AUTO TRANS DIAGNOSIS - A-241E & A-244E
Article Text

1988 Toyota MR2
For Rse 555 Main Street Clarksville Va 22901

Thursday, February 14, 2002 03:44PM

ARTICLE BEGINNING

AUTOMATIC TRANSMISSIONS
Toyota A-241E & A-244E Electronic Controls

APPLICATION

Vehicle	Transmission Model
1988-92 MR2	A-241E
1990-92 Celica 2.2L (5S-FE)	A-241E
1992 Paseo	A-244E

CAUTION: Celica and MR2 models are equipped with a Supplemental Restraint System (SRS). When servicing vehicle, use care to avoid accidental air bag deployment. All SRS electrical connections and wiring harness(s) are covered with Yellow insulation. SRS-related components are located in steering column, center console, instrument panel and lower panel on instrument panel. DO NOT use electrical test equipment on these circuits. It may be necessary to deactivate SRS before servicing components. See appropriate AIR BAG article in the ACCESSORIES/SAFETY EQUIP section. See the following menu:

- **1991 Celica 2.2L & MR2: AIR BAG RESTRAINT SYSTEM**
- **1992 Celica 2.2L & MR2: AIR BAG RESTRAINT SYSTEM**

DESCRIPTION

Automatic transmission is electronically controlled. Transmission shifting and torque converter lock-up are controlled by an Engine and Electronic Controlled Transmission (ECT) Electronic Control Unit (ECU).

NOTE: The Engine and Electronic Controlled Transmission (ECT) Electronic Control Unit (ECU) is used to control the engine fuel injection system and the transmission. In this article, control unit will be referred to as the ECU.

The ECU receives information from various input devices and uses this information to control No. 1 and No. 2 solenoids for transmission shifting, and lock-up solenoid for torque converter lock-up.

On Celica models, a pattern select switch is located near

shift lever. See Fig. 1. Pattern select switch contains a POWER (depressed) and a NORMAL (released) operating position. When pattern select switch is depressed, transmission upshifts and downshifts will occur at a higher vehicle speed than with switch released. An ECT indicator light on instrument panel will come on when switch is in POWER position.

On all models, an Overdrive (OD) switch is mounted on the shift lever. See Fig. 1. When OD switch is depressed to ON position, transmission will shift into 4th gear when shift lever is in "D" position, and OD OFF light on instrument panel will go off. When OD switch is released to OFF position, transmission will shift into 3rd gear, and OD OFF light on instrument panel will come on. See Fig. 1.

Transmission is equipped with a shift lock and key lock system. Shift lock system prevents shift lever from being moved from Park unless brake pedal is depressed. In case of a malfunction, shift lever can be released by depressing shift lock override button, located near shift lever. Key lock system prevents ignition key from being moved from ACC to LOCK position unless shift lever is in Park. For more information on shift lock and key lock system, Refer to the SHIFT LOCK SYSTEM article.

OPERATION

ELECTRONIC CONTROL UNIT (ECU)

The ECU receives information from various input devices and uses this information to control No. 1, No. 2 and lock-up solenoids. The ECU contains a self-diagnostic system, which will store fault code if failure or problem exists in the electronic control system. Fault code can be retrieved to determine transmission problem area. See SELF-DIAGNOSTIC SYSTEM. On MR2 models, ECU is located near left rear corner of engine compartment. See Fig. 1. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

ECU INPUT DEVICES

Pattern Select Switch Signal (Celica)

Pattern select switch delivers an input signal to ECU to indicate transmission shift points selected by operator. Pattern select switch is located near shift lever. See Fig. 1.

Engine Speed Signal

Distributor delivers an engine RPM and crankshaft angle signal to the ECU.

Neutral Start Switch Signal

Neutral start switch delivers an input signal to ECU to

indicate shift lever position. Neutral start switch is located on side of transmission. See Fig. 1.

Throttle Position Sensor Signal

Throttle position sensor delivers an input signal to ECU to indicate throttle position and idle signal. Throttle position sensor is located on side of throttle body. See Fig. 1.

Vehicle Speed Signal

Vehicle speed signal is delivered to ECU by speed sensors. Speed sensors are located on transmission and on rear of instrument panel. See Fig. 1.

Brakelight Switch Signal

Brakelight switch delivers input signal to ECU, indicating vehicle braking. Brakelight switch is located on brake pedal support.

OD Switch Signal

The OD switch provides an input signal to ECU to indicate when overdrive is selected by the operator. When OD switch is depressed to ON position, transmission will shift into 4th gear when shift lever is in "D" position, and OD OFF light on instrument panel will go off. When OD switch is released to OFF position, transmission will shift into 3rd gear, and OD OFF light on instrument panel will come on. See Fig. 1. The OD switch is mounted on the shift lever. See Fig. 1.

Coolant Temperature Sensor Signal

Coolant temperature sensor delivers input signal to ECU, indicating engine coolant temperature. Coolant temperature sensor is located in coolant passage on the engine. See Fig. 1.

Cruise Control Electronic Control Unit (ECU)

Cruise control ECU delivers an input signal to control overdrive operation in accordance with vehicle speed when cruise control is operating. When in overdrive with cruise control on, if vehicle speed drops 3 MPH below the set speed, overdrive is released. Once vehicle speed is above the set speed, overdrive is resumed. On MR2, cruise control ECU is located behind passenger's side of instrument panel. On Celica and Paseo, cruise control ECU is located near front of center console. See Fig. 7.

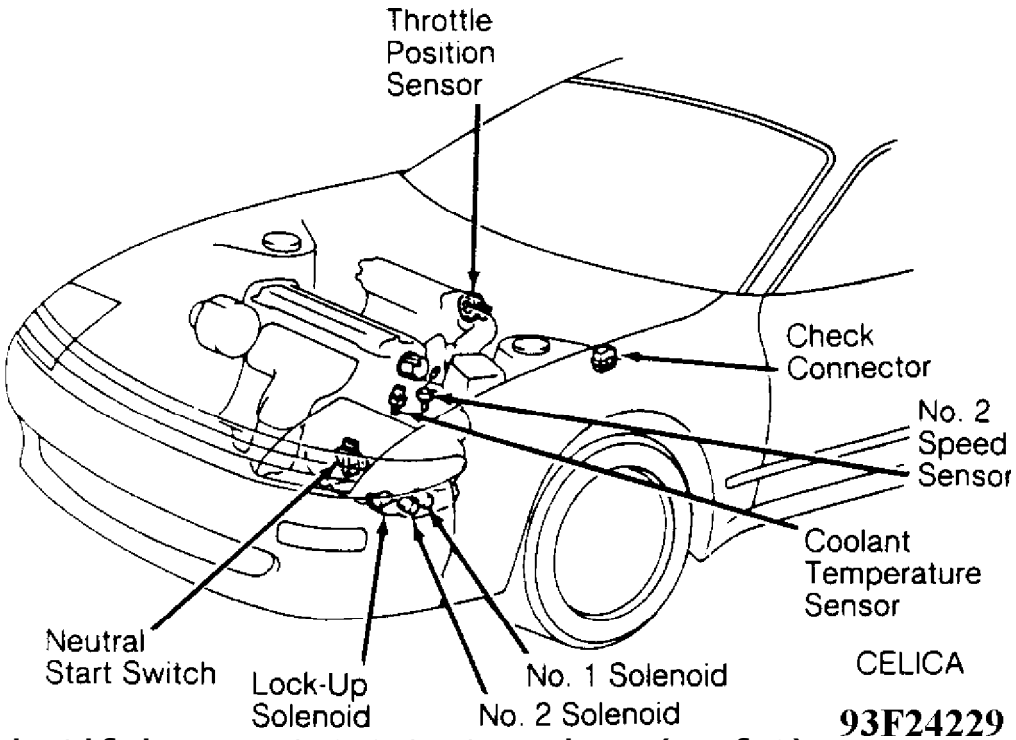

Fig. 1: Identifying Input & Output Devices (1 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

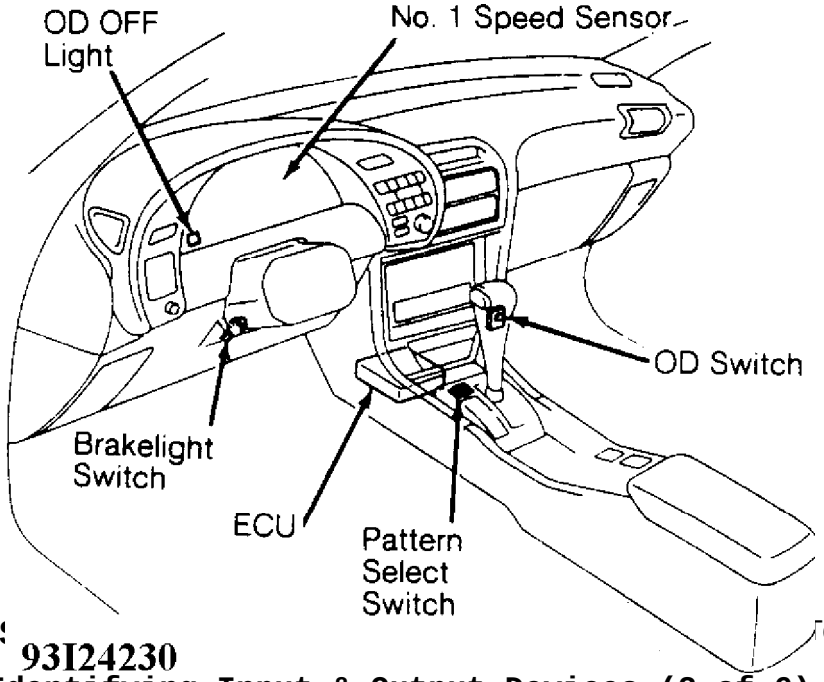

Fig. 2: Identifying Input & Output Devices (2 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

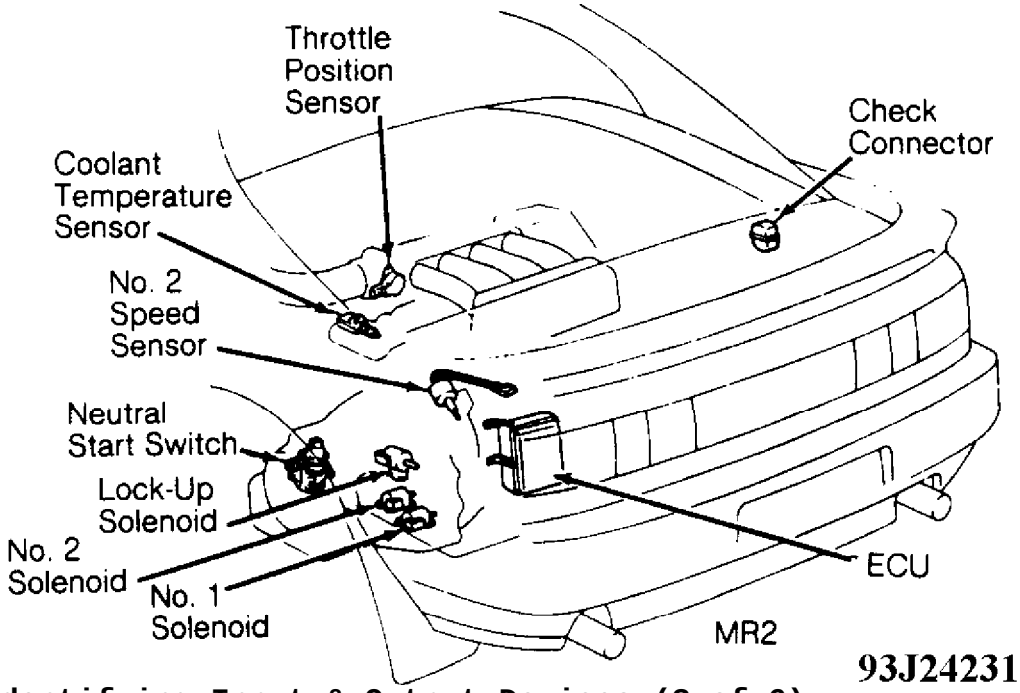

Fig. 3: Identifying Input & Output Devices (3 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

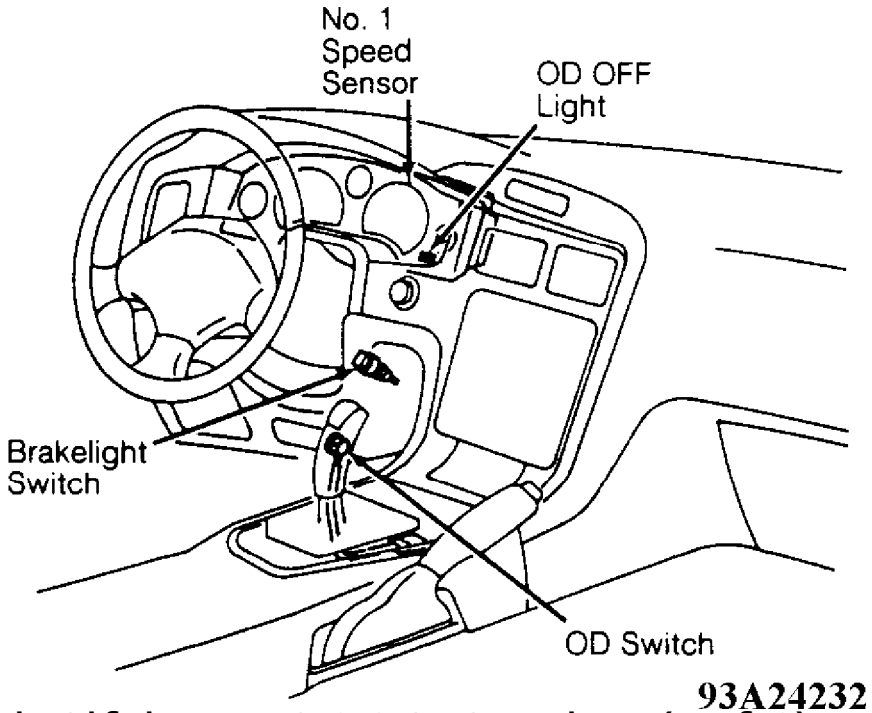

Fig. 4: Identifying Input & Output Devices (4 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

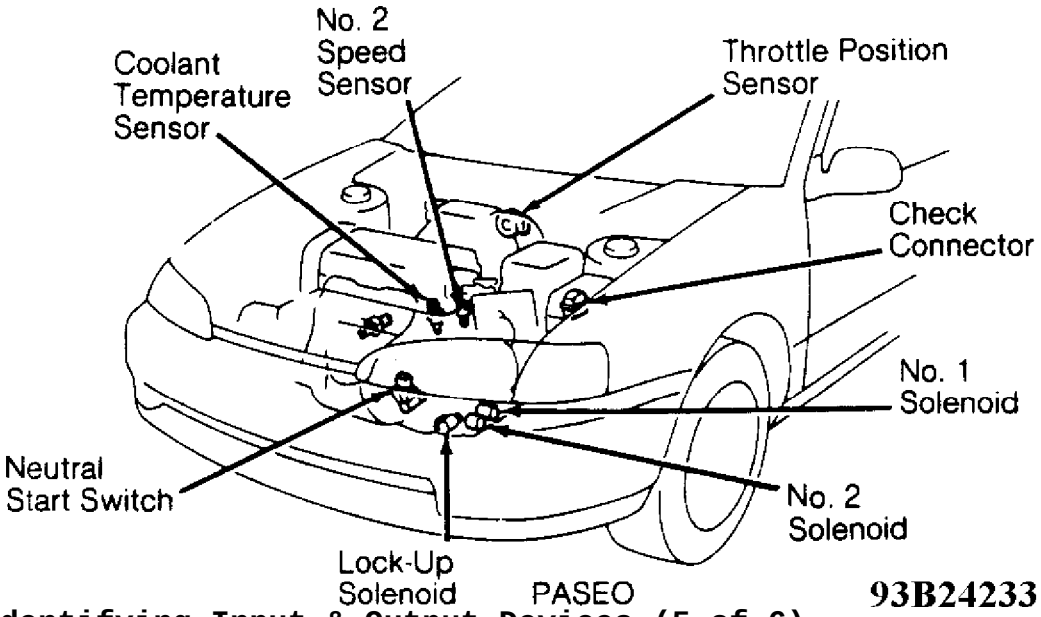

Fig. 5: Identifying Input & Output Devices (5 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

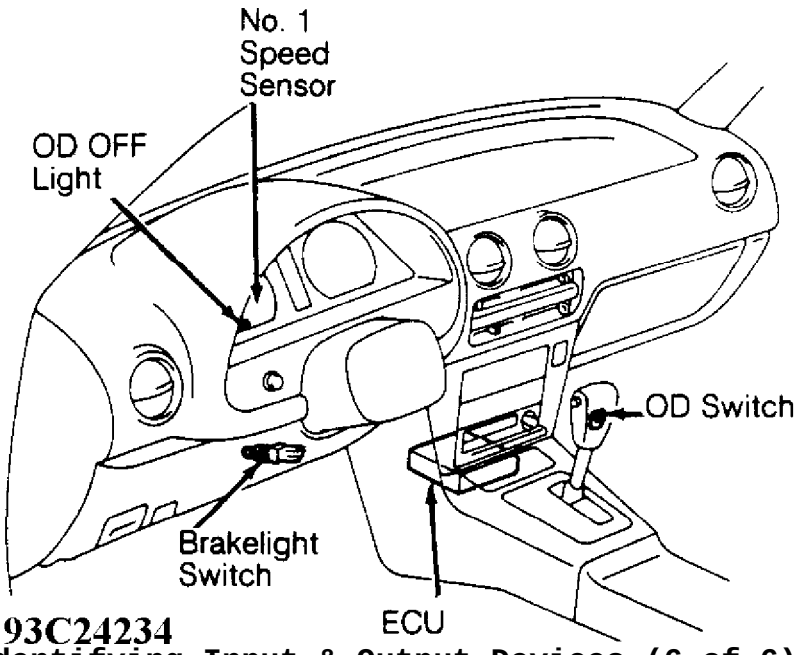

Fig. 6: Identifying Input & Output Devices (6 of 6)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

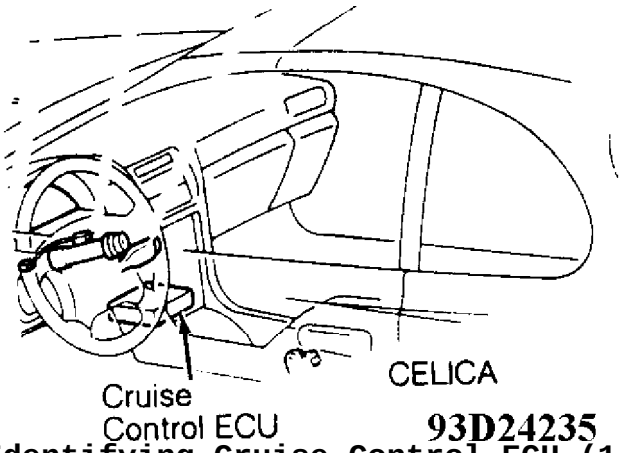

Fig. 7: Identifying Cruise Control ECU (1 of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

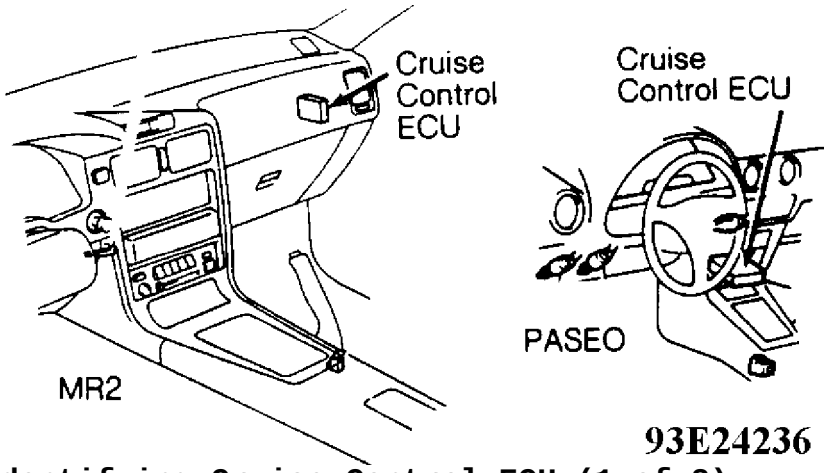

Fig. 8: Identifying Cruise Control ECU (1 of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ECU OUTPUT DEVICES

No. 1 & No. 2 Solenoids

The ECU controls transmission shifting by delivering an output signal to operate proper solenoid. Solenoids are operated in accordance with shift lever range. See Fig. 9. If a solenoid malfunctions, designated gear may result. See Fig. 9. Solenoids are located on transmission. See Fig. 1.

Lock-up Solenoid

ECU controls torque converter lock-up by delivering an output signal to lock-up solenoid. Lock-up solenoid is activated when shift lever is in "D" position and vehicle is at specified speed. Lock-up solenoid is located on transmission. See Fig. 1.

Range	NORMAL			No.1 SOLENOID MALFUNCTIONING			No.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No.1	No.2		No.1	No.2		No.1	No.2		No.1	No.2	
D range	ON	OFF	1st	X	ON	3rd	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	X	X	O/D
2 range	ON	OFF	1st	X	ON	3rd	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	X	X	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	X	X	3rd
L range	ON	OFF	1st	X	OFF	1st	ON	X	1st	X	X	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	X	X	1st

X: Malfunctions

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Fig. 9: Determining No. 1 & No. 2 Solenoid Operation
Courtesy of Toyota Motor Sales, U.S.A., Inc.

SELF-DIAGNOSTIC SYSTEM

SYSTEM DIAGNOSIS

ECU monitors transmission operation and contains a self-diagnostic system which stores fault code if transmission electronic control system failure or problem exists. If a problem exists in the No. 1 or No. 2 solenoids or speed sensors and fault code is set, the ECU delivers a signal to blink the OD OFF light on instrument panel to warn the driver.

NOTE: The OD OFF light on instrument panel will not blink to warn the driver if a problem exists or fault code is stored for lock-up solenoid, or problem exists with brakelight switch signal or throttle position sensor signal.

Fault codes may be set if a failure exists and can be retrieved for transmission diagnosis. See TRANSMISSION TESTING.

TRANSMISSION TESTING

NOTE: Before testing transmission, ensure fluid level is correct and throttle and shift cables are properly adjusted. Ensure engine starts with shift lever in Park and Neutral to ensure proper adjustment of neutral start switch. Transmission must first be tested by checking for stored fault codes. See RETRIEVING FAULT CODES.

RETRIEVING FAULT CODES

NOTE: Before retrieving fault codes, ensure proper battery voltage exists for proper self-diagnosis system operation. Perform diagnostic circuit check before retrieving fault codes to ensure proper operation of OD OFF light. See DIAGNOSTIC CIRCUIT CHECK heading below.

Diagnostic Circuit Check

1) Turn ignition on. Release OD switch on shift lever to OFF position. Ensure OD OFF light on instrument panel comes on. If OD OFF light does not come on, check OD switch and wiring circuit.

2) Depress OD switch to ON position. Ensure OD OFF light on instrument panel goes off. If OD OFF light remains on, check OD switch and wiring circuit. If OD OFF light is blinking, check for stored fault codes. See ECU FAULT CODES heading below.

ECU Fault Codes

1) Turn ignition on. DO NOT start engine. Depress OD switch on shift lever to the ON position.

NOTE: Fault codes can only be retrieved with OD switch in ON position. If OD switch is in OFF position, OD OFF light will be on continuously and will not blink the fault code.

2) Locate check connector in engine compartment. See Fig. 1. Note check connector terminal identification. See Fig. 10. Install jumper wire between designated terminals of check connector. See CHECK CONNECTOR TERMINAL USAGE table.

CHECK CONNECTOR TERMINAL USAGE

Application	Terminal Usage
Celica	
1991 Models	TT & E1
1992 Models	TE1 & E1
MR2	
1991 Models	TT & E1
1992 Models	TE1 & E1
Paseo	TT & E1

3) Note number of blinks from OD OFF light on instrument panel. If normal system operation exists, OD OFF light will blink once every .25 second. See Fig. 11.

4) If system is operating correctly and no fault code exists, turn ignition off and remove jumper wire. Perform MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING to determine if problem is a electrical or mechanical transmission problem. Check system by symptom. See appropriate symptom under SYMPTOM TROUBLESHOOTING.

5) If fault code exists, OD OFF light will blink once every .5 second. The number of blinks will equal the first digit of fault code. After a pause of 1.5 seconds, the second digit will be displayed. See Fig. 11.

6) If more than one fault code exists, the next fault code will be displayed after pause of 2.5 second. See Fig. 11. System will display smallest value fault code first and then continue to largest value fault code. Fault codes will be repeated.

7) Once fault code is obtained, determine probable cause and symptom. See FAULT CODE IDENTIFICATION table. For trouble shooting of fault codes, see FAULT CODE TROUBLESHOOTING. Turn ignition off and remove jumper wire.

NOTE: Once repairs have been performed, fault codes must be cleared from ECU memory. See CLEARING FAULT CODES under TRANSMISSION TESTING.

FAULT CODE IDENTIFICATION

Fault Code	(1) Probable Cause
42	(2) Defective No. 1 Speed Sensor
61	(2) Defective No. 2 Speed Sensor
62	Defective No. 1 Solenoid
63	Defective No. 2 Solenoid
64	Defective Lock-Up Solenoid

(1) - Check listed component for probable cause. Also check wiring and connections of specified component.
(2) - If both the No. 1 and the No. 2 speed sensors fail simultaneously, the fault code will not exist, but transmission will not upshift from 1st gear with shift lever in "D" position.

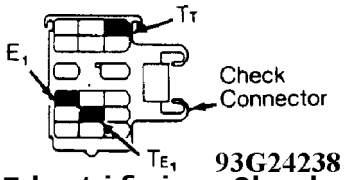

Fig. 10: Identifying Check Connector Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

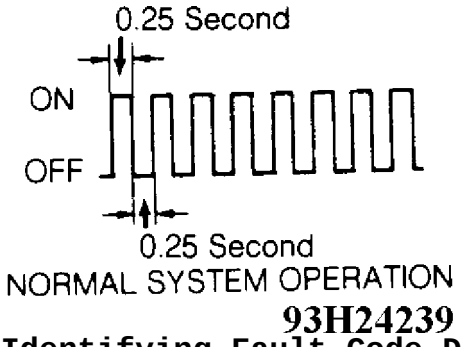

Fig. 11: Identifying Fault Code Displays (Normal System Operation) Courtesy of Toyota Motor Sales, U.S.A., Inc.

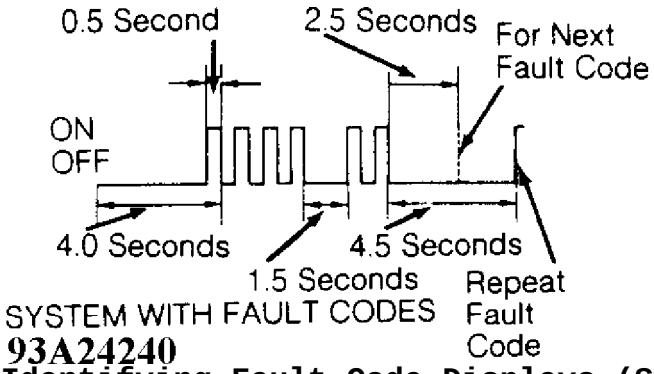

Fig. 12: Identifying Fault Code Displays (System With Fault Codes) Courtesy of Toyota Motor Sales, U.S.A., Inc.

CLEARING FAULT CODES

1) Once repairs have been performed, fault codes must be cleared from ECU memory. Remove EFI fuse (15-amp) from engine compartment fuse box for 10 seconds to clear memory in ECU.

2) On MR2, engine compartment fuse box is located on driver's side of engine compartment. On Celica and Paseo, engine compartment fuse box is located near the battery in engine compartment.

3) Fuse may need to be removed for more than 10 seconds in cold ambient temperatures. Reinstall fuse.

NOTE: Fault codes may also be cleared by disconnecting negative battery cable, but memory for electronic components will be also be canceled.

FAULT CODE TROUBLESHOOTING

When trouble shooting transmission, first check for stored fault codes and repair as necessary. If no fault codes exist, perform manual shifting test to determine if problem area is in the electrical circuits or if there is a mechanical transmission problem. Refer to MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING.

FAULT CODE NO. 42

Defective No. 1 Speed Sensor

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. See Fig. 1. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Using ohmmeter, check for continuity between terminal SPD of ECU connector and body ground. See Figs. 13 and 16.

3) If continuity exists, replace ECU. If continuity does not exist, check No. 1 speed sensor. See NO. 1 SPEED SENSOR under COMPONENT TESTING.

4) Replace No. 1 speed sensor if defective. If No. 1 speed sensor is okay, check wiring between ECU and No. 1 speed sensor.

FAULT CODE NO. 61

Defective No. 2 Speed Sensor

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Using ohmmeter, check for continuity between terminal SP2 of ECU connector and body ground. See Figs. 13 and 16.

3) If continuity exists, replace ECU. If continuity does not exist, check No. 2 speed sensor. See NO. 2 SPEED SENSOR under COMPONENT TESTING.

4) Replace No. 2 speed sensor if defective. If No. 2 speed sensor is okay, check wiring between ECU and No. 2 speed sensor located on transmission. See Fig. 1.

FAULT CODE NO. 62

Defective No. 1 Solenoid

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Using ohmmeter, check resistance between terminal S1 and body ground with connector removed from ECU. See Figs. 13 and 16.

3) Resistance should be 11-15 ohms. If resistance is okay, replace ECU. If resistance is not within specification, remove oil pan. Disconnect electrical connector at No. 1 solenoid, located on transmission. See Fig. 1.

4) Check resistance between electrical terminal on No. 1 solenoid and body ground. Replace No. 1 solenoid if resistance is not 11-15 ohms. If resistance is 11-15 ohms, check wiring between No. 1 solenoid and ECU.

FAULT CODE NO. 63

Defective No. 2 Solenoid

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Using ohmmeter, check resistance between terminal S2 and body ground with connector removed from ECU. See Figs. 13 and 16.

3) Resistance should be 11-15 ohms. If resistance is okay, replace ECU. If resistance is not within specification, remove oil pan. Disconnect electrical connector at No. 2 solenoid, located on transmission. See Fig. 1.

4) Check resistance between electrical terminal on No. 2 solenoid and body ground. Replace No. 2 solenoid if resistance is not 11-15 ohms. If resistance is 11-15 ohms, check wiring between No. 2 solenoid and ECU.

FAULT CODE NO. 64

Defective Lock-Up Solenoid

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Using ohmmeter, check resistance between terminal SL and body ground with connector removed from ECU. See Figs. 13 and 16.

3) Resistance should be 11-15 ohms. If resistance is okay, replace ECU. If resistance is not within specification, remove oil pan. Disconnect electrical connector at lock-up solenoid. See Fig. 1.

4) Check resistance between electrical terminal on lock-up solenoid and body ground. Replace lock-up solenoid if resistance is not 11-15 ohms. If resistance is 11-15 ohms, check wiring between lock-up solenoid and ECU.

TRANSMISSION SHIFT TESTING

MANUAL SHIFTING TEST

NOTE: Perform manual shifting test if no fault codes exist. Manual shifting test determines if problem area is in electrical circuits or a mechanical transmission problem.

1) With ignition off, disconnect electrical connector from solenoids on transmission. Electrical connector is located near neutral start switch on transmission.

2) Road test vehicle and ensure transmission gear changes corresponds with shift lever position. See GEAR APPLICATION table. If abnormality exists, a mechanical transmission problem exists.

3) If all gears are correct, perform trouble shooting in

accordance with the symptom. See SYMPTOM TROUBLESHOOTING. Turn ignition off.

4) Reconnect electrical connector. Clear fault codes from ECU memory. See CLEARING FAULT CODES under TRANSMISSION TESTING.

GEAR APPLICATION

Shift Lever Position	Transmission Gear
"D"	Overdrive
"2"	3rd Gear
"L"	1st Gear
"R"	Reverse
"P"	Park

SYMPTOM TROUBLESHOOTING

NOTE: If problem area is not listed under symptom trouble shooting, check throttle position sensor signal, brake signal, gear signal and ECU voltages. See ELECTRICAL TESTING.

TRANSMISSION WILL NOT SHIFT

1) Warm engine to normal operating temperature. Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

2) Turn ignition on. Note that voltage changes with throttle opening. If voltage changes with throttle opening, proceed to step 6). If voltage does not change with throttle opening, proceed to step 3).

3) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1. Connect voltmeter between terminals B/K and E1 on ECU with connector installed on ECU. See Figs. 13 and 16.

4) No voltage should exist with brake pedal released. Approximately 10-14 volts should exist with brake pedal depressed. If voltage is not as specified, check for defective brakelight switch or wiring circuit.

5) If voltage is as specified, check for defective ECU power source or ground connections. Check for short or open circuit in wire to TT terminal of check connector. Check for defective throttle position sensor or wiring.

6) Perform MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING. If transmission does not perform correctly, repair transmission. If transmission operates correctly, road test vehicle and ensure voltage at terminal TT increases from zero to 7 volts.

7) If no voltage exists, proceed to step 9). If voltage increases from zero to 7 volts, transmission or solenoid is faulty. If voltage increases from zero to 4 volts, perform test procedures for NO UPSHIFT TO OVERDRIVE under SYMPTOM TROUBLESHOOTING.

8) If voltage increases from zero to 2 volts, check for 10-14 volts between terminals 2 and E1 on ECU with connector installed on ECU and shift lever in "D" position. See Figs. 13 and 16. If 10-14 volts exist, check for defective neutral start switch or wiring circuit. If 10-14 volts does not exist, replace ECU.

9) Check for 10-14 volts between terminals "L" and E1 on ECU with connector installed on ECU and shift lever in "D" position. See Figs. 13 and 16. If 10-14 volts exist, check for defective neutral start switch or wiring circuit. If 10-14 volts does not exist, replace ECU.

SHIFT POINTS TOO HIGH OR LOW

Celica

1) Warm engine to normal operating temperature. Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

2) Turn ignition on. Note that voltage changes with throttle opening. If voltage changes with throttle opening, proceed to step 6). If voltage does not change with throttle opening, proceed to step 3).

3) Obtain access to ECU, located near front of center console. See Fig. 1. Connect voltmeter between terminals B/K and E1 on ECU with connector installed on ECU. See Fig. 13.

4) No voltage should exist with brake pedal released. Approximately 10-14 volts should exist with brake pedal depressed. If voltage is not as specified, check for defective brakelight switch or wiring circuit.

5) If voltage is as specified, check for defective ECU power source or ground connections. Check for short or open circuit in wire to TT terminal of check connector. Check for defective throttle position sensor or wiring.

6) Connect voltmeter between terminals "P" and E1 on ECU with connector installed on ECU. See Fig. 13. Check voltage with pattern select switch in POWER (depressed) and NORMAL (released) operating positions.

7) Voltage should be 10-14 volts with switch in POWER position and one volt with switch in NORMAL position. If voltage is as specified, ECU or transmission is defective. If voltage is not as specified, check for defective pattern select switch or wiring circuit.

MR2 & Paseo

1) Warm engine to normal operating temperature. Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between

terminals TT and E1 of check connector. See Fig. 10.

2) Turn ignition on. Note that voltage changes with throttle opening. If voltage changes with throttle opening, ECU or transmission is defective. If voltage does not change with throttle opening, proceed to next step.

3) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Paseo, ECU is located near front of center console. See Fig. 1. Connect voltmeter between terminals B/K and E1 on ECU with connector installed on ECU. See Fig. 7.

4) No voltage should exist with brake pedal released. Approximately 10-14 volts should exist with brake pedal depressed. If voltage is not as specified, check for defective brakelight switch or wiring circuit.

5) If voltage is as specified, check for defective ECU power source or ground connections. Check for short or open circuit in wire to TT terminal of check connector. Check for defective throttle position sensor or wiring.

NO UPSHIFT TO OVERDRIVE

1) Warm engine to normal operating temperature. With ignition off, disconnect electrical connector from solenoids on transmission. Electrical connector is located near neutral start switch on transmission.

2) Road test vehicle and note if transmission upshifts to overdrive once transmission shifts from "L" to "2" and then into "D" range. Reconnect electrical connector. Clear fault codes from ECU memory, as disconnecting electrical connector may set fault code. See CLEARING FAULT CODES under TRANSMISSION TESTING. If no overdrive upshift exists, transmission is defective. If overdrive upshift exists, proceed to step 3).

3) Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10. Road test vehicle and ensure voltage at terminal TT increases from zero to 7 volts.

4) If no voltage exists, obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

5) Check for 10-14 volts between terminals "L" and E1 on ECU with connector installed on ECU with shift lever in "D" position and ignition on. See Figs. 14 and 16. If 10-14 volts exist, check for defective neutral start switch or wiring circuit. If 10-14 volts does not exist, replace ECU.

6) If voltage increases from zero to 2 volts, check for 10-14 volts between terminals 2 and E1 on ECU with connector installed on ECU with shift lever in "D" position and ignition on. See Figs. 13 and

13. If 10-14 volts exist, check for defective neutral start switch or wiring circuit. If 10-14 volts does not exist, replace ECU.

7) If voltage increases from zero to 7 volts, transmission or solenoid is faulty. If voltage increases from zero to 4 volts, connect voltmeter between terminals OD2 and E1 on ECU with connector installed on ECU. See Figs. 13 and 16.

8) Turn ignition on. Check voltage with OD switch on the shift lever in released (OFF position) and depressed (ON position). No voltage should exist with switch released and 10-14 volts should exist with switch depressed.

9) If voltage is correct, proceed to step 10). If voltage is not as specified, check for defective OD switch or wiring circuit.

10) Check voltage between terminals OD1 and E1 on ECU with connector installed on ECU and ignition on. Voltage should be about 5 volts. If voltage is correct, replace ECU. If voltage is not correct, proceed to step 11).

11) Disconnect electrical connector from cruise control Electronic Control Unit (ECU). On MR2, cruise control ECU is located behind passenger's side of instrument panel. On Celica and Paseo, cruise control ECU is located near front of center console. See Fig. 2.

12) Check voltage between terminals OD1 and E1 on ECU with connector installed on ECU and ignition on. If voltage is now about 5 volts, replace cruise control ECU. If voltage is not about 5 volts, check for defective cruise control ECU wiring. If wiring is okay, replace ECU.

NO LOCK-UP

1) Warm engine to normal operating temperature. Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

2) Road test vehicle and ensure voltage at terminal TT is 7 volts in lock-up range. If voltage is correct, lock-up solenoid, torque converter or transmission is defective.

3) If voltage is not as specified, obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. See Fig. 1. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

4) Connect voltmeter between terminals B/K and E1 on ECU with connector installed on ECU. See Figs. 13 and 16.

5) No voltage should exist with brake pedal released. Approximately 10-14 volts should exist with brake pedal depressed. If voltage is not as specified, check for defective brakelight switch or wiring circuit.

6) If voltage is as specified, check for defective ECU power source or ground connections. Check for defective throttle position sensor or wiring.

ELECTRICAL TESTING

NOTE: All voltage checks are made with ignition switch in ON position unless otherwise stated.

THROTTLE POSITION SENSOR SIGNAL

1) Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

2) Turn ignition on. Note that voltage gradually increases as accelerator is depressed. Voltage should gradually increase to about 6 volts with throttle fully open.

3) If voltage does not change with throttle opening, check throttle position sensor. See THROTTLE POSITION SENSOR under COMPONENT TESTING. If throttle position sensor is okay, check wiring circuit for throttle position sensor.

BRAKE SIGNAL

1) Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

2) Depress accelerator pedal until 6 volts exists. Depress brake pedal and note that voltage decreases to no voltage. Release brake pedal and note that voltage increases to 6 volts.

3) If voltage is not as specified, check brakelight switch. See BRAKELIGHT SWITCH under COMPONENT TESTING. If brakelight switch is okay, check wiring circuit for brakelight switch.

GEAR SIGNAL

1) Warm engine to normal operating temperature. On Celica models, place pattern select switch in NORMAL (released position). Pattern select switch is located near shift lever. See Fig. 1.

2) On all models, depress OD switch, mounted on shift lever, to the ON position. Locate check connector in engine compartment. See Fig. 1. Connect voltmeter between terminals TT and E1 of check connector. See Fig. 10.

3) Road test vehicle with shift lever in "D" position and vehicle speed greater than 6 MPH. Voltage should increase as specified in accordance with transmission gear position. See GEAR SIGNAL VOLTAGES table.

4) If voltages are as specified, electronic control system is operating correctly. If voltages are not as specified, system must be checked.

GEAR SIGNAL VOLTAGES

Gear Position	Voltage
1st Gear	0
2nd Gear	2
3rd Gear	4
Overdrive	6
Overdrive With Lock-Up	7

ECU VOLTAGES

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Turn ignition on. Using voltmeter, check voltage between designated terminals on ECU with connector installed on ECU. Voltage should be as specified. See Figs. 13 and 16.

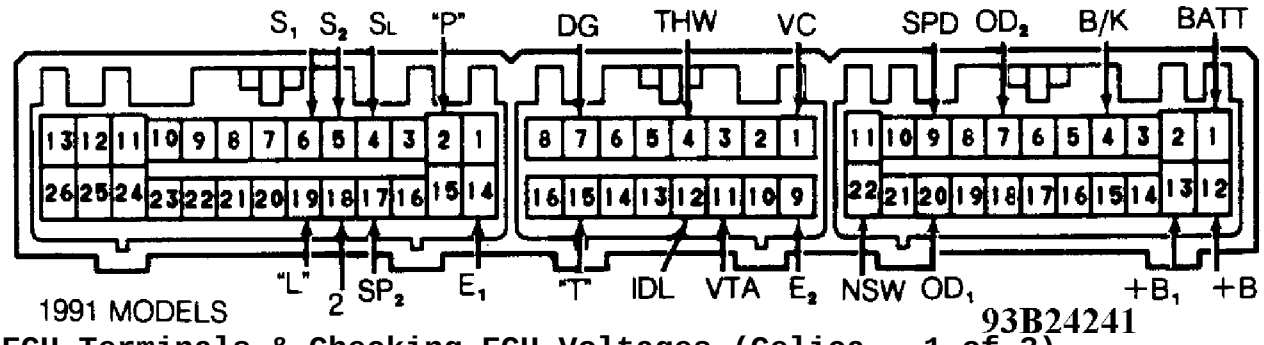

Fig. 13: ECU Terminals & Checking ECU Voltages (Celica - 1 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

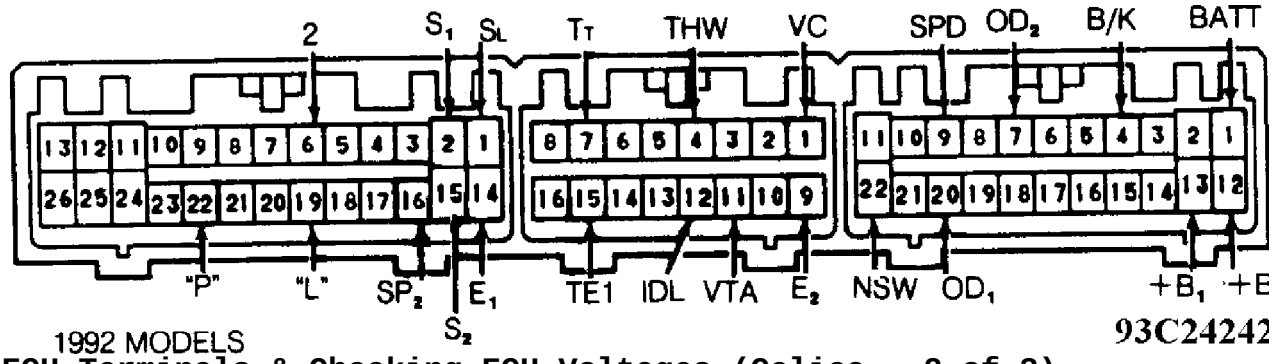

Fig. 14: ECU Terminals & Checking ECU Voltages (Celica - 2 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Terminal	Measuring condition		Voltage (V)
$S_1 - E_1$	Ignition switch turned ON		10 – 14
$S_2, S_L - E_1$	Ignition switch turned ON		Under 1
$P - E_1$	PWR pattern		10 – 14
	NORM pattern		Under 1
$B/K - E_1$	Brake pedal is depressed		10 – 14
	Brake pedal is released		Under 1
$THW - E_2$	Coolant temp. 176°F (80°C)		0.3 – 0.8
$IDL - E_2$	Throttle valve fully closed		Under 0.5
	Throttle valve open		4.5 – 5.5
$VTA - E_2$	Throttle valve fully closed		Under 0.5
	Throttle valve open		4.5 – 5.5
$VC - E_2$	———		4.5 – 5.5
$OD_1 - E_1$	———		10 – 14
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		Under 1
$SPD - E_1$	Cruise control main switch OFF	Standing still	Under 1
		Vehicle moving	Repeat : 0 ↔ 10 – 4
$SP_2 - E_1$	Standing still		Under 1
	Vehicle moving		Repeat : 0 ↔ 4.5 – 5.5
$NSW - E_1$	P, N range		10 – 14
	R, D, 2, L range		Under 1
$2 - E_1$	2 range		10 – 14
	Except 2 range		Under 1
$L - E_1$	L range		10 – 14
	Except L range		Under 1
$+B, +B - E_1$	Ignition switch turned ON		10 – 14
$BATT - E_1$	All conditions		10 – 14

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Fig. 15: ECU Terminals & Checking ECU Voltages (Celica - 3 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

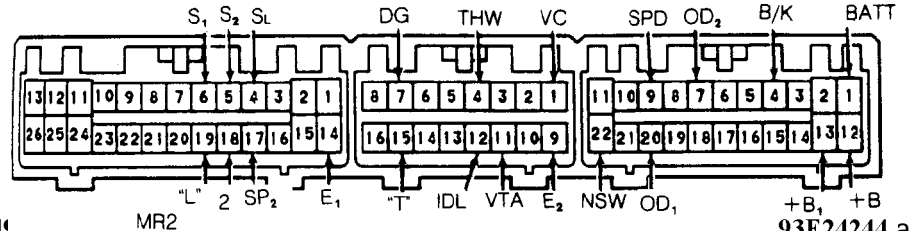

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Fig. 16: ECU Terminals & Checking ECU Voltages (MR2 & Paseo 1 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

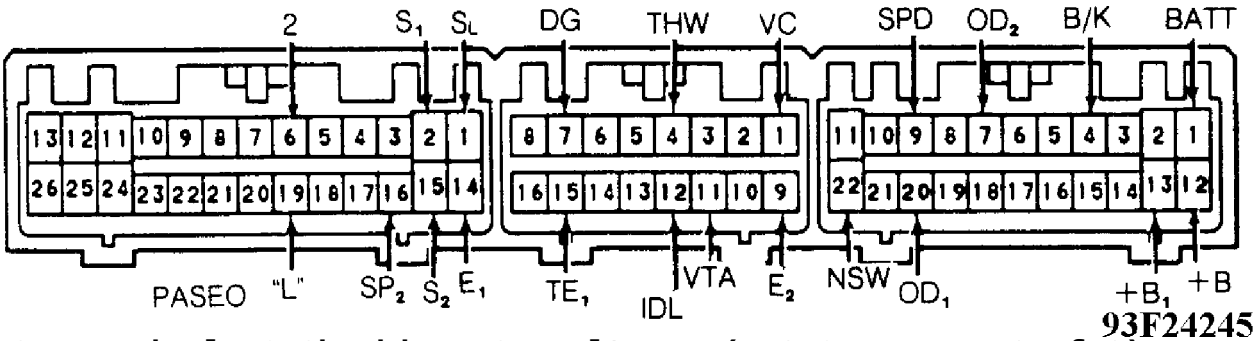

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Fig. 17: ECU Terminals & Checking ECU Voltages (MR2 & Paseo - 2 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Terminal	Measuring condition		Voltage (V)
$S_1 - E_1$	Ignition switch turned ON		10 – 14
S_2, $S_L - E_1$	Ignition switch turned ON		1 or less
B/K – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		1 or less
THW – E_2	Coolant temp. 176°F (80°C)		0.1 – 0.8
IDL – E_2	Throttle valve fully closed		1 or less
	Throttle valve open		4.5 – 5.5
VTA – E_2	Throttle valve fully closed		0.1 – 0.8
	Throttle valve open		4.5 – 5.5
VC – E_2	——		4.5 – 5.5
$OD_1 - E_1$	——		10 – 14
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		1 or less
SPD – E_1	Cruise control main switch OFF	Standing still	1 or less
		Vehicle moving	Repeat : 0 ↔ 10 – 4
$SP_2 - E_1$	Standing still		1 or less
	Vehicle moving		Repeat : 0 ↔ 4.5 – 5.5
NSW – E_1	P, N range		10 – 14
	R, D, 2, L range		1 or less
2 – E_1	2 range		10 – 14
	Except 2 range		1 or less
L – E_1	L range		10 – 14
	Except L range		1 or less
$+B_1$, +B – E_1	Ignition switch turned ON		10 – 14
BATT – E_1	All conditions		10 – 14

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Fig. 18: ECU Terminals & Checking ECU Voltages (MR2 & Paseo - 3 of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

COMPONENT TESTING

SOLENOIDS

NOTE: The No. 1, No. 2 solenoids and lock-up solenoid can be checked. Resistance and operation can be checked with solenoid on the vehicle. Solenoid must be removed from transmission to check solenoid seals.

1) Obtain access to ECU. On MR2 models, ECU is located near left rear corner of engine compartment. On Celica and Paseo, ECU is located near front of center console. See Fig. 1.

2) Ensure ignition is off. Disconnect electrical connector containing the SL, S1 and S2 terminals from ECU. See Figs. 13 and 16.

NOTE: Solenoid terminal identification is as follows: SL, terminal lock-up solenoid; S1, terminal No. 1 solenoid; and S2, terminal No. 2 solenoid.

3) Using ohmmeter, measure resistance between SL, S1 and S2 terminal on wiring harness side of ECU connector and body ground for proper solenoid. See Fig. 19. Replace solenoid if resistance is not 11-15 ohms.

4) To check solenoid operation, apply battery voltage to SL, S1 and S2 terminal of ECU connector for proper solenoid. Ensure operating sound can be heard when battery voltage is connected. Replace solenoid if operating sound cannot be heard.

5) To check solenoid seals, connect battery voltage to solenoid. Apply 71 psi (5 kg/cmý) to solenoid with battery voltage connected. See Fig. 21.

6) With battery voltage applied, air should pass through solenoid. Disconnect battery and ensure air does not pass through solenoid. Replace solenoid if defective.

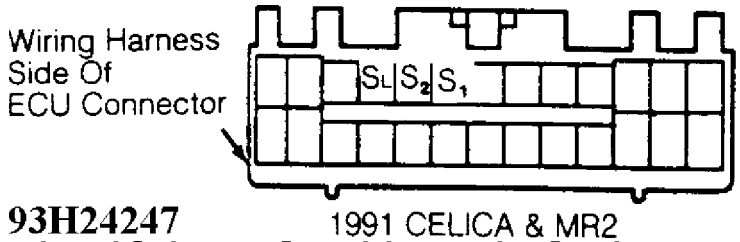

Fig. 19: Identifying Solenoid Terminals (1991 Celica & MR2) Courtesy of Toyota Motor Sales, U.S.A., Inc.

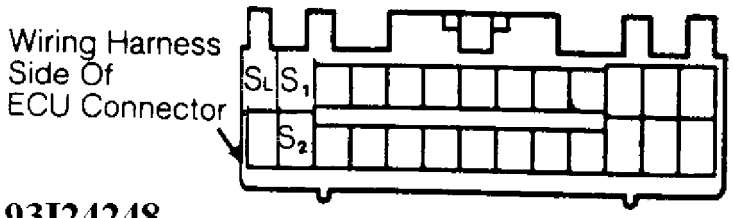

Fig. 20: Identifying Solenoid Terminals (1992 Celica & Paseo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

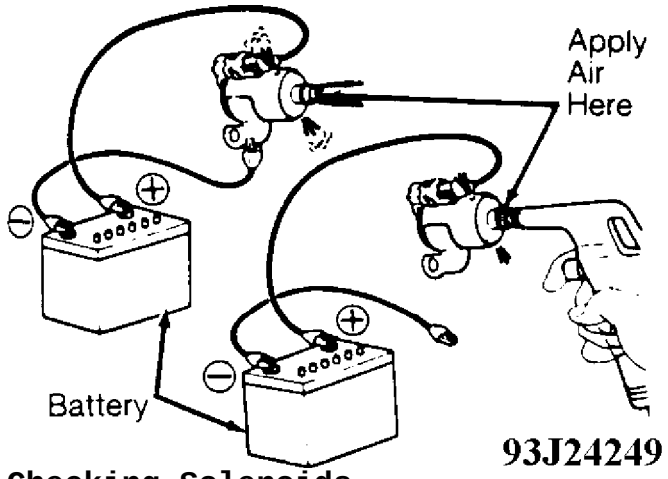

Fig. 21: Checking Solenoids
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NEUTRAL START SWITCH

1) Disconnect electrical connector at neutral start switch. Neutral start switch is located on side of transmission. See Fig. 1.

2) Note neutral start switch terminal identification. See Fig. 22. Using ohmmeter, check for continuity between specified terminals in accordance with the shift lever position. Refer to the NEUTRAL START SWITCH CONTINUITY table. Replace neutral start switch if defective. Install electrical connector.

NEUTRAL START SWITCH CONTINUITY

Shift Lever Position	Terminals
Park	2 & 3, 1 & 6
Reverse	5 & 6
Neutral	2 & 3, 6 & 7
D	6 & 8
2	6 & 9
"L"	4 & 6

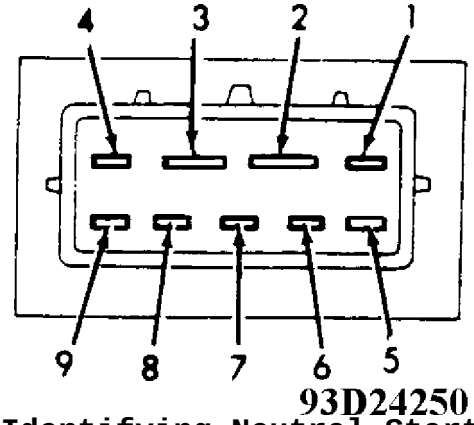

Fig. 22: Identifying Neutral Start Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

THROTTLE POSITION SENSOR

1) Disconnect electrical connector at throttle position sensor, located on side of throttle body. Note throttle position sensor terminal identification. See Fig. 23.

2) Using ohmmeter, check resistance between specified terminals in relation to throttle position. See the specifications in the THROTTLE POSITION SENSOR RESISTANCE SPECIFICATIONS table. Replace throttle position sensor if resistance is not as specified.

THROTTLE POSITION SENSOR RESISTANCE SPECIFICATIONS

Terminals	Ohms
IDL & E2	
Throttle Fully Closed	0-100
Throttle Fully Open	Infinity
VC & E2	3000-7000
VTA & E2	
Throttle Fully Closed	200-800
Throttle Fully Open	3200-10,000

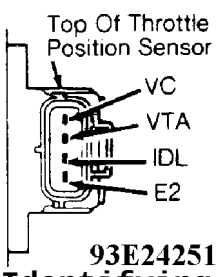

Fig. 23: Identifying Throttle Position Sensor Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

COOLANT TEMPERATURE SENSOR

1) Disconnect electrical connector from coolant temperature sensor. Coolant temperature sensor is located in coolant passage on engine. See Fig. 1.

2) Using ohmmeter, check resistance between terminals of coolant temperature sensor. Resistance should as specified in accordance with coolant temperature. See Fig. 24. Replace coolant temperature sensor if resistance is not within specification.

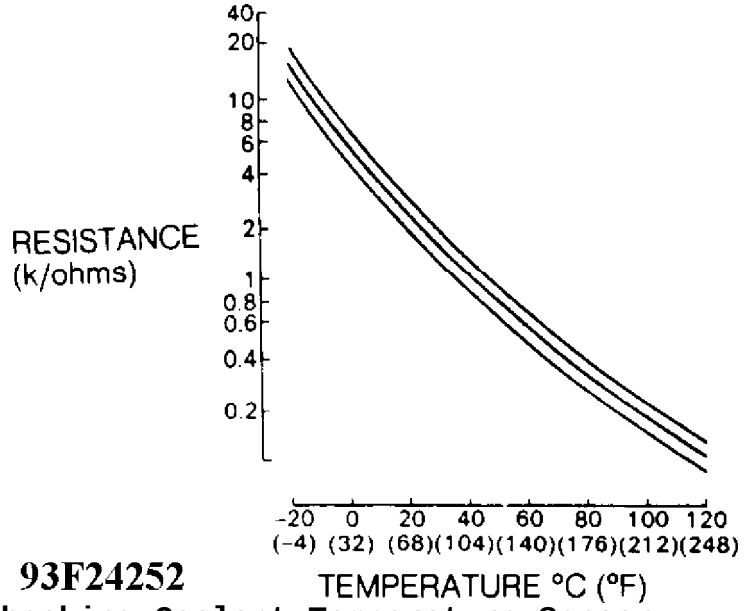

Fig. 24: Checking Coolant Temperature Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NO. 1 SPEED SENSOR

1) Remove instrument panel. Connect ohmmeter between terminals on rear of instrument panel. See Fig. 25.

2) Rotate speedometer cable shaft on instrument panel. Note that ohmmeter needle fluctuates from continuity to no continuity. If reading does not fluctuate correctly, replace speedometer or speed sensor as necessary.

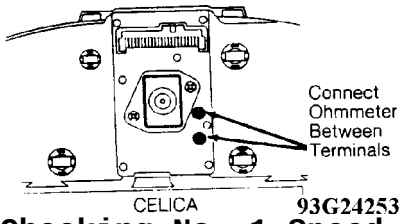

Fig. 25: Checking No. 1 Speed Sensor (Celica)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

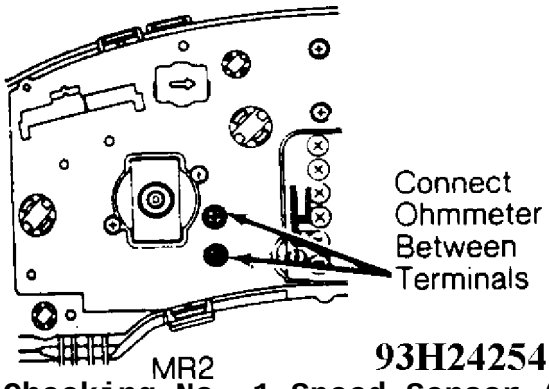

Fig. 26: Checking No. 1 Speed Sensor (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

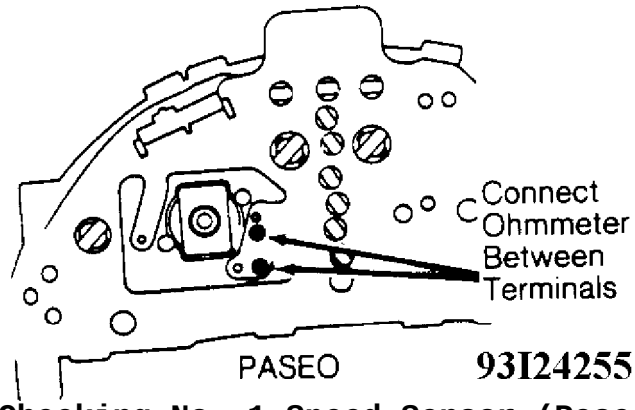

Fig. 27: Checking No. 1 Speed Sensor (Paseo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NO. 2 SPEED SENSOR

1) Disconnect electrical connector from No. 2 speed sensor, located on transmission. See Fig. 1. Raise and support vehicle so front wheels can rotate. Connect ohmmeter between terminals of No. 2 speed sensor.

2) Rotate front wheel. Note that ohmmeter needle fluctuates from continuity to no continuity. If reading does not fluctuate correctly, remove No. 2 speed sensor from transmission.

3) Connect ohmmeter between terminals of No. 2 speed sensor. Note that ohmmeter needle fluctuates from continuity to no continuity when magnet is brought close to speed sensor and then moved away.

4) Replace speed sensor if reading does not fluctuate. If reading fluctuates correctly, components in transmission for speed sensor must be replaced.

PATTERN SELECT SWITCH (CELICA ONLY)

1) Disconnect electrical connector from pattern select switch, located near shift lever. See Fig. 1. Note terminal

identification on pattern select switch. See Fig. 28.

2) Using ohmmeter, ensure continuity exists between terminals No. 2 and 3 with switch in POWER (depressed) position, and no continuity exists with switch in NORMAL (released) position. Replace switch if defective.

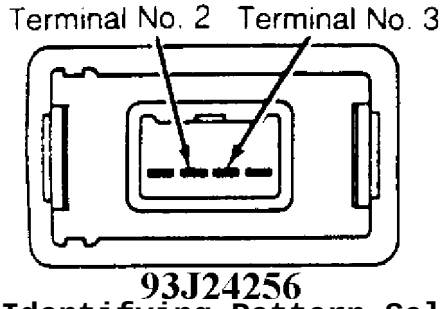

Fig. 28: Identifying Pattern Select Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OVERDRIVE (OD) SWITCH

1) Disconnect electrical connector from OD switch, located on shift lever. Note terminal identification on OD switch. See Fig. 29.

2) Using ohmmeter, ensure continuity exists between terminals No. 1 and 3 with switch released (OFF position).

3) Ensure no continuity exists between terminals No. 1 and 3 with switch depressed (ON position). Replace switch if defective.

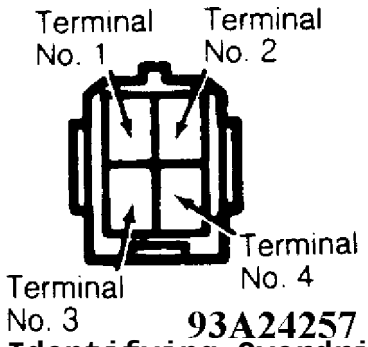

Fig. 29: Identifying Overdrive (OD) Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

BRAKELIGHT SWITCH

1) Disconnect electrical connector from brakelight switch, located near brake pedal. Note brakelight switch terminal identification. See Fig. 30.

2) Using ohmmeter, ensure no continuity exists between terminals No. 1 and 3 with brake pedal released. Replace brakelight switch if continuity exists.

3) Using ohmmeter, ensure continuity exists between terminals

No. 1 and 3 with brake pedal depressed. If continuity does not exist, ensure brake pedal is properly adjusted so brakelight switch has proper travel for switch operation. If proper brakelight switch travel exists, replace brakelight switch.

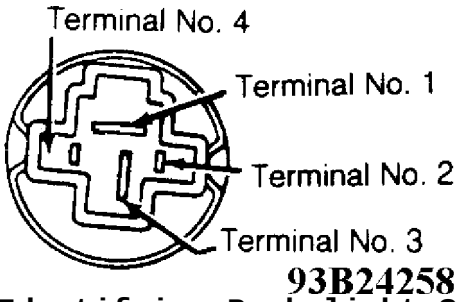

Fig. 30: Identifying Brakelight Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REMOVAL & INSTALLATION

BRAKELIGHT SWITCH

Removal & Installation

1) Disconnect electrical connector. Remove lock nut, and unscrew brakelight switch. To install, screw brakelight switch inward until brakelight plunger contacts brake pedal.

2) Install and tighten lock nut on brakelight switch. Install electrical connector. Ensure brakelights and cruise control operate properly.

COOLANT TEMPERATURE SENSOR

Removal & Installation (Celica & Paseo)

Coolant temperature sensor is located in coolant passage on the engine. See Fig. 1. Drain cooling system. Remove coolant temperature sensor. To install, reverse removal procedure. Fill cooling system.

Removal (MR2)

Coolant temperature sensor is located in coolant passage on the engine. See Fig. 1. Drain cooling system. Remove coolant temperature sensor.

Installation

1) To install, reverse removal procedure. Proper cooling system bleeding procedure must be followed.

2) Remove spare tire, front luggage compartment trim and upper radiator support seal. Connect air bleed hoses to heater and radiator air drain plugs. Attach and support opposite end of hoses to

hood or hood support. See Fig. 17. Ensure hoses are not pinched.

3) Place heater control lever on instrument panel to warmest position. Open heater and radiator air drain plugs at least 3 turns.

4) Slowly add coolant through coolant filler. Air will bleed from hoses on heater and radiator air drain plugs. Ensure coolant in air bleed hoses and coolant filler are at the same lever.

5) If coolant level in air bleed hoses is lower than lever in coolant filler, air still exists in cooling system. Check for pinched or restriction in air bleed hoses. If necessary, repeat step 4). When proper coolant level is obtained in air bleed hoses, close air drain plugs. Remove air bleed hoses.

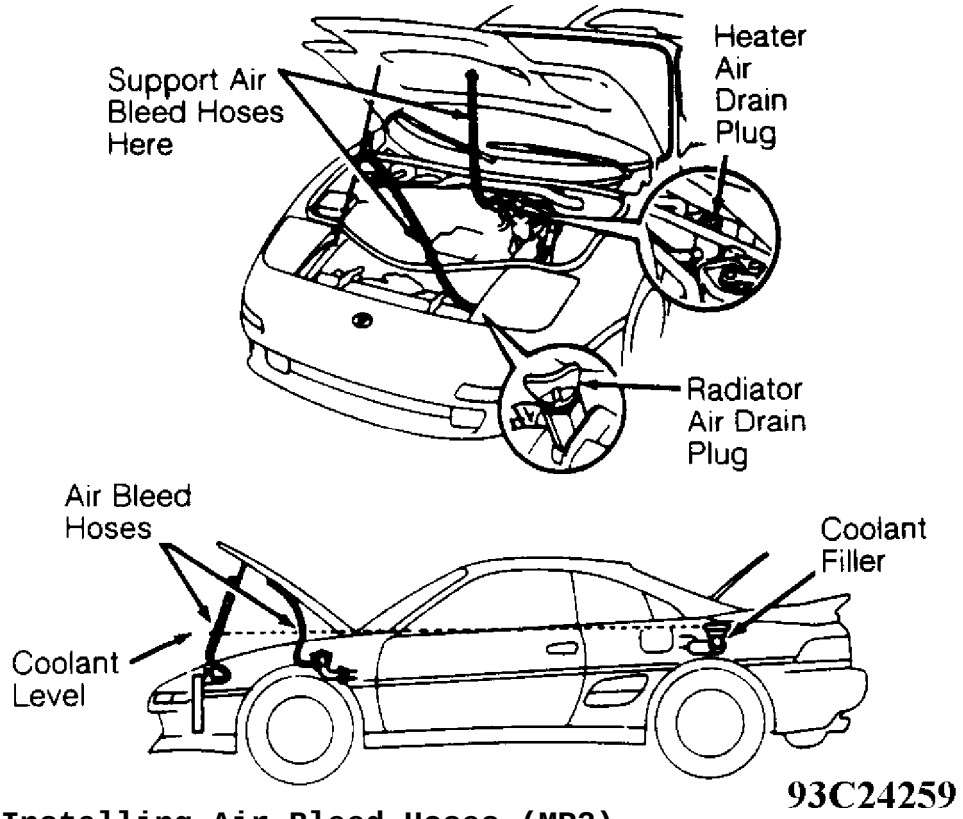

Fig. 31: Installing Air Bleed Hoses (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ELECTRONIC CONTROL UNIT (ECU)

On MR2 models, ECU is located near left rear corner of engine compartment. See Fig. 1. On Celica and Paseo, ECU is located near front of center console. Replacement information not available from manufacturer.

NO. 1 & NO. 2 SOLENOIDS

Removal & Installation

Solenoids are located on the valve body. See Fig. 1. Remove bolt, solenoid and "O" ring from valve body. To install, reverse removal procedure using NEW "O" ring.

LOCK-UP SOLENOID

Removal & Installation

Solenoid is located on the valve body. See Fig. 1. Remove bolt, solenoid and "O" ring from valve body. To install, reverse removal procedure using NEW "O" ring.

NEUTRAL START SWITCH

Removal

1) Neutral start switch is located on side of transmission. Remove lock nut, washer and manual lever from control shaft. See Fig. 18.

2) Bend up tabs on lock washer. Remove lock nut, lock washer and seal from control shaft. Remove retaining bolts and neutral start switch.

Installation

1) Install neutral start switch on control shaft. Loosely install neutral start switch retaining bolts. Install seal and lock washer. Install lock nut and tighten to specification. Refer to the TORQUE SPECIFICATIONS table. Bend tabs on lock washer over against lock nut.

2) Switch must be adjusted. Ensure parking brake is applied. Temporarily install manual lever on control shaft. Place shift lever in Neutral. Remove manual lever.

3) Rotate neutral start switch and align reference mark on neutral start switch with groove. See Fig. 18. Hold neutral switch in this position. Tighten retaining bolts to specification. To install remaining components, reverse removal procedure.

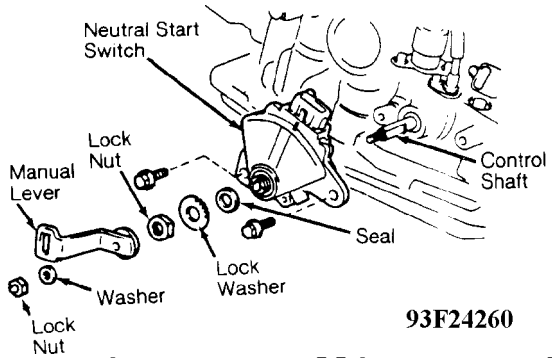

Fig. 32: Removing & Installing Neutral Start Switch (1 of 2) Courtesy of Toyota Motor Sales, U.S.A., Inc.

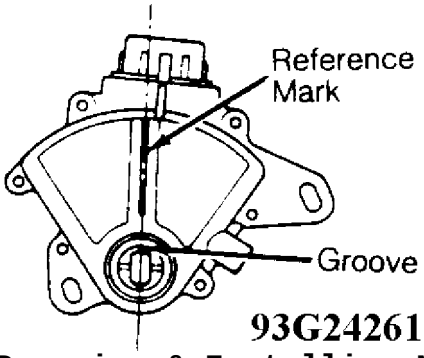

Fig. 33: Removing & Installing Neutral Start Switch (1 of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OVERDRIVE (OD) SWITCH

Overdrive (OD) switch is mounted on the shift lever. See Fig. 1. Replacement information not available from manufacturer.

PATTERN SELECT SWITCH (CELICA ONLY)

Pattern select switch is located near shift lever. See Fig. 1. Replacement information not available from manufacturer.

THROTTLE POSITION SENSOR

Removal

Ensure ignition is off. Disconnect electrical connector from throttle position sensor. Throttle position sensor is located on throttle body. Remove screws and throttle position sensor.

Installation

1) Install throttle position sensor on throttle body with screws loosely installed. Throttle position sensor must be adjusted. Connect ohmmeter leads to IDL and E2 terminals of throttle position sensor. See Fig. 23.

2) Apply vacuum to throttle opener on valve body. See Fig. 34. Insert a .024" (.60 mm) feeler gauge between throttle stop screw and stop lever. Gradually rotate throttle position sensor until ohmmeter deflects, and tighten retaining screws.

3) Remove feeler gauge. Insert a .020" (.50 mm) feeler gauge between throttle stop screw and stop lever. Ensure continuity now exists between IDL and E2 terminals. Remove feeler gauge.

4) Insert a .028" (.70 mm) feeler gauge between throttle stop screw and stop lever. Ensure no continuity now exists between IDL and E2 terminals. Remove feeler gauge.

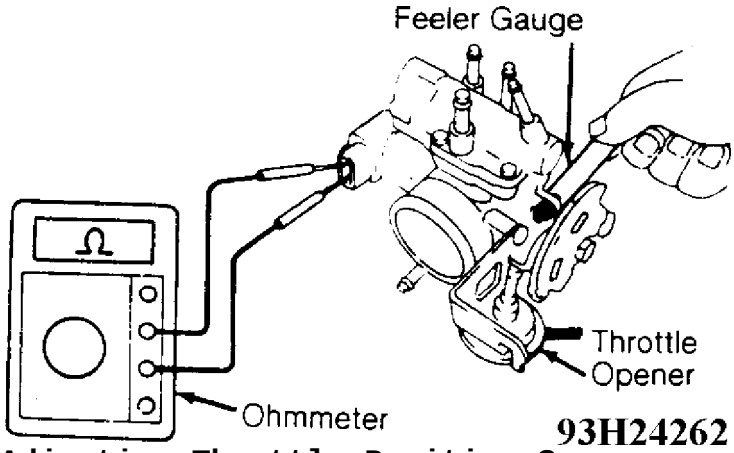

Fig. 34: Adjusting Throttle Position Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NO. 1 SPEED SENSOR

The No. 1 speed sensor is mounted on rear of instrument panel. See Fig. 1. Replacement information not available from manufacturer.

NO. 2 SPEED SENSOR

Removal

Disconnect electrical connector from No. 2 speed sensor, located on transmission. See Fig. 1. Remove bolt, retaining plate and No. 2 speed sensor. Remove "O" ring from No. 2 speed sensor.

Installation

To install, reverse removal procedure using NEW "O" ring. Coat "O" ring with ATF before installing No. 2 speed sensor. Tighten retaining bolt to specification. See TORQUE SPECIFICATIONS.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	INCH Lbs. (N.m)
Neutral Start Switch Bolt	48 (5)
Neutral Start Switch Lock Nut	62 (7)
No. 2 Speed Sensor Bolt	
Celica 2.2L & MR2 (A-241E)	89 (10)
Paseo (A-244E)	48 (5)

WIRING DIAGRAMS

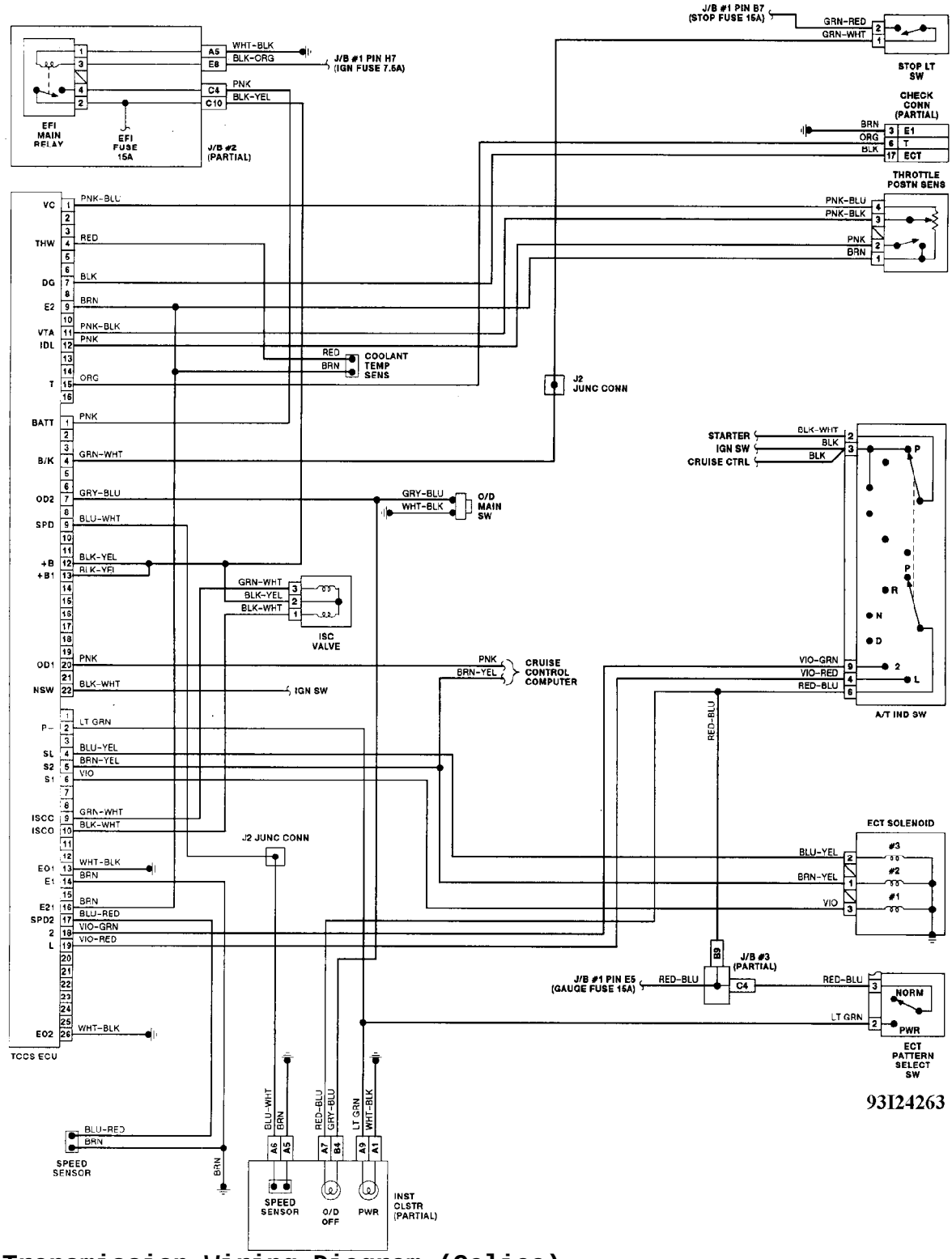

Fig. 35: Transmission Wiring Diagram (Celica)

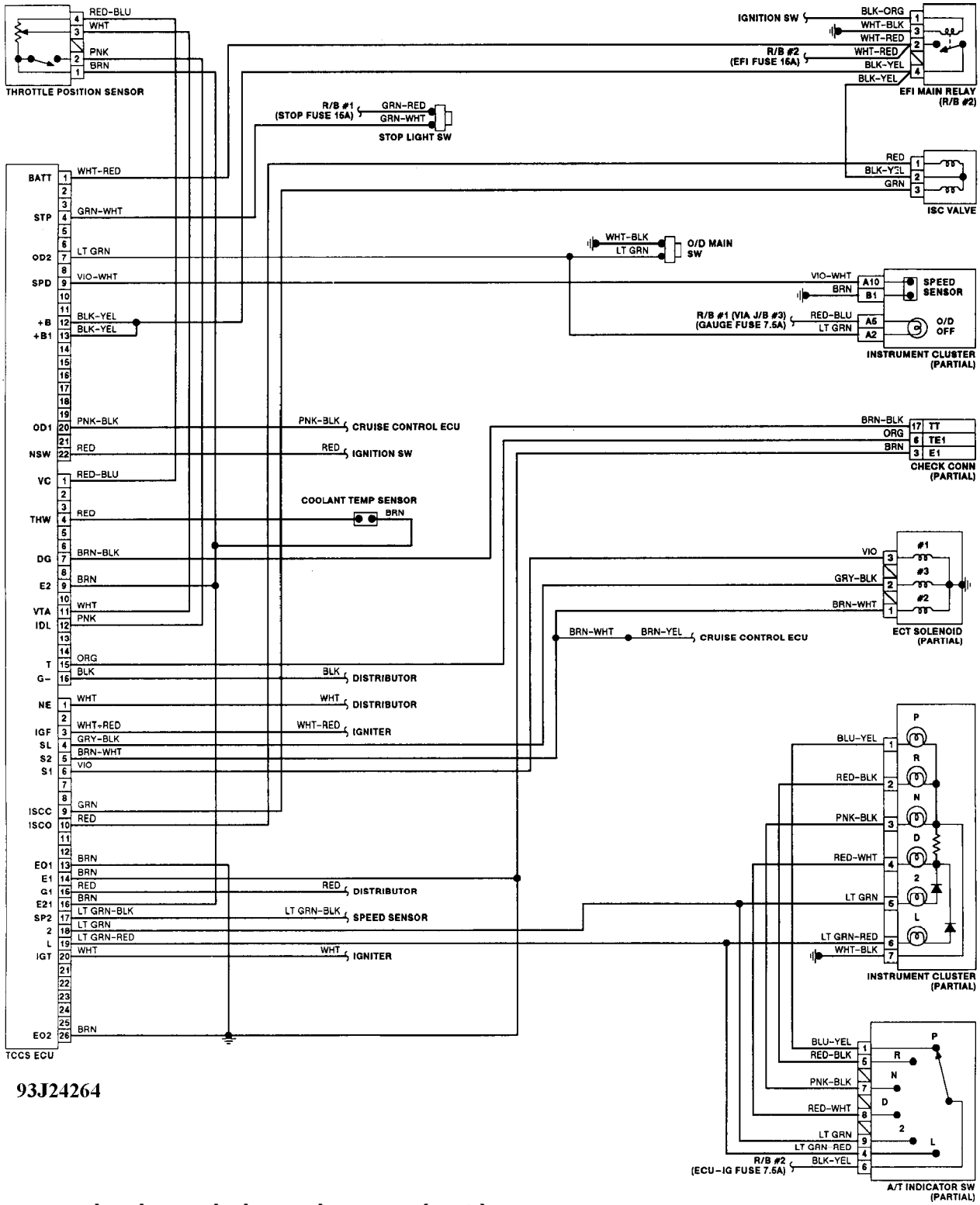

Fig. 36: Transmission Wiring Diagram (MR2)

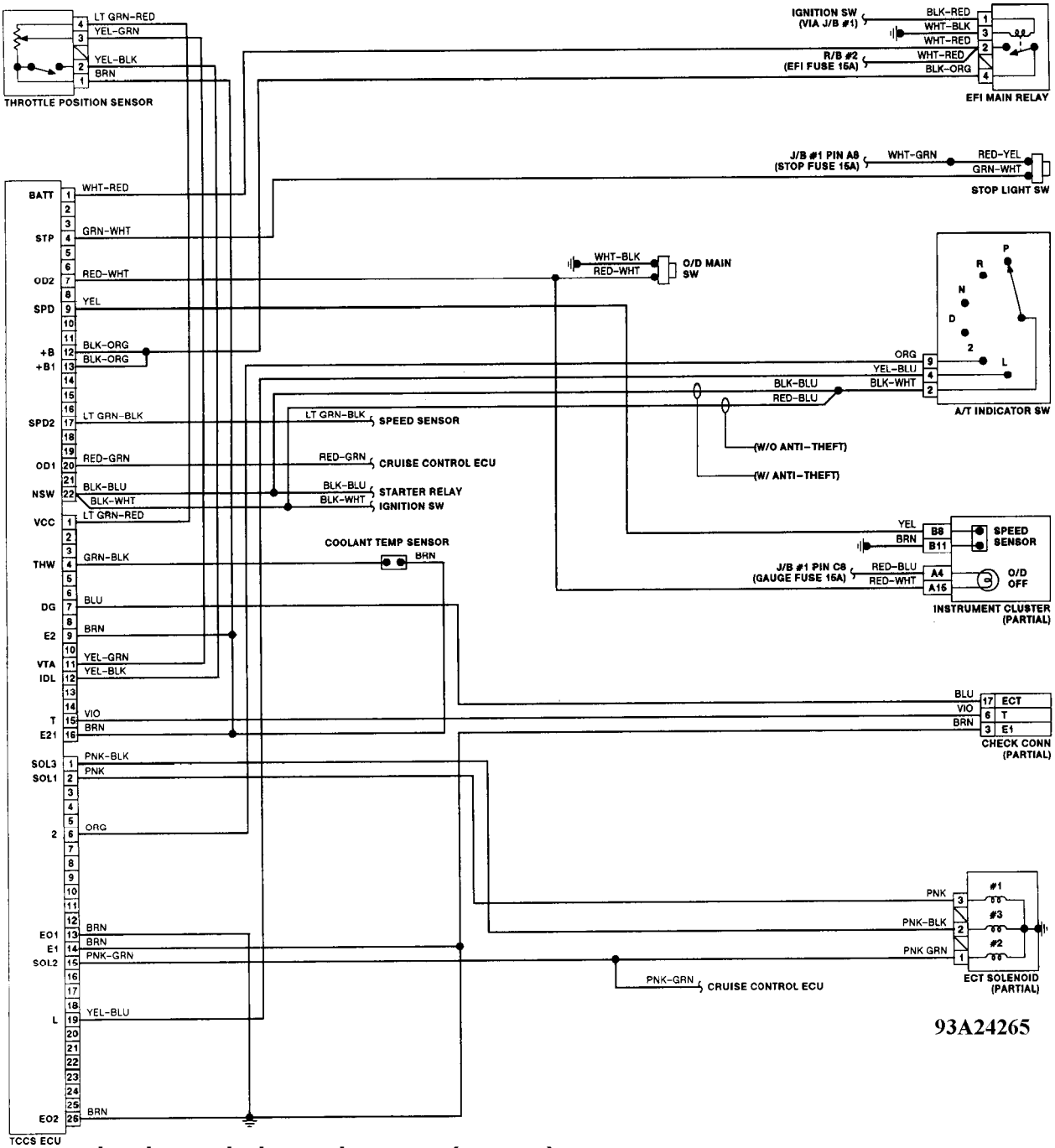

Fig. 37: Transmission Wiring Diagram (Paseo)

END OF ARTICLE