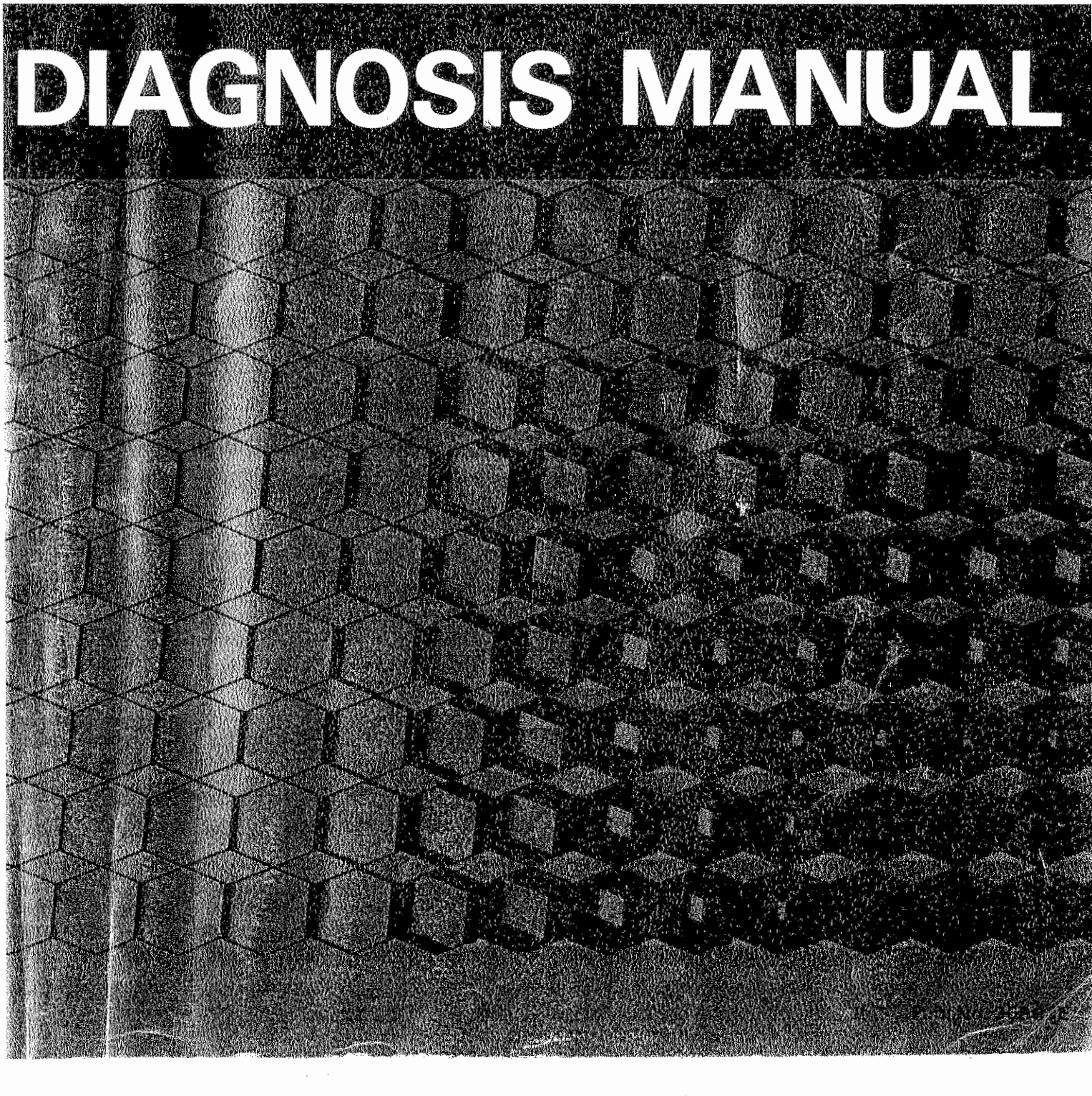
TOYOTA

TOYOTA COMPUTER-CONTROLLED SYSTEM

For Corolla and Celica 4A-GE Engine

DIAGNOSIS MANUAL



FOREWORD

The TCCS (Toyota Computer-Controlled System) has been designed, based upon the very latest in electronic technology, to control the ignition timing and the amount of fuel injected into the intake manifold by means of an ECU (Electronic Control Unit).

Since the TCCS is provided with many sensors, which keep the computer informed of engine operating conditions, and with actuators, which operate as the ECU's "hands and feet" to do the actual work, the TCCS looks very complicated on the surface. Technicians may therefore get the impression that an engine equipped with TCCS is totally different from other types of engines.

It must not be forgotten, however, that *since the TCCS does nothing more than control the ignition timing and the supply of fuel, the engine itself is almost exactly the same an ordinary engine.*

Therefore, if something goes wrong with an engine equipped with TCCS, there is a good chance that the problem is in another part of the engine and does not involve the TCCS at all.

And even if the trouble is found to be in the TCCS, the ECU is equipped with a self-diagnosis system, which allows the problem to be easily identified.

For the above reasons, this manual explains the most ideal method of troubleshooting the 1983 and later 4A-GE engines, and tells how to carry out the necessary repairs.

The section of this manual entitled GENERAL INFORMATION contains the information that must be known by the technician before inspection and repair can be carried out.

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

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ABBREVIATIONS USED IN THIS MANUAL

A/C	—	Air Conditioner
BTDC	—	Before Top Dead Center
C	—	Condition(s)
DP	—	Dash Pot
ECU	—	Electronic Control Unit
EFI	—	Electronic Fuel Injection
ESA	—	Electronic Spark Advance
FL	—	Fusible Link
J/B	—	Junction Block
L	—	Location
N	—	Note(s)
OK	—	Normal
P	—	Procedure
SST	—	Special Service Tool
S/W	—	Switch

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HOW TO USE THIS MANUAL

ARRANGEMENT

This manual is divided into the following sections.

Basic Engine Inspection Chart

The Basic Engine Inspection Chart is the basic chart of this manual and is used to determine whether or not troubles originate with the TCCS system. You should begin all troubleshooting at step 1 of this chart regardless of the symptom.

TCCS Initial Inspection & Symptom Charts

The TCCS Initial Inspection Chart is used for a pre-test of concerning TCCS problems.
The Symptom Charts are to be used only if the problem has not been corrected even after steps of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart have been completed.

System or Parts Inspection Charts

The Fuel System Chart, etc., are used to determine whether or not the corresponding systems or part is operating normally.
These charts should not be used independently of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart since that chart will direct you to the relevant System or Parts Inspection Chart if this is necessary.

Diagnostic Code Charts

When the diagnostic system outputs a code, the chart corresponding to that code should be used. These charts should not be used independently of the Basic Engine Inspection Chart or the TCCS Initial Inspection Chart since their use will be indicated as necessary by this chart.

Removal, Installation & Adjustment

This contains directions for the removal, installation and adjustment of all relevant parts, test gauges, etc.

Again we repeat: Always begin troubleshooting with step 1 of the Basic Engine Inspection Chart and go to the other charts only if the Basic Engine Inspection Chart so directs.

The first four of the above-mentioned charts use the following troubleshooting symbols.

C Condition
P Procedure
OK Normal
N Note(s)

HOW TO USE THIS MANUAL

Taking Customer's Report

Find our first from the customer what the problem seems to be and under what conditions it occurs, and record this information on the Basic Engine & TCCS Initial Inspection Check Sheet (included at the back of this manual). It goes without saying that you must check to see if the problem that the customer is complaining about actually exists, and if so, you must correct it.

Basic Engine Inspection

Begin your inspection at Step 1 of the Basic Engine Inspection Chart, and work your way down the chart *a step at a time,* checking off each step on the Check Sheet as you complete it. If you come to an instruction directing you to another chart, carry out the instructions that appear in that chart, then, if necessary, return to where you left off on the Basic Engine Inspection Chart and continue on.

BASIC ENGINE & TCCS INITIAL INSPECTION CHECK SHEET

(NOTE: This check sheet should be copied and the copies used rather than the original.)

CUSTOMER'S NAME	MAKE & MODEL OF AUTO	ODOMETER READING

REGISTRATION YEAR	HOW OFTEN DOES PROBLEM OCCUR ?	WHEN DID PROBLEM BEGIN ?
/ /	CONTINUALLY INTERMITTENTLY → (TIMES A DAY)	ABOUT DAYS AGO

OUTSIDE TEMP. WHEN PROBLEM OCCURS		WEATHER	FUEL REMAINING IN TANK	COOLANT TEMP.
Hot, Warm, Cool, Cold	( )° C	Clear, Cloudy, Raining, Snowing	F, 3/4, 1/2, 1/4, E	( )° C

CUSTOMER'S COMPLAINT	

BASIC ENGINE INSPECTION		RESULTS (STANDARD)			
Ignition timing		°BTDC (10° BTDC)			
Idle RPM		rpm (800 ± 50 rpm)			
CO concentration		% (1.5 ± 0.5 %)			
Spark test		good · no good			
Distributor cap, Rotor, Spark plug cord		good · no good			
Spark plug	F.D.: Fouled (dry) F.W.: Fouled (wet) B.: Burnt OK: Normal	#1	#2	#3	#4
Throttle linkage		good · no good			
Air filter		good · no good			
Air leakage		present · absent			
Compression	kg/cm² (psi, kPa)	#1	#2	#3	#4
Valve clearance	mm (in.)	#1	#2	#3	#4
	Intake				
	Exhaust				

TCCS INITIAL INSPECTION		RESULTS (STANDARD)		
Diagnostic code		normal code · code ( )		
Fuel pressure	kg/cm² (psi, kPa)	CRANKING 2.3 – 2.7 (32 – 39, 226 – 264)	RACING 2.3 – 2.7 (32 – 39, 226 – 264)	IDLING 1.9 – 2.2 (27 – 31, 187 – 216)

After Completion of Repairs

After finishing a repair job, recheck the following:

1. Are all connectors, hoses, etc., firmly hooked up ?
2. Have all sub-wires been removed from their check connectors ?
3. Have all rubber caps been replaced on their connectors ?

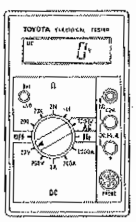
Finally, if a particular problem caused a diagnostic code to be output by the ECU, be sure to clear the ECU's memory (as explained on p. 4-7), then re-check to make sure that the memory has been cleared. Do this by restarting the engine and checking to make sure that the ECU is outputting a normal code (see p. 3-2).

NOTE: All charts have been gathered together in outline form and made into a small booklet, which is included at the back of this manual.
This booklet may be pulled out and used separately so that, once you have become accustomed to working on the TCCS, you can work directly from it without step by the necessity of going through the manual step every time.

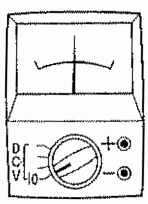
NECESSARY TOOLS & EQUIPMENT

CIRCUIT TESTERS

Digital Type



Analog Type

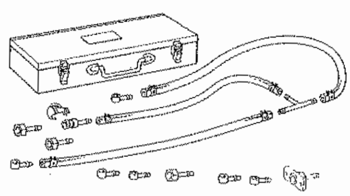


NOTE:

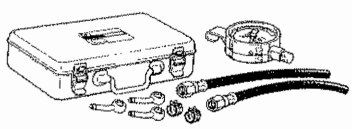
Use a circuit tester with a high-impedance (10kΩ/V minimum).

SOUND SCOPE

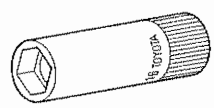
INJECTION MEASURING TOOL SET (SST 09268-41045)



FUEL PRESSURE GAUGE (SST 09268-45011)



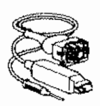
SPARK PLUG WRENCH (SST 09155-16100)



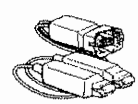
SERVICE WIRE

For checking injector operation

(SST 09842-30050)



(SST 09842-30020)



Short-circuiting wire

Clip type jumper wire

SYSTEM DESCRIPTION

FUNCTIONS

TCCS is short for Toyota Computer Controlled System. The TCCS totally controls the engine, such as fuel injection, ignition timing and self-diagnosis, with the ECU (Electronic Control Unit) incorporating the latest electronics technology.

These contorls are extremely accurate to ensure optimum fuel supply and optimum ignition timing, and both engine output power and fuel efficiency are improved.

The TCCS contains the following three functions.

EFI

EFI is short for Electronic Fuel Injection.

The EFI detects engine rpm, intake manifold pressure, coolant temperature and other engine conditions via sensors, and supplies an optimum amount of fuel from the injectors to best suit the engine condition at that time.

ESA

ESA is short for Electronic Spark Advance.

The ESA replaces the conventional governor advance and vacuum advance mechanisms.

Optimum ignition timing data for each engine condition is stored in the memory circuit of the ECU which detects the engine conditions by means of sensors, and selects an optimum ignition timing data from memory for the current engine condition. The ECU then sends a signal to the igniter to generate spark at the specific timing.

DIAGNOSIS

ECU contains a built-in self-diagnosis system.

The ECU constantly monitors each sensor.

Whenever a malfunction is detected, the ECU warns the driver by means of the "CHECK ENGINE" warning light in the instrument panel. At the same time, it retains in memory the particular sensor system that detected the malfunction. This information is not erased when the ignition switch is turned off.

Therefore, the system having a malfunction can be easily identified by checking the contents of the memory during repair work.

COMPONENTS

Electronic Control Unit (ECU)

The ECU is the "brains" of the TCCS. It uses the following sensors, switches, and signals to keep itself informed at all times of the current engine operating condition so that it can control the engine accordingly.

Vacuum Sensor

The vacuum sensor manifold pressure changes the absolute pressure in the manifold into a voltage signal, which is supplied to the ECU. The ECU then reduces the amount of fuel injection when the pressure is low, and increases the amount when the pressure is high. If the manifold pressure is low (vacuum is high), the voltage signal from vacuum sensor is low; if pressure is high, the voltage signal is high.

Water Temp. Sensor

The water temp. sensor is located at the cylinder head rear plate and detects the temperature of the coolant. When the temperature of the coolant is low, the electrical resistance of the water temp. sensor is high; when the temperature is high, the resistance is low.

Intake Air Temp. Sensor

The intake air temp. sensor is located at air intake chamber. When the intake air temperature is low, the electrical resistance of the intake air temp. sensor is high; when the temperature is high, the resistance is low.

Throttle Position Sensor

The throttle position sensor is built into the throttle body. This sensor linealy converts the throttle valve opening angle into voltage signals.

Speed Sensor

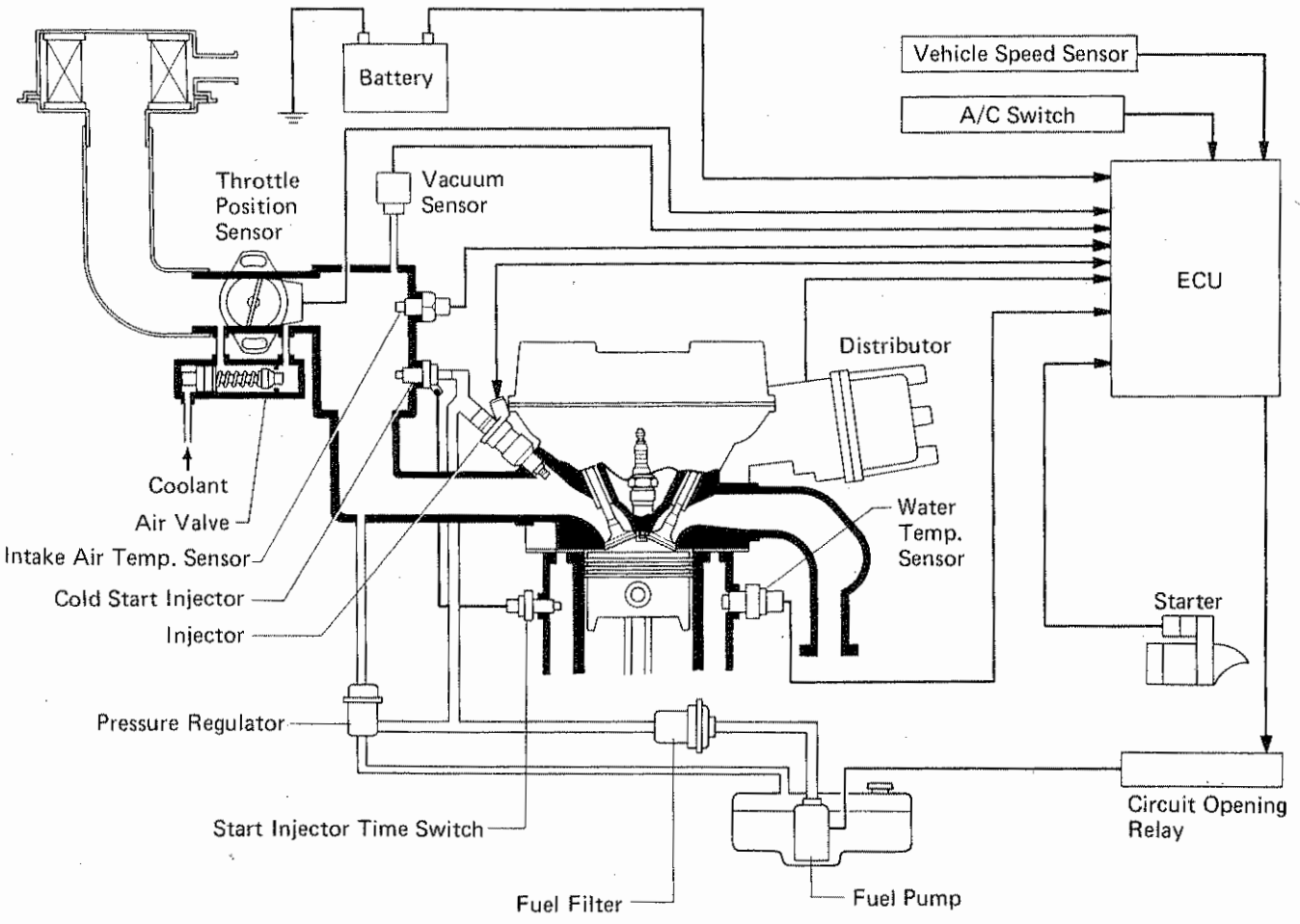
The speed sensor is located inside the speedometer, and outputs four pulsed signals for each revolution of the speedometer cable.

G and Ne Signals

The G and Ne signals are generated by the timing rotors and pick-up coils located inside the distributor. These signals are used by the ECU to detect the engine speed (RPMs) and crankshaft angle.

Air Conditioner Switch

The ECU uses the output from the air conditioner switch to determine whether or not the air conditioner is operating.



DIAGNOSTIC SYSTEM

GENERAL

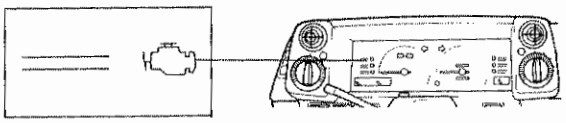
The ECU contains a built-in self-diagnosis system which detects any trouble in the sensor network and causes the "CHECK ENGINE" light on the instrument panel to flash.

By analyzing various signals as shown in the table on the next page, the ECU detects the system malfunctions that are related to the various sensors.

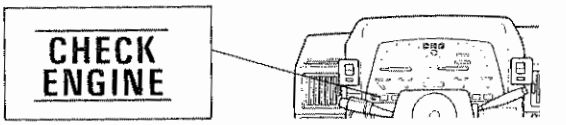
The ECU stores the malfunction code associated with the detected failure until the diagnostic system is cleared by the removal of the STOP fuse with the ignition switch off or battery disconnected.

The "CHECK ENGINE" warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been gone out.

For AE



For AA



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"CHECK ENGINE" Warning Light

DIAGNOSTIC CODES

Diagnostic codes shown below will be displayed when the prescribed operations are performed.

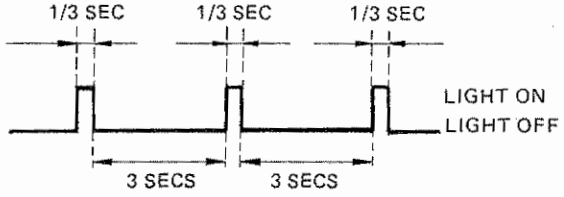
See the chart on page 3-2 for detailed operation.

Normal System Operation

The "CHECK ENGINE" warning light will blink once every 3 seconds.

(see illustration)

NORMAL



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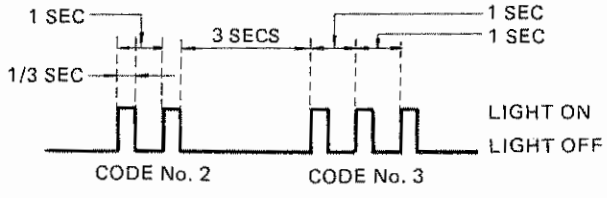
Malfunction Code Indication

The "CHECK ENGINE" warning light will blink a number of times equal to the malfunction code indication with a 3-second delay between each indication.

In the illustration, malfunction codes 2 and 3 are indicated.

CODES NO. 2 AND NO. 3



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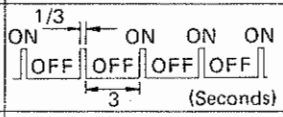
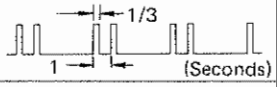
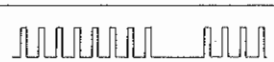
Code No.	Number of blinks "CHECK ENGINE"	Item	Diagnosis	"CHECK ENGINE" Diagnostic Light
1		Normal condition	–	OFF
2		Intake vacuum signal	Intake manifold pressure signal is open or short-circuited.	ON
3		Ignition signal	Ignition confirmation signal (IGf) was not received four times in a row.	ON
4		Water temp. sensor signal	Water thermosignal is open or short-circuited.	ON
6		RPM signal	G or Ne signal was not received when the engine was cranked for two seconds or longer. Ne signal was not received for 50 msec at engine speed over 1,000rpm.	ON
7		Throttle position sensor signal	Throttle opening angle signal is open or short-circuited.	OFF
8		Intake air temp. sensor signal	Intake air thermo signal is open or short-circuited.	OFF
9		Vehicle speed sensor signal	Signal from the vehicle speed sensor is 0km/h for several seconds when the engine speed is faster than 2,800rpm and the intake manifold pressure signal is over rated value.	OFF
10		Starter signal	STA signal was not received until the engine exceeded 800rpm at vehicle speed 0km/h.	OFF
11		Switch signal	Air conditioning switch ON or IDL points in the throttle position sensor OFF. (Not registered in memory.)	OFF

NOTE:

1. *Including "Normal", the ECU is programmed with the 10 diagnostic codes shown above.*
2. *When 2 or more codes are indicated, the lowest number (code) will appear first.*
3. *All detected diagnostic codes, except 11, will be retained in memory by the ECU from the time of detection until cancelled out.*
4. *Once the malfunction is gone out the "CHECK ENGINE" warning light on the instrument panel will go out but the diagnostic code(s) will remain stored in the ECU memory (except for code no. 11).*
5. *For the code numbers that have "OFF" in the "CHECK ENGINE" Diagnostic Light column, the CHECK ENGINE light does not go on if the indicated malfunction occurs. However, the trouble codes (except for code no. 11) are still stored in the memory of the ECU.*

GENERAL PRECAUTIONS

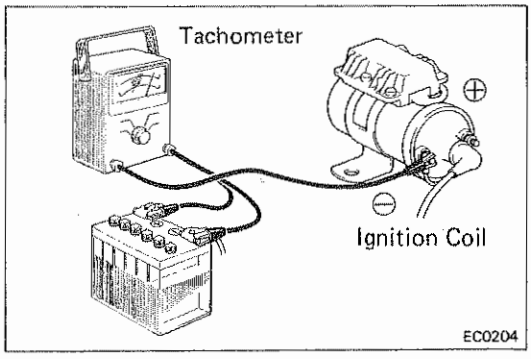
MAINTENANCE PRECAUTIONS

1. INSURE CORRECT ENGINE TUNE-UP

2. PRECAUTIONS WHEN CONNECTING GAUGE

   (a) Connect the tachometer (+) terminal to the ignition coil (—) terminal.

   (b) Use the battery as the power source for the timing light, tachometer, etc.

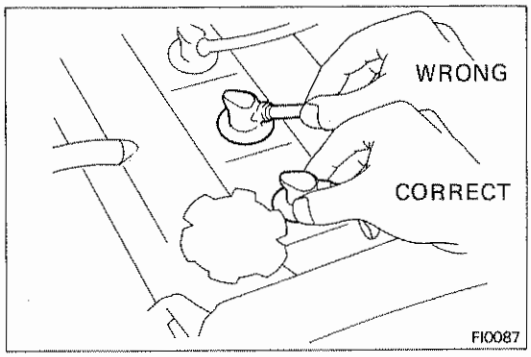


3. IN EVENT OF ENGINE MISFIRE THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

   (a) Insure proper connection of battery terminals, etc.

   (b) Handle high tension cords carefully.

   (c) After repair work, insure that the ignition coil terminals and all other ignition system lines are reconnected securely.
   When cleaning the engine compartment, be especially careful to protect the electrical system from water.



IF CAR IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

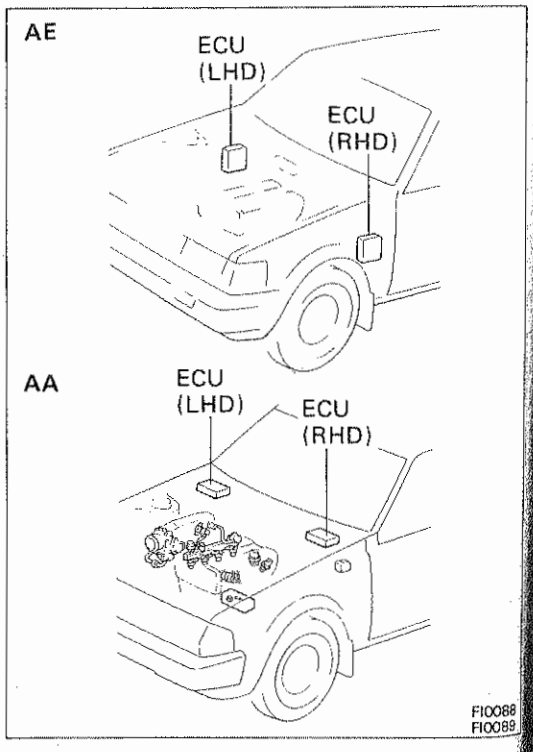
The ECU has been designed so that it will not be affected by outside interference.
However, if your vehicle is equipped with an CB radio transceiver, etc. (even one with about 10 W output), it may, at times, have an affect upon ECU operation, especially if the antenna and feeder are installed nearby.
Therefore, observe the following precautions.

(a) Install the antenna as far as possible from the ECU. The ECU is located under the radio so the antenna should be installed at the rear side of the vehicle.

(b) Keep the antenna feeder as far away as possible from the ECU wires — at least 20 cm (7.87 in.) and, especially, do not wind them together.

(c) Insure that the feeder and antenna are properly adjusted.

(d) Do not equip your vehicle with a powerful mobil radio system.



AIR INDUCTION SYSTEM

1. Separation of the engine oil level gauge, oil filter cap. PCV hose, etc. may cause the engine to run out of tune.

2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause bad engine tune.

ELECTRONIC CONTROL SYSTEM

1. Before removing TCCS wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch off or disconnecting the battery cables from the battery terminals.

   NOTE: Any diagnosis code retained by the computer will be cleared when the battery cable is removed. Therefore, if necessary, read the diagnostic code(s) before removing the battery cable.

2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.

3. Do not permit parts to receive a severe impact during removal or installation. Handle all TCCS parts carefully and, in particular, the ECU.

4. Do not be careless during troubleshooting as there are numerous electronic circuits and even slight terminal contact can cause further troubles.

5. Do not open the ECU cover.

6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the TCCS parts and wiring connectors.

7. Parts should be replaced as an assembly.

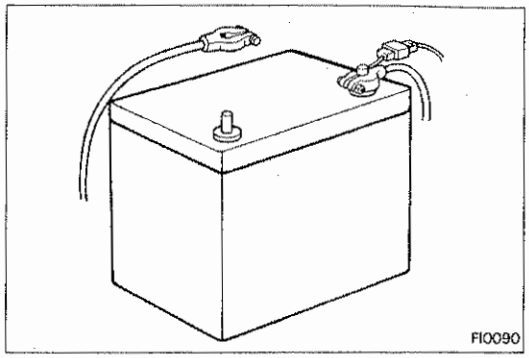
8. Care is required when (a) pulling out wiring connectors and (b) when inserting them.

   (a) Release the lock and pull out the connector, pulling on the connectors *(not the cord).*

   (b) Fully insert the connector and insure that it is locked.

9. When inspecting a connector with a circuit tester:

   (a) Carefully remove the water-proofing rubber if it is a water-proof type connector.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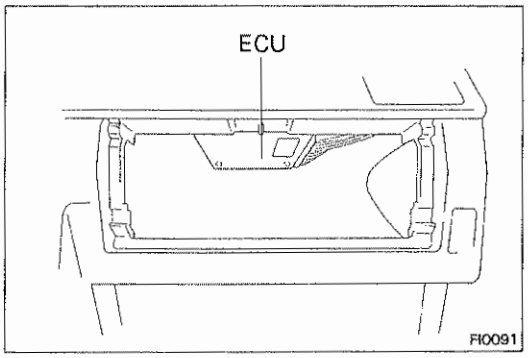
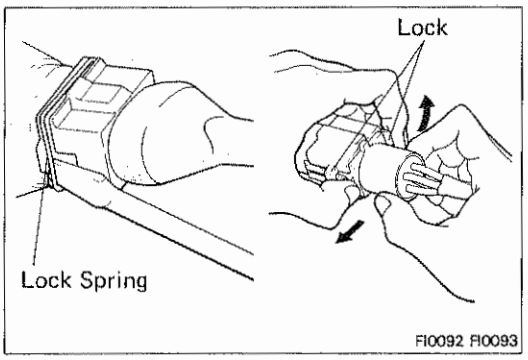
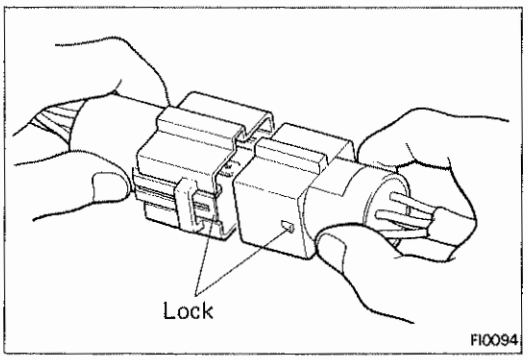


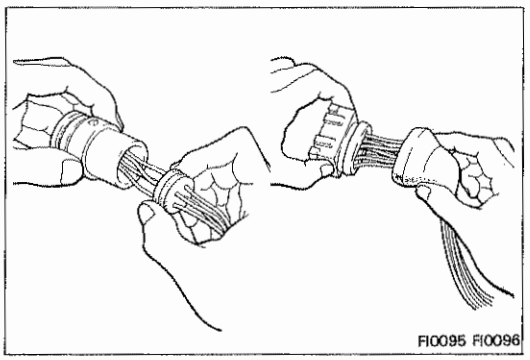
FI0091



FI0092 FI0093



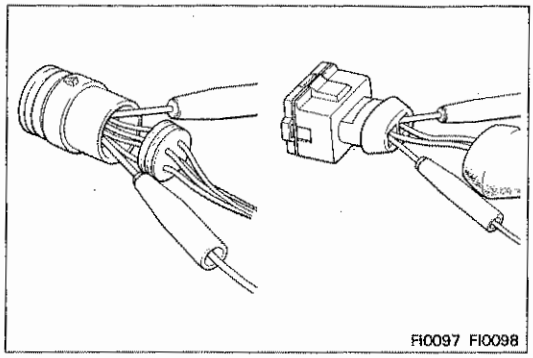
FI0094


FI0095 FI0096

(b) Insert the tester probe into the connector from the wiring side when checking the continuity, amperage or voltage.

(c) Do not apply unnecessary force to the terminal.

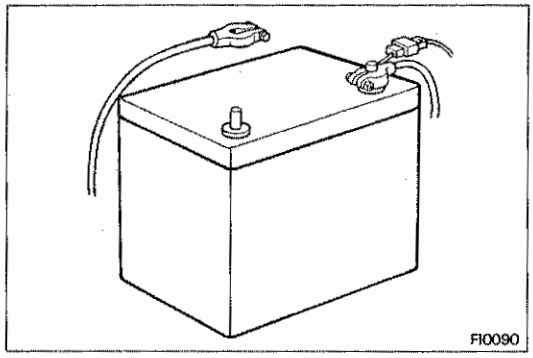
(d) After checking, securely reinstall the water-proofing rubber on the connector.


FI0097 FI0098

FUEL SYSTEM

1. Before working on the fuel system, disconnect the negative cable from the battery.

   NOTE: Any diagnosis code retained by the computer will be cleared when the battery cable is removed. Therefore, if necessary, read the diagnostic code(s) before removing the battery cable.

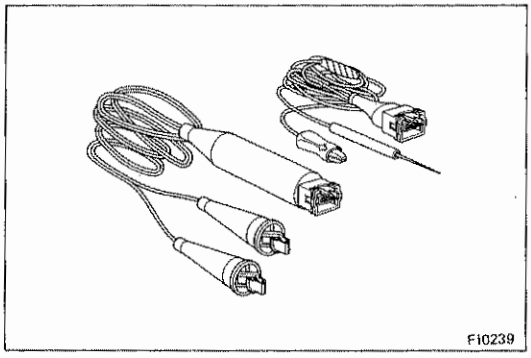

FI0090

2. When working on the fuel system, do not smoke or work near any flame.

3. Keep gasoline off rubber or leather parts.

4. Use SST for inspection or testing of the injector, cold start injector or its wiring connector.

   SST 09842-30020 and 09842-30050


FI0239

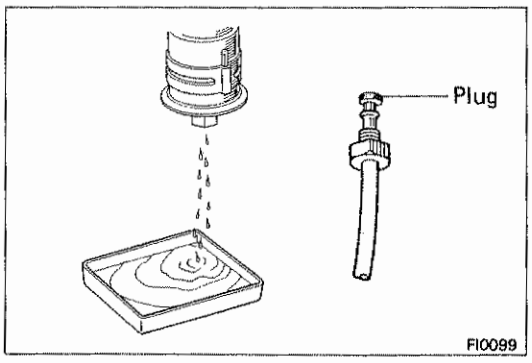
5. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline will come out so observe the following procedure:

   (a) Put a container under the connection.

   (b) Slowly loosen the connection.

   (c) Disconnect the connection.

   (d) Plug the connection with a rubber plug.



FI0099

6. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure.

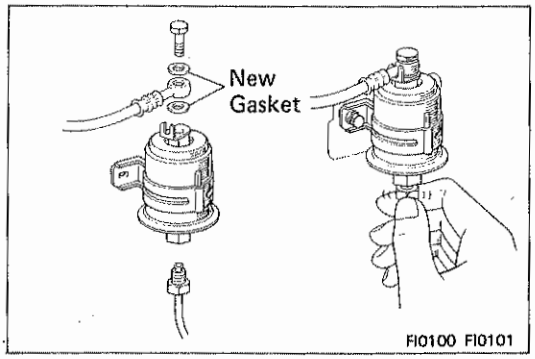
   [Union bolt type]

   (a) Always use new gaskets.

   (b) First tighten the union bolt by hand.

   (c) Then tighten the bolt to the specified torque.

   Torque: 320 – 450 kg-cm (24 – 32 ft-lb, 32 – 44 N·m)



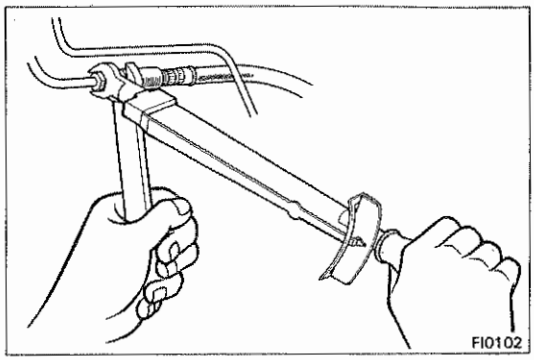
FI0100 FI0101

[Flare nut type]

(a) Apply a thin coat of oil to the flare and first tighten the flare nut by hand.

(b) Then tighten the nut to the specified torque.

Torque: 320 – 450 kg-cm (24 – 32 ft-lb, 32 – 44 N·m)

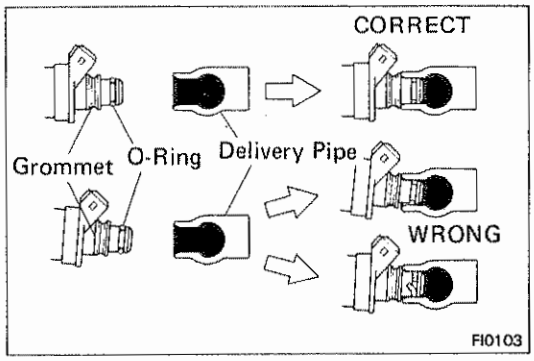


7. Observe the following precautions when removing and installing the injectors.

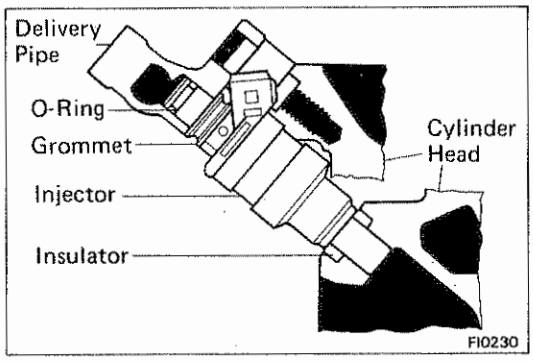
(a) Never re-use an O-ring.

(b) When placing an O-ring on the injector, use care not to damage it in any way.

(c) Lubricate the O-ring with spindle oil or gasoline before installing – never use engine, gear or brake oil.



8. Install the injector to the delivery pipe and cylinder head as shown in the figure.

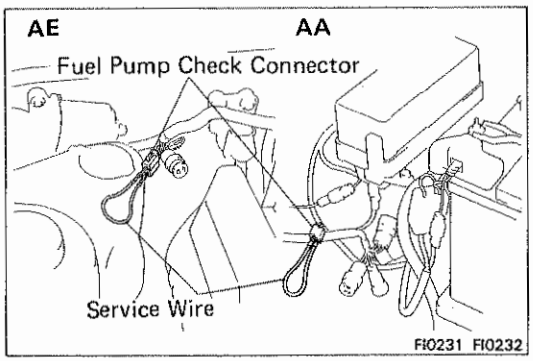


9. Confirm that there are no fuel leaks after performing any maintenance on the fuel system.

(a) With engine stopped, turn the ignition switch ON.

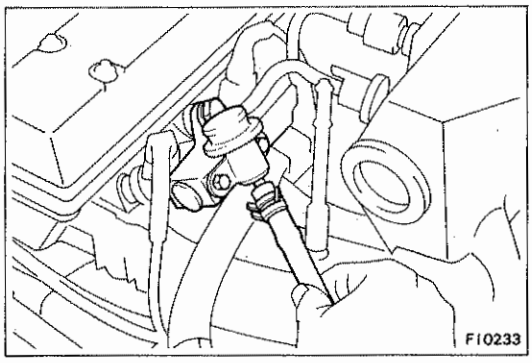
(b) Short circuit the terminals of the fuel pump check connector.

NOTE: The fuel pump check connector is located near the wiper motor (AE) or battery (AA).



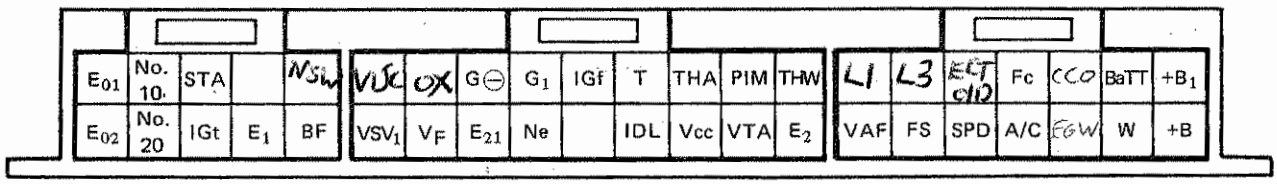
(c) When the fuel return hose is pinched, the pressure within the high pressure line will rise to about 4 kg/cm² (57 psi, 392 kPa). In this state, check to see that there are no leaks from any part of the fuel system.

CAUTION: Always pinch the hose. Avoid bending as it may cause the hose to crack.



ECU CONNECTORS

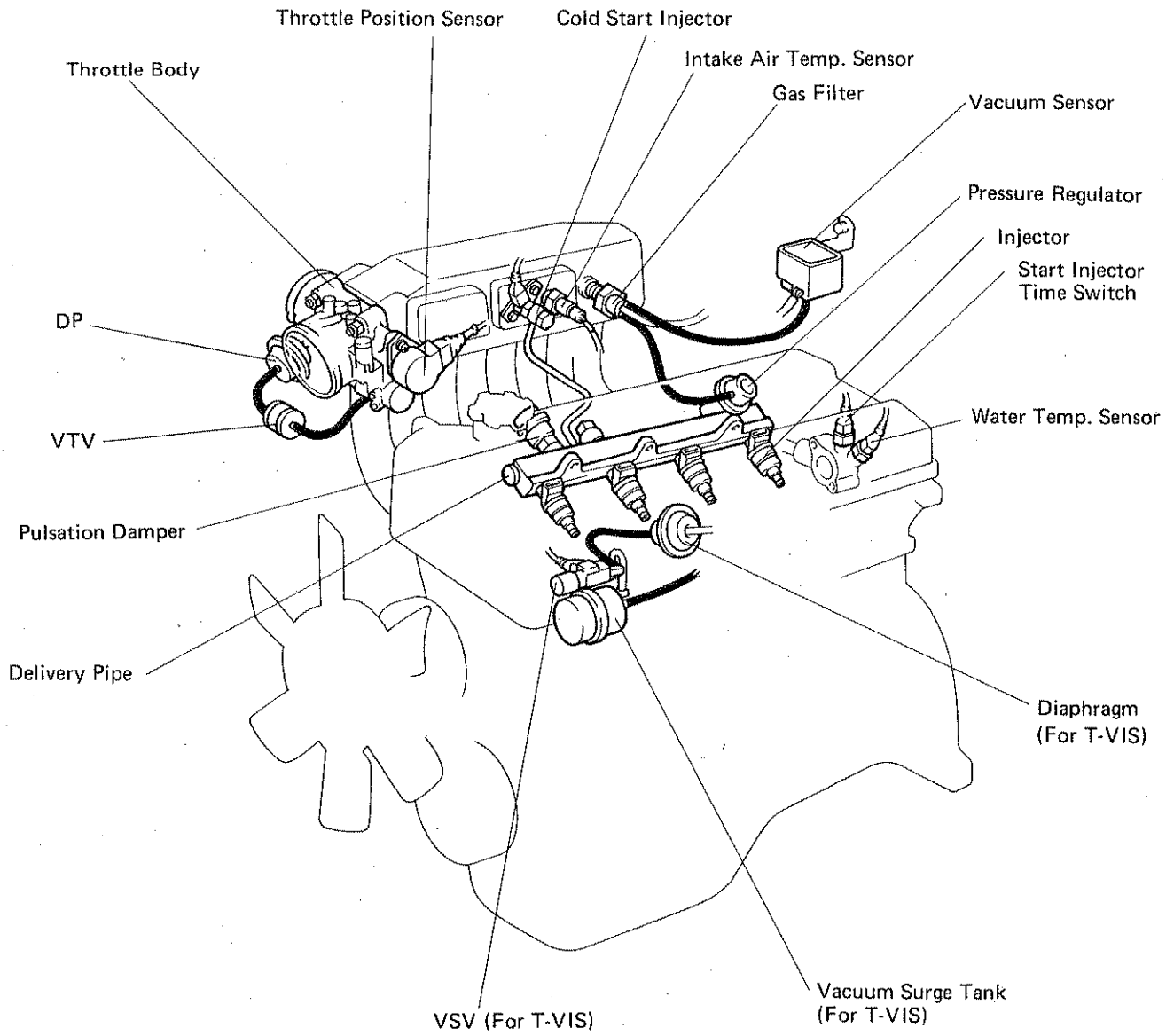
Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	IDL	THROTTLE SENSOR
E_{02}	ENGINE GROUND	THA	AIR TEMP. SENSOR
No. 10	NO. 1, 3 INJECTOR	Vcc	SENSOR POWER SUPPLY (+5V)
No. 20	NO. 2, 4 INJECTOR	PIM	VACUUM SENSOR
STA	STARTER SWITCH	VTA	THROTTLE SENSOR
IGt	IGNITER	THW	WATER TEMP. SENSOR
E_1	ENGINE GROUND	E_2	SENSOR GROUND
BF	INJECTOR +B	VAF	VARIABLE RESISTOR
VSV_1	VACUUM SWITCHING VALVE	FS	FAIL SAFE RELAY
VF	CHECK CONNECTOR	SPD	SPEEDOMETER
G⊖	ENGINE REVOLUTION SENSOR	Fc	CIRCUIT OPENING RELAY
E_{21}	SENSOR GROUND	A/C	A/C MAGNET SWITCH
G_1	ENGINE REVOLUTION SENSOR	BaTT	BATTERY
Ne	ENGINE REVOLUTION SENSOR	W	WARNING LAMP
IGf	IGNITER	$+B_1$	MAIN RELAY
T	CHECK CONNECTOR	+B	MAIN RELAY



FI0234

10 18 14

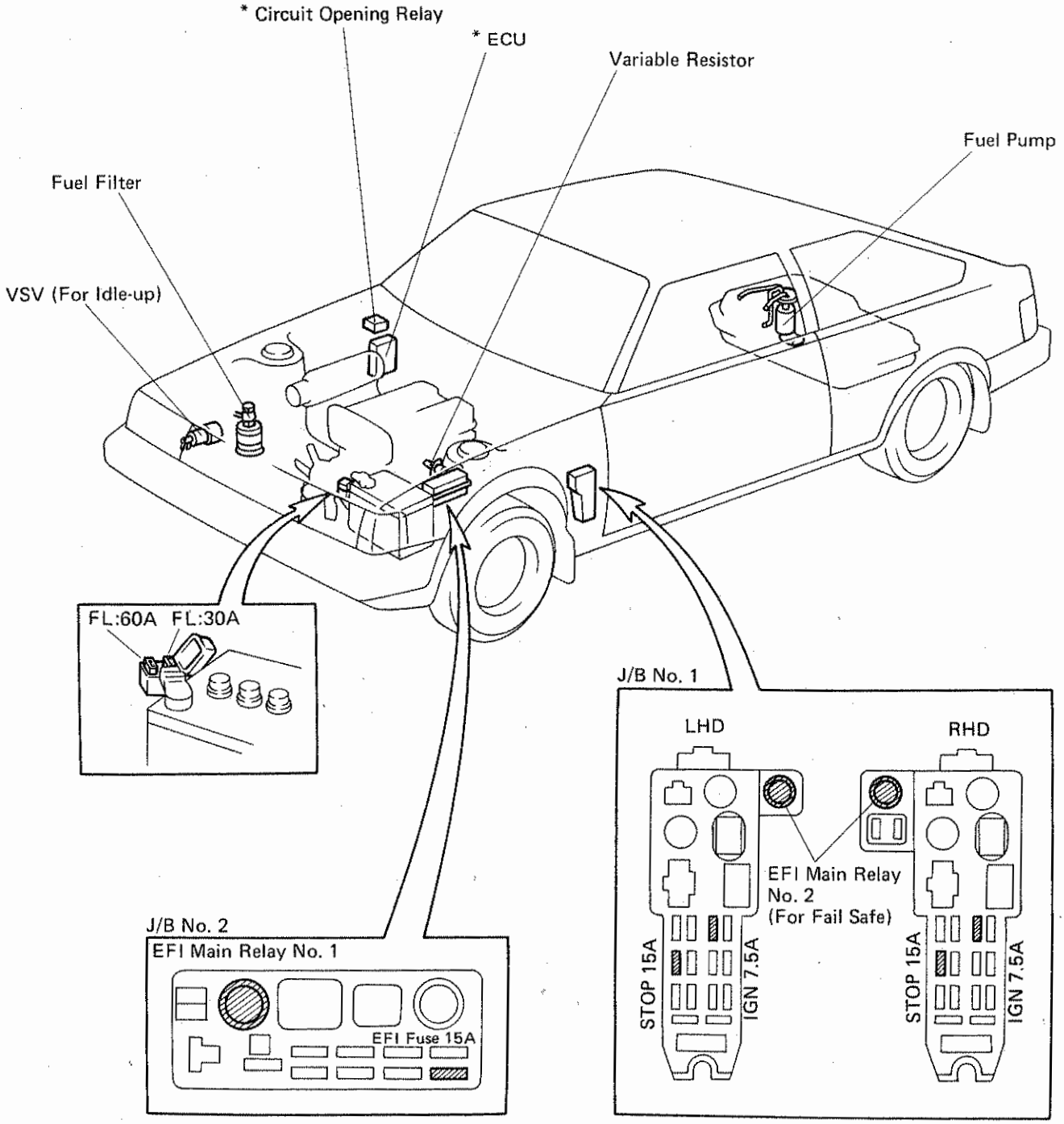
SYSTEM LAYOUT — 4A-GE ENGINE



FI0235

SYSTEM LAYOUT — COROLLA

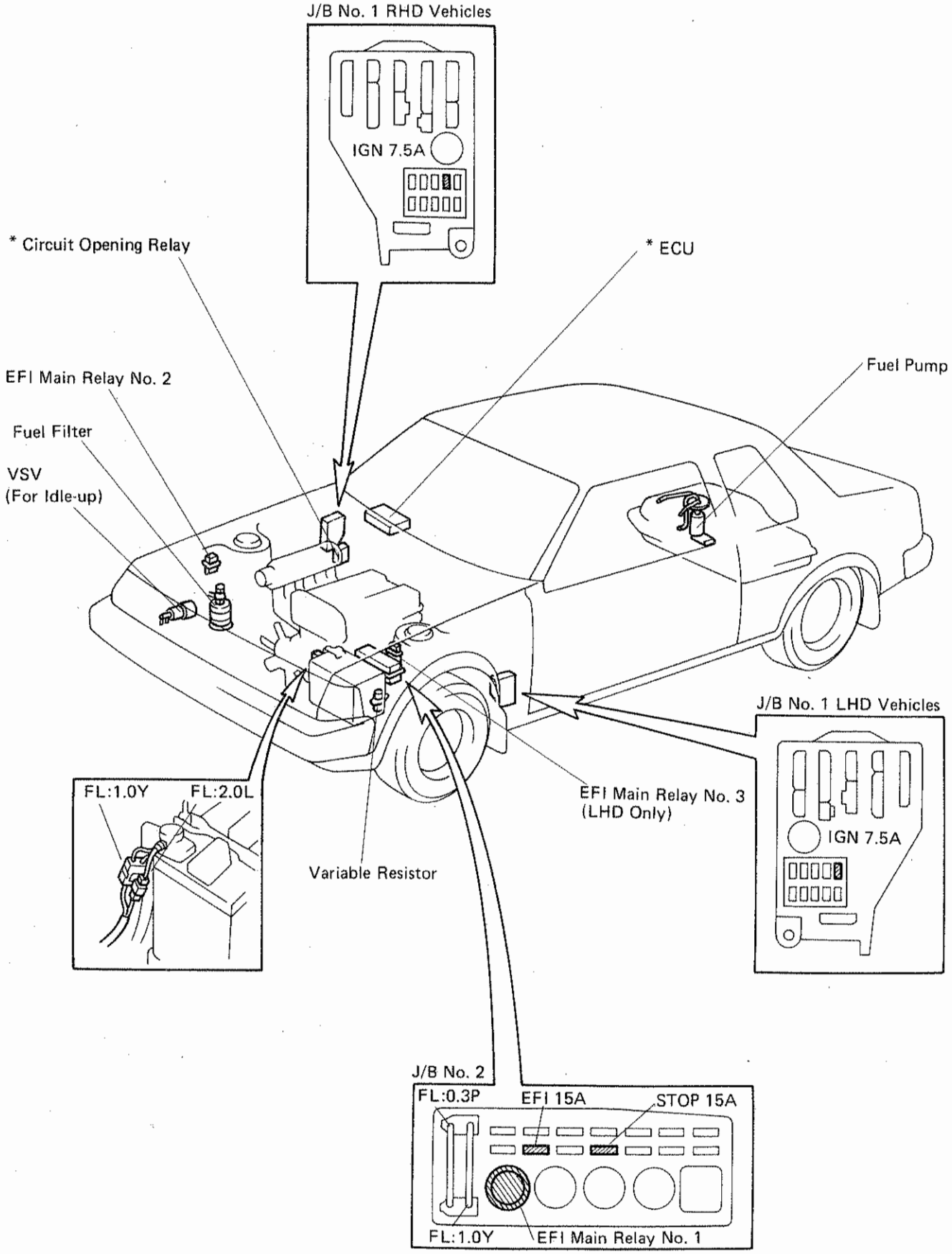
NOTE: On RHD vehicles, parts marked with an asterisk are in opposite position.



FI0236

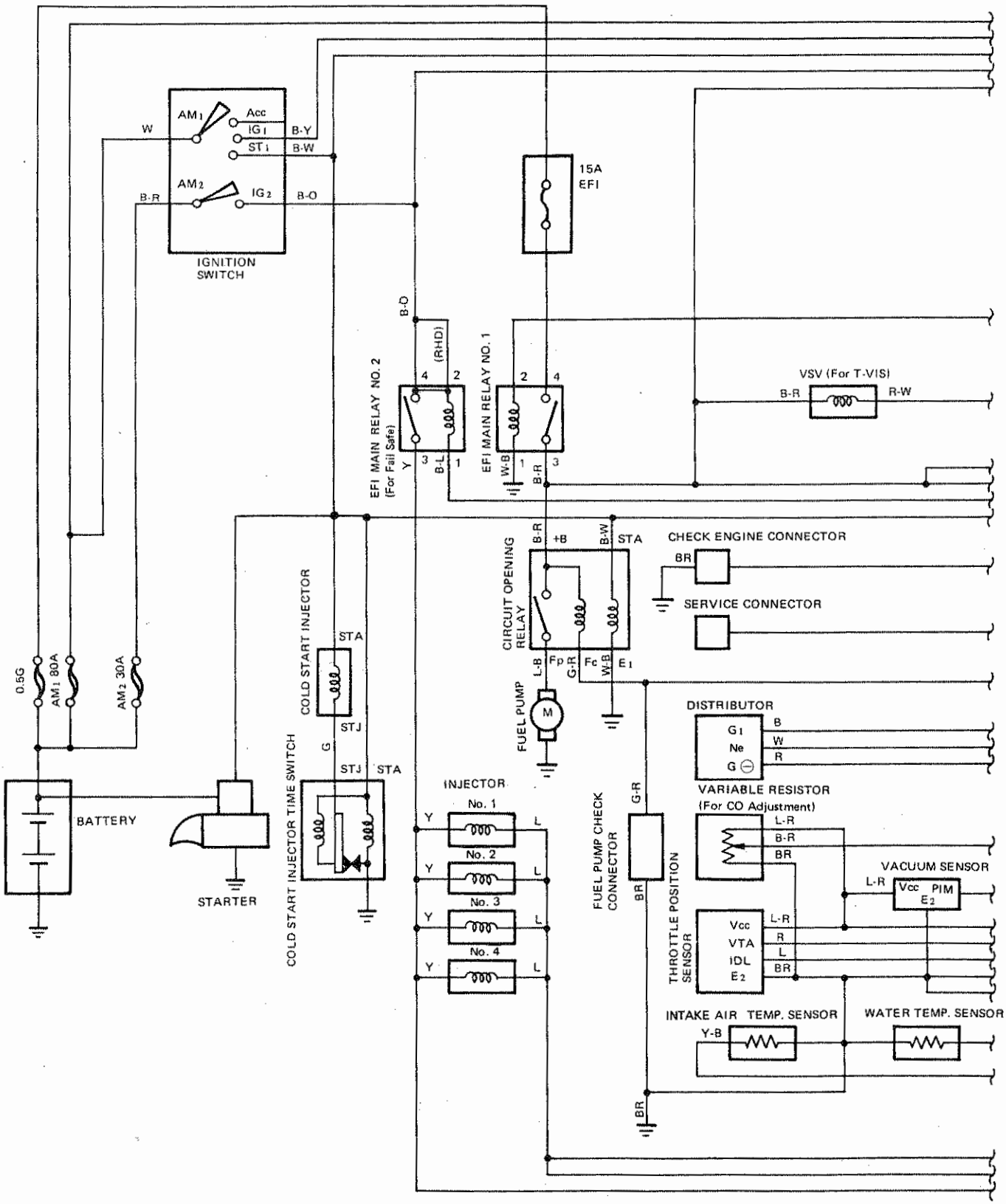
SYSTEM LAYOUT — CELICA

NOTE: On RHD vehicles, parts marked with an asterisk are in opposite position.

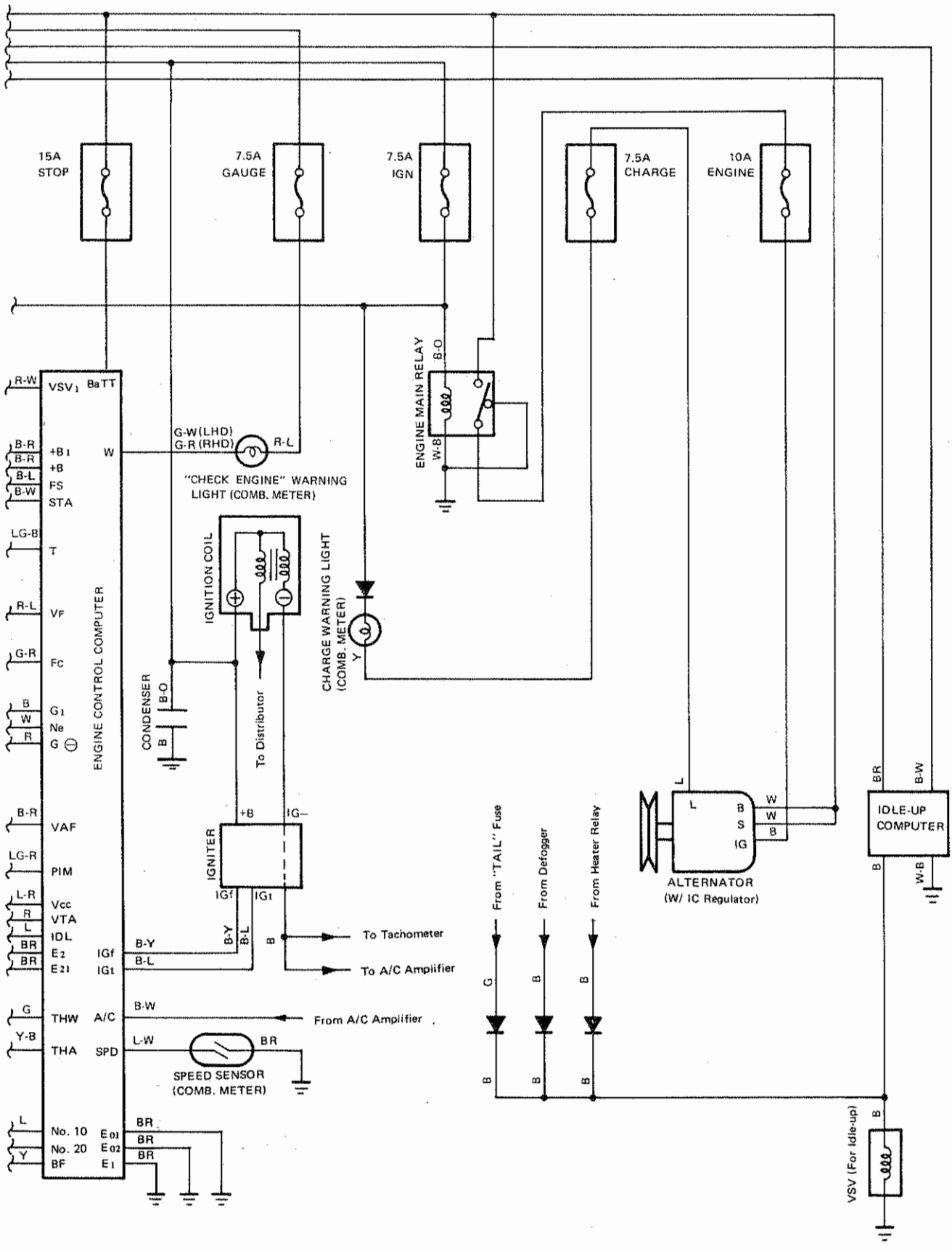


FI0237

WIRING DIAGRAM — COROLLA

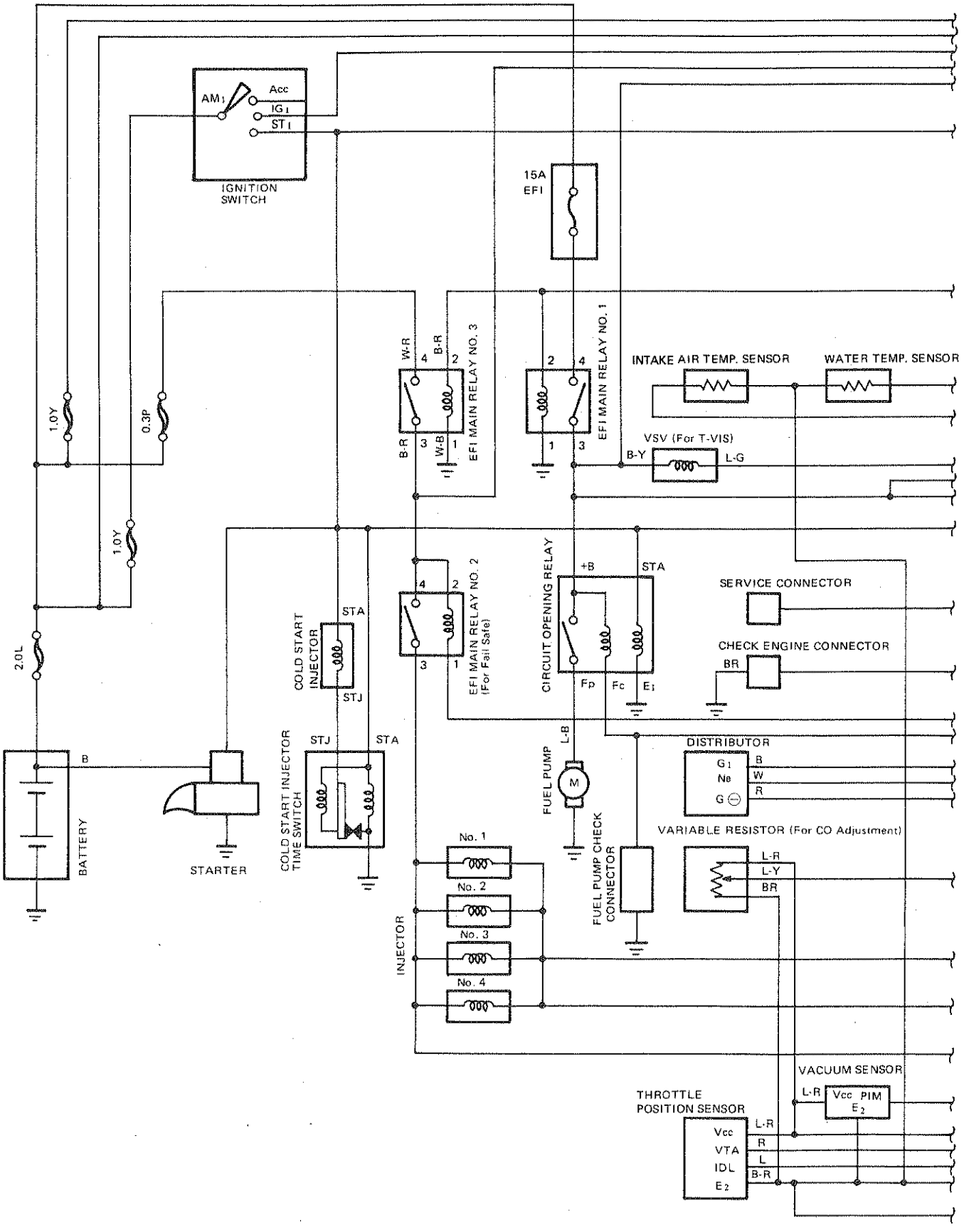


FI0104

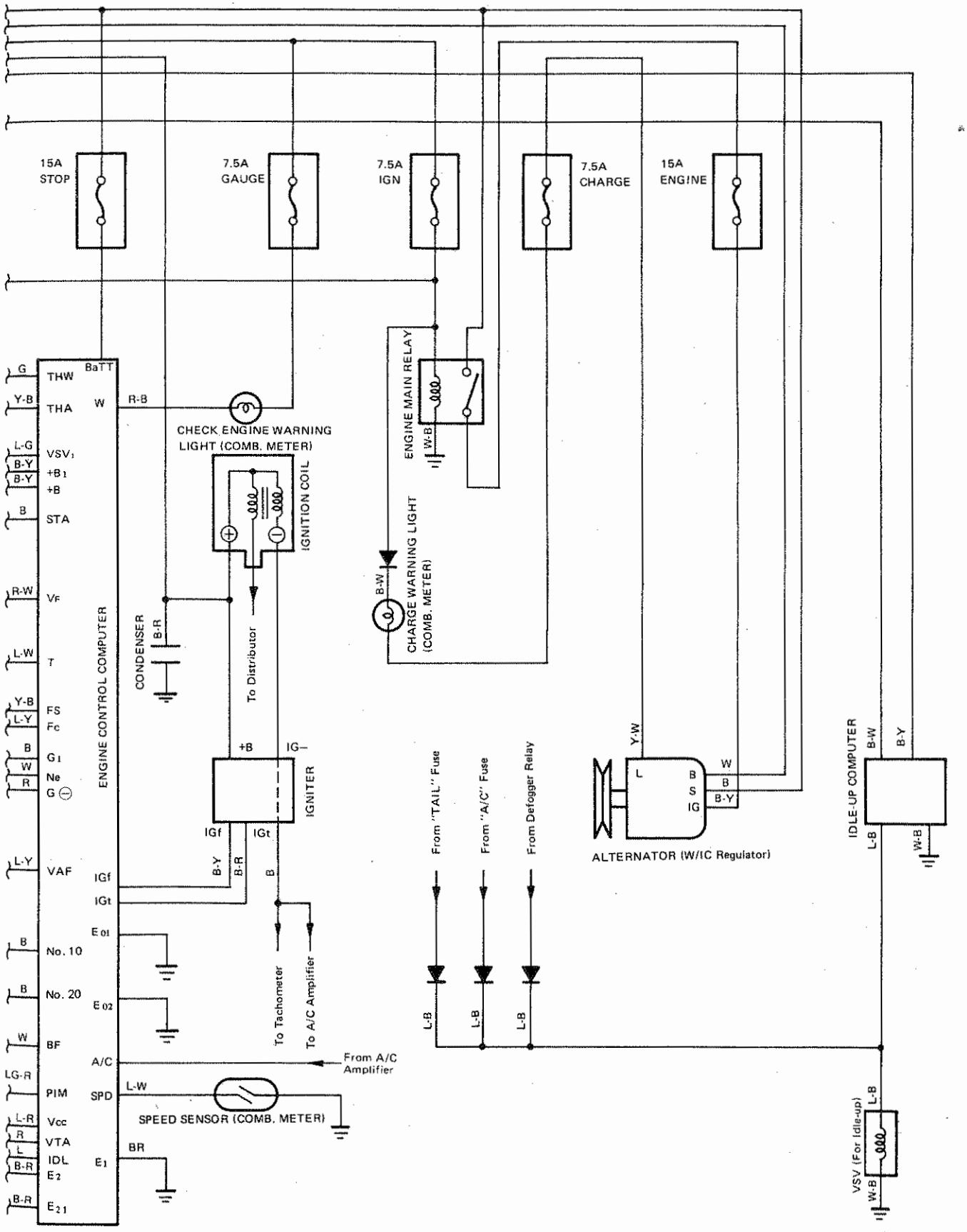

15A
STOP
7.5A
GAUGE
7.5A
IGN
7.5A
CHARGE
10A
ENGINE
ENGINE MAIN RELAY
B-O
W-B
R-W
VSV1
BaTT
B-R
+B1
W
B-R
+B
B-L
FS
B-W
STA
LG-B
T
R-L
VF
G-R
FC
B
G1
W
Ne
R
G
ENGINE CONTROL COMPUTER
G-W(LHD)
G-R(RHD)
R-L
"CHECK ENGINE" WARNING
LIGHT (COMB. METER)
IGNITION COIL
CHARGE WARNING LIGHT
(COMB. METER)
Y
CONDENSER
B-O
B
To Distributor
B-R
VAF
LG-R
PIM
L-R
Vcc
R
VTA
L
IDL
BR
E2
IGf
BR
E21
IGt
+B
IG-
IGNITER
IGf
IGt
B-Y
B-L
B
To Tachometer
To A/C Amplifier
B-Y
B-L
G
THW
A/C
B-W
From A/C Amplifier
Y-B
THA
SPD
L-W
BR
SPEED SENSOR
(COMB. METER)
L
No. 10
E01
BR
Y
No. 20
E02
BR
BF
E1
BR
From "TAIL" Fuse
From Defogger
From Heater Relay
G
B
B
B
B
B
L
L
B
S
IG
W
W
B
ALTERNATOR
(W/ IC Regulator)
BR
B-W
IDLE-UP
COMPUTER
B
W-B
B
VSV (For Idle-up)

FI0105

WIRING DIAGRAM — CELICA LHD

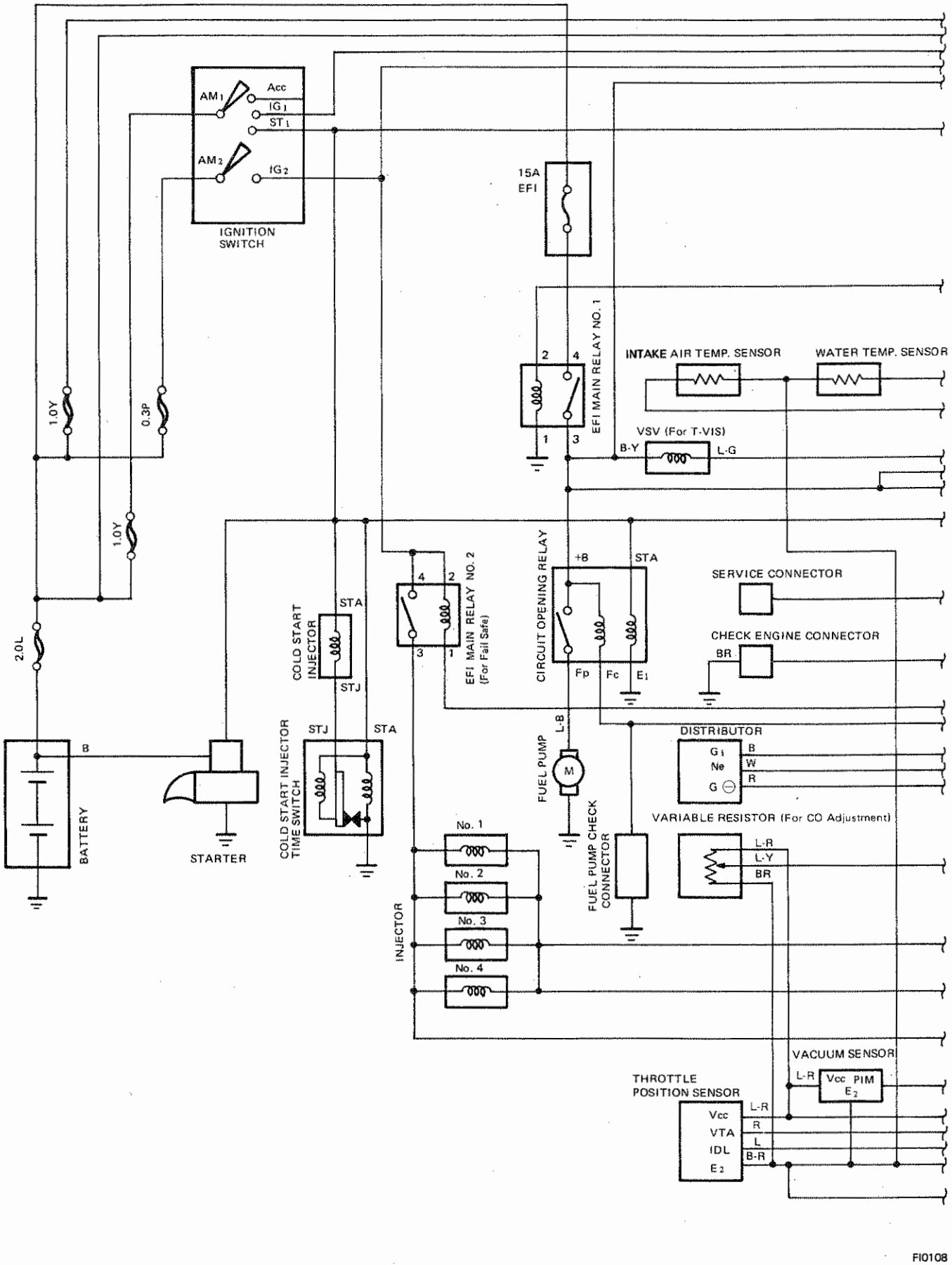


FI0106

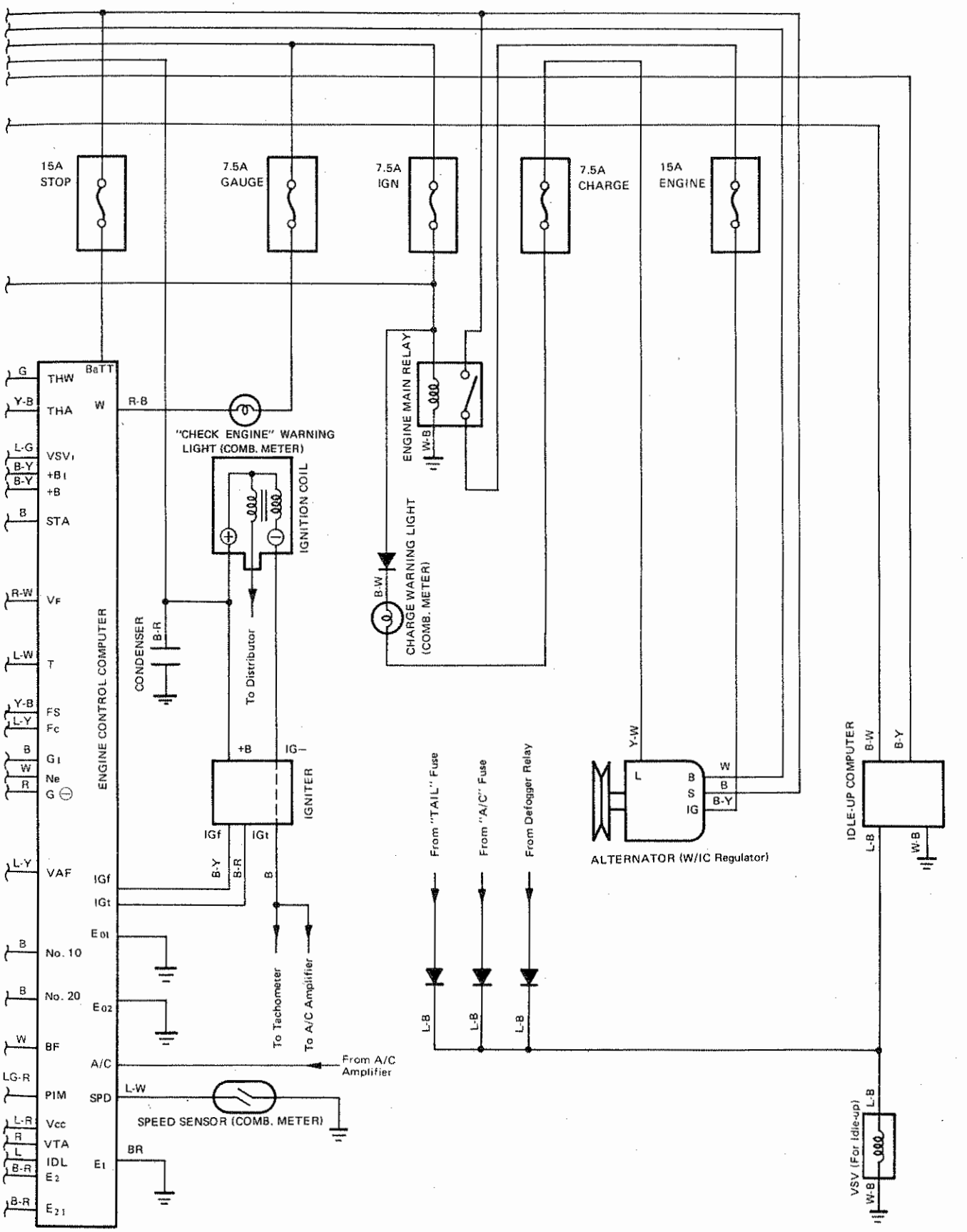

15A
STOP
7.5A
GAUGE
7.5A
IGN
7.5A
CHARGE
15A
ENGINE
ENGINE MAIN RELAY
W-B
CHECK ENGINE WARNING
LIGHT (COMB. METER)
IGNITION COIL
CHARGE WARNING LIGHT
(COMB. METER)
B-W
CONDENSER
B-R
To Distributor
+B
IG–
IGNITER
IGf
IGt
B-Y
B-R
B
To Tachometer
To A/C Amplifier
From A/C
Amplifier
From "TAIL" Fuse
From "A/C" Fuse
From Defogger Relay
L-B
ALTERNATOR (W/IC Regulator)
Y-W
L
B
S
IG
W
B
B-Y
IDLE-UP COMPUTER
B-W
B-Y
L-B
W-B
VSV (For Idle-up)
ENGINE CONTROL COMPUTER
G
THW
BATT
Y-B
THA
W
R-B
L-G
VSV1
B-Y
+B1
B-Y
+B
B
STA
R-W
VF
L-W
T
Y-B
FS
L-Y
FC
B
G1
W
Ne
R
G⊖
L-Y
VAF
IGf
IGt
E01
B
No. 10
B
No. 20
E02
W
BF
A/C
LG-R
PIM
SPD
L-W
L-R
Vcc
R
VTA
L
IDL
B-R
E2
BR
E1
B-R
E21
SPEED SENSOR (COMB. METER)

FI0107

WIRING DIAGRAM — CELICA RHD



FI0108


15A
STOP
7.5A
GAUGE
7.5A
IGN
7.5A
CHARGE
15A
ENGINE
ENGINE MAIN RELAY
W-B
CHARGE WARNING LIGHT
(COMB. METER)
B-W
"CHECK ENGINE" WARNING
LIGHT (COMB. METER)
IGNITION COIL
CONDENSER
B-R
To Distributor
+B
IG−
IGNITER
IGf
IGt
B-Y
B-R
B
To Tachometer
To A/C Amplifier
ENGINE CONTROL COMPUTER
BaTT
THW
THA
W
R-B
VSV1
+B1
+B
STA
VF
T
FS
Fc
G1
Ne
G
VAF
IGf
IGt
E01
No. 10
No. 20
E02
BF
A/C
PIM
SPD
Vcc
VTA
IDL
E2
E1
E21
From A/C
Amplifier
L-W
SPEED SENSOR (COMB. METER)
BR
From "TAIL" Fuse
From "A/C" Fuse
From Defogger Relay
L-B
Y-W
L
B
S
IG
W
B
B-Y
ALTERNATOR (W/IC Regulator)
IDLE-UP COMPUTER
B-W
B-Y
L-B
W-B
VSV (For Idle-up)
L-B
W-B

FI0109

BASIC ENGINE INSPECTION CHART

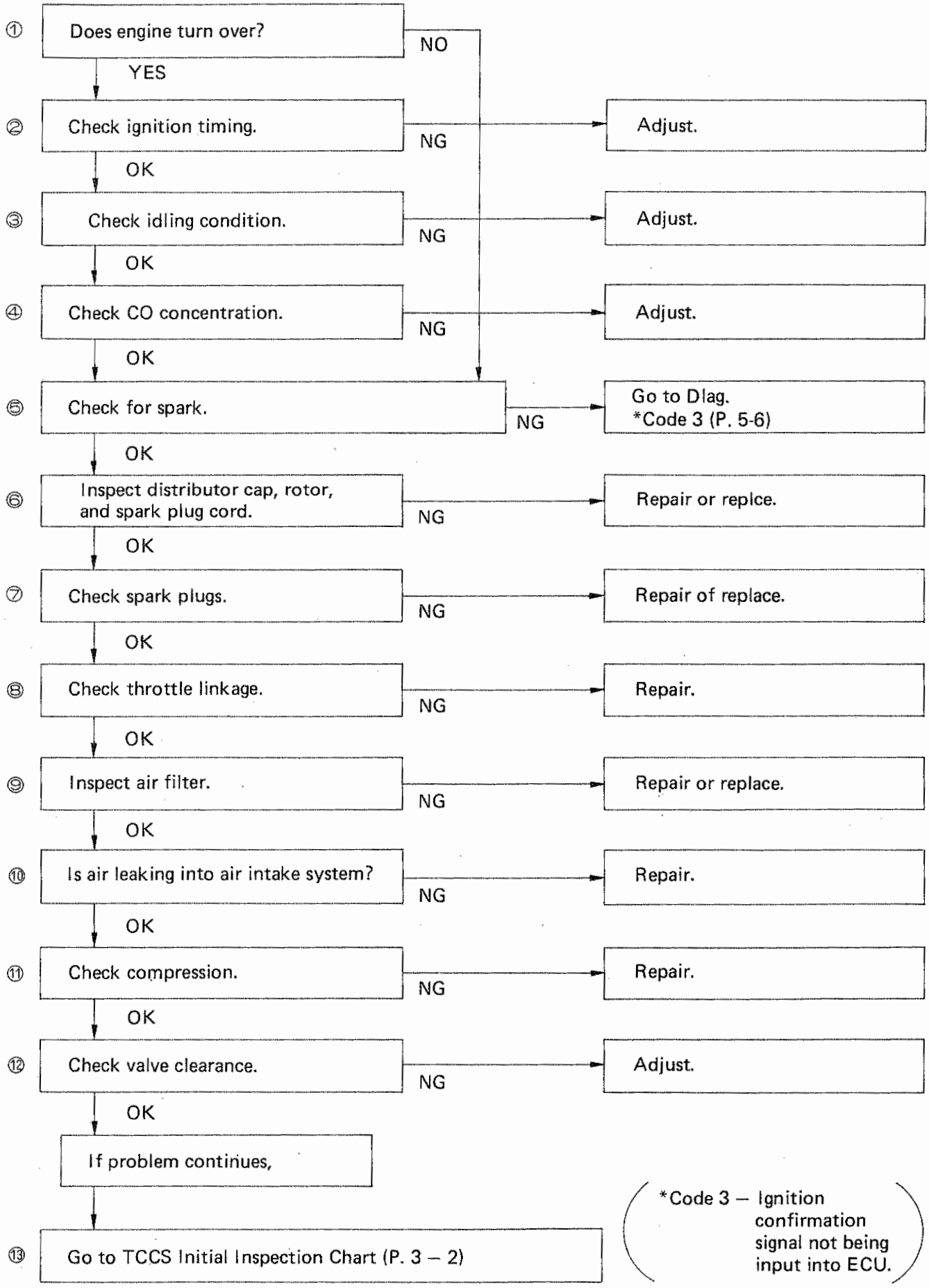
2

NOTE

The Basic Engine Inspection Chart is the basic chart of this manual and is used to determine whether or not troubles originate with the TCCS system.

You should begin all troubleshooting at step 1 of this chart regardless of the symptom.

BASIC ENGINE INSPECTION CHART



1 **Does engine start?**

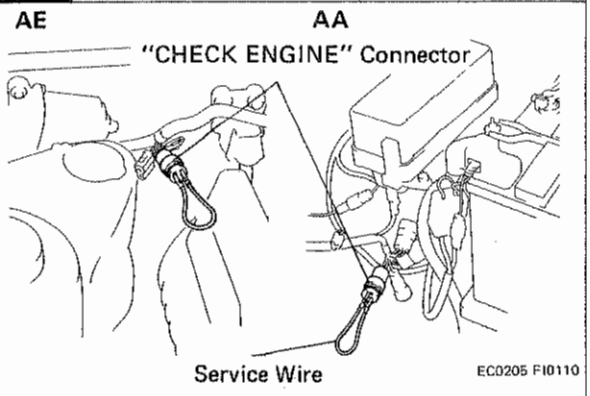
NO Go to Step 5 of this chart.

2 **Check ignition timing.**

NG Adjust ignition timing by turning distributor.

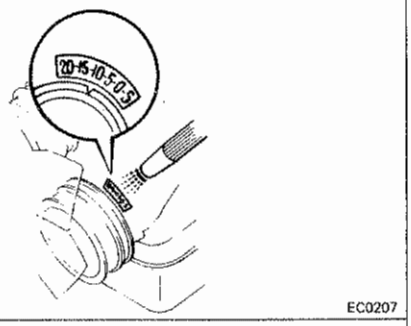
C (a) Engine at normal operating temperature.
(b) Timing light connected to engine.
(c) Engine idling.
(d) Terminals of check engine connector shorted.

N "CHECK ENGINE" connector is located near wiper motor (AE) or battery (AA).



P Check ignition timing using timing light.

OK Ignition timing = 10° BTDC @ 800 rpm.

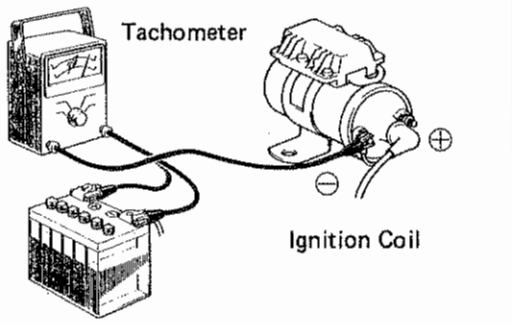


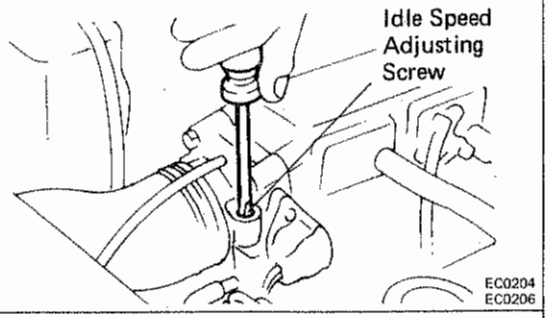
3 **Check idling condition.**

C (a) Engine at normal operating temperature.
(b) All accessories switched off.
(c) Air conditioner switched off.
(d) Tachometer connected to engine.

OK Idle speed = 800 ± 50 rpm.
Idle is stable.

N If not as specified, adjust the idle rpm by turning the idle speed adjusting screw.





4 **Check CO concentration.**

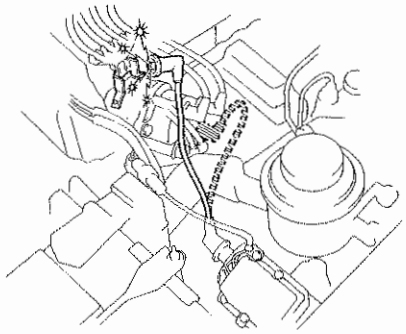
P See chart 12 CO concentration (P. 4-26)

5 **Check for spark.**

NG Go to Diag. Code 3 Chart (P. 5-6).

P Disconnect high-tension cord from distributor and, holding the end about 12.5 mm (½") from body of car, see if spark occurs while engine is being cranked.

N To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.



FI0111

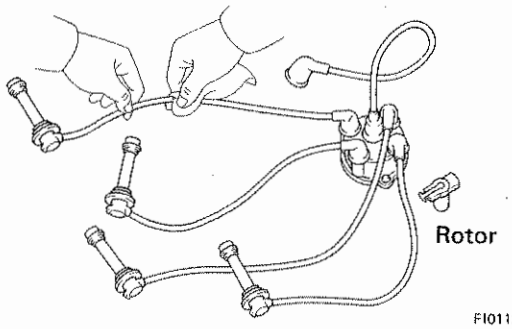
6 **Inspect distributor, rotor, and spark plug cord.**

NG Repair or replace.

C Distributor cap removed.

P (a) Check distributor cap and rotor for cracks, carbon tracks, or corroded terminals.
(b) Check distributor center contact for wear.
(c) Check cord terminals for corrosion, breaks, or distortion.
(d) Using ohmmeter, check that resistance of cord does not exceed maximum. Replace cord as required.

Maximum resistance: 25 kΩ per cord



FI0112

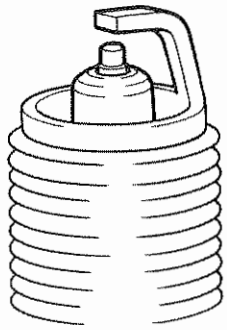
7 **Check spark plugs.**

NG Repair or replace spark plug(s).

C Spark plugs removed.
Using SST 09155-16100, remove plugs.

P Check clearance of spark plug gap, and check end of plug for fouling, etc.

N Regardless of whether or not a plug seems normal in other ways, if it is either partially or completely fouled, air-fuel mixure is probably too rich. Go to After-firing Chart (p. 3-5).

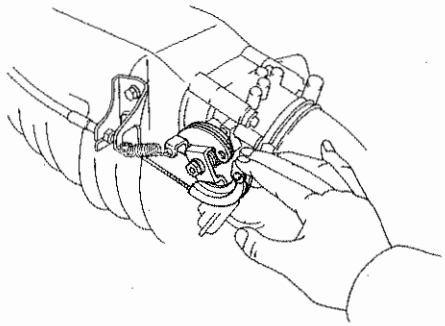


FI0113

8 **Check throttle linkage.**

NG Repair throttle linkage.

P (a) Check that throttle linkage moves smoothly.
(b) Make sure that throttle valve both fully opens and fully closes.

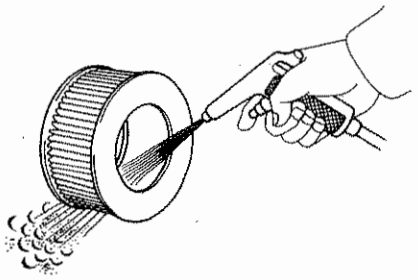


FI0114

9 **Inspect air filter.**

NG Repair or replace.

P (a) Visually check air cleaner to see that it is not excessively dirty, damaged, or oily.
(b) If necessary, clean element with compressed air, first throughly blowing it out from inside, then blowing it off from outside.



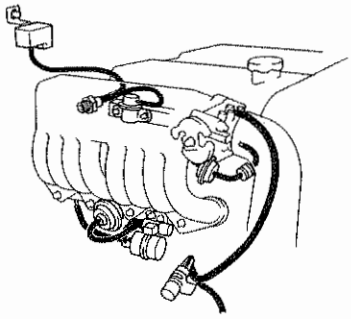
FI0115

10 **Is air leaking into air intake system?**

NG Repair air leak.

N Loose or missing engine oil dipstick, oil filler cap, PCV hose, vacuum hoses, etc., can allow air to leak into air intake system.

OK No air leaking into air intake sytem.



FI0116

11 **Check compression (See Chart 15 (P. 4-34)).**

12 **Check valve clearance (See page 6-9).**

13 **Go to TCCS Initial Inspection Charts (P. 3-2).**

N If problem continues even after all 12 steps of Basic Engine Inspection Chart have been completed, go to TCCS Initial Inspection Charts.

TCCS INITIAL INSPECTION AND SYMPTOM CHARTS

3

TCCS INITIAL INSPECTION 3-2
SYMPTOM CHARTS 3-4
Engine does not start
Difficult to start
Poor idling
Poor driveability
After-firing (Over-rich fuel mixture)
Back-firing (Over-lean fuel mixture)

NOTE

The TCCS Initial Inspection Chart is used for a pretest of concerning TCCS problems.

The Symptom Charts are to be used only if the problem has been corrected even after steps of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart have been completed.

TCCS INITIAL INSPECTION CHART

1 **Does "CHECK ENGINE" warning light come on?**

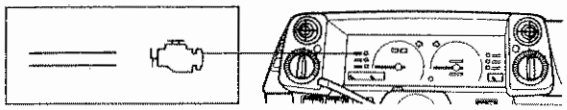
NO Go to chart 1 (P. 4-2).

C (a) Battery voltage above 11 volts.
(b) Throttle valve fully closed (throttle position sensor IDL contacts closed).
(c) Transmission in neutral.
(d) Air conditioner OFF.

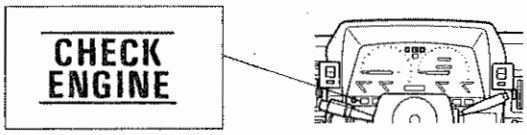
P Turn ignition switch to ON. Do not start engine.

OK "CHECK ENGINE" warning light comes on.

For AE



For AA



FI0084

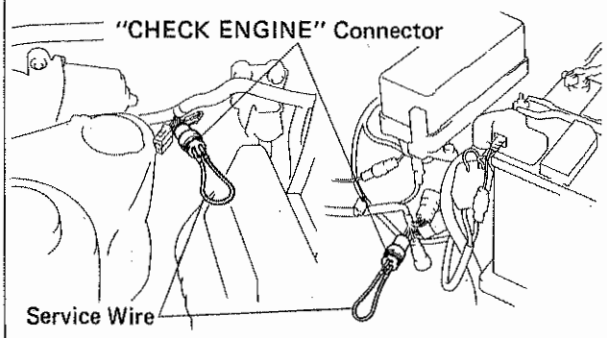
2 **Is Normal code output?**

NO Go to chart 2 (P. 4-6).

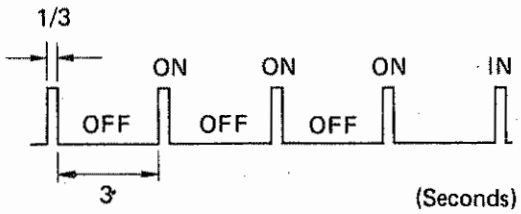
P (a) Using service wire, short terminals of check connector located near wiper motor (AE) or battery (AA).
(b) Turn ignition switch to ON. Do not start engine.
(c) Count number of times "CHECK ENGINE" warning light blinks.

OK Light blinks once every 3 seconds.

AE AA



EC0205 FI0110



FI0117

3 **Check fuel pressure.**

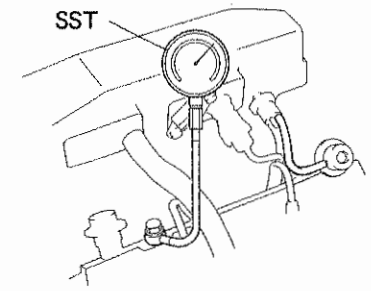
NG Go to chart 4 (P. 4-9).

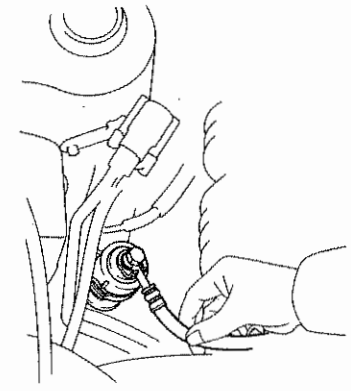
C (a) Enough fuel in tank.
(b) Fuel pressure gauge (SST 09268-45011) hooked up as explained in p. 6-7.

P Note fuel pressure under following conditions:
(a) Engine cranking.
(b) Engine being raced from the idle to 5,000 rpm rapidly.
(c) Engine idling.

OK (a), (b) Fuel pressure = 2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)
(c) Fuel pressure = 1.9 – 2.2 kg/cm² (27 – 31 psi, 186 – 216 kPa)

N If fuel pressure gauge is not available, pinch flexible hose running between fuel filter and pulsation damper with your fingers and see if there is any pressure.





FI0118
FI0119

4 **Go to Symptom Charts (P. 3-4).**

N If problem continues even after all 13 steps of Basic Engine Inspection Chart and all 3 steps of TCCS Initial Inspection Chart have been completed, go to Symptom Charts.

SYMPTOM CHARTS

These charts are not to be used until all steps of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart have been completed with no problems found.

ENGINE DOES NOT START

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	–
1	Check water temp. sensor.	Diag. code 4 (5-8)
2	Check vacuum sensor.	Diag. code 2 (5-2)
3	Check cold start injector time switch.	Chart 8 (4-22)
4	Check cold start injector.	Chart 9 (4-23)
5	Check electrical circuitry of injectors.	Chart 6 (4-15)
6	Check injectors.	Chart 10 (4-24)
7	If step 1 – 6 are all OK, try another ECU.	–

DIFFICULT TO START

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	–
1	Check auxiliary air control valve.	Chart 7 (4-21)
2	Check vacuum sensor.	Diag. code 2 (5-2)
3	Check water temp. sensor.	Diag. code 4 (5-8)
4	Check for residual pressure in fuel line.	Chart 5 (4-14)
5	Check cold start injector time switch.	Chart 8 (4-22)
6	Check cold start injector.	Chart 9 (4-23)
7	Check injectors.	Chart 10 (4-24)
8	If steps 1 – 7 are all OK, try another ECU.	–

POOR IDLING

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	–
1	Check idle-up system.	Chart 14 (4-32)
2	Check CO concentration.	Chart 12 (4-26)
3	Check auxiliary air control valve.	Chart 7 (4-21)
4	Check vacuum sensor.	Diag. code 2 (5-2)
5	Check dash pot.	Chart 11 (4-25)
6	Check for residual pressure in fuel line.	Chart 5 (4-14)
7	Check cold start injector.	Chart 9 (4-23)
8	Check injectors.	Chart 10 (4-24)
9	If steps 1 – 8 are all OK, try another ECU.	–

POOR DRIVEABILITY

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11 (5-15)
2	Check water temp. sensor.	Diag. code 4 (5-8)
3	Check vacuum sensor.	Diag. code 2 (5-2)
4	Check for residual pressure in fuel line.	Chart 5 (4-14)
5	Check variable induction (T-VIS) system.	Chart 13 (4-31)
6	Check cold start injector.	Chart 9 (4-23)
7	Check injectors.	Chart 10 (4-24)
8	If steps 1 — 7 are all OK, try another ECU.	—

AFTER-FIRING (Over-rich fuel mixture)

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11 (5-15)
2	Check water temp. sensor.	Diag. code 4 (5-8)
3	Check vacuum sensor.	Diag. code 2 (5-2)
4	Check for residual pressure in fuel line.	Chart 5 (4-14)
5	Check cold start injector.	Chart 9 (4-23)
6	Check injectors.	Chart 10 (4-24)
7	If steps 1 — 6 are OK, try another ECU.	—

BACK-FIRING (Over-lean fuel mixture)

No.	Item	Reference (page)
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11 (5-15)
2	Check vacuum sensor.	Diag. code 2 (5-2)
3	Check dash pot.	Chart 11 (4-25)
4	Check injection volume.	Chart 10 (4-24)
5	If steps 1 — 4 are all OK, try another ECU.	—

SYSTEM OR PARTS INSPECTION CHARTS

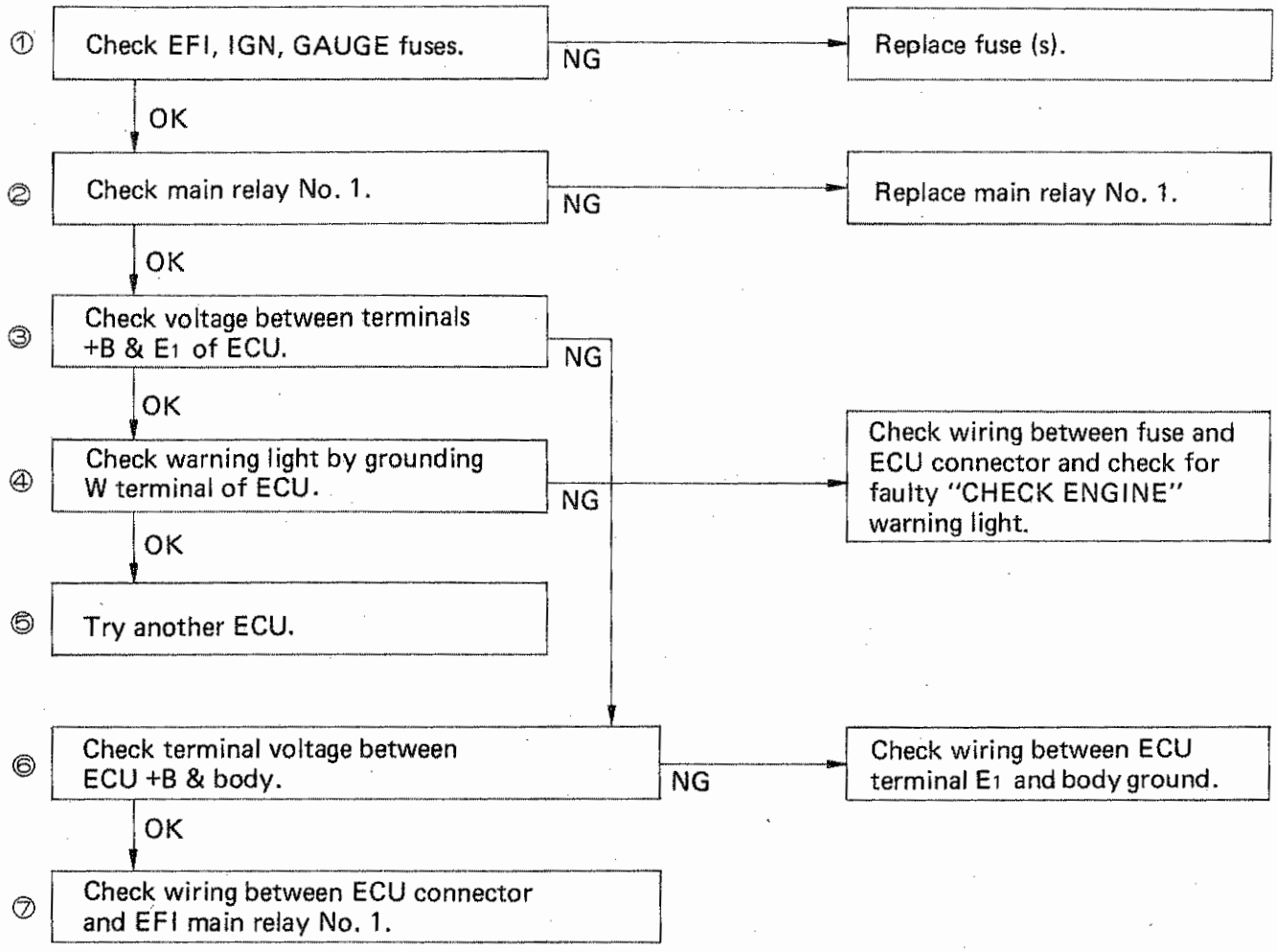
Chart 1 – No "CHECK ENGINE" warning light 4-2
Chart 2 – Reading & confirming diagnostic codes 4-6
Chart 3 – Intermittent trouble or problems 4-8
Chart 4 – Fuel system 4-9
Chart 5 – Residual fuel pressure 4-14
Chart 6 – Injector electrical circuitry 4-15
Chart 7 – Auxiliary air control valve 4-21
Chart 8 – Cold start injector time switch 4-22
Chart 9 – Cold start injector 4-23
Chart 10 – Injectors 4-24
Chart 11 – Dash pot (DP) 4-25
Chart 12 – CO concentration 4-26
Chart 13 – Toyota variable induction (T-VIS) system 4-31
Chart 14 – Idle-up system 4-32
Chart 15 – Compression pressure 4-34

NOTE

The Fuel System Chart, etc., are used to determine whether or not the corresponding systems or part is operating normally.

These charts should not be used independently of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart since that chart will direct you to the relevant System or Parts Inspection Chart if this is necessary.

CHART 1 — No "CHECK ENGINE" warning light



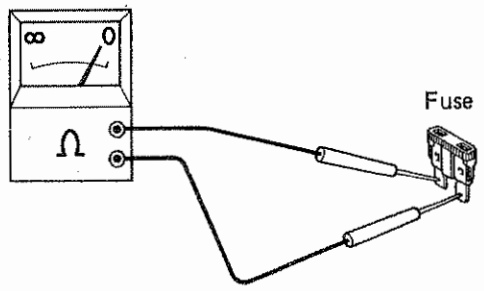
1 **Check EFI, IGN, GAUGE fuses.**

NG Replace fuse(s).

P Remove fuses and measure their resistances using tester.

OK Resistance = 0 Ω.

N Fuses may be burnt out even if they appear to be OK during visual inspection.

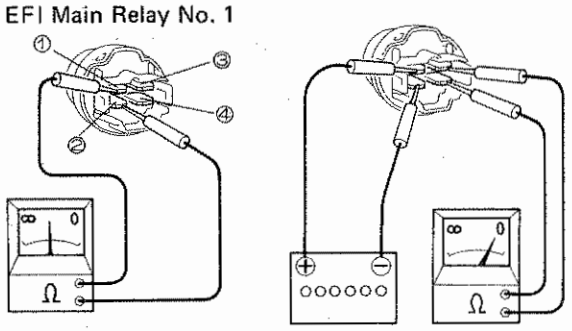


FI0044

2 **Check main relay No. 1.**

NG Replace main relay No. 1

P Remove relay and measure resistance between its terminals as follows:
(a) Between terminals 1 & 2 : **OK** 60 – 90 Ω
(b) Between terminals 3 & 4 with battery power (regardless of polarity) going to terminals 1 & 2: **OK** 0 Ω.



FI0120 FI0121

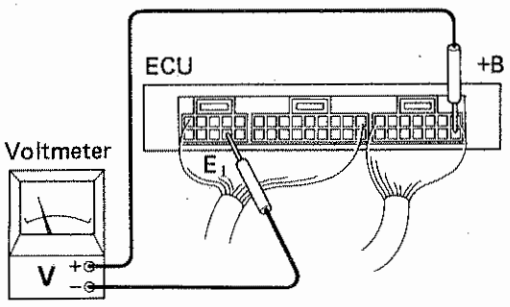
3 **Check voltage between terminals +B & E_1 of ECU.**

NG Go to Step **6** of this chart.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between +B and E_1 with voltmeter.

OK Voltage = Battery voltage.



FI0122

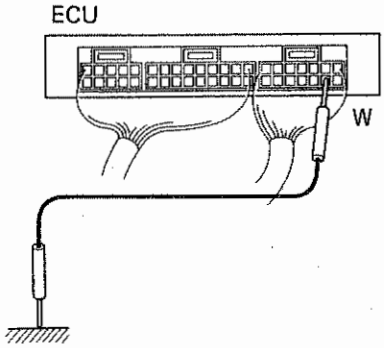
4 **Check warning light by grounding W terminal of ECU.**

NG Check wiring between fuse and ECU connector and check for faulty "CHECK ENGINE" warning light.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Using service wire, ground ECU W terminal.

OK "CHECK ENGINE" warning light comes on.



FI0123

5 Try another ECU. **END**

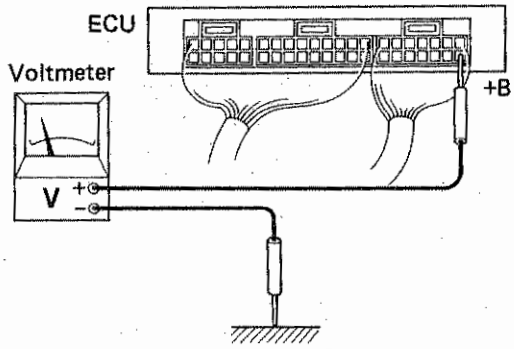
6 Check terminal voltage between ECU +B & body.

C Ignition switch ON.

P Measure voltage between ECU +B and body with voltmeter.

OK Voltage = Battery voltage.

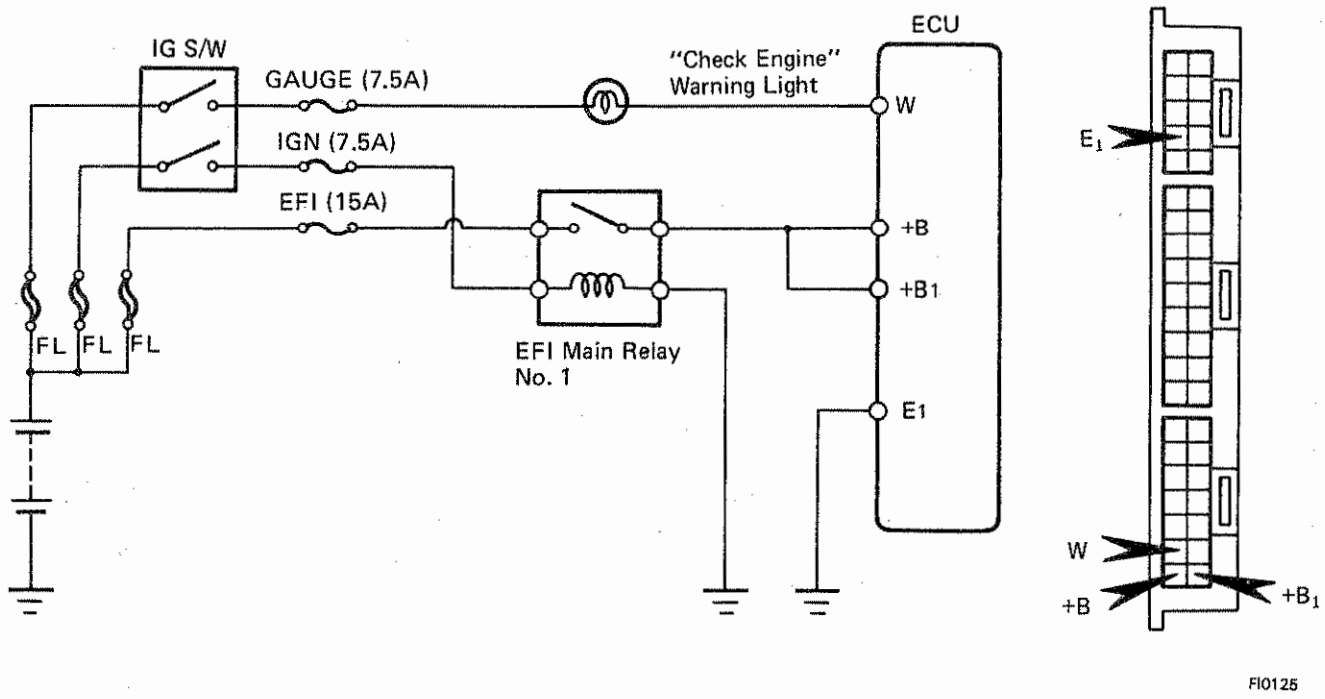
NG Check wiring between ECU terminal E_1 and body ground.



FI0124

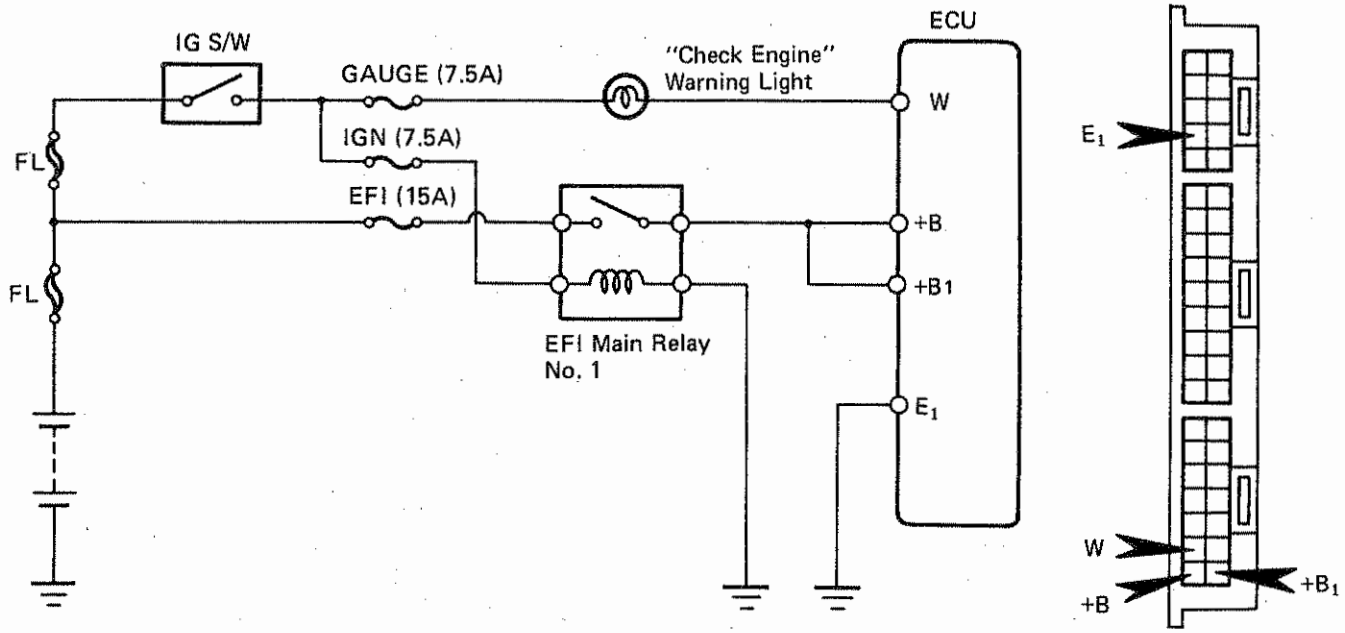
7 Check wiring between ECU connector and EFI main relay No. 1. **END**

COROLLA



FI0125

CELICA



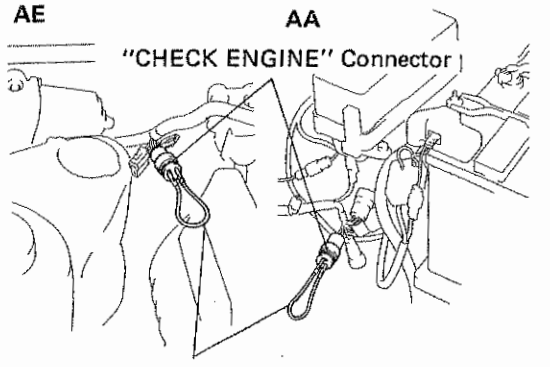
FI0126

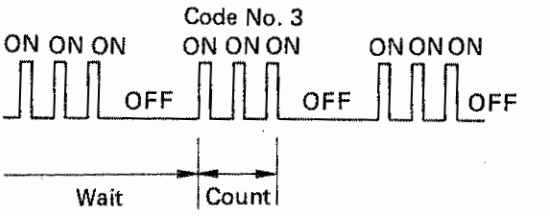
CHART 2 — Reading & confirming diagnostic codes

1 **Read and record diagnostic code(s).**

P
(a) Short terminals of the check engine connector.
(b) Turn ignition switch to ON.
(c) Wait for 3-second light-off.
(d) Count number of times "CHECK ENGINE" warning light blinks after 3-second light off.
(e) If more than one code is output, light will remain off for 3 seconds, and then indicate next code in step (d) above.
(f) After all codes have been output, light repeats above sequence until memory is cleared. (As explained in step **4** of this chart).

N For diagnostic codes and their meanings, see table (p. 1-7).





2 **Code 9?**
YES Go to Diag. Code 9 Chart (P. 5-13).

3 **Code 11?**
YES Go to Step **7** of this Chart.

4 Clear memory, then see whether previously-output codes are still being output.

HOW TO CLEAR MEMORY

C (a) Ignition switch turned off (Lock).
(b) STOP fuse removed.

P Wait at least 10 seconds before continuing.

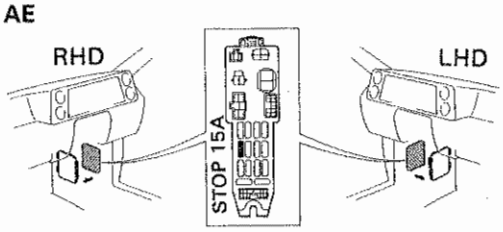
N The memory can also be cleared by removing battery cable from negative terminal of battery, but this will also clear memories of other systems (clock, etc.).

HOW TO CHECK MEMORY OUTPUT

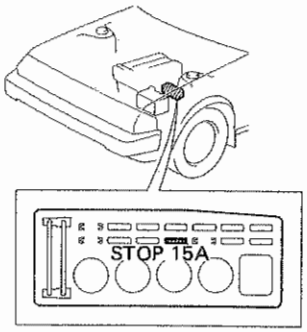
C Check connector terminals removed.

P (a) Turn ignition switch to ON for 2 seconds.
(b) Start engine. If it will not start, crank it for 5 seconds, then go to step (d).
(c) Let engine run at 2,000 rpm for 10 seconds.
(d) Stop engine.
(e) Check to see if a diagnostic code is being output.

AE



AA



FI0128
FI0129

5 Are previously-output codes still being output?

YES → Go to relevant Diag. Code Chart.

6 Go to Chart 3 (P. 4-8).

END

N If no previous code is being output, but only a Normal code, the problem may be an intermittent one. In this case, refer to chart 3 (p. 4-8).

7 Check the following:

P (a) Air conditioner switch on?
(b) Throttle valve fully closed?

N (a) If code 11 continues to be output even after above checks have been completed, go to code 11 chart (p. 5-15).
(b) If any other code (besides 11) is output, go to step 4 of this chart.

CHART 3 — Intermittent trouble or problems

We define "Intermittent trouble or problems" as a problem about which the customer has a complaint but which does not occur in the repair shop and cannot therefore, be checked. Intermittent problems also include complaints of the CHECK ENGINE light going on and off erratically.

The most common causes of these kinds of problems in the TCCS are loose connectors, relays, switches, or sensors.

HOW TO FIND INTERMITTENT PROBLEMS

The self-diagnostic system with which the ECU is equipped memorizes the location of intermittent problem; note that this data remains in memory even if the ignition switch is turned off. Due to this function of the self-diagnostic system, it is usually very easy to locate even the source of intermittent problems.

Systems which are indicated as the source of the problem(s) by a diagnostic code must be inspected and repaired as explained below.

1. **Connectors**

   Check each connector in the system indicated by the diagnostic code to find out...

   (a) Is it loosely connected?

   (b) Does the wire harness connecting it up with its corresponding part have insufficient slack?

   (c) Are its terminals dirty?

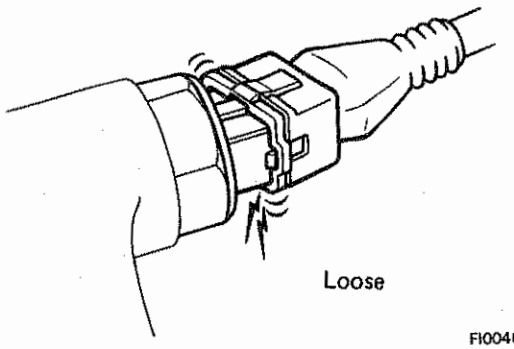
   (d) Are its terminals making loose contact due to terminals that have spread?

   If any of these conditions are found, repair or replace the terminal(s).

2. **Sensors, Relays, and Switches**

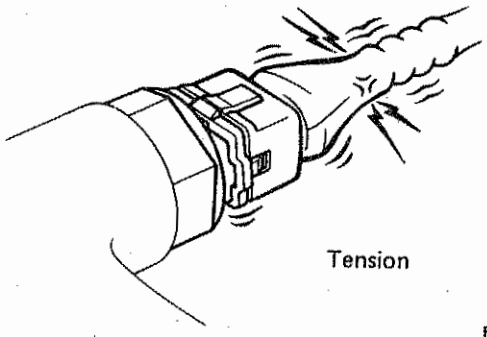
   With your finger, flick each sensor, relay and switch in the system in which trouble is indicated. If this causes the problem to intermittently appear and disappear, replace the offending sensor, relay , or switch.

NOTE: For the diagnostic code corresponding to each connector, sensor, relay, and switch, refer to the Diagnostic Code charts and to the wiring diagrams in the Initial Information section of this manual.



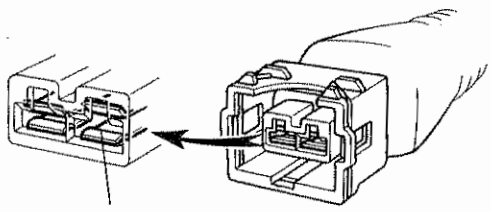
Loose

FI0046



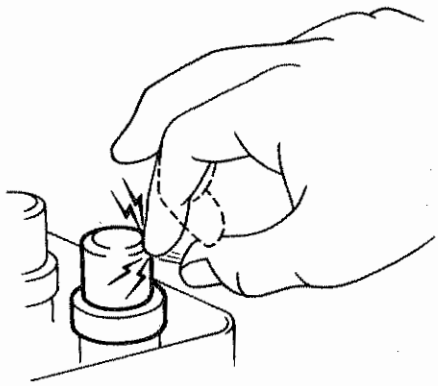
Tension

FI0047



Terminals Have Spread

FI0048



Flick Lightly

FI0049

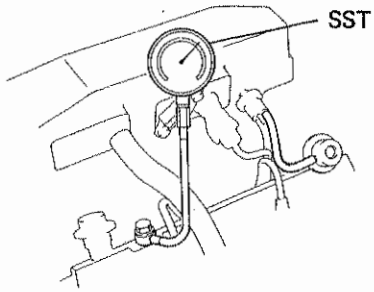
CHART 4 — Fuel system

1 **Check fuel pressure.**

C (a) Enough fuel in tank.
(b) Fuel pressure gauge (SST 09268-45011) installed (see p. 6-7 for installation).

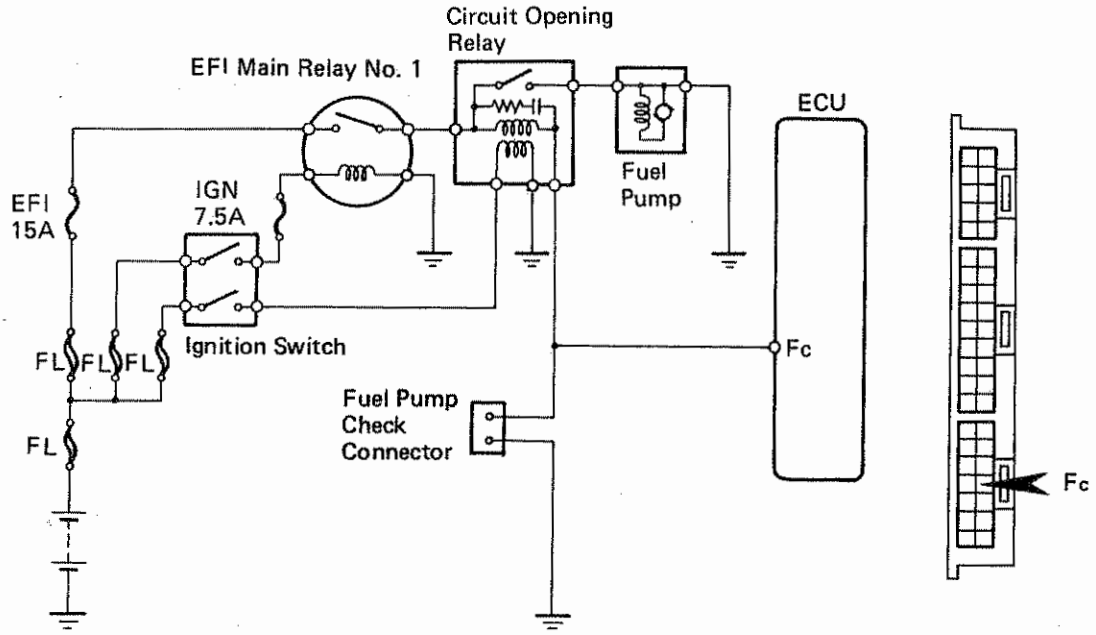
P Note fuel pressure under the following conditions:
(a) Engine cranking.
(b) Engine being raced from the idle to 5,000 rpm rapidly.
(c) Engine idling.

OK (a), (b) Fuel pressure = 2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)
(c) Fuel pressure = 1.9 – 2.2 kg/cm² (27 – 31 psi, 186 – 216 kPa)



FI0118

2	**Is fuel pressure zero while cranking?**	**YES**	Go to **7** of this Chart.
3	**Does fuel pressure gradually drop after engine is started?**	**YES**	Go to **15** of this Chart.
4	**Is fuel pressure above 2.7 kg/cm² (38 psi, 265 kPa)?**	**YES**	Go to **13** of this Chart.
5	**Is fuel pressure below 2.3 kg/cm² (33 psi, 226 kPa) when engine is raced?**	**YES**	Go to **19** of this Chart.
6	**Is fuel pressure above 2.2 kg/cm² (31 psi, 216 kPa) when engine is idling?**	**YES**	Go to **20** of this Chart.



FI0130

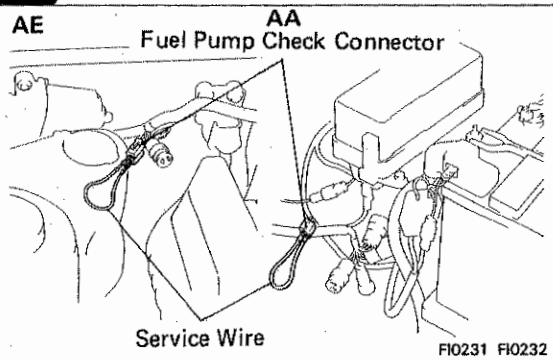
7 **Short terminals of fuel pump check connector.**

NG Go to Step **10** of this Chart.

C (a) Ignition switch turned to ON.
(b) Both terminals of fuel pump check connector shorted.

P Check fuel pressure.

OK Fuel pressure = 2.3 – 2.7 kg/cm^2
(33 – 38 psi, 226 – 265 kPa)



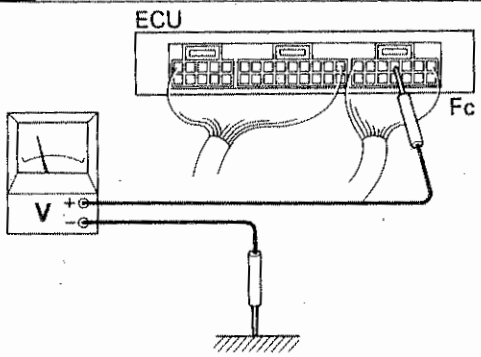
8 **Check voltage between Fc terminal of ECU & body.**

NG Try another ECU.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Engine cranking by turning ignition switch to ST.

P Using a voltmeter, measure voltage between Fc terminal of ECU and body ground.

OK Voltage = Under 1.0 V.



9 **Check wiring between circuit opening relay and ECU.** **END**

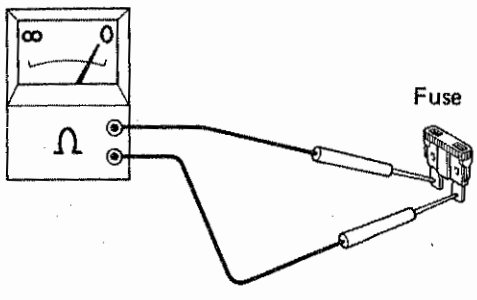
10 **Check EFI and IGN fuses.**

NG Replace fuse(s).

P Remove fuses and measure their resistances using tester.

OK Resistance = 0 Ω.

N Fuses may be burnt out even if they appear to be okay.



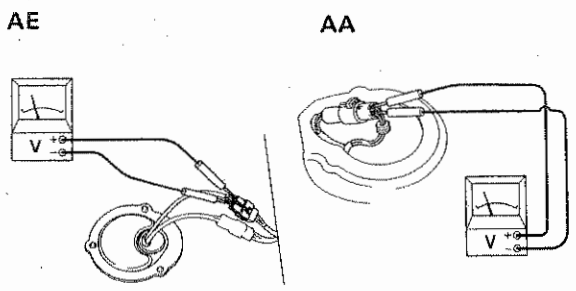
11 **Check voltage at fuel pump connector.**

C (a) Ignition switch turned to ON.
(b) Both terminals of fuel pump check connector shorted.

P Measure voltage using voltmeter at fuel pump connector terminals.

OK Voltage = 11 V or more.

OK Replace fuel pump.



FI0132 FI0133

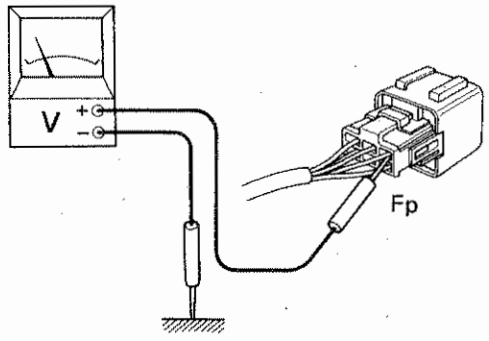
12 **Check voltage between Fp terminal of circuit opening relay & body.**

C (a) Ignition switch turned to ON.
(b) Both terminals of fuel pump check connector shorted.

P Using voltmeter, measure voltage between F_P terminal of circuit opening relay and body ground.

OK Voltage = 11 V or more.

OK Check wiring between circuit opening relay and fuel pump.



FI0134

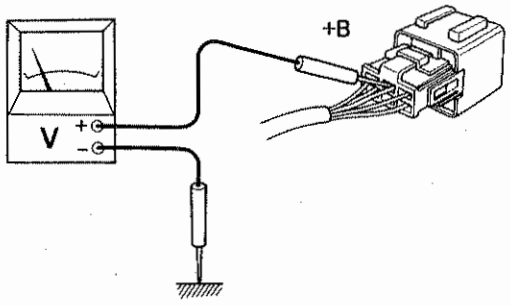
13 **Check voltage between +B terminal of circuit opening relay & body.**

C (a) Ignition switch turned to ON.
(b) Both terminals of fuel pump check connector shorted.

P Using voltmeter, measure voltage between +B terminal of circuit opening relay and body ground.

OK Voltage = 11 V or more.

NG Check wiring between fuse and circuit opening relay.



FI0135

14 **Replace circuit opening relay.**

END

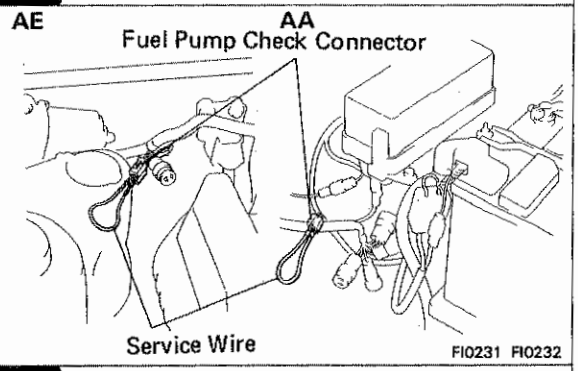
15 **Short terminals of fuel pump check connector.**

C (a) Ignition switch turned to ON.
(b) Both terminals of fuel pump check connector shorted.

P Check fuel pressure.

OK Fuel pressure = 2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)

NG Replace circuit opening relay.



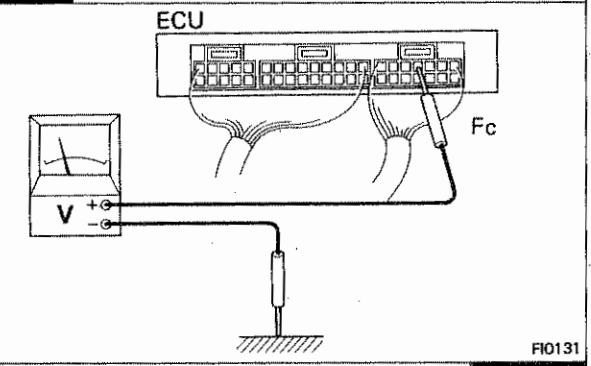
16 **Check voltage between Fc terminal of ECU & body.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Engine cranking by turning ignition switch to ST.

P Using a voltmeter, measure voltage between Fc terminal of ECU and body ground.

OK Voltage = Under 1.0 V.

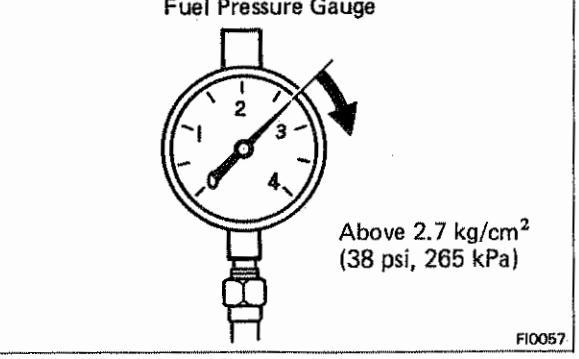
NG Try another ECU.



17 **Check wiring between circuit opening relay and ECU.** END

18 **Fuel pressure above 2.7 kg/cm² (38 psi, 265 kPa).**

P In this case, check fuel return line to see if it is clogged.
If it is OK, replace pressure regulator.



19 Fuel pressure below 2.3 kg/cm² (33 psi, 226 kPa) when engine is raced.

P If fuel pressure is below 2.3 kg/cm² (33 psi, 226 kPa) check the following:

(a) Clogged fuel filter or fuel line?

(b) If (a) is OK, check fuel pressure under the following conditions:

(1) Flexible hose of fuel return line pinched off.

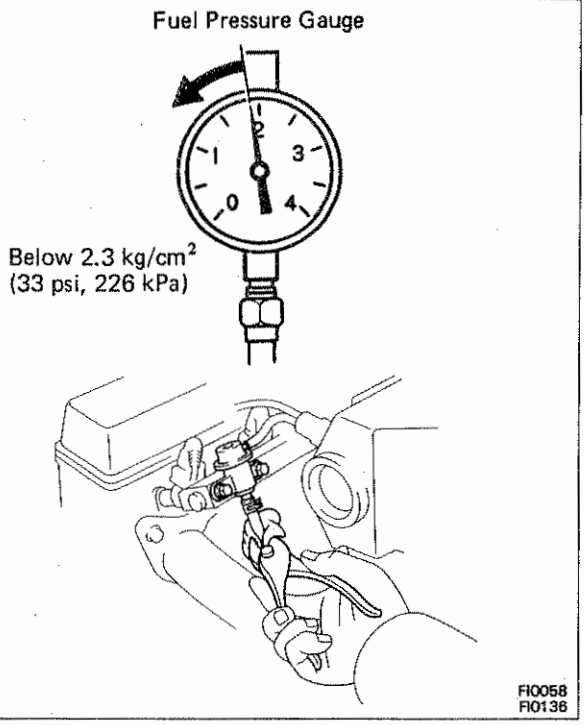
(2) Engine cranking or started.

Results

(1) Fuel pressure above 2.3 kg/cm² (33 psi, 226 kPa): replace pressure regulator.

(2) Fuel pressure 2.3 kg/cm² (33 psi, 226 kPa) or below: replace fuel pump.

– END –



20 Check pressure regulator.

C Engine idling

P Check fuel pressure both with vacuum sensing hose of pressure regulator disconnected and connected.

OK

HOSE	FUEL PRESSURE kg/cm² (psi, kPa)
Connected	1.9 – 2.1 (27 – 30, 186 – 206)
Disconnected	2.5 – 2.7 (36 – 38, 245 – 265)

– END –

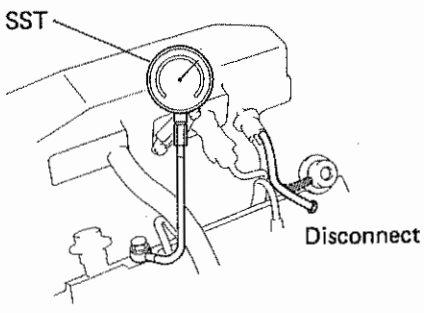
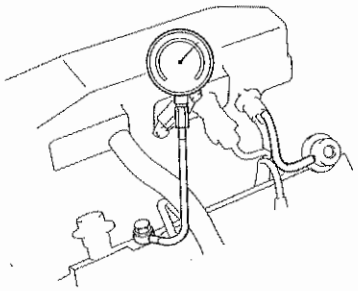


CHART 5 — Residual fuel pressure

C Fuel pressure gauge (SST 09268-45011) hooked up (for installation, see p. 6-7).

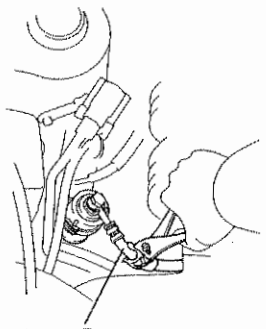
P (a) Crank or start engine.
(b) Stop engine and measure change in fuel pressure.

OK Fuel pressure remains above 1.5 kg/cm² (21 psi, 147 kPa) at least 5 minutes after engine is stopped.

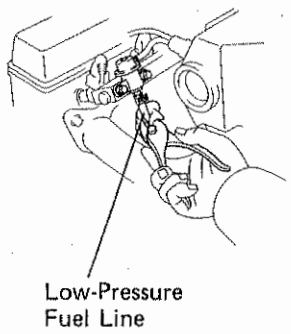


FI0118

N If fuel pressure drops below this level, check as follows:
(a) Completely pinch off flexible hose of high-pressure fuel line (to engine) and flexible hose of low-pressure fuel line (return).
(b) If pressure drops, check for injector or cold start injector leak (see p. 4-23).

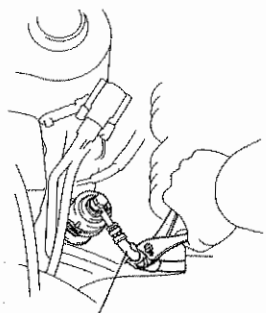


FI0138



FI0136

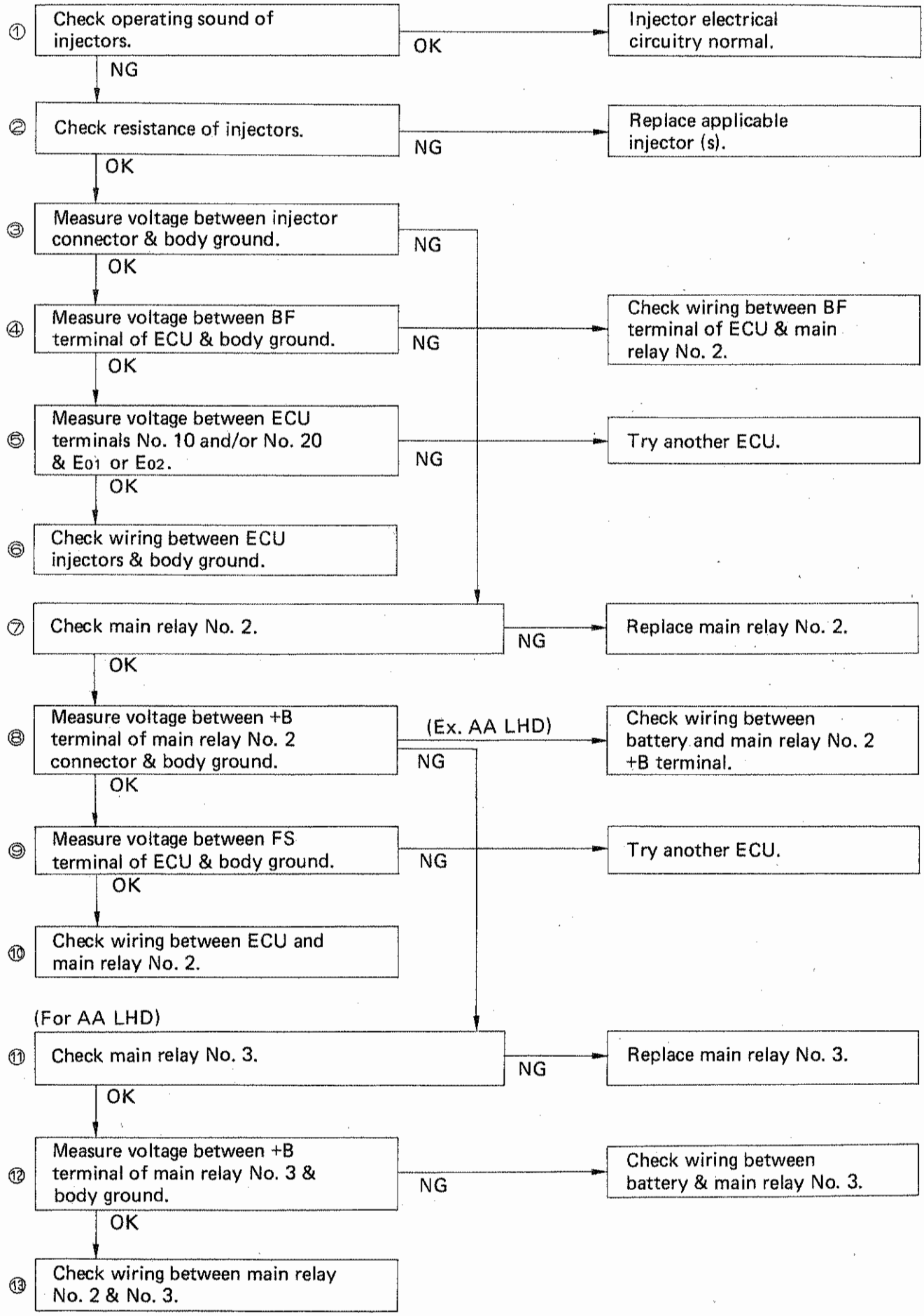
(c) If pressure does not drop when lines are blocked, pinch off only high-pressure hose, leaving low-pressure hose open.
(d) If pressure drops, replace pressure regulator.



FI0138

(e) If pressure does not drop after either step (a) or (c), replace fuel pump.

CHART 6 — Injector electrical circuitry

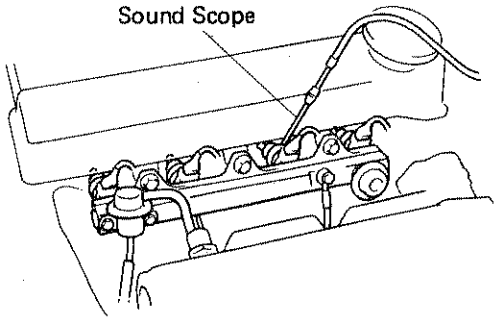


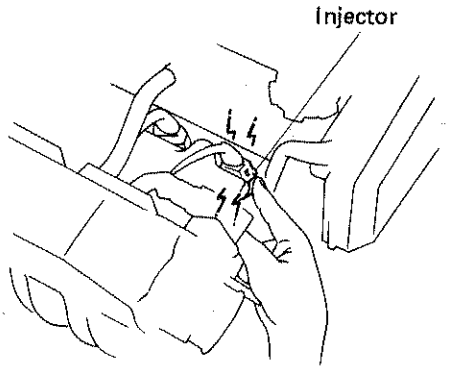
1 Check operating sound of injectors.

OK Injector electrical circuitry normal.

P Check operating sound of each injector.
(a) With engine running or cranking, use sound scope to check that there is normal operating sound in proportion to engine RPM.
(b) If no sound scope is available, check with your finger to see if you can feel injector operating.

N If only one particular injector makes no sound (or does not vibrate), check to see if it is connected securely to its connector.
If connector is OK, check injector. (See p. 4-24 for how to check this.)





FI0139
FI0140

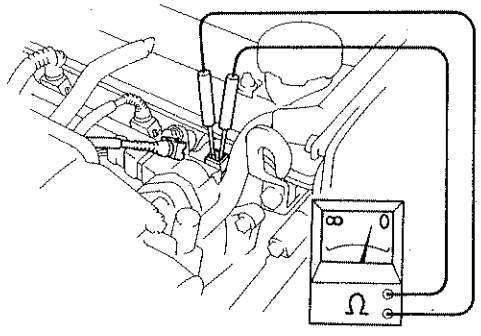
2 Check resistance of injectors.

NG Replace applicable injector(s).

C Injector connectors removed.

P Using an ohmmeter, check resistance of both terminals for all injectors.

OK Resistnace : 1.0 – 2.5 Ω.



FI0141

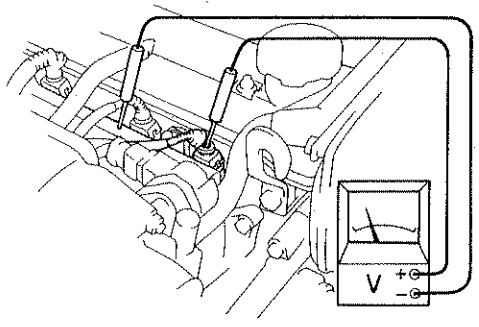
3 Check voltage between injector connector & body ground.

NG Go to Step **7** of this Chart.

C (a) Carefully remove water-proofing rubber cover of injector connector.
(b) Crank engine by turning ignition switch to ST.

P Measure voltage between a terminal of connector and body ground.

OK Voltage = Battery voltage.



FI0142

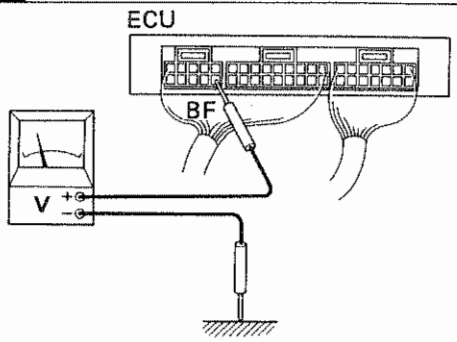
4 **Check voltage between BF terminal of ECU & body ground.**

NG Check wiring between BF terminal of ECU & main relay No. 2.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between BF terminal of ECU and body ground.

OK Voltage = Battery voltage.



FI0143

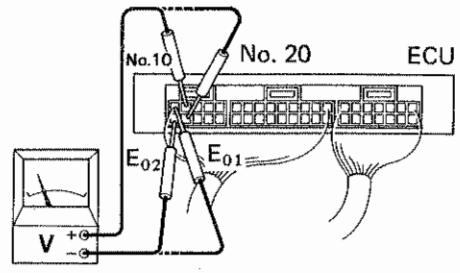
5 **Check voltage between ECU terminals No. 10 and/or No. 20 & E_{01} or E_{02}.**

NG Try another ECU.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between ECU terminals No. 10 and/or No. 20 & E_{01} or E_{02}.

OK Voltage = Battery voltage.



FI0144

6 **Check wiring between ECU, injectors & body ground.**

END

7 Check main relay No. 2.

C Main relay No. 2 removed.

(For AE RHD)

P (a) Measure resistance between terminals 1 & 2: OK 60 – 90 Ω.
(b) Measure resistance between terminals 3 & 4 with battery power going to terminals 1 & 2: OK 0 Ω.

(For AE LHD)

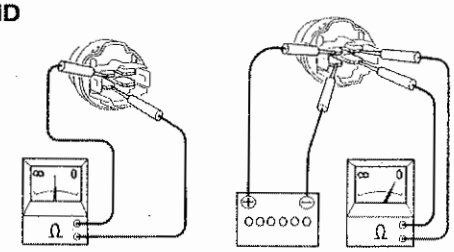
P (a) Measure resistance between terminals 1 & 2: OK 60 – 90 Ω.
(b) Measure voltage between terminal 3 & 1 battery (–) terminal with battery power going to terminals 1 & 2: OK battery voltage.

(For AA)

P (a) Measure resistance between terminals IG & E: OK 60 – 120 Ω.
(b) Measure resistance between terminals B & INJ with battery power going to terminals IG & E: OK 0 Ω.

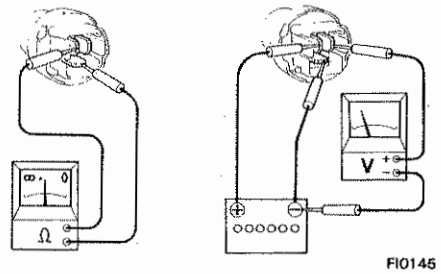
NG Replace main relay No. 2.

AE RHD



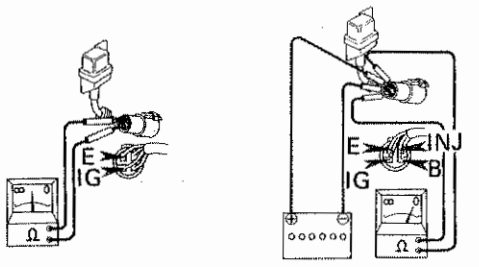
FI0120 FI0121

AE LHD



FI0145 FI0146

AA



FI0147 FI0148

8 Check voltage between +B terminal of main relay No. 2 connector & body ground.

(For AE)

C (a) Kick panel on driver's side removed.
(b) Main relay No. 2 removed.

(For AA)

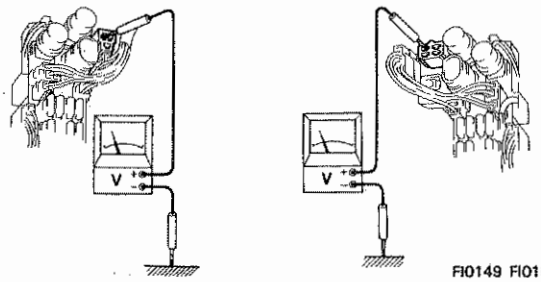
Water-proofing rubber plug of connector carefully removed.

P (a) Turn ignition switch to ON.
(b) Measure voltage between +B terminal (IG terminal for AA) of connector and body ground.

OK Voltage = Battery voltage.

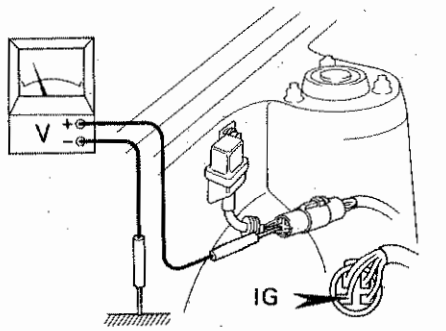
NG Check wiring between battery and main relay No. 2 +B terminal. (For AALHD ... Go to step 11 of this Chart.)

AE LHD RHD



FI0149 FI0150

AA



FI0151

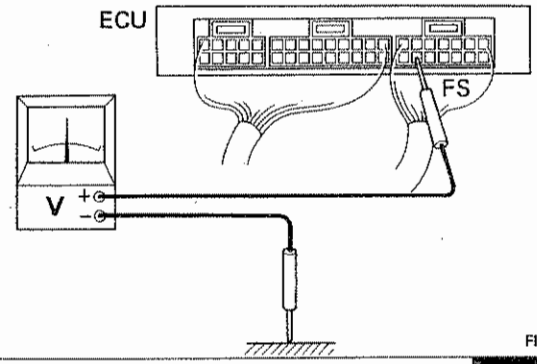
9 **Check voltage between FS terminal of ECU & body ground.**

NG Try another ECU.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between FS terminal of ECU and body ground.

OK Voltage = Under 1.0 V.



FI0152

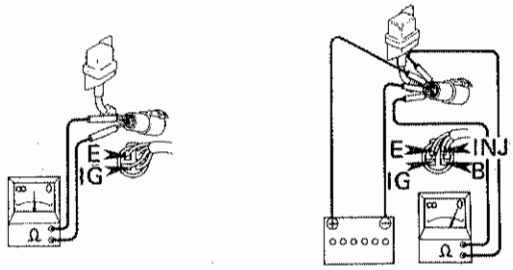
10 **Check wiring between ECU and main relay No.2.** **END**

(For AA LHD)

11 **Check main relay No. 3.**

NG Replace main relay No. 3.

P Remove relay and measure resistance between its terminals as follows:
(a) Between terminals IG & E: **OK** 60 – 120 Ω.
(b) Between terminals B & INJ with battery power (regardless of polarity) going to terminals IG & E: **OK** 0 Ω.



FI0147 FI0148

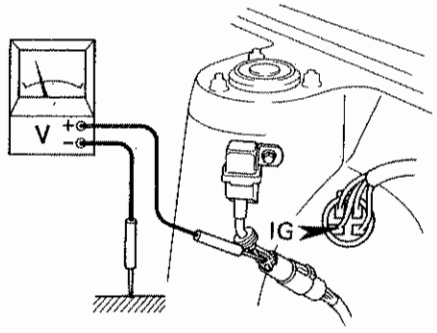
12 **Check voltage between IG terminal of main relay No. 3 & body ground.**

NG Check wiring between battery & main relay No. 3.

C Water-proofing rubber plug of connector carefully removed.

P (a) Ignition switch turned to ON.
(b) Measure voltage between IG terminal of the connector and body ground.

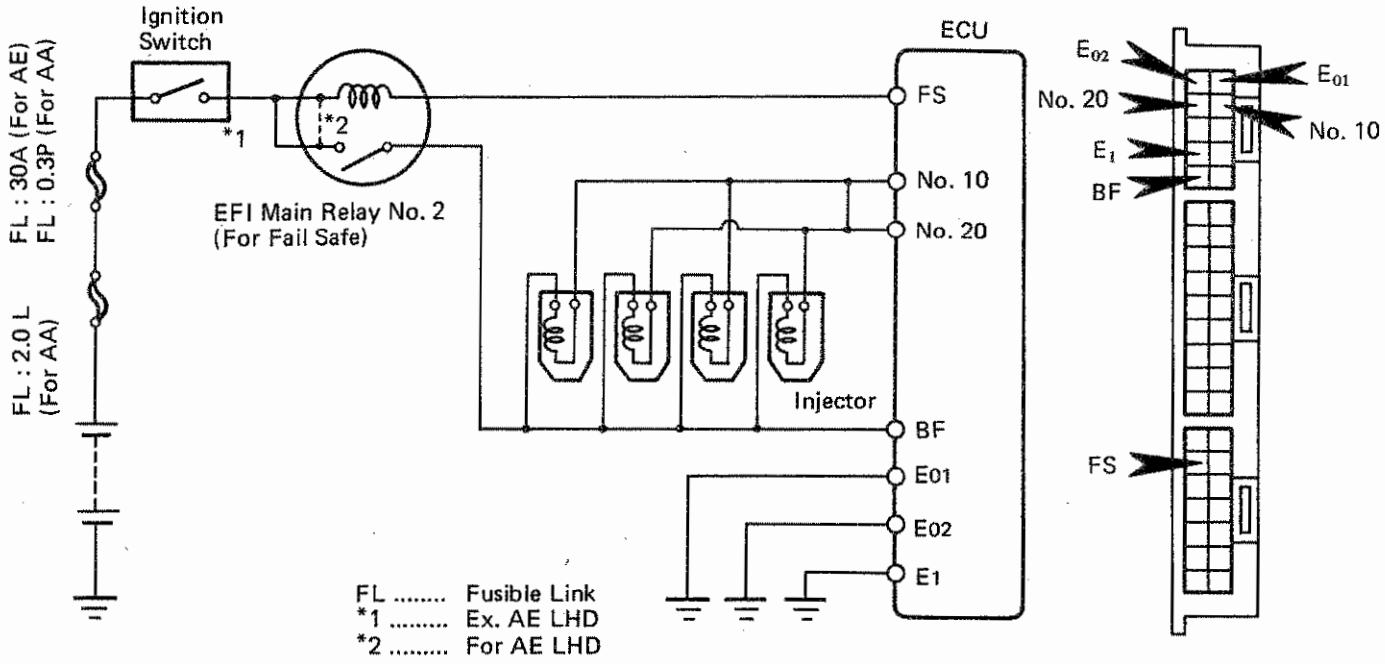
OK Voltage = Battery voltage.



FI0153

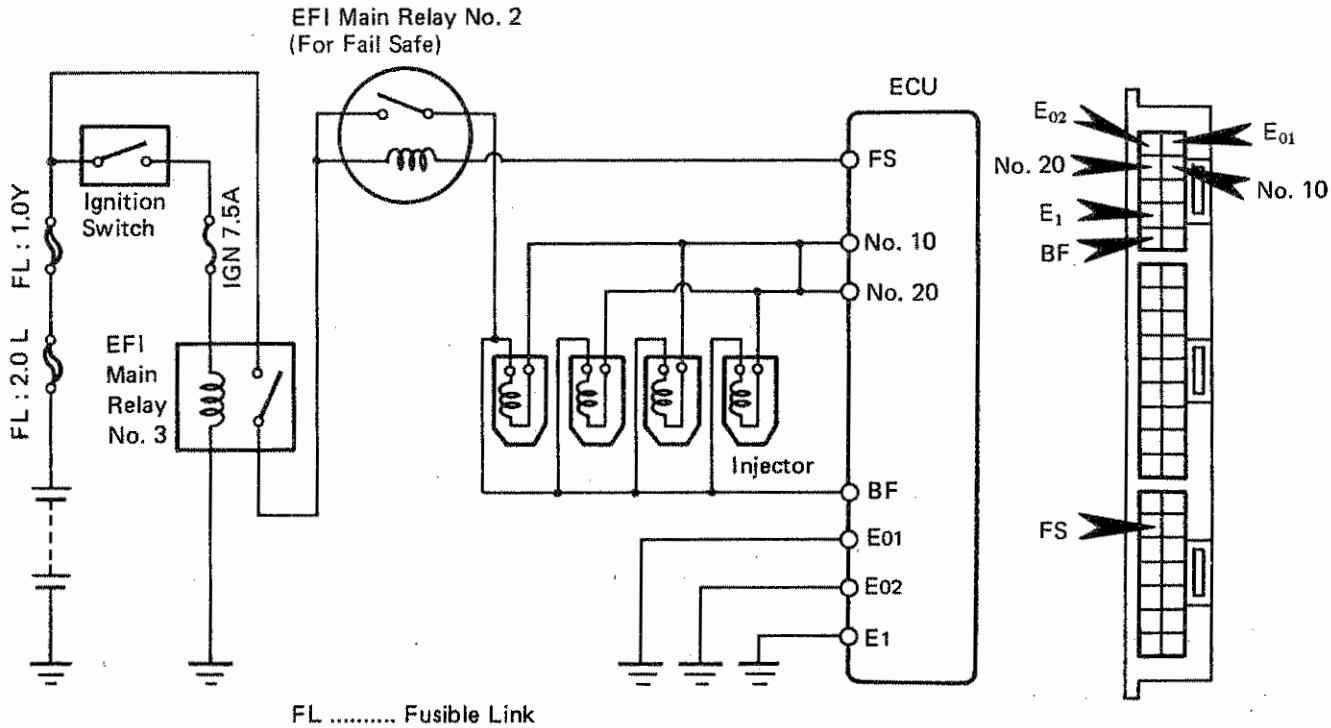
13 **Check wiring between main relay No. 2 and No. 3.** **END**

Ex. AA LHD



FI0154

For AA LHD



FI0155

CHART 7 — Auxiliary air control valve

CHECK OPERATION OF AUXILIARY AIR CONTROL VALVE WITH COLD ENGINE

C (a) Air cleaner hose removed.
(b) Tachometer connected to engine.
(c) Engine coolant is cool.

P Check engine rpm by closing auxiliary air control valve port on throttle body.

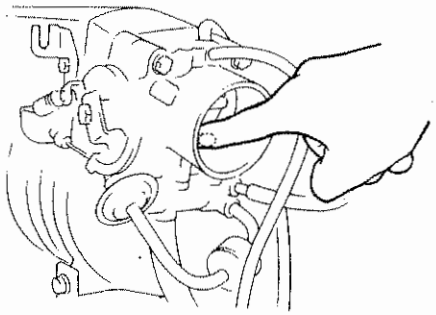
OK Air is sucked strongly at port, and engine will die or idle roughly.

CHECK OPERATION OF AUXILIARY AIR CONTROL VALVE WITH WARM ENGINE

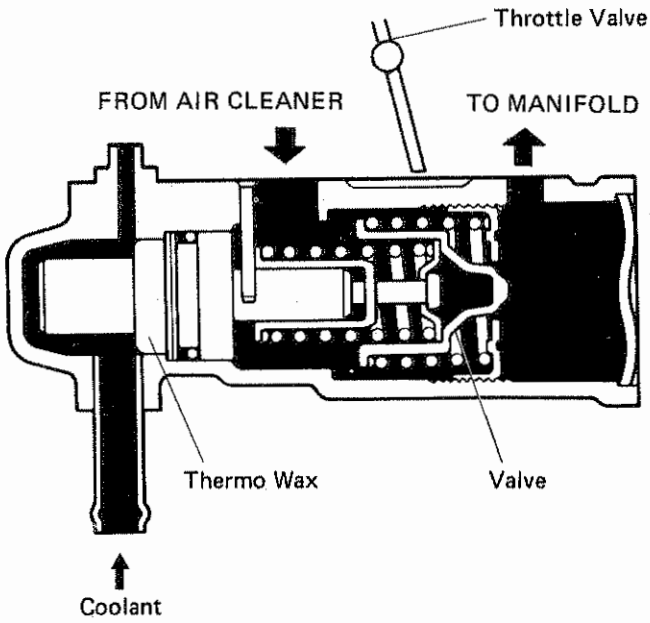
C (a) Air cleaner hose removed.
(b) Tachometer connected to engine.
(c) Engine at normal operating temperature.

P Check engine rpm by closing auxiliary air control valve port on throttle body.

OK There is almost no air suction at port, and engine rpm lowers less than 100 rpm.



EC0210



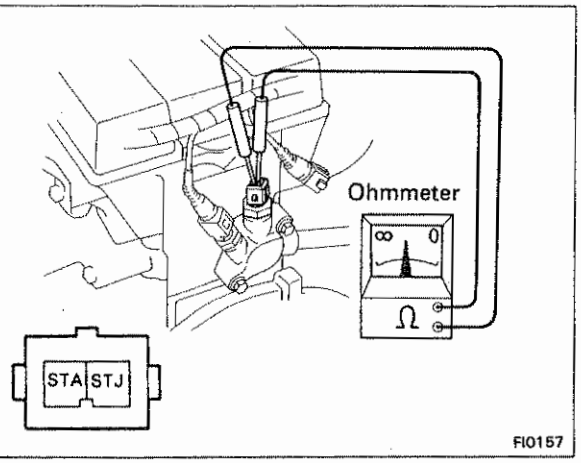
FI0156

CHART 8 — Cold start injector time switch

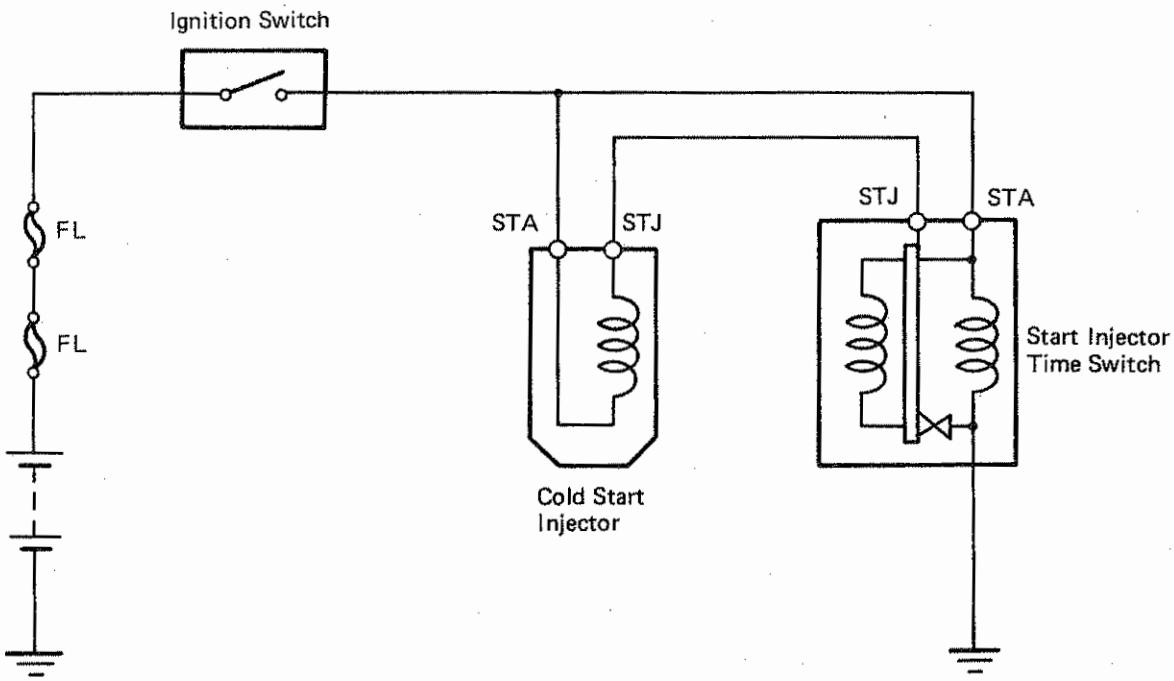
C Connector disconnected.
Location: Cylinder head rear plate.

P Using an ohmmeter, measure resistance between each of the teminals shown in the table below:

Between terminals	Resistance (Ω)	Coolant temp.
STA – STJ	20 – 40	Below 35°C (95°F)
	40 – 60	Above 35°C (95°F)
STA – Ground	20 – 80	–



FI0157



FI0158

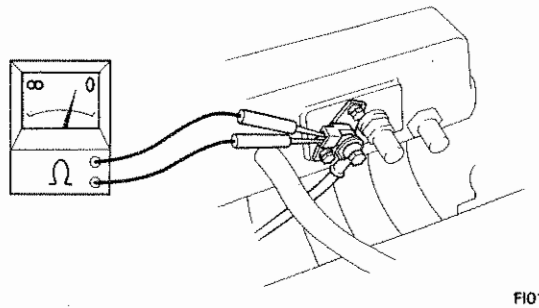
CHART 9 — Cold start injector

CHECK RESISTANCE

C Cold start injector connector removed.

P Using an ohmmeter, measure resistance of cold start injector.

OK Resistance = 2 – 4 Ω.

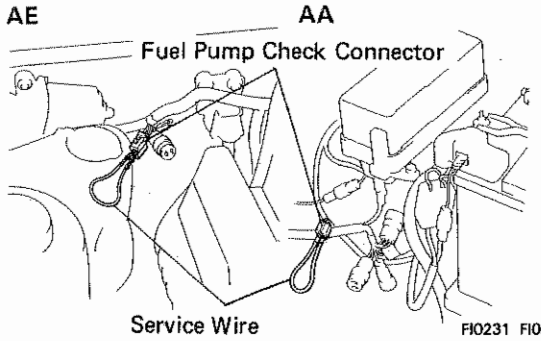


FI0159

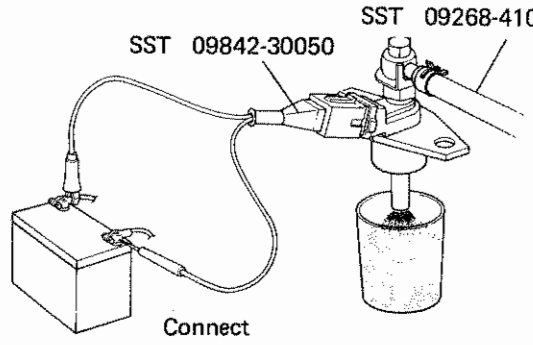
CHECK INJECTION

P (a) Remove cold start injector (see p. 6-6).
(b) Using SST 09268-41045, connect delivery pipe and cold start injector.
(c) Put a container under injector.
(d) Turn on ignition switch, but do not start engine.
(e) Short both terminals of fuel pump check connector with service wire.
(f) Connect SST 09842-30050 to cold start injector.
(g) Connect test probes of SST to battery and check that fuel spray is as shown.

N (a) Position injector as far away from battery as possible.
(b) Perform this check within the shortest possible time.



FI0231 FI0232

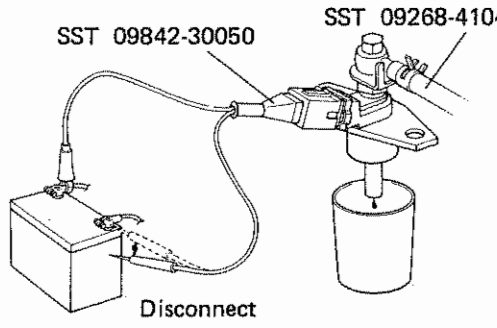


FI0160

CHECK SEALING

P Disconnect test probes from battery and check that fuel does not leak from injector.

OK Leakage: Less than 1 drop of fuel per minute.



FI0161

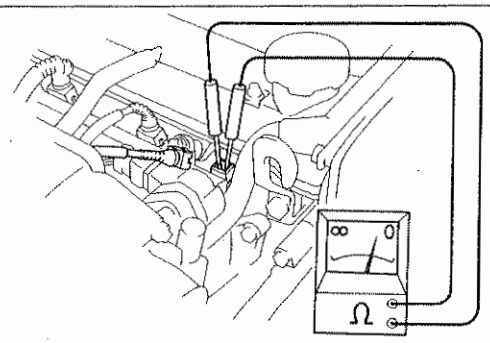
CHART 10 — Injectors

CHECK RESISTANCE

C Injector connectors removed.

P Using an ohmmeter, measure resistance of injectors.

OK Resistance = 1.0 – 2.5 Ω.



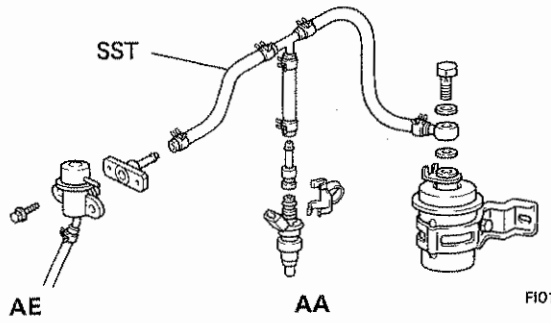
FI0141

CHECK INJECTION VOLUME

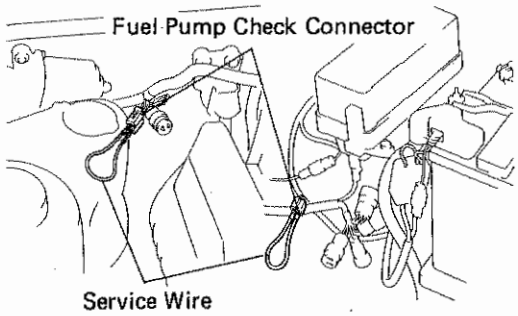
C (a) Injectors removed (see P. 6-4).
(b) Fuel filter, pressure regulator and injector connected up with SST 09268-41045.
(c) Vinyl tube attached to lower end of injector to prevent gasoline from splashing.
(d) SST 09842-30020 connected to injector.
(e) Injector in graduated cylinder.
(f) Ignition switch turned to ON but engine not started.
(g) Both terminals of fuel pump check connector shorted with service wire.

P Connect test probes of SST to battery for 15 seconds and measure injection volume with graduated cylinder. Test each injector two or three times. If not within specified volume, clean or replace.

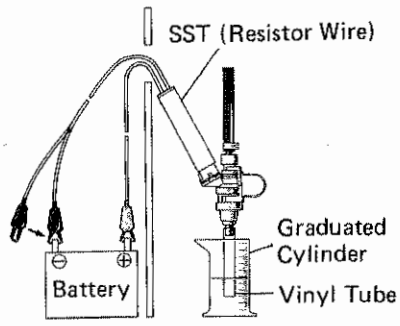
OK Volume: 40 – 50 cc (1.35 – 1.7 fl. oz) per 15 seconds.
Difference between each injector: Less than 5 cc (0.2 fl. oz.)



FI0162



FI0231 FI0232

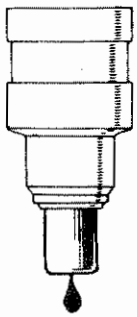


FI0502

CHECK INJECTOR SEALING

P Check to see if injectors leak when put under pressure as explained above.

OK Leakage: Less than 1 drop of fuel per minute.



FI0164

CHART 11 — Dash pot (DP)

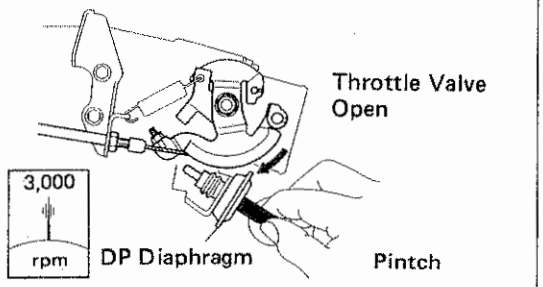
C Engine at normal operating temperature.

CHECK DP SETTING SPEED

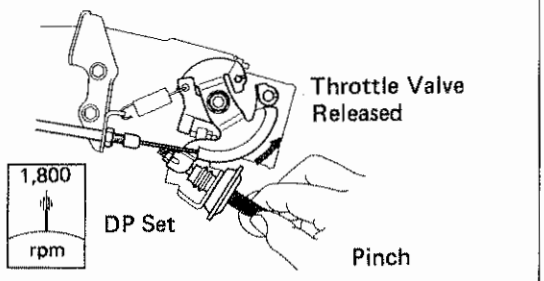
P (a) Open throttle valve so that engine is running at 3,000 rpm.
(b) Pinch off DP hose as shown in illustration.
(c) Close throttle vlave.
(d) Check engine speed.

OK Engine speed = 1,800 rpm

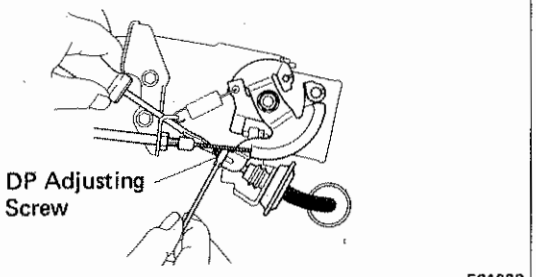
N If not at specified speed, adjust DP adjusting screw.



EC1221



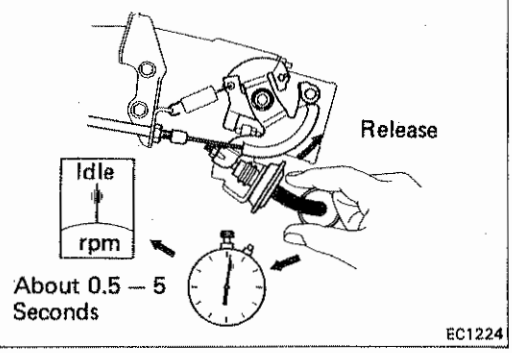
EC1222



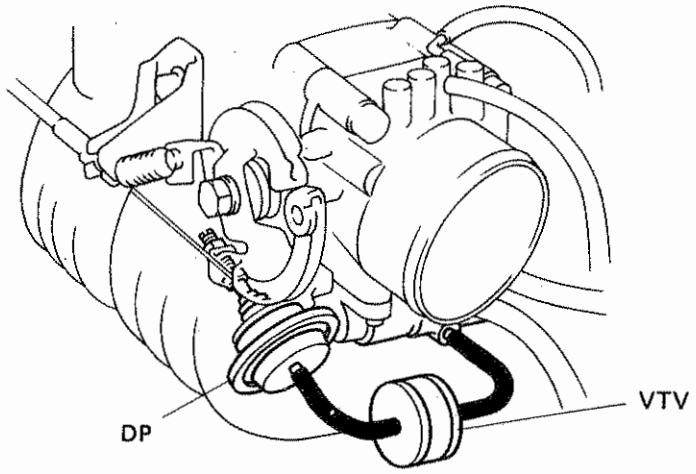
EC1223

CHECK OPERATION OF VTV

P (a) Set DP speed as explained above.
(b) Release pinched hose and check that engine returns to idle in about 1 second.

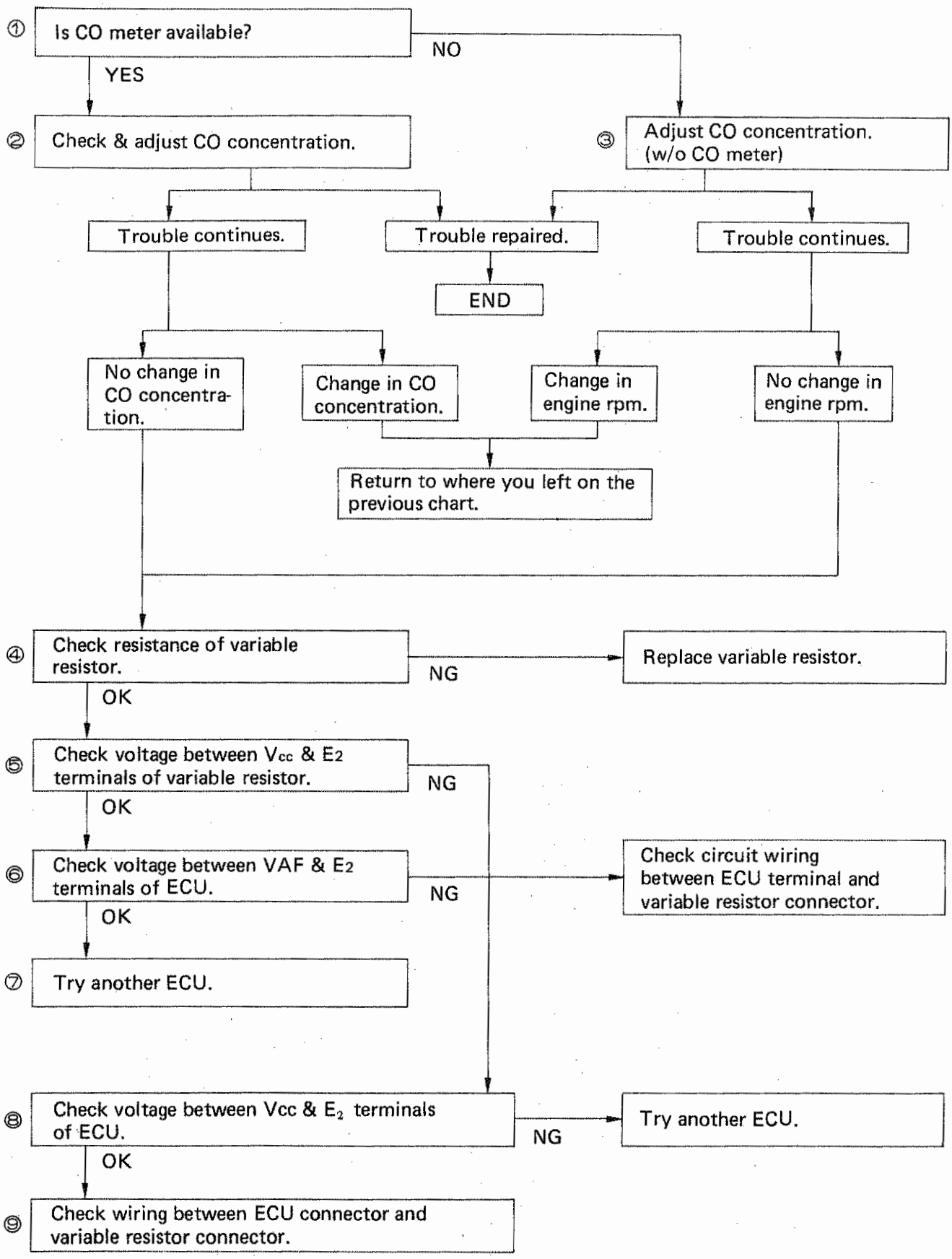


EC1224



EC1225

CHART 12 — CO concentration



1 **Is CO meter available?** **NO** Go to **3** of this chart.

2 **Check & adjust CO concentration.**

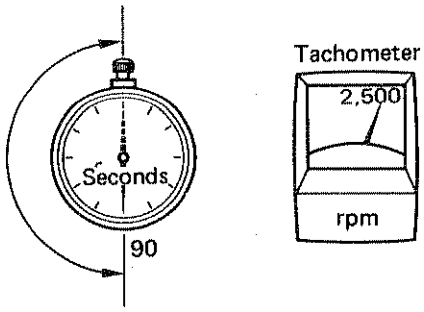
CHECK CO CONCENTRATION

C (a) Normal engine operating temperature.
(b) All accessories switched off.
(c) All vacuum lines properly connected.
(d) Tachometer connected to engine.
(e) Ignition timing set correctly.
(f) Idle rpm set correctly.
(g) Make sure CO meter is properly calibrated.

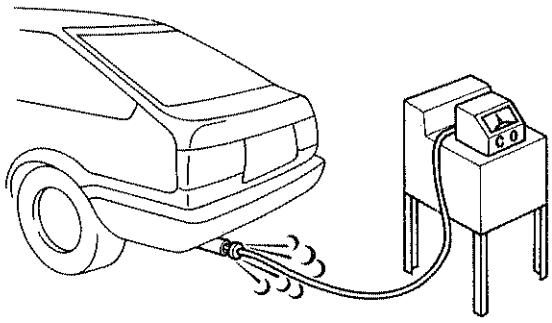
P (a) Race engine for 90 seconds at about 2,500 rpm before measuring concentration.
(b) Wait 1 — 3 minutes after racing engine to allow concentration to stabilize.
(c) Insert testing probe at least 40 cm (1.3 ft) into tailpipe and measure concentration within a short time.

OK Idle CO concentration: 1.5 ± 0.5%

N If CO concentration is not as specified, adjust according to following procedure.



EC0163



EC0211

CO CONCENRATION ADJUSTMENT

C Same condition as check CO concentration above.

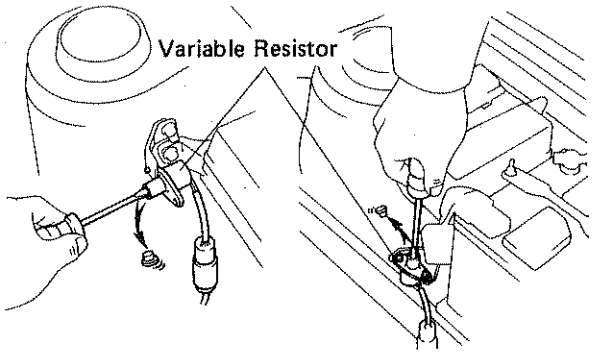
P (a) Remove rubber plug from variable resistor.
(b) Adjust idle mixture by turning idle mixture adjusting screw in variable resistor.

OK Idle CO concentration: 1.5 ± 0.5%

- IF THERE IS NO CHANGE IN CO CONCENTRATION WHEN TURNING SCREW, GO TO STEP **4** OF THIS CHART.
- IF PROBLEM CONTINUES EVEN AFTER ADJUSTMENT HAVE BEEN COMPLETED, RETURN TO WHERE YOU LEFT OFF ON PREVIOUS CHART.

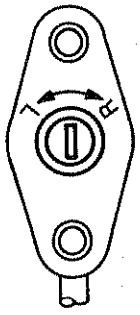
N (a) Always check idle speed after turning idle mixture adjusting screw. If it is incorrect, readjust idle speed.
(b) Adjustable range of idle mixture adjusting screw is 260 degrees. Do not to adjust to turn this screw more than this.
(c) Adjustment by this screw is very sensitive so turn the screw a little at a time.

AE AA



EC0212 FI0165

260 degrees



EC0213

3 Adjust CO concentration (w/o CO meter)

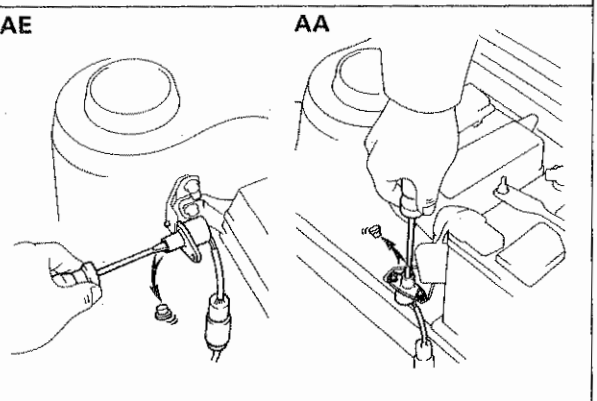
THIS ADJUSTMENT IS ONLY TEMPORARY, SO READJUST CO CONCENTRATION WITH CO METER

C Same condition as step 2 (a) ~ (e).

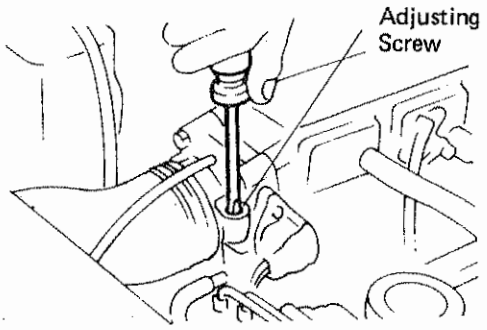
P (a) Adjust idle speed to 800 rpm by idle speed adjusting screw.
(b) Remove rubber plug from variable resistor.
(c) Turn idle mixture adjusting screw in variable resistor to maximum idle speed.
(d) Adjust idle speed to 800 rpm by idle speed adjusting screw.

- IF THERE IS NO CHANGE IN ENGINE SPEED WHEN TURNING SCREW, GO TO STEP **4** OF THIS CHART.
- IF PROBLEM CONTINUES EVEN AFTER ADJUSTMENT HAVE BEEN COMPLETED, RETURN TO WHERE YOU LEFT OFF ON PREVIOUS CHART.

N (a) The adjustable range of the idle mixture adjusting screw is 260 degrees.
(b) Adjusting by this screw is very sensitive, so turn screw a little at a time.



EC0212 FI0165



EC0206

4 **Check resistance of variable resistor.**

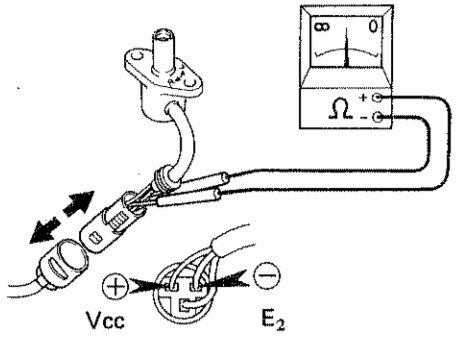
NG Replace variable resistor.

C (a) Carefully remove water-proofing rubber plug of variable resistor connector.
(b) Disconnected variable resistor connector.

CHECK RESISTANCE BETWEEN V_{cc} & E_2

P Using ohmmeter, measure resistance between V_{cc} and E_2 terminals of variable resistor.

OK Resistance: 4 – 6 kΩ.

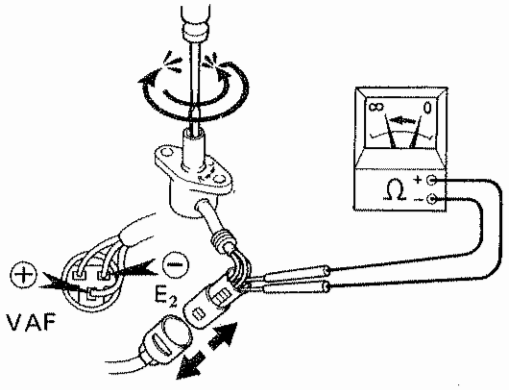


FI0166

CHECK RESISTANCE BETWEEN VAF & E_2

P (a) Turn adjusting screw fully counterclockwise.
(b) Connect an ohmmeter to terminals VAF and E_2.
(c) Turn adjusting screw fully clockwise.

OK Resistance value: Changes from about 5 kΩ to 0Ω accordingly.



FI0167

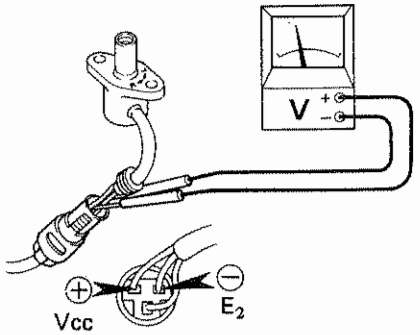
5 **Check voltage between Vcc & E_2 terminals of variable resistor.**

NG Go to **8** of this chart.

C (a) Carefully remove water-proofing rubber plug of variable resistor connector.
(b) Ignition switch turned to ON.

P Measure voltage between V_{cc} and E_2 terminals of variable resistor connector.

OK Voltage = 4 – 6 V.



FI0168

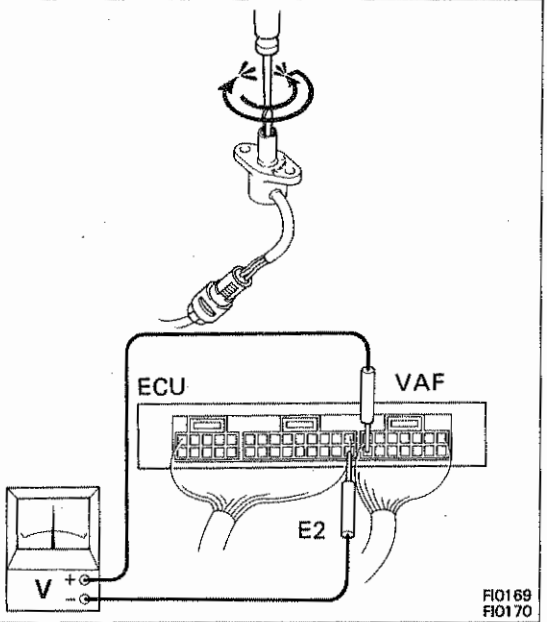
6 **Check voltage between VAF & E_2 terminals of ECU.**

NG Check wiring between ECU terminal and variable resistor connector.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Check change in voltage between VAF and E_2 terminals of ECU connector while slowly turning idle mixture screw first fully counterclockwise, and then fully clockwise.

OK Voltage changes smoothly from 0V to about 5V; i.e., does not suddenly jump up to 5V or down to 0V.



FI0169
FI0170

7 **Try another ECU.** **END**

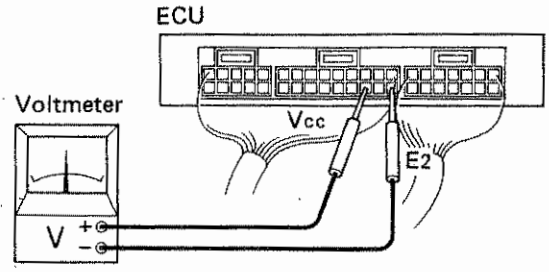
8 **Check voltage between Vcc & E_2 terminals of ECU.**

NG Try another ECU.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

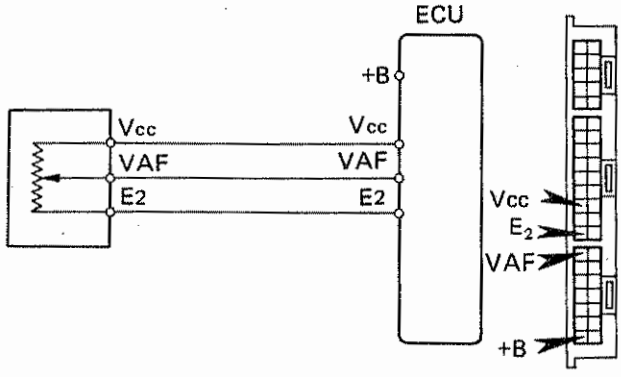
P Measure voltage between Vcc and E_2 terminals of ECU.

OK Voltage = 4 – 6 V.



FI0171

9 **Check wiring between ECU connector and variable resistor connector.** **END**

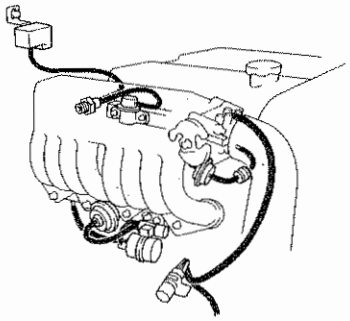


FI0172

CHART 13 — Toyota variable induction (T-VIS) system

CHECK VACUUM HOSE CONNECTION

P Check for loose connection.



FI0116

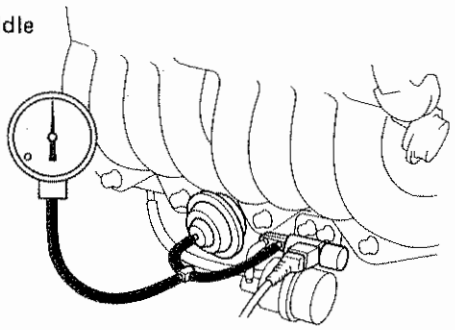
CHECK OPERATION OF T-VIS SYSTEM

C Vacuum gauge connected between VSV and diaphragm.

P (a) Check that vacuum gauge indicate high vacuum when engine idles.

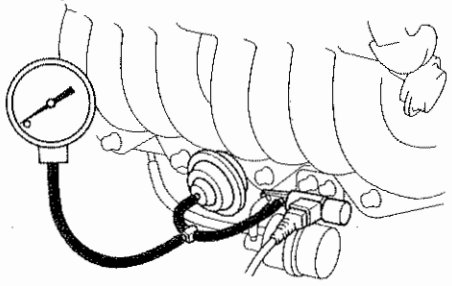
(b) Increase engine speed to above 5,000 rpm.
(c) Check that vacuum gauge indicates zero.

Idle



FI0173

Above
5,000 rpm



FI0174

CHART 14 — Idle-up system

1 Check idle-up system.

C (a) Engine at normal operating temperature.
(b) All accessories switched off.
(c) Air conditioner switched off.
(d) Tachometer connected.

CHECK IDLE-UP SYSTEM IMMEDIATELY AFTER STARTING ENGINE

P (a) Start engine.
(b) As soon as engine is started, observe engine rpm for more than 10 seconds.

OK Engine rpm drops about 100 rpm after 10 seconds.

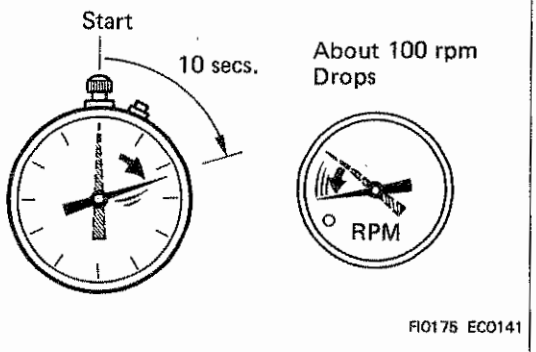
CHECK IDLE-UP SYSTEM FOR ELECTRICAL LOAD

C Engine at idle rpm

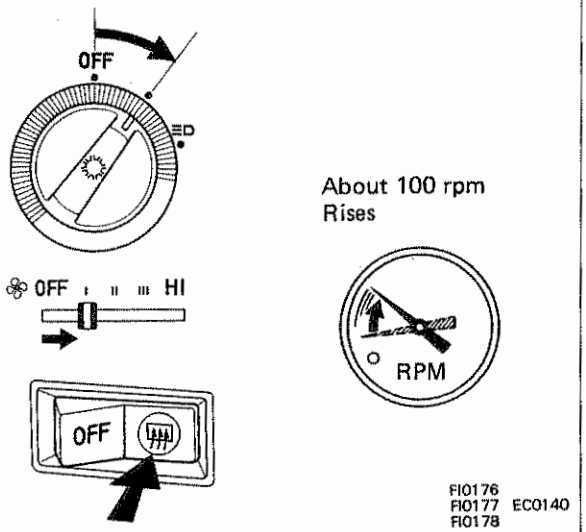
P Check engine idle-up under each of following conditions.
(a) Light control switch turned ON.
(b) Heater blower switch turned ON.
(c) Defogger switch turned ON.

OK Engine rpm rises about 100 rpm.

OK System normal.



FI0175 EC0141



FI0176
FI0177 EC0140
FI0178

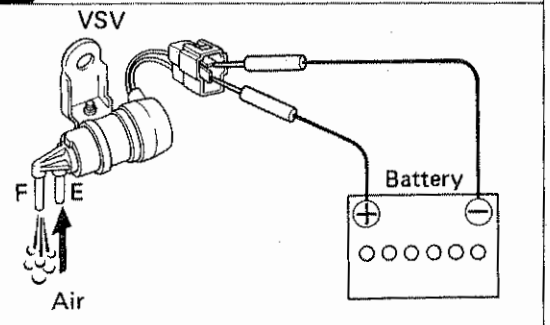
2 Check VSV for idle-up.

C VSV for idle-up removed.

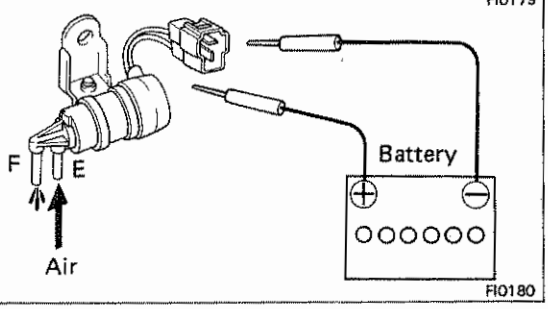
P Check vacuum circuit continuity in VSV by blowing air into pipe E under the following conditions:
(a) Connect VSV terminals to battery terminals as illustrated.
(b) Disconnect battery.

OK (a) Air comes out of pipe F.
(b) VSV is closed.

NG Replace VSV.



FI0179



FI0180

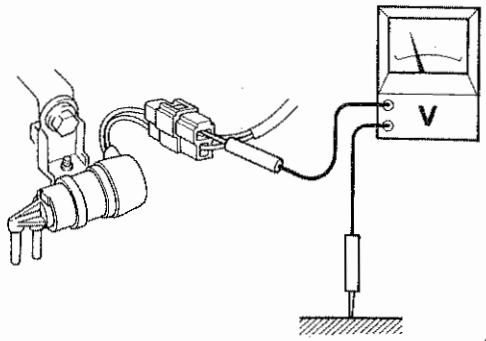
3 **Check voltage between +B terminal of VSV & body.**

C Ignition switch turned ON.

P Measure voltage between +B terminal of VSV and body ground, when light or heater blower or defogger switch turned ON.

OK Voltage = Battery voltage.

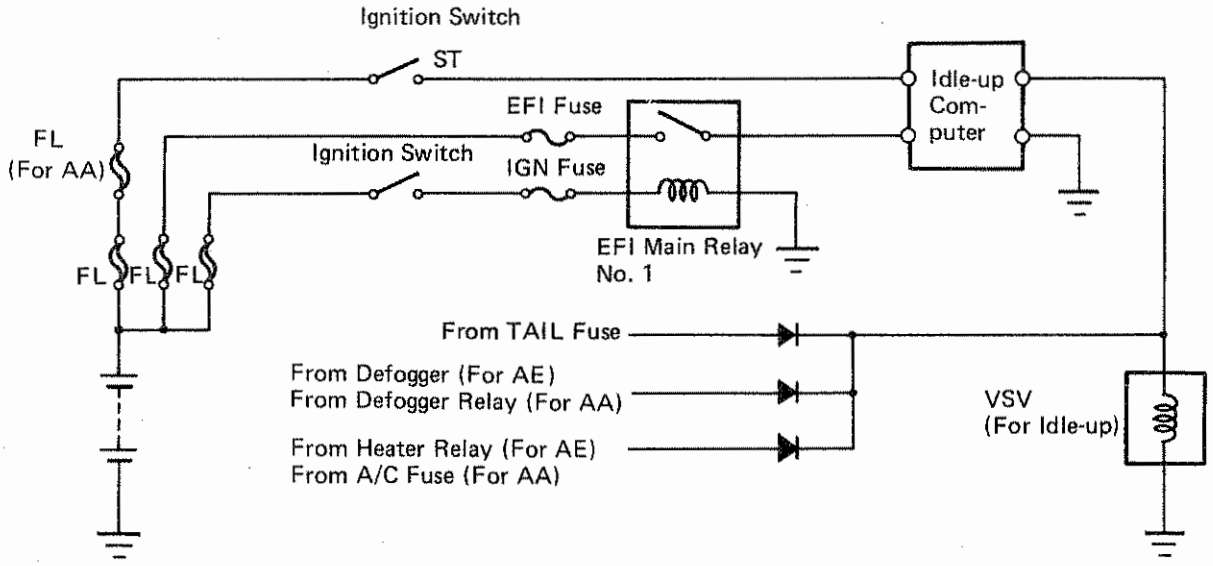
NG Check wiring between TAIL fuse, defogger and heater relay and VSV.



FI0181

4 **Check wiring between ignition switch, main relay No. 1 and VSV.**

END



FI0182

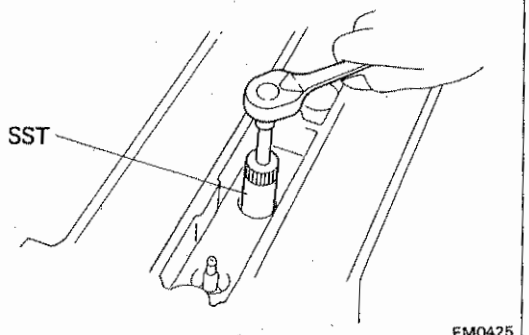
CHART 15 — Compression pressure

CHECK COMPRESSION PRESSURE

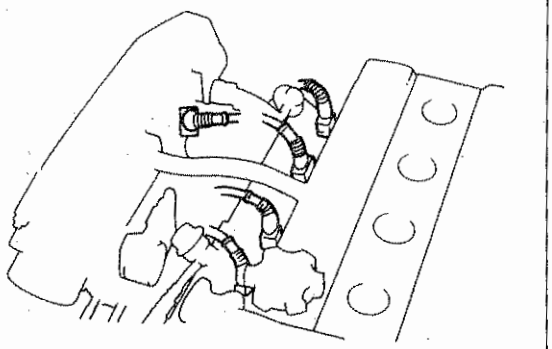
C (a) Engine at normal operating temperature.
(b) Four spark plugs removed.
Using SST 09155-16100, remove plugs.
(c) Distributor cord disconnected from ignition coil.
(d) Cold start injector connector disconnected.
(e) Injector connectors disconnected.

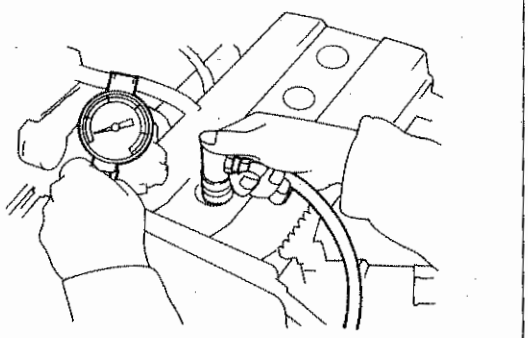
P (a) Insert compression gauge into spark plug hole.
(b) Fully open throttle valve.
(c) Measure compression pressure, while cranking engine.
(d) Repeat steps (a) through (c) for each cylinder.

OK Compression pressure:
General 12.6 kg/cm² (179 psi, 1,236 kPa)
Europe 12.7 kg/cm² (180 psi, 1,245 kPa)
Minimum pressure:
9 kg/cm² (128 psi, 883 kPa)
Difference between each cylinder:
Less than 1.0 kg/cm² (14 psi, 98 kPa)



EM0425


EM0426


EM0427

DIAGNOSTIC CODE CHARTS

Code 2 – Open or short circuit in vacuum sensor circuitry 5-2

Code 3 – Ignition confirmation signal not being input into ECU 5-6

Code 4 – Open or short circuit in water temp. sensor circuitry 5-8

Code 6 – NO RPM signals to ECU 5-9

Code 7 – Open or short circuit throttle position sensor circuitry 5-10

Code 8 – Open or short circuit in intake air temp. sensor circuitry 5-12

Code 9 – Open or short circuit in vehicle speed sensor circuitry 5-13

Code 10 – Open circuit in starter signal circuitry 5-14

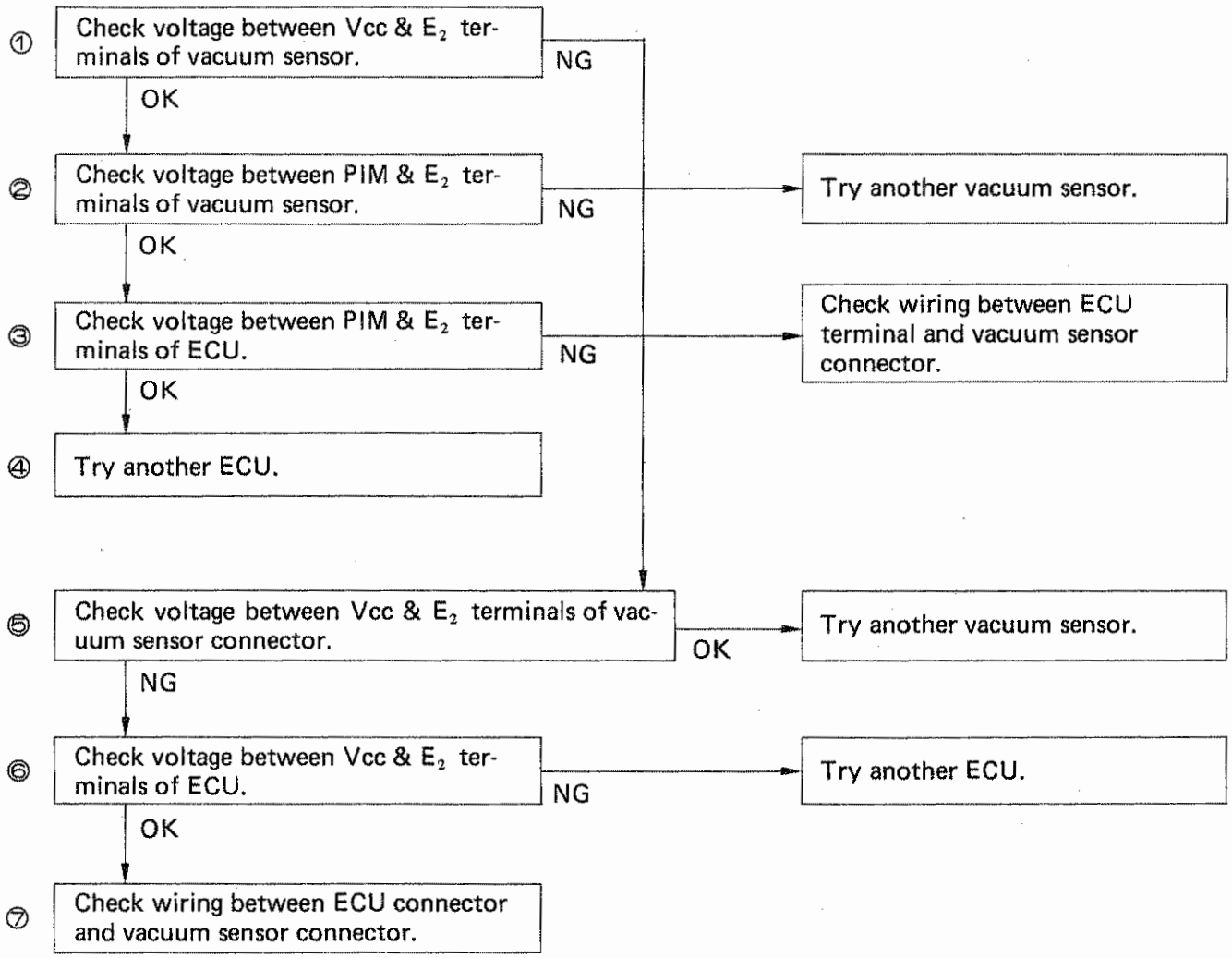
Code 11 – Switch input signal test 5-15

NOTE

When the diagnostic system outputs a code, the chart corresponding to that code should be used.

These charts should not be used independently of the Basic Engine Inspection Chart or the TCCS Initial Inspection Chart since their use will be indicated as necessary by this chart.

CODE 2 — Open or short circuit in vacuum sensor circuitry



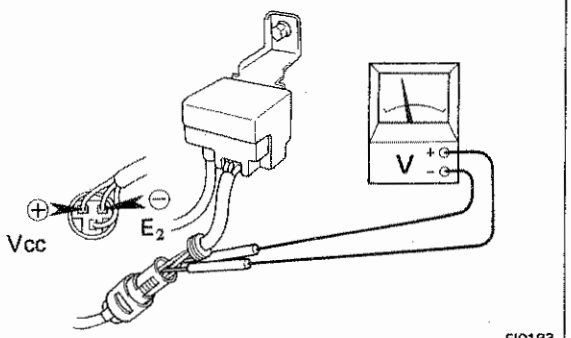
1 **Check voltage between Vcc & E_2 terminals of vacuum sensor.**

NG Go to **5** of this chart.

C (a) Carefully remove water-proofing rubber plug of vacuum sensor connector.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 terminals of vacuum sensor connector.

OK Voltage = 4 – 6 V.



FI0183

2 **Check voltage between PIM & E_2 terminals of vacuum sensor.**

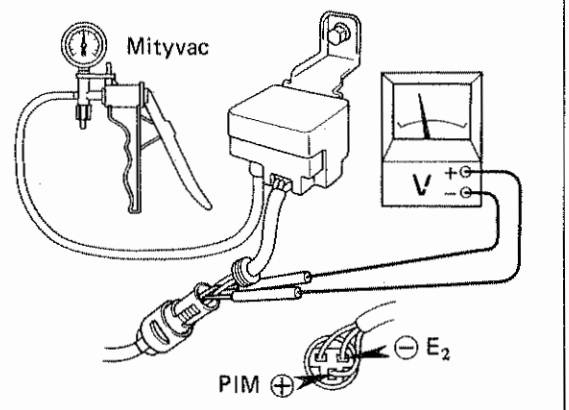
NG Try another vacuum sensor.

C (a) Carefully remove water-proofing rubber plug of vacuum sensor connector.
(b) Vacuum hose for vacuum sensor removed from gas filter.
(c) Voltmeter connected to PIM and E_2 terminals of vacuum sensor.

P (a) Turn ignition switch to ON.
(b) Measure and record output voltage under ambient atmospheric pressure.
(c) Using a mityvac, apply vacuum to vacuum sensor in 100 mmHg segments to 500 mmHg.
(d) Measure voltage drop from step (b) above for each segment.

OK Voltage drop

Applied Vacuum mmHg (in.Hg, kPa)	100 (3.94 13.3)	200 (7.87 26.7)	300 (11.81 40.0)	400 (15.75 53.3)	500 (19.69 66.7)
Voltage drop V	0.3–0.5	0.7–0.9	1.1–1.3	1.5–1.7	1.9–2.1



FI0184

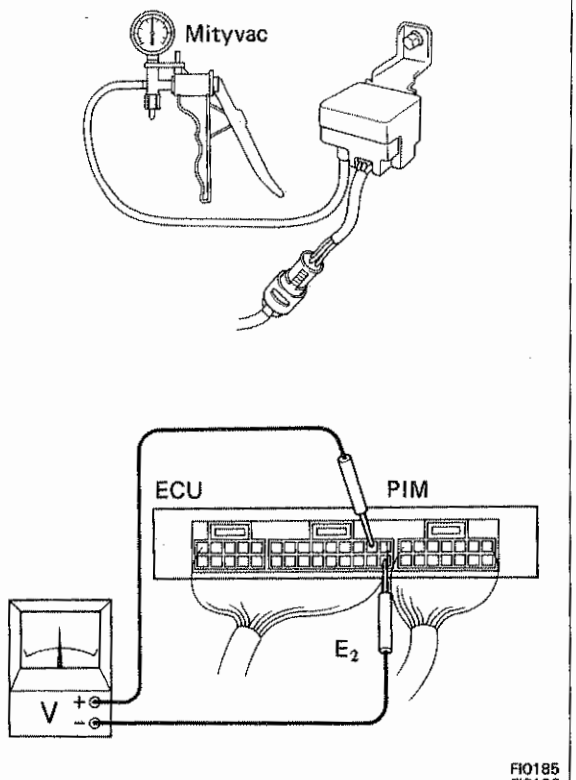
3 **Check voltage between PIM & E_2 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Vacuum hose for vacuum sensor removed from gas filter.
(c) A voltmeter connected to PIM & E_2 terminals of ECU.

P Same as step **2** of this chart.

OK Same value as step **2** of this chart.

NG **Check wiring between ECU terminal and vacuum sensor connector.**



FI0185
FI0186

4 **Try another ECU.**

END

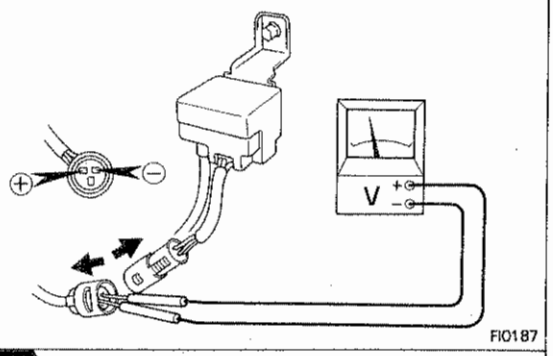
5 **Check voltage between Vcc & E_2 terminals of vacuum sensor connector.**

C (a) Vacuum sensor connector removed.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 connectors of vacuum sensor.

OK Voltage = 4 – 6 V.

OK → Try another vacuum sensor.



FI0187

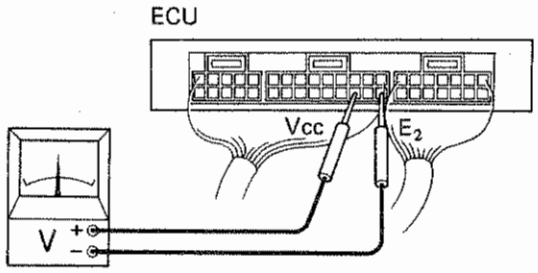
6 **Check voltage between Vcc & E_2 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 terminals of ECU.

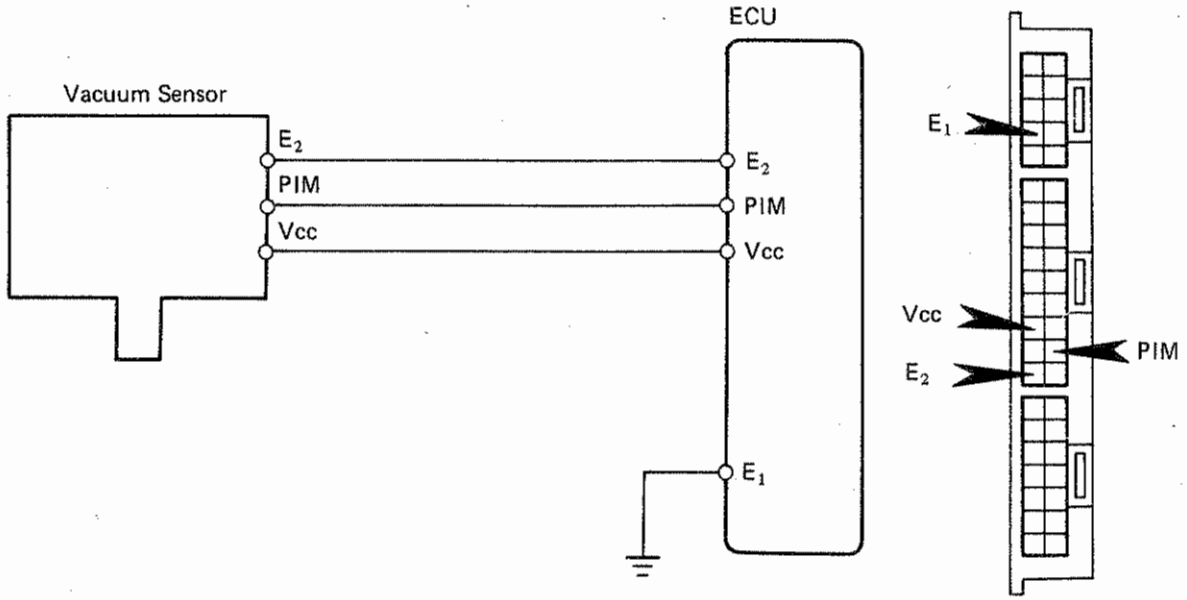
OK Voltage = 4 – 6 V.

NG → Try another ECU.



FI0171

7 **Check wiring between ECU connector and vacuum sensor connector.** → END



FI0188

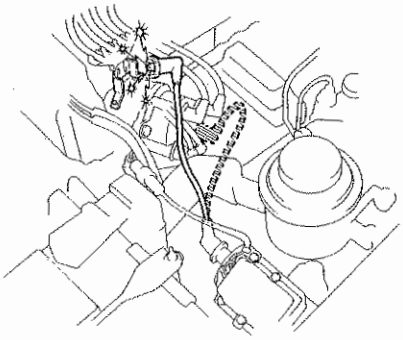
CODE 3 — Ignition confirmation signal not being input into ECU

1 **Check for sparking.**

NG Go to **4** of this chart.

P Unhook spark plug cord from distributor and, holding end about 12.5 mm (1/2") from body of car, see if spark occurs while engine is being cranked.

N To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.



FI0111

2 **Check voltage between IGf & E_1 terminals of ECU.**

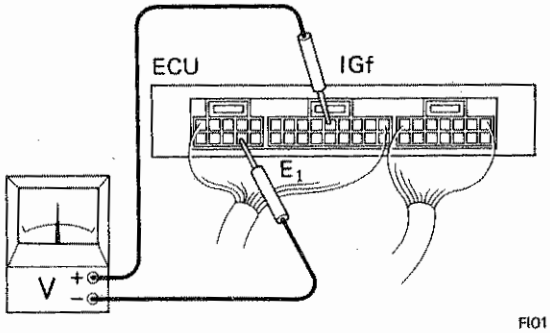
NG Check wiring between ECU connector and igniter connector.

C Kick panel on front passenger's side (AE) or glove box (AA) removed.

P Measure voltage between IGf and E_1 terminals both with ignition switch turned to ON but engine not cranking, and with switch turned to ON and engine cranking.

OK Voltage between 1.0 and 2.0 V in both cases.

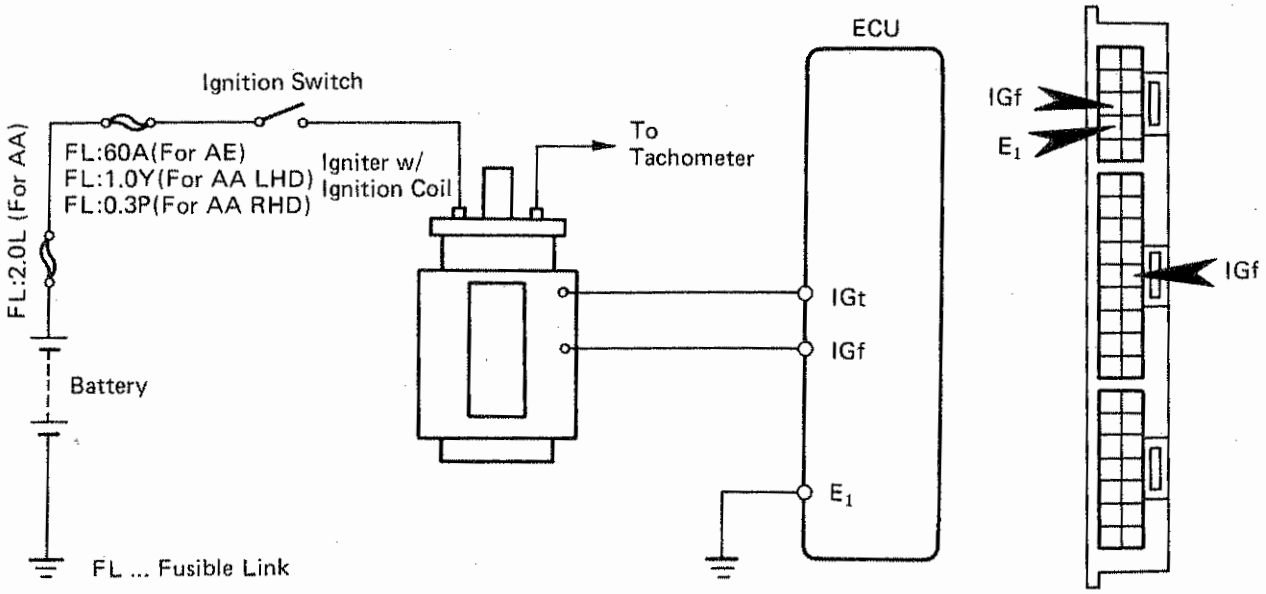
N If voltage is 5 V, there is probably an open wire somewhere; if it is 0 V, there is probably a short.



FI0189

3 **Try another ECU.**

END



FI0190

4 Check ignition coil w/igniter.

NG Replace ignition coil or igniter.

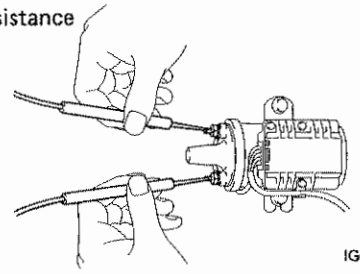
CHECK PRIMARY COIL RESISTANCE

C Disconnect ignition coil with igniter connector.

P Using an ohmmeter, measure resistance between positive (+) and negative (−) terminals.

OK Primary coil resistance (cold): 0.5 – 0.7 Ω.

Primary Coil Resistance



IG0046

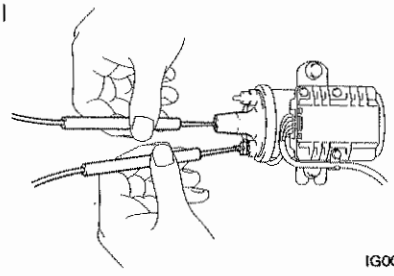
CHECK SECONDARY COIL RESISTANCE

C Disconnect ignition coil with igniter connector.

P Using an ohmmeter, measure resistance between positive terminal (+) and high tension terminals.

OK Primary coil resistance (cold). 11 – 16 kΩ.

Secondary Coil Resistance



IG0047

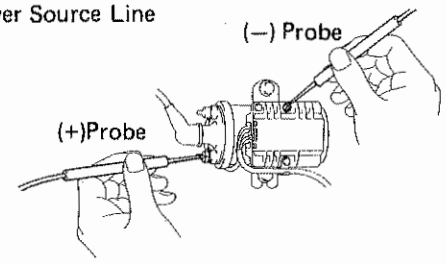
CHECK POWER SOURCE LINE VOLTAGE OF IGNITER

C Turn ignition switch on.

P Using a voltmeter, connect positive probe to ignition coil positive (+) terminal and negative probe to igniter body.

OK Voltage: Approx. 12 V.

Power Source Line



IG0048

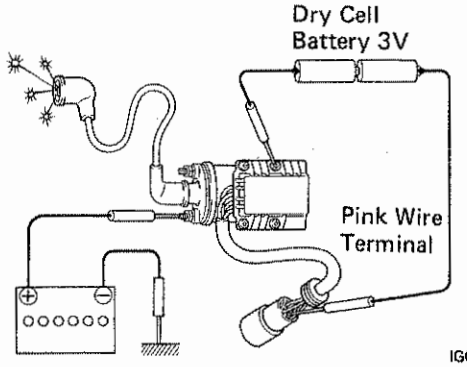
CHECK POWER TRANSISTOR IN IGNITER

C (a) Disconnect ignition coil connector.
(b) Disconnect coil cord from distributor.
(c) Connect battery voltage to ignition coil positive (+) terminal.

P Apply voltage (3 V) and connect positive terminal of battery to pink wire terminal and negative terminal to body ground.

OK There is a spark from tip of coil cord in about 1 second. If not, replace igniter.

N More than 5 V will destroy diodes in igniter.



IG0088

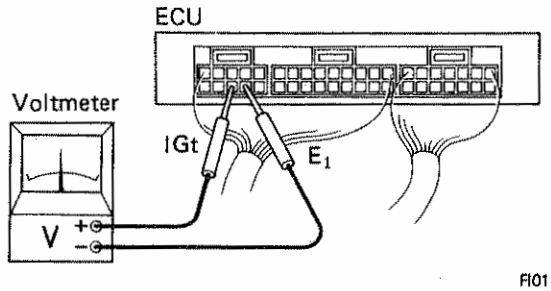
5 Check voltage between IGt & E_1 terminals of ECU.

NG Check wiring between ECU connecotr and igniter connector.

C Kick panel on front passenger's side (AE) or glove box (AA) removed.

P Measure voltage between IGt and E_1 terminals when engine is cranking.

OK Voltage = 0.5 – 1.0 V.



FI0191

6 Try another ECU.

END

CODE 4 — Open or short circuit in water temp. sensor circuitry

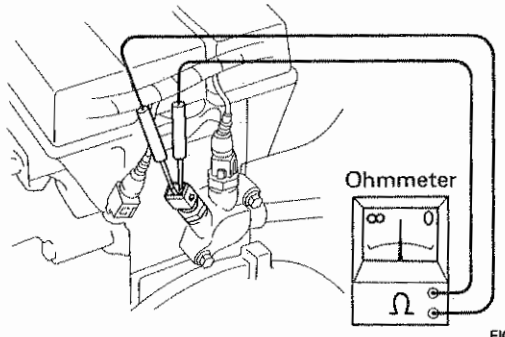
1 **Check resistance of water temp. sensor.**

C Connector disconnected.
Location: Cylinder head rear plate.

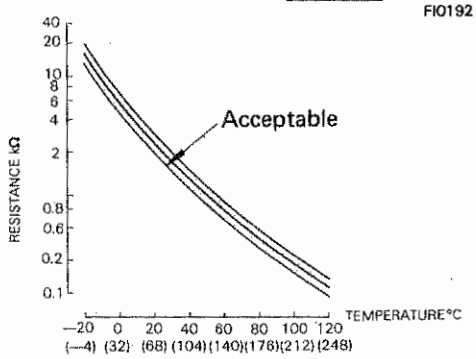
P Using an ohmmeter, measure resistance between both terminals.

OK Resistance is in Acceptable range on chart.

NG Replace water temp. sensor.



FI0192



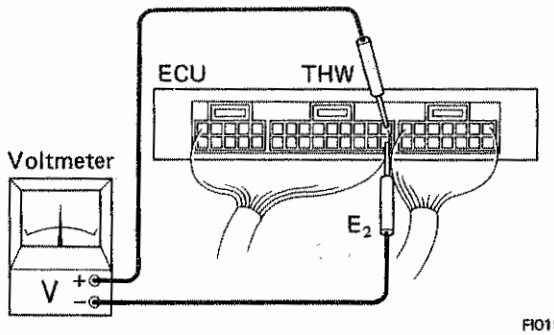
FI0193

2 **Check voltage between THW & E_2 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

OK Voltage neither 0 V nor 5 V.

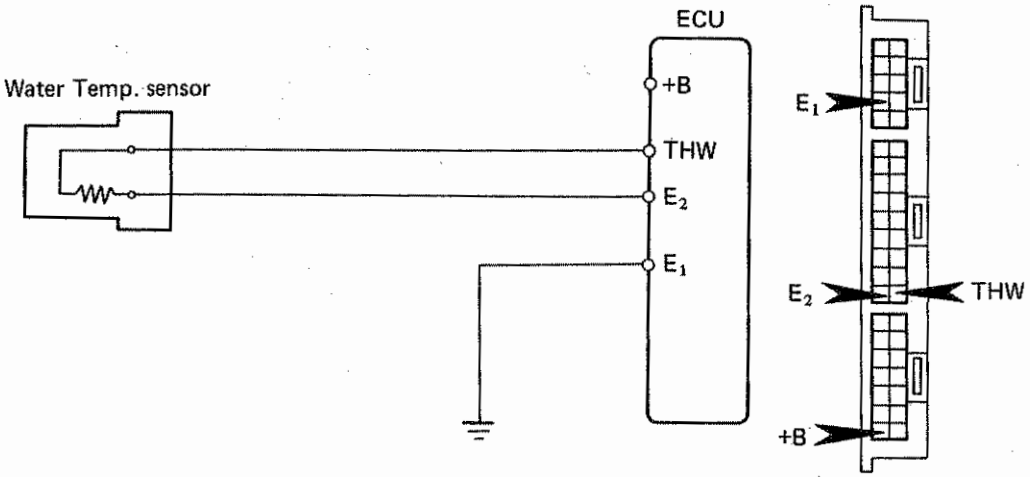
NG Check wiring between ECU connector and water temp. sensor.



FI0194

3 **Try another ECU.**

END



FI0195

CODE 6 — NO RPM signals to ECU

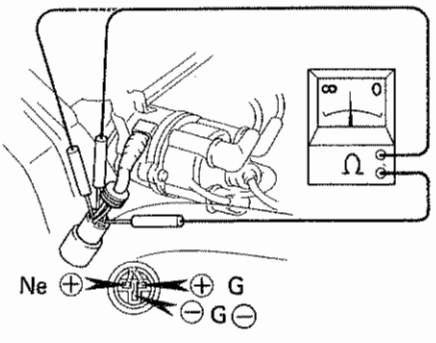
1 Check pick-up coils in distributor.

C Connector disconnected.

P Using an ohmmeter, measure resistance between G and G⊖ and between Ne and G⊖ .

OK Resistances between G and G⊖ and between Ne and G⊖ = 140 — 180 Ω.

NG Replace pick-up coil.



FI0196

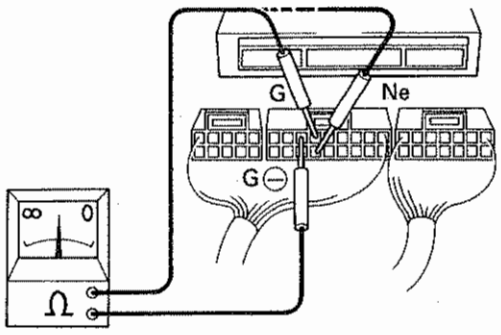
2 Check resistance of pick-up coils at ECU connector.

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch set to LOCK.
(c) Wiring connectors disconnected from ECU.

P Measure resistance between G and G⊖ terminals, and between Ne and G⊖ terminals.

OK Resistance between G and G⊖ = 140 – 180 Ω.
Resistance between Ne and G⊖ = 140 – 180 Ω.

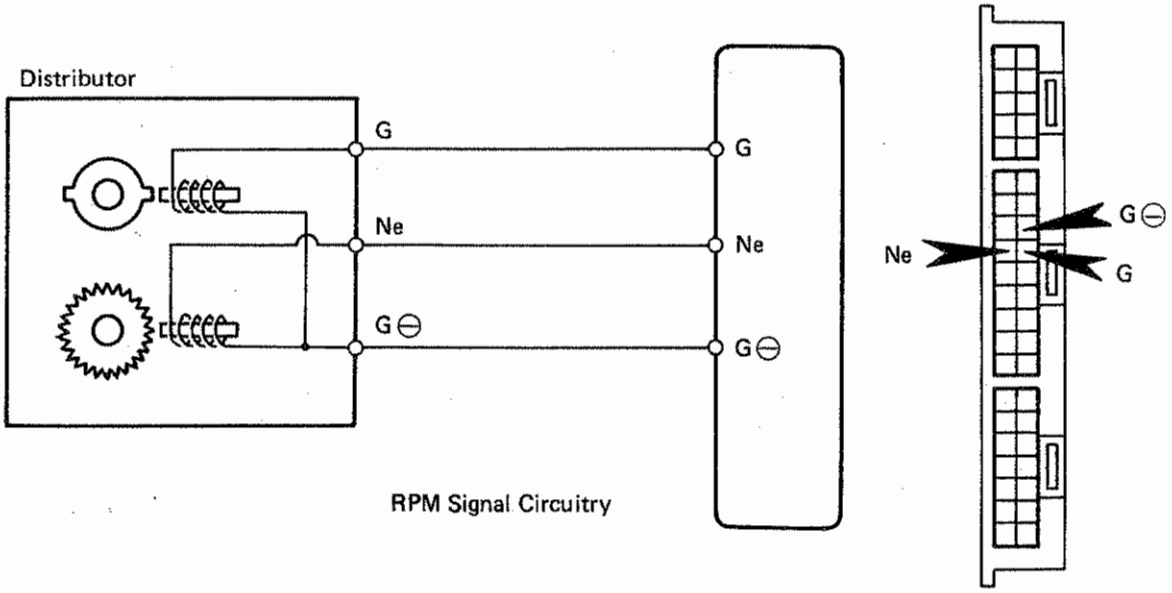
NG Check wiring between ECU connector & distributor connector.



FI0197

3 Try another ECU.

END



RPM Signal Circuitry

FI0198

CODE 7 — Open or short circuit in throttle position sensor circuitry

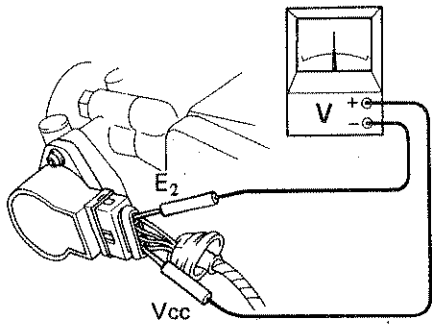
1 Check voltage between Vcc & E_2 terminals of throttle position sensor.

C (a) Carefully remove water-proofing rubber cover of throttle position sensor connector.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 terminals of throttle position sensor connector.

OK Voltage = 4 – 6 V.

NG Go to **5** of this chart



FI0199

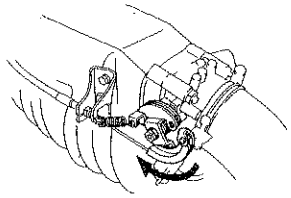
2 Check voltage between VTA & E_2 terminals of throttle position sensor connector.

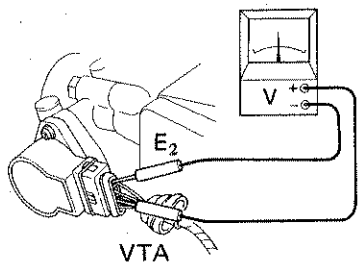
C (a) Carefully remove water-proofing rubber cover of throttle position sensor connector.
(b) Ignition switch turned to ON.

P Check change in voltage between VTA and E_2 terminals of ECU connector while slowly open throttle valve from closed to open position.

OK Voltage changes smoothly from 0.1 V (when closed) to about 4.5 V (when open); i.e., does not suddenly jump up to 4.5 V or down to 0.1 V.

NG Try another throttle position sensor.





FI0200
FI0201

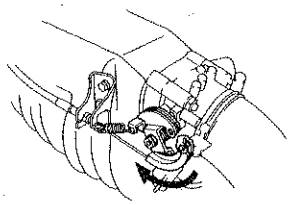
3 Check voltage between VTA & E_2 terminals of ECU connector.

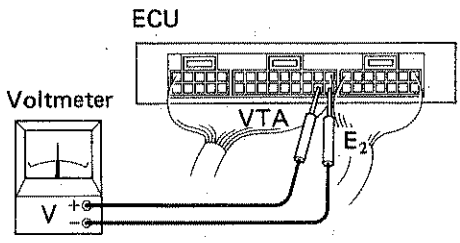
C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Check change in voltage between VTA and E_2 terminals of ECU connector while slowly open throttle valve from closed to open position.

OK Voltage changes smoothly from 0.1 V (when closed) to about 4.5 V (when open); i.e., does not suddenly jump up to 4.5 V or down to 0.1 V.

NG Check wiring between ECU terminal and throttle position sensor connector.





FI0200
FI0202

4 Try another ECU.

END

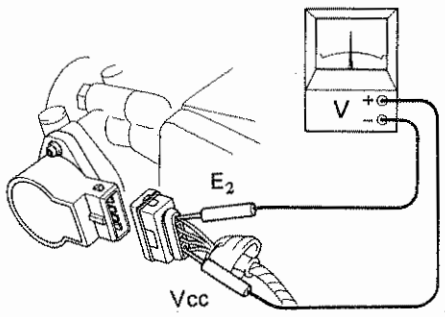
5 **Check voltage between Vcc & E_2 terminals of throttle position sensor connector.**

C (a) Throttle position sensor connector removed.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 connectors of throttle position sensor.

OK Voltage = 4 – 6 V.

OK → Try another throttle position sensor.



FI0203

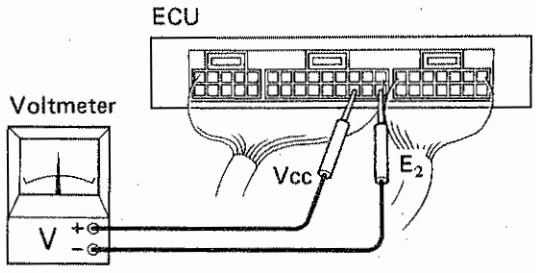
6 **Check voltage between Vcc & E_2 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

P Measure voltage between Vcc and E_2 terminals of ECU.

OK Voltage = 4 – 6 V.

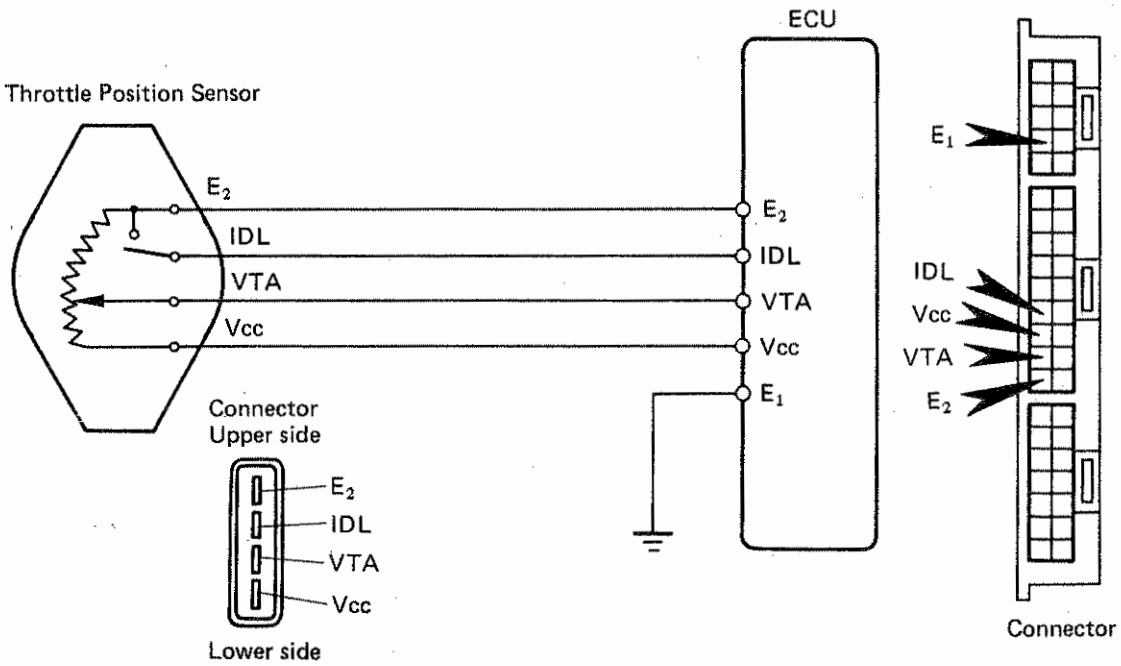
NG → Try another ECU.



FI0171

7 **Check wiring between ECU connector and throttle position sensor connector.**

→ END



FI0204

CODE 8 — Open or short circuit in intake air temp. sensor circuitry

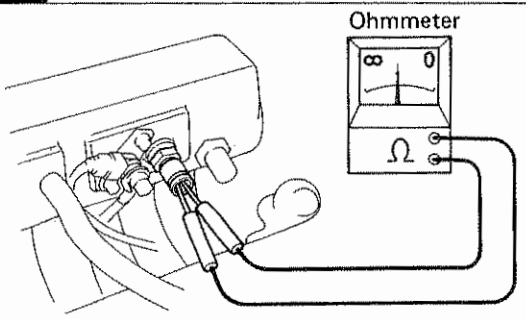
1 **Check resistance of intake air temp. sensor.**

C Connector disconnected.

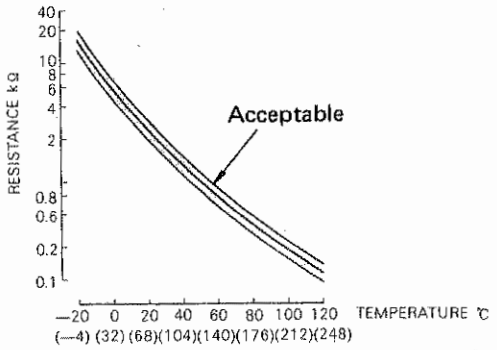
P Using ohmmeter, measure resistance between both terminals.

OK Resistance is in Acceptable range on chart.

NG Replace intake air temp. sensor.



FI0205



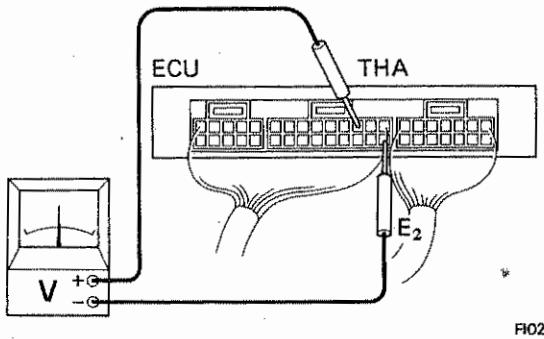
FI0193

2 **Check voltage between THA & E_2 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ON.

OK Voltage neither 0 V nor 5 V.

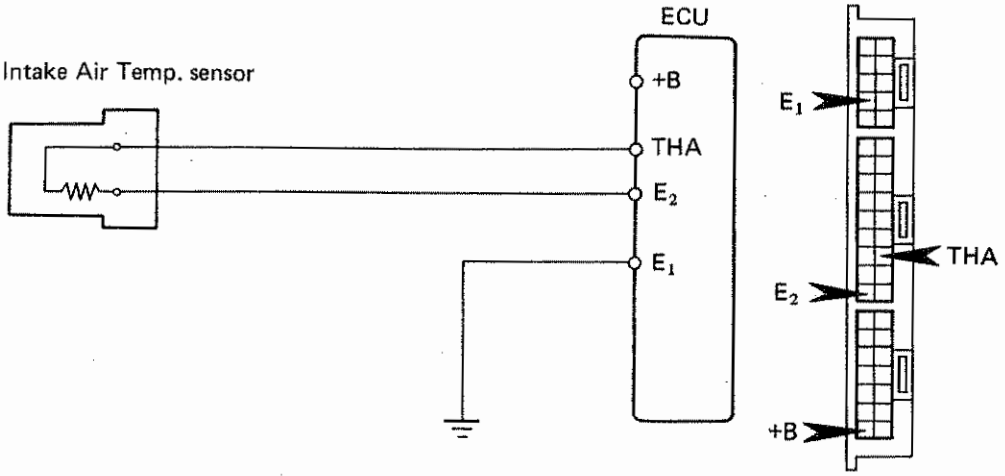
NG Check wiring between ECU connector and intake air temp. sensor.



FI0206

3 **Try another ECU.**

END



FI0207

CODE 9 — Open or short circuit in vehicle speed sensor circuitry

1 **Before using this chart, check again to see whether Code 9 is still being output.**

P Drive vehicle for at least 10 seconds in compliance with the following conditions:

1. Speed 5 km/h (3 mph) or faster
2. Engine speed 2,800 rpm or higher.
3. Vacuum 300 mmHg (11.81 in.Hg, 40.0 kPa) or lower

N If code is no longer being output, problem is probably intermittent trouble, so see chart 3 (p. 4-8).

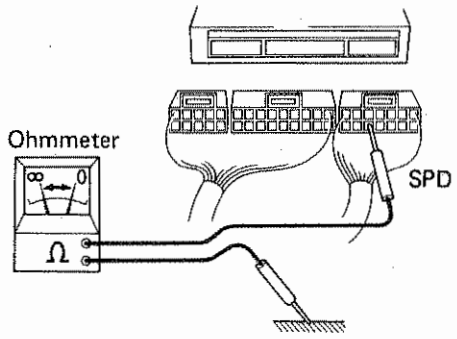
2 **Check continuity between SPD terminal of ECU & body.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) ECU connector disconnected.
(c) Rear wheels jacked up.
(d) Ignition switch turned to ON.

P Check for continuity between SPD terminal of ECU and body ground while turning propeller shaft slowly by hand.

OK Continuity is made and broken once each time propeller shaft makes 1 complete revolution.

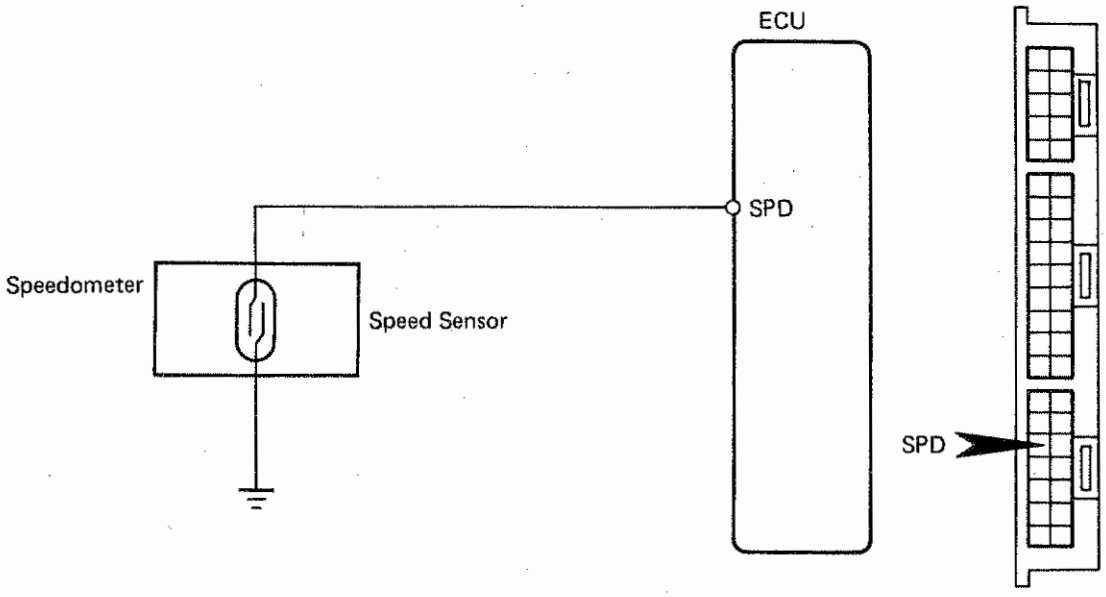
NG **Check wiring and speed sensor in speedometer.**



FI0208

3 **Try another ECU.**

END



FI0209

CODE 10 — Open circuit in starter signal circuitry

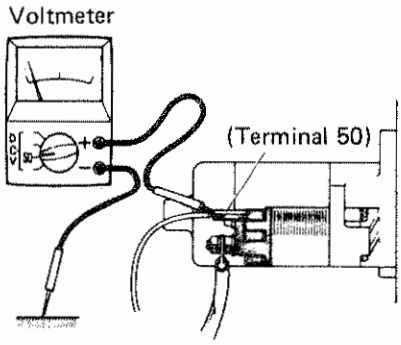
1 **Check that there is voltage at STA (50) terminal of starter.**

C Ignition switch turned to ST.

P Using voltmeter, measure voltage between body and STA (50) terminals of starter.

OK Voltage = 9 – 11 V.

NG Check wiring between positive terminal of battery & STA (50) terminal of starter.



FI0210

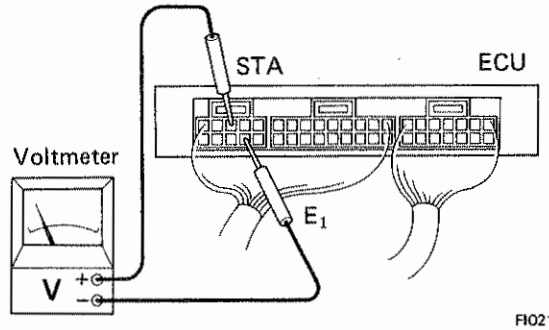
2 **Check voltage between STA & E_1 terminals of ECU.**

C (a) Kick panel on front passenger's side (AE) or glove box (AA) removed.
(b) Ignition switch turned to ST.

P Measure voltage between STA & E_1 terminals of ECU while cranking.

OK Voltage = 6 – 12 V.

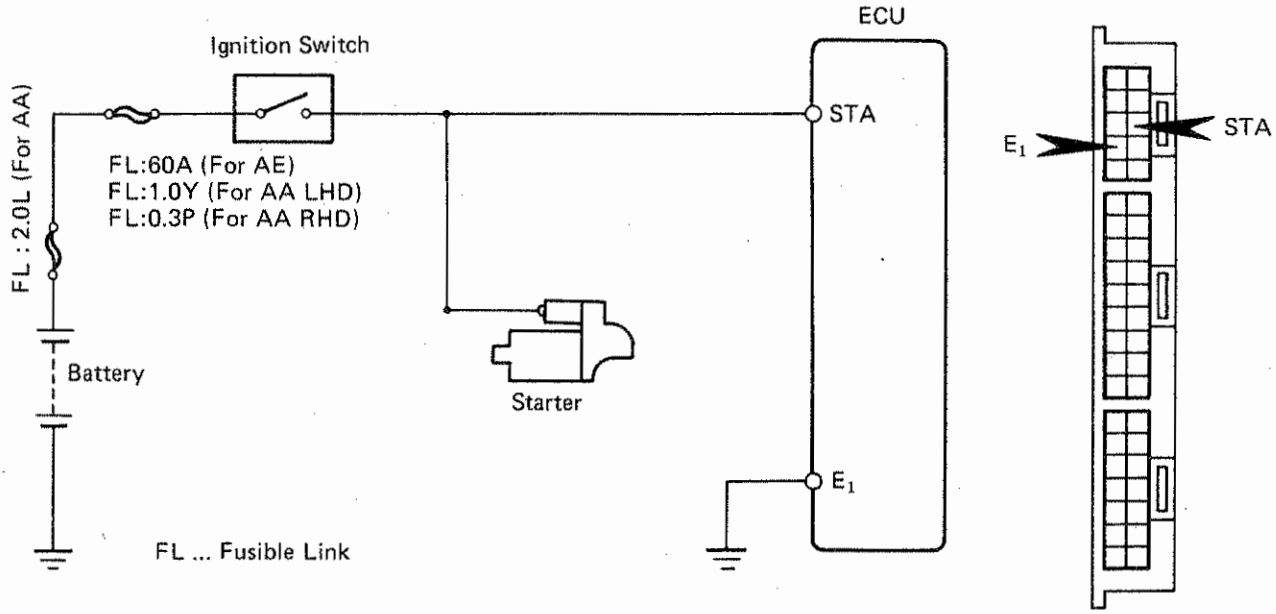
NG Check wiring between ECU connector & STA (50) terminal of starter.



FI0211

3 **Try another ECU.**

END



FI0212

CODE 11 — Switch input signal test

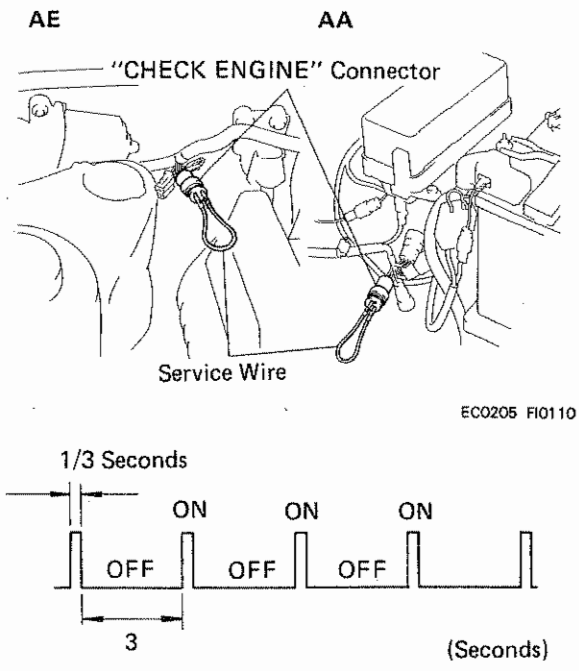
1 Is Normal code being output?

C (a) Battery voltage above 11 V.
(b) Throttle valve fully closed (throttle position sensor IDL contacts closed).
(c) Air conditioner OFF.

P (a) Turn ignition switch to ON. Do not start engine.
(b) Using a sub-wire, short terminals of check engine connector located.
(c) Count number of times "CHECK ENGINE" warning light blinks.

OK Light blinks once every 3 seconds.

NG Check wiring between ECU connector & air conditioner.



2 Test air conditioner signal.

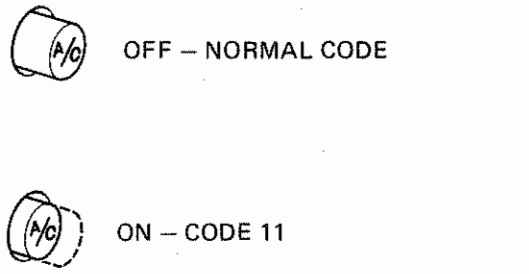
C Normal code being output.

P Turn air conditioner switch on and off.

OK Code 11 output when switch is on and Normal code output when switch is off.

N If this signal is not input into ECU, idle speed will not increase when air conditioner is turned on.

NG Check wiring between ECU connector & air conditioner.



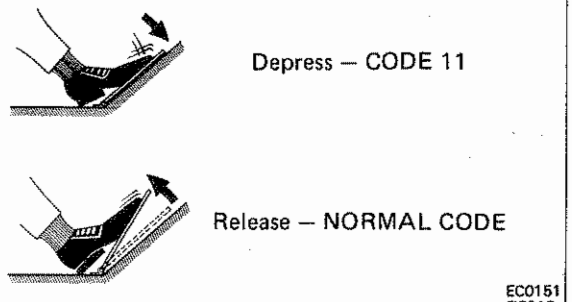
3 Test throttle position sensor signal.

C Normal code being output.

P Depress and release acceleration pedal.

OK Code 11 output when acceleration is depressed and and Normal code output when acceleration is released.

NG Check wiring between ECU connector & throttle position sensor.



REMOVAL, INSTALLATION AND ADJUSTMENT

6

REMOVAL AND INSTALLATION

Throttle body 6-2
Fuel pressure regulator 6-3
Injector 6-4
Cold start injector 6-6
Fuel pressure gauge 6-7

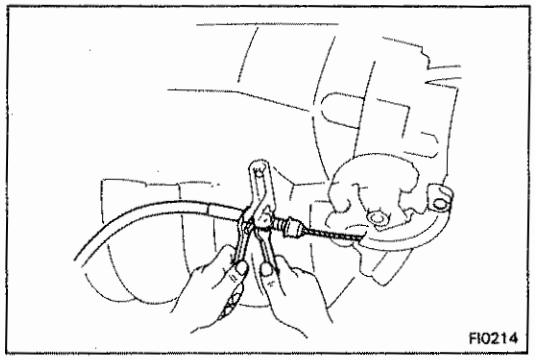
ADJUSTMENT

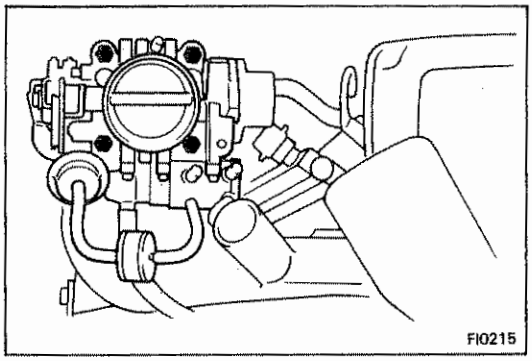
Throttle position sensor 6-8
Valve clearance 6-9

THROTTLE BODY

REMOVAL

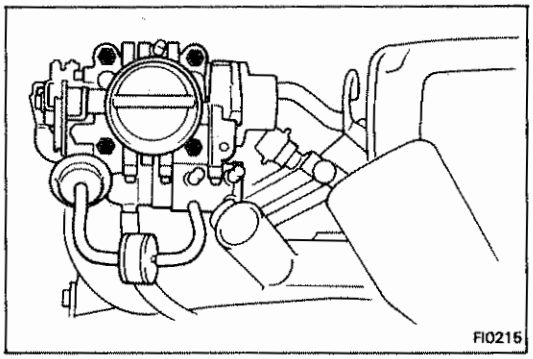
1. Drain coolant.
2. Remove air cleaner hose.
3. Disconnect throttle position sensor connector.
4. Disconnect water and vacuum hoses.
5. Remove accelerator return spring.
6. Disconnect accelerator cable.
7. Remove throttle body.
   Remove two bolts, two nuts and throttle body with gasket.

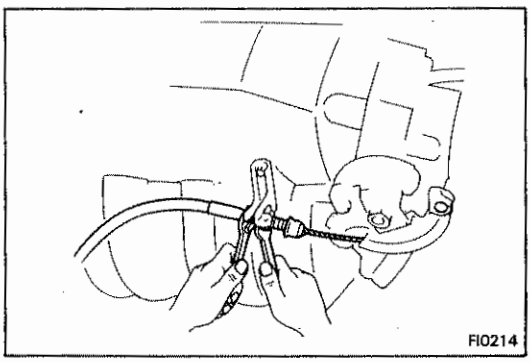




INSTALLATION

1. Install throttle body.
   Place on new gasket and install throttle body with two bolts and two nuts.
   Torque: 190 – 250 kg-cm (14 – 18 ft-lb, 19 – 24 N·m)
2. Connect accelerator cable.
3. Install accelerator return spring.
4. Connect water and vacuum hoses.
5. Connect throttle position sensor connector.
6. Install air cleaner hose.
7. Fill with coolant.

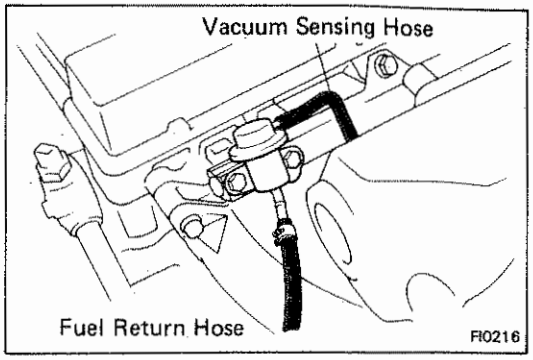


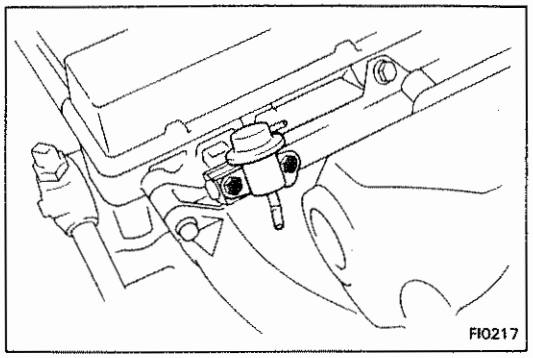


FUEL PRESSURE REGULATOR

REMOVAL

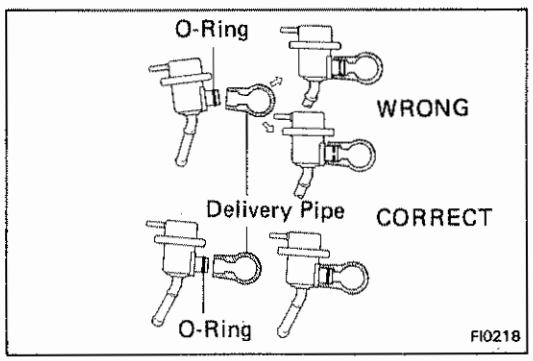
1. Disconnect vacuum sensing hose from pressure regulator.
2. Disconnect fuel hose from pressure regulator.
   (a) Put suitable container or shop towel under pressure regulator.
   (b) Disconnect fuel hose from pressure regulator.
3. Remove pressure regulator.
   Remove two bolts and pull out pressure regulator from delivery pipe.





INSTALLATION

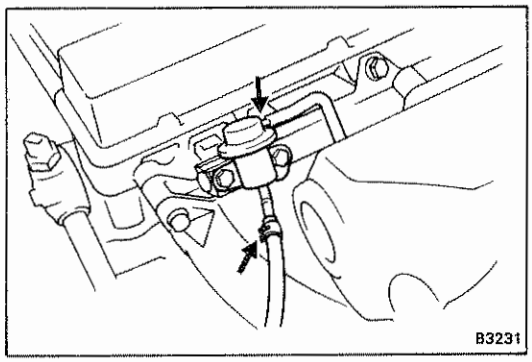
1. Install pressure regulator.
   Install pressure regulator and torque two bolts.
   Torque: 50 – 90 kg-cm
   (44 – 78 in.-lb, 5.0 – 8.8 N·m)
2. Connect fuel hose.
3. Connect vacuum sensing hose.



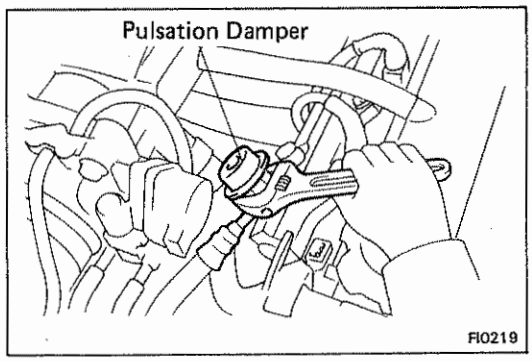
INJECTOR

REMOVAL

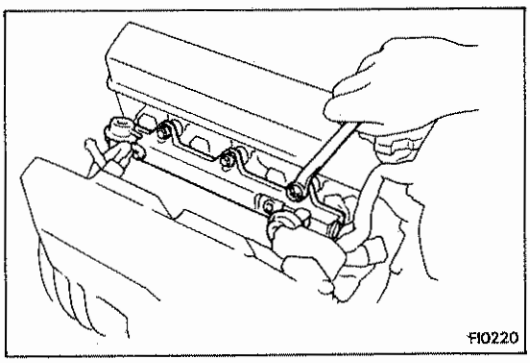
1. Disconnect cable from negative terminal of battery.
2. Disconnect following hoses:
   (a) PCV hose from cylinder head cover.
   (b) Vacuum sensing hose from pressure regulator.
   (c) Fuel return hose from pressure regulator.
3. Remove cold start injector pipe.



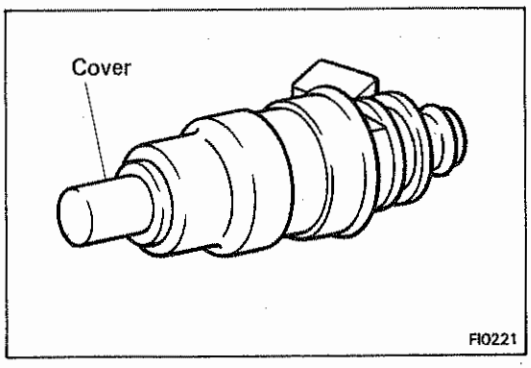
4. Disconnect fuel inlet hose.
   Remove pulsation damper and disconnect fuel inlet hose from delivery pipe.
5. Disconnect injector connectors.



6. Remove delivery pipe.
   Remove three bolts, and then remove delivery pipe with four injectors and three collars from cylinder head.
   NOTE: When removing delivery pipe, be careful not to drop injectors.

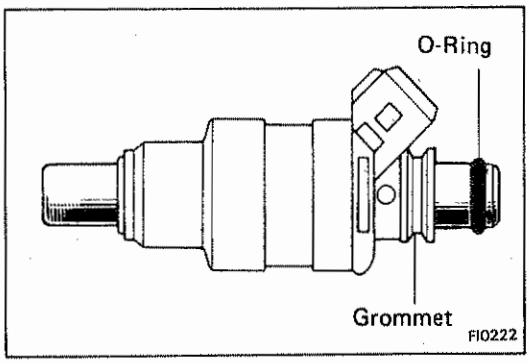


7. Remove injectors.
   Pull out injectors from delivery pipe.
   NOTE: Do not remove injector cover.

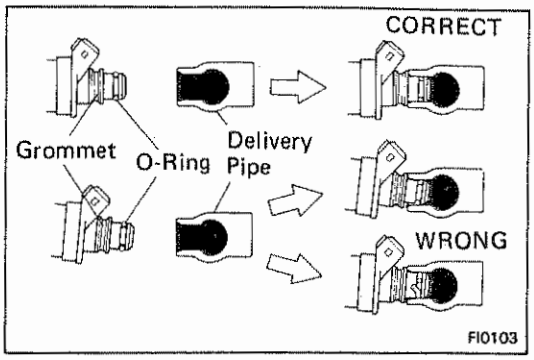


INSTALLATION

1. Install injectors into delivery pipe.
   (a) Replace O-ring on to injector.

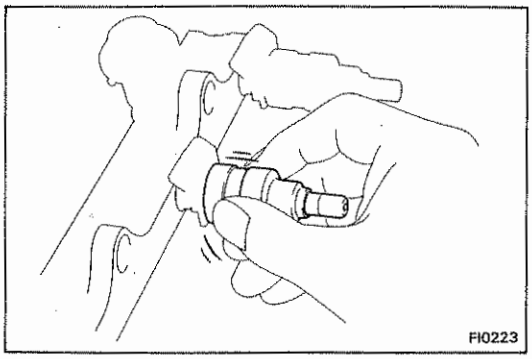


(b) Apply thin coat of gasoline to O-rings and install injectors into delivery pipe.

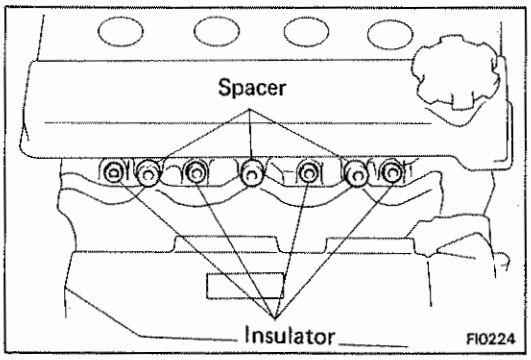


(c) Make sure that injectors rotate smoothly.

NOTE: If injectors do not rotate smoothly, probable cause is incorrect installation of O-rings. Replace O-rings.

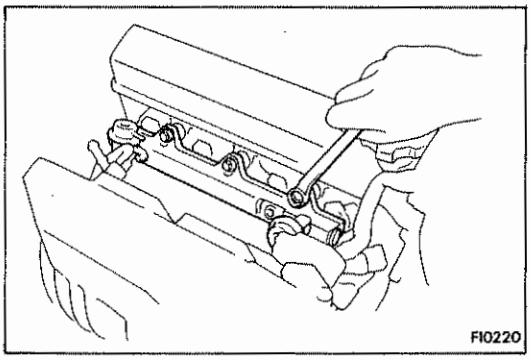


2. Install delivery pipe with injectors.
   (a) Install four insulators into injector hole of cylinder head.
   (b) Install three collars on delivery pipe mounting hole of cylinder head.



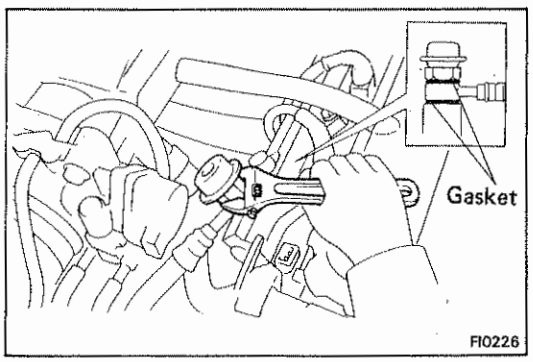
   (c) Place injectors together with delivery pipe on cylinder head.
   (d) Install and torque three bolts.

   Torque: 170 – 190 kg-cm (12.3 – 13.7 ft-lb, 17 – 18 N·m)



3. Connect injector connectors.
4. Connect fuel inlet hose.
   (a) Place fuel inlet hose with new gasket on delivery pipe.
   (b) Install and torque pulsation damper.

   Torque: 250 – 350 kg-cm (19 – 25 ft-lb, 25 – 34 N·m)



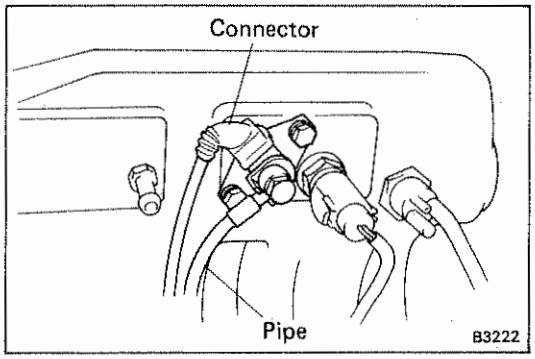
5. Install cold start injector pipe.
6. Connect following hoses:
   (a) Fuel return hose to pressure regulator.
   (b) Vacuum sensing hose to pressure regulator.
   (c) PCV hose to cylinder head cover.
7. Connect cable to negative terminal of battery.

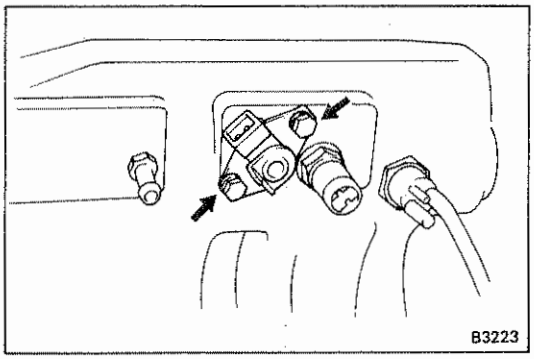
COLD START INJECTOR

REMOVAL

1. Disconnect cable from negative terminal of battery.
2. Disconnect cold start injector connector.
3. Remove cold start injector pipe.
   (a) Put suitable container or shop towel under cold start injector pipe.
   (b) Remove two union bolts and cold start injector pipe with gaskets.

   NOTE: Loosen union bolts.
4. Remove cold start injector.
   Remove two bolts and cold start injector with gasket.



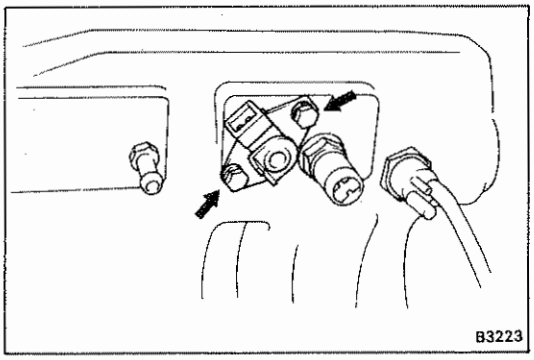


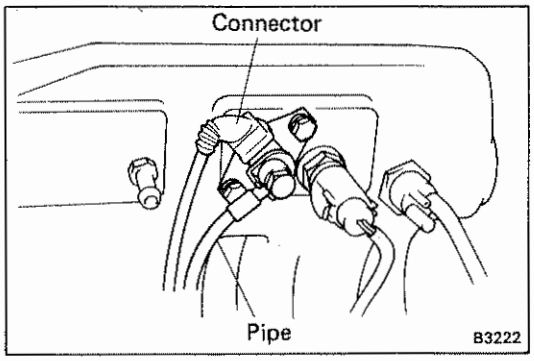
INSTALLATION

1. Install cold start injector.
   Place on new gasket and install cold start injector with two bolts.

   Torque: 50 – 90 kg-cm (44 – 78 in.-lb, 5.0 – 8.8 N·m)
2. Install cold start injector pipe.
   Using new gaskets, connect cold start injector pipe to delivery pipe and cold start injector. Install union bolts.

   Torque: 120 – 180 kg-cm (9 – 13 ft-lb, 12 – 17 N·m)
3. Connect cold start injector connector.
4. Connect cable to negative terminal of battery.

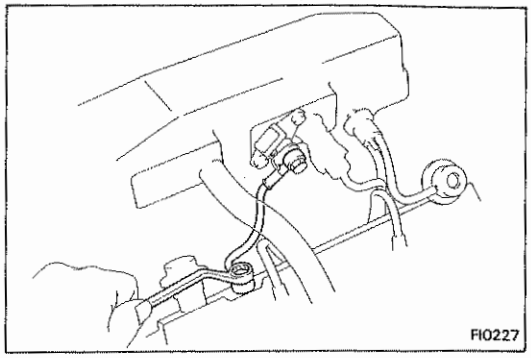


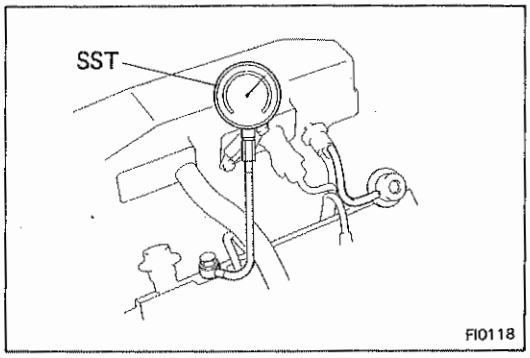


FUEL PRESSURE GAUGE

INSTALLATION

1. Disconnect cable from negative terminal of battery.
2. Disconnect wiring connector from cold start injector.
3. Put suitable container or shop towel under cold start injection pipe.
4. Remove cold start injection pipe.
   NOTE: Slowly loosen union bolt.
5. Install a gasket, SST, another gasket and union bolt to delivery pipe as shown in the figure.
   SST 09268-45011
6. Wipe off any splattered gasoline.
7. Reconnect battery cable.





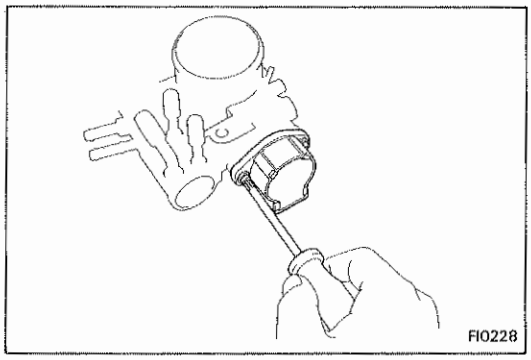
REMOVAL

1. After checking fuel pressure, disconnect battery ground cable and carefully remove SST to prevent gasoline from splashing.
2. Using new gaskets, reconnect cold start injector pipe to delivery pipe and cold start injector.
3. Reconnect wiring connector to cold start injector.

THROTTLE POSITION SENSOR

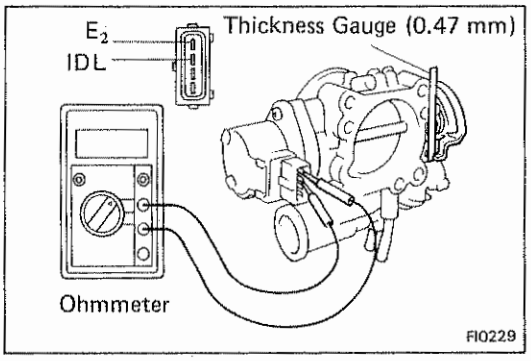
ADJUSTMENT

1. Loosen two screws of throttle position sensor.



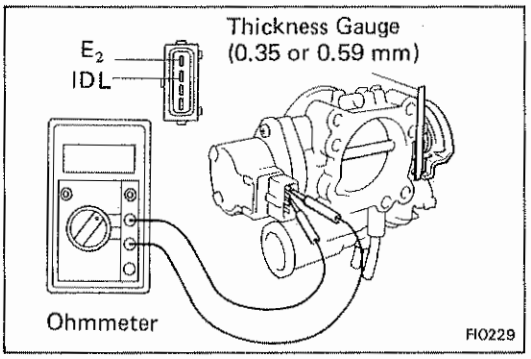
2. Insert thickness gauge (0.47 mm or 0.0185 in.) between throttle stop screw and lever, and connect ohmmeter to terminals IDL and E_2.

   Gradually turn sensor clockwise until ohmmeter deflects, and secure sensor with two screws.



3. Using thickness gauge, recheck continuity between terminals IDL and E_1.

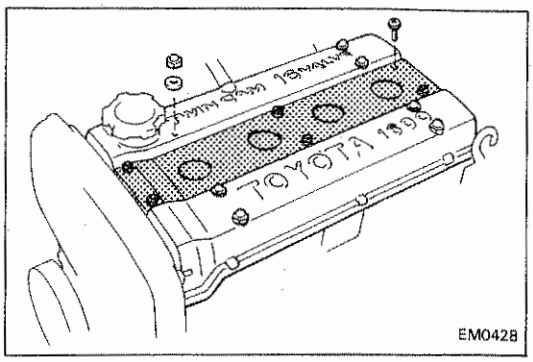
Clearance between Lever and stop screw	Continuity (IDL – E_2)
0.35 mm (0.0138 in.)	Continuity
0.59 mm (0.0232 in.)	No continuity



VALVE CLEARANCE

NOTE: Check and adjust valve clearance while engine is cold.

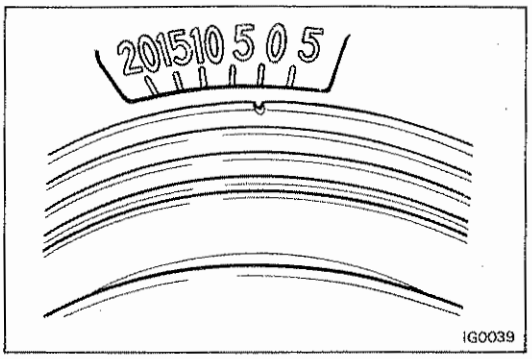
1. Remove cylinder head covers with gaskets.
   (a) Remove six bolts and center cover.
   (b) Remove cap nuts, seals and head covers with gaskets.



2. Measure valve clearance.
   (a) Set No. 1 cylinder to TDC/compression.
   - Turn crankshaft pulley and align its groove with "0" mark on No. 1 timing belt cover.
   - Check that valve lifters on No. 1 cylinder are loose and valve lifters on No. 4 are tight.

   If not, turn crankshaft pulley one complete revolution.

   (b) Measure clearance of half of valves.
   - Measure only those valves indicated by arrows in figure.
   - Record measurements which are out of specification. They will be used later to determine required replacement shims.

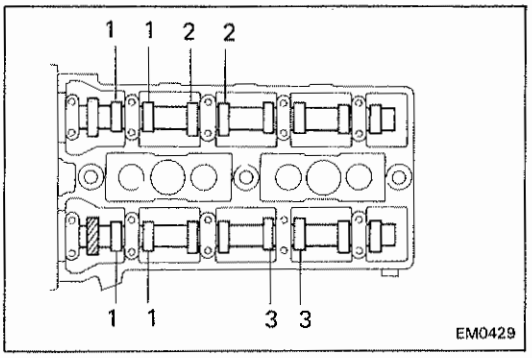


Valve clearance (Cold):

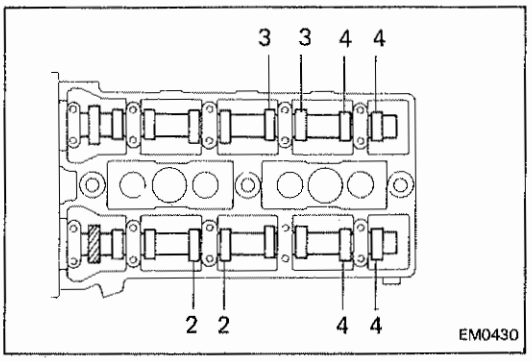
Intake	**0.15 – 0.25 mm (0.006 – 0.010 in.)**
Exhaust	**0.20 – 0.30 mm (0.008 – 0.012 in.)**

Valve clearance (Hot) (Reference):

Intake	**0.20 – 0.30 mm (0.008 – 0.012 in.)**
Exhaust	**0.26 – 0.36 mm (0.010 – 0.014 in.)**



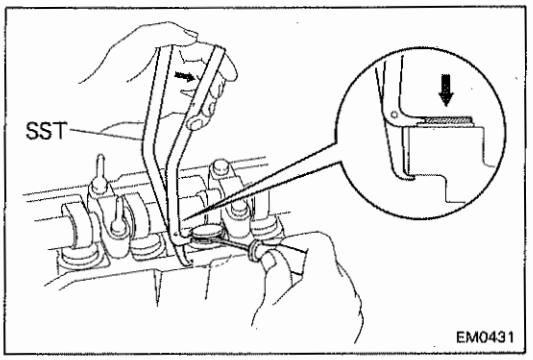
   (c) Turn crankshaft pulley one revolution and measure other valves.
   - Turn crankshaft pulley one revolution and align timing marks as stated in (a) above.
   - Measure only valves indicated by arrows as shown.



3. Adjust valve clearance.
   (a) Turn crankshaft pulley to position lobe on adjusting valve camshaft upward.
   (b) Using SST, press down valve lifter and remove adjusting shim with small screwdriver.

   SST 09248-70010

   NOTE: Before pressing down valve lifter, position notch toward spark plug.



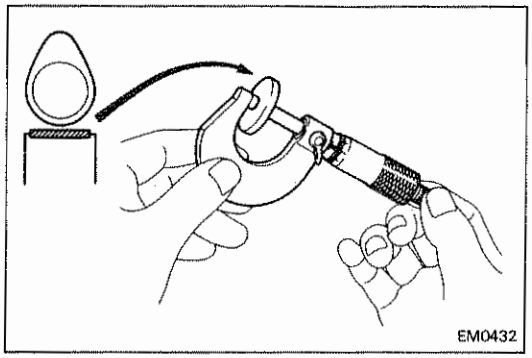
(c) Determine replacement shim size by using following (Formula or Chart).

- Using micrometer, measure thickness of shim which was removed.
- Calculate thickness of new shim so valve clearance comes within specified value.

T ..... Thickness of shim used
A ..... Valve clearance measured
N ..... Thickness of shim new

Intake side: N = T + [A-0.20 mm (0.008 in.)]
Exhaust side: N = T + [A-0.25 mm (0.010 in.)]

- Select shim with thickness as close as possible to vlave clearance calculated.



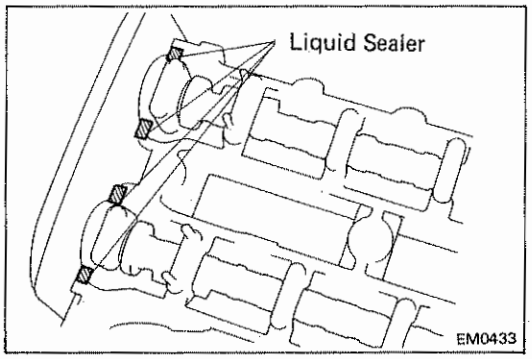
NOTE: Shims are available in 17 sizes, in increments of 0.050 mm (0.0020 in.), from 2.500 mm (0.0984 in.) to 3.300 mm (0.1299 in.).

(d) Using SST, press down valve lifter and install new adjusting shim.

SST 09248-70010

4. Recheck valve clearance.

5. Install cylinder head covers with gasket.
   (a) Apply liquid sealer to areas indicated in figure.
   (b) Install intake and exhaust head covers with gaskets.
   (c) Install center cover.



Intake

Measured Clearance (mm)	Installed Shim Thickness (mm)																																																							
	2.500	2.525	2.550	2.575	2.600	2.620	2.625	2.640	2.650	2.660	2.675	2.680	2.700	2.720	2.725	2.740	2.750	2.760	2.775	2.780	2.800	2.820	2.825	2.840	2.850	2.860	2.875	2.880	2.900	2.920	2.925	2.940	2.950	2.960	2.975	2.980	3.000	3.020	3.025	3.040	3.050	3.060	3.075	3.080	3.100	3.120	3.125	3.140	3.150	3.160	3.175	3.180	3.200	3.225	3.250	3.275	3.300
0.000 – 0.009											02	02	02	04	04	04	04	04	06	06	06	08	08	08	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	26	26
0.010 – 0.025										02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	26	26
0.026 – 0.029									02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	26	26	28
0.030 – 0.040								02	02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	26	26	28
0.041 – 0.050								02	02	02	02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	26	26	28
0.051 – 0.070						02	02	02	02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	28	28
0.071 – 0.075					02	02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	28	28
0.076 – 0.090					02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	28	28	30
0.091 – 0.100					02	02	02	04	04	04	04	04	06	06	06	08	08	08	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	28	28	30
0.101 – 0.120				02	02	04	04	04	04	04	06	06	06	08	08	08	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	30	30
0.121 – 0.125			02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	30	30
0.126 – 0.140			02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	30	30	32
0.141 – 0.149			02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	30	30	32
0.150 – 0.250																																																									
0.251 – 0.270	04	06	06	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34		
0.271 – 0.275	04	06	06	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34		
0.276 – 0.290	06	06	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34			
0.291 – 0.300	06	06	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34			
0.301 – 0.320	06	08	08	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34				
0.321 – 0.325	06	08	08	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34				
0.326 – 0.340	08	08	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34					
0.341 – 0.350	08	08	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34						
0.351 – 0.370	08	10	10	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34							
0.371 – 0.375	08	10	10	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34								
0.376 – 0.390	10	10	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34									
0.391 – 0.400	10	10	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34										
0.401 – 0.420	10	12	12	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34												
0.421 – 0.425	10	12	12	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34												
0.426 – 0.440	12	12	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34													
0.441 – 0.450	12	12	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34													
0.451 – 0.470	12	14	14	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34															
0.471 – 0.475	12	14	14	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																
0.476 – 0.490	14	14	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																	
0.491 – 0.500	14	14	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																		
0.501 – 0.520	14	16	16	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																				
0.521 – 0.525	14	16	16	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																				
0.526 – 0.540	16	16	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																					
0.541 – 0.550	16	16	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																					
0.551 – 0.570	16	18	18	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																							
0.571 – 0.575	16	18	18	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																								
0.576 – 0.590	18	18	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																									
0.591 – 0.600	18	18	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																										
0.601 – 0.620	18	20	20	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																												
0.621 – 0.625	18	20	20	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																												
0.626 – 0.640	20	20	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																													
0.641 – 0.650	20	20	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																													
0.651 – 0.670	20	22	22	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																															
0.671 – 0.675	20	22	22	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																
0.676 – 0.690	22	22	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																	
0.691 – 0.700	22	22	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																																		
0.701 – 0.720	22	24	24	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																																				
0.721 – 0.725	22	24	24	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																				
0.726 – 0.740	24	24	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																					
0.741 – 0.750	24	24	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34																																						
0.751 – 0.770	24	26	26	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																																							
0.771 – 0.775	24	26	26	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																								
0.776 – 0.790	26	26	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																									
0.791 – 0.800	26	26	28	28	30	30	30	32	32	32	32	32	34	34	34																																										
0.801 – 0.820	26	28	28	30	30	32	32	32	32	32	34	34	34																																												
0.821 – 0.825	26	28	28	30	30	32	32	32	32	34	34	34	34																																												
0.826 – 0.840	28	28	30	30	32	32	32	32	34	34	34	34																																													
0.841 – 0.850	28	28	30	30	32	32	32	34	34	34	34	34																																													
0.851 – 0.870	28	30	30	32	32	34	34	34	34	34																																															
0.871 – 0.875	28	30	30	32	32	34	34	34	34																																																
0.876 – 0.890	30	30	32	32	34	34	34	34																																																	
0.891 – 0.900	30	30	32	32	34	34	34																																																		
0.901 – 0.925	30	32	32	34	34																																																				
0.926 – 0.950	32	32	34	34																																																					
0.951 – 0.975	32	34	34																																																						
0.976 – 1.000	34	34																																																							
1.001 – 1.025	34																																																								

Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.500 (0.0984)	20	2.950 (0.1161)
04	2.550 (0.1004)	22	3.000 (0.1181)
06	2.600 (0.1024)	24	3.050 (0.1201)
08	2.650 (0.1043)	26	3.100 (0.1220)
10	2.700 (0.1063)	28	3.150 (0.1240)
12	2.750 (0.1083)	30	3.200 (0.1260)
14	2.800 (0.1102)	32	3.250 (0.1280)
16	2.850 (0.1122)	34	3.300 (0.1299)
18	2.900 (0.1142)		

Intake valve clearance (cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)

Example: 2.800 mm Installed is
Measured clearance is 0.450 mm
Replace 2.800 mm shim with
shim No. 24 (3.050 mm).

Exhaust

Measured Clearance (mm)	Installed Shim Thickness (mm)																																																							
	2.500	2.525	2.550	2.575	2.600	2.620	2.625	2.640	2.650	2.660	2.675	2.680	2.700	2.720	2.725	2.740	2.750	2.760	2.775	2.780	2.800	2.820	2.825	2.840	2.850	2.860	2.875	2.880	2.900	2.920	2.925	2.940	2.950	2.960	2.975	2.980	3.000	3.020	3.025	3.040	3.050	3.060	3.075	3.080	3.100	3.120	3.125	3.140	3.150	3.160	3.175	3.180	3.200	3.225	3.250	3.275	3.300
0.000 – 0.009														02	02	02	02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	24	24
0.010 – 0.025														02	02	02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	24	26
0.026 – 0.040													02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	24	24	26
0.041 – 0.050												02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	24	24	26
0.051 – 0.070											02	02	02	04	04	04	04	04	06	06	06	08	08	08	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	26	26
0.071 – 0.090									02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	26	26	28
0.091 – 0.100								02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	26	26	28
0.101 – 0.120						02	02	02	02	02	04	04	04	06	06	06	06	06	08	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	28	28
0.121 – 0.140					02	02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	28	28	30
0.141 – 0.150					02	02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	28	28	30
0.151 – 0.170				02	02	04	04	04	04	04	06	06	06	08	08	08	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	30	30
0.171 – 0.190			02	02	04	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	30	30	32
0.191 – 0.199			02	02	04	04	04	06	06	06	06	08	08	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	30	30	32
0.200 – 0.300																																																									
0.301 – 0.320	04	06	06	08	08	10	10	10	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34		
0.321 – 0.325	04	06	06	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34		
0.326 – 0.340	06	06	08	08	10	10	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34			
0.341 – 0.350	06	06	08	08	10	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34			
0.351 – 0.370	06	08	08	10	10	12	12	12	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34				
0.371 – 0.375	06	08	08	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34				
0.376 – 0.390	08	08	10	10	12	12	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34					
0.391 – 0.400	08	08	10	10	12	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34					
0.401 – 0.420	08	10	10	12	12	14	14	14	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34							
0.421 – 0.425	08	10	10	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34								
0.426 – 0.440	10	10	12	12	14	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34									
0.441 – 0.450	10	10	12	12	14	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34										
0.451 – 0.470	10	12	12	14	14	16	16	16	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34												
0.471 – 0.475	10	12	12	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34												
0.476 – 0.490	12	12	14	14	16	16	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34													
0.491 – 0.500	12	12	14	14	16	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34													
0.501 – 0.520	12	14	14	16	16	18	18	18	18	18	20	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34															
0.521 – 0.525	12	14	14	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																
0.526 – 0.540	14	14	16	16	18	18	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																	
0.541 – 0.550	14	14	16	16	18	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																		
0.551 – 0.570	14	16	16	18	18	20	20	20	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																				
0.571 – 0.575	14	16	16	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																				
0.576 – 0.590	16	16	18	18	20	20	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																					
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0.601 – 0.620	16	18	18	20	20	22	22	22	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																							
0.621 – 0.625	16	18	18	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																								
0.626 – 0.640	18	18	20	20	22	22	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																									
0.641 – 0.650	18	18	20	20	22	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																										
0.651 – 0.670	18	20	20	22	22	24	24	24	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																												
0.671 – 0.675	18	20	20	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																												
0.676 – 0.690	20	20	22	22	24	24	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																													
0.691 – 0.700	20	20	22	22	24	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																													
0.701 – 0.720	20	22	22	24	24	26	26	26	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																															
0.721 – 0.725	20	22	22	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																
0.726 – 0.740	22	22	24	24	26	26	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																	
0.741 – 0.750	22	22	24	24	26	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																																		
0.751 – 0.770	22	24	24	26	26	28	28	28	28	28	30	30	30	32	32	32	32	32	34	34	34																																				
0.771 – 0.775	22	24	24	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																				
0.776 – 0.790	24	24	26	26	28	28	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																					
0.791 – 0.800	24	24	26	26	28	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																																					
0.801 – 0.820	24	26	26	28	28	30	30	30	30	30	32	32	32	34	34	34	34	34																																							
0.821 – 0.825	24	26	26	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																								
0.826 – 0.840	26	26	28	28	30	30	30	30	32	32	32	32	34	34	34	34																																									
0.841 – 0.850	26	26	28	28	30	30	30	32	32	32	32	32	34	34	34																																										
0.851 – 0.870	26	28	28	30	30	32	32	32	32	32	34	34	34																																												
0.871 – 0.875	26	28	28	30	30	32	32	32	32	34	34	34	34																																												
0.876 – 0.890	28	28	30	30	32	32	32	32	34	34	34	34																																													
0.891 – 0.900	28	28	30	30	32	32	32	34	34	34	34	34																																													
0.901 – 0.925	28	30	30	32	32	34	34	34	34																																																
0.926 – 0.950	30	30	32	32	34	34	34																																																		
0.951 – 0.975	30	32	32	34	34																																																				
0.976 – 1.000	32	32	34	34																																																					
1.001 – 1.025	32	34	34																																																						
1.026 – 1.050	34	34																																																							
1.051 – 1.075	34																																																								

Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.500 (0.0984)	20	2.950 (0.1161)
04	2.550 (0.1004)	22	3.000 (0.1181)
06	2.600 (0.1024)	24	3.050 (0.1201)
08	2.650 (0.1043)	26	3.100 (0.1220)
10	2.700 (0.1063)	28	3.150 (0.1240)
12	2.750 (0.1083)	30	3.200 (0.1260)
14	2.800 (0.1102)	32	3.250 (0.1280)
16	2.850 (0.1122)	34	3.300 (0.1299)
18	2.900 (0.1142)		

Exhaust valve clearance (cold):
0.20 – 0.30 mm (0.008 – 0.012 in.)

Example: 2.800 mm Installed is
Measured clearance is 0.450 mm
Replace 2.800 mm shim with
shim No. 22 (3.000 mm).

BASIC ENGINE & TCCS INITIAL INSPECTION CHECK SHEET

(NOTE: This check sheet should be copied and the copies used rather than the original.)

CUSTOMER'S NAME	MAKE & MODEL OF AUTO	ODOMETER READING

REGISTRATION YEAR	HOW OFTEN DOES PROBLEM OCCUR ?	WHEN DID PROBLEM BEGIN ?
/ /	CONTINUALLY INTERMITTENTLY → (TIMES A DAY)	ABOUT DAYS AGO

OUTSIDE TEMP. WHEN PROBLEM OCCURS		WEATHER	FUEL REMAINING IN TANK	COOLANT TEMP.
Hot, Warm, Cool, Cold	( )° C	Clear, Cloudy, Raining, Snowing	F, 3/4, 1/2, 1/4, E	( )° C

CUSTOMER'S COMPLAINT	

BASIC ENGINE INSPECTION		RESULTS (STANDARD)			
Ignition timing		°BTDC (10° BTDC)			
Idle RPM		rpm (800 ± 50 rpm)			
CO concentration		% (1.5 ± 0.5 %)			
Spark test		good · no good			
Distributor cap, Rotor, Spark plug cord		good · no good			
Spark plug FD: Fouled (dry) FW: Fouled (wet) B: Burnt OK: Normal		#1	#2	#3	#4
Throttle linkage		good · no good			
Air filter		good · no good			
Air leakage		present · absent			
Compression kg/cm² (psi, kPa)		#1	#2	#3	#4
Valve clearance mm (in.)		#1	#2	#3	#4
	Intake				
	Exhaust				

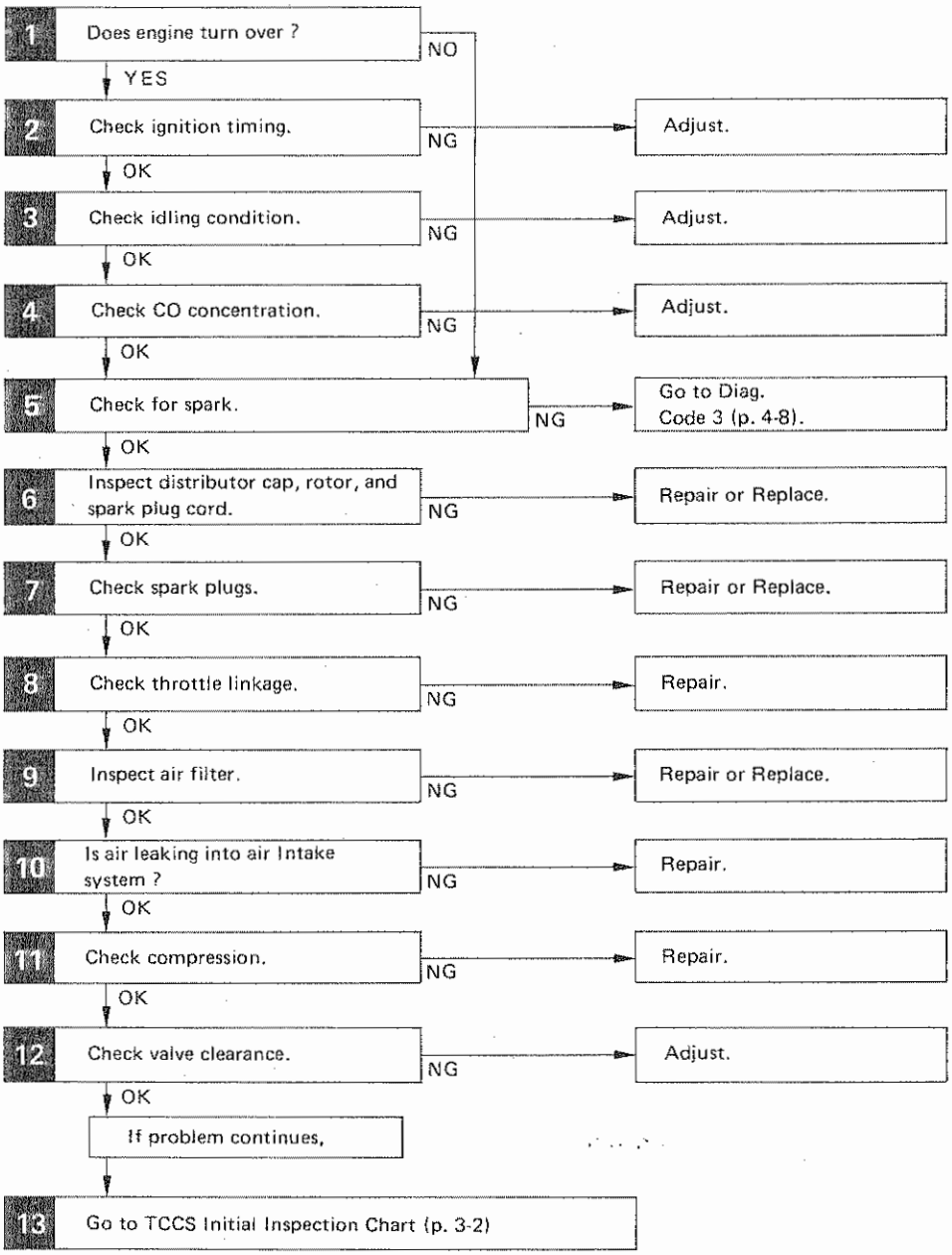
TCCS INITIAL INSPECTION	RESULTS (STANDARD)		
Diagnostic code	normal code · code ( )		
Fuel pressure kg/cm² (psi, kPa)	CRANKING 2.3 – 2.7 (32 – 39, 226 – 264)	RACING 2.3 – 2.7 (32 – 39, 226 – 264)	IDLING 1.9 – 2.2 (27 – 31, 187 – 215)

FOREWORD

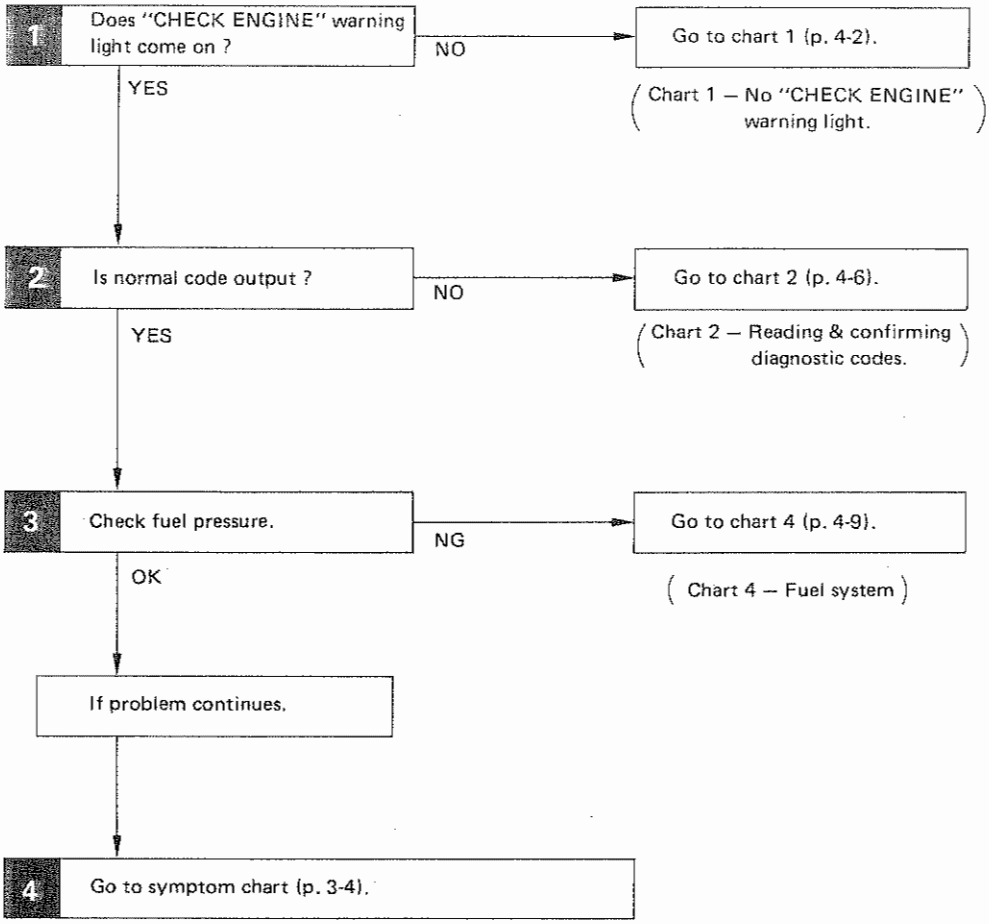
The various charts used in this manual have been brought together and summarized here to make them easier to understand and use. This section may therefore be pulled out and stapled together to make a small booklet; this will make troubleshooting and repair work easier and faster since the technician can rely in most cases on the booklet alone and need only refer to the Diagnosis Manual itself when necessary.

As in the case of the Diagnostic Manual, troubleshooting should begin with Step **1** *of the Basic Engine Inspection Chart and proceed step by step to the end. The other charts should be used only if the Basic Engine Inspection Chart so directs.*

BASIC ENGINE INSPECTION CHART (P. 2-3)



TCCS INITIAL INSPECTION CHART (P. 3-2)



SYMPTOM CHARTS (P.3-4)

ENGINE DOES NOT START

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check water temp. sensor.	Diag. code 4
2	Check vacuum sensor.	Diag. code 2
3	Check cold start injector time switch.	Chart 8
4	Check cold start injector.	Chart 9
5	Check electrical circuitry of injectors.	Chart 6
6	Check injectors.	Chart 10
7	If step 1 — 6 are all OK, try another ECU.	—

DIFFICULT TO START

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check auxiliary air control valve.	Chart 7
2	Check vacuum sensor.	Diag. code 2
3	Check water temp. sensor.	Diag. code 4
4	Check for residual pressure in fuel line.	Chart 5
5	Check cold start injector time switch.	Chart 8
6	Check cold start injector.	Chart 9
7	Check injectors.	Chart 10
8	If steps 1 — 7 are all OK, try another ECU.	—

POOR IDLING

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check CO concentration.	Chart 12
2	Check auxiliary air control valve.	Chart 7
3	Check vacuum sensor.	Diag. code 2
4	Check dash pot.	Chart 11
5	Check for residual pressure in fuel line.	Chart 5
6	Check idle-up system.	Chart 14
7	Check cold start injector.	Chart 9
8	Check injectors.	Chart 10
9	If steps 1 — 8 are all OK, try another ECU.	—

SYMPTOM CHARTS (P. 3-5)

POOR DRIVEABILITY

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11
2	Check water temp. sensor.	Diag. code 4
3	Check vacuum sensor.	Diag. code 2
4	Check for residual pressure in fuel line.	Chart 5
5	Check variable induction (T-VIS) system.	Chart 13
6	Check cold start injector.	Chart 9
7	Check injectors.	Chart 10
8	If steps 1 — 7 are all OK, try another ECU.	—

AFTER-FIRING (Over-rich fuel mixture)

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11
2	Check water temp. sensor.	Diag. code 4
3	Check vacuum sensor.	Diag. code 2
4	Check for residual pressure in fuel line.	Chart 5
5	Check cold start injector.	Chart 9
6	Check injectors.	Chart 10
7	If steps 1 — 6 are OK, try another ECU.	—

BACK-FIRING (Over-lean fuel mixture)

No.	Item	Reference
C	Basic Engine Inspection and TCCS Initial Inspection completed. No problem found.	—
1	Check throttle position sensor.	Diag. code 11
2	Check vacuum sensor.	Diag. code 2
3	Check dash pot.	Chart 11
4	Check injection volume.	Chart 10
5	If steps 1 — 4 are all OK, try another ECU.	—

SYSTEM OR PARTS INSPECTION CHARTS

USE THESE CHARTS ONLY IF THE BASIC ENGINE AND THE TCCS INITIAL INSPECTION CHART SO DIRECTS.

CHART 1 — No "CHECK ENGINE" warning light. (P. 4-2)

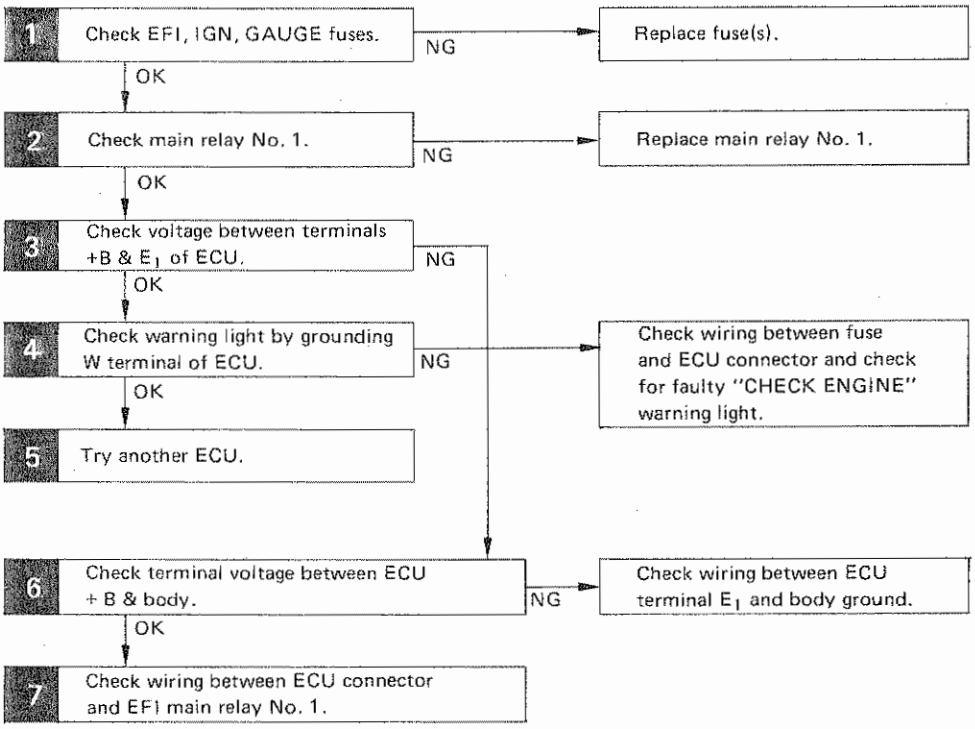


CHART 2 — Reading & confirming diagnostic codes (P. 4-6)

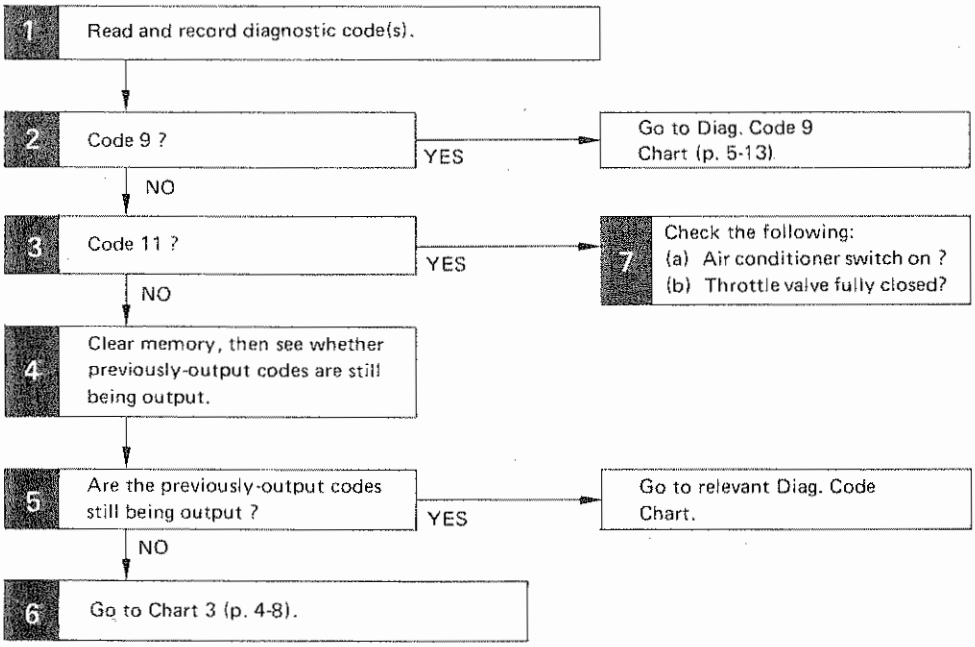


CHART 3 — Intermittent trouble (P. 4-8)

CHART 4 — Fuel system (P. 4-9)

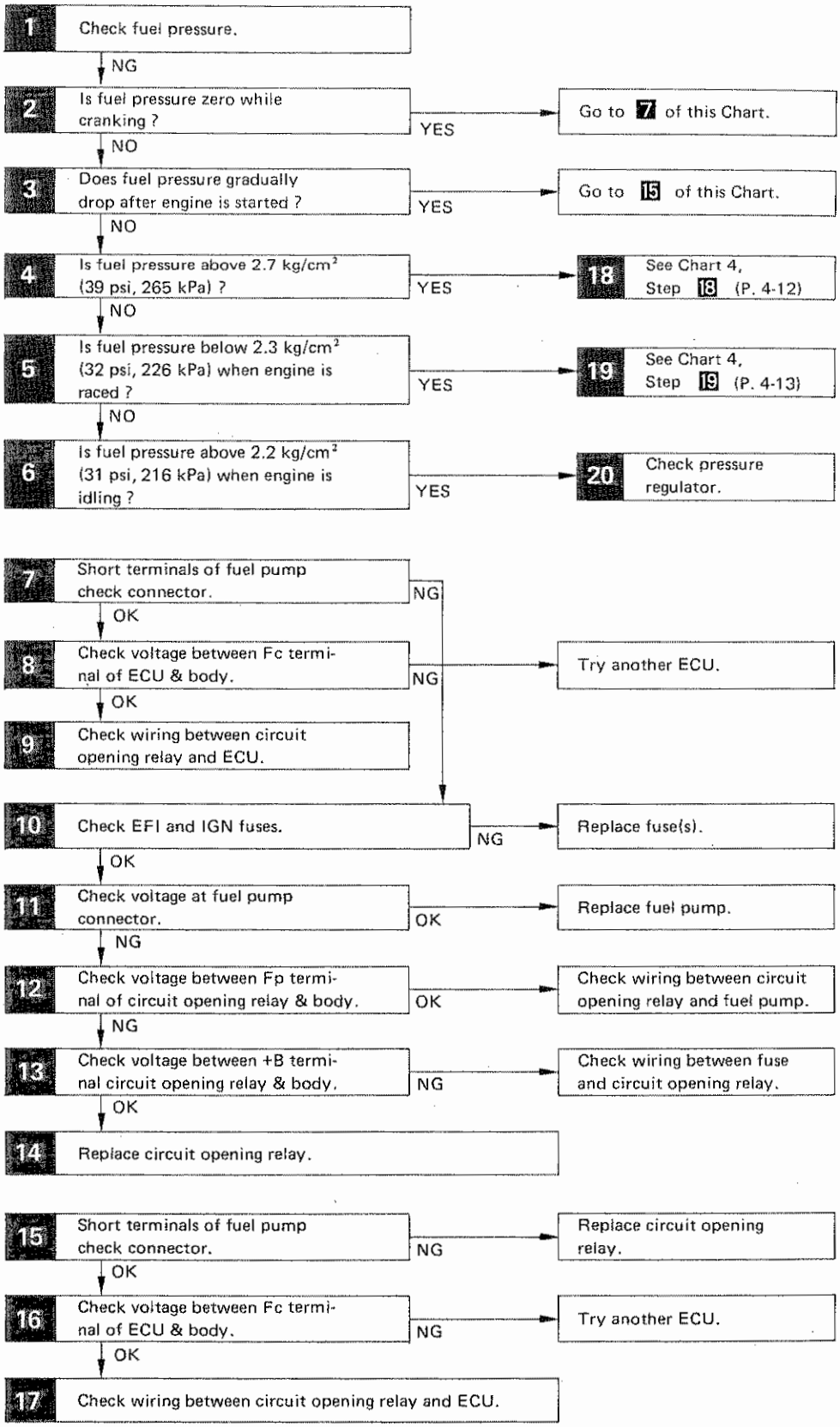


CHART 5 — Residual fuel pressure (P. 4-14)

CHART 6 — Injector electrical circuitry (P. 4-15)

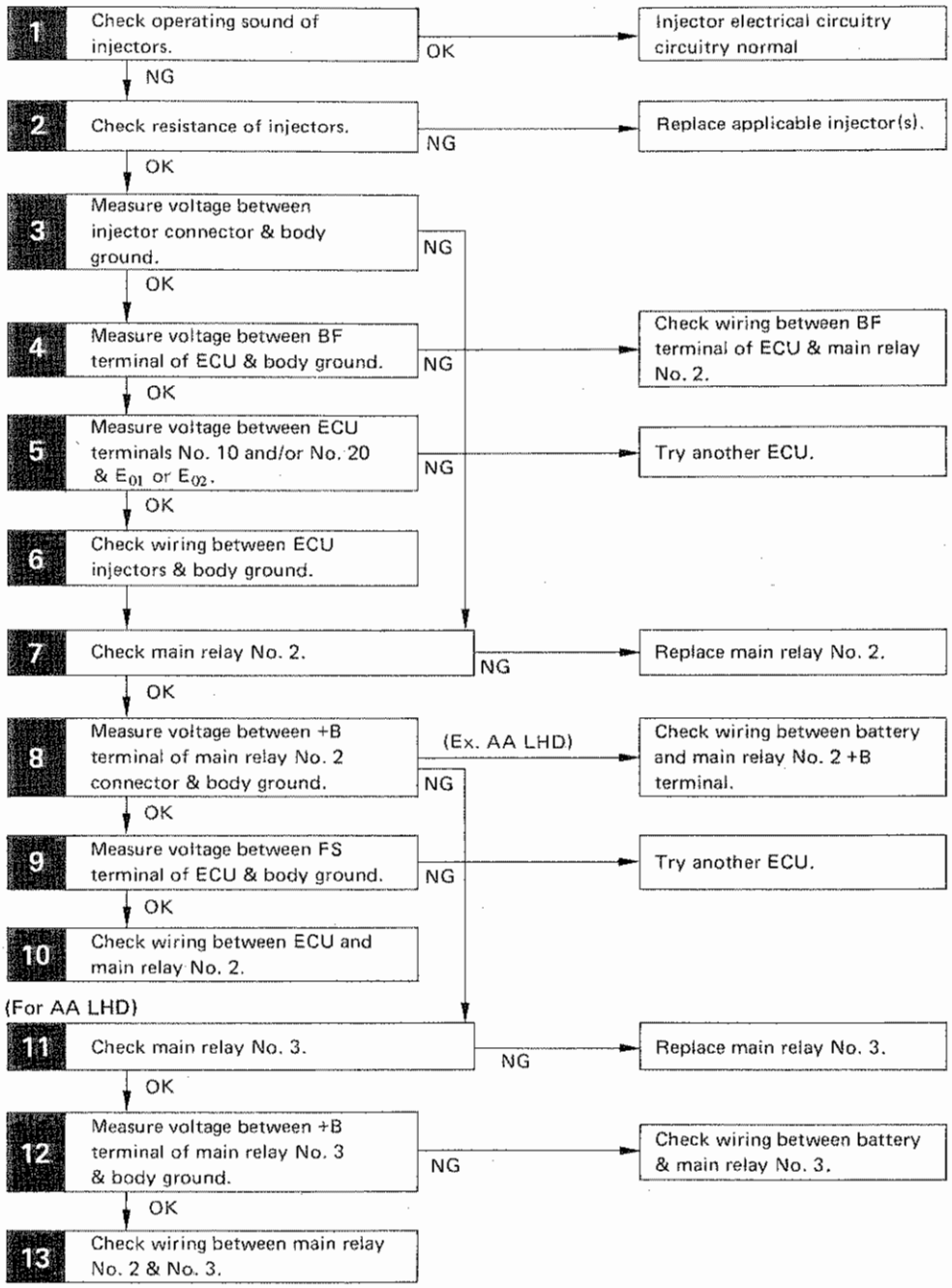


CHART 7 — Auxiliary air control valve (P. 4-21)

CHART 8 — Cold start injector time switch (P. 4-22)

CHART 9 — Cold start injector (P. 4-23)

CHART 10 — Injectors (P. 4-24)

CHART 11 — Dash pot (DP) (P. 4-25)

CHART 12 — CO concentration (P. 4-26)

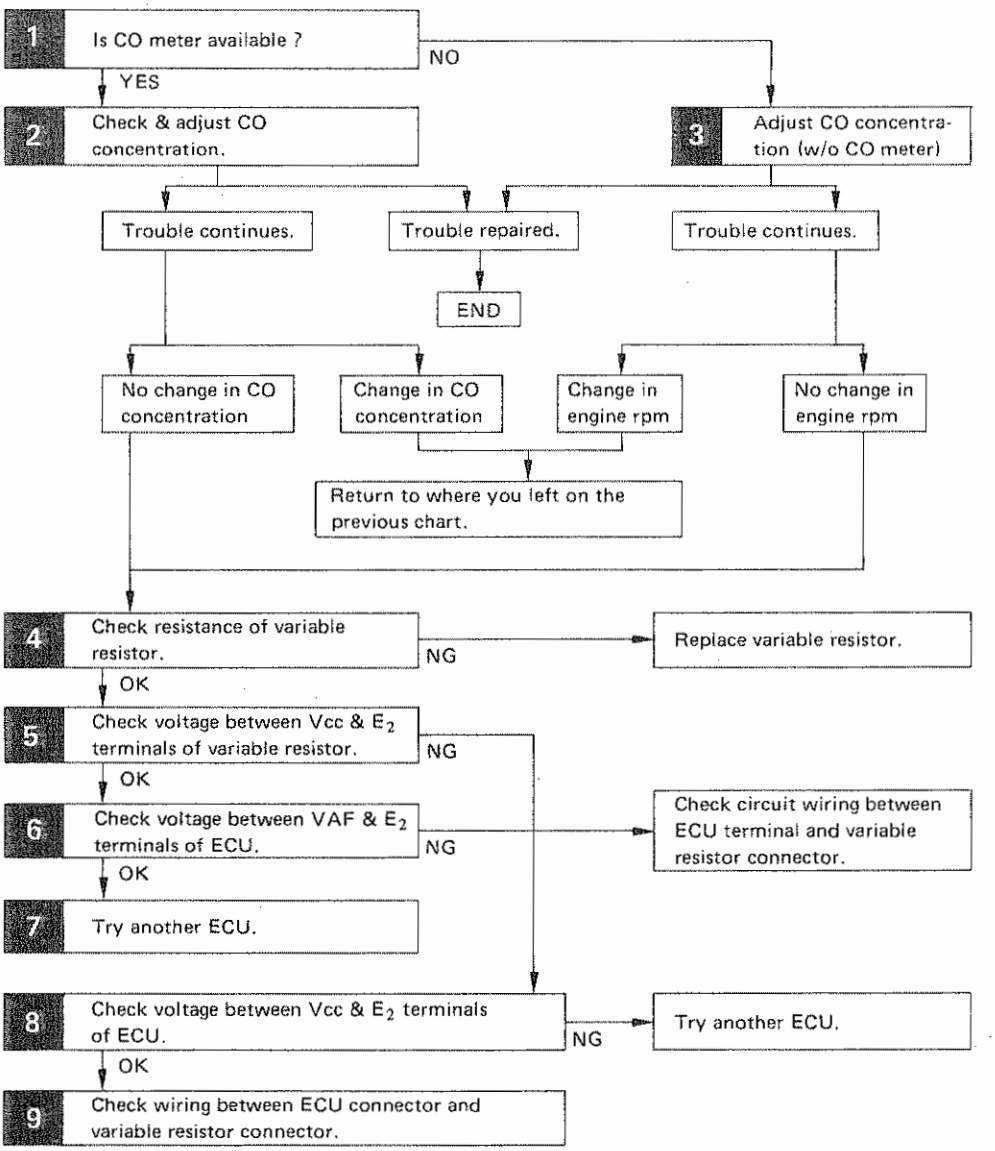


CHART 13 — Toyota Variable Induction (T-VIS) System (P. 4-31)

CHART 14 — Idle-up system (P. 4-32)

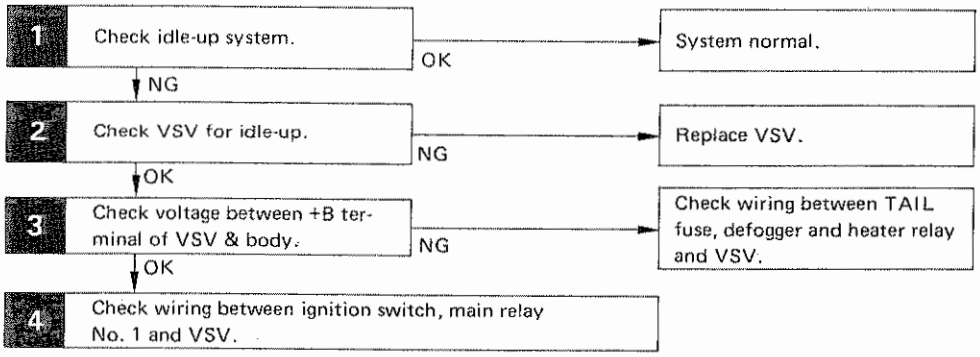
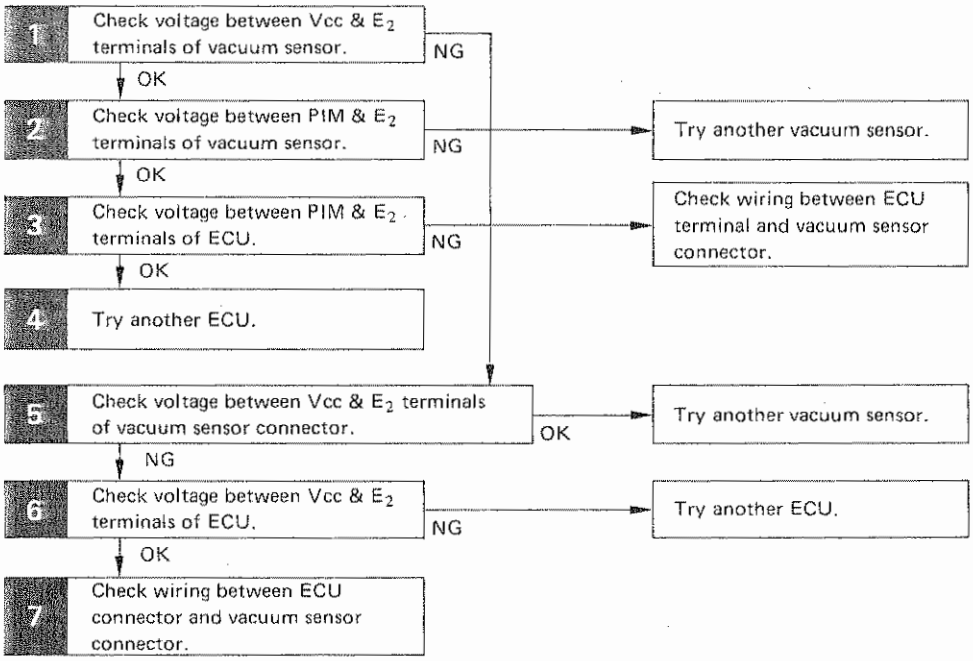


CHART 15 — Compression pressure (P. 4-34)

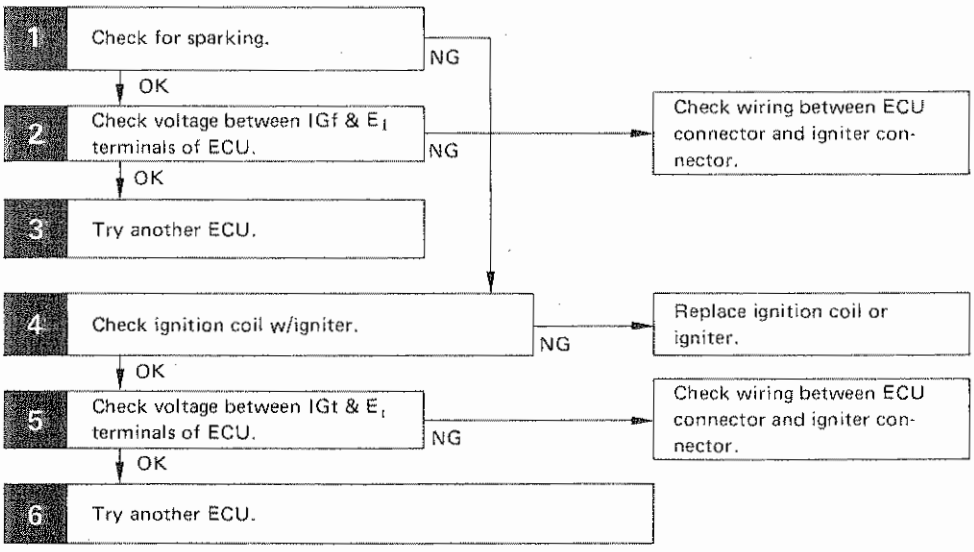
DIAGNOSTIC CODE CHARTS

USE THESE CHARTS ONLY IF BASIC ENGINE AND TCCS INITIAL INSPECTION CHART SO DIRECTS.

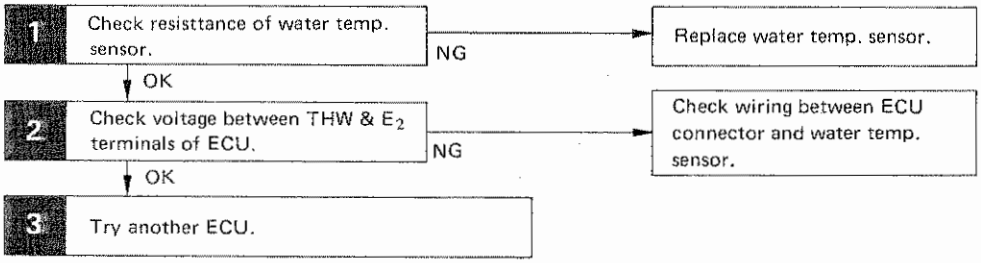
CODE 2 — Open or short circuit in vacuum sensor circuitry (P. 5-2)



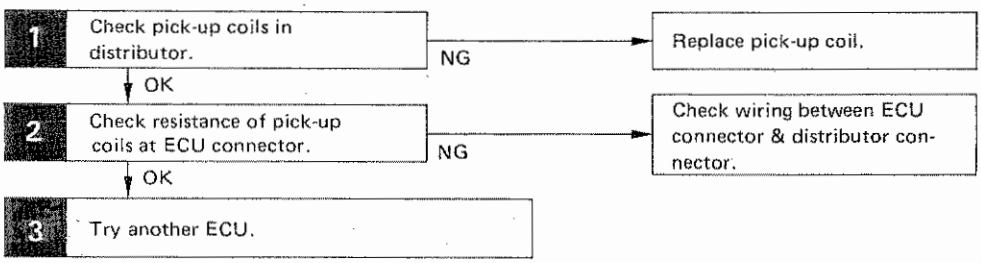
CODE 3 — Ignition conformation signal not being input into ECU (P. 5-6)



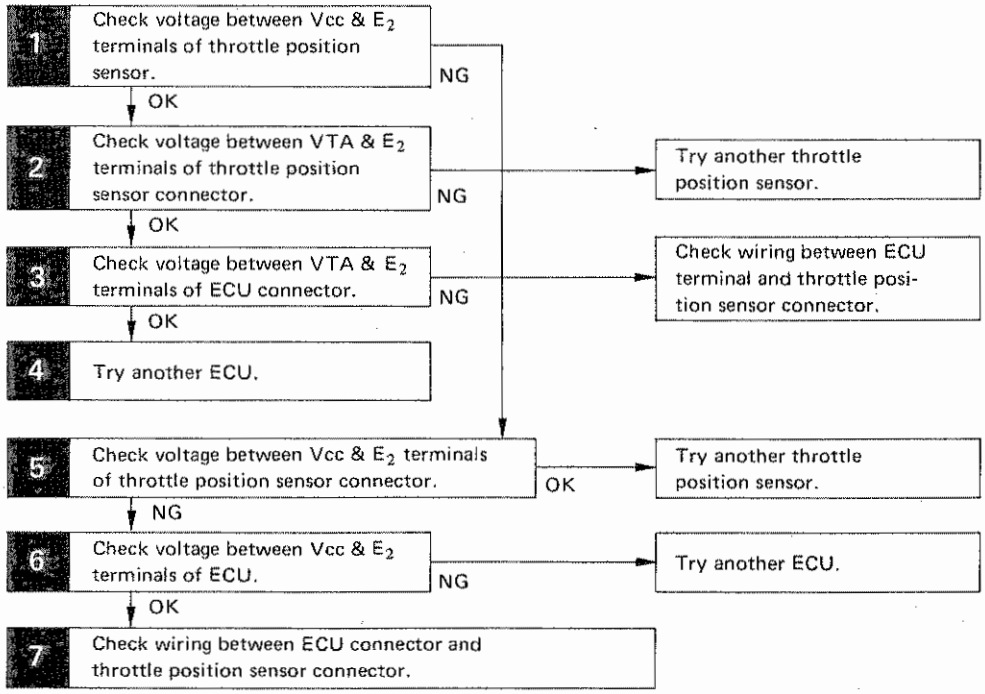
CODE 4 — Open or short circuit in water temp. sensor circuitry (P. 5-8)



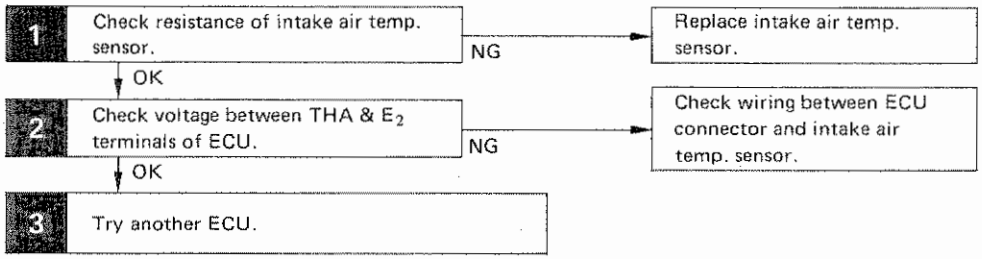
CODE 6 — No RPM signals to ECU (P. 5-9)



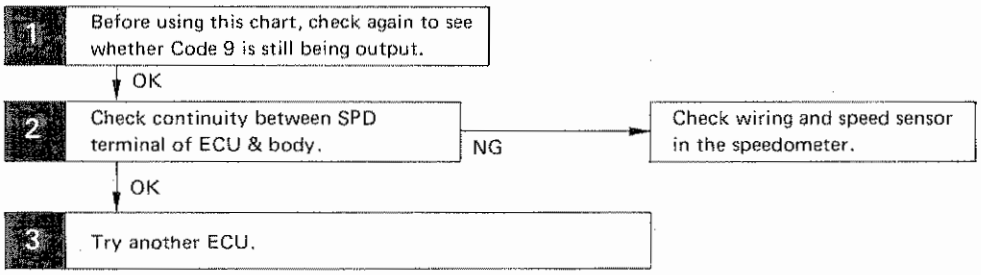
CODE 7 — Open or short circuit throttle position sensor circuitry (P. 5-10)



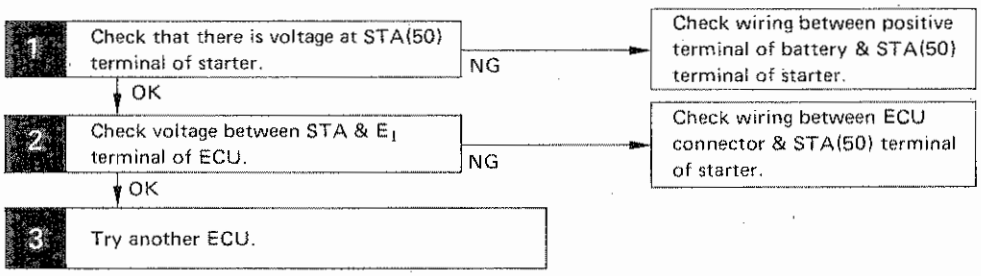
CODE 8 — Open or short circuit in intake air temp. sensor circuitry (P. 5-12)



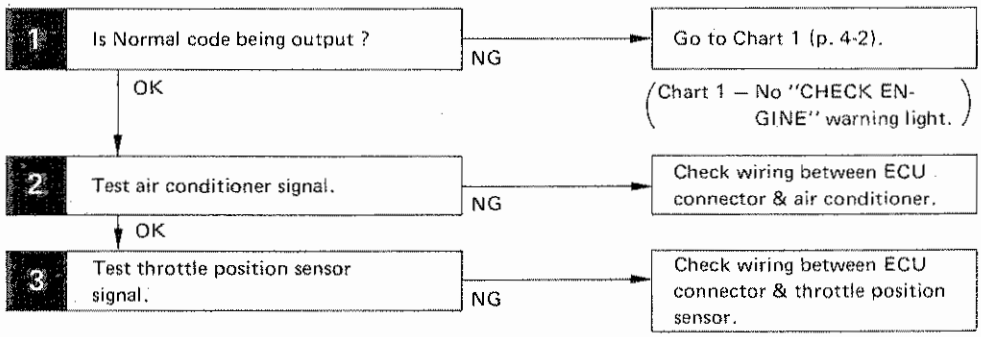
CODE 9 — Open or short circuit in vehicle speed sensor circuitry (P. 5-13)



CODE 10 — Open circuit in starter signal circuitry (P. 5-14)



CODE 11 — Switch input signal test (P. 5-15)



TOYOTA

QUALITY SERVICE