

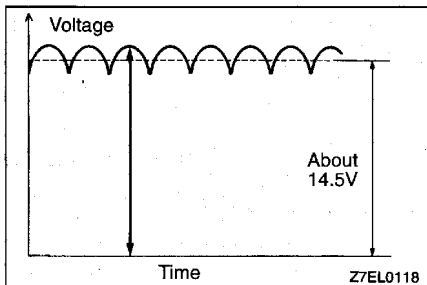
CHARGING SYSTEM

GENERAL INFORMATION

110003664

The charging system is a system which charges the battery with the generator output to keep the

battery charged at a constant level during varying electrical load.



Operation

Rotation of the excited field coil generates AC voltage in the stator.

This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration at left.

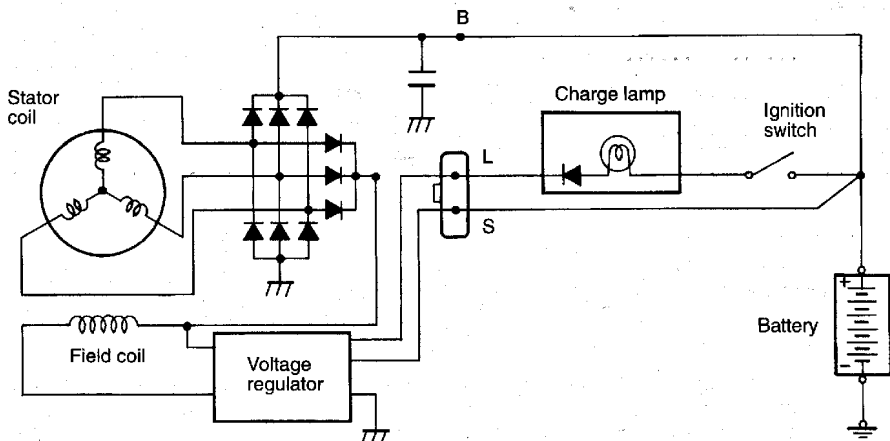
The average output voltage fluctuates slightly with the generator load condition.

When the ignition switch is turned on, current flows in the field coil and initial excitation of the field coil occurs.

When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.

The generator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (generator S

terminal voltage) reaches a regulated voltage of approx. 14.4V, the field current is cut off. When the battery voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current. In addition, when the field current is constant, the generator output voltage rises as the engine speed increases.



GENERATOR SPECIFICATIONS

Items	Specifications	
Type	Battery voltage sensing	
Rated output V/A	1.5L Engine	12/70
	1.8L Engine	12/75
Voltage regulator	Electronic built-in type	

SERVICE SPECIFICATIONS

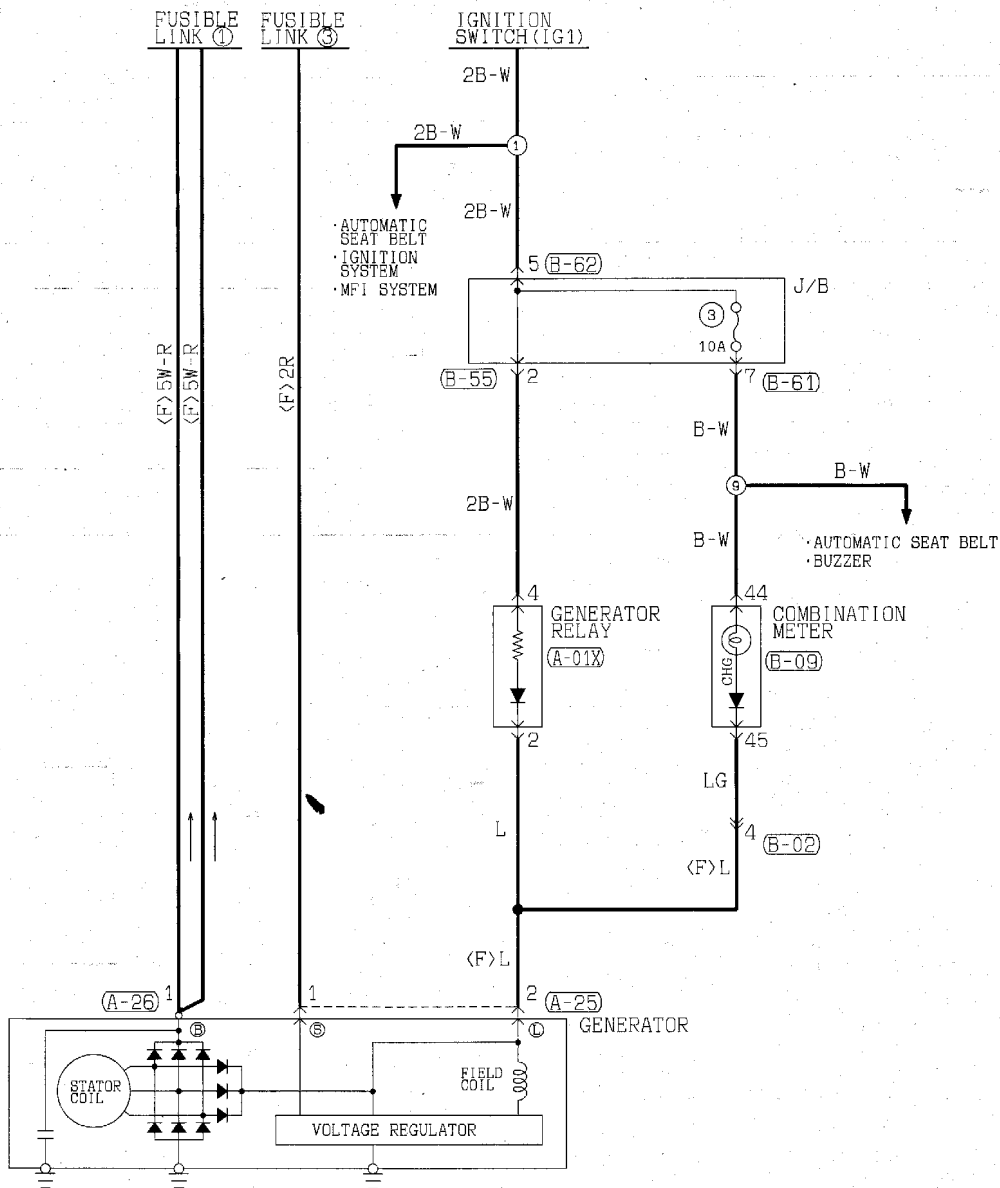
110003665

Items	Standard value	Limit
Regulated voltage Ambient temp. at voltage regulator V	-20°C (-4°F)	-
	20°C (68°F)	-
	60°C (140°F)	-
	80°C (176°F)	-
Rotor coil resistance Ω	Approx. 3-5	-
Output current	-	70 % of nominal output current

TROUBLESHOOTING

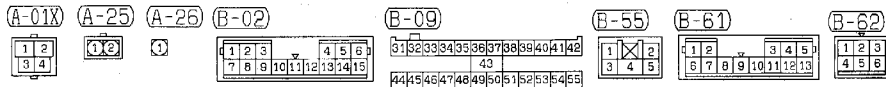
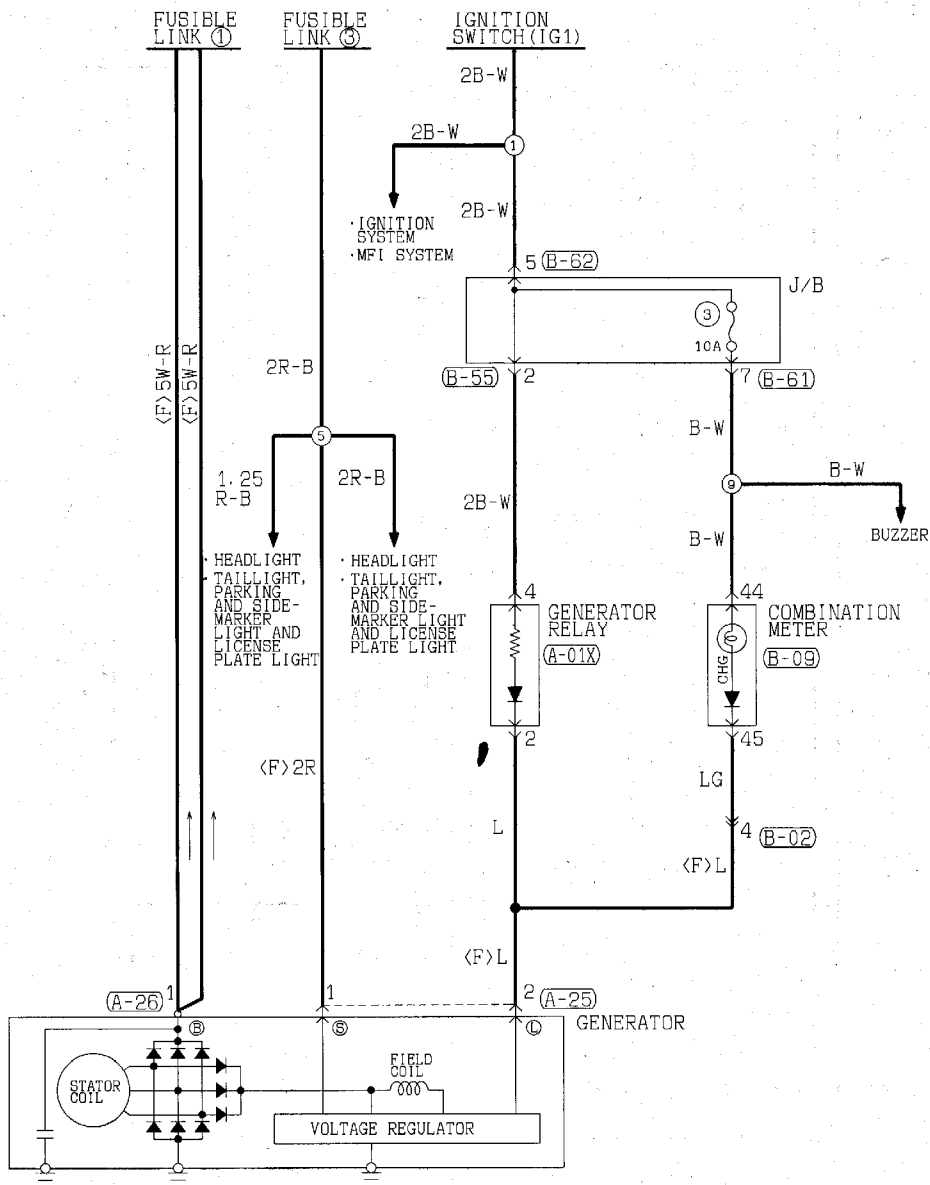
CIRCUIT DIAGRAM

<1.5L ENGINE (UP TO 1994 MODELS)>

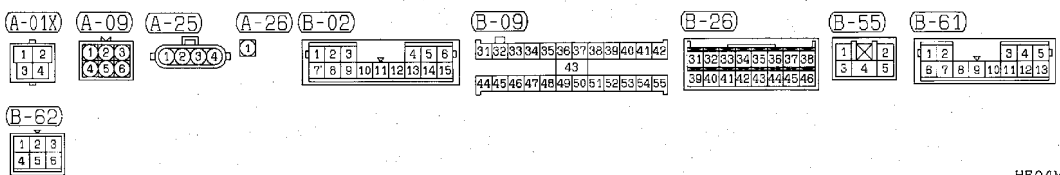
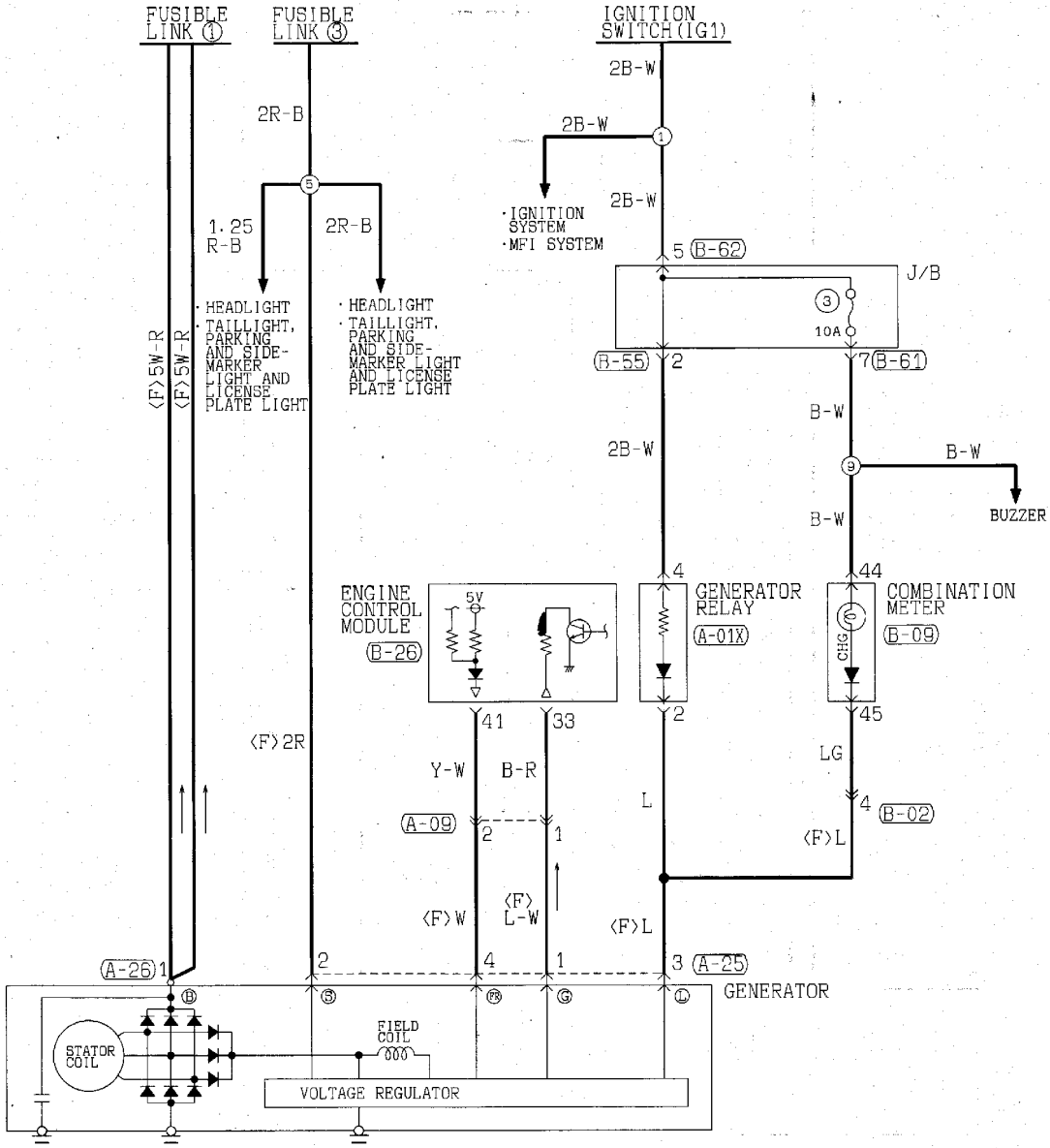


(A-01X)	(A-25)	(A-26)	(B-02)	(B-09)	(B-55)	(B-61)	(B-62)
1 2 3 4	012	0	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6

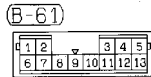
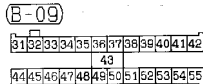
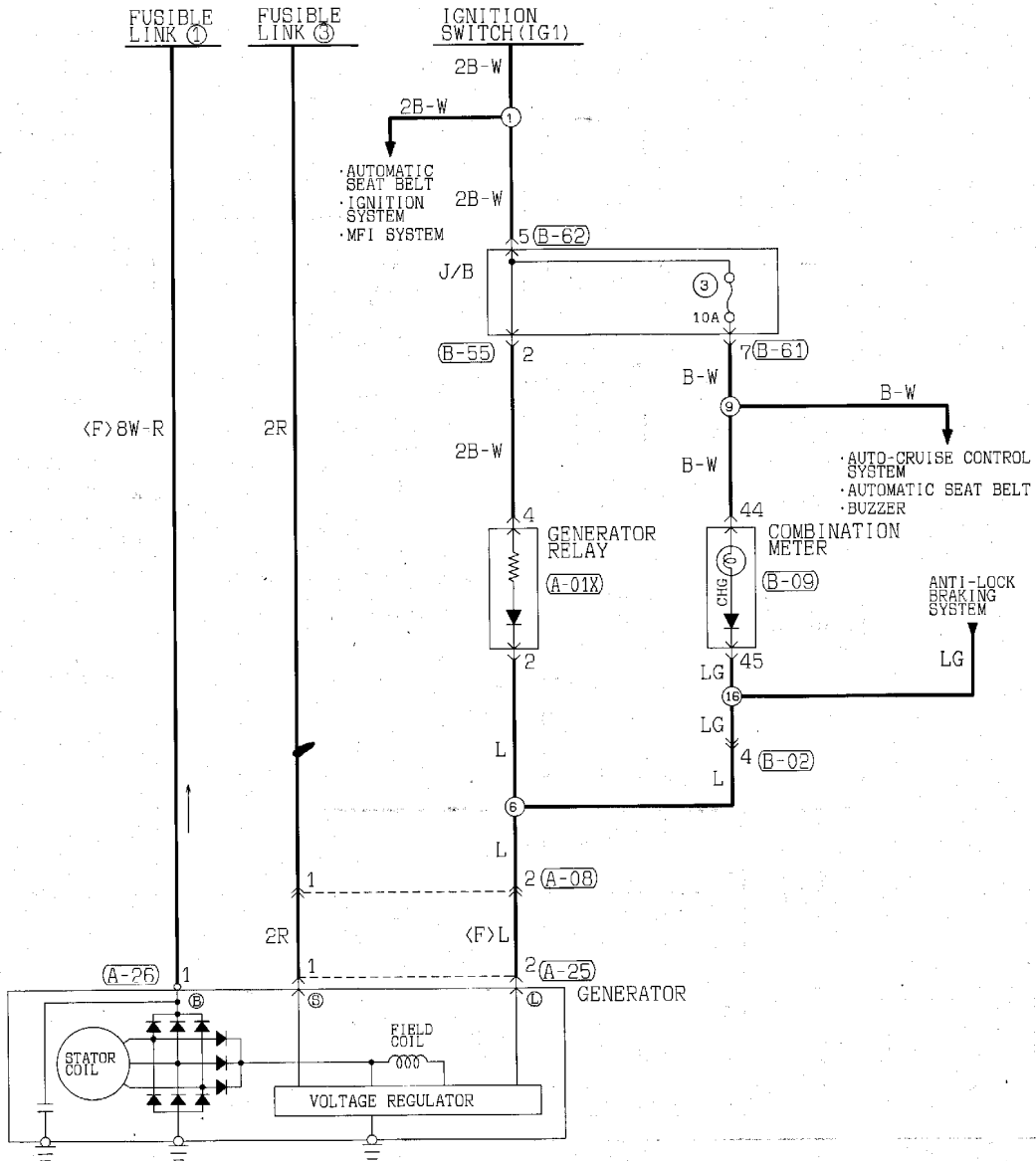
<1.5L ENGINE (1995 MODELS FOR FEDERAL)>



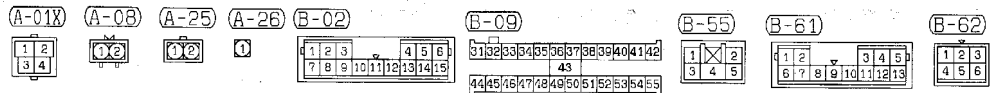
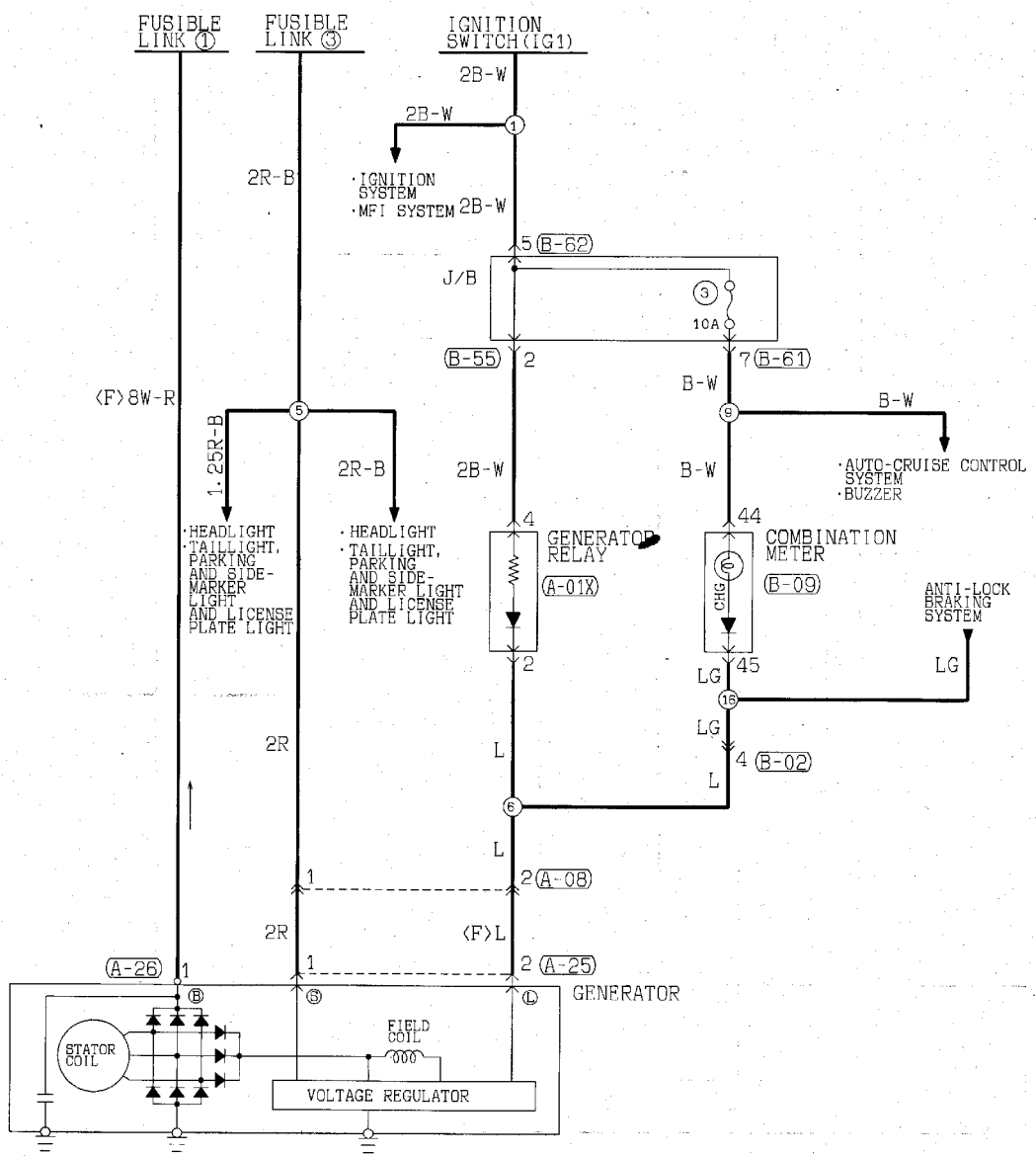
<1.5L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



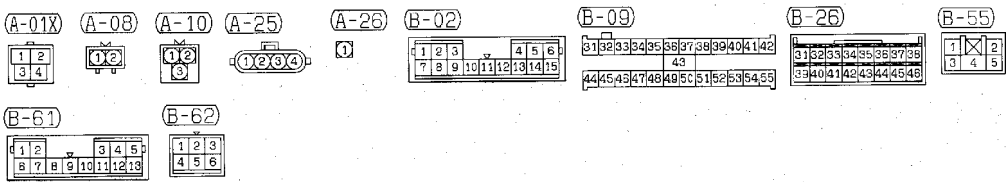
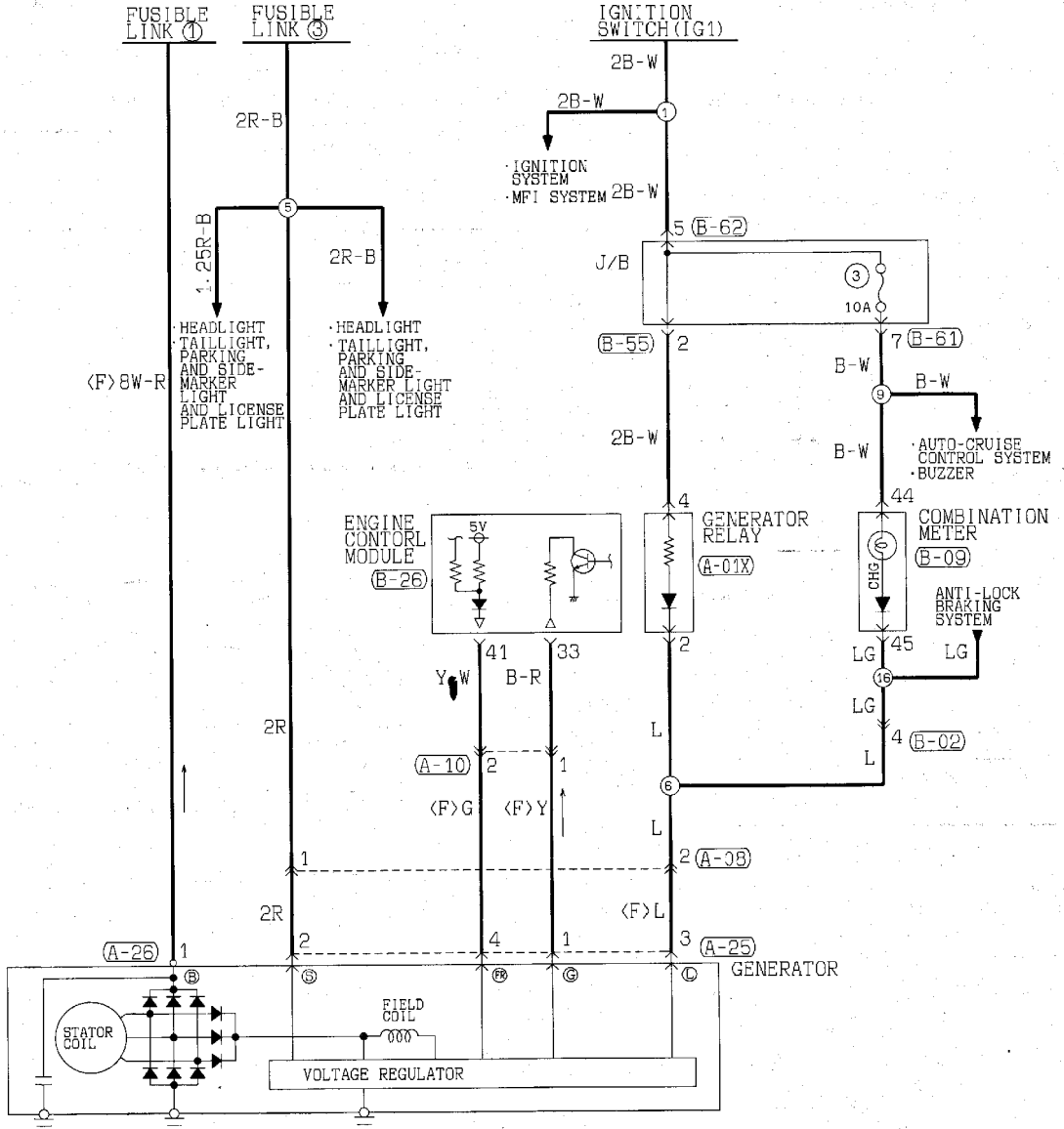
<1.8L ENGINE (UP TO 1994 MODELS)>



<1.8L ENGINE (1995 MODELS FOR FEDERAL)>



<1.8L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



OPERATION**When engine is stopped**

When the ignition switch is switched to the “ON” position, electricity flows from the “L” terminal of the generator to the field coil, and at the same time the charging warning light illuminates.

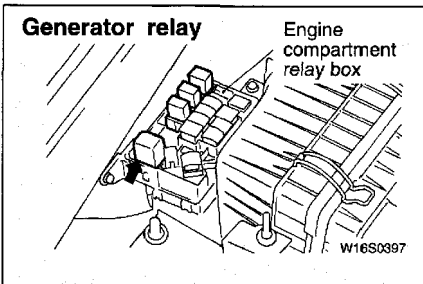
When engine is being started/has started

When the engine is started, charging voltage is applied to the “L” terminal of the generator, with the result that the charging warning light is extinguished. In addition, because battery voltage is applied to the “S” terminal of the generator, this battery voltage is monitored at the IC voltage regulator, thus switching ON and OFF the current to the field coil and thereby controlling the amount of generation by the generator.

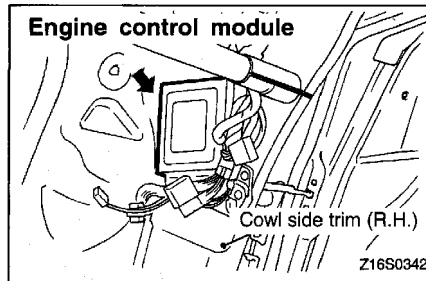
Power is supplied to each load from the “B” terminal of the generator.

NOTE

The generator relay functions as a back-up for the flow of electricity to the field coil if there is a disconnection or damaged wiring of the charging warning light.

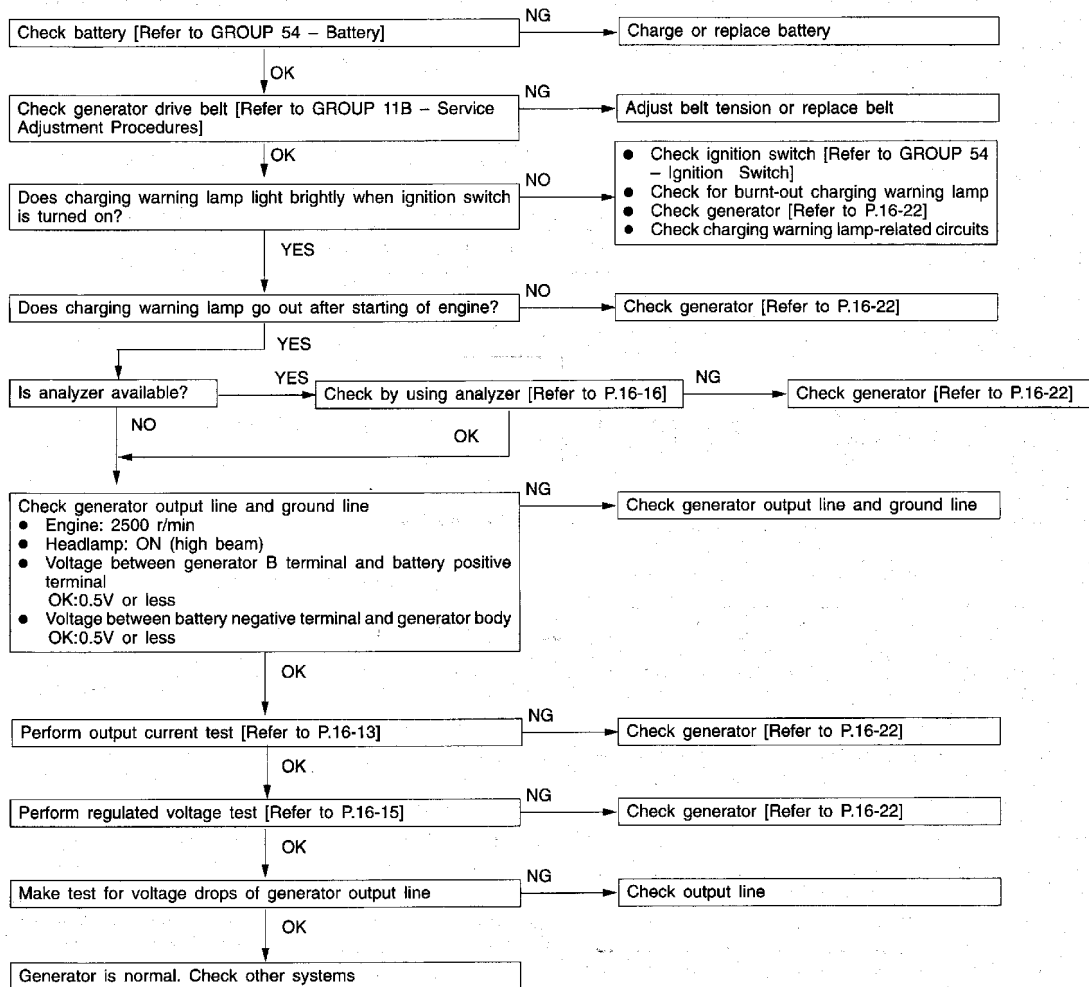
COMPONENT LOCATION**TROUBLESHOOTING HINTS**

1. Charging indicator light does not go on when the ignition switch is turned to “ON”, before the engine starts.
 - Check the bulb.
2. Charging indicator light fails to go off once the engine starts.
 - Check the IC voltage regulator (located within the generator).
3. Discharged or overcharged battery.
 - Check the IC voltage regulator (located within the generator).
4. The charging warning light illuminates dimly.
 - Check the diode (within the combination meter) for a short-circuit.



TROUBLESHOOTING GUIDE

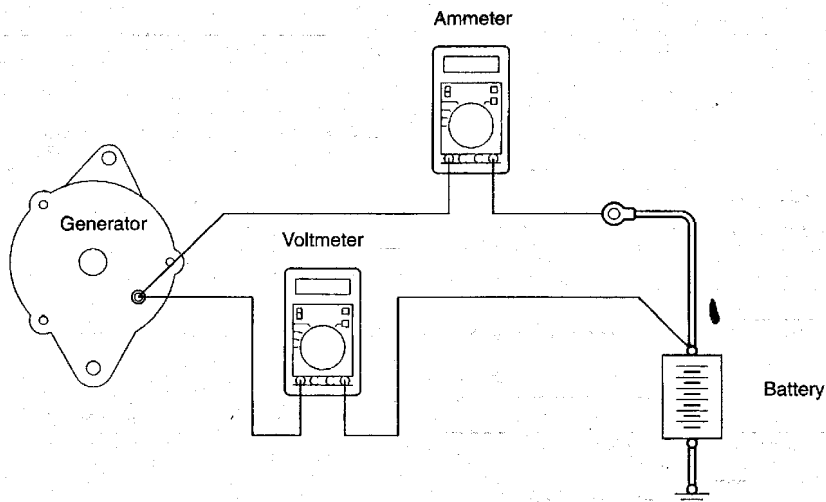
The charging system troubleshooting guide is shown in the following chart.



SERVICE ADJUSTMENT PROCEDURES

GENERATOR OUTPUT LINE VOLTAGE DROP TEST

110003667



6EN0962

This test determines whether the wiring from the generator "B" terminal to the battery (+) terminal (including the fusible link) is in a good condition or not.

(1) Always be sure to check the following before the test.

- Generator installation
- Generator drive belt tension (Refer to GROUP 00 – Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.

(3) Disconnect the negative battery cable.

(4) Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0 – 100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the

(-) lead of the ammeter to the disconnected output wire.)

NOTE

A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended. The reason for this is if a vehicle in which the voltage may have dropped due to an imperfect connection at the generator "B" terminal is being inspected, and the generator "B" terminal is loosened when the test ammeter is connected, the connection will be completed at this time and the possibility of finding problems will be reduced.

(5) Connect a digital-type voltmeter between the generator "B" terminal and the battery (+) terminal. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (-) lead of the voltmeter to the battery (+) cable.)

- (6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – Service Adjustment Procedures.)
- (7) Reconnect the negative battery cable.
- (8) Leave the hood open.
- (9) Start the engine.
- (10) With the engine running at 2500 r/min., turn the headlights and other lights on and off to adjust the generator load so that the value displayed on the ammeter is slightly above 30A.

Limit value: Max. 0.3 V

NOTE

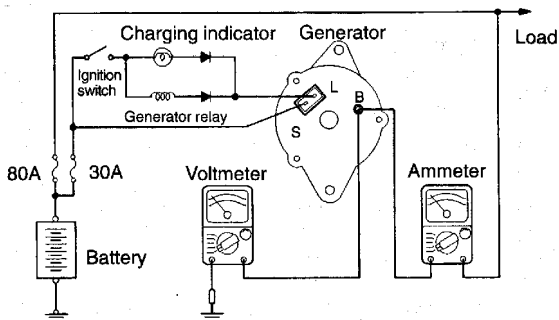
When the generator output is high and the value displayed on the ammeter does not decrease to 30A, set the value to 40A. Read the value displayed on the voltmeter at this time. In this case the limit value becomes max. 0.4V. Adjust the engine speed by gradually decreasing

it until the value displayed on the ammeter is 30A. Take a reading of the value displayed on the voltmeter at this time.

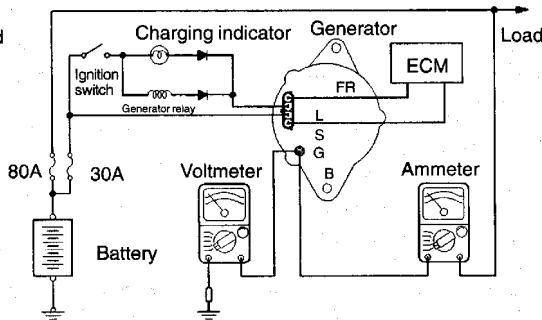
- (11) If the value displayed on the voltmeter is above the limit value, there is probably a malfunction in the generator output wire, so check the wiring between the generator "B" terminal and the battery (+) terminal (including fusible link). If a terminal is not sufficiently tight or if the harness has become discolored due to overheating, repair and then test again.
- (12) After the test, run the engine at idle.
- (13) Turn off all lights and turn the ignition switch to the OFF position.
- (14) Disconnect the negative battery cable.
- (15) Disconnect the ammeter, voltmeter and tachometer.
- (16) Connect the generator output wire to the generator "B" terminal.
- (17) Connect the negative battery cable.

OUTPUT CURRENT TEST

<Except from 1996 models and 1995 models for California>



<From 1996 models and 1995 models for California>



110003668

This test determines whether the generator outputs normal current.

- (1) Before the test, always be sure to check the following.

- Generator installation
- Battery (Refer to GROUP 54 – Battery.)

NOTE

The battery to be used should be slightly discharged. The load in a fully-charged battery will be insufficient and the test may not be able to be carried out correctly.

- Generator drive belt tension (Refer to GROUP 11A – Engine Adjustment.)
- Fusible link
- Abnormal noise from the generator while the engine is running

- (2) Turn the ignition switch to the OFF position.
 (3) Disconnect the negative battery cable.
 (4) Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0–100A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the (-) lead of the ammeter to the disconnected output wire.)

Caution

Never use clips but tighten bolts and nuts to connect the line. Otherwise loose connections (e.g. using clips) will lead to a serious accident because of high current.

NOTE

A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended.

- (5) Connect a voltmeter with a range of 0-20 V between the generator "B" terminal and the ground. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (-) lead of the voltmeter to the ground.)
 (6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – Service Adjustment Procedures.)
 (7) Connect the negative battery cable.
 (8) Leave the hood open.
 (9) Check to be sure that the reading on the voltmeter is equal to the battery voltage.

NOTE

If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "B" terminal and the battery (+) terminal.

- (10) After turning the light switch on and turning on the headlights, start the engine.
 (11) Immediately after setting the headlights to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min. and read the maximum current output value displayed on the ammeter. Limit value: 70% of nominal current output

NOTE

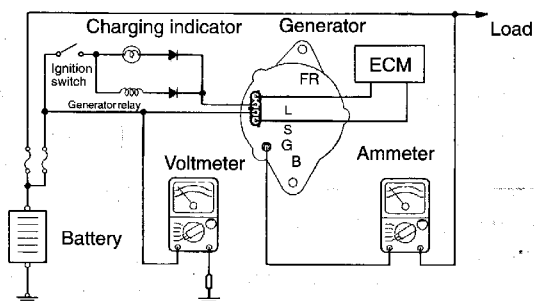
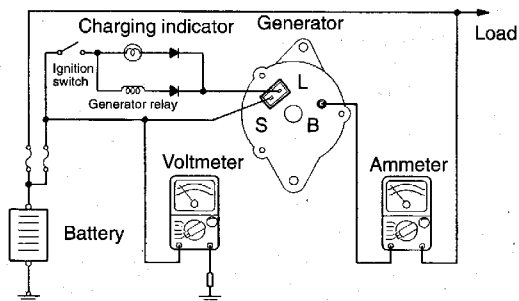
- For the nominal current output, refer to the Generator Specifications.
 - Because the current from the battery will soon drop after the engine is started, the above step should be carried out as quickly as possible in order to obtain the maximum current output value.
 - The current output value will depend on the electrical load and the temperature of the generator body.
 - If the electrical load is small while testing, the specified level of current may not be output even though the generator is normal. In such cases, increase the electrical load by leaving the headlights turned on for some time to discharge the battery or by using the lighting system in another vehicle, and then test again.
 - The specified level of current also may not be output if the temperature of the generator body or the ambient temperature is too high. In such cases, cool the generator and then test again.
- (12) The reading on the ammeter should be above the limit value. If the reading is below the limit value and the generator output wire is normal, remove the generator from the engine and check the generator.
 (13) Run the engine at idle speed after the test.
 (14) Turn the ignition switch to the OFF position.
 (15) Disconnect the negative battery cable.
 (16) Disconnect the ammeter, voltmeter and tachometer.
 (17) Connect the generator output wire to the generator "B" terminal.
 (18) Connect the negative battery cable.

110003669

REGULATED VOLTAGE TEST

<Except from 1996 models and 1995 models for California>

<From 1996 models and 1995 models for California>



9EN0435

This test determines whether the voltage regulator is correctly controlling the generator output voltage.

(1) Always be sure to check the following before the test.

- Generator installation
- Check to be sure that the battery installed in the vehicle is fully charged. (Refer to GROUP 54 – Battery.)
- Generator drive belt tension (Refer to GROUP 00 – Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

- (2) Turn the ignition switch to the OFF position.
- (3) Disconnect the negative battery cable.
- (4) Connect a digital-type voltmeter between the generator “S” terminal and the ground. (Connect the (+) lead of the voltmeter to the “S” terminal, and then connect the (–) lead of the voltmeter to a secure ground or to the battery (–) terminal.)
- (5) Disconnect the generator output wire from the generator “B” terminal.
- (6) Connect a DC test ammeter with a range of 0–100A in series between the “B” terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the “B” terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)
- (7) Connect a tachometer. (Refer to GROUP 11A – Service Adjustment Procedures.)

- (8) Reconnect the negative battery cable.
- (9) Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

NOTE

If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator “S” terminal and the battery (+) terminal.

- (10) Check to be sure that all lights and accessories are off.
- (11) Start the engine.
- (12) Increase the engine speed to 2,500 r/min.
- (13) Read the value displayed on the voltmeter when the current output by the generator becomes 10A or less.
- (14) If the voltage reading conforms to the value in the voltage regulation table, then the voltage regulator is operating normally. If the voltage is outside the standard value, there is a malfunction of the voltage regulator or of the generator.
- (15) After the test, lower the engine speed to the idle speed.
- (16) Turn the ignition switch to the “OFF” position.
- (17) Disconnect the negative battery cable.
- (18) Disconnect the ammeter, voltmeter and tachometer.
- (19) Connect the generator output wire to the generator “B” terminal.
- (20) Connect the negative battery cable.

VOLTAGE REGULATION TABLE

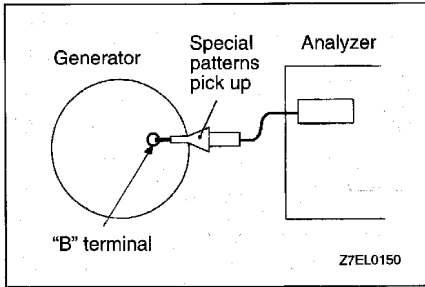
Inspection terminal	Voltage regulator ambient temperature (°C [°F])	Standard value (V)	Inspection terminal	Voltage regulator ambient temperature (°C [°F])	Standard value (V)
Terminal “S”	–20 (–4)	14.2–15.4	Terminal “S”	60 (140)	13.4–14.5
	20 (68)	13.9–14.9		80 (176)	13.1–14.5

WAVE-FORM INSPECTION USING AN ANALYZER

110003670

MEASUREMENT METHOD

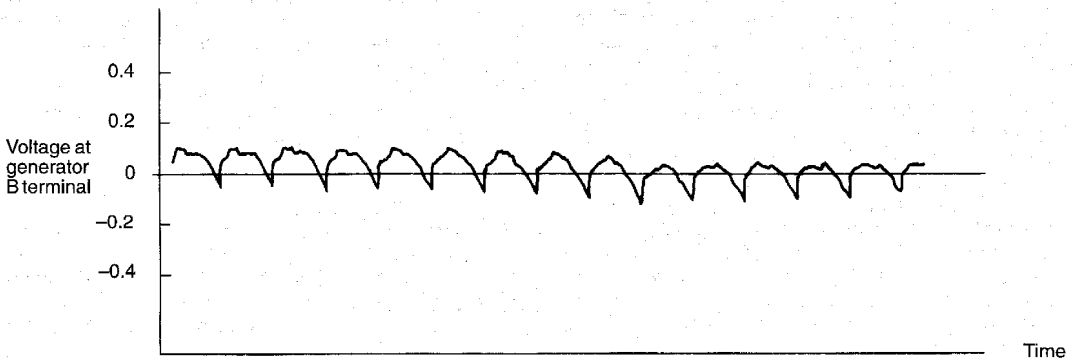
Connect the analyzer special patterns pick-up to the generator B terminal.



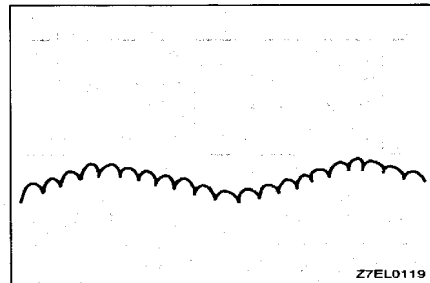
STANDARD WAVE-FORM

Observation Conditions

FUNCTION	SPECIAL PATTERNS
PATTERN HEIGHT	VARIABLE
VARIABLE Knob	Adjust while viewing the wave-form
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



Z7EL0115







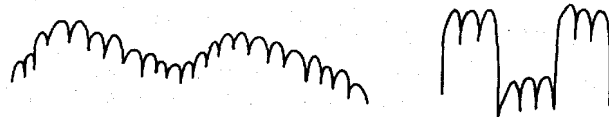
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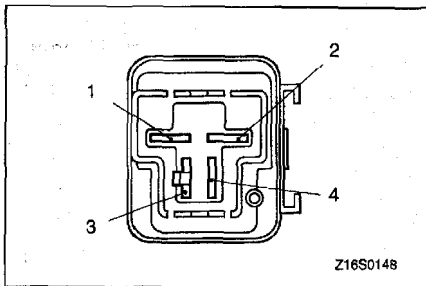
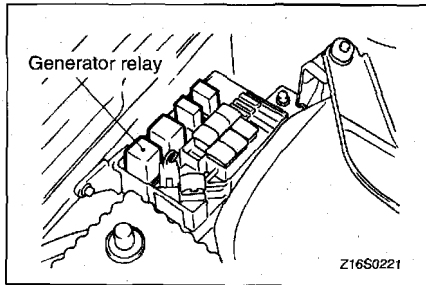
Furthermore, the voltage wave-form of the generator B terminal can undulate as shown at left. This wave-form is produced when the regulator operates according to fluctuations in the generator load (current), and is normal for the generator.

ABNORMAL WAVE-FORMS EXAMPLES

NOTE

1. The size of the wave-form patterns differs largely depending on the adjustment of the variable knob on the analyzer.
2. Identification of abnormal waveforms is easier when there is a large output current (regulator is not operating). (Wave-forms can be observed when the headlamps are illuminated.)
3. Check the conditions of the charge lamp (illuminated/not illuminated) also, and carry out a total check.

Abnormal wave-forms	Problem cause
<p>Example 1</p>  <p style="text-align: right;">Z7EL0120</p>	<ul style="list-style-type: none"> ● Open diode
<p>Example 2</p>  <p style="text-align: right;">Z7EL0121</p>	<ul style="list-style-type: none"> ● Short in diode
<p>Example 3</p>  <p style="text-align: right;">Z7EL0122</p>	<ul style="list-style-type: none"> ● Broken wire in stator coil
<p>Example 4</p>  <p style="text-align: right;">Z7EL0123</p>	<ul style="list-style-type: none"> ● Short in stator coil
<p>Example 5</p>  <p>At this time, the charge lamp is illuminated.</p> <p style="text-align: right;">Z7EL0124</p>	<ul style="list-style-type: none"> ● Open supplementary diode



GENERATOR RELAY CONTINUITY CHECK

110003671

- (1) Remove the generator relay from the relay box inside the engine compartment.

- (2) Use an ohmmeter to check that there is continuity when the (+) terminal of the tester is connected to terminal 4 of the generator relay and the (-) terminal is connected to terminal 2.
- (3) Next, check that there is no continuity when the (+) terminal is connected to terminal 2 and the (-) terminal is connected to terminal 4.
- (4) If the continuity checks in steps (2) and (3) show a defect, replace the generator relay.

GENERATOR

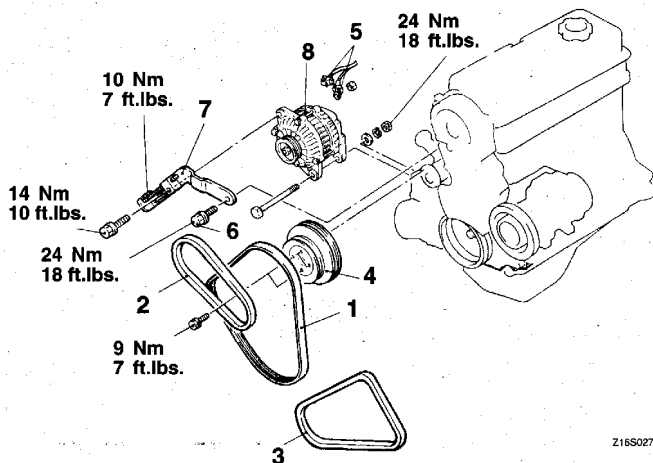
REMOVAL AND INSTALLATION

110003672

Post-Installation Operation

- Drive Belt Tension Adjustment (Refer to GROUP 00 – Maintenance Service.)

<1.5L Engine>



Z16S0273

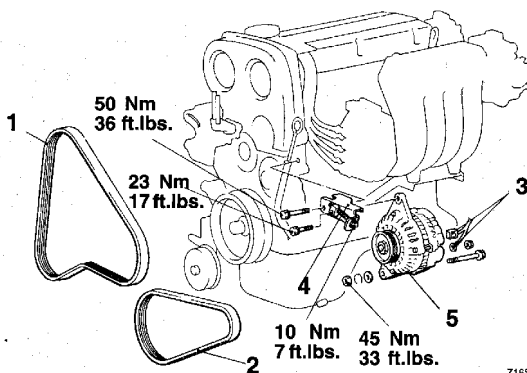
Removal steps

1. Drive belt (Air conditioning)
2. Drive belt (Power steering)
3. Drive belt (Generator)
4. Water pump pulley

5. Generator connector
6. Generator brace mounting bolt
7. Generator brace
8. Generator



<1.8L Engine>



Z16S0113

Removal steps

1. Drive belt (Power steering, air conditioning)
2. Drive belt (Generator)

3. Generator connector
4. Generator brace
5. Generator

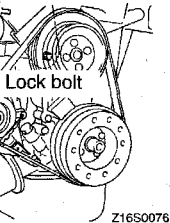


<1.5L Engine>

Adjusting bolt

Belt tension
decreasesBelt tension
increases

Pivot bolt



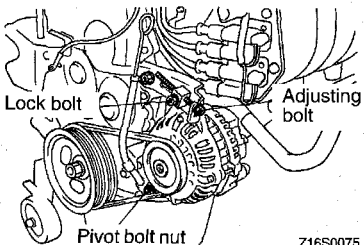
Z16S0076

<1.8L Engine>

Lock bolt

Adjusting bolt

Pivot bolt nut



Z16S0075

REMOVAL SERVICE POINT

◀A▶ DRIVE BELT (GENERATOR) REMOVAL

- (1) Loosen the pivot bolt nut and the lock bolt as shown in the illustration.
- (2) Loosen the adjusting bolt and lift it upwards.
- (3) Push the generator towards the engine to remove the drive belt.

INSTALLATION SERVICE POINTS

▶A◀ GENERATOR INSTALLATION / GENERATOR / BRACE / DRIVE BELT (GENERATOR)

- (1) Install the generator to the cylinder block and front case mounting boss with the pivot bolt, and provisionally tighten the nut to still allow the generator to move smoothly.
- (2) Insert the generator brace between the power steering oil pump bracket and the water pump, and tighten it to the specified torque.
- (3) Press the generator body towards the engine, and provisionally tighten the generator and generator brace with the lock bolt.
- (4) Install the generator drive belt and adjust the belt tension using the adjusting bolt. (Refer to GROUP 00 - Maintenance Service.)
- (5) After adjusting the belt tension, fully tighten the nut of the pivot bolt and the lock bolt to the specified torque, and then tighten the adjusting bolt to the specified torque.

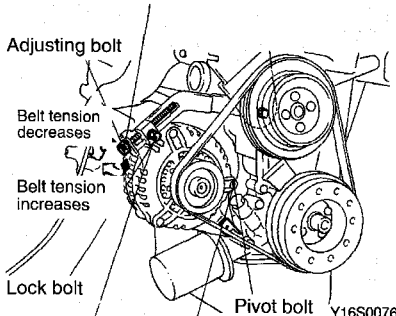
10 Nm
7 ft.lbs

Adjusting bolt

Belt tension
decreasesBelt tension
increases

Lock bolt

Pivot bolt

14 Nm
10 ft.lbs.24 Nm
18 ft.lbs.

Y16S0076

50 Nm
36 ft.lbs.

23 Nm
17 ft.lbs.

10 Nm
7 ft.lbs.

45 Nm
33 ft.lbs.

Pivot bolt
nut

Adjusting bolt

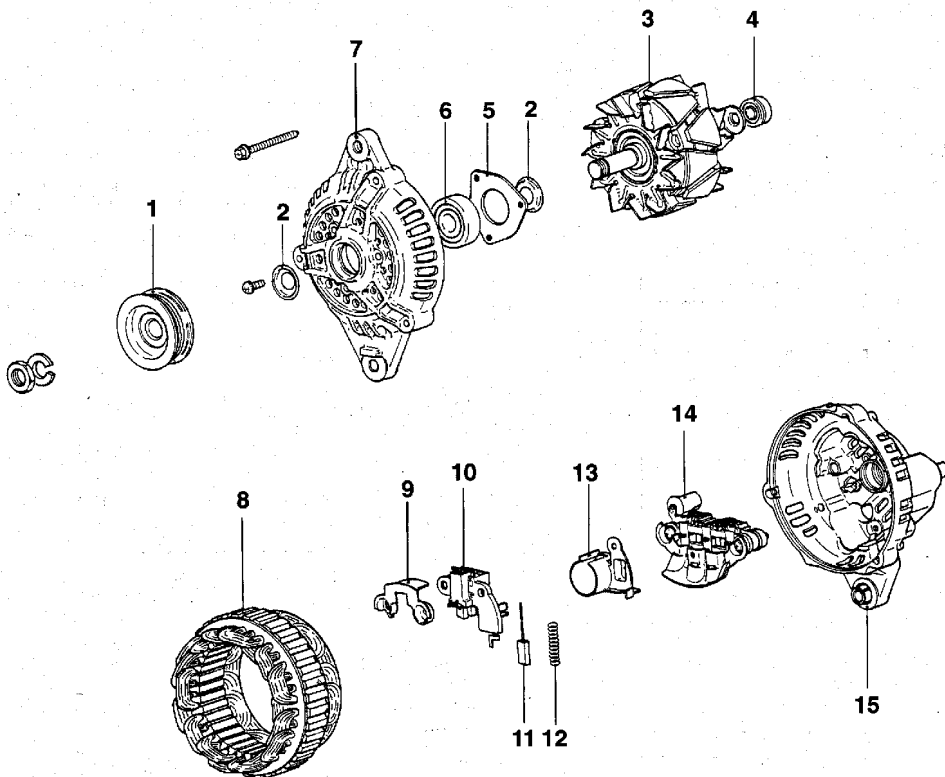
Y16S0075

►B◄ GENERATOR INSTALLATION / GENERATOR / BRACE / DRIVE BELT (GENERATOR)

- (1) Install the generator to the front case mounting boss with the pivot bolt, and provisionally tighten the nut to still allow the generator to move smoothly.
- (2) Install the generator brace to the water pump, and tighten it to the specified torque.
- (3) Press the generator body towards the engine, and provisionally tighten the generator and generator brace with the lock bolt.
- (4) Install the generator drive belt and adjust the belt tension using the adjusting bolt. (Refer to GROUP 00 – Maintenance Service.)
- (5) After adjusting the belt tension, fully tighten the nut of the pivot bolt and the lock bolt to the specified torque, and then tighten the adjusting bolt to the specified torque.

DISASSEMBLY AND REASSEMBLY <1.5L Engine (Up to 1993 models)>

110003673

**Disassembly steps**

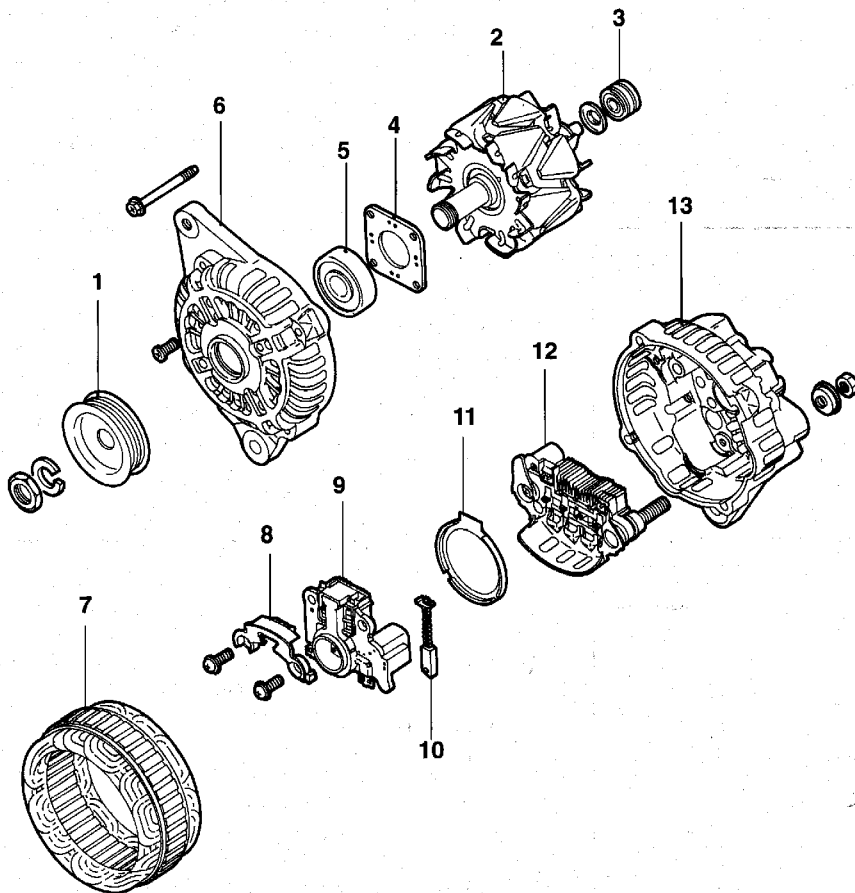
- ◀A▶
▶A▶
1. Generator pulley
 2. Seal
 3. Rotor assembly
 4. Rear bearing
 5. Bearing retainer
 6. Front bearing
 7. Front bracket

◀B▶

8. Stator assembly
9. Plate
10. Regulator and brush holder
11. Brush
12. Brush spring
13. Slinger
14. Rectifier assembly
15. Rear bracket

Z1EN0349

DISASSEMBLY AND REASSEMBLY <1.5L Engine (From 1994 models), 1.8L Engine>



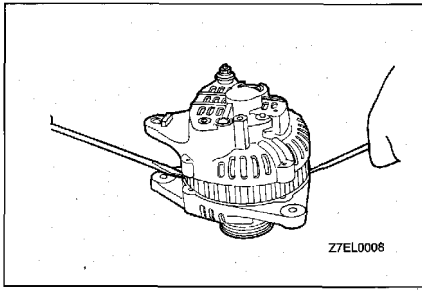
29EN0187

Disassembly steps

- ◀A▶ ▶A▶
1. Generator pulley
 2. Rotor assembly
 3. Rear bearing
 4. Bearing retainer
 5. Front bearing
 6. Front bracket

▶B▶

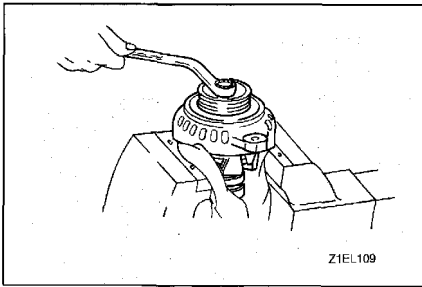
7. Stator assembly
8. Plate
9. Regulator and brush holder
10. Brush
11. Slinger
12. Rectifier assembly
13. Rear bracket

**DISASSEMBLY SERVICE POINTS****◀A▶ GENERATOR PULLEY REMOVAL**

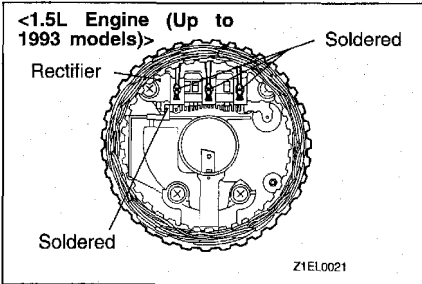
- (1) Remove the bolts.
- (2) Insert flat tip screwdriver between front bracket and stator core and pry downward.

Caution

Do not insert screwdriver too deep, as there is danger of damage to stator coil.



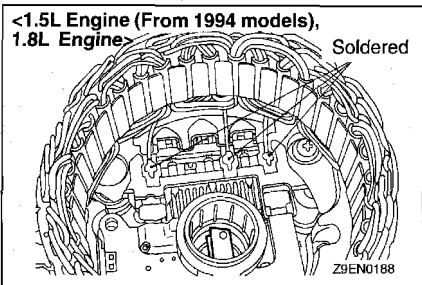
- (3) Clamp the rotor in a vise with soft jaws.
- (4) After removing the nut, remove the pulley and front bracket from the rotor.

**◀B▶ STATOR REMOVAL**

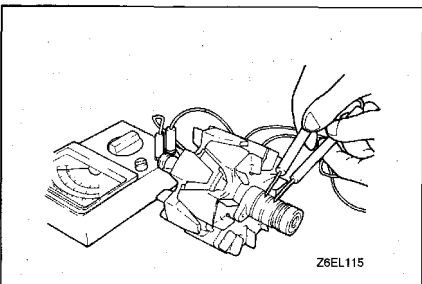
- (1) When removing stator, unsolder three stator leads soldered to main diodes on rectifier.
- (2) When removing rectifier from brush holder, unsolder two soldered points to rectifier.

Caution

(1) When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to diodes for a long period. Finish soldering or unsoldering in as short a time as possible.

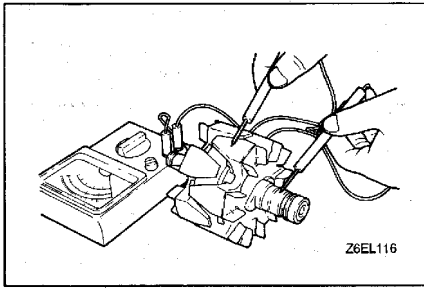


- (2) Use care that no undue force is exerted to leads of diodes.**

**INSPECTION****ROTOR**

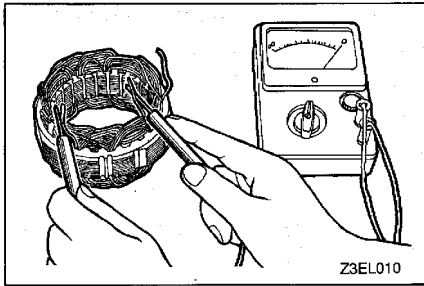
- (1) Check field coil for continuity. Check to ensure that there is continuity between slip rings. If resistance is extremely small, it means that there is a short circuit. If there is no continuity or if there is short circuit, replace rotor assembly.

Resistance value: Approx. 3–5 Ω



Z6EL116

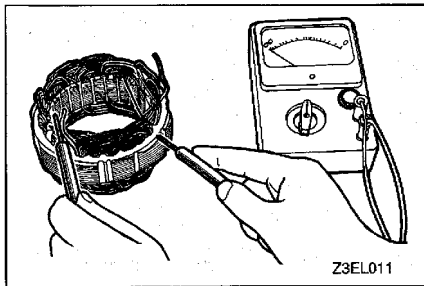
- (2) Check field coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.



Z3EL010

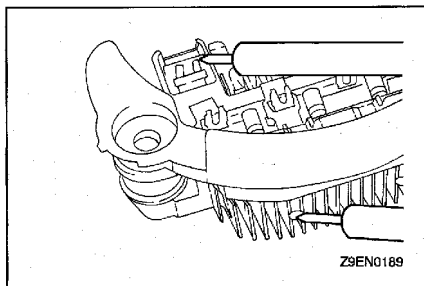
STATOR

- (1) Make continuity test on stator coil. Check to ensure that there is continuity between coil leads. If there is no continuity, replace stator assembly.



Z3EL011

- (2) Check coil for grounding. Check to ensure that there is no continuity between coil and core. If there is continuity, replace stator assembly.

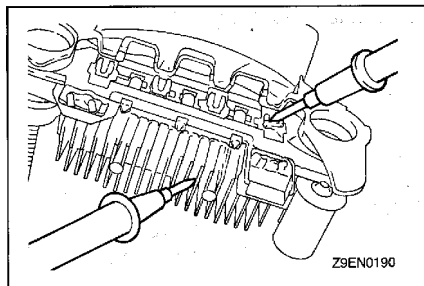


Z9EN0189

RECTIFIERS

(1) Positive Rectifier Test

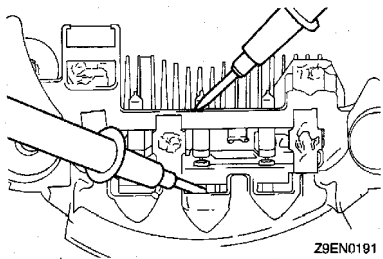
Check for continuity between positive rectifier and stator coil lead connection terminal with an ohmmeter. If there is continuity in both directions, diode is shorted. Replace rectifier assembly.



Z9EN0190

(2) Negative Rectifier Test

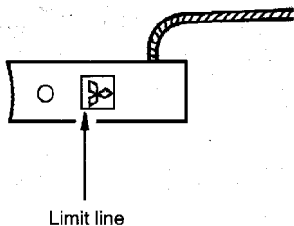
Check for continuity between negative rectifier and stator coil lead connection terminal. If there is continuity in both directions, diode is shorted, and rectifier assembly must be replaced.

**(3) Diode Trio Test**

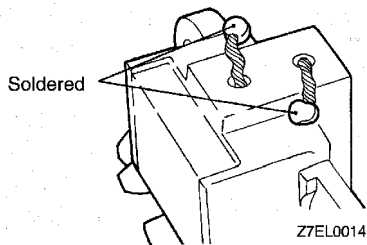
Check three diodes for continuity by connecting an ammeter to both ends of each diode. If there is no continuity in both directions, diode is faulty and heatsink assembly must be replaced.

BRUSH REPLACEMENT <1.5L Engine (Up to 1993 models)>

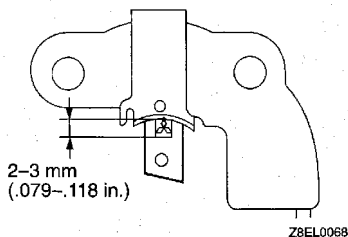
- (1) Replace brush by the following procedures if it has been worn to limit line.



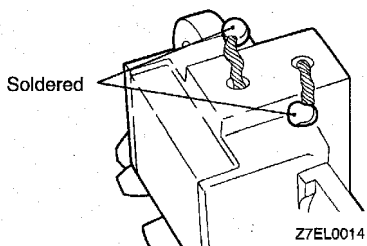
- (2) Unsolder pigtail and remove old brush and spring.



- (3) Install brush spring and new brush in brush holder.
 (4) Insert the brush to where there is a space 2 to 3 mm (.079 to .118 in.) between the limit line and the end of the brush holder.

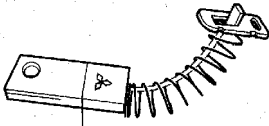


- (5) Solder pigtail to brush holder as shown in the illustration.



BRUSH REPLACEMENT <1.5L Engine (From 1994 models), 1.8L Engine>

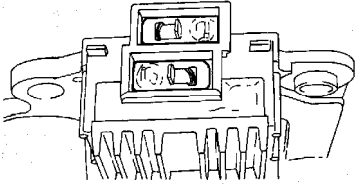
- (1) Replace brush by the following procedures if it has been worn to limit line.



Wear limit line

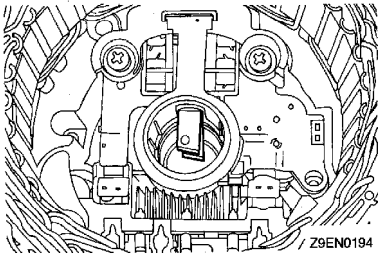
Z9EN0192

- (2) Unsolder the lead wire of the brush, and the brush will appear.



Z9EN0193

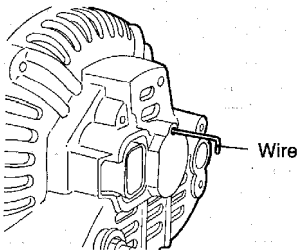
- (3) To install a new brush, insert the brush in the holder until it is positioned as illustrated, and solder the lead wire.



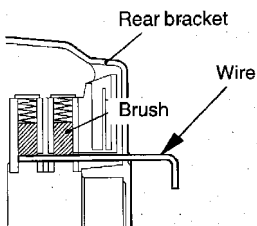
Z9EN0194

REASSEMBLY SERVICE POINT**▶◀ ROTOR ASSEMBLY INSTALLATION**

Before rotor is attached to rear bracket, insert wire through small hole made in rear bracket to lift brush. After rotor has been installed, remove the wire.



Z7EL0016



Z6EN0879

STARTING SYSTEM

GENERAL INFORMATION

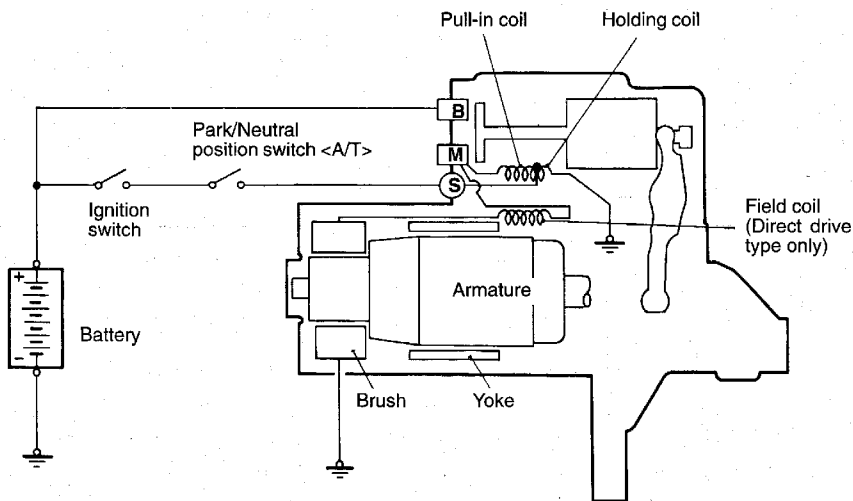
110003674

If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch.

On the other hand, attracting the plunger will turn on the magnetic switch, allowing the B terminal and M terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.

An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



Z9EN0288

STARTER MOTOR SPECIFICATIONS

Items	1.5L Engine M/T	1.5L Engine A/T
Type	Direct drive	Direct drive
Rated output kW/V	0.7/12	0.9/12
No. of pinion teeth	8	8

Items	1.8L Engine M/T	1.8L Engine A/T
Type	Direct drive	Reduction drive
Rated output kW/V	0.9/12	1.0/12
No. of pinion teeth	8	8

SERVICE SPECIFICATIONS

110003675

Direct drive type

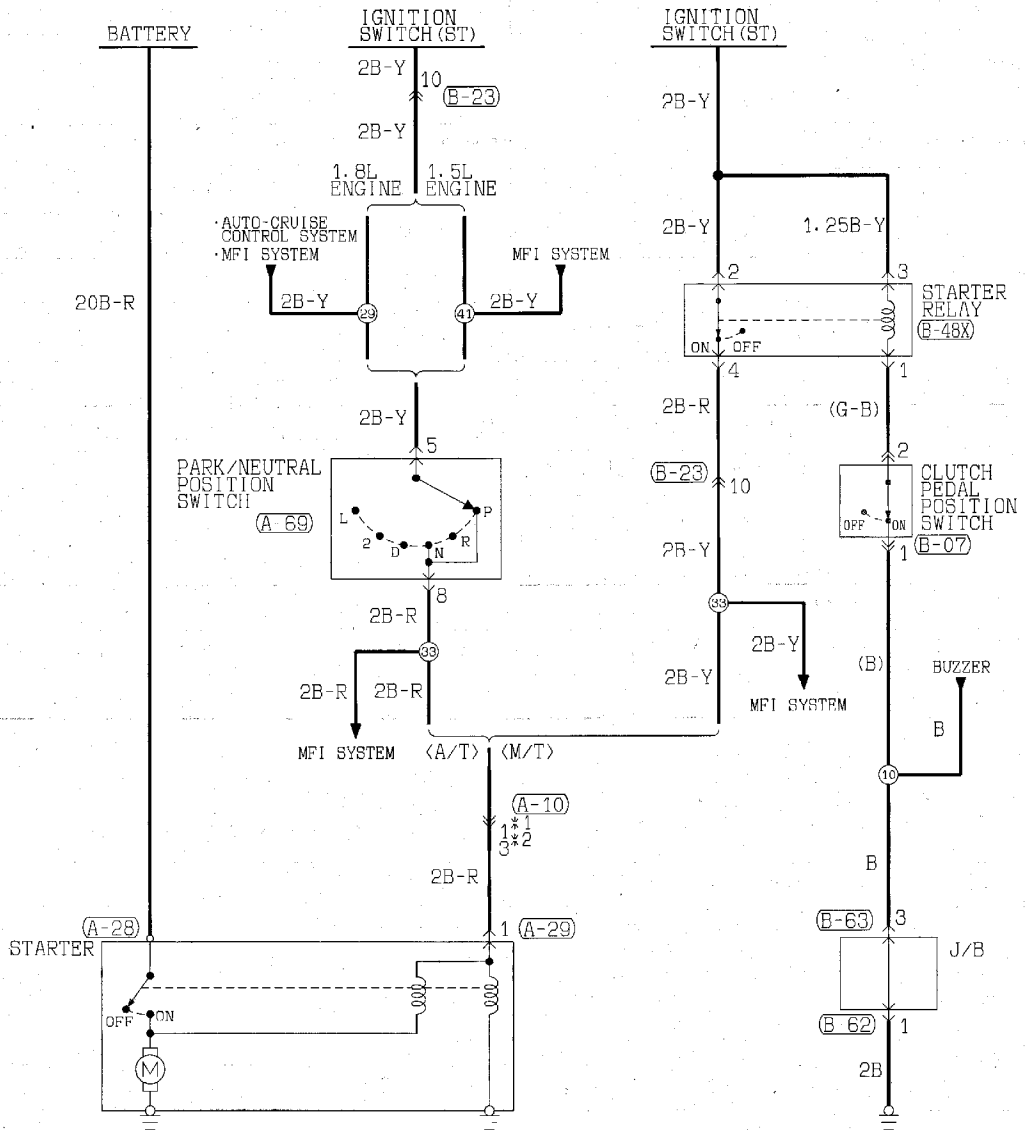
Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11.5	—
	Current A	60 or less	—
	Speed r/min.	6,600	—
Pinion gap mm (in.)		0.5–2.0 (.020–.079)	—
Commutator runout mm (in.)		0.05 (.002)	0.1 (.004)
Commutator diameter mm (in.)		32.0 (1.260)	31.0 (1.220)
Undercut depth mm (in.)		0.5 (.020)	—

Reduction drive type

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11	—
	Current A	90 or less	—
	Speed r/min.	3,000	—
Pinion gap mm (in.)		0.5–2.0 (.020–.079)	—
Commutator runout mm (in.)		0.05 (.002)	0.1 (.004)
Commutator diameter mm (in.)		29.4 (1.158)	28.4 (1.118)
Undercut depth mm (in.)		0.5 (.020)	—

TROUBLESHOOTING

CIRCUIT DIAGRAM



*1: 1.5L ENGINE, 1.8L ENGINE-UP TO 1994 MODELS, 1995 MODELS FOR FEDERAL.
 *2: 1.8L ENGINE-1995 MODELS FOR CALIFORNIA, FROM 1996 MODELS.

(A-10)
(A-28)
(A-29)
(A-69)
(B-07)
(B-23)
(B-48X)
(B-62)
(B-63)

3

TSB Revision

OPERATION

- For models equipped with the M/T, the interlock switch contact is switched OFF when the clutch pedal is depressed; when the ignition switch is then switched to the “ST” position, electricity flows to the starter relay and the starter motor, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

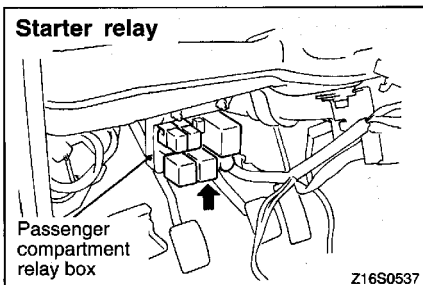
NOTE

If the ignition switch is switched to the “ST” position without the clutch pedal being depressed, electricity flows to the starter relay (coil), the interlock switch (contacts) and to ground, with the result that the contacts of the starter relay are switched OFF, and, because the power to the starter motor is thereby interrupted, the starter motor is not activated.

- For models equipped with the A/T, when the ignition switch is switched to the “ST” position while the selector lever is at the “P” or “N” position, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

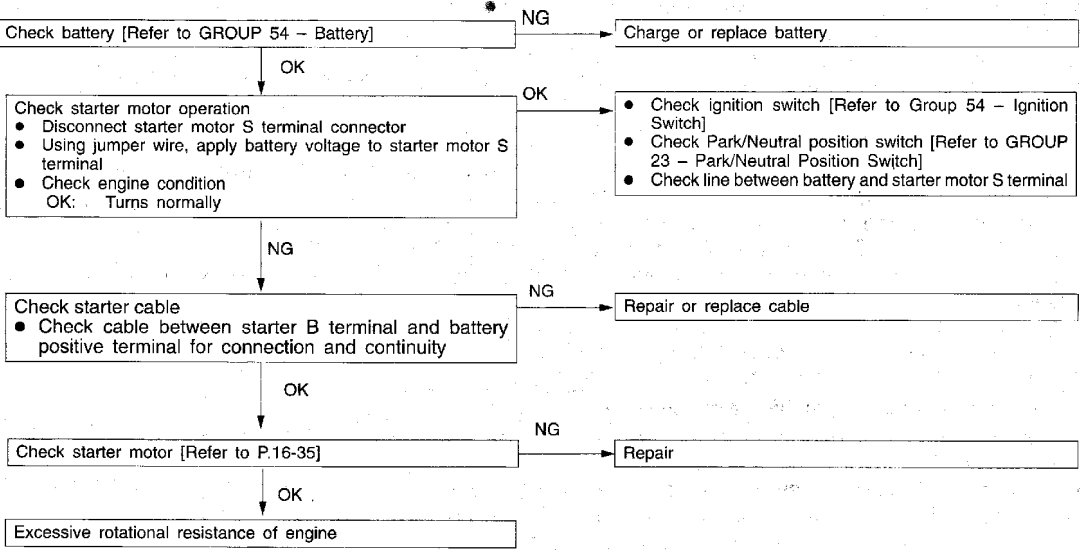
TROUBLESHOOTING HINTS

1. The starter motor does not operate at all.
 - Check the starter (coil).
 - Check for poor contact at the battery terminals.
 - Check the PNP switch <A/T>
 - Check the interlock switch <M/T>
2. The starter motor doesn't stop.
 - Check the starter (magnetic switch).

COMPONENT LOCATION

TROUBLESHOOTING GUIDE

The starting system troubleshooting guide is shown in the following chart.



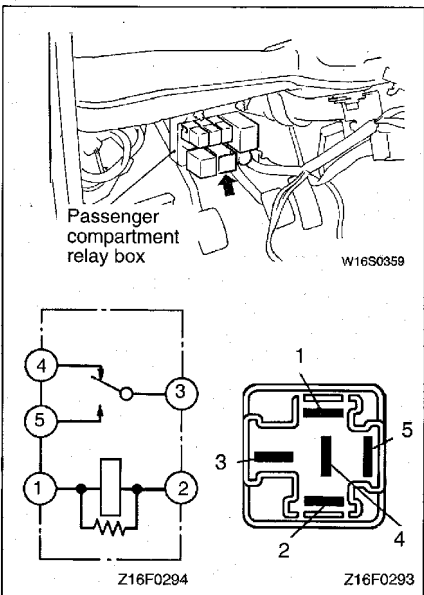
SERVICE ADJUSTMENT PROCEDURES

STARTER RELAY CONTINUITY CHECK

110003677

- (1) Remove the starter relay.
- (2) Check the continuity between the relay terminals according to the list below.

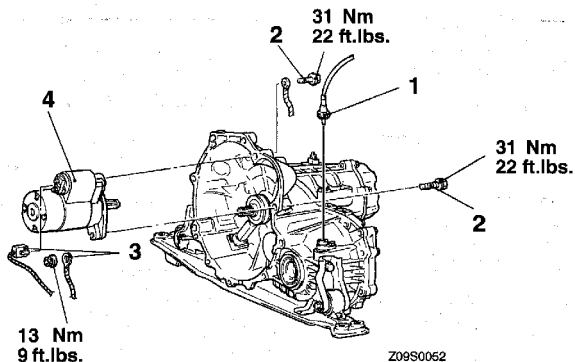
Battery voltage between the terminals 1 and 2 energized	3 – 4 terminals	No continuity
	3 – 5 terminals	Continuity
Battery voltage not energized.	3 – 4 terminals	Continuity
	3 – 5 terminals	No continuity
	1 – 2 terminals	Continuity



STARTER MOTOR

REMOVAL AND INSTALLATION

110003678



Removal steps

1. Speedometer cable connection
2. Starter mounting bolt
3. Starter connector
4. Starter

INSPECTION

PINION GAP ADJUSTMENT

- (1) Disconnect field coil wire from M-terminal of magnetic switch.
- (2) Connect a 12V battery between S-terminal and M-terminal.
- (3) Set switch to "ON", and pinion will move out.

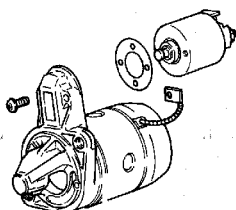
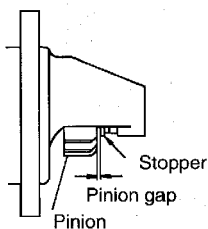
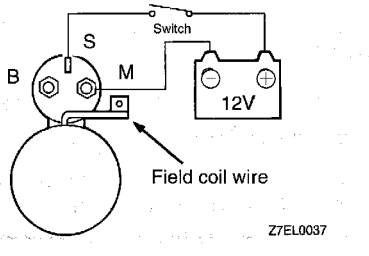
Caution

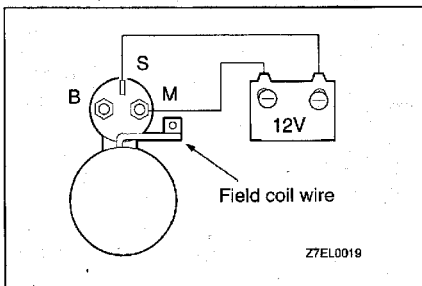
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

- (4) Check pinion to stopper clearance (pinion gap) with a feeler gauge.

Pinion gap: 0.5–2.0 mm (.020–.079 in.)

- (5) If pinion gap is out of specification, adjust by adding or removing gaskets between magnetic switch and front bracket.



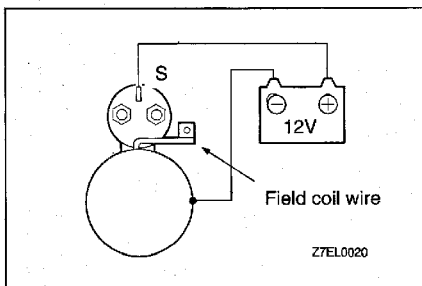
**MAGNETIC SWITCH PULL-IN TEST**

- (1) Disconnect field coil wire from M-terminal of magnetic switch.
- (2) Connect a 12V battery between S-terminal and M-terminal.

Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

- (3) If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.

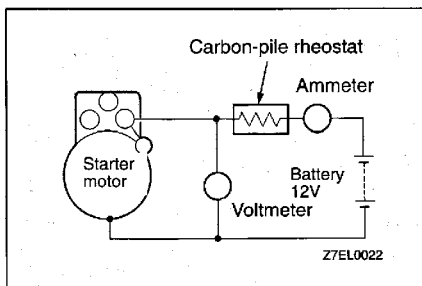
**MAGNETIC SWITCH HOLD-IN TEST**

- (1) Disconnect field coil wire from M-terminal of magnetic switch.
- (2) Connect a 12V battery between S-terminal and body.

Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

- (3) Pull the pinion by hand until it hits against the piston stopper.
- (4) If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.

**FREE RUNNING TEST**

- (1) Place starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
- (2) Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series with battery positive post and starter motor terminal.
- (3) Connect a voltmeter (15-volt scale) across starter motor.
- (4) Rotate carbon pile to full-resistance position.
- (5) Connect battery cable from battery negative post to starter motor body.
- (6) Adjust the rheostat until the battery voltage shown by the voltmeter is 11.5V (for the direct-drive type) or 11V (for the reduction-drive type).
- (7) Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current:

max. 60 Amps (Direct drive type)

max. 90 Amps (Reduction drive type)

MAGNETIC SWITCH RETURN TEST

- (1) Disconnect field coil wire from M-terminal of magnetic switch.
- (2) Connect a 12V battery between M-terminal and body.

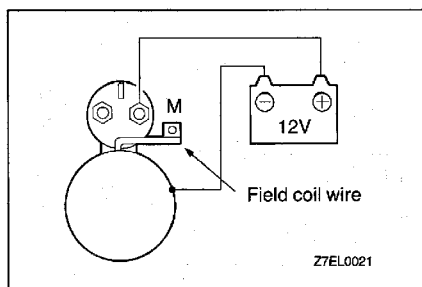
Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

- (3) Pull pinion out and release. If pinion quickly returns to its original position, everything is in order. If it doesn't, replace magnetic switch.

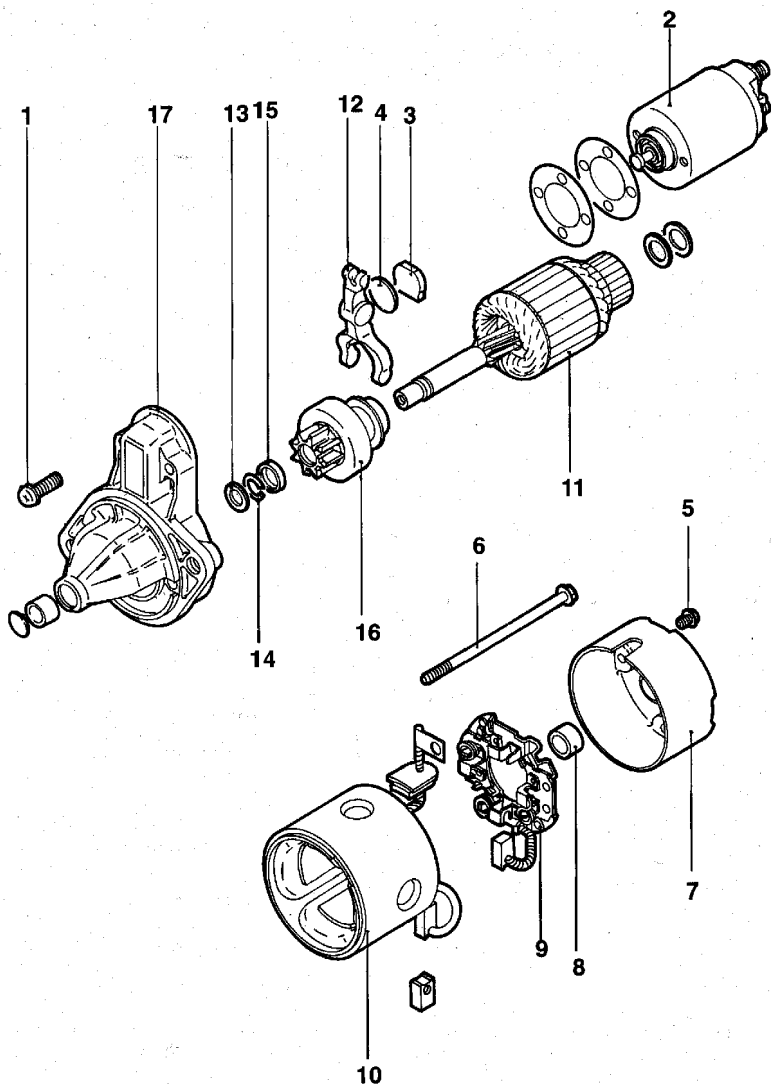
Caution

When pulling out the piston, use care not to have your finger pinched.



DISASSEMBLY AND REASSEMBLY <DIRECT DRIVE TYPE>

110003679



Disassembly steps

1. Screw
2. Magnetic switch
3. Packing
4. Plate
5. Screw
6. Through bolt
7. Rear bracket
8. Rear bearing

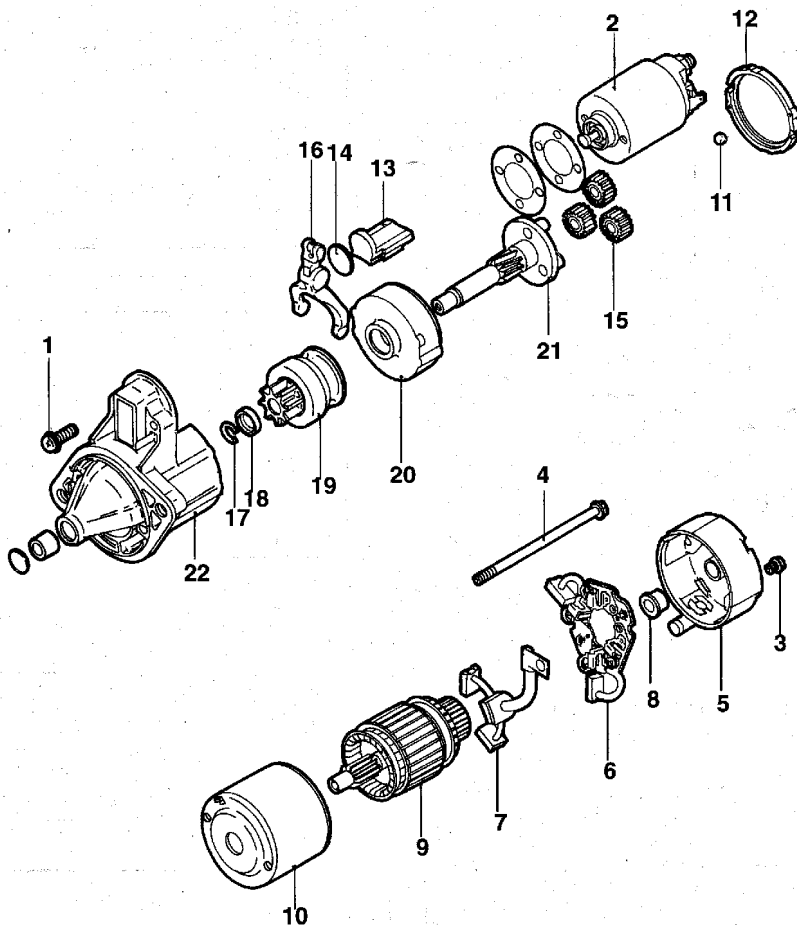
9. Brush holder assembly
10. Yoke assembly
11. Armature
12. Lever
13. Washer
14. Snap ring
15. Stop ring
16. Overrunning clutch
17. Front bracket



Z9EN0186



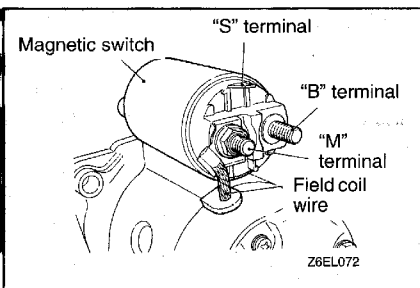
DISASSEMBLY AND REASSEMBLY <REDUCTION DRIVE TYPE>



Z9EN0290

Disassembly steps

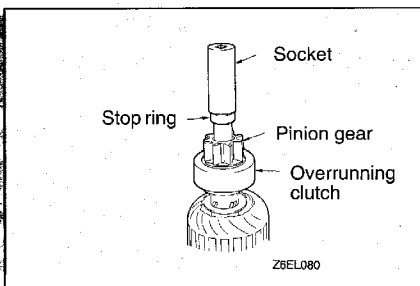
- | | | | |
|----------------------------------|---|---|-------------------------------|
| <p>◀A▶</p> <p>◀B▶</p> <p>◀B▶</p> | <ol style="list-style-type: none"> 1. Screw 2. Magnetic switch 3. Screw 4. Screw 5. Rear bracket 6. Brush holder 7. Brush 8. Rear bearing 9. Armature 10. Yoke assembly 11. Ball | <ol style="list-style-type: none"> 12. Packing A 13. Packing B 14. Plate 15. Planetary gear 16. Lever 17. Snap ring 18. Stop ring 19. Overrunning clutch 20. Internal gear 21. Planetary gear holder 22. Front bracket | <p>◀C▶ ▶A▶</p> <p>◀C▶ ▶A▶</p> |
|----------------------------------|---|---|-------------------------------|

**DISASSEMBLY SERVICE POINTS****◀A▶ MAGNETIC SWITCH REMOVAL**

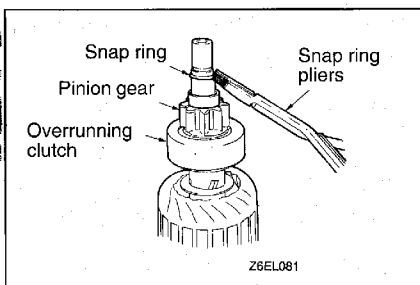
Disconnect field coil wire from "M" terminal of magnetic switch.

◀B▶ ARMATURE / BALL REMOVAL**Caution**

When removing the armature, take care not to lose the ball (which is used as a bearing) in the armature end.

**◀C▶ SNAP RING / STOP RING REMOVAL**

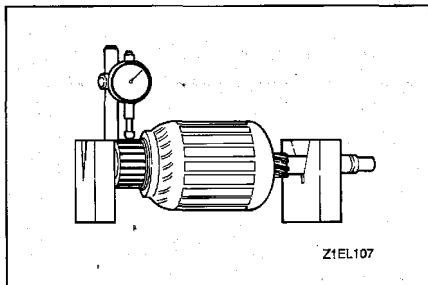
(1) Press stop ring off snap ring with a suitable socket.



(2) Remove snap ring with snap ring pliers and then remove stop ring and overrunning clutch.

STARTER MOTOR PARTS CLEANING

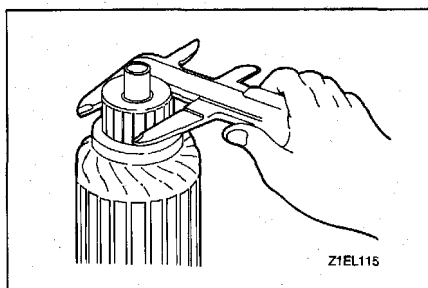
1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

**INSPECTION****COMMUTATOR**

- (1) Place the armature in a pair of "V" blocks and check the runout with a dial indicator.

Standard value: 0.05 mm (.002 in.)

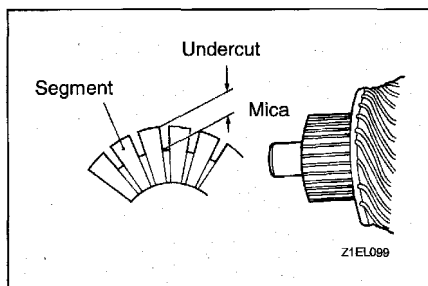
Limit: 0.1 mm (.004 in.)



- (2) Measure the commutator outer diameter.

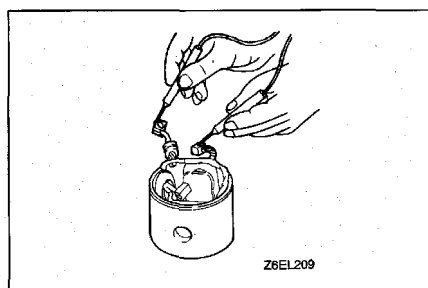
Standard value: 32.0 mm (1.260 in.)

Limit: 31.0 mm (1.220 in.)

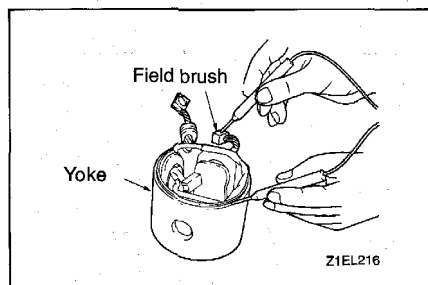


- (3) Check the undercut depth between segments.

Standard value: 0.5 mm (.020 in.)

**FIELD COIL OPEN-CIRCUIT TEST (Direct drive type only)**

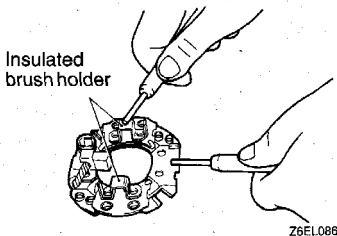
Check the continuity between field brushes. If there is continuity, the field coil is in order.

**FIELD COIL GROUND TEST (Direct drive type only)**

Check the continuity between field coil brush and yoke. If there is no continuity, the field coil is free from grounding.

BRUSH HOLDER

Check the continuity between brush holder plate and brush holder.
If there is no continuity, the brush holder is in order.

**OVERRUNNING CLUTCH**

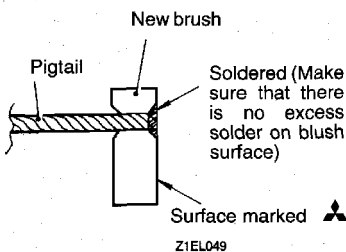
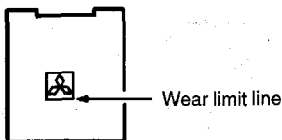
1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

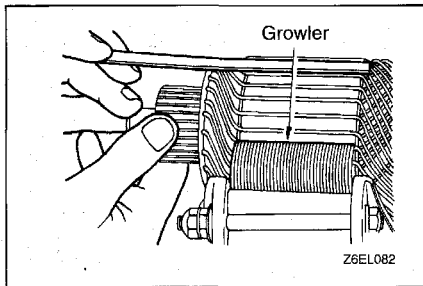
FRONT AND REAR BRACKET BUSHING

Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.

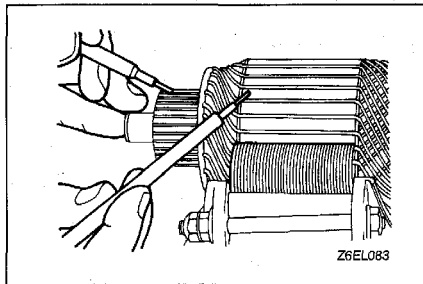
BRUSH AND SPRING REPLACEMENT

1. Brushes that are worn beyond wear limit line, or are oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.
3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it.
Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retaining spring back.



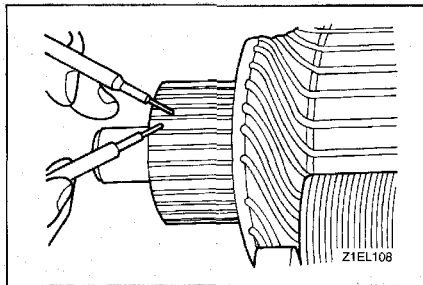
**ARMATURE TEST****ARMATURE SHORT-CIRCUIT TEST**

1. Place armature in a growler.
2. Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.

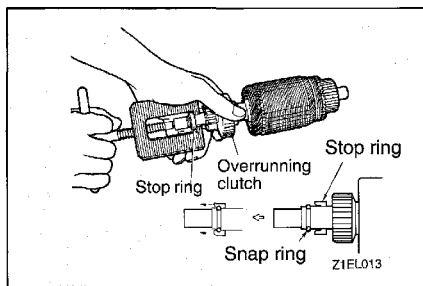
**ARMATURE COIL GROUND TEST**

Check the insulation between each commutator segment and armature coil core.

If there is no continuity, the insulation is in order.

**ARMATURE COIL OPEN-CIRCUIT INSPECTION**

Check the continuity between segments. If there is continuity, the coil is in order.

**REASSEMBLY SERVICE POINTS****▶◀ STOP RING / SNAP RING INSTALLATION**

Using a suitable pulling tool, pull overrunning clutch stop ring over snap ring.

IGNITION SYSTEM

GENERAL INFORMATION

110003680

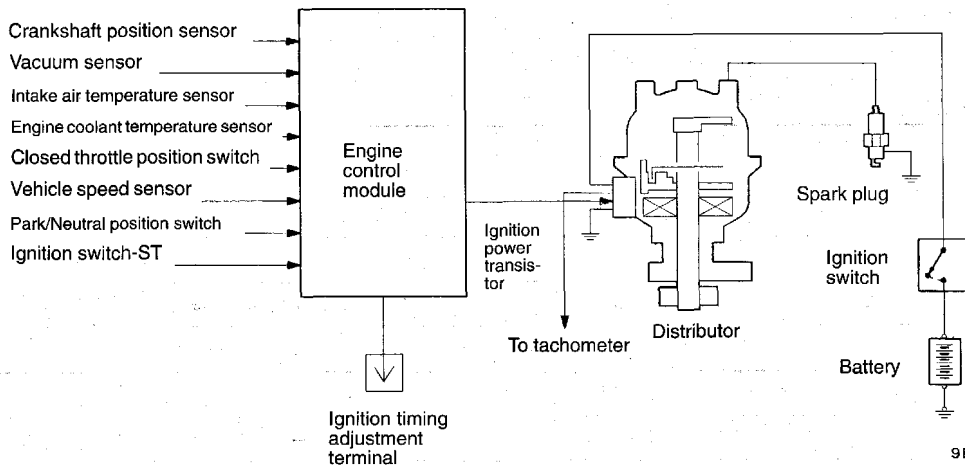
Interruption of the primary current flowing in the primary side of the ignition coil generates high voltage in the secondary side of the ignition coil. The high voltage thus generated is directed by the distributor to the applicable spark plug. The engine firing order is 1-3-4-2 cylinders.

On application of high voltage, the spark plug generates a spark to ignite the compressed air fuel mixture in the combustion chamber.

The engine control module makes and breaks the primary current of the ignition coil to regulate the ignition timing.

The engine control module detects the crankshaft position by the crankshaft position sensor incorporated in the distributor to provide ignition at the most appropriate timing for the engine operating condition.

When the engine is cold or operated at a high altitude, the ignition timing is slightly advanced to provide optimum performance to the operating condition.



SPECIFICATIONS

DISTRIBUTOR

Items	1.5L Engine (Except from 1996 models and 1995 models for California)	1.5L Engine (From 1996 models and 1995 models for California)
Type	With a built-in crankshaft position sensor and ignition coil	With a built-in ignition coil
Identification No.	T6T57171	T6T58771
Ignition timing control	Controlled by engine control module	Controlled by engine control module
Firing order	1-3-4-2	1-3-4-2

Items	1.8L Engine (Except from 1996 models and 1995 models for California)	1.8L Engine (From 1996 models and 1995 models for California)
Type	With a built-in crankshaft position sensor and ignition coil	With a built-in ignition coil
Identification No.	T6T57671	T6T58571
Ignition timing control	Controlled by engine control module	Controlled by engine control module
Firing order	1-3-4-2	1-3-4-2

IGNITION COIL

Items	1.5L Engine	1.8L Engine
Type	Mold single-coil with a built-in distributor	Mold single-coil with a built-in distributor

SPARK PLUG

Manufacturer	1.5L Engine	1.8L Engine
NGK	BPR5ES-11	BKR5E-11
NIPPON DENSO	W16EPR-11	K20PR-U11
CHAMPION	RN11YC4	–


SERVICE SPECIFICATIONS

110003681

Items	Standard value	Limit
Ignition coil	Primary coil resistance at 20°C (68°F) Ω	0.9 – 1.2
	Secondary coil resistance at 20°C (68°F) kΩ	20–29
Spark plug gap mm (in.)	1.0–1.1 (.039–.043)	–
Spark plug cable resistance kΩ	–	Max. 22

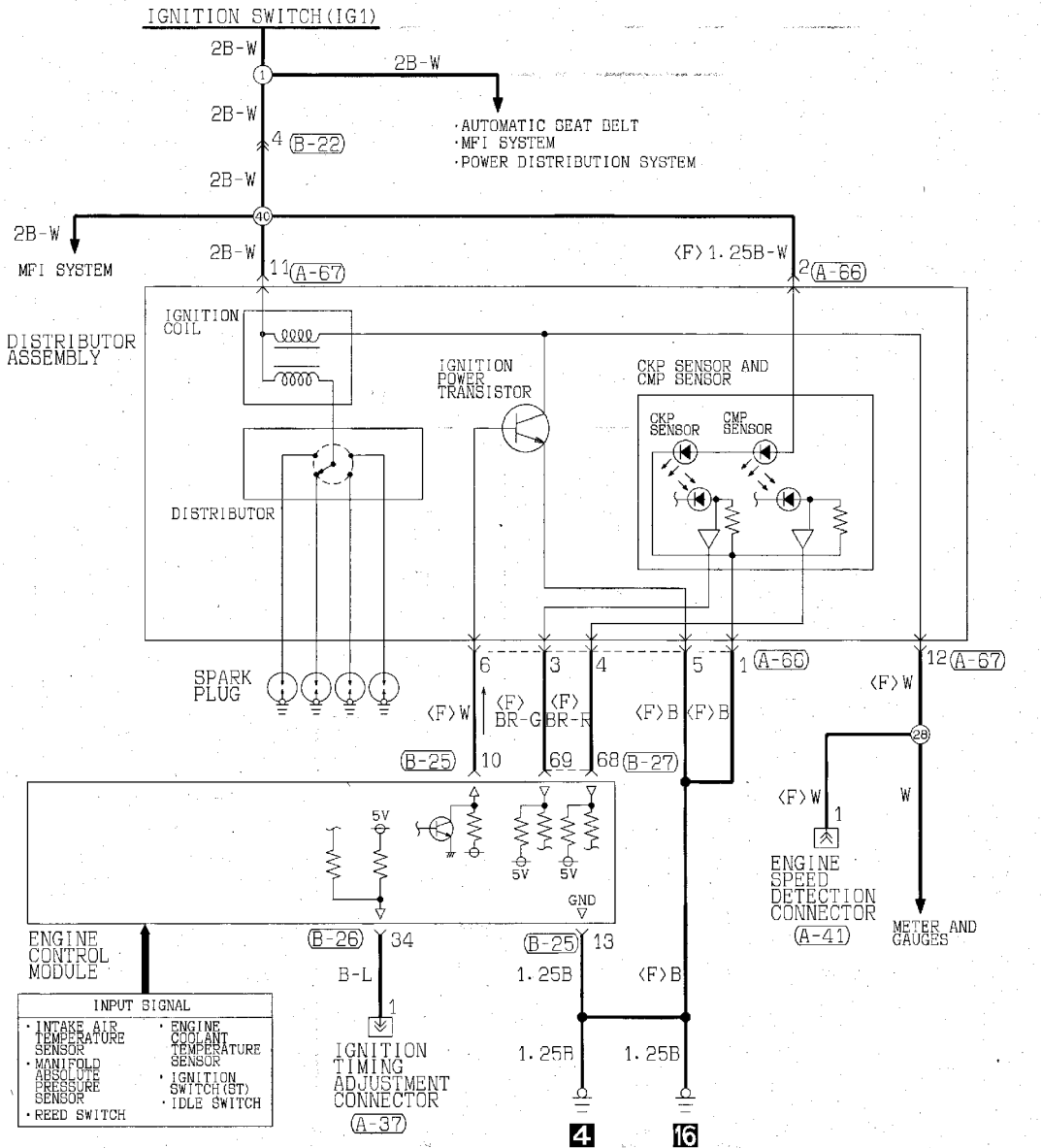
SPECIAL TOOL

110003682

Tool	Tool number and name	Supersession	Application
	MB991348 Test harness set	Tool not available	Inspection by analyzer

ZMB991348

TROUBLESHOOTING

CIRCUIT DIAGRAM
<1.5L ENGINE (1993 MODELS)>

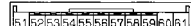
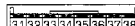
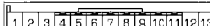
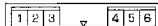
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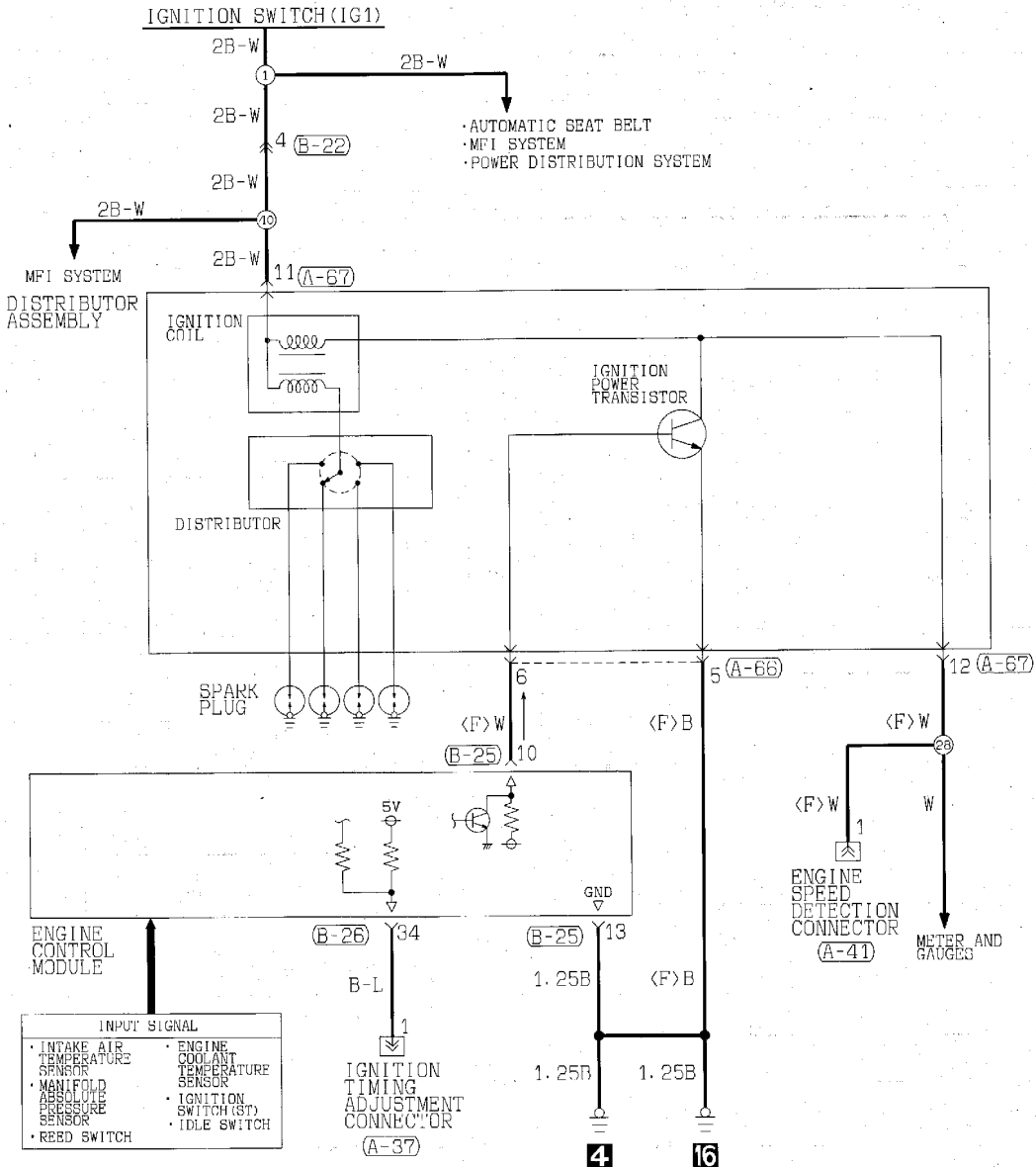
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<1.5L ENGINE (1994 MODELS)>



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(A-41)

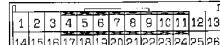
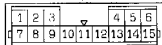
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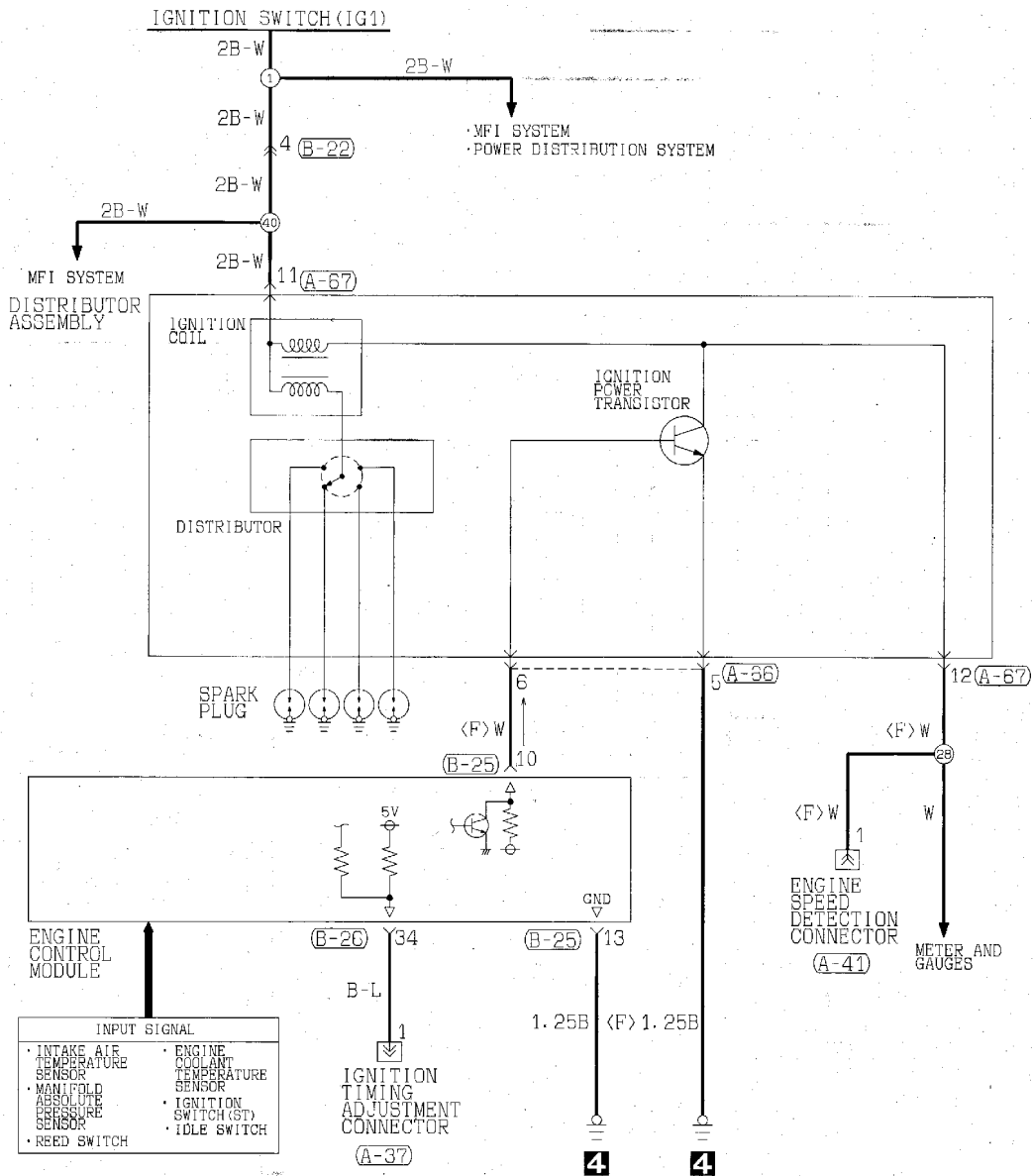
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<1.5L ENGINE (1995 MODELS FOR FEDERAL)>



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A-66

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B-22

B-25

B-26

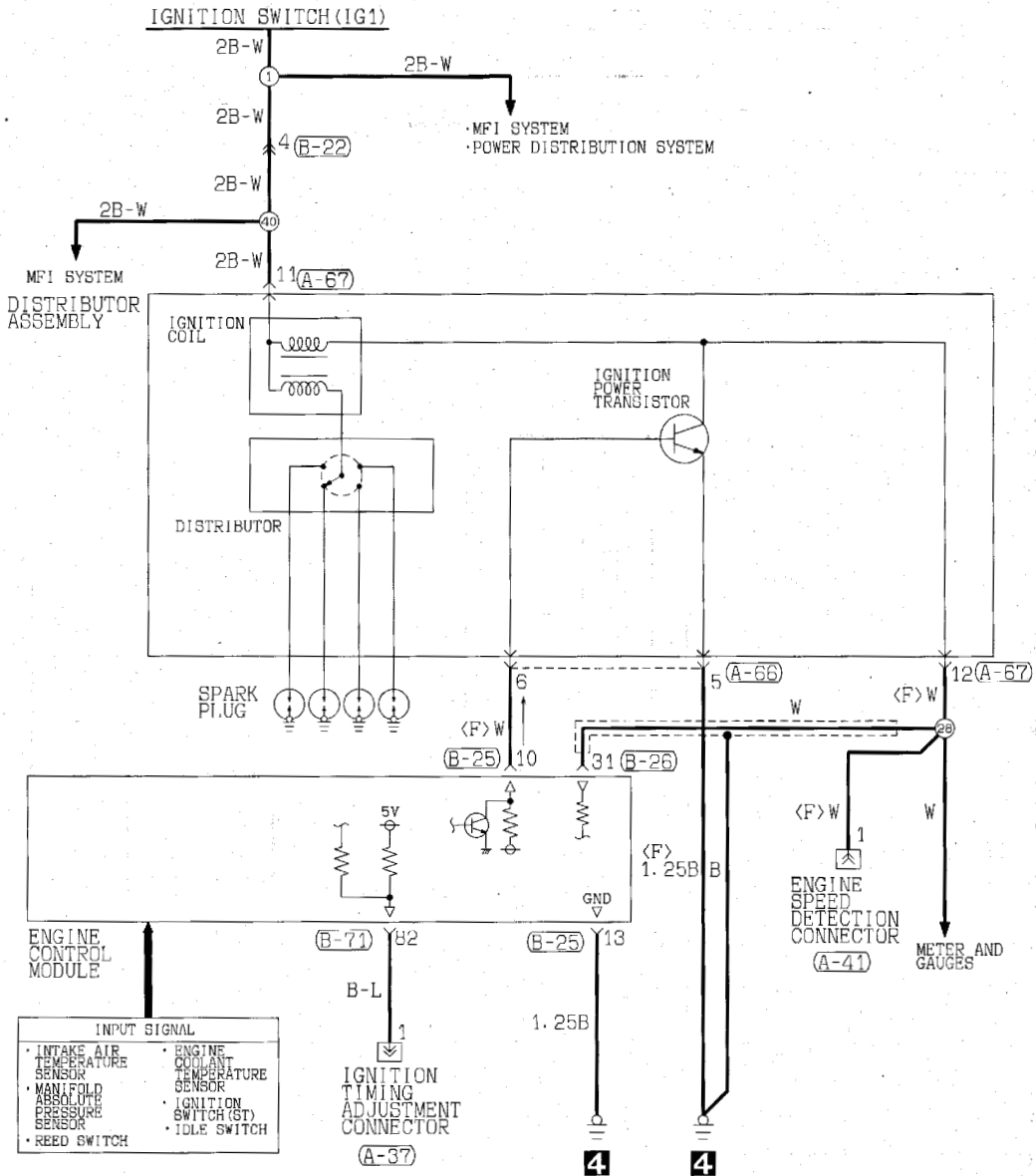


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13	14	15			

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14	15	16	17	18	19	20	21	22	23	24	25	26

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

<1.5L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



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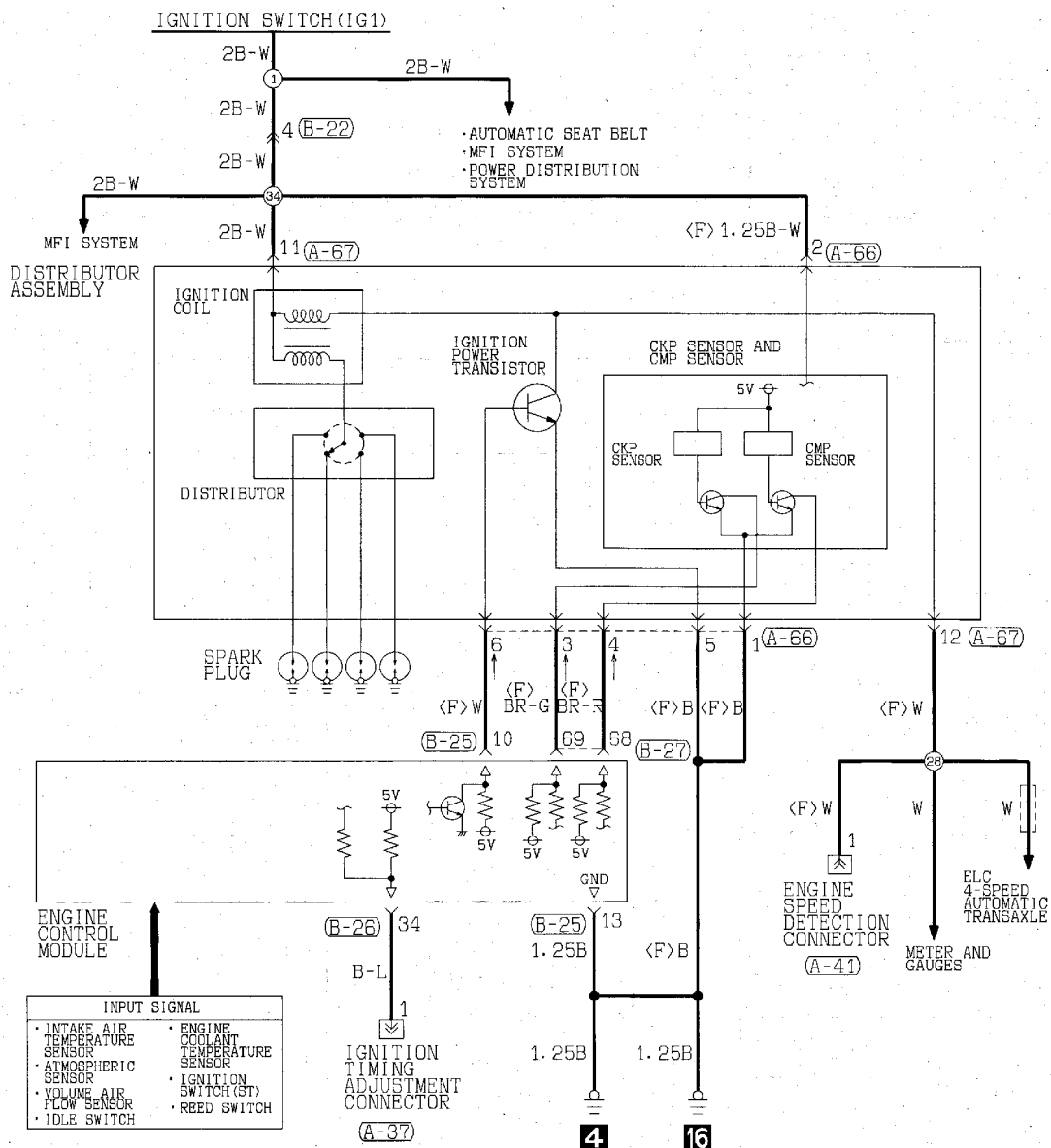
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<1.8L ENGINE (1993 MODELS)>



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19	20	21	22	23	24
25	26				

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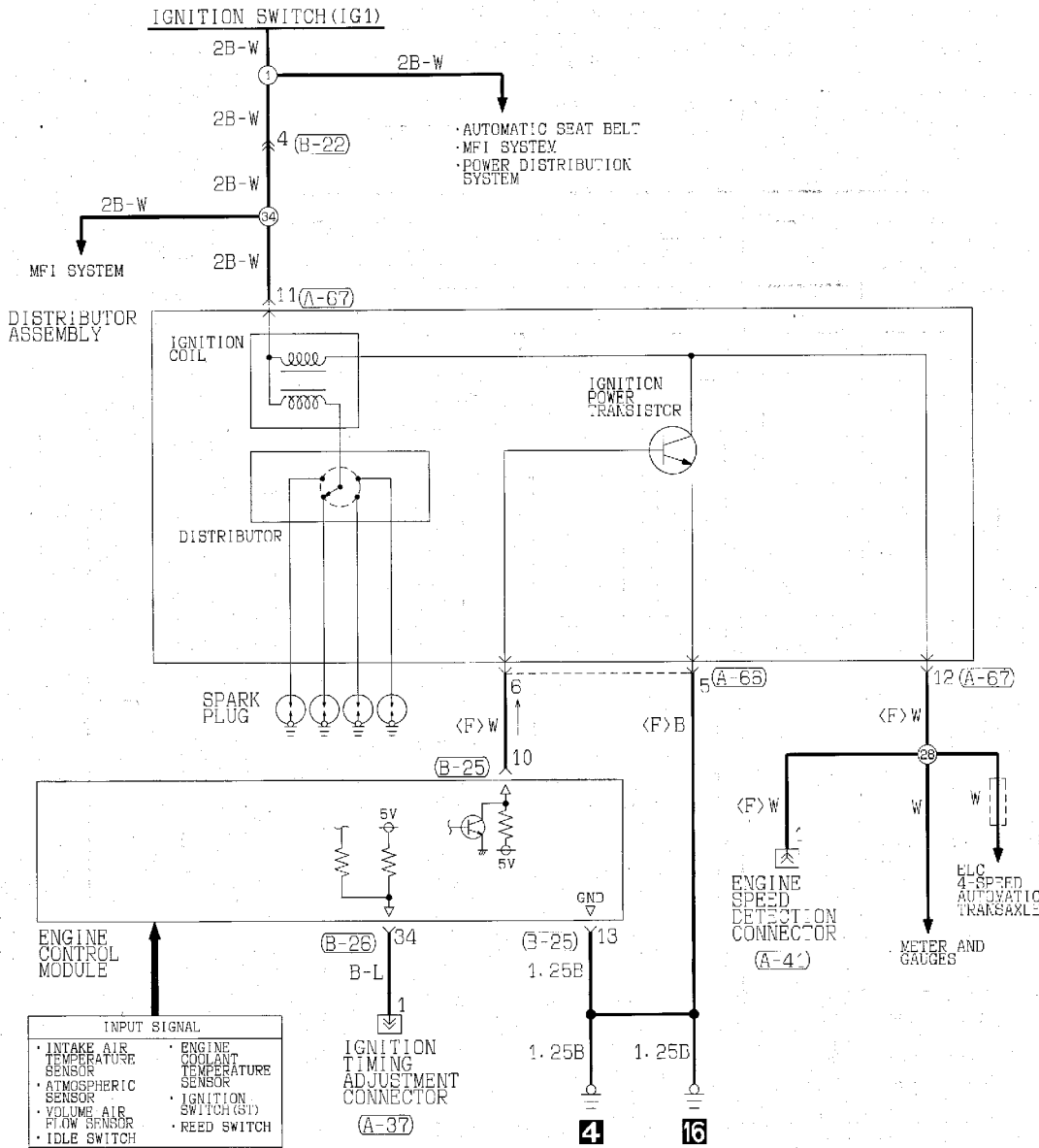
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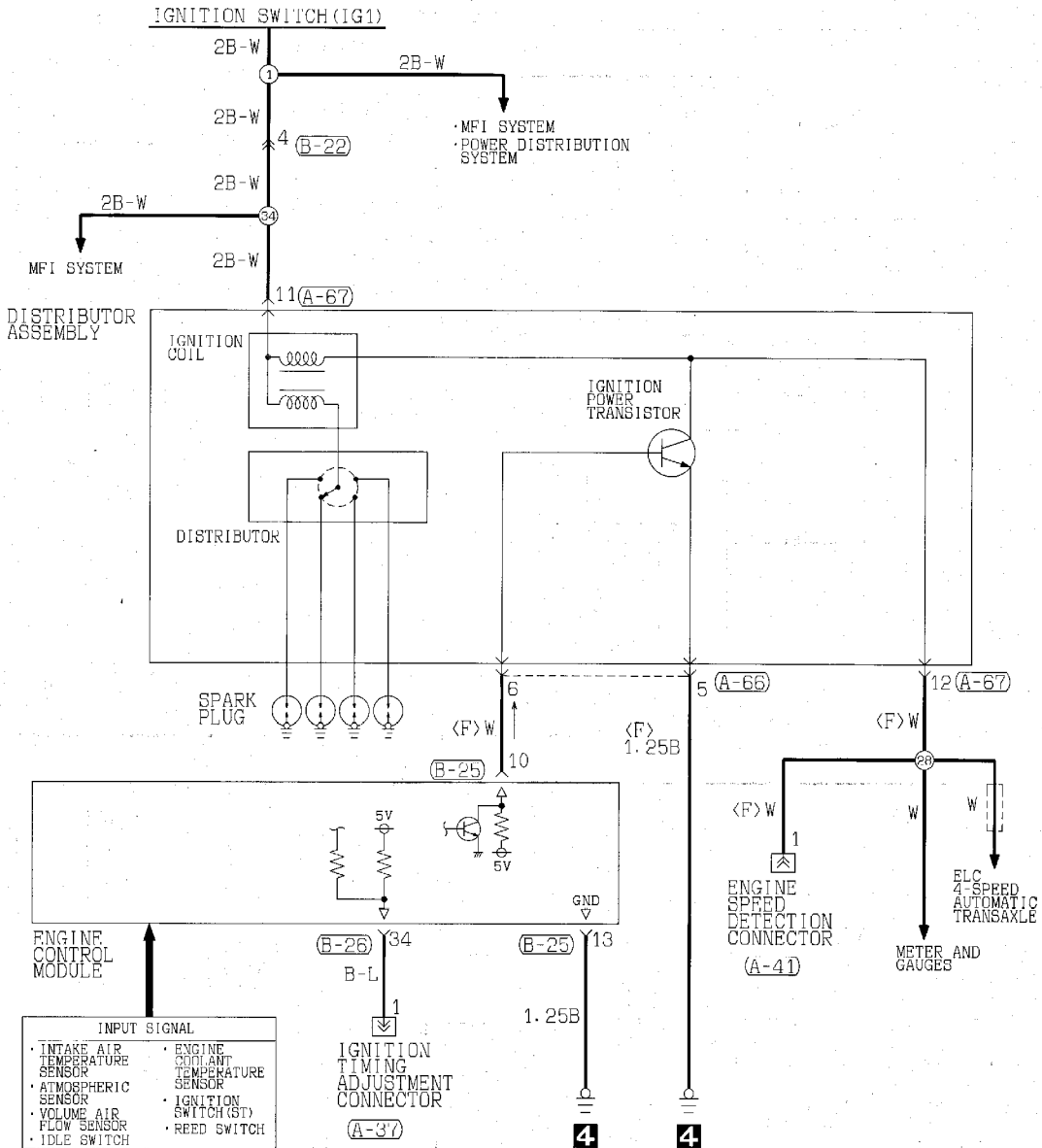
<1.8L ENGINE (1994 MODELS)>



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<1.8L ENGINE (1995 MODELS FOR FEDERAL)>

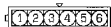


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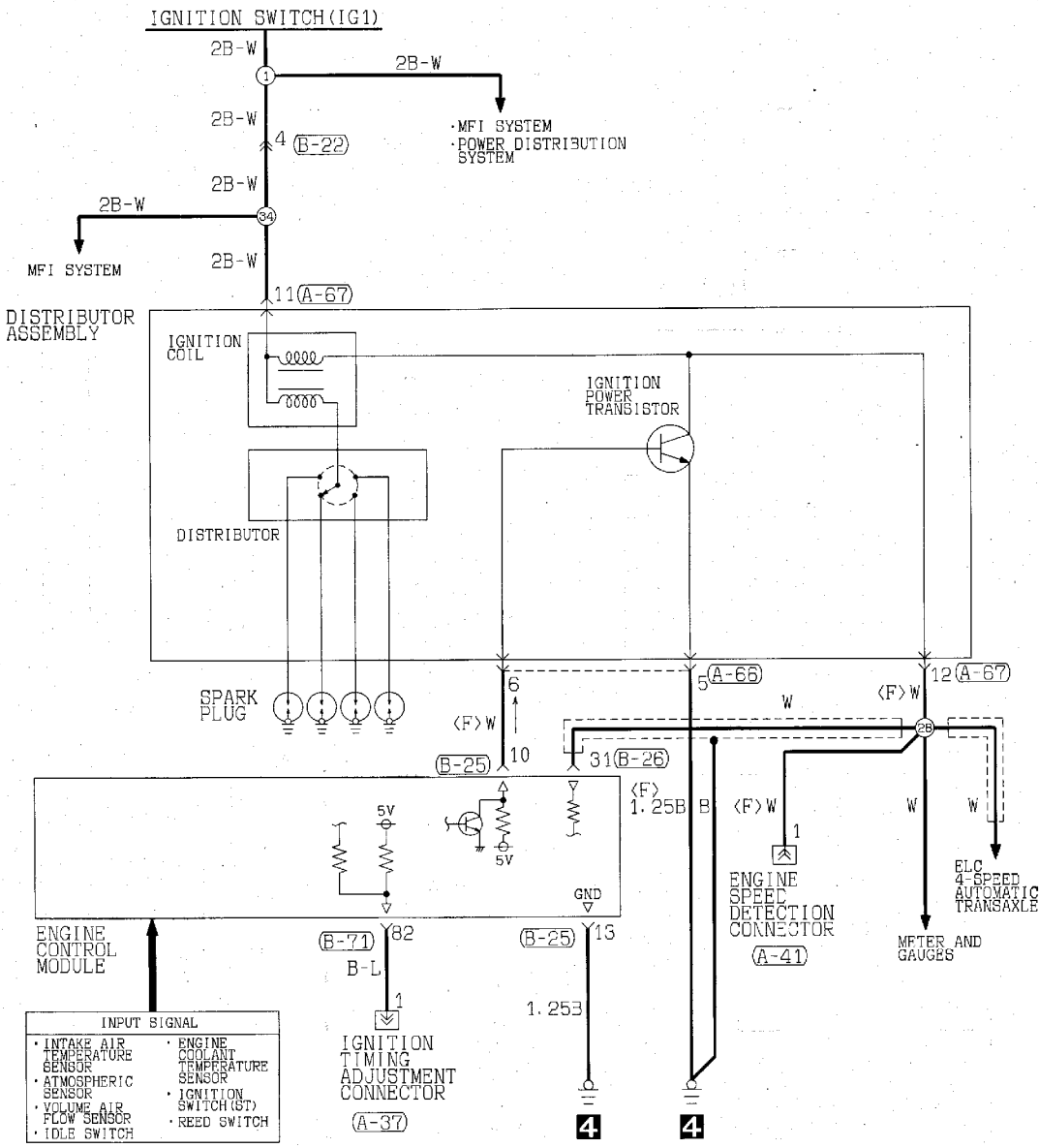


1	2	3	4	5	6
7	8	9	10	11	12
13	14	15			

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

<1.8L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



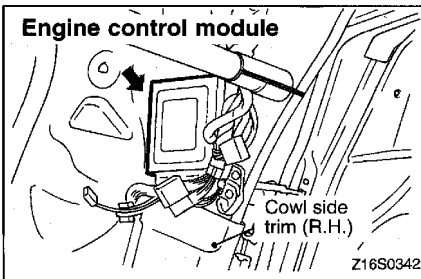
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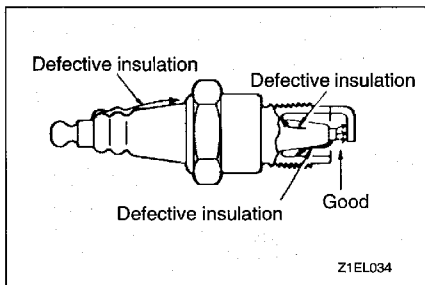
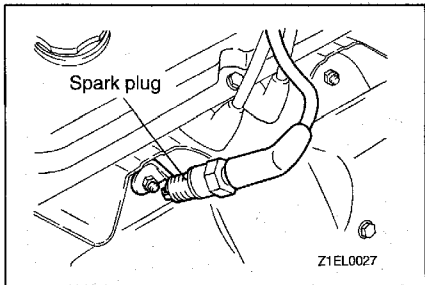
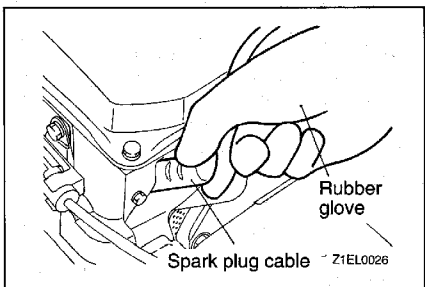
OPERATION

- Turn ignition switch to "ON" position, and battery voltage will be applied to primary winding of ignition coil.
- When crankshaft position sensor signal is input to engine control module, engine control module makes ON-OFF control of ignition power transistors one by one.
- When ignition power transistor is turned on, current flows from ignition coil (primary winding) to ground through ignition power transistor.

TROUBLESHOOTING HINTS

1. Engine cranks, but does not start.
 - (1) Spark is insufficient or does not occur at all (on spark plug).
 - Check ignition coil.
 - Check crankshaft position sensor (with a built-in distributor).
 - Check ignition power transistor.
 - Check spark plugs.
 - Check spark plug cable.
 - (2) Spark is good.
 - Check ignition timing.
2. Engine idles roughly or stalls.
 - Check spark plugs.
 - Check ignition timing.
 - Check ignition coil.
 - Check spark plug cable.
3. Poor acceleration
 - Check ignition timing.
 - Check spark plug cable.
 - Check ignition coil.

COMPONENT LOCATION



SERVICE ADJUSTMENT PROCEDURES

SPARK PLUG CABLE TEST

110003684

- (1) Disconnect, one at a time, each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.

Caution

Wear rubber gloves while doing so.

- (2) If the engine performance does not change, check the resistance of the spark plug cable, and check the spark plug itself.

SPARK PLUG TEST

110003685

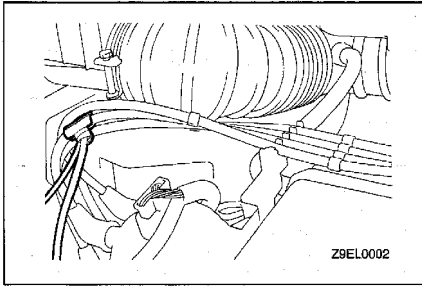
- (1) Remove the spark plug and connect to the spark plug cable.
- (2) Ground the spark plug outer electrode (body), and crank the engine.
Check to be sure that there is an electrical discharge between the electrodes at this time.

IGNITION SECONDARY VOLTAGE WAVE-FORM INSPECTION

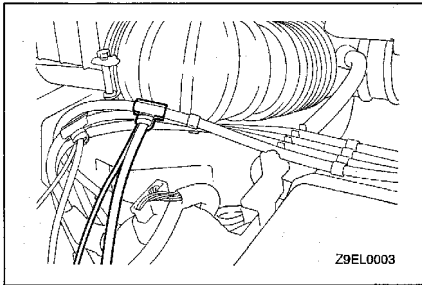
110003686

MEASUREMENT METHOD

- (1) Clamp the spark plug cable (No.1, No.2, No.3 or No.4) with the secondary pickup.



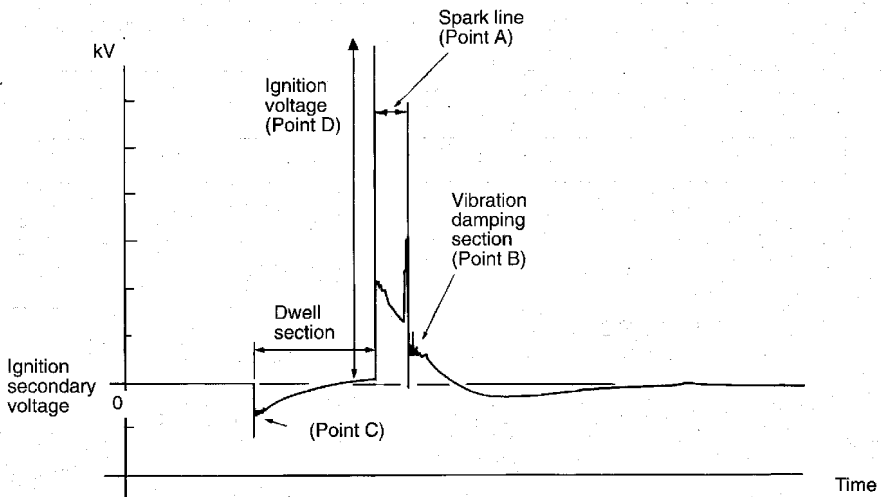
- (2) Clamp the No.1 cylinder spark plug cable with the trigger pickup.



STANDARD WAVE-FORM

Observation Conditions

FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



Z7EL0128

WAVE-FORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal wave-form examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B: Number of vibrations in reduction vibration section (Refer to abnormal wave-form example 5)

Number of vibrations	Coil and condenser
Three or more	Normal
Except above	Abnormal


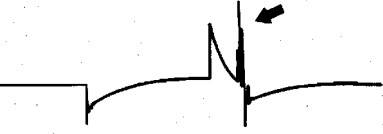

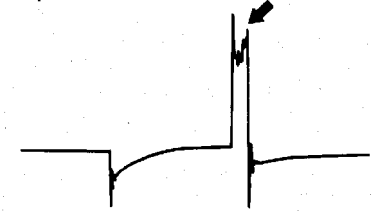
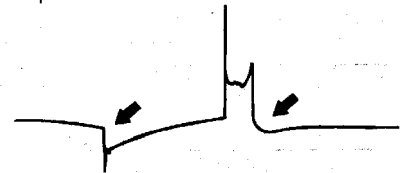
Point C: Number of vibrations at beginning of dwell section (Refer to abnormal wave-form example 5)

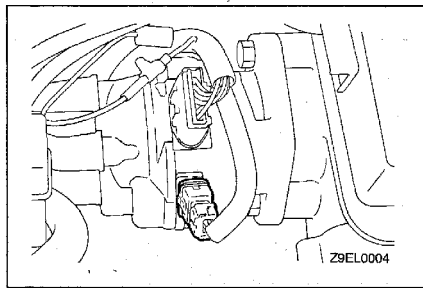
Number of vibrations	Coil
5 – 6 or higher	Normal
Except above	Abnormal

Point D: Ignition voltage height (distribution per each cylinder) shows the following trends.

Ignition voltage	Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVE-FORMS EXAMPLES

Abnormal wave-form	Wave characteristics	Cause of problem
<p>Example 1</p>  <p>Z01P0215</p>	<p>Spark line is high and short.</p>	<p>Spark plug gap is too large.</p>
<p>Example 2</p>  <p>Z01P0216</p>	<p>Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.</p>	<p>Spark plug gap is too small.</p>
<p>Example 3</p>  <p>Z01P0217</p>	<p>Spark line is low and long, and is sloping. However, there is almost no spark line distortion.</p>	<p>Spark plug gap is fouled.</p>
<p>Example 4</p>  <p>Z01P0218</p>	<p>Spark line is high and short. Difficult to distinguish between this and abnormal wave-form example 1.</p>	<p>Spark plug cable is nearly falling off. (Causing a dual ignition)</p>
<p>Example 5</p>  <p>Z01P0219</p>	<p>No waves in wave damping section.</p>	<p>Rare short in ignition coil.</p>

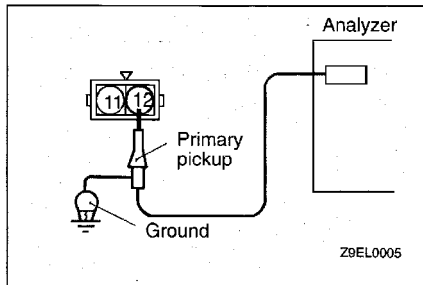


IGNITION PRIMARY VOLTAGE WAVE-FORM CHECK

110003687

MEASUREMENT METHOD

- (1) Disconnect the distributor 2 pin connector and connect the special tool (test harness: MB991348) in between. (All of the terminals should be connected.)



- (2) Connect the analyzer primary pickup to the distributor connector terminal 12.
- (3) Connect the primary pickup ground terminal.
- (4) Clamp the spark plug cable with the trigger pickup.

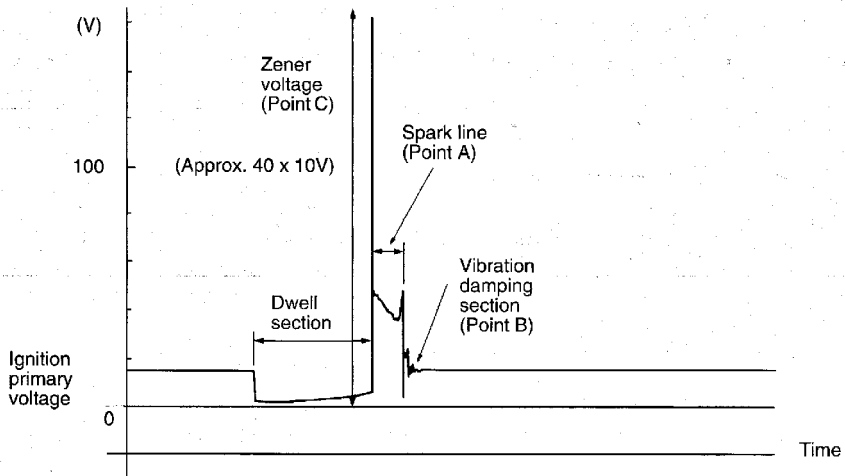
NOTE

The wave pattern of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVE-FORM

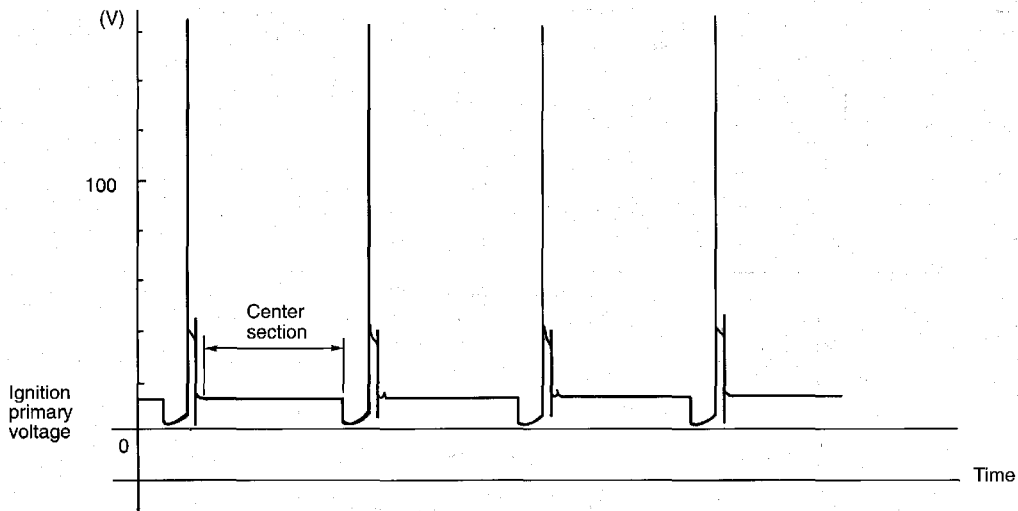
Observation Conditions

FUNCTION	PRIMARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



Observation conditions (Only the pattern selector shown below changes from the previous conditions)

PATTERN SELECTOR	DISPLAY
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Z9EL0006

WAVEFORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal wave-form examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	High tension cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	—	—	—	—

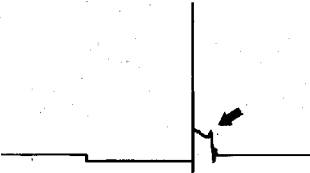
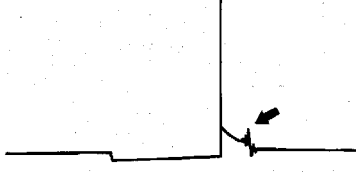
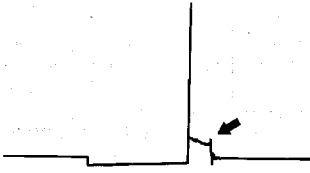
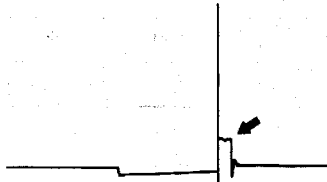
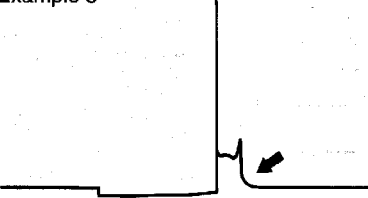
Point B: Number of vibrations in reduction vibration section (Refer to abnormal wave-form example 5)

Number of vibrations	Coil and condenser
3 or higher	Normal
Except above	Abnormal

Point C: Height of Zener voltage

Height of Zener voltage	Probable cause
Higher	Problem in Zener diode
Lower	Abnormal resistance in primary coil circuit

ABNORMAL WAVE-FORMS EXAMPLES

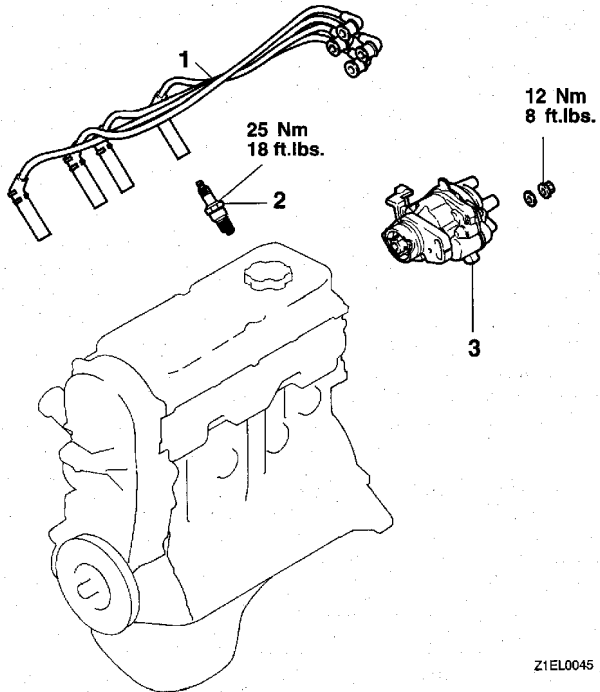
Abnormal wave-form	Wave characteristics	Cause of problem
<p>Example 1</p>  <p>Z01P0210</p>	<p>Spark line is high and short.</p>	<p>Spark plug gap is too large.</p>
<p>Example 2</p>  <p>Z01P0211</p>	<p>Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.</p>	<p>Spark plug gap is too small.</p>
<p>Example 3</p>  <p>Z01P0212</p>	<p>Spark line is low and long, and is sloping. However, there is almost no spark line distortion.</p>	<p>Spark plug gap is fouled.</p>
<p>Example 4</p>  <p>Z01P0213</p>	<p>Spark line is high and short.</p>	<p>Spark plug cable is nearly falling off. (Causing a dual ignition)</p>
<p>Example 5</p>  <p>Z01P0214</p>	<p>No waves in wave damping section.</p>	<p>Rare short in ignition coil.</p>

IGNITION SYSTEM

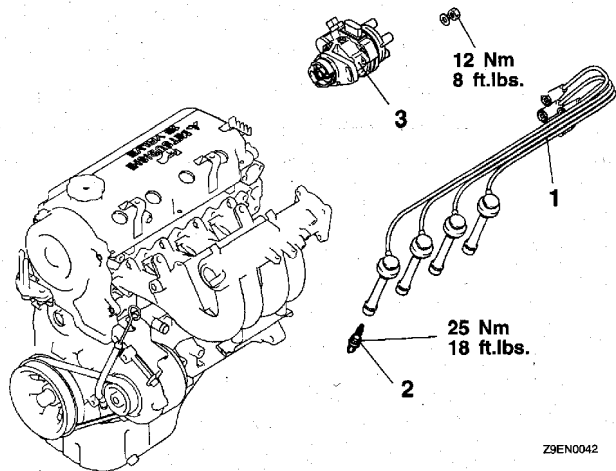
REMOVAL AND INSTALLATION

110003688

<1.5L Engine>



<1.8L Engine>



Removal steps

1. Spark plug cable
2. Spark plug
3. Distributor

INSPECTION

SPARK PLUG

- (1) Check the following items to see that electrodes are not burnt, and insulators are not broken, and how porcelain insulator is burnt.

- Broken insulators
- Wearing electrodes
- Deposited carbon

For cleaning, use a plug cleaner or wire brush. Clean porcelain insulator above shell as well.

- Damaged or broken gasket
- Burnt condition of porcelain insulator at spark gap
Dark deposit of carbon indicates too rich a fuel mixture or extremely low air intake. Also, misfiring due to excessive spark gap is suspected.

White burn indicates too lean a fuel mixture or excessively advanced ignition timing. Also insufficient plug tightening is suspected.

- (2) Clean with a plug cleaner.
Use an air gun to remove dust deposited on plug threads.
- (3) Check plug gap using a plug gap gauge and adjust if it is not as specified.

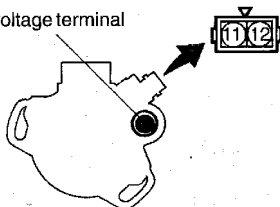
Standard value: 1.0–1.1 mm (.039–.043 in.)

SPARK PLUG CABLE

- (1) Check cap and coating for cracks.
(2) Measure resistance.

Limit: Max. 22 k Ω

High voltage terminal



Z9EL0001

IGNITION COIL

- (1) Measurement of the primary coil resistance
Measure the resistance of the positive terminal 11 and negative terminal 12 of the ignition coil.

Standard value: 0.9–1.2 Ω

- (2) Measurement of the secondary coil resistance
Measure the resistance of the positive terminal 11 and the high voltage terminal.

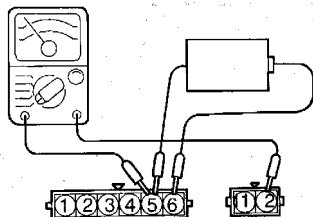
Standard value: 20–29 k Ω **IGNITION POWER TRANSISTOR****NOTE**

An analog-type circuit tester should be used.

- (1) Connect the negative (–) terminal of the 1.5V power supply to terminal 5 of the ignition power transistor; then check whether there is continuity between terminal 5 and terminal 12 when terminal 6 and the positive (+) terminal are connected and disconnected.

NOTE

Connect the negative (–) probe of the circuit tester to terminal 12.



Z9EL0058

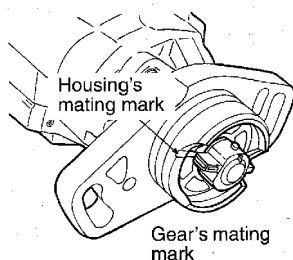
Terminal 6 and (+) terminal	Terminal 5 and terminal 12
Connected	Continuity
Unconnected	No continuity

- (2) Replace the ignition power transistor if there is a malfunction.

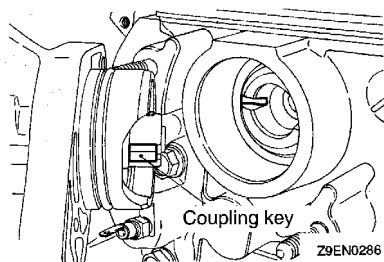
INSTALLATION SERVICE POINTS**►◄ DISTRIBUTOR INSTALLATION**

- (1) Turn the crankshaft so that the No. 1 cylinder is at top dead center.
- (2) Align the distributor housing and gear mating marks.

- (3) Install the distributor with the coupling key fitted in the keyway provided in the camshaft end.



Z9EN0078



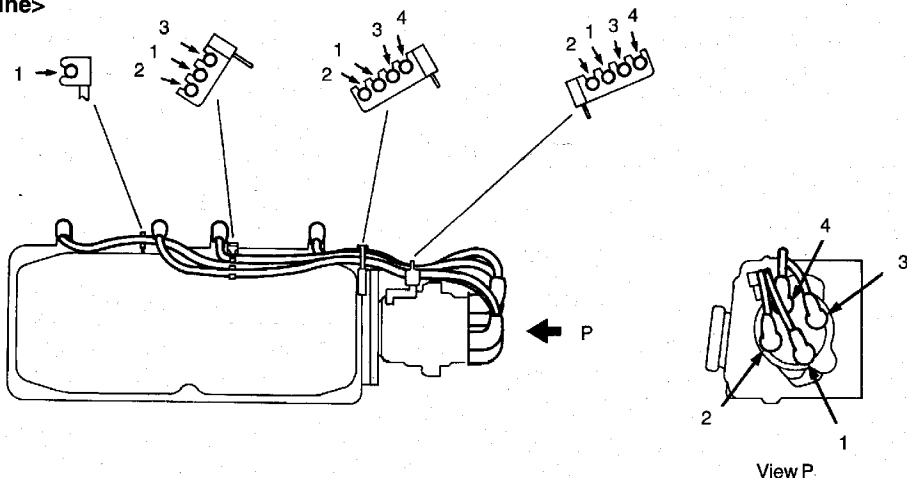
Z9EN0286

▶B◀ SPARK PLUG CABLE INSTALLATION

Improper arrangement of spark plug cables will induce voltage between the cables, causing miss firing and developing a surge at acceleration in high-speed operation. Therefore, be careful to arrange the spark plug cables properly by the following procedure.

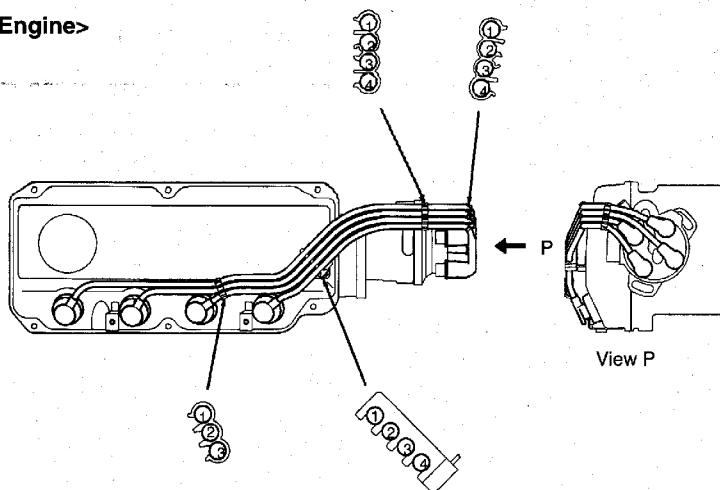
1. Install the spark plug cable clamps as shown in the illustration.
2. The numerals on the support and clamp indicate the spark plug cable No.
3. Pay attention to the following items when the spark plug cables are installed.
 - (1) Install the cables securely to avoid possible contact with metal parts.
 - (2) Install the cables neatly, ensuring they are not too tight, loose, twisted or kinked.

<1.5L Engine>



Z1EL0050

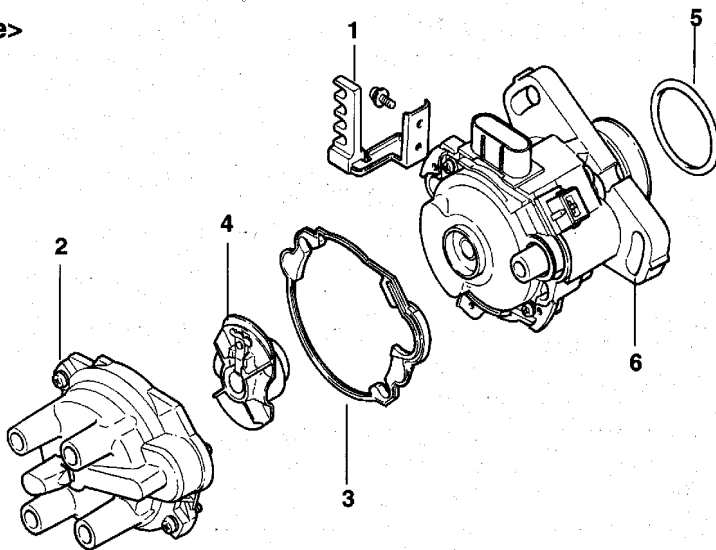
<1.8L Engine>



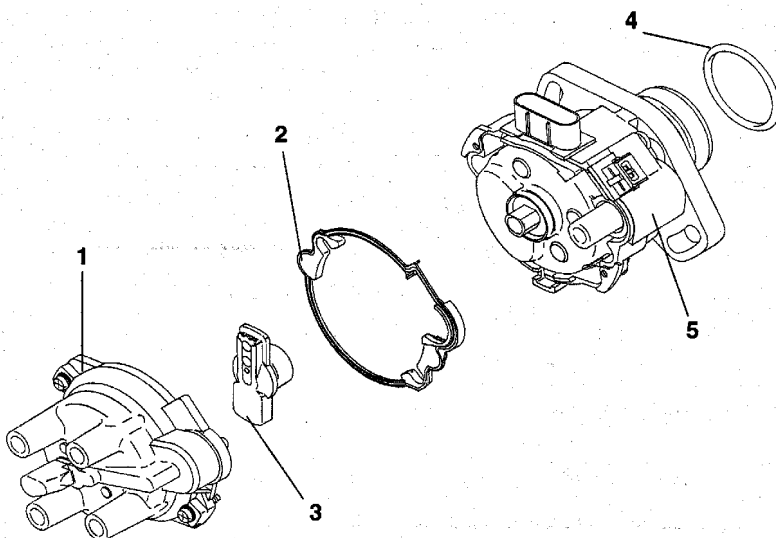
Z9EN0266

DISTRIBUTOR**DISASSEMBLY AND REASSEMBLY**

110003689

<1.5L Engine>

Z1EL0055

<1.8L Engine>

Z9EN0120

**Disassembly steps
<1.5L ENGINE>**

1. Cable clamp
2. Distributor cap
3. Packing
4. Rotor
5. O-ring
6. Distributor housing

<1.8L ENGINE>

1. Distributor cap
2. Packing
3. Rotor
4. O-ring
5. Distributor housing

INSPECTION

Check the following points; repair or replace if a problem is found.

CAP, ROTOR

- (1) There must be no cracking in the cap.
- (2) There must be no damage to the cap's electrode or the rotor's electrode.
- (3) Clean away any dirt from the cap and rotor.

CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR

Refer to GROUP13A – On-vehicle Inspection MFI Components