FUEL SYSTEM

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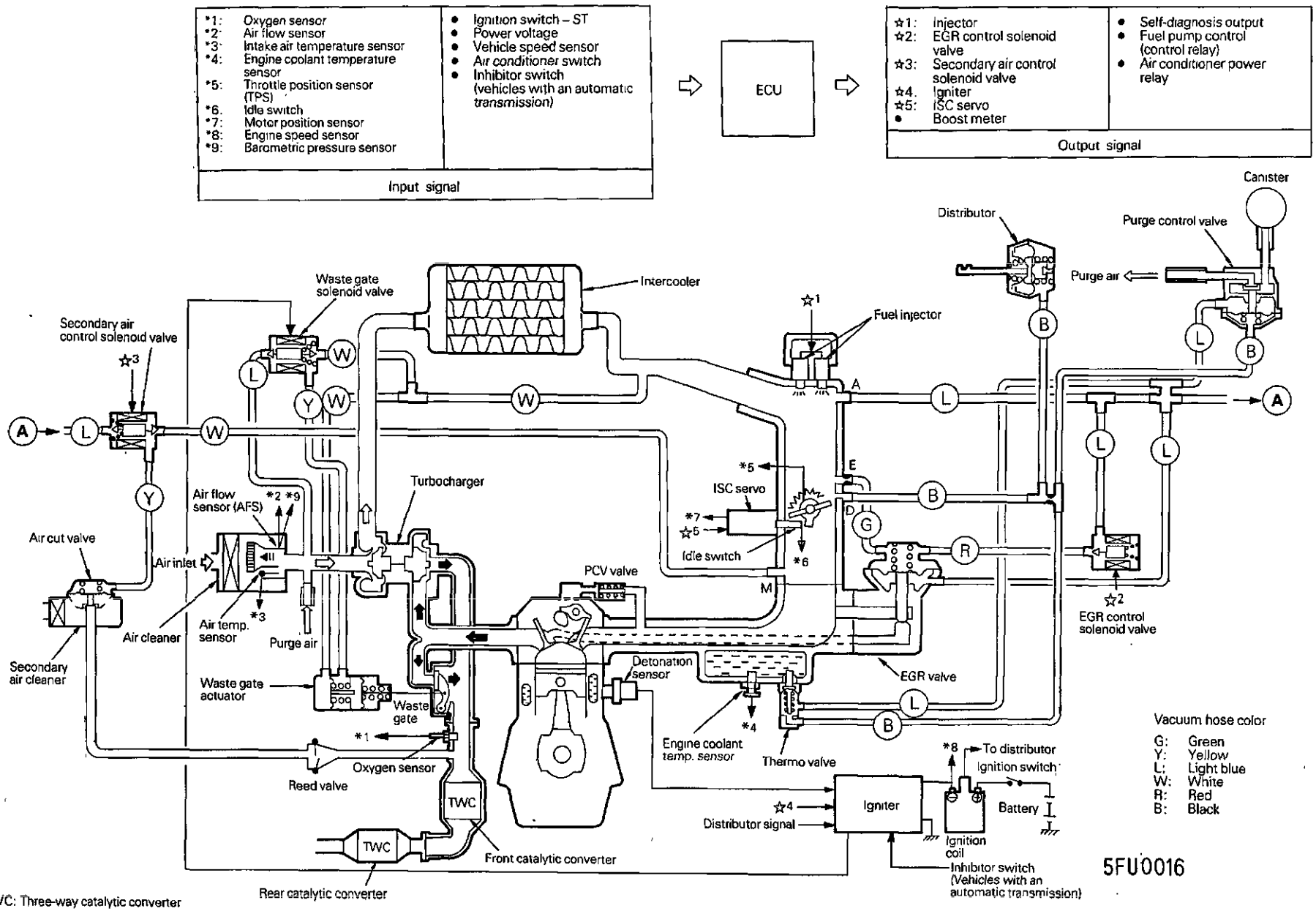
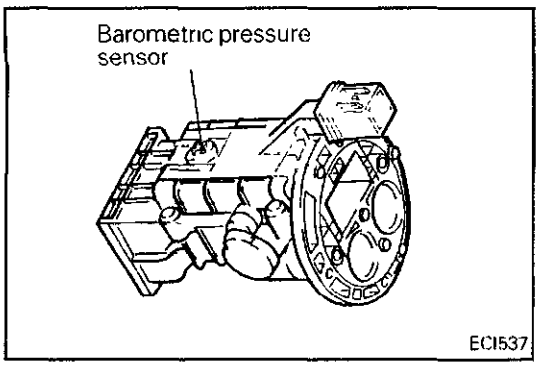
GENERAL INFORMATION

N14BA--

The ECI (Electronic Controlled Injection)-Turbo System provides optimum air-fuel ratio control by judging the engine operating state with its electronic control unit (ECU) based on various sensor input signals and accordingly controlling the injectors installed on the injection mixer. The ECU also performs the idle speed, ignition timing, and other controls.

ECI SYSTEM DIAGRAM





ECI SYSTEM COMPONENTS

N14BBCA

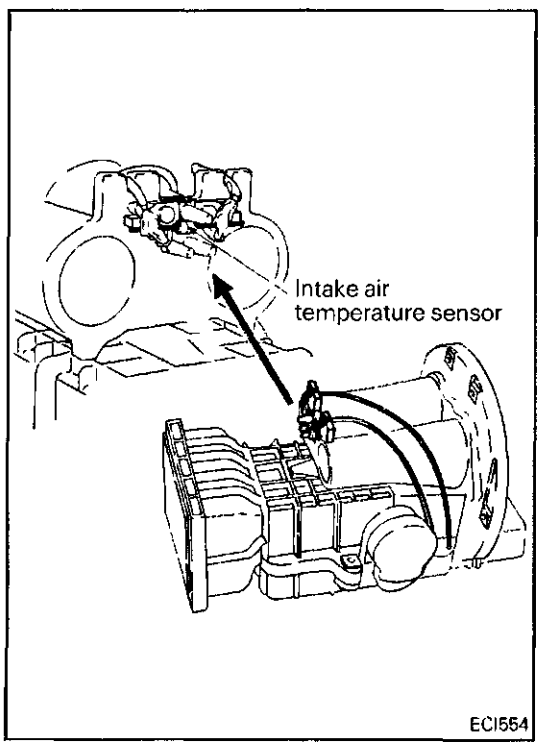
AIR FLOW SENSOR (AFS)

The AFS measures the intake air volume. It makes use of Karman vortex to detect the air flow rate and sends it to the ECU as the intake air volume signal.
The ECU uses this intake air volume signal to decide the basic fuel injection duration.

BAROMETRIC PRESSURE SENSOR

N14BBDA

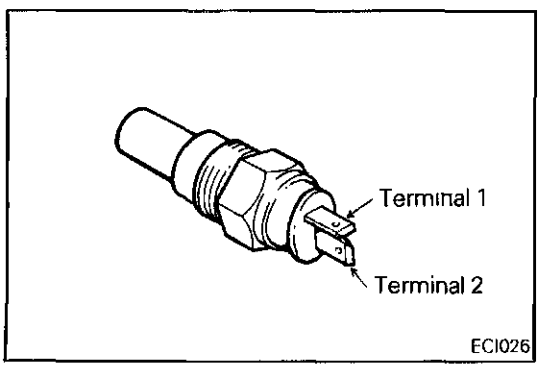
The barometric pressure sensor installed on the AFS senses the barometric pressure and converts it into a voltage which is sent to the ECU.
The ECU uses this signal to compute the altitude at which the vehicle is running and corrects accordingly the air-fuel ratio to the optimum and also corrects the ignition timing, thus improving driveability at high altitude.



INTAKE AIR TEMPERATURE SENSOR

N14BBEA

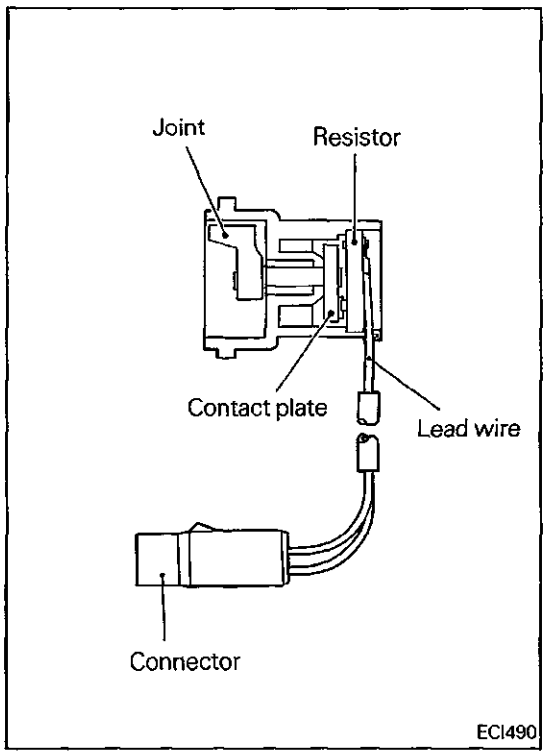
The intake air temperature sensor, located at the illustrated position on AFS, is a resistor-based sensor for detecting the intake air temperature.
According to the intake air temperature information from the sensor, the ECU provides necessary fuel injection amount control.



ENGINE COOLANT TEMPERATURE SENSOR

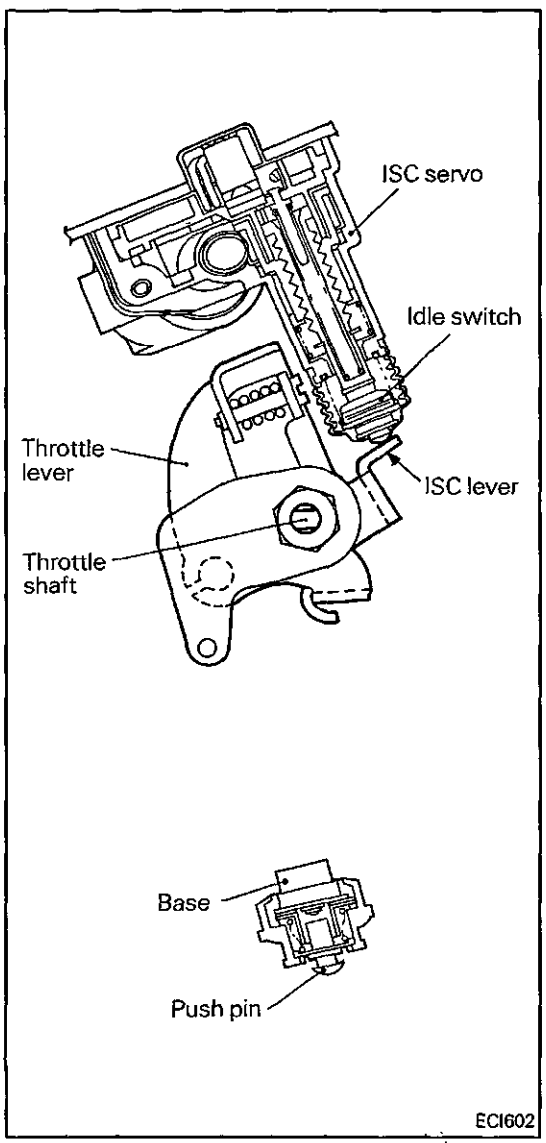
N14BBAA

The engine coolant temperature sensor installed in the engine coolant passage of the intake manifold is a resistor-based sensor. The ECU judges engine warm-up state by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



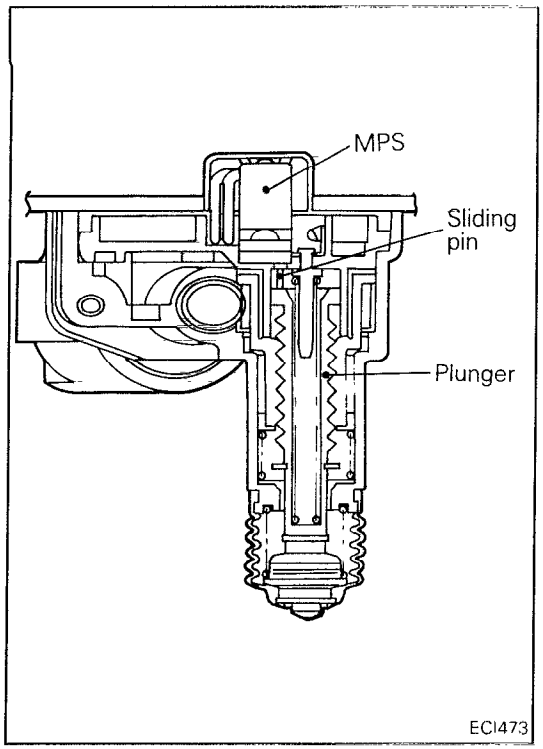
THROTTLE POSITION SENSOR (TPS) N14BBBB

The TPS is a rotating type variable resistor that rotates together with the injection mixer throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the output voltage of the TPS changes and the ECU detects the throttle valve opening based on the change of the voltage.
Based on this output voltage, the ECU computes throttle valve opening change (output voltage change) and judges the engine acceleration/deceleration state and accordingly corrects fuel injection amount during acceleration/deceleration.



IDLE SWITCH N14BBFA

The idle switch, which is a contact type switch, senses accelerator operation. The switch is installed at the tip of the ISC servo. When the throttle valve is at idle opening, the ISC lever pushes the push pin to turn on the contact.

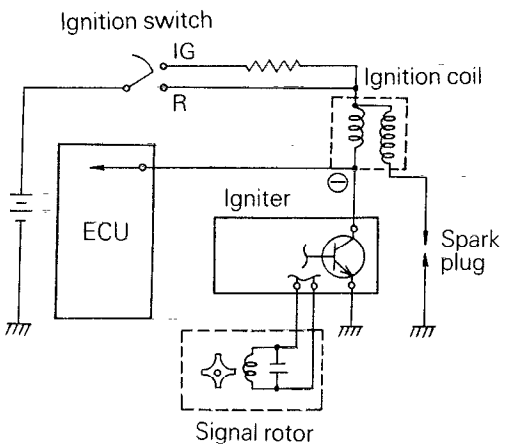


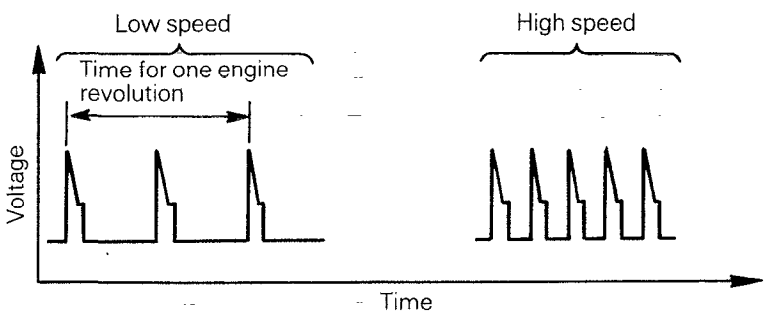
MOTOR POSITION SENSOR (MPS) N14BBGA

The MPS, a variable resistor type sensor, is installed in the ISC servo. Its sliding pin is in contact with the plunger end and as the plunger moves, the internal resistance of the MPS changes (namely, the output voltage changes).
The MPS senses the ISC servo plunger position and sends the signal to the ECU.
The ECU controls the valve opening, and consequently the idle speed by using the MPS signal, idle signal, engine coolant temperature signal, load signals (automatic transmission and air conditioner) and vehicle speed signal.

ENGINE SPEED SENSOR (IGNITION COIL NEGATIVE TERMINAL VOLTAGE SENSOR) N14BBHB

The ignition coil negative terminal voltage makes sudden increase twice per engine revolution synchronously with ignition timing.
By sensing this ignition coil negative terminal voltage change and measuring the time between peak voltages, the ECU computes the engine speed, judges the engine operating mode and controls the air-fuel ratio and idle speed.





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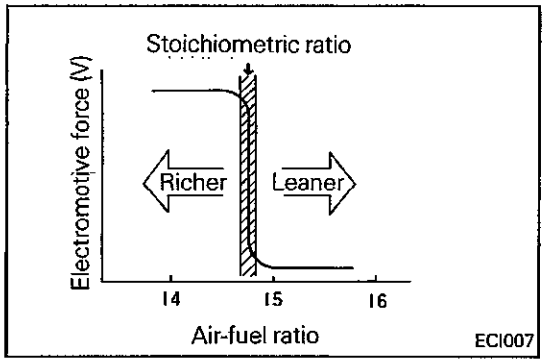
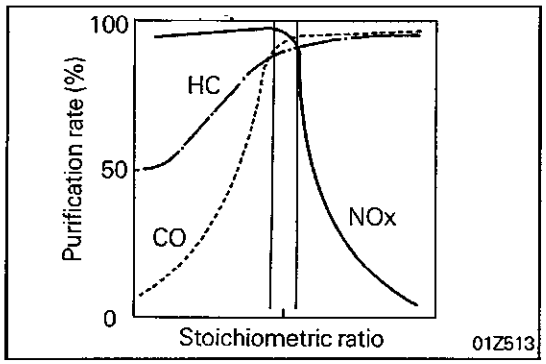


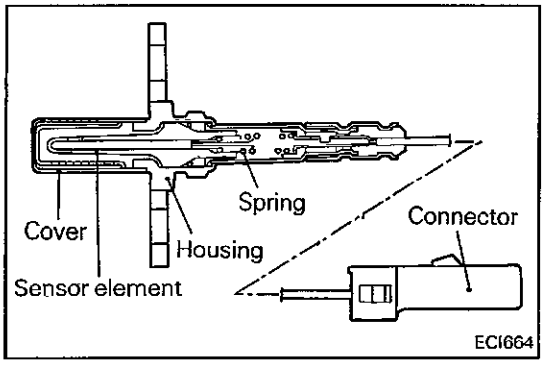
OXYGEN SENSOR

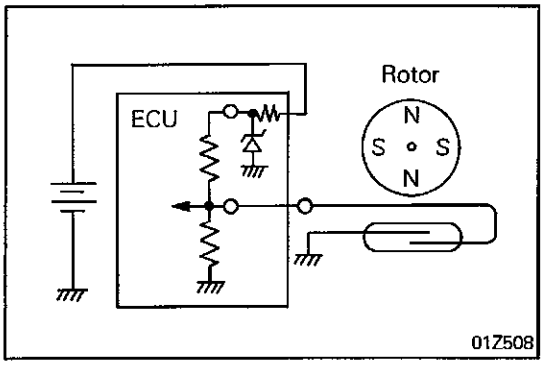
N14BBIB

The oxygen sensor installed in the exhaust pipe makes use of the principles of solid electrolyte oxygen concentration cell. It is characterized by sharp change of the output voltage in the vicinity of the stoichiometric air-fuel ratio.



Using such characteristics, the oxygen sensor senses the oxygen concentration in the exhaust gas and feeds it back to the ECU. The ECU then judges if the air-fuel ratio is richer or leaner as compared to the stoichiometric ratio and provides feedback control to adjust the air-fuel ratio to the stoichiometric ratio where the emission purification rate of the three-catalyst converter is the optimum.

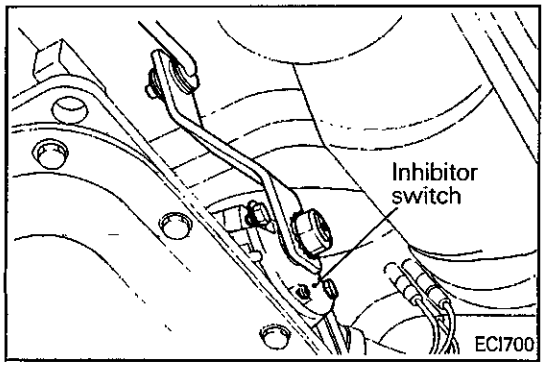




VEHICLE SPEED SENSOR

N14BBJA

The vehicle speed sensor uses a reed switch. The speed sensor built in the speedometer converts the transmission speedometer gear revolution (vehicle speed) into pulse signals, which are sent to the ECU.



INHIBITOR SWITCH – Vehicles with an Automatic Transmission

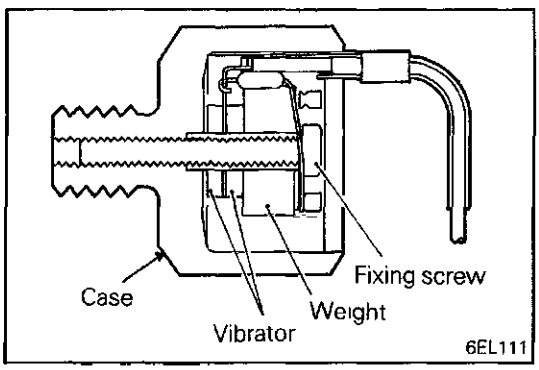
N14BBMB

This switch detects whether the select lever is currently positioned at N or P. Based on this signal, the ECU senses the automatic transmission load and drives the ISC servo to keep optimum idle speed.

AIR CONDITIONER SWITCH

N14BBNA

When the air conditioner is turned on, the air conditioner ON signal is sent to the ECU. Based on this signal, the ECU drives the ISC servo to keep optimum idle speed.



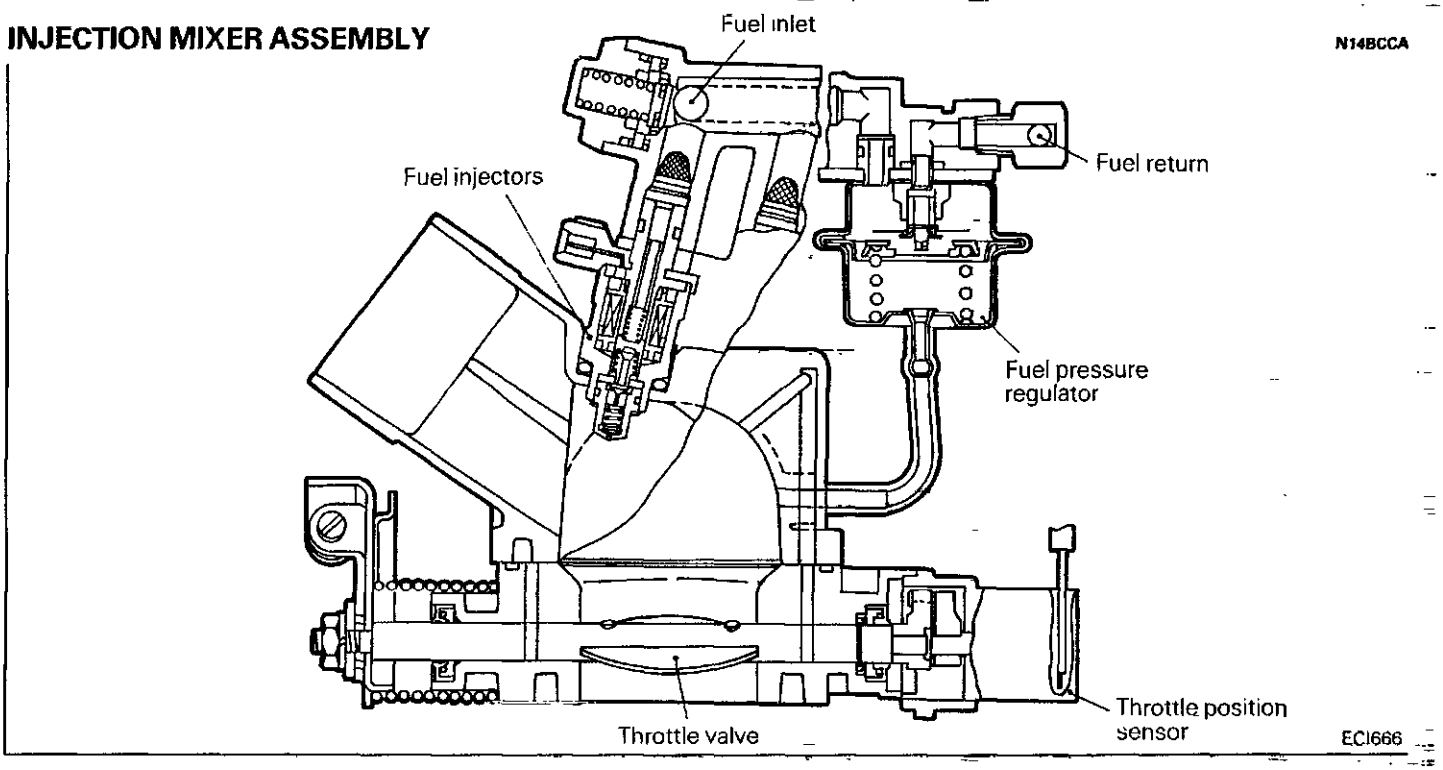
DETONATION SENSOR

N14BBOA

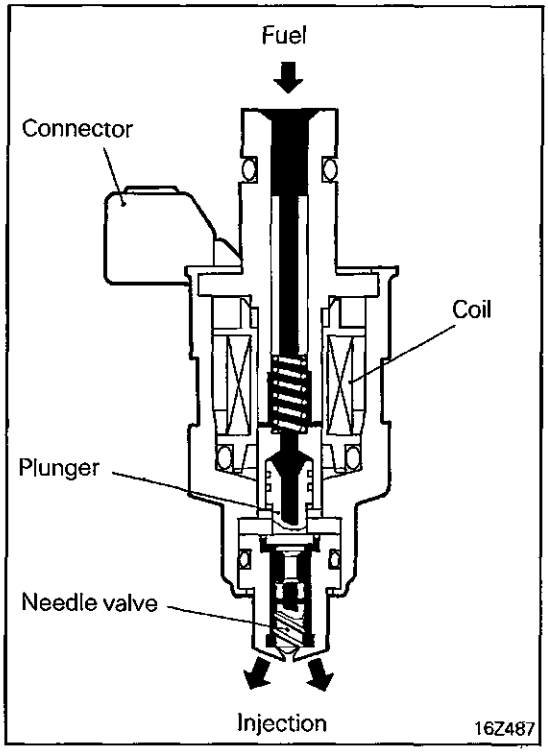
Installed on the cylinder block, the detonation sensor converts vibration into voltage by its piezoelectric element. When detonation occurs, it resonates with cylinder block vibration to generate high voltage which is sent to the igniter as the detonation signal. Based on this signal, the igniter retards the ignition timing to prevent detonation.

INJECTION MIXER ASSEMBLY

N14BCCA



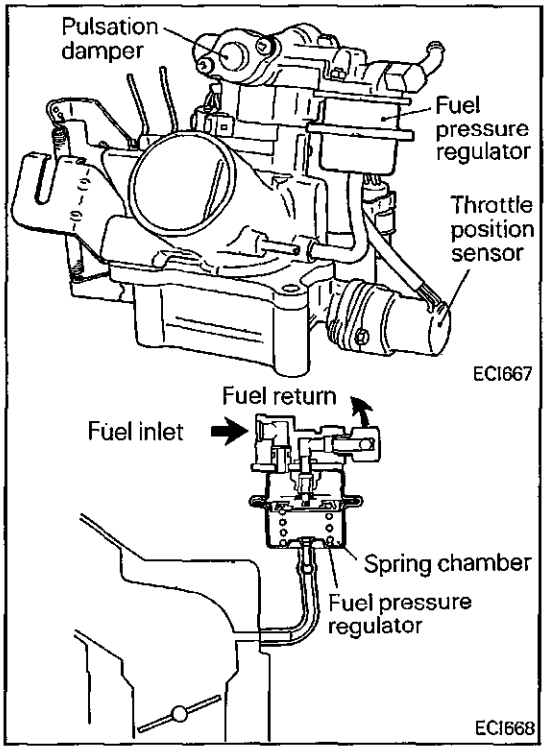
The injection mixer assembly consists of fuel injectors, fuel pressure regulator and throttle valve.



INJECTORS

N14BCDA

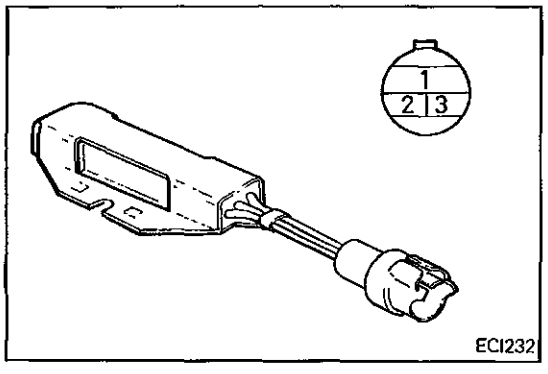
The injector, which is an injection nozzle with solenoid valve, injects fuel based on the injection signal from the ECU.
The injectors are installed on the injection mixer and inject fuel upstream of the throttle valve.
When the solenoid coil is energized, the plunger is attracted. The needle valve integral with the plunger is then pulled to the full open position with the plunger and fuel is injected through the valve so opened.
As the injection nozzle opening is fixed and the fuel pressure is also fixed, the injection amount is determined by the duration during which the needle valve is open, namely, by the time during which the solenoid coil is energized.



FUEL PRESSURE REGULATOR

N14BCEA

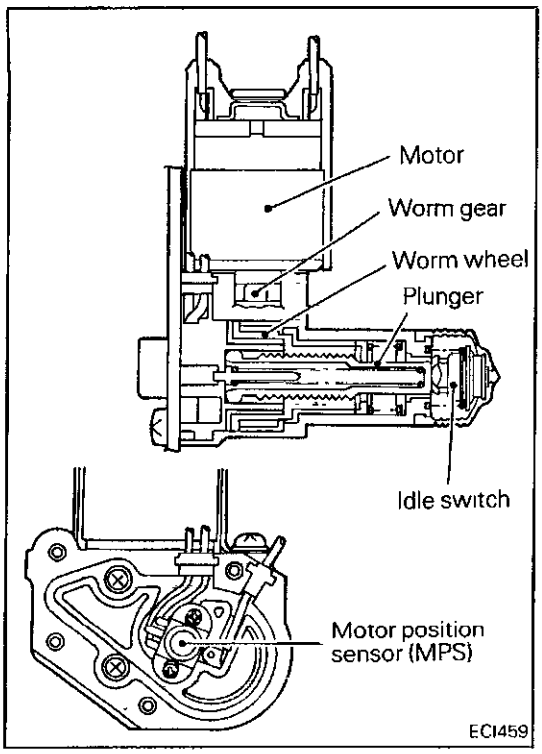
The fuel pressure regulator always keeps the injector fuel pressure at a level 250 kPa (36 psi) higher than the injection mixer inside pressure. By doing so, the fuel injection amount is kept constant even when the mixer inside pressure changes.
The spring chamber is connected by vacuum hose to the mixer nipple so that the mixer inside intake pressure always acts in the spring chamber.
Therefore, when the fuel pressure becomes higher than the spring tension plus intake air pressure in the mixer, the diaphragm is forced up and excess fuel is returned through the return pipe to the fuel tank.



RESISTOR

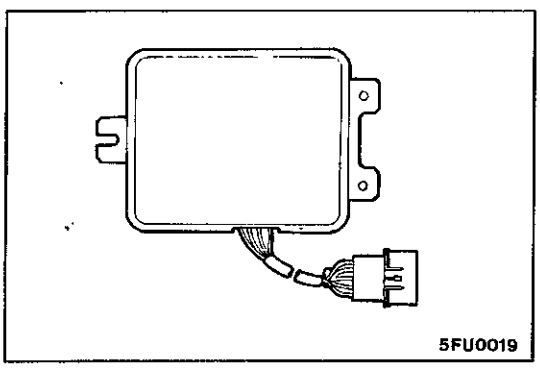
N14BCFA

The resistor limits the electric current flowing to the injector coil. The injector is required to respond quickly to the fuel injection signal. This fast response is achieved by reducing the number of turns of the injector coil and thus improving current rise when the coil is energized.
This smaller number of turns, however, draws more current and generates more heat. In order to prevent this, a resistor is provided between the power supply (+) and the injector to limit current flowing to the coil.



IDLE SPEED CONTROL (ISC) SERVO N14BCGA

The ISC servo consists of a motor, worm gear, worm wheel and plunger.
Also are incorporated the motor position sensor (MPS) to detect plunger position and the idle switch to detect idle position.
The worm gear, installed on the motor shaft, transmits motor rotation to the worm wheel.
The worm wheel is meshed with worm on the plunger so that the plunger extends or retracts as the worm wheel rotates.
As the motor rotates according to the signal from the ECU, the plunger extends or retracts depending on the direction of rotation of the motor to actuate the throttle valve via the ISC lever.
In this way, the idle speed is controlled by adequately changing the throttle valve opening.



IGNITER N14BCHA

The igniter, consisting of the knocking level evaluating section and the ignition timing and boost pressure control section, evaluates the knocking level and controls the ignition timing and the boost pressure. When the knock sensor malfunction, it retards the ignition timing by a fixed angle (except when idling) to protect the engine. (Fail-safe design)

WASTE GATE SOLENOID VALVE, CONTROL RELAY AND AIR CONDITIONER POWER RELAY N14BCID

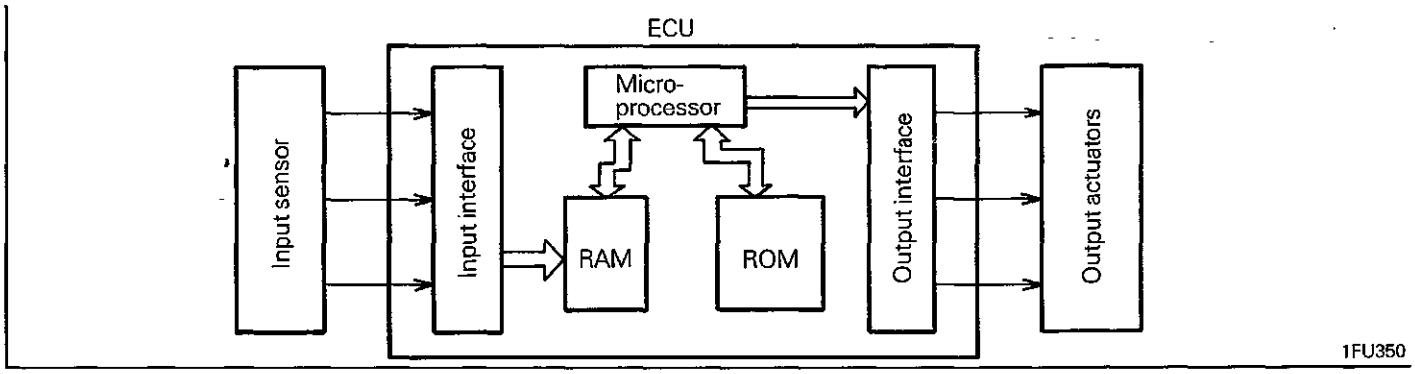
Refer to ECI SYSTEM OPERATION, P.14-12.

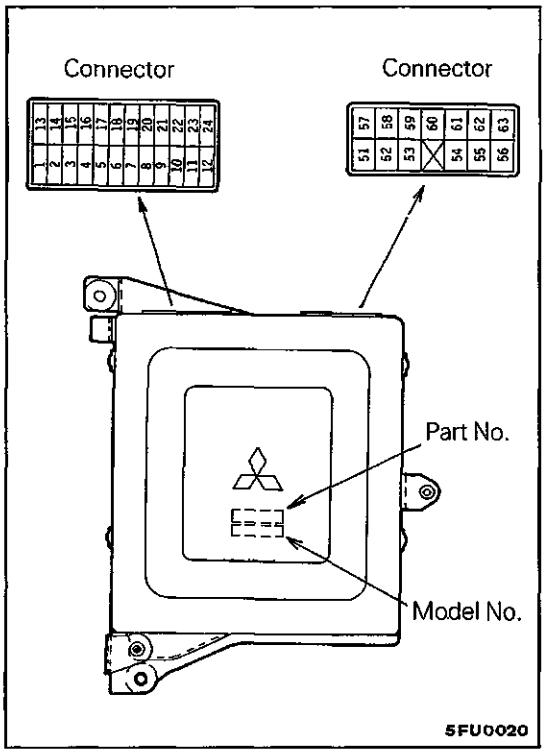
SECONDARY AIR CONTROL SOLENOID VALVE AND EGR CONTROL SOLENOID VALVE N14BCJB

Refer to GROUP 25 EMISSION CONTROL SYSTEMS.

ELECTRONIC CONTROL UNIT (ECU) N14BDAC

Based on the information from various sensors, the ECU determines (computes) an optimum control for varying operating conditions and accordingly drives the output actuators.
The ECU consists of an 8-bit microprocessor, random access memory (RAM), read only memory (ROM) and input/output (I/O) interface.





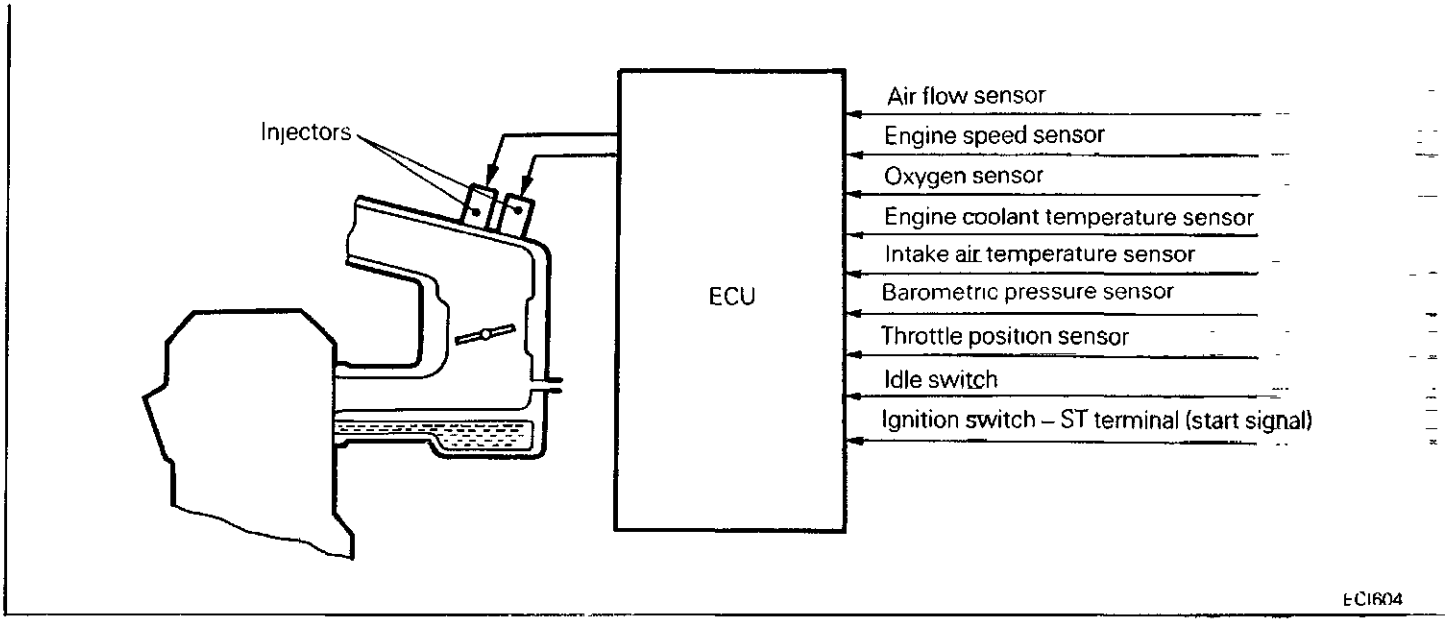
ECU Connector I/O Pin Composition

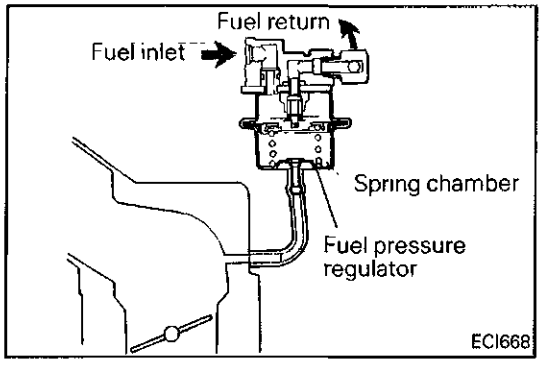
1: Engine speed sensor [Ignition coil (–) terminal]
2: Air flow sensor (AFS)
3: Motor position sensor (MPS)
4: Sensor GND
5: Intake air temperature sensor
6: Engine coolant temperature sensor
7: Idle switch
8: –
9: –
10: Sensor power
11: Oxygen sensor
12: ISC servo (for retraction)
13: Igniter – advance control signal
14: Sensor power – MPS backup
15: Throttle position sensor (TPS)
16: Barometric pressure sensor
17: –
18: –
19: Vehicle speed sensor
20: Secondary air control solenoid valve
21: Diagnosis output
22: Control relay (fuel pump relay control)
23: ISC servo (for extension)
24: Air conditioner power relay
51: Power switch fuel pump relay
52: GND
53: GND
54: EGR control solenoid valve
55: Ignition switch – ST terminal (start signal)
56: Air conditioner switch (air conditioner signal)
57: Power switch fuel pump relay
58: Inhibitor switch
59: Boost meter
60: Injector, small orifice
61: Igniter – detonation control signal
62: Injector, large orifice
63: Backup power

ECI SYSTEM OPERATION

N14BEBC

AIR-FUEL RATIO CONTROL SYSTEM

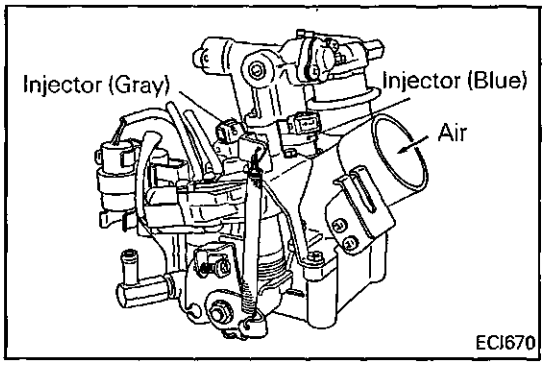


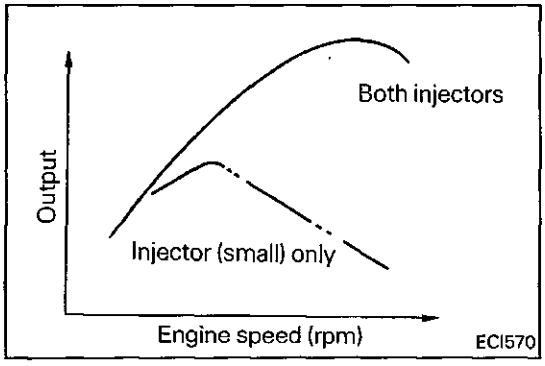


The air-fuel ratio control is achieved by controlling the driving time of two injectors installed to the injection mixer.
After passing through the in-tank filter, fuel is force-fed by the in-tank fuel pump so as to be sent to the two injectors on the injection mixer through the main pipe and fuel filter.
The fuel pressure applied to the injector is maintained at a fixed level by the fuel pressure regulator so that it may be 250 kPa (36.26 psi) higher than the internal pressure of the injection mixer where fuel injection takes place. After pressure regulation, excess fuel is returned to the fuel tank through the return hose. When the injector is energized, the valve inside the injector opens fully to inject the fuel.
Since the fuel pressure is kept at a fixed level, supply of fuel injected from the injectors into the injection mixer varies with the energizing time.

FUEL INJECTION CONTROL

The amount of fuel injection is basically determined by the air flow sensor (AFS) output frequency corresponding to the amount of intake air.
With the increase of air flow sensor output frequency, the amount of fuel injection increases and as the air flow sensor output frequency decreases, the amount of fuel injection decreases.
When the air flow sensor is in trouble, the backup control is made by driving the injectors by means of engine speed sensor signal.





Injector Drive Range

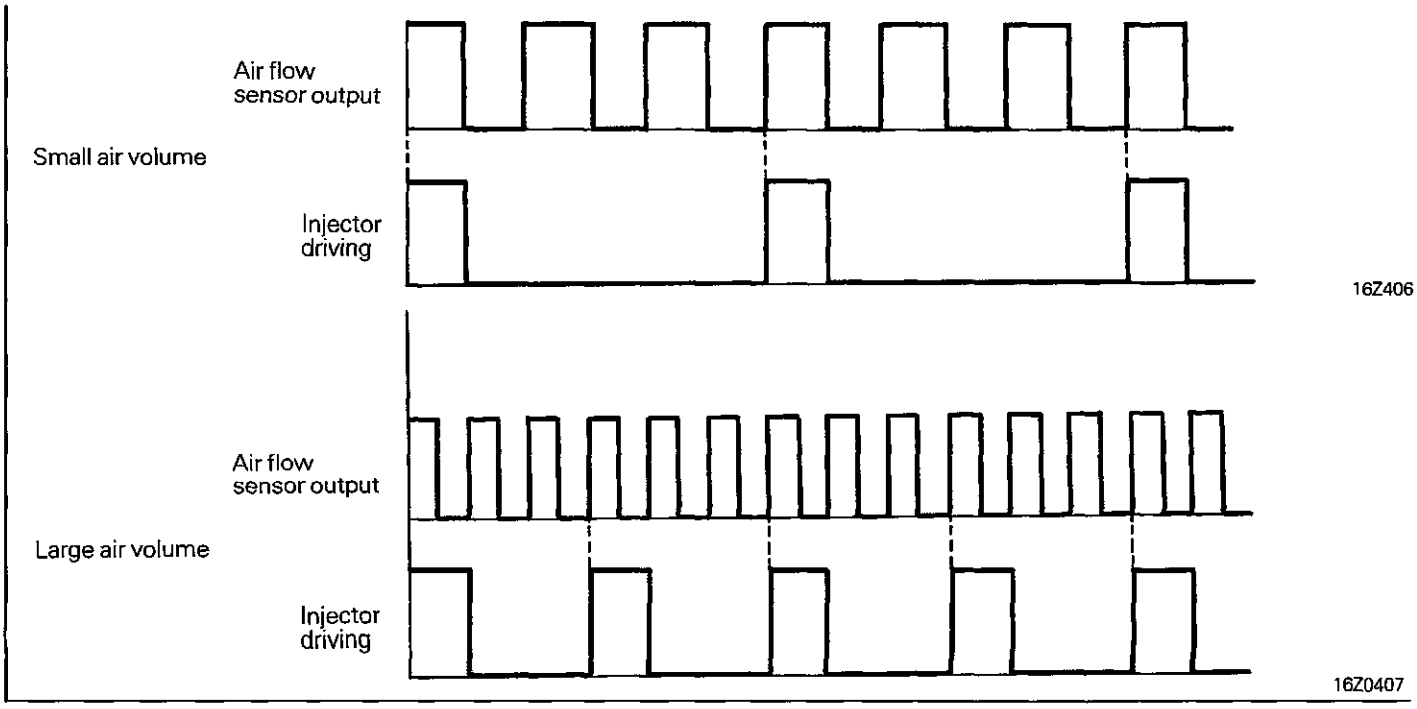
In the range where the amount of intake air is small, only the small flow type injector with a small orifice is driven and the fuel injection intervals are reduced to inject fuel continuously for improvement of idling stability.
In the range where the amount of intake air is large, both the large flow type injector with large orifice and the small flow type injector are driven to provide sufficient fuel supply.

Injector Drive (Fuel Injection) Timing

(1) Fixed injection
When starting (cranking) the engine, only small injector is driven at a cycle of 13.3 Hz.

(2) Karman synchronous injection
After starting the engine, the injectors are driven synchronously with air flow sensor signal.

NOTE
If the injector driving time is constant, air flow sensor output frequency increases with the amount of intake air and accordingly the number of injector driving time also increases. Therefore, air-fuel ratio is maintained at a fixed level.



Injector Driving Time

The injector driving time (amount of fuel injection) at which the air-fuel ratio for the amount of intake air reaches stoichiometric air-fuel ratio is called basic driving time and is stored in the memory of ECU in advance.
When starting (cranking) the engine, the map value* determined by the engine coolant temperature sensor signal is used as the basic driving time.
During the deceleration, the basic driving time is set as zero.

* Map value: The map value is a value set in advance and stored in the ROM inside the ECU.

The injector driving time is obtained by making the following corrections on the above-mentioned basic driving time.

- Oxygen sensor feedback correction (Closed loop control correction)

  In normal operation (excluding idling*) after engine warming up, air-fuel ratio is corrected to stoichiometric air-fuel ratio by using oxygen sensor signals. The three-way catalytic converter gives best degree of purification at stoichiometric air-fuel ratio.

  * Excluding idling: A correction factor for oxygen sensor feedback operation has been stored in advance and during idling, this factor is applied for correction on the rich side to increase the air-fuel ratio over the stoichiometric ratio, thus improving the idle stability. During idling, secondary air is supplied from the reed valve to reduce emissions (CO and HC).

- Air-fuel ratio map correction (Open loop control correction)

  During engine warming up and heavy load operation, correction to the optimum air-fuel ratio is made by the map values set by engine speed and amount of intake air.

- Engine coolant temperature correction

  To maintain operability of cold engine, correction is so made that the lower the engine coolant, the more the amount of fuel injection.

- Intake air temperature correction

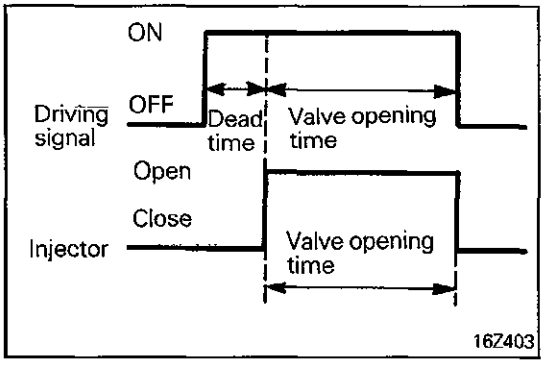
  Change in air-fuel ratio due to difference in intake air density caused by intake air temperature is corrected.

- Barometric pressure correction

  Change in air-fuel ratio due to difference in intake air density caused by change in barometric pressure is corrected.

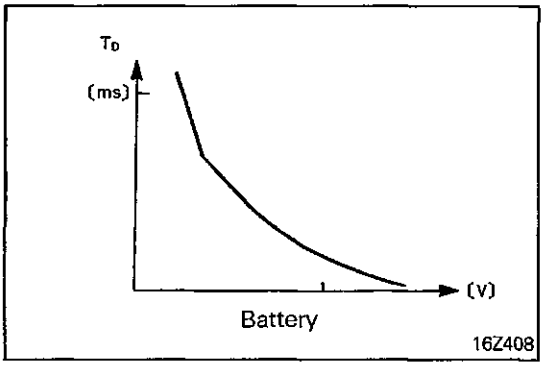
- Acceleration/deceleration correction

  In accordance with change in opening of throttle valve, fuel amount is corrected, improving operability at acceleration and deceleration.



- Dead time correction

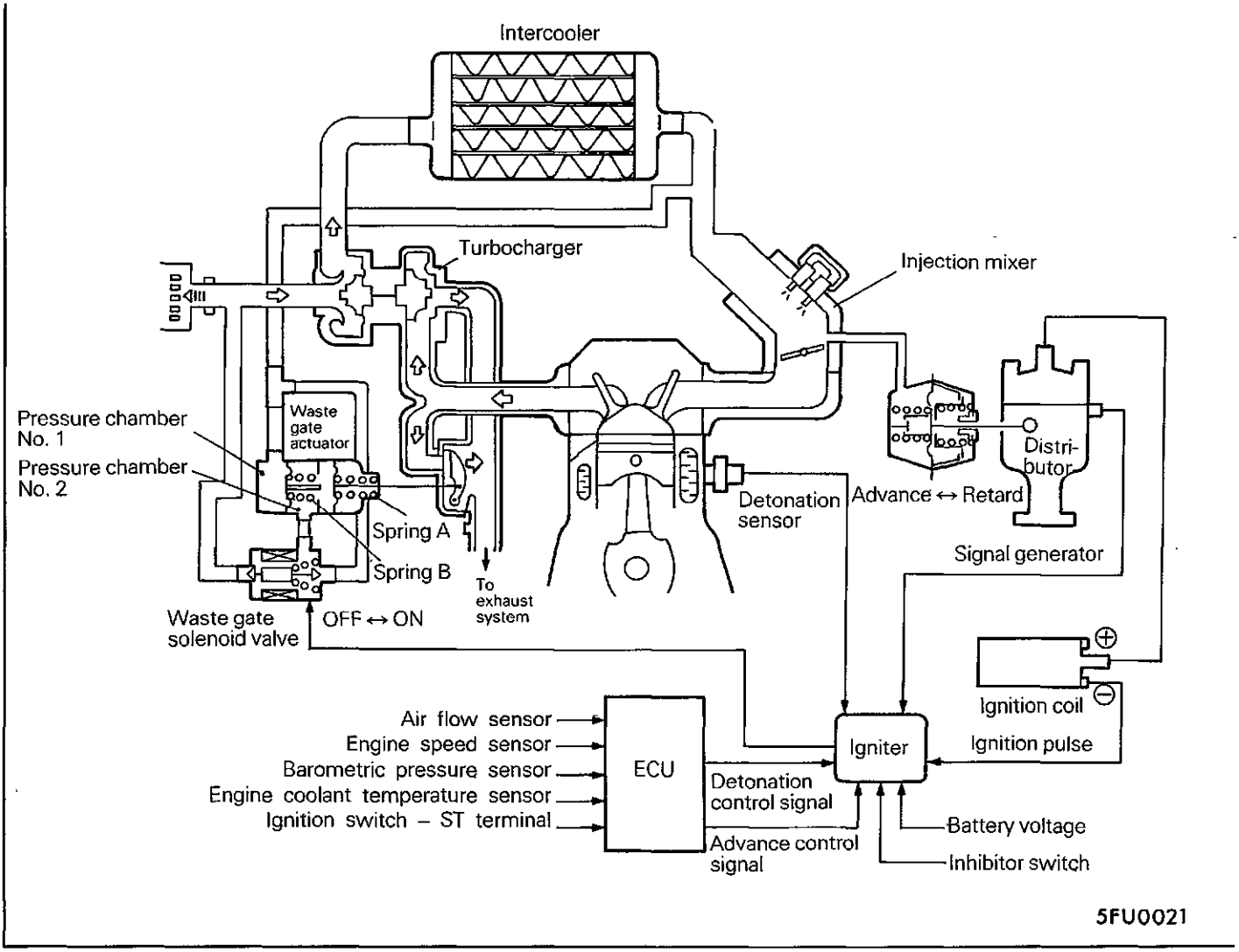
  The injectors opened by the driving signal from ECU have operational lag which changes according to difference due to battery voltage. This means that actual injector valve opening time becomes less than injector driving signal, failing to provide expected air-fuel ratio.



Therefore, battery correction time corresponding to the battery voltage is added.

IGNITION TIMING CONTROL SYSTEM

N14BFBA



The ignition timing control system provides the following three types of control.

Detonation Control

When detonation control signal is applied to the igniter from the ECU, the igniter retards the ignition timing to such an extent that detonation is eliminated (max. 12° in crank angle).
Should the harness from the detonation sensor have an open or short circuit, the igniter retards the ignition timing by a fixed angle (approx. 8° in crank angle) to prevent detonation (fail-safe feature).

Cold and High Altitude Timing Control

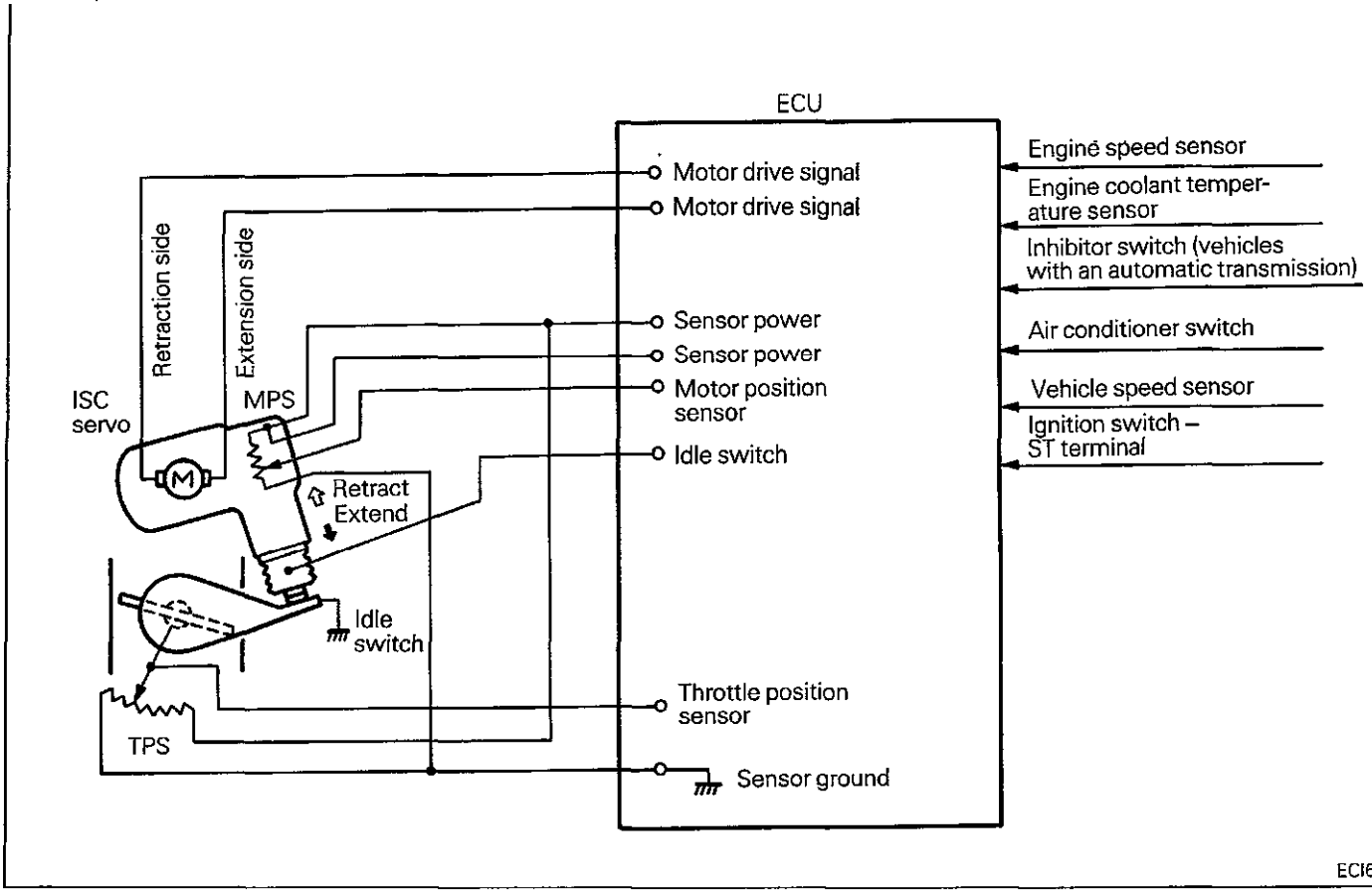
When the engine coolant temperature is low (approx. 35°C (95°F) or lower) or the vehicle is driving at altitude 1,200 m (3,937 ft.) or higher (barometric pressure 88 kPa (12.8 psi) or lower), the system causes the ignition timing to advance a fixed angle (approx. 5° in crank angle) to improve mileage and driveability.

Boost Pressure Control

When gasoline with a high octane number is used, the igniter energizes the waste gate solenoid valve so that the boost pressure may be applied only to the pressure chamber No. 1. In this condition, the waste gate valve does not open until the boost pressure overcomes the force of springs A and B, resulting in a higher boost pressure being applied. When regular gasoline is used, the igniter turns off the waste gate solenoid valve circuit to cause the boost pressure to be applied to the pressure chamber No. 2 as well. In this condition, the waste gate valve opens if the boost pressure only overcomes the force of spring A. Accordingly, the boost pressure is kept lower, which protects the engine from knocking.
In case of vehicles with a manual transmission, however, the waste gate solenoid valve circuit is always turned off if the engine speed is lower than 4,000 rpm, as the inhibitor switch terminal on the igniter is grounded at all times. Within this range, therefore, the boost pressure is kept lower, which prevents the transmission from being damaged.

IDLE SPEED CONTROL (ISC) SYSTEM

N14BGAA



The ISC system provides the following four modes of control.

Start Control

The throttle valve opening is controlled to optimum position for start according to the engine coolant temperature.

Fast Idle Control

(1) When the idle switch is on, the engine speed is controlled to a target rpm according to the engine coolant temperature (rpm feedback control).
(2) When the idle switch is off, the ISC servo is actuated to move the throttle valve to a target opening position according to the engine coolant temperature (target opening control).

Idle Control

When the air conditioner switch is turned on or when the transmission is shifted from N to D (vehicles with an automatic transmission), the system causes the idle speed to increase to the target rpm according to the load (rpm feedback control).

Dash Pot Control

The system provides dash pot control according to deceleration conditions to alleviate shock at deceleration.

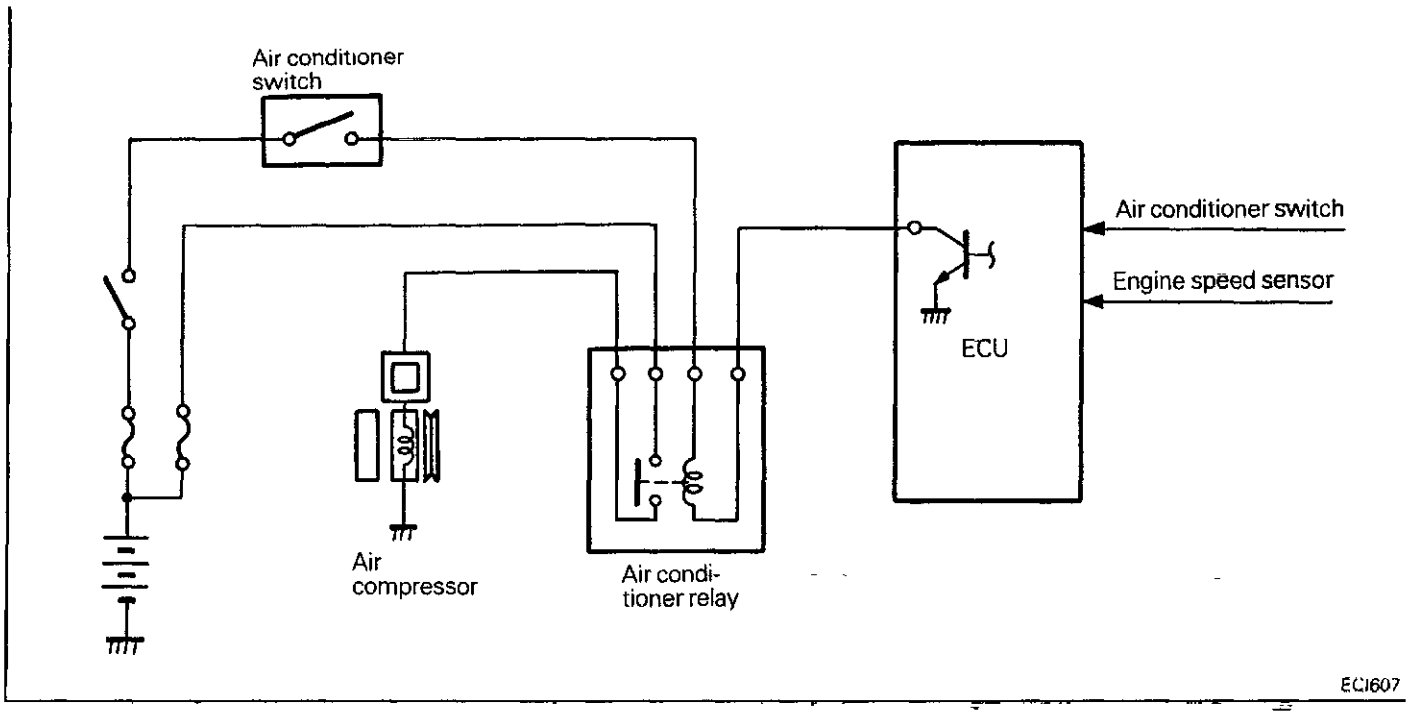
SECONDARY AIR CONTROL SYSTEM AND EGR CONTROL SYSTEM

N14BHBA

Refer to GROUP 25 EMISSION CONTROL SYSTEMS.

AIR CONDITIONER RELAY CONTROL

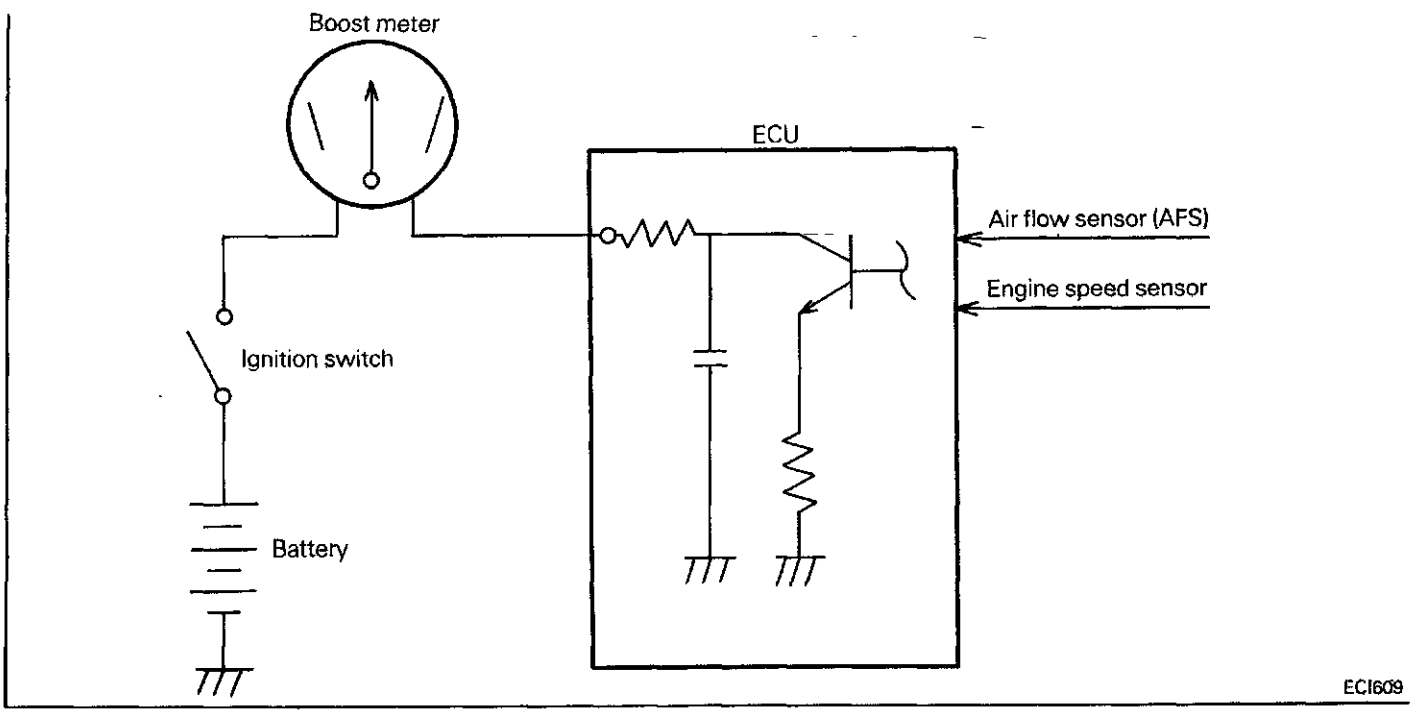
N14BKBA



When the air conditioner switch is turned on while the engine is at idle, the ISC servo operates to increase the engine speed. However, there is some delay before the engine speed actually increases. To maintain the engine free from the air conditioner load during that delay period, the ECU keeps the power transistor off for a fixed time (about 0.5 second) to open the air conditioner power relay circuit. As a result, even if the air conditioner switch is on, the air compressor is not driven instantly, preventing engine speed drop due to compressor load.

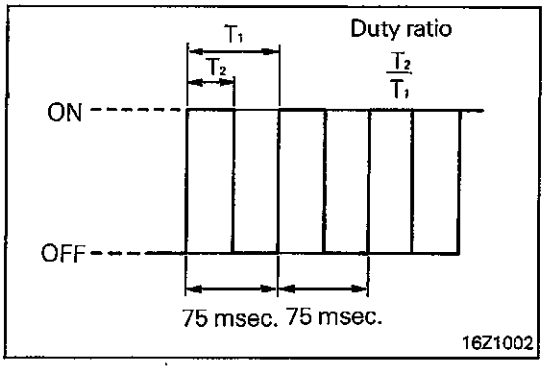
BOOST METER CONTROL

N14BNAA



The boost meter is basically an ammeter. Based on the intake air volume signal from the air flow sensor (AFS) and the engine speed signal from the engine speed sensor, the ECU computes the load and determines the duty ratio accordingly and drives the boost meter.

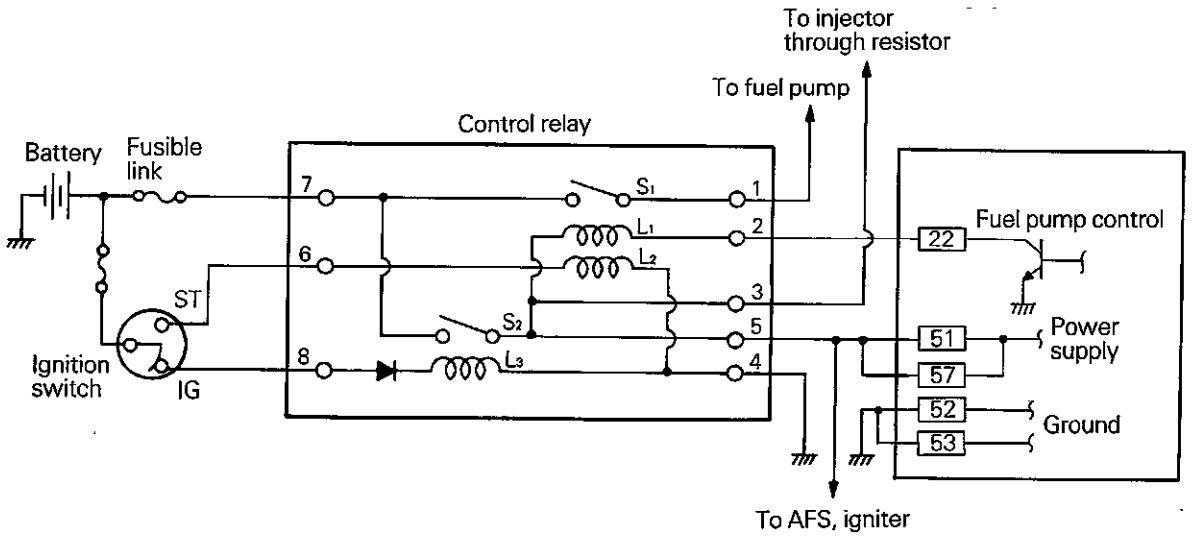
Load α: intake air volume/rpm



NOTE
The duty ratio is the ON duration ratio of 13.3 Hz pulse or T_2/T_1. The higher the duty ratio, the more mean current flows to the boost meter, and as a result, the boost meter reads the higher value.
The smaller is the duty ratio, the boost meter reads the smaller value.

POWER SUPPLY AND FUEL PUMP CONTROL

N14B0AA



- While cranking (ignition switch at ST), current flows through coil L_2 to close switch S_1. As a result, the fuel pump is driven.
  Current also flows through coil L_3 to close switch S_2. As a result, power is supplied to the ECU, AFS, igniter and injectors.
- While the engine is running, the ECU turns on the power transistor to supply current to coil L_1 and to close switch S_1. As a result, the fuel pump is driven.

- In the event of engine stall or other abnormal conditions, the ECU turns off the power transistor and open the coil L_1 circuit. As a result, switch S_1 opens to stop driving of the fuel pump, thus securing safety.

SELF-DIAGNOSIS N14BQAA

Self-diagnosis is a system in which the input signal from each sensor is monitored by the computer (ECU) and should any abnormality happen in the input signal, the abnormal item is memorized by the computer. The diagnosis items are 7 items including that for normal condition and can be confirmed using a voltmeter.

The abnormality-diagnosis memory is kept by direct power supply from the battery. Therefore, the memory of diagnosis result is not erased by turning off the ignition switch. However, it is erased if the back-up power supply is turned off by disconnection of battery cable or ECU connector.

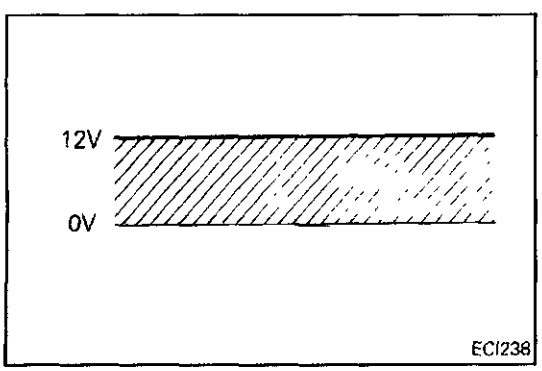
DIAGNOSIS ITEMS

The abnormality-diagnosis items are the following 6 items. If there are two or more items found abnormal, they are indicated in the order of increasing code numbers.

Malfunction No.	Diagnosis item
1	Oxygen sensor
2	Ignition pulse (engine speed sensor)
3	Air flow sensor
5	Throttle position sensor
6	ISC motor position sensor
7	Coolant temperature sensor

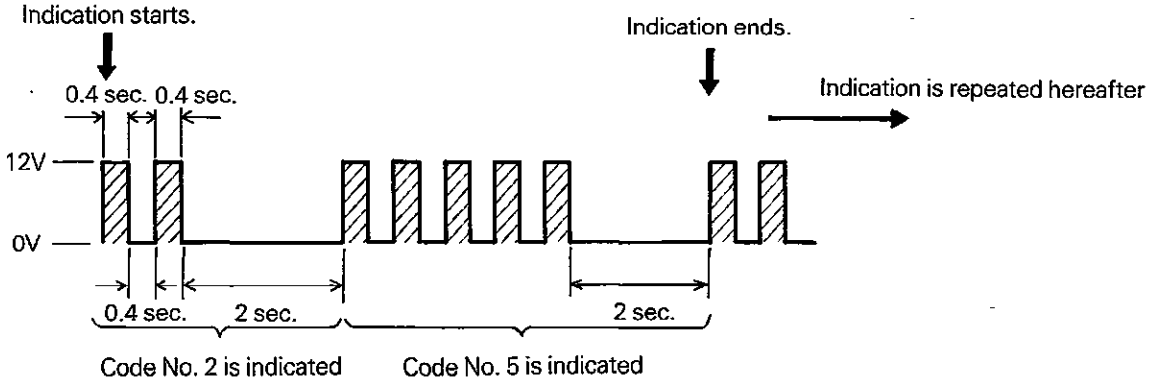
INDICATION METHOD

Indication is made by deflection of the pointer of voltmeter. Connect a voltmeter to the connector for diagnosis and the following indication will be made.



1. When normal
   Constantly 12V is indicated.

2. When abnormal
   Indication alternates between 0V and 12V every 0.4 second.
   When there are two or more abnormal items, the low-code-numbered item is first indicated. Then, after indication of 0V for 2 seconds, subsequent indication is made in the same manner as mentioned above.
   The following diagram shows an example of indication where codes No. 2 and No. 5 are abnormal.



ECI239

SPECIFICATIONS

N14CA-A

GENERAL SPECIFICATIONS

Items	Specifications
Fuel	
Tank capacity lit. (gal.)	75 (19.8)
Return system	Provided
Filter	High pressure type
Fuel pump	
Type	Electric type
Injection mixer	
Identification model number	46EID-735
Injector type and number	Electromagnetic, 2
Injector identification mark	M (Blue connector, large orifice) L (Gray connector, small orifice)
Throttle bore mm (in.)	46 (1.811)
Fuel pressure regulator	
Regulated pressure kPa (psi)	245 (33.6)
Throttle position sensor (TPS)	Variable resistor type
Idle speed control (ISC) servo	Electric motor
Idle position switch	Contact type, within ISC servo
Motor position sensor (MPS)	Variable resistor type
Electronic control unit (ECU)	
Identification model No.	E2T13677
Input sensor	
Air flow sensor (AFS)	Karman vortex type
Barometric pressure sensor	Semiconductor diffusion type sensor
Intake air temperature sensor	Thermistor type
Engine coolant temperature sensor	Thermistor type
Oxygen sensor	Zirconia sensor
Vehicle speed sensor	Reed switch type
Inhibitor switch	Contact type switch
Detonation sensor	Piezoelectric device type
Output actuator	
Igniter	
Identification model No.	E2T16671
Control relay	
Identification model No.	E8T00571
Resistor	
Identification model No.	E8T00271
EGR control solenoid valve	ON-OFF solenoid valve
Secondary air control solenoid valve	ON-OFF solenoid valve
Waste gate solenoid valve	ON-OFF solenoid valve

SERVICE SPECIFICATIONS

N14CB-A

Items	Specifications
Engine	
Basic ignition timing	10° ± 2°BTDC at curb idle
Actual ignition timing at high altitude	15°BTDC at curb idle
Curb idle speed rpm	850 ± 100
Idle speed when air conditioner is on rpm	1,000 at neutral position
	750 at D range (Vehicles with automatic transmission)
Idle speed control (ISC) setting rpm	850
Throttle position sensor (TPS) regulating voltage V	0.48 – 0.52 at curb idle
Injection mixer	
Injector coil resistance Ω	
Blue connector [at 20°C (68°F)]	2 – 3
Gray connector [at 20°C (68°F)]	2 – 3
Throttle position sensor (TPS) resistance kΩ	3.5 – 6.5
Motor position sensor (MPS) output voltage V	Approx. 0.5 – 5
ISC servo motor coil resistance [at 20°C (68°F)] Ω	5 – 35
Input sensor	
Intake air temperature sensor resistance [at 20°C (68°F)] kΩ	2.7
Engine coolant temperature sensor resistance kΩ	
20°C (68°F)	2.5
80°C (176°F)	0.3
Oxygen sensor output voltage V	Approx. 1
Air flow sensor output voltage V	2.2 – 3.2
Barometric pressure sensor output voltage V	
101 kPa (14.7 psi)	4
88 kPa (12.8 psi)	3.5
Output actuator	
EGR control solenoid valve resistance [at 20°C (68°F)] Ω	36 – 44
Secondary air control solenoid valve resistance [at 20°C (68°F)] Ω	36 – 44
Waste gate solenoid valve resistance [at 20°C (68°F)] Ω	36 – 44

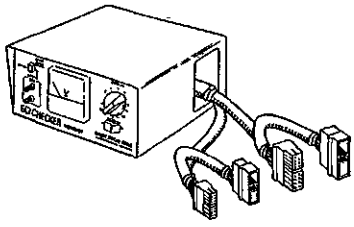
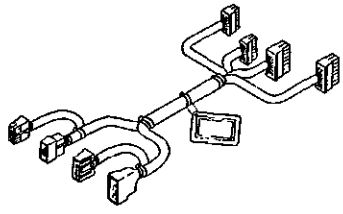
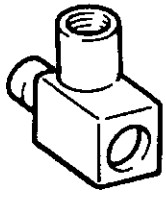
TORQUE SPECIFICATIONS

N14CC--

Items	Nm	ft.lbs.
Injection mixer attaching bolt	15 – 20	10.8 – 14.5
Injector holder attaching screw	4 – 6	2.9 – 4.3
Engine coolant temperature sensor	20 – 40	14.5 – 28.9
Oxygen sensor attaching nut	25 – 30	18 – 22
Detonation sensor	20 – 25	14.5 – 18.1
Throttle position sensor (TPS)	1.5 – 2.5	1.1 – 1.8
Pipe assembly attaching bolt	1.0	0.7
Fuel gauge unit attaching bolt	1.0	0.7
Fuel tank drain plug	15 – 25	11 – 18
Fuel tank attaching nut	25 – 30	18 – 22
Fuel main pipe flare nut	32 – 42	23 – 30
Fuel high pressure hose attaching bolt (eye bolt)	25 – 35	18 – 25
Accelerator cable lock nut	8 – 11	5.8 – 8.0

SPECIAL TOOLS

N14DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998451 ECI checker 	Diagnosis and inspection for ECI system	MD998452 Harness connector 	Inspection for ECI system Use with MD998451
MD998700 Adapter 	Measurement of fuel pressure		

TROUBLESHOOTING

N14EBBA

When checking and correcting engine troubles, it is important to start with inspection of the basic systems. In case you have such troubles as (1) engine start failure, (2) unstable idling or (3) poor acceleration, therefore, you should first check the following basic systems:

(1) Power supply
- Battery
- Fusible link
- Fuse

(2) Body ground

(3) Fuel supply
- Fuel line
- Fuel filter
- Fuel pump

(4) Ignition system
- Spark plug
- High tension cable
- Distributor
- Ignition coil

(5) Emission control system
- PCV system
- EGR system
- Vacuum leak

(6) Others
- Ignition timing
- Idle speed

Troubles with the ECI system are often caused by poor contact of harness connector. It is, therefore, important to check harness connector contact.

N14EFBB

Symptom	Probable cause	Remedy
Engine will not start or start too hard (cranks OK)	ECI system malfunction	Check for output of self-diagnosis code
	Fuel pump control system malfunction	Check system If faulty, check components
	Distributor signal generator or igniter malfunction	Check ignition pulse by using ECI checker (MD998451)
	Vacuum hose disconnected or damaged	Repair or replace
	Power is not supplied to ECU	Check by using checker (MD998451)
	Damaged control relay	Replace
	Idle switch malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Injector malfunction	• Check drive signal by using checker (MD998451) • Check component
	Damaged resistor	Replace
	Improper fuel pressure	Check fuel pressure
	Damaged ECU	Replace
	Harness broken/short-circuited or connector not connected securely	Repair or replace
Rough idle or engine stalls	ECI system malfunction	Check for output of self-diagnosis code
	Idle switch malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Injector malfunction	• Check drive signal by using checker (MD998451) • Check component
	Vacuum hose disconnected or damaged	Repair or replace
	Barometric pressure sensor malfunction	Check by using checker (MD998451)
	Intake air temperature sensor malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Vehicle speed sensor malfunction	Check by using checker (MD998451)
	Air conditioner switch malfunction	Check by using checker (MD998451)
	Inhibitor switch malfunction	Check by using checker (MD998451)
	ISC servo malfunction	• Check drive signal by using checker (MD998451) • Check component
	Improper fuel pressure	Check fuel pressure
	Harness broken/short-circuited or connector not connected securely	Repair or replace

Symptom	Probable cause	Remedy
Rough idle or engine stalls	Damaged resistor	Replace
	Engine coolant temperature sensor malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Air flow sensor malfunction	Check by using checker (MD998451)
	Engine speed sensor malfunction	• Check by using checker (MD998451) • Check harness for continuity
	Motor position sensor malfunction	Check by using checker (MD998451)
Engine hesitates or poor acceleration	ECI system malfunction	Check for output of self-diagnosis code
	Injector malfunction	• Check drive signal by using checker (MD998451) • Check component
	Improper fuel pressure	Check fuel pressure
	Barometric pressure sensor malfunction	Check by using checker (MD998451)
	Intake air temperature sensor malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Vacuum hose disconnected or damaged	Repair or replace
	Harness broken/short-circuited or connector not connected securely	Repair or replace
	Air flow sensor malfunction	Check by using checker (MD998451)
	Engine coolant temperature sensor malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Throttle position sensor malfunction	Check component and adjust if necessary
	Engine speed sensor malfunction	• Check by using checker (MD998451) • Check harnesses for continuity
Poor fuel mileage	ECI system malfunction	Check for output of self-diagnosis code
	Injector malfunction	• Check drive signal by using checker (MD998451) • Check component
	Oxygen sensor malfunction	Check by using checker (MD998451) (Check components and replace if faulty)
	Improper fuel pressure	Check fuel pressure

FUEL TANK AND FUEL LINE

N14EAAA

Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Clogged fuel filter or in-tank fuel filter	Replace
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line
	Dirty or rusted fuel tank interior	Clean or replace
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace
Evaporative emission control system malfunctions (When tank cap is removed, pressure releasing noise is heard)	Mispiping of vapor line	Correct
	Disconnected vapor line piping joint	Correct
	Folded, bent, cracked or clogged vapor line	Replace
	Faulty fuel tank cap	Replace
	Malfunctioning overfill limiter (two-way valve)	Replace

CONTROL FUNCTION TABLE

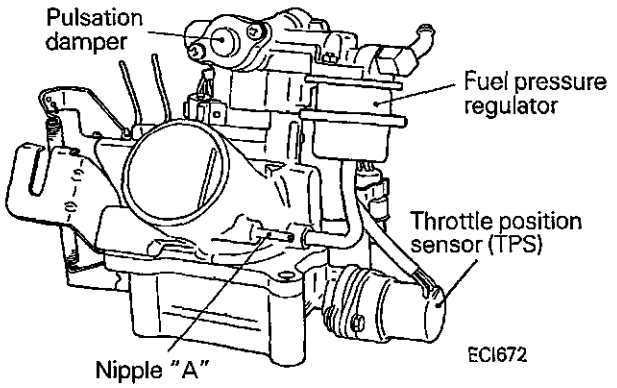
N14EE--

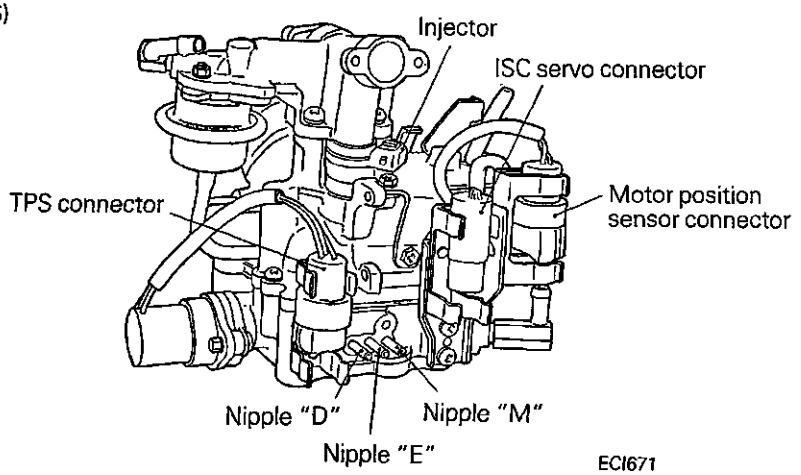
Functional elements \ Function		Air-fuel ratio control (ECI)	Ignition timing control	Idle seed control (ISC)	Air conditioner power relay control	Fuel pump drive control	Secondary air control	EGR control	Boost meter control
Input	Power supply (interlocked with ignition switch)	X	X	X	X	X	X	X	X
	Power supply (battery backup)	X	X	X	X	X	X	X	X
	Air flow sensor	X	X				X		X
	Barometric pressure sensor	X	X						X
	Intake air temperature sensor	X							X
	Engine coolant temperature sensor	X	X	X			X	X	
	Throttle position sensor (TPS)	X		X					
	Idle switch	X		X			X		
	Motor position sensor (MPS)			X					
	Engine speed sensor	X	X	X	X	X	X	X	X
	Oxygen sensor	X							
	Vehicle speed sensor			X					
	Air conditioner switch			X	X				
	Inhibitor switch (vehicles with an automatic transmission)			X					
	Detonation sensor (input to igniter)		X						
	Ignition switch ST terminal (start signal)	X	X	X					
Output	Injector	X							
	ISC servo			X					
	Igniter		X						
	Air conditioner power relay				X				
	Control relay					X			
	Resistor	X							
	Fuel pressure regulator	X							
	Secondary air control solenoid valve						X		
	EGR control solenoid valve							X	
	Boost meter								X
	Waste gate solenoid valve		X						

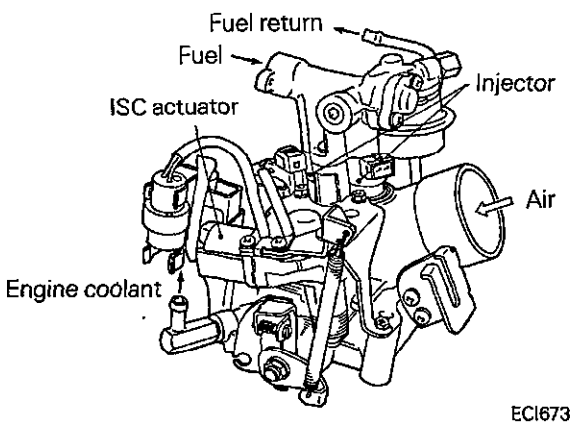
SERVICE ADJUSTMENT PROCEDURES

N14FJ--

INJECTION MIXER APPEARANCE







IDLE SPEED CHECK PROCEDURE N14FHAA

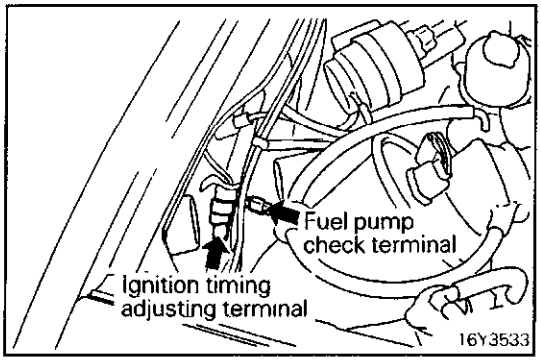
Caution
The improper setting (throttle value opening) will increase exhaust gas temperature at deceleration, reducing catalyst life greatly and deteriorating exhaust gas cleaning performance. It also has effect on fuel consumption and engine braking.

Checking Conditions

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- Lights, electric cooling fan and accessory drive: OFF
- Transmission: Neutral (N or P for vehicles with an automatic transmission)
- Steering wheel: Straight forward

(1) Set the timing light and tachometer.
(2) Start the engine and let it idle.
(3) Check the basic ignition timing and adjust if necessary.

Basic ignition timing: 10°BTDC ± 2°*



* When checking the basic ignition timing at high altitude, stop the engine and disconnect the waterproof female connector from the ignition timing adjusting connector. Connect a lead wire with an alligator clip to the ignition timing adjusting terminal to ground it.

NOTE
For the ignition timing check and adjustment procedures, refer to GROUP 8 ELECTRICAL – Ignition System.

(4) Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
(5) Run the engine at idle for 2 minutes.
(6) Take idle speed reading. If outside specified limits, check the ISC system.

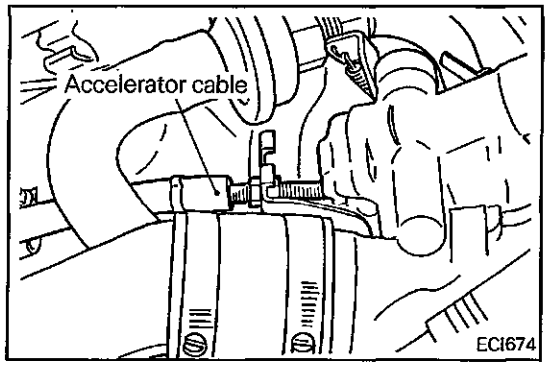
NOTE
The idle speed adjustment is unnecessary since this system controls the idle speed.

Curb idle speed: 850 ± 100 rpm

IDLE SPEED CONTROL (ISC) AND THROTTLE POSITION SENSOR (TPS) ADJUSTMENT N14FIAA

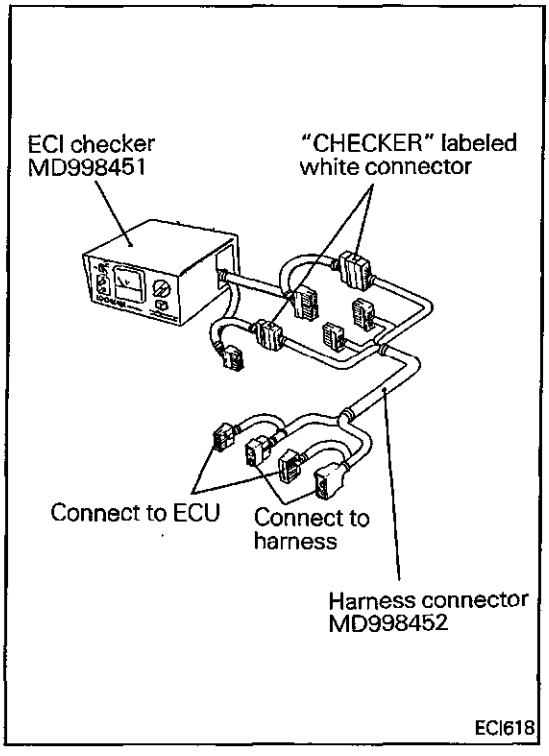
Adjustment Conditions

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- Lights, electric cooling fan and accessories: OFF
- Transmission: Neutral (N or P for vehicles with an automatic transmission)
- Steering wheel: Straightforward (vehicles with a power steering)

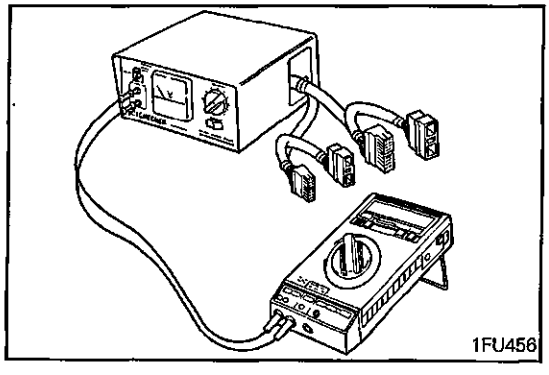


(1) Slacken the accelerator cable enough.
(2) Connect the tachometer.

(3) Turn ignition switch to "LOCK".
(4) Disconnect the large harness connector and small harness connector from the ECU.
(5) Set check switch of the ECI checker to OFF.
(6) Set select switch of the ECI checker to A.



(7) Connect white color connectors, with labeled "CHECKER", of the ECI harness connector A to the connectors of ECI checker, and then connect ECI harness connector A to the ECU and the harness connectors.



(8) Connect voltmeter to extension terminals of ECI checker, and then change extension switch from check meter down to extension position

Caution
Use an acculate digital voltmeter.

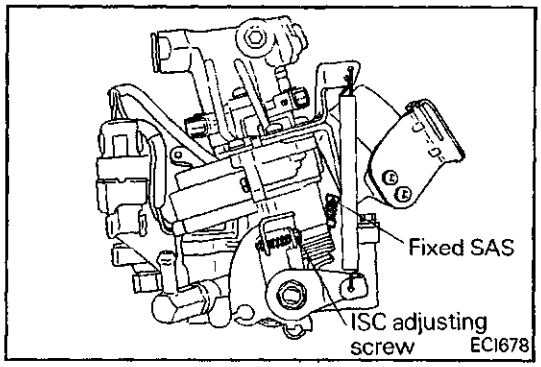
(9) Set select switch of ECI checker to "A" and check switch to "7".

NOTE
The voltmeter indicates motor position sensor (MPS) output voltage.

(10)In order to prevent binding of the throttle valve, open the throttle valve by hand to a half or more opening two or three times and then release it to allow to return with a snap. Then, loosen the fixed SAS enough.
(11)Start the engine and run idle.
(12)Check that the engine speed and motor position sensor (MPS) output voltage (voltmeter reading) are as specified.

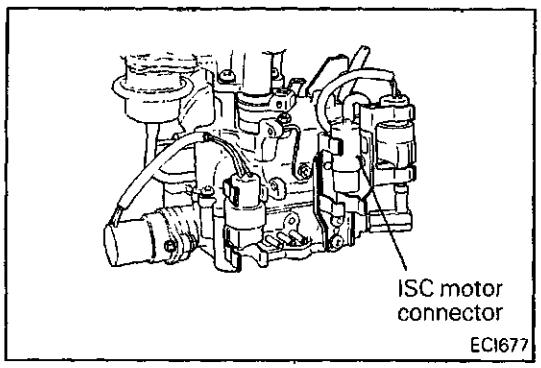
Standard value:
Engine speed 850 rpm
MPS output voltage 0.9 V

NOTE
In case of a vehicle which has not undergone enough break-in operations, there may be a case where the output voltage of the motor position sensor is 0.05 to 0.15V higher than the standard value. In such a case, it is not necessary to adjust the engine.



(13)If these are not as specified, adjust by the ISC adjusting screw.

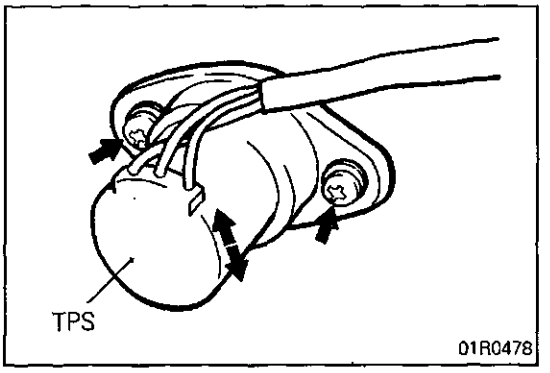
Caution
1. **When turning the ISC adjusting screw, use hexagon wrench whenever possible. To prevent the screw from becoming loose due to backlash of the screw, make the adjustment only when it is turned in the tightening direction.**
2. **After adjusting with the ISC adjusting screw, allow some time for the engine rotation to stabilize. Then, read the engine speed and the voltage.**



(14)Turn the ignition switch to "LOCK".
(15)Disconnect the ISC motor connector and fix the ISC motor.
(16)Start the engine and run idle.

(17)Tighten the fixed SAS until the engine speed starts to increase. Then, loosen it until the engine speed ceases to drop (touch point) and then loosen one turn from the touch point.
(18)Stop the engine.
(19)Set the select switch of ECI checker to "A", and check switch to "6".

NOTE
The ECI indicates the throttle position sensor (TPS) output.



(20)Turn the ignition switch to ON (engine does not start) and check that the TPS output voltage is as specified.

Standard value: 0.48 – 0.52 V

(21)If it is not as specified, loosen the TPS mounting screws and adjust by turning TPS.

NOTE
Turning TPS clockwise increases the output voltage.

Caution
Securely tighten the mounting screws after adjustment.

(22)Set check switch of the ECI checker to OFF.
(23)Set ignition switch to "LOCK".
(24)Disconnect connectors of the ECI checker and the ECI harness connector A from the ECU and the body side harness connectors.
(25)Connect the body side harness connectors to the ECU.
(26)Adjust the accelerator cable free play. (Refer to P.14-126.)
(27)Connect ISC motor connector.
(28)Start the engine and check that the engine idle speed is as specified.

Standard value: 850 ± 100 rpm

(29)Turn the ignition switch to "OFF".
Disconnect the battery terminal for 5 to 6 seconds and then reconnect it. (This erases the data stored in diagnosis memory during the ISC adjustment.)

INJECTION MIXER INSPECTION

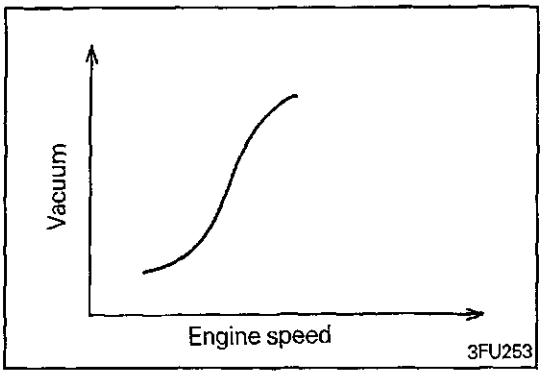
DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM) N14FUBA

Inspection Condition

Engine coolant temperature: 85 – 95°C (185 – 205°F)

(1) Disconnect the vacuum hose from the injection mixer D vacuum nipple and connect a hand vacuum pump to the nipple.

NOTE
For the location of the nipple, refer to the Injection Mixer Appearance (P.14-31).



(2) Start and race the engine to make sure that D vacuum increases with the engine speed.

NOTE
If abnormality is found in change of vacuum, clogged injection mixer D port is suspected. Therefore, clean the port as necessary.

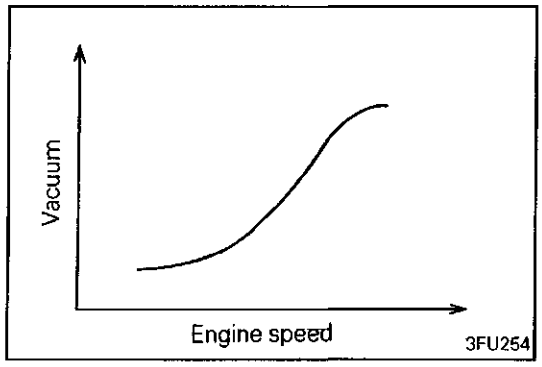
EGR VALVE CONTROL VACUUM (E VACUUM) N14FVBA

Checking Condition

Engine coolant temperature: 85 – 95°C (185 – 205°F)

(1) Disconnect the vacuum hose from the injection mixer E vacuum nipple and connect a hand vacuum pump to the nipple.

NOTE
For the location of the nipple, refer to the Injection Mixer Appearance (P.14-31).



(2) Start and race the engine to make sure that E vacuum increases with the engine speed.

NOTE
If abnormality is found in change of vacuum, clogged injection mixer E port is suspected. Therefore, clean the port as necessary.

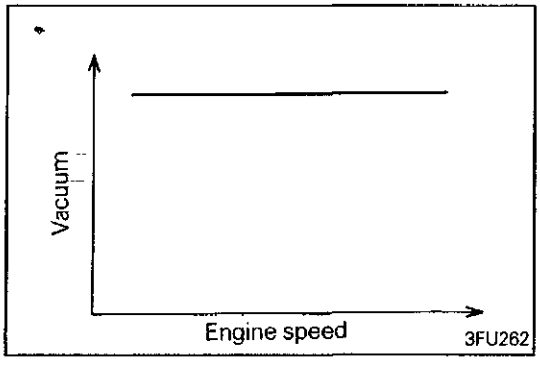
SECONDARY AIR CONTROL VACUUM (M VACUUM) N14FXAA

Checking Condition

Engine coolant temperature: 85 – 95°C (185 – 205°F)

(1) Disconnect the vacuum hose from the injection mixer M vacuum nipple and connect a hand vacuum pump to the nipple.

NOTE
For the location of the nipple, refer to the Injection Mixer Appearance (P.14-31).

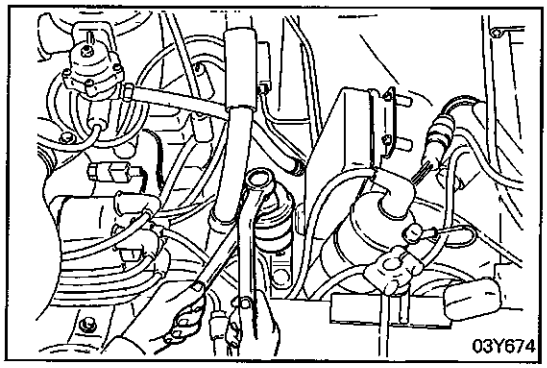


(2) Start and race the engine to make sure that M vacuum is kept constant regardless of the increased engine speed.

NOTE
If M vacuum is not formed, clogged injection mixer M port is suspected. Therefore, clean the port as necessary.

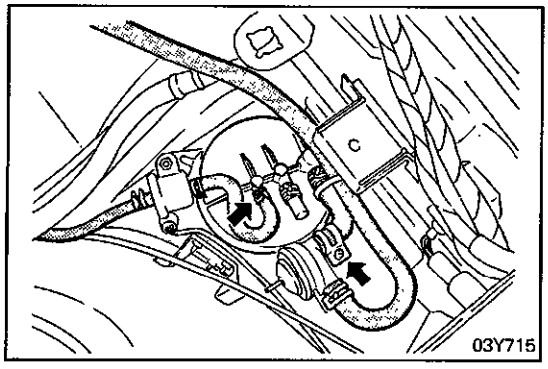
THROTTLE POSITION SENSOR N14FSAA
INJECTOR
ISC SERVO
FUEL PRESSURE REGULATOR

Refer to ECI SYSTEM COMPONENTS (P.14-59).



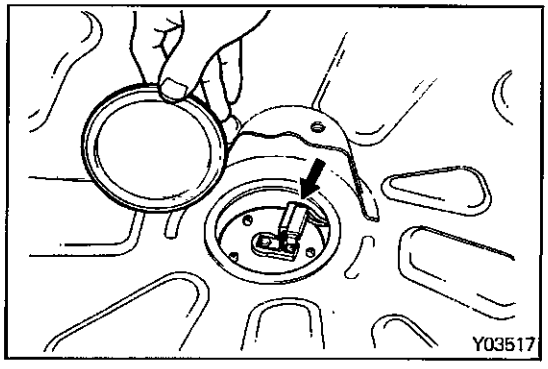
FUEL FILTER REPLACEMENT N14FCBA

(1) Reduce the internal pressure of the fuel pipes and hoses.
(2) Remove the eye bolts while holding the fuel filter nuts securely.
(3) Remove the fuel filter assembly.



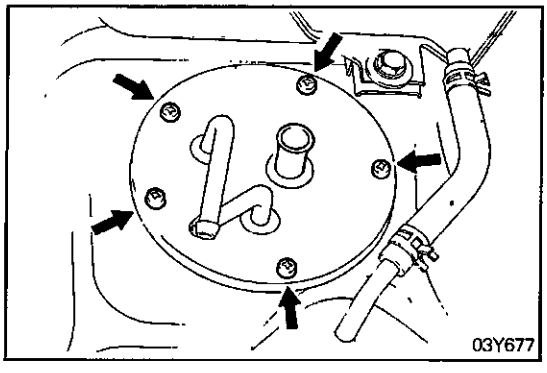
OVERFILL LIMITER (TWO-WAY VALVE) REPLACEMENT N14FEAA

(1) Remove the overfill limiter mounting bolt.
(2) Disconnect the vapor hoses, and then remove the overfill limiter.



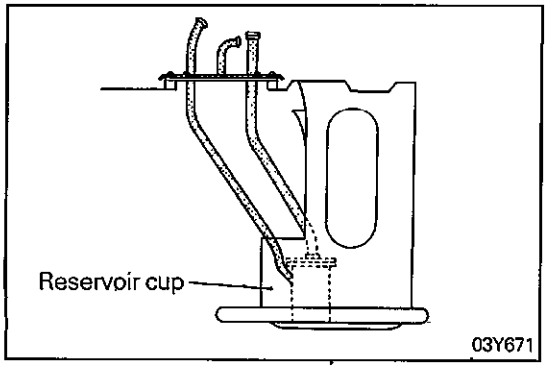
FUEL GAUGE UNIT REPLACEMENT N14FFAD

(1) Pry up and remove the plug on the baggage compartment floor.
(2) Disconnect the fuel gauge unit connectors.
(3) Remove the fuel gauge unit.
(4) After installing the fuel gauge unit, confirm that the unit is securely grounded.
(5) When installing the floor plug, apply a semi-drying sealant around the circumference of the floor plug mounting surface.

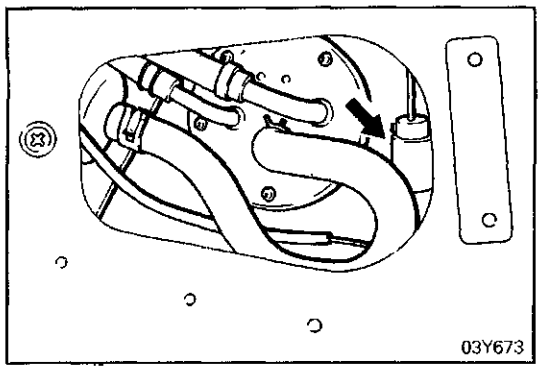


IN-TANK FUEL FILTER REPLACEMENT N14FCBC

(1) Remove the high floor side panel located in the baggage compartment floor.
(2) Pry up and remove the lid.
(3) Disconnect the fuel hoses from the pipe assembly.
(4) Remove the pipe assembly from the tank.
(5) Press the tabs on the filter, and remove the in-tank fuel filter.



NOTE
When installing the in-tank fuel filter, the filter should be placed inside the reservoir cup located inside the fuel tank, and then the pipe assembly should be tightened to the fuel tank securely.

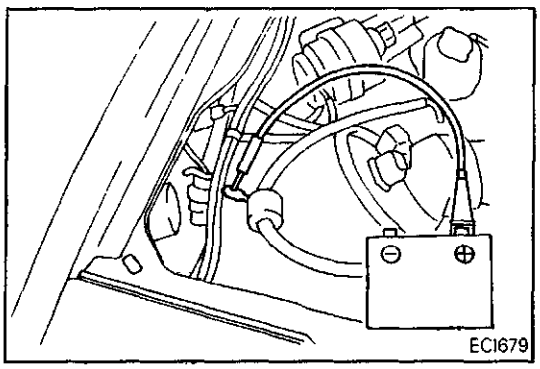


RELEASING RESIDUAL PRESSURE OF FUEL HIGH PRESSURE HOSE N14FGAB

Reduce the internal pressure of the fuel main pipes and hoses by using the following procedure.

NOTE
Be sure to reduce the internal pressure. If the hose is removed from the fuel main pipe without reducing the internal pressure, fuel will gush out.

(1) Remove high floor side panel located in the baggage compartment floor.
(2) Start the engine, and then disconnect the fuel gauge unit connector.
(3) After the engine has been stopped, set the ignition key to "OFF" position.
(4) Disconnect the battery cable from the negative terminal of the battery.

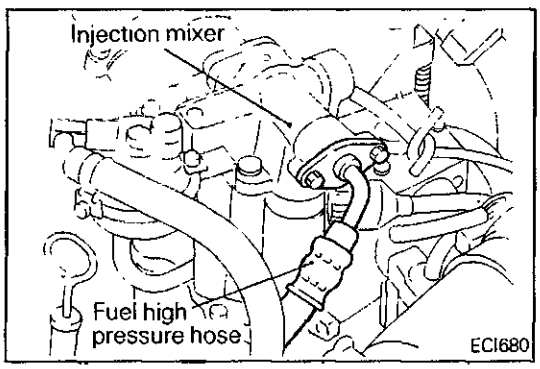


FUEL PUMP OPERATION CHECK N14FDAA

(1) Turn the ignition switch to OFF.
(2) Apply battery voltage to the fuel pump connector and check the pump operating sound.

NOTE
The fuel pump is in-tank type and its operating sound is hard to hear without removing the fuel filler cap.

(3) Pinch the fuel hose with fingers to check that fuel pressure is felt.

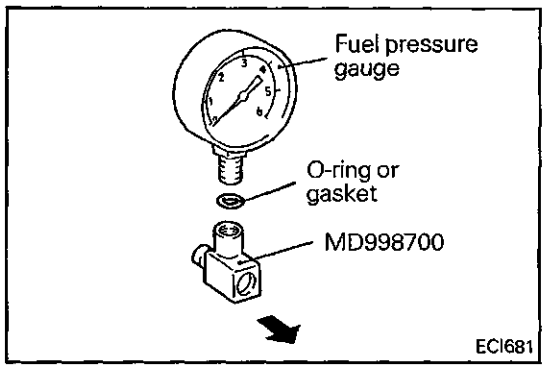


FUEL PRESSURE MEASUREMENT N14FNAA

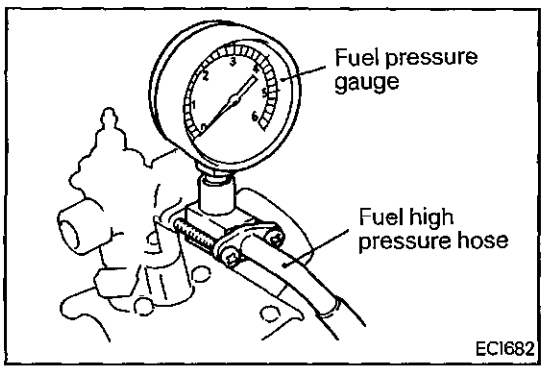
(1) Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.
   ① Disconnect the fuel pump harness connector. (Connector location: below rear seat cushion)
   ② Start the engine and after it stops by itself, turn the ignition switch to OFF.
   ③ Disconnect the battery (–) terminal.
   ④ Connect the fuel pump harness connector.

(2) Disconnect the fuel high pressure hose from the injection mixer.

Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



(3) Set a fuel pressure gauge on the special tool, placing an adequate O-ring or gasket between the gauge and tool to prevent fuel leaks.



(4) Install the special tool attached with fuel pressure gauge on the injection mixer.
(5) Insert the fuel high pressure hose into the special tool and tighten securely with the attached two special tool screws.
(6) Connect the battery ⊖ terminal.
(7) Apply battery voltage to the fuel pump terminal to operate the fuel pump so that fuel pressure will act. In this state, make sure that the fuel pressure gauge and special tool connection present no fuel leaks.
(8) Measure the fuel pressure when the engine is running at idle.

Standard value: 240 – 260 kPa (35 – 38 psi)

(9) If the pressure is out of specification, determine and remove causes according to the following table.

Fuel pressure	Probable cause	Remedy
Lower than specified	a. Clogged fuel strainer b. Faulty pressure regulator (regulator inside valve open) c. Faulty fuel pump	a. Replace fuel strainer b. Replace pressure regulator c. Replace fuel pump
Higher than specified	a. Faulty pressure regulator (regulator inside valve binding) b. Clogged fuel return hose or pipe	a. Replace pressure regulator b. Clean or replace hose or pipe

(10) Stop the engine and check change of fuel pressure gauge indication, which should not drop.
If the gauge indication drops, observe the rate of drop and determine and remove the causes according to the following table.

Fuel pressure	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	a. Faulty injector (leaks due to trapped foreign matter)	a. Replace injector
Fuel pressure drops sharply immediately after engine is stopped	a. Faulty fuel pump (pump inside check valve binding) b. Faulty pressure regulator (regulator inside valve fails to close)	a. Replace fuel pump b. Replace pressure regulator

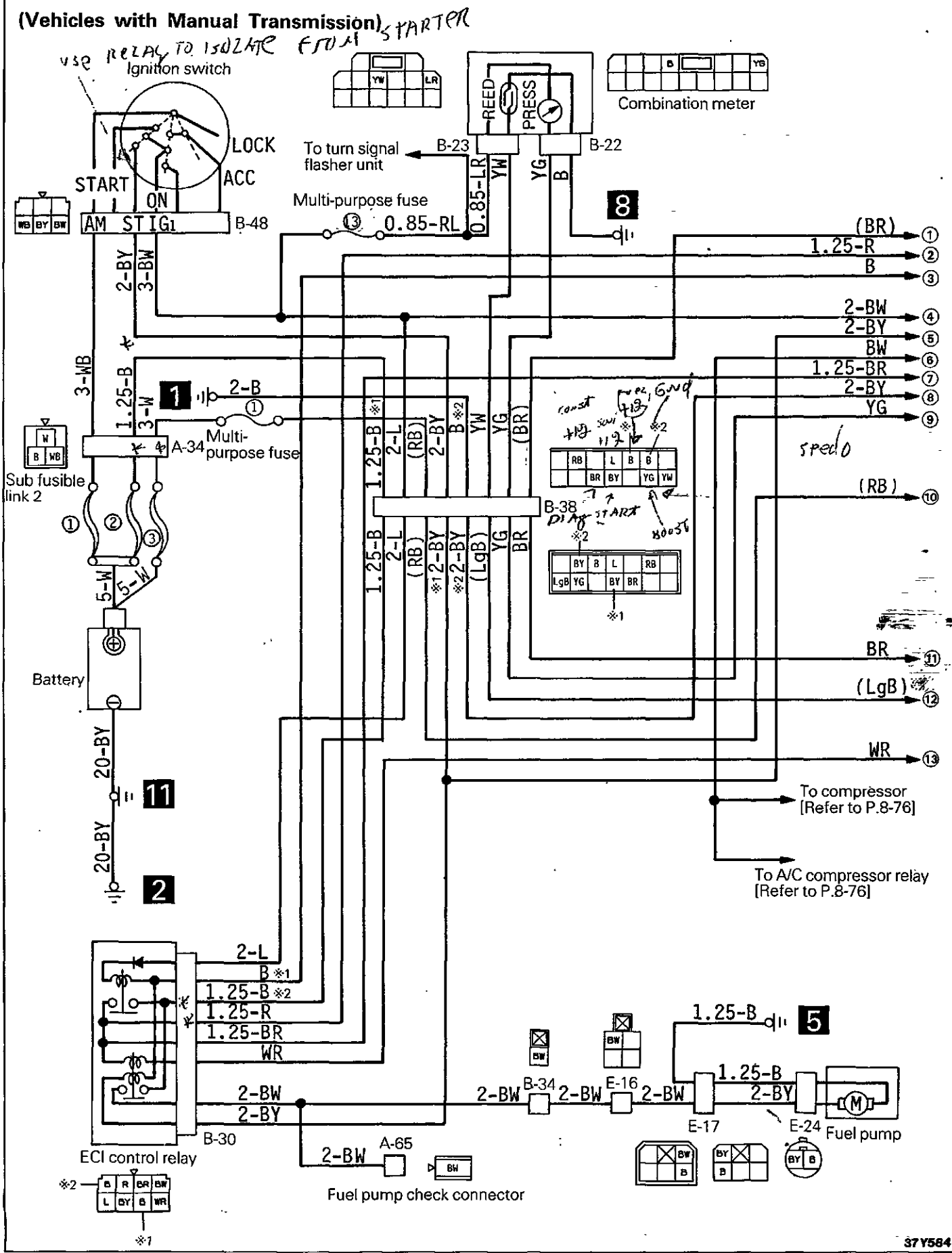
(11) Release residual pressure from the fuel pipe line.
(12) Remove the fuel high pressure hose and the special tool from the injection mixer.

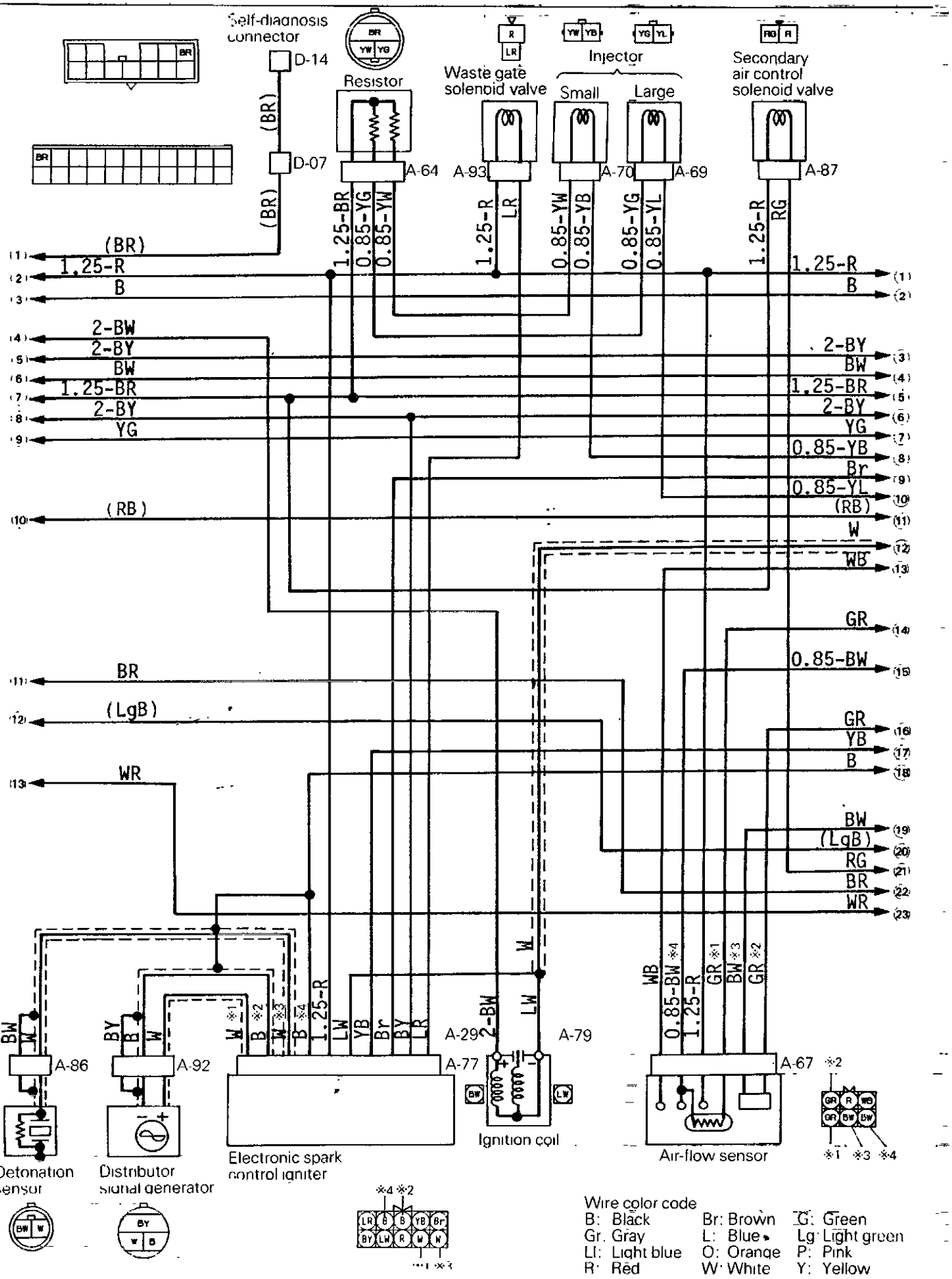
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

(13)Using a new O-ring, install the fuel high pressure hose. Tighten the screws firmly.
(14)Check for fuel leaks.
(1) Apply battery voltage to the fuel pump terminal to operate the fuel pump.
(2) With fuel pressure acting, check the fuel line for leaks.

CIRCUIT DIAGRAMS

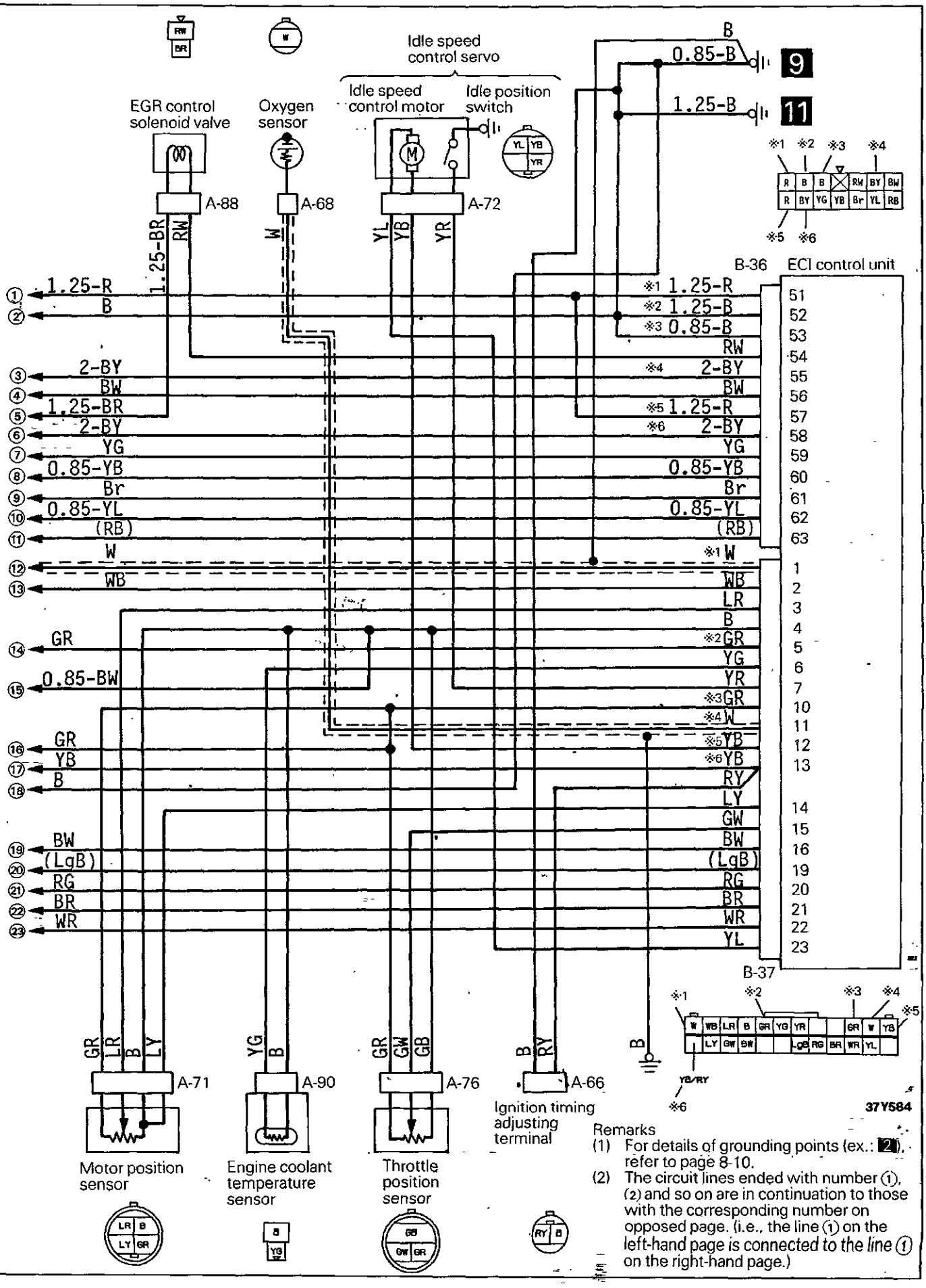
(Vehicles with Manual Transmission)





Wire color code

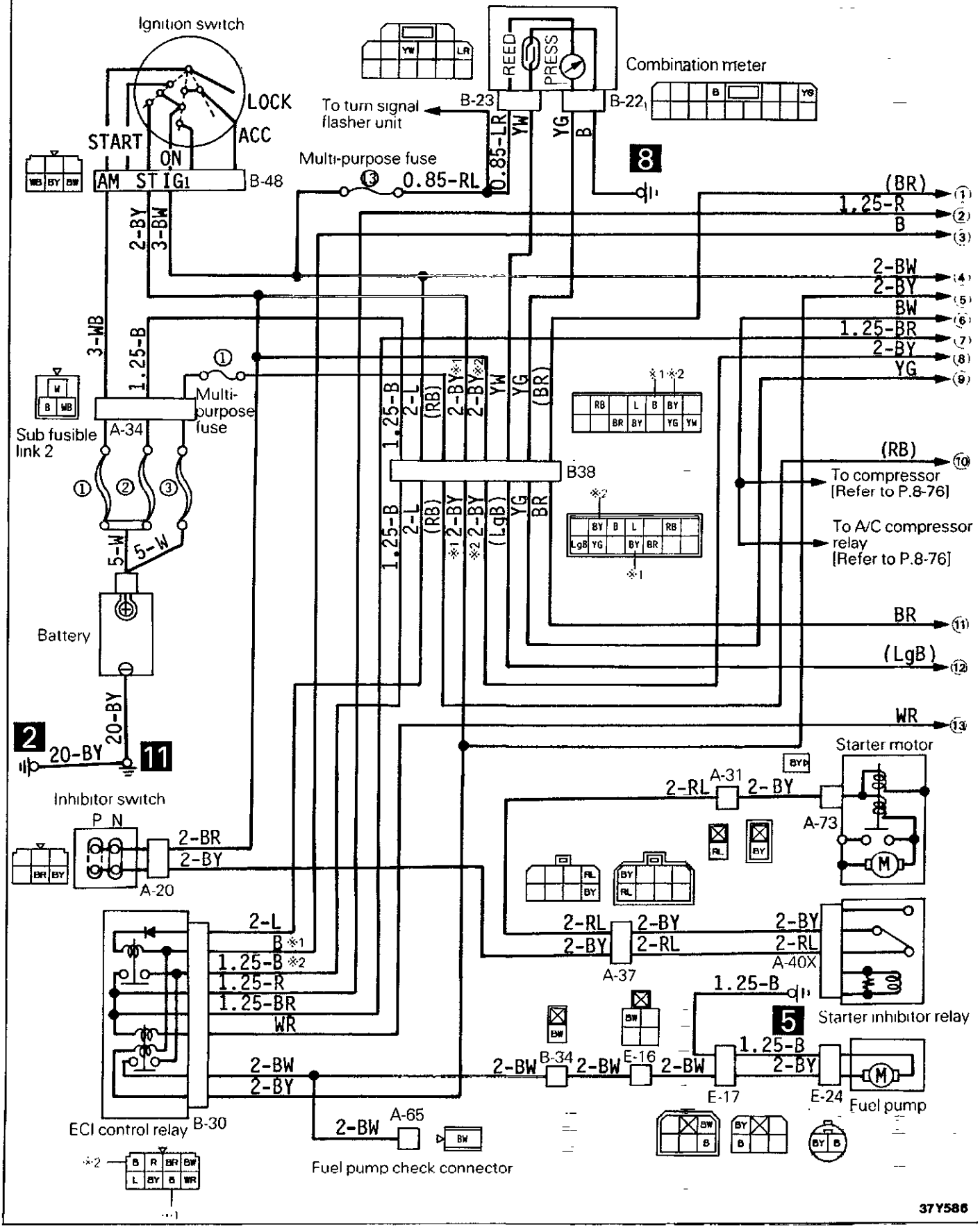
B: Black	Br: Brown	G: Green	
Gr: Gray	L: Blue	Lg: Light green	
Ll: Light blue	O: Orange	P: Pink	
R: Red	W: White	Y: Yellow	

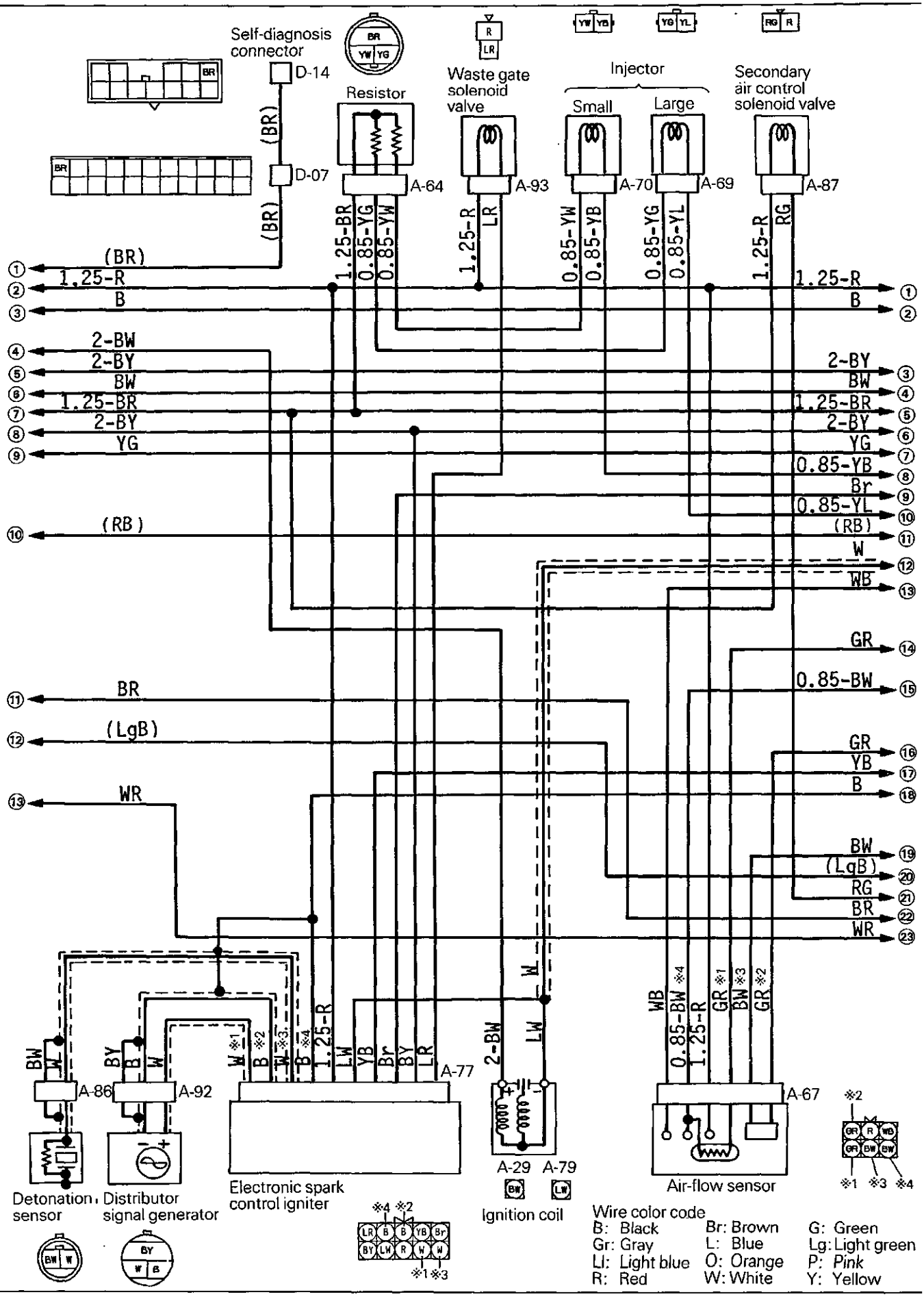


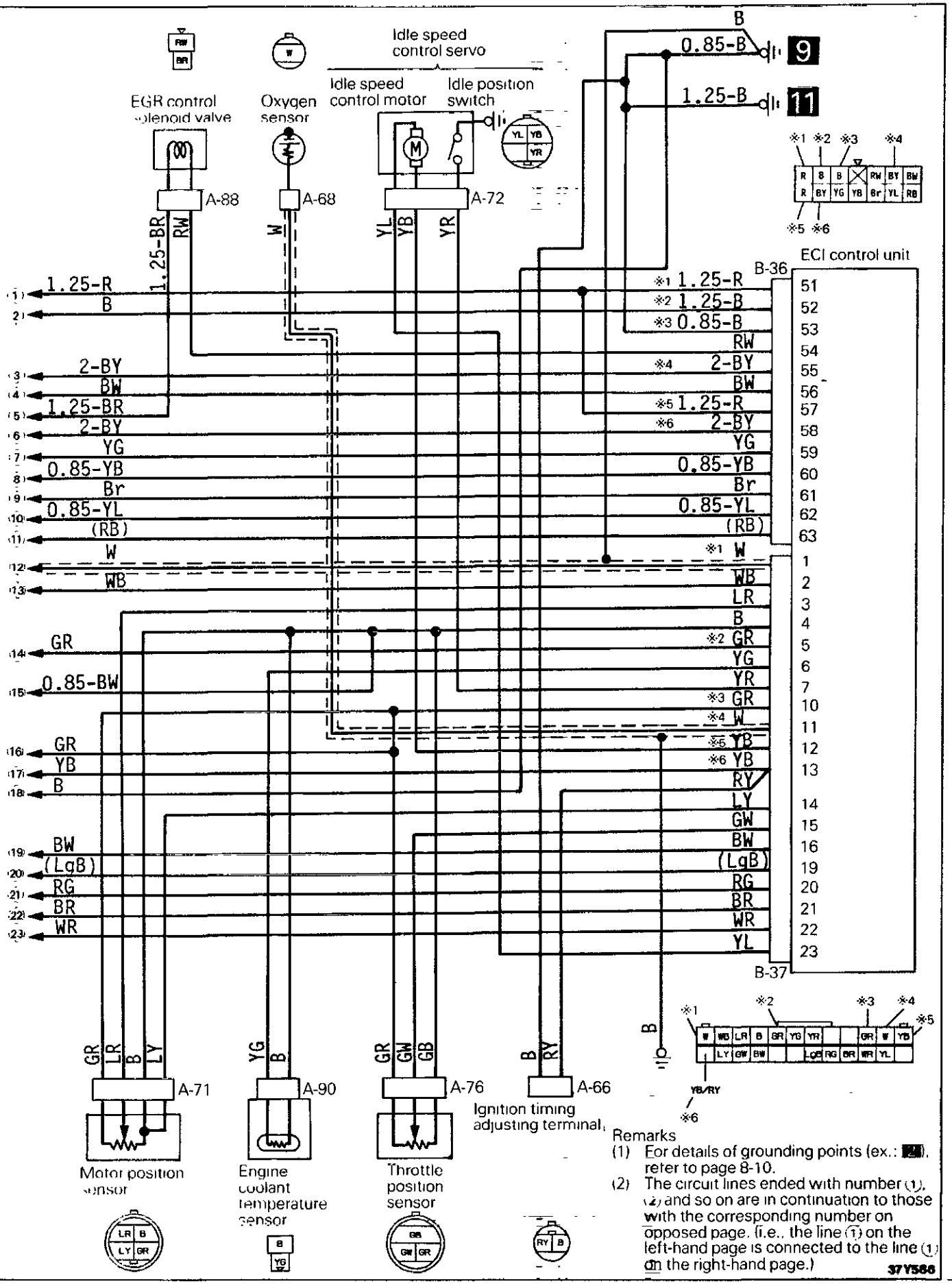
Remarks
(1) For details of grounding points (ex.: 2), refer to page 8-10.
(2) The circuit lines ended with number ①, ② and so on are in continuation to those with the corresponding number on opposed page. (i.e., the line ① on the left-hand page is connected to the line ① on the right-hand page.)

CIRCUIT DIAGRAMS

(Vehicles with Automatic Transmission)




Self-diagnosis connector
D-14
D-07
(BR)
Resistor
Waste gate solenoid valve
Injector
Small
Large
Secondary air control solenoid valve
A-64
A-93
A-70
A-69
A-87
1.25-BR
0.85-YG
0.85-YW
1.25-R
LR
0.85-YW
0.85-YB
0.85-YG
0.85-YL
1.25-R
RG
(BR)
1.25-R
B
2-BW
2-BY
BW
1.25-BR
2-BY
YG
0.85-YB
Br
0.85-YL
(RB)
W
WB
GR
0.85-BW
BR
(LgB)
GR
YB
B
WR
BW
(LgB)
RG
BR
WR
A-86
A-92
A-77
A-67
A-29
A-79
Detonation sensor
Distributor signal generator
Electronic spark control igniter
Ignition coil
Air-flow sensor
Wire color code
B: Black
Gr: Gray
LI: Light blue
R: Red
Br: Brown
L: Blue
O: Orange
W: White
G: Green
Lg: Light green
P: Pink
Y: Yellow



Remarks

(1) For details of grounding points (ex.: [2]), refer to page 8-10.

(2) The circuit lines ended with number (1), (2) and so on are in continuation to those with the corresponding number on opposed page. (i.e., the line (1) on the left-hand page is connected to the line (1) on the right-hand page.)

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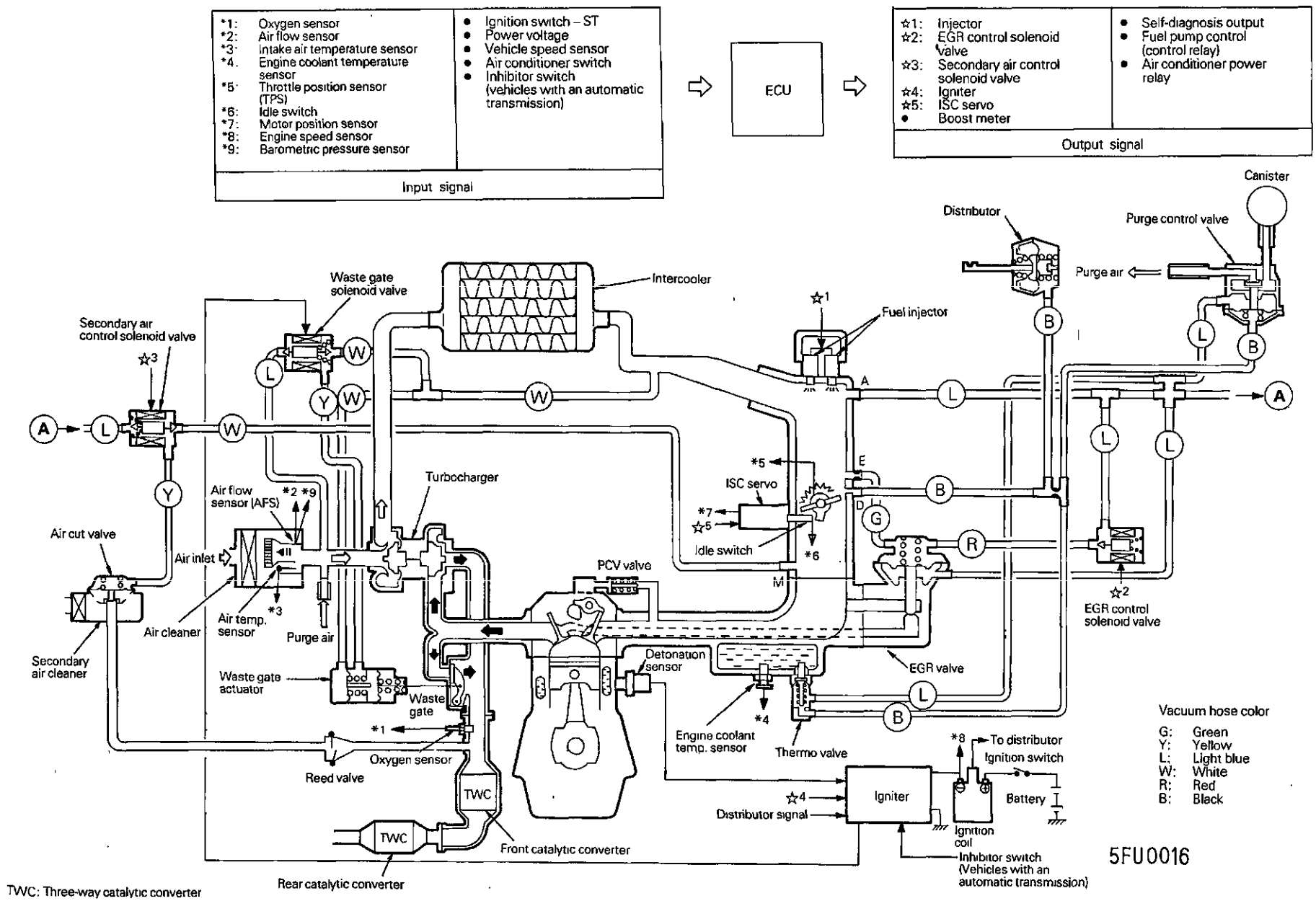
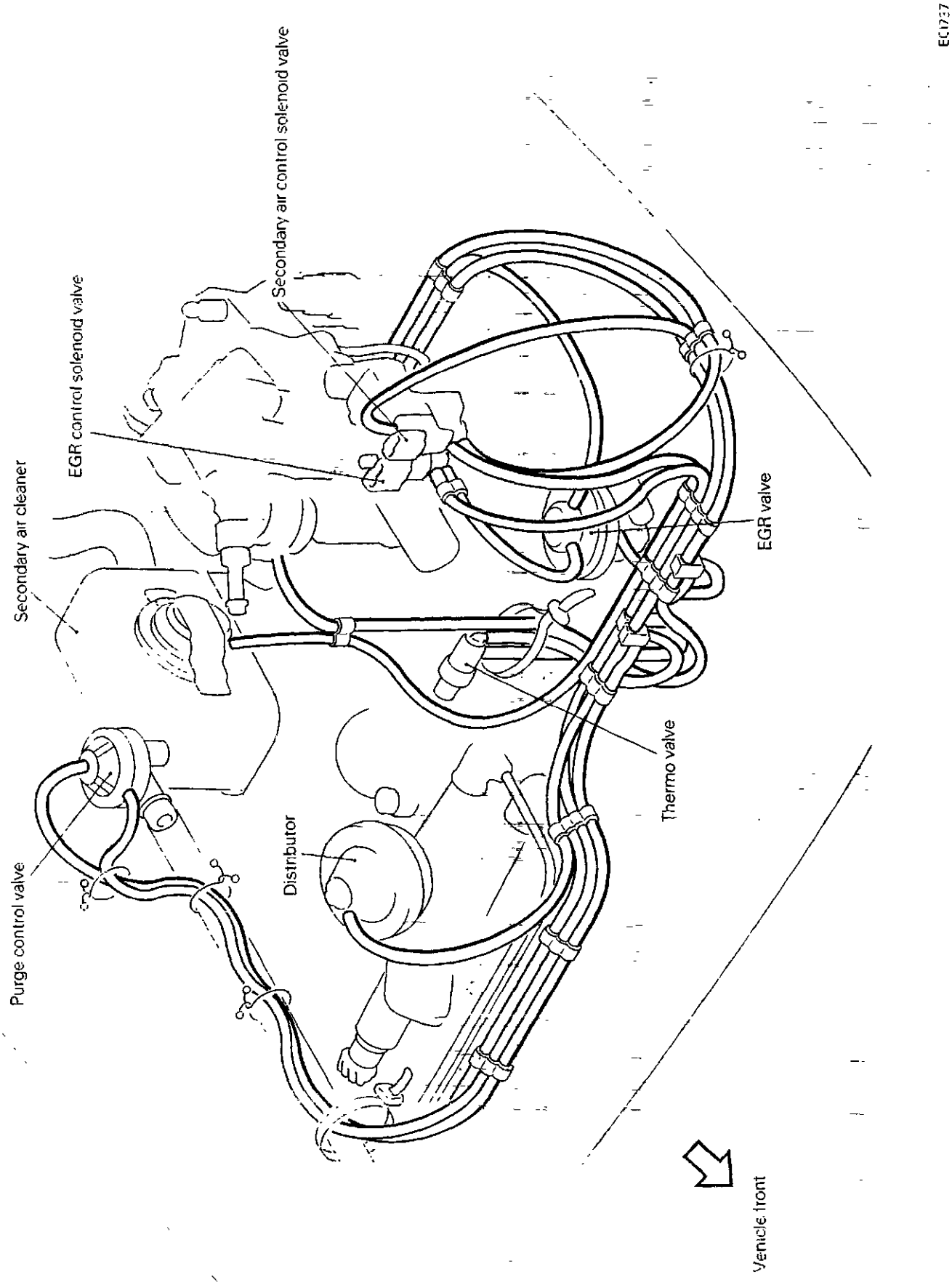
VACUUM HOSES DIAGRAM




EC1737
Secondary air control solenoid valve
EGR control solenoid valve
Secondary air cleaner
EGR valve
Thermo valve
Distributor
Purge control valve
Vehicle front

ECI SYSTEM INSPECTION N14PAAA

(1) Before removing or installing a part, read diagnosis code and then disconnect the battery ⊖ terminal cable.

(2) Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of battery cable during engine operation or while the ignition switch is ON could cause erroneous operation of the ECU or damage to semiconductors.

(3) The control harnesses between the ECU and the ignition coil (⊖ terminal) and oxygen sensor are shielded wires with shield grounded to the body in order to prevent influence of ignition noises and radio interference. When the shielded wire is faulty, therefore, the control harness must be replaced.

(4) When ECI checker is used, pay attention to the following:
- Avoid rough operation of switches.
- Do not subject ECI checker to shock and other external forces, heat, etc.
- Keep the checker away from water and oil.
- Store ECI checker in a moisture- and dust-free place and take steps to protect the checker from heat and vibration.

CHECK PROCEDURE (SELF-DIAGNOSIS) N14PCAA

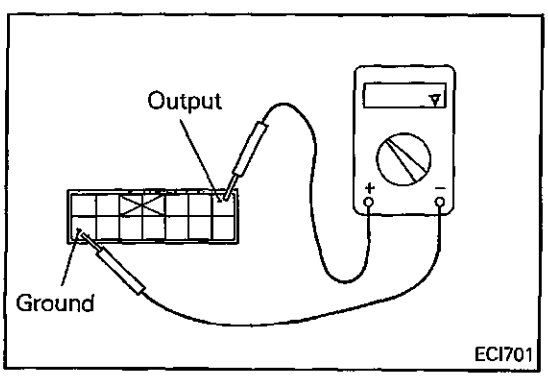
Precautions for Operation

(1) When battery voltage is low, no detection of failure is possible. Be sure to check the battery for voltage and other conditions before starting the test.

(2) Diagnosis item is erased if the battery or the ECU connector is disconnected. Do not disconnect the battery before the diagnosis result is completely read.

(3) To diagnose the oxygen sensor, warm up engine and drive a good distance. Do not turn off the ignition switch after driving. If ignition switch is turned off, the result in memory is erased.

(4) After check and correction are over, disconnect ground cable for 15 seconds or more from negative terminal of battery and connect it again to make sure that failure code is erased.



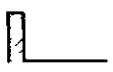
Check Steps

NOTE
The memory of oxygen sensor (diagnosis code No. 1) is erased from ECU when the ignition switch is turned off. Therefore, to diagnose the oxygen sensor, drive the vehicle a good distance and keep the engine running.

(1) Connect an analog voltmeter to the self-diagnosis output harness connector located in the glove box.

(2) On turning the ignition switch to ON, the indication of ECU memory contents will start. If the system is in normal condition, pointer of voltmeter constantly indicates 12V. If any failure data is stored in memory, the pointer of voltmeter will deflect indicating abnormal items as described in "Indication Method". Abnormal item can be known from the number of pointer deflection which reflects the voltage waveform peculiar to the item. See "Diagnosis Chart" for the voltage waveforms of different abnormal items.
After recording the abnormal item, check and repair each part according to the check items in "Diagnosis Chart".
(3) If the defective parts have been repaired, disconnect ground cable for 15 seconds or more from negative terminal of battery and connect it again to make sure that failure code has been erased.

Diagnosis Chart

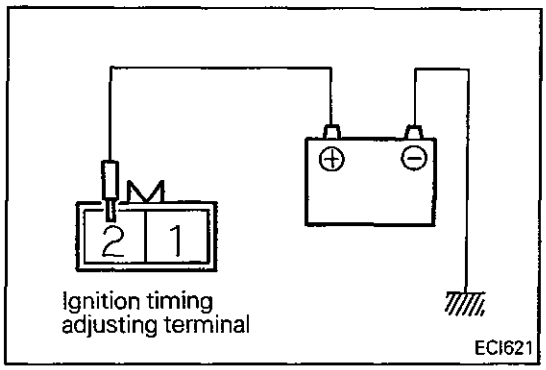
Malfunction No.	Diagnosis item	Self-diagnosis output pattern and output code	Problem	Check item
1	Oxygen sensor		Oxygen sensor signal does not change for 20 seconds or more in its feedback range.	• Wire harness and connector • Oxygen sensor • ECU
2	Ignition pulse		While cranking the engine, input of ignition signal is not applied to ECU for 3 seconds or more	• Wire harness and connector • Igniter • ECU • Distributor
3	Air flow sensor (AFS)		AFS output is 10 Hz or less while engine is idling.	• Wire harness and connector • AFS • ECU
5	Throttle position sensor (TPS)		• TPS output is 0.2V or less. • TPS output is 4V or higher for 1 second or more while engine is idling (Idle switch is on).	• Wire harness and connector • TPS • ECU
6	ISC motor position sensor		• MPS output voltage is 4.8V or more. • MPS output voltage is 0.2V or less.	• Wire harness and connector • Motor position sensor (MPS) • ECU
7	Engine coolant temperature sensor		• Engine coolant temperature sensor output is 4.5V or more. • Engine coolant temperature sensor output is 0.1V or less.	• Wire harness and connector • Engine coolant temperature sensor • ECU

CONTROL SYSTEM OPERATION

IGNITION TIMING CONTROL SYSTEM INSPECTION

High Altitude and Cold Timing Control Function N14PIAA

Based on the information supplied by the atmospheric pressure sensor and engine coolant temperature sensor, the ECI control unit judges whether the vehicle is at high altitude and/or the engine is cold, and in case such condition(s) exists, the ECI control unit controls the ESC igniter for timing advance of approximately 5° in crank angle. Check this function by the following procedure.



Altitude of Lower than 1,200 m (3,900 ft.)

(1) Check the ignition timing for both when battery voltage is applied directly to the ignition timing adjusting terminal and when not.

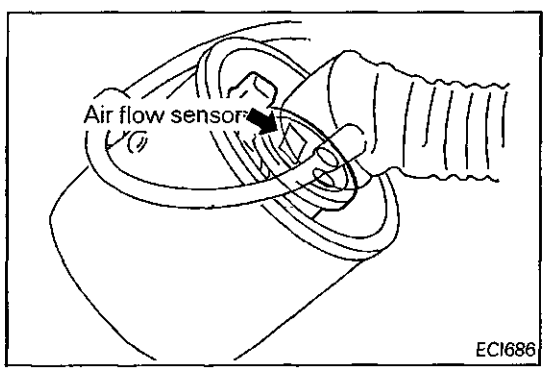
Battery voltage	Ignition timing
When not applied	Base (10°BTDC at idle)
When applied	5° advanced (15°BTDC at idle)

Altitude of 1,200 m (3,900 ft.) or Higher

(2) Check the ignition timing for both when the ignition timing adjusting terminal is grounded and when not.

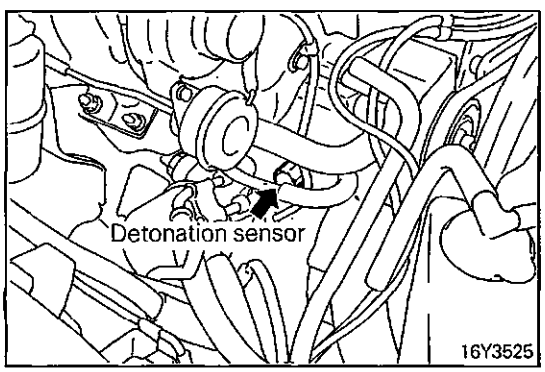
Connector	Ignition timing
When not grounded	Base (15°BTDC at idle)
When grounded	5° retard (10°BTDC at idle)

(3) If the check result is out of specification, replace the ESC igniter.



Detonation Control Function

(1) Turn the ignition switch to OFF, after all the self-diagnosis contents of the ECI system have been read out.
(2) Disconnect the air flow sensor connector and start the engine, running it at idle.



(3) Check that the ignition timing is retarded (approx. 8°) when the detonation sensor connector is disconnected.

NOTE
(1) If the ignition timing is retarded but the engine knocks (in full throttle acceleration etc.), replace the detonation sensor and recheck. Be careful about continuous knocking which damages the engine.
(2) If the ignition timing is not retarded, probably the harness between detonation sensor and igniter is broken or the detonation sensor is faulty. Repair or replace it and recheck. If the ignition timing is not retarded, replace the igniter.

(4) With the ignition switch at OFF, disconnect the battery minus ⊖ terminal for more than 10 seconds, after the air flow sensor has been connected.

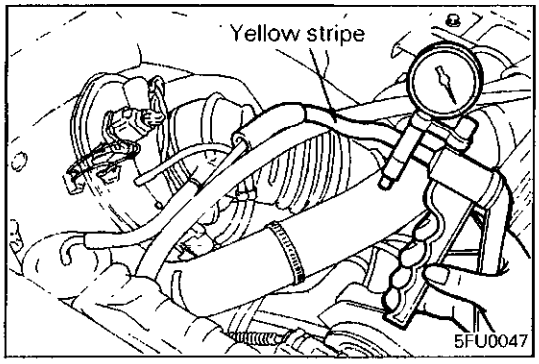
NOTE
This operation is for erasing the diagnosis memory of air flow sensor failure caused by disconnecting the air flow sensor connector.

(5) Restart the engine and run it at idle for more than 5 minutes with the air conditioner switch at both ON and OFF positions.

NOTE
Carry out break-in operation by this way.

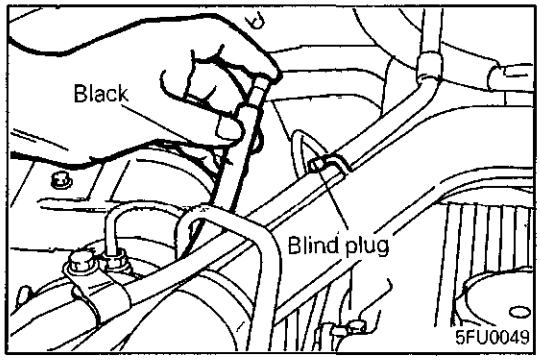
Boost Pressure Control System Inspection

(1) Turn off the ignition switch after all the self-diagnosis items have been read out.



(2) Remove the vacuum hose (yellow stripe) from the waste gate actuator, then connect a hand vacuum pump to the vacuum hose.

(3) Disconnect the vacuum hose (black) from the air intake pipe between the intercooler and injection mixer, then plug the air intake pipe nipple.



(4) Apply negative pressure of approx. 20 kPa (3 psi) and check for airtightness, which repeatedly stopping up or releasing the hose end with a finger.

Engine condition	Hose end	Normal condition
Idle	Release	Negative pressure leaks
	Stopped up	Negative pressure maintained
More than 4,000 rpm		Negative pressure leaks

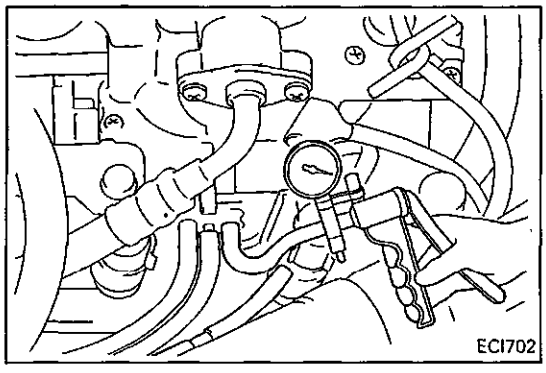
NOTE
If airtightness is not normal, check the waste gate solenoid valve or vacuum hose as it is probably faulty.

FUEL PUMP DRIVE CONTROL SYSTEM INSPECTION

N14PKAA

(1) Disconnect the high tension cable from the ignition coil.
(2) Holding the fuel hose connected to the injection mixer with a hard, crank the engine and check that pulsation of fuel flow is felt to the hand.

NOTE
If no fuel flow pulsation is felt, check the ignition switch, control relay and fuel pump.


ECI702

BOOST METER CONTROL SYSTEM INSPECTION N14PNAA

(1) Disconnect the vacuum hose (white stripe) from the injection mixer and connect a vacuum gauge to the nipple (vacuum nipple "M").
(2) Make road test and check that the boost meter indication nearly agrees with the vacuum gauge indication.
(3) If the indication deviates greatly, check the harness for open or short circuit and also check the boost meter, air flow sensor and engine speed sensor.

SECONDARY AIR CONTROL SYSTEM INSPECTION N14POAA

Refer to GROUP 25 EMISSION CONTROL SYSTEMS.

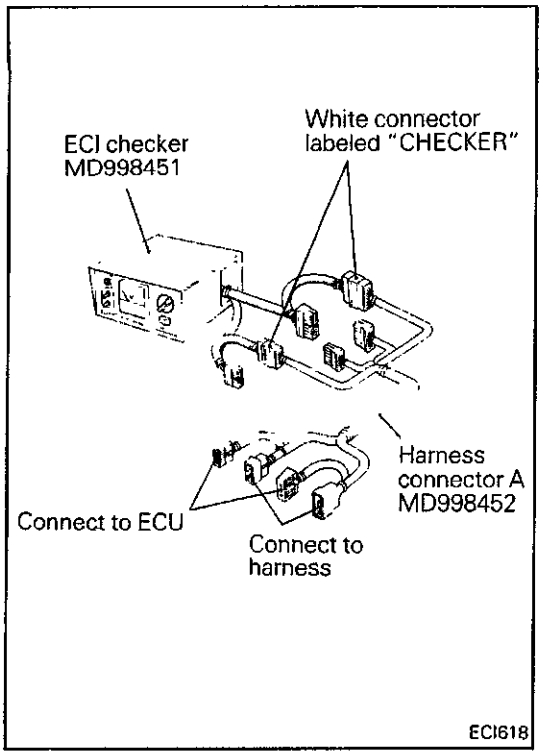
EGR CONTROL SYSTEM INSPECTION N14PPAA

Refer to GROUP 25 EMISSION CONTROL SYSTEMS.

ECI SYSTEM INSPECTION BY USING ECI CHECKER N14PDBC

The electric system of ECI system can be quickly inspected and maintained if the electric input and output signals of ECU are checked by ECI checker and the component whose abnormality is indicated by the signal and the harness connected between ECU and the component is checked as well.
Using the special tools (ECI harness connector A and ECI checker), perform the ECI system checks by the following procedure.

Caution
Perform these checks after completion of all steps in the preceding "CHECK PROCEDURE (SELF-DIAGNOSIS)".



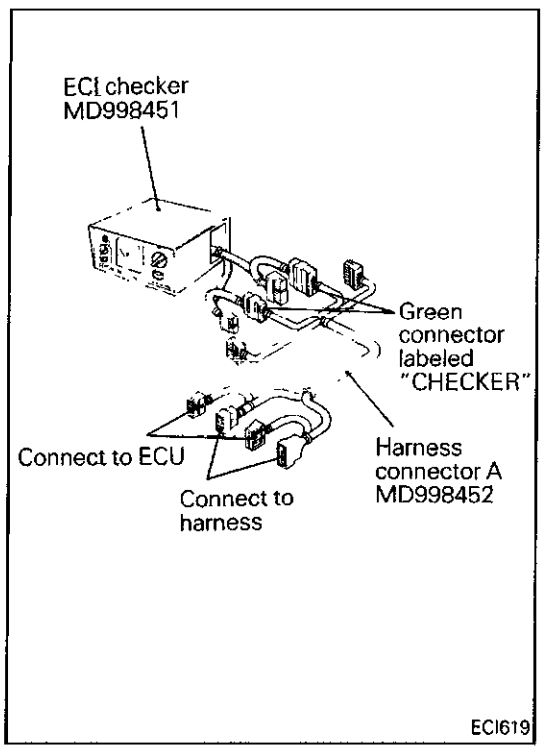
Check Steps

STEP 1

(1) Turn ignition switch to LOCK.
(2) Remove the ECU cover.
(3) Remove the large harness connector and small harness connector from the ECU.
(4) Set check switch of the ECI checker to OFF.
(5) Set select switch of the ECI checker to A.
(6) Connect white color connectors labeled "CHECKER" of the ECI harness connector A to the ECI checker connectors. Then connect ECI harness connector A to the ECU and harness connectors.
(7) Perform checks according to the "ECI System Check Procedure Chart – Step 1.

STEP 2

(8) Turn ignition switch to LOCK.
(9) Set check switch of the ECI checker to OFF.



(10) Disconnect white color connectors labeled "CHECKER" of the ECI harness connector A from the ECI checker. Then connect green color connectors labeled "CHECKER" of the ECI harness connector A to the connectors of ECI checker.
(11) Perform checks according to the "ECI System Check Procedure Chart – Step 2".
(12) If checker shows any deviation from specifications, check the corresponding sensor and related electrical wiring. Repair or replace if necessary.
(13) After repair or replacement, recheck with the ECI checker to confirm that the repair has removed the problem.
(14) Set the ignition switch to LOCK.
(15) Set the check switch of the ECI checker to OFF.
(16) Disconnect the connectors of the ECI checker and the ECI harness connector A from the ECU and body side harness connectors. Make certain that the power supply has been removed from ECU for at least 15 seconds. This will erase the memory.
(17) Connect the body side harness connector to the ECU.
(18) After completion of the above test, perform a road test to be sure that the trouble has been eliminated.

ECI SYSTEM CHECK PROCEDURE CHART
(Use Harness Connector – MD998452)

STEP 1 (Connect white color connectors labeled "CHECKER" of harness connector to ECI checker)

ECI Checker Operation		Check Item	ECU Terminal # Checked	Condition		Test Specification
Select Switch	Check Switch					
"A"	1	Power supply	51	Ignition switch "LOCK" → "ON"		11V – 13V
	2	Ignition pulse	1	Ignition switch "LOCK" → "START"		4V – 10V
	3	Intake air temperature sensor	5	Ignition switch "LOCK" → "ON"	0°C (32°F)	3.4V – 3.6V
					20°C (68°F)	2.5V – 2.7V
					40°C (104°F)	1.7V – 1.9V
					80°C (176°F)	0.6V – 0.8V
	4	Engine coolant temperature sensor	6	Ignition switch "LOCK" → "ON"	0°C (32°F)	3.4V – 3.6V
					20°C (68°F)	2.5V – 2.7V
					40°C (104°F)	1.5V – 1.7V
					80°C (176°F)	0.5V – 0.7V
	5	Power supply for sensor	10	Ignition switch "LOCK" → "ON"		4.5V – 5.5V
	6	Throttle position sensor	15	Ignition switch "LOCK" → "ON" (Warm engine)	Accelerator fully closed	0.4V – 0.7V
					Accelerator fully opened	4.5V – 5.5V
	7	Motor position sensor	3	Ignition switch "LOCK" → "ON"	After 15 seconds	0.8V – 1.2V
	8	Idle position switch	7	Ignition switch "LOCK" → "ON"	Accelerator fully closed	0V – 0.6V
					Accelerator fully opened	8V – 13V
	9	Cranking signal	55	Ignition switch "LOCK" → "START"		Over 8V
	10	Vehicle speed sensor reed switch	19	Start engine and operate vehicle slowly in 1st or DRIVE range		0V – 0.6V ↑ (pulsates) ↓ Over 2V
	11	Air conditioner switch	56	Ignition switch "LOCK" → "ON"	Air conditioner switch "OFF"	0V – 0.6V
					Air conditioner switch "ON" *1	11V – 13V
	12	Inhibitor switch	58	Ignition switch "LOCK" → "ON"	At "P" or "N" range	0V – 0.6V
					At "D" range	11V – 13V

NOTE
*1: ON means compressor clutch engaged.

STEP 1

ECI Checker Operation		Check Item	ECU Terminal # Checked	Condition		Test Specification
Select Switch	Check Switch					
	1					
	2					
	3					
	4	Spark advance signal	13	Idling	Engine coolant temperature less than 35°C (95°F)	Over 5V
					Engine coolant temperature 35°C (95°F) or higher, altitude up to approx. 1,200 m (3,900 ft.)	0 – 0.6V
					Engine coolant temperature 35°C (95°F) or higher, altitude approx. 1,200 m (3,900 ft.) or above	Over 5V
"B"	5	Air flow sensor	2	Idling		2.2 – 3.2V
				3,000 rpm		
	6					
	7	EGR control solenoid valve	54	Hold engine at a speed less than 3,500 rpm after warming up		13V – 15V
				Hold engine at a speed 3,500 rpm or higher		0V – 0.6V
	8	Oxygen sensor	11	Hold engine at a constant speed above 1,300 rpm, after 30 seconds from start of warm engine		0V – 0.6V *2 ↑ (pulsates) ↓ 2V – 3V
	9					
	10					
	11					
	12					

NOTE

*2: Failure of parts other than the oxygen sensor can also cause deviation from the specifications. Therefore, check other parts related to air-fuel ratio control. (Refer to P.14-30.)

STEP 2 (Connect green color connectors labeled "CHECKER" of harness connector to ECI checker)

ECI Checker Operation		Check Item	ECU Terminal # Checked	Condition	Test Specification
Select Switch	Check Switch				
"A"	1				
	2	Secondary air control solenoid valve	20	Hold engine over 1,500 rpm, 15 seconds after start of warm engine	0V – 0.6V then 13V – 15V
	3				
	4				
	5	Barometric pressure sensor	16	Ignition switch at sea level "LOCK" → "ON"	3.8V – 4.2V
				Idling	
	6				
	7	Self-diagnosis	21	Ignition switch "LOCK" → "ON"	Refer to P.14-49.
	8				
	9				
	10				
	11				
	12				

ECU terminal

View from front as installed in ECU

5FU0025

STEP 2

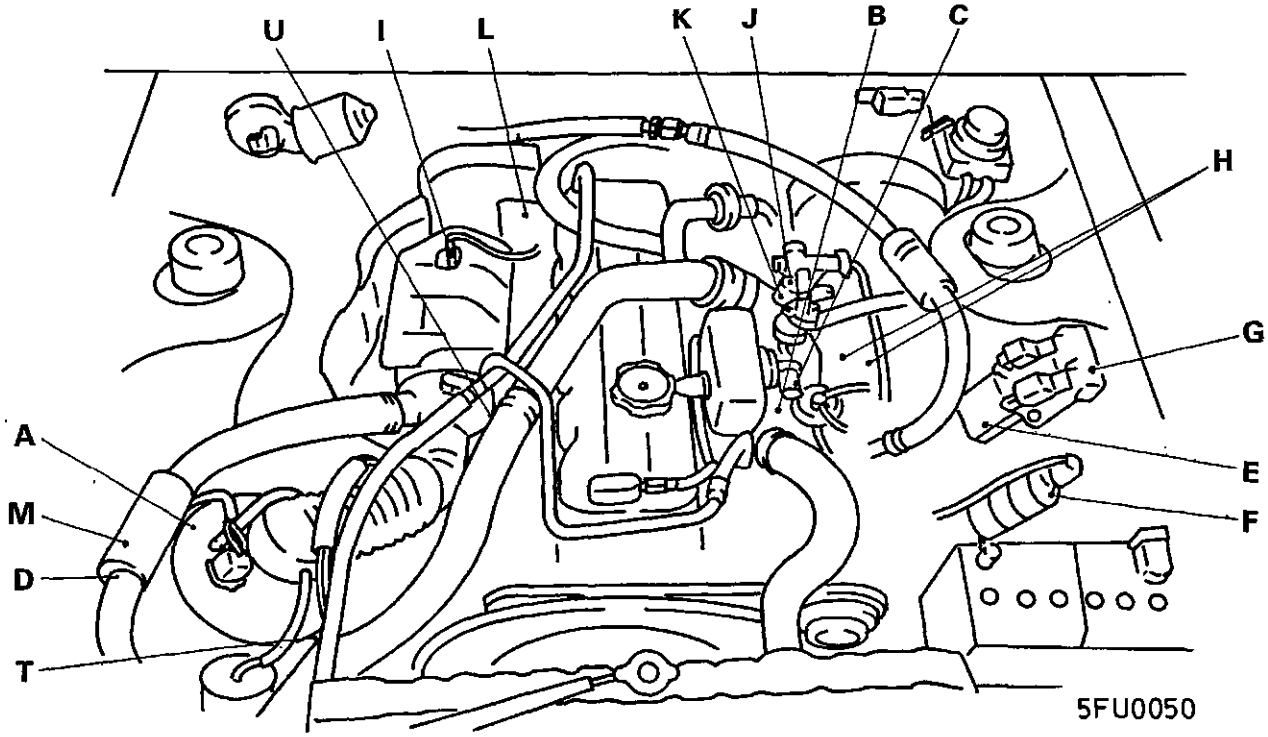
ECI Checker Setting		Check item	ECU Terminal # Checked	Condition		Test Specification
Select switch	Check switch					
"B"	1	ISC motor for extension	23	Idling	Air conditioner switch OFF → ON *1	Momentarily over 4V, then 0V – 2V *2
	2	ISC motor for retraction	12	Idling	Air conditioner switch ON → OFF *1	Momentarily over 4V, then 0V – 2V *2
	3	Air conditioner cutoff relay	24	Idling	Air conditioner switch OFF → ON *1	12V – 15V, then 0V – 0.6V
	4	Control relay	22	Ignition switch "LOCK" → "ON"		11V – 13V
				Idling		0V – 0.6V
	5					
	6	Boost meter	59	Idling		12V – 14V
				Quick acceleration from idling to above 2,000 rpm in "N" or "P" position		Slight drop
	7	Injector No. 1 pulse	60	Idling		12V – 14V
				Quick acceleration from idling to above 2,000 rpm in "N" or "P" position		Slight drop
	8					
	9	Detonation retard signal	61	Idling		Over 5V
				Quick acceleration from idling to above 2,000 rpm in "N" or "P" position		0V – 0.6V
	10					
	11	Injector No. 2 pulse	62	Idling		12V – 15V
				Quick acceleration from idling to above 2,000 rpm in "N" or "P" position		Slight drop
	12					

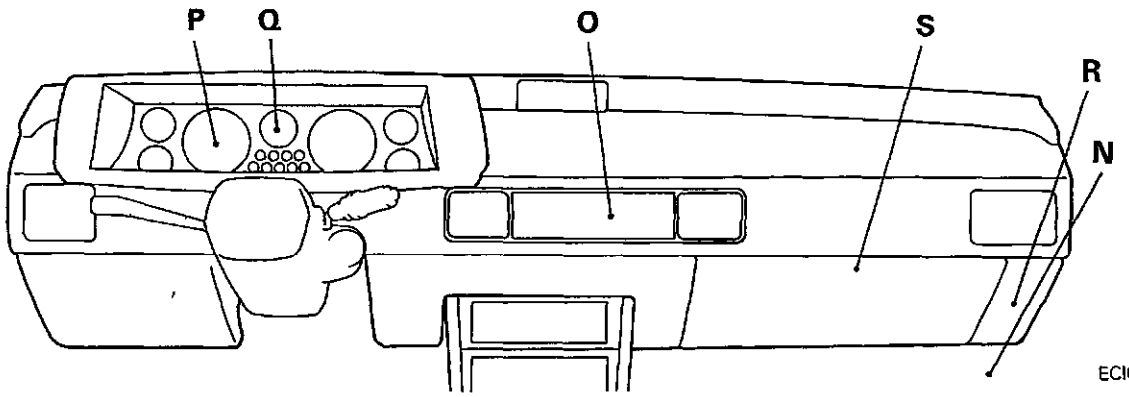
NOTE
*1: ON means compressor clutch engaged.
*2: Pointer indicates over 6V momentarily. If it is hard to read indication, repeat OFF → ON or ON → OFF operation of air conditioner switch several times. If the pointer of voltmeter deflects, ISC motor is normal.

ECI SYSTEM COMPONENTS

N14ED-B

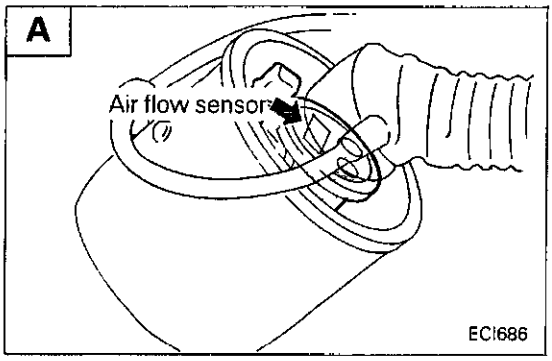
COMPONENT LOCATION



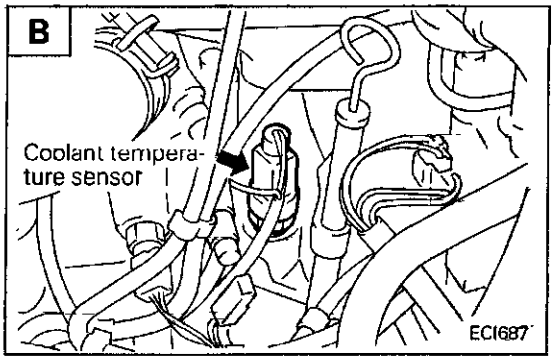


Name	Symbol	Name	Symbol
Air conditioner relay	G	Fuel pump check terminal, ignition timing adjusting terminal	D
Air conditioner switch	O	Igniter	E
Air flow sensor (with built-in barometric pressure sensor and intake air temperature sensor)	A	Inhibitor switch (vehicles with an automatic transmission)	L
Boost meter	Q	Injector	J
Control relay	R	ISC motor (idle switch, motor position sensor)	K
Coolant temperature sensor	B	Oxygen sensor	I
Detonation sensor	U	Resistor	M
Diagnosis terminal	S	Throttle position sensor (TPS)	C
ECU	N	Vehicle speed sensor (reed switch)	P
EGR control solenoid valve, secondary air control solenoid valve	H	Waste gate solenoid valve	T
Engine speed sensor (ignition coil ⊖)	F	–	–

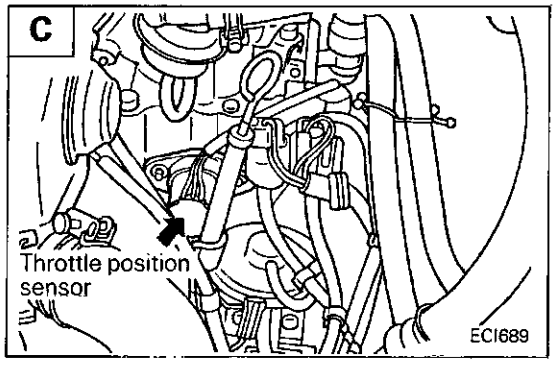
A


Air flow sensor
ECI686

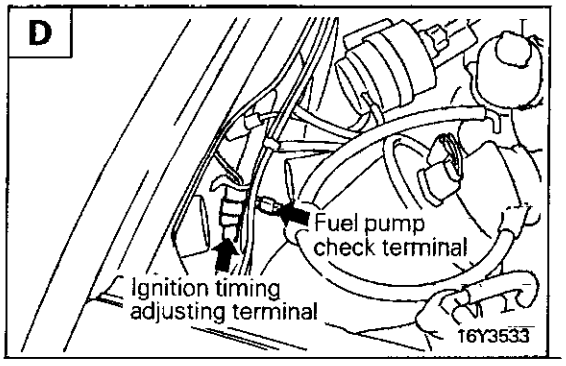
B


Coolant temperature sensor
ECI687

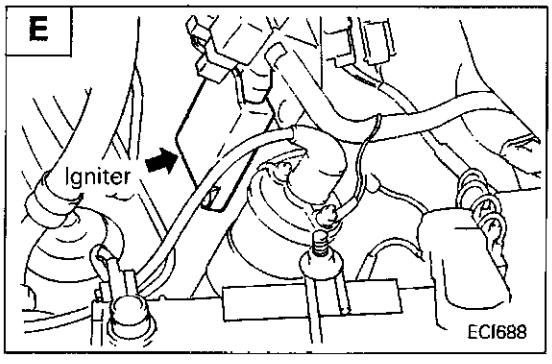
C


Throttle position sensor
ECI689

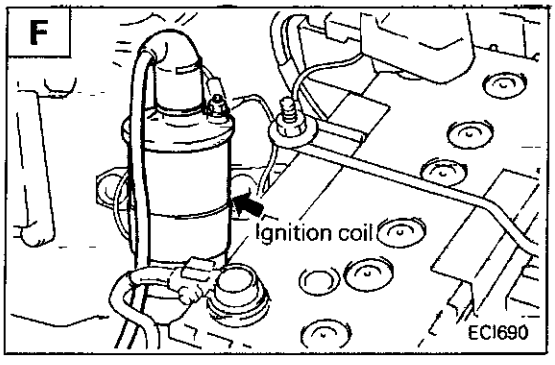
D


Fuel pump check terminal
Ignition timing adjusting terminal
16Y3533

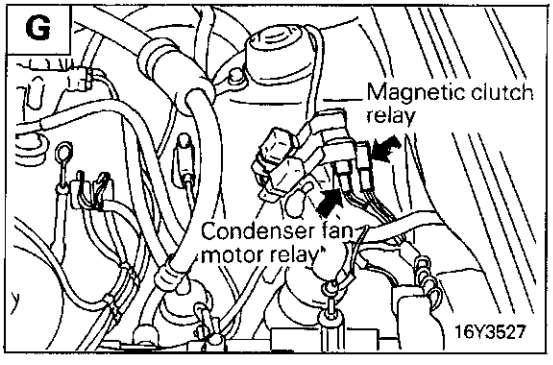
E


Igniter
ECI688

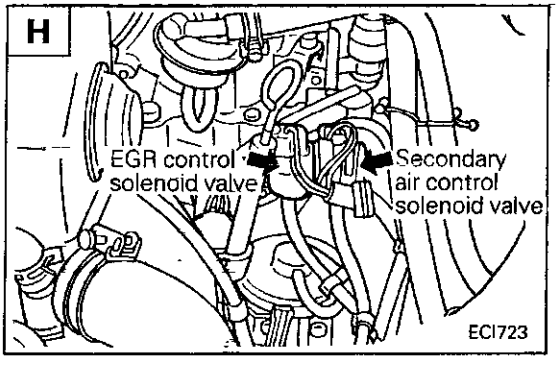
F


Ignition coil
ECI690

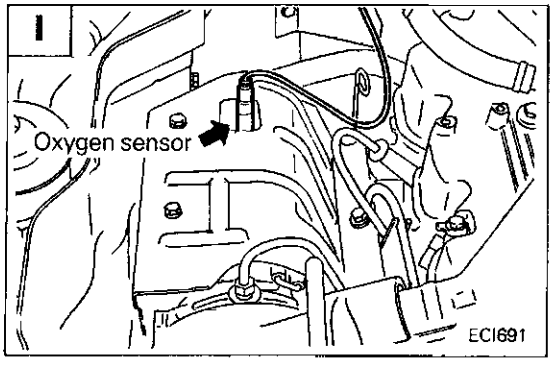
G


Magnetic clutch relay
Condenser fan motor relay
16Y3527

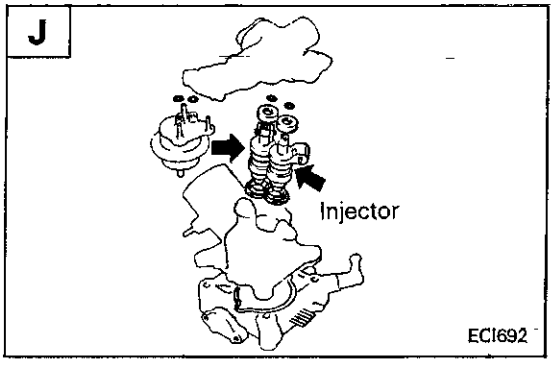
H


EGR control solenoid valve
Secondary air control solenoid valve
ECI723

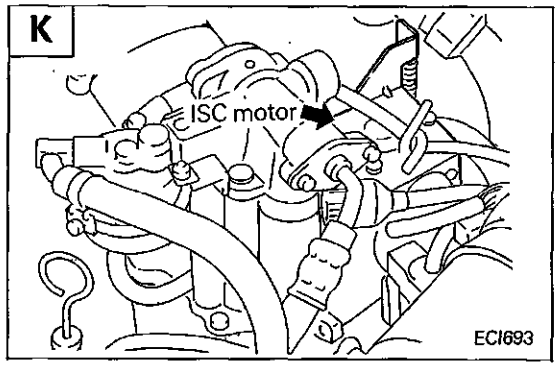
I


Oxygen sensor
ECI691

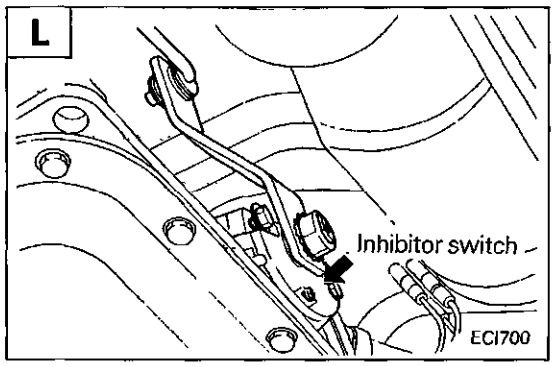
J


Injector
ECI692

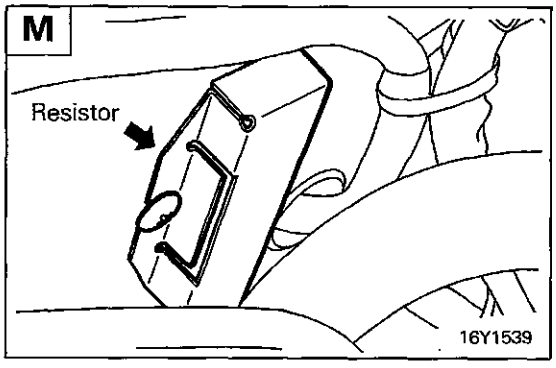
K


ISC motor
ECI693

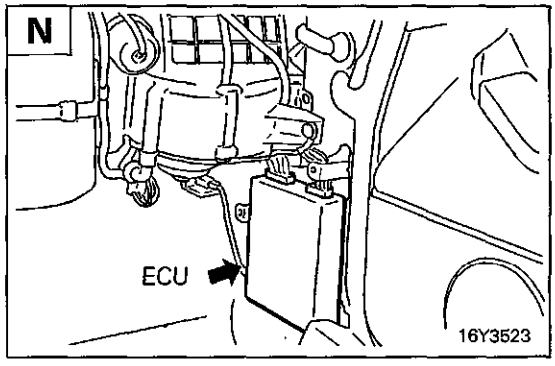
L


Inhibitor switch
ECI700

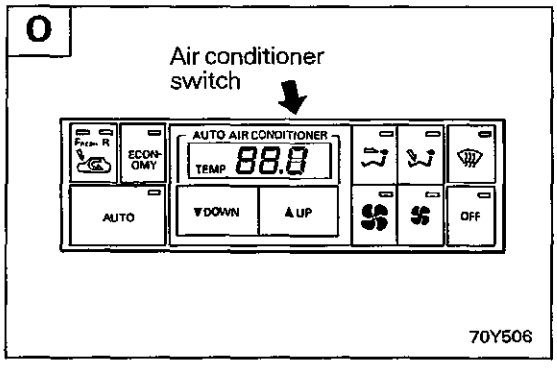
M


Resistor
16Y1539

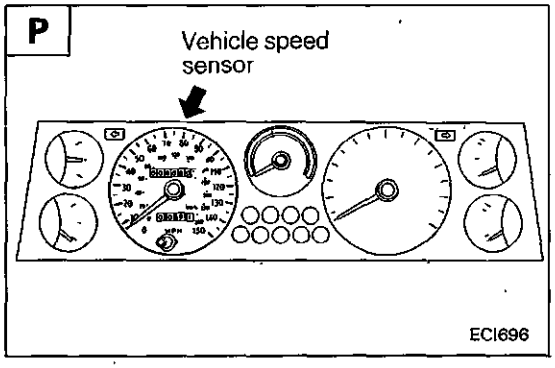
N


ECU
16Y3523

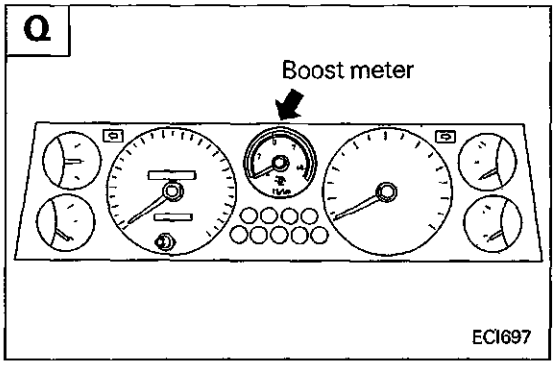
O


Air conditioner switch
AUTO AIR CONDITIONER
TEMP
ECON-OMY
AUTO
DOWN
UP
OFF
70Y506

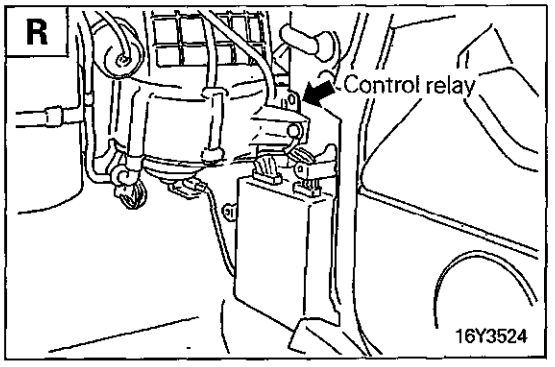
P


Vehicle speed sensor
ECI696

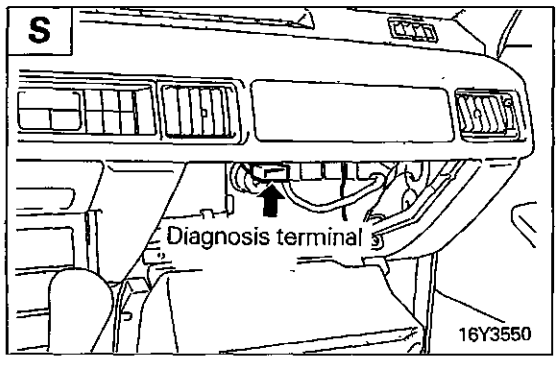
Q


Boost meter
ECI697

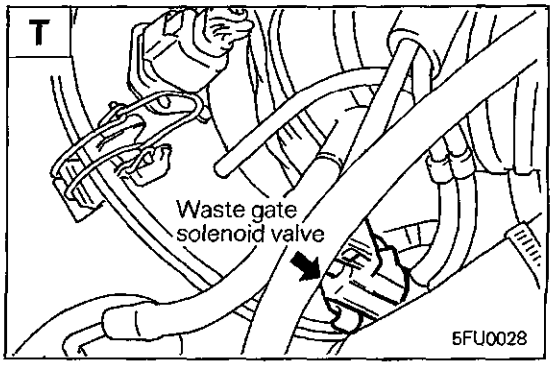
R

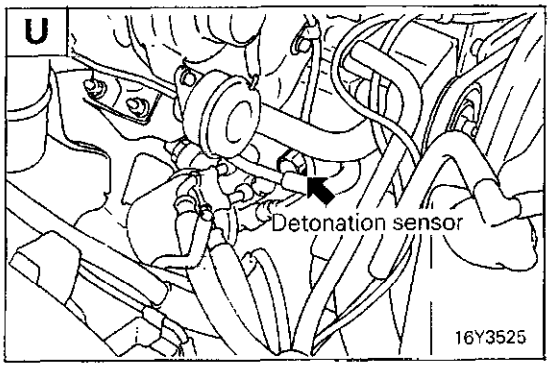

Control relay
16Y3524

S


Diagnosis terminal
16Y3550

T


Waste gate solenoid valve
5FU0028


U
Detonation sensor
16Y3525

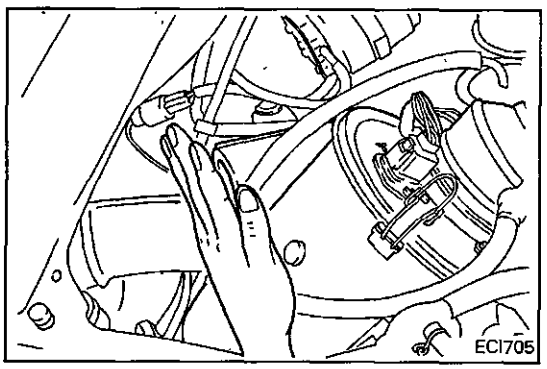
AIR FLOW SENSOR (AFS)

INSPECTION

Check using the ECI checker. (Refer to P.14-53.)

NOTE

If the air flow sensor fails, the intake air volume cannot be measured and as a result, normal fuel injection control is no longer available. The vehicle can be run, however, by the backup function.



BAROMETRIC PRESSURE SENSOR

INSPECTION

Check using the ECI checker. (Refer to P.14-53.)

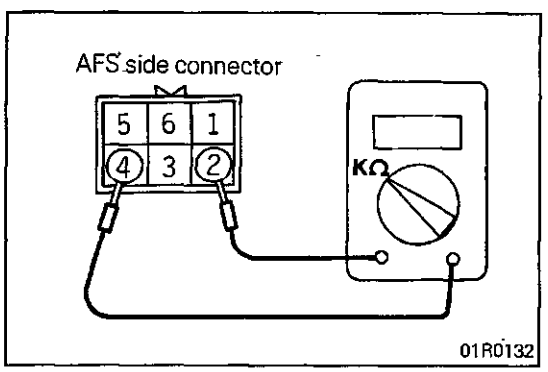
NOTE

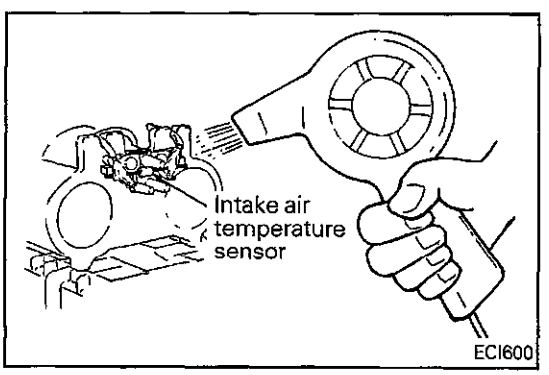
Close the air cleaner air inlet gradually to about a half of opening and check voltage change.

Pressure	Voltage
Lower (close opening)	Drops

Information

Pressure kPa abs (psi abs)	20 (3.0)	47.6 (6.9)	101 (14.7)
Center voltage V	0.79	1.84	4.00





INTAKE AIR TEMPERATURE SENSOR N140HAA

INSPECTION

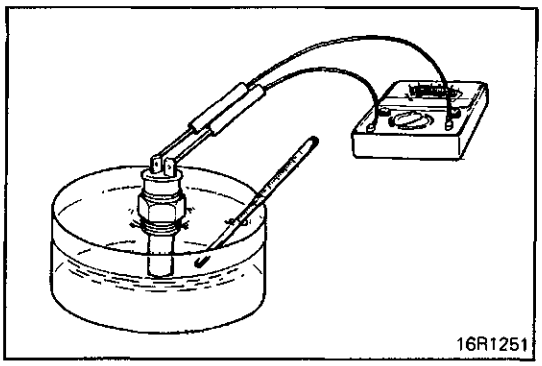
(1) Disconnect the air flow sensor connectors.
(2) Measure resistance between terminals ② and ④.

Temperature °C (°F)	Resistance kΩ
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4

(3) Measure resistance while heating the sensor using a hair drier.

Temperature	Resistance
Higher	Smaller

(4) If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.


16R1251

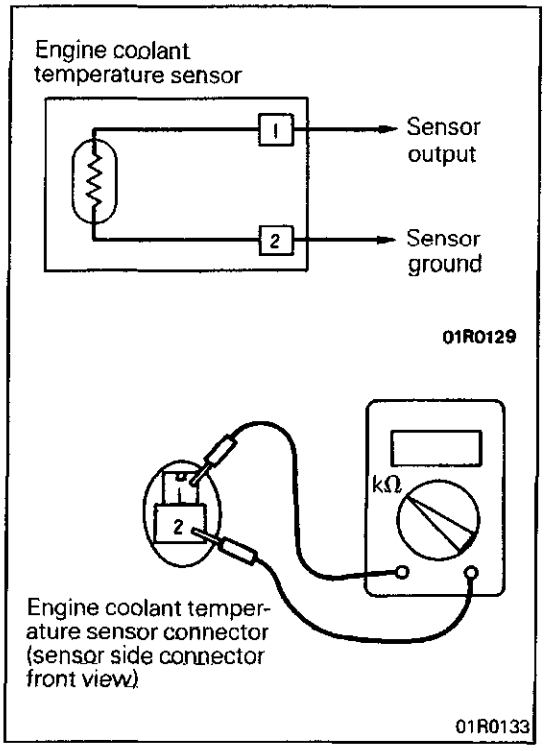
ENGINE COOLANT TEMPERATURE SENSOR N14QABA

INSPECTION

(1) Remove engine coolant temperature sensor from the intake manifold.
(2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance. The sensor should be held with its housing 3 mm (.12 in.) away from the surface of the hot water.

Temperature °C (°F)	Resistance kΩ
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3

(3) If the resistance deviates from the standard value greatly, replace the sensor.

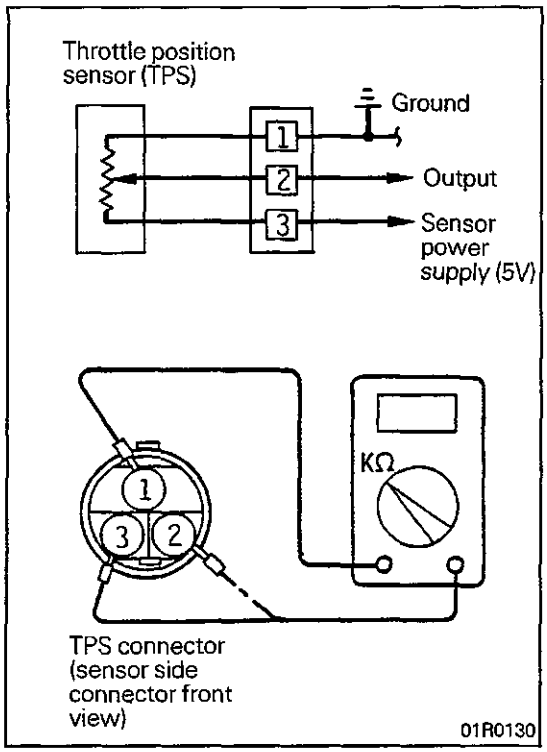


INSTALLATION

(1) Apply anaerobic sealant to threaded portion.
(2) Install engine coolant temperature sensor and tighten it to specified torque.

Sensor tightening torque: 20 – 40 Nm (14 – 29 ft.lbs.)

(3) Fasten harness connectors securely.



THROTTLE POSITION SENSOR (TPS) N14QBBA

INSPECTION

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ① (sensor GND) and terminal ③ (sensor power).

Standard value: 3.5 – 6.5 kΩ

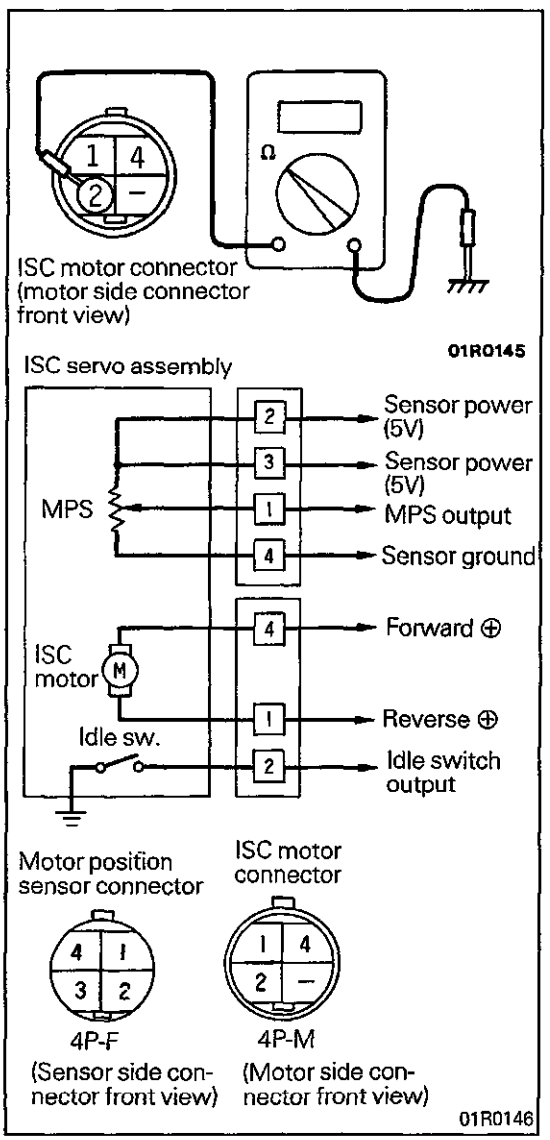
(3) Connect a pointer type ohmmeter between terminal ① (sensor GND terminal) and terminal ② (sensor output terminal).
(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.

NOTE
The resistance changes within the range from approx. 0.5 kΩ to the value measured at step 2.

(5) If the resistance is out of specification, or fails to change smoothly, replace the TPS.

TPS installation torque: 1.5 – 2.5 Nm (1.1 – 1.8 ft.lbs.)

NOTE
For the throttle position sensor adjusting procedure, refer to P.14-32.



IDLE SWITCH N14QKAA

INSPECTION

(1) Disconnect the ISC motor connector.
(2) Check continuity between terminal ② and body GND.

Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

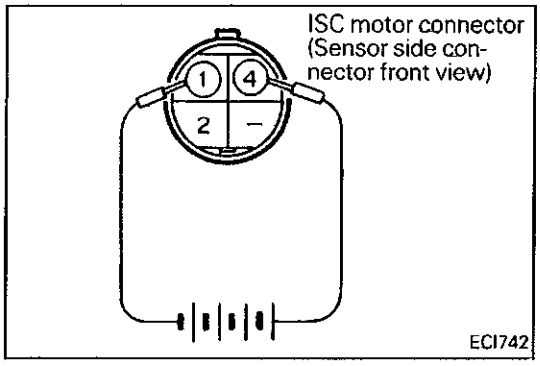
(3) If out of specification, replace the ISC servo assembly.

MOTOR POSITION SENSOR (MPS) N14QLAA

INSPECTION

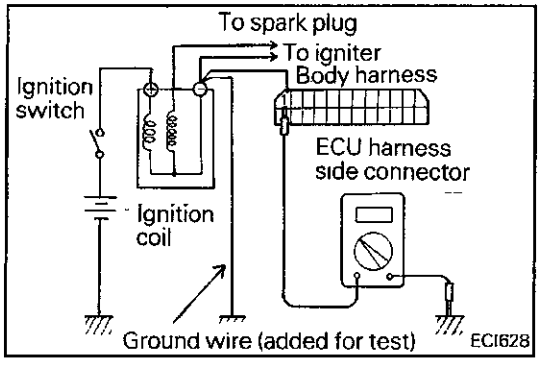
Use the ECI checker for inspection. (Refer to P.14-53.)

NOTE
Inspection of change on output voltage of MPS can be inspected by moving the ISC motor as follows.



(1) Turn the ignition switch to "LOCK".
(2) Disconnect the ISC motor connector.
(3) Turn the ignition switch to "ON". (Do not run the engine.)
(4) Connect 6V DC (four dry cells) between terminals ① and ④ of the ISC motor connector to operate the ISC motor (extend/retract), and make sure that the MPS output voltage changes smoothly between approximately 0.5 and 5 V.

Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.



ENGINE SPEED SENSOR (IGNITION COIL ⊖ TERMINAL) N14QCBA

INSPECTION

Check that there is continuity between the ignition coil ⊖ terminal and the electronic control unit (ECU) terminal No. 1.

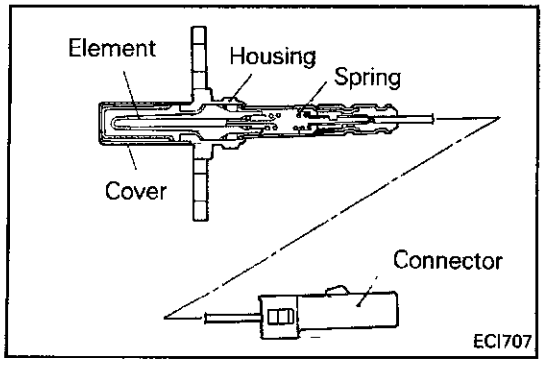
NOTE
Shake the harness connector to check for lurking open circuit.

OXYGEN SENSOR N14QDBA

INSPECTION

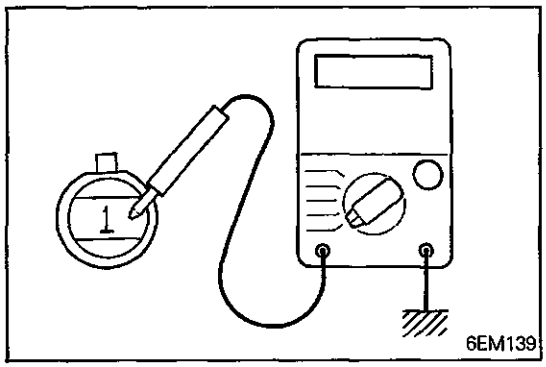
Caution
1. **Before checking, warm up the engine until engine coolant temperature reaches 85 to 95°C (185 to 205°F).**
2. **Use an accurate digital voltmeter.**

(1) Disconnect the oxygen sensor connector and connect a voltmeter to the oxygen sensor connector.



(2) While repeating engine racing, measure the oxygen sensor output voltage.

Engine	Oxygen sensor output voltage	Remarks
Race	Approx. 1V	Make air-fuel mixture rich by accelerator operation



NOTE
For removal and installation of the oxygen sensor, refer to GROUP 11 INTAKE AND EXHAUST SYSTEM.

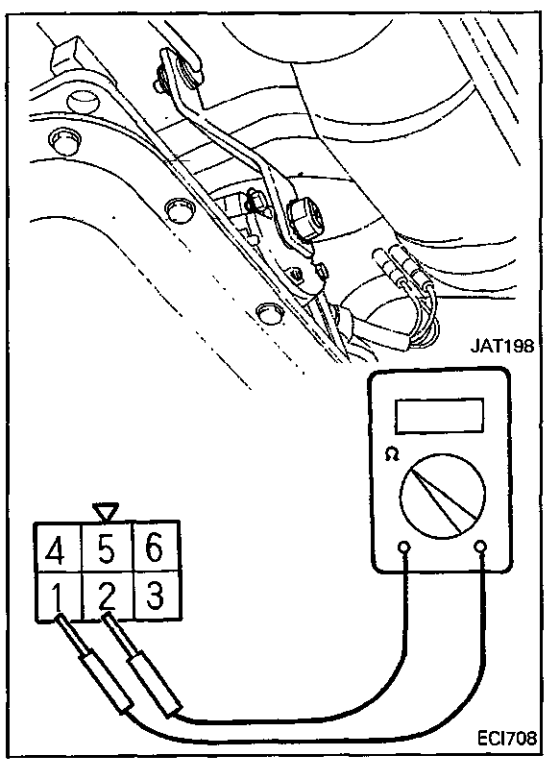
Oxygen sensor installation torque:
25 – 30 Nm (18 – 22 ft.lbs.)

VEHICLE SPEED SENSOR N14QEBA

Refer to GROUP 8 ELECTRICAL.

AIR CONDITIONER SWITCH N14QOAA

Refer to GROUP 24 HEATERS AND AIR CONDITIONING.



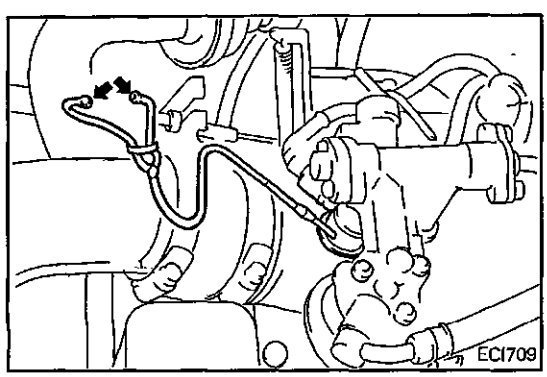
INHIBITOR SWITCH – VEHICLES WITH AN AUTOMATIC TRANSMISSION N14QRAA

INSPECTION

(1) Disconnect the inhibitor switch connector.
(2) Operate the control lever to check continuity between terminals ① and ② of the inhibitor switch side connector.

Control lever position	Continuity between terminals ① and ②
P, N	Conductive
R	Non-conductive

(3) If the check result is not as specified, adjust the inhibitor switch.
Refer to GROUP 21 TRANSMISSION for adjusting procedure.



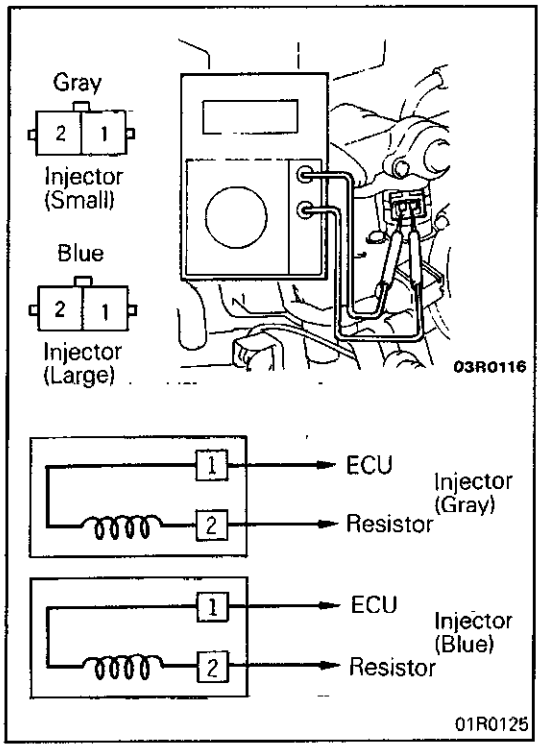
INJECTORS N14QTAC

INSPECTION

Operation Sound Check

Using a sound scope, check operation sound (tick, tick). Check that the sound is produced at shorter intervals as the engine speed increases.

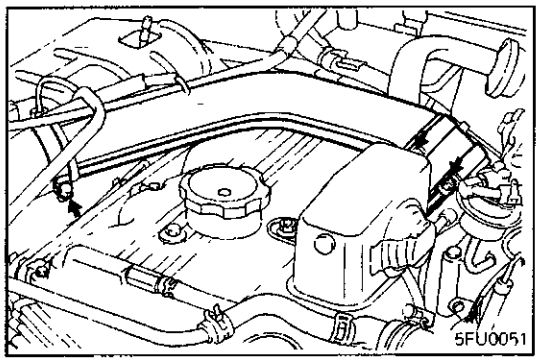
Engine state	Injector connector color	Operating sound
Cranking	Gray	Heard
	Blue	Not heard
Idling	Gray	Heard
	Blue	Not heard
Racing	Gray	Heard
	Blue	



Caution
Check carefully. Other injectors may produce sound as they operate even if the injector under checking does not operate.

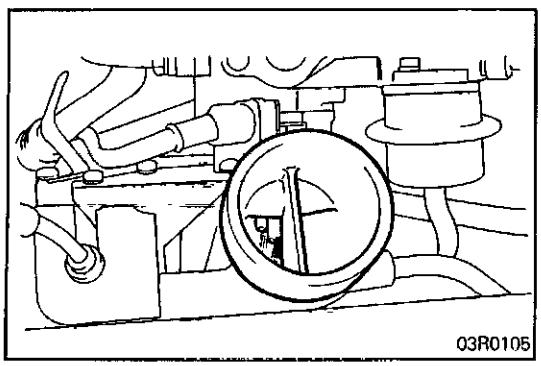
Resistance between Terminals Measurement

(1) Disconnect the injector connector.
(2) Measure resistance between terminals.
Standard value: 2 – 3 Ω [at 20°C (68°F)]
(3) Install the injector connector.



Injection State Inspection

(1) Remove the air intake pipe.
(2) Disconnect the high tension cable from the ignition coil.



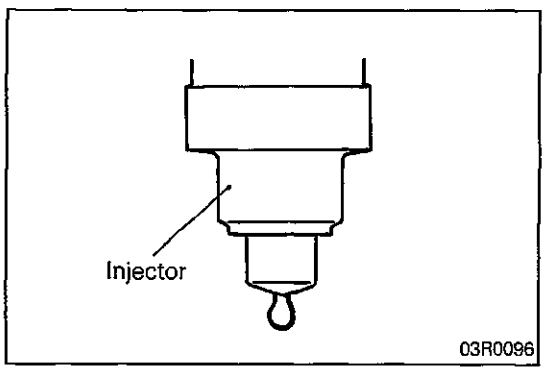
Injector with Gray Connector Inspection

(3) Observing through the air inlet of the injection mixer, visually check injection state of the injector with gray connector when the ignition switch is set to ST position. Judge the injector as normal unless the injection state is very poor.
(4) Turn the ignition switch to OFF and check the injector nozzle for leaks.

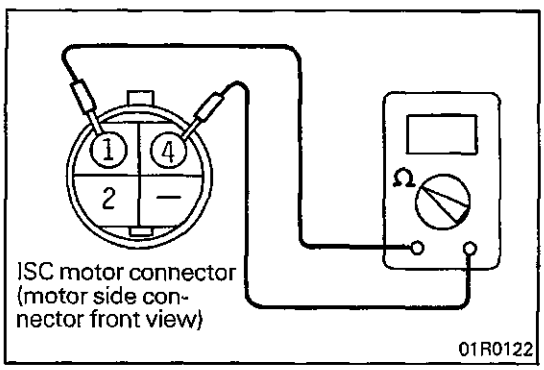
Injector with Blue Connector Inspection

(5) Disconnect the injector harness of the blue connector.
(6) Connect the harness connected to the injector having gray connector to the injector having blue connector.

Caution
Connect the harness with adequate slackness so that undue tension will not act on the harness when the engine is cranked.



(7) Observing through the air inlet of the injection mixer, visually check injection state of the injector with blue connector when the ignition switch is set to ST position. Judge the injector as normal unless the injection state is very poor.
(8) Turn the ignition switch to OFF and check the injector nozzle for leaks.

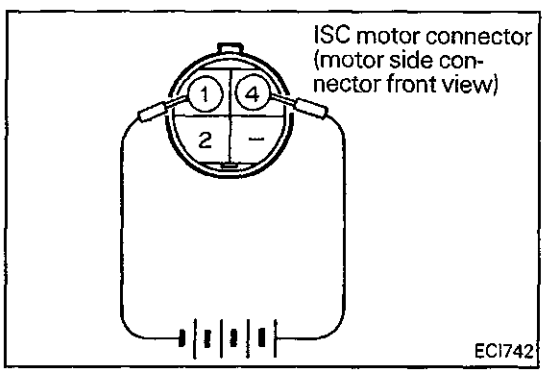


ISC MOTOR (DC MOTOR) N14QUAA

INSPECTION

(1) Disconnect the ISC motor connector.
(2) Check continuity of the ISC motor coil.

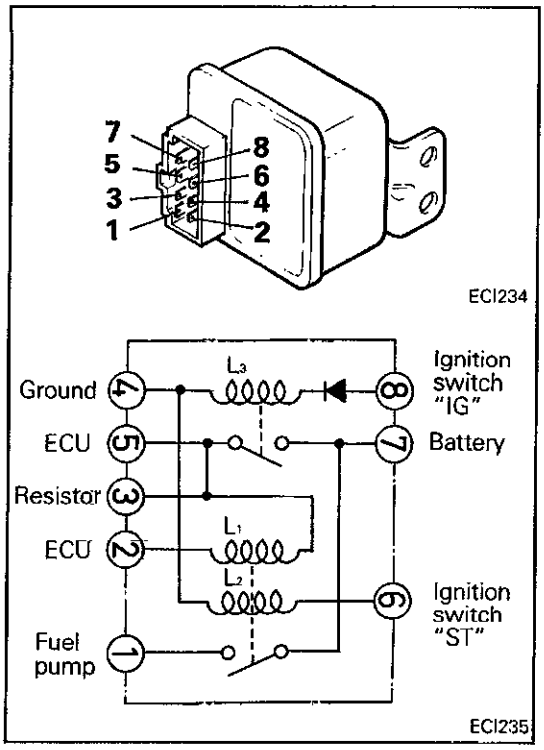
Measuring terminals	Continuity
① – ④	Conductive [5 to 11 Ω resistance at 20°C (68°F)]

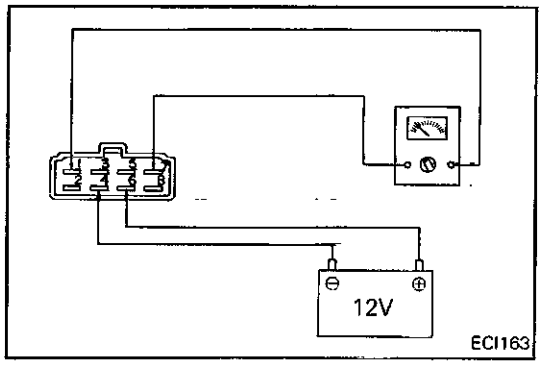


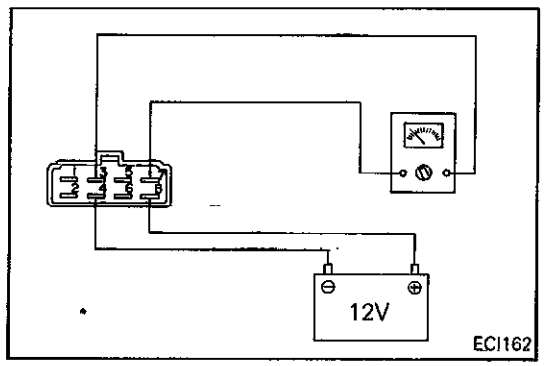
(3) Connect 6V DC between terminals ① and ④ of the ISC motor connector and check that ISC servo operates.

Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

(4) If not, replace ISC servo as an assembly.







CONTROL RELAY

N14QYAA

INSPECTION

Caution

When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

NOTE

Failure of the control relay prevents power supply to the fuel pump, injectors and ECU, resulting in start failure.

(1) Check continuity between terminals for both when the relay coil is energized and when not.

NOTE

In the following tables, the arrows indicate direction of current flow.

Confirm circuit tester polarity before checking continuity.

① Coils L_1 and L_2

Condition	Measuring terminals	Continuity
Not energized	①–⑦	Non-conductive (∞ Ω)
	②–⑤	Conductive (approx. 95 Ω)
	②–③	
	⑥–④	Conductive (approx. 35 Ω)
Energized	①–⑦	Conductive (0 Ω)

NOTE

"Energized" means voltage applied across terminals ⑥ and ④.

② Coil L_3

Condition	Measuring terminals	Continuity
Not energized	③–⑦	Non-conductive (∞ Ω)
	④ → ⑧	Non-conductive (∞ Ω)
	④ ← ⑧	Conductive (0 Ω)
Energized	③–⑦	Conductive (0 Ω)

NOTE

"Energized" means voltage applied across terminals ⑧ and ④.

(2) If the result is not satisfactory, replace the control relay.

AIR CONDITIONER RELAY

N14RAAA

Refer to GROUP 24 HEATERS AND AIR CONDITIONING.

WASTE GATE VALVE

Refer to GROUP 11 INTAKE AND EXHAUST SYSTEM.

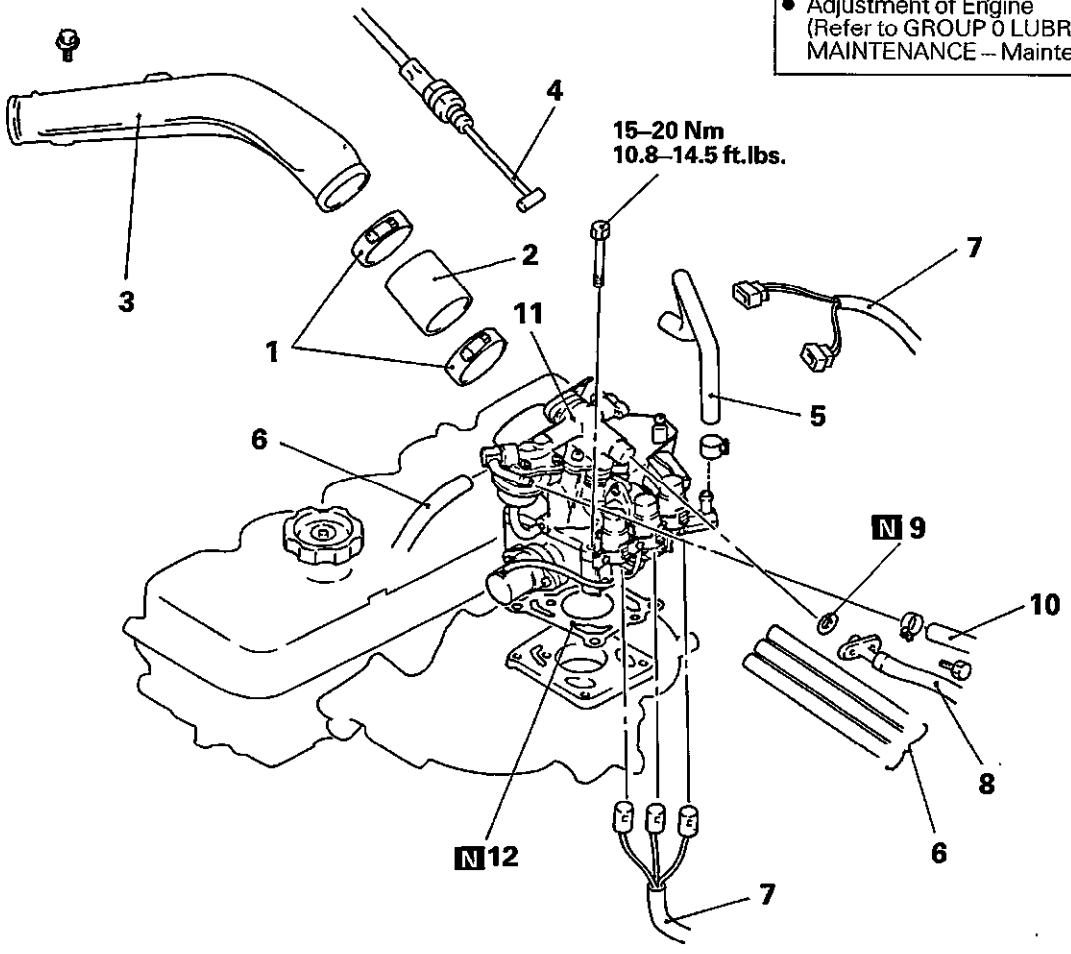
INJECTION MIXER

N14NA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Engine Coolant
- Releasing Residual Pressure from Fuel High Pressure Hose (Refer to P.14-38.)

Post-installation Operation
- Charging Engine Coolant
- Adjustment of Accelerator Cable
- Adjustment of Engine (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

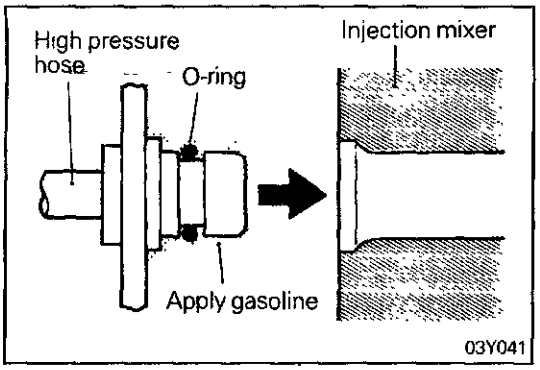


03Y753

Removal steps

1. Hose clamp
2. Air hose
3. Air intake pipe
4. Accelerator cable connection
5. Water hose connection
6. Vacuum hose connection
7. Engine control wiring harness connection
- ◆◆ 8. Fuel high pressure hose connection
9. O-ring
10. Fuel return hose connection
11. Injection mixer
12. Gasket

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆: Refer to "Service Points of Installation"
(3) N: Non-reusable parts



SERVICE POINT OF INSTALLATION N14NDA

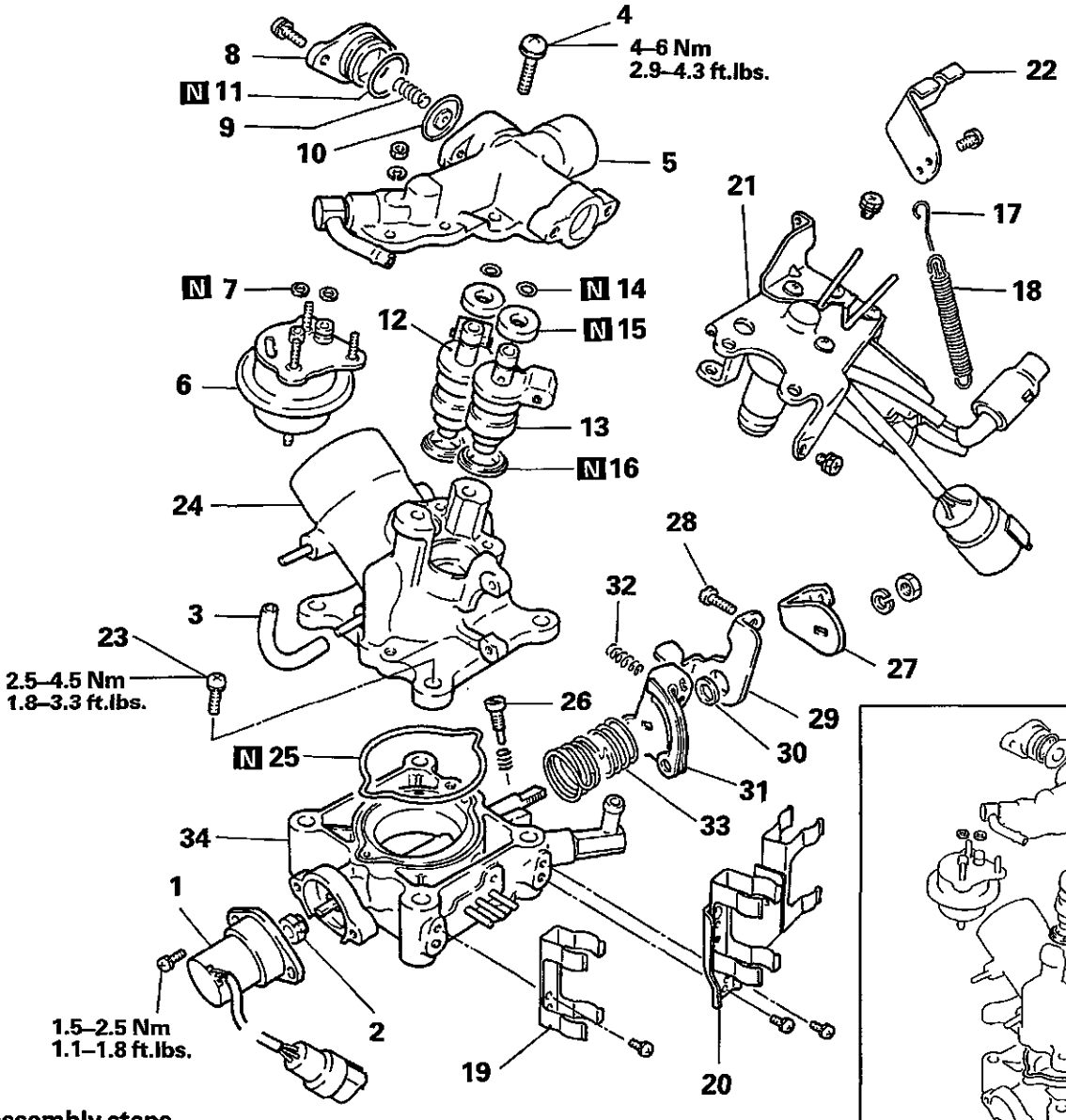
8. INSTALLATION OF FUEL HIGH PRESSURE HOSE

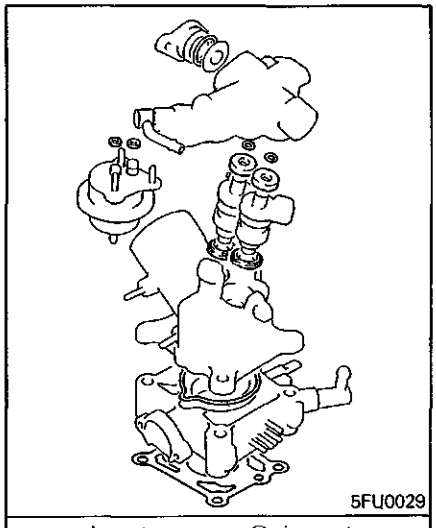
When connecting the fuel high pressure hose to the injection mixer, coat the hose union with gasoline and insert using care not to cause damage to the O-ring.

INJECTION MIXER

N14NE--

DISASSEMBLY AND REASSEMBLY





Injection mixer O-ring set

Disassembly steps

- ◆◆ ▶◀ 1. Throttle position sensor (TPS)
- 2. Joint
- 3. Hose
- ▶◀ 4. Screw
- ▶◀ 5. Injector holder
- ▶◀ 6. Fuel pressure regulator
- 7. O-ring
- 8. Pulsation damper cover
- 9. Spring
- ▶◀ 10. Diaphragm
- 11. O-ring
- ◆◆ ▶◀ 12. Injector
- ◆◆ ▶◀ 13. Injector
- 14. O-ring
- 15. Collar
- ▶◀ 16. Seal ring
- 17. Damper spring
- 18. Return spring
- 19. Connector bracket
- 20. Connector bracket
- ◆◆ 21. ISC servo assembly
- 22. Throttle cable bracket
- 23. Screw
- 24. Mixing body
- ▶◀ 25. Seal ring
- 26. Throttle valve set screw (fixed SAS)
- 27. Kickdown lever
- 28. Adjusting screw
- 29. Free lever
- 30. Ring
- 31. Throttle lever
- 32. Spring
- 33. Return spring
- 34. Throttle body

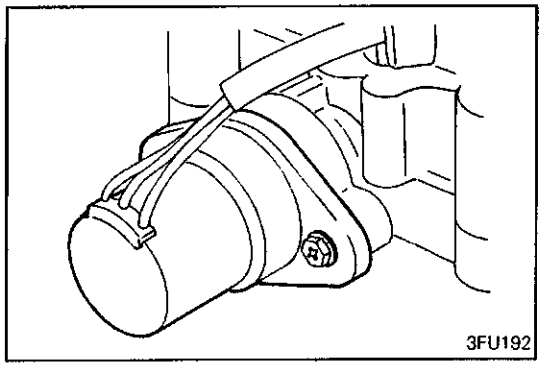
NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆: Refer to "Service Points of Disassembly".
(3) ▶◀: Refer to "Service Points of Reassembly".
(4) N: Non-reusable parts.

ECI711

SERVICE POINTS OF DISASSEMBLY N14NFAA

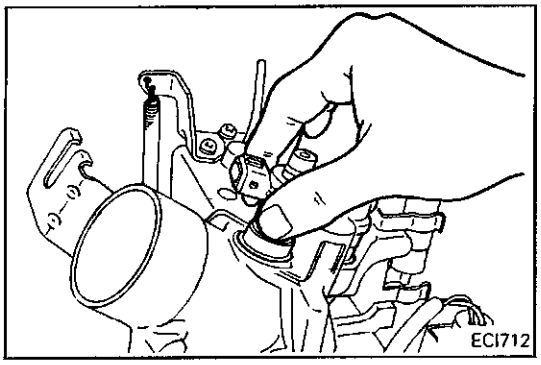
Caution

1. **When loosening a Phillips screw which has been firmly tightened, use a Phillips screwdriver that is an exact fit for the screw.**
2. **Do not remove the throttle valve.**
3. **Do not remove the injector holder screen.**
4. **Do not remove the fuel return nipple.**



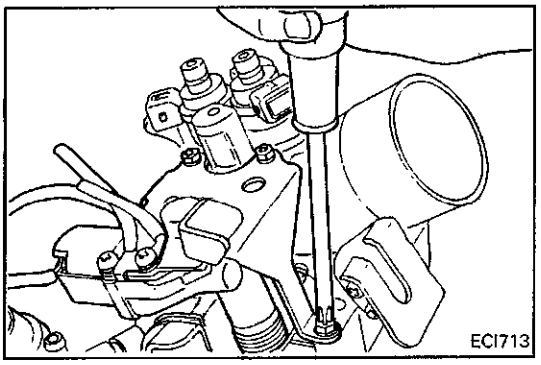
1. REMOVAL OF THROTTLE POSITION SENSOR (TPS)

Do not remove the throttle position sensor unless it requires replacement.



12. 13. REMOVAL OF INJECTOR

(1) Do not hold the injector by pliers when removing it.
(2) After removal of an injector, close the fuel inlet by seal tape, etc. to prevent entry of foreign matter.



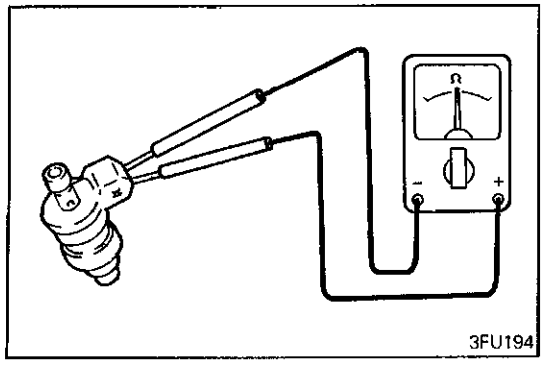
21. REMOVAL OF ISC SERVO ASSEMBLY

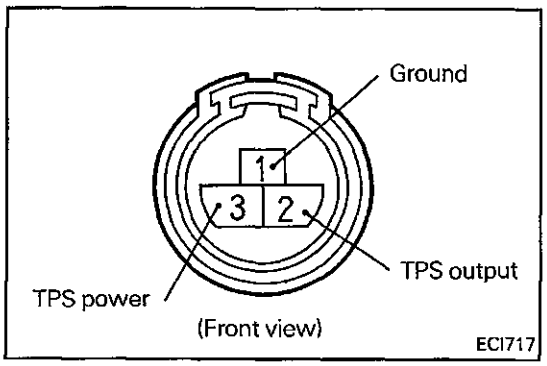
(1) Do not remove the ISC servo assembly unless it requires replacement.
(2) Do not disassemble the ISC servo assembly.

INSPECTION N14NGAA

INJECTORS

(1) Measure resistance of injector coils using a circuit tester.
Standard value: 2 – 3 Ω [at 20°C (68°F)]
(2) If the resistance is out of specification, replace the injector.

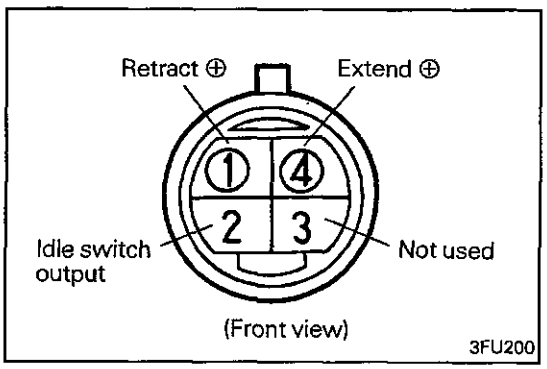




THROTTLE POSITION SENSOR (TPS) CONTINUITY CHECK

N14NJAA

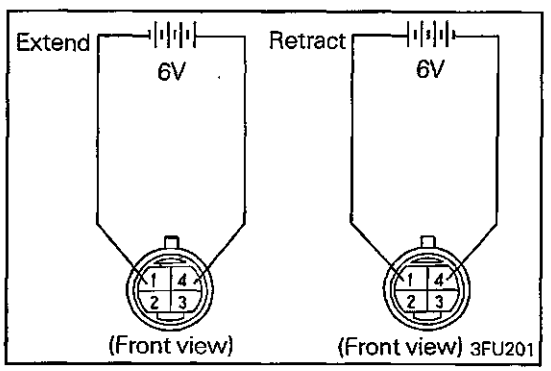
(1) Measure resistance between terminals 1 and 3 of the throttle position sensor using a circuit tester.
Standard value: 3.5 – 6.5 kΩ
(2) Check sensor body for cracks and damages.



ISC SERVO CONTINUITY CHECK

N14NJBA

Measure resistance between terminals 1 and 4 using a circuit tester.
Standard value: 5 – 11 Ω [at 20°C (68°F)]



ISC SERVO OPERATION INSPECTION

N14NJCA

(1) Connect 6V DC (four dry cells) to terminals 1 and 4 and check that the ISC servo extends and retracts by itself.
Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

	ISC servo motion
When terminal 1 is ⊕	Retracts
When terminal 4 is ⊕	Extends

(2) If the ISC servo does not move, replace the ISC servo assembly.

THROTTLE VALVE SHAFT INSPECTION

N14NGBA

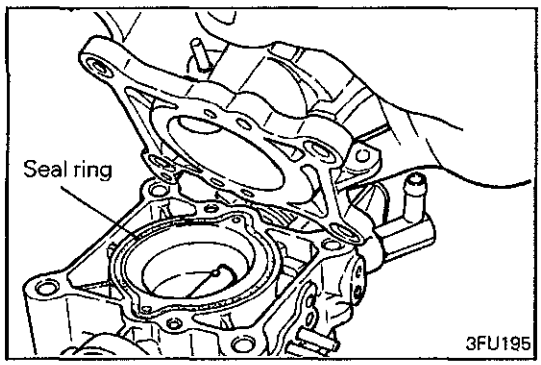
Check operation of the throttle valve shaft. If it does not operate smoothly and lightly, wash well and then apply a light coat of engine oil to the shaft.

PARTS CLEANING

N14NHAA

(1) Clean all parts. Do not use detergent to clean the following parts:
- Throttle position sensor
- ISC servo

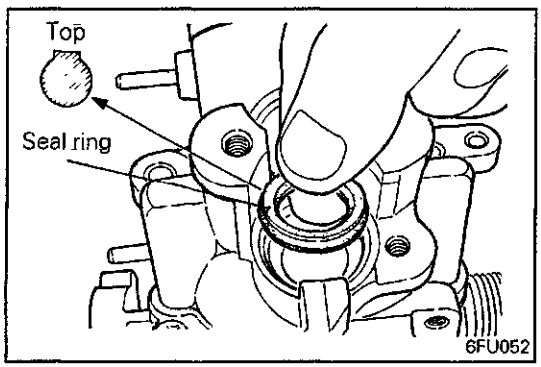
Immersion of these parts in detergent causes damage to insulation. Only wipe them with cloth.
(2) When cleaning the injectors and fuel pressure regulator, close tightly the fuel inlet and outlet by sealing tape and use clean detergent.
(3) Check the vacuum port and passage for clogging. Blow compressed air in the vacuum and fuel passages to clean them.



SERVICE POINTS OF REASSEMBLY N14NIAA

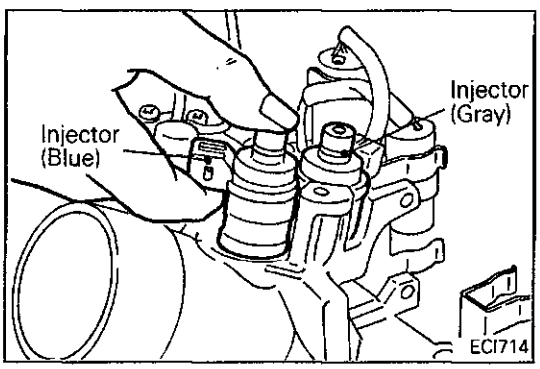
25. INSTALLATION OF SEAL RING

Make sure that the seal ring does not protrude from the groove.



16. INSTALLATION OF SEAL RING

Install a new seal ring in the mixing body. When fitting the seal ring, make sure that its flat side faces up.

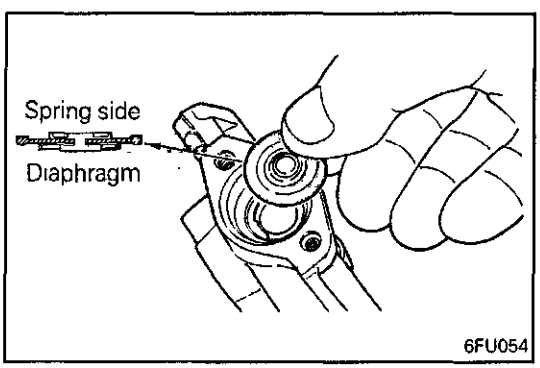


13. 12. INSTALLATION OF INJECTORS

(1) Fit a new O-ring and collar to the injector.
(2) Set the injector on the mixing body at correct position and push down firmly with a finger until it is seated.

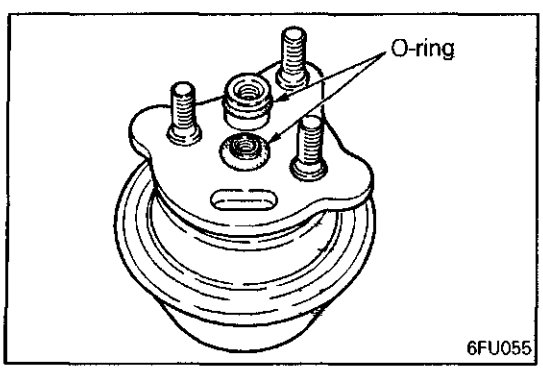
Identification of injectors

Connector color	Position	Orifice
Blue	Right	Large
Gray	Left	Small



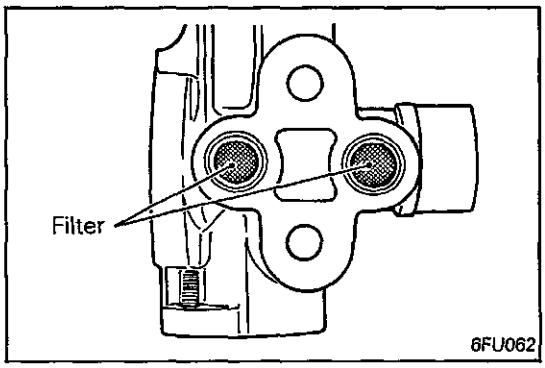
10. INSTALLATION OF DIAPHRAGM

Install the diaphragm in the injector holder in correct direction as shown.



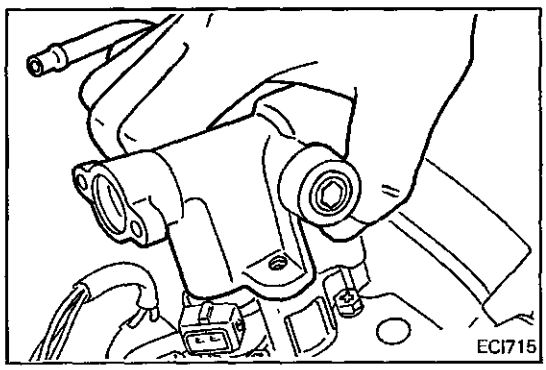
6. INSTALLATION OF FUEL PRESSURE REGULATOR

Fit a new O-ring to the regulator.

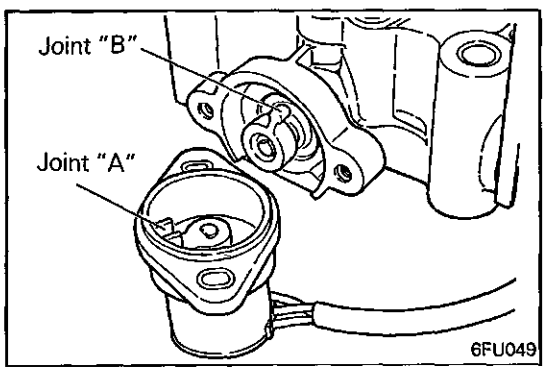


5. INSTALLATION OF INJECTOR HOLDER / 4. SCREW

(1) Check the injector holder filter for clogging and damage. Replace if necessary.

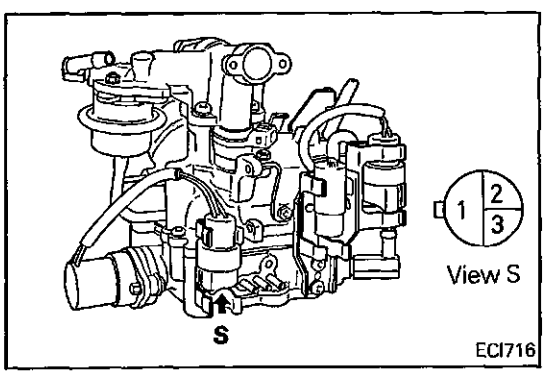


(2) Set the injector holder and push it down firmly.
(3) Tighten the screw little by little and alternately. Finally tighten to specified torque.

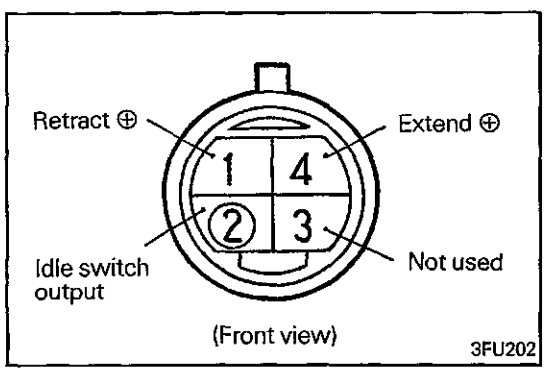


1. INSTALLATION OF THROTTLE POSITION SENSOR (TPS)

(1) Fit the joint "A" of throttle position sensor on the joint "B" of throttle body and combine the throttle position sensor to the throttle body by temporarily tightening the screw.



(2) Check correct installation of the throttle position sensor. While moving the throttle lever in both open and close directions, check that resistance between terminals 1 and 2 or 2 and 3 changes smoothly. If resistance changes smoothly, the throttle position sensor has been installed correctly.



AFTER REASSEMBLY INSPECTION N14NJDA

IDLE SWITCH CONTINUITY CHECK

(1) Using a circuit tester, check continuity between the body and terminal 2 when the throttle valve is fully closed and when fully opened.

Throttle valve	Continuity
Fully closed	Conductive
Fully opened	Non-conductive

(2) If otherwise than shown above, replace the ISC servo assembly.

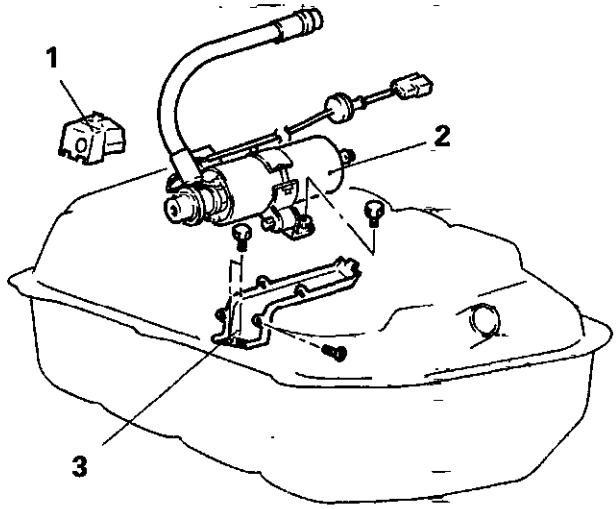
FUEL PUMP

N14HA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Release of Residual Pressure from Fuel High Pressure Hose (Refer to P.14-38.)
- Draining Fuel
- Removal of Fuel Tank

Post-installation Operation
- Installation of Fuel Tank
- Replenishment of Fuel



03Y754

Removal steps

1. Fuel pump protector
2. Fuel pump
3. Fuel pump support

NOTE
Reverse the removal procedures to reinstall.

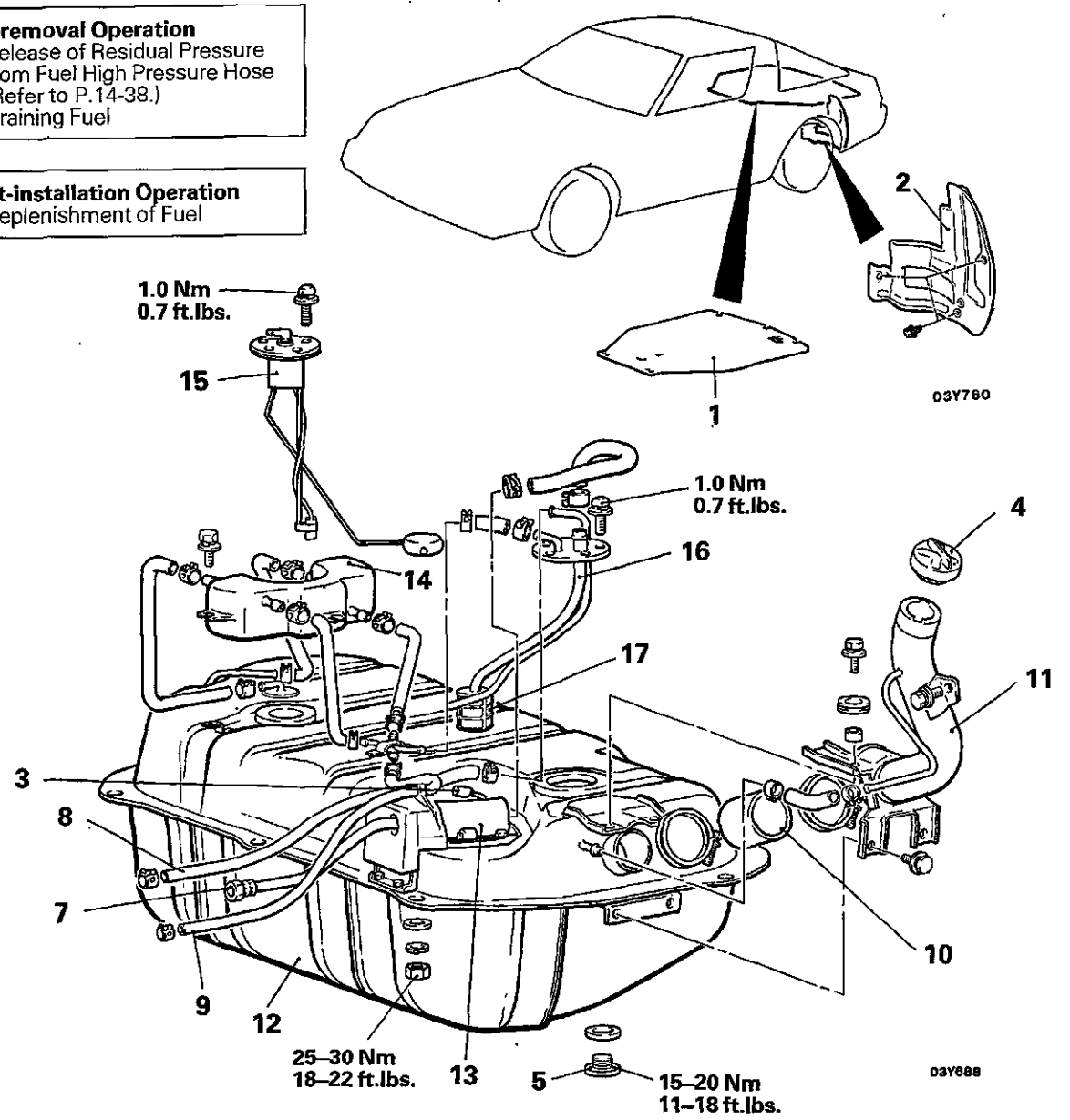
FUEL TANK

N14GA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Release of Residual Pressure from Fuel High Pressure Hose (Refer to P.14-38.)
- Draining Fuel

Post-installation Operation
- Replenishment of Fuel



Removal steps

1. High floor side panel
2. Fuel pipe cover
3. Fuel pump connector connection
4. Fuel tank cap
5. Drain plug
6. Fuel gauge unit connector connection
7. ◆◆ Fuel high pressure hose connection
8. ◆◆ Return hose
9. ◆◆ Vapor hose
10. Fuel filler hose
11. Fuel filler neck
12. Fuel tank
13. Electrical fuel pump
14. Separator tank
15. Fuel gauge unit
16. Pipe assembly
17. In-tank fuel filter

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆: Refer to "Service Points of Installation".

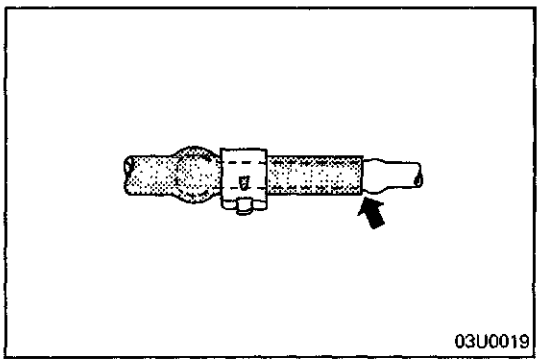
INSPECTION

N14GCAD

- Check the hoses and pipes for cracks, bends, deformation, wear or clogging.
- Check the fuel tank cap for operation.
- Check the fuel tank for deformation, corrosion or cracks.
- Check the fuel tank for entry of dust or foreign material.

NOTE
If the inside of the fuel tank is to be cleaned, use any one of the following:
(1) Kerosene
(2) Trichloroethylene
(3) A neutral emulsion type detergent

- Check the in-tank fuel filter for damage or clogging.

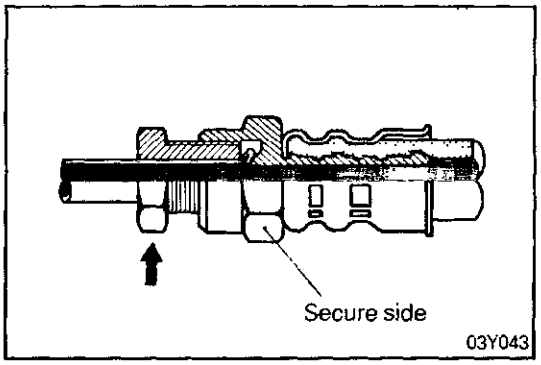


SERVICE POINTS OF INSTALLATION

N14GDAF

9. INSTALLATION OF VAPOR HOSE / 8. RETURN HOSE

When attaching the hoses to the pipes, be sure that the hose is attached until its end comes in touch with the bulge of the pipe as shown in the illustration.



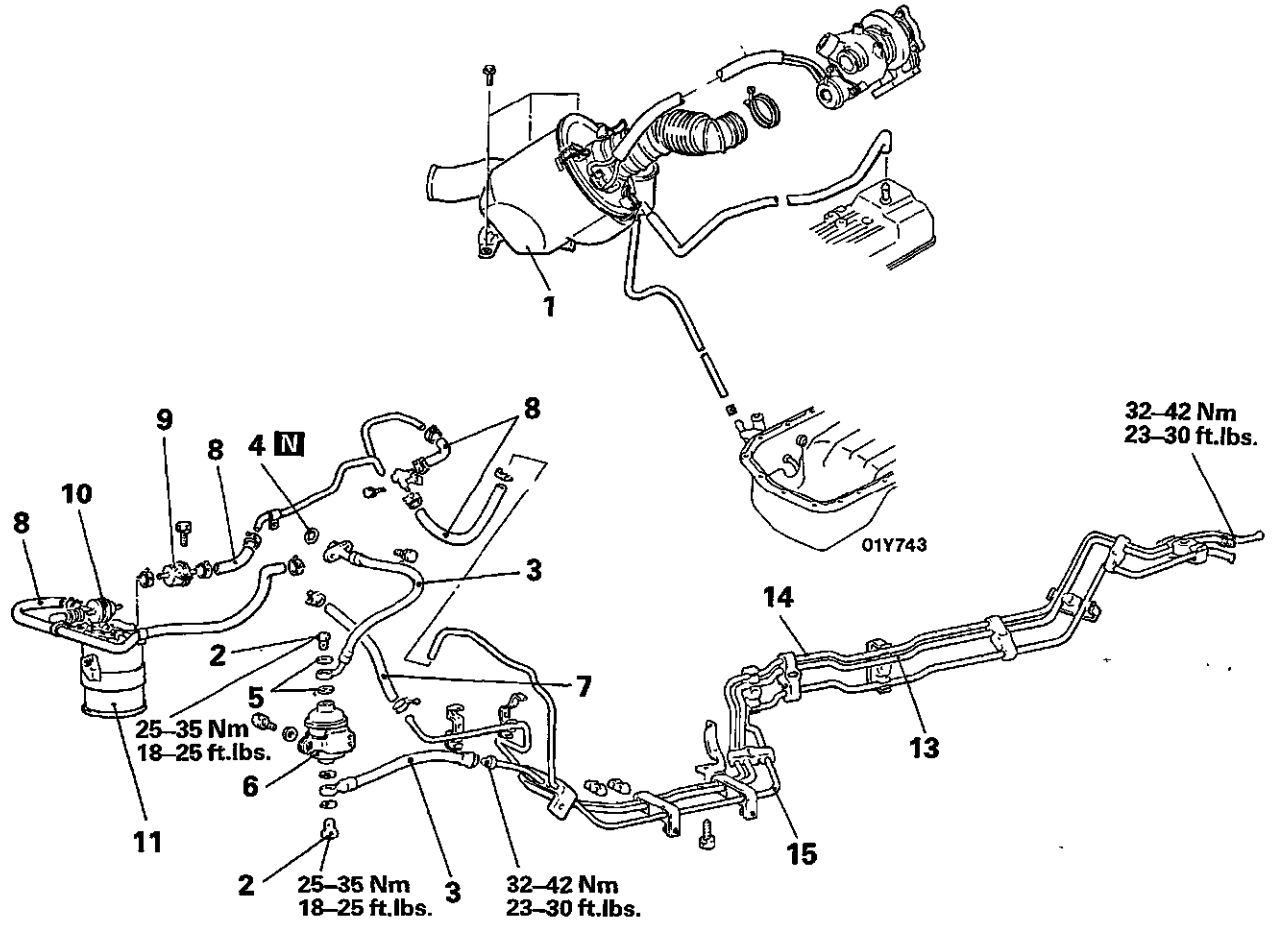
7. INSTALLATION OF FUEL HIGH PRESSURE HOSE

When connecting the fuel high pressure hose to pump, tighten the flare nut by hand, and then tighten it to 32 – 42 Nm (23 – 30 ft.lbs.) being careful that the fuel hose does not become twisted.

FUEL LINE AND VAPOR LINE

N14KA--

REMOVAL AND INSTALLATION



Removal steps

1. Air cleaner
2. Eye bolt
3. ◆◆ Fuel high pressure hose
4. O-ring
5. Gasket
6. Fuel filter
7. ◆◆ Return hose
8. ◆◆ Vapor hose
9. Overfill limiter (two-way valve)
10. Purge control valve
11. Fuel check valve
12. Canister
13. Main pipe
14. Return pipe
15. Vapor pipe

Pre-removal Operation
- Release of Residual Pressure from Fuel High Pressure Hose (Refer to P.14-38.)

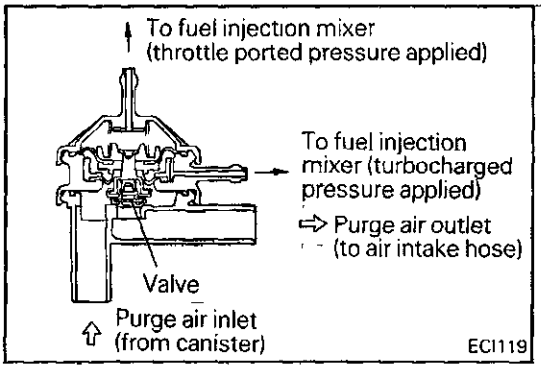
NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆: Refer to "Service Points of Installation".
(3) N: Non-reusable parts

03Y700

INSPECTION

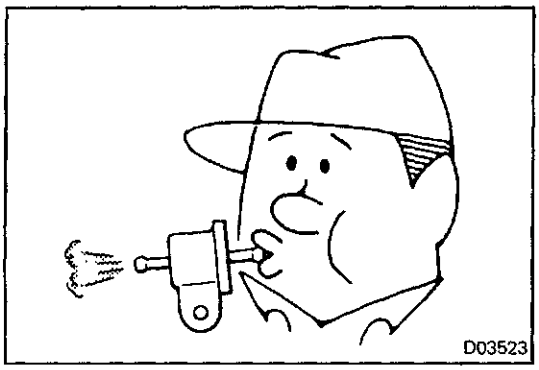
N14KCAC

- Check the hoses and pipes for cracks, bends, deformation, wear or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging.
- Check the fuel check valve for malfunction.



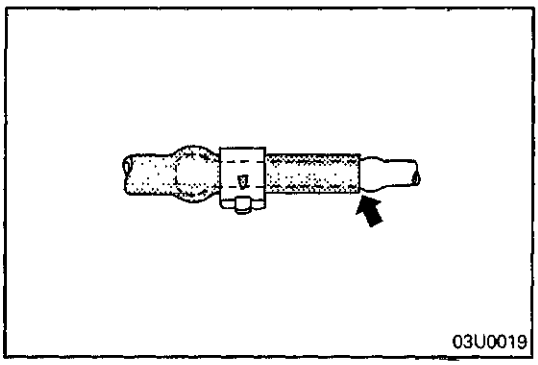
INSPECTION OF PURGE CONTROL VALVE

(1) Make sure that the engine coolant is at a temperature between 80 and 90°C (180 and 190°F).
(2) Disconnect the purge control hose from the air cleaner and blow into the purge hose. If the valve is not open, its operation is normal. Then start the engine and increase the engine speed to 1,500 to 2,000 rpm and blow into the purge hose. If the valve is not open, check for clogged or broken vacuum hose, or malfunctioning thermo valve.



INSPECTION OF OVERFILL LIMITER (TWO-WAY VALVE)

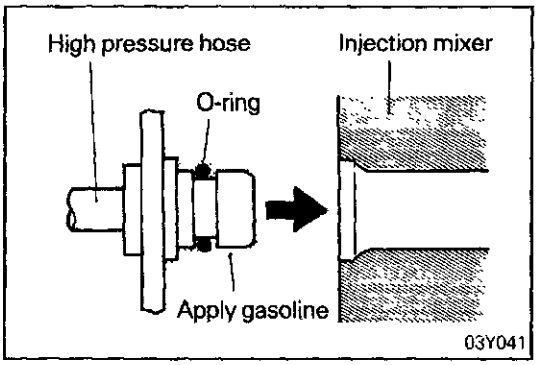
A simple way of inspection, however, may be adopted in which the overfill limiter is removed and then air is lightly blown into either the inlet or outlet by mouth. If the air passes after a slight resistance, overfill limiter is in good condition.



SERVICE POINTS OF INSTALLATION N14KDAA

8. INSTALLATION OF VAPOR HOSE / 7. RETURN HOSE

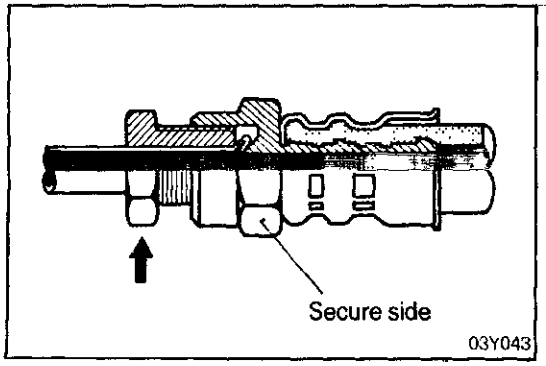
When attaching the hoses to the pipes, be sure that the hose is attached until its end comes in touch with the bulge of the pipe as shown in the illustration.



3. INSTALLATION OF FUEL HIGH PRESSURE HOSES

(1) When connecting the fuel high pressure hose to the injection mixer, apply gasoline to the hose union. Then insert the hose, being careful not to damage the O-ring, and tighten securely.

Caution
Because there is high pressure applied between the fuel pump and the injection mixer, be especially sure that there is no fuel leakage in this area.



(2) When connecting the fuel high pressure hose to pipe, tighten the flare nut by hand, and then tighten it to 32 – 42 Nm (23 – 30 ft.lbs.), being careful that the fuel hose does not become twisted.