

# SECTION 9B

# RESUME CRUISE CONTROL

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### GENERAL DESCRIPTION

Electronic cruise control is an automatic speed control system which maintains a desired vehicle speed under normal driving conditions. The system can also be enabled to cause the vehicle to accelerate, coast, and resume the desired speed after accelerating or coasting.

### MAJOR COMPONENTS AND FUNCTIONAL DESCRIPTION

#### Mode Control Switches

*Figure 1*

The mode control switches are on the turn signal lever for most carlines. The OFF-ON-R/A switch controls the on-off modes, and the resume speed and accelerate modes. The SET switch controls the cruise speed and coast modes.

**OFF:** The cruise control system is non-functional when the switch is set to OFF.

**ON:** This position enables the system cruise control module (controller). This position must be set for 1 to 2 seconds before a cruise speed can be set.

**R/A (Resume/Accelerate):** This is a spring-loaded position. If the system had been de-activated by braking the vehicle, sliding the switch momentarily to R/A changes the system mode to "resume" and causes the vehicle to accelerate to the previously set cruise speed. If the switch is held at R/A for more than 1 second, the system changes to the "accelerate" mode, and the vehicle will accelerate until the switch is released. When it is released, the "accelerate" mode changes to the "cruise" mode; the speed present at that time becomes the new cruise speed.

**SET:** This is a spring-loaded switch and is used to set the cruise speed. With ON-OFF-R/A set to ON and with the vehicle moving faster than 25 mph, pressing the SET switch sets the cruise speed. After a speed has been set, if SET is pressed and held, the system changes to the "coast" mode; the vehicle will decelerate until the switch is released. When it is released, that speed becomes the new cruise speed (if greater than 25 mph).

#### Cruise Control Module

*Figure 2*

The cruise control module (controller) receives inputs from the mode control switches, vehicle speed sensor, servo, and in some carlines, the electronic control module (ECM). In turn, the controller signals for the opening or closing of vent and vacuum solenoid valves in the servo, which then positions the throttle to maintain the cruise speed, or accelerate or coast.

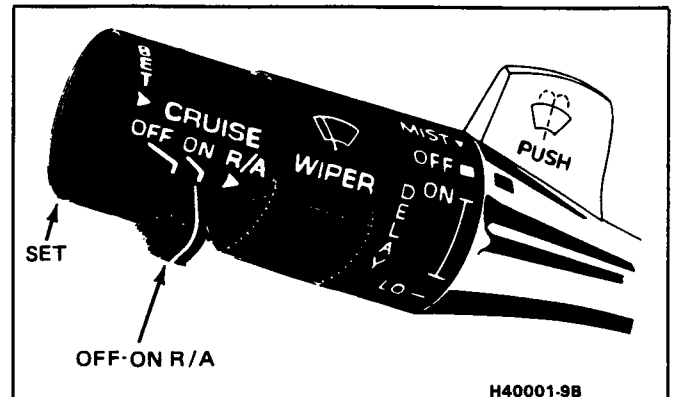


Figure 1. Mode Control Switches

Some cruise control systems do not have separate controllers. Controller functions are performed by the ECM in A carline models with engine code VIN R; in J carline models with engine code VIN K; and in N carline models with engine code VIN U. In E carline models, the functions are performed primarily by the body computer module (BCM).

See Figure 7 for controller mounting locations.

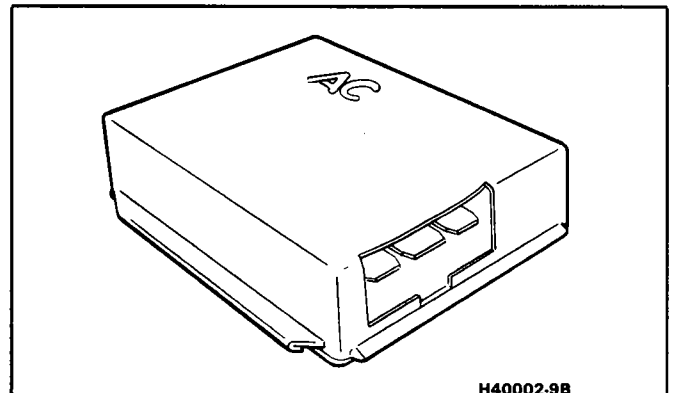


Figure 2. Cruise Control Module (Typical)

#### Servo

*Figure 3*

The servo consists of a vacuum-operated diaphragm, a normally-open solenoid valve to vent the diaphragm chamber to the atmosphere, a normally-closed solenoid valve to connect the diaphragm chamber to the vacuum source, and a variable inductance position sensor. The servo operates the throttle in response to command signals from the controller, BCM, or ECM. The following describes its function for various speed conditions:

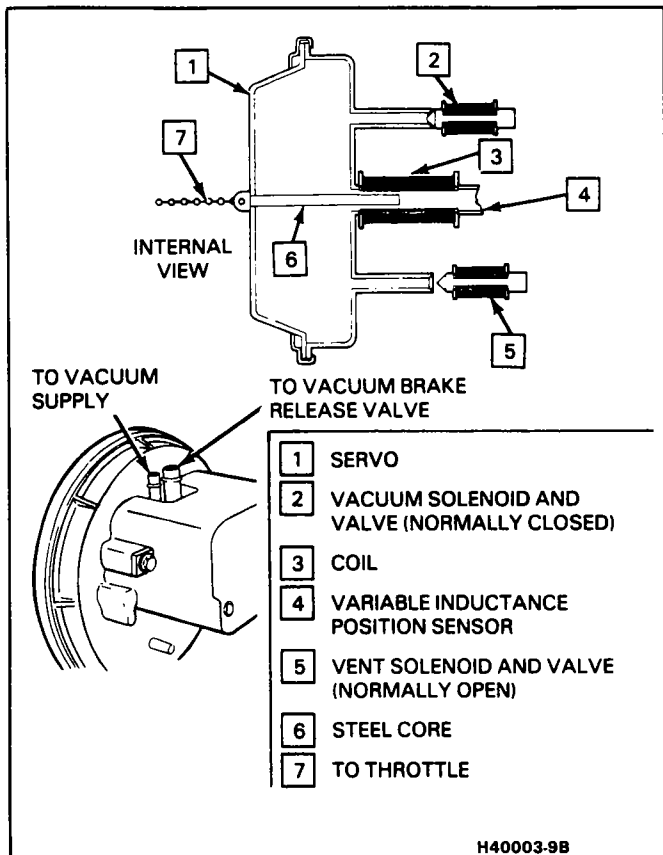


Figure 3. Servo (Typical)

- **Steady Speed.** When the system is on and set, and the speed is steady, the controller maintains both the vacuum and vent valves in the closed position. A constant vacuum is on the servo diaphragm, which places no-flow requirements on the vacuum source. Vacuum is trapped in the servo, and the throttle is constant.
- **Vehicle Losing Speed.** When this is caused by uphill grades or changes in mode control switch settings, the controller energizes the vacuum solenoid to open the vacuum valve to the vacuum source. The vent valve remains closed, the servo vacuum level increases, and the throttle is increased to bring the vehicle up to speed.
- **Vehicle Gaining Speed.** When this is caused by downhill grades or changes in mode control switch settings, the controller de-energizes the vent solenoid. The vent valve opens to the atmosphere, the vacuum valve remains closed, the servo vacuum is reduced, and the throttle is decreased (by throttle return spring action) to bring the vehicle down in speed.

When the cruise system is on and operating (without new input from the mode control switches), speed correction operations occur when the vehicle speed exceeds the set cruise speed by about  $\pm 1/4$  mph. When the controller senses such a speed variation, it pulses the vent or vacuum valve. These pulses are repeated until the vehicle's speed reaches the set cruise speed.

Under normal road and load conditions, the vacuum valve remains open after vehicle speed drops 5 mph below the set speed. When vehicle speed exceeds the set speed by 3 mph, the vent valve goes to a constant-open position.

The servo also goes to an open vent valve position when:

- the brake (or clutch) pedal is depressed;

- the variable inductance position sensor coil in the servo opens;
- the system loses electrical power; or
- the ignition is turned off.

The variable inductance position sensor provides for a continuous voltage servo position signal to the controller. This signal is constantly compared to the vehicle speed signal. The controller then determines if a speed error has been corrected or if additional pulses are needed.

The servo is mounted in the engine compartment. Refer to carline Figures in this section for locations.

### Vehicle Speed Sensors

Figure 4

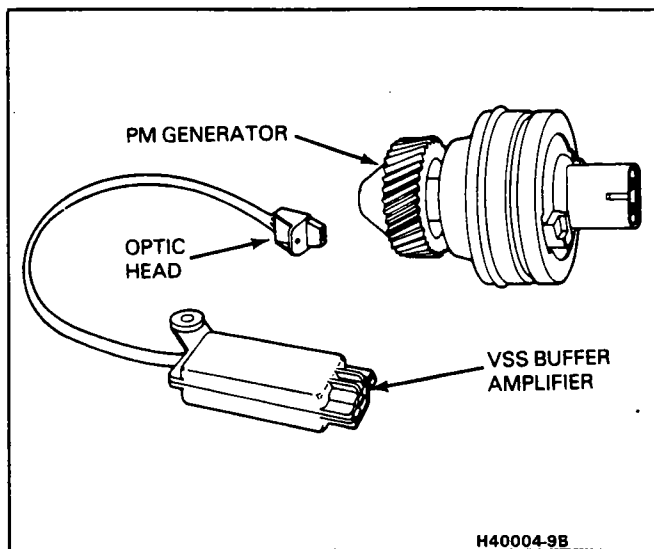


Figure 4. Vehicle Speed Sensors

A vehicle speed sensor (VSS) system generates speed information which is used in part by the controller as a comparison signal to determine if the vehicle speed is under or over that which was set as the desired cruise speed.

One system uses a permanent magnet (PM) generator to develop a signal. This signal is amplified and shaped by the VSS buffer amplifier before being sent to the controller. Another system uses an optic head assembly instead of a PM generator. Within this assembly, a photocell "reads" the number of times the rotating speedometer magnet interrupts a light beam from a light emitting diode (LED). The "reading" results in output pulses which serve as the speed signal. As with a PM generator VSS system, the signal goes to a VSS buffer amplifier and then on to the controller.

The PM generator usually is mounted in or on the transxle, and the optic head assembly is on the back of the instrument cluster, next to the speedometer cable.

### Vacuum Supply

Vacuum is used to operate the servo and, in turn, to change the throttle position. The vacuum supply can be from a manifold source, from the manifold through a vacuum storage tank, or from a vacuum pump. For specific routing, see the applicable Figure in this section.

### Electrical and Vacuum Release Switches

These switches are used to disengage the cruise control system. An electrical release switch on the brake pedal bracket (and clutch pedal bracket on manual transaxle vehicles) disengages the system electrically when the pedal

is depressed. The switch interrupts the voltage signal to the controller.

A vacuum release valve on the pedal bracket vents the vacuum trapped in the servo when the pedal is depressed. This enables the servo to quickly let the throttle return to the idle position. A separate hose is routed directly to the servo from the normally-closed vacuum valve.

These two types of controls are sometimes combined with a stop light switch, TCC switch, etc.

## DIAGNOSIS

Faulty operation can be caused by one or a combination of mechanical, vacuum and electrical problems.

Before beginning fault diagnosis, make a visual inspection for the following:

1. Disconnected or damaged wiring.
2. Pinched, cracked, plugged, or disconnected vacuum hoses.
3. Binding or misadjusted servo-to-throttle linkage.

If any of these faults are noticed, repair as needed.

Servo linkage adjustment procedures are in the On-Car Service in this section.

If the visual inspection shows no fault, check the adjustment of the electrical and vacuum release switches, as under On-Car Service.

If the fault still exists, refer to Section 8A for complete diagnostic procedures.

Several cruise system quick test units are available for isolating faults; two are shown in Figure 5. The tester connects to the cruise harness in place of the controller. Instructions for using the tester are provided with each tool.

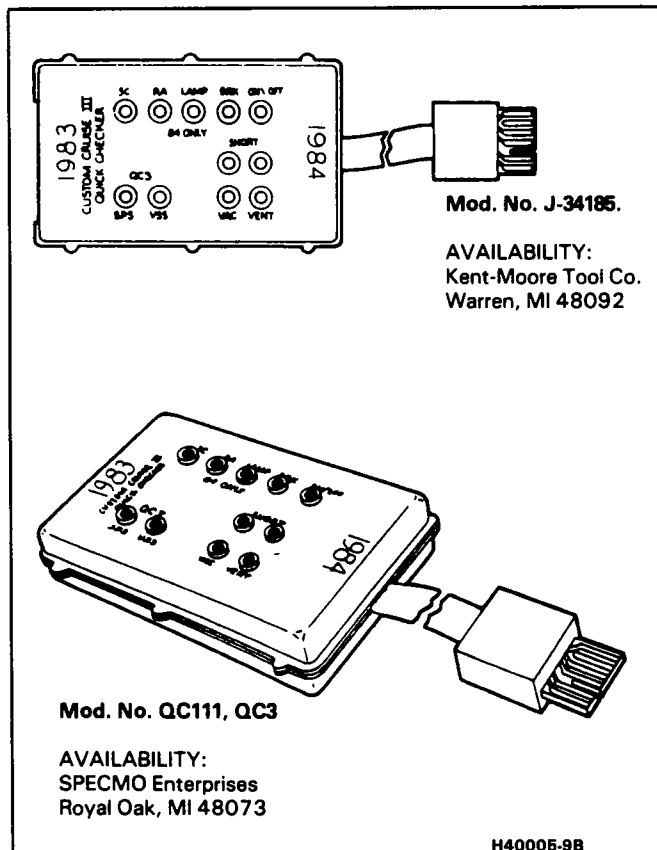


Figure 5. Cruise Control Testers

## ON-CAR SERVICE

### ELECTRICAL RELEASE SWITCH CHECK

#### A, B, C, E, G, H Carlines; J & N Carlines With Automatic Transmission

1. Set ignition to ON; set cruise control ON-OFF-R/A switch to ON. Connect ground lead of test lamp (or voltmeter) to ground.
2. Probe brown wire (or brown/white on C-H carlines) at brake release switch connector. Lamp should light (meter should show 12 volts). If not, skip to Step 4.
3. With probe still on wire of Step 2, depress pedal 3.5mm - 12.5 mm (1/8" - 1/2"). Lamp should go out (meter should show 0 volts). If not, adjust or replace switch, as needed.
4. If no light (or 12 volts) observed in Step 2, probe wire in adjacent cavity of connector. If still no light (or 12 volts), refer to Section 8A schematics, and check wiring.

#### J Carline With Manual Transmission

1. Check brake release switch by doing procedure for J carline with automatic transmission. Results must be okay before continuing here.
2. Check clutch release switch by doing same procedure as in Step 1, but do it at the clutch release switch instead of the brake switch.

#### N Carline With Manual Transmission

1. Set ignition to ON; set cruise control ON-OFF-R/A switch to ON. Connect ground lead of test lamp (or voltmeter) to ground.
2. Probe brown/white wire at brake release switch connector. Lamp should light (meter should show 12 volts). If not, skip to Step 4.
3. With probe still on brown/white wire terminal, depress pedal 3.5 mm - 12.5 mm (1/8" - 1/2"). Lamp should go off (meter should show 0 volts). If not, adjust or replace switch, as needed.
4. If no light (or 12 volts) observed in Step 2, probe wire in adjacent cavity of brake switch connector. If lamp now lights (meter now shows 12 volts), adjust or replace switch, as needed. If lamp does not light (meter does not show 12 volts), do the following:
  - a. Set ignition to OFF or LOCK.
  - b. Disconnect clutch release switch connector.
  - c. Check for good continuity between clutch release switch terminals. If 0 ohms is indicated, refer to Section 8A schematics, and check wiring. If continuity is not good, adjust or replace switch, as needed.

### VACUUM RELEASE VALVES

An inoperative (sticking, leaking, or plugged) valve must be replaced. Before replacing it, check that the fault is not with the vacuum hose to the switch, or with adjustment. Check that the hose connection is tight and the hose is not cracked or deteriorated. Check that the valve opens at 27-33 mm (1 1/16" - 1 5/16") of pedal travel, as measured at the centerline of the pedal pad.

### RELEASE SWITCH/VALVE REPLACEMENT & ADJUSTMENT

Refer to Figure 6 for replacement and adjustment.

## **CONTROLLER**

See Figure 7.

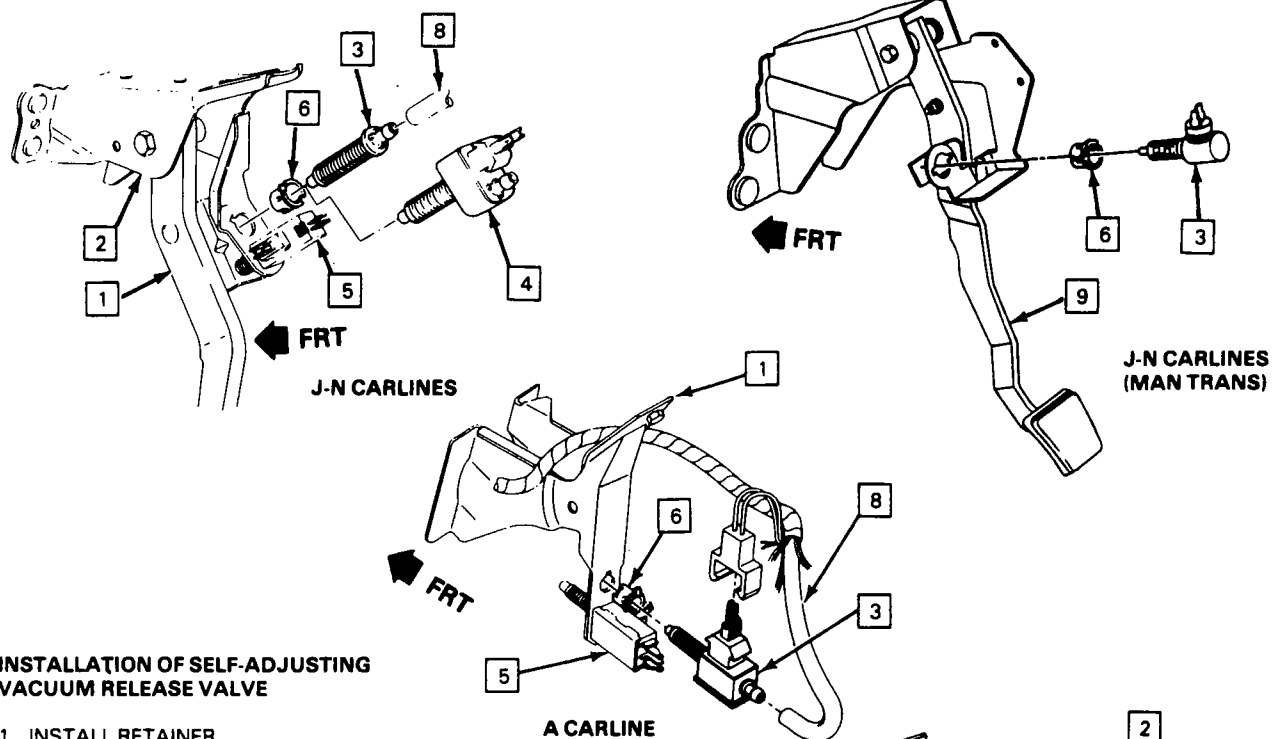
## **CRUISE CONTROL ENGAGEMENT (MODE CONTROL) SWITCH**

The switch is part of the turn signal lever assembly. It is not serviceable. The entire turn signal lever must be replaced as an assembly as shown in Figure 8.

## **VEHICLE SPEED SENSOR (VSS)**

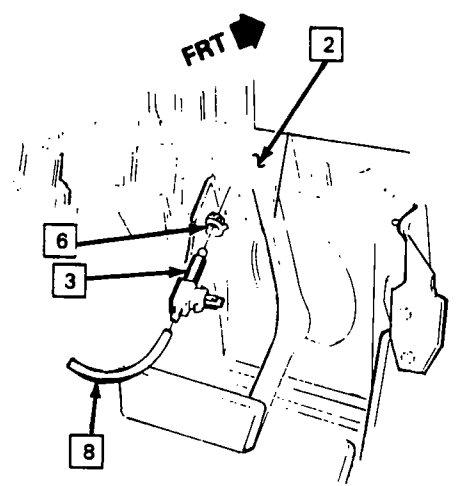
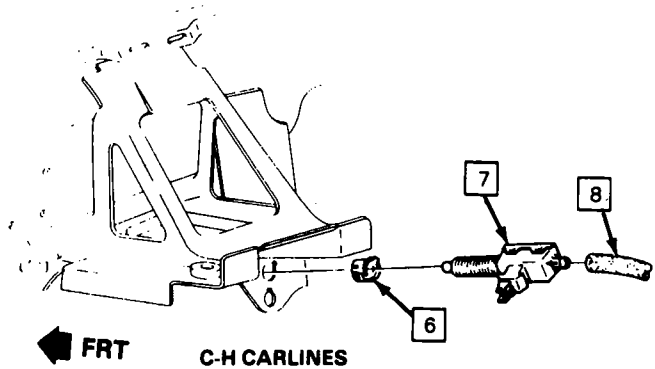
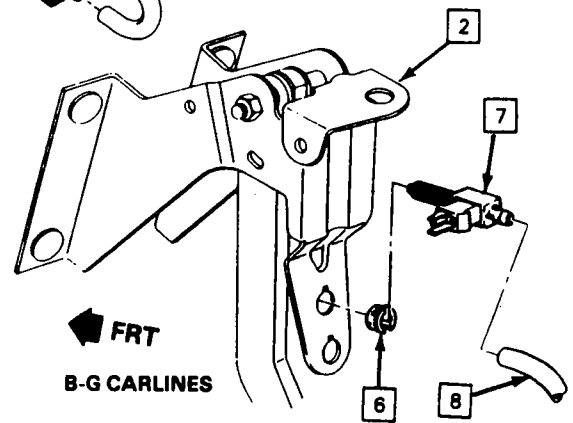
Refer to Section 7 of this manual for service information on PM generator VSS systems.

Refer to Section 8C for service information on optical head VSS systems.



**INSTALLATION OF SELF-ADJUSTING VACUUM RELEASE VALVE**

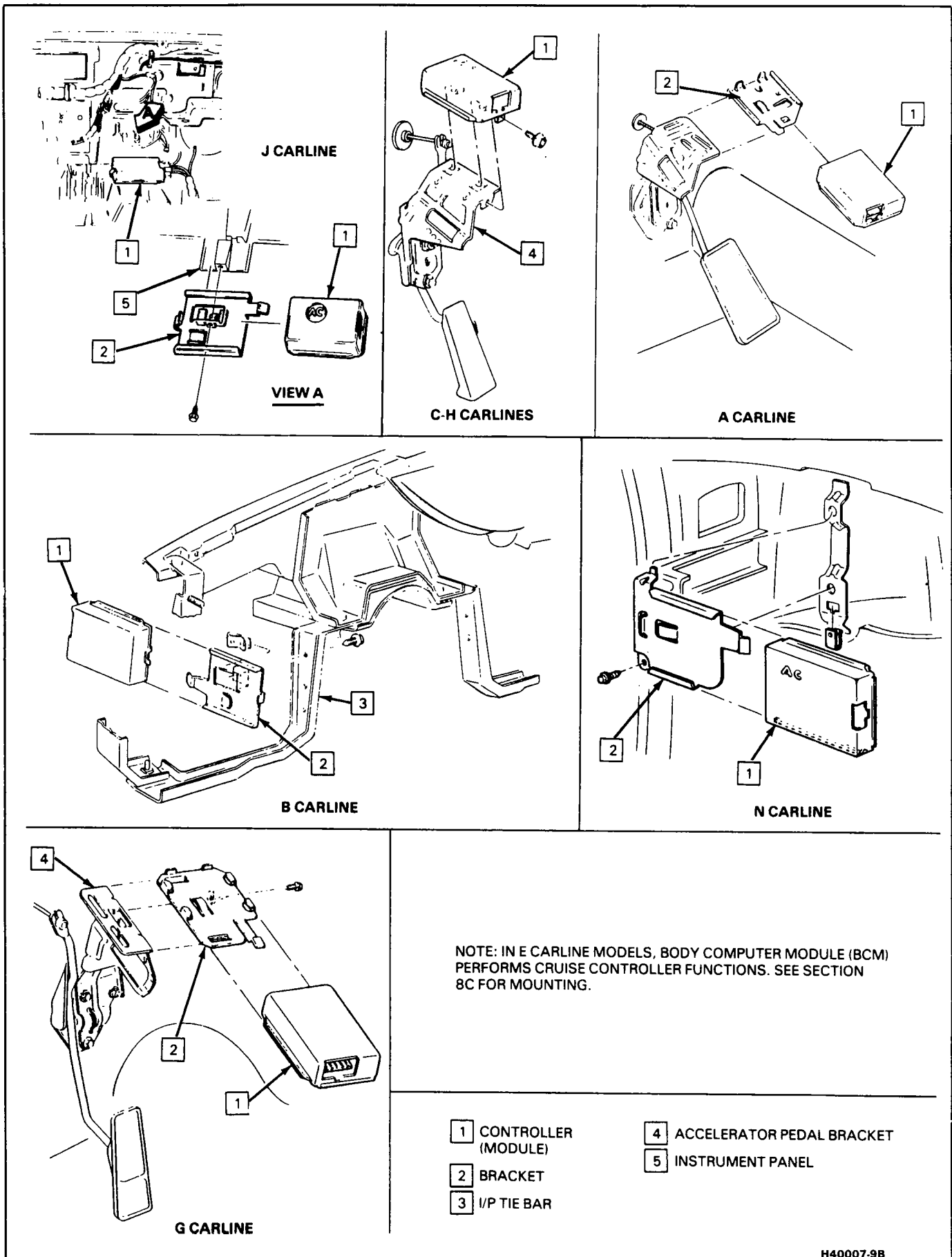
1. INSTALL RETAINER.
2. DEPRESS BRAKE/CLUTCH PEDAL. INSERT VALVE INTO RETAINER. AUDIBLE CLICKS CAN BE HEARD AS VALVE THREADS PASS THROUGH RETAINER TOWARD PEDAL.
3. PULL PEDAL REARWARD, HARD AGAINST PEDAL STOP UNTIL AUDIBLE CLICKS ARE NO LONGER HEARD. VALVE WILL MOVE IN RETAINER PROVIDING ADJUSTMENT.
4. RELEASE PEDAL. REPEAT STEP 3 TO BE SURE AUDIBLE CLICKS ARE NOT HEARD.



- |                                  |                                  |
|----------------------------------|----------------------------------|
| 1 BRAKE PEDAL ASM.               | 6 RETAINER                       |
| 2 BRAKE MOUNTING BKT.            | 7 CRUISE VAC. VALVE & TCC SWITCH |
| 3 CRUISE RELEASE VALVE           | 8 HOSE (TO SERVO)                |
| 4 CRUISE REL. VALVE (AUTO TRANS) | 9 CLUTCH PEDAL                   |
| 5 STOPLIGHT SWITCH               |                                  |

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Figure 6. Cruise Control Switches/Valves



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Figure 7. Cruise Control Module (Controller)

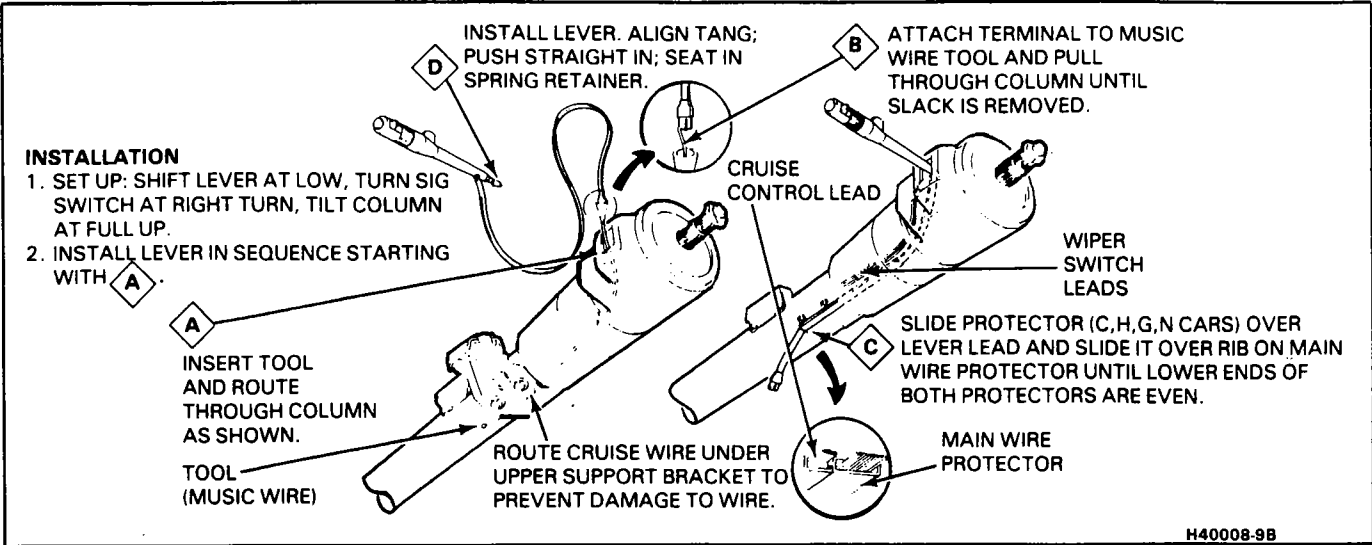


Figure 8. Cruise Control Switch Assembly (Typical)

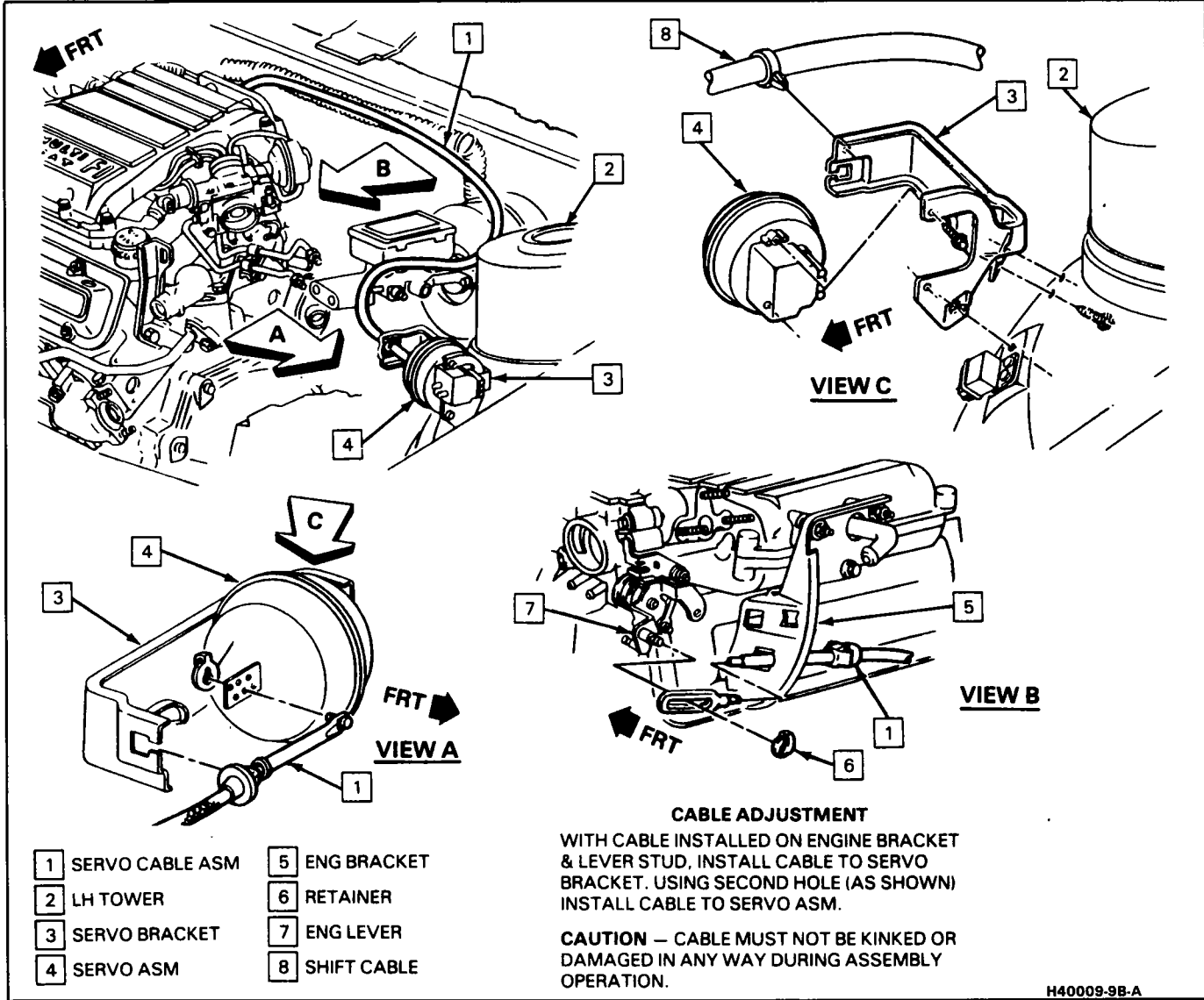
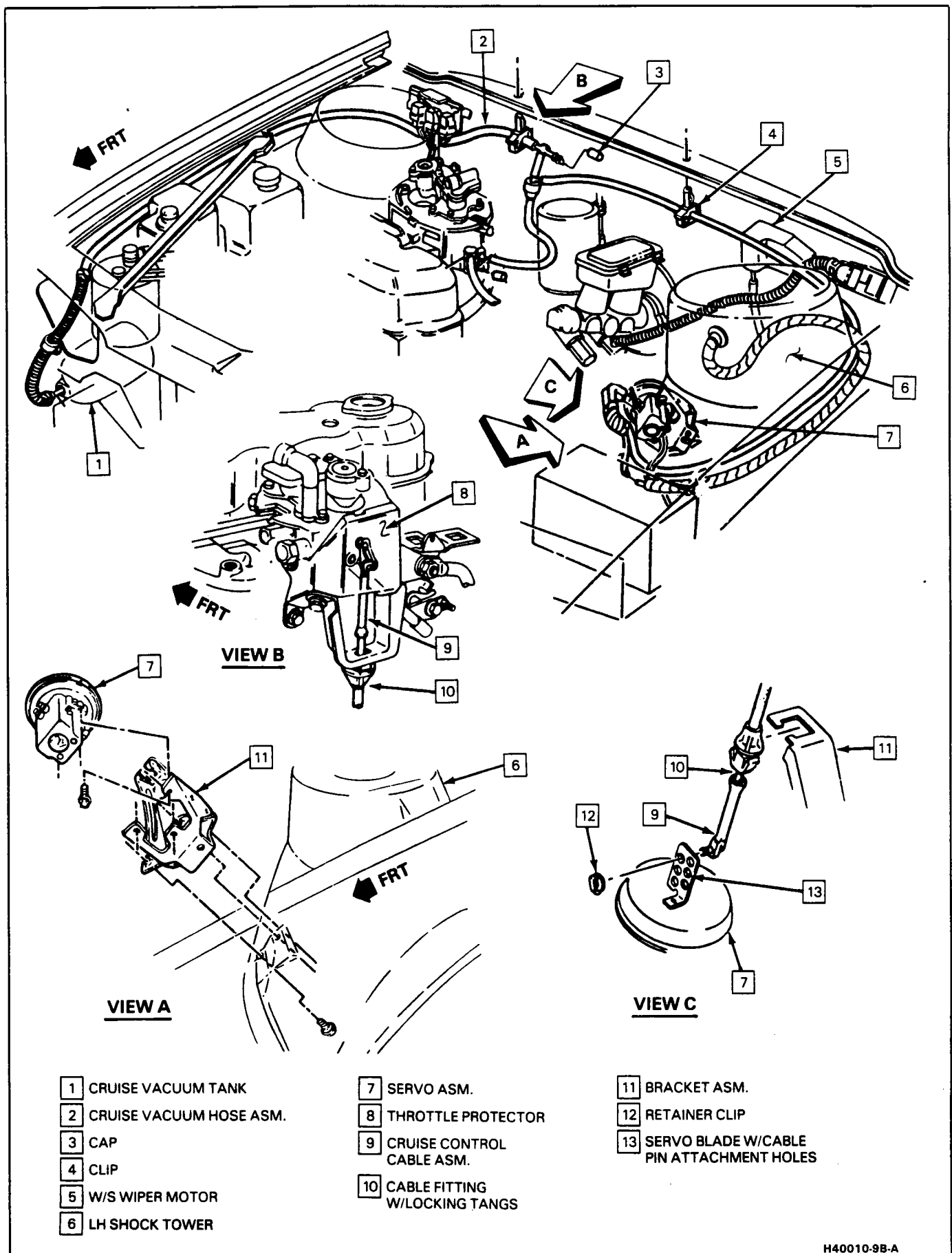


Figure 9. Servo Mounting and Cable Installation, A Carline, Eng. Code VIN W



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Figure 10. Servo and Cable Installation, A Carline, Eng. Code VIN R



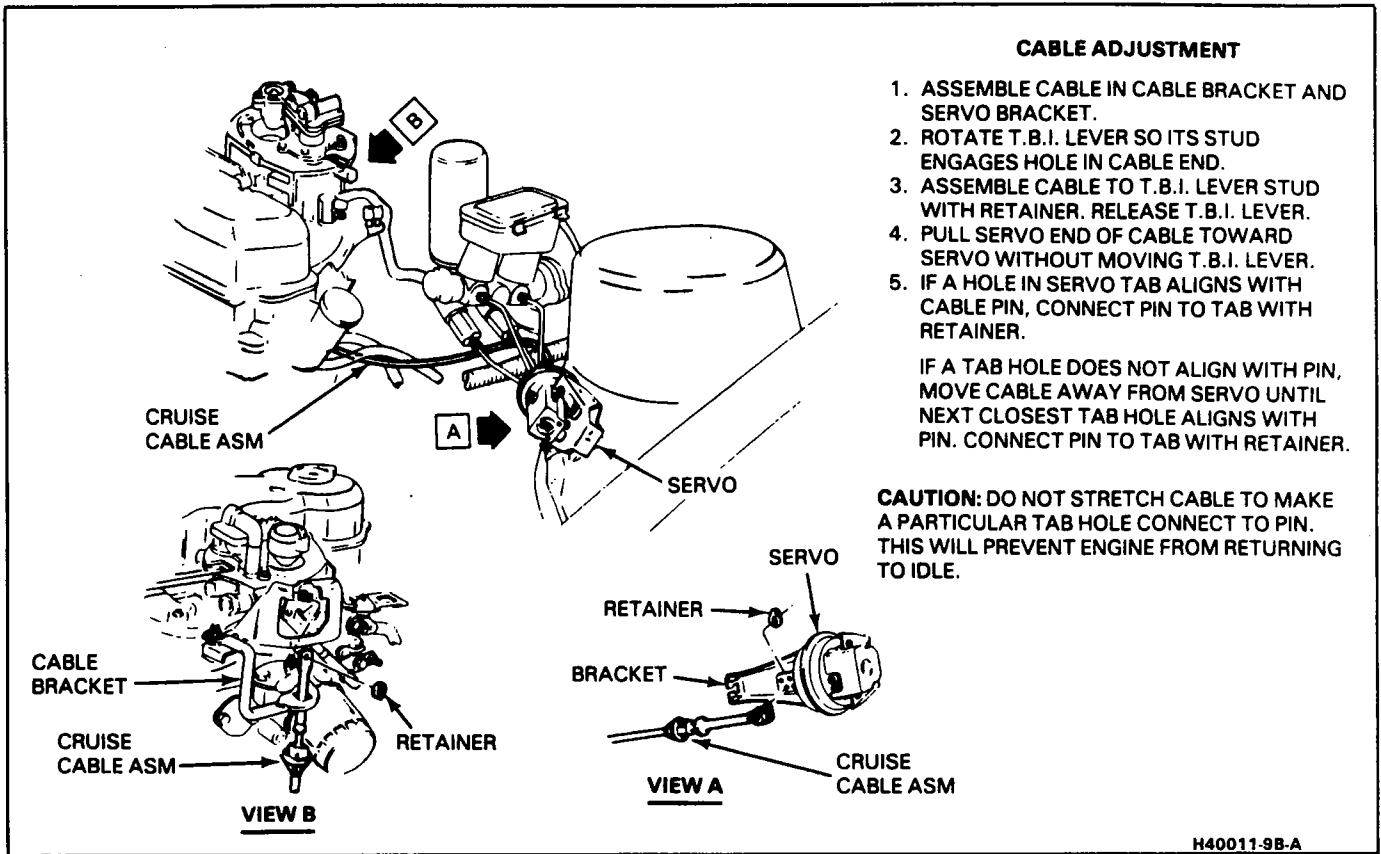


Figure 11. Servo and Cable Installation, A Carline, Eng. Code VIN R

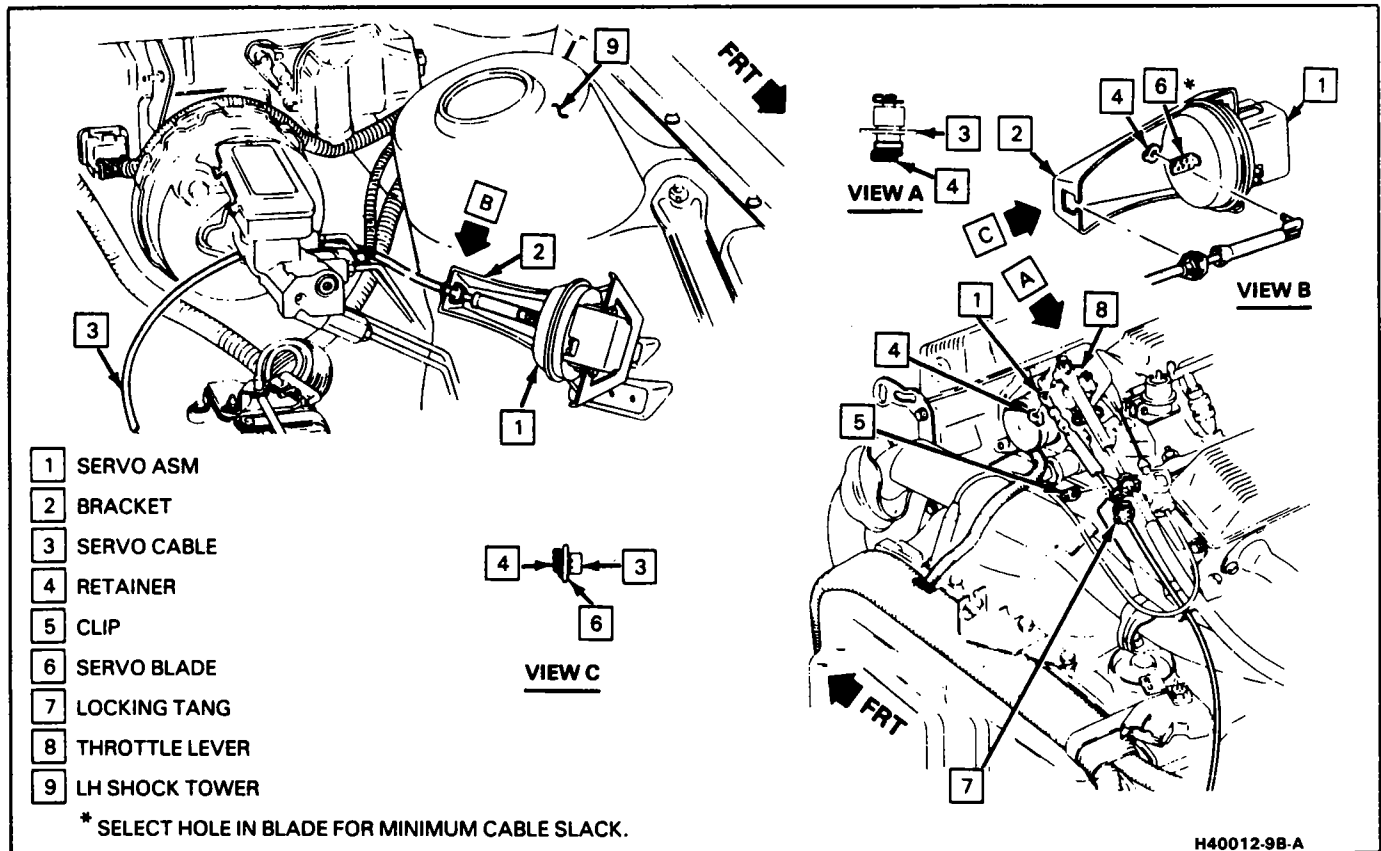


Figure 12. Servo and Cable Installation, A Carline, Eng. Code VIN 3

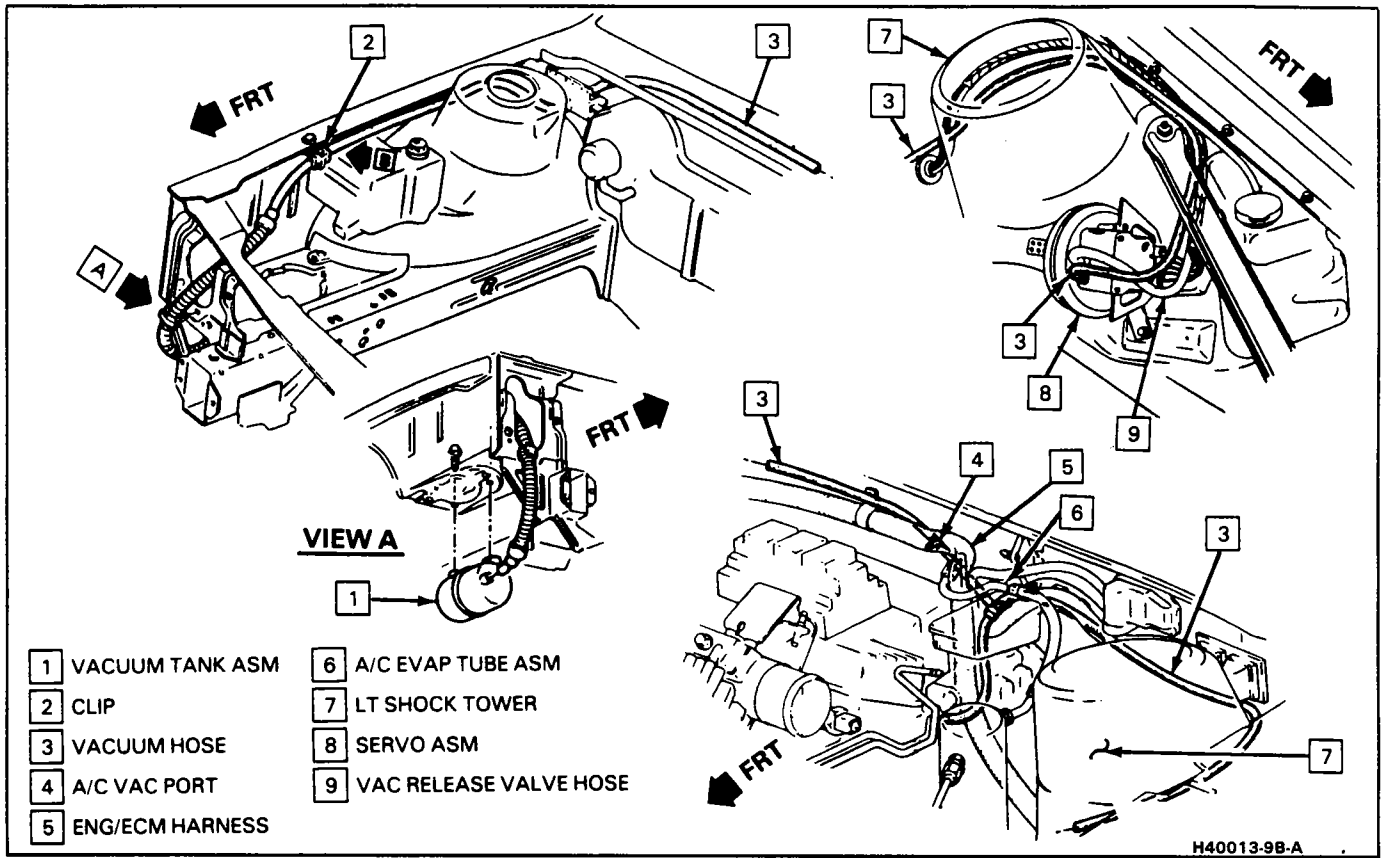


Figure 13. Vacuum Hose Routing, A Carline, Eng. Code VIN 3

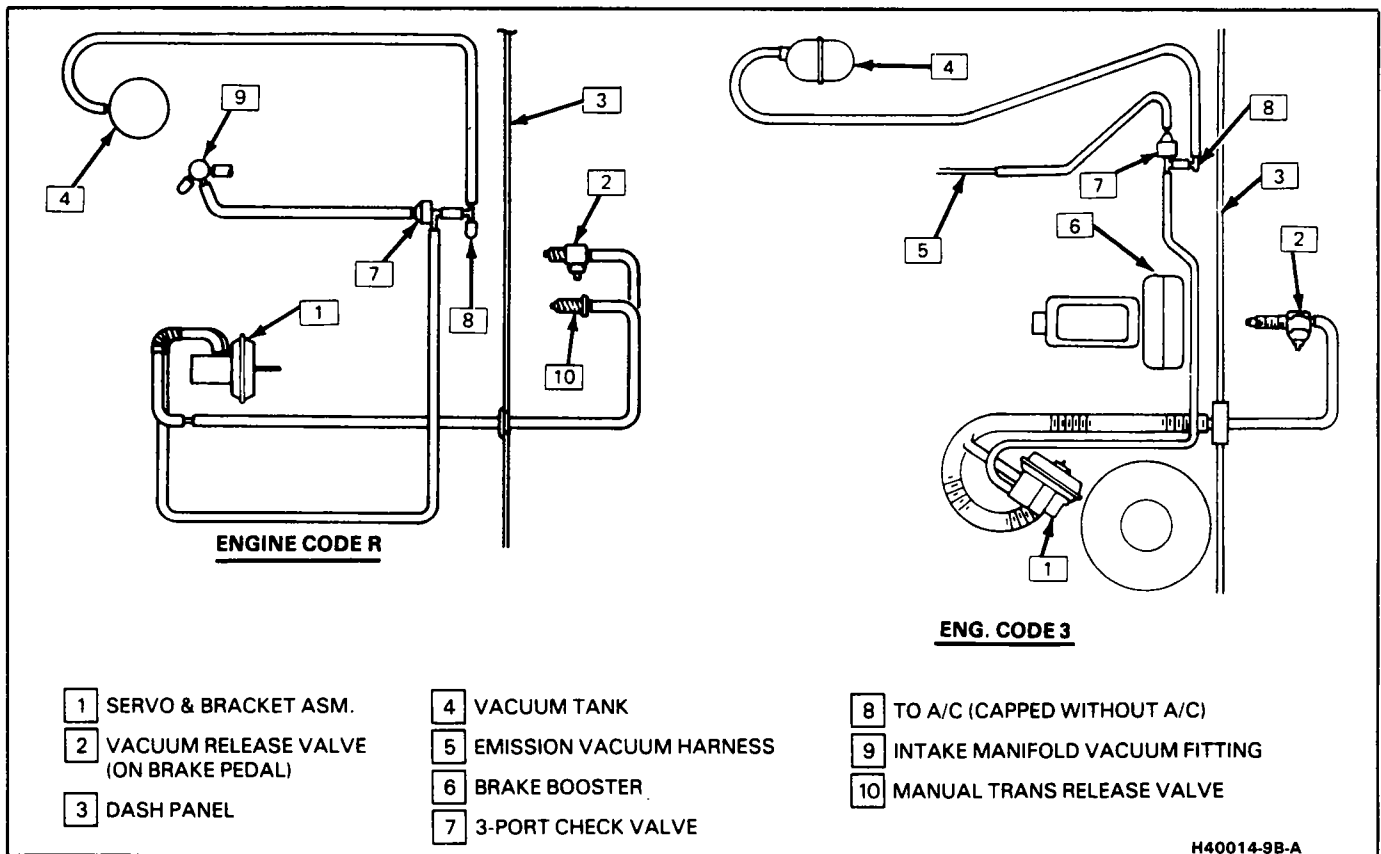
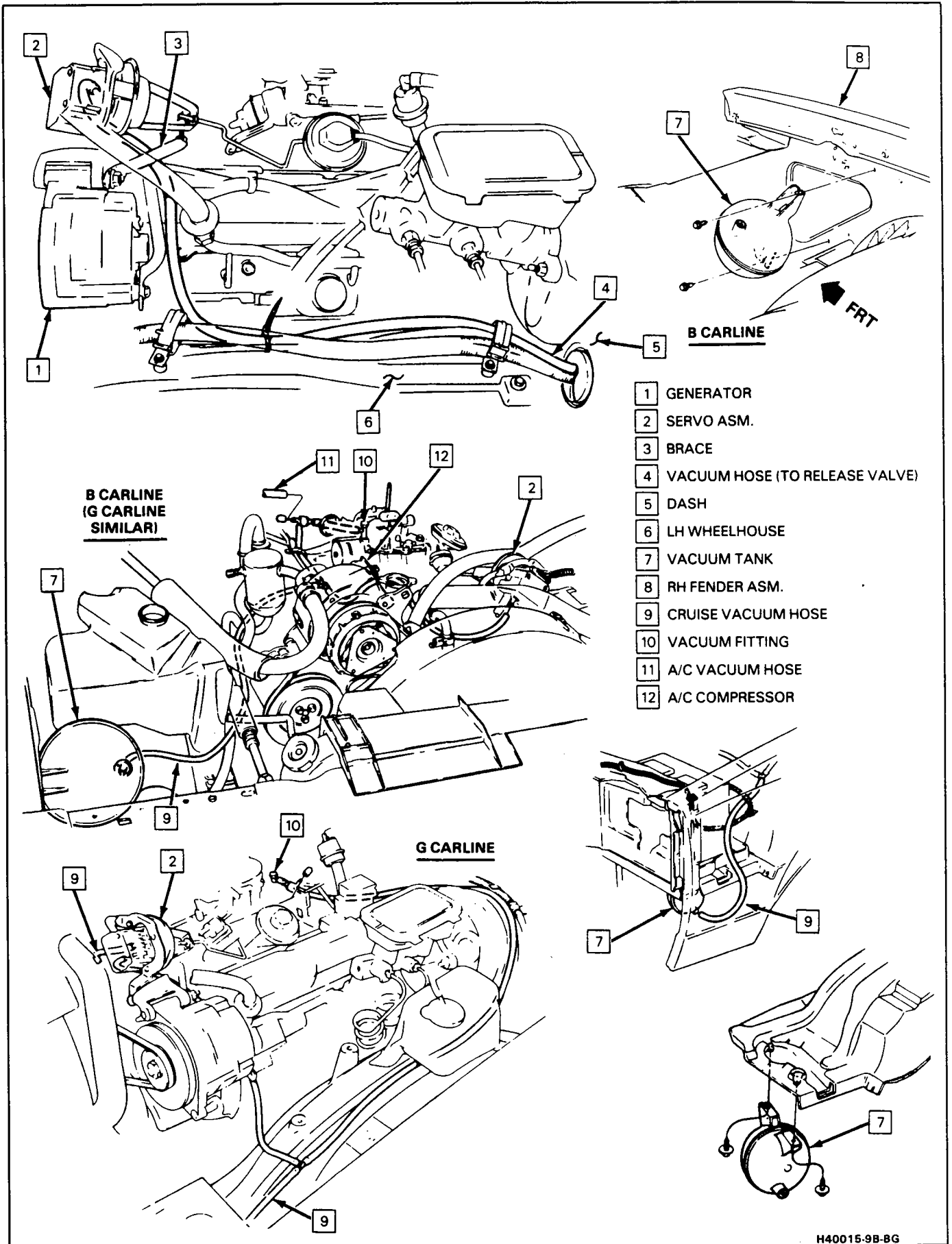


Figure 14. Vacuum Schematic, A Carline



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Figure 15. Vacuum Tank Mounting and Hose Routing, B and G Carlines, Eng. Code VIN Y

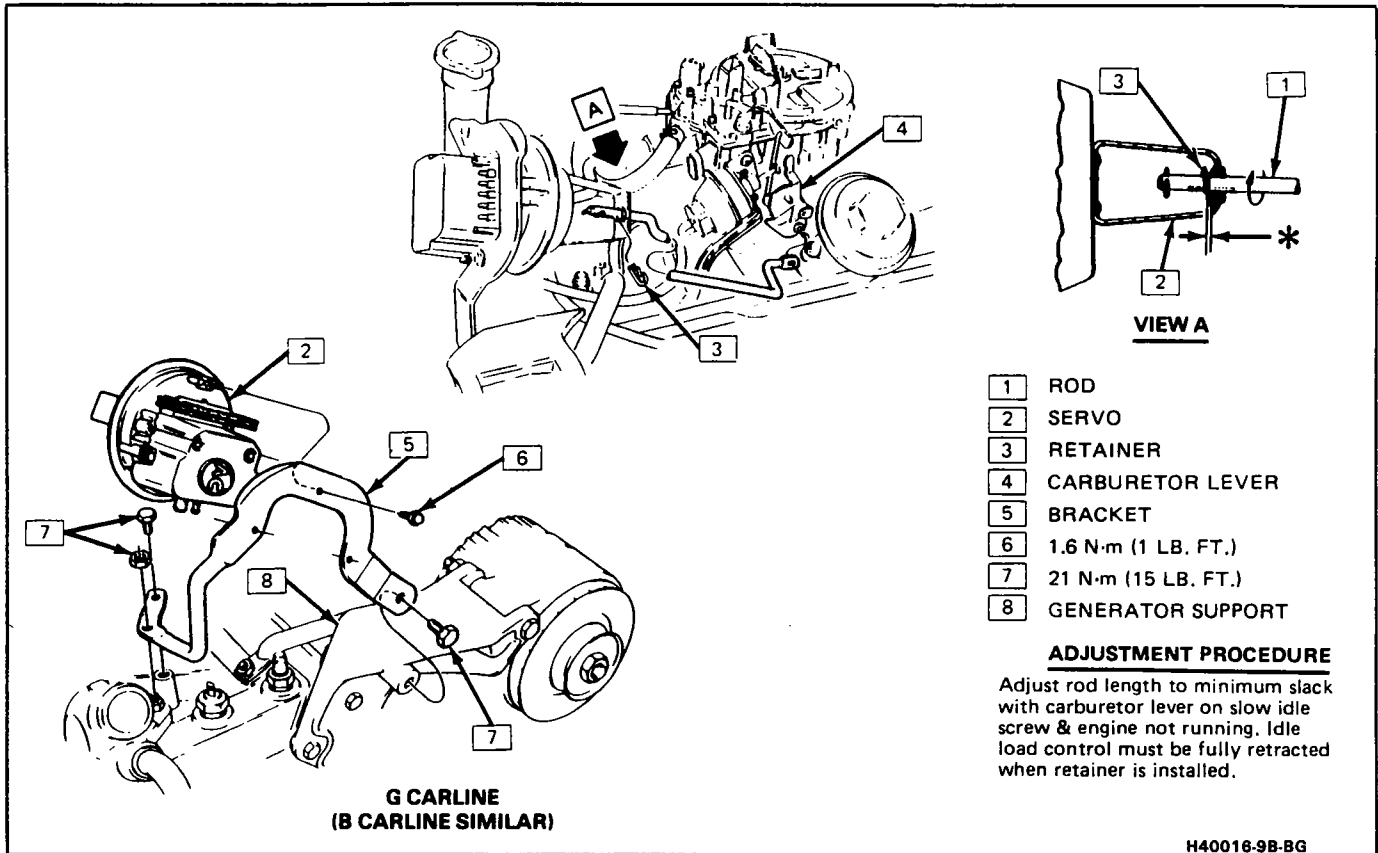


Figure 16. Servo Mounting and Cable Installation, B and G Carlines, Eng. Code VIN Y

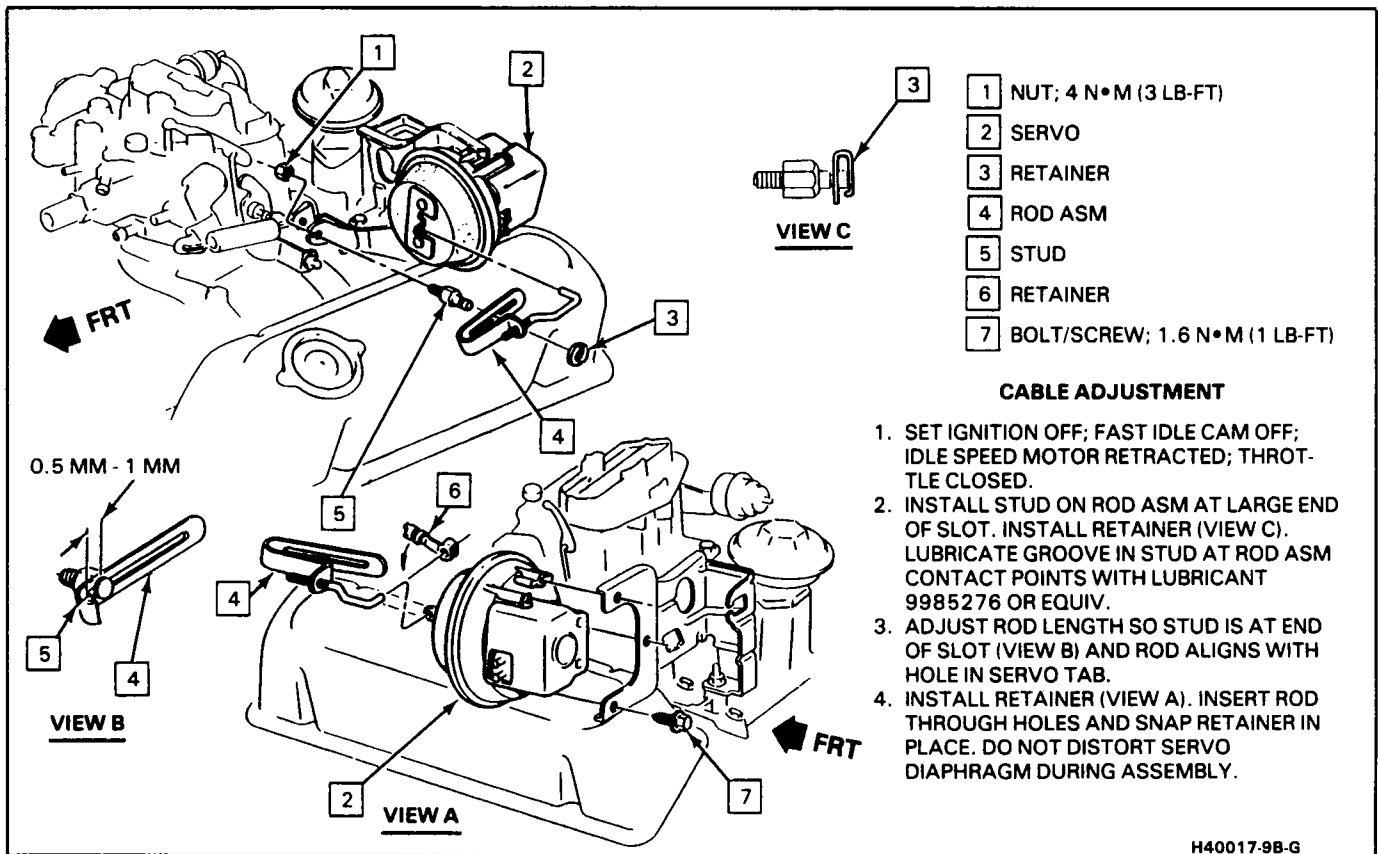


Figure 17. Servo Mounting and Cable Adjustment, G Carline, Eng. Code VIN A

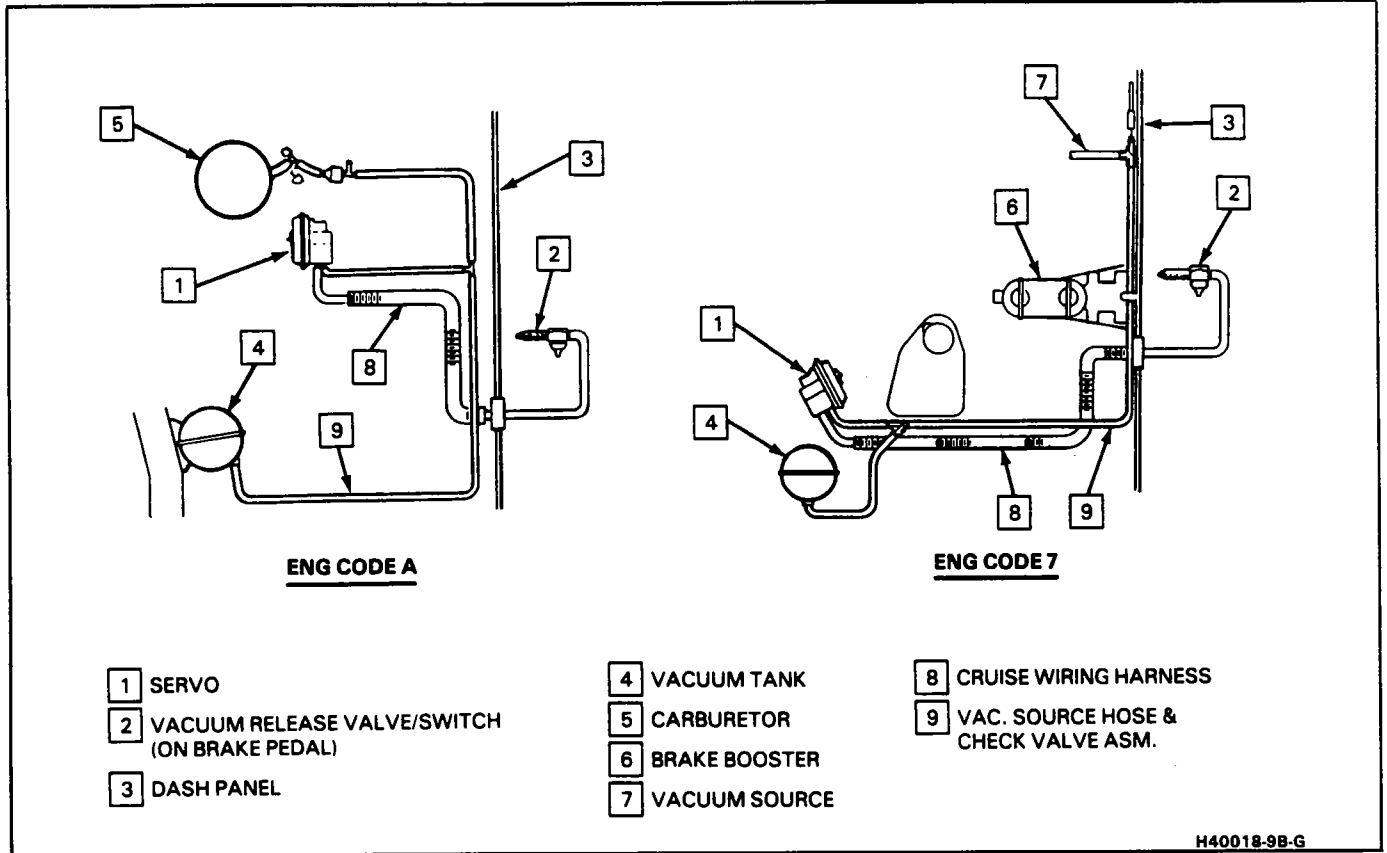


Figure 18. Vacuum Schematic, G Carline

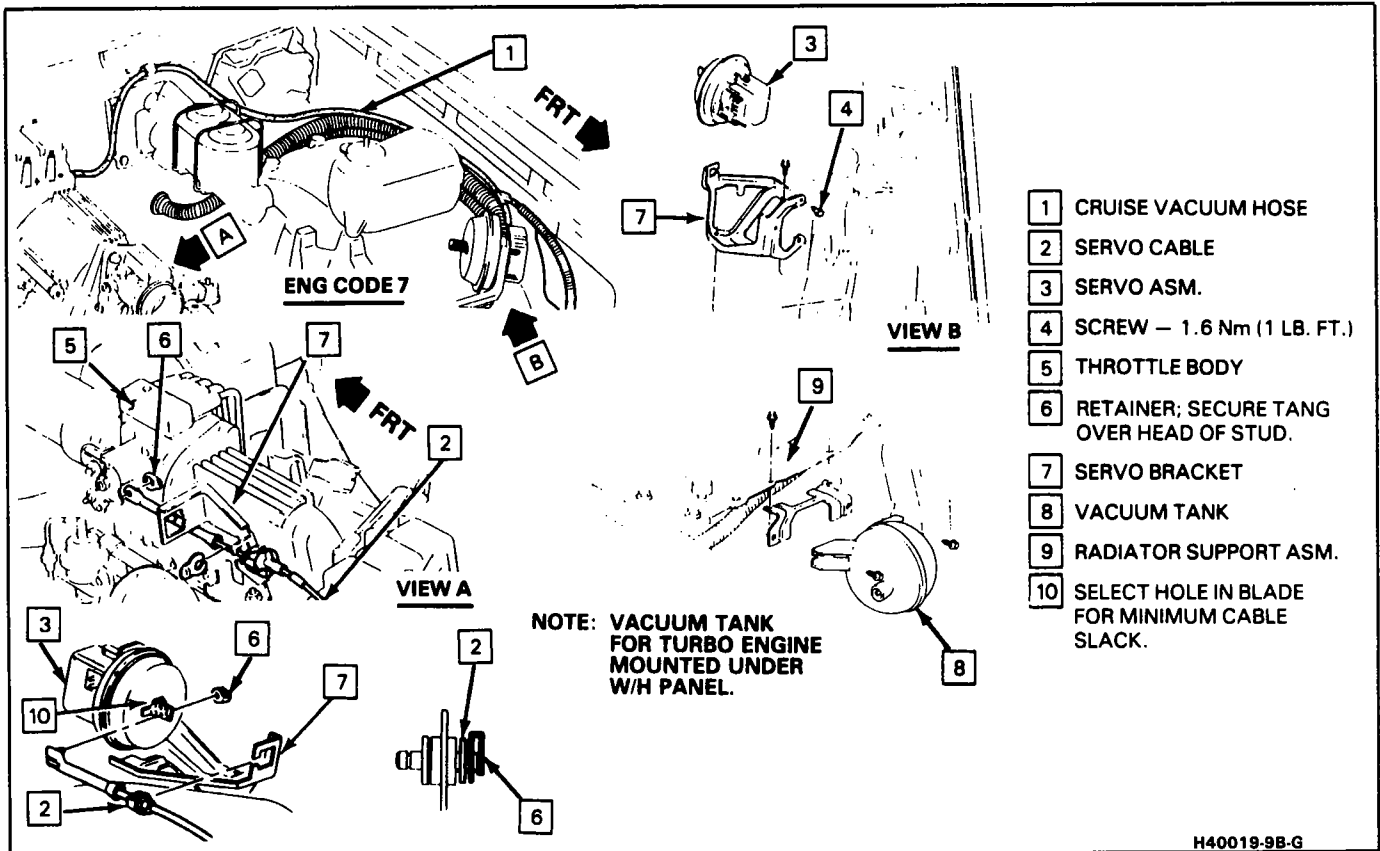


Figure 19. Servo, Vacuum Tank Mounting, and Cable Adjustment, G Carline, Eng. Code VIN 7

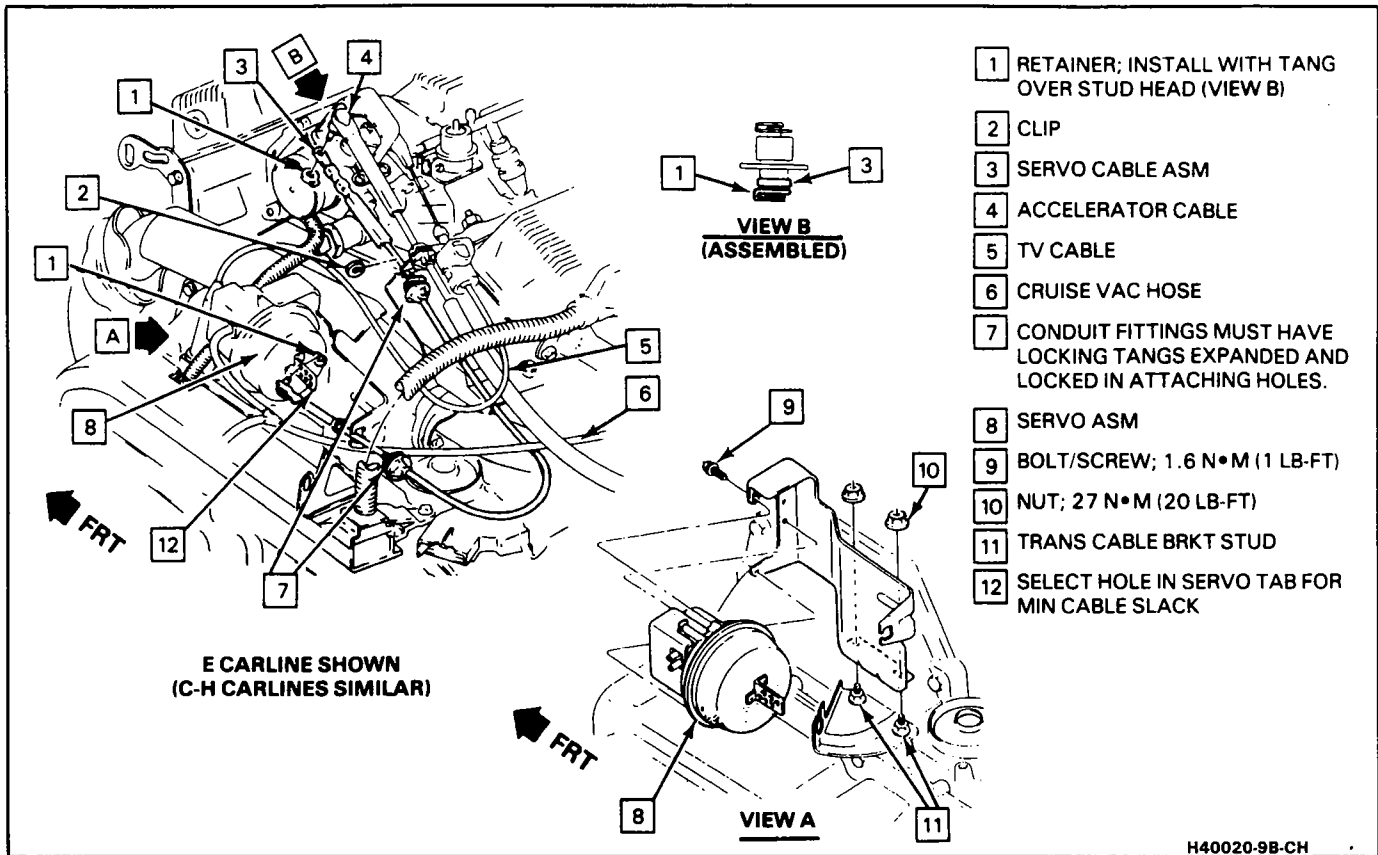


Figure 20. Servo and Cable Routing, C, E, and H Carlines

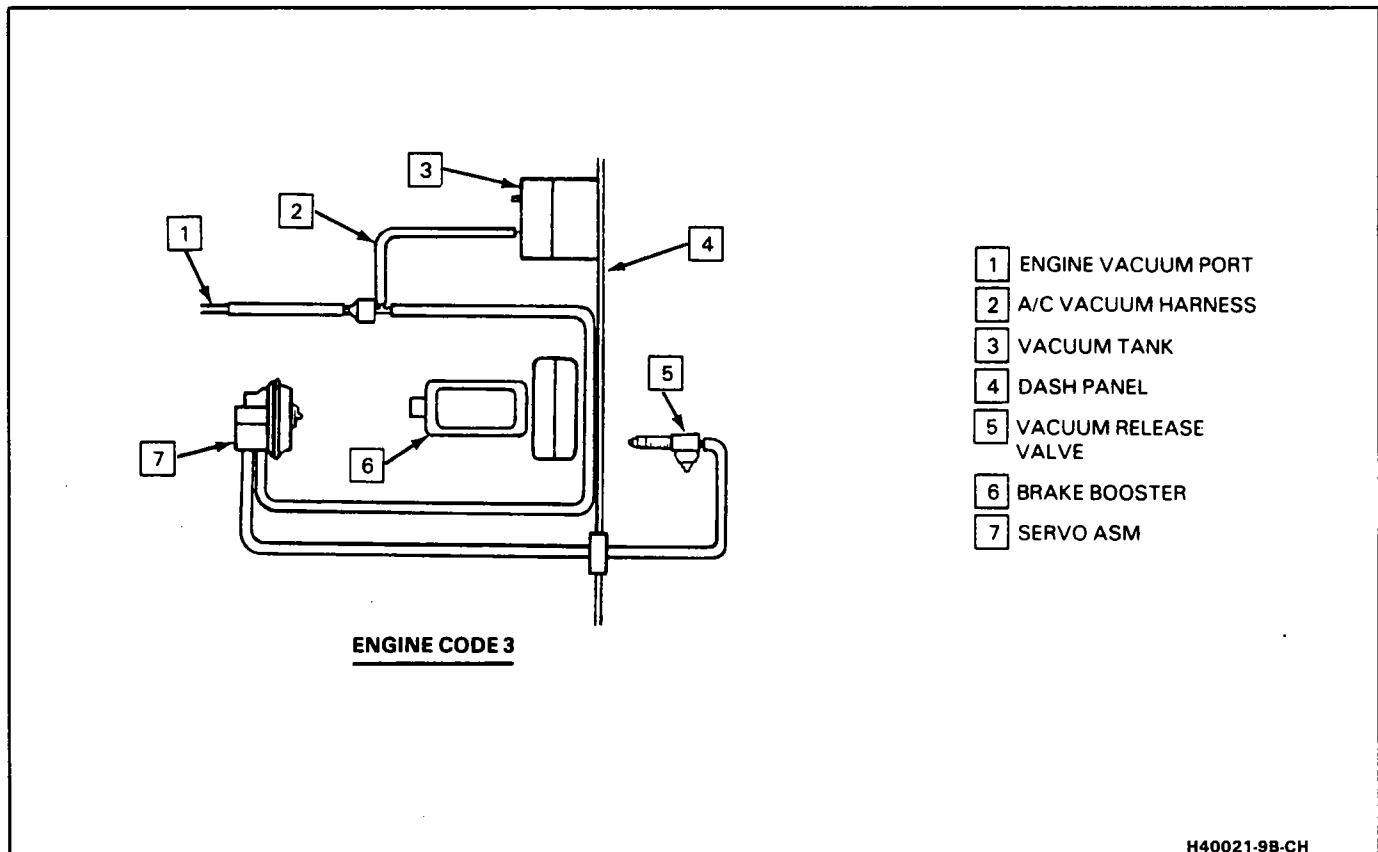


Figure 21. Vacuum Schematic, C and H Carlines

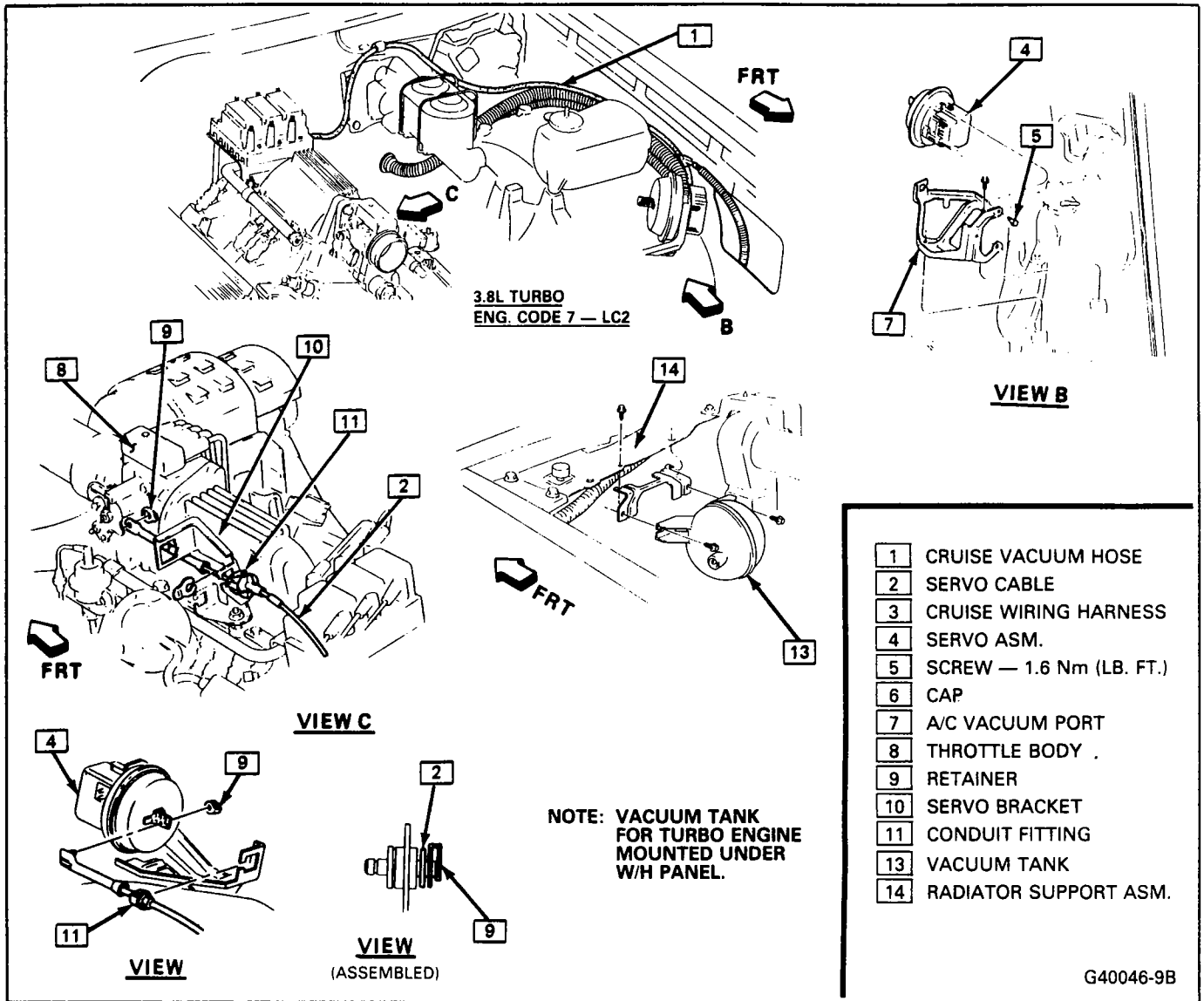


Figure 9B-35 Servo & Vacuum Tank Mounting, Hose Routing, "G" Series-Eng. LC2 (7)

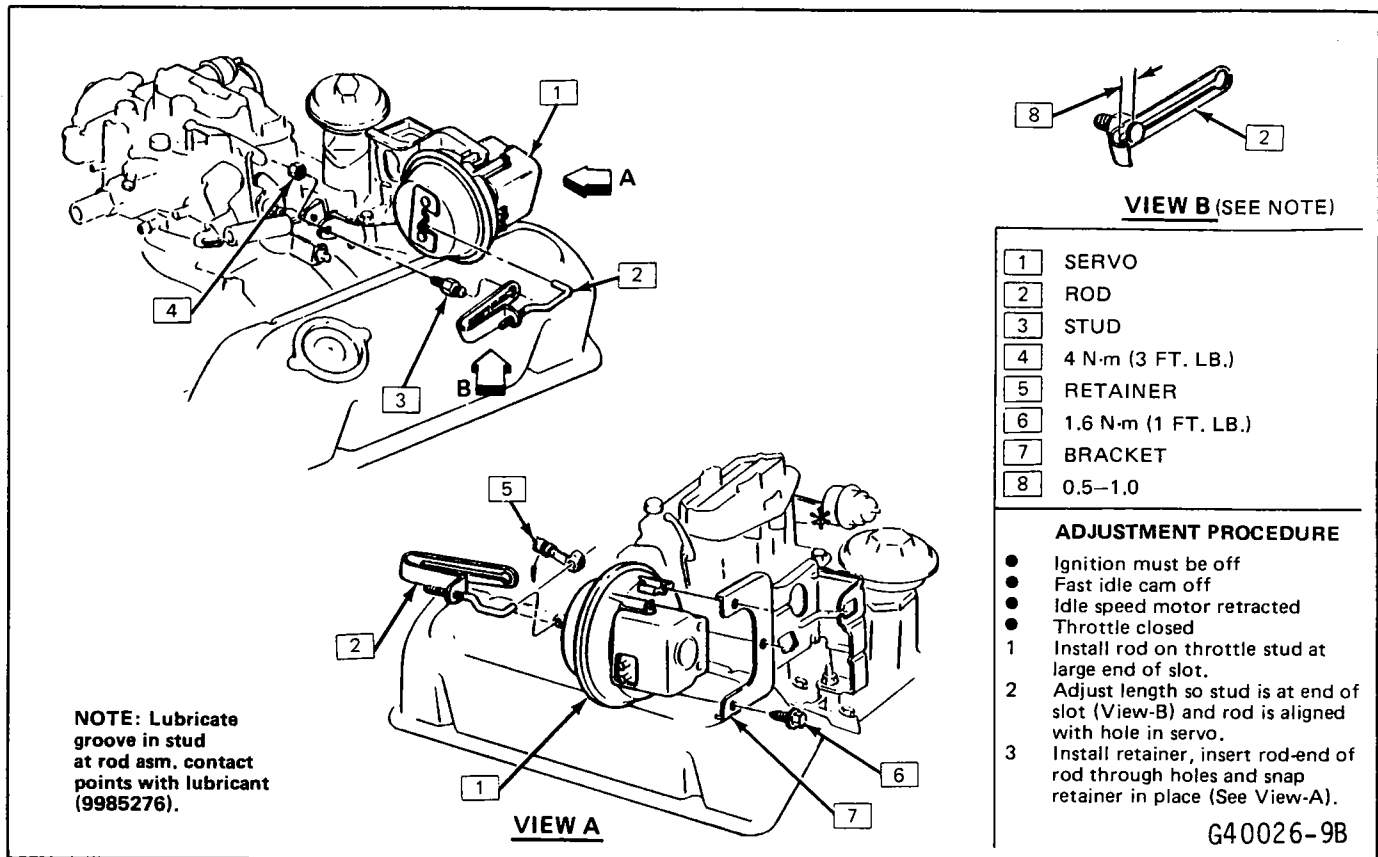


Figure 9B-36 Servo Mounting and Cable Adjustment, "G" Series-Eng. LD5 (A)

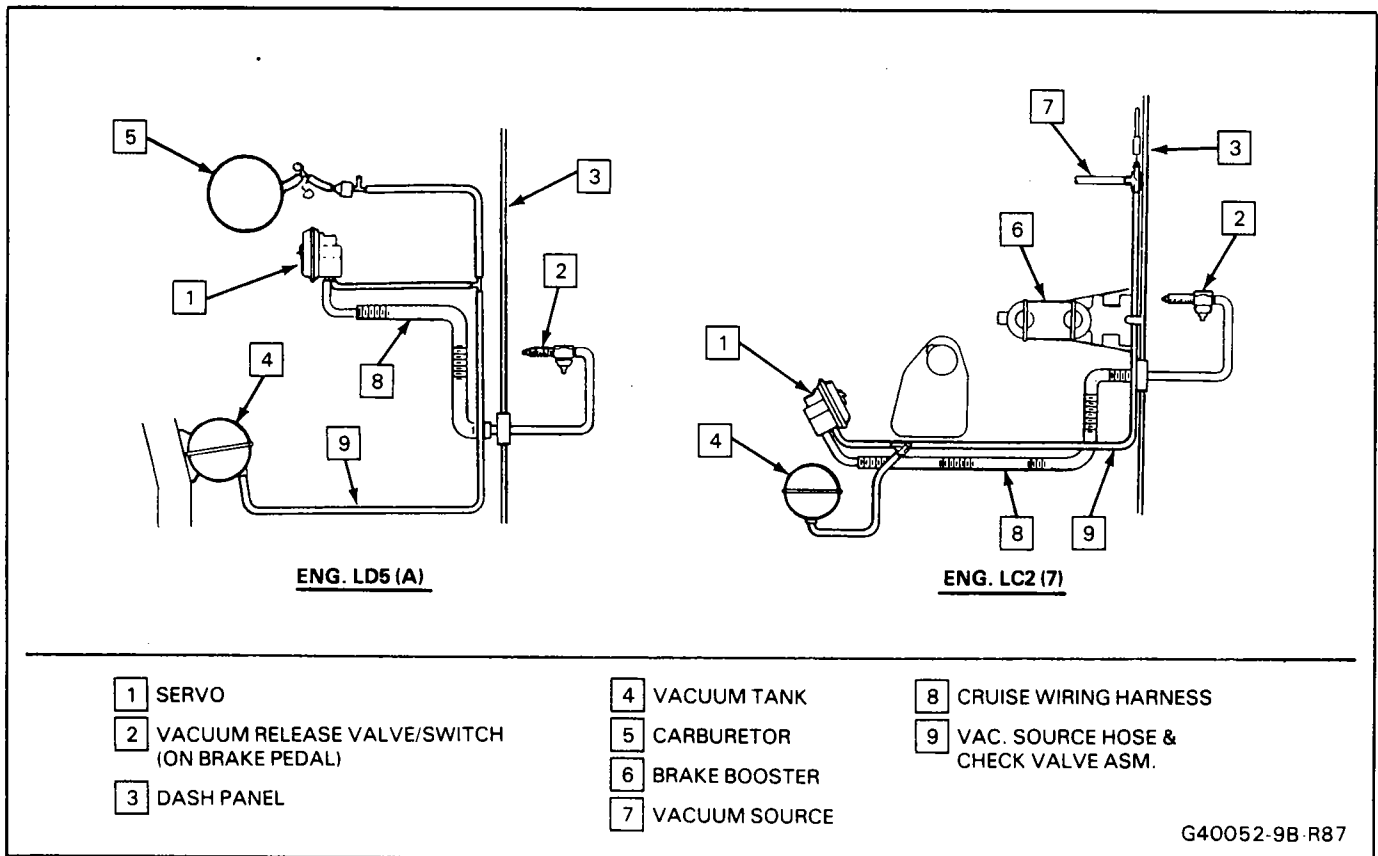


Figure 9B-37 Vacuum Schematic, "G" Series