

CRUISE CONTROL SYSTEM

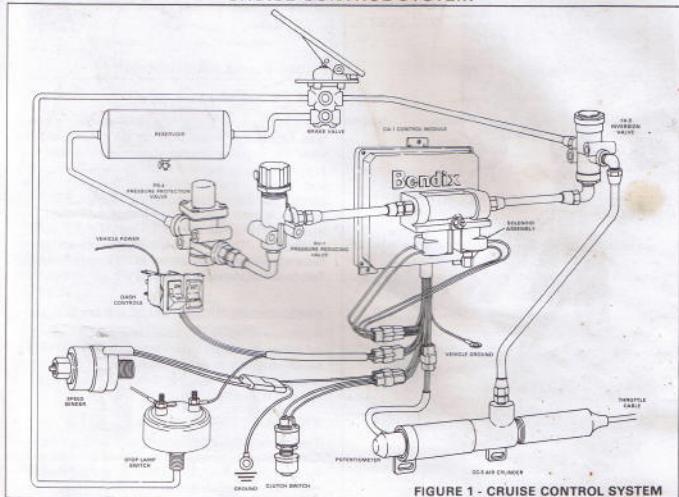


FIGURE 1 - CRUISE CONTROL SYSTEM

DESCRIPTION

Bendix Cruise Control is a driver controlled, automatic speed control system designed for use on heavy duty highway vehicles. It can be used on most popular diesel engines and any type of standard or automatic transmission.

The system incorporates the following standard features:

1. Set/Resume - permits vehicle speed to be set or to resume a previously set speed after disengagement.
2. Accelerate/Coast - permits vehicle speed increase or decrease with control switches.

In addition, the following optional features are available:

1. Top speed, Set limit - prevents Cruise Control System use above a preset maximum vehicle speed.
2. Throttle Control - provides control of the engine throttle position while the vehicle is stationary.

The Bendix Cruise Control System is available for either

12 volt or 24 volt electrical systems. The Cruise Control System is a combination of the following pneumatic and electronic components:

CA-1 CONTROL MODULE (Figure 2)

The CA-1 Control Module is a digital micro-computer that serves as the control center for the Cruise Control System.

The function of the module is to process vehicle speed information and control vehicle speed or throttle position commanding the solenoids to either increase or decrease air pressure to the CC-5 air cylinder.

The CA-1 Control Module is comprised of the electronic package, housed in a 5" x 7" steel case.

**Accelerate feature not available in early design models*

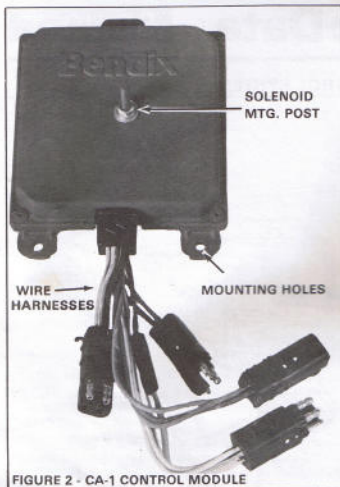


FIGURE 2 - CA-1 CONTROL MODULE

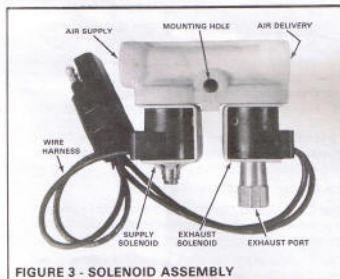


FIGURE 3 - SOLENOID ASSEMBLY

SOLENOID ASSEMBLY (Figure 3)

The solenoid assembly can either be mounted directly to the CA-1 module case or, in some cases, remotely mounted. The assembly employs two solenoids; one solenoid controls the inlet valve, the other controls the exhaust valve.



FIGURE 4 - CC-5 AIR CYLINDER

CC-5 AIR CYLINDER (Figure 4)

The CC-5 Air Cylinder is a die cast aluminum, piston type air cylinder which controls the throttle position while the cruise or throttle control is in operation. A potentiometer located at the end of the CC-5 monitors and reports throttle position to the CA-1 Control Module via the connecting wiring harness. The CC-5 Cylinder is approximately two inches in diameter and nine inches long with a single 1/4 inch N.P.T.F. air connection port. The end of the cylinder body and piston rod are threaded to accept the throttle cable assembly. Two mounting lugs are provided.

PRESSURE REDUCING VALVE (Figure 1)

A pressure reducing valve such as the RV-1 or RV-3 (60 psi delivery pressure) is installed between the vehicle air supply and the solenoid assembly. The 60 psi air pressure is necessary for proper operation of the solenoid assembly.

STOP LAMP SWITCH (Figure 1)

The vehicle's stop lamp switch is connected to the CA-1 Control Module. In addition to lighting the vehicle stop lights, it signals the CA-1 to disengage the Cruise Control when the service brakes are applied.

TR-3 INVERSION VALVE (Figure 1)

The TR-3 Inversion Valve is installed in the foot valve service delivery line and exhausts air from the CC-5 Air Cylinder each time a service brake application is made. This serves as a pneumatic back-up disengagement system and assures that no single point failure, either electrical or pneumatic, will allow the engine to overspeed after a brake application is made.

PRESSURE PROTECTION VALVE (Figure 1)

A pressure protection valve such as the PR-2 or PR-4 is installed in the air supply line to the Cruise Control System. It assures that brake system air pressure will not be excessively depleted should a pneumatic failure occur in the Cruise Control System. NOTE: The pressure protection valve is not required when the vehicle is equipped with a protected reservoir for the operation of auxiliary air devices.

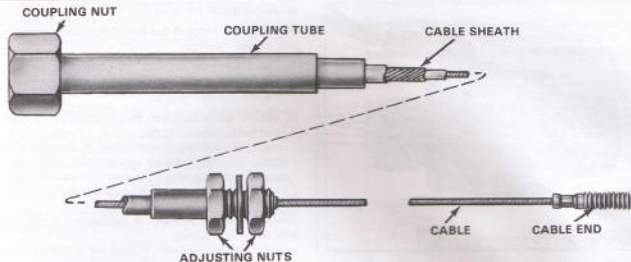


FIGURE 5 - THROTTLE CABLE ASSEMBLY

THROTTLE CABLE ASSEMBLY (Figure 5)

The throttle cable assembly links the CC-5 Air Cylinder to the engine throttle control. It permits the pull developed by the CC-5 to be transmitted to the engine throttle.

Both the cable and sheath incorporate a threaded nut for attachment to the CC-5. Various cable ends are incorporated for attachment to the throttle or its linkage.

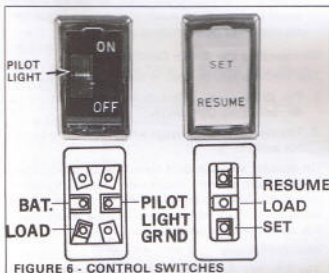


FIGURE 6 - CONTROL SWITCHES

CONTROL SWITCHES (Figure 6)

Two electrical switches, located within easy reach of the driver, are used to control the system. Control switch location and type may vary, however; two typical dash mounted rocker style switches are shown in Figure 1 & 6. The on/off switch supplies electrical power to the system and the set/resume switch controls the vehicle speed set and speed resume function.

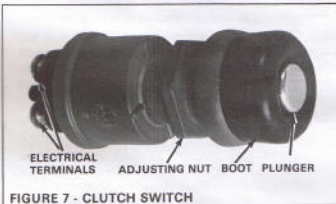


FIGURE 7 - CLUTCH SWITCH

CLUTCH SWITCH (Figure 7)

The clutch switch is utilized on vehicles with standard transmissions to disengage the Cruise Control System each time the clutch is depressed. The Cruise Control will re-engage at the previously selected speed when the clutch is released. This permits the driver to shift gears in the normal manner.

CAUTION:

DO NOT attempt to shift gears without using clutch when cruise control is engaged.

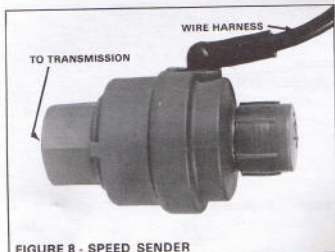


FIGURE 8 - SPEED SENDER

SPEED SENDER (Figure 8)

A speed sender is utilized to provide vehicle speed information to the CA-1 Control Module. One of two types of speed sensing equipment is generally used. One type is a unitized device which is installed in the transmission speedometer output. The other type is a sensor/rotor assembly installed in one of the vehicle's drive wheels.

SYSTEM OPERATION

General

The Cruise Control System may be turned on at any time; however, vehicle speed must be greater than 20 m.p.h. before the speed can be set. (The 20 m.p.h. minimum speed may vary due to tire size and rear-end ratio.)

CAUTION: THE CRUISE CONTROL SYSTEM SHOULD NOT BE USED IN HEAVY TRAFFIC OR WHEN ROAD SURFACES ARE SLIPPERY.

Setting Vehicle Speed

With the vehicle in motion, vehicle speed information is transmitted to the micro-computer within the CA-1 Control Module. Depressing and releasing the SET switch sets the vehicle speed. The micro-computer "memorizes" the vehicle speed the instant the switch is released. Supply air flows through the solenoid assembly and TR-3 Inversion Valve and enters the CC-5 Air Cylinder. Air pressure positions the CC-5 piston and engine throttle. Throttle position is transmitted to the CA-1 micro-computer via the potentiometer within the CC-5 Air Cylinder.

If the vehicle speed changes (due to road conditions, etc.), the system responds by increasing or decreasing air pressure to the CC-5 Air Cylinder and maintains the original set speed.

NOTE: If system incorporates the optional "Top Speed Set Limit" feature, a speed setting in excess of the pre-determined limit cannot be made.

Increasing the set speed

A previously selected set speed may be increased by one of two methods.

1. The driver may depress the accelerator pedal until the desired speed is attained and again depress and release the SET switch.
2. Vehicle speed may also be increased by depressing and holding the RESUME switch. The vehicle will accelerate at the rate of approximately 1 m.p.h. per second until the desired speed is reached and the switch released.

Decreasing the set speed

There are two methods of decreasing a previously selected speed setting.

1. The driver may disengage the Cruise Control by "tapping" the service brake (making a slight service brake application). The vehicle will coast after disengagement and when the desired lower speed is attained, a new speed setting is obtained by depressing the SET switch.
2. Vehicle speed may also be decreased by depressing and holding the SET switch. While the SET switch is depressed the vehicle will coast. When the desired speed is reached, the switch is released and the new set speed will be maintained.

Disengaging the Cruise Control

Two methods may be used to disengage the system.

1. The Cruise Control System may be turned off by depressing the OFF switch.
2. The system will disengage when the service brakes are applied.

On vehicles with standard transmission, a temporary system disengagement occurs when the clutch pedal is depressed. The system will automatically re-engage when the clutch is released, provided the vehicle speed has not dropped below 20 m.p.h.

Resume feature

The RESUME switch may be used to return the vehicle to its previous speed setting after a service brake application has disengaged the system provided that:

1. the vehicle speed is above 20 m.p.h. This will vary with tire size and gear ratios.
2. the electrical power has not been interrupted prior to using the RESUME switch.

Stationary Throttle Control

This optional feature permits the operator to increase or decrease engine R.P.M. with the vehicle parked. Bus systems will not have this option available.

The throttle position is increased by repeatedly depressing and releasing the RESUME switch and is reduced by using the SET switch in the same manner. Each time the RESUME or SET switch is depressed the throttle position increases or decreases.

The throttle control may be permanently disengaged by one of two methods.

1. by depressing the clutch (standard transmission vehicles).
2. turning the system off.

PREVENTIVE MAINTENANCE

Every three months, 25,000 miles, or 900 operating hours:

1. Inspect the CC-5 Air Cylinder for secure mounting.
2. Remove accumulated grime from the outside of the CC-5 Air Cylinder with particular attention to the three body vents (Figure 9).
3. Remove accumulated grime from the exterior of the solenoid assembly.
4. Visually inspect the throttle cable and cable end for fraying or wear. Replace if necessary.
5. Inspect the throttle cable hardware for secure mounting.
6. Visually inspect the system wiring and connectors for deterioration or wear.
7. Perform the system operation and road test.

Every year, 100,000 miles or 3,600 operating hours, remove, repair or replace and test the following components:

1. TR-3 Inversion Valve (refer to Service Data Sheet SD-03-65).
2. RV-1 Reducing Valve (refer to Service Data Sheet SD-03-60).
3. PR-2 or PR-4 Pressure Protection Valve (refer to Service Data Sheet SD-03-55).
4. CC-5 Air Cylinder.
5. Solenoid Assembly.

OPERATING AND LEAKAGE TESTS

NOTE: To properly test the solenoid assembly and CC-5 Air Cylinder, remove from the vehicle and bench test. A volt-ohmmeter is required to perform the tests.

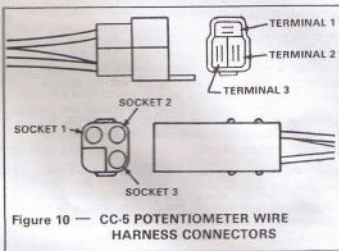


Figure 10 — CC-5 POTENTIOMETER WIRE HARNESS CONNECTORS

Refer to Figure 10 and determine which type of connector is installed on the potentiometer wire assembly. Release all air pressure from the CC-5. With a volt-ohmmeter, perform the following tests:

1. Check the resistance between sockets or terminals 1 and 3. Resistance should be 3600-4400 ohms.
2. Check the resistance between sockets or terminals 2 and 3. Resistance should be 1080-1320 ohms.
3. Check the resistance between sockets or terminals 1 and 2. Resistance should be 4320-5280 ohms.
4. Apply air pressure to the CC-5 cylinder. With the volt-ohmmeter connected to sockets or terminals 2 and 3, slowly raise the pressure from 0-60 psi. Resistance should increase smoothly as the piston strokes. If the meter needle wavers or "jumps", the potentiometer is faulty and must be replaced.

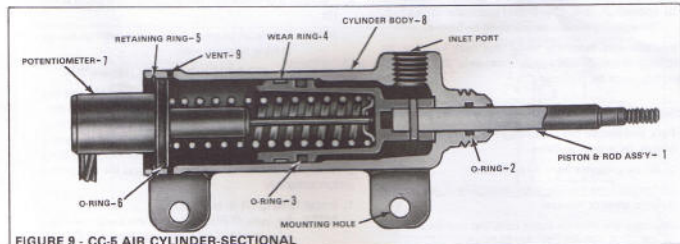


FIGURE 9 - CC-5 AIR CYLINDER-SECTIONAL

CC-5 AIR CYLINDER (Figure 9)

Connect an adjustable air regulator and gauge between an air source and the inlet port of the CC-5 Air Cylinder. Raise and lower the air pressure between 0 and 60 psi several times, noting that the piston rod (1) extends and retracts smoothly. With 60 psi applied to the CC-5, ap-

ply a soap solution around the piston rod (1) and the body vents (9). Total leakage should not exceed a one inch soap bubble in less than five seconds.

The air connections should remain in place when performing the electrical tests.

If the CC-5 Cylinder does not function as described or leakage is excessive, it is recommended that it be replaced with a new or remanufactured unit or repaired with genuine Bendix parts. (A maintenance kit which contains all necessary parts is available.)

SOLENOID ASSEMBLY

To test the solenoids, a source of power (such as a battery) will be needed. Check to make certain that the proper voltage is used. (Some vehicles utilize dual voltage systems; i.e., 24 volt for starting, 12 volt for system power.)

To confirm solenoid power requirements, check the solenoid wire leads; black wires indicate 12 volt, red and black wires indicate 24 volt.

Connect a 60 psi air source to the supply port and install a gauge in the delivery port.

1. With 60 psi applied to the supply port, apply a soap solution to the exhaust port. Leakage should not exceed a 1" bubble in less than five seconds.
2. Simultaneously, apply positive (+) power to terminals or pins 3 and 4, and negative (-) power to terminals or sockets 1 and 2. With power applied note that 60 psi is registered on the gauge installed in the delivery port.
3. Continue to apply power (Step 2) and apply a soap solution to the exhaust port, the exterior of the body and around solenoid coils. Leakage should not exceed a 1" bubble in less than five seconds at the exhaust port. No leakage permitted elsewhere.
4. Remove the electrical power from the solenoid terminals, sockets, or pins.
5. Connect a volt-ohmmeter to: (Refer to Figure 11)
 - a) socket 1 and pin 4 or terminals 1 and 4. Resistance should be 19-25 ohms for a 12 volt solenoid assembly or 90-110 ohms for a 24 solenoid assembly.
 - b) socket 2 and pin 3 or terminals 2 and 3. (Resistance should be same as in Step a).

If the solenoid assembly does not test/function as described above or leakage is excessive, the solenoid assembly must be replaced.

REMOVING THE CC-5 AIR CYLINDER (Figure 9)

1. Park and secure the vehicle by means other than air brakes on a level surface.
2. Drain air pressure from all reservoirs.
3. Disconnect the throttle cable assembly at the engine throttle lever or linkage.
4. Unscrew the throttle cable coupling nut on the end of the CC-5 throttle cylinder body (8).
5. Unscrew the cable nut at the end of the piston and rod assembly (1).
6. Disconnect the air inlet line.
7. Disconnect the electrical connector for the potentiometer assembly (7).

8. Remove the two mounting screws and remove the CC-5 from the vehicle.

NOTE: Maintenance Kit P.c. No. 102315 containing all parts necessary for minor rebuild is available at Bendix H.V.S.G. outlets.

DISASSEMBLY - CC-5 AIR CYLINDER (Figure 9)

1. Remove and discard retaining ring (5).
2. Remove and retain the potentiometer assembly (7).

CAUTION Do not apply force to end of potentiometer plunger and spring assembly.
3. Remove and discard O-Ring (6) from potentiometer assembly (7).

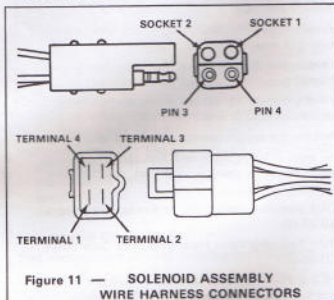


Figure 11 — SOLENOID ASSEMBLY WIRE HARNESS CONNECTORS

4. Push the piston and rod assembly (1) out of the body (8).
5. Remove and discard O-Ring (3) and wear ring (4) from the piston assembly (1).
6. Remove and discard O-Ring (2) from the CC-5 body (8).

NOTE: This is an internal O-Ring and will require an O-Ring removal tool.

ASSEMBLY - CC-5 AIR CYLINDER (Figure 9)

Prior to assembly, the piston and rod assembly and the body should be cleaned with mineral spirits. Make certain the vent holes (9) in the body (8) are open. Using Bendix lubricant 291126 (Dow Corning 55M furnished in maintenance kit), lubricate all O-Rings, O-Ring grooves, the piston bore in the body and the rod of the piston assembly.

1. Install O-Ring (2) in body (8).

NOTE: Be sure O-Ring (2) and the body are well lubricated before installing. Bend the O-Ring in half and insert it into the body. Using the "dulled" point of a wooden pencil, push part of the O-Ring into the groove in the body (use care not to damage the O-Ring). Using the eraser end of the pencil, push the balance of the O-Ring into the body groove. The O-Ring should "slide" into the groove.

2. Install O-Ring (3) and wear ring (4) on piston and rod assembly (1).
3. Install piston and rod assembly (1) in body (8), taking care not to damage O-Rings (2 and 3).
4. Install O-Ring (6) on potentiometer assembly (7).
5. Install potentiometer assembly (7) in body (8) and install retaining ring (5). Make sure that retaining ring (5) is completely seated in its groove in the body. (8).
6. Perform operating and leakage tests prior to re-installing the CC-5 air cylinder assembly.

INSTALLATION - CC-5 AIR CYLINDER (Figure 9)

1. Install two mounting screws and reconnect the potentiometer (7) electrical connector. Mounting screw torque not to exceed 125 inch pounds.
2. Reconnect the air line to the cylinder body (8).
3. Reconnect the cable nut to the piston rod assembly (1). Torque not to exceed 100 inch pounds.
4. Reconnect the cable coupling nut to the end of the CC-5. Torque not to exceed 125 inch pounds.
5. Reconnect the cable assembly at the engine throttle lever or linkage bracket. Using the adjusting nuts shown in Figure 12, adjust the throttle cable so that it is taut when the accelerator pedal is released. Cable nut torque not to exceed 175 inch pounds.

CAUTION: The cable must be taut; however, the engine throttle should remain closed and in the idle position. In cab over engine trucks, the cable should be adjusted so that it is taut when the cab is down and locked.

6. Start the engine and build up the air pressure.

NOTE: If the Cruise Control system has the throttle control feature, it is recommended that it be operated and checked for proper operation. Refer to the Throttle Control Section of "System Operational Check."

SYSTEM OPERATIONAL CHECK

If the Cruise Control System or any of its features are not used regularly, the operational check and road test should be performed monthly.

Throttle Control

Throttle control is an optional feature not incorporated in all Cruise Control Systems. Check the vehicle handbook or specification sheet to determine if the vehicle is equipped with this feature before testing for proper function.

With the vehicle out of gear and clutch released (engaged) and parked (not using the service brakes), turn the Cruise Control System on.

1. RESUME

Depressing and releasing (clicking) the RESUME switch will cause the throttle to advance. It takes several "clicks" before the throttle will begin to advance. Each "click" will advance the throttle a fixed increment.

2. SET

Depressing and releasing the SET switch will retract the throttle a fixed increment.

3. Brake

With the throttle set at 1500 r.p.m., make and hold a service brake application and note that engine r.p.m. will drop back to idle. When the brake application is released, the throttle control will bring engine r.p.m. back to 1500 r.p.m.

NOTE: While the brakes are applied, the solenoids can be heard opening and closing (clicking). The "clicking" will slow down and stop after the engine r.p.m.'s regain the original setting (1500 r.p.m.).

4. Clutch

On vehicles equipped with standard transmission, depress and release the clutch and note that the throttle control setting is disengaged permanently.

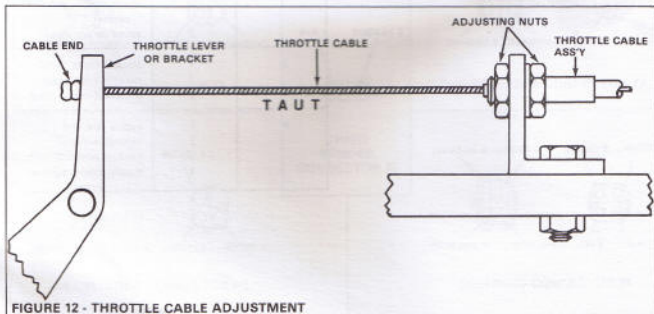


FIGURE 12 - THROTTLE CABLE ADJUSTMENT

ROAD TESTING THE SYSTEM

Select a road where traffic and weather conditions will safely permit the road test to be performed. **CAUTION: CRUISE CONTROL SHOULD NOT BE USED ON WET OR SLIPPERY ROADS.**

1. With a vehicle speed of 40 m.p.h., turn the system on.
2. Activate the SET switch to establish a speed setting. (Vehicle speed must be greater than 20 m.p.h.) Vehicle speed should be maintained within one (1) m.p.h. of speed setting.
3. Apply the brake and allow vehicle to coast down to less than 20 m.p.h. Depress and release the RESUME switch. The original vehicle speed should not be resumed.

NOTE: On vehicles with standard transmission, Cruise Control System should temporarily disengage each time clutch is depressed.

4. Accelerate vehicle to 30 m.p.h. and activate RESUME switch; vehicle should automatically accelerate to original set speed (40 m.p.h.).
5. When vehicle has reached its set speed of 40 m.p.h., depress the clutch and allow the vehicle to coast to less than 20 m.p.h. Release the clutch. The original vehicle speed should not be resumed.
6. Repeat Step 4 and proceed to Step 7.
7. Depress and hold RESUME switch in. Vehicle speed should increase at approximately 1 m.p.h. per second. Release RESUME switch at 50 m.p.h. This should establish a new set speed of 50 m.p.h.
8. Depress and hold SET switch and allow vehicle to coast down to 40 m.p.h. and release switch. This should establish a new set speed of 40 m.p.h.

IMPORTANT: If the road test indicates system is not operating as described, system should not be used until it has been repaired, tested and proven to be operating properly.

TROUBLESHOOTING (Figure 13)

The purpose of this troubleshooting manual is to assist you to quickly locate the cause of system malfunction. It is strongly recommended that a complaint of system malfunction be confirmed by performing the road test procedure. This will minimize the possibility of unnecessary work being done due to a lack of understanding of how the system is designed to operate.

Before beginning the checks, visually inspect all electrical wiring, connectors, air lines and components for obvious damage, corrosion, etc.

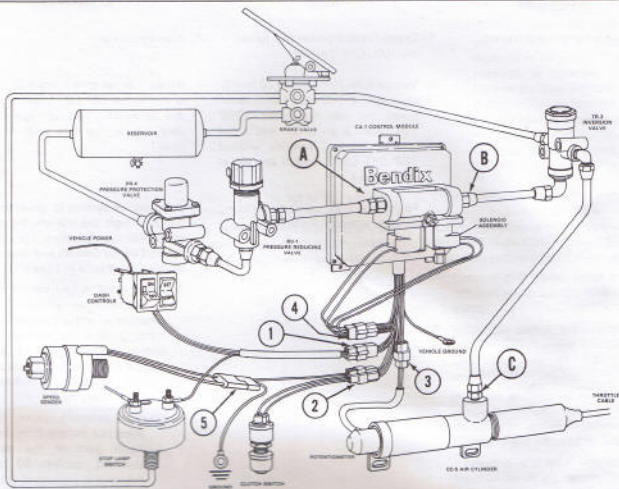
Electrical tests section can be performed with a volt-ohmmeter. The electrical tests described in this section are to be performed on the wiring connectors attached to system components and not the connectors leading to the CA-1 Control Module. The connectors illustrated in Figure 13 are connectors leading to the system components.

Before proceeding with the electrical tests, determine if the cruise control system is designed for 12 or 24 volt electrical power. Identification can be made as follows:

Red and black solenoid lead wires = 24 volt system
Black solenoid lead wires = 12 volt system

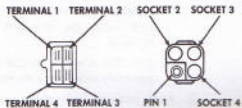
The following component connector identification chart should be of additional help when used in conjunction with Figure 13

CONNECTOR NO.	TERMINAL, SOCKET, OR PIN	CIRCUIT
1	1	SET switch
	2	RESUME switch
	3	vehicle electrical power
	4	stop lamp switch
2	1	clutch switch
	2	clutch switch electrical power
	3	speed sensor input
3	1	potentiometer supply
	2	potentiometer wiper
	3	potentiometer ground
4	1	supply solenoid
	2	exhaust solenoid
	3	exhaust solenoid power
	4	supply solenoid power

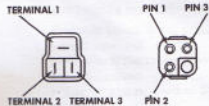


BENDIX CRUISE CONTROL SYSTEM

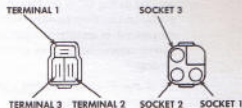
FIGURE 13 - COMPONENT CONNECTOR IDENTIFICATION



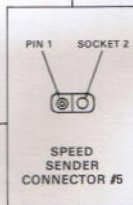
CONTROL CONNECTOR #1



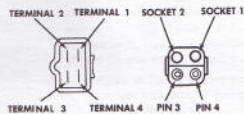
INHIBIT/SPEED CONNECTOR #2



AIR CYLINDER CONNECTOR #3



**SPEED
SENDER
CONNECTOR #5**



SOLENOID CONNECTOR #4

I. Cruise Control will not set.

1. Cruise Control power not turned on. (ON/OFF Switch)
 2. Vehicle speed was below 20 m.p.h. or above its TOP SET LIMIT when speed set was attempted. (TOP SET LIMIT is an option and is not on all vehicles. Vehicles without TOP SET LIMIT option can set at any speed.)
 3. Faulty RV-1 air pressure reducing valve or solenoid assembly.
1. Turn system on.
 2. Attempt to set speed above 20 m.p.h. or below the TOP SET LIMIT. (NOTE: the 20 m.p.h. minimum speed may vary due to tire size and rear end ratio.)
 3. Build the air system to governor cut-out and park the vehicle by means other than the air brakes. Turn off the Cruise Control System and disconnect wiring connector 4 in Figure 13.
 - A. Apply positive (+) vehicle power to terminal or socket 1, and negative (-) vehicle power to terminal or pin 4. An audible "click" should be heard and air should escape out the exhaust port on the exhaust solenoid. If exhaust is heard, proceed to B.
 - (1) If the solenoid "clicks" but air does not escape from the exhaust port of the exhaust solenoid, confirm 60 psi air pressure is present at fitting A in Figure 13. If 60 psi air pressure is present, the solenoid assembly is faulty and must be replaced. If 60 psi air pressure is not present, the connecting air lines are at fault and must be replaced or repaired.
 - (2) If no click is heard, the solenoid assembly must be replaced.
 - B. Apply positive (+) vehicle power to terminals or pins 3 and 4 and negative (-) vehicle power to terminals or sockets 1 and 2 simultaneously. Both solenoids should "click" (open inlet, close exhaust) and air pressure should be applied to the CC-5 Air Cylinder as evidenced by throttle movement. If movement is detected, reconnect wiring connector 4 and continue testing.
 - (1) If the throttle does not move, test for air pressure at fittings B and C in Figure 13. If air pressure is detected at B but not at C, the TR-3 inversion valve or its connecting air lines

4. (Standard transmission vehicles.) Clutch pedal not fully released (out) or clutch switch not properly adjusted in relation to clutch pedal or faulty clutch switch or wiring.

4. Clutch switch is normally open type (allows current to flow when switch is depressed or vehicle clutch is engaged). Turn Cruise Control System power on before making these tests.

A. Confirm that clutch pedal is fully released and in contact with clutch switch.

B. With the clutch out (released), confirm vehicle power is present at both terminals of the clutch switch.

If power is detected at both terminals turn Cruise Control off and disconnect wiring connector 2 in Figure 13 and proceed to Step D.

If power is detected at only one terminal of the clutch switch, depress the switch manually and check for power at both terminals again. If power is detected at both terminals when the switch is manually operated, the switch requires adjustment; if not, the switch is faulty and must be replaced.

If vehicle power is not detected at either terminal of the clutch switch, turn the Cruise Control off and disconnect connector 2 in Figure 13 and proceed to Steps C and D.

C. Check resistance across the two terminals of the clutch switch. Resistance should be below 2 ohms if switch is O.K.

D. Check wiring into and out of the clutch switch by testing resistance across terminals or pins 1 and 2 of connector 2, Figure 13. Resistance should be less than 5 ohms.

If no problem is found during these tests, reconnect connector 2 and proceed to the next cause.

are at fault and must be repaired or replaced. If no air pressure is detected at B, replace the solenoid assembly. If air pressure is detected at C, visually inspect for damage to the CC-5 Air Cylinder and the throttle cable. Check for binding.

SYMPTOM

CAUSE

REMEDY

5. Vehicle's air brake stop lamp switch is closed. (Stop lamps at rear of vehicle on.) Faulty stop lamp switch or brake application air pressure is trapped.
5. Build air pressure in all reservoirs to 100 psi. With vehicle power on, apply and **release** the air brakes. Park vehicle by blocking the wheels.
- A. Test for vehicle power at both terminals of the stop lamp switch. If power is detected at both terminals, check for air pressure trapped beneath stop light switch.
- (1) If air pressure is present, find cause and repair.
- (2) If no air pressure is present, the stop lamp switch is faulty, and must be replaced.
6. SET switch is shorted to power or grounded continuously. The SET switch is a normally open switch. (Power will not flow through it when it is not activated.)
6. With the vehicle parked and the Cruise Control System turned on, disconnect wiring connector 1 in Figure 13.
- A. Confirm power between terminal or pin 1 of the connector and vehicle ground. If power is detected, the switch is faulty. If no power is detected, proceed to Step B.
- B. Depress and hold the SET switch and confirm vehicle power between terminal or pin 1 and vehicle ground. If power is detected, proceed to next cause. If no power, proceed to Step C.
- C. Confirm vehicle power at the output side of the SET switch while holding it depressed. If power is detected, the wire to the connector is faulty and the wiring harness must be replaced. If no power is detected, the switch is faulty and must be replaced.
7. Inoperative, faulty or improperly adjusted speed sender or faulty wiring.
7. Disconnect wiring connector 2 in Figure 13 and jack up the vehicle drive wheels, block other wheels. Shift the transmission to neutral and release the parking brakes.
- A. Check resistance between vehicle ground and pin or terminal 3 of the connector. Resistance should be between 250 and 3000 ohms. If not, the speed sender or wiring is shorted or open. Proceed to B.

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- B. Using a "jumper" wire ground pin or terminal 3 of connector #2, disconnect connector #5 and with a volt-ohmmeter, individually check the resistance between vehicle ground and pin #1 and socket #2 of the wire harness half of connector #5. If resistance is greater than 10 ohms in either check, replace wiring between connectors #2 and 5. If less than 10 ohms, proceed to C. (Refer to Figure 13.)
- C. Check the speed sender output with a volt-ohmmeter set on the lowest DC voltage scale and its leads on pin #1 and socket #2 of the speed sender half of connector #5. Rotate drive wheels and note that meter needle is deflected from one side of 0 to the other. If needle deflection is noted, proceed to Cause 8. If not, proceed with 1 or 2 below.
- (1) If speed sender is transmission mounted, check sender drive tang condition and make certain tang is fully engaged in sender and transmission driven gear. Repeat Test C and if no needle deflection is noted, replace speed sender.
- (2) If speed sender is located in wheel, readjust sender and repeat Test C. If no needle deflection is noted, replace speed sender.
8. Electrical power not reaching CA-1 Control Module.
8. A. Check the fuse or circuit breaker and wiring and replace as necessary.
- B. With the Cruise Control System turned on, check for vehicle power at each of the ON/OFF switch terminals. If vehicle power is detected to one terminal only, the switch is faulty.
- C. Disconnect wiring connector 1 in Figure 13 and confirm vehicle power at terminal or socket 3. If power is not detected, the wire harness is faulty and should be replaced.

SYMPTOM

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D. Turn the Cruise Control System off and check the resistance between the CA-1 Control Module ground wire and vehicle ground. 0 ohms should be read. Disconnect wiring connector 3 and check resistance between socket 3 and the CA-1 ground wire. 0 ohms should be read. If resistance is noted in either test, the Control Module should be replaced.

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|---|--|---|
| <p>II. The Cruise Control System "drops out" of the cruise mode by itself and speed must be reset.</p> | <p>9. Faulty CA-1 Control Module.</p> | <p>9. If the source of the problem was not located in the preceding tests, replace the CA-1 Control Module.</p> |
| | <p>1. Stop lamp switch or wiring is shorting to power causing a false brake signal to the CA-1 Control Module (i.e.: when the vehicle hits a bump.)</p> | <p>1. Replace stop lamp switch and inspect wiring. Replace as necessary. See Symptom I Cause and Remedy 5 for confirmation tests.</p> |
| | <p>2. Intermittent power to CA-1 Control Module.</p> | <p>2. Inspect power wiring and ON/OFF switch and replace as necessary. See Symptom I Cause and Remedy 8 for confirmation tests.</p> |
| | <p>3. Faulty or improperly adjusted speed sensor or faulty wiring.</p> | <p>3. Perform confirmation tests as outlined under Symptom I Cause and Remedy 7.</p> |
| | <p>4. Faulty CA-1 Control Module.</p> | <p>4. If the source of the problem was not located in the preceding tests, replace the CA-1 Control Module.</p> |
| <p>III. The Cruise Control System intermittently "drops out" of the cruise mode but resumes original speed or close to it. (Does not require resetting the system manually.)</p> | <p>1. (Standard transmission vehicles.) Faulty or improperly adjusted clutch switch or shorting wire. When vehicle vibrates, the clutch switch is activated.</p> | <p>1. See Symptom I Cause and Remedy 4 for confirmation tests.</p> |
| | <p>2. SET switch has internal mechanical fault.</p> | <p>2. Replace SET switch. See Symptom I Cause and Remedy 6 for confirmation tests.</p> |
| | <p>3. Faulty CA-1 Control Module.</p> | <p>3. If the source of the problem was not located in the preceding tests, replace the CA-1 Control Module.</p> |
| <p>IV. Cruise Control System "drops out" of a smooth control and begins oscillating above and below the speed setting but returns to a "smooth" control mode by itself. (The system should hold a speed setting with a ± 1 m.p.h. variation on a level highway.)</p> | <p>1. Intermittent shorting or breaking of the CC-5 potentiometer or wiring.</p> | <p>1. Inspect for faulty wiring. Replace potentiometer. See Symptom V Cause and Remedy 3 for confirmation tests.</p> |

SYMPTOM

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- V. Cruise Control System oscillates above and below the speed setting. Will not hold a specific speed setting within plus or minus 1 m.p.h. on level highway.
2. Faulty CA-1 Control Module or its wiring.
 1. Bobtail tractor with speed setting of less than 35 m.p.h.
 2. CC-5 Air Cylinder installed improperly.
 3. CC-5 potentiometer or its wiring is defective.
 4. Speed sensor defective or improperly adjusted.
 5. CA-1 Control Module faulty.
2. If the source of the problem was not the potentiometer or its wiring, replace the CA-1 Control Module.
1. Cruise Control System will oscillate around the speed setting under these conditions. These conditions pertain only to a tractor without a trailer. Raise the speed setting above 35 m.p.h., conditions permitting, or turn off speed control.
2. Check the travel of the throttle cable in relation to the full travel of the engine throttle. The CC-5 should increase engine r.p.m. from idle to governed r.p.m. in **not less** than 1-1/4". (See Figure 12.)
3. Visually inspect for broken or obviously damaged wiring to the CC-5 potentiometer (Figure 13). Disconnect wiring connector 3 in Figure 13 and check the resistance between the sockets or terminals shown:
- | Sockets/Terminals | Resistance |
|-------------------|----------------|
| 1 and 3 | 3600-4400 ohms |
| 2 and 3 | 1080-1320 ohms |
| 1 and 2 | 4320-5280 ohms |
- If these readings are not obtained, replace the CC-5 potentiometer.
3. Visually inspect for broken or obviously damaged wiring to the CC-5 potentiometer (Figure 13). Disconnect wiring connector 3 in Figure 13 and check the resistance between the sockets or terminals shown:
 4. Disconnect wiring connector 2 and test sensor output as described in Remedy 7 under Symptom #1, "Cruise Control will not set."
 5. If the cause of the problem was not located in the previous tests, replace the CA-1 Control Module.
1. Visually inspect and repair or replace as necessary.
2. Check all air lines for kinks, bends or damage which could slow air flow. Inspect the air lines, RV-1 reducing valve, solenoid assembly, TR-3 inversion valve and pressure protection valve (if used) for excessive contamination.
1. Bent, kinked or damaged throttle cable assembly.
2. Obstructed air flow to CC-5 Air Cylinder.
- VI. The Cruise Control System is sluggish in response when the speed is set or the acceleration or coast features are used.