

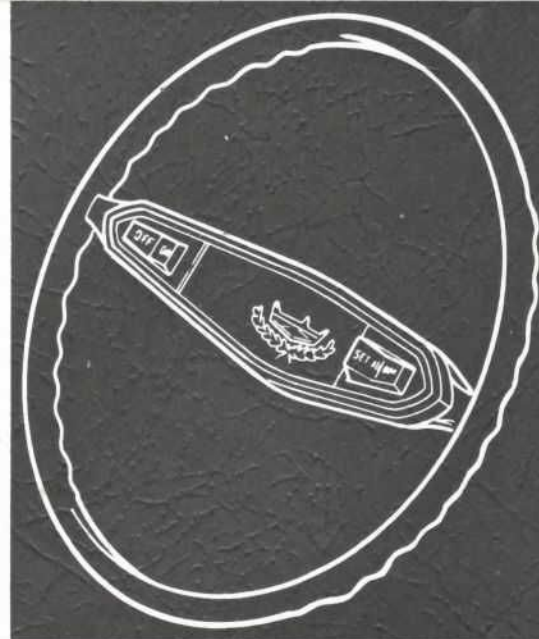
HANDBOOK 17006

# BENDIX SPEED CONTROL

## OPERATION, DIAGNOSIS and ADJUSTMENT



VOL. 69 S8 L2



# BENDIX SPEED CONTROL—OPERATION, DIAGNOSIS, ADJUSTMENT

## HANDBOOK 17006

### VOL. 69 S8 L2

# TABLE OF CONTENTS

<b>INTRODUCTION</b>	<b>Page</b>
<b>DESCRIPTION and OPERATION</b> .....	1
Sensor .....	1
Throttle Actuator .....	1
Amplifier .....	2
On Button .....	2
Off Button .....	3
Set-ACC Button .....	3
Coast Button .....	4
Accelerating the Car .....	4
 <b>DIAGNOSIS and ADJUSTMENT</b> .....	 4
Operational Test .....	4
Test for Power to Controls .....	6
Testing Stoplight Circuit .....	6
Throttle Actuator Bead Chain Adjustment .....	6
Actuator Lever and Throttle Linkage Check .....	7
Tests for Vacuum .....	7
Circuit Connector Functions .....	8
Circuit Tests .....	9
Component Tests .....	10
Diagnosis Charts .....	11

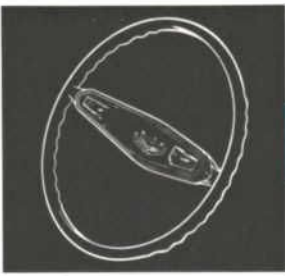
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## INTRODUCTION

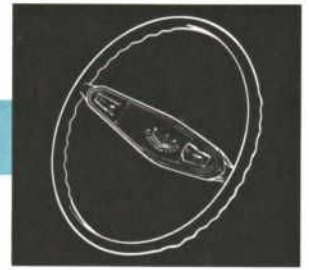
### INTRODUCTION

The Bendix design speed control is used for the first time in 1969 Ford, Mercury and Meteor cars.

This speed control handbook describes how the new speed control operates; the locations and functions of components; the complete diagnosis procedure and repair methods for the operating controls.

The speed control system components are serviced only as units, and the diagnosis tests are simple and well-detailed to simplify trouble-shooting and repair of this system.

## DESCRIPTION AND OPERATION



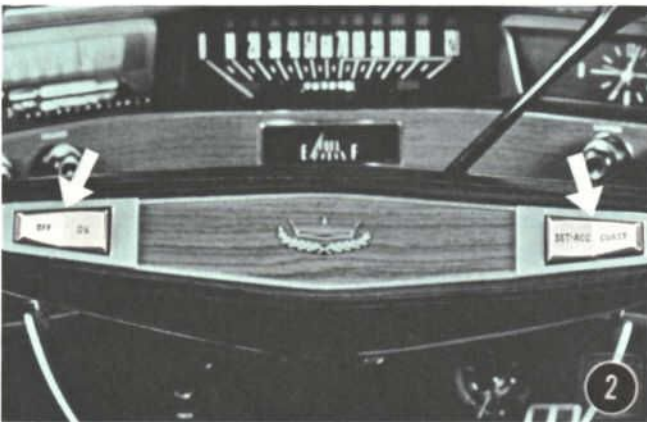
### DESCRIPTION AND OPERATION

The operation of the Bendix Speed Control is similar to other speed controls. It allows the operator to select a road speed between 30 and 80 miles per hour and have the speed maintained automatically. Its components, however, are all new to Ford Motor Company vehicles.

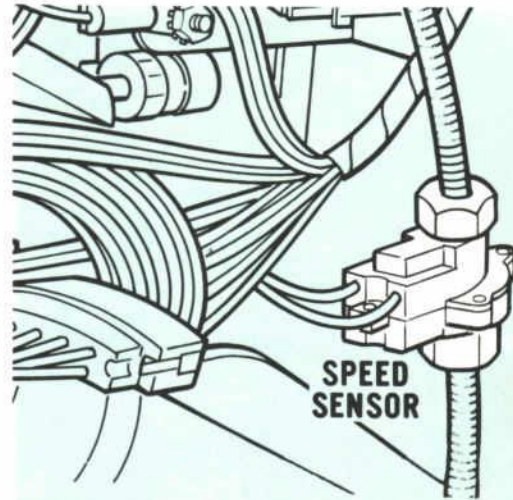


The system consists essentially of the control switches and three main parts:

- 1) A throttle actuator
- 2) A speed sensor
- 3) An electronic amplifier



The controls for the system are a pair of single-pole double-throw switches located in the steering wheel cross spoke. These switches are spring loaded and open in the released position similar to the 1969 Thunderbird controls.

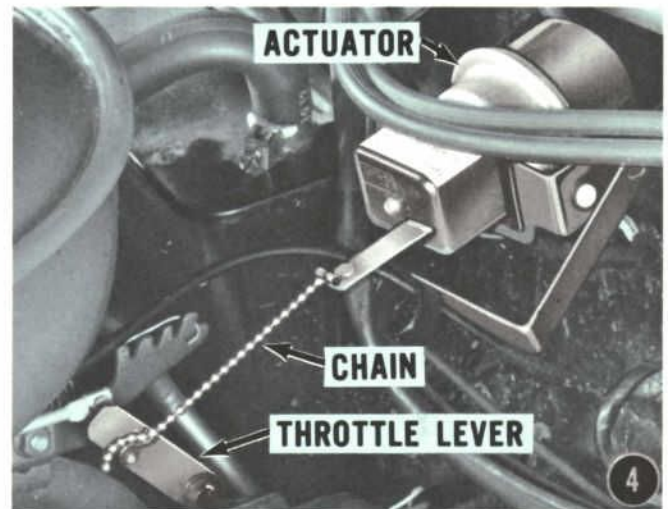


### SENSOR

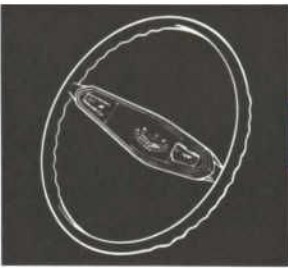
The speed sensor is a sort of electrical pulse generator. It is connected into the speedometer cable below the speedometer. The sensor generates an electrical signal proportional to road speed.

### THROTTLE ACTUATOR

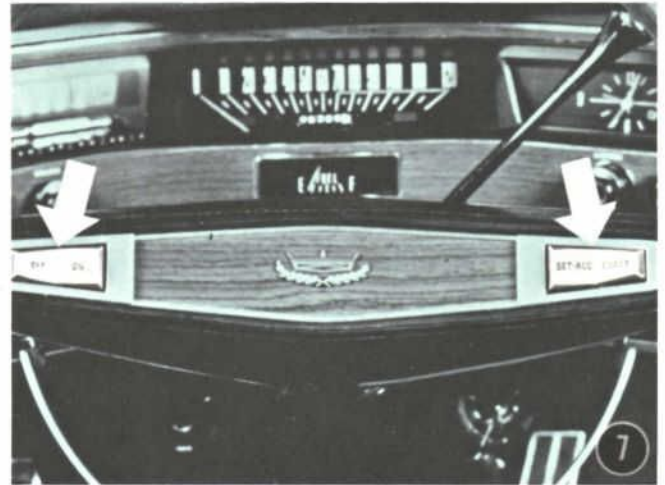
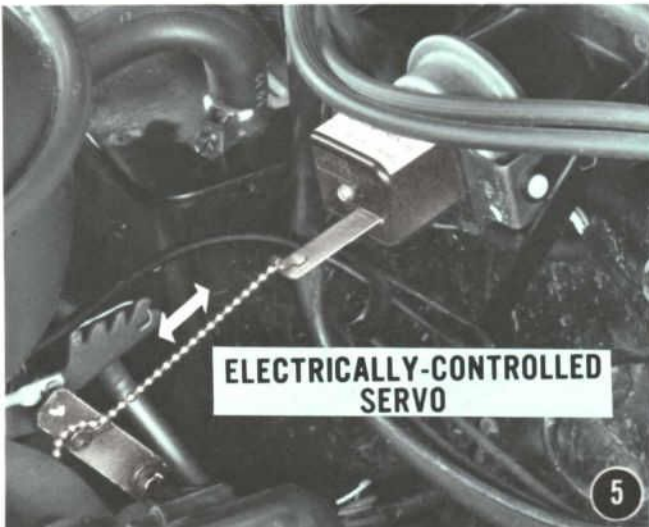
The throttle actuator is installed on the dash panel in the engine compartment, and is linked to the throttle lever with a bead chain.



Think of the throttle actuator as an electrically controlled vacuum servo. Its function is simply to position the throttle lever in response to the operating signal from the amplifier.



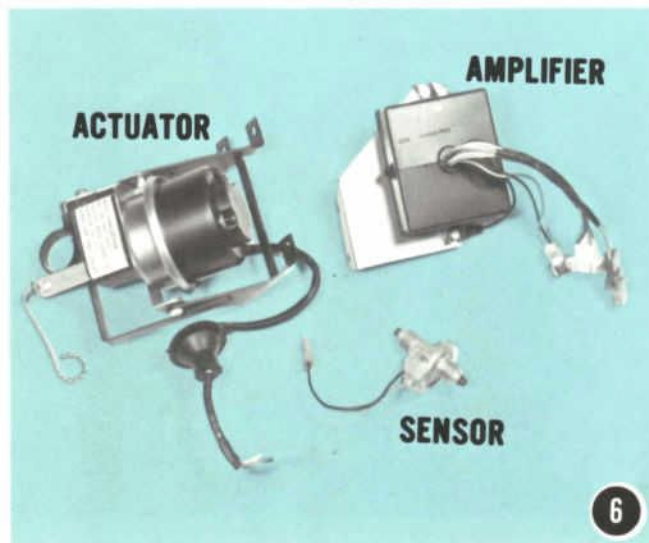
## DESCRIPTION AND OPERATION



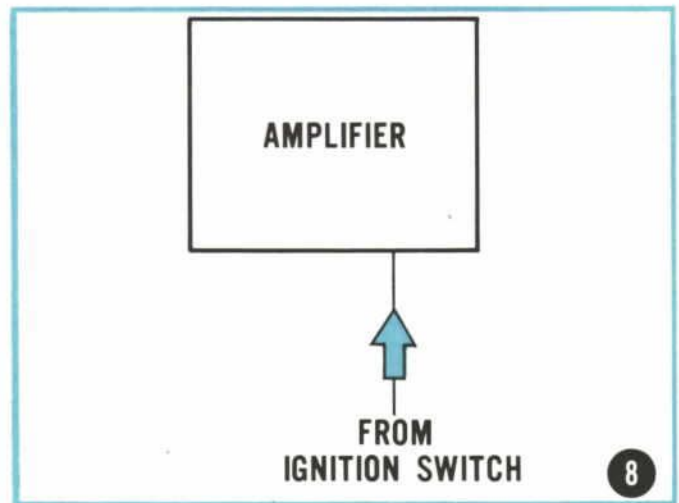
The control switches to operate the speed control are located on the steering wheel. The left switch is ON-OFF and the right switch is SET-ACCelerate and COAST.

### AMPLIFIER

The amplifier is located in front of the steering column; mounted on a bracket attached to the dash panel. The amplifier functions as an electronic computer. It receives signals from: the steering wheel controls, the stoplight switch, the speed sensor, and the actuator. It sorts and compares these signals and transmits an operating signal to the throttle actuator. The actuator then adjusts the throttle opening as required to maintain the selected speed.



These three main components; the sensor, amplifier and actuator are serviced **only** as assemblies. If they are damaged, replace rather than repair them.



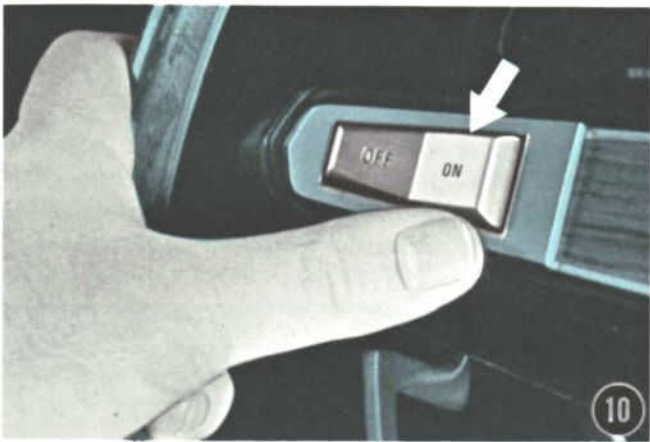
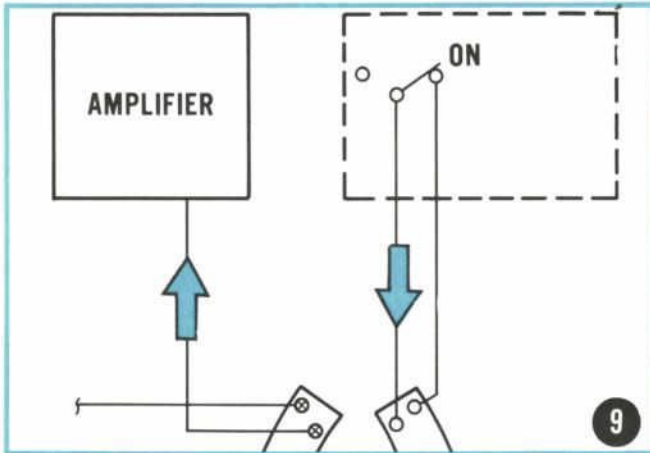
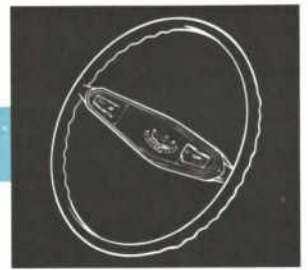
When the ignition is turned on, power is available to the amplifier, which then waits for a signal from the steering wheel controls before going to work.

### “ON” BUTTON

When the ON control button is pushed, it sends an impulse to the amplifier to prepare it for operation.

The ON button is spring-loaded and returns to a normal position as soon as it is released. However, the amplifier remembers the signal and stays in the operational condition.

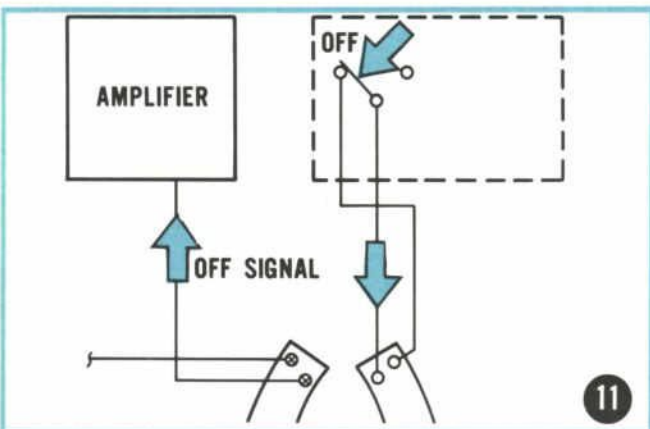
## DESCRIPTION AND OPERATION



With **ignition on**, there is only one way the “on” signal to the amplifier can be cancelled.

### “OFF” BUTTON

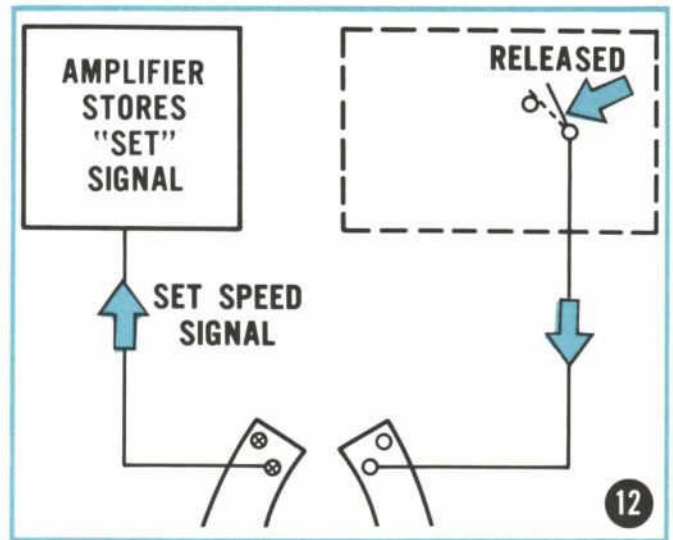
If the driver pushes the off button, the amplifier receives an “off” signal.



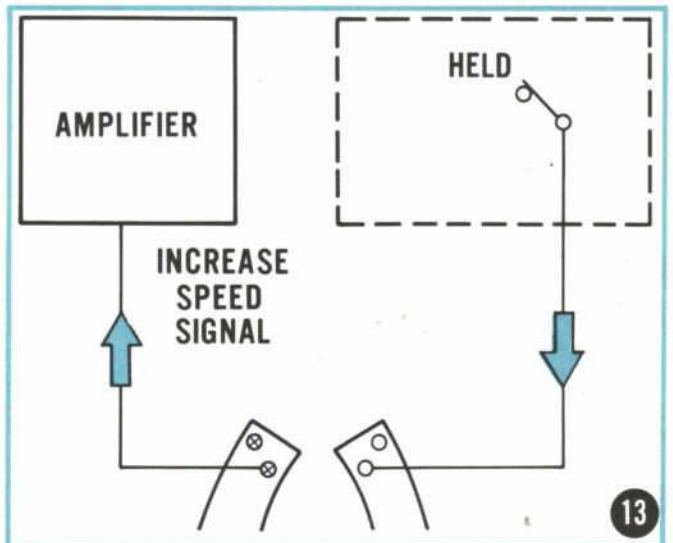
When the brake pedal is depressed, the brake stop-light switch sends a signal to shut the system down. The SET button must be pressed again to reactivate the control.

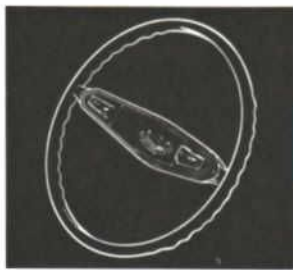
### “SET-ACC” BUTTON

The SET-ACCelerate button also is spring returned—and it performs two functions.



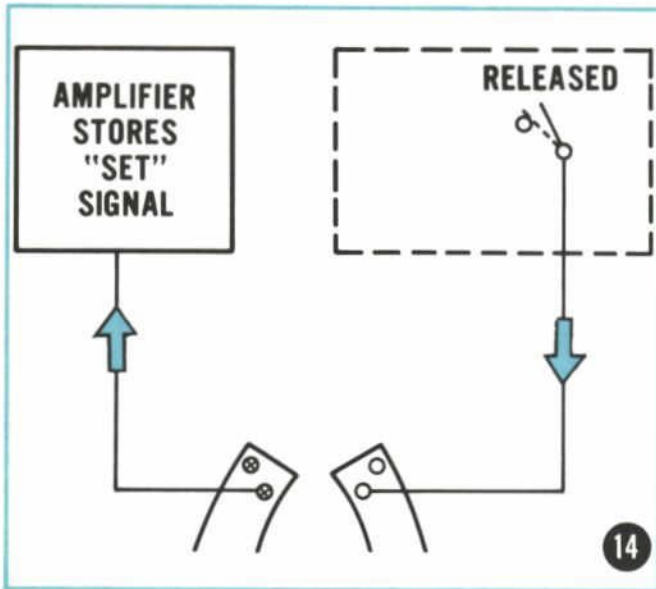
When the button is pressed and released, it sends the amplifier a set or hold signal—meaning “maintain this speed.” However, if the SET-ACCelerate button is held down, it tells the amplifier to “increase speed.” The “increase” signal continues until the button is released; the speed is then set to hold.





## DIAGNOSIS AND ADJUSTMENT

The amplifier stores and remembers the set speed signal until it receives a new signal or a stop signal; or until the ignition is shut off.



### “COAST” BUTTON

The COAST button operation allows the operator to temporarily disconnect the speed control system while coasting down to a lower speed.

This is done by holding the button down which releases the throttle to idle speed.



If the driver wants to maintain a lower speed, he can simply release the COAST button at the new speed and that speed will be the new amplifier set speed signal.

### ACCELERATING THE CAR

The driver can also accelerate the car above the set speed (with the accelerator pedal) for passing without disturbing the automatic control.

## DIAGNOSIS AND ADJUSTMENT

Diagnosis of trouble in the Bendix speed control consists of an operational test followed by diagnosis procedures that have been charted for you. The diagnosis charts start on page 12 of this handbook.

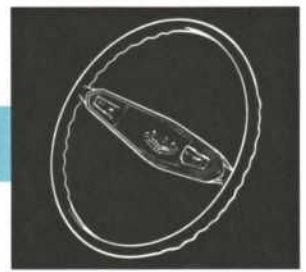
### OPERATIONAL TEST

Always verify a speed control system complaint before going through the diagnosis chart procedure. Make the operational road test in the following manner:



1. Start the engine and press the speed control ON button. Accelerate the vehicle to 30 miles per hour or higher.

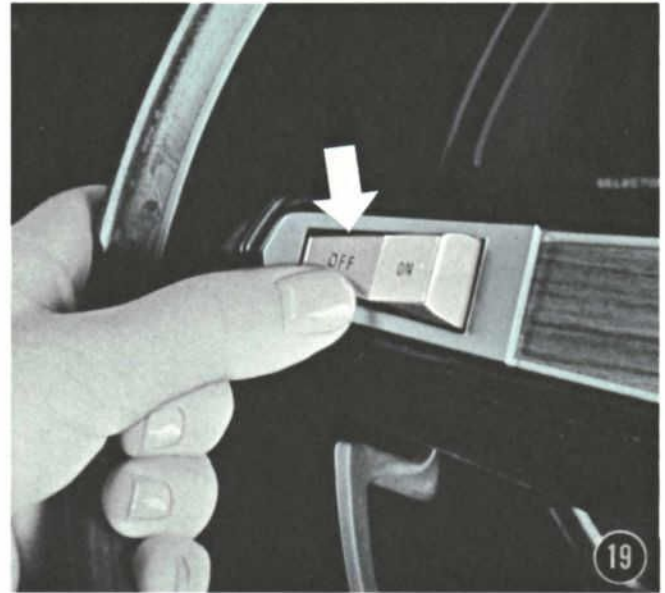
## DIAGNOSIS AND ADJUSTMENT



2. Depress the SET ACCelerate button and observe that the car continues to gain speed while the button is pressed down. At the same time, hold the foot pressure lightly on the accelerator pedal. You should be able to feel the speed control take over acceleration.

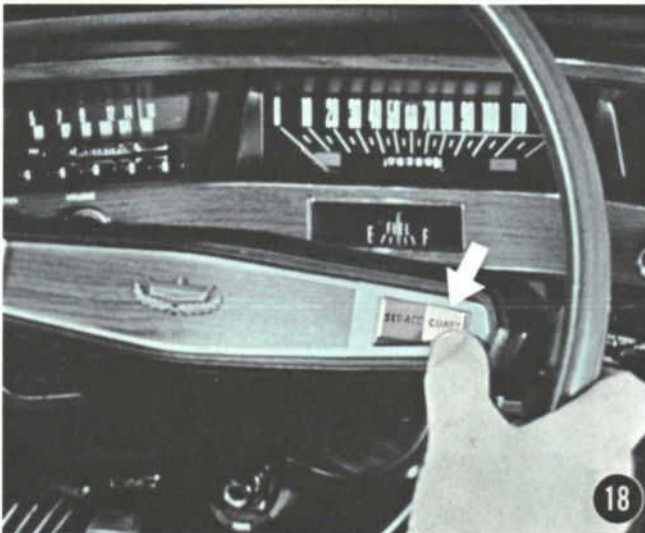
3. Release the SET-ACCelerate button. The car should hold the speed at which you released the button.

4. Accelerate **above** the control speed and check that the speed is restored and maintained after you release the accelerator.



6. With the system controlling, press the OFF button, then press the ON button. Observe that engine compression slows the car.

7. Reset a control speed and observe that the engine drops to idle after pressing and releasing the **brake pedal**. Reset the speed after releasing the brake.



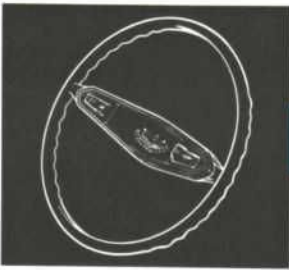
5. Press and hold the COAST button. The engine should drop to idle speed. See that the car gradually slows. When you release the COAST button, see that the control takes over at the control speed at which the button was released.



### Driver Education

If the system passes the operational test, demonstrate to the owner how the controls work. However, if it does not perform as it should, proceed to the other steps in the diagnosis procedure.

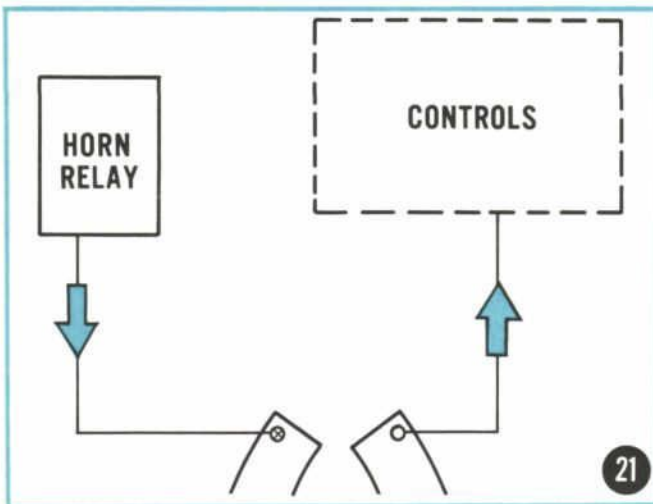




## DIAGNOSIS AND ADJUSTMENT

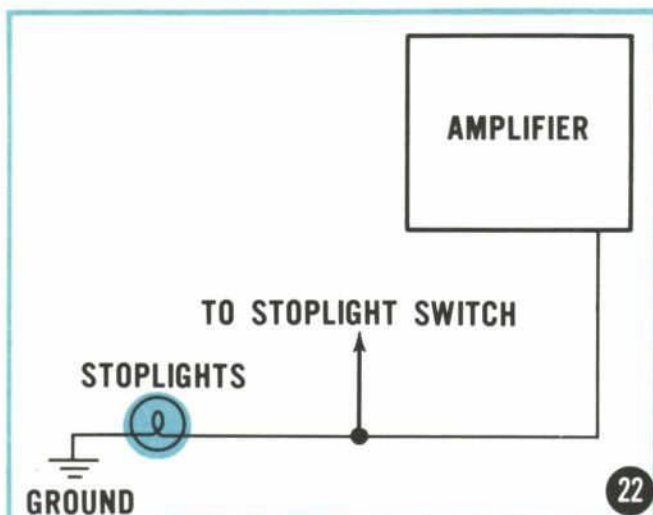
### TEST FOR POWER TO CONTROLS

The first diagnostic test is for power to the controls in the steering wheel. This power comes from the horn relay, and the test is simply to blow the horn. Turn the steering wheel fully to the right and left when making the test, to check the slip ring contact. The horn should work in all positions. If the horn doesn't blow, or blows intermittently, repair the horn circuit. If the horn does blow, test the stoplight circuit.



### TESTING STOPLIGHT CIRCUIT

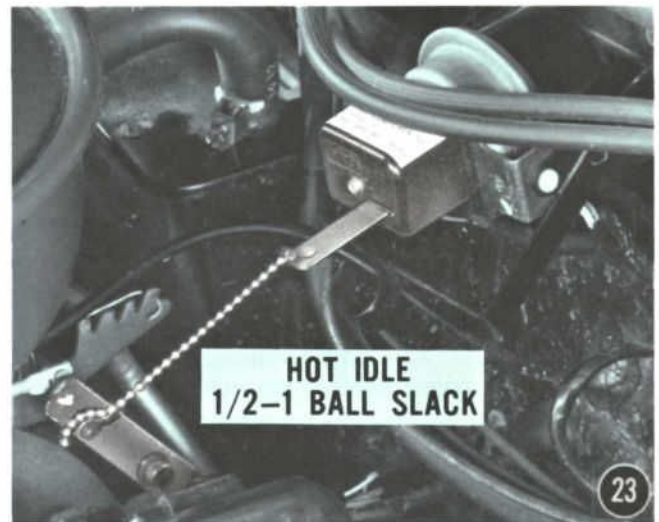
The amplifier circuits are grounded through the stoplight bulbs, but do not pull enough current for the bulbs to glow. Without this ground the system will not operate. To test for circuit grounding, press the brake pedal and see if the brake stoplights work.



If they don't light, or if they stay on when the pedal is released, repair the stoplight circuit. If the stoplights do not operate, the system will not shut down when the brakes are applied.

### THROTTLE ACTUATOR BEAD CHAIN ADJUSTMENT

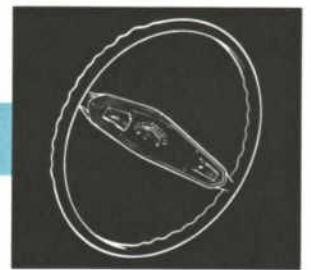
There is only one adjustment in this speed control system. It is the throttle actuator chain. That's the next step in the diagnostic check.



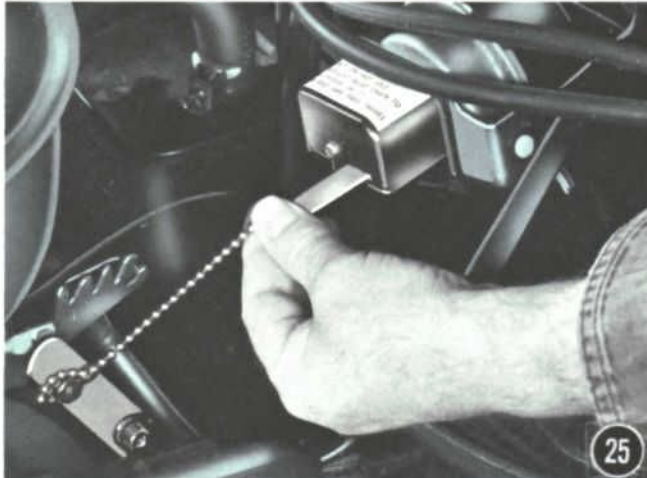
With the throttle positioned for hot idle speed, the chain should be from one-half to one-ball slack, or the actuator should travel from one-sixteenth to one-fourth of an inch before the throttle lever moves.



## DIAGNOSIS AND ADJUSTMENT



If the adjustment is off, correct it as required. If it is good, check the actuator lever and throttle linkage next.

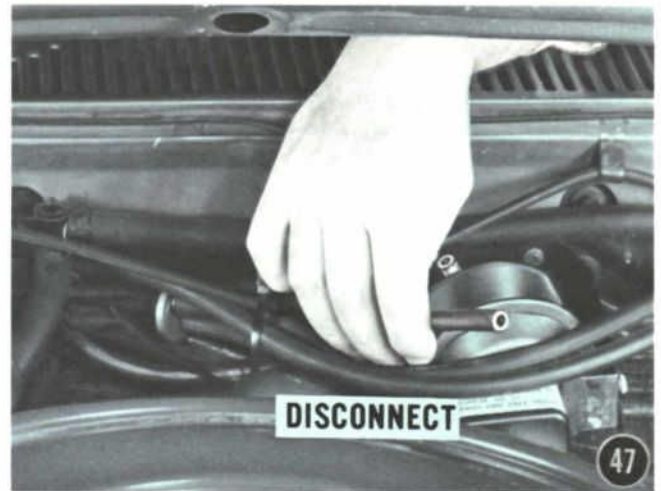


### ACTUATOR LEVER & THROTTLE LINKAGE CHECK

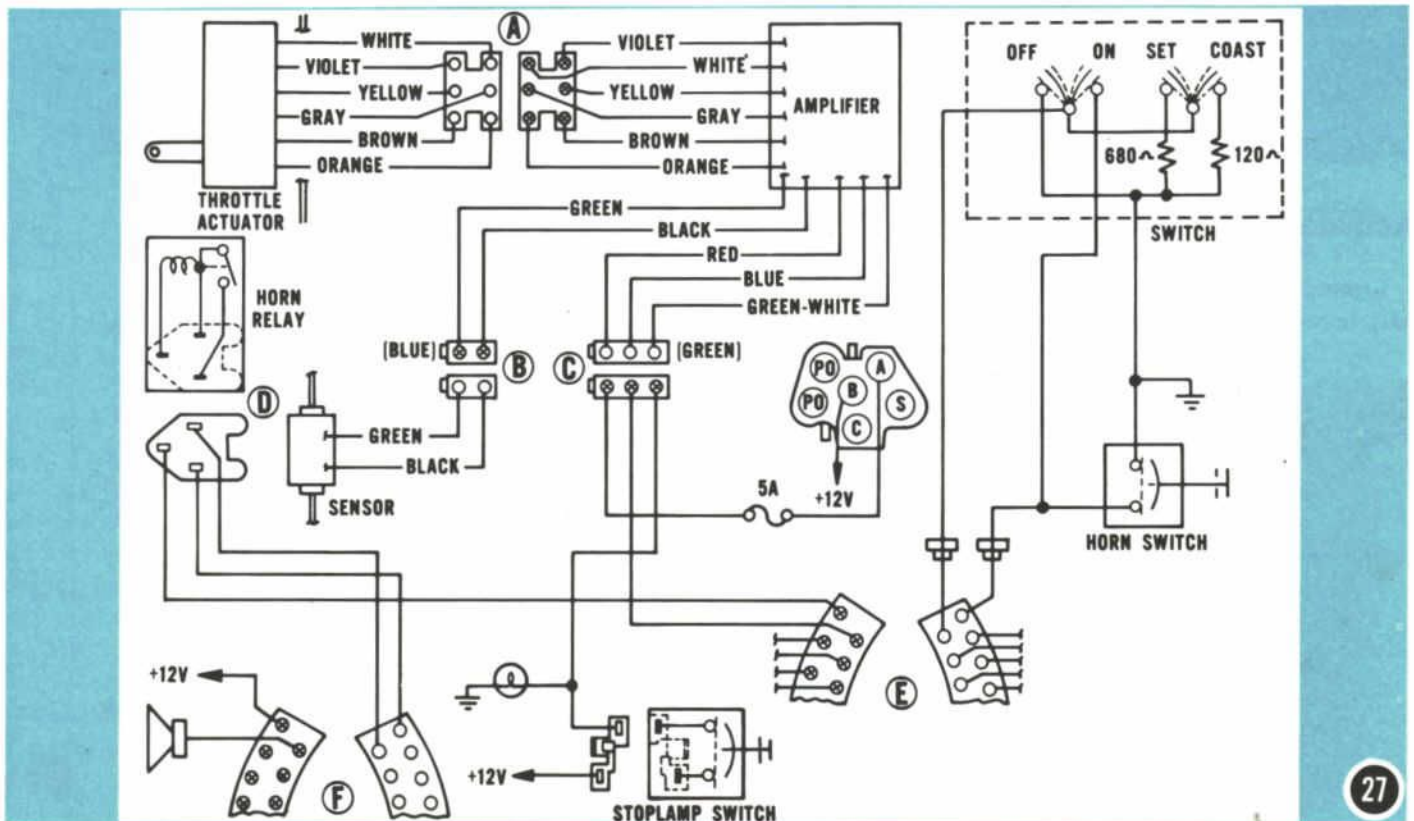
Inspect the actuator for dirt and corrosion. Move the actuator lever by hand. It should move freely. Also, the throttle lever should move freely when you tighten the chain.

### TEST FOR VACUUM

Disconnect the vacuum line at the actuator and check for the presence of engine vacuum and for leaks. If necessary, replace the vacuum hose.



If the engine vacuum is good and the system still doesn't function, proceed to tests of the control switches and circuits, which follows:



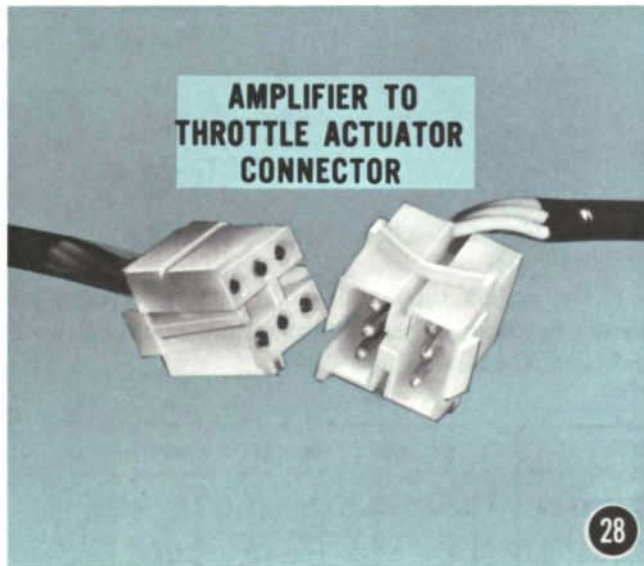


## DIAGNOSIS AND ADJUSTMENT

### CIRCUIT CONNECTOR FUNCTIONS

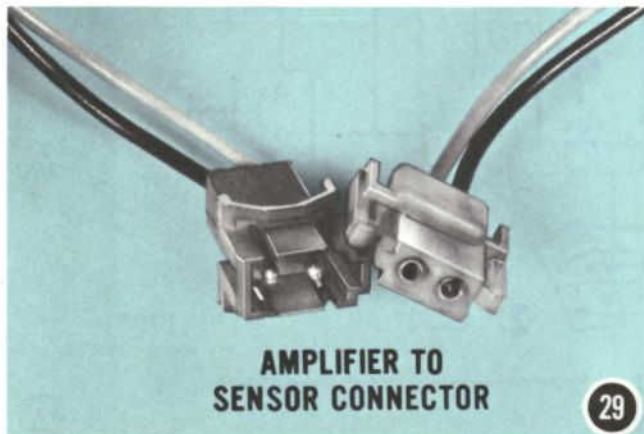
At this point, the speed control diagnosis chart leads through a number of electrical tests. A voltmeter, an ohmmeter, a 12 volt test light, some jumper leads and an acquaintanceship with the electrical connectors are required to perform the tests.

As the circuit diagram shows, there are five connectors in the system. They are all located under the instrument panel and identified by the letters "A" through "F".



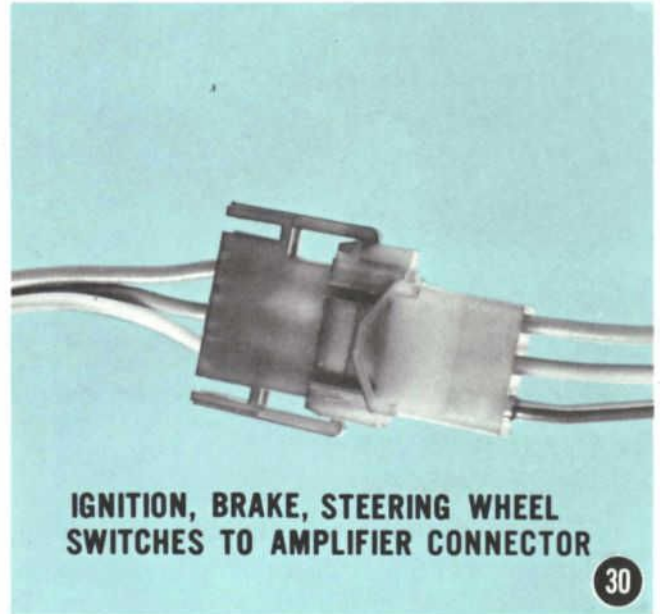
### Actuator Connector

Connector "A", colored white, carries electrical signals between the amplifier and the throttle actuator.



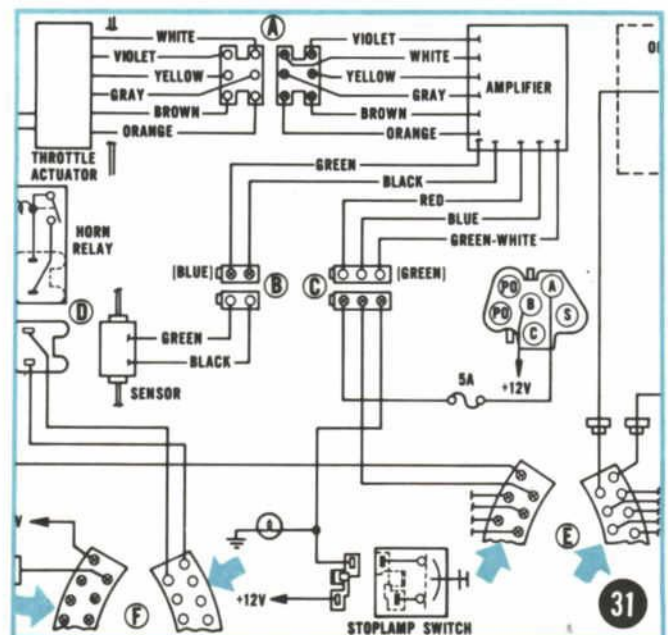
### Sensor Connector

Blue connector "B", connects two leads between the amplifier and speed sensor.

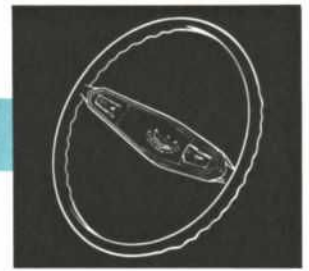


### Control Connector

Connector "C", colored green, connects the ignition switch, brake light switch, stoplights and steering wheel button switches to the amplifier.



## DIAGNOSIS AND ADJUSTMENT



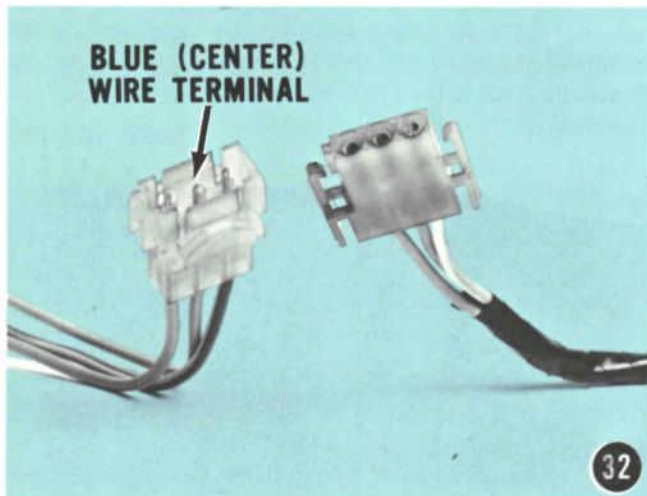
### Horn Relay Connectors

Crescent shaped connectors "E" and "F", used for the turn signals and horn in a standard installation, are separated and joined to two new connectors in the speed control system. This arrangement supplies power from the horn relay to the speed control switches in the steering wheel.

### CIRCUIT TESTS

#### Control Switch Test

Your first electrical tests are for proper operation of the control switches in the steering wheel. They are made at the blue wire terminal of the green connector "C."



1. Insert one probe of your ohmmeter in the terminal socket and clip the other to a good ground. **CAUTION: Don't press the ON button or you will damage the ohmmeter.**

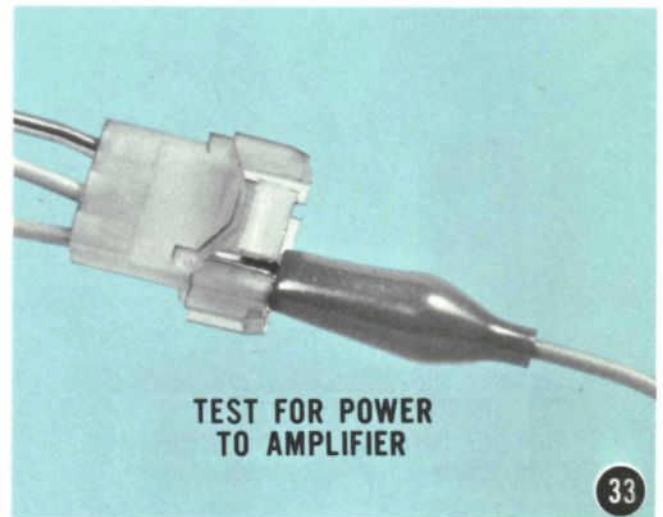
2. Press the OFF switch and check for continuity to ground. You should read zero ohms—no resistance at all. If there is resistance, the switch wiring or slip rings are damaged and should be repaired or replaced. Turn the steering wheel both right and left to check the slip ring contacts. Readings should be constant in all positions of the steering wheel.

3. Next, press the SET ACCelerate switch. The resistance should be 675 to 685 ohms. If it is higher, there is a poor connection. A reading of zero ohms indicates a short circuit. Turn the steering wheel right and left to check the slip ring contacts again.

4. Finally, press the COAST switch. The resistance should read 118 to 122 ohms. Again, too much resistance means there is a damaged switch, wire, or slip ring. A reading of zero ohms indicates a short circuit. Remember to turn the steering wheel and check the slip ring contacts once again for a constant reading.

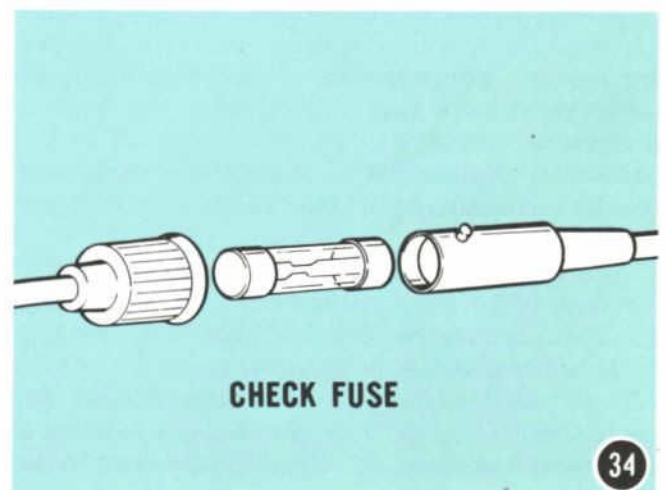
#### Amplifier Power Test

Continuing at the green connector "C," test for power to the amplifier from the ignition switch.



Check for power at the red wire terminal. This is the ignition switch supply voltage to the amplifier.

If there's no power with the ignition switch on, check the 5-amp fuse. If the fuse is good, trace the circuit back to the ignition switch, as necessary.

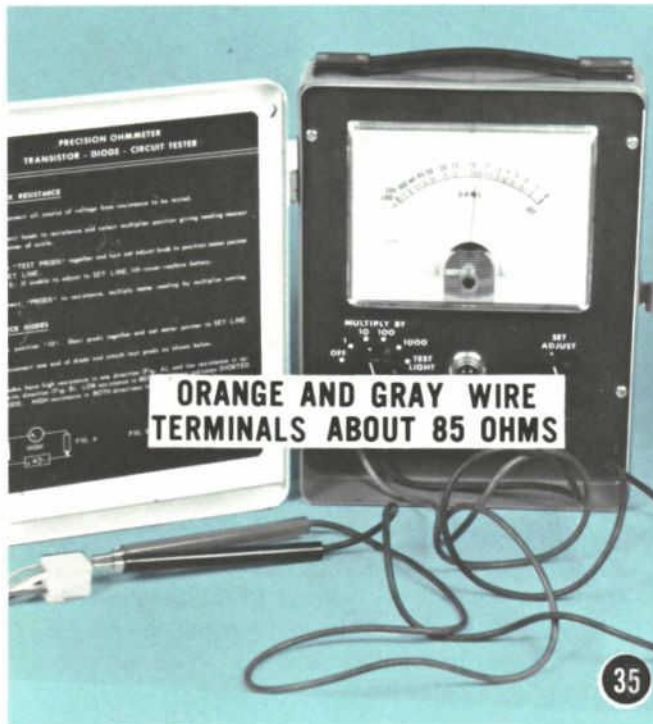


## COMPONENT TESTS

If the damage shows up in the circuit tests, make the necessary repairs. If the circuits test good, go on to electrical tests of the other components as follows:

### Actuator Resistance Test

For tests of the throttle actuator, separate the white connector "A" to make ohmmeter resistance readings between the female terminals.

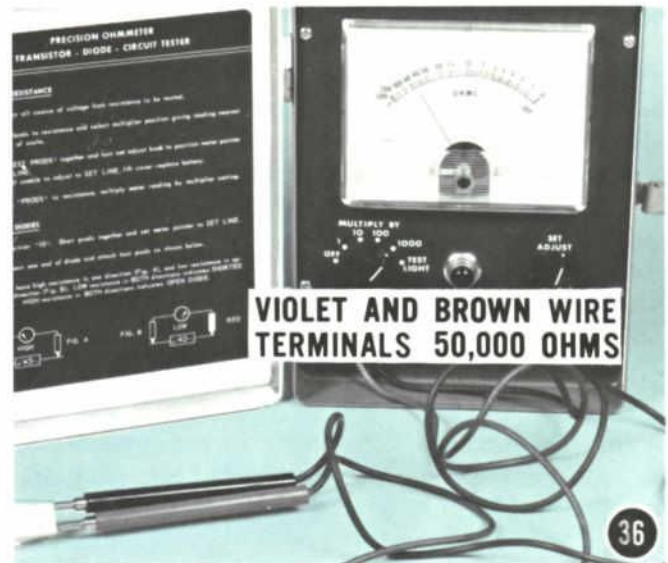


1. Read the resistance between the orange and gray wire terminals. It should be about 85-ohms. If the reading varies more than 5-ohms either way, replace the actuator.

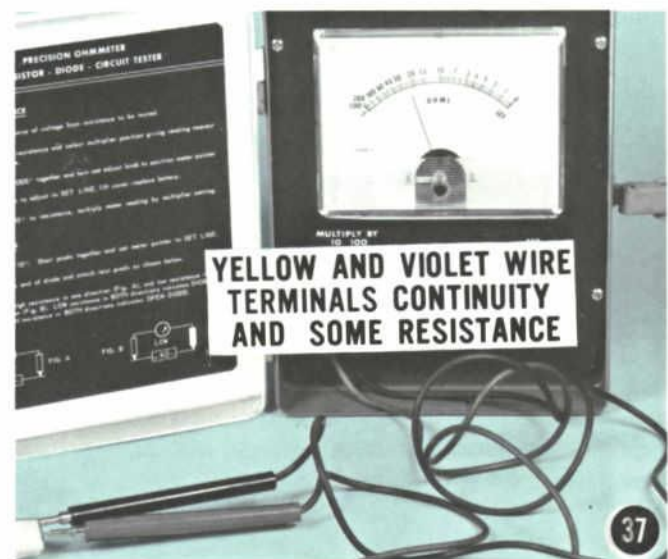
2. Repeat the test again, between the orange and white wire terminals. Again, there should be a resistance of about 85 ohms.

If there is too much resistance in either case, there is an open circuit in the actuator. The actuator assembly should be replaced.

If you read zero or near zero ohms between the orange wire and the white or gray wires, it indicates a short circuit—which would require replacement of the actuator.



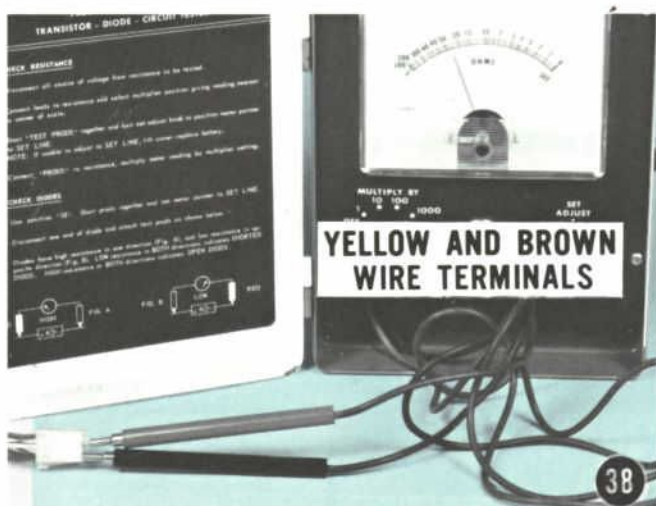
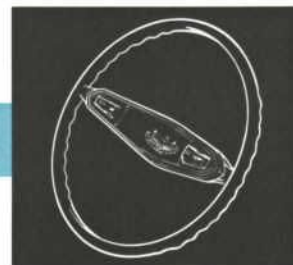
3. Read the resistance between the violet and brown terminals. It should be approximately 50,000 ohms. If the circuit is more than 500 ohms off either way, replace the actuator.



4. Connect the ohmmeter leads between the yellow and violet wire terminals. There should be continuity and **some** resistance.

5. Hold the ohmmeter connection and have someone move the actuator lever back and forth. While the actuator lever is moving, the resistance should increase and decrease smoothly. If the needle movement is jerky, or if there is not continuity between the terminals, replace the actuator.

## DIAGNOSIS AND ADJUSTMENT



6. Repeat test procedure steps 4 and 5 between the yellow and brown terminals. Again the needle must move or oscillate smoothly back and forth or the actuator must be replaced.

### Sensor Test

If the resistance tests indicate the actuator is good, test the speed sensor at the blue connector.



1. Check for continuity in the sensor circuit (about 400 ohms resistance) by inserting the ohmmeter probes in the connector terminals.

If the resistance is more than 410 ohms, the circuit may be open. If the resistance is less than 390 ohms, the sensor circuit may be shorted. Replace the sensor. If the resistance is close to the limits, take another reading

with the rear wheels off the floor on a hoist and the engine idling in gear. **Do not speed the engine.** (A diode placed in series with the ohmmeter will help give a larger reading.)



The resistance reading should **change** when the speedometer is being driven. If it does, the sensor is good.

### Amplifier Operational Test

There are no electrical tests that can be made on an amplifier that is suspect or damaged. Only an operational test can be performed. **CAUTION: Always complete all the other tests before trying a replacement amplifier. If any other part of the system isn't operating properly, the amplifier may be damaged.**

To make an operational test, disconnect the amplifier and install one known to be good. **Be certain the replacement unit is grounded.** If the new amplifier makes the system work, the trouble has been found.

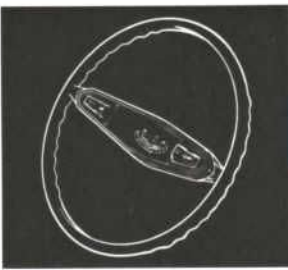
### Check Contacts in Connectors

If all the components test satisfactorily, and there is still system trouble, check all the connectors carefully for proper contact. **This is important.**

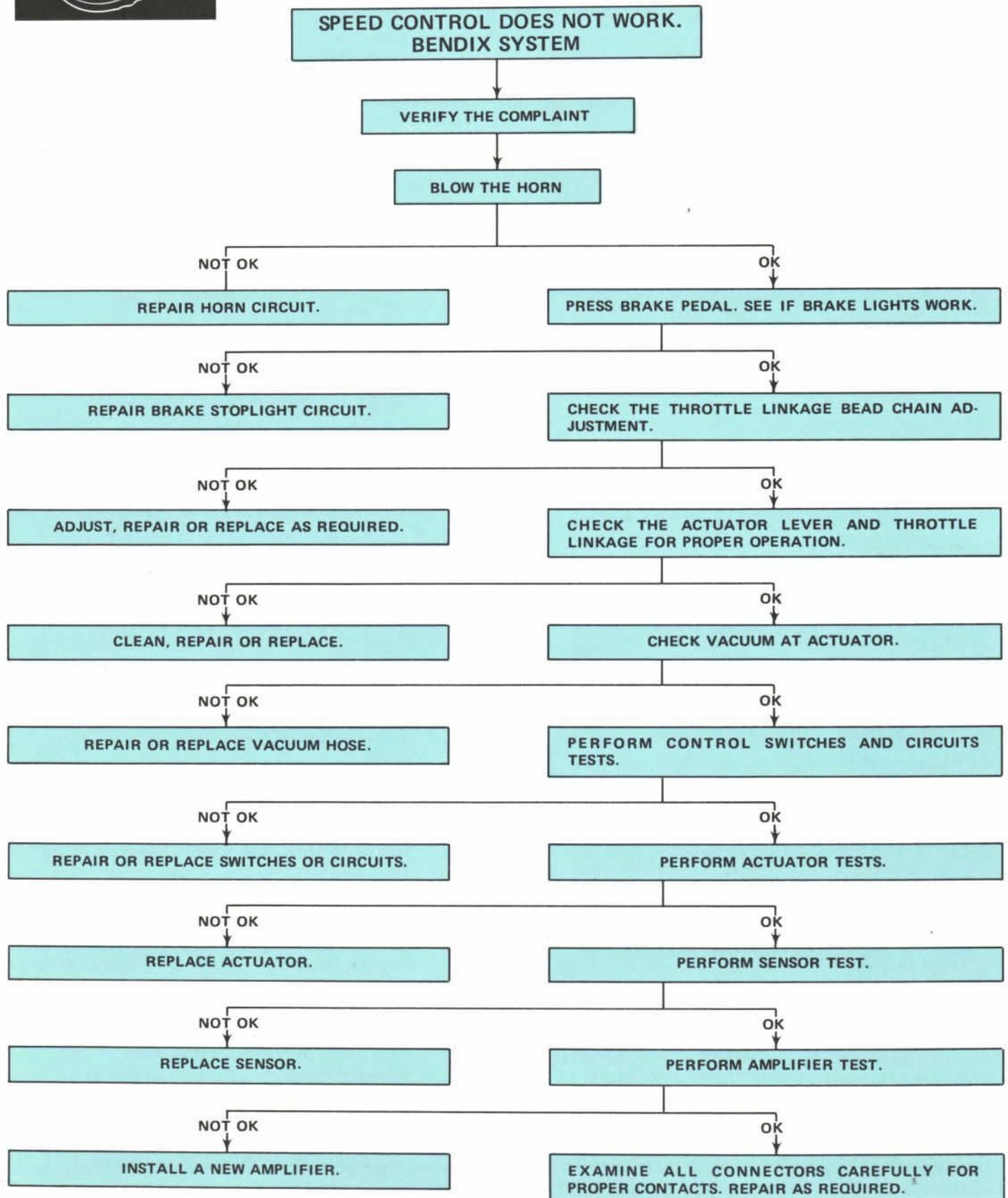
### DIAGNOSIS CHARTS

The following diagnosis charts show the exact procedures to follow, to diagnose all Speed Control troubles.

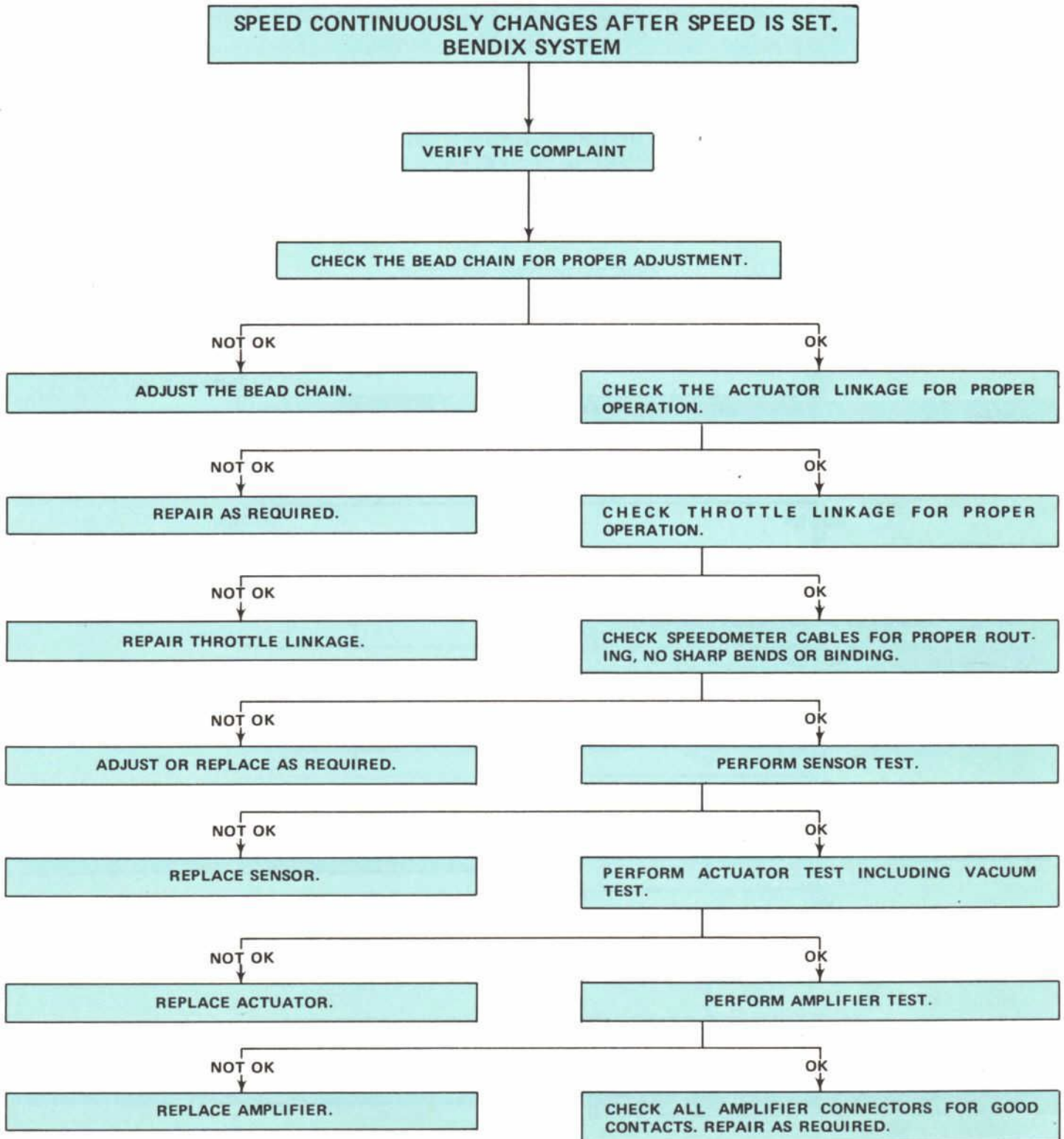
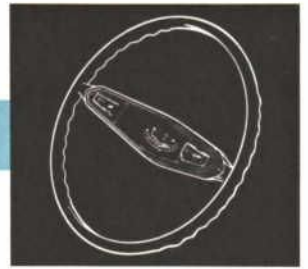
This handbook contains all the information you need to find the trouble in the Speed Control system. Repair procedures are contained in Volume Three (Electrical) of the Car Shop Manual.



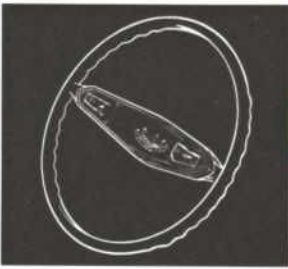
## DIAGNOSIS AND ADJUSTMENT



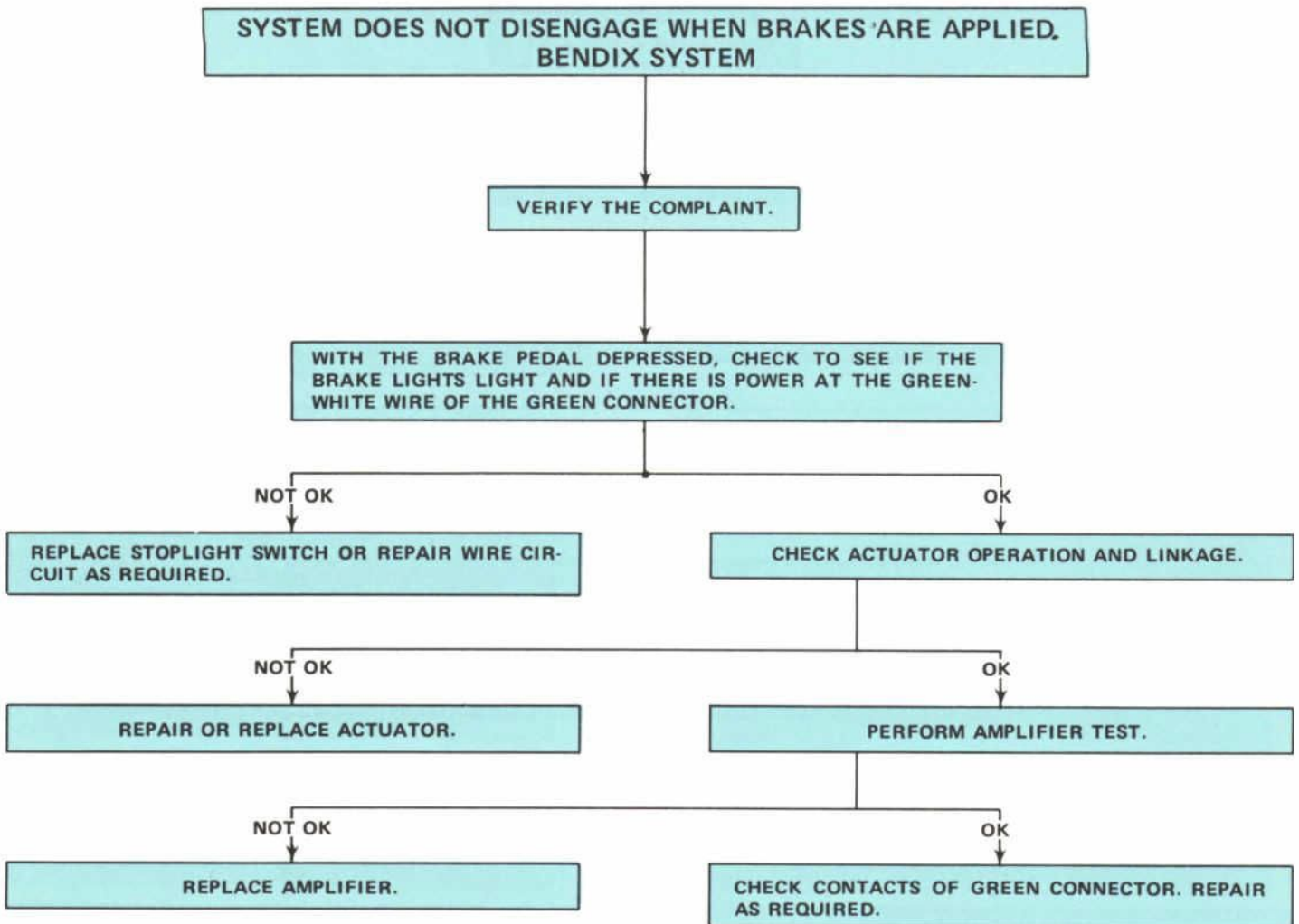
# DIAGNOSIS AND ADJUSTMENT







## DIAGNOSIS AND ADJUSTMENT



# DIAGNOSIS AND ADJUSTMENT

