

# COMPUTER CONTROL SYSTEM

## 1988 Toyota Celica

1988 Computerized Engine Controls  
TOYOTA COMPUTER CONTROL SYSTEM

Celica

### DESCRIPTION

The Toyota Computer Control System (TCCS) is a computerized emission, ignition and fuel control system. The TCCS controls Electronic Fuel Injection (EFI), engine operation and lowers exhaust emissions while maintaining good fuel economy and driveability.

The Electronic Control Unit (ECU) controls the TCCS. The ECU contains data used for maintaining ignition timing under all operating conditions. Input from various sensors allows the ECU to deliver spark at precise timing. The ECU controls engine related systems to adjust engine operation.

The TCCS is primarily an emission control system, designed to maintain proper air/fuel ratio at all operating conditions.

### OPERATION

The TCCS consists of the following subsystems: Electronic Fuel Injection (EFI) system, data sensors, Electronic Control Unit (ECU), Electronic Spark Advance (ESA) system, Idle Speed Control (ISC) system, EGR Control, Electronic Controlled Transmission (ECT), diagnostic system and catalytic converter.

### ELECTRONIC FUEL INJECTION (EFI)

All models are equipped with a Bosch AFC fuel injection system. An electric fuel pump provides fuel to the fuel pressure regulator. Pressure regulator maintains constant fuel pressure to the injectors.

The ECU controls the injection duration in accordance with engine conditions to provide efficient engine operation. For more information, see BOSCH AFC FUEL INJECTION article in the FUEL SYSTEMS section.

### DATA SENSORS

**NOTE:** The following data sensors are not necessarily used on every model. Note engine application. See TOYOTA ENGINE CODE IDENTIFICATION chart and appropriate computer control system schematic. See Figs. 6 through 8.

#### A/C Switch

Switch sends a signal to the ECU during A/C operation. ECU uses this signal for controlling idle speed during A/C operation.

#### Airflow Sensor

Airflow sensor, mounted within the airflow meter, measures airflow rate through the airflow meter. Signal is sent to ECU for controlling fuel injection duration and spark advance system.

#### Air Temperature Sensor

Sensor is mounted in the airflow meter. Sensor measures incoming air temperature. Signal is sent to ECU for controlling fuel injection duration.

Cold Start Injector Time Switch

Switch determines coolant temperature and sends signal to ECU on some models for cold start injector control.

Coolant Temperature Sensor

Coolant temperature sensor sends signal to ECU in relation to coolant temperature. ECU uses sensor signal for controlling fuel injection duration, spark advance system, idle speed control system and EGR system.

Coolant Temperature Switch

Switch monitors coolant temperature and sends signal to ECU.

EGR Gas Temperature Sensor

Sensor determines EGR gas temperature and sends signal to ECU.

Engine Speed

Engine speed signal information is received from the ignition coil. The ECU uses these signals for fuel injection duration control and spark advance system operation.

Knock Sensor

Sensor monitors ignition knock conditions and sends signal to ECU.

Neutral/Start Switch

Switch is installed on A/T models to inform ECU of gear selection. Information is used by the ECU to allow starter operation and control engine idle.

Oxygen (O2) Sensor

Oxygen sensor is installed in the exhaust system and monitors oxygen content of exhaust gases. Signal is sent to the ECU and is used for determining fuel injection duration.

Sub-Oxygen Sensor (Calif. Only)

Sensor is used in conjunction with O2 sensor. Sensor monitors oxygen content of exhaust gases and sends signal to the ECU.

Throttle Position Sensor (TPS)

Throttle Position Sensor (TPS) is mounted on throttle body. Sensor determines changes in throttle valve positions and send signals to the ECU. Signals are used for controlling fuel injection duration and idle speed control system.

Turbo Pressure Sensor

Sensor monitors turbo pressure and sends signal to ECU.

Vehicle Speed Sensor (VSS)

Sensor is used to monitor vehicle speed. Vehicle speed information is used by the ECU for cruise control and electronic control of automatic transmission.

4WD Switch

Switch indicates 4WD operation and sends signal to ECU.

TOYOTA ENGINE CODE IDENTIFICATION

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Application

Code

4-Cylinder Engine

|           |       |               |
|-----------|-------|---------------|
| Celica    |       |               |
| Non-Turbo | ..... | 3S-FE & 3S-GE |
| Turbo     | ..... | 3S-GTE        |

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## ELECTRONIC CONTROL UNIT (ECU)

The ECU controls all functions of the TCCS. The ECU receives signals from the data sensors and switches. Signals are processed by the ECU for controlling the Electronic Fuel Injection (EFI), Electronic Spark Advance (ESA), Idle Speed Control (ISC), Electronic Controlled Transmission (ECT) and EGR systems.

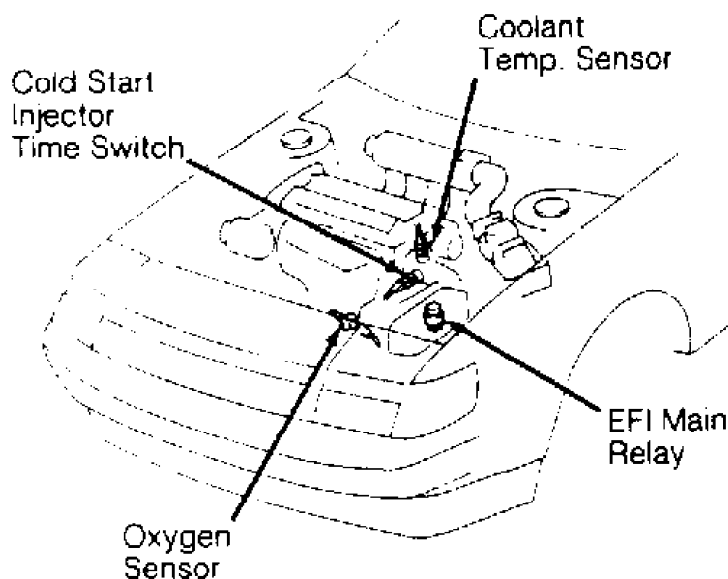
The ECU contains a fail-safe function used in case of a data sensor or switch failure. This function provides a back-up system to provide minimal driveability. The "CHECK ENGINE" light will also be activated during this function.

## DIAGNOSTIC SYSTEM

The ECU is equipped with a self-diagnostic system which detects system failures or abnormalities. When malfunction occurs, the "CHECK ENGINE" light on instrument panel is activated. On models with Super Monitor Display, trouble code may be obtained from the screen on the instrument panel.

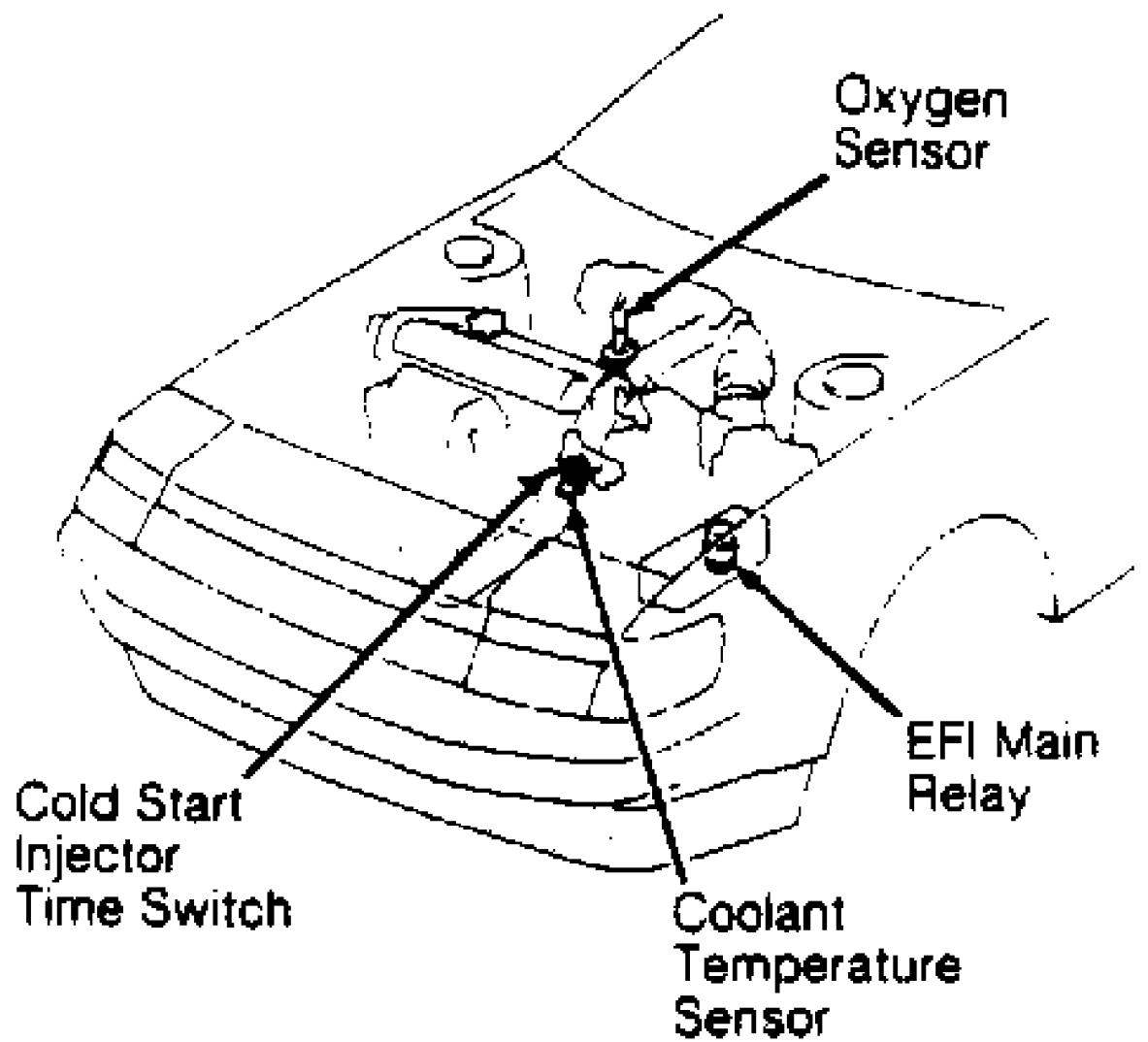
By analyzing various signals, the ECU detects system malfunctions related to various operating parameter sensors. The ECU stores trouble codes associated with the detected failure until the diagnostic system is cleared. The "CHECK ENGINE" light will go out when trouble codes are cleared.

## COMPONENT LOCATIONS



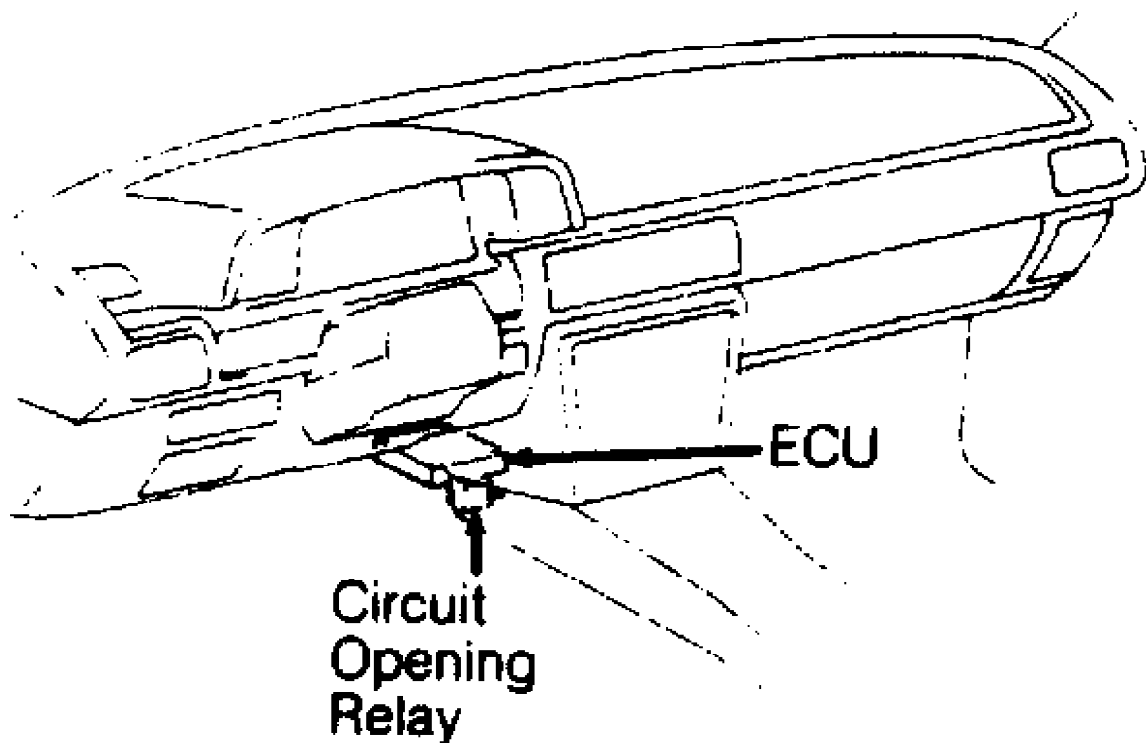
### CELICA NON-TURBO (3S-FE)

Fig. 1: Non-Turbo 3S-FE TCCS Component Locations  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



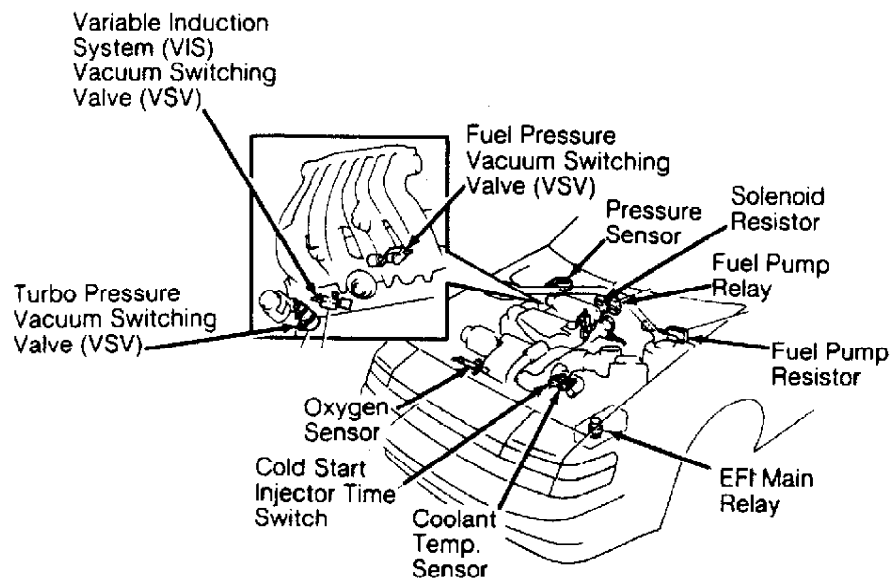
### CELICA NON-TURBO (3S-GE)

Fig. 2: Non-Turbo 3S-GE TCCS Component Locations  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



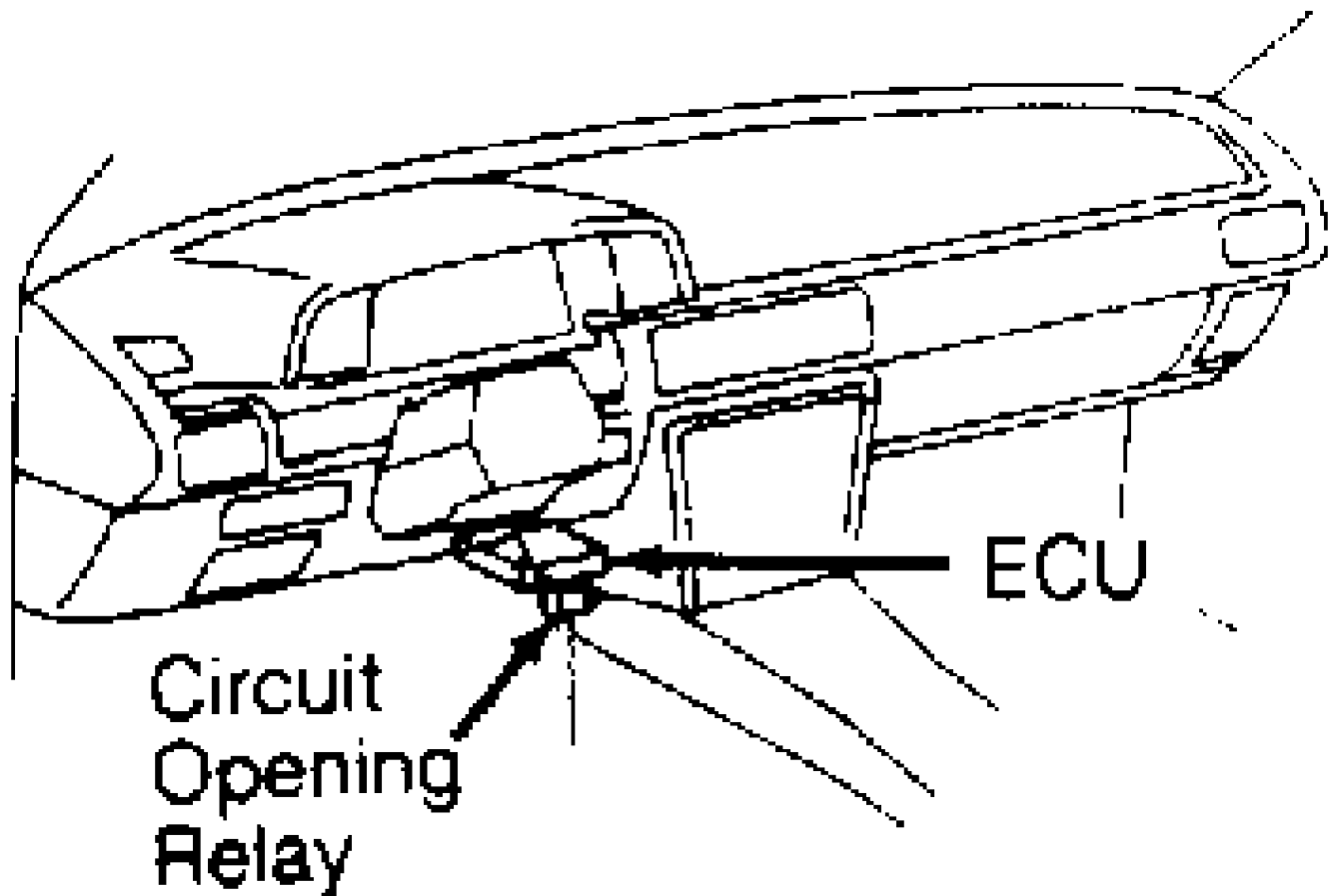
## CELICA NON-TURBO (ALL MODELS)

Fig. 3: Non-Turbo TCCS Component Locations  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



## CELICA (4WD TURBO)

Fig. 4: 4WD Turbo (1 of 2) TCCS Component Locations  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



## CELICA (4WD TURBO)

Fig. 5: 4WD Turbo (2 of 2) TCCS Component Locations  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

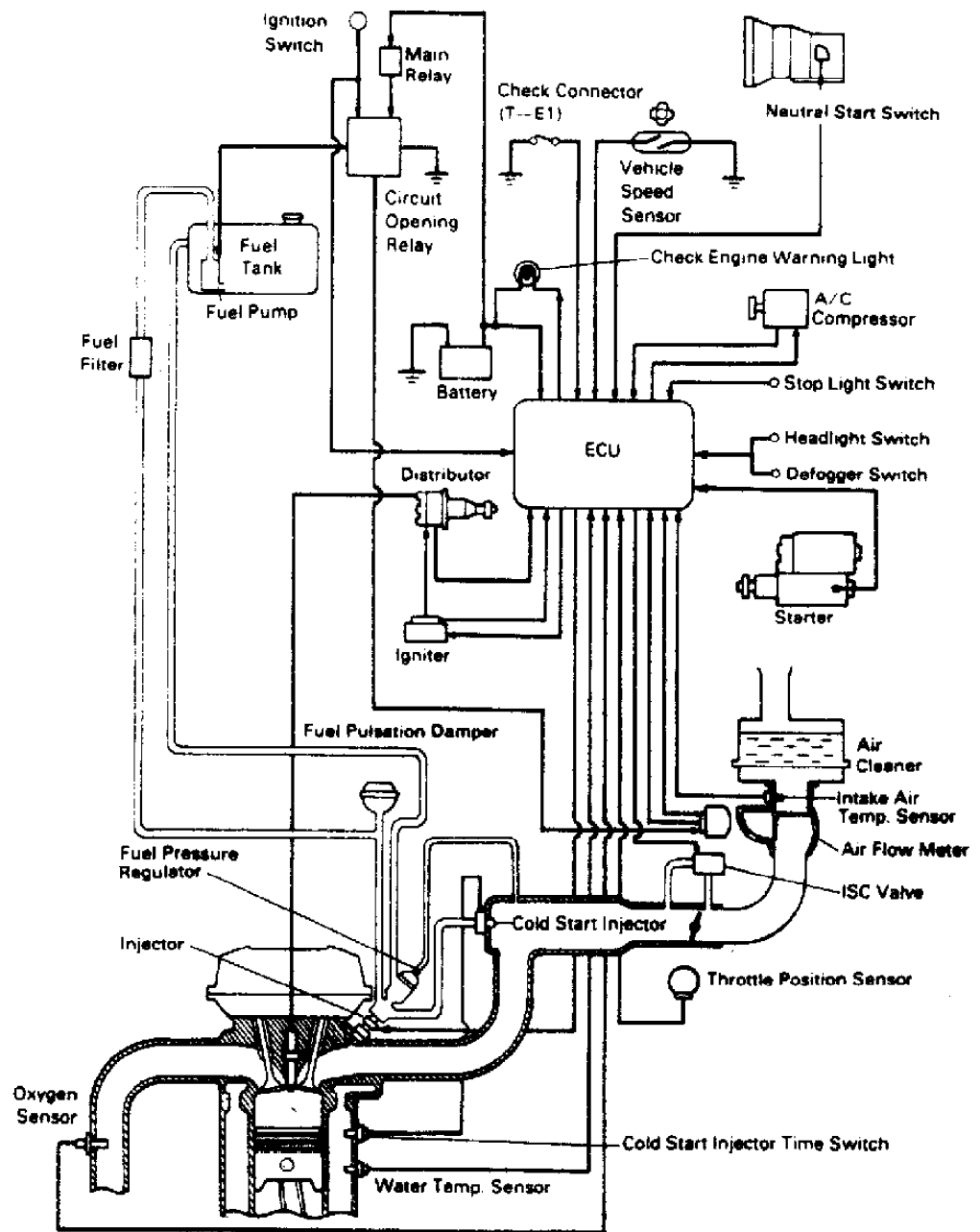


Fig. 6: 3S-FE 2WD Computer Control System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

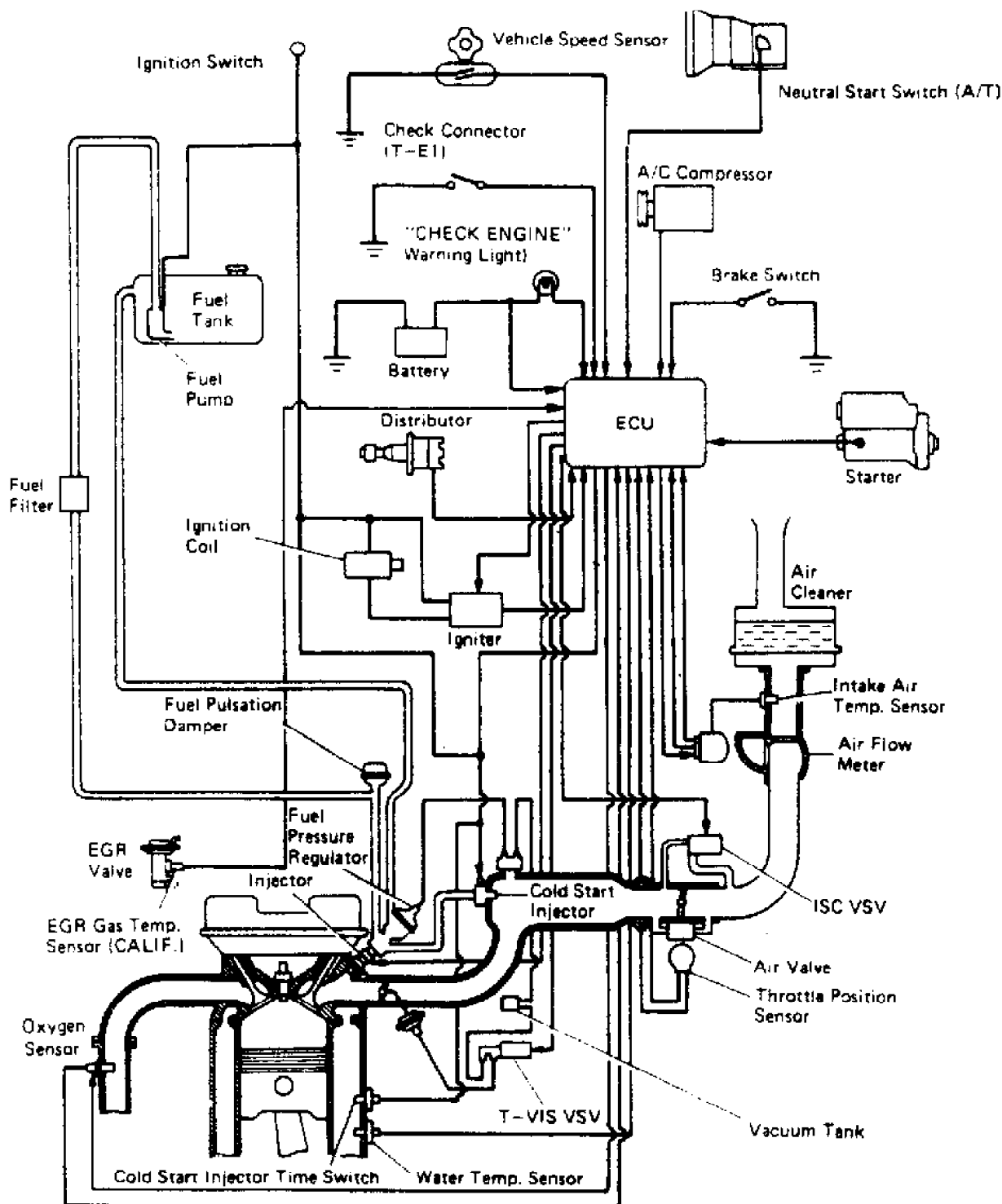


Fig. 7: 3S-GE Computer Control System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

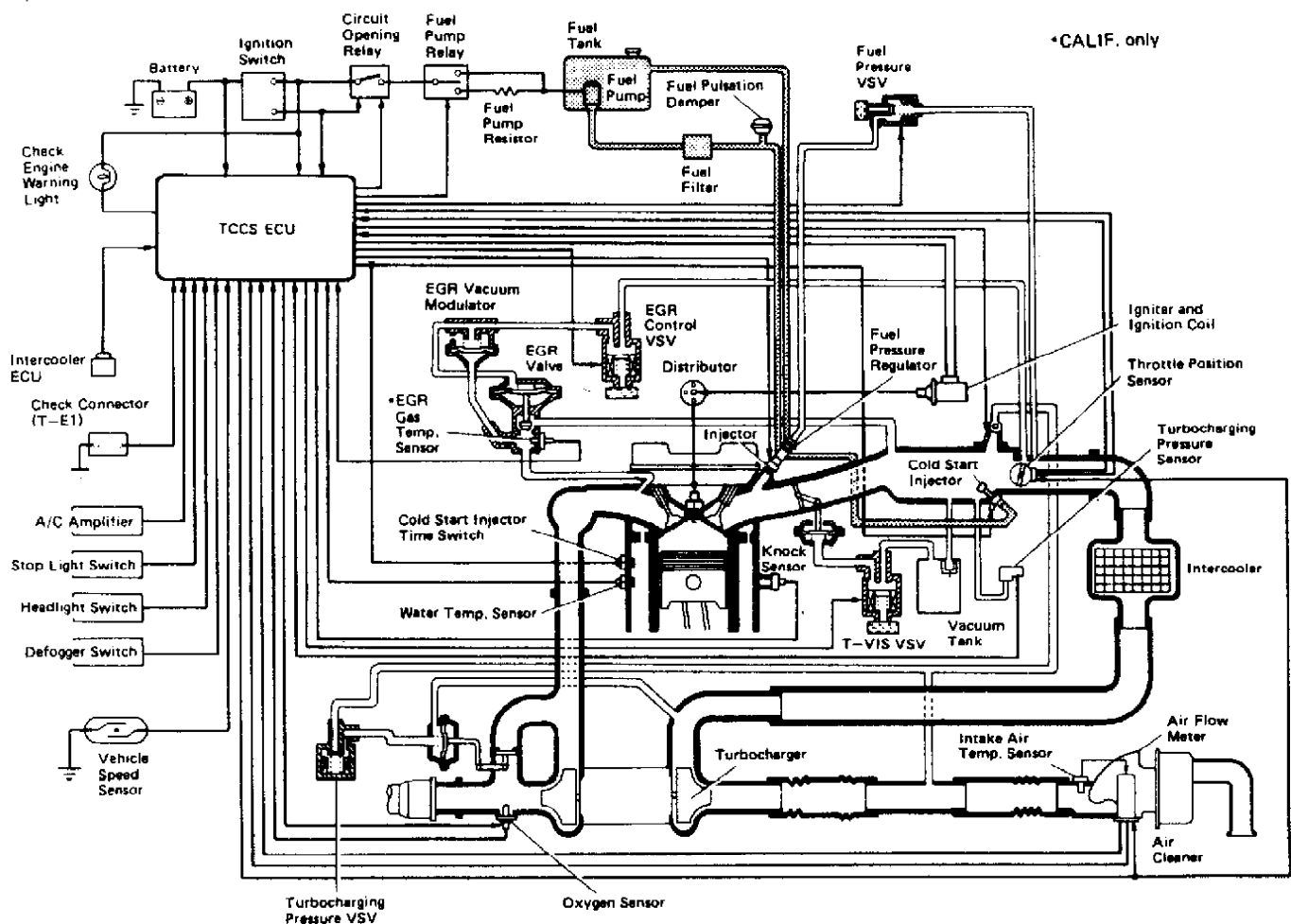


Fig. 8: 4WD Computer Control System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

## DIAGNOSIS & TESTING INFORMATION

### DIAGNOSIS

1) Ensure all engine systems NOT related to TCCS are fully operational. Do not proceed with testing until all other problems have been repaired. Ensure fuses, fusible links and wire connectors are in good condition before diagnosing ECU.

2) Enter diagnostic mode and record trouble codes. Exit diagnostic mode. If no trouble codes were displayed, proceed to appropriate DIAGNOSTIC CIRCUIT CHECK charts. Follow instructions given there.

3) If no trouble codes were displayed after performing diagnostic circuit check, perform voltage and resistance checks. See appropriate ECU PIN VOLTAGE TEST chart in this article.

4) If trouble codes are displayed, perform tests to confirm cause of malfunction which set the corresponding trouble code.

5) After any repairs are made, clear trouble codes and perform diagnostic circuit check. Normal system operation code should be displayed if repair solved cause of malfunction.

## CHECK ENGINE LIGHT

Turn ignition on. The "CHECK ENGINE" light will activate with ignition on and engine not running. Start engine and note that light is not activated. If light remains activated, a system malfunction or abnormality exists.

## RETRIEVING TROUBLE CODES

1) Ensure battery voltage is greater than 11 volts and throttle valve is fully closed. Place transmission or transaxle in Neutral and turn off all accessory switches.

2) To enter diagnostic mode, turn ignition on. DO NOT start engine. Install jumper wire between terminals of engine check connector. See Fig. 9.

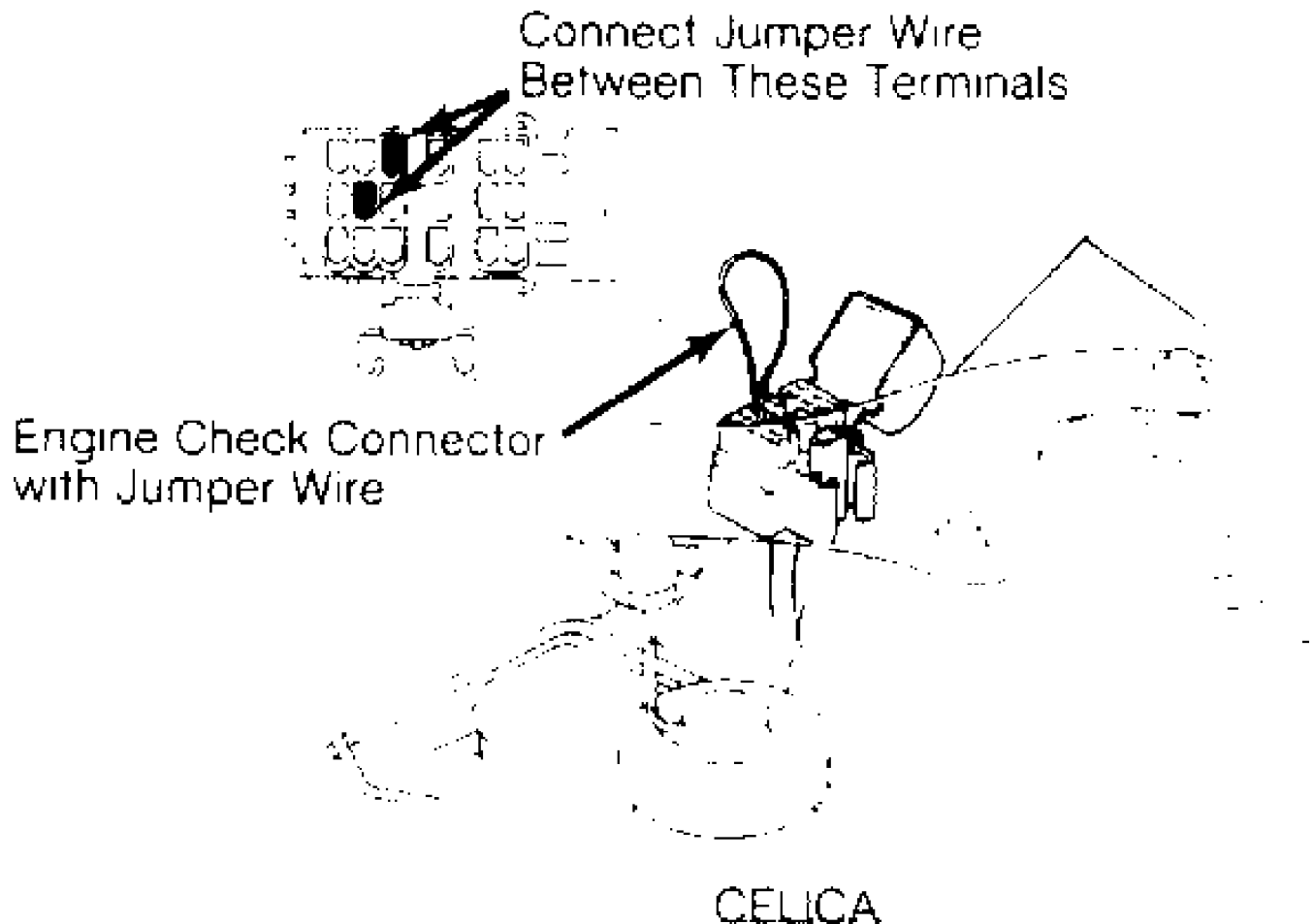


Fig. 9: Installing Engine Check Connector Jumper Wire  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

3) Count number of flashes from "CHECK ENGINE" light. If system is operating properly (with no codes), "CHECK ENGINE" light will blink continuously and evenly.

4) On all models, a code will be identified by a .5 second flash on and off for the first number. A 1.5 second pause will occur followed by the second number. See Fig. 10.

5) If more than one code is stored, a 2.5 second pause will

occur prior to the flashing of the second code. Once all codes have been displayed, a 4.5 second pause will occur and code(s) will repeat.

7) On all models, trouble codes are given from smallest value in order to largest value. After code(s) are retrieved, remove jumper wire to exit diagnostic mode.

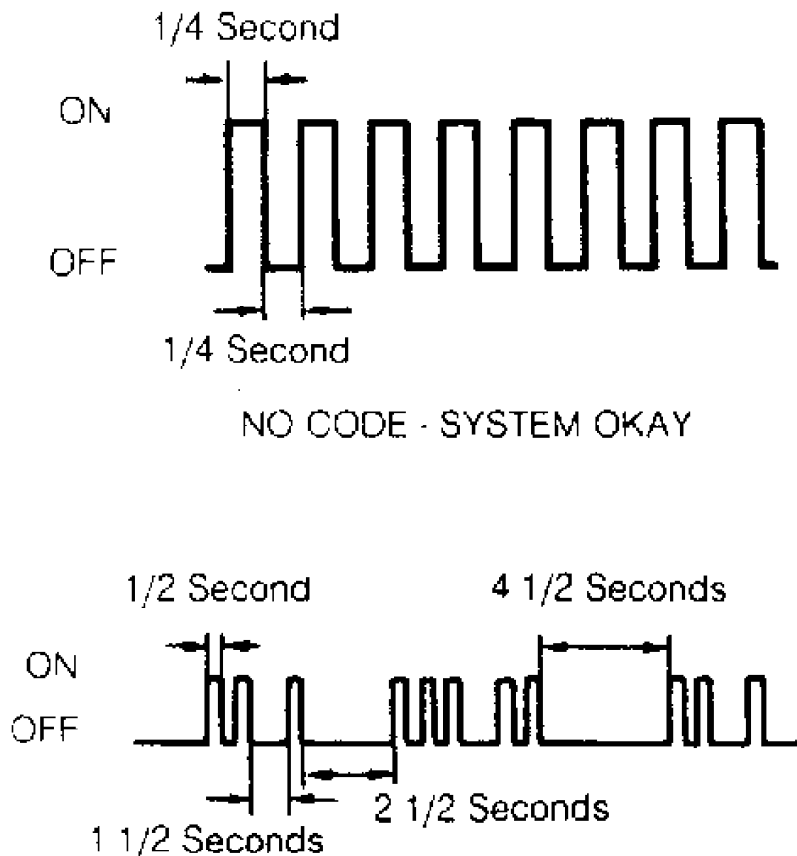
8) Compare trouble code to that listed to locate probable cause. See appropriate TROUBLE CODE IDENTIFICATION and TROUBLE CODES & PROBABLE CAUSE tables.

CAUTION: Ensure trouble codes are cleared after performing repair.  
Road test and recheck that trouble code does not exist.

#### Clearing Trouble Codes

1) After repairs are performed, clear ECU memory of all stored trouble codes. To clear memory, turn ignition off and remove EFI 15 Amp fuse from fuse block for 30 seconds or more.

2) Fuse may require to be removed longer depending on the ambient temperature. Replace fuse and exit diagnostic mode. Trouble codes can also be cleared by disconnecting vehicle battery. However, other memory functions (clock, etc.), will need to be reset.



#### CODE 21 & CODE 32

Fig. 10: Example of Trouble Codes  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

1) If trouble codes exist and diagnostic circuit check has been performed, compare code with appropriate code chart for circuits and components associated with trouble code(s). Trouble code flow charts are arranged in alphabetical order by each model. A test No. has been assigned each chart. The test No. and trouble code are in numerical order for each model. All ECU pin identifications are at end of TROUBLE CODES & PROBABLE CAUSE charts.

2) If no code is present, circuit checking is necessary. Each model has an ECU PIN VOLTAGE TEST table after DIAGNOSTIC CIRCUIT CHECK flow chart. DIAGNOSTIC CIRCUIT CHECK flow chart is the first flow chart on each model. Using ECU PIN VOLTAGE TEST table, check appropriate circuits using the test No. in the right column of the appropriate table.

3) Component testing will also be necessary. All component testing available from manufacturer and pertaining to CEC, follow the CEC flow charts. For components not covered, see appropriate article in FUEL or DISTRIBUTORS & IGNITION SYSTEMS.

## TROUBLE CODE I.D.

### TROUBLE CODE IDENTIFICATION

| Code No. | Circuit Affected                |
|----------|---------------------------------|
| No Code  | System Normal                   |
| 11       | ECU (B+)                        |
| 12 & 13  | RPM Signal                      |
| 14       | Ignition Signal                 |
| 21       | Oxygen Sensor Signal            |
| 22       | Coolant Temp. Sensor Signal     |
| 23       | Intake Air Temp. Sensor Signal  |
| 24       | Intake Air Temp. Sensor Signal  |
| 25 (1)   | Lean Air/Fuel Mixture           |
| 26 (1)   | Rich Air/Fuel Mixture           |
| 31       | Airflow Meter Signal            |
| 32       | Airflow Meter Signal            |
|          | (2) HAC Sensor Signal           |
| 34 (2)   | Turbocharger Pressure           |
| 35 (3)   | Turbocharger Pressure           |
| 41       | Throttle Position Sensor Signal |
| 42       | Vehicle Speed Sensor Signal     |
| 43       | Starter Signal                  |
| 51       | Switch Signal                   |
| 52 (4)   | Knock Sensor Signal             |
| 53 (4)   | Knock Sensor Control (ECU)      |
| 54 (3)   | Intercooler ECU Signal          |
| 71 (5)   | EGR System Malfunction          |

- (1) - Only applicable to 3S-GE and 4WD models.
- (2) - Only applicable to 4WD models.
- (3) - Only applicable to 4WD models.
- (4) - Only applicable to 4WD models.
- (5) - Only applicable to 3S-GE and Calif. applications of 4WD models.

### TROUBLE CODES & PROBABLE CAUSE

| Code No. | Probable Cause                                                    |
|----------|-------------------------------------------------------------------|
| 11       | Main Relay and/or Circuit,<br>Ignition Switch and/or Circuit, ECU |

- (1) - 4WD & 3S-GE California models only.
- (2) - On 4WD models.
- (3) - On 4WD models.
- (4) - On 4WD models.
- (5) - 4WD California models only.

|     |        |     |    |     |      |   |   |     |     |     |   |     |     |  |  |     |     |     |      |     |
|-----|--------|-----|----|-----|------|---|---|-----|-----|-----|---|-----|-----|--|--|-----|-----|-----|------|-----|
| E01 | No. 10 | STA | VF | NSW | ISC1 | W | T | IDL | IGF | G ⊖ | G |     | NE  |  |  | VC  | VS  | THA | BATT | +B1 |
| E02 | No. 20 | IGT | E1 |     | ISC2 |   |   | A/C | E2  | OX  |   | PSW | THW |  |  | E21 | STP | SPD | ELS  | +B  |

Fig. 11: 3S-FE ECU Connector Pin Identification

CELICA (3S-GE)

Fig. 12: 3S-GE ECU Connector Pin Identification



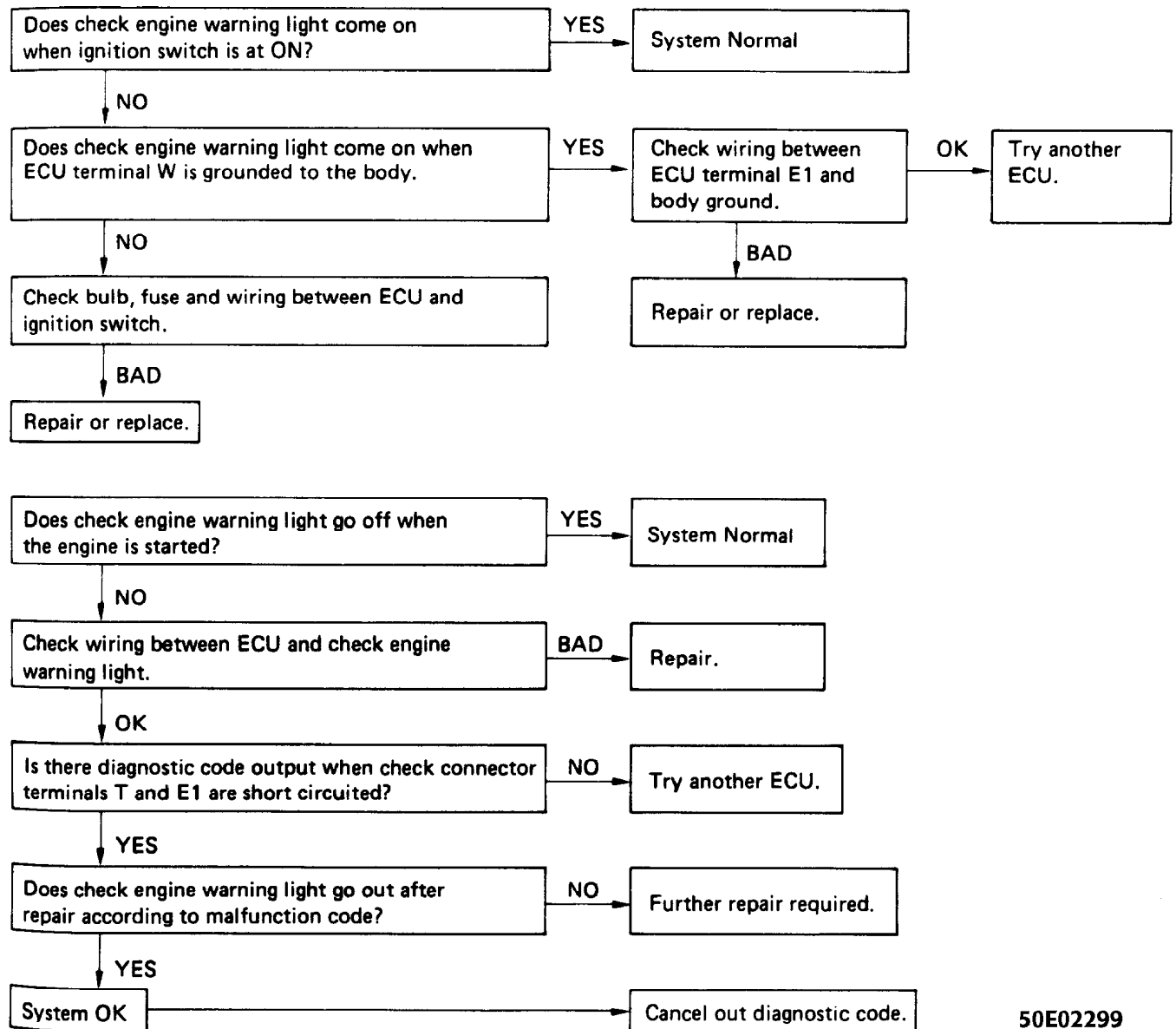


Fig. 15: Diagnostic Circuit Check, Flow Chart

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## ECU PIN VOLTAGE TEST

| Terminals                    | STD voltage (V) | Condition                                                         |                                    | TEST NO. |
|------------------------------|-----------------|-------------------------------------------------------------------|------------------------------------|----------|
| +B<br>+B1 — E1               | 10 – 14         | Ignition S/W ON                                                   |                                    | 1        |
| BATT — E1                    | 10 – 14         | —                                                                 |                                    | 11       |
| IDL — E1                     | 8 – 14          | Ignition S/W ON                                                   | Throttle valve open                | 8        |
| PSW — E1                     | 4 – 5           |                                                                   | Throttle valve fully closed        |          |
| IGT — E1                     | 0.7 – 1.0       | Idling                                                            |                                    | 2        |
| STA — E1                     | 6 – 14          | Cranking                                                          |                                    | 9        |
| No. 10 — E01<br>No. 20 — E02 | 9 – 14          | Ignition S/W ON                                                   |                                    | 12       |
| W — E1                       | 8 – 14          | No trouble (check engine warning light off)<br>and engine running |                                    | 13       |
| VC — E2                      | 4 – 6           | Ignition S/W ON                                                   | —                                  | 6        |
| VS — E2                      | 4 – 5           |                                                                   | Measuring plate fully closed       |          |
|                              | 0.02 – 0.5      |                                                                   | Measuring plate fully open         |          |
|                              | 2 – 4           |                                                                   | Idling                             |          |
| THA — E2                     | 1 – 3           | Ignition S/W ON                                                   | Intake air temperature 20°C (68°F) | 5        |
| THW — E2                     | 0.1 – 1.0       |                                                                   | Coolant temperature 80°C (176°F)   | 4        |
| ISC1<br>ISC2 — E1            | 9 – 14          | Ignition S/W ON                                                   |                                    | 14       |
| A/C — E1                     | 8 – 14          | Ignition S/W ON                                                   | Air conditioning ON                | 15       |

50I02300

Fig. 16: ECU Pin Voltage Test (2WD)

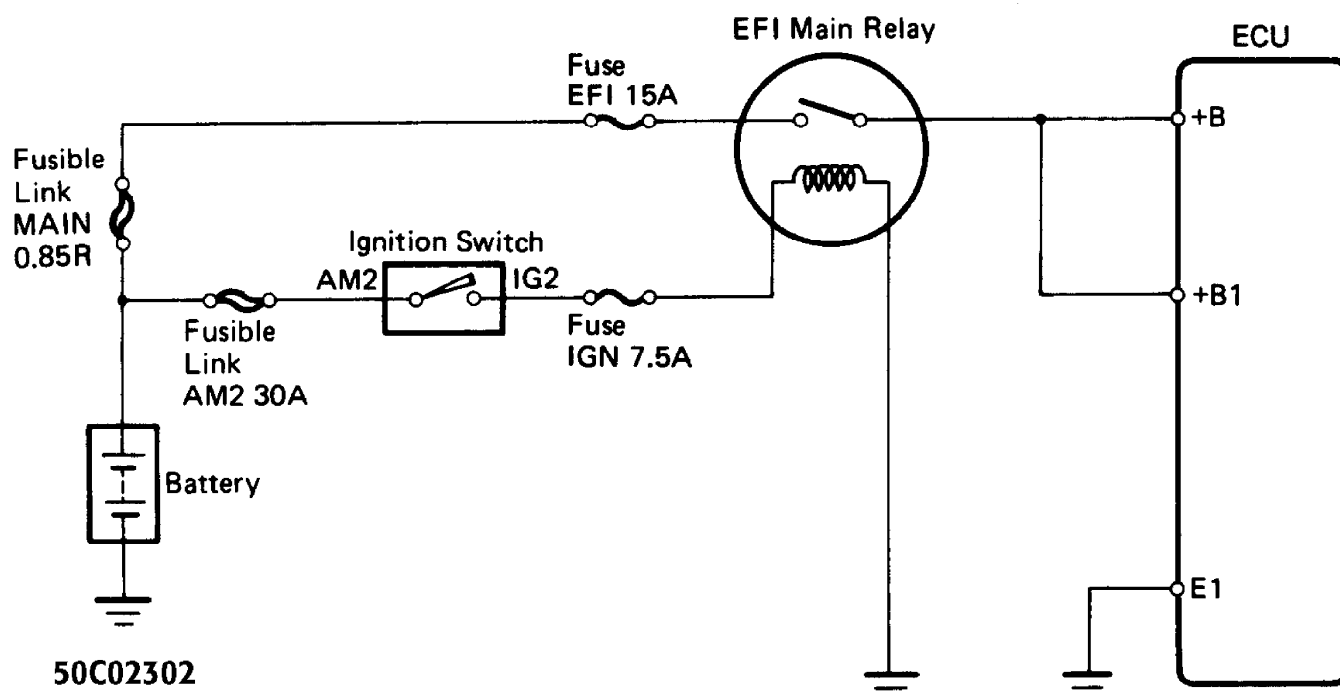
| Terminals                                    | STD voltage (V) | Condition                                                      |                              | TEST NO. |
|----------------------------------------------|-----------------|----------------------------------------------------------------|------------------------------|----------|
| +B<br>+B1 — E1                               | 10 — 14         | Ignition S/W ON                                                |                              | 1        |
| BATT — E1                                    | 10 — 14         | —                                                              |                              | 11       |
| IDL — E2                                     | 4 — 6           | Ignition S/W ON                                                | Throttle valve open          | 8        |
| VTA — E2                                     | 0.1 — 1.0       |                                                                | Throttle valve fully closed  |          |
|                                              | 3 — 4.5         |                                                                | Throttle valve open          |          |
| VC — E2                                      | 4 — 6           |                                                                | —                            |          |
| IGT — E1                                     | 0.7 — 1.0       | Cranking or idling                                             |                              | 2        |
| STA — E1                                     | 6 — 14          | Cranking                                                       |                              | 9        |
| No. 1<br>No. 2 — E01<br>No. 3 — E02<br>No. 4 | 10 — 14         | Ignition S/W ON                                                |                              | 12       |
| W — E1                                       | 8 — 14          | No trouble (Check engine warning light off) and engine running |                              | 13       |
| VC — E2                                      | 4 — 6           | Ignition S/W ON                                                | —                            | 6        |
| VS — E2                                      | 4 — 6           |                                                                | Measuring plate fully closed |          |
|                                              | 1.0 or less     |                                                                | Measuring plate fully open   |          |
|                                              | 2 — 4           | Idling                                                         |                              |          |
| THA — E2                                     | 1 — 3           | Ignition S/W ON                                                | Intake air temp. 20°C (68°F) | 5        |
| THW — E2                                     | 0.1 — 1.0       |                                                                | Coolant temp. 80°C (176°F)   | 4        |
| ISC1<br>ISC2 — E1                            | 9 — 14          | Ignition S/W ON                                                |                              | 14       |
| PIM — E2                                     | 2.5 — 4.5       |                                                                |                              | 7        |
| VC — E2                                      | 4 — 6           |                                                                |                              |          |
| A/C — E1                                     | 8 — 14          | Ignition S/W ON                                                | Air conditioning ON          | 15       |

50A02301

Fig. 17: ECU Pin Voltage Test (4WD)

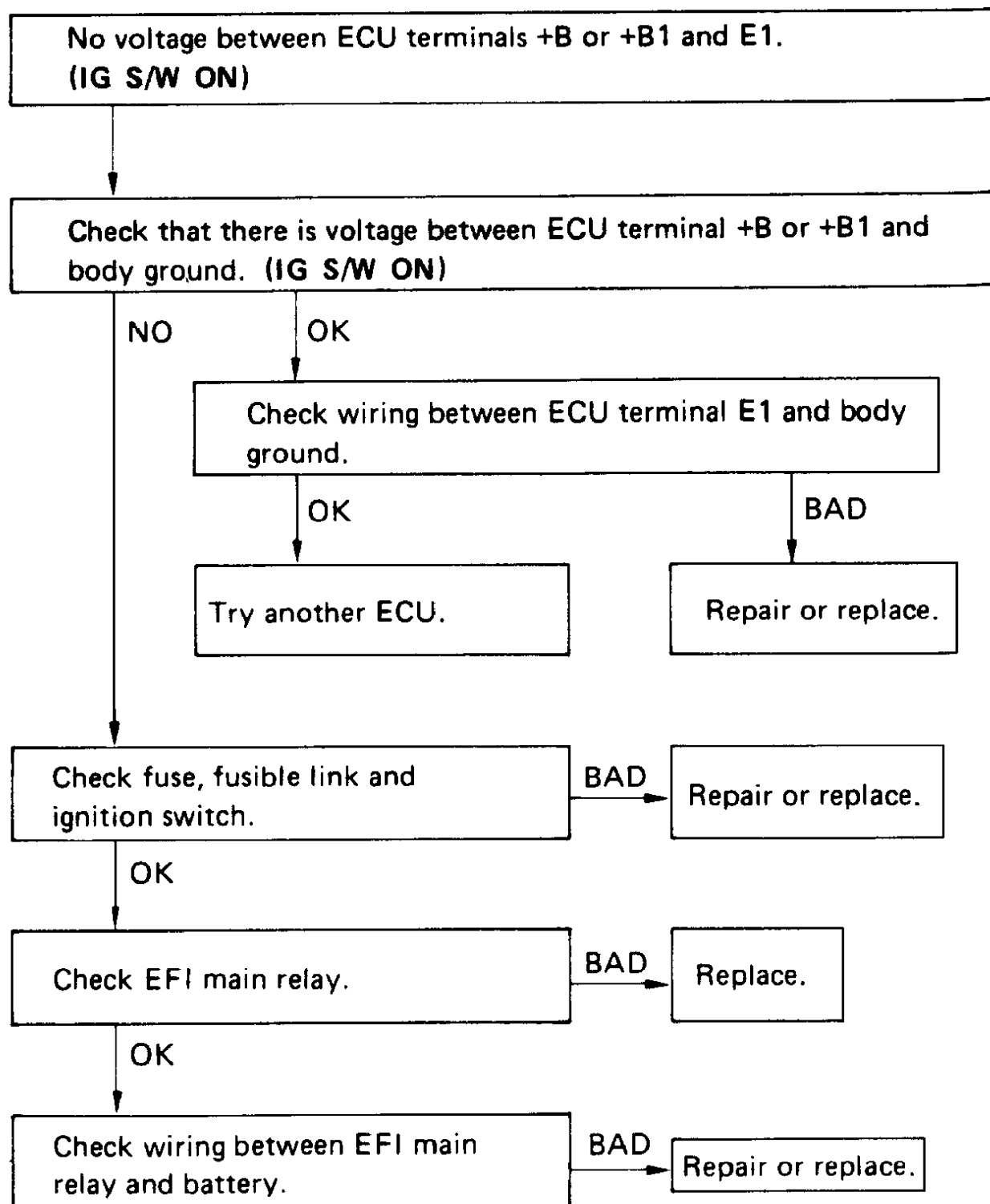
NO. 1 TEST, CODE 11 ECU (+B) CIRCUIT

| Terminals      | Trouble    | Condition       | STD voltage |
|----------------|------------|-----------------|-------------|
| +B<br>+B1 - E1 | No Voltage | Ignition S/W ON | 10 - 14 V   |



50C02302

Fig. 18: No. 1 Test Schematic, Code 11 ECU (+B) Circuit

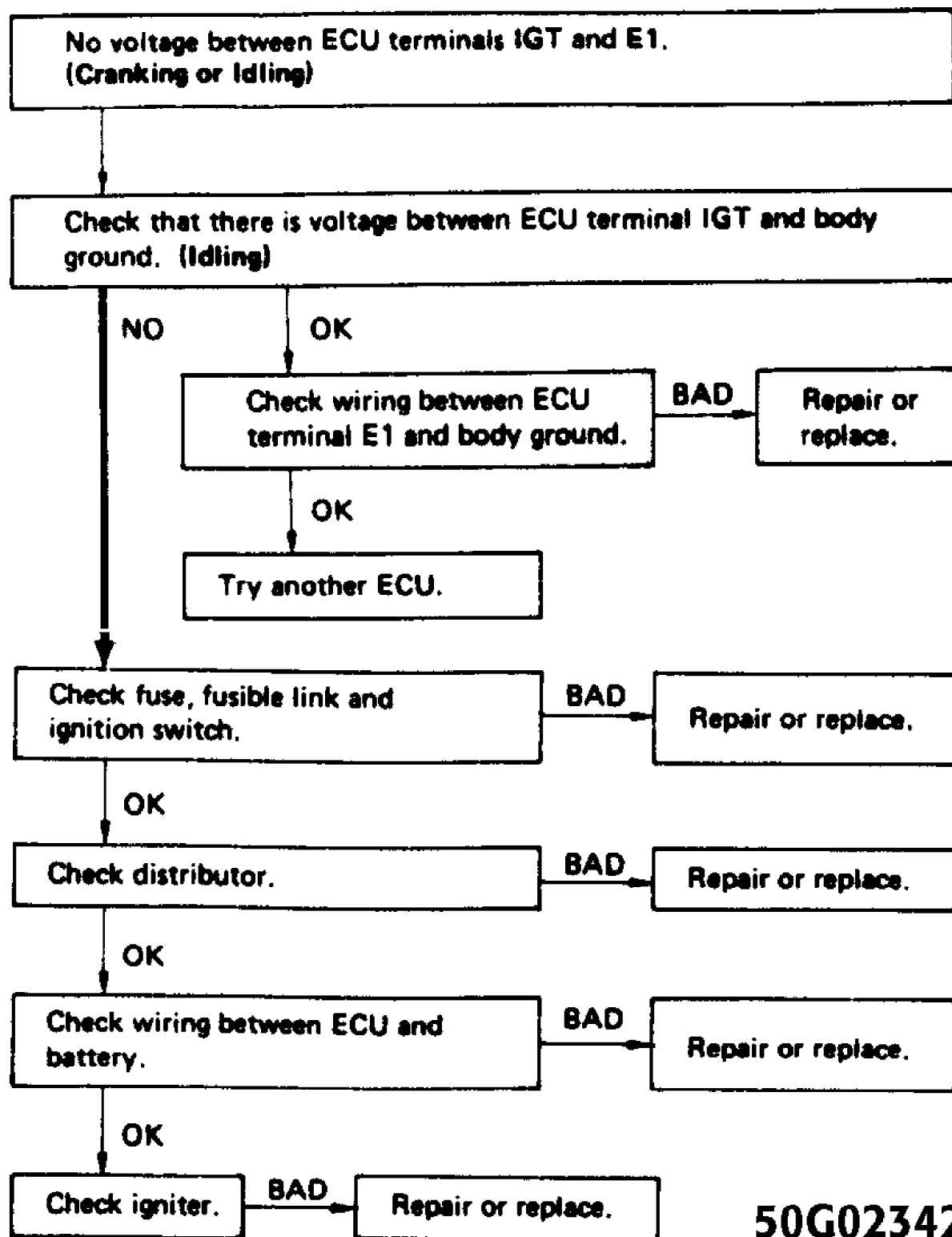


**50E02303**

Fig. 19: No. 1 Test Flow Chart, Code 11 ECU (+B) Circuit

NO. 2 TEST, CODE 12, 13, 14, RPM & IGNITION SIGNAL

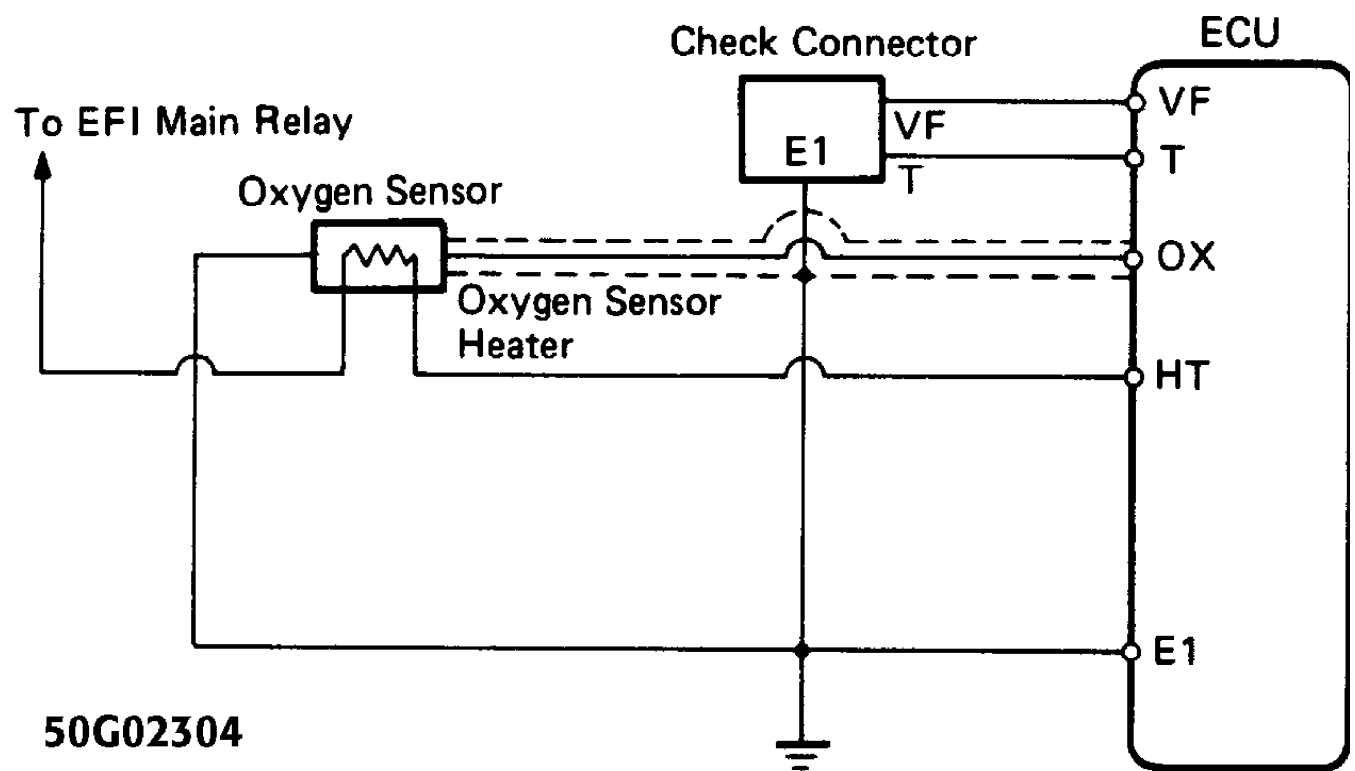




50G02342

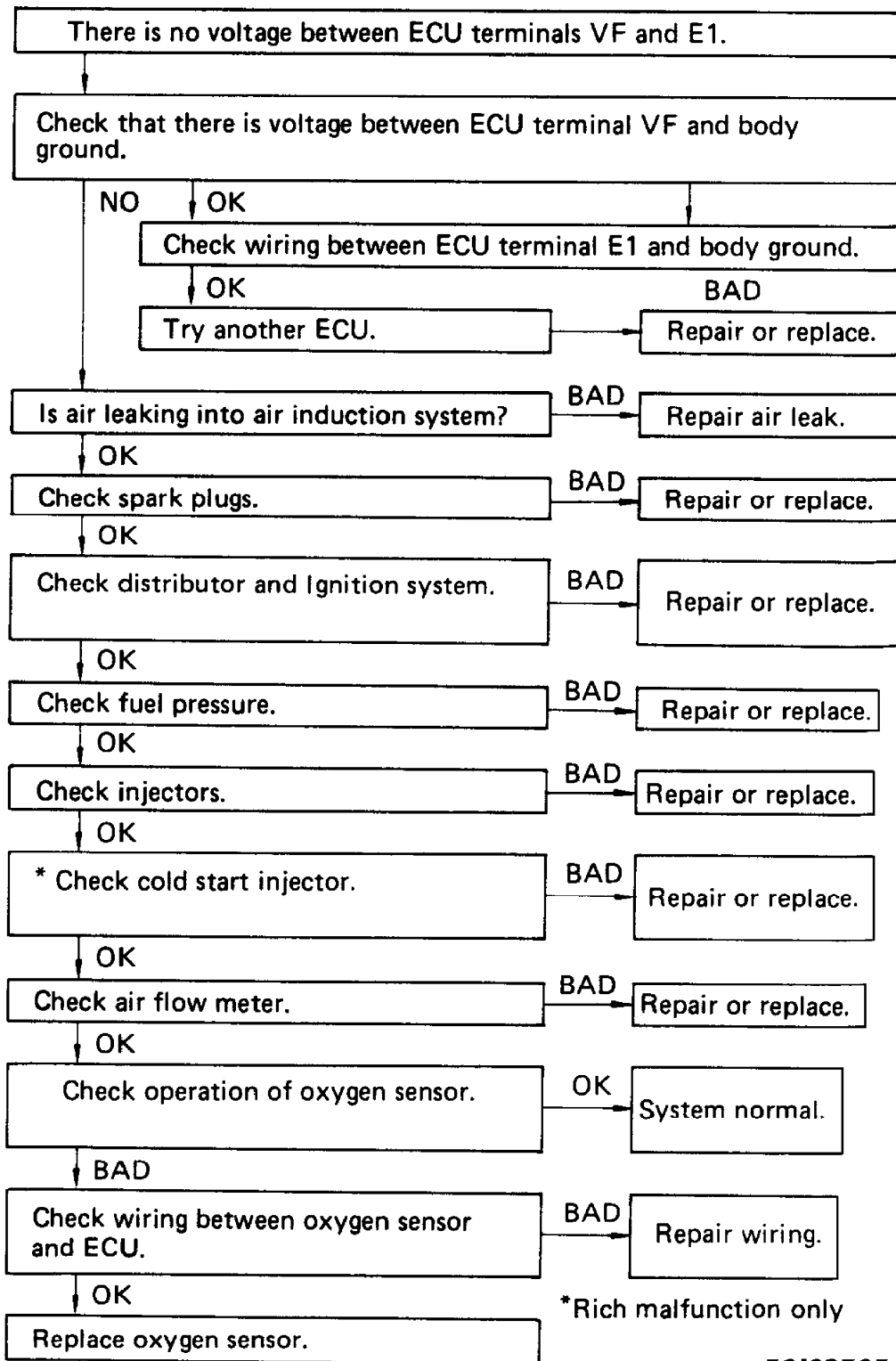
Fig. 22: No. 2 Test, Code 12, 13, 14, RPM & Ign. Sig. Flow Chart

NO. 3 TEST, CODE 21, 25, 26, O2 SENSOR SIGNAL



**50G02304**

Fig. 23: No. 3 Test, Code 21, 25, 26 Schematic, O2 Sensor Signal



50J02305

Fig. 24: No. 3 Test, Code 21, 25, 26 Flow Chart, O2 Sensor Signal

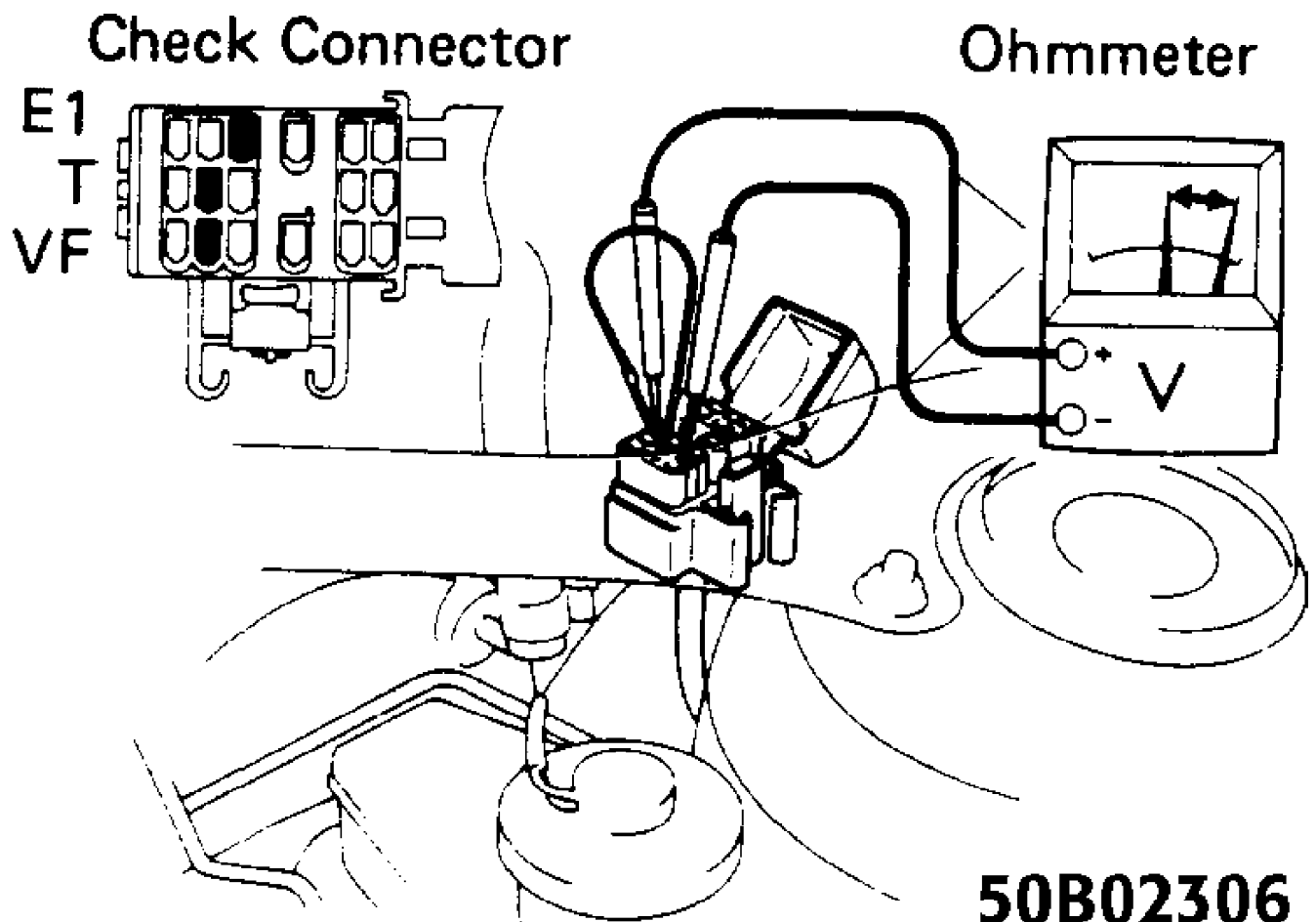
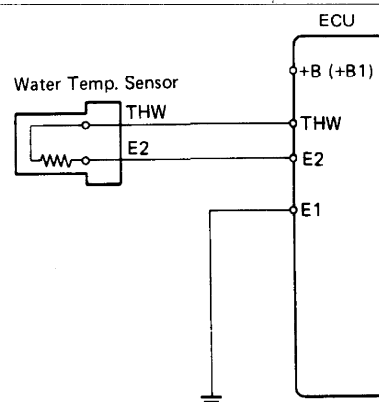


Fig. 25: No. 3 Test, Code 21, 25, 26, O2 Sensor Operation Check

#### NO. 4 TEST, CODE 22, COOLANT TEMP. SENSOR SIGNAL

| Terminals | Trouble    | Condition |                                  | STD voltage |
|-----------|------------|-----------|----------------------------------|-------------|
| THW – E2  | No voltage | IG S/W ON | Coolant temperature 80°C (176°F) | 0.1 – 1.0 V |



50D02307

Fig. 26: No. 4 Test, Code 22 Schematic, Coolant Temp. Sensor Signal

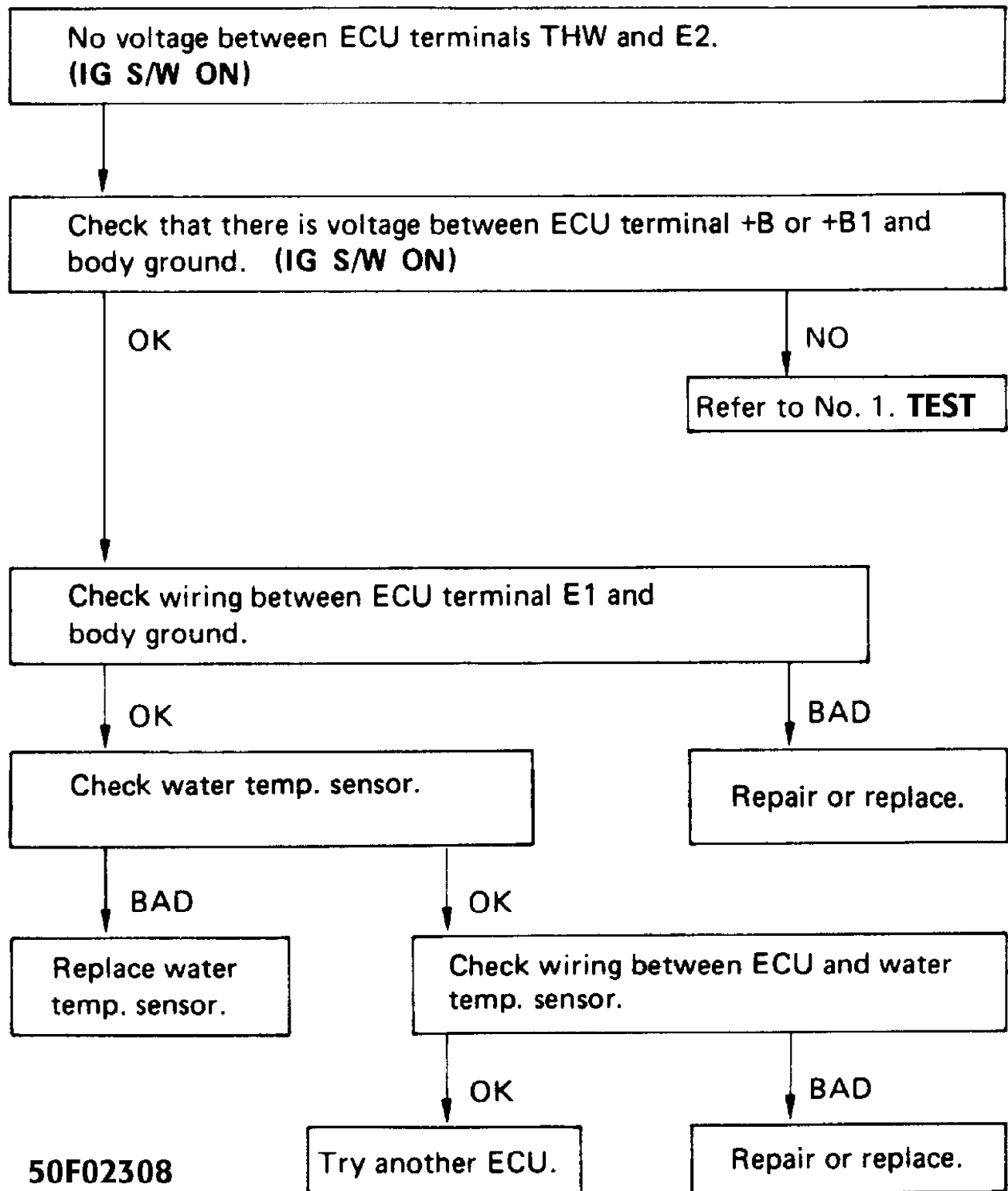
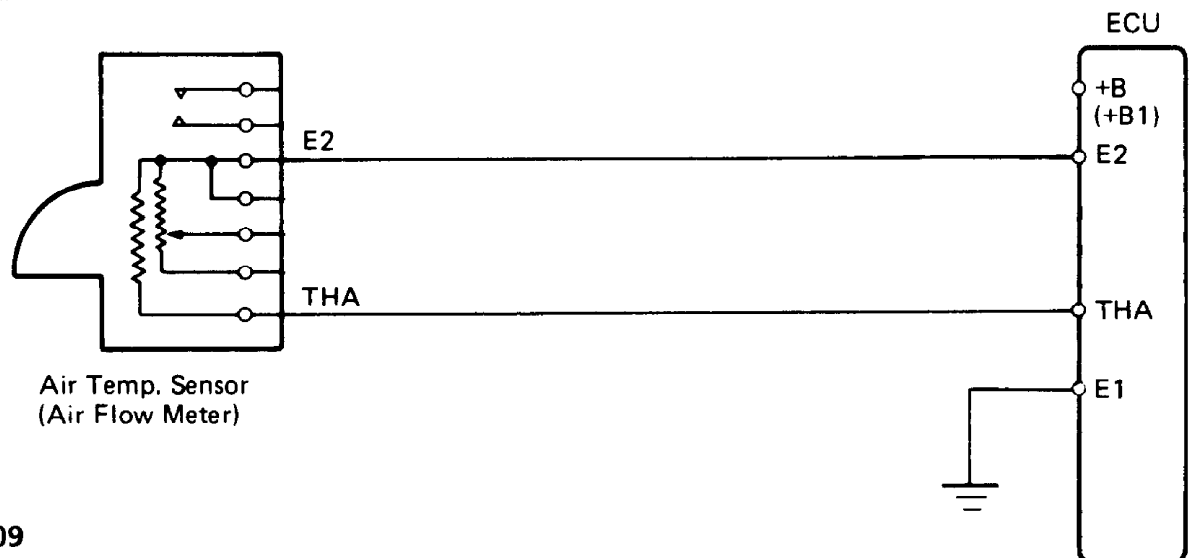


Fig. 27: No. 4 Test, Code 22 Flow Chart, Coolant Temp. Sensor Signal

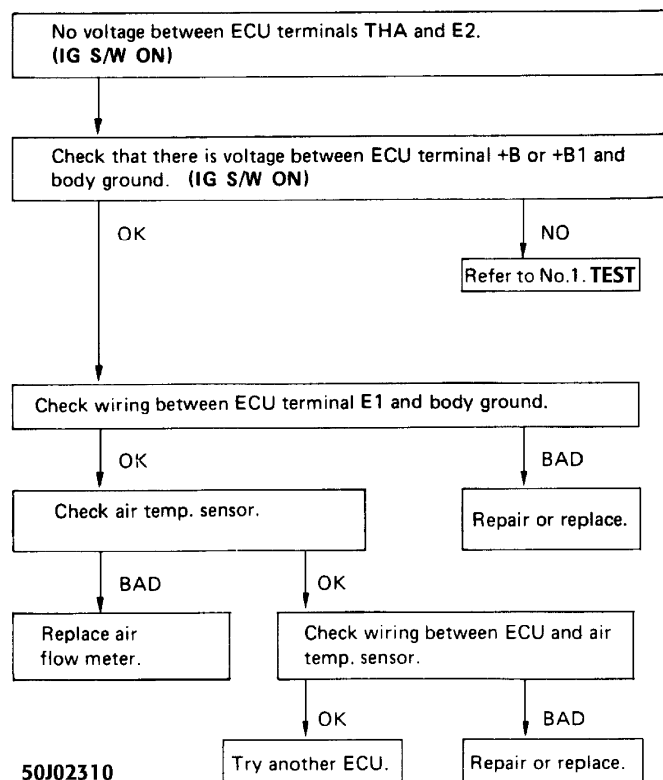
NO. 5 TEST, CODE 24, INTAKE AIR TEMP. SENSOR SIGNAL

| Terminals | Trouble    | Condition |                                    | STD voltage |
|-----------|------------|-----------|------------------------------------|-------------|
| THA – E2  | No voltage | IG S/W ON | Intake air temperature 20°C (68°F) | 1 – 3 V     |



### 50H02309

Fig. 28: No. 5 Test, Code 24 Schematic, Intake Air Temp. Sens. Signal



### 50J02310

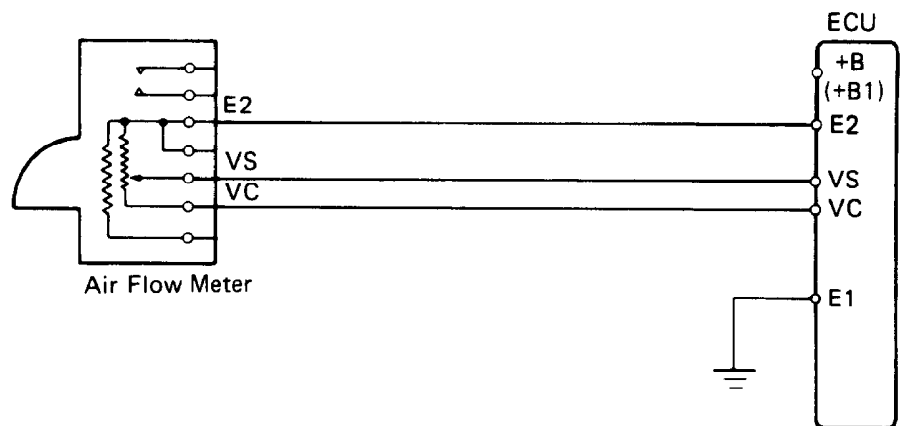
Fig. 29: No. 5 Test, Code 24 Flow Chart, Intake Air Temp. Sens. Sig.

## CODE 25, 26, AIR/FUEL, LEAN OR RICH

NOTE: Use No. 3 test in this article.

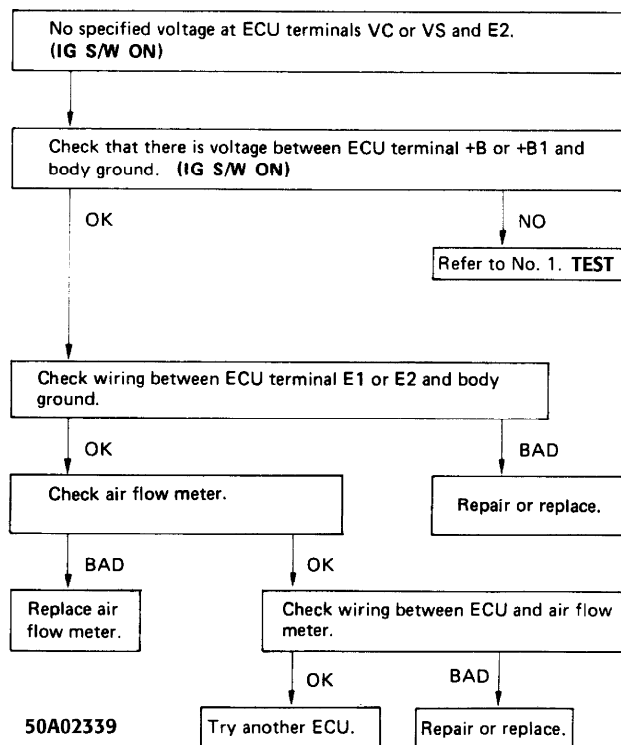
## NO. 6 TEST, CODE 31, 32, AIRFLOW METER SIGNAL

| Terminals | Trouble    | Condition |                              | STD voltage  |
|-----------|------------|-----------|------------------------------|--------------|
| VC – E2   | No voltage | IG S/W ON | –                            | 4 – 6 V      |
| VS – E2   |            |           | Measuring plate fully closed | 4 – 5 V      |
|           |            |           | Measuring plate fully open   | 0.02 – 0.5 V |
|           |            | Idling    |                              | 2 – 4 V      |



50I02338

Fig. 30: No. 6 Test, Code 31, 32 Schematic, Airflow Meter Signal

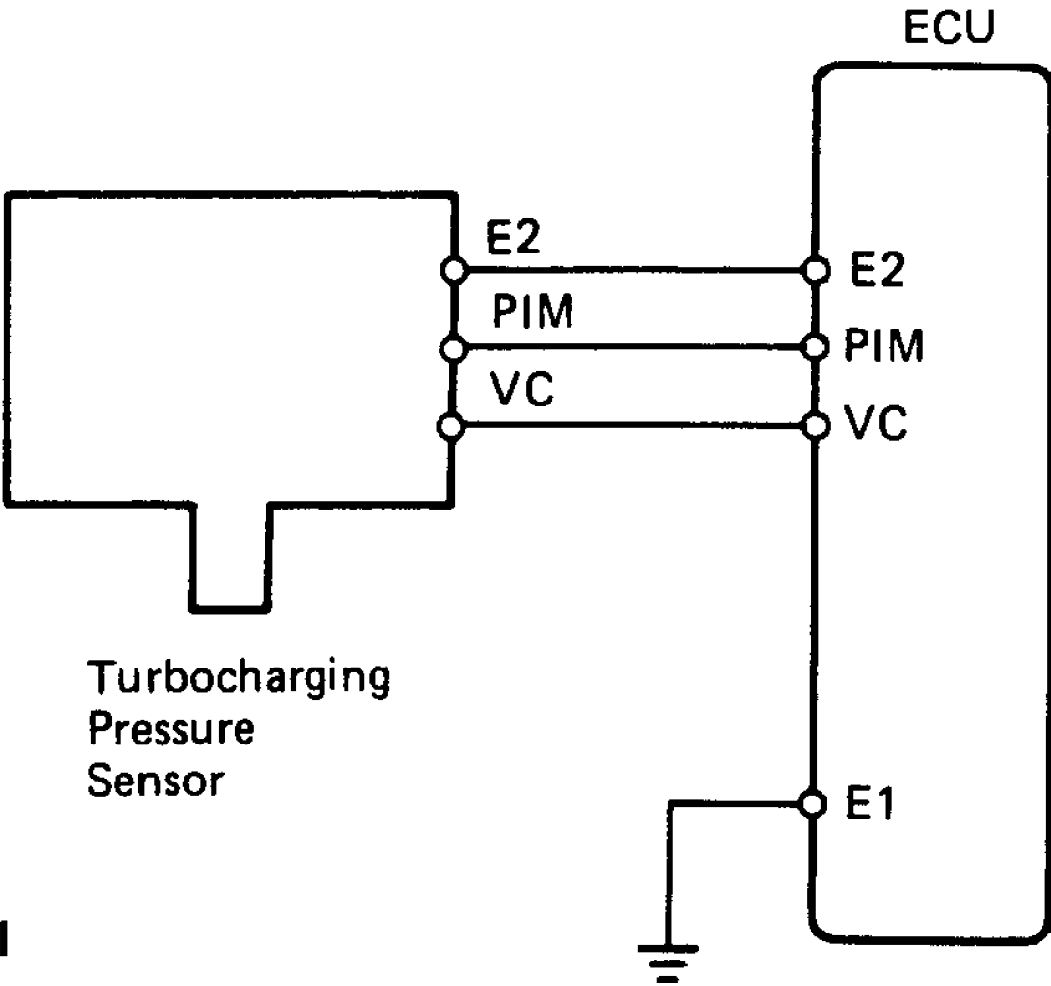


50A02339

Fig. 31: No. 6 Test, Code 31, 32 Flow Chart, Airflow Meter Signal

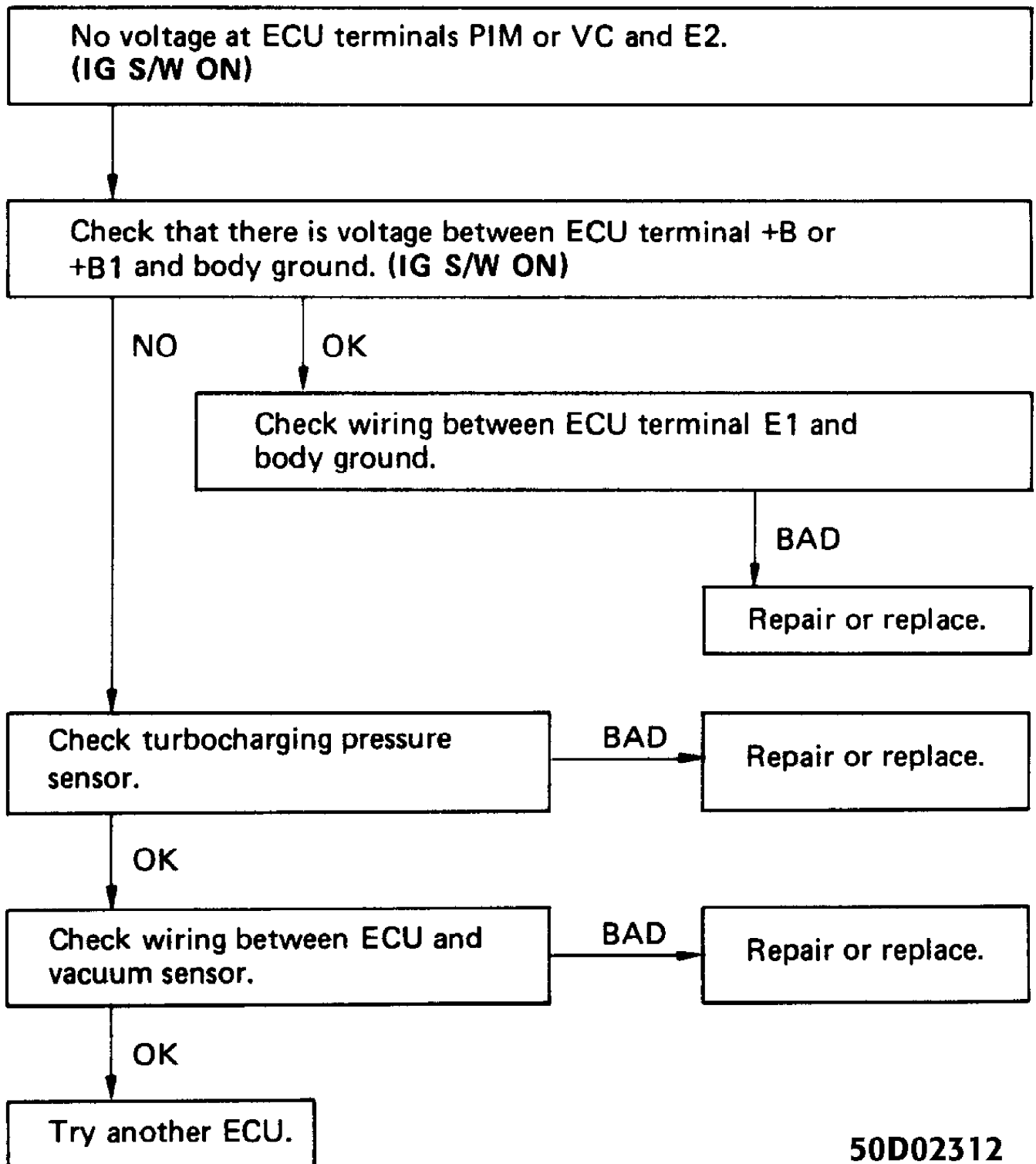
## NO. 7 TEST, CODE 34, 35, TURBO PRESSURE SIGNAL

| Terminals | Trouble    | Condition | STD voltage |
|-----------|------------|-----------|-------------|
| PIM – E2  | No voltage | IG S/W ON | 2.5 – 4.5 V |
| VC – E2   |            |           | 4 – 6 V     |



**50B02311**

Fig. 32: No. 7 Test, Code 34, 35 Schematic, Turbo Pressure Signal

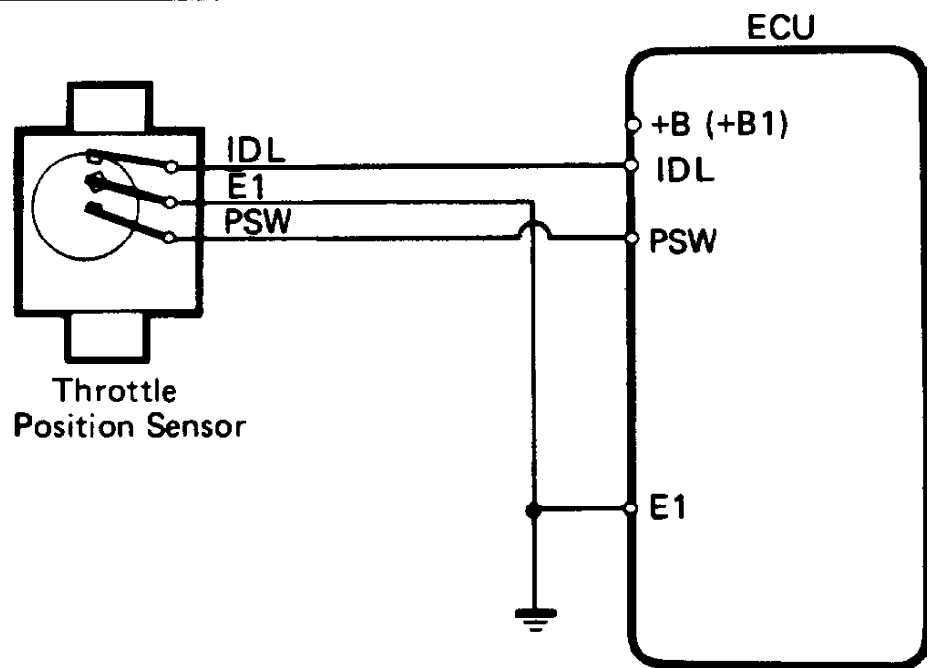


**50D02312**

Fig. 33: No. 7 Test, Code 34, 35 Flow Chart, Turbo Pressure Signal

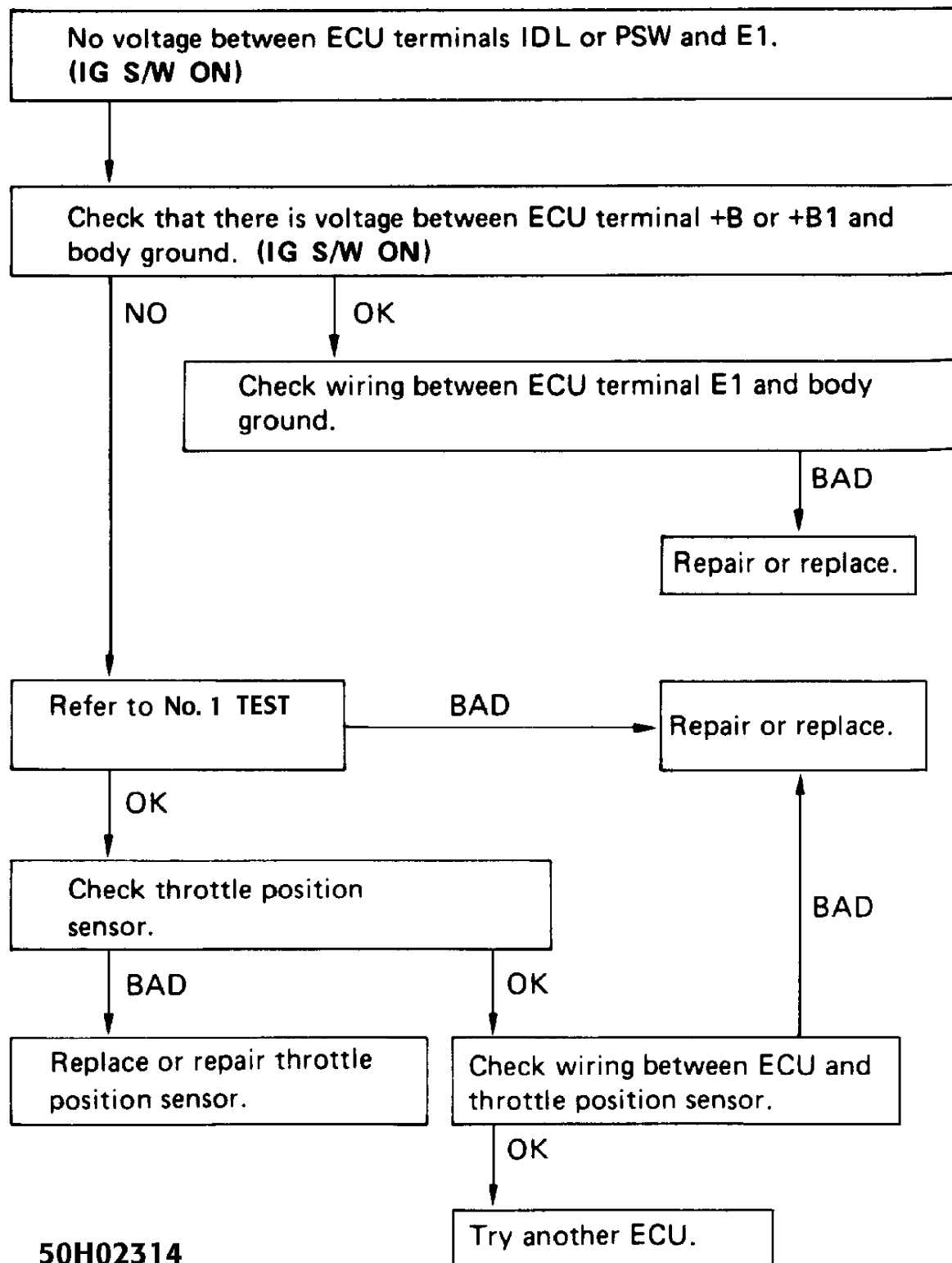
NO. 8 TEST, CODE 41, THROTTLE POSITION SENSOR SIGNAL

| Terminals | Trouble    | Condition |                             | STD voltage |
|-----------|------------|-----------|-----------------------------|-------------|
| IDL – E1  | No voltage | IG S/W ON | Throttle valve open         | 8 – 14 V    |
| PSW – E1  |            |           | Throttle valve fully closed | 4 – 5 V     |



**50F02313**

Fig. 34: 2WD (W/3S-FE) No. 8 Test, Code 41 Schematic, TPS Sens. Sig.



**50H02314**

Fig. 35: 2WD (W/3S-FE) No. 8 Test, Code 41 Flow Chart, TPS Sens. Sig.

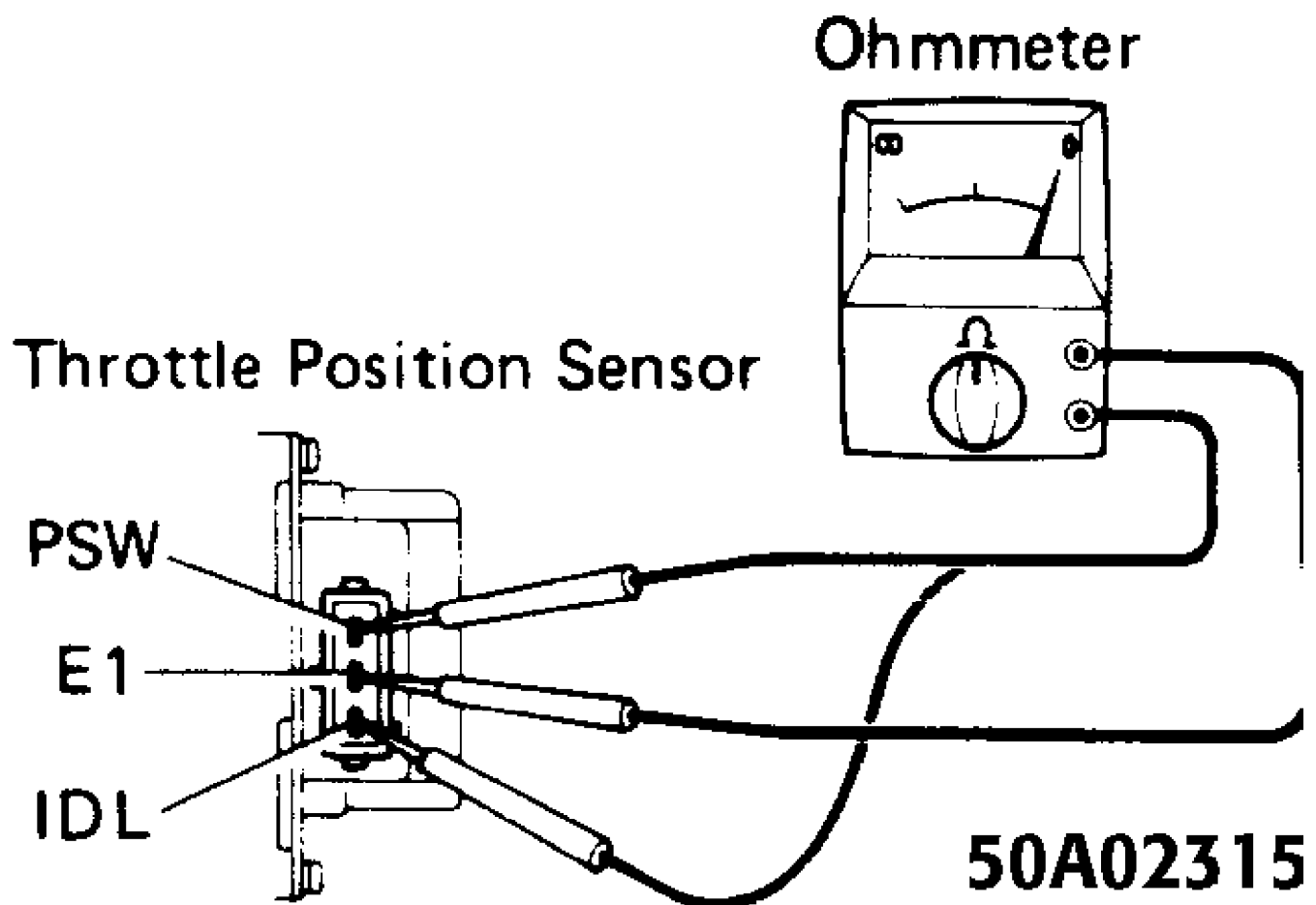


Fig. 36: 2WD (W/3S-FE) No. 8 Test, Code 41, TPS Sensor Signal Check

| Terminals | Trouble    | Condition                   | STD voltage                                     |
|-----------|------------|-----------------------------|-------------------------------------------------|
| IDL – E2  | No voltage | Throttle valve open         | <sup>*1</sup> 4 – 6 V or <sup>*2</sup> 8 – 14 V |
| VTA – E2  |            | Throttle valve fully closed | 0.1 – 1.0 V                                     |
|           |            | Throttle valve fully open   | 4 – 5 V                                         |
| VC – E2   |            | –                           | 4 – 6 V                                         |

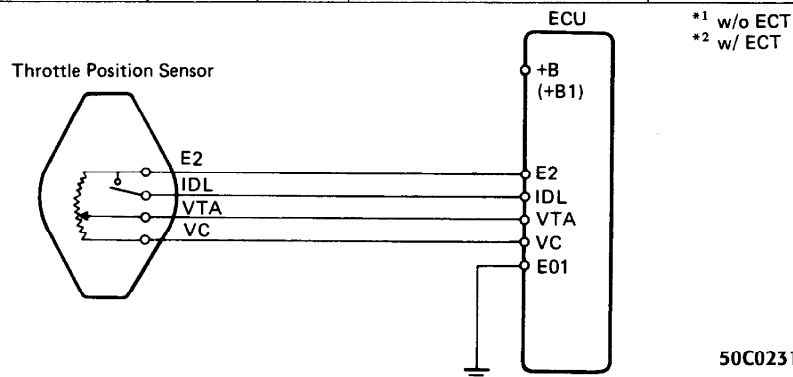


Fig. 37: 2WD (W/3S-GE) & 4WD, No. 8 Test, Code 41 Schematic, TPS Sens Signal

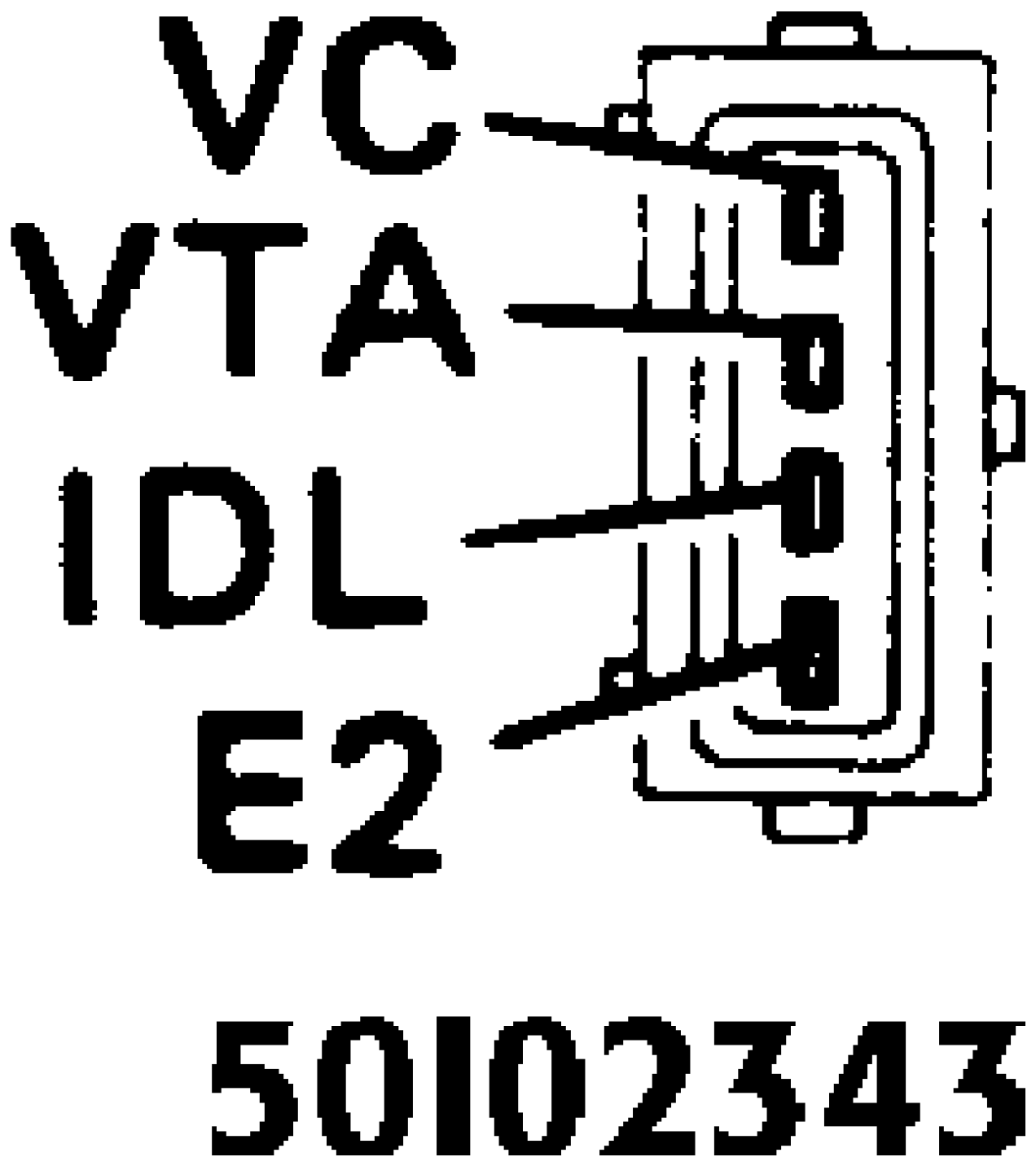
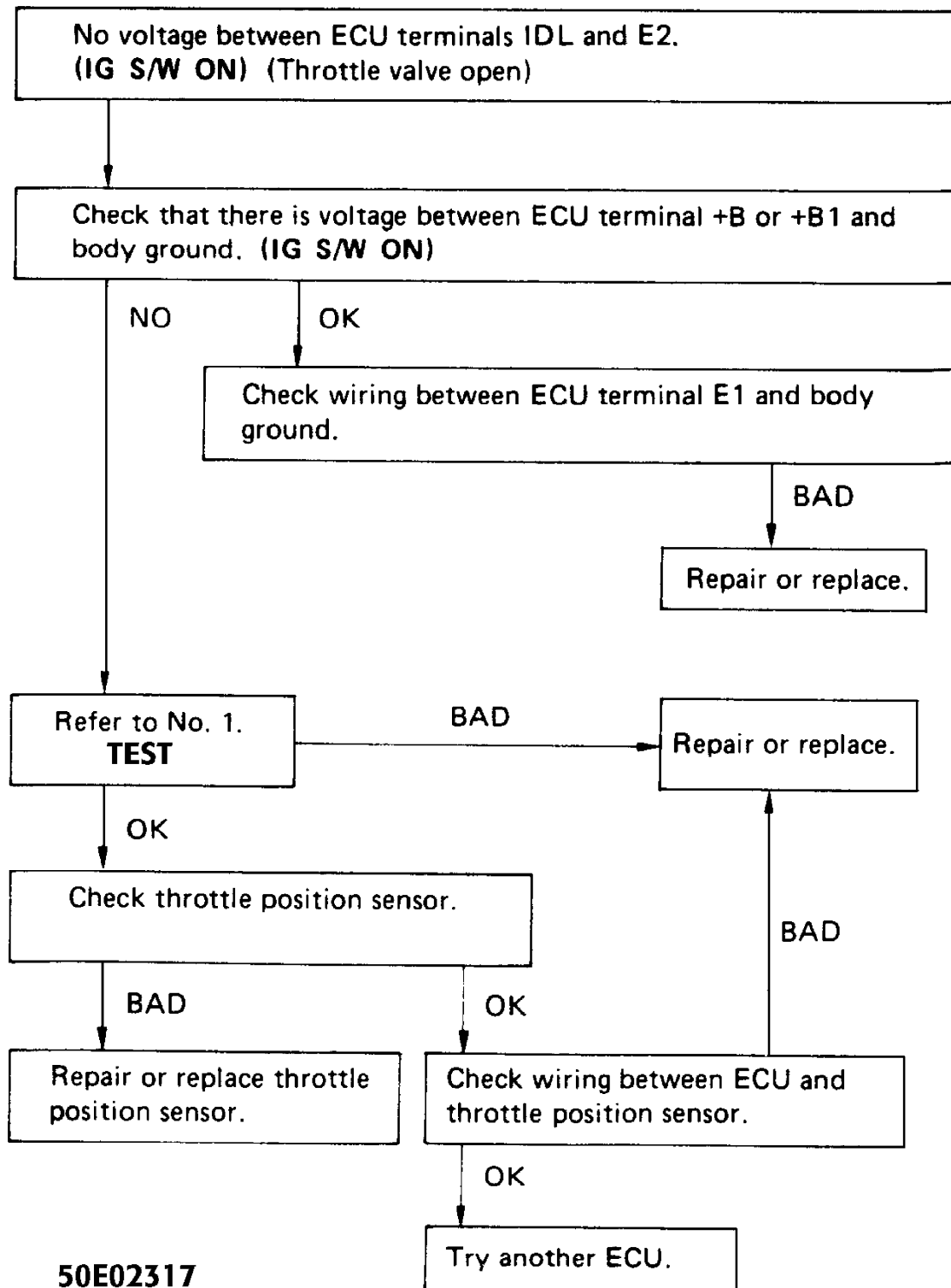


Fig. 38: 2WD (W/3S-GE) & 4WD, TPS Sens. Connector

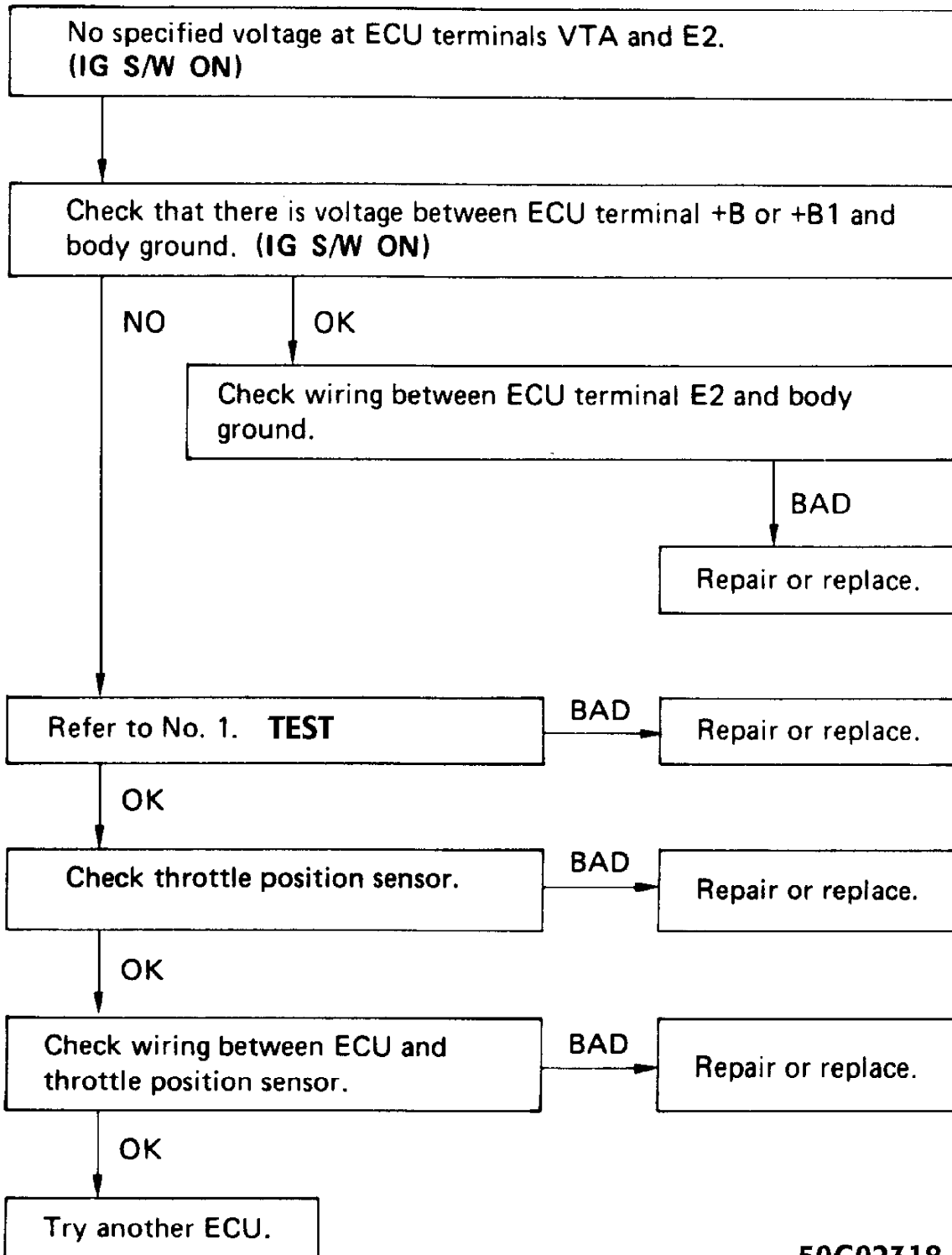
## IDL – E2



**50E02317**

Fig. 39: 2WD (W/3S-GE) & 4WD, Flow Chart (1 of 3) No. 8 Test, Code 41  
TPS Sensor Signal

## VTA – E2



**50G02318**

Fig. 40: 2WD (W/3S-GE) & 4WD, Flow Chart (2 of 3) No. 8 Test, Code 41  
TPS Sensor Signal

## VC – E2

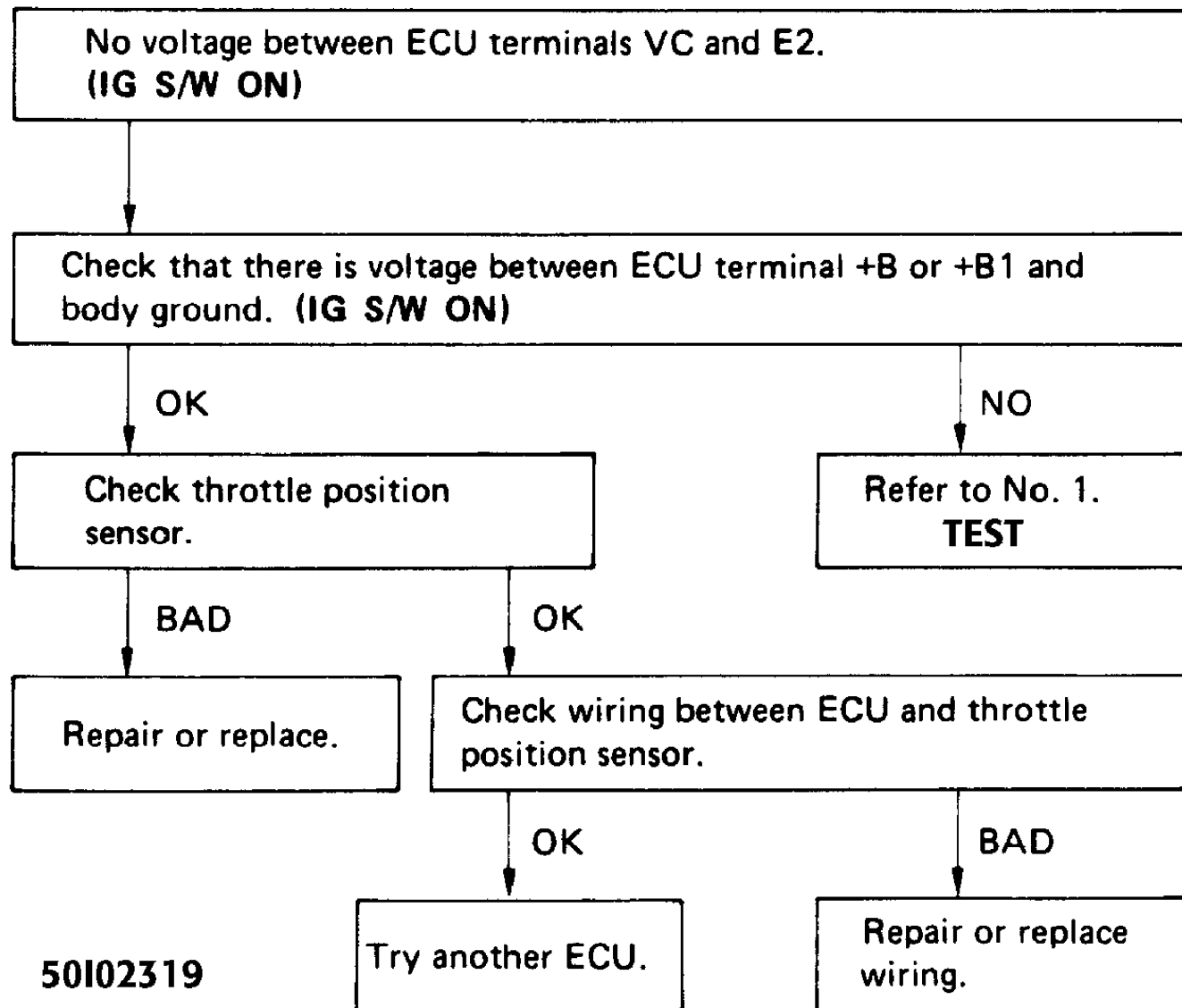


Fig. 41: 2WD (W/3S-GE) & 4WD, Flow Chart (3 of 3) No. 8 Test, Code 41  
TPS Sensor Signal

## CODE 42, VEHICLE SPEED SENSOR

NOTE: See component test in this article.

## NO. 9 TEST, CODE 43, STARTER SIGNAL

| Terminals | Trouble    | Condition | STD voltage |
|-----------|------------|-----------|-------------|
| STA – E1  | No voltage | Cranking  | 6 – 14 V    |

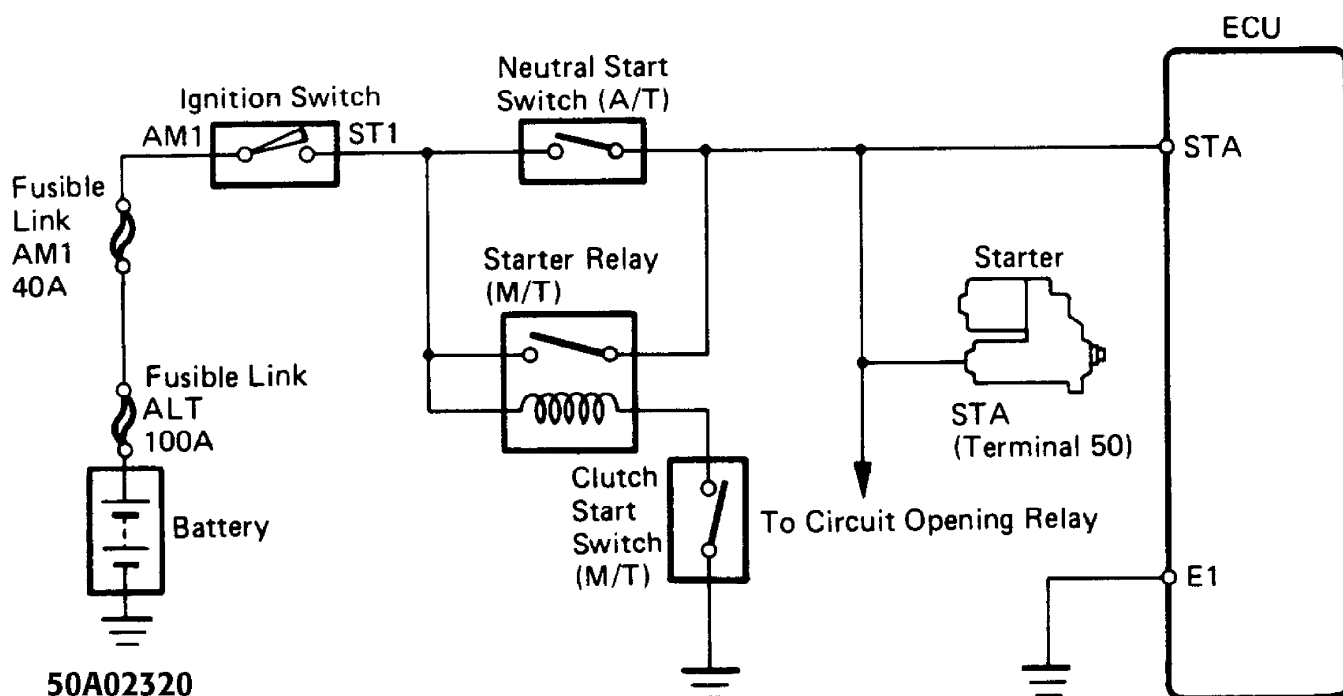
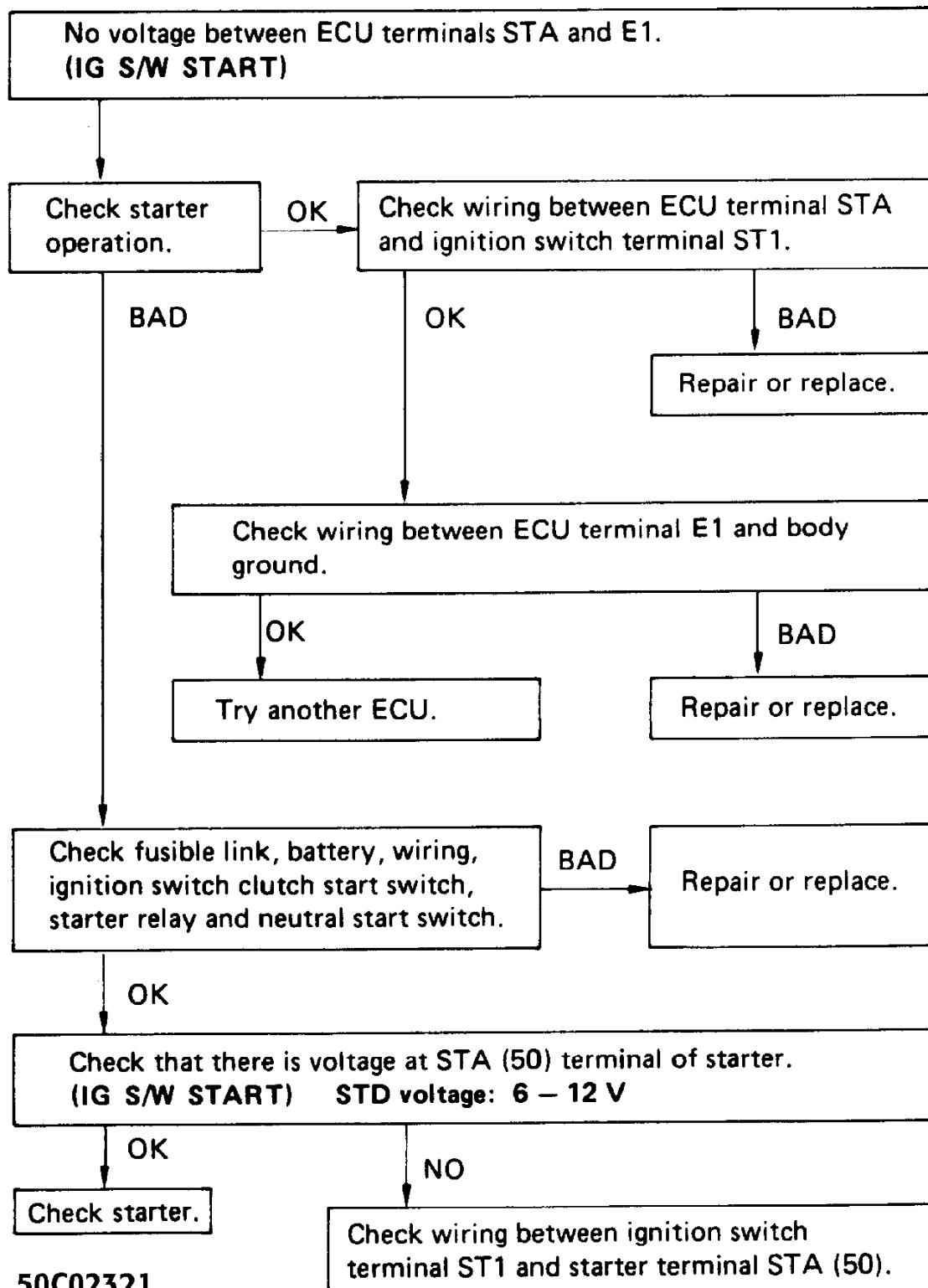


Fig. 42: No. 9 Test, Code 43 Schematic, Starter Signal



**50C02321**

Fig. 43: No. 9 Test, Code 43 Flow Chart, Starter Signal

CODE 51

No "IDL", "NSW" or "A/C" Signal to ECU,

With Check Connector Terminals "E1" & "T" Shorted

NOTE: No further information available from manufacturer.

### CODE 52, 53, KNOCK SENSOR SIGNAL

Open or Short in Knock Sensor Signal (KNK)  
or Knock Control in ECU Faulty

NOTE: No further information available from manufacturer.

### CODE 54, INTERCOOLER ECU SIGNAL

Due to Low Coolant Level for Intercooler  
and/or Defective Intercooler Water Pump Motor

NOTE: No further information available from manufacturer.

### NO. 10 TEST, CODE 71, EGR SYSTEM SIGNAL

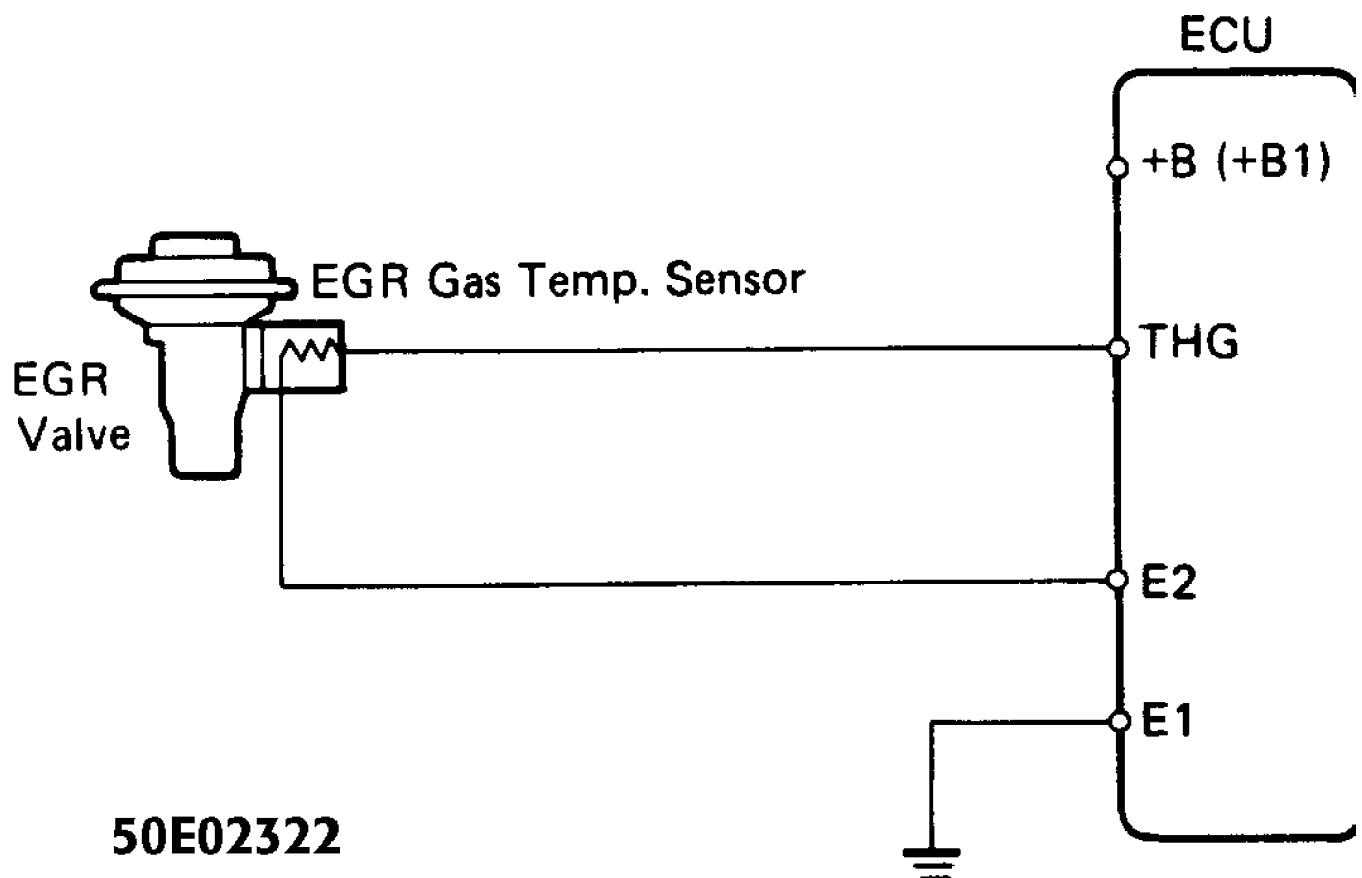


Fig. 44: No. 10 Test, Code 71 Schematic, EGR System Signal

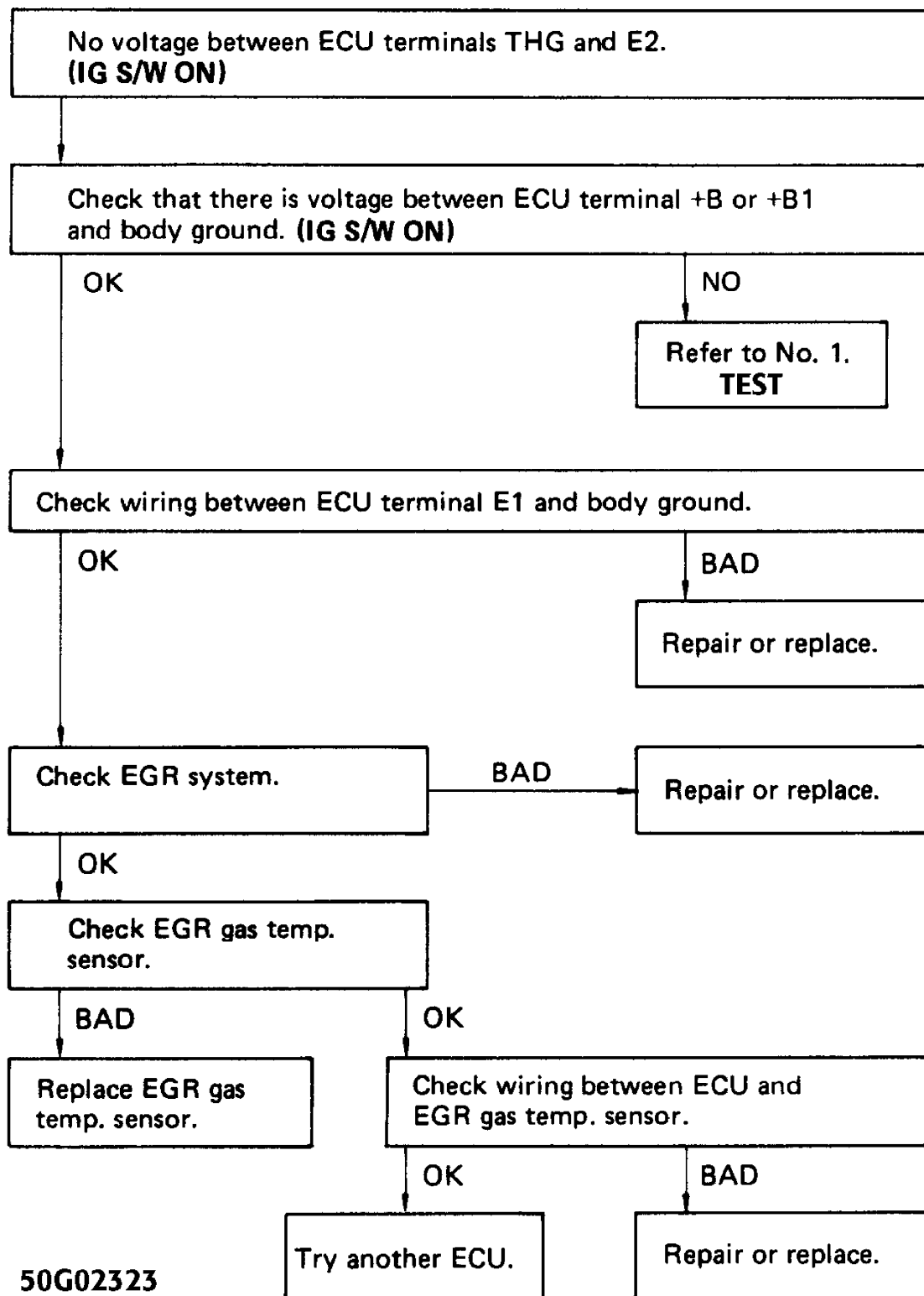
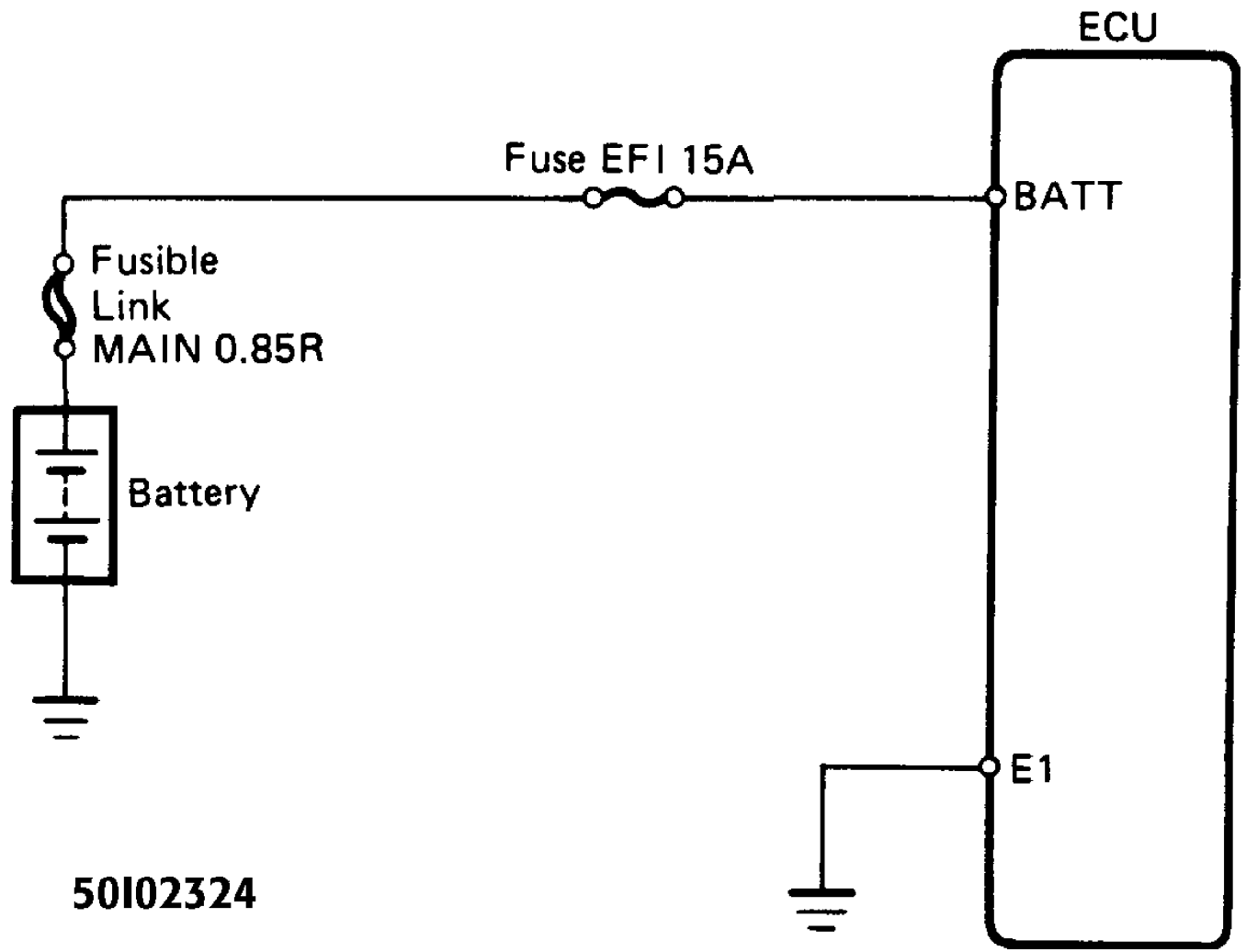


Fig. 45: No. 10 Test, Code 71 Flow Chart, EGR System Signal

NO. 11 TEST, ECU POWER SOURCE

| Terminals | Trouble    | Condition | STD voltage |
|-----------|------------|-----------|-------------|
| BATT – E1 | No voltage | –         | 10 – 14 V   |



50I02324

Fig. 46: No. 11 Test Schematic, ECU Power Source

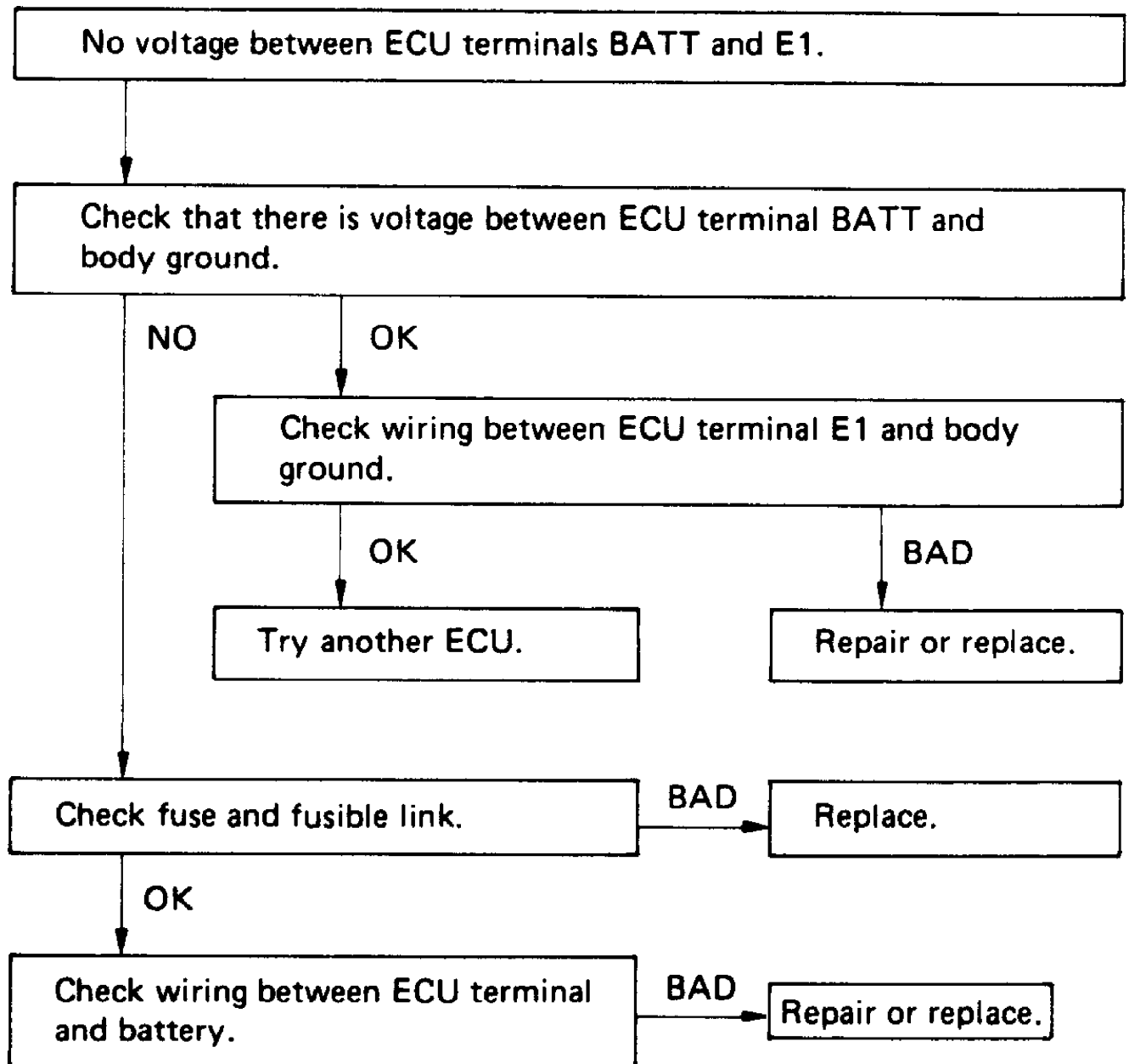
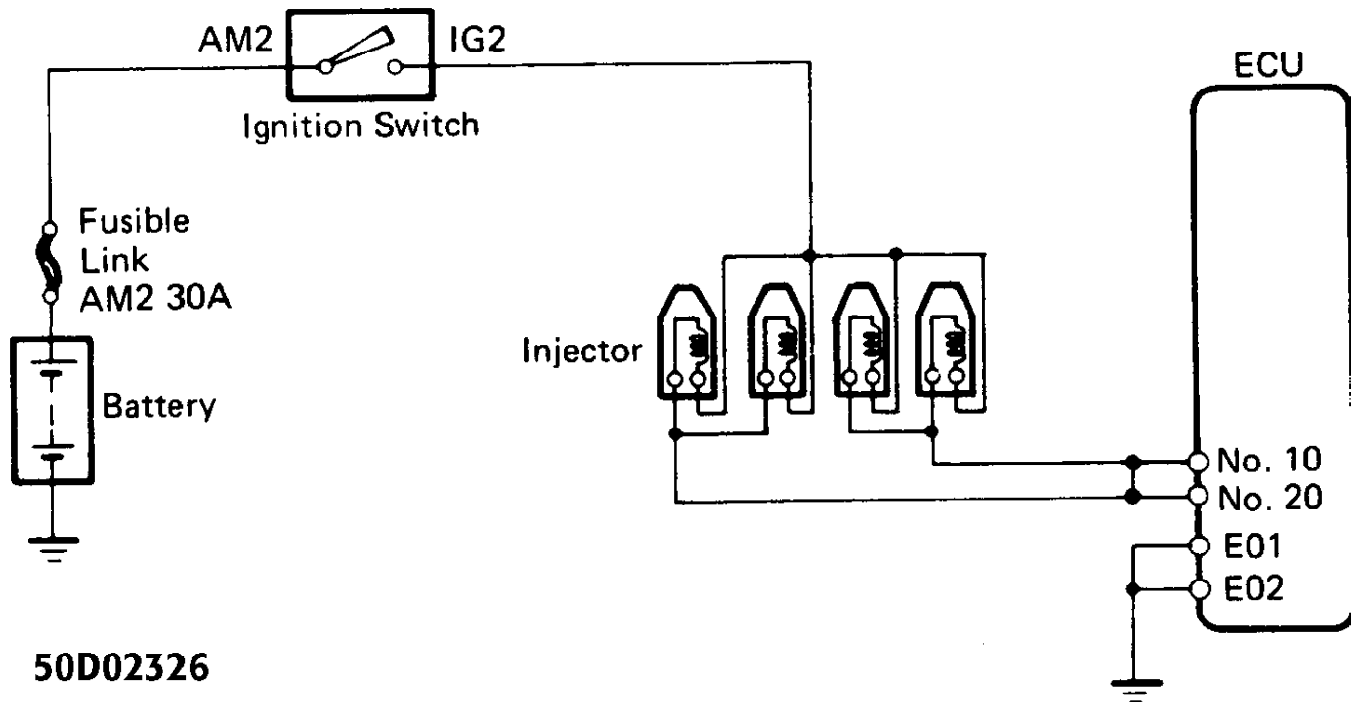


Fig. 47: No. 11 Test Flow Chart, ECU Power Source

50B02325

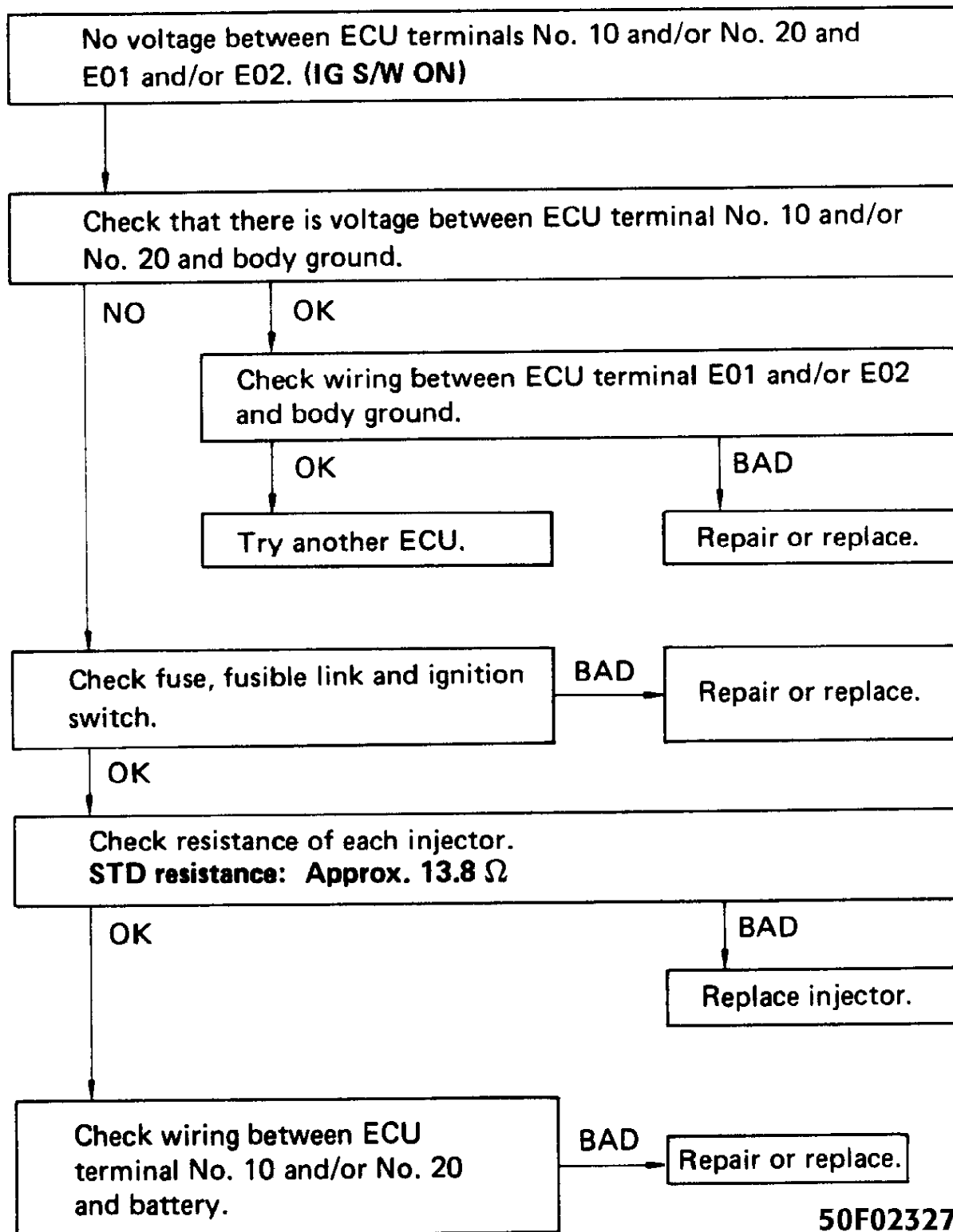
NO. 12 TEST, INJECTOR CIRCUIT TEST

| Terminals                    | Trouble    | Condition | STD voltage |
|------------------------------|------------|-----------|-------------|
| No. 10 - E01<br>No. 20 - E02 | No voltage | IG S/W ON | 9 - 14 V    |



**50D02326**

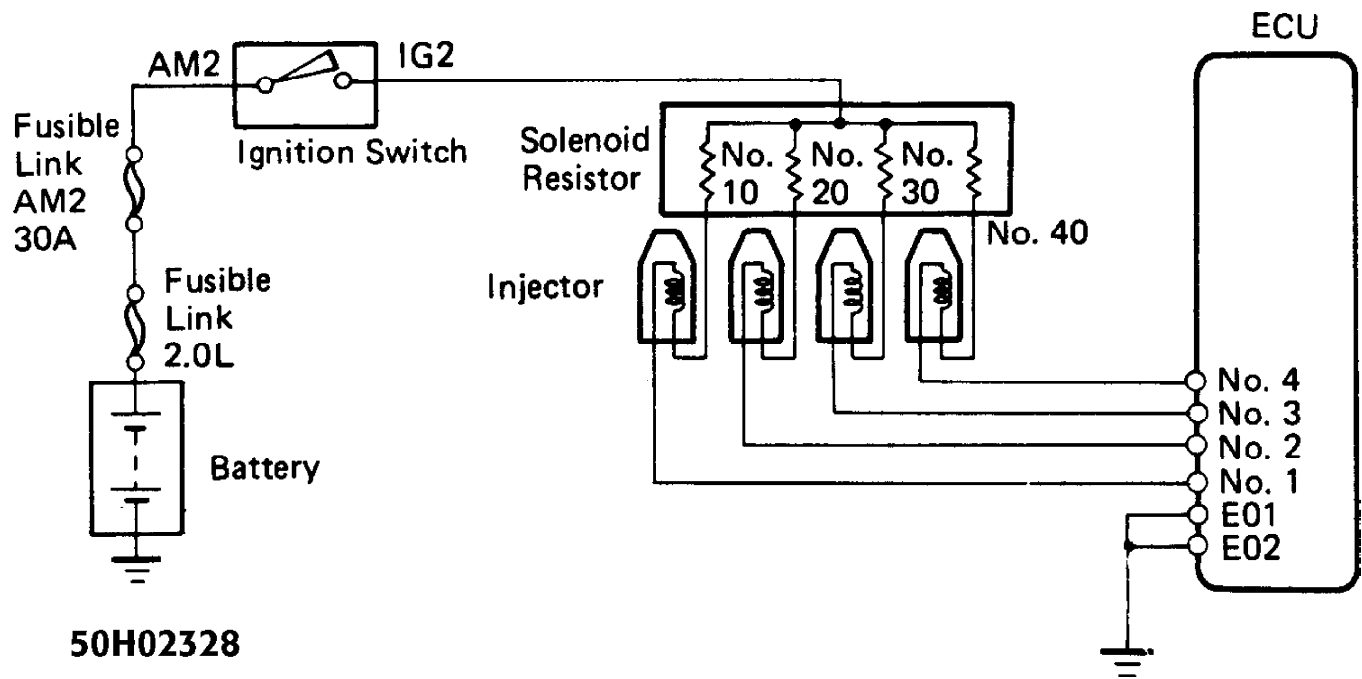
Fig. 48: 2WD (W/3S-FE) No. 12 Test Schematic, Injector Circuit Test



50F02327

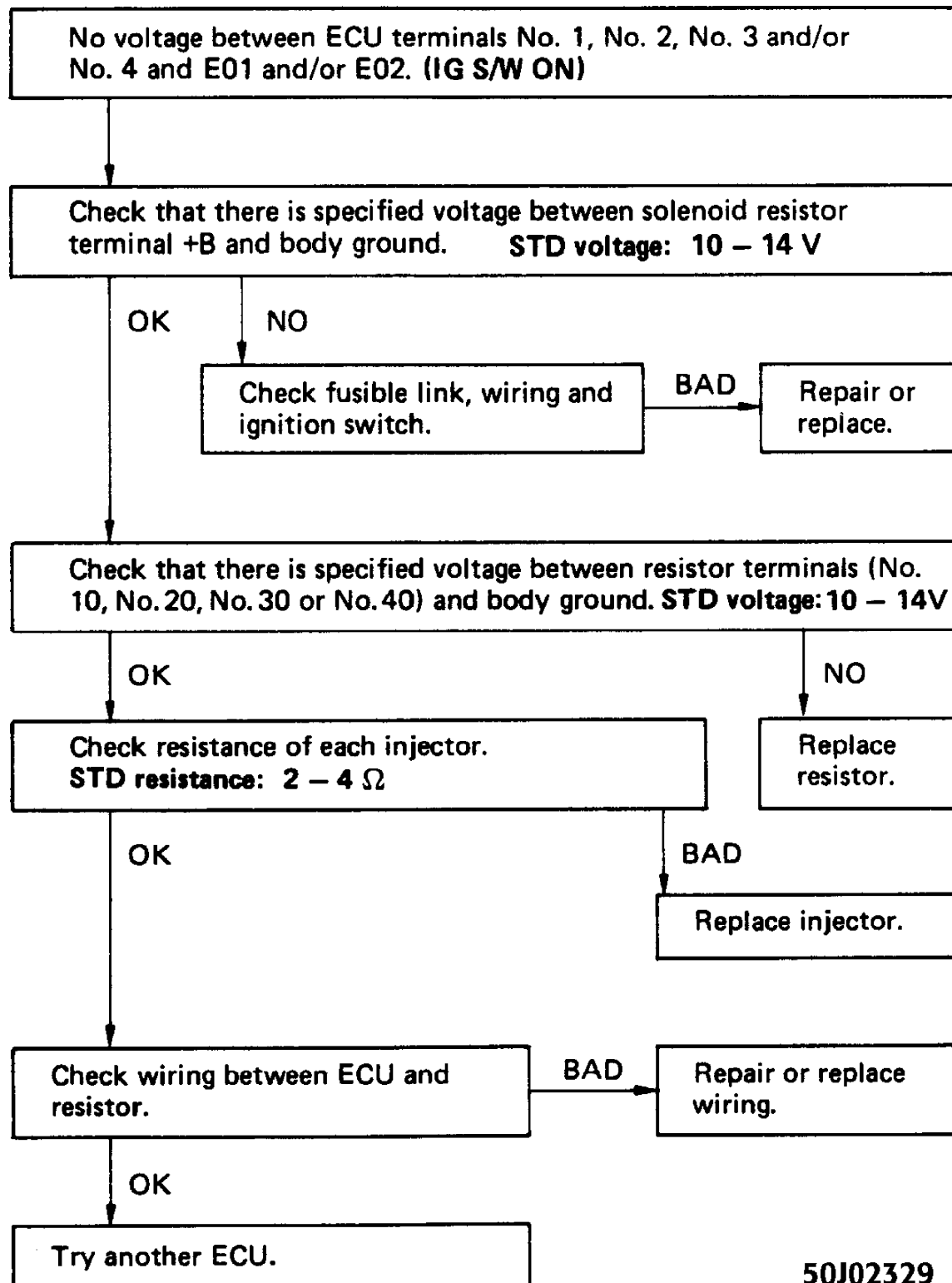
Fig. 49: 2WD (W/3S-FE) No. 12 Test Flow Chart, Injector Circuit Test

| Terminals                                    | Trouble    | Condition | STD voltage |
|----------------------------------------------|------------|-----------|-------------|
| No. 1<br>No. 2 — E01<br>No. 3 — E02<br>No. 4 | No voltage | IG S/W ON | 10 — 14 V   |



**50H02328**

Fig. 50: 2WD (W/3S-GE) & 4WD, No. 12 Test Schematic, Inj. Ckt. Test



50J02329

Fig. 51: 2WD (W/3S-GE) & 4WD, No. 12 Test Flow Chart, Inj. Ckt. Test

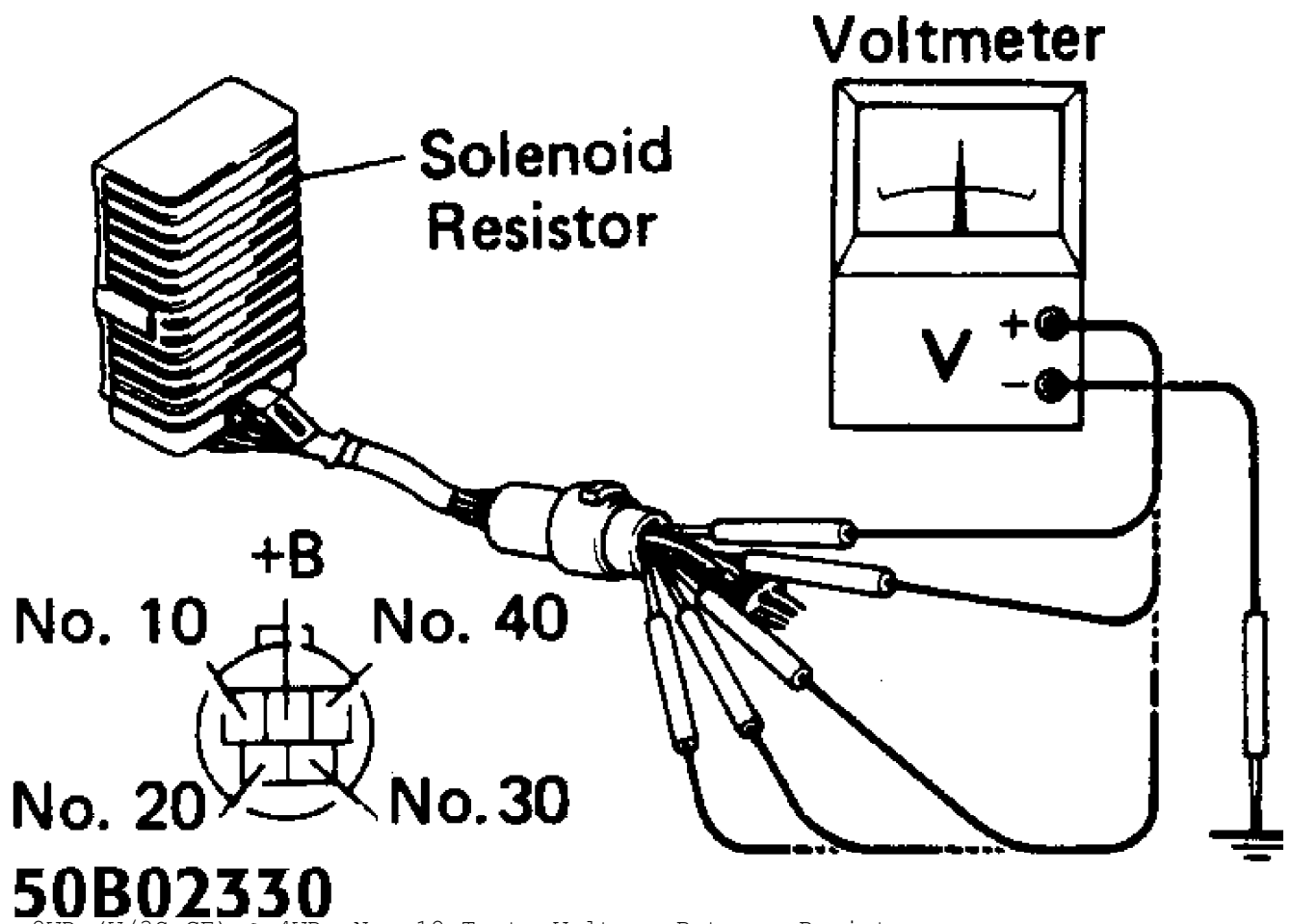
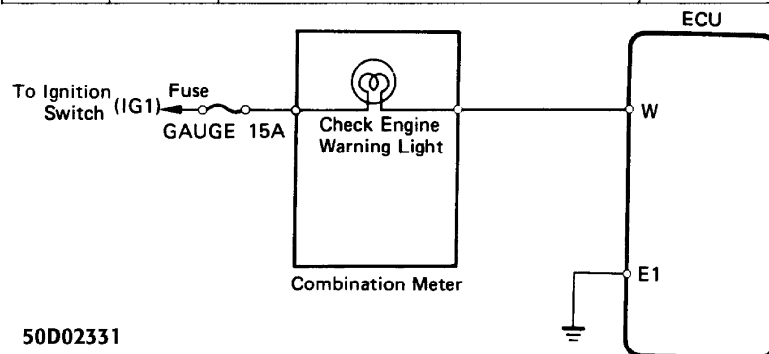


Fig. 52: 2WD (W/3S-GE) & 4WD, No. 12 Test, Voltage Between Resistor Terminals Check

### NO. 13 TEST, "CHECK ENGINE" LIGHT CIRCUIT

| Terminals | Trouble    | Condition                                                      | STD voltage |
|-----------|------------|----------------------------------------------------------------|-------------|
| W – E1    | No voltage | No trouble (check engine warning light off) and engine running | 8 – 14 V    |



50D02331

Fig. 53: No. 13 Test Schematic, "CHECK ENGINE" Light Circuit

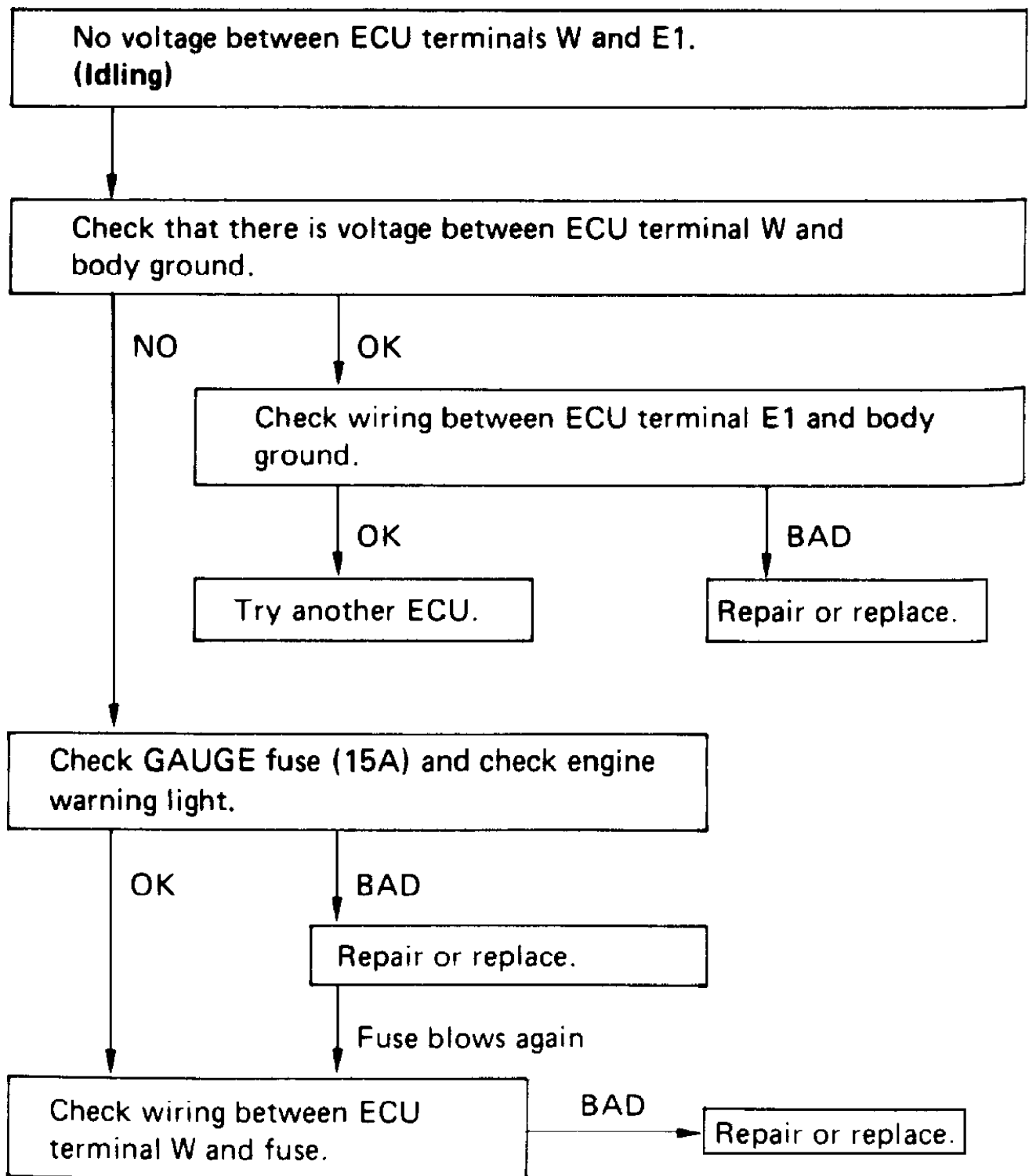
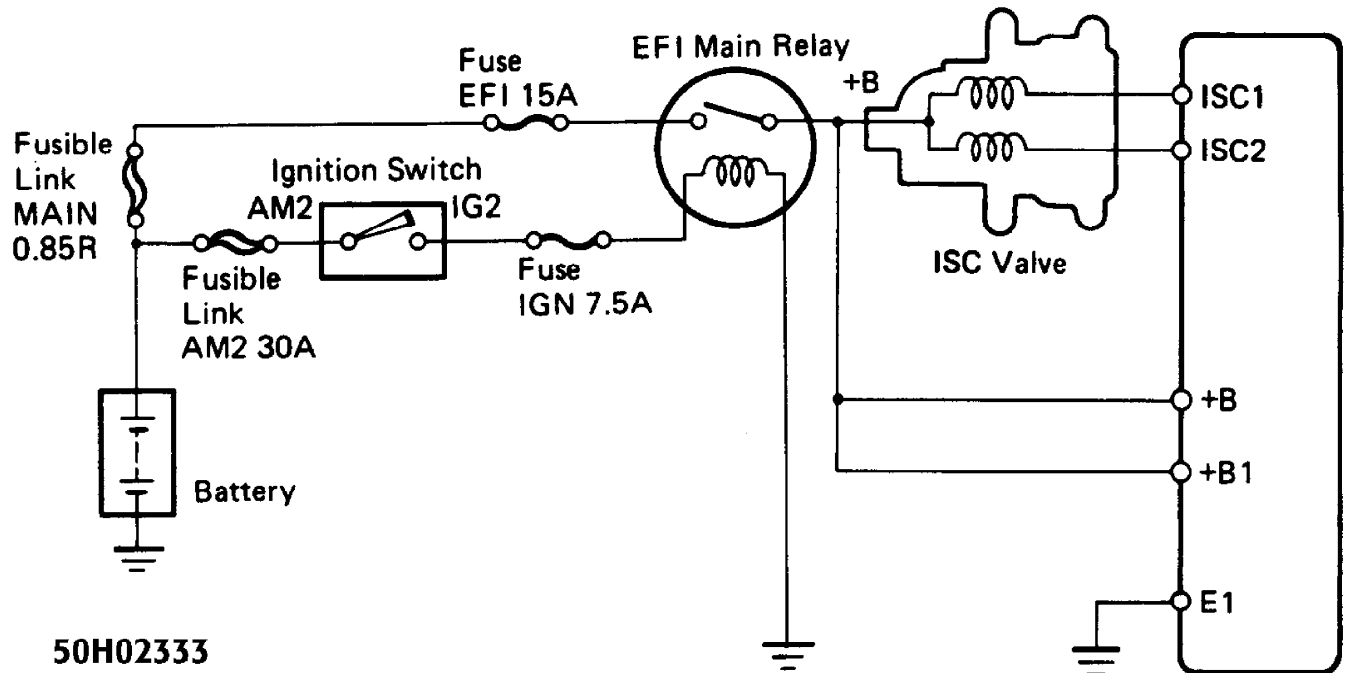


Fig. 54: No. 13 Test Flow Chart, "CHECK ENGINE" Light Circuit

**50F02332**

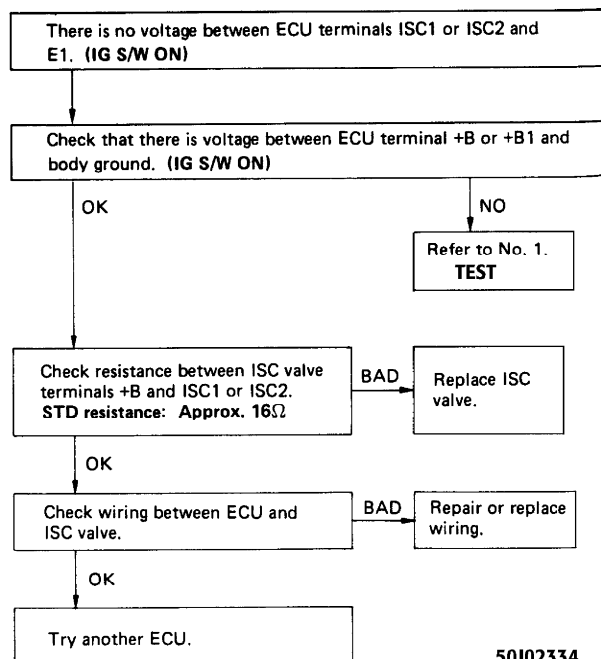
NO. 14 TEST, ISC VALVE CIRCUIT TEST

| Terminals         | Trouble    | Condition | STD voltage |
|-------------------|------------|-----------|-------------|
| ISC1<br>ISC2 – E1 | No voltage | IG S/W ON | 9 – 14 V    |



**50H02333**

Fig. 55: Exc. 2WD (W/3S-GE), No. 14 Test Schematic, ISC Valve Circuit Test



**50J02334**

Fig. 56: Exc. 2WD (W/3S-GE), No. 14 Test Flow Chart, ISC Valve Ckt. Test

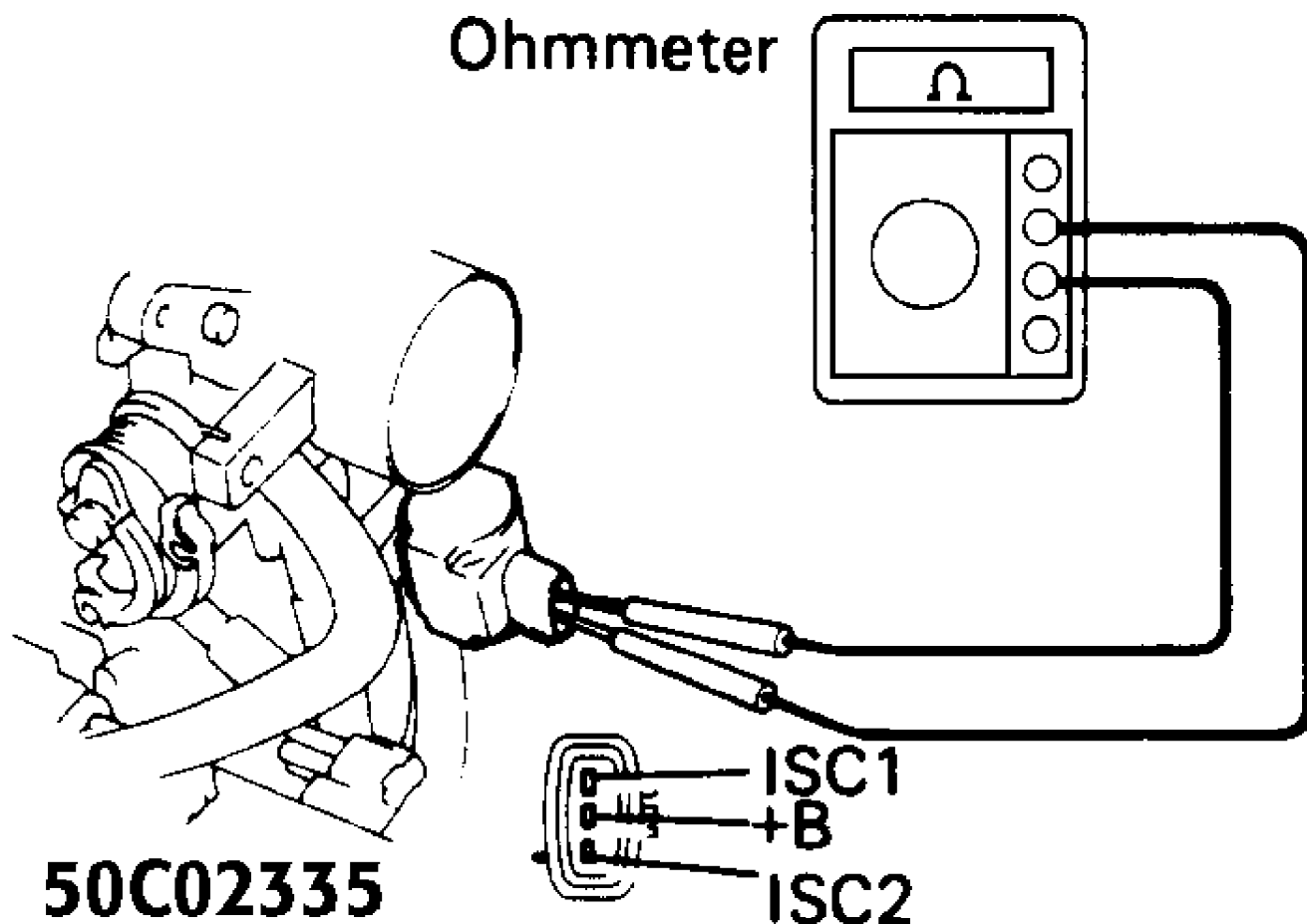


Fig. 57: Exc. 2WD (W/3S-GE), No. 14 Test, ISC Valve Resistance Check

#### NO. 15 TEST, A/C SWITCH CIRCUIT

| Terminals | Trouble    | Condition           | STD voltage |
|-----------|------------|---------------------|-------------|
| A/C - E1  | No voltage | Air conditioning ON | 8 - 14 V    |

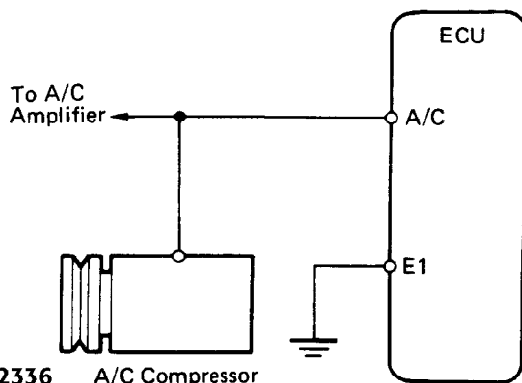


Fig. 58: No. 15 Test Schematic, A/C Switch Circuit

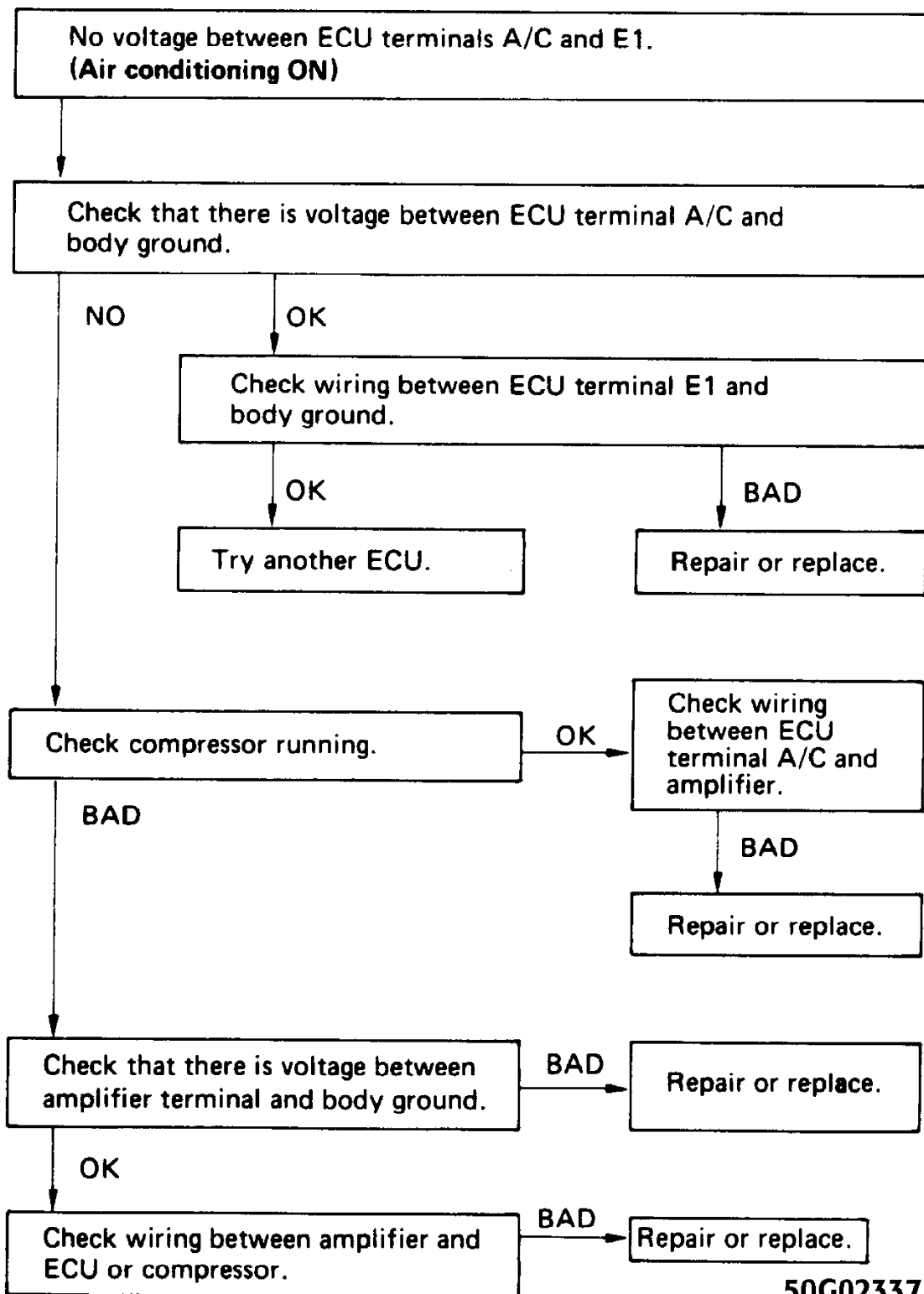


Fig. 59: No. 15 Test Flow Chart, A/C Switch Circuit

50G02337

## AIRFLOW METER

Turn ignition off. Disconnect wiring connector from airflow meter. Note terminal identification. See Fig. 60. Using an ohmmeter, measure resistance between specified terminals. Replace airflow meter if not within specification. See AIRFLOW METER RESISTANCE SPECIFICATIONS table.

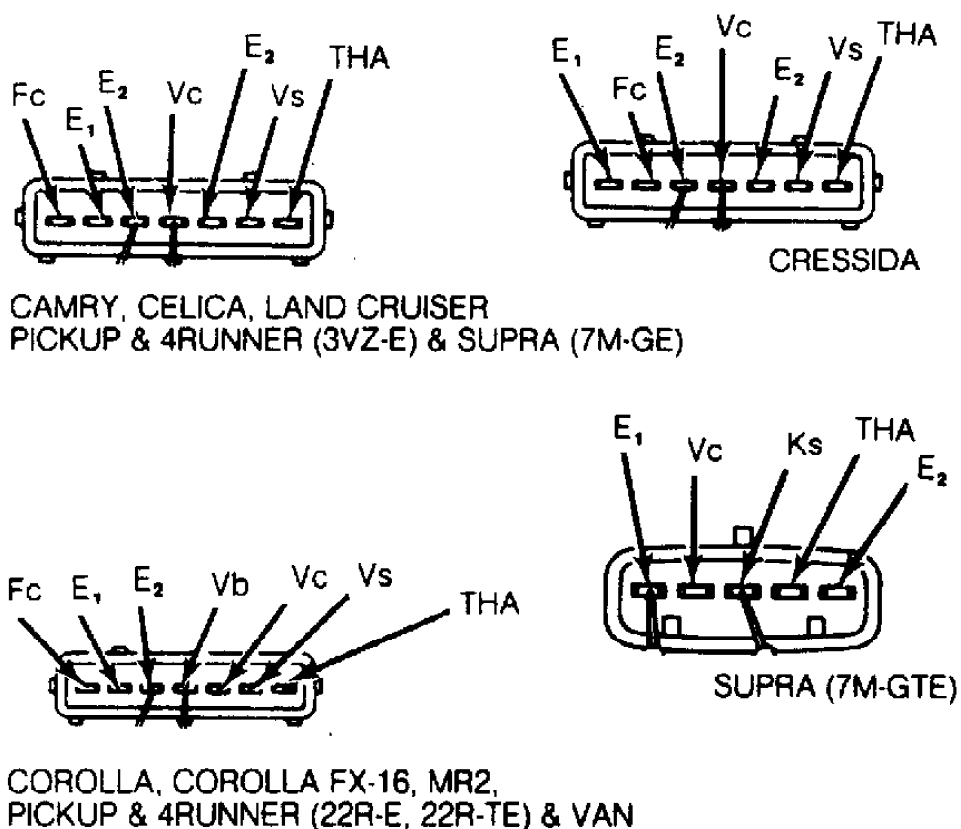


Fig. 60: Airflow Meter Terminal Identification  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AIRFLOW METER RESISTANCE SPECIFICATIONS TABLE

| Application<br>Terminals          | Ohms          |
|-----------------------------------|---------------|
| All Models                        |               |
| E2-THA                            |               |
| -4°F (20°C)                       | 10,000-20,000 |
| 32°F (0°C)                        | 4000-7000     |
| 68°F (20°C)                       | 2000-3000     |
| 104°F (40°C)                      | 900-1300      |
| 140°F (60°C)                      | 400-700       |
| E2-Vc                             | 200-400       |
| E1-Fc                             |               |
| Measuring Plate Fully Closed      | Infinity      |
| Measuring Plate Other Than Closed | 0             |
| E2-Vs                             |               |
| Measuring Plate Fully Closed      | 200-600       |

## IDLE SPEED CONTROL (ISC) VALVE

### 2WD 3S-FE

1) Warm engine to normal operating temperature. Ensure idle speed is correct. Apply parking brake and place transaxle in Neutral. Install jumper wire between terminals "T" and "E1" of check connector located near left shock tower. See Fig. 61.

2) Note that engine RPM is maintained at 600-800 RPM on Celica models.

3) If engine RPM was not within specification, disconnect ISC valve connector. Using ohmmeter, measure resistance between terminals "B +" and "ISC1" AND "ISC2". See Fig. 62. Replace valve if resistance is not within 16-17 ohms.

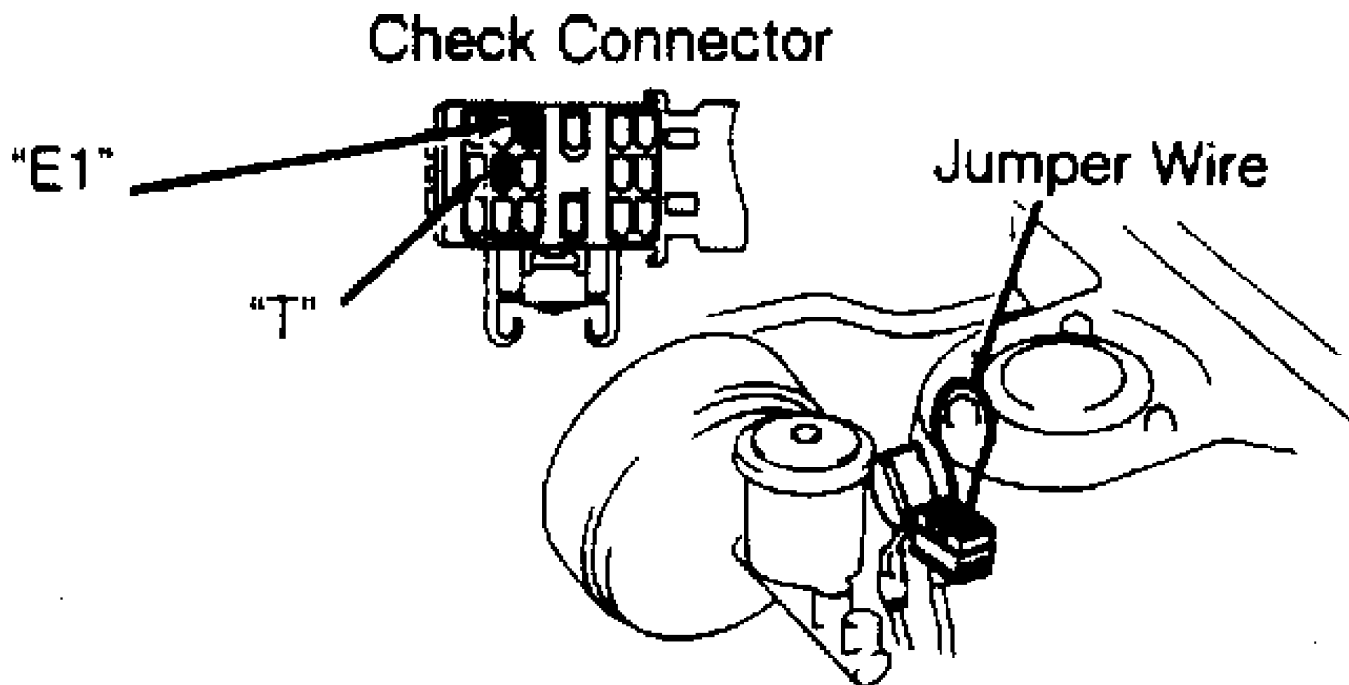


Fig. 61: 2WD 3S-FE Checking ISC Valve  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

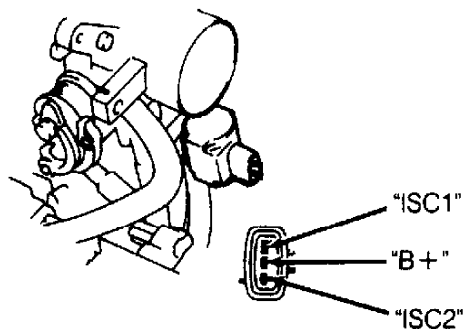


Fig. 62: Checking ISC Valve  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### 4WD

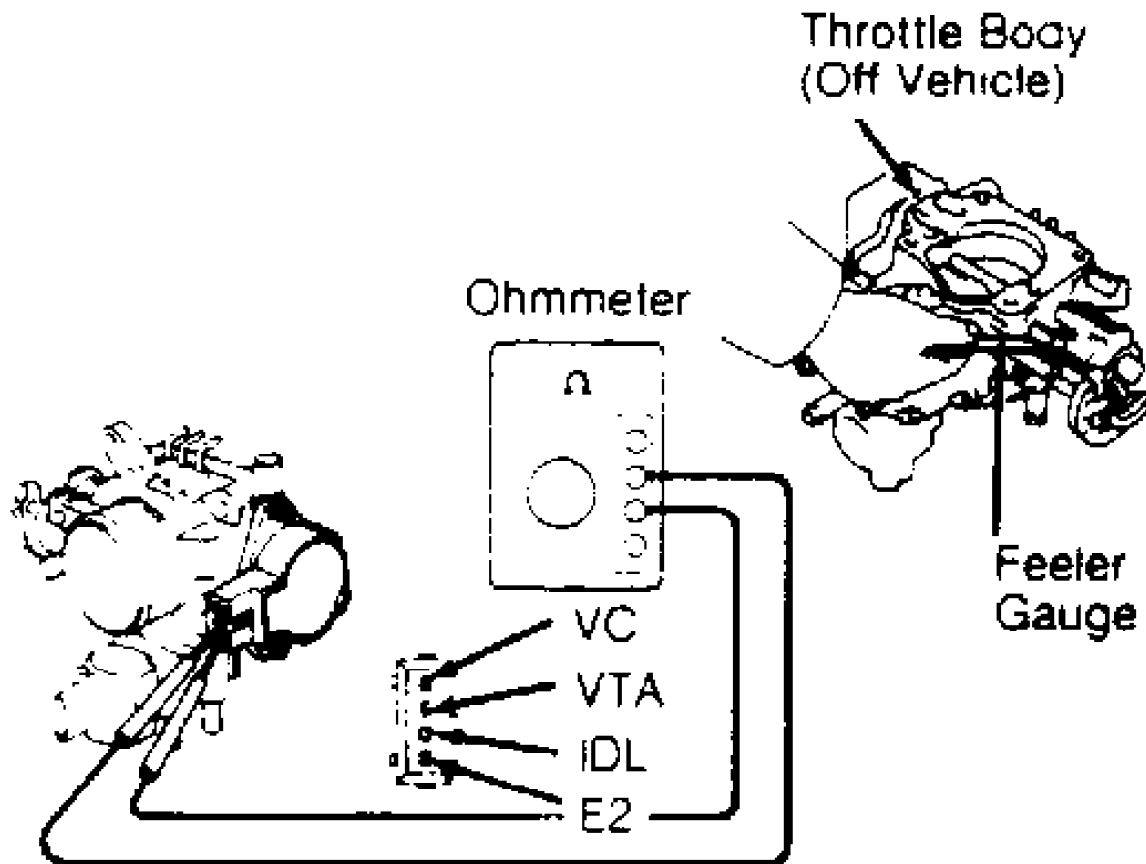
1) Warm engine to normal operating temperature. Ensure idle

speed is correct. Disconnect ISC valve connector. Engine speed should be above 1000 RPM.

2) Reconnect ISC valve. Engine should return to idle speed of 700-800 RPM. If engine RPM was not within specification, disconnect ISC valve connector. Using ohmmeter, measure resistance between terminals "B +" and "ISC1" AND "ISC2". See Fig. 62. Replace valve if resistance is not within 16-17 ohms.

### THROTTLE POSITION SENSOR (TPS)

Turn ignition off and disconnect electrical connector at TPS. Note terminal identification. See Fig. 63. Insert specified thickness feeler gauge between throttle stop screw and throttle lever. See TPS RESISTANCE SPECIFICATIONS table. Using an ohmmeter, check for resistance or continuity. Replace or adjust TPS if not within specification. See TPS SPECIFICATIONS table.



### CAMRY (2VZ-FE), CELICA (3S-GE & 3S-GTE) & LAND CRUISER

Fig. 63: 3S-GE & 3S-GTE Checking Throttle Position Sensor  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

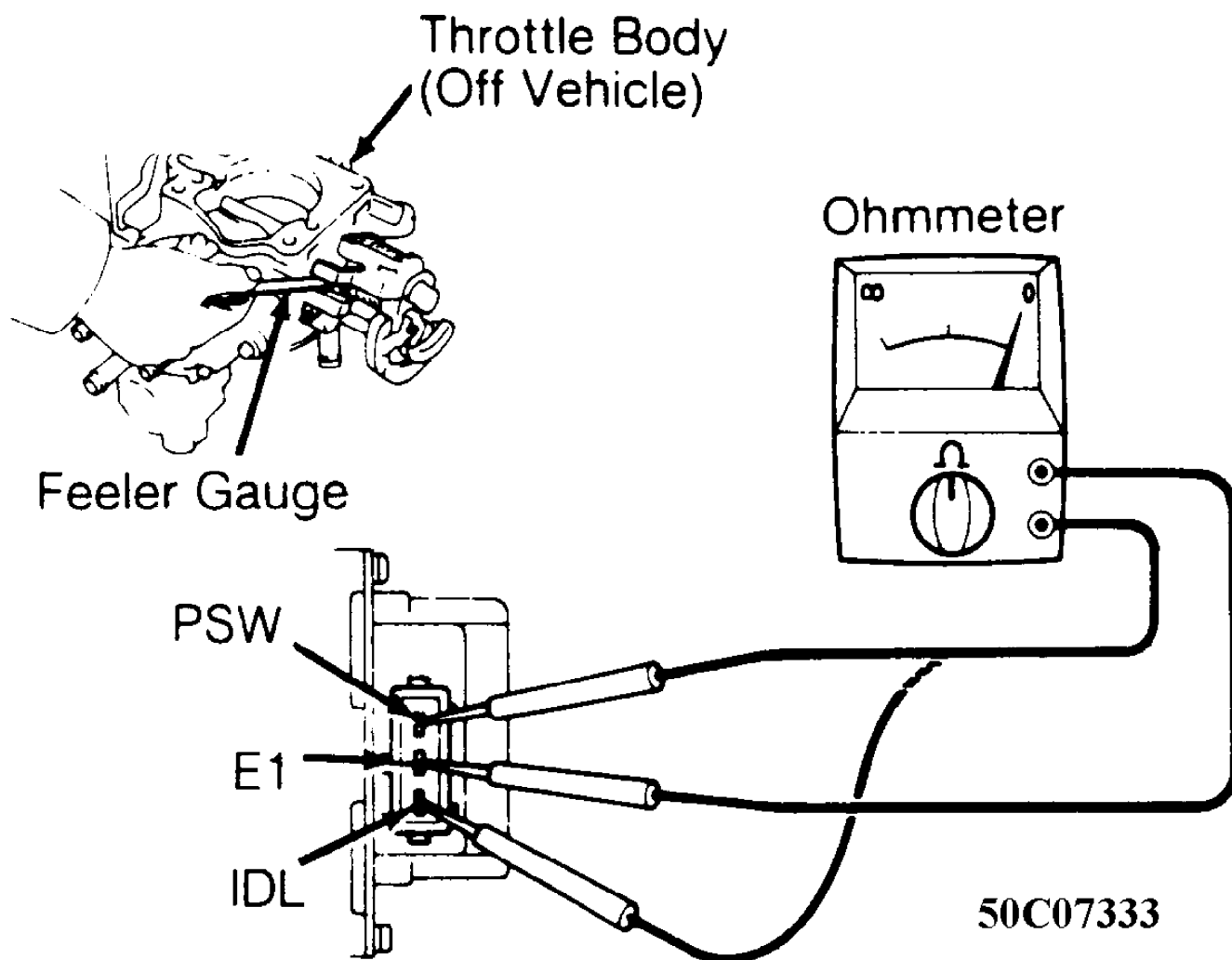


Fig. 64: 3S-FE Checking Throttle Position Sensor  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

#### TPS RESISTANCE SPECIFICATIONS TABLE

| Application   | Clearance<br>In. (mm) | Terminal | Ohmmeter<br>Reading |
|---------------|-----------------------|----------|---------------------|
| <b>Celica</b> |                       |          |                     |
| 3S-GE         | 0 (0)                 | VTA & E2 | 200-800             |
|               | .020 (.51)            | IDL & E2 | 2300 or Less        |
|               | .028 (.71)            | IDL & E2 | Infinity            |
|               | Fully Open            | VTA & E2 | 3300-10,000         |
|               |                       | VC & E2  | 3000-7000           |
| 3S-GTE        | 0 (0)                 | VTA & E2 | 200-800             |
|               | .020 (.51)            | IDL & E2 | 2300 or Less        |
|               | .028 (.71)            | IDL & E2 | Infinity            |
|               | Fully Open            | VTA & E2 | 3300-10,300         |
|               |                       | VC & E2  | 3000-8300           |
| 3S-FE         | .020 (.51)            | IDL & E1 | Continuity          |
|               | .020 (.51)            | PSW & E1 | No Continuity       |
|               | .035 (.89)            | IDL & E1 | No Continuity       |
|               | .035 (.89)            | PSW & E1 | No Continuity       |
|               | Fully Open            | IDL & E1 | No Continuity       |
|               |                       | PSW & E1 | Continuity          |

---

## COLD START INJECTOR TIME SWITCH

Disconnect switch connector. Note terminal identification. See Fig. 65. Using ohmmeter, check resistance between terminals "STA" & "STJ" at appropriate temperature. See COLD START INJECTOR TIME SWITCH SPECIFICATIONS table. Check resistance between terminal "STA" and ground. Replace switch if not within specification.

COLD START INJECTOR TIME SWITCH SPECIFICATIONS TABLE

| Application          | Ohms        | Condition          |
|----------------------|-------------|--------------------|
| Celica               |             |                    |
| 3S-GE & 3S-GTE ..... | 30-50 ..... | Below 50°F (10°C)  |
|                      | 70-90 ..... | Above 77°F (25°C)  |
|                      | 30-90 ..... | To Ground          |
| 3S-FE .....          | 20-40 ..... | Below 86°F (30°C)  |
|                      | 40-60 ..... | Above 104°F (40°C) |
|                      | 20-80 ..... | To Ground          |

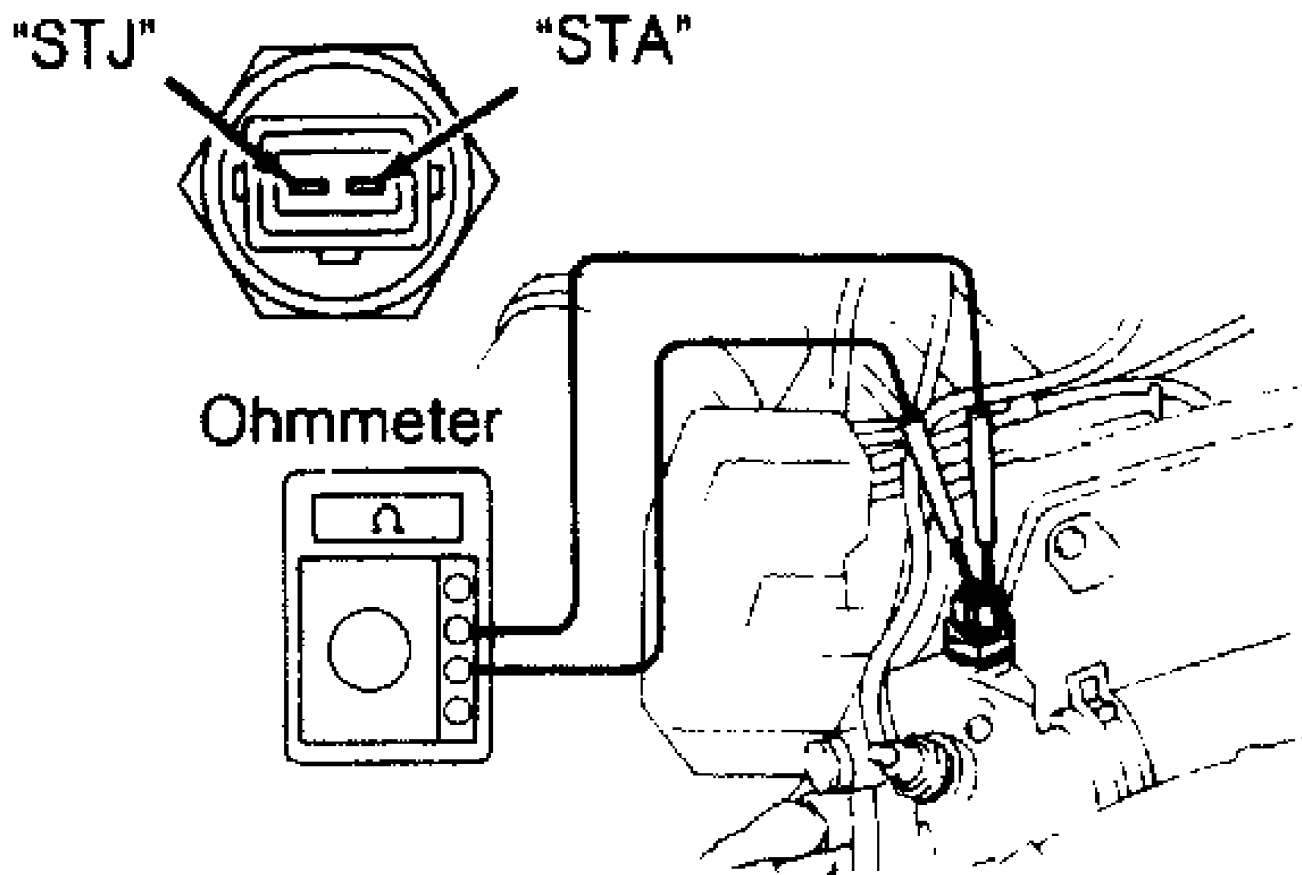


Fig. 65: Checking Cold Start Injector Time Switch  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## COOLANT TEMPERATURE SENSOR

Remove connector from sensor. Using ohmmeter, check

resistance between sensor terminals. Replace sensor if resistance is not within specification at specified temperature. See Fig. 66.

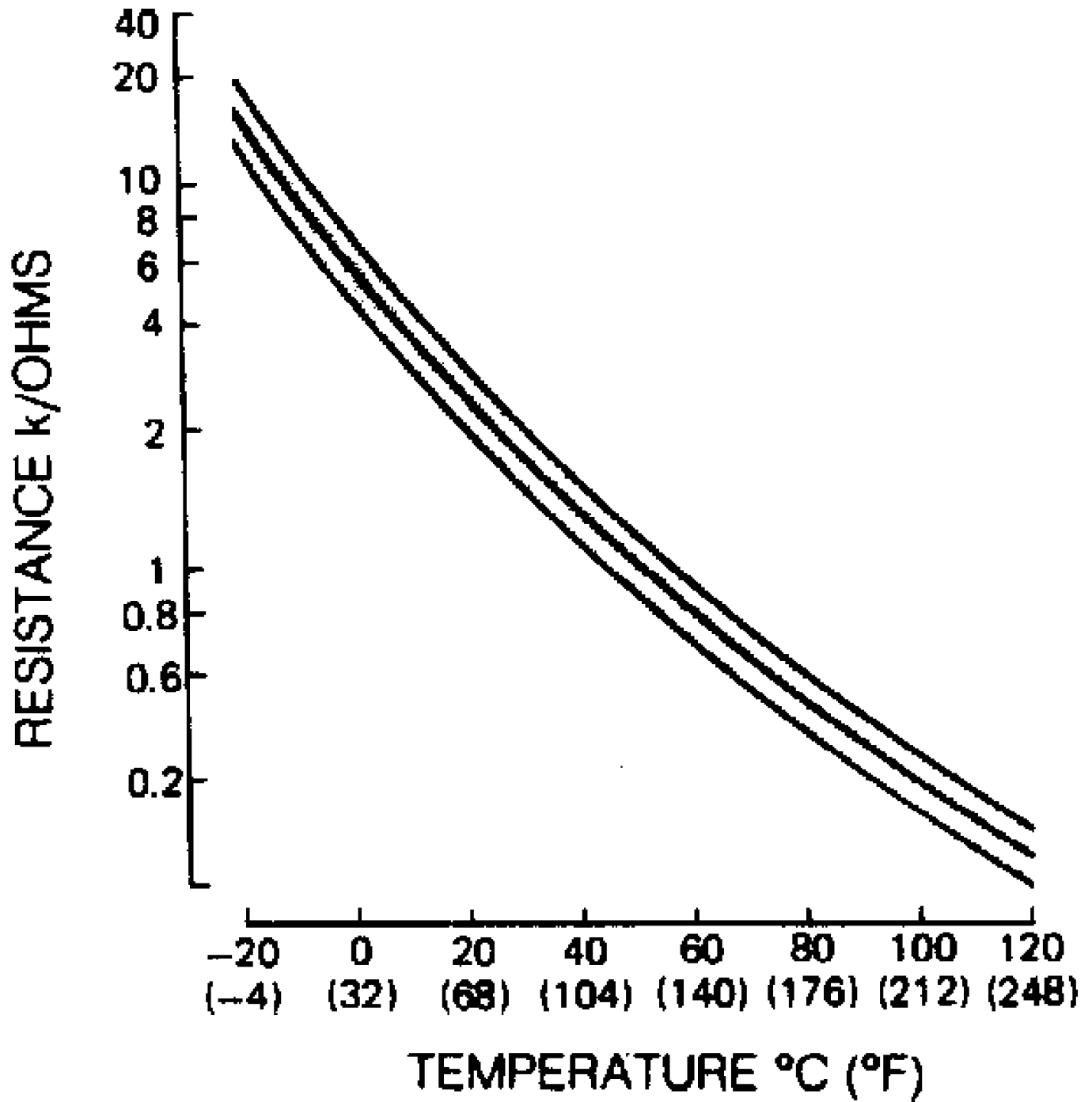


Fig. 66: Coolant Temperature Sensor Specifications  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EGR TEMPERATURE SENSOR

Place threaded end of sensor and thermometer in container of oil. Attach ohmmeter to sensor terminals. Heat the oil and note the resistance at specified temperature. See EGR TEMPERATURE SENSOR SPECIFICATIONS table. Replace sensor if not within specification.

EGR TEMPERATURE SENSOR SPECIFICATIONS TABLE

| Temperature<br>°F (°C) |       | Ohms  |
|------------------------|-------|-------|
| 122 (50)               | ..... | 69-89 |
| 212 (100)              | ..... | 12-14 |
| 302 (150)              | ..... | 3-4   |

## OXYGEN (O2) SENSOR HEATER

Disconnect sensor connector. Using ohmmeter, measure resistance between sensor terminals. Replace sensor if resistance is not within 5-6 ohms at 68°F (20°C).

## KNOCK SENSOR

Information not available at time of publication.

## OXYGEN SENSOR

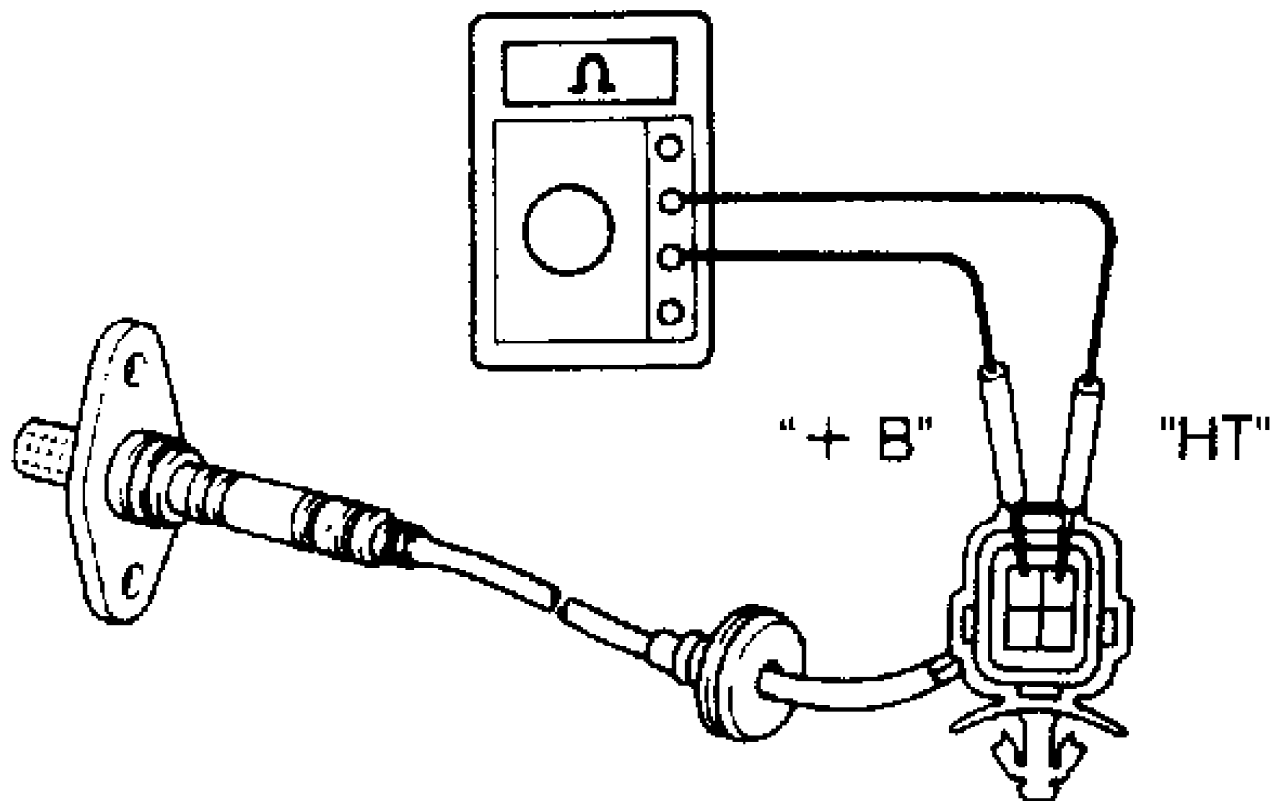


Fig. 67: Measuring Oxygen Sensor Resistance  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

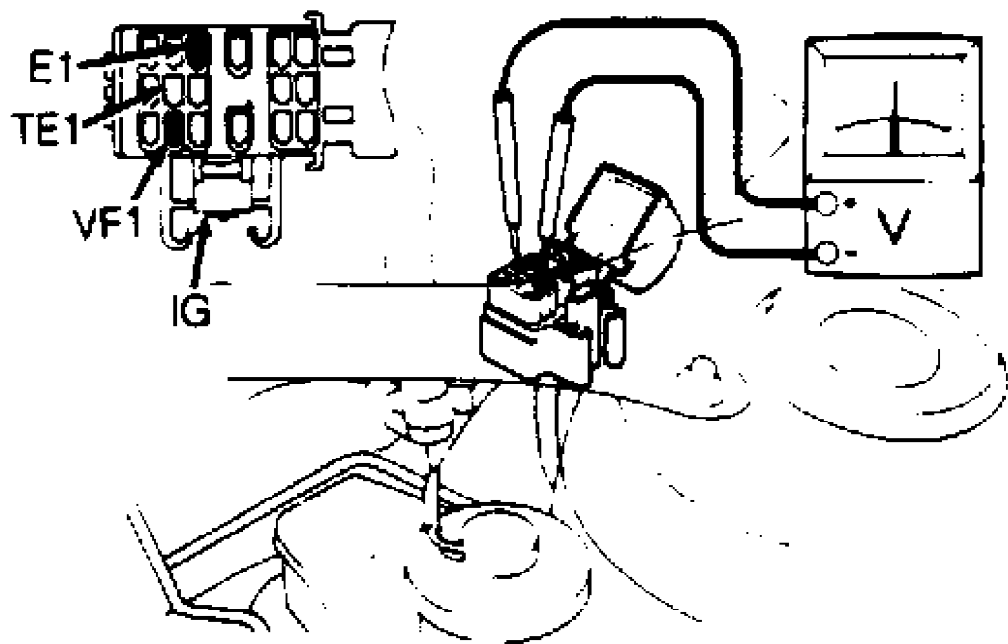
### Feedback Voltage Test

- 1) Warm engine to normal operating temperature. Connect an

analog type voltmeter to appropriate EFI check connector terminal. See Fig. 68. Install jumper wire between appropriate check engine connector terminals. See CHECK ENGINE CONNECTOR TERMINALS table.

CHECK ENGINE CONNECTOR TERMINALS TABLE

| Application  | Terminals |
|--------------|-----------|
| Celica ..... | T & E1    |



CELICA

Fig. 68: Attaching Voltmeter To EFI Check Connector Terminals  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

2) Maintain engine speed at 2500 RPM and check the number of times voltmeter needle fluctuates in 10 seconds. See VOLTMETER NEEDLE FLUCTUATION table. If needle does not fluctuate at all, go to step 4). If needle fluctuations are less than amount specified, go to step 3). If needle fluctuations are as specified or more, oxygen sensor is okay.

VOLTMETER NEEDLE FLUCTUATION TABLE

| Application  | Normal Fluctuations |
|--------------|---------------------|
| Celica ..... | 8 Times             |

3) If needle fluctuations are less than amount specified, remove jumper wire at check engine connector, but keep voltmeter connected to EFI check connector terminals. Maintain engine speed at 2500 RPM (ensuring oxygen sensor is thoroughly warmed), and measure voltage at EFI check connector terminals. If voltage reading is 0 (zero), go to step 4). If voltage is more than 0 (zero) volts, replace main oxygen sensor and repeat step 1).

4) Read and record diagnostic codes. See RETRIEVING TROUBLE CODES in DIAGNOSIS & TESTING in this article. Repair any codes that are nonrelated. If codes are relevant or are normal, remove jumper wire previously installed at check engine connector, but keep voltmeter connected to EFI check connector terminals.

5) Maintain engine speed at 2500 RPM and measure voltage again. If voltage is 5 volts or more, go to next step. If voltage does not exist, disconnect PCV hose and measure voltage again. If voltage reading remains at 0 (zero), replace oxygen sensor and repeat step 1). If voltage is more than 0 (zero) volts, repair for an over rich condition.

6) Unplug coolant temperature sensor connector. Connect a 4-8 ohm resistor across connector terminals. If resistor is not available, replace with new coolant temperature sensor. Repeat step 1) and measure voltage at terminals. If voltage is not present, replace the main oxygen sensor and repeat step 1). If needle fluctuations are less than specified after replacing the oxygen sensor, replace ECU.

## TURBOCHARGING PRESSURE SENSOR

### Power Source

Turn ignition on. Disconnect turbocharging pressure sensor connector and measure voltage between terminals "VC" and "E2" of harness connector. See Fig. 69. Voltage should be 4-6 volts.

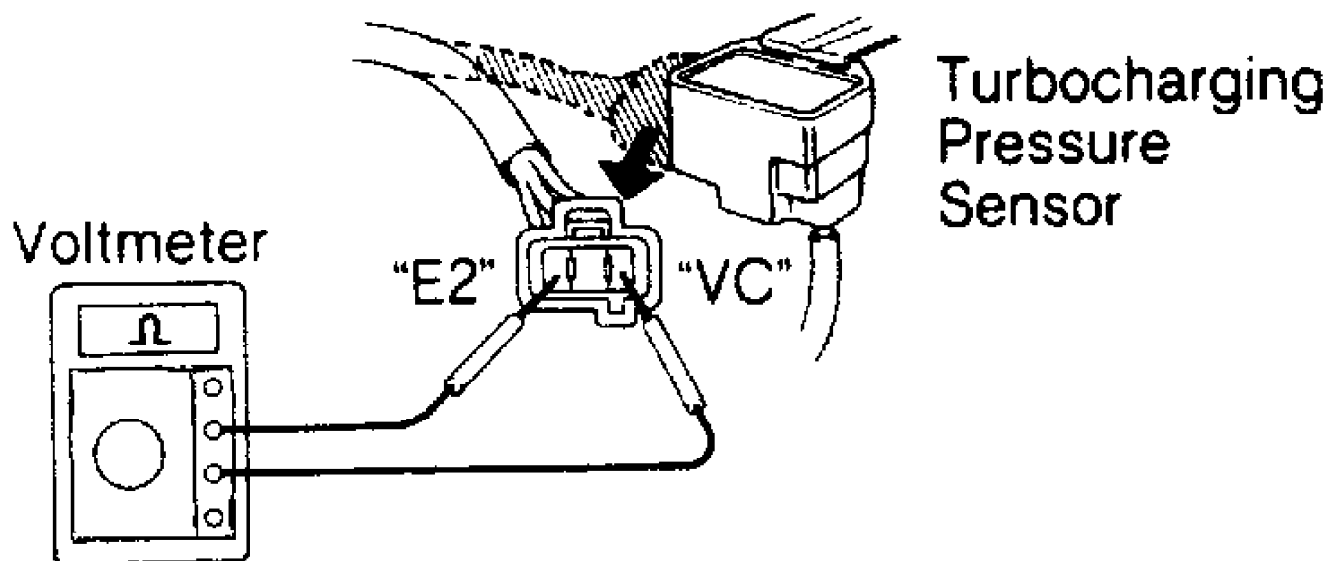


Fig. 69: Measuring Voltage To Turbocharging Pressure Sensor  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### Power Output

1) Turn ignition on. Disconnect turbocharging pressure sensor vacuum hose from intake manifold. Connect voltmeter to terminals "PIM" and "E2" (pressure sensor) of ECU connector and measure output voltage under ambient atmospheric pressure.

2) Attach a vacuum pump to turbocharging pressure sensor

vacuum hose and apply vacuum in specified stages. See Fig. 70. Measure and record voltage readings for each stage of applied vacuum. See VACUUM/VOLTAGE SPECIFICATIONS table. Replace sensor if readings are not within specifications.

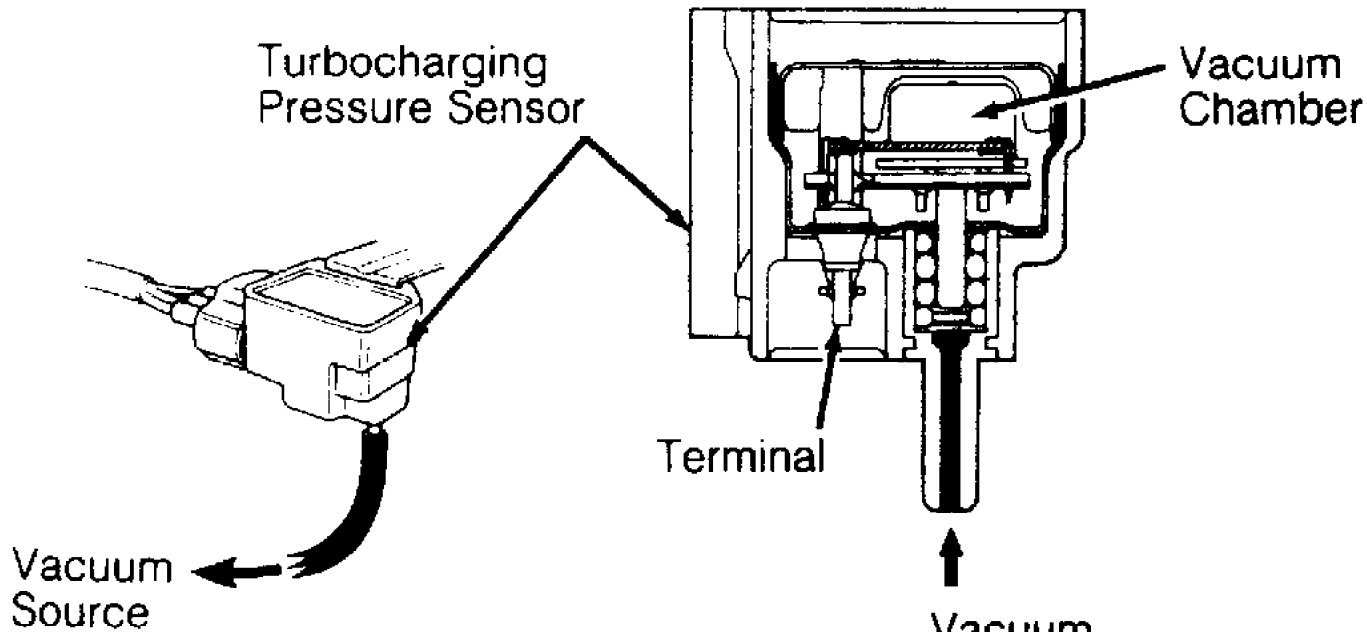


Fig. 70: Turbocharging Pressure Sensor Vacuum Hose  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

VACUUM/VOLTAGE SPECIFICATIONS TABLE

| Applied Vacuum<br>In. Hg |       | Volts      |
|--------------------------|-------|------------|
| 3.94                     | ..... | .15-.35    |
| 7.87                     | ..... | .4-.35     |
| 11.81                    | ..... | .65-.85    |
| 15.75                    | ..... | .9-1.1     |
| 19.69                    | ..... | 1.15-11.35 |

### TURBOCHARGING PRESSURE VACUUM SWITCHING VALVE (VSV)

- 1) Using an ohmmeter, check continuity between both terminals of turbocharging pressure VSV connector. See Fig. 71. Replace VSV if no continuity exists.
- 2) Check that no continuity exists between VSV case (body) and each terminal. If continuity exists, replace VSV.
- 3) Check that air does not flow from pipe "E" to pipe "F". If air flows through from pipe "E" to pipe "F", replace VSV.

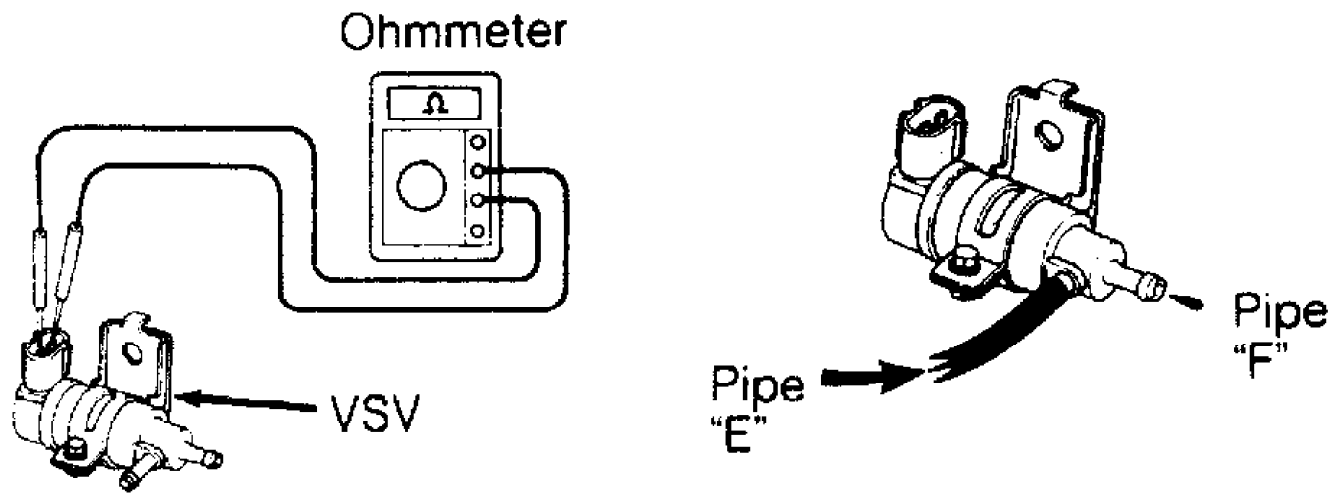


Fig. 71: Checking Continuity On VSV  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

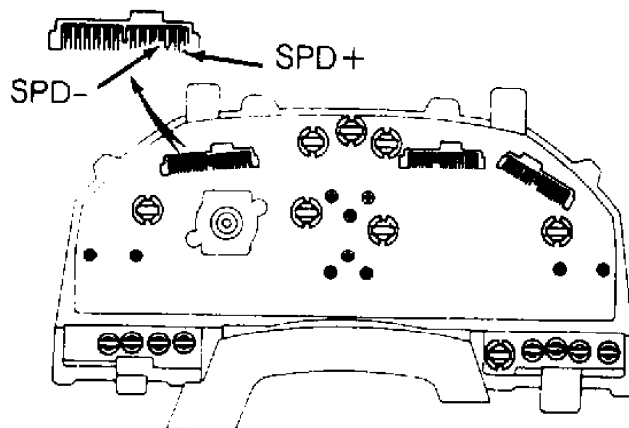
## VEHICLE SPEED SENSOR

### Speed Sensor (Analog Type)

Remove combination meter from instrument cluster. Connect ohmmeter between proper terminals. See Fig. 72. See NO. 1 SPEED SENSOR TEST TERMINALS (ANALOG TYPE). Rotate meter shaft and note reading. Ohmmeter should deflect from 0 (zero) to infinity ohms as shaft is rotated.

### NO. 1 SPEED SENSOR TEST TERMINALS TABLE (ANALOG TYPE)

| Application  | Test Terminals    |
|--------------|-------------------|
| Celica ..... | SPD (+) & SPD (-) |



## CELICA

Fig. 72: No. 1 Speed Sensor Terminal I.D. (Analog Type)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

## FUEL-CUT RPM

1) Connect a tachometer to engine (to monitor needle fluctuations). Start engine and warm to operating temperature. Disconnect throttle position sensor connector from throttle position sensor. Short terminals IDL and E1 (or E2) on wire side of connector. See Fig. 73.

2) Gradually raise engine RPM. Fuel-cut operation can be checked by noting the fluctuation of tachometer needle. Fluctuation indicates fuel-cut system is being turned on and off. See Fig. 74. Check that fuel-cut points and fuel return points are within specifications. See FUEL-CUT & FUEL RETURN RPM table.

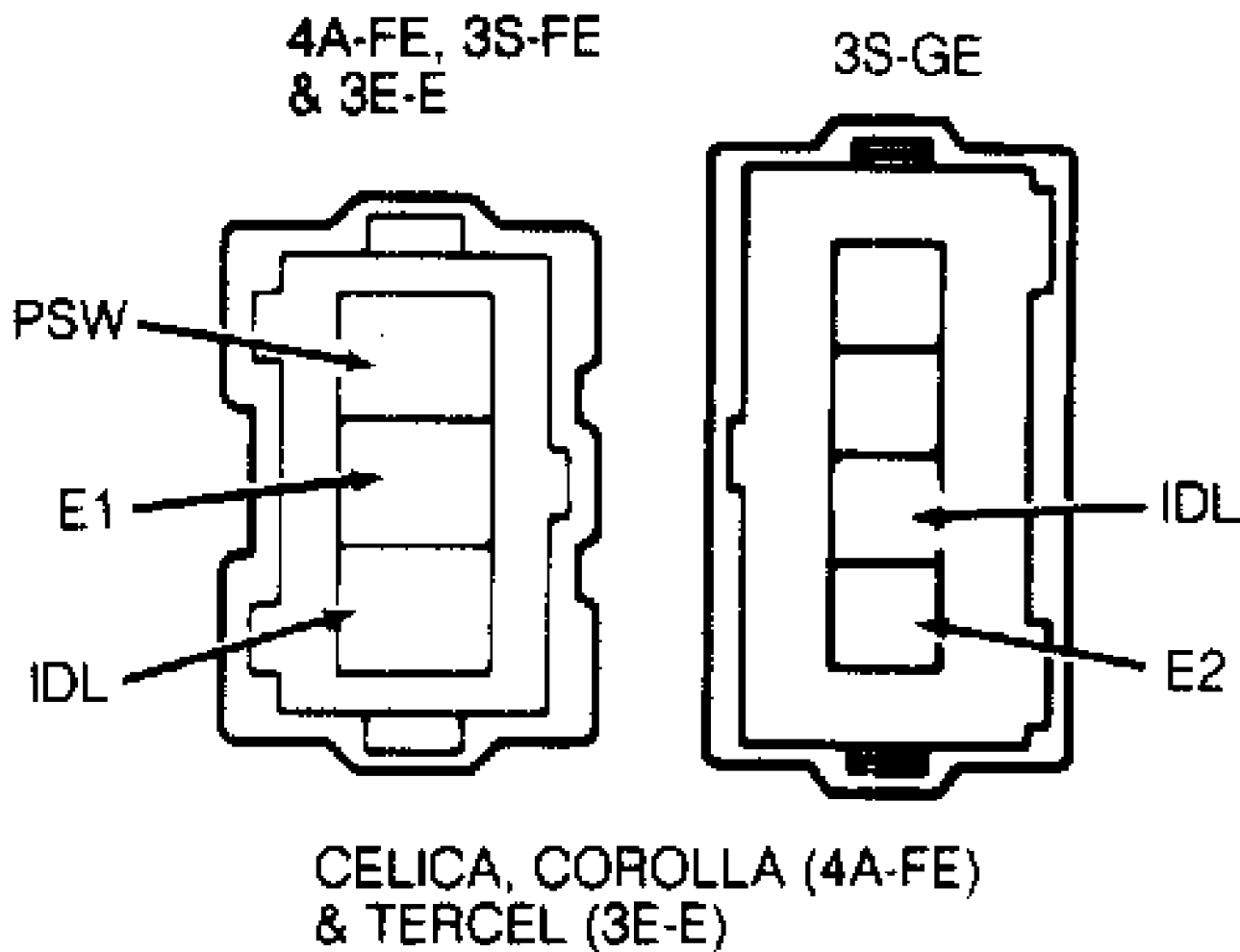


Fig. 73: Terminal Connectors For Testing Fuel-Cut RPM  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

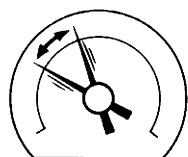


Fig. 74: Needle Fluctuations When Testing Fuel-Cut RPM  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL-CUT & FUEL RETURN RPM TABLE

| Model                | Fuel-Cut<br>Engine RPM | Fuel Return<br>Engine RPM |
|----------------------|------------------------|---------------------------|
| 3S-FE .....          | 1700 .....             | 1300                      |
| 3S-GE & 3S-GTE ..... | 2000 .....             | 1600                      |

NEUTRAL/START SWITCH

Disconnect switch connector. Note terminal identification. See Fig. 75. Using ohmmeter, check for continuity at specified terminals with gearshift in proper range. See NEUTRAL/START SWITCH SPECIFICATIONS table.

NEUTRAL/START SWITCH SPECIFICATIONS TABLE

| Gearshift Position | Terminals |
|--------------------|-----------|
| "N" .....          | N & C     |
| "2" .....          | 2 & C     |
| "L" .....          | L & C     |

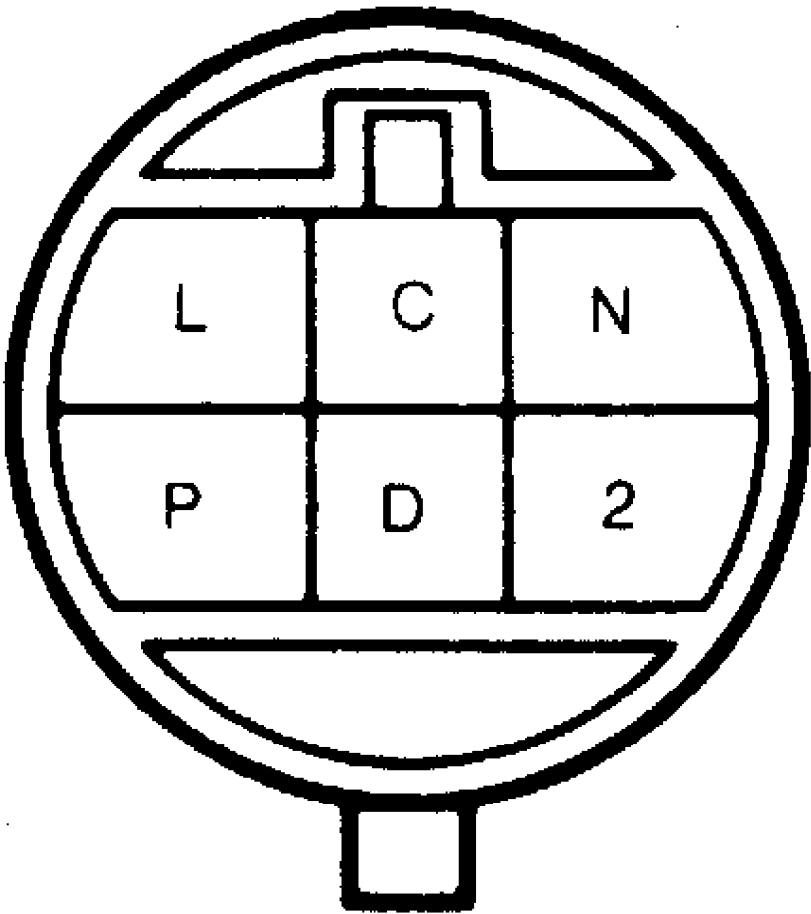
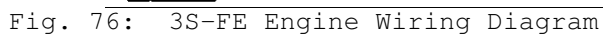


Fig. 75: Neutral/Start Switch Terminal I.D.  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



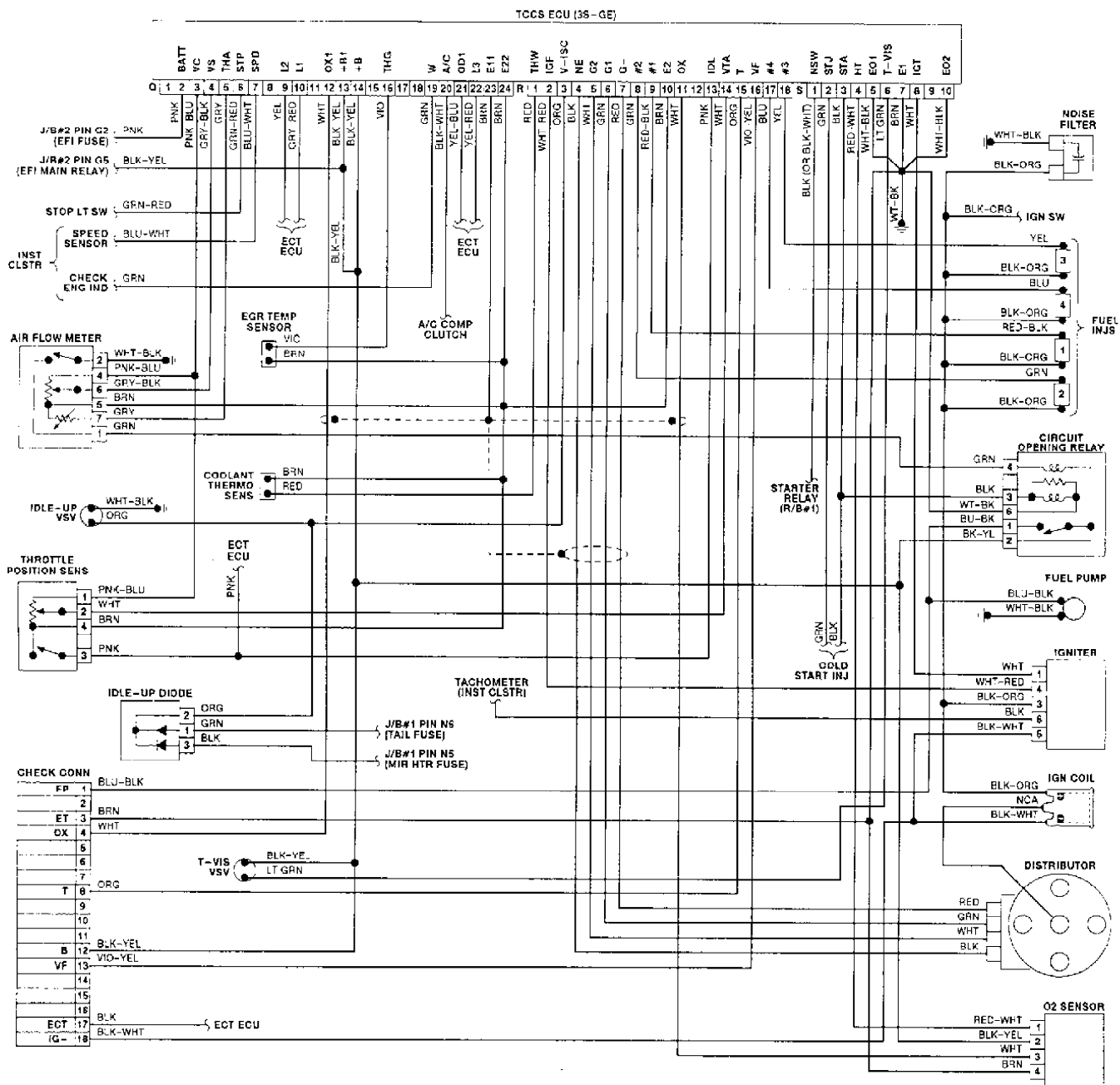


Fig. 77: 3S-GE Engine Wiring Diagram

