air-fuel ratio control	Executing
Following conditions are met:	(a) and (b)
(a) Target air-fuel ratio	Lean
(b) Sensor output voltage	More than 0.59 V
(c) OSC	0.88 g or more
2. Sensor output voltage	1.2 V or more

COMPONENT OPERATING RANGE

Heated oxygen sensor voltage	0 to 1.0 V

MONITOR RESULT

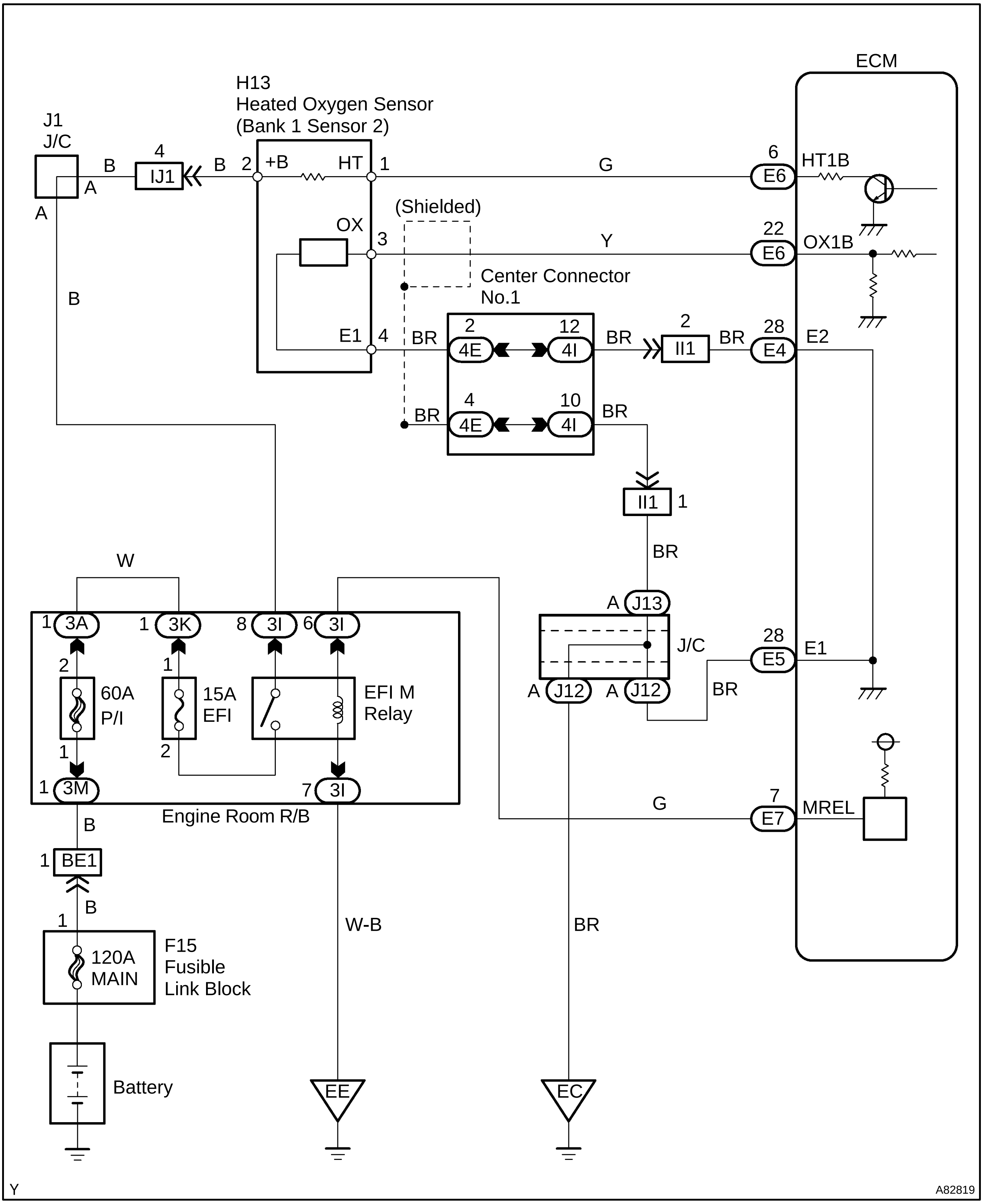
The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

HO2S Bank 1 Sensor 2

MID	TID	Scaling	Description of Test Value
$02	$07	Multiply by 0.001 (V)	Minimum sensor voltage
	$08	Multiply by 0.001 (V)	Maximum sensor voltage
	$8F	Multiply by 0.001 (g)	Maximum oxygen sensor storage capacity

WIRING DIAGRAM

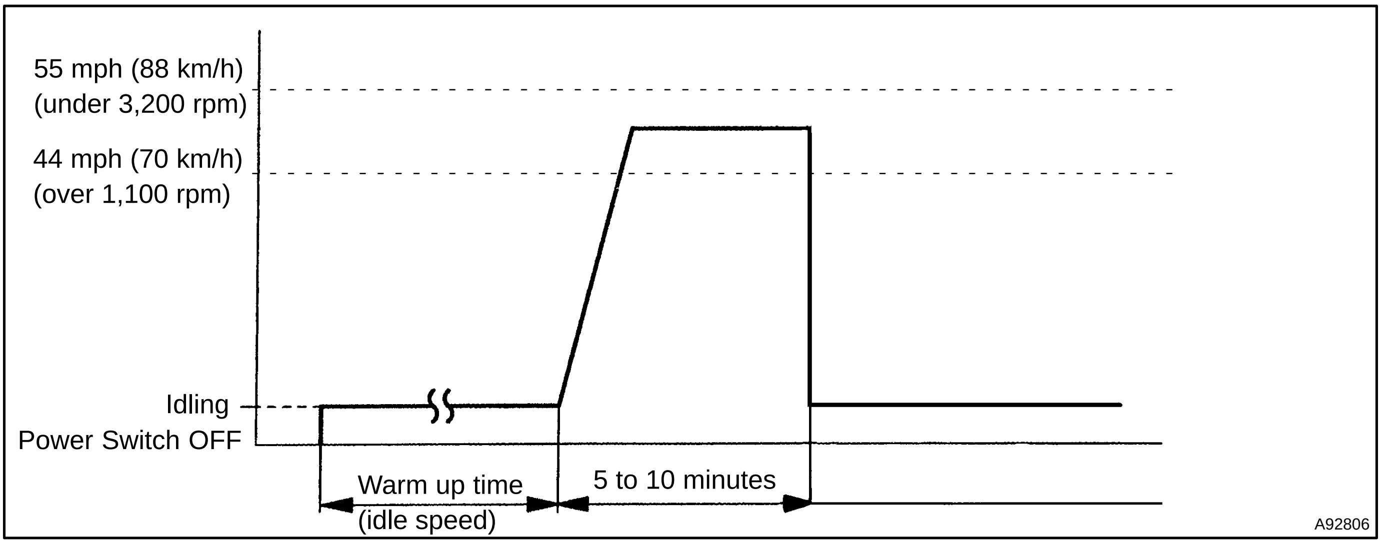


CONFIRMATION DRIVING PATTERN for DTC P0136 and P0137

PURPOSE

HINT:

Performing this confirmation pattern will activate the DTC detection (P0136) of the ECM. This is very useful for verifying the completion of a repair.



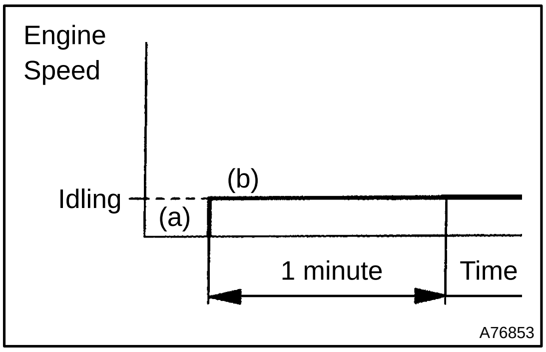
(a) Clear the DTCs (see page 05-40).
(b) Put the engine in inspection mode (see page 01-27).
(c) Start the engine and warm it up with all the accessory switches OFF.
(d) Deactivate the inspection mode and drive the vehicle at 44 to 70 mph (70 to 112 km/h) for 5 to 10 minutes.
(e) Read DTCs.

NOTICE:

- **If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the hand-held tester, turn the power switch OFF after performing steps (c) and (e), then perform step (d) again.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.**

CONFIRMATION DRIVING PATTERN for DTC P0138

PURPOSE



HINT:

Performing this confirmation pattern will activate the DTC detection (P0138) of the ECM. This is very useful for verifying the completion of a repair.

(a) Clear the DTCs (see page 05-40).
(b) Put the engine in inspection mode (see page 05-1).
(c) Start the engine and let the engine idle for 1 minute.
(d) Read DTCs.

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected.

INSPECTION PROCEDURE

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand-held tester:

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0136, P0137 AND/OR P0138)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

Display (DTC output)	Proceed to
P0136, P0137 and/or P0138	A
P0136, P0137 and/or P0138, and other DTCs	B

HINT:
If any other codes besides P0136, P0137 and/or P0138 are output, perform troubleshooting for those DTCs first.

B **GO TO RELEVANT DTC CHART**
(See page 05-54)

A

2	PERFORM ACTIVE TEST USING HAND-HELD TESTER(A/F CONTROL)

HINT:
Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble area are malfunctioning or not.
(a) Perform A/F CONTROL operation using the hand-held tester.
HINT:
The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.
(1) Connect the hand-held tester to the DLC3 on the vehicle.
(2) Turn the power switch ON (IG).
(3) Put the engine in inspection mode (see page 01-27).
(4) Warm up the engine by running the engine at 2,500 rpm, depressing the accelerator pedal more than 60 % for approximately 90 seconds.
(5) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(6) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:
A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
-12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
-12.5 % → lean output: Less than 0.4 V

NOTICE:
The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Extremely RICH or LEAN actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of both A/F sensor and heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL / USER DATA, select "AFS B1S1 and O2S B1S2" by pressing the "YES" button followed by the "ENTER" button and then the "F4" button.

- A high A/F sensor voltage could be caused by a RICH air-fuel mixture. Check the conditions that would cause the engine to run with the RICH air-fuel mixture.
- A low A/F sensor voltage could be caused by a LEAN air-fuel mixture. Check the conditions that would cause the engine to run with the LEAN air-fuel mixture.

Result:

Output voltage of A/F sensor	Output voltage of heated oxygen sensor	Proceed to
OK	OK	A
NG	OK	B
OK	NG	C
NG	NG	D

B → **GO TO DTC P2238**

C → **Go to step 5**

D → **GO TO DTC P0171**

A

3 PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4 READ OUTPUT DTCS (DTC P0136, P0137 AND/OR P0138 ARE OUTPUT AGAIN)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs.

Result:

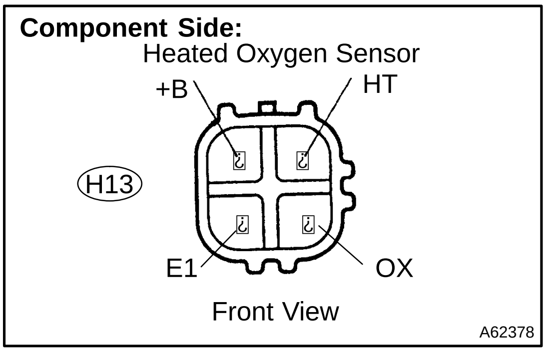
Display (DTC output)	Proceed to
P0136, P0137 and/or P0138	A
P0136, P0137 and/or P0138, and other DTCs	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

5 INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H13 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard:

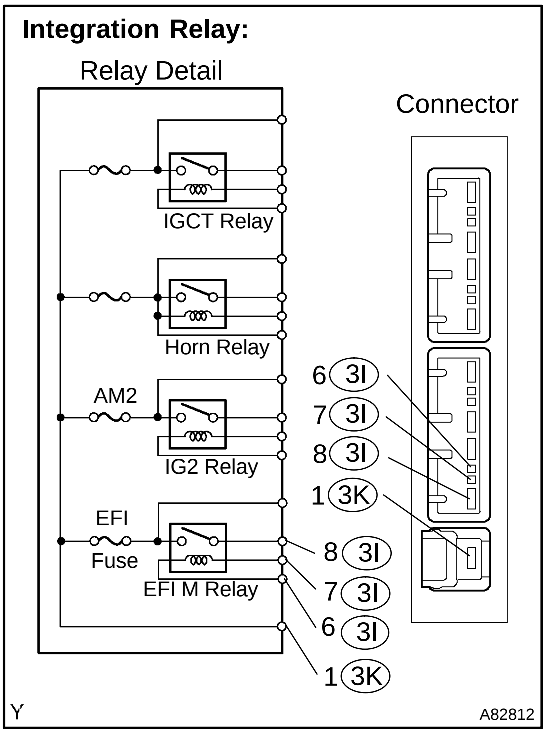
Tester Connection	Specified Condition
HT (H13-1) - +B (H13-2)	11 to 16 Ω at 20 °C (68 °F)
HT (H13-1) - E1 (H13-4)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.

Standard:

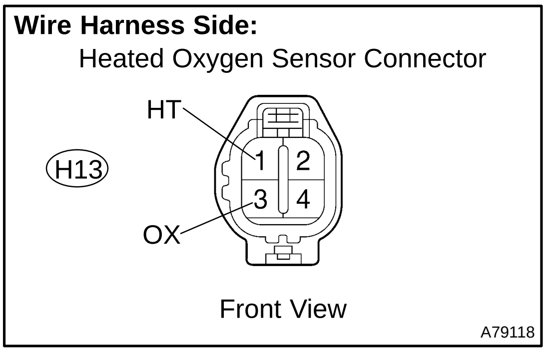
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

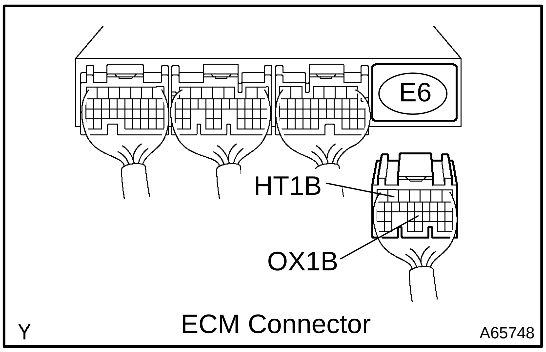
(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

7	CHECK HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR - ECM)





(a) Disconnect the H13 heated oxygen sensor connector.
(b) Disconnect the E6 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

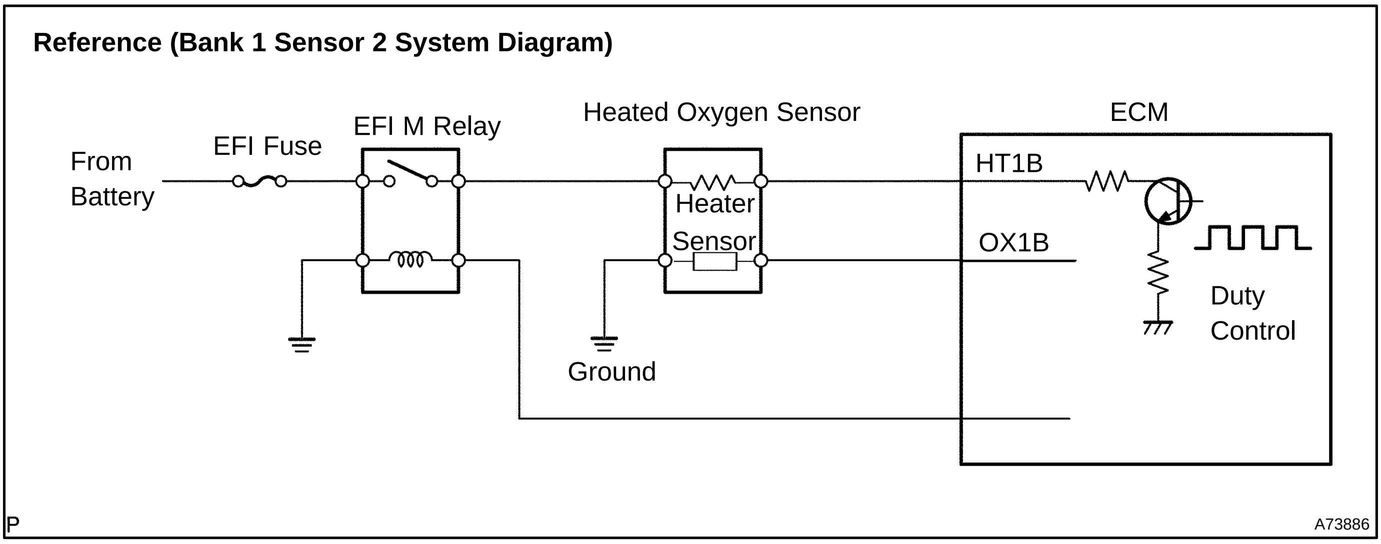
Standard (Check for open):

Tester Connection	Specified Condition
HT (H13-1) - HT1B (E6-6)	Below 1 Ω
OX (H13-3) - OX1B (E6-22)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
HT (H13-1) or HT1B (E6-6) - Body ground	10 kΩ or higher
OX (H13-3) or OX1B (E6-22) - Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE HEATED OXYGEN SENSOR

OBD II scan tool (excluding hand-held tester):

1	CHECK OTHER DTC OUTPUT(IN ADDTION TO DTC P0136, P0137 AND/OR P0138)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0136, P0137 and/or P0138	A
P0136, P0137 and/or P0138, and other DTCs	B

HINT:
If any other codes besides P0136, P0137 and/or P0138 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-54)**

A

2	INSPECT HEATED OXYGEN SENSOR(OUTPUT VOLTAGE)

(a) After warming up the engine, run the engine at 2,500 rpm for 90 seconds.
(b) Read the output voltage of the heated oxygen sensor when the engine rpm is suddenly increased.

HINT:
Quickly accelerate the engine to 2,500 rpm 3 times by using the accelerator pedal.

Heated oxygen sensor output voltage: Fluctuates.

NG → **Go to step 5**

OK

3	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

GO

4	READ OUTPUT DTCS (DTC P0136, P0137 AND/OR P0138 ARE OUTPUT AGAIN)

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the OBD II scan tool ON.
(d) Read DTCs using the OBD II scan tool.

Result:

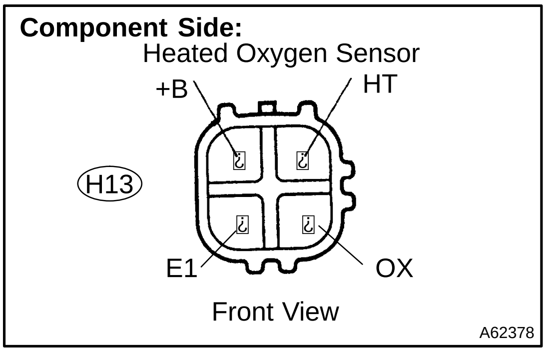
Display (DTC output)	Proceed to
P0136, P0137 and/or P0138	A
P0136, P0137 and/or P0138, and other DTCs	B

B → **REPLACE HEATED OXYGEN SENSOR**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

5	INSPECT HEATED OXYGEN SENSOR(HEATER RESISTANCE)



(a) Disconnect the H13 heated oxygen sensor connector.
(b) Measure the resistance between the terminals of the heated oxygen sensor connector.

Standard:

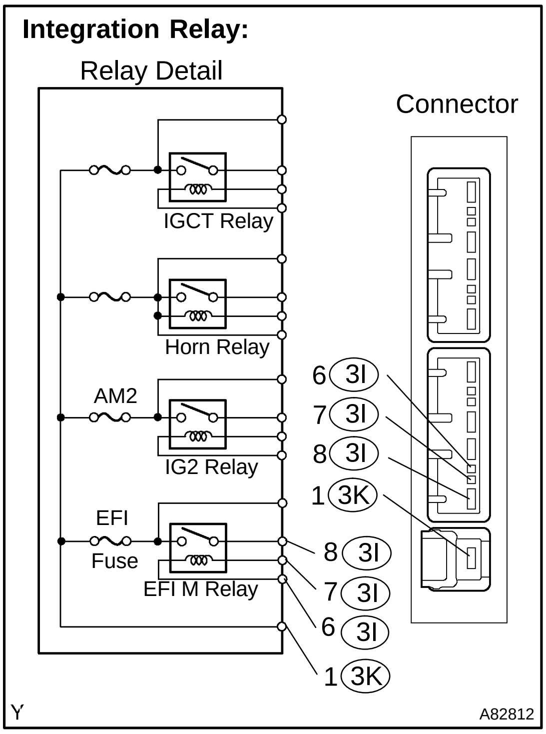
Tester Connection	Specified Condition
HT (H13-1) - +B (H13-2)	11 to 16 Ω at 20 °C (68 °F)
HT (H13-1) - E1 (H13-4)	10 kΩ or higher

(c) Reconnect the heated oxygen sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

6	INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.

(b) Inspect the EFI M relay.

Standard:

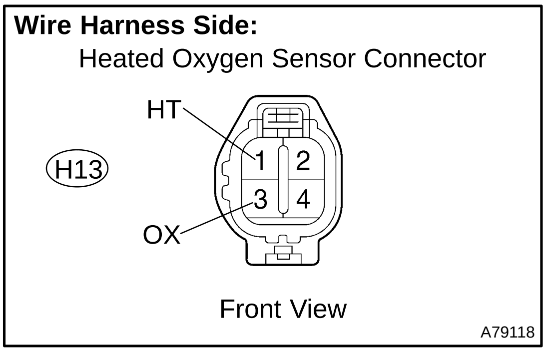
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

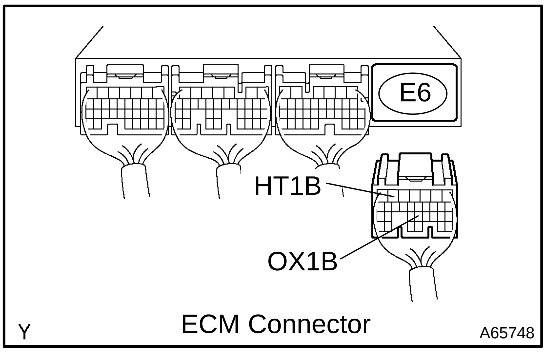
(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

7	INSPECT HARNESS AND CONNECTOR(HEATED OXYGEN SENSOR - ECM)





(a) Disconnect the H13 heated oxygen sensor connector.
(b) Disconnect the E6 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

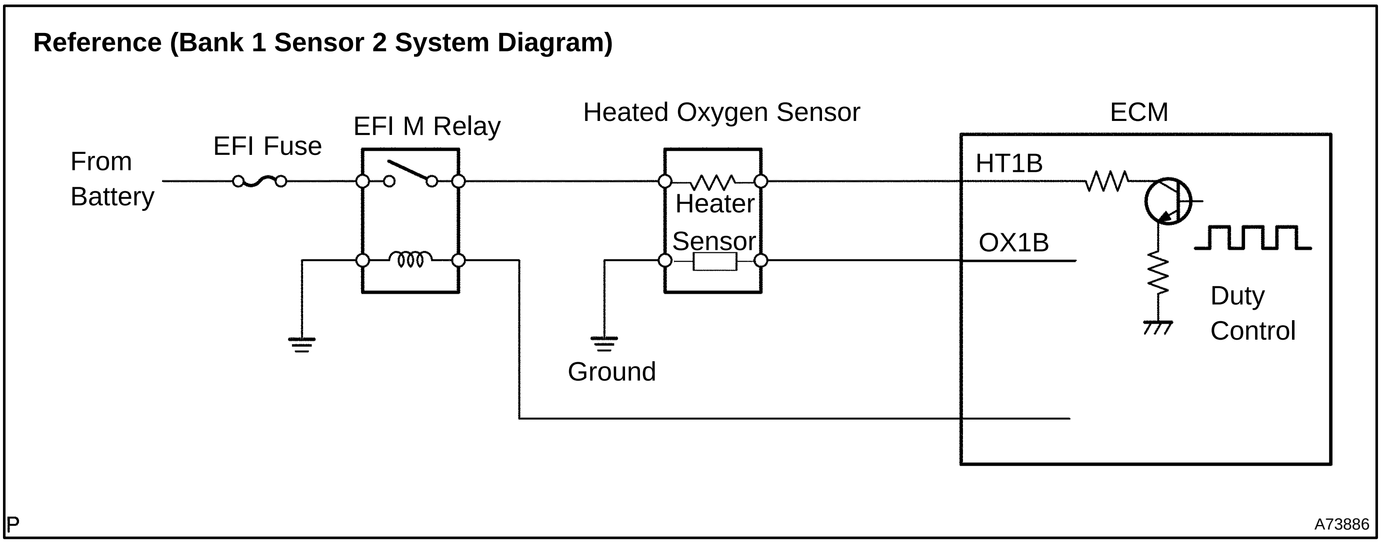
Standard (Check for open):

Tester Connection	Specified Condition
HT (H13-1) - HT1B (E6-6)	Below 1 Ω
OX (H13-3) - OX1B (E6-22)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
HT (H13-1) or HT1B (E6-6) - Body ground	10 kΩ or higher
OX (H13-3) or OX1B (E6-22) - Body ground	10 kΩ or higher

(d) Reconnect the heated oxygen sensor connector.
(e) Reconnect the ECM connector.



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE HEATED OXYGEN SENSOR

DTC P0171 SYSTEM TOO LEAN (BANK 1)

DTC P0172 SYSTEM TOO RICH (BANK 1)

CIRCUIT DESCRIPTION

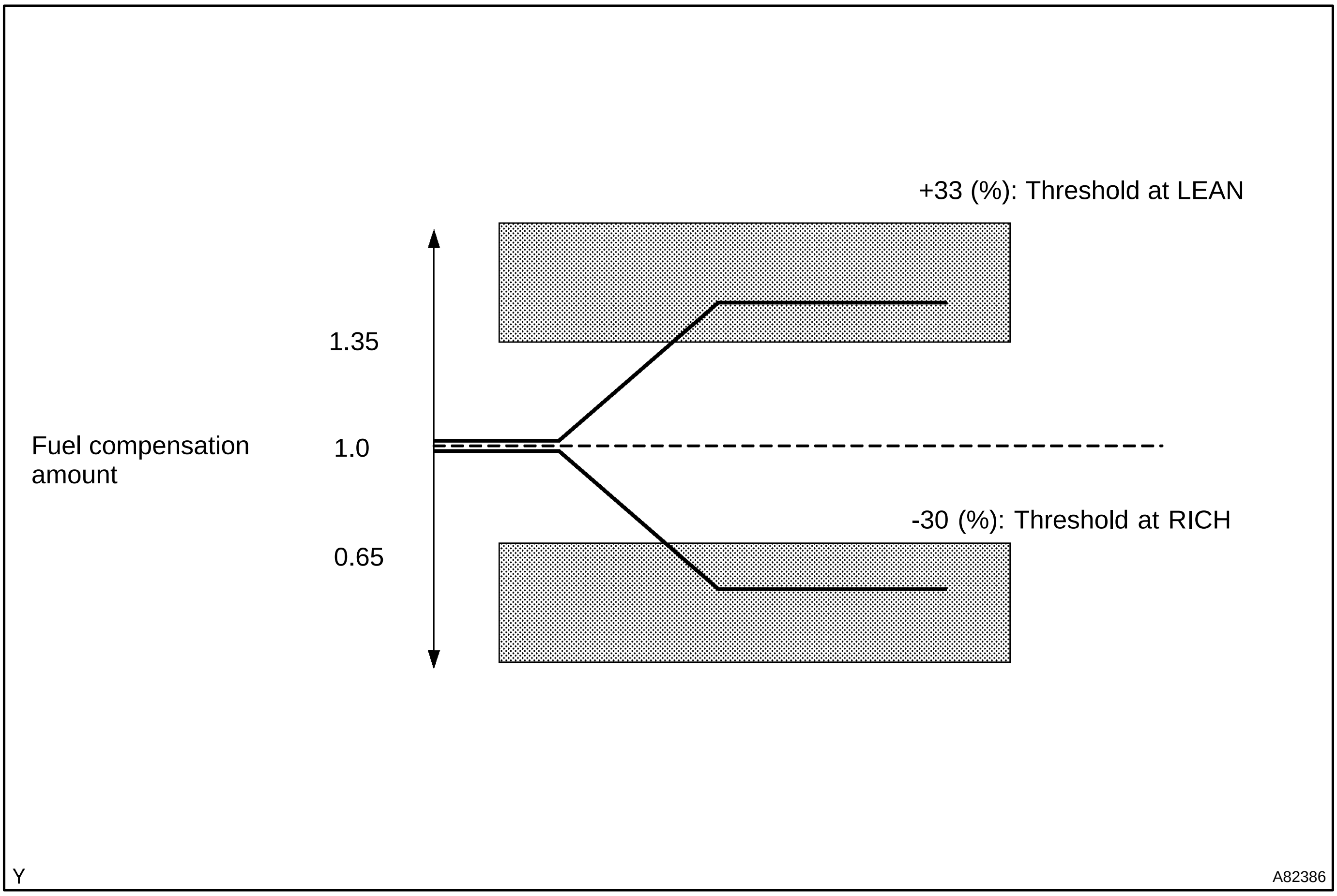
The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short-term fuel trim and the long-term fuel trim.
The short-term fuel trim is the short-term fuel compensation used to maintain the air-fuel ratio at stoichiometric air-fuel ratio. The signal from the A/F sensor indicates whether the air-fuel ratio is RICH or LEAN compared to the stoichiometric air-fuel ratio. This variance triggers a reduction in the fuel volume if the air-fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.
The long-term fuel trim is the overall fuel compensation carried out in long-term to compensate for a continual deviation of the short-term fuel trim from the central value, due to individual engine differences, wear overtime and changes in the operating environment.
If both the short-term fuel trim and the long-term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated and DTC is set.

DTC No.	DTC Detection Condition	Trouble Area
P0171	When air-fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in A/F sensor (bank 1, sensor 1) circuit • A/F sensor (bank 1, sensor 1) • A/F sensor heater (bank 1, sensor 1) • EFI M relay • PCV valve and hose • PCV hose connection • ECM
P0172	When air-fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in A/F sensor (bank 1, sensor 1) circuit • A/F sensor (bank 1, sensor 1) • A/F sensor heater • EFI M relay • ECM

HINT:

- When DTC P0171 is recorded, the actual air-fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air-fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air-fuel ratio is LEAN and DTC P0171 may be recorded. The MIL then illuminates.
- If the total of the short-term fuel trim value and long-term fuel trim value is between +33 % and -30 % (engine coolant temperature is more than 75°C (167°F)), the system is functioning normally.

MONITOR DESCRIPTION



Under closed-loop fuel control, fuel injection amount that deviates from the ECM's estimated fuel amount will cause a change in the long-term fuel trim compensation value. This long-term fuel trim is adjusted when there are persistent deviations in the short-term fuel trim values. And the deviation from the simulated fuel injection amount by the ECM affects a smoothed fuel trim learning value. The smoothed fuel trim learning value is the combination of smoothed short-term fuel trim (fuel feedback compensation value) and smoothed long-term fuel trim (learning value of the air-fuel ratio). When the smoothed fuel trim learning value exceeds the DTC threshold, the ECM interprets this as a fault in the fuel system and sets a DTC.
Example:
The smoothed fuel trim leaning value is more than +33% or less than -30%. The ECM interprets this as a failure in the fuel system.
DTC P0171 indicates that the air-fuel mixture is extremely LEAN, and P0172 indicates extremely RICH.

MONITOR STRATEGY

Related DTCs	P0171: Fuel system lean (bank 1) P0172: Fuel system rich (bank 1)
Required sensors/components	Main: A/F sensor Related: Engine coolant temperature sensor, mass air flow meter, crankshaft position sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more
Fuel system: Closed-loop	13 seconds or more
One of the following condition is met:	(a) or (b)
(a) Engine speed	Less than 1,100 rpm
(b) Intake air amount per revolution	0.22 g/rev or more
Warm-up condition enables air-fuel ratio learning control	Conditions are met

TYPICAL MALFUNCTION THRESHOLDS

Following condition is continued for 3 seconds	(a) or (b)
(a) Smoothed fuel trim learning value (lean)	33 % or more
(b) Smoothed fuel trim learning value (rich)	-30 % or less

WIRING DIAGRAM

Refer to DTC P2195 on page 05-314 .

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation. The A/F CONTROL operation can determine if the A/F sensor, heated oxygen sensor or other potential trouble area are malfunctioning or not.

(a) Perform the ACTIVE TEST A/F CONTROL operation.

HINT:

The A/F CONTROL operation lowers the injection volume 12.5% or increases the injection volume 25%.

(1) Connect the hand-held tester to the DLC3 on the vehicle.
(2) Turn the power switch ON (IG).
(3) Put the engine in inspection mode (see page 01-27).
(4) Warm up the engine by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(5) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(6) Perform the A/F CONTROL operation with the engine in an idle condition (press the right or left button).

Result:

A/F sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: Less than 3.0 V
-12.5 % → lean output: More than 3.35 V
Heated oxygen sensor reacts in accordance with increase and decrease of injection volume:
+25 % → rich output: More than 0.55 V
-12.5 % → lean output: Less than 0.4 V

NOTICE:

The A/F sensor output has a few seconds of delay and the heated oxygen sensor output has about 20 seconds of delay at maximum.

	Output voltage of A/F sensor (sensor 1)	Output voltage of heated oxygen sensor (sensor 2)	Main Suspect Trouble Area
Case 1	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0 V **OK**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage More than 0.55 V Less than 0.4V **OK**	A/F sensor (A/F sensor, sensor heater, sensor circuit)
Case 3	Injection volume +25 % -12.5 % Output voltage More than 3.35 V Less than 3.0V **OK**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Heated oxygen sensor (heated oxygen sensor, sensor heater, sensor circuit)
Case 4	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % -12.5 % Output voltage Almost no reaction **NG**	Extremely RICH or LEAN actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage output of both A/F sensor and heated oxygen sensor.

To display the graph, enter ACTIVE TEST/ A/F CONTROL/USER DATA, select ”AFS B1S1 and O2S B1S2” by pressing the ”YES” button followed by the ”ENTER” button and then the ”F4” button.

HINT:

- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high A/F sensor voltage could be caused by a RICH air-fuel mixture. Check the conditions that would cause the engine to run with the RICH air-fuel mixture.
- A low A/F sensor voltage could be caused by a LEAN air-fuel mixture. Check the conditions that would cause the engine to run with the LEAN air-fuel mixture.

1	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.
OK: No vacuum leakage.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

2	CHECK CONNECTION OF PCV HOSE

OK: PCV hose is connected correctly and PCV hose is not damaged.

NG → REPAIR OR REPLACE PCV HOSE

OK

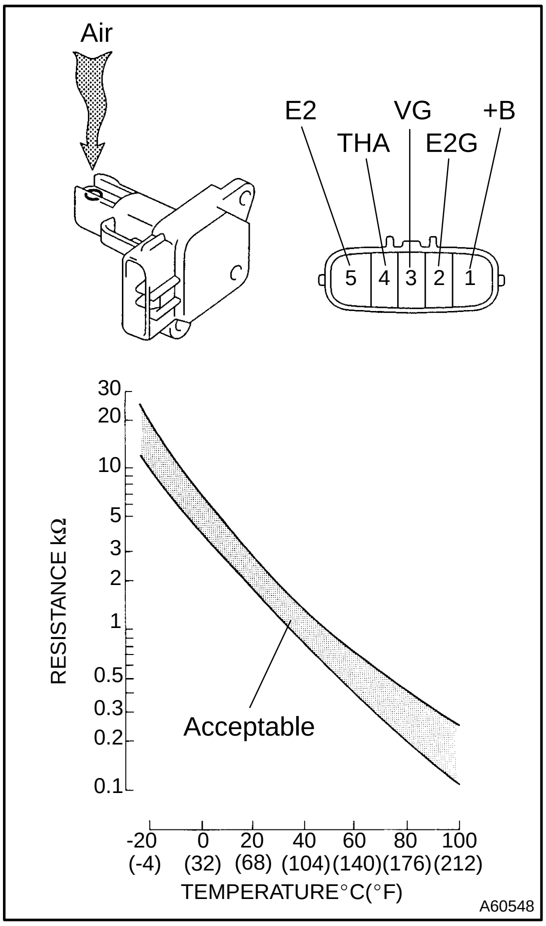
3	INSPECT FUEL INJECTOR ASSY(INJECTION AND VOLUME) (See page 11-9)

OK:
Injection volume: 36 to 46 cm^3 (2.1 to 2.8 cu in.) per 15 seconds.

NG → REPLACE FUEL INJECTOR ASSY (See page 11-12)

OK

4 INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.

(b) Inspect output voltage.

(1) Apply battery voltage across terminals +B and E2G.

(2) Connect the positive (+) tester prove to terminal VG, and negative (-) tester prove to terminal E2G.

(3) Blow air into the mass air flow meter, and check that the voltage fluctuates.

Standard:

Tester Connection	Specified Condition
VG (3) - E2G (2)	Sensor output voltage fluctuates between 0.3 V and 4.8 V

(c) Inspect resistance.

(1) Measure the resistance between the terminals of the mass air flow meter.

Standard:

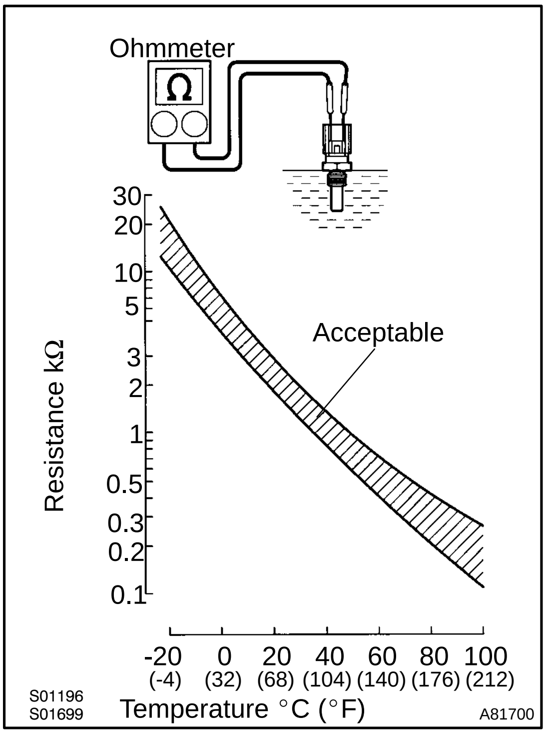
Tester Connection	Specified Condition
THA (4) - E2 (5)	13.6 to 18.4 kΩ at -20°C (-4°F)
THA (4) - E2 (5)	2.21 to 2.69 kΩ at 20°C (68°F)
THA (4) - E2 (5)	0.49 to 0.67 kΩ at 60°C (140°F)

(d) Reinstall the mass air flow meter.

NG → **REPLACE MASS AIR FLOW METER**

OK

5	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:
When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the engine coolant temperature sensor.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

6	CHECK FOR SPARK AND IGNITION (See page 18-3)

OK: Spark occurs.

NG → **REPAIR OR REPLACE IGNITION SYSTEM COMPONENTS**

OK

7	CHECK FUEL PRESSURE (See page 11-7)

OK:
Fuel pressure: 304 to 343 kPa (3.1 to 3.5 kgf·cm^2, 44 to 50 psi)

NG → **REPAIR OR REPLACE FUEL SYSTEM**

OK

8	CHECK FOR EXHAUST GAS LEAKAGE

OK: No gas leak.

NG → **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT (See page 15-1)**

OK

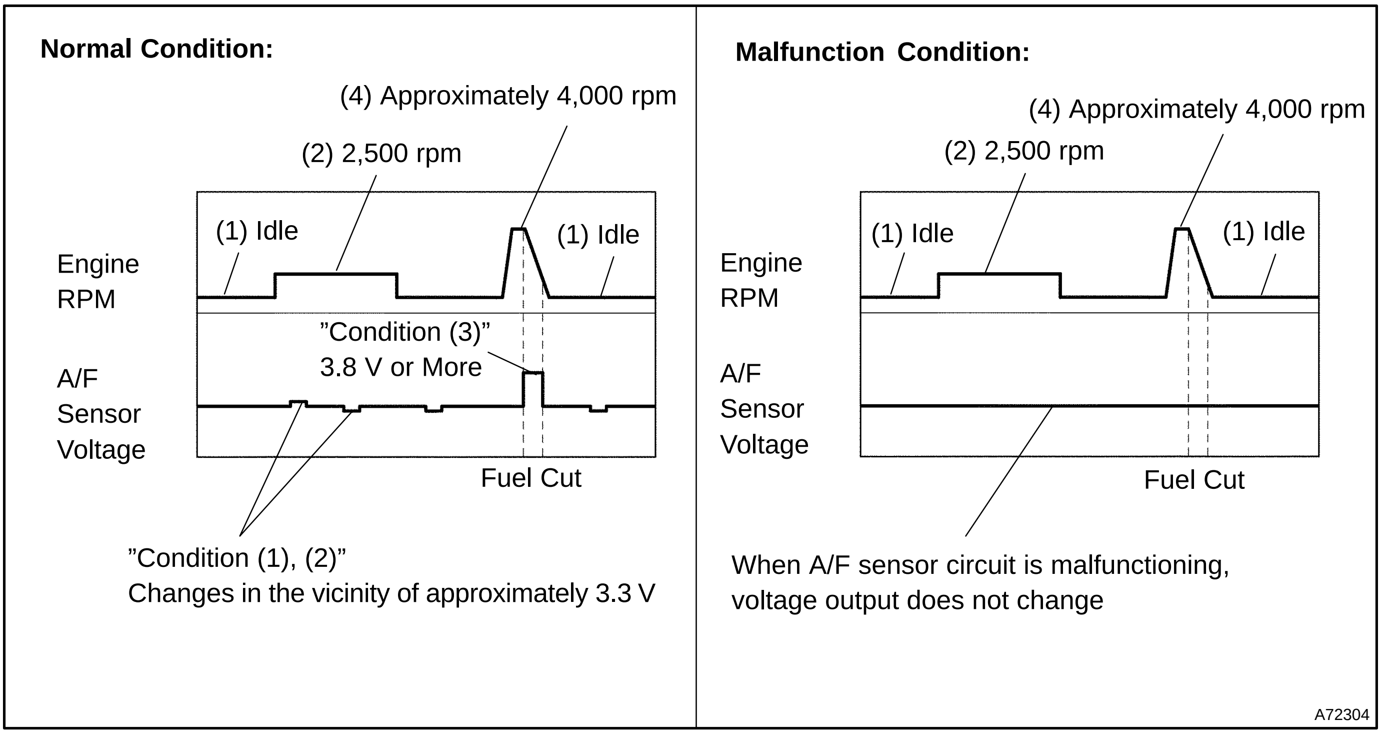
9	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(OUTPUT VOLTAGE OF AIR FUEL RATIO SENSOR (BANK 1 SENSOR 1))

(a) Connect the hand-held tester or the OBD II scan tool to the DLC 3.
(b) Put the engine in inspection mode (see page 01-27).
(c) Warm up the A/F sensors (bank 1 sensor 1) by running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % for approximately 90 seconds.
(d) Read A/F sensor voltage output on the OBD II scan tool or the hand-held tester.
(e) Hand-held tester only:
On the hand-held tester, enter the menus: ENHANCED OBD II / SNAPSHOT / MANUAL SNAPSHOT / USER DATA.
(f) Select ”AFS B1 S1/ENGINE SPD” and press button ”YES”.
(g) Monitor the A/F sensor voltage carefully.
(h) Check the A/F sensor voltage output under the following conditions:
(1) Put the engine in inspection mode and allow the engine to idle for 30 seconds.
(2) Put the engine in inspection mode and running the engine at 2,500 rpm with the accelerator pedal depressed more than 60 % (where engine RPM is not suddenly changed).
(3) Deactivate the inspection mode and drive the vehicle with shift position ”B” range.
(4) Accelerate the vehicle to 44 mph (70 km/h) and quickly release the accelerator pedal so that the throttle valve is fully closed.

CAUTION:

- **Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.**

Standard:
Condition (1) and (2)
Voltage changes in the vicinity of 3.3 V (0.66 V)* (between approximately 3.1 to 3.5 V) as shown in the illustration.
Condition (4)
A/F sensor voltage increases to 3.8 V (0.76 V)* or more during engine deceleration (when fuel cut) as shown in the illustration.
***: Voltage when using the OBD II scan tool.**



HINT:

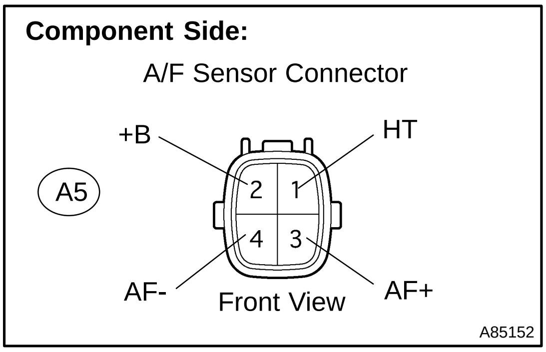
- Whenever the output voltage of the A/F sensor remains at approximately 3.3 V (0.660 V)* (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have an open-circuit. (This will happen also when the A/F sensor heater has an open-circuit.)
- Whenever the output voltage of the A/F sensor remains at a certain value of approximately 3.8 V (0.76 V)* or more, or 2.8 V (0.56 V)* or less (see diagram Malfunction Condition) under any condition as well as the above conditions, the A/F sensor may have a short-circuit.
- The ECM will stop fuel injection (fuel cut) during engine deceleration. This will cause a LEAN condition and should result in a momentary increase in A/F sensor voltage output.
- The ECM must establish a closed throttle position learned value to perform fuel cut. If the battery terminal was reconnected, the vehicle must be driven over 10 mph to allow the ECM to learn the closed throttle position.
- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 2.8 V (0.76 V)* during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element, and therefore the current is converted into voltage inside the ECM. If measuring voltage at connectors of A/F sensor or ECM, you will observe a constant voltage.

*: Voltage when using the OBD II scan tool.

OK → **Go to step 17**

NG

10 INSPECT AIR FUEL RATIO SENSOR(HEATER RESISTANCE)



(a) Disconnect the A5 A/F sensor connector.
(b) Measure the resistance between the terminals of the A/F sensor.
Standard:

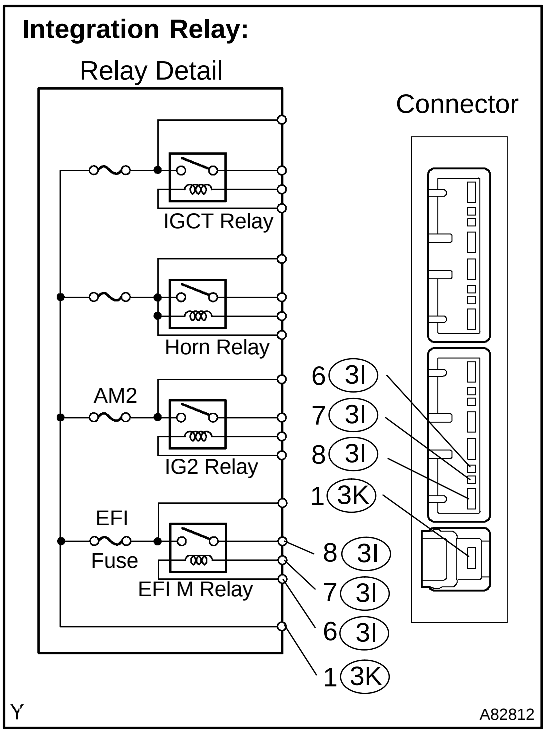
Tester Connection	Specified Condition
HT (1) - +B (2)	1.8 to 3.4 Ω at 20°C (68 °F)

(c) Reconnect the A/F sensor connector.

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

11 INSPECT INTEGRATION RELAY(EFI M RELAY)



(a) Remove the integration relay from the engine room R/B.
(b) Inspect the EFI M relay.
Standard:

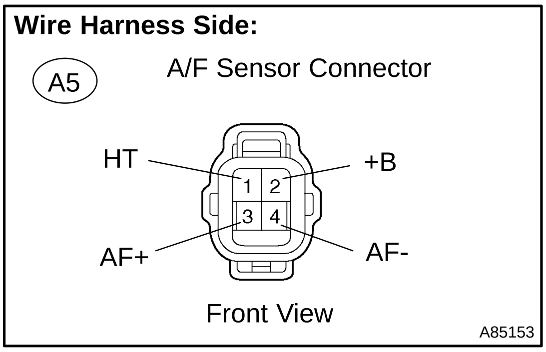
Tester Connection	Specified Condition
(3K-1) - (3I-8)	10 kΩ or higher
(3K-1) - (3I-8)	Below 1 Ω (Apply battery voltage to terminals 3I-6 and 3I-7)

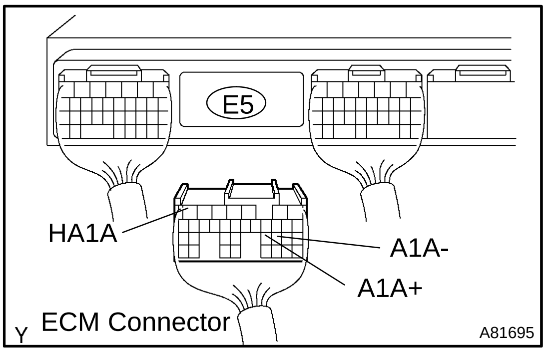
(c) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

OK

12 CHECK HARNESS AND CONNECTOR(A/F SENSOR - ECM)





(a) Disconnect the A5 A/F sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance between the wire harness side connectors.

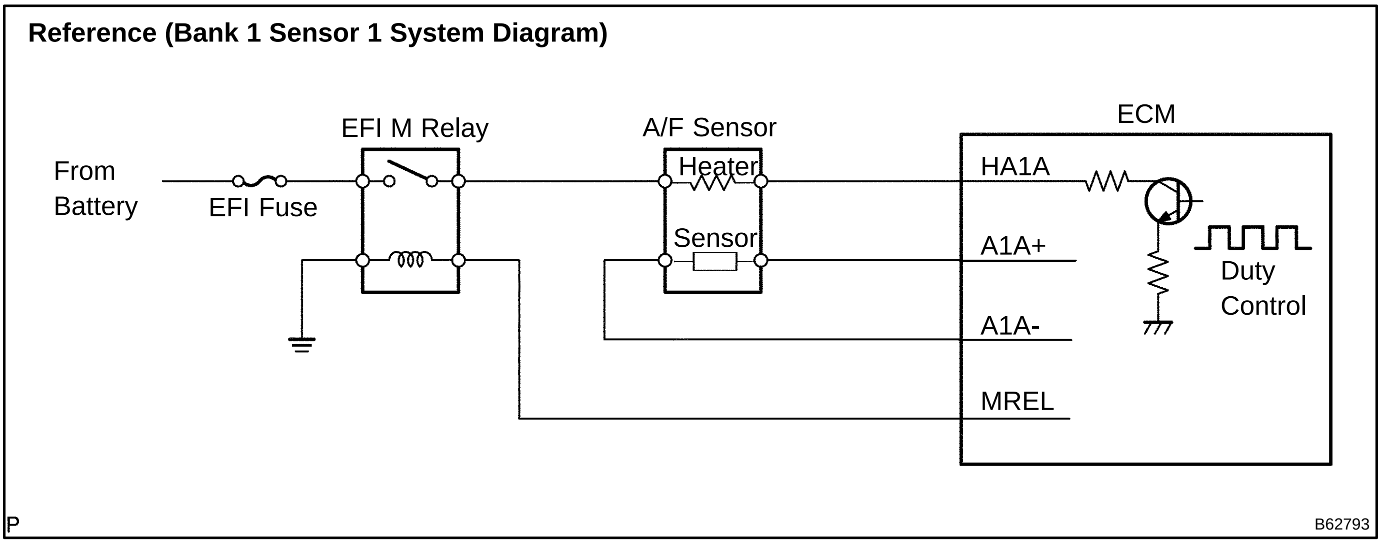
Standard (Check for open):

Tester Connection	Specified Condition
AF+ (A5-3) - A1A+ (E5-23)	Below 1 Ω
AF- (A5-4) - A1A- (E5-22)	Below 1 Ω
HT (A5-1) - HA1A (E5-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
AF+ (A5-3) or A1A+ (E5-23) - Body ground	10 kΩ or higher
AF- (A5-4) or A1A- (E5-22) - Body ground	10 kΩ or higher
HT (A5-1) or HA1A (E5-7) - Body ground	10 kΩ or higher

(d) Reconnect the A/F sensor connector.
(e) Reconnect the ECM connector.



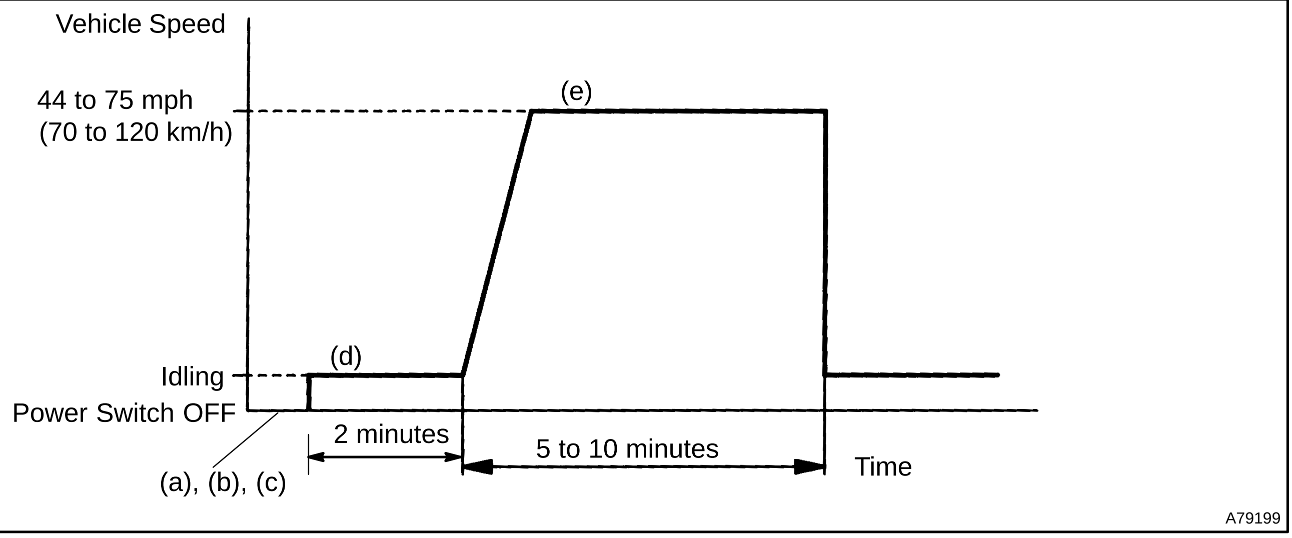
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

13	REPLACE AIR FUEL RATIO SENSOR

GO

14	PERFORM CONFIRMATION DRIVING PATTERN



(a) Clear the DTCs (see page 05-41).
(b) Connect the hand-held tester to the DLC3.
(c) Switch the ECM from normal mode to check mode using the hand-held tester (see page 05-45).
(d) Put the engine in inspection mode, and start the engine and warm it up with all the accessory switches OFF.
(e) Deactivate inspection mode and drive the vehicle at 44 to 75 mph (70 to 120 km/h) and engine speed of 1,100 to 3,200 rpm for 5 to 10 minutes.

HINT:
If malfunction exists, the MIL will be illuminated during step (e).

NOTICE:

- **If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have a hand-held tester, turn the power switch OFF after performing steps (d) and (e), then perform step (e) again.**
- **Do not drive the vehicle without deactivating inspection mode, otherwise damaging the trans-axle may result.**

GO

15	READ OUTPUT DTCS(SEE IF DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
No output	A
P0171 and/or P0172	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN (Refer to step 14)**

A

16	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTCS ARE CAUSED BY RUNNING OUT OF FUEL (DTCS P0171 and/or P0172)

17	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

GO

18	READ OUTPUT DTCS(SEE IF DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
P0171 and/or P0172	A
No output	B

B → **Go to step 22**

A

19	REPLACE AIR FUEL RATIO SENSOR

GO

20	PERFORM CONFIRMATION DRIVING PATTERN

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

GO

21	READ OUTPUT DTCS(SEE IF DTC P0171 AND/OR P0172 ARE OUTPUT AGAIN)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.
Result:

Display (DTC Output)	Proceed to
No output	A
P0171 and/or P0172	B

B → **REPLACE ECM (See page 10-24) AND PERFORM CONFIRMATION DRIVING PATTERN (Refer to step 14)**

A

22	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

YES

DTCS ARE CAUSED BY RUNNING OUT OF FUEL

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

DTC	P0301	CYLINDER 1 MISFIRE DETECTED

DTC	P0302	CYLINDER 2 MISFIRE DETECTED

DTC	P0303	CYLINDER 3 MISFIRE DETECTED

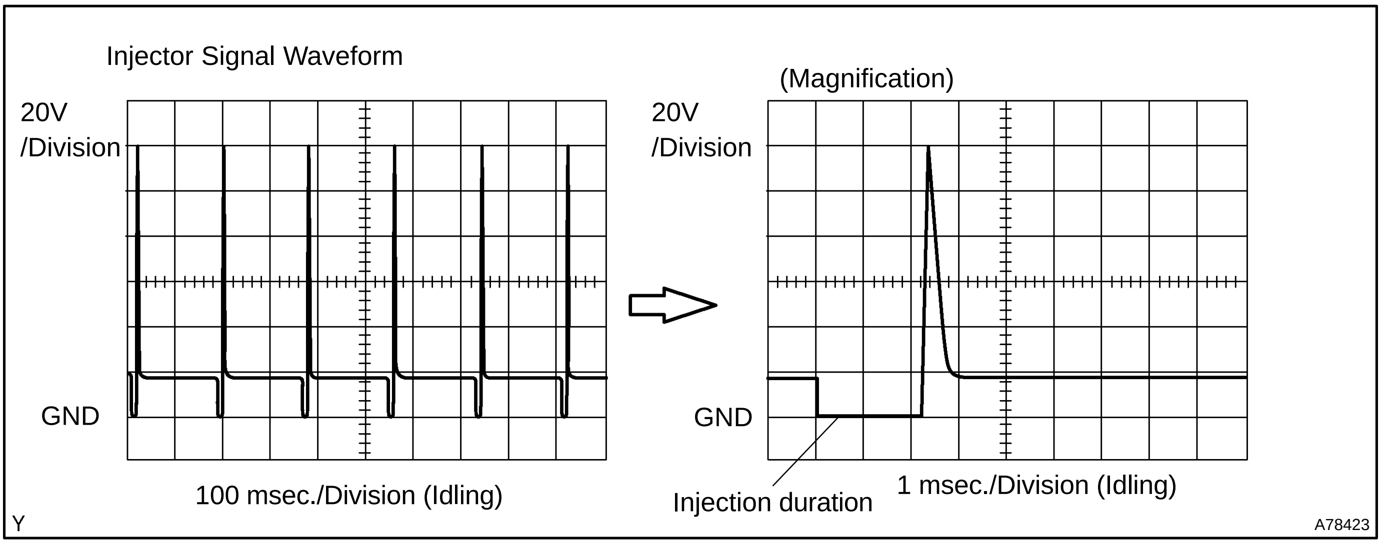
DTC	P0304	CYLINDER 4 MISFIRE DETECTED

CIRCUIT DESCRIPTION

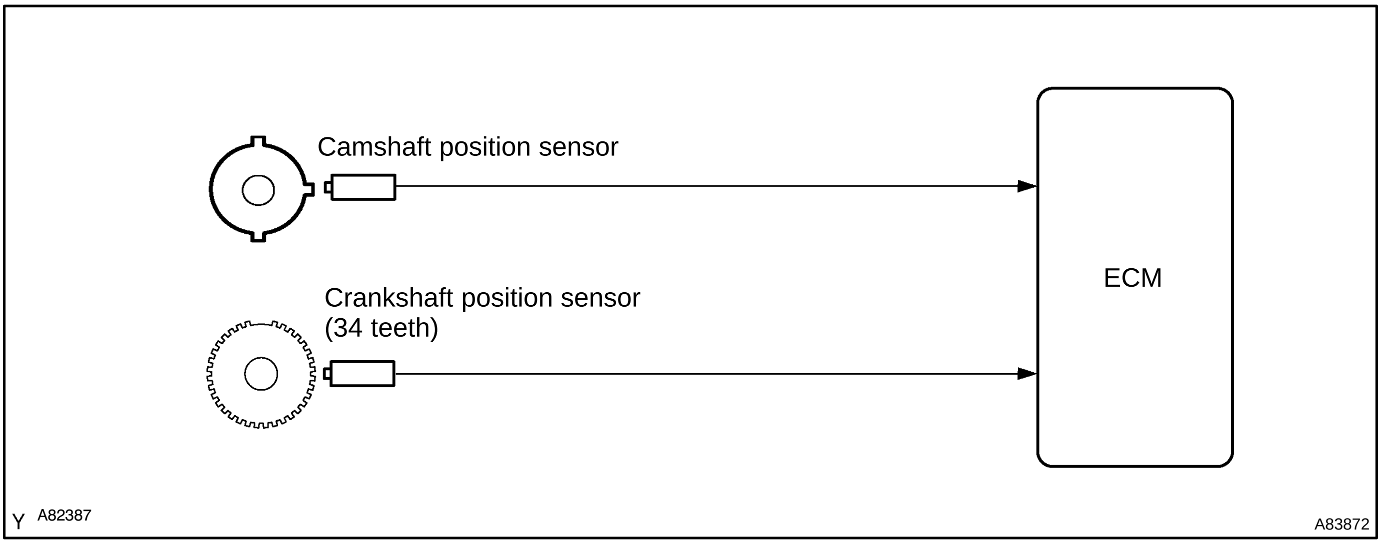
When a misfire occurs in the engine, hydrocarbons (HC) enter the exhaust gas in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emissions levels. High concentrations of HC can also cause to temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. The misfire counter increments when crankshaft rotation speed variations exceed threshold values.
If the misfiring rate exceeds the threshold value and could cause emissions deterioration, the ECM illuminates the MIL.

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions 1 trip detection logic: MIL blinks 2 trip detection logic: MIL illuminates	• Open or short in engine wire harness • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	• For any particular 200 revolutions of engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink) • For any particular 1,000 revolutions of engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	• Open or short in engine wire harness • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM

HINT:
When several codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.
Reference: Inspection using oscilloscope
With the engine idling, check the waveform between terminals #10 to #40 and E01 of the ECM connectors.
HINT:
The correct waveform is as shown.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:

- The percent misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will set the MIL. After engine start, four occurrences of excessive misfire set the MIL.

The ECM blinks the MIL (immediately) if:

- The threshold for percent of misfire causing catalyst damage is reached 1 time in 200 engine revolutions at a high rpm, and 3 times in 200 engine revolutions at a normal rpm.
- The threshold for percent of misfire causing catalyst damage is reached

MONITOR STRATEGY

Related DTCs	P0300: Random/Multiple cylinder misfire detected P0301: Cylinder 1 misfire detected P0302: Cylinder 2 misfire detected P0303: Cylinder 3 misfire detected P0304: Cylinder 4 misfire detected
Required sensors/components	Main: Camshaft position sensor, crankshaft position sensor Related: Engine coolant temperature sensor, intake air temperature sensor, throttle position sensor
Frequency of operation	Continuous
Duration	Every 1,000 revolutions: Every 200 revolutions:
MIL operation	2 driving cycles: MIL ON Immediately: MIL blinking (catalyst deteriorating)
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	More than 8 V
VVT	Normal operation (i. e. not under scan-tool control)
Engine speed fluctuation	Engine speed should not have changed rapidly
Engine speed	850 rpm or more, and 5,300 rpm or less
Intake air temperature	-10 °C (14°F) or more
Engine coolant temperature	-10 °C (14°F) or more
Intake air amount per revolution (varies with engine speed)	0.095 g/rev
Throttle position learning	Completed
Throttle position	Rapid throttle opening or closing operation has not occurred
Rough road counter	Less than 10 times/1,000 revolutions (not running on rough road)

TYPICAL MALFUNCTION THRESHOLDS

Emission related misfire:

One of the following conditions is met	(a) or (b)
(a) Misfire rate when engine start at cold	2.0 % or more/1,000 revolutions
(b) Misfire rate when engine start at hot	5.0 % or more/1,000 revolutions

Catalyst damage misfire:

Either of the following conditions is met	
Misfire counts	108 or more/200 revolutions at intake air amount: 0.2 g/rev and engine rpm: 1,600 rpm
Misfire counts of paired cylinder	150 per 200 revolutions

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

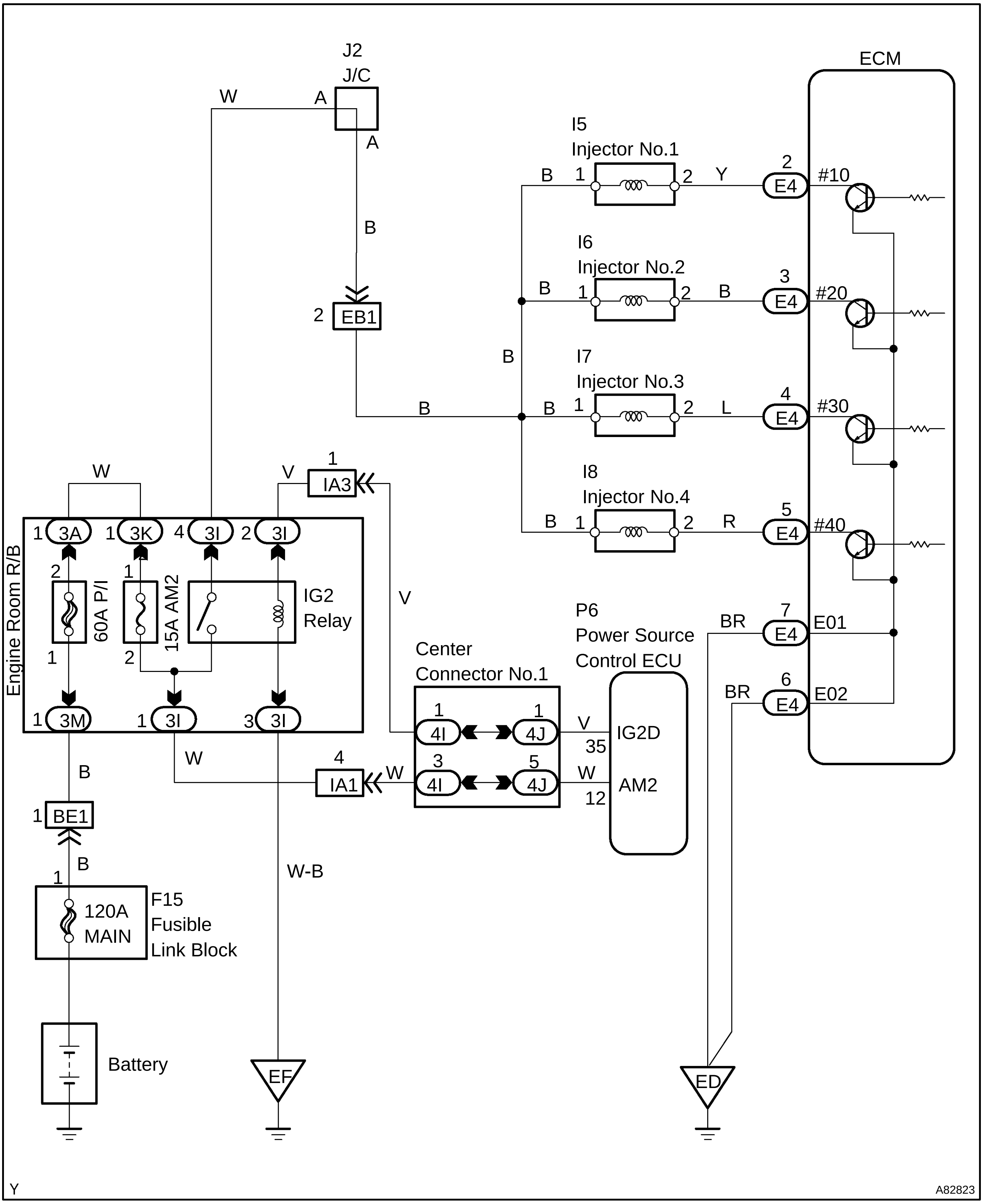
- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

Misfire Monitor

MID	TID	Scaling	Description of Test Value
$A1	$0B	Multiply by 1 (time)	Exponential Weighted moving average misfire counts for last 10 driving cycles - total (All cylinder)
	$0C	Multiply by 1 (time)	Misfire counts for last and current driving cycles - total (All cylinder)
$A2	$0B	Multiply by 1 (time)	Exponential Weighted moving average misfire counts for last 10 driving cycles - total (Cylinder 1)
	$0C	Multiply by 1 (time)	Misfire counts for last and current driving cycles - total (Cylinder 1)
$A3	$0B	Multiply by 1 (time)	Exponential Weighted moving average misfire counts for last 10 driving cycles - total (Cylinder 2)
	$0C	Multiply by 1 (time)	Misfire counts for last and current driving cycles - total (Cylinder 2)
$A4	$0B	Multiply by 1 (time)	Exponential Weighted moving average misfire counts for last 10 driving cycles - total (Cylinder 3)
	$0C	Multiply by 1 (time)	Misfire counts for last and current driving cycles - total (Cylinder 3)
$A5	$0B	Multiply by 1 (time)	Exponential Weighted moving average misfire counts for last 10 driving cycles - total (Cylinder 4)
	$0C	Multiply by 1 (time)	Misfire counts for last and current driving cycles - total (Cylinder 4)

WIRING DIAGRAM

Refer to DTC P0351 on page 05-184 for the wiring diagram of the ignition system.



CONFIRMATION DRIVING PATTERN

(a) Connect the hand-held tester to the DLC3.
(b) Record DTCs and the freeze frame data.
(c) Switch the ECM from normal mode to check mode using the hand-held tester (see page 05-44).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with an engine speed (ENGINE SPD), engine load (CALC LOAD) and other data stored in the freeze frame data.

If you have no hand-held tester, turn the power switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

In order to memorize the misfire DTCs, it is necessary to drive with MISFIRE RPM and MISFIRE LOAD in the DATA LIST for the period of time in the chart below. Take care not to turn the power switch OFF. Turning the power switch OFF switches the diagnosis system from check mode to normal mode and all DTCs, freeze frame data and other data are erased.

Engine Speed	Time
Idling (Inspection mode)	3 minutes 30 seconds or more
1,000 rpm	3 minutes or more
2,000 rpm	1 minute 30 seconds or more
3,000 rpm	1 minute or more

(f) Check if there is a misfire, DTC and the freeze frame data. Record DTCs, freeze frame data and misfire counter data.
(g) Turn the power switch OFF and wait at least for 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non-misfire DTCs first.
- Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing repairs, confirm that there is no misfire (see confirmation driving pattern).
- When either of SHORT FT #1 and LONG FT #1 in the freeze frame data is over the range of ±20 %, there is a possibility that the air-fuel ratio is inclining either to RICH (-20 % or less) or LEAN (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm-up.
- If the misfire cannot be reproduced, the reason may be because of the driving the vehicle with lack of fuel, use of improper fuel, a stain on the ignition plug, etc.
- Be sure to check the value on the misfire counter after repairs.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO MISFIRE DTCS)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC output)	Proceed to
P0300, P0301, P0302, P0303 and/or P0304	A
P0300, P0301, P0302, P0303 and/or P0304, and other DTCs	B

HINT:
If any other codes besides P0300, P0301, P0302, P0303 or P0304 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-54)

A

2 CHECK WIRE HARNESS, CONNECTOR AND VACUUM HOSE IN ENGINE ROOM

(a) Check the connection conditions of the wire harness and connectors.
(b) Check the vacuum hose piping for disconnection or breakage.

OK: Connected correctly and no damage on wire harness.

NG → **REPAIR OR REPLACE, THEN CONFIRM THAT THERE IS NO MISFIRE**

OK

3 CHECK CONNECTION OF PCV HOSE

OK: PCV hose is connected correctly, and has no damage.

NG → **REPAIR OR REPLACE PCV HOSE**

OK

4	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (NUMBER OF MISFIRE CYLINDER)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) Put the engine in inspection mode (see page 01-27).
(e) Start the engine.
(f) Select the items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / USER DATA / CYL#1 - CYL#4.
(g) Read the number of misfire cylinders on the hand-held tester or the OBD II scan tool.

HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

Result:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

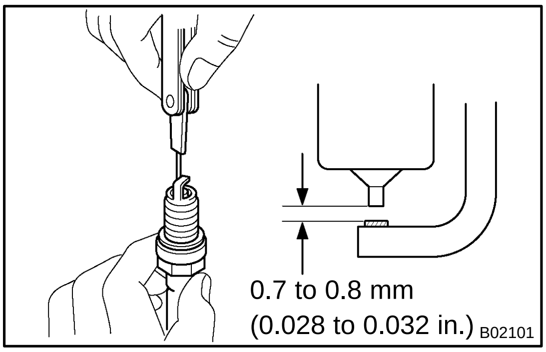
B → **Go to step 15**

A

5	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER

(a) Remove the ignition coil No.1.
(b) Remove the spark plug.
(c) Check the spark plug type.
Recommended spark plug:

DENSO made	SK16R11



(d) Check the spark plug electrode gap.
Electrode gap: 0.7 to 0.8 mm (0.028 to 0.032 in.)
Maximum electrode gap: 1.16 mm (0.046 in.)

NOTICE:
If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.

(e) Check the electrode for carbon deposits.
(f) Perform a spark test.

CAUTION:
Absolutely disconnect the each injector connector.
NOTICE:
Do not crank the engine for more than 2 seconds.

(1) Install the spark plug to the ignition coil No.1, and connect the ignition coil No.1 connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.
OK: Spark jumps across electrode gap.

(g) Reinstall the spark plug.
(h) Reinstall the ignition coil No.1.

OK	Go to step 8

NG

6	CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER

(a) Change to the normal spark plug.
(b) Perform a spark test.

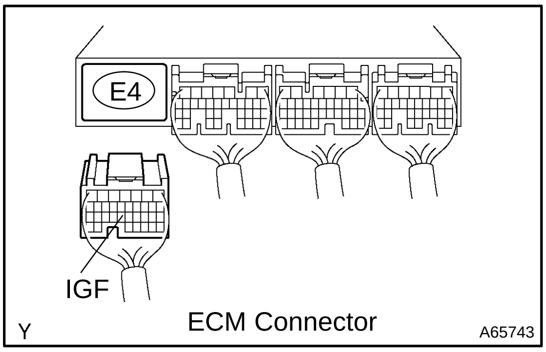
CAUTION:
Absolutely disconnect each injector connector.
NOTICE:
Do not crank the engine for more than 2 seconds.

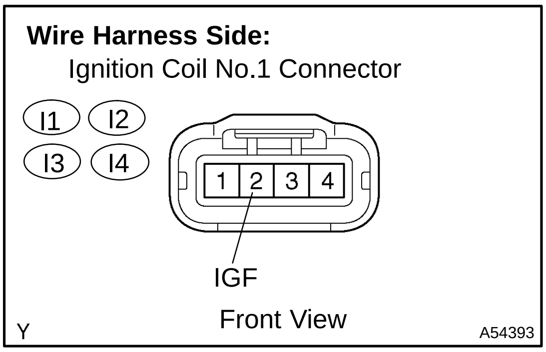
(1) Install the spark plug to the ignition coil No.1, and connect the ignition coil No.1 connector.
(2) Disconnect the injector connector.
(3) Ground the spark plug.
(4) Check if spark occurs while the engine is being cranked.
OK: Spark jumps across electrode gap.

OK	REPLACE SPARK PLUG

NG

7	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(IGNITION COIL NO.1 - ECM)





(a) Check the harness and connectors between the ignition coil No.1 and ECM (IGF terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

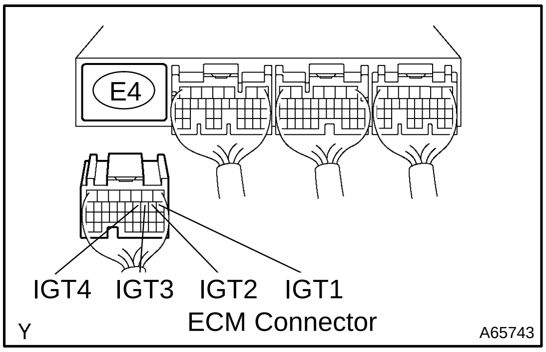
Standard (Check for open):

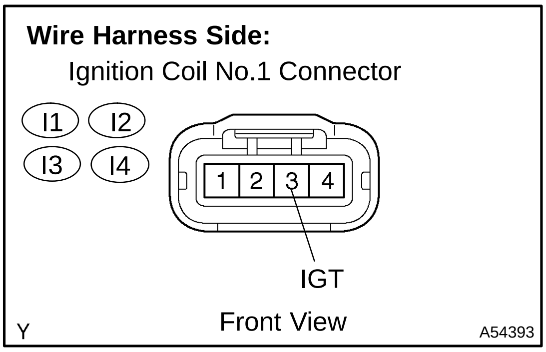
Tester Connection	Specified Condition
IGF (I1-2) - IGF (E4-23)	Below 1 Ω
IGF (I2-2) - IGF (E4-23)	Below 1 Ω
IGF (I3-2) - IGF (E4-23)	Below 1 Ω
IGF (I4-2) - IGF (E4-23)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IGF (I1-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I2-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I3-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I4-2) or IGF (E4-23) - Body ground	10 kΩ or higher

(4) Reconnect the ignition coil No.1 connector.
(5) Reconnect the ECM connector.





(b) Check the harness and connectors between the ignition coil No.1 and ECM (IGT terminal) connectors
(1) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGT (I1-3) - IGT1 (E4-8)	Below 1 Ω
IGT (I2-3) - IGT2 (E4-9)	Below 1 Ω
IGT (I3-3) - IGT3 (E4-10)	Below 1 Ω
IGT (I4-3) - IGT4 (E4-11)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IGT (I1-3) or IGT1 (E4-8) - Body ground	10 kΩ or higher
IGT (I2-3) or IGT2 (E4-9) - Body ground	10 kΩ or higher
IGT (I3-3) or IGT3 (E4-10) - Body ground	10 kΩ or higher
IGT (I4-3) or IGT4 (E4-11) - Body ground	10 kΩ or higher

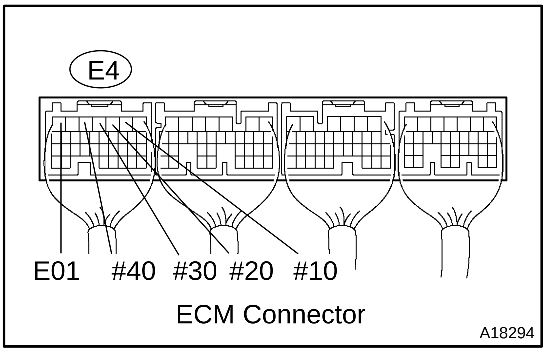
(4) Reconnect the ignition coil No.1 connector.
(5) Reconnect the ECM connector.

OK → **REPLACE IGNITION COIL NO.1 (THEN CONFIRM THAT THERE IS NO MISFIRE)**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

8	INSPECT ECM TERMINAL OF MISFIRING CYLINDER(#1, #2, #3 OR #4 VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the applicable terminals of the E4 ECM connector.
Standard:

Symbols (Terminal No.)	Specified condition
#10 (E4-2) - E01 (E4-7)	9 to 14 V
#20 (E4-3) - E01 (E4-7)	9 to 14 V
#30 (E4-4) - E01 (E4-7)	9 to 14 V
#40 (E4-5) - E01 (E4-7)	9 to 14 V

OK → **Go to step 11**

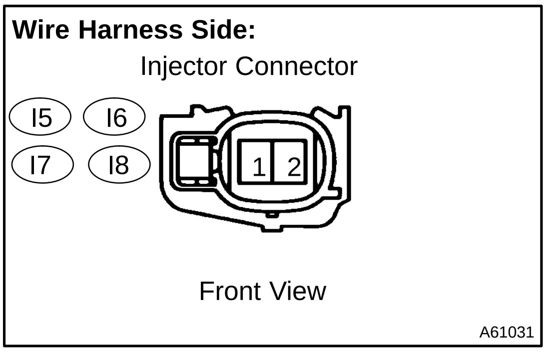
NG

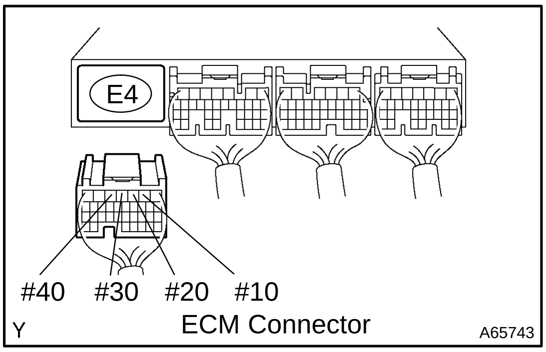
9	INSPECT FUEL INJECTOR RESISTANCE OF MISFIRING CYLINDER (See page 11-9)

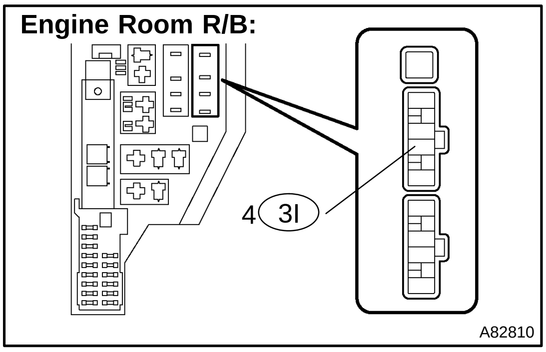
NG → **REPLACE FUEL INJECTOR ASSY (See page 11-12)**

OK

10	CHECK HARNESS AND CONNECTOR OF MISFIRING CYLINDER(INJECTOR - ECM, INJECTOR - IG2 RELAY)







(a) Check the harness and connectors between the injector connector and ECM connector.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Disconnect the E4 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I5-2) - #10 (E4-2)	Below 1 Ω
Injector (I6-2) - #20 (E4-3)	Below 1 Ω
Injector (I7-2) - #30 (E4-4)	Below 1 Ω
Injector (I8-2) - #40 (E4-5)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I5-2) or #10 (E4-2) - Body ground	10 kΩ or higher
Injector (I6-2) or #20 (E4-3) - Body ground	10 kΩ or higher
Injector (I7-2) or #30 (E4-4) - Body ground	10 kΩ or higher
Injector (I8-2) or #40 (E4-5) - Body ground	10 kΩ or higher

(4) Reconnect the injector connector.
(5) Reconnect the ECM connector.

(b) Check the harness and connectors between the injector connector and IG2 relay.
(1) Disconnect the I5, I6, I7 or I8 injector connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I5-1) - IG2 relay (3I-4)	Below 1 Ω
Injector (I6-1) - IG2 relay (3I-4)	Below 1 Ω
Injector (I7-1) - IG2 relay (3I-4)	Below 1 Ω
Injector (I8-1) - IG2 relay (3I-4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I5-1) or IG2 relay (3I-4) - Body ground	10 kΩ or higher
Injector (I6-1) or IG2 relay (3I-4) - Body ground	10 kΩ or higher
Injector (I7-1) or IG2 relay (3I-4) - Body ground	10 kΩ or higher
Injector (I8-1) or IG2 relay (3I-4) - Body ground	10 kΩ or higher

(4) Reconnect the injector connector.
(5) Reinstall the integration relay connector.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

11	INSPECT FUEL INJECTOR INJECTION AND VOLUME OF MISFIRING CYLINDER (See page 11-9)

OK:
Injection volume: 36 to 46 cm^3 (2.1 to 2.8 cu in.) per 15 seconds.

NG → **REPLACE FUEL INJECTOR ASSY (See page 11-12)**

OK

12	CHECK CYLINDER COMPRESSION PRESSURE OF MISFIRING CYLINDER (See page 14-1)

OK:
Compression pressure: 728 kPa (7.4 kgf/cm^2, 106 psi)
Minimum pressure: 537 kPa (5.4 kgf/cm^2, 77 psi)

NG → **REPAIR OR REPLACE**

OK

13	CHECK VALVE CLEARANCE OF MISFIRING CYLINDER (See page 14-6)

OK:
Valve clearance (cold):
Intake: 0.17 to 0.23 mm (0.007 to 0.009 in.)
Exhaust: 0.27 to 0.33 mm (0.011 to 0.013 in.)

NG → **ADJUST VALVE CLEARANCE (See page 14-6)**

OK

14	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER TO RESULT OF STEP 4)

HINT:
- If the result of step 4 is ”1 or 2 cylinders”, proceed to A.
- If the result of step 4 is ”more than 3 cylinders”, proceed to B.

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

A

15	CHECK VALVE TIMING(CHECK FOR LOOSENESS OR A JUMPED TOOTH OF THE TIMING CHAIN) (See page 14-6)

OK: The match marks of crankshaft pulley and camshaft pulley are aligning.

NG → **ADJUST VALVE TIMING (See page 14-6) (REPAIR OR REPLACE TIMING CHAIN)**

OK

16	CHECK FUEL PRESSURE (See page 11-7)

OK:
Fuel pressure: 304 to 343 kPa (3.1 to 3.5 kgf/cm^2, 44 to 50 psi)

NG → **CHECK AND REPLACE FUEL PUMP, PRESSURE REGULATOR, FUEL PIPE LINE AND FILTER**

OK

17	READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL(INTAKE AIR TEMPERATURE AND MASS AIR FLOW RATE)

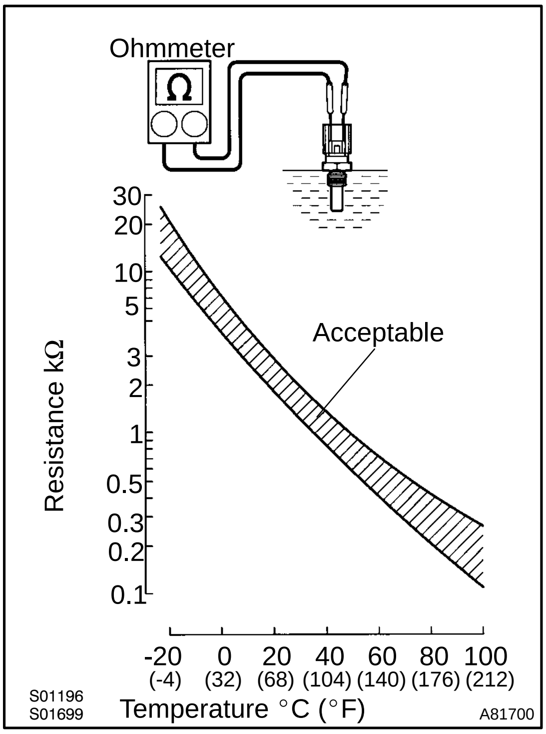
(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) Check the intake air temperature.
  (1) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
  (2) Read the value.
Temperature: Equivalent to ambient air temperature.
(e) Check the air flow rate.
  (1) On the hand-held tester or the OBD II scan tool, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / MAF.
  (2) Read the value.
Standard:

Condition	Air flow rate (gm/s)
Power switch ON (do not start engine)	0.0
Idling (Inspection mode)	3.2 to 4.7
Running without load (Inspection mode, engine speed of 2,500 rpm)	13.1 to 18.9
During vehicle running (Vehicle speed of more than 38 mph)	Air flow rate fluctuates

NG → **REPLACE MASS AIR FLOW METER**

OK

18	INSPECT ENGINE COOLANT TEMPERATURE SENSOR(RESISTANCE)



(a) Remove the engine coolant temperature sensor.

(b) Measure the resistance between the terminals of the engine coolant temperature sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	2 to 3 kΩ at 20°C (68°F)
1 - 2	0.2 to 0.4 kΩ at 80°C (176°F)

NOTICE:

When checking the engine coolant temperature sensor in water, be careful not to allow water to contact the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

19	SWITCH STEP BY NUMBER OF MISFIRE CYLINDER(REFER TO RESULT OF STEP 4)

HINT:

- If the result of step 4 is "1 or 2 cylinders", proceed to A.
- If the result of step 4 is "more than 3 cylinders", proceed to B.

B → **AGAIN GO TO STEP 5**

A

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0327	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

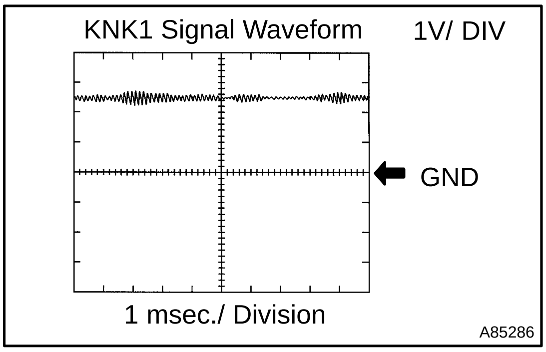
DTC	P0328	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

A flat type knock sensor (non-resonant type) has the structure that can detect vibration in a wider band of the frequency from about 6 kHz to 15 kHz and has the following features.
Knock sensors are fitted on the cylinder block to detect engine knocking.
The knock sensor contains a piezoelectric element which generates voltage when it becomes deformed. The generation of the voltage occurs when the cylinder block vibrates due to the knocking. If the engine knocking occurs, in order to suppress it, the ignition timing is retarded.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	Knock sensor signal level remains at low for more than 10 seconds	• Open or short in knock sensor circuit • Knock sensor (under-torqued or looseness) • ECM
P0327	Output voltage of the knock sensor is 0.5 V or less	• Short in knock sensor circuit • Knock sensor • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more	• Open in knock sensor circuit • Knock sensor • ECM

HINT:
If the ECM detects the DTC P0325,P0327 and P0328, it enters fail-safe mode in which the corrective retarded angle value is set to its maximum value.



Reference: Inspection by using an oscilloscope.
(1) After warming up, run the engine at 2,500 rpm, check the waveform between terminals KNK1 and EKNK of the ECM connector.

MONITOR DESCRIPTION

The knock sensor, located on the cylinder block, detects spark knocks. When the spark knocks occur, the sensor picks-up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.
The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 seconds, and if the knock sensor output voltage is out of the normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0325: Knock sensor (bank 1) range check or rationality P0327: Knock sensor (bank 1) range check (low voltage) P0328: Knock sensor (bank 1) range check (high voltage)
Required sensors/components	Main: Knock sensor Related: Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	10.5 V or more
Idle	OFF
Time after engine start	5 seconds or more
Engine coolant temperature	60°C (140°F) or more
Intake air amount per revolution	0.3 g/rev or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1: P0325 (Range check/Rationality)

Time while the voltage output of the knock sensor is below the specific threshold	10 seconds

Case 2: P0325 (Fluttering *)

Knock sensor voltage	Less than 0.5 V and more than 4.5 V

Case 3: P0327

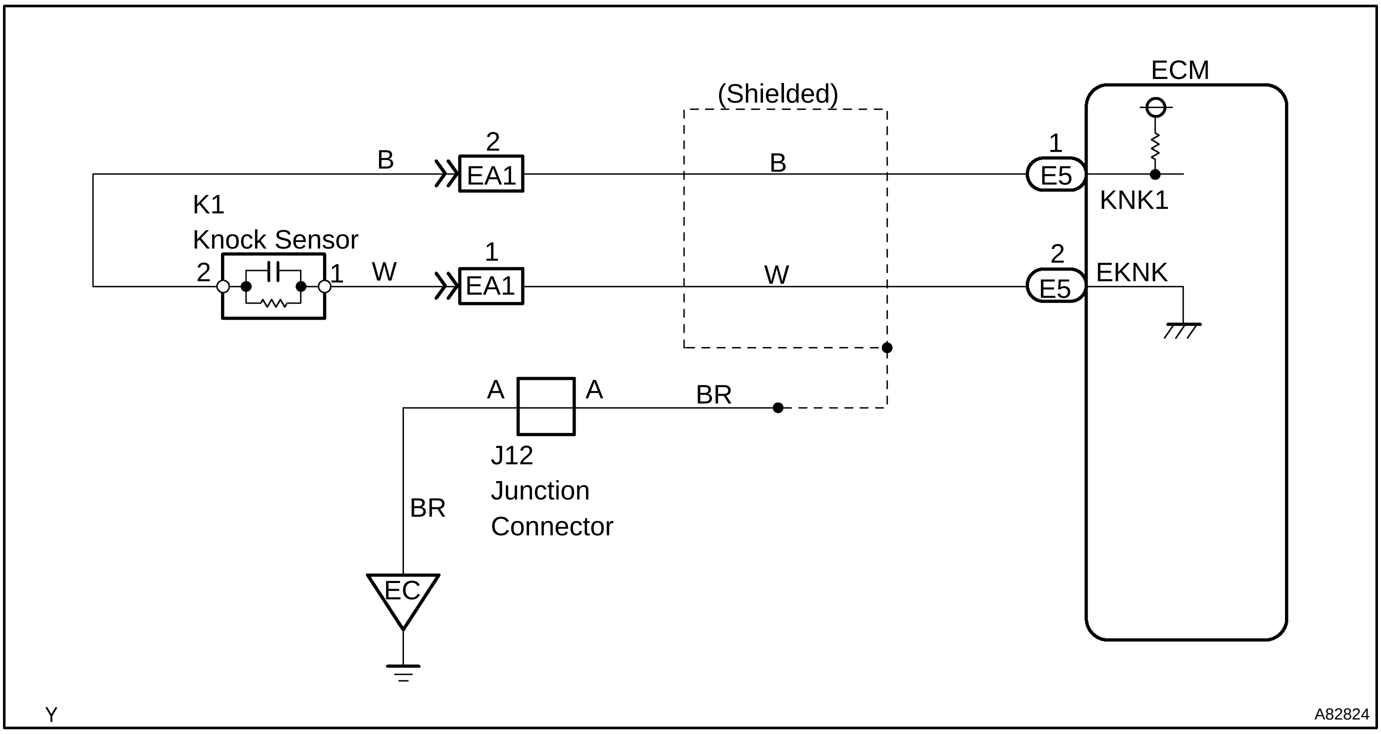
Knock sensor voltage	Less than 0.5 V

Case 4: P0328

Knock sensor voltage	More than 4.5 V

*: Two different malfunctions intermingle.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 READ OUTPUT DTCS

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Clear the DTCs.
(f) Put the engine in inspection mode (see page 01-27).
(g) Warm up the engine.
(h) Run the engine at 2,500 rpm for 10 seconds or more.
(i) Read DTCs.

Result :

Display (DTC output)	Proceed to
P0325	A
P0325, P0327 and/or P0328	B
No output	C

B → **Go to step 3**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)**

A

2 INSPECT KNOCK SENSOR

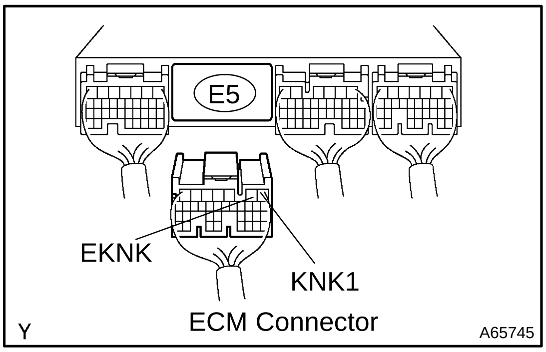
(a) Check the knock sensor installation.
OK:
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

NG → **SECURELY REINSTALL SENSOR**

OK

REPLACE KNOCK SENSOR

3 CHECK HARNESS AND CONNECTOR(ECM - KNOCK SENSOR)



(a) Disconnect the E5 ECM connector.
(b) Measure the resistance between the terminals of the E5 ECM connector.
Standard:

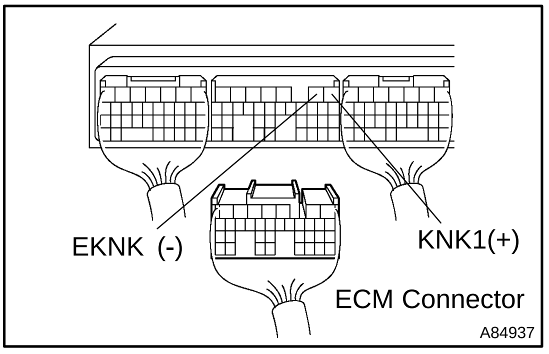
Tester Connection	Specified Condition
KNK1 (E5-1) - EKNK (E5-2)	120 to 280 kΩ at 20°C (68°F)

(c) Reconnect the ECM connector.

NG → **Go to step 5**

OK

4	INSPECT ECM(KNK1 - EKNK VOLTAGE)



(a) Disconnect the E5 ECM connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the terminals of the E5 ECM terminals.
Standard:

Tester Connection	Specified Condition
KNK1 (E5-1) - EKNK (E5-2)	4.5 to 5.5 V

(d) Reconnect the ECM connector.

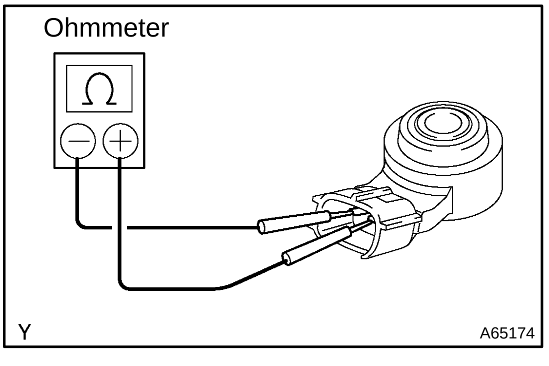
NG → **REPLACE ECM (See page 10-24)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)

NOTICE:
Fault may be intermittent. Check wire harness and connectors carefully.

5	INSPECT KNOCK SENSOR



(a) Remove the knock sensor.
(b) Measure the resistance between the terminals.
Standard:

Tester Connection	Specified Condition
KNK1 (K1-2) - EKNK (K1-1)	120 to 280 KΩ at 20°C (68°F)

(c) Reinstall the knock sensor.

NG → **REPLACE KNOCK SENSOR**

OK

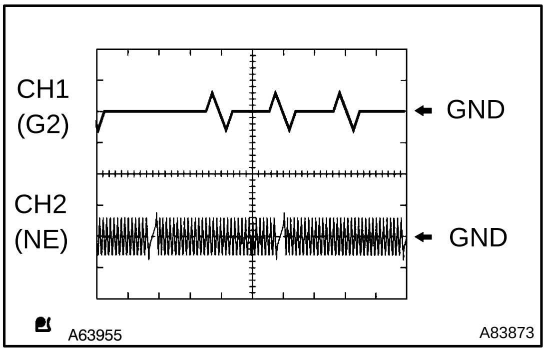
REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC | P0335 | CRANKSHAFT POSITION SENSOR ”A” CIRCUIT

CIRCUIT DESCRIPTION

The crankshaft position sensor (CKP) system consists of a crankshaft position sensor plate and a pick-up coil. The sensor plate has 34 teeth and is installed on the crankshaft. The pick-up coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pick-up coil, a pulse signal is created. The pick-up coil generates 34 signals per engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine RPM. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM



Reference: Inspection using an oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 - NE- CH2: NE+ - NE-
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the crankshaft sensor despite the engine revolving, the ECM interprets this as malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335: Crankshaft position sensor range check or rationality
Required sensors/components	Crankshaft position sensor
Frequency of operation	Continuous
Duration	4.7 seconds
MIL operation	2 driving cycles
Sequence of operation	None

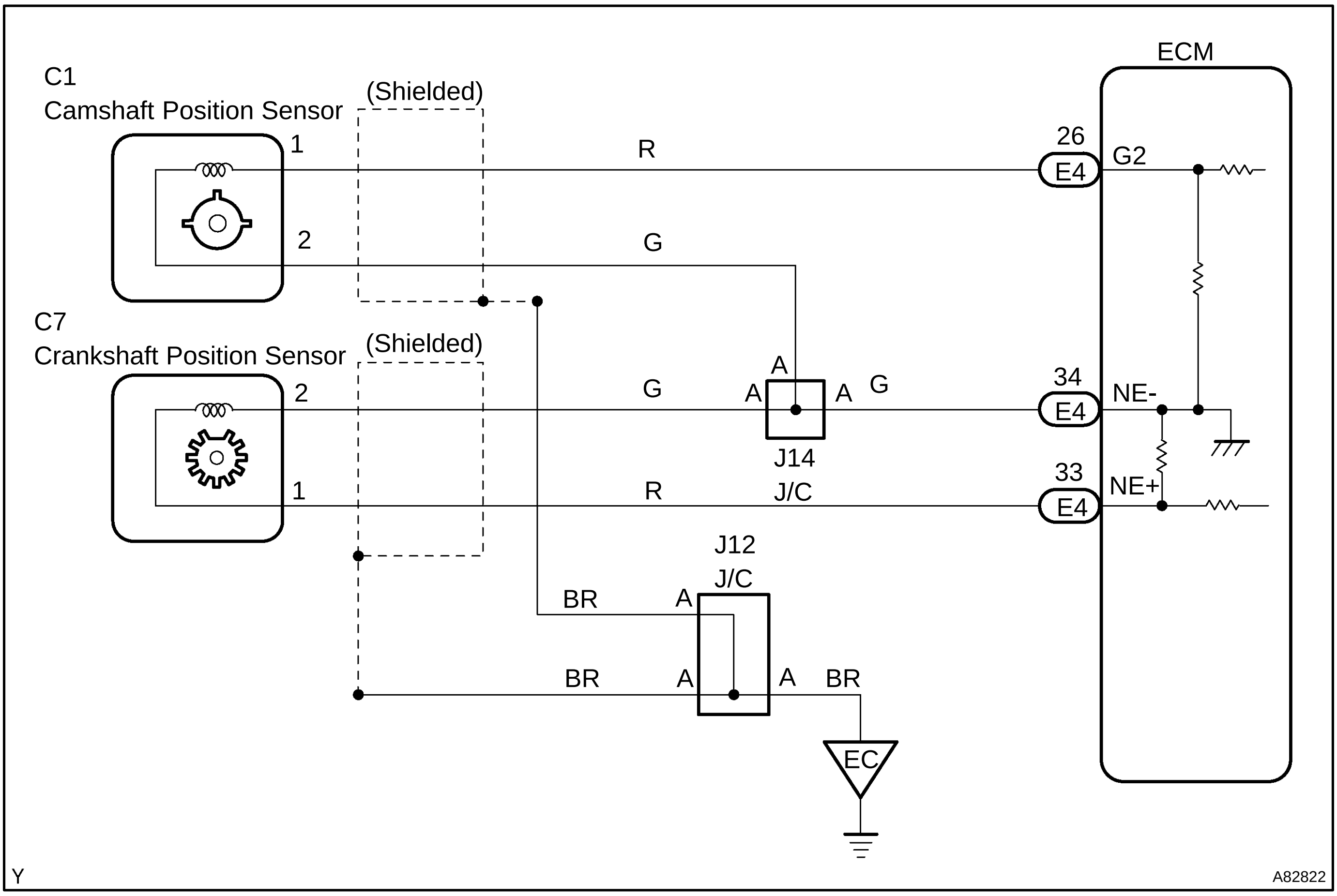
TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Power switch	ON
Engine rotating signal from HV ECU	HV ECU judges that the engine is running

TYPICAL MALFUNCTION THRESHOLDS

Engine speed signal	No signal for 4.7 seconds

WIRING DIAGRAM



INSPECTION PROCEDURE

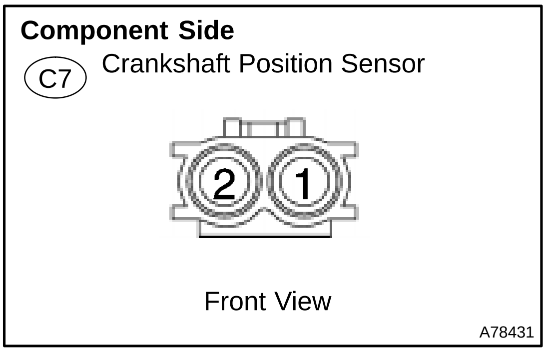
HINT:

- Perform troubleshooting on DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

- READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL
  (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
  (b) Turn the power switch ON (IG).
  (c) Turn the hand-held tester or the OBD II scan tool ON.
  (d) Put the engine in inspection mode (see page 01-27).
  (e) Start the engine.
  (f) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / ENGINE SPD.
  (g) Read the value using the hand-held tester or the OBD II scan tool.

The engine speed can be observed in DATA LIST using the hand-held tester or OBD II scan tool. If there is no NE signal from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If voltage output from the crankshaft position sensor is insufficient, the engine speed will be indicated as lower PRM (than the actual RPM).

1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C7 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor connector.

Standard:

Tester Connection	Specified Condition
1 - 2	985 to 1,600 Ω at cold
1 - 2	1,265 to 1,890 Ω at hot

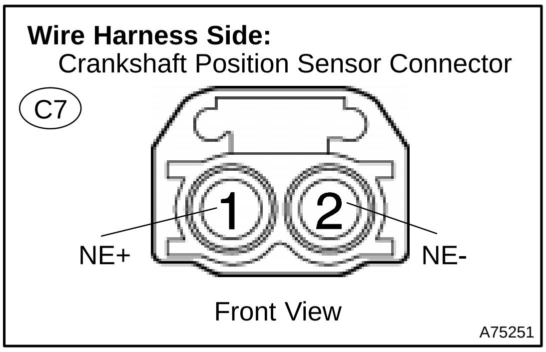
NOTICE:
Terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C to 50°C (14°F to 122°F). "Hot" means approximately 50°C to 100°C (122°F to 212°F).

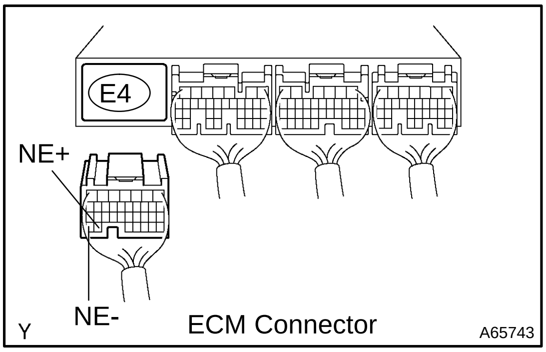
(c) Reconnect the crankshaft position sensor connector.

NG — **REPLACE CRANKSHAFT POSITION SENSOR (See page 18-10)**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR - ECM)





(a) Disconnect the C7 crankshaft position sensor connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
NE+ (C7-1) - NE+ (E4-33)	Below 1 Ω
NE- (C7-2) - NE- (E4-34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
NE+ (C7-1) or NE+ (E4-33) - Body ground	10 kΩ or higher
NE- (C7-2) or NE- (E4-34) - Body ground	10 kΩ or higher

(d) Reconnect the crankshaft position sensor connector.
(e) Reconnect the ECM connector.

NG — **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

(a) Check that the crankshaft position sensor is properly installed.
OK: Sensor is installed correctly.

NG → **SECURELY REINSTALL SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT))

(a) Check the teeth of the sensor plate.
OK: No deformation on the teeth of sensor plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE**

OK

REPLACE ECM (See page 10-24)

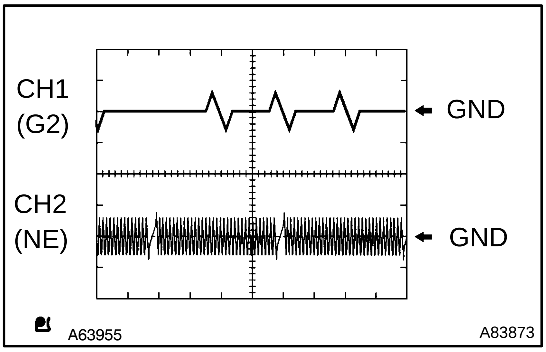
DTC	P0340	CAMSHAFT POSITION SENSOR ”A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0341	CAMSHAFT POSITION SENSOR ”A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

The variable valve timing (VVT) sensor consists of a magnet, iron core and pickup coil.
The variable valve (VV) signal plate has 3 teeth on its outer circumference and is installed on the camshaft. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating voltage in the pickup coil.
This sensor monitors a timing rotor located on the camshaft and is used to detect an camshaft angle by the ECM. The camshaft rotation synchronizes with the crankshaft rotation, and this sensor communicates the rotation of the camshaft timing rotor as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

DTC No.	DTC Detection Condition	Trouble Area
P0340	• No camshaft position sensor signal to ECM at engine speed of 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the camshaft position sensor signal is input into the ECM 3 times per 2 engine revolutions	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM



Reference: Inspection using an oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G2 - NE- CH2: NE+ - NE-
Equipment Setting	5 V/Division, 20 ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the VVT sensor even though the engine is turning, or if the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340: Camshaft position sensor (bank 1) range check or rationality P0341: Camshaft position sensor (bank 1) range check or rationality
Required sensors/components	Main: Camshaft position sensor Related: Crankshaft position sensor, engine speed sensor
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0340:

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine speed	600 rpm or more

P0341:

The monitor will run whenever the following DTCs are not present	See page 05-20
Starter	OFF
Engine revolution angle	720 °CA*

*: CA stands for Crankshaft Angle.

TYPICAL MALFUNCTION THRESHOLDS

P0340:

Crankshaft/camshaft synchronization	Not synchronized (judged by comparing the crankshaft position with the camshaft position)
Camshaft position sensor signal	No input in appropriate timing

P0341:

Crankshaft/Camshaft synchronization	Not synchronized
Camshaft position sensor count	12 or more / 720°CA (= 2 engine revolutions)

COMPONENT OPERATING RANGE

Camshaft position sensor signal input every 720°CA	3 times

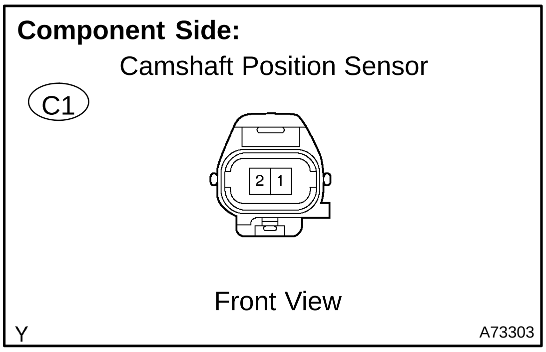
WIRING DIAGRAM

Refer to DTC P0335 on page 05-177 .

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	INSPECT CAMSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C1 camshaft position sensor connector.
(b) Measure the resistance between the terminals of camshaft position sensor connector.
Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
1 - 2	2,065 to 3,225 Ω at hot

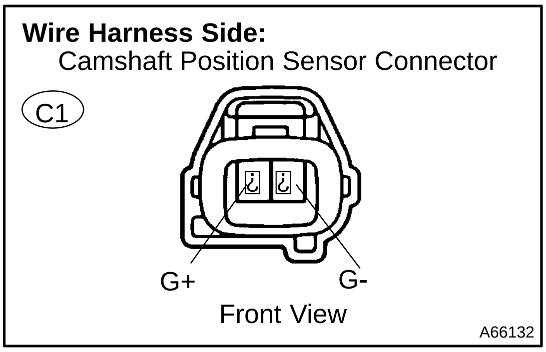
NOTICE:
Terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10°C to 50°C (14°F to 122°F). "Hot" means approximately 50°C to 100°C (122°F to 212°F).

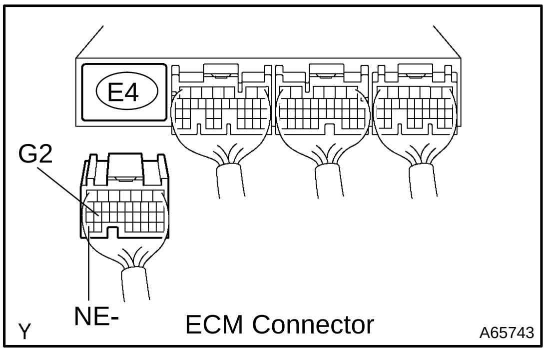
(c) Reconnect the camshaft position sensor connector.

NG → REPLACE CAMSHAFT POSITION SENSOR

OK

2	CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR - ECM)





(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance between the wire harness side connectors.
Standard (Check for open):

Tester Connection	Specified Condition
G+ (C1-1) - G2 (E4-26)	Below 1 Ω
G- (C1-2) - NE- (E4-34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
G+ (C1-1) or G2 (E4-26) - Body ground	10 kΩ or higher
G- (C1-2) or NE- (E4-34) - Body ground	10 kΩ or higher

(d) Reconnect the camshaft position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

(a) Check that the camshaft position sensor is properly installed.
OK: Sensor is installed correctly.

NG → **SECURELY REINSTALL SENSOR**

OK

4 CHECK CAMSHAFT TIMING GEAR ASSY

(a) Remove the camshaft.
(b) Check the camshaft lobes.
OK: No deformation on the camshaft lobe.

NG → **REPLACE CAMSHAFT TIMING GEAR ASSY**

OK

REPLACE ECM (See page 10-24)

DTC	P0351	IGNITION COIL ”A” PRIMARY/SECONDARY CIRCUIT

DTC	P0352	IGNITION COIL ”B” PRIMARY/SECONDARY CIRCUIT

DTC	P0353	IGNITION COIL ”C” PRIMARY/SECONDARY CIRCUIT

DTC	P0354	IGNITION COIL ”D” PRIMARY/SECONDARY CIRCUIT

CIRCUIT DESCRIPTION

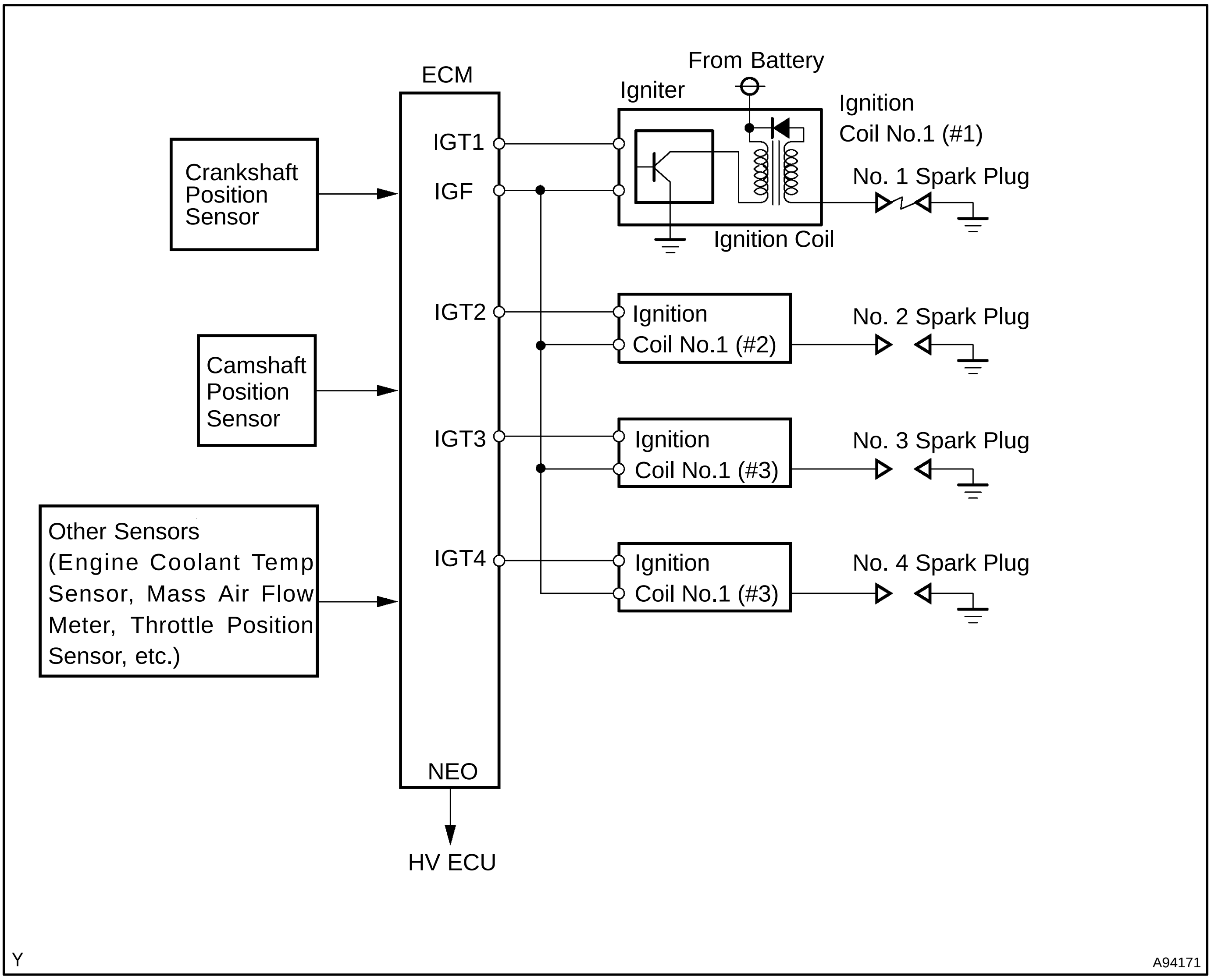
HINT:

- These DTCs indicate malfunction related to the primary circuit.
- If DTC P0351 is displayed, check the ignition coil No.1 (#1) circuit.
- If DTC P0352 is displayed, check the ignition coil No.1 (#2) circuit.
- If DTC P0353 is displayed, check the ignition coil No.1 (#3) circuit.
- If DTC P0354 is displayed, check the ignition coil No.1 (#4) circuit.

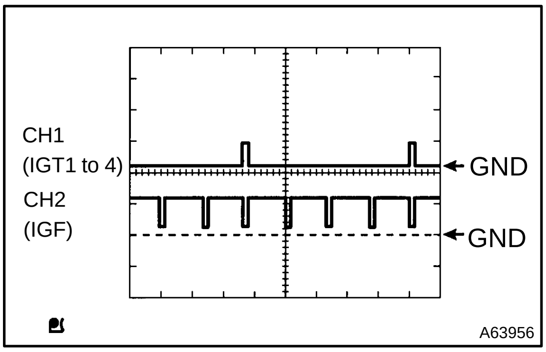
A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1-cylinder ignition system which ignites one cylinder with one ignition coil. In the 1-cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Using the IGT signal, the ECM turns ON and OFF the power transistor inside the igniter and this switches ON and OFF the current to the primary coil. When the current flow to the primary coil is cut off, high-voltage is generated in the secondary coil and this voltage is applied to the spark plugs to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation (IGF) signal to the ECM.



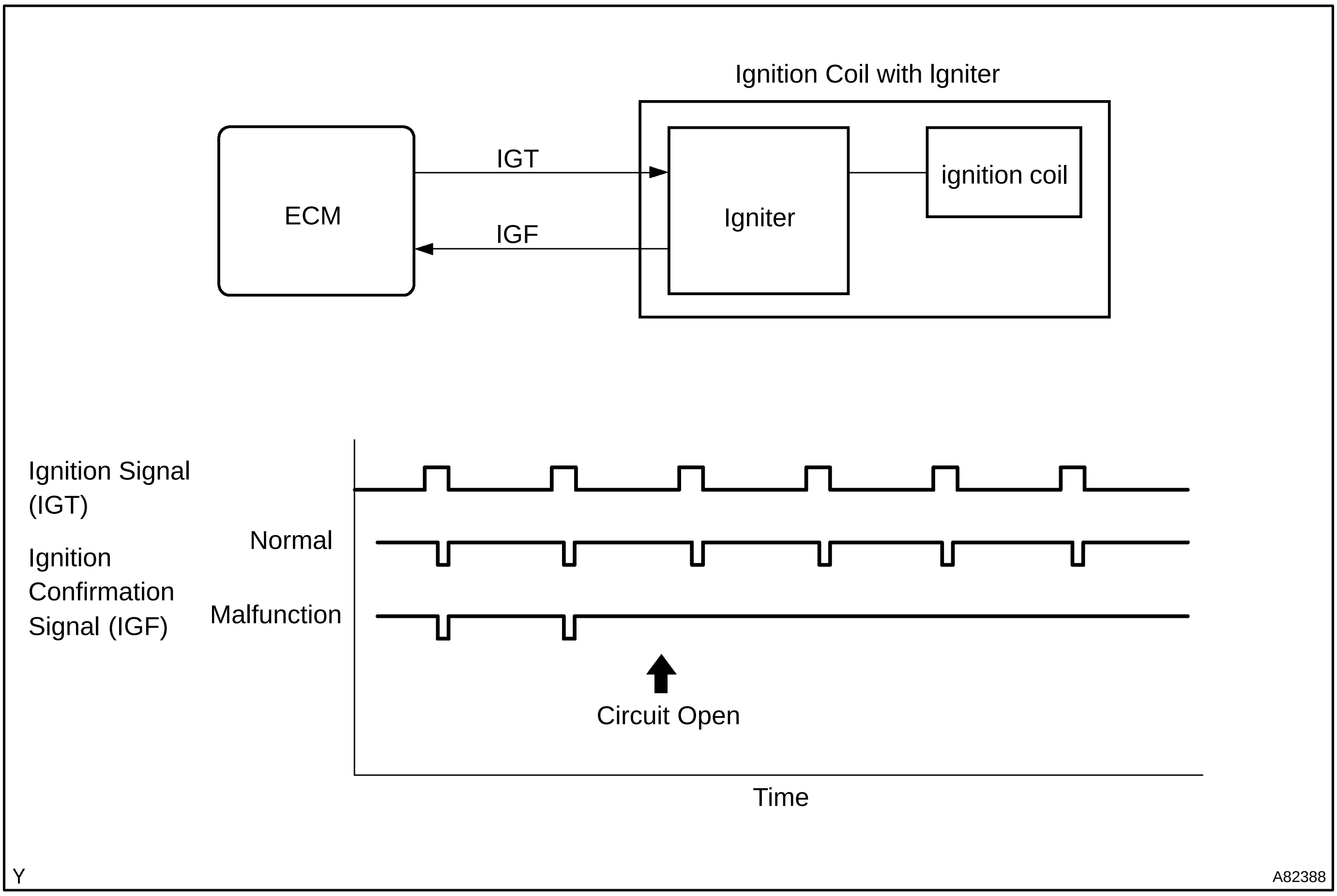
DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF or IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil with igniter (ignition coil circuit 1 through 4) • ECM



Reference: Inspection using an oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 - E1 CH2: IGF - E1
Equipment Setting	2 V/Division, 20 ms/Division
Condition	While the engine is cranking or idling

MONITOR DESCRIPTION



If the ECM does not receive the ignition confirmation (IGF) signal after sending the ignition (IGT) signal, the ECM interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351: Ignition coil with igniter circuit (#1) malfunction P0352: Ignition coil with igniter circuit (#2) malfunction P0353: Ignition coil with igniter circuit (#3) malfunction P0354: Ignition coil with igniter circuit (#4) malfunction
Required sensors/components	Igniter
Frequency of operation	Continuous
Duration	0.256 second
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine speed	1,500 rpm or less
Either of the following conditions is met:	(a) or (b)
(a) Following conditions are met:	1 & 2
1. Engine speed	500 rpm or less
2. Battery voltage	6 V or more
(b) Following conditions are met:	1 & 2
1. Engine speed	More than 500 rpm
2. Battery voltage	10 V or more

TYPICAL MALFUNCTION THRESHOLDS

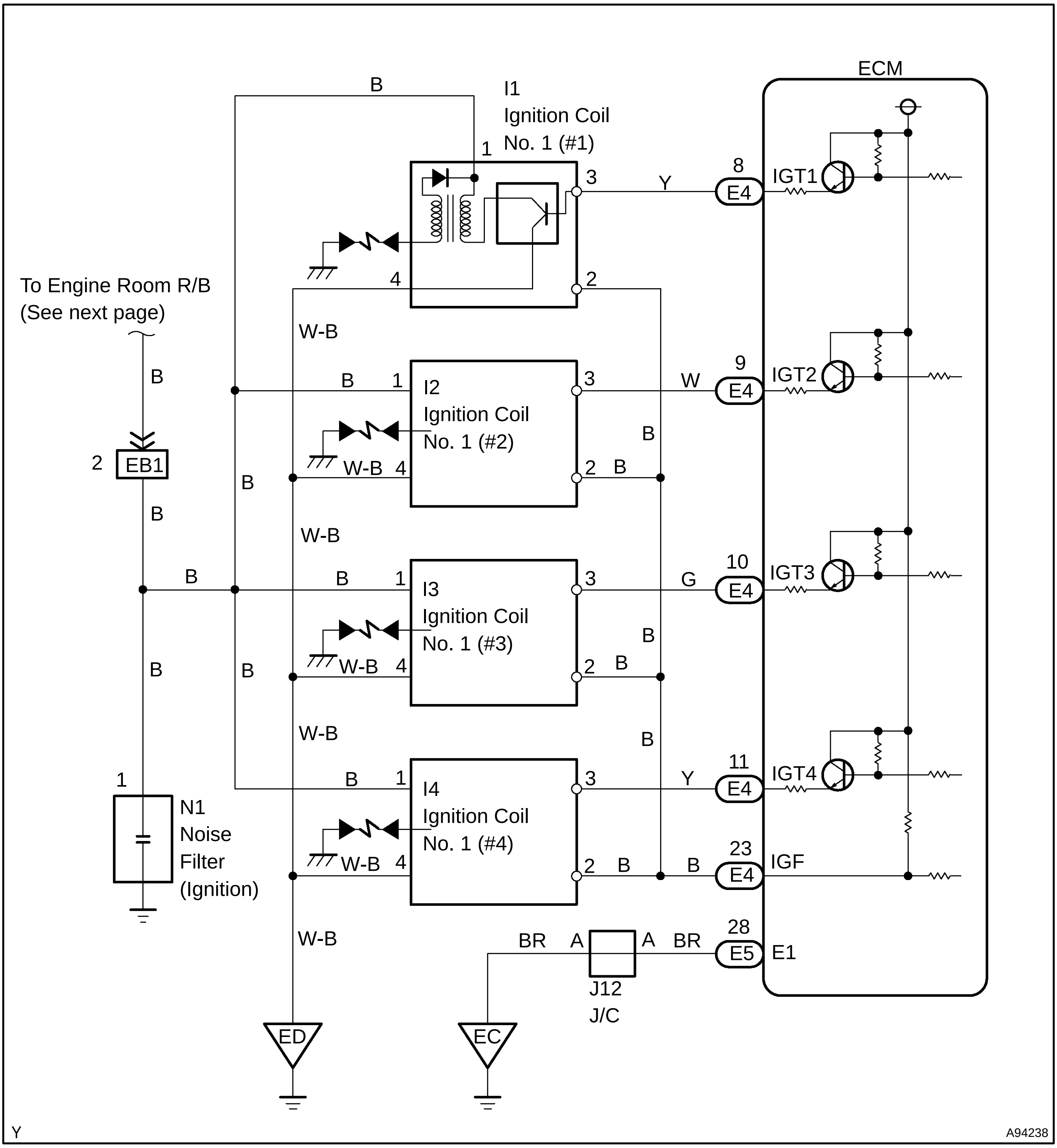
Ignition signal fail count*	More than 2 times

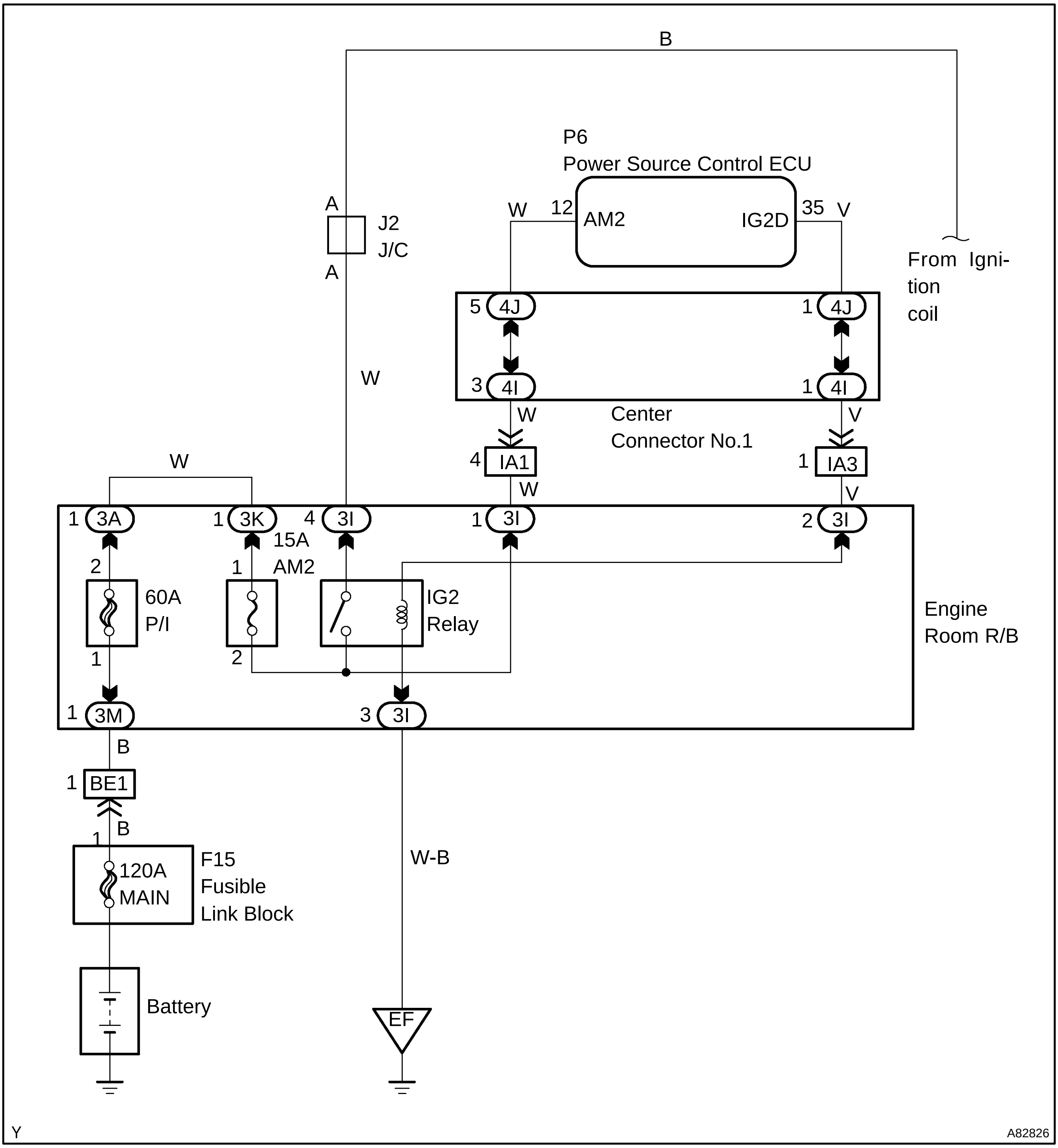
*: Counted when the IGF signal is not returned to the ECM despite sending the IGT signal.

COMPONENT OPERATING RANGE

Number of IGF signals	Equals the number of IGT signals

WIRING DIAGRAM




B
P6
Power Source Control ECU
W
12
AM2
IG2D
35
V
A
J2
J/C
A
From Igni-
tion
coil
5
4J
1
4J
W
3
4I
1
4I
W
Center
Connector No.1
V
W
4
IA1
1
IA3
W
V
1
3A
1
3K
4
3I
1
3I
2
3I
15A
AM2
2
1
60A
P/I
IG2
Relay
Engine
Room R/B
1
2
1
3M
3
3I
B
1
BE1
B
1
120A
MAIN
F15
Fusible
Link Block
W-B
Battery
EF
Y
A82826

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

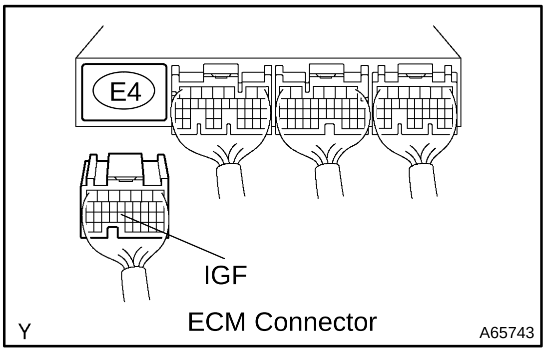
1 CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18-3)

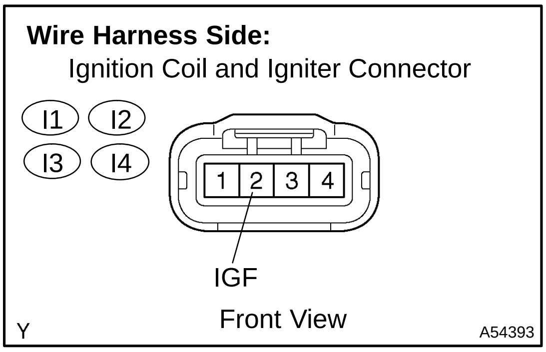
OK: Spark occurs.

NG → **Go to step 4**

OK

2 CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 - ECM (IGF SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Disconnect the E4 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I1-2) - IGF (E4-23)	Below 1 Ω
IGF (I2-2) - IGF (E4-23)	Below 1 Ω
IGF (I3-2) - IGF (E4-23)	Below 1 Ω
IGF (I4-2) - IGF (E4-23)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IGF (I1-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I2-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I3-2) or IGF (E4-23) - Body ground	10 kΩ or higher
IGF (I4-2) or IGF (E4-23) - Body ground	10 kΩ or higher

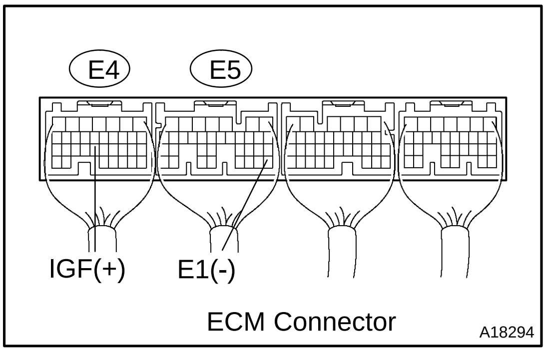
(d) Reconnect the ignition coil and igniter connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ECM(IGF VOLTAGE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Turn the power switch ON (IG).

(c) Measure the voltage between the specified terminals of the E4 and E5 ECM connectors.

Standard:

Tester Connection	Specified Condition
IGF (E4-23) - E1 (E5-28)	4.5 to 5.5 V

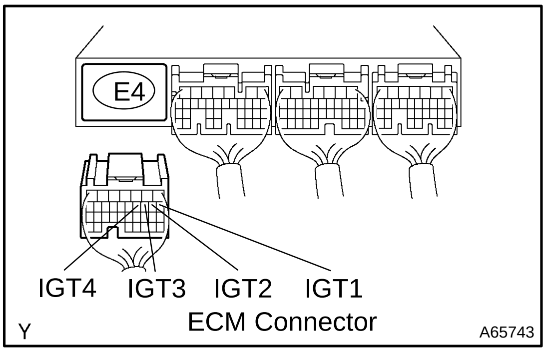
(d) Reconnect the ignition coil and igniter connector.

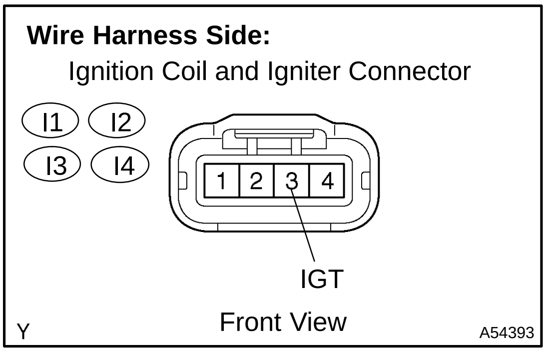
NG → **REPLACE ECM (See page 10-24)**

OK

REPLACE IGNITION COIL NO.1

4	CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 - ECM (IGT SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Disconnect the E4 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGT (I1-3) - IGT1 (E4-8)	Below 1 Ω
IGT (I2-3) - IGT2 (E4-9)	Below 1 Ω
IGT (I3-3) - IGT3 (E4-10)	Below 1 Ω
IGT (I4-3) - IGT4 (E4-11)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
IGT (I1-3) or IGT1 (E4-8) - Body ground	10 kΩ or higher
IGT (I2-3) or IGT2 (E4-9) - Body ground	10 kΩ or higher
IGT (I3-3) or IGT3 (E4-10) - Body ground	10 kΩ or higher
IGT (I4-3) or IGT4 (E4-11) - Body ground	10 kΩ or higher

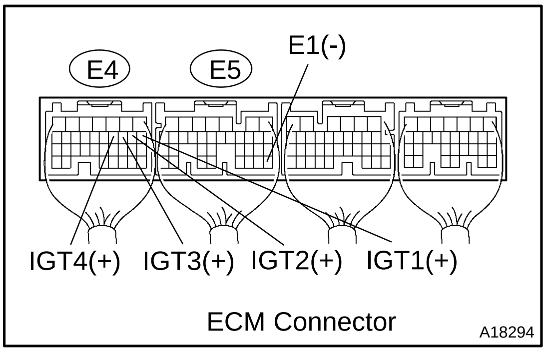
(d) Reconnect the ignition coil and igniter connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	INSPECT ECM(IGT1, IGT2, IGT3 OR IGT4 VOLTAGE)



(a) Measure the voltage between the applicable terminals of the E4 and E5 ECM connectors when the engine is cranked.

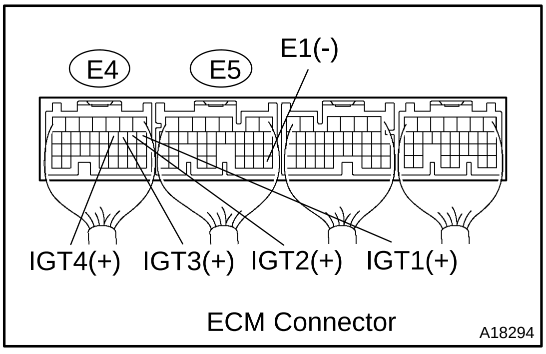
Standard:

Tester Connection	Specified Condition
IGT1 (E4-8) - E1 (E5-28)	Between 0.1 V and 4.5 V
IGT2 (E4-9) - E1 (E5-28)	Between 0.1 V and 4.5 V
IGT3 (E4-10) - E1 (E5-28)	Between 0.1 V and 4.5 V
IGT4 (E4-11) - E1 (E5-28)	Between 0.1 V and 4.5 V

NG → **REPLACE ECM (See page 10-24)**

OK

6	INSPECT ECM(IGT1, IGT2, IGT3 OR IGT4 VOLTAGE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.

(b) Measure the voltage between the applicable terminals of the E4 and E5 ECM connectors when the engine is cranked.

Standard:

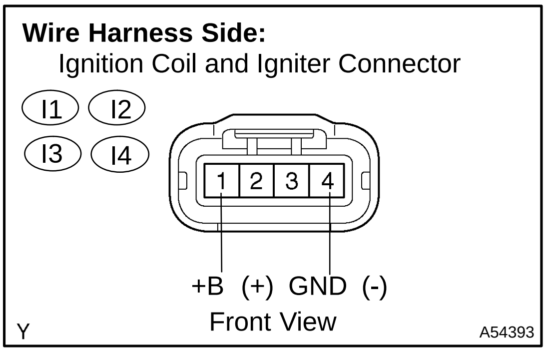
Tester Connection	Specified Condition
IGT1 (E4-8) - E1 (E5-28)	4.5 V or more
IGT2 (E4-9) - E1 (E5-28)	4.5 V or more
IGT3 (E4-10) - E1 (E5-28)	4.5 V or more
IGT4 (E4-11) - E1 (E5-28)	4.5 V or more

(c) Reconnect the ignition coil and igniter connector.

NG → **REPLACE ECM (See page 10-24)**

OK

7	INSPECT IGNITION COIL NO.1(POWER SOURCE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

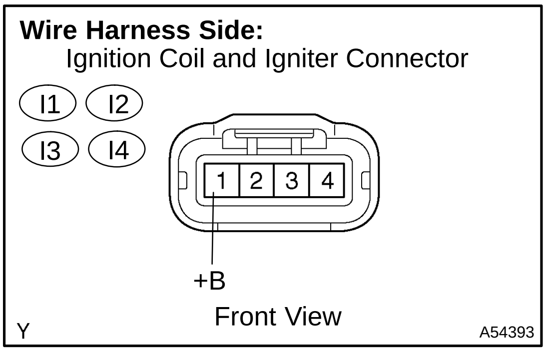
Tester Connection	Specified Condition
+B (I1-1) - GND (I1-4)	9 to 14 V
+B (I2-1) - GND (I2-4)	9 to 14 V
+B (I3-1) - GND (I3-4)	9 to 14 V
+B (I4-1) - GND (I4-4)	9 to 14 V

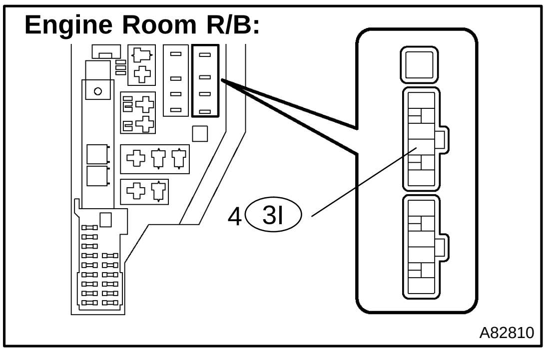
(d) Reconnect the ignition coil and igniter connector.

OK → **REPLACE IGNITION COIL NO.1**

NG

8	CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 - IG2 RELAY)





(a) Disconnect the I1, I2, I3 or I4 ignition coil and igniter connector.
(b) Remove the integration relay from engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (I1-1) - IG2 relay(3I-4)	Below 1 Ω
+B (I2-1) - IG2 relay(3I-4)	Below 1 Ω
+B (I3-1) - IG2 relay(3I-4)	Below 1 Ω
+B (I4-1) - IG2 relay(3I-4)	Below 1 Ω
GND (I1-4) - (Body ground)	Below 1 Ω
GND (I2-4) - (Body ground)	Below 1 Ω
GND (I3-4) - (Body ground)	Below 1 Ω
GND (I4-4) - (Body ground)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (I1-1) or IG2 relay(3I-4) - Body ground	10 kΩ or higher
+B (I2-1) or IG2 relay(3I-4) - Body ground	10 kΩ or higher
+B (I3-1) or IG2 relay(3I-4) - Body ground	10 kΩ or higher
+B (I4-1) or IG2 relay(3I-4) - Body ground	10 kΩ or higher

(d) Reconnect the ignition coil and igniter connector.
(e) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL NO.1

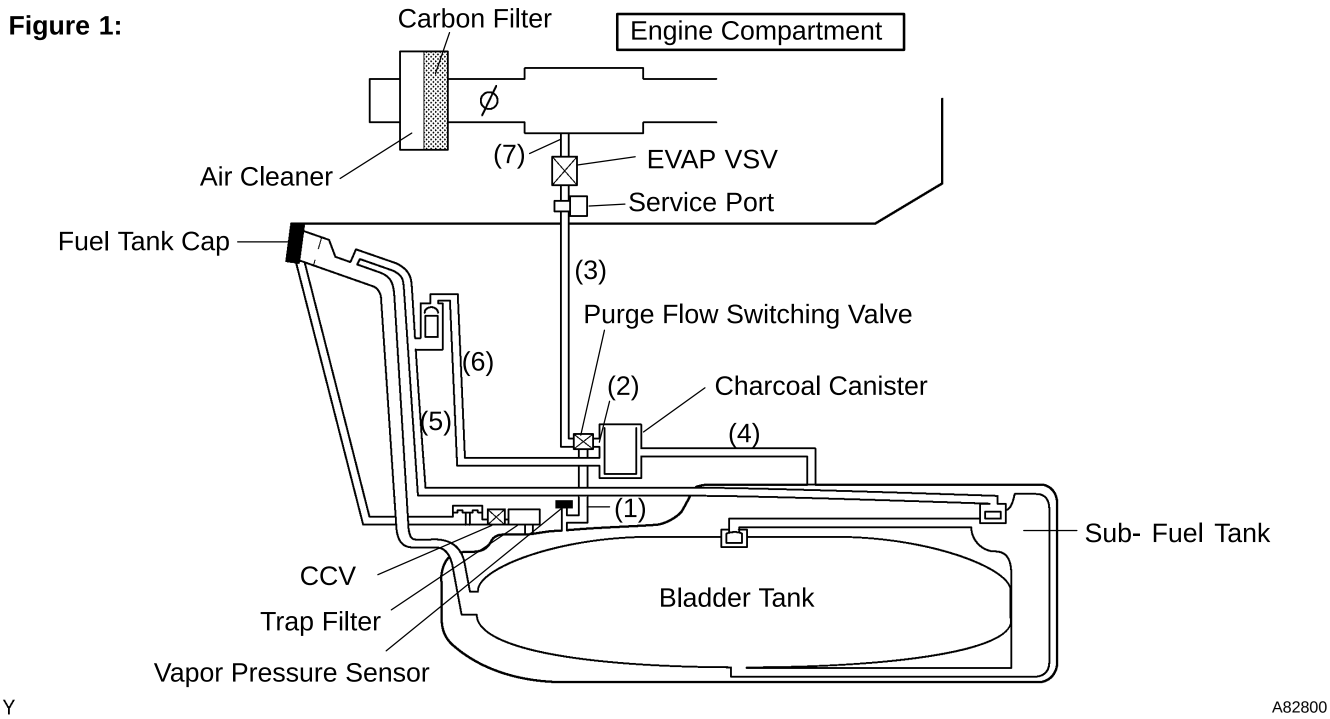
DTC	P0441	EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW

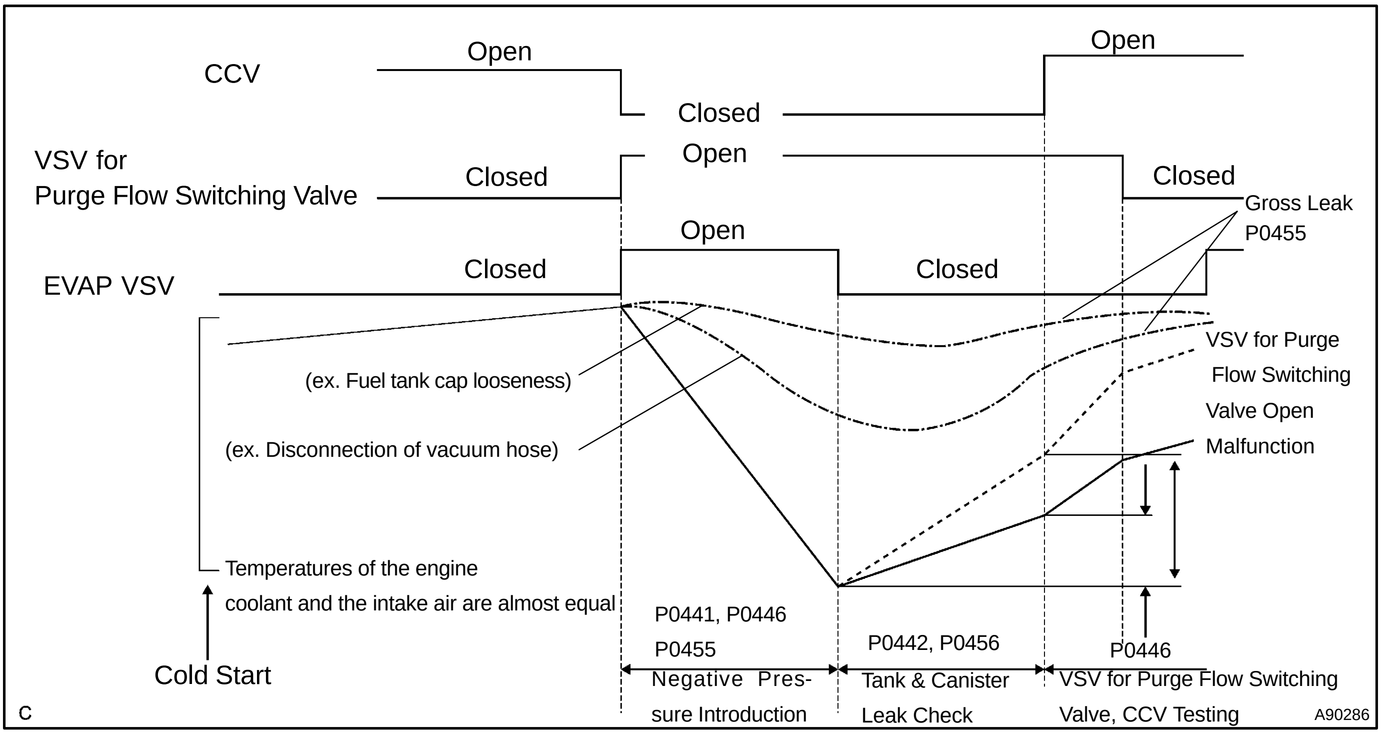
DTC	P0446	EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for canister closed valve (CCV) are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in figure 1 below, or when there is malfunction in either the EVAP VSV or the vapor pressure sensor itself.

Figure 1:





DTC No.	DTC Detection Condition	Trouble Area
P0441	• Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic) • During purge cut-off, pressure is very low compared with atmospheric pressure (2 trip detection logic)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6) and (7) in fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in EVAP VSV circuit • EVAP VSV • Open or short in CCV circuit • CCV • Open or short in VSV for purge flow switching valve circuit • VSV for purge flow switching valve • Fuel tank is cracked or damaged • Charcoal canister is cracked or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0446	• No rise in fuel tank pressure when commanding the CCV to open after an EVAP leak test • No change in fuel tank pressure when commanding the pressure switching valve to close after an EVAP leak test • A high negative pressure (vacuum) does not occur in the system when commanding the EVAP VSV to open with the CCV closed	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6) and (7) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in EVAP VSV circuit • EVAP VSV • Open or short in CCV circuit • CCV • Open or short in VSV for purge flow switching valve circuit • VSV for purge flow switching valve • Fuel tank is cracked or damaged • Charcoal canister is cracked or damaged • Fuel tank over fill check valve is cracked or damaged • ECM

HINT:
Typical DTC output of each trouble part.

Trouble Part	Trouble Condition	Typical DTC Output (*1)
—	Small Leak	P0442 and/or P0456 (*2)
—	Medium Leak (ex: Vacuum hose looseness)	P0455
—	Large Leak (ex: Fuel tank cap looseness)	P0441 and P0455 and P0446
EVAP VSV	Open Malfunction	P0441
EVAP VSV	Close Malfunction	P0441 and P0446 and P0455
CCV	Open Malfunction	P0441 and P0446 and P0455
CCV	Close Malfunction	P0446
VSV for Purge Flow Switching	Open Malfunction	P0446
VSV for Purge Flow Switching	Close Malfunction	P0441 and P0446 and P0455

*1: ECM may output some other DTCs combination.
*2: Refer to P0442 and P0456 on page 05-230 .

MONITOR DESCRIPTION

The ECM tests the evaporative emissions (EVAP) system using the fuel tank pressure sensor, the canister close valve (CCV), and the EVAP VSV. The ECM closes the EVAP system and introduces negative pressure (vacuum) into it. The ECM then monitors the internal pressure using the fuel tank pressure sensor.

P0441

The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

The ECM checks for EVAP VSV ”stuck open” fault by commanding both valves (EVAP VSV and CCV) to close at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure at this early stage of the test, the ECM determines that the EVAP VSV has stuck OPEN.

The ECM will turn on the MIL and a DTC is set.

P0446

If there is malfunction detected in the VSV for evaporative emission (EVAP), the canister closed valve (CCV) and the VSV for purge flow switching valve; the ECM will illuminate the MIL and set a DTC.

This portion of the EVAP diagnosis checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV ”stuck closed” malfunction by commanding the CCV to open after an EVAP leak test. If the fuel tank pressure does not rise (lose vacuum), the ECM determines that the CCV has stuck closed. The ECM will turn on the MIL and a DTC is set.

(b) VSV for purge flow switching valve stuck closed.
The ECM checks for a VSV for purge flow switching valve ”stuck closed” malfunction by commanding the VSV for purge flow switching valve to close after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the VSV for purge flow switching valve is malfunctioning. The ECM will turn on the MIL and a DTC is set.

(c) EVAP VSV (Purge line to intake manifold) stuck closed.
The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0441: EVAP VSV malfunction P0446: Canister close valve stuck malfunction
Required sensors/components	EVAP VSV, canister closed valve, bypass VSV, vapor pressure sensor
Frequency of operation	Once per driving cycle
Duration	90 seconds: EVAP VSV malfunction 10 seconds: Canister close valve malfunction
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0441: EVAP VSV malfunction

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more
Altitude	Less than 2,400 m (8,000 ft)
Intake air temperature (IAT)	10 °C (50 °F) or more
Intake air temperature (IAT) at engine start	Between 10 °C (50 °F) and 35 °C (92 °F)
Engine coolant temperature (ECT) at engine start	Between 10 °C (50 °F) and 35 °C (92 °F)
Intake air temperature at engine start compared with engine coolant temperature	Maximum of 7°C (12.6°F) lower or 11.1°C (19.9°F) higher
EVAP VSV and CCV malfunction	Not detected
Time after engine start	Less than 60 minutes
Vehicle speed	Less than 130 km/h
Fuel slosh	No sloshing, i.e. fairly smooth road
MAF	No great change
Fuel tank pressure change	Minimal change

P0446: Canister close valve stuck, Purge flow switching valve malfunction

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more
Altitude	Less than 2,400 m (8,000 ft)
Intake air temperature (IAT)	10 °C (50 °F) or more
Intake air temperature (IAT) at engine start	CCV stuck open malfunction: Between 10 °C (50 °F) and 35 °C (92 °F) CCV stuck close malfunction: 4.4 °C (39.9 °F) or more Purge flow switching valve malfunction: Between 10 °C (50 °F) and 35 °C (92 °F)
Engine coolant temperature (ECT) at engine start	CCV stuck open malfunction: Between 10 °C (50 °F) and 35 °C (92 °F) CCV stuck close malfunction: 4.4 °C (39.9 °F) or more Purge flow switching valve malfunction: Between 10 °C (50 °F) and 35 °C (92 °F)
Intake air temperature at engine start compared with engine coolant temperature	Maximum of 7°C (12.6°F) lower or 11.1°C (19.9°F) higher
EVAP VSV and CCV malfunction	Not detected
Time after engine start	Less than 60 minutes
Vehicle speed	Less than 130 km/h
Fuel slosh	No sloshing, i.e. fairly smooth road
MAF	No great change
Fuel tank pressure change	Minimal change

TYPICAL MALFUNCTION THRESHOLDS

P0441: EVAP VSV malfunction

A. Following conditions are met:	(a) and (b)
(a) Fuel tank pressure at the vacuum introduction start	Less than -2.66 kPa (-20 mmHg)
(b) Difference between the fuel tank pressure at the vacuum introduction start and completion	Less than 0.93 kPa (7 mmHg)
B. Following conditions are met:	(a) and (b)
(a) Time after fuel tank pressure measurement start	9 seconds
(b) Fuel tank pressure	Less than -1.3 kPa (-10 mmHg)

P0446: Canister close valve stuck malfunction

Either of following conditions is met:	1 or 2
1. EVAP VSV monitoring	Stuck close malfunction
2. Following conditions (a) and (b) are met:	4 seconds
(a) Accumulated purge volume	0.5 g or more
(b) Fuel tank pressure	Less than -1.4 kPa
3. Following conditions are met:	(a) and (b)
(a) Fuel tank pressure difference between before and after switching canister bypass valve	-0.267 kPa or more
(b) Fuel tank pressure	More than -2.667 kPa

P0446: Purge flow switching valve malfunction

1. Following conditions are met:	(a) and (b)
(a) Fuel tank pressure difference between before and after switching canister bypass valve	-0.267 kPa or more
(b) Fuel tank pressure	More than -2.667 kPa

MONITOR RESULT

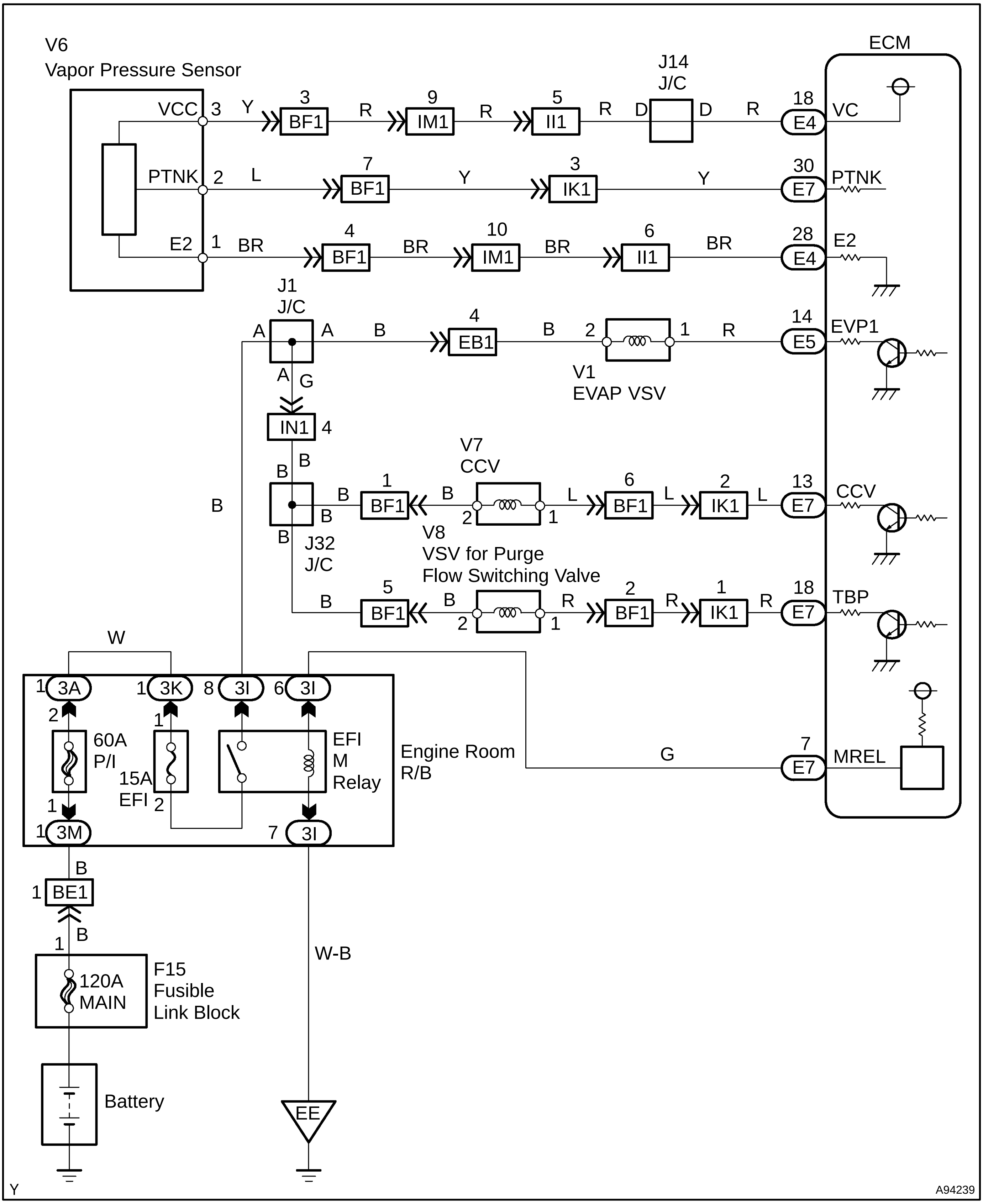
The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

EVAP - Bladder Tank System

MID	TID	Scaling	Description of Test Value
$3B	$C1	Multiply by 0.001 (kPa)	Test value of 0.02 inch leak: Determined by fuel tank pressure change
$3C	$C2	Multiply by 0.001 (kPa)	Test value of 0.04 inch leak: Determined by fuel tank pressure change
$3D	$C7	Multiply by 0.001 (kPa)	Test value of canister closed valve (CCV): Determined by fuel tank pressure change at switching over CCV
	$C8	Multiply by 0.001 (kPa)	Test value of bypass VSV (VSV for bypass valve): Determined by fuel tank pressure change at switching over bypass VSV
	$D4	Multiply by 0.001 (kPa)	Test value of EVAP VSV stuck closed: Determined by fuel tank pressure change during vacuum introduction
	$D5	Multiply by 0.1 (seconds)	Test value of EVAP VSV stuck open: Determined by abnormal state continuation time

WIRING DIAGRAM

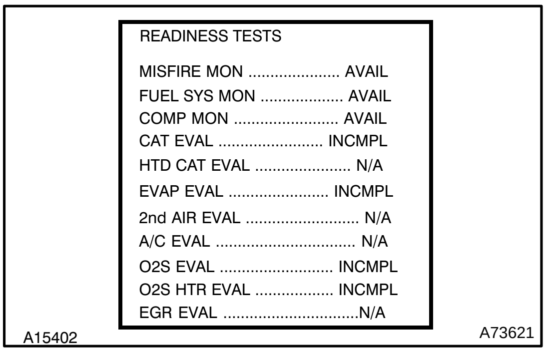


CONFIRMATION READINESS TEST

First Trip Procedure

(a) The vehicle must be cold and the ambient air temperature must be approximately 10° (50°) to 35°C (95°F).

(b) The Intake Air Temperature (IAT) and the Engine Coolant Temperature (ECT) sensors indicate almost the same value.



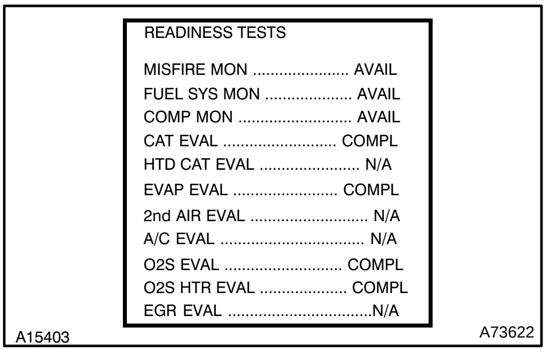
(c) Clear the DTCs (see page 05-40).

- READINESS TESTS will show INCMPL (incomplete).

(d) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. As each Readiness Test passes EVAP evaluation monitors, its status will change to COMPL (complete). This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine - the results will be invalid.



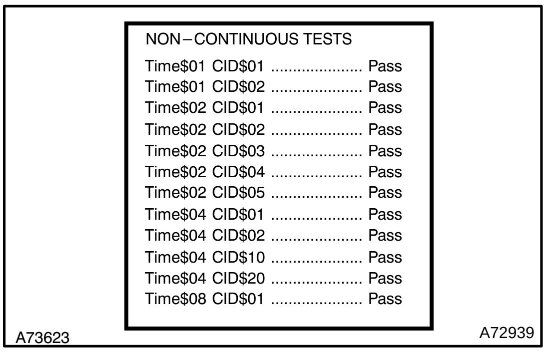
Pass Condition - No problem Found by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON-CONTINUOUS TESTS screen.

- Enter the following menus: ADVANCED OBD II / ONBOARD TESTS / NON-CONTINUOUS.

NOTICE:

Do not shut off the engine - the results will be invalid.



If all of the tests in the "Time $02" category show "Pass", the EVAP evaluation monitor detected no problem.

READINESS TESTS

MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	COMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	COMPL
O2S HTR EVAL	COMPL
EGR EVAL	N/A

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Fail Condition - Problem Detected by the ECM

If the EVAP evaluation monitor shows COMPL, go to the NON-CONTINUOUS TESTS screen.

NON−CONTINUOUS TESTS

Time$01 CID$01	Pass
Time$01 CID$02	Pass
Time$02 CID$01	Fail
Time$02 CID$02	Fail
Time$02 CID$03	Fail
Time$02 CID$04	Fail
Time$02 CID$05	Fail
Time$04 CID$01	Pass
Time$04 CID$02	Pass
Time$04 CID$10	Pass
Time$04 CID$20	Pass
Time$08 CID$01	Pass

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(1) If all tests show ”Pass”, one of the following may has occurred:
- The EVAP evaluation monitor did not operate.
- The EVAP evaluation monitor did not finish its tests.
- The ECM has withheld judgement.

(2) If one or more of the tests in the time $02 category show ”Fail”, the EVAP evaluation monitor did operate and the ECM detected a problem.

(3) Go to the CONTINUOUS TESTS screen. This is the only place DTCs are listed for the first trip.

CONTINUOUS TESTS
ECU: $10 (Engine)
Number of Tsts: 3

P0441
EVAP Control System Incorrect
Purge Flow

P0442
EVAP Emission Control System
Leak Detected

P0446
EVAP Control System Vent Control
Malfunction

A71014

NOTICE:

The listed DTCs may be invalid. A second trip is needed to confirm listed DTCs.

READINESS TESTS

MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	COMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	COMPL
O2S HTR EVAL	COMPL
EGR EVAL	N/A

A73624

Second Trip Procedure

(e) The vehicle must be cold, and the ambient air temperature must be approximately 50 to 95°F.

(f) Go to the READINESS TESTS screen.

(g) Drive the vehicle on a freeway. Write down the initial status of the READINESS TESTS. This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine - the results will be invalid.

CONTINUOUS TESTS
ECU: $10 (Engine)
Number of Tsts: 3

P0441
EVAP Control System Incorrect
Purge Flow

P0442
EVAP Emission Control System
Leak Detected

P0446
EVAP Control System Vent Control
Malfunction

A71014

(h) If the READINESS TESTS change to COMPL, the EVAP evaluation monitor has operated. Check for any stored DTCs.
- If a DTC was stored, the problem has been detected and confirmed by the ECM.
- If no DTC was found, the EVAP monitor operated but no problem was detected.

INSPECTION PROCEDURE

HINT:

- When using the hand-held tester, follow the procedures under the title ”Hand-held tester ” (see next page).
- When using the OBD II scan tool, follow the procedures under the title ”OBD II scan tool (excluding hand-held tester)” (see the procedures after the hand-held tester procedures).
- Always troubleshoot DTCs P0441 (purge flow), P0446 (CCV), P0451, P0452 and P0453 (evaporative pressure sensor) before troubleshooting DTCs P0442 or P0456.
- Ask the customer the following questions:
  1) When the MIL came on, if the fuel tank cap was loose and if it was then tightened.
  2) When refueling, if the fuel tank cap was loose.
  If the fuel tank cap was loose, that is why the DTC was stored.
  If the fuel cap was not loose or if the customer cannot remember, troubleshoot according to the procedures on the following page.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

DTC Output	Malfunction Indicated	Troubleshooting Procedures	Operation
P0441 only	Open Malfunction of EVAP VSV	Execute steps from 13 to 16	Check and replace of EVAP VSV
P0446 only	Close Malfunction of CCV	Execute steps from 17	Check and replace of CCV
P0442 and/or P0456	Very small or small or medium leak	Refer to DTC P0442 (see page 05-201)	—
P0455 only	Medium leak (for example, vacuum hose is disconnected or hole is about ϕ 2.0)	Refer to DTC P0442 (see page 05-201)	—
P0441, P0455 and P0446	Large leak (for example, fuel tank cap is loose) or VSV malfunction (open malfunction of CCV or close malfunction of EVAP VSV)	Execute steps from 2* and refer to DTC P0442 (see page 05-201)	Inspect fuel tank cap

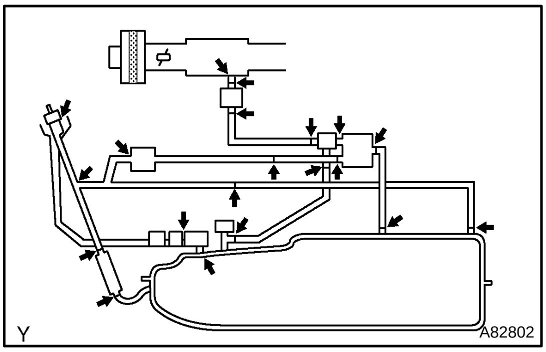
*: In most cases, troubleshooting can be completed by checking if the fuel tank cap was loose, or repairing the CCV or the EVAP VSV.

HINT:

Use the chart above to check the malfunction for each DTC output. Then perform the necessary repairs listed under ”Operation.”

Hand-held tester:

1	CHECK WHETHER THERE ARE SIGNS OF ANY ACCIDENT NEAR FUEL TANK OR CHARCOAL CANISTER



(a) Check if any hoses close to the fuel tank have been modified, and check if there are signs of any accident or damage near the fuel tank or the charcoal canister.

(1) Check the following parts for cracks, deformation or loose connections:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around the fuel tank and charcoal canister

NG → **REPAIR OR REPLACE**

OK

2	INSPECT FUEL TANK CAP ASSY(CHECK THAT FUEL TANK CAP MEETS SPECIFICATIONS)

OK: Tank cap meets specifications in the owner's manual.

NG → **REPLACE FUEL TANK CAP ASSY**

OK

3	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

OK: Tank cap is correctly installed.

NG → **CORRECTLY REINSTALL FUEL TANK CAP**

OK

4	INSPECT FUEL TANK CAP ASSY (See page 12-9)

OK: No deformation on the fuel tank cap.

NG → **REPLACE FUEL TANK CAP ASSY**

OK

5	CHECK FILLER NECK FOR DAMAGE

OK: Filler neck has no damage.

NG → **REPLACE FUEL TANK INLET PIPE SUB-ASSY**

OK

6	CHECK HOSES AND TUBES(VAPOR PRESSURE SENSOR - VSV FOR PURGE FLOW SWITCHING VALVE, CHARCOAL CANISTER - EVAP VSV)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for cracks, holes, damage, or blockage.

NG → **REPAIR OR CONNECT VSV AND SENSOR CONNECTORS**

OK

7	CHECK HOSES AND TUBES(FUEL TANK - CHARCOAL CANISTER)

(a) Check the connection between the fuel tank and fuel EVAP pipe, fuel EVAP pipe and under-floor fuel tube, and under-floor fuel tube and charcoal canister.
(b) Check the hose and tube for cracks, holes and damage.

NG → **REPAIR OR REPLACE HOSE AND TUBE**

OK

8	CHECK EACH CONNECTOR FOR LOOSENESS AND DISCONNECTION(EVAP VSV, CCV, VSV FOR PURGE FLOW SWITCHING VALVE AND VAPOR PRESSURE SENSOR)

NG → **REPAIR OR CONNECT VSV AND SENSOR CONNECTORS**

OK

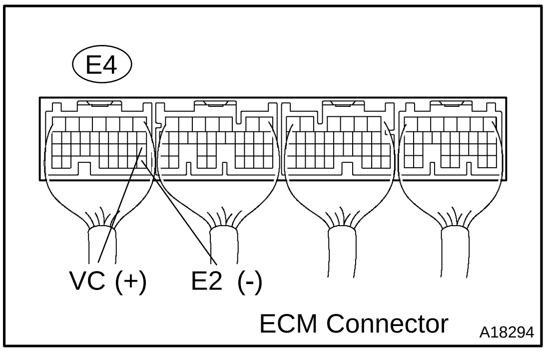
9	CHECK VACUUM HOSES((4), (5), (6) AND (7) IN FIG. 1 IN CIRCUIT DESCRIPTION)

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, holes, damage and blockages.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

10 INSPECT ECM(VC VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the specified terminals of the E4 ECM connector.

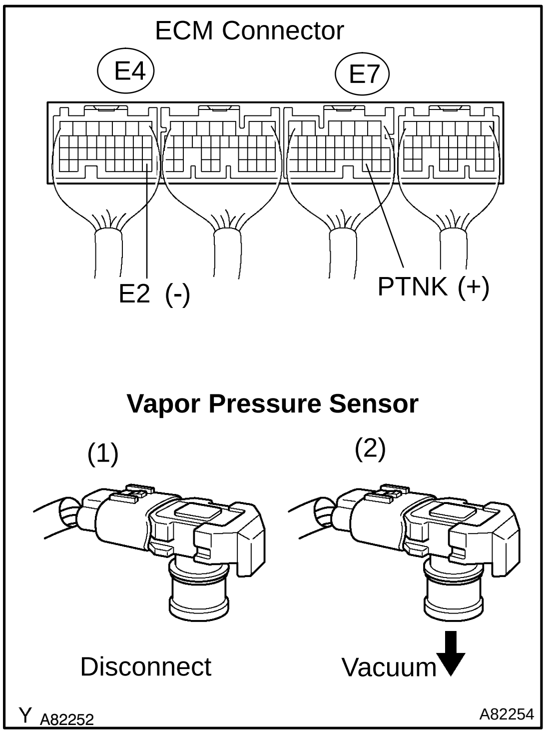
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-24)**

OK

11 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the specified terminals of the E4 and E7 ECM connectors.

(1) Remove the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand-Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

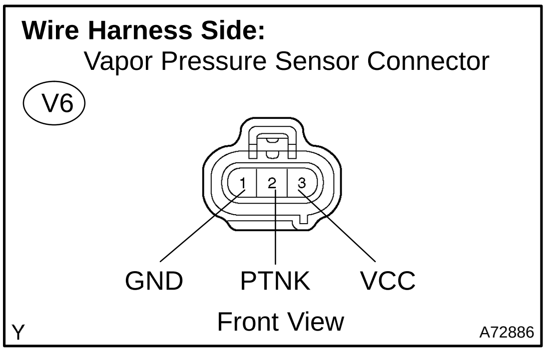
Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	0.5 V or less

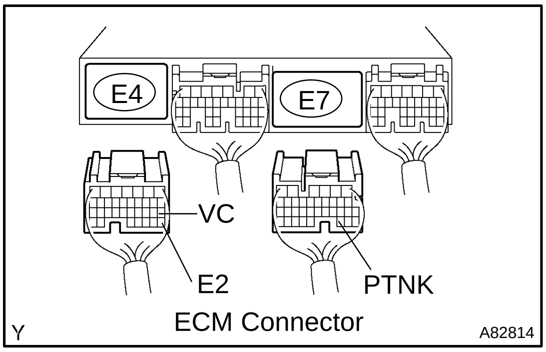
(3) Reinstall the vapor pressure sensor.

OK → **Go to step 13**

NG

12 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)





(a) Disconnect the V6 vapor pressure sensor connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V6-2) - PTNK (E7-30)	Below 1 Ω
GND (V6-1) - E2 (E4-28)	Below 1 Ω
VCC (V6-3) - VC (E4-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V6-2) or PTNK (E7-30) - Body ground	10 kΩ or higher
VCC (V6-3) or VC (E4-18) - Body ground	10 kΩ or higher

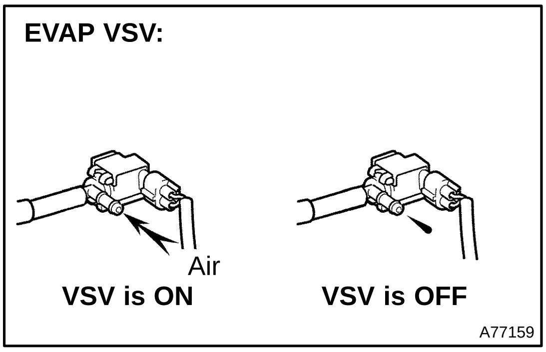
(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

13 PERFORM ACTIVE TEST BY HAND-HELD TESTER(EVAP VSV PURGE FLOW)



(a) Disconnect the vacuum hose of the EVAP VSV from the charcoal canister.
(b) Put the engine in inspection mode (see page 01-27).
(c) Start the engine.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV (press the right or left button).
(e) When the EVAP VSV is operated using the hand-held tester, check whether the disconnected hose applies suction to your finger.

Standard:

Tester Operation	Specified Condition
VSV is ON	Disconnected hose applies suction to your finger
VSV is OFF	Disconnected hose applies no suction to your finger

(f) Reconnect the vacuum hose.

OK → **Go to step 17**

NG

14	CHECK VACUUM HOSES(INTAKE MANIFOLD - EVAP VSV, EVAP VSV - CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for cracks, holes, damage, or blockages.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

15	CHECK OPERATION OF EVAP VSV (See page 12-9)

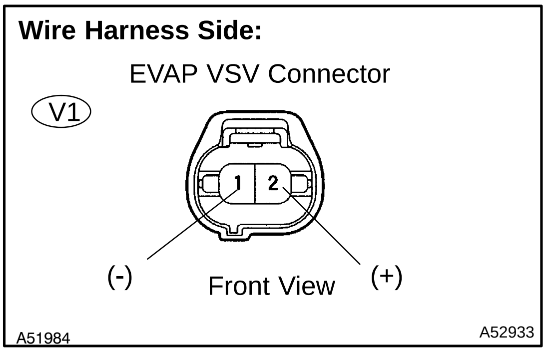
OK: Air from port E flows out through port F when applying the battery voltage.

OK → **Go to step 16**

NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

16 CHECK HARNESS AND CONNECTOR(EVAP VSV - ECM, EVAP VSV - EFI M RELAY)



(a) Disconnect the V1 EVAP VSV connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the specified terminal of the V1 EVAP VSV connector and body ground.
Standard :

Tester Connection	Specified Condition
EVAP VSV (V1-2) - Body ground	9 to 14 V

(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV (press the right or left button).
(e) When the EVAP VSV is operated using the hand-held tester, measure the voltage between the specified terminals of the V1 EVAP VSV connector.
Standard :

Tester Operation	Tester Connection	Specified Condition
VSV is ON	EVAP VSV: (V1-1) - (V1-2)	9 to 14 V
VSV is OFF	EVAP VSV: (V1-1) - (V1-2)	0 V

(f) Turn the power switch OFF.
(g) Check the resistance in EVAP VSV wire harness.
Standard :

Tester Connection	Specified Condition
EVAP VSV (V1-1) - Body ground	10 Ω or higher
EVAP VSV (V1-2) - Body ground	10 Ω or higher

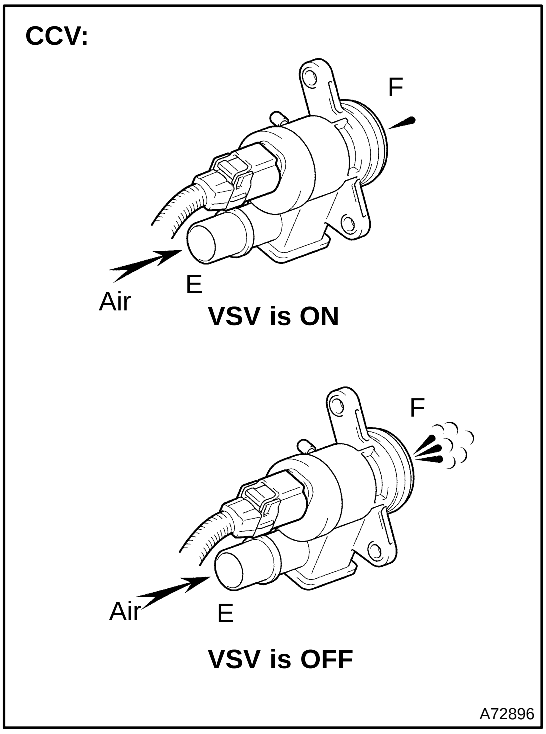
(h) Reconnect the EVAP VSV connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

17 PERFORM ACTIVE TEST BY HAND-HELD TESTER(CCV)



(a) Remove the CCV.
(b) Turn the power switch ON (IG).
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV (press the right or left button).
(d) Check the CCV operation while operating it with using hand-held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air does not flow from port E to F
VSV is OFF	Air from port E flows out through port F

(e) Reinstall the CCV.

OK → **Go to step 21**

NG

18 CHECK VACUUM HOSES(CCV - CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check that the vacuum hoses are not loose or disconnected.
(c) Check the vacuum hoses and tubes for cracks, holes, damage, or blockages.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

19 CHECK OPERATION OF CCV (See page 12-9)

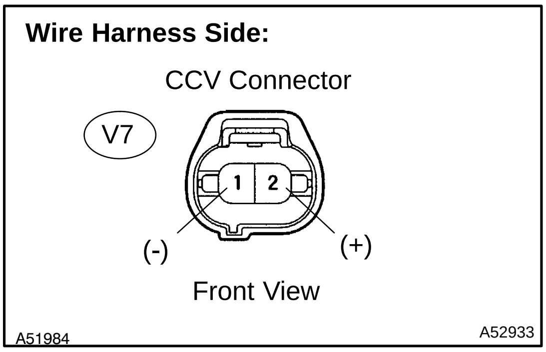
OK: Air does not flow from port E to F when applying the battery voltage.

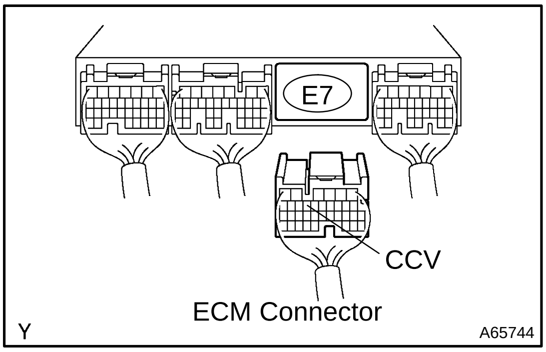
OK → **Go to step 20**

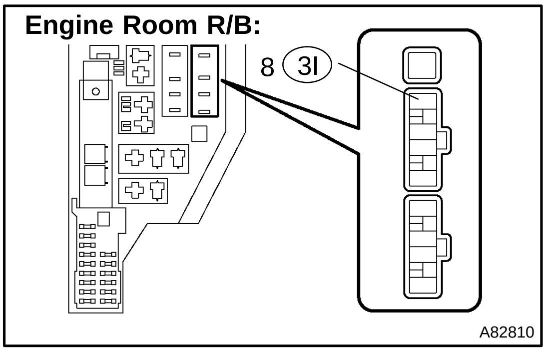
NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

20	CHECK HARNESS AND CONNECTOR(CCV - ECM, CCV - EFI M RELAY)







(a) Check the harness and connectors between the CCV and ECM.
(1) Disconnect the V7 CCV connector.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-1) - CCV (E7-13)	Below 1 Ω

Tester Connection	Specified Condition
CCV (V7-1) or CCV (E7-13) - Body ground	10 kΩ or higher

(4) Reconnect the CCV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the CCV and the EFI M relay.
(1) Disconnect the V7 CCV connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

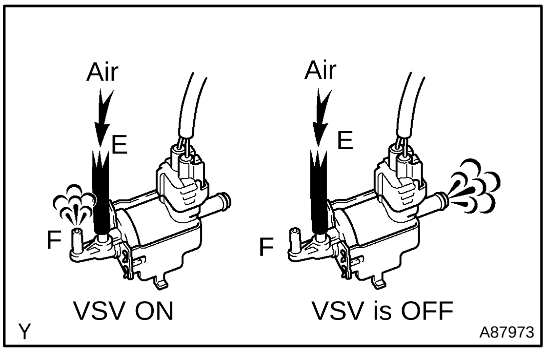
(4) Reconnect the CCV connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

21	PERFORM ACTIVE TEST BY HAND-HELD TESTER(VSV FOR PURGE FLOW SWITCHING VALVE)



(a) Remove the VSV for purge flow switching valve.
(b) Turn the power switch ON (IG).
(c) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV (press the right or left button).
(d) Check the VSV for purge flow switching valve operation while operating it using the hand-held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air from port E flows out through port F
VSV is OFF	Air does not flow from port E to F

(e) Reinstall the VSV for purge flow switching valve.

OK → **Go to step 24**

NG

22	INSPECT VSV FOR PURGE FLOW SWITCHING VALVE(OPERATION) (See page 12-9)

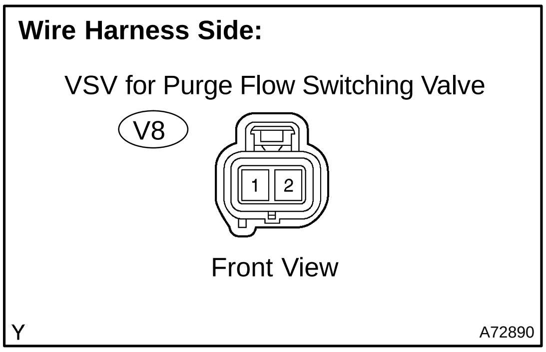
OK: Air from port E flows out through port F when applying the battery voltage.

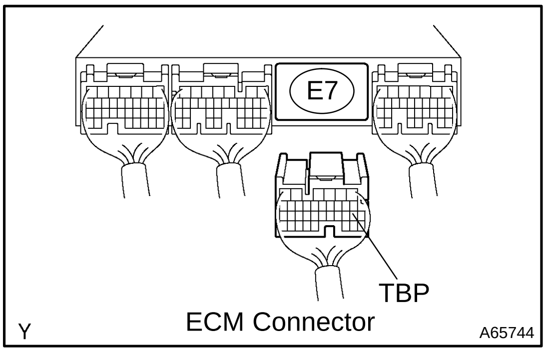
NG → **Go to step 23**

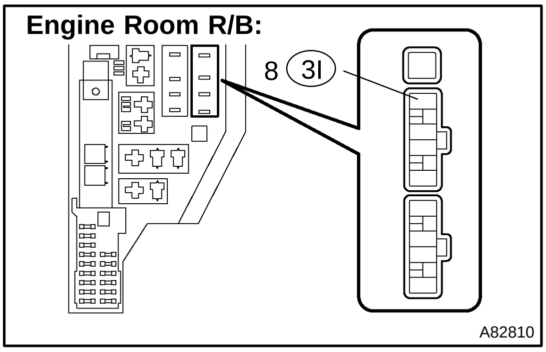
OK

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

23	CHECK HARNESS AND CONNECTOR(VSV FOR PURGE FLOW SWITCHING VALVE - EFI M RELAY, VSV FOR PURGE FLOW SWITCHING VALVE - ECM)







(a) Check the harness and the connectors between the VSV for purge flow switching valve and the ECM.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Disconnect the E7 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) - TBP (E7-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) or TBP (E7-18) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the VSV for purge flow switching valve and the EFI M relay.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Remove the integration relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

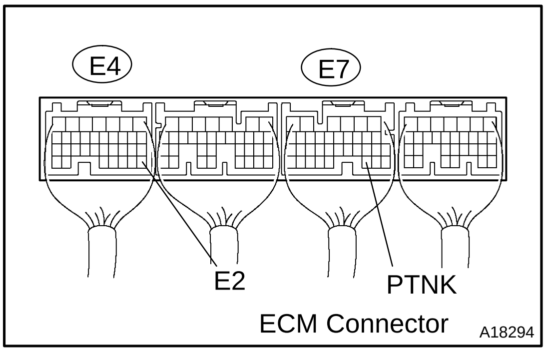
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

24 PERFORM ACTIVE TEST BY HAND-HELD TESTER(CHARCOAL CANISTER AND FUEL TANK)



(a) Connect the hand-held tester to the DLC3.
(b) Put the engine in inspection mode (see page 01-27).
(c) Start the engine.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / CAN CTRL VSV, and turn ON the CCV.
(e) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
(f) Turn ON the EVAP VSV until voltage between terminals PTNK and E2 becomes 1.2 V.
(g) Turn EVAP VSV OFF.
(h) Measure the voltage between terminals PTNK and E2 of the ECM connector for 30 seconds after switching the VSV for EVAP from ON to OFF

Standard:

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.3 V or less

OK → **REPLACE ECM (See page 10-24)**

NG

25 INSPECT FUEL TANK ASSY

OK: Fuel tank has no damage (crack or hole).

NG → **REPLACE FUEL TANK ASSY**

OK

26 INSPECT CHARCOAL CANISTER ASSY (See page 12-9)

OK: Canister has no crack or hole.

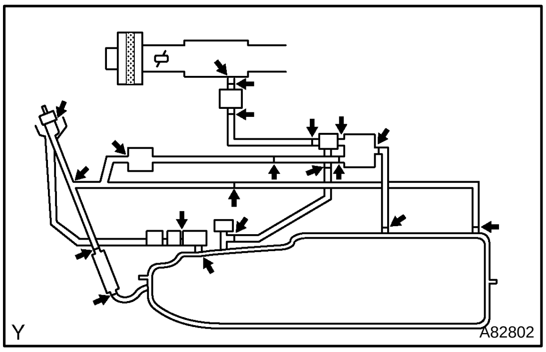
NG → **REPLACE CHARCOAL CANISTER ASSY**

OK

REPLACE ECM (See page 10-24)

OBD II scan tool (excluding hand-held tester):

1	CHECK WHETHER THERE ARE SIGNS OF ANY ACCIDENT NEAR FUEL TANK OR CHARCOAL CANISTER(OR ANY MODIFICATION)



(a) Check whether hoses close to the fuel tank have been modified, and check if there are signs of any accident near the fuel tank.

(1) Check the following parts for cracks, deformation or loose connections:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → REPAIR OR REPLACE

OK ↓

2	INSPECT FUEL TANK CAP ASSY(CHECK THAT FUEL TANK CAP MEETS SPECIFICATIONS)

NG → REPLACE CAP ASSY, FUEL TANK

OK ↓

3	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY REINSTALL FUEL TANK CAP

OK ↓

4	CHECK FUEL TANK CAP ASSY (See page 12-9)

NG → REPLACE FUEL TANK CAP ASSY

OK ↓

5	CHECK FILLER NECK FOR DAMAGE

NG → REPLACE FUEL TANK INLET PIPE SUB-ASSY

OK ↓

6	CHECK EACH VSV CONNECTOR FOR LOOSENESS AND DISCONNECTION(EVAP VSV, CCV, VSV FOR PURGE FLOW SWITCHING VALVE AND VAPOR PRESSURE SENSOR)

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, holes or damage.

NG → **REPAIR OR CONNECT VSV AND SENSOR CONNECTOR**

OK

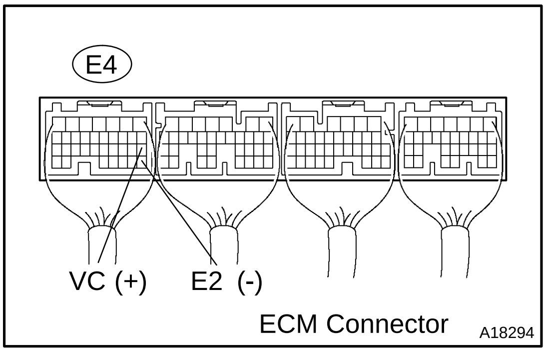
7	CHECK VACUUM HOSES

(a) Check the connection between the fuel tank and fuel EVAP pipe, the fuel EVAP pipe and under-floor fuel tube, the under-floor fuel tube and charcoal canister.
(b) Check the hose and the tube for cracks, holes or damage.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

8	INSPECT ECM(VC - E2 VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E4 ECM connector.

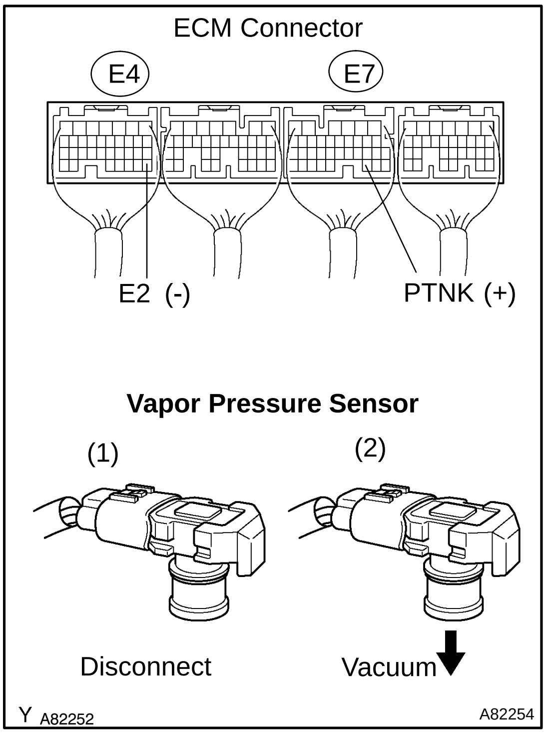
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-24)**

OK

9 INSPECT ECM(PTNK - E2 VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the specified terminals of the E4 and E7 ECM connectors.

(1) Remove the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand-Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

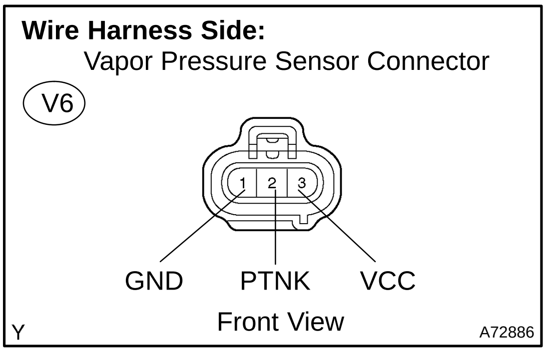
Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	0.5 V or less

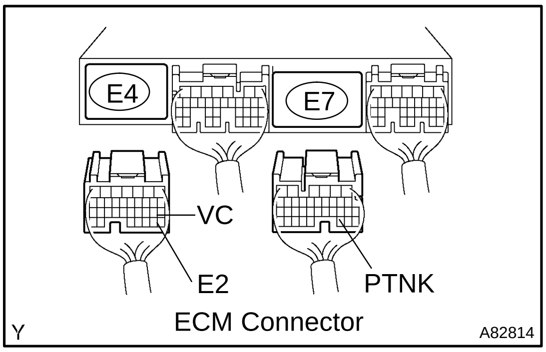
(3) Reinstall the vapor pressure sensor.

NG → **Go to step 11**

OK

10 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)





(a) Disconnect the V6 vapor pressure sensor connector.

(b) Disconnect the E4 and E7 ECM connectors.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V6-2) - PTNK (E7-30)	Below 1 Ω
GND (V6-1) - E2 (E4-28)	Below 1 Ω
VCC (V6-3) - VC (E4-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V6-2) or PTNK (E7-30) - Body ground	10 kΩ or higher
VCC (V6-3) or VC (E4-18) - Body ground	10 kΩ or higher

(d) Reconnect the vapor pressure sensor connector.

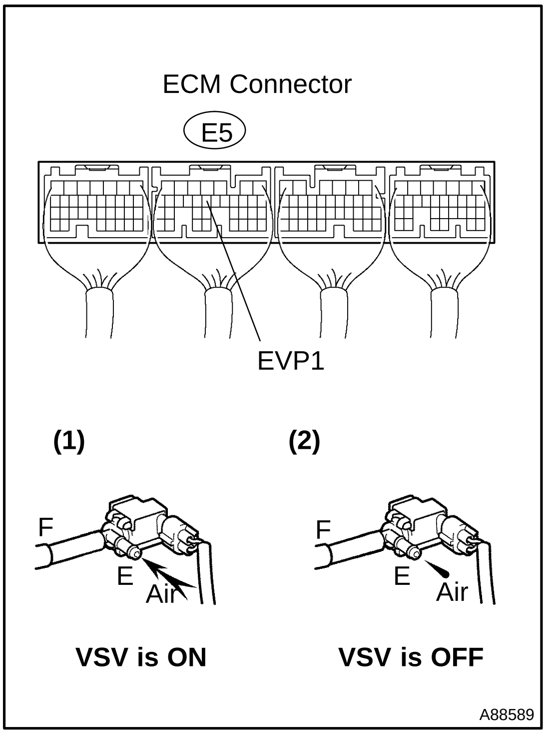
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

11 INSPECT EVAP VSV



(a) Remove the EVAP VSV.
(b) Turn the power switch ON (IG).
(c) Check the VSV function.
(1) Connect terminal EVP1 (E5-14) of the ECM connector and the body ground (EVAP VSV should be OPEN, i.e. ON).
Standard (1):
Air from port E flows out through port F.
(2) Disconnect between terminal EVP1 of the ECM connector and the body ground (EVAP VSV should CLOSED, i.e. OFF).
Standard (2):
Air does not flow from port E to port F.
(d) Reinstall the EVAP VSV.

OK → **Go to step 14**

NG

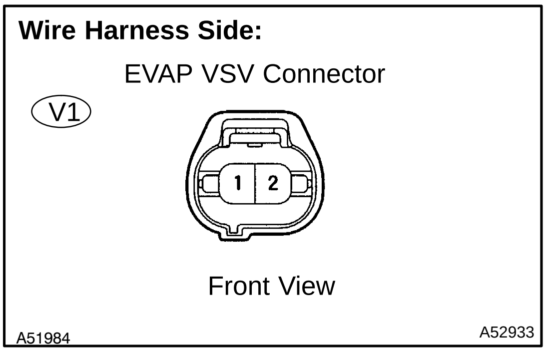
12 CHECK OPERATION OF EVAP VSV (See page 12-9)

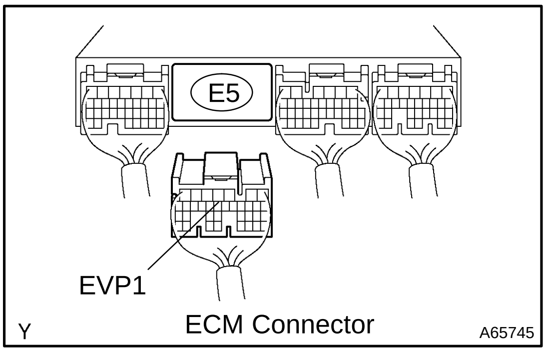
OK → **Go to step 13**

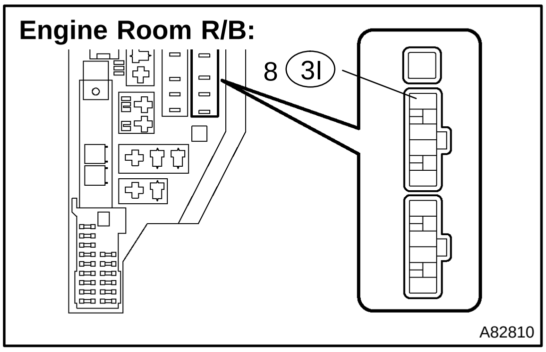
NG

REPLACE VSV AND CLEAN VACUUM HOSES, AND THEN CHECK CHARCOAL CANISTER

13	CHECK HARNESS AND CONNECTOR(EFI M RELAY - EVAP VSV, EVAP VSV - ECM)







(a) Check the harness and the connectors between the EVAP VSV and the ECM connectors.
(1) Disconnect the V1 VSV for EVAP connector.
(2) Disconnect the E5 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-1) - EVP1 (E5-14)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-1) or EVP1 (E5-14) - Body ground	10 kΩ or higher

(4) Reconnect the EVAP VSV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the EVAP VSV connector and the EFI M relay.
(1) Disconnect the V1 EVAP VSV connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

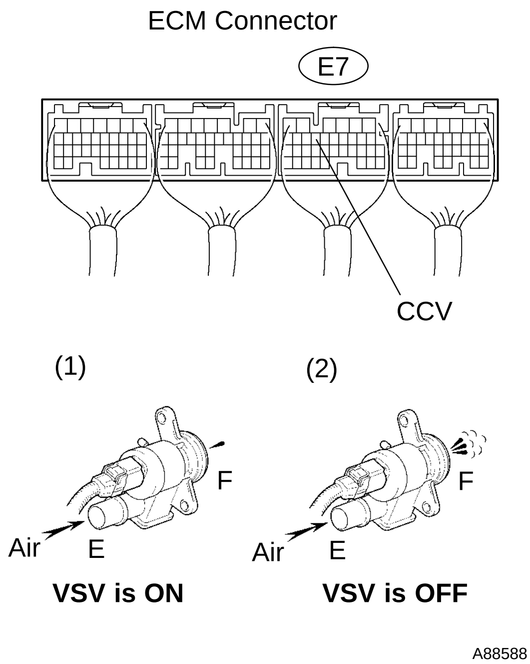
(4) Reconnect the EVAP VSV connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

14	INSPECT CCV



(a) Remove the CCV.
(b) Turn the power switch ON (IG).
(c) Check the VSV function.
(1) Connect terminal CCV (E7-13) of the ECM connector and the body ground (CCV should be CLOSED, i.e. ON).
Standard (1):
Air does not flow from port E to port F.
(2) Disconnect between terminal CCV of the ECM connector and the body ground (CCV should be OPEN, i.e. OFF).
Standard (2):
Air from port E flows out through port F.
(d) Reinstall the CCV.

OK — **Go to step 17**

NG

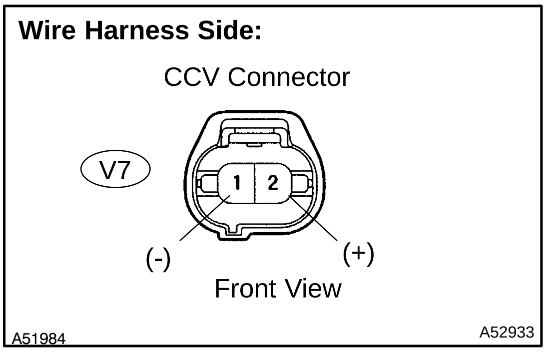
15	CHECK OPERATION OF CCV (See page 12-9)

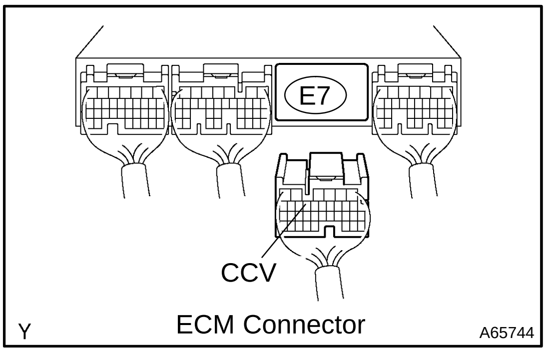
OK — **Go to step 16**

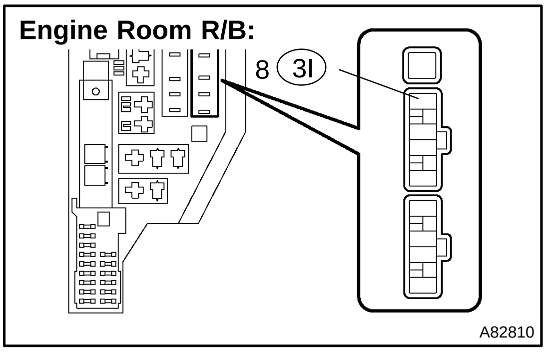
NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE (VACUUM HOSE BETWEEN CHARCOAL CANISTER AND CCV)

16	CHECK HARNESS AND CONNECTOR(EFI M RELAY - CCV, CCV - ECM)







(a) Check the harness and the connectors between the CCV connector and the ECM connectors.
 (1) Disconnect the V7 CCV connector.
 (2) Disconnect the E7 ECM connector.
 (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-1) - CCV (E7-13)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-1) or CCV (E7-13) - Body ground	10 kΩ or higher

 (4) Reconnect the CCV connector.
 (5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the CCV connector and the EFI M relay.
 (1) Disconnect the V7 CCV connector.
 (2) Remove the integration relay from the engine room R/B.
 (3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

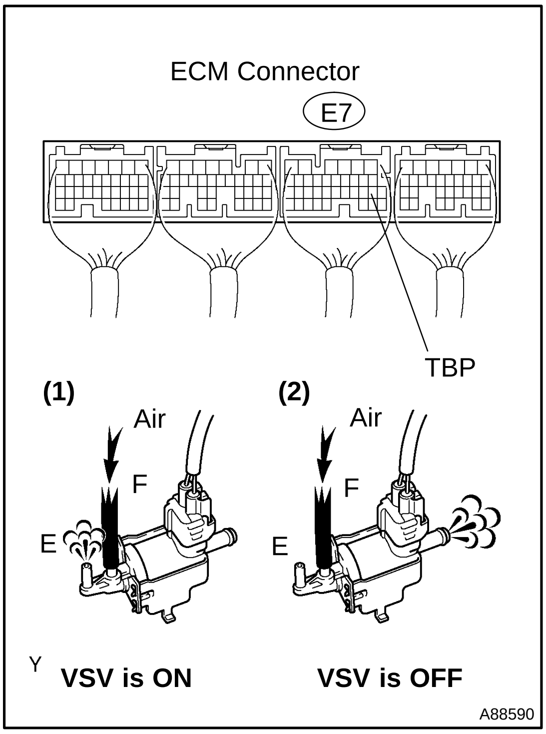
 (4) Reconnect the CCV connector.
 (5) Reinstall the integration relay.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (See page 10-24)

17	INSPECT VSV FOR PURGE FLOW SWITCHING VALVE



(a) Remove the VSV for purge flow switching valve.
(b) Turn the power switch ON (IG).
(c) Check the VSV function.
(1) Connect terminal TBP (E7-18) of the ECM connector and the body ground (VSV for purge flow switching valve should be OPEN, i.e. ON).

Standard (1):
Air from port E flows out through port F.

(2) Disconnect between terminal TBP of the ECM connector and the body ground (VSV for purge flow switching valve should be CLOSED, i.e. OFF).

Standard (2):
Air does not flow from port E to port F.

(d) Reinstall the VSV for purge flow switching valve.

OK → **REPLACE CHARCOAL CANISTER ASSY**

NG

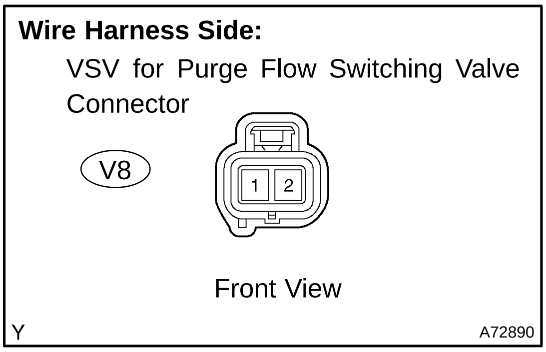
18	CHECK OPERATION OF VSV(FOR PURGE FLOW SWITCHING VALVE) (See page 12-9)

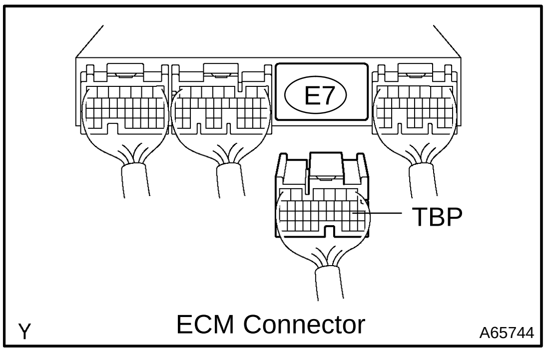
OK → **Go to step 19**

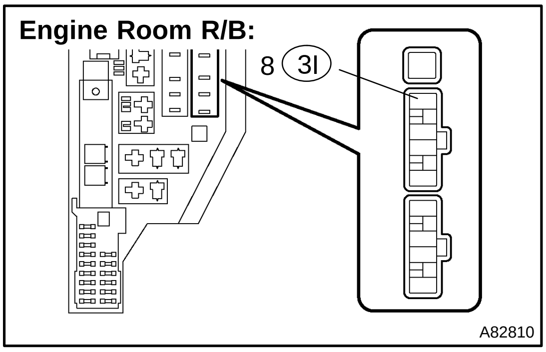
NG

REPLACE VSV AND CHARCOAL CANISTER, AND THEN CLEAN VACUUM HOSE

19 CHECK HARNESS AND CONNECTOR(EFI M RELAY - VSV FOR PURGE FLOW SWITCHING VALVE, VSV FOR PURGE FLOW SWITCHING VALVE - ECM)







(a) Check the harness and the connectors between the VSV connector for purge flow switching valve and the ECM connectors.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Disconnect the E7 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) - TBP (E7-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) or TBP (E7-18) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the VSV for purge flow switching valve connector and the EFI M relay.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Remove the integration relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

DTC	P0442	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

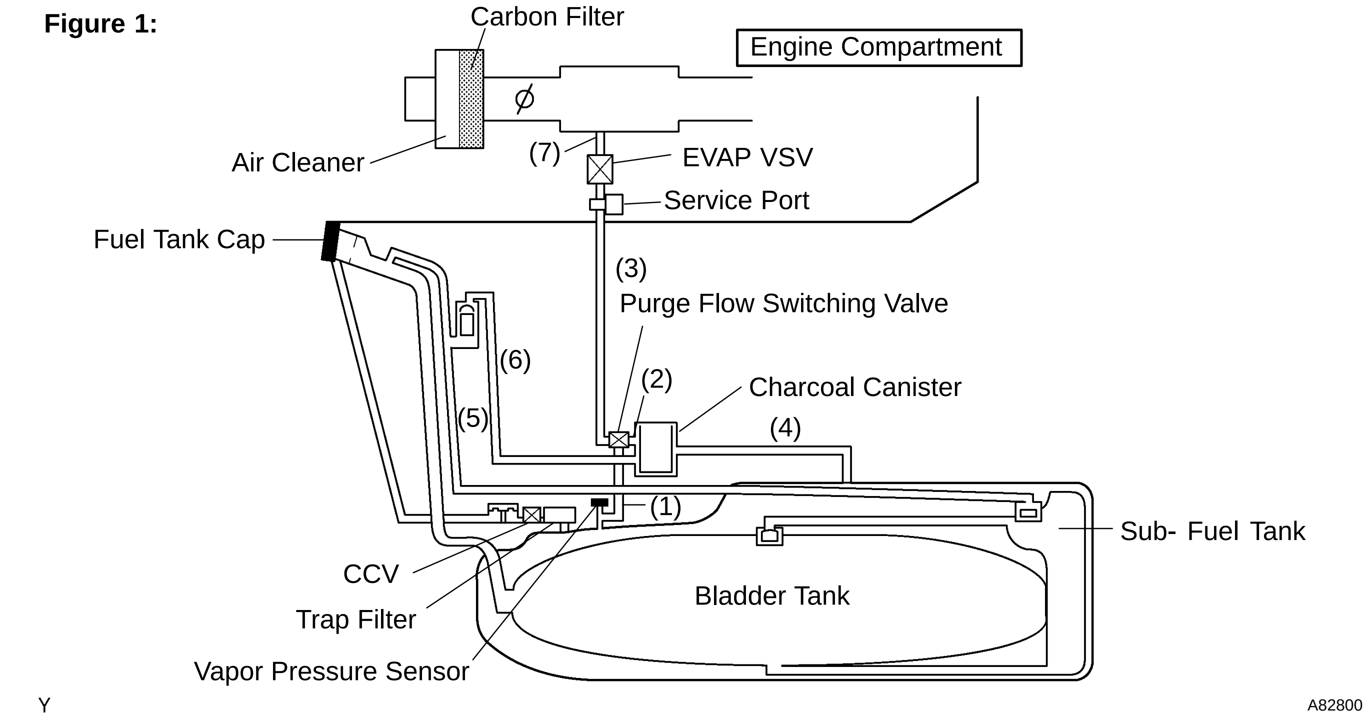
DTC	P0455	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (GROSS LEAK)

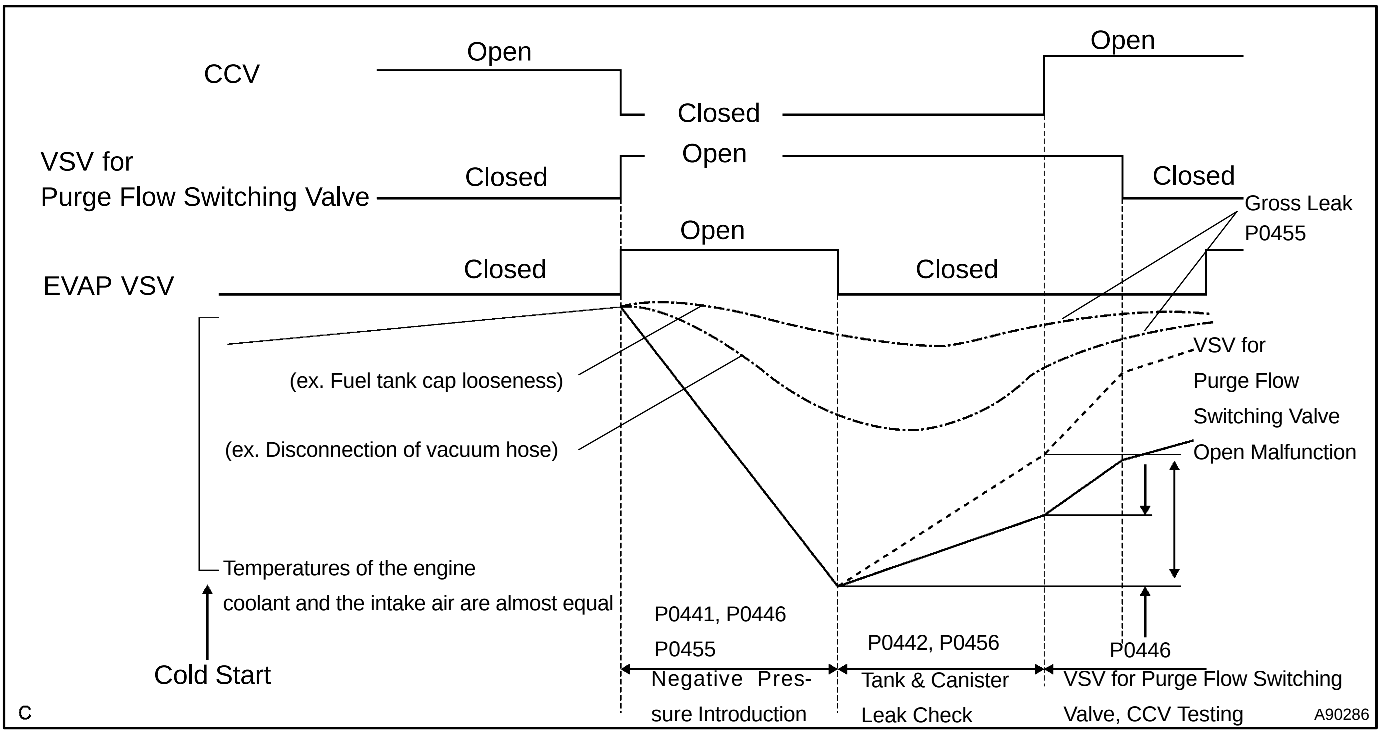
DTC	P0456	EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

CIRCUIT DESCRIPTION

The vapor pressure sensor and the VSV for the canister closed valve (CCV) are used to detect abnormalities in the evaporative emission control system. The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0442, P0455 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in figure 1 below, or when the vapor pressure sensor malfunctions.

Figure 1:





DTC No.	DTC Detection Condition	Trouble Area
P0442	After negative pressure (vacuum) introduction is completed, if the pressure in the EVAP system sharply increases (small leak) (2 trip detection logic)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose cracks is blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6) and (7) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in EVAP VSV circuit • EVAP VSV • Open or short in CCV circuit • CCV • Open or short in VSV for purge flow switching valve circuit • VSV for purge flow switching valve • Fuel tank is cracked, or damaged • Charcoal canister is cracked, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0455	Following conditions are met: • While the negative pressure introduction is performed, if the fuel tank pressure does not reach standard level • If the pressure in the EVAP system sharply increases during leak check	• Same as DTC P0442
P0456	If the pressure in the EVAP system slightly increases while the ECM performs a leak check (very small leak) (2 trip detection logic)	• Same as DTC P0442

HINT:
Typical DTC output of each trouble part.

Trouble Part	Trouble Condition	Typical DTC Output (*1)
—	Small leak	P0442 and/or P0456
—	Medium leak (ex: Vacuum hose looseness)	P0442 and/or P0455
—	Large leak (ex: Fuel tank cap looseness)	P0441 and P0442 and P0446 and P0455 (*2)
EVAP VSV	Open malfunction	P0441
EVAP VSV	Close malfunction	P0441 and P0442 and P0446
CCV	Open malfunction	P0441 and P0442 and P0446 and P0455
CCV	Close malfunction	P0446
VSV for Purge flow Switching valve	Open malfunction	P0446
VSV for Purge flow Switching valve	Close malfunction	P0441 and P0442 and P0446

*1: ECM may output some other DTCs combination.
*2: Refer to DTCs P0441 and P0446 on page 05-230 .

MONITOR DESCRIPTION

The evaporative emission system consists of the vapor pressure sensor, the canister close valve (CCV), the VSV for purge flow switching valve and the EVAP VSV (Purge VSV). These are used to detect malfunction in the system by ECM.
This test will run once per driving cycle when the ECM detects stable vapor pressure in the fuel tank. While the vehicle is being driven on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressure and the diagnostic test will not be executed.
The ECM performs the following steps:
(a) Closes the canister close valve (CCV) (shuts the system).
(b) Checks the stability of the fuel tank pressure. If the variation in the pressure is greater than the specified value, disables the diagnosis.
(c) Opens the EVAP VSV to introduce negative pressure (vacuum) from the intake manifold into the fuel tank.
(d) Closes the EVAP VSV to seal the fuel tank for storing the negative pressure.
(e) Monitors the negative pressure in the fuel tank for:
 (1) Rapid decrease, i.e. a large leak, 0.040 inch or more
 (2) Decrease greater than the normal value
 If the ECM detects either of above conditions, the ECM interprets this as a leak in the EVAP system. The ECM will illuminate the MIL (2 trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0442: Small leak (0.040inch or more hole) detected P0455: Large leak detected P0456: Very small leak (0.020 inch or more hole)
Required sensors/components	Main: Vapor pressure sensor, EVAP VSV (purge VSV), CCV, Related: Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Once per driving cycle
Duration	60 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	11 V or more
Altitude	Less than 2,400 m (8,000 ft)
Intake air temperature (IAT)	10 °C (50 °F) or more
Intake air temperature (IAT) at engine start	0.040 inch malfunction: Between 10 °C (50 °F) and 35 °C (92 °F) 0.020 inch malfunction: Between 10 °C (50 °F) and 32 °C (89.6 °F) Gross leak malfunction: Between 10 °C (50 °F) and 35 °C (92 °F)
Engine coolant temperature (ECT) at engine start	Between 10 °C (50 °F) and 35 °C (92 °F)
Intake air temperature at engine start compared with engine coolant temperature	Maximum of 7°C (12.6°F) lower or 11.1°C (19.9°F) higher
EVAP VSV and CCV	Not operated by scan tool
Time after engine start	Less than 60 minutes
Vehicle speed	Less than 130 km/h
Fuel slosh	No sloshing, i.e. fairly smooth road
MAF	No great change
Fuel tank pressure change	Minimal change

TYPICAL MALFUNCTION THRESHOLDS

P0442: 0.040 inch malfunction detection

Fuel tank pressure changing value for 5 seconds from -2.0 kPa (-15 mmHg) point	Increases 0.187 kPa (1.4 mmHg) or more
Fuel tank pressure changing value for 5 seconds from -2.6 kPa (-20 mmHg) point	Increases 0.187 kPa (1.4 mmHg) or more

P0455: gloss leak

Fuel tank pressure changing value for 5 seconds from -2.0 kPa (-15 mmHg) point	Increases more than 0.187 kPa (1.4 mmHg)
Fuel tank pressure changing value for 5 seconds from -2.6 kPa (-20 mmHg) point	Increases more than 0.187 kPa (1.4 mmHg)
Fuel tank pressure minimum value	More than -2.4 kPa (18 mmHg)

P0456: 0.020 inch malfunction detection

Fuel tank pressure changing value for 5 seconds from -2.3 kPa (-17 mmHg) point	Increases more than 0.0533 kPa (0.4 mmHg)
Fuel tank pressure changing value for 5 seconds from -2.6 kPa (-20 mmHg) point	Increases more than 0.0533 kPa (0.4 mmHg)

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page 05-26).

- MID (Monitor Identification) is assigned to each component/system.
- TID (Test Identification) is assigned to each test component.
- Scaling is used to calculate the test value indicated on generic OBD scan tools.

EVAP - Bladder Tank System

MID	TID	Scaling	Description of Test Value
$3B	$C1	Multiply by 0.001 (kPa)	Test value of 0.02 inch leak: Determined by fuel tank pressure change
$3C	$C2	Multiply by 0.001 (kPa)	Test value of 0.04 inch leak: Determined by fuel tank pressure change
$3D	$C7	Multiply by 0.001 (kPa)	Test value of canister closed valve (CCV): Determined by fuel tank pressure change at switching over CCV
	$C8	Multiply by 0.001 (kPa)	Test value of bypass VSV (VSV for bypass valve): Determined by fuel tank pressure change at switching over bypass VSV
	$D4	Multiply by 0.001 (kPa)	Test value of EVAP VSV stuck closed: Determined by fuel tank pressure change during vacuum introduction
	$D5	Multiply by 0.1 (seconds)	Test value of EVAP VSV stuck open: Determined by abnormal state continuation time

INSPECTION PROCEDURE

HINT:

- When using the hand-held tester, follow the procedures under the title ”Hand-held tester ” (see below).
- When using the OBD II scan tool, follow the procedures under the title ”OBD II scan tool (excluding hand-held tester)” (see the procedures after the ”Hand-held tester” procedures).
- Always troubleshoot DTCs P0441 (purge flow), P0446 (CCV), P0451, P0452 and P0453 (evaporative pressure sensor) before troubleshooting DTCs P0442 or P0456.
- Ask the customer the following questions:
  1) When the MIL came on, if the fuel tank cap was loose and if it was then tightened.
  2) When refueling, if the fuel tank cap was loose.
  If the fuel tank cap was loose, that is why the DTC was stored.
  If the fuel cap was not loose or if the customer cannot remember, troubleshoot according to the procedures on the following page.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

Hand-held Tester:

1	CHECK FUEL TANK CAP ASSY(CHECK THAT FUEL TANK CAP MEETS SPECIFICATIONS)

OK: Tank cap meets specifications in the owner’s manual.

NG → **FUEL TANK CAP ASSY**

OK

2	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

OK: Tank cap is correctly installed.

NG → **CORRECTLY REINSTALL FUEL TANK CAP**

OK

3	INSPECT FUEL TANK CAP ASSY (See page 12-9)

OK: Tank cap has no deformation.

NG → **REPLACE FUEL TANK CAP ASSY**

OK

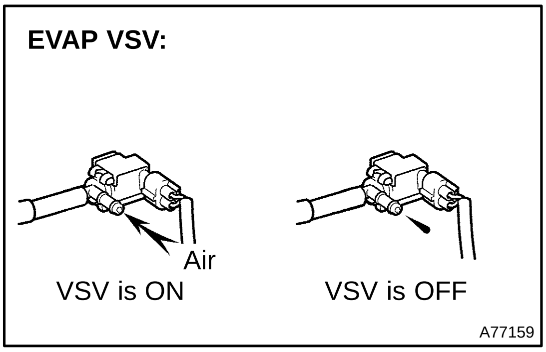
4	CHECK FILLER NECK FOR DAMAGE

(a) Remove the fuel tank cap.
(b) Visually check the fuel inlet pipe for damage.
(c) Reinstall the fuel tank cap.
OK: Filler neck has no damage.

NG → **REPLACE FUEL TANK INLET PIPE SUB-ASSY**

OK

5	PERFORM ACTIVE TEST BY HAND-HELD TESTER(CHECK FOR EVAP PURGE FLOW)



(a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST on the hand-held tester.
(b) Disconnect the vacuum hose of the EVAP VSV from the charcoal canister.
(c) Put the engine in inspection mode (see page 01-27).
(d) Start the engine.
(e) Select the item: EVAP VSV (ALONE) and operate EVAP VSV (press the right or left button).
(f) When the EVAP VSV is operated using the hand-held tester, check if the disconnected hose applies suction to your finger.
Result:
VSV is ON: Disconnected hose sucks.
VSV is OFF: Disconnected hose does not suck.
(g) Reconnect the vacuum hose.

OK → **Go to step 9**

NG

6	CHECK VACUUM HOSES(INTAKE MANIFOLD - EVAP VSV, EVAP VSV - CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, hole, damage or blockages.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

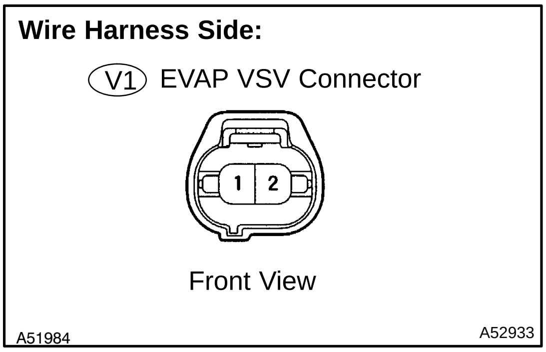
7	INSPECT EVAP VSV(OPERATION) (See page 12-9)

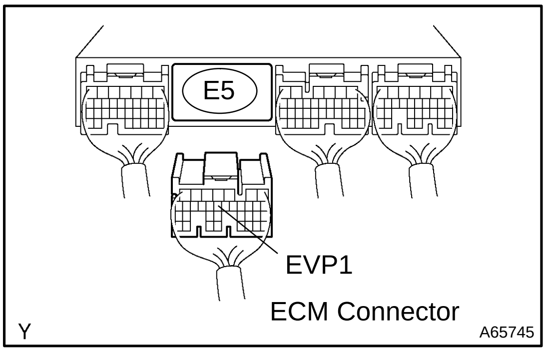
OK: Air from port E flows out through port F when applying the battery voltage.

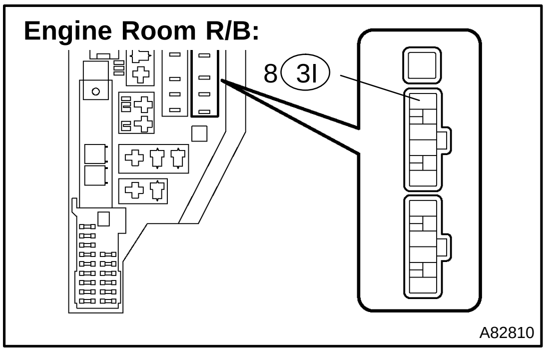
NG → **REPLACE EVAP VSV**

OK

8	CHECK HARNESS AND CONNECTOR(EFI M RELAY - EVAP VSV, EVAP VSV - ECM)







(a) Check the harness and the connectors between the EVAP VSV and ECM connectors.
(1) Disconnect the V1 EVAP VSV connector.
(2) Disconnect the E5 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-1) - EVP1 (E5-14)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-1) or EVP1 (E5-14) - Body ground	10 kΩ or higher

(4) Reconnect the EVAP VSV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the EVAP VSV connector and EFI M relay.
(1) Disconnect the V1 EVAP VSV connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

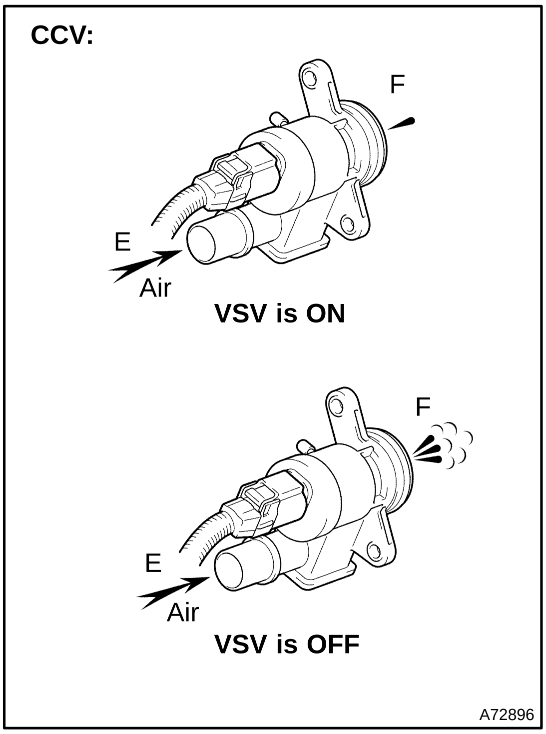
(4) Reconnect the EVAP VSV connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

9 PERFORM ACTIVE TEST BY HAND-HELD TESTER(CCV)



(a) Disconnect the vacuum hose of the CCV from the charcoal canister.
(b) Put the engine in inspection mode (see page 01-27).
(c) Start the engine.
(d) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST on the hand-held tester.
(e) Select the item: CAN CTRL VSV and operate CAN CTRL VSV (press the right or left button).
(f) Check the VSV operation when it is operated using the hand-held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air does not flow from port E to F
VSV is OFF	Air from port E flows out through port F

OK → **Go to step 13**

NG

10 CHECK VACUUM HOSES(CCV - CHARCOAL CANISTER)

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, hole, damage or blockages.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

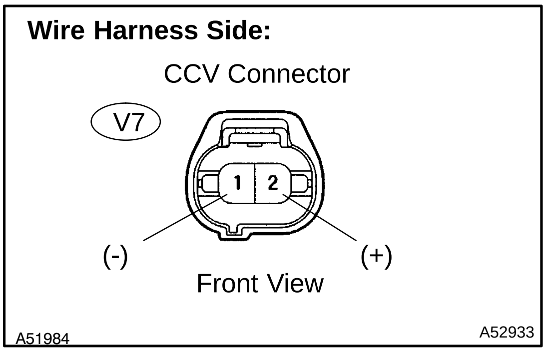
11 INSPECT CCV(OPERATION) (See page 12-9)

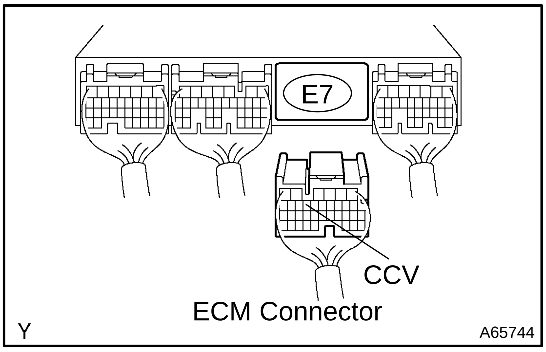
OK: Air does not flow from port E to F when applying the battery voltage.

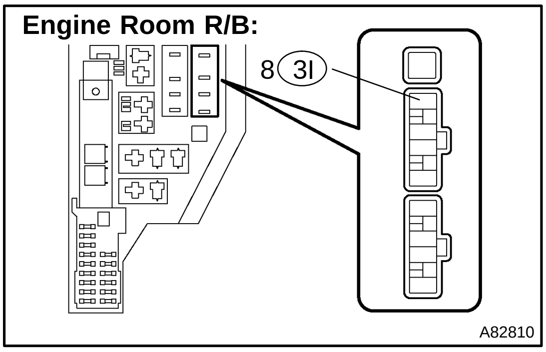
NG → **REPLACE CCV**

OK

12	CHECK HARNESS AND CONNECTOR(EFI M RELAY - CCV, CCV - ECM)







(a) Check the harness and connectors between the CCV and ECM.

(1) Disconnect the V7 CCV connector.

(2) Disconnect the E7 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-1) - CCV (E7-13)	Below 1 Ω

Tester Connection	Specified Condition
CCV (V7-1) or CCV (E7-13) - Body ground	10 kΩ or higher

(4) Reconnect the CCV connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the CCV connector and EFI M relay.

(1) Disconnect the V7 CCV connector.

(2) Remove the integration relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the CCV connector.

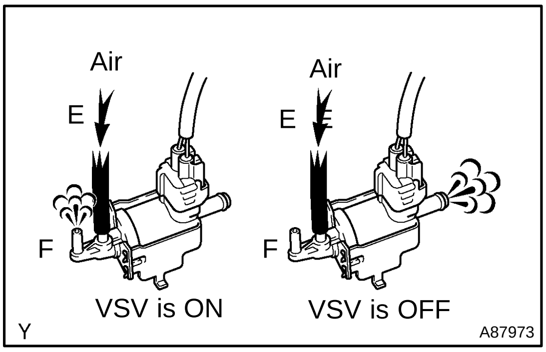
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

13	PERFORM ACTIVE TEST BY HAND-HELD TESTER(VSV FOR PURGE FLOW SWITCHING VALVE)



(a) Select the item: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST on the hand-held tester.
(b) Select the item: TANK BYPASS VSV / ALL and operate TANK BYPASS VSV (press the right or left button).
(c) Check the VSV operation when it is operated using the hand-held tester.

Standard:

Tester Operation	Specified Condition
VSV is ON	Air from port E flows out through port F
VSV is OFF	Air does not flow from port E to F

OK — **Go to step 16**

NG

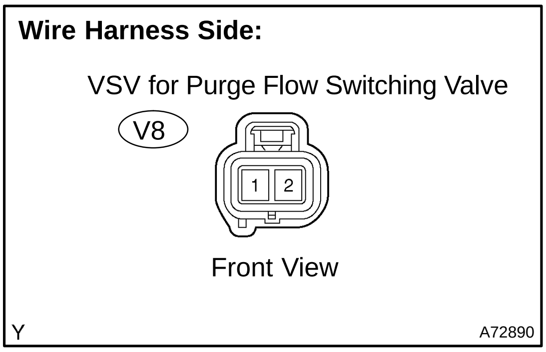
14	INSPECT VSV FOR PURGE FLOW SWITCHING VALVE(OPERATION) (See page 12-9)

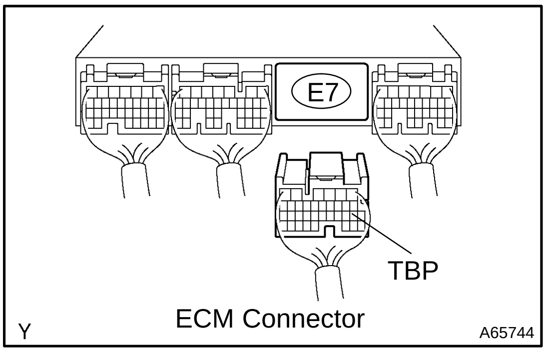
OK: Air from port E flows out through port F when applying the battery voltage.

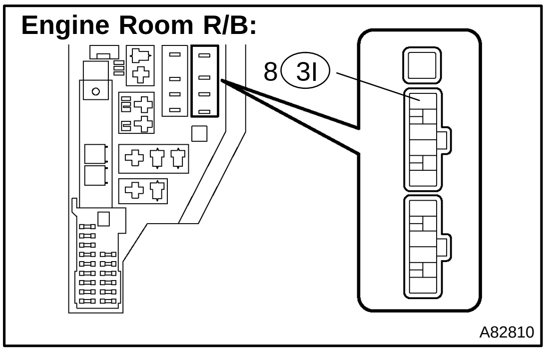
NG — **REPLACE VSV FOR PURGE FLOW SWITCHING VALVE**

OK

15 CHECK HARNESS AND CONNECTOR(EFI M RELAY - VSV FOR PURGE FLOW SWITCHING VALVE, VSV FOR PURGE FLOW SWITCHING VALVE - ECM)







(a) Check the harness and the connectors between the VSV for purge flow switching valve and the ECM connectors.
(1) Disconnect the V8 VSV for purge flow switching valve connector.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) - TBP (E7-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) or TBP (E7-18) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the VSV for purge flow switching valve connector and EFI M relay.
(1) Disconnect the V8 VSV for purge flow switching valve connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

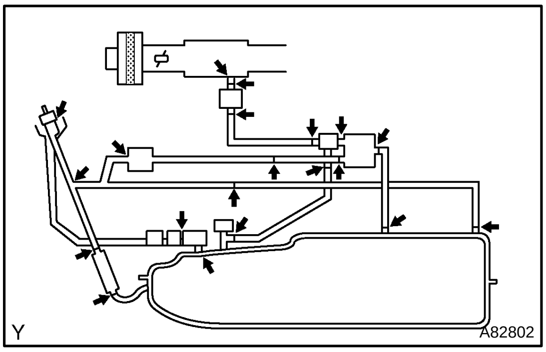
(4) Reconnect the VSV for purge flow switching valve connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

16	CHECK FOR EVAPORATIVE EMISSIONS LEAK(NEAR FUEL TANK)



(a) Check whether hoses close to the fuel tank have been modified, and check if there are signs of any accident near the fuel tank.
(1) Check the following parts for cracks, deformation or loose connections:
- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

OK: No leakage in the system

NG → **REPAIR OR REPLACE EVAPORATIVE EMISSIONS LEAK PART**

OK

17	CHECK VACUUM HOSES((1), (2) AND (3))

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, hole or damage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

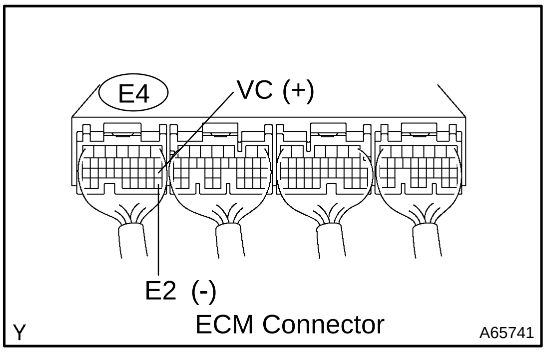
18	CHECK HOSE AND TUBE(FUEL TANK - CHARCOAL CANISTER)

(a) Check the connection between the fuel tank and fuel EVAP pipe, the fuel EVAP pipe and under-floor fuel tube, the under-floor fuel tube and charcoal canister.
(b) Check the hose and the tube for cracks, holes or damage.

NG → **REPAIR OR REPLACE HOSE AND TUBE**

OK

19	INSPECT ECM(VC VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the terminals of the E4 ECM connector.

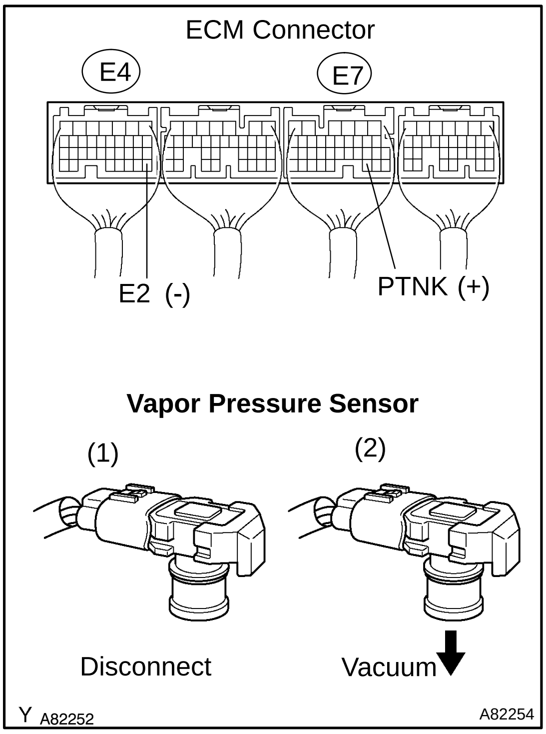
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-24)**

OK

20 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between terminals of the E4 and E7 ECM connectors.
 (1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.9 to 3.7 V

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

 (2) Using the MITYVAC (Hand-held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

Standard (2):

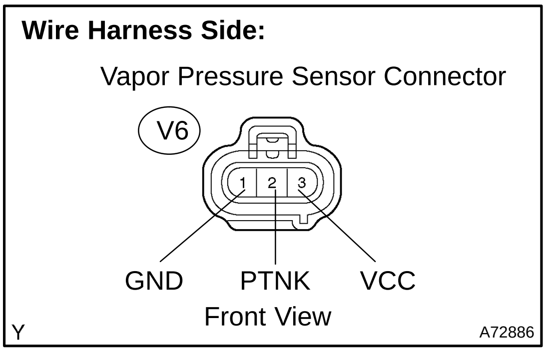
Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	0.5 V or less

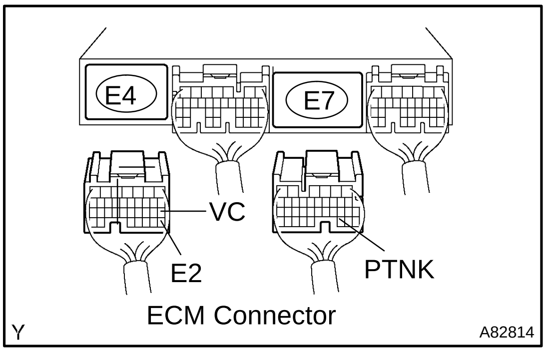
 (3) Reconnect the vacuum hose.

OK **Go to step 22**

NG

21 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)





(a) Disconnect the V6 vapor pressure sensor connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V6-2) - PTNK (E7-30)	Below 1 Ω
GND (V6-1) - E2 (E4-28)	Below 1 Ω
VCC (V6-3) - VC (E4-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V6-2) or PTNK (E7-30) - Body ground	10 kΩ or higher
VCC (V6-3) or VC (E4-18) - Body ground	10 kΩ or higher

(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connectors.

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

22	INSPECT FUEL TANK ASSY

OK: Fuel tank has no crack or hole.

NG → **REPLACE FUEL TANK ASSY**

OK

23	INSPECT CHARCOAL CANISTER ASSY(CRACKS, HOLES AND DAMAGE)

OK: Canister has no crack or holes.

NG → **REPAIR OR REPLACE CHARCOAL CANISTER ASSY**

OK

REPLACE ECM (See page 10-24)

OBDII scan tool (excluding Hand-held Tester):

1	CHECK FUEL TANK CAP ASSY(CHECK THAT FUEL TANK CAP MEETS SPECIFICATIONS)

NG → REPLACE FUEL TANK CAP ASSY

OK

2	CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG → CORRECTLY REINSTALL FUEL TANK CAP

OK

3	INSPECT FUEL TANK CAP ASSY (See page 12-9)

NG → REPLACE FUEL TANK CAP ASSY

OK

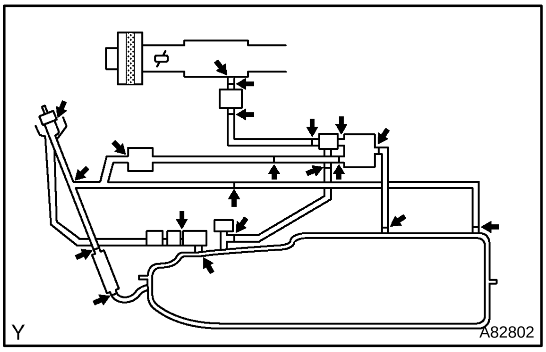
4	CHECK FILLER NECK FOR DAMAGE

(a) Remove the fuel tank cap.
(b) Visually check the fuel inlet pipe for damage.

NG → REPLACE FUEL TANK INLET PIPE SUB-ASSY

OK

5	CHECK FOR EVAPORATIVE EMISSIONS LEAK(NEAR FUEL TANK OR CHACOAL CANISTER)



(a) Check whether hoses close to the fuel tank have been modified, and check if there are signs of any accident near the fuel tank or the charcoal canister.
  (1) Check the following parts for cracks, deformation or loose connection:
  - Fuel tank
  - Charcoal canister
  - Fuel tank filler pipe
  - Hoses and tubes around fuel tank and charcoal canister

NG → REPAIR OR REPLACE EVAPORATIVE EMISSIONS LEAK PART

OK

6	CHECK VACUUM HOSES((1), (2) AND (3))

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, holes or damage.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

7	CHECK HOSE AND TUBE(FUEL TANK - CHARCOAL CANISTER)

(a) Check the connection between the fuel tank and fuel EVAP pipe, the fuel EVAP pipe and under-floor fuel tube, the under-floor fuel tube and charcoal canister.
(b) Check the hose and the tube for cracks, hole or damage.

NG → **REPAIR OR REPLACE HOSE AND TUBE**

OK

8	CHECK VACUUM HOSES((5), (6), (7), (8) AND (9) IN FIG. 1 IN CIRCUIT DESCRIPTION)

(a) Check that the vacuum hoses are connected correctly.
(b) Check the vacuum hoses for looseness or disconnection.
(c) Check the vacuum hoses for cracks, hole or damage.

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

9	CHECK EACH VSV CONNECTOR FOR LOOSENESS AND DISCONNECTION(EVAP VSV, CCV, VSV FOR PURGE FLOW SWITCHING VALVE)

NG → **REPAIR OR CONNECT VSV AND SENSOR CONNECTOR**

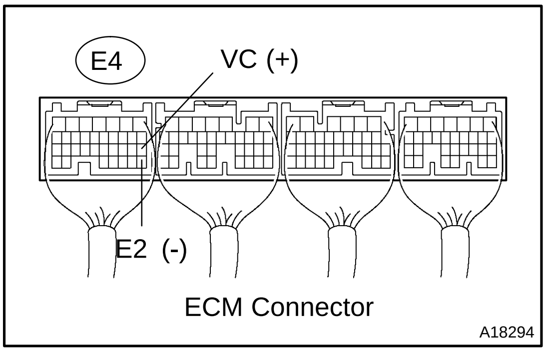
OK

10	INSPECT CHARCOAL CANISTER ASSY(CRACKS, HOLES AND DAMAGE) (See page 12-9)

NG → **CHECK AND REPLACE CHARCOAL CANISTER ASSY**

OK

11 INSPECT ECM(VC VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure voltage between the terminals of the E4 ECM connector.

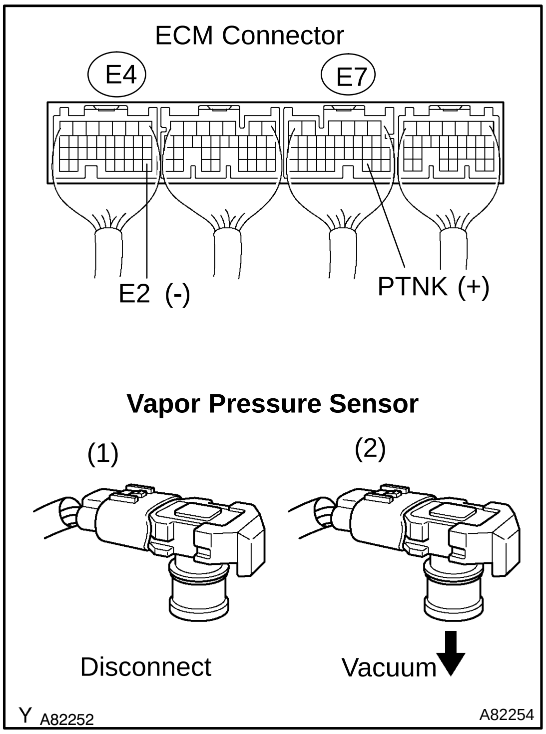
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG **REPLACE ECM (See page 10-24)**

OK

12 INSPECT ECM(PTNK VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the terminals of the E4 and E7 ECM connector.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.9 to 3.7 V

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

(2) Using the MITYVAC (Hand-held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

Standard (2):

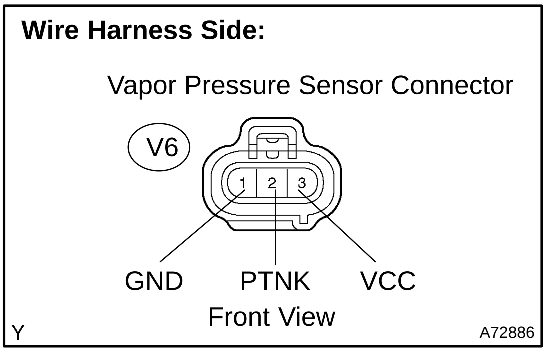
Tester Connection	Specified Condition
PTNK (E6-21) - E2 (E3-28)	0.5 V or less

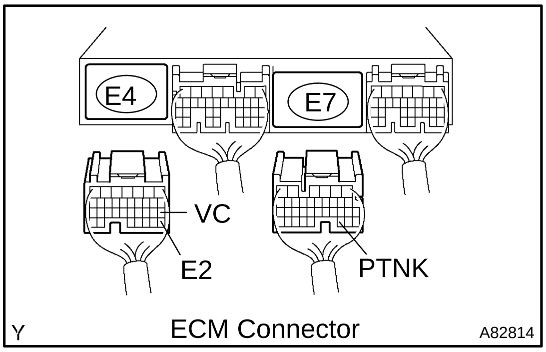
(3) Reconnect the vacuum hose from the vapor pressure sensor.

OK **Go to step 14**

NG

13 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)





(a) Disconnect the V6 vapor pressure sensor connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V6-2) - PTNK (E7-30)	Below 1 Ω
GND (V6-1) - E2 (E4-28)	Below 1 Ω
VCC (V6-3) - VC (E4-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V6-2) or PTNK (E7-30) - Body ground	10 kΩ or higher
VCC (V6-3) or VC (E4-18) - Body ground	10 kΩ or higher

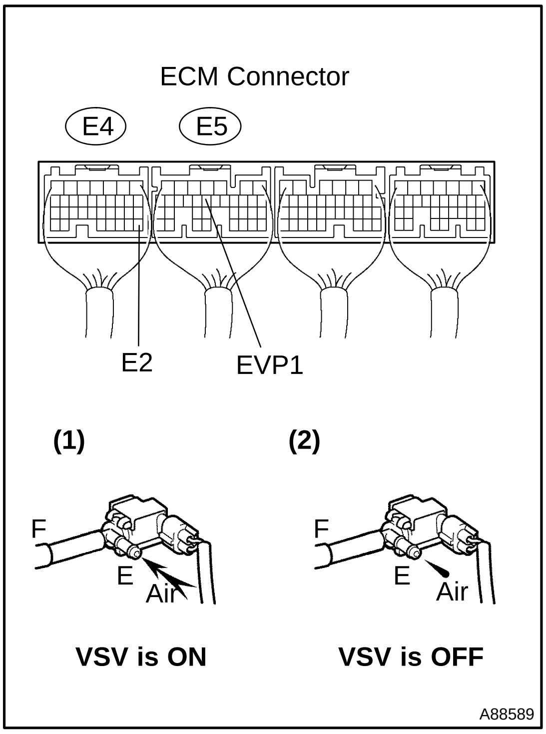
(d) Reconnect the vapor pressure sensor connector
(e) Reconnect the ECM connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

14 INSPECT EVAP VSV(FUNCTION)



(a) Turn the power switch ON (IG).
(b) Check the VSV function.
(1) Connect terminals EVP1 and E2 of the ECM connector (VSV ON).

VSV is ON:
Air from port E flows out through port F

(2) Disconnect terminals EVP1 and E2 of the ECM connector (VSV OFF).

VSV is OFF:
Air does not flow from port E to port F

OK → **Go to step 17**

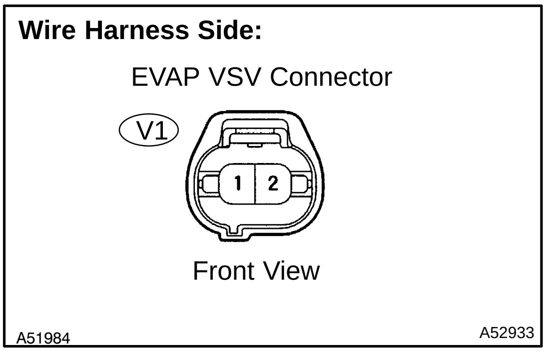
NG

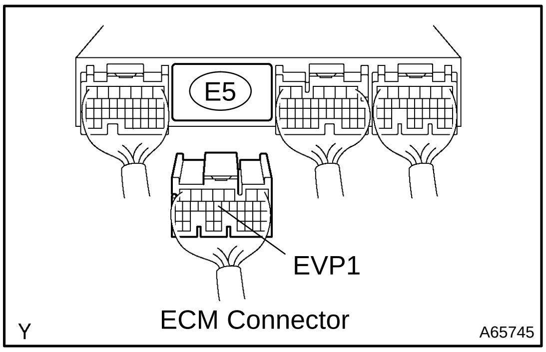
15	INSPECT EVAP VSV(OPERATION) (See page 12-9)

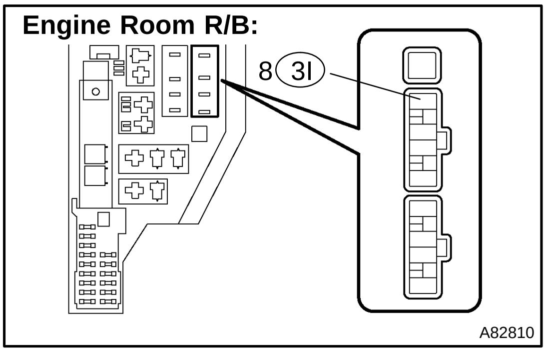
NG → **REPLACE EVAP VSV**

OK

16	CHECK HARNESS AND CONNECTOR(EFI M RELAY - EVAP VSV, EVAP VSV - ECM)







(a) Check the harness and connectors between the EVAP VSV and ECM connectors.
(1) Disconnect the V1 EVAP VSV connector.
(2) Disconnect the E5 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-1) - EVP1 (E5-14)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-1) or EVP1 (E5-14) - Body ground	10 kΩ or higher

(4) Reconnect the EVAP VSV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and connectors between the EVAP VSV connector and EFI M relay.
(1) Disconnect the V1 EVAP VSV connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EVAP VSV (V1-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EVAP VSV (V1-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

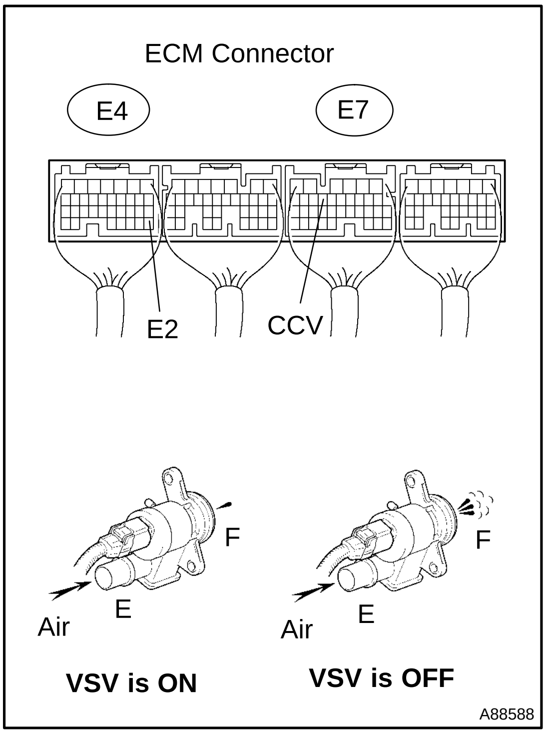
(4) Reconnect the EVAP VSV connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

17	INSPECT CCV(FUNCTION)



(a) Turn the power switch ON (IG).
(b) Check the VSV function.
 (1) Connect terminals CCV and E2 of the ECM connector (VSV ON).
 VSV is ON:
 Air from port E flows out through port F
 (2) Disconnect terminals CCV and E2 of the ECM connector (VSV OFF).
 VSV is OFF:
 Air does not flow from port E to port F

OK → **Go to step 20**

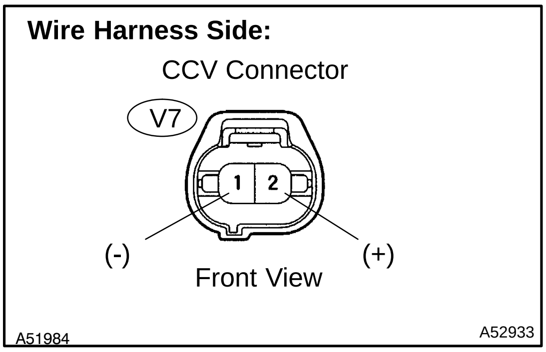
NG

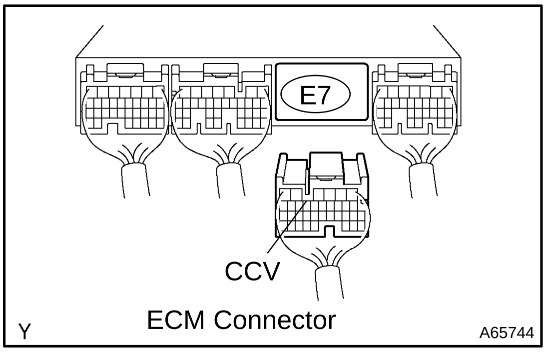
18	INSPECT CCV(OPERATION) (See page 12-9)

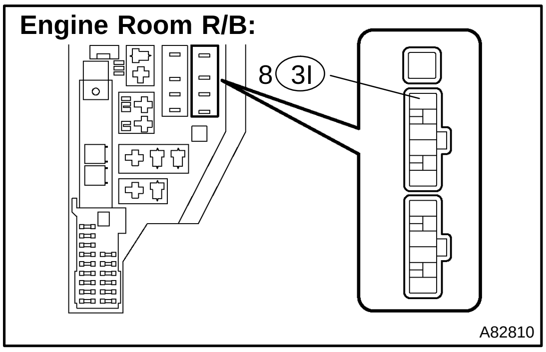
NG → **REPLACE CCV**

OK

19	CHECK HARNESS AND CONNECTOR(EFI M RELAY - CCV, CCV - ECM)







(a) Check the harness and the connectors between the CCV and ECM connectors.
(1) Disconnect the V7 CCV connector.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-1) - CCV (E7-13)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-1) or CCV (E7-13) - Body ground	10 kΩ or higher

(4) Reconnect the CCV connector.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the CCV connector and EFI M relay.
(1) Disconnect the V7 CCV connector.
(2) Remove the integration relay from the engine room R/B.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
CCV (V7-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CCV (V7-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

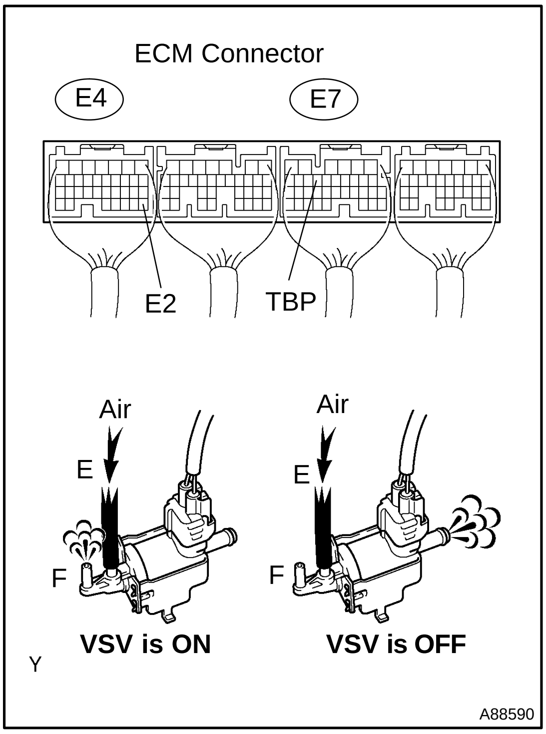
(4) Reconnect the CCV connector.
(5) Reinstall the integration relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-24)

20	INSPECT VSV FOR PURGE FLOW SWITCHING VALVE(FUNCTION)



(a) Turn the power switch ON (IG).
(b) Check the VSV function.
(1) Connect terminals TBP and E2 of the ECM connector (VSV ON).
VSV is ON: Air from port E flows out through port F
(2) Disconnect terminals TBP and E2 of the ECM connector (VSV OFF).
VSV is OFF: Air does not flow from port E to port F

OK → **Go to step 23**

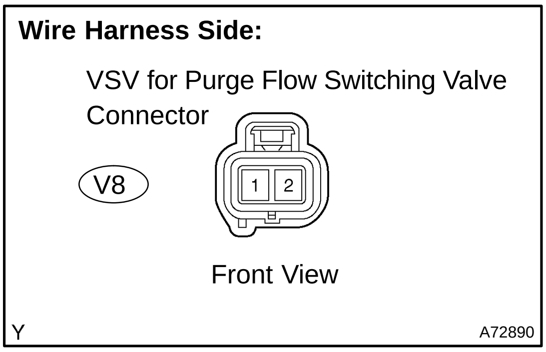
NG

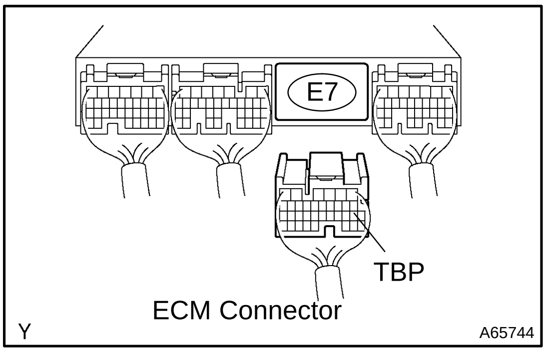
21	INSPECT VSV FOR PURGE FLOW SWITCHING VALVE(OPERATION) (See page 12-9)

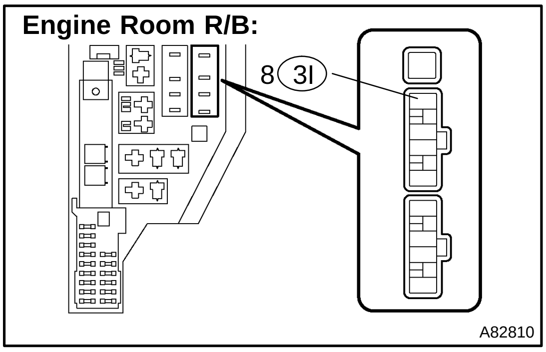
NG → **REPLACE VSV FOR PURGE FLOW SWITCHING VALVE**

OK

22	CHECK HARNESS AND CONNECTOR(EFI M RELAY - VSV FOR PURGE FLOW SWITCHING VALVE, VSV FOR PURGE FLOW SWITCHING VALVE - ECM)







(a) Check the harness and the connectors between the VSV for purge flow switching valve and ECM connectors.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Disconnect the E7 ECM connector.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) - TBP (E7-18)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-1) or TBP (E7-18) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the VSV for purge flow switching valve connector and EFI M relay.

(1) Disconnect the V8 VSV for purge flow switching valve connector.

(2) Remove the integration relay from the engine room R/B.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) - EFI M relay (3I-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VSV for purge flow switching valve (V8-2) or EFI M relay (3I-8) - Body ground	10 kΩ or higher

(4) Reconnect the VSV for purge flow switching valve connector.

(5) Reinstall the integration relay.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (See page 10-24)

23	INSPECT FUEL TANK ASSY

NG → **REPLACE FUEL TANK ASSY**

OK

IT IS LIKELY THAT VEHICLE USER DID NOT PROPERLY CLOSE FUEL TANK CAP

DTC	P0451	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH RANGE/PERFORMANCE

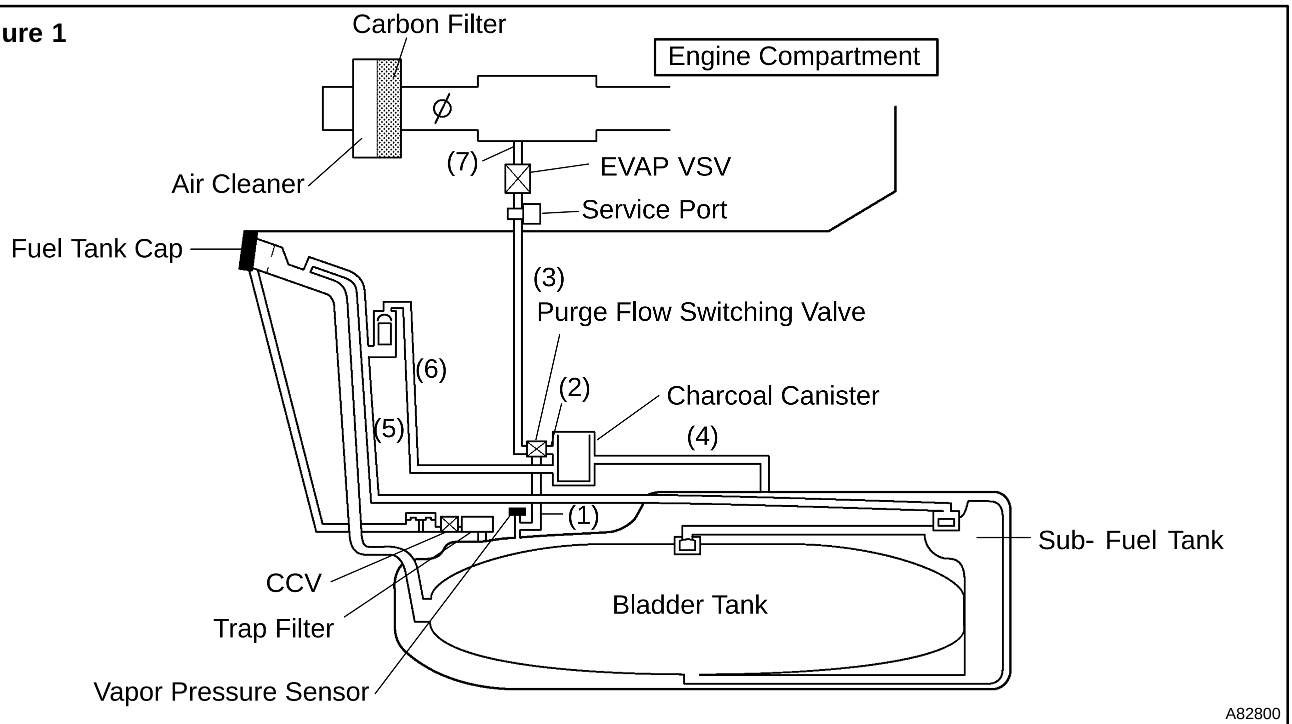
DTC	P0452	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH LOW INPUT

DTC	P0453	EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH HIGH INPUT

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for purge flow switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

Figure 1



DTC No.	DTC Detection Condition	Trouble Area
P0451	Either condition (a) or (b) is met (2 trip detection logic): (a) Output of vapor pressure sensor frequently changes when vehicle speed is 0 mph and engine speed is idling (b) Output of vapor pressure sensor remains stuck for 5 minutes or more	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0452	Output of vapor pressure sensor remains below threshold: (2 trip detection logic)	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0453	Output of vapor pressure sensor remains above threshold: (2 trip detection logic)	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM

MONITOR DESCRIPTION

DTC P0451, P0452 or P0453 is recorded by the ECM when the vapor pressure sensor malfunctions.

P0451

The ECM senses pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference-voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a ”noisy” sensor or a ”stuck” sensor.
The ECM checks for the ”noisy” sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure exceeds specified limits, the ECM will illuminate the MIL and a DTC is set.
The ECM checks for the ”stuck” sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning. The ECM will illuminate the MIL and a DTC is set.

P0452 and P0453

The ECM senses pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference-voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
If the output voltage of the vapor pressure sensor is out of the normal range, the ECM will determine that there is malfunction in the sensor or sensor circuit.
When pressure indicated by the vapor pressure sensor is below -3.999 kPa (-30 mmHg) or above 1.999 kPa (15 mmHg), the ECM interprets this as malfunction in the vapor pressure sensor. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Case 1

Related DTCs	P0451: Evaporative emission control system pressure sensor range/performance (Signal fluctuation monitoring)
Required sensors/components	Main: Vapor pressure sensor Related: Mass air flow meter, engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 seconds
MIL operation	2 driving cycles
Sequence of operation	None

Case 2

Related DTCs	P0451: Evaporative emission control system pressure sensor range/performance (No signal change monitoring)
Required sensors/components	Main: Vapor pressure sensor Related: Mass air flow meter, engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	20 minutes
MIL operation	2 driving cycles
Sequence of operation	None

Case 3

Related DTCs	P0452: Evaporative emission control system pressure sensor low input P0453: Evaporative emission control system pressure sensor high input
Required sensors/components	Main: Vapor pressure sensor Related: Mass air flow meter, engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	7 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Case 1

P0451: Evaporative emission control system pressure sensor range/performance (Signal fluctuation monitoring)

The monitor will run whenever the following DTCs are not present	See page 05-20
Intake air temperature at engine atart compared with engine coolant temperature	Maximum of 7°C (19.4°F) lower or 11.1°C (19.9°F) higher
Engine coolant temperature at engine start	4.4°C (40°F) or more, and 35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F) or more, and 35°C (95°F)

Case 2

P0451: Evaporative emission control system pressure sensor range/performance (Stuck monitoring)

The monitor will run whenever the following DTCs are not present	See page 05-20
Intake air temperature at engine atart compared with engine coolant temperature	Maximum of 7°C (19.4°F) lower or 11.1°C (19.9°F) higher
Engine coolant temperature at engine start	4.4°C (40°F) or more, and 35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F) or more, and 35°C (95°F)

Case 3

(a) P0452: Evaporative emission control system pressure sensor low input
(b) P0453: Evaporative emission control system pressure sensor high input

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine coolant temperature at engine start compared with intake air temperature	Less than 12°C (21.6°F)
Engine coolant temperature at engine start	10°C (50°F) or more, and 35°C (95°F) or less
Intake air temperature at engine start	10°C (50°F) or more, and 35°C (95°F) or less
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Case 1:

P0451: Evaporative emission control system pressure sensor range/performance (Signal fluctuation monitoring)

The number of times the sensor output changed ±0.7 kPa (5 mmHg) or more for 5 to 15 seconds after vehicle stop	7 times or more

Case 2

P0451: Evaporative emission control system pressure sensor range/performance (Stuck monitoring)

Fuel tank pressure "no change" time (variation is less than 0.138 kPa (0.02 mmHg) after engine start)	20 minutes or more

Case 3

(a) P0452: Evaporative emission control system pressure sensor low input

Fuel tank pressure	Less than -3.999 kPa (-30 mmHg) / when engine running

(b) P0453: Evaporative emission control system pressure sensor high input

Fuel tank pressure	1.999 kPa (15 mmHg) or more / when engine running

WIRING DIAGRAM

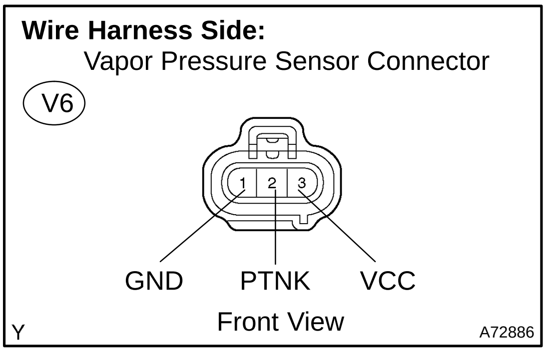
Refer to DTCs P0441 and P0446 on page 05-202 .

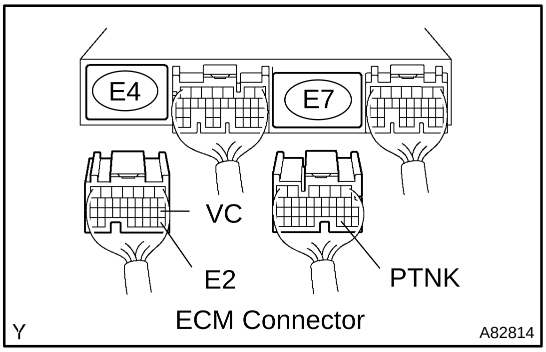
INSPECTION PROCEDURE

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- If DTC P0441 (Purge Flow), P0446 (CCV), P0451, P0452 or P0453 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, troubleshoot DTC P0441, P0446, P0451, P0452 or P0453 first. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand-held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR - ECM)





(a) Disconnect the V6 vapor pressure sensor connector.
(b) Disconnect the E4 and E7 ECM connectors.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V6-2) - PTNK (E7-30)	Below 1 Ω
GND (V6-1) - E2 (E4-28)	Below 1 Ω
VCC (V6-3) - VC (E4-18)	Below 1 Ω

Standard (Check for short):

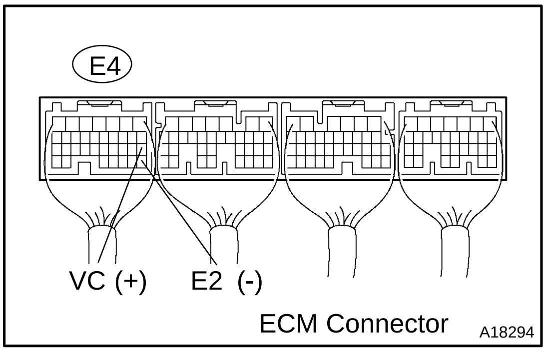
Tester Connection	Specified Condition
PTNK (V6-2) or PTNK (E7-30) - Body ground	10 kΩ or higher
VCC (V6-3) or VC (E4-18) - Body ground	10 kΩ or higher

(d) Reconnect the vapor pressure sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 INSPECT ECM(VC VOLTAGE)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between the specified terminals of the E4 ECM connector.

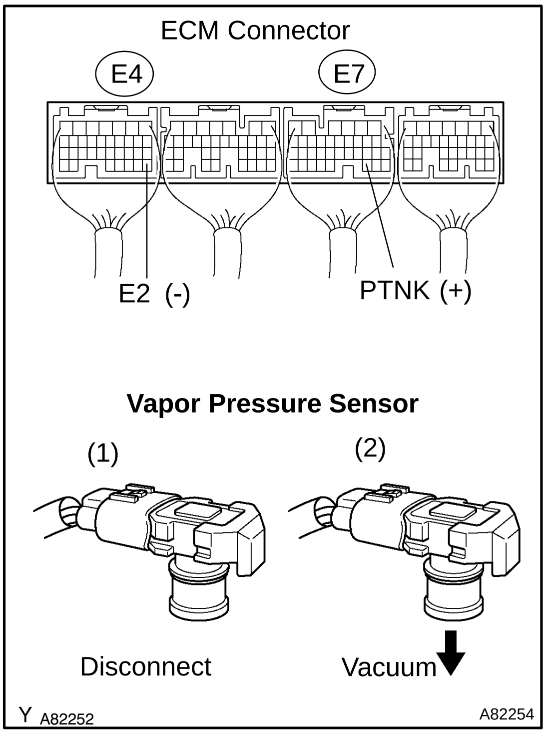
Standard:

Tester Connection	Specified Condition
VC (E4-18) - E2 (E4-28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-24)**

OK

3	INSPECT ECM(PTNK VOLTAGE)



(a) Turn the power switch ON (IG).

(b) Measure the voltage between the specified terminals of the E4 and E7 ECM connectors.

(1) Remove the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand-Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:
The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

Tester Connection	Specified Condition
PTNK (E7-30) - E2 (E4-28)	0.5 V or less

(3) Reinstall the vapor pressure sensor.

OK → **REPLACE ECM (See page 10-24)**

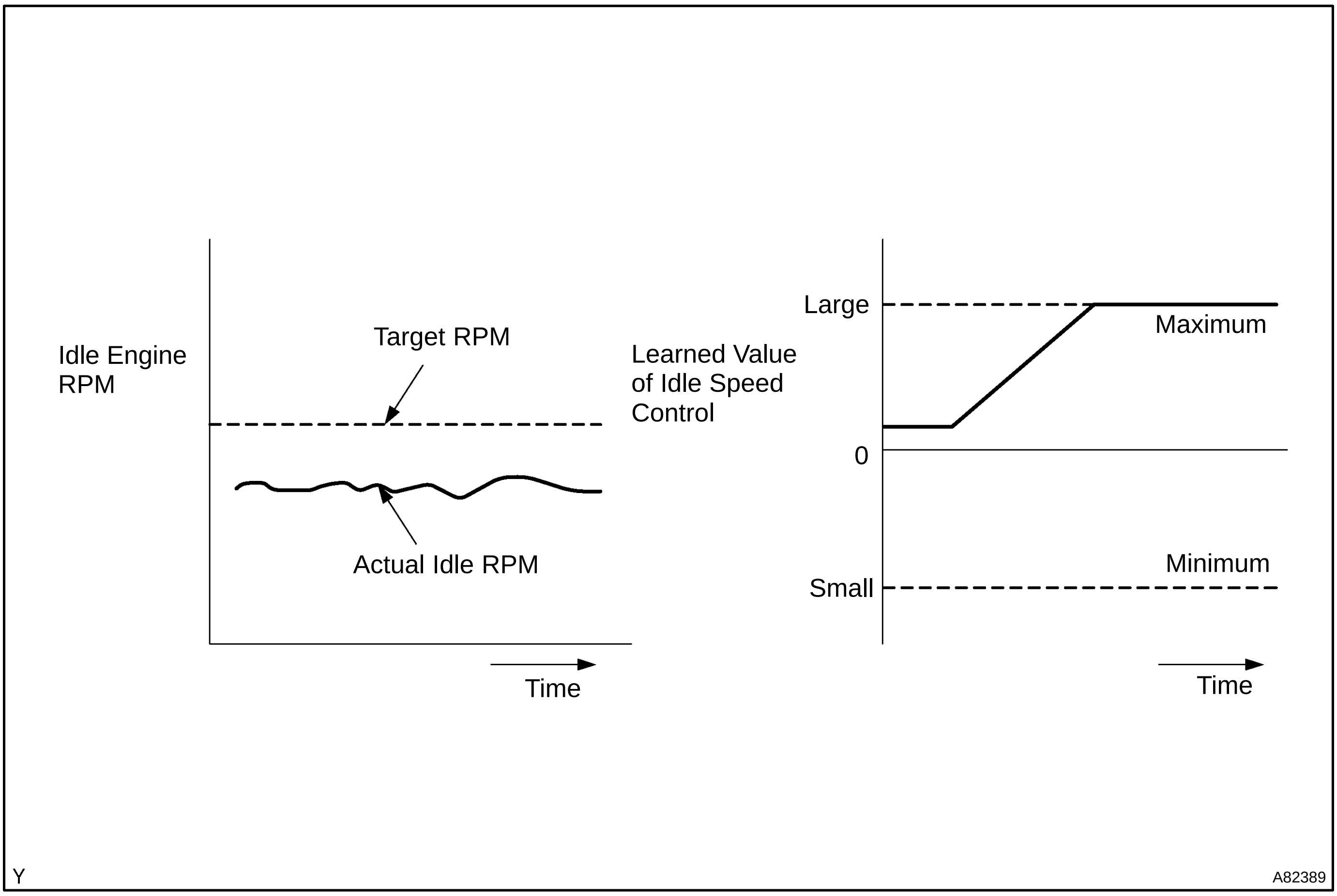
NG

REPLACE VAPOR PRESSURE SENSOR ASSY

DTC	P0505	IDLE AIR CONTROL SYSTEM

MONITOR DESCRIPTION

The idle speed is controlled by the Electronic Throttle Control System (ETCS).
The ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor which detects the opening angle of the throttle valve.
The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. If the actual idle RPM varies more than a specified amount or a learned value of the idle speed control remains at the maximum or minimum five times or more during a trip, the ECM concludes that there is a problem in the idle speed control ECM function. The ECM will turn on the MIL and a DTC is set.
Example:
If the actual idle RPM varies from the target idle RPM by more than 200 (*1) rpm five times during a drive cycle, the ECM will turn on the MIL and a DTC is set.
HINT:
*1: RPM threshold varies depending on engine loads.



DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (1 trip detection logic)	• Electric throttle control system • Air induction system • PCV hose connection • ECM

MONITOR STRATEGY

Related DTCs	P0505: Idle air control malfunction (Functional check)
Required sensors/components	Main: Crankshaft position sensor Related: Vehicle speed sensor, engine coolant temperature sensor
Frequency of operation	Once per driving cycle
Duration	10 minutes
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Following conditions are met: (during idling after driving for more than 6.2 mph (10 km/h) per cycle)	A & B & C
A. Either of following conditions is met:	1 or 2
1. Deviation of engine speed (when shift position N or A/C ON)	Less than -100 rpm, or more than 200 rpm
2. Deviation of engine speed (when shift position D or A/C OFF)	Less than -100 rpm, or more than 150 rpm
B. IAC flow rate (learned value)	0.6 L/sec or less or 4.5 L/sec or more
C. Number of detection	5 times/trip

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0505)

(a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the hand-held tester or the OBD II scan tool ON.
(d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(e) Read DTCs using the hand-held tester or the OBD II scan tool.

Result:

Display (DTC Output)	Proceed to
P0505	A
P0505 and other DTCs	B

HINT:
If any other codes besides P0505 are output, perform troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART**
(See page 05-55)

A

2	CHECK CONNECTION OF PCV HOSE

OK: PCV hose is connected correctly and has no damage.

NG → **REPAIR OR REPLACE PCV HOSE**

OK

3	CHECK AIR INDUCTION SYSTEM

(a) Check for vacuum leaks in the air induction system.
OK: No leakage in the air induction system.

NG → **REPAIR OR REPLACE AIR INDUCTION SYSTEM**

OK

CHECK ELECTRIC THROTTLE CONTROL SYSTEM (See page 10-3)

DTC	P0560	SYSTEM VOLTAGE

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even if the ignition switch is OFF. This electricity allows the ECM to store DTC history, freeze frame data, fuel trim values, and other data. If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back-up power source circuit	• Open in back-up power source circuit • ECM

HINT:
If DTC P0560 is present, the ECM will not store other DTCs.

MONITOR STRATEGY

Related DTCs	P0560: System voltage malfunction
Required sensors/components	ECM
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	Immediately
Sequence of operation	None

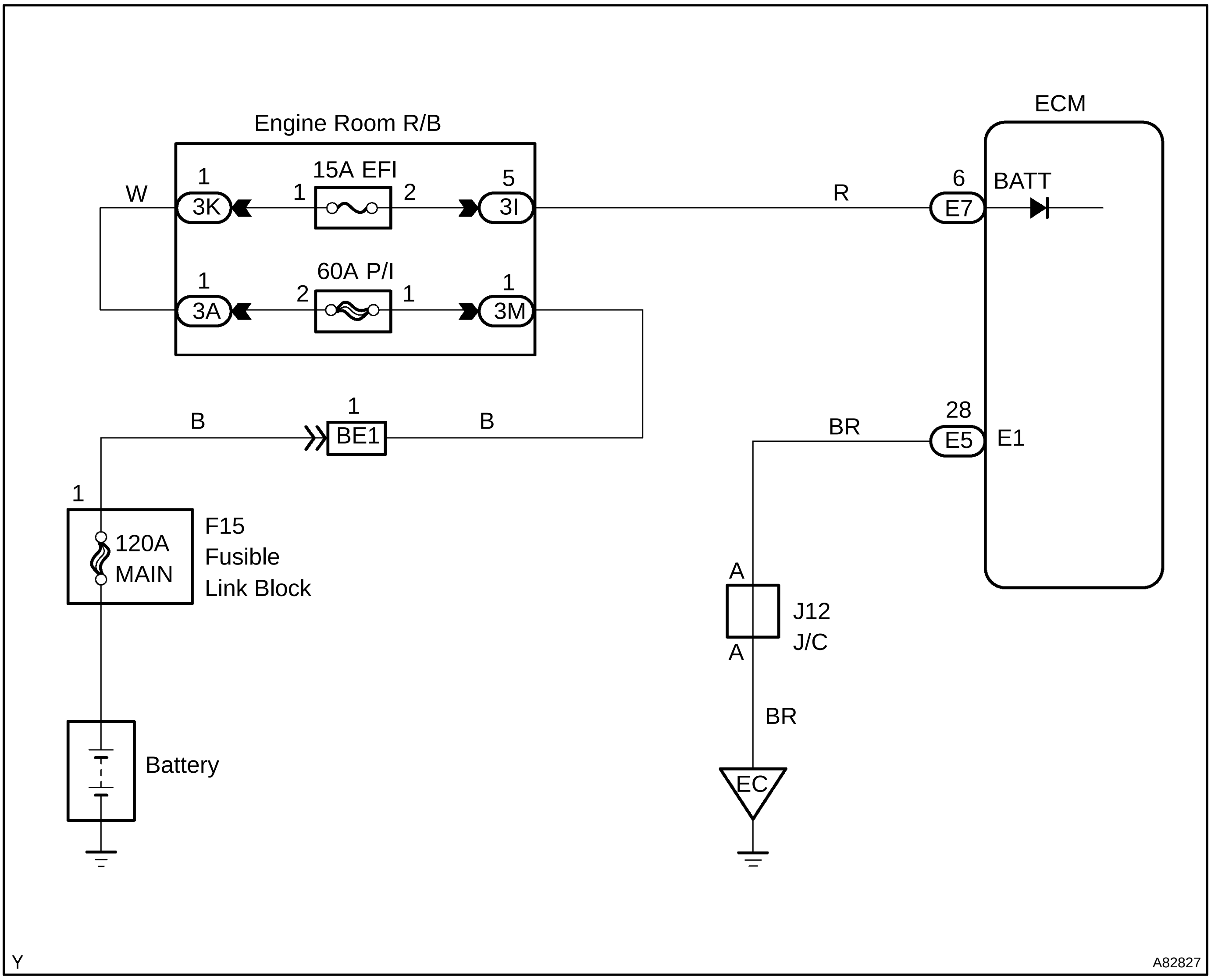
TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Stand-by RAM	Initialized

TYPICAL MALFUNCTION THRESHOLDS

Battery voltage	Less than 3.5 V

WIRING DIAGRAM

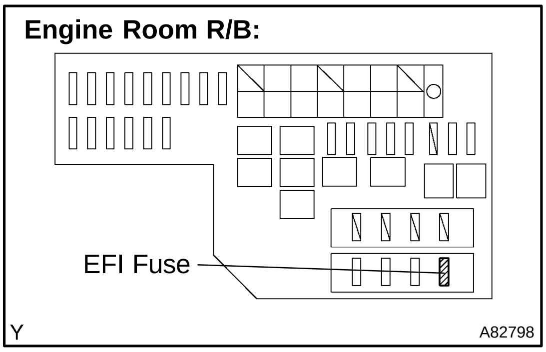


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	CHECK FUSE(EFI FUSE)



(a) Remove the EFI fuse from the engine room R/B.

(b) Check the resistance of the EFI fuse.

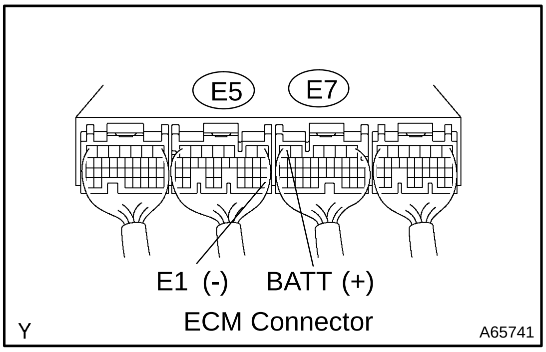
Standard: Below 1 Ω

(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED TO FUSE**

OK

2	INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E5 and E7 ECM connectors.

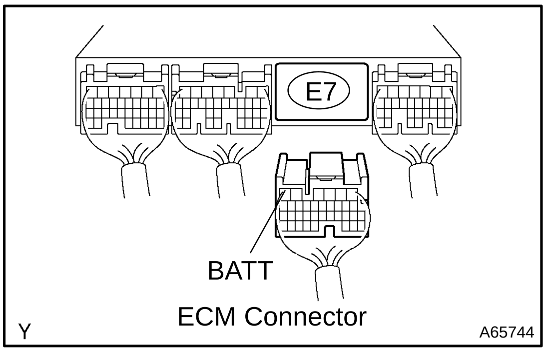
Standard:

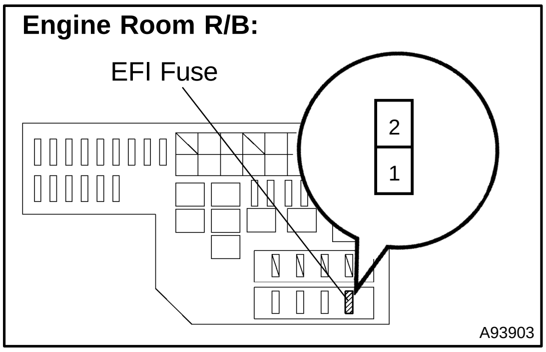
Tester Connection	Specified Condition
BATT (E7-6) - E1 (E5-28)	9 to 14 V

OK → **REPLACE ECM (See page 10-24)**

NG

3	CHECK HARNESS AND CONNECTOR(ECM - EFI FUSE, EFI FUSE - BATTERY)





(a) Check the harness and the connectors between the EFI fuse and the ECM connector.
(1) Remove the integration relay from the engine room R/B.
(2) Disconnect the E7 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EFI fuse (2) - BATT (E7-6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI fuse (2) or BATT (E7-6) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.
(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the EFI fuse and the battery.
(1) Remove the integration relay from the engine room R/B.
(2) Disconnect the positive battery terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal - EFI fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or EFI fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the integration relay.
(5) Reconnect the positive battery terminal.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE ROOM RELAY BLOCK

DTC	P0604	INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P0657	ACTUATOR SUPPLY VOLTAGE CIRCUIT/OPEN

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self-check ensures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.
The ECM memory status is diagnosed by internal "mirroring" of the main CPU and the sub CPU to detect random access memory (RAM) errors. The two CPUs also perform continuous mutual monitoring.
The ECM sets a DTC if: 1) output from the 2 CPUs are different and deviate from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detection Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM internal errors	• ECM

MONITOR STRATEGY

Related DTCs	P0604: ECM RAM errors P0606: ECM CPU malfunction P0657: ETCS power supply function of ECM malfunction
Required sensors/ components	ECM
Frequency of operation	Continuous
Duration	Within 1 second
MIL operation	Immediately
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20

TYPICAL MALFUNCTION THRESHOLDS

ECM RAM errors:

Difference between main and sub CPUs output	Larger than the specified range

ECM CPU malfunction:

Either of the following conditions is met:	
Difference between throttle position of main CPU and throttle position of sub CPU	0.3 V or more
Difference between accelerator pedal position of main CPU and accelerator pedal position of sub CPU	0.3 V or more

Electronic throttle control system power supply function of ECM malfunction:

Electronic throttle control system power supply when ignition switch is turned from OFF to ON	7 V or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

REPLACE ECM (See page 10-24)

05287-27

PROBLEM SYMPTOMS TABLE

When the malfunction is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, use this table and troubleshoot according to the priority order given below.

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	26.MG1 27.Hybrid system 28.Immobilizer 29.Push start system	- 05-404 05-2321 -
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Spark plug 4. Immobilizer system 5. Injector 6. ECM 7. Crankshaft position sensor circuit	05-366 05-373 18-3 05-2321 11-7 10-5 05-177
No complete combustion (Does not start)	1. Fuel pump control circuit 2. Spark plug 3. Immobilizer system 4. Injector 5. Crankshaft position sensor circuit	05-373 18-3 05-2321 11-7 05-177
Engine cranks normally but difficult to start	1. Fuel pump control circuit 2. Compression 3. Spark plug 4. Injector 5. Crankshaft position sensor circuit	05-373 14-1 18-3 11-7 05-177
Difficult to start with cold engine	1. Fuel pump control circuit 2. Spark plug 3. Injector 4. Crankshaft position sensor circuit	05-373 18-3 11-7 05-177
Difficult to start with hot engine	1. Fuel pump control circuit 2. Spark plug 3. Injector 4. Crankshaft position sensor circuit	05-373 18-3 11-7 05-177
High engine idle speed (Poor idling)	1. ECM power source circuit 2. Electronic throttle control system	05-366 05-13
Low engine idle speed (Poor idling)	1. Fuel pump control circuit 2. Electronic throttle control system 3. Injector	05-373 05-13 11-7
Rough idling (Poor idling)	1. Compression 2. Electronic throttle control system 3. Injector 4. Fuel pump control circuit 5. Spark plug	14-1 05-13 11-7 05-373 18-3
Hunting (Poor idling)	1. ECM power source circuit 2. Electronic throttle control system 3. Fuel pump control circuit	05-366 05-13 05-373
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. Injector 3. Spark plug 4. HV transaxle	05-373 11-7 18-3 -
Surging (Poor driveability)	1. Fuel pump control circuit 2. Spark plug 3. Injector	05-373 18-3 11-7

Symptom	Suspected Area	See page
Engine stalls soon after starting	1. Fuel pump control circuit	05-373
	2. Electronic throttle control system	05-13
	3. Immobilizer	05-2321
	4. Crankshaft position sensor circuit	05-177
Unable to refuel/Difficult to refuel	1. ORVR system	¿

05FNI-02

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

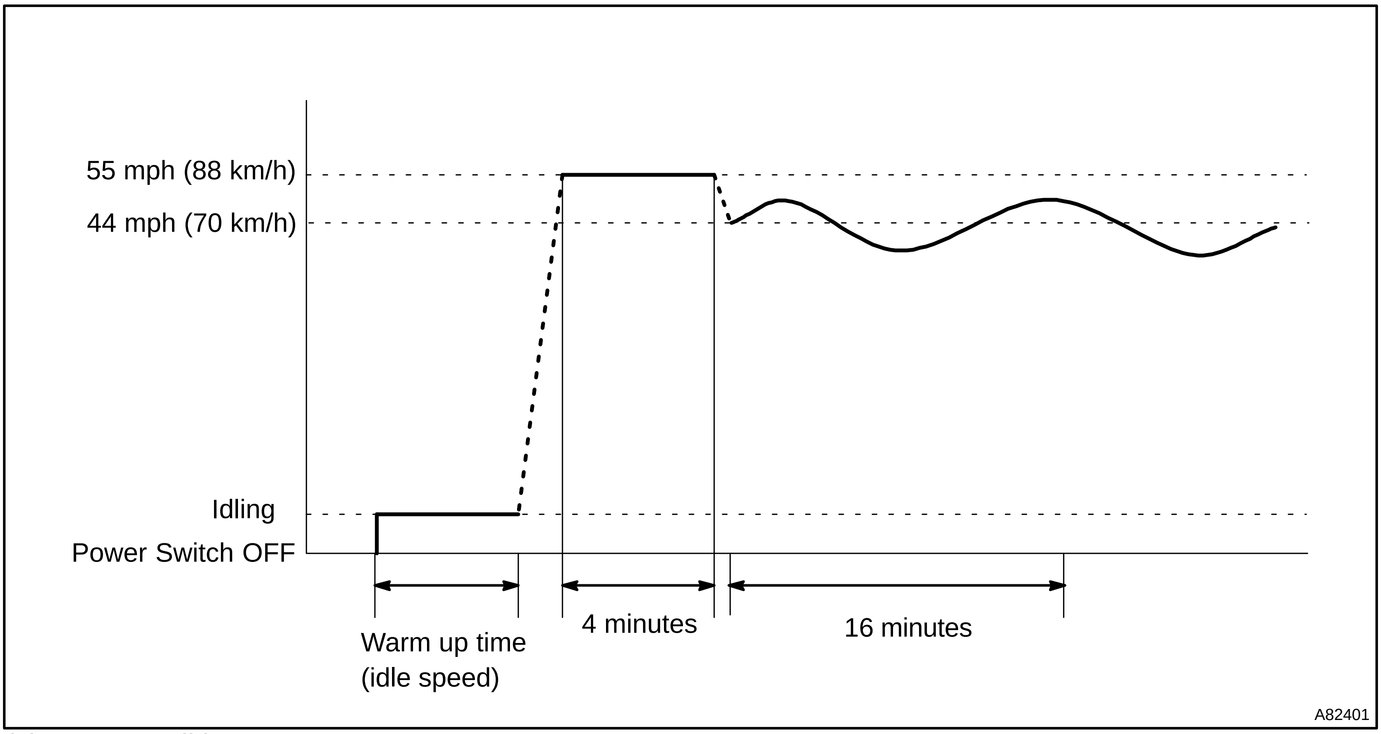
- The On-Board Diagnostic (OBD II) system is designed to monitor the performance of emission-related components, and report any detected abnormalities with Diagnostic Trouble Codes (DTCs). Since various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called readiness monitors.
- The hand-held tester's software must be version 9.0 or newer to view the readiness monitor status. From the "Enhanced OBD II Menu", select "Monitor Status" to view the readiness monitor status.
- A generic OBD II scan tool can also be used to view the readiness monitor status.
- When the readiness monitor status reads "complete", the necessary conditions have been met for running performance tests for that readiness monitor.

HINT:
Many state Inspection and Maintenance (I/M) programs require a vehicle's readiness monitor status to show "complete".

- The Readiness Monitor will be reset to "incomplete" if:
  - The ECM has lost battery power or a fuse has blown.
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- If the readiness monitor status shows "incomplete", follow the appropriate readiness monitor drive pattern to change the status to "complete".

CAUTION:
Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.
NOTICE:
The following drive patterns are the fastest method of completing all the requirements necessary for making the readiness monitor status read "complete".
If forced to momentarily stop a drive pattern due to traffic or other factors, the drive pattern can be resumed. Upon completion of the drive pattern, in most cases, the readiness monitor status will change to "complete".
Sudden changes in vehicle loads and speeds, such as driving up and down hills and / or sudden acceleration, hinder readiness monitor completion.

2. CATALYST MONITOR (A/F SENSOR TYPE)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF.
- Engine Coolant Temperature (ECT) is 80˚C (176˚F) or greater.
- Intake Air Temperature (IAT) is -10˚C (14˚F) or greater.*

NOTICE:

*** 2002 and later MY vehicles:**

To completed the readiness test in cold ambient conditions (less than -10˚C [14˚F]), turn the power switch OFF and then turn it ON again. Perform the drive pattern a second time.

(b) Drive Pattern

(1) Connect the hand-held tester or OBD II scan tool to DLC3 to check readiness monitor status and preconditions.

(2) Put the engine in inspection mode (see page 01-27).

(3) Start the engine and warm it up.

(4) Deactivate inspection mode and drive the vehicle with shift position in B at 44 to 55 mph (70 to 88 km/h) for approximately 4 minutes(the engine must be run during monitoring).

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

If IAT was less than 10˚C (50˚F) when the engine was started, drive the vehicle at 44 to 55 mph (70 to 88 km/h) for additional 4 minutes.

(5) Drive the vehicle allowing speed to fluctuate between 44 to 55 mph (70 to 88 km/h) for about 16 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden closure of the throttle valve.

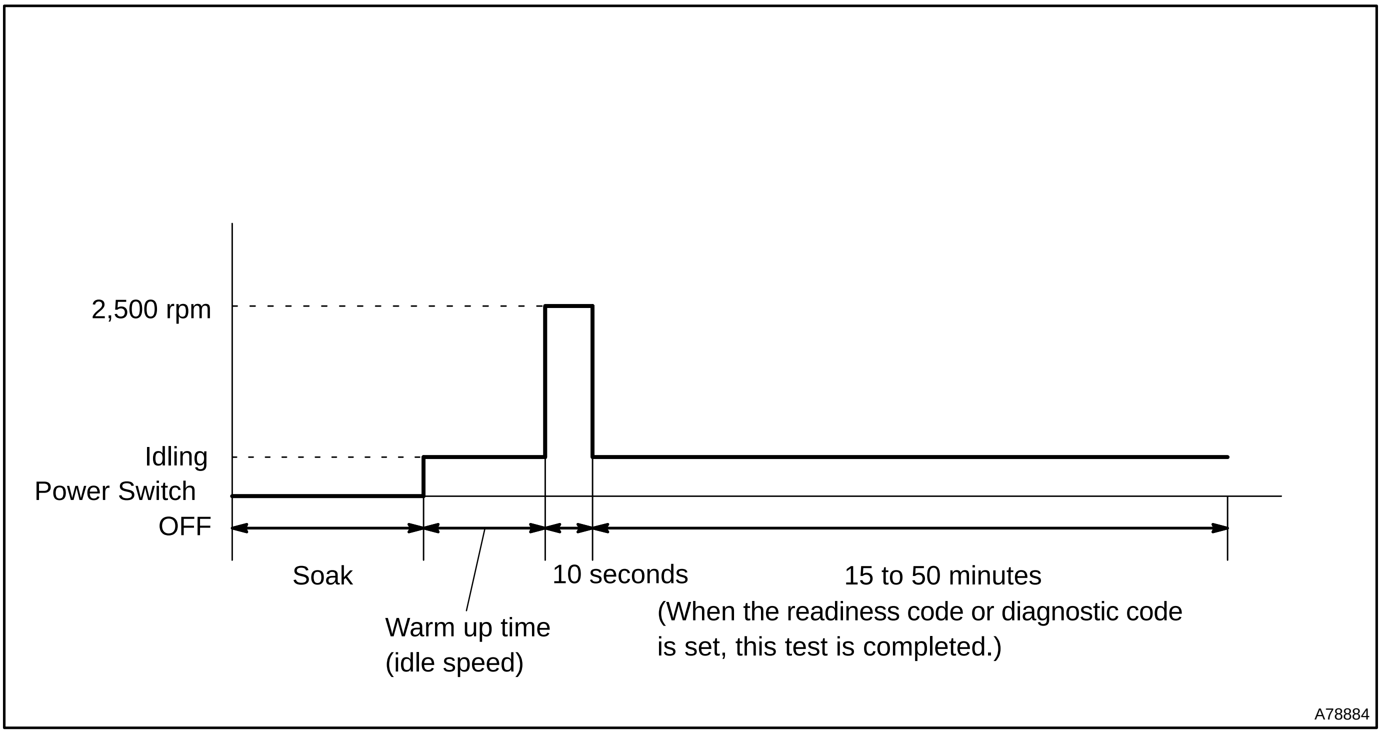
(6) Check the status of the readiness monitor on the scan tool display. If readiness monitor status did not switch to complete, verify that the preconditions are met, turn the power switch OFF, and then repeat steps (4) and (5).

3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:
A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

(a) Cold Soak Preconditions
- MIL is OFF.
- Fuel level is approximately 1/2 to 3/4 full.
- Altitude is 8,000 feet (2,438 m) or less.

(b) Cold Soak Procedure
Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT reaches less than 7˚C (13˚F).



(c) EVAP Monitor Preconditions
The monitor will not run unless:
- MIL is OFF.
- Fuel level is approximately 1/2 to 3/4 full.
- Altitude is 8,000 feet (2438 m) or less.*
- Engine Coolant Temperature (ECT) is between 4.4˚C and 35˚C (40˚F and 95˚F).
- Intake Air Temperature (IAT) is between 4.4˚C and 35˚C (40˚F and 95˚F).*
- Cold Soak Procedure has been completed.
- Before starting the engine, the difference between ECT and IAT must be less than 7˚C (13˚F).

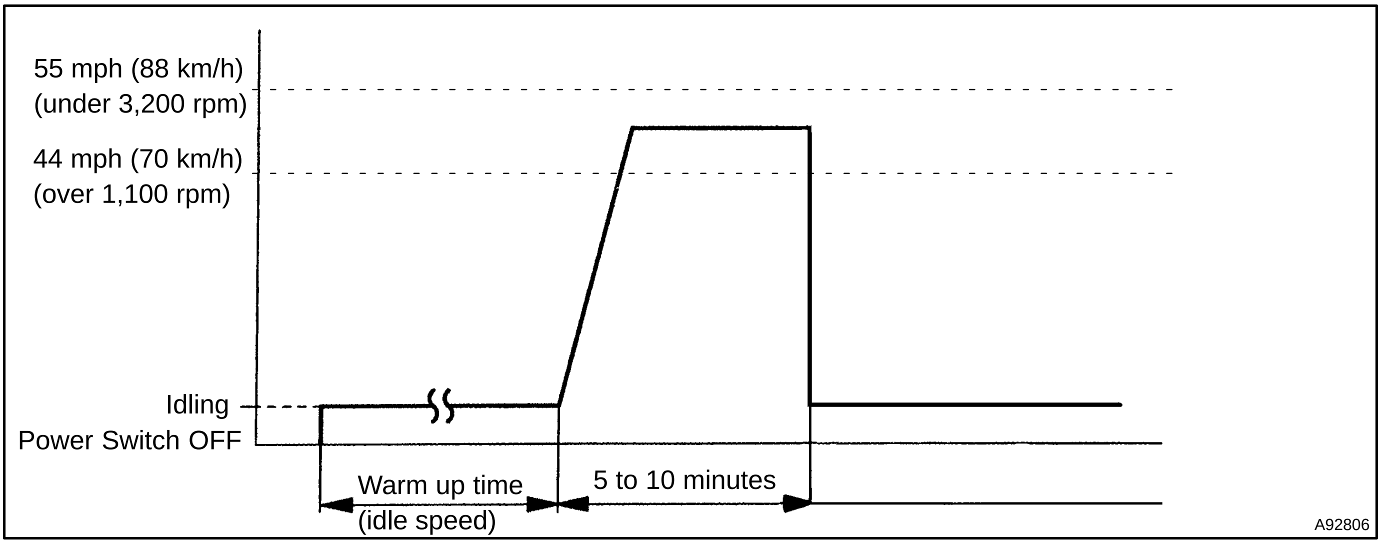
HINT:
- Example 1
  ECT = 24˚C (75˚F)
  IAT = 16˚C (60˚F)
  Difference between ECT and IAT is 8˚C (15˚F).
  → The monitor will not run because the difference between ECT and IAT is greater than 7˚C (13˚F).

- Example 2
  ECT = 21°C (70°F)
  IAT = 20°C (68°F)
  Difference between ECT and IAT is 1°C (2°F).
  → The monitor will run because the difference between ECT and IAT is less than 7°C (13°F).

NOTICE:
*** NOTE for 2002 and later MY vehicles:**
The readiness test can be completed in cold ambient conditions (less than 4.4°C [40°F]) and/or at high altitudes (more than 8,000 feet / 2,438 m).Finish the drive pattern, turn the power switch OFF and then turn ON the HV main system again, and repeat the drive pattern a second time.

(d) Drive Pattern
  (1) Connect the hand-held tester or OBD II scan tool to DLC3 to check monitor status and preconditions (refer to step "c").
  (2) Release pressure in fuel tank by removing the fuel tank cap, and then reinstall it.
  (3) Put the engine in inspection mode (see page 01-27).
  (4) Start the engine and allow it to idle until ECT reaches 75°C (167°F) or higher.
  (5) Run the engine at 2,500 rpm for about 10 seconds.
  (6) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

4. OXYGEN / AIR FUEL RATIO SENSOR MONITOR (FRONT A/F SENSOR AND REAR O2S SYSTEM)

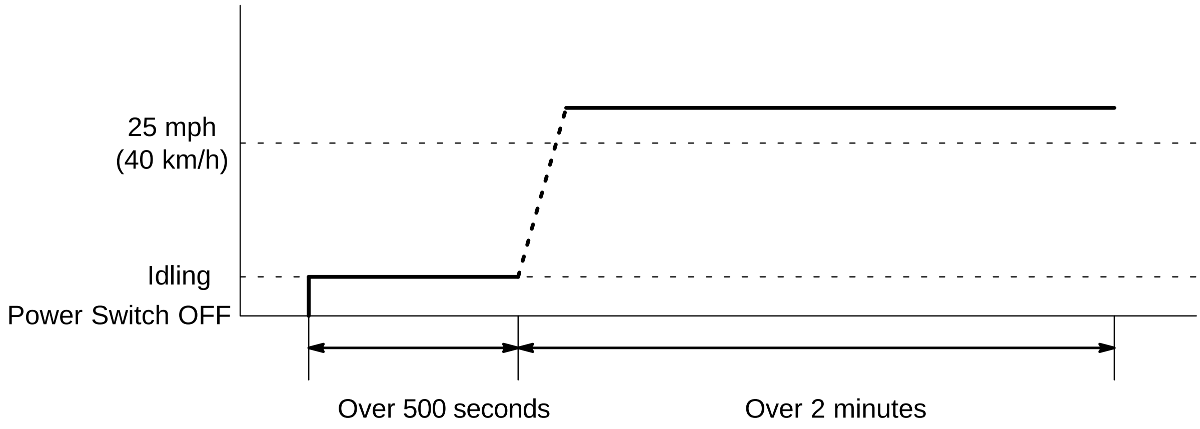


(a) Preconditions
  The monitor will not run unless:
  MIL is OFF

(b) Drive Pattern
  (1) Connect the hand-held tester or OBD II scan tool to DLC3 to check monitor status and preconditions.
  (2) Put the engine in inspection mode.
  (3) Start the engine and allow it to idle for 2 minutes.
  (4) Deactivate the inspection mode and drive the vehicle at 44 to 55 mph (70 to 88 km/h) or more for 5 to 10 minutes.
  (5) Check the readiness monitor status. If the readiness monitor status did not switch to "complete," check the preconditions, turn the power switch OFF, and then repeat steps (1) to (9).

NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

5. OXYGEN / A/F SENSOR HEATER MONITOR

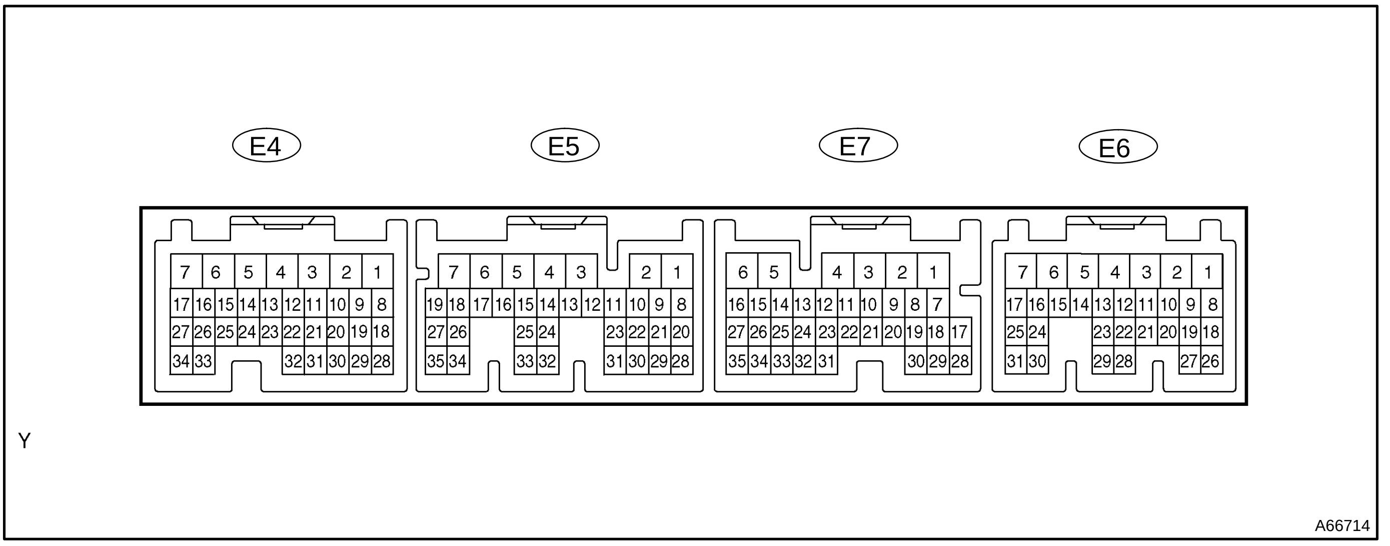


(a) Preconditions
The monitor will not run unless:
MIL is OFF.

(b) Drive Pattern
(1) Connect the hand-held tester or OBD II scan tool to DLC3 to check monitor status and preconditions.
(2) Put the engine in inspection mode.
(3) Start the engine and allow it to idle for 500 seconds or more.
(4) Deactivate the inspection mode and drive the vehicle at 25 mph (40 km/h) or more at least for 2 minutes.
(5) Check the readiness monitor status. If the readiness monitor status did not change to ”complete”, check the preconditions, turn the power switch OFF, and repeat steps (2) and (3).

NOTICE:
Do not drive the vehicle without deactivating inspection mode, otherwise damaging the transaxle may result.

TERMINALS OF ECM



Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminals No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "STD voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
BATT (E7-6) - E1 (E5-28)	R - BR	Battery	Always	9 to 14
+B (E7-4) - E1 (E5-28)	B - BR	Power source of ECM	Power switch ON (IG)	9 to 14
+BM (E7-5) - E1 (E5-28)	GR - BR	Power source of ETCS	Always	9 to 14
IGSW (E6-9) - E1 (E5-28)	O - BR	Power switch signal	Power switch ON (IG)	9 to 14
MREL (E7-7) - E1 (E5-28)	G - BR	Main relay control signal	Power switch ON (IG)	9 to 14
VC (E4-18) - E2 (E4-28)	R - BR	Power source of sensor (a specific voltage)	Power switch ON (IG)	4.5 to 5.5
NE+ (E4-33) - NE- (E4-34)	R - G	Crankshaft position sensor	Idling (during inspection mode)	Pulse generation (See page 05-177)
G2 (E4-26) - NE- (E4-34)	R - G	Camshaft position sensor	Idling (during inspection mode)	Pulse generation (See page 05-177)
VTA (E4-32) - E2 (E4-28)	P - BR	Throttle position sensor	Power switch ON (IG), Throttle valve fully closed	0.5 to 1.2
VTA (E4-32) - E2 (E4-28)	P - BR	Throttle position sensor	HV system ON, During active test to open throttle valve (see page 05-47)	3.2 to 4.8
VTA2 (E4-31) - E2 (E4-28)	L - BR	Throttle position sensor	Power switch ON (IG), Accelerator pedal released	2.0 to 2.9
VTA2 (E4-31) - E2 (E4-28)	L - BR	Throttle position sensor	HV system ON, During active test to open throttle valve (see page 05-47)	4.6 to 5.5
VG (E5-33) - EVG (E5-32)	G - R	Mass air flow meter	Idling (during inspection mode), A/C switch OFF	1.0 to 1.5
THA (E4-20) - E2 (E4-28)	W - BR	Intake air temperature sensor	Idling (during inspection mode), Intake air temperature at 20°C	0.5 to 3.4
THW (E4-19) - E2 (E4-28)	W - BR	Engine coolant temperature sensor	Idling (during inspection mode), Engine coolant temperature at 80°C	0.2 to 1.0
#10 (E4-2) - E01 (E4-7)	Y - BR	Injector	Power switch ON (IG)	9 to 14
#20 (E4-3) - E01 (E4-7)	B - BR	Injector	Power switch ON (IG)	9 to 14
#30 (E4-4) - E01 (E4-7)	L - BR	Injector	Power switch ON (IG)	9 to 14
#40 (E4-5) - E01 (E4-7)	R - BR	Injector	Power switch ON (IG)	9 to 14

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
IGT1 (E4-8) - E1 (E5-28)	Y - BR	Ignition coil No. 1 (#1) (Ignition signal)	Idling (during inspection mode)	Pulse generation (See page 05-185)
IGT2 (E4-9) - E1 (E5-28)	W - BR	Ignition coil No. 1 (#2) (Ignition signal)	Idling (during inspection mode)	Pulse generation (See page 05-185)
IGT3 (E4-10) - E1 (E5-28)	G - BR	Ignition coil No. 1 (#3) (Ignition signal)	Idling (during inspection mode)	Pulse generation (See page 05-185)
IGT4 (E4-11) - E1 (E5-28)	Y - BR	Ignition coil No. 1 (#4) (Ignition signal)	Idling (during inspection mode)	Pulse generation (See page 05-185)
KNK1 (E5-1) - EKNK (E5-2)	B - W	Knock sensor	Idling (during inspection mode)	Pulse generation (See page 05-172)
IGF (E4-23) - E1 (E5-28)	B - BR	Ignition confirmation signal	Idling (inspection mode)	Pulse generation (See page 05-185)
A1A+ (E5-23) - E1 (E5-28)	G - BR	A/F sensor	Power switch ON (IG)	3.0 to 3.6
A1A- (E5-22) - E1 (E5-28)	R - BR	A/F sensor	Power switch ON (IG)	2.7 to 3.3
OX1B (E6-22) - E2 (E4-28)	Y - BR	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation
HA1A (E5-7) - E04 (E4-1)	Y - BR	A/F sensor heater	Idling (during inspection mode)	Below 3.0
HA1A (E5-7) - E04 (E4-1)	Y - BR	A/F sensor heater	Power switch ON (IG)	9 to 14
HT1B (E6-6) - E03 (E6-7)	G - BR	Heated oxygen sensor heater	Idling (during inspection mode)	Below 3.0
HT1B (E6-6) - E03 (E6-7)	G - BR	Heated oxygen sensor heater	Power switch ON (IG)	9 to 14
PTNK (E7-30) - E2 (E4-28)	Y - BR	Vapor pressure sensor	Power switch ON (IG)	2.9 to 3.7
PTNK (E7-30) - E2 (E4-28)	Y - BR	Vapor pressure sensor	Apply vacuum 4.0 kPa	Below 0.5
EVP1 (E5-14) - E1 (E5-28)	R - BR	EVAP VSV	Power switch ON (IG)	9 to 14
CCV (E7-13) - E1 (E5-28)	L - BR	CCV	Power switch ON (IG)	9 to 14
TBP (E7-18) - E1 (E5-28)	R - BR	Tank bypass VSV	Power switch ON (IG)	9 to 14
M+ (E5-6) - E1 (E5-28)	L - BR	Throttle actuator control motor	Idling (during inspection mode)	Pulse generation
M- (E5-5) - E1 (E5-28)	P - BR	Throttle actuator control motor	Idling (during inspection mode)	Pulse generation
OCV+ (E4-15) - OCV- (E4-14)	Y - W	Camshaft timing oil control	Power switch ON (IG)	Pulse generation (See page 05-63)
TAM (E7-21) - E2 (E4-28)	W - BR	Outside air temperature sensor	Ambient air temperature -40 °C to 140°C (-40 to 284°F)	0.8 to 1.3
MOPS (E5-15) - E1 (E5-28)	Y - BR	Engine oil pressure	Power switch ON (IG), not engine running	9 to 14
WBAD (E7-20) - E1 (E5-28)	R - BR	Water valve position signal	Power switch ON (IG)	0.3 to 4.7
THW2 (E7-33) - E1 (E5-28)	W - BR	CHS tank outlet temperature sensor	Power switch ON (IG), Coolant temperature at 80°C	0.2 to 1.0
WSL1 (E7-24) - WSL2 (E7-23)	Y - V	Water valve motor	Changing valve position	Pulse generation
WPL (E7-15) - E1 (E5-28)	V - BR	CHS water pump	Pre-heat mode	0 to 2
FAN (E7-8) - E1 (E5-28)	LG - BR	Cooling fan relay	Power switch ON (IG), Engine coolant temperature less than 94.5°C	9 to 14
W (E6-18) - E1 (E5-28)	LG - BR	MIL	Idling (during inspection mode)	9 to 14
W (E6-18) - E1 (E5-28)	LG - BR	MIL	Power switch ON (IG)	Below 3.0
FC (E6-10) - E1 (E5-28)	G - BR	Fuel pump control	Power switch ON (IG)	9 to 14
FC (E6-10) - E1 (E5-28)	G - BR	Fuel pump control	Idling (during inspection mode)	Below 3.0
TC (E6-14) - E1 (E5-28)	P - BR	Terminal TC of DLC3	Power switch ON (IG)	9 to 14
NEO (E7-1) - E1 (E5-28)	LG - BR	Revolution signal	Idling (during inspection mode)	Pulse generation
GO (E7-2) - E1 (E5-28)	Y - BR	Revolution signal	Idling (during inspection mode)	Pulse generation

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
CANH (E6-31) - E1 (E5-28)	B - BR	CAN communication line	Power switch ON (IG)	Pulse generation
CANL (E6-30) - E1 (E5-28)	W - BR	CAN communication line	Power switch ON (IG)	Pulse generation

DTC	U0293	LOST COMMUNICATION WITH HV ECU

CIRCUIT DESCRIPTION

The Controller Area Network (CAN) is a serial data communication system for real-time application. It is a multiplex communication system designed for on-vehicle use that provides a superior communication speed of 500 kbps and a capability to detect malfunction. Through the combination of the CANH and CANL bus lines, the CAN is able to maintain communication based on differential voltage.

HINT:

- Malfunction in the CAN bus (communication line) can be checked through the DLC3 connector, except in case of an open circuit in the DLC3 sub bus line.
- DTCs pertaining to CAN communication can be accessed through the use of the intelligent tester II (with CAN extension module).
- Malfunction in the DLC3 sub bus line cannot be detected through CAN communication, even though the DLC3 connector is connected to CAN communication.

DTC No.	DTC Detecting Condition	Trouble Area
U0293	When communication with HV ECU is interrupted	• Wire harness • HV ECU • ECM

MONITOR DESCRIPTION

The ECM and the HV control ECU are connected through a set of communication lines on the CAN, in order to maintain mutual communication. The ECM uses the communication lines to transmit the engine speed or other pieces of information to the HV control ECU. The HV control ECU transmits signals such as a engine torque request signal to the ECM.

A few seconds after the power switch is turned ON, the ECM starts checking for any malfunction in the communication with the HV ECU. If the ECM detects a malfunction in the communication, the ECM sets a DTC and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	U0293: Lost communication with HV ECU
Required sensors/ components	ECM
Frequency of operation	Continuous
Duration	0.68 second
MIL operation	Immediately
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Power switch	ON

TYPICAL MALFUNCTION THRESHOLDS

Communication signal	No signal from HV ECU

WIRING DIAGRAM

Refer to CAN Communication System on page 05-2591 .

INSPECTION PROCEDURE

Refer to CAN Communication System on page 05-2594 .

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

STEERING COLUMN

031Q3-01

SERVICE DATA

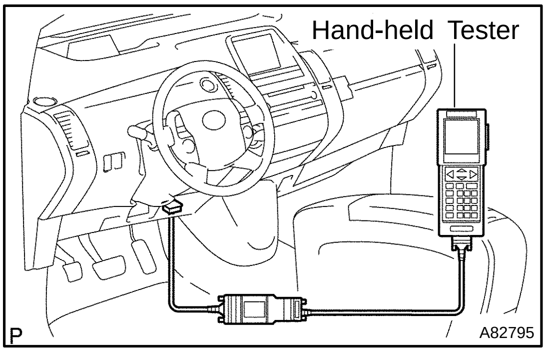
Steering wheel free play	Maximum	30 mm (1.18 in.)

031QE-01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Steering column assembly set bolt	25	255	18
Power steering motor set bolt	18	185	13
Steering Intermediate shaft assy No.2 x Steering column assembly	35	360	26
Steering Intermediate shaft assy No.2 x Steering sliding yoke sub-assy	35	360	26
Steering sliding yoke sub-assy x Steering Intermediate shaft assy	35	360	26
Steering wheel set nut	50	510	37
Tilt lever bracket set screw	2.0	20	37
Steering wheel pad set screw (Torx screw)	8.8	90	78 in.·lbf
Power steering motor assy x Steering column assembly	18	185	18 in.·lbf
Power steering ECU assy	5	50	44 in.·lbf
Tie rod end lock nut	74	750	54

CHECK MODE PROCEDURE



1. CHECK MODE (SIGNAL CHECK)

(a) Connect the hand-held tester to the DLC3.

(b) Turn the power switch on (IG).

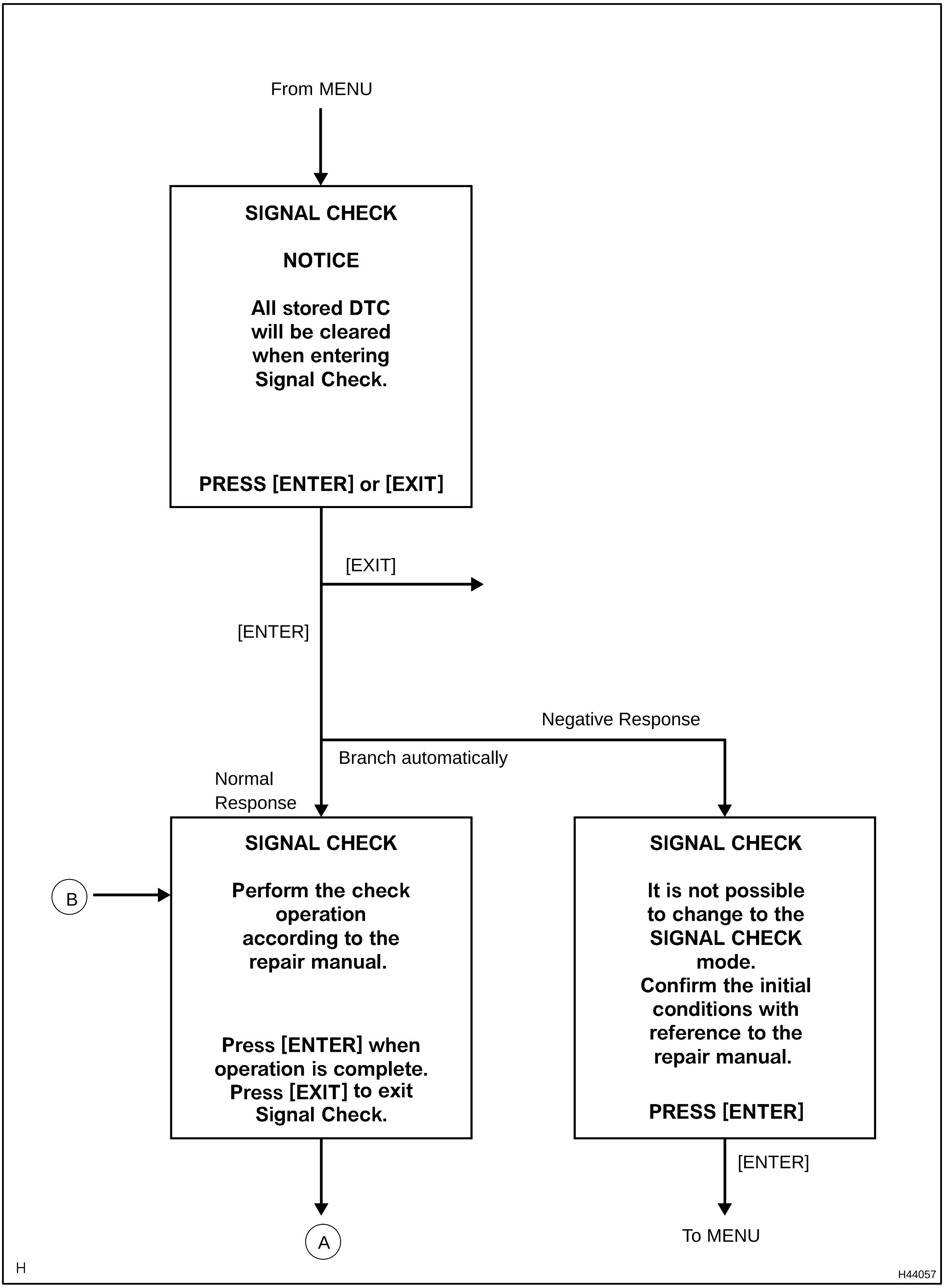
(c) Select the "SIGNAL CHECK", and proceed checking with the hand-held tester.

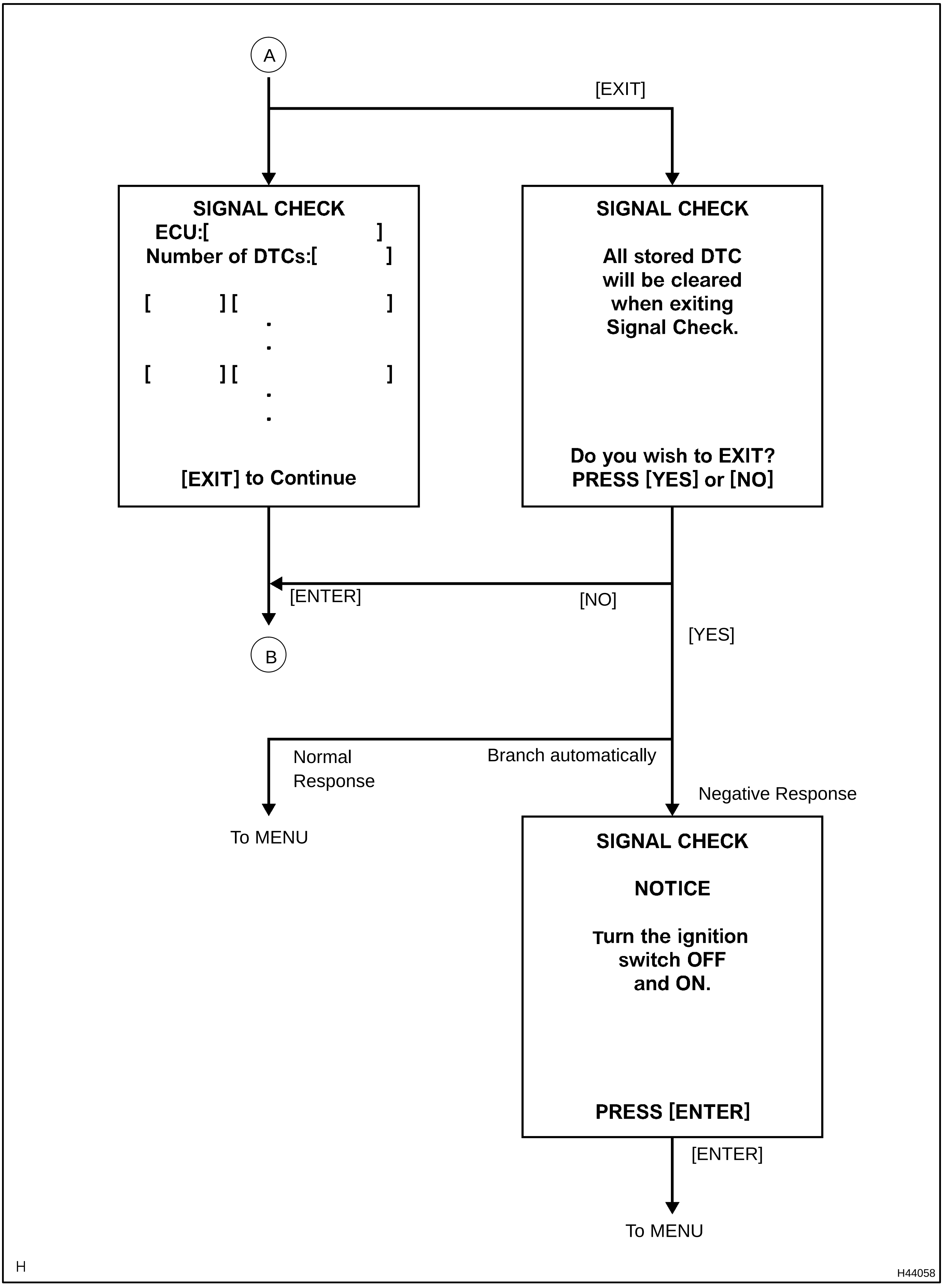
HINT:

- Malfunctions can be detected in the check mode better than the normal check mode.
- If the normal system code is output in the normal check mode even when a sensor signal malfunction is suspected, perform the inspection in the check mode.

[System Selection Screen]

"DIAGNOSIS" - "OBD/MOBD" - "MODEL YEAR" - "MODEL SELECTION = PRIUS" - Select the option parts - "SRS AIRBAG " - "SIGNAL CHECK"


From MENU
SIGNAL CHECK
NOTICE
All stored DTC will be cleared when entering Signal Check.
PRESS [ENTER] or [EXIT]
[EXIT]
[ENTER]
Negative Response
Branch automatically
Normal Response
SIGNAL CHECK
Perform the check operation according to the repair manual.
Press [ENTER] when operation is complete. Press [EXIT] to exit Signal Check.
B
SIGNAL CHECK
It is not possible to change to the SIGNAL CHECK mode. Confirm the initial conditions with reference to the repair manual.
PRESS [ENTER]
[ENTER]
A
To MENU
H
H44057


A
[EXIT]
SIGNAL CHECK
ECU:[ ]
Number of DTCs:[ ]
[ ] [ ]
[ ] [ ]
[EXIT] to Continue
SIGNAL CHECK
All stored DTC will be cleared when exiting Signal Check.
Do you wish to EXIT?
PRESS [YES] or [NO]
[ENTER]
[NO]
[YES]
B
Normal Response
Branch automatically
Negative Response
To MENU
SIGNAL CHECK
NOTICE
Turn the ignition switch OFF and ON.
PRESS [ENTER]
[ENTER]
To MENU
H
H44058

05IX8-01

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name ____________________

Customer's Name		**VIN**	
		Production Date	
		Licence Plate No.	
Date Vehicle Brought In		**Odometer Reading**	km Miles

Date Problem Occurred	
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Condition	
Details of Problem	

Vehicle Inspection, and Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnostic System Inspection

SRS Warning Light Inspection	**1st Time**	☐ Remains on ☐ Sometimes comes on ☐ Does not come on
	2nd Time	☐ Remains on ☐ Sometimes comes on ☐ Does not come on
DTC Inspection	**1st Time**	☐ Normal System Code ☐ Trouble Code [Code.]
	2nd Time	☐ Normal System Code ☐ Trouble Code [Code.]

DATA LIST/ACTIVE TEST

HINT:
By accessing the DATA LIST displayed by the hand-held tester, you can perform such functions as reading the values of switches and sensors without removing any parts. Reading the DATA LIST is the first step of troubleshooting and is one method to shorten labor time.

(d) Connect the hand-held tester to the DLC3.
(e) Turn the power switch on (IG).
(f) Following the display on the tester screen, read the ”DATA LIST”.

1. DATA LIST FOR AIRBAG ECU ASSY

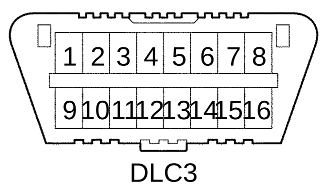
[System Selection Screen]

”DIAGNOSIS” - ”OBD/MOBD” - ”MODEL YEAR” - ”MODEL SELECTION = PRIUS” - Select the option parts - ”SRS AIRBAG” - ”DATA LIST” - ”ALL”

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
D SEAT POSITION	Seat position (Driver side)/ FORWARD: Seat position forward BKWARD: Seat position back FAIL: Failure detected	FORWARD/BKWARD	-
PASSENGER DETECT	Passenger detection/ NG: Indeterminate data NONE: Seat vacant DETECT: Seat occupied FAIL: Failure detected	NG/NONE/DETECT	-
D BUCKLE SW	Buckle switch (Driver side)/ ON: Seat belt fastened OFF: Seat belt not fastened NG: In determinate data	ON/OFF	-
P BUCKLE SW	Buckle switch (Passenger side)/ ON: Seat belt fastened OFF: Seat belt not fastened NG: In determinate data	ON/OFF	-
DISPLAY TYPE	Display type identification information/ LR: Display indicated by LH/RH DP: Display indicated by Driver/Passenger	DP	-
#CODES	Number of past DTC recorded/ Min.: 0, Max.: 255	0	-

05IX9-01

DIAGNOSIS SYSTEM



1. CHECK DLC3

(a) The HV ECU uses the ISO 14230 and ISO 9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 14230 and ISO 9141-2 format.

Symbols (Terminals No.)	Terminal Description	Condition	Specified condition
SIL (7) - SG (5)	Bus " +" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	HIGH-level CAN bus line	Power switch is off	54 to 67 Ω
CANH (6) - Battery positive	HIGH-level CAN bus line	Power switch is off	1 MΩ or Higher
CANH (6) - CG (4)	HIGH-level CAN bus line	Power switch is off	3 kΩ or Higher
CANL (14) - Battery positive	LOW-level CAN bus line	Power switch is off	1 MΩ or Higher
CANL (14) - CG (4)	LOW-level CAN bus line	Power switch is off	3 kΩ or Higher

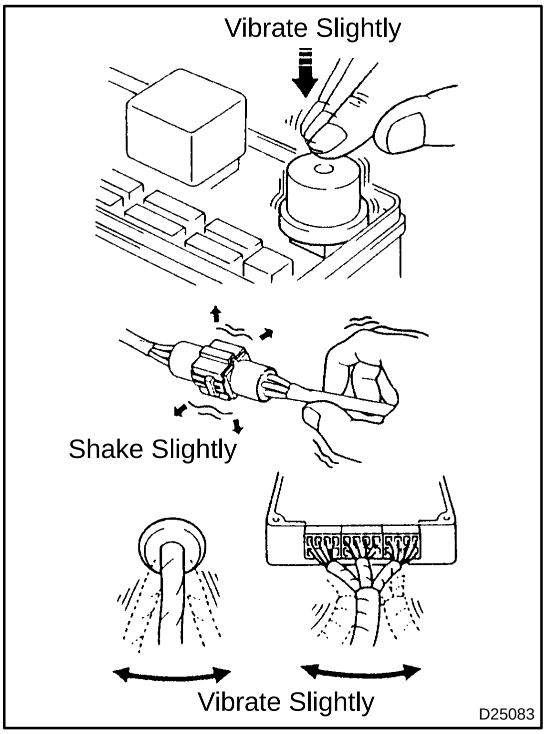
HINT:
If the display shows UNABLE TO CONNECT TO VEHICLE after connecting the cable of the hand-held tester to the DLC3, turning the power switch on (IG) and operating the hand-held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.

2. SYMPTOM SIMULATION

HINT:

The most difficult case in troubleshooting is when no symptoms occur. In such cases, a thorough customer problem analysis must be carried out. Then the same or similar conditions and environment in which the problem occurred in the customer's vehicle should be simulated. No matter how experienced or skilled a technician may be, if he proceeds to troubleshoot without confirming the problem symptoms, he will likely overlook something important and make a wrong guess at some points in the repair operation. This leads to a standstill in troubleshooting.



(a) Vibration method: When vibration seems to be the major cause.

HINT:

Perform the simulation method only during the primary check period (for approximately 6 seconds after the power switch on (IG)).

(1) Slightly vibrate the part of the sensor considered to be the problem cause with your fingers and check whether the malfunction occurs.

HINT:

Shaking the relays too strongly may result in open relays.

(2) Slightly shake the connector vertically and horizontally.

(3) Slightly shake the wire harness vertically and horizontally.
The connector joint and fulcrum of the vibration are the major areas to be checked thoroughly.

3. FUNCTION OF SRS WARNING LIGHT

(a) Primary check

(1) Turn the power switch off. Wait for at least 2 seconds, then turn the power switch on (IG). The SRS warning light comes on for approximately 6 seconds and the diagnosis of the SRS airbag system (including the seat belt) is performed.

HINT:

If trouble is detected during the primary check, the SRS warning light remains on even after the primary check period (for approximately 6 seconds after the power switch is turned on (IG)) has elapsed.

(b) Constant check

(1) After the primary check, the airbag ECU assy monitors the SRS airbag system for trouble.

HINT:

If trouble is detected during the constant check, the airbag ECU assy functions as follows:

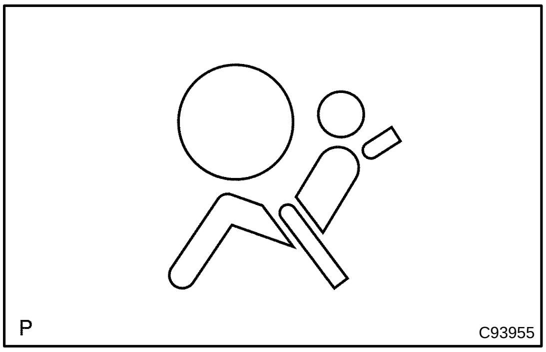
- The SRS warning light comes on.
- The SRS warning light goes off and then comes on. This blinking pattern indicates the source voltage drop. The SRS warning light goes off 10 seconds after the source voltage returns to normal.

(c) Review

(1) When the SRS airbag system is normal:
The SRS warning light comes on only during the primary check period (for approximately 6 seconds after the power switch is turned on (IG)).

(2) When the SRS airbag system has trouble:
- The SRS warning light remains on.
- The SRS warning light goes off after the primary check, but comes on again during the constant check.
- The SRS warning light does not come on when turning the power switch from off to on (IG).

HINT:
The airbag ECU assy keeps the SRS warning light on if one of the airbags has been deployed.



4. SRS WARNING LIGHT CHECK

(a) Turn the power switch on (IG) and check that the SRS warning light comes on for approximately 6 seconds (primary check).

(b) Check that the SRS warning light goes off approximately 6 seconds after the power switch is turned on (IG) (constant check).

HINT:
When any of the following symptoms occur, refer to the "Problem Symptoms Table" (see page 05-1393):
- The SRS warning light comes on occasionally even after the primary check period has elapsed, there may be an open or short in the SRS warning light circuit.
- The SRS warning light comes on even when a DTC or normal system code is not output.
- The SRS warning light does not come on when the power switch is turned from off to on (IG).

5. ACTIVATION PREVENTION MECHANISM

(a) An activation prevention mechanism is built into the connector (airbag ECU assy side) of the SRS airbag system squib circuit to prevent accidental airbag activation.

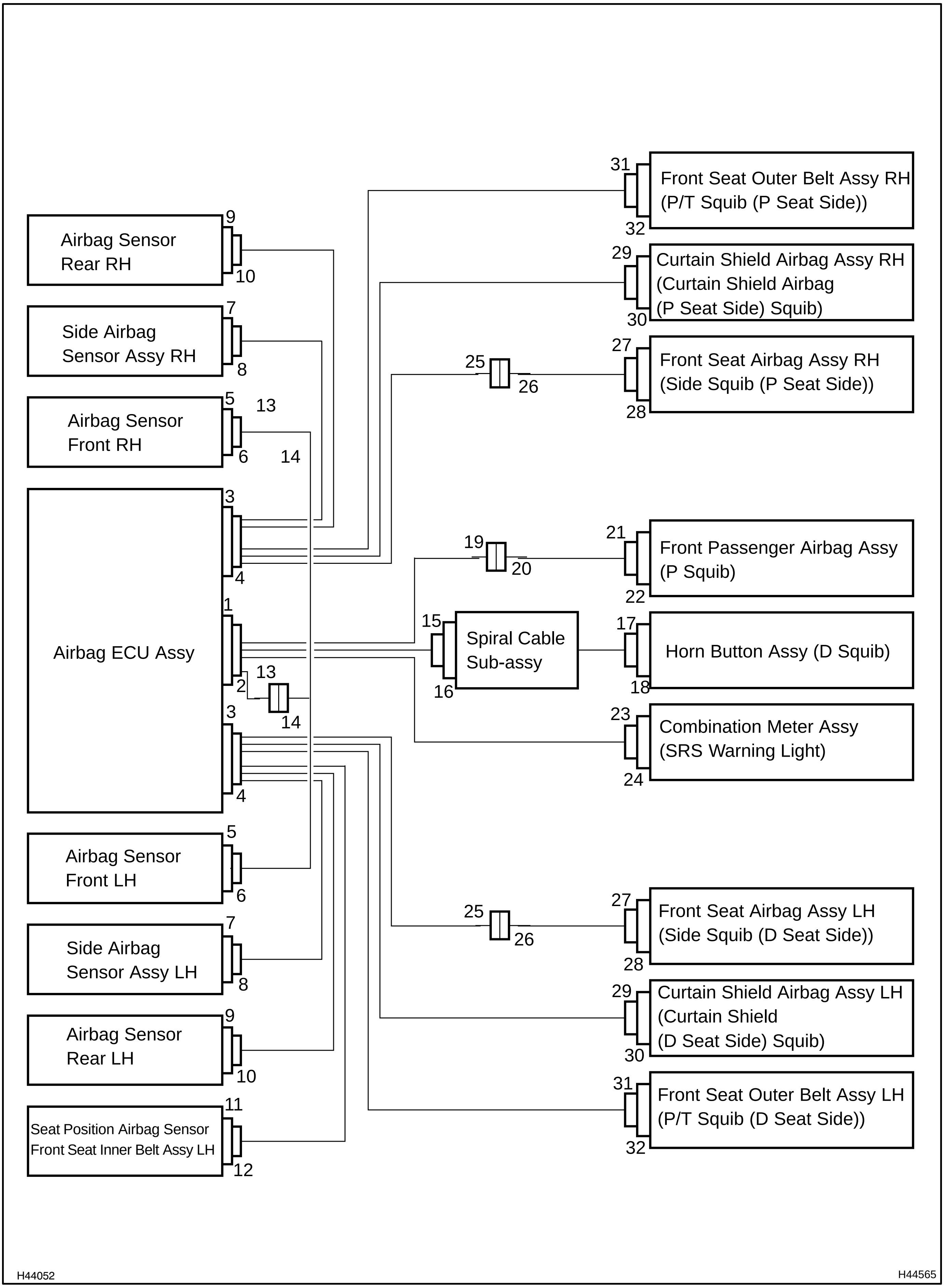
(b) This mechanism closes the circuit when the connector is disconnected by bringing the short spring into contact with the terminal and shutting off external electricity of prevent accidental SRS airbag activation.

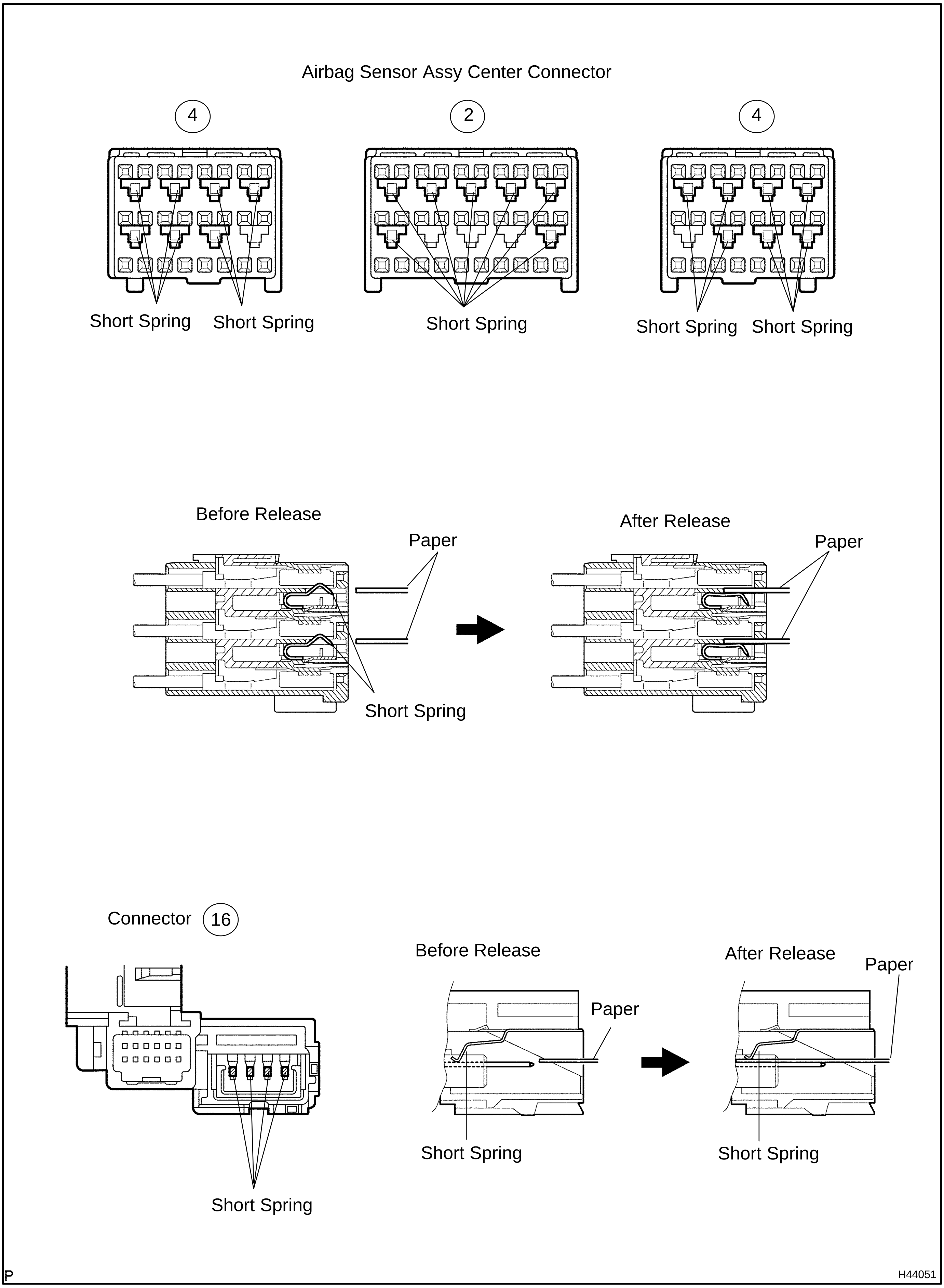
(c) To release the activation prevention mechanism, insert a piece of paper with the same thickness as the male terminal between the terminal and the short spring to break the connection.

(d) Refer to the illustrations on the next 2 pages concerning connectors utilizing the activation prevention mechanism and its release method.

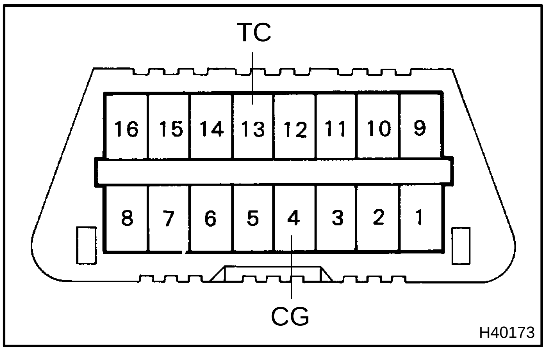
CAUTION:
Never release the activation prevention mechanism on the squib connector.

NOTICE:
- **Do not release the activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **To prevent the terminal and the short spring from being damaged, always use a piece of paper with the same thickness as the male terminal.**


Airbag Sensor Rear RH
Side Airbag Sensor Assy RH
Airbag Sensor Front RH
Airbag ECU Assy
Airbag Sensor Front LH
Side Airbag Sensor Assy LH
Airbag Sensor Rear LH
Seat Position Airbag Sensor
Front Seat Inner Belt Assy LH
Front Seat Outer Belt Assy RH (P/T Squib (P Seat Side))
Curtain Shield Airbag Assy RH (Curtain Shield Airbag (P Seat Side) Squib)
Front Seat Airbag Assy RH (Side Squib (P Seat Side))
Front Passenger Airbag Assy (P Squib)
Spiral Cable Sub-assy
Horn Button Assy (D Squib)
Combination Meter Assy (SRS Warning Light)
Front Seat Airbag Assy LH (Side Squib (D Seat Side))
Curtain Shield Airbag Assy LH (Curtain Shield (D Seat Side) Squib)
Front Seat Outer Belt Assy LH (P/T Squib (D Seat Side))
H44052
H44565


Airbag Sensor Assy Center Connector
4
2
4
Short Spring
Short Spring
Short Spring
Short Spring
Short Spring
Before Release
After Release
Paper
Paper
Short Spring
Connector
16
Before Release
After Release
Paper
Paper
Short Spring
Short Spring
Short Spring
P
H44051

DTC CHECK/CLEAR



1. DTC CHECK (USING SST CHECK WIRE)

(a) Check the DTCs (Present trouble code).

(1) Turn the power switch on (IG), and wait for approximately 60 seconds.

(2) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

NOTICE:

Connect the terminals to the correct positions to avoid a malfunction.

(b) Check the DTCs (Past trouble code).

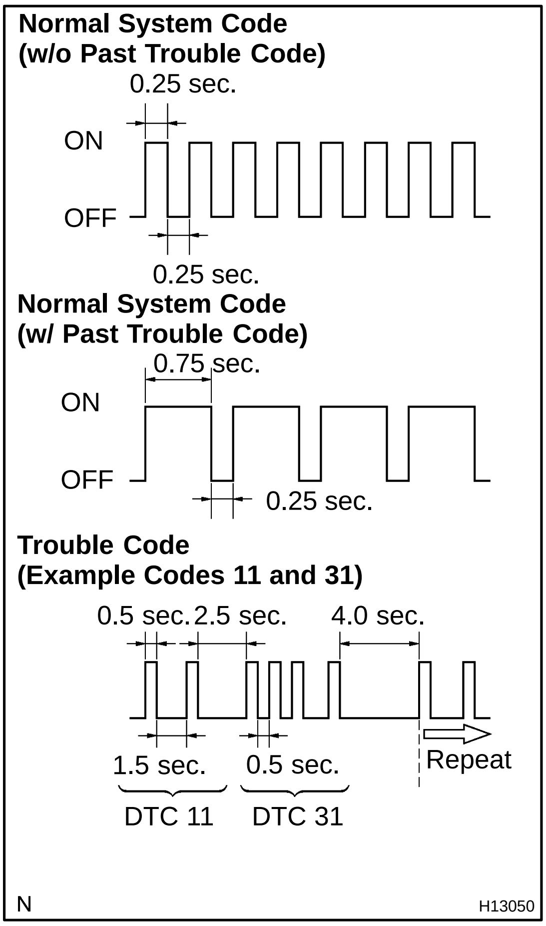
(1) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

NOTICE:

Connect the terminals to the correct positions to avoid a malfunction.

(2) Turn the power switch on (IG), and wait for approximately 60 seconds.



(c) Read the DTCs.

(1) Read the blinking patterns of the DTCs. Examples, the blinking patterns for the normal system code and trouble codes 11 and 31 are shown in the illustration to the left.

- Normal system code indication (w/o past trouble code)
  The light blinks twice per second.
- Normal system code indication (w/ past trouble code)
  When the past trouble code is stored in the airbag ECU assy, the light blinks only once per second.
- Trouble code indication
  The first blinking indicates the first DTC. The second blinking occurs after a 1.5-second pause.

If there are more than 1 code, there will be a 2.5-second pause between each code. After all codes are shown, there will be a 4.0-second pause, and they all will be repeated.

HINT:

- If 2 or more malfunctions are found, the indication begins with the smaller numbered code.
- If DTCs are indicated without connecting the terminals, proceed to the ”TC Terminal Circuit” on page 05-1655 .

2. DTC CLEAR (USING SST CHECK WIRE)

(a) Clear the DTCs.

(1) When the power switch is turned off, the DTCs are cleared.

HINT:

Depending on the DTC, the code may not be cleared by turning off the power switch. In this case, proceed to the next procedure.

(2) Using SST, connect terminals TC and CG of the DLC3, and then turn the power switch on (IG).

SST 09843-18040

(3) Disconnect terminal TC of the DLC3 within 3 to 10 seconds after the DTCs are output, and check if the SRS warning light comes on after 3 seconds.

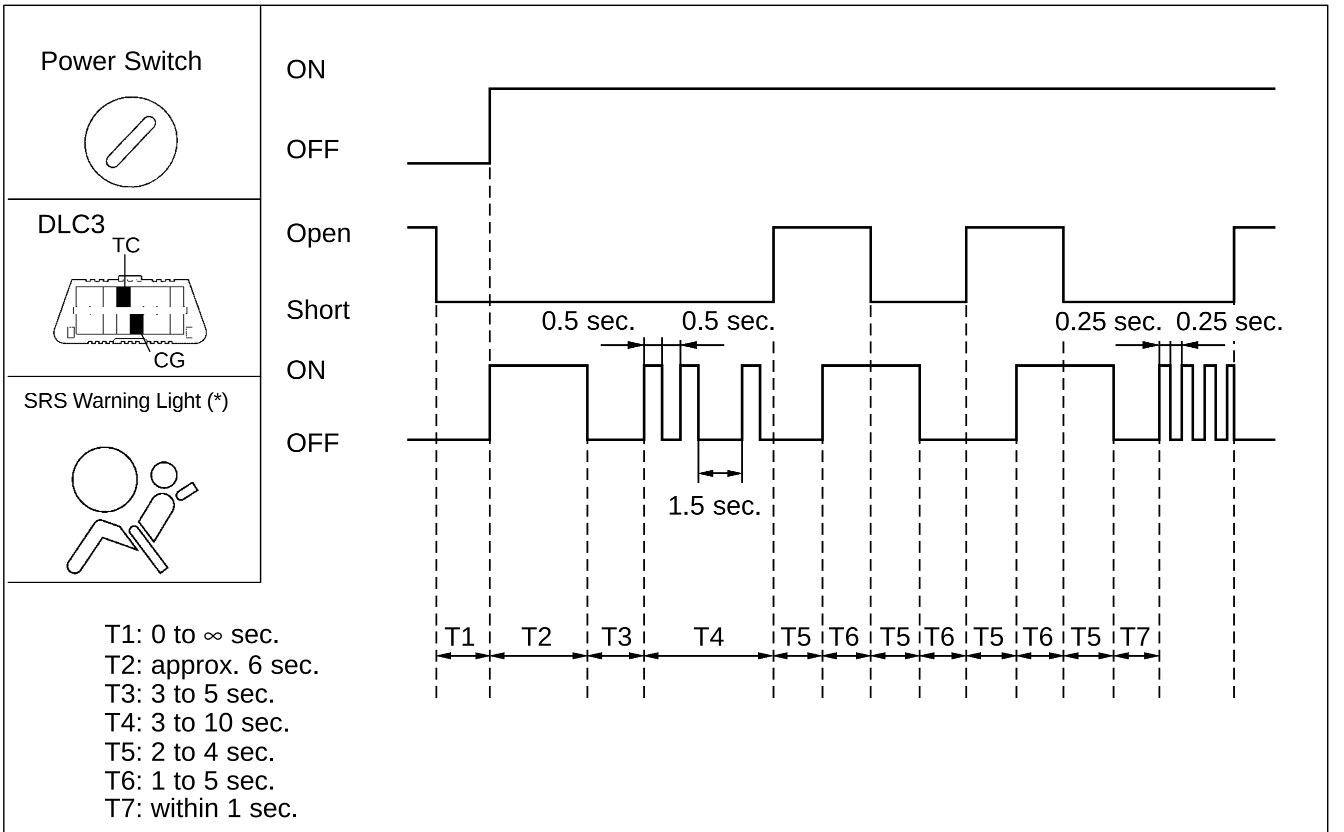
(4) Within 2 to 4 seconds after the SRS warning light comes on, connect terminals TC and CG of the DLC3.

(5) The SRS warning light should go off within 2 to 4 seconds after connecting terminals TC and CG of the DLC3. Then, disconnect terminal TC within 2 to 4 seconds after the SRS warning light goes off.

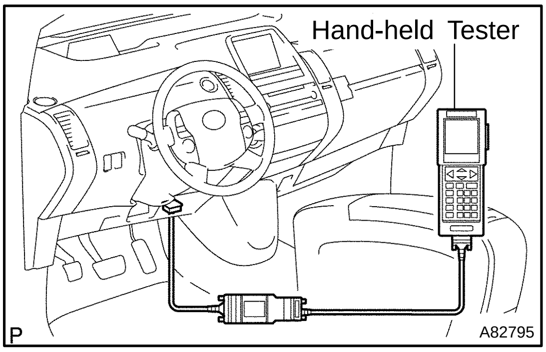
(6) The SRS warning light comes on again within 2 to 4 seconds after disconnecting terminal TC. Then, reconnect terminals TC and CG within 2 to 4 seconds after the SRS warning light comes on, connect terminals TC and CG of the DLC3.

(7) Check if the SRS warning light goes off 2 to 4 seconds after connecting terminals TC and CG of the DLC3. Also check if the normal system code is output within 1 second after the SRS warning light goes off.

If DTCs are not cleared, repeat this procedure until the codes are cleared.



*: The past trouble code in the illustration shows DTC 21 as an example.



3. DTC CHECK (USING HAND-HELD TESTER)

(a) Check the DTCs.

(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch on (IG).

(3) Check the DTCs by following the prompts on the tester screen.

HINT:

Refer to the hand-held tester operator's manual for further details.

(b) Clear the DTCs.

(1) Connect the hand-held tester to the DLC3.

(2) Turn the power switch on (IG).

(3) Clear the DTCs by following the prompts on the tester screen.

HINT:

Refer to the hand-held tester operator's manual for further details.

05256-24

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used in steps 3, 4, 6, 9, 10 and 11.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05-1392)

(a) Confirm problem symptoms.

3	CHECK MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2541)

(a) Check for the DTC outputs.

DTC IS OUTPUT: CHECK MULTIPLEX COMMUNICATION CIRCUIT (SEE PAGE 05-2541)

DTC IS NOT OUTPUT: Go to step 4

4	CHECK CAN COMMUNICATION SYSTEM (SEE PAGE 05-261 1)

(a) Check for the DTC outputs.

DTC IS OUTPUT: CHECK CAN COMMUNICATION CIRCUIT (SEE PAGE 05-261 1)

DTC IS NOT OUTPUT: Go to step 5

5	WARNING LIGHT CHECK (SEE PAGE 05-1396)

6	CHECK DTC (Present and Past DTCs) (SEE PAGE 05-1401)

DTC IS OUTPUT (Including Normal system code): Go to step 7

DTC IS NOT OUTPUT: PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1393)

7	DTC CHART (SEE PAGE 05-1408)

8	CIRCUIT INSPECTION (SEE PAGE 05-1412 to 05-1644)

9	REPAIR

10	CLEAR DTCs (Present and Past DTC) (SEE PAGE 05-1401)

11	CHECK DTC (Present and Past DTCs) (SEE PAGE 05-1401)

DTC IS NOT OUTPUT: Go to step 12

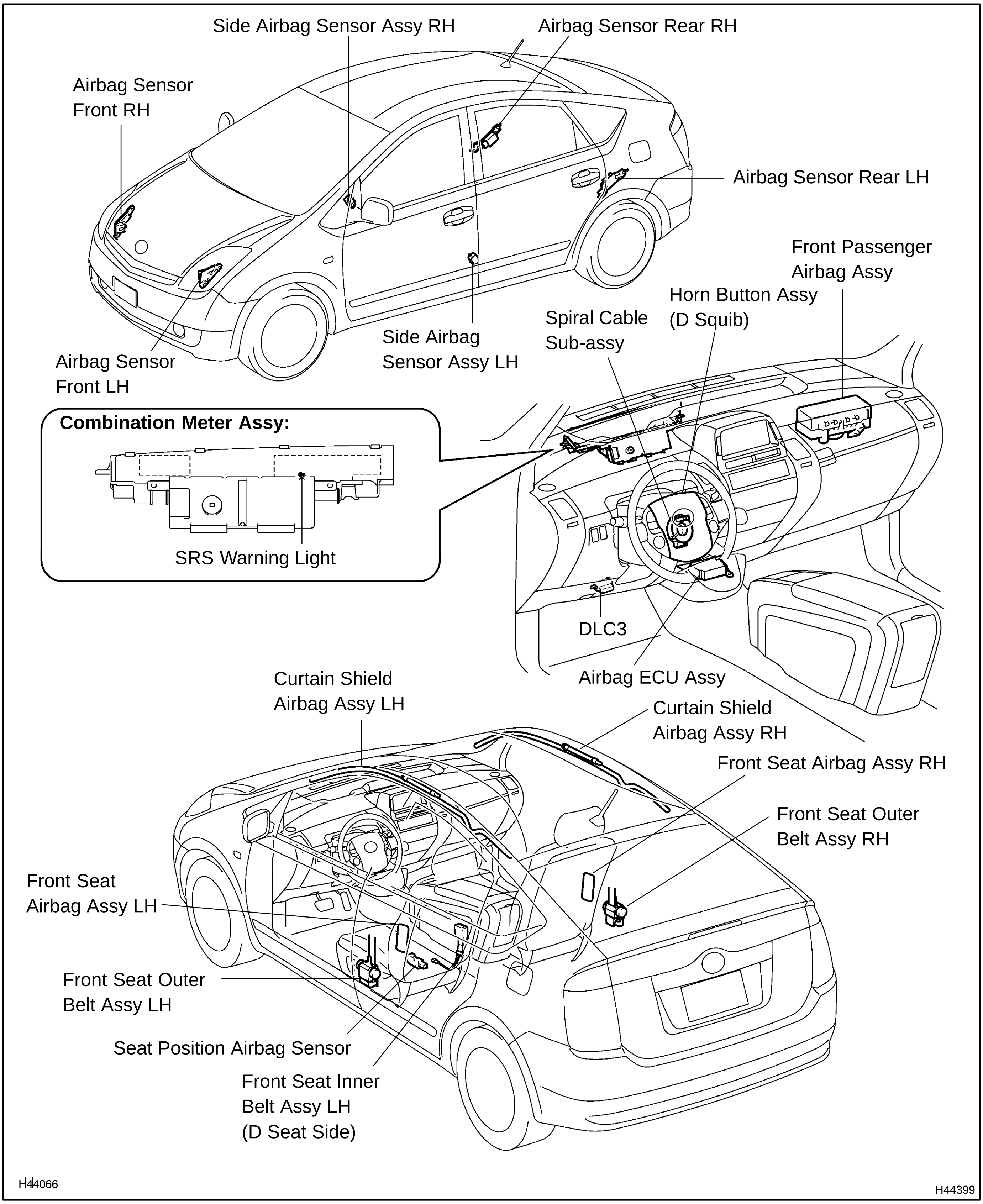
DTC IS OUTPUT: Go to step 7

12	CONFIRMATION TEST

END

0525A-22

LOCATION



SUPPLEMENTAL RESTRAINT SYSTEM

05IX5-01

PRECAUTION

NOTICE:

When disconnecting the negative (-) battery terminal, initialize the following system after the terminal is reconnected.

System Name	See Page
Power Window Control System	01-28

NOTICE:

- **When the warning lamp is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.**
- **With the power switch's power mode changed to ON (IG), disconnect the battery. If the key is not in the key slot during reconnection, DTC B2799 may be output.**

1. HANDLING PRECAUTIONS FOR AIRBAG SENSOR

HINT:

The airbag sensors include the airbag ECU assy, airbag sensor front LH, airbag sensor front RH, side airbag sensor assy LH, side airbag sensor assy RH, airbag sensor rear LH, airbag sensor rear RH and seat position airbag sensor.

(a) Make sure that the power switch is off and wait at least 90 seconds after disconnecting the negative (-) terminal cable of the battery when performing the following.
  (1) Replacement of the airbag sensors
  (2) Adjustment of the front or rear door a vehicle equipped with a front seat airbag and curtain shield airbag

(b) When connecting or disconnecting the connectors, ensure that the airbag sensors have already been installed in the vehicle.

(c) Do not use airbag sensors that have been dropped during the operation or transportation.

(d) When installing the airbag sensors, ensure that they are affixed using the specified torque.

(e) Do not disassemble the airbag sensors.

05259-23

DIAGNOSTIC TROUBLE CODE CHART

1. DTCS FOR SUPPLEMENTAL RESTRAINT SYSTEM

If a trouble code is displayed during the DTC check, check the circuit listed for the code in the table below (Proceed to the page listed for that circuit).

HINT:

- When the SRS warning light remains on and the DTC output is the normal system code, a voltage source drop is likely to occur. This malfunction is not stored in the memory by the airbag ECU assy. If the power source voltage returns to normal, the SRS warning light will automatically go off.
- When 2 or more codes are indicated, the code with the lower number appears first.
- If a code is not listed on the display chart, the airbag ECU assy may have failed.
- In the case of any malfunction concerning an open circuit, short to ground, or short to B+ due to a squib, other trouble codes may not be detected. In this case, repair the malfunction currently indicated and then perform malfunction diagnosis again.
- Mark in the check mode column:
  "○": DTC is corresponding to the check mode.
  "—": DTC is not corresponding to the check mode.

DTC No. (See Page)	Detection Item	Trouble Area	Check Mode	SRS Warning Light
B1000/31 (05-1412)	• Airbag ECU assy malfunction	• Airbag ECU assy	-	ON
B1610/13 (05-1420)	• Front airbag sensor RH circuit malfunction	• Airbag front RH sensor • Airbag ECU assy • Instrument panel wire • Engine room main wire	-	ON
B1615/14 (05-1424)	• Front airbag sensor LH circuit malfunction	• Airbag sensor front LH • Airbag ECU assy • Instrument panel wire • Engine room main wire	-	ON
B1620/21 (05-1428)	• Side airbag sensor assembly (D seat side) malfunction	• Side airbag sensor assy LH • Airbag ECU assy • Floor wire	-	ON
B1625/22 (05-1433)	• Side airbag sensor assembly (P seat side) malfunction	• Side airbag sensor assy RH • Airbag ECU assy • Floor wire No.2	-	ON
B1630/23 (05-1438)	• Curtain shield airbag sensor (D seat side) malfunction	• Airbag sensor rear RH • Airbag ECU assy • Floor wire	-	ON
B1635/24 (05-1443)	• Curtain shield airbag sensor (P seat side) malfunction	• Airbag sensor rear LH • Airbag ECU assy • Floor wire No.2	-	ON
B1653/35 (05-1448)	• Seat position sensor assembly malfunction	• Seat position airbag sensor • Airbag ECU assy • Floor wire	-	ON
B1655/37 (05-1454)	• Seat belt buckle switch (D seat side) malfunction	• Front seat inner belt assy RH • Airbag ECU assy • Floor wire	-	ON
B1800/51 (05-1460)	• Short in D squib circuit	• Horn button assy (D squib) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1801/51 (05-1465)	• Open in D squib circuit	• Horn button assy (D squib) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON

B1802/51 (05-1470)	• Short in D squib circuit (to ground)	• Horn button assy (D squib) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1803/51 (05-1475)	• Short in D squib circuit (to B+)	• Horn button assy (D squib) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1805/52 (05-1480)	• Short in P squib circuit	• Front passenger airbag assy (P squib) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1806/52 (05-1485)	• Open in P squib circuit	• Front passenger airbag assy (P squib) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1807/52 (05-1490)	• Short in P squib circuit (to ground)	• Front passenger airbag assy (P squib) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1808/52 (05-1495)	• Short in P squib circuit (to B+)	• Front passenger airbag assy (P squib) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1810/53 (05-1500)	• Short in D squib (Dual stage - 2nd step) circuit	• Horn button assy (D squib, Dual stage - 2nd step) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1811/53 (05-1505)	• Open in D squib (Dual stage - 2nd step) circuit	• Horn button assy (D squib, Dual stage - 2nd step) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1812/53 (05-1510)	• Short in D squib (Dual stage - 2nd step) circuit (to ground)	• Horn button assy (D squib, Dual stage - 2nd step) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1813/53 (05-1515)	• Short in D squib (Dual stage - 2nd step) circuit (to B+)	• Horn button assy (D squib, Dual stage - 2nd step) • Spiral cable sub-assy • Airbag ECU assy • Instrument panel wire	○	ON
B1815/54 (05-1520)	• Short in P squib (Dual stage - 2nd step) circuit	• Front passenger airbag assy (P squib, Dual stage - 2nd step) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1816/54 (05-1525)	• Open in P squib (Dual stage - 2nd step) circuit	• Front passenger airbag assy (P squib, Dual stage - 2nd step) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1817/54 (05-1530)	• Short in P squib (Dual stage - 2nd step) circuit (to ground)	• Front passenger airbag assy (P squib, Dual stage - 2nd step) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1818/54 (05-1535)	• Short in P squib (Dual stage - 2nd step) circuit (to B+)	• Front passenger airbag assy (P squib, Dual stage - 2nd step) • Airbag ECU assy • Instrument panel wire • Instrument panel wire No.2	○	ON
B1820/55 (05-1540)	• Short in side squib (D seat side) circuit	• Front seat airbag assy LH (Side squib (D seat side)) • Airbag ECU assy • Floor wire • Seat airbag No.1 wire	○	ON

B1821/55 (05-1545)	• Open in side squib (D seat side) circuit	• Front seat airbag assy LH (Side squib (D seat side)) • Airbag ECU assy • Floor wire • Seat airbag No.1 wire	○	ON
B1822/55 (05-1550)	• Short in side squib (D seat side) circuit (to ground)	• Front seat airbag assy LH (Side squib (D seat side)) • Airbag ECU assy • Floor wire • Seat airbag No.1 wire	○	ON
B1823/55 (05-1555)	• Short in side squib (D seat side) circuit (to B+)	• Front seat airbag assy LH (Side squib (D seat side)) • Airbag ECU assy • Floor wire • Seat airbag No.1 wire	○	ON
B1825/56 (05-1560)	• Short in side squib (P seat side) circuit	• Front seat airbag assy RH (Side squib (P seat side)) • Airbag ECU assy • Floor wire No.2 • Seat airbag No.2 wire	○	ON
B1826/56 (05-1565)	• Open in side squib (P seat side) circuit	• Front seat airbag assy RH (Side squib (P seat side)) • Airbag ECU assy • Floor wire No.2 • Seat airbag No.2 wire	○	ON
B1827/56 (05-1570)	• Short in side squib (P seat side) circuit (to ground)	• Front seat airbag assy RH (Side squib (P seat side)) • Airbag ECU assy • Floor wire No.2 • Seat airbag No.2 wire	○	ON
B1828/56 (05-1575)	• Short in side squib (P seat side) circuit (to B+)	• Front seat airbag assy RH (Side squib (P seat side)) • Airbag ECU assy • Floor wire No.2 • Seat airbag No.2 wire	○	ON
B1830/57 (05-1580)	• Short in curtain shield airbag (D seat side) squib circuit	• Curtain shield airbag assy LH (curtain shield airbag (D seat side) squib) • Airbag ECU assy • Floor wire	○	ON
B1831/57 (05-1584)	• Open in curtain shield airbag (D seat side) squib circuit	• Curtain shield airbag assy LH (curtain shield airbag (D seat side) squib) • Airbag ECU assy • Floor wire	○	ON
B1832/57 (05-1588)	• Short in curtain shield airbag (D seat side) squib circuit (to ground)	• Curtain shield airbag assy LH (curtain shield airbag (D seat side) squib) • Airbag ECU assy • Floor wire	○	ON
B1833/57 (05-1592)	• Short in curtain shield airbag (D seat side) squib circuit (to B+)	• Curtain shield airbag assy LH (curtain shield airbag (D seat side) squib) • Airbag ECU assy • Floor wire	○	ON
B1835/58 (05-1596)	• Short in curtain shield airbag (P seat side) squib circuit	• Curtain shield airbag assy RH (curtain shield airbag (P seat side) squib) • Airbag ECU assy • Floor wire No.2	○	ON
B1836/58 (05-1600)	• Open in curtain shield airbag (P seat side) squib circuit	• Curtain shield airbag assy RH (curtain shield airbag (P seat side) squib) • Airbag ECU assy • Floor wire No.2	○	ON
B1837/58 (05-1604)	• Short in curtain shield airbag (P seat side) squib circuit (to ground)	• Curtain shield airbag assy RH (curtain shield airbag (P seat side) squib) • Airbag ECU assy • Floor wire No.2	○	ON
B1838/58 (05-1608)	• Short in curtain shield airbag (P seat side) squib circuit (to B+)	• Curtain shield airbag assy RH (curtain shield airbag (P seat side) squib) • Airbag ECU assy • Floor wire No.2	○	ON

B1900/73 (05-1612)	• Short in P/T squib (D seat side) circuit	• Front seat outer belt assy LH (P/T squib (D seat side)) • Airbag ECU assy • Floor wire	○	ON
B1901/73 (05-1616)	• Open in P/T squib (D seat side) circuit	• Front seat outer belt assy LH (P/T squib (D seat side)) • Airbag ECU assy • Floor wire	○	ON
B1902/73 (05-1620)	• Short in P/T squib (D seat side) circuit (to ground)	• Front seat outer belt assy LH (P/T squib (D seat side)) • Airbag ECU assy • Floor wire	○	ON
B1903/73 (05-1624)	• Short in P/T squib (D seat side) circuit (to B+)	• Front seat outer belt assy LH (P/T squib (D seat side)) • Airbag ECU assy • Floor wire	○	ON
B1905/74 (05-1628)	• Short in P/T squib (P seat side) circuit	• Front seat outer belt assy RH (P/T squib (P seat side)) • Airbag ECU assy • Floor wire No.2	○	ON
B1906/74 (05-1632)	• Open in P/T squib (P seat side) circuit	• Front seat outer belt assy RH (P/T squib (P seat side)) • Airbag ECU assy • Floor wire No.2	○	ON
B1907/74 (05-1636)	• Short in P/T squib (P seat side) circuit (to ground)	• Front seat outer belt assy RH (P/T squib (P seat side)) • Airbag ECU assy • Floor wire No.2	○	ON
B1908/74 (05-1640)	• Short in P/T squib (P seat side) circuit (to B+)	• Front seat outer belt assy RH (P/T squib (P seat side)) • Airbag ECU assy • Floor wire No.2	○	ON
Normal (05-1644)	• Voltage source drop	• Battery • Airbag ECU assy	-	ON
Normal	• System normal	-	-	OFF

0525C-22

PROBLEM SYMPTOMS TABLE

HINT:

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
• When the power switch is on (IG), the SRS warning light sometimes comes on after approximately 6 seconds. • The SRS warning light remains on when DTC is not output.	• SRS Warning Light Circuit Malfunction (Remains on when DTC is not output)	05-1648
• The SRS warning light does not come on with the power switch on (IG).	• SRS Warning Light Circuit Malfunction (Does not come on when the power switch is turned on (IG)).	05-1653
• SRS warning light is blink. • DTC cannot read.	• TC Terminal Circuit	05-1655

SYSTEM DESCRIPTION

1. **SES AIRBAG SYSTEM OUTLINE**

(a) FRONTAL COLLISION

(1) The driver and front passenger airbags were designed to supplement seat belts in the event of a front collision in order to help reduce shock to the head and chest of the driver and front passenger.

(2) Frontal collisions are detected by the airbag ECU assy and two front airbag sensors. The driver and front passenger airbags and the seat belt pretensioner then operate simultaneously.

(3) Electrical deceleration sensors are built into the two front airbag sensors in the engine compartment in order to detect the severity of the impact during the initial stage of the collision. The deployment of the driver and front passenger airbags in controlled in two stages according to the severity of the impact.

(b) SIDE COLLISION

(1) The front seat airbag assy and curtain shield airbag assy were designed to help reduce shock to the driver, front passenger and rear outer passenger. The curtain shield airbag assy was designed to help reduce shock to the front and rear passengers in the event of a side collision.

(2) Side collisions are detected by the side airbag sensor assy installed in the bottom of the center pillar and the airbag sensor rear installed in the bottom of the rear pillar. Front side collisions are detected by the side airbag sensor assy, causing the front seat airbag assy and curtain shield airbag assy to deploy simultaneously. Rear side collisions are detected by the airbag sensor rear to deploy only the curtain shield airbag assy.

2. **CONSTRUCTION AND OPERATION**

(a) AIRBAG SENSOR FRONT

(1) The front airbag sensor assy's are installed on the right and left side members.

(2) The deceleration sensor is built into the airbag sensor front and distortion that is created in the sensor is converted into an electric signal based on the vehicle deceleration rate during a frontal collision Accordingly, the extent of the initial collision can be detected in detail.

(b) SIDE AIRBAG SENSOR ASSY

(1) The side airbag sensor assy's are installed on the right and left center pillars.

(2) The side airbag sensor assy consists of the deceleration sensor, ignition control circuit, and diagnostic circuit. The side airbag sensor assy receives signals from the deceleration sensor and determines whether the front seat airbag assy and curtain shield airbag assy should be activated, and diagnoses system malfunctions simultaneously.

(c) AIRBAG SENSOR REAR

(1) The airbag sensor rear is installed on the bottom of the right and left rear pillars respectively.

(2) The deceleration sensor is built into the airbag sensor rear and the distortion that is created in the sensor is converted into an electric signal based on the vehicle deceleration rate during a rear side collision.

(d) AIRBAG ECU ASSY

(1) General

- The airbag ECU assy is installed on the center floor under the instrument panel.
- The airbag ECU assy consists of the deceleration sensor, safing sensor, electrical safing sensor, ignition control circuit and diagnostic circuit.
- The airbag ECU assy receives signals from the safing sensor built into the airbag ECU assy and from the deceleration sensor and safing sensor built into the airbag sensor front. The the airbag ECU assy determines whether or not the driver and front passenger airbags and the seat belt pretensioner should be activated, and diagnoses system malfunctions.
- The airbag ECU assy causes the front seat airbag assy and the curtain shield airbag assy to deploy when receiving signals from the deceleration sensor and the safing sensor built into the side airbag sensor assy.
- The airbag ECU assy receives signals from the deceleration sensors and the electrical safing sensors built into the airbag ECU assy and the airbag sensor rear, and determines whether or not the curtain shield airbag assy should be activated, and then diagnoses system malfunctions.
- The airbag ECU assy is operable using check mode, which can detect and output DTCs. If the mal function does not recur during troubleshooting, joggling each connector or driving on a city or rough road with the airbag ECU assy in check mode as a simulation method makes it possible to obtain more accurate information.

(2) Deceleration sensor and ignition control circuit

- The deceleration sensor is built into the airbag ECU assy, and the distortion created during a frontal or rear side collision based on the deceleration of the vehicle is converted into an electric signal.
- The ignition control circuit performs calculations based on the signal output from the deceleration sensors of the airbag ECU assy and airbag sensor front. If the calculated values are greater than the specified values, the airbag deploy.

(3) Safing sensor

- The safing sensor is built into the airbag ECU assy. During a frontal collision, the sensor turns on and outputs an ON signal to the airbag ECU assy if a deceleration rate greater than the specified value is applied to the safing sensor.

(4) Electronic safing sensor

- The electronic safing sensor is built into the airbag ECU assy. During a rear side collision, the sensor turns on and outputs an ON signal to the airbag ECU assy if a deceleration rate greater than the specified value is applied to the electronic safing sensor.

(5) Back-up power source

- The back-up power source consists of a condenser and a DC-DC converter. When the power system does not function during a collision, the condenser discharges and supplies electric power to the system. The DC-DC converter operates as a boosting transformer when the battery voltage falls below a predetermined level.

(6) Diagnostic circuit

- This circuit constantly diagnoses the system malfunctions. When a malfunction is detected, it lights up the SRS warning light on the combination meter assy to inform the driver.

(7) Memory circuit

- When a malfunction is detected in the diagnostic circuit, it is coded and stored in the memory circuit.

(e) SRS WARNING LIGHT

(1) The SRS warning light is located on the combination meter assy. The SRS warning light informs the driver of detected malfunctions in the diagnostic circuit of the airbag ECU assy or the SRS airbag system. Under formal operating conditions when the power switch is turned on, the SRS warning light comes on for approximately 6 seconds and then goes off.

3. IGNITION JUDGEMENT AND CONDITIONS

(a) FRONTAL COLLISION

(1) When the vehicle collides in the hatched are (Fig.1) and shock is greater than the specified value, the driver and front passenger airbags are activated automatically. The deceleration sensor of the airbag ECU assy determines whether or not ignition in necessary based on signals from the deceleration sensor of the airbag sensor front.

(2) The safing sensor of the airbag ECU assy was designed to be turned on at a smaller deceleration rate than the deceleration sensor. If the safing sensor and the deceleration sensor turn on simultaneously, current flows to the squib and deploys the driver and front passenger airbags as shown in illustration Fig.2.

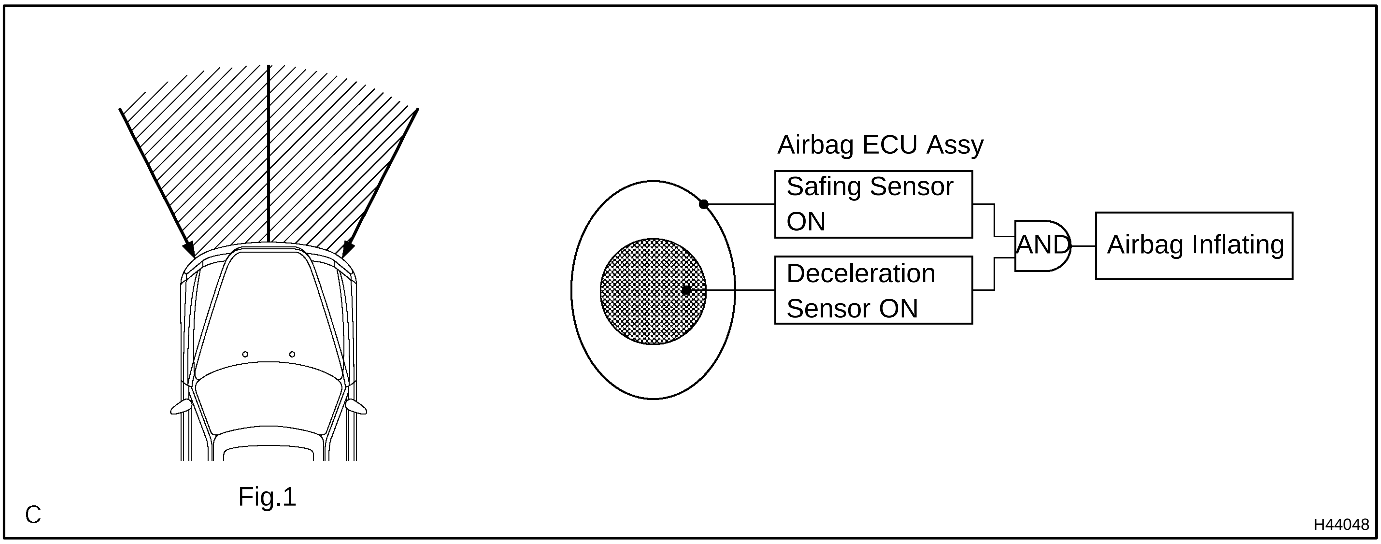
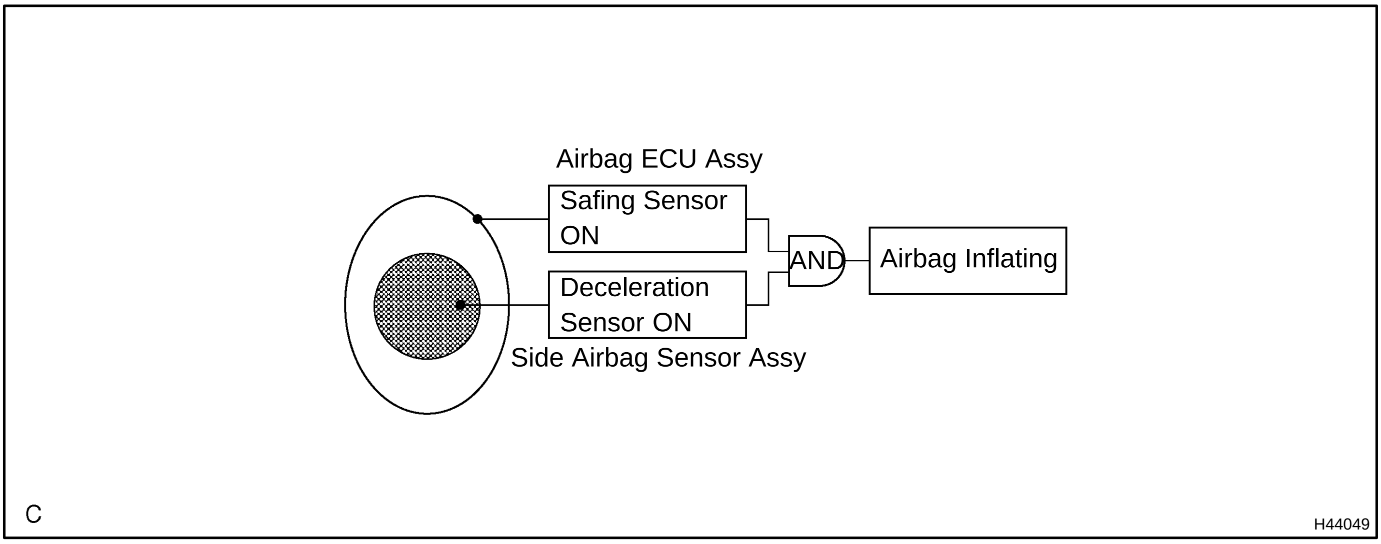


Fig.1

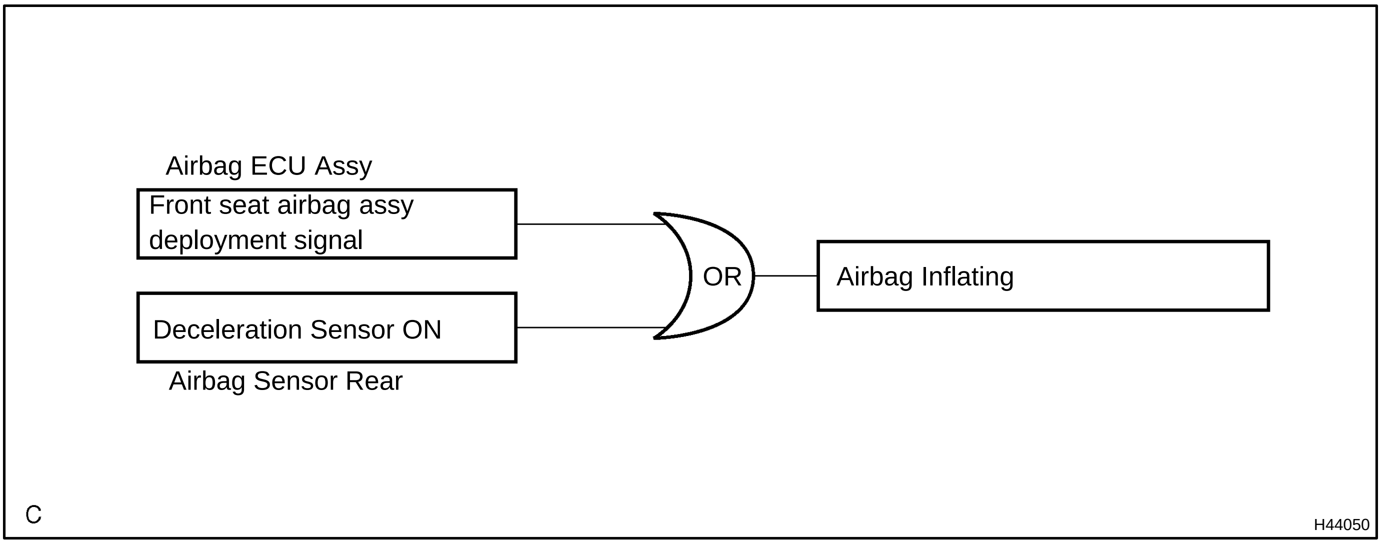
(b) FRONT SIDE COLLISION

(1) The safing sensor of the side airbag sensor assy was designed to be turned on at a smaller deceleration rate than the deceleration sensor of the deceleration sensor. If the safing sensor and the deceleration sensor turn on simultaneously, current flows to the squib and deploys the driver and front passenger side airbags and curtain shield airbag as shown in the illustration below



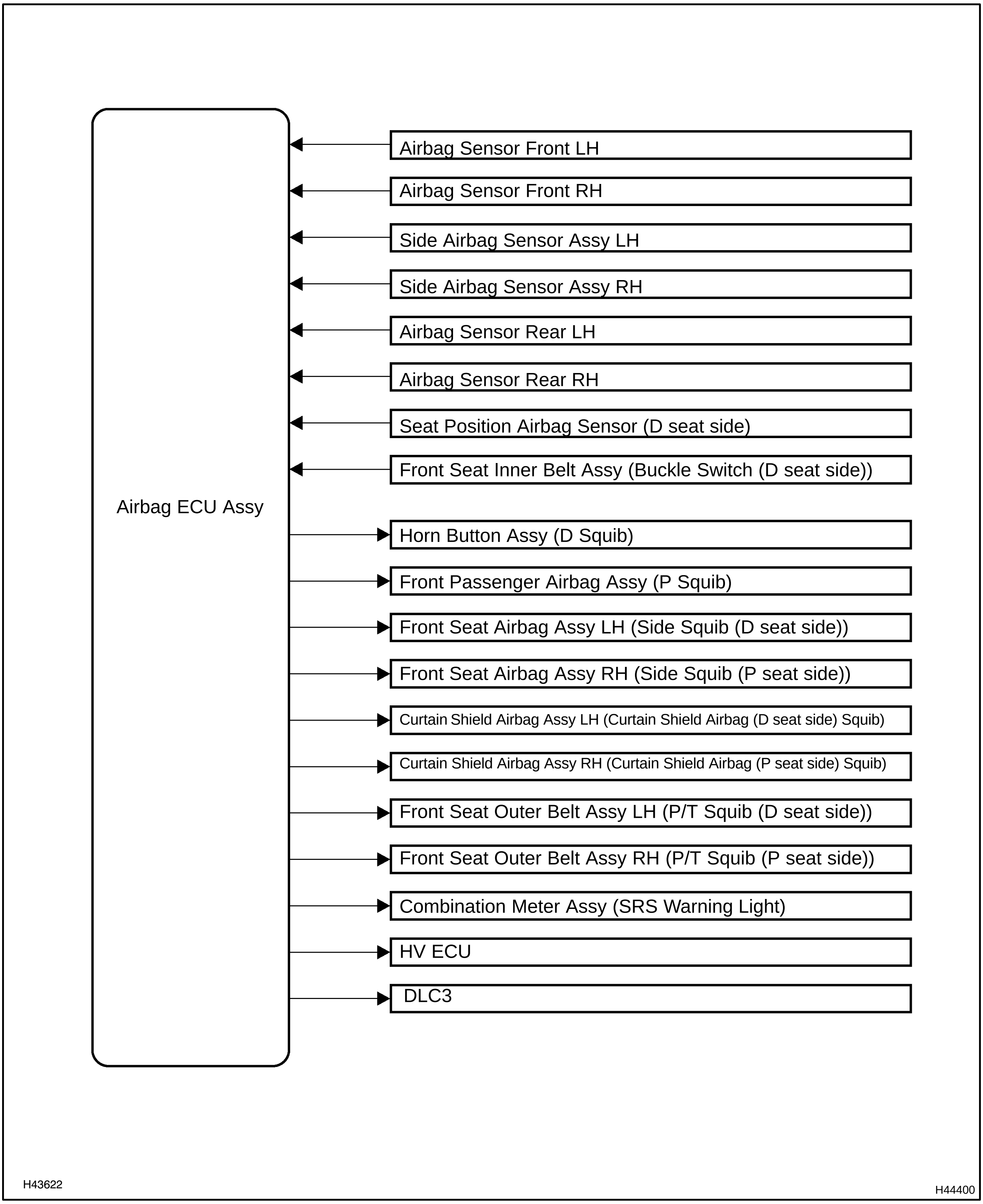
(c) REAR SIDE COLLISION

(1) The curtain shield airbag deploys if the curtain shield airbag assy receives the ignition signal for the front seat airbag assy or for the curtain shield airbag assy (transmitted from the airbag sensor rear) as shown in the illustration below.



05IX6-01

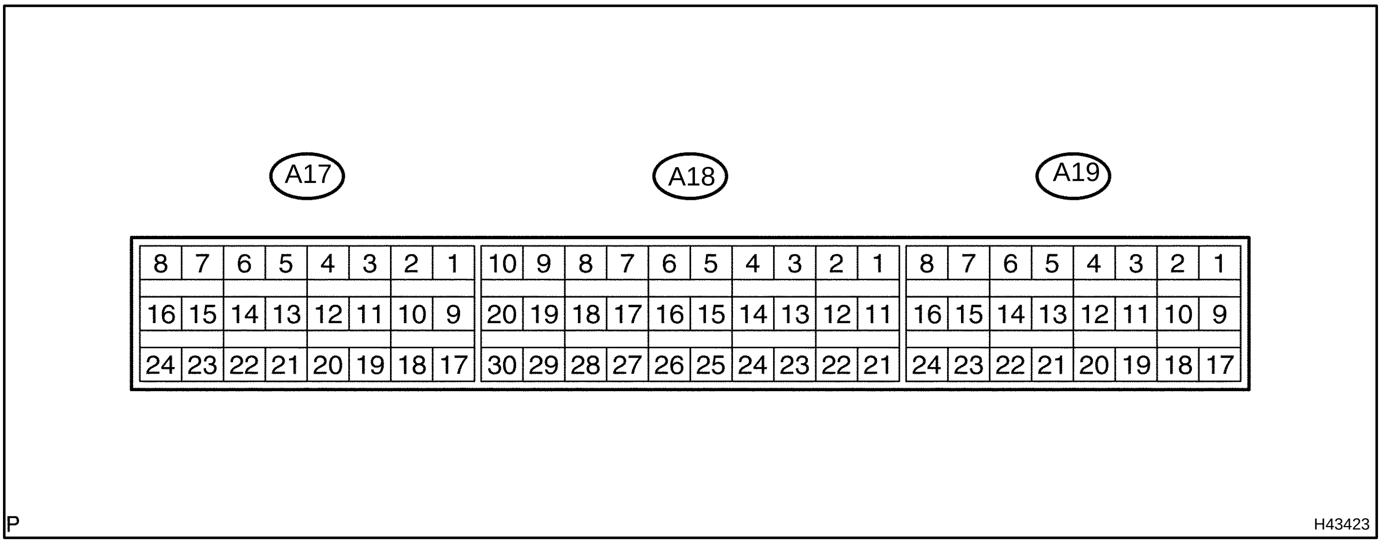
SYSTEM DIAGRAM



0525B-06

TERMINALS OF ECU

1. AIRBAG ECU ASSY



Terminal No.	Terminal Symbol	Destination
A17-1	SFD+	Front seat airbag assy LH (Side squib (D seat side))
A17-2	SFD-	Front seat airbag assy LH (Side squib (D seat side))
A17-3	ICD-	Curtain shield airbag assy LH (Curtain shield airbag (D seat side) squib)
A17-4	ICD+	Curtain shield airbag assy LH (Curtain shield airbag (D seat side) squib)
A17-5	PD+	Front seat outer belt assy LH (P/T squib (D seat side))
A17-6	PD-	Front seat outer belt assy LH (P/T squib (D seat side))
A17-9	DSP+	Front seat inner belt assy LH
A17-10	DBE+	Seat position airbag sensor
A17-17	DSP-	Front seat inner belt assy LH
A17-18	DBE-	Seat position airbag sensor
A17-19	VUPD	Side airbag sensor assy LH
A17-20	VUCD	Airbag sensor rear LH
A17-21	ESD	Side airbag sensor assy LH
A17-22	ESCD	Airbag sensor rear LH
A18-1	P2+	Front passenger airbag assy (P squib, Dual stage - 2nd step)
A18-2	P2-	Front passenger airbag assy (P squib, Dual stage - 2nd step)
A18-3	P-	Front passenger airbag assy (P squib)
A18-4	P+	Front passenger airbag assy (P squib)
A18-5	D+	Horn button assy (D squib)
A18-6	D-	Horn button assy (D squib)
A18-7	D2-	Horn button assy (D squib, Dual stage - 2nd step)
A18-8	D2+	Horn button assy (D squib, Dual stage - 2nd step)
A18-14	LA	Combination meter assy (SRS warning light)
A18-15	TC	DLC3
A18-16	SIL	DLC3
A18-21	IG2	IGN Fuse
A18-22	GSW2	HV ECU
A18-25	E1	Ground
A18-26	E2	Ground
A18-27	-SR	Airbag sensor front RH
A18-28	-SL	Airbag sensor front LH

Terminal No.	Terminal Symbol	Destination
A18-29	+SR	Airbag sensor front RH
A18-30	+SL	Airbag sensor front LH
A19-3	PP-	Front seat outer belt assy RH (P/T squib (P seat side))
A19-4	PP+	Front seat outer belt assy RH (P/T squib (P seat side))
A19-5	ICP+	Curtain shield airbag assy RH (Curtain shield airbag (D seat side) squib)
A19-6	ICP-	Curtain shield airbag assy RH (Curtain shield airbag (D seat side) squib)
A19-7	SFP-	Front seat airbag assy RH (Side Squib (D seat side))
A19-8	SFP+	Front seat airbag assy RH (Side Squib (D seat side))
A19-15	PBE+	Front seat inner belt assy RH
A19-19	ESCP	Airbag sensor rear RH
A19-20	ESP	Side airbag sensor assy RH
A19-21	VUCP	Airbag sensor rear RH
A19-22	VUPP	Side airbag sensor assy RH

TIRE & WHEEL

031QO-01

SERVICE DATA

Cold tire inflation pressure	185/65R 15 86S	Front: Rear:	240 kPa (2.4 kgf/cm^2, 35 psi) 230 kPa (2.3 kgf/cm^2, 33 psi)

Tire runout	1.4 mm (0.055 in.) or less
Imbalance after adjustment	8.0 g (0.018 lb) or less

WIPER & WASHER

031W4-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Wiper motor x Wiper link	5.4	55	48 in.·lbf
Wiper motor x Crank arm	17	175	13
Wiper link x Body	5.5	56	49 in.·lbf
Wiper arm x Wiper link	21	214	15
Rear wiper motor x Body	5.5	56	49 in.·lbf
Rear wiper motor x Rear wiper arm	5.5	56	49 in.·lbf

HOW TO USE THIS MANUAL

GENERAL INFORMATION

1. GENERAL DESCRIPTION

(a) This manual is written in accordance with SAE J2008.

(b) Repair operations can be separated into 3 main processes:

1. Diagnosis
2. Removing/Installing, Replacing, Disassembling/Reassembling, Checking and Adjusting
3. Final Inspection

(c) This manual explains the "Diagnosis" (found in the "Diagnostics" section) and "Removing and Installing, Replacing, Disassembling, Installing and Checking, and Adjusting". "Final Inspection" is omitted.

(d) The following essential operations are not written in this manual. However, these operations must be performed in actual situations.

(1) Operations with a jack or lift

(2) Cleaning of a removed part when necessary

(3) Visual check

(e) The "< >" marks highlight the part's name in the Parts Catalog.

2. INDEX

(a) An alphabetical INDEX section is provided at the end of the book as a reference to help you find the item to be repaired.

3. PREPARATION

(a) Use of Special Service Tools (SST) and Special Service Materials (SSM) may be required, depending on the repair situation. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the Preparation section of this manual.

4. REPAIR PROCEDURES

(a) A component illustration is placed under the title where necessary.

(b) Non-reusable parts, grease application areas, precoated parts and torque specifications are noted in the component illustrations.

Example: