

CRUISE CONTROL SYSTEM

1993 Mitsubishi Montero

1993 ACCESSORIES & EQUIPMENT
Mitsubishi Cruise Control Systems

Montero

DESCRIPTION & OPERATION

The cruise control system is electronically and vacuum controlled. System components include a control unit, actuator, vacuum pump, cruise control switch, clutch pedal switch, cruise indicator light, diode, inhibitor switch (A/T), stoplight switch, vehicle speed sensor and A/T control unit.

The system has self-diagnostic capability. When self-diagnostic mode is activated, each switch and sensor is checked for defects. When cruise control system has been canceled without using a normal cancel method, a code will be set and stored in control unit. Codes can be retrieved to help determine which circuit is malfunctioning.

PRELIMINARY INSPECTION

Before performing TROUBLE SHOOTING steps, inspect linkage assembly, actuator, cables and vacuum hoses. Ensure linkage and cables move smoothly. Ensure cables do not have excessive slack or tension.

TROUBLE SHOOTING

NOTE: For further trouble shooting information, see CHECK RESULTS & SYMPTOM CHARTS. See Figs. 5-7.

SYSTEM CANCELS OR WILL NOT RESET AFTER CANCELLATION

1) Check trouble codes, see SELF-DIAGNOSTICS under DIAGNOSIS & TESTING. If no trouble codes are stored, ensure cruise control can be set.

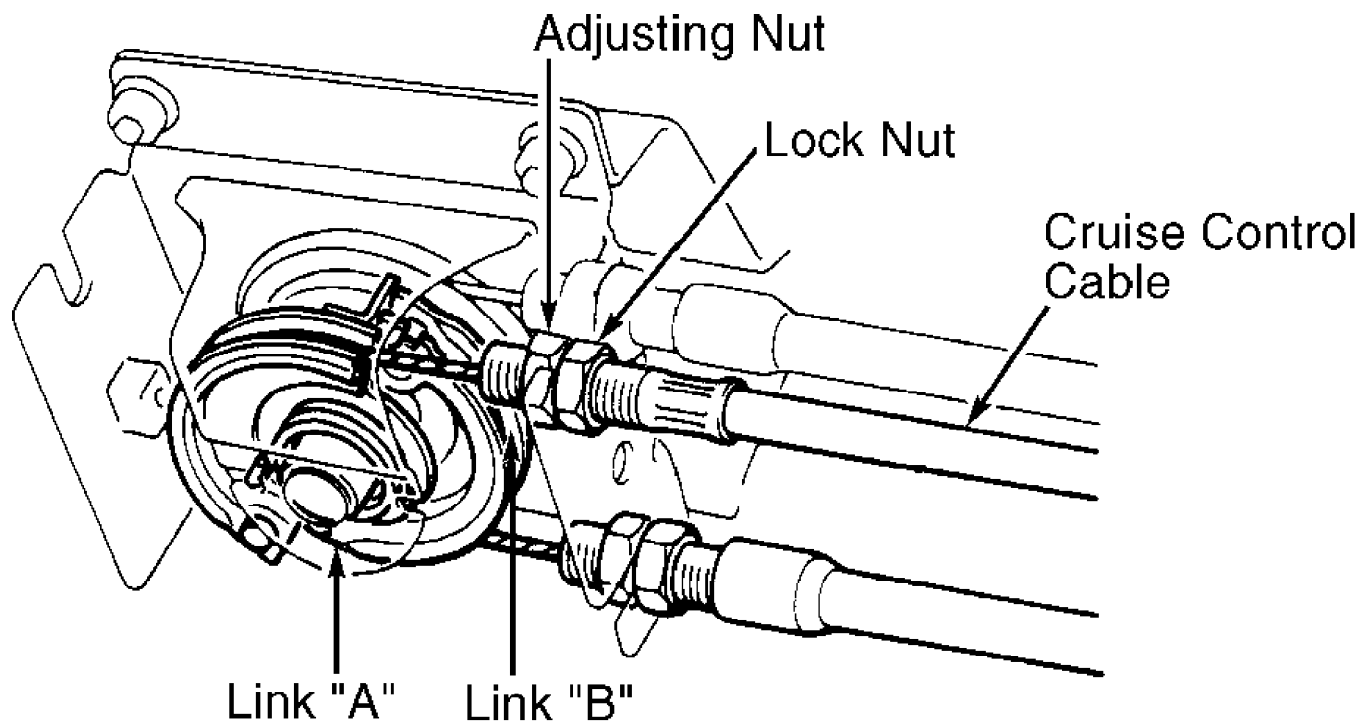
2) If cruise control can be set, system may have canceled because of driving on steep hills or loose wiring connection. If cruise control still cannot be set, perform SYSTEM INPUT TESTS under DIAGNOSIS & TESTING.

3) If SYSTEM INPUT TESTS check okay, check vacuum pump circuit. See TEST NO. 6 under CIRCUIT TESTS. If SYSTEM INPUT TESTS do not check okay, see INPUT CODE CHART. See Fig. 4.

ADJUSTMENTS

CRUISE CONTROL CABLE

Remove link protector. Loosen lock nut. Hold link "A" so that it touches link "B". Adjust free play by turning adjusting nut until free play is .04-.08" (1-2 mm). Tighten lock nut. See Fig. 1.



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Fig. 1: Adjusting Cruise Control Cable
 Courtesy of Mitsubishi Motor Sales of America

DIAGNOSIS & TESTING

CRUISE CONTROL SWITCH FUNCTION TEST

NOTE: If vehicle speed decreases approximately 9 MPH below set speed, set speed will be canceled.

1) Cruise control switch is part of multifunction switch mounted on steering column. To operate cruise control system, turn ignition on. Turn cruise control switch to ON position. Ensure switch indicator light comes on.

NOTE: Speed will not set beyond system limit of 90 MPH.

2) With cruise control switch in ON position, drive vehicle between 25 and 90 MPH. Press and release SET button. Vehicle speed should stay at set speed. Instrument cluster cruise indicator light should come on. To increase set speed, turn control switch to RESUME position and hold until new set speed is reached.

3) To lower set speed, press SET button and hold until new set speed is reached. To return to set speed after cancellation, move resume switch from ON to OFF position. Vehicle speed should return to previous setting before cancellation. Set speed should cancel when any of the following occurs:

- * Brake pedal is pressed.
- * Clutch pedal is pressed.
- * Transmission is shifted to Neutral or Park.
- * Cruise control main switch is turned to OFF position.
- * Ignition switch is turned to OFF position.

SELF-DIAGNOSTICS

1) Self-diagnostics should be performed when cruise control cancels without the driver using normal cancel modes. Diagnosis connector is located on right side of fuse box. Use analog voltmeter or Scan Tester (MB991341) for code retrieval.

2) Use scan tester according to operating instructions provided with tester. Connect leads of analog voltmeter between cruise control terminal and ground terminal of data link connector. See Fig. 2. Read voltmeter needle sweeps to determine trouble code.

3) Once trouble codes have been displayed, see SELF-DIAGNOSTIC CODE CHART to determine appropriate CIRCUIT TEST. See Fig. 3.

4) To clear trouble codes, either disconnect battery cable or turn ignition on. Turn main cruise control switch and set switch to ON position. Within one second turn resume switch to ON position.

5) Hold stoplight switch and cruise control switch in ON position for more than 5 seconds. Verify codes are cleared.

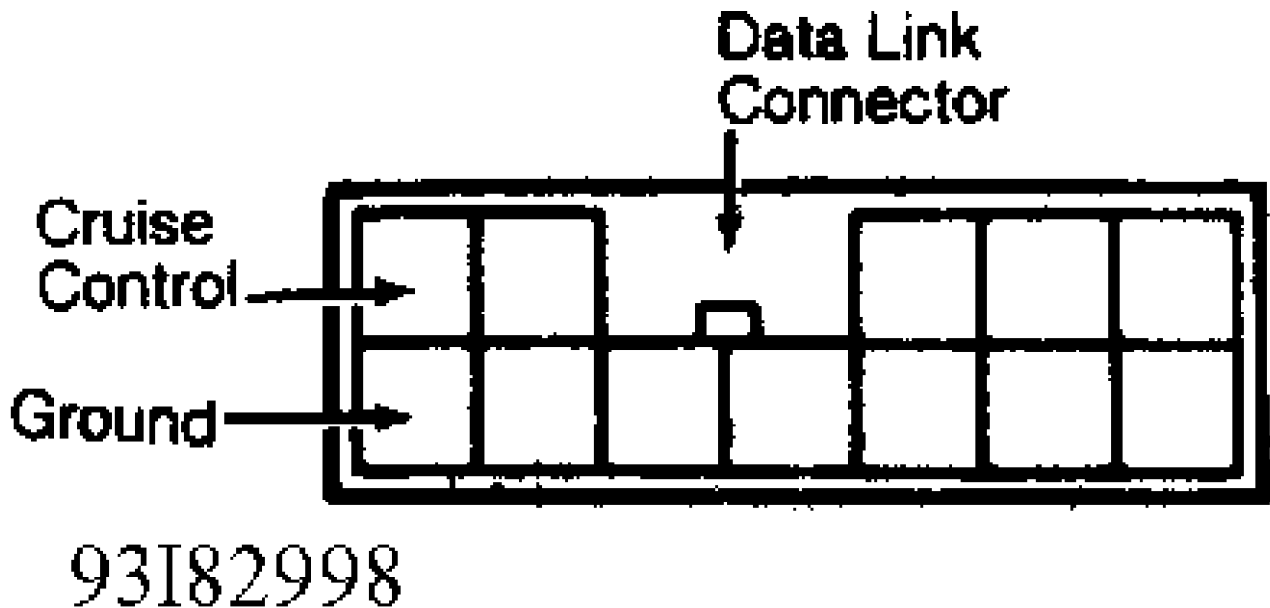







Fig. 2: Data Link Connector Terminal ID
Courtesy of Mitsubishi Motor Sales of America

Code No.	Display patterns (output codes) (Use with voltmeter)	Probable cause	Circuit Test
11		Abnormal condition of motor-driven vacuum pump system	No. 6
12		Abnormal condition of vehicle-speed signal system	No. 5
15		Control switch malfunction (when SET and RESUME switches switched ON simultaneously.)	No. 2, 3
16		Abnormal condition of ECU	No. 7, 8, 9
17		Abnormal condition of throttle position sensor Abnormal condition of idle switch	No. 11

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Fig. 3: Self-Diagnostic Code Chart
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SYSTEM INPUT TESTS

1) System input tests should be performed if no trouble codes are stored when performing SELF-DIAGNOSTICS. System input tests cycle each cruise control switch and sensor.

2) Use Scan Tester (MB991341) for system input check. Use scan tester according to operating instructions provided with tester. Connect leads of analog voltmeter between cruise control terminal and ground terminal of data link connector. See Fig. 2. Turn ignition switch to ON position. Follow INPUT CODE CHART sequence. See Fig. 4.

3) To display results of input check, move SET switch to ON position. Then turn MAIN switch to ON position. Within one second, activate RESUME switch. Codes will display if circuit tested is okay.

Check No	Input operation	Code No	Display patterns (output codes) (with voltmeter)	Check results
1	SET switch ON	21		SET switch circuit normal
2	RESUME switch ON	22		RESUME switch circuit normal
3	Stop light switch (brake pedal depressed)	23		Stop light switch normal
4	Driving at approximately to 40 km/h (25 mph) or higher	24		When both No. 4 and No. 5 can be confirmed, vehicle-speed sensor circuit normal.
5	Driving at less than approximately to 40 km/h (25 mph)	25		
6	1. Clutch switch ON (clutch pedal depressed) <M/T> 2. Inhibitor switch ON (selector lever to "N" range) <A/T>	26		Clutch switch or inhibitor switch normal
7	CANCEL switch ON	27		CANCEL switch circuit normal
8	Throttle position sensor output (when the accelerator pedal is pressed more than half way)	28		Throttle position sensor normal
9	Idle switch OFF (accelerator pedal depressed)	29		idle switch normal

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Fig. 4: Input Code Chart
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Check results	Probable cause	Remedy	Circuit Test
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch.	No. 2
	SET switch input line short-circuit	Repair the harness.	
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	No. 3
	RESUME switch input line short-circuit	Repair the harness.	
Code 23 remains even if the stop light switch is turned OFF by releasing the brake pedal.	Malfunction of stop light switch circuit.	Replace stop light switch or repair harness.	No. 7
Code 25 remains, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle-speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	No. 5
Code 26 remains even if the clutch switch is turned OFF by releasing the clutch pedal. <M/T>	Malfunction of clutch switch circuit.	Replace clutch switch or repair harness.	No. 8
Code 26 remains even if the selector lever is moved to anything but N, P. <A/T>	Malfunction of inhibitor switch circuit.	Replace inhibitor switch or repair harness.	No. 9
Code 27 remains even though CANCEL switch is set to OFF.	Malfunction of CANCEL switch circuit.	Replace the control switch or repair harness.	No. 4
Code 28 remains even if the accelerator is released.	Malfunction of throttle position sensor circuit.	Replace the sensor or repair harness.	No. 11
Code 29 remains even though the idle switch is set to ON.	Malfunction of idle switch circuit	Replace the switch or repair harness.	No. 11

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Fig. 5: Check Results Chart
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Trouble symptom	Probable cause	Circuit Test	Remedy
<ul style="list-style-type: none"> The set vehicle speed varies greatly upward or downward. "Hunching" (repeated alternating acceleration and deceleration) occurs after setting is made. 	Malfunction of the vehicle speed sensor circuit	No. 5	Repair the vehicle speed sensor system, or replace the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Motor-driven vacuum pump circuit poor contact	No. 6	Repair the motor-driven vacuum pump or replace the part.
	Malfunction of the motor-driven vacuum pump		
	Malfunction of the ECU	—	Replace the ECU.
The auto-cruise control system is not canceled when the brake pedal is depressed.	Damaged or disconnected wiring of the stop light switch input circuit or stop light switch (for auto-cruise control) poor contact (short-circuit)	No. 7	Repair the harness or replace the stop light switch.
	Motor-driven vacuum pump drive circuit short-circuit	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of the ECU	—	Replace the ECU.
The auto-cruise control system is not canceled when the clutch pedal is depressed. <M/T> (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch switch input circuit	No. 8	Repair the harness, or repair or replace the clutch switch.
	Clutch switch improper installation (won't switch ON)		
	Malfunction of the ECU	—	Replace the ECU.
The auto-cruise control system is not canceled when the selector lever is moved to the "N" position. <A/T> (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of inhibitor switch input circuit	No. 9	Repair the harness, or repair or replace the inhibitor switch.
	Improper adjustment of inhibitor switch		
	Malfunction of the ECU	—	Replace the ECU.

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Fig. 6: Symptom Chart (1 Of 2)
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Trouble symptom	Probable cause	Circuit Test	Remedy
Cannot decelerate by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	No. 2	Repair the harness or replace the control switch.
	Motor-driven vacuum pump circuit poor contact	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of the auto-cruise actuator		
	Malfunction of the ECU	—	Replace the ECU.
Cannot accelerate or resume speed by using the RESUME switch.	Damaged or disconnected wiring, or short-circuit, of RESUME switch input circuit	No. 3	Repair the harness or replace the control switch.
	Motor-driven vacuum pump circuit poor contact	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of the motor-driven vacuum pump		
	Malfunction of the ECU	—	Replace the ECU.
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle-speed sensor circuit	No. 5	Repair the vehicle-speed sensor system, or replace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the ECU	—	Replace the ECU.
The indicator light of the main switch does not illuminate. (But auto-cruise control system is normal.)	Damaged or disconnected bulb of indicator light or malfunction of the main switch	—	Repair the harness or replace the main switch.
	Harness damaged or disconnected		
Overdrive is not canceled during fixed speed driving. <A/T>	Malfunction of circuit related to overdrive cancelation, or malfunction of ECU	No. 10	Repair the harness or replace the part.
No shift to overdrive during manual driving. <A/T>			

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Fig. 7: Symptom Chart (2 Of 2)

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CIRCUIT TESTS

NOTE: To identify circuit connector terminals, see Figs. 8-15. See appropriate wiring diagram in the WIRING DIAGRAMS section.

Test No. 1 (Power & Ground Circuit)

1) Turn ignition on. When cruise control main switch is turned to ON position, battery voltage should be present on terminal No. 2 of cruise control unit connector.

2) If voltage is not present, check fuse No. 11 and replace as necessary. If fuse is okay, check and repair harness as necessary. Terminal No. 8 should be grounded at all times. If terminal No. 8 is not grounded, repair harness.

Test No. 2 (Set Switch Circuits)

When set switch is turned to ON position, 3 volts should be present on terminal No. 18 of cruise control unit. When set switch is turned to OFF position, voltage should not be present on terminal No. 18 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 3 (Resume Switch Circuit)

When resume switch is turned to ON position, 6 volts should be present on terminal No. 18 of cruise control unit. When resume switch is turned to OFF position, voltage should not be present on terminal No. 18 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 4 (Cancel Switch Circuit)

When cancel switch is turned to On position, battery voltage should be present on terminal No. 18 of cruise control unit. When cancel switch is in OFF position, voltage should not be present on terminal No. 18 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 5 (Vehicle Speed Sensor Circuit)

When vehicle moves slowly, voltage should alternate between zero and 2 or more volts at terminal No. 19 of cruise control unit. If circuit does not test correctly, replace sensor as necessary or repair harness.

Test No. 6 (Vacuum Pump Circuit)

1) When cruise system is in deceleration or release mode, battery voltage should be present on terminals No. 26 and 13 of cruise control unit. If circuit does not test correctly, replace vacuum pump as necessary or repair harness.

2) When cruise system is in release mode, battery voltage should be present on terminal No. 12 of cruise control unit. When cruise system is in hold mode, voltage on terminals No. 12, 13 and 26 will go from battery voltage to zero volts depending on driving conditions. If circuit does not test correctly, replace vacuum pump as necessary or repair harness.

Test No. 7 (Stoplight Switch Circuit)

When brake pedal is pressed, battery voltage should be present on terminal No. 15 of cruise control unit. If voltage is not present, adjust or replace brake switch. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 8 (Clutch Switch Circuit)

When clutch pedal is pressed, battery voltage should be present at terminal No. 1 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 9 (Inhibitor Switch Circuit)

When transmission is in Neutral position, battery voltage should be present on terminal No. 1 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair

harness.

Test No. 10 (Overdrive Switch Circuit)

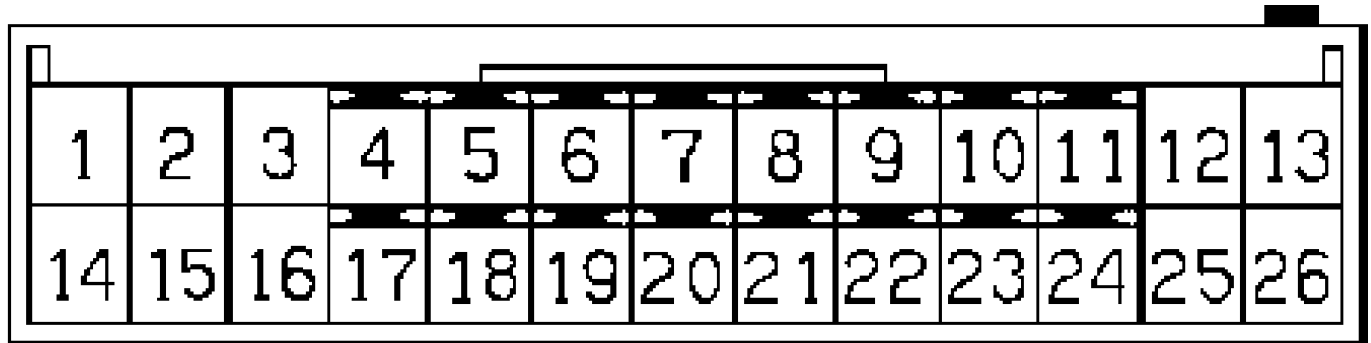
When overdrive switch is pushed to ON position, battery voltage should be present on terminal No. 11 of cruise control unit. If circuit does not test correctly, replace switch as necessary or repair harness.

Test No. 11 (Idle Switch & Throttle Position Sensor Circuit)

1) When accelerator pedal is pressed, 4.5-5.5 volts should be present on terminal No. 4 (idle switch) of cruise control unit. When accelerator pedal is released, voltage should not be present on terminal No. 4 of cruise control unit.

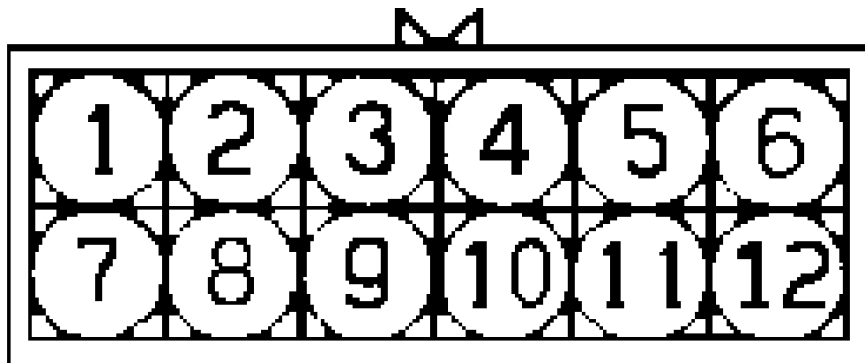
2) When accelerator pedal is pressed to wide open throttle, 4.0-5.5 volts should be present on terminal No. 5 (throttle position sensor) of cruise control unit. When accelerator pedal is released, .5-.7 volt should be present on terminal No. 5 of cruise control unit. If circuit does not test correctly, replace sensor as necessary or repair harness.

CRUISE CONTROL CONNECTOR ID



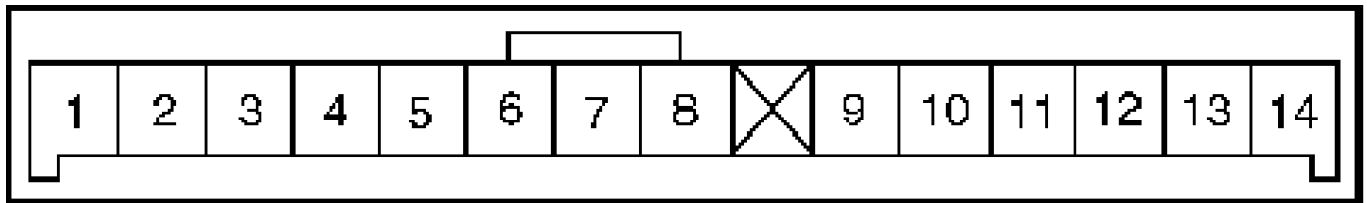
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Fig. 8: Cruise Control Unit Connector Terminal ID
Courtesy of Mitsubishi Motor Sales of America.



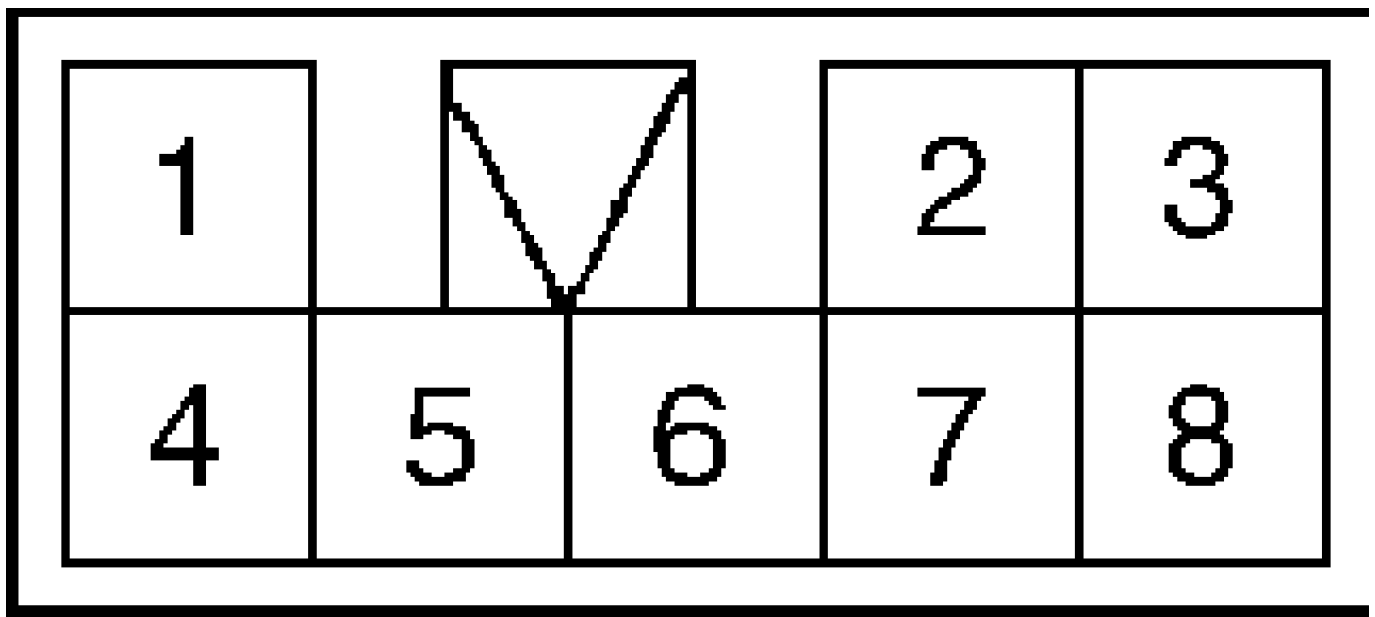
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Fig. 9: Main Cruise Control Switch Connector Terminal ID
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Fig. 10: Stoplight Switch Connector Terminal ID
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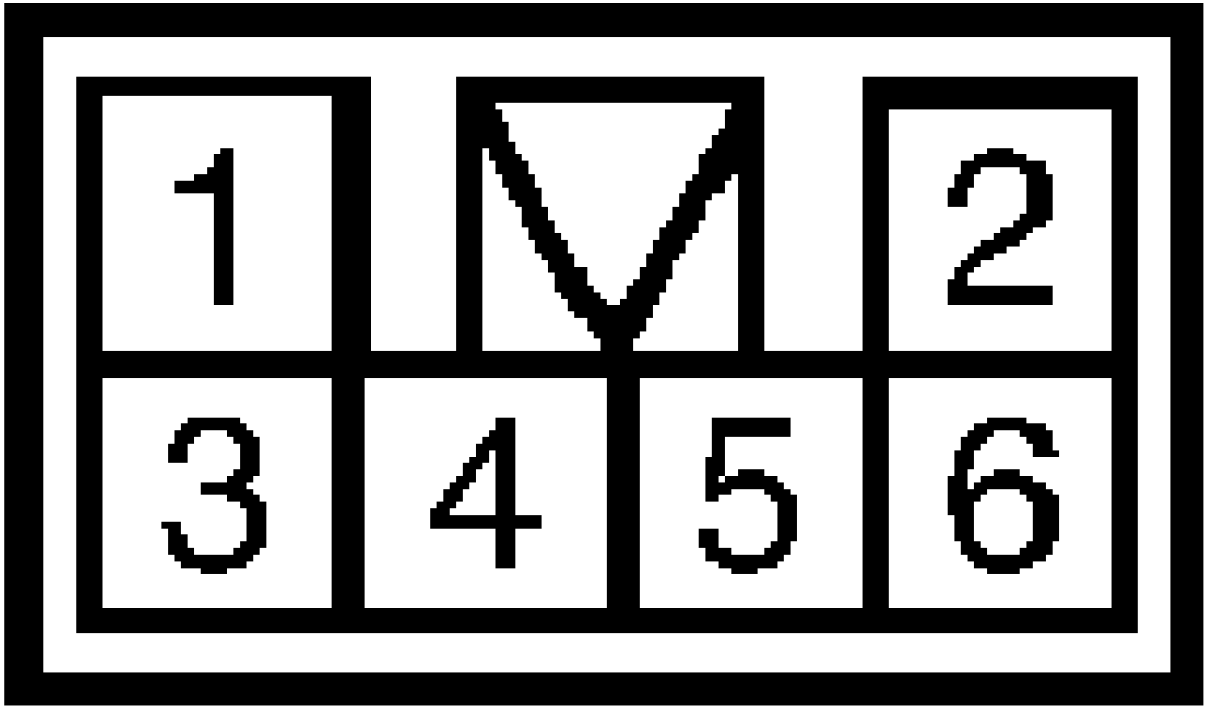
Fig. 11: Vacuum Pump Connector Terminal ID
 Courtesy of Mitsubishi Motor Sales of America.



OVERDRIVE SWITCH
 CONNECTOR

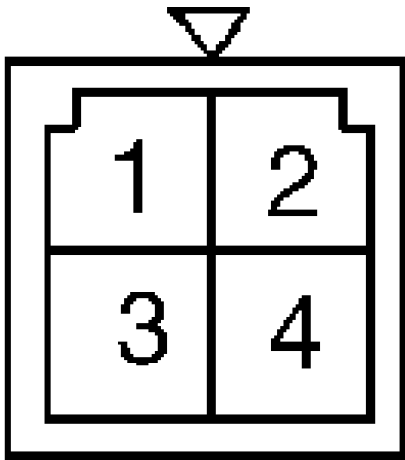
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Fig. 12: Instrument Cluster Connector Terminal ID
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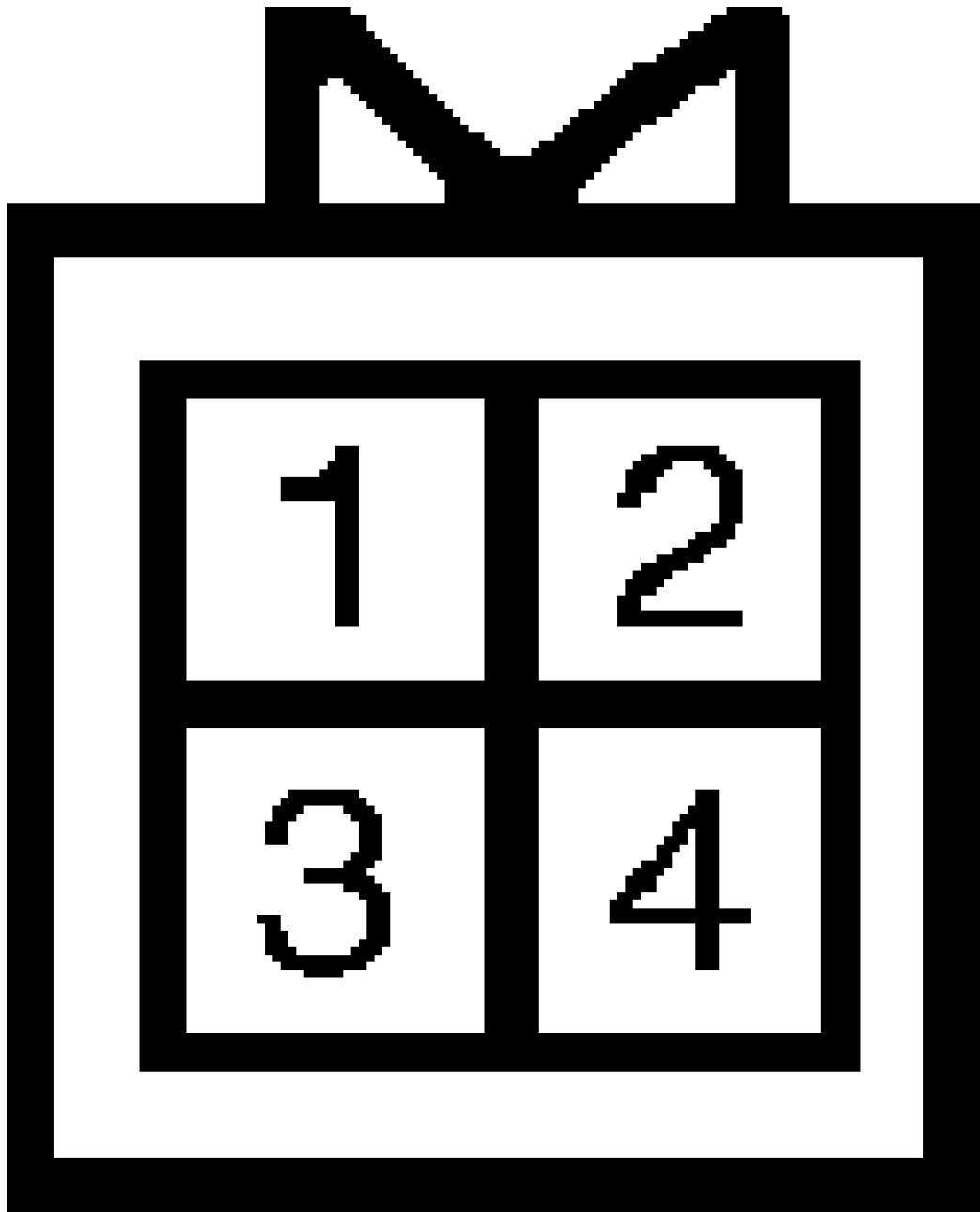
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Fig. 13: Overdrive Switch Connector Terminal ID
 Courtesy of Mitsubishi Motor Sales of America.



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Fig. 14: Inhibitor Switch Connector Terminal ID
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Fig. 15: Throttle Position Sensor & Idle Switch Connector Terminal ID
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CRUISE CONTROL SWITCH TESTS

Set & Resume Switches

1) Remove lower steering column cover. Disconnect 2-pin switch connector. Operate and test switch. When cancel switch is operated, continuity should be present between terminals No. 1 and 2. Zero ohms resistance should be indicated.

2) When resume switch is operated, 820 ohms resistance should be present between terminals No. 1 and 2. When set switch is operated, 2700 ohms resistance should be present between terminals No. 1 and 2. Replace cruise control switch if it does not test correctly.

Main Switch

1) In each switch position, continuity should be present between terminals No. 2 and 7 for switch illumination. See Fig. 9. When switch is moved to Neutral position, continuity should be present between terminals No. 1 and 4.

2) When switch is moved to ON position, continuity should be present between terminals No. 1, 4 and 5. Connect battery voltage to terminal No. 5 and ground terminal No. 4.

3) Battery voltage should be present on terminal No. 1 when main switch is moved to ON position. Replace switch if it does not test correctly.

BRAKELIGHT/STOPLIGHT SWITCH TEST

Disconnect switch connector. When brake pedal is pressed, continuity should be present between terminals No. 2 and 3. See Fig. 10. When brake pedal is released, continuity should be present between terminals No. 1 and 4. Replace switch if it does not test correctly.

IDLE SWITCH & THROTTLE POSITION SENSOR TESTS

Throttle Position Sensor

1) Disconnect sensor connector. Resistance between terminals No. 1 and 4 should be 3500-6500 ohms. Use an analog ohmmeter to measure resistance between terminals No. 1 and 3. See Fig. 15.

2) Slowly open throttle valve to wide open throttle. Resistance should change smoothly as throttle is opened. Replace throttle position sensor if it does not test correctly.

Idle Switch

1) Disconnect throttle position sensor connector. Continuity should be present between terminals No. 1 and 2 with accelerator pedal released. See Fig. 15. Continuity should not be present with accelerator pedal pressed.

2) If continuity is not present with accelerator released, loosen throttle position sensor mounting screw. Turn throttle position sensor completely clockwise. Recheck continuity. Replace throttle position sensor if idle switch does not test correctly.

INHIBITOR SWITCH TEST

Disconnect switch connector. Shift transaxle into Neutral and Park positions. Continuity should be present between terminals No. 7 and 12. See Fig. 14. If continuity is not present, adjust inhibitor switch. If switch is adjusted properly, replace switch.

VACUUM PUMP TEST

1) Remove vacuum pump connector. Resistance should be 50-60 ohms between terminal No. 1 and terminals No. 2 and 3. See Fig. 11. Ensure solenoid valve makes operating noise when battery voltage is

applied between terminal No. 1 and terminals No. 2 and 3.

2) If solenoid valve does not make noise, replace vacuum pump assembly. Apply battery voltage to terminals No. 1 and 4, motor should operate. Replace vacuum pump if motor does not operate.

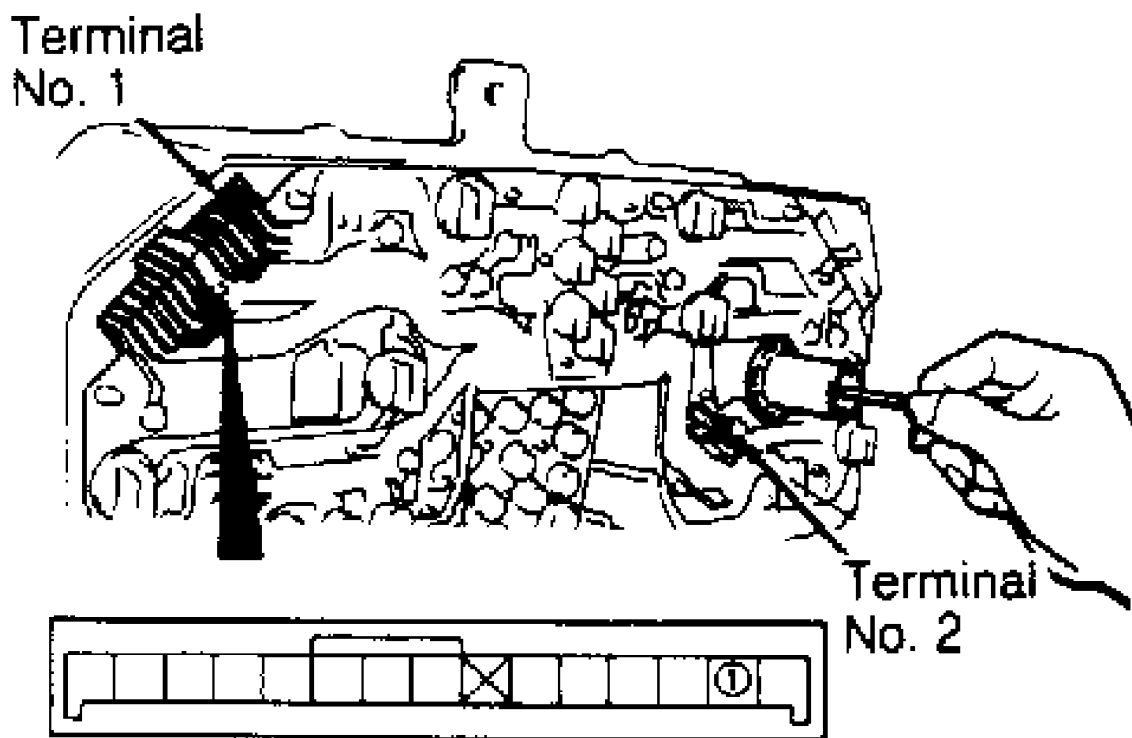
ACTUATOR TESTS

Remove actuator. Apply vacuum to actuator. Actuator linkage holder should move more than 1.38" (35 mm). Actuator diaphragm should hold vacuum. Replace actuator if actuator does not test correctly.

VEHICLE SPEED SENSOR TEST

1) Remove instrument cluster. See INSTRUMENT CLUSTER under REMOVAL & INSTALLATION. Check continuity between vehicle speed sensor terminals at instrument cluster. See Fig. 16.

2) Ensure continuity pulses on and off 4 times per revolution of speedometer shaft connection. If continuity is not as specified, replace vehicle speed sensor.



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Fig. 16: Checking Speed Sensor Circuit
Courtesy of Mitsubishi Motor Sales of America

REMOVAL & INSTALLATION

ACTUATOR

Removal & Installation

Disconnect cruise control cable from link. Disconnect actuator wiring connector. Remove vacuum pump and vacuum pump bracket. Remove actuator and actuator bracket. To install, reverse removal procedure.

CRUISE CONTROL SWITCH

Removal & Installation

Remove lower steering column cover. Disconnect electrical connectors. Remove screws attaching cruise control switch to steering column. Remove switch. To install, reverse removal procedure.

VEHICLE SPEED SENSOR

Removal & Installation

Remove instrument cluster. See INSTRUMENT CLUSTER. Speed sensor is a part of speedometer.

INSTRUMENT CLUSTER

Removal & Installation

Disconnect negative battery cable. Remove cluster cover. Disconnect speedometer cable. Remove instrument cluster. To install, reverse removal procedure.

CONTROL UNIT

Removal & Installation

Cruise control unit is located behind center of dash panel. Remove center trim panel and radio or radio plug bezel. Remove control unit. To install, reverse removal procedure.

WIRING DIAGRAMS

See appropriate chassis wiring diagram in the WIRING DIAGRAMS section.