Self diagnosis symptom

○ : Effect much
△ : Effect little

ITEM	Symptom / Main cause	Hard to start	Rough idling	Lack of power/ Poor accelera-tion	Bad return of overrun rpm	Engine stop	Much black smoke	Much white smoke	Knocking and vibrtion	Poor fuel economy	Impossible to stop the engine	Sudden rise of engine rpm	Check point
Fuel cut solenoid valve	Poor connection or looseness of terminal	○				○			△				Tightening torque : 2.0-2.5kg·m
	Valve fail (Open or being stuck)	○				○					○		Check the resistance or output signal Inspect the part after removal
TCV	Poor connection or looseness of connector	○	○	○	△	△	○	○	○	○			Check the installation condition
	Malfunction of TCV (open or being stuck)	○	○	○	△	△	○	○	○	○			Check the resistance or output signal
	TCV filter clogged (O-ring torn)	○	○	○	△	△	○	○	○	○			
CSP sensor	Bad output of CSP sensor	○	○	○	○	○	○	○	○	○		○	Check the resistance or output signal
	Malfunction of CSP sensor(open or short)	○	○	○	○	○	○	○	○	○			
GE actuator	Bad output of GE coil	○	○	○	○	○	○	○	○	○	△	△	Check the resistance or output signal
	Malfunction of GE coil (open or short)	○	○	○	○	○	○	○	○	○	△		
Fuel temp. sensor	Malfunction of fuel temp. sensor	○	○				○	○		○			Check the resistance or output signal
	Bad output of sensor	○	○		△		○	○		○			Check the characteristic of resistance for temp. range
Compensation resistor	Compensation resistor poor connection	○	○	○	△	△	○	○	△	○			Check the open or short
	Wrong resistor	○	○	○	△	△	○	○	△	○			Check the compensation resistor
Np sensor (TDC sensor is good)	Bad installation, noise				○								Tightening torque : 2.0-2.5kg·m Compensation resistor

ITEM	Symptom / Main cause	Hard to start	Rough idling	Lack of power/ Poor accelera-tion	Bad return of overrun rpm	Engine stop	Much black smoke	Much white smoke	Knocking and vibrtion	Poor fuel economy	Impossible to stop the engine	Sudden rise of engine rpm	Check point
Np sensor (TDC sensor is good)	Malfunction of sensor (open or short)				○				△				Check the resistance and output signal
Np sensor (with faulty TDC sensor)	Bad installation, noise		○			○							Tightening torque : 2.0-2.5Kg· m Check the output signal
	Malfunction of sensor (open or short)					○							Check the resistance and output signal
TPS	Bad installation and output signal	○	○	○	△	△	○	○	○	○			Tightening torque : 0.7-0.9Kg· m Check the output signal
	Malfunction of sensor (open or short)	○	○	○	△	△	○	○	○	○			Check the resistance
Boost sensor	Bad installation and output signal			○			△	△		△			Inspect the installation condition
	Malfunction of sensor (open or short)			○			△	△		△			Check the output signal's char-acteristic
TDC sensor (with good Np sensor	Bad installation, noise Malfunction of sensor (open or short)		○	○			○	○	○	○		○	Inspect the installation condition and fly wheel Check the output signal's char-acteristic
TDC sensor (with faulty Np sensor)	Bad installation, noise Malfunction of sensor (open or short)		○	○	○	○	○	○	○	○			
*ECT sensor	Bad installation and output signal	○	○	△			○	○	△	○		△	Inspect the installation condition
	Malfunction of sensor (open or short)	△	○	△			○	○	△	○		△	Check the output signal's char-acteristic
VSP	Bad installation and output signal			○					○				Check the output signal's char-acteristic
	Malfunction of sensor (open or short)			○					○				Check the wiring harness
APS sensor	Malfunction of sensor (open or short)	△	○	○	○		○	○		○		○	Check the output signal's char-acteristic

ITEM	Symptom / Main cause	Hard to start	Rough idling	Lack of power/ Poor accelera-tion	Bad return of overrun rpm	Engine stop	Much black smoke	Much white smoke	Knocking and vibrtion	Poor fuel economy	Impossible to stop the engine	Sudden rise of engine rpm	Check point
IDLE switch	Open or short		○		○					△		○	Check the wiring harness
Neutral switch	Bad installation and output signal(open and short)					△							Check the neutral switch Check the wiring harness
ECU	Power system(open or short)	○											Check the wiring harness
	Bad output signal of PWM signal for TCM (open or short)			○					○				Check the PWM signal of APS
ECU	Bad output signal of barometric pressure sensor			○			○	○		○			Replace ECM after confirming error code
	Bad communication for IMMOBI(open or short)	○				○							Check the communication line
T/C waste gate (boost hose)	Malfunction(stuck)			○			○			○			Check the waste gate's operation and the boost hose
Glow relay	Open or short	○	○					○					Check the grow relay's output signal and wiring harness
EGR solenoid valve	Being stuck, bad operation			○			○			○			Check the operation and wiring harness

NOTE
Abbreviations marked * are listed below.

Np : Injection pump speed sensor
CSP : Control sleeve position
FCV : Fuel cut valve
GE : Electronic governor
Tf : Fuel temperature sensor.
APS : Acceleration position sensor
Tw : Water temperature sensor
TCV : Timing control valve.
ECT : Engine coolant temperature
IMMOBI : Immobilizer

SELF-DIAGNOSIS PRECAUTIONS

WARNINGS

The following definitions and warming signs are used in this service manual. These are extremely important to safe operation. Important points are described to prevent bodily injury and property damage. They must be fully understood before beginning COVEC-F self diagnosis system operation.

CAUTION

Improper maintenance can result in injury or property damage.

MEANINGS OF MARKS

The following marks are used in this service manual to facilitate correct COVEC-F self diagnosis system operation.

Advice

Procedures that must be performed to enable the best possible COVEC-F self diagnosis system operation.

NOTE

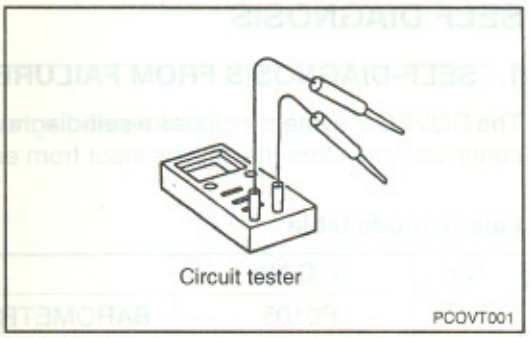
Information assisting in the best possible COVEC-F self diagnosis system operation.

1. PREPARATION

Prepare the following.

- Circuit tester

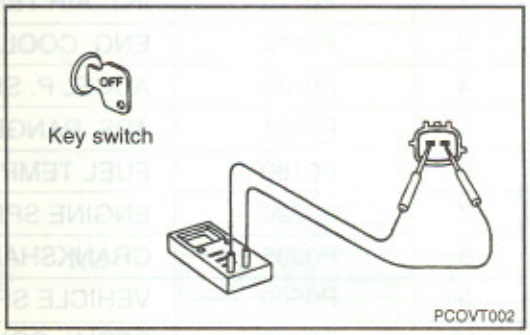
Note
The circuit tester is used during inspection procedures to check the continuity and resistances of each electrical component.



2. CIRCUIT TESTER USE

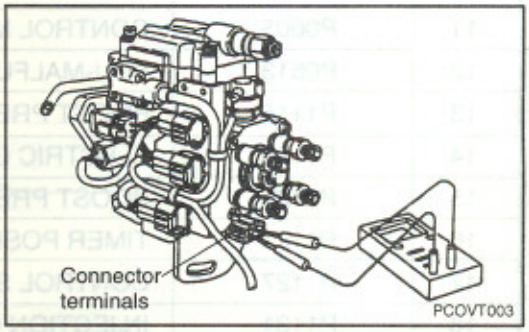
- Turn the engine's key switch OFF when checking continuity or resistance.

CAUTION
If the key switch is on when checking continuity or resistance, electrical components may be damaged.



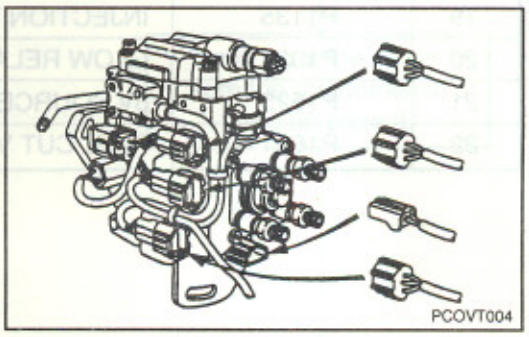
- Do not damage connector terminals when checking continuity or resistance. Do not push the tester pins into the female terminals.

CAUTION
New faults may arise if the connector terminals are damaged.



- Always reconnect connectors in their original positions after checking continuity or resistance.

CAUTION
New faults or improper operation may arise if connectors are not remstalled in their original positions.



SELF DIAGNOSIS

1. SELF-DIAGNOSIS FROM FAILURE MODE

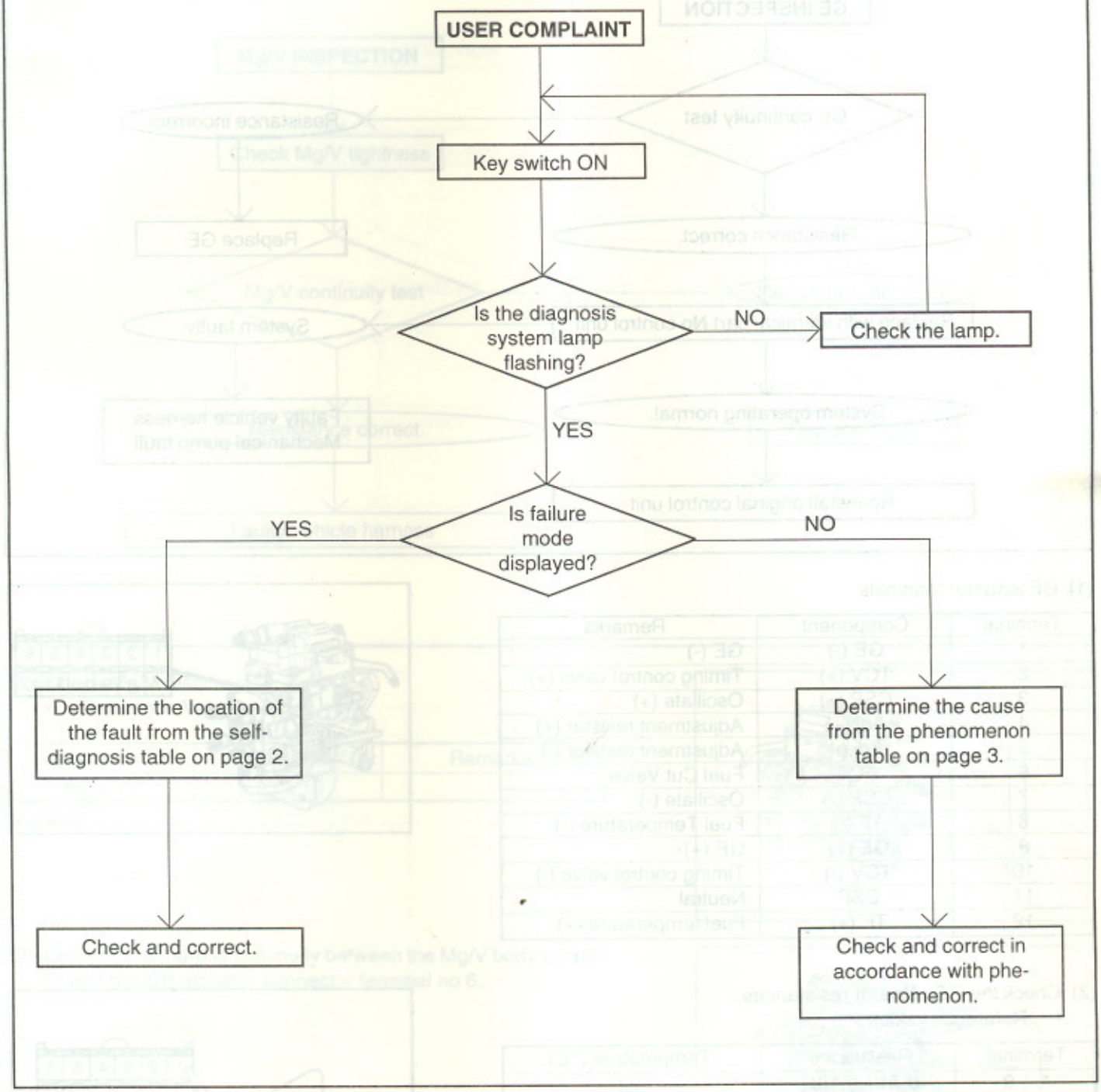
The COVEC-F system includes a self-diagnosis system which alerts the operator to system malfunctions. The control unit continually monitors the signals input from each sensor and the GE actuator for abnormal values.

Failure mode table

No.	DTC No.	CONTENTS	MIL
1	P0105	BAROMETRIC SENSOR-MAL.	X
2	P0110	INT. AIR TEMP. CIRCUIT-MAL.	X
3	P0115	ENG. COOLANT TEMP.-MAL.	O
4	P0120	ACCEL P. SNSR-MAL.	X
5	P0121	APS. RANGE/PERFORMANCE-MAL.	O
6	P0180	FUEL TEMP. SNSR. CIRCUIT-MAL.	X
7	P0320	ENGINE SPEED INPUT CIRCUIT-MAL.	X
8	P0335	CRANKSHAFT P. SNSR-MAL.	X
9	P0500	VEHICLE SPEED SNSR-MAL.	X
10	P0600	SERIAL COM. LINK-MAL.	X
11	P0605	CONTROL MODULE (EEPROM) ROM-MAL.	X
12	P0613	ECU-MALFUNCTION	
13	P1116	BOOST PRESSURE SENSOR-MAL.	O
14	P1120	ELECTRIC GOVERNOR-MAL.	O
15	P1122	BOOST PRESSURE CONTROL VALVE-MAL.	O
16	P1123	TIMER POSITION SENSOR-MAL	X
17	P1127	CONTROL SLEEVE POSITION SNSR.-MAL	O
18	P1131	INJECTION QUANTITY ADJUST-MAL.	X
19	P1135	INJECTION TIMING SERVO-MAL.	X
20	P1324	GLOW RELAY-MALFUNCTION	X
21	P1525	5V SOURCE VOLTAGE	X
22	P1621	FUEL CUT VALVE-MAL.	O

Use the follwing chart to check the system when malfunctions occur.

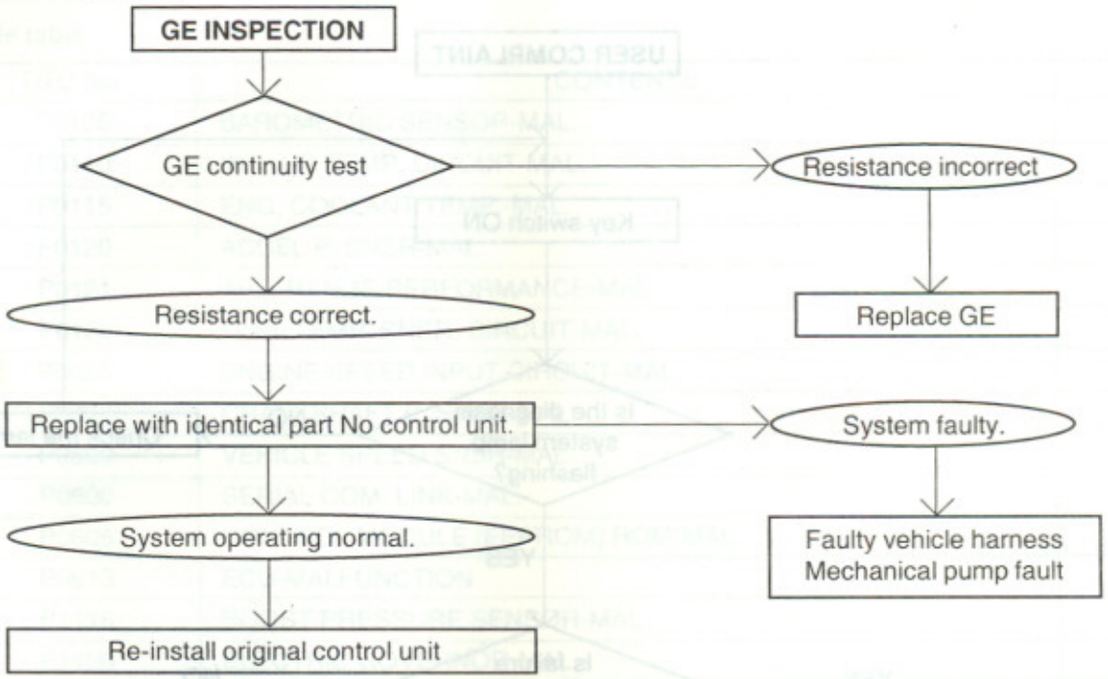
Advice
When the key switch in ON, leave each electrical component's connector connected.



INSPECTION OF PARTS

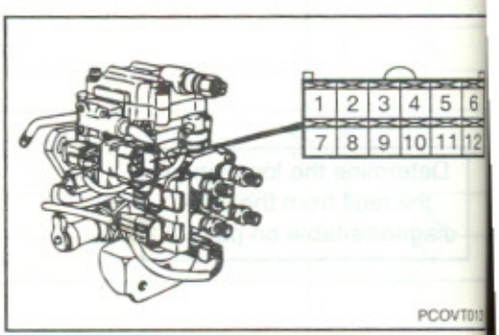
1. GE ACTUATOR

Advice
Turn the key switch OFF.



(1) GE actuator terminals

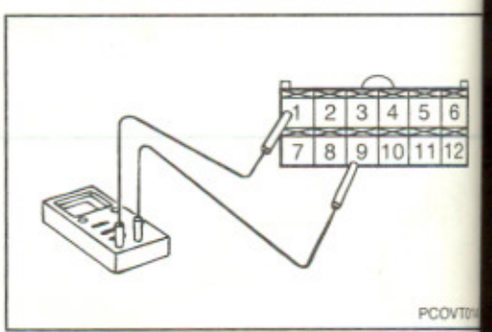
Terminal	Component	Remarks
1	GE (-)	GE (-)
2	TCV (+)	Timing control valve (+)
3	CSP (+)	Oscillate (+)
4	Adj (+)	Adjustment resistor (+)
5	Adj (-)	Adjustment resistor (-)
6	FCV	Fuel Cut Valve
7	CSP (-)	Oscillate (-)
8	TF (-)	Fuel Temperature (-)
9	GE (+)	GE (+)
10	TCV (-)	Timing control valve (-)
11	CSP	Neutral
12	TF (+)	Fuel temperature (+)



(2) Check the GE actuator resistances.

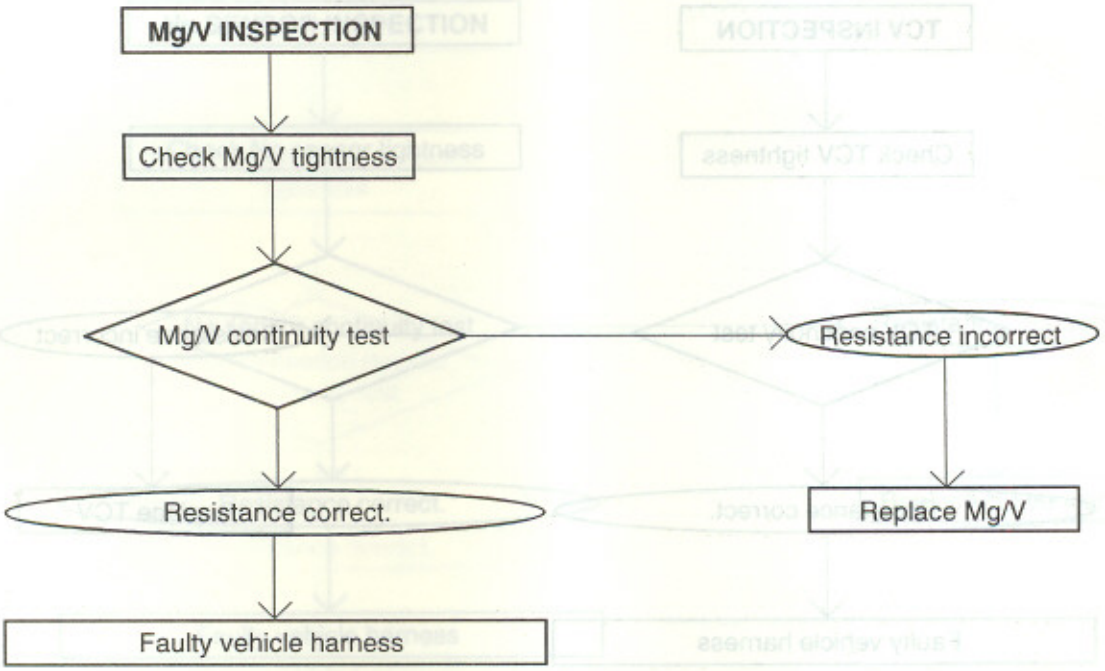
- Reference values

Terminal	Resistance	Temperature (°C)
1 -- 9	0.71 ± 0.13Ω	23
3 -- 7	11.8 ± 0.6Ω	23
3 -- 11	5.9 ± 0.3Ω	23
7 -- 11	5.9 ± 0.3Ω	23



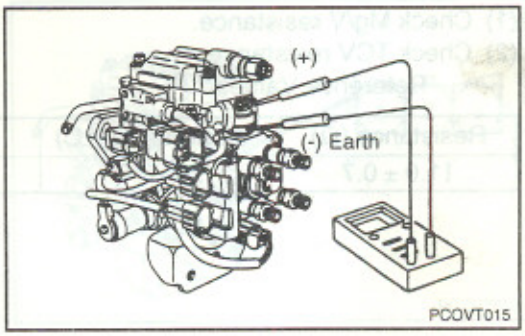
2. Mg/V (MAGNET VALVE)

Advice
Turn the key switch OFF.

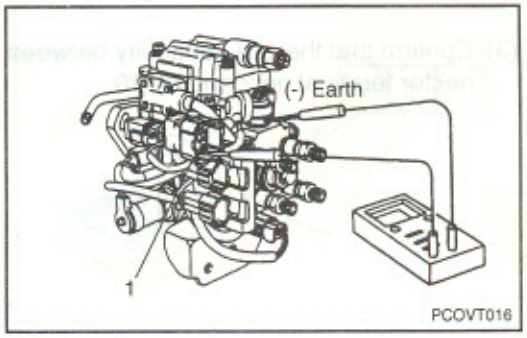


(1) Check Mg/V resistance.
- Reference Values

Resistance (Ω)	Temperature (°C)	Remarks
8.6 ± 1.1	23 ± 10	

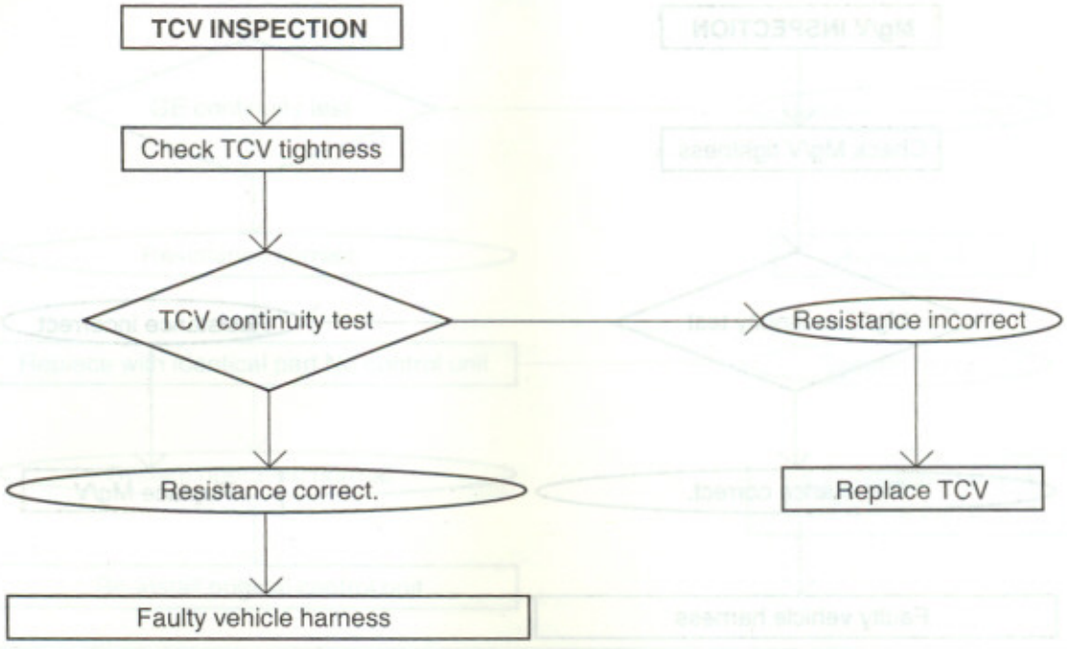


(2) Confirm that there is continuity between the Mg/V body's earth (-) and the GE actuator connector terminal no 6.



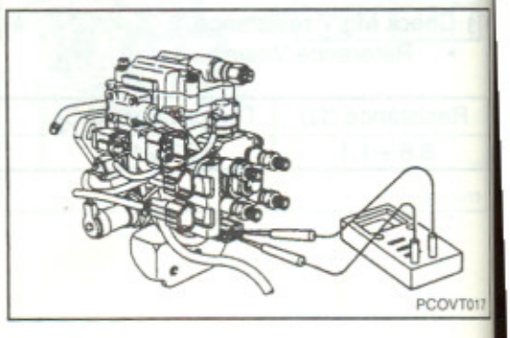
3. TCV (TIMING CONTROL VALVE)

Advice
Turn the key switch OFF.

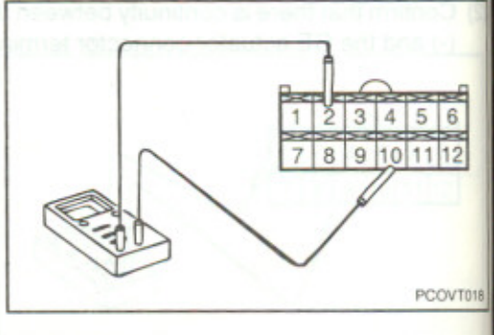


(1) Check Mg/V resistance.
(2) Check TCV resistance.
- Reference Values

Resistance (Ω)	Temperature (°C)	Remarks
11.0 ± 0.7	20 ± 10	

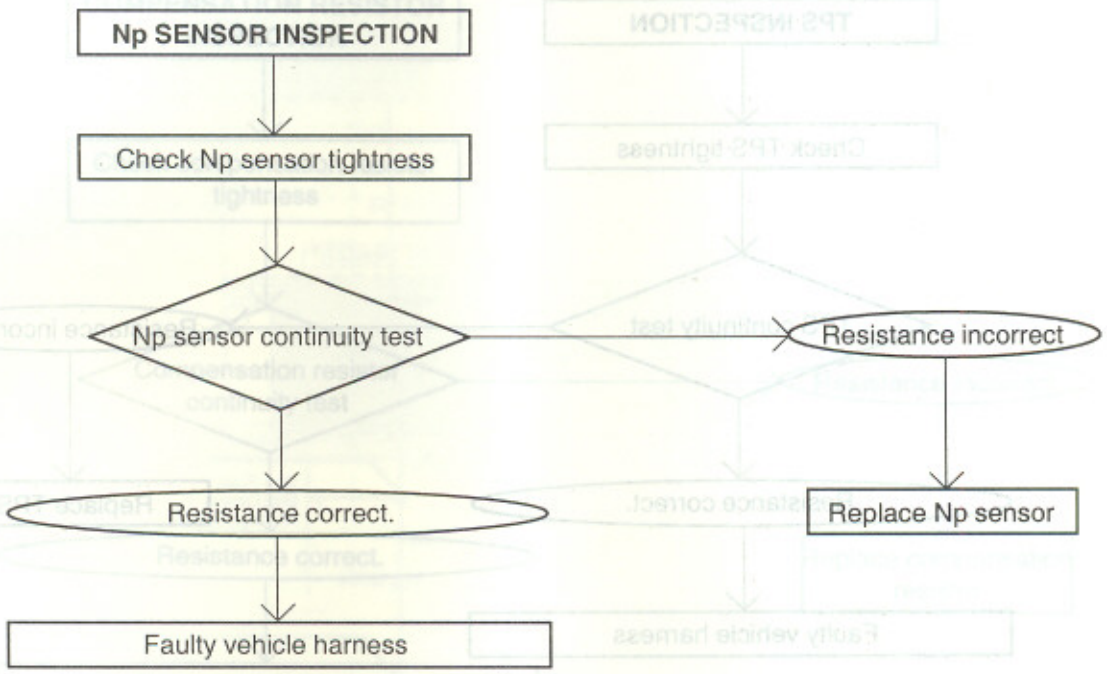


(3) Confirm that there is continuity between the GE actuator connector terminal no 2 and no 10.



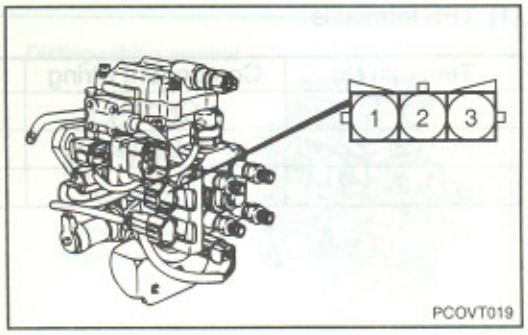
4. Np SENSOR

Advice
Turn the key switch OFF.



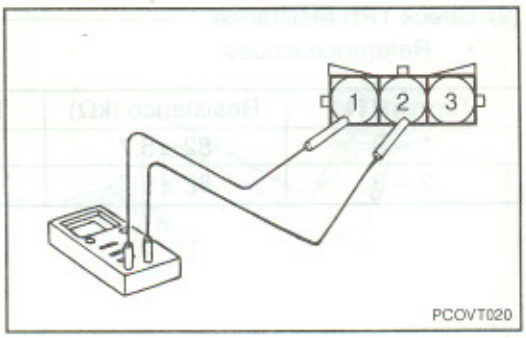
(1) Np sensor terminals.

Terminal No	Component wiring	Remarks
1	SIGNAL	Output
2	GND	
3	Blind plug	2.6V



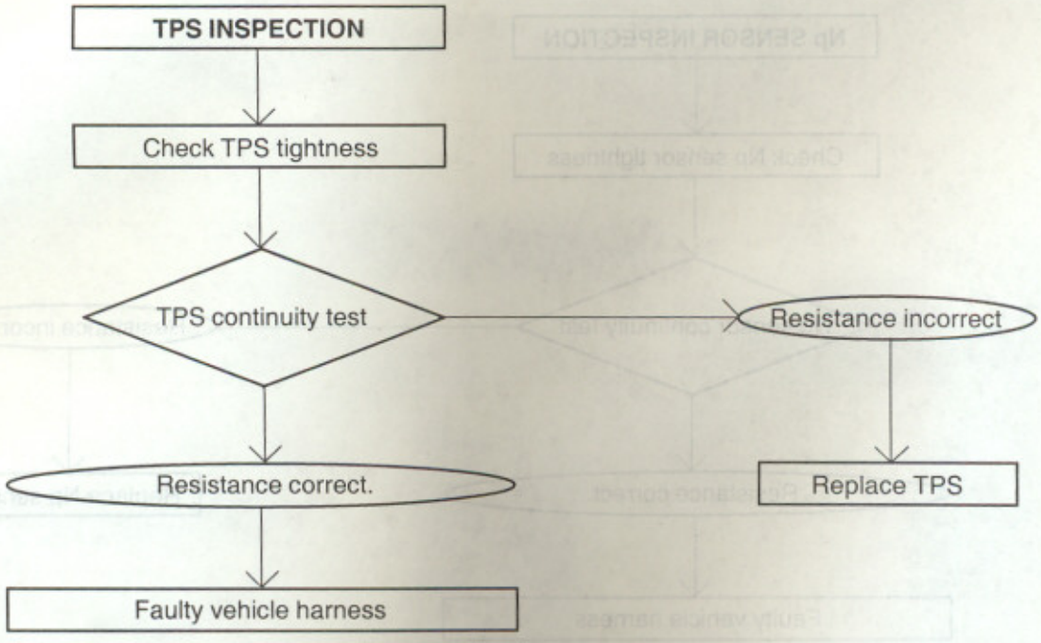
(2) Check Np sensor resistance.
- Reference values

Terminal No	Resistance (kΩ)	Temperature (°C)
1 -- 2	1.65 ± 0.15	25 ± 5



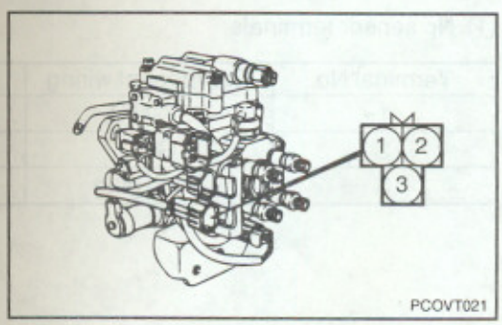
5. TPS (TIMING POSITION SENSOR)

Advice
Turn the key switch OFF.



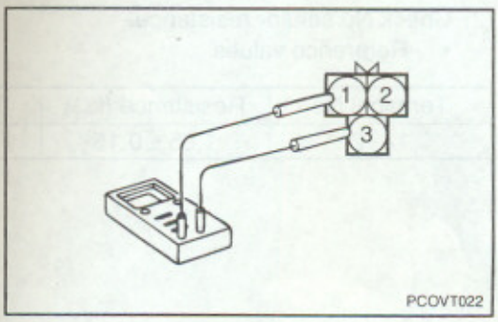
(1) TPS terminals.

Terminal No	Component wiring	Remarks
1	OSC (-)	Oscillate (-)
2	OSC (+)	Oscillate (+)
3	MDL	



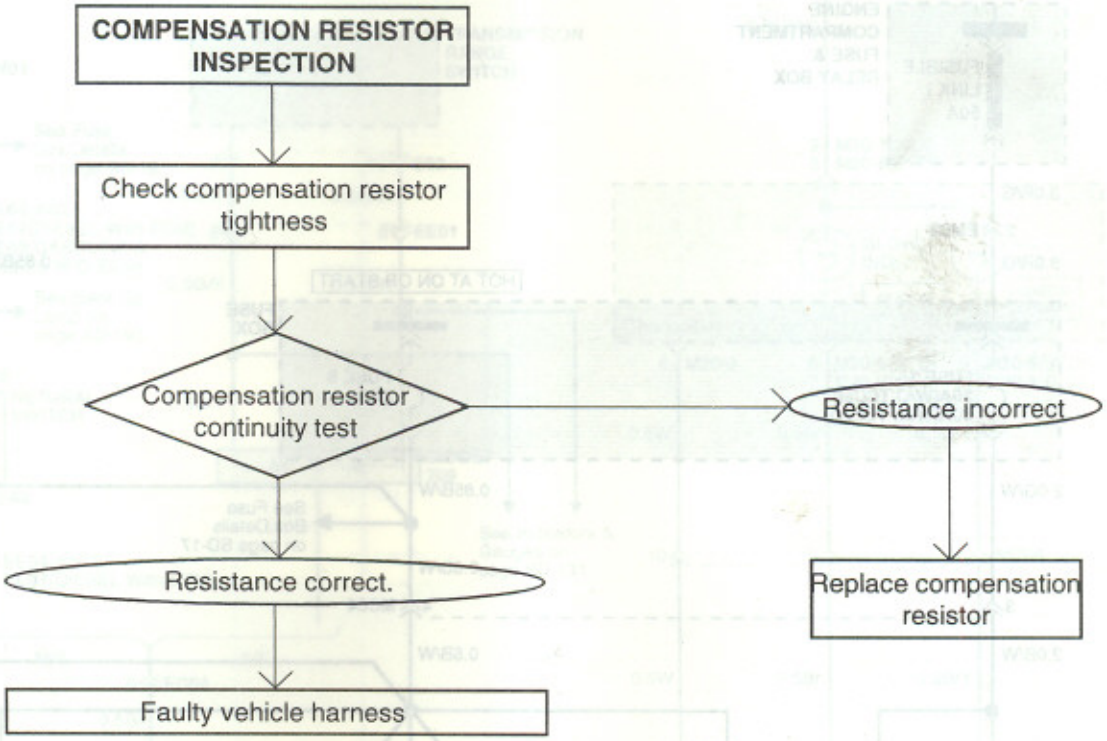
(2) Check TPS resistance.
- Reference values

Terminal No	Resistance (kΩ)	Temperature (°C)
1 -- 3	82 ± 5.7	25 ± 10
2 -- 3	82 ± 5.7	25 ± 10



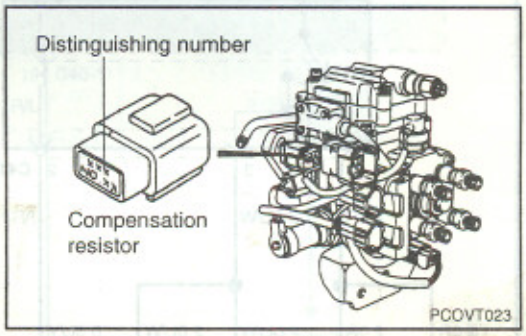
6. COMPENSATION RESISTOR

Advice
Turn the key switch OFF.

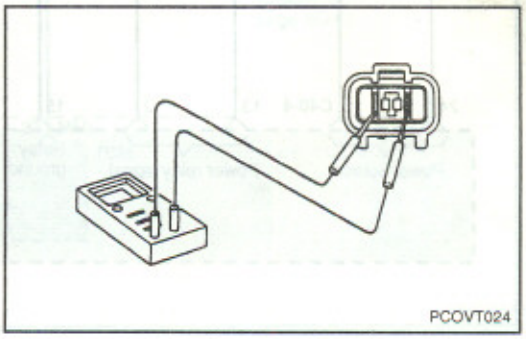


(1) GE actuator terminals

Compensation resistor (No, kΩ)	Distinguishing No	Part no
No1, 0.18	945	146649-4500
No2, 0.30	946	146649-4600
No3, 0.43	947	146649-4700
No4, 0.62	948	146649-4800
No5, 0.82	949	146649-4900
No6, 1.10	950	146649-5000
No7, 1.50	951	146649-5100
No8, 2.00	952	146649-5200
No9, 2.70	953	146649-5300
No10, 3.90	954	146649-5400
No11, 5.60	955	146649-5500
No12, 8.20	956	146649-5600
No13, 15.0	957	146649-5700

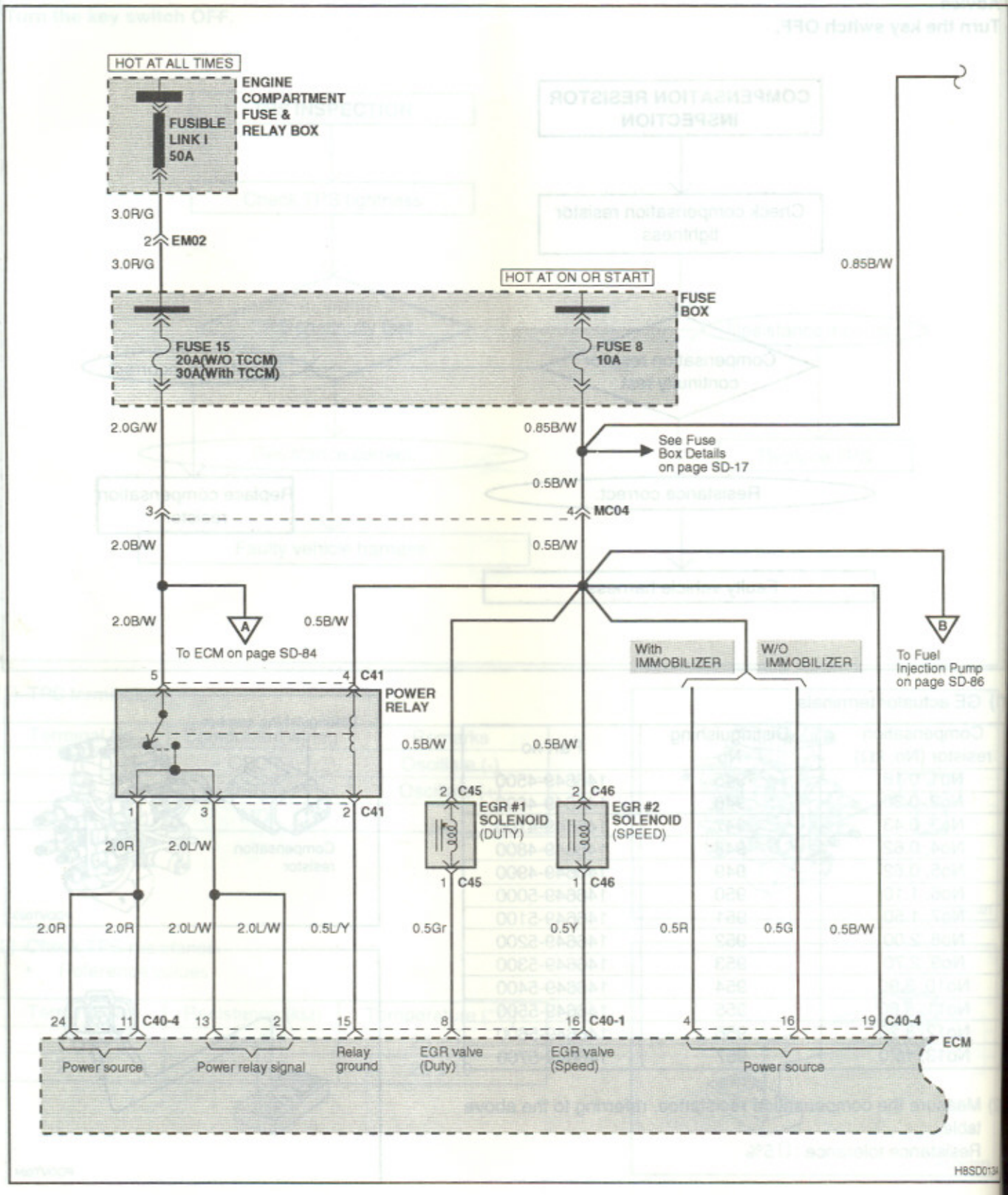


(2) Measure the compensation resistance, referring to the above table.
Resistance tolerance : □ 5%

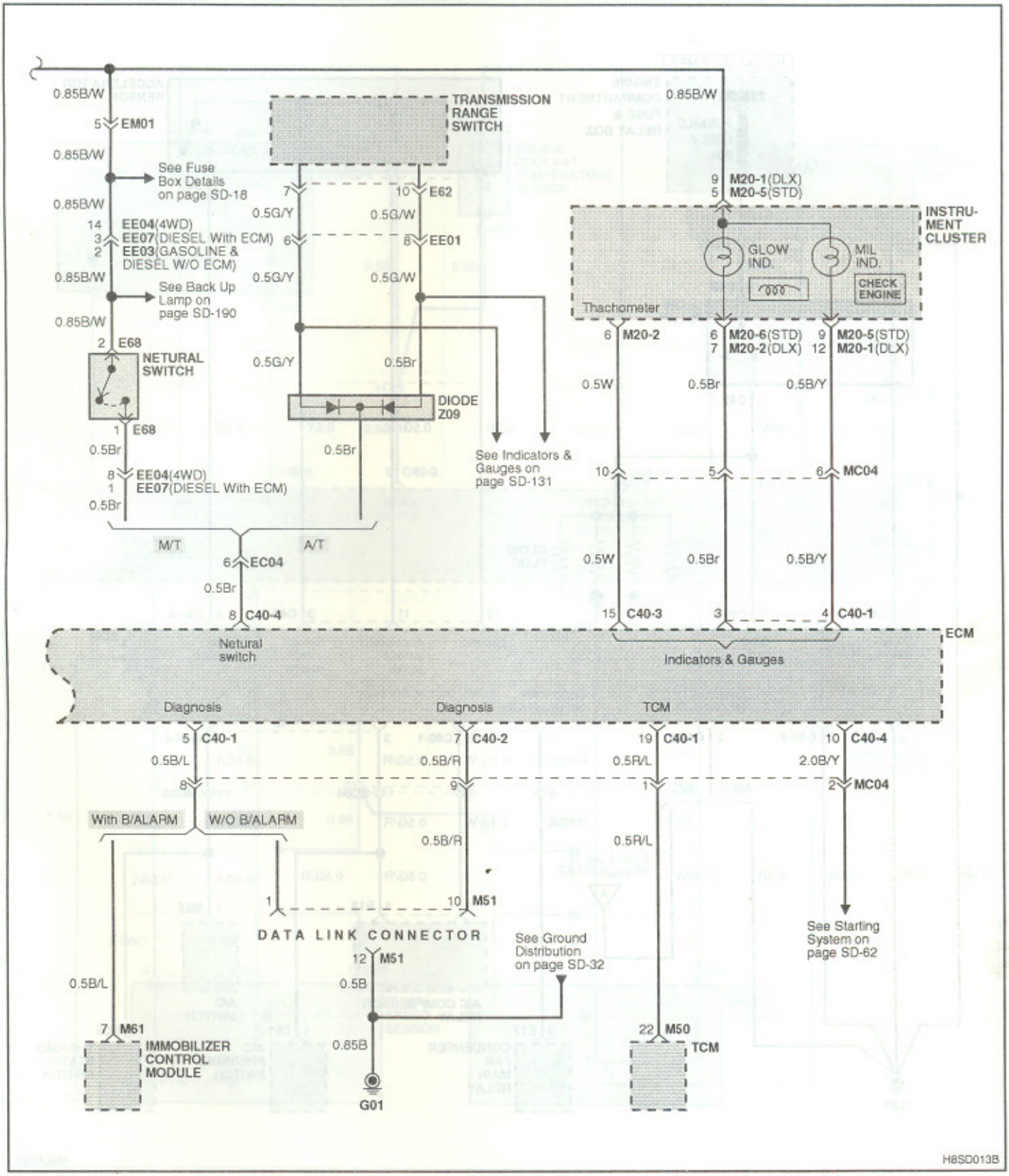


SCHEMATIC DIAGRAM

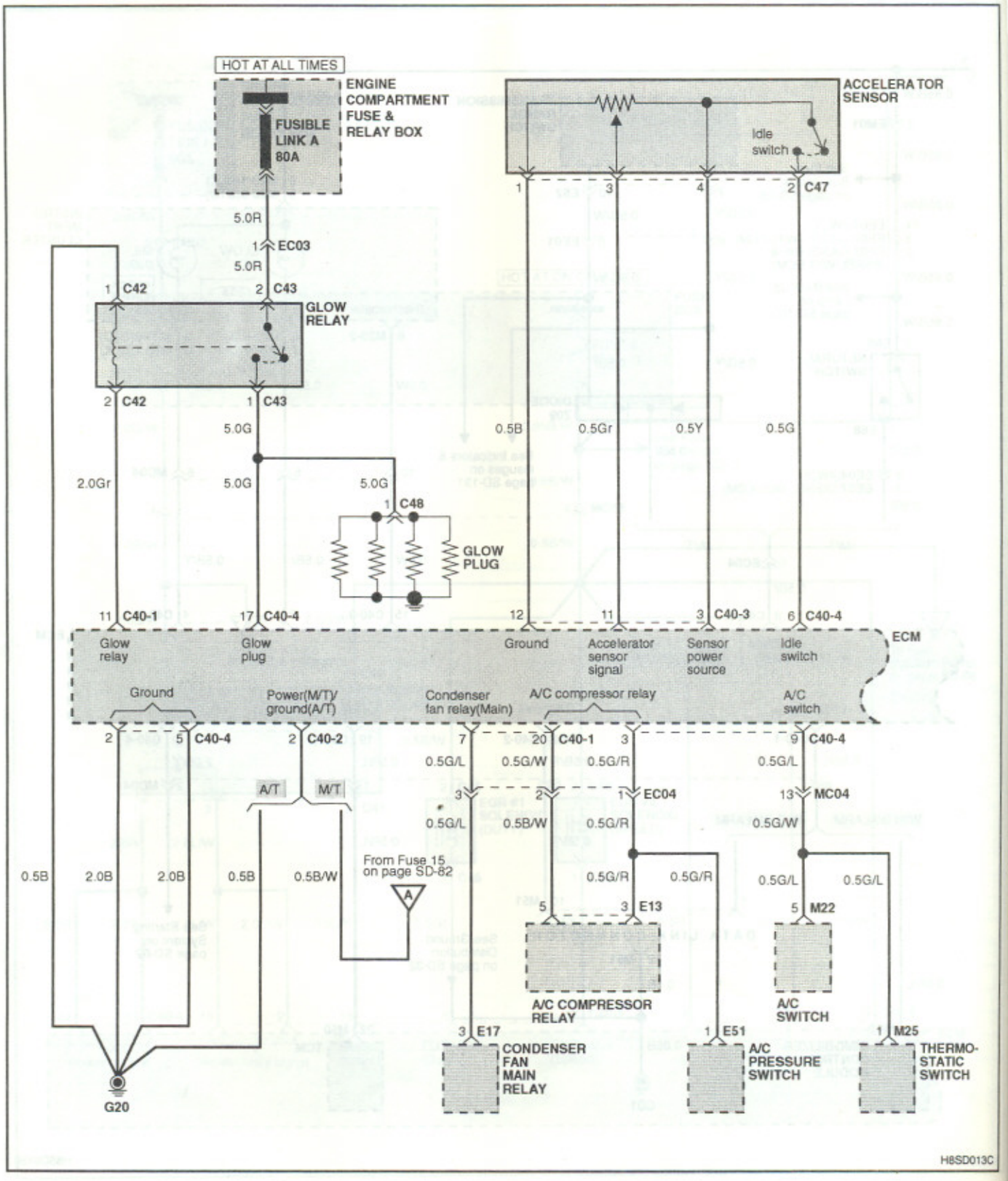
ENGINE CONTROL SYSTEM (1)



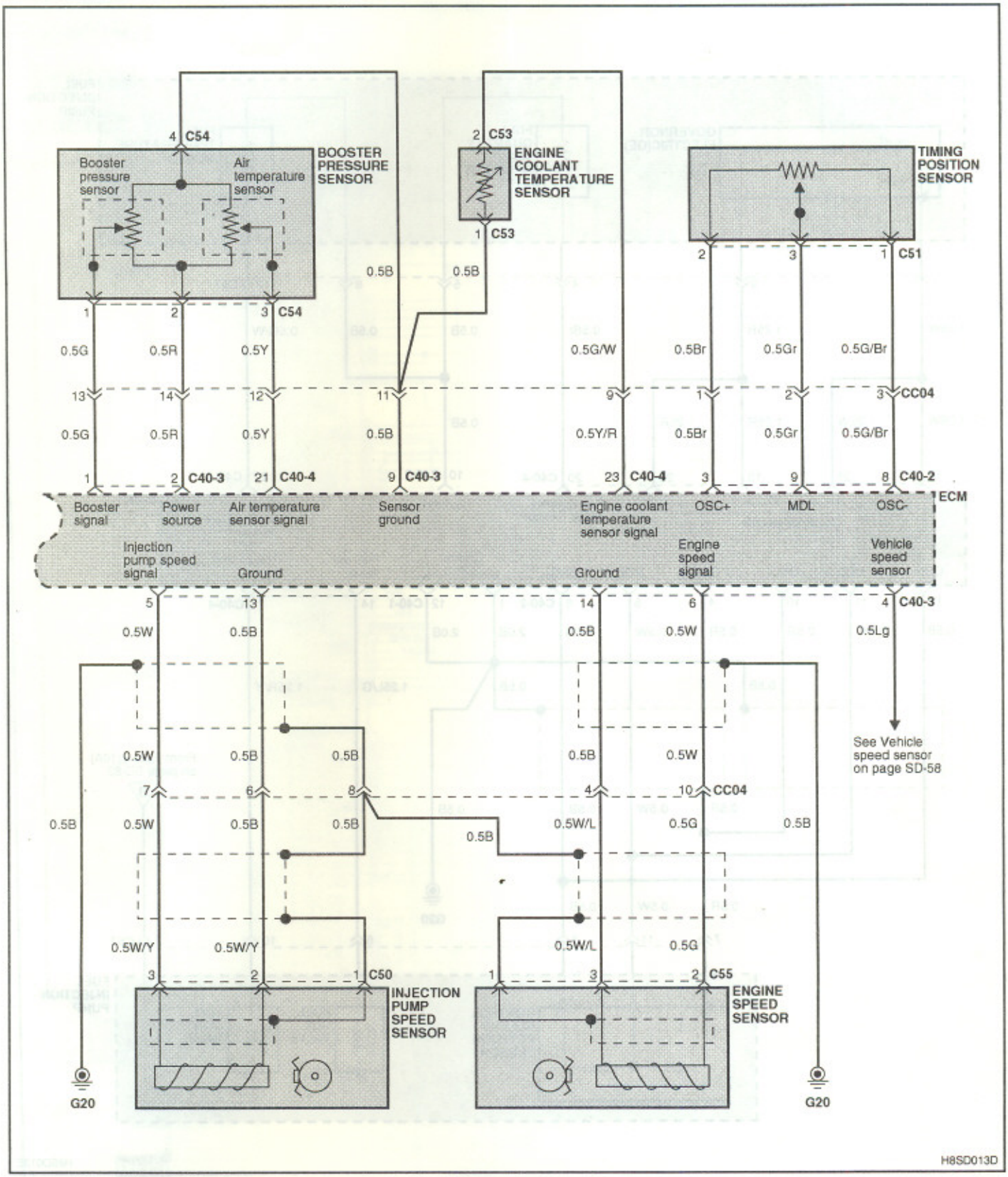
ENGINE CONTROL SYSTEM (2)



ENGINE CONTROL SYSTEM (3)



ENGINE CONTROL SYSTEM (4)



ENGINE CONTROL SYSTEM (5)