

FUEL SYSTEM

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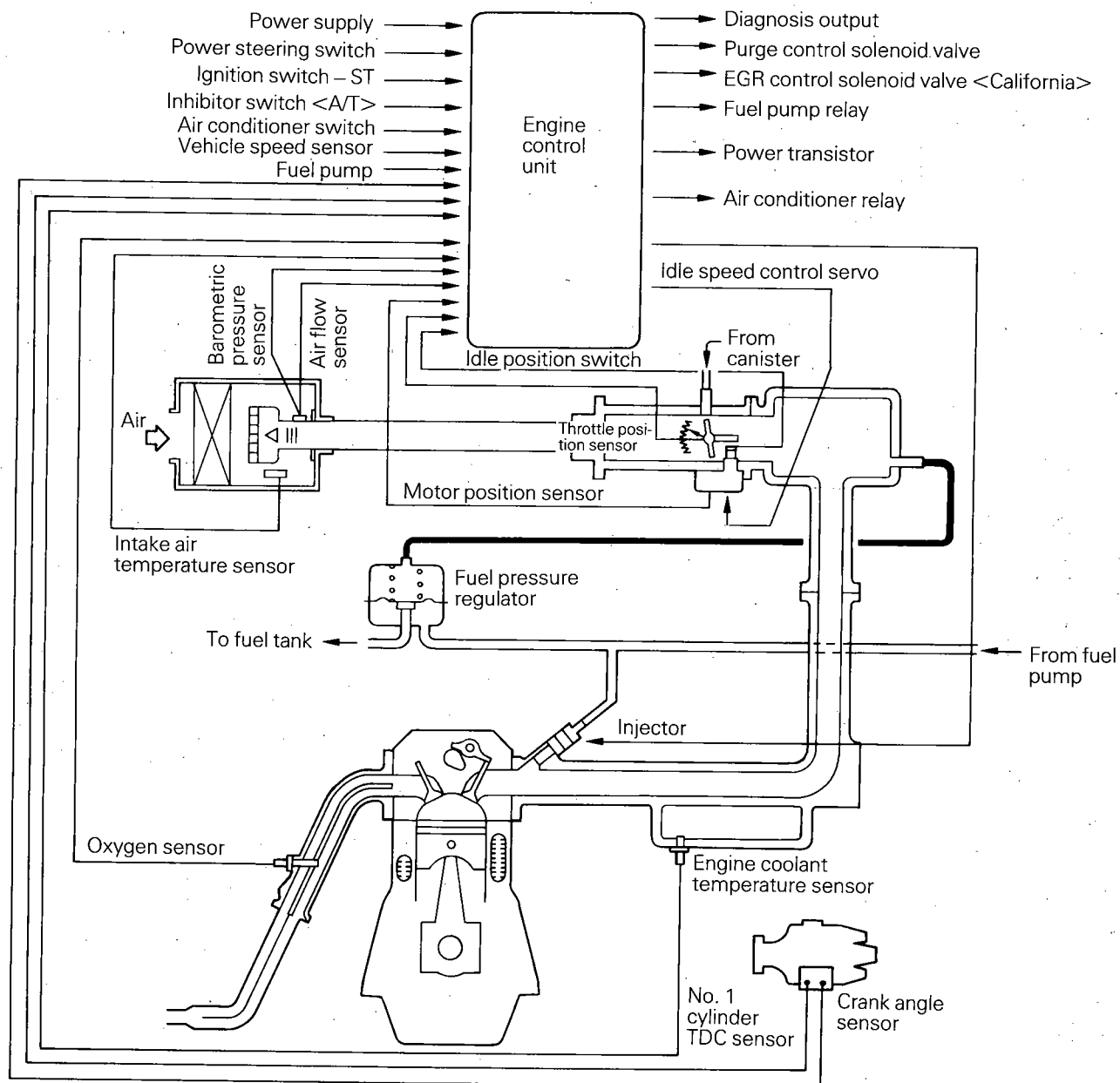
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MPI SYSTEM

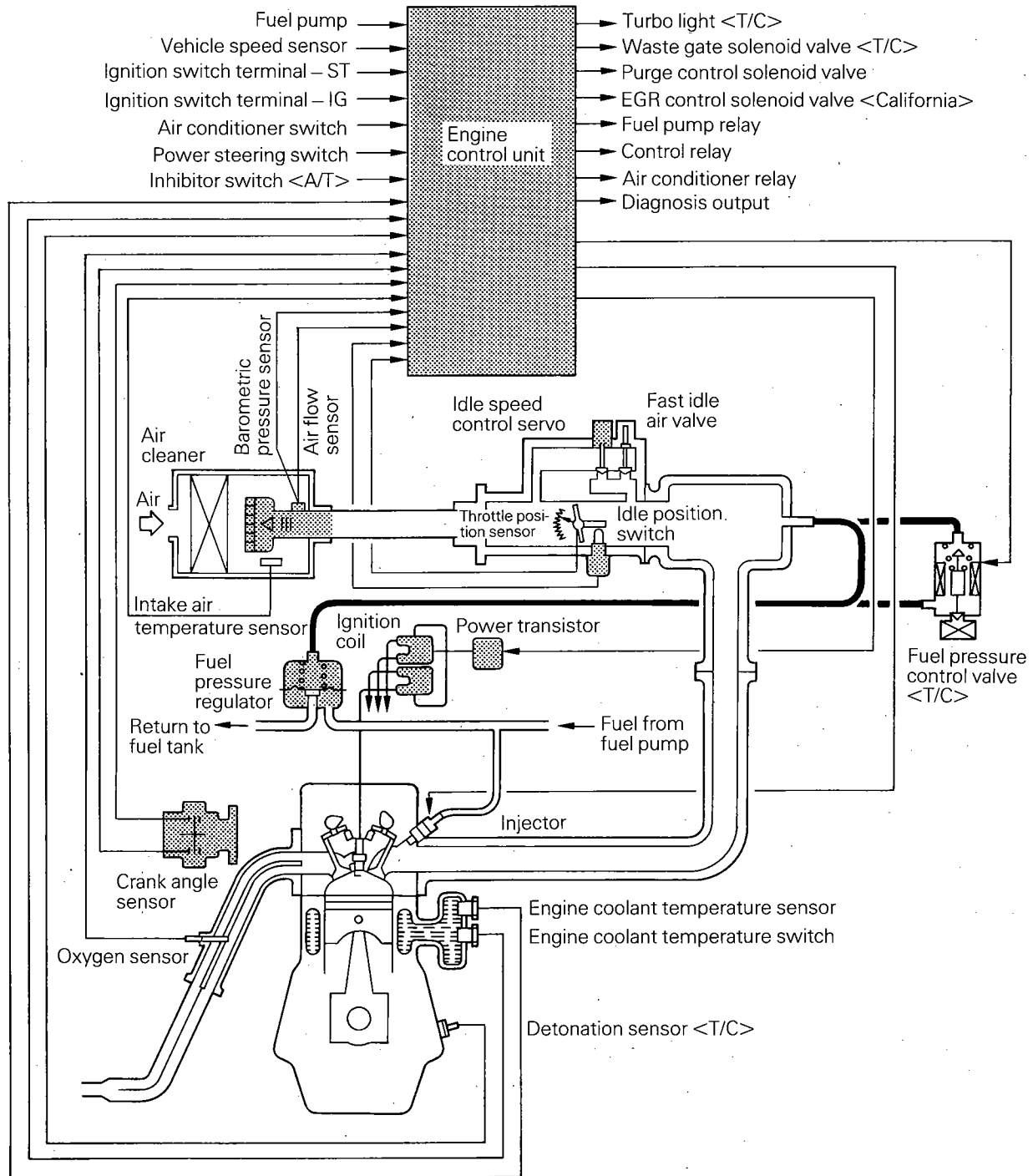
N14BA--

GENERAL INFORMATION

<1.5L Engine>



<1.6L, Engine>



6FU1003

SPECIFICATIONS

N14CA-A

GENERAL SPECIFICATIONS

<1.5L Engine>

Items	Specifications
Fuel Tank capacity lit. (gal.) Return system Filter	50 (13.2) Equipped High pressure type
Fuel pump Type Driven by	Electrical, in-tank type Electric motor
Throttle body Identification model No. Throttle bore mm (in.) Throttle position sensor Idle speed control servo Idle position switch Motor position sensor	AC46-101: <M/T> AC46-103: <A/T> 46 (1.811) Variable resistor type Electric motor Contact type, within idle speed control servo Variable resistor type
Engine control unit Identification model No. <Federal, Canada> <California>	E2T33473 E2T33472
Sensors Air flow sensor Barometric pressure sensor Intake air temperature sensor Engine coolant temperature sensor Oxygen sensor Vehicle speed sensor Inhibitor switch No. 1 cylinder TDC sensor Crank angle sensor EGR temperature sensor <California>	Karman vortex type Semiconductor diffusion type Thermistor type Thermistor type Zirconia sensor Reed switch type Contact switch type Photo diode sensor Photo diode sensor Thermistor type
Actuators Control relay identification model No. Injector type and number Injector identification mark Purge control solenoid valve EGR control solenoid valve <California>	E8T06871 Electromagnetic, 4 B182H ON/OFF type solenoid valve Duty cycle solenoid valve
Fuel pressure regulator Regulated pressure kPa (psi)	335 (47.6)

<1.6L Engine>

Items	Specifications
Fuel Tank capacity lit. (gal.) Return system Filter	50 (13.2) Equipped High pressure type
Fuel pump Type Driven by	Electrical, in-tank type Electric motor
Throttle body Identification model No. Throttle bore mm (in.) Throttle position sensor Idle speed control servo Idle position switch	AC54-101: <N/A> AC54-600: <T/C> 54 (2.126) Variable resistor type Stepper motor type The stepper motor type by-pass air control system with the first idle air valve Contact switch type
Engine control unit Identification model No. <Federal, Canada> <California>	E2T34374: <N/A> E2T34376: <T/C> E2T34373: <N/A> E2T34375: <T/C>
Sensors Air flow sensor Barometric pressure sensor Intake air temperature sensor Engine coolant temperature sensor Oxygen sensor Vehicle speed sensor Detonation sensor <T/C> Top dead center sensor Crank angle sensor EGR temperature sensor <California> Power steering oil pressure switch	Karman vortex type Semiconductor diffusion type sensor Thermistor type Thermistor type Zirconia sensor Reed switch type Piezoelectric device type Photo diode sensor Photo diode sensor Thermistor type Contact switch type
Actuators Control relay identification model No. Resistor identification model No. <T/C> Injector type and number Injector identification mark Purge control solenoid valve EGR control solenoid valve <California> Fuel pressure control solenoid valve <T/C> Waste gate solenoid valve <T/C>	E8T06771 E8T05871 Electromagnetic, 4 B210H: <N/A> B390L: <T/C> ON/OFF type solenoid valve Duty cycle solenoid valve ON/OFF type solenoid valve ON/OFF type solenoid valve

Items	Specifications
Fuel pressure regulator	
Regulated pressure kPa (psi)	335 (47.6): <N/A> 255 (36.3): <T/C>

SERVICE SPECIFICATIONS

N14CB-A

<1.5L Engine>

Items	Specifications
Basic ignition timing	5° ± 2°BTDC at curb idle
Curb idle speed rpm	750 ± 100
Idle speed when air conditioner is on rpm	
Vehicles with a manual transaxle and an automatic transaxle	850 at neutral position
Vehicles with an automatic transaxle	700 at D range
Idle speed control adjustment rpm	750 ± 50
Throttle position sensor regulating voltage V	0.48 – 0.52 at curb idle
Throttle position sensor resistance kΩ	3.5 – 6.5
Motor position sensor resistance kΩ	4 – 6
Idle speed control servo motor coil resistance Ω	5 – 35 [at 20°C (68°F)]
Intake air temperature sensor resistance kΩ	2.7 [at 20°C (68°F)]
Engine coolant temperature sensor resistance kΩ	
20°C (68°F)	2.5
80°C (176°F)	0.3
Injector coil resistance Ω	13 – 16 [at 20°C (68°F)]

<1.6L Engine>

Items	Specifications
Basic ignition timing	5° ± 2°BTDC at curb idle
Curb idle speed rpm	750 ± 100
Idling rpm when air conditioner ON rpm	
Vehicles with a manual transaxle and an automatic transaxle	850 at neutral position
Vehicles with an automatic transaxle	700 at D range
Basic idle speed adjustment rpm	750 ± 50
Throttle position sensor adjustment voltage V	0.48 – 0.52 at curb idle
Throttle position sensor resistance kΩ	3.5 – 6.5
Idle speed control servo (stepper motor) coil resistance Ω	28 – 33 [at 20°C (68°F)]
Intake air temperature sensor resistance kΩ	2.7 [at 20°C (68°F)]
Engine coolant temperature sensor resistance kΩ	
20°C (68°F)	2.5
80°C (176°F)	0.3
Injector coil resistance Ω	
<N/A>	13 – 16 [at 20°C (68°F)]
<T/C>	2 – 3 [at 20°C (68°F)]
Fuel hose insertion distance mm (in.)	25 – 30 (1.0 – 1.2)

TORQUE SPECIFICATIONS

N14CC-A

Items	Nm	ft.lbs.
Engine coolant temperature sensor	20 – 40	15 – 29
Throttle position sensor attaching bolts	1.5 – 2.5	1.1 – 1.8
Idle speed control servo attaching bolts <1.5L Engine>	2.5 – 4.5	1.8 – 3.3
Delivery pipe mounting bolts	10 – 13	7 – 9
Fuel pressure regulator to delivery pipe		
<1.5L Engine>	7 – 10	5 – 7
<1.6L Engine>	8 – 10	6 – 7
Throttle body mounting bolts <1.5L Engine>	10 – 13	7 – 9
Throttle body mounting bolts and nuts <1.6L Engine>	15 – 22	11 – 16
Accelerator cable adjusting bolts	4 – 6	3 – 4
High pressure fuel hose to pipe	32 – 42	23 – 30
Eye bolt	25 – 35	18 – 25


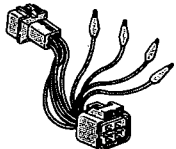

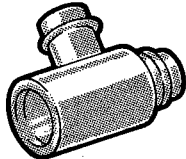
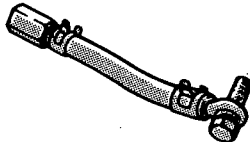
SEALANT

N14CE-A

Items	Specified sealant	Quantity
Engine coolant temperature sensor threaded portion	3M NUT Locking No. 4171 or equivalent	As required

SPECIAL TOOLS

N14DA-A

Tool	Number	Name	Use
	MD998478	Harness connector (3 pin, triangle)	Throttle position sensor inspection and adjustment
	MD998464	Harness connector (4 pin, square)	Motor position sensor inspection
	MD998460	Harness connector (4 pin, round)	Oxygen sensor inspection
	MD998742	Hose adapter	Measurement of fuel pressure (to be used together with MD998709)
	MD998709	Adapter hose	Measurement of fuel pressure (to be used together with MD998742)

TROUBLESHOOTING

N14EBBH

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) rough 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 plugs
 - High tension cable
 - Distributor <1.5L Engine>
 - Crank angle sensor <1.6L Engine>
 - Ignition coil
- (5) Emission control system
 - Crankcase ventilation system
 - Exhaust gas recirculation system
 - Vacuum leak
- (6) Others
 - Ignition timing
 - Idle speed

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

Symptom	Probable cause	Remedy
Engine will not start or start too hard (Crank OK)	Trouble in the MPI system	Check for output of self-diagnosis code. Read the code with a voltmeter.
	Malfunction of the fuel pump drive control system	Check the fuel pump drive control system and the fuel pump.
	Malfunction of the ignition timing control system	Check the ignition timing.
	Malfunction of the power transistor	Check the power transistor as a single unit.
	Power is not supplied to the engine control unit.	Check the power supply circuit.
	Malfunction of the control relay	Replace.
	Malfunction of the injector	Check the injector drive circuit. Check the injector as a single unit.
	The fuel pressure is not proper.	Check the fuel pressure.
	Vacuum hose disconnected or damaged	Repair or replace.
	Malfunction of the engine control unit	Replace.
	Wire breakage or short circuit occurs in the harness, or the connector is improperly connected.	Repair or replace.
Rough idle or engine stumbles	Trouble in the MPI system	Check for output of self-diagnosis code. Read the code with a voltmeter.
	Malfunction of the sensor <ul style="list-style-type: none"> ● Intake air temperature sensor ● Engine coolant temperature sensor ● Barometric pressure sensor ● Ignition switch ● Idle position switch ● Throttle position sensor ● No. 1 cylinder TDC sensor, crank angle sensor <1.5L Engine> ● TDC sensor, crank angle sensor <1.6L Engine> ● Power steering oil pressure switch ● Air conditioner switch ● Inhibitor switch <A/T> ● Motor position sensor <1.5L Engine> ● Air flow sensor ● Oxygen sensor 	Check the sensor-related circuit. Check the sensor as a single unit.
	Malfunction of the engine control system <ul style="list-style-type: none"> ● Stepper motor <1.6L Engine> ● Injector 	Check the actuator-related circuit. Check the actuator as a single unit.

Symptom	Probable cause	Remedy
Rough idle or engine stable	Malfunction of the vehicle speed reed switch	Check the vehicle speed reed switch.
	The fuel pressure is not proper.	Check the fuel pressure.
	Vacuum hose disconnected or damaged.	Repair or replace.
	Malfunction of the engine control unit.	Replace.
	Wire breakage or short circuit occurs in the harness, or the connector is improperly connected.	Repair or replace.
Engine hesitates or poor acceleration	Trouble in the MPI system	Check for output of self-diagnosis code. Read the code with a voltmeter.
	Malfunction of the sensor <ul style="list-style-type: none"> ● Intake air temperature sensor ● Engine coolant temperature sensor ● Barometric pressure sensor ● Ignition switch ● Idle position switch ● Throttle position sensor ● No. 1 cylinder TDC sensor, crank angle sensor <1.5L Engine> ● TDC sensor, crank angle sensor <1.6L Engine> ● Power steering oil pressure switch ● Air conditioner switch ● Inhibitor switch <A/T> ● Motor position sensor <1.5L Engine> ● Air flow sensor ● Oxygen sensor 	Check the sensor-related circuit. Check the sensor as a single unit.
	Malfunction of the engine control system <ul style="list-style-type: none"> ● Stepper motor <1.6L Engine> ● Injector 	Check the actuator-related circuit. Check the actuator as a single unit.
	Malfunction of the air conditioner power relay control system	Check the system, and the components if the system is found defective.
	The fuel pressure is not proper.	Check the fuel pressure.
	Vacuum hose disconnected or damaged.	Repair or replace.
	Malfunction of the engine control unit.	Replace.
	Wire breakage or short circuit occurs in the harness, or the connector is improperly connected.	Repair or replace.

Symptom	Probable cause	Remedy
Poor fuel mileage	Trouble in the MPI system	Check for output of self-diagnosis code. Read the code with a voltmeter.
	Malfunction of the sensor <ul style="list-style-type: none"> ● Intake air temperature sensor ● Engine coolant temperature sensor ● Barometric pressure sensor ● Ignition switch ● Idle position switch ● Throttle position sensor ● No. 1 cylinder TDC sensor, crank angle sensor <1.5L Engine> ● TDC sensor, crank angle sensor <1.6L Engine> ● Power steering oil pressure switch ● Air conditioner switch ● Inhibitor switch <A/T> ● Motor position sensor <1.5L Engine> ● Air flow sensor ● Oxygen sensor 	Check the sensor-related circuit. Check the sensor as a single unit.
	Malfunction of the engine control system <ul style="list-style-type: none"> ● Stepper motor <1.6L Engine> ● Injector 	Check the actuator-related circuit. Check the actuator as a single unit.
	The fuel pressure is not proper.	Check the fuel pressure.

CONTROL FUNCTIONS

N14EE-

<1.5L Engine>

Function Functional elements		Air-fuel mixture control	Ignition timing control	Idle speed control	Air con- ditioner power relay control	Fuel pump drive control	Purge control	EGR control
In- put	Power supply (ignition switch coupled)	X	X	X	X	X	X	X
	Power supply (battery backup)	X	X	X	X	X	X	X
	Air flow sensor	X	X				X	
	Barometric pressure sensor	X	X					
	Intake air temperature sensor	X	X				X	
	Engine coolant temperature sensor	X	X	X			X	
	Throttle position sensor	X	X	X	X*			
	Idle position switch	X	X	X				
	Motor position sensor			X				
	No. 1 cylinder TDC sensor	X						
	Crank angle sensor	X	X	X	X	X		
	Oxygen sensor	X						
	Vehicle speed sensor		X	X				
	Air conditioner switch			X	X*		X	
	Inhibitor switch <A/T>		X	X	X			
	Ignition switch ST terminal (start signal)	X	X	X				
	Power steering oil pressure switch			X				
Out- put	Injector	X						
	Idle speed control servo			X				
	Power transistor		X					
	Air conditioner power relay				X			
	Control relay					X		
	Purge control solenoid valve						X	
	EGR control solenoid valve <California>							X

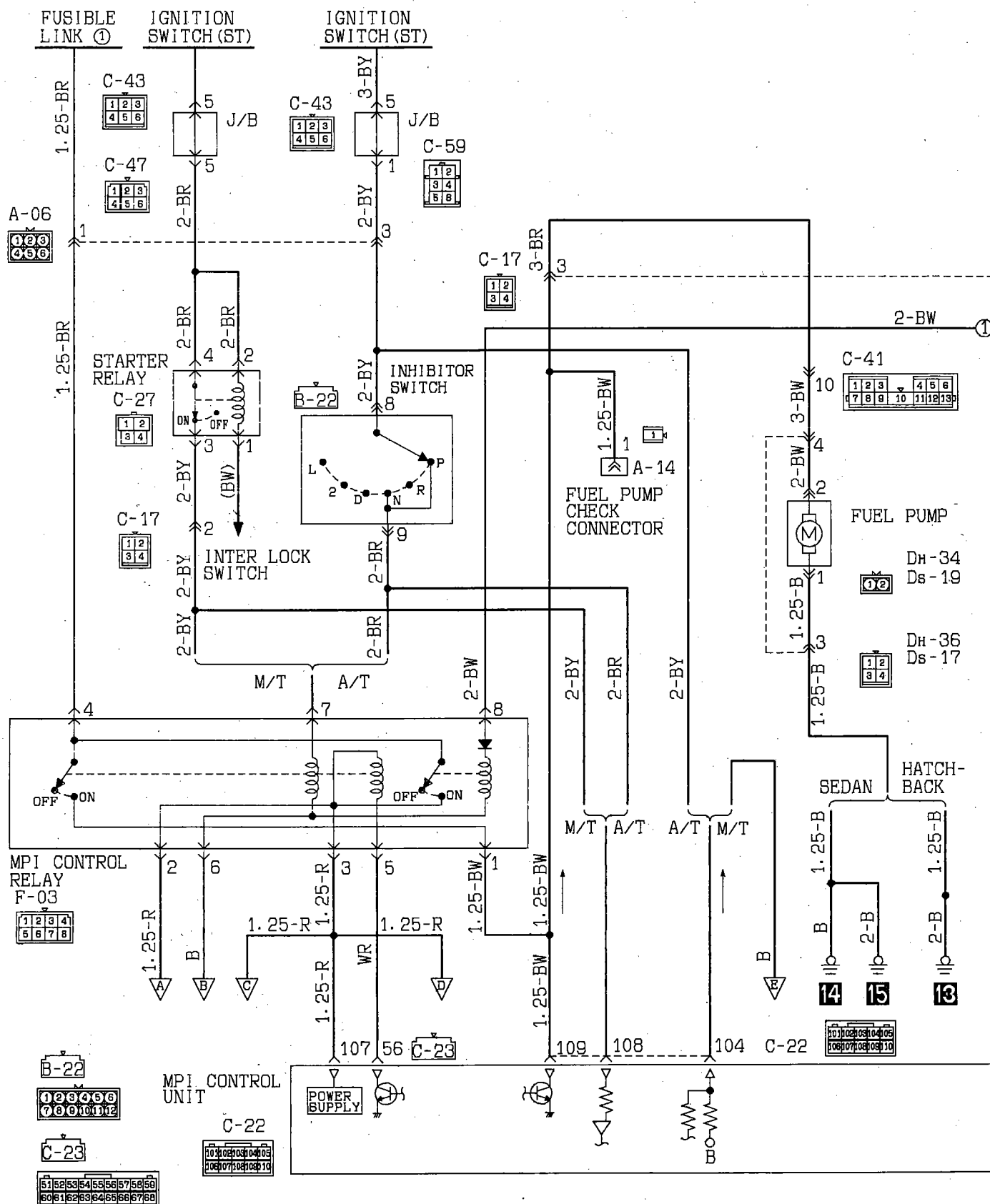
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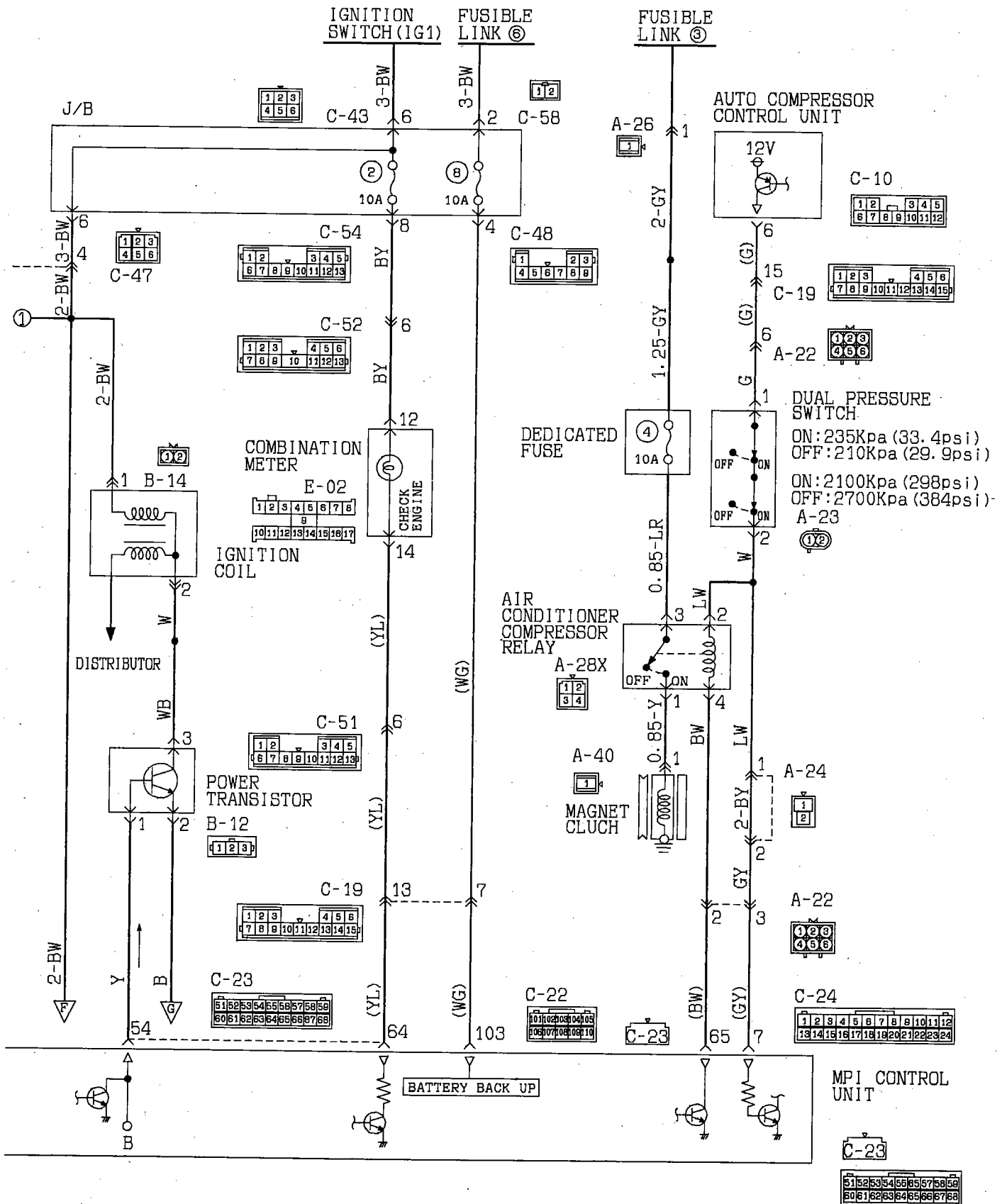
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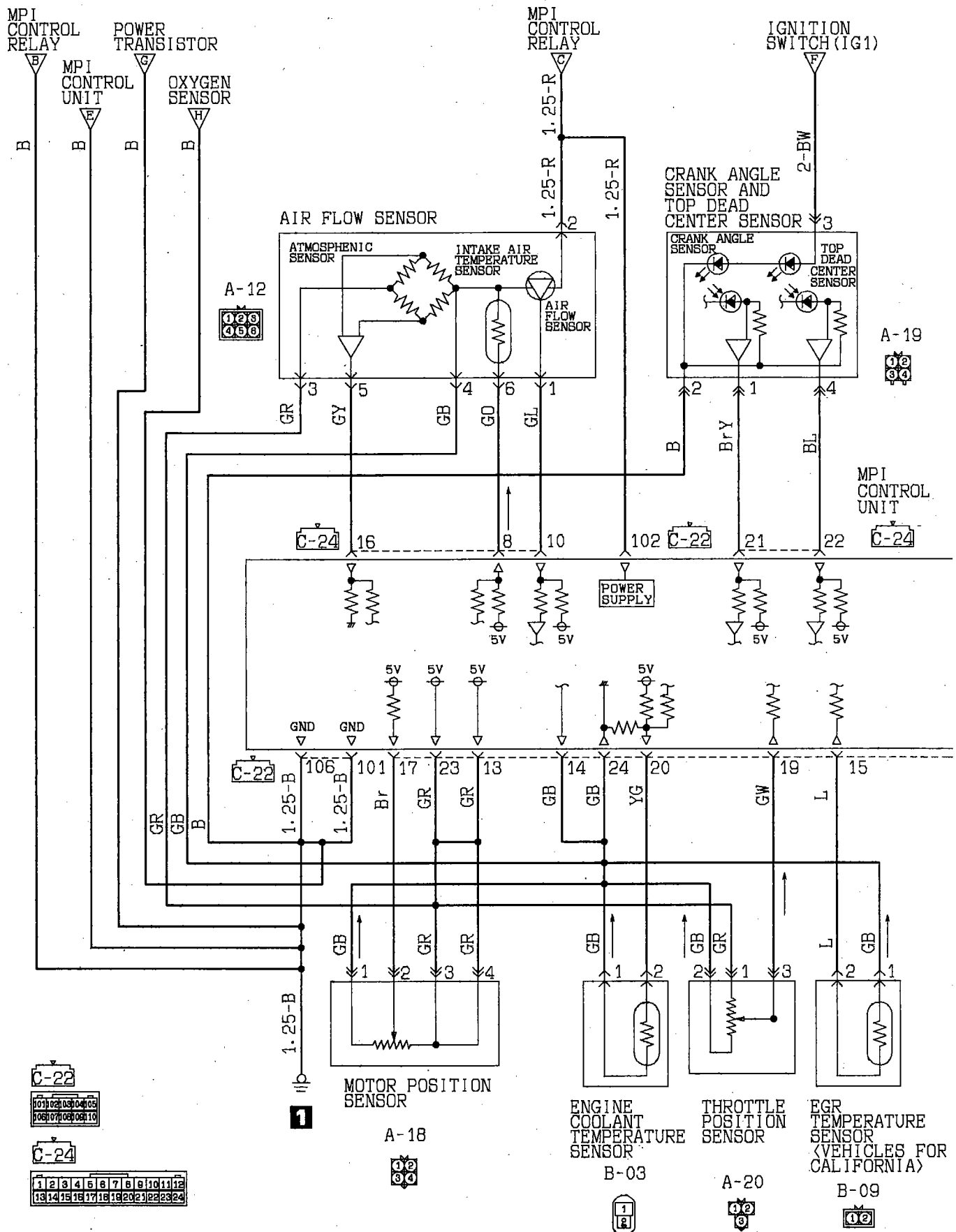
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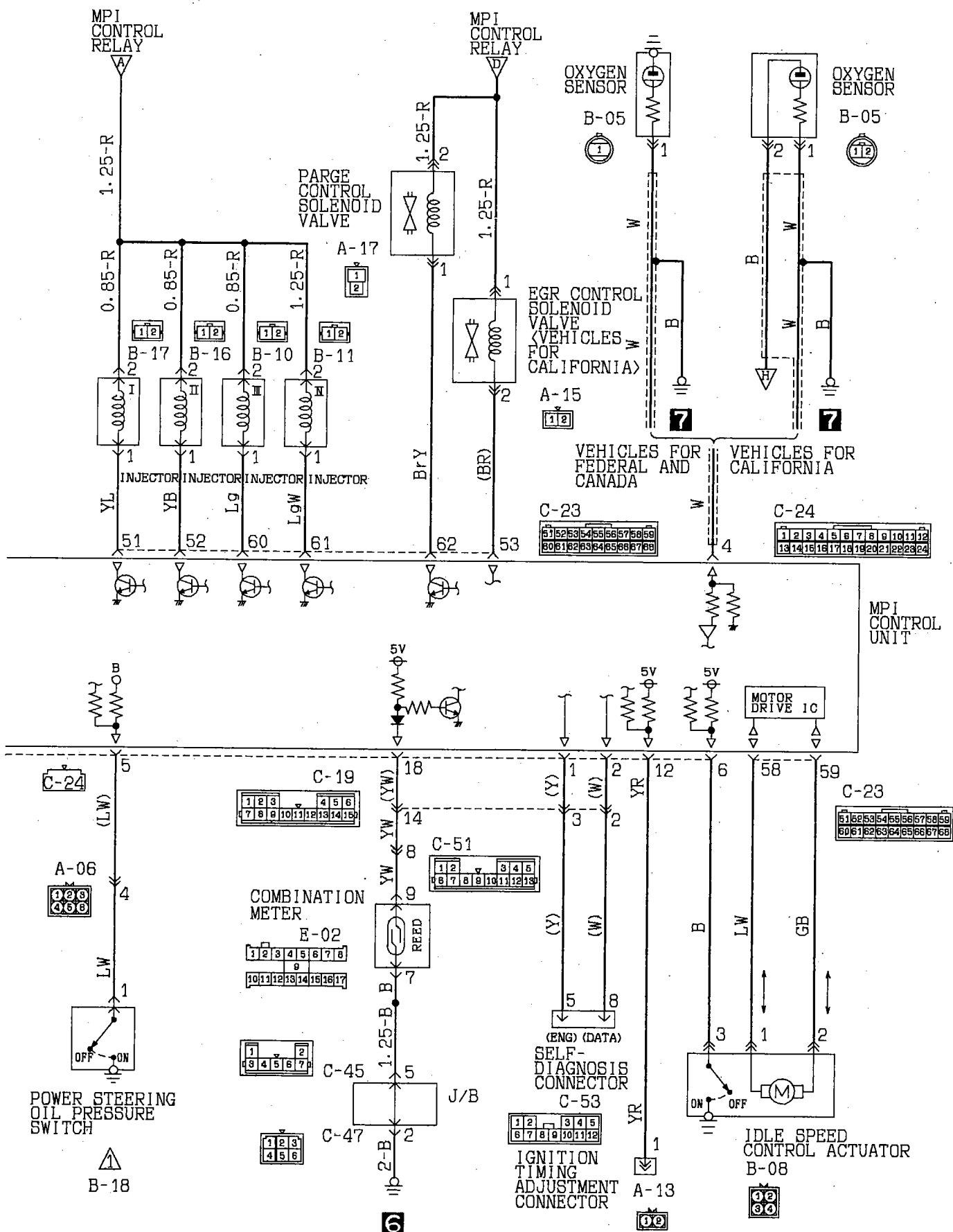
Function Functional elements		Air-fuel mixture control	Ignition timing control	Idle speed control	Air con- ditioner power relay control	Fuel pump drive control	Fuel pressure control	Purge air control	EGR control
In- put	Power supply (ignition switch coupled)	X	X	X		X	X	X	X
	Power supply (battery backup)	X	X	X				X	X
	Air flow sensor	X	X	X				X	
	Barometric pressure sensor	X	X						
	Intake air temperature sensor	X	X	X			X	X	X
	Engine coolant temperature sensor	X	X	X			X	X	X
	Throttle position sensor	X		X	X				
	Idle position switch	X	X	X					
	Top dead center sensor	X	X	X		X			
	Crank angle sensor	X	X		X				
	Oxygen sensor	X							
	Vehicle speed sensor		X	X					
	Air conditioner switch			X	X			X	
	Power steering oil pressure switch			X					
	Detonation sensor <T/C>		X						
	Ignition switch			X		X			
	Ignition switch ST terminal	X	X	X					
	Inhibitor switch <A/T>		X	X	X				
Out- put	Injector	X							
	Resistor <T/C>	X							
	Idle speed control servo			X					
	Power transistor		X						
	Air conditioner power relay				X				
	Control relay	X	X	X		X			
	Fuel pressure control valve <T/C>						X		
	Purge control solenoid valve							X	
	EGR control solenoid valve <California>								X

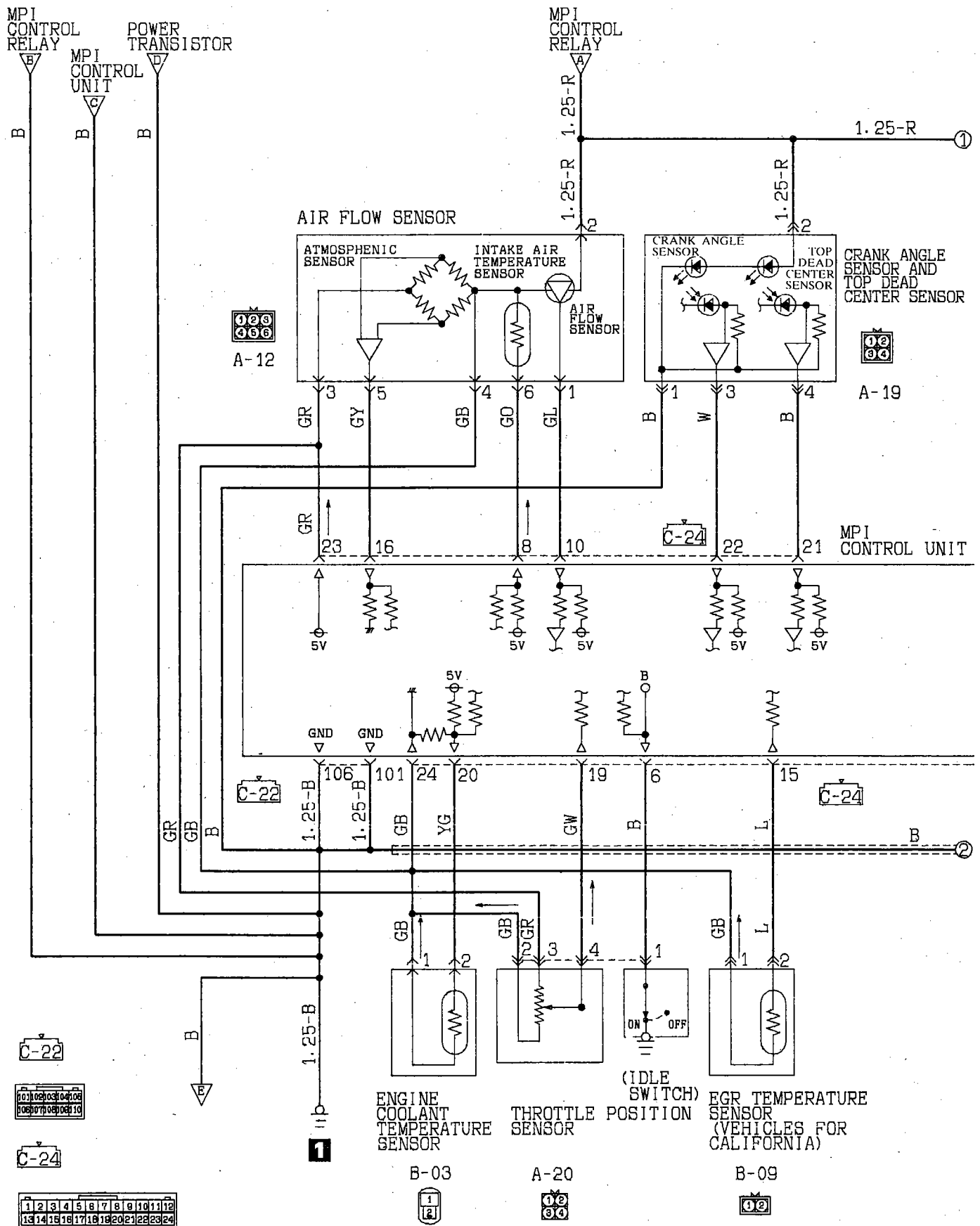
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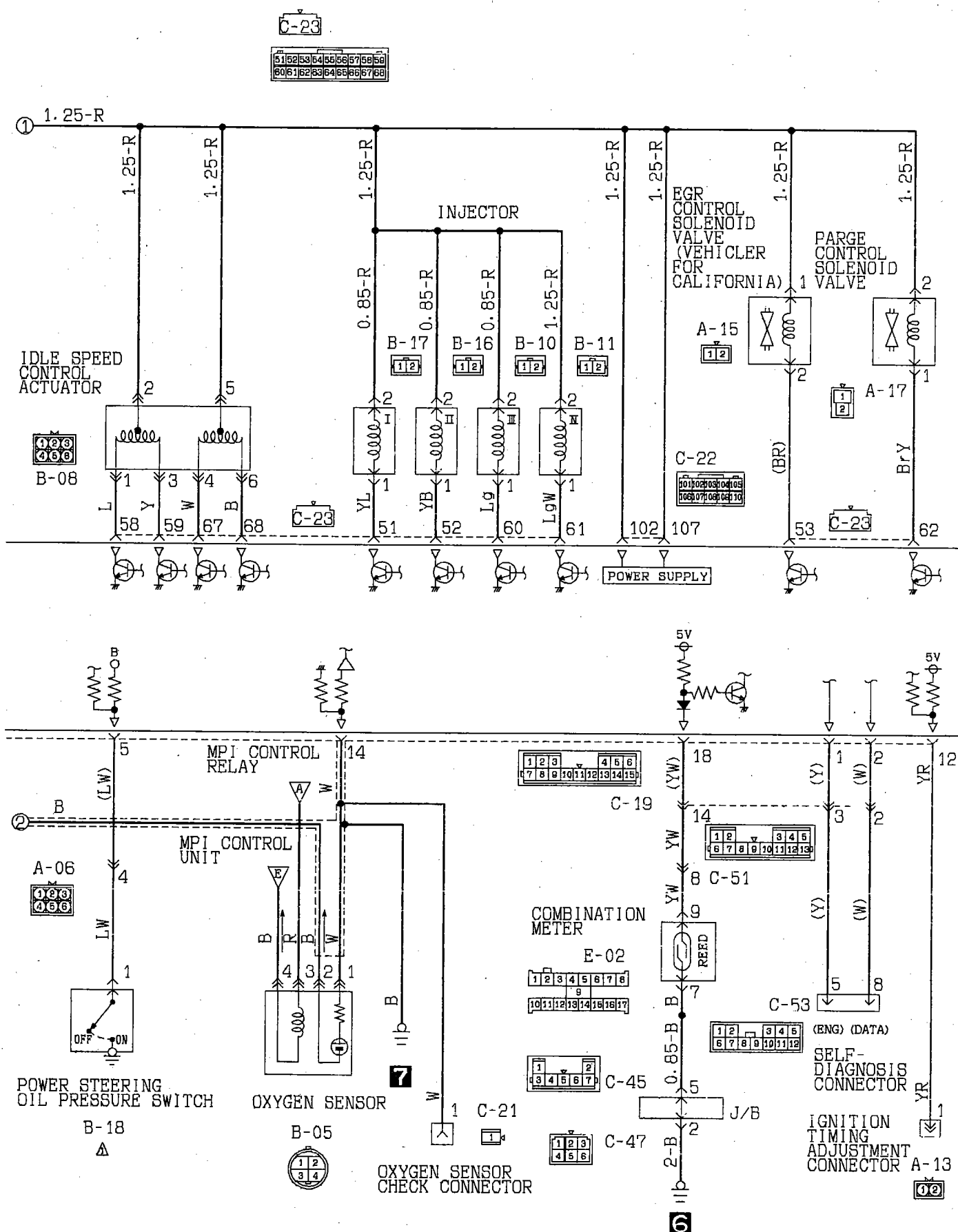


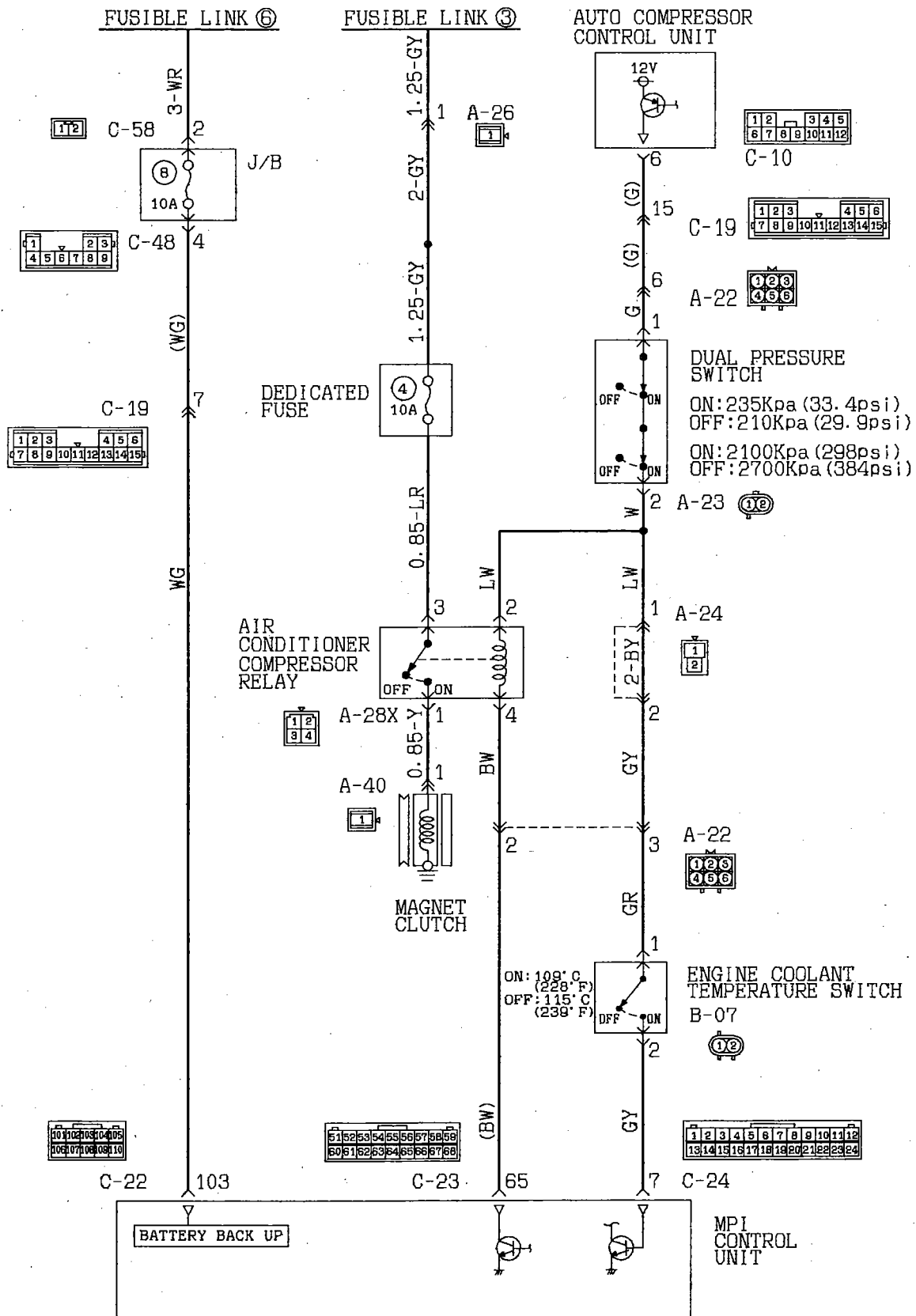






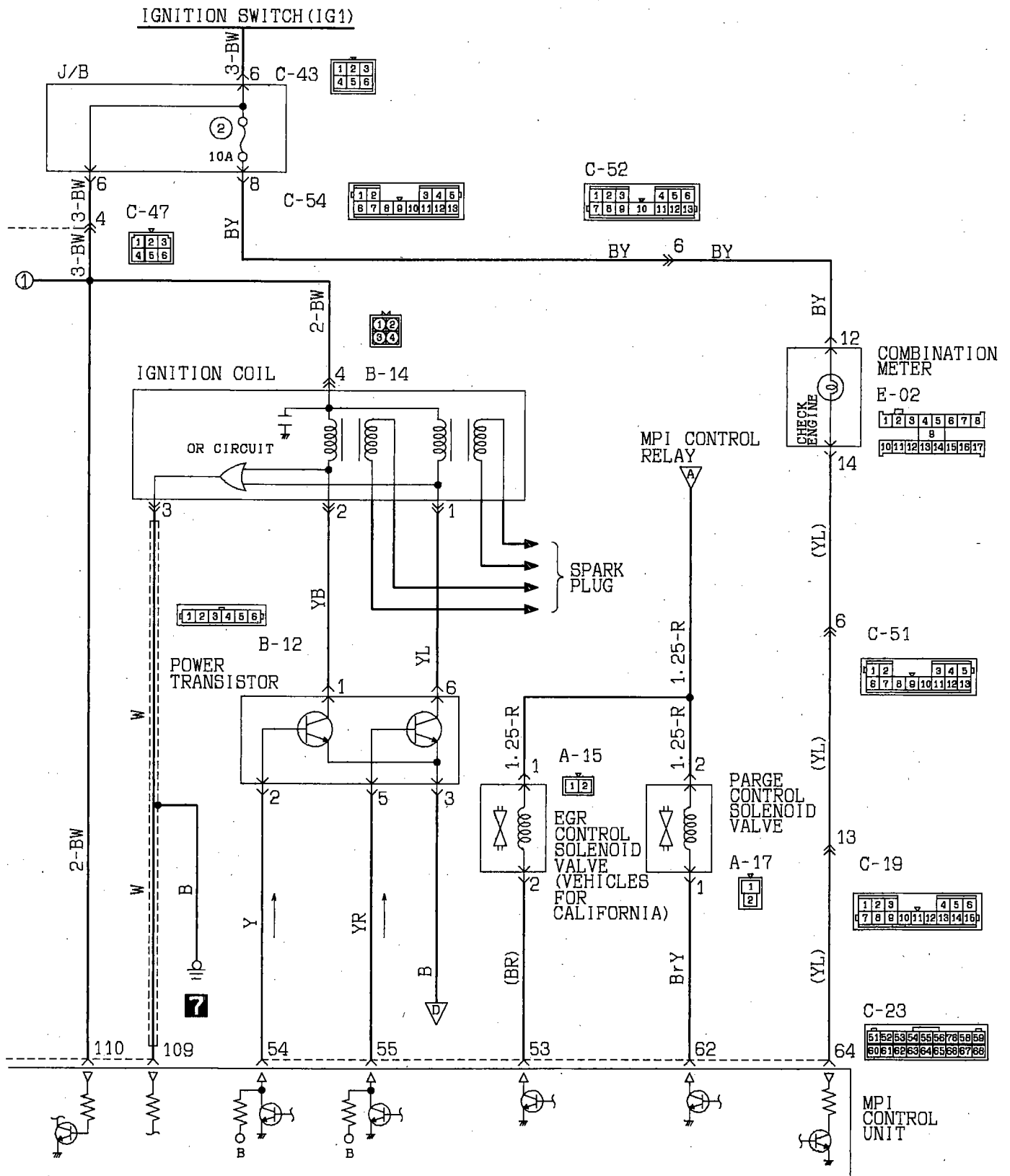


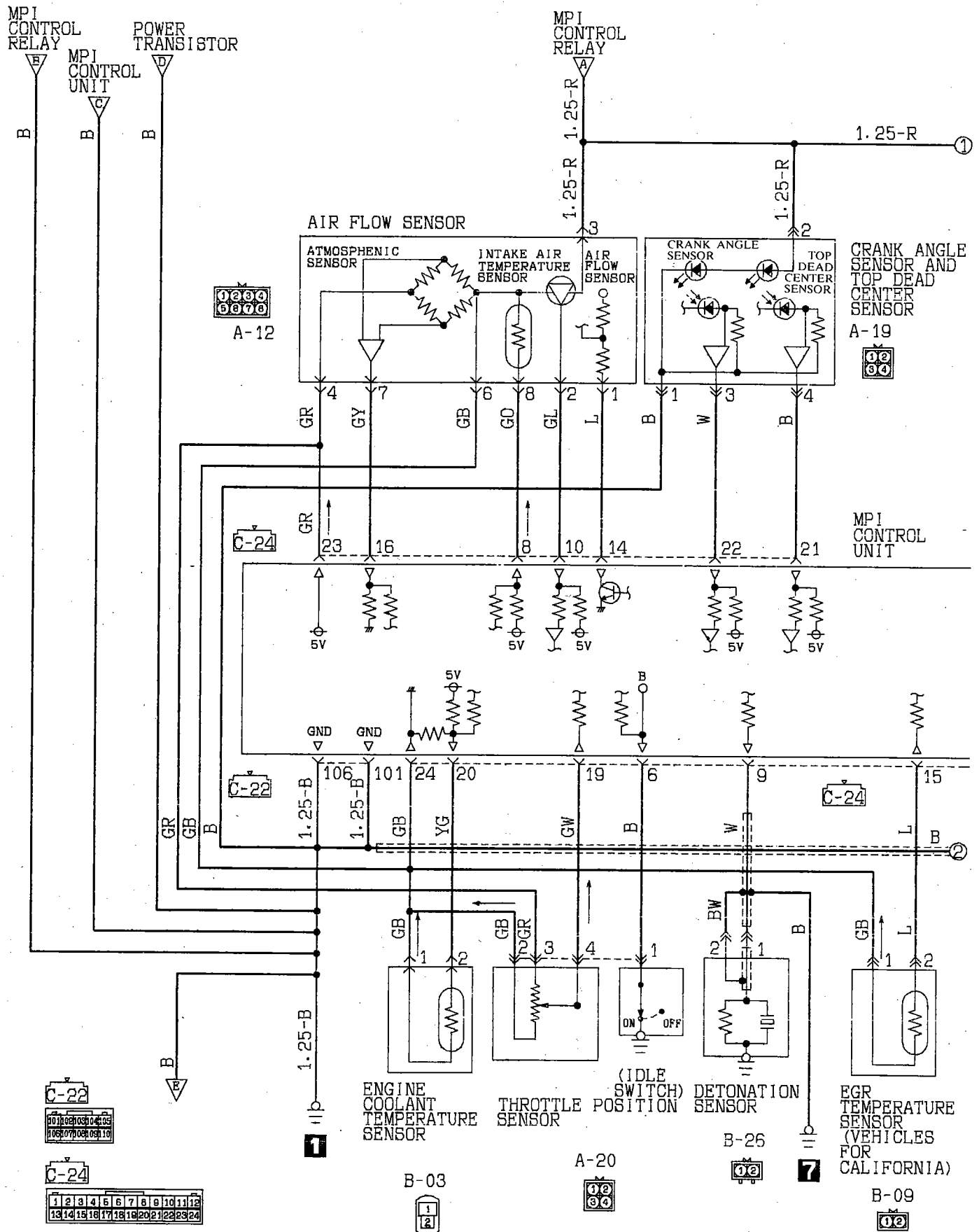


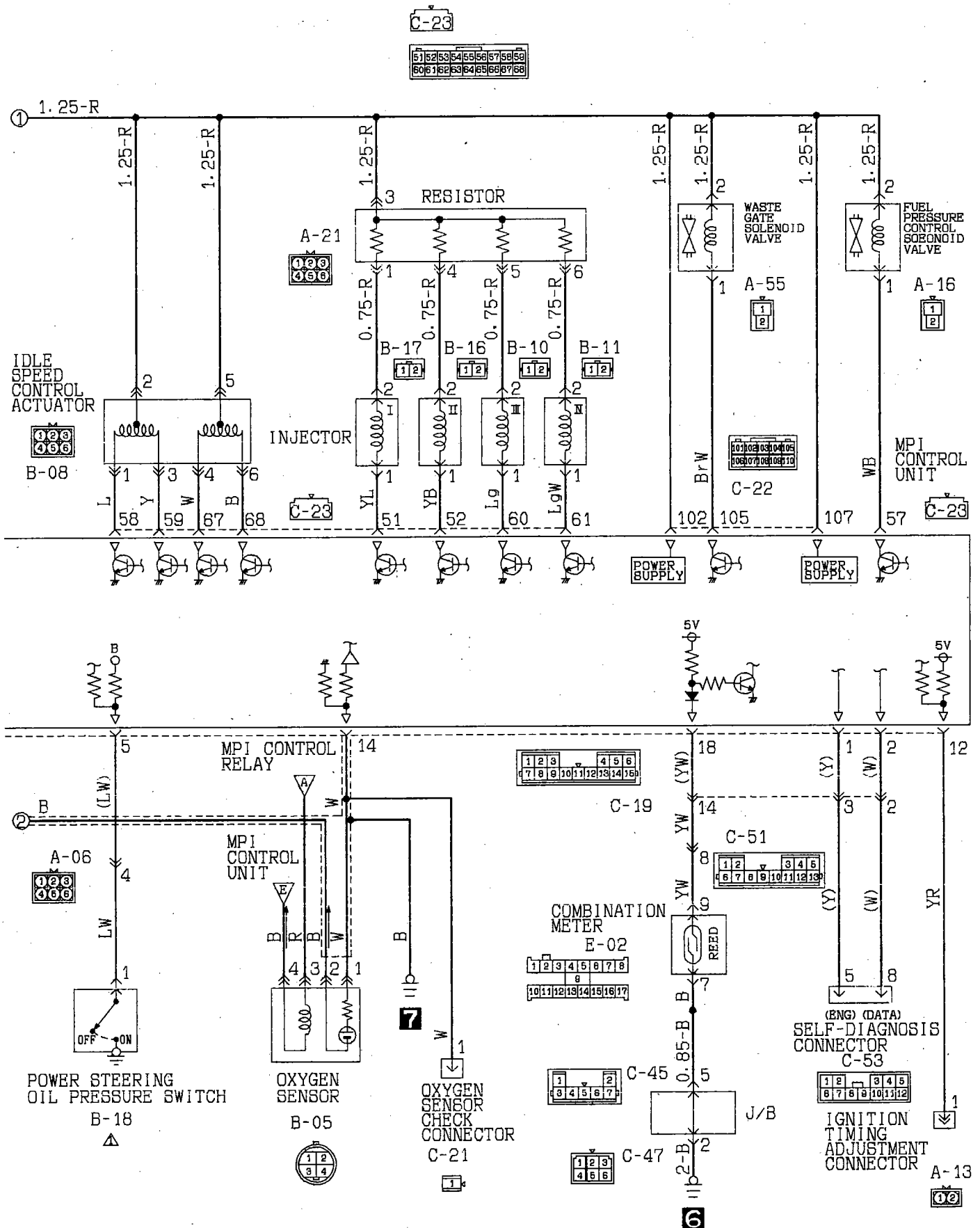


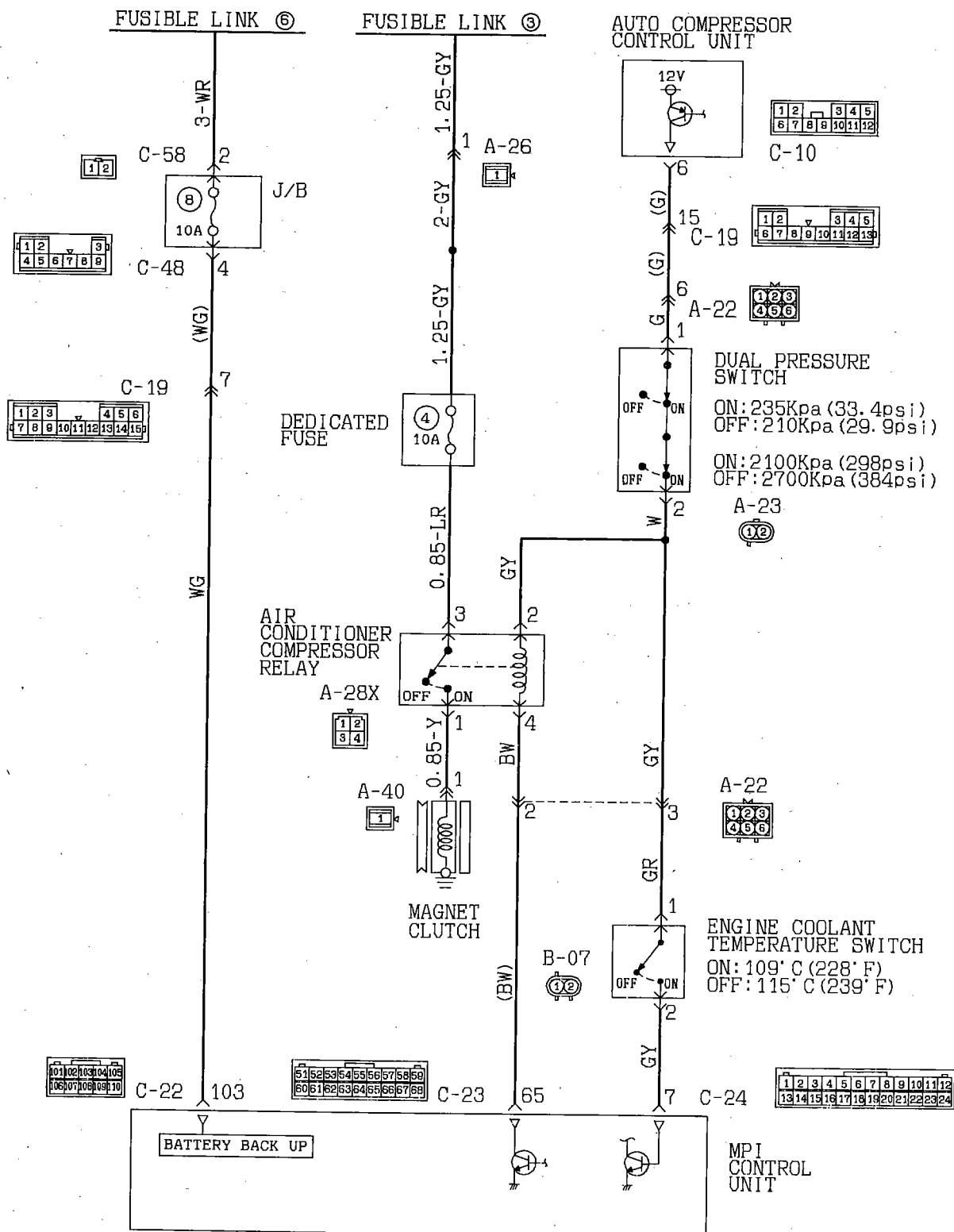
FUSIBLE LINK ① IGNITION SWITCH (ST)











FUEL TANK AND FUEL LINE

N14EAAAb2

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)	Misrouting 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

SERVICE ADJUSTMENT PROCEDURES <1.5L Engine>

N14FHAF

CURB IDLE SPEED INSPECTION

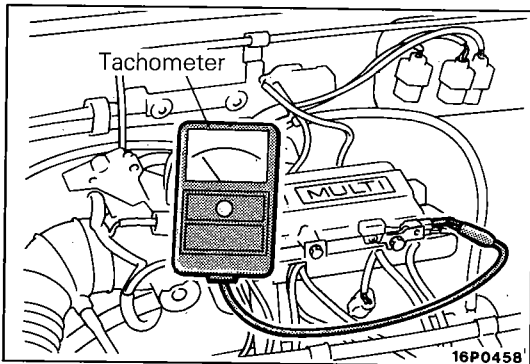
Caution

The improper setting (throttle valve 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.

Pre-conditions for inspection

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral (N or P for A/T)
- Steering wheel: Neutral position (vehicles with a power steering)

- (1) Check ignition timing and adjust if necessary. Refer to GROUP 8.



- (2) Connect a tachometer to the engine speed detection terminal.
- (3) Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
- (4) Run the engine at idle for 2 minutes.
- (5) Read the idling rpm. If it is not within the specified speed, check the idle speed control system.

Curb idle speed: 750 ± 100 rpm

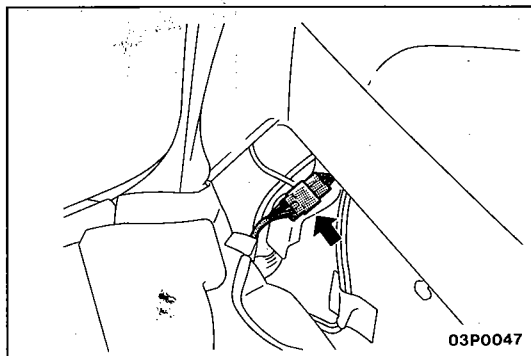
NOTE

Adjustment of the idling speed is usually unnecessary, because this system controls the idling speed.

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

N14FICF

- (1) Warm up the engine, then stop it.
- (2) Remove the air intake hose from the throttle body.
- (3) Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
- (4) Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable, slightly open the throttle valve to keep the engine running.
- (5) If the deposit on the throttle valve has not been completely removed, repeat steps (3) and (4).
- (6) Attach the air intake hose.
- (7) Disconnect the battery terminals and reconnect them more than 10 seconds later.
- (8) Adjust the idle speed control and throttle position sensor.

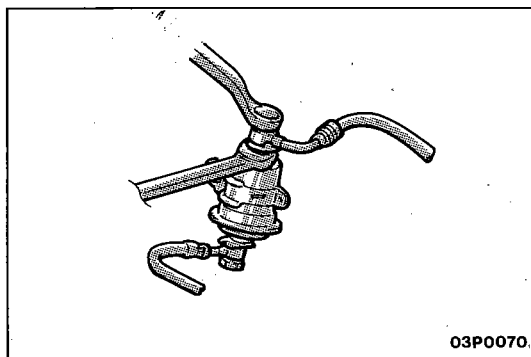


RELEASE OF RESIDUAL PRESSURE FROM HIGH PRESSURE FUEL HOSE

N14FGAD

Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.

- (1) Remove the rear seat cushion. (Refer to GROUP 23 – Rear Seat.)
- (2) Disconnect the fuel pump harness connector.
- (3) Start the engine and after it stops by itself, turn the ignition switch to OFF.
- (4) Disconnect the battery (–) terminal.
- (5) Connect the fuel pump harness connector.



FUEL FILTER REPLACEMENT

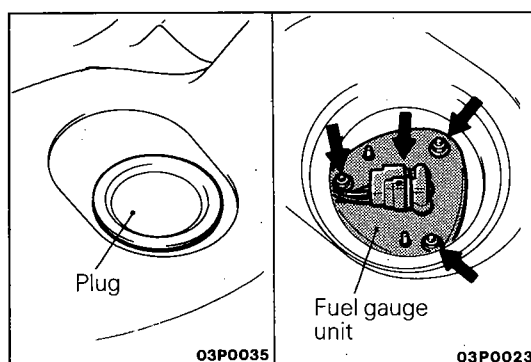
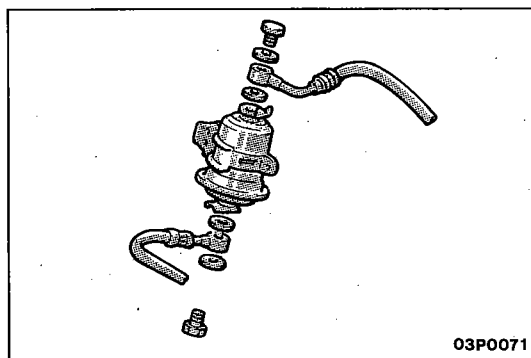
N14FCBH

- (1) Remove the air cleaner. (Refer to GROUP 11 – Air Cleaner.)
- (2) Reduce the internal pressure of the fuel pipes and hoses.
- (3) Remove the eye bolt while holding the fuel filter nut securely.

Caution

Cover with rags to avoid gasoline from splashing.

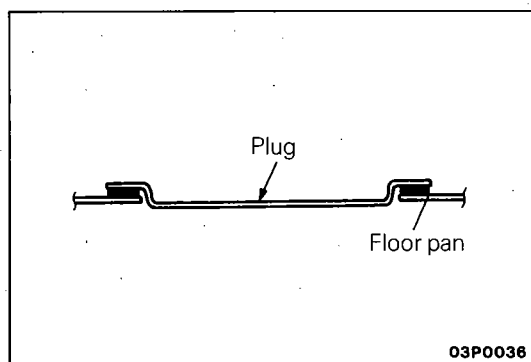
- (4) Remove the fuel filter.
- (5) When the fuel filter is remounted, use new gaskets and tighten the high pressure fuel hoses to the specified torque.
- (6) After the installation is completed, check whether or not there is fuel leakage.
 - ① Apply battery voltage to the terminal for fuel pump activation so as to actuate the fuel pump.
 - ② Check for leakage from the fuel line with fuel pressure applied.



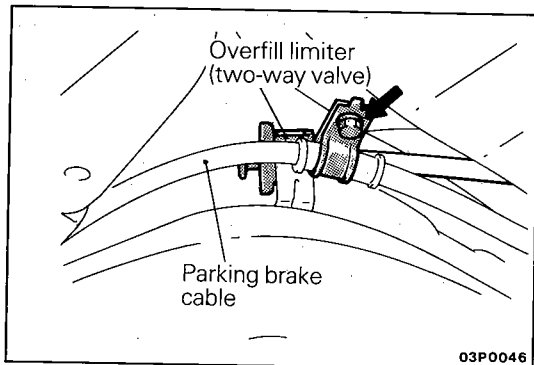
FUEL GAUGE UNIT REPLACEMENT

N14FFAG

- (1) Remove the rear seat cushion. (Refer to GROUP 23 – Rear Seat.)
- (2) Remove the plug.
- (3) Disconnect the fuel gauge unit connector and remove the fuel gauge unit.



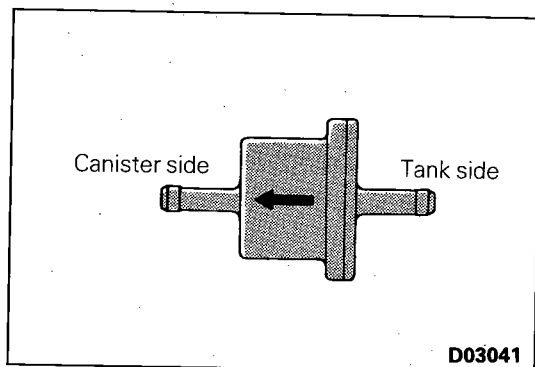
- (4) Apply a non-drying sealant between the plug and floor pan and remount the plug.



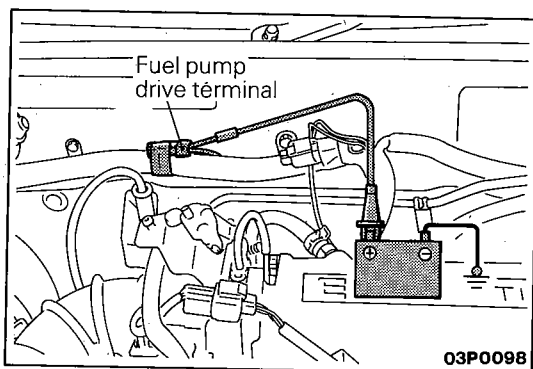
OVERFILL LIMITER (TWO-WAY VALVE) REPLACEMENT

N14FEAD

- (1) Remove the parking brake cable clamp bolt.
- (2) Remove the overfill limiter.



- (3) Mount the overfill limiter in the correct direction.



FUEL PUMP OPERATION CHECK

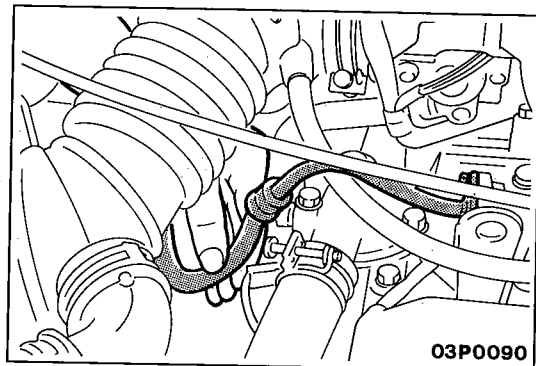
N14FDAC

- (1) Set the ignition switch at OFF.
- (2) Check that when the battery voltage is directly applied to the fuel pump drive connector, the operating sound of the pump can be heard.

NOTE

Since the fuel pump is installed in the fuel tank, its operating sound cannot be readily heard. Remove the fuel tank cap and listen to the operating sound through the filler port.

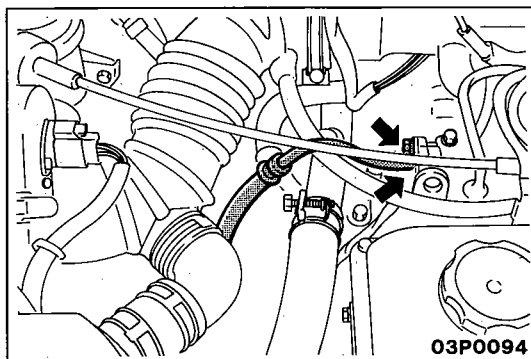
- (3) Hold the fuel hose between your fingers and check that the fuel pressure can be felt.



FUEL PRESSURE TEST

N14FNAG

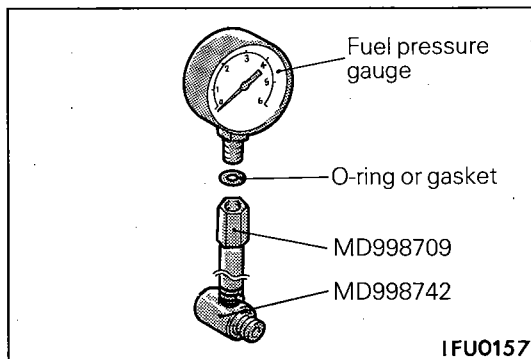
- (1) Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.
 - ① Disconnect the fuel pump harness connector at the fuel tank side.
 - ② Start the engine and after it stops by itself, turn the ignition switch to OFF.
 - ③ Disconnect the battery \ominus terminal.
 - ④ Connect the fuel pump harness connector.



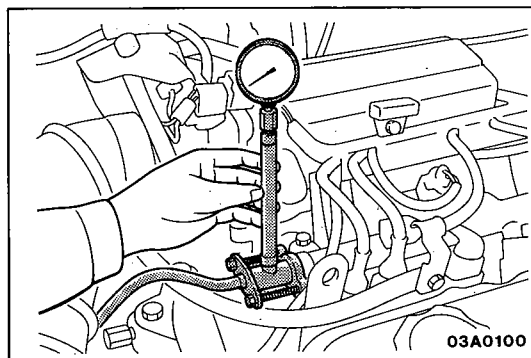
- (2) Disconnect the fuel high pressure hose at the delivery pipe side.

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.



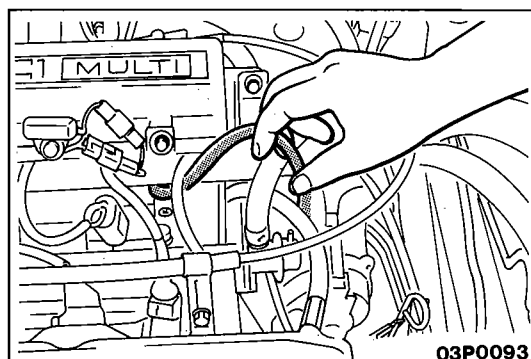
- (3) Connect a fuel pressure gauge to the special tool (adapter hose).
Use a suitable O-ring or gasket between the fuel pressure gauge and the special tool so as to seal in order to prevent fuel leakage at this time.



- (4) Install the special tool, which was set in place in step (3), between the delivery pipe and the high pressure hose.
(5) Connect the \ominus terminal of the battery.
(6) Apply battery voltage to the terminal for fuel pump drive and activate the fuel pump: then, with fuel pressure thus applied, check to be sure that there is no fuel leakage from the pressure gauge or the special tool connection part.

- (7) Start the engine and run at curb idle speed.
(8) Measure the fuel pressure when the vacuum hose is connected to the pressure regulator:

Standard value: Approx. 270 kPa (38 psi) at curb idle



- (9) Disconnect the vacuum hose from the pressure regulator and clog the vacuum hose end. Measure the fuel pressure.

Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle

- (10) Race the engine repeatedly in two or three series. Then check that the fuel pressure does not fall when the engine is running at idle.
(11) Check to be sure that there is fuel pressure in the return hose also (by gently pressing the fuel return hose with fingers while repeatedly racing the engine).

NOTE

There will be no fuel pressure in the return hose when the volume of fuel flow is not sufficient.

(12) If the results of the measurements made in steps (8) and (9) above are not within the standard value, use the table below to determine the probable cause, and then make the necessary repair.

Condition	Probable cause	Remedy
Fuel pressure too low	a. Clogged fuel filter b. Fuel leaking toward return port due to improper seating of valve in fuel pressure regulator c. Low delivery pressure of fuel pump	a. Replace fuel filter. b. Replace fuel pressure regulator. c. Replace fuel pump.
Fuel pressure too high	a. Stuck valve in fuel pressure regulator b. Clogged or bent fuel return hose or pipe	a. Replace fuel pressure regulator. b. Repair or replace hose or pipe.
Fuel pressure with vacuum hose connected not different from fuel pressure with vacuum hose not connected	a. Clogged or broken vacuum hose or nipple b. Stuck valve in fuel pressure regulator or defective valve seating	a. Repair or replace vacuum hose or nipple. b. Replace fuel pressure regulator.

(13) Stop the engine and check for changes in 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.

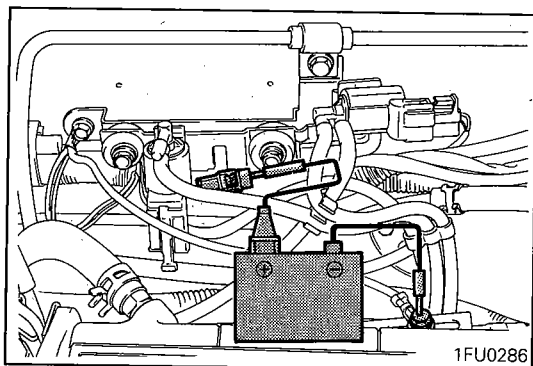
Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	Leakage from injector	Replace injector.
Fuel pressure drops immediately after engine is stopped	Check valve in fuel pump does not close.	Replace fuel pump.

(14) Reduce the fuel pressure in the fuel line.

(15) Disconnect the high pressure hose and remove the fuel pressure gauge from the delivery pipe.

Caution

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

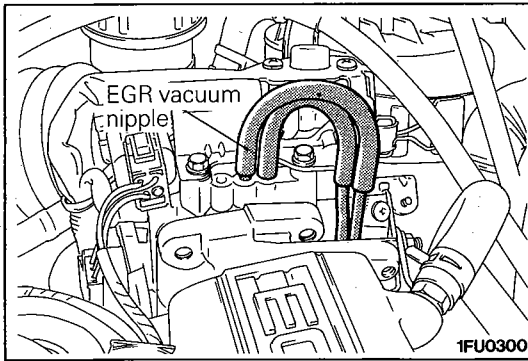


(16) Mount a new O-ring in the groove at the end of the high pressure hose.

(17) Connect the fuel high pressure hose to the delivery pipe and tighten the screws to specified torque.

(18) 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.

**EGR VALVE CONTROL VACUUM CHECK**

N14FVBB

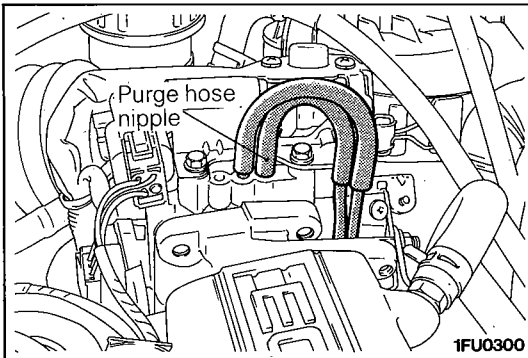
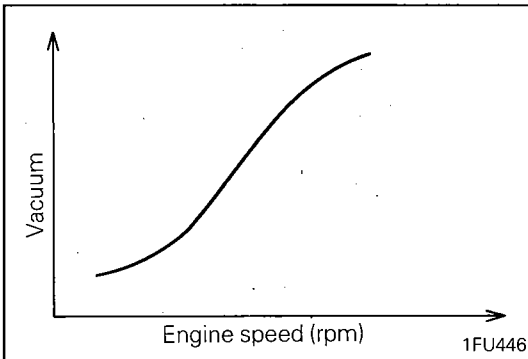
Check condition

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- (1) Disconnect the vacuum hose from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.

- (2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.

**PURGE PORT VACUUM CHECK**

N14FVBCa

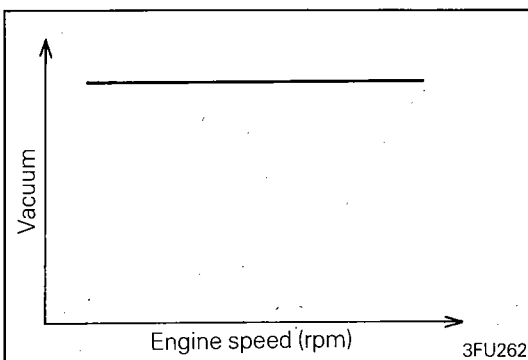
Check condition

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- (1) Disconnect the vacuum hose from the throttle body purge hose nipple and connect a hand vacuum pump to the nipple.

- (2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

NOTE

If there is no vacuum created, it is possible that the throttle body port may be clogged and require cleaning.



SERVICE ADJUSTMENT PROCEDURES <1.6L Engine>

N14FHAG

CURB IDLE SPEED INSPECTION

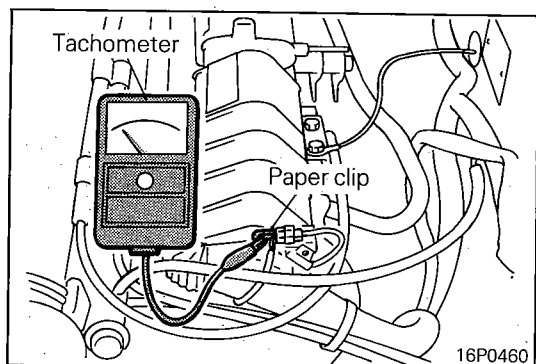
Caution

The improper setting (throttle valve 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.

Pre-conditions for inspection

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral
- Steering wheel: Neutral position (vehicles with a power steering)

- (1) Check ignition timing and adjust if necessary. Refer to GROUP 0.



16P0460

- (2) Connect a tachometer to the engine speed detection terminal.
- (3) Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
- (4) Run the engine at idle for 2 minutes.
- (5) Read the idling rpm. If it is not within the specified speed, check the idle speed control system.

Curb idle speed: 750 ± 100 rpm

NOTE

Adjustment of the idling speed is usually unnecessary, because this system controls the idling speed.

BASIC IDLE SPEED ADJUSTMENT

N14FHBC

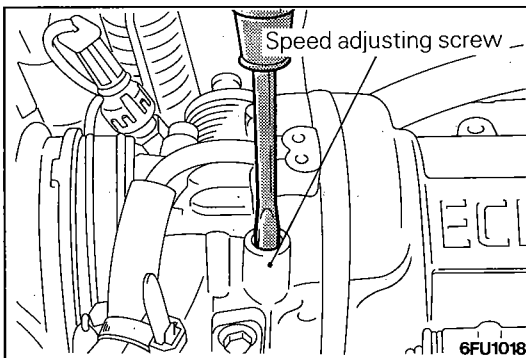
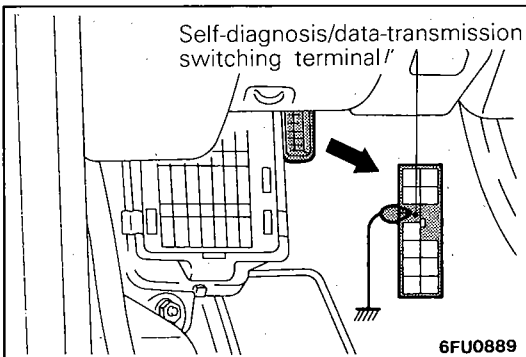
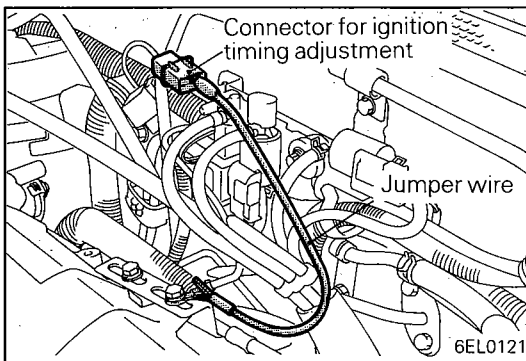
Caution

There should usually be no need to adjust the basic idle speed because it has been precisely adjusted by the manufacturer.

Pre-conditions for inspection

- Engine coolant temperature: 85 – 95°C (185 – 205°F)
- Lights, electric cooling fan and accessories
- Steering wheel: Neutral position (vehicles with a power steering)
- Transaxle: Neutral

- (1) Connect a tachometer.



- (2) Disconnect the female connector for waterproof from the connector for ignition timing adjustment.
- (3) Connect the ignition timing adjusting terminal to the ground using a jumper wire with alligator clips.

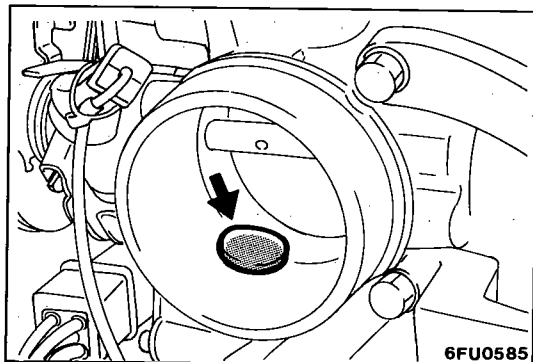
- (4) Connect terminal No. 10 of the self-diagnosis connector to the ground with a jumper wire with alligator clips.
- (5) Start the engine and let it run at idle.

- (6) Check to be sure that the engine idling speed is the basic idle speed.

Basic idle speed: 750 ± 50 rpm

If the engine speed does not conform to the basic idle speed, check whether any of the following conditions exists, and then adjust the speed adjusting screw until the engine runs at the specified basic idle speed.

- (a) The engine speed may be 20 – 100 rpm low for a new vehicle [driven about 500 km (300 miles) or less], therefore adjustment is not necessary.
 - (b) If engine stalling occurs or the engine speed is low even though the vehicle has been driven about 500 km (300 miles) or more, it is probable that there are deposits adhered to the throttle valve, so it should be cleaned. (Refer to P.14-38.)
 - (c) If the engine speed is higher than the standard value even though the speed adjusting screw is fully closed, check for any indication that the idle position switch (fixed speed adjusting screw) position has changed; if there is such an indication, adjust the idle position switch (speed adjusting screw).
If there is no evidence of a change of position, it is probable that there is leakage resulting from deterioration of the fast idle air valve, so replace the throttle body.
- (7) Turn OFF the ignition switch and stop the engine.
 - (8) Disconnect the grounding jumper wire from the diagnosis connector.
 - (9) Disconnect the grounding jumper wire from the ignition timing connector and mount a waterproof connector.
 - (10) Disconnect the tachometer.
 - (11) Start the engine once again and let it idle for about five minutes; check to be sure that the idling condition is normal.



THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

N14FIG

- (1) Warm up the engine, then stop it.
- (2) Remove the air intake hose from the throttle body.
- (3) Plug the bypass passage inlet of the throttle body.

Caution

Do not allow cleaning solvent to enter the bypass passage.

- (4) Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
- (5) Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (engine stall) slightly open the throttle valve to keep the engine running.
- (6) If the deposit on the throttle valve has not been completely removed, repeat steps (4) and (5).
- (7) Unplug the bypass passage inlet.
- (8) Attach the air intake hose.
- (9) Disconnect the battery terminals and reconnect them more than 10 seconds later.
- (10) Adjust the basic idle speed. (Refer to P.14-36.)

IDLE POSITION SWITCH ADJUSTMENT

N14FIDAa

Caution

The idle position switch has been adjusted by the manufacturer. Do not change the setting of the idle position switch carelessly. If the setting has been accidentally changed or if the idle position sensor has been replaced, set the switch by the following procedure.

- (1) Sufficiently loosen the tension of the accelerator cable.

- (2) Disconnect the connector of the idle position switch.
- (3) Loosen the lock nut of the idle position switch.
- (4) Sufficiently loosen the idle position switch by turning it in the counterclockwise direction and fully close the throttle valve.

Caution

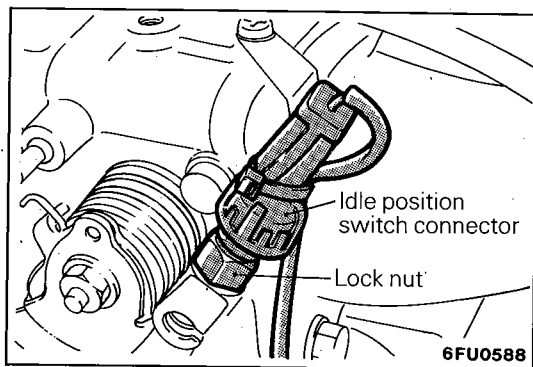
Be sure to completely close the throttle valve.

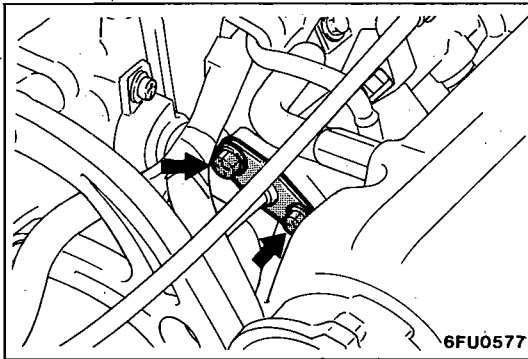
- (5) Connect a circuit tester (ohm. range) between the idle position switch terminal and the body.
- (6) Turn down the idle position switch until it enter the "ON" state where the switch establishes a continuity to body (this point is called "touch point"). Turn the switch down 15/16 of a turn more from that point.

NOTE

The "touch point" refers to the point where the throttle valve begins opening.

- (7) While holding the idle position switch to make sure that it does not turn, tighten the lock nut.
- (8) Adjust the accelerator cable. (Refer to P.14-94.)
- (9) Adjust the basic idle speed. (Refer to P.14-36.)
- (10) Setting the throttle position sensor.



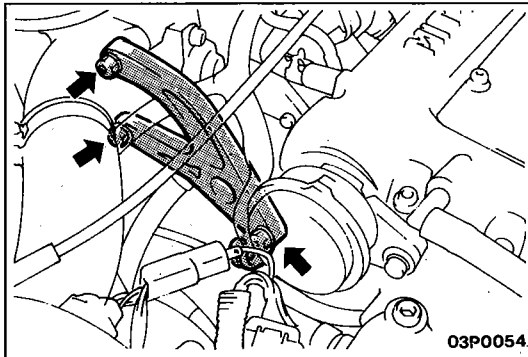
**FUEL PRESSURE TEST**

N14FNAH

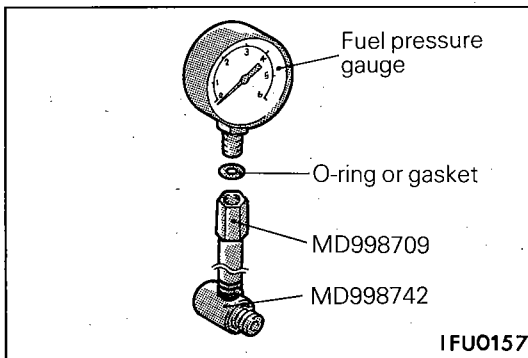
- (1) Reduce the fuel pressure in the fuel line.
(Refer to P.14-31.)
- (2) Disconnect the fuel high pressure hose from the delivery pipe.

Caution

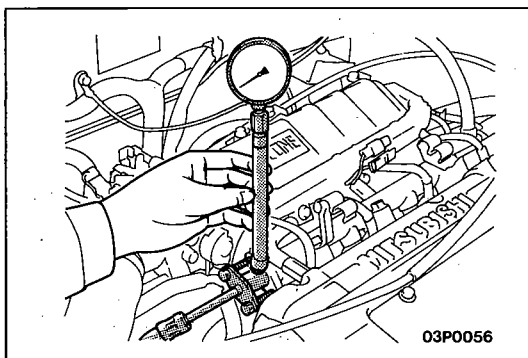
Cover the hose connection with shop towel to prevent splash of fuel that could be caused by residual pressure in the fuel pipe line.



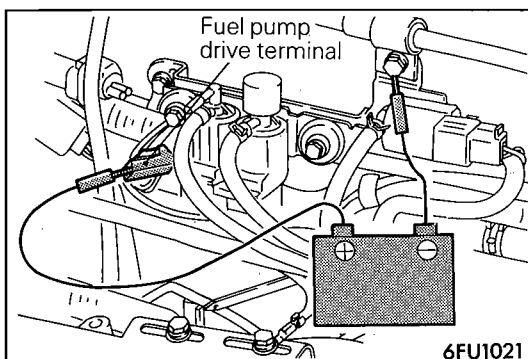
- (3) Remove the throttle body stay.



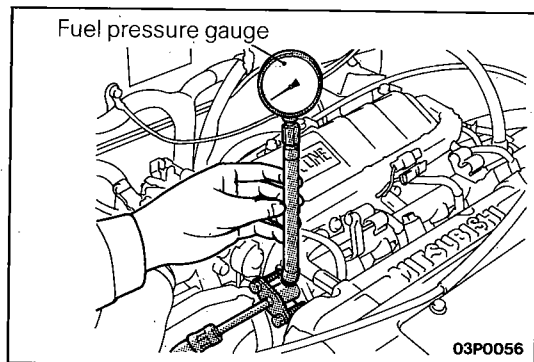
- (4) Connect a fuel pressure gauge to the special tool (adapter hose).
Use a suitable O-ring or gasket between the fuel pressure gauge and the special tool so as to seal in order to prevent fuel leakage at this time.



- (5) Install the special tool, which was set in place in step (4), between the delivery pipe and the high pressure hose.

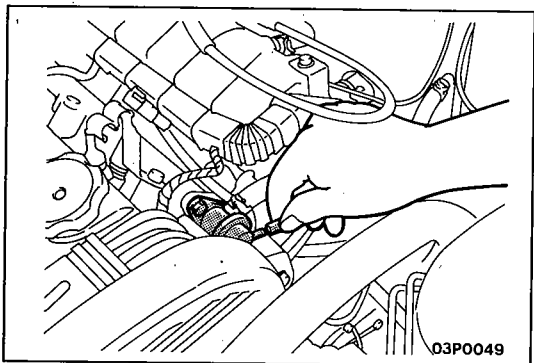


- (6) Apply battery voltage to the terminal for fuel pump drive and activate the fuel pump: then, with fuel pressure thus applied, check to be sure that there is no fuel leakage from the pressure gauge or the special tool connection part.



- (7) Start the engine and run at curb idle speed.
- (8) Measure the fuel pressure when the vacuum hose is connected to the pressure regulator:

Standard value: Approx. 270 kPa (38 psi) at curb idle



- (9) Disconnect the vacuum hose from the pressure regulator and clog the vacuum hose end. Measure the fuel pressure.

Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle

- (10) Race the engine repeatedly in two or three series. Then check that the fuel pressure does not fall when the engine is running at idle.

- (11) Check to be sure that there is fuel pressure in the return hose also (by gently pressing the fuel return hose with fingers while repeatedly racing the engine).

NOTE

There will be no fuel pressure in the return hose when the volume of fuel flow is not sufficient.

- (12) If the results of the measurements made in steps (8) and (9) above are not within the standard value, use the table below to determine the probable cause, and then make the necessary repair.

Condition	Probable cause	Remedy
Fuel pressure too low	<ol style="list-style-type: none"> a. Clogged fuel filter b. Fuel leaking toward return port due to improper seating of valve in fuel pressure regulator c. Low delivery pressure of fuel pump 	<ol style="list-style-type: none"> a. Replace fuel filter. b. Replace fuel pressure regulator. c. Replace fuel pump.
Fuel pressure too high	<ol style="list-style-type: none"> a. Stuck valve in fuel pressure regulator b. Clogged or bent fuel return hose or pipe 	<ol style="list-style-type: none"> a. Replace fuel pressure regulator. b. Repair or replace hose or pipe.
Fuel pressure with vacuum hose connected not different from fuel pressure with vacuum hose not connected	<ol style="list-style-type: none"> a. Clogged or broken vacuum hose or nipple b. Stuck valve or defective seating of valve in fuel pressure regulator 	<ol style="list-style-type: none"> a. Repair or replace vacuum hose or nipple. b. Replace fuel pressure regulator.

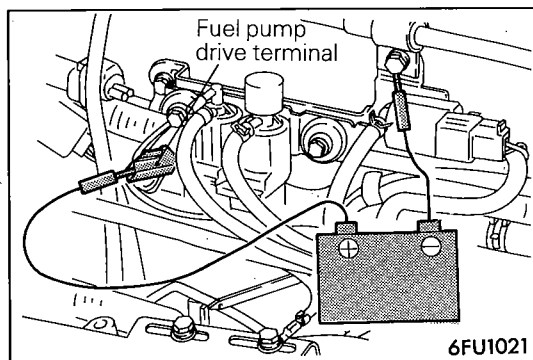
- (13) Stop the engine and check for changes in fuel pressure gauge indication, which should not drop.
If the gauge indication drops, observe the rate of drop and determine and remove the causes according to the following table.

Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	Leakage from injector	Replace injector.
Fuel pressure drops immediately after engine is stopped	Check valve in fuel pump does not close.	Replace fuel pump.

- (14) Reduce the fuel pressure in the fuel line.
(15) Disconnect the high pressure hose and remove the fuel pressure gauge from the delivery pipe.

Caution

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

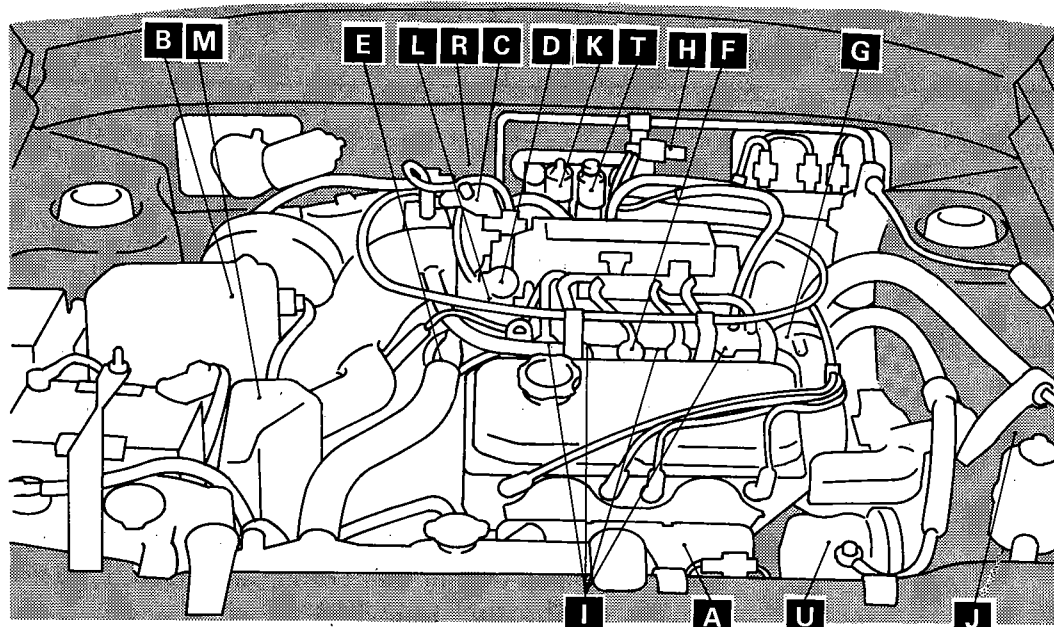


- (16) Mount a new O-ring in the groove at the end of the high pressure hose.
(17) Connect the fuel high pressure hose to the delivery pipe and tighten the screws to the specified torque.
(18) Check for fuel leaks.
① Apply battery voltage to the fuel pump terminal to operate the fuel pump.
② With fuel pressure acting, check the fuel line for leaks.

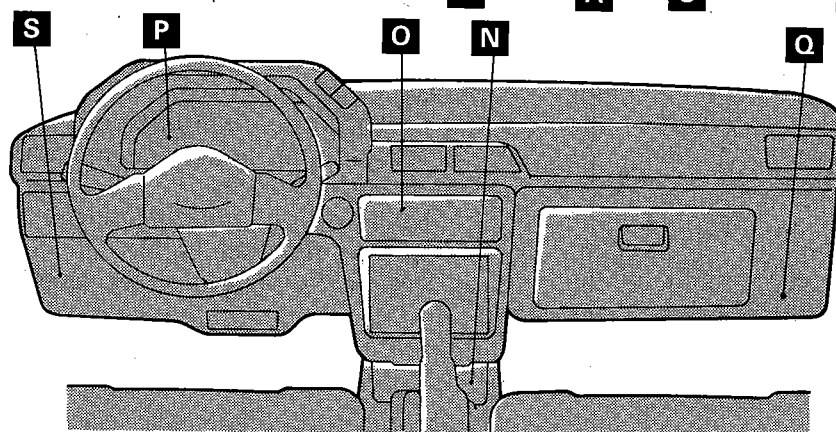
MPI SYSTEM INSPECTION <1.5L Engine>

N141B-A

COMPONENTS LOCATION



1FU0287



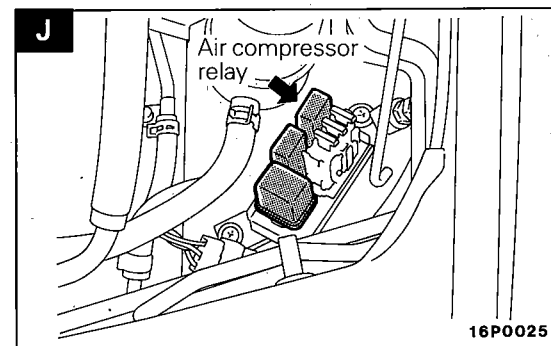
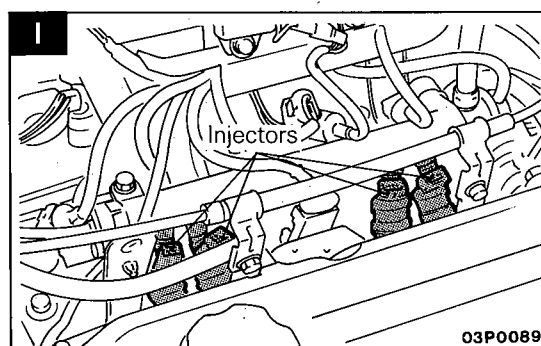
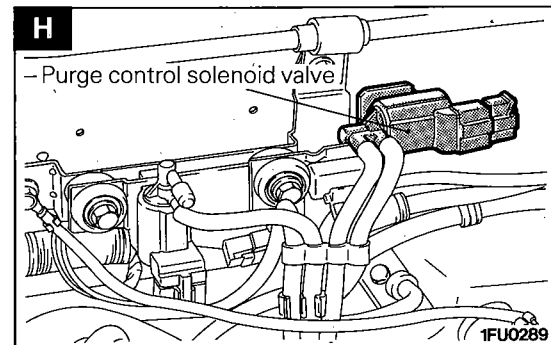
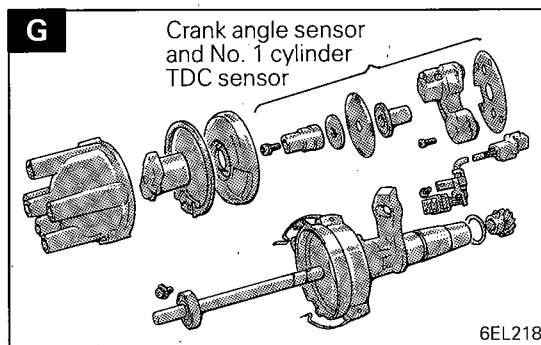
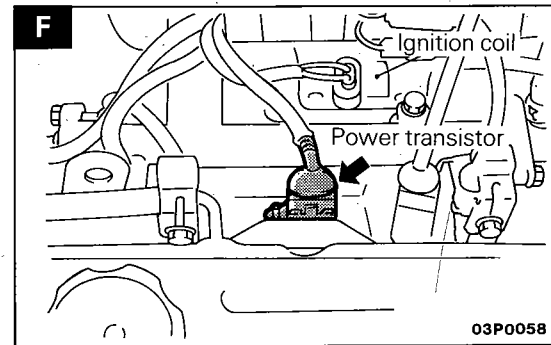
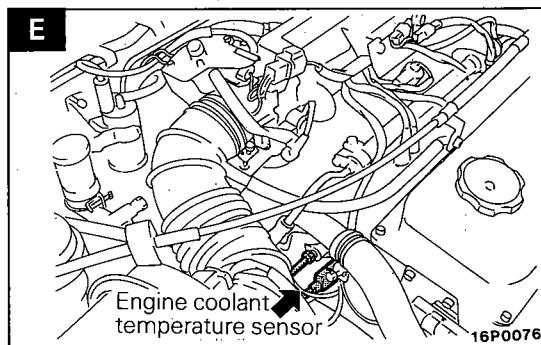
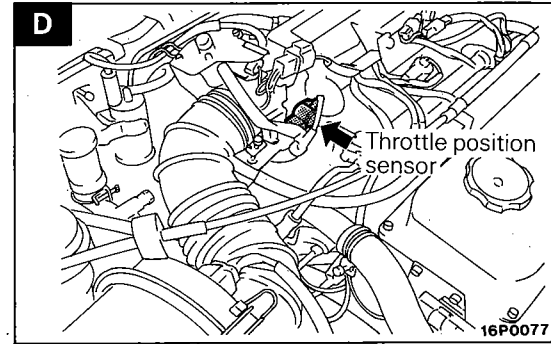
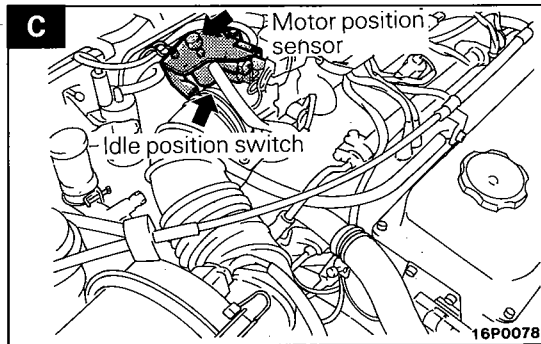
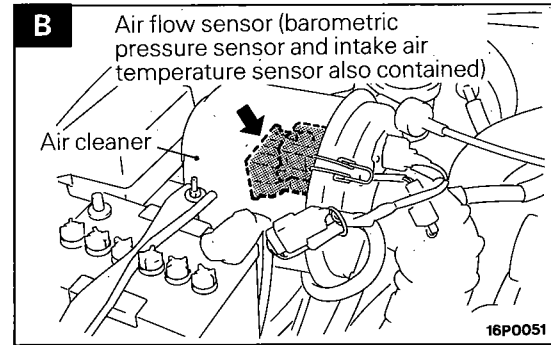
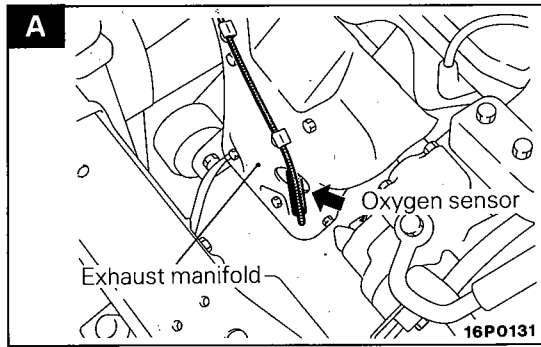
1FU0288

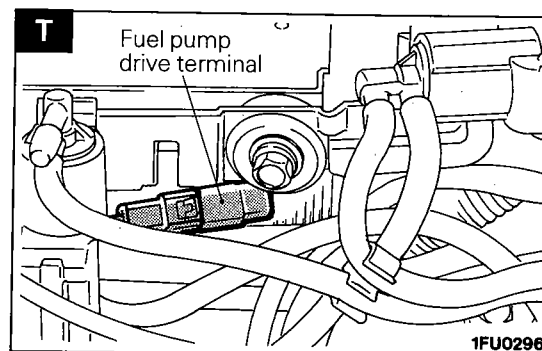
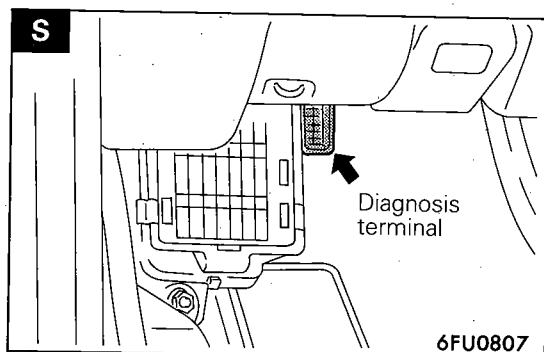
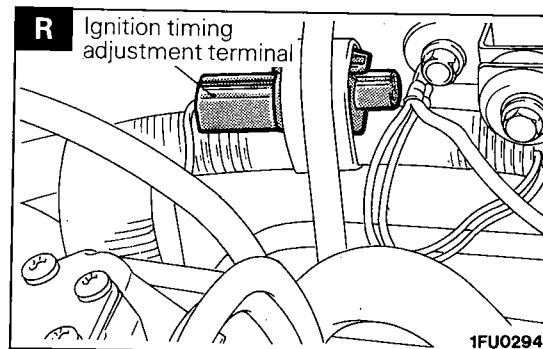
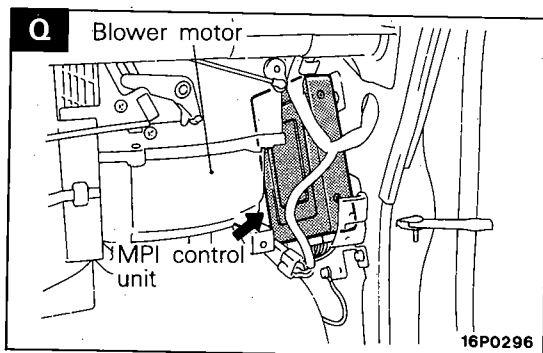
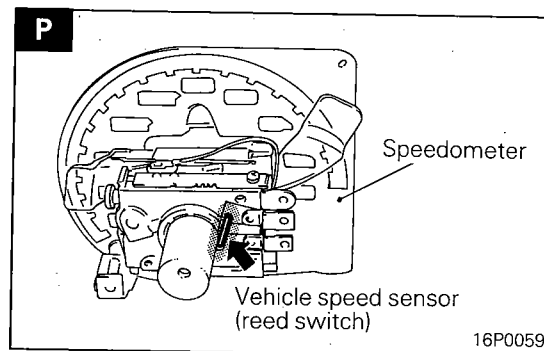
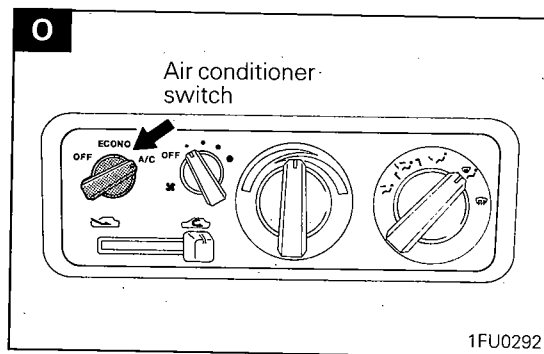
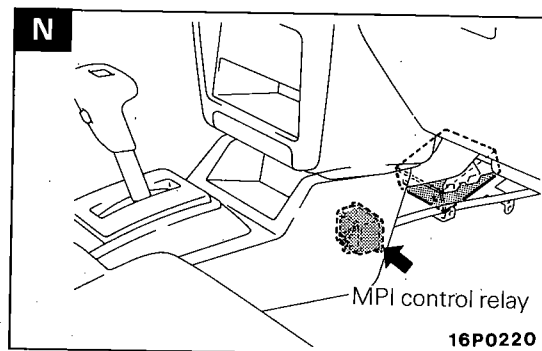
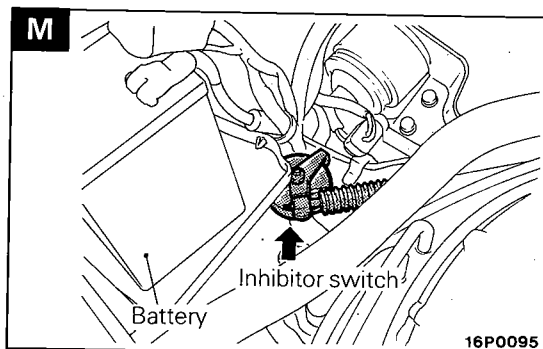
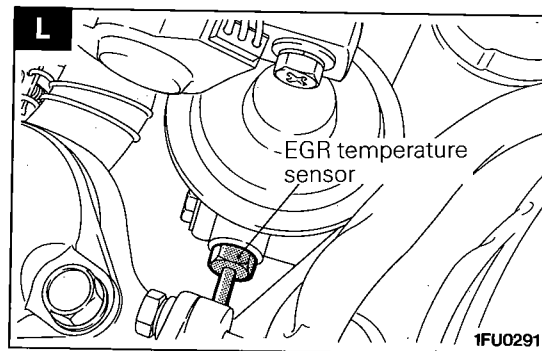
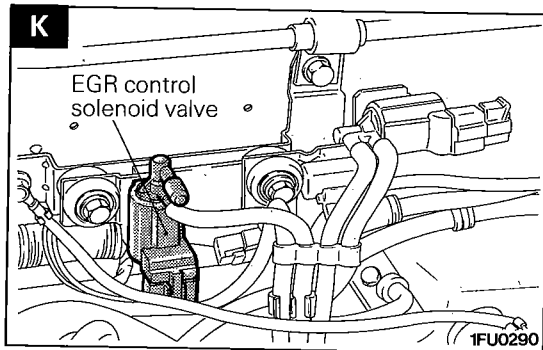
Name	Symbol	Name	Symbol
Air conditioner relay	J	Ignition coil (power transistor)	F
Air conditioner switch	O	Ignition timing adjustment terminal	R
Air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	B	Inhibitor switch <A/T>	M
Crank angle sensor and No. 1 cylinder TDC sensor	G	Injector	I
Diagnosis terminal	S	MPI control relay	N
EGR control solenoid valve*	K	Oxygen sensor	A
EGR temperature sensor*	L	Power steering oil pressure switch	U
Engine control unit	Q	Purge control solenoid valve	H
Engine coolant temperature sensor	E	Throttle position sensor	D
Fuel pump drive terminal	T	Vehicle speed sensor (reed switch)	P
Idle speed control servo (idle position switch, motor position sensor)	C	—	—

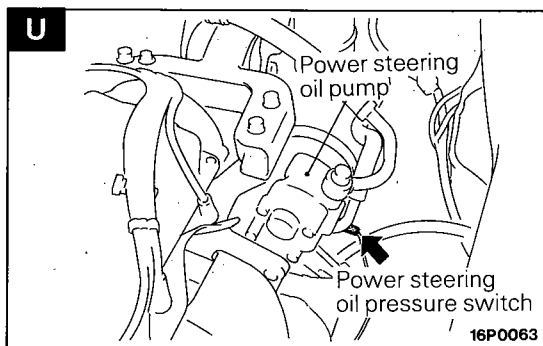
NOTE

*: <California>

The "Name" column is arranged in alphabetical order.







MALFUNCTION INDICATOR LIGHT

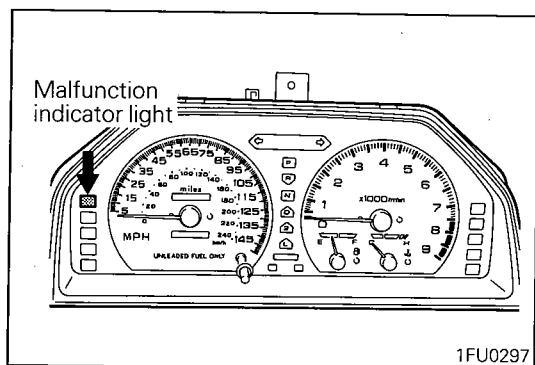
N14PQABa

Among the self-diagnosis items, a malfunction indicator light comes on to notify the driver of the emission control items when an irregularity is detected.

However, when an irregular signal returns to normal and the engine control unit judges that it has returned to normal, the malfunction indicator light goes out.

Moreover, when the ignition switch is turned off, the light goes out. Even if the ignition switch is turned on again, the light does not come on until the irregularity is detected.

Here, immediately after the ignition switch is turn on, the malfunction indicator light is lit for 2.5 seconds to indicate that the malfunction indicator light operates normally.



1FU0297

Items indicated by the lightening malfunction light

Computer
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Motor position sensor
Engine coolant temperature sensor
Crank angle sensor
No. 1 cylinder TDC sensor
Barometric pressure sensor
Injector
Fuel pump
EGR*

NOTE

*: <California>

MALFUNCTION INDICATOR LIGHT INSPECTION

When turning on the ignition switch, check that the light comes on.

NOTE

If the light does not come on, check the harness and light for breakage.

SELF-DIAGNOSIS

N14PAAFa

The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored. Passing a certain number, the engine control unit judges that an irregularity has occurred, memorizes the trouble code, and outputs the signal to the self-diagnosis output terminal.

There are 13 diagnosis items, and the diagnosis results can be read out with a voltmeter.

Moreover, since memorization of the trouble codes is backed up directly by the battery, the diagnosis results are memorized even if the ignition key is turned off. The trouble codes will, however, be erased when the battery terminal or the engine control unit connector is disconnected.

Caution

If the sensor connector is disconnected with the ignition switch turned on, the diagnosis code is memorized. In this case, disconnect the battery terminal (–) for 10 seconds or more, and the diagnosis memory will be erased.

The 13 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Malfunction code	Diagnosis item	Malfunction code	Diagnosis item
11	Oxygen sensor	23	No. 1 cylinder TDC sensor
12	Air flow sensor	24	Vehicle speed sensor (reed switch)
13	Intake air temperature sensor	25	Barometric pressure sensor
14	Throttle position sensor	41	Injector
15	Motor position sensor	42	Fuel pump
21	Engine coolant temperature sensor	43	EGR*
22	Crank angle sensor	–	–

NOTE

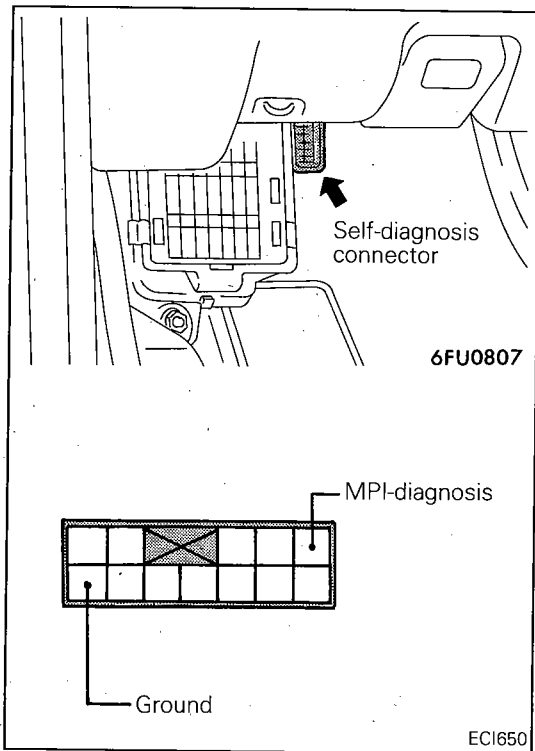
*: <California>

CHECK PROCEDURE (SELF-DIAGNOSIS)

N14PCA1

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 engine control unit connector is disconnected. Do not disconnect the battery before the diagnosis result is completely read.
- (3) After check and correction are over, disconnect ground cable for 10 seconds or more from negative terminal of battery and connect it again to make sure that failure code is erased.



INSPECTION PROCEDURE – USING VOLTMETER






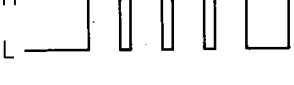
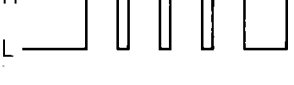


N14PCAG1a

- (1) Connect an analogue voltmeter to the self-diagnosis connector.
- (2) Turn ignition switch to ON, and indication of engine control unit memory contents will immediately start. If the system is in normal condition, pointer of voltmeter indicates normal pattern. If any abnormality is in memory, the pointer of voltmeter will deflect, indicating abnormal item as described in "Diagnosis Chart".
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 the negative terminal of battery cable for 10 seconds or more and connect it again to make sure that the abnormal code has been erased.

DIAGNOSIS CHART (FAULT TREE)

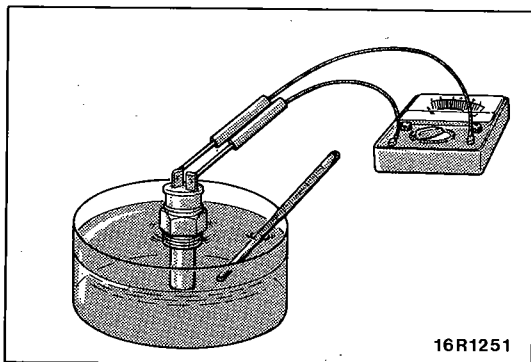
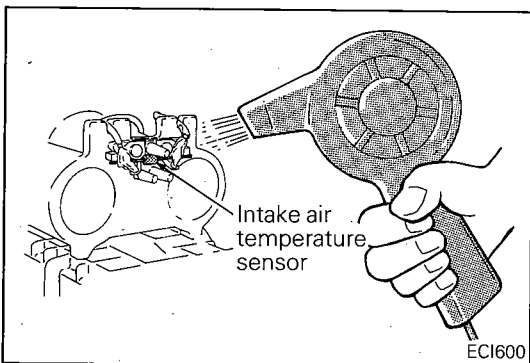
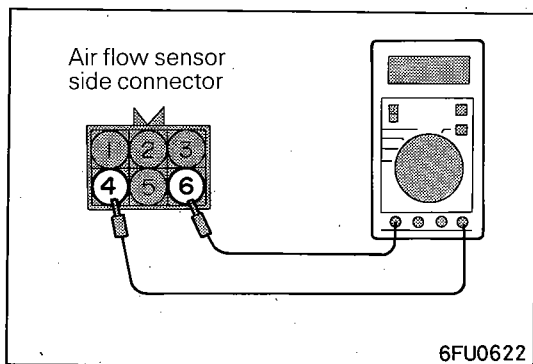
N14PRAC

Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control unit	<p>12A0104</p>	—	—	(Replace engine control unit)
2	Oxygen sensor	<p>12A0104</p>	11	Retained	<ul style="list-style-type: none"> • Harness and connector • Fuel pressure • Injectors (Replace if defective) • Intake air leaks • Oxygen sensor
3	Air flow sensor	<p>12A0104</p>	12	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	<p>12A0104</p>	13	Retained	<ul style="list-style-type: none"> • Harness and connector • Intake air temperature sensor
5	Throttle position sensor	<p>12A0104</p>	14	Retained	<ul style="list-style-type: none"> • Harness and connector • Throttle position sensor • Idle position switch
6	Motor position sensor	<p>12A0104</p>	15	Retained	<ul style="list-style-type: none"> • Harness and connector • Motor position sensor

Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
7	Engine coolant temperature sensor	 12A0107	21	Retained	<ul style="list-style-type: none"> • Harness and connector • Engine coolant temperature sensor
8	Crank angle sensor	 12A0107	22	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace distributor assembly.)
9	No. 1 cylinder top dead center sensor	 12A0107	23	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace distributor assembly.)
10	Vehicle speed sensor (reed switch)	 12A0107	24	Retained	<ul style="list-style-type: none"> • Harness and connector • Vehicle speed sensor (reed switch)
11	Barometric pressure sensor	 12A0107	25	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)
12	Injector	 12A0105	41	Retained	<ul style="list-style-type: none"> • Harness and connector • Injector coil resistance
13	Fuel pump	 12A0105	42	Retained	<ul style="list-style-type: none"> • Harness and connector • Control relay
14	EGR*	 12A0105	43	Retained	<ul style="list-style-type: none"> • Harness and connector • EGR thermo sensor • EGR valve • EGR valve control solenoid valve • EGR valve control vacuum
15	Normal state	 12A0104	—	—	—

NOTE

1. Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items.
2. *: <California>



INTAKE AIR TEMPERATURE SENSOR INSPECTION

N14QHAB1

- (1) Disconnect the air flow sensor connectors.
- (2) Measure resistance between terminals ④ and ⑥.

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 °C (°F)	Resistance kΩ
Higher	Smaller

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

ENGINE COOLANT TEMPERATURE SENSOR

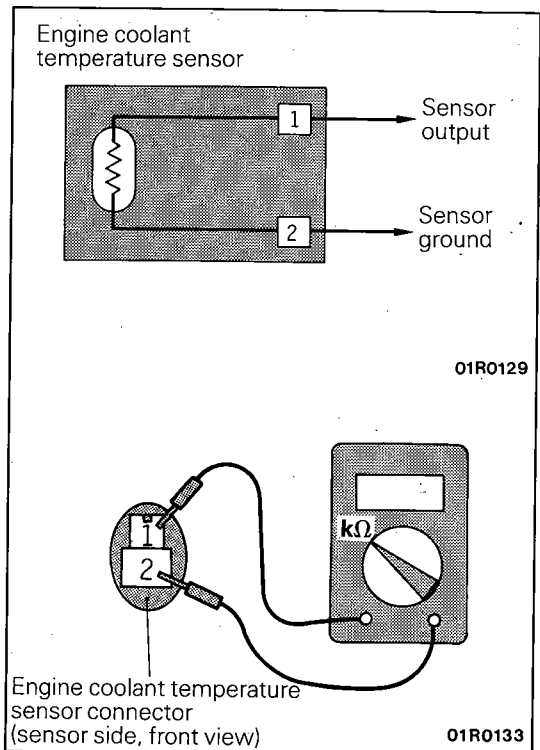
N14QABC1

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)	2.7
80 (176)	0.3

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



INSTALLATION

- (1) Apply specified sealant to threaded portion and tighten to specified torque.

**Specified sealant: 3M NUT Locking No. 4171
or equivalent**

Specified torque: 20 – 40 Nm (15 – 29 ft.lbs.)

- (2) Fasten harness connectors securely.

THROTTLE POSITION SENSOR

N14QBBE

INSPECTION

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

Standard value: 3.5 – 6.5 k Ω

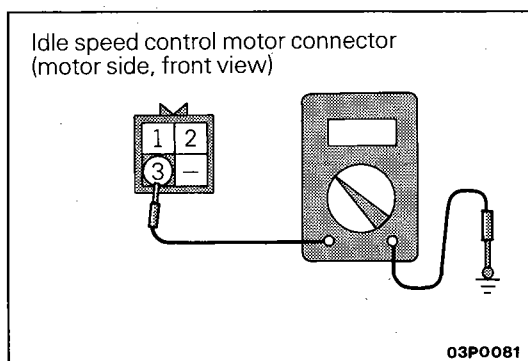
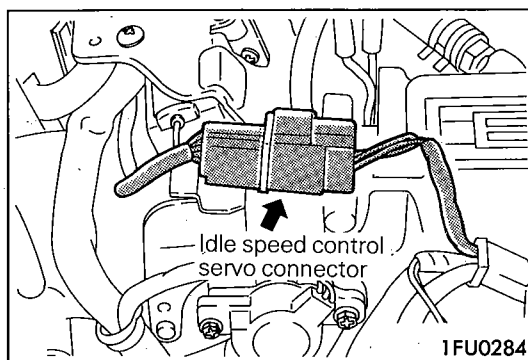
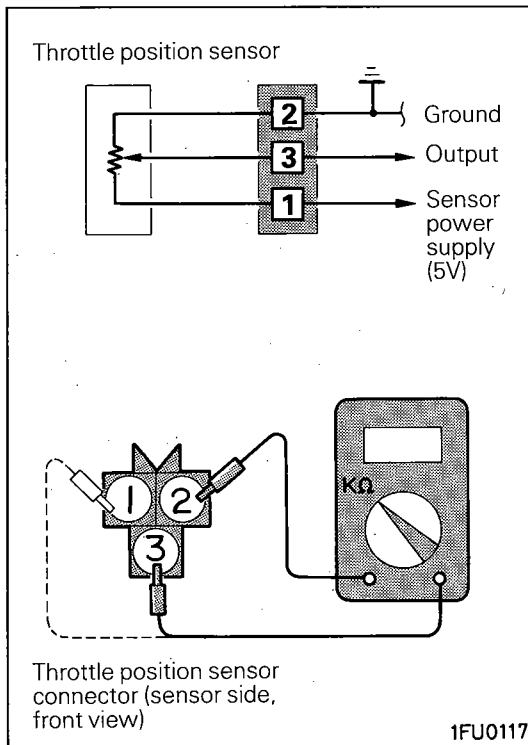
- (3) Connect a pointer type ohmmeter between terminal ② (sensor ground) and terminal ③ (sensor output).
- (4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.

NOTE

The resistance changes within the range from approx. 0.5 k Ω to the value measured at step (2).

- (5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

**Throttle position sensor installation torque:
1.5 – 2.5 Nm (1.1 – 1.8 ft.lbs.)**

**IDLE POSITION SWITCH**

N14QKAD

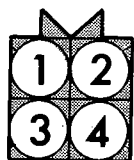
INSPECTION

- (1) Disconnect the connectors of the idle speed control servo.

- (2) Check the continuity between terminal ③ and the body ground.

Accelerator pedal	Continuity
Depressed	Non-conductive ($\infty \Omega$)
Released	Conductive (0Ω)

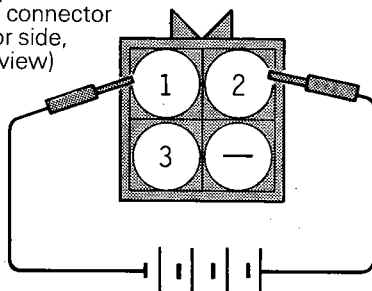
- (3) If defective, replace the idle speed control servo assembly.



Motor position sensor
connector
(motor side, front view)

6FU1041

Idle speed control
servo connector
(motor side,
front view)



6FU0015

MOTOR POSITION SENSOR INSPECTION

N14QLAE

- (1) Disconnect the motor position sensor connector.
- (2) Measure the resistance between terminals ① and ③

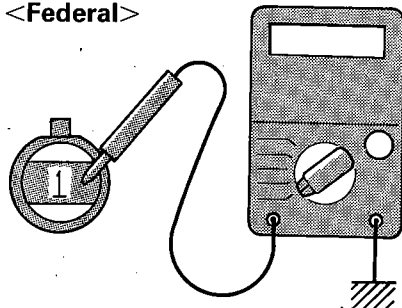
Standard value: 4 – 6 k Ω

- (3) Disconnect the idle speed control servo connector.
- (4) Connect DC 6V between terminals ① and ② of the idle speed control servo connector, and then measure the resistance between terminals ① and ② of the motor position sensor connector when the idle speed control servo is activated (caused to expand and contract).

Standard value: Within the range of from approx. 0.5 Ω to the resistance value measured in (2) above

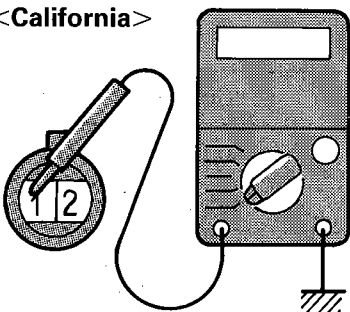
- (5) If there is a deviation from the standard value, or if the change is not smooth, replace the idle speed control servo assembly.

<Federal>



6EM139

<California>



6FU0986

OXYGEN SENSOR INSPECTION

N14QDBAb

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 – Exhaust Manifold.

Oxygen sensor installation torque:
40 – 50 Nm (30 – 36 ft.lbs.)

EGR TEMPERATURE SENSOR <California> N14RCHAA

Refer to GROUP 25 – Exhaust Gas Recirculation System.

VEHICLE SPEED SENSOR N14QEBA

Refer to GROUP 8 – Meters and Gauges.

AIR CONDITIONER SWITCH N14QABa

Refer to GROUP 8 – Column Switch.

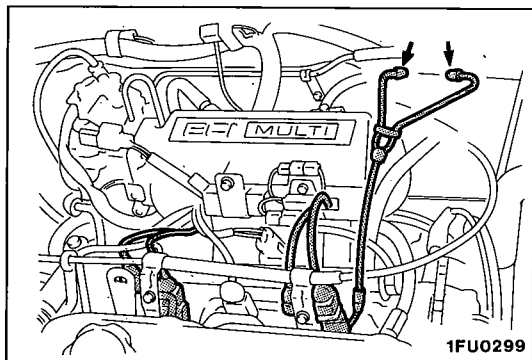
INHIBITOR SWITCH N14QRACa

Refer to GROUP 21 – Service Adjustment Procedures.

POWER STEERING OIL PRESSURE SWITCH

N14RCJB

Refer to GROUP 19 for power steering system inspection.

**INJECTORS**

N14QTAG

CHECKING OPERATION SOUND

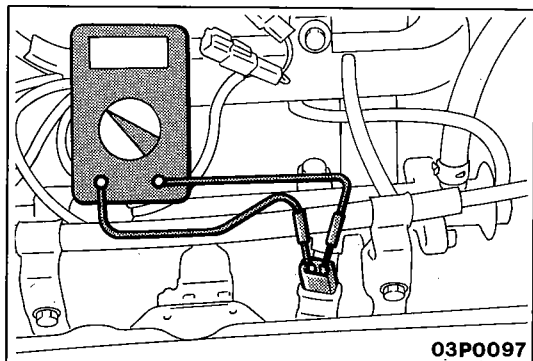
Using a sound-scope, check the operation sound ("chi-chi-chi") of injectors during idling or during cranking. Check that as the rotating speed increases, the frequency of the operating sound also increases.

Caution

Note that even if the injector you are checking is not operating, you will hear the operating sound of the other injectors.

NOTE

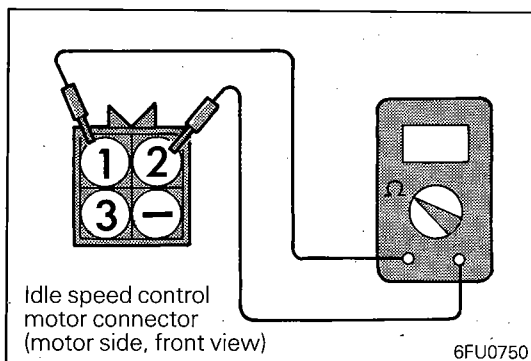
If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control unit is suspected.

**MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Remove the injector connector.
- (2) Measure the resistance between the terminals.

Standard value: 13 – 16 Ω [at 20°C (68°F)]

- (3) Install the injector connector.



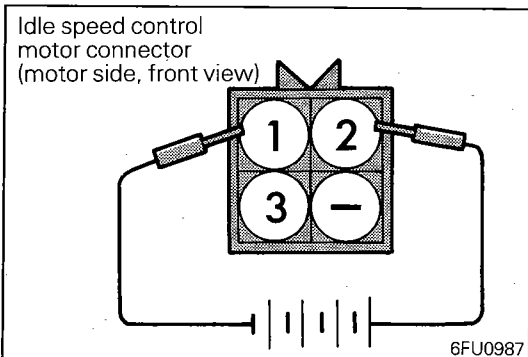
IDLE SPEED CONTROL MOTOR

N14QUAAb

INSPECTION

- (1) Disconnect the idle speed control motor connector.
- (2) Check continuity of the idle speed control motor coil.

Measuring terminals	Continuity
① – ② Conductive	5 to 35 Ω resistance at 20°C (68°F)

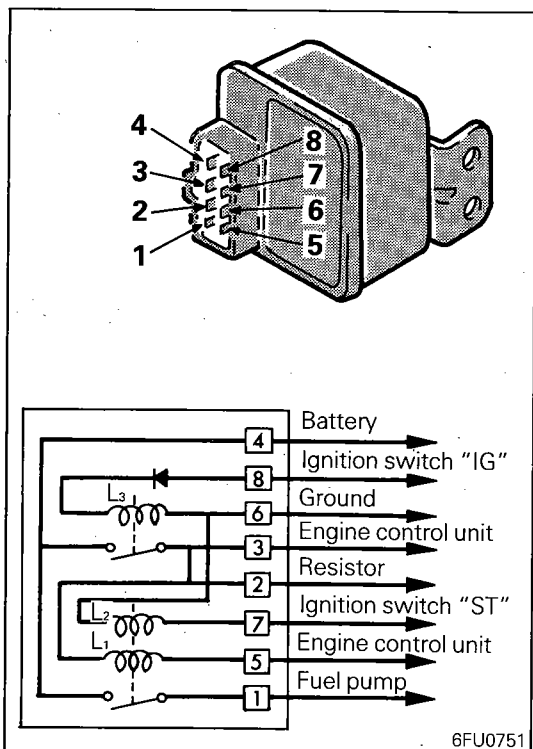


- (3) Connect 6V DC between terminal ① and terminal ② of the idle speed control motor connector, and check to be sure that the idle speed control servo operates.

Caution

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

- (4) If not, replace idle speed control servo as an assembly.



CONTROL RELAY

N14QYABa

INSPECTION

Caution

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

NOTE

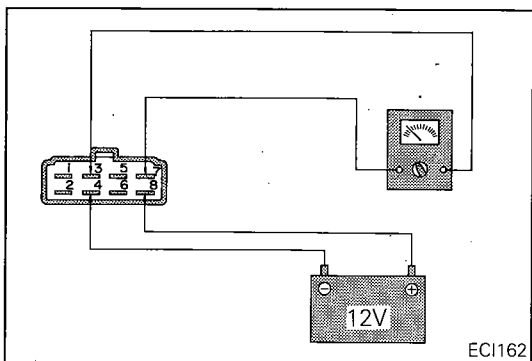
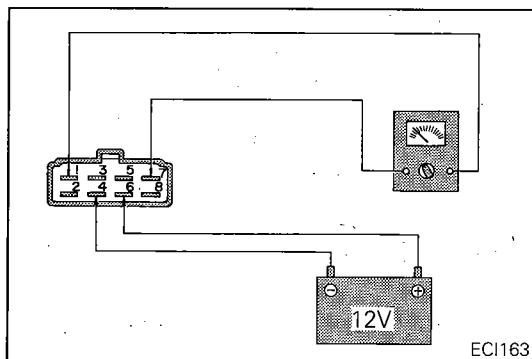
Failure of the control relay prevents power supply to the fuel pump, injectors and engine control unit, resulting in start failure.

- (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.



- Coils L_1 and L_2

Condition	Measuring terminals	Continuity
Not energized	① – ④	Non-conductive ($\infty \Omega$)
	③ – ⑤	Conductive (approx. 95Ω)
	② – ⑤	Conductive (approx. 35Ω)
Energized	① – ④	Conductive (0Ω)

NOTE

"Energized" means voltage applied across terminals ⑥ and ⑦.

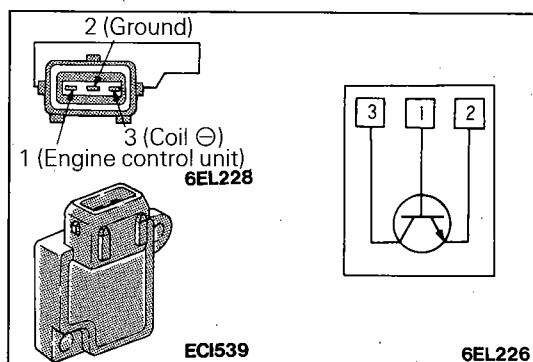
- Coil L_3

Condition	Measuring terminals	Continuity
Not energized	② – ④	Non-conductive ($\infty \Omega$)
	⑥ → ⑧	Non-conductive ($\infty \Omega$)
	⑥ ← ⑧	Conductive (0Ω)
Energized	② – ④	Conductive (0Ω)

NOTE

"Energized" means voltage applied across terminals ⑧ and ⑥.

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



POWER TRANSISTOR INSPECTION

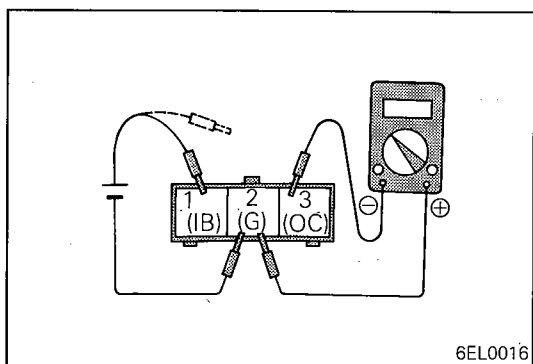
N14RCGF

- Disconnect the power transistor connector.
- Connect a power supply of 1.5 V to terminals ① (+) and ② (–) of the power transistor and then check for continuity between terminals ③ and ② under power ON and power OFF conditions.

NOTE

- For continuity check, use an analog type circuit tester.
- When checking the continuity, connect the circuit tester to terminal ② on the positive side and terminal ③ on the negative side.

① – ② terminals	③ – ② terminals
Power ON	Continuity
Power OFF	No continuity



AIR CONDITIONER POWER RELAY

N14RCLB

Refer to GROUP 24 – Air Conditioner.

PURGE CONTROL SOLENOID VALVE

N14RCKA

Refer to GROUP 25 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE <California>

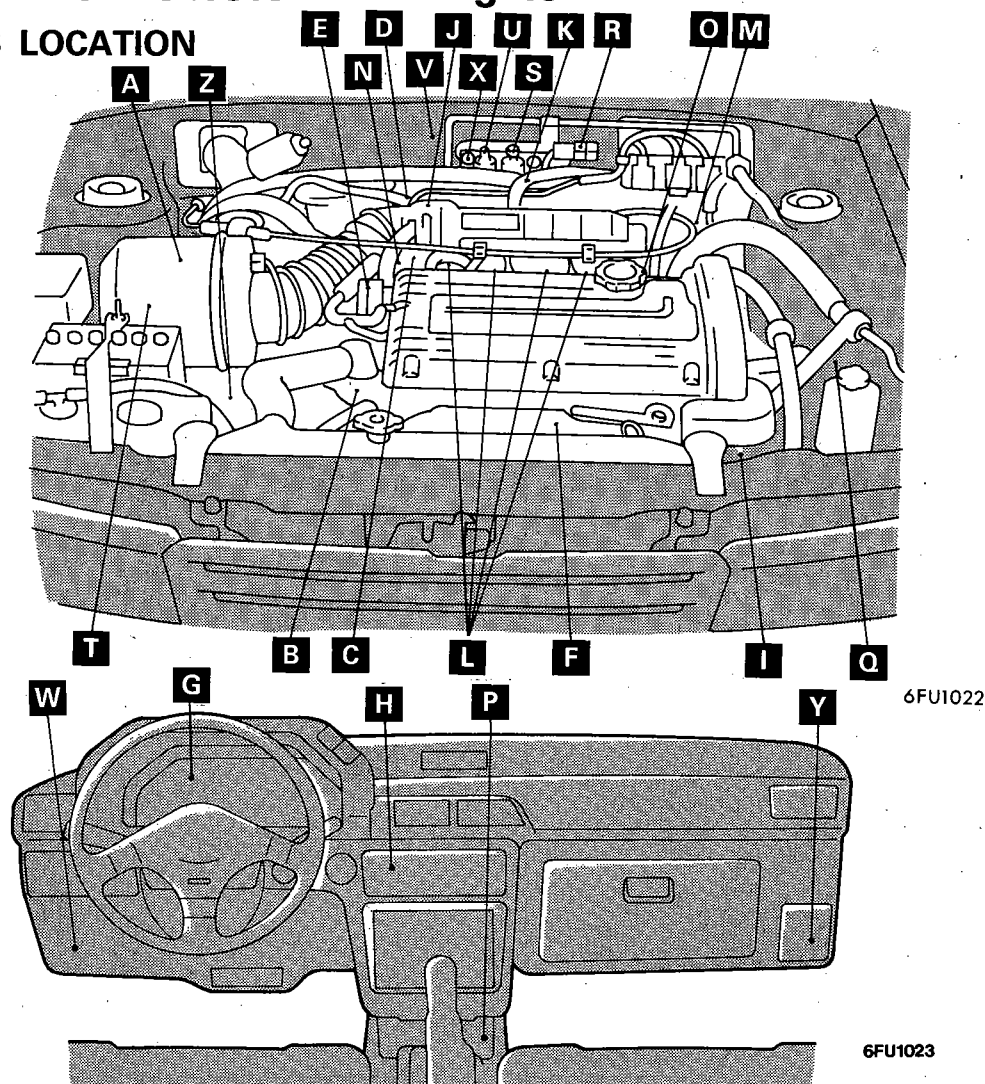
N14RCLA

Refer to GROUP 25 – Exhaust Gas Recirculation System.

MPI SYSTEM INSPECTION <1.6L Engine>

N14IB-A

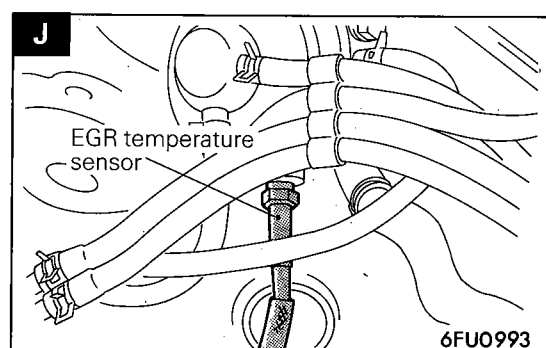
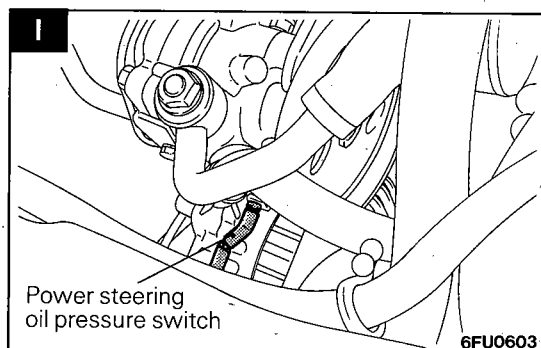
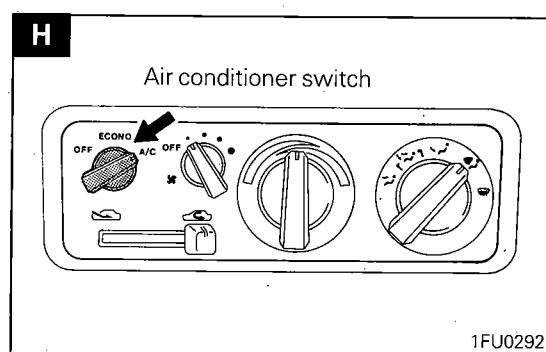
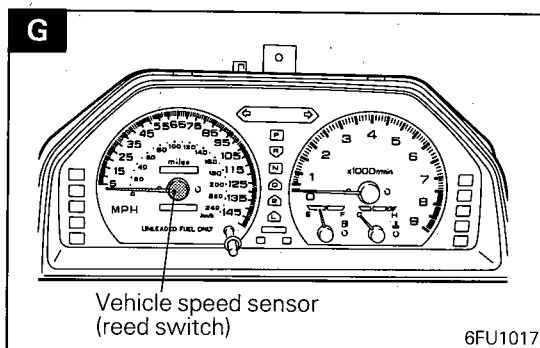
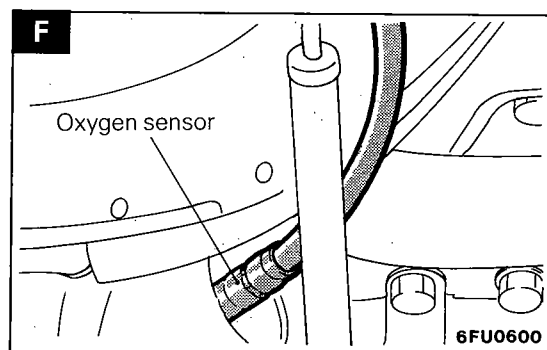
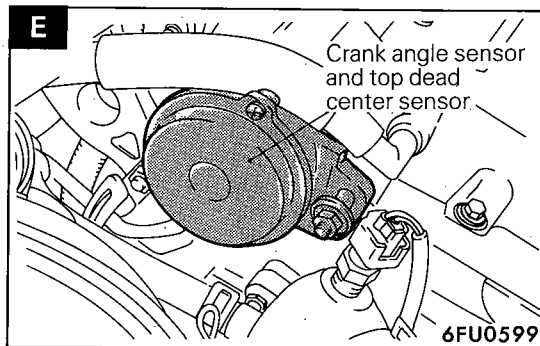
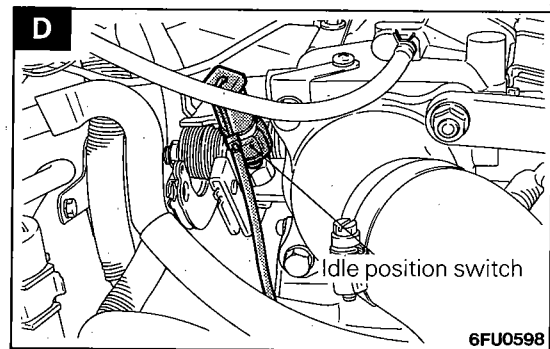
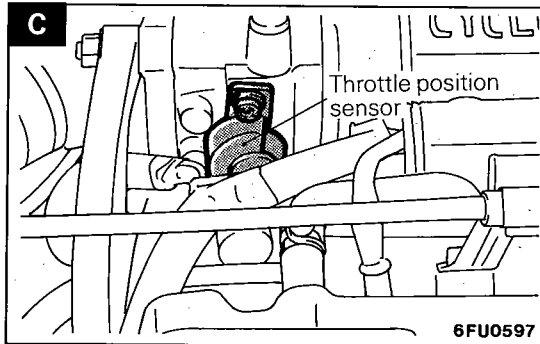
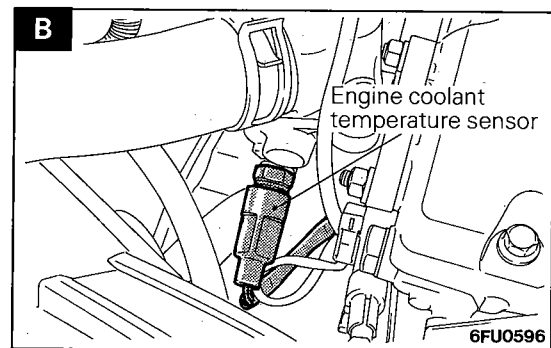
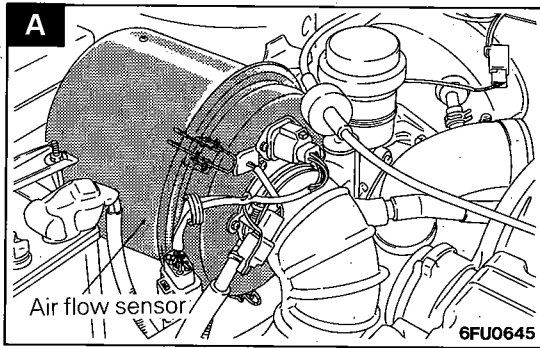
COMPONENTS LOCATION

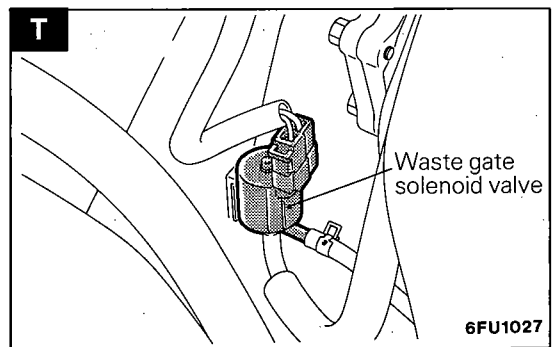
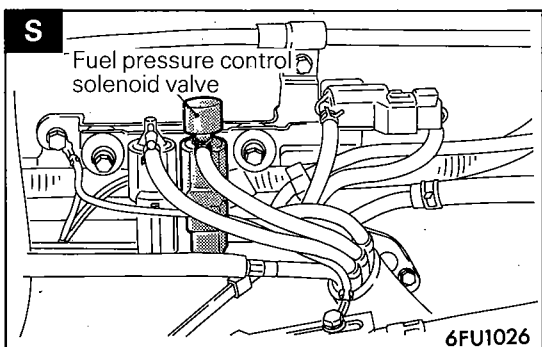
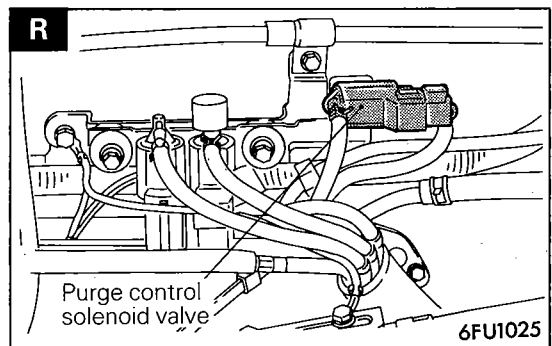
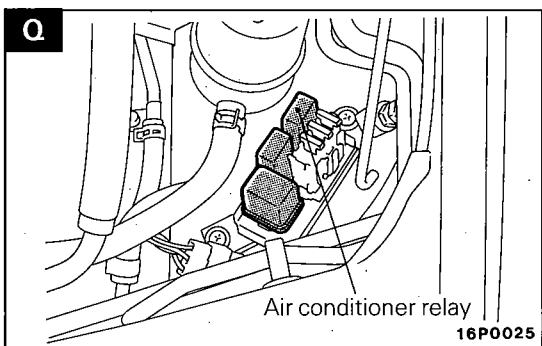
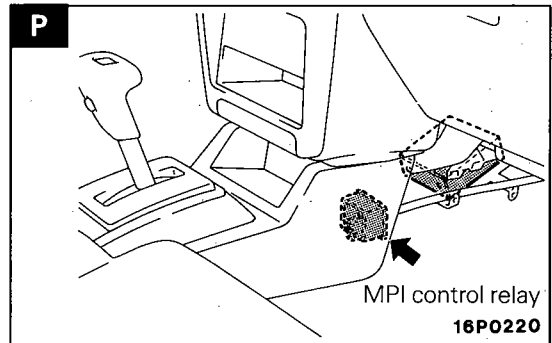
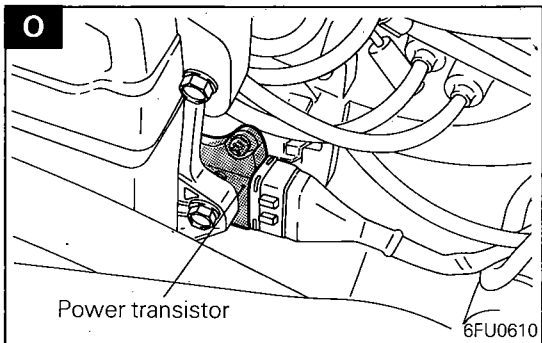
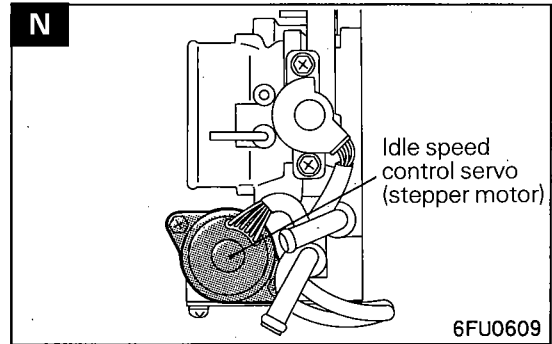
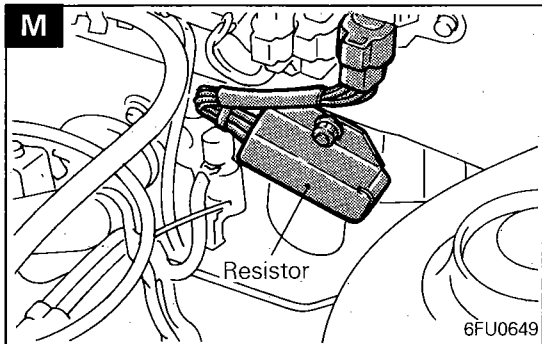
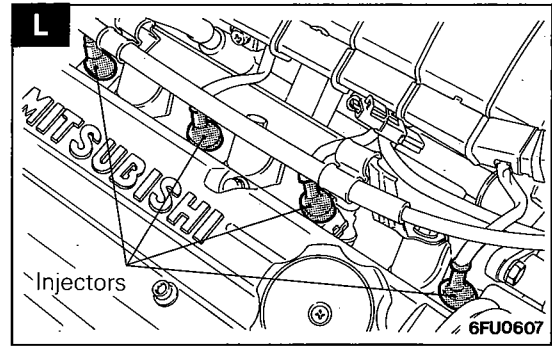
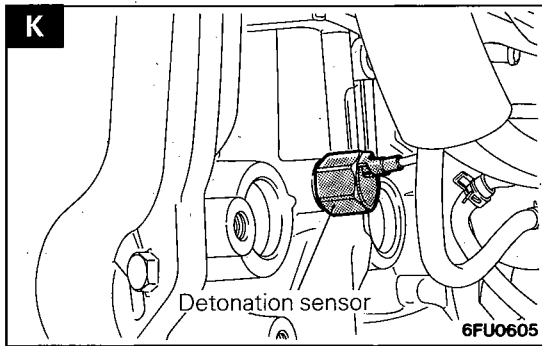


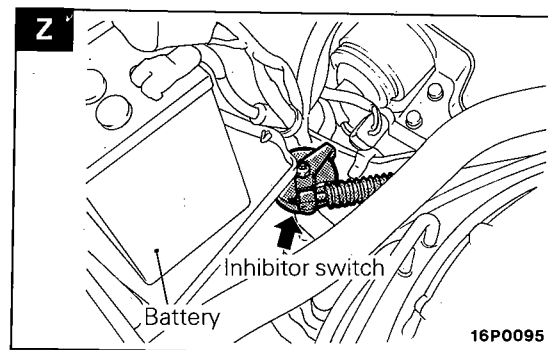
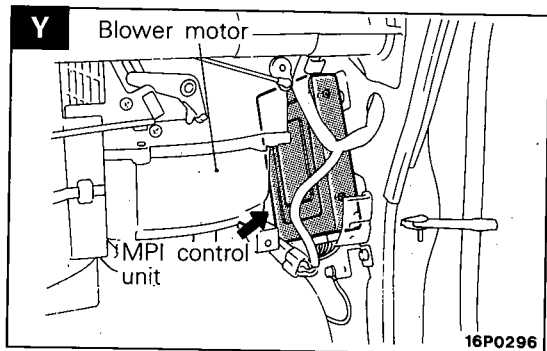
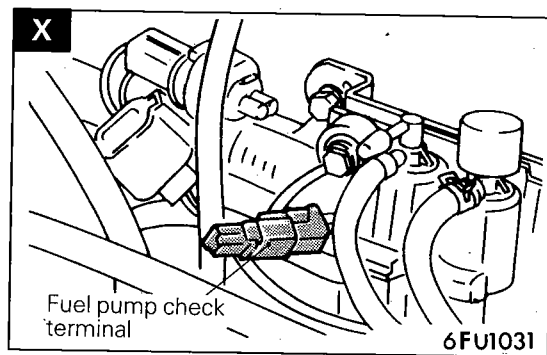
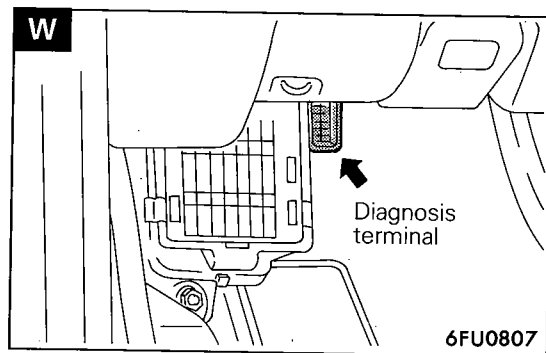
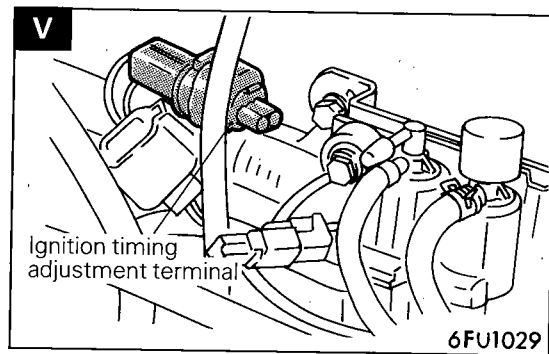
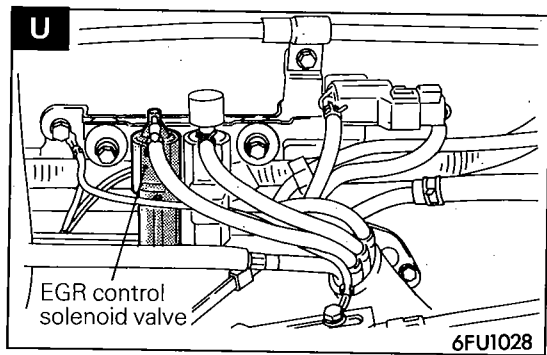
Name	Symbol	Name	Symbol
Air conditioner relay	Q	Idle speed control servo	N
Air conditioner switch	H	Ignition coil (power transistor)	O
Air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	A	Ignition timing adjustment terminal	V
Crank angle sensor and top dead center sensor	E	Inhibitor switch <A/T>	Z
Detonation sensor	K	Injector	L
Diagnosis terminal	W	MPI control relay	P
EGR control solenoid valve*	U	Oxygen sensor	F
EGR temperature sensor*	J	Power steering oil pressure switch	I
Engine control unit	Y	Purge control solenoid valve	R
Engine coolant temperature sensor	B	Resistor	M
Fuel pressure control solenoid valve	S	Throttle position sensor	C
Fuel pump check terminal	X	Vehicle speed sensor (reed switch)	G
Idle position switch	D	Waste gate solenoid valve	T

NOTE

*: <California>







MALFUNCTION INDICATOR LIGHT

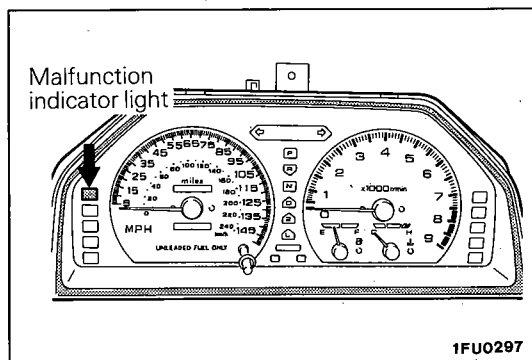
N14PQAC

Among the self-diagnosis items, a malfunction indicator light comes on to notify the driver of the emission control items when an irregularity is detected.

However, when an irregular signal returns to normal and the engine control unit judges that it has returned to normal, the malfunction indicator light goes out.

Moreover, when the ignition switch is turned off, the light goes out. Even if the ignition switch is turned on again, the light does not come on until the irregularity is detected.

Here, immediately after the ignition switch is turn on, the malfunction indicator light is lit for 2.5 seconds to indicate that the malfunction indicator light operates normally.



1FU0297

Items indicated by the lightening malfunction light

Computer
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Top dead center sensor
Barometric pressure sensor
Detonation sensor*
Injector
Fuel pump
EGR*
Ignition coil

NOTE

*: <California>

☆: <T/C>

MALFUNCTION INDICATOR LIGHT INSPECTION

When turning on the ignition switch, check that the light comes on.

NOTE

If the light does not come on, check the harness and light for breakage.

SELF-DIAGNOSIS

N14PAAEa

The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored. Passing a certain number, the engine control unit judges that an irregularity has occurred, memorizes the trouble code, and outputs the signal to the self-diagnosis output terminal.

There are 14 diagnosis items, and the diagnosis results can be read out with a voltmeter.

Moreover, since memorization of the trouble codes is backed up directly by the battery, the diagnosis results are memorized even if the ignition key is turned off. The trouble codes will, however, be erased when the battery terminal or the engine control unit connector is disconnected.

Caution

If the sensor connector is disconnected with the ignition switch turned on, the diagnosis code is memorized. In this case, disconnect the battery terminal (–) for 10 seconds or more, and the diagnosis memory will be erased.

The 14 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Malfunction code	Diagnosis item	Malfunction code	Diagnosis item
11	Oxygen sensor	24	Vehicle speed sensor (reed switch)
12	Air flow sensor	25	Barometric pressure sensor
13	Intake air temperature sensor	31	Detonation sensor*
14	Throttle position sensor	41	Injector
21	Engine coolant temperature sensor	42	Fuel pump
22	Crank angle sensor	43	EGR*
23	Top dead center sensor	44	Ignition coil

NOTE

*: <California>

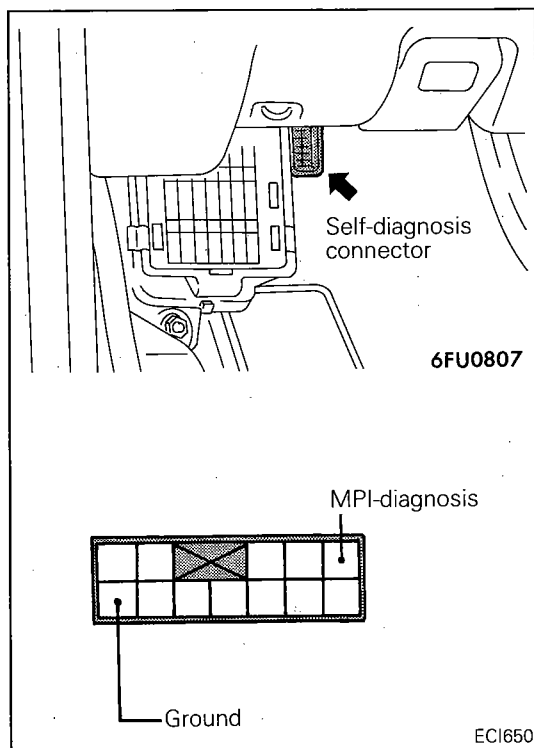
☆: <T/C>

CHECK PROCEDURE (SELF-DIAGNOSIS)

N14PCAE2

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 engine control unit connector is disconnected. Do not disconnect the battery before the diagnosis result is completely read.
- (3) After check and correction are over, disconnect ground cable for 10 seconds or more from negative terminal of battery and connect it again to make sure that failure code is erased.



INSPECTION PROCEDURE – USING VOLTMETER

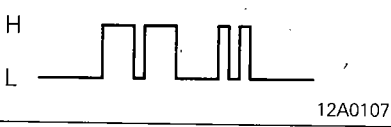
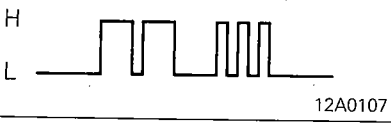
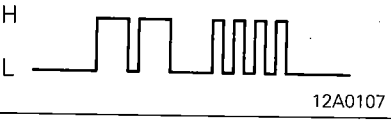
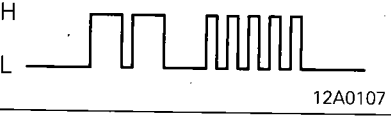
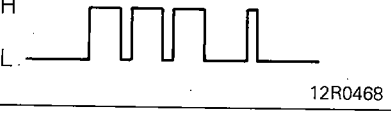
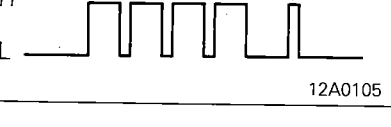
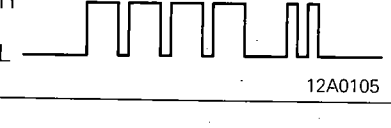
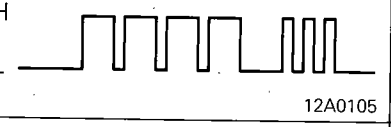
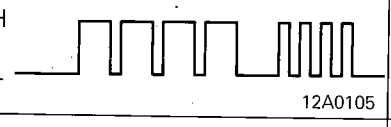
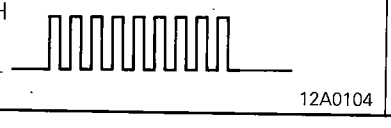
N14PCAG2

- (1) Connect an analogue voltmeter to the self-diagnosis connector.
- (2) Turn ignition switch to ON, and indication of engine control unit memory contents will immediately start. If the system is in normal condition, pointer of voltmeter indicates normal pattern. If any abnormality is in memory, the pointer of voltmeter will deflect, indicating abnormal item as described in "Diagnosis Chart".
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 the negative terminal of battery cable for 10 seconds or more and connect it again to make sure that the abnormal code has been erased.

DIAGNOSIS CHART (FAULT TREE)

N14PRAD

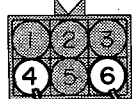
Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control unit	 12A0104	--	—	(Replace engine control unit)
2	Oxygen sensor	 12A0104	11	Retained	<ul style="list-style-type: none"> • Harness and connector • Oxygen sensor • Fuel pressure • Injectors (Replace if defective) • Intake air leaks
3	Air flow sensor	 12A0104	12	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	 12A0104	13	Retained	<ul style="list-style-type: none"> • Harness and connector • Intake air temperature sensor
5	Throttle position sensor	 12A0104	14	Retained	<ul style="list-style-type: none"> • Harness and connector • Throttle position sensor • Idle position switch
6	Engine coolant temperature sensor	 12A0107	21	Retained	<ul style="list-style-type: none"> • Harness and connector • Engine coolant temperature sensor

Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
7	Crank angle sensor	 12A0107	22	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace crank angle sensor assembly.)
8	Top dead center sensor	 12A0107	23	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace crank angle sensor assembly.)
9	Vehicle speed sensor (reed switch)	 12A0107	24	Retained	<ul style="list-style-type: none"> • Harness and connector • Vehicle speed sensor (reed switch)
10	Barometric pressure sensor	 12A0107	25	Retained	<ul style="list-style-type: none"> • Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)
11	Detonation sensor*	 12R0468	31	Retained	<ul style="list-style-type: none"> • Harness and connector • Detonation sensor
12	Injector	 12A0105	41	Retained	<ul style="list-style-type: none"> • Harness and connector • Injector coil resistance
13	Fuel pump	 12A0105	42	Retained	<ul style="list-style-type: none"> • Harness and connector • Control relay
14	EGR *	 12A0105	43	Retained	<ul style="list-style-type: none"> • Harness and connector • EGR thermo sensor • EGR valve • EGR valve control solenoid valve • EGR valve control vacuum
15	Ignition coil	 12A0105	44	Retained	<ul style="list-style-type: none"> • Harness and connector • Ignition coil • Power transistor
16	Normal state	 12A0104	—	—	—

NOTE

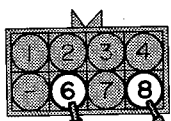
1. Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items.
2. *: <California>
3. *: <T/C>

<N/A>

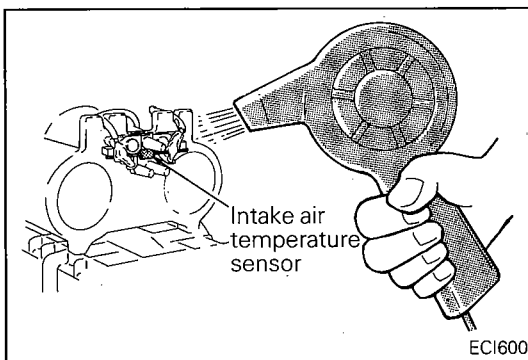
Air flow sensor
side connector

6FU0622

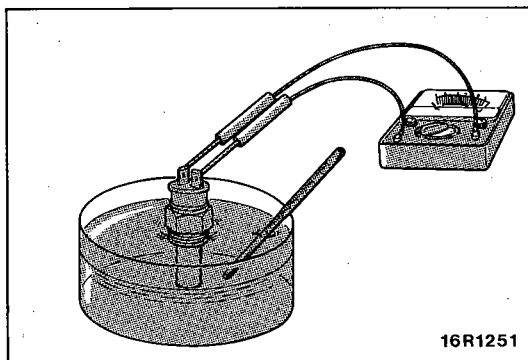
<T/C>



6FU0623



ECI600



16R1251

INTAKE AIR TEMPERATURE SENSOR INSPECTION

N14QHABa2

- (1) Disconnect the air flow sensor connectors.
- (2) Measure resistance between terminals ④ and ⑥ <N/A>.
- (3) Measure resistance between terminals ⑥ and ⑧ <T/C>.

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

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

Temperature °C (°F)	Resistance kΩ
Higher	Smaller

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

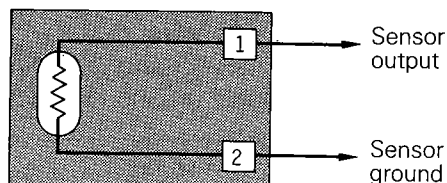
ENGINE COOLANT TEMPERATURE SENSOR

N14QABC2

INSPECTION

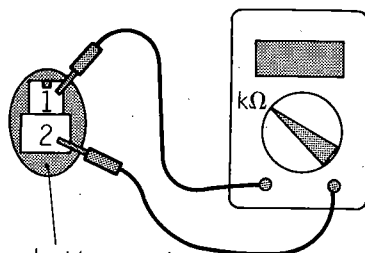
- (1) Remove engine coolant temperature sensor from the intake manifold.
- (2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance. The sensor should be held with its housing 3 mm (.12 in.) away from the surface of the hot water.

Engine coolant temperature sensor



01R0129

Engine coolant temperature sensor connector (sensor side, front view)



01R0133

Temperature °C (°F)	Resistance kΩ
0 (32)	5.9
20 (68)	2.5
40 (104)	2.7
80 (176)	0.3

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

INSTALLATION

- (1) Apply specified sealant to threaded portion and tighten to specified torque.

Specified sealant: 3M NUT Locking No. 4171 or equivalent

Specified torque: 20 – 40 Nm (15 – 29 ft.lbs.)

- (2) Fasten harness connectors securely.

THROTTLE POSITION SENSOR INSPECTION

N14QBBE

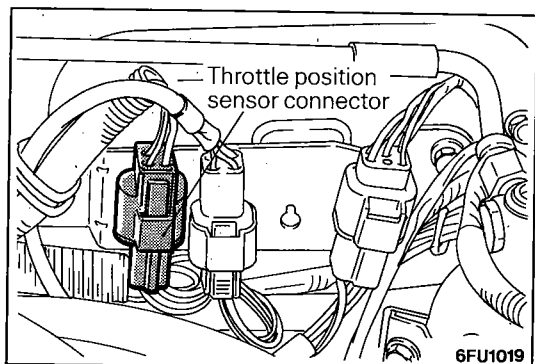
- (1) Disconnect the throttle position sensor connector.
 (2) Measure resistance between terminal ② (sensor ground) and terminal ③ (sensor power).

Standard value: 3.5 – 6.5 kΩ

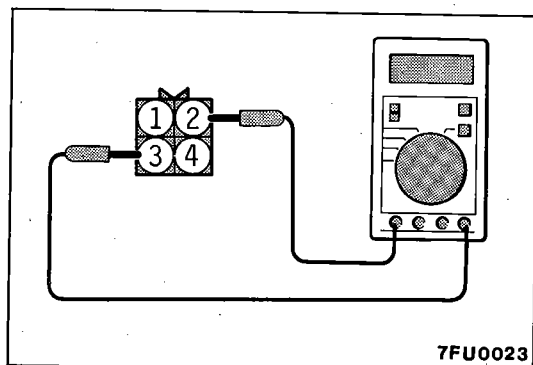
- (3) Connect a pointer type ohmmeter between terminal ② (sensor ground) and terminal ④ (sensor output).
 (4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.

NOTE

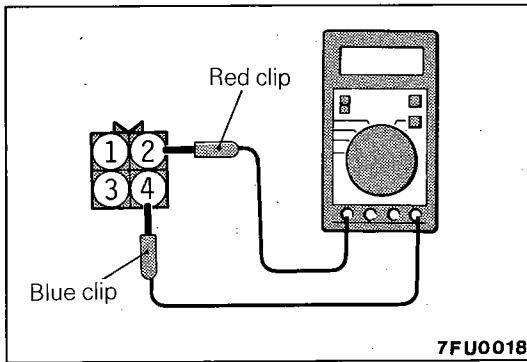
The resistance changes within the range from approx. 0.5 kΩ to the value measured at step (3).



6FU1019

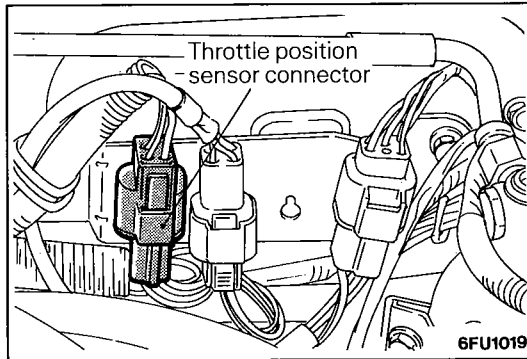


7FU0023



- (5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

Throttle position sensor installation torque:
1.5 – 2.5 Nm (1.1 – 1.8 ft.lbs.)



IDLE POSITION SWITCH INSPECTION

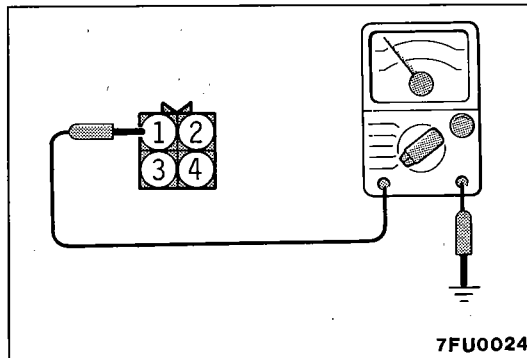
N14QKAE

- (1) Keeping the accelerator pedal released, check that the throttle valve lever or the idle position switch is pushed.

NOTE

If it is not pushed, adjust the idle position switch (fixed speed adjusting screw). (Refer to P.14-38.)

- (2) Disconnect the throttle position sensor connector.
(3) Check the continuity across the throttle position sensor connector terminal ① to the ground.

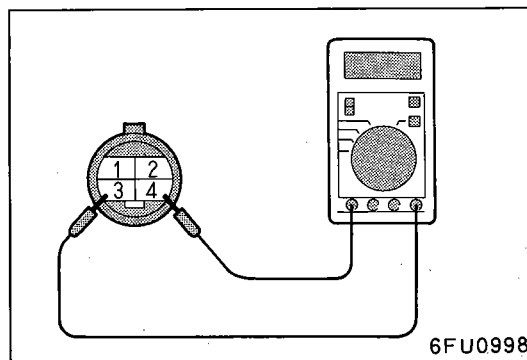


Accelerator pedal	Continuity
Depressed	Non-conductive ($\infty \Omega$)
Released	Conductive (0Ω)

- (4) Replace the idle position switch if faulty.

NOTE

For replacement procedure, refer to the idle position switch (fixed speed adjusting screw) adjustment section (P.14-38).



OXYGEN SENSOR INSPECTION

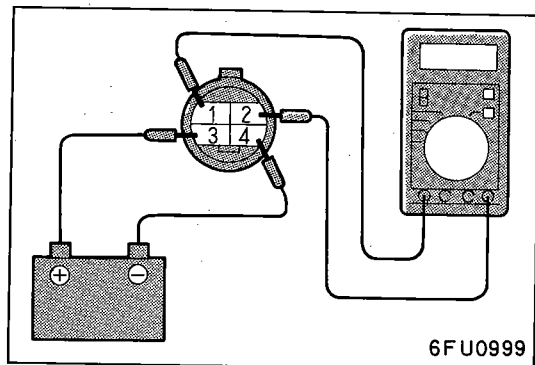
N14QDBD

- (1) Let the engine warm up until the engine coolant temperature reaches 85 – 95°C (185 – 205°F).
(2) Disconnect the oxygen sensor connector.
(3) Measure the resistance between terminals ③ and ④ of the oxygen sensor connector.

Standard value

Temperature °C (°F)	Resistance value Ω
20 (68)	Approx. 15
400 (752)	30 or more

- (4) Replace the oxygen sensor if defective.



- (5) Apply the battery voltage directly across terminals ③ and ④ of the oxygen sensor connector.

Caution

If the voltage is applied to the wrong terminal or a short circuit occurs, damage could result.

- (6) Connect a digital voltmeter between terminals ① and ② of the oxygen sensor connector.
 (7) While repeatedly racing the engine, measure the oxygen sensor output voltage.

Standard value

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

- (8) If the voltage is abnormal, a defective oxygen sensor is suspected.

INSTALLATION

- For removal and installation of oxygen sensor, refer to GROUP 11 – Exhaust Manifold.
- Oxygen sensor tighten to specified torque.

Specified torque: 40 – 50 Nm (29 – 36 ft.lbs.)

EGR TEMPERATURE SENSOR

N14RCHAA

Refer to GROUP 25 – Exhaust Gas Recirculation System.

VEHICLE SPEED SENSOR

N14QEBBa

Refer to GROUP 8 – Meters and Gauges.

AIR CONDITIONER SWITCH

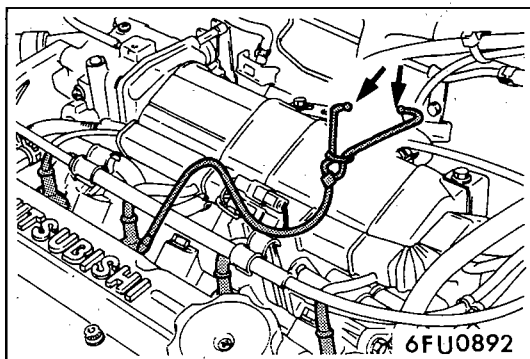
N14QQABa

Refer to GROUP 8 – Column Switch.

POWER STEERING OIL PRESSURE SWITCH

N14RCJB

Refer to GROUP 19 for power steering system inspection.



INJECTORS

N14QTAH

CHECKING OPERATION SOUND

Using a sound-scope, check the operation sound ("chi-chi-chi") of the injectors during idling or during cranking. Check to be sure that the operation sound increases when the engine speed is increased.

Caution

Note that the sounds of other injectors may be heard even though the injector being checked is not operating, so care must be taken when checking.

NOTE

If the operation sounds cannot be heard, check the injector activation circuit.

If this circuit is normal, there is probably a malfunction of the injector or of the engine control unit.

MEASURING OF RESISTANCE BETWEEN TERMINALS

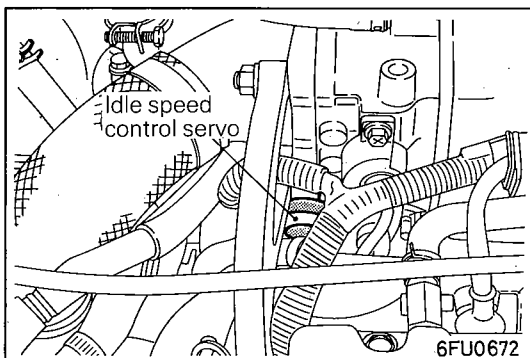
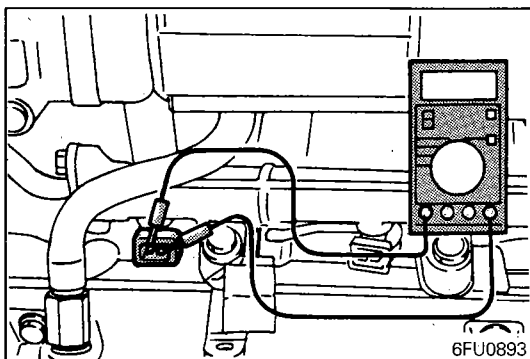
- (1) Disconnect the connector for the injectors.
- (2) Measure the resistance between terminals.

Standard value:

<N/A> 13 – 16 Ω [at 20°C (68°F)]

<T/C> 2 – 3 Ω [at 20°C (68°F)]

- (3) Connect the connector for the injectors.



IDLE SPEED CONTROL SERVO

N14QUAD

CHECKING OPERATING SOUND

- (1) Check that when the ignition switch is placed in the ON position (the engine not started), the operating sound of the stepper motor can be heard over the idle speed control servo.
- (2) If no operating sound can be heard, check the stepper motor drive circuit.
(If the circuit is good, a defective stepper motor or engine control unit is suspected.)

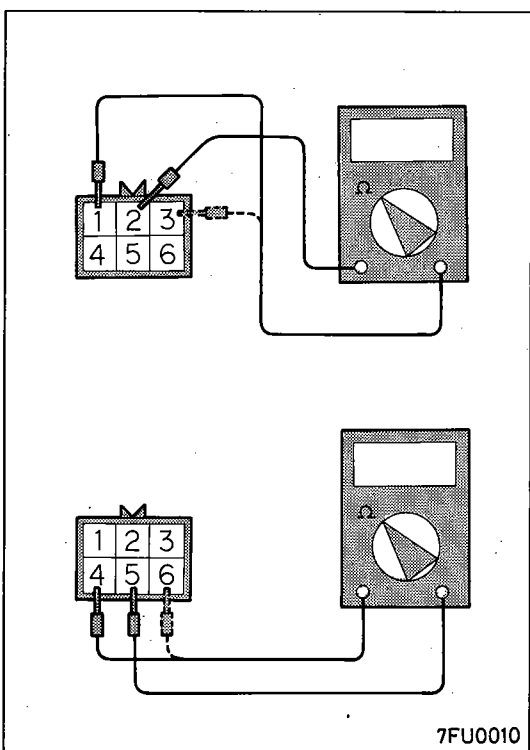
CHECKING COIL RESISTANCE

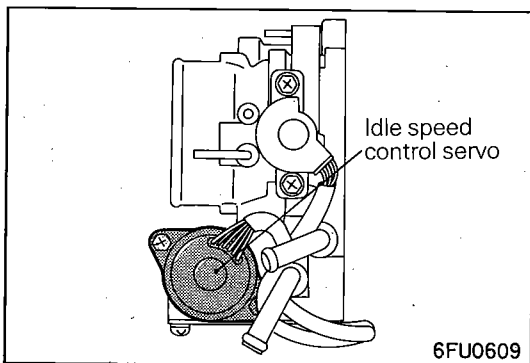
- (1) Disconnect the idle speed control servo connector.
- (2) Measure the resistance between terminals ② and ① or between terminals ② and ③ of the idle speed control servo connector.

Standard resistance: 28 – 33 Ω [at 20°C (68°F)]

- (3) Measure the resistance between terminals ⑤ and ⑥ or between terminals ⑤ and ④ of the idle speed control servo connector.

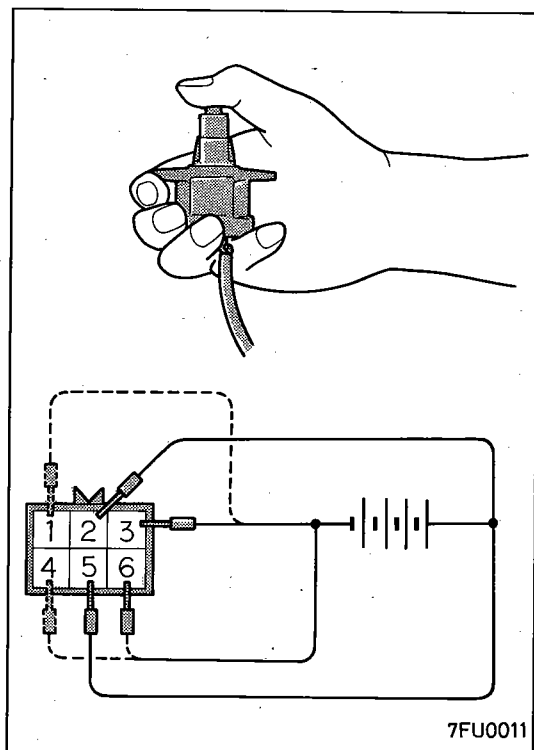
Standard resistance: 28 – 33 Ω [at 20°C (68°F)]





OPERATION CHECK

- (1) Remove the throttle body.
- (2) Remove the stepper motor.



- (3) Apply voltage as indicated below and check for presence/absence of vibration due to stepper motor operation.
 1. Connect the positive terminal of the power supply (about 6V) to terminals ② and ⑤ of the connector.
 2. Connect the negative terminal of the power supply to terminals ③ and ⑥.
 3. Connect the negative terminal to terminals ① and ⑥.
 4. Connect the negative terminal to terminals ① and ④.
 5. Connect the negative terminal to terminals ③ and ④.
 6. Connect the negative terminal to terminals ③ and ⑥.
 7. Connect the terminals in sequence from step 6 to 2.
- (4) If vibration is felt as a result of the inspections, the stepper motor can be judged as normal.

CONTROL RELAY INSPECTION

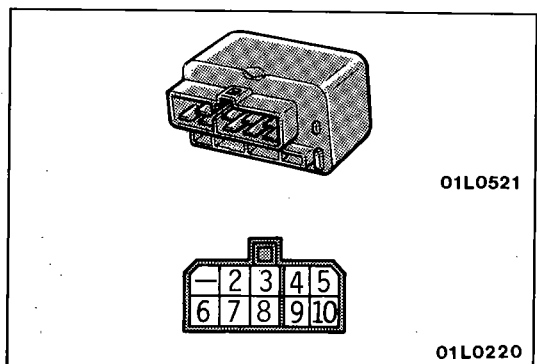
N14QYAC

Caution

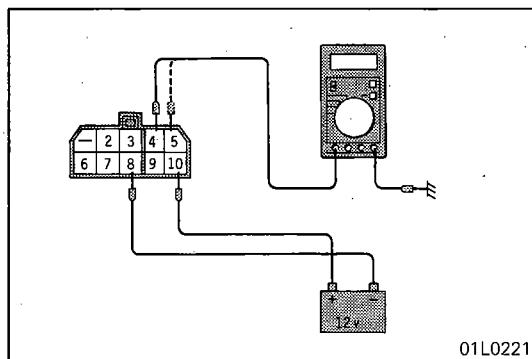
When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

NOTE

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

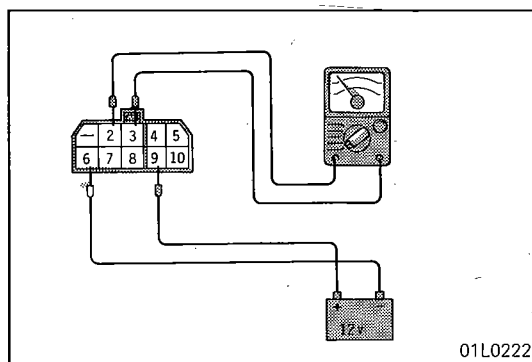


- (1) Remove the cover under the glove box and the glove box.
- (2) Disconnect the control relay and connector.



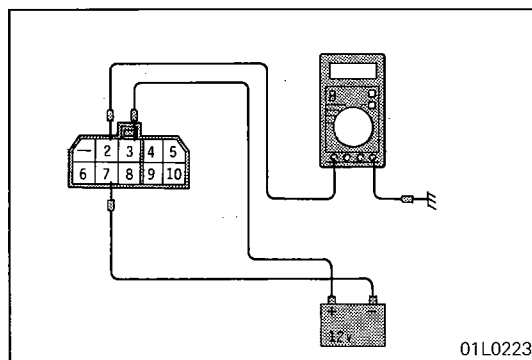
- (3) Connect a 12V power supply \oplus terminal to the terminal ⑩ of the control relay and measure the voltages at terminals ④ and ⑤ when the \ominus terminal is connected to and disconnected from the terminal ⑧.

Terminal ⑧ and 12V power supply \ominus terminal	Terminal ④	Terminal ⑤
Connected	12V	12V
Disconnected	0V	0V



- (4) Connect a 12V power supply \ominus terminal to the terminal ⑥ of the control relay and check the continuity between terminals ③ and ② when the \oplus terminal is connected to and disconnected from the terminal ⑨.

Terminal ⑨ and 12V power supply \oplus terminal	Terminal ③ and terminal ②
Connected	Continuity
Disconnected	Discontinuity



- (5) Connect a 12V power supply \oplus terminal to the terminal ③ of the control relay and measure the voltages at the terminal ② when the \ominus terminal is connected to and disconnected from the terminal ⑦.

Terminal ⑦ and \ominus terminal	Terminal ②
Connected	12V
Disconnected	0V

- (6) If one of the above is improper, replace the control relay.

POWER TRANSISTOR INSPECTION

N14RCGE

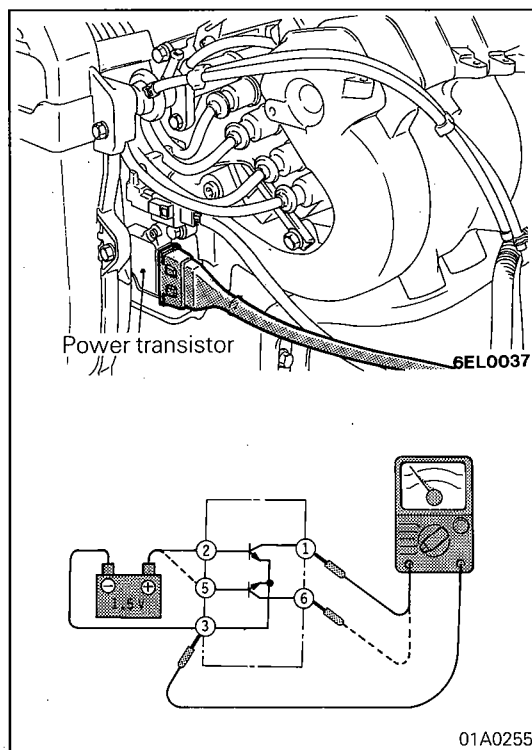
- Disconnect the power transistor connector.
- Check operation of the power transistor by the following procedure.

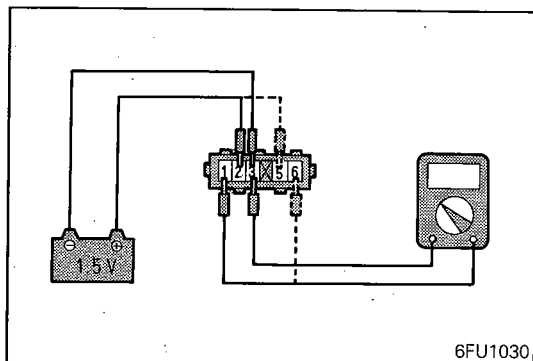
- Coil side for No. 1 and No. 4 cylinders
Apply 1.5V power across terminals ⑤ (+) and ④ (-) of power transistor and check for continuity between terminals ⑥ and ④ both when power is supplied and when power is not supplied.

NOTE

For continuity check, use an analog type circuit tester and connect the (-) probe of the circuit tester to terminal ⑥.

Terminals ⑤ – ④	Terminals ⑥ – ④
Power applied	Continuity
No power applied	No continuity



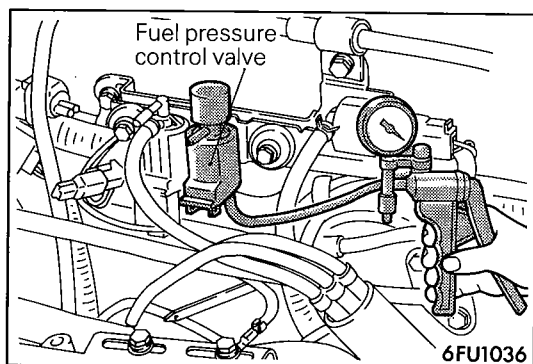


- ② Coil side for No. 2 and No. 3 cylinders
Connect a 1.5V power supply to terminals ② (+) and ④ (–) of power transistor and check for continuity between terminals ① and ④ when power is applied and when no power is applied.

NOTE

Connect the (–) probe of the circuit tester to terminal ①.

Terminals ② – ④	Terminals ① – ④
Power applied	Continuity
No power applied	No continuity



FUEL PRESSURE CONTROL VALVE <T/C>

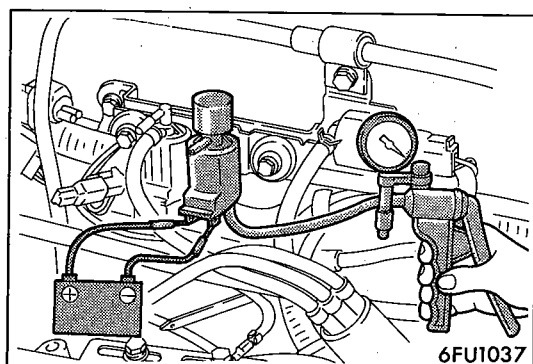
N14RCMA

OPERATIONAL CHECK

NOTE

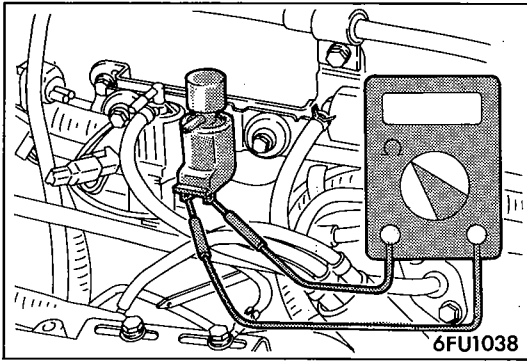
Before the vacuum hoses are removed, make a mark on the hose for visual identification so that they can be reconnected in their original positions.

- (1) Remove the vacuum hoses (blue stripes and black) from the solenoid valve.
- (2) Disconnect the harness connector.



- (3) Apply vacuum with a hand vacuum pump to the nipple to which the black vacuum hose was connected and check for air tightness both when a voltage is applied to the solenoid valve terminal and when the voltage is removed.

Battery voltage	Other nipple of solenoid valve	Normal condition
When voltage is removed	Open	Vacuum leaks
	Blocked by finger	Vacuum is retained
When voltage is applied	Open	Vacuum is retained

**CHECKING COIL RESISTANCE**

Measure the coil resistance with a tester.

Standard resistance: 36 – 46 Ω [at 20°C (68°F)]

AIR CONDITIONER POWER RELAY

N14RCLB

Refer to GROUP 24 – Air Conditioner.

PURGE CONTROL SOLENOID VALVE

N14RCKA

Refer to GROUP 25 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE <California>

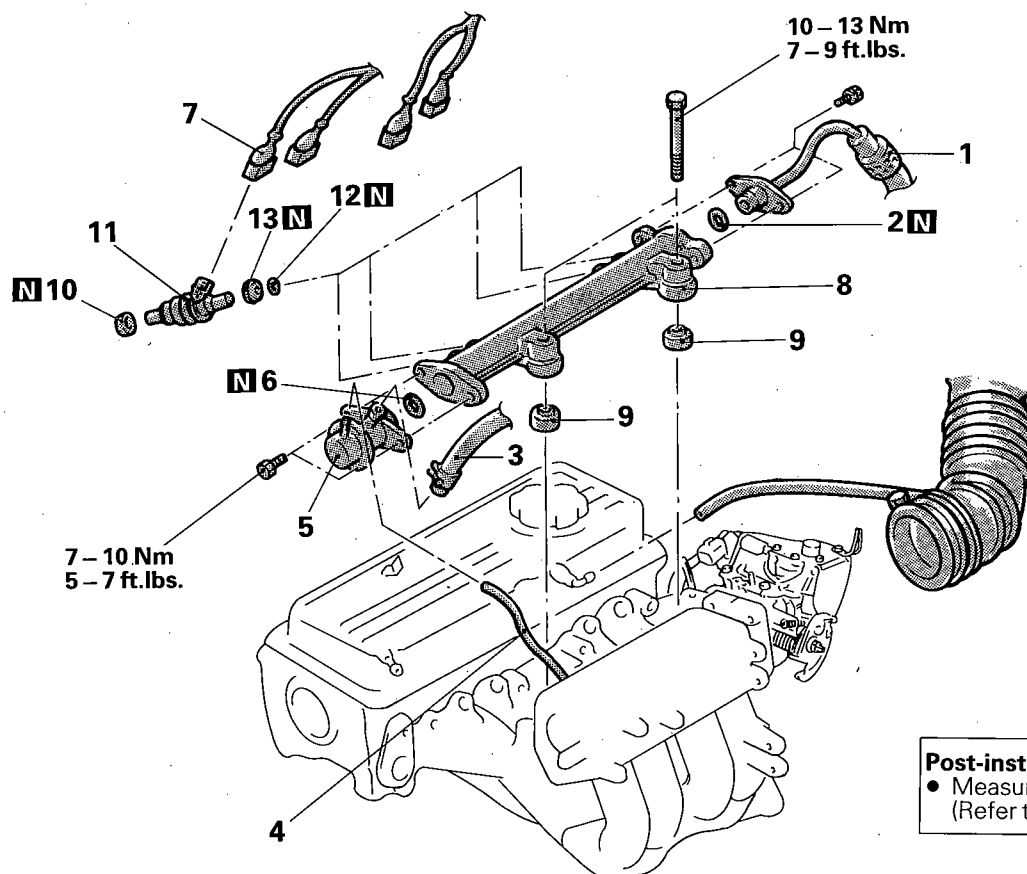
N14RCLA

Refer to GROUP 25 – Exhaust Gas Recirculation System.

INJECTOR <1.5L Engine>

N14SA-1

REMOVAL AND INSTALLATION

**Post-installation Operation**

- Measurement of Fuel Pressure (Refer to P.14-32.)

03P0102

Removal steps

- ◆◆ ◆◆ 1. High pressure fuel hose connection
- ◆◆ 2. O-ring
- ◆◆ 3. Fuel return hose connection
- ◆◆ 4. Vacuum hose connection
- ◆◆ 5. Fuel pressure regulator
- ◆◆ 6. O-ring
- ◆◆ 7. Injector connectors
- ◆◆ 8. Delivery pipe
- ◆◆ 9. Insulator
- ◆◆ 10. Insulator

- ◆◆ ◆◆ 11. Injector
- ◆◆ 12. O-ring
- ◆◆ 13. Grommet

NOTE

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

SERVICE POINTS OF REMOVAL

N14SBAD1

1. DISCONNECTION OF HIGH PRESSURE FUEL HOSE

Bleed the residual pressure within the fuel pipe line so as to prevent the flow of fuel.

For information concerning the method to be followed for bleeding the residual pressure, refer to P.14-31.

Caution

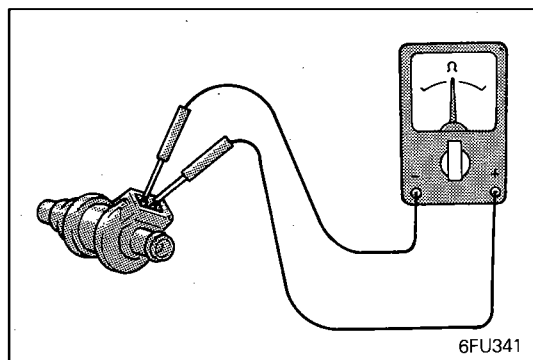
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

8. REMOVAL OF DELIVERY PIPE / 11. INJECTOR

Remove the delivery pipe (with the injectors attached to it).

Caution

Care must be taken, when removing the delivery pipe, not drop the injector.



INSPECTION

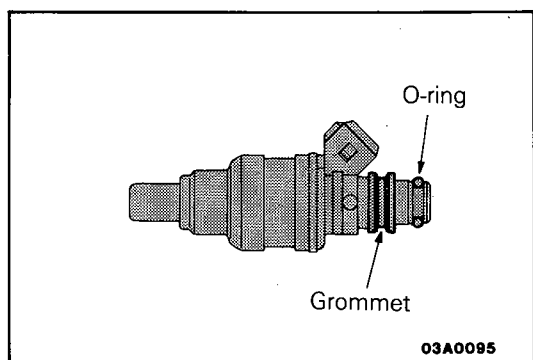
N14NGAA

INJECTORS

- (1) Measure resistance between terminals of injector using a circuit tester.

Standard value: 13 – 16 Ω [at 20°C (68°F)]

- (2) If the resistance is out of specification, replace the injector.

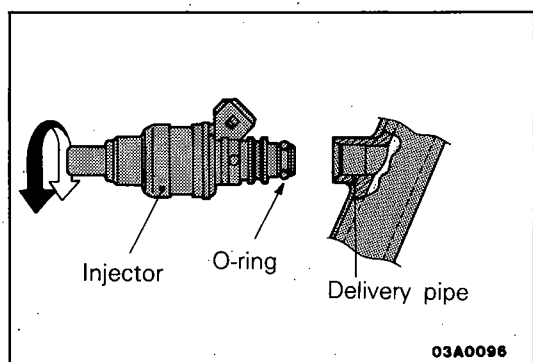


SERVICE POINTS OF INSTALLATION

N14SDAE1

13. INSTALLATION OF GROMMET / 12. O-RING / 11. INJECTOR

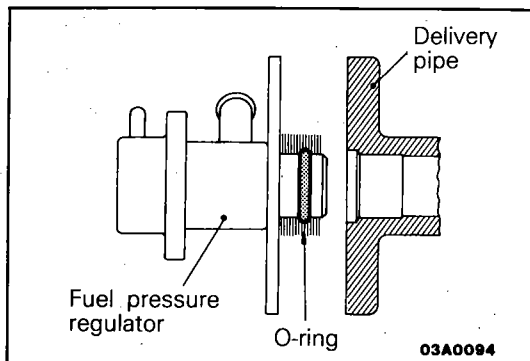
- (1) After installation of the grommet and O-ring (in that sequence) to the injector, apply light oil or petrol to the O-ring.



- (2) While turning the injector to the left and right, install it to the delivery pipe.
- (3) Check to be sure that the injector turns smoothly.

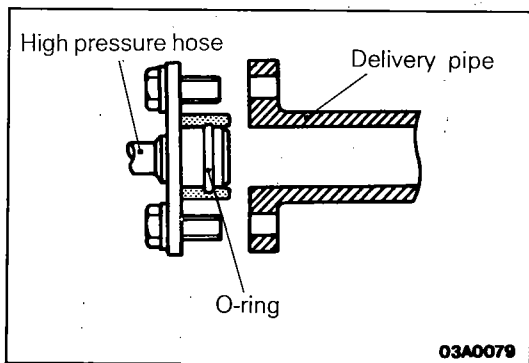
Caution

If it does not turn smoothly, the O-ring may be trapped remove the injector and then re-insert it into the delivery pipe and check once again.



5. INSTALLATION OF FUEL PRESSURE REGULATOR

When connecting the fuel pressure regulator to the delivery pipe, apply light oil or petrol to the O-ring, and then insert, being careful not to damage the O-ring.

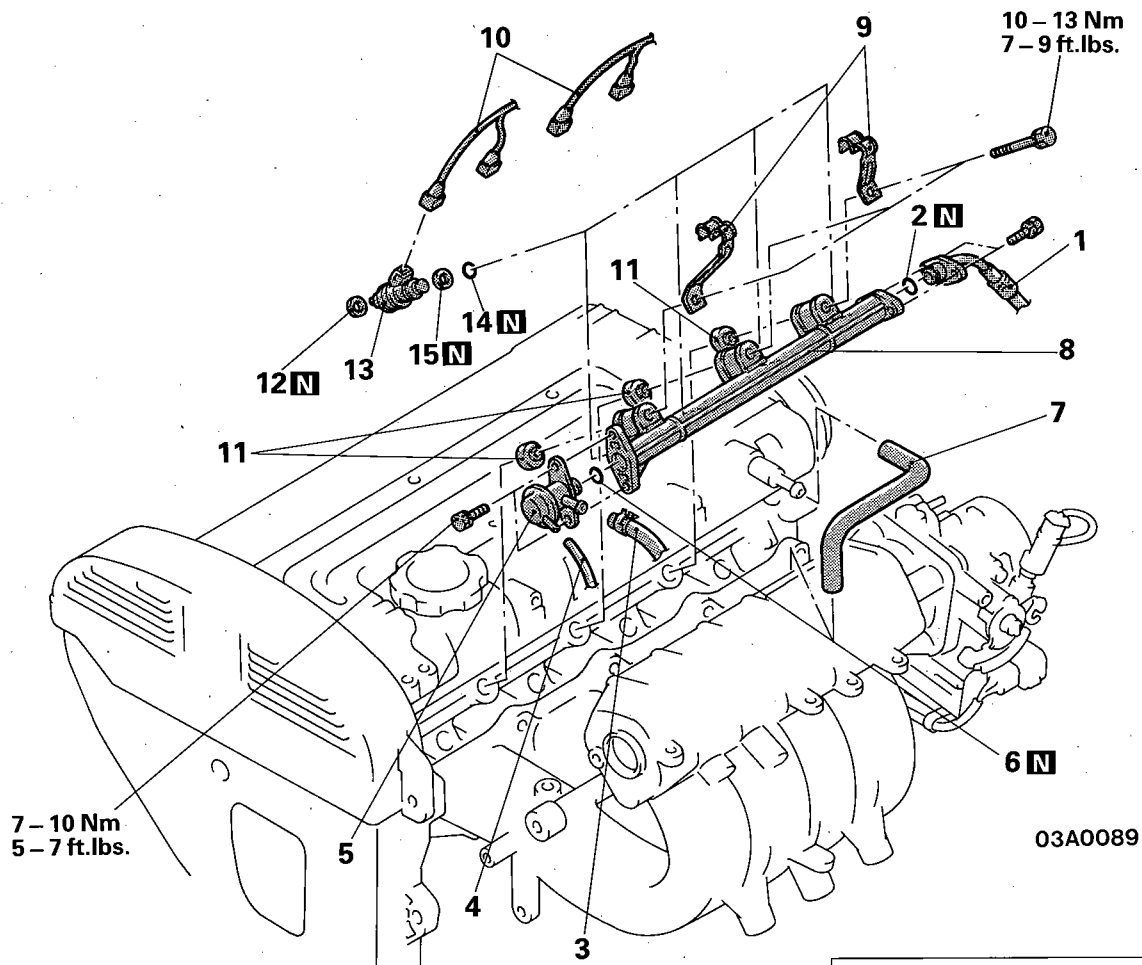


1. CONNECTION OF HIGH PRESSURE FUEL HOSE

When connecting the high pressure fuel hose to the delivery pipe, apply petrol to the hose union, and then insert, being careful not to damage the O-ring.

INJECTOR <1.6L Engine>

REMOVAL AND INSTALLATION



03A0089

Post-installation Operation

- Measurement of Fuel Pressure (Refer to P.14-39.)

Removal steps

- ◆◆ ◆◆ 1. High pressure fuel hose connection
- ◆◆ 2. O-ring
- ◆◆ 3. Fuel return hose connection
- ◆◆ 4. Vacuum hose connection
- ◆◆ 5. Fuel pressure regulator
- ◆◆ 6. O-ring
- ◆◆ 7. PCV hose
- ◆◆ 8. Delivery pipe
- ◆◆ 9. Accelerator cable clamp
- ◆◆ 10. Injector connectors

- ◆◆ 11. Insulator
- ◆◆ 12. Insulator
- ◆◆ 13. Injector
- ◆◆ 14. O-ring
- ◆◆ 15. Grommet

NOTE

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

SERVICE POINTS OF REMOVAL

N14SBAD2

1. DISCONNECTION OF HIGH PRESSURE FUEL HOSE

Bleed the residual pressure within the fuel pipe line so as to prevent the flow of fuel.

For information concerning the method to be followed for bleeding the residual pressure, refer to P.14-31.

Caution

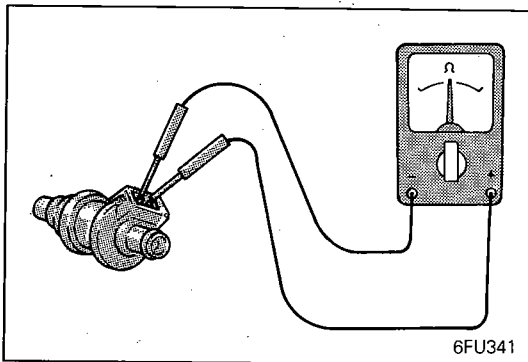
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

8. REMOVAL OF DELIVERY PIPE / 13. INJECTOR

Remove the delivery pipe (with the injectors attached to it).

Caution

Care must be taken, when removing the delivery pipe, not to drop the injector.

**INSPECTION**

N14NGAA

INJECTORS

- (1) Measure resistance between terminals of injector using a circuit tester.

Standard value:

<N/A> 13 – 16 Ω [at 20°C (68°F)]

<T/C> 2 – 3 Ω [at 20°C (68°F)]

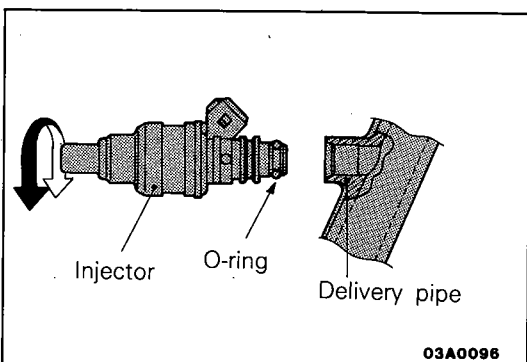
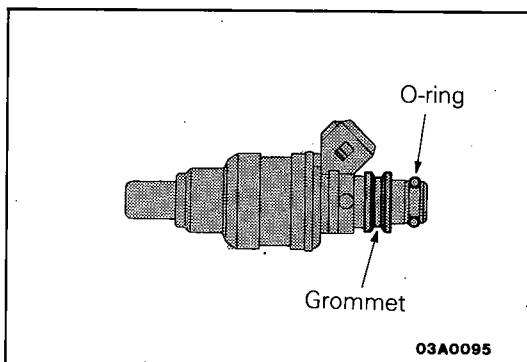
- (2) If the resistance is out of specification, replace the injector.

SERVICE POINTS OF INSTALLATION

N14SDAE2

15. INSTALLATION OF GROMMET / 14. O-RING / 13. INJECTOR

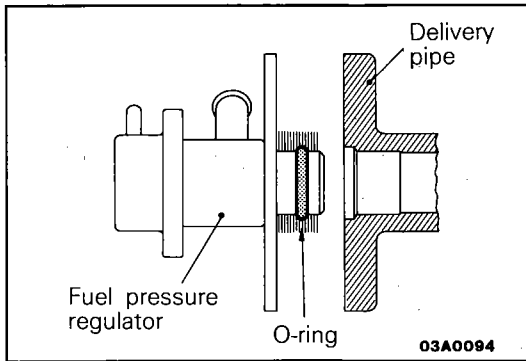
- (1) After installation of the grommet and O-ring (in that sequence) to the injector, apply light oil or petrol to the O-ring.



- (2) While turning the injector to the left and right, install it to the delivery pipe.
- (3) Check to be sure that the injector turns smoothly.

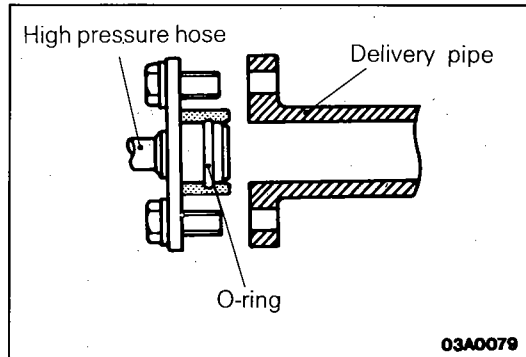
Caution

If it does not turn smoothly, the O-ring may be trapped remove the injector and then re-insert it into the delivery pipe and check once again.



5. INSTALLATION OF FUEL PRESSURE REGULATOR

When connecting the fuel pressure regulator to the delivery pipe, apply light oil or petrol to the O-ring, and then insert, being careful not to damage the O-ring.



1. CONNECTION OF HIGH PRESSURE FUEL HOSE

When connecting the high pressure fuel hose to the delivery pipe, apply petrol to the hose union, and then insert, being careful not to damage the O-ring.

THROTTLE BODY <1.5L Engine>

N14SA-3

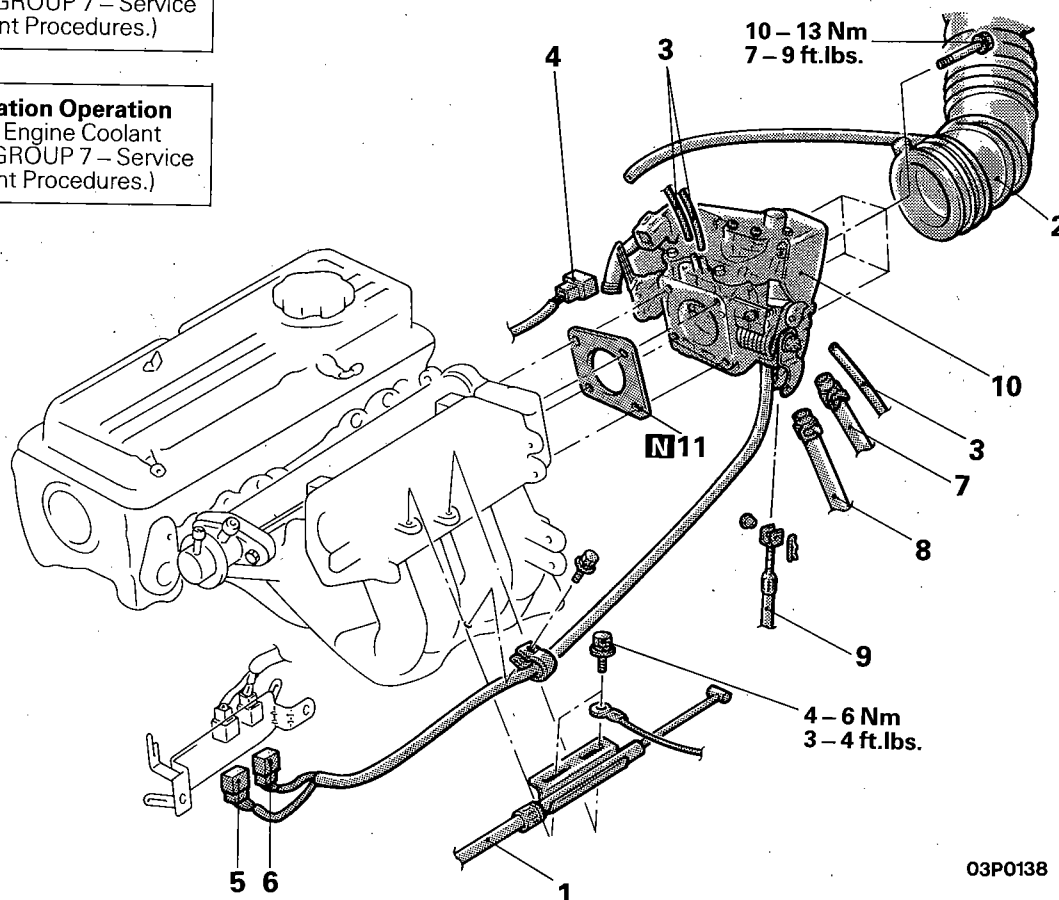
REMOVAL AND INSTALLATION

Pre-removal Operation

- Draining Engine Coolant
(Refer to GROUP 7 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying Engine Coolant
(Refer to GROUP 7 – Service Adjustment Procedures.)



03P0138

Removal steps

- ◆◆ 1. Accelerator cable
2. Air intake hose connection
3. Vacuum hose connection
4. Idle speed control motor connector
5. Motor position sensor connector
6. Throttle position sensor connector
7. Water hose connection
8. Water by-pass hose connection
9. Throttle control cable
10. Throttle body
11. 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

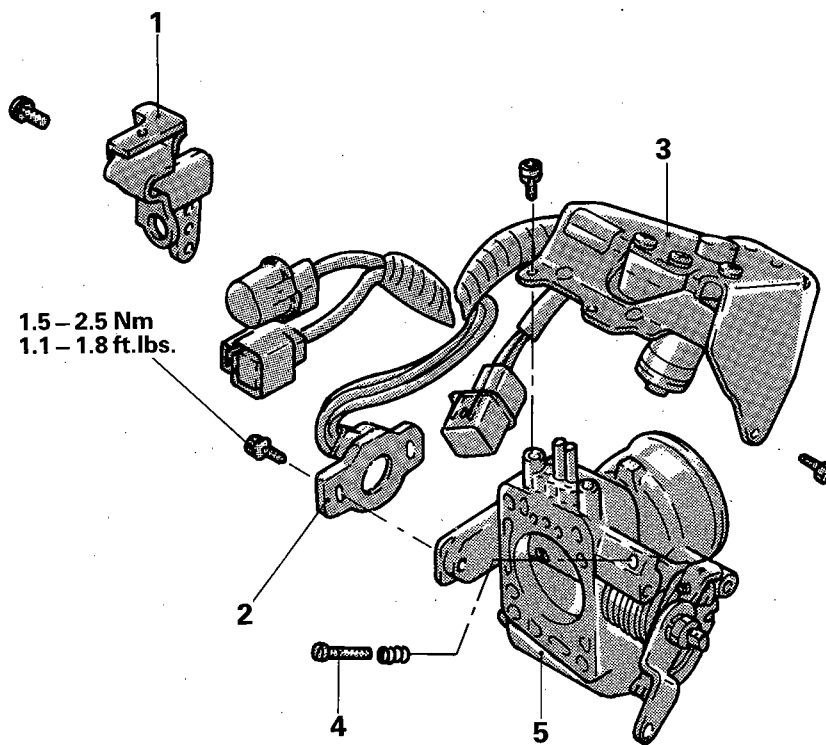
N14SDAF1

1. ACCELERATOR CABLE ADJUSTMENT

For information concerning adjustment of the accelerator cable, refer to P.14-94.

DISASSEMBLY AND REASSEMBLY

N14SE-1



1FU0303

Disassembly steps

- 1. Connector bracket
- ◆◆ 2. Throttle position sensor
- 3. Idle speed control servo assembly
- 4. Throttle valve set screw
- 5. Throttle body

NOTE

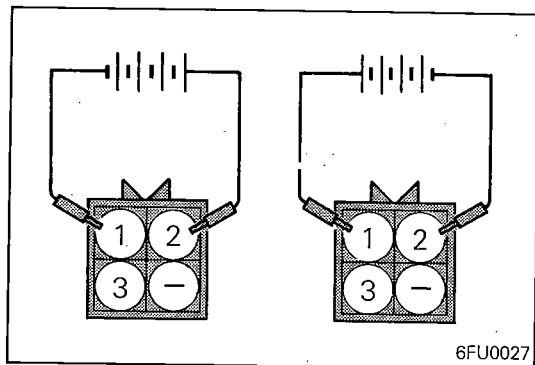
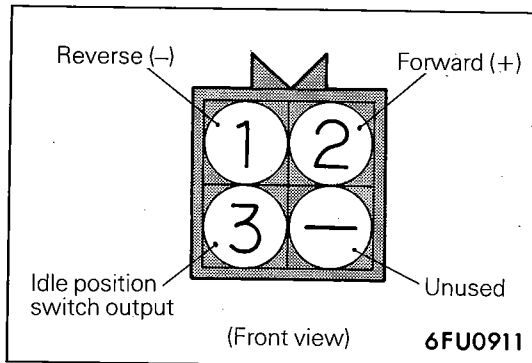
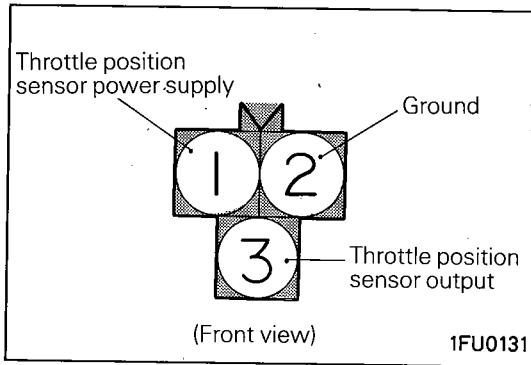
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆: Refer to "Service Points of Reassembly".

SERVICE POINTS OF DISASSEMBLY

N14SFAE

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. Be careful when removing the throttle position sensor screw as it has been coated with adhesive.



INSPECTION

N14SHAD

THROTTLE POSITION SENSOR CONTINUITY CHECK

- (1) Measure resistance between terminals ① and ② of the throttle position sensor using a circuit tester.

Standard value: 3.5 – 6.5 Ω

- (2) Check sensor body for cracks and damages.

IDLE SPEED CONTROL SERVO CONTINUITY CHECK

Measure resistance between terminals ① and ② using a circuit tester.

Standard value: 5 – 35 Ω [at 20°C (68°F)]

IDLE SPEED CONTROL SERVO OPERATION INSPECTION

Caution

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

- (1) Connect 6V DC to terminals ① and ② and check that the idle speed control servo extends and retracts by itself.

	Idle speed control servo motion
When terminal ① is \oplus	Retracts
When terminal ② is \oplus	Extends

- (2) If the idle speed control servo does not move, replace the idle speed control servo assembly.

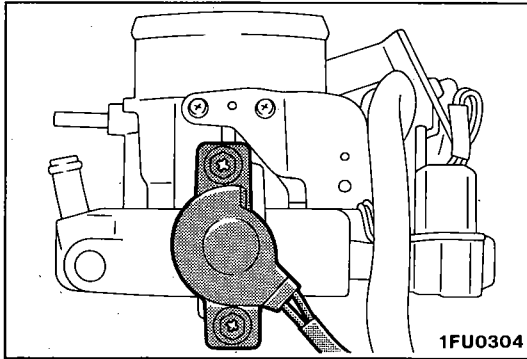
THROTTLE BODY COMPONENTS CLEANING

- (1) Clean all components, but the following components must not be cleaned by using a cleaning agent.

- Throttle position sensor
- Idle speed control servo assembly

The insulation of these components will be damaged if they are immersed in a cleaning agent. They should be cleaned by using only a piece of cloth.

- (2) Check for clogging of the vacuum port or passage. Clean the vacuum passage by using compressed air.

**SERVICE POINT OF REASSEMBLY**

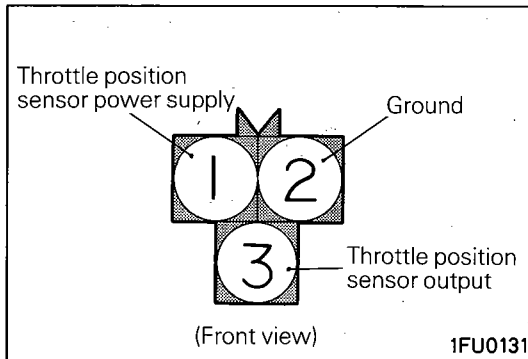
N14SGAE

2. INSTALLATION OF THROTTLE POSITION SENSOR

- (1) Install throttle position sensor on throttle body and temporarily tighten screw.

Caution

Adjust the throttle position sensor and idling speed control according to the engine load condition.

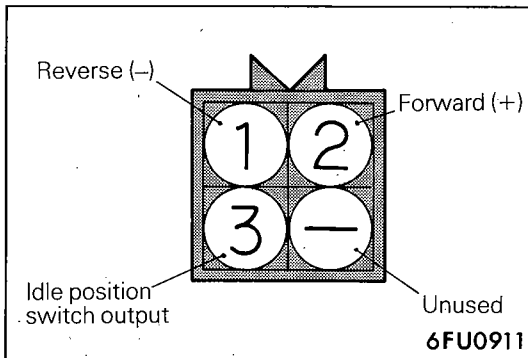


- (2) Check correct installation of the throttle position sensor. While moving the throttle lever in both open and close directions, that resistance between terminals ① and ③ or ② and ③ changes. If resistance changes smoothly, the throttle position sensor has been installed correctly.

AFTER REASSEMBLY INSPECTION**IDLE POSITION SWITCH CONTINUITY CHECK**

- (1) Using a circuit tester, check continuity between the body and terminal ③ when the throttle valve is fully closed and when fully opened.

Throttle valve	Continuity
Fully closed	Conductive
Fully opened	Non-conductive

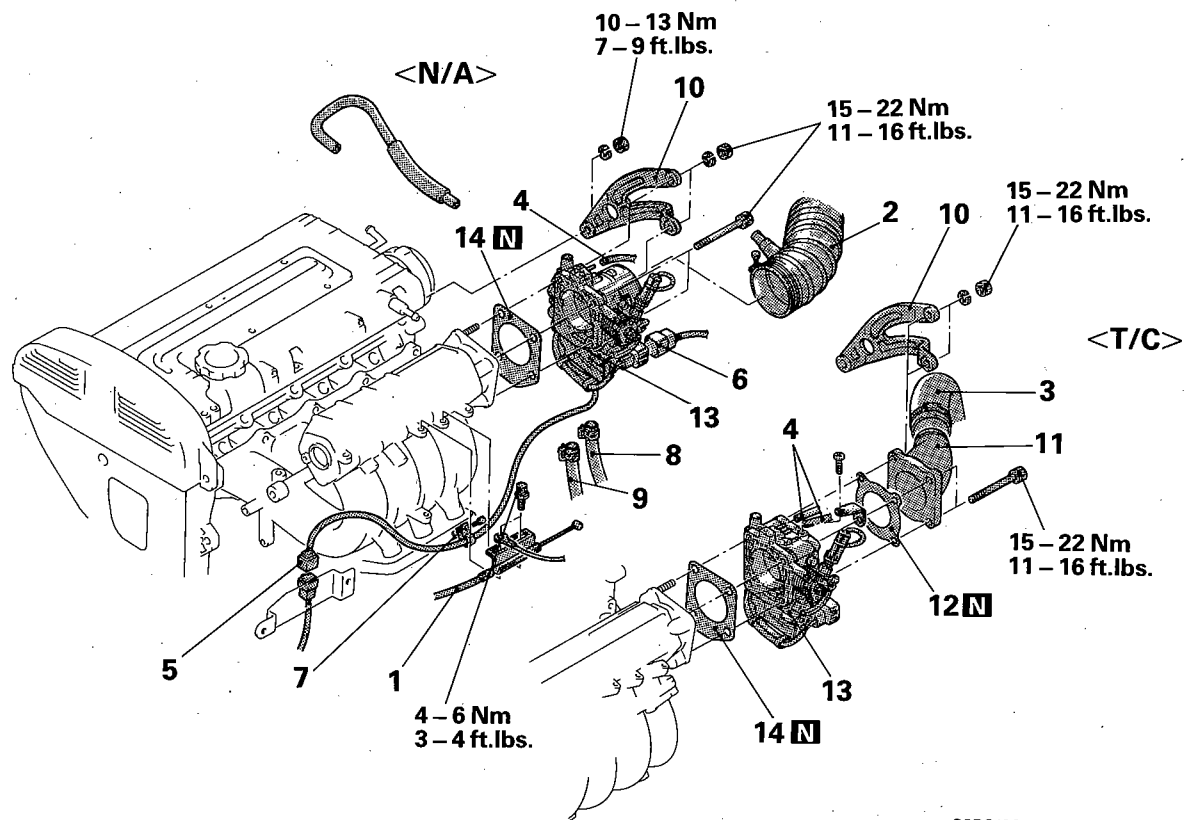


- (2) If otherwise than shown above, replace the idle speed control servo assembly.

THROTTLE BODY <1.6L Engine>

N14SA-4

REMOVAL AND INSTALLATION



03P0139

Removal steps

- ◆◆ 1. Accelerator cable
2. Air intake hose connection <N/A>
3. Air hose E connection <T/C>
4. Vacuum hose connection
5. Throttle position sensor connector
6. Idle speed control (stepper motor) connector
7. Harness clamp
8. Water hose connection
9. Water by-pass hose connection
10. Throttle body stay
11. Air fitting <T/C>
12. Gasket <T/C>
13. Throttle body
14. Gasket

Pre-removal Operation

- Draining Engine Coolant
(Refer to GROUP 7 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying Engine Coolant
(Refer to GROUP 7 – Service Adjustment Procedures.)

NOTE

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

SERVICE POINT OF INSTALLATION

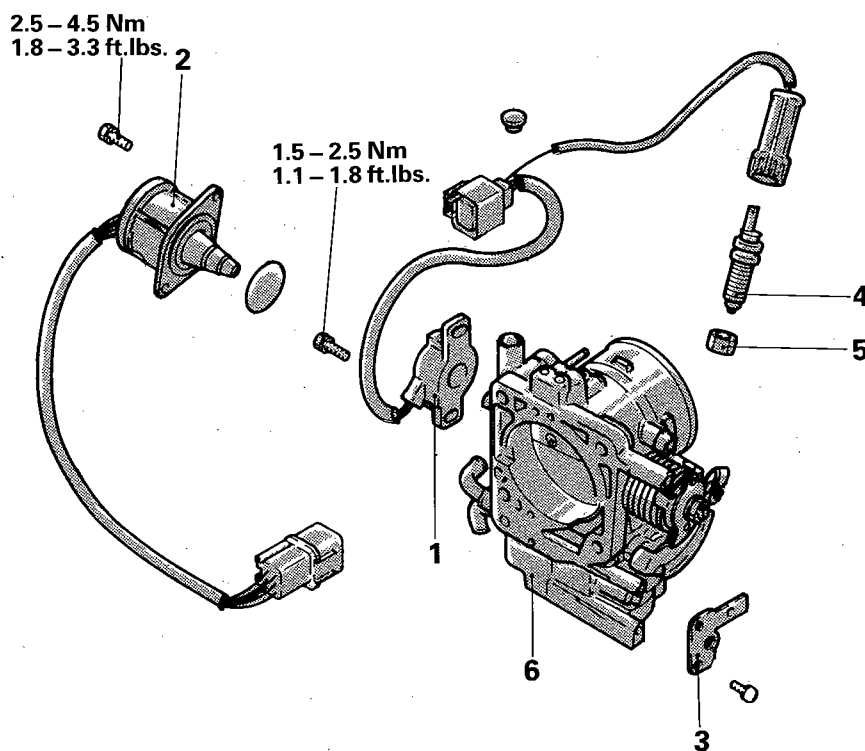
N14SDAF2

1. ACCELERATOR CABLE ADJUSTMENT

For information concerning adjustment of the accelerator cable, refer to P.14-94.

DISASSEMBLY AND REASSEMBLY

N14SE-2



6FU0716

Disassembly steps

1. Throttle position sensor
2. Idle speed control servo
3. Connector bracket
4. Idle position switch
5. Adjusting nut
6. Throttle body

NOTE

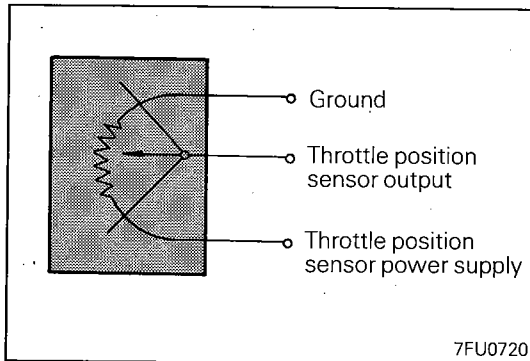
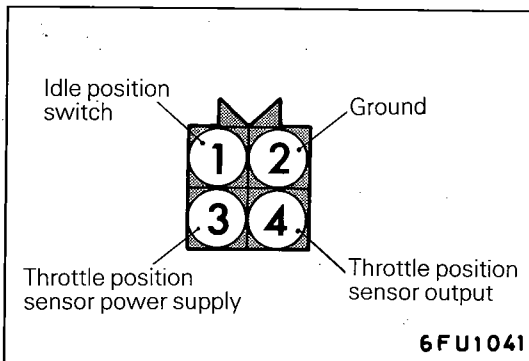
Reverse the disassembly procedures to reassemble.

SERVICE POINTS OF DISASSEMBLY

N14SFAF

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. Be careful when removing the throttle position sensor screw and the idle speed control servo screw as they have been coated with adhesive.



INSPECTION

THROTTLE POSITION SENSOR CONTINUITY TEST

- (1) Using a circuit tester, measure the resistance between terminal ② and terminal ③ of the throttle position sensor connector.

Standard resistance: 3.5 – 6.5 kΩ

- (2) While the circuit tester is connected to terminals ② and ④, or ③ and ④ of the throttle position sensor connector, slowly operate the throttle valve until it is at its maximum open position and check that the resistance changes smoothly.

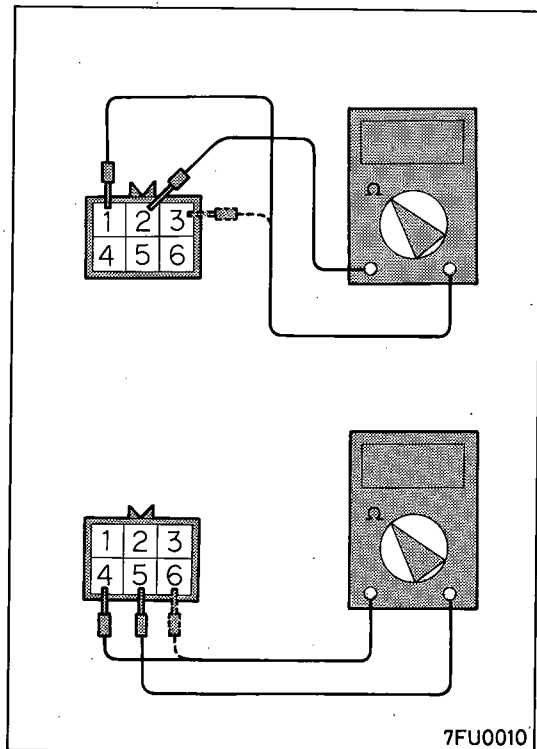
IDLE SPEED CONTROL SERVO CONTINUITY CHECK

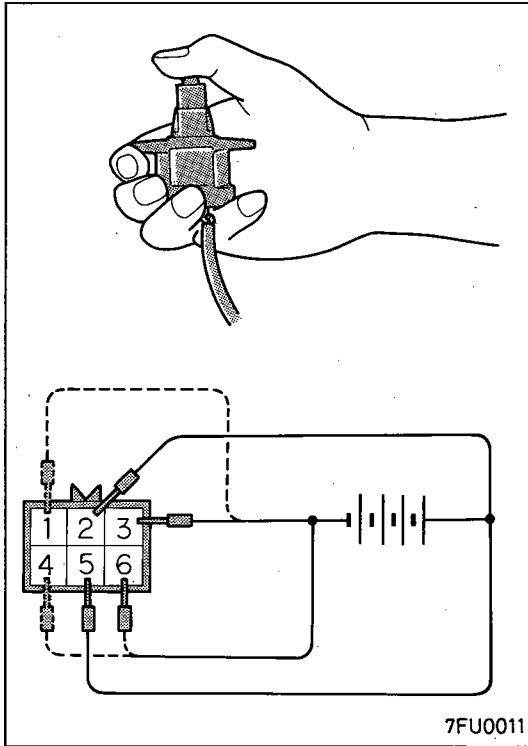
Measure the resistance between each of the terminals.

Standard resistance:

Between terminal ② and either terminal ① or ③ 28 – 33 Ω [at 20°C (68°F)]

Between terminal ⑤ and either terminal ⑥ or ④ 28 – 33 Ω [at 20°C (68°F)]



**IDLE SPEED CONTROL SERVO OPERATIONAL CHECK**

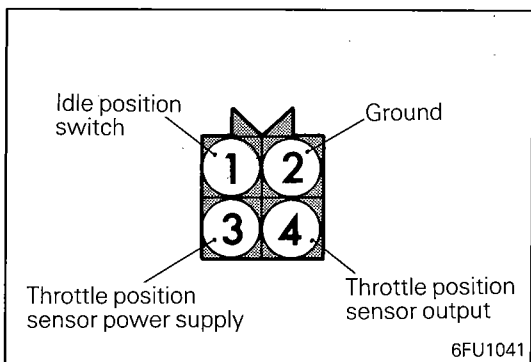
- (1) Connect the positive terminal of a DC power supply of approx. 6V to terminals ② and ⑤ of the idle speed control servo connector.
- (2) Holding the idle speed control servo as indicated in the illustration, connect the negative terminal of the power supply to each pair of its terminals in the order given below, and ascertain whether or not small vibration is created due to the operation of the stepper motor.
 1. Connect the negative terminal of the power supply to terminals ③ and ⑥.
 2. Connect the negative terminal of the power supply to terminals ① and ⑥.
 3. Connect the negative terminal of the power supply to terminals ① and ④.
 4. Connect the negative terminal of the power supply to terminals ③ and ④.
 5. Connect the negative terminal of the power supply to terminals ③ and ⑥.
 6. Repeat the test in the order from step 5 to 1.
- (3) The stepper motor is functioning properly if vibration is felt each time.

CLEANING THROTTLE BODY PARTS

- (1) Clean all parts. A cleanser should not be used to clean the following parts:
 - Throttle position sensor
 - Idle speed control servo
 - Idle position switch

Immersing these parts in cleanser damages the insulation. Wipe them with a cloth only.

- (2) Check that the vacuum port and passage are not plugged up. Clean the vacuum passage with compressed air.

**INSPECTION AFTER REASSEMBLY****IDLE POSITION SWITCH CONTINUITY CHECK**

- (1) Check the continuity between connector terminal ① and the body of the throttle position sensor both when the throttle valve is at its completely closed position and at maximum open position.

Throttle valve	Continuity
Completely closed	Conductive
Fully opened	Non-conductive

- (2) If the results of the test do not conform to the above, replace the idle position switch.

FUEL TANK

REMOVAL AND INSTALLATION

N14GA -

Pre-removal Operation

- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.14-31.)

Post-installation Operation

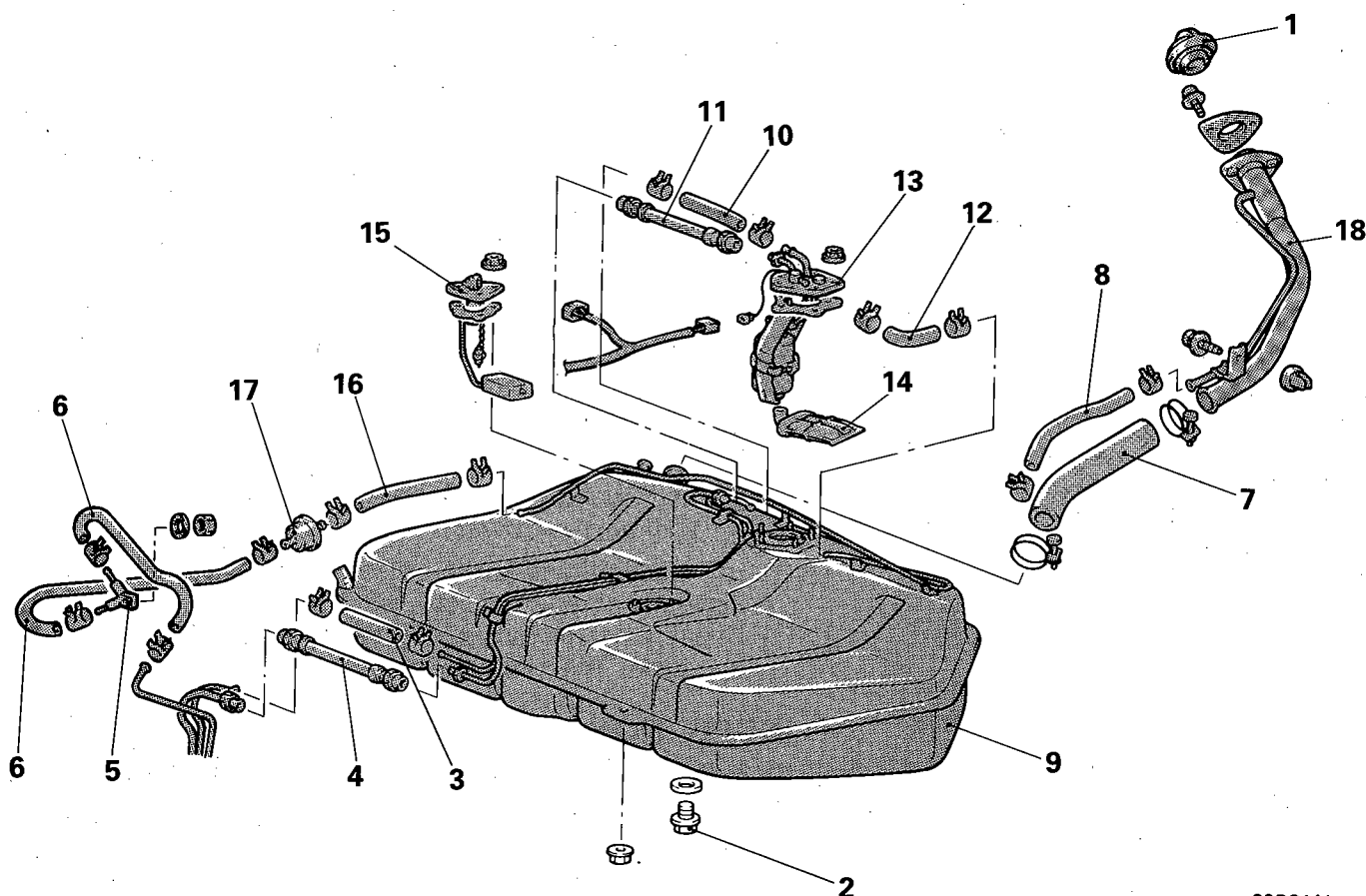
- Checking for Fuel Leakage

Flare nut



32 – 42 Nm
23 – 30 ft.lbs.

14F038



03P0141

Removal steps

- 1. Fuel tank cap
- 2. Drain plug
- 3. Return hose
- 4. High pressure fuel hose
- 5. Check valve
- 6. Vapor hose
- 7. Filler hose
- 8. Breather hose
- 9. Fuel tank
- 10. Return hose
- 11. High pressure fuel hose
- 12. Vapor hose
- 13. Fuel pump
- 14. In-tank fuel filter

- 15. Fuel gauge unit
- 16. Vapor hose
- 17. Two-way valve
- 18. Filler neck

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦♦: Refer to "Service Points of Removal".
- (3) ♦♦♦: Refer to "Service Points of Installation".

SERVICE POINT OF REMOVAL

N14GBAG

2. REMOVAL OF DRAIN PLUG

Remove the drain plug and drain the fuel.

INSPECTION

N14GCAF

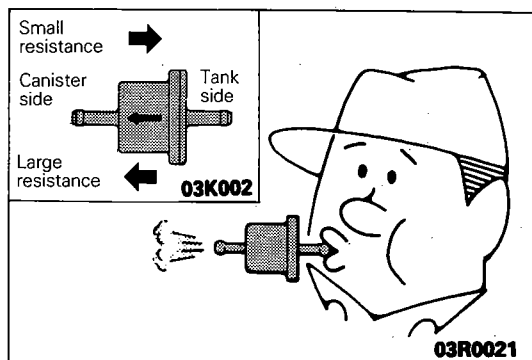
- Check the hoses and pipes for cracks or damage.
- Check the fuel tank cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.
- Check the fuel tank for dust or foreign material.

NOTE

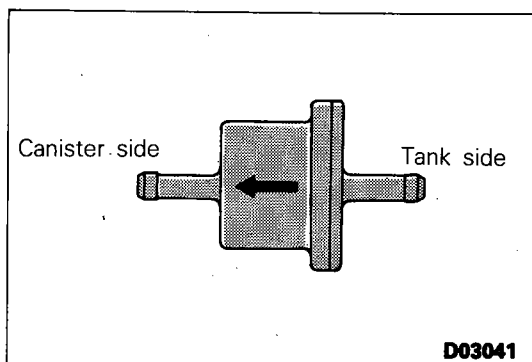
If the inside of the fuel tank is to be cleaned, use any one of the following:

- (1) Kerosene
- (2) Trichloroethylene
- (3) A neutral emulsion type detergent

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

**CHECKING TWO-WAY VALVE**

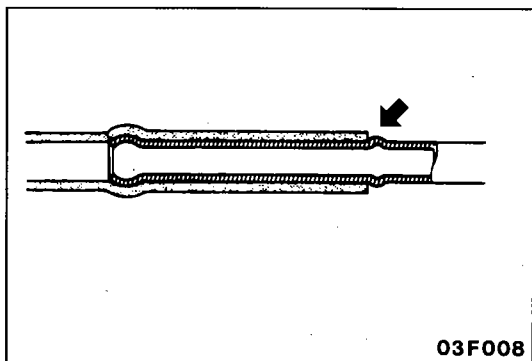
Lightly breathe into the inlet and outlet. If the air passes through after slight resistance, then the valve may be considered good.

**SERVICE POINTS OF INSTALLATION**

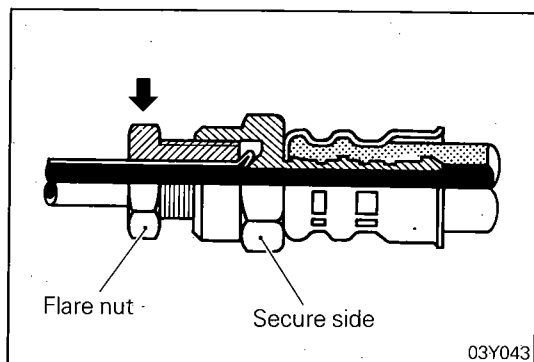
N14GDAJ

17. INSTALLATION OF TWO-WAY VALVE

Install so that the two-way valve is facing in the direction shown in the illustration.

**16. 12. 6. CONNECTION OF VAPOR HOSE / 10. 3. RETURN HOSE**

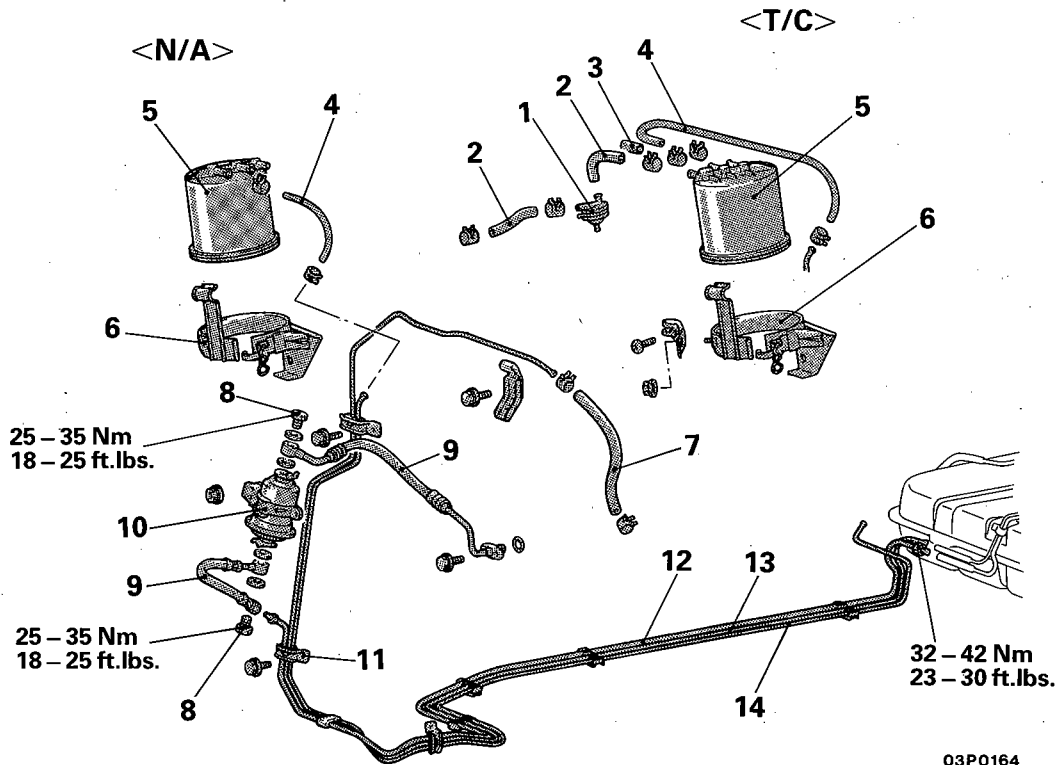
When attaching the fuel hose to the pipe, be sure that the hose is attached all the way up to the bulge as shown in the illustration.

**11. 4. CONNECTION OF HIGH PRESSURE FUEL HOSE**

Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.

FUEL LINE AND VAPOR LINE REMOVAL AND INSTALLATION

N14KA-



03P0164

Removal steps

1. Purge control valve <T/C>
2. Vapor hose <T/C>
3. Cap <T/C>
- ◆◆ 4. Fuel vapor hose
5. Canister
- ◆◆ 6. Canister holder
- ◆◆ 7. Fuel return hose
- ◆◆ 8. Eye bolt
- ◆◆ 9. High pressure fuel hose
- ◆◆ 10. Fuel filter
- ◆◆ 11. Clip
12. Fuel main pipe
13. Fuel return pipe
14. Fuel vapor pipe

Pre-removal Operation

- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.14-31.)

Post-installation Operation

- Checking for Fuel Leakage

NOTE

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

SERVICE POINTS OF REMOVAL

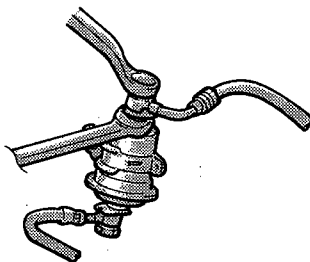
N14KBAH

8. REMOVAL OF EYE BOLT

Remove the eye bolt while holding the fuel filter nut securely.

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.



03P0070

11. REMOVAL OF CLIP

After removing the steering gear box, remove the clip.
(Refer to GROUP 19 – Steering Gear Box.)

INSPECTION

N14KCAF

- Check the hoses and pipes for cracks, bends, deformation and clogging.
- Check the canister for clogging.
- Check the fuel filter for clogging and damage.

SERVICE POINTS OF INSTALLATION

N14KDAJ

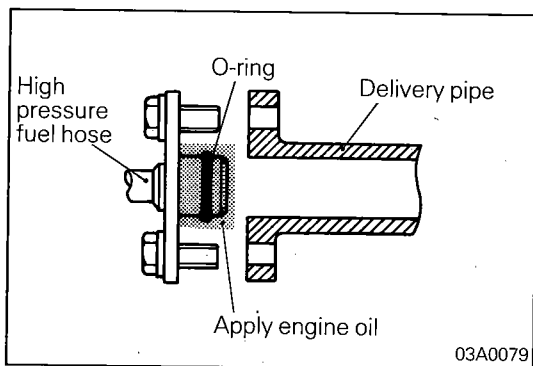
9. INSTALLATION OF HIGH PRESSURE FUEL HOSE

- (1) Apply engine oil to the hose union.
Insert the hose, being careful not to damage the O-ring, and tighten securely.

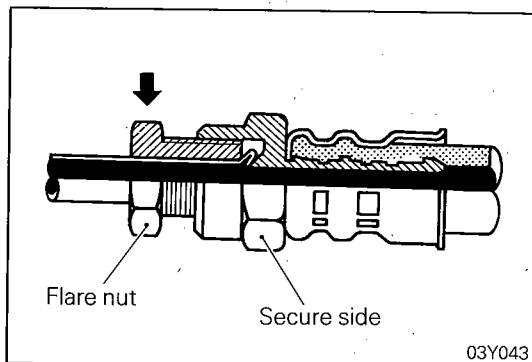
Caution

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) Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.



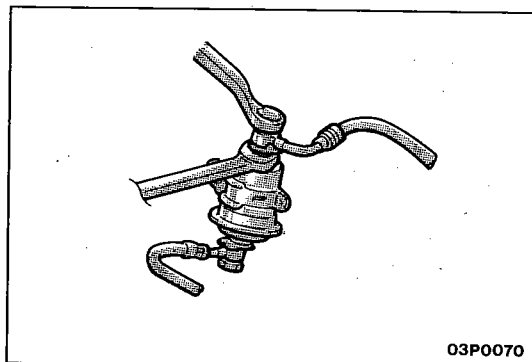
03A0079



03Y043

8. INSTALLATION OF EYE BOLT

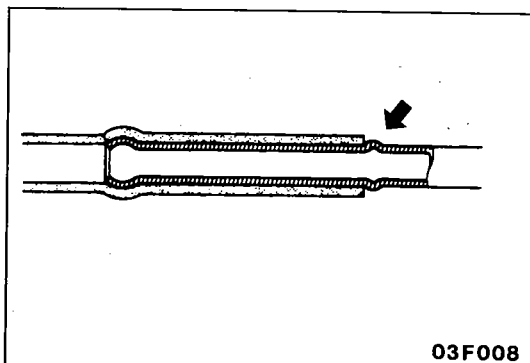
While holding the fuel filter with a wrench, tighten the eye bolt to the specified torque.



03P0070

9. INSTALLATION OF FUEL RETURN HOSE / 4. FUEL VAPOR HOSE

Connect the fuel hose to the pipe securely, up to the bulge, as shown in the illustration.



03F008

ENGINE CONTROL

N14CB-B

SPECIFICATIONS

SERVICE SPECIFICATIONS

Items	Specifications
Standard value	
Accelerator cable play mm (in.)	
<M/T, 3-A/T>	1 – 2 (.04 – .08)
<4-A/T>	3 – 5 (.12 – .20)
Accelerator switch switching point mm (in.)	2 – 6 (.08 – .24)

TROUBLESHOOTING

N14EGABa

ACCELERATOR CABLE AND ACCELERATOR PEDAL

Symptom	Probable cause	Remedy
Throttle valve will not fully open or close	Misadjusted accelerator cable	Adjust
	Misadjusted auto-cruise control cable	Adjust
	Broken return spring	Replace
	Throttle lever malfunction	Replace
Accelerator pedal operation not smooth (over acceleration)	Accelerator pedal wrongly tightened	Repair
	Misinstalled accelerator cable	Repair
	Accelerator cable requires lubrication	Lubricate or replace

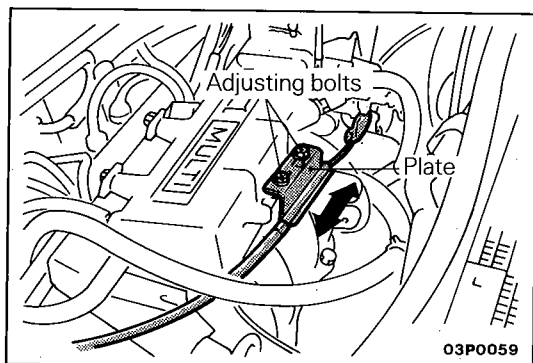
SERVICE ADJUSTMENT PROCEDURES

N14FBCF

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT

For models equipped with the auto-cruise control system, refer to P.14-125.

- (1) Turn air conditioner and lights OFF.
Inspect and adjust at no load.
- (2) Warm engine until stabilized at idle.
- (3) Confirm idle speed is at prescribed rpm.
- (4) Stop engine (ignition switch OFF).
- (5) Confirm there are no sharp bends in accelerator cable.
- (6) Check inner cable for correct slack.
- (7) If there is too much slack or no slack, adjust play by the following procedures.
 - ① On models with a 1.5L engine, turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds.



- ② Loosen the adjusting bolts on the air intake plenum, and then secure the outer cable so that the free play of the inner cable will be the standard value.

Standard value:

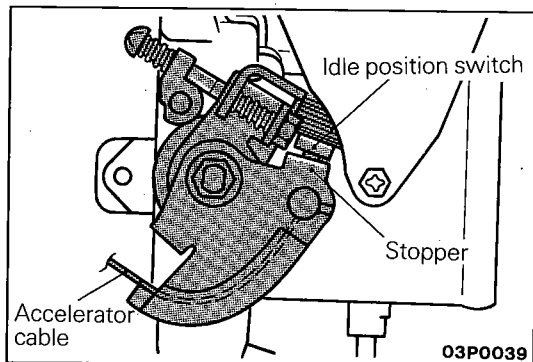
<M/T, 3-A/T>
<4-A/T>

1 – 2 mm (.04 – .08 in.)
3 – 5 mm (.12 – .20 in.)

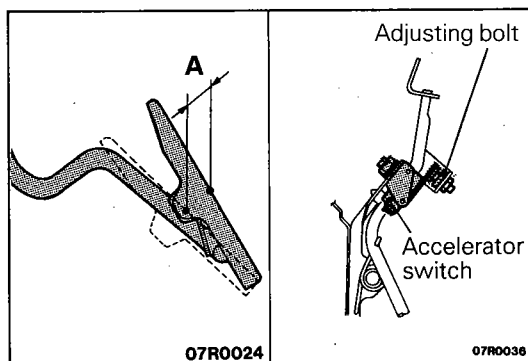
NOTE

If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.

If there is no play (excessive tension) of the accelerator cable, the idling speed will increase.



- (8) Confirm that throttle valve fully opens and closes by operating pedal.
- (9) Confirm that throttle lever stopper touches the idle position switch.



ACCELERATOR SWITCH INSPECTION AND ADJUSTMENT

N14FTBBb

- (1) After warming up the engine, check to be sure that the accelerator switch is ON when the accelerator pedal is in the free condition. If there is a malfunction, adjust by using the adjusting bolt.
- (2) Press the accelerator pedal by hand until the accelerator switch switches from ON to OFF and confirm that the amount of pedal movement (A in the illustration) is within the standard value range.

Accelerator switch switching point

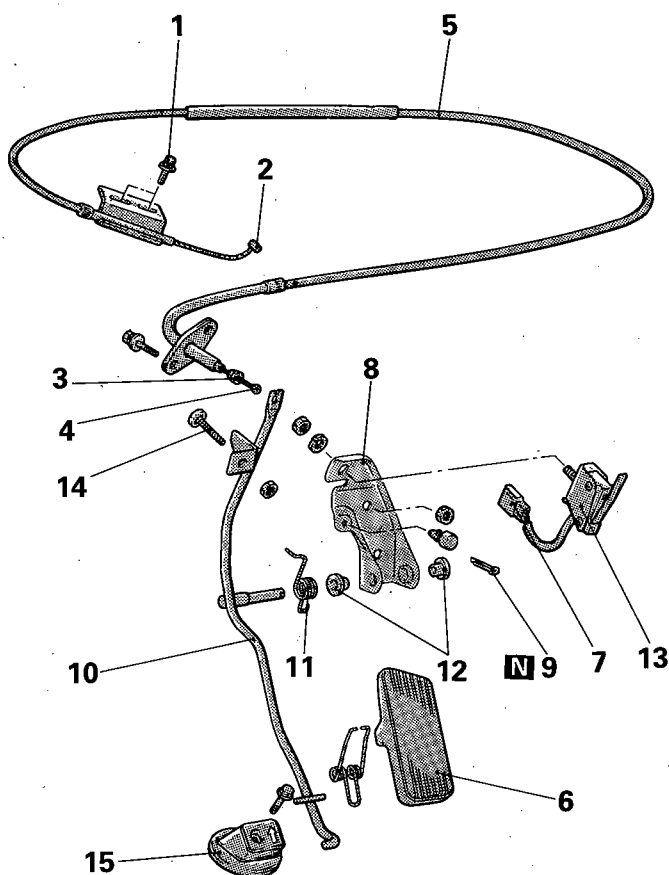
Standard value: 2 – 6 mm (.08 – .24 in.)

- (3) If the distance (A in the illustration) is not the standard value, adjust it by using the adjusting bolt.

ENGINE CONTROL

REMOVAL AND INSTALLATION

N140A-A



07P0012

Removal steps

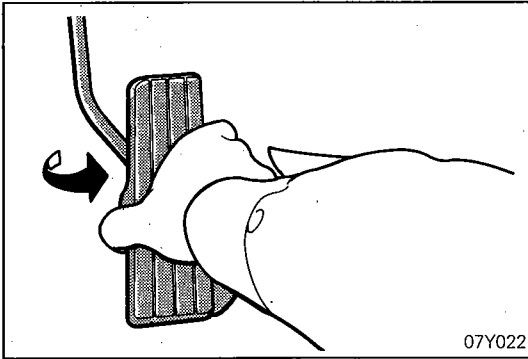
1. Adjusting bolt
2. Throttle body side inner cable
- ◆◆ 3. Bushing
- ◆◆ 4. Accelerator arm side inner cable
- ◆◆ 5. Accelerator cable
- ◆◆ 6. Accelerator pedal
- ◆◆ 7. Accelerator switch connector <4-A/T>
8. Accelerator arm bracket
9. Split pin
- ◆◆ 10. Accelerator arm
- ◆◆ 11. Return spring
12. Bushing
13. Accelerator switch <4-A/T>
14. Bolt <4-A/T>
- ◆◆ 15. Accelerator pedal stopper

Post-installation Operation

- Accelerator Cable Adjustment
(Refer to P. 14-94;
for models equipped with
auto-cruise control system,
refer to P. 14-125.)

NOTE

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



07Y022

SERVICE POINT OF REMOVAL

N140BAC

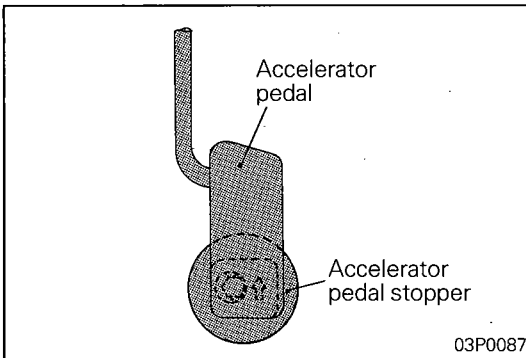
6. REMOVAL OF ACCELERATOR PEDAL

Pull the left side of the accelerator pedal toward you, and then remove the accelerator pedal from the accelerator arm.

INSPECTION

N140CAI

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the accelerator arm for bending.
- Check the return spring for deterioration.
- Check the connection of bushing to end metal fitting.
- Check the accelerator pedal switch for correct ON-OFF operation. <4-A/T>



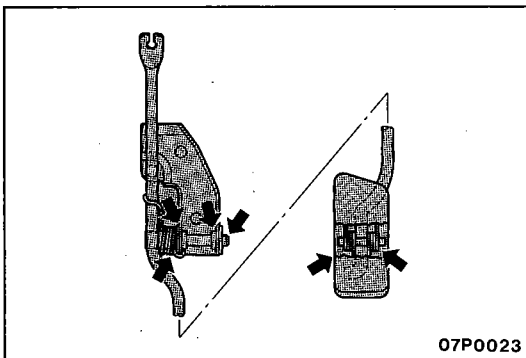
03P0087

SERVICE POINTS OF INSTALLATION

N140DAQ

15. INSTALLATION OF ACCELERATOR PEDAL STOPPER

Install the stopper in the direction indicated in the illustration.

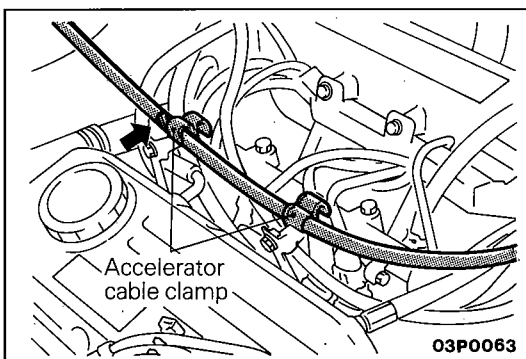


07P0023

11. APPLICATION OF GREASE TO RETURN SPRING / 10. ACCELERATOR ARM

Apply multipurpose grease around the each moving point of the accelerator arm.

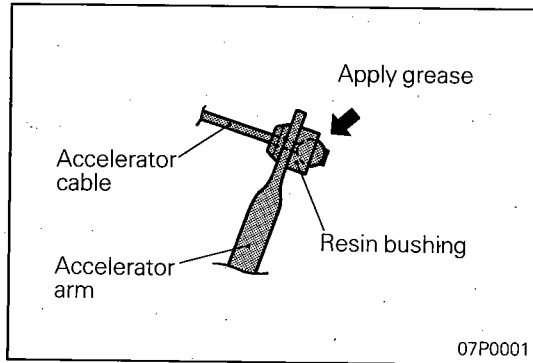
Grease: MOPAR Multi-mileage Lubricant
Part Number 2525035 or equivalent



03P0063

5. INSTALLATION OF ACCELERATOR CABLE

Secure the accelerator cable with the identification mark at the illustrated position.



4. APPLICATION OF GREASE TO ACCELERATOR ARM SIDE INNER CABLE / 3. BUSHING

- (1) Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.
- (2) Apply multipurpose grease around the cable end.

**Grease: MOPAR Multi-mileage Lubricant
Part Number 2525035 or equivalent**

AUTO-CRUISE CONTROL SYSTEM

N14CA-C

SPECIFICATIONS

GENERAL SPECIFICATIONS

Items	Specifications
Auto-cruise control switch Rated load A SET RESUME Voltage drop V	 0.2 ± 0.1 0.2 ± 0.1 0.2 or less
Stop light switch Rated load A Voltage drop (at rated load) V	 0.1 – 1.5 0.15 or less
Clutch switch Maximum load A Voltage drop (at 15A) V	 15 0.15 or less
Auto-cruise control unit Set error km/h (mph) Range of speed control km/h (mph)	 ±1.0 (±0.6) 40 – 145 (25 – 90)
Actuator Drive system Stroke mm (in.)	 Electrical (DC motor) 38 – 42 (1.5 – 1.7)

SERVICE SPECIFICATIONS

N14CB-C

Items	Specifications
Accelerator cable B (throttle valve side) play mm (in.) Accelerator cable A (accelerator pedal side) play mm (in.) <M/T> <A/T> Actuator clutch coil resistance Ω	 1 – 2 (.04 – .08) 0 – 1 (0 – .04) 2 – 3 (.08 – .12) Approx. 20

TORQUE SPECIFICATIONS

N14CC-C

Items	Nm	ft.lbs.
Actuator bracket	9 – 14	7 – 10

TROUBLESHOOTING

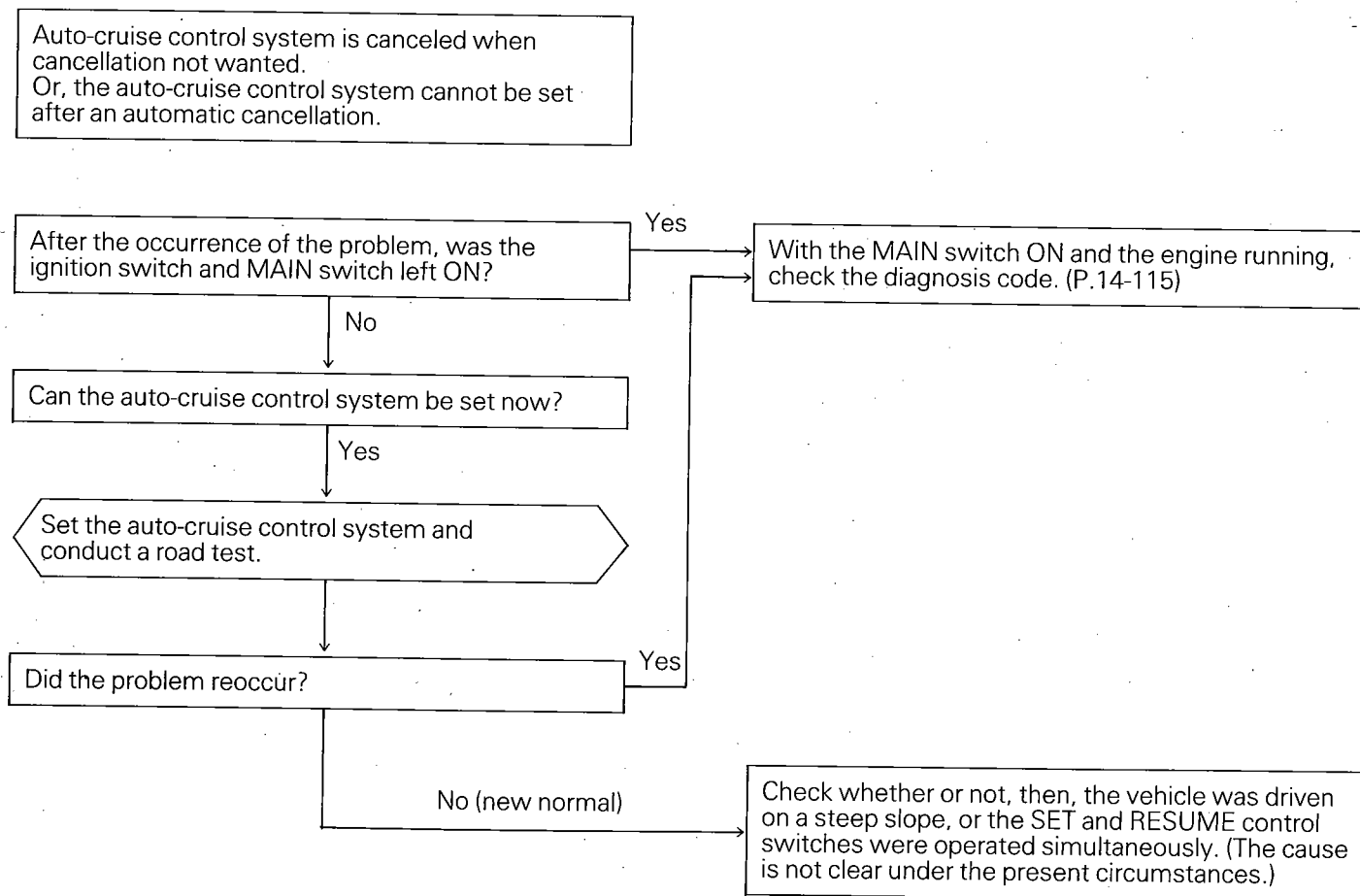
N14EBDI

The auto-cruise control system performs control functions for the setting or cancellation of the fixed speed driving speed based upon the data provided by input signals. As a result, when the auto-cruise control system is canceled, the cause of the cancellation is memorized in a separate circuit by the engine control unit, regardless of whether or not the auto-cruise control system condition is normal or abnormal, thus providing the engine control unit with the self-diagnosis function by certain fixed patterns, as well as the function of being able to check whether or not the engine control unit's input switches or sensor are normal. Thus, by effectively using these functions, the time required checking and repair can be shortened.

NOTE

When the engine control unit power supply (ignition switch and main switch) is switched OFF, the memorized diagnosis codes are erased, and so for this reason the power supply must be left ON until the checking is completed.

TROUBLESHOOTING QUICK REFERENCE CHART



Auto-cruise control system cannot be set.

Prepare to conduct input check.
(Refer to P.14-117.)

Were codes No. 21, 22 and 25 displayed when, with the vehicle stationary, the input check codes were recalled?

No

NOTE

If, after the occurrence of the problem, the ignition switch and the MAIN switch have not been switched OFF, it is possible to determine (by checking the diagnosis output code) which circuit canceled the system's operation.

This chart is to be used, then, for troubleshooting if it is not possible to use the self-diagnosis for checking.

- Damaged or disconnected wiring of the engine control unit power supply circuit (Go to check chart No. 1 on P.14-104.)
- Damaged or disconnected wiring of the SET or RESUME switch (Go to check charts No. 2 and 3 on P.14-105, 106.)

Yes

Are the results of all input checks normals?

Yes

No

Check results	Probable cause	Remedy	Check chart No.
Code No. 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch.	No. 2
	SET switch input line short-circuit	Repair the harness.	
Code No. 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	No. 3
	RESUME switch input line short-circuit	Repair the harness.	
Code No. 23 remains even though CANCEL switch is set to OFF.	Malfunction of the CANCEL circuit (ON malfunction)	Check or repair each CANCEL circuit.	No. 6-1, 6-2, 6-3
Code No. 25 does not disappear, and code No. 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	No. 4

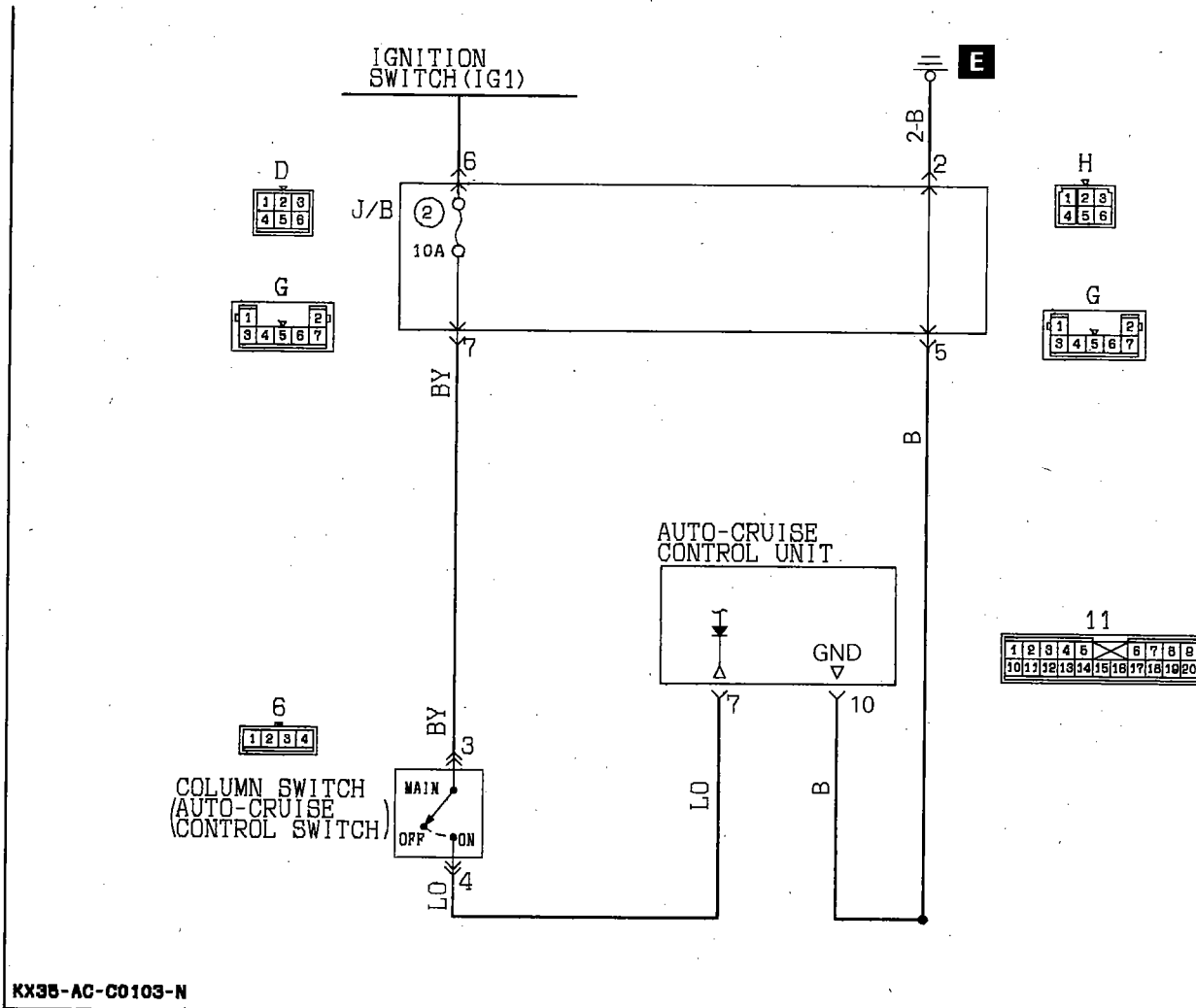
Check the actuator circuit.
(Go to check chart No. 5 on P.14-108.)

NOTE

If the results of the check of the actuator circuit (check chart No. 5) and of the actuator itself (P.14-108) reveal no abnormal condition, replace the engine control unit.

Trouble symptom	Probable cause	Check chart No.	Remedy
<ul style="list-style-type: none"> • The set vehicle speed varies greatly upward or downward. • "Hunching" (repeated alternating acceleration and deceleration) occurs after setting is made. 	Malfunction of the vehicle speed sensor circuit	No. 4	Repair the vehicle speed sensor system, or replace the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Actuator circuit poor contact	No. 5	Repair the actuator system, or replace the part.
	Malfunction of the actuator		
	Malfunction of the engine control unit	—	Replace the engine control unit.
The auto-cruise control system is not canceled when the brake pedal is depressed.	Damaged or disconnected wiring of the stop light switch input circuit; brake switch (for auto-cruise control) malfunction (short-circuit)	If the input check code No. 23 indicates a malfunction. No. 6-1	Repair the harness or replace the stop light switch.
	Actuator drive circuit short-circuit	No. 5	Repair the harness or replace the actuator.
	Malfunction of the engine control unit	—	Replace the engine control unit.
The auto-cruise control system is not canceled when the clutch pedal is depressed. <M/T> (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch switch input circuit	If the input check code No. 23 indicates a malfunction. No. 6-3	Repair the harness, or repair or replace the clutch switch.
	Clutch switch improper installation (won't switch ON)		
	Malfunction of the engine control unit	—	Replace the engine control unit.
The auto-cruise control system is not canceled when the shift lever is moved to the "N" position. <A/T> (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of inhibitor switch input circuit	If the input check code No. 23 indicates a malfunction. No. 6-2	Repair the harness, or repair or replace the inhibitor switch.
	Improper adjustment of inhibitor switch		
	Malfunction of the engine control unit	—	Replace the engine control unit.

Trouble symptom	Probable cause	Check chart No.	Remedy
Cannot decelerate by using the SET switch.	Temporary damaged or disconnected wiring of SET switch input circuit	No. 2	Repair the harness or replace the SET switch.
	Actuator circuit poor contact	No. 5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the engine control unit	—	Replace the engine control unit.
Cannot accelerate or resume speed by using the RESUME switch.	Damaged or disconnected wiring, or short-circuit, of RESUME switch input circuit	No. 3	Repair the harness or replace the RESUME switch.
	Actuator circuit poor contact	No. 5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the engine control unit	—	Replace the engine control unit.
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle speed sensor circuit	No. 4	Repair the vehicle speed sensor system, or replace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the engine control unit	—	Replace the engine control unit.
The MAIN switch indicator light does not illuminate. (But auto-cruise control system is normal.)	Damaged or disconnected bulb of MAIN switch indicator	—	Repair the harness or replace the control switch.
	Harness damaged or disconnected		
Malfunction of control function by ON/OFF switching of 4-A/T accelerator switch. (Non-operation of damper clutch, 2nd gear hold, etc.)	Malfunction of circuit related to accelerator switch OFF function	No. 7	Repair the harness or replace the part.
	Malfunction of the engine control unit		
Overdrive is not canceled during fixed speed driving. <A/T>	Malfunction of circuit related to overdrive cancellation, or malfunction of engine control unit	No. 8	Repair the harness or replace the part.
No shift to overdrive during manual driving. <A/T>			

CHECK CHART**1. CHECKING THE CONTROL UNIT POWER SUPPLY CIRCUIT****OPERATION**

When the "MAIN" switch (of the auto-cruise control's switches) is switched ON while the ignition switch is ON, current flows to the ignition

switch (IG1), to fuse No. (2) of the junction block, and to the auto-cruise control switch, the control unit, the junction block, and to ground.

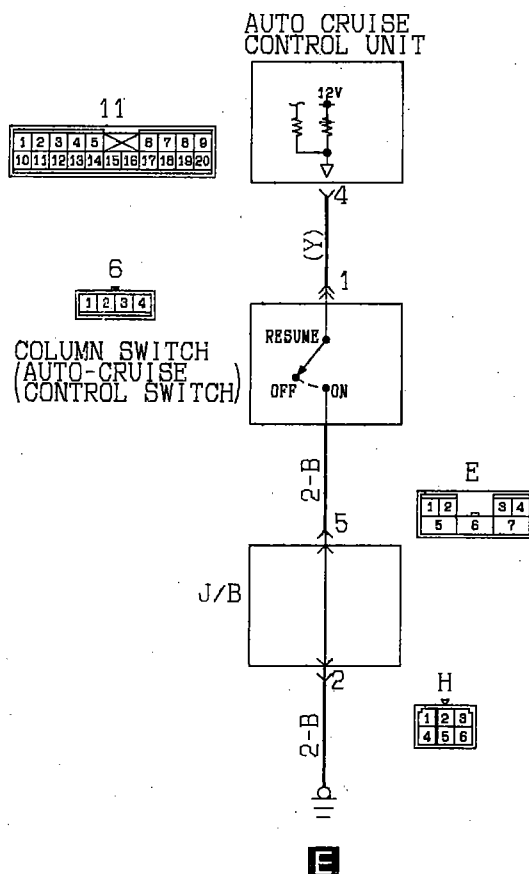
TROUBLESHOOTING HINTS**Auto-cruise control unit terminal voltage**

Terminal No.	Signal	Conditions	Terminal voltage
7	Control unit power supply	When the auto-cruise control switch ("MAIN") is switched ON	12V
10	Control unit ground	At all times	0V

[illegible]

Terminal No.	Signal	Conditions	Terminal voltage
5	SET switch	When the SET switch is switched ON	0V
		When the SET switch is switched OFF	12V

3. CHECKING THE RESUME SWITCH CIRCUIT



KX35-AC-C0305-N

OPERATION

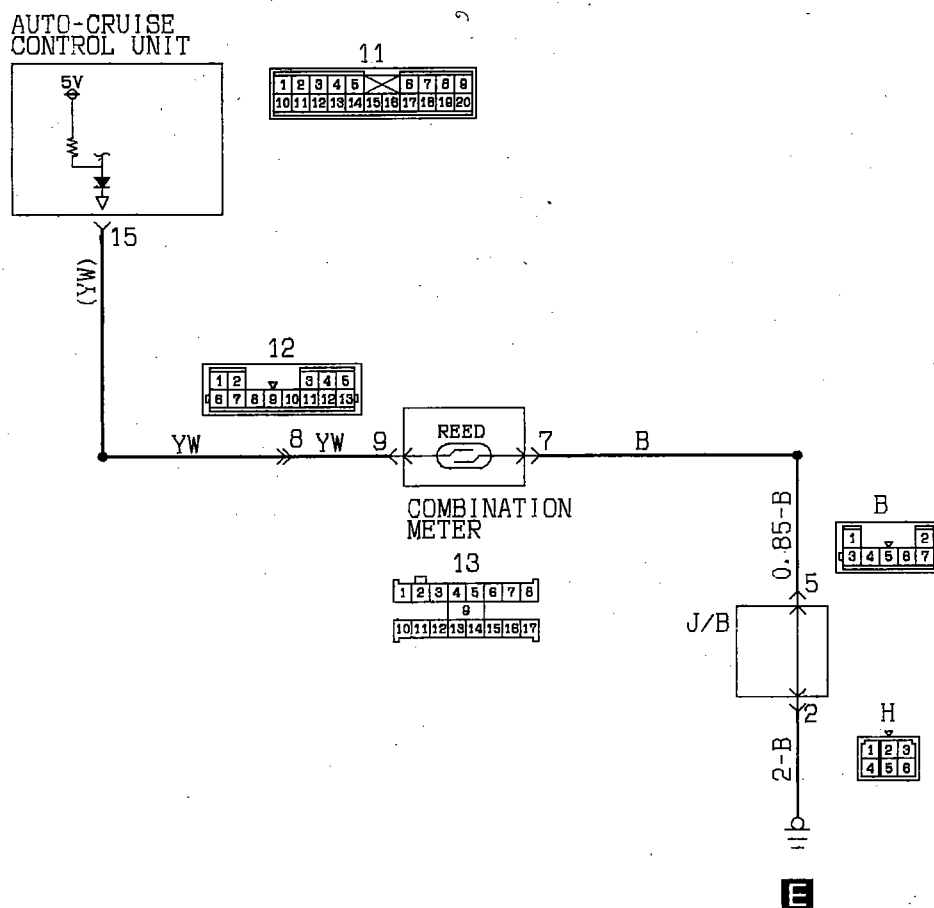
The set speed (before cancellation) resumes when the RESUME switch is switched ON, even if the constant speed control has been cancelled. That speed will not resume, however, even if the "RESUME" switch is switched ON, if the MAIN switch is switched OFF and if the vehicle speed decreases to 40 km/h (25 mph) or lower.

In addition, when the RESUME is switched ON and held while the vehicle is traveling at a constant speed, the vehicle speed will increase; the speed at which the switch is subsequently released will become the newly set constant speed. Current flows to the control unit, the auto-cruise control switch (RESUME), the junction block, and to ground.

TROUBLESHOOTING HINTS**Diagnosis No. 15 (automatically cancelled)****Auto-cruise control unit terminal voltage**

Terminal No.	Signal	Conditions	Terminal voltage
4	RESUME switch	When the RESUME switch is switched ON	0V
		When the RESUME switch is switched OFF	12V

4. CHECKING THE VEHICLE SPEED SENSOR CIRCUIT



KX35-AC-C0403-N

OPERATION

The vehicle speed sensor is installed within the speedometer; it sends to the control unit pulse signals that are proportional to the rotation speed (i.e., the vehicle speed) of the transaxle's output gear.

This vehicle speed sensor is the reed switch type of sensor; it generates four pulse signals for each rotation of the speedometer's driven gear.

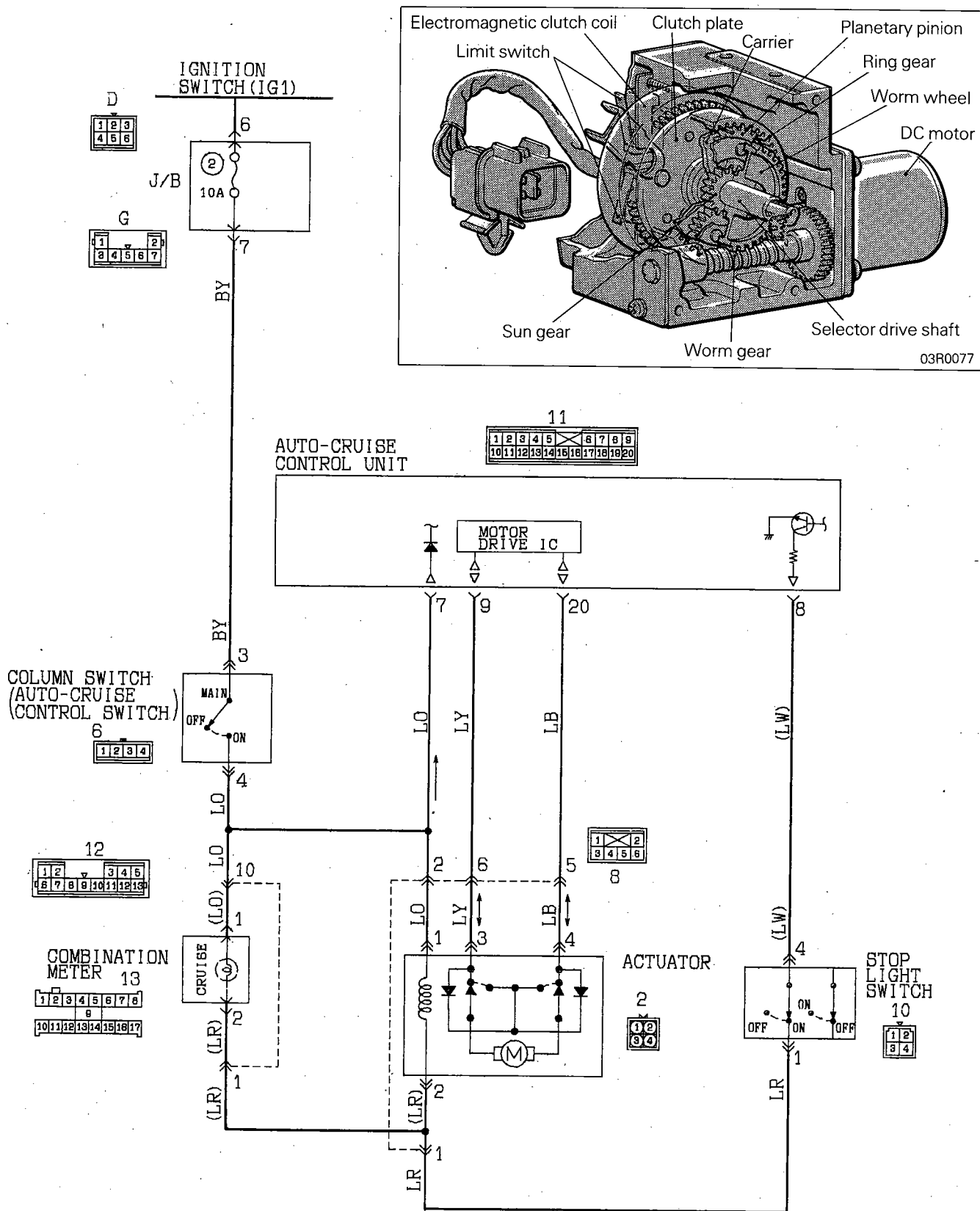
TROUBLESHOOTING HINTS

Diagnosis No. 12 (automatically cancelled)

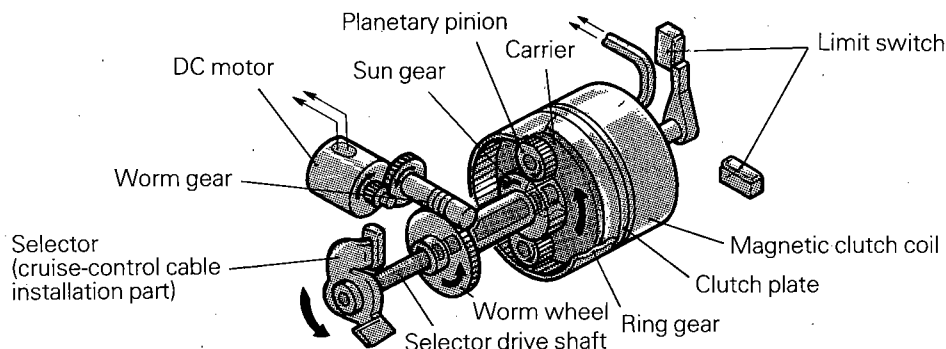
Auto-cruise control unit terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
15	Vehicle speed sensor	Move the vehicle forward slowly.	0V – 0.6V ↑ Flashing 2V or higher

5. CHECKING THE ACTUATOR CIRCUIT



OPERATION



07R0103

1. When (with the "MAIN" switch ON) the driver switches ON the SET switch when the prescribed vehicle speed is reached, the control unit causes current to flow to the electromagnetic clutch coil of the actuator, thus causing attraction of the clutch plate; then, when the ring gear is secured, the control motor at the same time causes the DC motor to be switched ON, and the DC motor operates at high speed.
2. The rotation of the DC motor is, as described in the illustration above, transmitted to the worm gear, and thereafter to the worm wheel, the sun gear, and the planetary pinions in that sequence. Because the ring gear is secured at this time, the planetary pinions rotate while revolving around the sun gear. Because the planetary pinions are installed to the carrier, both the carrier and the selector drive shaft unified with it, as well as the selector, are caused to rotate.
3. The switching of the direction (PULL or REL.) of rotation of the selector is accomplished by reversing the direction of current flow to the motor, and this is automatically regulated by the control unit.
4. The current flow to the electromagnetic clutch is interrupted if the driver switches OFF the MAIN switch, or if the operation of the auto-cruise control system is cancelled as a result of the input of a cancel signal to the control unit because the stop light switch, clutch switch <M/T> or the inhibitor switch <A/T> is activated.
5. As a result of the interruption of current to the electromagnetic clutch, the clutch plate is caused to return from the electromagnetic clutch side to the ring gear side by the force of the spring, and therefore the ring gear becomes free.
6. When the ring gear becomes free, the planetary pinions become free relative to the sun gear, and thus the selector is caused, by the return spring installed to the selector part, to return to its original position.
7. While the actuator is functioning, the auto-cruise indicator light in the combination meter remains illuminated.

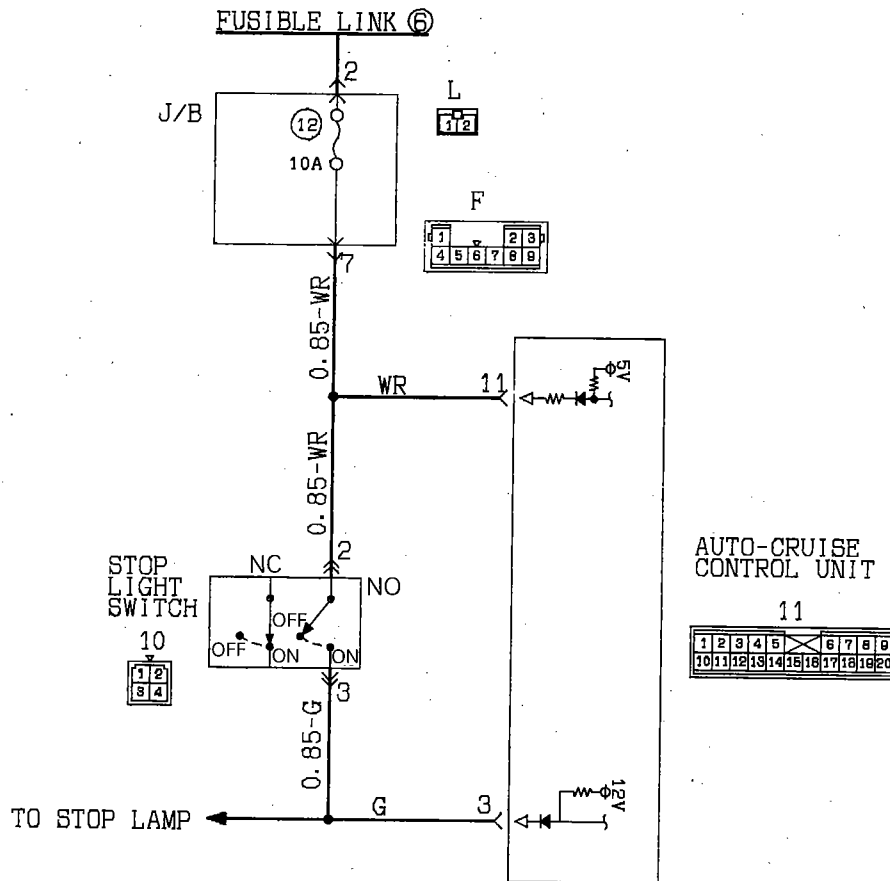
TROUBLESHOOTING HINTS

Diagnosis No. 11 (automatically cancelled)

Auto-cruise control unit terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
8	Transistor for electromagnetic clutch coil	When the auto-cruise control switch (MAIN) is switched ON	0V
9	DC motor drive ("PULL" side)	During acceleration by RESUME switch	0V
	DC motor drive ("REL." side)	During speed reduction (coasting) by SET switch	12V
20	DC motor drive ("PULL" side)	During acceleration by RESUME switch	12V
	DC motor drive ("REL." side)	During speed reduction (coasting) by SET switch	0V

6-1. CHECKING THE STOP LIGHT SWITCH CIRCUIT



NOTE

- (1) NC: Indicates ON at all times.
 (2) NO: Indicates OFF at all times.

KX35-AC-C0606-N

OPERATION

When the brake pedal is depressed during constant speed travel, the stop light switch's (NC) contacts for the auto-cruise control system open, with the result that the current to the electromagnetic clutch of the actuator is interrupted, thus cancelling the constant speed travel.

At the same time, moreover, the closing of the (NO) contacts for the stop light results in the sending of the cancel signal to the control unit, so that the actuator's electromagnetic clutch current is discontinued within the control unit, thereby canceling the constant speed travel.

The flow of current is from the battery to fuse No. (12) of the junction block, the stop light switch, and the control unit.

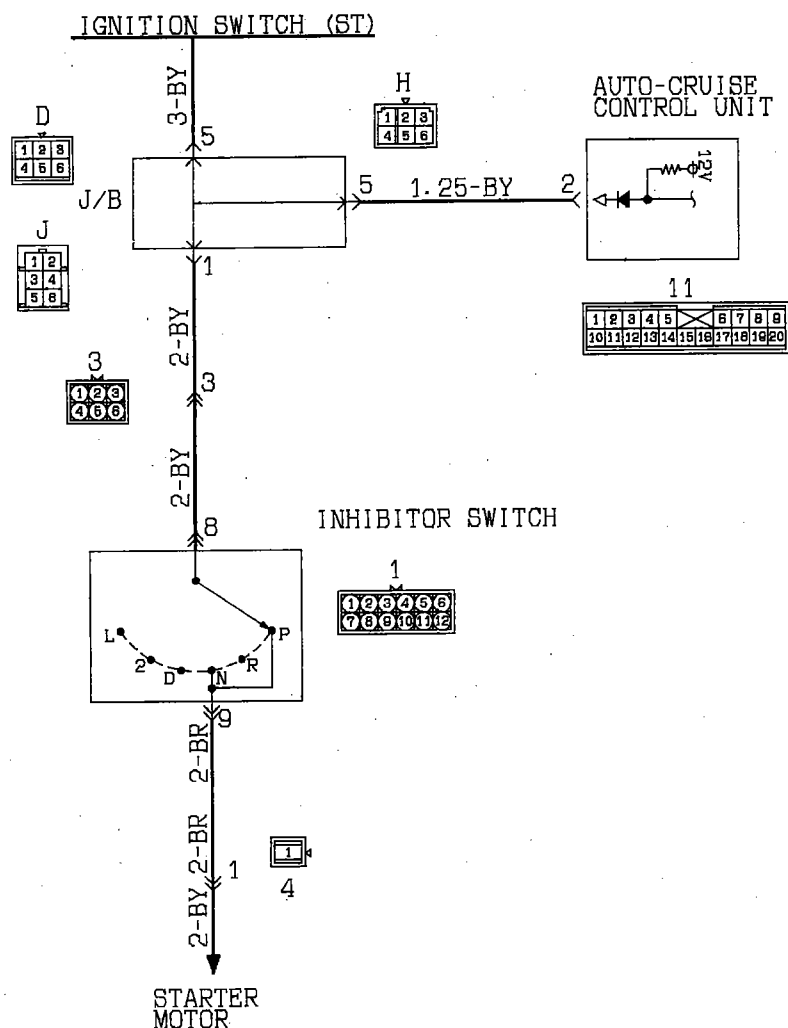
TROUBLESHOOTING HINTS

Diagnosis No. 16 (automatically cancelled)

Auto-cruise control unit terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
3	Stop light switch (load side)	When the brake pedal is depressed	12V
		When the brake pedal is not depressed	0V
11	Stop light switch (power supply side)	At all times	12V

6-2. CHECKING THE INHIBITOR SWITCH CIRCUIT <A/T>



KX35-AC-C0807-N

OPERATION

The inhibitor switch also functions as the switch for the starter.

If the selector handle is moved to the "N" position during constant speed travel, current flows from

TROUBLESHOOTING HINTS

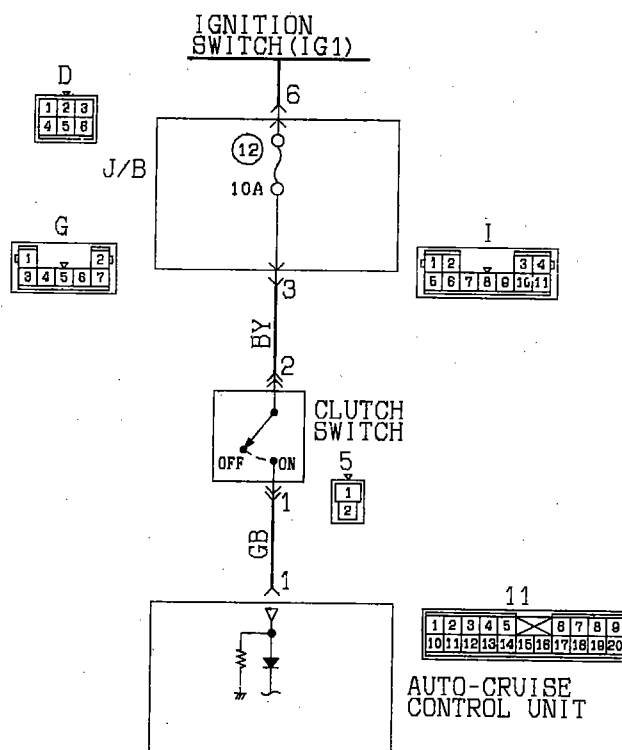
Diagnosis No. 16 (automatically cancelled)

Auto-cruise control unit terminal voltage

the control unit to the inhibitor switch, starter motor, and to ground; the cancel signal is therefore input to the control unit, thus canceling the constant speed travel.

Terminal No.	Signal	Conditions	Terminal voltage
2	Inhibitor switch	At all times	12V

6-3. CHECKING THE CLUTCH SWITCH CIRCUIT <M/T>



KX3B-AC-C0808-N

OPERATION

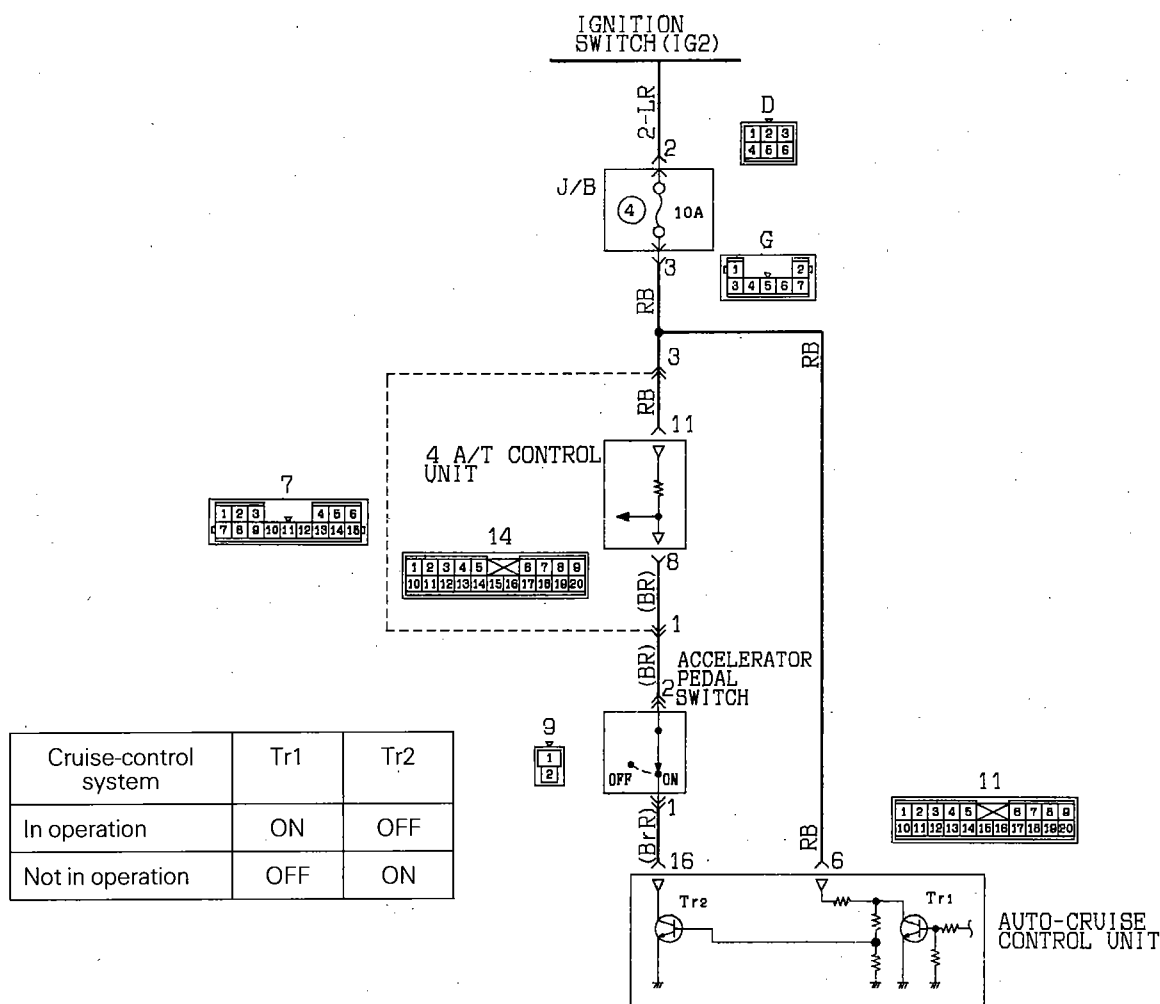
If the clutch pedal is depressed during constant speed travel, the contacts of the clutch switch close, with the result that the cancel signal is sent to the control unit, so that the current to the electromagnetic clutch of the actuator is discontinued within the control unit, thereby canceling the constant speed travel.

The flow of current is to the ignition switch (IG1), fuse No. (12) of the junction block, the clutch switch, and the control unit.

TROUBLESHOOTING HINTS**Diagnosis No. 16 (automatically cancelled)****Auto-cruise control unit terminal voltage**

Terminal No.	Signal	Conditions	Terminal voltage
1	Clutch switch	When the clutch pedal is depressed	12V
		When the clutch pedal is not depressed	0V

7. CHECKING THE CIRCUITS RELATED TO THE ACCELERATOR SWITCH OFF FUNCTION <A/T>



KX35-AC-C0704-N

OPERATION

The accelerator switch is a switch that detects the operational status of the accelerator pedal; it is one of the sensors of the automatic transaxle. Because the status of the accelerator pedal during

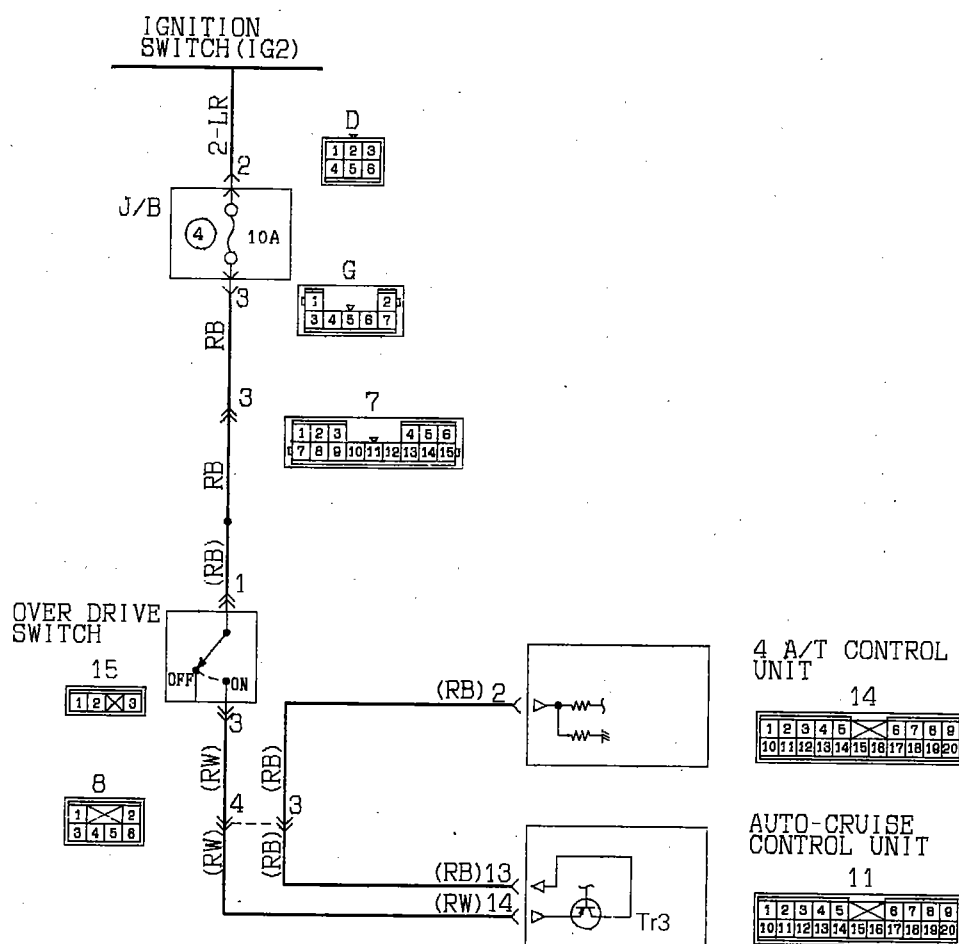
constant speed driving is non-operational, the ground circuit (transistor Tr2) of the accelerator switch is switched OFF only during constant speed driving in order not to interfere with the function of the automatic transaxle.

TROUBLESHOOTING HINTS

Auto-cruise control unit terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
6	Control unit power supply (IG2)	At all times	12V
16	Accelerator switch	When the accelerator pedal is depressed	0V
		When the accelerator pedal is not depressed	12V

8. CHECKING THE CIRCUITS RELATED TO THE OVERDRIVE CANCELLATION FUNCTION <A/T>



KX35-AC-C0811-N

OPERATION

This is function that cancels the overdrive function for a certain fixed period of time, if during constant speed travel in overdrive, the actual vehicle speed decreases to less than the vehicle speed retained in the memory, and then after a short time causes the vehicle speed to return to the vehicle speed retained in the memory.

Overdrive is canceled under the following conditions.

1. If the "RESUME" switch is used.

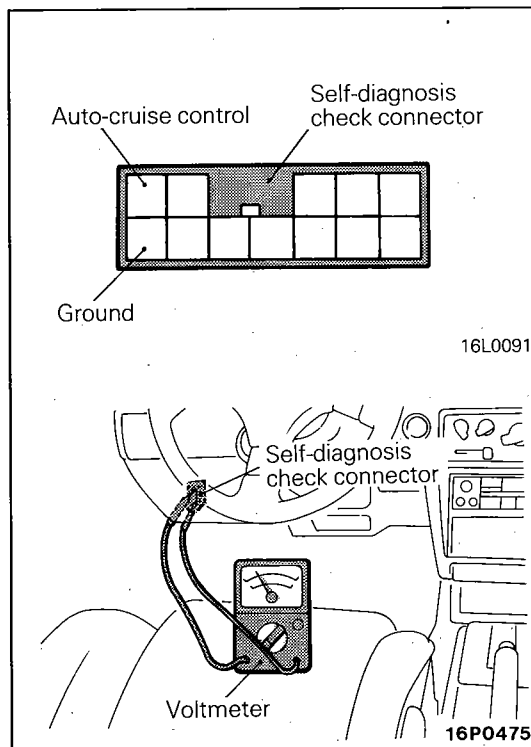
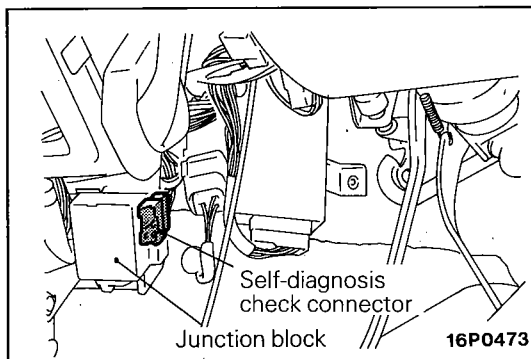
TROUBLESHOOTING HINTS**Auto-cruise control unit terminal voltage**

Terminal No.	Signal	Conditions	Terminal voltage
13	4-A/T control unit	When the overdrive switch is switched ON	12V
14	Overdrive switch	When the overdrive switch is switched ON	12V

2. If, during constant speed travel, the actual vehicle speed decreases to 1.25 km/h (0.78 mph) or more below the set vehicle speed.

Under either of the conditions described above, the overdrive-ON signals output from the microcomputer (within the control unit) are no longer output, and transistor Tr3 is switched OFF.

The current passing through the overdrive switch of the selector handle is thus interrupted at transistor Tr3, with the result that the drive is controlled at 3rd gear.



SELF-DIAGNOSIS CHECKING

Self-diagnosis checking is performed when there has been an automatic cancellation, without cancel switch operation.

- (1) The following method can be used for checking the diagnosis. Note that the diagnosis check connector is located under the driver's side instrument panel. Connect a voltmeter between the ground terminal and the terminal for auto-cruise control of the diagnosis check connector.







It is possible to discover which circuit is the cause of the cancellation by verifying the indication shown by the voltmeter with the display patterns shown on the next page.

- (2) When diagnosis code No. 11, 12, 15 or 16 is displayed, check by referring to the check chart applicable to that number.

NOTE

There are six diagnosis items, including the one for the normal condition. As examples of the normal condition, code No. 16 is entered in the memory as cancel switch ON signal input if the system is canceled by depressing the brake pedal, and code No. 13 or No. 14 is entered when there is an automatic cancellation because the vehicle speed drops when the vehicle is driven up a steep slope with the preset speed setting left set, etc., when however, there is a cancellation not intentionally made by the driver, the cause might be damaged or disconnected stop light switch input wiring, a malfunction of the stop light switch ON, etc., even though the same code No. 16 is displayed.

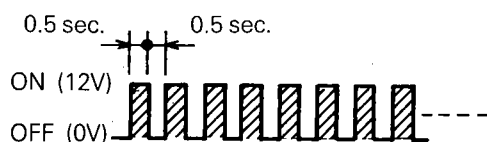
DIAGNOSIS DISPLAY PATTERNS AND CODES

Code No.	Display patterns (output codes) (Use with voltmeter)	Probable cause	Check chart No.
11	12V 0V 	Abnormal condition of actuator drive system	No. 5
12	12V 0V 	Abnormal condition of vehicle speed signal system	No. 4
13*	12V 0V 	Low speed limiter activation (The system is normal if it can be reset.)	—
14*	12V 0V 	Automatic cancellation activated by vehicle speed reduction. (The system is normal if it can be reset.)	—
15*	12V 0V 	Control switch malfunction (when SET and RESUME switches switched ON simultaneously)	No. 2, 3
16*	12V 0V 	Cancel switch ON signal input (including stop light switch input wiring damage or disconnection)	No. 6-1, 6-2, 6-3

NOTE

- Codes indicated by the * symbol are displayed, if the conditions are satisfied, even if the system is normal. In either case, the system is normal if it can be reset. If there is an automatic cancellation not intentionally made by the driver, however, excluding cancellations explicitly made by the cancel procedure, there may be a temporary malfunction such as poor contact of a harness connector even though the system can be reset, and for that reason it is necessary to check according to each individual check chart that is applicable.

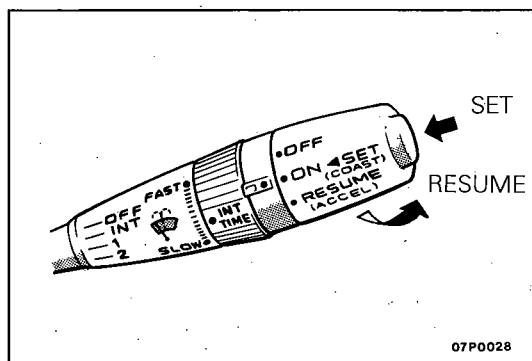
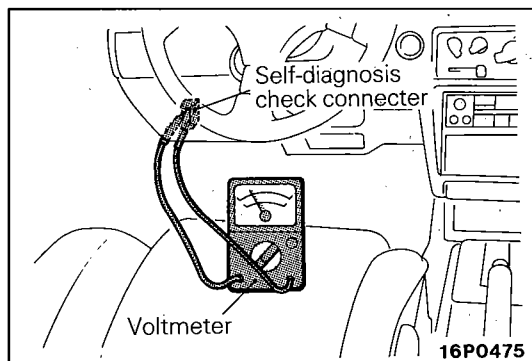
Display when vehicle speed is approximately 20 km/h (12 mph) or higher, or before the auto-cruise control system is set



03R0196

- Diagnosis codes are displayed when, after cancellation of the auto-cruise control system, the vehicle speed decreases to less than approximately 20 km/h (12 mph), and are erased by switching OFF the ignition switch or the MAIN switch.

After the diagnosis codes in the memory are erased, if (when the power supply of the engine control unit is switched ON once again) the power supply of the engine control unit is normal, continuous ON/OFF signals will be displayed at 0.5-second intervals regardless of whether the system condition is normal or not. (Refer to the illustration at the left.)



INPUT CHECKING

Input checks should be made when the auto-cruise control system cannot be set and when it is necessary to check (when a malfunction related to the auto-cruise control system occurs) whether or not the input signals are normal.

NOTE






1. If inspection of self-diagnosis is necessary, confirm diagnosis code first and conduct input check.
 2. Input check can be conducted by set operations. Self-diagnosis terminal outputs display patterns.
 3. Display codes are displayed only if the circuit is normal according to the conditions shown in the table the next page.
- (1) Set the voltmeter in the same way as for the self-diagnosis check.
 - (2) Turn the ignition key to ON. (Check No. 1 to No. 3 of the input check table.)
 - (3) Start the engine. (Check No. 4 and No. 5 of the input check table.)
 - (4) Code call-out
 - ① Switch ON the SET switch while holding the RESUME switch ON.
 - ② This procedure makes it possible to display the results of the input check.
 - (5) Code read-out
 - ① Perform each input operation according to the input check table (on the next page) and read the codes.

NOTE

Each code will be displayed in an order of priority beginning from No. 1.

If there is no display, it is possible that there is a malfunction of the engine control unit power supply circuit or the SET and/or RESUME switch, so check according to check charts No. 1, 2 and 3 (P.14-104, 105, 106).

INPUT CHECK TABLE

Check No.	Input operation	Code No.	Display patterns (output codes) (use with voltmeter)	Check results
1	SET switch ON	21	12V  0V	SET switch circuit normal
2	RESUME switch ON	22	12V  0V	RESUME switch circuit normal
3	Each CANCEL switch ON 1 Stop light switch (brake pedal depressed) 2 Clutch switch (clutch pedal depressed) <M/T> 3 Inhibitor switch (shift lever to "N" range) <A/T>	23	12V  0V	Each CANCEL circuit normal
4	Driving at approximately to 40 km/h (25 mph) or higher	24	12V  0V	When both No. 4 and No. 5 can be confirmed, vehicle speed sensor circuit normal.
5	Driving at less than approximately 40 km/h (25 mph) or stopped	25	12V  0V	

② Switch the MAIN switch OFF.

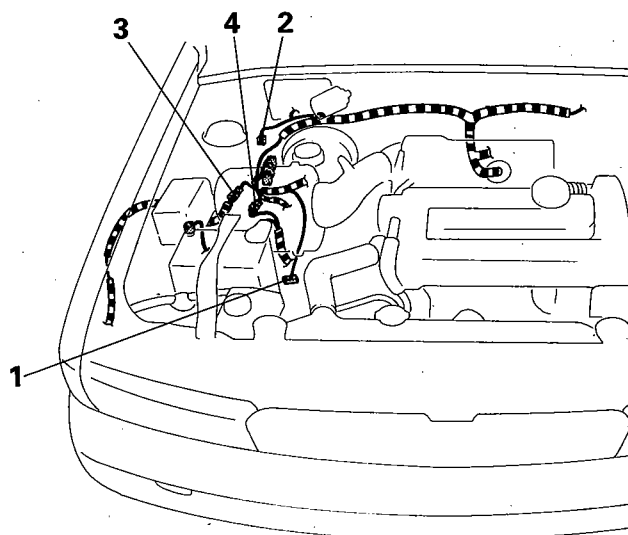
NOTE

1. When each input operation is performed and the signals for the conditions are received by the computer, each output code will be repeatedly displayed in the sequence of priority for as long as that signal continues.
2. If, during the display of output codes, the input operation is canceled (if, for example, the SET switch is set from ON to OFF), the code will be displayed for one cycle of the display, but will not be displayed during the next cycle.

This makes it possible, therefore, to check the OFF condition (existence of not of a short-circuit of the input line or the switch).

AUTO-CRUISE CONTROL RELATED HARNESS

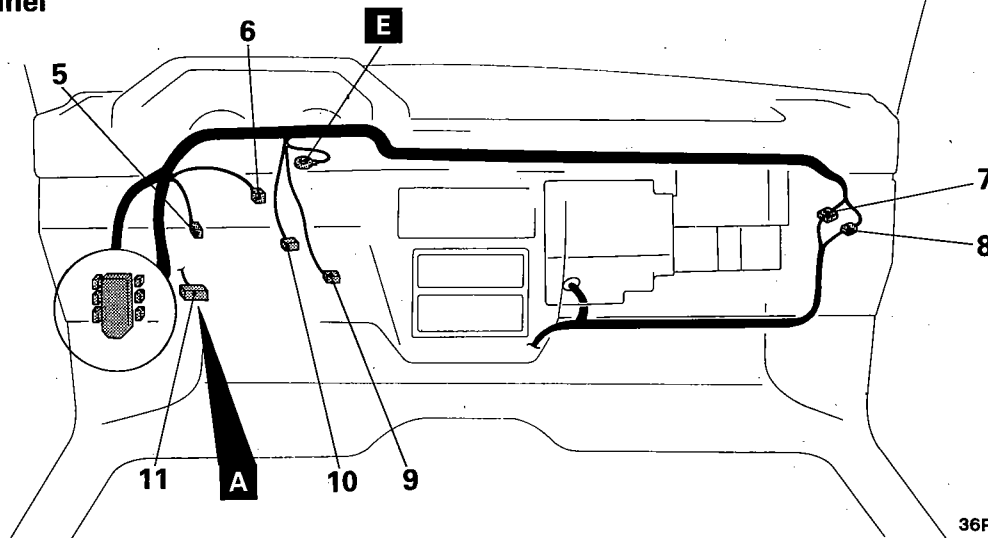
<ENGINE COMPARTMENT>



1. Inhibitor switch <A/T>
2. Auto-cruise control actuator
3. Front harness and control harness connection
4. Battery cable assembly and control harness connection
5. Clutch pedal switch <M/T>
6. Column switch
7. Main harness and control harness connection
8. Accelerator pedal switch <A/T>
9. Stop light switch
10. Auto-cruise control unit
11. Main harness and instrument panel harness connection
12. Main harness and control harness connection

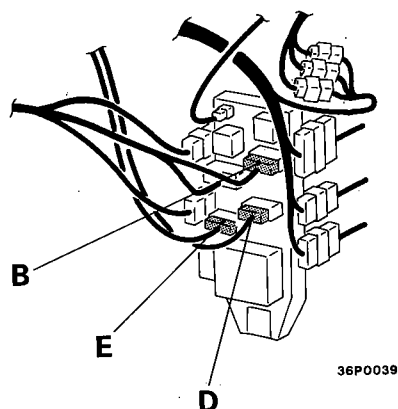
<INSIDE THE CABIN>

Dash Panel

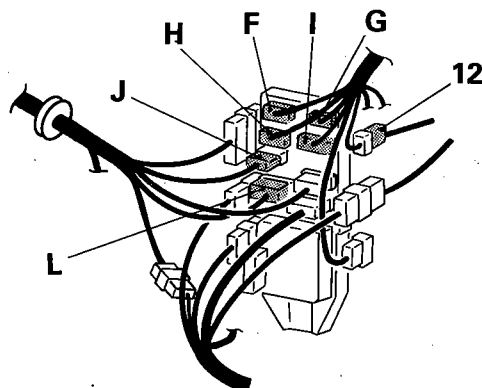


Junction Block

<Front side view>



<Rear side view>



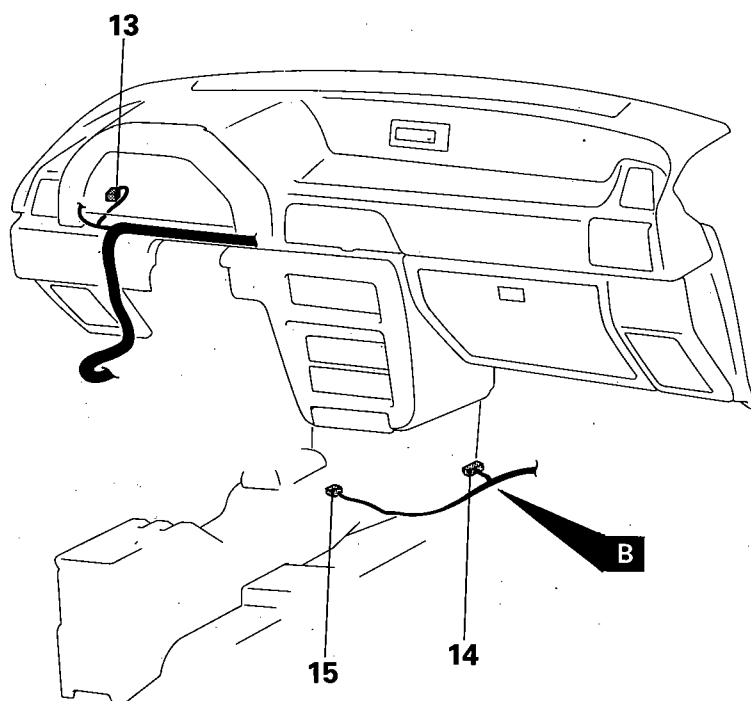
36P0039

36P0040

36P0069

36P0070

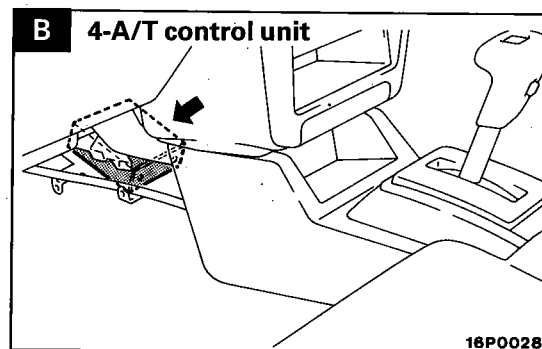
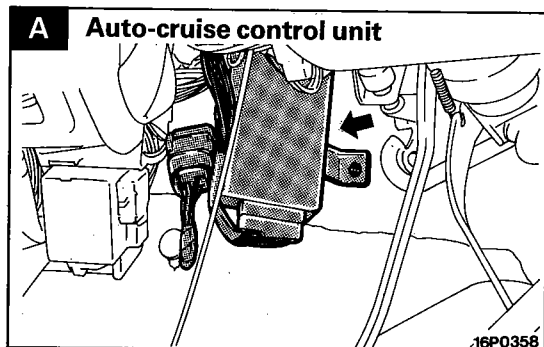
<INSTRUMENT PANEL AND FLOOR CONSOLE>



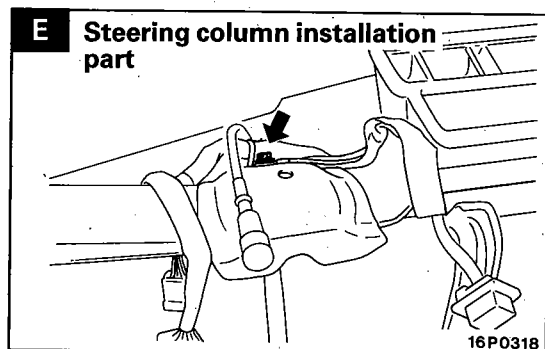
36P0071

- 13. Combination meter
- 14. 4-A/T control unit
- 15. Overdrive switch <A/T>

LOCATION OF CONTROL UNIT

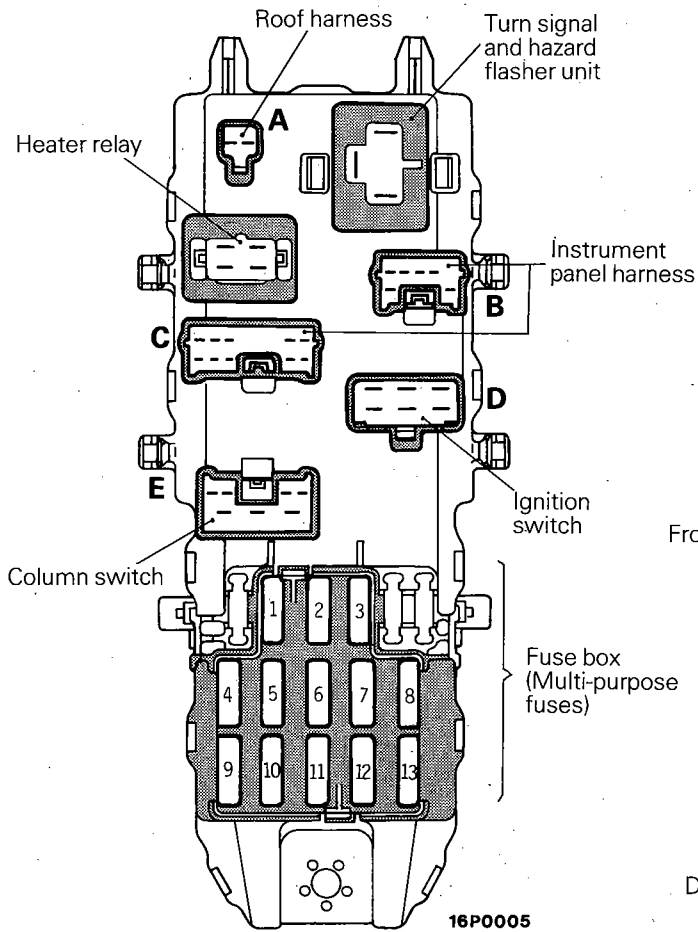


GROUND POINT

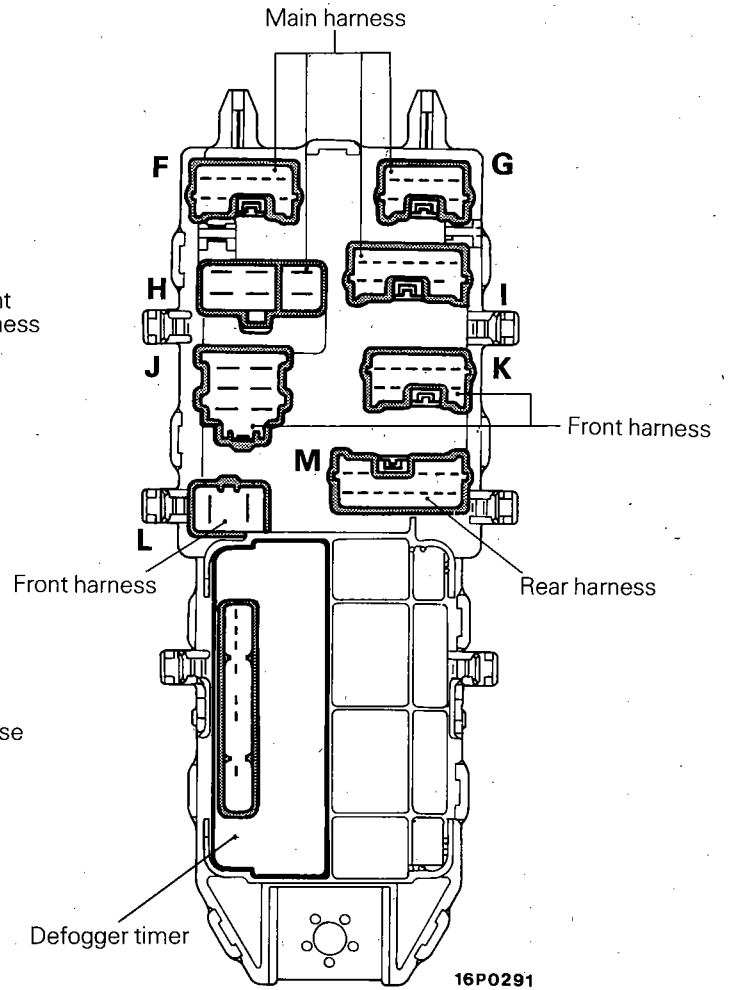


JUNCTION BLOCK

Outer side



Rear side



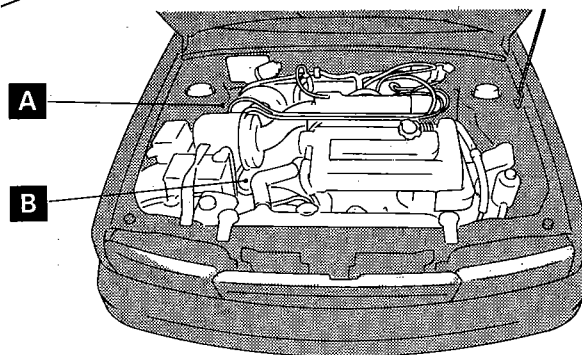
AUTO-CRUISE CONTROL COMPONENTS LOCATION

Name	Symbol	Name	Symbol
Accelerator pedal switch <A/T>	H	Inhibitor switch <A/T>	B
Auto-cruise control actuator	A	Overdrive switch <A/T>	G
Auto-cruise control switch	E	Stop light switch	I
Auto-cruise control unit	K	Vehicle speed sensor (Reed switch)	D
Auto-cruise indicator light	C	4-A/T control unit <A/T>	F
Clutch pedal switch <M/T>	J	–	–

NOTE

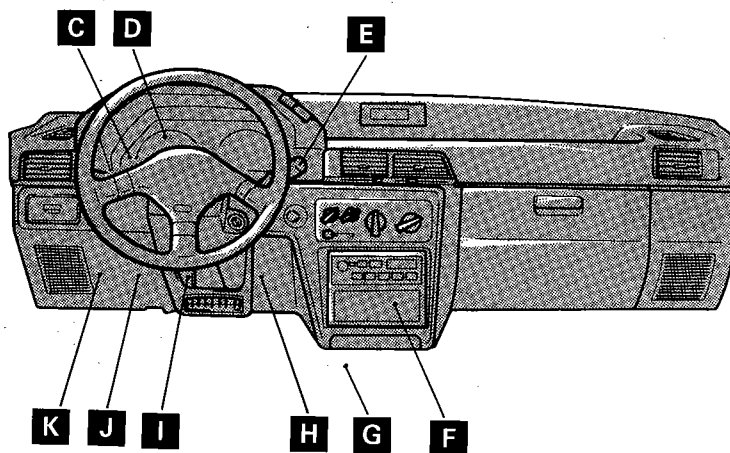
The "Name" column is arranged in alphabetical order.

<Engine Compartment>

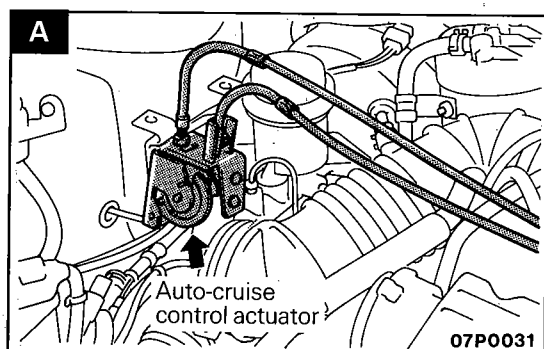


07P0030

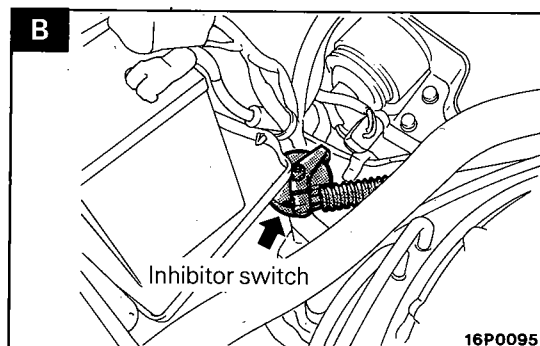
<Interior>



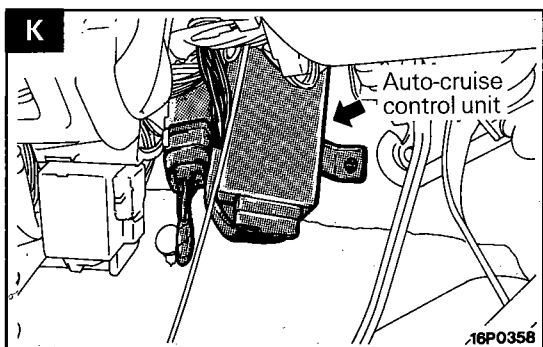
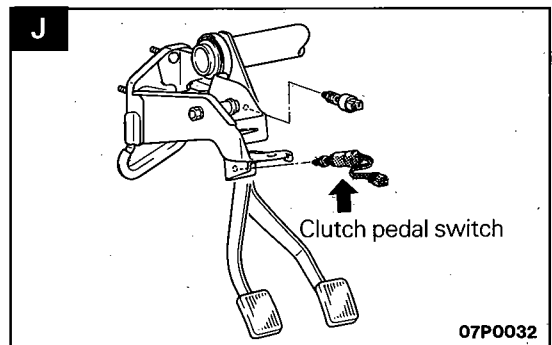
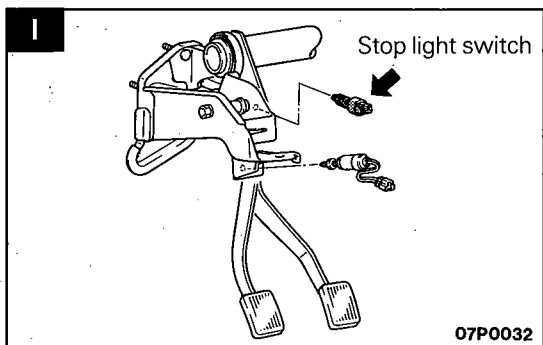
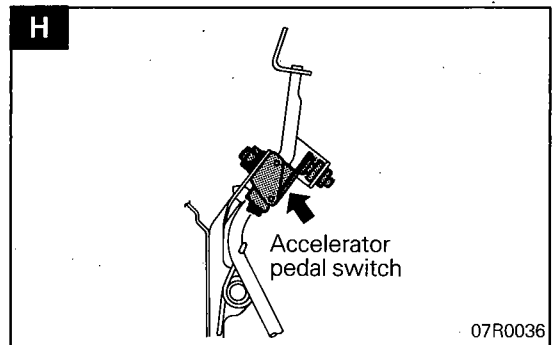
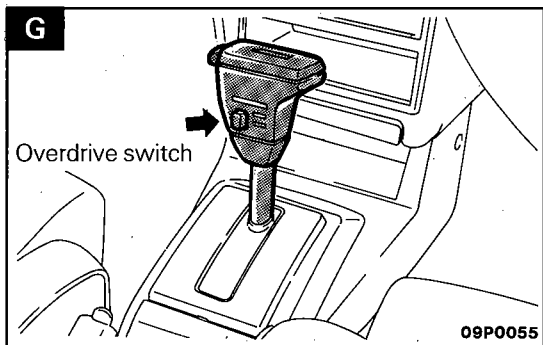
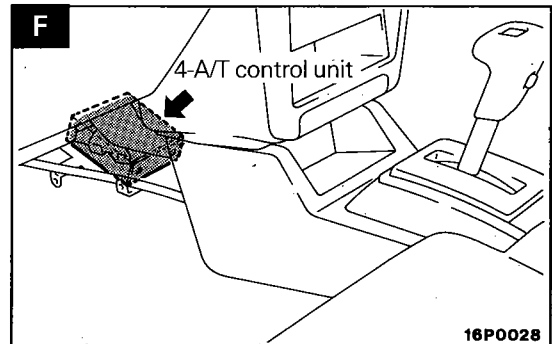
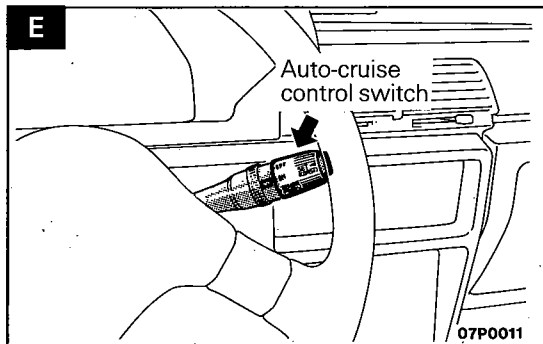
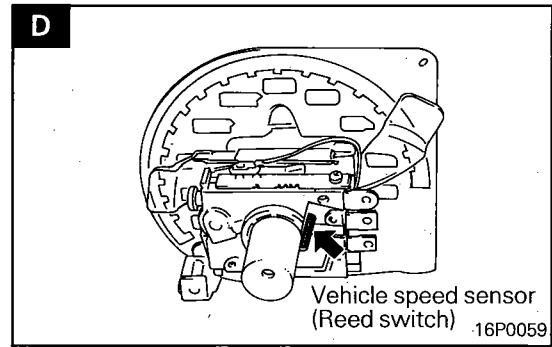
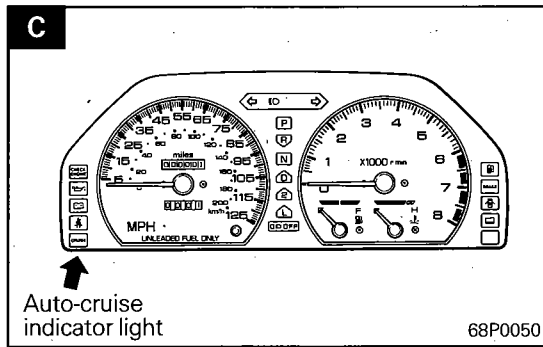
19P0254



07P0031



16P0095

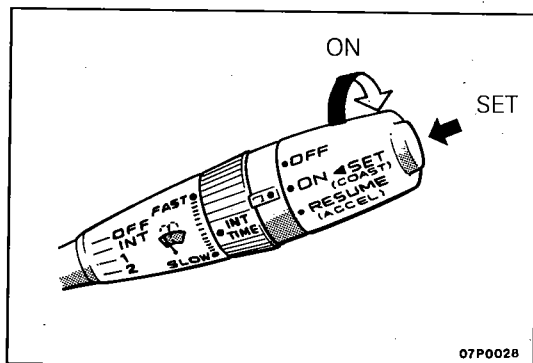
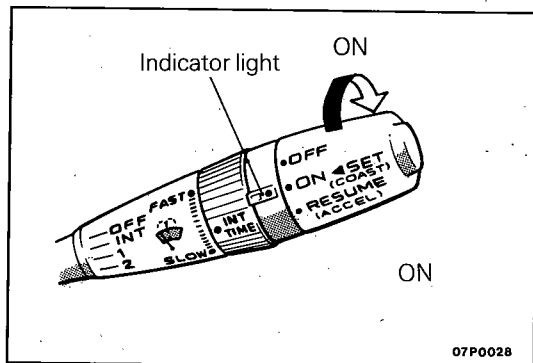


SERVICE ADJUSTMENT PROCEDURES

N14FTA4

AUTO-CRUISE CONTROL SYSTEM INSPECTION AUTO-CRUISE CONTROL MAIN SWITCH CHECK

- (1) Turn the ignition key to ON.
- (2) Check to be sure that the indicator light within the switch illuminates when the MAIN switch is switched ON.



AUTO-CRUISE CONTROL SETTING CHECK

- (1) Switch ON the MAIN switch.
- (2) Drive at the desired speed within the range of approximately 40 – 145 km/h (25 – 90 mph).
- (3) Press the SET button.
- (4) Check that when the switch is released, the speed is the desired constant speed, and that the auto-cruise indicator light in the combination meter is illuminated.

NOTE

If the vehicle speed decreases to approximately 20 km/h (12 mph) below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.

SPEED INCREASE SETTING CHECK

- (1) Set to the desired speed.
- (2) Turn the control switch to RESUME position.
- (3) Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE

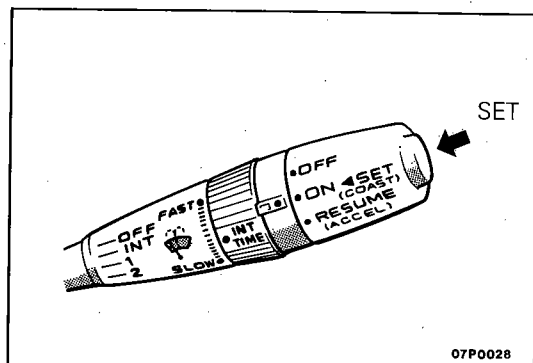
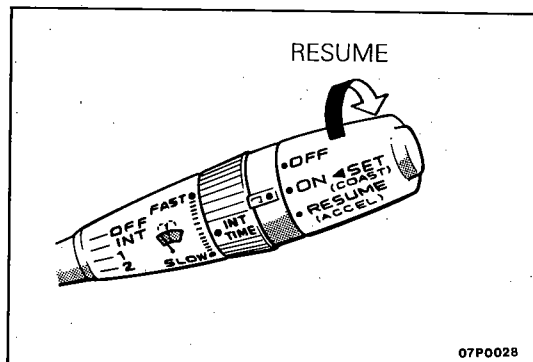
Even if, during acceleration, the vehicle speed reaches or exceeds the high limit [approximately 145 km/h (90 mph)], acceleration will continue, however, when the switch is released, the set speed ("memorized speed") will become the high limit of the vehicle speed.

SPEED REDUCTION SETTING CHECK

- (1) Set to the desired speed.
- (2) Press the SET button.
- (3) Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

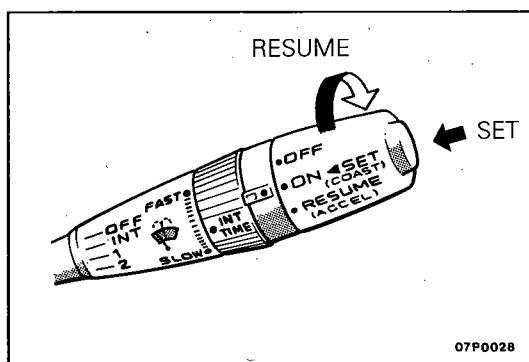
NOTE

When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the auto-cruise control will be cancelled.



AUTO-CRUISE CONTROL CANCELLATION CHECK

- (1) Set the auto-cruise control.
- (2) Check that the system returns to the ordinary driving mode, and that the auto-cruise indicator light goes out when either of the operations below is performed.
 - ① The brake pedal is depressed.
 - ② The clutch pedal is depressed. <M/T>
 - ③ The shift lever is moved to the "N" range. <A/T>
 - ④ The auto-cruise control MAIN switch is switched OFF.

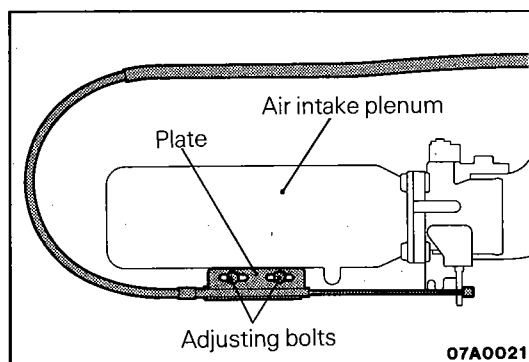


CHECK OF RETURN TO THE SET SPEED BEFORE CANCELLATION

- (1) Set the auto-cruise control.
- (2) Check to be sure that the auto-cruise control is cancelled when either of the operations below is performed.
 - ① The brake pedal is depressed.
 - ② The clutch pedal is depressed. <M/T>
 - ③ The shift lever is moved to the "N" range. <A/T>
- (3) Turn the control switch to RESUME position and release (RESUME switch ON → OFF) while driving at a vehicle speed of approximately 40 km/h (25 mph) or higher.
- (4) After switching RESUME switch to OFF there will be a return to the auto-cruise control speed before the auto-cruise control speed will be cancelled and the vehicle will travel at the constant speed.

ACCELERATOR CABLES INSPECTION AND ADJUSTMENT

- (1) Turn air conditioner and lights OFF. Inspect and adjust at no load.
- (2) Warm engine until stabilized at idle.
- (3) Confirm idle speed is at prescribed rpm.
- (4) Stop engine (ignition switch OFF).
- (5) Confirm there are no sharp bends in accelerator cables.
- (6) Check inner cables for correct slack.
- (7) If there is too much slack or no slack, adjust play by the following procedures.
 - ① Remove the air cleaner.



- ② First, adjust accelerator cable B (throttle valve side). After loosening the adjustment bolts at the air intake plenum side and freeing the inner cable, use the adjustment bolts to secure the plate so that the free play of the inner cable becomes the standard value.

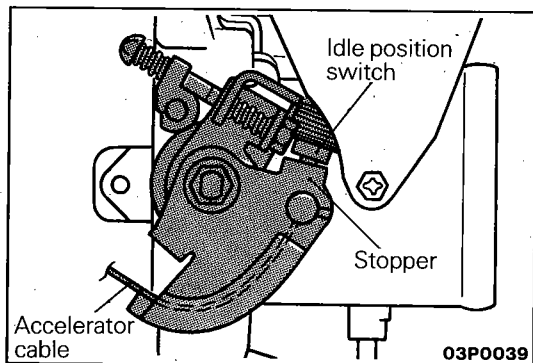
Standard value: 1 – 2 mm (.04 – .08 in.)

NOTE

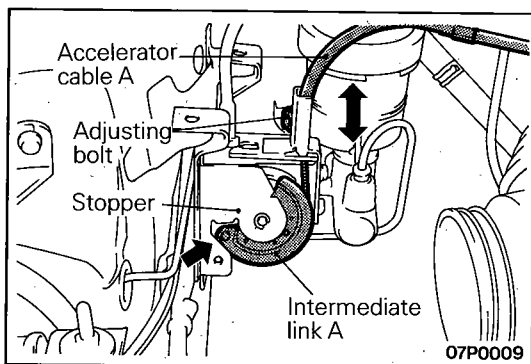
If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.

If there is no play (excessive tension) of the accelerator cable, the idling speed will increase.

14-126AUTO-CRUISE CONTROL SYSTEM – Service Adjustment Procedures



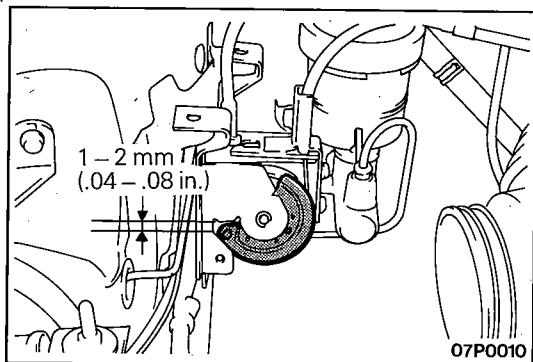
- ③ After adjusting the accelerator cable B, confirm that the throttle lever touches the idle position switch.



- ④ Next, adjust accelerator cable A (accelerator pedal side). Loosen the adjusting bolt. While keeping intermediate link A of the actuator in close contact with the stopper (indicated by arrow in the illustration), adjust the inner cable play of accelerator cable A to specification and tighten the adjusting bolt.

Standard value:

<M/T> 0 – 1 mm (0 – .04 in.)
<A/T> 2 – 3 mm (.08 – .12 in.)



- ⑤ After making the adjustment of the cable as described above, check to be sure that the throttle lever at the engine side is caused to move at the distance shown in the illustration when the actuator link is turned.
- ⑥ Confirm that throttle valve fully opens and closes by operating pedal.
- ⑦ Install the air cleaner.

INDIVIDUAL PARTS INSPECTION

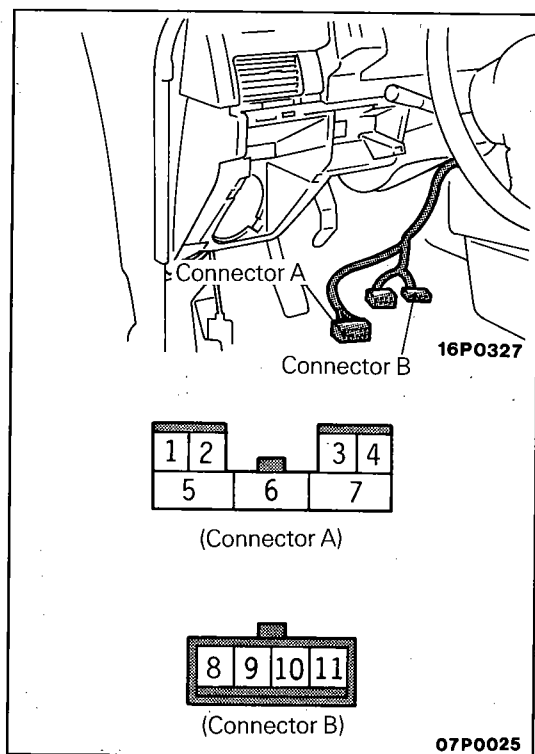
N14FTA1

AUTO-CRUISE CONTROL SWITCH INSPECTION

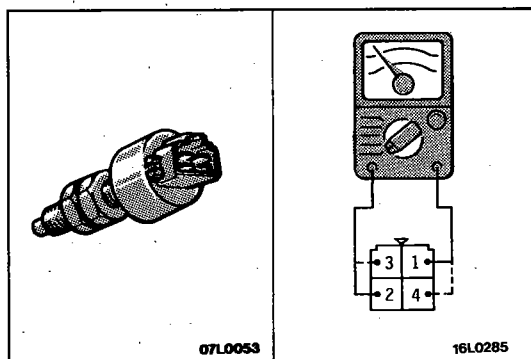
- (1) Remove the knee protector (or lower panel assembly) and the column cover. (Refer to GROUP 23 – Instrument Panel.)
- (2) Disconnect the column switch connector and check the continuity between the terminals.

○—○: Continuity

Terminal	7	9	11	8	10
Switch position					
OFF					
MAIN switch ON			○—○		○—○
SET switch ON	○—○	○—○			
RESUME switch ON	○—○		○—○	○—○	○—○



07P0025

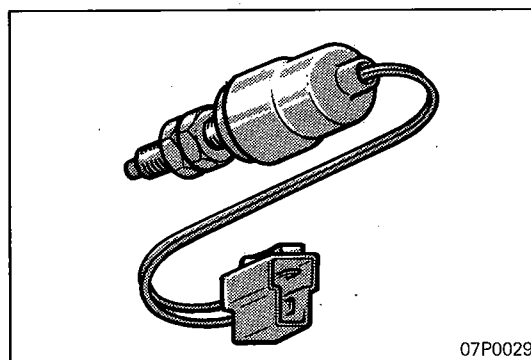


STOP LIGHT SWITCH/BRAKE SWITCH INSPECTION

- (1) Disconnect the connector.
- (2) Check for continuity between the terminals of the switch.

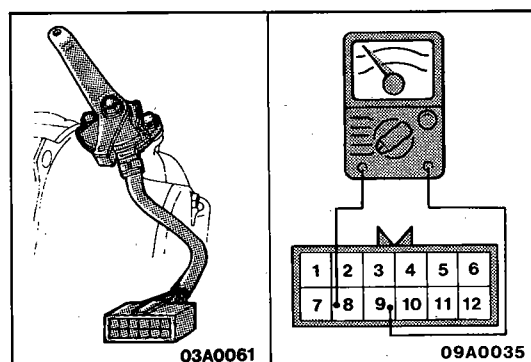
○—○: Continuity

Measurement conditions	Switch Terminal	Brake switch		Stop light switch	
		3	4	1	2
When brake pedal depressed.				○—○	○—○
When brake pedal not depressed.		○—○	○—○		



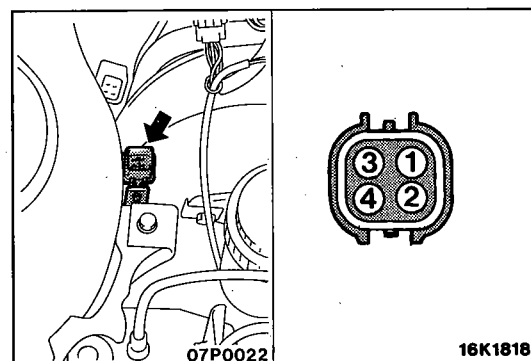
CLUTCH SWITCH INSPECTION

- (1) Disconnect the connector.
- (2) Check to be sure that there is continuity between connector terminals when the clutch pedal is depressed.



INHIBITOR SWITCH ("N" AND "P" POSITIONS) INSPECTION

- (1) Disconnect the connector.
- (2) Check to be sure that there is continuity between connector terminals ⑧ and ⑨ when the shift lever is moved to the "N" range.



ACTUATOR INSPECTION

- (1) Disconnect the connector.
- (2) Measure the resistance value of the clutch coil.

Resistance of clutch coil between connector terminals

① — ③

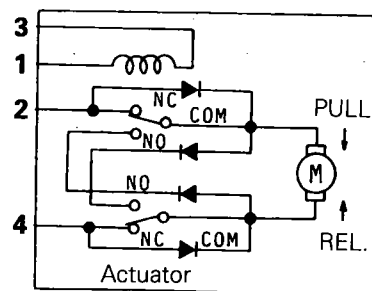
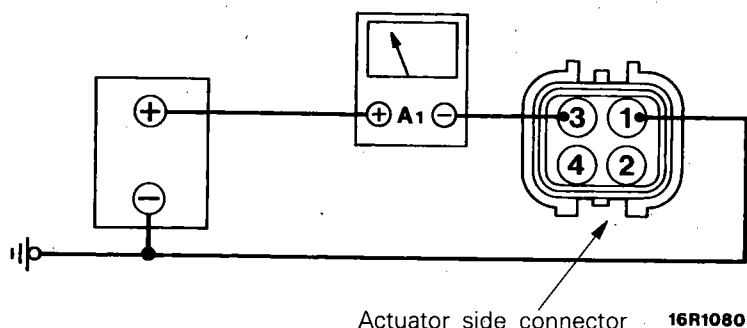
Standard value: Approx. 20 Ω

ACTUATOR OPERATION CHECK

Disconnect the actuator's connector and, in the order described below, check the actuator's operation and the circuit tester's indication; replace the actuator assembly if any abnormal condition is discovered.

(1) Checking the clutch coil solenoid operation

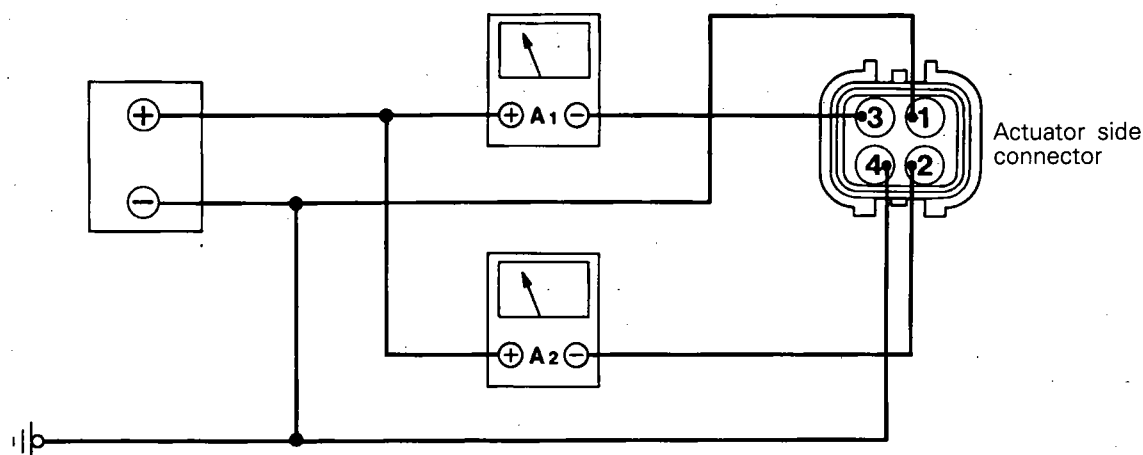
Connect terminal ③ of the actuator through the ammeter to the positive ⊕ terminal of the battery, and connect terminal ① to the negative ⊖ terminal.



Judgement		Probable cause
Normal	Abnormal	
Solenoid operation sound ("click") can be heard. $A_1: 0.5 - 0.7 \text{ A}$	No solenoid sound $A_1 = 0 \text{ A}$	Damaged or disconnected wiring of clutch coil
	No solenoid sound $A_1 = \infty \text{ A}$	Short-circuit of clutch coil

(2) Checking the motor (PULL direction) and limit switch operation

In the condition described in (1), connect terminal ② of the actuator, through the ammeter, to the positive \oplus side and terminal ④ to the negative \ominus side.

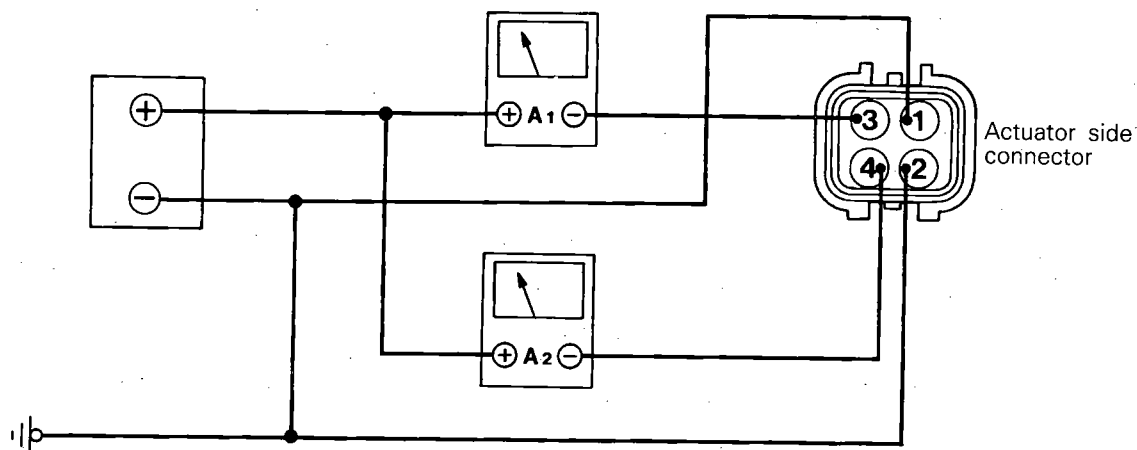


16R1082

Judgement		Probable cause
Normal	Abnormal	
Current is cut off when selector is turned in PULL direction for full stroke (full open). A_1 : 0.5 – 0.7 A A_2 : less than 0.5 A (when current ON)	Selector moves in PULL direction but A_2 equal or more than 1 A A_1 : 0.5 – 0.7 A	<ul style="list-style-type: none"> Improper backlash between gears Imminent burning between shaft and metal Insufficient thrust clearance
	Selector doesn't move. A_2 equal or more than 1 A A_1 : 0.5 – 0.7 A	<ul style="list-style-type: none"> Shaft burned Foreign material caught between gears Motor burned
	Selector doesn't move. $A_2 = 0$ A A_1 : 0.3 – 0.7 A	<ul style="list-style-type: none"> Damaged or disconnected internal lead wire Damaged or disconnected motor wiring Poor contact of limit switch Open diode
With the selector stroke at the intermediate level, disconnect the connection to terminal ③ and cut the current flow to the clutch coil.	The selector doesn't return to the original position even if the current to the clutch coil is cut.	Malfunction of clutch operation (Clutch plate remains engaged with clutch)

14-130 AUTO-CRUISE CONTROL SYSTEM – Service Adjustment Procedures

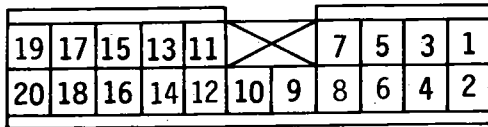
- (3) Checking the motor (REL. direction) and limit switch operation
Reverse the connections to terminal ④ and terminal ② from those described in (2).



16R1081

Judgement		Probable cause
Normal	Abnormal	
Current is cut off when selector is turned in REL. direction for full stroke (fully closed). A ₁ : 0.5 – 0.7 A A ₂ : less than 0.5 A (when current ON)	Selector moves in REL. direction but A ₂ equal or more than 1 A A ₁ : 0.5 – 0.7 A	<ul style="list-style-type: none"> Improper backlash between gears Imminent burning between shaft and metal Insufficient thrust clearance
	Selector doesn't move. A ₂ equal or more than 1 A A ₁ : 0.5 – 0.7 A	<ul style="list-style-type: none"> Shaft burned Foreign material caught between gears Motor burned
	Selector doesn't move. A ₂ = 0 A A ₁ : 0.3 – 0.7 A	<ul style="list-style-type: none"> Damaged or disconnected internal lead wire Damaged or disconnected motor wiring Poor contact of limit switch Open diode

Engine control unit
connector terminals



16R1060

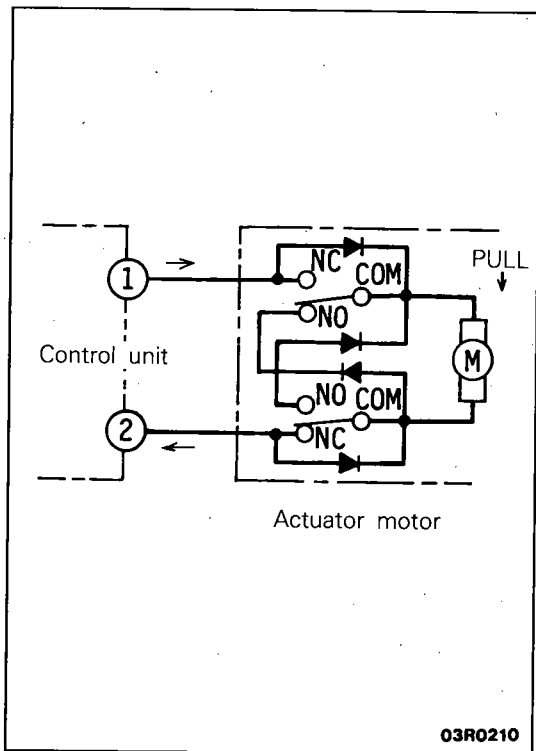
ENGINE CONTROL UNIT SIGNAL CIRCUIT CHECK

Disconnect the connector of the engine control unit, and then check at the body side wiring harness according to the chart below.

Terminal	Connection or measured part	Measurement item	Tester connection	Check conditions		Standard
1	Actuator (motor)	Resistance	1 → *12	Actuator selector (Fully closed position)		Approx. 12 Ω
2						
3	Stop light switch (for auto-cruise control cancellation) and actuator (clutch)	Voltage	3 – Ground	Ignition switch ON, MAIN switch ON (Don't press brake pedal.)		Approx. 12V
				Press brake pedal after checking above.		Approx. 12V → 0V
4	None	—	—	—		—
5	Power supply (MAIN)	Voltage	5 – Ground	Ignition switch ON, MAIN switch ON		Approx. 12V
6	None	—	—	—		—
7	Power supply (IG ₂)	Voltage	7 – Ground	Ignition switch ON		Approx. 12V
8*2	Self-diagnosis	—	—	—		—
9	Accelerator pedal switch	Voltage	9 – Ground	Ignition switch ON (Accelerator pedal free)		Approx. 12V
				Press accelerator pedal after checking above.		Approx. 12V → 0V
10	Vehicle speed sensor	Voltage	10 – Ground	With the ignition key at the ON position, slowly turn the speedometer cable.		4 voltage changes/ cable rotation
11	SET switch	Continuity	11 – Ground	SET switch ON (Press)		Continuity
				SET switch OFF (Release)		No continuity
12	Overdrive switch	Voltage	12 – Ground	Ignition switch ON	Overdrive switch ON	Approx. 12V
					Overdrive switch OFF	0V
13	RESUME switch	Continuity	13 – Ground	RESUME switch ON (Turn)		Continuity
				RESUME switch OFF (Release)		No continuity

14-132 AUTO-CRUISE CONTROL SYSTEM – Service Adjustment Procedures

Terminal	Connection or measured part	Measurement item	Tester connection	Check conditions		Standard
14*2	4-A/T control unit	—	—	—		—
15	Stop light switch load side	Voltage	15 – Ground	Press the brake pedal.		Approx. 12V
16	Ground	Continuity	16 – Ground	At all times		Continuity
17	Inhibitor switch (P, N)	Continuity	17 – Ground	“P” or “N” range		Continuity
				Other than “P” or “N” range		No continuity
18	Stop light switch power supply side	Voltage	18 – Ground	At all times		Approx. 12V
19	Clutch switch	Voltage	19 – Ground	Ignition switch ON	Clutch switch ON	Approx. 12V
					Clutch switch OFF	0V
20	Ground	Continuity	20 – Ground	At all times		Continuity



NOTE

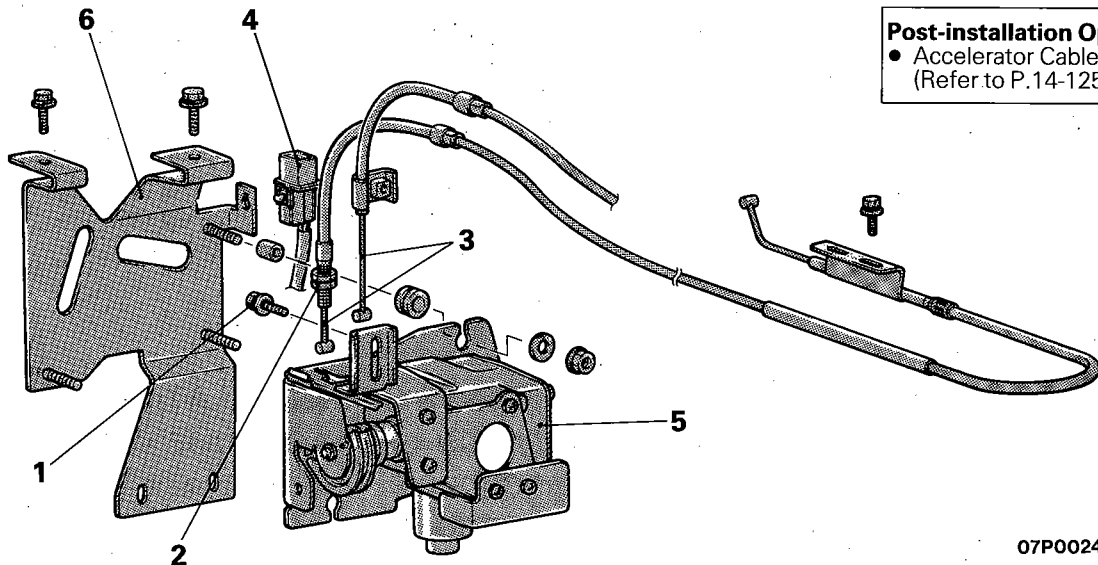
1. As shown by the *1 symbol, the limit switch within the actuator will become as shown in the illustration at the left if the actuator selector is at the fully closed position when the resistance between terminals No. 1 and No. 2 is measured; for that reason, after checking the polarity of the tester, the tester's probe should be connected so that current flows from the No. 1 terminal to the No. 2 terminal.
2. For terminals No. 8 and 14 indicated by the *2 symbol, it is necessary to check individual terminal voltages with the engine control unit's harness connector connected and with the ignition switch ON.
 - (1) The No. 8 terminal is normal if the self-diagnosis code can be confirmed. (Refer to P.14-115.)
 - (2) The No. 14 terminal is normal if there is approximately 12V with the auto-cruise control system not functioning and the overdrive switch switched ON. (Refer to P.14-114.)

VEHICLE SPEED SENSOR INSPECTION

Refer to GROUP 8 – Meters and Gauges for checking of vehicle speed sensor.

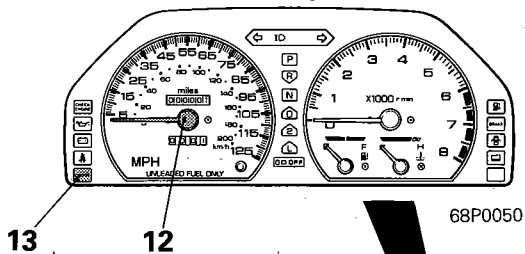
AUTO-CRUISE CONTROL REMOVAL AND INSTALLATION

N14TD--



Post-installation Operation
• Accelerator Cable Adjustment
(Refer to P.14-125.)

07P0024



68P0050

Removal steps of actuator

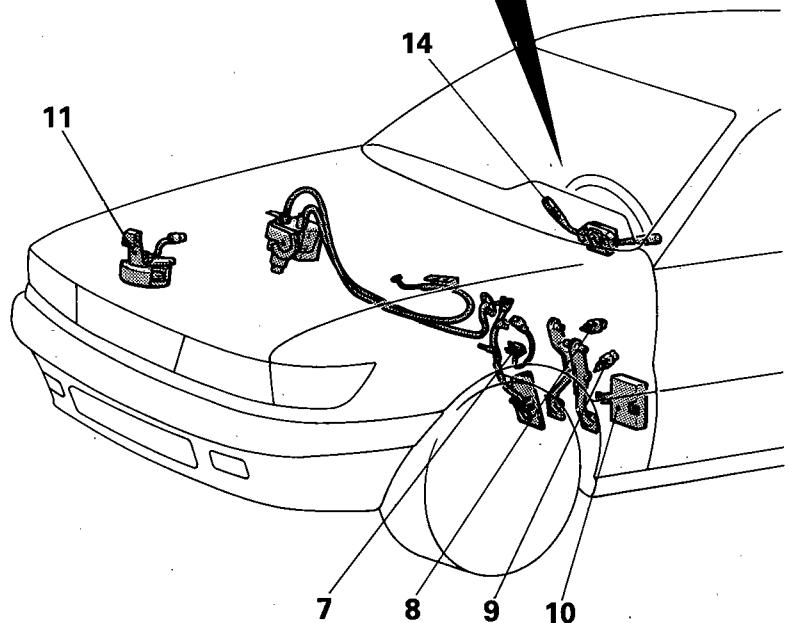
1. Accelerator cable A adjusting bolt
2. Accelerator cable B adjusting nut
3. Actuator side inner cable
4. Actuator connector
5. Actuator
6. Bracket

Removal steps of sensor and switches

7. Accelerator switch <A/T>
8. Clutch switch <M/T>
9. Stop light switch
10. Control unit
11. Inhibitor switch <A/T>
12. Vehicle speed sensor
13. Auto-cruise control indicator light
14. Auto-cruise control switch

NOTE

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



07P0014

SERVICE POINTS OF REMOVAL

N14TDBC

12. REMOVAL OF VEHICLE SPEED SENSOR

Refer to GROUP 8 – Meters and Gauges.

13. REMOVAL OF AUTO-CRUISE CONTROL INDICATOR LIGHT

Refer to GROUP 8 – Meters and Gauges.

14. REMOVAL OF AUTO-CRUISE CONTROL SWITCH

Refer to GROUP 8 – Column Switch.

INSPECTION

N14TDCC

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the actuator cover for damage.

CHECKING THE ACTUATOR

Refer to P.14-128.

SERVICE POINTS OF INSTALLATION

N14TDDD

14. INSTALLATION OF AUTO-CRUISE CONTROL SWITCH

Refer to GROUP 8 – Column Switch.

13. INSTALLATION OF AUTO-CRUISE CONTROL INDICATOR LIGHT

Refer to GROUP 8 – Meters and Gauges.

12. INSTALLATION OF VEHICLE SPEED SENSOR

Refer to GROUP 8 – Meters and Gauges.