SUZUKI

SE416/SZ416

SUPPLEMENTARY SERVICE MANUAL
FOR VEHICLE WITH STEPPER MOTOR TYPE EGR VALVE

USE THIS SUPPLEMENTARY SERVICE MANUAL WITH MANUALS MENTIONED IN THE FOREWORD OF THIS MANUAL.

SUZUKI
Caring for Customers

99501-61A20-01E
(英)

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING, CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:
Indicates a potential hazard that could result in death or injury.

CAUTION:
Indicates a potential hazard that could result in vehicle damage.

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

WARNING:
This service manual is intended for authorized Suzuki dealers and qualified service mechanics only. Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual. Improper repair may result in injury to the mechanic and may render the vehicle unsafe for the driver and passengers.

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around air bag system components or wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around air bag system components or wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag deployment.**
- **Do not modify the steering wheel, dashboard, or any other air bag system component (on or around air bag system componenrs or wiring). Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93°C, 200°F (for example, during a paint baking process), remove the air bag system components (air bag inflator module, sensing and diagnostic module, forward discriminating sensor) beforehand to avoid component damage or unintended deployment.**

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to SE416/SZ416 SERVICE MANUAL.

It has been prepared exclusively for SE416/SZ416 equipped with stepper motor type EGR valve.

Applicable model: SE416/SZ416 equipped with stepper motor type EGR valve

It describes only different service information of SE416/SZ416 equipped with stepper motor type EGR valve as compared with that for the vehicle without that system Therefore, whenever servicing SE416/SZ416 equipped with stepper motor type EGR valve, consult this service manual first.

And for any section, item or description not found in this service manual, refer to the right listed SERVICE MANUAL.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricants, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others. Therefore, note that illustrations may differ from the vehicle being actually serviced. The right is reserved to make changes at any time without notice.

TABLE OF CONTENTS	SECTION
ENGINE	
Electronic Fuel Injection System (Single Point Throttle Body Fuel Injection)	**6E**
Electronic Fuel Injection System (Sequential Multiport Fuel Injection)	**6E1**
Ignition System	**6F1**

RELATED SERVICE MANUAL

- **VITARA SERVICE MANUAL (99500-60A10)**
- **VITARA SUPPLEMENTARY SERVICE MANUAL (99501-60A70)**
- **VITARA SUPPLEMENTARY SERVICE MANUAL (99501-61A10)**
- **SE/SV/SZ/SY SERIES SUPPLEMENTARY SERVICE MANUAL (99501-60G10)**

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

ABBREVIATIONS USED IN THIS MANUAL

ABS :Anti-lock Brake System
A/C :Air Conditioning
A/T :Automatic Transmission
B+ :Battery Voltage
CMP sensor :Camshaft Position sensor
CTP switch :Closed Throttle Position switch
DLC :Data Link Connecter
ECM :Engine Control Module
ECT sensor :Engine Coolant Temp. sensor
EGR :Exhaust Gas Recirculation
EVAP :Evaporative Emission
GND :Ground
IAC valve :Idle Air Control valve
IAT sensor :Intake Air Temp. sensor
IC :Ignition Control
PCV valve :Positive Crankcase Ventilation valve
PSP switch :Power Steering Pressure switch
MAF sensor :Mass Air Flow sensor
MAP sensor :Manifold Absolute Pressure sensor
TCM :Transmission Control Module
TP sensor :Throttle Position sensor
VSS :Vehicle Speed Sensor

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

(SINGLE-POINT THROTTLE BODY FUEL INJECTION)

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the same section of SE/SZ/SV/SY SERIES SUPPLEMENTARY SERVICE MANUAL (99501-60G10).

CONTENTS

GENERAL DESCRIPTION

The Electronic Fuel Injection system in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions.
It uses the single-point throttle body fuel injection system which injects fuel into the throttle body through one injector.

This system has 2 major sub-systems: air/fuel delivery system and electronic control system. Air/fuel delivery system includes fuel pump, throttle body, etc..

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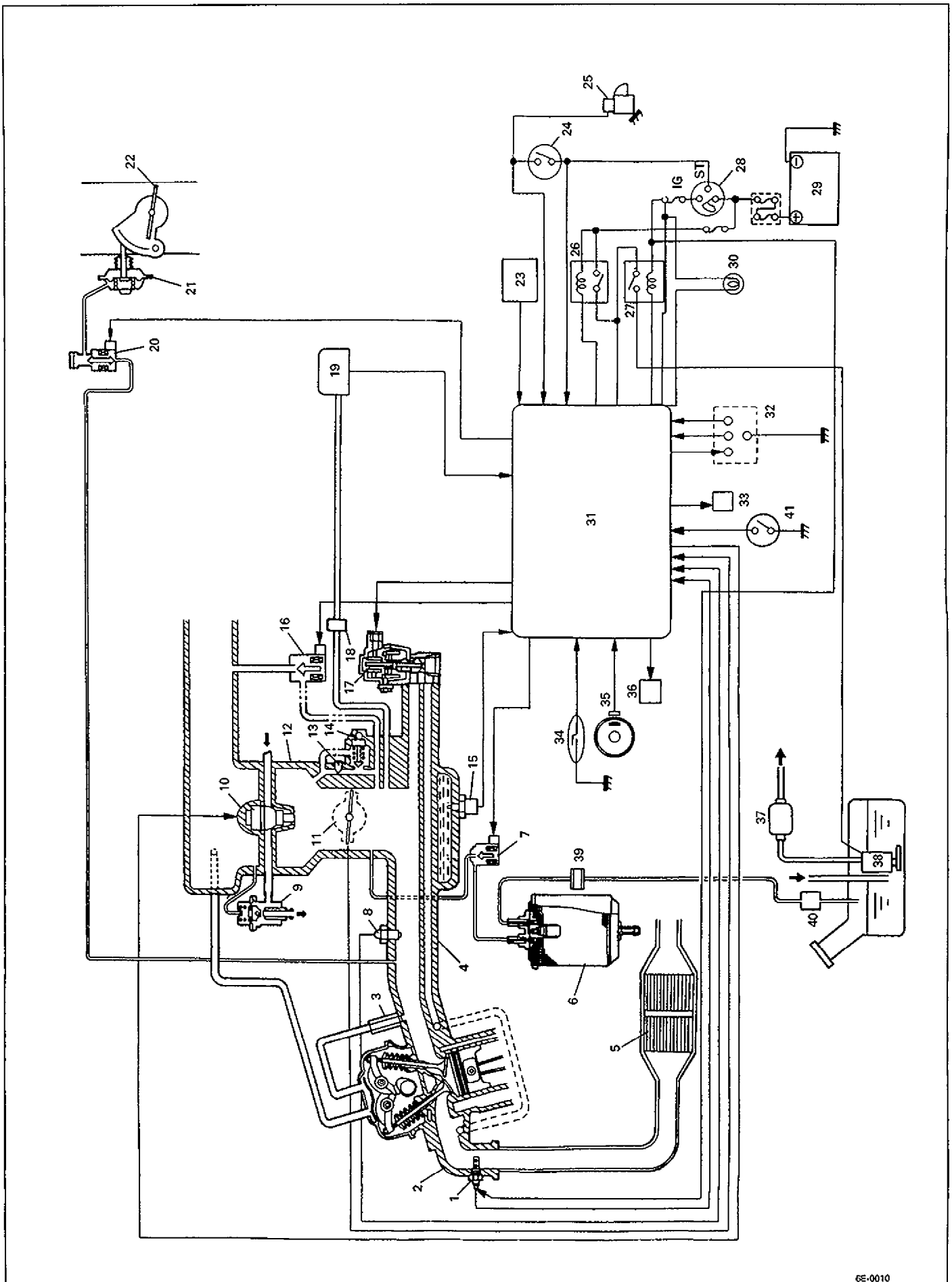
Electronic control system includes ECM, various sensors and controlled devices.

This section explains not only the system related to the electronic fuel injection but also such functions of ECM as listed below.

- EGR control system
- Throttle opener control system
- IC (Ignition Control)
- Fuel evaporative emission control system

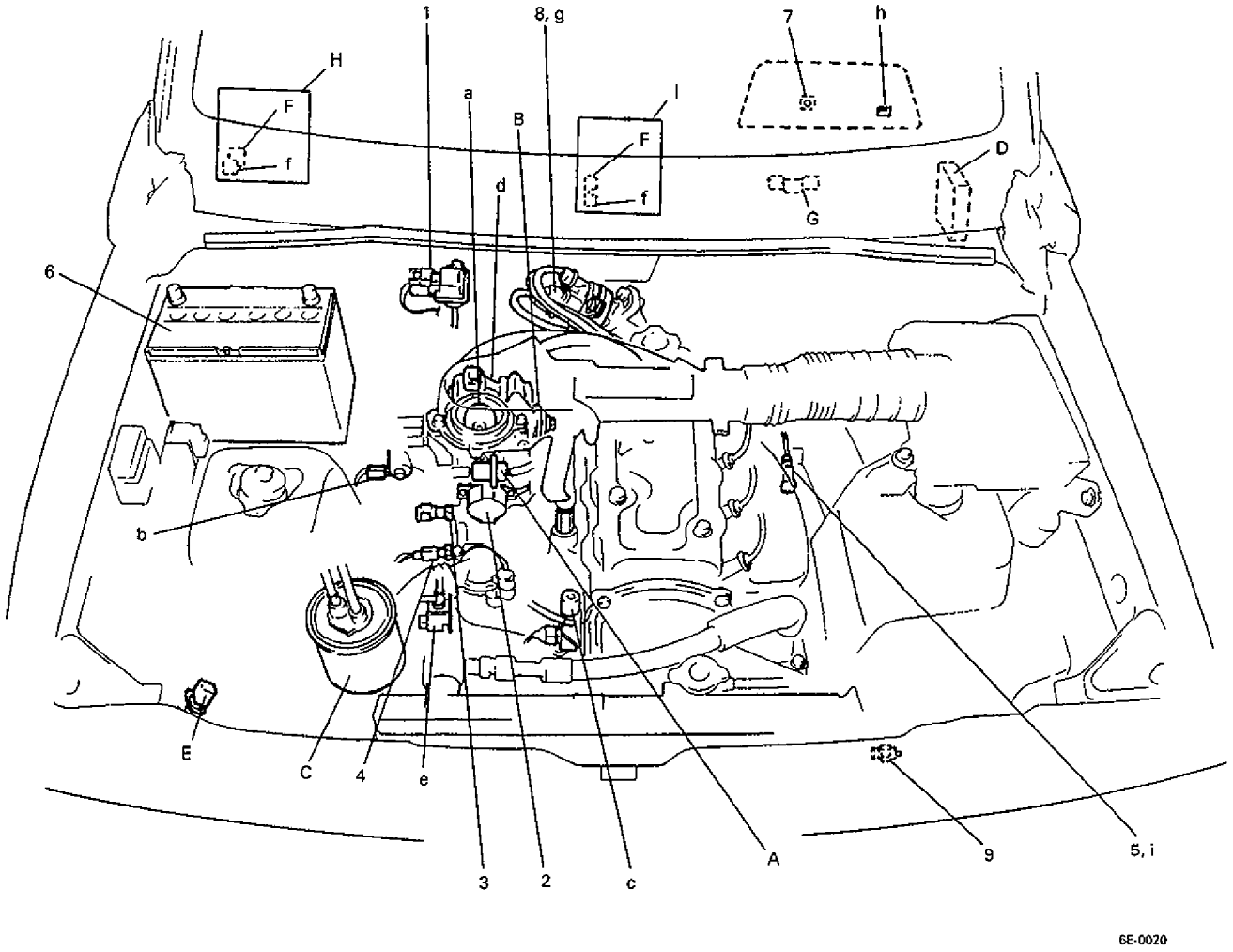


1. Heated oxygen sensor
2. Exhaust manifold
3. PCV valve
4. Intake manifold
5. Three way catalytic converter
6. EVAP canister
7. EVAP canister purge valve
8. IAT sensor
9. Fuel pressure regulator
10. Fuel injector
11. TP sensor
12. Throttle body
13. Idle speed adjust screw
14. Fast idle air valve
15. ECT sensor
16. IAC valve
17. EGR valve (stepper motor)
18. Filter
19. MAP sensor
20. Throttle opener solenoid vacuum valve
21. Throttle opener
22. Throttle valve
23. A/C amplifier (if equipped)
24. Shift switch (A/T)
25. Starter magnetic switch
26. Main relay
27. Fuel pump relay
28. Main switch
29. Battery
30. Malfunction indicator lamp ("CHECK ENGINE" light)
31. ECM
32. Monitor coupler
33. Igniter
34. VSS
35. CMP sensor
36. Lock-up relay (A/T only)
37. Fuel filter
38. Fuel pump
39. Tank pressure control valve
40. Fuel/vapor separator
41. Power steering pressure switch (if equipped)

ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into 8 sub systems:

- Fuel injection control system
- IAC valve control system
- Fuel pump control system
- Throttle opener control system
- EGR control system
- Ignition control system
- EVAP emission control system
- Oxygen sensor heater control system



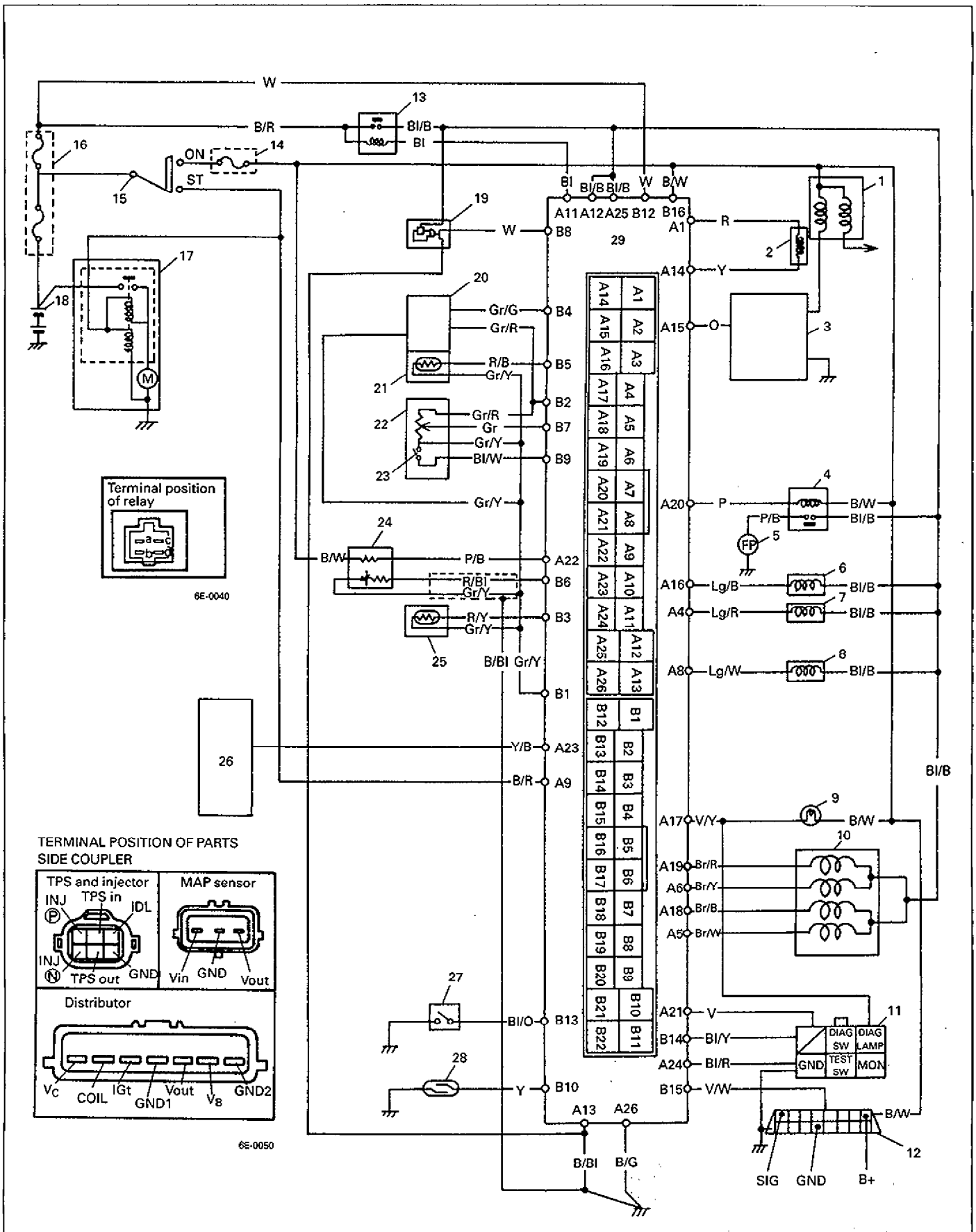
6E-0020

INFORMATION SENSORS
1. MAP sensor
2. Throttle position sensor
3. IAT sensor
4. ECT sensor
5. Heated oxygen sensor
6. Battery
7. Vehicle speed sensor
8. CMP sensor (in distributor)
9. Power steering pressure switch (if equipped)

CONTROLLED DEVICES
a : Injector
b : IAC valve
c : Throttle opener solenoid vacuum valve
d : EGR valve (stepper motor)
e : EVAP canister purge valve
f : Fuel pump relay
g : Igniter (Power unit; in distributor)
h : Malfunction indicator lamp ("CHECK ENGINE" light)
i : Oxygen sensor heater

OTHERS
A : Fuel pressure regulator
B : Throttle opener
C : EVAP canister
D : ECM
E : Monitor coupler
F : Main relay
G : Data link connector
H : Right hand steering vehicle
I : Left hand steering vehicle

NOTE:
Above figure shows left-hand steering vehicle. For right-hand steering vehicle, Combination meter, ECM and DLC are installed at the other side.



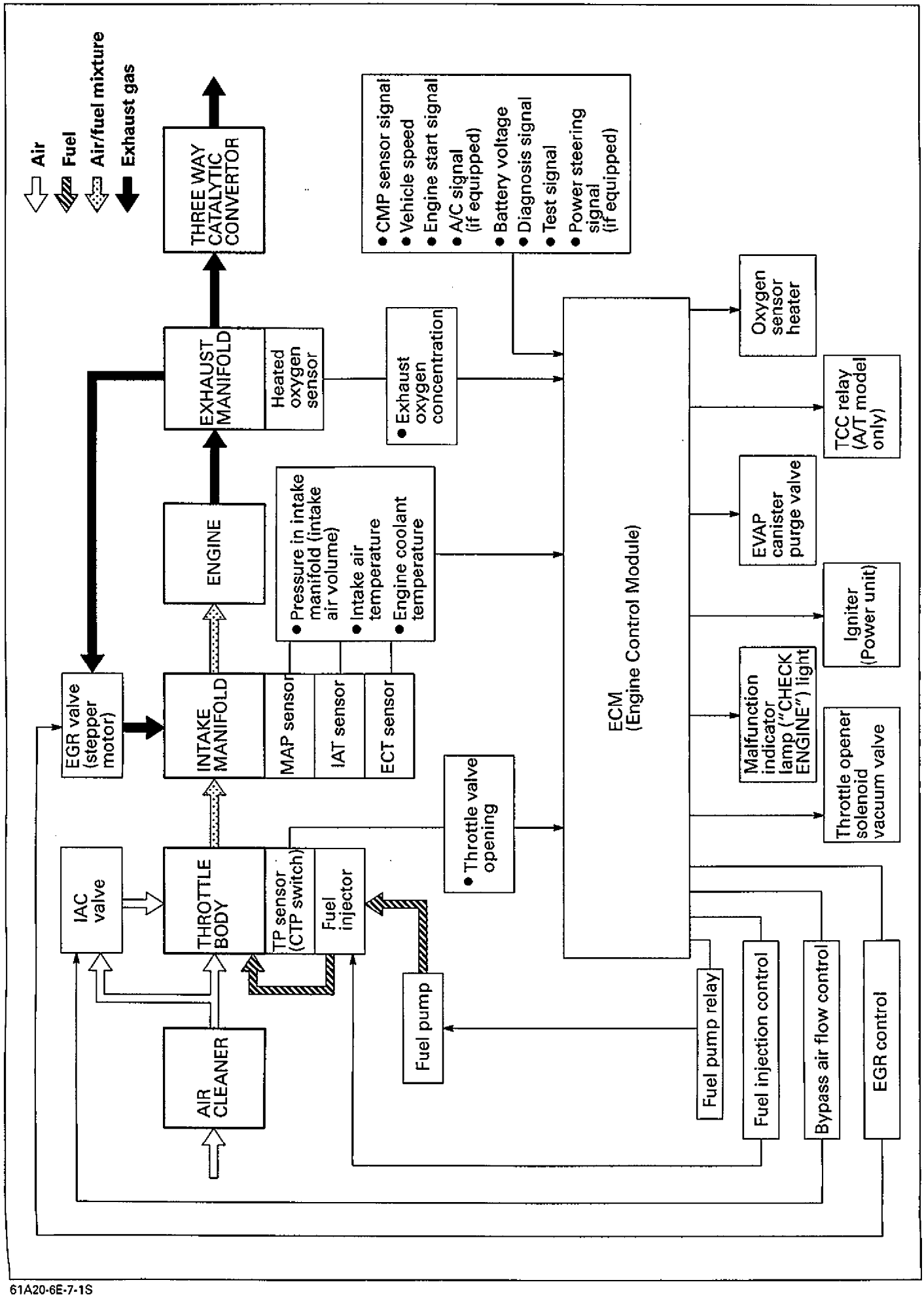
6E-0030

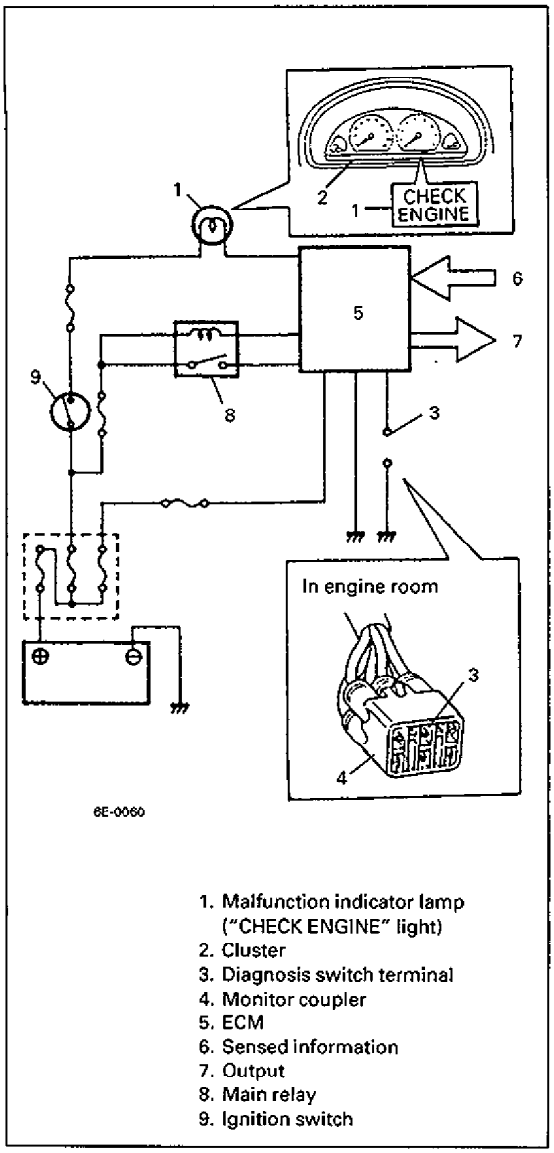
1. Ignition coil (in distributor)
2. Fuel injector
3. Igniter (in distributor)
4. Fuel pump relay
5. Fuel pump
6. IAC valve
7. EVAP canister purge valve
8. Throttle opener solenoid vacuum valve
9. Malfunction indicator lamp ("CHECK ENGINE" light)
10. EGR valve (stepper motor)
11. Monitor coupler
12. Data link connector
13. Main relay
14. Circuit fuse
15. Ignition switch
16. Main fuse
17. Starter motor
18. Battery
19. CMP sensor (in distributor)
20. MAP sensor
21. IAT sensor
22. TP sensor
23. CTP (Closed Throttle Position : idle) switch
24. Heated oxygen sensor
25. ECT sensor
26. A/C amplifier
27. PSP switch
28. VSS
29. ECM

TER-MINAL	WIRE COLOR	CIRCUIT
A1	R	Fuel injector (positive)
A2 A3	—	Blank
A4	Lg/R	EVAP canister purge valve
A5	Br/W	EGR valve (stepper motor coil 4)
A6	Br/Y	EGR valve (stepper motor coil 2)
A7	—	Blank
A8	Lg/W	Throttle opener solenoid vacuum valve
A9	B/R	Engine start switch
A10	—	Blank
A11	Bl	Main relay
A12	Bl/B	Power source
A13	B/Bl	Ground
A14	Y	Fuel injector (negative)
A15	O	Igniter
A16	Lg/B	Idle air control valve
A17	V/Y	Malfunction indicator lamp ("CHECK ENGINE" light)
A18	Br/B	EGR valve (stepper motor coil 3)
A19	Br/R	EGR valve (stepper motor coil 1)
A20	P	Fuel pump relay
A21	V	Duty output terminal
A22	P/B	Oxygen sensor heater
A23	Y/B	A/C amplifier (if equipped)
A24	Bl/R	Test switch terminal
A25	Bl/B	Power source
A26	B/G	Ground
B1	Gr/Y	Sensor ground
B2	Gr/R	Power source (for sensors)
B3	R/Y	Engine coolant temp. sensor
B4	Gr/G	Manifold absolute pressure sensor
B5	R/B	Intake air temp. sensor
B6	R/Bl	Heated oxygen sensor
B7	Gr	Throttle position sensor
B8	W	Camshaft position sensor
B9	Bl/W	CTP switch
B10	Y	Vehicle speed sensor
B11	—	Blank
B12	W	Power source for back up
B13	Bl/O	Power steering pressure switch (if equipped)
B14	Bl/Y	Diag. switch terminal
B15	V/W	Data link connector
B16	B/W	Ignition switch
B17 B18 B19 B20 B21 B22	—	Blank

Wire color

B/Bl ..... Black/Blue	Lg/B ..... Lightgreen/Black
B/G ..... Black/Green	Lg/R ..... Lightgreen/Red
B/R ..... Black/Red	Lg/W .... Lightgreen/White
B/W ..... Black/White	Lg/Y ..... Lightgreen/Yellow
B/Y ..... Black/Yellow	O ..... Orange
Bl ..... Blue	P ..... Pink
Bl/B ..... Blue/Black	P/B ..... Pink/Black
Bl/G ..... Blue/Green	R ..... Red
Bl/R ..... Blue/Red	R/B ..... Red/Black
Bl/W ..... Blue/White	R/G ..... Red/Green
Bl/Y ..... Blue/Yellow	R/Y ..... Red/Yellow
Bl/O ..... Blue/Orange	R/Bl ..... Red/Blue
Br ..... Brown	Sb ..... Skyblue
Br/B ..... Brown/Black	V ..... Violet
Br/Y ..... Brown/Yellow	V/Y ..... Violet/Yellow
Gr ..... Gray	W ..... White
Gr/G ..... Gray/Green	W/Y ..... White/Yellow
Gr/R ..... Gray/Red	Y ..... Yellow
Gr/Y ..... Gray/Yellow	Y/B ..... Yellow/Black
Lg ..... Lightgreen	





1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Cluster
3. Diagnosis switch terminal
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

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Engine Control Module (ECM)

Self-diagnosis function

When any of such troubles as listed below occurs in Electronic Fuel Injection system, ECM activates Malfunction Indicator lamp ("CHECK ENGINE" light) while engine is running to warn the driver of occurrence of such trouble and stores the data on defective area (where trouble occurred) in its back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for 20 seconds or longer.) ECM also indicated defective area in memory by means of flashing of Malfunction Indicator lamp ("CHECK ENGINE" light) at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON).

- When ECM received a defect informing signal from any one of following sensors and circuits or no signal whatever
  * Heated oxygen sensor
  * IAT sensor
  * MAP sensor
  * ECT sensor
  * TP sensor
  * Vehicle speed sensor
  * Idle switch (CTP switch)
  * CMP sensor
  * EGR valve
- When CPU (Central Processing Unit) of ECM fails to operate

NOTE:

- **Even when a trouble occurs in CMP sensor or idle switch (CTP switch) circuit (circuit open), ECM does not indicate it (or activate Malfunction Indicator lamp ("CHECK ENGINE" light) while engine is running.**
  And when that troubled circuit regains good condition, the memory of defective area will be erased automatically even if the power circuit to ECM is not opened as described above.

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.

The EGR system consists EGR valve and piping for exhaust gas.

The EGR valve is controlled by ECM according to the signals from CMP sensor, ECT sensor, MAP sensor and VSS.

The EGR valve consists of a stepper motor, rods, valve, etc.

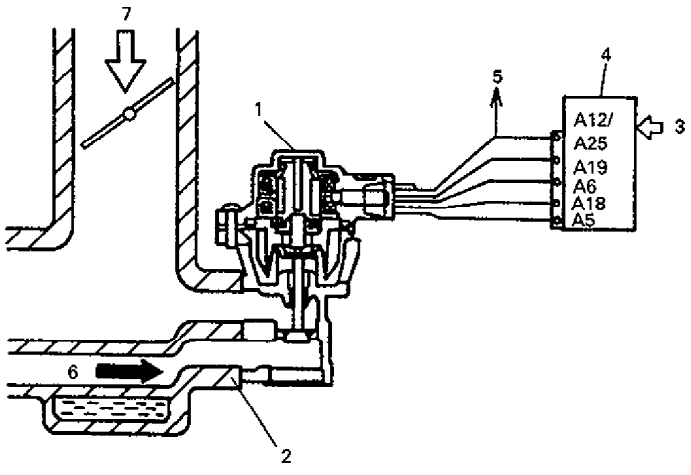
When the EGR valve stepper motor receives "open" signal from ECM, it turns in the "open" direction according to the number of steps and pushes out the rod which is in mesh with the worm of the stepper motor. As the rod installed to the EGR valve is pushed by this rod, the EGR valve opens by the amount corresponding to the number of steps of the "open" signal from ECM to let the exhaust gas flow from the exhaust manifold to the intake manifold.

To close the EGR valve, the stepper motor turns in the "close" direction according to the number of steps of the "close" signal from ECM and pulls up the rod. In this way, the valve is closed by the spring force.

And in this state, the exhaust gas is not allowed to flow to the air intake system or the combustion chamber.

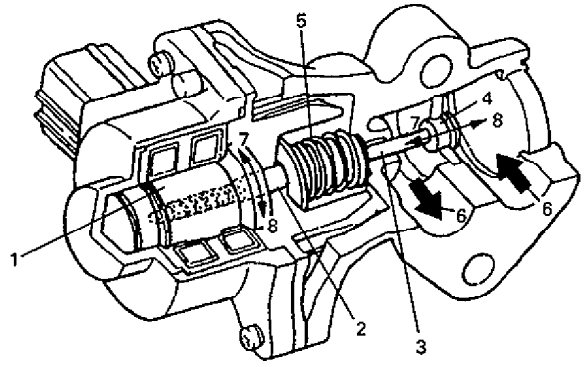
Under any one of the following conditions, ECM closes the EGR valve.

- When engine coolant temperature is low
- When throttle valve is at idle position
- When engine is running under high load



6E-0070

1. EGR valve
2. Intake manifold
3. Sensed information
4. ECM
5. From main relay
6. Exhaust gas
7. Fresh air



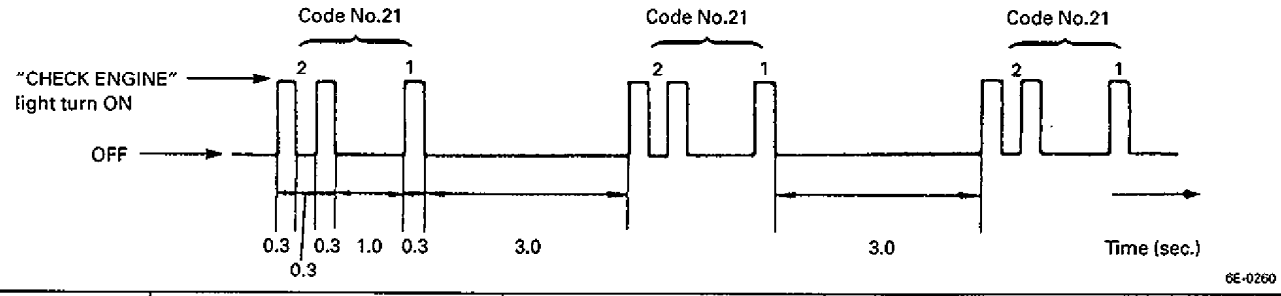
6E-0080

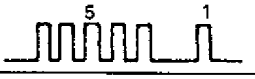
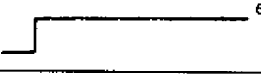
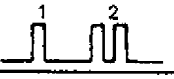
1. Stepper motor
2. Rod (with thread)
3. Rod
4. Valve
5. Spring
6. Exhaust gas
7. Valve close
8. Valve open

DIAGNOSIS

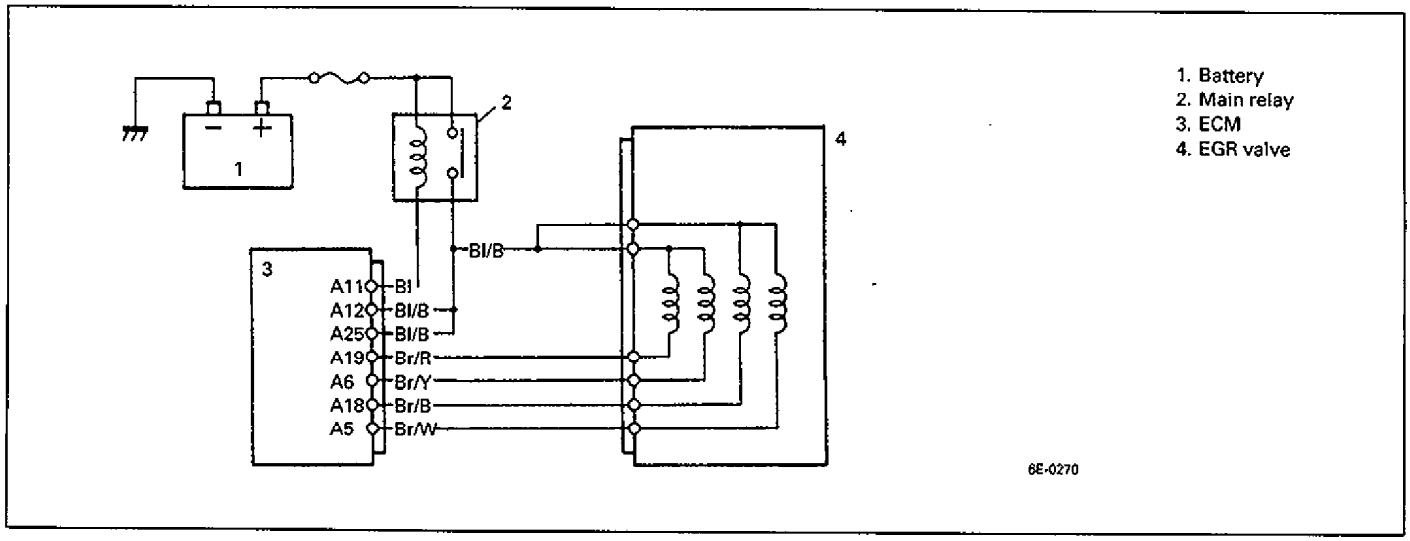
DIAGNOSIS CODE TABLE

EXAMPLE: When throttle position sensor is defective (Code No.21)

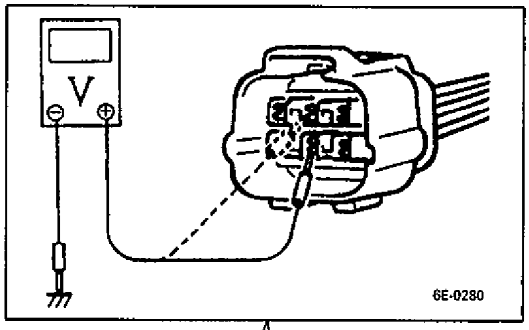


DIAGNOSTIC CODE NO.	"CHECK ENGINE" LIGHT FLASHING PATTERN	DIAGNOSTIC ITEM	DIAGNOSIS
13	 6E-0090	Oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	 6E-0100	ECT sensor	
15	 6E-0110		
21	 6E-0120	TP sensor	
22	 6E-0130		
23	 6E-0140	IAT sensor	
25	 6E-0150		
24	 6E-0160	VSS	
31	 6E-0170	MAP sensor	
32	 6E-0180		
42	 6E-0200	CMP sensor	
44	 6E-0210	CTP switch of TP sensor	
45	 6E-0220		
51	 6E-0230	EGR valve (stepper motor)	
ON	 6E-0240	ECM	ECM failure.
12	 6E-0250	Normal	This code appears when none of the other codes (Above codes) are identified.

CODE NO.51 EGR VALVE (STEPPER MOTOR OR ITS CIRCUIT OPEN OR SHORT)



Does EGR stepper motor operate for about 1 second after ignition switch ON?

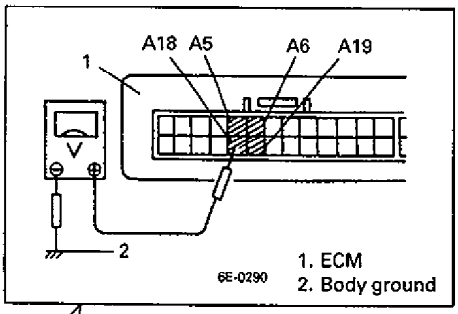


NO

1. Disconnect EGR valve coupler with ignition switch OFF.
2. Check voltage between "BI/B" wire terminals and body ground.
3. Are they about 10 – 14 V?

NO

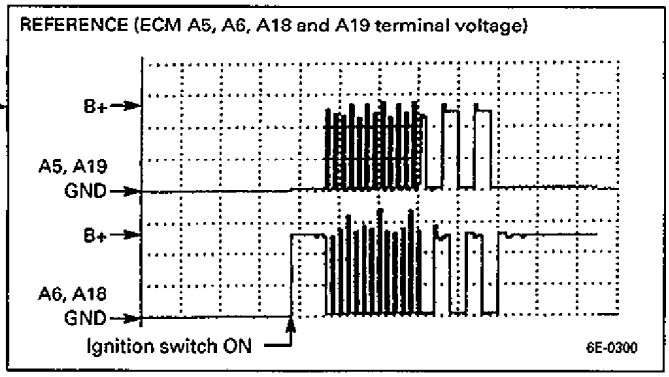
"BI/B" wire open



YES

Check voltage between A5, A6, A18 and A19 terminals of ECM coupler and body ground for about 1 second after ignition switch ON.
Is each measured voltage about 4 – 8.4 V?

YES



NO

Check EGR valve referring to P.6E-19.
Is it OK?

YES

Intermittent trouble or faulty ECM.
Recheck referring to intermittent trouble.

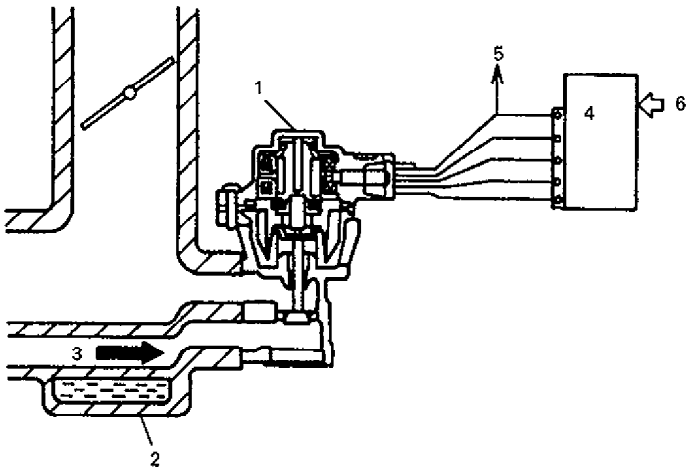
YES

"Br/R", "Br/Y", "Br/B" or "Br/W" wire open or shorted to ground or poor A19, A6, A18 or A5 connection of ECM coupler.
If wire harness and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to intermittent trouble.

NO

Faulty EGR valve.

B-6 EGR SYSTEM INSPECTION



1. EGR valve
2. Intake manifold
3. Exhaust gas
4. ECM
5. From main relay
6. Sensed information

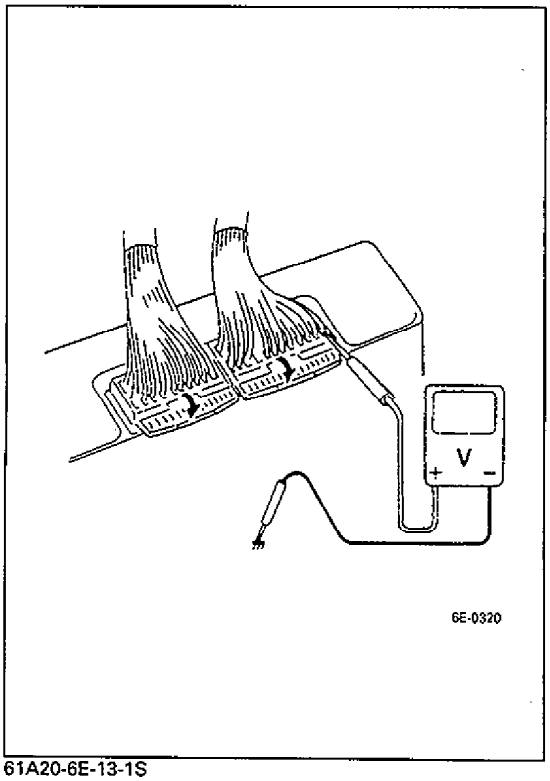
Check EGR system by using tech-1. referring to P.6E - 18.
Is it good condition?

YES

EGR system is in good condition.

NO

Clogged EGR gas passage, stuck or faulty EGR valve or poor performance of ECT sensor, TP sensor.



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INSPECTION OF ECM AND ITS CIRCUITS

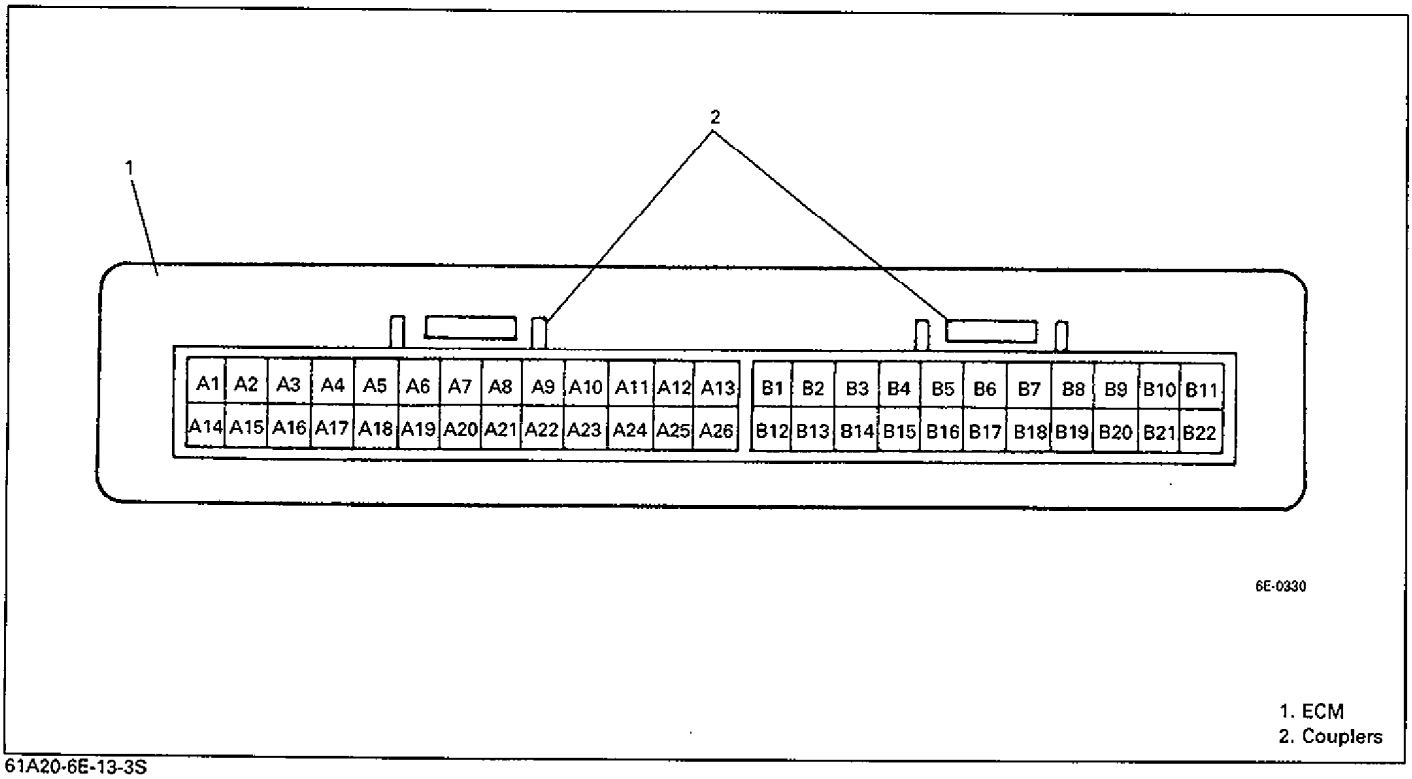
ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

CAUTION:
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.

Voltage Check

1) Remove ECM from body referring to ECM REMOVAL.
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal of couplers connected.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.

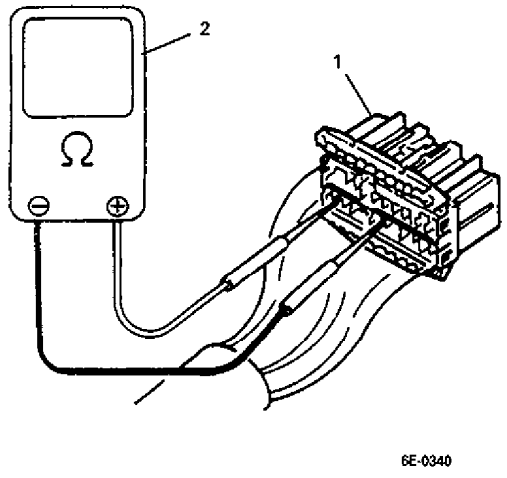


61A20-6E-13-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Injector ⊕	–	–
A2 A3	Blank	–	–
A4	EVAP canister purge valve	10 – 14 V	Ignition switch ON
A5	EGR valve (stepper motor) 4	0 – 1 V	Over 1 second after ignition switch ON
A6	EGR valve (stepper motor) 2	10 – 14 V	Over 1 second after ignition switch ON
A7	Blank	–	–
A8	Throttle opener solenoid vacuum valve	10 – 14 V	Ignition switch ON
A9	Engine start switch	6 – 12 V	While engine cranking
		0 V	Other than above
A10	Blank	–	–
A11	Main relay ground	0 – 1 V	Ignition switch ON
		10 – 14 V	Over 3 seconds after ignition switch OFF
A12	Power source	10 – 14 V	Ignition switch ON
A13	Ground	–	–
A14	Injector ⊖	–	–
A15	Ignition output signal	0 – 1 V	Ignition switch ON
		0 – 3 V	While engine cranking
A16	IAC valve	–	–
A17	Malfunction indicator lamp ("CHECK ENGINE" light)	0 – 1 V	Ignition switch ON
		10 – 14 V	When engine running
A18	EGR valve (stepper motor) 3	10 – 14 V	Over 1 second after ignition switch ON
A19	EGR valve (stepper motor) 1	0 – 1 V	Over 1 second after ignition switch ON
A20	Fuel pump relay ground	0 – 1 V	For 3 seconds after ignition switch ON
		10 – 14 V	Over 3 seconds after ignition switch ON
A21	Duty output terminal	–	–
A22	Oxygen sensor heater	10 – 14 V	Ignition switch ON
		0 – 1 V	Over 3min. after engine started Engine running at idle speed
A23	A/C amplifier (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	A/C ON
A24	Test switch terminal	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch ON and test switch terminal grounded
A25	Power source	10 – 14 V	Ignition switch ON
A26	Ground	–	–
B1	Ground for sensors	–	–
B2	Power source for sensors	4.75 – 5.25 V	Ignition switch ON
B3	ECT sensor	0.5 – 0.9 V	Ignition switch ON Coolant temp.: 80 °C (176 °F)
B4	MAP sensor	3.6 – 4.4 V	Ignition switch ON Barometric pressure: 760 mmHg
B5	IAT sensor	2.2 – 3.0 V	Ignition switch ON Sensor ambient temp.: 20 °C (68 °F)
B6	Heated oxygen sensor	Refer to diagnostic flow chart for code No.13	
B7	TP sensor	0.5 – 1.2 V	Ignition switch ON Throttle valve at idle position (with throttle opener rod drawn by vacuum gauge)
		3.4 – 4.7 V	Ignition switch ON Throttle valve at full open position

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B8	CMP sensor	Indicator deflection repeated between 0 V and about 5 V	Ignition switch ON Crankshaft turned slowly
B9	CTP switch of TP sensor	0 – 1 V	Ignition switch ON Throttle valve is at idle position (within throttle opener rod drawn in by vacuum pump gauge)
		4 – 5 V	Ignition switch ON Throttle valve opens larger than idle position
B10	Vehicle speed sensor	Indicator deflection repeated between 0 V and 4–5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
B11	Blank	—	—
B12	Power source for back-up circuit	10 – 14 V	Ignition switch ON and OFF
B13	Power steering pressure switch (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times.
B14	Diagnosis switch terminal	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch ON and diag. switch terminal grounded
B15	Data link connector	4 – 5 V	Ignition switch ON
B16	Ignition switch	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch OFF
B17 B18 B19 B20 B21 B22	Blank	—	—

61A20-6E-15-1S



1. ECM coupler disconnected
2. Ohmmeter

61A20-6E-15-4S

Resistance Check

1) Disconnect ECM couplers from ECM with ignition switch OFF.

CAUTION:
Never touch terminals of ECM itself or connect voltmeter or ohmmeter.

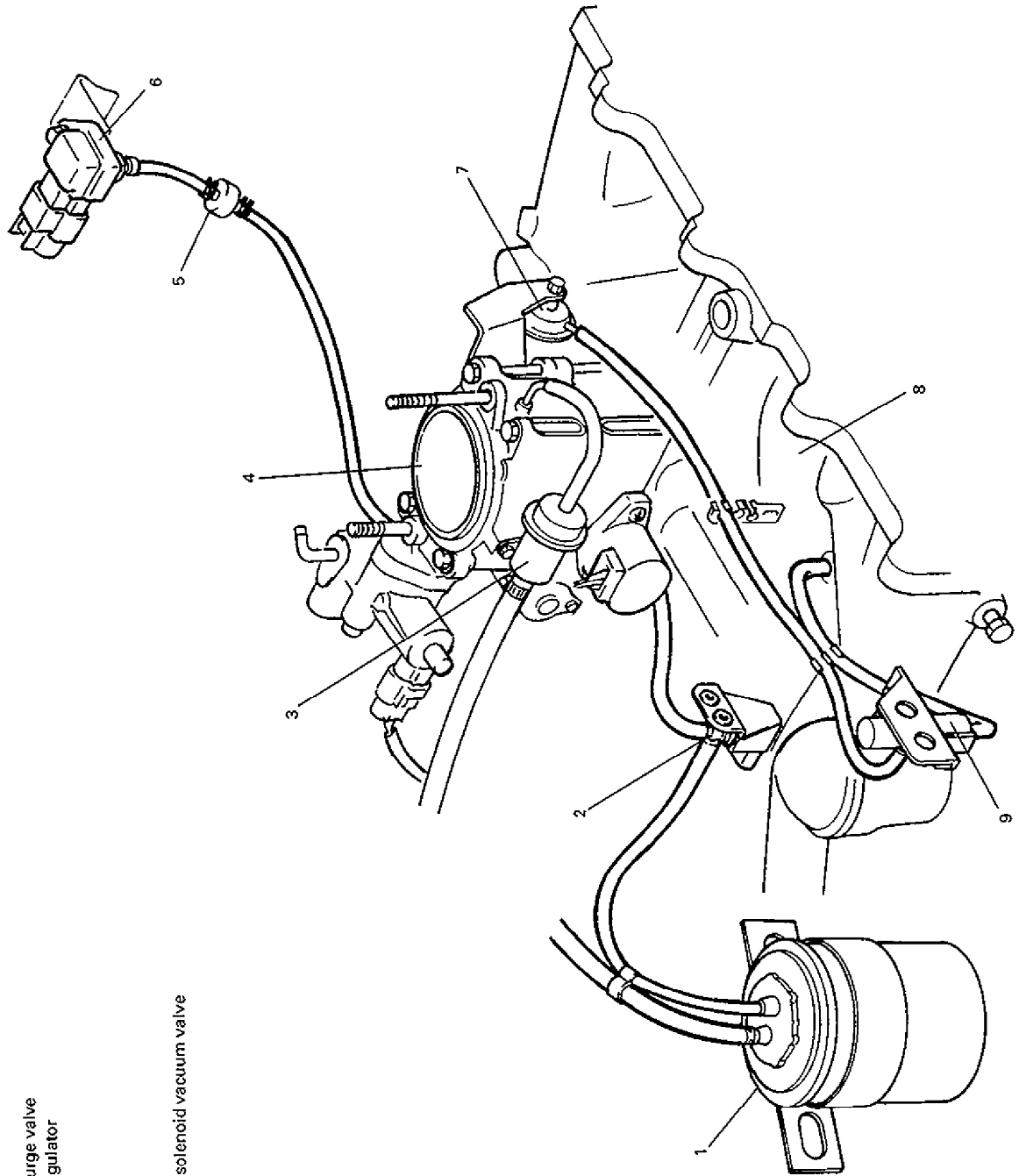
2) Check resistance between each pair of terminals of disconnected couplers as listed in following table.

CAUTION:
- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in table represents that when parts temperature is 20 °C (68 °F).**

TERMINALS	CIRCUIT	STANDARD RESISTANCE	CONDITION	
A4 – A12	EVAP canister purge valve	36 – 44 Ω	–	
A5 – A12	EGR valve (stepper motor coil 4)	20 – 24 Ω	–	
A6 – A12	EGR valve (stepper motor coil 2)	20 – 24 Ω	–	
A8 – A12	Throttle opener solenoid vacuum valve	33 – 39 Ω	–	
A11 – B12	Main relay	56 – 84 Ω	–	
A16 – A12	IAC valve	11 – 14 Ω	–	
A18 – A12	EGR valve (stepper moter coil 3)	20 – 24 Ω	–	
A19 – A12	EGR valve (stepper moter coil 1)	20 – 24 Ω	–	
A20 – B16	Fuel pump relay	56 – 84 Ω	–	
A22 – A12	Oxygen sensor heater	11.7 – 14.3 Ω	–	
B3 – B1	ECT sensor	0.29 – 0.35 kΩ	Engine coolant temp.: 80 °C (176 °F)	
B5 – B1	IAT sensor	2.28 – 2.87 kΩ	Sensor ambient temp.: 20 °C (68 °F)	
B7 – B1	TP sensor	0.3 – 2.0 kΩ	Throttle valve at idle position	with MAP sensor coupler desconnected
		2.0 – 6.5 kΩ	Throttle valve at full open position	
B9 – B1	CTP switch	0 – 500 Ω	Throttle valve is at idle position	
		∞ (infinity)	Throttle valve opens larger than idle position	
B10 – Body ground	Vehicle speed sensor	Ohmmeter indicator deflects between 0 and ∞	Rear left tire turned slowly with rear right tire locked	

61A20-6E-16-1S

ON VEHICLE SERVICE

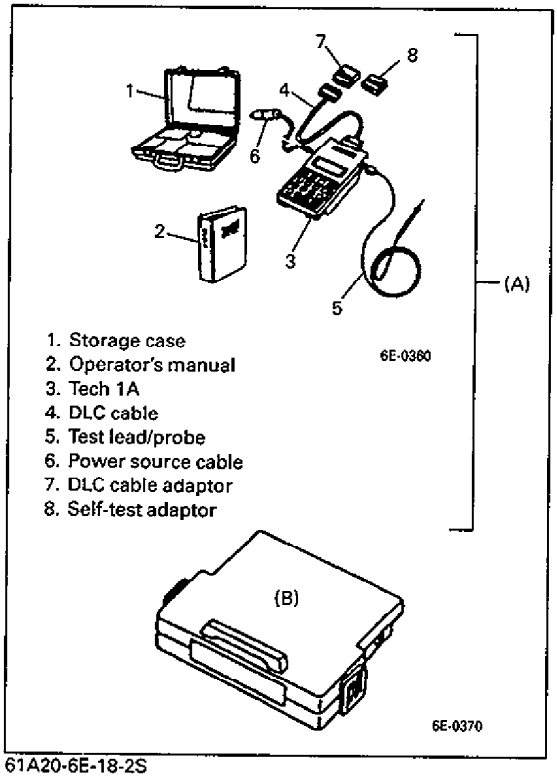


1. EVAP canister
2. EVAP canister purge valve
3. Fuel pressure regulator
4. Throttle body
5. Filter
6. MAP sensor
7. Throttle opener
8. Intake manifold
9. Throttle opener solenoid vacuum valve

GENERAL

When hoses are disconnected and system components are removed for service, reinstall components propely, and route and connect hoses correctly after service. Refer to figure on previous page for proper routing of hoses.

61A20-6E-18-1S



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

EGR SYSTEM

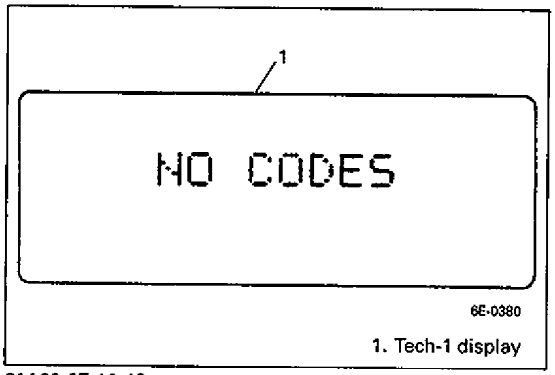
System Inspection

1) Connect scan tool (Tech-1) and cartridge to data link connector with ignition switch OFF.

Special tool
(A): 09931-76011 (Tech-1)
(B): (ECM cartridge)

NOTE:
For operation procedure of Tech-1, refer to tech-1 operator's manual.

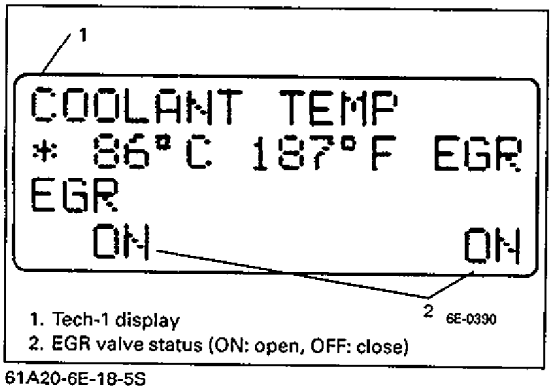
61A20-6E-18-2S



1. Tech-1 display

2) Start engine and warm up engine to normal operating temperature (55 °C, 131 °F or more).
3) Check diagnostic trouble code by using Tech-1 (TROUBLE CODE mode).
If tech 1 indicates trouble code, go back to "Diagnostic Flow Chart".

61A20-6E-18-4S



1. Tech-1 display
2. EGR valve status (ON: open, OFF: close)

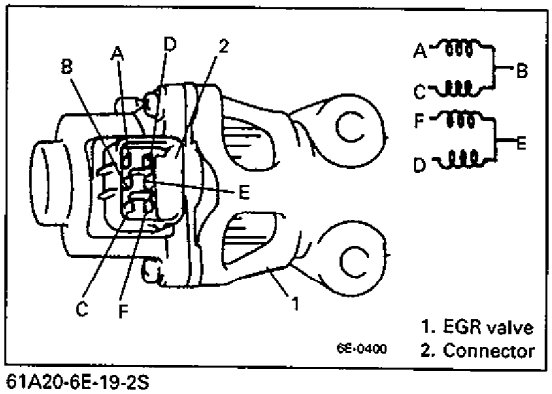
4) Increase engine speed to 1,500 – 4000 r/min and open EGR valve by using tech-1 (MISC TEST mode).
Make sure that engine speed drops when EGR valve opens. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve, poor performance of ECT sensor or TP sensor.

61A20-6E-18-5S

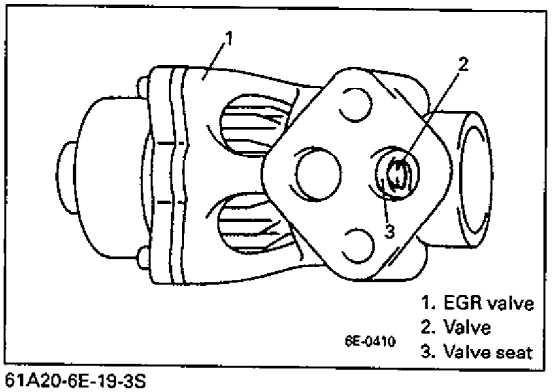
Removal

1) Disconnect negative cable at battery.
2) Disconnect EGR valve coupler.
3) Remove EGR valve and gasket from intake manifold.

61A20-6E-19-1S



61A20-6E-19-2S



61A20-6E-19-3S

Inspection

1) Check resistance between following terminals of EGR valve in each pair.

Terminal	Standard resistance
A – B C – B F – E D – E	20 – 24 Ω

If found faulty, replace EGR valve ass'y

2) Remove carbon from EGR valve gas passage.

NOTE:
Do not use any sharp-edged tool to remove carbon. Be careful not to damage or bend EGR valve, valve seat and rod.

3) Inspect valve, valve seat and rod for fault, cracks, bend or other damage.
If found faulty, replace EGR valve ass'y.

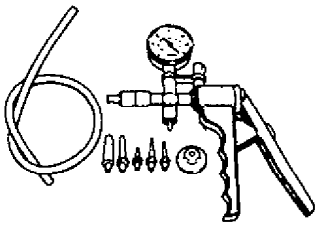
Installation

Reverse removal procedure noting following.

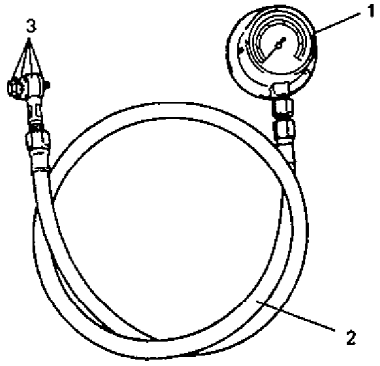
- Clean mating surface of valve and intake manifold.
- Use new gasket

61A20-6E-19-4S

SPECIAL TOOLS

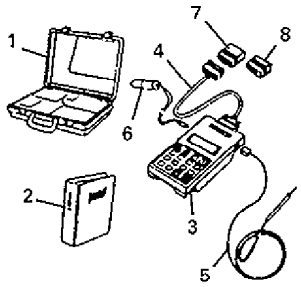


09917-47910
Vacuum pump gauge



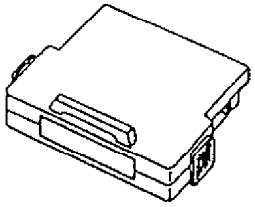
1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. Gauge attachment
   09912-58450

09912-58412
Fuel pressure gauge set

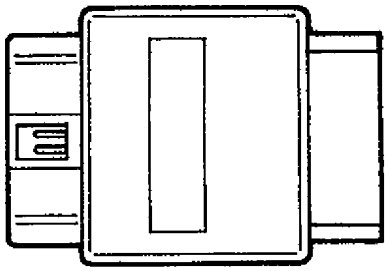


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

09931-76011
Tech 1 (scan tool) kit



Tech 1 cartridge for ECM



09931-96020
16/12 pin DLC adapter

61A20-6E-20-1S

SECTION 6E1

6E1

ELECTRONIC FUEL INJECTION SYSTEM

(SEQUENTIAL MULTIPORT FUEL INJECTION)

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the same section of SE/SZ/SV/SY SERIES SUPPLEMENTARY SERVICE MANUAL (99501-60G10).

CONTENTS

GENERAL DESCRIPTION

The Electronic Fuel Injection System in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions.
It uses the sequential multiport fuel injection system which injects fuel into each intake port of the cylinder head.

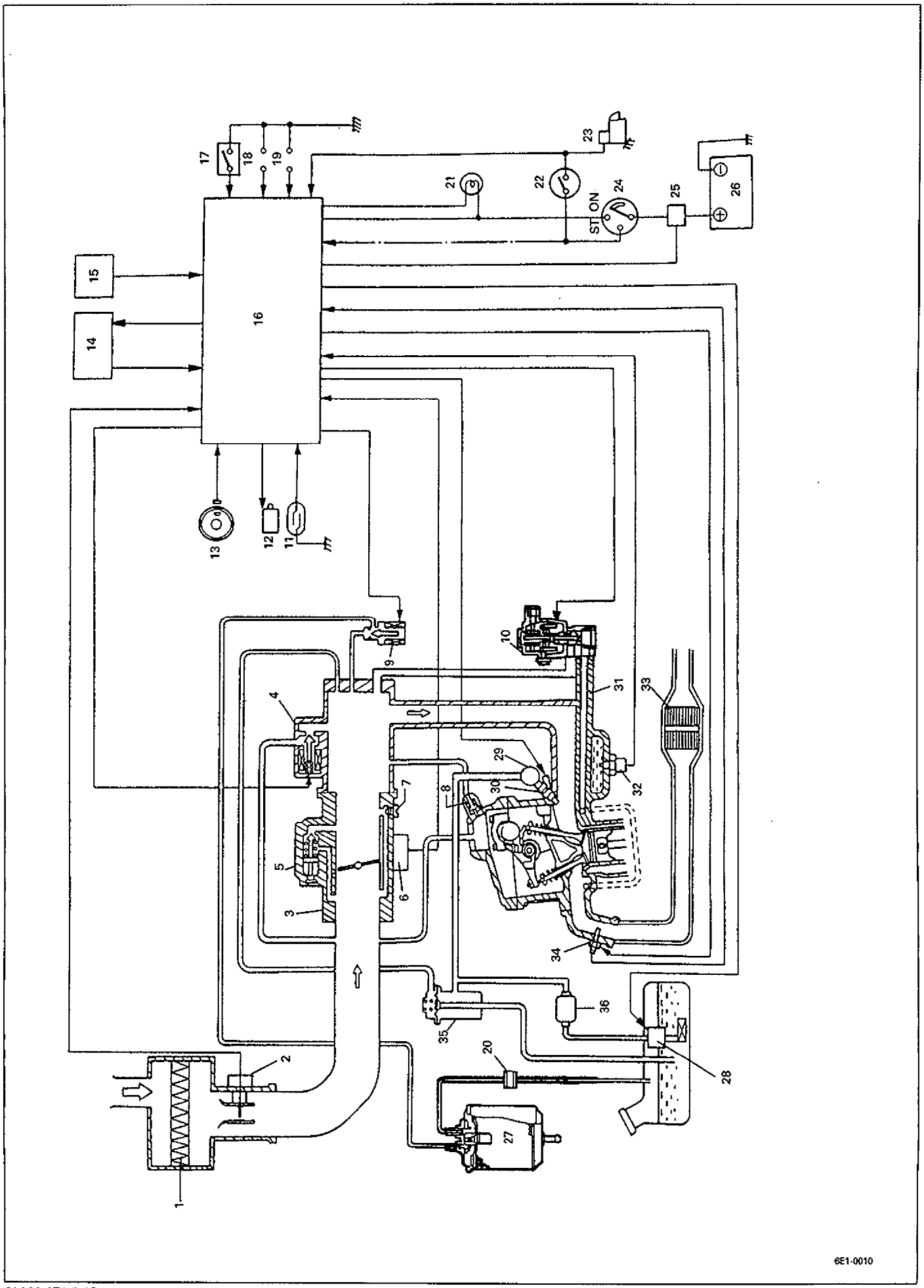
This system has 3 major sub-systems: air intake system, fuel delivery system and electronic control system.
Air intake system includes air cleaner, mass air flow sensor, throttle body, fast idle air valve, idle air control valve and intake manifold.
Fuel delivery system includes fuel pump, delivery pipe, fuel pressure regulator, etc.

Electronic control system includes ECM, various sensors and controlled devices.

This section explains the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR system.
- Evaporative emission control system.
- Throttle valve opening signal and coolant temp. signal outputs for TCM.
- IC (Ignition Control)

61A20-6E1-1-1S



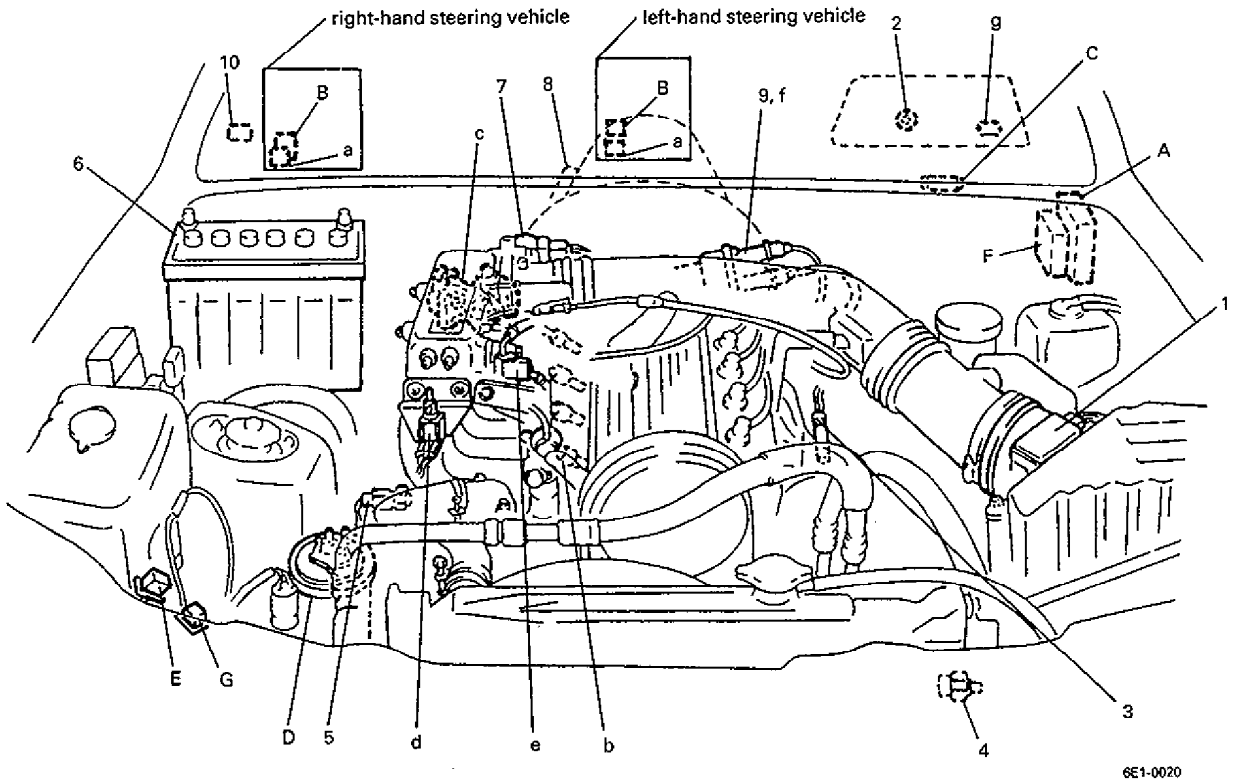
1. Air Cleaner
2. Mass air flow sensor
3. Throttle body
4. Idle air control valve
5. Fast idle air valve
6. Throttle position sensor
7. Idle speed adjust screw
8. PCV valve
9. EVAP canister purge valve
10. EGR valve (stepper motor)
11. Vehicle speed sensor
12. Igniter
13. Camshaft position sensor
14. Transmission control module (A/T vehicle)
15. A/C amplifier (if equipped)
16. ECM
17. Power steering pressure switch (if equipped)
18. Test switch terminal
19. Diag. switch terminal
20. Tank pressure control valve
21. Malfunction indicator lamp ("CHECK ENGINE" light)
22. Shift switch (A/T)
23. Starter magnetic switch
24. Main switch
25. Main fuse
26. Battery
27. EVAP canister
28. Fuel pump
29. Fuel delivery pipe
30. Fuel injector
31. Intake manifold
32. Engine coolant temp. sensor
33. Three way catalytic converter
34. Heated oxygen sensor
35. Fuel pressure regulator
36. Fuel filter

ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into the following sub systems:

- Fuel infection control system
- Heated oxygen sensor heater control system
- Idle air control system
- Fuel pump control system
- Evaporative emission control system
- IC (Ignition Control) system
- EGR system

Also, with 4 A/T model, ECM sends throttle valve opening signal and coolant temp. signal to transmission control module to control A/T.

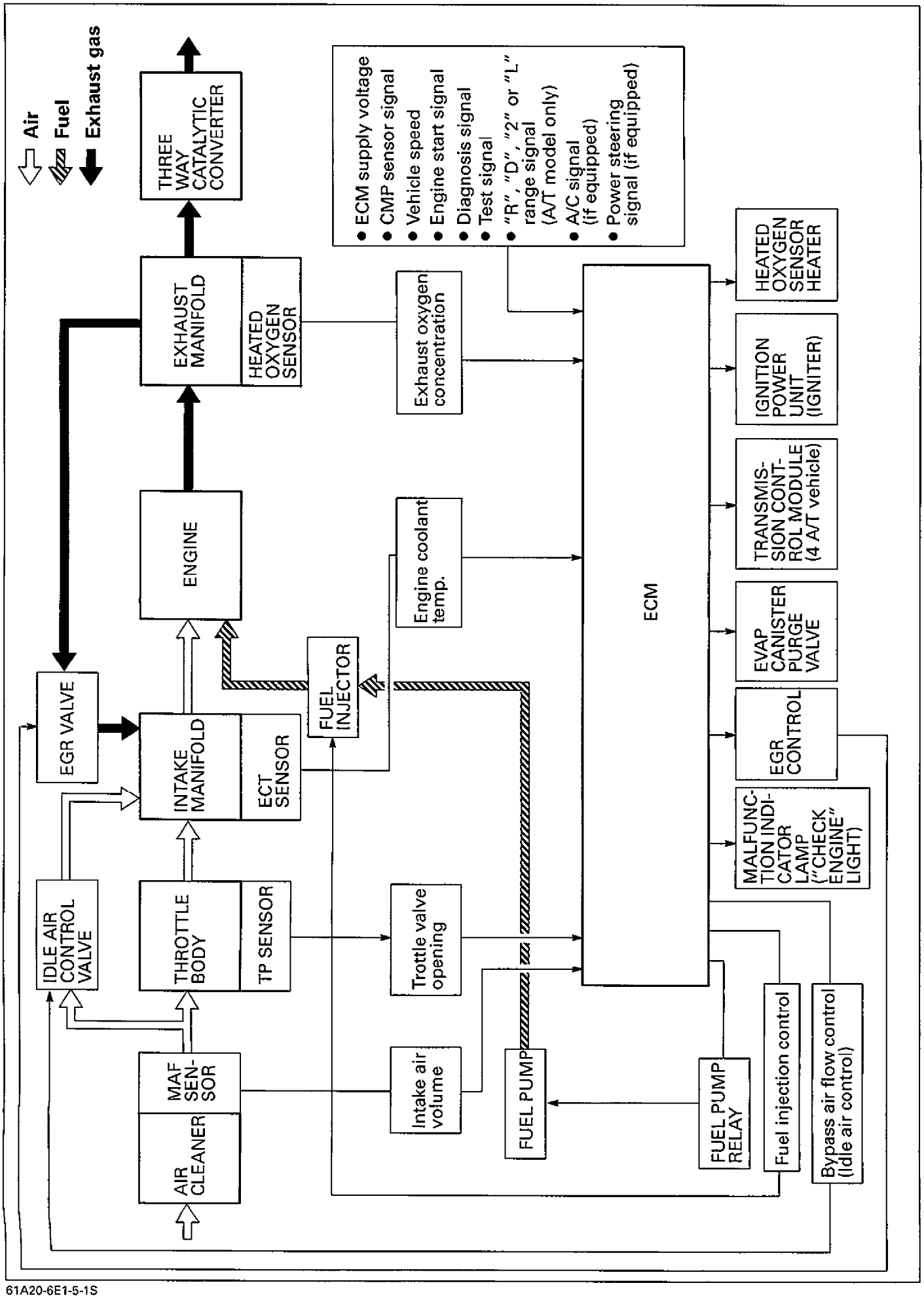


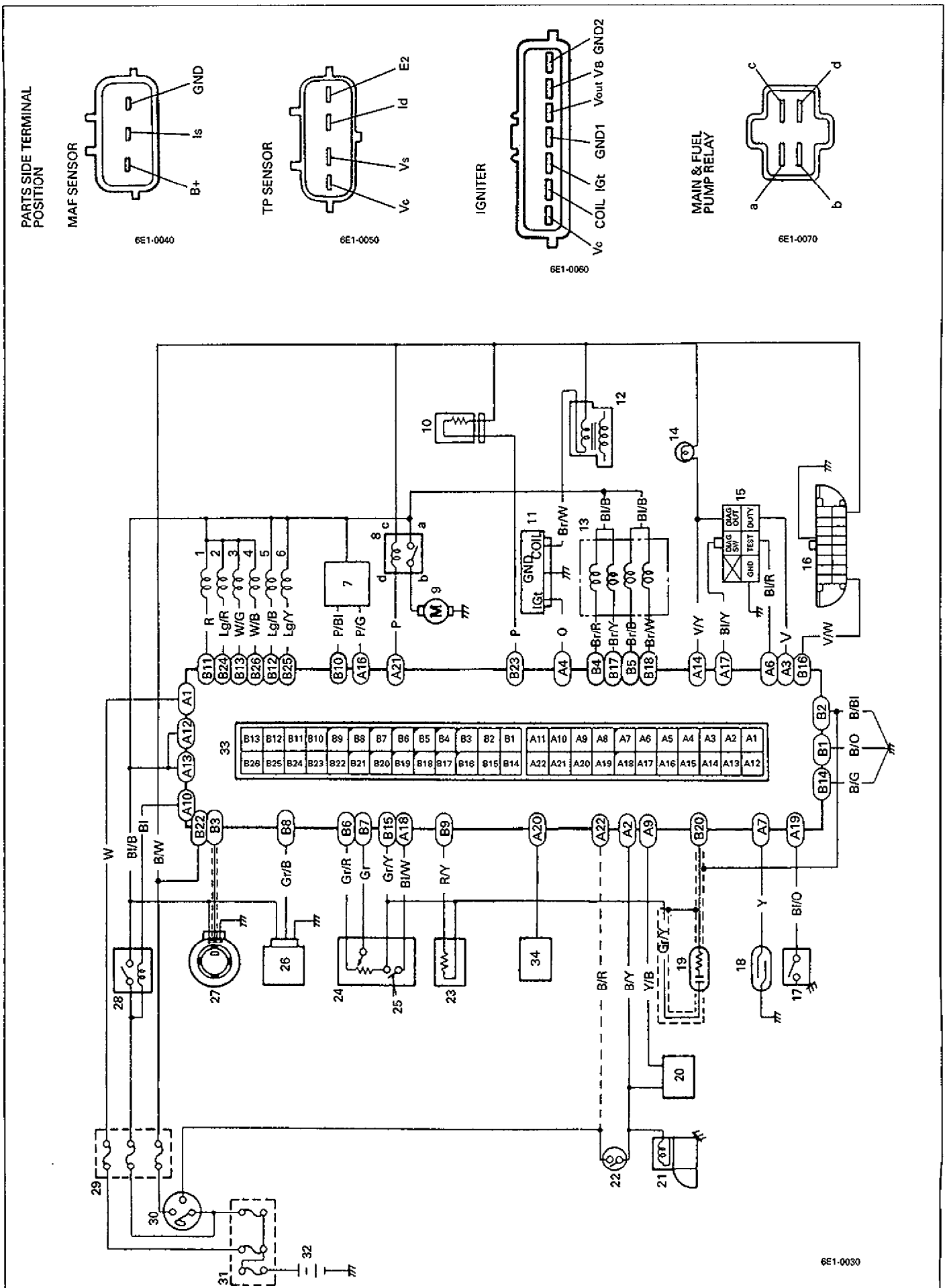
INFORMATION SENSORS
1. MAF sensor
2. VSS
3. Heated oxygen sensor
4. Power steering pressure switch (if equipped)
5. ECT sensor
6. Battery
7. TP sensor
8. Shift switch (A/T only)
9. Camshaft position sensor (CMP sensor) (in distributor)

CONTROLLED DEVICES
a : Fuel pump relay
b : Injector
c : EGR valve (stepper motor)
d : EVAP canister purge valve
e : Idle air control valve
f : Igniter (in distributor)
g : Malfunction indicator lamp ("CHECK ENGINE" light)

OTHERS
A : ECM
B : Main relay
C : Data link connector (Assembly line diag. link)
D : EVAP canister
E : Monitor coupler (Engine)
F : TCM (A/T vehicle)
G : Monitor couple (A/T)

NOTE:
Above figure shows left-hand steering vehicle. For right-hand steering vehicle, combination meter and ECM, are installed at the other side (right side of vehicle).



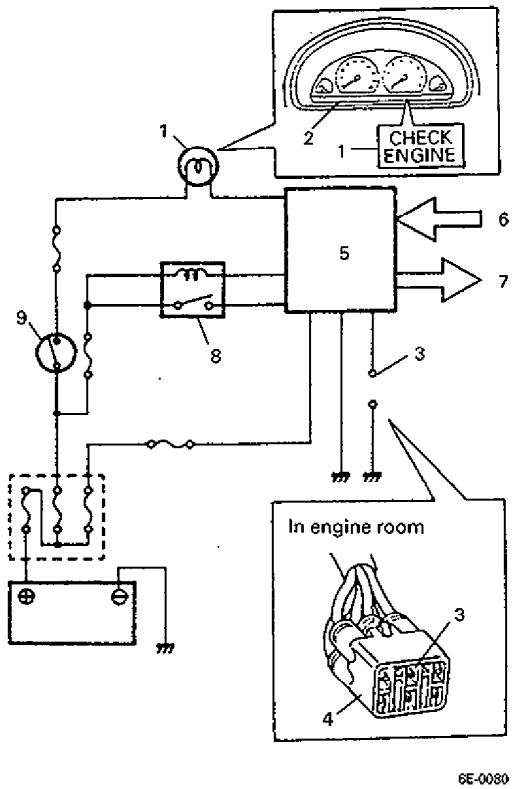


1. No.1 injector
2. No.2 injector
3. No.3 injector
4. No.4 injector
5. Idle air control valve (IAC valve)
6. EVAP canister purge valve
7. Transmission control module (4 A/T model)
8. Fuel pump relay
9. Fuel pump
10. Heated oxygen sensor heater
11. Igniter
12. Ignition coil
13. EGR valve (stepper motor)
14. Malfunction indicator lamp ("CHECK ENGINE" light)
15. Monitor coupler
16. Data link connector (Assembly line diag. link)
17. Power steering pressure switch (if equipped)
18. VSS
19. Heated oxygen sensor
20. A/C amplifier (if equipped)
21. Starter magnetic switch
22. Shift switch for A/T
23. ECT sensor
24. TP sensor
25. CTP switch
26. MAF sensor
27. Camshaft position sensor
28. Main relay
29. Circuit fuse
30. Main switch
31. Main fuse
32. Battery
33. ECM
34. ABS control module (if equipped)

Wire color

B	: Black
B/G	: Black/Green
B/Bl	: Black/Blue
B/R	: Black/Red
B/Y	: Black/Yellow
Bl	: Blue
Bl/B	: Blue/Black
Bl/G	: Blue/Green
Bl/O	: Blue/Orange
Bl/R	: Blue/Red
Bl/W	: Blue/White
Bl/Y	: Blue/Yellow
Br	: Brown
Br/Y	: Brown/Yellow
Gr	: Gray
Gr/B	: Gray/Black
Gr/R	: Gray/Red
Gr/Y	: Gray/Yellow
Lg	: Lightgreen
Lg/B	: Lightgreen/Black
Lg/R	: Lightgreen/Red
Lg/Y	: Lightgreen/Yellow
Lg/W	: Lightgreen/White
O	: Orange
P	: Pink
P/B	: Pink/Black
P/Bl	: Pink/Blue
P/G	: Pink/Green
R	: Red
R/B	: Red/Black
R/Y	: Red/Yellow
Y	: Yellow
Y/B	: Yellow/Black
V	: Violet
V/G	: Violet/Green
V/Y	: Violet/Yellow

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Power source	B3	Camshaft position sensor
A2	Engine start switch	B4	EGR valve (stepper motor coil 1)
A3	Duty output terminal	B5	EGR valve (stepper motor coil 3)
A4	Igniter (IGt)	B6	Power source (for sensor)
A5	Blank	B7	TP sensor
A6	Test switch terminal	B8	MAF sensor
A7	VSS	B9	ECT sensor
A8	Blank	B10 (A/T vehicle)	Transmission control module (throttle valve opening signal)
A9	A/C amplifier (if equipped)	B11	Injector No.1
A10	Main relay	B12	Idle air control valve
A11	Blank	B13	Injector No.3
A12	Power source	B14	Ground
A13	Power source	B15	Sensor ground
A14	Malfunction indicator lamp ("CHECK ENGINE" light)	B16	Data link connector
A15	Blank	B17	EGR valve (stepper motor coil 2)
A16 (A/T vehicle)	Transmission control module (Coolant temp. signal)	B18	EGR valve (stepper motor coil 4)
A17	Diag. switch terminal	B19	Blank
A18	CTP switch (in TP sensor)	B20	Heated oxygen sensor
A19	Power steering pressure switch (if equipped)	B21	Blank
A20	ABS control module	B22	Ignition switch
A21	Fuel pump relay	B23	Heated oxygen sensor heater
A22 (A/T vehicle)	Shift switch	B24	Injector No.2
B1	Ground	B25	EVAP canister purge valve
B2	Ground	B26	Injector No.4



1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Cluster
3. Diagnosis switch terminal
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

61A20-6E1-8-1S

Engine Control Module (ECM)

On-board diagnostic system (Self-diagnosis function)

ECM diagnoses troubles which may occur in the areas including the following parts when the ignition switch is ON or the engine is running, and indicates the result by turning on or flashing malfunction indicator lamp ("CHECK ENGINE" light).

- Heated oxygen sensor
- Engine coolant temp. sensor
- Throttle position sensor (including CTP switch)
- Vehicle speed sensor
- Mass air flow sensor
- Camshaft position sensor
- EGR valve
- CPU (Central Processing Unit) of ECM

ECM and malfunction indicator lamp ("CHECK ENGINE" light) operate as follows.

- Malfunction indicator lamp ("CHECK ENGINE" light) lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the malfunction indicator lamp ("CHECK ENGINE" light) bulb and its circuit.
- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp ("CHECK ENGINE" light) turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp ("CHECK ENGINE" light) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the exact trouble area in ECM back-up memory.

  (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for 20 seconds or longer.)

  ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp ("CHECK ENGINE" light) at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON).

  NOTE:

  Even when a trouble occurs in CMP sensor or CTP switch circuit (circuit open), ECM does not indicate it (or activate malfunction indicator lamp ("CHECK ENGINE" light)) while engine is running. And when that troubled circuit regains good condition, the memory of defective area will be erased automatically.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.

The EGR system consists EGR valve and piping for exhaust gas.

The EGR valve is controlled by ECM according to the signals from CMP sensor, ECT sensor, MAF sensor and VSS.

The EGR valve consists of a stepper motor, rods, valve, etc.

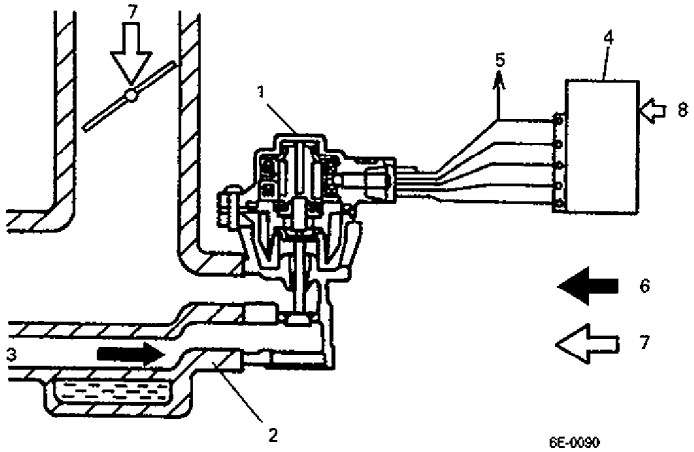
When the EGR valve stepper motor receives "open" signal from ECM, it turns in the "open" direction according to the number of steps and pushes out the rod which is in mesh with the worm of the stepper motor. As the rod installed to the EGR valve is pushed by this rod, the EGR valve opens by the amount corresponding to the number of steps of the "open" signal from ECM to let the exhaust gas flow from the exhaust manifold to the intake manifold.

To close the EGR valve, the stepper motor turns in the "close" direction according to the number of steps of the "close" signal from ECM and pulls up the rod. In this way, the valve is closed by the spring force.

And in this state, the exhaust gas is not allowed to flow to the air intake system or the combustion chamber.

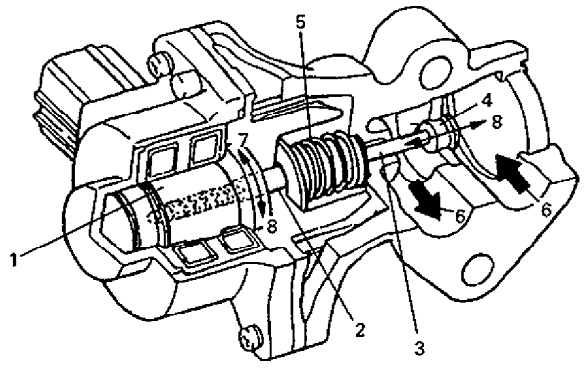
Under any one of the following conditions, ECM closes the EGR valve.

- When engine coolant temperature is low
- When throttle valve is at idle position
- When engine is running under high load



6E-0090

1. EGR valve
2. Intake manifold
3. From exhaust manifold
4. ECM
5. From main relay
6. Exhaust gas
7. Fresh air
8. Sensed information



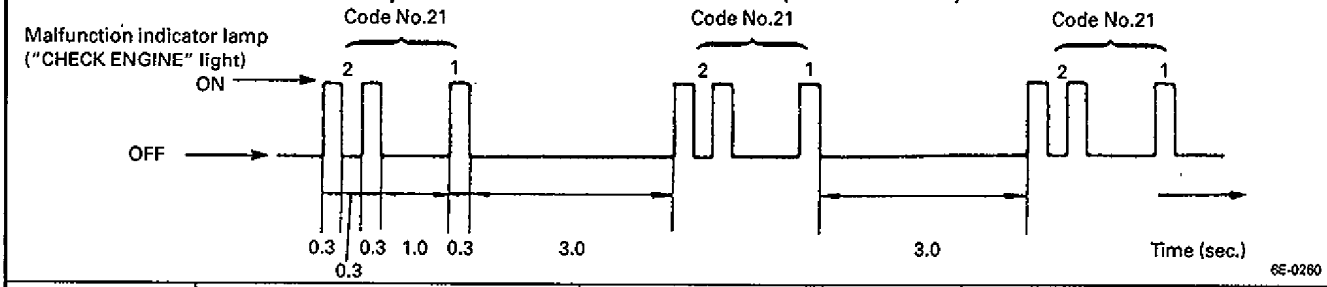
6E-0080

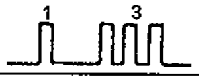
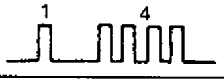
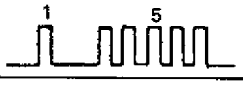
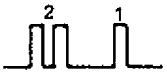
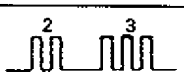
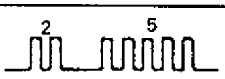
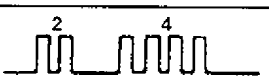
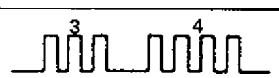
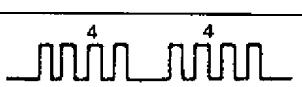
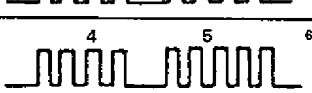
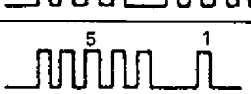
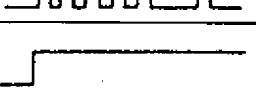
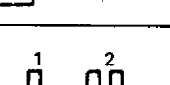
1. Stepper motor
2. Rod (with thread)
3. Rod
4. Valve
5. Spring
6. Exhaust gas
7. Valve close
8. Valve open

DIAGNOSIS

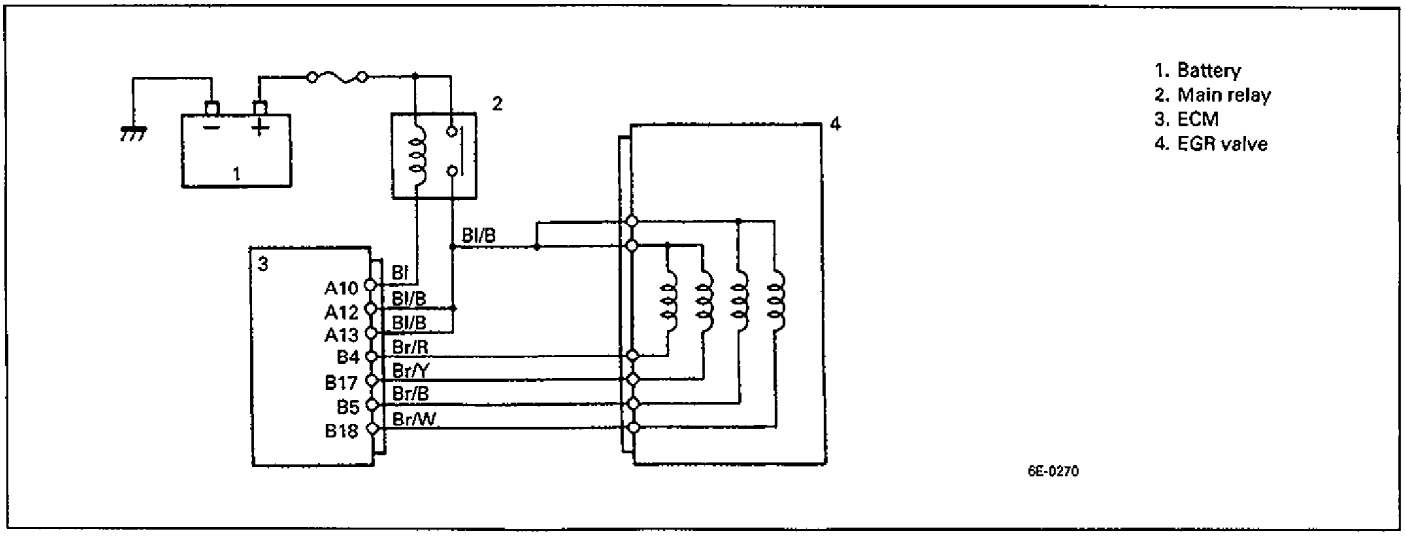
DIAGNOSTIC TROUBLE CODE TABLE

EXAMPLE: When throttle position sensor is defective (Code No.21)

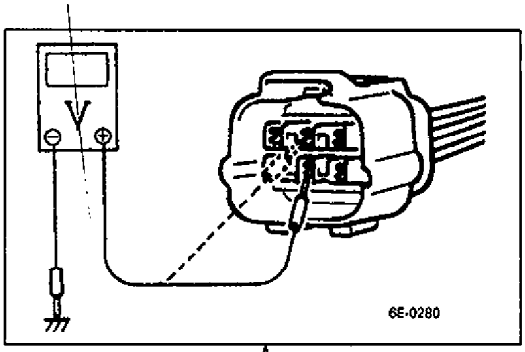


DIAGNOSTIC TROUBLE CODE NO.	MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) FLASHING PATTERN	DIAGNOSTIC ITEM	DIAGNOSIS
13	 6E-0090	Heated oxygen sensor (if equipped)	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	 6E-0100	Engine coolant temperature sensor	
15	 6E-0110		
21	 6E-0120	Throttle position sensor	
22	 6E-0130		
23	 6E-0140	Intake air temperature sensor (if equipped)	
25	 6E-0150		
24	 6E-0160	Vehicle speed sensor	
33	 6E1-0100	Mass air flow sensor	
34	 6E1-0110		
42	 6E-0200	Camshaft position sensor	
44	 6E-0210	CTP switch of throttle position sensor	
45	 6E-0220		
51	 6E-0230	EGR valve (stepper motor)	
ON	 6E-0240	ECM	ECM failure.
12	 6E-0250	Normal	This code appears when none of the other codes (above codes) are identified.

CODE NO.51 EGR VALVE (STEPPER MOTOR OR ITS CIRCUIT OPEN OR SHORT)

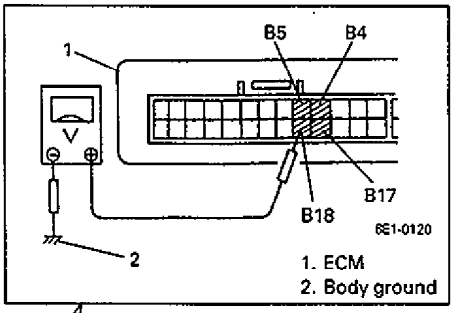


Does EGR stepper motor operate for about 1 second after ignition switch ON?



NO

1. Disconnect EGR valve coupler with ignition switch OFF.
2. Check voltage between "Bl/B" wire terminals and body ground.
3. Are they about 10 – 14 V?



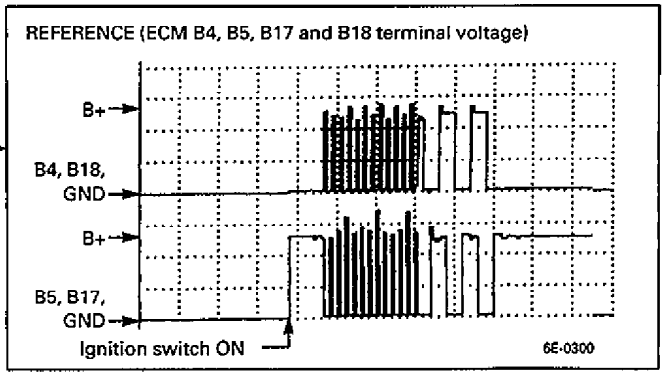
NO

"Bl/B" wire open

YES

YES

Check voltage between B4, B5, B17, B18 terminals of ECM coupler and body ground for about 1 second after ignition switch ON, Is each measured voltage about 4 – 8.4 V ?



NO

Check EGR valve referring to p.6E1-20. Is it OK?

YES

Intermittent trouble or faulty ECM. Recheck referring to intermittent trouble.

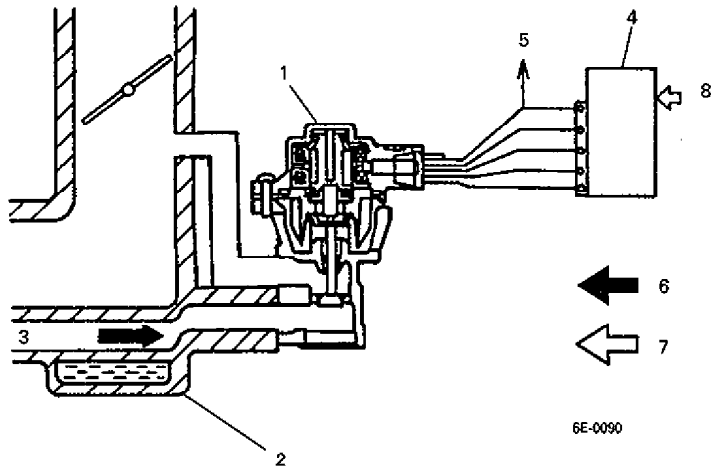
YES

"Br/R", "Br/Y", "Br/B" or "Br/W" wire open or shorted to ground or poor B4, B5, B17 or B18 connection of ECM coupler. If wire harness and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to intermittent trouble.

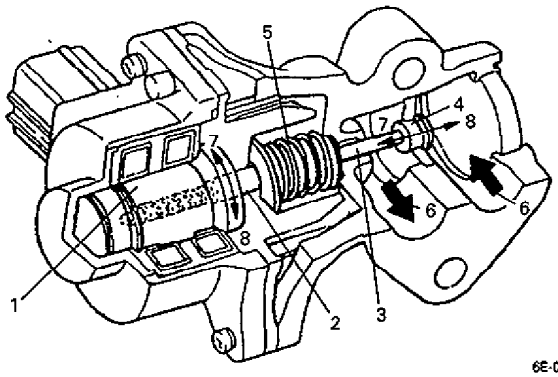
NO

Faulty EGR valve

B-5 EGR SYSTEM CHECK



1. EGR valve
2. Intake manifold
3. From exhaust manifold
4. ECM
5. From main relay
6. Exhaust gas
7. Fresh air
8. Sensed information

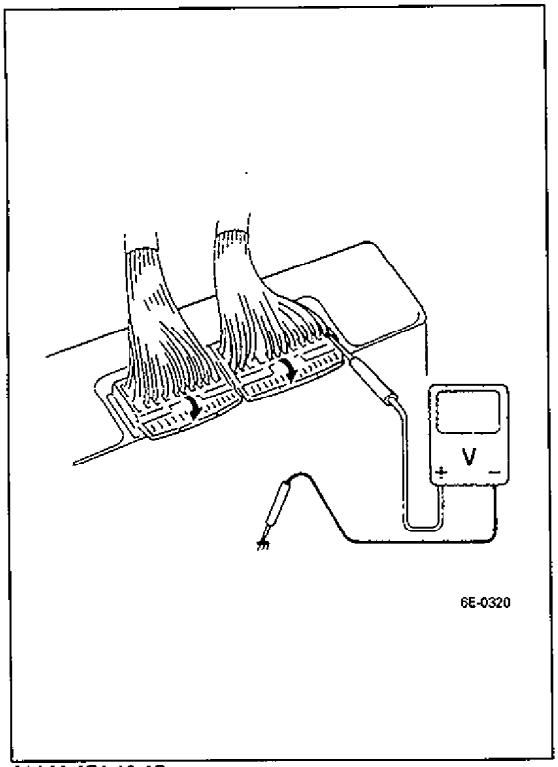


1. Stepper motor
2. Rod (with thread)
3. Rod
4. Valve
5. Spring
6. Exhaust gas
7. Valve close
8. Valve open

Check EGR system by using tech-1. referring to p.6E1-19.
Is it good condition?

YES → EGR system is in good condition.

NO → Clogged EGR pipe, stuck or faulty EGR valve or poor performance of ECT sensor, TP sensor.



61A20-6E1-13-1S

INSPECTION OF ECM AND ITS CIRCUITS

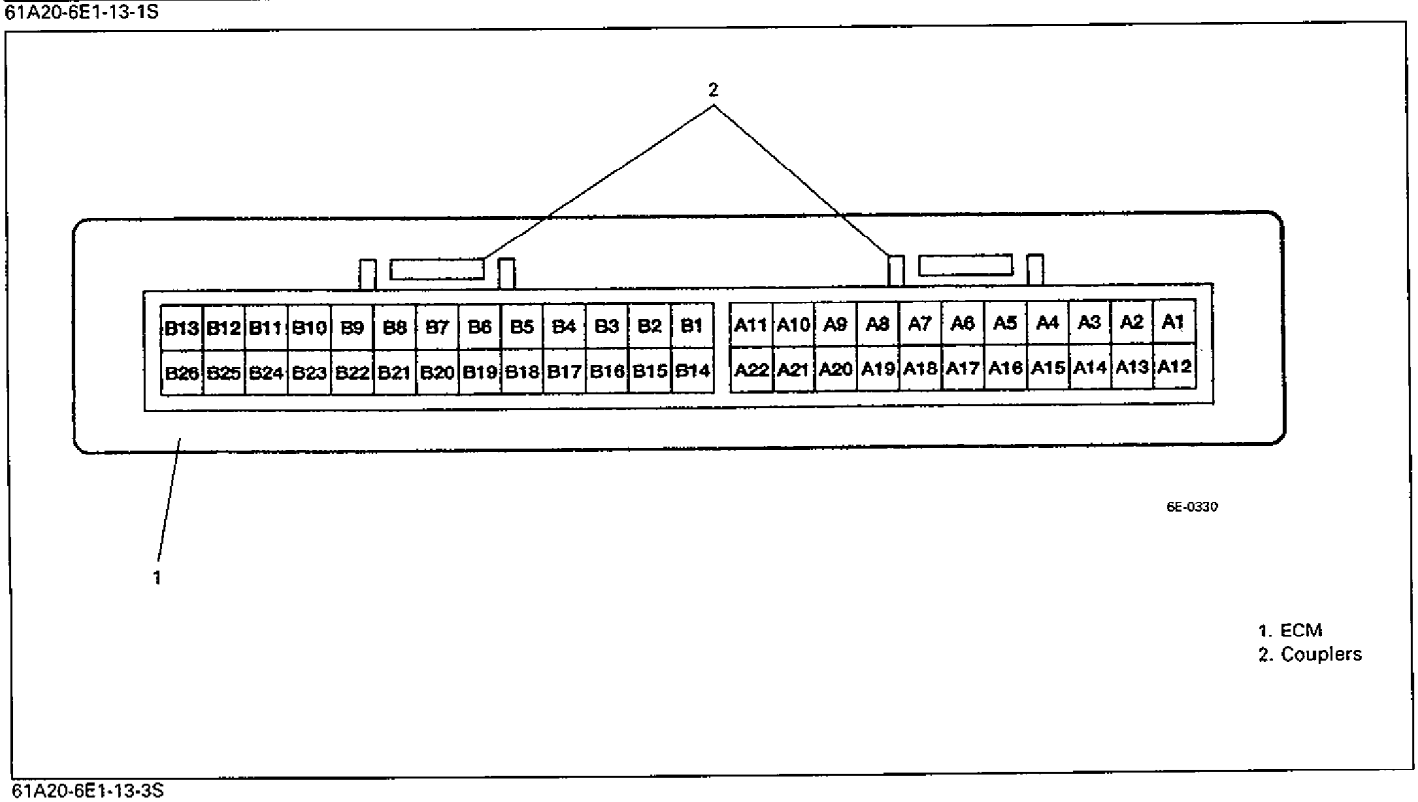
ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

CAUTION:
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.

Voltage Check

1) Remove ECM from body referring to ECM REMOVAL.
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal of couplers connected.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.

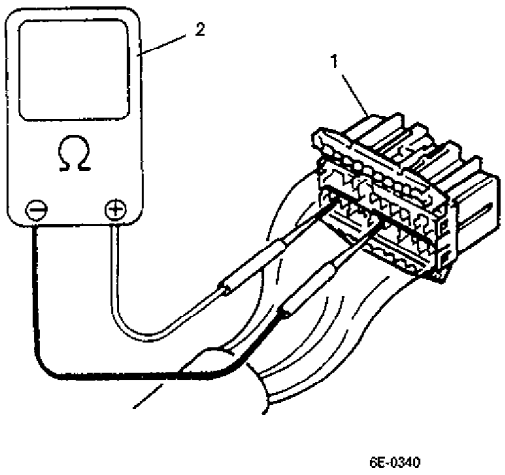


1. ECM
2. Couplers

61A20-6E1-13-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Power source for back-up circuit	10 – 14 V	Ignition switch ON and OFF
A2	Engine start switch (Engine start signal)	6 – 12 V	While engine cranking
		0 V	Other than above
A3	Duty output terminal	—	—
A4	Ignition trigger signal	0 – 1 V	Ignition switch ON
		Between 0 – 3 V	While engine cranking
A5	Blank	—	—
A6	Test switch terminal	10 – 14 V	Ignition switch ON
		0 V	Ignition switch ON Test switch terminal grounded
A7	VSS	Indicator deflection repeated between 0 V and 4 – 5 V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A8	Blank	—	—
A9	Air conditioning circuit (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running A/C ON
A10	Main relay	0 – 1 V	Ignition switch ON
		10 – 14 V	Ignition switch OFF
A11	Blank	—	—
A12 A13	Power source	10 – 14 V	Ignition switch ON
A14	Malfunction indicator lamp ("CHECK ENGINE" light)	0 – 1 V	Ignition switch ON
		10 – 14 V	Engine running
A15	Blank	—	—
A16 (A/T vehicle)	Transmission control module (coolant temp. switch signal)	0 – 1 V	Ignition switch ON Engine coolant temp.: below 25 °C (77 °F)
		10 – 14 V	Ignition switch ON Engine coolant temp.: over 30 °C (86 °F)
A17	Diag. switch terminal	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch ON Diag. switch terminal grounded
A18	Idle switch (in TP sensor)	0 – 1 V	Ignition switch ON Throttle valve at idle position
		4 – 5 V	Ignition switch ON Throttle valve opens larger than idle position
A19	Power steering presure switch (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running at idle speed, turning steering wheel to the right or left as far as it stops
A20	ABS control module	10 – 14 V	Over 3 seconds after ignition switch ON
A21	Fuel pump relay	0 – 1 V	For 3 seconds after ignition switch ON
		10 – 14 V	After the above time

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A22 (A/T vehicle)	Shift switch	0 – 1 V	Ignition switch ON Selector lever in "P" or "N" range
		10 – 14 V	Ignition switch ON Selector lever in "R", "D", "2" or "L" range
B1 B2	Ground	—	—
B3	CMP sensor	Indicator deflection repeated between 0 – 1 V and 3 – 5 V	Ignition switch ON Crankshaft turned slowly
B4	EGR valve (Stepper motor coil 1)	0 – 1 V	Over 1 second after ignition switch ON
B5	EGR valve (Stepper motor coil 3)	10 – 14 V	Over 1 second after ignition switch ON
B6	Power source for sensors	4.75 – 5.25 V	Ignition switch ON
B7	TP sensor	0.5 – 1.2 V	Ignition switch ON Throttle valve at idle position
		3.4 – 4.7 V	Ignition switch ON Throttle valve at full open position
B8	MAF sensor	1.0 – 1.6 V	Ignition switch ON
		1.7 – 2.0 V	With engine running at idle speed
B9	ECT sensor	0.5 – 0.9 V	Ignition switch ON Engine coolant temp.: 80 °C (176 °F)
B10 (A/T vehicle)	Transmission control module (Throttle valve opening signal)	—	Ignition switch ON Voltage varies as specified at graph in p.6E1-32 of VITARA supplement (99501-60A70) while throttle valve is opened gradually.
B11	Injector No.1	10 – 14 V	Ignition switch ON
B12	Idle air control valve	10 – 14 V	Ignition switch ON
B13	Injector No.3	10 – 14 V	Ignition switch ON
B14	Ground	—	—
B15	Sensor ground	—	—
B16	Data link connector	4 – 5 V	Ignition switch ON
B17	EGR valve (stepper motor coil 2)	10 – 14 V	Over 1 second after ignition switch ON
B18	EGR valve (stepper motor coil 4)	0 – 1 V	Over 1 second after ignition switch ON
B19	Blank	—	—
B20	Oxygen sensor	Indicator deflection repeated between over and under 0.45V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B21	Blank	—	—
B22	Ignition switch	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch OFF
B23	Heated oxygen sensor heater	10 – 14 V	Ignition switch ON
		0 – 1 V	Over 3 min. after engine started Engine running at idle speed
B24	Injector No.2	10 – 14 V	Ignition switch ON
B25	EVAP canister purge valve	10 – 14 V	Ignition switch ON
B26	Injector No.4	10 – 14 V	Ignition switch ON



1. ECM coupler disconnected
2. Ohmmeter

61A20-6E1-16-1S

Resistance Check

1) Disconnect ECM couplers from ECM with ignition switch OFF.

> **CAUTION:**
> **Never touch ternimals of ECM itself or connect voltmeter or ohmmeter.**

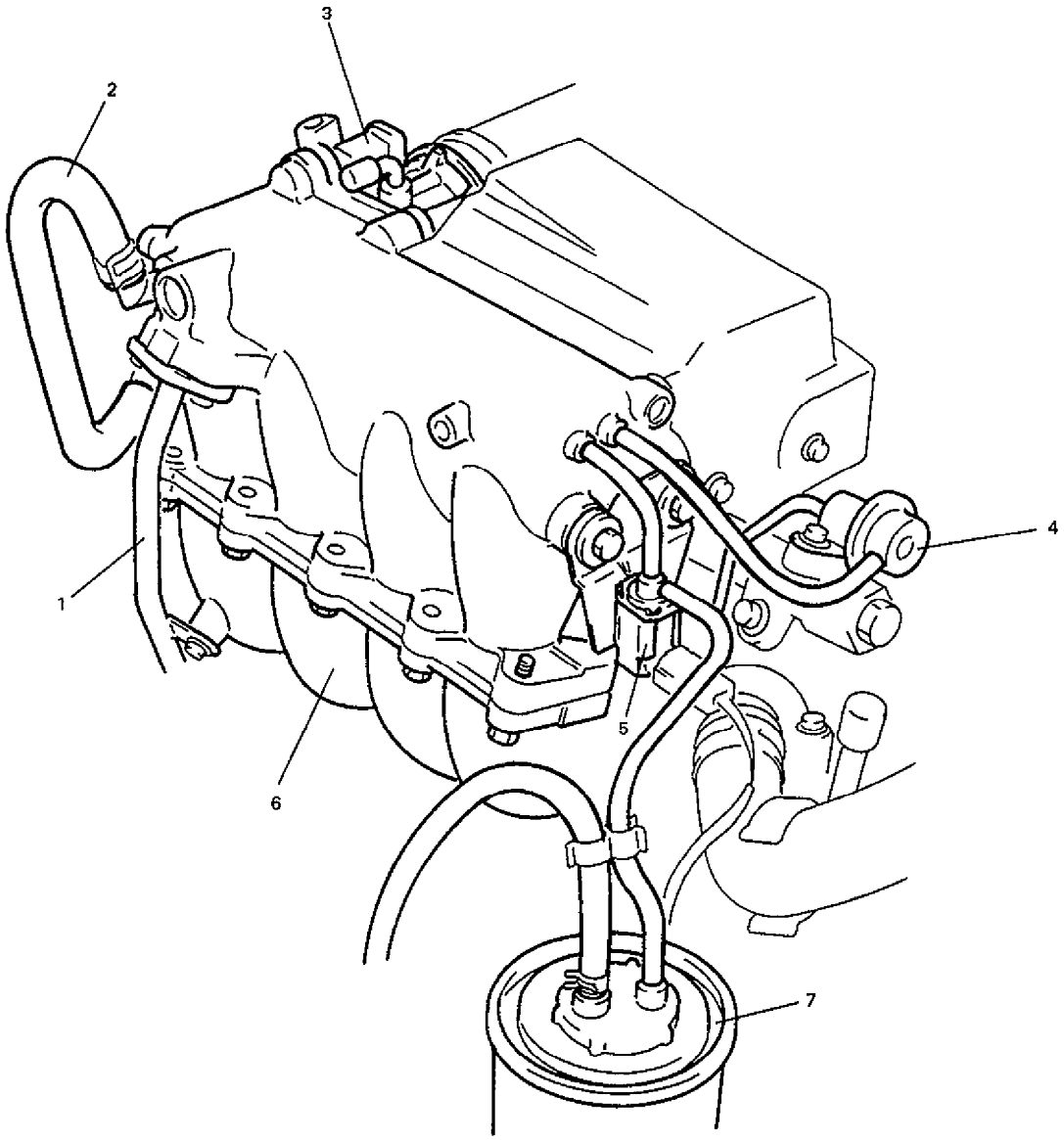
2) Check resistance between each pair of terminals of disconnected couplers as listed in following table.

> **CAUTION:**
> - **Be sure to connect ohmmeter probe from wire harness side of coupler.**
> - **Be sure to turn OFF ignition switch for this check.**
> - **Resistance in table represents that when parts temperature is 20 °C (68 °F).**

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
A7 – Body ground	VSS	Ohmmeter indicator deflect between 0 and ∞	Rear left tire turned slowly with rear right tire locked
A10 – A1	Main relay	56 – 84 Ω	–
A17 – Body ground	Diag. switch terminal	∞ (infinity)	–
A18 – B15	CTP (Closed Throttle Position, Idle) switch	continuity	Throttle valve is at idle position
		∞ (infinity)	Throttle valve opens larger than idle position
A21 – B22	Fuel pump relay	56 – 84 Ω	
A22 – Body ground (A/T only)	Shift switch	continuity	Selector lever in "P" or "N" range
		∞ (infinity)	Selector lever in "R", "D", "2" or "L" range
B1 – Body B2 ground	Ground	continuity	–
B4 – A12	EGR valve (stepper motor coil 1)	20 – 24 Ω	–
B5 – A12	EGR valve (stepper motor coil 3)	20 – 24 Ω	–
B7 – B15	TP sensor	0.3 – 2.0 kΩ	Throttle valve at idle position
		2.0 – 6.5 kΩ	Throttle valve at full open position
B9 – B15	ECT sensor	0.29 – 0.35 kΩ	Engine coolant temp. 80 °C (176 °F)
B11 – A12	Fuel injector No.1	12 – 17 Ω	–
B12 – A12	Idle air control valve	11 – 14 Ω	–
B13 – A12	Fuel injector No.3	12 – 17 Ω	–
B14 – Body ground	Ground	continuity	–
B17 – A12	EGR valve (stepper motor coil 2)	20 – 24 Ω	–
B18 – A12	EGR valve (stepper motor coil 4)	20 – 24 Ω	–
B23 – B22	Oxygen sensor heater	11.7 – 14.3 Ω	–
B24 – A12	Fuel injector No.2	12 – 17 Ω	–
B25 – A12	EVAP canister purge valve	28 – 36 Ω	–
B26 – A12	Fuel injector No.4	12 – 17 Ω	–

61A20-6E1-17-1S

ON VEHICLE SERVICE



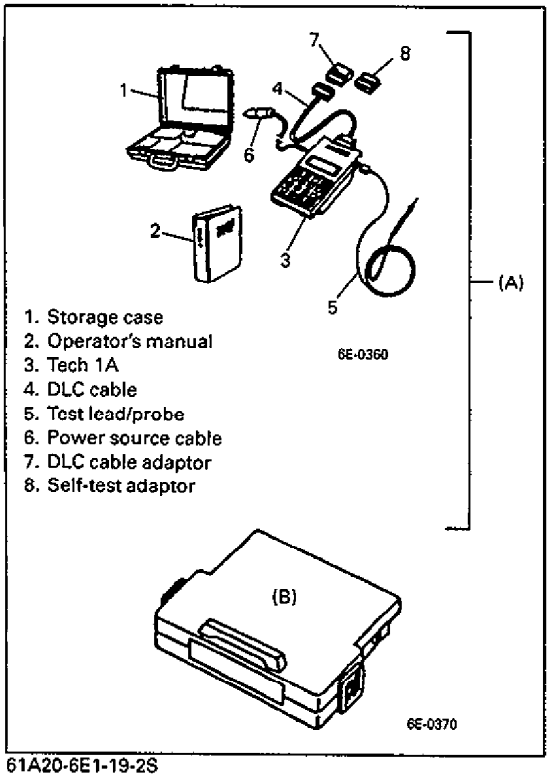
6E1-0130

1. EGR pipe
2. Brake booster vacuum hose
3. Throttle body
4. Fuel pressure regulator
5. EVAP canister purge valve
6. Intake manifold
7. EVAP canister

GENERAL

When hoses are disconnected and system components are removed for service, reinstall components properly, and route and connect hoses correctly after service. Refer to figure on previous page for proper routing of hoses.

61A20-6E1-19-1S



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

ELECTRONIC CONTROL SYSTEM

EGR SYSTEM

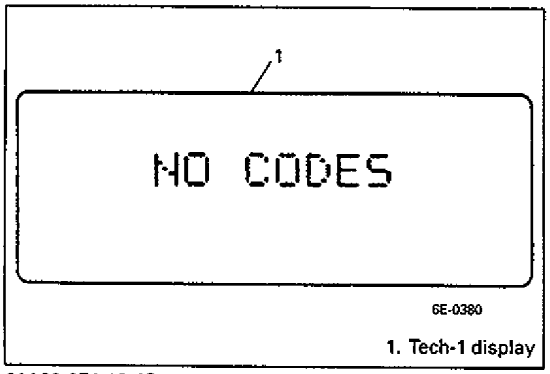
System Inspection

1) Connect scan tool (Tech-1) and cartridge to data link connector with ignition switch OFF.

Special tool
(A): 09931-76011 (Tech-1)
(B): (ECM cartridge)

NOTE:
For operation procedure of Tech-1, refer to tech-1 operator's manual.

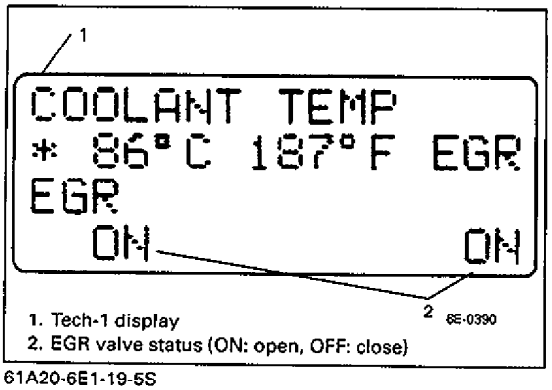
61A20-6E1-19-2S



1. Tech-1 display

61A20-6E1-19-4S

2) Start engine and warm up engine to normal operating temperature (55 °C, 131 °F or more).
3) Check diagnostic trouble code by using Tech-1 (TROUBLE CODE mode).
If tech 1 indicates trouble code, go back to "Diagnostic Flow Chart".



1. Tech-1 display
2. EGR valve status (ON: open, OFF: close)

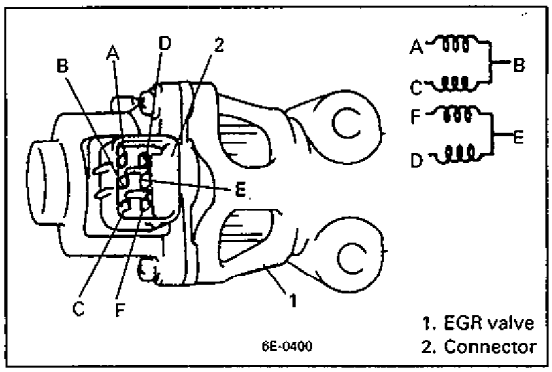
61A20-6E1-19-5S

4) Increase engine speed to 1500 – 4000 r/min and open EGR valve by using tech-1 (MISC TEST mode).
Make sure that engine speed drops when EGR valve opens. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve, poor performance of ECT sensor or TP sensor.

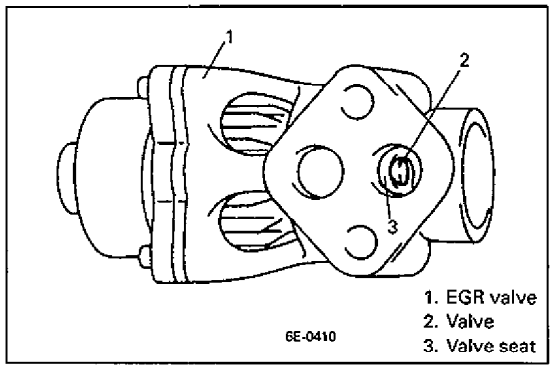
Removal

1) Disconnect negative cable at battey.
2) Disconnect EGR valve coupler.
3) Remove EGR valve and gasket from intake manifold.

61A20-6E1-20-1S



61A20-6E1-20-2S



61A20-6E1-20-3S

Inspection

1) Check resistance between following terminals of EGR valve in each pair.

Terminal	Standard resistance
A – B C – B F – E D – E	20 – 24 Ω

If found faulty, replace EGR valve ass'y

2) Remove carbon from EGR valve gas passage.

NOTE:
Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve, valve seat and rod.

3) Inspect valve, valve seat and rod for fault, cracks, bend or other damage.
If found faulty, replace EGR valve ass'y.

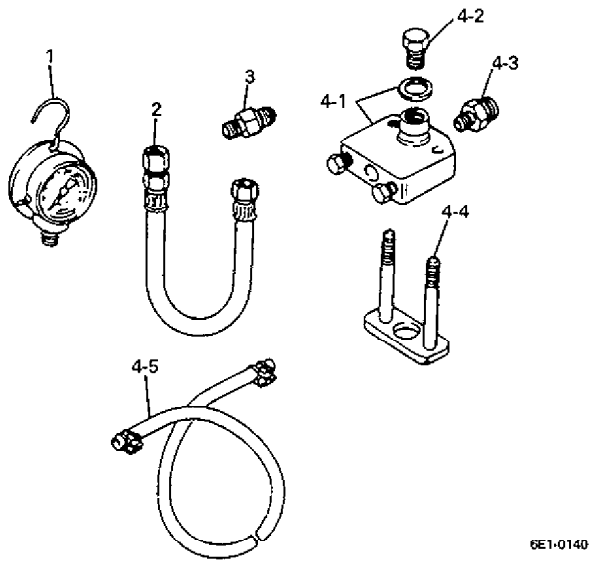
Installation

Reverse removal procedure noting following.

- Clean mating surface of valve and intake manifold.
- Use new gasket

61A20-6E1-20-4S

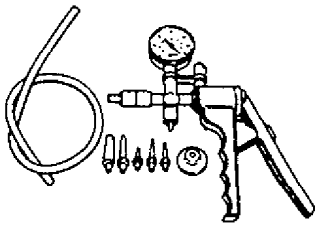
SPECIAL TOOLS



6E1-0140

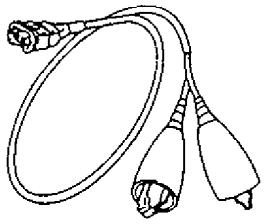
1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. Attachment
   09919-46010
4. Checking tool set
   09912-58421

4-1. Tool body & washer
4-2. Body plug
4-3. Body attachment
4-4. Holder
4-5. Return hose & clamp



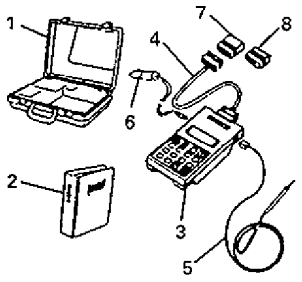
6E-0420

09917-47910
Vacuum pump gauge



6E1-0150

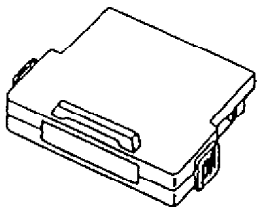
09930-88530
Injector test lead



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

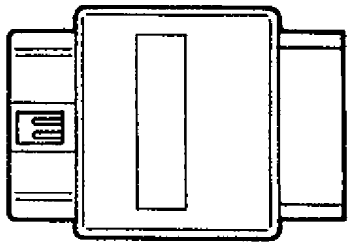
6E-0440

09931-76011
Tech 1 (scan tool) kit



6E-0450

Tech 1 cartridge for ECM



6E-0470

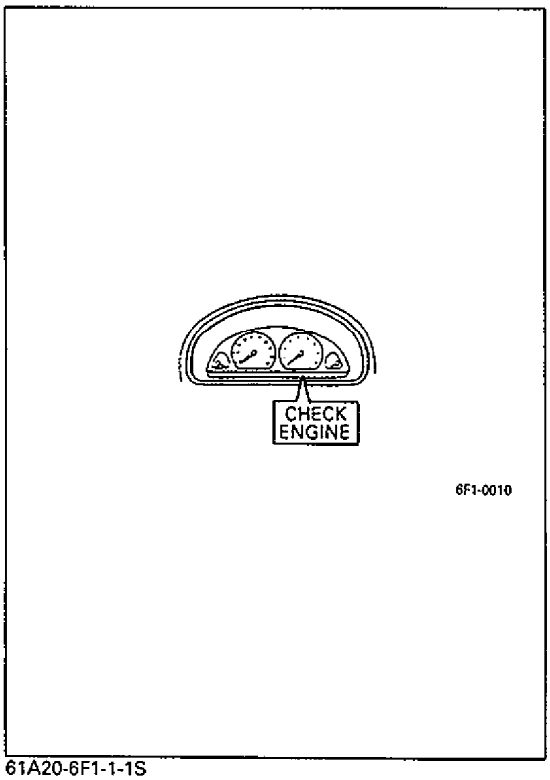
09931-96020
16/12 pin DLC adapter

SECTION 6F1

IGNITION SYSTEM

6F1

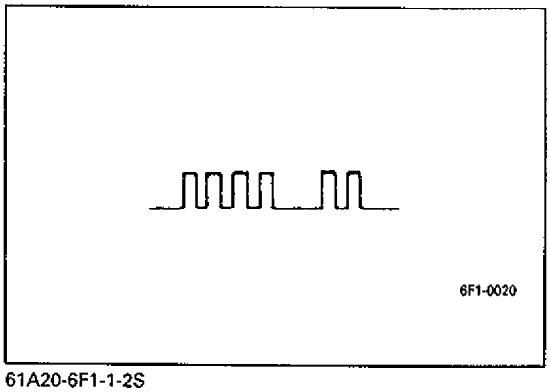
NOTE:
For the description (items) not found in this section of this manual, refer to the same section of VITARA SUPPLEMENTARY SERVICE MANUAL (99501-61A10)



61A20-6F1-1-1S

DIAGNOSIS
SELF-DIAGNOSIS

1. To insure correct diagnosis, check to confirm that battery voltage is within standard value when engine is standstill.
2. Turn on ignition switch and make sure that Malfunction Indicator lamp ("CHECK ENGINE" light) lights.
3. If engine will not start but cranking is possible, crank it for more than 3 seconds.
4. While ignition switch is ON, ground diagnosis switch terminal in moniter coupler and then read diagnostic code (observe Malfunction Indicator lamp ("CHECK ENGINE" light)).



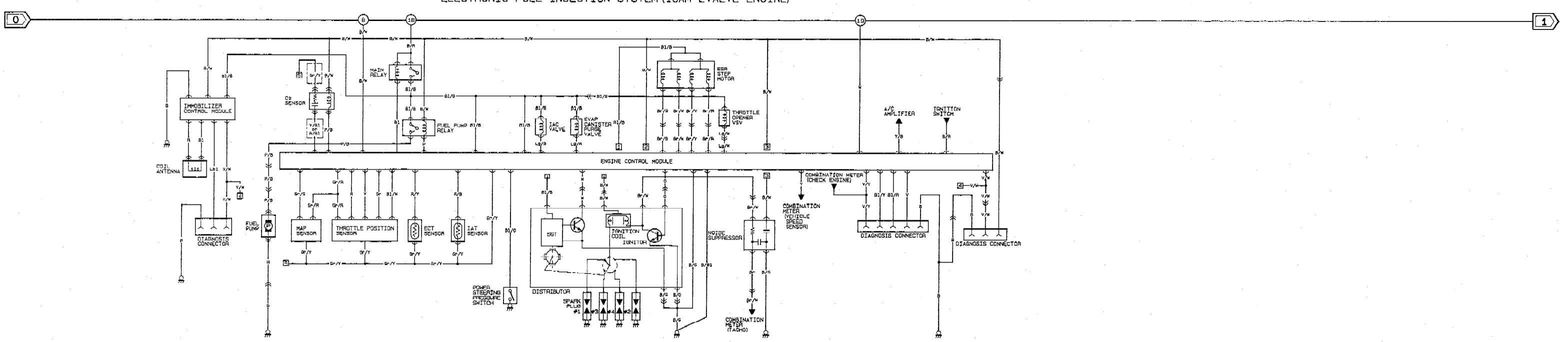
61A20-6F1-1-2S

DIAGNOSTIC CODE NO.42
ECM indicates that no CMP sensor signal is inputted for more than 3 seconds while engine is being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No.42" in Section 6E (or 6E1).

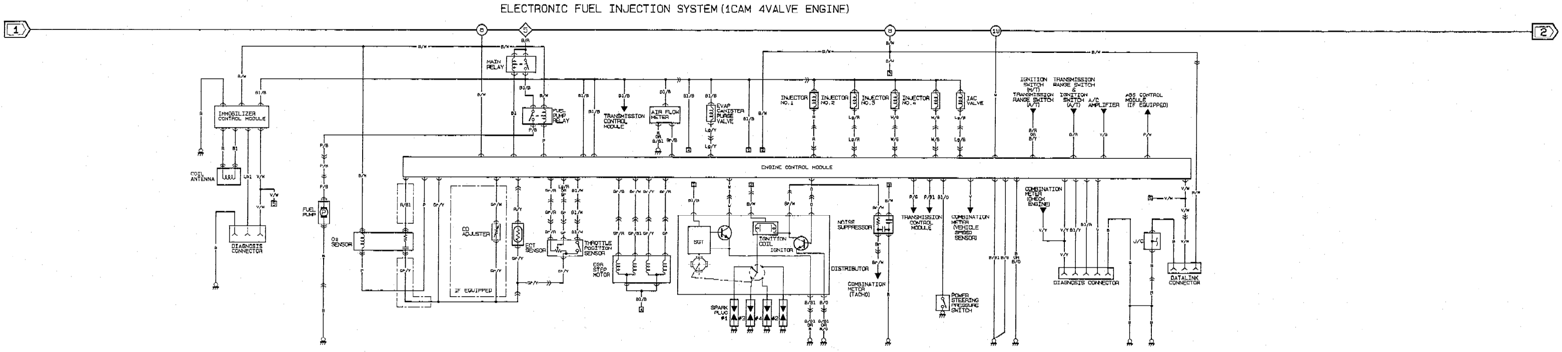
WIRING DIAGRAM

NOTE: The numerical symbols of power source corresponds wiring diagram of SE416/SV620 SUPPLEMENTARY SERVICE MANUAL (99501-61A10) mentioned in Forward. So refer to it for power circuit.

ELECTRONIC FUEL INJECTION SYSTEM (1CAM 2VALVE ENGINE)



ELECTRONIC FUEL INJECTION SYSTEM (1CAM 4VALVE ENGINE)



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