TOYOTA

3S-FE

TOYOTA COMPUTER-CONTROLLED SYSTEM

DIAGNOSIS MANUAL

1987 Celica and Camry

FOR USA & CANADA Pub. No. DM011U

FOREWORD

The TCCS (Toyota Computer-Controlled System) is a system of sensors and actuators based upon the latest electronic technology, to both control ignition timing and the amount of fuel injected into the intake manifold as well acting as the "hands and feet" of the computer keeping it informed of engine operating conditions. And although the complexity of the TCCS may cause technicians to believe such an engine equipped is different, Toyota would like to make this point clear; since the TCCS does nothing more than control the ignition timing and the supply of fuel, the engine is almost the same as an ordinary engine.

If something does go wrong with an engine equipped with TCCS, the problem should be clarified whether it originates in the TCCS or in the engine mechanics. In the event the problem is with the TCCS, the self-diagnosis system of the ECU (Electronic Control Unit) can quickly identify the problem.

For the above reasons, this manual explains the most ideal method of troubleshooting and tells how to carry out the necessary repairs.

Applicable models: 1987 model ST162 series
1987 model SV21 series

The **GENERAL INFORMATION** section contains the information the technician is requested to know before carrying out repair and inspection.

For other service specifications and repair procedures of the above models than those listed in this manual, refer to the following manuals:

Manual Name	Pub. No.
• 1987 Camry New Car Features	NCF014U
• 1987 Camry Repair Manual	RM044U
• 1987 Celica Repair Manual	RM042U
• 1987 Camry Electrical Wiring Diagram Manual	EWD023U
• 1987 Celica Electrical Wiring Diagram Manual	EWD021U

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.

If any discrepancies are noted between this manual and the engine under repair, refer to the most recent update of the repair manual.

TOYOTA MOTOR CORPORATION

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ABBREVIATIONS USED IN THIS MANUAL

A/C	–	Air Conditioner
A/T	–	Automatic Transmission
BTDC	–	Before Top Dead Center
C	–	Condition(s)
ECT	–	Electronic Controlled Transmission
ECU	–	Electronic Control Unit
EFI	–	Electronic Fuel Injection
EGR	–	Exhaust Gas Recirculation
ESA	–	Electronic Spark Advance
Ex.	–	Except
FL	–	Fusible Link
ISC	–	Idle Speed Control
J/B	–	Junction Block
M/T	–	Manual Transmission
N	–	Note(s)
OK	–	Normal
P	–	Procedure
SST	–	Special Service Tools
S/W	–	Switch
TCCS	–	TOYOTA Computer Controlled System
VSV	–	Vacuum Switching Valve
w/	–	With
w/o	–	Without

GENERAL INFORMATION

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 and Symptom Charts

The TCCS Initial Inspection Chart is used for a pretest 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 Units Inspection Charts

The Fuel System Chart, etc., are used to determine whether or not the corresponding systems or units are 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 Units 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 and Adjustment

This contains directions for the removal, installation and adjustment of all relevant units, 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 out first from the customer what the problem seems to be and under what conditions it occurs, and record this information on the Basic Engine and 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 then 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 AND TCCS INITIAL INSPECTION CHECK SHEET

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

CUSTOMER'S NAME	MAKE AND 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 w/check connector T-E1 shorted)			
Idle speed		rpm (650 rpm)			
Throttle linkage		good · no good			
Air filter		good · no good			
Fuel pressure		good · no good			
Spark test		good · no good			
Spark plug FD: Fouled (dry) FW: Fouled (wet) B: Burnt OK: Normal		#1	#2	#3	#4
Distributor cap, Rotor, Spark plug cord		good · no good			
Air leakage		present · absent			
ISC system		good · no good			
Compression kg/cm² (psi, kPa)		#1	#2	#3	#4
		#1	#2	#3	#4
Valve clearance mm (in.)	Intake				
	Exhaust				

TCCS INITIAL INSPECTION	RESULTS (STANDARD)		
Diagnostic code	normal code · code ( )		
Fuel pressure kg/cm² (psi, kPa)	CRANKING 2.7 – 3.1 (38 – 44, 265 – 304)	RACING 2.7 – 3.1 (38 – 44, 265 – 304)	IDLING 2.3 – 2.6 (33 – 37, 226 – 265)

After Completion of Repairs

After finishing a repair job, recheck the following:

1. Are all connectors, houses, 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?

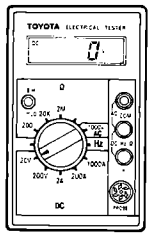
Finally, if a particular problem caused a diagnostic code to be output by the ECU, be sure to clear the ECU's memory (as explained on p. 4-6), then recheck to make sure that the memory has been cleared. Do this by restarting the engine and checking to make sure that the ECU is outputting the normal code (see p. 3-2).

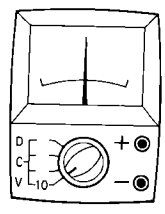
NOTE: Outlines of all charts and specifications have been gathered together and made into a small booklet, which is included at the back of this manual.
This booklet may be pulled out and used separately, so that once you become accustomed to working on the TCCS, you can work directly from it without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

NECESSARY TOOLS AND EQUIPMENT

VOLT/OHMMETER

Digital Type Analog Type





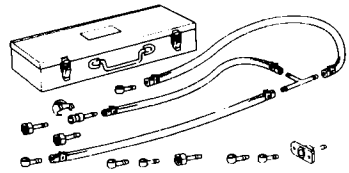
FI0889

NOTE:
Use a circuit tester with a highimpedance (10kΩ/V minimum).

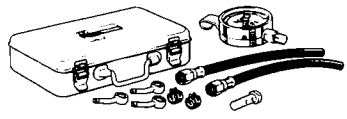
COMPRESSION GAUGE

SOUND SCOPE

INJECTION MEASURING TOOL SET (SST 09268-41045)

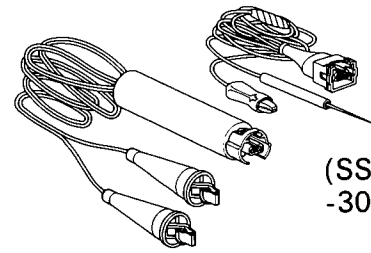


FUEL PRESSURE GAUGE (SST 09268-45011)



SERVICE WIRE

For checking injector operation



(SST 09842 -30050)

FI1595

(SST 09842-30060)

Short-circuiting wire

Clip type jumper wire

SYSTEM DESCRIPTION

FUNCTIONS

By means of the ECU, the TCCS (Toyota Computer-Controlled System) controls the following functions:

Electronic Fuel Injection (EFI)

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the injectors.
These injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU.
The ECU receives signals from various sensors indicating changing engine operating conditions such as:

- Intake air volume
- Intake air temperature
- Coolant temperature
- Engine RPM
- Acceleration / deceleration
- Exhaust oxygen content

These signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

Electronic Spark Advance (ESA)

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by the sensors that monitor various engine functions (RPM, intake air volume, coolant temperature, etc.), the microcomputer (ECU) sends igniter control signal (ignition signal) to igniter to trigger the spark at precisely the right instant.

Idle Speed Control (ISC)

The ECU is programmed with target engine speed values to respond to different engine conditions (coolant temperature, air conditioner on / off, etc.). Sensors transmit signals to the ECU, which, by means of the ISC valve, controls the flow of air through the throttle valve bypass and adjusts idle speed to the target value.

Electronic Controlled Transmission (ECT) [CAMRY only]

A serial signal is transmitted to the ECT computer to prevent up-shifting into overdrive during cold engine operation.

Diagnostics

The ECU detects any malfunctions or abnormalties in the sensor network and lights the "CHECK ENGINE" warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU.

Fail-Safe Function

In the event of computer malfunction, a backup circuit will take over to provide minimal drivability. Simultaneously, the "CHECK ENGINE" warning light will come on.

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.

Air Flow Meter
The air flow meter is located directly behind the air cleaner, and detects the intake air volume. It converts the intake air readings into a voltage signal by means of a potentiometer. When the intake air volume is small, the voltage is high; when the volume is great, the voltage is close to zero.

Water Temp. Sensor
The water temp. sensor is located at the water outlet 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 built into the air flow meter. 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 determines the load on the engine depending upon the throttle valve opening angle.

Oxygen Sensor
The oxygen sensor is located in the exhaust manifold. It indirectly determines whether the fuel mixture is rich or lean by detecting the concentration of oxygen present in the exhaust gas.

Vehicle 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 [Distributor]
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.

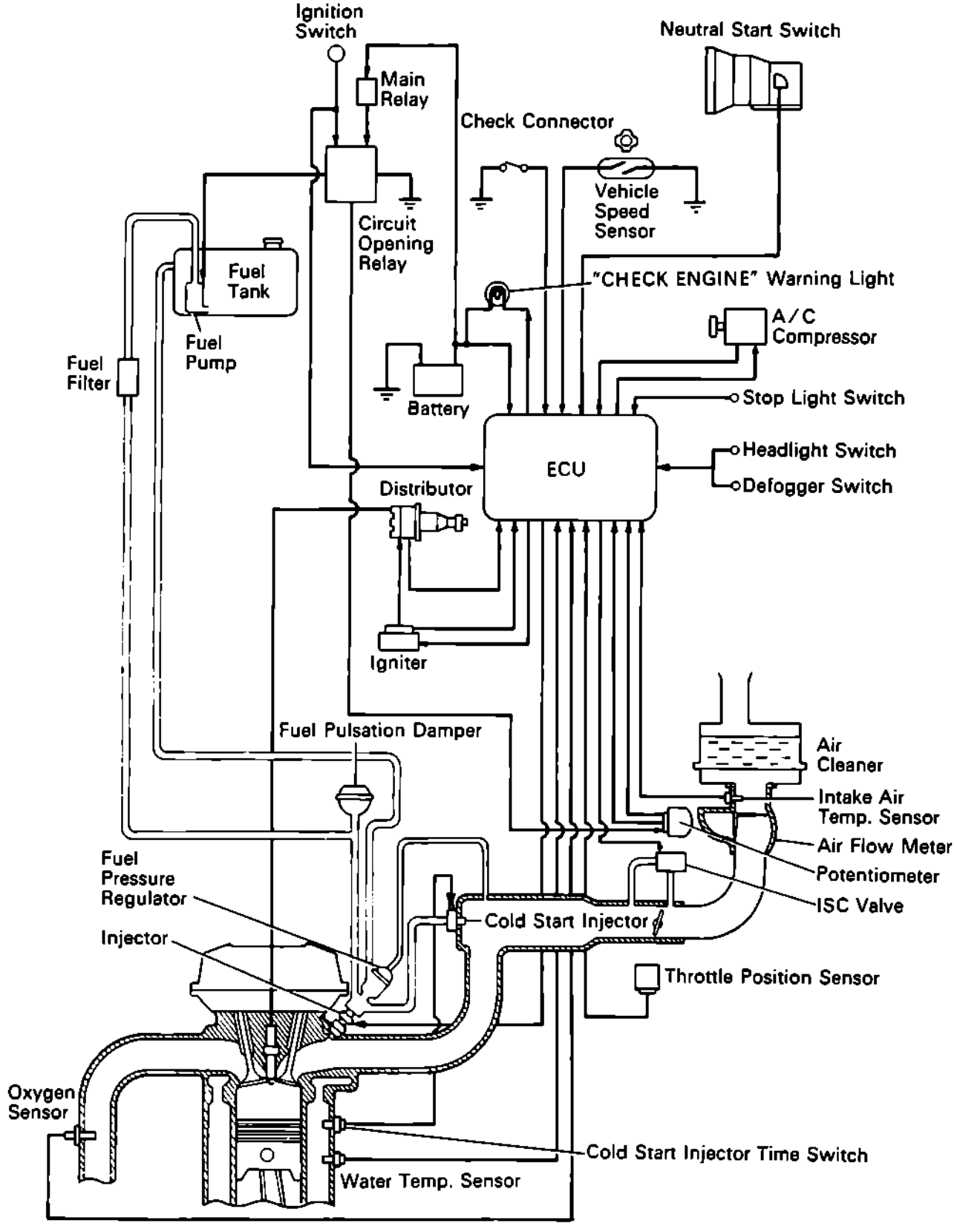
Ignition Switch
The ECU uses the signals from the ignition switch to detect the condition of the engine clanking.

Headlight and Defogger Switch
The ECU uses the signals from the headlight and defogger switch to detect the electric load.

Air Conditioner Switch
The ECU uses the output from the air conditioner switch to determine whether or not the air conditioner is operating so that it can increase the idling speed of the engine if necessary.

Neutral Start Switch
The ECU uses the signals from the neutral start switch to determine whether the transmission is in park or neutral, or in some other gear.

TCCS SYSTEM DIAGRAM



DIAGNOSTIC SYSTEM

GENERAL

The ECU contains a built-in self-diagnostic system.

The ECU, which constantly monitors all sensors, light the "CHECK ENGINE" warning light when it detects a problem in a sensor or its circuitry. At the same time, the ECU stores the system containing the malfunction in its memory. This information is retained in memory after the ignition switch is turned off, and even after the malfunction has been corrected. When the vehicle requires service because of a problem in the TCCS system, the contents of the memory may be checked to identify the malfunction. After the problem is repaired, the diagnostic system is cleared by removing the EFI fuse with the ignition switch off.

"CHECK ENGINE" WARNING LIGHT

The diagnostic system monitors 14 conditions, including the normal condition, listed in the chart on page 1-8, 9. Whenever a malfunction is detected in any one of the systems marked with ON in the "CHECK ENGINE" warning light column, the ECU lights the "CHECK ENGINE" warning light to alert the driver that it has detected a malfunction in the engine. For all of the systems marked with OFF in the "CHECK ENGINE" warning light column, the ECU does not light the "CHECK ENGINE" warning light when a malfunction is detected because a malfunction in those systems would not cause any major trouble such as engine stalling.

After the malfunction is corrected, the ECU turns off the "CHECK ENGINE" warning light, but the ECU memory retains a record of the system that contained the malfunction.

CHECK

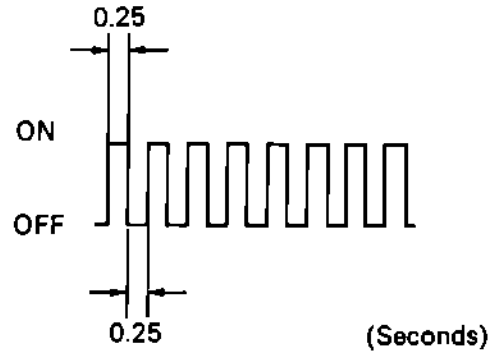
FI0534

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 light will alternately blink on and off for 0.25 second intervals.



AT0718

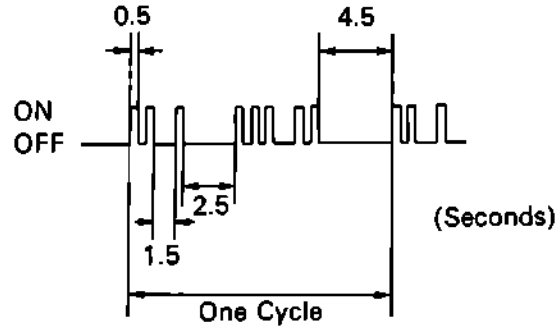
MALFUNCTION CODE INDICATION

In the event of a malfunction, the light will blink. The first number of code No. will equal the first digit of a 2-digit diagnostic code, and after a 1.5 second pause, the 2nd number of code No. will equal the 2nd digit. If there are two or more codes, there will be a 2.5 second pause between each.

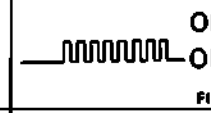
After all the codes have been output, there will be a 4.5 second pause and they will all be repeated.

NOTE: In the event of a number of trouble codes, indication will begin from the smaller value and continue to the larger in order.

Code No. 21 Code No. 32 Code No. 21



FI0524

Code No.	Number of "CHECK ENGINE" blinks	System	Diagnosis	Trouble area	"CHECK ENGINE" Warning Light
—	 ON OFF FI1401	Normal	This appears when none of the other codes (11 thru 51) are identified.	—	OFF
11	 FI1388	ECU (+B)	Momentary interruption in power supply to ECU.	1. IG switch circuit 2. IG Switch 3. Main relay circuit 4. Main relay 5. ECU	OFF
12	 FI1389	RPM signal	No Ne, G signal to ECU within several seconds after engine is cranked.	1. Distributor circuit 2. Distributor 3. Starter signal circuit 4. ECU	ON
13	 FI1391	RPM signal	No Ne signal to ECU within several seconds after engine reaches 1,000 rpm.	1. Distributor circuit 2. Distributor 3. ECU	ON
14	FI1400	Ignition signal	No IGf signal to ECU 4 ~ 5 times in succession.	1. Igniter and ignition coil circuit 2. Igniter and ignition coil 3. ECU	ON
21	FI1392	Oxygen sensor signal	When engine speed is above 1,500 rpm and coolant temp. is above 50°C for over two minutes, and also fuel is being injected under a heavy load, a lean signal is output for one second.	1. Oxygen sensor circuit 2. Oxygen sensor 3. ECU 4. Fuel system 5. Ignition system	ON
22	 FI1571	Water temp. sensor signal	Open or short circuit in water temp. sensor signal (THW).	1. Water temp. sensor circuit 2. Water temp. sensor 3. ECU	ON
24	 FI1394	Intake air temp. sensor signal	Open or short circuit in intake air temp. sensor signal (THA).	1. Intake air temp. sensor circuit 2. Intake air temp. sensor 3. ECU	OFF
31	 FI1395	Air flow meter signal	Vc circuit open or Vs – E_2 short circuit when idle contacts are closed.	1. Air flow meter circuit 2. Air flow meter 3. ECU	ON
32	 FI1396	Air flow meter signal	V_2 circuit open or Vc – Vs short circuited.	Same as Code No. 31	ON
41	FI1397	Throttle position sensor signal	[CELICA] IDL and PSW signals being output simultaneously for several seconds. [CAMRY] Open or short circuit in throttle position sensor signal.	1. Throttle position sensor circuit 2. Throttle position sensor 3. ECU	OFF
42	 FI1398	Vehicle speed sensor signal	No SPD signal for several seconds when engine speed is between 2,500 rpm and 5,500 rpm except when racing the engine.	1. Vehicle speed sensor circuit 2. Vehicle speed sensor 3. ECU	OFF

Code No.	Number of "CHECK ENGINE" blinks	System	Diagnosis	Trouble area	"CHECK ENGINE" Warning Light
43	 FI1398	Starter signal	No STA signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	1. Main relay circuit 2. Main relay 3. IG switch circuit (starter) 4. IG switch 5. ECU	OFF
51	 FI1399	Switch signal	Air conditioner switch ON, idle switch OFF or shift position other than P or N range during diagnosis check.	1. Air con. S/W circuit 2. Air con. S/W 3. Neutral start switch circuit 4. Neutral start switch 5. Throttle position sensor circuit 6. Throttle position sensor 7. Accelerator pedal and cable 8. ECU	OFF

NOTE:
1. *When 2 or more codes are indicated, the lowest number (code) will appear fist.*
2. *All detected diagnostic codes, except for code No. 51, will be retained in memory by the ECU from the time of detection until cancelled out.*
3. *Once the malfunction has been corrected, the "CHECK ENGINE" warning light on the instrument panel will go out, but the diagnostic codes, except for code No. 51, will remain stored in the ECU memory.*
4. *For the code numbers that have "OFF" in the"CHECK ENGINE" Warning Light column, the "CHECK ENGINE" warning light does not go on if the indicated malfunction occurs. However, the trouble codes, except for code No. 51, are still stored in the memory of the ECU.*
5. *When there is no code display (the light does not blink), the computer is faulty or open circuit in terminal T.*
6. *If the light stays on, the wire harness is shorted.*
7. *If a code not listed on the chart is displayed, then the ECU is faulty.*
8. *There is a case where code No. 43 is displayed when the vehicle (engine) is push started.*

GENERAL PRECAUTIONS

1. **Before working on the fuel system, disconnect the cable from negative (–) terminal of the battery.**

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

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

3. **Keep gasoline off rubber or leather parts.**

INSPECTION PRECAUTIONS

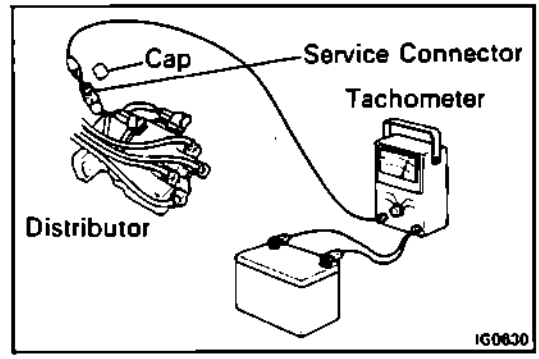
MAINTENANCE PRECAUTIONS

1. INSURE CORRECT ENGINE TUNE-UP

2. PRECAUTIONS WHEN CONNECTING GAUGE

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

(b) Connect the tachometer test probe to the service connector of the distributor.



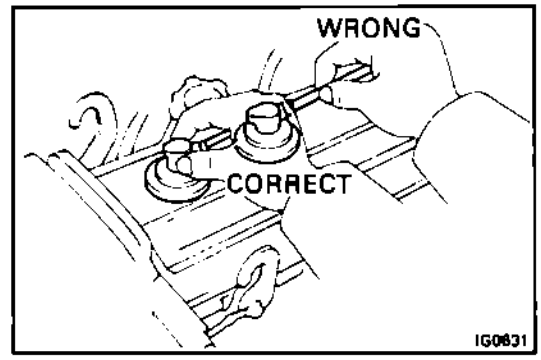
3. IN EVENT OF ENGINE MISFIRE THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN:

(a) Insure correct drive belt adjustment.

(b) Insure proper connection of the battery terminals, etc.

(c) Handle high-tension cords carefully.

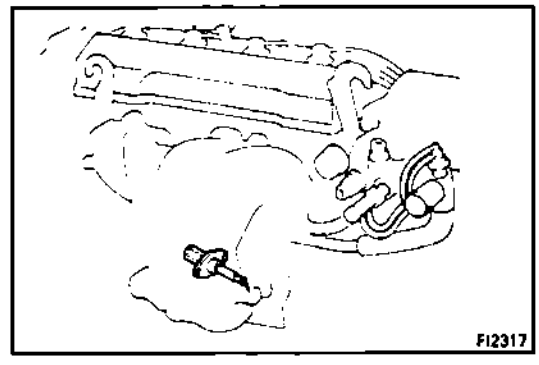
(d) After repair work, insure that the ignition coil terminals and all other ignition system lines are reconnected securely.
When cleaning the engine compartment, be especially careful to protect the electrical system from water.



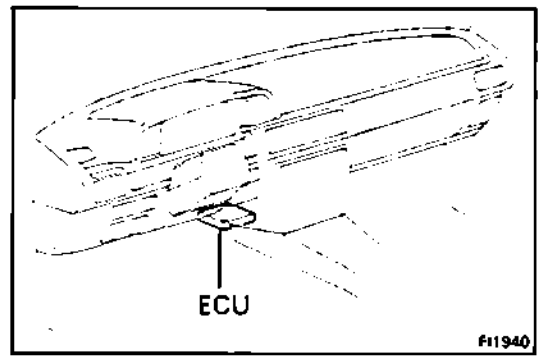
4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

(a) Do not allow oxygen sensor to drop or hit against an object.

(b) Do not allow water to come into contact with the sensor or attempt to cool it.



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.

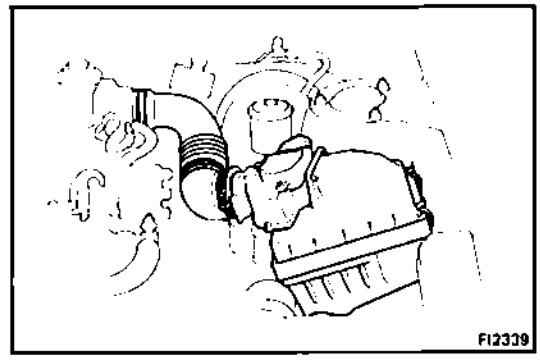
(a) Install the antenna as far as possible from the ECU located as shown.

(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.

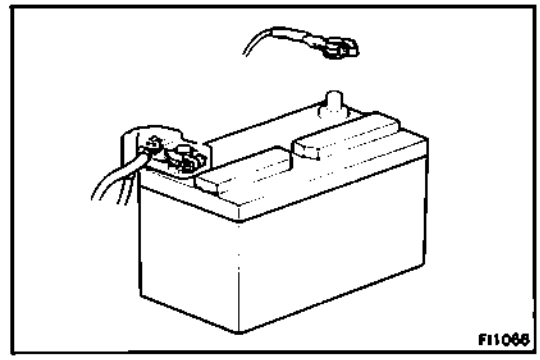
(d) Do not equip your vehicle with a powerful mobile radio system.

AIR INDUCTION SYSTEM



1. Separation of the engine oil level gauge, oil filler cap, PCV hoses, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cranks in the parts of the air induction system between the air flow meter and cylinder head will allow air suction and may cause the engine to run out of 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 installation. Handle all TCCS parts carefully and, in particular, the ECU.

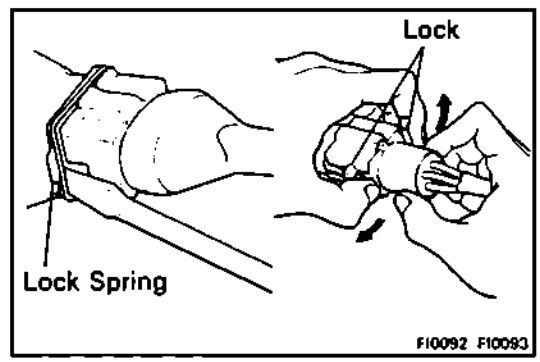
4. Do not be careless during troubleshooting as there are numerous electronic circuits and even slight terminal contact can cause further troubles.

5. Do not open the ECU cover.

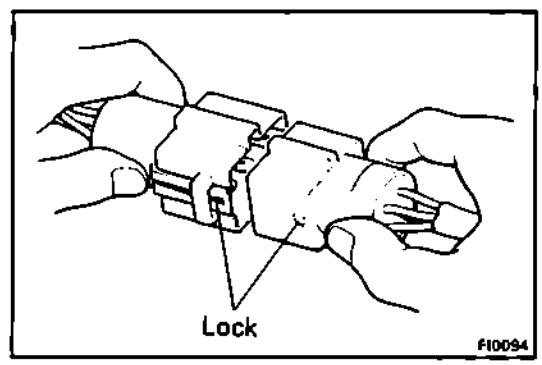
6. When inspecting during rainy weather, take care to prevent entry of moisture. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.

7. Parts should be replaced as an assembly.

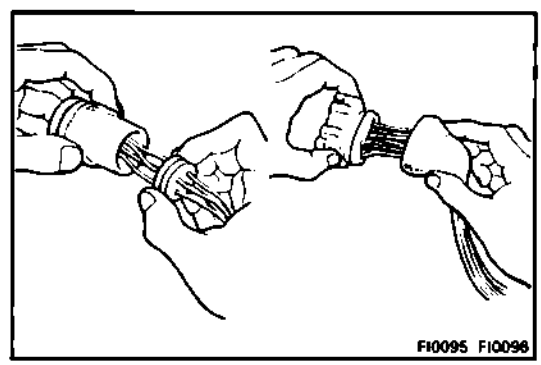
8. Sufficient care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector, pulling on the connector itself.



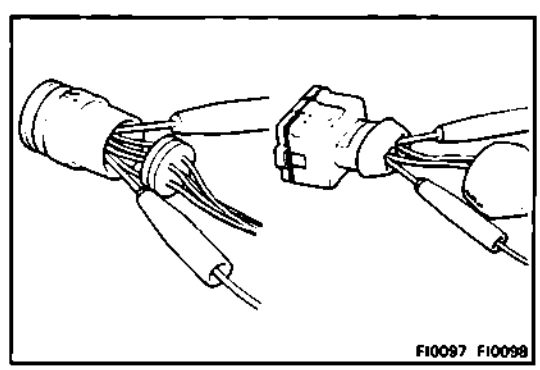
   (b) Fully insert the connector and insure that it is locked.



9. When inspecting a connector with a volt/ohmmeter.
   (a) Carefully take out the water-proofing rubber if it is a water-proof type connector.



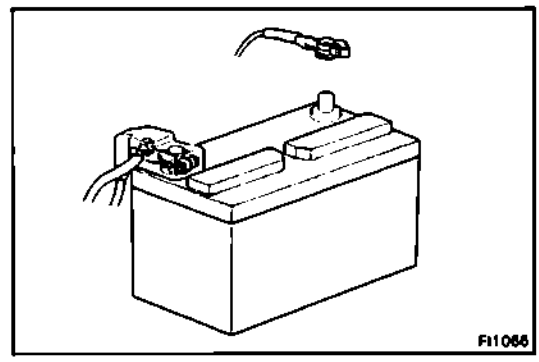
   (b) Insert the volt/ohmmeter probe into the connector from the wiring side when checking the continuity, amperage or voltage.
   (c) Do not apply unnecessary force to the terminal.
   (d) After checking, install the water-proofing rubber on the connector securely.



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.

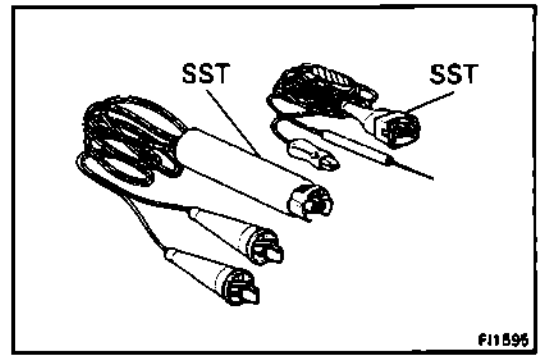


2. When working on the fuel system, do not smoke or work near any flame.

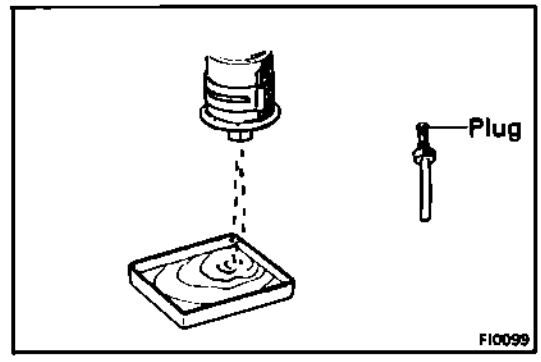
3. Keep gasoline off rubber or leather parts.

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

   SST 09842-30050 and 09842-30060



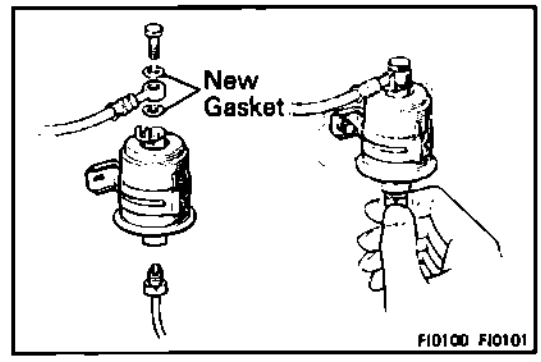
5. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline will come out so observe the following procedure:
   (a) Put a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.



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.

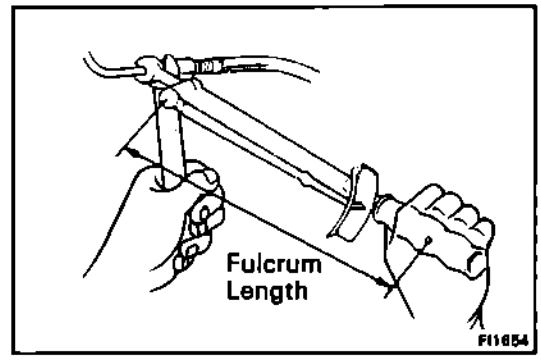
   Torque: 300 kg-cm (22 ft-lb, 29 N·m)



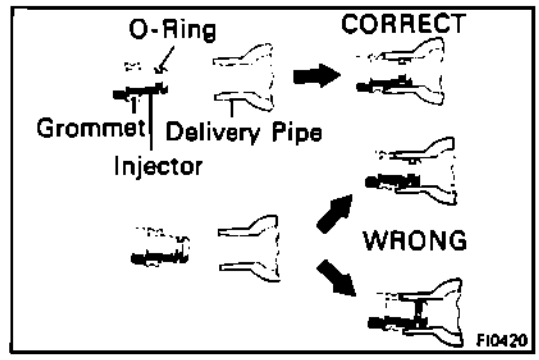
   [Flare nut type]
   (a) Apply a thin coat of oil to the flare and first tighten the flare nut by hand.
   (b) Then tighten the nut to the specified torque.

   Torque: 310 kg-cm (22 ft-lb, 30 N·m)

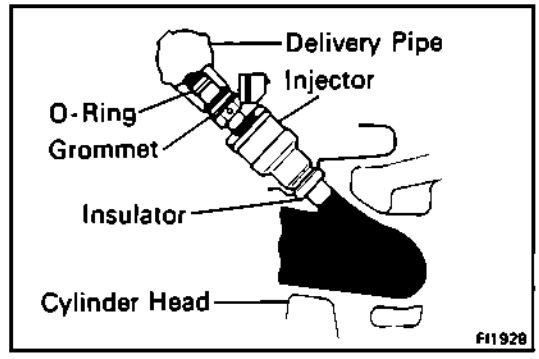
   NOTE: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).



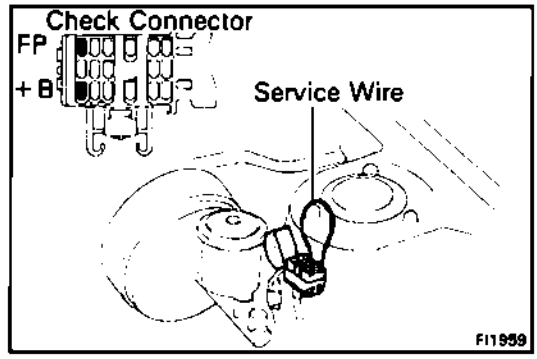
7. Observe the following precautions when removing and installing the injectors:
   (a) Never reuse the O-ring.
   (b) When placing a new O-ring on the injector, take care not to damage it in any way.
   (c) Coat a new O-ring with spindle oil or gasoline before installing – never use engine, gear or brake oil.



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

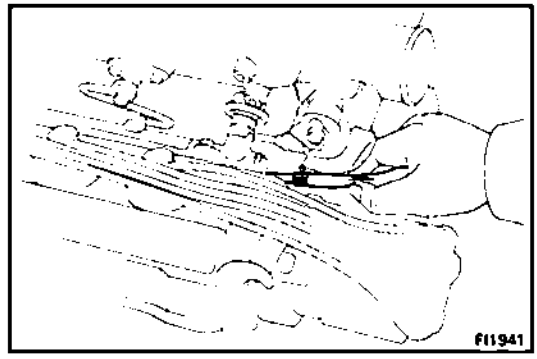


9. Check that there are no fuel leaks after performing any maintenance on the fuel system.
   (a) With engine stopped, turn the ignition switch ON.
   (b) Using a service wire, short terminals +B and FP of the check connector.



   (c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 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.

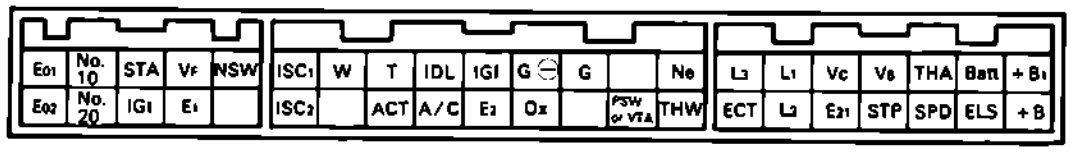
CAUTION: Always pinch the hose. Avoid bending as it may cause the hose to crack.



ECU CONNECTORS

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	*1 ACT	A/C AMPLIFIER	*1 L1	ECU ECT
E02	POWER GROUND	IDL	THROTTLE POSITION SENSOR	*1 L2	ECU ECT
No. 10	INJECTOR	A/C	A/C MAGNET SWITCH	Vc	*3 AIR FLOW METER THROTTLE POSITION SENSOR
No. 20	INJECTOR	IGf	IGNITER	E21	SENSOR GROUND
STA	STARTER SWITCH	E2	SENSOR GROUND	Vs	AIR FLOW METER
IGt	IGNITER	G ⊖	DISTRIBUTOR	STP	STOP LIGHT SWITCH
VF	CHECK CONNECTOR	Ox	OXYGEN SENSOR	THA	AIR TEMP. SENSOR
E1	SENSOR GROUND	G	DISTRIBUTOR	SPD	SPEED SENSOR
NSW	NEUTRAL START SWITCH	*2 PSW or VTA	THROTTLE POSITION SENSOR	Batt	BATTERY
ISC1	ISC VALVE	Ne	DISTRIBUTOR	ELS	HEADLIGHT and DEFOGGER
ISC2	ISC VALVE	THW	WATER TEMP. SENSOR	+B1	MAIN RELAY
W	WARNING LIGHT	*1 L3	ECU ECT	+B	MAIN RELAY
T	CHECK CONNECTOR	*1 ECT	ECU ECT		

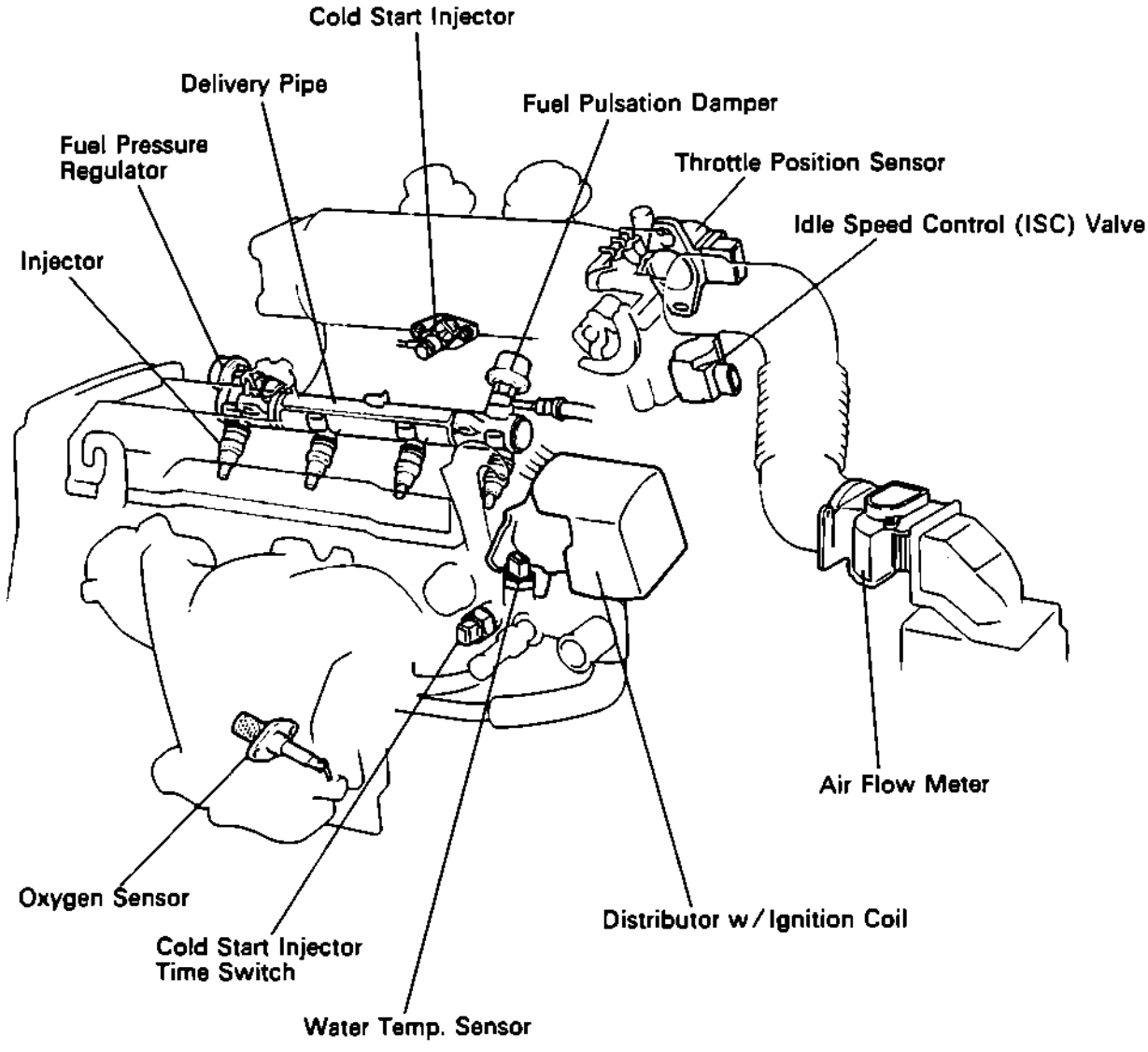
ECU Terminals



*1 CAMRY only
*2 PSW: CELICA, VTA: CAMRY
*3 Throttle Position Sensor: CAMRY only

FI0605

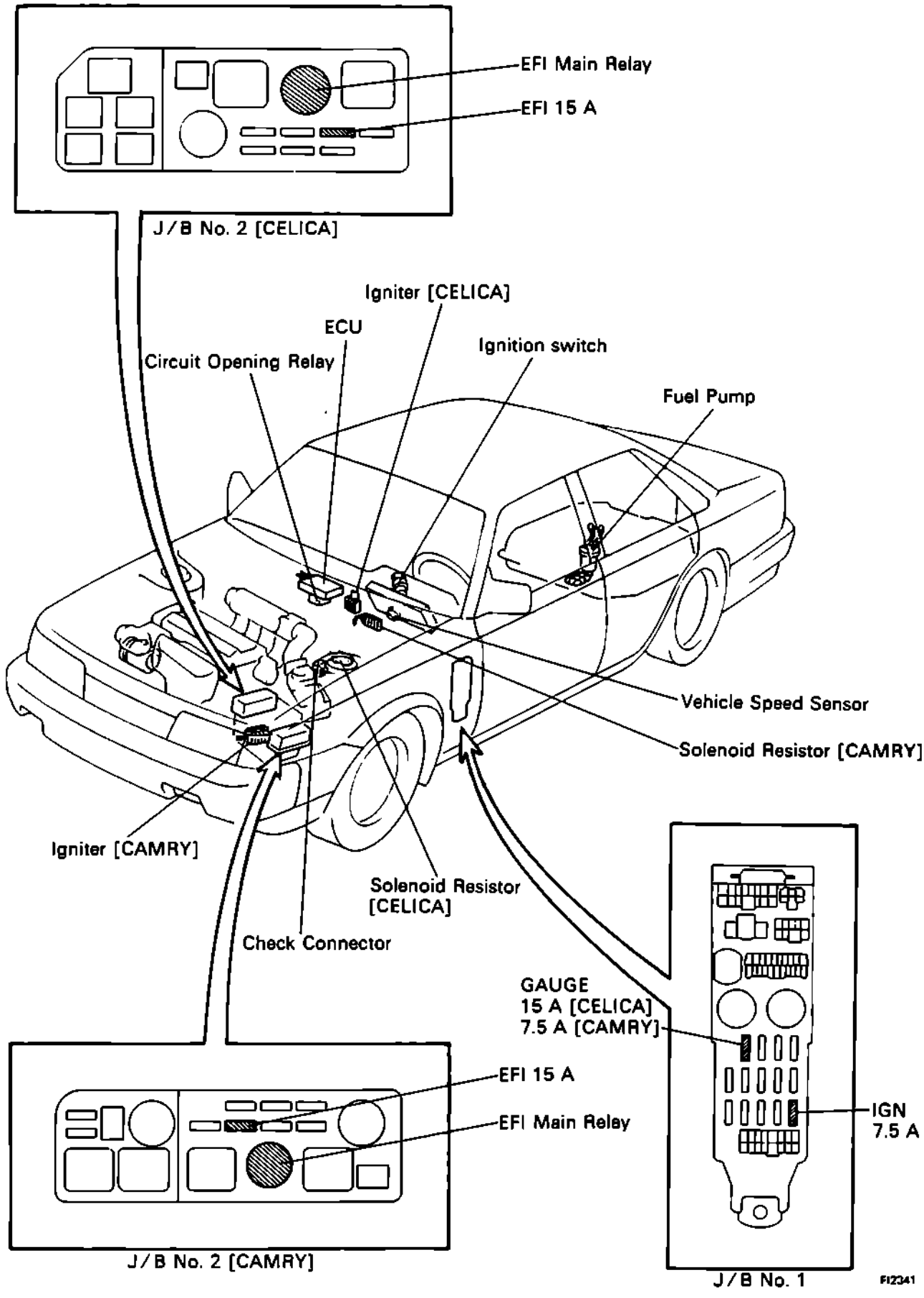
SYSTEM LAYOUT — 3S-FE ENGINE



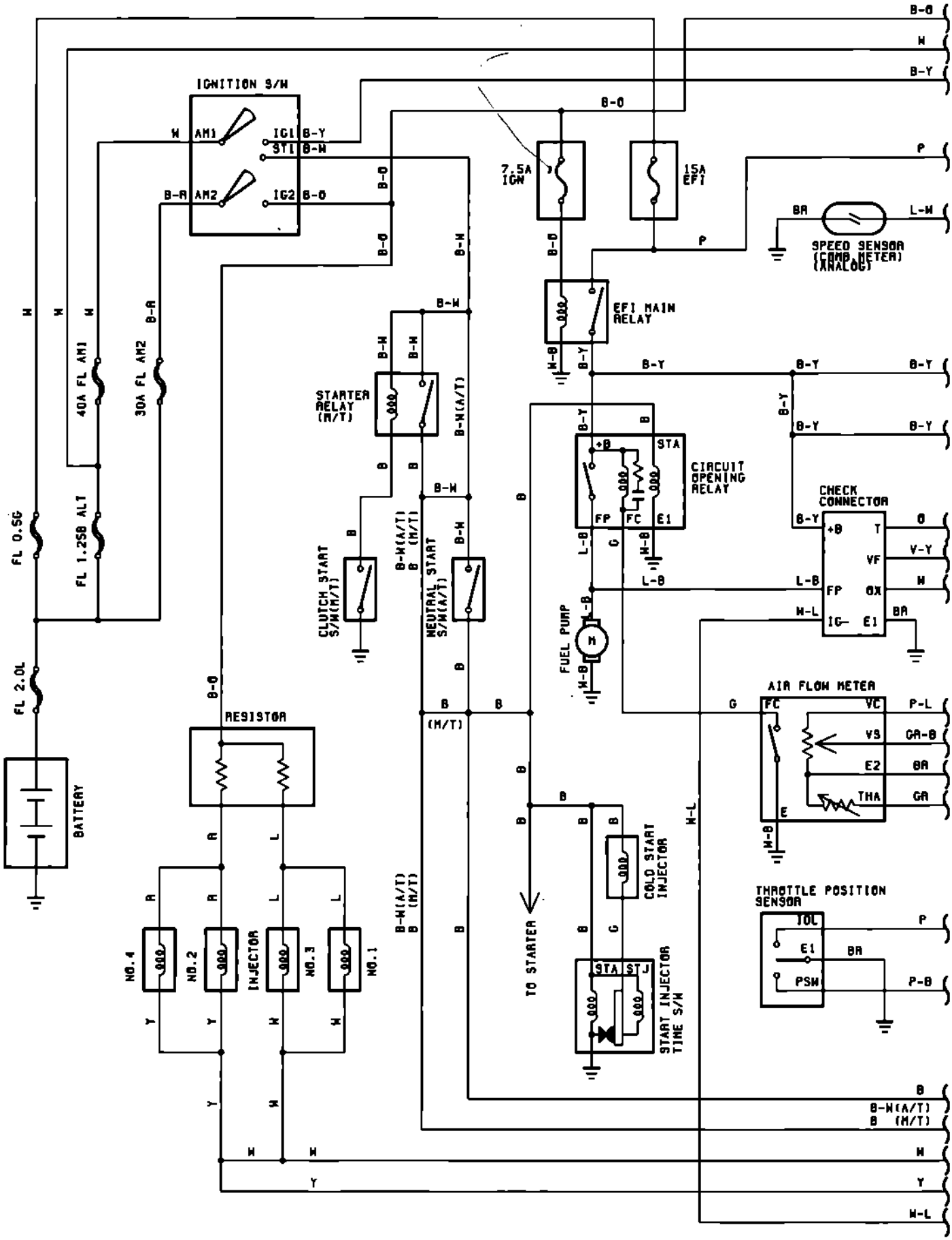
FI2340

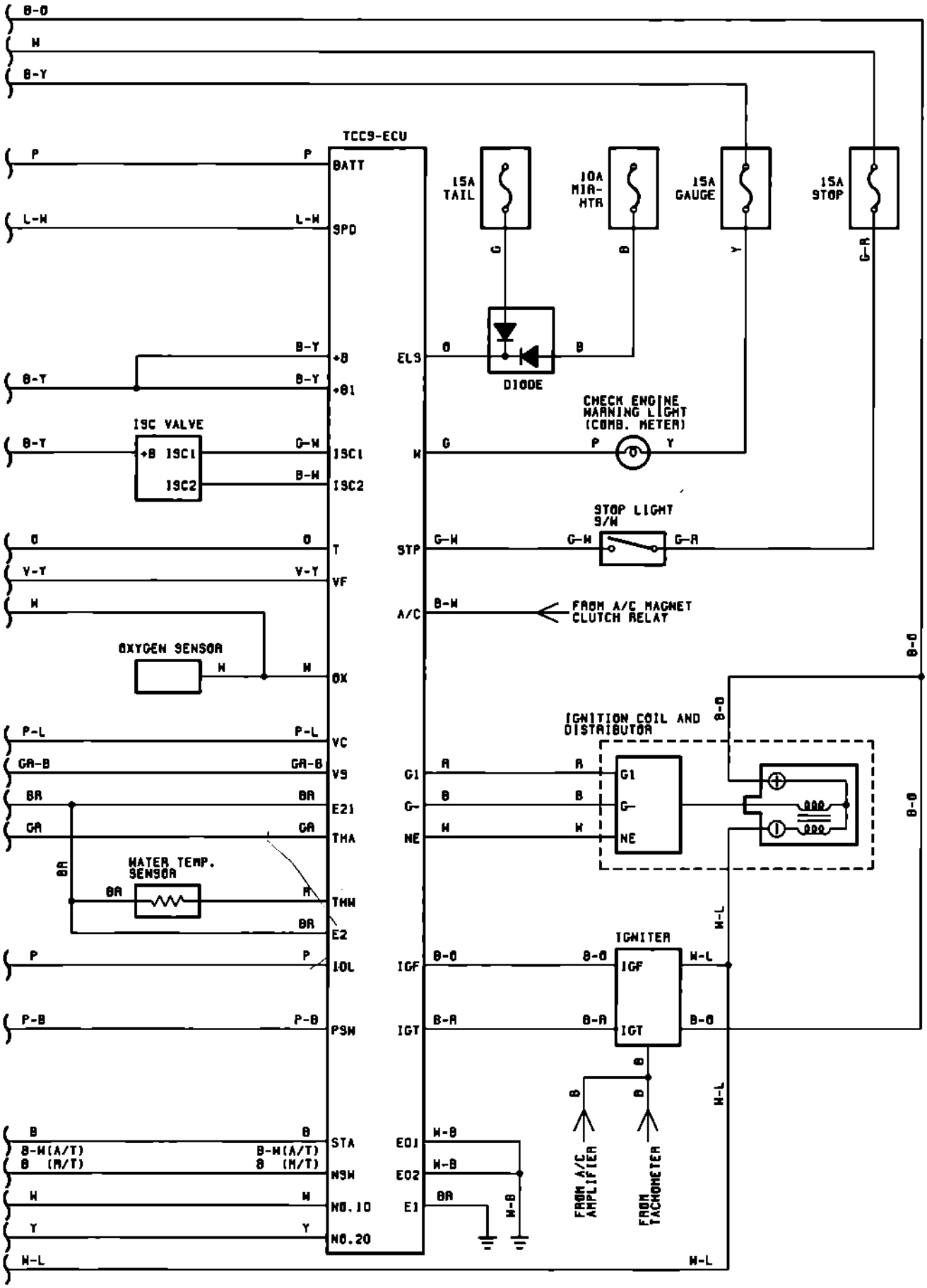
SYSTEM LAYOUT – CELICA, CAMRY

(The external appearance shown below is for the CAMRY)

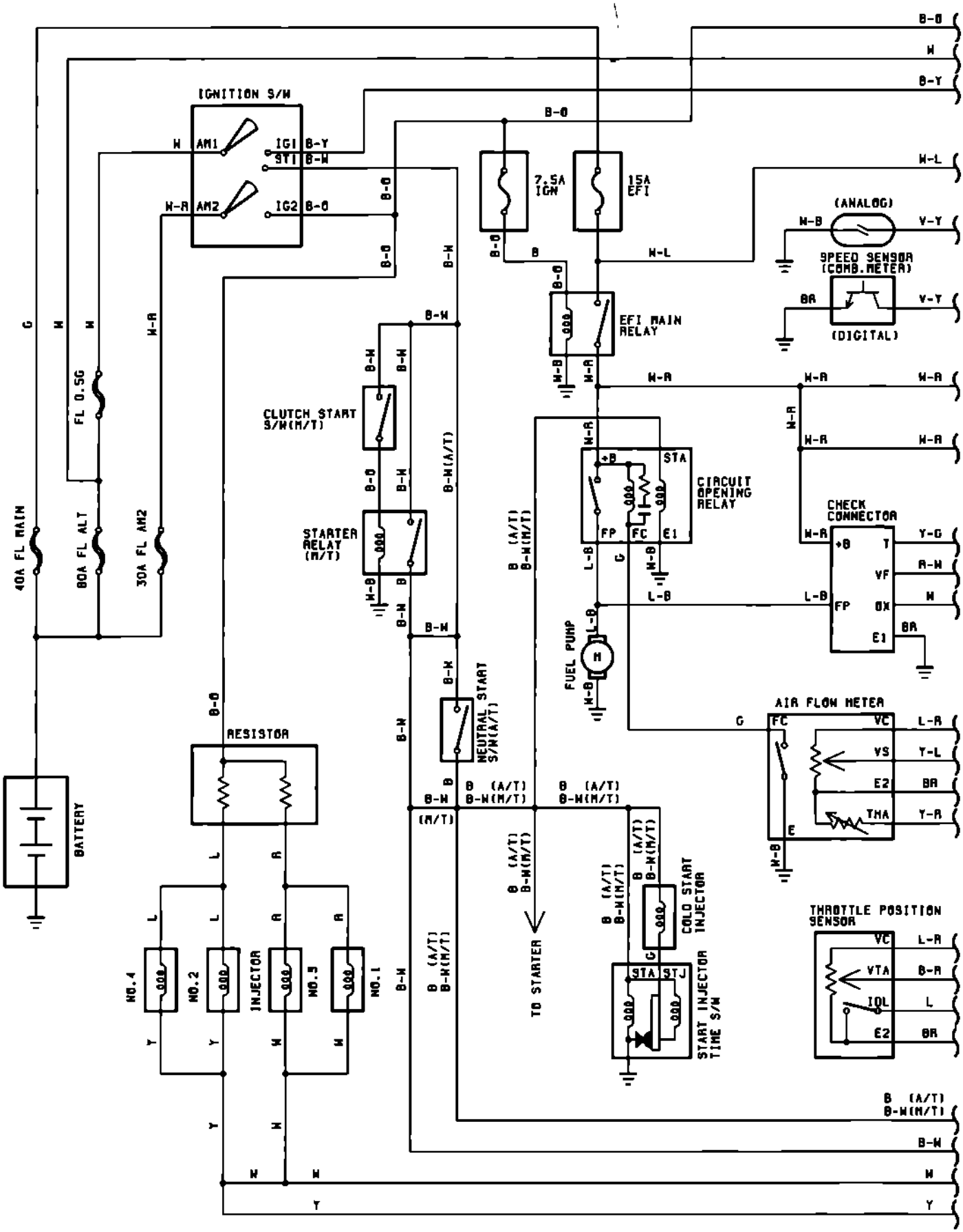


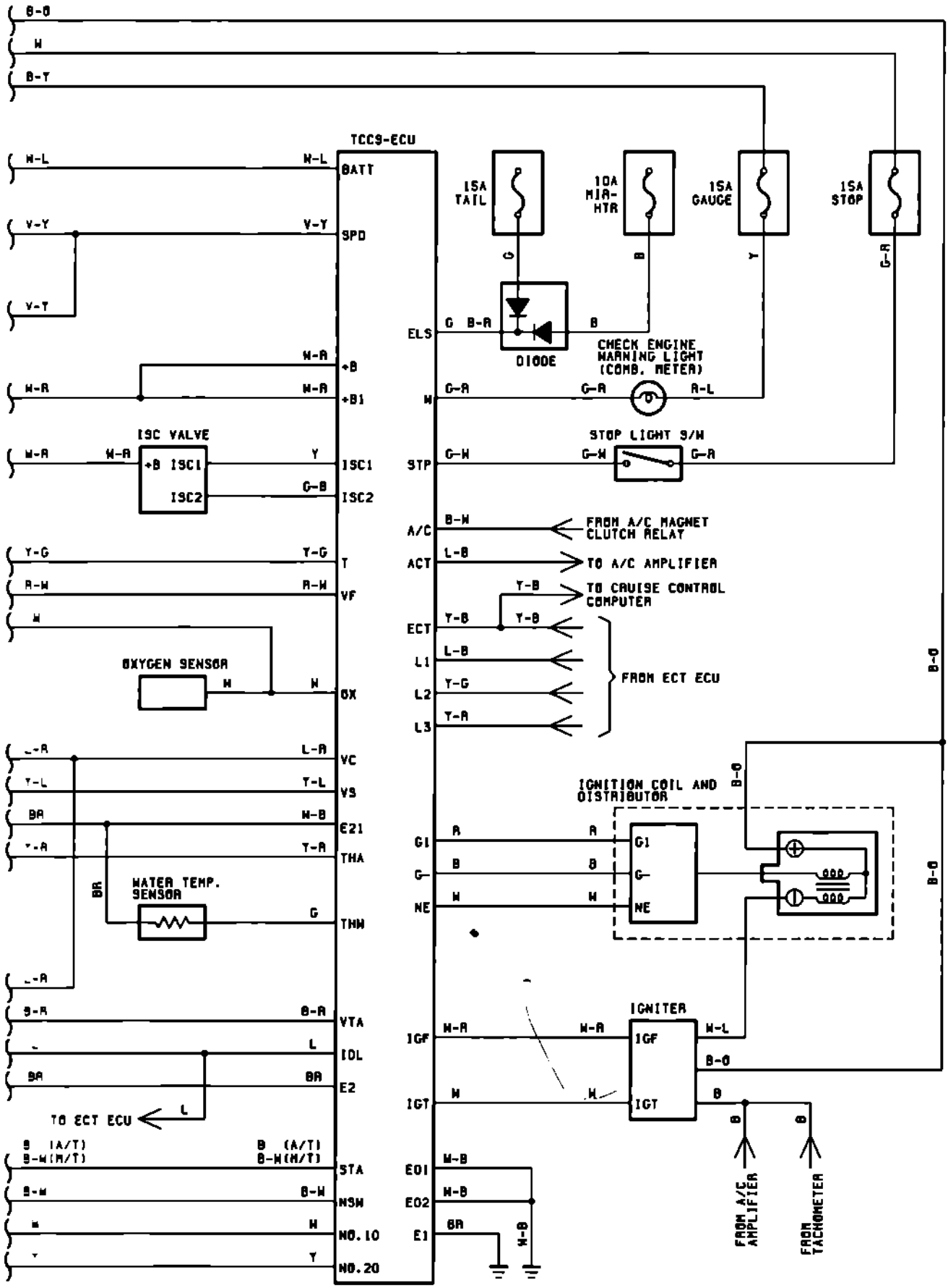
WIRING DIAGRAM – CELICA




B-O
W
B-Y
TCCS-ECU
P
BATT
L-W
SPD
B-Y
+B
B-Y
+B1
B-Y
ISC VALVE
+B ISC1
ISC2
G-W
ISC1
B-W
ISC2
O
T
V-Y
VF
W
OXYGEN SENSOR
W
OX
P-L
VC
GR-B
VS
BR
E21
GR
THA
BR
WATER TEMP. SENSOR
R
THW
BR
E2
P
IOL
P-B
PSW
B
STA
B-W(A/T)
B (M/T)
NSW
W
NO.10
Y
NO.20
W-L
15A TAIL
10A MIR-HTR
15A GAUGE
15A STOP
G
B
Y
G-R
ELS
DIODE
CHECK ENGINE WARNING LIGHT (COMB. METER)
STOP LIGHT S/W
STP
A/C
FROM A/C MAGNET CLUTCH RELAY
IGNITION COIL AND DISTRIBUTOR
G1
G-
NE
IGNITER
IGF
IGT
EO1
EO2
E1
FROM A/C AMPLIFIER
FROM TACHOMETER

WIRING DIAGRAM — CAMRY




B-O
W
B-Y
TCCS-ECU
W-L
BATT
V-Y
SPD
V-Y
W-R
+B
W-R
+B1
ISC VALVE
W-R
W-R
+B ISC1
ISC2
Y
G-B
ISC1
ISC2
Y-G
T
R-W
VF
W
OXYGEN SENSOR
W
OX
L-R
VC
Y-L
VS
BR
W-B
E21
Y-R
THA
BR
WATER TEMP. SENSOR
G
THW
L-R
B-R
VTA
L
IDL
BR
E2
TO ECT ECU
L
B (A/T)
B-W(M/T)
B (A/T)
B-W(M/T)
STA
B-W
NSW
W
NO.10
Y
NO.20
1SA TAIL
10A MIR-HTR
1SA GAUGE
1SA STOP
G
B
Y
G-R
ELS
G B-R
B
DIODE
CHECK ENGINE WARNING LIGHT (COMB. METER)
W
G-R
G-R
R-L
STOP LIGHT S/W
STP
G-W
G-W
G-R
A/C
B-W
FROM A/C MAGNET CLUTCH RELAY
ACT
L-B
TO A/C AMPLIFIER
Y-B
TO CRUISE CONTROL COMPUTER
ECT
Y-B
Y-B
L1
L-B
L2
Y-G
L3
Y-R
FROM ECT ECU
IGNITION COIL AND DISTRIBUTOR
G1
A
A
G-
B
B
NE
W
W
G1
G-
NE
IGNITER
IGF
W-R
W-R
IGF
W-L
IGT
W
W
IGT
B
B-O
B-O
B-O
B
B
FROM A/C AMPLIFIER
FROM TACHOMETER
E01
W-B
E02
W-B
E1
BR
W-B

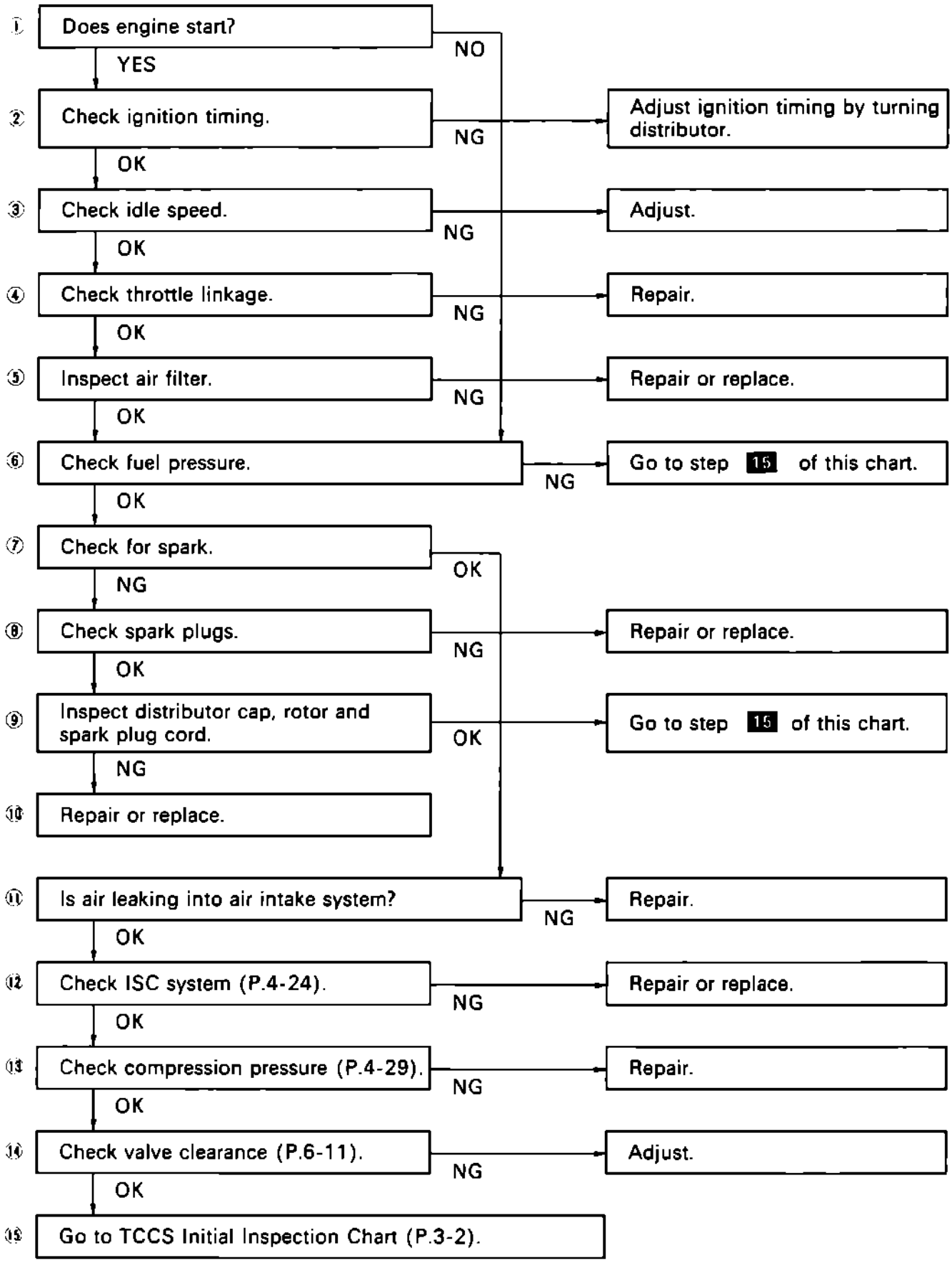
BASIC ENGINE INSPECTION CHART

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.

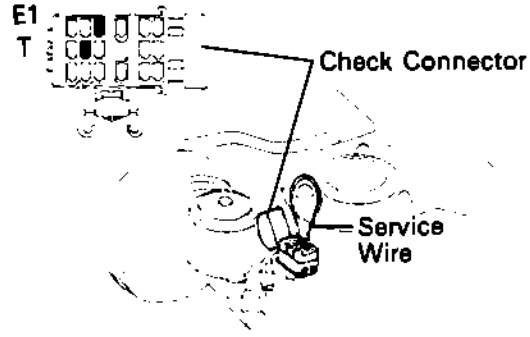
You should begin all troubleshooting at step 1 of this chart regardless of the symptom.

BASIC ENGINE INSPECTION CHART



1	Does engine start?	NO	Go to step 6 of this chart.
2	Check ignition timing.	NG	Adjust ignition timing by turning distributor.

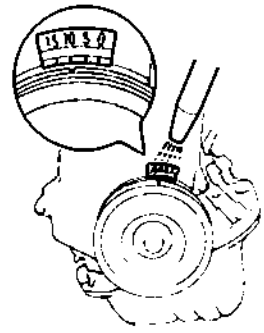
C (a) Engine at normal operating temperature.
(b) Connect the timing light to the engine.
(c) Engine idling.
(d) Using a service wire, short the terminals T – E1 of the check connector.



P Check the ignition timing using a timing light.

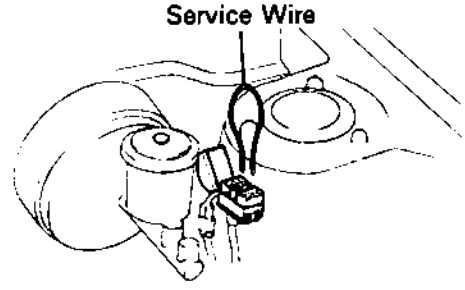
OK Ignition timing = 10° BTDC @ idle

N Transmission in "N" range.



Further check

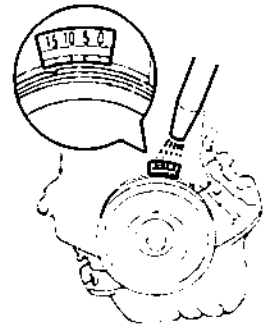
C Unshort the terminals T – E1 of the check connector.



P Check that the ignition timing advances using a timing light.

OK Ignition timing = 13 – 22° BTDC @ idle
The timing mark moves in a range between 13° and 22°.

N Transmission in "N" range.



FI1960
EM2047
FI1968
IG0428

BASIC ENGINE INSPECTION CHART

3 **Check idle speed.**

C (a) Engine at normal operating temperature.
(b) All accessories switched off.
(c) Air conditioner switched off.
(d) Transmission in "N" range.
(e) Connect the tachometer to the engine.

(f) Race the engine at 2,500 rpm for about 90 seconds.
(g) Using a service wire, short terminals T and E1 of the check connector.

P Check the idle speed.

OK Idle speed = 650 rpm or more (Cooling fan OFF)
Idle is stable.

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

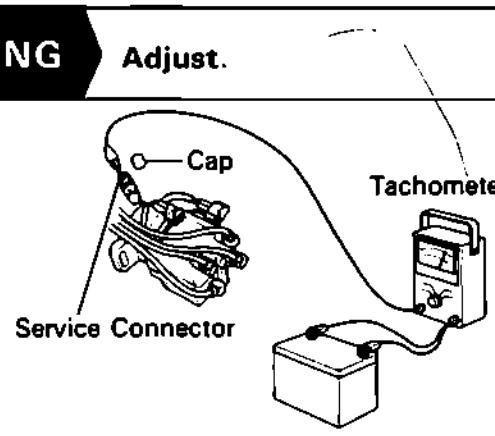
Further check

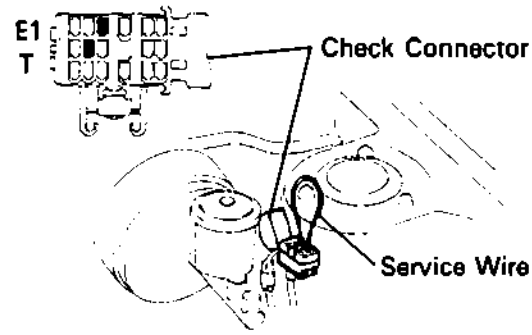
If the idle speed is not within these values, carry out either of the belowlisted procedures and then recheck the idle speed.
Carry out a driving test, including stop-go several times at a speed above 10 km/h, or start the engine, idle for 30 seconds and then turn the engine off repeatedly. By doing this, idle data will be stored in the ISC and the idle rpm will be at specified value.

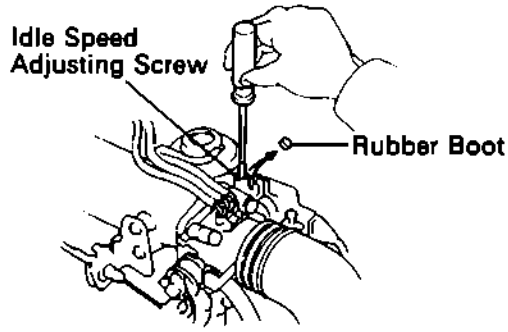
C Unshort the terminals T – E1 of the check connector.

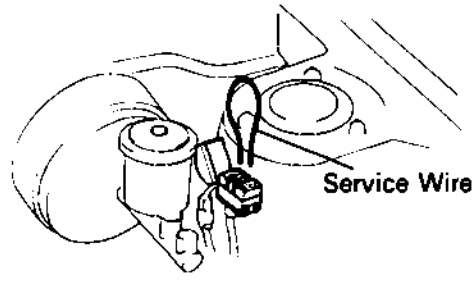
OK Idle speed = 700 ± 50 rpm (Cooling fan OFF)

NG **Adjust.**







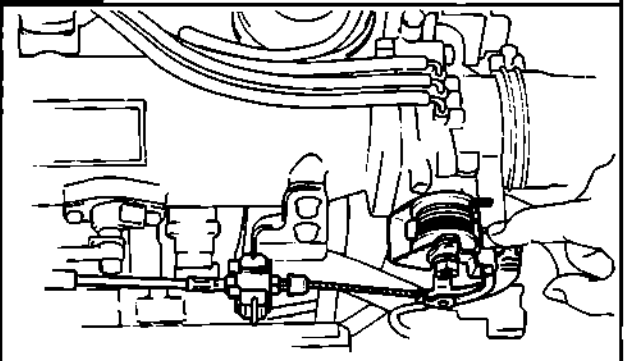


IG0630
FI1980
EM3270
FI1988

4 **Check throttle linkage.**

NG Repair.

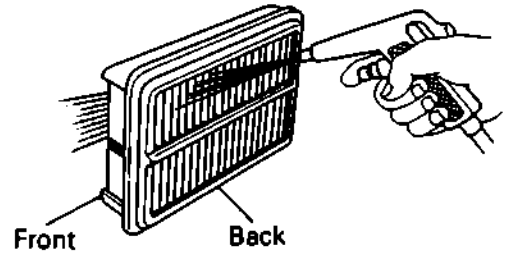
P (a) Check that the throttle linkage moves smoothly.
(b) Make sure that the throttle valve both fully opens and fully closes.



5 **Inspect air filter.**

NG Repair or replace.

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

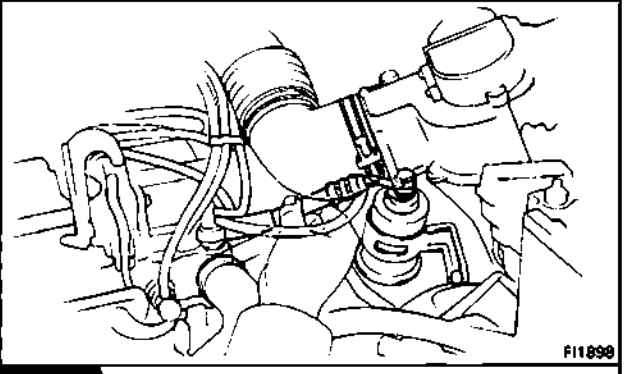


6 **Check fuel pressure.**

NG Go to step **15** of this chart.

C During engine cranking.

P Pinch the flexible hose running between the fuel filter and pulsation damper with your fingers and see if there is any pressure.



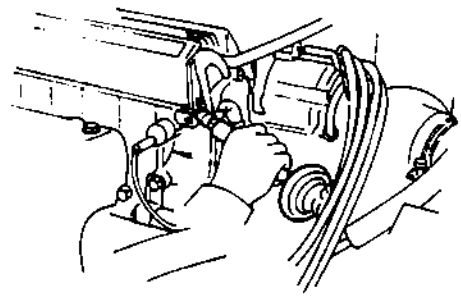
7 **Check for spark.**

OK Go to step **11** of this chart.

C (a) Disconnect the spark plug cord.
(b) Using a plug wrench, remove the spark plug.
(c) Connect the spark plug and spark plug cord.
(d) Ground the spark plug ground electrode.

P Check the spark while the engine is being cranked.

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



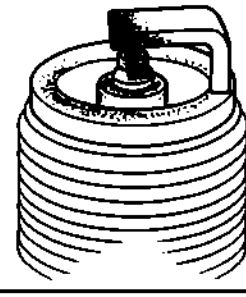
BASIC ENGINE INSPECTION CHART

8 **Check spark plugs.** — **NG** **Repair or replace.**

C Remove the spark plugs.

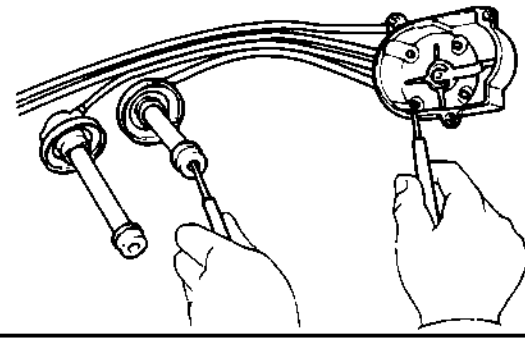
P Check clearance of the spark plug gap, and check end of the plug for fouling, etc.

N Regardless of whether or not a plug seems normal in other ways, if it is either partially or completely fouled, air-fuel mixture is probably too rich.


IG0148

9 **Inspect distributor cap, rotor and spark plug cord.** — **OK** **Go to step 15 of this chart.**

C Remove the distributor cap.
(a) Check the distributor cap and rotor for cranks, carbon tracks, or corroded terminals.
(b) Check the distributor center contact for wear.
(c) Check the cord terminals for corrosion, breaks, or distortion.
(d) Using a ohmmeter, check that resistance of the cord does not exceed maximum. Replace the cord as required.
Maximum resistance: 25kΩ per cord

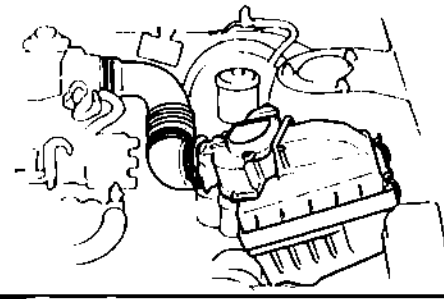

IF0632

10 **Repair or replace.**

11 **Is air leaking into air intake system?** — **NG** **Repair.**

N Loose or missing engine oil dipstick, oil filler cap, PCV hose, etc., can allow air to leak into the air intake system, causing mixture to become too lean.

OK No air leaking into air intake system between the air flow meter and cylinder head.


FI2339

12 **Check ISC system (P4-24).** — **NG** **Repair or replace.**

13 **Check compression pressure (P.4-29).** — **NG** **Repair.**

14 **Check valve clearance (P.6-11).** — **NG** **Adjust.**

15 **Go to TCCS Initial Inspection Chart (P.3-2).**

N If problem continues even after all 14 teps of Basic Engine Inspection Chart have been completed, go to TCCS Initial Inspection Charts.

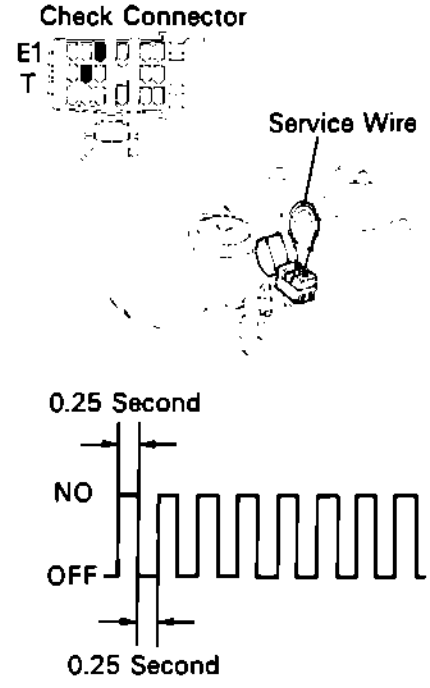
TCCS INITIAL INSPECTION AND SYMPTOM CHARTS

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

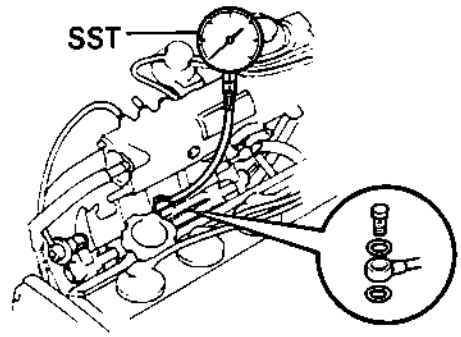
1	**Does "CHECK ENGINE" warning light come on?**	**NO**	**Go to Chart 1 (P.4-2).**
C	Battery voltage above 11 volts.		
P	Turn the ignition switch to ON. Do not start the engine.		
OK	"CHECK ENGINE" warning light comes on.		 CHECK FI0534
2	**Is normal code output?**	**NO**	**Go to Chart 2 (P.4-5).**
C	(a) Throttle valve fully closed (throttle position sensor IDL contacts closed). (b) Transmission in P or N range. (c) Air conditioner OFF.		
P	(a) Using a service wire, short the terminals T – E1 of the check connector. (b) Turn the ignition switch to ON. Do not start the engine. (c) Count number of times "CHECK ENGINE" warning light blinks.		 FI1960 AT0716
OK	The light will alternately blink on and off for 0.25 second intervals.		

3 Check fuel pressure.

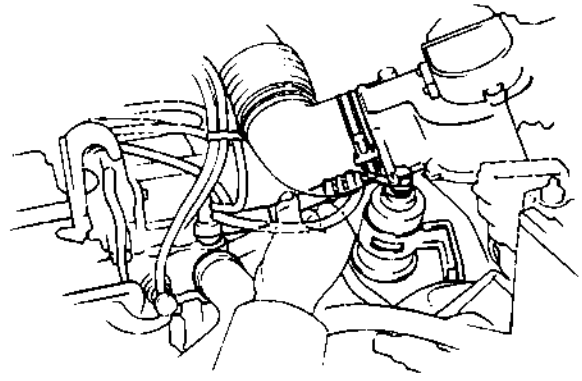
NG Go to Chart 4 (P.4-11).

C (a) Enough fuel in tank.
(b) Hook up the fuel pressure gauge (SST 09268-45011) as explained in page 6-16.

P Note fuel pressure under following conditions:
(a) During engine cranking.
(b) When the engine is quickly raced from idle to 5,000 rpm.
(c) When the engine is idling.



OK (a), (b) Fuel pressure = 2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)
(c) Fuel pressure = 2.3 – 2.6 kg/cm² (33 – 37 psi, 226 – 265 kPa)



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

FI1874
FI1896

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

N If problem continues even after all 14 steps of the 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.

Symptom / Reference (page) / System			Does not start		Difficult to start			Poor idling		
			No initial combusion	No complete combusion	Cold	Hot	Ordinary	Incorrect fast idle	High engine idle speed	Low engine idle speed
Diagnosis code		1-7	12, 13, 14 51	11, 22, 31 32	22, 31 32	21	11, 43	22	22, 31, 32 42, 51	
Fuel system	Solenoid resistor	4-18	○	○						
	Injector	4-20	○	○			○			
	Fuel pump	4-11	○				○			○
	Fuel pressure regulator	4-11	○	○			○		○	○
	Fuel filter Fuel pipe line	4-11	○	○			○			○
Ignition system	Ignition coil Igniter	5-5	○							
Electric source	Circuit opening relay	4-11	○	○						
	EFI main relay	4-2 4-11	○	○			○			
Cold start system	Cold start injector	4-23	○	○	○	○	○			
	Cold start injector time switch	4-22	○	○	○	○	○			
Electronic control system	ECU	-	○	○	○	○	○	○	○	○
	Air flow meter	4-11 5-14		○	○				○	○
	Distributor	5-3 5-4	○							
	Water temp. sensor	5-12		○	○	○		○	○	○
	Throttle position sensor	5-16 5-18							○	
	Intake air temp. sensor	5-13								
	Vehicle speed sensor	5-20							○	○
	Oxygen sensor	5-8								
	Neutral start switch	5-22	○						○	○
	Starter switch	5-21					○			
Air induction system	Throttle body	-							○	○
	ISC valve	4-24		○			○	○	○	○
Other	EGR system	4-26		○			○			
	A/C idle-up system	-							○	○

Poor idling		Poor drivability						Engine stall			
Rough idle	Hunting	Hesitation	Backfires	Loss of power	Black smoking	Hunting	Knocking	Some time after starting	After acceleration pedal depressed	After acceleration pedal released	During A/C operation
11, 12, 13 14, 21, 31 32, 41	11, 21	14, 21 22, 31, 32	21	14,21,22 31,32,41	21, 31 32	12, 13, 21	31, 32	11, 21, 31 32	31, 32		
○											
○		○	○	○	○	○					
○		○	○	○				○			
○		○	○	○	○			○			
○		○	○	○		○		○			
○		○		○			○				
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○	○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○		○	○	○		
○						○	○				
		○	○	○	○		○	○			
○	○	○	○	○	○	○	○		○		
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											○

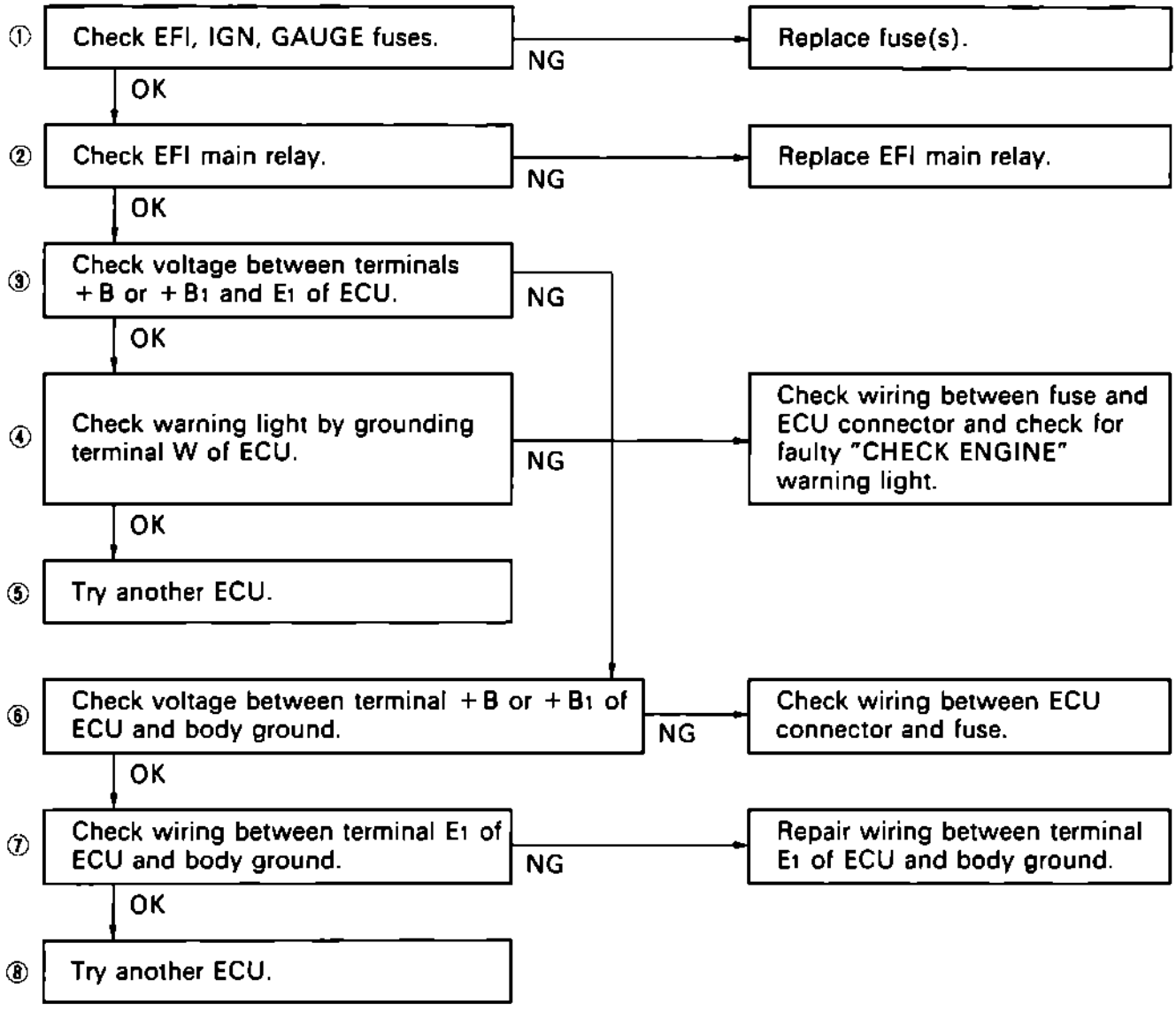
SYSTEM OR UNITS INSPECTION CHARTS

NOTE

The Fuel System Chart, etc., are used to determine whether or not the corresponding systems or parts are 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 Units Inspection Chart if necessary.

CHART 1 — No "CHECK ENGINE" warning light



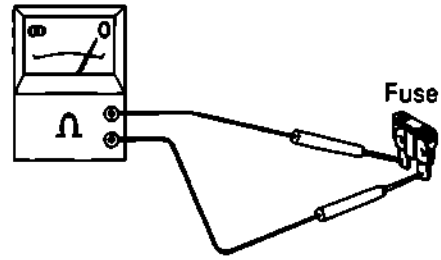
1 **Check EFI, IGN, GAUGE fuses.**

NG **Replace fuse(s).**

P Remove the fuses and measure their resistances using a tester.

OK Resistance = 0 Ω

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



FI0044

2 **Check EFI main relay.**

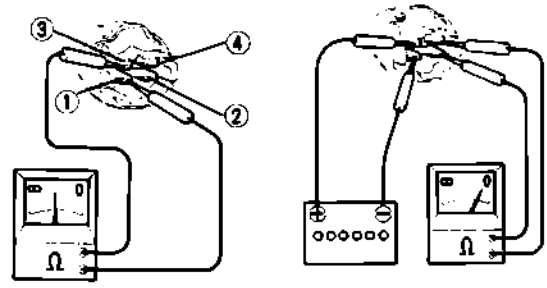
NG **Replace EFI main relay.**

C Remove the EFI main relay.

P Measure resistance between each of the terminals as follows:

(a) Between terminals 1 and 3.
(b) Between terminals 2 and 4 with battery power (regardless of polarity) going to terminals 1 and 3.

OK (a) Resistance = 60 – 90 Ω
(b) Resistance = 0 Ω



FI0120 FI0121

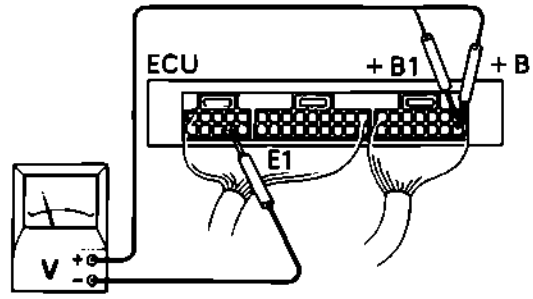
3 **Check voltage between terminals +B or +B1 and E1 of ECU.**

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

C Turn the ignition switch to ON.

P Measure voltage between terminals +B or +B1 and E1 of the ECU.

OK Voltage = Battery voltage



FI1245

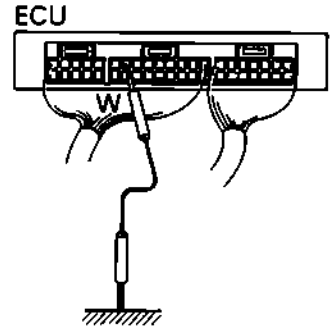
4 **Check warning light by grounding terminal W of ECU**

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

C Turn the ignition switch to ON.

P Using a service wire, ground ECU terminal W.

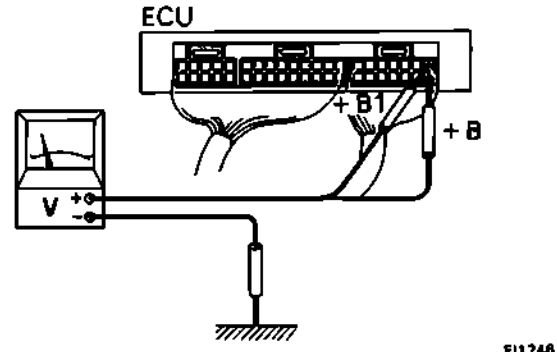
OK "CHECK ENGINE" warning light comes on.



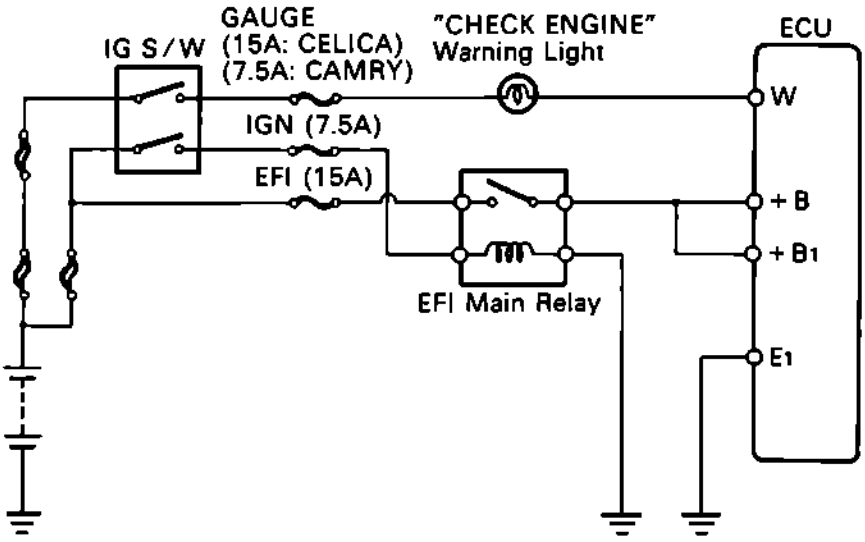
FI2311

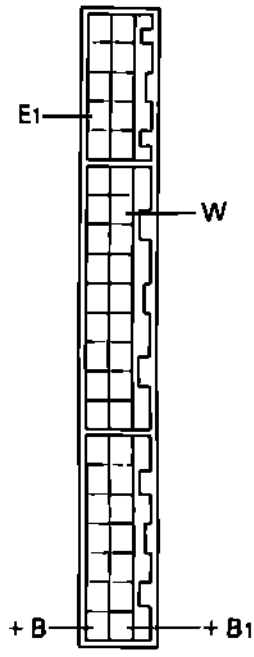
CHART 1 – No "CHECK ENGINE" warning light

5	**Try another ECU.**	**END**

6	**Check voltage between terminal +B or +B1 of ECU and body ground.**	**NG**	**Check wiring between ECU connector and fuse.**
C	Turn the ignition switch to ON.		
P	Measure voltage between ECU terminal +B or +B1 and body ground with voltmeter.		
OK	Voltage = Battery voltage		
7	**Check wiring between terminal E1 of ECU and body ground.**	**NG**	**Repair wiring between terminal E1 of ECU and body ground.**
8	**Try another ECU.**		**END**

FI1246





FI1465 FI2378

CHART 2 – Reading and confirming diagnostic codes

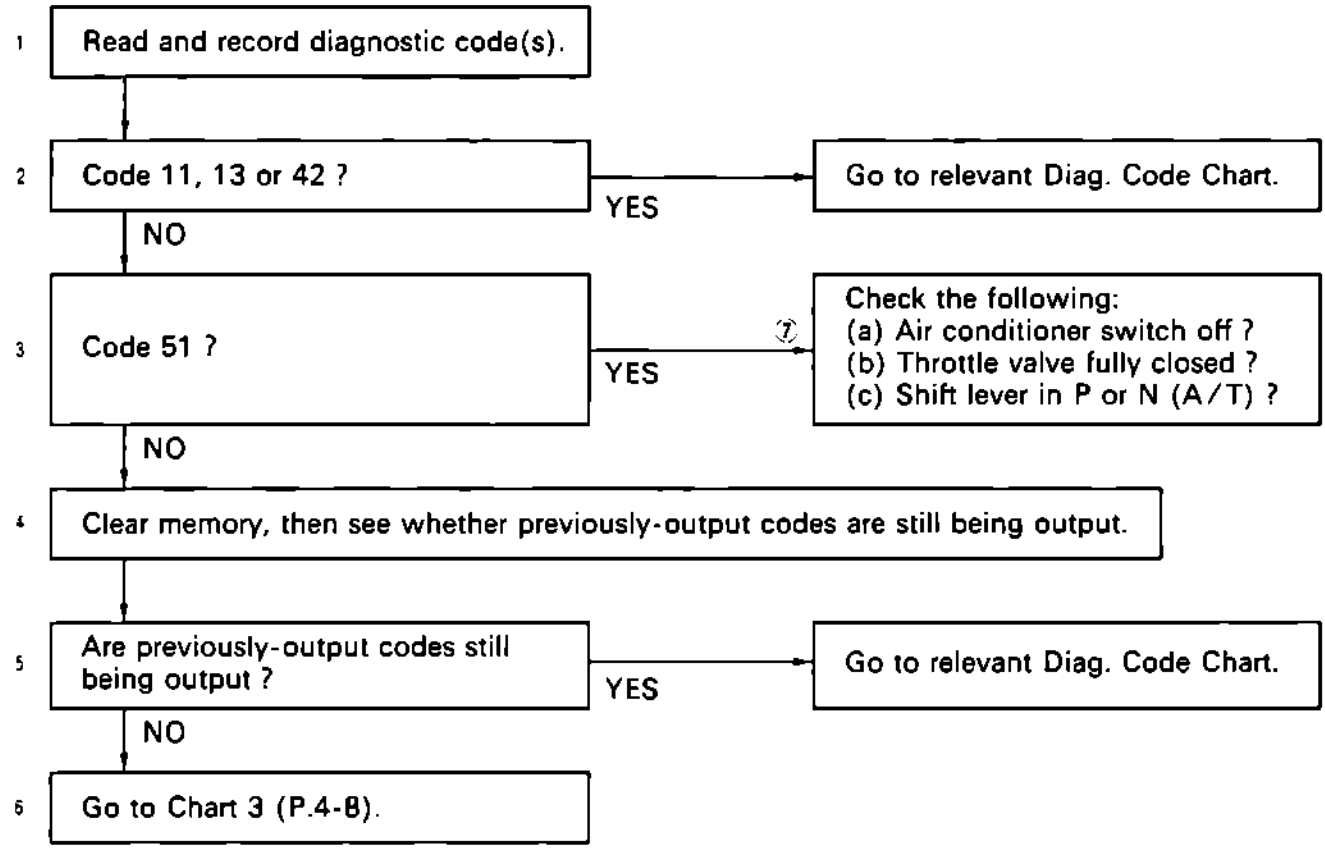


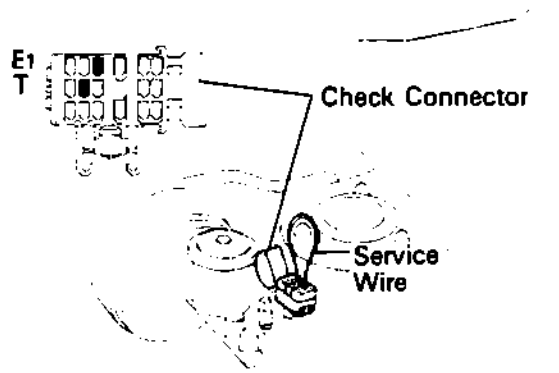
CHART 2 – Reading and confirming diagnostic codes

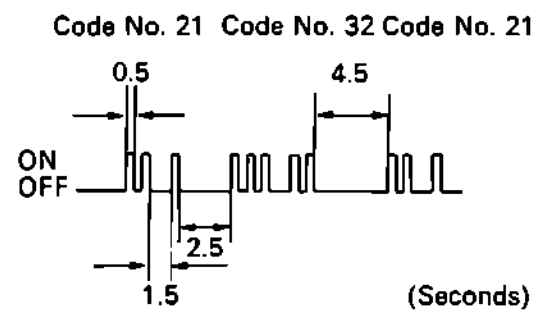
1 **Read and record diagnostic code(s).**

P (a) Using a service wire, short the terminals T–E1 of the check connector.
(b) Turn the ignition switch to ON. Do not start the engine.

(c) In the event of a malfunction, the light will blink once every 1 seconds. The first number of blinks will equal the first digit of a 2-digit diagnostic code, and after a 1.5 second pause, the 2nd number of blinks will equal the 2nd.
(d) If there are two or more codes, there will be a 2.5 second paused between each.
(e) After all the codes have been output, there will be a 4.5 second pause and they will all be repeated.

N For diagnostic codes and their meanings, see table on page 1-8, 9.





FI1960
FI0524

2 **Code 11, 13 or 42 ?** — **YES** **Go to relevant Diag. Code Chart.**

3 **Code 51?** — **YES** **Go to step 7 of this chart.**

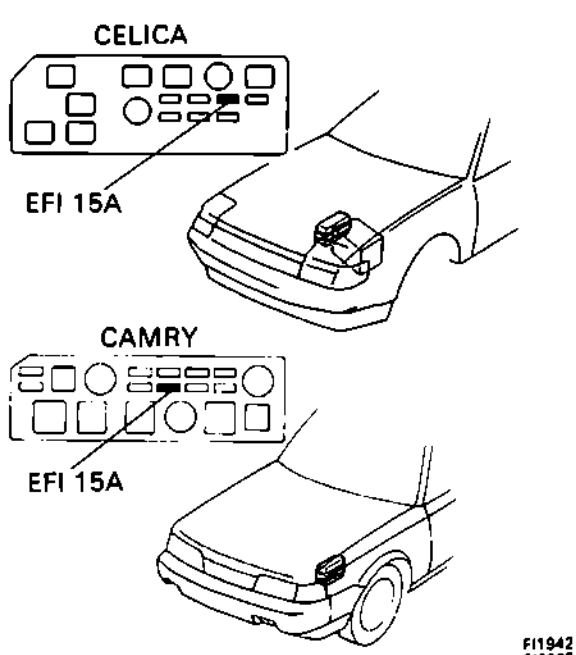
4 **Clear memory, then see whether previously-output codes are still being output.**

HOW TO CLEAR MEMORY

C (a) Turn the ignition switch to off (lock).
(b) Remove the EFI fuse.

P Wait at least 10 seconds before continuing.

N (a) The lower the temperature, the longer the fuse must be left out.
(b) The memory can also be cleared by removing the battery cable from the negative terminal of the battery, but this will also clear memories of other system (clock, etc.).



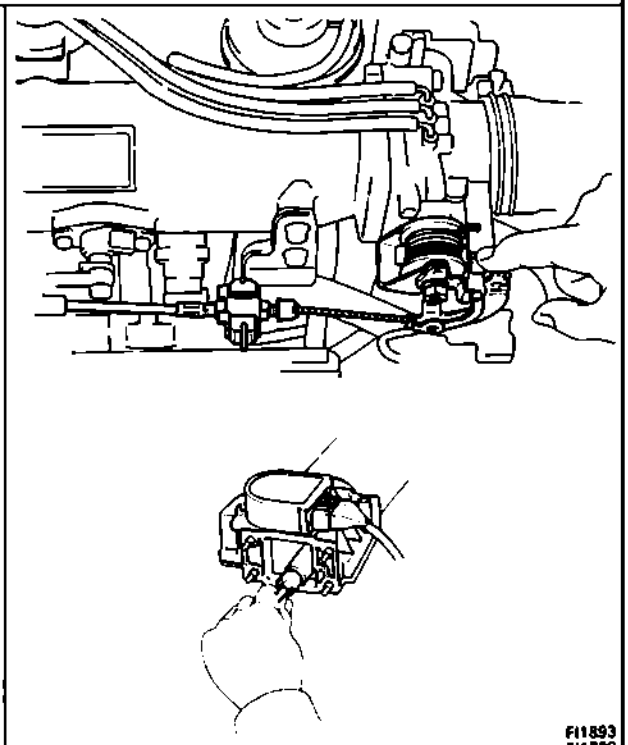
FI1942
FI2025

4 **Clear memory, then see whether previously-output codes are still being output. (cont'd)**

HOW TO CHECK MEMORY OUTPUT

C (a) Remove the air cleaner case.
(b) Engine at normal operating temperature.

P (a) Turn the ignition switch to ON for 10 seconds.
(b) Open the throttle valve from closed to full open position 2 times.
(c) Push the air flow meter measuring plate from closed to full open position 2 times with a screwdriver or similar object.
(d) Start the engine. If it will not start, crank it for 5 seconds then go to step (f).
(e) Let engine run at 2,500 rpm for 2 minutes and 4,500 rpm for 5 seconds.
(f) Stop the engine.
(g) Check to see if a diagnostic code is being output.



FI1893
FI1729

5 **Are previously-output codes still being output?**

YES **Go to relevant Diag. Code Chart.**

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

END

P Check wiring of the area(s) indicated by the previously-output code(s).

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 off?
(b) Throttle valve fully closed?
(c) Shift lever in P or N (A/T)?

N (a) If code 51 is output continuously even after the above checks have been completed, go to code 51 chart (P. 5-22).

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 about the "CHECK ENGINE" warning light going on and off erratically.

The self-diagnostic system with which the ECU is equipped memorizes the location of the intermittent problem; note that this data remains in memory even if the ignition switch is turned off.

And, for accurate diagnosis of intermittent trouble or problems, you should record a customer information on the Basic Engine and TCCS Initial Inspection Check Sheet (included at the back of this manual), and reproduction of intermittent trouble or problems is absolutely necessary.

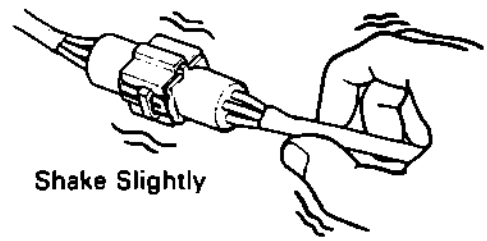
You can make intermittent – troubleshooting accurate by reproducing the trouble by the methods described below after detecting the trouble area with the self diagnosis system.

The methods to reproduce the problem conditions by applying vibration, heat, and humidity causes to the stopped vehicle are described here.

1 VIBRATION METHOD: When vibration seems to be the major cause.

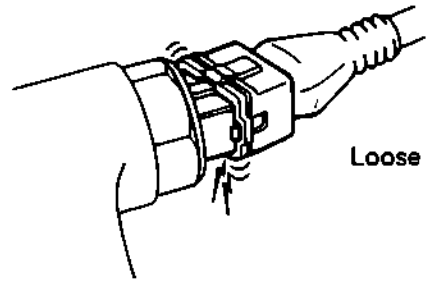
CONNECTORS

Slightly shake the connector vertically and horizontally.

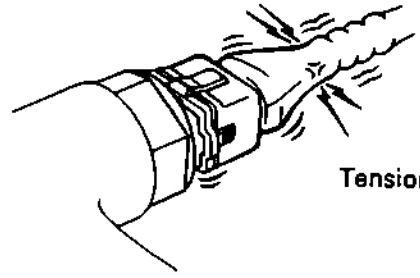


(Inspection of connectors)

(1) Is it loosely connected ?

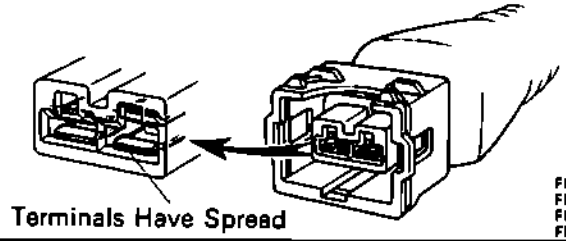


(2) Does the wire harness connecting it with its corresponding part have insufficient slack ?



(3) Are its terminals dirty ?

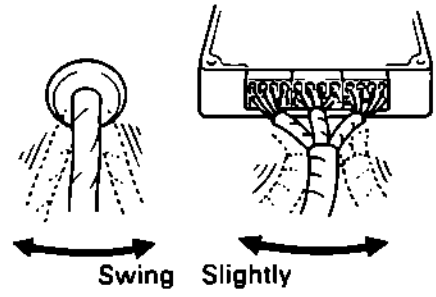
(4) Are its terminals making loose contact due to terminals that have spread ?



1 VIBRATION METHOD: When vibration seems to be the major cause. (cont'd)

WIRE HARNESS

Slightly shake the wire harness vertically and horizontally. The connector joint, fulcrum of the vibration, and body through portion are the major portions to be checked thoroughly.

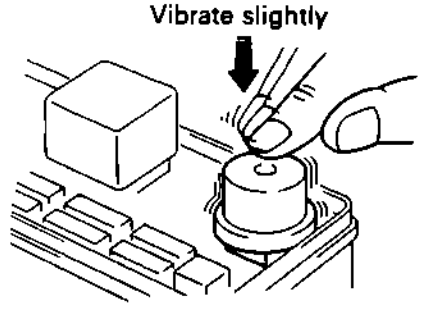


FI2332

PARTS AND SENSORS

Apply vibration slightly by a finger to the part or sensor considered to be the problem cause and check if the malfunction will occur.

NOTE: Strongly vibrating relays may result in open relays.



FI2330

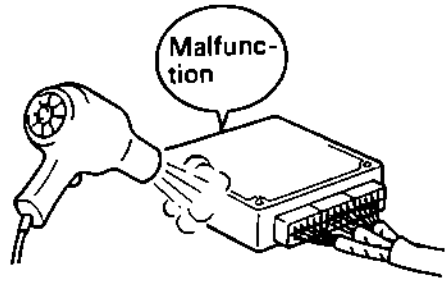
2 HEAT METHOD: When the problem seems to occur when the suspect area is heated.

Heat the component that is likely the cause of the malfunction with a hair dryer or similar object. Check to see if the malfunction will occur.

CAUTION:

(1) Do not heat to more than 60°C. (Temperature limit that the component can be touched with a hand.)

(2) Do not apply heat directly to part in the ECU.



FI2334

3 WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high-humidity condition.

Sprinkle water onto the vehicle and check to see if the malfunction will occur.

CAUTION:

(1) Never sprinkle water directly into the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.

(2) Never apply water directly onto the electronic components.

(Service hint)

If a vehicle is subject to water leakage, the leaked water

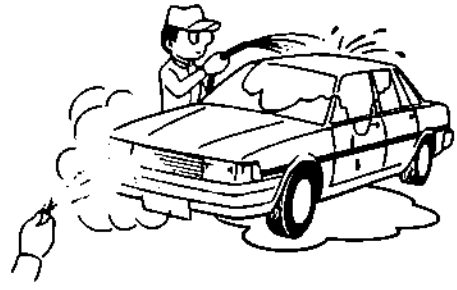

FI2335

CHART 3 – Intermittent trouble or problems

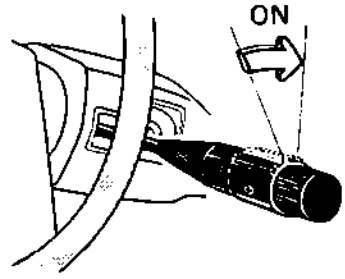
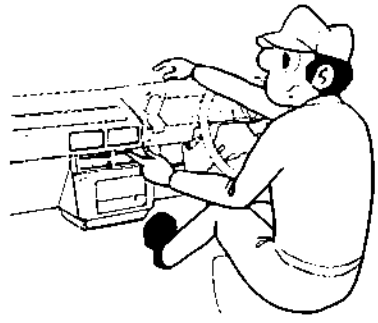
3	**WATER SPRINKLING METHOD:**	**When the malfunction seems to occur on a rainy day or in a high-humidity condition. (cont'd)**
may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be paid.		
4	**OTHER:**	**When a malfunction seems to occur when electrical load is excessive.**
Turn on all electrical loads including the heater blower, head lamps, rear window defogger, etc. and check to see if the malfunction will occur.		  FI2336 FI2337

CHART 4 — Fuel system

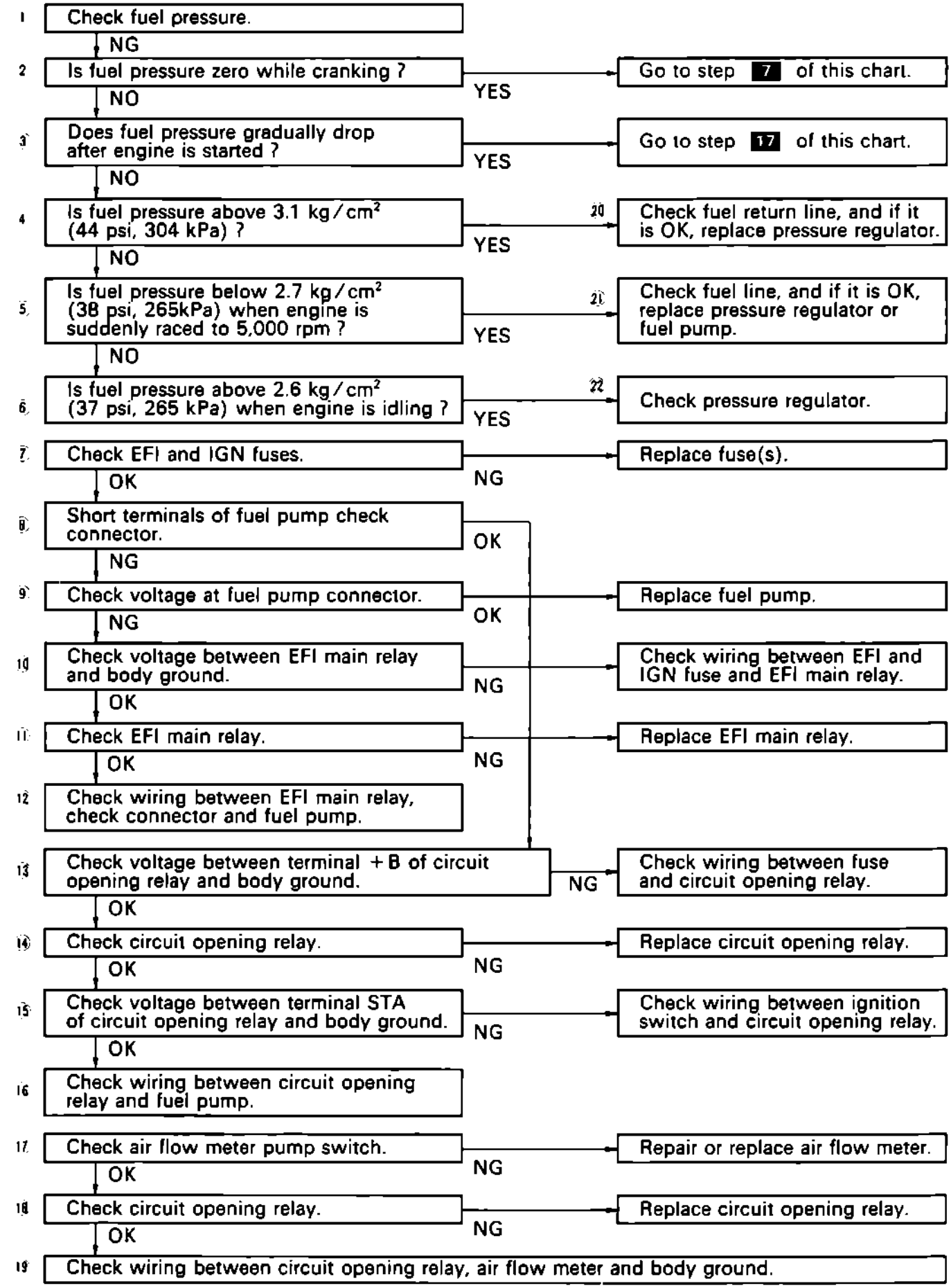


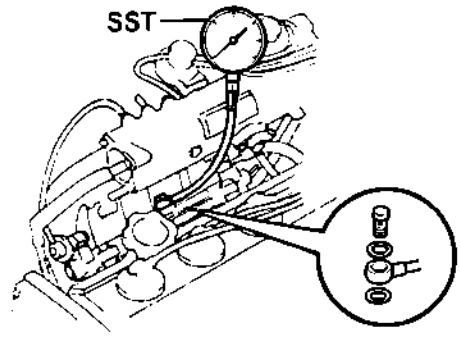
CHART 4 – Fuel system

1 **Check fuel pressure.**

C (a) Enough fuel in tank.
(b) Hook up the fuel pressure gauge (SST 09268-45011) as explained in page 6-16.

P Note fuel pressure under the following conditions:
(a) During engine cranking.
(b) When engine is quickly raced from idle to 5,000 rpm.
(c) When engine is idling.

OK (a), (b) Fuel pressure = 2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)
(c) Fuel pressure = 2.3 – 2.6 kg/cm² (33 – 37 psi, 226 – 265 kPa)



2	**Is fuel pressure zero while cranking?**	**YES**	**Go to step 7 of this Chart.**
3	**Does fuel pressure gradually drop after engine is started?**	**YES**	**Go to step 17 of this Chart.**
4	**Is fuel pressure above 3.1 kg/cm² (44 psi, 304 kPa)?**	**YES**	**Go to step 20 of this Chart.**
5	**Is fuel pressure below 2.7 kg/cm² (38 psi, 265 kPa) when engine is suddenly raced to 5,000 rpm?**	**YES**	**Go to step 21 of this Chart.**
6	**Is fuel pressure above 2.6 kg/cm² (37 psi, 265 kPa) when engine is idling?**	**YES**	**Go to step 22 of this Chart.**

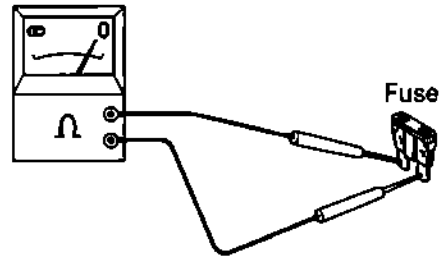
7 **Check EFI and IGN fuses.** **NG** **Replace fuse (s).**

C Remove the EFI and IGN fuses.

P Measure resistance using a tester.

OK Resistance = 0 Ω

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



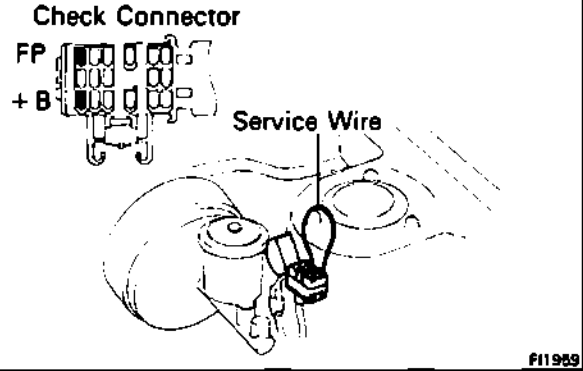
8 **Short terminals of fuel pump check connector.**

C (a) Turn the ignition switch to ON.
(b) Short the terminals + B –Fp of the check connector.

P Check fuel pressure.

OK Fuel pressure = 2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kpa)

OK **Go to step 13 of this Chart.**



FI1989

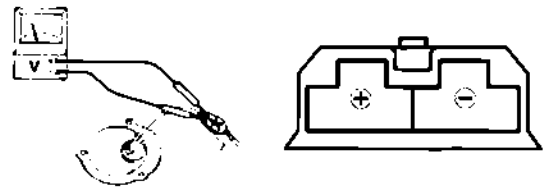
9 **Check voltage at fuel pump connector.**

C (a) Turn the ignition switch to ON.
(b) Short the terminals + B –Fp of the check connector.

P Measure voltage using a voltmeter at the fuel pump connector terminals.

OK Voltage = 11 V or more

OK **Replace fuel pump.**



FI0132 D-2-1

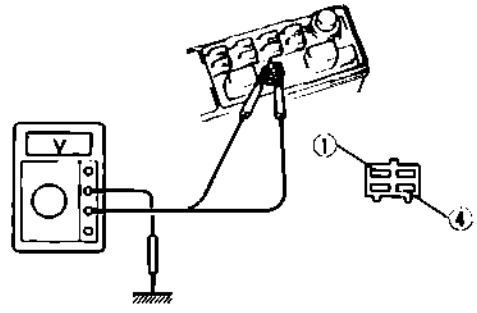
10 **Check voltage between EFI main relay and body ground.**

C (a) Remove the EFI main relay.
(b) Turn the ignition switch to ON.

P Using a voltmeter, measure voltage between terminals 1 and 4 of the EFI main relay connector and body ground.

OK Voltage = Battery voltage

NG **Check wiring between EFI and IGN fuses and EFI main relay.**



FI2346

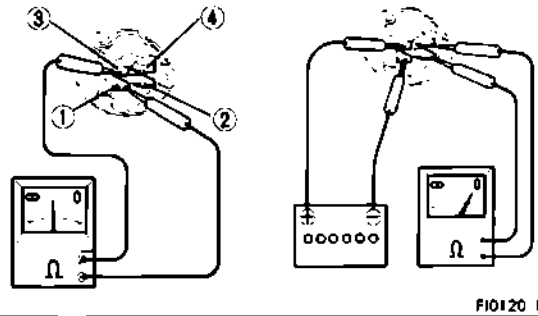
11 **Check EFI main relay.**

C Remove the EFI main relay.

P Measure resistance between each of the terminals as follows:
(a) Between terminals 1 and 3.
(b) Between terminals 2 and 4 with battery power (regardless of polarity) going to terminals 1 and 3.

OK (a) Resistance = 60 – 90 Ω
(b) Resistance = 0 Ω

NG **Replace EFI main relay.**



FI0120 FI0122

CHART 4 – Fuel system

12 Check wiring between EFI main relay, check connector and fuel pump.

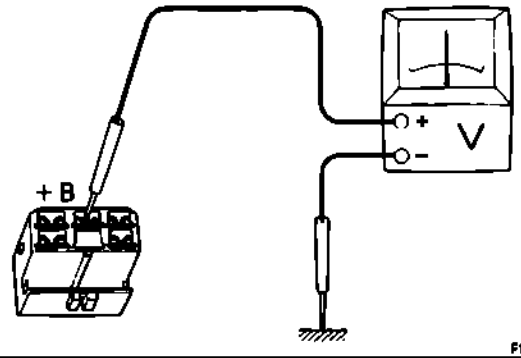
13 Check voltage between terminal +B of circuit opening relay and body ground.

C (a) Remove the circuit opening relay.
(b) Turn the ignition switch to ON.

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

OK Voltage = Battery voltage

NG Check wiring between fuse and circuit opening relay.



FI1457

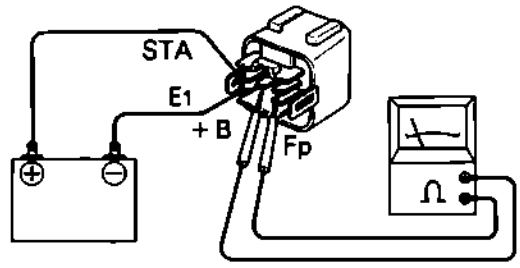
14 Check circuit opening relay.

C Remove the circuit opening relay.

P Measure resistance between +B and Fp with current from battery flowing between STA and E1.

OK Resistance = 0 Ω

NG Replace circuit opening relay.



FI0862

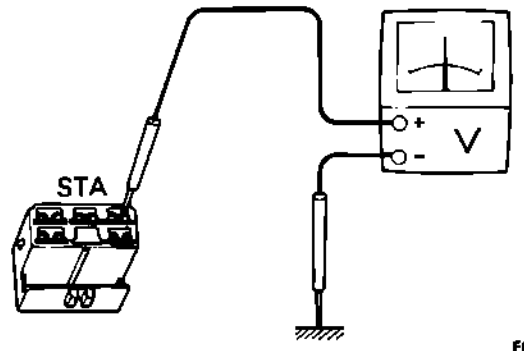
15 Check voltage between terminal STA of circuit opening relay and body ground.

C Remove the circuit opening relay.

P Using a voltmeter, measure voltage between terminal STA of the circuit opening relay connector and body ground while cranking engine.

OK Voltage = 8 – 12 V

NG Check wiring between ignition switch and circuit opening relay.



FI1458

16 Check wiring between circuit opening relay and fuel pump.

END

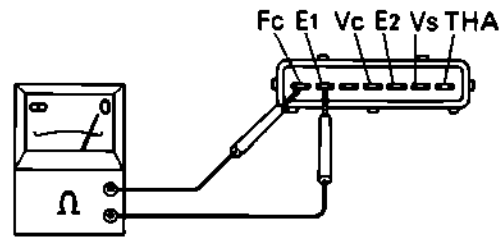
17 **Check air flow meter pump switch.** — NG → **Repair or replace air flow meter.**

C Disconnect the air flow meter connector.

P Using an ohmmeter, measure resistance between terminals. Fc and E1 both when the measuring plate is fully closed and when it is slightly open.

OK

MEASURING PLATE	RESIS. BETWEEN Fc & E1
Fully closed	Infinity
Slightly open	0 Ω



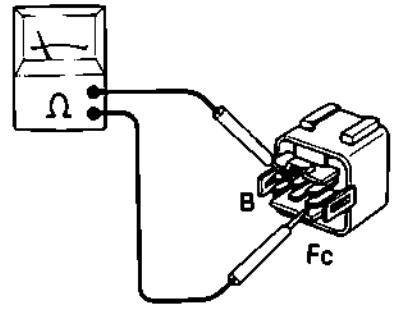
FI0084

18 **Check circuit opening relay.** — NG → **Replace circuit opening relay.**

C Remove the circuit opening relay.

P Measure resistance between terminals B and Fc.

OK Resistance = 88 – 132 Ω



FI0085

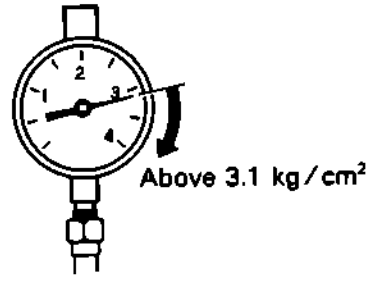
19 **Check wiring between circuit opening relay, air flow meter and body ground.** — END

20 **Fuel pressure above 3.1 kg/cm² (44 psi, 304 kPa).**

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

– END –

Fuel Pressure Gauge



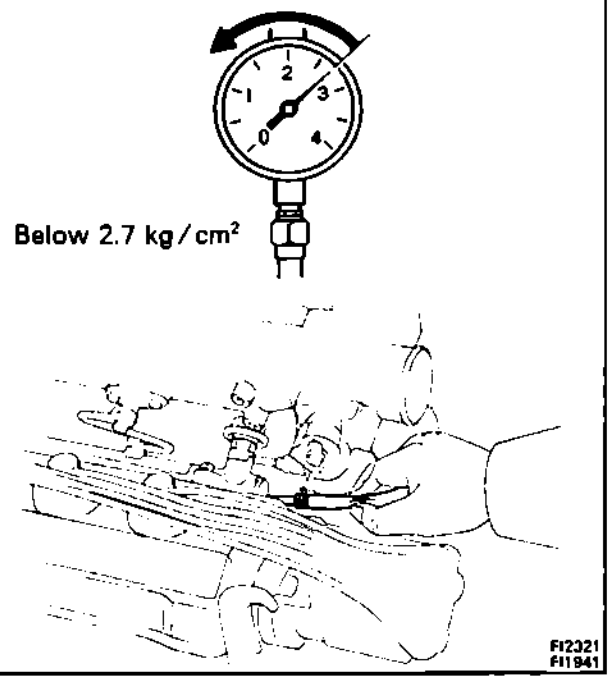
FI2322

CHART 4 – Fuel system

21 Fuel pressure below 2.7 kg/cm² (38 psi, 265 kPa) when engine is suddenly raced to 5,000 rpm.

P If fuel pressure is below 2.7 kg/cm² (38 psi, 265 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 2.7 kg/cm² (38 psi, 265 kPa): replace pressure regulator.
(2) Fuel pressure 2.7 kg/cm² (38 psi, 265 kPa) or below: replace fuel pump.

– END –



22 Check pressure regulator.

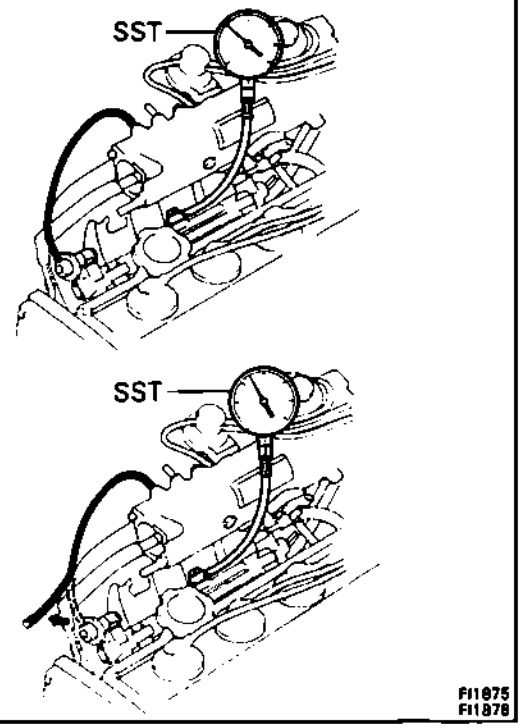
C Engine idling.

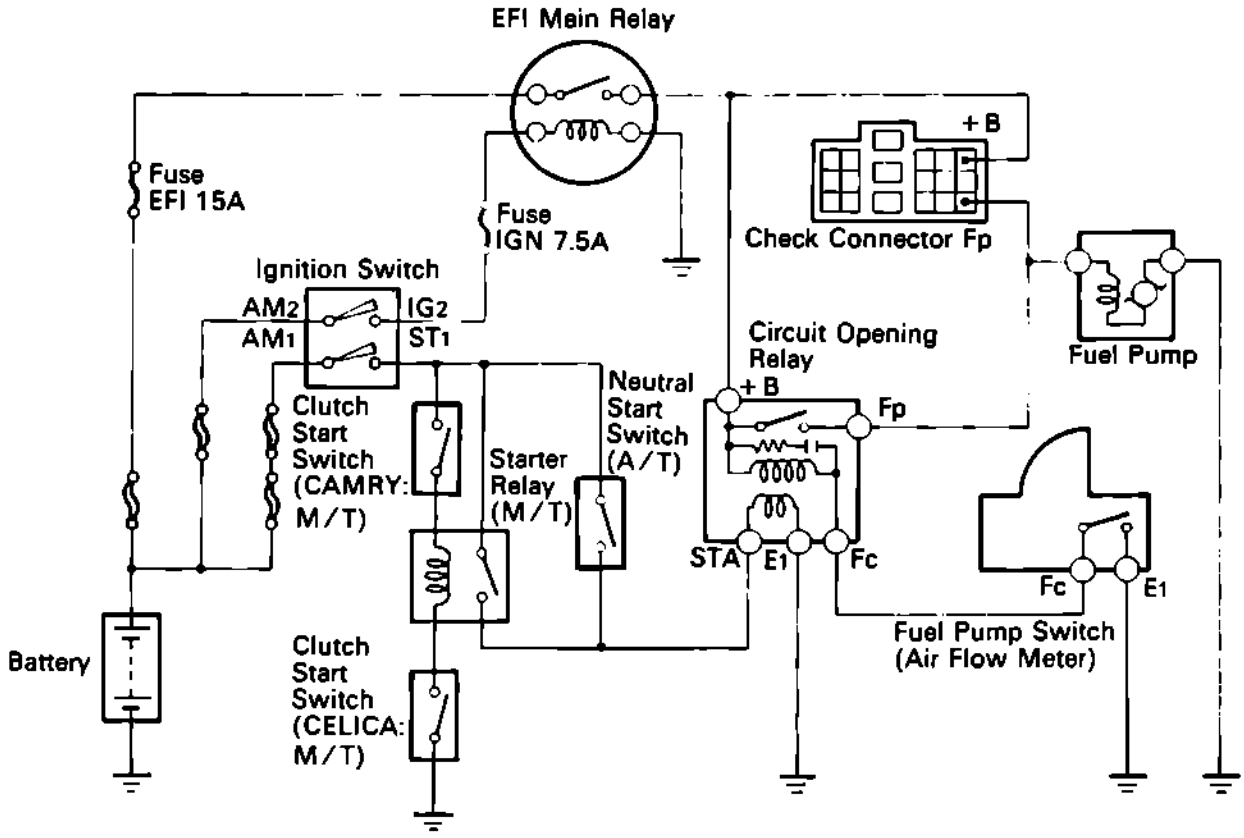
P Check fuel pressure both with the vacuum sensing hose of the pressure regulator disconnected and connected.

OK

HOSE	FUEL PRESSURE kg/cm² (psi, kPa)
Connected	2.3 – 2.6 (33 – 37, 226 – 265)
Disconnected	2.7 – 3.1 (38 – 44, 265 – 304)

– END –




EFI Main Relay
Fuse
EFI 15A
Fuse
IGN 7.5A
+B
Check Connector Fp
Ignition Switch
AM2
AM1
IG2
ST1
Circuit Opening
Relay
+B
Fp
Fuel Pump
Clutch
Start
Switch
(CAMRY:
M/T)
Starter
Relay
(M/T)
Neutral
Start
Switch
(A/T)
STA
E1
Fc
Fc
E1
Fuel Pump Switch
(Air Flow Meter)
Battery
Clutch
Start
Switch
(CELICA:
M/T)

FI2344

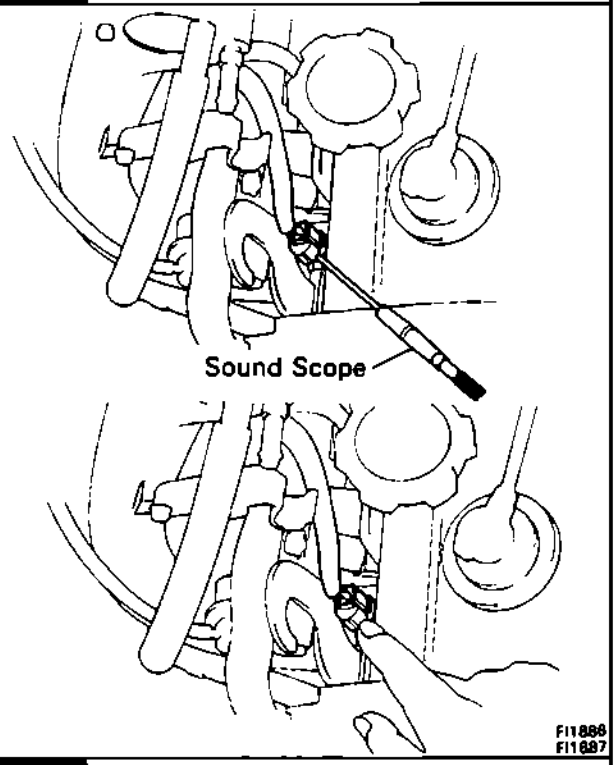
CHART 5 — Injector electrical circuitry

1 **Check operating sound of injectors.**

P Check operating sound of each injector.
(a) With engine running or cranking, use a 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 the 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 the injector. (P. 4-20).

OK **Injector electrical circuitry normal.**



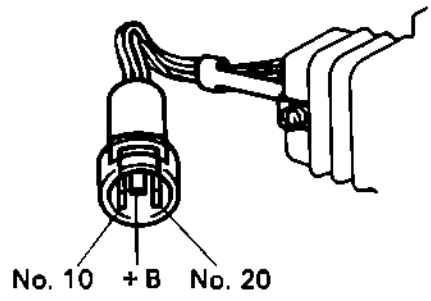
2 **Check resistance of solenoid resistor.**

C Remove the solenoid resistor connector.

P Using an ohmmeter, measure resistance between +B and other terminals.

OK Resistance = 2 – 3 Ω each

NG **Replace solenoid resistor.**



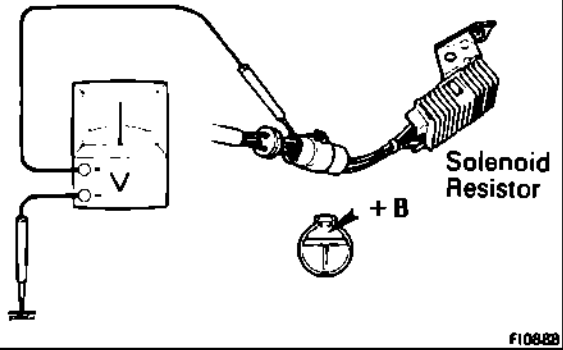
3 **Check voltage between terminal +B of solenoid resistor and body ground.**

C (a) Remove the water-proofing rubber cover of the solenoid resistor.
(b) Turn the ignition switch to ON, but do not start the engine.

P Using a voltmeter, measure voltage between terminal +B of the solenoid resistor and body ground.

OK Voltage = battery voltage

NG **Check wiring between battery and solenoid resistor.**



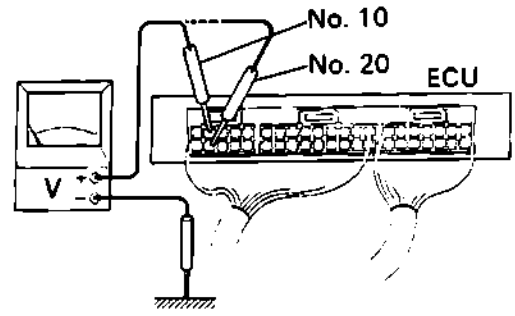
4 **Check voltage between terminals No. 10 and/or No. 20 of ECU and body ground.**

C Turn the ignition switch to ON.

P Measure voltage between terminal No. 10 and/or No. 20 of the ECU and body ground.

OK Voltage = Battery voltage

NG **Check wiring between solenoid resistor and injectors, and injectors and ECU.**



FI2558

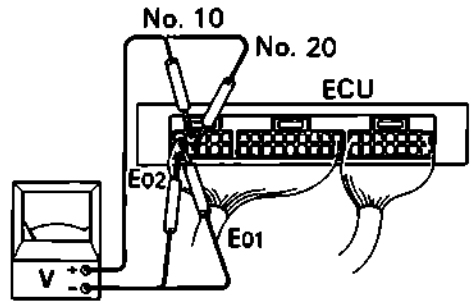
5 **Check voltage between terminals No. 10 and/or No. 20 and E01 or E02 of ECU.**

C Turn the ignition switch to ON.

P Measure voltage between terminals No. 10 and/or No. 20 and E01 or E02 of the ECU.

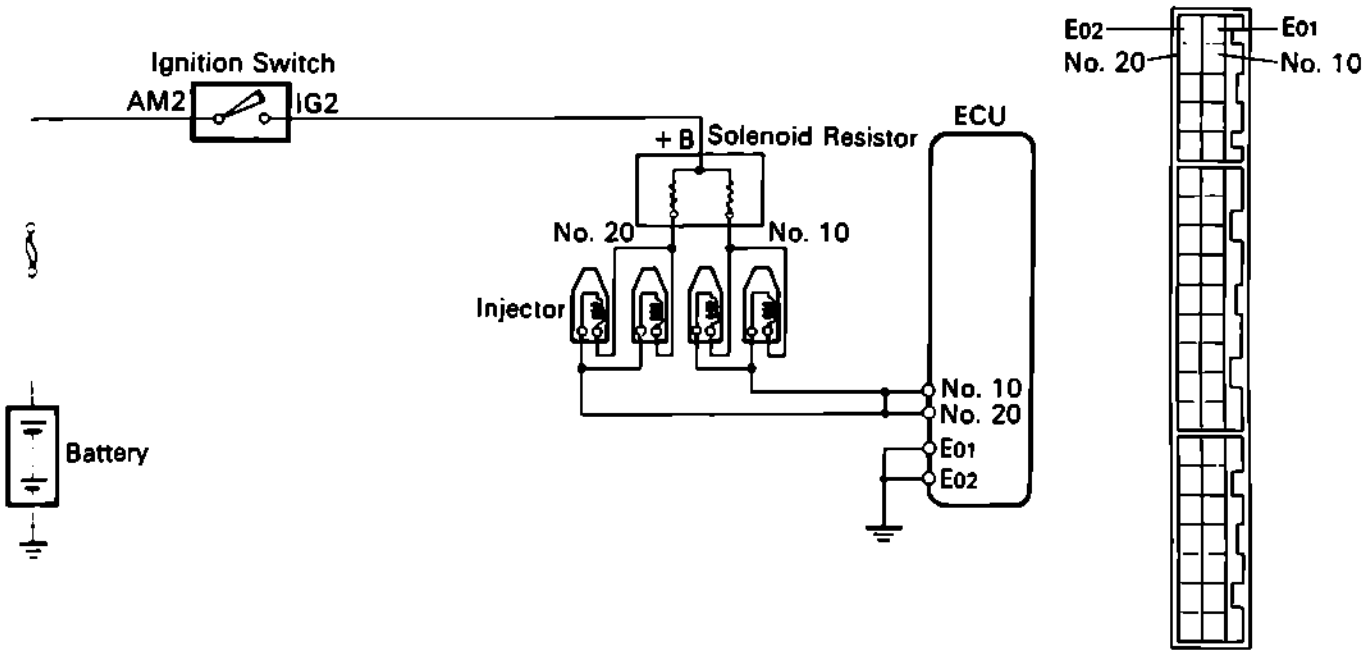
OK Voltage = Battery voltage

NG **Check wiring between ECU and body ground.**



FI0144

6 **Try another ECU.** **END**



FI1845 FIZ378

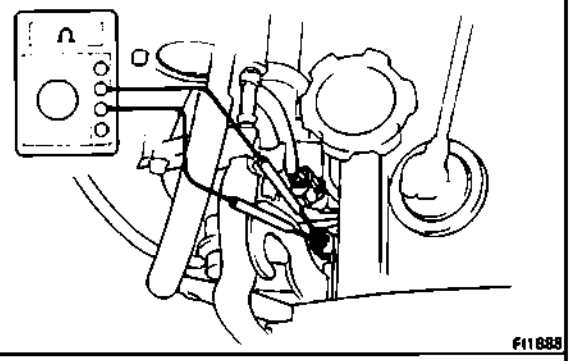
CHART 6 – Injectors

CHECK RESISTANCE

C Disconnect the injector connectors.

P Using an ohmmeter, measure resistance of the injectors.

OK Resistance = 1.1 – 2.2 Ω

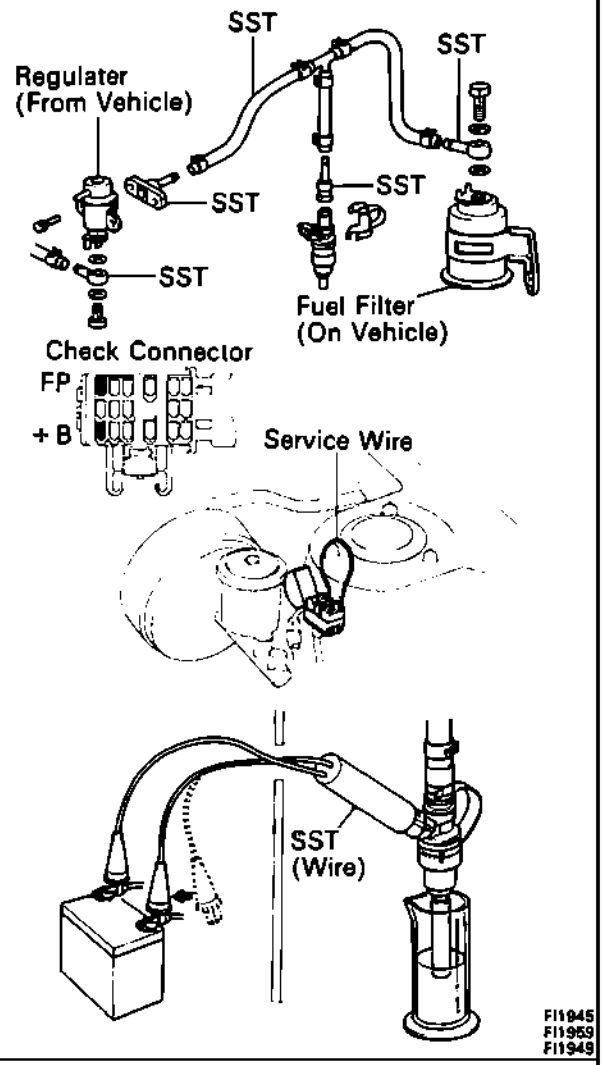


CHECK INJECTION VOLUME

C (a) Remove the injectors. (See P. 6-8)
(b) Fuel filter, pressure regulator and injector connected up with SST 09268-41045.
(c) Vinyl tube attached to lower end of the injector to prevent gasoline from splashing.
(d) SST 09842-30060 connected to the injector.
(e) The injector in graduated cylinder.
(f) The ignition switch turned to ON but the engine not started.
(g) Using a service wire, short the terminals + B – Fp of the check connector.

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

OK Volume: 45 – 55 cc (2.7 – 3.4 cu in.) per 15 seconds
Difference between each injector: Less than 5 cc (0.31 cu in.)



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

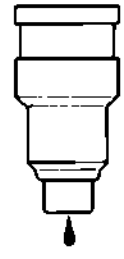


CHART 7 — Residual fuel pressure

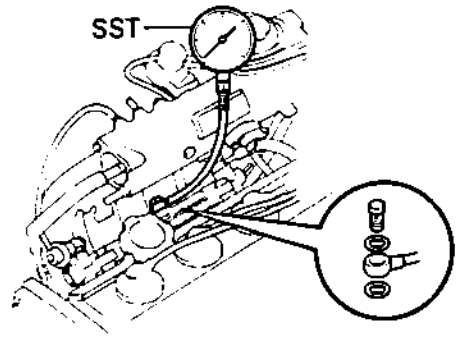
C Hook up the fuel pressure gauge (SST 09268-45011) as explained in page 6-16.

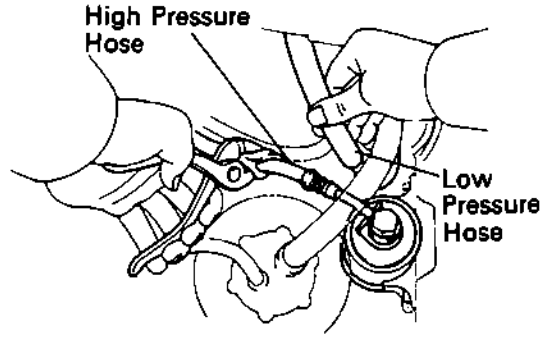
P (a) Crank or start the engine.
(b) Stop the engine and measure change in fuel pressure.

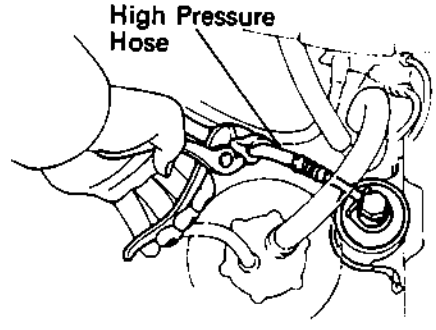
OK Fuel pressure remains above 1.5 kg/cm² (21 psi, 147 kPa) at least 5 minutes after engine is stopped.

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 the injector or the cold start injector leak (P. 4-20, 23).

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







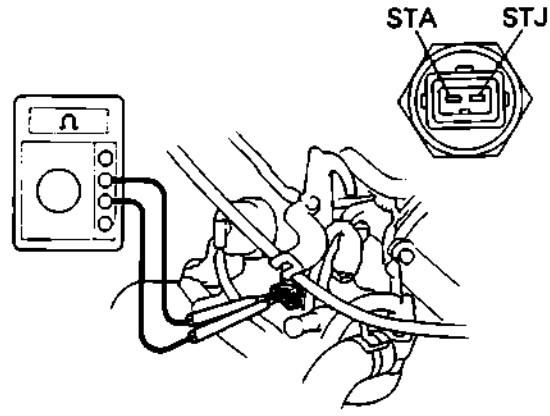
FI1874
FI2327
FI2328

CHART 8 — Cold start injector time switch

C Disconnect the cold start injector time switch connector.

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

Terminals	Resistance (Ω)	Coolant temp.
STA – STJ	20 – 40	below 30°C (86°F)
	40 – 60	below 40°C (104°F)
STA – Ground	20 – 80	–



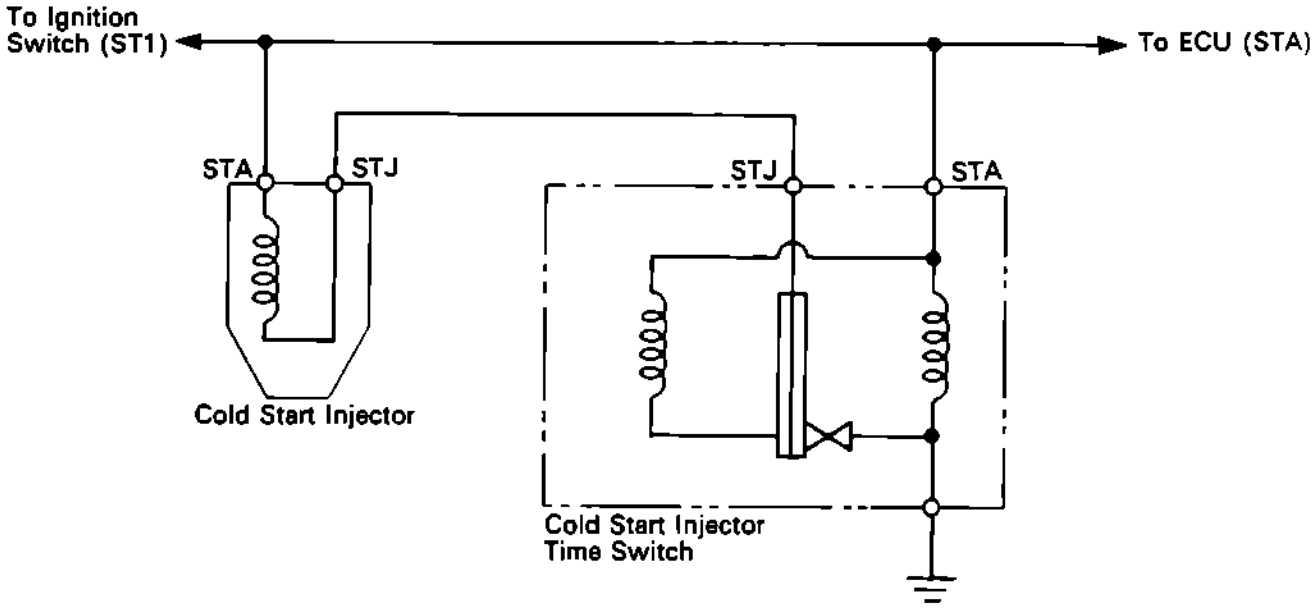


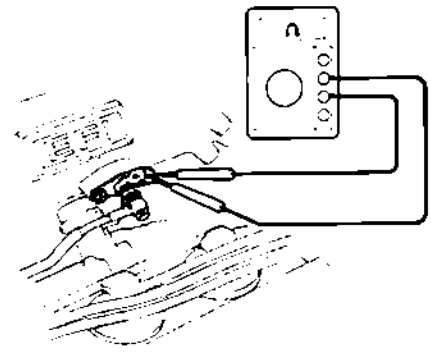
CHART 9 — Cold start injector

CHECK RESISTANCE

C Disconnect the cold start injector connector.

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

OK Resistance = 2 – 4 Ω

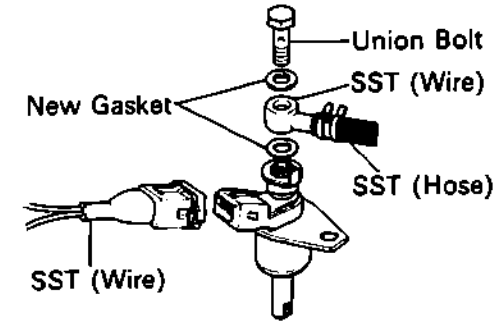


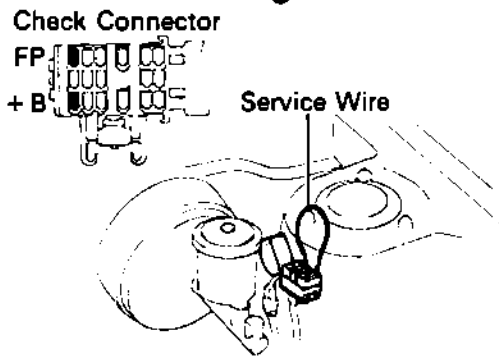
FI1666

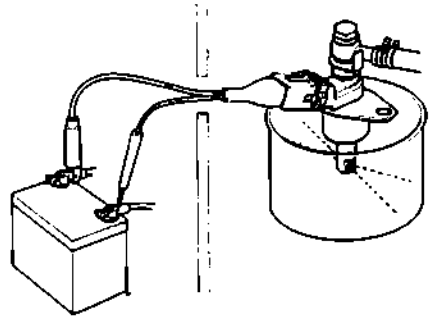
CHECK INJECTION

P (a) Remove the cold start injector.
(b) Using SST 09268-41045, connect the delivery pipe and the cold start injector.
(c) Connect SST 09842-30050 to the cold start injector.
(d) Put a container under the injector.
(e) Turn the ignition switch ON, but do not start the engine.
(f) Using a service wire, short the terminals + B – Fp of the check connector.
(g) Connect the test probes of SST to the battery and check that fuel spray is as shown.

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





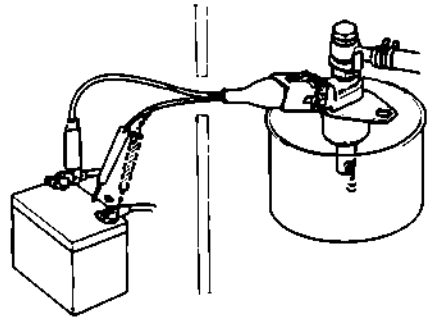


FI1679
FI1659
FI1660

CHECK SEALING

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

OK Leakage: Less than 1 drop of fuel per minute



FI1661

CHART 10 — Idle speed control (ISC) system

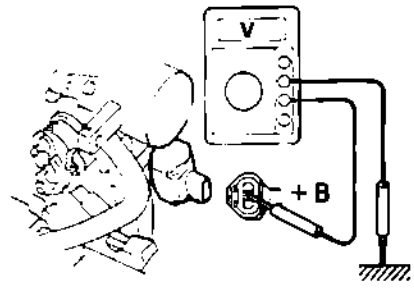
1 **Check voltage between ISC valve connector and body ground.**

C (a) Disconnect the ISC valve connector.
(b) Turn the ignition switch to ON.

P Using a voltmeter, measure voltage between +B terminal of the ISC valve connector and body ground.

OK Voltage = Battery voltage

NG **Check wiring between ISC valve connector and EFI main relay.**



FI2391

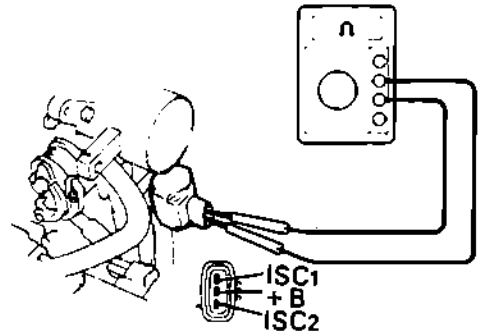
2 **Check ISC valve.**

C Disconnect the ISC valve connector.

P Using a ohmmeter, measure resistance between terminal +B and ISC_1, ISC_2 of ISC valve.

OK Resistance = 16.0 – 17.0 Ω

NG **Repair or replace ISC valve.**



FI1897

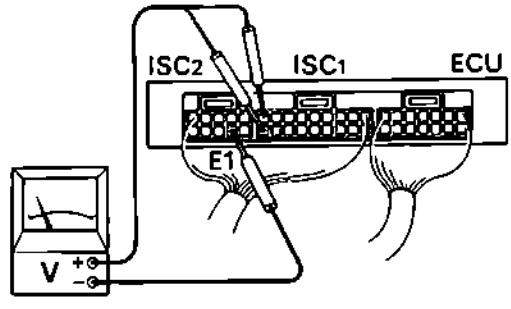
3 **Check voltage between terminals ISC_1, ISC_2 and E_1 of ECU.**

C Turn the ignition switch to ON.

P Using a voltmeter, measure voltage between terminals ISC_1, ISC_2 and E_1 of the ECU.

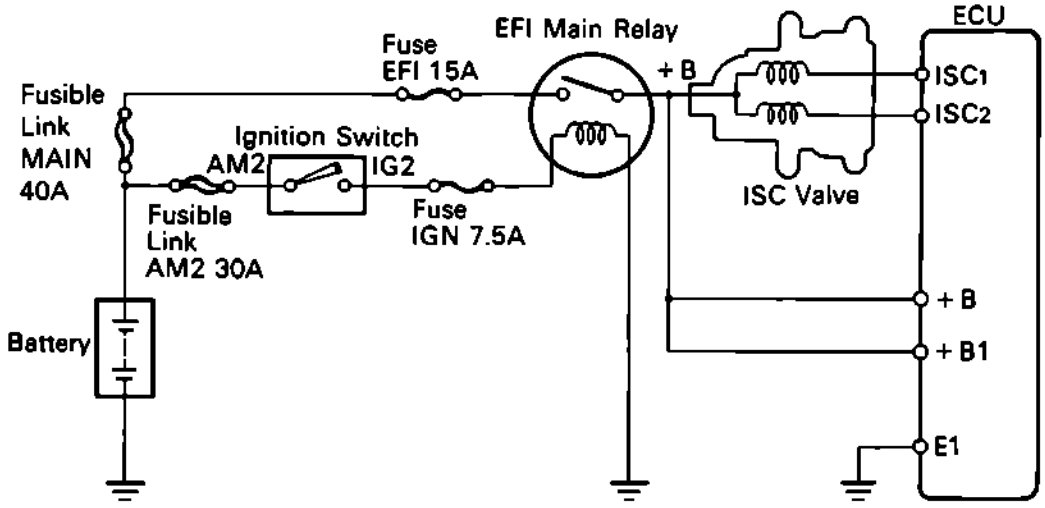
OK Voltage = Battery voltage

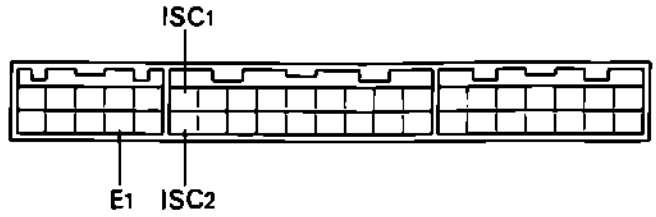
NG **Check wiring between ISC valve and ECU.**



FI1901

4 **Try another ECU.** END



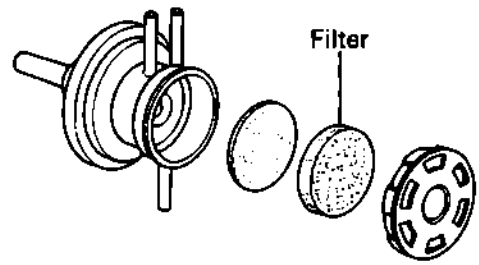


FI1884
FI2378

CHART 11 — Exhaust gas recirculation (EGR) system

CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

P (a) Check the filter for dirt or damage.
(b) Clean the filter with compressed air if necessary.

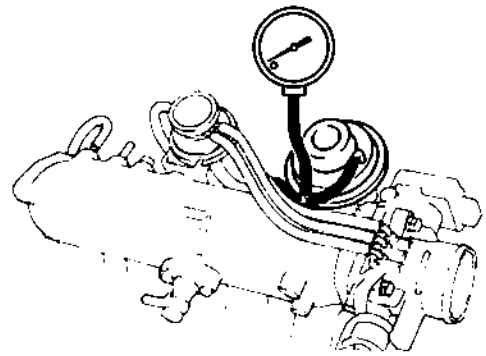


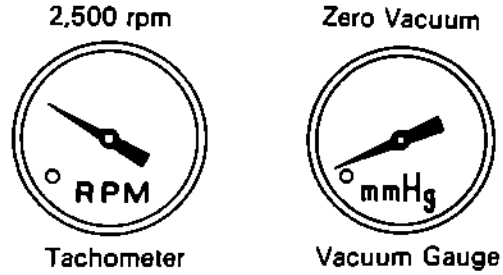
EC1901

CHECK BVSV WITH ENGINE COLD

C (a) Vacuum hose disconnected from the EGR valve and connected to the vacuum gauge with three-way union.
(b) The coolant temperature should be below 45°C (113°F)

P Check that the vacuum gauge indicates zero at 2,500 rpm.


COLD



EC2395 EC0137 EC0128

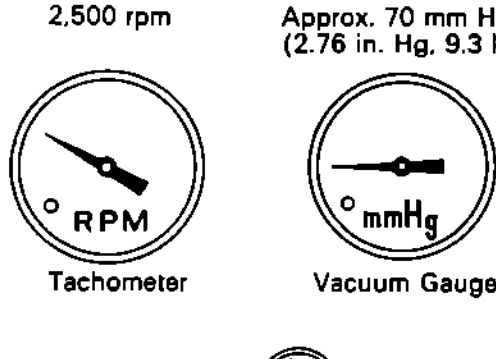
CHECK BVSV, VSV AND EGRA VACUUM MODULATOR WITH ENGINE WARM

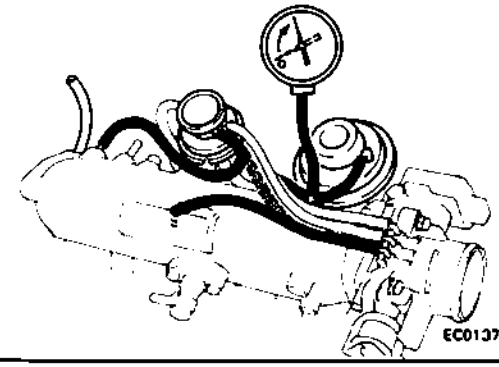
C (a) Same as condition (a) above.
(b) Engine at normal operating temperature.

P (a) Check that the vacuum gauge indication is approx. 70 mmHg (2.76 in.Hg, 9.3 kPa) at 2,500 rpm.
(b) Check that the vacuum gauge indication is zero at idle.
(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm.
(e) Disconnect the vacuum gauge and reconnect th vacuum hoses to the proper locations.

N As a large amount of EGR gas enters, the engine will misfire slightly at this inspection.

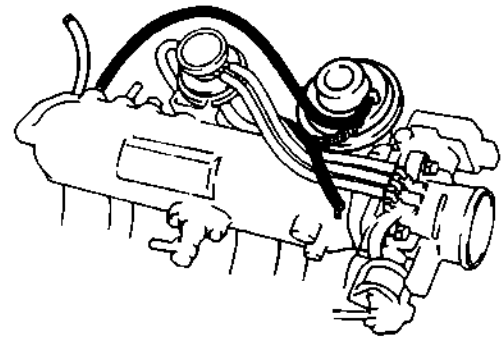
HOT



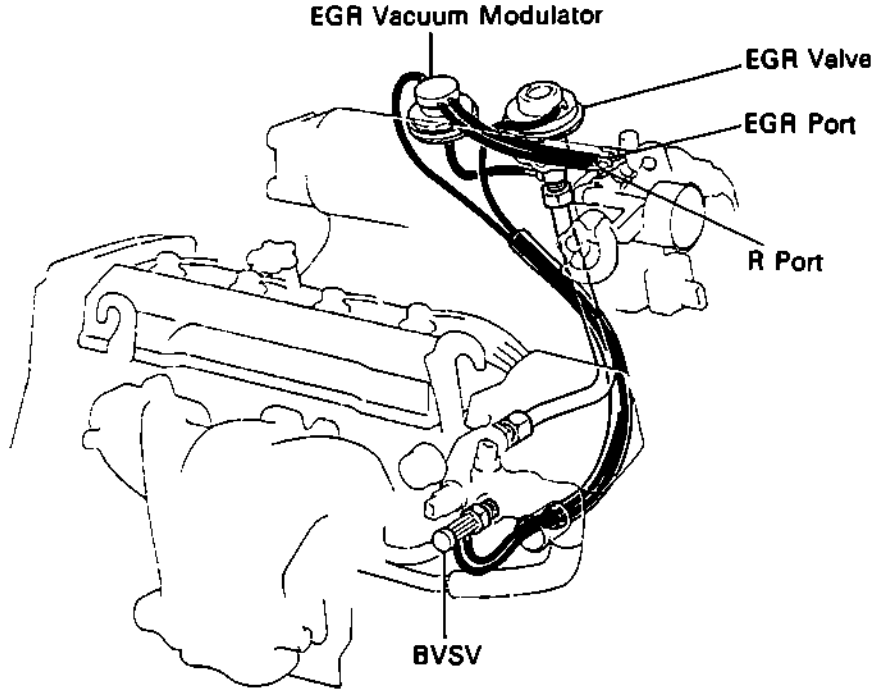

EC0137 EC0129 EC2396

CHECK EGR VALVE

P (a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper location.



EC2387



EC2416

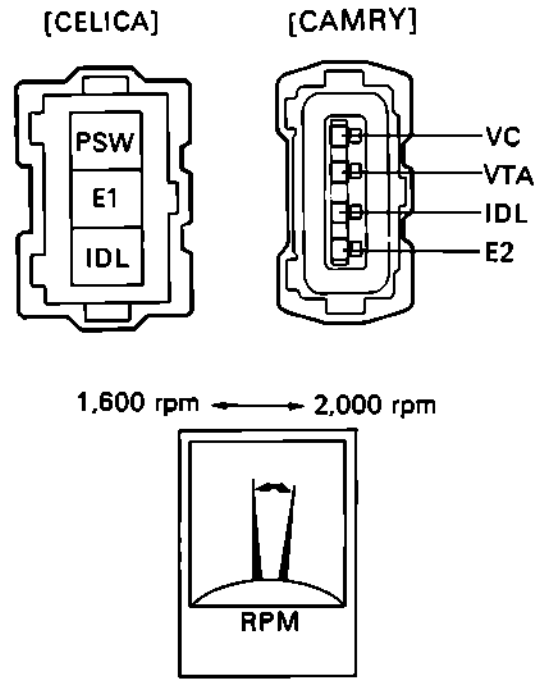
CHART 12 — Fuel cut system

C (a) Engine at normal operating temperature.
(b) Disconnect the connector from the throttle position sensor.

P (a) Short the terminals IDL and E_1 or E_2 of the wiring connector.
(b) Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

OK Fuel cut rpm = 2,000 rpm
Fuel return rpm = 1,600 rpm

N The vehicle should be stopped.



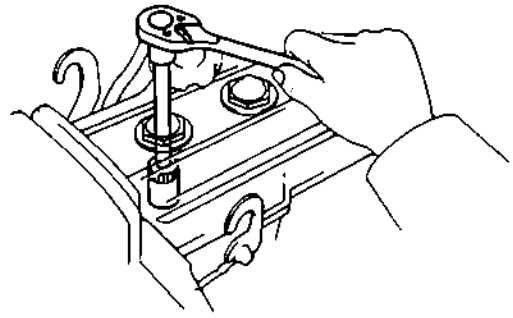
J-3-1 FI0547
FI0037

CHART 13 – Compression pressure

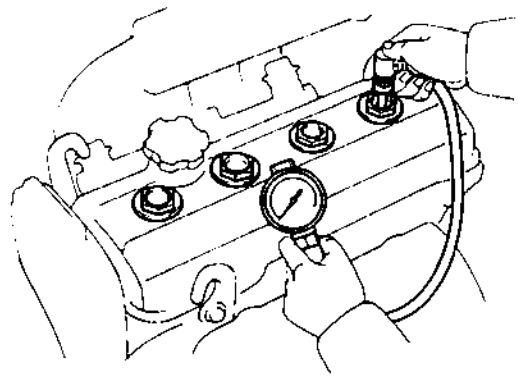
CHECK COMPRESSION PRESSURE

C (a) Engine at normal operating temperature.
(b) Disconnect the distributor connector.
(c) Disconnect the solenoid resistor connector.
(d) Disconnect the cold start injector connector.

(e) Remove the spart plugs.



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



OK Compression pressure:
12.5 kg/cm² (178 psi, 1,226 kPa)
Minimum pressure:
10.0 kg/cm² (142 psi, 981 kPa)
Difference between each cylinder:
Less than 1.0 kg/cm² (14 psi, 98 kPa)

N (a) Always use a fully charged battery to insure that at least 250 rpm is attained.
(b) If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps P (a) through (c) for the cylinder with low compression.
- If adding oil helps the compression, chances are that the piston rings and / or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

IG0833
EM3354

DIAGNOSTIC CODE CHARTS

NOTE

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

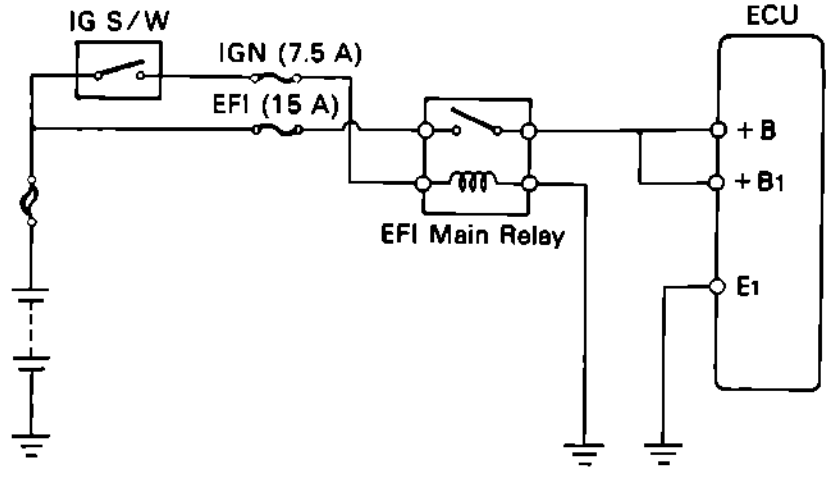
These charts should not be used independently of the Basic Engine Inspection Chart or the TCCS Initial Inspection Chart since their use will be indicated, as necessary, by this chart.

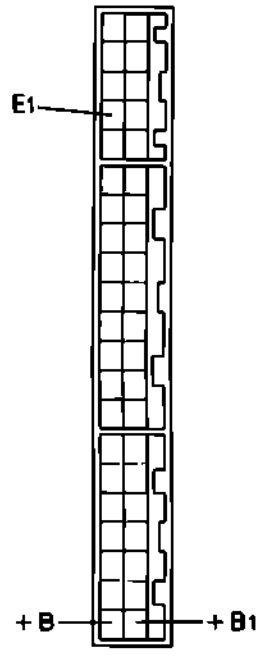
CODE 11 — Momentary interruption of current to ECU

This code indicates that a momentary interruption of current to the ECU has occured, but that the problem corrected itself immediately.
Note that although this problem may not necessarily appear at the time of the inspection, it cannot be ignored for this reason.
This is because this diagnostic code is still being output, indicating that there is something wrong in the ECU power supply circuitry; this "something" is usually a loose connector. Therefore the parts shown in the illustration below should be checked for all of the following:

1. Loose connectors
2. Dirty connector terminals
3. Loose connector terminals

N Refer to chart 3 (P. 4-8)





FI2377 FI2378

CODE 12 — No RPM signal to ECU while engine is cranked

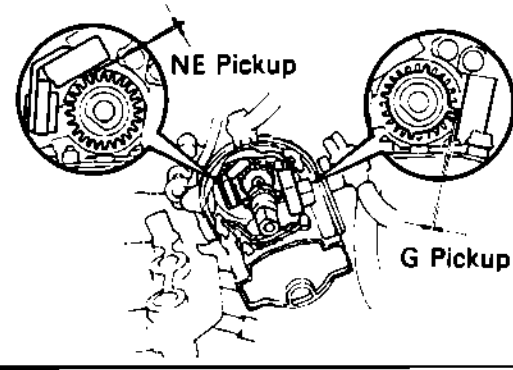
1 **Check air gap.**

NG Replace distributor.

C Remove the distributor cap.

P Using a thickness gauge, measure the gap between the signal rotor and pickup coil projection.

OK Air gap = 0.2 – 0.4 mm (0.008 – 0.016 in)



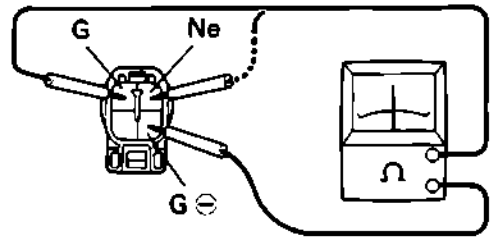
2 **Check pickup coils in distributor.**

NG Replace distributor.

C Disconnect the distributor connector.

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

Coil	Terminals	Resistance (Ω)
G pickup coil	G – G ⊖	140 – 180
Ne pickup coil	Ne – G ⊖	140 – 180



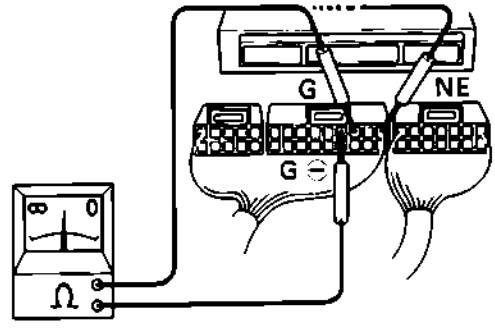
3 **Check resistance of pickup coils at ECU connector.**

NG Check wiring between ECU connector and distributor connector.

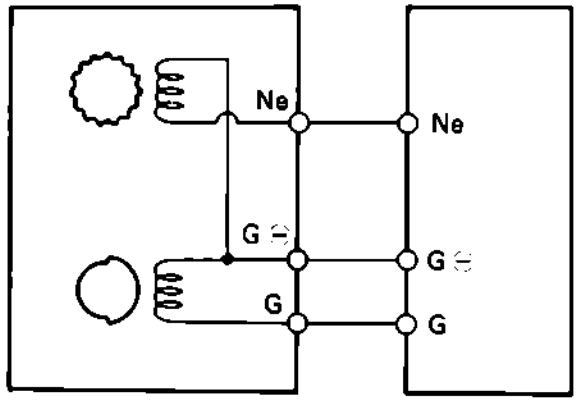
C (a) Turn the ignition switch switch to LOCK.
(b) Disconnect the ECU wiring connectors from ECU.

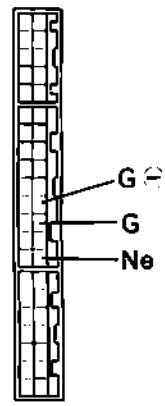
P Using an ohmmeter, measure resistance between each of the terminals shown in the table below:

Coil	Terminals	Resistance (Ω)
G pickup coil	G – G ⊖	140 – 180
Ne pickup coil	Ne – G ⊖	140 – 180



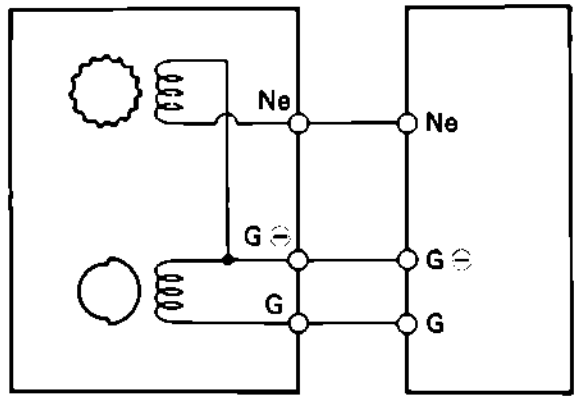
4 **Try another ECU.** **END**

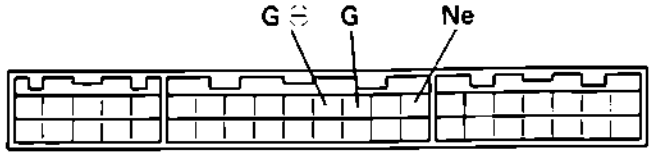




CODE 13 – Momentary interruption of RPM signal

This code indicates that a momentary interruption of the RPM signal from the distributor to the ECU has occurred, but that it immediately corrected itself. Note that although this problem may not necessarily appear at the time of inspection, it cannot be ignored for this reason. This is because this diagnostic code is still being output, indicating that there is something wrong in the RPM signal circuitry; this "something" is usually a loose connector.	The distributor connector and the Ne terminal of the ECU connector must therefore be checked for the following: 1. Loose connectors 2. Dirty connector terminals 3. Loose connector terminals N Refer to chart 3 (P. 4-8)





FI2380
FI2378

CODE 14 – Ignition confirmation signal not being input into ECU

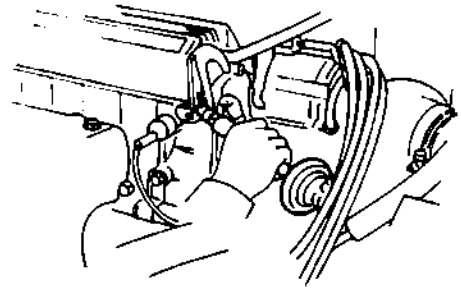
1 **Check for sparking.**

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

(a) Disconnect the spark plug cord.
(b) Using a plug wrench, remove the spark plug.
(c) Connect the spark plug and spark plug cord.
(d) Ground the spark plug ground electrode.

Check the spark while the engine is being cranked.

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



FI2320

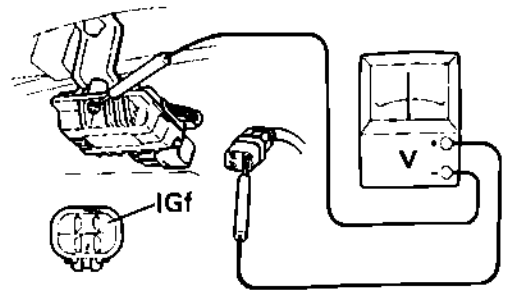
2 **Check voltage between terminal IGf of igniter connector and body ground.**

OK Replace igniter.

(a) Disconnect the igniter connector.
(b) Ignition switch turned to ON.

Using a voltmeter, connect the positive prove to the igniter connector IGf terminal and the negative prove to body ground.

OK Voltage = battery voltage



FI2376

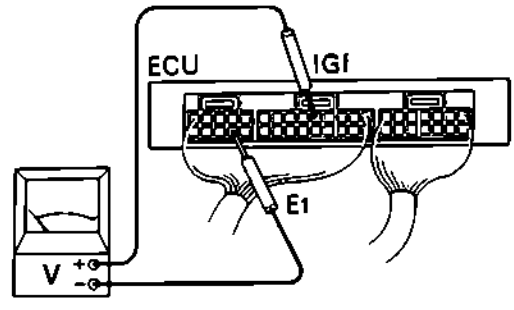
3 **Check voltage between terminals IGf and E1 of ECU.**

NG Check wiring between ECU connector and igniter connector; if still NG, try another ECU.

Measure voltage between terminals IGf and E1 of the ECU both with the ignition switch turn to ON but the engine not cranking, and with the switch turn to ON and the engine cranking.

OK Voltage = About 1.0 V in both cases

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



FI2314

4 **Try another ECU.** **END**

5 **Check ignition coil.**

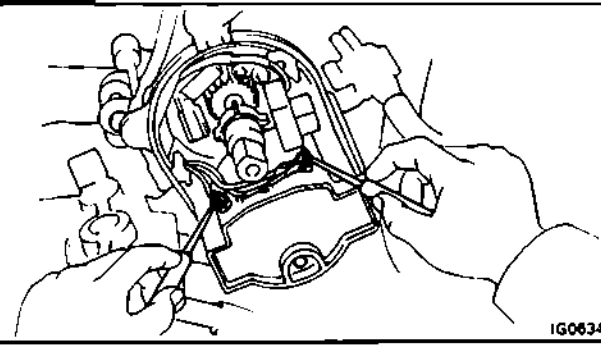
NG Replace ignition coil

CHECK PRIMARY COIL RESISTANCE

C Remove the distributor cap.

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

OK Primary coil resistance (cold) = 0.38 – 0.46 Ω



IG0634

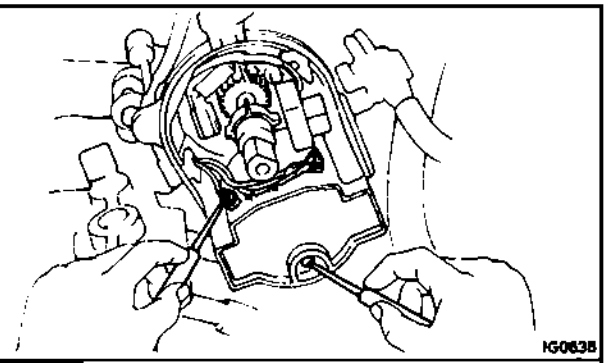
CODE 14 – Ignition confirmation signal not being input into ECU

CHECK SECONDARY COIL RESISTANCE

C Remove the distributor cap.

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

OK Secondary coil resistance (cold) = 7.7 – 10.4 kΩ



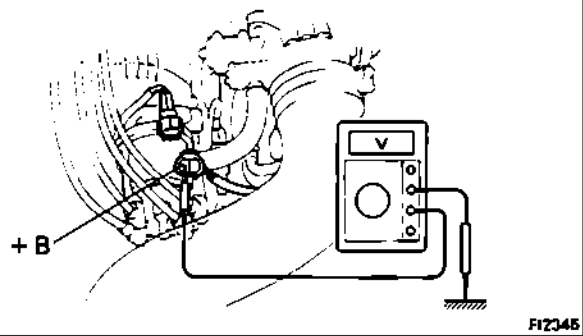
6 Check power source line voltage of ignition coil.

C (1) Disconnect the ignition coil connector.
(2) Turn the ignition switch to ON.

P Using a voltmeter, connect the prove to the ignition coil connector positive terminal and the negative prove to body ground.

OK Voltage = battery voltage

NG Check wiring between ignition coil connector and ignition switch.



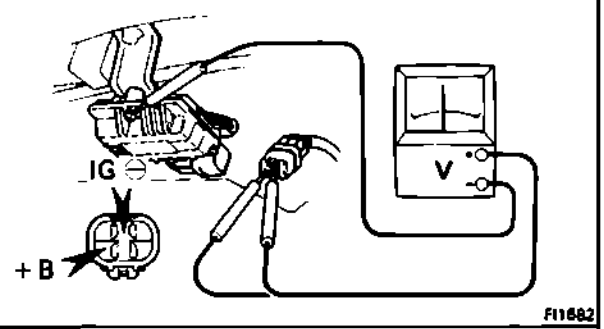
7 Check power source line voltage of igniter.

C (1) Disconnect the igniter connector.
(2) Turn the ignition switch to ON.

P Using a voltmeter, connect the positive prove to the igniter connector + B and the negative prove to body ground, then connect the positive prove to the igniter connector IG ⊖ and the negative prove to body ground.

OK Voltage = battery voltage

NG Check wiring between igniter connector and ignition coil connector, and igniter connector and ignition switch.



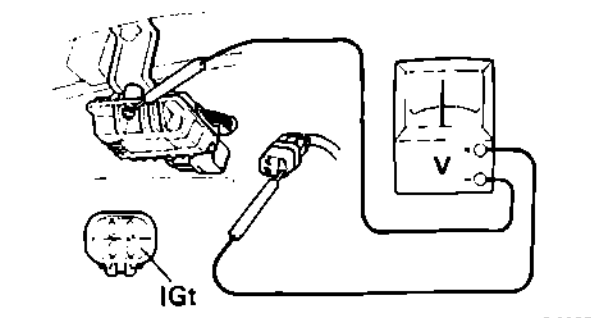
8 Check voltage between terminal IGt of igniter connector and body ground.

C Disconnect the igniter connector.

P Using a voltmeter, connect the positive prove to the igniter connector IGt terminal and the negative prove to body ground while the engine is being cranked.

OK Voltage = About 1.0 V
(Neither 0 V nor 5 V)

OK Replace igniter.

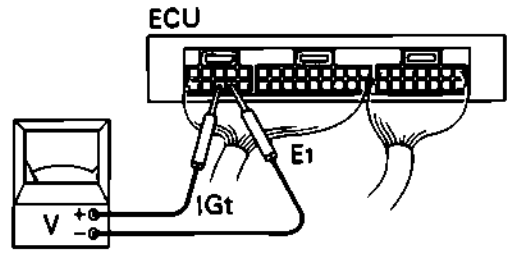


9 **Check voltage between terminals IGt and E1 of ECU.**

NG **Check wiring between ECU connector and igniter connector; if still NG, try another ECU.**

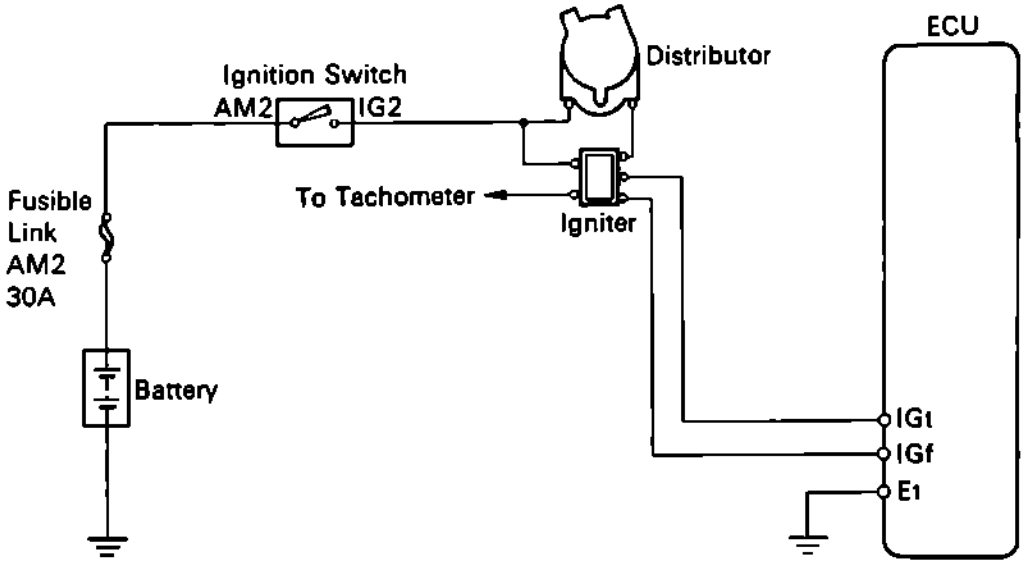
Measure voltage between terminals IGf and E1 the ECU when the engine is cranking.

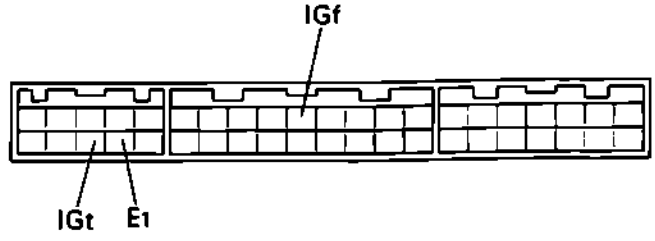
Voltage = About 1.0 V
(Neither 0 V nor 5 V)



FI0191

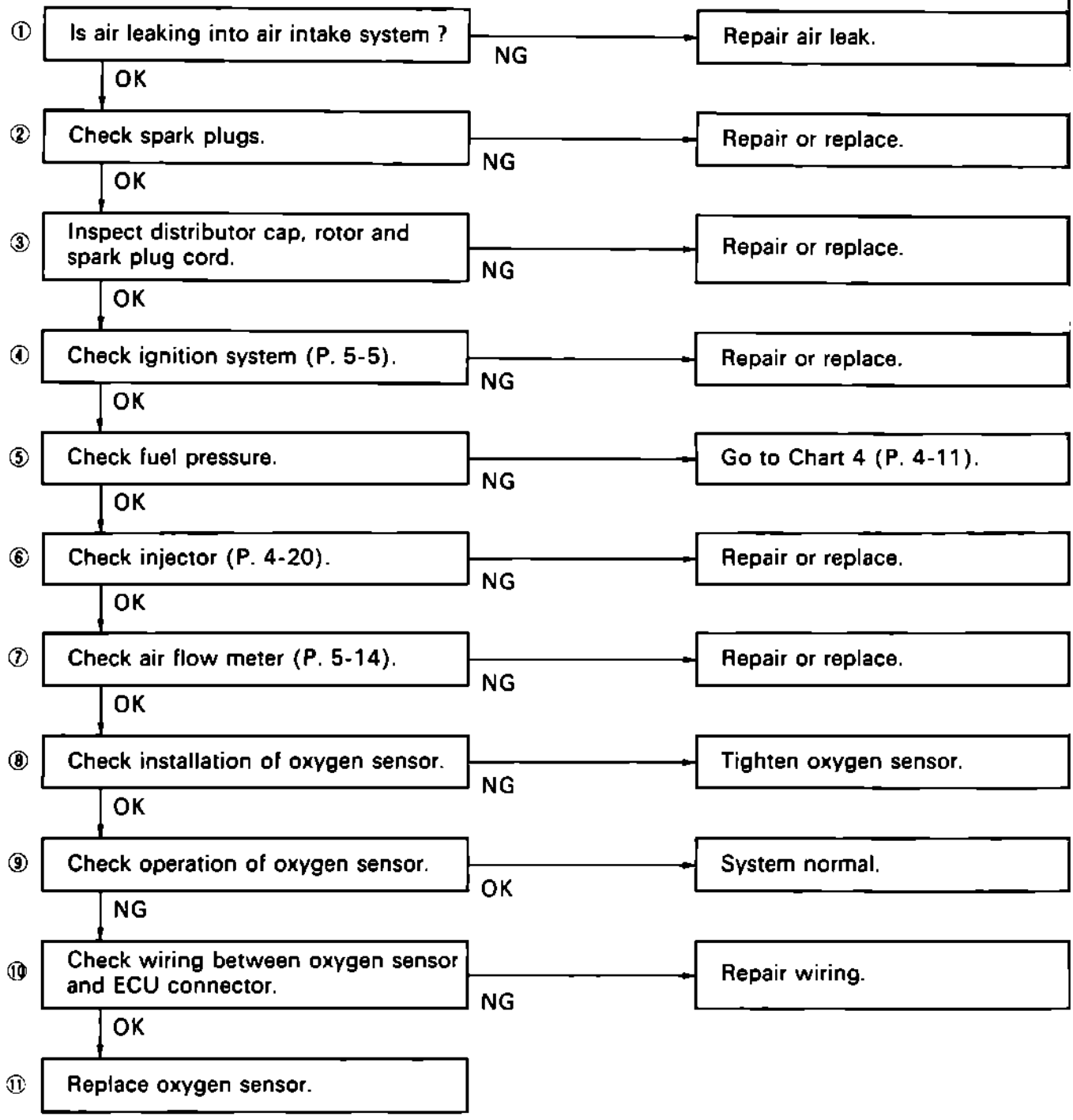
10 **Try another ECU.** **END**





FI1847
FI2378

CODE 21 — Lean exhaust

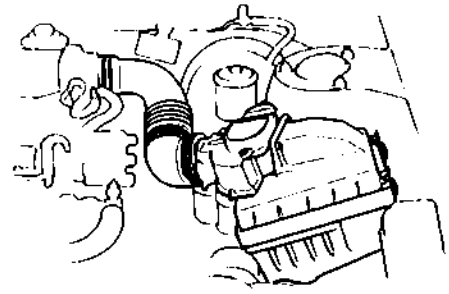


1 **Is air leaking into air intake system?**

NG **Repair air leak.**

Loose or missing engine oil dipstick, oil filler cap, PCV hose, etc., can allow air to leak into air intake system, causing mixture to become too lean.

OK No air leaking into air intake system between air flow meter and cylinder head.



FI2339

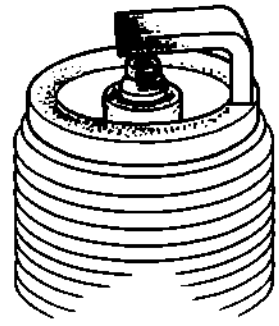
2 **Check spark plugs.**

NG **Repair or replace.**

C Rmove the spark plugs.

P Check clearance of the spark plug gap, and check end of the 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 mixture is probably too rich.

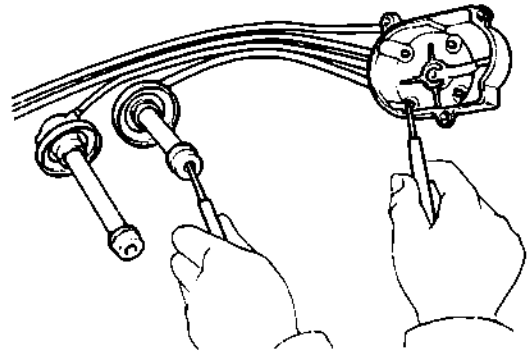


IG0148

3 **Inspect distributor cap, rotor and spatk plug cord.**

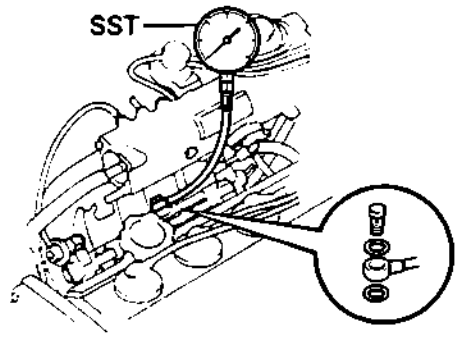
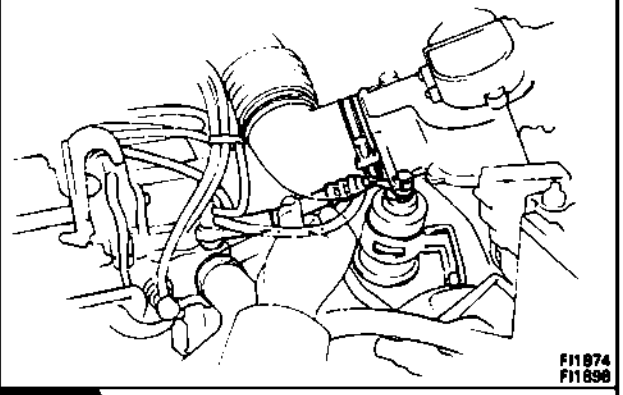
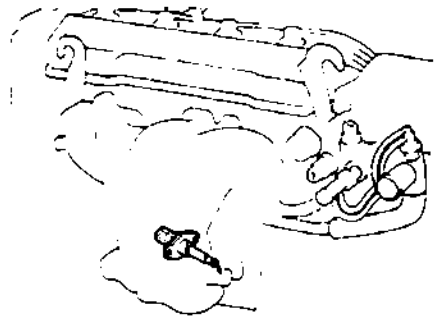
NG **Repair or replace.**

C Remove the distributor cap.
(a) Check the distributor cap and rotor for cracks, carbon tracks, or corroded terminals.
(b) Check the distributor center contact for wear.
(c) Check the cord terminals for corrosion, breaks, or distortion.
(d) Using a ohmmeter, check that resistance of the cord does not exceed maximum. Replace the cord as required.
Maximum resistance: 25kΩ per cord



IG0632

CODE 21 – Lean exhaust

4	**Check ignition system (P. 5-5).**	**NG**	**Repair or replace.**
5	**Check fuel pressure.**	**NG**	**Go to Chart 4 (P. 4-11).**
C	(a) Enough fuel in tank. (b) Hook up the fuel pressure gauge (SST 09268-45011) as explained in page 6-16.		
P	Note fuel pressure under following conditions: (a) During engine cranking. (b) When the engine is quickly raced from idle to 5,000 rpm. (c) When the engine is idling.		
OK	(a), (b) Fuel pressure = 2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa) (c) Fuel pressure = 2.3 – 2.6 kg/cm² (33 – 37 psi, 226 – 265 kPa)	 FI1874 FI1898	
N	If a fuel pressure gauge is not available, pinch the flexible hose running between the fuel filter and pulsation damper with your fingers and see if there is any pressure.		
6	**Check injector (P. 4-20).**	**NG**	**Repair or replace.**
7	**Check air flow meter (P. 5-14).**	**NG**	**Repair or replace.**
8	**Check installation of oxygen sensor.**	**NG**	**Tighten oxygen sensor.**
P	Check the oxygen sensor and oxygen sensor connector to see if they are loose.	 FI2317	

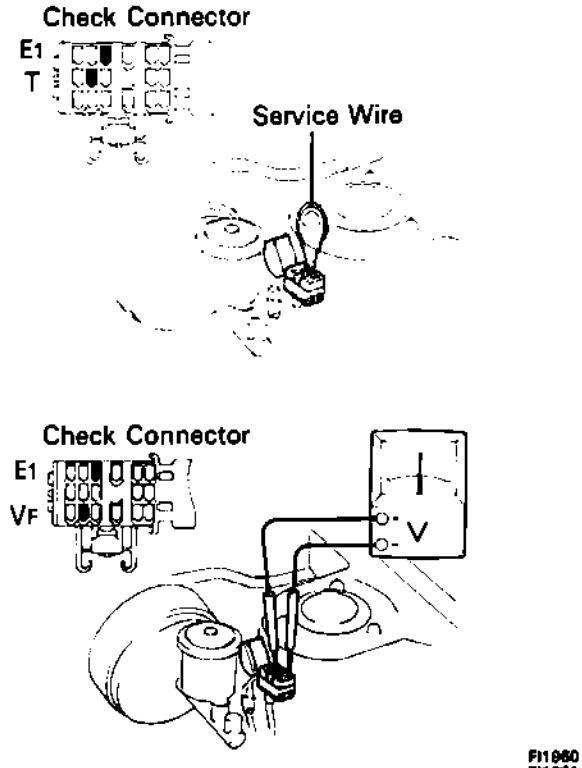
9 **Check operation of oxygen sensor.**

OK **System normal.**

Engine at normal operating temperature.

(a) Short the terminals T – E1 of the check connector.
(b) Using an analog voltmeter, connect positive prove to the VF terminal and negative prove to the E1 terminal of the check connector, and set it to the 5 – 20 V range.
(c) Warm up the oxygen sensor by running engine at 2,500 rpm for about 2 minutes.
(d) Then, maintaining engine at 2,500 rpm, count how many times needle of voltmeter fluctuates between 0 and 5 V.

Needle fluctuates a minimum of 8 times for every 10 seconds.

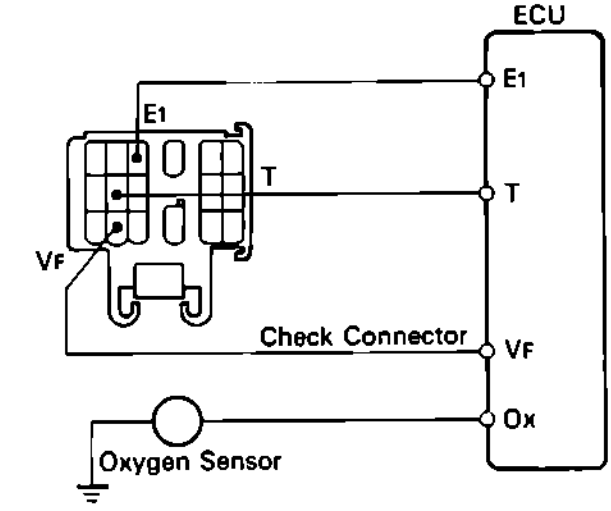


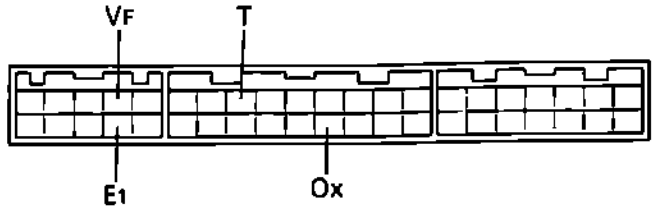
10 **Check wiring between oxygen sensor and ECU connector.**

NG **Repair wiring.**

11 **Replace oxygen sensor.**

END





FI1570
FI2378

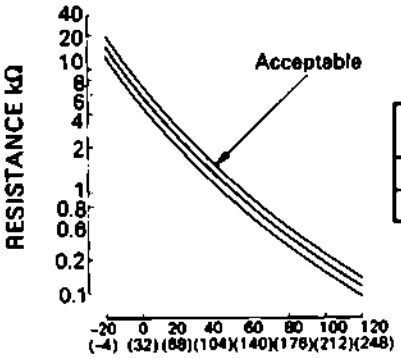
CODE 22 — Open or short circuit in water temp. sensor circuitry

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

C Disconnect the water temp. sensor connector.

P Using an ohmmeter, measure resistance between both terminals.

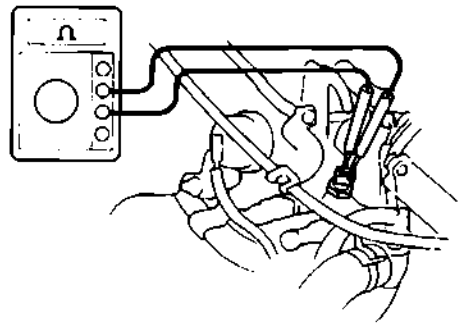
OK Resistance is below Acceptable line on chart.



WATER TEMP. °C (°F)	RESISTANCE kΩ
20 (68)	2 - 3
80 (176)	0.2 - 0.4

FI0193

NG **Replace water temp. sensor.**



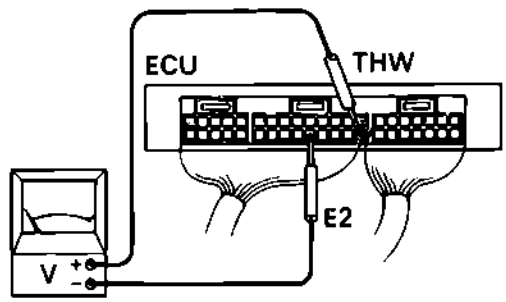
FI1912

2 **Check voltage between terminals THW and E2 of ECU.**

C Turn the ignition switch to ON.

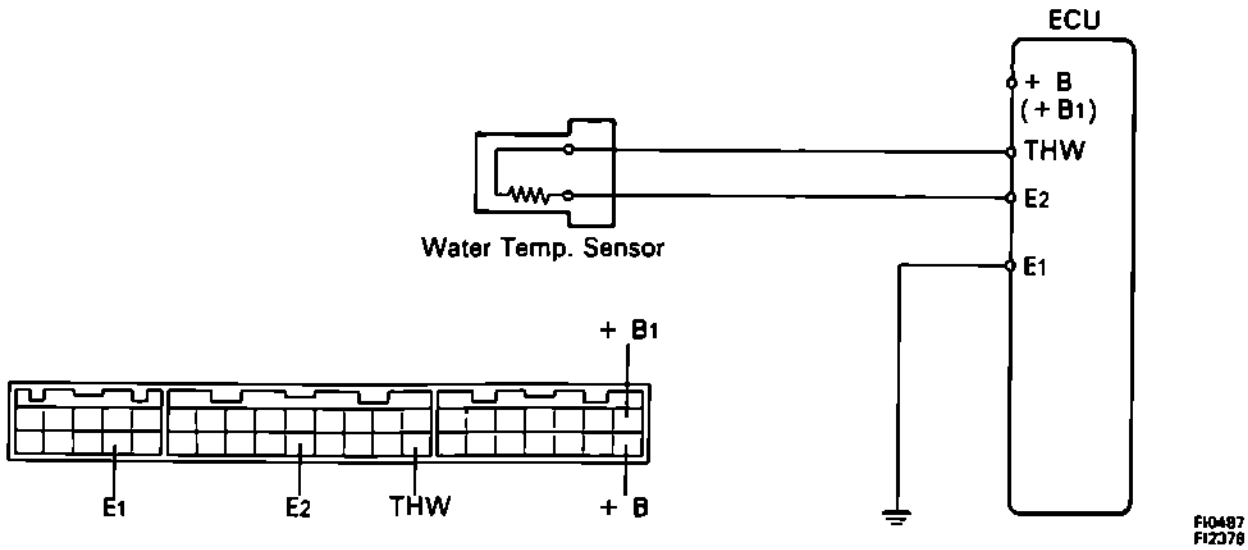
OK Voltage neither 0 V nor 5 V

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



FI0658

3 **Try another ECU.** END



FI0487
FI2378

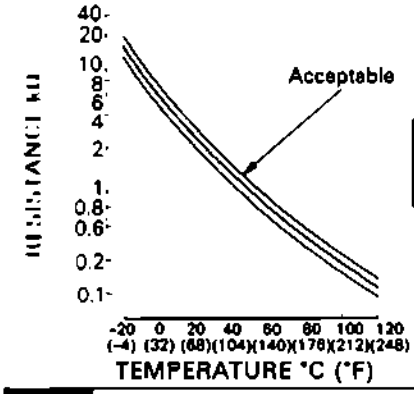
CODE 24 — Open or short circuit in intake air temp. sensor circuitry

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

C Disconnect the air flow meter connector.

P Using an ohmmeter, measure resistance between terminals THA and E2.

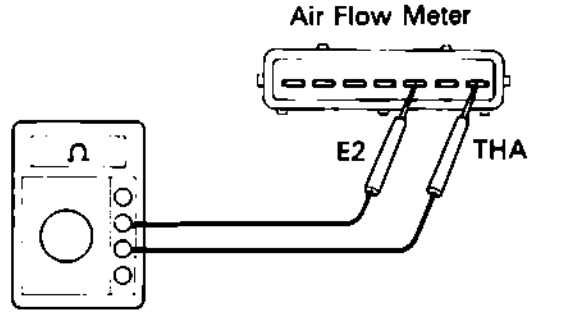
OK Resistance is below Acceptable line on chart.



AIR TEMP. °C (°F)	RESISTANCE kΩ
20 (68)	2 - 3

FI0193

NG Replace air flow meter.



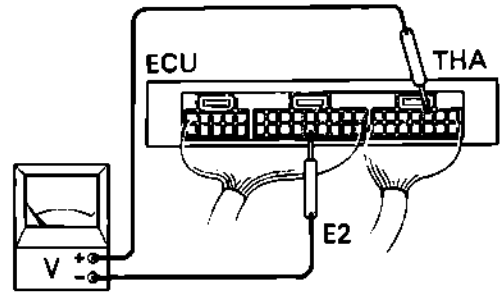
FI1253

2 **Check voltage between terminals THA and E2 of ECU.**

C Turn the ignition switch to ON.

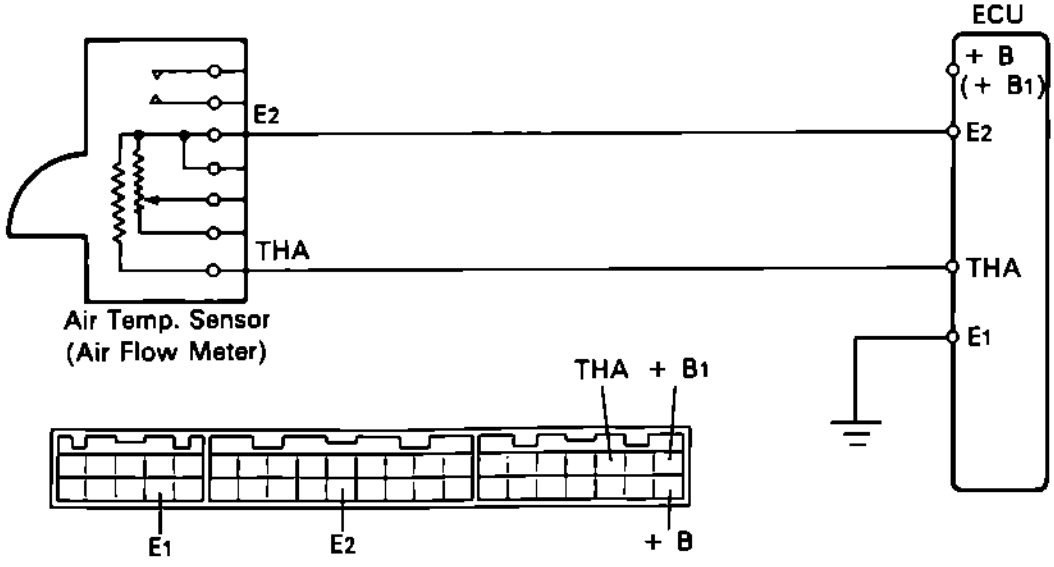
OK Voltage neither 0 V nor 5 V

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



FI0557

3 **Try another ECU.** END



FI1272
FI2378

CODE 31 OR 32 — Open or short circuit in air flow meter circuitry

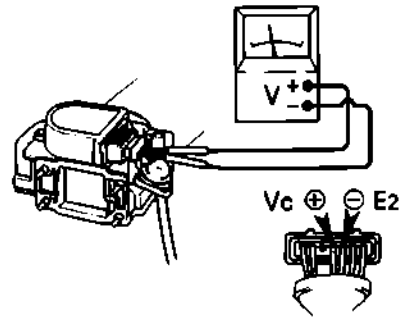
1 **Check voltage between terminals Vc and E2 of air flow meter.**

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

C (a) Carefully remove the water-proofing rubber cover of the air flow meter connector.
(b) Turn the ignition switch to ON.

P Measure voltage between terminals Vc and E2 of the air flow meter connector.

OK Voltage = 4 – 6 V



FI1736

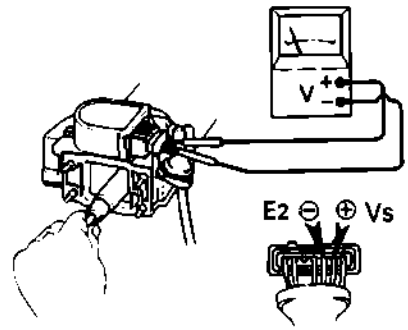
2 **Check voltage between terminals Vs and E2 of air flow meter.**

NG Check wiring between ECU terminal and air flow meter connector; if still NG, try another air flow meter.

C (a) Carefully remove the water-proofing rubber cover of the air flow meter connector.
(b) Air cleaner case removed.
(c) Turn the ignition switch to ON.

P Check change in voltage between terminals Vs and E2 of the air flow meter connector while slowly pushing the air flow meter measuring plate from closed to open position with a screwdriver or similar object.

OK Voltage changes smoothly from 4 – 5 V to 0.02 – 0.5 V; i.e., does not suddenly jump up to 4 – 5 V or down to 0.02 – 0.5 V.



FI1732

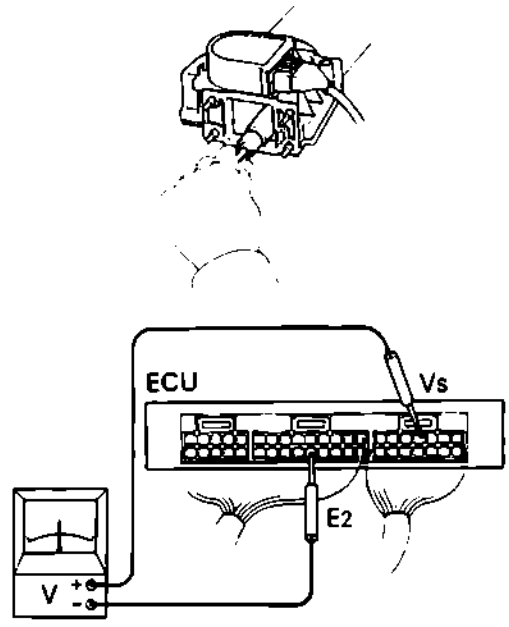
3 **Check voltage between terminals Vs and E2 of ECU.**

NG Check wiring between ECU terminal and air flow meter connector.

C Turn the ignition switch to ON.

P Check change in voltage between terminals Vs and E2 of ECU connector while slowly pushing the air flow meter measuring plate from closed to open position with a screwdriver or similar object.

OK Voltage changes smoothly from 4 – 5 V (when closed) to 0.02 – 0.5 V (when open); i.e., does not suddenly jump up to 4 – 5 V or down to 0.02 – 0.5 V.



FI1729
FI2313

4 **Try another ECU.**

END

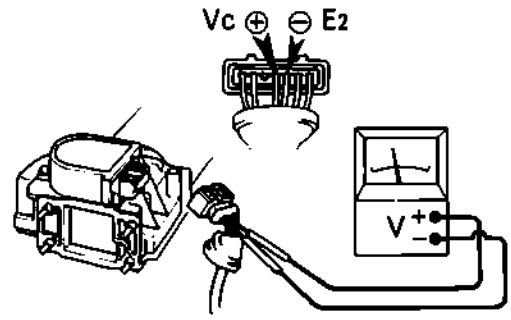
5 **Check voltage between terminals Vc and E2 of air flow meter connector.**

OK Try another air flow meter.

C (a) Disconnect the air flow meter connector.
(b) Carefully remove the water-proofing rubber cover of air flow meter connector.
(c) Turn the ignition switch to ON.

P Measure voltage between terminals Vc and E2 of the air flow meter connector.

OK Voltage = 4 – 6 V



FI1731

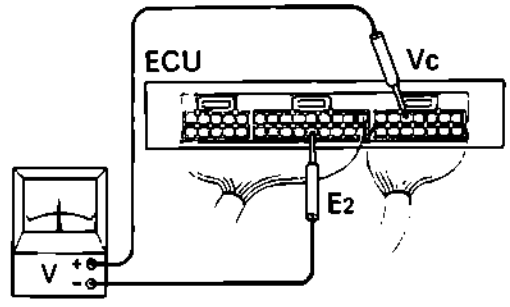
6 **Check voltage between terminals Vc and E2 of ECU.**

NG Check wiring between ECU terminal and air flow meter connector; if still NG, try another ECU.

C Turn the ignition switch to ON.

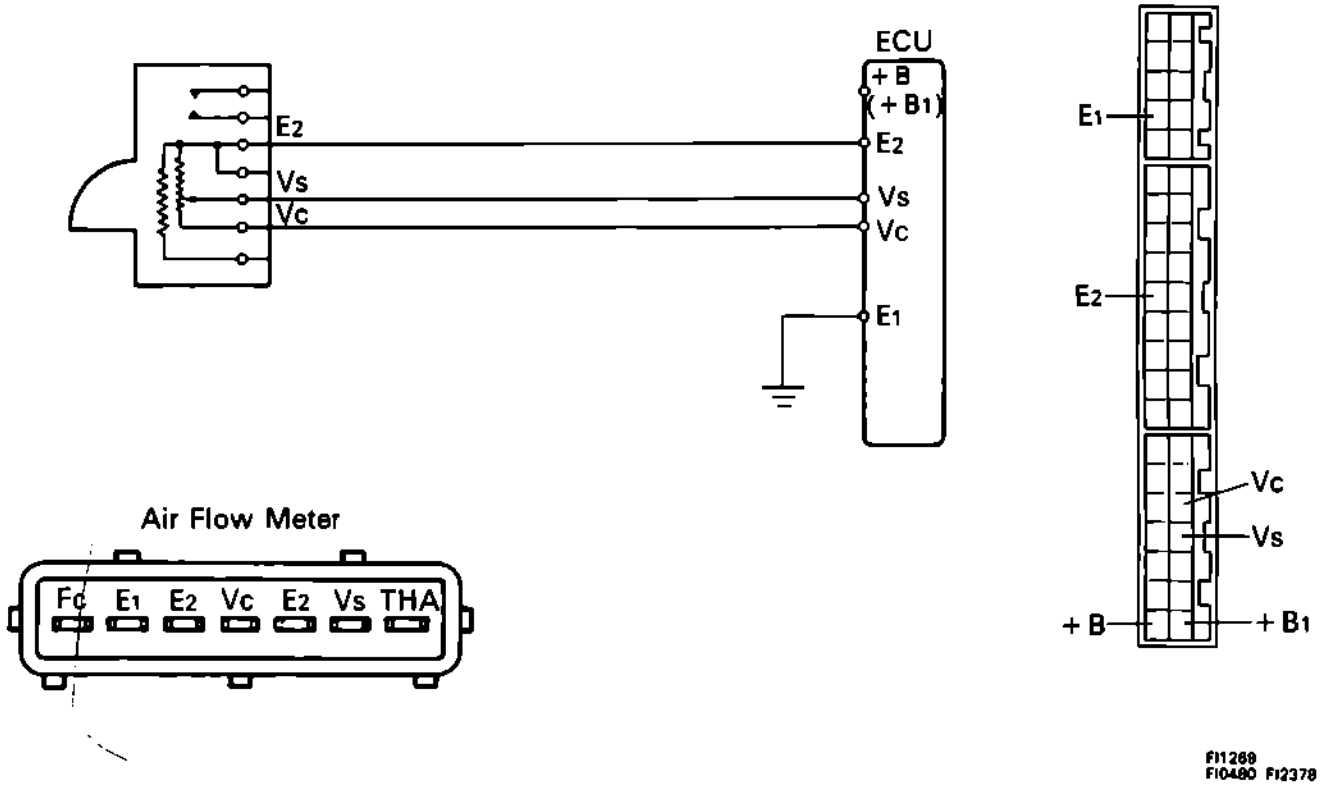
P Measure voltage between terminals Vc and E2 of the ECU.

OK Voltage = 4 – 6 V



FI2312

7 **Check wiring between ECU connector and air flow meter connector.** **END**



FI1268
FI0480 FI2378

CODE 41 — Simultaneous IDL and PSW signal to ECU

[FOR POINT TYPE: CELICA]

1 **Check throttle position sensor contacts.**

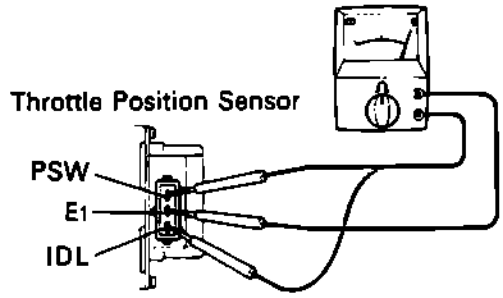
NG Adjust (P.6-4) or replace. throttle position sensor.

C Disconnect the throttle position sensor connector.

P Using an ohmmeter, measure changes in resistance between terminals IDL and E1, and PSW and E1 of throttle position sensor.

OK **IDL ↔ E1**
(a) Resistance when fully closed = 0 Ω.
(b) Resistance jumps to ∞ when the throttle valve is slightly opened and remains there until valve reaches fully opened position.

PSW ↔ E1
(a) Resistance when fully closed = ∞
(b) When the throttle valve is slowly opened from fully closed to fully opened position, resistance remains ∞, then somewhere in the middle jumps to 0 and remains there.



FI0711

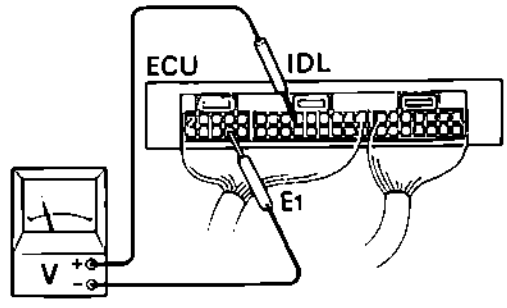
2 **Check voltage between terminals IDL and E1 of ECU.**

NG Check wiring between ECU and throttle position sensor; if still NG, try another ECU.

C Turn the ignition switch to ON.

P Measure voltage between terminals IDL and E1 of the ECU connector while slowly opening the throttle valve from fully closed to fully open position.

OK (a) Voltage = 0 V when fully closed
(b) Voltage jumps to 8 – 14 V when the valve is slightly opened, then remains there until the valve is fully open.



FI2390

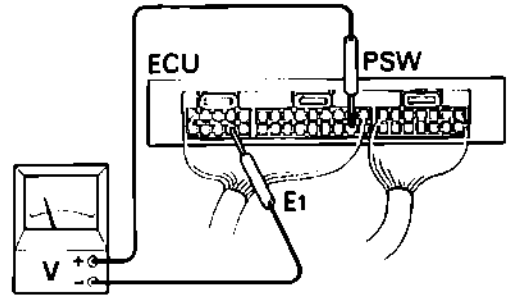
3 **Check voltage between terminals Psw and E1 of ECU.**

NG Check wiring between ECU and throttle position sensor; if still NG, try another ECU.

C Turn the ignition switch to ON.

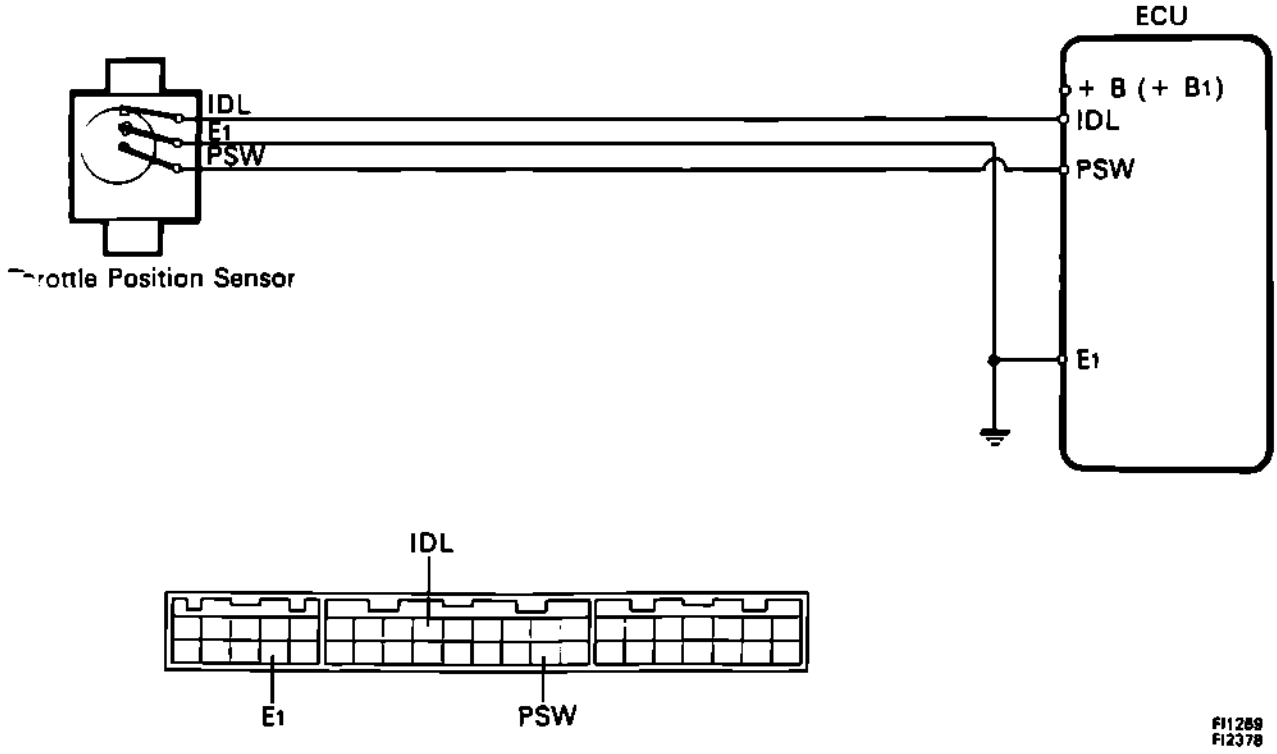
P Measure voltage between terminals PSW and E1 of the ECU connector while slowly opening the throttle valve from fully closed to fully open position.

OK 4 – 5 V is output until the valve is open about halfway, then voltage drops to 0 V and remains there.



FI2389

4 **Throttle position sensor is normal.** **END**


ECU
IDL
E1
PSW
Throttle Position Sensor
+ B (+ B1)
IDL
PSW
E1
IDL
E1
PSW
FI1259
FI2378

CODE 41 — Open or short circuit in throttle position sensor circuitry
[FOR LINEAR TYPE: CAMRY]

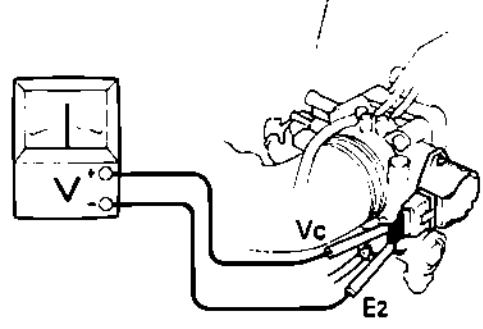
1 **Check voltage between terminals Vc and E2 of throttle position sensor.**

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

P Measure voltage between terminals Vc and E2 of the throttle position sensor connector.

OK Voltage = 4 – 6 V

NG → Go to 5 of this chart.



FI1586

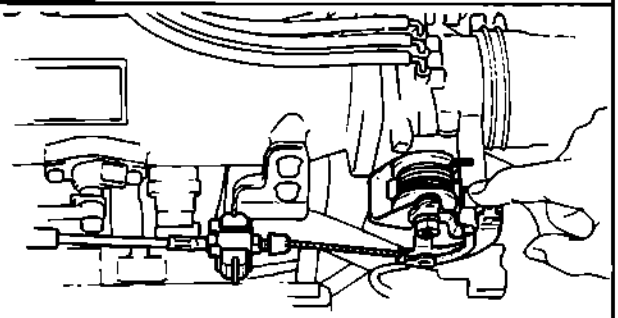
2 **Check voltage between terminals VTA and E2 of throttle position sensor.**

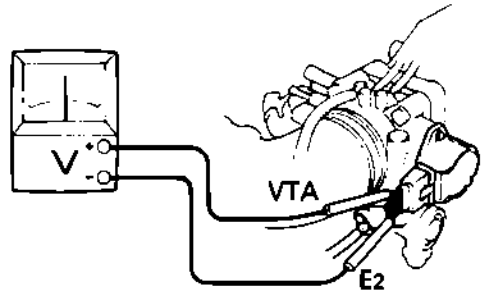
C (a) Carefully remove the water-proofing rubber cover of the throttle position sensor connector.
(b) Turn the injection switch to ON.

P Check change in voltage between terminals VTA and E2 of the throttle position sensor connector while slowly opening the throttle valve from closed to open position.

OK Voltage changes smoothly from 0.1 – 1.0 V (when closed) to 4 – 5 V (when open); i.e., it does not suddenly jump up to 4 – 5 V or down to 0.1 – 1.0 V.

NG → Check wiring between ECU and throttle position sensor; if still NG, try another throttle position sensor.





FI1893
FI1587

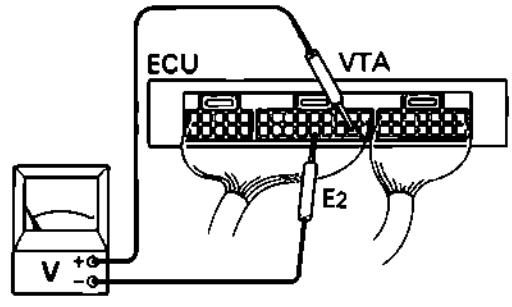
3 **Check voltage between terminals VTA and E2 of ECU.**

C Turn the ignition switch to ON.

P Check change in voltage between terminals VTA and E2 of the ECU connector while slowly opening the throttle valve from closed to open position.

OK Voltage changes smoothly from 0.1 – 1.0 V (when closed) to 4 – 5 V (when open); i.e.,it does not suddenly jump up to 4 – 5 V or down to 0.1 – 1.0 V.

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



FI0554

4 **Try another ECU.** → END

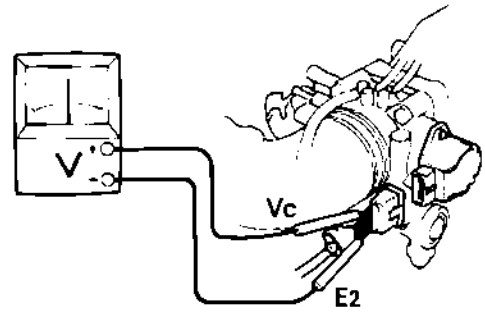
5 **Check voltage between terminals Vc and E2 of throttle position sensor connector.**

OK **Try another throttle position sensor.**

(a) Disconnect the throttle position sensor connector.
(b) Carefully remove the water-proofing rubber cover of throttle position sensor connector.
(c) Turn the ignition switch to ON.

Measure voltage between terminals Vc and E2 of the throttle position sensor connector.

Voltage = 4 – 6 V



FI1588

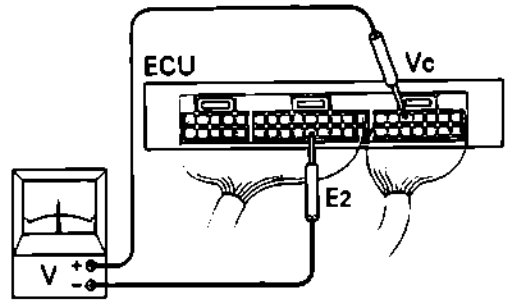
6 **Check voltage between terminals Vc and E2 of ECU.**

NG **Check wiring between ECU and throttle position sensor; if still NG, try another ECU.**

Turn the ignition switch to ON.

Measure voltage between terminals Vc and E2 of the ECU.

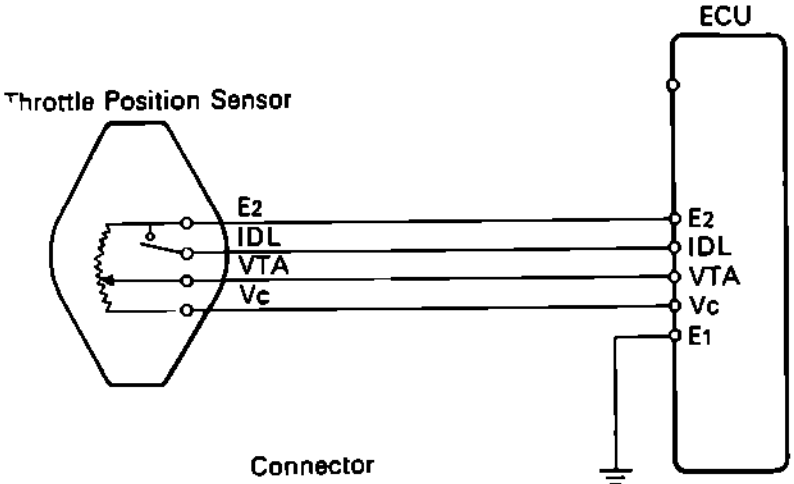
Voltage = 4 – 6 V

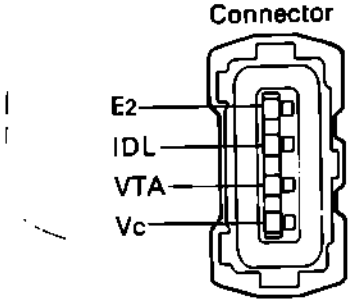


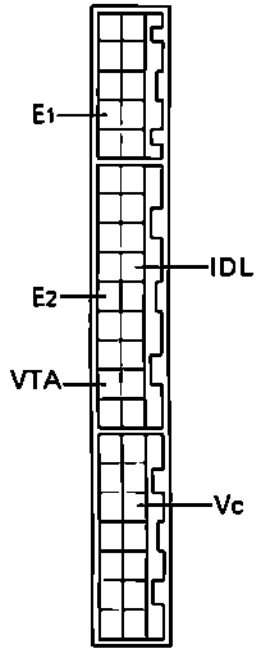
FI2313

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

END







FI1388
FI0647 FI2378

CODE 42 — Open or short circuit in vehicle speed sensor circuitry

1 **Before using this chart, check again to see whether Code 42 is still being output.**

P Drive the vehicle for at least 10 seconds under the following conditions:

1. Speed 5 km/h (3 mph) or faster
2. Engine speed 2,500 rpm or higher
3. Vacuum 100 mm Hg
4. Coolant temperature 80°C or more

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

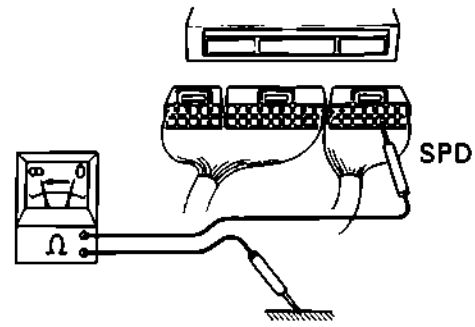
2 **Check continuity between terminal SPD of ECU and body.**

C (a) Disconnect the ECU wiring connectors from the ECU.
(b) Jack up one front wheel.

P Using an analog ohmmeter, check for continuity between terminal SPD of the ECU and body ground while turning the wheel slowly by hand.

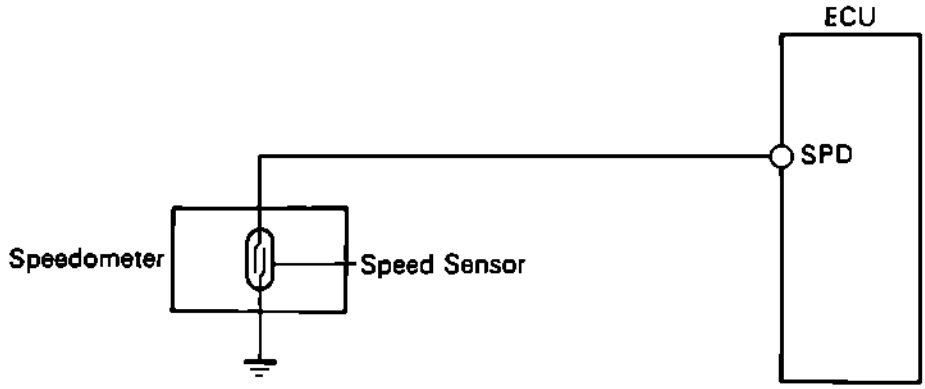
OK The analog ohmmeter needle deflects from 0 Ω to ∞ Ω.

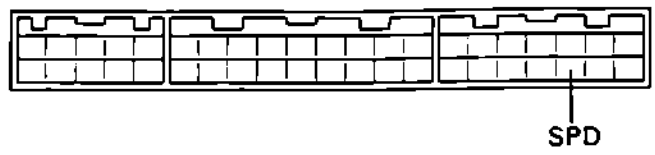
NG **Check wiring and speed sensor in the speedometer.**



FI2310

3 **Try another ECU.** END





FI0079
FI2378

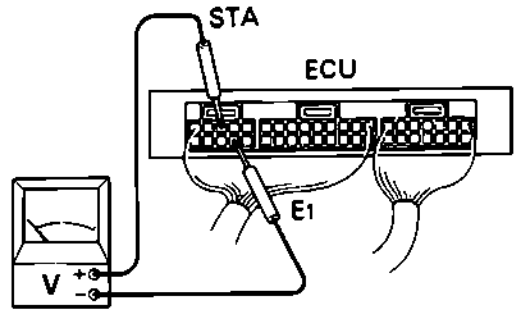
CODE 43 — Open circuit in starter signal circuitry

1	Check starter operation.	NG	Check wiring between positive terminal of battery and terminal STA (50) of starter.
2	Check voltage between terminals STA and E1 of ECU.	NG	Check wiring between ECU connector and terminal STA (50) of starter.

C Turn the ignition switch to ST.

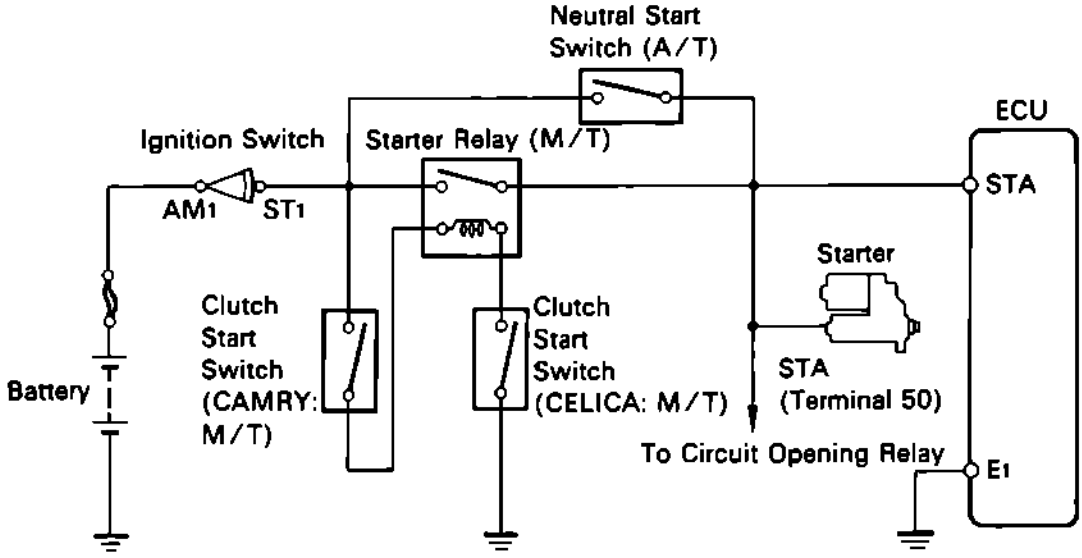
P Measure voltage between terminals STA and E1 of ECU while engine cranking.

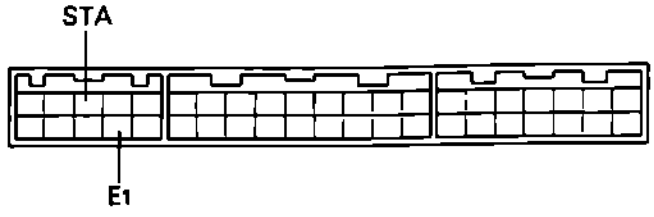
OK Voltage = 6 – 12 V



FI0211

3	Try another ECU.	END





FI2388
FI2378

CODE 51 – Switch input signal test

1 **Is normal code being output?** — **NG** Go to Chart 1 (P. 4-2).

C (a) Battery voltage above 11 V.
(b) Air conditioner OFF.
(c) Throttle valve fully closed (throttle position sensor IDL contacts closed).
(d) Automatic transmission in "P" or "N" range.

P Same procedure as TCCS INITIAL INSPECTION CHART step 2 on page 3-2.

2 **Test air conditioner signal.** — **NG** **Check wiring between ECU connector and air conditioner.**

C Normal code being output.

P Turn the air conditioner switch on and off.

OK Code 51 output when the switch is on and Normal code output when the switch is off.

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

OFF – NORMAL CODE

ON – CODE 51

FI0080

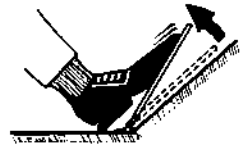
3 **Test throttle position sensor signal.** — **NG** **Check wiring between ECU connector and throttle position sensor.**

C Normal code being output.

P Depress and release the acceleration pedal.

OK Code 51 output when the acceleration pedal is depressed and Normal code output when the acceleration is released.

Depress – CODE 51



Release – NORMAL CODE

EC0151
FI0213

4 **Test neutral start switch signal (A/T only).** — **NG** **Check wiring between ECU connector and neutral start switch.**

C Normal code being output.

P Shift the shift selector in any range other than "N" or "P".

OK Code 51 output when the shift selector is in any range other than "N" or "P" and Normal code output when in "N" or "P".

P or N – NORMAL CODE

R, D, 2 or 1 – CODE 51

FI1186

REMOVAL, INSTALLATION AND ADJUSTMENT

COMPONENTS

TEST EQUIPMENT

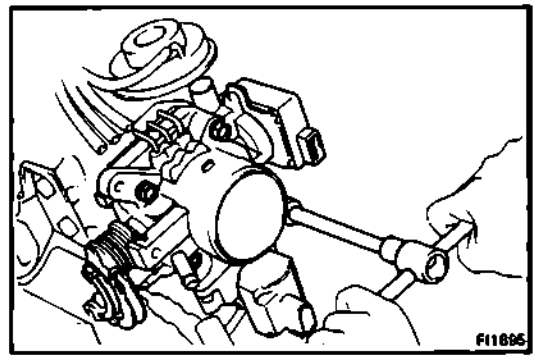
THROTTLE BODY

REMOVAL

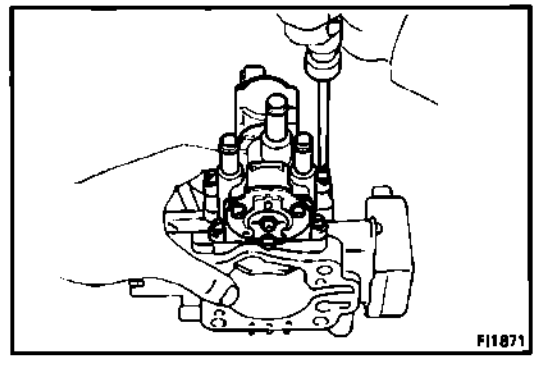
1. Drain the engine coolant.
2. (A/T)
   Disconnect the throttle cable from the throttle linkage.
3. Disconnect the accelerator cable from the throttle linkage.
4. Disconnect the air cleaner hose.
5. Disconnect the throttle position sensor connector.
6. Disconnect the ISC valve connector.

7. Remove the throttle body.
   (a) Disconnect the following hoses:
   - PCV hose
   - Water hoses
   - Air tube hose
   - Emission control vacuum hoses

   (b) Remove the four bolts, throttle body and gasket.

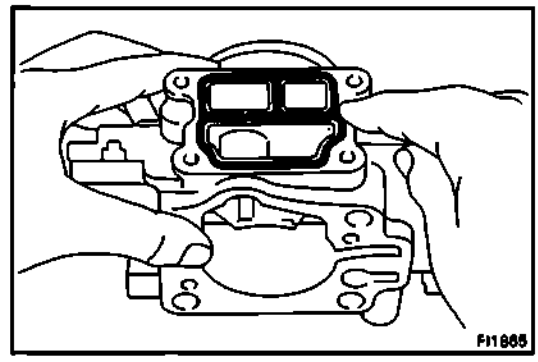


8. If necessary, remove the ISC valve from the throttle body.



INSTALLATION

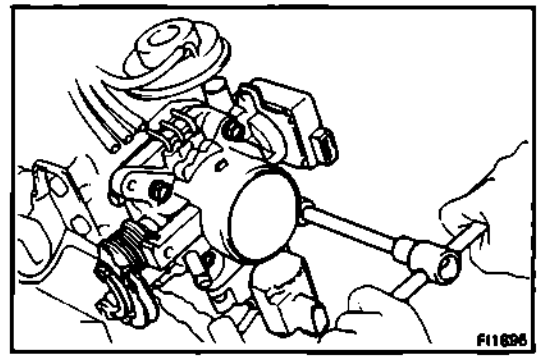
1. Install the ISC valve to the throttle body.
   (a) Place a new gasket on the throttle body.
   (b) Install the ISC valve with the four screws.



2. Install the throttle body.
   (a) Install a new gasket and the throttle body with the four bolts.

   Torque: 195 kg-cm (14 ft-lb, 19 N·m)

   (b) Connect the following hoses:
   - PCV hose
   - Water hoses
   - Air tube hose
   - Emission control vacuum hoses



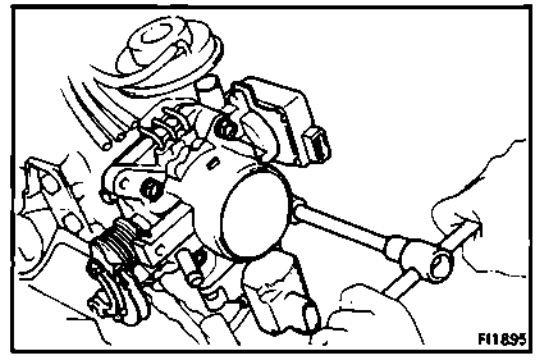
3. Connect the ISC valve connector.
4. Connect the throttle position sensor connector.
5. Connect the air cleaner hose.
6. (A/T)
   Connect the throttle cable, and adjust it.
7. Connect the accelerator cable, and adjust it.
8. Fill with the engine coolant.

THROTTLE POSITION SENSOR

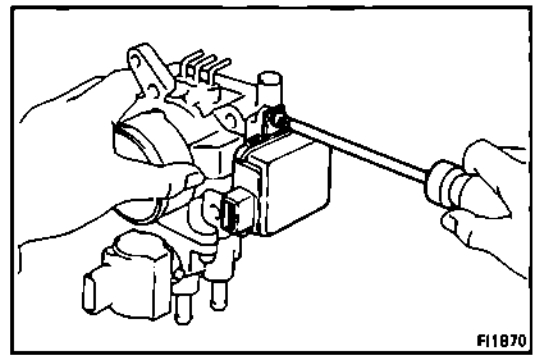
ADJUSTMENT

[FOR POINT TYPE: CELICA]

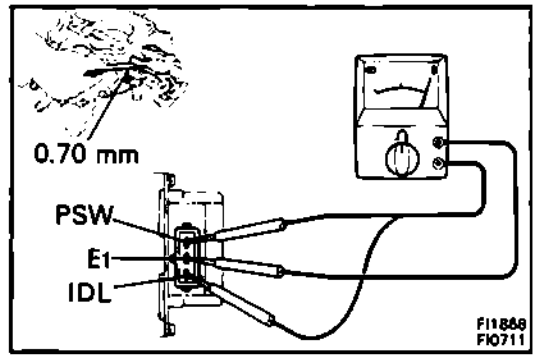
1. Remove the throttle body. (See P. 6-2)



2. Loosen the two screws of the sensor.

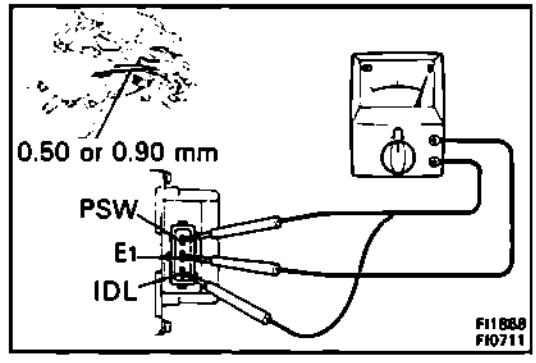


3. Insert a 0.70 mm (0.028 in.) thickness gauge, between the throttle stop screw and stop lever.
4. Connect the test probe of an ohmmeter to the terminals IDL and E1 of the sensor.
5. Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two screws.

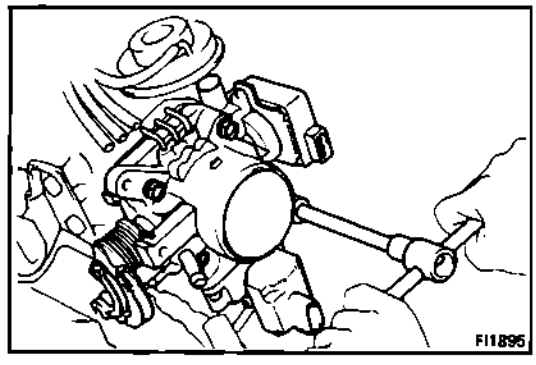


6. Recheck the continuity between terminals IDS and E1.

Clearance between lever and stop screw	Continuity IDL – E1
0.50 mm (0.020 in.)	Continuity
0.90 mm (0.035 in.)	No continuity

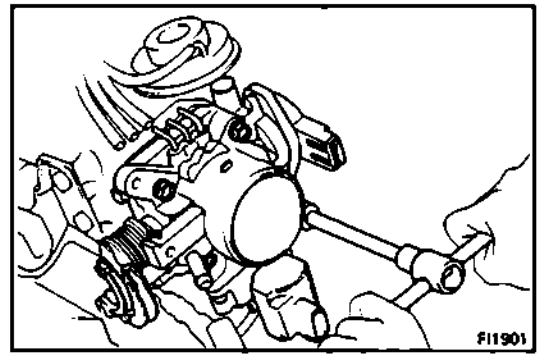


7. Install the throttle body. (See P. 6-3)

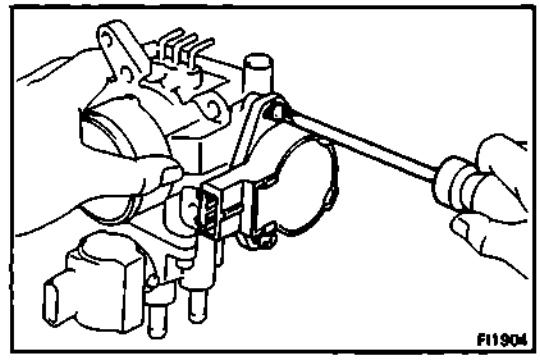


[FOR LINEAR TYPE: CAMRY]

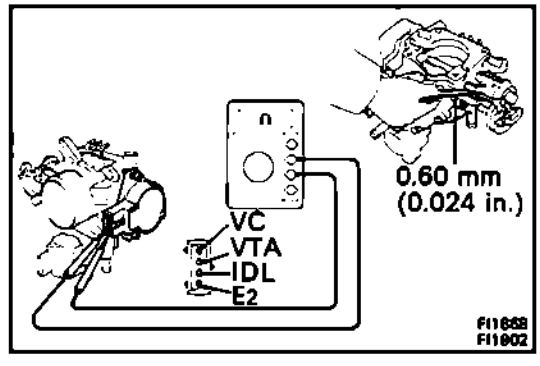
1. Remove the throttle body. (See P. 6-2)



2. Loosen the two screw of the sensor.

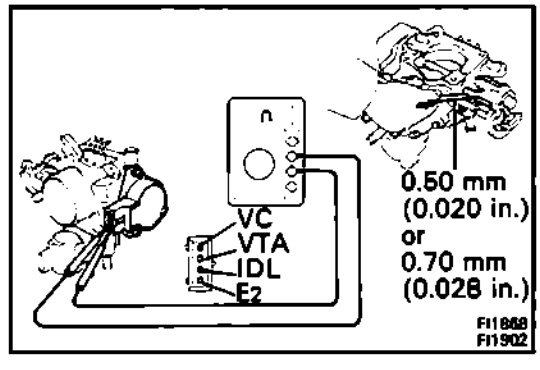


3. Insert a 0.6 mm (0.024 in.) thickness gauge, between the throttle stop screw and stop lever.
4. Connect the test probe of an ohmmeter to the terminals IDL and E_2 of the sensor.
5. Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two screws.

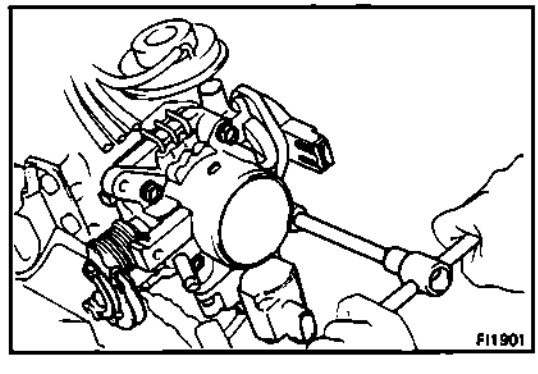


6. Recheck the continuity between terminals IDL and E_2.

Clearance between lever and stop screw	Continuity IDL – E_2
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



7. Install the throttle body. (See P. 6-3)

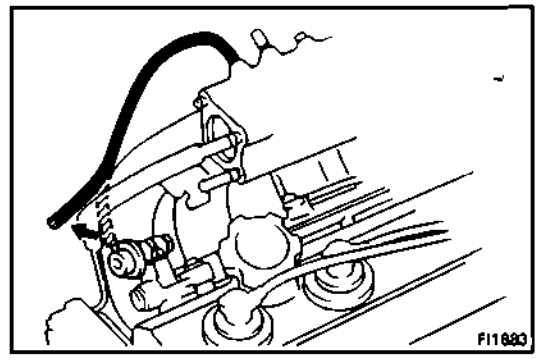


FUEL PRESSURE REGULATOR

REMOVAL

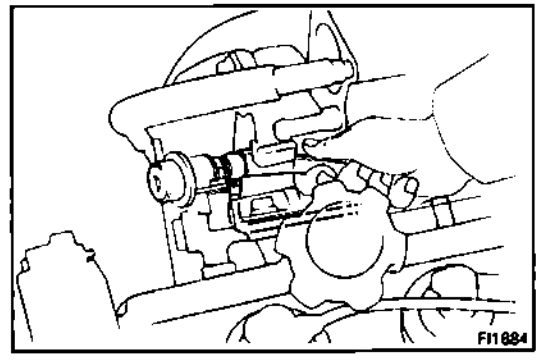
1. Disconnect the cable from the negative terminal of the battery.

2. Disconnect the vacuum sensing hose.

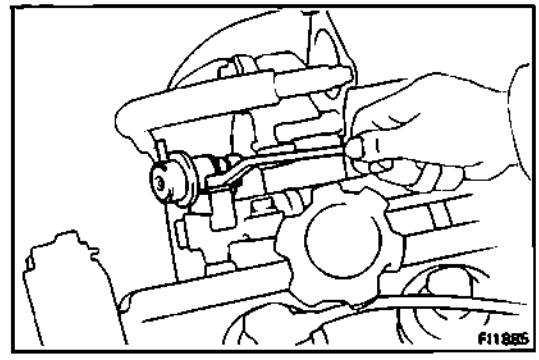


3. Disconnect the fuel return pipe.
   (a) Put a suitable container or shop towel under the pressure regulator.
   (b) Remove the union bolt and two gaskets, and disconnect the return pipe.

   NOTE: Slowly loosen the union bolt.



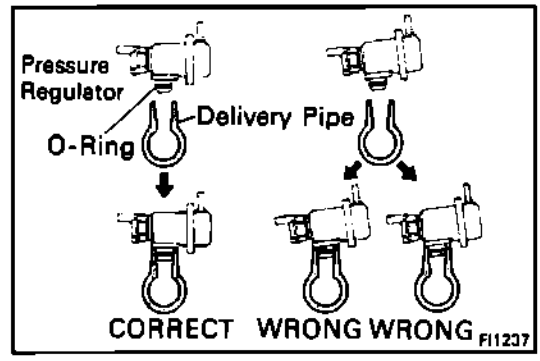
4. Remove the two bolts, and pull out the pressure regulator.



INSTALLATION

1. Install the fuel pressure regulator.
   (a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.
   (b) Install the pressure regulator with the two bolts.

   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



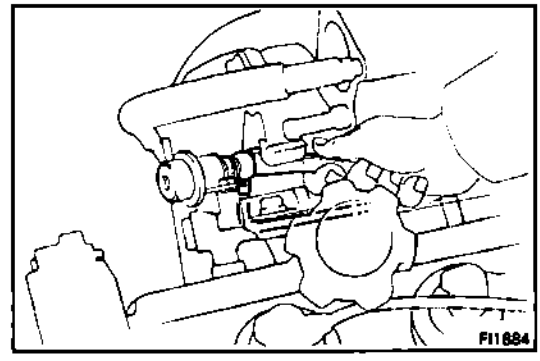
2. Install the return pipe with new two gaskets and the union bolt.

   Torque: 180 kg-cm (13 ft-lb, 18 N·m)

3. Connect the vacuum sensing hose.

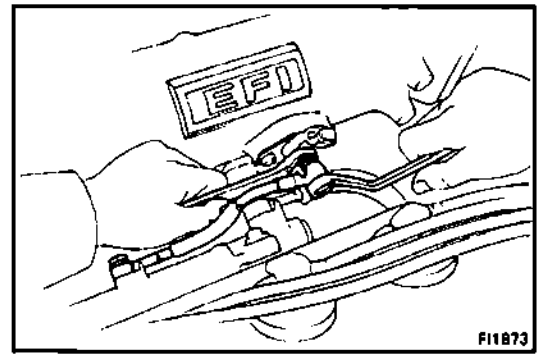
4. Connect the cable to the negative terminal of the battery.

5. Check for fuel leakage. (See P. 1-14)



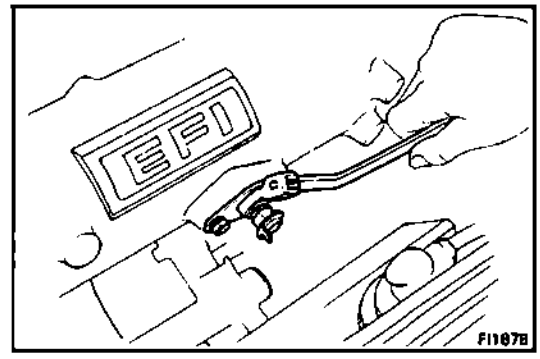
COLD START INJECTOR

REMOVAL



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

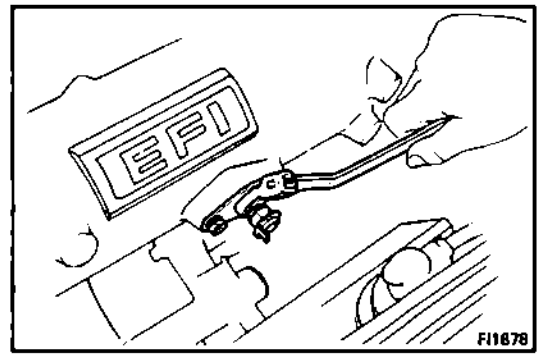
   NOTE: Slowly loosen the union bolts.
4. Remove the two bolts and cold start injector with the gasket.



INSTALLATION

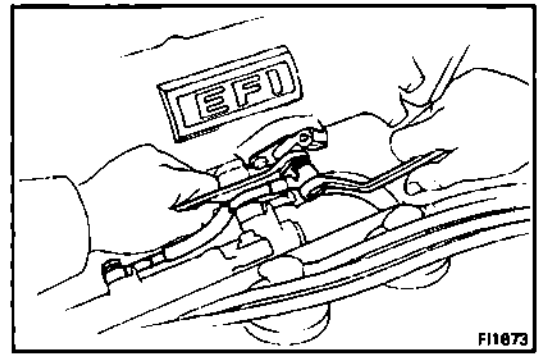
1. Install a new gasket and cold start injector with he two bolts.

   Torque: 95 kg-cm (82 in.-lb, 9.3 N·m)



2. Using a new gasket, install the cold start injector pipe to the delivery pipe and cold start injector. Torque the union bolts.

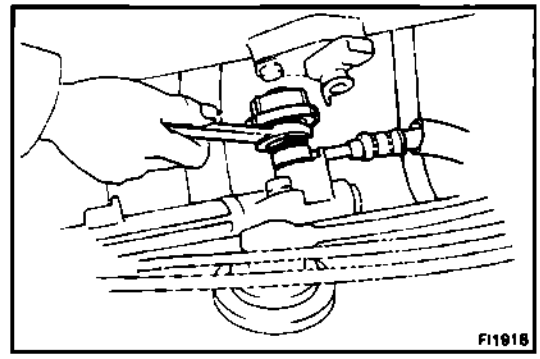
   Torque: 180 kg-cm (13 ft-lb, 18 N·m)
3. Connect the cold start injector connector.
4. Connect the cable to the negative terminal of the battery.
5. Check for fuel leakage. (See P. 1-14)



INJECTOR

REMOVAL

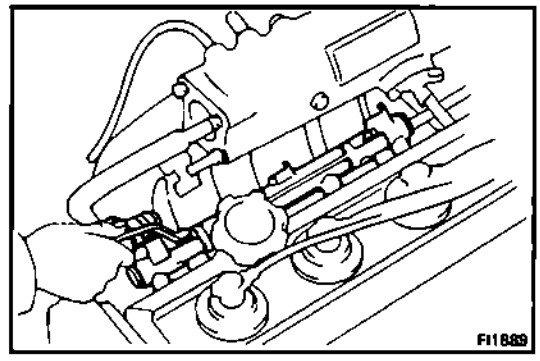
1. Disconnect the cable from the negative terminal of the battery.
2. Remove the cold start injector pipe.
(See P. 6-7)
3. Disconnect the vacuum sensing hose from the fuel pressure regulator.
4. Disconnect the injector connectors.
5. Disconnect the hose from the fuel return pipe.
6. Remove the fuel pulsation damper and two gaskets.



7. Remove the delivery pipe and the injectors.
   (a) Remove the two bolts and delivery pipe together with the four injectors.

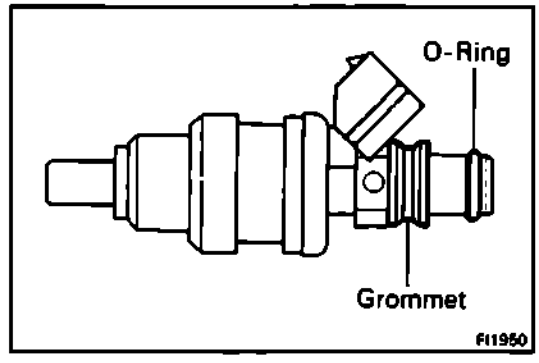
   CAUTION: Be careful not drop the injectors, when removing the delivery pipe.

   (b) Remove the four insulators and two spacers from the cylinder head.
   (c) Pull out the four injectors from the delivery pipe.

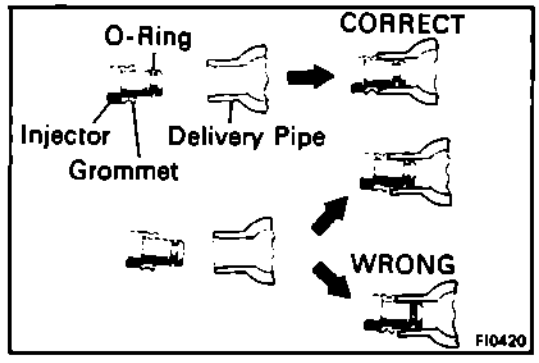


INSTALLATION

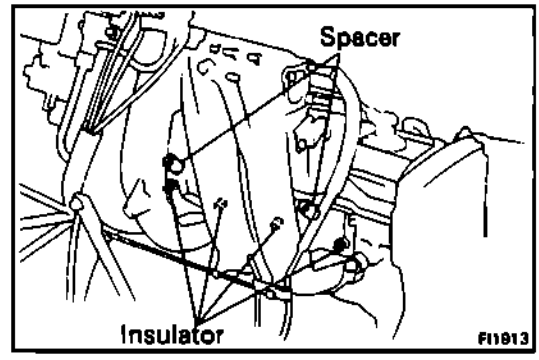
1. Install the injectors and the delivery pipe.
   (a) Install a new grommet to the injector.
   (b) Apply a light coat of gasoline to a new O-ring and install it to the injector.



   (c) While turning the injector left and right, install it to the delivery pipe. Install the four injectors.



(d) Place the four insulators and two spacers in position on the cylinder head.

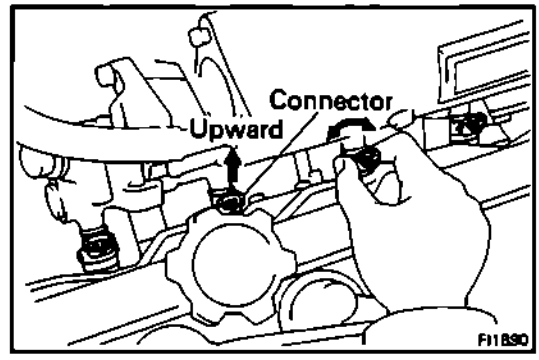


(e) Place the injectors together with the delivery pipe in position on the cylinder head.

(f) Check that the injectors rotate smoothly.

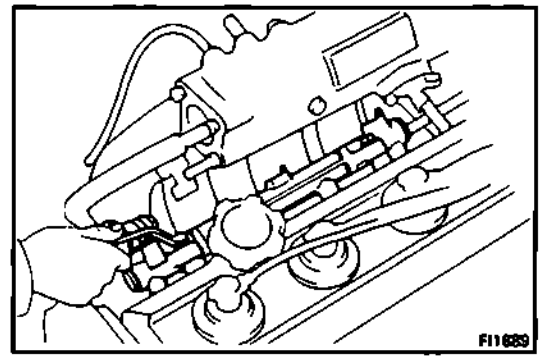
NOTE: If injectors do not rotate smoothly the probable cause is incorrect installation of O-rings. Replace the O-rings.

(g) Position the injector connector upward.

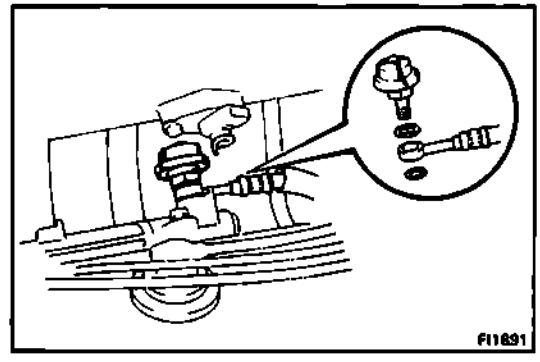


(h) Install and torque the two bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

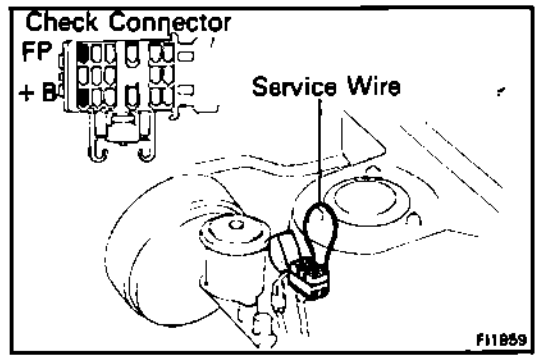


2. Install a new gasket, the hose, a new gasket and the fuel pulsation damper.



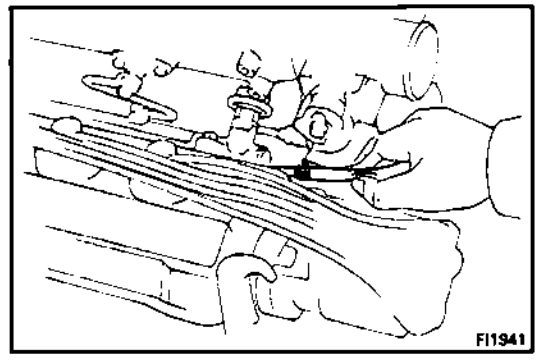
3. Connect the fuel return hose.
4. Connect the injector connectors.
5. Connect the vacuum sensing hose.
6. Install the cold start injector pipe.
(See P. 6-7)
7. Connect the cable to the negative terminal of the battery.

8. Check for fuel leakage.
   (a) Turn the ignition switch to ON.
   NOTE: Do not start the engine.
   (b) Using a service wire, short terminals +B an FP of the check connector.



   (c) When the pressure regulator fuel return hose is pinched, the pressure within the high pressure line will rise to approx. 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.



VALVE CLEARANCE

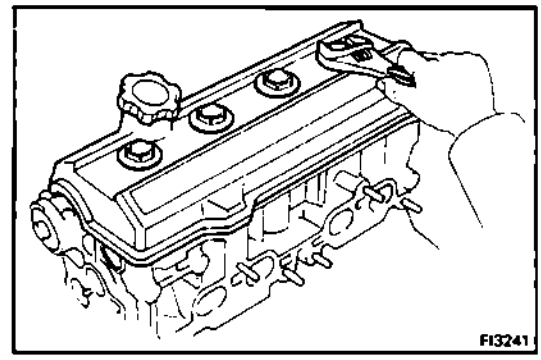
ADJUSTMENT

NOTE: Adjust the valve clearance while the engine is cold.

1. Disconnect the high-tension cords from the spark plugs.

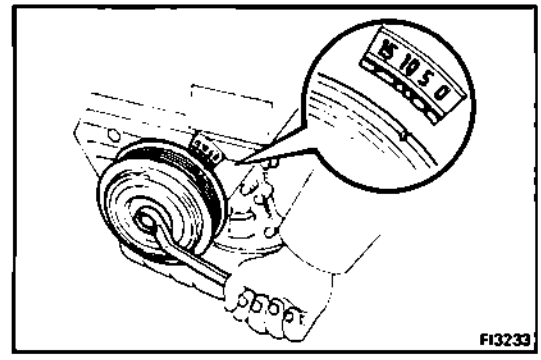
2. Remove the four nuts, grommets, head cover and gasket.

   NOTE: Arrange the grommets in correct order, so that they can be reinstalled into their original positions . This minimizes any possibility of oil leakage due to reuse of grommets.



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

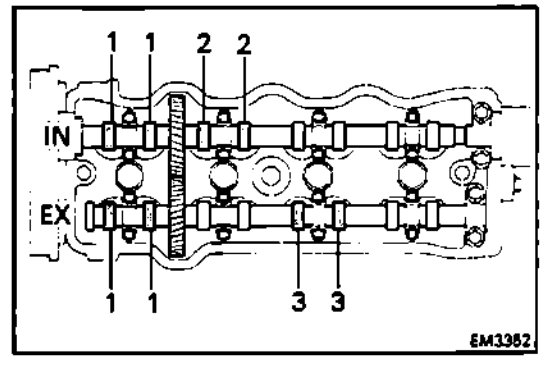
   If not, turn the crankshaft one revolution (360°) and align the mark as above.

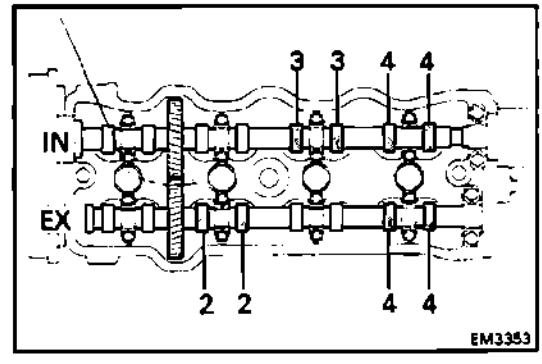


4. Adjust the valve clearance.
   (a) Check the only those valves indicated.
   - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
   - Record the valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

   Valve clearance (Cold):
   Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)
   Exhaust 0.26 – 0.38 mm (0.011 – 0.015 in.)

   (b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure step 3)
   (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure step (a))





(d) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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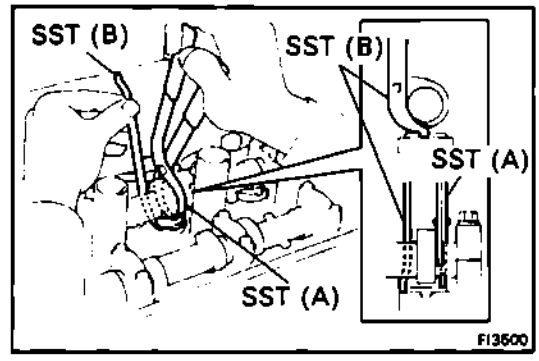
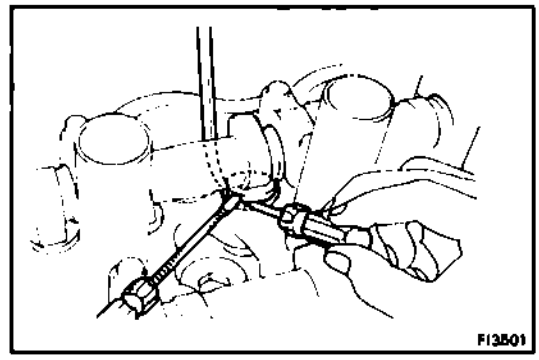
NOTE: Before pressing down the valve lifter, position the notch toward the spark plug.

- Remove the adjusting shim with a small screwdriver and magnetic finger.





(e) Determine the replacement adjusting shim size following Formula or Charts:

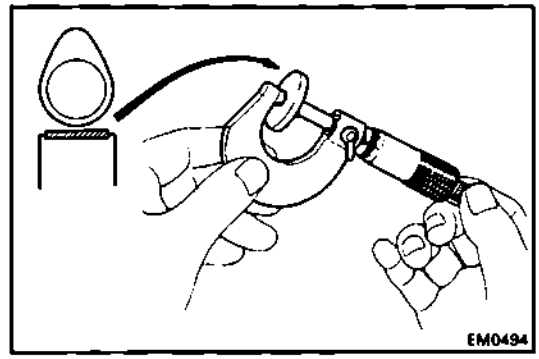
- Using a micrometer, measure the thickness of the shim which was removed.
- Calculate the thickness of a new shim so the valve clearance comes within specified value.

T .....Thickness of used shim
A .....Measured valve clearance
N ....Thickness of new shim

Intake N = T + (A – 0.24 mm (0.009 in.))
Exhaust N = T + (A – 0.33 mm (0.013 in.))

- Select a new shim with a thickness as close as possible to the calculated valve.

NOTE: Shims are available in twenty-seven sizes of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



(f) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).

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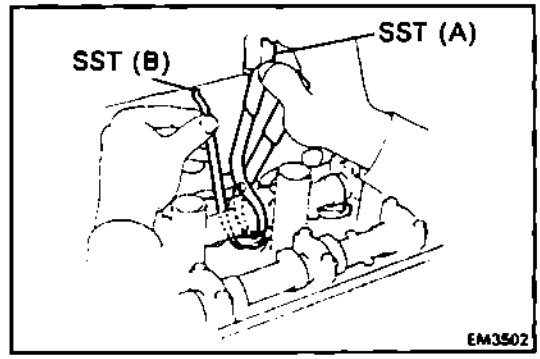
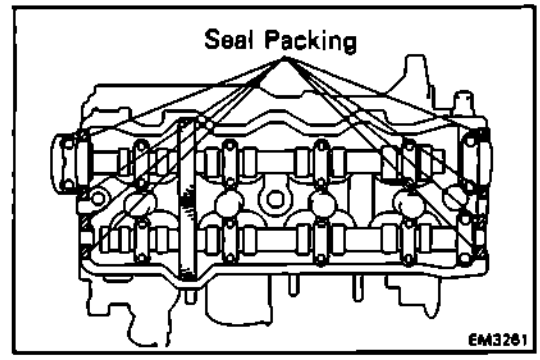
(g) Recheck the valve clearance.



5. Install the cylinder head cover.
   (a) Apply seal packing to the cylinder head as shown in the figure.

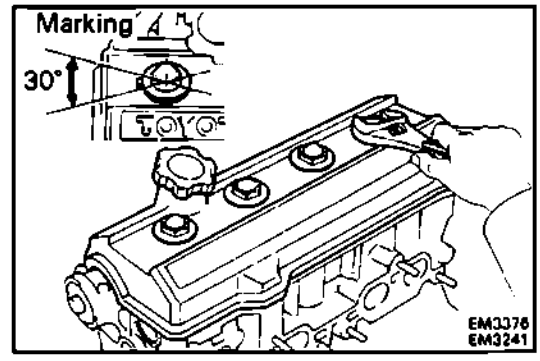
   Seal packing: Part No. 08826-00080 or equivalent



   (b) Install the gasket to the head cover.
   (c) Install the head cover with the four grommets and nuts.

   Torque: 180 kg-cm (13 ft-lb, 18 N·m)

   NOTE: Install the grommets so that it's markings are as shown in the illustration. Then install the grommet to its original position.



6. Connect the high-tension cords to the spark plugs.

Adjusting Shim Selection Using Chart

INTAKE

Measured clearance (mm)	Installed shim thickness (mm)																																								
	2.500	2.550	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.250	3.300
0.000 - 0.025								02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	24
0.026 - 0.050					02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	24	26
0.051 - 0.075				02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	26
0.076 - 0.100			02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	26	28
0.101 - 0.125			02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	28
0.126 - 0.150		02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	28	30
0.151 - 0.175		02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	30
0.176 - 0.189		02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	30	32
0.190 - 0.290																																									
0.291 - 0.300	04	06	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	
0.301 - 0.325	04	06	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	
0.326 - 0.350	06	08	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34		
0.351 - 0.375	06	08	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34		
0.376 - 0.400	08	10	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34			
0.401 - 0.425	08	10	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34				
0.426 - 0.450	10	12	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34						
0.451 - 0.475	10	12	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34								
0.476 - 0.500	12	14	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34									
0.501 - 0.525	12	14	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34										
0.526 - 0.550	14	16	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34													
0.551 - 0.575	14	16	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34															
0.576 - 0.600	16	18	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34																
0.601 - 0.625	16	18	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34																	
0.626 - 0.650	18	20	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34																			
0.651 - 0.675	18	20	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34																				
0.676 - 0.700	20	22	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																					
0.701 - 0.725	20	22	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																						
0.726 - 0.750	22	24	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																								
0.751 - 0.775	22	24	26	28	28	28	30	30	30	32	32	32	34	34	34																										
0.776 - 0.800	24	26	28	28	30	30	30	32	32	32	34	34	34	34																											
0.801 - 0.825	24	26	28	30	30	30	32	32	32	34	34	34	34																												
0.826 - 0.850	26	28	30	30	32	32	32	34	34	34	34																														
0.851 - 0.875	26	28	30	32	32	32	34	34	34																																
0.876 - 0.900	28	30	32	32	34	34	34	34																																	
0.901 - 0.925	28	30	32	34	34	34	34																																		
0.926 - 0.950	30	32	34	34	34																																				
0.951 - 0.975	30	32	34																																						
0.976 - 1.000	32	34																																							
1.001 - 1.025	34	34																																							
1.026 - 1.090	34																																								

Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.50 (0.0984)	20	2.95 (0.1161)
04	2.55 (0.1004)	22	3.00 (0.1181)
06	2.60 (0.1024)	24	3.05 (0.1201)
08	2.65 (0.1043)	26	3.10 (0.1220)
10	2.70 (0.1063)	28	3.15 (0.1240)
12	2.75 (0.1083)	30	3.20 (0.1260)
14	2.80 (0.1102)	32	3.25 (0.1280)
16	2.85 (0.1122)	34	3.30 (0.1299)
18	2.90 (0.1142)		

Intake valve clearance (Cold):

0.19 – 0.29 mm (0.007 – 0.011 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with No. 22 shim.

Adjusting Shim Selection Using Chart

EXHAUST

Measured clearance (mm)	Installed shim thickness (mm)																																							
	2.500	2.550	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.250	3.300
0.000 - 0.025													02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	20	22
0.026 - 0.050											02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	22
0.051 - 0.075										02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	22	24
0.076 - 0.100								02	02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	24
0.101 - 0.125							02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	24	26
0.126 - 0.150					02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	26
0.150 - 0.175				02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	26	28
0.176 - 0.200			02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	28
0.201 - 0.225			02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	28	30
0.226 - 0.250		02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	30
0.251 - 0.275		02	04	04	04	06	06	08	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	30	32
0.275 - 0.279		02	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	30	32
0.280 - 0.380																																									
0.381 - 0.400	04	06	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	
0.401 - 0.425	06	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	
0.426 - 0.450	06	08	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34		
0.451 - 0.475	08	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34		
0.476 - 0.500	08	10	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34				
0.501 - 0.525	10	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34					
0.526 - 0.550	10	12	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34							
0.551 - 0.575	12	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34								
0.576 - 0.600	12	14	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34									
0.601 - 0.625	14	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34											
0.626 - 0.650	14	16	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34													
0.651 - 0.675	16	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34														
0.676 - 0.700	16	18	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34															
0.701 - 0.725	18	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																	
0.726 - 0.750	18	20	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34																			
0.751 - 0.775	20	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																				
0.776 - 0.800	20	22	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34																					
0.801 - 0.825	22	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																							
0.826 - 0.850	22	24	26	28	28	28	28	30	30	32	32	32	32	34	34	34																									
0.851 - 0.875	24	26	28	28	28	30	30	30	32	32	32	34	34	34	34																										
0.876 - 0.900	24	26	28	30	30	30	30	32	32	34	34	34	34	34																											
0.901 - 0.925	26	28	30	30	30	32	32	32	34	34	34	34																													
0.926 - 0.950	26	28	30	32	32	32	32	34	34	34																															
0.951 - 0.975	28	30	32	32	32	34	34	34	34																																
0.976 - 1.000	28	30	32	34	34	34	34	34																																	
1.001 - 1.025	30	32	34	34	34	34																																			
1.026 - 1.050	30	32	34	34																																					
1.051 - 1.075	32	34	34																																						
1.076 - 1.100	32	34																																							
1.101 - 1.125	34	34																																							
1.126 - 1.160	34																																								

Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.50 (0.0984)	20	2.95 (0.1161)
04	2.55 (0.1004)	22	3.00 (0.1181)
06	2.60 (0.1024)	24	3.05 (0.1201)
08	2.65 (0.1043)	26	3.10 (0.1220)
10	2.70 (0.1063)	28	3.15 (0.1240)
12	2.75 (0.1083)	30	3.20 (0.1260)
14	2.80 (0.1102)	32	3.25 (0.1280)
16	2.85 (0.1122)	34	3.30 (0.1299)
18	2.90 (0.1142)		

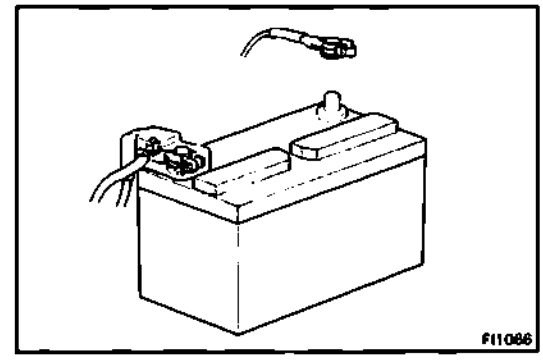
Exhaust valve clearance:
0.28 – 0.38 mm (0.011 – 0.015 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with No. 18 shim.

FUEL PRESSURE GAUGE

INSTALLATION

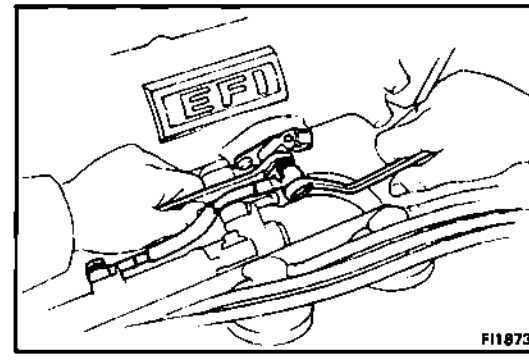
1. Disconnect the cable from the negative terminal of the battery.



2. Disconnect the cold start injector connector.

3. Remove the cold start injector pipe.
   (a) Put a suitable container or shop towel under the injector pipe.
   (b) Remove the two union bolts, four gaskets and injector pipe.

   NOTE: Slowly loosen the union bolts.

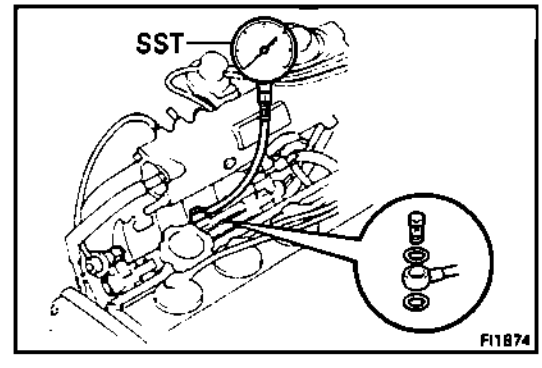


4. Install the fuel pressure gauge.
   (a) Install SST (pressure gauge) to the delivery pipe with new two gaskets and union bolt.

   SST 09268-45011

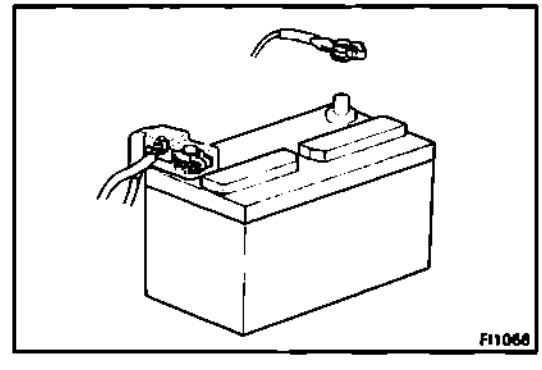
   Torque: 180 kg-cm (13 ft-lb, 18 N·m)

   (b) Wipe off any splattered gasoline.
   (c) Reconnect the battery negative (–) cable.



REMOVAL

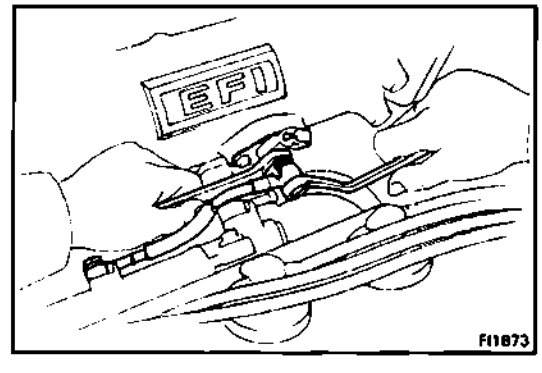
1. After checking fuel pressure, disconnect the battery negative cable and carefully remove the SST to prevent gasoline from splashing.



2. Install the injector pipe with new four gaskets and the two union bolts.

   Torque: 180 kg-cm (13 ft-lb, 18 N·m)

3. Connect cold start injector connector.
4. Connect cable to negative terminal of battery.
5. Check for fuel leakage. (See P. 1-14)



BASIC ENGINE AND TCCS INITIAL INSPECTION CHECK SHEET

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

CUSTOMER'S NAME	MAKE AND 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 w/check connector T-E1 shorted)			
Idle speed	rpm (650 rpm)			
Throttle linkage	good · no good			
Air filter	good · no good			
Fuel pressure	good · no good			
Spark test	good · no good			
Spark plug FD: Fouled (dry) FW: Fouled (wet) B: Burnt OK: Normal	#1	#2	#3	#4
Distributor cap, Rotor, Spark plug cord	good · no good			
Air leakage	present · absent			
ISC system	good · no good			
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 2.7 – 3.1 (38 – 44, 265 – 304)	RACING 2.7 – 3.1 (38 – 44, 265 – 304)	IDLING 2.3 – 2.6 (33 – 37, 226 – 265)

TOYOTA

DIAGNOSTIC CHARTS AND SERVICE SPECIFICATIO

Toyota Computer Controlled System

for Celica and Camry

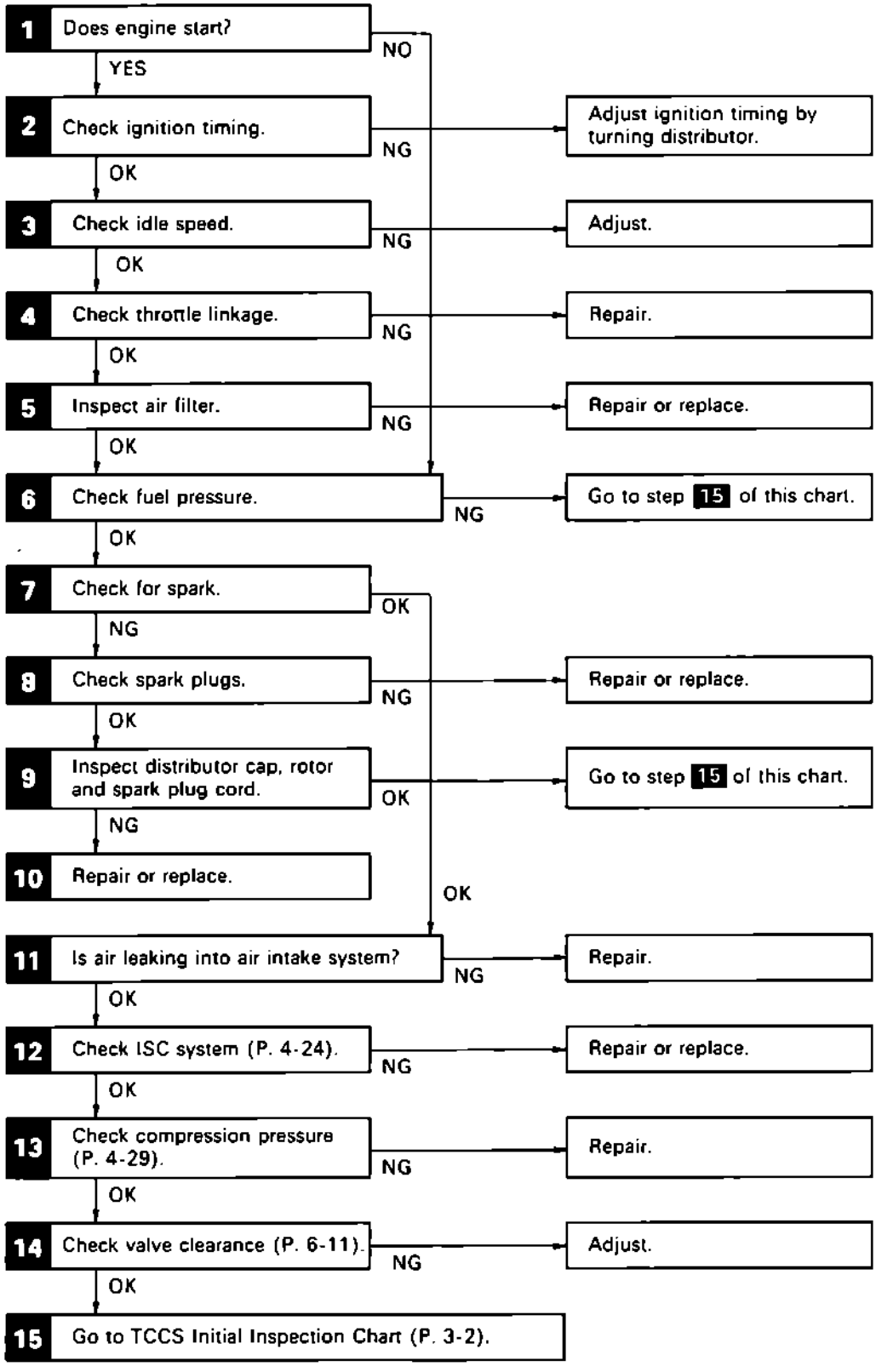
3S-FE

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, in most cases, rely 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. 2-2)



TCCS INITIAL INSPECTION CHART (P. 3-2)

1 Does "CHECK ENGINE" warning light come on?

NO → Go to Chart 1 (P. 4-2).

(Chart 1 – No. "CHECK ENGINE" warning light.)

YES

2 Is normal code output?

NO → Go to Chart 2 (P. 4-5).

(Chart 2 – Reading and confirming diagnosis codes.)

YES

3 Check fuel pressure.

NG → Go to Chart 4 (P. 4-11).

(Chart 4 Fuel system)

OK

If problem continues.

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

SYMPTOM CHARTS (P. 3-4)

Symptom / Reference (page) / System			Does not start		Difficult to start			Poor idling				
			No initial combusion	No complete combusion	Cold	Hot	Ordinary	Incorrect fast idle	High engine idle speed	Low engine idle speed	Rough idle	Hunting
Diagnosis code		1-7	12,13,14 51	11,22,31 32	22,31 32	21	11,43	22	22,31,32 42,61		11,12,13 14,21,31 32,41	11,21
Fuel system	Solenoid resistor	4-18	O	O							O	
	Injector	4-20	O	O			O				O	
	Fuel pump	4-11	O				O			O	O	
	Fuel pressure regulator	4-11	O	O			O		O	O	O	
	Fuel filter Fuel pipe line	4-11	O	O			O			O	O	
Ignition system	Ignition coil Igniter	5-5	O								O	
Electric source	Circuit opening relay	4-11	O	O								
	EFI main relay	4-2 4-11	O	O			O				O	O
Cold start system	Cold start injector	4-23	O	O	O	O	O				O	
	Cold start injector time switch	4-22	O	O	O	O	O				O	
Electronic control system	ECU	-	O	O	O	O	O	O	O	O	O	O
	Air flow meter	4-11 6-14		O	O				O	O	O	
	Distributor	5-3 5-4	O								O	
	Water temp. sensor	5-12		O	O	O		O	O	O		
	Throttle position sensor	5-16 6-18							O		O	O
	Intake air temp. sensor	5-13										
	Vehicle speed sensor	6-20							O	O		
	Oxygen sensor	5-8									O	
	Neutral start switch	5-22	O						O	O	O	
	Starter switch	6-21					O					
Air induction system	Throttle body	-							O	O	O	O
	ISC valve	4-24		O			O	O	O	O	O	O
Other	EGR system	4-26		O			O				O	
	A/C idle-up system	-							O	O		

SYMPTOM CHARTS

Symptom / Reference (page) / System			Poor drivability						Engine stall			
			Hesitation	Backfires	Loss of power	Black smuking	Hunting	Knocking	Some time after starting	After acceleration pedal depressed	After acceleration pedal released	During A/C operation
Diagnosis code		1-7	14.21.22 31.32	21	14.21.22 31.32.41	21.31.32	12.13.21	31.32	11.21.31 32	31.32		
Fuel system	Solenoid resistor	4-18										
	Injector	4-20	O	O	O	O	O					
	Fuel pump	4-11	O	O	O				O			
	Fuel pressure regulator	4-11	O	O	O	O			O			
	Fuel filter Fuel pipe line	4-11	O	O	O		O		O			
Ignition system	Ignition coil Igniter	5-5	O		O			O				
Electric source	Circuit opening relay	4-11							O			
	EFI main relay	4-2 4-11							O			
Cold start	Cold start injector	4-23				O						
	Cold start injector time switch	4-22				O						
Electronic control system	ECU	-	O	O	O	O	O	O	O	O	O	O
	Air flow meter	4-11 5-14	O	O	O	O		O	O	O		
	Distributor	5-3 5-4					O	O				
	Water temp. sensor	5-12	O	O	O	O		O	O			
	Throttle position sensor	5-16 5-18	O	O	O	O	O	O		O		
	Intake air temp. sensor	5-13										
	Vehicle speed sensor	5-20									O	
	Oxygen sensor	5-8										
	Neutral start switch	5-22										
	Starter switch	5-21	O	O	O							
Air induction system	Throttle body	-		O								
	ISC valve	4-24									O	
Other	EGR system	4-26	O		O				O			
	A/C idle-up system	-										O

SYSTEM OR UNITS 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)

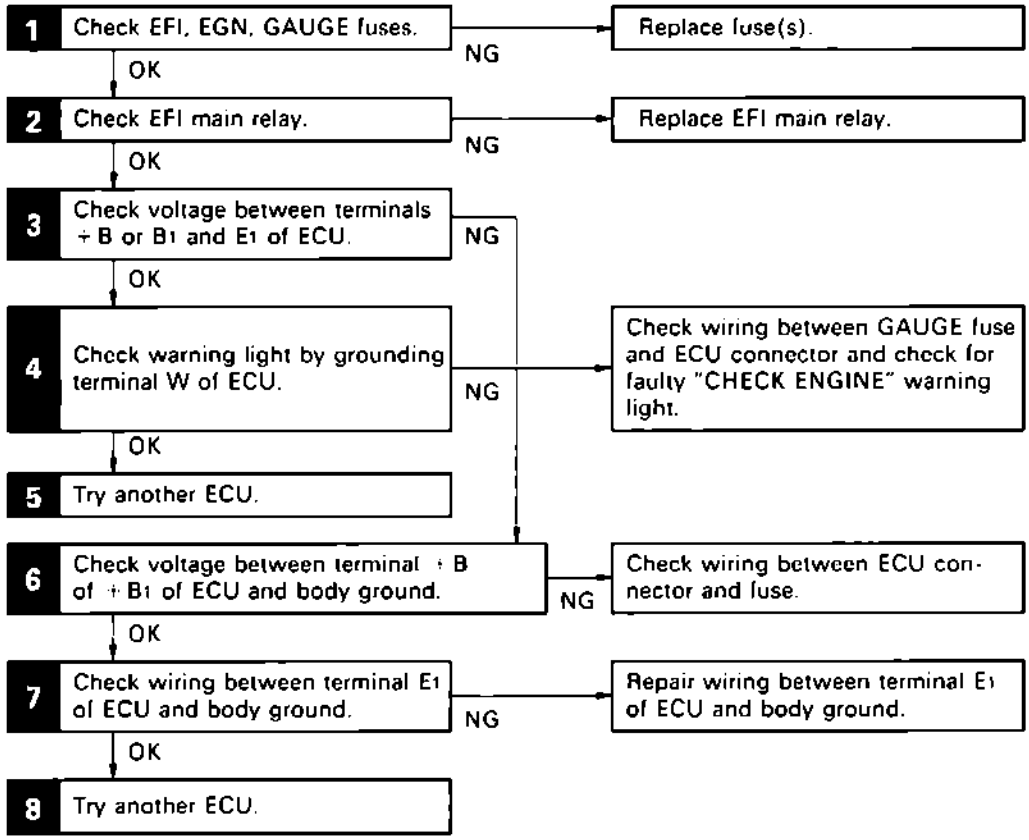


CHART 2 – Reading and confirming diagnostic codes (P. 4-5)

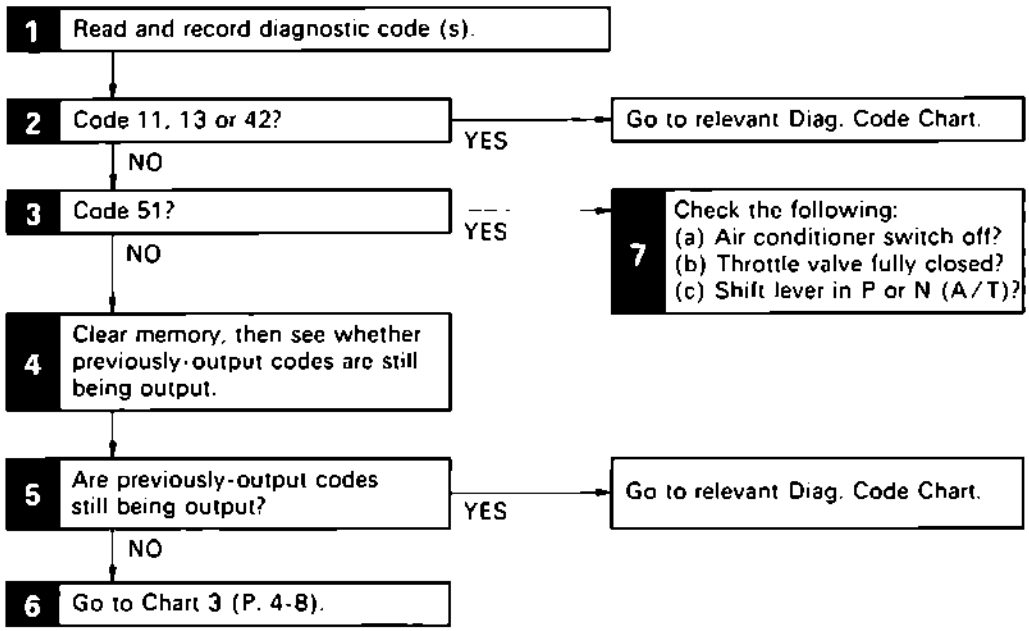


CHART 3 – Intermittent trouble or problems (P. 4-8)

CHART 4 – Fuel system (P. 4-11)

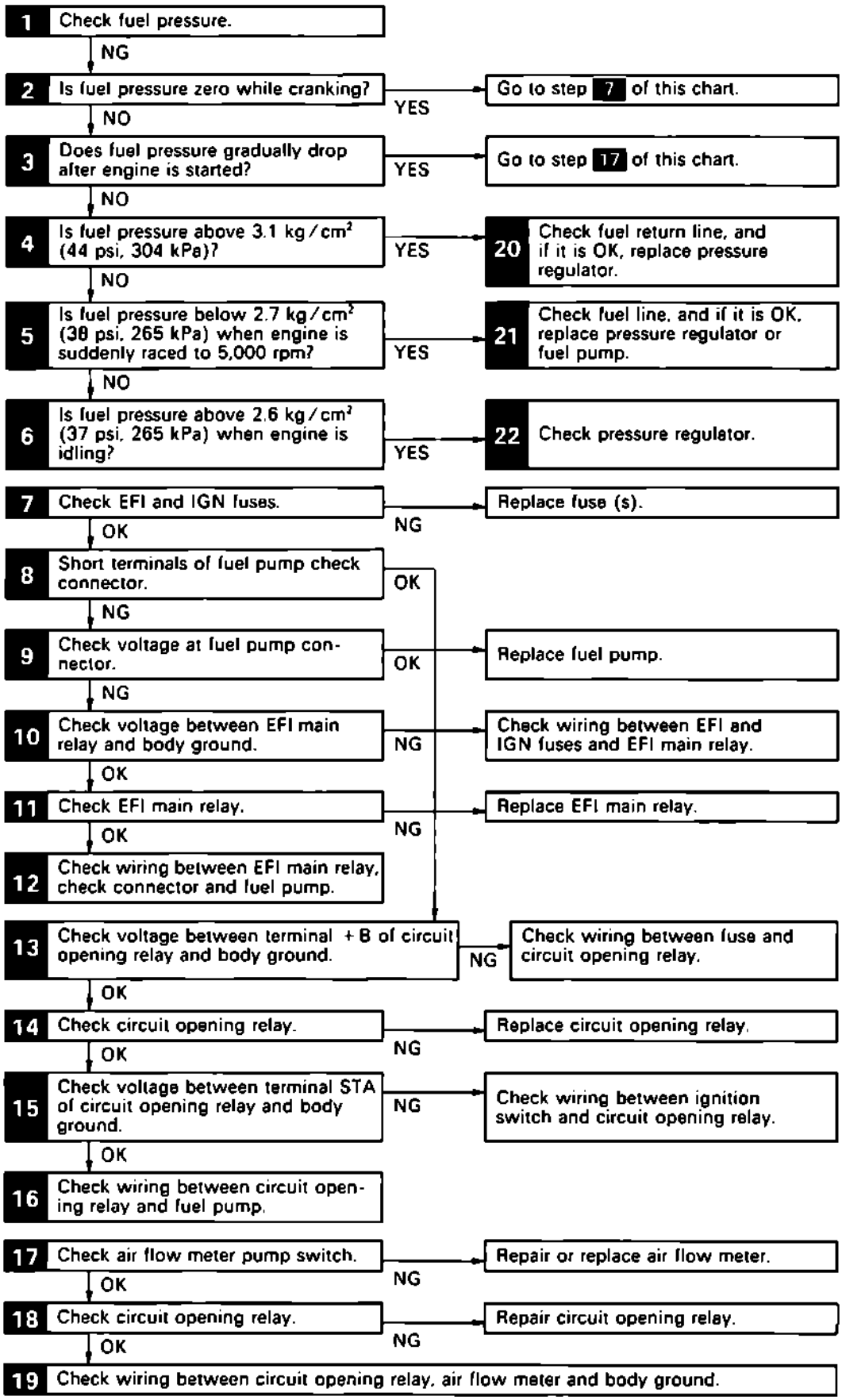


CHART 5 – Injector electrical circuity (P. 4-18)

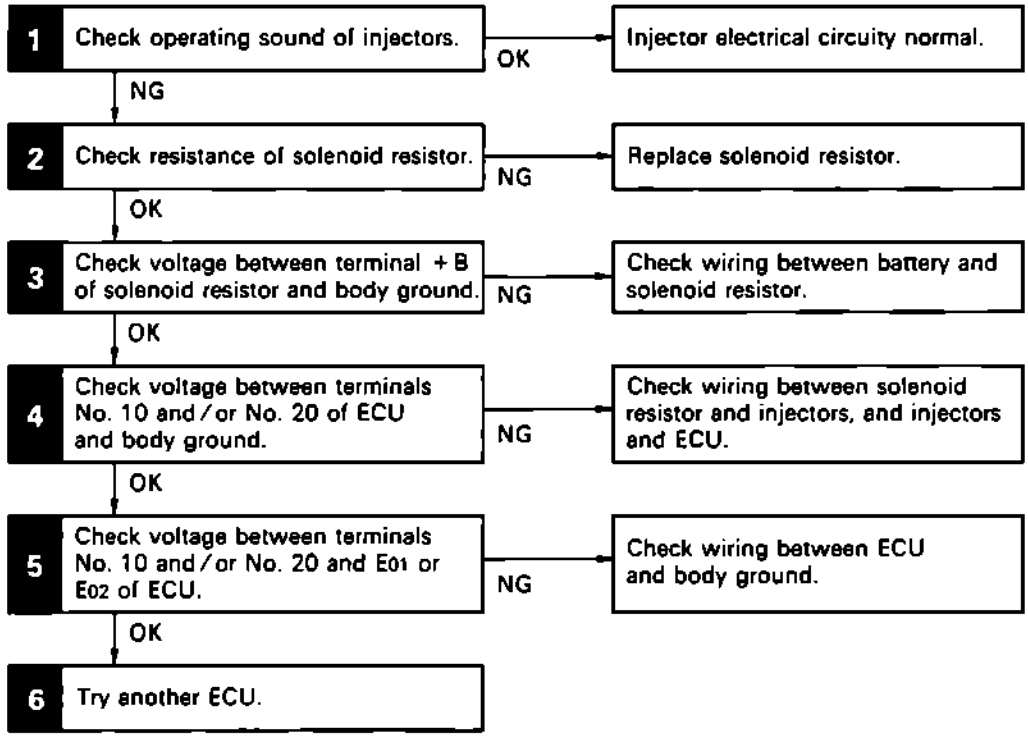


CHART 6 – Injectors (P. 4-20)

CHART 7 – Residual fuel pressure (P. 4-21)

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

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

CHART 10 – Idle speed control (ISC) system (P. 4-24)

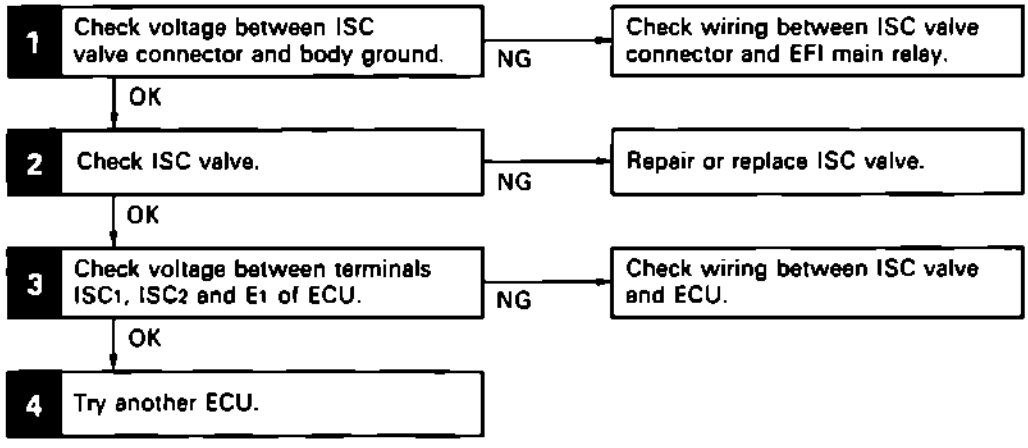


CHART 11 – Exhaust gas recirculation (EGR) system (P. 4-26)

CHART 12 – Fuel cut system (P. 4-28)

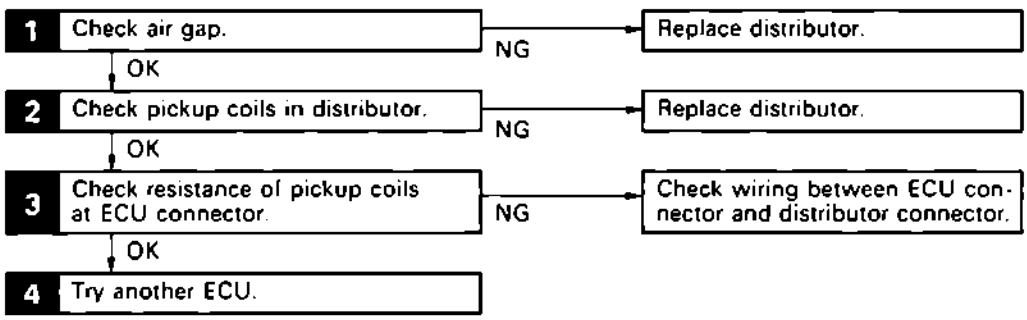
CHART 13 – Compression pressure (P. 4-29)

DIAGNOSTIC CODE CHARTS

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

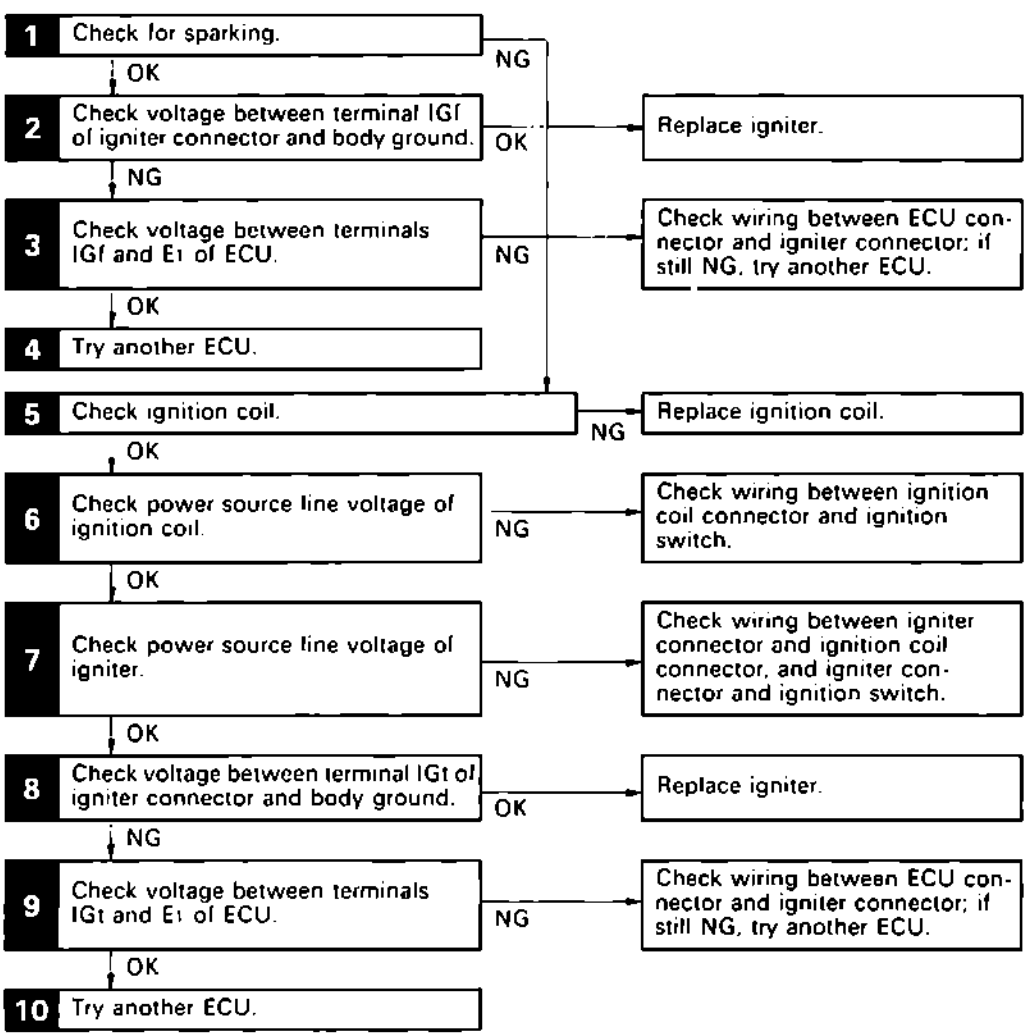
CODE 11 – Momentary interruption of current to ECU (P. 5-2)

CODE 12 – No RPM signal to ECU while engine is cranked (P. 5-3)

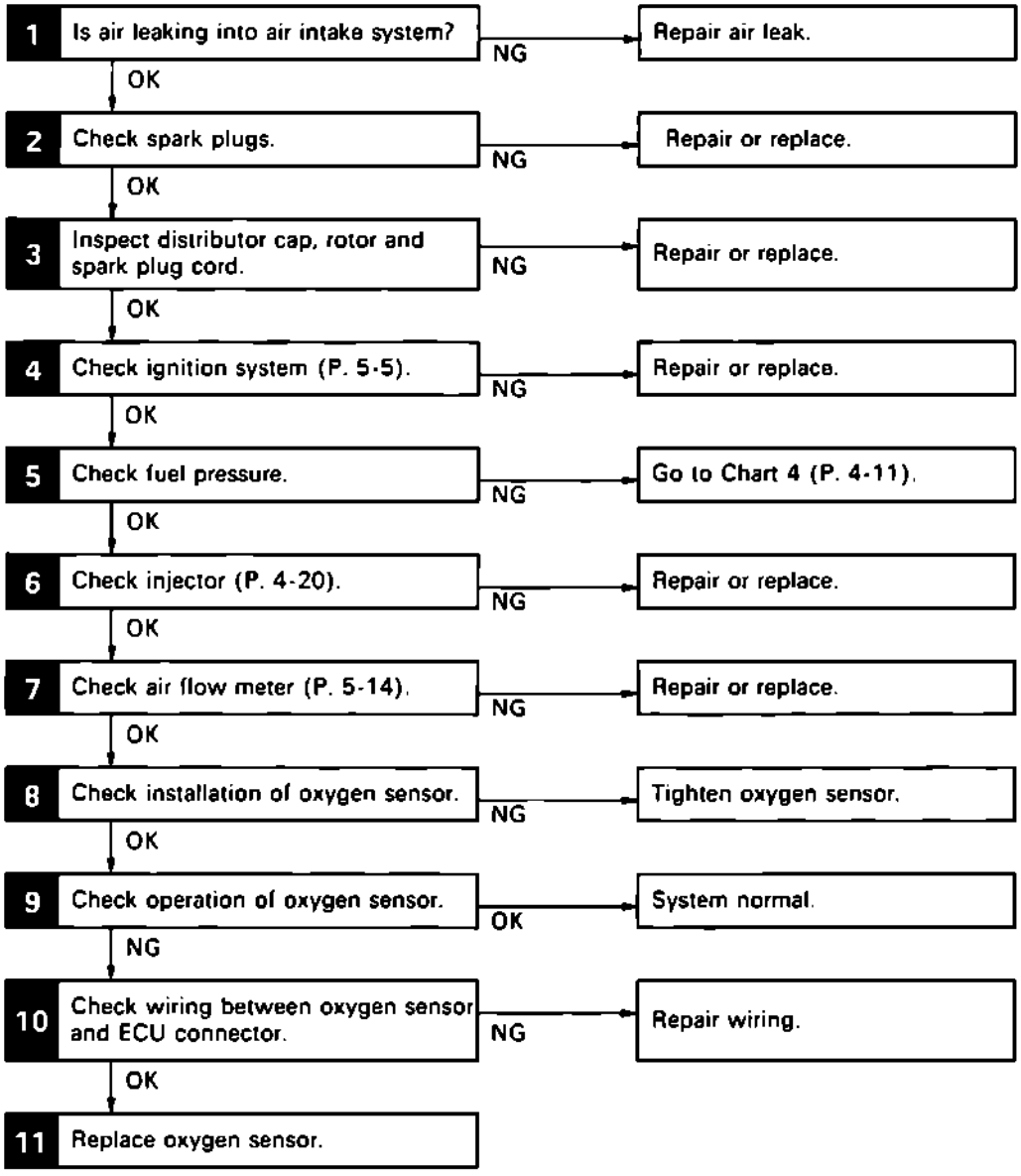


CODE 13 – Momentary interruption of RPM signal (P. 5-4)

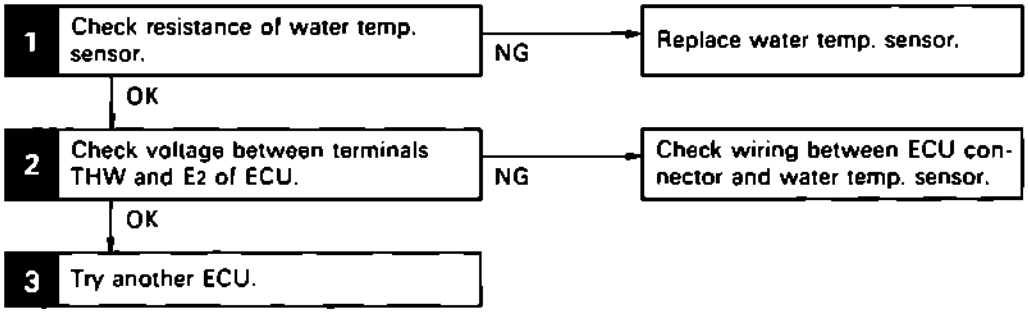
CODE 14 – Ignition confirmation signal not being input into ECU (P. 5-5)



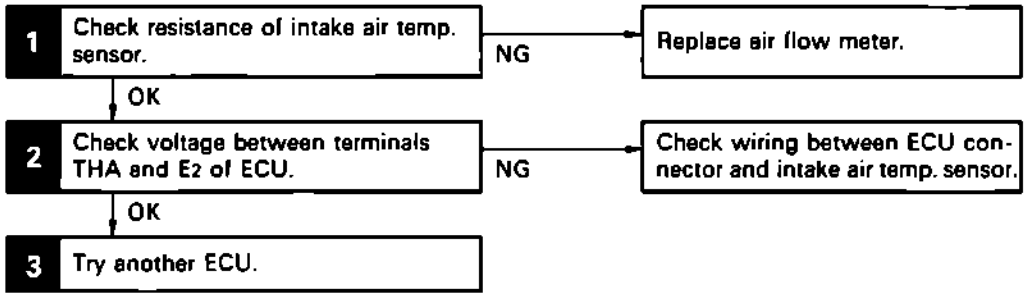
CODE 21 – Lean exhaust (P. 5-8)



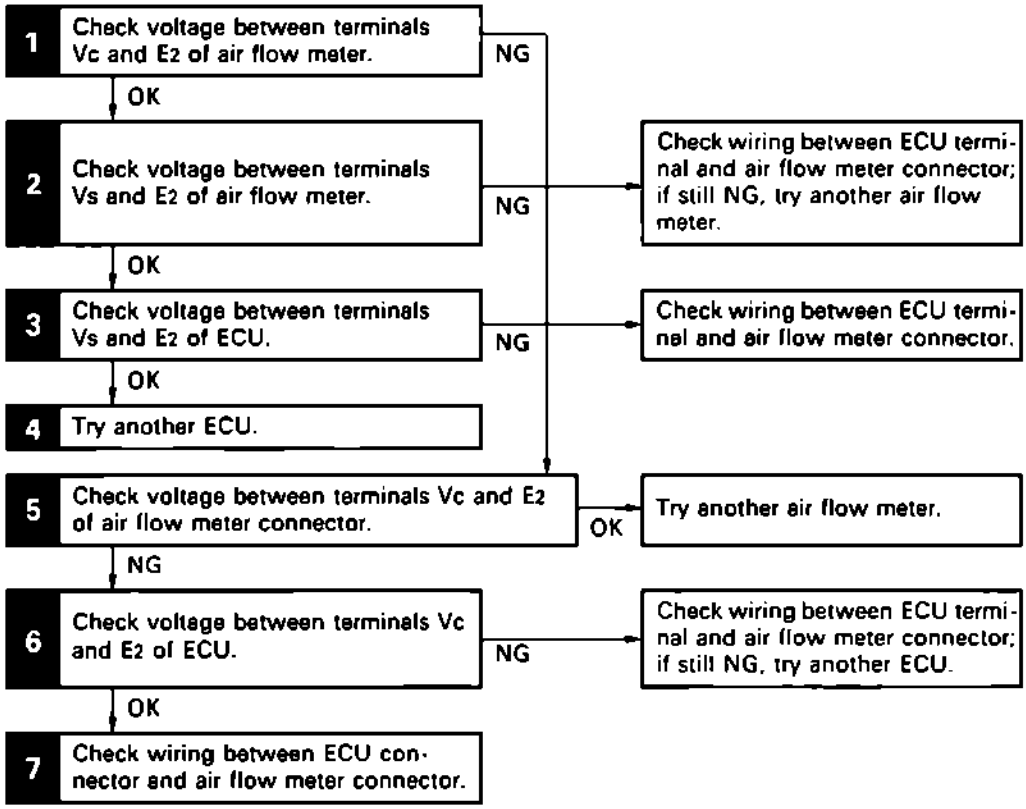
CODE 22 – Open or short circuit in water temp. sensor circuitry (P. 5-12)



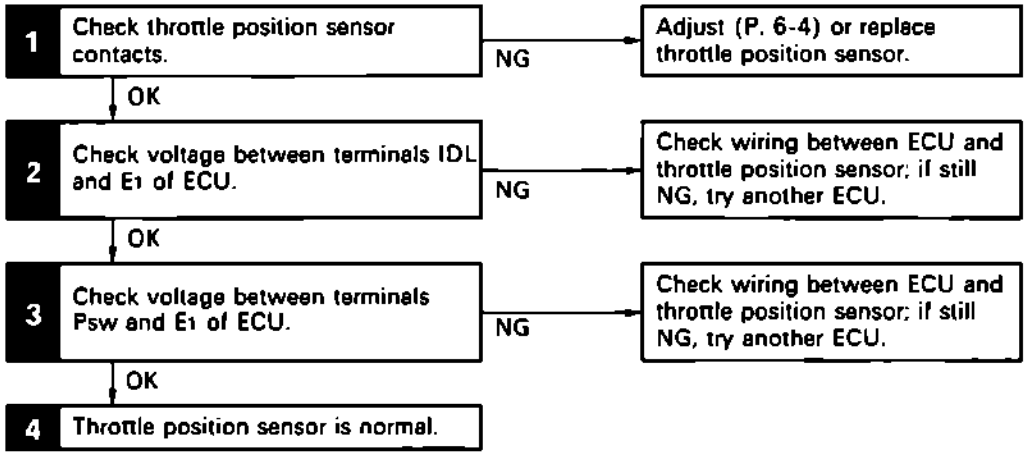
CODE 24 – Open or short circuit in intake air temp. sensor circuitry (P. 5-13)



CODE 31 OR 32 – Open or short circuit in air flow meter circuitry (P. 5-14)

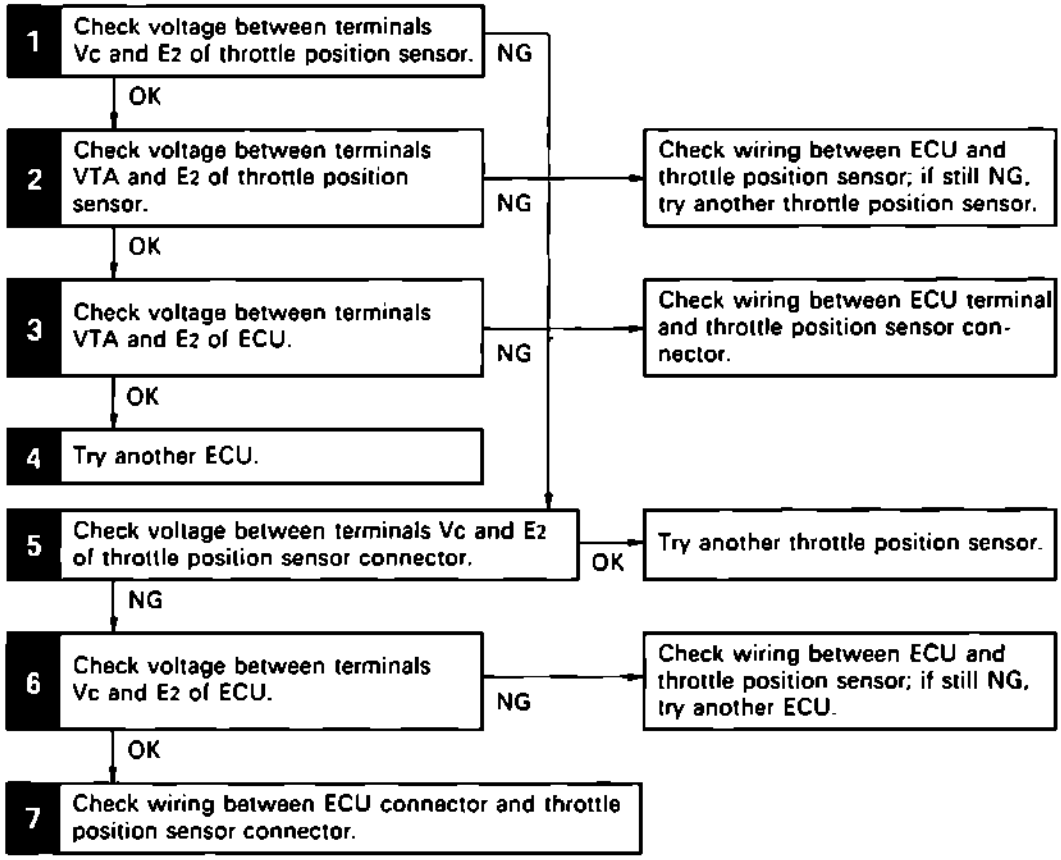


CODE 41 – Simultaneous IDL and PSW signal to ECU (P. 5-16) [FOR POINT TYPE: CELICA]

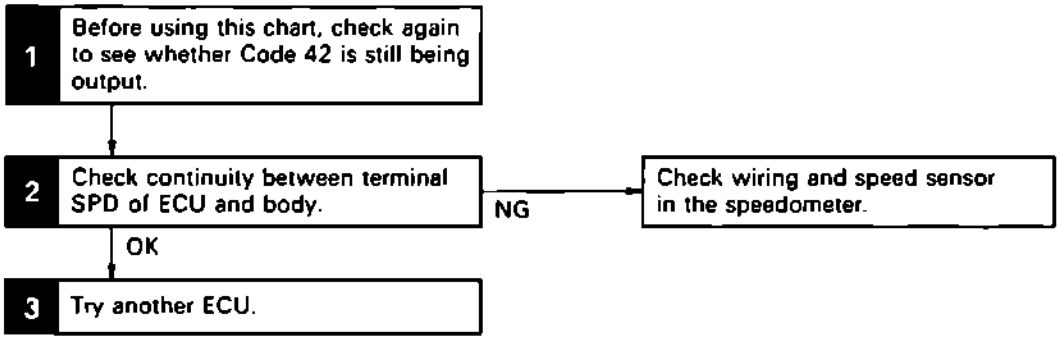


CODE 41 – Open or short circuit in throttle position sensor circuitry (P. 5-18)

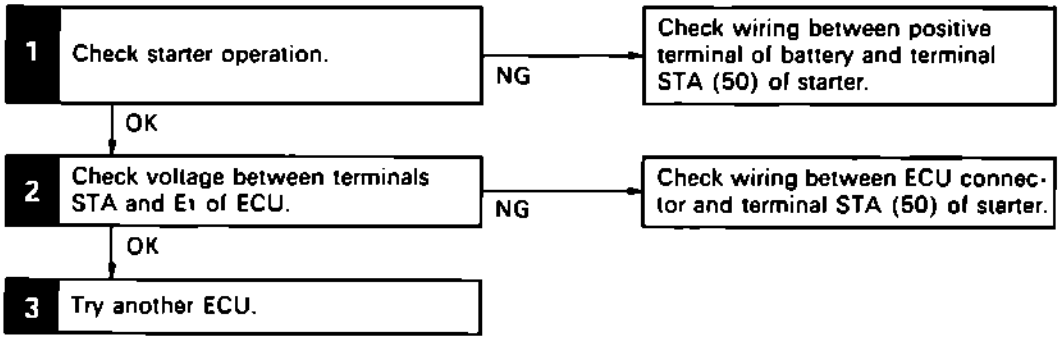
[FOR LINEAR TYPE: CAMRY]



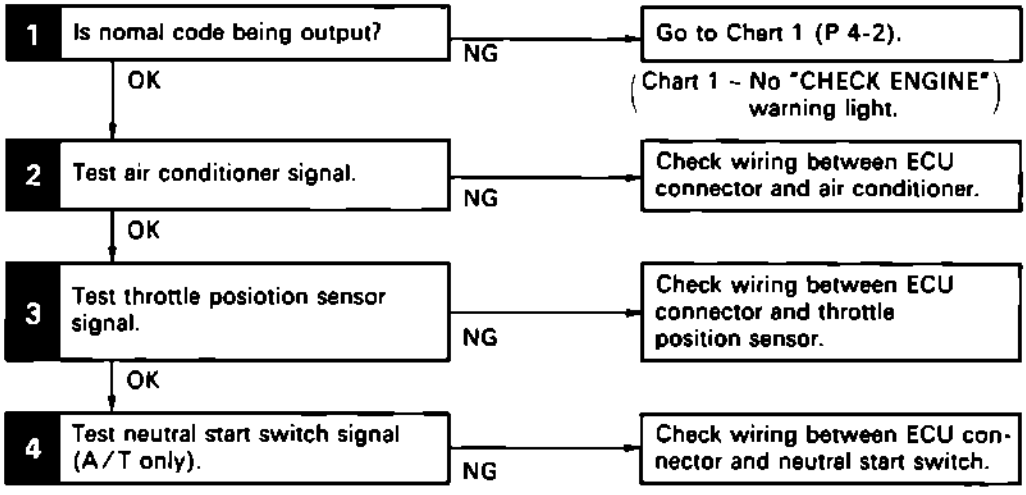
CODE 42 – Open or short circuit in vehicle speed sensor circuitry (P. 5-20)



CODE 43 – Open circuit in starter signal circuitry (P. 5-21)



CODE 51 – Switch input signal test (P. 5-22)



SERVICE SPECIFICATIONS

ENGINE

Idle speed		650 rpm (w/ check connector T-E1 shorted)
Compression pressure	Compression pressure Minimum pressure Difference between each cylinder	12.5 kg/cm² (178 psi, 1226 kPa) 10.0 kg/cm² (142 psi, 981 kPa) Less than 1.0 kg/cm² (14 psi, 98 kPa)
Valve clearance	Intake Exhaust	0.19 – 0.29 mm (0.007 – 0.011 in.) 0.28 – 0.38 mm (0.011 – 0.015 in.)

IGNITION SYSTEM

Ignition timing		10° BTDC @ Idle (w/ check connector T – E1 shorted)
Hight-tension cord	Resistance	25 kΩ per cord
Ignition coil	Primary coil resistance Secondary coil resistance	0.38 – 0.46 Ω 7.7 – 10.4 Ω
Distributor	Air gap G and NE pickups Signal generator (pickup coil) resistance G and NE pickups	0.2 – 0.4 mm 0.008 – 0.016 in. 140 – 180 Ω

EFI SYSTEM

Fuel pressure regulator	Fuel pressure	at No vacuum	2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)
Cold start injector	Resistance Fuel leakage		2 – 4 Ω One drop or less per minute
Injector	Resistance Injection volume Difference between each injector Fuel leakage		1.1 – 2.2 Ω 45 – 55 cc (2.7 – 3.4 cu in.)/15 sec. 5 cc (0.31 cu in.) or less One drop or less per minute

	Vehicle	Clearance between stop screw and lever	Continuity (IDL – E1 or E2)
Throttle position sensor	CELICA	0.50 mm (0.020 in.)	Continuity
		0.90 mm (0.035 in.)	No continuity
	CAMRY	0.50 mm (0.020 in.)	Continuity
		0.70 mm (0.028 in.)	No continuity

ISC valve	Resistance	ISC1 – +B ISC2 – +B	16.0 – 17.0 Ω 16.0 – 17.0 Ω
Solenoid resistor	Resistance	No. 10 – +B No. 20 – +B	2 – 3 Ω 2 – 3 Ω
Cold start injector time switch	Resistance STA – E1 STA – Ground	below 30°C (86°F) above 40°C (104°F)	20 – 40 Ω 40 – 60Ω 20 – 80Ω
Water temp. sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 8 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ

EFI SYSTEM (Con'd)

Air flow meter	Resistance	Fc – E1		Infinity (Measuring plate fully closed) 0 Ω (Measuring plate slightly open)
		E2 – THA	at –20°C (–4°F)	10 – 20 kΩ
			at 0°C (32°F)	4 – 7 kΩ
			at 20°C (68°F)	2 – 3 kΩ
			at 40°C (104°F)	0.9 – 1.3 kΩ
			at 60°C (140°F)	0.4 – 0.7 kΩ

ECU	NOTE: 1. Perform all voltage and resistance measurements with the computer connected. 2. Verify that the battery voltage is 11 V or above when the ignition switch is ON.			
	Voltage			
	Terminals	Condition		STD voltage
	+B – E1 +B – E1	Ignition S/W ON		10 – 14
	BATT – E1	—		10 – 14
CELICA	IDL – E1	Ignition S/W ON	Throttle valve open	8 – 14
CELICA	PSW – E1	Ignition S/W ON	Throttle valve fully closed	4 – 5
CAMRY	IDL – E2	Ignition S/W ON	Throttle valve open	4 – 6
CAMRY	VTA – E2	Ignition S/W ON	Throttle valve fully closed	0.1 – 1.0
CAMRY	VTA – E2	Ignition S/W ON	Throttle valve fully open	4 – 5
	IGT – E1	Idling		About 1.0
	STA – E1	Cranking or idling		6 – 12
	No. 10 – E01 No. 20 – E02	Ignition S/W ON		9 – 14
	W – E1	No trouble (Check engine warning light off and engine running)		8 – 14
	VC – E2	Ignition S/W ON	—	4.5 – 5.5
	VS – E2	Ignition S/W ON	Measuring plate fully closed	4 – 5
	VS – E2	Ignition S/W ON	Measuring plate fully open	0.02 – 0.5
	VS – E2	Idling		2 – 4
	THA – E2	Ignition S/W ON	Intake air temperature 20°C (68°F)	1 – 3
	THW – E2	Ignition S/W ON	Coolant temperature 80°C (176°F)	0.5 – 2.5
	ISC1 ISC2 – E1	Ignition S/W ON	—	9 – 14
	A/C – E1	Ignition S/W ON	Air conditioning ON	8 – 14
	ACT – E1	Ignition S/W ON	Throttle valve fully closed	4 – 5
	T – E1	Ignition S/W ON	Check connector T – E1 not short	10 – 14
	T – E1	Ignition S/W ON	Check connector T – E1 short	0
	Resistance			
	Terminals	Condition		Resistance (Ω)
	G – G –	—		140 – 160
	NE – G –	—		140 – 160
	Fuel cut rpm (w/ Vehicle speed 0 km/h and coolant temperature 80°C or 176°F)			
		Fuel cut rpm		2,000 rpm
		Fuel return rpm		1,600 rpm

TOYOTA
QUALITY SERVICE

OVERSEAS SERVICE DEPARTMENT
TOYOTA MOTOR CORPORATION

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