

SUZUKI

SE/SV/SZ/

SV SERIES

SUPPLEMENTARY SERVICE MANUAL FOR IMMOBILIZER CONTROL SYSTEM

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

SUZUKI
Caring for Customers

99501-60G10-02E
(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 components 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, SV620, SZ416, SY413/416 and SY418 SERVICE MANUAL and has been prepared exclusively for SE416, SV620, SZ416, SY Series equipped with immobilizer control system.

Applicable model:

SE416, SV620, SZ416, SY413, SY416 and SY418 equipped with immobilizer control system

This SUPPLEMENTARY SERVICE MANUAL contains only the service information for the immobilizer control system equipped vehicle as compared with that for the vehicle without that system.

Therefore, whenever servicing immobilizer control system of SE416, SV620, SZ416, SY413, SY416 and SY418 consult this supplement first. And for any section, item or description not found in this supplement, 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.

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RELATED SERVICE MANUAL

- SY413/SY416 SERVICE MANUAL (99500-60G00)
- SV620 SERVICE MANUAL (99500-85F00)
- VITARA SERVICE MANUAL (99500-60A10)
- VITARA SUPPLEMENTARY SERVICE MANUAL (99501-60A70)
- VITARA SUPPLEMENTARY SERVICE MANUAL (99501-61A10)
- SY418 SUPPLEMENTARY SERVICE MANUAL (99501-62G00)
- SZ416 SERVICE MANUAL (99500-79E00)

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

SECTION 8A

IMMOBILIZER CONTROL SYSTEM

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.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

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GENERAL DESCRIPTION

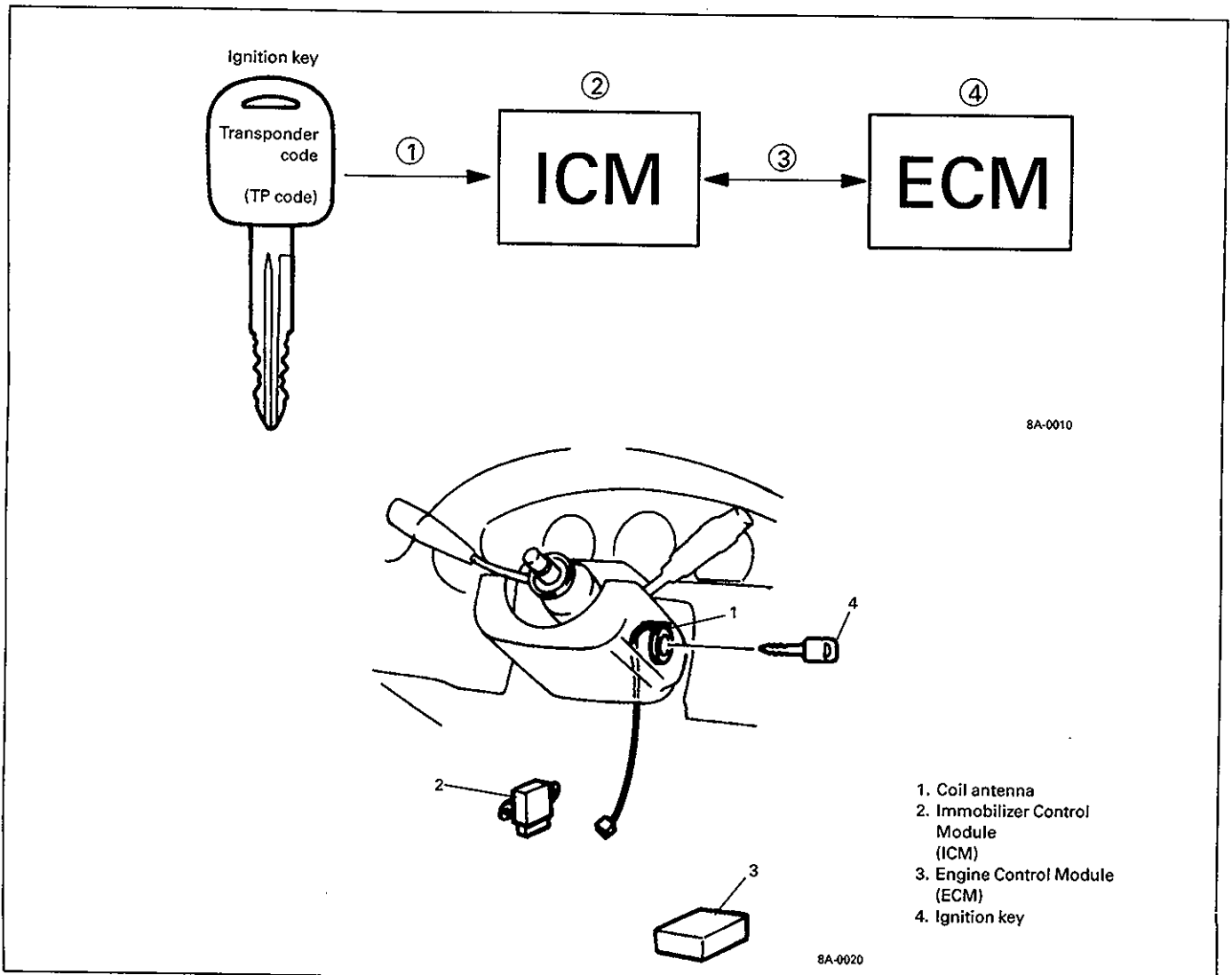
The immobilizer control system designed to prevent vehicle burglar consists of following components.

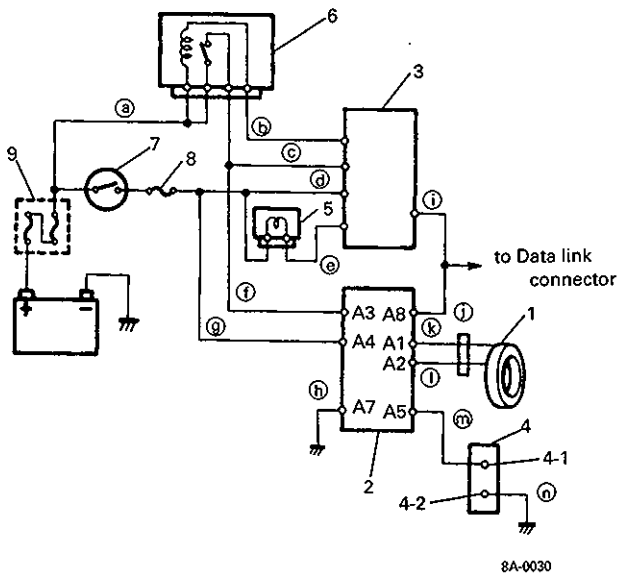
- Engine control module (ECM)
- Immobilizer control module (ICM)
- Ignition key (with built-in transponder)
- Coil antenna

Operation of this system is as follows.

- ① Each ignition key has its own code (Transponder (TP) code) stored in memory. When the ignition switch is turned ON, ICM tries to read the TP code through the coil antenna installed to the steering lock assembly.
- ② ICM compares the TP code read in ① and that registered in ICM and checks if they match.
- ③ When it is confirmed that two TP codes match each other as described above, ICM and ECM check if ECM/ICM codes registered in them respectively match.
- ④ Only when it is confirmed that ECM/ICM codes match, the engine starts running. If TP codes in Step ② or ECM/ICM codes in Step ③ do not match, ECM will stop operation of the injector and the ignitor (i.e., ignition of spark plug).

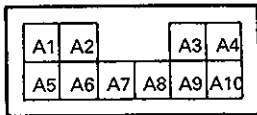
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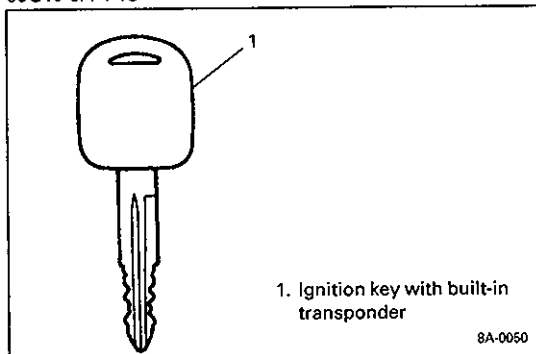
WIRE SYMBOL	WIRE COLOR		
	SY Series	SV620	SE416/SZ416
Ⓐ	R	B/R	B/R
Ⓑ	Gr	BI	BI
Ⓒ	R/B	BI/B	BI/B
Ⓓ	B/W	V/Y	B/W
Ⓔ	V	B/W	V/Y
Ⓕ	R/B	BI/B	BI/B
Ⓖ	B/W	B/W	B/W
Ⓗ	B	B	B
Ⓙ	Y/B	V/W	V/W
Ⓚ	Y/B	V/W	V/W
Ⓛ	P/B	BI	BI
Ⓜ	P/BI	R	R
Ⓝ	P/G	Sb	Sb
Ⓞ	B	B	B

1. Coil antenna
2. Immobilizer control module (ICM)
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6. Main relay
7. Ignition switch
8. Fuse
9. Main fuse



Terminal arrangement of immobilizer control module coupler (Viewed from harness side)

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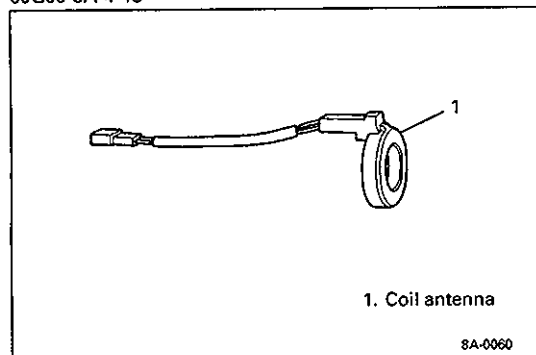


1. Ignition key with built-in transponder

Ignition key

The ignition key for the immobilizer control system has a built-in transponder. Each transponder in the key has an each transmitting code (Transponder code). The code will be transmitted from the key via the coil antenna to ICM when the ignition switch is turned ON.

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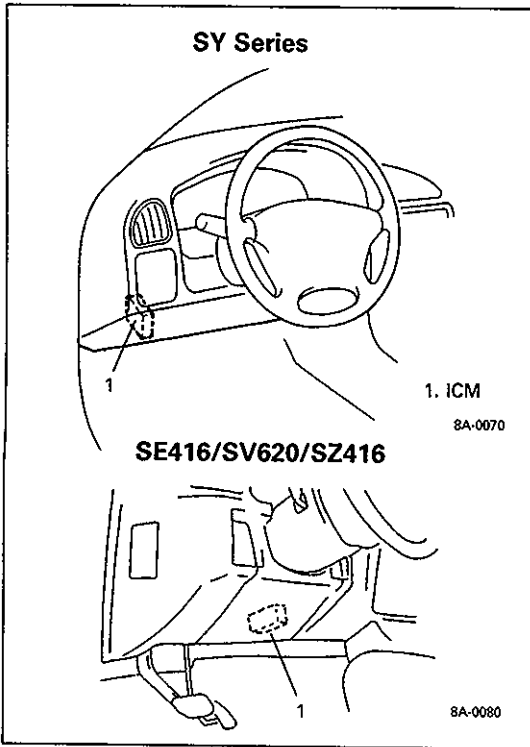


1. Coil antenna

Coil antenna

The coil antenna is installed to the steering lock assembly. As it is energized by ICM, it transmits the transponder (TP) code of the ignition key to ICM.

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IMMOBILIZER CONTROL MODULE (ICM) & ENGINE CONTROL MODULE (ECM)

ICM:

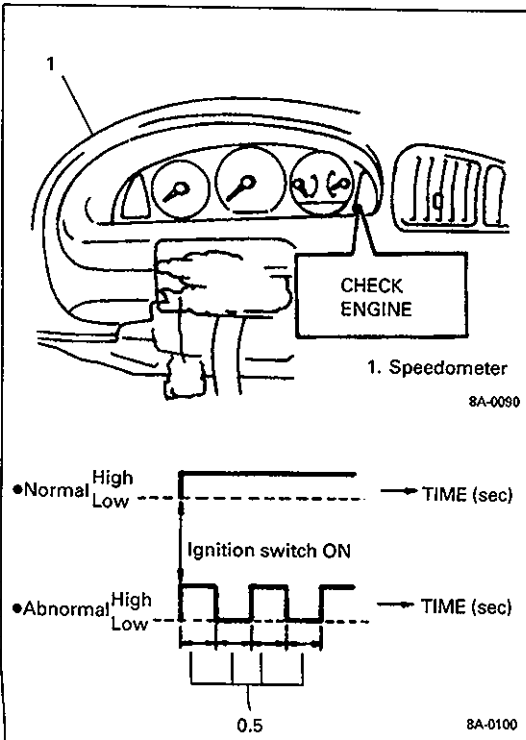
ICM is installed to the underside of the instrument panel at the driver's seat side.

As main functions, ICM checks matching not only between the TP Code transmitted from the ignition key and that registered in ICM (Up to 4 different TP codes can be registered.) but also between the ECM/ICM code transmitted from ECM and that registered in ICM. In addition, it has an on-board diagnostic system (self-diagnosis function) which is described in the next section.

ECM:

As main functions, ECM not only checks matching of ECM/ICM codes but also has an on-board diagnostic system (self-diagnosis function) as described in the next section. For installation position of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for the vehicle being serviced.

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60G00-8A-5-5S

On-board diagnostic system (Self-diagnosis function)

ICM & ECM diagnose troubles which may occur in the area including the following parts when the ignition switch is ON. They indicate the diagnosis result by using following items in the manner as described below.

- ECM:
- ECM/ICM code
 - Data link connector wire
 - ECM

- ICM:
- Transponder code (TP code)
 - Coil antenna
 - ECM/ICM code
 - Data link connector wire
 - ICM
 - Ignition signal

- 1) With the diagnosis switch terminal not grounded, the ignition switch turned ON (but the engine at stop) and regardless of the condition of the electronic fuel injection system, ECM indicates whether a trouble has occurred in the immobilizer control system or not by causing the malfunction indicator lamp ("CHECK ENGINE" light) to flash or turn ON. If it is ON, it means that no trouble exists in the immobilizer control system currently and if it is flashing, it means that either ECM or ICM has detected some trouble in the immobilizer control system.

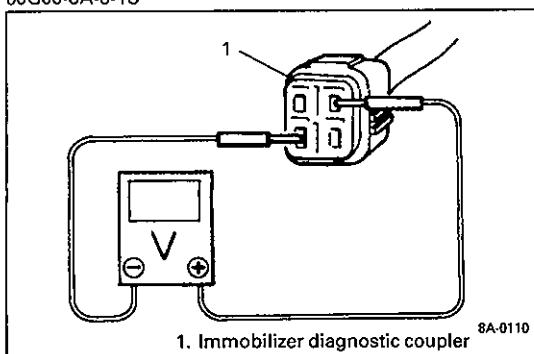
NOTE:

As soon as the ignition switch is turned ON, ECM and ICM diagnose if a trouble has occurred in the immobilizer control system. While the diagnosis is being made, the malfunction indicator lamp ("CHECK ENGINE" light) stays ON and if the diagnosis result is "abnormal", it immediately changes to flashing but if the result is "normal", it remains ON. Diagnosis takes about 3 seconds at maximum.

- 2) With the ignition switch turned ON and the diagnostic switch terminal grounded, ECM outputs the result (Diagnostic trouble code) of diagnosing above area of the immobilizer control system and the result (Diagnostic trouble code) of the electronic fuel injection system by flashing the malfunction indicator lamp ("CHECK ENGINE" light) as listed below. (For positions of the diagnostic switch terminal and the ground terminal, refer to "Electronic Fuel Injection System" Section in Service Manual of the vehicle being serviced.

Immobilizer control system	Electronic Fuel Injection system	Malfunction indicator lamp ("CHECK ENGINE" light)
ECM doesn't detect a trouble	ECM doesn't detect a trouble	Normal code (DTC 12) is indicated.
ECM doesn't detect a trouble	ECM detects a trouble	Fault code for electronic fuel injection system is indicated.
ECM detects a trouble.	ECM doesn't detect a trouble.	Fault code for immobilizer control system is indicated.
ECM detects a trouble.	ECM detects a trouble.	Fault code of both electronic fuel injection system and immobilizer control system are indicated alternately.

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- 3) With the ignition switch turned ON, ICM outputs the result (Diagnostic trouble code) of diagnosing the above area through the diagnostic output terminal of the immobilizer diagnostic coupler. This can be read by checking deflection of the voltmeter indicator as it deflects when the positive probe and the negative probe of the voltmeter are connected to the diagnostic output terminal and the ground terminal respectively.

NOTE:

When a trouble exists in the immobilizer control system (when ICM or ECM detects a diagnostic trouble code (DTC)), ECM will stop operation of the injector and the ignitor (i.e., ignition of spark plug).

DIAGNOSIS

ECM and ICM have on-board diagnostic system (a system self-diagnosis function) as described previously.

Investigate where the trouble is by referring to "DIAGNOSTIC FLOW CHART" and "DIAGNOSTIC TROUBLE CODE TABLE" on later pages.

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PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

ECM

- Before identifying diagnostic trouble code indicated by malfunction indicator lamp ("CHECK ENGINE" light), don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine. Such disconnection will clear trouble codes for electronic fuel injection system stored in memory of ECM.
- If abnormality or malfunction lies in two or more areas, malfunction indicator lamp ("CHECK ENGINE" light) indicates applicable codes three times each. And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.
- When ECM detects a trouble in both electronic fuel injection system and immobilizer control system, malfunction indicator lamp ("CHECK ENGINE" light) indicates trouble codes of both systems alternately while the ignition switch is turned ON and the diagnosis terminal is grounded.
- Take a note of diagnostic trouble code indicated first.

ICM

- Take a note of diagnostic trouble code indicated first.

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[INTERMITTENT TROUBLES]

- There are cases where output of diagnostic output terminal and/or malfunction indicator lamp ("CHECK ENGINE" light) indicate a diagnostic trouble code representing a trouble which occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such accident, be sure to follow instructions given below when checking by using "Diagnostic Flow Chart".

- * When trouble can be identified, it is not an intermittent one:

Check coil antenna, ignition key, wires and each connection and if they are all in good condition, substitute a known-good ECM and recheck.

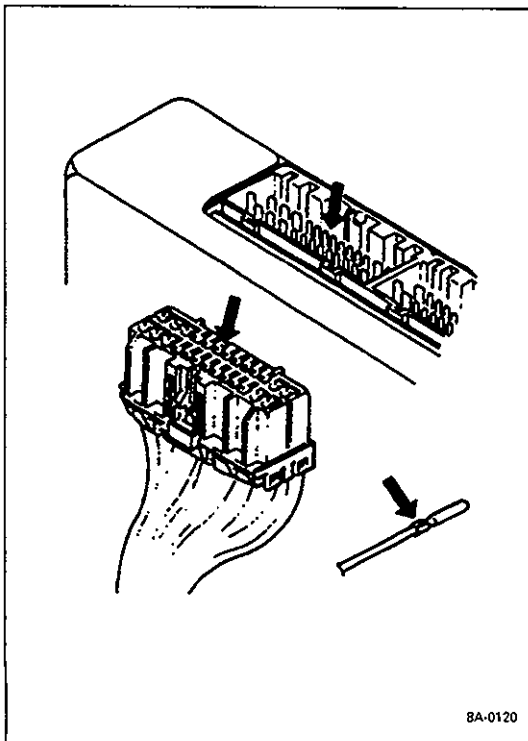
- * When trouble can not be identified but output of diagnostic output terminal and/or malfunction indicator lamp ("CHECK ENGINE" light) indicate a trouble code: Diagnose trouble by using that code No. and if ignition key, coil antenna, wires and each connection are all in good condition, turn OFF ignition switch and then ON.

Then check what malfunction indicator lamp ("CHECK ENGINE" light) and/or output of diagnostic output terminal indicate.

Only when they indicate trouble code again, substitute a known-good ECM or ICM and check again.

If they indicate not trouble code but normal code, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.

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8A-0120

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[NOTES ON SYSTEM CIRCUIT INSPECTION]

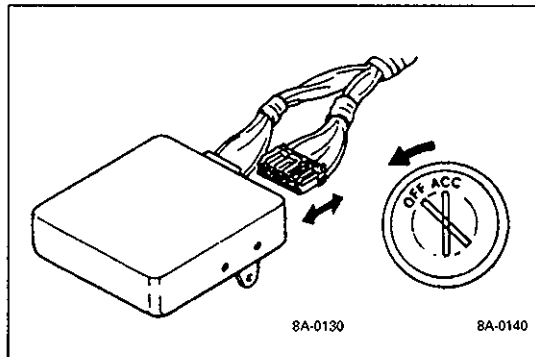
- Intermittent troubles

Most intermittent problems are caused by faulty electrical connections or wiring.

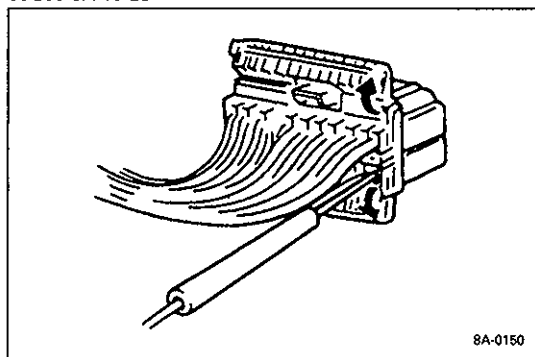
- Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
- Improperly formed or damaged terminals. All coupler terminals in problem circuit should be carefully reformed to increase contact tension.
- Poor terminal to wire connection.

- When there is a question "Are couplers connected properly?" in FLOW CHART, check male half of terminal for bend and female half for excessive opening, terminal for poor locking (looseness), corrosion, dust, etc.

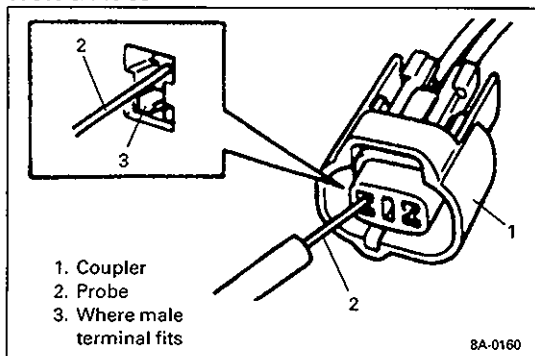
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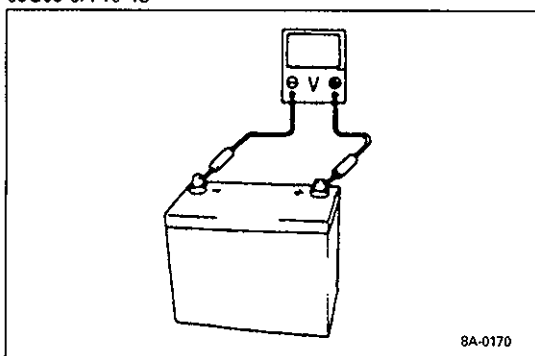
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60G00-8A-10-3S



60G00-8A-10-4S



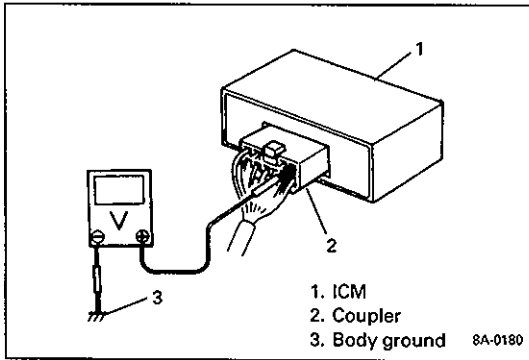
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- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempting to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempting to do it may cause damage to ECM and sensors.
- Be sure to use a voltmeter with high impedance ($M\Omega/V$ minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or ECM or ICM may get damaged.

- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.

- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler or force its female terminal open for connection. In case of such coupler as shown at the left, connect probe as shown to avoid opening female terminal. Never connect probe where male terminal is supposed to fit.

- Before measuring voltage at each terminal, check to make sure that battery voltage is 11V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



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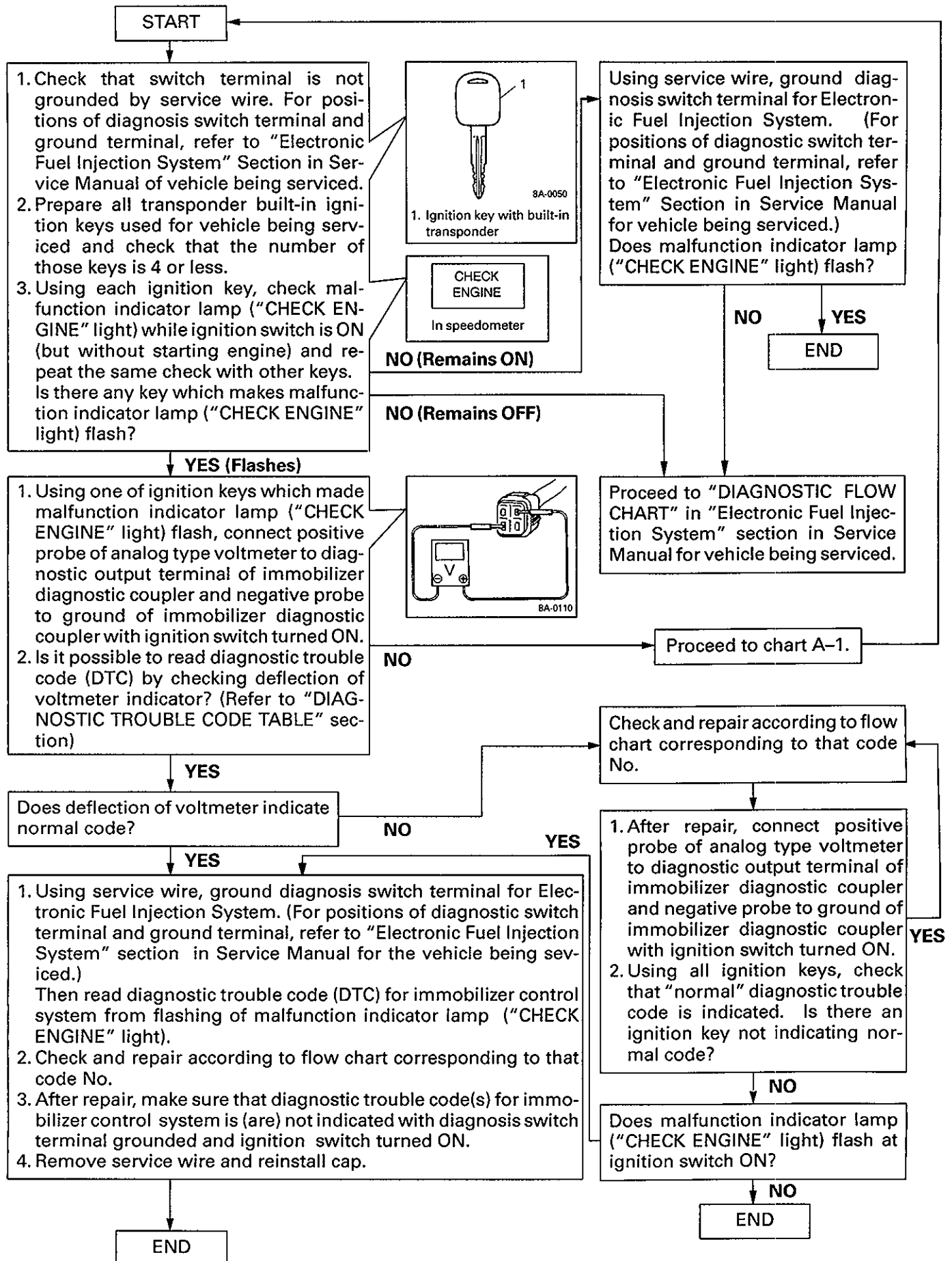
- When checking voltage at each terminal of the coupler which is connected to ECM or ICM, be sure to connect negative probe to body ground as shown. Any other way is prohibited even by accident. Applying probes of voltmeter improperly may cause the sensor, ECM or ICM to be shorted and damaged.

[Precaution after replacing ECM or ICM]

- When ECM was replaced, including when replaced because rechecking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM and ICM by performing procedure described in "Procedure after ECM Replacement" Section. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.
- When ICM was replaced, including when replaced because rechecking by using a known-good ICM was necessary during trouble diagnosis, the TP code and ECM/ICM code must be registered in ICM and ECM/ICM code in ECM by performing procedure described in "Procedure after ICM Replacement" Section. If they are not registered, the engine would not start and accurate trouble diagnosis would not be assured.

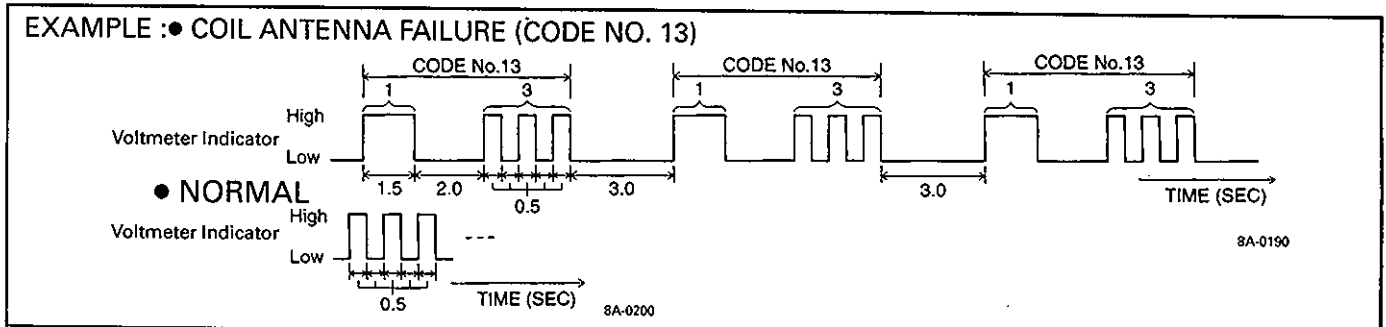
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DIAGNOSTIC FLOW CHART



DIAGNOSTIC TROUBLE CODE TABLE

Immobilizer Control Module (ICM) side



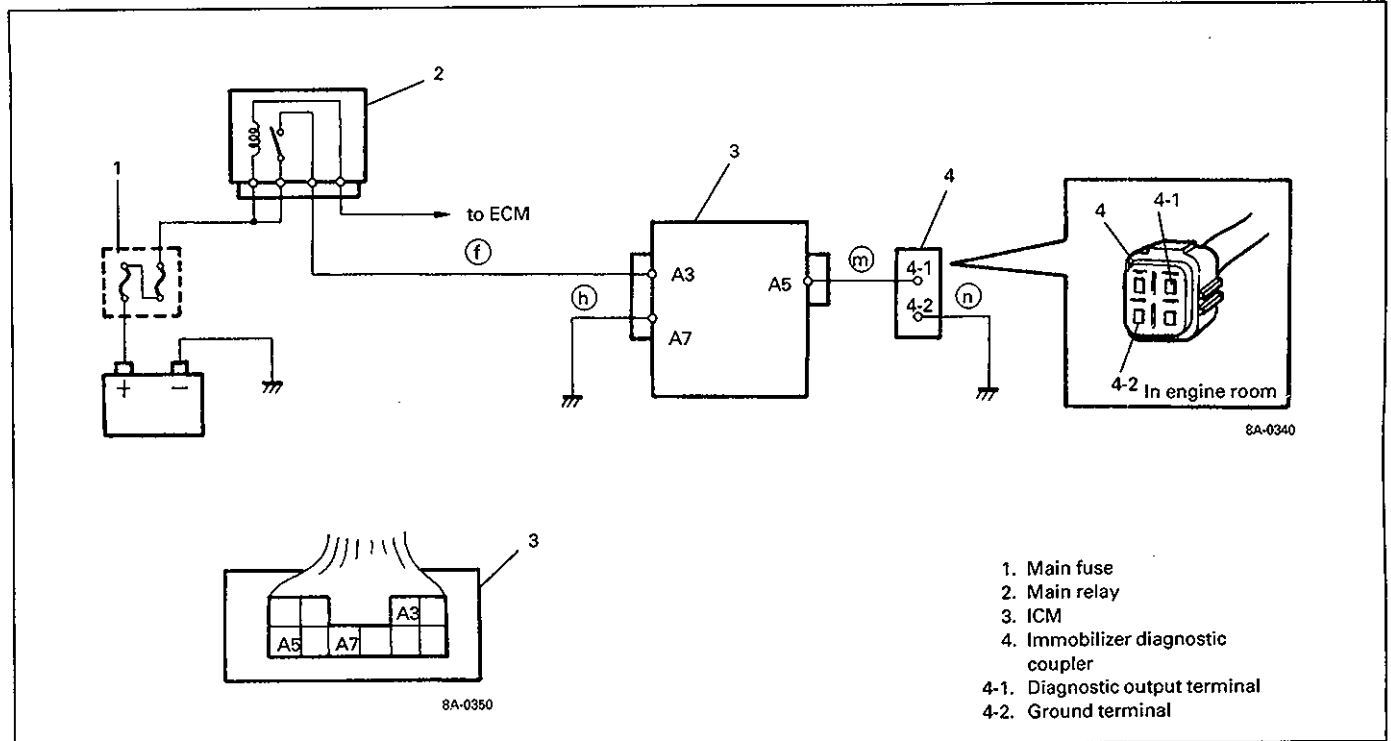
DIAGNOSTIC TROUBLE CODE		DIAGNOSTIC AREA	DIAGNOSIS
NO.	VOLTMETER INDICATION		
-	 8A-0210	Normal	This code appears when none of the other codes are identified. Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
11	 8A-0220	Transponder code (TP code)	
31	 8A-0230		
12	 8A-0240	ICM	
13	 8A-0250	Coil antenna or ignition key with built-in transponder	
21	 8A-0260	ECM/ICM code	
22	 8A-0270	Ignition switch circuit	
23	 8A-0280	Serial data link wire	

Engine Control module (ECM) side

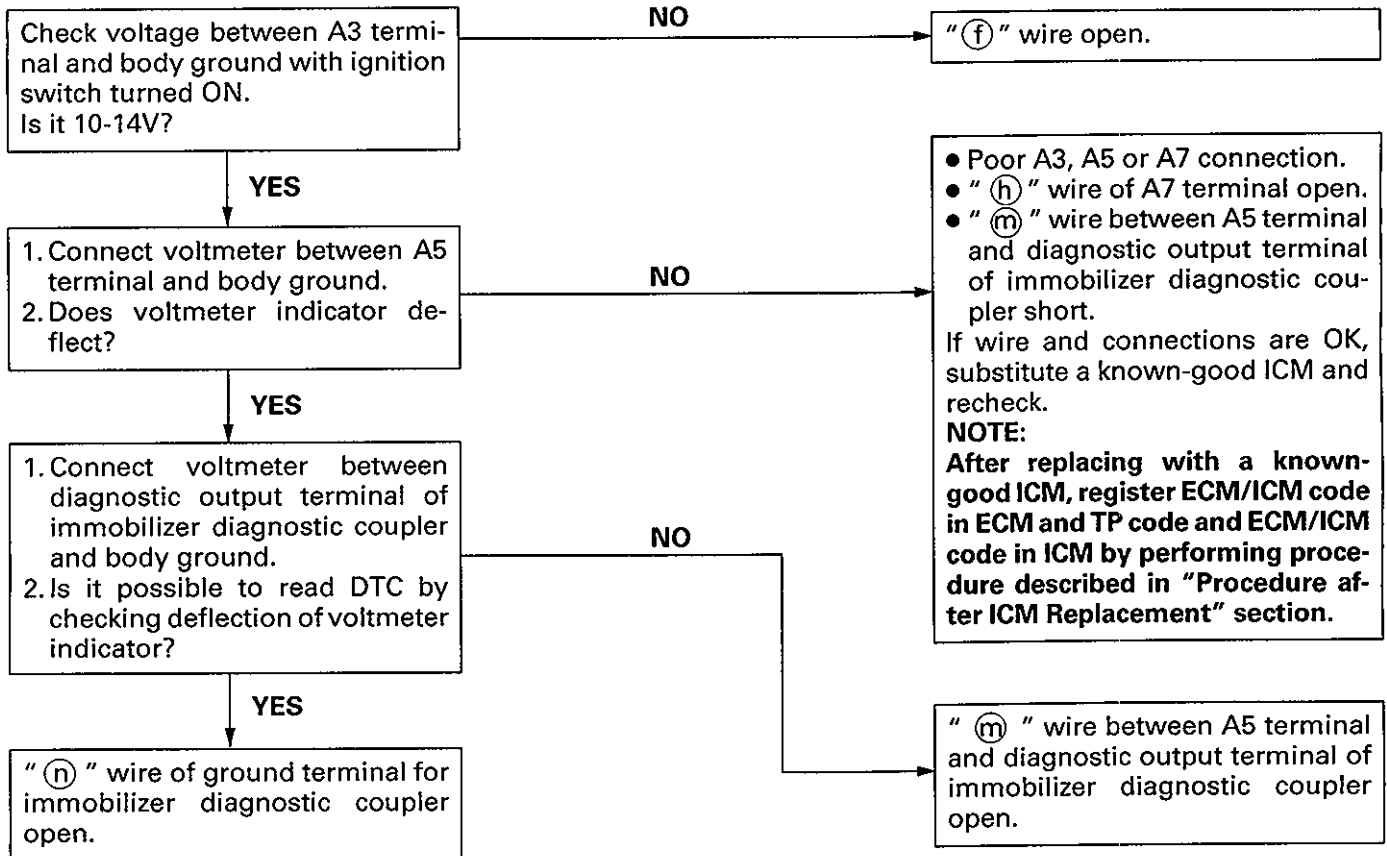
To learn how to read diagnostic trouble code (DTC) from flashing of malfunction indicator lamp ("CHECK ENGINE" light), refer to "Electronic Fuel Injection System" Section in Service Manual for vehicle being serviced.

DIAGNOSTIC TROUBLE CODE		DIAGNOSTIC AREA	DIAGNOSIS
NO.	MALFUNCTION INDICATOR lamp ("CHECK ENGINE" light) INDICATION		
12	 8A-0290	Normal	This code appears when it is confirmed that none of other trouble codes is set for immobilizer control system or electronic fuel injection system. Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
81	 8A-0300	ECM/ICM code	
84	 8A-0310		
82	 8A-0320	ECM	
83	 8A-0330	Serial data link wire	

A-1 CODE (DTC) IS NOT OUTPUTTED FROM DIAGNOSTIC OUTPUT TERMINAL OF IMMOBILIZER DIAGNOSTIC COUPLER



60G00-8A-14-1S



60G10-8A-14-3S

DTC11 TP CODE (TRANSPONDER CODE) NOT MATCHED**DESCRIPTION:**● **DTC11**

ICM checks if TP code transmitted from ignition key and that registered in ICM match when ignition switch is ON. If they do not, this DTC is set.

INSPECTION:

Register ignition key with built-in transponder by using TECH1 (TECH1 cartridge for immobilizer control system and TECH 1A kit) and performing following steps.

NOTE:

For operation procedure of TECH1, refer to TECH1 operator's manual.

1. Using TECH1, execute "ENT. TP CODE" command in SELECT MODE menu.
2. Turn ignition switch OFF, then turn it ON and check that DTC11 is not set.

DTC31 TP CODE (TRANSPONDER CODE) NOT REGISTERED

DESCRIPTION:

- **DTC31**

ICM checks if TP code transmitted from ignition key and that registered in ICM match when ignition switch is ON. If there is no TP code registered in ICM, this DTC is set.

INSPECTION:

Register ignition key with built-in transponder by using TECH1 (TECH1 cartridge for immobilizer control system and TECH 1A kit) and performing following steps.

NOTE:

For operation procedure of TECH1, refer to TECH1 operator's manual.

1. Prepare all ignition keys with built-in transponder to be registered. Up to 4 ignition keys can be registered for vehicle.
2. Using TECH1, execute "ENT. TP CODE" command in SELECT MODE menu.
3. Turn ignition switch OFF, then turn it ON and check that DTC31 is not set.
4. Repeat Step 2 as many times as the number of transponder built-in ignition keys not registered yet.

DTC12 FAULT IN IMMOBILIZER CONTROL MODULE (ICM)**DESCRIPTION:**

This DTC is set when an internal fault is detected in ICM.

INSPECTION:

- 1) Ignition switch "OFF".
- 2) Disconnect connectors from ICM.
- 3) Check for proper connection to ICM at all terminals.
Are they in good condition?

YES**NO**

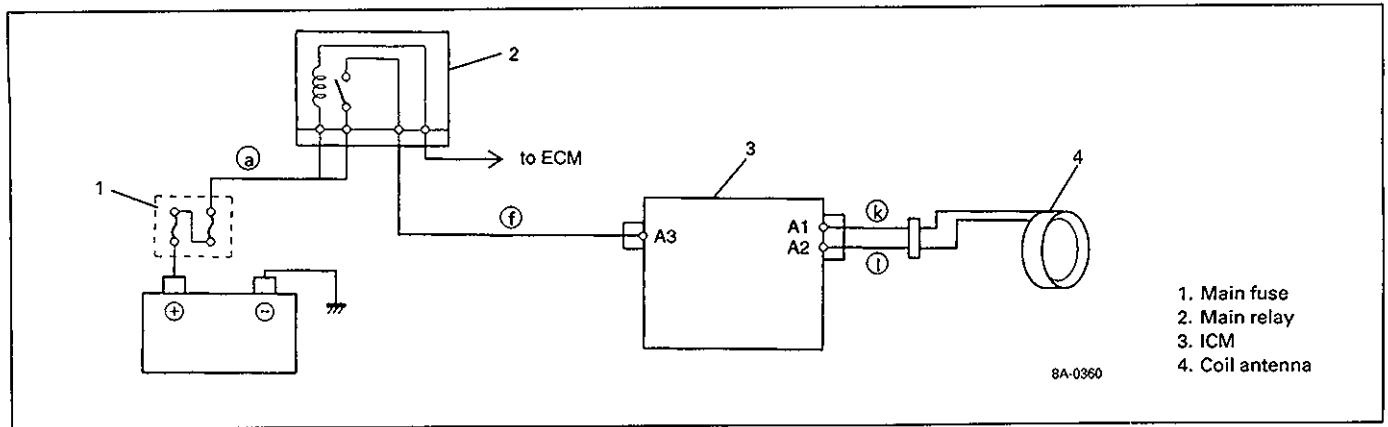
Substitute a known-good ICM and recheck.

NOTE:

After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

Repair or replace

DTC13 NO TP (TRANSPONDER) CODE TRANSMITTED OR COIL ANTENNA OPENED/SHORTED

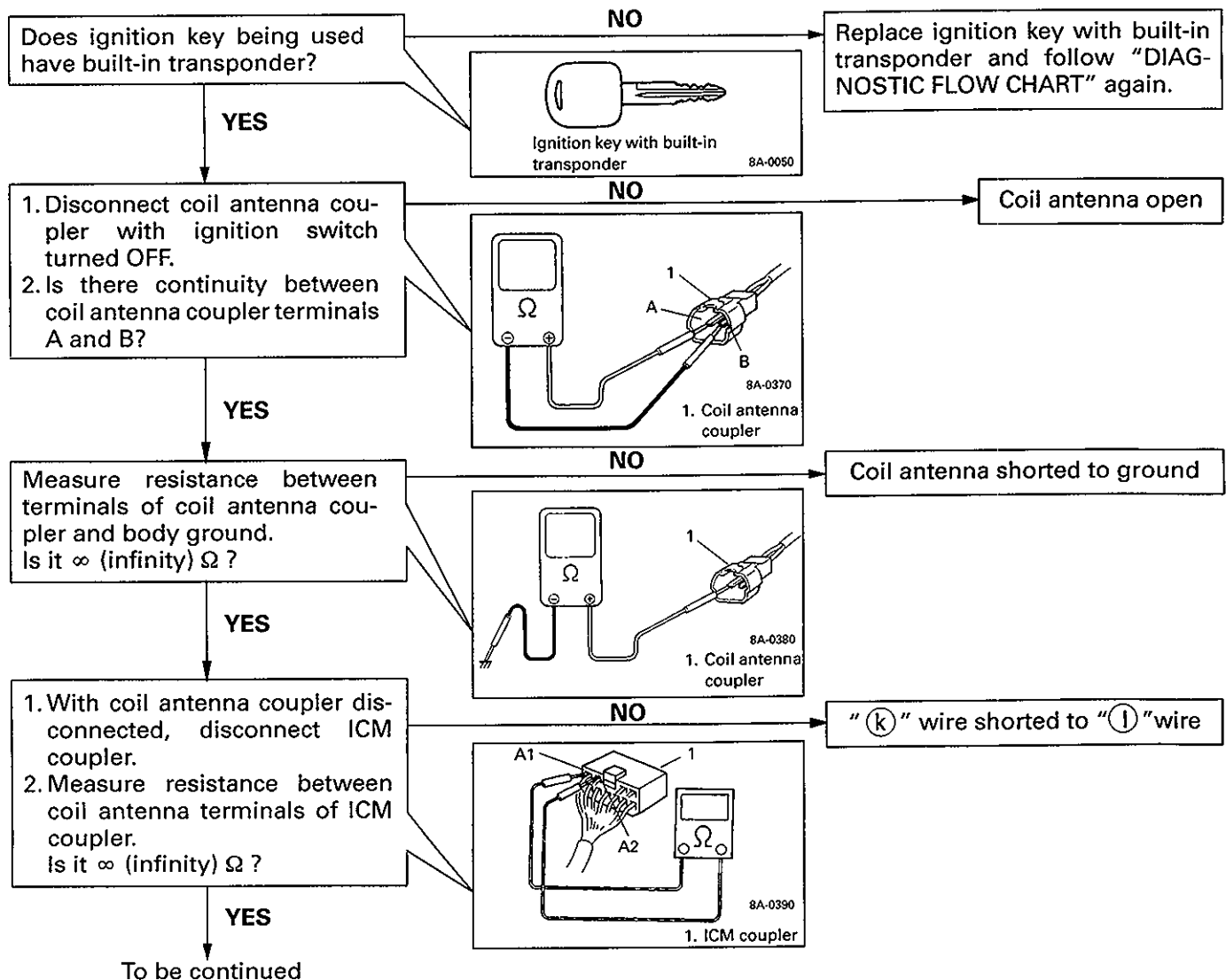


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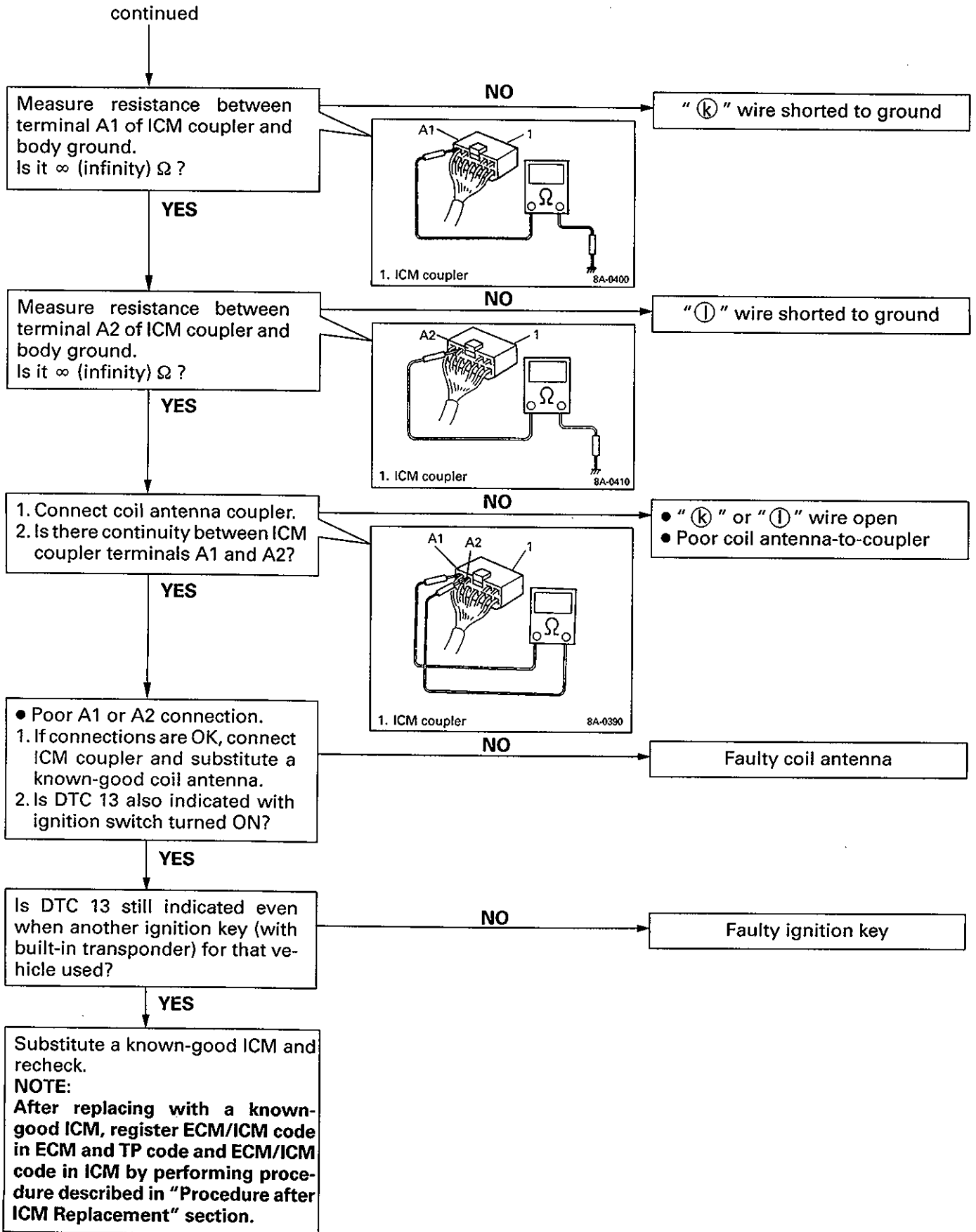
DESCRIPTION:

ICM energizes the coil antenna when the ignition switch is ON and reads TP code from the ignition key. When ICM cannot read TP code from the ignition key even when the coil antenna is energized, this DTC is set.

INSPECTION:



60G00-8A-18-2S



DTC21 ECM/ICM CODE NOT MATCHED (ICM SIDE)

DTC81 ECM/ICM CODE NOT MATCHED (ECM SIDE)

DTC84 ECM/ICM CODE NOT REGISTERED

DESCRIPTION:

- **DTC21**
ICM checks if ECM/ICM code transmitted from ECM and that registered in ICM match when ignition switch is ON. If they do not, this DTC is set.
- **DTC81**
ECM checks if ECM/ICM code transmitted from ICM and that registered in ECM match when ignition switch is ON. If they do not, this DTC is set.
- **DTC84**
ECM checks if code transmitted from ICM and that registered in ECM match when ignition switch is ON. If there is no ECM/ICM code registered in ECM, this DTC is set.

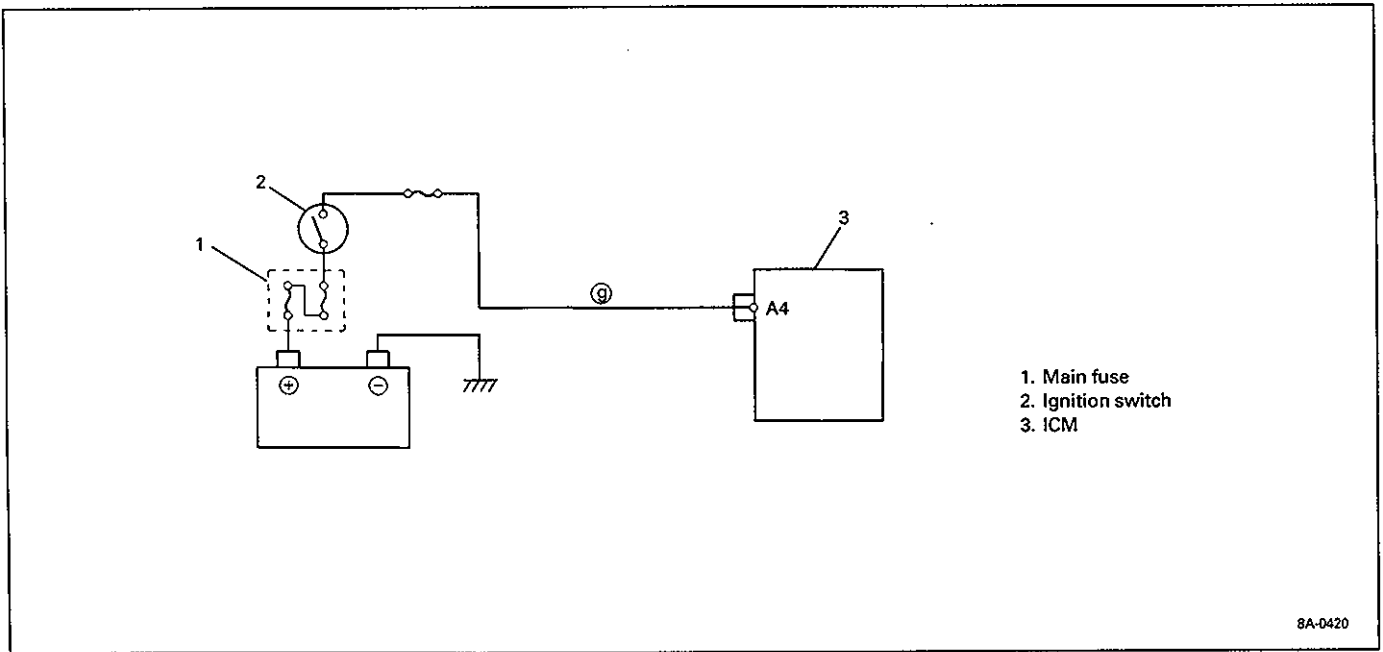
INSPECTION:

Using TECH1 (TECH1 cartridge for immobilizer control system and TECH1A kit), execute "RECORD ECM/ICM" command in SELECT MODE menu.

NOTE:

For operation procedure of TECH1, refer to TECH1 operator's manual.

DTC22 IGNITION SWITCH CIRCUIT OPEN/SHORT



60G00-8A-21-1S

DESCRIPTION:

ICM monitors ignition signal when the ignition switch is ON. This DTC is set when no ignition signal input is detected by ICM.

INSPECTION:

Check voltage between ICM coupler terminal A4 and body ground with ignition switch turned ON. Is it 10–14V?

YES

Poor A4 terminal connection. If connection is OK, substitute a known-good ICM and recheck.
NOTE: After replacing with a know-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

NO

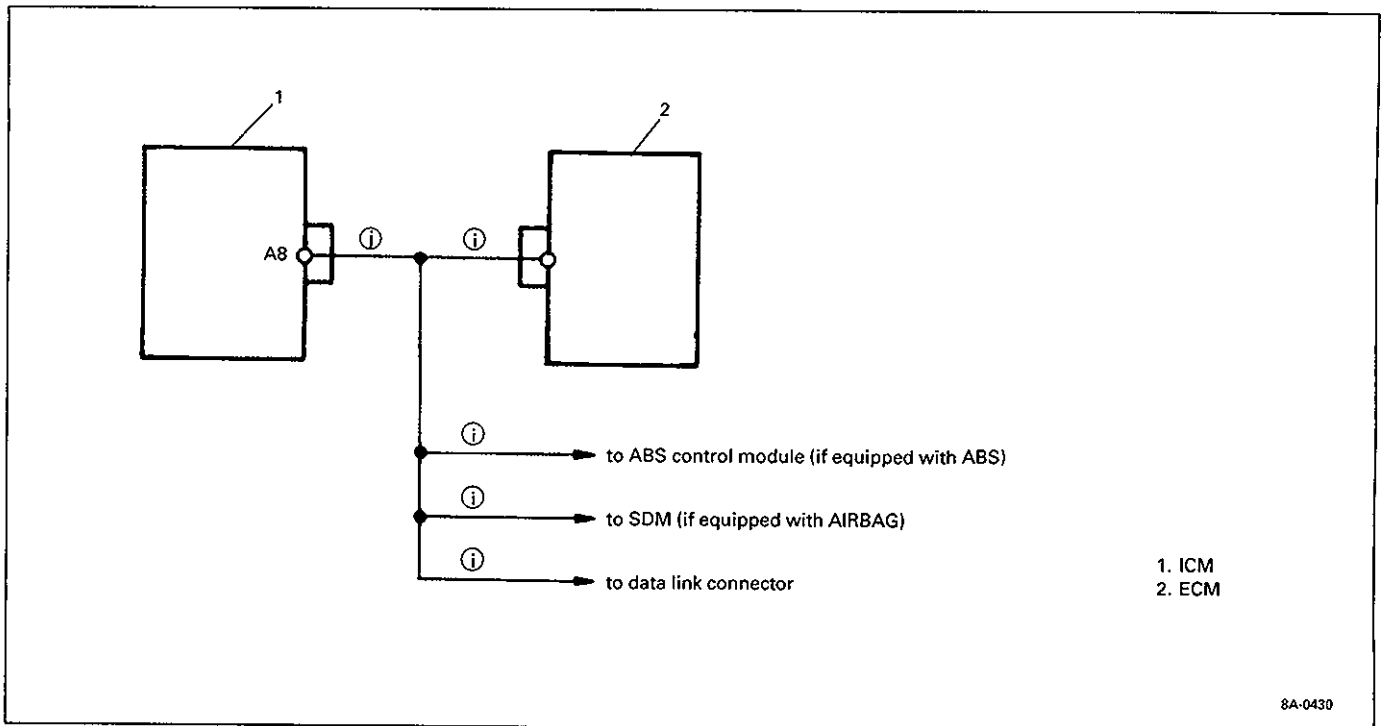
"g" wire open or short

8A-0180
1. ICM

60G00-8A-21-2S

DTC23 NO ECM/ICM CODE TRANSMITTED FROM ECM OR DATA LINK CONNECTOR WIRE OPENED/SHORTED

DTC83 NO ECM/ICM CODE TRANSMITTED FROM ICM OR DATA LINK CONNECTOR WIRE OPENED/SHORTED



60G00-8A-22-1S

DESCRIPTION

When the ignition switch is ON, ICM requests ECM and ECM requests ICM to transmit ECM/ICM code. If ECM/ICM code is not transmitted from ECM or ICM, ICM sets DTC23 and ECM sets DTC83.

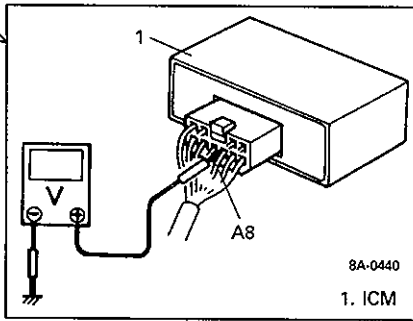
INSPECTION:

Check voltage between ICM coupler terminal A8 and body ground with ignition switch turned ON. Is it 4-5V?

NO

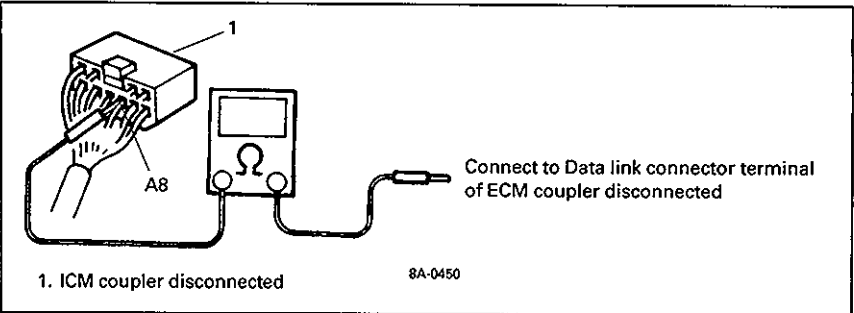
"i" or "j" wire short

YES



1. Disconnect ECM coupler with ignition switch turned OFF.
2. Is there continuity between ICM coupler terminal A8 and Data link connector terminal of ECM coupler? (For positions of Data link connector terminal of ECM coupler, refer to "Electronic Fuel Injection System" section in Service Manual of vehicle being serviced.)

YES



NO

"i" or "j" wire between ICM and ECM open

Poor A8 connection (ICM) or Poor Data link connector terminal connection (ECM). If connections are OK, substitute a known-good ECM or ICM and recheck.

NOTE :

- After replacing with a known-good ECM, register ECM/ICM code in ECM by performing procedure described in "Procedure after ECM Replacement" section.
- After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

DTC82 FAULT IN ENGINE CONTROL MODULE (ECM)

DESCRIPTION:

This DTC is set when an internal fault is detected in ECM.

INSPECTION:

- 1) Ignition switch "OFF".
- 2) Disconnect connectors from ECM.
- 3) Check for proper connection to ECM at all terminals.
Are they in good condition?

YES

Substitute a known-good ECM and recheck.
NOTE:
After replacing with a known-good ECM/ICM, register ECM/ICM code in ECM by performing procedure described in "Procedure after ECM Replacement" section.

NO

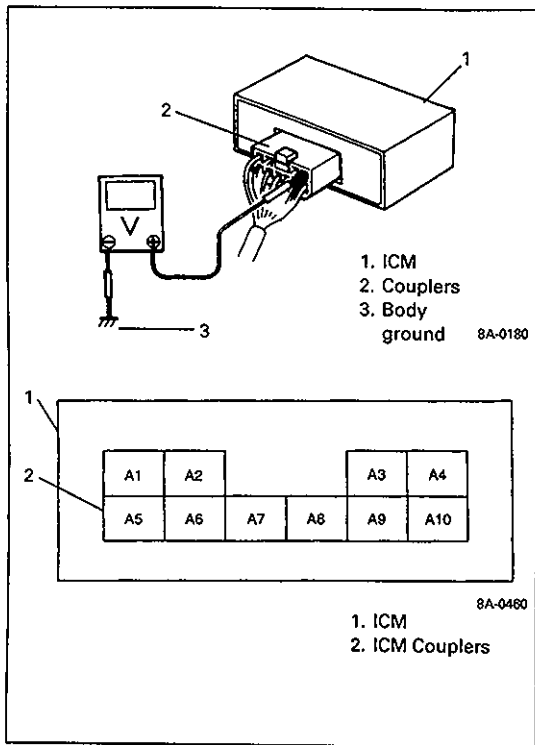
Repair or replace

INSPECTION OF ECM, ICM AND ITS CIRCUIT

ECM, ICM and its circuit can be checked at ECM wiring couplers and ICM wiring coupler by measuring voltage and resistance. Described here is only inspection of ICM. For inspection of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for the vehicle being serviced.

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

60G00-8A-25-1S



60G00-8A-25-3S

Voltage Check

- 1) Remove ICM from body with ignition switch OFF referring to p. 8A-28.
- 2) Connect ICM couplers to ICM.
- 3) Check voltage at each terminal of couplers connected.

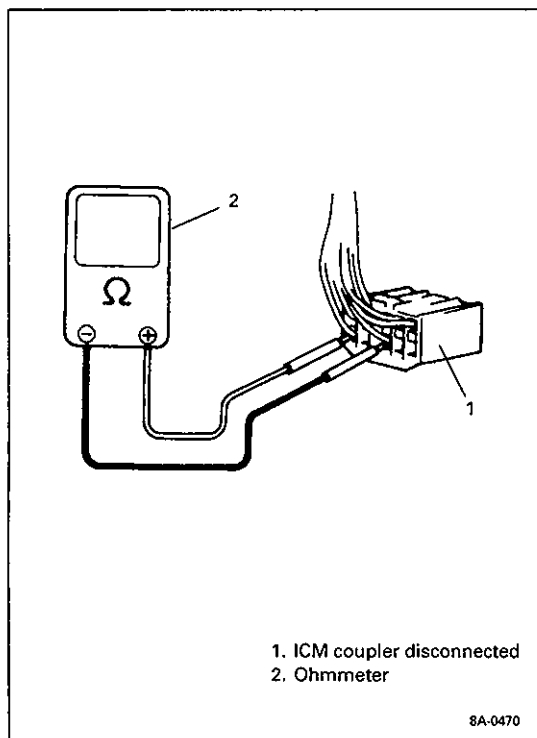
NOTE:

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

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Coil antenna 1	0V	Ignition switch ON
A2	Coil antenna 2	0V	
A3	Power source	10-14V	
A4	Ignition signal	10-14V	Ignition switch ON
		0-0.8V	Ignition switch OFF
A5	Diagnosis output	0-14V	Ignition switch ON
		0V	Ignition switch OFF
A6	Blank	-	-
A7	Ground	-	-
A8	Data link connector (Serial data terminal)	4-5V	Ignition switch ON
A9 A10	Blank	-	-

NOTE:

When measuring voltage at A1 and A2 terminals with ignition switch turned ON, be sure to turn ignition switch ON before connecting positive probe of voltmeter to A1 or A2 terminal. If it is not turned ON first, DTC13 (Diagnostic Trouble Code 13) may be indicated.

**Resistance Check**

- 1) Disconnect ICM couplers from ICM with ignition switch OFF.

CAUTION:

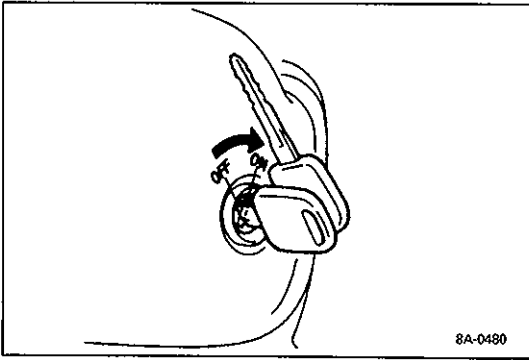
Never touch terminals of ICM itself or connect voltmeter or ohmmeter.

- 2) Check resistance between each terminal of couplers disconnected.

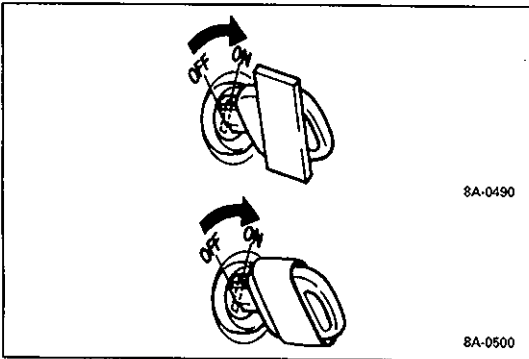
CAUTION:

- 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 below represents that when parts temperature is 20°C (68°F).

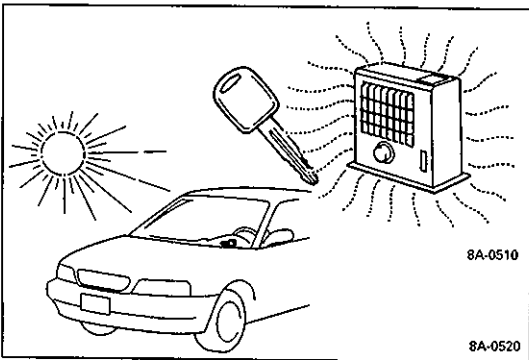
TERMINAL	CIRCUIT	NORMAL RESISTANCE	CONDITION
A1 - A2	Coil antenna	Continuity	-



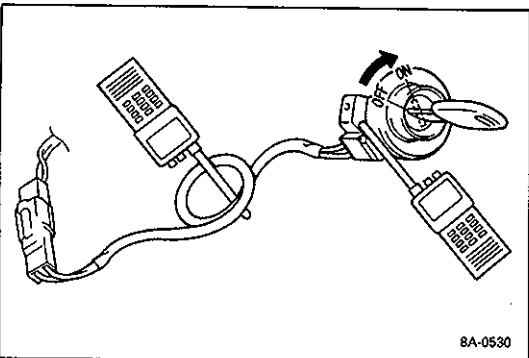
60G00-8A-27-1S



60G00-8A-27-2S



60G00-8A-27-3S



60G00-8A-27-4S

ON-VEHICLE SERVICE

Precautions in handling immobilizer control system

- Don't turn ON ignition switch with ignition key for immobilizer control system put together with another one or placed quite close to another one. Or the system may detect abnormal condition and prevent engine from starting.
- Do not turn ON ignition switch by using ignition key with any type of metal wound around its grip or in contact with it. Or the system may detect abnormal condition and prevent engine from starting.
- Do not leave ignition key where high temperature is anticipated. High temperature will cause transponder in ignition key to be abnormal or damaged.
- Do not turn ON ignition switch with a radio antenna placed near coil antenna or its harness to ICM. Or the system may detect abnormal condition and prevent engine from starting.

IMMOBILIZER CONTROL MODULE (ICM)**Removal**

- 1) Disconnect negative (-) cable at battery.
- 2) Disconnect coupler.
- 3) Remove immobilizer control module.

60G00-8A-28-1S

Installation

Reverse removal procedure for installation

NOTE:

After replacing ICM, be sure to register TP code and ECM/ICM code in ICM and ECM/ICM code in ECM by performing procedure described in "Procedure after ICM Replacement" section.

60G00-8A-28-2S

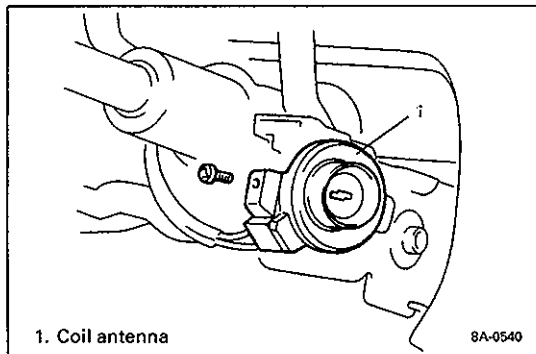
ENGINE CONTROL MODULE (ECM)**Removal and Installation**

For removal and installation of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for vehicle being serviced.

NOTE:

After replacing ECM, be sure to register ECM/ICM code in ECM by performing procedure described in "Procedure after ECM Replacement" section.

60G00-8A-28-3S



60G00-8A-28-4S

COIL ANTENNA**Removal**

- 1) Disconnect negative (-) cable at battery.
- 2) Remove air bag module (if equipped), steering wheel and combination switch assembly (together with steering sensor if suspension control system is equipped). Refer to Section 3C (without air bag), 3C1 (with air bag) or 3G (with suspension control system).
- 3) Remove coil antenna

Installation

For installation, reverse removal procedure, surely referring to Section 3C (without air bag), 3C1 (with air bag) or 3G (with suspension control system).

60G00-8A-28-5S

HOW TO REGISTER IGNITION KEY

Register the ignition key (TP code) in the immobilizer control system by using the following procedure.

- 1) Prepare ignition keys with a built-in transponder to be registered for the vehicle.

NOTE:

As up to 4 ignition keys may be used for immobilizer control system, make sure that total number of ignition keys that are used for the vehicle is 4 or less.

- 2) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

NOTE:

For operation procedure of TECH1, refer to TECH1 operator's manual.

- 3) If necessary, clear all TP codes registered in ICM by executing "CLEAR TP CODE" command in SELECT MODE menu with TECH1.

NOTE:

When "CLEAR TP CODE" command is executed with the malfunction indicator lamp ("CHECK ENGINE" light) ON, it remains ON even after execution of that command is over. It will start flashing when the ignition switch is turned OFF once and then turned ON after some seconds.

- 4) Using TECH1, register TP code in ICM one by one by executing "ENTER TP CODE" command in SELECT MODE menu.

Then after completing registration of TP code for all ignition keys, turn ON ignition switch by using all ignition keys one by one and check that malfunction indicator lamp ("CHECK ENGINE" light) lights each time.

NOTE:

ICM does not accept registration of the same TP code.

PROCEDURE AFTER ICM REPLACEMENT

When ICM was replaced, including when replaced because rechecking by using a known-good ICM was necessary during trouble diagnosis, register TP code and ECM/ICM code in ICM and ECM/ICM code in ECM by performing following procedure.

- 1) Prepare all existing ignition keys (those that have been used for that vehicle).

NOTE:

As up to 4 ignition keys may be used for immobilizer control system, make sure that total of existing ignition keys is 4 or less

- 2) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

NOTE:

For operation procedure of TECH 1, refer to TECH1 operator's manual.

- 3) Check the number of TP codes registered in ICM which has been replaced by executing "DATA LIST" command in SELECT MODE menu of TECH1. If even one TP code has been registered, execute "CLEAR TP CODE" command in SELECT MODE menu.

NOTE:

When "CLEAR TP CODE" command is executed with the malfunction indicator lamp ("CHECK ENGINE" light) ON, it remains ON even after execution of that command is over. It will start flashing when the ignition switch is turned OFF once and then turned ON after some seconds.

- 4) Using TECH1, register TP code in ICM one by one by executing "ENT. TP CODE" command in SELECT MODE menu.

NOTE:

ICM does not accept registration of the same TP code.

- 5) Using TECH1, register ECM/ICM code in both ICM and ECM by executing "RECORDECM/ICM" command in SELECT MODE menu.
- 6) Turn ON ignition switch by using all ignition keys one by one and check that malfunction indicator lamp ("CHECK ENGINE" light) lights each time.

PROCEDURE AFTER ECM REPLACEMENT

When ECM was replaced, including when replaced because rechecking by using a known-good ECM was necessary during trouble diagnosis, register ECM/ICM code in ECM by performing following procedure.

- 1) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

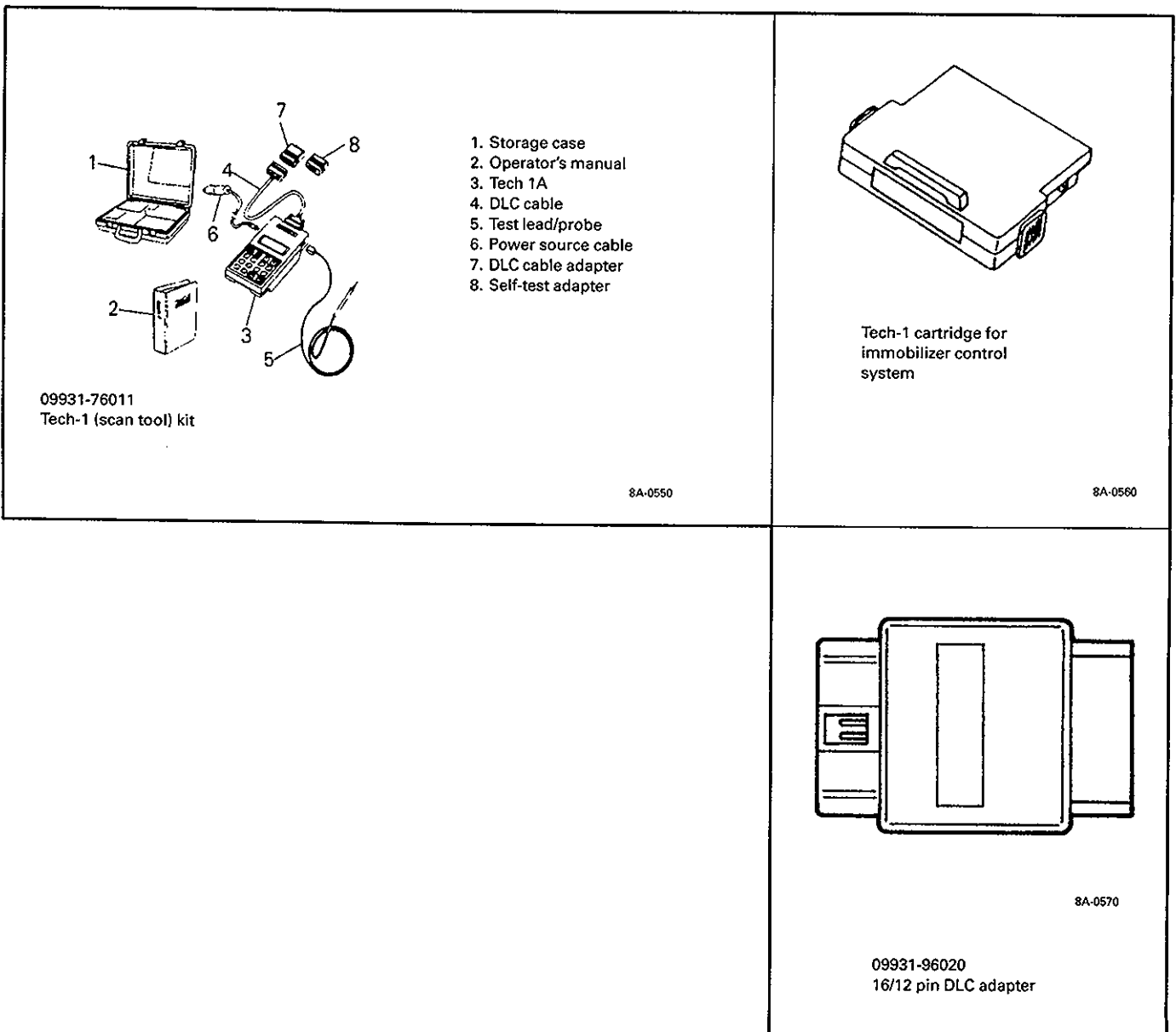
NOTE:

For operation procedure of TECH 1, refer to TECH1 operator's manual.

- 2) Using TECH1, register ECM/ICM code in ECM by executing "RECORD ECM/ICM" command in SELECT MODE menu.

60G00-8A-31-1S

SPECIAL TOOLS



60G10-8A-31-2S

GROUP 2

GROUP 2

SUZUKI

SE416/SZ416

SUPPLEMENTARY SERVICE MANUAL

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 components 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 (GROUP 2) is a supplement to VITARA SERVICE MANUAL, VITARA SUPPLEMENTARY SERVICE MANUAL and SZ416 SERVICE MANUAL. It has been prepared exclusively for VITARA (SE416) and SZ416 equipped with immobilizer control system.

Applicable model: SE416 and SZ416 equipped with immobilizer control system

This SUPPLEMENTARY SERVICE MANUAL contains service information for vehicles equipped with the immobilizer control system but only on different items as compared to those without the immobilizer control system and except the contents of "SECTION 8A : Immobilizer Control System".

Therefore, whenever servicing immobilizer control system of SE416 and SZ416, consult this supplement first. And for any section, item or description not found in this supplement (GROUP 2), refer to the below listed SERVICE MANUAL and SECTION 8A (GROUP 1) in this 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.

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SECTION

ENGINE

Electronic Fuel Injection System (Throttle Body Fuel Injection)

6E

Electronic Fuel Injection System (Sequential Multiport Fuel Injection)

6E1

RELATED SERVICE MANUAL

- VITARA SERVICE MANUAL (99500-60A10)
- VITARA SUPPLEMENTARY SERVICE MANUAL (99501-60A70)
- VITARA SUPPLEMENTARY SERVICE MANUAL (99501-61A10)
- SZ416 SERVICE MANUAL (99500-79E00)

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

6E

6E1

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

(THROTTLE BODY FUEL INJECTION SYSTEM)

NOTE:

This section describes the electronic fuel injection system equipped with the immobilizer control system but only on the items different from those of the electronic fuel injection system not equipped with the immobilizer control system. Therefore, for the information on the electronic fuel injection system equipped with the immobilizer control system not found in this section and on the electronic fuel injection system not equipped with the immobilizer control system, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

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DIAGNOSIS	6E- 7	ECM and its circuit check	6E-11
		Voltage Check	6E-11
		Resistance Check	6E-14

GENERAL DESCRIPTION

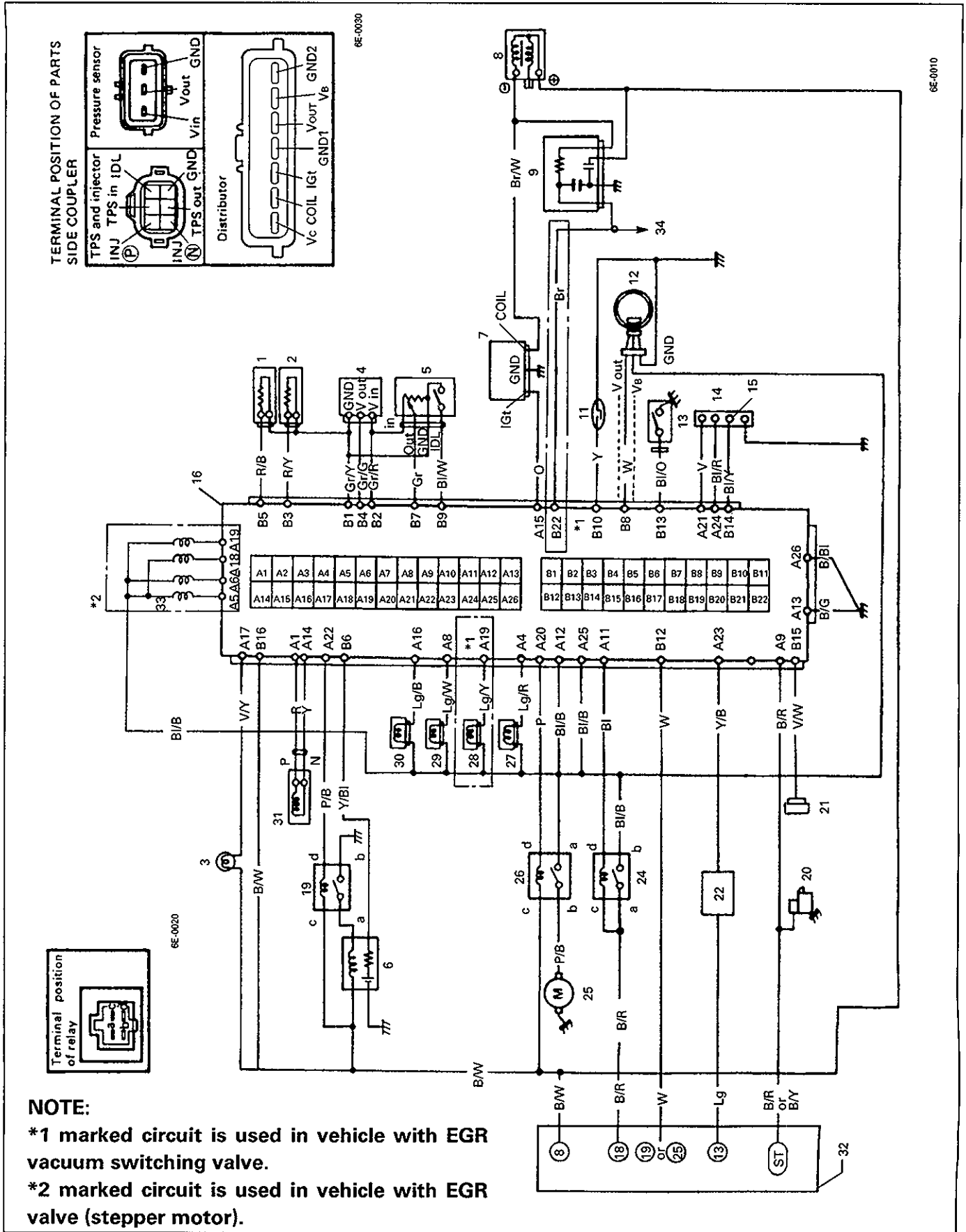
The electronic fuel injection system of the vehicle equipped with the immobilizer control system differs from that of the vehicle without the immobilizer control system mainly in following points.

- Position of each terminal of engine control module (ECM)
- Circuit from main fuse box to main relay

For the details of these differences (due to change or addition), refer to the next section "ELECTRONIC CONTROL SYSTEM".

ELECTRONIC CONTROL SYSTEM

With Immobilizer Control System



		Wire color	
1. ATS	20. Starter magnetic switch	B/B	Black/Blue
2. ECT	21. Serial data terminal (DLC)	B/G	Black/Green
3. "CHECK ENGINE" light	22. A/C amplifier (if equipped)	B/R	Black/Red
4. Pressure sensor	23. Blank	B/W	Black/White
5. TP Sensor	24. Main relay	B/Y	Black/Yellow
6. Heated oxygen sensor	25. Fuel pump	Bl	Blue
7. Ignitor (Power unit)	26. Fuel pump relay	B/B	Blue/Black
8. Ignition coil	27. EVAP canister purge valve	B/G	Blue/Green
9. Noise suppressor	28. EGR vacuum switching valve	B/R	Blue/Red
10. Blank	29. Throttle opener vacuum switching valve	B/W	Blue/White
11. VSS	30. IAC valve	B/Y	Blue/Yellow
12. CMP Sensor (in distributor)	31. Fuel injector	B/O	Blue/Orange
13. Power steering pressure switch (if equipped)	32. To fuses	Br	Brown
14. Monitor coupler	The wire No. s are same No. as figure of POWER SUPPLY	Br/B	Brown/Black
15. Diag. switch terminal	DIAGRAM (Refer to SECTION 8).	Br/Y	Brown/Yellow
16. ECM	33. EGR valve (stepper motor)	Gr	Gray
17. Blank	34. To tachometer	Gr/G	Gray/Green
18. Blank		Gr/R	Gray/Red
19. Heated oxygen sensor heater relay		Gr/Y	Gray/Yellow
		Lg	Lightgreen
		Lg/B	Lightgreen/Black
		Lg/R	Lightgreen/Red
		Lg/W	Lightgreen/White
		Lg/Y	Lightgreen/Yellow
		O	Orange
		P	Pink
		P/B	Pink/Black
		R	Red
		R/B	Red/Black
		R/G	Red/Green
		R/Y	Red/Yellow
		R/Bl	Red/Blue
		Sb	Skyblue
		V	Violet
		V/Y	Violet/Yellow
		W	White
		W/Y	White/Yellow
		Y	Yellow
		Y/B	Yellow/Black

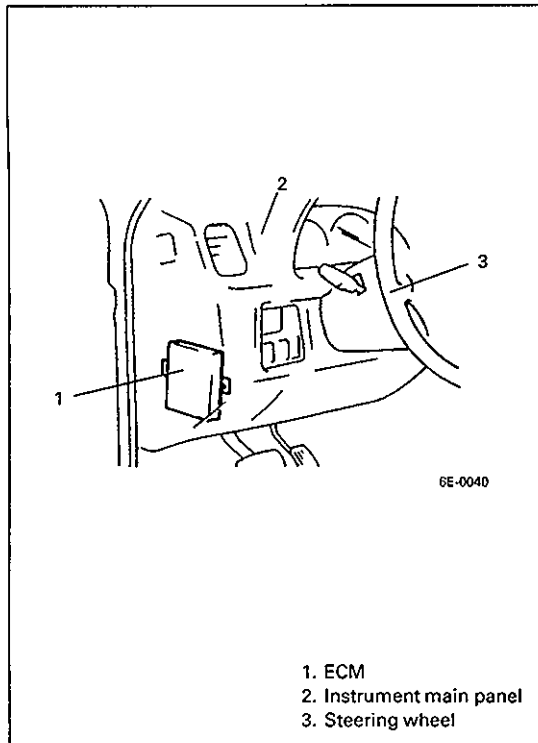
Relation between ECM terminals and circuits for vehicles equipped with immobilizer control system.

TERMINAL	CIRCUIT	
	With EGR vacuum switching valve	With EGR valve (stepper motor)
A1	Injector ⊕	
A2	Blank	
A3		
A4	EVAP canister purge valve	
A5	Blank	EGR valve (stepper motor)
A6		
A7	Blank	
A8	Throttle opener vacuum switching valve	
A9	Engine start switch (Engine start signal)	
A10	Blank	
A11	Main relay	
A12	Power source	
A13	Ground	
A14	Injector ⊖	
A15	Ignition trigger signal	
A16	IAC valve	
A17	"CHECK ENGINE" light	
A18	Blank	EGR valve (stepper motor)
A19	EGR vacuum switching valve	
A20	Fuel pump relay	
A21	Duty output terminal	
A22	Oxygen sensor heater	
A23	A/C circuit (if equipped)	
A24	Test switch terminal	
A25	Power source	
A26	Ground	
B1	Ground of sensors	
B2	Power source of sensors	
B3	ECT	
B4	Pressure sensor	
B5	ATS	
B6	Oxygen sensor	
B7	TP sensor	
B8	CMP sensor	
B9	Idle switch of TP sensor	

TERMINAL	CIRCUIT	
	With EGR vacuum switching valve	With EGR valve (stepper motor)
B10	VSS	
B11	Blank	
B12	Power source for back-up circuit	
B13	Power steering pressure switch (if equipped)	
B14	Diagnosis switch terminal	
B15	Data link connector	
B16	Ignition switch	
B17	Blank	
B18		
B19		
B20		
B21		
B22	Ignition fail-safe signal	Blank

Comparison between ECM terminals of vehicles equipped with immobilizer control system and those of vehicles not equipped with immobilizer control system

TERMINAL (WITHOUT IMMOBILIZER CONTROL SYSTEM)	TERMINAL (WITH IMMOBILIZER CONTROL SYSTEM)	CIRCUIT	
		With EGR vacuum switching valve	With EGR valve (stepper motor)
A1	B22	Ignition fail-safe signal	
A2	A23	A/C circuit (if equipped)	
A3	B14	Diagnosis switch terminal	
A4	—	Blank	
A5	—	Brake pedal switch (A/T)	
A6	B13	Power steering pressure switch (if equipped)	
A7	A24	Test switch terminal	
A8	A4	EVAP canister purge valve	
A9	A21	Duty output terminal	
A10	—	Blank	
A11	—	Lock-up relay for A/T	
A12	A15	Ignition trigger signal	
A13	B8	CMP sensor	
A14	B9	Idle switch of TPS	
A15	B10	VSS	
A16	—	Blank	
A17	B5	ATS	
A18	B3	ECT	
A19	B6	Oxygen sensor	
A20	B15	Data link connector	
A21	B7	TP sensor	
A22	B4	Pressure sensor	
A23	B2	Power source of sensors	
A24	B1	Ground of sensors	
B1	A12	Power source	
B2	A26	Ground	
B3	A22	Oxygen sensor heater	
B4	—	Blank	
B5	A19	EGR vacuum switching valve	EGR valve (stepper motor)
B6	A16	IAC valve	
B7	A25	Power source	
B8	A1	Injector ⊕	
B9	B12	Power source for back-up circuit	
B10	A13	Ground	
B11	A9	Engine start switch (Engine start signal)	
B12	—	Shift switch (A/T only)	
B13	A17	"CHECK ENGINE" light	
B14	A8	Throttle opener vacuum switching valve	
B15	A11	Main relay	
B16	A20	Fuel pump relay	
B17	A14	Injector ⊖	
—	B16	Ignition switch	
	A5, A6, A18	Blank	EGR valve (stepper motor)
	A2, A3, A7, A10, B11, B17, B18, B19, B20, B21	Blank	



60G10-6E-G2-6-1S

Engine Control Module (ECM)

ECM for immobilizer control system has following additional function.

- On-board diagnostic system (Self-diagnosis function) for immobilizer control system

For more information on above item for immobilizer control system, refer to Section 8A of this manual.

NOTE:

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.

However, if Malfunction indicator lamp ("CHECK ENGINE" light) blinks, Immobilizer control system is in malfunction.

DIAGNOSIS

Contents of this DIAGNOSIS section are following items only.

- DIAGNOSTIC FLOW CHART
- A-1 ECM POWER AND GROUND CIRCUIT CHECK
- ECM AND ITS CIRCUIT CHECK

For other items, refer to the same section of Service Manual mentioned in FOREWORD of this manual. At the same time use care for changed items described in the previous section.

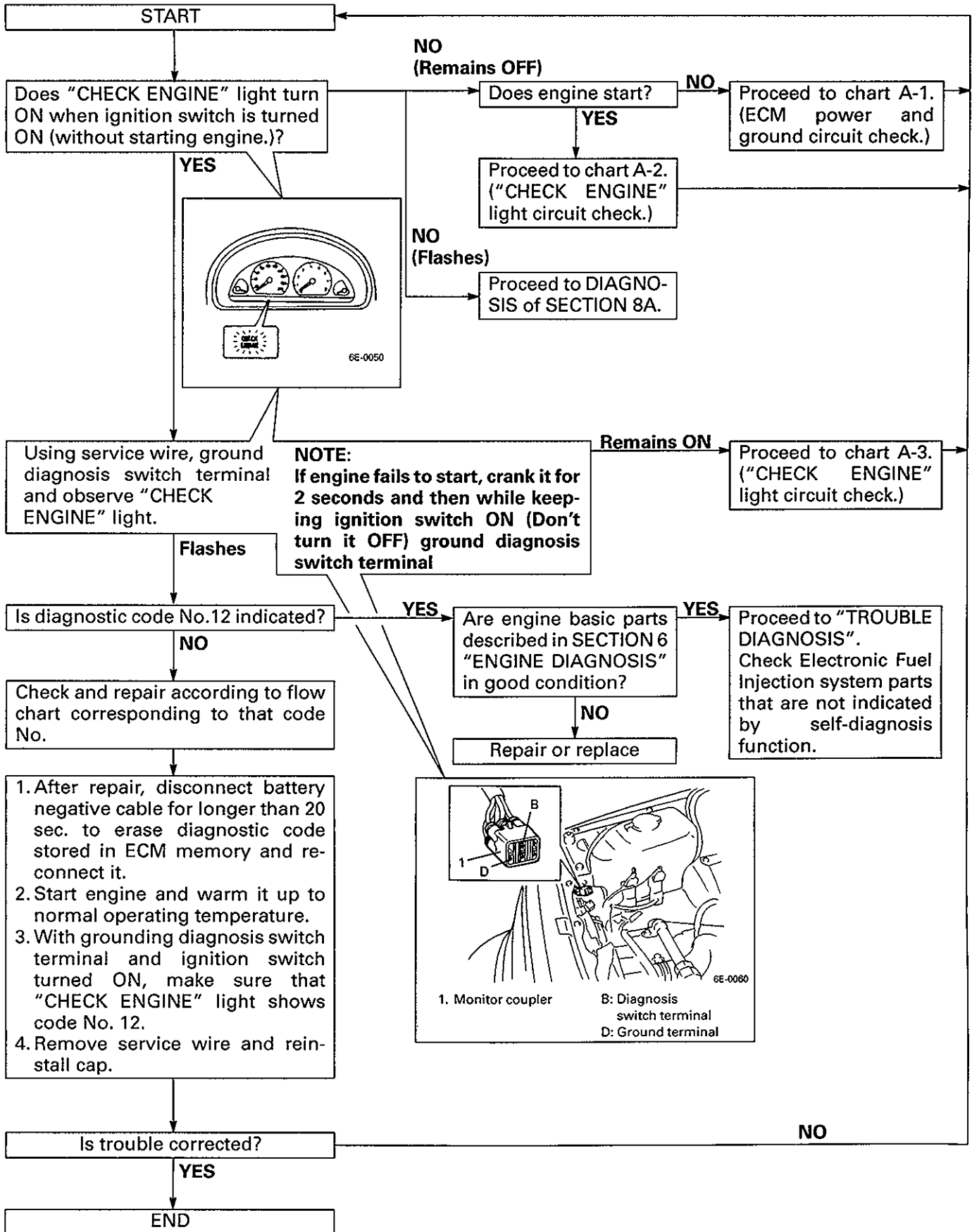
NOTE:

When ECM on the vehicle equipped with the immobilizer control system was replaced, including when replaced because re-checking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.

For more information, refer to "Procedure after ECM Replacement" in SECTION 8A.

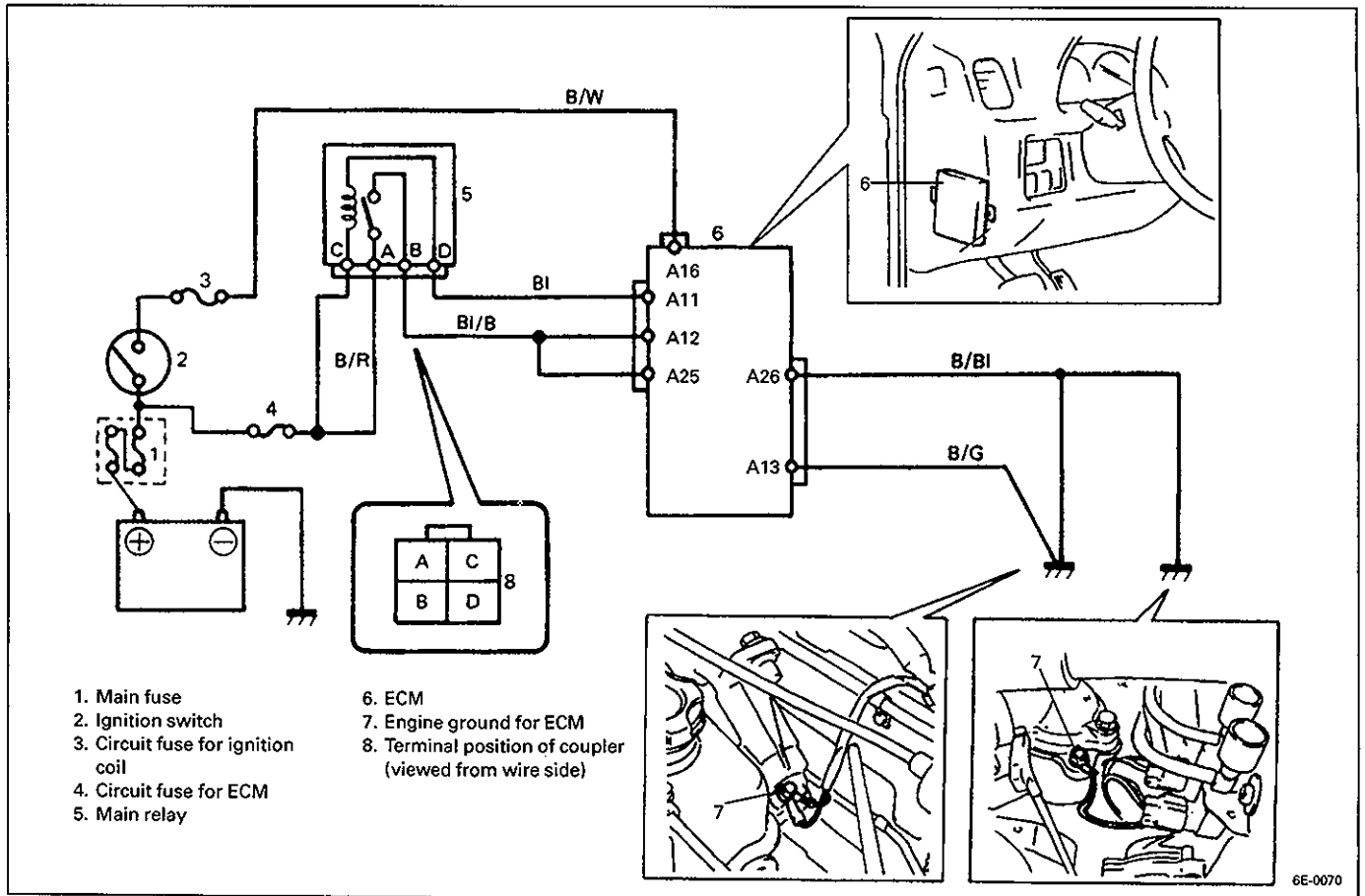
60G10-6E-G2-7-1S

DIAGNOSTIC FLOW CHART



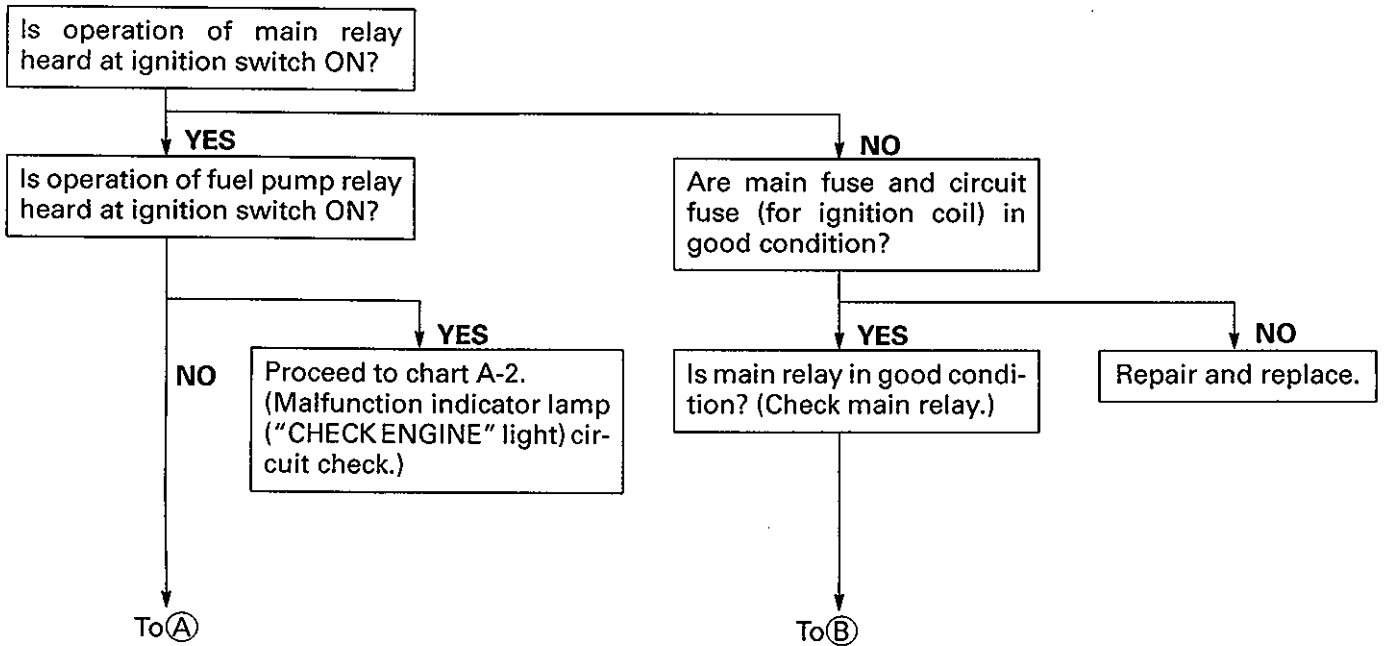
A-1 ECM POWER AND GROUND CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

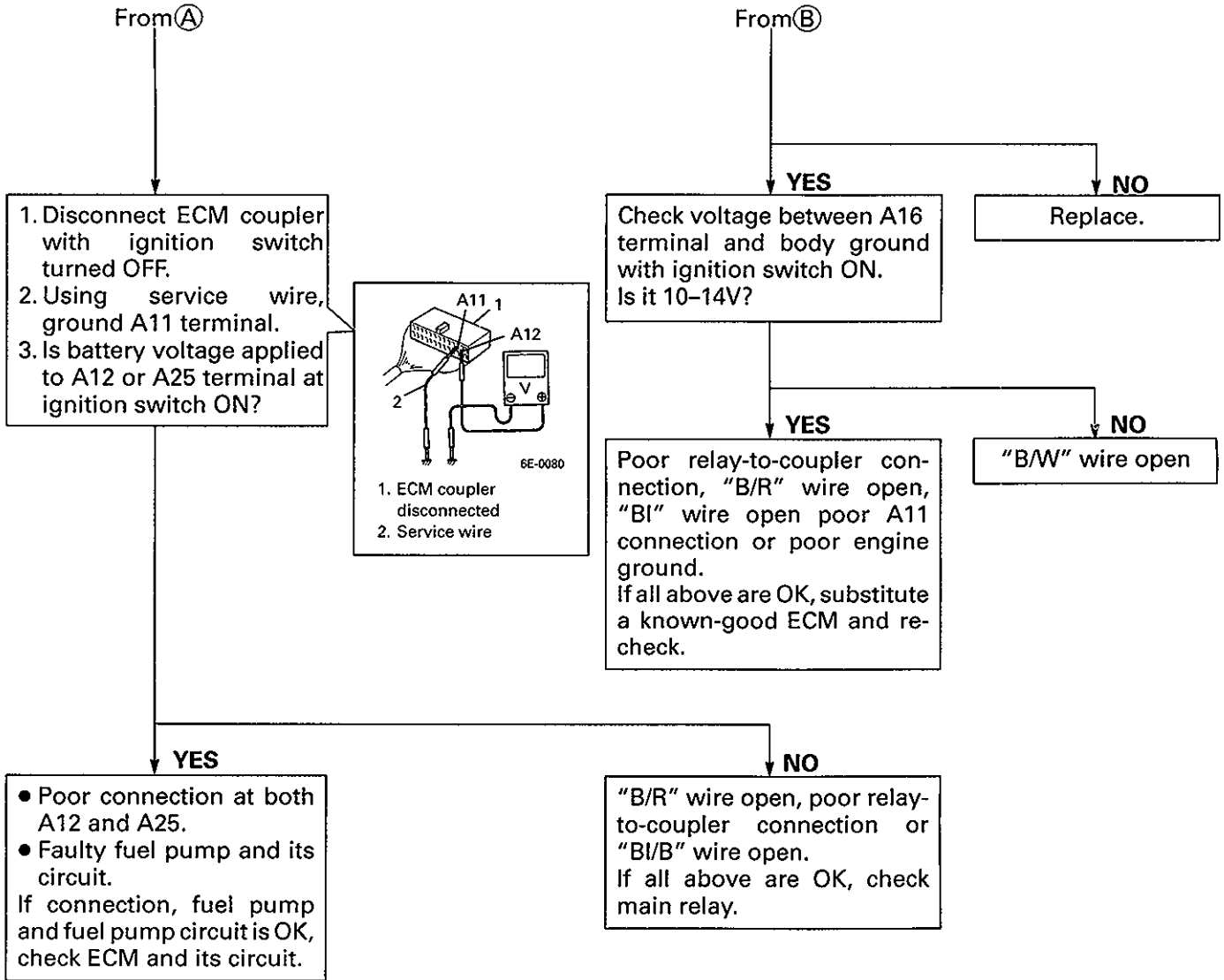


60G00-6E-G2-9-1S

6E-0070



60G00-6E-G2-9-4S



ECM AND ITS CIRCUIT CHECK

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.

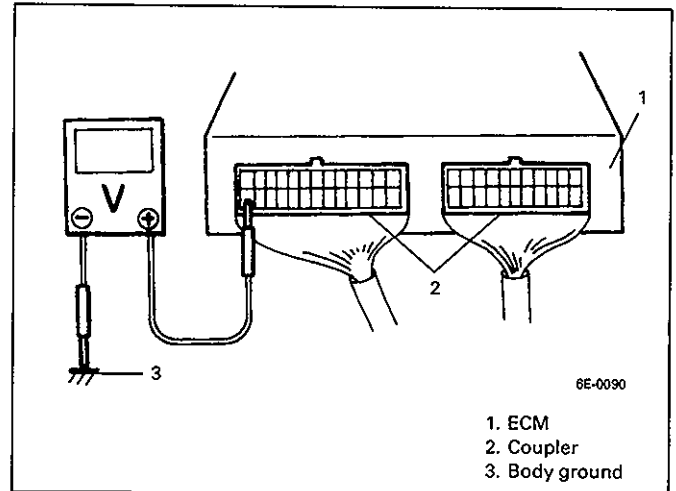
VOLTAGE CHECK

1. Remove radio speaker cover (front left side).
2. Remove radio speaker, if equipped.
3. Remove ECM with its bracket, fuse box, relays and wire harness from steering column holder.
4. Remove ECM cover.
5. Check that ECM couplers are connected securely.

6. Check voltage at each terminal of couplers connected.

NOTE:

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



TERMI-NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Injector ⊕	—	—
A2	Blank	—	—
A3			
A4	EVAP canister purge valve	10 - 14V	Ignition switch ON
A5	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	0 - 1V	Ignition switch ON
A6	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	10 - 14V	Ignition switch ON
A7	Blank	—	—
A8	Throttle opener vacuum switching valve	10 - 14V	Ignition switch ON
A9	Engine start switch (Engine start signal)	6 - 12V	While engine cranking
		0V	Other than above
A10	Blank	—	—
A11	Main relay	0 - 1V	Ignition switch ON
		10 - 14V	When over 3 sec. after ignition switch OFF
A12	Power source	10 - 14V	Ignition switch ON
A13	Ground	—	—
A14	Injector ⊖	—	—
A15	Ignition trigger signal	0 - 1V	Ignition switch ON
		0 - 3V	While engine cranking
A16	IAC valve	—	—

TERMI- NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A17	"CHECK ENGINE" light	0 - 1V	Ignition switch ON
		10 - 14V	When engine running
A18	Blank	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	10 - 14V	Ignition switch ON
A19	EGR vacuum switching valve (with EGR vacuum switching valve)	10 - 14V	Ignition switch ON
	EGR valve (stepper motor) (with EGR valve (stepper motor))	0 - 1V	Ignition switch ON
A20	Fuel pump relay	0 - 1V	For 3 sec. after ignition switch ON
		10 - 14V	When over 3 sec. after ignition switch ON
A21	Duty output terminal	—	—
A22	Oxygen sensor heater	10 - 14V	Ignition switch ON
		0 - 1V	Engine running at idle speed
A23	Air-conditioner circuit (if equipped)	10 - 14V	Ignition switch ON
		0 - 1V	With engine running Air-conditioner ON
A24	Test switch terminal	10 - 14V	Ignition switch ON
		0V	Ignition switch ON
A25	Power source	10 - 14V	Ignition switch ON
A26	Ground	—	—
B1	Ground of sensors	—	—
B2	Power source of sensors	4.75 - 5.25V	Ignition switch ON
B3	ECT	0.5 - 0.9V	Ignition switch ON Cooling water temperature: 80°C (176°F)
B4	Pressure sensor	3.6 - 4.4V	Ignition switch ON Barometric pressure: 760 mmHg
B5	ATS	2.2 - 3.0V	Ignition switch ON Sensor ambient temperature: 20°C (68°F)
B6	Oxygen sensor	Refer to Diagnostic Flow Chart for Code No. 13	
B7	TP sensor	0.5 - 1.2V	Ignition switch ON Throttle valve at idle position (with throttle opener rod drawn in by vacuum gauge)
		3.4 - 4.7V	Ignition switch ON Throttle valve at full open position
B8	CMP sensor	Indicator deflection repeated between 0V and about 5V	Ignition switch ON Crankshaft turned slowly
B9	Idle switch of TPS	0 - 1V	Ignition switch ON Throttle valve is at idle position (with throttle opener rod drawn in by vacuum pump gauge)
		4 - 5V	Ignition switch ON Throttle valve opens larger than idle position

TERMI- NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B10	VSS	Indicator deflection repeated between 0V and 4 – 5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
B11	Blank	_____	_____
B12	Power source of back-up circuit	10 – 14V	Ignition switch OFF and ON
B13	Power steering pressure switch (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	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 – 14V	Ignition switch ON
		0V	Ignition switch ON Diagnosis switch terminal grounded
B15	Data link connector	4 – 5V	When over 3 sec. after ignition switch ON
B16	Ignition switch	10 – 14V	Ignition switch ON
		0 – 1V	Ignition switch OFF
B17	Blank	_____	_____
B18			
B19			
B20			
B21			
B22	Ignition fail-safe signal (with EGR vacuum switching valve)	10 – 14V	Ignition switch ON
	Blank (with EGR valve (stepper motor))	_____	_____

RESISTANCE CHECK

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

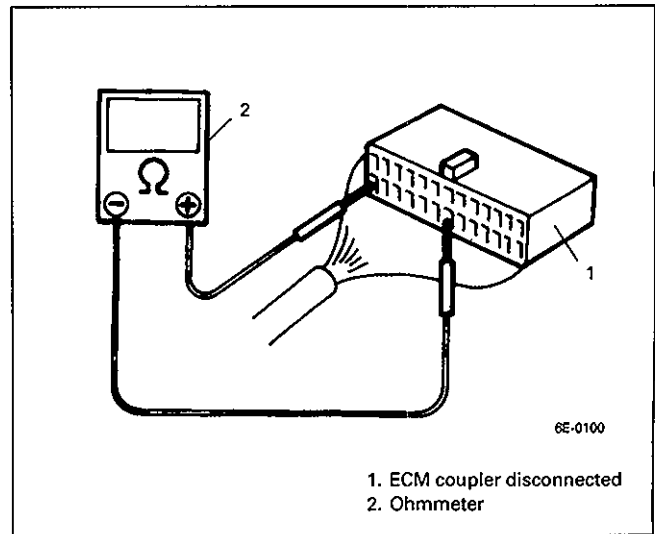
CAUTION:

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 table on the next page.

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	
B14 – Body ground	Diagnosis switch terminal	∞ (infinity)	_____	
A24 – Body ground	Test switch terminal	∞ (infinity)	_____	
A4 – A12	EVAP canister purge valve	30 – 38 Ω	_____	
A21 – Body ground	Duty output terminal	∞ (infinity)	_____	
B9 – B1	Idle switch	Continuity	Throttle valve is at idle position	
		∞ (infinity)	Throttle valve opens larger than idle position	
B10 – Body ground	VSS	Ohmmeter indicator deflects between 0 and ∞	Rear left tire turned slowly with rear right tire locked	
B5 – B1	ATS	2.28 – 2.87 k Ω	Sensor ambient temp. 20°C (68°F)	
B3 – B1	ECT	0.29 – 0.35 k Ω	Engine cooling water temp. 80°C (176°F)	
B7 – B1	TP sensor	0.3 – 2 k Ω	Throttle valve at idle position	with PS coupler disconnected
		2.0 – 6.5 k Ω	Throttle valve at full open position	
A19 – A12	EGR vacuum switching valve (vehicle with EGR vacuum switching valve)	33 – 39 Ω	_____	
A5 – A12	EGR valve (stepper motor) (vehicle with EGR valve (stepper motor))	19 – 25 Ω	_____	
A6 – A12			_____	
A18 – A12			_____	
A19 – A12			_____	
A16 – A12	IAC valve	11 – 14 Ω	_____	
A1 – A14	Fuel injector	0.8 – 1.8 Ω	_____	
A8 – A12	Throttle opener vacuum switching valve	33 – 39 Ω	_____	
B16 – A20	Fuel pump relay	56 – 84 Ω	_____	
A11 – B12	Main relay	56 – 84 Ω	_____	

SECTION 6E1

6E1

ELECTRONIC FUEL INJECTION SYSTEM

(SEQUENTIAL MULTIPOINT FUEL INJECTION)

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.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:

This section describes the electronic fuel injection system equipped with the immobilizer control system but only on the items different from those of the electronic fuel injection system not equipped with the immobilizer control system. Therefore, for the information on the electronic fuel injection system equipped with the immobilizer control system not found in this section and on the electronic fuel injection system not equipped with the immobilizer control system, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

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Engine Control Module (ECM)	6E1- 5
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DIAGNOSTIC FLOW CHART	6E1- 7
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Inspection of ECM and Its Circuits	6E1-10
Voltage Check	6E1-10
Resistance Check	6E1-13

GENERAL DESCRIPTION

The electronic fuel injection system equipped with the immobilizer control system differs from un-equipped one in following points.

- Position of each terminal of engine control module (ECM) changed and ignition switch terminal added

Without immobilizer control system

TERMINAL	CIRCUIT
A5	Fuel pump relay
A21	Blank
B22	Blank
B4	Blank
B15	
B17	
B18	



With immobilizer control system

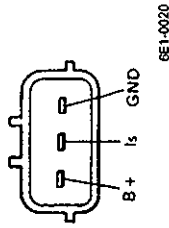
TERMINAL	CIRCUIT	
	with EGR vacuum switching valve	with EGR valve (stepper motor)
A5	Blank	
A21	Fuel pump relay	
B22	Ignition switch	
B4	Blank	EGR valve (stepper motor)
B5		
B17		
B18		

- Circuit from main fuse box to main relay changed

For the details of above changed or added items, refer to "ELECTRONIC CONTROL SYSTEM" in the next section.

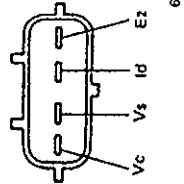
ELECTRONIC CONTROL SYSTEM

PARTS SIDE TERMINAL POSITION
MAF SENSOR



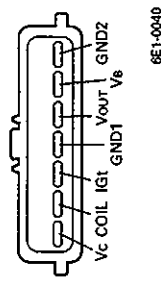
6E1-0020

TP SENSOR



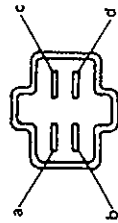
6E1-0030

IGNITER

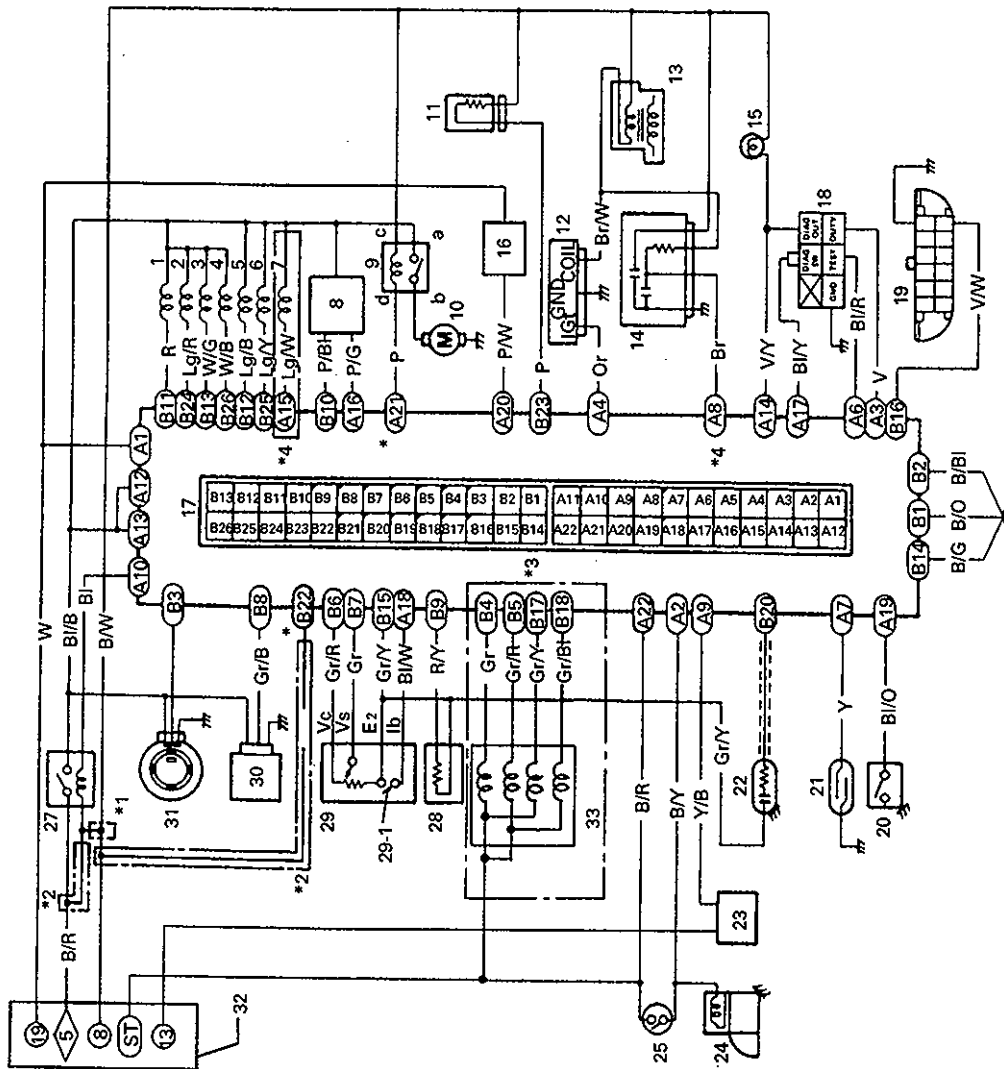


6E1-0040

MAIN & FUEL PUMP RELAY



6E1-0050



6E1-0010

NOTE:

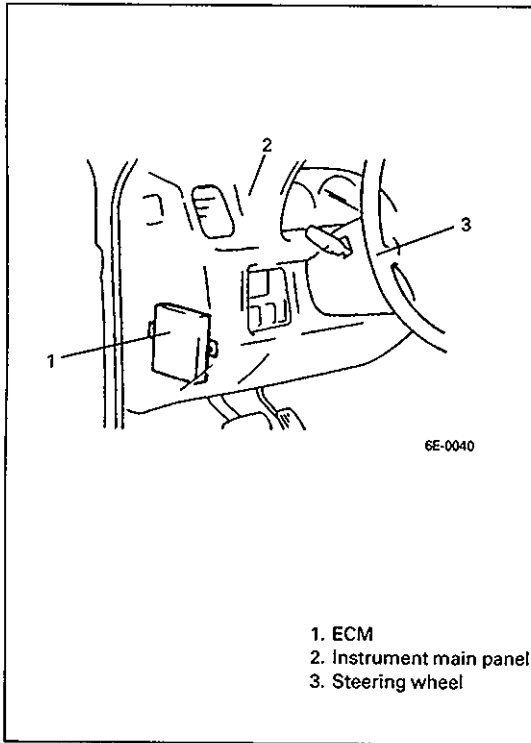
- *1 marked circuit is used in vehicles without immobilizer control system.
- *2 marked circuit is used in vehicles with immobilizer control system.
- *3 marked circuit is used in vehicles with EGR valve (stepper motor).
- *4 marked circuit is used in vehicles with EGR vacuum switching valve.
- * marked terminal is a terminal which has been newly added or whose position has been changed due to installation of immobilizer control system.

TERMINAL	CIRCUIT		TERMINAL	CIRCUIT
	with EGR vacuum switching valve	with EGR valve (stepper motor)		
A1	Power source		B3	Camshaft position sensor
A2	Engine start switch		B4	Blank
A3	Duty output terminal		B5	Blank
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	Ignition coil (IGf)	Blank	B10 (4 A/T model)	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	EGR vacuum switching valve (if equipped)		B17	Blank
A16 (A/T only)	Torque converter clutch relay (3 A/T model) or transmission control module (Coolant temp. signal) (4A/T model)		B18	Blank
A17	Diag. switch terminal		B19	Blank
A18	Idle switch (in TP sensor)		B20	Heated oxygen sensor (if equipped)
A19	Power steering pressure switch (if equipped)		B21	Blank
A20	ABS control module switch (if equipped)		*B22	Ignition switch
*A21	Fuel pump relay		B23	Heated oxygen sensor heater (if equipped)
A22 (A/T only)	Idle switch (in TP sensor)		B24	Injector No.2
B1	Ground		B25	EVAP SP valve
B2	Ground		B26	Injector No.4

NOTE:
* marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system

- Wire color
- B : Black
 - B/G : Black/Green
 - B/BI : Black/Blue
 - B/R : Black/Red
 - B/Y : Black/Yellow
 - BI : Blue
 - BI/B : Blue/Black
 - BI/G : Blue/Green
 - BI/O : Blue/Orange
 - BI/R : Blue/Red
 - BI/W : Blue/White
 - BI/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/BI : 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

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 solenoid purge valve
 7. EGR solenoid vacuum valve (if equipped)
 8. Transmission control module (4 A/T model)
 9. Fuel pump relay
 10. Fuel pump
 11. Heated oxygen sensor heater (if equipped)
 12. Igniter (in distributor)
 13. Ignition coil (in distributor)
 14. Noise suppressor (vehicle with EGR vacuum switching valve)
 15. Malfunction indicator lamp ("CHECK ENGINE" light)
 16. ABS control module (if equipped)
 17. ECM
 18. Monitor coupler
 19. Data link connector (Assembly line diag. link)
 20. Power steering pressure switch (if equipped)
 21. VSS
 22. Heated oxygen sensor (if equipped)
 23. A/C amplifier (if equipped)
 24. Starter magnetic switch
 25. Shift switch (4 A/T model)
 26. Blank
 27. Main relay
 28. ECT sensor
 29. TP sensor
 - 29-1. Idle switch
 30. MAF sensor
 31. CMP sensor
 32. To fuse
- The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Refer to SECTION 8)
33. EGR valve (stepper motor) (if equipped)



60G00-6E1-G2-5-1S

Engine Control Module (ECM)

ECM for immobilizer control system has following additional function.

- On-board diagnostic system (Self-diagnosis function) for immobilizer control system.

For more information on above item for immobilizer control system, refer to Section 8A of this manual.

NOTE:

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.

However, if Malfunction indicator lamp ("CHECK ENGINE" light) blinks, Immobilizer control system is in malfunction.

DIAGNOSIS

Contents of this DIAGNOSIS section are following items only.

- DIAGNOSTIC FLOW CHART
- A-1 ECM POWER AND GROUND CIRCUIT CHECK
- INSPECTION OF ECM AND ITS CIRCUITS

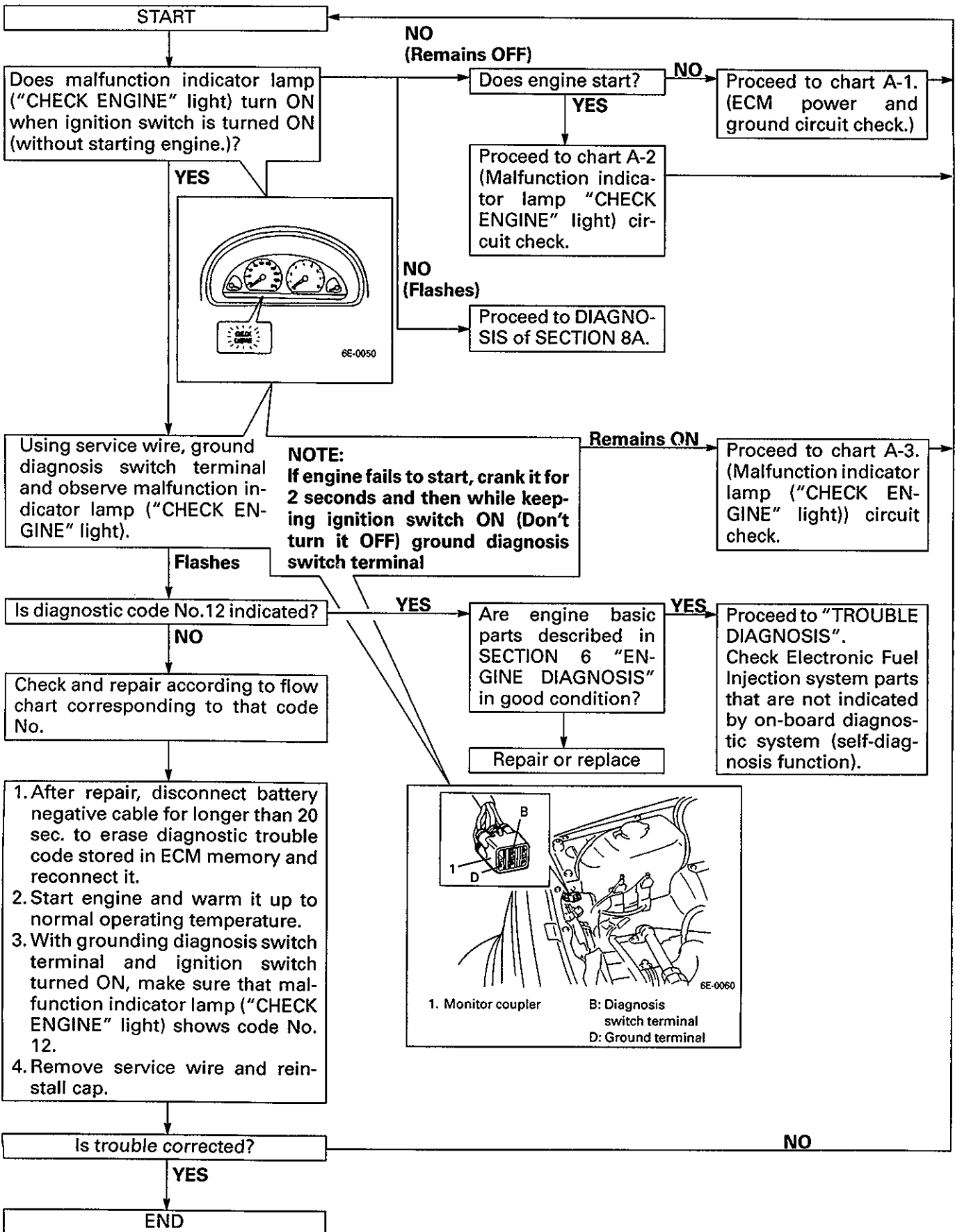
For other items, refer to the same section of Service Manual mentioned in FOREWORD of this manual. At the same time use care for changed items described in the previous section.

NOTE:

When ECM on the vehicle equipped with the immobilizer control system was replaced, including when replaced because re-checking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.

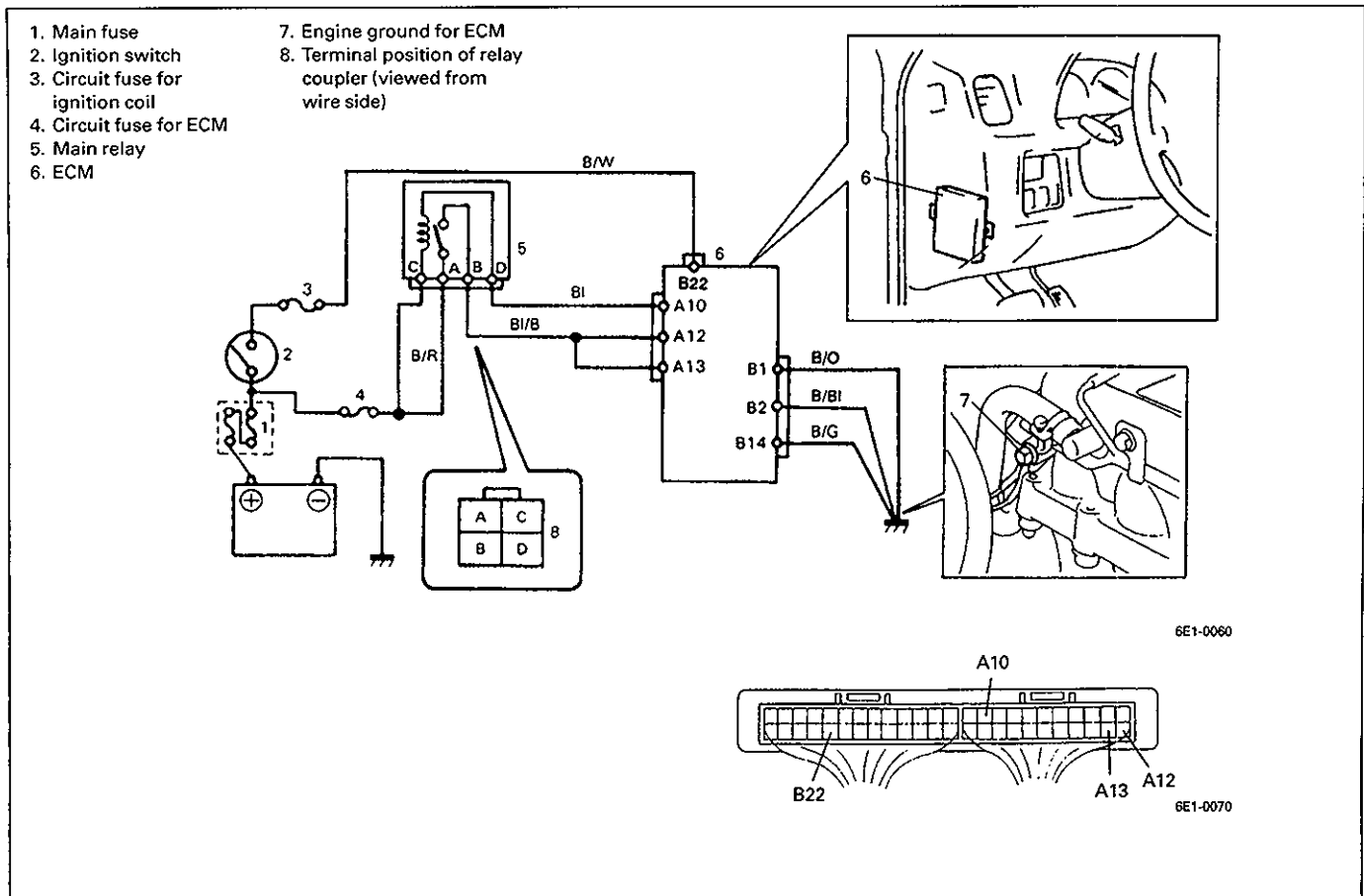
For more information, refer to "Procedure after ECM Replacement" in SECTION 8A.

DIAGNOSTIC FLOW CHART

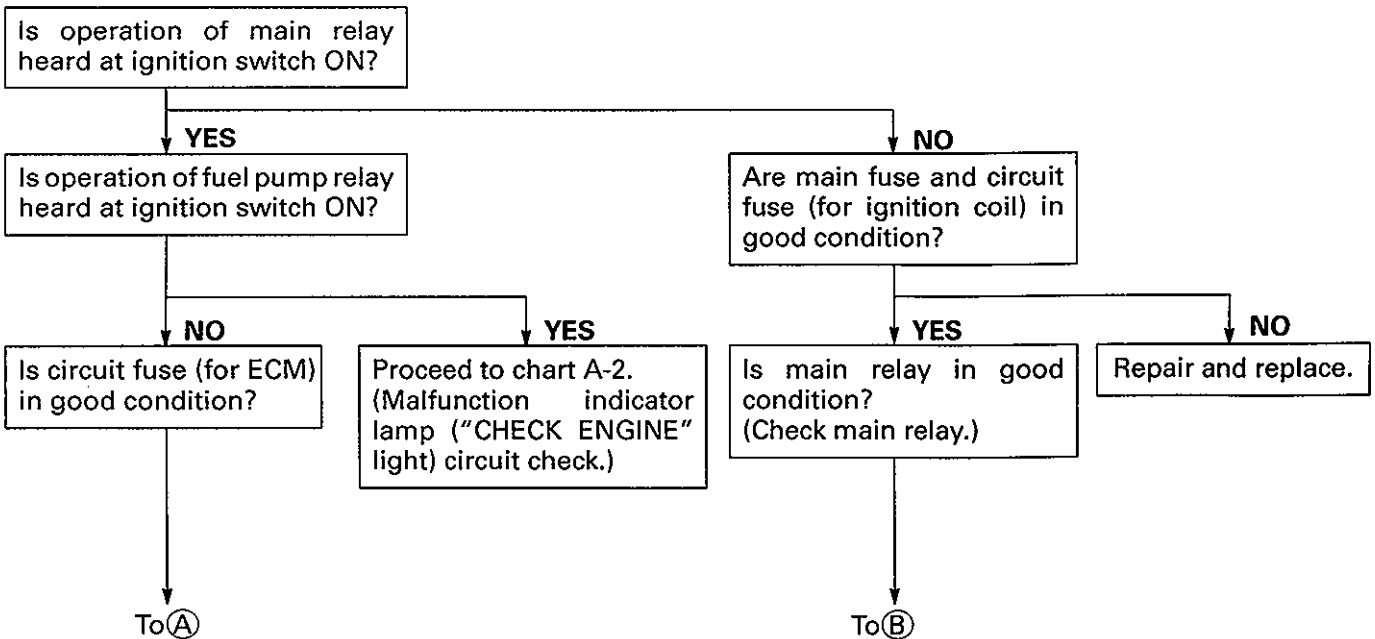


A-1 ECM POWER AND GROUND CIRCUIT CHECK

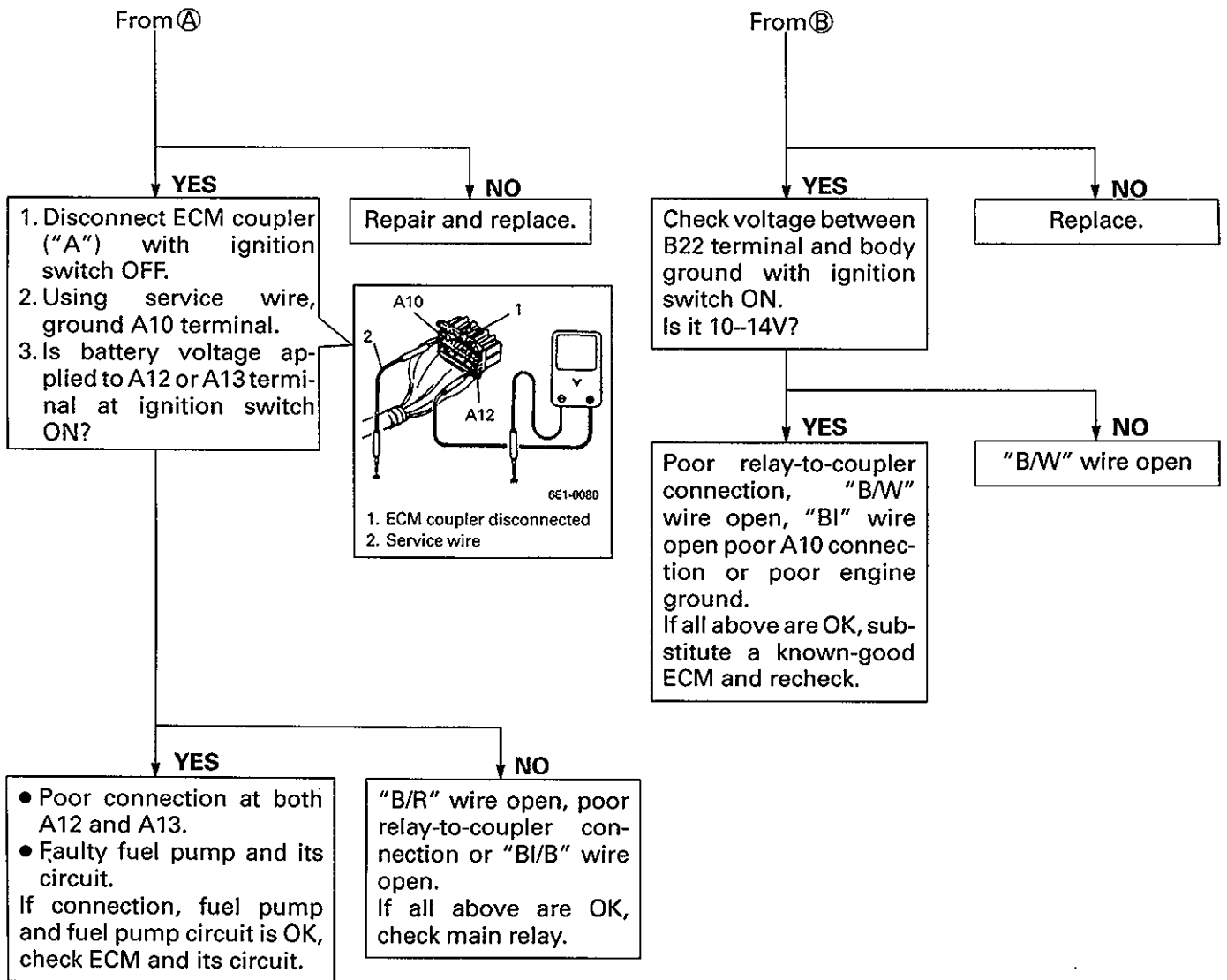
(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

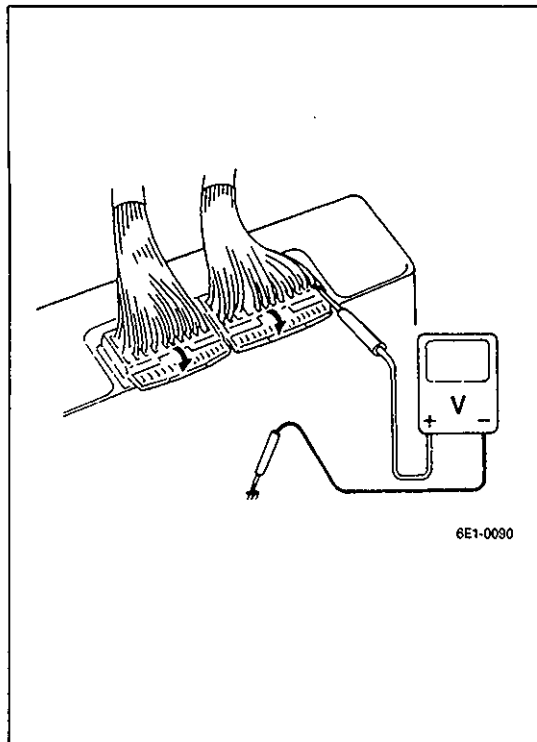


60G00-6E1-G2-8-1S



60G00-6E1-G2-8-4S





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.

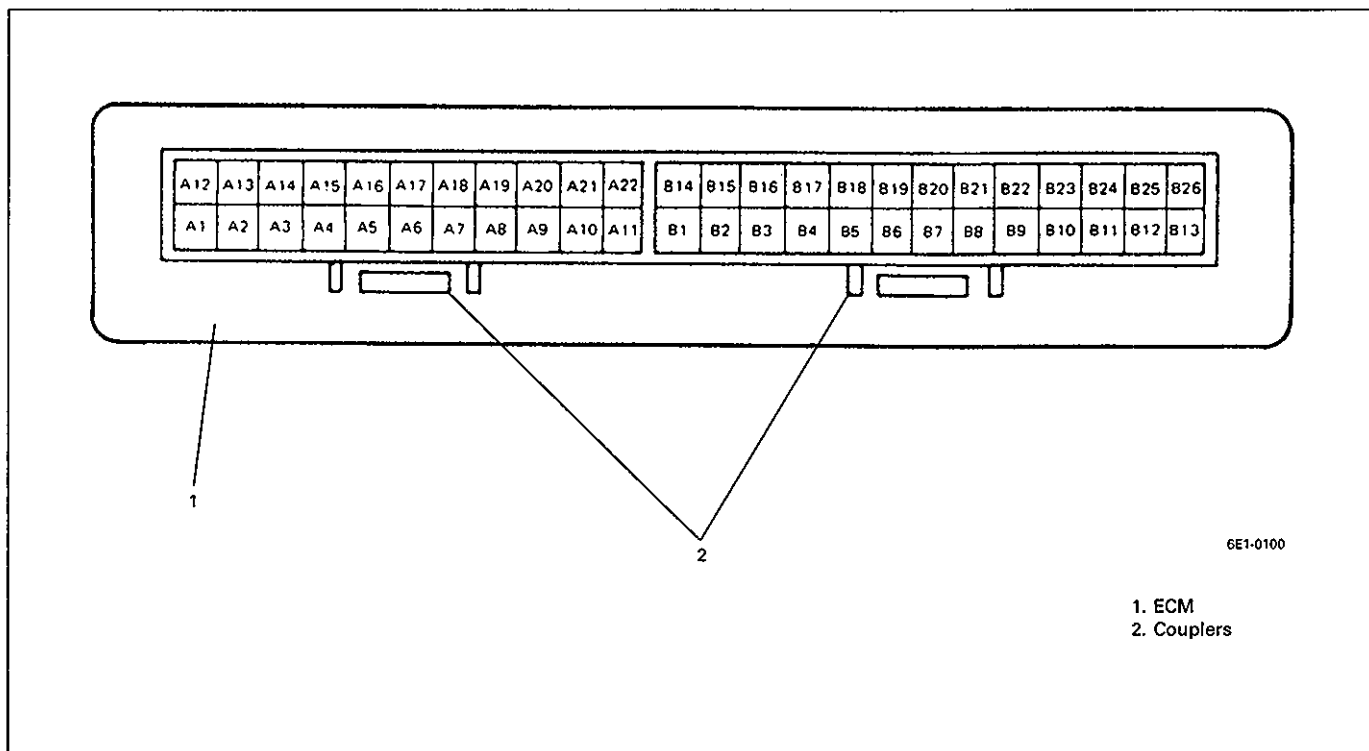
Voltage Check

- 1) Remove ECM from body.
- 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 11V or more when ignition switch is ON.

60G00-6E1-G2-10-1S



6E1-0100

1. ECM
2. Couplers

60G00-6E1-G2-10-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Power source for back-up circuit	10 – 14V	Ignition switch ON and OFF
A2	Engine start switch (Engine start signal)	6 – 12V	While engine cranking
		0V	Other than above
A3	Duty output terminal	—	—
A4	Ignition trigger signal	0 – 1V	Ignition switch ON
		Between 0 – 1 and 4 – 5V	While engine cranking
*A5	Blank	—	—
A6	Test switch terminal	10 – 14V	Ignition switch ON
		0V	Ignition switch ON Test switch terminal grounded
A7	VSS	Indicator deflection repeated between 0V and 4 – 5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A8	Ignition fail-safe signal (vehicle with EGR vacuum switching valve)	10 – 14V	Ignition switch ON
A9	Air conditioning circuit (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running A/C ON
A10	Main relay	0 – 1V	Ignition switch ON
		10 – 14V	When over 3 sec. after ignition switch OFF
A11	Blank	—	—
A12 A13	Power source	10 – 14V	Ignition switch ON
A14	Malfunction indicator lamp ("CHECK ENGINE" light)	0 – 1V	Ignition switch ON
		10 – 14V	Engine running
A15	EGR vacuum switching valve (if equipped)	10 – 14V	Ignition switch ON
A16 (A/T only)	TCC relay for A/T (3 A/T model)	10 – 14V	Ignition switch ON
		0 – 1V	With "D" range position, driving vehicle at 67 km/h (42 mile/h) on flat road and keep it for 4 seconds or more
	Transmission control module (coolant temp. switch signal) (4 A/T model)	0 – 1V	Ignition switch ON Engine coolant temp.: below 25°C (77°F)
		10 – 14V	Ignition switch ON Engine coolant temp.: over 30°C (86°F)
A17	Diag. switch terminal	10 – 14V	Ignition switch ON
		0 – 1V	Ignition switch ON Diag. switch terminal grounded
A18	Idle switch (in TP sensor)	0 – 1V	Ignition switch ON Throttle valve at idle position
		3 – 5V	Ignition switch ON Throttle valve opens larger than idle position
A19	Power steering pressure switch (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running at idle speed, turning steering wheel to the right or left as far as it stops

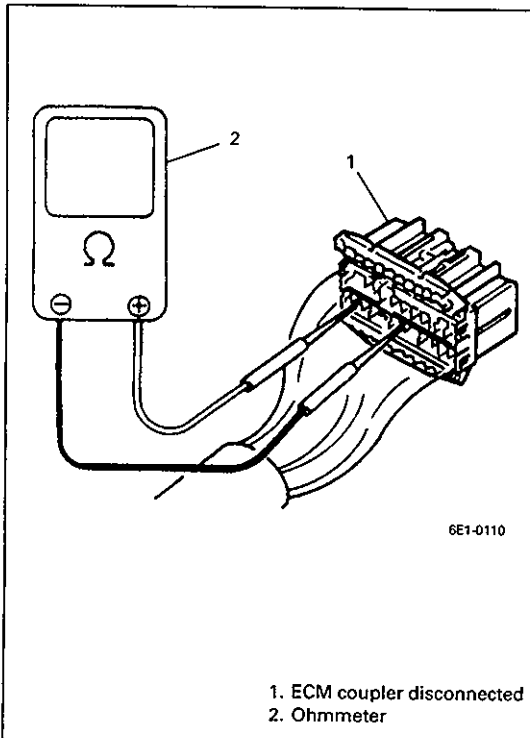
TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A20	ABS control module (if equipped)	10 – 14V	Ignition switch ON ABS (antilock brake system) doesn't operate
*A21	Fuel pump relay	0 – 1V	For 3 seconds after ignition switch ON
		10 – 14V	After the above time
A22 (A/T only)	Shift switch	0 – 1V	Ignition switch ON Selector lever in "P" or "N" range
		10 – 14V	Ignition switch ON Selector lever in "R", "D", "2" or "L" range
B1 B2	Ground	—	—
B3	CMP sensor	Indicator deflection repeated between 0 – 1V and 3 – 5V	Ignition switch ON Crankshaft turned slowly
B4	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	0 – 1V	Ignition switch ON
B5	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	10 – 14V	Ignition switch ON
B6	Power source for sensors	4.75 – 5.25V	Ignition switch ON
B7	TP sensor	0.5 – 1.2V	Ignition switch ON Throttle valve at idle position
		3.4 – 4.7V	Ignition switch ON Throttle valve at full open position
B8	MAF sensor	1.0 – 1.6V	Ignition switch ON
		1.7 – 2.0V	With engine running at idle speed
B9	ECT sensor	0.5 – 0.9V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
B10 (4 A/T only)	Transmission control module (Throttle valve opening signal)	—	Ignition switch ON Voltage varies as specified at graph in Section "THROTTLE VALVE OPENING SIGNAL OUTPUT FOR TCM" while throttle valve is opened gradually.
B11	Injector No.1	10 – 14V	Ignition switch ON
B12	Idle air control valve	10 – 14V	Ignition switch ON
B13	Injector No.3	10 – 14V	Ignition switch ON
B14	Ground	—	—
B15	Sensor ground	—	—
B16	Data link connector	4 – 5V	When over 3 sec. after ignition switch ON
B17	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	10 – 14V	Ignition switch ON

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B18	Blank (with EGR vacuum switching valve)	—	—
	EGR valve (stepper motor) (with EGR valve (stepper motor))	0 – 1V	Ignition switch ON
B19	Blank	—	—
B20	Oxygen sensor (if equipped)	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 – 14V	Ignition switch ON
		0 – 1V	Ignition switch OFF
B23	Heated oxygen sensor heater (if equipped)	10 – 14V	Ignition switch ON
B24	Injector No.2	10 – 14V	Ignition switch ON
B25	EVAP SP valve	10 – 14V	Ignition switch ON
B26	Injector No.4	10 – 14V	Ignition switch ON

NOTE:

* marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system.

60G10-6E1-G2-13-1S



60G00-6E1-G2-13-3S

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).

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
*A21 – *B22	Fuel pump relay	56 – 84Ω	—
A7 – Body ground	VSS	Ohmmeter indicator deflect between 0 and ∞	Rear left tire turned slowly with rear right tire locked

60G10-6E1-G2-13-5S

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
A15 – A12	EGR vacuum switching valve (if equipped)	30 – 38Ω	_____
A16 – A12 (3 A/T model)	TCC relay	90 – 110Ω	_____
A17 – Body ground	Diag. switch terminal	∞ (infinity)	_____
A18 – B15	Idle switch	continuity	Throttle valve is at idle position
		∞ (infinity)	Throttle valve opens larger than idle position
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 – A22 B5 – A22 B17 – A22 B18 – A22	EGR valve (stepper motor) (vehicle with EGR valve (stepper motor))	19 – 25Ω	_____
B7 – B15	TP sensor	0.3 – 2.0kΩ	Throttle valve at idle position
		2.0 – 6.5kΩ	Throttle valve at full open position
B9 – B15	ECT sensor	0.29 – 0.35kΩ	Engine cooling water temp. 80°C (176°F)
B11 – A12	Fuel injector No.1	12 – 17Ω	_____
B12 – A12	Idle air control valve	11 – 14Ω	_____
B13 – A12	Fuel injector No.3	12 – 17Ω	_____
B14 – Body ground	Ground	continuity	_____
B24 – A12	Fuel injector No.2	12 – 17Ω	_____
B25 – A12	EVAP SP valve	28 – 36Ω	_____
B26 – A12	Fuel injector No.4	12 – 17Ω	_____
A10 – A1	Main relay	56 – 84Ω	_____

NOTE:

* marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system.

GROUP 3

GROUP 3

SUZUKI

SV620

SUPPLEMENTARY SERVICE MANUAL

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 components 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 SV620 SERVICE MANUAL and has been prepared exclusively for SV620 equipped with immobilizer control system.

Applicable model: SV620 equipped with immobilizer control system

This SUPPLEMENTARY SERVICE MANUAL contains service information for vehicles equipped with the immobilizer control system but only on different items as compared to those without the immobilizer control system and except the contents of "SECTION 8A : Immobilizer Control System".

Therefore, whenever servicing immobilizer control system of SV620, consult this supplement first. And for any section, item or description not found in this supplement (GROUP 3), refer to the below listed SERVICE MANUAL and SECTION 8A in this 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 (Sequential Multi-port Fuel Injection for H20A Type Engine/For SV620 equipped with ignitor)

6E2

NOTE:

For SV620 equipped with immobilizer control system and not igniter, refer to SV620 SUPPLEMENTARY SERVICE MANUAL(99501-85F10)

RELATED SERVICE MANUAL

- SV620 SERVICE MANUAL (99500-85F00)
- VITARA SUPPLEMENTARY SERVICE MANUAL (99501-61A10)

SUZUKI MOTOR CORPORATION

OVERSEAS SERVICE DEPARTMENT

SECTION 6E2

ELECTRONIC FUEL INJECTION SYSTEM**(SEQUENTIAL MULTIPOINT FUEL INJECTION
FOR H20A TYPE ENGINE)****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.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:

This section describes the electronic fuel injection system equipped with the immobilizer control system but only on the items different from those of the electronic fuel injection system not equipped with the immobilizer control system. Therefore, for the information on the electronic fuel injection system equipped with the immobilizer control system not found in this section and on the electronic fuel injection system not equipped with the immobilizer control system, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

GENERAL DESCRIPTION	6E2- 2
ELECTRONIC CONTROL SYSTEM	6E2- 3
Engine Control Module (ECM)	6E2- 5
DIAGNOSIS	6E2- 6
DIAGNOSTIC FLOW CHART	6E2- 7
A-1 ECM Power and Ground Circuit Check	6E2- 8
Inspection of ECM and Its Circuits	6E2-10
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Resistance Check	6E2-14

GENERAL DESCRIPTION

The electronic fuel injection system of the vehicle equipped with the immobilizer control system differs from that of the vehicle without the immobilizer control system mainly in following points.

- Position of each terminal of engine control module (ECM)

Without immobilizer control system

TERMINAL	CIRCUIT
A8 A9	CMP sensor (Reference signal)
A10 A11	CMP sensor (Position signal)
B7	Blank
C7	Ignition switch

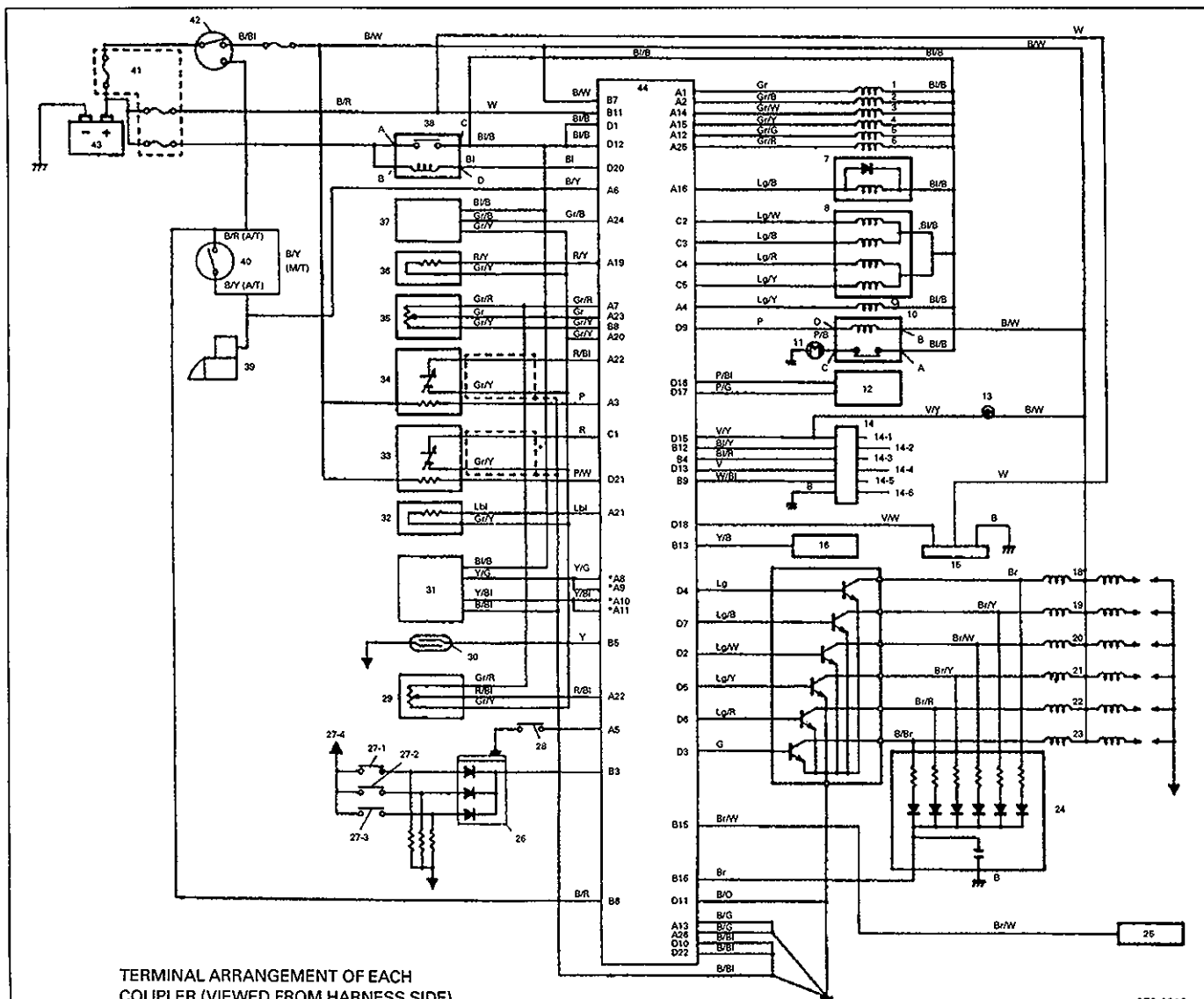


With immobilizer control system

TERMINAL	CIRCUIT
A8 A9	CMP sensor (Position signal)
A10 A11	CMP sensor (Reference signal)
B7	Ignition switch
C7	Blank

For the details of these differences (due to change or addition), refer to the next section "ELECTRONIC CONTROL SYSTEM".

ELECTRONIC CONTROL SYSTEM

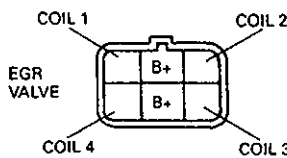


TERMINAL ARRANGEMENT OF EACH COUPLER (VIEWED FROM HARNESS SIDE)

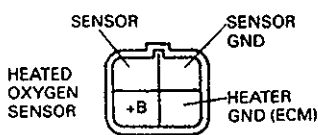
ECM

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B1	B2	B3	B4	B5	B6	B7	B8	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	B9	B10	B11	B12	B13	B14	B15	B16	C7	C8	C9	C10	C11	C12	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22

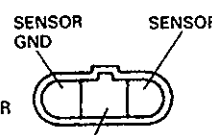
6E2-0010



6E2-0030



6E2-0040



6E2-0020



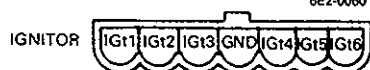
6E2-0060



6E2-0070



6E2-0050



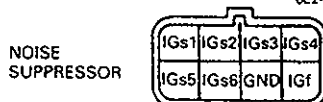
6E2-0090



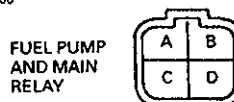
6E2-0100

IGt: Ignition trigger signal
IGs: Ignition signal
IGf: Ignition fail safe signal

6E2-0080



6E2-0110



6E2-0120

NOTE:

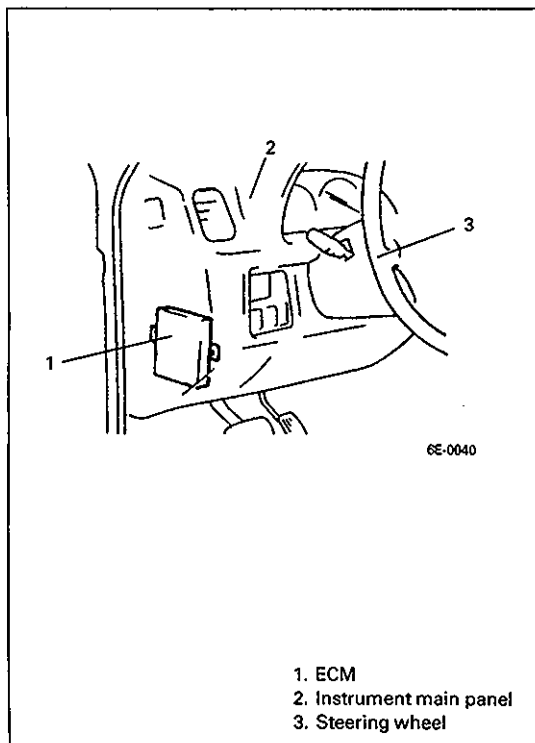
* marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.

1. No.1 injector
2. No.2 injector
3. No.3 injector
4. No.4 injector
5. No.5 injector
6. No.6 injector
7. IAC valve
8. EGR valve (stepper motor) (if equipped)
9. EVAP canister purge valve
10. Fuel pump relay
11. Fuel pump
12. Transmission control module (A/T vehicle only)
13. Malfunction indicator lamp ("CHECK ENGINE" light)
14. Monitor coupler
- 14-1. Diagnosis output terminal
- 14-2. Diagnosis switch terminal
- 14-3. Test switch terminal
- 14-4. Duty output terminal
- 14-5. A/F duty (Right bank, B2) output terminal
- 14-6. Ground terminal
15. Data link connector
16. A/C amplifier
17. Ignitor
18. No.1 ignition coil
19. No.2 ignition coil
20. No.3 ignition coil
21. No.4 ignition coil
22. No.5 ignition coil
23. No.6 ignition coil
24. Noise suppressor
25. Tachometer
26. Electric load signal diodes
- 27-1. Small light switch
- 27-2. Heater fan motor switch
- 27-3. Rear defogger switch
- 27-4. From battery
28. Power steering pressure switch
29. CO adjusting resistor (if equipped)
30. Vehicle speed sensor (Reed switch in speedometer)
31. CMP sensor
32. IAT sensor
33. Right bank heated oxygen sensor (if equipped)
34. Left bank heated oxygen sensor (if equipped)
35. Throttle position sensor
36. ECT sensor
37. MAF sensor
38. Main relay
39. Starter magnetic switch
40. Transmission range switch (A/T vehicle only)
41. Main fuse
42. Main switch
43. Battery
44. ECM

TER-MINAL	CIRCUIT	TER-MINAL	CIRCUIT
A1	No.1 injector	C1	Right bank heated oxygen sensor (Bank 2 HO2S), if equipped
A2	No.2 injector	C2	EGR valve (stepper motor coil 1), if equipped
A3	Left bank heated oxygen sensor heater (Bank 1 HO2S heater), if equipped	C3	EGR valve (stepper motor coil 2), if equipped
A4	EVAP canister purge valve	C4	EGR valve (stepper motor coil 3), if equipped
A5	Power steering pressure switch	C5	EGR valve (stepper motor coil 4), if equipped
A6	Engine start switch	C6	Blank
A7	Power source (for sensors)	*C7	
*A8	CMP sensor (Position signal)	C8	
*A9		C9	
*A10	CMP sensor (Reference signal)	C10	
*A11		C11	
A12	No.5 injector	C12	
A13	Ground		
A14	No.3 injector	D1	Power source
A15	No.4 injector	D2	Ignitor (No.3 cylinder)
A16	IAC valve	D3	Ignitor (No.6 cylinder)
A17	Blank	D4	Ignitor (No.1 cylinder)
A18		D5	Ignitor (No.4 cylinder)
A19	ECT sensor	D6	Ignitor (No.5 cylinder)
A20	Sensor ground	D7	Ignitor (No.2 cylinder)
A21	IAT sensor	D8	Blank
A22	Left bank heated oxygen sensor (Bank 1 HO2S) or CO adjusting resistor	D9	Fuel pump relay
A23	Throttle position sensor	D10	Ground
A24	MAF sensor	D11	
A25	No.6 injector	D12	Power source
A26	Ground	D13	Duty output terminal
B1	Blank	D14	Blank
B2		D15	Diagnosis output terminal and MIL ("CHECK ENGINE" light)
B3	Electric load signal diodes	D16	Throttle valve opening signal to TCM (A/T vehicle only)
B4	Test switch terminal	D17	Engine coolant signal to TCM (A/T vehicle only)
B5	Vehicle speed sensor	D18	Data link connector
B6	Transmission range switch	D19	Blank
*B7	Ignition switch	D20	Main relay
B8	Sensor ground	D21	Right bank heated oxygen sensor heater (Bank 2 HO2S heater), if equipped
B9	A/F duty (Right bank, B2) output terminal	D22	Ground
B10	Blank		
B11	Power source for back-up		
B12	Diagnosis switch terminal		
B13	A/C amplifier (if equipped)		
B14	Blank		
B15	Tachometer		
B16	Noise suppressor (ignition fail safe signal)		

NOTE:

*** marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.**



60G10-6E2-G3-5-1S

Engine Control Module (ECM)

ECM for immobilizer control system has following additional function.

- On-board diagnostic system (Self-diagnosis function) for immobilizer control system.

For more information on above item for immobilizer control system, refer to Section 8A of this manual.

NOTE:

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.

However, if Malfunction indicator lamp ("CHECK ENGINE" light) blinks, Immobilizer control system is in malfunction.

DIAGNOSIS

Contents of this DIAGNOSIS section are following items only.

- DIAGNOSTIC FLOW CHART
- A-1 ECM POWER AND GROUND CIRCUIT CHECK
- INSPECTION OF ECM AND ITS CIRCUITS

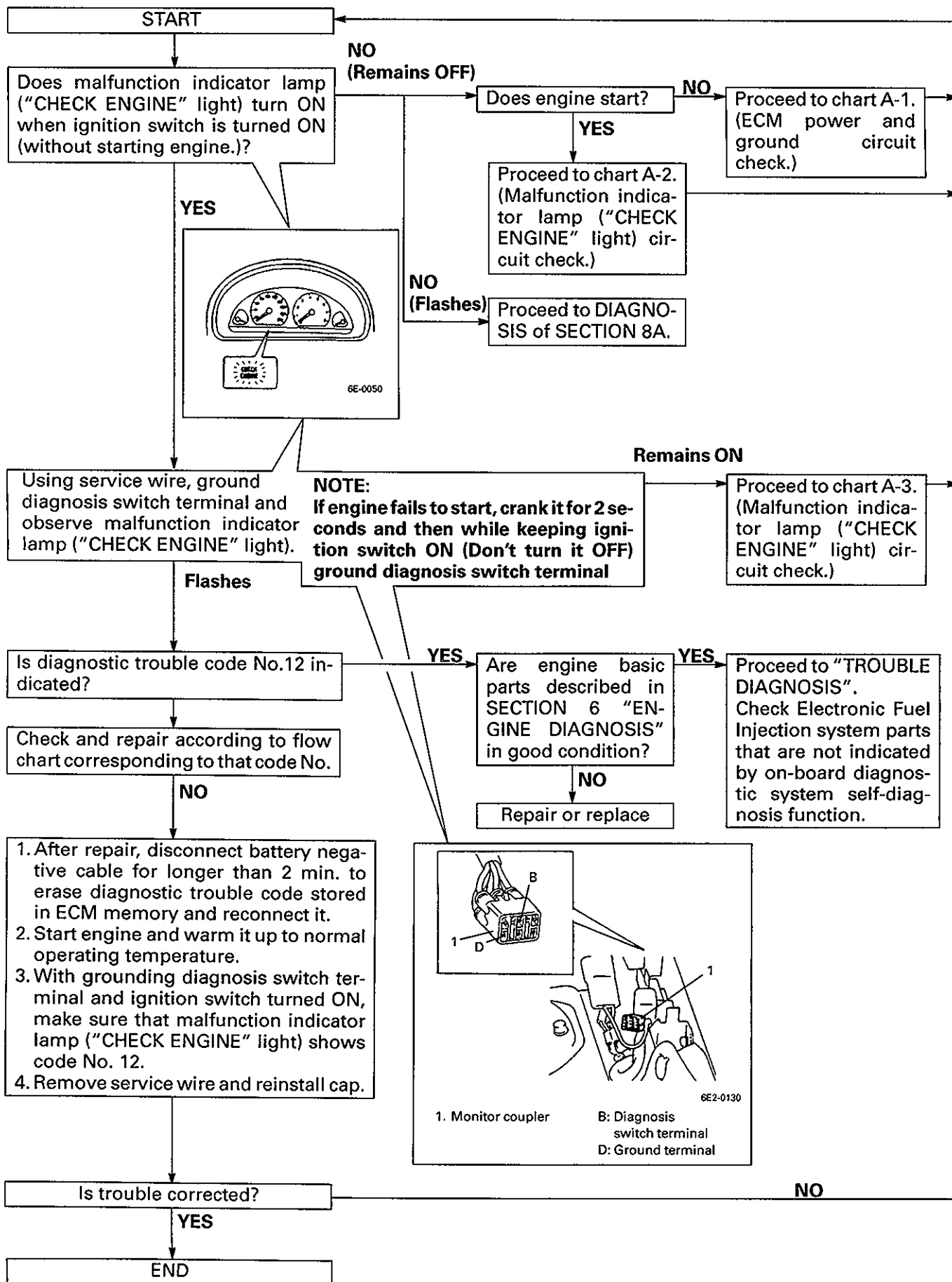
For other items, refer to the same section of Service Manual mentioned in FOREWORD of this manual. At the same time use care for changed items described in the previous section.

NOTE:

When ECM on the vehicle equipped with the immobilizer control system was replaced, including when replaced because re-checking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.

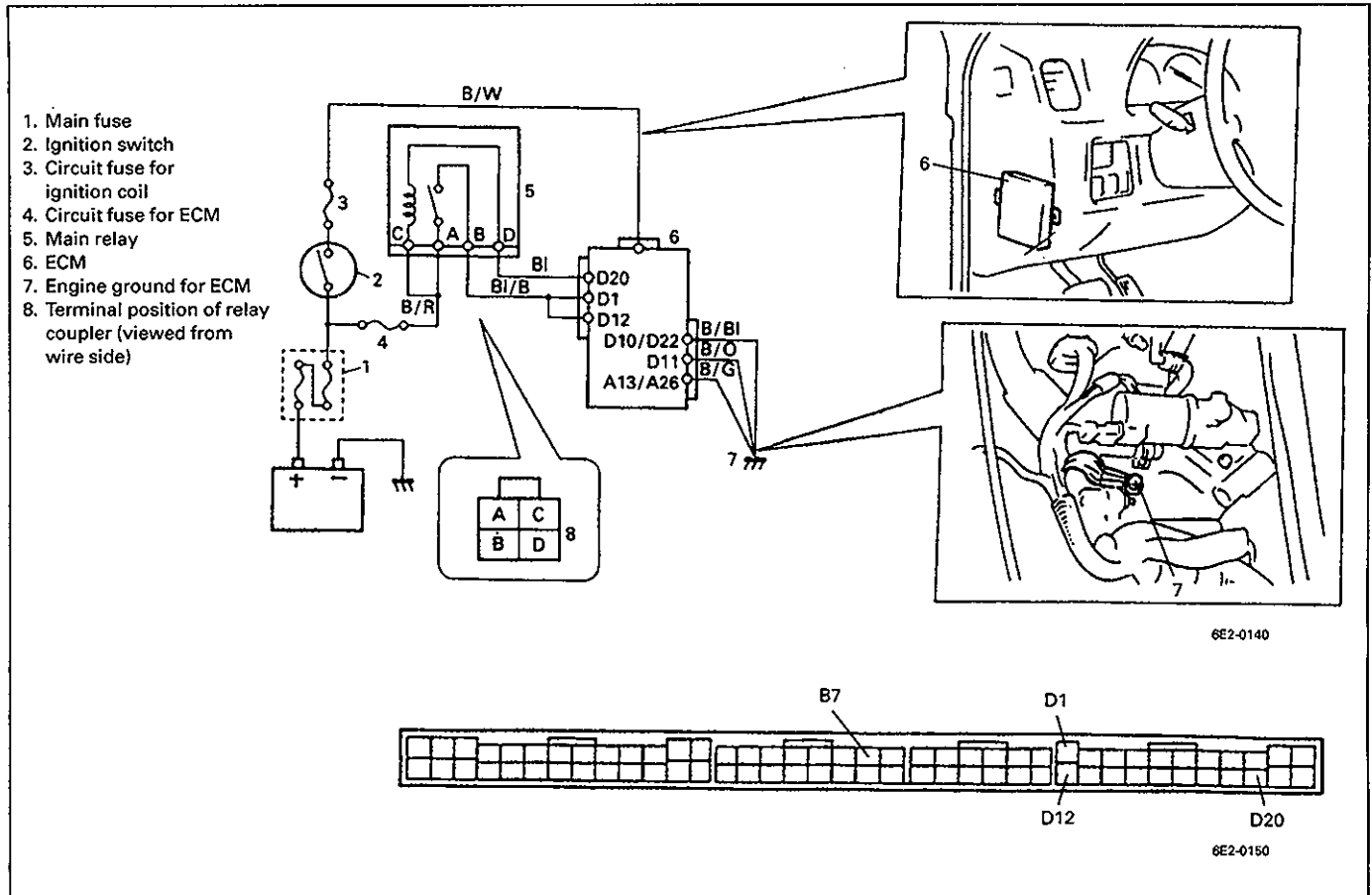
For more information, refer to "Procedure after ECM Replacement" in SECTION 8A.

DIAGNOSTIC FLOW CHART

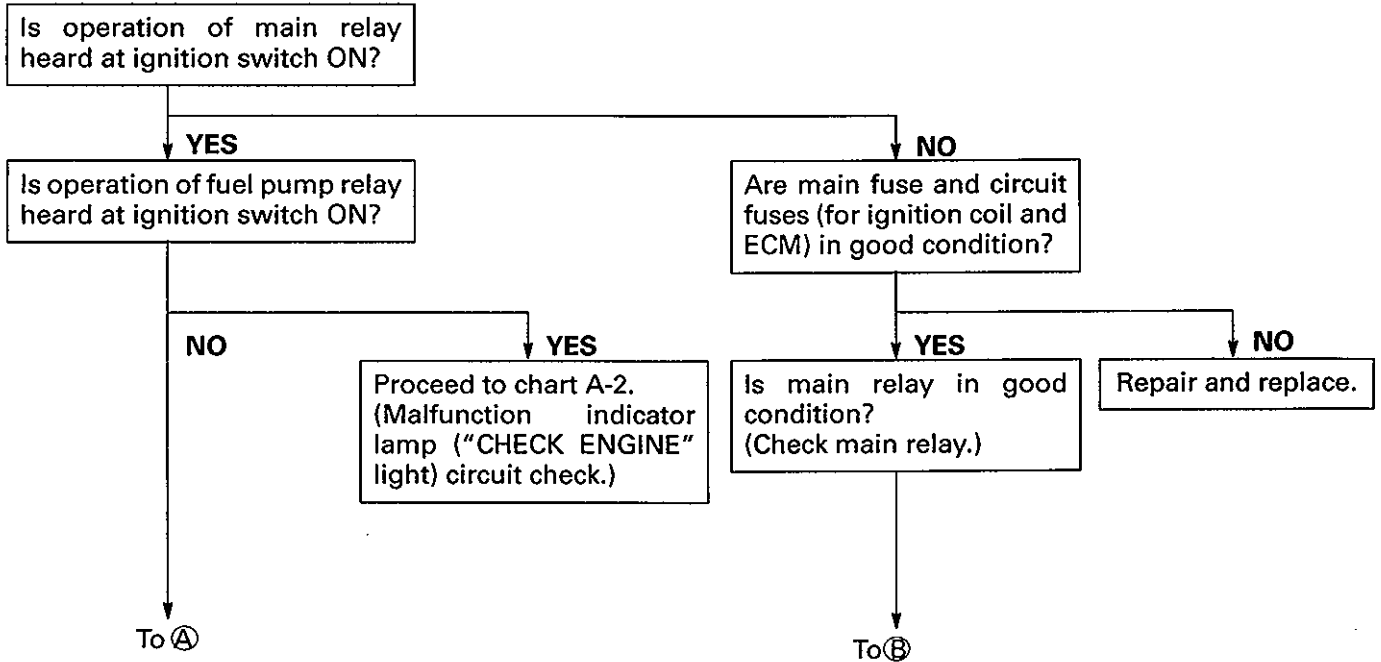


A-1 ECM POWER AND GROUND CIRCUIT CHECK

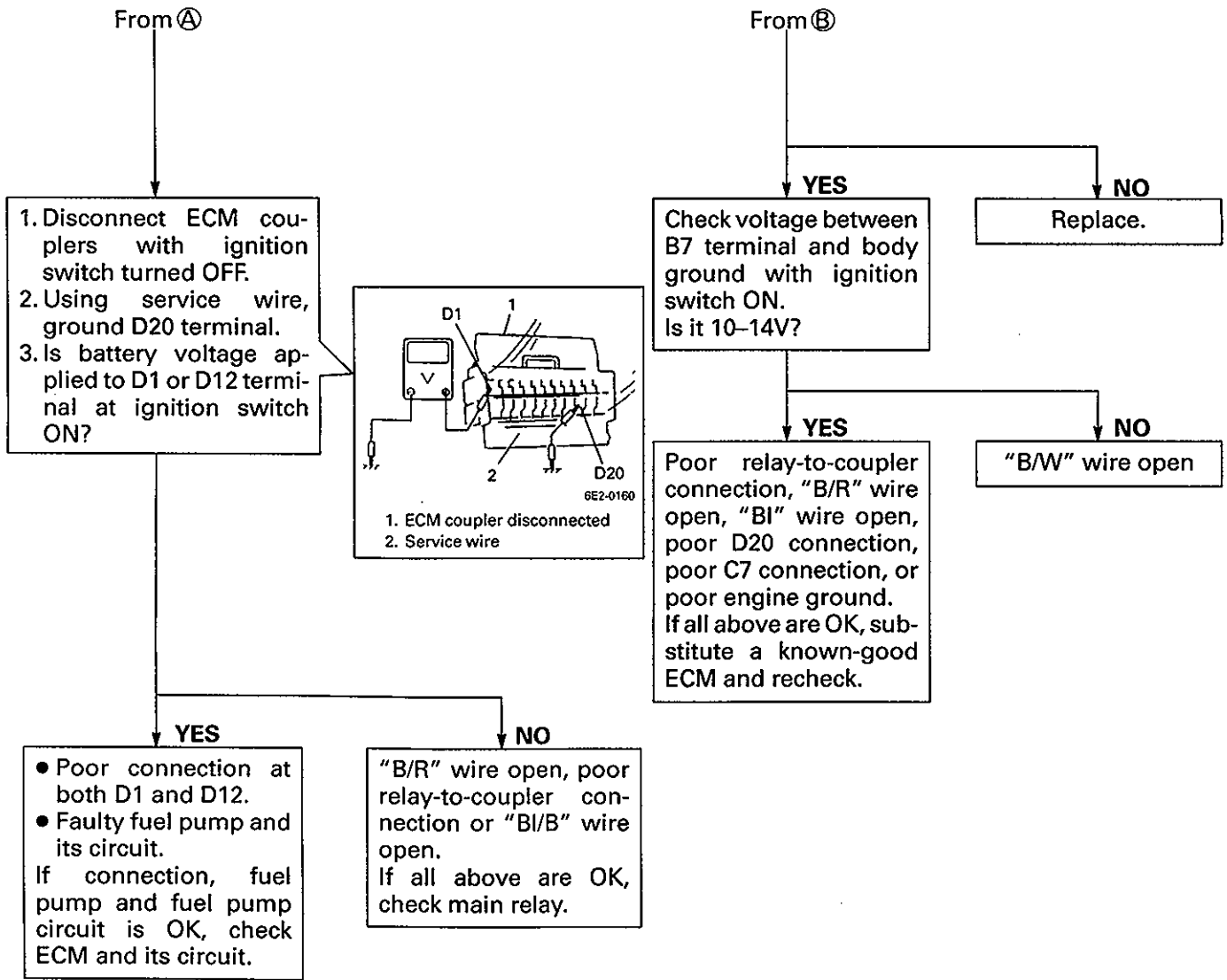
(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

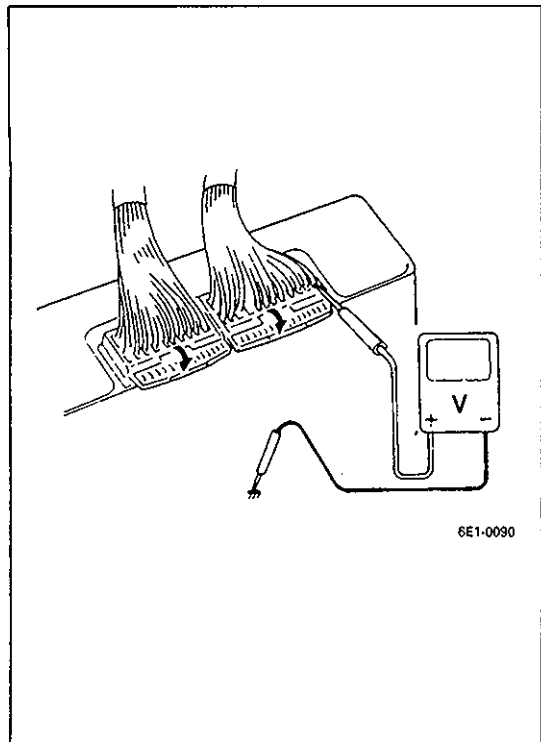


60G00-6E2-G3-8-1S



60G00-6E2-G3-8-4S





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.

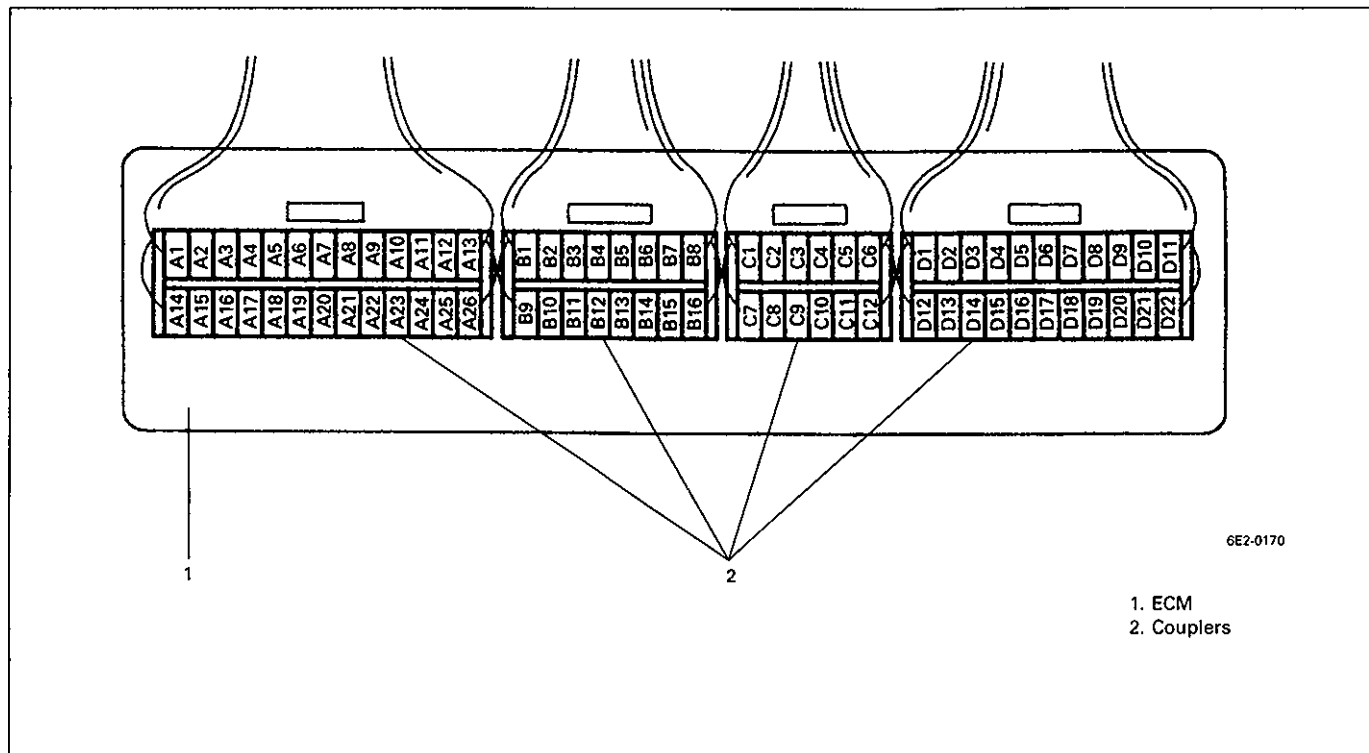
Voltage Check

- 1) Remove ECM from body.
- 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 11V or more when ignition switch is ON.

60G10-6E2-G3-10-1S

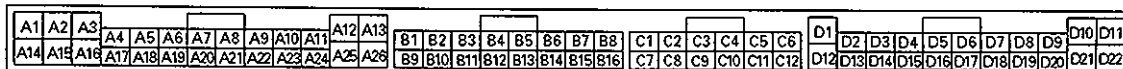


1. ECM
2. Couplers

60G00-6E2-G3-10-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	No.1 injector	10 – 14V	Ignition switch ON
A2	No.2 injector	10 – 14V	Ignition switch ON
A3	Left bank heated oxygen sensor heater (if equipped)	10 – 14V	Ignition switch ON
		0 – 2V	At specified idle speed after engine warmed up.
A4	EVAP canister purge valve	10 – 14V	Ignition switch ON
A5	Power steering pressure switch	4.75 – 5.25V	Ignition switch ON
		0 – 0.8V	Engine running at idle speed and steering wheel turned to the right and left as far as it stops.
A6	Engine start switch (Engine start signal)	0 – 1V	Ignition switch ON
		6 – 14V	While engine cranking
A7	Power source (for sensors)	4.75 – 5.25V	Ignition switch ON
*A8 *A9	CMP sensor signal (Position signal)	Indicator deflection between 0 – 1 V and 4 – 6V	Ignition switch ON Crankshaft turned slowly
*A10 *A11	CMP sensor signal (Reference signal)	Indicator deflection between 0 – 1V and 4 – 6V	Ignition switch ON Crankshaft turned slowly
A12	No.5 injector	10 – 14V	Ignition switch ON
A13	Ground	—————	—————
A14	No.3 injector	10 – 14V	Ignition switch ON
A15	No.4 injector	10 – 14V	Ignition switch ON
A16	IAC valve	6.2 – 8.7V { (62% : ON DUTY) }	At specified idle speed after engine warmed up.
A17 A18	Blank	—————	—————
A19	ECT sensor	About 0.8V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
A20	Sensor ground	—————	—————
A21	IAT sensor	About 3.0V	Ignition switch ON sensor ambient temp: 20°C (68°F)
A22	Left bank heated oxygen sensor (if equipped)	Indicator deflection repeated between over and under 0.31V	While engine running at 2,000 r/min for 1 minute or longer after warmed up.
	CO adjusting resistor (vehicle without heated oxygen sensor only)	Ignition switch ON Voltage varies as specified in graph in Section "CO Adjusting Resistor" while CO adjusting resistor knob turned.	
A23	TP sensor	0.35 – 0.65V	Ignition switch ON after engine warmed up. Throttle valve at idle position.
		3.6 – 4.5V	Ignition switch ON Throttle valve at full open position.
A24	MAF sensor	0.5 – 1.0V	Ignition switch ON
		1.5 – 1.8V	With engine running at idle speed
A25	No.6 injector	10 – 14V	Ignition switch ON
A26	Ground	—————	—————

TERMINAL ARRANGEMENT OF ECM COUPLER (VIEWED FROM HARNESS SIDE)

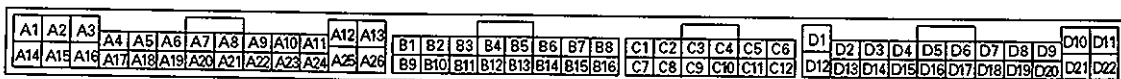


TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B1 B2	Blank	————	————
B3	Electric load signal diode	0 – 1V	Ignition switch ON. small light, heater fan and rear defogger all turned OFF
		10 – 14V	Ignition switch ON. Small light, heater fan and rear defogger turned ON
B4	Test switch terminal	4.75 – 5.25V	Ignition switch ON
		0 – 0.8V	Ignition switch ON Test switch terminal grounded
B5	Vehicle speed sensor	Indicator deflection repeated between 0 – 1 and 4 – 5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked.
B6	Transmission range switch	0 – 0.8V	Ignition switch ON Selector lever in "P" or "N" range
		4.75 – 5.25V	Ignition switch ON Selector lever in "R", "D", "2" or "L" range
*B7	Ignition switch	10 – 14V	Ignition switch ON
		0 – 0.8V	Ignition switch OFF
B8	Sensor ground	————	————
B9	A/F duty (Right bank) output terminal	4.75 – 5.25V	Ignition switch ON
B10	Blank	————	————
B11	Power source for back-up	10 – 14V	Ignition switch ON and OFF
B12	Diagnosis switch terminal	4.75 – 5.25V	Ignition switch ON
		0 – 0.8V	Ignition switch ON Diagnosis switch terminal grounded
B13	A/C amplifier (if equipped)	4.75 – 5.25V	Ignition switch ON
		0 – 1.5V	A/C ON
B14	Blank	————	————
B15	Tachometer	0 – 0.8V	Ignition switch ON
B16	Noise suppressor (ignition fail safe signal)	10 – 14V	Ignition switch ON

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
C1	Right bank heated oxygen sensor (if equipped)	Indicator deflection repeated between over and under 0.31V	While engine running at 2,000 r/min for 1 minute or longer after engine warmed up
C2	EGR valve (stepper motor coil 1), if equipped	10 – 14V	More than 3 seconds after ignition switch ON
		0 – 3.5V	After engine start (At fast idle)
C3	EGR valve (stepper motor coil 2), if equipped	0 – 3.5V	More than 3 seconds after ignition switch ON
		10 – 14V	After engine start (At fast idle)
C4	EGR valve (stepper motor coil 3), if equipped	0 – 3.5V	More than 3 seconds after ignition switch ON
		10 – 14V	After engine start (At fast idle)
C5	EGR valve (stepper motor coil 4), if equipped	10 – 14V	More than 3 seconds after ignition switch ON
		0 – 3.5V	After engine start (At fast idle)
*C7	Blank	————	————

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
D1	Power source	10 – 14V	Ignition switch ON
D2	Ignitor (No.3 ignition coil)	————	————
D3	Ignitor (No.6 ignition coil)	————	————
D4	Ignitor (No.1 ignition coil)	————	————
D5	Ignitor (No.4 ignition coil)	————	————
D6	Ignitor (No.5 ignition coil)	————	————
D7	Ignitor (No.2 ignition coil)	————	————
D8	Blank	————	————
D9	Fuel pump relay	0 – 2.5V	For 3 seconds after ignition switch ON
		10 – 14V	After the above time
D10 D11	Ground	————	————
D12	Power source	10 – 14V	Ignition switch ON
D13	Duty output terminal	10 – 14V	Ignition switch ON
D14	Blank	————	————
D15	Diagnosis output terminal and malfunction indicator lamp. ("CHECK ENGINE" light)	0 – 2.5V	Ignition switch ON
		10 – 14V	Engine running
D16 (A/T only)	Transmission control module (throttle valve opening signal)	Ignition switch ON Voltage varies as specified in graph in SECTION "THROTTLE VALVE OPENING SIGNAL OUTPUT FOR TCM (A/T VEHICLE ONLY)" while throttle valve is opened gradually.	
D17 (A/T only)	Transmission control module (engine coolant temp. signal)	0 – 1V (0% ON duty)	Ignition switch ON Engine coolant temp. = below 0°C (32°F)
		3.4 – 4.6V (33% ON duty)	Ignition switch ON Engine coolant temp. = between 0°C (32°F) and 31°C (88°F)
		6.7 – 9.3V (67% ON duty)	Ignition switch ON Engine coolant temp. = over 31°C (88°F)
D18	Data link connector	4 – 5V	Ignition switch ON
D19	Blank	————	————
D20	Main relay	0 – 2.0V	Ignition switch ON
		10 – 14V	Ignition switch OFF
D21	Right bank heated oxygen sensor heater (if equipped)	10 – 14V	Ignition switch ON
		0 – 2.0V	At specified idle speed after engine warmed up
D22	Ground	————	————

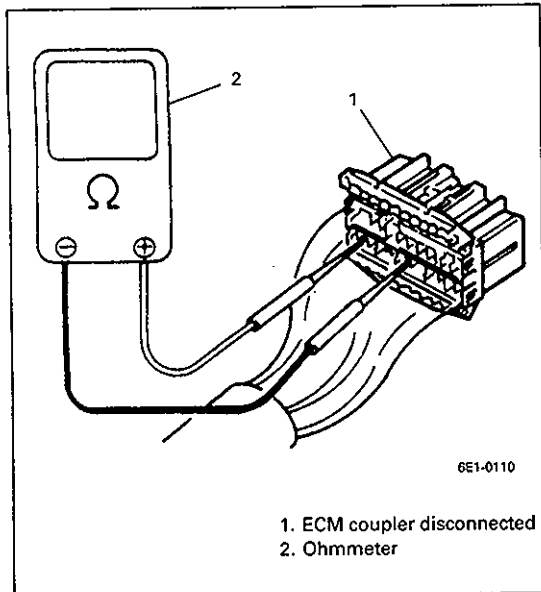
TERMINAL ARRANGEMENT OF ECM COUPLER (VIEWED FROM HARNESS SIDE)



6E2-0020

NOTE:

* marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.



60G00-6E2-G3-14-1S

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).

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
A1 - D1	No.1 injector	10.8 - 13.2Ω	_____
A2 - D1	No.2 injector	10.8 - 13.2Ω	_____
A3 - *B7	Left bank HO ₂ S heater (if equipped)	5.5 - 6.5Ω	_____
A4 - D1	EVAP canister purge valve	28 - 36Ω	_____
A12 - D1	No.5 injector	10.8 - 13.2Ω	_____
A14 - D1	No.3 injector	10.8 - 13.2Ω	_____
A15 - D1	No.4 injector	10.8 - 13.2Ω	_____
A16 - D1	IAC valve	8.7 - 10.5Ω	_____
A19 - B8	ECT sensor	305 - 324Ω	Engine coolant temp.: 80°C (176°F)
A21 - B8	IAT sensor	2.21 - 2.69kΩ	Intake air temp.: 20°C (68°F)
A22 - A7	CO adjusting resistor (if equipped)	0 - 50kΩ	_____
A25 - D1	No.6 injector	10.8 - 13.2Ω	_____
B5 - Body ground	Vehicle speed sensor	Ohmmeters indicator deflects between 0 and ∞	Rear left wheel turned slowly with rear right wheel locked.
B6 - Body ground	Transmission range switch	Continuity	Selector lever in "P" or "N" range
		∞	Selector lever in "R", "D", "2" or "L" range
C2 - D1	EGR valve	21 - 23Ω	_____
C3 - D1	EGR valve	21 - 23Ω	_____
C4 - D1	EGR valve	21 - 23Ω	_____
C5 - D1	EGR valve	21 - 23Ω	_____
D9 - *B7	Fuel pump relay	61 - 73Ω	_____
D20 - B11	Main relay	61 - 73Ω	_____
D21 - *B7	Right bank HO ₂ S heater (if equipped)	5.5 - 6.5Ω	_____

NOTE:

* marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.

GROUP 4

GROUP 4

SUZUKI

GV SERIES

SUPPLEMENTARY SERVICE MANUAL

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 components 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 SY413/416 and SY418 SERVICE MANUAL and has been prepared exclusively for SY series equipped with immobilizer control system.

**Applicable model: SY413/SY416/SY418
equipped with immobilizer control system**

This SUPPLEMENTARY SERVICE MANUAL contains service information for vehicles equipped with the immobilizer control system but only on different items as compared to those without the immobilizer control system and except the contents of "SECTION 8A : Immobilizer Control System".

Therefore, whenever servicing immobilizer control system of SY series, consult this supplement first. And for any section, item or description not found in this supplement (GROUP 4), refer to the below listed SERVICE MANUAL and SECTION 8A in this 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 (For SY413/416 not equipped with oxygen sensor heater)

6E1

Electronic Fuel Injection System (For SY418)

6E2

NOTE:

For SY413/SY416 equipped with immobilizer control system and oxygen sensor heater, refer to SY413/SY416 SUPPLEMENTARY SERVICE MANUAL FOR OXYGEN SENSOR HEATER EQUIPPED VEHICLE(99501-60G20)

RELATED SERVICE MANUAL

- SY413/416 SERVICE MANUAL (99500-60G00)
- SY416 SUPPLEMENTARY SERVICE MANUAL (99501-60G00)
- SY418 SUPPLEMENTARY SERVICE MANUAL (99501-62G00)

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

6E1

6E2

SECTION 6E1

ELECTRONIC FUEL INJECTION SYSTEM**(For SY413/416 NOT EQUIPPED WITH
OXYGEN SENSOR HEATER)****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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:

This section describes the electronic fuel injection system equipped with the immobilizer control system but only on the items different from those of the electronic fuel injection system not equipped with the immobilizer control system. Therefore, for the information on the electronic fuel injection system equipped with the immobilizer control system not found in this section and on the electronic fuel injection system not equipped with the immobilizer control system, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

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GENERAL DESCRIPTION

The electronic fuel injection system equipped with the immobilizer control system differs from un-equipped one in following points.

- Position of each terminal of engine control module (ECM) changed and ignition switch terminal added.

Without immobilizer control system

TERMINAL	CIRCUIT
A7	Fuel pump relay
A20	Blank
A23	
C2	Camshaft position sensor (positive)
C4	Throttle position sensor
C8	Camshaft position sensor (negative)
C10	Oxygen sensor ground



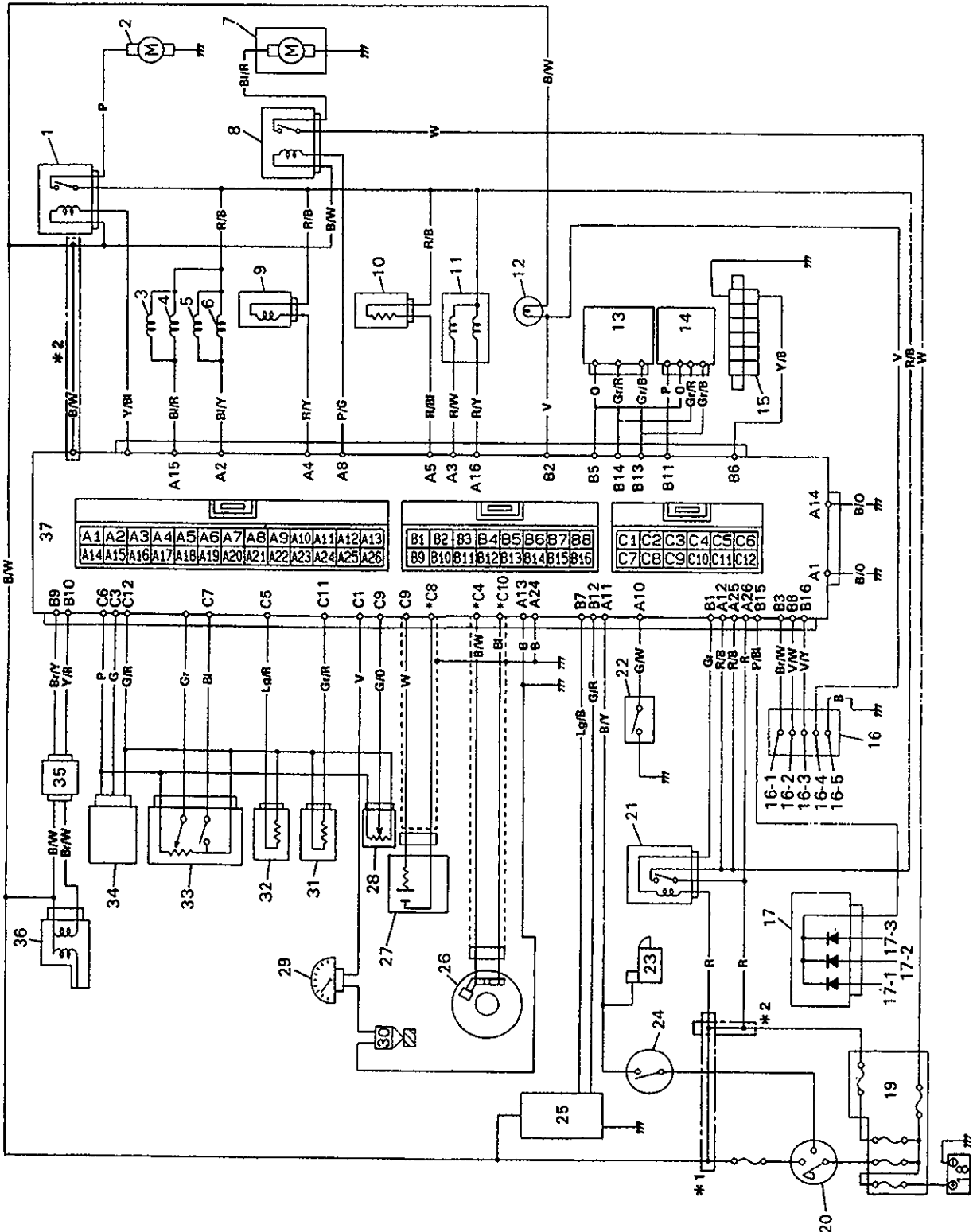
With immobilizer control system

TERMINAL	CIRCUIT
A7	Blank
A20	Fuel pump relay
A23	Ignition switch
C2	Throttle position
C4	Camshaft position sensor (positive)
C8	Oxygen sensor ground
C10	Camshaft position sensor (negative)

- Circuit from main fuse box to main relay changed.

For the details of above changed or added items, refer to "ELECTRONIC CONTROL SYSTEM" in the next section.

ELECTRONIC CONTROL SYSTEM



NOTE:

- *1 marked circuit is used in vehicles without immobilizer control system.
- *2 marked circuit is used in vehicles with immobilizer control system.
- * marked terminal is a terminal which has been newly added or whose position has been changed due to installation of immobilizer control system.

- 35. Ignition coil
- 36. Ignition coil
- 37. Engine control module

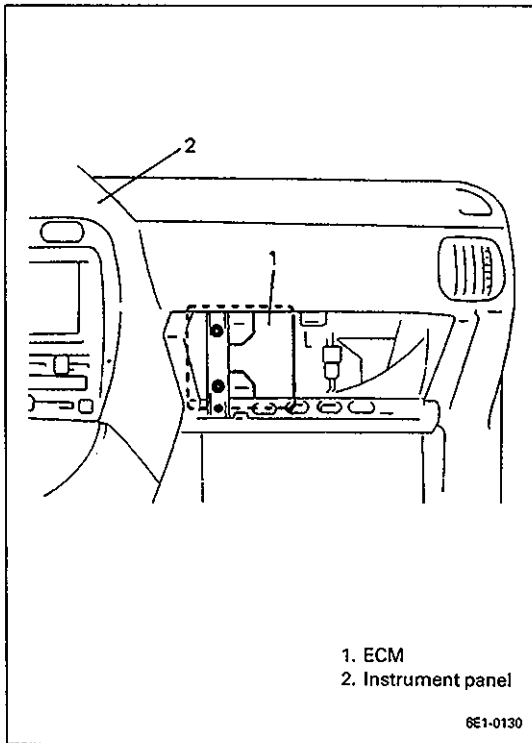
Wire color

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

- 1. Fuel pump relay
- 2. Fuel pump
- 3. No. 1 injector
- 4. No. 2 injector
- 5. No. 3 injector
- 6. No. 4 injector
- 7. Radiator fan motor
- 8. Radiator fan control relay
- 9. EGR solenoid vacuum valve (if equipped)
- 10. EVAP canister purge valve (if equipped)
- 11. Idle air control valve
- 12. Malfunction indicator lamp ("CHECK ENGINE" light)
- 13. Transmission control module (4 A/T)
- 14. Transmission control module (3 A/T)
- 15. Data link connector
- 16. Diagnosis connector 1
- 16-1. Duty output terminal
- 16-2. Test switch terminal
- 16-3. Diag. switch terminal
- 16-4. Diag. output terminal
- 16-5. Ground terminal
- 17. Diodes (For electric loads)
- 17-1. Lighting switch
- 17-2. Rear window defogger switch
- 17-3. Heater blower switch
- 18. Battery
- 19. Main fuse box
- 20. Main switch
- 21. Main relay
- 22. Power steering pressure switch (if equipped)
- 23. Starter magnetic switch
- 24. Transmission range switch (A/T)
- 25. A/C amplifier (if equipped)
- 26. Camshaft position sensor
- 27. Oxygen sensor (if equipped)
- 28. CO adjusting resistor (vehicle without oxygen sensor only)
- 29. Speedometer
- 30. Vehicle speed sensor
- 31. Intake air temperature sensor
- 32. Engine coolant temperature sensor
- 33. Throttle position sensor
- 34. Manifold absolute pressure sensor

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Ground	B7	A/C ON signal from A/C amplifier (if equipped)
A2	Injector (No. 3 and No. 4)	B8	Test switch terminal
A3	IAC valve (open)	B9	Igniter (IGt)
A4	EGR solenoid vacuum valve (if equipped)	B10	Igniter (IGf)
A5	EVAP canister purge valve (if equipped)	B11	Transmission control module (throttle valve opening signal, 3 A/T)
A6	Blank	B12	A/C cut signal for A/C amplifier (if equipped)
*A7			
A8	Radiator fan control relay		
A9	Blank	B13	Transmission control module (throttle valve opening signal, 3 A/T)
A10	Power steering pressure switch		
A11	Engine start signal		
A12	Power source	B14	Transmission control module (coolant temp. signal, 4 A/T)
A13	Ground		
A14	Ground	B15	Diodes for electric load
A15	Injector (No. 1 and No. 2)	B16	Diag. switch terminal
A16	IAC valve (close)		
A17	Blank	C1	Vehicle speed sensor
A18	Blank	*C2	Throttle position sensor
A19	Fuel pump relay	C3	Manifold absolute pressure sensor
*A20		*C4	Camshaft position sensor (positive)
A21	Blank	C5	Engine coolant temperature sensor
A22	Ignition switch	C6	Power source for sensors
*A23		C7	Idle switch
A24	Ground	*C8	Oxygen sensor ground (if equipped)
A25	Power source		
A26	Power source for back-up	C9	Oxygen sensor (if equipped)
			CO adjusting resistor (vehicle without oxygen sensor only)
B1	Main relay	*C10	Camshaft position sensor (negative)
B2	Malfunction indicator lamp ("CHECK ENGINE" light)	C11	Intake air temperature sensor
B3	Duty output terminal	C12	Ground for sensors
B4	Blank		
B5	Transmission control module (throttle valve opening signal, A/T)		
B6	Data link connector		

NOTE:
*marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system.



60G10-6E1-G4-5-1S

Engine Control Module (ECM)

ECM for immobilizer control system has following additional function.

- On-board diagnostic system (Self-diagnosis function) for immobilizer control system.

For more information on above item for immobilizer control system, refer to Section 8A of this manual.

NOTE:

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.

However, if Malfunction indicator lamp ("CHECK ENGINE" light) blinks, Immobilizer control system is in malfunction.

DIAGNOSIS

Contents of this DIAGNOSIS section are following items only.

- DIAGNOSTIC TROUBLE CODE(S) CHECK
- A-1 ECM POWER AND GROUND CIRCUIT CHECK
- INSPECTION OF ECM AND ITS CIRCUITS

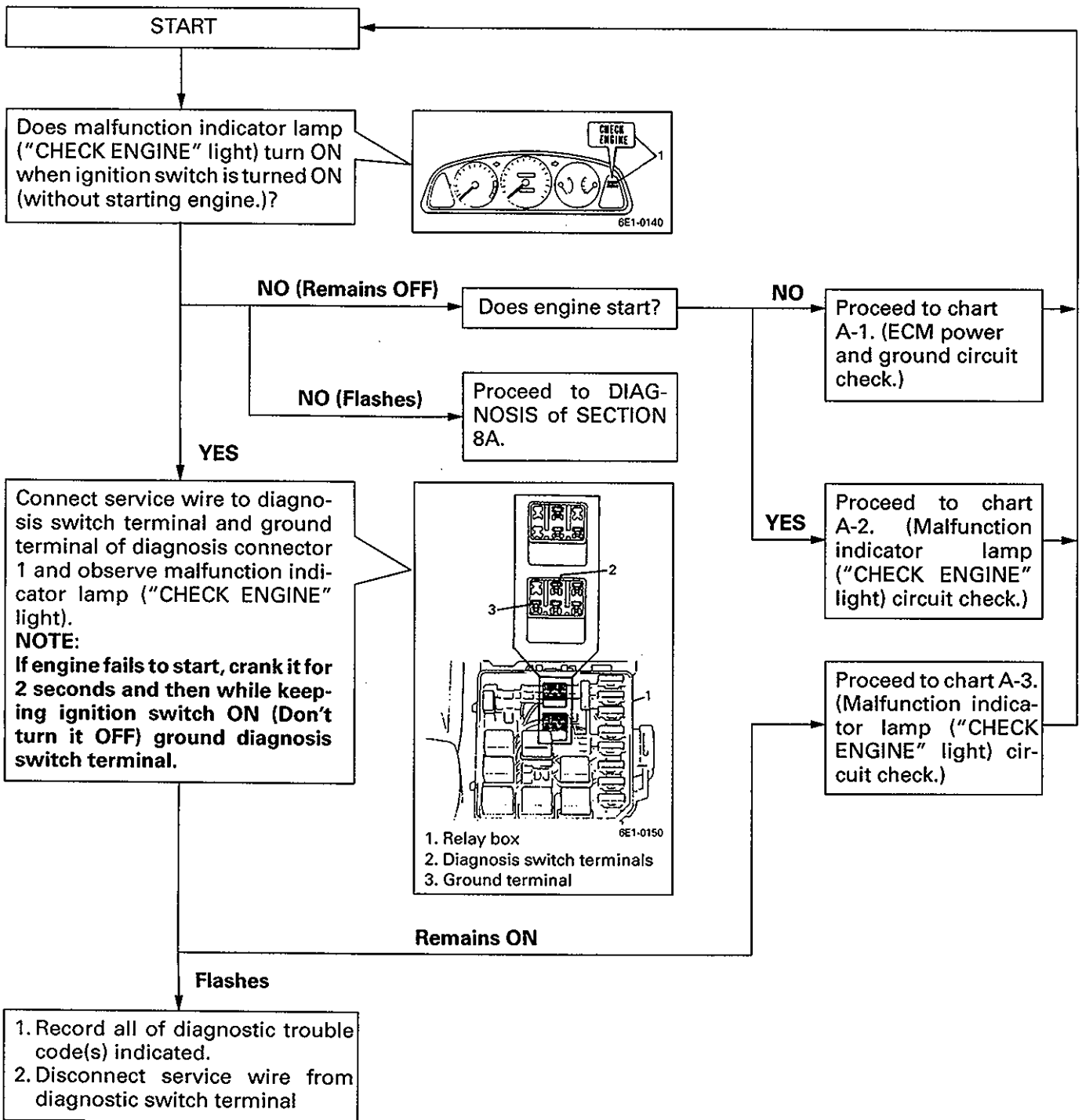
For other items, refer to the same section of Service Manual mentioned in FOREWORD of this manual. At the same time use care for changed items described in the previous section.

NOTE:

When ECM on the vehicle equipped with the immobilizer control system was replaced, including when replaced because re-checking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.

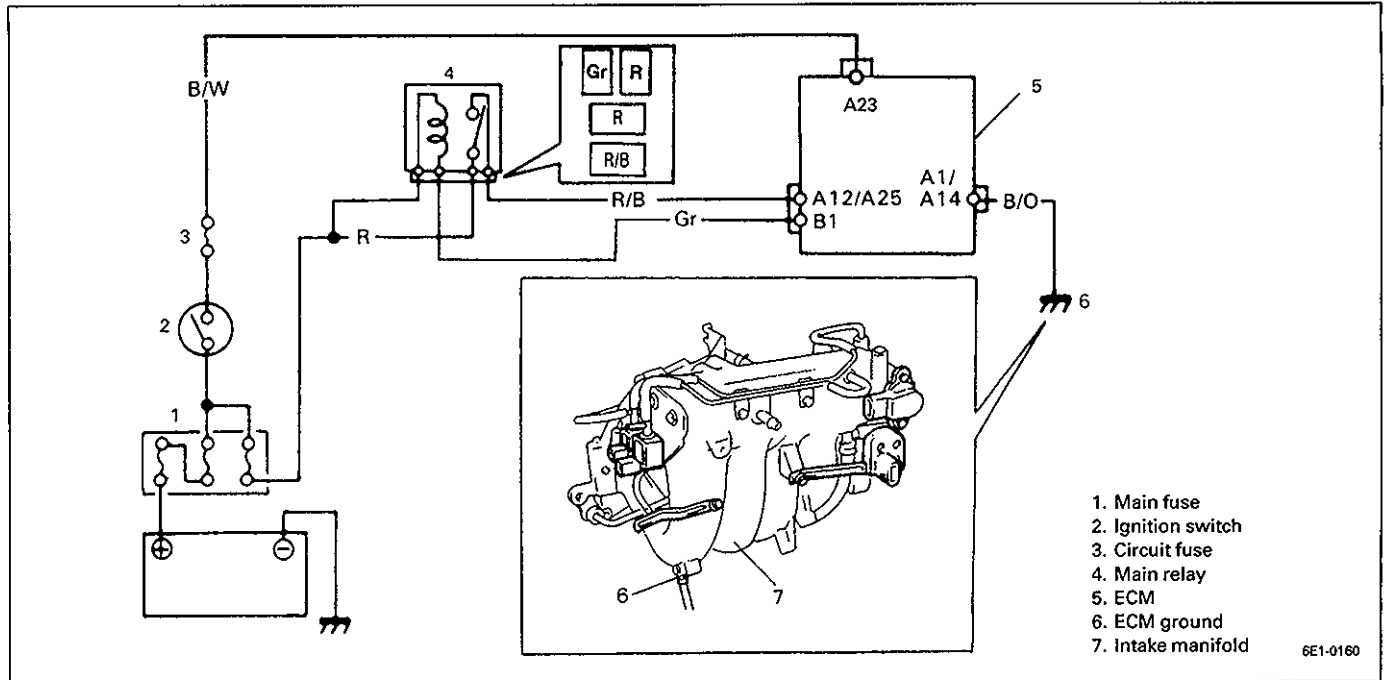
For more information, refer to "Procedure after ECM Replacement" in SECTION 8A.

DIAGNOSTIC TROUBLE CODE(S) CHECK



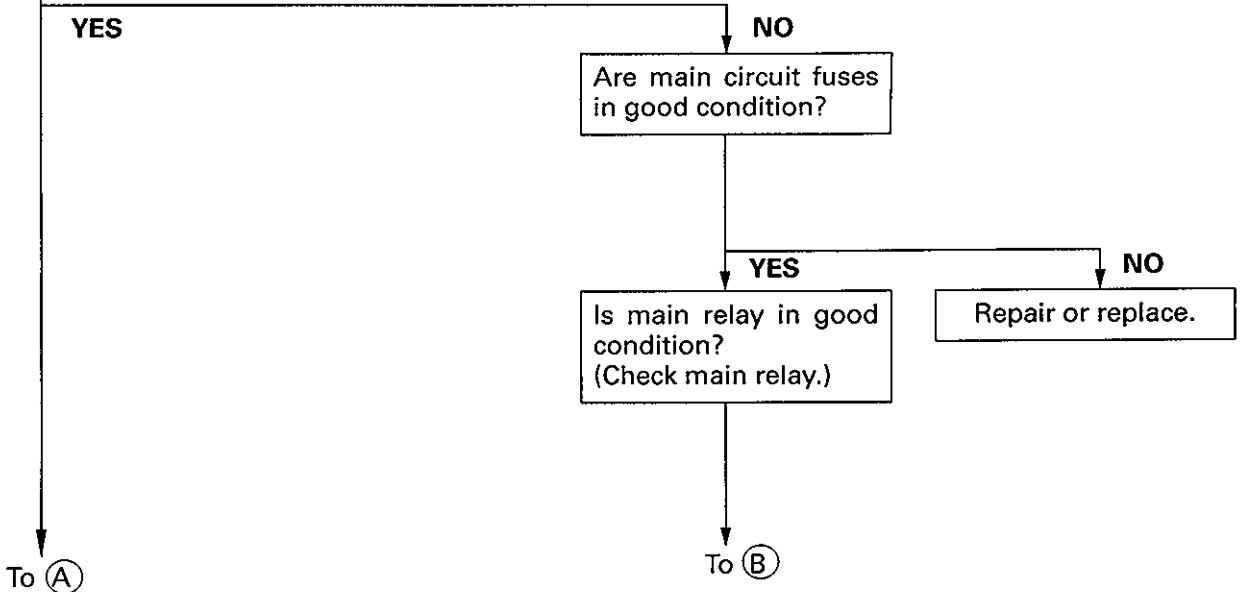
A-1 ECM POWER AND GROUND CIRCUIT CHECK

(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

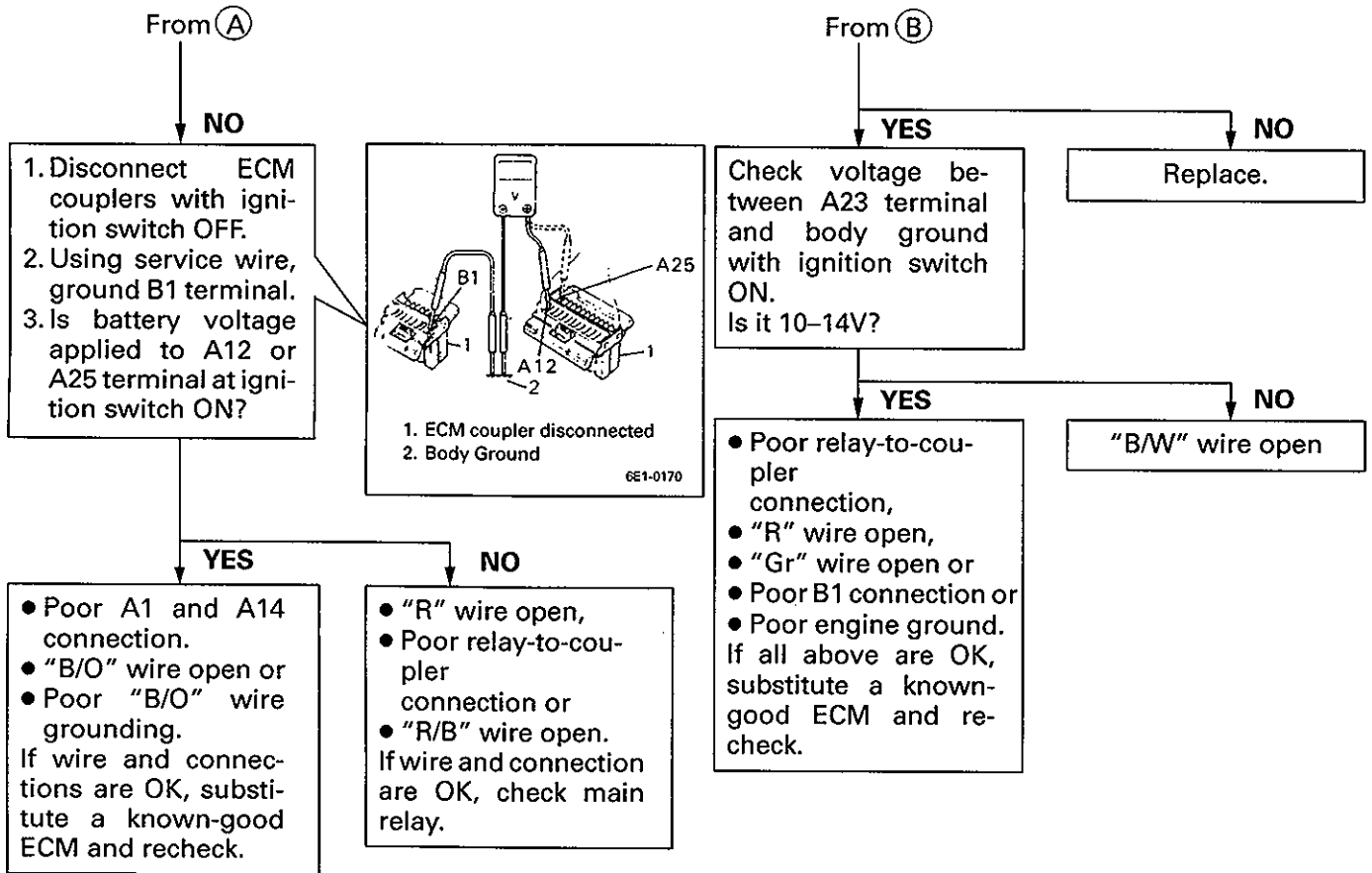


60G00-6E1-G4-8-1S

Is operation of main relay heard at ignition switch ON?



60G00-6E1-G4-8-2S



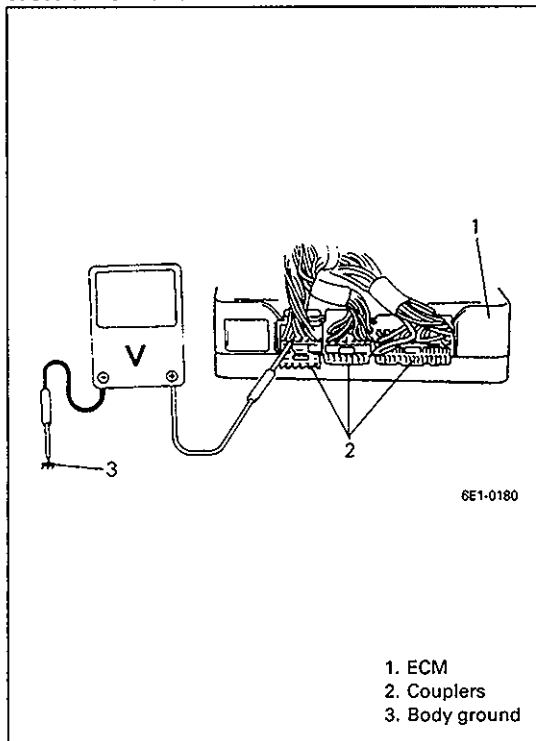
INSPECTION OF ECM AND ITS CIRCUITS

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 coupler disconnected from it.

60G00-6E1-G4-10-1S



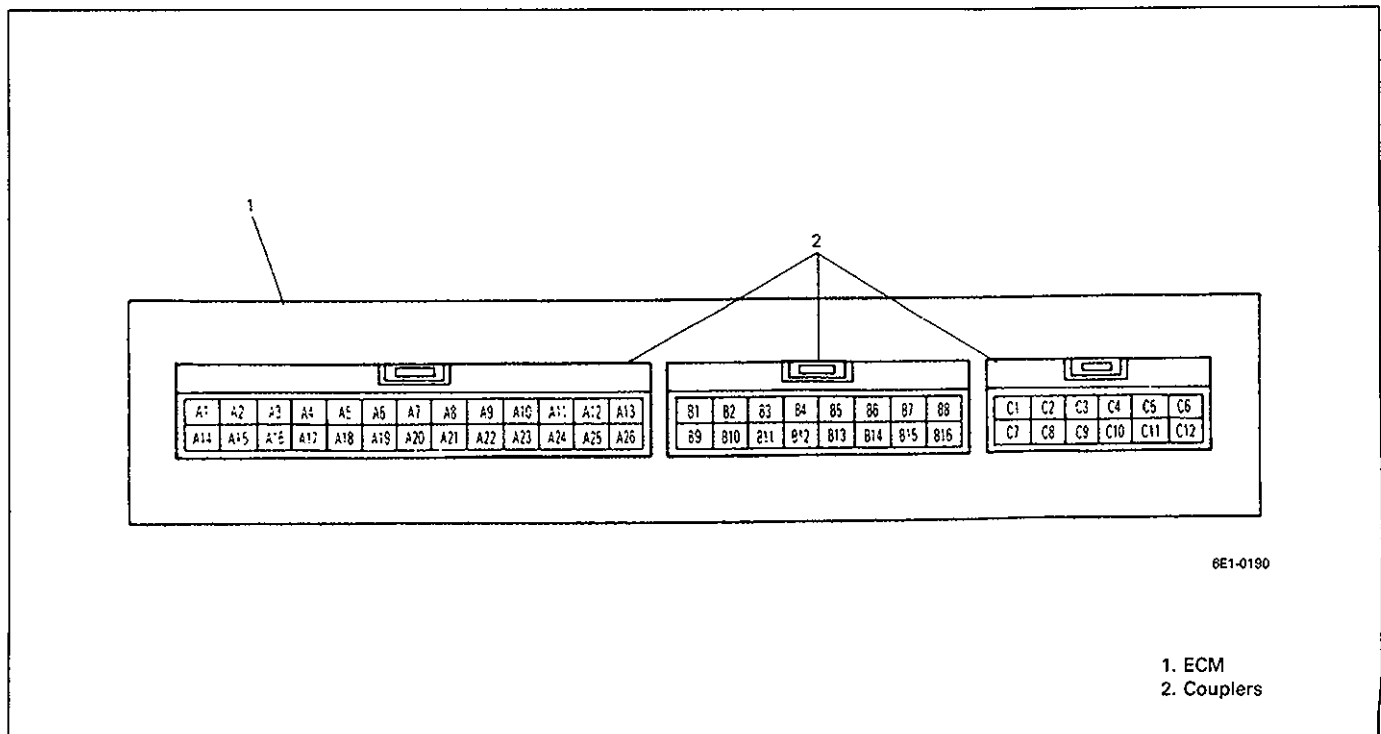
Voltage Check

- 1) Remove ECM from body.
- 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 11V or more when ignition switch is ON.

60G00-6E1-G4-10-2S



60G00-6E1-G4-10-4S

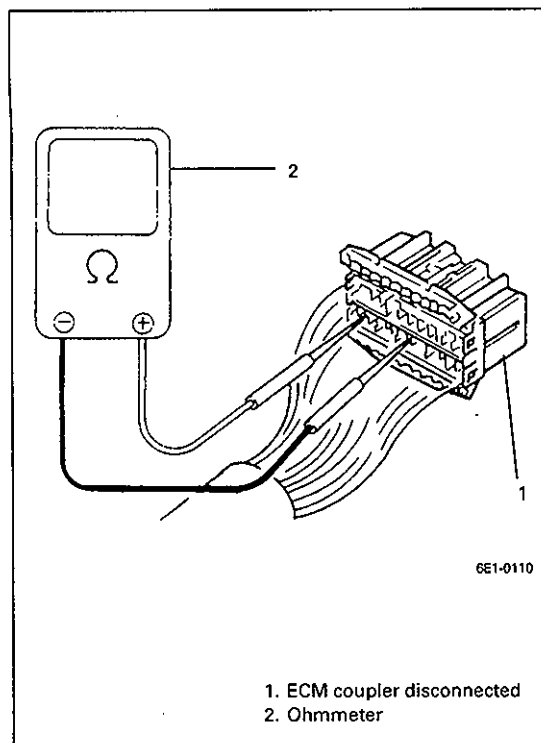
TERMI-NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ground	—	—
A2	Injector (No.3 and No.4)	10 – 14V	Ignition switch on
A3	IAC valve (open)	9.8 – 14V	Warmed up engine running at idle speed
A4	EGR solenoid vacuum valve (if equipped)	10 – 14V	Ignition switch ON
A5	EVAP canister purge valve (if equipped)	10 – 14V	Ignition switch ON
A6 *A7	Blank	—	—
A8	Radiator fan control relay	10 – 14V	Ignition switch ON
		0.3 – 1.0V	Ignition switch ON When engine cooling fan ON
A9	Blank	—	—
A10	Power steering pressure switch (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times
A11	Engine start switch (Engine start signal)	6 – 12V	While engine cranking
		about 0V	Other than above
A12	Power source	10 – 14V	Ignition switch ON
A13 A14	Ground	—	—
A15	Injector (No.1 and No.2)	10 – 14V	Ignition switch ON
A16	IAC valve (close)	0 – 4.2V	Warmed up engine running at idle speed
A17 A18 A19	Blank	—	—
*A20	Fuel pump relay	0 – 1.0V	For 2 seconds after ignition switch ON
		10 – 14V	After the above time
A21 A22	Blank	—	—
*A23	Ignition signal	10 – 14V	Ignition switch ON
		about 0V	Ignition switch OFF
A24	Ground	—	—
A25	Power source	10 – 14V	Ignition switch ON
A26	Power source for back-up circuit	10 – 14V	Ignition switch ON and OFF
B1	Main relay	0.4 – 1.0V	Ignition switch ON
B2	Malfunction indicator lamp ("CHECK ENGINE" light)	0.5 – 2.0V	Ignition switch ON
		10 – 14V	When engine running
B3	Duty output terminal	0V	Ignition switch ON
B4	Blank	—	—
B5 (A/T only)	Transmission control module (Throttle valve opening signal)	Ignition switch ON Voltage varies as specified in figure in Section "OUTPUT SIGNAL OF THROTTLE VALVE OPENING" while throttle valve is opened gradually.	
B6	Data link connector (serial data terminal)	4 – 5V	Ignition switch ON

TERMI- NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B7	A/C amplifier (A/C ON signal) (if equipped)	10 – 14V	While engine running and A/C OFF
		0 – 0.6V	While engine running and A/C ON
B8	Test switch terminal	10 – 14V	Ignition switch ON
B9	Ignition trigger signal	0 – 1V	Ignition switch ON
B10	Ignition fail safe signal	0 – 1V	Ignition switch ON
B11 (3 A/T only)	Transmission control module (Throttle valve opening signal, 3A/T)	Ignition switch ON Voltage varies as specified in figure in Section "OUTPUT SIG- NAL OF THROTTLE VALVE OPENING" while throttle valve is opened gradually.	
B12	A/C amplifier (A/C cut signal) (if equipped)	about 0V	While engine running and A/C OFF
		10 – 14V	While engine running and A/C ON
B13 (A/T only)	Transmission control module (Throttle valve opening signal, 3 A/T)	Ignition switch ON Voltage varies as specified in figure in p. 6E1-107 with throttle valve is opened gradually.	
		0 – 1V (0% ON duty)	Engine coolant temp.:Below 0°C (32°F)
	Transmission control module (Engine coolant temp. signal, 4 A/T)	3.4 – 4.6V (33% ON duty)	Engine coolant temp.:Between 0°C – 50°C (32°F – 122°F)
		6.7 – 9.3V (67% ON duty)	Engine coolant temp.:Above 50°C (122°F)
B14 (A/T only)	Transmission control module (Transmission range switch signal)	About 0V (3 A/T)	Ignition switch ON, selector lever in "P" or "N" range position.
		10 – 14V (4 A/T)	
		10 – 14V (3 A/T)	Ignition switch ON, selector lever in "R" or "D", "2" or "L" range position.
		About 0V (4 A/T)	
B15	Electric load signal	About 0V	Ignition switch ON Headlight, small light, heater fan or rear de- fogger turned ON
		10 – 14V	Ignition switch ON Headlight, small light, heater fan or rear de- fogger turned ON
B16	Diagnosis switch terminal	10 – 14V	Ignition switch ON
C1	Vehicle speed sensor	Indicator deflection repeated 0 – 1V and 4 – 6V	Ignition switch ON Front left tire turned quickly with front right tire locked
*C2	Throttle position sensor	0.18 – 1.03V	Ignition switch ON Throttle valve at idle position
		3.27 – 4.58V	Ignition switch ON Throttle valve at full open position
C3	Manifold absolute pressure sensor	3.3 – 4.0V	Ignition switch ON Barometric pressure = 760 mmHg
*C4	Camshaft position sensor (positive)	about 0V	Ignition switch ON

TERMI- NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
C5	Engine coolant temp. sensor	0.55 – 0.95V	Ignition switch ON Engine coolant temp.:80°C (176°F)
C6	Power source for sensors (MAP sensor and TP sensor)	4.75 – 5.25V	Ignition switch ON
C7	Idle switch (in TP sensor)	about 0V	Ignition switch ON Throttle valve at idle position
		10 – 14V	Ignition switch ON Throttle valve opens larger than idle position
*C8	Oxygen sensor ground (if equipped)	0V	Ignition switch ON
C9	Oxygen sensor (if equipped)	Indicator deflec- tion repeated between over and under 0.45V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
	CO adjusting resistor (vehicle without oxygen sen- sor)	Ignition switch ON Voltage varies as specified in figure in Section "CO adjusting Resistor" while CO adjusting resistor knob is turned gradually.	
*C10	Camshaft position sensor (negative)	about 0V	Ignition switch ON
C11	Intake air temp. sensor	2.0 – 2.7V	Ignition switch ON Sensor ambient temp. (intake air temp.):20°C (68°F)
C12	Ground for sensors	0V	Ignition switch ON

NOTE:

* marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system.



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 below represents that when parts temperature is 20°C (68°F).

60G00-6E1-G4-14-1S

TERMINAL	CIRCUIT	NORMAL RESISTANCE	CONDITION
A2 – A12/A25	Injector (No.3 and No.4)	6.1 – 7.1Ω	_____
A3 – A12/A25	IAC valve (open)	19.3 – 22.3Ω	_____
A4 – A12/A25	EGR solenoid vacuum valve (if equipped)	33 – 39Ω	_____
A5 – A12/A25	EVAP canister purge valve (if equipped)	33 – 39Ω	_____
*A20 – *A23	Fuel pump relay	60 – 120Ω	_____
B1 – A26	Main relay	60 – 120Ω	_____
A8 – B1	Radiator fan control relay and main relay	140 – 220Ω	_____
A15 – A12/A25	Injector (No.1 and No.2)	6.0 – 8.0Ω	_____
A16 – A12/A25	IAC valve (close)	18.8 – 22.8Ω	_____
*C4 – *C10	Camshaft position sensor	205 – 255Ω	_____
C5 – C12	ECT sensor	305 – 331Ω	Engine coolant temp.: 80°C (176°F)
C7 – C12	Idle switch in TP sensor	continuity	Throttle valve at idle position
		∞ (infinity)	Throttle valve opens larger than idle position
C9 – C12	CO adjusting resistor (vehicle without oxygen sensor)	0 – 50 kΩ with MAP sensor and TP sensor coupler disconnected	Resistance depending on CO adjusting resistor knob position
C11 – C12	IAT sensor	2.21 – 2.69Ω	Intake air temp.: 20°C (68°F)

NOTE:

* marked terminal is a terminal which has been newly added or modified due to installation of immobilizer control system.

SECTION 6E2

6E2

ELECTRONIC FUEL INJECTION SYSTEM

(For SY418)

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.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:

This section describes the electronic fuel injection system equipped with the immobilizer control system but only on the items different from those of the electronic fuel injection system not equipped with the immobilizer control system. Therefore, for the information on the electronic fuel injection system equipped with the immobilizer control system not found in this section and on the electronic fuel injection system not equipped with the immobilizer control system, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

CONTENTS

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GENERAL DESCRIPTION

The electronic fuel injection system equipped with the immobilizer control system differs from un-equipped one in following points.

- Position of each terminal of engine control module (ECM) changed and ignition switch terminal added.

Without immobilizer control system

A8, 9	CMP sensor (Reference signal)
A10, 11	CMP sensor (Position signal)
B7	Blank



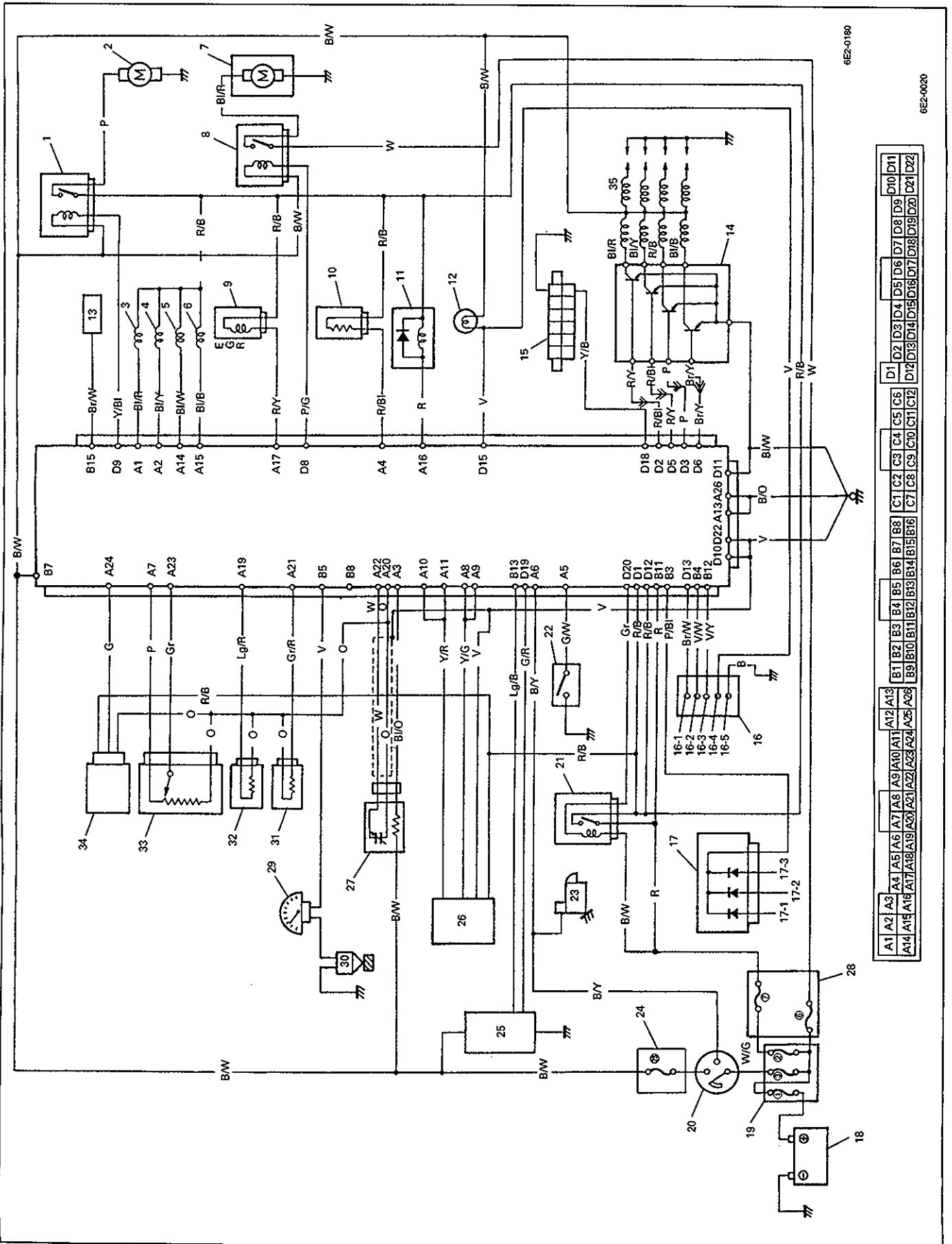
With immobilizer control system

A8, 9	CMP sensor (Position signal)
A10, 11	CMP sensor (Reference signal)
B7	Ignition switch

- Circuit from main fuse box to main relay changed.

For the details of above changed or added items, refer to "ELECTRONIC CONTROL SYSTEM" in the next section.

ELECTRONIC CONTROL SYSTEM



6E2-0180

6E2-0020

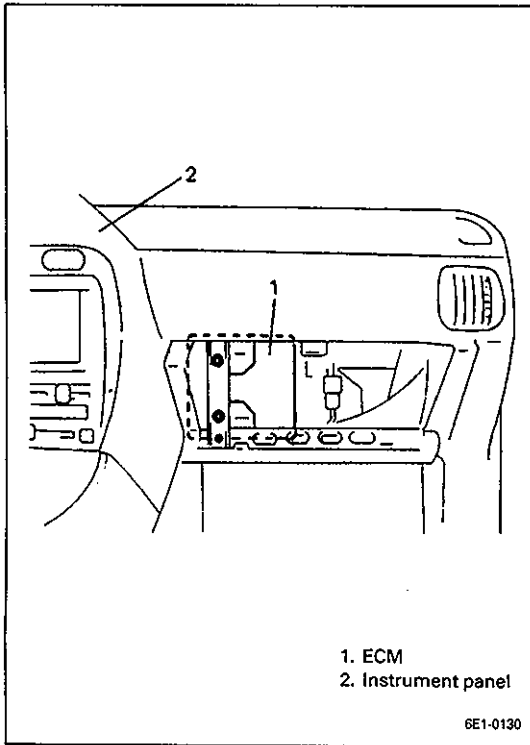
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26
D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26

TER-MINAL	CIRCUIT	TER-MINAL	CIRCUIT
A1	No.1 injector	B12	Diagnosis switch terminal
A2	No.2 injector	B13	A/C amplifier (A/C ON Signal) (if equipped)
A3	Heated oxygen sensor heater (if equipped)	B14	Blank
A4	EVAP canister purge valve (if equipped)	B15	Tachometer
A5	Power steering pressure switch	B16	Blank
A6	Engine start switch (engine start signal)		
A7	Power source (for sensors)	C1-C12	Blank
*A8	CMP sensor (Position signal)	D1	Power source
*A9		D2	Ignitor (No.1 cylinder)
*A10	CMP sensor (Reference signal)	D3	Ignitor (No.3 cylinder)
*A11		D4	Blank
A12	Blank	D5	Ignitor (No.2 cylinder)
A13	Ground	D6	Ignitor (No.4 cylinder)
A14	No.3 injector	D7	Blank
A15	No.4 injector	D8	Radiator fan control relay
A16	IAC valve	D9	Fuel pump relay
A17	EGR solenoid vacuum valve (if equipped)	D10	Ground
A18	Blank	D11	Power source
A19	ECT sensor	D12	Duty output terminal
A20	Sensor ground	D13	Blank
A21	IAT sensor	D14	Diagnosis output terminal and MIL ("CHECK ENGINE" light)
A22	Heated oxygen sensor (if equipped)	D15	Blank
A23	Throttle position sensor	D16	Blank
A24	MAF sensor	D17	Blank
A25	Blank	D18	Data link connector
A26	Ground	D19	A/C amplifier (A/C OFF Signal) (if equipped)
B1	Blank	D20	Main relay
B2	Blank	D21	Blank
B3	Electric load signal diodes	D22	Ground
B4	Test switch terminal		
B5	Vehicle speed sensor		
B6	Blank		
*B7	Ignition switch		
B8	Sensor ground		
B9	Blank		
B10	Blank		
B11	Power source for back-up		

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

- Fuel pump relay
- Fuel pump
- No.1 injector
- No.2 injector
- No.3 injector
- No.4 injector
- Radiator fan motor
- Radiator fan control relay
- EGR solenoid vacuum valve
- EVAP canister purge valve
- Idle air control valve
- Malfunction indicator lamp ("CHECK ENGINE" light)
- Tachometer
- Ignitor
- Data link connector
- Diagnosis connector 1
- Duty output terminal
- Test switch terminal
- Diag. switch terminal
- Diag. output terminal
- Ground terminal
- Diodes (For electric loads)
- Lighting switch
- Rear window defogger switch
- Heater blower switch
- Battery
- Main fuse box
- Main switch
- Main relay
- Power steering pressure switch
- Starting motor
- Junction/fuse block
- A/C amplifier (if equipped)
- Camshaft position sensor
- Oxygen sensor
- Relay/fuse box
- Speedometer
- Vehicle speed sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Throttle position sensor
- MAF sensor
- Ignition coil

NOTE:
 *marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.



60G10-6E2-G4-5-1S

Engine Control Module (ECM)

ECM for immobilizer control system has following additional function.

- On-board diagnostic system (Self-diagnosis function) for immobilizer control system.

For more information on above item for immobilizer control system, refer to Section 8A of this manual.

NOTE:

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.

However, if Malfunction indicator lamp ("CHECK ENGINE" light) blinks, Immobilizer control system is in malfunction.

DIAGNOSIS

Contents of this DIAGNOSIS section are following items only.

- DIAGNOSTIC TROUBLE CODE(S) CHECK
- A-1 ECM POWER AND GROUND CIRCUIT CHECK
- INSPECTION OF ECM AND ITS CIRCUITS

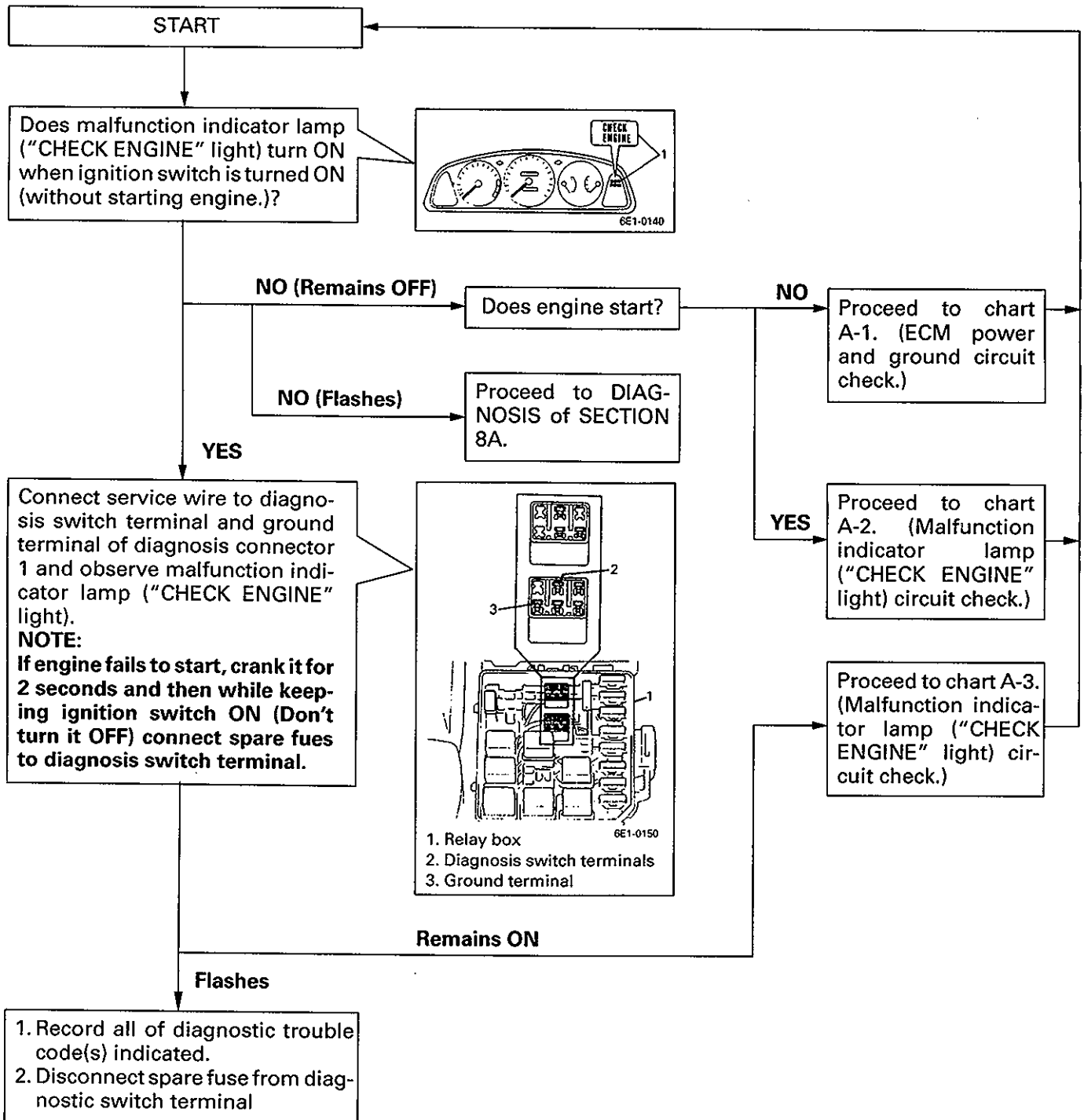
For other items, refer to the same section of Service Manual mentioned in FOREWORD of this manual. At the same time use care for changed items described in the previous section.

NOTE:

When ECM on the vehicle equipped with the immobilizer control system was replaced, including when replaced because re-checking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.

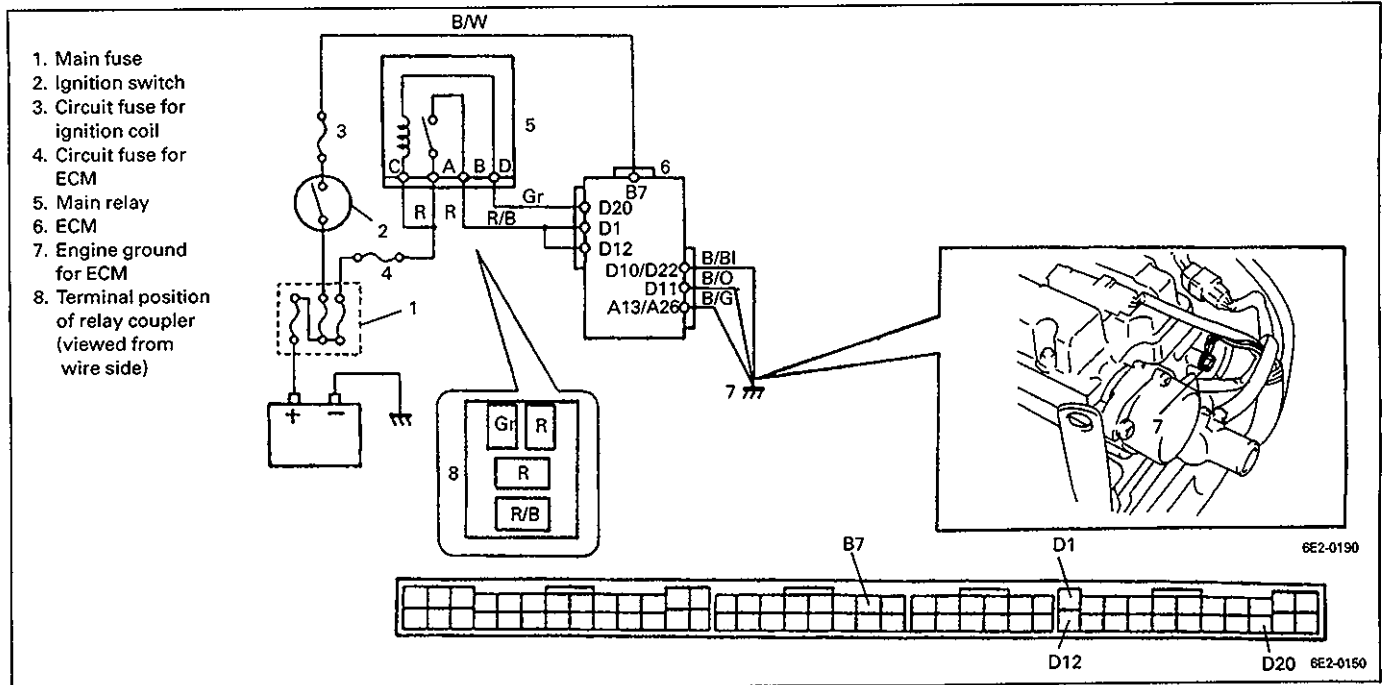
For more information, refer to "Procedure after ECM Replacement" in SECTION 8A.

DIAGNOSTIC TROUBLE CODE(S) CHECK



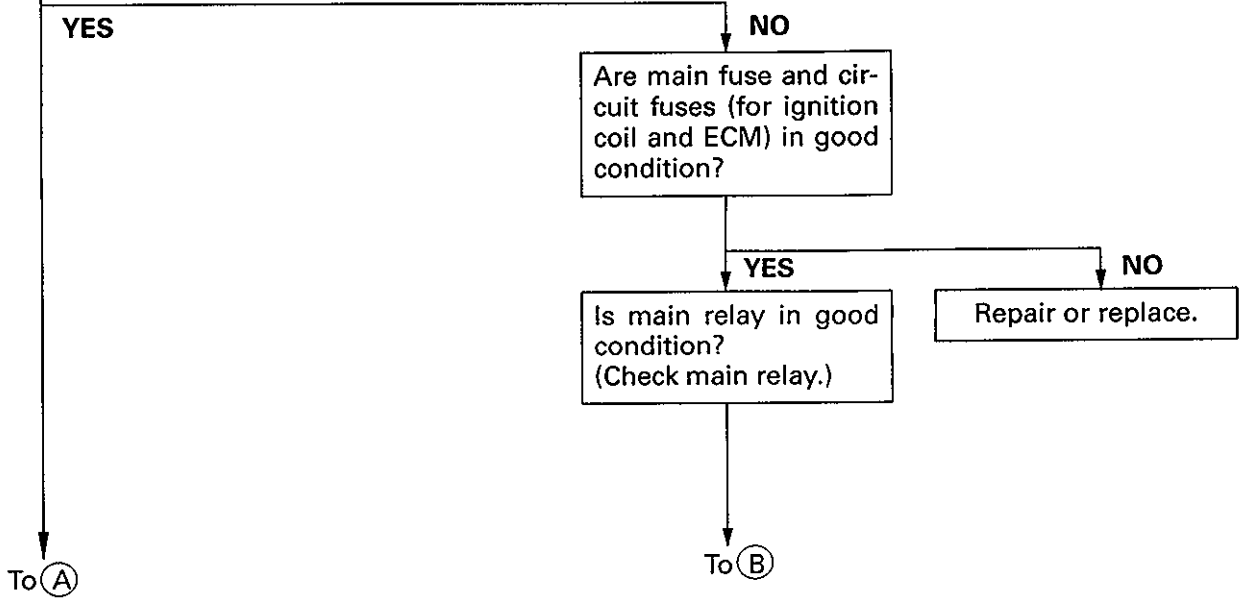
A-1 ECM POWER AND GROUND CIRCUIT CHECK

(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

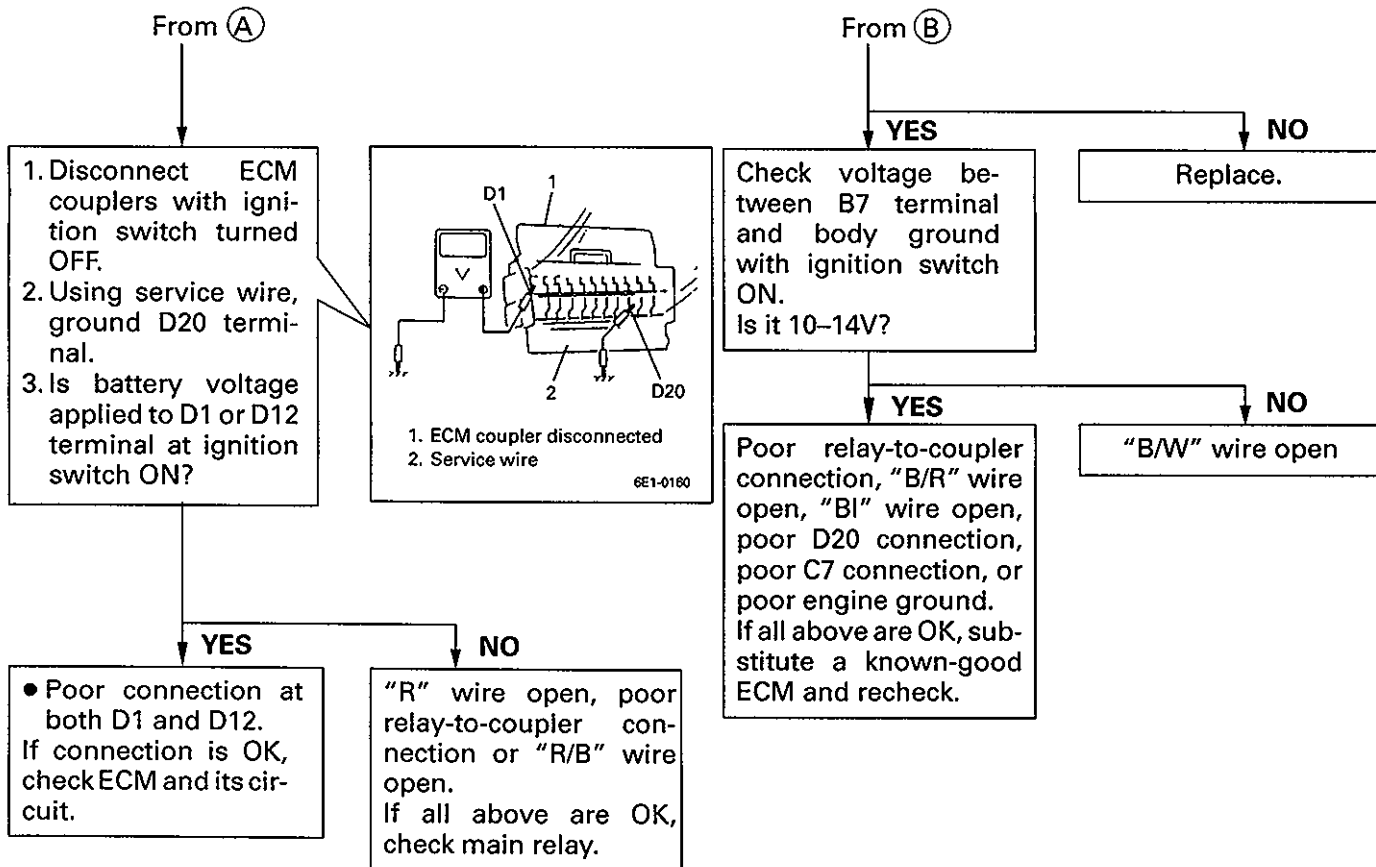


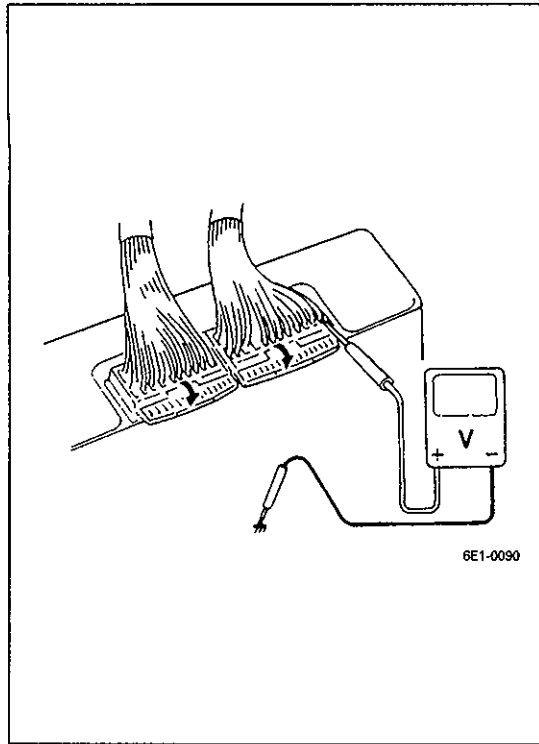
60G10-6E2-G4-8-1S

Is operation of main relay heard at ignition switch ON?



60G10-6E2-G4-8-2S





60G10-6E2-G4-10-1S

INSPECTION OF ECM AND ITS CIRCUITS

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

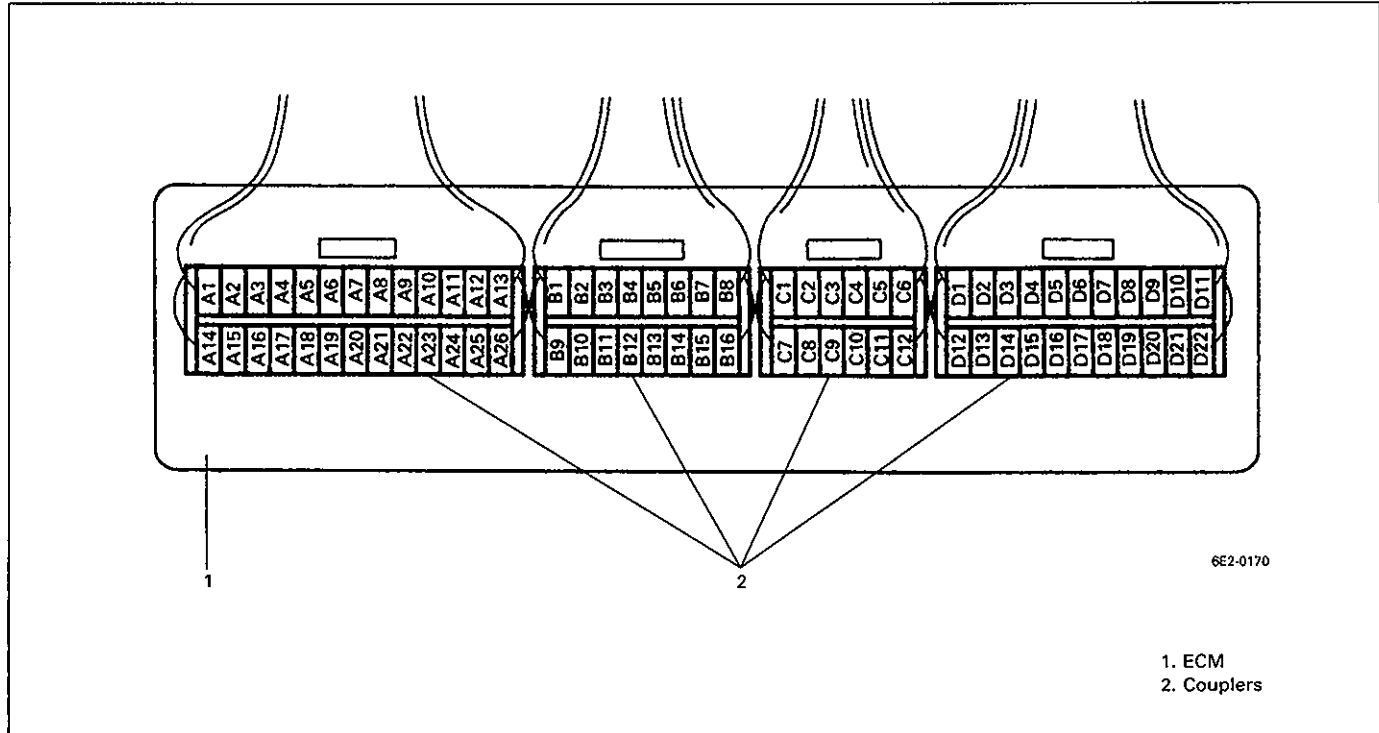
CAUTION:
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.

Voltage Check

- 1) Remove ECM from body.
- 2) Connect ECM couplers to ECM.
- 3) Check outage at each terminal of couplers connected.

NOTE:

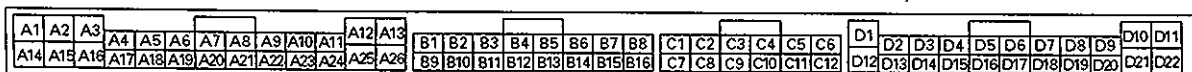
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.



60G10-6E2-G4-10-3S

TERMI-NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	No.1 injector	10 – 14V	Ignition switch ON
A2	No.2 injector	10 – 14V	Ignition switch ON
A3	Heated oxygen sensor heater (if equipped)	10 – 14V	Ignition switch ON
		0 – 2V	At specified idle speed after engine warmed up.
A4	EVAP canister purge valve	10 – 14V	Ignition switch ON
A5	Power steering pressure switch	4.75 – 5.25V	Ignition switch ON
		0 – 0.8V	Engine running at idle speed and steering wheel turned to the right and left as far as it stops.
A6	Engine start switch (Engine start signal)	0 – 1V	Ignition switch ON
		6 – 14V	While engine cranking
A7	Power source (for sensors)	4.75 – 5.25V	Ignition switch ON
*A8 *A9	CMP sensor signal (Position signal)	Indicator deflection between 0 – 1V and 4 – 6V	Ignition switch ON Crankshaft turned slowly
*A10 *A11	CMP sensor signal (Reference signal)	Indicator deflection between 0 – 1V and 4 – 6V	Ignition switch ON Crankshaft turned slowly
A12	Blank	—————	—————
A13	Ground	—————	—————
A14	No.3 injector	10 – 14V	Ignition switch ON
A15	No.4 injector	10 – 14V	Ignition switch ON
A16	IAC valve	{ 6.2 – 8.7V {(62% : ON DUTY) }	At specified idle speed after engine warmed up.
A17	EGR solenoid vacuum valve	10 – 14V	Ignition switch ON
A18	Blank	—————	—————
A19	ECT sensor	About 0.8V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
A20	Sensor ground	—————	—————
A21	IAT sensor	About 3.0V	Ignition switch ON sensor ambient temp.: 20°C (68°F)
A22	Heated oxygen sensor (if equipped)	Indicator deflection repeated between over and under 0.31V	While engine running at 2,000 r/min for 1 minute or longer after warmed up.
A23	TP sensor	0.35 – 0.65V	Ignition switch ON after engine warmed up. Throttle valve at idle position.
		3.6 – 4.5V	Ignition switch ON Throttle valve at full open position.
A24	MAF sensor	0.5 – 1.0V	Ignition switch ON
		1.5 – 1.8V	With engine running at idle speed
A25	Blank	—————	—————
A26	Ground	—————	—————

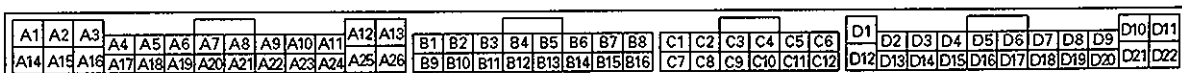
TERMINAL ARRANGEMENT OF ECM COUPLER (VIEWED FROM HARNESS SIDE)



TERMI-NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B1 B2	Blank	_____	_____
B3	Electric load signal diode	0 - 1V	Ignition switch ON. small light, headlight, heater fan or rear defogger all turned OFF
		10 - 14V	Ignition switch ON. Small light, headlight, heater fan or rear defogger turned ON
B4	Test switch terminal	4.75 - 5.25V	Ignition switch ON
		0 - 0.8V	Ignition switch ON Test switch terminal grounded
B5	Vehicle speed sensor	Indicator deflection repeated between 0 - 1 and 4 - 5V	Ignition switch ON Rear left tire turned slowly with front right tire locked.
B6	Blank	_____	_____
*B7	Ignition switch	10 - 14V	Ignition switch ON
		0 - 0.8V	ignition switch OFF
B8	Sensor ground	_____	_____
B9	Blank	_____	_____
B10	Blank	_____	_____
B11	Power source for back-up	10 - 14V	Ignition switch ON and OFF
B12	Diagnosis switch terminal	4.75 - 5.25V	Ignition switch ON
		0 - 0.8V	Ignition switch ON Diagnosis switch terminal grounded
B13	A/C amplifier (A/C ON signal) (if equipped)	4.75 - 5.25V	A/C OFF
		0 - 1.5V	While engine running and A/C ON
B14	Blank	_____	_____
B15	Tachometer	0 - 0.8V	Ignition switch ON
B16	Blank	_____	_____

TERMI-NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
C1 - C12	Blank	_____	_____

TERMINAL ARRANGEMENT OF ECM COUPLER (VIEWED FROM HARNESS SIDE)



6E2-0020

TERMI- NAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
D1	Power source	10 – 14V	Ignition switch ON
D2	Ignitor (No.1 ignition coil)	_____	_____
D3	Ignitor (No.3 ignition coil)	_____	_____
D4	Blank	_____	_____
D5	Ignitor (No.2 ignition coil)	_____	_____
D6	Ignitor (No.4 ignition coil)	_____	_____
D7	Blank	_____	_____
D8	Radiator fan control relay	10 – 14V	Ignition switch ON
		0 – 2.5V	Ignition switch ON and engine cooling fan ON
D9	Fuel pump relay	0 – 2.5V	For 3 seconds after ignition switch ON
		10 – 14V	After the above time
D10 D11	Ground	_____	_____
D12	Power source	10 – 14V	Ignition switch ON
D13	Duty output terminal	10 – 14V	Ignition switch ON
D14	Blank	_____	_____
D15	Diagnosis output terminal and malfunction indicator lamp ("CHECK ENGINE" light)	0 – 2.5V	Ignition switch ON
		10 – 14V	Engine running
D16	Blank	_____	_____
D17	Blank	_____	_____
D18	Data link connector	4 – 5V	Ignition switch ON
D19	A/C amplifier (A/C cut switch) (if equipped)	0 – 0.8V	While engine running and A/C OFF
		4.75 – 5.25V	While engine running and A/C ON
D20	Main relay	0 – 2.0V	Ignition switch ON
		10 – 14V	Ignition switch OFF
D21	Blank	_____	_____
D22	Ground	_____	_____

TERMINAL ARRANGEMENT OF ECM COUPLER (VIEWED FROM HARNESS SIDE)

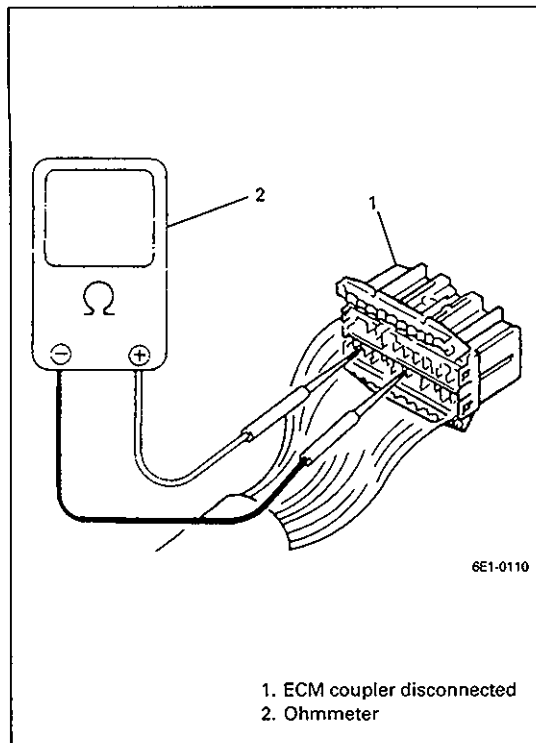
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B1	B2	B3	B4	B5	B6	B7	B8	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	B9	B10	B11	B12	B13	B14	B15	B16	C7	C8	C9	C10	C11	C12	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22

6E2-0020

NOTE:

*marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.

60G10-6E2-G4-13-1S



Resistance Check

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

CAUTION:

Never touch terminals of ECM itself or connect volt-meter 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).

60G10-6E2-G4-14-1S

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
A1 - D1	No.1 injector	10.8 - 13.2Ω	——
A2 - D1	No.2 injector	10.8 - 13.2Ω	——
A3 - *B7	Heated oxygen sensor heater	5.5 - 6.5Ω	——
A4 - D1	EVAP canister purge valve	33 - 39Ω	——
A14 - D1	No.3 injector	10.8 - 13.2Ω	——
A15 - D1	No.4 injector	10.8 - 13.2Ω	——
A16 - D1	IAC valve	8.7 - 10.5Ω	——
A19 - B8	ECT sensor	305 - 324Ω	Engine coolant temp.: 80°C (176°F)
A21 - B8	IAT sensor	2.21 - 2.69kΩ	Intake air temp.: 20°C (68°F)
D20 - B11	Main relay	60 - 120Ω	——
B5 - Body ground	Vehicle speed sensor	Ohmmeters indicator deflects between 0 and ∞	Front left wheel turned slowly with front right wheel locked.
A17 - D1	EGR solenoid vacuum valve	33 - 39Ω	——
D9 - *B7	Fuel pump relay	60 - 120Ω	——
D8 - *B7	Radiator fan control relay	60 - 120Ω	——

NOTE:

* marked terminal is a terminal which has been newly modified due to installation of immobilizer control system.

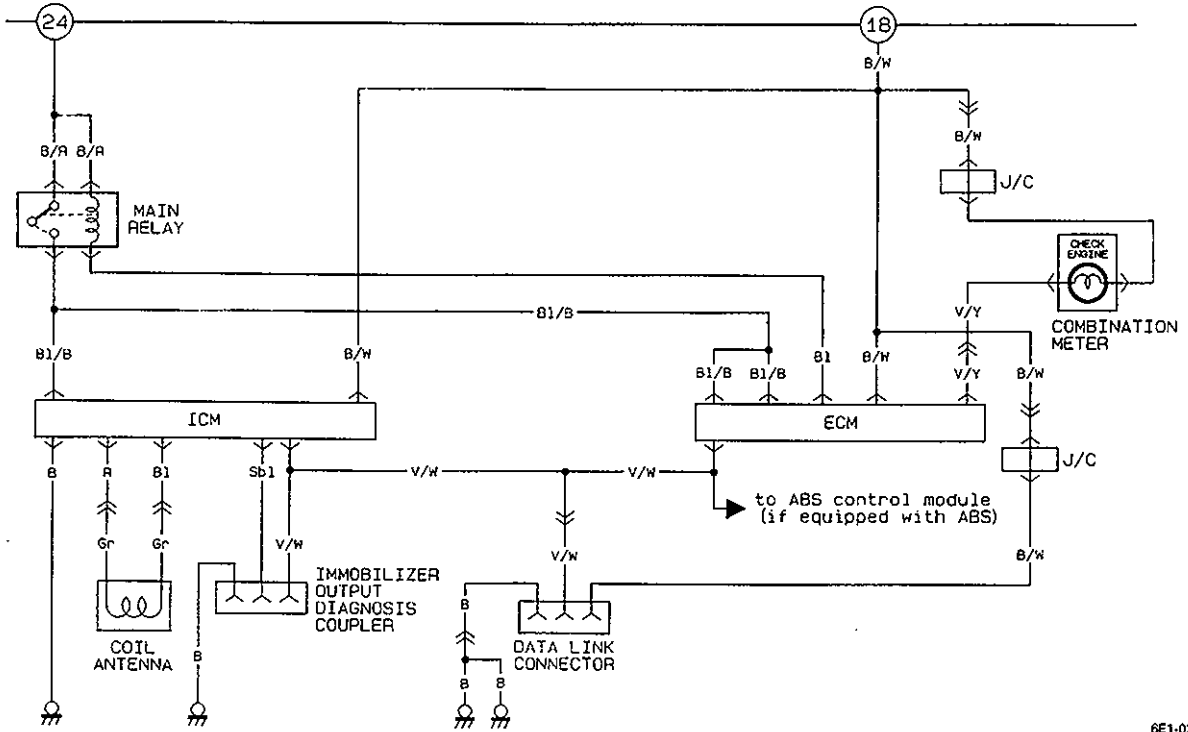
60G10-6E2-G4-14-2S

WIRING DIAGRAM

NOTE:

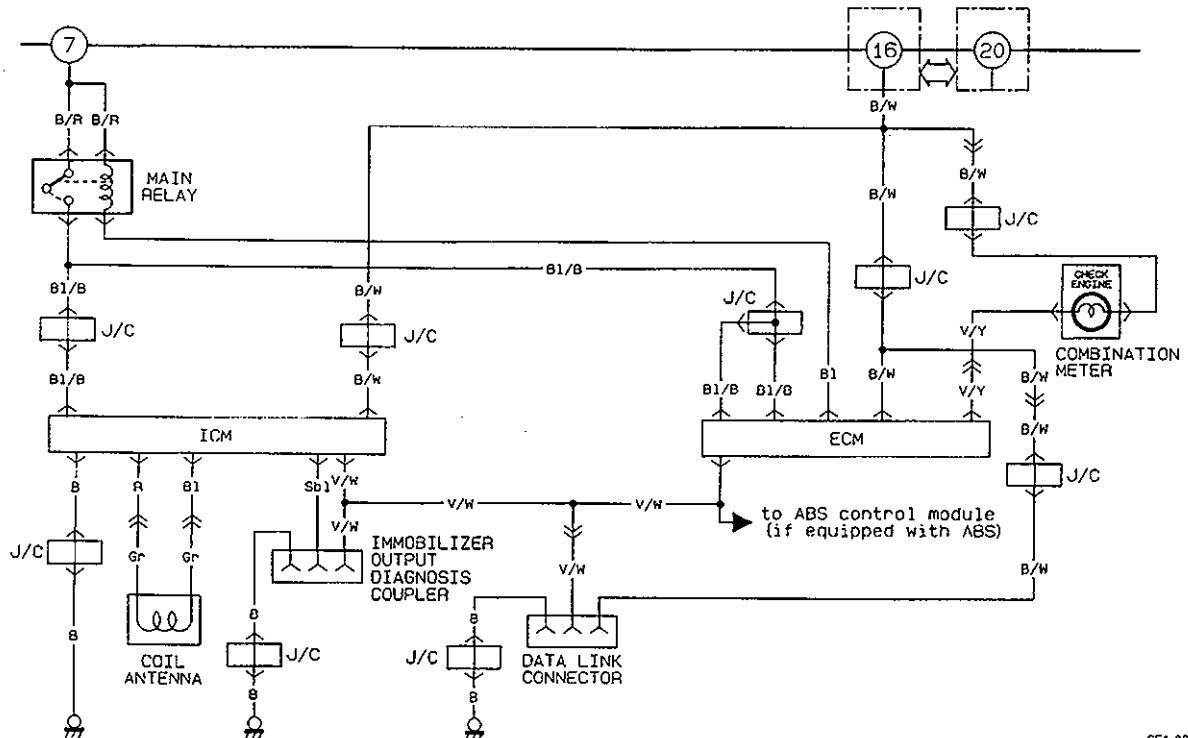
For the item not found in this WIRING DIAGRAM, refer to the WIRING DIAGRAM of the Service Manual mentioned in the Foreword of this manual

IMMOBILIZER CONTROL SYSTEM (FOR SE416/SZ416)



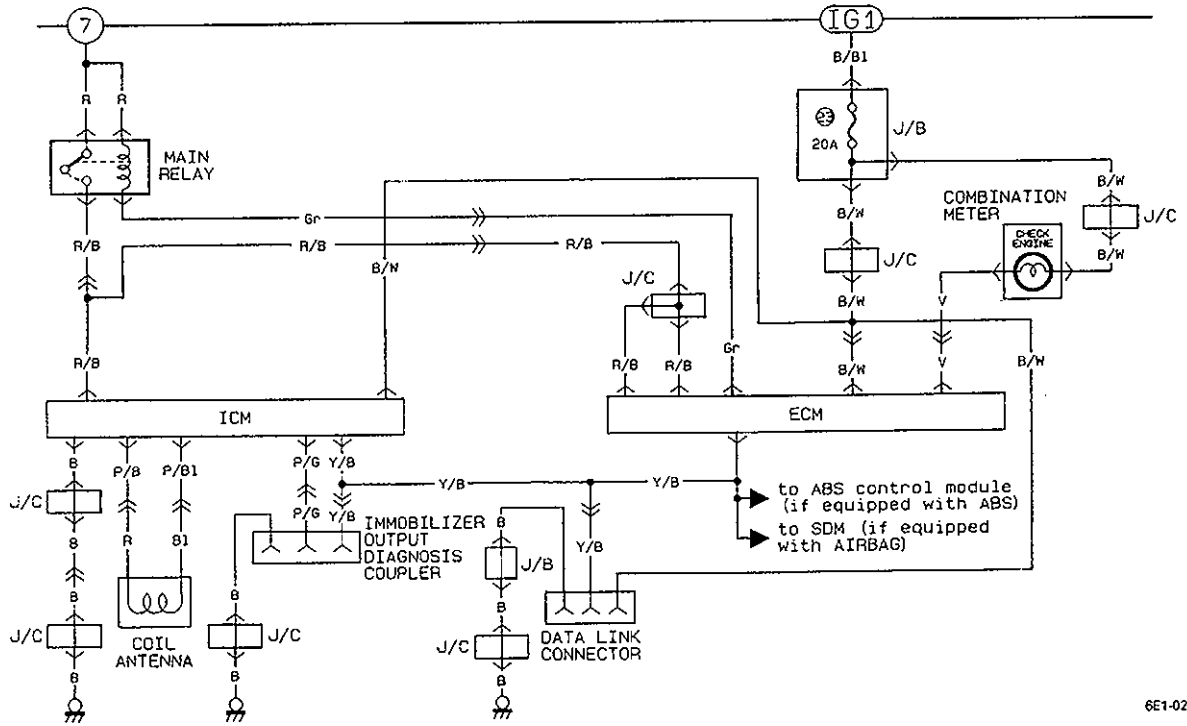
6E1-0200

IMMOBILIZER CONTROL SYSTEM (FOR SV620)



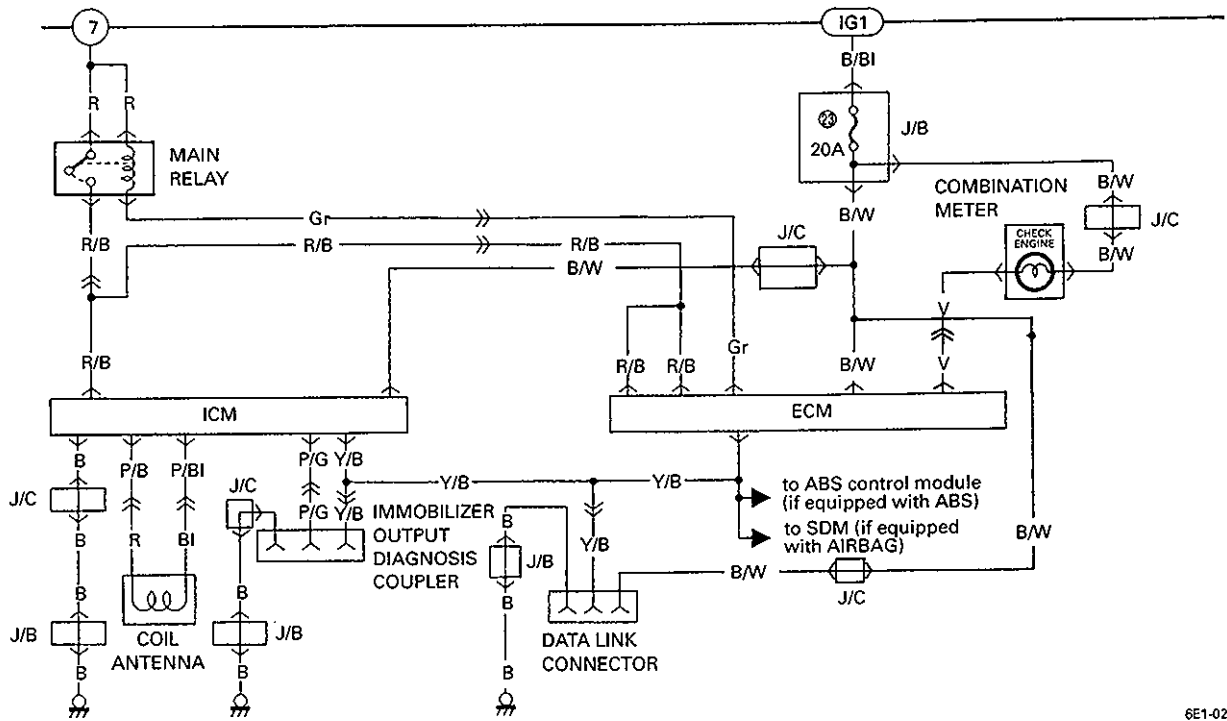
6E1-0210

IMMOBILIZER CONTROL SYSTEM (FOR SY413/416)



6E1-0220

IMMOBILIZER CONTROL SYSTEM (FOR SY418)



6E1-0230

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