GROUP

FUEL SYSTEM 10

(9000)

SECTION 10-00 Fuel System—Service

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

This Section covers diagnosis and cleaning procedures related to fuel injection for both unleaded gasoline and flexible fuel (FF) vehicles. Other emission systems related to the fuel system are covered in the Powertrain Control / Emissions Diagnosis Manual[1].

NOTE: Fuel methanol refers to a blend of fuel with a maximum of 85 percent methanol.

WARNING: DO NOT SWALLOW FUEL METHANOL. LIKE GASOLINE, IT IS HIGHLY TOXIC AND IF SWALLOWED CAN CAUSE DEATH OR PERMANENT INJURY. SWALLOWING METHANOL CAN ALSO CAUSE BLINDNESS. CALL A PHYSICIAN IMMEDIATELY TO TREAT ANYONE WHO HAS SWALLOWED FUEL METHANOL. VOMITING SHOULD BE INDUCED UNDER THE DIRECTION OF A PHYSICIAN OR POISON CONTROL CENTER. BE AWARE THAT THE ONSET OF POTENTIAL ILL HEALTH EFFECTS MAY BE DELAYED.

AVOID INHALING FUEL VAPORS. INHALING TOO MUCH FUEL METHANOL OR GASOLINE VAPOR CAN LEAD TO EYE AND RESPIRATORY TRACT IRRITATION. IN SEVERE CASES, EXCESSIVE OR PROLONGED BREATHING OF FUEL METHANOL OR GASOLINE VAPORS CAN CAUSE SERIOUS ILLNESS AND PERMANENT INJURY SUCH AS BLINDNESS.

AVOID GETTING FUEL METHANOL OR GASOLINE LIQUID IN YOUR EYES. IF YOU GET ANY FUEL METHANOL OR GASOLINE IN YOUR EYES, REMOVE CONTACT LENSES (IF WORN), FLUSH IMMEDIATELY WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND SEEK MEDICAL ATTENTION.

1 Can be purchased as a separate item.

DESCRIPTION (Continued)

ALLOWING FUEL METHANOL OR GASOLINE TO GET IN YOUR EYES WILL CAUSE SEVERE IRRITATION. FAILURE TO SEEK PROPER MEDICAL ATTENTION FOR FUEL METHANOL OR GASOLINE CONTACT WITH THE EYES COULD LEAD TO PERMANENT INJURY SUCH AS BLINDNESS.

IF YOU GET FUEL METHANOL OR GASOLINE ON YOUR SKIN, WASH WITH SOAP AND WATER. REPEATED OR PROLONGED SKIN CONTACT WITH METHANOL OR GASOLINE LIQUID OR VAPOR CAUSES SKIN IRRITATION. MAKE SURE YOU WASH YOUR HANDS BEFORE HANDLING FOOD.

IF YOU ARE TAKING MEDICATION FOR THE TREATMENT OF ALCOHOLISM, SUCH AS ANTABUSE OR OTHER FORMS OF DISULFIRAM, SKIN CONTACT WITH FUEL METHANOL OR BREATHING ITS VAPORS CAN CAUSE THE SAME KIND OF ADVERSE REACTION AS DRINKING ALCOHOL. IN SENSITIVE INDIVIDUALS, SERIOUS PERSONAL INJURY OR SICKNESS COULD RESULT. IF YOU ARE TAKING SUCH MEDICATION, YOU SHOULD TAKE EXTRA CARE TO AVOID SKIN CONTACT WITH FUEL METHANOL AND TO AVOID BREATHING ITS VAPORS. IF YOU DO GET FUEL METHANOL ON YOUR SKIN, WASH IT OFF IMMEDIATELY. CONSULT A PHYSICIAN PROMPTLY IF YOU EXPERIENCE AN ADVERSE REACTION.

WARNING: DO NOT MODIFY THE FUEL SYSTEM CONFIGURATION OR COMPONENTS, OR REPLACE COMPONENTS WITH PARTS NOT ESPECIALLY DESIGNED FOR USE WITH FUEL METHANOL. FORD MOTOR COMPANY HAS SPECIALLY-DESIGNED THE MATERIALS, COMPONENTS AND SYSTEM CONFIGURATION FOR METHANOL-FUELED VEHICLES AND EACH PARTICULAR SYSTEM IS PRECISELY CALIBRATED FOR EFFICIENT OPERATION. THE USE OF DIFFERENT PARTS OR MATERIALS COULD PRODUCE AN UNTESTED CONFIGURATION THAT COULD RESULT IN FIRE, PERSONAL INJURY, OR COULD CAUSE ENGINE DAMAGE.

WARNING: DO NOT OPERATE ENGINE OR SMOKE WHILE REFUELING.

CAUTION: Use only fuel methanol which meets Ford Specification ESE-M4C97-B. Use of other fuel methanol may cause powertrain damage as well as loss of vehicle performance. It will also invalidate any extended service agreement.

WARNING: IT IS IMPORTANT THAT YOUR FLEXIBLE FUEL VEHICLE BE PROPERLY MAINTAINED BY FORD FLEXIBLE FUEL TRAINED PERSONNEL. IF A PROBLEM OCCURS, IT IS IMPORTANT THAT PROPERLY TRAINED PERSONNEL DIAGNOSE THE CAUSE. IF THE PROBLEM RELATES TO THE FUEL SYSTEM, PROPER PART REPLACEMENT IS IMPERATIVE TO KEEP YOUR VEHICLE OPERATING AT NORMAL PERFORMANCE. FLEXIBLE FUEL COMPONENTS AND STANDARD FUEL COMPONENTS ARE NOT INTERCHANGEABLE AND IF YOUR VEHICLE IS NOT SERVICED IN ACCORDANCE WITH FLEXIBLE FUEL VEHICLE PROCEDURES, DAMAGE MAY OCCUR AND YOUR WARRANTY MAY BE INVALIDATED.

DIAGNOSIS

Almost any electric fuel pump (FP) (9350) malfunction that can occur will result in a loss or reduction of fuel flow and/or pressure. Loss of pressure and/or flow will be detected by a reduction of engine performance. These diagnostic procedures will concentrate on determining if the electric fuel pump is operating properly. Other diagnosis procedures will cover the analysis of other malfunctions that can cause loss or reduction of engine performance.

Refer to the Electrical and Vacuum Troubleshooting manual for detailed wiring schematics.

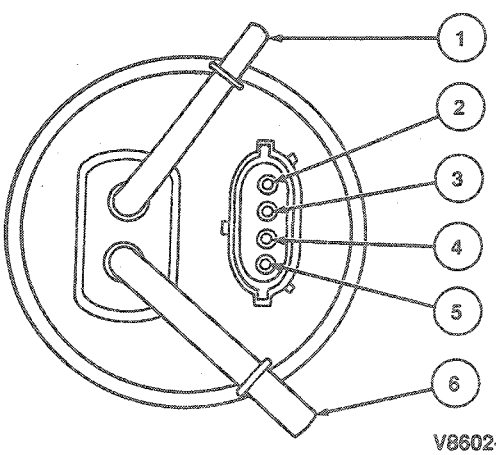
Use the diagnosis charts to determine if the electric fuel pump is operating properly.

CAUTION: At the completion of each pinpoint test step shut off fuel pump by removing ground from jumper to FP lead or by turning ignition switch to the OFF position (unless otherwise specified).

NOTE: Grounding the FP lead of test connector allows pump to run continuously when the ignition switch is in the ON position.

Fuel Pump Terminals

Except FF Vehicles



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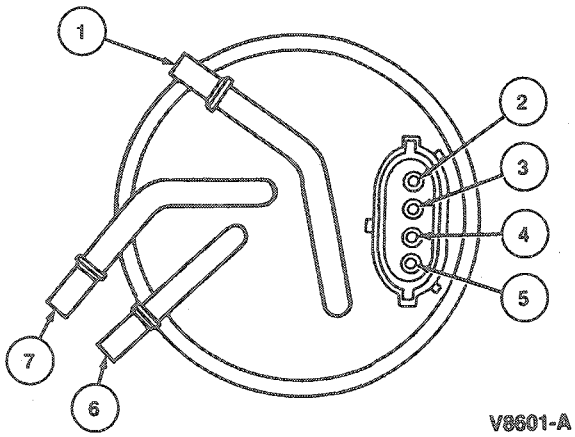
DIAGNOSIS (Continued)

Item	Description
1	Fuel Return
2	Sender Ground
3	Sender Positive
4	Fuel Pump Positive
5	Fuel Pump Negative
6	Fuel Supply

FF Vehicles



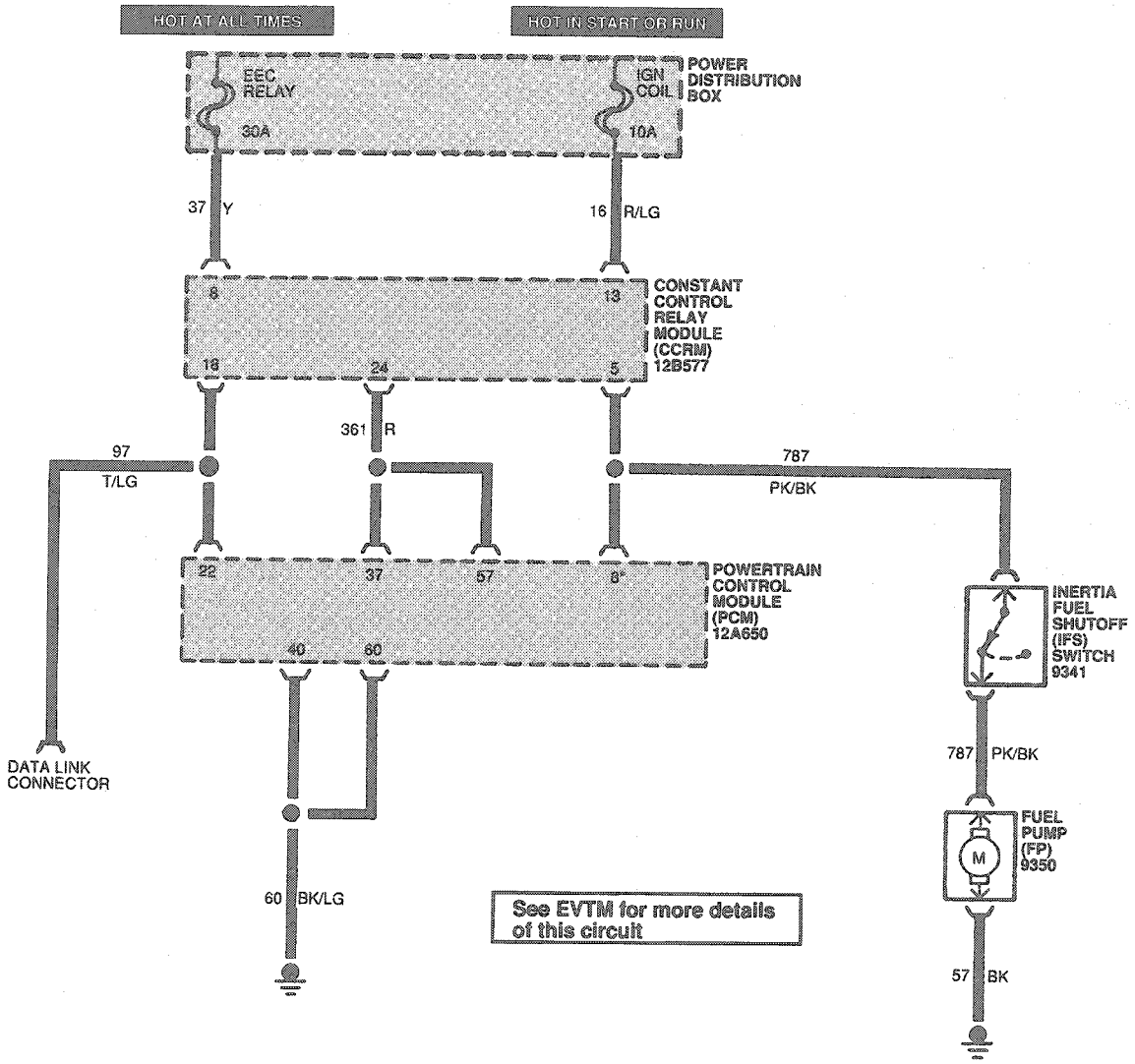
V8601-A

Item	Description
1	Fuel Tank Drain
2	Sender Ground
3	Sender Positive
4	Fuel Pump Positive
5	Fuel Pump Ground
6	Fuel Return
7	Fuel Supply

DIAGNOSIS (Continued)

Wiring Diagram

Except FF Vehicles

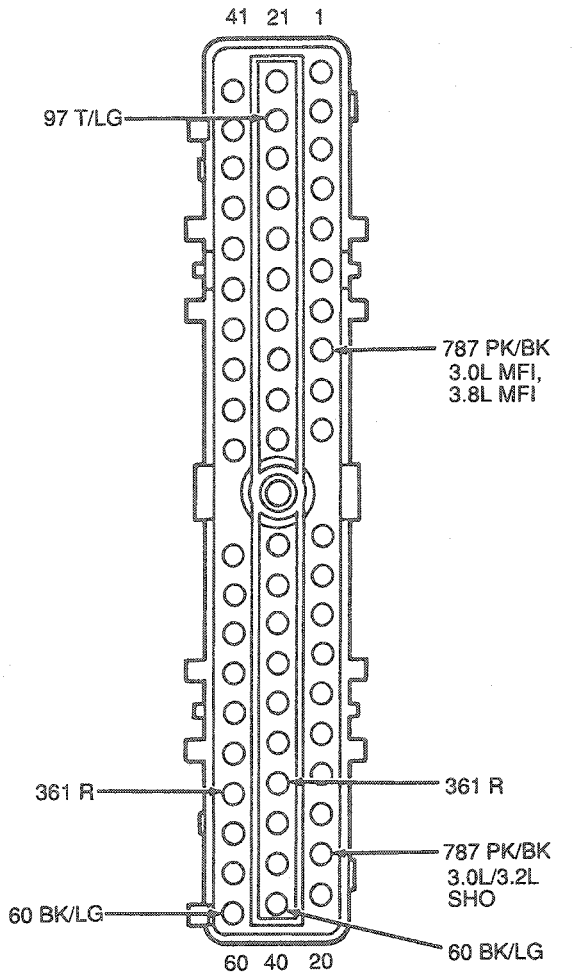


*PIN 19 ON 3.0L/3.2L SHO

A16105-A

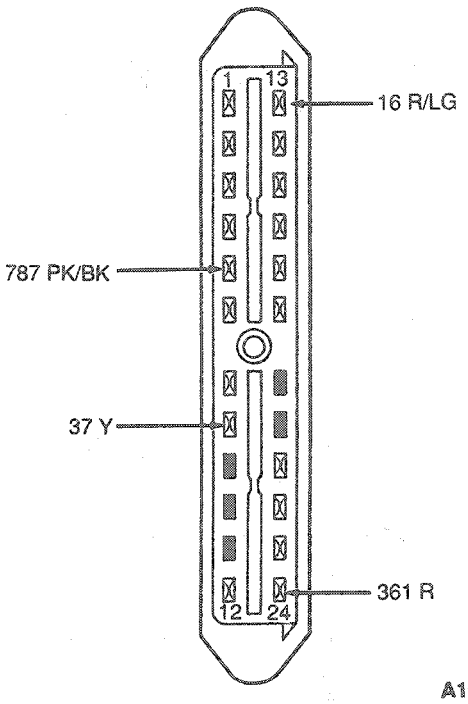
DIAGNOSIS (Continued)

Connector End Views



POWERTRAIN CONTROL MODULE (PCM) CONNECTOR

A16167-A



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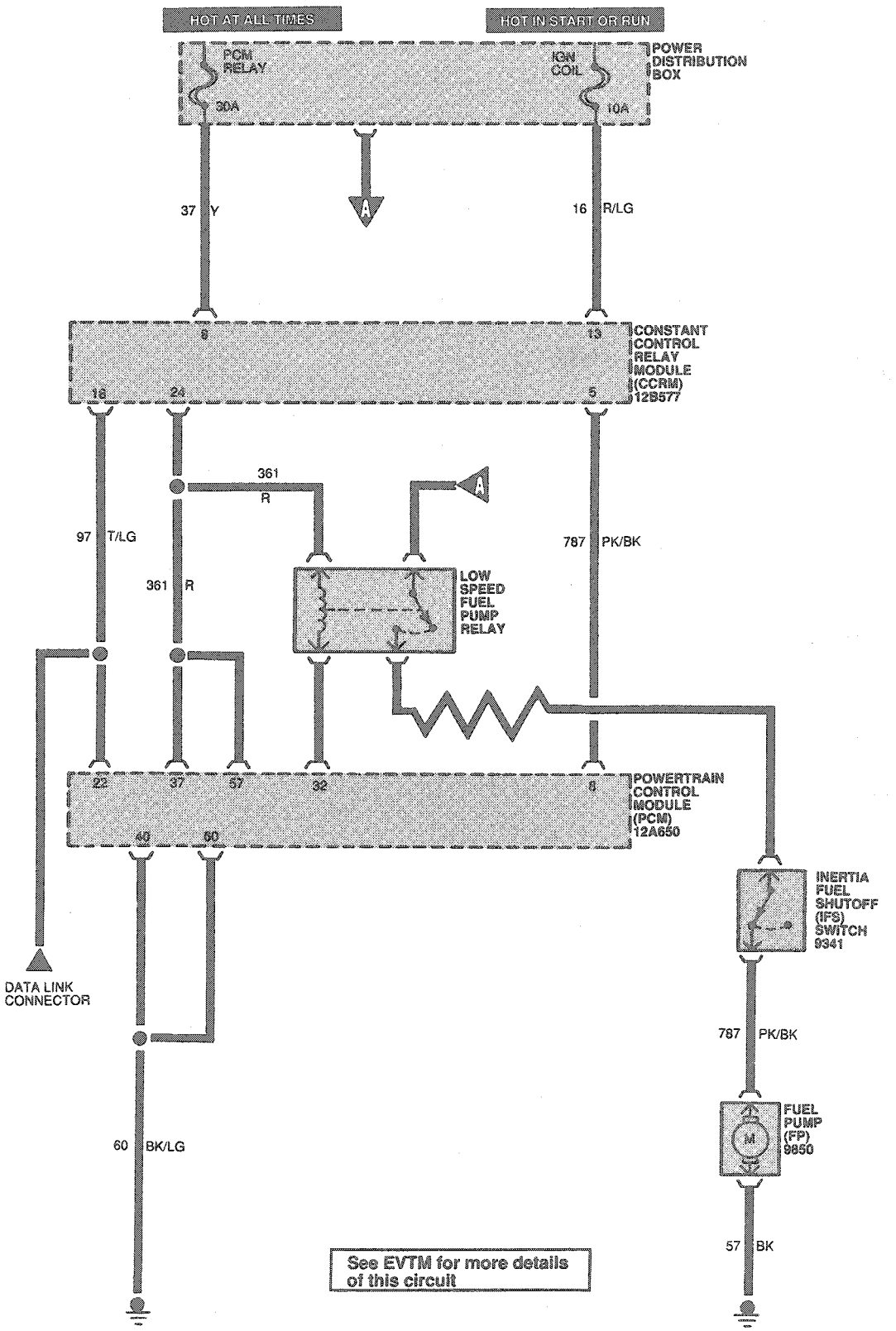
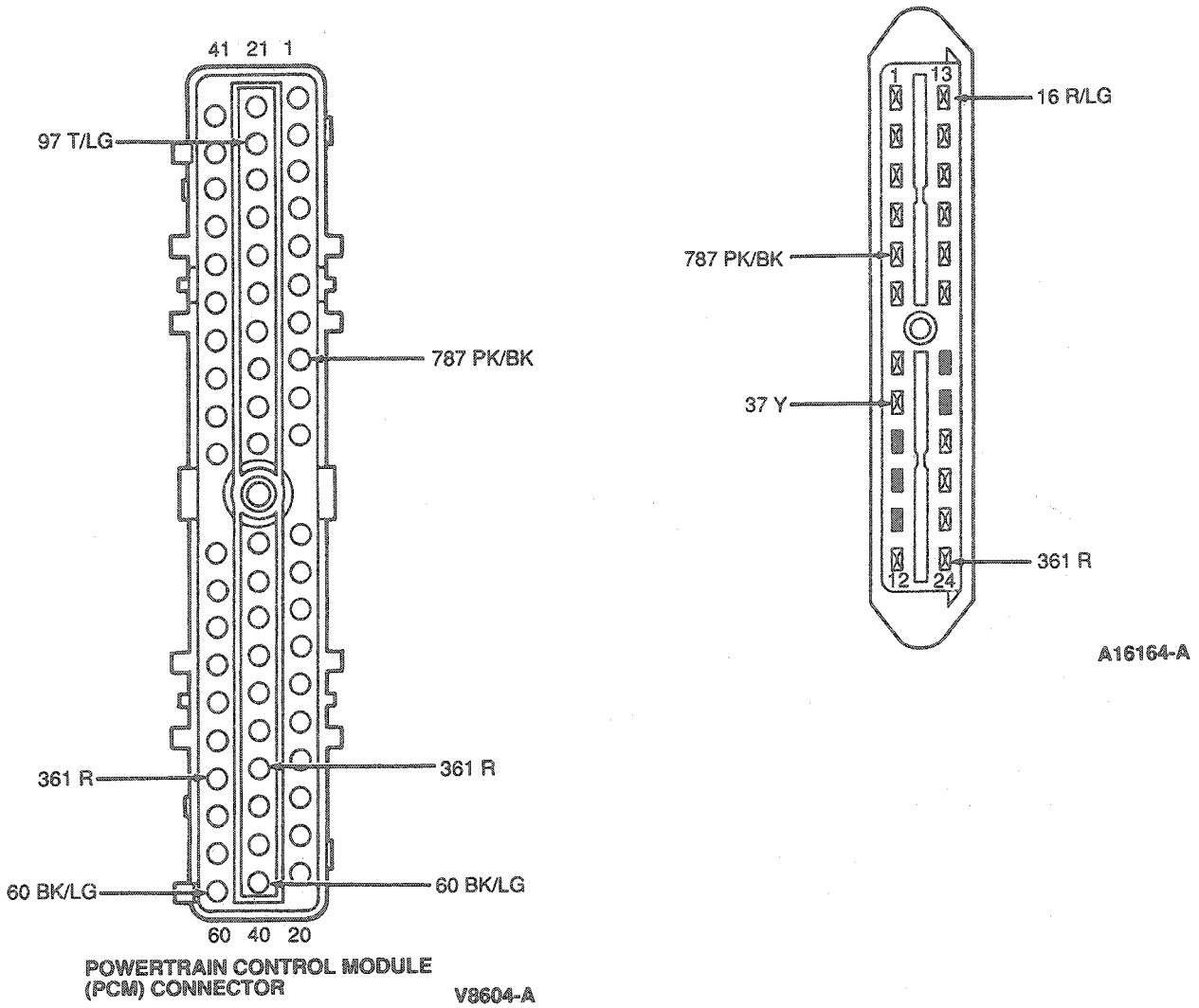
DIAGNOSIS (Continued)

Wiring Diagram
FF Vehicles



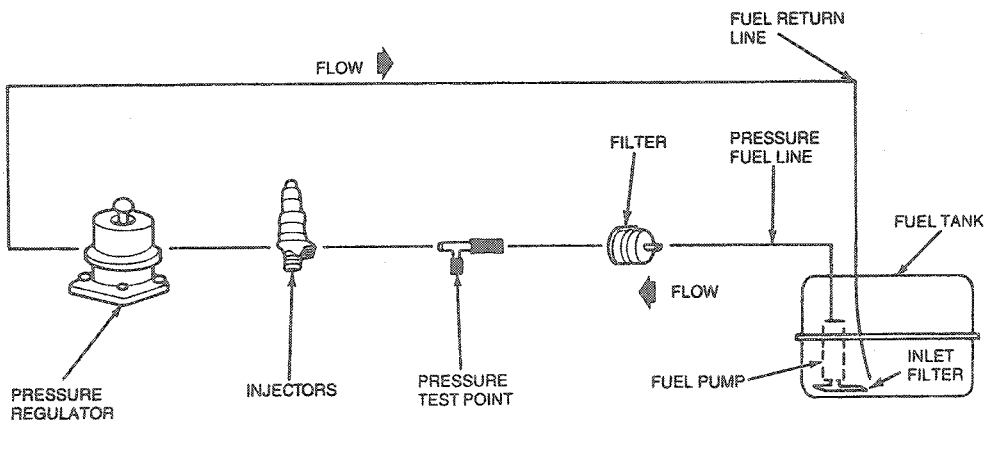
DIAGNOSIS (Continued)

Connector End Views



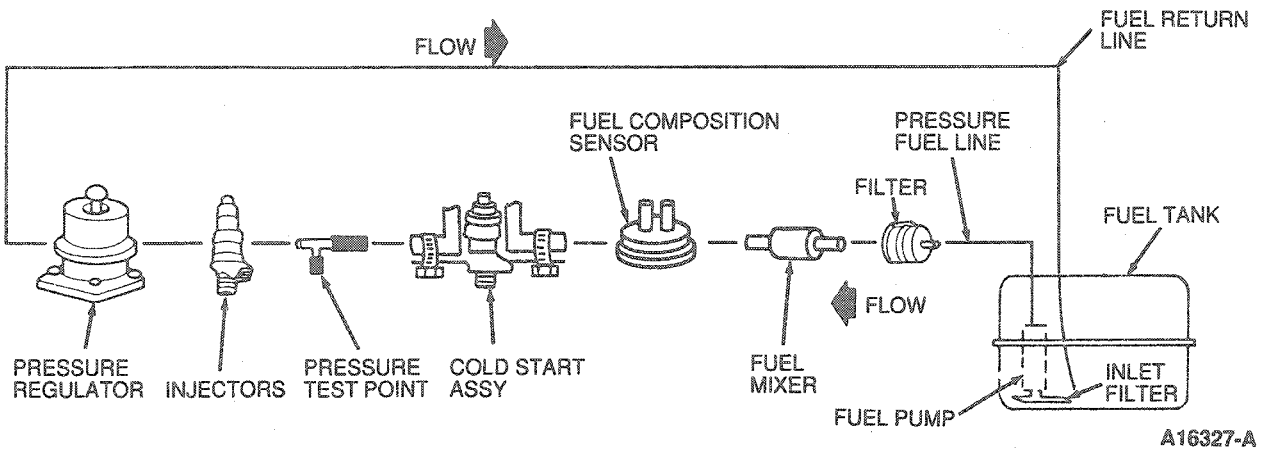
POWERTRAIN CONTROL MODULE (PCM) CONNECTOR V8604-A

System Component Schematics Except FF Vehicles

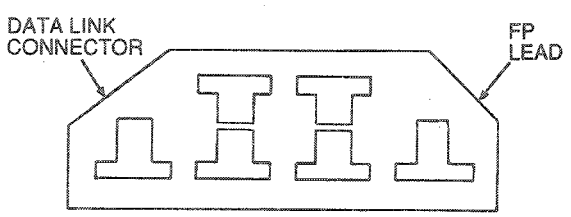


DIAGNOSIS (Continued)

FF Vehicles



PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS

TEST STEP		RESULT	ACTION TO TAKE
A1	INSPECT SYSTEM		
	• Run Self-Test to verify no electrical codes. • Check fuel system for adequate fuel supply. • Check inertia fuel shutoff (IFS) switch. • Verify that the battery is fully charged. • Check fuse for open condition. • Visually inspect the fuel delivery system including fuel tank, lines, filter, injectors, pressure regulator, battery, electrical lines, and connectors for leakage, looseness, cracks, pinching, kinking, corrosion, grounding, abrasion, or other damage caused by accident, collision, assembly or usage. • **Is the system free of any evidence of leakage, damage, or any evident cause for concern?**	Yes ▶ No ▶	GO to A2. SERVICE or REPLACE components as necessary. GO to A2.
A2	CHECK FUEL PUMP FUNCTION		
	• Install the fuel pressure tester on the schrader valve on the fuel injection supply manifold. • Locate the data link connector (DLC) in the engine compartment. Ground fuel pump (FP) lead. • Turn the ignition key to the RUN position to operate the fuel pump. • Raise vehicle on hoist and use stethoscope to listen to fuel tank to monitor fuel pump sound. **CAUTION: Unless otherwise specified, at the completion of each step, shut off the fuel pump by removing ground from jumper to FP lead or by turning ignition switch to the OFF position. Grounding the FP lead allows the fuel pump to run continuously when the ignition switch is in the RUN position.** • **Is fuel pump running?**  	Yes ▶ No ▶	GO to A3. GO to A6.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A3	CHECK FUEL INJECTION SUPPLY MANIFOLD STATIC PRESSURE		
	• Run fuel pump as in A2. • Verify that the observed fuel pressure is within 255-297 kPa (37-43 psi). • Observe the time it takes to reach the specified fuel pressure limits. • **Is the fuel pressure with 255-297 kPa (37-43 psi) within 3 seconds of turning key to RUN?** NOTE: If fuel has been evacuated from the lines which occurs when a line is disconnected or schrader valve is depressed for an extended time (no fuel in lines), it may take up to 12 seconds to obtain system pressure.	Yes No	GO to A4. If pressure is high, GO to A11. Otherwise, GO to A12.
A4	CHECK FUEL INJECTION SUPPLY MANIFOLD STATIC LEAKDOWN		
	• Run fuel pump as in A2 for 10 seconds and note pressure. • Turn off fuel pump and monitor pressure for 1 minute. (Remove ground or turn ignition switch to the OFF position.) • **Does the fuel rail pressure remain within 34 kPa (5 psi) of shut off pressure for one-minute?**	Yes No	GO to A5. GO to A13.
A5	TEST VEHICLE UNDER LOAD		
	• Remove and block vacuum hose to pressure regulator. • Run vehicle at idle and then increase engine speed to 2000 rpm or more in short bursts. • **Does fuel injection supply pressure remain 210-310 kPa (30-45 psi) with engine running?** NOTE: Running vehicle under load with vacuum hose removed from fuel pressure regulator (road test) may give better results. NOTE: The Taurus FF vehicle has a voltage control system for the fuel pump. When starting and when the engine speed is greater than 3300 rpm, the fuel pump electrical supply will be at system voltage. At other times, voltage to the fuel pump will be reduced. If this system fails to operate properly, a diagnostic test code will be produced. Refer to Powertrain Control / Emissions Diagnosis[2] manual for electrical system diagnostics for these codes.	Yes No	Fuel system is OK. DISCONNECT all test connections. CONNECT vacuum hose to pressure regulator. GO to A14 to check injectors. CONNECT vacuum hose to pressure regulator, GO to A6.
A6	CHECK FUEL PUMP VOLTAGE SUPPLY		
	• Check for voltage to fuel pump through the wiring harness by connecting pump power to ground wire leads through a voltmeter. Test point should be in the body wiring harness as close to the fuel pump as is possible. • Attempt to run pump as in A2. • Check battery voltage with voltmeter. • **Is voltage greater than 10.5 volts and within 0.5 volt of battery voltage?** NOTE: The Taurus FF vehicle has a voltage control system for the fuel pump. When operating the fuel as in Step A2, the fuel pump is powered by system voltage.	Yes No	GO to A7. RUN Self-Test to check electrical system diagnostics. SERVICE as needed, then GO to A3 to verify.

2 Can be purchased as a separate item.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A7 CHECK ELECTRICAL RESISTANCE OF FUEL PUMP		
• Check for continuity through fuel pump by connecting ohmmeter to pump power and ground wire leads as close to fuel pump as possible. • **Is there continuity through the fuel pump?**	Yes ▶	If fuel pump runs, GO to **A8**. If fuel pump does not run, GO to **A10**.
	No ▶	REPLACE fuel pump and RECHECK as in A2. If fuel pump runs, GO to **A3**. If fuel pump does not run, RECHECK fuel pump connectors for oversize connectors or other source of non-continuous electrical circuit. SERVICE as required, GO to **A3**.
A8 CHECK FUEL PUMP STATIC PRESSURE (IN-LINE FUEL FILTER CHECK)		
• Install a second fuel pressure tester on schrader valve equivalent installed between fuel pump and the in-line fuel filter, as close to fuel pump as possible. • Operate fuel pump as in A3 and compare pressure observed at the fuel injection supply manifold with the pressure observed at the fuel pump. • **Is pressure at fuel pump within 68 kPa (10 psi) of fuel injection supply manifold pressure?** NOTE: When fuel pump is not in operation, the fuel delivery system is at the same pressure, regardless of location of pressure tap. Therefore, both gauges should read the same pressure when pump is not in operation. Any difference in pressure readings when fuel pump is not in operation is due to pressure gauge error.	Yes ▶ No ▶	GO to **A10**. REPLACE in-line fuel filter and GO to **A3**. If pressure is OK, GO to **A4**. If pressure is not OK, RECHECK fuel lines for kinks or other restrictions. SERVICE and RECHECK as in Step A3.
A9 TEST FUEL PUMP CHECK VALVE		
• Install fuel pressure tester on schrader valve equivalent installed between fuel pump and in-line fuel filter, as close to fuel pump as possible. • Operate fuel pump momentarily as in A2 and bring pressure to about system pressure. • Observe fuel pressure for one minute. • **Does pressure remain within 34 kPa (5 psi) of starting pressure over one minute period?**	Yes ▶ No ▶	GO to **A5**. REPLACE fuel pump assembly. RECHECK pressure as in Step A3.
A10 CHECK STATIC FUEL PUMP CURRENT DRAW		
• Install an ammeter in series with the fuel pump electrical circuit. • Operate fuel pump as in A2. • **Is current draw within 2-9 amps?**	Yes ▶	Static test of fuel pump is OK. GO to **A14** to check injectors. Dynamic testing may be required to detect root cause.
	No ▶	REPLACE fuel pump assembly. If current is high, contamination may be a concern. INSPECT fuel tank for debris and CLEAN tank as needed. GO to **A2**.
A11 CHECK FUEL PRESSURE REGULATOR		
• Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. • Run fuel pump as in Step A2. • **Is fuel pressure within 255-297 kPa (37-43 psi)?**	Yes ▶ No ▶	GO to **A18**. REPLACE fuel pressure regulator. RECHECK pressure as in Step A3.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP	RESULT ▶	ACTION TO TAKE
A12 CHECK FUEL PRESSURE REGULATOR ● Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. ● Run fuel pump as in Step A2. ● **Is fuel being returned from regulator with low pressure in system?**	Yes ▶ No ▶	REPLACE regulator. RECHECK pressure as in Step A3. GO to A4.
A13 CHECK FUEL PRESSURE REGULATOR FOR LEAKS ● Disconnect return line at fuel pressure regulator. Connect outlet of regulator to appropriate receptacle to catch return fuel. ● Run fuel pump as in A2. ● Turn off fuel pump by removing ground or turning ignition to OFF position. ● Observe fuel return flow from regulator and system when pump is off. ● Remove vacuum hose from fuel pressure regulator and check for presence of fuel in regulator fitting (diaphragm leak). ● **Is there return flow when pump is turned off and system pressure is dropping or is there fuel in regulator fitting?**	Yes ▶ No ▶	REPLACE regulator and RECHECK pressure and leakage as in Steps A3 and A4. If OK, GO to A5. If not OK, REPEAT Step A3. If leakdown concern exists, GO to A8. Otherwise, GO to A7.
A14 CHECK FUEL INJECTOR FUNCTION ● With the engine warmed and idling (or cranking it if it does not start) and using a mechanics stethoscope or equivalent, listen for regularly spaced operating sounds at each fuel injector. ● **Is operating sound present?**	Yes ▶ No ▶	GO to A17. GO to A15.
A15 CHECK FUEL INJECTOR RESISTANCE ● Key off. ● Disconnect the electrical connector of the injector (one at the time). ● Measure the resistance of each injector, using the DVOM. ● **Are all resistances between 13.0 and 18.0 ohms?**	Yes ▶ No ▶	GO to A16. REPLACE the worn or damaged injectors. RECONNECT injectors.
A16 CHECK FUEL INJECTOR ELECTRICAL CONTINUITY SIGNAL ● Key off. ● Disconnect the injector lead and insert the continuity checker FA-407 (from the Rotunda Fuel Injector Tester 113-00001) into the injector lead plug. ● Start the engine. ● Observe whether the continuity checker blinks (showing a completed circuit for the injector being tested). ● Repeat the check for each injector. ● **Do all injector circuits show continuity?**	Yes ▶ No ▶	GO to A17. CHECK for 12 volts at each injector lead. SERVICE or REPLACE leads as required. REFER to EEC-IV Quick Test.

DIAGNOSIS (Continued)

PINPOINT TEST A: FUEL SYSTEM DIAGNOSTICS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A17	CHECK FUEL INJECTOR FLOW AND LEAKAGE		
	• Observe "Note, Caution and Warning" to avoid fuel spillage and injury. • Using the Fuel Injector Tester as described in the accompanying instruction test the fuel injectors and verify that the flow rate for injector group is within specification. • With the tester still installed on the fuel system, note any significant pressure loss due to injector leakage when the tester pump is turned off. • Check the fuel injectors individually for leakage as required using the Injector Bench Fixture and the Fuel Injector Bench Testing Procedure associated with the Rotunda Tester as required and verify that each injector leakage rate is within specification (1 drop per minute maximum). • **Is flow rate for the injector group and the leakage rate for individual injectors within specification?**	Yes ▶ No ▶	Fuel injectors are OK. If pressure leakdown concern exists in system, CHECK lines and connections between fuel pump and pressure regulator for leaks. SERVICE as necessary. REPLACE the worn or damaged injectors as necessary. REPEAT test Step A17. When OK, GO to A3 to verify system.
A18	CHECK FUEL RETURN SYSTEM FOR HIGH PRESSURE CAUSES		
	• Observe the "Note, Caution and Warning" to avoid fuel spillage and injury. • Check the fuel return system for restriction due to blockage, kinking, or pinching. • Remove the fuel return line at the fuel pressure regulator. • Apply 21-34 kPa (3-5 psi) regulated, filtered, shop air to the fuel return line. • **Do you hear air entering the tank?**	Yes ▶ No ▶	GO to A19. GO to A19.
A19	CHECK FUEL RETURN SYSTEM PRESSURE		
	• Key off. • Reconnect fuel return line at the fuel pressure regulator. • Install a second fuel pressure tester on schrader valve equivalent installed in the return line at the fuel tank. • Operate fuel pump as in Step A3 and compare pressure observed at fuel injection supply manifold with the pressure observed at the fuel tank. • **Is pressure at the fuel tank within 34 kPa (5 psi) of fuel injection supply manifold pressure?**	Yes ▶ No ▶	VERIFY that fuel injection supply manifold pressure is higher than specification limits. REPLACE pressure regulator and RECHECK as in Step A3. SERVICE the return fuel line to remove excessive restriction. REPEAT Step A3 to verify.

TESTING

Refer to the Powertrain Control / Emissions Diagnosis Manual[3] for testing procedures.

CLEANING AND INSPECTION

WARNING: DO NOT SMOKE OR CARRY LIGHTED TOBACCO OR OPEN FLAME OF ANY TYPE WHEN WORKING ON OR NEAR ANY FUEL RELATED COMPONENT. HIGHLY FLAMMABLE MIXTURES ARE ALWAYS PRESENT AND MAY BE IGNITED, RESULTING IN POSSIBLE PERSONAL INJURY.

Air Cleaner

Refer to Section 00-03 for the recommended engine air cleaner (9600) assembly maintenance mileage interval. **Cleaning the engine air cleaner or crankcase ventilation filter elements is not recommended.** They should be replaced at the specified mileage intervals. Clean the engine air cleaner body and the cover with a solvent or compressed air. Wipe the engine air cleaner body and cover dry if a solvent is used. Inspect the engine air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace engine air cleaner cover or body if they are damaged beyond service. Hold filter in front of a light and carefully inspect it for any splits or cracks. If filter is split or cracked, replace it.

3 Can be purchased as a separate item.

CLEANING AND INSPECTION (Continued)

Idle Air Control (IAC) Valve

CAUTION: The idle air control (IAC) valve is a sludge tolerant design and should not be cleaned as damage may occur.

ADJUSTMENTS

Refer to the Powertrain Control / Emissions Diagnosis Manual[4] for adjustments.

SPECIFICATIONS

Refer to the Engine / Emissions Facts Book and Calibration number.

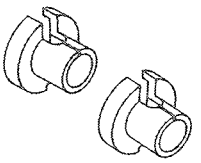
FUEL PRESSURE SPECIFICATIONS

Description	Specification
Engine Running	30-45 psi 210-310 kPa
Key ON Engine OFF	37-43 psi 255-297 kPa

FUEL PUMP CURRENT SPECIFICATION

Description	Specification
Key ON, Engine OFF	2-9 Amps

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T90T-9550-B Fuel Line Disconnect Tool 5 / 16" T90T-9550-C Fuel Line Disconnect Tool 3 / 8"	

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
014-00748	Fuel Pressure Testing Kit
113-00001	Fuel Injector Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9600	Engine Air Cleaner	

4 Can be purchased as a separate item.

SECTION 10-01 Fuel Tank, Filter and Electric Fuel Pump

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

NOTE: Fuel methanol refers to a blend of fuel with a maximum of 85 percent methanol.

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DESCRIPTION AND OPERATION (Continued)

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WARNING: DO NOT OPERATE ENGINE OR SMOKE WHILE REFUELING.

CAUTION: Use only fuel methanol which meets Ford Specification ESE-M4C97-B. Use of other fuel methanol may cause powertrain damage as well as loss of vehicle performance. It will also invalidate any extended service agreement.

WARNING: IT IS IMPORTANT THAT YOUR FLEXIBLE FUEL VEHICLE BE PROPERLY MAINTAINED BY FORD FLEXIBLE FUEL TRAINED PERSONNEL. IF A PROBLEM OCCURS, IT IS IMPORTANT THAT PROPERLY TRAINED PERSONNEL DIAGNOSE THE CAUSE. IF THE PROBLEM RELATES TO THE FUEL SYSTEM, PROPER PART REPLACEMENT IS IMPERATIVE TO KEEP YOUR VEHICLE OPERATING AT NORMAL PERFORMANCE. FLEXIBLE FUEL COMPONENTS AND STANDARD FUEL COMPONENTS ARE NOT INTERCHANGEABLE AND IF YOUR VEHICLE IS NOT SERVICED IN ACCORDANCE WITH FLEXIBLE FUEL VEHICLE PROCEDURES, DAMAGE MAY OCCUR AND YOUR WARRANTY MAY BE INVALIDATED.

Fuel Injected Engines

The fuel systems which are used with fuel injected engines have electric fuel pumps to provide high-pressure fuel to the injectors. The high-pressure pump is part of the fuel tank sending unit and pump (9H307) and is located in the fuel tank (9002).

The fuel lines leading from the fuel tank to the engine are under pressure during vehicle operation. When fuel injected engines are turned off, the fuel in the fuel lines remains pressurized for long periods of time to provide quick start-ups. Special procedures for servicing these pressurized fuel systems are outlined.

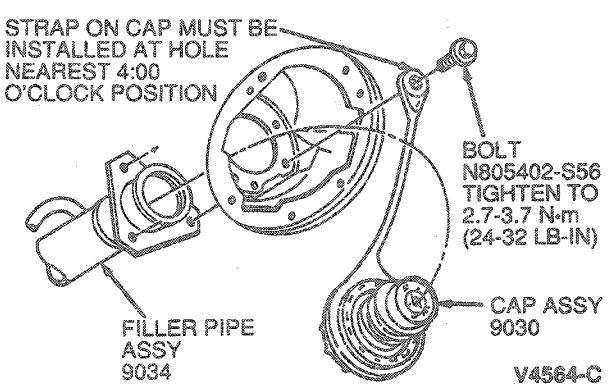
Fuel Lines

All vehicles (except Police and flexible fuel (FF) vehicles), use nylon lines with push connect fittings or spring lock couplings. Police and the flexible fuel vehicles use a combination of nylon / stainless steel fuel lines with steel push connect fittings and spring lock couplings. The steel push connect and spring lock couplings used on the flexible fuel vehicles have special O-rings for methanol fuel compatibility.

In the base and Police vehicles, nylon push connect fittings are used to make the fuel line connections to the fuel pump in the fuel tank and to the fuel filter (9155). Spring lock couplings connect the fuel lines to the engine. The flexible fuel vehicles use steel push connect fittings to make the fuel line connections to the fuel pump and the fuel drain tube in the fuel tank, fuel filter and the fuel mixer / sensor assembly. Special spring lock couplings with methanol compatible O-rings connect the fuel lines to the engine. Unique nylon vapor connectors are used to connect the vapor management system in the FF vehicles. These fittings must be serviced using the procedures outlined.

Fuel Tanks and Fillers

All vehicles, (except FF vehicles), are equipped with a restricted fuel filler opening that allows only a non-leaded fuel nozzle to be inserted.



The restrictor consists of a narrow opening in the fuel tank filler pipe (9034), covered by a spring steel trap door. The smaller non-leaded fuel nozzle will fit through the narrow opening and push the trap door aside, allowing normal filling. Leaded fuel nozzles will not fit through the narrow opening. The trap door being closed causes a fuel backup and automatic nozzle shutoff.

DESCRIPTION AND OPERATION (Continued)

The restricted fuel tank filler pipe is manufactured as an assembly, and must be serviced by removal and replacement with a new fuel tank filler pipe assembly. Fuel tank filler pipes are not to be modified in any way.

Fill limiting is accomplished through fuel tank filler pipe configuration. The fill limiting system is designed to permit an approximate 10 to 12 percent fuel tank volume air space when the fuel tank is filled to capacity. This air space provides for thermal expansion of fuel as well as being an aid to the in-tank vapor vent system.

FF Vehicle Fuel Filler Pipe

The fuel tank filler pipe has a special methanol resistant coating to protect against corrosion. A special screen is installed in the fuel tank filler pipe to prevent syphoning of fuel from the fuel tank through the fuel tank filler pipe. A vent hose is connected between the top of the fuel tank filler pipe and the fuel vapor valve (9B593) on the fuel tank.

Fuel Cap

WARNING: FUEL TANK MAY BE PRESSURIZED. REMOVE FUEL TANK FILLER CAP SLOWLY. IF FUEL TANK FILLER CAP IS VENTING FUEL OR A HISSING SOUND IS HEARD, WAIT UNTIL THE CONDITION STOPS BEFORE REMOVING THE FUEL TANK FILLER CAP. IF THESE PRECAUTIONS ARE NOT FOLLOWED, FUEL MAY SPRAY AND CAUSE PERSONAL INJURY.

The fuel tank filler cap (9030) is a threaded screw-on design with a pre-vent feature that allows the fuel tank to vent for the first three-quarter turn before unthreading. All fuel tank filler caps are attached to the vehicle with a tether using the fuel tank filler pipe-to-housing screw at the three to four o'clock position. The fuel tank filler cap assembly provides pressure and vacuum relief functions and should be replaced with the proper pressure / vacuum relief fuel tank filler cap to prevent possible system malfunction. The fuel tank filler cap is fitted with a torque-limiting ratchet to prevent difficulty in removal. When installing, turn clockwise until the ratchet mechanism gives off three or more distinct "clicks".

WARNING: DO NOT SMOKE, CARRY LIGHTED TOBACCO OR AN OPEN FLAME OF ANY TYPE WHEN WORKING ON OR NEAR ANY FUEL-RELATED COMPONENT. HIGHLY FLAMMABLE MIXTURES ARE ALWAYS PRESENT AND MAY BE IGNITED, RESULTING IN POSSIBLE PERSONAL INJURY.

Fuel Filter

Fuel is filtered at three locations on all applications.

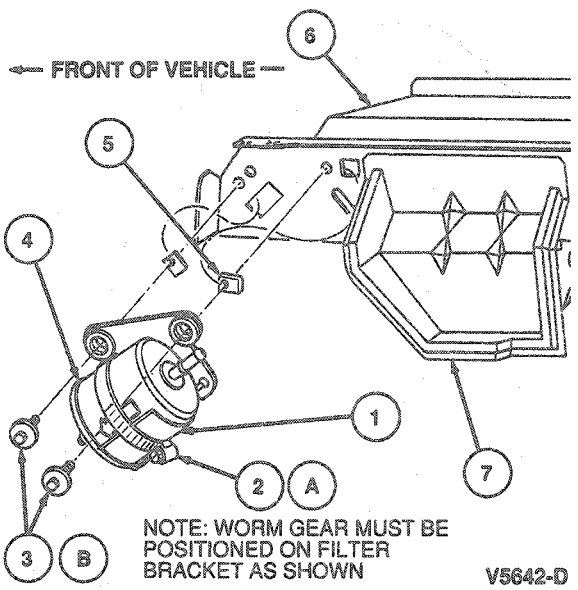
Fuel Pump Inlet Filter

A nylon filter element is mounted on the electric fuel pump inlet inside the fuel tank and is used to protect the fuel pump (FP) (9350) from fuel tank contaminants.

Fuel Filter, In-Line

The purpose of the in-line fuel filter is to provide filtration to protect the small metering orifices of the injector nozzles. The fuel filter is located downstream of the electric fuel pump and is mounted on the underbody. The fuel filter is a one-piece construction which cannot be cleaned. If it becomes clogged it must be replaced.

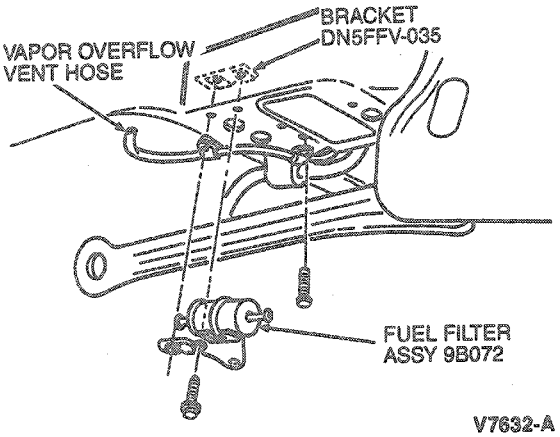
The FF vehicle fuel filter is fuel methanol compatible. Use of a gasoline fuel filter will result in failure of the filter. The filter is located at the rear of the fuel tank.



Item	Part Number	Description
1	9B072	Filter and Bracket Assy
2A	—	Worm Gear Mounting Clamp
3B	N606679-S56	Screw (2 Req'd)
4	9155	Filter
5	N623332-S36	U-Nut (2 Req'd)
6	—	Underside Of Right Rear Frame Rail
7	—	Right Rear Tension Strut Support Bracket
A		Tighten to 1.7-2.8 N·m (15-25 Lb-In)
B		Tighten to 8-12 N·m (71-106 Lb-In)

DESCRIPTION AND OPERATION (Continued)

FF Vehicles

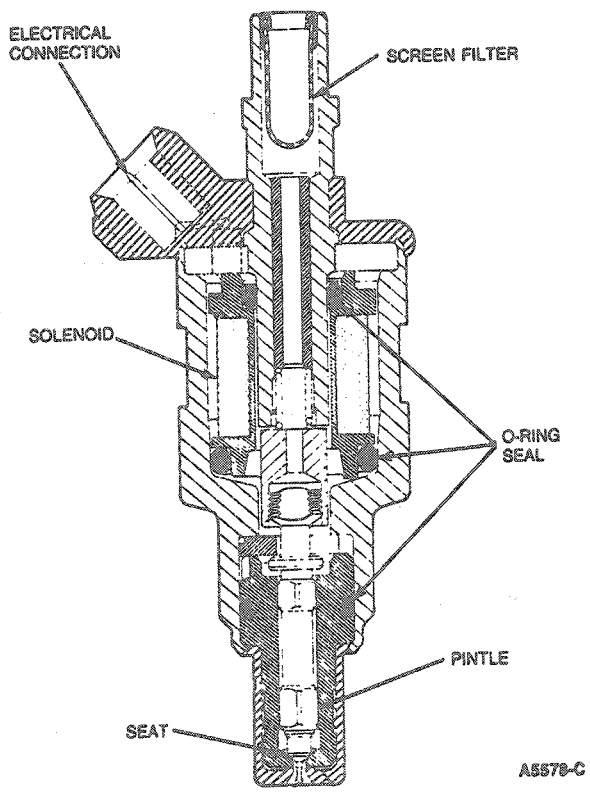


NOTE: When replacing fuel filters, use the fuel filter specified for the engine being serviced.

Injector Filter Screen

An injector filter is located at the top of each injector and is not serviceable. If injector screen becomes clogged, the complete injector assembly must be replaced. Refer to Section 03-04A (3.0L / 3.0L FF), 03-04B (3.0L / 3.2L SHO), and 03-04C (3.8L) for fuel injector information.

Fuel Injector



Fuel Pump (FP)

NOTE: The FF vehicle fuel pump operates the same as unleaded gasoline fuel pumps, but is made of methanol compatible materials.

The fuel system has a fuel pump relay controlled by the powertrain control module (PCM) (12A650), which provides power to the fuel pump under various operating conditions. When the ignition switch is in the OFF position, the contacts of the powertrain control module (PCM) power and fuel pump relays are open. The fuel pump and powertrain control module (PCM) relays are contained in the constant control relay module (CCRM) (12B577) which is serviced as a separate unit.

When the ignition switch is first turned to the ON position, the powertrain control module (PCM) power relay is energized, closing its contacts. Power is provided to both the fuel pump relay and a timing device in the powertrain control module (PCM). The fuel pump runs through the contacts of the fuel pump relay and the inertia switch. If the ignition switch is not turned to the START position, the timing device in the powertrain control module (PCM) will open the ground Circuit 57 after approximately one second. Opening the ground circuit de-energizes the fuel pump relay (opening its contacts), which in turn de-energizes the fuel pump. This circuitry provides for pre-pressurization of the fuel system.

When the ignition switch is turned to the START position, the powertrain control module (PCM) operates the fuel pump relay to provide fuel for starting the engine while cranking.

After the engine starts, the ignition switch is returned to the ON position, and power to the fuel pump is again supplied through the fuel pump relay. The powertrain control module (PCM) senses engine speed and shuts off the fuel pump by opening the ground circuit to the fuel pump relay when the engine stops, or is below 120 rpm.

The fuel system uses a fuel tank sending unit and pump assembly. The fuel tank has an internal reservoir in which the fuel tank sending unit and pump rests. This design increases satisfactory pump operation during extreme vehicle maneuvers and steep vehicle attitudes with low tank fill levels.

The fuel pump is mounted on the fuel sender assembly inside the fuel tank. This assembly includes a check valve which is inside the fuel pump outlet. The function of this valve is to maintain pressure in the system after the vehicle is shut down.

DESCRIPTION AND OPERATION (Continued)

The pressure retention helps prevent hot starting concerns. The pump for the 3.0L MFI, 3.8L MFI and 3.2L SHO is capable of supplying 60 liters (15.8 gal) of fuel per hour at 269 kPa (39 psi). The pump for the 3.0L SHO is capable of supplying 110 L (29 gal) of fuel per hour at 269 kPa (39 psi). The pump for the 3.0L FF vehicle is capable of supplying 145 L (38 gal) of fuel per hour at 269 kPa (39 psi). The fuel pump has an internal pressure relief valve to provide overpressure protection in the event the fuel flow becomes restricted (damaged lines, clogged, filter, etc.). Overpressure is restricted to 850 kPa (123 psi) and reduced fuel flow will result. The system pressure is controlled by a pressure regulator mounted on the engine.

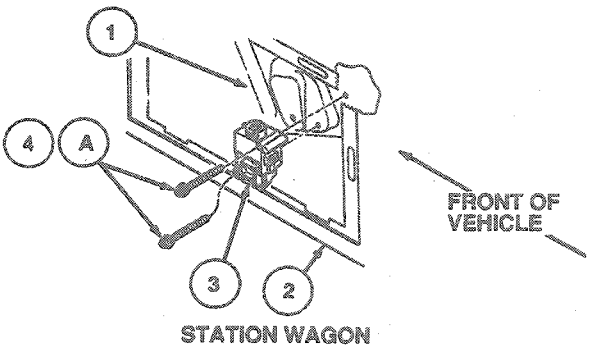
The fuel pump is protected at its inlet by a nylon pick-up screen. It filters dirt and contaminants which could plug or damage the internal pump components, while at the same time allowing passage of small quantities of water which may accumulate within the fuel tank reservoir.

Inertia Fuel Shutoff Switch (IFS)

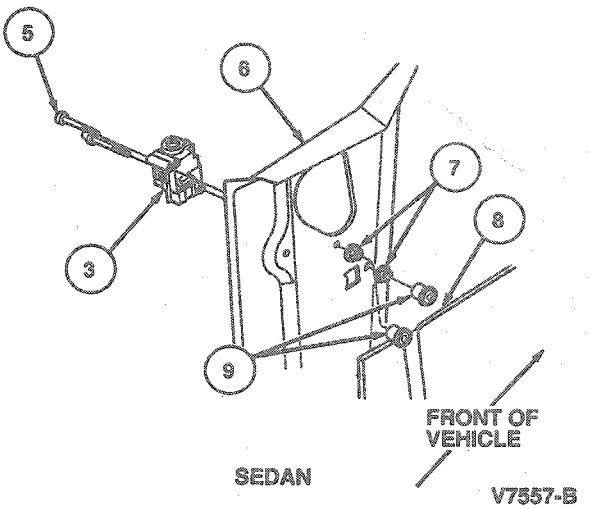
In the event of a collision, the electrical contacts in the inertia fuel shutoff switch (9341) open and the fuel pump automatically shuts off. The fuel pump will shut off even if the engine does not stop running. However, the engine will stop a few seconds after the fuel pump stops. It is not possible to restart the engine until the inertia fuel shutoff switch is manually reset. The inertia fuel shutoff switch is located in the luggage compartment on the door hinge support above the LH inner wheel house on the sedan and on the RH rear lower corner pillar reinforcement behind an access door, on the station wagon. Both locations are clearly marked on the vehicles.

CAUTION: Do not reset the inertia fuel shutoff switch until the fuel system has been inspected for leaks.

To reset the inertia fuel shutoff switch, depress the button on switch.



STATION WAGON



SEDAN

V7557-B

Item	Part Number	Description
1	—	RH Rear Inner Quarter Panel
2	—	Interior Trim Panel
3	9341	Inertia Fuel Shutoff Switch
4A	55911-S36	Screw (2 Req'd)
5	11N523	Retainer
6	—	LH Rear Inner Quarter Panel
7A	N621900-S2	Nut and Washer Assy (2 Req'd)
8	—	Luggage Compartment Liner
9	390694-S	Cap Plugs (2 Req'd)
A		Tighten to 1.5-2.2 N·m (14-19 Lb-In)

REMOVAL AND INSTALLATION

Most component parts of the standard fuel system are retained by a simple nut, bolt or screw for removal and installation. Refer to individual system illustrations for specific part references.

REMOVAL AND INSTALLATION (Continued)

Fuel System Pressure Relief

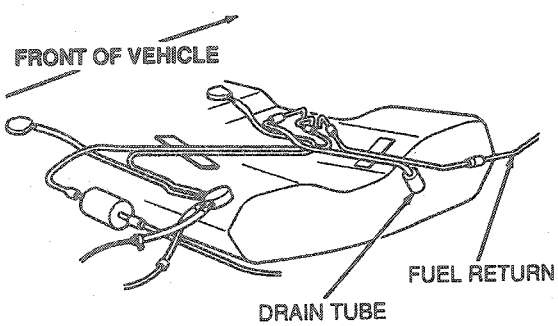
WARNING: FUEL SUPPLY LINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUT DOWN. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN. A VALVE IS PROVIDED ON THE FUEL CHARGING ASSEMBLY FOR THIS PURPOSE. REMOVE THE AIR CLEANER. ATTACH EFI AND CFI FUEL PRESSURE GAUGE T80L-9974-B OR EQUIVALENT TO THE FUEL DIAGNOSTIC VALVE ON THE FUEL CHARGING ASSEMBLY. PRESSURE IN THE FUEL SYSTEM MAY NOW BE RELEASED.

Fuel Tank Draining Procedure — Flexible Fuel Vehicles

NOTE: The flexible fuel vehicle fuel tank cannot be drained through the fuel tank filler pipe. A special screen is installed in the fuel tank filler pipe to prevent siphoning of fuel through the fuel tank filler pipe. The fuel tank on this vehicle is equipped with a drain tube connected to the fuel tank sending unit and pump on the RH side of the vehicle which has a quick disconnect for this purpose. It is not necessary to lower the fuel tank to drain the system.

Drain the system as follows:

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Remove foam cover and protective rubber cover from drain tube.



3. Connect drain tube quick disconnect fitting to Rotunda Fuel Storage Tanker and Adapter Hose 034-00020. Drain fuel from fuel tank.

Fuel Tank

Unleaded Gasoline Vehicles

Tools Required:

- Fuel Tank Sender Switch T74P-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Adapter Hose 034-00012

Removal

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Fuel should be drained from fuel tank as completely as possible prior to fuel tank removal. On unleaded gasoline vehicles, this is accomplished by siphoning or pumping fuel out the fuel tank filler pipe using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.

   Vehicles with fuel injected engines have reservoirs inside fuel tank to maintain fuel near fuel pickup during vehicle cornering maneuvers and under low fuel operating conditions. These reservoirs could block siphon tubes or hoses from reaching bottom of fuel tank. This situation can be overcome with a few repeated attempts using different hose orientations.
3. Loosen fuel tank filler pipe and vent hose clamps at fuel tank and remove hoses from fuel tank.
4. Place a safety support under fuel tank and remove bolts from rear of fuel tank support straps (9092). The fuel tank support straps are hinged at the front and will swing out of the way.
5. Partially remove fuel tank and disconnect fuel lines and electrical connector from fuel tank sending unit and pump, if required. Refer to Push Connect Fitting Removal.
6. Remove fuel tank from vehicle.

Installation

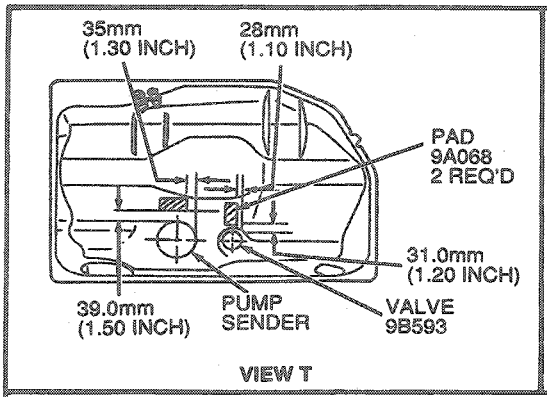
NOTE: If fuel tank sending unit and pump has been removed, the O-ring seal on unleaded gasoline vehicles or gasket on Flexible Fuel vehicles must be replaced.

1. Before proceeding, check following items:
   a. Leak check sender unit. If necessary, use Fuel Tank Sender Wrench T74P-9275-A or equivalent.
   b. Ensure fuel vapor valve is installed completely on fuel tank top.
   c. Make all required fuel line, fuel return line, vapor vent and electrical connections which will be inaccessible after fuel tank is installed. Route lines through clip on fuel tank.
2. Place fuel tank in its proper position in vehicle.
3. Bring fuel tank support straps around fuel tank and start retaining bolt. Align fuel tank as far forward in vehicle as possible while securing retaining bolts.

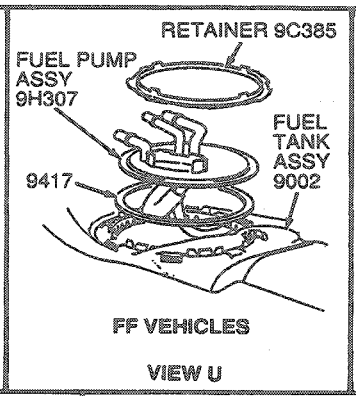
   CAUTION: If equipped with heat shield, make sure that it is installed with fuel tank support straps and positioned correctly on the fuel tank.
4. Check hoses and wiring mounted on fuel tank top, to ensure they are correctly routed and will not be pinched between fuel tank and body.
5. Tighten fuel tank support strap retaining bolts to 29-41 N·m (22-30 lb-ft).

REMOVAL AND INSTALLATION (Continued)

6. Install fuel filler hoses which connect fuel tank to fuel tank filler pipe. Install hose clamps and tighten to 2.7-3.7 N·m (24-32 lb-in).
7. Replace fuel drained from fuel tank.
8. Start engine and check all connections for leaks.

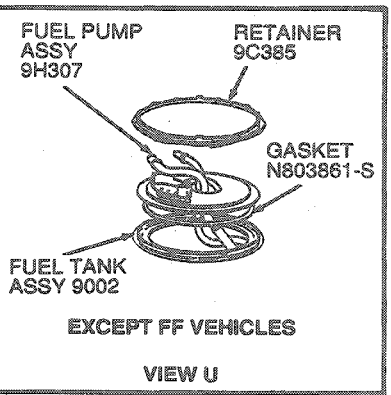


VIEW T



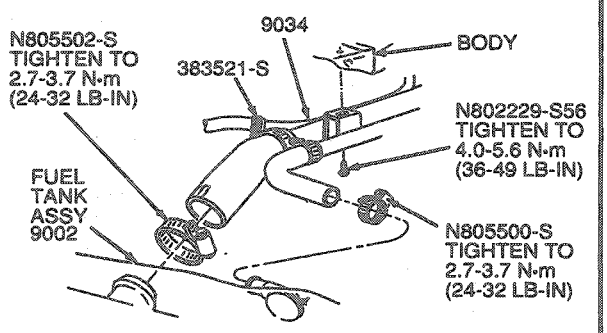
FF VEHICLES

VIEW U



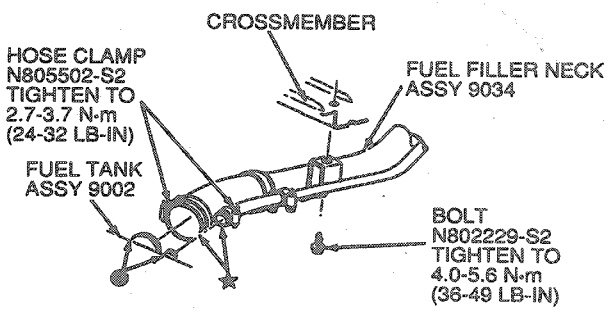
EXCEPT FF VEHICLES

VIEW U



FF VEHICLES

VIEW Z

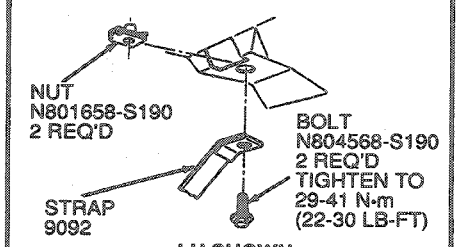


EXCEPT FF VEHICLES

VIEW Z

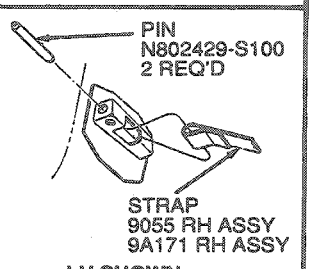
SAE 10W-40 ENGINE OIL MAY BE USED ON 9002 AND OR 9034 AS AN ASSY AID. NO OTHER MATERIAL MAY BE USED.

INSTALL HOSES FLUSH TO TANK SURFACE. CLAMP MUST BE ON HOSE FLUSH TO 3.0MM (.1 INCH) FROM END OF HOSE.



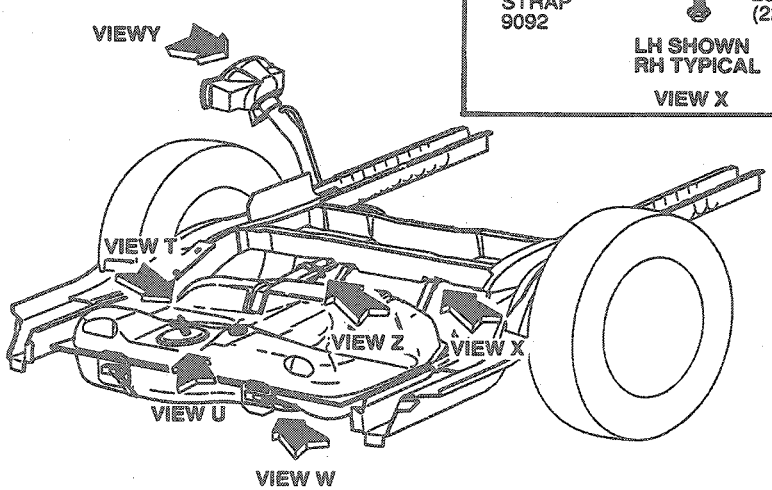
LH SHOWN
RH TYPICAL

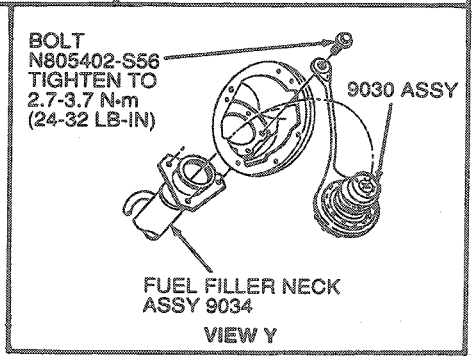
VIEW X



LH SHOWN
RH TYPICAL

VIEW W



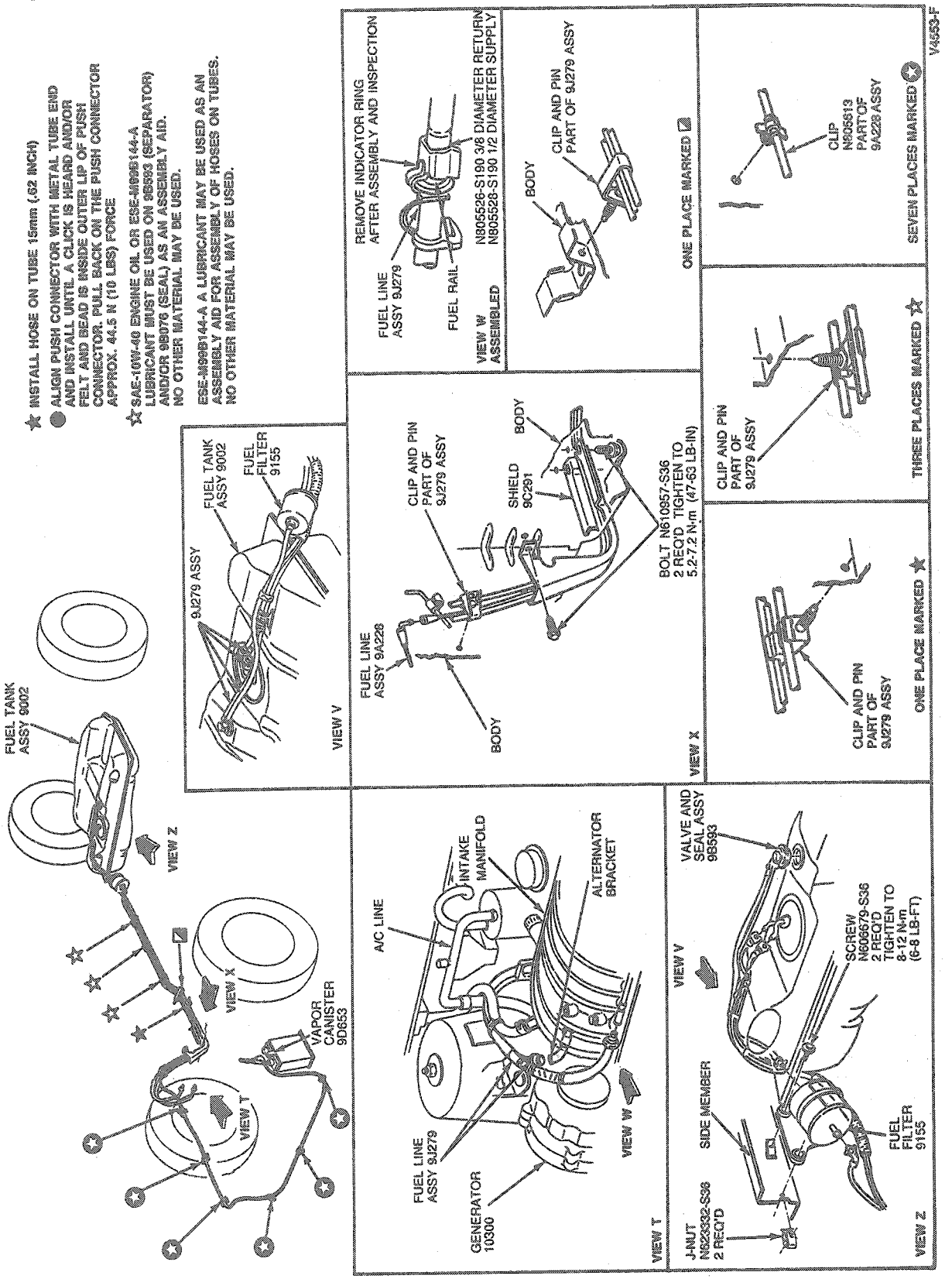


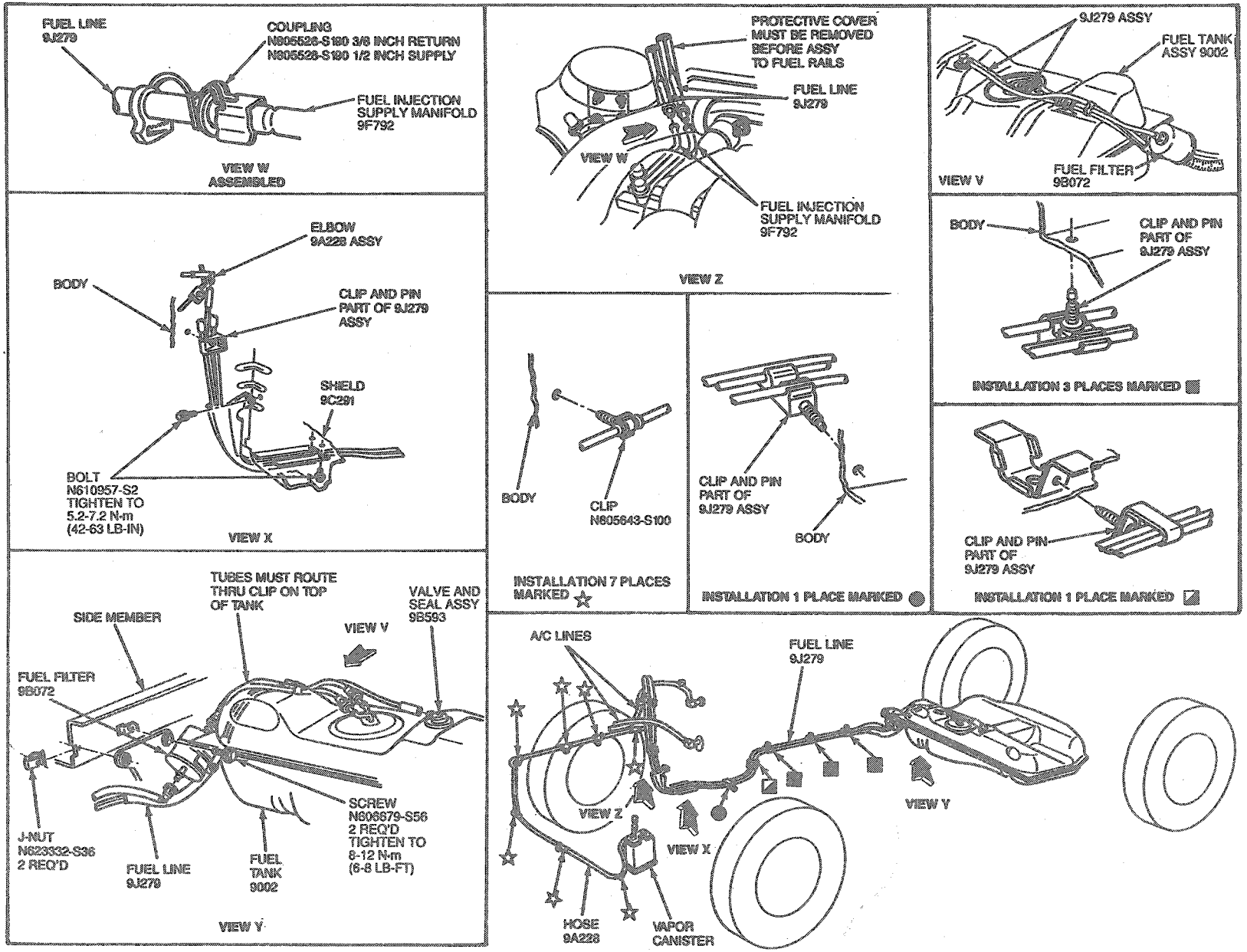
VIEW Y

V4551-G

REMOVAL AND INSTALLATION (Continued)

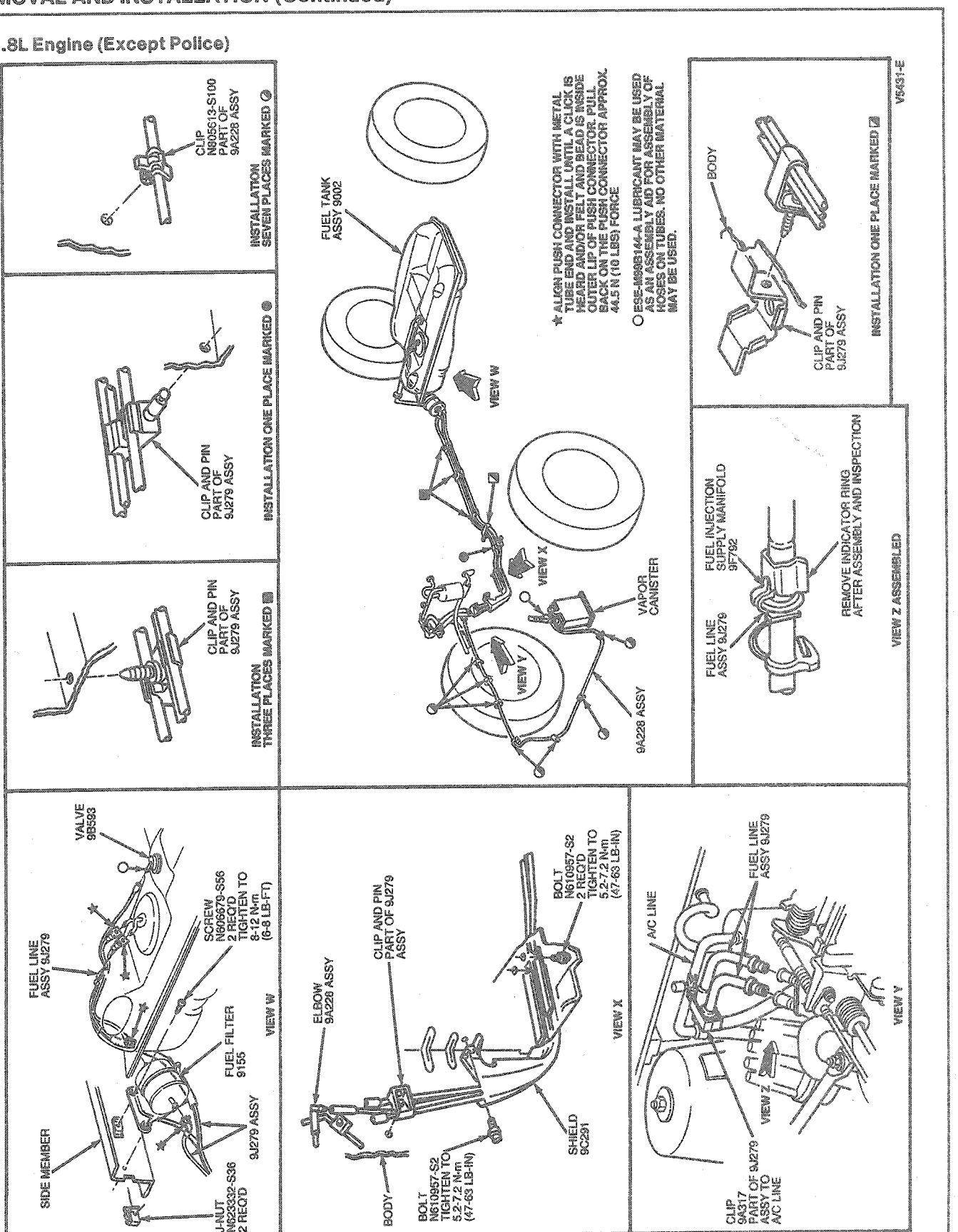
3.0L Engine




FUEL LINE
9J279
COUPLING
N805528-S100 3/8 INCH RETURN
N805528-S100 1/2 INCH SUPPLY
FUEL INJECTION
SUPPLY MANIFOLD
9F792
VIEW W
ASSEMBLED
PROTECTIVE COVER
MUST BE REMOVED
BEFORE ASSY
TO FUEL RAILS
FUEL LINE
9J279
VIEW W
FUEL INJECTION
SUPPLY MANIFOLD
9F792
VIEW Z
9J279 ASSY
FUEL TANK
ASSY 9002
VIEW V
FUEL FILTER
9B072
ELBOW
9A228 ASSY
BODY
CLIP AND PIN
PART OF 9J279
ASSY
SHIELD
9C291
BOLT
N610957-S2
TIGHTEN TO
5.2-7.2 N-m
(42-63 LB-IN)
VIEW X
BODY
CLIP AND PIN
PART OF
9J279 ASSY
INSTALLATION 3 PLACES MARKED
BODY
CLIP
N805643-S100
INSTALLATION 7 PLACES
MARKED
CLIP AND PIN
PART OF
9J279 ASSY
BODY
INSTALLATION 1 PLACE MARKED
CLIP AND PIN
PART OF
9J279 ASSY
INSTALLATION 1 PLACE MARKED
TUBES MUST ROUTE
THRU CLIP ON TOP
OF TANK
VALVE AND
SEAL ASSY
9B593
SIDE MEMBER
VIEW V
FUEL FILTER
9B072
SCREW
N805879-S56
2 REQ'D
TIGHTEN TO
8-12 N-m
(6-8 LB-FT)
J-NUT
N623332-S36
2 REQ'D
FUEL LINE
9J279
FUEL
TANK
9002
VIEW Y
A/C LINES
FUEL LINE
9J279
VIEW Z
VIEW Y
VIEW X
HOSE
9A228
VAPOR
CANISTER
V7347-C

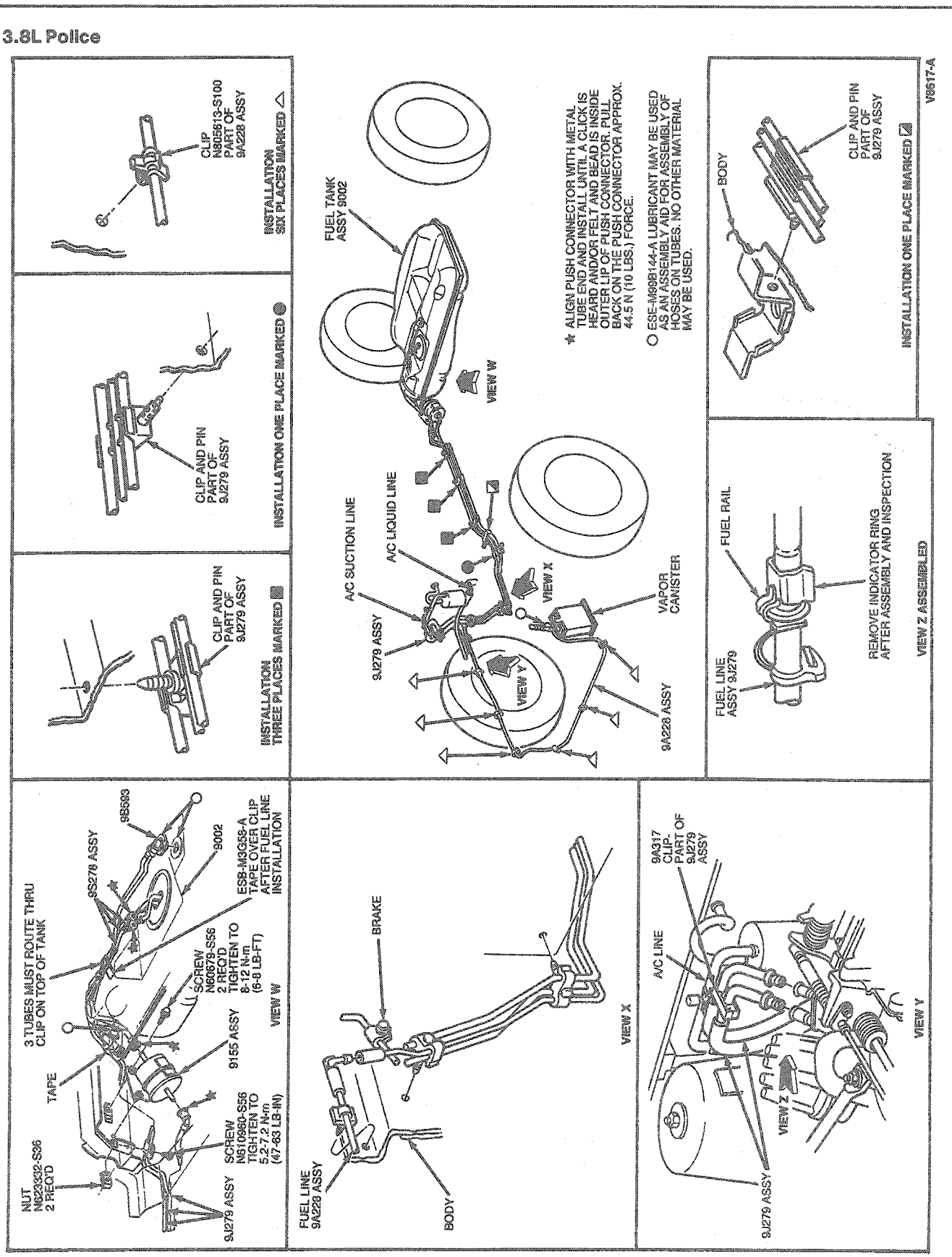
REMOVAL AND INSTALLATION (Continued)

3.8L Engine (Except Police)



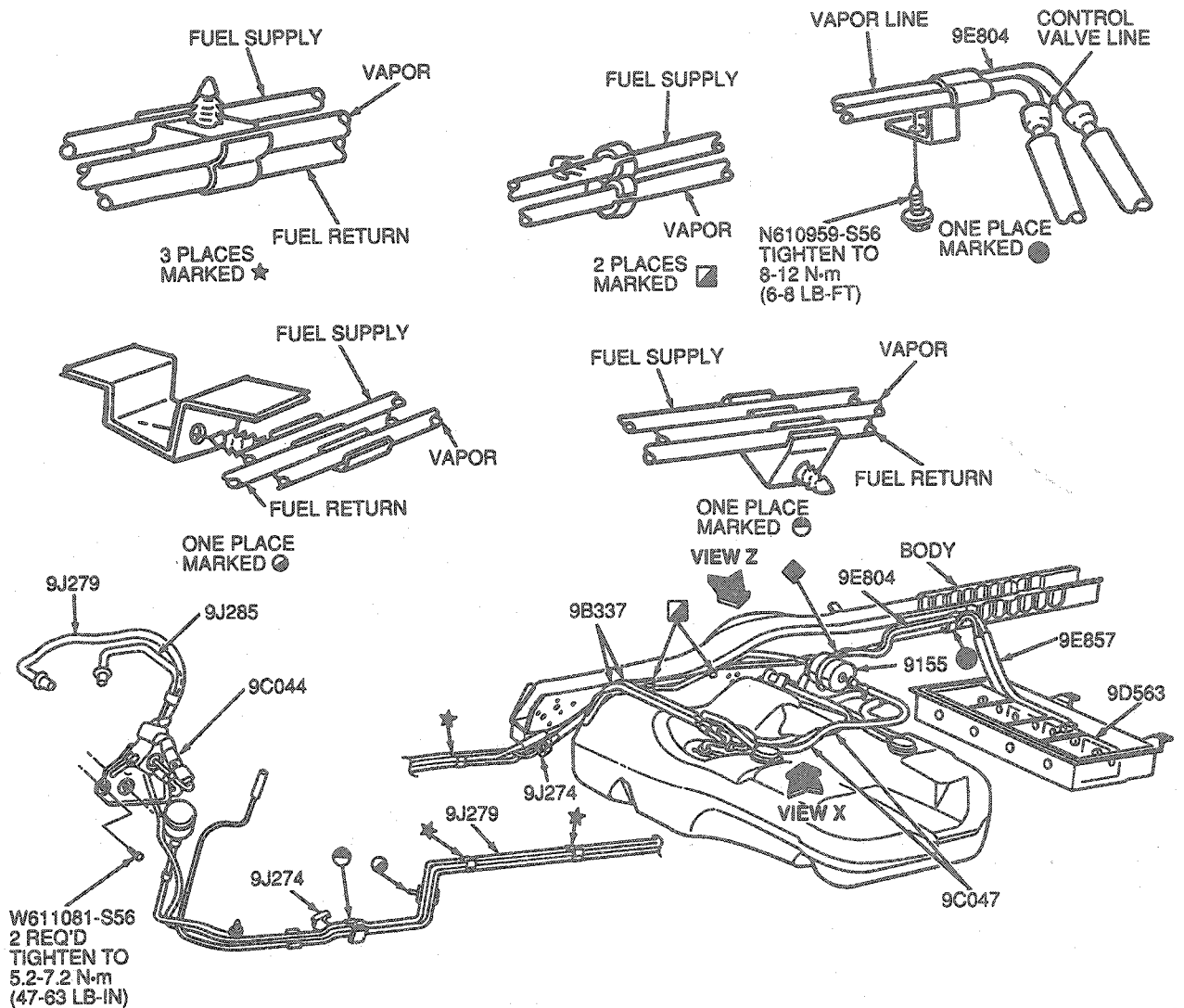
REMOVAL AND INSTALLATION (Continued)

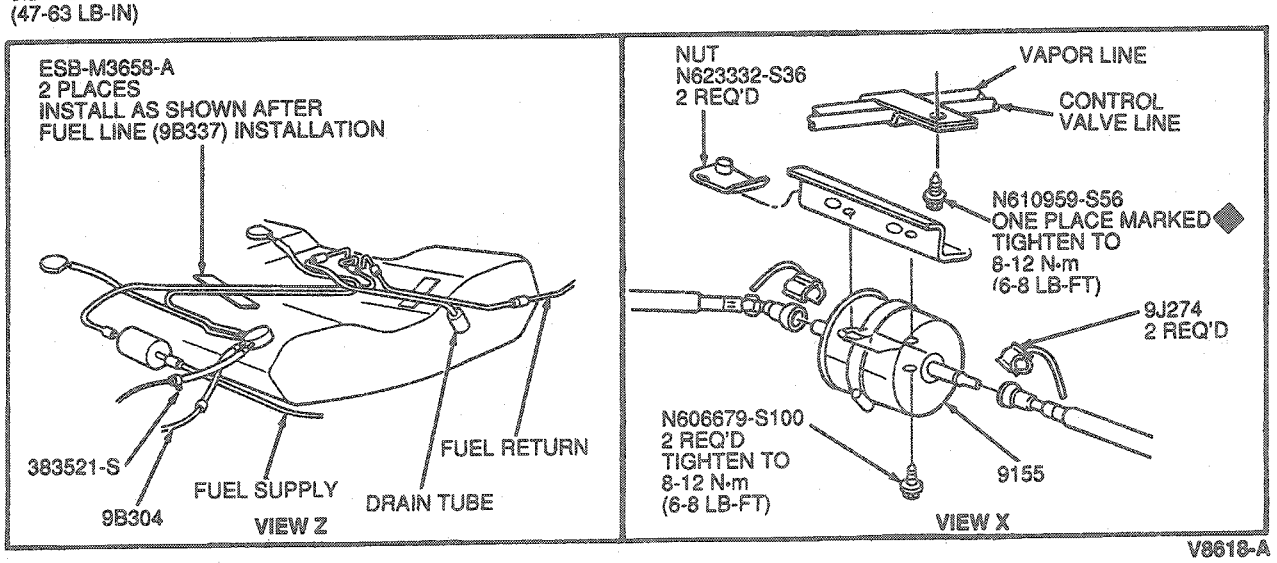
3.8L Police



REMOVAL AND INSTALLATION (Continued)

3.0L Flexible Fuel Vehicle





V8618-A

REMOVAL AND INSTALLATION (Continued)

Filler Pipe

Removal

1. Open filler door to remove three screws retaining fuel tank filler pipe to pocket. Mark filler cap tether location.
2. Raise vehicle. Refer to Section 00-02.
3. Loosen filler and vent hose on fuel tank filler pipe.
4. Remove bolt retaining fuel tank filler pipe assembly to underbody.
5. Remove fuel tank filler pipe.

Installation

1. Position fuel tank filler pipe in body location.
2. Connect hoses with clamps to fuel tank filler pipe.
3. Install underbody fuel tank filler pipe assembly bolt. Tighten to 4-6 N·m (36-53 lb-in).
4. Lower vehicle.
5. Install fuel tank filler cap to tether location and install three retaining screws.

Fuel Tank Straps

Removal

Fuel tank support straps may be removed, and / or replaced without removing the tank, if each fuel tank support strap is removed and installed one at a time and a support is provided under the fuel tank.

The hinged end of the fuel tank support strap attachment holds the fuel tank support strap in place after the fuel tank is removed. This hinged end uses a pin-type attachment through a loop in the end of the fuel tank support strap.

1. To remove fuel tank support strap, push fuel tank support strap up into bracket until pin lines up with large hole. There is a guide and stop inside bracket to assist in aligning fuel tank support strap for removal and installation of pin.

   NOTE: A magnetized screwdriver is helpful to draw pin out of large opening in bracket if pin does not line up properly.
2. Push pin out of large hole in side of bracket by inserting a small drift pin or punch into small hole in opposite side of bracket.

Installation

1. Push fuel tank support strap into bracket opening.

   CAUTION: The pin must rest flat against bottom of bracket. If it does not, fuel tank could be damaged. Do not install fuel tank. Attempt to position pin so that it will seat properly. If unsuccessful, remove pin and fuel tank support strap. Check for, and remove any obstruction that may be inside bracket. Check to ensure pin is correct length.
2. Insert pin into loop in fuel tank support strap.
3. Pull fuel tank support strap down until pin is fully seated on bottom of bracket.

Fuel Lines—Nylon

WARNING: FUEL SUPPLY LINES ON ALL VEHICLES EQUIPPED WITH EFI ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN. THE PRESSURE MUST BE RELIEVED BEFORE SERVICING THE FUEL SYSTEM. REFER TO FUEL SYSTEM PRESSURE RELIEF.

Nylon lines replace the conventional steel tubing (except on Taurus Police and FF vehicles which use combination nylon / stainless steel fuel lines). The individual tubes are clipped and taped together by the manufacturer and are supplied as an assembly. The nylon fuel tube assembly is secured to the body rails with clips and push pins. The clips are located along the tube assembly by upsets on the fuel tube. In addition to locating the clips, these upsets prevent the tubes from sliding through the clips after they have been installed on the vehicle. The fuel supply and return lines are connected to the fuel tank sending unit and pump and fuel filter using push-connects. Connections to the engine are made with spring lock couplings. Refer to Push Connect and Spring Lock Coupling Removal and Installation.

CAUTION: Ford approved nylon fuel tubing is made from material which has been tested and proven to be acceptable for use with commercially available fuels. It is also resistant to most environmental conditions. Avoid using alternate tubing materials. Use of non-approved tubing could pose a hazard in service.

CAUTION: Nylon fuel tube must not be serviced using hose and hose clamps. Push connect fittings cannot be serviced except to replace the retaining clips. Should the plastic tubes, push connect fittings or steel tube ends become damaged and leak, approved service parts must be used to service the fuel lines.

CAUTION: The nylon fuel lines can be damaged by torches, welding sparks, grinding and other operations which involve heat and high temperatures. If any service operation will be used which involves heat and high temperatures, locate all fuel system components, especially the nylon fuel lines to be certain they will not be damaged. It is recommended that the nylon fuel tubes be removed from the vehicle if a torch or high heat producing equipment is to be used for service in the following areas:

1. **Exhaust or suspension components in proximity to fuel tubes**
2. **Floorpan under vehicle and inside the passenger compartment (RH side)**
3. **Rocker panel (RH side)**
4. **Underbody frames, rails and crossmembers (RH side)**

REMOVAL AND INSTALLATION (Continued)

5. **Dash panel, under vehicle or inside the passenger compartment (lower RH side)**
6. **Front or rear wheel house/fender apron (RH side)**

Removal

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Drain fuel from fuel tank as outlined under Fuel Tank, Removal. On Flexible Fuel vehicles drain fuel tank as outlined under Fuel Tank Draining Procedure — Flexible Fuel Vehicles.
3. Lower fuel tank and disconnect push connect fittings from fuel tank sending unit and pump.
4. Disconnect push connect fittings from fuel filter at RH side of fuel tank.
5. On all vehicles except Flexible Fuel vehicles, remove three screws retaining fuel tube shield (9C291) to lower dash crossmember and remove fuel tube shield.
6. Disconnect vapor tube from fuel line assembly at in-line connection in engine compartment along RH side member between shock tower and dash panel.
7. On vehicles with 3.0L MFI engines, cut strap which retains fuel lines and vacuum hose in engine compartment.
8. Disconnect spring lock couplings from engine.
9. Cut push pins off between each retaining clip and body.

Installation

NOTE: New fuel lines come equipped with push pins. If a fuel line is being reused, new push pins must be installed on existing line. Any damaged clips must be replaced.

1. Install fuel line assembly by pushing five or six pins into existing holes in underbody.

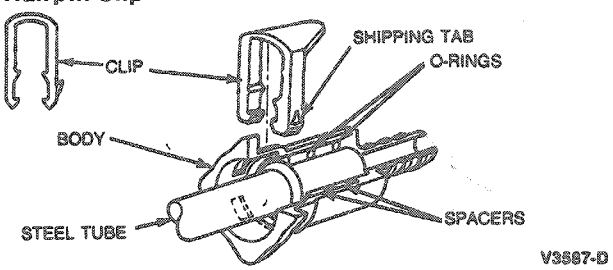
   NOTE: On all vehicles except flexible fuel vehicles, lines must be routed between fuel tube shield and lower dash.
2. Install fuel tube shield to lower dash crossmember and install three retaining screws.
3. Raise fuel tank up to underbody and connect fuel lines to fuel tank sending unit and pump and fuel vapor valve. Route lines through clip on top of tank. Connect electrical connector to fuel pump.
4. Install fuel tank to underbody.
5. Connect fuel lines to fuel filter.
6. Connect vapor tube to fuel tube assembly in engine compartment.
7. Connect fuel line spring lock coupling to engine fuel injection supply manifold (9F792).

Push Connect Fittings

CAUTION: The steel push connect and spring lock couplings used on the Flexible Fuel vehicles have special O-rings for methanol fuel compatibility. Refer to Steel Push Connect 5/16 inch or 3/8 inch fittings Removal and Disconnect procedure. Use Disconnect Tools T90T-9550-B or T90T-9550-C.

Push connect fittings are designed with a retaining clip. The fittings used with 9.5 and 7.9mm (3/8 and 5/16 inch) diameter tubing use a hairpin clip. Clips should be replaced whenever a connector is removed.

Hairpin Clip



Removal

NOTE: Drain fuel tank if necessary, as outlined under Fuel Tank, Removal. On Flexible Fuel vehicles, drain fuel tank as outlined under Fuel Tank Draining Procedure — Flexible Fuel Vehicles.

1. Inspect internal portion of fitting for dirt accumulation. If more than a light coating of dust is present, clean fitting before disassembly.
2. Some adhesion between seals in fitting and tubing occurs with time. To separate, twist fitting on tube, then push and pull fitting until it moves freely on tube.

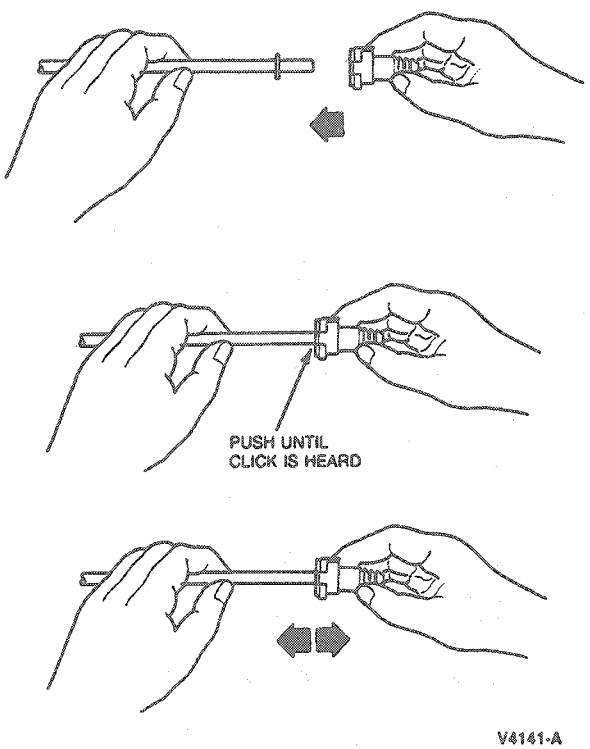
   CAUTION: Do not use any tools.
3. Remove hairpin clip from fitting by first bending shipping tab and breaking. Next **(using hands only)**, spread two clip legs about 3.2mm (1/8 inch) each to disengage body and push legs into fitting. Complete removal is accomplished by lightly pulling from triangular end of clip and working it clear of tube and fitting.

   NOTE: On 90 degree elbow connectors, excessive side loading could break connector body.
4. Grasp fitting and hose assembly and pull in an axial direction to remove fitting from steel tube.
5. After disassembly, inspect and clean the tube end sealing surface. Tube end should be free of scratches and corrosion as they result in path for fuel leakage. Inspect the inside of the fitting for any internal parts such as O-rings and spacers that may have been dislodged from the fitting. Replace any damaged connector.

REMOVAL AND INSTALLATION (Continued)

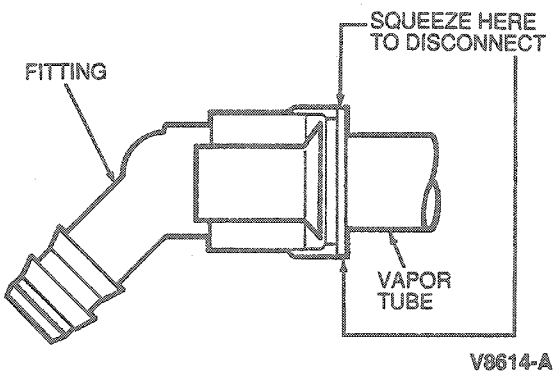
Installation

1. Install new connector if damage was found. Install new clip, insert clip into any two adjacent openings with triangular portion pointing away from fitting opening. Install clip to fully engage body (legs of hairpin clip locked on outside of body). Piloting with an index finger is necessary.
2. Before installing fitting on tube, wipe tube end with a clean cloth. Inspect inside of fitting to ensure it is free of dirt and/or obstructions. Apply a light coat of engine oil to the tube end for ease of assembly.
3. To install fitting onto tube, align fitting and tube axially and push fitting onto tube end. When fitting is engaged, a definite click will be heard. Pull on fitting to ensure it is fully engaged.



Fuel Vapor Tube Push Connect Removal

No removal tool is required for the nylon fuel vapor connectors used on the Flexible Fuel vehicles. These connectors can be disconnected by squeezing the connector and pulling it off the tube end.

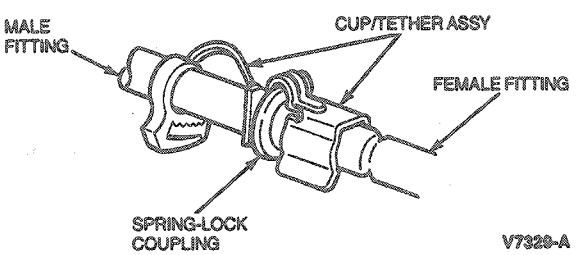


Spring Lock Coupling

Tools Required:

- Fuel Line Disconnect Tool 3/8 Inch (Yellow) D87L-9280-A
- Fuel Line Disconnect Tool 1/2 Inch (Green) D87L-9280-A

The spring lock coupling is a fuel line coupling held together by a garter spring inside a circular cage. When the coupling is connected together, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting. The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage. As a redundant locking feature, a horseshoe shaped retaining clip is incorporated to improve the retaining reliability of the spring lock coupling.



Removal

1. Release fuel system pressure as outlined under Fuel System Pressure Relief.
2. Remove retaining clip from spring lock coupling by hand only. Do not use any sharp tool or screwdriver as it may damage the spring lock coupling.
3. Twist fitting to free it from any adhesion at the O-ring seals.
4. Fit Fuel Line Disconnect Tool D87L-9280-A (3/8 inch) (Yellow) or D87L-9280-B (1/2 inch) (Green) or equivalents to coupling.
5. Close tool and push into open side of cage to expand garter spring and release female fitting.
6. After garter spring is expanded, pull fittings apart.

REMOVAL AND INSTALLATION (Continued)

7. Remove tool from disconnected coupling.

Installation

1. Ensure that garter spring is in cage of male fitting. If garter spring is missing, install a new spring by pushing it into cage opening. If garter spring is damaged, remove it from cage with a small wire hook (do not use a screwdriver) and install a new spring.
2. Clean all dirt or foreign material from both pieces of coupling.

   WARNING: USE ONLY THE SPECIFIED O-RINGS AS THEY ARE MADE OF A SPECIAL MATERIAL. THE USE OF ANY O-RING OTHER THAN THE SPECIFIED O-RING MAY ALLOW THE CONNECTION TO LEAK INTERMITTENTLY DURING VEHICLE OPERATION.
3. Replace missing or damaged O-rings. Use only O-rings listed in Spring Lock Coupling illustration.

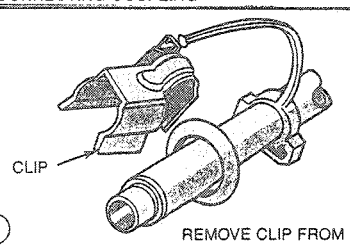
   Lubricate male fitting and O-rings and inside of female fitting with clean engine oil.
4. Fit female fitting to male fitting and push until garter spring snaps over flared end of female fitting.
5. Ensure coupling engagement by pulling on fitting and visually checking to ensure garter spring is over flared end of female fitting.

   NOTE: All vehicles require the large black clip to be installed on the supply side fuel line and the small gray clip to be installed on the return side fuel line.
6. Position retaining clip over metal portion of spring lock coupling. Firmly push retaining clip onto spring lock coupling. Ensure that horseshoe portion of clip is over the coupling. Do not install retaining clip over rubber fuel line.

REMOVAL AND INSTALLATION (Continued)

TO DISCONNECT COUPLING

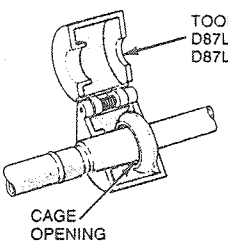
CAUTION — RELIEVE FUEL PRESSURE BEFORE DISCONNECTING COUPLING



1 REMOVE CLIP FROM COUPLING

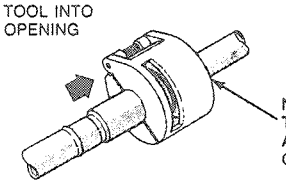
USE SPECIFIED TOOL OR EQUIVALENT

TOOL:
D87L-9280-A — 3/8 INCH
D87L-9280-B — 1/2 INCH

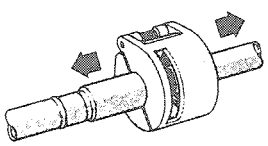


2 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.

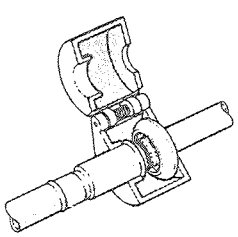
PUSH TOOL INTO CAGE OPENING



3 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING

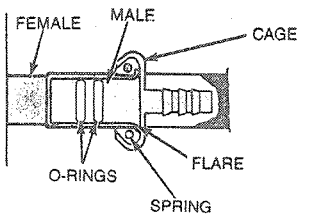


4 PULL THE COUPLING MALE AND FEMALE FITTINGS APART



5 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING

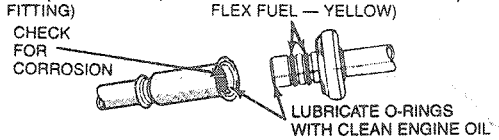
TO CONNECT COUPLING



1

REPLACEMENT O-RINGS
390846-S96 (3/8 INCH DIA., 2 PER FITTING)
390847-S96 (1/2 INCH DIA., 2 PER FITTING)

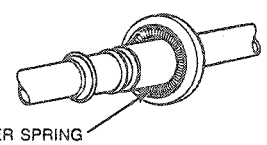
USE ONLY SPECIFIED FUEL RESTRAINT O-RINGS
(COLOR:
EXCEPT FLEX FUEL — BROWN)
FLEX FUEL — YELLOW)



CLEAN FITTINGS WITH SOLVENT. CHECK FOR MISSING OR DAMAGED O-RINGS. REPLACE MISSING O-RINGS. IF EITHER O-RING IS DAMAGED, REPLACE BOTH O-RINGS.

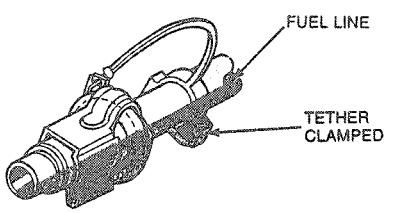
REPLACEMENT GARTER SPRINGS:
3/8-INCH — E1ZZ-19E576-A
1/2-INCH — E1ZZ-19E576-B

2

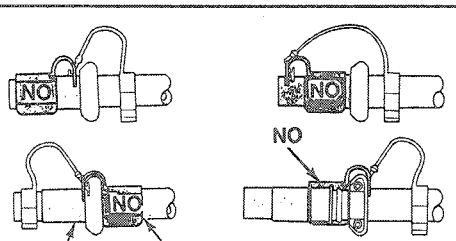


TO ENSURE COUPLING ENGAGEMENT, PULL ON FITTING AND VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING

3



4 YES



5 WRONG — WHEN FLARE OR O-RINGS ARE SHOWING

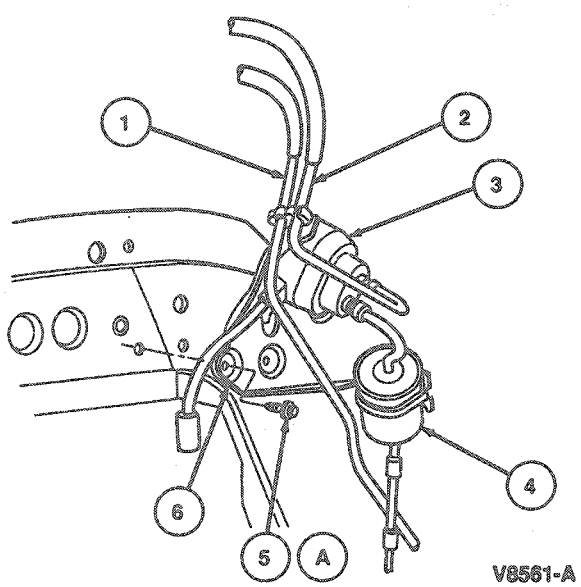
V8616-A

REMOVAL AND INSTALLATION (Continued)

Flexible Fuel Mixer / Sensor Assembly

Removal and Installation

1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Remove upper and lower supply line quick disconnect secondary retaining clips from fittings. Disconnect fuel lines from flexible fuel (FF) sensor (9C044).
3. Remove flexible fuel (FF) sensor (9C044) bracket retaining screws and remove.
4. To install, reverse Removal procedures. Tighten fuel and vapor return tube (9J279) retaining screws to 5.2-7.2 N·m (47-63 lb-in). Start engine and check for fuel leaks.



V8561-A

Item	Part Number	Description
1	9J279	Fuel and Vapor Return Tube
2	9J285	Fuel Supply Line
3	9C044	Flexible Fuel Sensor
4	9S301	Fuel Mixer Assy
5A	W611081-S56	Screw (2 Req'd)
6	9D319	Fuel Sensor Bracket
A		Tighten to 8-11.5 N·m (6-8 Lb-Ft)

Fuel Filter

Tools Required:

- EFI and CFI Fuel Pressure Gauge T80L-9974-B

Removal

WARNING: BECAUSE OF THE COMBUSTION CHARACTERISTICS OF GASOLINE, ALWAYS USE EXTREME CARE WHEN REMOVING AND INSTALLING ANY FUEL SYSTEM COMPONENT.

1. Depressurize fuel system as outlined in Fuel System Pressure Relief.
2. Remove push connect fittings at both ends of the fuel filter as outlined.
3. Install retainer clips in each connect fitting.

   NOTE: The flow arrow direction should be positioned forward and downward to ensure proper flow of fuel through replacement fuel filter.
4. Remove fuel filter from bracket by loosening worm gear mounting clamp enough to allow fuel filter to pass through.

Installation

1. Install fuel filter in bracket, ensuring proper direction of flow as noted earlier. Locate the fuel filter against tab at lower end of bracket.
2. Install push connect fittings at both ends of fuel filter as outlined.
3. Tighten worm gear mounting clamp to 1.7-2.8 N·m (15-25 lb-in).
4. Start engine and inspect for leaks.

Fuel Pump and Sender Assembly

Unleaded Gasoline Vehicles

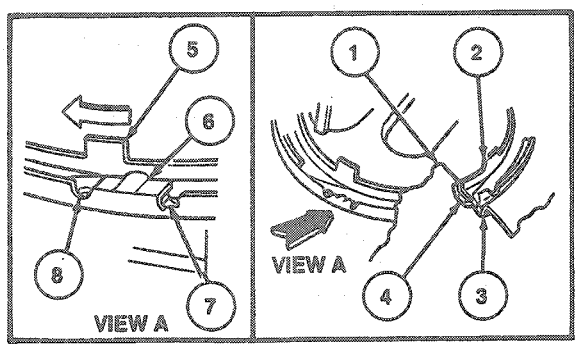
Tools Required:

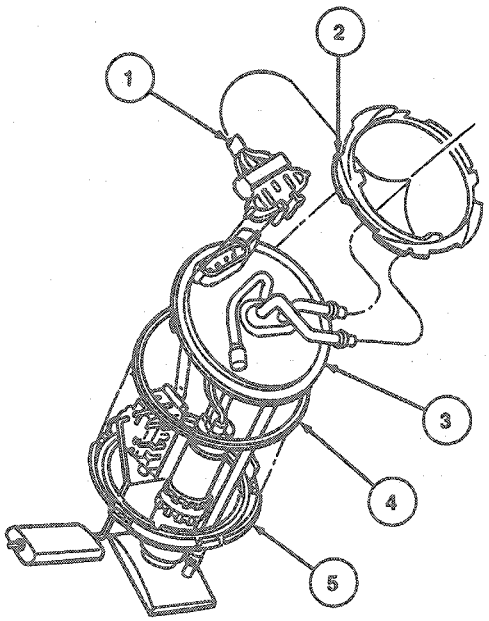
- Fuel Tank Sender Wrench D84P-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Adapter Hose 034-00012

Removal

1. Place vehicle on hoist, do not raise.
2. Depressurize fuel system as outlined in Fuel System Pressure Relief.
3. Drain fuel from fuel tank through fuel tank filler pipe using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.
4. Raise vehicle on hoist.
5. Disconnect and remove fuel tank filler pipe.
6. Support fuel tank and remove fuel tank support straps. Lower fuel tank partially and remove fuel lines, electrical connectors and vent lines from tank. Remove fuel tank to bench.
7. Remove any dirt that has accumulated around fuel pump retaining flange so that it will not enter fuel tank during removal and installation.
8. Turn fuel pump locking retainer ring (9C385) counterclockwise using Fuel Tank Sender Wrench D84P-9275-A or an equivalent and remove fuel pump locking retainer ring.
9. Remove fuel tank sending unit and pump.
10. Remove seal gasket and discard.

REMOVAL AND INSTALLATION (Continued)





V8612-A

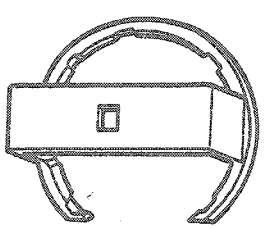
Item	Part Number	Description
1	9H307	Fuel Tank Sending Unit and Pump
2	9C385	Fuel Pump Locking Retainer Ring
3	—	Retainer Ring
4	N803861-S	O-Ring
5	—	Locating Tabs
6	—	Tab
7	—	Stop
8	—	Detent

Installation

1. Clean the fuel tank sending unit and pump mounting flange, fuel tank mounting surface and seal ring groove.
2. Apply a light coating of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent on a new seal ring to hold it in place during assembly and install it in fuel ring groove.
3. Install fuel tank sending unit and pump carefully to ensure that filter is not damaged. Ensure that locating keys are in keyways and seal ring remains in place.
4. Hold assembly in place and install fuel pump locking retainer ring finger-tight. Ensure that all locking tabs are under fuel tank lock ring tabs.
5. Secure unit with fuel pump locking retainer ring by rotating fuel pump locking retainer ring clockwise using Fuel Tank Sender Wrench D84P-9275-A or an equivalent until fuel pump locking retainer ring stops against stops.
6. Remove fuel tank from bench to vehicle and support fuel tank while connecting fuel lines, vent line, and electrical connectors to appropriate places.
7. Install fuel tank in vehicle and secure with fuel tank support straps.
8. Lower vehicle.
9. Install fuel tank filler pipe and retaining screws.
10. Install a minimum of 38l (10 gal) of fuel and check for leaks.
11. Turn ignition switch to ON position for three seconds repeatedly (5 to 10 times) until pressure gauge shows at least 270 kPa (30 psi). Check for leaks at fittings.
12. Remove pressure gauge, start engine, and recheck for leaks.

Flexible Fuel (FF) Vehicles

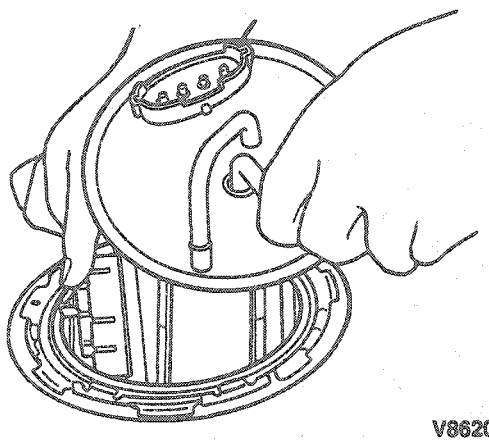
1. Depressurize fuel system as outlined under Fuel System Pressure Relief.
2. Drain fuel tank as outlined under Fuel Tank Draning Procedure—Flexible Fuel Vehicles.
3. Raise vehicle on a hoist. Refer to Section 00-02.
4. Disconnect and remove fuel tank filler pipe.
5. Support fuel tank and remove fuel tank support straps. Lower fuel tank partially and disconnect fuel lines, electrical connectors and fuel vapor and vent lines from fuel tank. Remove fuel tank to bench.
6. Remove any dirt that has accumulated around fuel tank sending unit and pump so that dirt does not enter fuel tank during fuel tank sending unit and pump removal.
7. Remove fuel pump locking retainer ring using Fuel Tank Sender Wrench D90P-9275-A or equivalent.



V8619-A

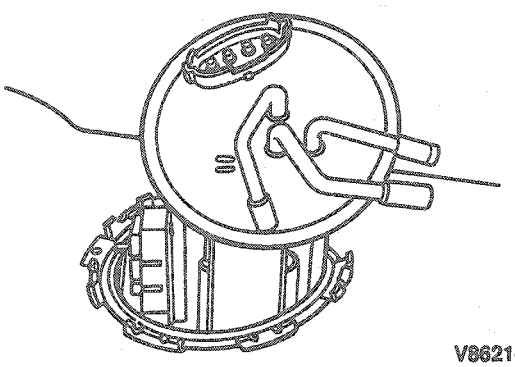
REMOVAL AND INSTALLATION (Continued)

8. Lift fuel tank sending unit and pump locating tabs from fuel tank location slots.
9. Lift fuel tank sending unit and pump upward rotating left, while aligning float wiper arm retainer and return line into fuel tank location slots.



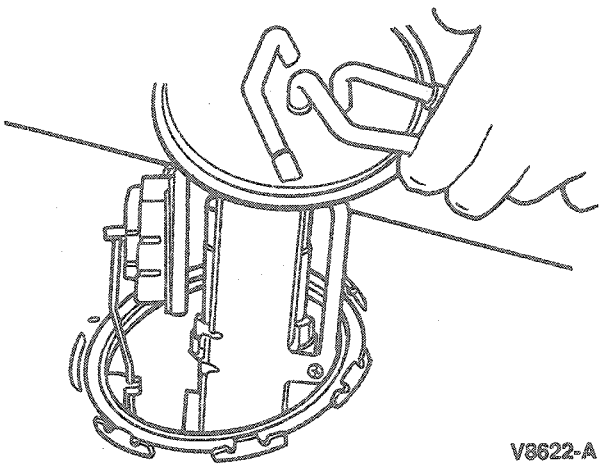
V8620-A

10. Apply slight pressure to remove fuel tank sending unit and pump.



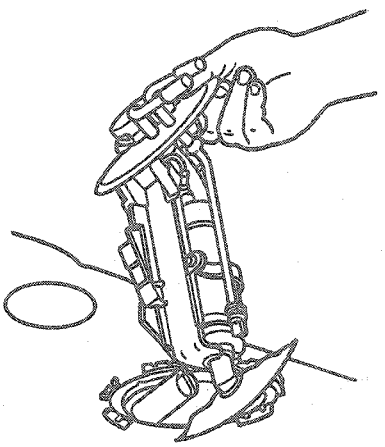
V8621-A

11. Lift float wiper arm through LH fuel tank slot and pass pump motor retaining bracket through the RH fuel tank slot.



V8622-A

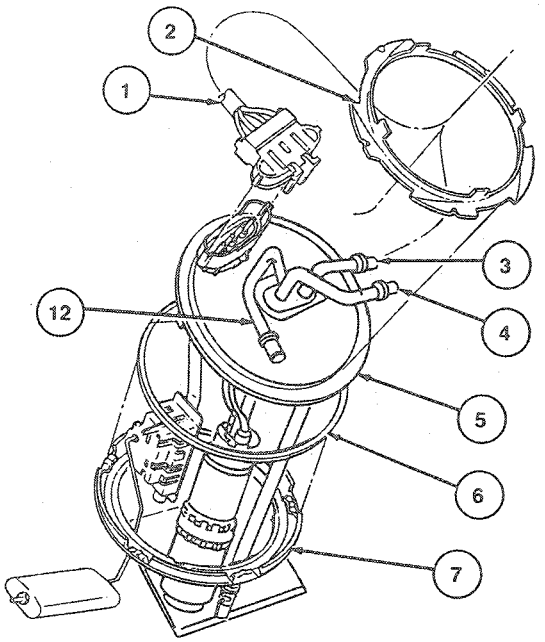
12. Remove fuel tank sending unit and pump keeping return line in fuel tank slot. Lift fuel pump inlet filter then sender arm float through fuel tank opening.

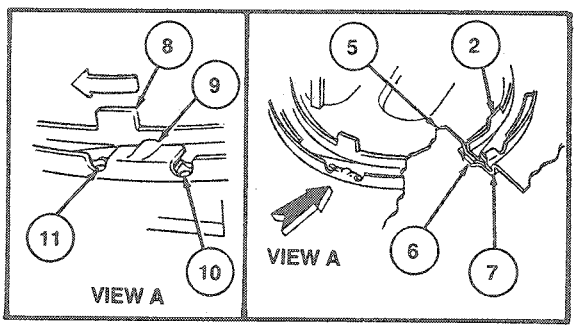


V8623-A

13. Remove fuel methanol compatible fuel pump mounting gasket (9417).
14. To install, position new fuel methanol compatible fuel tank sending unit and pump gasket and reverse Remove procedure.

REMOVAL AND INSTALLATION (Continued)





V8629-A

Item	Part Number	Description
1	—	Electrical Connector
2	9C385	Fuel Pump Locking Retainer Ring
3	—	Fuel Return
4	—	Fuel Supply
5	9H307	Fuel Tank Sending Unit and Pump
6	9417	Fuel Pump Mounting Gasket
7	—	Retainer Ring
8	—	Locating Tabs
9	—	Tab
10	—	Stop
11	—	Detent
12	—	Fuel Tank Drain Tube

15. To install fuel tank, reverse Removal procedure. Start engine and check for leaks.

MAJOR SERVICE OPERATIONS

Fuel Tanks

An electric fuel pump is located in the fuel tank. The pump is attached to the fuel tank, or as part of the sender unit. The fuel tank must be removed to service the fuel pump. Care should be taken during installation due to the hose and wire routing on the tank. Route all fuel lines and electrical harnesses properly. Check the fuel line connections for leaks.

Fuel tanks do not require special service procedures and may be steam-cleaned and / or serviced using standard procedures. After steaming, allow to thoroughly air dry. The vapor separator assembly should be replaced. Replace fuel tank strap bolts.

CAUTION: Remove the fuel pump prior to steaming the fuel tank. Care should be exercised not to deform the plastic reservoir inside the tank with excessively hot steam or direct contact with plastic surface.

WARNING: FUEL SUPPLY LINES ON VEHICLES EQUIPPED WITH FUEL INJECTED ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN. THE PRESSURE MUST BE RELIEVED BEFORE SERVICING THE FUEL SYSTEM. REFER TO FUEL SYSTEM PRESSURE RELIEF.

Fuel Lines

Vehicles equipped with nylon fuel tubes and push connect fittings have two types of service repairs that can be performed on the fuel lines replacing nylon tubing (splicing nylon to nylon) and replacing push connector or spring lock fittings.

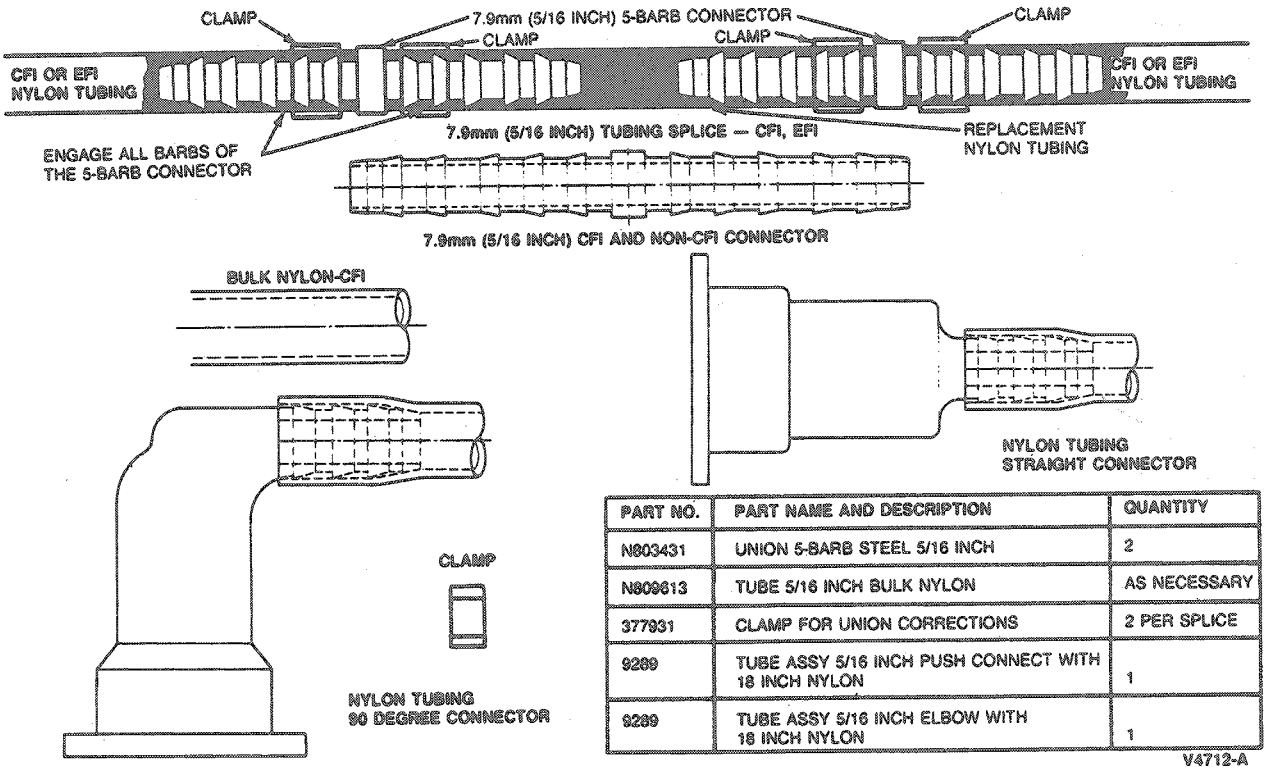
Splicing Nylon to Nylon

1. Relieve fuel system pressure as outlined in Fuel System Pressure Relief. Read cautionary note prior to relieving pressurized fuel system. If necessary, drain fuel tank as outlined under Fuel Tank, Removal or Fuel Tank Draining Procedure—Flexible Fuel Vehicles.
2. Cut out damaged section of tubing and retain as a guide.
3. Cut a section of service tubing (type 11 or 12 nylon 7.9mm (5 / 16 inch) diameter) to same length as damaged section of tubing.

   NOTE: To make hand insertion of barbed connectors into nylon easier, tube end must be soaked in a cup of boiling water for one minute immediately before pushing barbs into nylon.
4. Select proper 7.9mm (5 / 16 inch) barbed connectors for completing splice. Two connectors are required for each splice.
5. Install barbed connectors into each end of replacement tubing using boiling water as outlined.
6. Install clips onto any tubes which might be difficult to access once final splices are completed.
7. Install four keystone clamps loosely onto original nylon tubing before beginning next step.

MAJOR SERVICE OPERATIONS (Continued)

8. Complete splice of replacement nylon to original nylon tubing at both ends.
9. Tighten clamps in locations shown in illustration under Step 11 of this procedure.
10. Install any remaining clips which were removed for this service and check that tubes are secure in original clips.
11. Fill fuel tank, start engine and check for leaks.



PART NO.	PART NAME AND DESCRIPTION	QUANTITY
N803431	UNION 5-BARB STEEL 5/16 INCH	2
N809613	TUBE 5/16 INCH BULK NYLON	AS NECESSARY
377931	CLAMP FOR UNION CORRECTIONS	2 PER SPLICE
9289	TUBE ASSY 5/16 INCH PUSH CONNECT WITH 18 INCH NYLON	1
9289	TUBE ASSY 5/16 INCH ELBOW WITH 18 INCH NYLON	1

V4712-A

Replacing Nylon Push Connectors

Refer to illustration under Splicing Nylon-to-Nylon, Step 11.

NOTE: Damaged push connectors must be discarded and replaced with new push connectors. If only retaining clip is damaged, replace clip.

1. Relieve fuel system pressure as outlined in Fuel System Pressure Relief. Read cautionary note prior to relieving pressurized fuel system. If necessary, drain fuel tank as outlined under Fuel Tank, Removal or Fuel Tank Draining Procedure—Flexible Fuel Vehicles.
2. Disconnect damaged push connector. Be sure to break the tab before removing retaining clip.
3. Select proper size replacement push connector and nylon tube assembly.
4. Cut out a section of original nylon tube to same length as nylon tube attached to new push connector.

   NOTE: To make hand insertion of barbed connectors into nylon easier, tube end must be soaked in a cup of boiling water for one minute immediately before pushing barbs into nylon.
5. Install proper barbed connector into replacement nylon assembly.
6. Install two keystone clamps onto original nylon tubing before beginning next Step.
7. Complete splice by connecting barbed connector to original nylon.
8. Tighten clamps in locations shown in illustration under Step 11 of Splicing Nylon-to-Nylon.
9. Connect new connector assembly to steel tube end.
10. Check that underbody clips are properly securing fuel tubes.
11. Fill tank, start engine and check for fuel leaks.

SPECIFICATIONS

APPROXIMATE FUEL TANK CAPACITY

Model Usage	Liters	Imp.	U.S
Standard	60.6	13.3	16.0
Extended Range	70.4	15.5	18.6

SPECIFICATIONS (Continued)

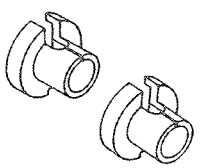
PUSH CONNECT RETAINERS—PART NUMBERS

Part Number	Component
N802241 (Black)	Hair Pin Clip[1]—3/8 Inch Connector
N802239 (White)	Hair Pin Clip[1]—5/16 Inch Connector
N802710-S190	Duck Bill Clip[1]—1/4 Inch
N802441-S	Duck Bill Clip[1]—1/2 Inch

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Filler Neck-to-Body Screws	2.7-3.7	24-32
Fuel Filler Clamp	1.7-2.8	15-25
Fuel Filter Bracket Screw	8-12	71-106
Inertia Fuel Shutoff Switch Nuts	1.5-2.2	14-19
Fuel Tank Strap Bolts	29-41	22-30 (Lb-Ft)
Fuel Filler Pipe Hose Clamps	2.7-3.7	24-32
Fuel Filler Neck Bolt	4-6	36-53
Flexible Fuel Mixer/Sensor Assy	5.2-7.2	47-63

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T74P-9275-A Fuel Tank Sender Wrench	 T74P-9275-A
T90T-9550-S Fuel Line Disconnect	 T90T-9550-S

Tool Number	Description
D87L-9280-A	Disconnect Tool 3/8 Inch (Yellow)
D87L-9280-B	Disconnect Tool 1/2 Inch (Green)
D90P-9275-A	Fuel Tank Sender Wrench

ROTUNDA EQUIPMENT

Model	Description
034-00002	Fuel Storage Tanker
034-00012	Adapter Hose
034-00020	Fuel Storage Tanker and Adapter Hose

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9002	Fuel Tank	
9030	Fuel Tank Filler Cap	
9034	Fuel Tank Filler Pipe	
9092	Fuel Tank Support Strap	
9155	Fuel Filter	
9341	Inertia Fuel Shutoff Switch	Fuel Pump Inertia Switch
9417	Fuel Pump Mounting Gasket	
9B593	Fuel Vapor Valve	
9C291	Fuel Tube Shield	
9C385	Fuel Pump Locking Retainer Ring	
9F792	Fuel Injection Supply Manifold	
9H307	Fuel Tank Sending Unit and Pump	
9J279	Fuel and Vapor Return Tube	

1 Replacement Required After Connector Removal

SECTION 10-02 Accelerator Pedal and Linkage

VEHICLE APPLICATION

Taurus / Sable.

DIAGNOSIS

Linkage

Based on the condition, the following Steps are to be used for diagnosis **following disconnection of the throttle cable (9A758) from the throttle body lever. (If the vehicle is equipped with speed control, disconnect the speed control cable from the throttle cable.)**

1. Accelerator pedal is hard to push down, or has a rough / raspy or sticky feel.
   - Make sure that disconnected end of throttle cable or its accelerator retracting spring (9737) does not come into contact with any surrounding parts.
   - Operate pedal by foot.
   - If throttle cable operation is smooth, throttle cable is not damaged. Refer to Powertrain Control / Emissions Diagnosis Manual[1] for other checks.
   - If condition recurs (making sure disconnected end of throttle cable has not come into contact with anything), check foot pedal assembly for free operation. If pedal operation is free, replace throttle cable.

   NOTE: Throttle cable should not be lubricated and is not serviceable.
2. High engine idle speed.
   - If cable ball socket extends beyond throttle lever ball stud (closed throttle plate direction), throttle cable is not damaged. Refer to Powertrain Control / Emissions Diagnosis Manual[1] for other checks.
   - If ball socket does not extend beyond stud, check foot pedal assembly for free operation. If pedal operation is free, replace throttle cable.

DIAGNOSTIC PROCEDURE — ACCELERATOR PEDAL TO THROTTLE CABLE

CONDITION	ACTION
• Accelerator Pedal is Hard to Push Down or Has a Rough / Raspy or Sticky Feel	• Be sure that the disconnected end of the throttle cable or its accelerator retracting spring does not come into contact with any of the surrounding parts. • Operate the pedal by foot. • If the condition recurs (being sure disconnected end of throttle cable has not come into contact with anything), check the accelerator pedal and shaft for free operation. If the accelerator pedal and shaft operation is free, replace the throttle cable.
• High Engine Idle Speed	• If the socket does not extend beyond the stud, check the accelerator pedal and shaft for free operation. If the accelerator pedal and shaft operation is free, replace the throttle cable.

NOTE: Throttle cable should not be lubricated, and it is not serviceable.

TV3036E

1 Can be purchased as a separate item.

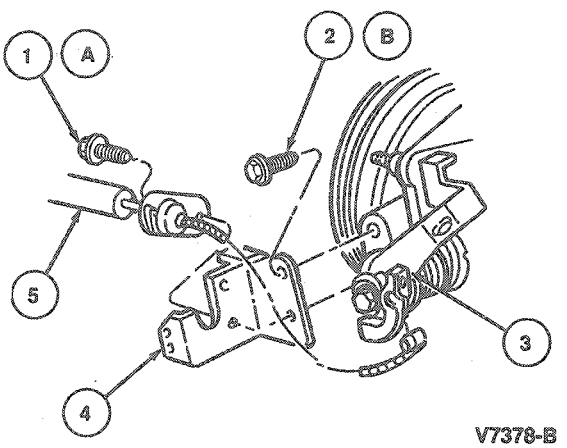
REMOVAL AND INSTALLATION

Throttle Cable

Removal and Installation

1. Remove intake air duct assembly. Refer to Section 03-12.
2. Using a suitable tool, remove throttle cable snap-in nylon bushing from pedal arm.
3. Remove throttle cable housing from dash panel by removing two screws retaining throttle cable to dash panel and pushing outward from inside passenger compartment.
4. On 3.0L SFI engine, remove accelerator control splash shield (9E766).
5. Remove speed control cable from throttle cable, if so equipped. Refer to Section 10-03.

   On 3.0L and 3.2L SHO, unwind cable core wire from pulley and slide cable end fitting out of slot in pulley.
6. Disconnect throttle cable at throttle body throttle lever by inserting a screwdriver between throttle cable and throttle lever and giving a twist.



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Item	Part Number	Description
1A	W611624-S36	Screw
2B	N605530-S36 (3.0L SFI) N605905-S2 (All Except 3.0L SFI)	Bolt
3	—	Pulley
4	9723	Accelerator Cable Bracket
5	9A758	Throttle Cable
A		Tighten to 5.2-7.2 N·m (47-63 Lb-in)
B		Tighten to 15-20 N·m (11-14 Lb-Ft)

(Continued)

7. Remove accelerator cable bracket (9723) retaining screw. Remove throttle cable from bracket slot.
8. To install, reverse Removal procedure.

Accelerator Cable Bracket

Removal and Installation

1. Remove air duct assembly and accelerator cable bracket (3.0L SFI engines). Refer to Section 03-12.
2. Disconnect throttle cable at throttle body throttle lever by inserting a screwdriver between throttle cable and throttle lever and giving a twist. On 3.0L and 3.2L SHO, unwind cable core wire from pulley and slide end fitting out of slot on pulley.
3. Remove throttle cable housing to bracket retaining screw.
4. Remove speed control cable from accelerator cable bracket, if so equipped. Refer to Section 10-03.
5. Remove bolts securing accelerator cable bracket to engine.
6. To install, reverse Removal procedure and tighten accelerator cable bracket bolts to 14-20 N·m (10-15 Lb-Ft).

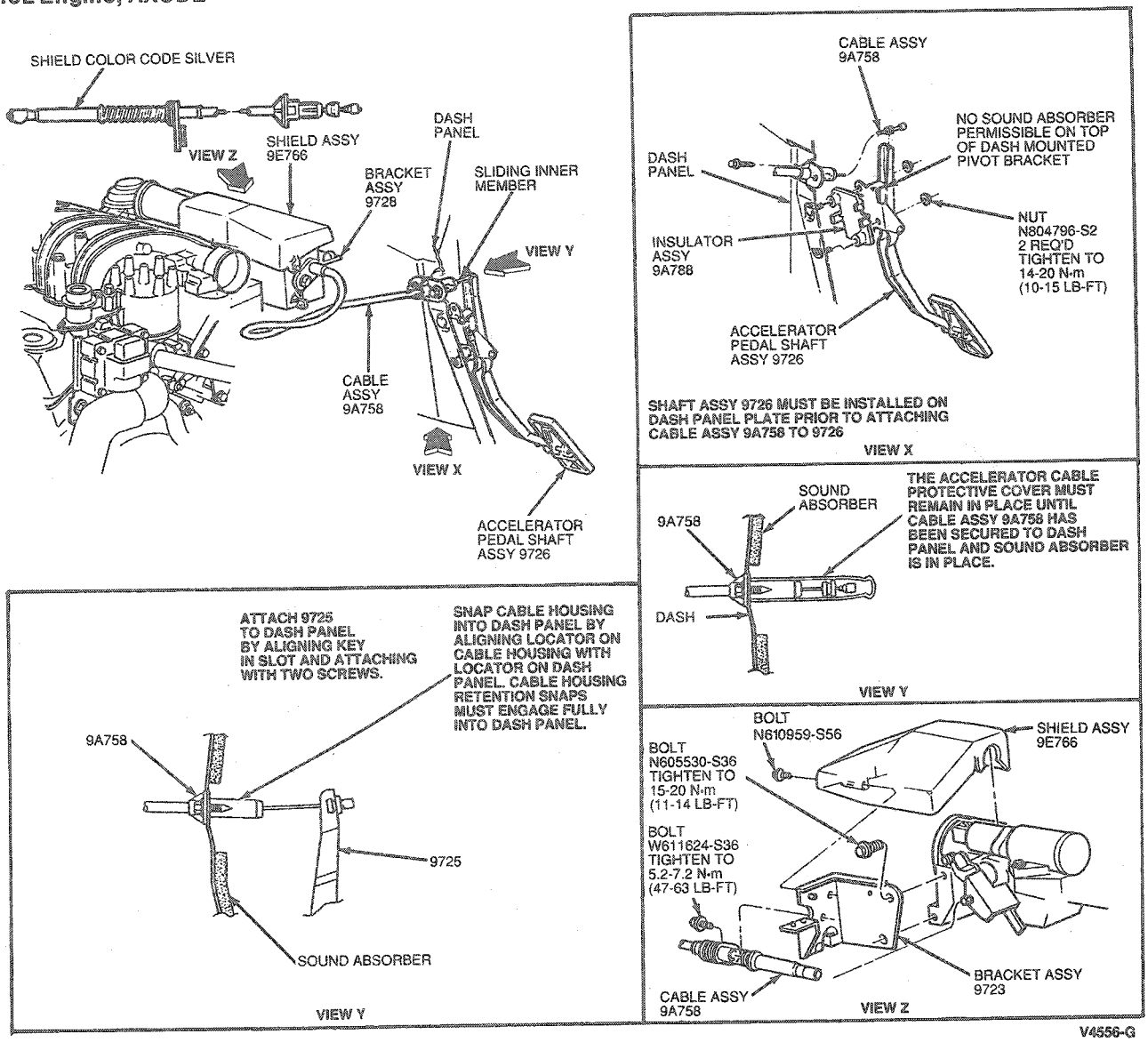
Accelerator Pedal and Shaft Assembly

Removal and Installation

1. Using a suitable tool, push the throttle cable nylon bushing, from back side of arm, out of the accelerator pedal arm.
2. Remove the accelerator pedal and shaft (9725) retaining nuts.
3. To install, reverse Removal procedure. Tighten accelerator pedal and shaft nuts to 14-20 N·m (10-15 lb-ft) and check pedal for smooth operation.

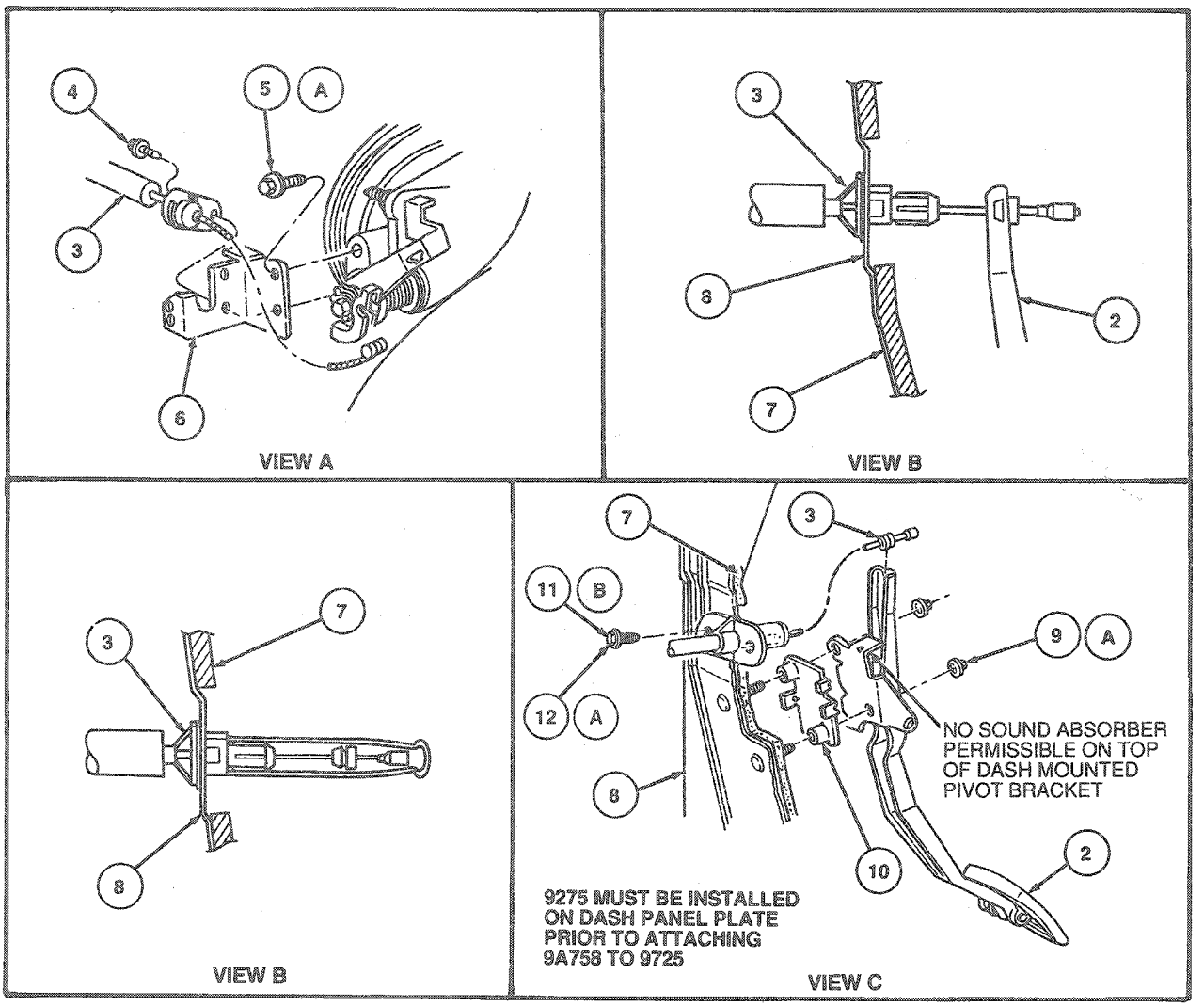
REMOVAL AND INSTALLATION (Continued)

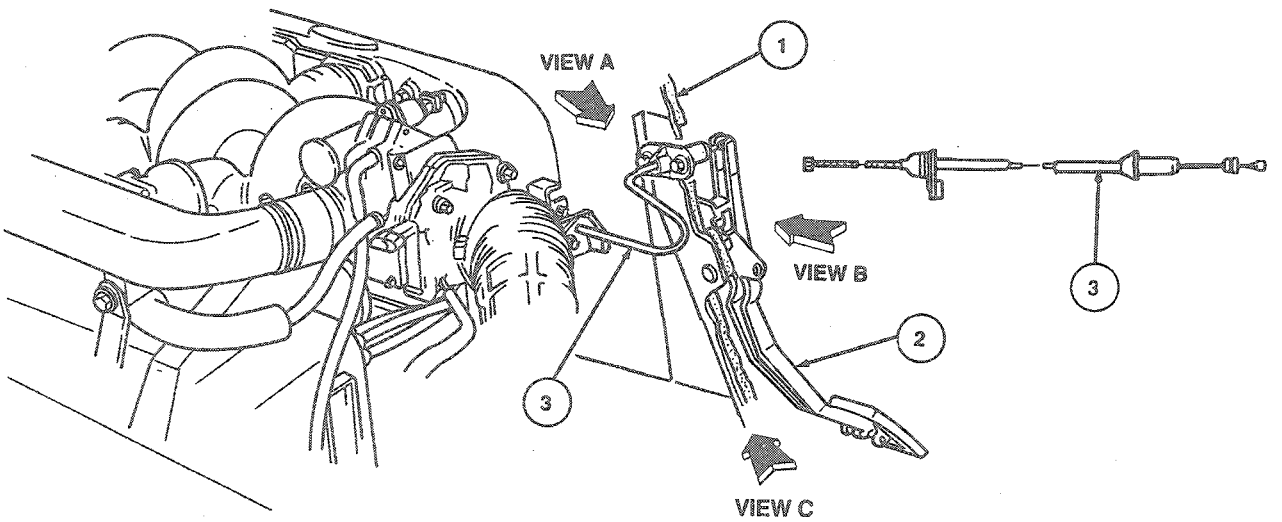
3.0L Engine, AXODE



REMOVAL AND INSTALLATION (Continued)

3.0L SHO Engine, MTX III





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REMOVAL AND INSTALLATION (Continued)

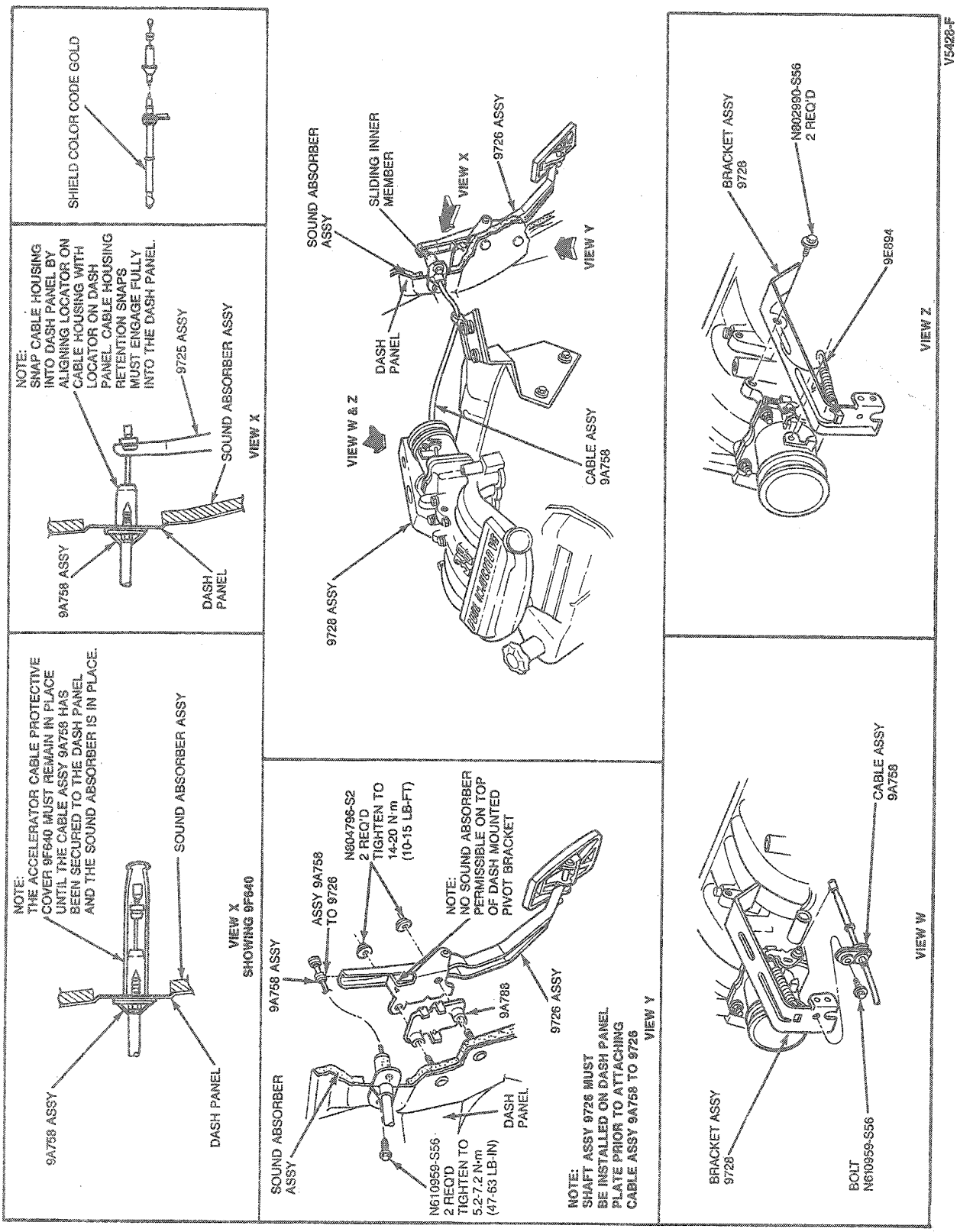
Item	Part Number	Description
1	01670	Sound Absorber Assy
2	9725	Accelerator Pedal and Shaft Assy
3	9A758	Throttle Cable Assy
4	W611624-S36	Bolt
5A	N605905-S2(3.0L SHO)	Bolt (2 Req'd)
6	9728	Accelerator Shaft Bracket Assy

(Continued)

Item	Part Number	Description
7	5401670-AA	Sound Absorber Assy
8	—	Dash
9A	N804796-S56	(2 Req'd)
10	9A788	Throttle Cable Assy
11B	W610959-S56	Bolt (2 Req'd)
12A	N605530-S36 (3.2L SHO)	Bolt (2 Req'd)
A		Tighten to 14-20 N·m (10-15 Lb-Ft)
B		Tighten to 1.6-2.2 N·m (15-19 Lb-In)

REMOVAL AND INSTALLATION (Continued)

3.8L Engine, AXODE



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Accelerator Cable Bracket Bolts	14-20	10-15
Accelerator Pedal and Shaft Attachment Nuts	14-20	10-15
Throttle Cable-to-Dash Panel Screws	1.6-2.2	15-19 (Lb-In)
Accelerator Pedal and Shaft-to-Accelerator Cable Bracket Screw	5.2-7.2	47-63 (Lb-In)

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9723	Accelerator Cable Bracket	
9725	Accelerator Pedal and Shaft	
9737	Accelerator Retracting Spring	
9A758	Throttle Cable	
9E766	Accelerator Control Splash Shield	

(Continued)

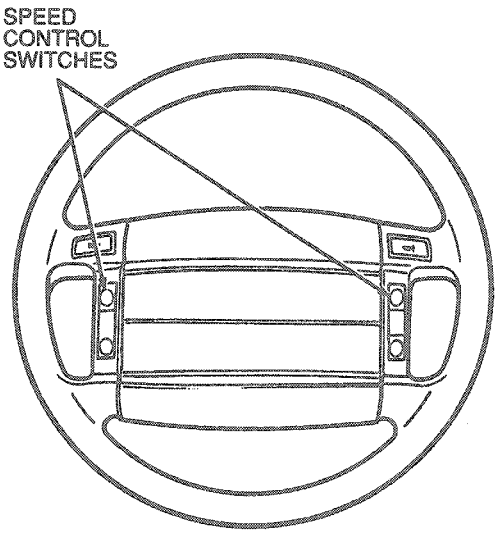
SECTION 10-03A Speed Control System—3.0L MFI, 3.0L SHO, 3.8L

VEHICLE APPLICATION

Taurus / Sable with 3.0L, 3.0L SHO and 3.8L.

DESCRIPTION

The Vehicle Speed Control system consists of operator controls, a speed control servo (9C735) (throttle actuator) assembly, a vehicle speed sensor (VSS)(9E731), a clutch switch (manual transaxle), a stoplamp switch, a speed control metering (dump) valve (9C727), a horn relay, a speed control vacuum reservoir (9E799), a check valve, an speed control amplifier (9D843) assembly and necessary wires and vacuum hoses. The speed control servo assembly is mounted in the engine compartment as shown in the illustrations and is connected to the throttle linkage with an actuator cable. The speed control servo is connected to the speed control vacuum reservoir and to manifold vacuum through the check valve as shown in the illustrations. The speed control amplifier assembly is located behind the glove compartment, under the instrument panel. The vehicle speed sensor is located on the transaxle.



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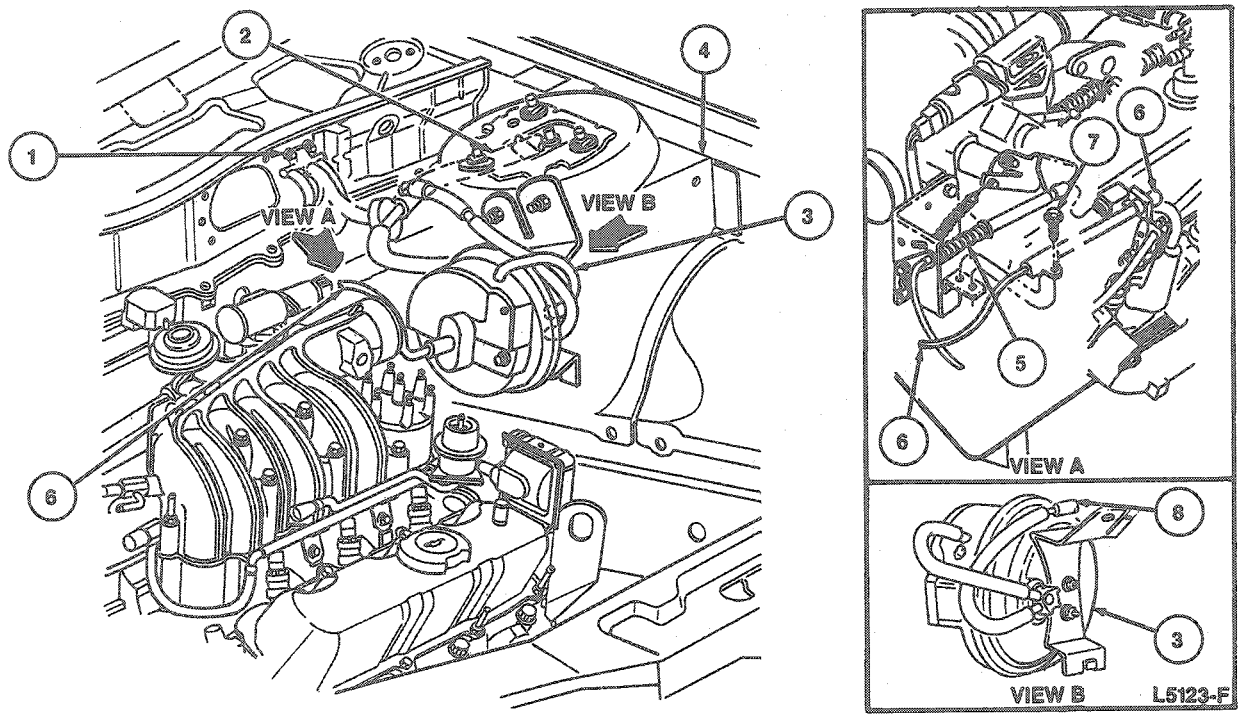
DESCRIPTION (Continued)

3.0L Engine

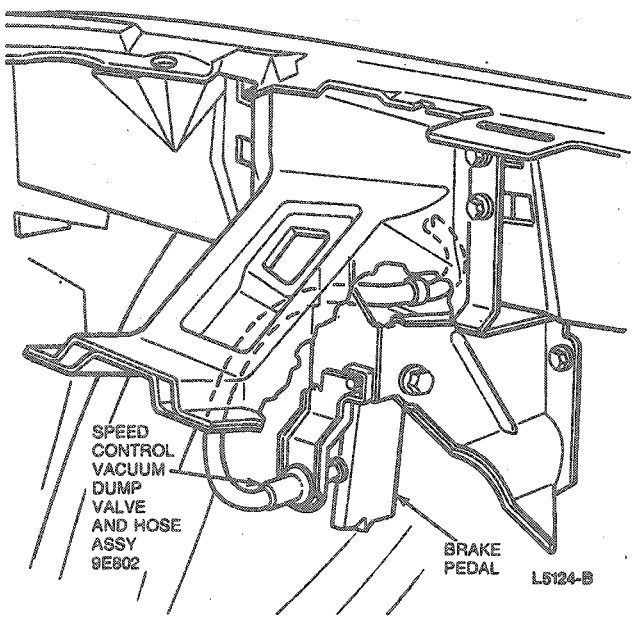


Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Vacuum Reservoir
3	9C735	Speed Control Servo
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	9C727	To Speed Control Metering (Dump) Valve

DESCRIPTION (Continued)

Speed Control Metering (Dump) Valve

The speed control metering (dump) valve provides an additional redundant safety feature in the system. Normally, when the brake pedal is depressed, an electrical signal from the stoplamps to the speed control amplifier will turn off the system. In addition, the speed control metering (dump) valve will mechanically release the vacuum in the speed control servo when the brake pedal is depressed. This releases the throttle independently of the speed control amplifier control.



Decreasing Set Speed

The vehicle speed may be reduced by applying the brake or clutch pedal and then resetting the speed using the foregoing method or by depressing and holding the COAST switch. When the vehicle has slowed to the desired speed, the COAST switch is released and the new speed is set automatically. If the vehicle speed is reduced below 48 km/h (30 mph), the driver must manually increase the speed and reset the system.

Increasing Set Speed

The vehicle set speed may be manually increased at any time by depressing the accelerator until the higher speed is reached and stabilized, then depressing and releasing the SET ACCEL button.

Speed may also be increased by depressing the SET ACCEL switch button, at speeds over 48 km/h (30 mph), and holding it in that position. The vehicle will then automatically increase speed. When the desired rate of speed is attained and the button is released, that new set speed will be maintained.

RESUME

When the speed control system is deactivated by depressing the brake or clutch pedal, the set speed prior to deactivation may be re-established by momentarily (hold for one or two seconds) depressing the RESUME switch. The RESUME switch is hinged on the side closest to the SET ACCEL switch. Therefore, it should be depressed on the side farthest from the SET ACCEL switch. The resume feature will not function if the system is deactivated with the OFF switch, or if the vehicle speed has been reduced to below 48 km/h (30 mph). In addition, when the ignition switch is turned off, the speed control memory is erased and the resume feature will not function.

OPERATION

System Activation

To operate the speed control system, the engine must be running and the vehicle speed must be greater than 48 km/h (30 mph). Under these conditions, the system is ready to accept a set speed signal. The driver must depress and release the ON switch in the steering wheel, and then the driver must depress and release the SET ACCEL switch. This will result in the current speed being maintained until a new speed is set by the driver, the brake pedal is depressed, the clutch pedal is depressed or the OFF switch is depressed.

DIAGNOSIS AND TESTING

Visual Inspection

Visual inspection is an important part of system diagnosis and should be performed before undertaking any of the following diagnostic procedures.

When performing a visual inspection, check all items for abnormal conditions such as bare, broken or disconnected wires and damaged vacuum hoses. For the speed control system to function properly, it is necessary that the speedometer cable, if so equipped, be properly routed and securely attached. All vacuum hoses must be securely attached and routed with no sharp bends or kinks. The speed control servo (throttle actuator) and throttle linkage should operate freely and smoothly.

DIAGNOSIS AND TESTING (Continued)

The actuator cable should be adjusted as tightly as possible without opening the throttle plate or increasing the idle speed. Electrical connections must be complete and tight. The wiring harness must be properly routed. Look for damaged wiring insulation or evidence of shorts.

Any concern revealed by the visual inspection should be corrected before further tests of the speed control system are made.

Control Switches Test

Tools Required:

- Rotunda Digital Volt-Ohmmeter 014-00407
- Rotunda Speed Control Tester 007-00013

Check main feed fuse and stoplamp fuse first. If these fuses are OK proceed with test. Disconnect the 6-pin connector at the speed control amplifier assembly. Refer to the wiring diagram before performing the following checks.

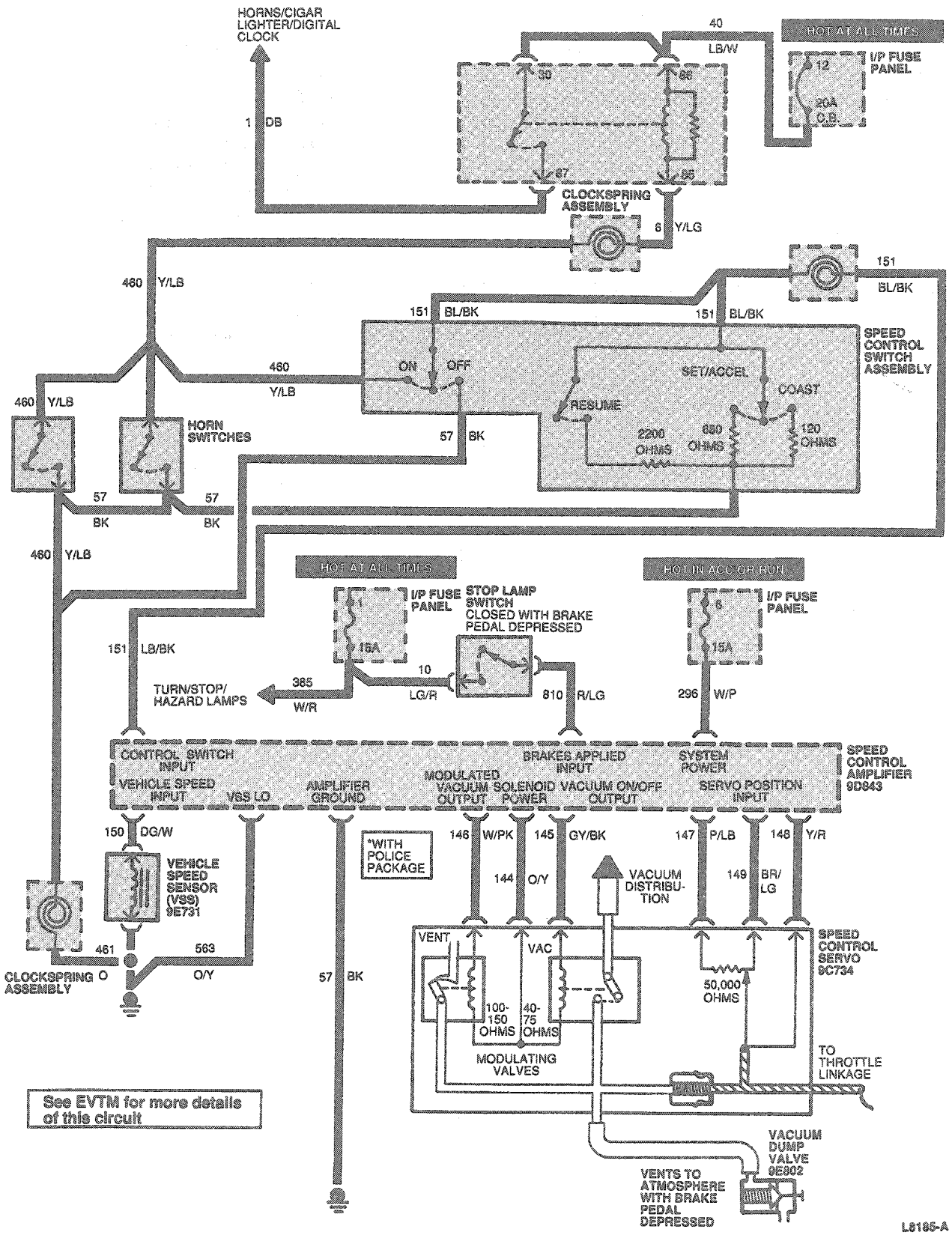
1. Connect a voltmeter across Circuit 151 (LB/BK) and ground. With ignition in the ON position depress the ON button and check for battery voltage.
2. Connect an ohmmeter between Circuit 151 (LB/BK) and ground.
3. Rotate the steering wheel throughout its full range of motion while making the following checks.
   a. Depress the OFF button and check for a reading between 0 and 1 ohm.
   b. Depress the SET ACCEL button and check for a reading between 714 and 646 ohms.
   c. Depress the COAST button and check for a reading between 126 and 114 ohms.
   d. Depress the RESUME button and check for a reading between 2310 and 2090 ohms.

If resistance values are above the allowable limits, check the switch assemblies, clockspring circuits and ground circuit.

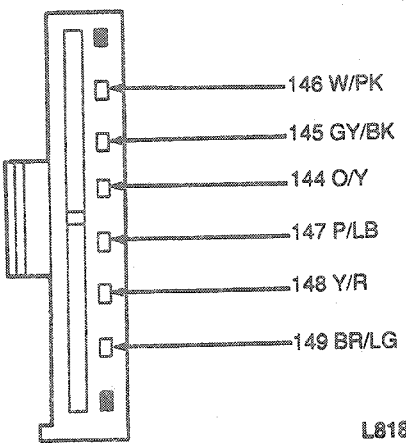
Reconnect the 6-pin connector at the speed control amplifier.

DIAGNOSIS AND TESTING (Continued)

3.0L and 3.8L Engines



DIAGNOSIS AND TESTING (Continued)



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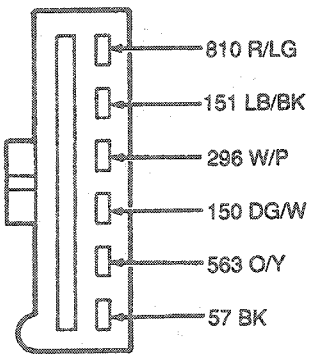

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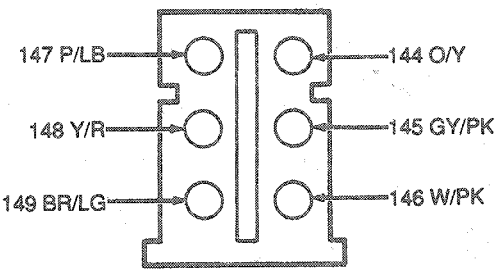

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CIRCUIT NUMBER	CIRCUIT DESCRIPTION	GAUGE	COLOR	CIRCUIT NUMBER	CIRCUIT DESCRIPTION	GAUGE	COLOR
57	STEERING WHEEL SWITCH GROUND	18	BK	460	HORN SWITCH FEED		Y/LB
10	STOPLAMP SWITCH TO TURN SIGNAL SWITCH	18	LG/R	810	BRAKE SWITCH (LOAD SIDE) TO SPEED CONTROL AMPLIFIER DISABLE	18	R/LG
563	VSS GROUND	18	O/Y	150	VSS SIGNAL TO SPEED CONTROL AMPLIFIER	20	DG/W
57	SPEED CONTROL AMPLIFIER GROUND	18	BK	151	SPEED CONTROL AMPLIFIER CONTROL LINE	18	LB/BK
296	IGNITION SWITCH (ACCESSORY) TO SPEED CONTROL AMPLIFIER FEED	20	W/P	149	SPEED CONTROL SERVO FEEDBACK POTENTIOMETER — TO SPEED CONTROL AMPLIFIER	20	BR/LG
148	SPEED CONTROL SERVO FEEDBACK—TO SPEED CONTROL AMPLIFIER	20	Y/R	147	SPEED CONTROL SERVO FEEDBACK POTENTIOMETER POSITION—TO SPEED CONTROL AMPLIFIER	18	P/LB
146	SPEED CONTROL SERVO VENT SOLENOID CONTROL	20	W/PK	145	SPEED CONTROL SERVO VACUUM SOLENOID CONTROL	20	GY/BK
144	SPEED CONTROL SERVO SOLENOID FEED	20	O/Y				

DIAGNOSIS AND TESTING (Continued)

VSS Test

Disconnect the 6-pin connector at the speed control amplifier and connect an ohmmeter between Circuit 150 (DG/W) (VSS signal) and Circuit 57 (BK) (VSS ground). A reading of approximately 200-300 ohms should be obtained. A reading of 0 ohms indicates a shorted coil or a shorted wire in the harness. A maximum reading indicates an open coil in the VSS or open wire in the harness. In either case, repeat the test at the VSS. Replace VSS if resistance is not approximately 200-300 ohms. Service harness if VSS resistance is satisfactory.

If ohmmeter records 200-300 ohms and the speedometer operates properly within needle waver, the VSS is probably good. A VSS of known good quality can also be substituted in place of the existing VSS to check for proper operation.

Servo Assembly Test

1. Separate the 8-pin connector at the speed control amplifier.
2. Connect an ohmmeter between the Circuit 144 (O/Y) and Circuit 145 (GY/BK) leads at the 8-pin connector. A resistance of 40 to 75 ohms should be obtained.
3. Connect the ohmmeter between the Circuit 144 (O/Y) and Circuit 146 (W/PK) leads. A resistance of 100 to 150 ohms should be obtained.
4. Connect the ohmmeter between Circuits 147 (P/LB) and 148 (Y/R). A resistance of 20 K ohms to 30 K ohms should be obtained.
5. Connect the ohmmeter between Circuits 147 (P/LB) and 149 (B/LG). A resistance of 40 K ohms to 60 K ohms should be obtained.
6. If proper resistance is not obtained, check the wiring and speed control servo separately for damage and replace or service as required.

Start the engine, and with the speed control servo disconnected from the speed control amplifier, connect the Circuit 144 (O/Y) lead of the speed control servo to the battery positive terminal. Connect the Circuit 146 (W/PK) lead of speed control servo to ground, and momentarily touch the Circuit 145 (GY/BK) lead of the speed control servo to ground. The speed control servo throttle actuator arm should pull in and the engine speed should increase. The arm should hold in that position or slowly release. When Circuit 146 (W/PK) is removed from ground, the speed control servo should release. Replace the servo if it fails any part of the preceding test.

If the Circuit 144 (O/Y) lead is shorted to either the Circuit 146 (W/PK) or Circuit 145 (GY/BK) leads, it may be necessary to replace the speed control amplifier.

Speed Control Amplifier Test

CAUTION: Do not use a test lamp to perform the following tests as excessive current draw will damage electronic components inside the speed control amplifier. Use only a voltmeter of 5,000 ohm/volt rating or higher.

On Circuit Test

Turn ignition switch to the RUN position. Connect voltmeter between Circuit 296 (W/P) and ground in 6-pin connector at speed control amplifier. Voltmeter should read battery voltage.

If battery voltage is not present, check the fuse voltage and service as required.

Connect voltmeter between Circuit 151 (LB/BK), and ground in 6-pin connector at speed control amplifier. The voltmeter should read battery voltage when the ON switch on the steering wheel is depressed and held. If voltage is not available perform control switch test.

Release the ON button. The voltmeter should read approximately 7.8 volts. The voltage should remain at approximately 7.8 volts until one of the speed control buttons is depressed and held. If the meter reads zero, check the ground connections on the speed control amplifier (either black wire on the 6-pin connector). If there is still no ground on the speed control amplifier, check the system ground connection, and wiring. Also check the 20-amp fuse and/or substitute (but do not install) a known good speed control amplifier and recheck for a properly operating ON circuit.

Brake Circuit Test

Connect an ohmmeter between Circuit 511 (LG) on the 6-pin connector and ground. The resistance should be less than 5 ohms. If it is greater than 5 ohms, check for improper wiring, burned out stoplamps or clutch switch malfunction.

OFF Circuit Test

With the ignition switch in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) on the 6-pin connector and ground, depress and hold the OFF switch on the steering wheel. The voltmeter should indicate 0 volts. If the voltage does not drop to zero, perform control switch test. If the switches check OK, hang in a known good speed control amplifier and recheck the OFF circuit as outlined.

SET ACCEL Circuit Test

With the ignition switch in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the SET ACCEL button on steering wheel. Voltmeter should indicate approximately 4.5 volt. Rotate the steering wheel back and forth and watch the voltmeter for fluctuations. If the voltage varies more than 0.5 volt, perform the control switch test.

COAST Circuit Test

With the ignition in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the COAST button on steering wheel. The voltmeter should indicate approximately 1.5 volts.

RESUME Circuit Test

With the ignition in the RUN position and the voltmeter connected between Circuit 151 (LB/BK) in the 6-pin connector and ground, depress and hold the RESUME button on the steering wheel. The voltmeter should read approximately 6.5 volts.

DIAGNOSIS AND TESTING (Continued)

If all the circuits check OK, perform the speed control servo assembly test and hang in a known good speed control amplifier. Do not substitute a good speed control amplifier until the speed control servo assembly test has been successfully completed.

Simulated Road Test

CAUTION: When performing this simulated road test, the front wheels of the vehicle must be raised clear of the floor. Block the rear wheels securely and use only a suitable lifting device (such as a garage-type hoist) and support the front end with one jack stand on each side of the vehicle. Never attempt to use the vehicle bumper jack for tests of this type.

Tools Required:

- Rotunda Speed Control 007-00013
- Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407

1. Start the engine.
2. Shift the transmission gear selector to DRIVE.
3. Turn ON the speed control.

   CAUTION: If any time during the following Steps the system should appear to go out of control and overspeed, be prepared to turn the system off at once with the OFF switch or the ignition switch.
4. Accelerate and hold at 56 km/h (35 mph).
5. Press and release the SET ACCEL button. Hold foot pressure very lightly on accelerator pedal. Normally the speed will continue at 56 km/h (35 mph) for a short period of time and then gradually start surging because the engine is not loaded.
6. Press the OFF button. The engine should drop back to idle. Stop the rear wheels with the brakes.
7. Press ON button, accelerate and hold the speed at 56 km/h (35 mph).
8. Press and hold the SET ACCEL button. Slowly remove the foot from the accelerator. The engine speed should gradually increase.
9. When the speed reaches 80 km/h (50 mph), release the SET ACCEL button. The vehicle should maintain 80 km/h (50 mph) for a short time before the surging begins.
10. Press the COAST button and hold. The engine should idle. Slow the front wheels to 56 km/h (35 mph).
11. Release the COAST button. Speed should maintain 56 km/h (35 mph). Surging should soon start.
12. Press and release the brake pedal. The system should shut off and the engine should slow to idle.
13. Accelerate engine and set the speed at 80 km/h (50 mph). Brake to 56 km/h (35 mph) and maintain 56 km/h (35 mph) with the accelerator. Depress and release the RESUME button. The speed should return to 80 km/h (50 mph).

When performing these tests, keep the vehicle speeds within reasonably low limits. If the system does not perform as normally expected, make note of the malfunction.

Stoplamp Switch and Circuit Test

To be performed when brake application will not disconnect the speed control:

1. Check for stoplamp operation with a maximum brake pedal effort of 3 Kg (6 lb). If more than 3 Kg (6 lb) effort is required, check stoplamp fuse and lamps, check the brake actuation and stoplamp switch. Service or replace as required.
2. If stoplamps do not work, the stoplamp switch supply circuit fuse, or bulbs must be checked.
3. If stoplamps work properly check for battery voltage on Circuit 296 (P/O) at the 6-pin connector. Depress the brake pedal until the stoplamps are lit. Check voltage on the Circuit 511 (LG) lead on the 6-pin connector. The difference between the two voltage readings must not exceed 1.5 volts. If a voltage difference greater than 1.5 volts is found, the high resistance in the stoplamp circuit must be found and corrected. There should be no voltage present on the Circuit 511 (LG) lead with the brakelamps off.
4. Perform the speed control metering valve (9C727) test.

Speed Control Metering Valve Test

The speed control metering valve releases the vacuum in the servo assembly whenever the brake pedal is depressed, and thus acts as a redundant safety feature. It should be checked whenever brake application does not disconnect the speed control.

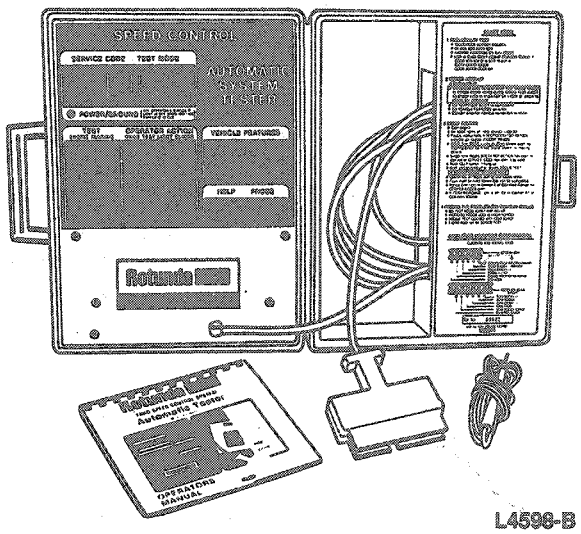
Disconnect the vacuum hose (white stripe) from the speed control metering valve to the speed control servo. Connect a hand vacuum pump to the hose, and pump up a vacuum. If a vacuum can not be obtained, the hose or the dump valve leaks and should be replaced or adjusted. Step on the brake pedal. The vacuum should be released. If it is not, adjust or replace the speed control metering valve.

DIAGNOSIS AND TESTING (Continued)

Speed Control Tester

The speed control system can be operated and diagnosed using the Rotunda Speed Control Tester 007-00013 or equivalent. The tester works on vehicles with all combinations of control switches, transmissions, speedometers (electronic and mechanical), brakes and clutches. With three modes of operation, Automatic, Single Scan, and Scan Probe, the technician can pinpoint any failure including wiring, vacuum hoses, switches and speed control servo. The tester includes an instruction manual with its own specially developed diagnostic tree charts for identifying any failed or marginal component in the speed control system.

SPEED CONTROL TESTER
MODEL 007-00013



L4598-B

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK

	TEST STEP	RESULT ▶	ACTION TO TAKE
A1	VERIFY CONDITION	▶	GO to A2.
A2	CHECK CONNECTIONS ● Check all electrical and vacuum connections. ● Are all connections OK?	Yes ▶ No ▶	GO to A3. SERVICE or REPLACE as required.
A3	CHECK STOPLAMPS ● Press brake pedal. ● Are stoplamps operating?	Yes ▶ No ▶	GO to A4 if manual transmission. GO to A5 if automatic transmission. SERVICE stoplamp circuit.
A4	CHECK CLUTCH SWITCH (MANUAL TRANSMISSION) ● Check clutch switch for proper operation. ● Does switch operate properly?	Yes ▶ No ▶	GO to A5. SERVICE as required.
A5	CHECK ACTUATOR CABLE CONNECTION TO THROTTLE BODY AND SPEED CONTROL SERVO ● Check to see if actuator cable is attached to throttle body accelerator linkage. ● Check to see if actuator cable is attached to speed control servo linkage. ● Is cable attached to both?	Yes ▶ No ▶	GO to A6. ADJUST or SERVICE as required.
A6	CHECK LINKAGE OPERATION ● Check the throttle linkage for proper operation. ● Does linkage operate properly?	Yes ▶ No ▶	GO to A7. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK (Continued)

TEST STEP	RESULT ▶	ACTION TO TAKE
A7 CHECK VACUUM HOSES ● Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? ● Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? ● Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? ● Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶ No ▶	GO to A8. SERVICE as required.
A8 CHECK THE CHECK VALVE AND RESERVOIR ● Disconnect the hose between check valve and speed control servo, at the speed control servo end. ● Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. ● **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes ▶ No ▶	GO to A9. SERVICE as required.
A9 CHECK SPEED CONTROL METERING (DUMP) VALVE ● Check speed control metering (dump) valve. ● **Is speed control metering (dump) valve OK?**	Yes ▶ No ▶	GO to A10. SERVICE or ADJUST as required.
A10 PERFORM CONTROL SWITCHES AND CIRCUIT TEST ● Perform control switches and circuit tests as outlined. ● **Are circuits and switches OK?**	Yes ▶ No ▶	GO to A11. SERVICE or REPLACE switches or circuits as required.
A11 PERFORM SPEED CONTROL SERVO TESTS ● Perform speed control servo tests as outlined. ● **Are tests successful?**	Yes ▶ No ▶	GO to A12. REPLACE speed control servo.
A12 PERFORM VSS TEST ● Perform vehicle speed sensor test as outlined. ● **Is test successful?**	Yes ▶ No ▶	GO to A13. REPLACE VSS.
A13 PERFORM SPEED CONTROL AMPLIFIER TEST ● Perform speed control amplifier test as outlined. ● **Is test successful?**	Yes ▶ No ▶	INSTALL a new speed control amplifier. EXAMINE all connectors carefully for proper contact. SERVICE as required. REMOVE substitute speed control amplifier.

TL7702B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: SPEED CONTROL OPERATION IS INTERMITTENT

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY THE CONDITION		
	• Note carefully when intermittent action occurs.	▶	GO to B2.
B2	INSPECT VISUALLY		
	• Perform Visual Inspection Test.	Intermittent action occurs while cruising ▶	GO to B3.
		Intermittent action occurs while using control buttons or turning steering wheel ▶	GO to B5.
B3	CHECK VACUUM TO SPEED CONTROL SERVO		
	• Check vacuum supply to speed control servo. NOTE: 8.42 kPa, (2.5 in-Hg) is minimum vacuum for normal speed control servo operation. The vacuum source hose is attached to the 7.9mm (5/16 inch) engine vacuum-fitting port. • Is vacuum OK?	Yes ▶ No ▶	GO to B4. SERVICE vacuum supply.
B4	PERFORM SPEED CONTROL SERVO ASSEMBLY TEST		
	• Perform Speed Control Servo Assembly Test. Lightly tap speed control servo body while making test. • Is test successful?	Yes ▶ No ▶	SUBSTITUTE known good speed control amplifier if OK — properly INSTALL speed control amplifier. REPLACE speed control servo assembly.
B5	PERFORM CONTROL SWITCHES AND CIRCUIT TEST		
	• Perform control switches and circuit tests as outlined. • Are tests successful?	Yes ▶ No ▶	SUBSTITUTE known good speed control amplifier if OK — properly INSTALL speed control amplifier. SERVICE circuits. REPLACE horn pad assembly.

TL7386C

PINPOINT TEST C: SPEED CONTROL OPERATES BUT DOES NOT RESUME, ACCELERATE OR COAST DOWN PROPERLY

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	VERIFY THE CONDITION		
		▶	GO to C2.
C2	CHECK THE FOLLOWING SWITCHES AND CIRCUITS		
	• Check the SET ACCEL switch, RESUME switch, COAST switch and clockspring circuits. • Are all circuits and switches OK?	Yes ▶ No ▶	GO to C3. SERVICE the circuit as required.
C3	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? • Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶ No ▶	GO to C4. SERVICE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: SPEED CONTROL OPERATES BUT DOES NOT RESUME, ACCELERATE OR COAST DOWN PROPERLY (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
C4	CHECK THE CHECK VALVE AND RESERVOIR ● Disconnect the hose between check valve and speed control servo, at the speed control servo end. ● Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. ● **Can vacuum be pumped to, and held at, 60.6 kPa (18 in-Hg) vacuum?**	Yes ▶ No ▶	GO to C5. SERVICE as required.
C5	TEST SPEED CONTROL SERVO ● Perform speed control servo test as outlined. ● **Is test successful?**	Yes ▶ No ▶	GO to C6. REPLACE speed control servo.
C6	TEST SPEED CONTROL AMPLIFIER ● Perform Speed Control Amplifier Test as outlined. ● **Is test successful?**	Yes ▶ No ▶	REPLACE speed control amplifier. CHECK circuit connections for proper contact. SERVICE as required.

TL7387C

PINPOINT TEST D: SPEED CONTINUOUSLY CHANGES UP AND DOWN

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	VERIFY CONDITION	▶	GO to D2.
D2	CHECK THROTTLE LINKAGE ● Check throttle linkage for proper operation and adjustment. ● **Is operation and adjustment OK?**	Yes ▶ No ▶	GO to D3. SERVICE or ADJUST as required.
D3	CONTINUITY CHECK ● Check continuity of Circuits 147, 148 and 149. ● **Is there continuity in all circuits?**	Yes ▶ No ▶	GO to D4. SERVICE or REPLACE wiring as necessary.
D4	CHECK VACUUM HOSES ● Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? ● Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? ● Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? ● Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶ No ▶	GO to D5. SERVICE or REPLACE wiring as necessary.
D5	CHECK THE CHECK VALVE AND RESERVOIR ● Disconnect the hose between check valve and speed control servo, at the speed control servo end. ● Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. ● **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes ▶ No ▶	GO to D6. SERVICE as required.
D6	TEST SPEED CONTROL SERVO ● Perform speed control servo test as outlined. ● **Is test successful?**	Yes ▶ No ▶	GO to D7. REPLACE as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: SPEED CONTINUOUSLY CHANGES UP AND DOWN (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
D7	CHECK SPEEDOMETER CABLES		
	• Check speedometer cables, if so equipped, for proper routing no sharp bends or binding. • **Are speedometer cables good?**	Yes ▶ No ▶	GO to D8. SERVICE as required.
D8	TEST VSS		
	• Perform vehicle speed sensor test as outlined. • **Is test successful?**	Yes ▶ No ▶	GO to D9. REPLACE VSS.
D9	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Check speed control metering (dump) valve. • **Is dump valve OK?**	Yes ▶ No ▶	GO to D10. SERVICE or ADJUST as required.
D10	TEST SPEED CONTROL AMPLIFIER		
	• Perform speed control amplifier test as outlined. • **Is test successful?**	Yes ▶ No ▶	REPLACE speed control amplifier. CHECK circuit connections for good contacts. SERVICE as required.

TL7701B

PINPOINT TEST E: SPEED CONTROL DOES NOT DISENGAGE WHEN BRAKES ARE APPLIED

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	VERIFY THE CONDITION	▶	GO to E2.
E2	CHECK STOPLAMPS		
	• Apply brakes and observe stoplamps. • **Do stoplamps operate?**	Yes ▶ No ▶	GO to E3. SERVICE stoplamp circuit as required. VERIFY fuses are not open. GO to E3.
E3	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Check speed control metering (dump) valve. • **Is speed control metering (dump) valve ok?**	Yes ▶ No ▶	GO to E4. ADJUST or SERVICE as required.
E4	CHECK SPEED CONTROL SERVO		
	• Check speed control servo operation and throttle linkage. • **Are speed control servo operation and linkage OK?**	Yes ▶ No ▶	GO to E5. REPLACE speed control servo.
E5	TEST SPEED CONTROL AMPLIFIER		
	• Perform Speed Control Amplifier Amplifier Test as outlined. • **Is test successful?**	Yes ▶ No ▶	REPLACE speed control amplifier. CHECK contacts of electrical connector. SERVICE as required.

TL8312A

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F
SPEED CONTROL SYSTEM DOES NOT DISENGAGE WHEN CLUTCH PEDAL IS DEPRESSED (MANUAL TRANSMISSION ONLY)

TEST STEP		RESULT	ACTION TO TAKE
F1	VERIFY		
	• Verify system disengages when stoplamp switch is activated. • Check clutch switch operation. • **Do both operate properly?**	Yes ▶ No ▶	SERVICE or REPLACE wire assembly 9A840 as required. SERVICE or REPLACE as required.

TL7697A

PINPOINT TEST G: SPEED GRADUALLY INCREASES OR DECREASES AFTER SPEED IS SET

TEST STEP		RESULT	ACTION TO TAKE
G1	VERIFY		
	• Verify that engine is properly tuned. • Check accelerator action and actuator cable adjustment. • **Is accelerator operation OK?**	Yes ▶ No ▶	GO to G2. ADJUST or CORRECT as required.
G2	CHECK SPEED CONTROL METER VALVE		
	• Check speed control metering valve. • **Is speed control metering valve OK?**	Yes ▶ No ▶	GO to G3. ADJUST or SERVICE as required.
G3	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on manifold check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and reservoir, and free of cuts, cracks and kinks? • Is dump valve hose tightly connected to the speed control servo and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶ No ▶	GO to G4. SERVICE as required.
G4	CHECK THE CHECK VALVE AND SPEED CONTROL VACUUM RESERVOIR		
	• Disconnect the hose between check valve and speed control servo, at the speed control servo end. Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • **Can vacuum be pumped to and held at 60.6 kPa (18 in-Hg) vacuum?**	Yes ▶ No ▶	GO to G5. SERVICE as required.
G5	TEST SPEED CONTROL SERVO		
	• Perform speed control servo test as outlined. • **Is test successful?**	Yes ▶ No ▶	PERFORM speed control amplifier test. REPLACE if required. REPLACE speed control servo.

TL7694B

Taurus 3.0L SHO (MTX) with IVSC

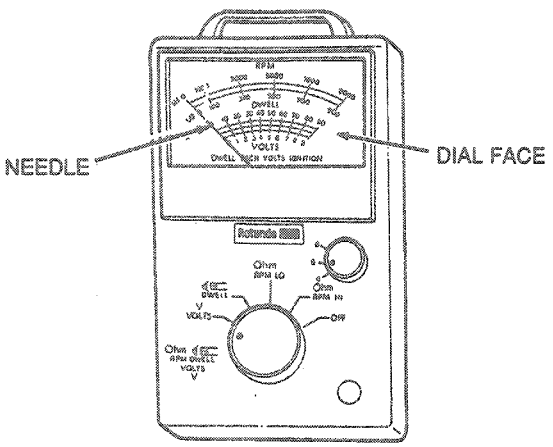
Tools Required:

- Rotunda SUPER STAR II Tester 007-00041A
- Inductive Dwell-Tach Volts-Ohms (DVOM) Tester 059-00010
- Rotunda EEC-IV Breakout Box 014-00322

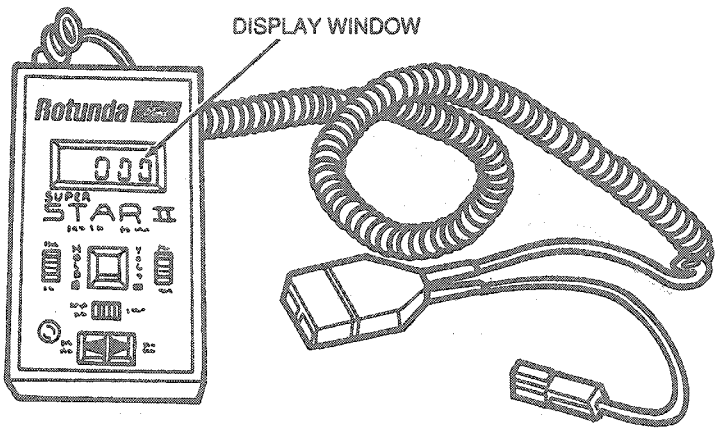
The integrated vehicle speed control (IVSC) contains a self-test capability. Key on, engine off (KOEO) and Key on, engine running (KOER) routines output error codes in a manner similar to EEC-IV subsystem "Quick Tests", which then refer to Pinpoint Tests for specific component diagnosis.

DIAGNOSIS AND TESTING (Continued)

The self-test capability applies only to the Taurus 3.0L SHO. The Rotunda Speed Control automatic system tester 007-0014A or equivalent cannot be used for IVSC diagnosis. The Rotunda SUPER STAR II Tester 007-00041-A, or Inductive Dwell-Tach-Volts Ohms Tester (VOM) 059-00010 or equivalent, 0 to 20 VDC (alternate to STAR) is required to perform the IVSC Quick Test and display error codes.



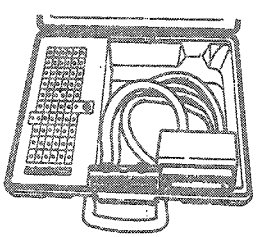
ANALOG-VOLT-OHMMETER
059-00010



SUPER STAR II TESTER
007-0041A

L5126-E

A Rotunda EEC-IV Breakout Box 014-00322 or equivalent can also be used for convenience during Pinpoint Testing.



BREAKOUT BOX
014-00322

L5130-B

Testing for the IVSC is divided into two formats: the Quick Test and Pinpoint Tests. The Quick Test is a functional IVSC system test. The Pinpoint Tests are specific component tests.

The Quick Test checks all IVSC components except the VSS, which must be tested separately. To test and service the IVSC system, perform the Quick Test first. If the system passes, check the VSS. If failure codes are generated, perform only the Pinpoint Test specified by that particular failure code.

After all test and services have been completed, repeat the entire Quick Test to verify that the IVSC system operates properly.

Quick Test

Description

The Quick Test is a functional test of the IVSC system consisting of basic Test Steps (described below). These Steps must be carefully followed in sequence. Otherwise, mis-diagnosis or the replacement of non-faulty components may result.

Quick Test Steps

1. Visual Check and Vehicle Preparation:
   - Checks for obvious faults
   - Properly prepares the vehicle for testing
2. Equipment Hookup:
   - Ensures that the proper equipment for gathering test data is ready, prior to testing
3. Key On, Engine Off Self-Test:
   - Is a static check of IVSC inputs and outputs

DIAGNOSIS AND TESTING (Continued)

4. Key On, Engine Running Self-Test:
   - Is a dynamic check of the IVSC with the engine in operation

   WARNING: ANYONE WHO DEPARTS FROM THE INSTRUCTION PROVIDED IN THIS PUBLICATION MUST FIRST ESTABLISH THAT HE COMPROMISES NEITHER HIS PERSONAL SAFETY NOR THE VEHICLE INTEGRITY BY HIS CHOICE OF METHODS, TOOLS OR PARTS.

Visual Check and Vehicle Preparation

Correct test results for the Quick Test are dependent on the proper operation of related non-IVSC component systems. It may be necessary to correct faults in these areas before the IVSC will pass the Quick Test.

Before hooking up any equipment to diagnose the IVSC system, make the following checks:

1. Check all engine vacuum hoses for:
   - Leaks or pinched hoses (speed control servo to speed control metering valve and speed control servo to manifold vacuum)
2. Check the IVSC and EEC system wiring harness electrical connections for:
   - Proper connections
   - Loose or detached connectors, wires and terminals
   - Corrosion
   - Proper routing of harness

   It may be necessary to disconnect or disassemble the connector assembly to perform some of the inspections. (Note the location of each pin before disassembly.)
3. Check the EEC-IV powertrain control module and IVSC sensors and actuators for physical damage.
4. Perform all safety steps required to start and run operation vehicle tests.
5. Apply the emergency brake. Place the shift lever in NEUTRAL.
6. Turn off all electrical loads such as the radio, lamps, air conditioner, etc. Ensure doors are closed whenever readings are made.
7. Verify engine coolant is at the specified level.
8. Start the engine and let idle until the upper radiator hose is hot and pressurized and the throttle is off fast idle.
9. Turn the ignition switch to the OFF position.
10. Service items as required, and proceed to equipment hookup.

Equipment Hookup

Using the SUPER STAR II Tester 007-00041A or equivalent:

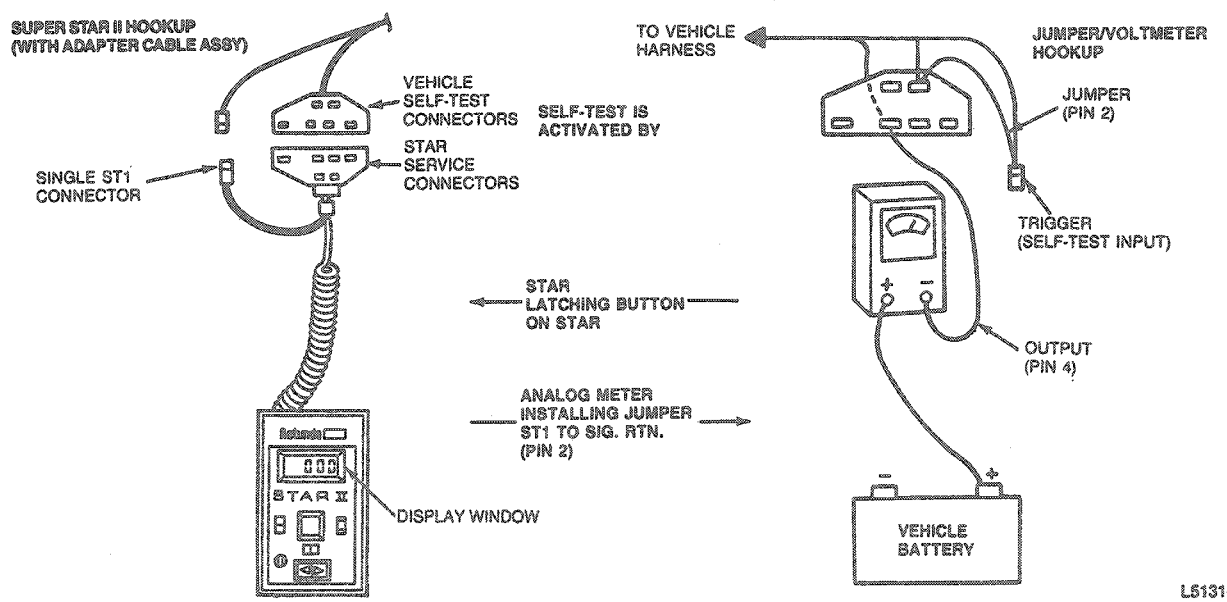
- Turn the ignition switch to the OFF position.
- Connect the adapter cable's two service connectors to the vehicle's appropriate self-test connectors.

After equipment hookup, go to Self Testing.

Using Inductive Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent:

- Turn ignition switch to the OFF position.
- Connect a jumper wire from Self-Test input (STI) to Pin 2, Signal Return on the Self-Test connector (refer to the diagram below).
- Set analog VOM on a DC voltage range to read from 0 to 15 volts DC. Connect VOM from battery (+) to Pin 4 Self-Test Output (STO) in the self-test connector.

After equipment hookup go to Self Testing.



DIAGNOSIS AND TESTING (Continued)

Quick Test Self-Test

Quick Test Self-Testing is divided into two specialized tests: Key On, Engine Off, and Key On, Engine Running. The Self-Test is not a conclusive test by itself, but is used as a part of the functional Quick Test diagnostic procedure. The PCM stores the Self-Test program in its permanent memory. When activated, it checks the IVSC system by testing its functional capability and verifies that various sensors and actuators are connected and operating properly.

The Key On, Engine Off and Engine Running tests are functional tests which only detect faults present at the time of the Self Test.

Key On, Engine Off Test

At this time, a test of the IVSC system is conducted with power applied and engine at rest.

The fault must be present at the time of testing for errors to be detected in this test.

Key On, Engine Running Test

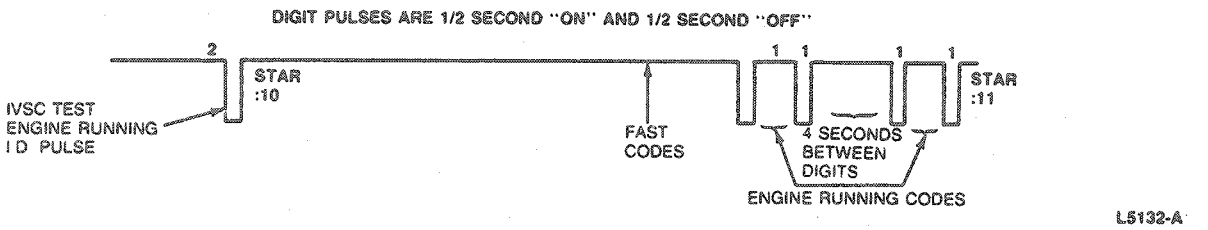
At this time, a test of the IVSC system is conducted with the engine running. The system is checked under actual operating conditions and at normal operating temperatures. The actuators are exercised and checked for corresponding results.

Service Codes

The EEC-IV system communicates service information through the Self-Test diagnostic trouble codes (DTC). These DTC's are two-digit numbers representing the results of the Self Test.

The DTC's are transmitted on the Self-Test output (STO) (found in the Self-Test connector) in the form of timed pulses, and read by the technician on a voltmeter or on the SUPER STAR II Tester.

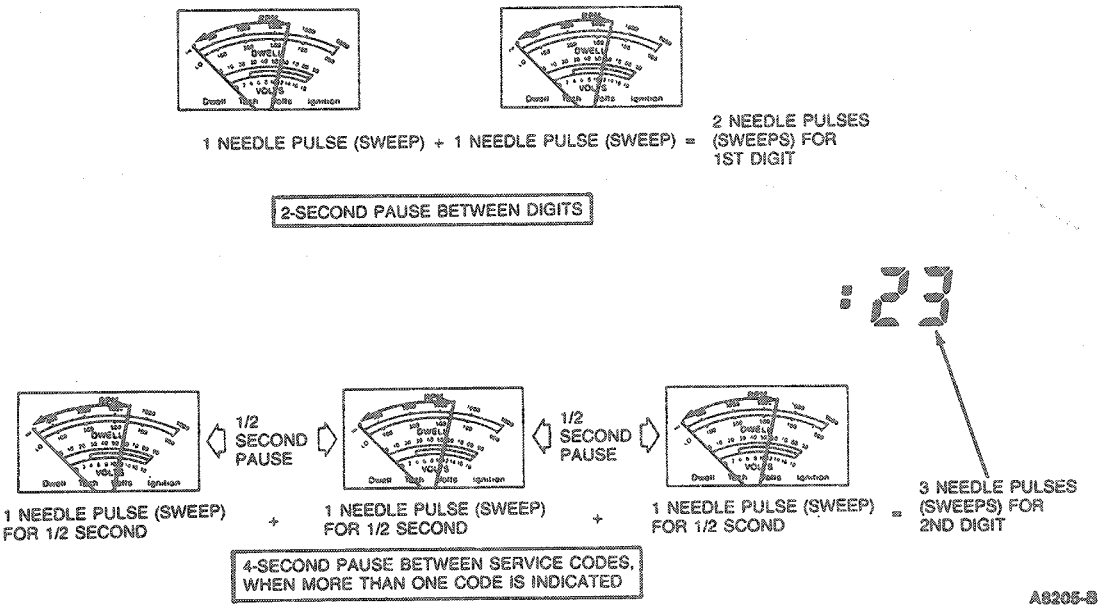
Self-Test Output Code Format



DIAGNOSIS AND TESTING (Continued)

Reading Codes—Analog Voltmeter

When a service code is reported on the analog voltmeter for a function test, it will represent itself as a pulsing or sweeping movement of the voltmeter's needle across the dial face of the voltmeter. Therefore, a single-digit number of three will be reported by three needle pulses (sweeps). However, as previously stated, a DTC is represented by a two-digit number, such as 2-3. As a result, the Self-Test DTC of 2-3 will appear on the voltmeter as two needle pulses (sweeps). After a two-second pause, the needle will pulse (sweep) three times.



Reading Codes—SUPER STAR II Tester 007-00041A or equivalent

After hooking up the SUPER STAR II Tester and turning on its power switch, the tester will run a display check and the numerals 88 will begin to flash in the display window. A steady 00 will then appear to signify that the SUPER STAR II Tester is ready to start the Self-Test and receive the test's diagnostic trouble codes (DTC's).

To receive the DTC's, press the push button at the front of the SUPER STAR II Tester. The button will latch down, and a colon will appear in the display window in front of the 00 numerals. The colon must be displayed to receive the DTC's.

If for any reason the technician wishes to clear the display window during the Self Test, he must turn off the vehicle's engine, press the tester's push buttons once to unlatch it (colon will disappear), then press the button again to latch down the button (colon will appear again). Every time the SUPER STAR II Tester is turned off, the low battery indicator (LO BAT) should show briefly at the upper LH corner of the tester's display window. If the LO BAT indicator shows steadily at any other time during the operation of the SUPER STAR II Tester with any DTC, turn its power switch to OFF and replace the 9-volt battery in the tester.

The SUPER STAR II Tester will display the last DTC received, even after it has been disconnected from the vehicle. It will hold the DTC on the display until the power is turned off or the push button is unlatched and relatched.

DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE OFF (KOEO) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CODE OUPUT		
	● To activate the KOEO IVSC test, do the following: — Place transmission shift lever in PARK. — Leave single STI connector unplugged; plug in multi-pin self-test connector. — Turn on SUPER STAR II Tester by moving slide switch to ON position. — Press SUPER STAR II push button. — Turn ignition key to RUN position. — Within 10 seconds, press speed control ON switch. — Observe code 10 on SUPER STAR II display (indicates IVSC test in progress). — Press speed control OFF, COAST, ACCEL, RESUME buttons; tap brake pedal once. NOTE: Do not depress throttle during KOEO self-test. — Observe and record all Diagnostic Trouble Codes indicated. One of the following outputs will occur.	Code 111 displayed ▶ Any other code(s) ▶ No codes output ▶	Key On Engine Off Test indicates a pass. GO to Key On Engine Running (KOER) Self-Test. Key On Engine Off Test indicates a fault. Record codes and GO to Step B. REPEAT Self-Test and verify that no DTC's are present. GO to Pinpoint Test Step Q1.

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DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE OFF (KOEO) SELF-TEST—Continued

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	RESULTS AND ACTION TO TAKE		
	• Using the Key On Engine Off service codes from Step A, follow the instructions in the ACTION TO TAKE column in this step. • When more than one DTC is received always start with the first code received. • Whenever a service is made, REPEAT Quick Test. NOTE: Before proceeding to the specified Pinpoint Test, read the instructions on how to use the Pinpoint Tests at the beginning of the Pinpoint Test section.	ON DEMAND DIAGNOSTIC TROUBLE CODES	
		Code 121 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 457 ▶	GO to Pinpoint Test Step A1.
		Code 458 ▶	GO to Pinpoint Test Step A3.
		Code 459 ▶	GO to Pinpoint Test Step A5.
		Code 123 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 122 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 536 ▶	GO to Pinpoint Test Step B1.
		Code 528 ▶	GO to Powertrain Control / Emissions Diagnosis Manual[1]. After service, return to this section and REPEAT Quick Test.
		Code 567 ▶	GO to Pinpoint Test Step C1.
		Code 568 ▶	GO to Pinpoint Test Step C5. NOTE: DTC's 121, 123, 122 and 528 are common with EEC-IV Diagnostics. These DTC's must be diagnosed using the Powertrain Control / Emissions Diagnosis Manual[1].

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1 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

QUICK TEST: KEY ON, ENGINE RUNNING (KOER) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CODE OUTPUT		
	• Before running KOER Self-Test, start the engine and idle until the upper radiator hose is hot and pressurized, with the throttle off fast idle and the idle stabilized, then shut engine off. To activate the KOER self-test, do the following: • Connect SUPER STAR II self-test and STI connectors. • Start engine, turn on SUPER STAR II Tester by moving slide switch to ON position. • Within 30 seconds of starting engine, press speed control ON switch. • Within 15 seconds, press SUPER STAR II pushbutton. • Observe code 10 on SUPER STAR II display (indicates IVSC test in progress). • Observe and record all DTC's indicated. One of the following outputs will occur. NOTE: Do not depress throttle or brake pedal during the KOER Self-Test. This procedure must be followed exactly to obtain IVSC KOER Self-Test. NOTE: The engine may stall at test exit. Turn off the ignition to prevent entry into EEC-IV Key On, Engine Off Self-Test.	Code 111 displayed ▶ Any other code(s) ▶ No codes outputted ▶	Engine Running Self-Test indicates a pass. If the drive symptom is currently present, GO to DIAGNOSTIC BY SYMPTOM. Otherwise testing is complete, IVSC system is OK. Engine Running Self-Test indicates a fault. GO to Step B. Repeat Self-Test and verify that no DTC's are present, then GO to Pinpoint Test Step G1.

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QUICK TEST: KEY ON, ENGINE RUNNING (KOER) SELF-TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	RESULTS AND ACTION TO TAKE		
	• Using the Engine Running DTC's from Step A, follow the instructions in the ACTION TO TAKE column in this step. • When more than one DTC is received, always start service with the first code received. • Whenever a service is made, REPEAT QUICK TEST.	ENGINE RUNNING DIAGNOSTIC TROUBLE CODES Code 453 ▶ Code 454 ▶ Code 455 ▶ Code 456 ▶	 GO to Pinpoint Test Step E1. GO to Pinpoint Test Step E5. GO to Pinpoint Test Step D1. GO to Pinpoint Test Step F1.

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Pinpoint Tests

Instructions for Using the Pinpoint Tests

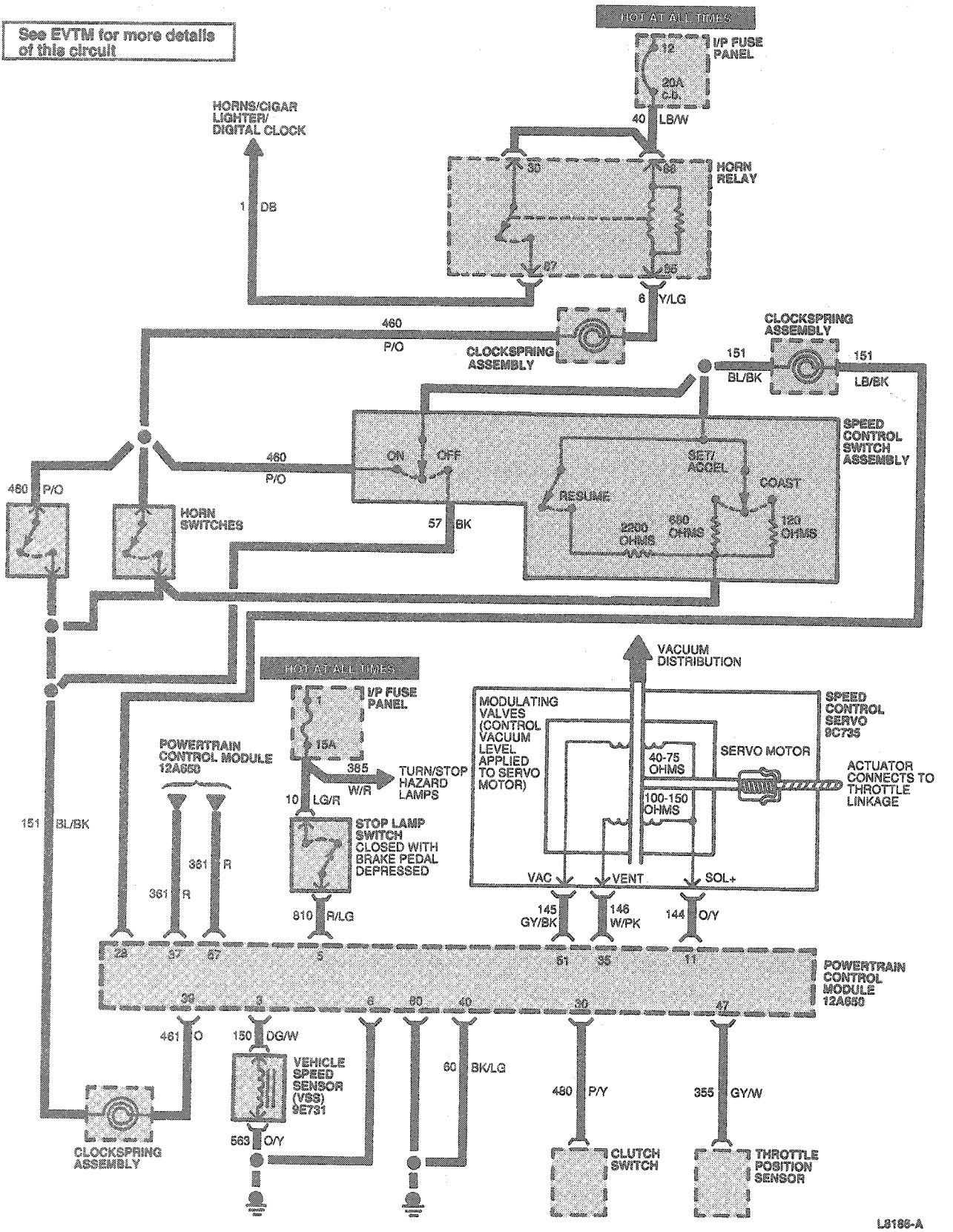
- Do not run any of the following Pinpoint Tests unless instructed by the Quick Test. Each Pinpoint Test assumes that a fault has been detected in the system with direction to enter a specific service routine. Performing any Pinpoint Test without direction from the Quick Test may produce incorrect results and cause replacement of undamaged components.
- Do not replace any parts unless the test result indicates that they should be replaced.
- When more than one DTC is received, always start service with the first code received.
- Do not measure voltage or resistance at the powertrain control module or connect any test lights to it, unless otherwise specified.
- Isolate both ends of a circuit, and turn the ignition switch to the OFF position whenever checking for shorts or continuity, unless otherwise specified.
- Disconnect solenoids and switches from the harness before measuring for continuity, resistance or energizing by way of 12-volt source, unless otherwise instructed.

DIAGNOSIS AND TESTING (Continued)

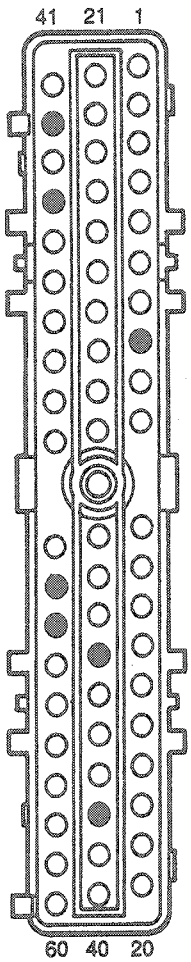
- In using the Pinpoint Tests, follow each Step in order, starting from the first Step in the appropriate test. Follow each Step until the fault is found.
- After completing any service to the IVSC system, verify that all components are properly reconnected and repeat the Quick Test.
- An open is defined as any resistance reading greater than 5 ohms unless otherwise specified.
- A short is defined as any resistance reading less than 10,000 ohms to ground, unless otherwise specified.
- Refer to the following wiring diagram as necessary during Pinpoint testing.

DIAGNOSIS AND TESTING (Continued)

SHO 3.0L Powertrain Control Module



DIAGNOSIS AND TESTING (Continued)



ELECTRONIC ENGINE CONTROL (EEC) MODULE (SHO) L8190-A

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	37 (Y)	B+
2	330 (Y/LG)	Power Steering Pressure Switch
3	150 (DG/W)	Vehicle Speed Sensor
4	395 (GY/O)	Ignition Diagnostic Monitor
5	810 (R/LG)	Brake On/Off (1300) Switch
6	563 (O/Y)	VSS (-)
7	354 (LG/R)	Engine Coolant Temperature (ECT) Sensor
8	—	Not Used
9	968 (T/LB)	MAF Return
10	883 (PK/LB)	Air Conditioner Clutch Signal
11	144 (O/Y)	Speed Control Solenoid (SOL+)

(Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
12	557 (BR/Y)	Fuel Injector No.3
13	558 (BR/LB)	Fuel Injector No.4
14	559 (T/BK)	Fuel Injector No.5
15	560 (LG/O)	Fuel Injector No.6
16	259 (O/R)	Ignition Ground
17	201 (T/R)	VIP Functional Tester
18	929 (PK)	Octane Adjust
19	787 (PK/BK)	Fuel Pump Monitor
20	57 (BK)	Case Ground
21	68 (O/BK)	Idle Air Control
22	97 (T/LG)	Low Speed Fuel Pump Relay
23	310 (Y)	Knock Sensor
24	795 (DG)	CAM Sensor
25	743 (GY)	Air Charge Temperature Sensor
26	351 (BR/W)	Reference Voltage
27	352 (BR/LG)	Pressure Feedback EGR Sensor
28	151 (LB/BK)	Speed Control Command Switch
29	94 (R/BK)	Heated Oxygen Sensor No.1
30	480 (P/Y)	Clutch Engage Switch
31	101 (GY/Y)	Canister Purge Solenoid
32	965 (LG/P)	Idle Air Control
33	360 (BR/PK)	EGR Valve Regulator
34	—	Not Used
35	146 (W/PK)	Speed Control Vent Solenoid (SCVNT)
36	324 (Y/LG)	Spark Output
37	361 (R)	Vehicle Power
38	—	Not Used
39	461 (O)	Speed Control Command Switch Ground
40	60 (BK/LG)	Power Ground
41	926 (LB/O)	Powertrain Control Module to High-Speed Fuel Pump
42	—	Not Used
43	90 (DB/LG)	H02S No. 2
44	—	Not Used
45	358 (LG/BK)	Barometric Absolute Pressure (BAP) Sensor
46	359 (GY/R)	Signal Return

(Continued)

DIAGNOSIS AND TESTING (Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
47	355 (GY/W)	Throttle Position (TP) Sensor
48	200 (BR)	STI Connector
49	89 (O)	HO2S Ground
50	967 (LB/R)	MAF Sensor
51	145 (GY/BK)	Speed Control Vacuum Solenoid (SCVAC)
52	—	Not Used
53	—	Not Used
54	331 (PK/Y)	WOT Cutout Relay
55	197 (T/O)	Electro-Drive Fan
56	349 (DB)	Profile Ignition Pick-Up (PIP)
57	361 (R)	Vehicle Power
58	555 (T)	Fuel Injector No. 1
59	556 (W)	Fuel Injector No. 2
60	60 (BK/LG)	Power Ground

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DIAGNOSTIC BY SYMPTOM

SYMPTOM	ACTION TO TAKE
● Speed control does not work.	GO to G.
● Code "11" displayed on QUICK TESTS.	
● Clutch does not disengage speed control on 3.0L SHO vehicle.	GO to H.

STOP-WARNING

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 457, 458 or 459 is received in the KOEO Self-Test.

To prevent the replacement of good components, be aware that the following non-IVSC areas may be at fault:

- Horn relay
- Fuse

This Pinpoint Test is intended to diagnose only the following:

- Speed control switches
- Clockspring assembly
- Wiring harness
- Powertrain Control Module

PINPOINT TEST A
SPEED CONTROL SWITCHES

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 DIAGNOSTIC TROUBLE CODE 457		
● **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO Self-Test?**	Yes ▶ No ▶	GO to A2. REPEAT IVSC KOEO Self-Test.
A2 SWITCH DOES NOT FUNCTION		
● Key Off, wait 10 seconds. ● Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install EEC-IV 60-Pin Breakout Box, leave powertrain control module disconnected. ● Measure resistance between test Pin 28 and test Pin 39 per table below. ● Rotate steering wheel through its full range while making resistance checks.	Yes ▶ No ▶	REPLACE powertrain control module. REPLACE switches.

DVOM Range	Button Pressed	Resistance Range
200 ohm	OFF	0-4 ohms
200 ohm	COAST	114-126 ohms
2000 ohm	ACCEL	646-714 ohms
5000 ohm	RESUME	2090-2310 ohms

● **Are resistances within range?**		
A3 DIAGNOSTIC TROUBLE CODE 458		
● **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO Quick Test?**	Yes ▶ No ▶	GO to A4. REPEAT IVSC KOEO Quick Test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL SWITCHES (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A4	SWITCH IS STUCK		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 5000 ohm scale. • Measure resistance between test Pin 28 and test Pin 39. • **Is resistance reading between 0 ohms and 2310 ohms?**	Yes No	REPLACE switches. REPLACE powertrain control module.
A5	DIAGNOSTIC TROUBLE CODE 459		
	• **Did you press the OFF, COAST, ACCEL and RESUME buttons during the IVSC KOEO QUICK TEST?**	Yes No	GO to A6. REPEAT IVSC KOEO Quick Test.
A6	GROUND CIRCUIT TO SWITCHES OPEN		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60-pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Disconnect speed control switch plug in steering column shroud. • DVOM on 200 ohm scale. • Measure resistance between test Pin 39 and ground terminal in 14290 half of disconnected switch plug. • **Is resistance reading greater than 5 ohms?**	Yes No	SERVICE open circuit between EEC-IV connector Pin 39 and switch plug ground terminal. REPLACE powertrain control module.

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Stop-Warning

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 536 is received in the KOEO Self-Test.

To prevent the replacement of good components, be aware that the following non-IVSC areas may be at fault:

- Brakelamp, brake switch, and fuse

This Pinpoint Test is intended to diagnose only the following:

- BOO Circuit
- Powertrain Control Module

PINPOINT TEST B
BRAKE ON/OFF (BOO)

TEST STEP		RESULT	ACTION TO TAKE
B1	DIAGNOSTIC TROUBLE CODE 536		
	• **Did you press brake during the KOEO Self-Test?**	Yes No	GO to B2. REPEAT KOEO Self-Test. PRESS brake once during test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B
BRAKE ON/OFF (BOO) (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B2	BOO CIRCUIT CYCLING		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 20 volt scale. • Measure voltage between test Pin 5 and test Pin 40 at the breakout box while depressing and releasing brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REPLACE powertrain control module. RETEST. GO to B3.
B3	BOO CIRCUIT SHORT TO GROUND		
	• Key off. • Breakout box installed. • Powertrain control module disconnected. • DVOM on 200 ohm scale. • Disconnect BOO circuit from 14290 harness (12-pin connector). • Measure resistance between test Pin 5 at the breakout box and ground. • **Is resistance reading greater than 5 ohms?**	Yes ▶ No ▶	SERVICE stoplamp circuit. Refer to Section 17-01. GO to B4.
B4	BOO CIRCUIT SHORT TO POWER		
	• Key off. • Breakout box installed. • Powertrain control module disconnected. • DVOM on 20 volt scale. • Disconnect BOO circuit from 14290 harness (12-pin connector). • Measure voltage between test Pin 5 at the breakout box and engine block ground. • **Is voltage reading greater than 10.5 volts?**	Yes ▶ No ▶	SERVICE BOO circuit short to power. BOO circuit OK. SERVICE stoplamp circuit. Refer to Section 17-01.

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Stop-Warning

You should enter this Pinpoint Test only when a Diagnostic Trouble Code (DTC) 567 and/or 568 is received in the KOEO Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Servo vent solenoid
- Servo vacuum solenoid
- Circuits SOL+, SCVNT, and SCVAC
- Powertrain control module

PINPOINT TEST C
SERVO SOLENOIDS
DTC 567 AND/OR 568

TEST STEP		RESULT	ACTION TO TAKE
C1	VENT SOLENOID TEST		
	• Key OFF. • Disconnect powertrain control module 60 pin connector, inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install Breakout box, leave powertrain control module disconnected. • DVOM on 200 ohm scale • Measure resistance between test Pin 11 and and test Pin 35.	Resistance is between 100 and 150 ohms ▶ Resistance is less than 100 ohms ▶ Resistance is greater than 150 ohms ▶	If code 82 is also set, GO to C4, if not, GO to C7. REPLACE speed control servo. REPEAT Quick Test. GO to C2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C
SERVO SOLENOIDS
DTC 567 AND/OR 568 (Continued)

TEST STEP	RESULT	ACTION TO TAKE
C2 CHECK CONTINUITY OF SOL+ CIRCUIT ● Disconnect harness connector from the speed control servo. ● DVOM on 200 ohm scale ● Measure resistance between test Pin 11 and SOL+ Circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms.	SERVICE open circuit. REPEAT Quick Test. GO to C3.
C3 CHECK CONTINUITY OF SCVNT CIRCUIT ● Disconnect harness connector from the speed control servo. ● DVOM on 200 ohm scale ● Measure resistance between test Pin 35 and SCVNT Circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test. REPLACE speed control servo. REPEAT Quick Test.
C4 VACUUM SOLENOID TEST ● Key OFF. ● Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install Breakout box, leave powertrain control module disconnected. ● DVOM on 200 ohm scale. ● Measure resistance between test Pin 11 and test Pin 51.	Resistance is between 40 and 75 ohms Resistance is less than 40 ohms Resistance is greater than 75 ohms	GO to C7. REPLACE speed control servo. REPEAT Quick Test. GO to C5.
C5 CHECK CONTINUITY OF SOL+ CIRCUIT ● Disconnect harness connector from the speed control servo. ● DVOM on 200 ohm scale. ● Measure resistance between test PIN 11 and SOL+ circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test. GO to C6.
C6 CHECK CONTINUITY OF SCVAC CIRCUIT ● Disconnect harness connector from the speed control servo. ● DVOM on 200 ohm scale. ● Measure resistance between test Pin 51 and SCVAC circuit at the harness connector.	Resistance is greater than 5 ohms Resistance is less than 5 ohms	SERVICE open circuit. REPEAT Quick Test REPLACE speed control servo. REPEAT Quick Test.
C7 CHECK SOL+ SHORT TO GROUND ● Disconnect the harness connector from the speed control servo. ● DVOM on 200,000 ohm scale. ● Measure resistance between test Pin 11 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	GO to C8. SERVICE short circuit. REPEAT Quick Test (short may have damaged powertrain control module).
C8 CHECK SCVNT SHORT TO GROUND ● Disconnect the harness connector from the speed control servo. ● DVOM on 200,000 ohm scale. ● Measure resistance between test Pin 35 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	GO to C9. SERVICE short circuit. REPEAT Quick Test.
C9 CHECK SCVAC SHORT TO GROUND ● Disconnect the harness connector from the speed control servo. ● DVOM on 200,000 ohm scale. ● Measure resistance between test Pin 51 and test Pin 40 at Breakout Box.	Resistance is greater than 10,000 ohms Resistance is less than 10,000 ohms	REPLACE powertrain control module. REPEAT Quick Test. SERVICE short circuit. REPEAT Quick Test.

DIAGNOSIS AND TESTING (Continued)

STOP-WARNING

You should enter this Pinpoint Test only when Diagnostic Trouble Code (DTC) 455 is received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Actuator cable
- Vacuum hose connections
- Speed control metering valve adjustment
- Powertrain control module
- Speed control vacuum reservoir
- Check valve

PINPOINT TEST D
SPEED DOES NOT INCREASE DURING DYNAMIC TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	DIAGNOSTIC TROUBLE CODE 455		
	• Repeat KOER Self-Test of Quick Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 455 still present ▶	GO to D2.
		No Diagnostic Trouble Code 455 ▶	Increase vehicle speed test passed. SERVICE any other Diagnostic Trouble Code as necessary.
D2	CHECK ACTUATOR CABLE CONNECTION TO THROTTLE BODY AND SPEED CONTROL SERVO		
	• Is actuator cable attached to throttle body accelerator linkage? • Is actuator cable attached to speed control servo linkage?	Yes ▶	GO to D3.
		No ▶	SERVICE as necessary.
D3	CHECK VACUUM HOSES		
	• Is speed control servo vacuum supply hose tightly connected to VAC port on check valve and to the vacuum manifold, and free of cuts, cracks and kinks? • Are vacuum hoses tightly connected between check valves and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control vacuum reservoir, and free of cuts, cracks and kinks? • Is the speed control metering valve hose tightly connected to the speed control servo and to the speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶	GO to D4.
		No ▶	SERVICE hoses. REPEAT Quick Test.
D4	VACUUM LEAK DOWN CHECK		
	• Disconnect the hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • Can vacuum be pumped to, and held at 60.6 kPa (18in-Hg) vacuum?	Yes ▶	GO to D6.
		No ▶	GO to D5.
D5	CHECK VACUUM RESERVOIR		
	• Disconnect hose between check valve and speed control vacuum reservoir, at check valve end. • Install vacuum pump to open end of hose to speed control vacuum reservoir. • Apply 60.6 kPa (18 in-Hg) vacuum to the speed control vacuum reservoir. • Does speed control vacuum reservoir hold vacuum?	Yes ▶	REPLACE check valve. REPEAT Quick Test.
		No ▶	REPLACE speed control vacuum reservoir. REPEAT Quick Test.
D6	CHECK SPEED CONTROL METERING (DUMP) VALVE		
	• Is the speed control metering (dump) valve adjusted properly so that the speed control metering (dump) valve is closed when the brake pedal is not depressed?	Yes ▶	GO to C1.
		No ▶	ADJUST speed control metering valve. REPEAT Quick Test.

DIAGNOSIS AND TESTING (Continued)

STOP-WARNING

You should enter this Pinpoint Test only when Diagnostic Trouble Codes (DTC's) 453 and / or 454 are received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Speed control servo
- Vacuum hose connections
- Speed control vacuum reservoir
- Check valve

PINPOINT TEST E
DOES NOT HOLD SPEED DURING DYNAMIC TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	DIAGNOSTIC TROUBLE CODE 453		
	• Repeat Engine Running Self-Test of QUICK TEST. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 453 still present? ▶	GO to E2.
		No Diagnostic Trouble Code 453 ▶	speed control servo leaks down test passed. SERVICE any other Diagnostic Trouble Code as necessary.
E2	CHECK VACUUM HOSES		
	• Is vacuum supply hose tightly connected to VAC port on check valve and to vacuum manifold, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control servo, and free of cuts, cracks and kinks? • Is vacuum hose tightly connected between check valve and speed control vacuum reservoir, and free of cuts, cracks and kinks? • Is speed control metering valve hose tightly connected to the speed control vacuum reservoir and speed control metering valve, and free of cuts, cracks and kinks?	Yes ▶ No ▶	GO to E3. SERVICE vacuum hoses. REPEAT Quick Test.
E3	CHECK SPEED CONTROL VACUUM RESERVOIR		
	• Disconnect hose between the check valve and speed control vacuum reservoir at check valve end. • Install vacuum pump to open end of hose to speed control vacuum reservoir. • Apply 60.6 kPa (18 in-Hg) vacuum to the speed control vacuum reservoir. • Does speed control vacuum reservoir hold vacuum?	Yes ▶ No ▶	GO to E4. REPLACE speed control vacuum reservoir. REPEAT Quick Test.
E4	CHECK THE CHECK VALVE		
	• Disconnect hose between check valve and speed control servo, at the speed control servo end. • Apply 60.6 kPa (18 in-Hg) vacuum to open end of hose. • Can vacuum be pumped to, and held at 60 kPa (18 in-Hg) vacuum?	Yes ▶ No ▶	REPLACE speed control servo. REPEAT Quick Test. REPLACE check valve. REPEAT Quick Test.
E5	DIAGNOSTIC TROUBLE CODE 454		
	• REPEAT Engine Running Self-Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Diagnostic Trouble Code 454 still present? ▶ No Diagnostic Trouble Code 454 ▶	REPLACE speed control servo. REPEAT Quick Test. Speed control servo leaks up test passed. SERVICE any other Diagnostic Trouble Code as necessary.

STOP-WARNING

You should enter this Pinpoint Test only when a Diagnostic Trouble Code 456 is received in the KOER Self-Test.

This Pinpoint Test is intended to diagnose only the following:

DIAGNOSIS AND TESTING (Continued)

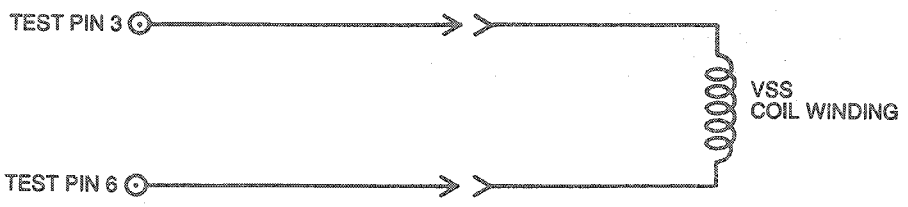
- Actuator cable
- Throttle shaft and linkage
- Throttle position sensor (9B989)
- Powertrain control module

PINPOINT TEST F
SPEED DOES NOT DECREASE DURING DYNAMIC TEST

TEST STEP		RESULT	ACTION TO TAKE
F1	DIAGNOSTIC TROUBLE CODE 456		
	• Repeat KOER Self-Test of Quick Test. Be sure that the speed control ON button is pressed before pressing the SUPER STAR II push button.	Code 456 still present? ▶	GO to F2.
		No Code 456 ▶	Decrease vehicle speed test passed. SERVICE any other Diagnostic Trouble Code(s) as necessary.
F2	CHECK FOR THROTTLE SHAFT/LINKAGE BINDING		
	• **Is the throttle or shaft throttle linkage binding, maintaining a part throttle opening?**	Yes ▶	SERVICE to eliminate binding. REPEAT Quick Test.
		No ▶	GO to F3.
F3	CHECK FOR SPEED CONTROL LINKAGE BINDING		
	• **Is the acutator cable binding?**	Yes ▶	REPLACE the actuator cable. REPEAT Quick Test.
		No ▶	GO to F4.
F4	CHECK FOR TP SENSOR BINDING		
	• **Is TP sensor binding at a part throttle opening?**	Yes ▶	REPLACE the TP sensor. REPEAT Quick Test.
		No ▶	REPLACE the powertrain control module. REPEAT Quick Test.

TL5150D

VSS — PINPOINT TEST G



L7709-B

STOP-WARNING

You should enter this Pinpoint Test only when directed here from the KOER Self-Test and the Diagnostic by Symptom chart.

This Pinpoint Test is intended to diagnose only the following:

- VSS resistance check
- Short or ground in VSS input circuit
- Open in VSS input circuit

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST G: SPEED SENSOR

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	VSS RESISTANCE CHECK		
	• Key off, wait 10 seconds. • Disconnect powertrain control module 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave powertrain control module disconnected. • Rotunda Digital Volt-Ohmmeter (DVOM) 014-00407 or equivalent, on 2000 ohm scale. • Measure resistance between test Pin 3 and test Pin 6.	DVOM reading less than 180 ohms ▶ DVOM reading greater than 240 ohms ▶ DVOM reading between 180 and 240 ohms ▶	GO to G2. GO to G3. REFER to Section 07-01 for AXOD-E electrical system diagnosis. PERFORM drive cycle and monitor for continuous codes 57, 59, 62 and 69. PERFORM diagnostics as required.
G2	CHECK FOR SHORT IN VSS INPUT CIRCUIT		
	• Key off. • Disconnect harness connector from vehicle speed sensor. • DVOM on 2000 ohm scale. • Measure resistance between the two connector pins on the VSS.	DVOM reading less than 180 ohms ▶ DVOM reading between 180 and 240 ohms ▶	REPLACE VSS. REPEAT Quick Test. SERVICE short in wire harness between VSS and PCM Pins 3 and 6 or grounded 150 Circuit. REPEAT Quick Test.
G3	CHECK FOR OPEN IN VSS INPUT CIRCUIT		
	• Key off. • Disconnect harness connector from VSS. • DVOM on 2000 ohm scale. • Measure resistance between the two connector pins on the VSS.	DVOM reading greater than 240 ohms ▶ DVOM reading between 180 and 240 ohms ▶	REPLACE VSS. REPEAT Quick Test. SERVICE open in wire harness between VSS and PCM Pins 3 and 6. REPEAT Quick Test.

TL5152E

STOP-WARNING

You should enter this Pinpoint Test only if directed here from the Diagnostic by Symptom Chart.

This Pinpoint Test is intended to diagnose only the following:

- Clutch switch resistance check
- Open in clutch switch circuit
- Clutch switch adjustment

PINPOINT TEST H
CLUTCH SWITCH

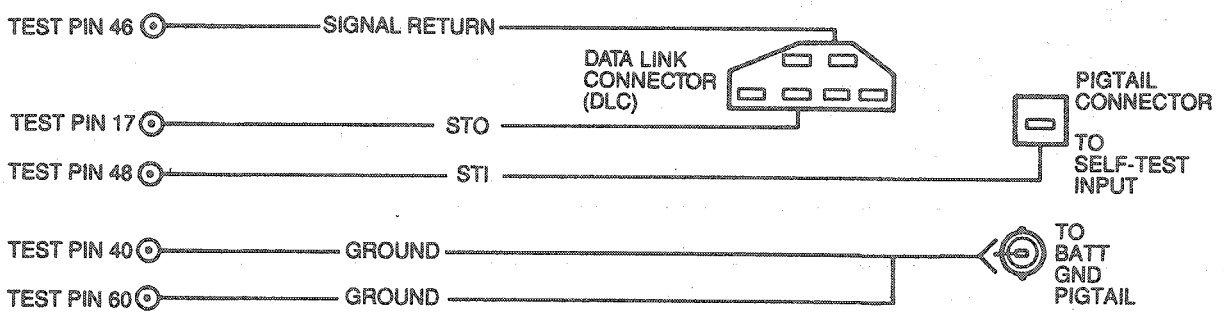
TEST STEP		RESULT ▶	ACTION TO TAKE
H1	CLUTCH INPUT CHECK		
	• Key OFF. Wait 10 seconds. • Disconnect powertrain control module (PCM) 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install Breakout Box. • DVOM on 200 ohm scale. • Measure resistance between test Pin 30 and test Pin 46 with the clutch pedal down. • Is resistance less than 5 ohms?	Yes ▶ No ▶	REPLACE powertrain control module. Road test to verify that depressing the clutch disengages the speed control. GO to H2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST H
CLUTCH SWITCH (Continued)

TEST STEP		RESULT	ACTION TO TAKE
H2	CHECK WIRE HARNESS		
	• Key OFF. • Breakout Box installed. • DVOM on 200 ohm scale. • Locate clutch switch (under the instrument panel). • Measure resistance between test Pin 30 and the clutch switch harness connector. • Measure resistance between test Pin 46 and the clutch switch harness connector. • Are all resistance readings less than 5 ohms?	Yes ▶ No ▶	GO to H3. SERVICE open circuit. Road test to verify that depressing the clutch disengages the speed control.
H3	CHECK CLUTCH SWITCH ADJUSTMENT		
	• Check that clutch switch is adjusted as outlined. • Is clutch switch adjusted properly?	Yes ▶ No ▶	REPLACE clutch switch. Road test to verify that depressing the clutch disengages the speed control. RE-ADJUST clutch switch. Road test to verify that depressing the clutch disengages the speed control.

NO CODES, CODES NOT LISTED —
PINPOINT TEST Q



TEST PINS ON BREAKOUT BOX. ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

L7710-B

STOP-WARNING
You should enter this Pinpoint Test only when directed here from the KOER or KOEO Self-Test.

This Pinpoint Test is intended to diagnose only the following:

- Powertrain control module
- Harness circuits: signal return, STO, STI, Ground

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST Q
NO CODES, CODES NOT LISTED

TEST STEP	RESULT ▶	ACTION TO TAKE
Q1 SELF-TEST INPUT CONTINUITY CHECK ● Key OFF, wait 10 seconds. ● Disconnect powertrain control module 60-Pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. ● Install breakout box, leave powertrain control module disconnected. ● Set DVOM to 200 ohm scale. ● Measure resistance between Self Test input at the Self Test single pin connector and test Pin 48 at the breakout box. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Q2. CORRECT open in circuit.
Q2 SELF-TEST OUTPUT CIRCUIT CONTINUITY CHECK ● Breakout box installed. ● DVOM to 200 ohm scale. ● Measure resistance between Self-Test output at the data-link connector (DLC) and test Pin 17 at the breakout box. ● **Is resistance less than 5 ohms?**	No ▶ Yes ▶	CORRECT open in circuit. GO to Q3.
Q3 EGO SENSOR GROUND CONTINUITY CHECK ● Breakout box installed. ● Key OFF. ● Measure resistance between EGO ground on engine and test Pin 49 at the breakout box. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Q4. CHECK and SERVICE EGO sensor ground wire or open circuit bad connection.
Q4 STO SHORT TO GROUND ● Breakout box installed. ● DVOM on 200,000 ohm scale. ● Measure resistance between Self Test output at the DLC and engine block ground. ● **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE powertrain control module. REPEAT Quick Test. SERVICE shorts to ground. REPEAT Quick Test.

TL5153C

REMOVAL AND INSTALLATION

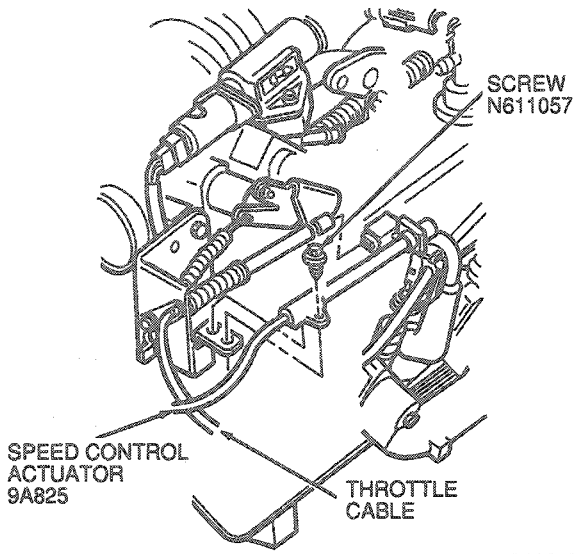
Speed Control Servo Assembly

Removal

1. Remove screw and disconnect speed control actuator cable from accelerator cable bracket.
2. Disconnect speed control actuator cable with adjuster from accelerator cable.

REMOVAL AND INSTALLATION (Continued)

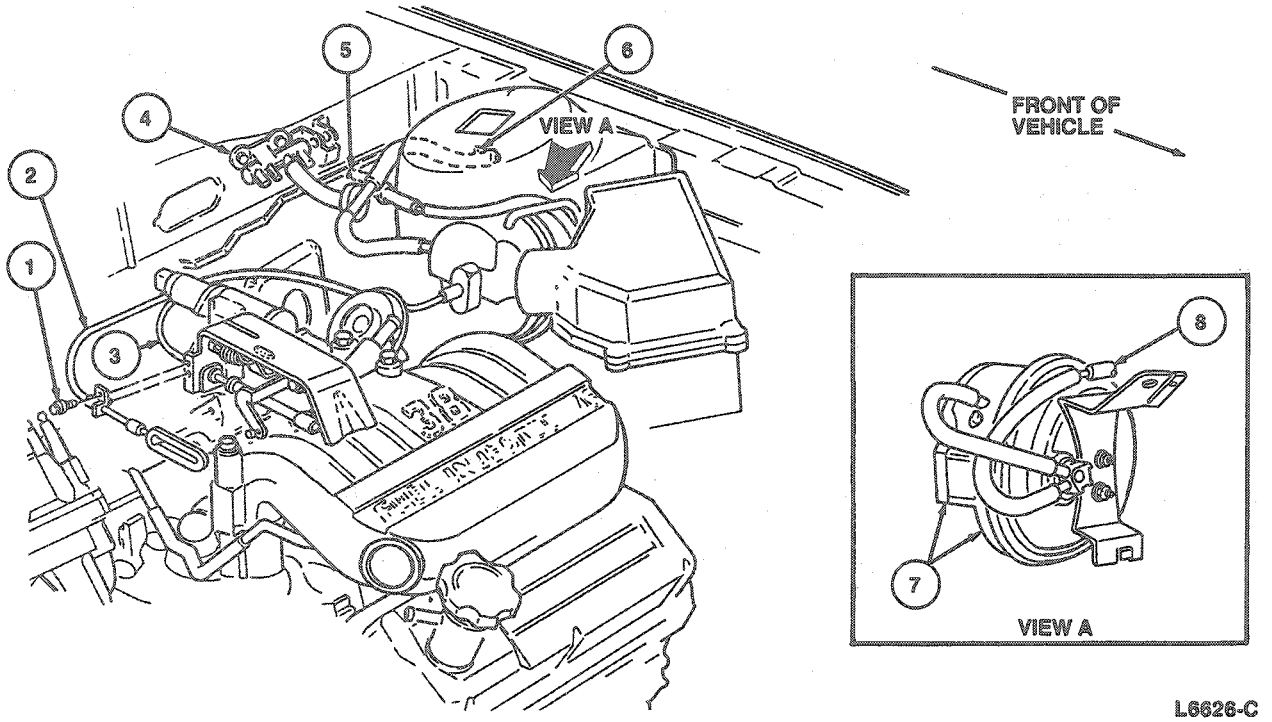
3.0L Engine



L7688-A

3. Remove two vacuum hoses and electrical connector from speed control servo assembly.

3.8L Engine



L6626-C

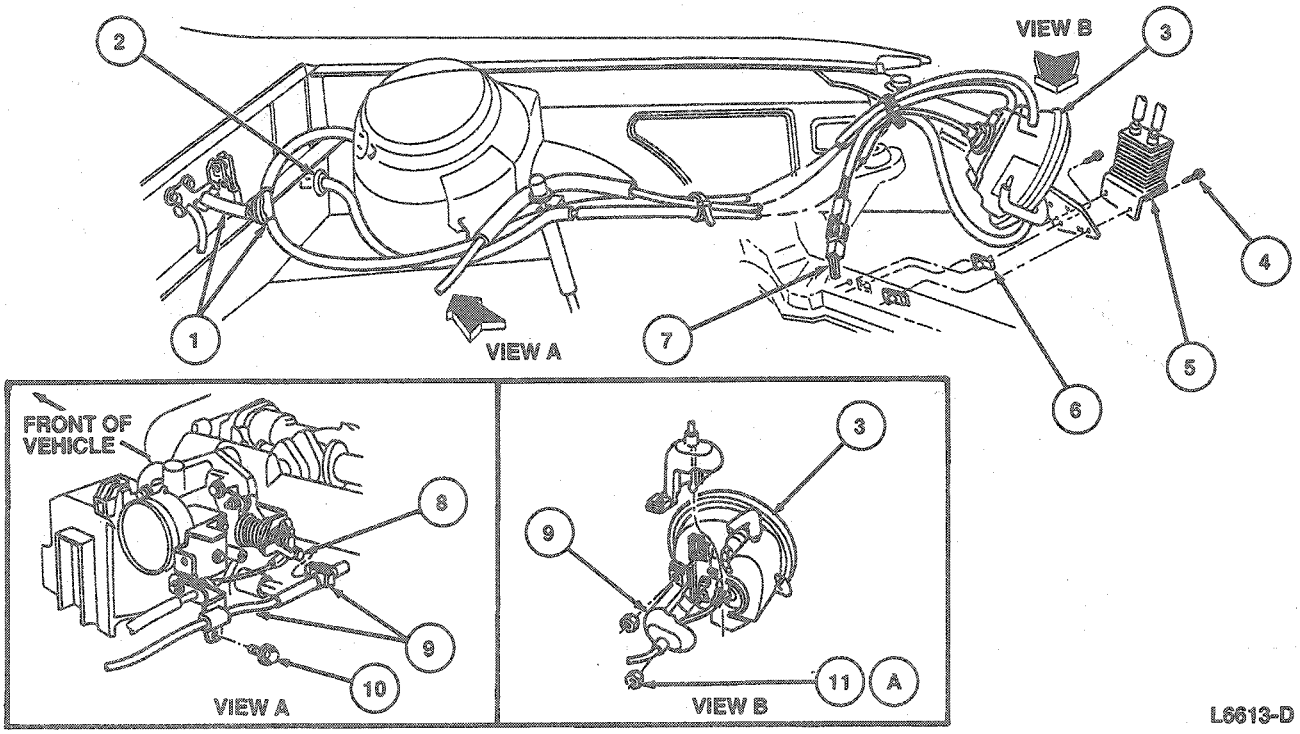
Item	Part Number	Description
1	N611057-S2	Screw
2	9A825	Speed Control Actuator
3	—	Throttle Cable
4	—	Vacuum Distribution Block
5	9C727	To Speed Control Metering (Dump) Valve
6	—	To Vacuum Reservoir Assy

(Continued)

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
7	9C735	Speed Control Servo
8	—	To Dump Valve Assy

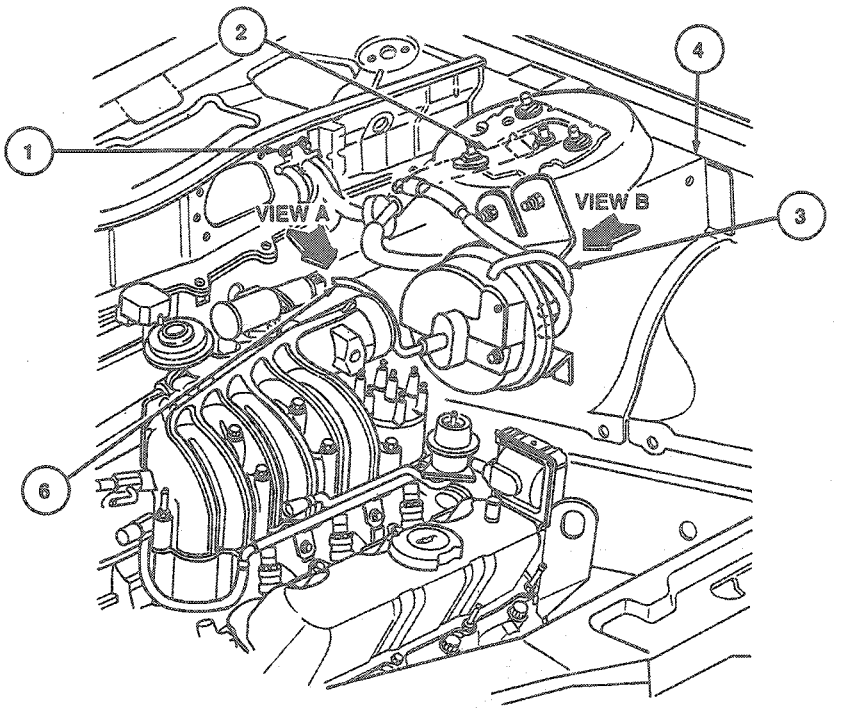
3.0L SHO Engine

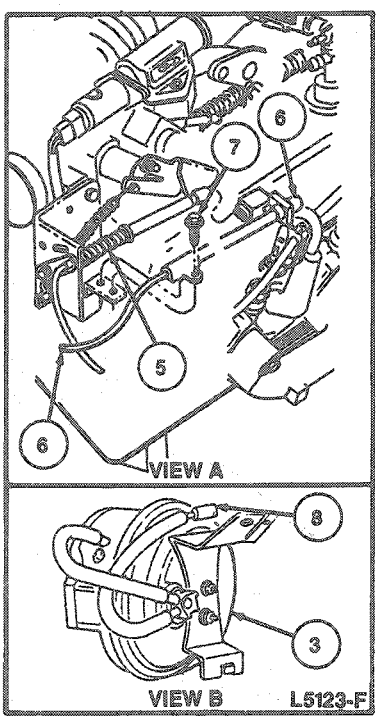


Item	Part Number	Description
1	—	Vacuum Manifold
2	—	To Speed Control Metering (Dump) Valve
3	9C735	Speed Control Servo
4	N605892-S2	Bolt (2 Req'd)
5	—	Power Steering Oil Cooler
6	N800925-S100	U-Nut (2 Req'd)
7	12A581	Wiring Assy
8	—	Attachment Point For Speed Control Actuator
9	9A825	Speed Control Actuator
10	N611057-S2	Screw
11A	N620480-S2	Nut (2 Req'd)
A		Tighten to 9.5-12 N·m (7-8 Lb-Ft)

REMOVAL AND INSTALLATION (Continued)

3.0L Engine





Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Vacuum Reservoir
3	9C735	Speed Control Servo
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	—	To Speed Control Metering (Dump) Valve Assy

4. Remove two nuts retaining speed control servo to its mounting bracket.
5. Carefully remove speed control servo and cable assembly.
6. Remove two nuts retaining cable cover to speed control servo.
7. Pull off cover and remove cable assembly.

Installation

1. Attach cable to speed control servo.
2. Install cable cover to speed control servo with two nuts. Tighten to 5-7 N·m (45-61 lb-in).
3. Install speed control servo to mounting bracket. Tighten retaining nuts to 5-7 N·m (45-61 lb-in).
4. Feed actuator cable under cleaner air duct.
5. Snap actuator cable with adjuster onto accelerator cable.
6. Connect actuator cable to accelerator cable bracket and install push pin.
7. Install two vacuum hoses and electrical connector at speed control servo.

Actuator Cable

Removal and Installation

To replace actuator assembly, remove speed control servo assembly, attach new actuator cable assembly to speed control servo and install total assembly.

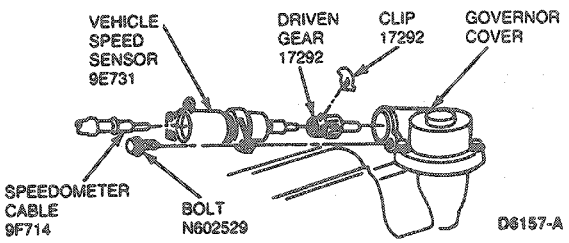
REMOVAL AND INSTALLATION (Continued)

VSS

AXOD-E Transaxle

Removal

1. Raise vehicle on hoist. Refer to Section 00-02.
2. Remove Y-pipe and heated oxygen sensors (H02S)(9F472) from exhaust system.
3. Remove VSS exhaust heat shield.
4. Remove bolt retaining VSS mounting clip to transaxle.
5. Remove VSS and driven gear from transaxle.



6. Disconnect electrical connector and speedometer cable from VSS.

   NOTE: Vehicles equipped with an electronic instrument cluster do not have a speedometer cable.

   NOTE: Do not attempt to remove spring retaining clip from driven gear with speedometer cable in VSS.
7. Remove driven gear retainer and driven gear from VSS.

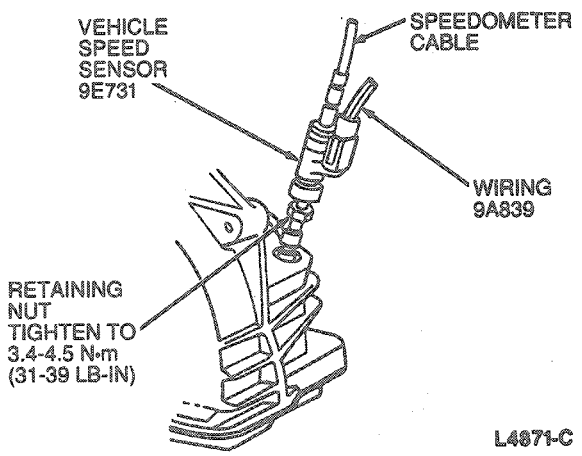
Installation

1. Position driven gear to VSS and install gear retainer.
2. Connect electrical connector to VSS.
3. Ensure internal O-ring is seated properly in VSS housing. Snap speedometer cable into VSS housing.
4. Install VSS into transaxle and secure with retaining bolt.
5. Install VSS exhaust heat shield.
6. Install Y-pipe and heated oxygen sensors to exhaust system.
7. Lower vehicle and verify proper speedometer / odometer operation.

MTX Transaxle

Removal

1. Raise vehicle on a hoist. Refer to Section 00-02.
2. Loosen retaining nut holding VSS in transaxle.
3. Remove VSS from transaxle.



4. Disconnect electrical connector.
5. Disconnect speedometer cable by pulling it out of VSS.

   NOTE: Do not attempt to remove spring retaining clip with speedometer cable in VSS.

Installation

1. Connect electrical connector.
2. Ensure internal O-ring is properly seated in VSS housing. Snap speedometer cable into VSS housing.
3. Insert VSS assembly into transaxle housing. Tighten retaining nut.
4. Lower vehicle.

Speed Control Amplifier Assembly

The speed control amplifier assembly is located on the LH side of the instrument panel behind the lamp dimmer potentiometer.

Removal

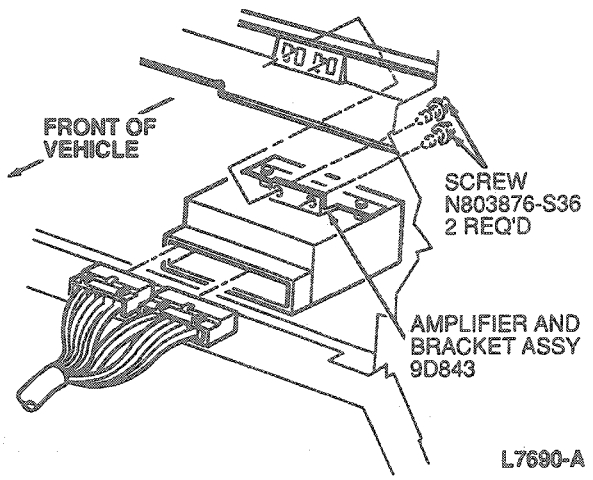
1. Disconnect two electrical connectors at speed control amplifier.
2. Remove two screws retaining speed control amplifier and bracket assembly to air bag power supply module bracket.
3. Remove speed control amplifier and bracket assembly from instrument panel.
4. Remove two bolts and nuts retaining speed control amplifier assembly to mounting bracket.

Installation

1. Install two bolts and nuts which retain speed control amplifier assembly to mounting bracket.
2. Install speed control amplifier and bracket assembly to air bag power supply module bracket with two screws and tighten to 5-7 N·m (45-61 lb-in).

REMOVAL AND INSTALLATION (Continued)

3. Connect two electrical connectors to speed control amplifier.



Speed Control Metering (Dump) Valve

Removal and Installation

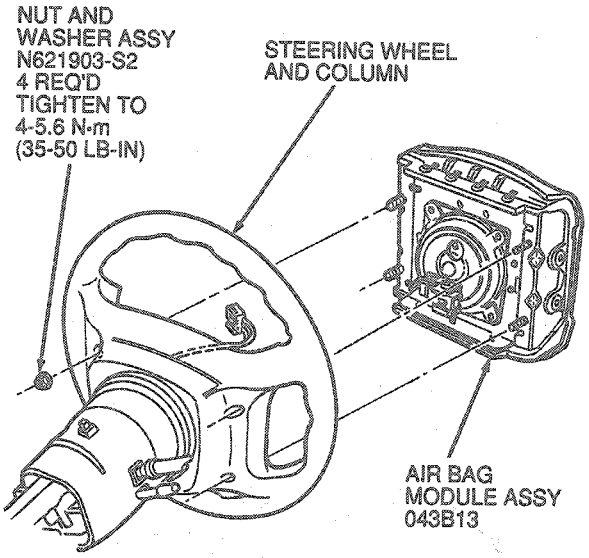
1. Remove vacuum hose from speed control metering (dump) valve.
2. Remove speed control metering (dump) valve from bracket.
3. To install, reverse Removal procedure. Adjust valve as outlined, if replacement part is installed.

Control Switches

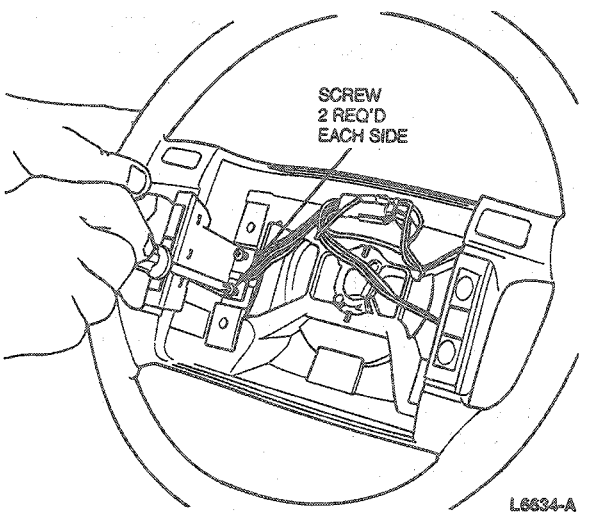
Removal

1. Disconnect battery ground cable and air bag back up power supply. Refer to Section 01-20B.
2. Remove four nut and washer assemblies retaining air bag module to steering wheel.
3. Disconnect air bag electrical connector from clockspring contact connector.
4. Remove air bag module from steering wheel.

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

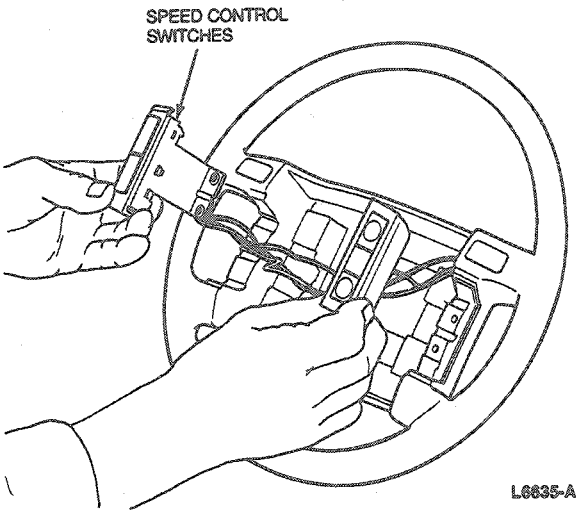


5. Remove horn buttons by gently prying with a small screwdriver. Disconnect horn wiring harness connector.
6. Remove Phillips head screws from speed control switch assemblies.



REMOVAL AND INSTALLATION (Continued)

7. Disconnect speed control switches from wiring harness and remove switches.



Installation

1. Position speed control switches onto steering wheel and install Phillips head screws.
2. Connect wiring harness to horn buttons and install horn buttons.
3. Connect speed control switches. Ensure wires are positioned so that no interference is encountered when installing air bag module.
4. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
5. Install air bag module on steering wheel and install four nut and washer assemblies. Tighten to 4-5.6 N·m (35-50 lb-in).
6. Connect battery air bag backup power supply and ground cable.

Clockspring Assembly

Tools Required:

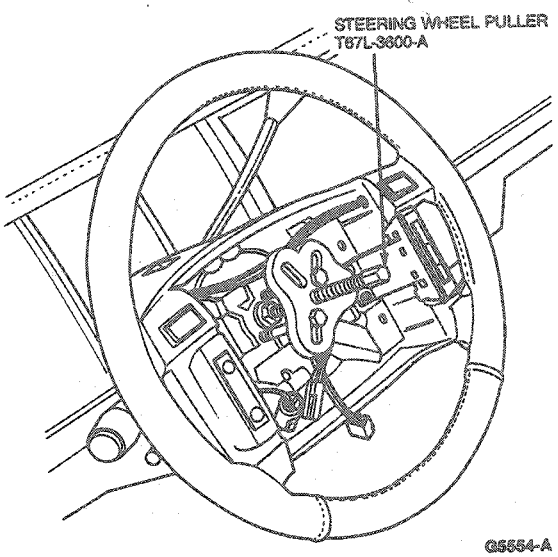
- Steering Wheel Puller T67L-3600-A

Removal

1. Center vehicle front wheels in the straight ahead position.
2. Disconnect battery ground cable and air bag backup power supply.

   WARNING: THE BACKUP POWER SUPPLY MUST BE DISCONNECTED BEFORE ANY AIR BAG COMPONENT SERVICE IS PERFORMED.
3. Remove four nut and washer assemblies retaining air bag module to steering wheel.
4. Disconnect air bag electrical connector from clockspring contact connector.
5. Remove air bag module from steering wheel.

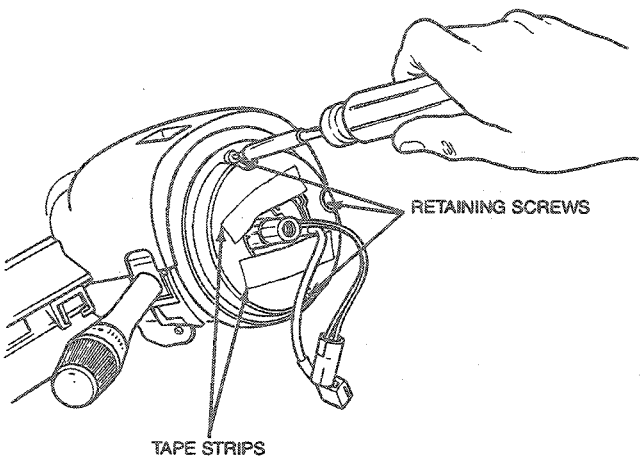
   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.
6. Disconnect speed control switches and horn switches from contact assembly.
7. Remove steering wheel retaining bolt.
8. Install Steering Wheel Puller T67L-3600-A and remove steering wheel.



9. Remove tilt lever if equipped.
10. Remove lower trim panel and lower steering column shroud.
11. Disconnect contact assembly wiring harness.
12. Apply two pieces of tape across contact assembly stator and rotor to prevent accidental rotation.

REMOVAL AND INSTALLATION (Continued)

13. Remove three contact assembly retaining screws and lift contact assembly off steering column shaft.



Installation

1. Ensure that vehicle front wheels are in straight ahead position and steering column shaft alignment mark is at 12 o'clock position.
2. Align contact assembly to column shaft and mounting bosses and slide contact assembly onto the shaft.
3. Install three screws that retain the contact assembly and tighten to 2-3 N·m (18-26 lb-in). Remove tape from contact assembly.
4. Route the contact assembly harness down the column and connect to main wiring.

   NOTE: If a new contact assembly is installed, remove the lock mechanism.
5. Install steering column shroud.
6. Install lower trim panel.
7. Install tilt lever if equipped.
8. Position steering wheel on steering shaft and install new steering wheel retaining bolt. Tighten to 31-45 N·m (23-33 lb-ft).

   NOTE: Route contact assembly wiring through steering wheel as wheel is being positioned.
9. Connect speed control and horn switches to contact assembly.

   NOTE: Ensure wiring is positioned so that no interference is encountered when installing air bag module.
10. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
11. Install air bag module on wheel and install four nut and washer assemblies.
12. Connect air bag backup power supply and battery ground cable.
13. Verify air bag warning indicator.

Clutch Switch

Removal

1. Remove screw retaining switch to bracket.
2. Disconnect electrical connector.
3. Remove switch assembly.
4. Remove switch from bracket.

Installation

1. Install switch on bracket.
2. Connect electrical connector.
3. Install retaining screw.
4. Adjust clutch switch as outlined.

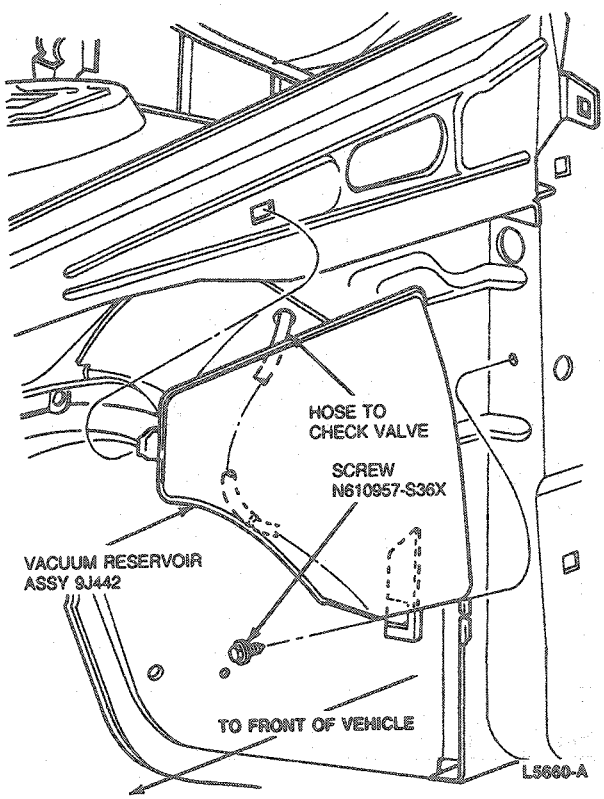
Vacuum Reservoir

Removal

1. Raise vehicle on hoist. Refer to Section 00-02.
2. Remove LH front wheel and tire assembly.
3. Remove inner fender splash shield. Refer to Section 01-02.
4. Remove hose connection at check valve in engine compartment.
5. Remove screw retaining speed control vacuum reservoirassembly to A-pillar and slide speed control vacuum reservoir forward to release hook.

REMOVAL AND INSTALLATION (Continued)

6. Remove speed control vacuum reservoir assembly by pulling hose through cowl side panel.



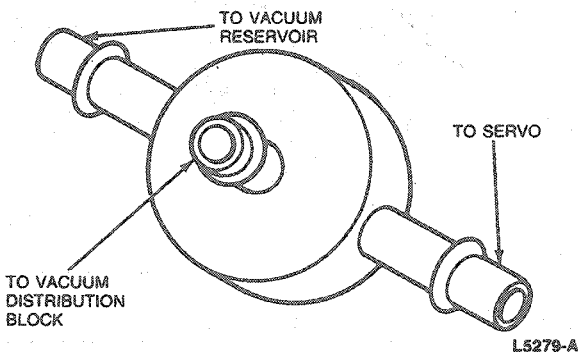
Installation

1. Place speed control vacuum reservoir hook in slot and slide rearward.
2. Install speed control vacuum reservoir assembly to A-pillar with retaining screw.
3. Route vacuum hose from speed control vacuum reservoirr through cowl side panel.
4. Install inner fender splash shield.
5. Connect hose to check valve in engine compartment.
6. Install LH front wheel and tire assembly. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
7. Lower vehicle.

Check Valve

Removal

1. Disconnect hose to vacuum distribution block.
2. Disconnect hose to speed control servo.
3. Disconnect hose to speed control vacuum reservoir.

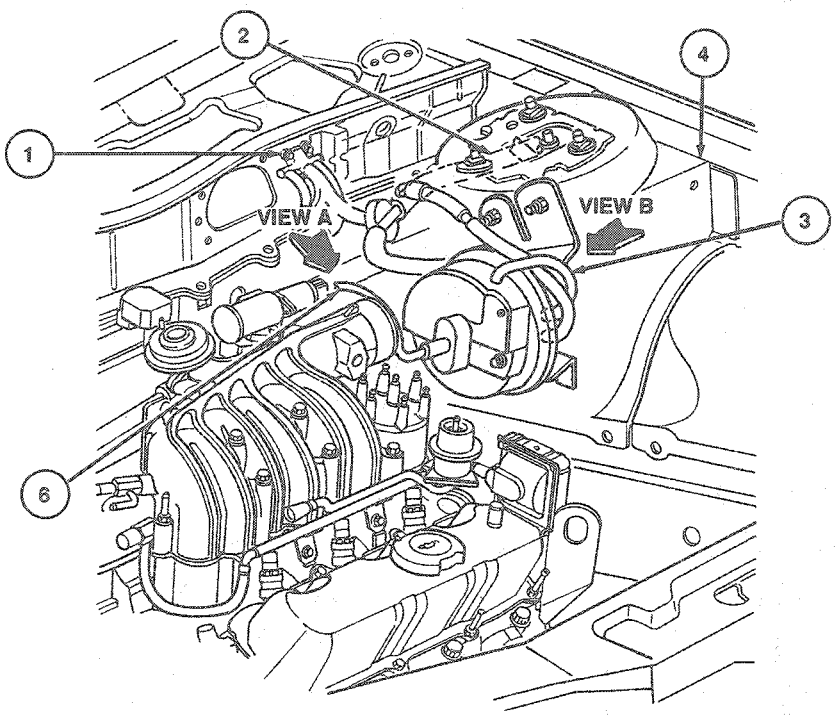


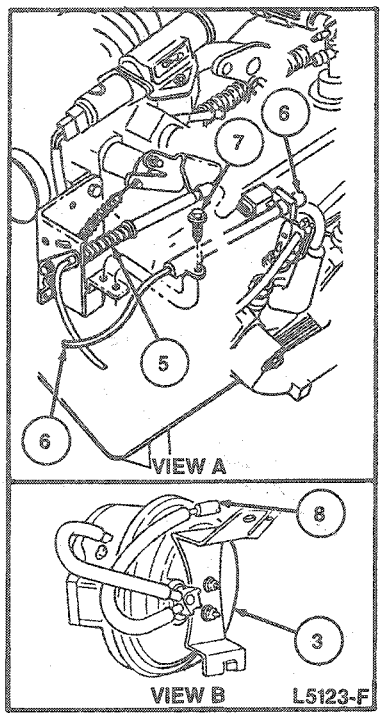
Installation

1. Connect hose from vacuum distribution block to VAC port on check valve.
2. Connect hose from speed control servo.
3. Connect hose from speed control vacuum reservoir.

REMOVAL AND INSTALLATION (Continued)

3.0L Engine



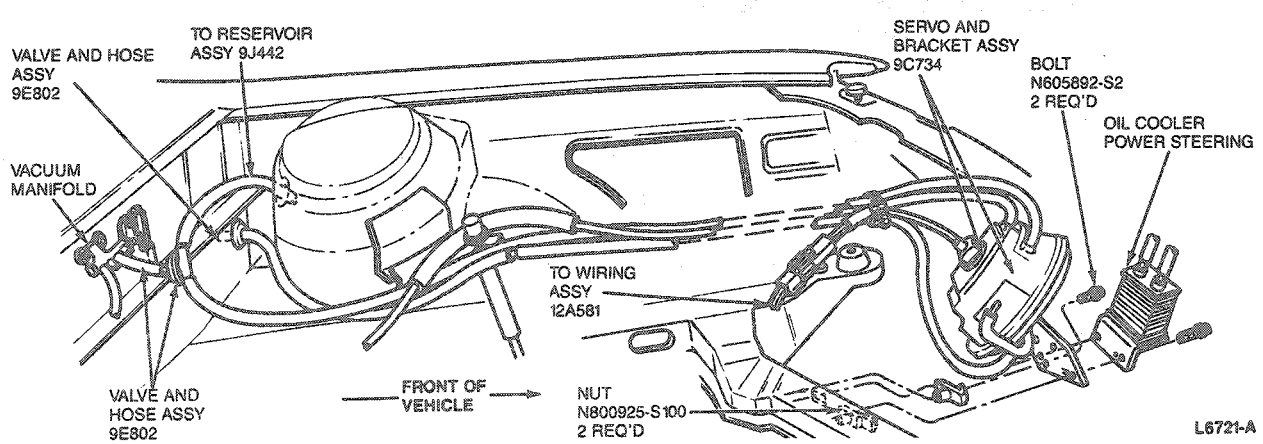


Item	Part Number	Description
1	—	Vacuum Distribution Block
2	—	To Speed Control Vacuum Reservoir
3	9C735	Speed Control Servo

(Continued)

Item	Part Number	Description
4	—	Driver's Side Shock Tower
5	—	Throttle Cable
6	9A825	Speed Control Actuator
7	N611057	Screw
8	—	To Speed Control Metering (Dump) Valve Assy

3.0L SHO

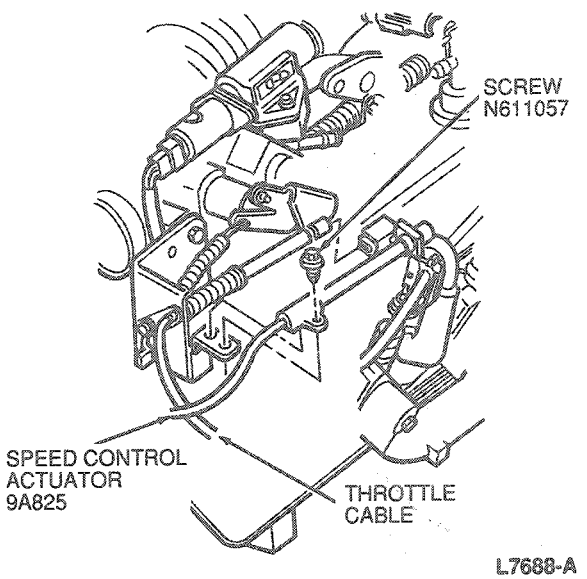


ADJUSTMENTS

Linkage Actuator Cable

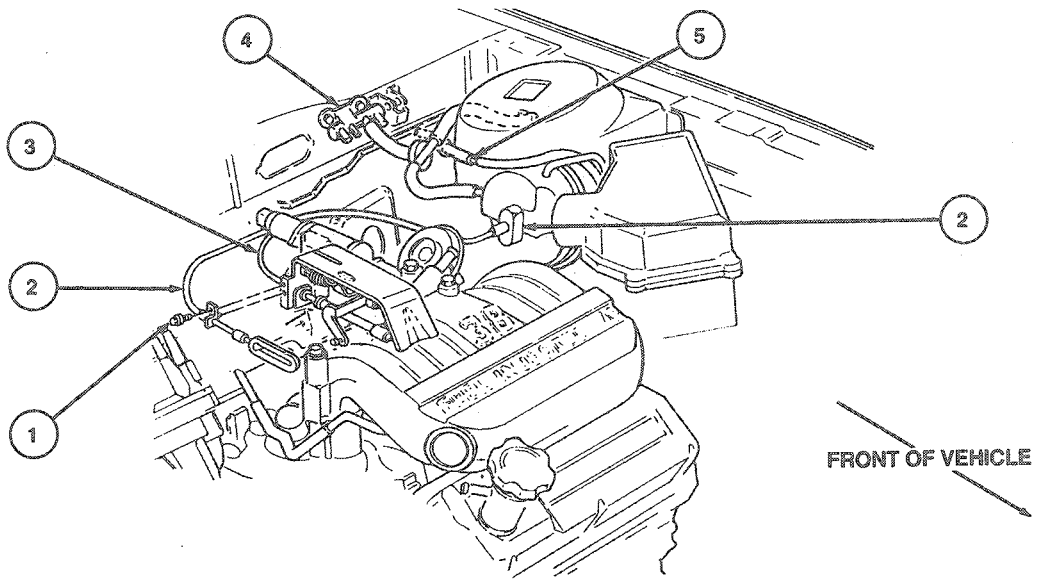
1. Remove speed control actuator cable retaining clip.
2. Push actuator cable through adjuster until slight tension is felt.
3. Insert cable retaining clip and snap into place.

3.0L Base Engine



L7688-A

3.8L Engine

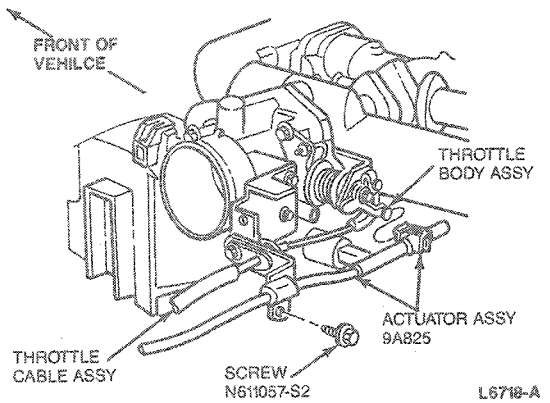


L7689-B

Item	Part Number	Description
1	N611057-S2	Screw
2	9A825	Speed Control Actuator
3	—	Throttle Cable
4	—	Vacuum Distribution Block
5	—	To Speed Control Metering (Dump) Valve

ADJUSTMENTS (Continued)

3.0L SHO Engine

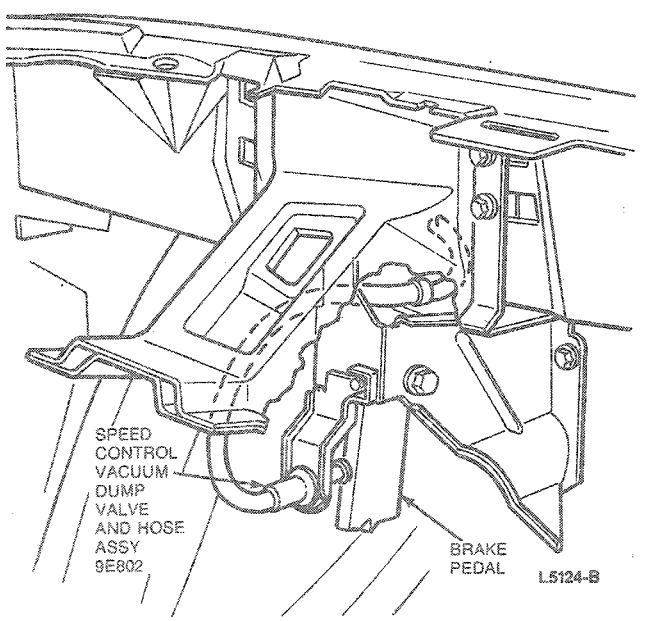


Speed Control Metering (Dump) Valve

Tools Required:

- Rotunda Vacuum Tester 021-00037

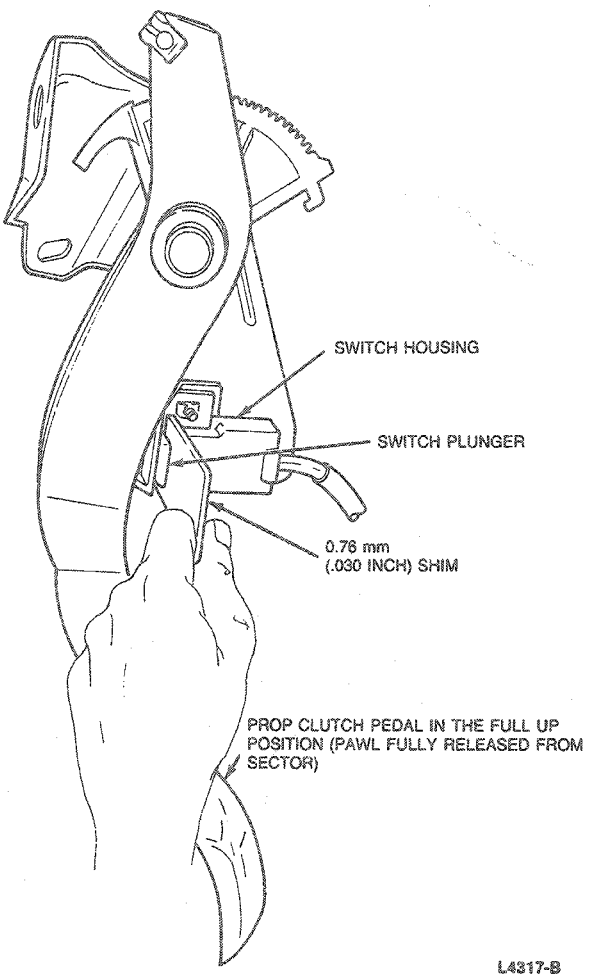
The factory installed speed control metering (dump) valve is no longer adjustable. However, a replacement speed control metering (dump) valve is adjustable at the mounting bracket. It should be adjusted so that it is closed (no vacuum leak) when the brake pedal is in its normal release position (not depressed), and open when the pedal is depressed. Use a hand vacuum pump such as Rotunda Vacuum Tester 021-00037 or equivalent to make this adjustment.



Clutch Switch

3.0L SHO

1. Prop clutch pedal in full-up position (pawl fully released from sector).
2. Loosen switch retaining screw.
3. Slide switch forward toward clutch pedal until switch plunger cap is 0.76mm (0.030 inch) from contacting switch housing. Tighten retaining screw.



4. Remove prop from clutch pedal and test drive for clutch switch cancellation of a speed control.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Speed Control Servo Nut	5-7	45-61 (Lb-in)
Cable Cover Nut	4-6	36-53 (Lb-in)

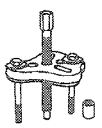
(Continued)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Air Bag Module Nut	4-5.6	35-50 (Lb-In)
Contact Brush Assembly Screw	2-3	18-26 (Lb-In)
Steering Wheel Bolt	31-45	23-33
Wheel Lug Nuts	115-142	85-104
Servo Nut (SHO)	9.5-12	7-8
Sensor Retaining Nut	3.4-4.5	31-39 (Lb-In)

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T67L-3600-A Steering Wheel Puller	 T67L-3600-A

ROTUNDA EQUIPMENT

Model	Description
007-00013	Speed Control Sensor
007-0041A	SUPER STAR II Tester

(Continued)

ROTUNDA EQUIPMENT (Cont'd)

Model	Description
014-00322	EEC-IV 60-Pin Breakout Box
014-00407	Digital Volt-Ohmmeter (DVOM)
021-00037	Vacuum Tester
059-00010	Inductive Dwell-Tach-Volts-Ohms Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9B989	Throttle Position Sensor	
9C727	Speed Control Metering Valve	
9C735	Speed Control Servo	
9D843	Speed Control Amplifier	
9E731	Vehicle Speed Sensor	Speed Sensor
9E799	Speed Control Vacuum Reservoir	
9F472	Heated Oxygen Sensor	Exhaust Gas Oxygen Sensor

SECTION 10-03B Speed Control System—3.2L SHO

VEHICLE APPLICATION

Taurus, 3.2L SHO, Automatic (AX4S).

DESCRIPTION

The speed control system consists of a speed control servo (9C735), actuator cable, horn relay, steering wheel switches, a brakelamp switch and a deactivator switch. The system operates independent of engine vacuum, therefore no vacuum lines are required. The speed control servo is mounted in the engine compartment near the brake booster, and is connected to the throttle linkage with an actuator cable. The electronics are integrated into the speed control servo, eliminating the need for any electronic modules in the vehicle.

Deactivator Switch

The deactivator switch is a normally closed switch and replaces the vacuum dump valve as a redundant safety feature in the system. Normally when the brake pedal is depressed, an electrical signal from the brakelamp circuit to the speed control amplifier (9D843) will disengage the system. Under increased brake pedal efforts (5-10 lbs, engine running), the deactivator switch mounted in the brake line will open and remove power to the speed control servo clutch, releasing the throttle independent of the speed control amplifier control. The deactivator switch is mounted to the underside of the master cylinder.

Vehicle Speed Sensor

The vehicle speed sensor (VSS)(9E731) is mounted to the transaxle.

OPERATION

System Activation

To operate the speed control system, the engine must be running and vehicle speed must be greater than 48 km/h (30 mph). The system is activated by pressing the ON switch in the steering wheel. Then the operator must depress and release the SET/ACCEL switch. Current speed will then be maintained until a new speed is set, the brake pedal is depressed or the OFF switch is depressed.

Increasing Set Speed

The vehicle set speed can be manually increased at any time by depressing the accelerator pedal until the higher speed is reached and stabilized, then depressing and releasing the SET/ACCEL switch.

ACCEL

A continuous depression of the SET/ACCEL switch will cause a smooth increase in vehicle speed. Upon release of the SET/ACCEL switch, the new vehicle speed will be maintained.

Tap-Up

Current vehicle set speed may be increased 1.6 km/h (1 mph) by a momentary tap of the SET/ACCEL switch. Multiple taps of the SET/ACCEL switch will cause vehicle speed to increase in increments of 1.6 km/h (1 mph). For example, if the current set speed is 60 mph, 5 taps will increase the vehicle speed and set it at 65 mph.

Decreasing Set Speed

The vehicle set speed can be manually decreased at any time by momentarily depressing the brake pedal until the lower speed is reached and stabilized, then depressing and releasing the SET/ACCEL switch.

COAST

A continuous depression of the COAST switch will cause a smooth decrease in vehicle speed. Upon release of the COAST switch, the new vehicle speed will be maintained.

If vehicle speed is reduced below 48 km/h (30 mph), the driver must manually increase the speed to over 48 km/h (30 mph) and reset the system.

Tap-Down

Current vehicle set speed may be decreased 1.6 km/h (1 mph) by a momentary tap of the COAST switch. Multiple taps of the COAST switch will cause vehicle speed to decrease in increments of 1.6 km/h (1 mph). For example, if the current set speed is 65 mph, 5 taps will decrease the vehicle speed and set it at 60 mph.

RESUME

When the speed control system is deactivated by pressing the brake pedal, the previous set speed may be re-established by momentarily depressing the RESUME switch. The resume feature will not function if the system has been turned off with the OFF switch, or if the vehicle speed has dropped below 48 km/h (30 mph). In addition, when the ignition switch is turned to the OFF position, the speed control memory is erased and RESUME will not function.

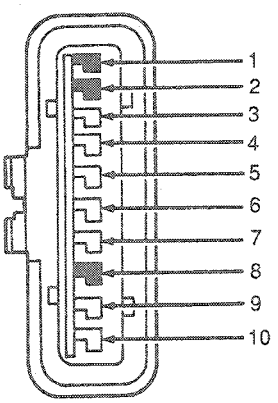
NOTE: Erratic speed control could result from the use of transmitting equipment that is not FCC approved or from driving in areas of high power radio transmitters.

DIAGNOSIS AND TESTING

Visual Inspection

Visual inspection should be performed before undertaking any of the following diagnostic procedures. Check the following items:

1. Horn and stoplamp operation;
   a. Verify proper horn operation. If not, check horn circuit fuse, horn relay and wiring.
   b. Verify proper stoplamp operation. If not, check stoplamp circuit fuse, stoplamps, stoplamp switch and wiring.
2. Wiring and electrical connections;
   a. Connections are complete with no loose wires or terminals.
   b. Wiring is not broken, shorted or corroded.
   c. Wiring is not misrouted.
3. Actuator cable and throttle linkage;
   a. The cable is adjusted properly without holding the throttle open or increasing idle speed.
   b. The throttle linkage operates freely and smoothly when connected to the actuator cable and speed control servo.



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DIAGNOSIS AND TESTING (Continued)

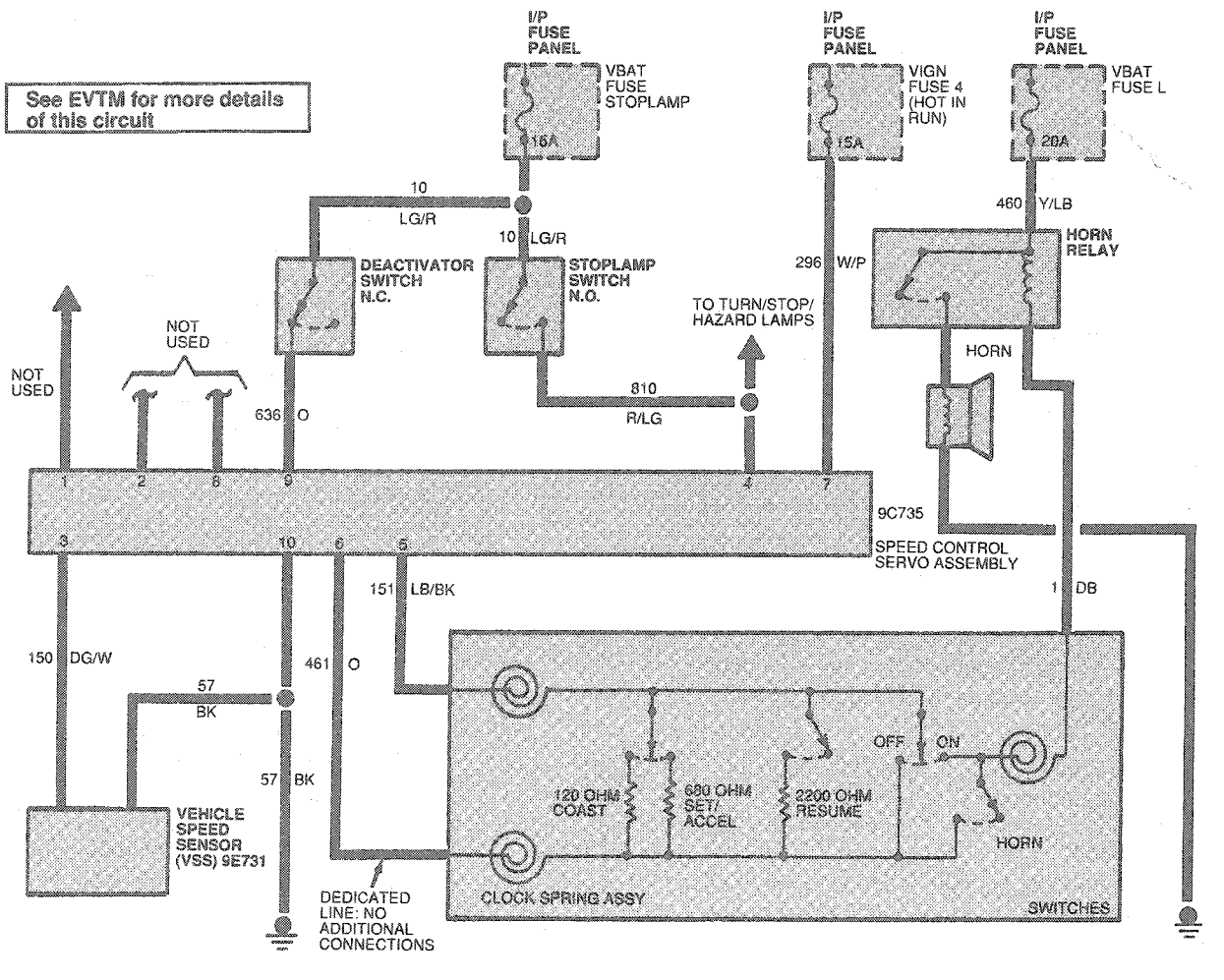
Key to Circuit Numbers and Wire Colors

Description	Pin	Circuit	Wire Harness/Wire Color
Servo Assembly Connector			14290 Harness
Not Used	1		
Not Used	2		
VSS Signal to Servo	3	150	DG/W
Stoplamp Switch to Stoplamps	4	810	R/LG

(Continued)

Key to Circuit Numbers and Wire Colors (Cont'd)

Description	Pin	Circuit	Wire Harness/Wire Color
Command Signal	5	151	LB/BK
Command Return	6	461	O
Fused Accy Feed	7	296	W/P
Not Used	8		
Deactivator Switch	9	636	O
Ground	10	57	BK
Battery Feed	—	10	LG/R



PINPOINT TEST INDEX

SYMPTOM	PINPOINT TESTS
Speed Control Does Not Work	A
Speed Continuously Changes	B

(Continued)

PINPOINT TEST INDEX (Cont'd)

SYMPTOM	PINPOINT TESTS
COAST/Tap-Down Inoperative	C

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST INDEX (Cont'd)

SYMPTOM	PINPOINT TESTS
ACCEL / Tap-Up inoperative	D
RESUME Inoperative	E
Speed Control Does Not Disengage When Brake is Applied	F
OFF Switch Inoperative	G

Pinpoint Tests

Tools Required:

- Rotunda Digital Volt-Ohmmeter 014-00407

The following pinpoint tests require a Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent.

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK

TEST STEP		RESULT	ACTION TO TAKE
A1	VERIFY POWER TO SPEED CONTROL SERVO • Disconnect 14290 harness connector from servo assembly. • Use a VOM to make the specified measurements at the connector. • With ignition switch in RUN position, measure voltage between Pin 7 (Battery Positive Voltage (B+), Circuit 296) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes No	GO to A4. GO to A2.
A2	CHECK IGNITION CIRCUIT • With ignition switch in RUN position, measure voltage between Pin 7 (Battery Positive Voltage (B+), Circuit 296) and a ground point on the chassis. • **Is there battery voltage?**	Yes No	GO to A3. SERVICE ignition fuse or circuit as required.
A3	CHECK MODULE GROUND CIRCUIT • Measure resistance between Pin 10 (GND, Circuit 57) and a ground point on the chassis. • **Is resistance less than 1 ohm?**	Yes No	REPEAT Step A1. SERVICE ground circuit.
A4	CHECK DEACTIVATOR SWITCH CIRCUIT • With no brakes applied, measure voltage between Pin 9 (DEACT, Circuit 636) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes No	GO to A8. GO to A5.
A5	CHECK DEACTIVATOR SWITCH • Remove 14290 harness connector from deactivator switch. Measure resistance between two pins of switch with no brakes applied. • **Is resistance less than 1 ohm?**	Yes No	GO to A6. REPLACE switch.
A6	VERIFY POWER AT DEACTIVATOR SWITCH HARNESS CONNECTOR • Measure voltage between Circuit 10 of deactivator switch connector and chassis ground. • **Is there battery voltage?**	Yes No	GO to A7. SERVICE blown fuse or open in circuit.
A7	CHECK FOR OPEN CIRCUIT BETWEEN DEACTIVATOR SWITCH AND SPEED CONTROL SERVO • Measure resistance of Circuit 636 from deactivator switch connector to Pin 9 (Circuit 636) of servo connector. • **Is resistance less than 1 ohm?**	Yes No	REPEAT Step A4. SERVICE open circuit in harness.
A8	CHECK BRAKE SWITCH • With no brakes applied, measure voltage between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes No	REPLACE switch. GO to A9.
A9	CHECK BRAKE CIRCUIT • Measure resistance between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is resistance less than 10 ohms?**	Yes No	GO to A10. SERVICE brakelamp bulbs or circuit.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
SPEED CONTROL DOES NOT WORK (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A10	CHECK FOR STUCK ON SWITCH		
	• With no steering wheel switches depressed, measure voltage between Pin 5 (command, Circuit 151) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	No Yes	GO to A11. REPLACE switch.
A11	CHECK ON SWITCH OPERATION		
	• With steering wheel ON switch depressed, measure voltage between Pin 5 (command, Circuit 151) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes No	GO to A13. GO to A12.
A12	CHECK FOR OPEN CIRCUIT IN SWITCH GROUND		
	• With horn depressed, measure voltage between Pin 6 (command RTN, Circuit 461) and chassis ground. • **Is there battery voltage?**	Yes No	REPLACE switch. SERVICE open, blown fuse, failed relay or open in switch return circuit.
A13	CHECK FOR STUCK COMMAND SWITCHES		
	• With no steering wheel switches depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461). • **Is resistance greater than 3k ohms?**	Yes No	GO to A14. REPLACE inoperative switch.
A14	CHECK SET/ACCEL SWITCH OPERATION		
	• With the SET/ACCEL switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461). • **Is resistance between 646 and 714 ohms?**	Yes No	GO to A15. REPLACE switch.
A15	CHECK VSS CIRCUIT		
	• Measure resistance between Pin 3 (VSS, Circuit 150) and Pin 10 (GND, Circuit 57). • **Is resistance between 200 and 300 ohms?**	Yes No	GO to A17. GO to A16.
A16	CHECK VSS		
	• Remove VSS connector. • Measure resistance across VSS terminals. • **Is resistance between 200 and 300 ohms?**	Yes No	CHECK for opens in wiring or short in Circuit 57. REPLACE VSS.
A17	CHECK FOR BROKEN OR BINDING CABLE		
	• Remove actuator cable from speed control servo assembly. • Check for broken or binding cable by pulling on cable ball slug to ensure throttle moves freely. • **Is cable OK?**	Yes No	REPLACE servo assembly. REPLACE cable.

PINPOINT TEST B
SPEED CONTINUOUSLY CHANGES

TEST STEP		RESULT	ACTION TO TAKE
B1	VERIFY CONDITION OCCURS ONLY WHILE USING SPEED CONTROL		
	• Verify that engine is properly tuned. • Verify that condition does not occur when driving without speed control. • **Does condition occur without speed control?**	Yes No	SERVICE engine as required. GO to B2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B
SPEED CONTINUOUSLY CHANGES (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B2	CHECK FOR BINDING IN ACTUATOR CABLE AND THROTTLE BODY LINKAGE		
	• Check to be sure actuator cable is attached to throttle linkage / speed control servo linkage. • Check for binding or sticking of actuator cable or throttle linkage and throttle plate. • Make sure accelerator cable bracket and speed control servo bracket are not loose. • **Are components OK?**	Yes ▶ No ▶	GO to B3. SERVICE as required.
B3	CHECK VSS		
	• Remove VSS connector. • Measure resistance across VSS terminals. • **Is resistance between 200 and 300 ohms?**	Yes ▶ No ▶	GO to B4. SERVICE VSS or circuit as required.
B4	CHECK SPEED CONTROL SERVO		
	• Substitute known good speed control servo. • Test vehicle for proper operation. • **Does system operate properly?**	Yes ▶ No ▶	REPLACE speed control servo. CHECK manifold absolute pressure sensor and EVP.

PINPOINT TEST C
COAST/TAP-DOWN INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	CHECK COAST SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With COAST switch depressed, measure resistance between Pin 5 (command RTN, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 114 and 126 ohms?**	Yes ▶ No ▶	GO to C2. REPLACE switch.
C2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE short in switch return circuit.

PINPOINT TEST D
ACCEL/TAP-UP INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	CHECK ACCEL/TAP-UP SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With ACCEL/TAP-UP switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 646 and 714 ohms?**	Yes ▶ No ▶	GO to D2. REPLACE switch.
D2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE short in switch return circuit.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E
RESUME INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	CHECK RESUME SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With RESUME switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 461) while rotating steering wheel through full range. • **Is resistance between 2090 and 2310 ohms?**	Yes ▶ No ▶	GO to E2. REPLACE switch.
E2	CHECK COMMAND SWITCH RETURN CIRCUIT		
	• Measure resistance between Pin 6 (command RTN, Circuit 461) and Pin 10 (GND, Circuit 57). • **Is resistance greater than 1 ohm?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE ground in switch return circuit.

PINPOINT TEST F
SPEED CONTROL DOES NOT DISENGAGE WHEN BRAKE IS APPLIED

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	CHECK BRAKE SWITCH CIRCUIT		
	• Disconnect 14290 harness connector at the speed control servo. • With brakes applied, measure voltage between Pin 4 (BRK, Circuit 810) and Pin 10 (GND, Circuit 57). • **Is there battery voltage?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE switch, fuse or open circuit.
F2	CHECK FOR BINDS IN ACTUATOR CABLE AND THROTTLE BODY ATTACHMENT		
	• Remove actuator cable from speed control servo. • Check for broken or binding cable by pulling on cable ball slug to ensure throttle moves freely. • **Is cable OK?**	Yes ▶ No ▶	REPLACE speed control servo. SERVICE as required.

PINPOINT TEST G
OFF SWITCH INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	CHECK OFF SWITCH OPERATION		
	• Disconnect 14290 harness connector from speed control servo. • With OFF switch depressed, measure resistance between Pin 5 (command, Circuit 151) and Pin 6 (command RTN, Circuit 46) while rotating steering wheel through full range. • **Is resistance less than 4 ohms?**	Yes ▶ No ▶	REPLACE speed control servo. REPLACE switch.

Voltage Measurements

Remove 14290 harness connector from speed control servo. Connect the negative lead of voltmeter to Pin 10 (Circuit 57) of connector. Measure the DC or voltage of the following circuits with positive lead meter.

DIAGNOSIS AND TESTING (Continued)

VOLTAGE MEASUREMENT—DC					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE VOLTAGE
Fused Accy Feed	7	296	W/P	Ignition in RUN position	Battery voltage (12 V)
Deactivator Switch	9	636	O	No brakes applied Brake applied[1]	Battery voltage (12 V) Less than 1/2 volt
Stoplamp Switch to Stoplamp	4	810	R/LG	No brakes applied Brake pedal depressed	Less than 1/2 volt Battery voltage (12 V)
Speed Control Switch to Servo	5	151	LB/BK	No switches pressed Press and hold ON switch	Less than 1/2 volt Battery voltage (12 V)

VOLTAGE MEASUREMENT—AC					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE VOLTAGE
VSS Output Signal to Speed Control Servo	3	150	DG/W	Vehicle on road about 30 mph Vehicle on road about 45 mph	1.4 volts AC minimum 1.6 volts AC minimum

Resistance Measurements

Remove 14290 harness connector at speed control servo. Connect an ohmmeter between the designated circuits with ignition in OFF position.

RESISTANCE MEASUREMENTS					
CIRCUIT NAME	PIN	CIRCUIT	WIRE COLOR	TEST CONDITION	APPROXIMATE RESISTANCE
Stoplamp Switch to Ground	4 to 10	8101 to 57	R/LG to BK	Brakes not applied	Less than 10 ohms
VSS Signal to Ground	3 to 10	150 to 57	DG/W to BK	Harness disconnected from servo	200-300 ohms
Command Signal to Command Return	5 to 6	151 to 461	LB/BK to O	No switches pressed Press OFF switch Press COAST switch Press ACCEL switch Press RESUME switch	Greater than 3000 ohms Less than 4 ohms 114-126 ohms 646-714 ohms 2090-2310
Command Signal to Command Return	6 to 10	461 to 57	O to BK	No switches pressed	Open circuit

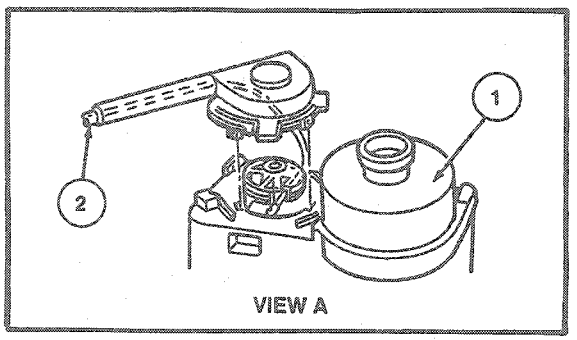
1 Increased brake pedal efforts will be required to trigger switch with engine OFF.

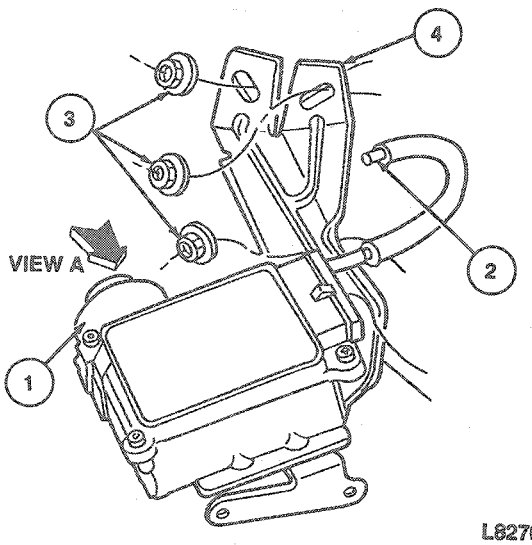
REMOVAL AND INSTALLATION

Servo and Bracket Assembly

Removal

Speed Control Actuator and Servo





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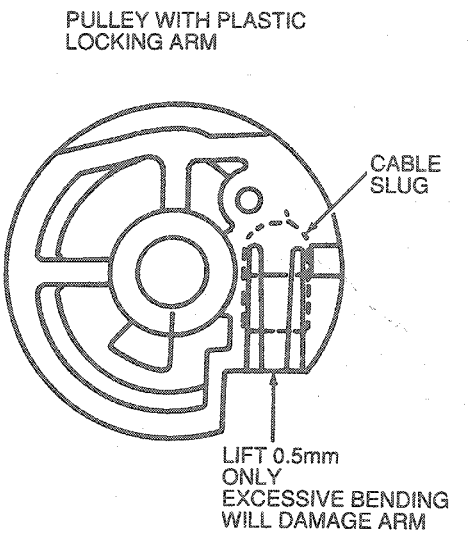
Item	Part Number	Description
1	9C735	Speed Control Servo
2	—	Actuator Assy
3	N620481-S2	Nut (3 Req'd)

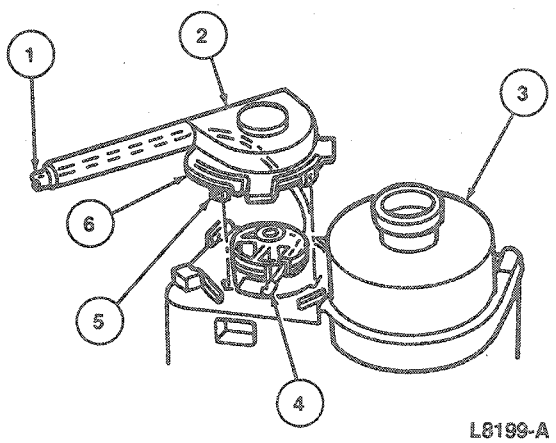
1. Remove retaining clip from actuator cable adjuster fitting.
2. Push actuator tube out of adjuster fitting attached to throttle cable.
3. Disconnect 14290 harness connector at speed control servo.
4. Remove three nuts attaching assembly to vehicle.
5. Remove actuator cable cap from speed control servo by depressing cap locking arm and rotating cap counterclockwise.
6. Remove cable slug from servo pulley. Gently pry-up the arm **slightly** with a small screwdriver, and at the same time push the cable slug out of the pulley slot.

   CAUTION: Excessive bending of the arm will cause it to break. DO NOT USE servos with damaged or missing locking arms.



L8268-A

7. Remove bracket from the speed control servo. Keep bracket and three screws for reinstallation on speed control servo



L8199-A

Item	Part Number	Description
1	—	Actuator Assy
2	—	Actuator Cable Cap
3	9C735	Speed Control Servo
4	—	Cable Ball Slug
5	—	Cap Locking Tabs
6	—	Locking Arm

REMOVAL AND INSTALLATION (Continued)

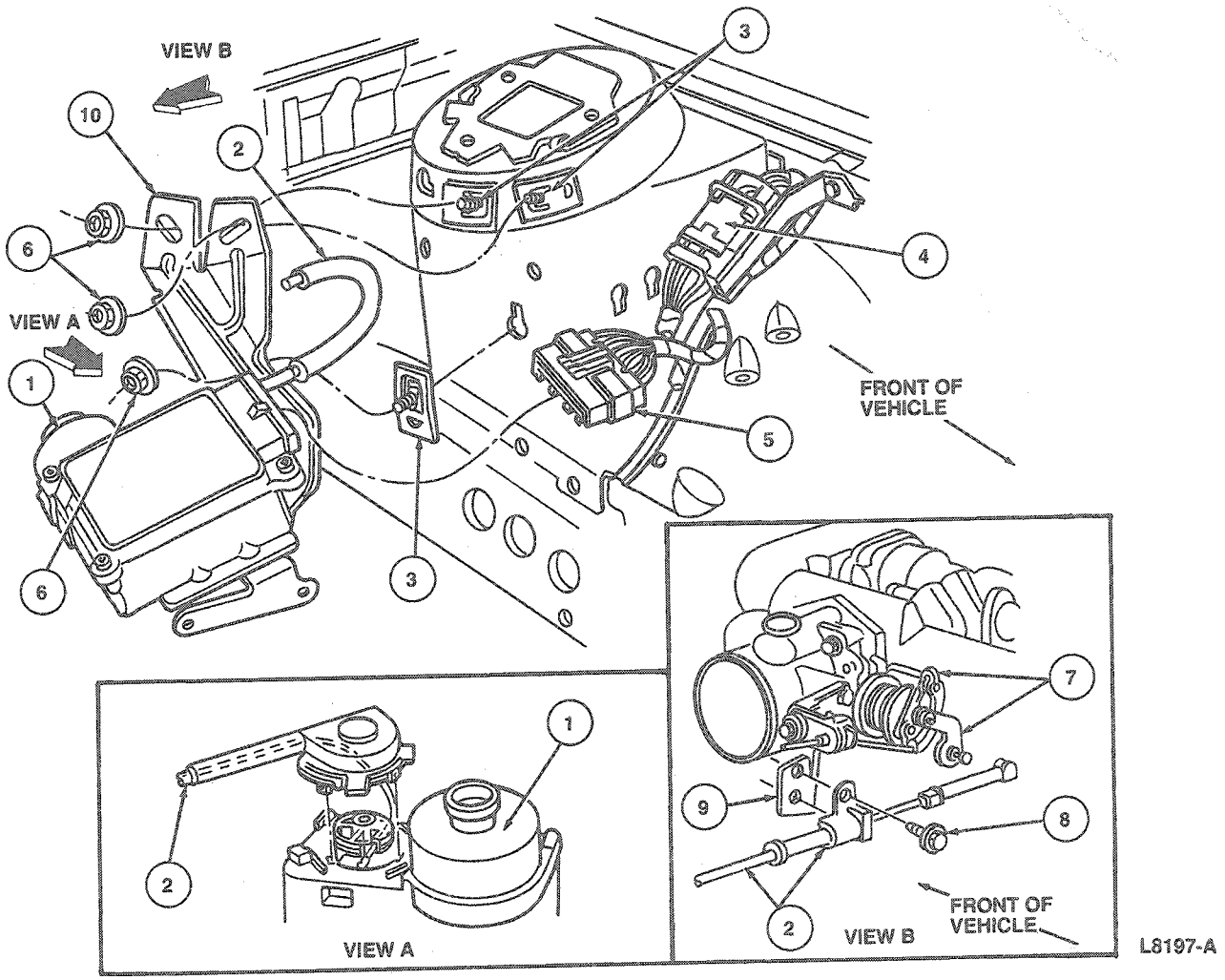
Installation

1. Attach bracket to the speed control servo with three screws. Tighten to 8-11 N·m (6-8 lb-ft).
2. Ensure that rubber seal is fully seated on actuator cable tab.
3. Lock cable ball slug into servo pulley slot.
4. Pull on throttle attachment end of cable to draw cable cap on to servo pulley.
5. Insert cable cap locking tabs into servo slots. Rotate cap clockwise until locking arm engages locking tab on speed control servo.
6. Position actuator cable and servo assembly in vehicle. Tighten mounting nuts to 5-7 N·m (45-61 lb-in).
7. Attach 14290 harness connector to speed control servo.
8. Adjust actuator cable as outlined and install retaining clip.

   NOTE: Incorrect wrapping of cable core wire around servo pulley may result in a high idle condition. Ensure that throttle lever is at idle position after cable installation and adjustment.

Actuator Cable

Speed Control Actuator and Servo



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	9C735	Speed Control Servo
2	—	Actuator Assy
3	N804526-S100	Bolt and Retainer (3 Req'd)
4	14401	Wiring Assy

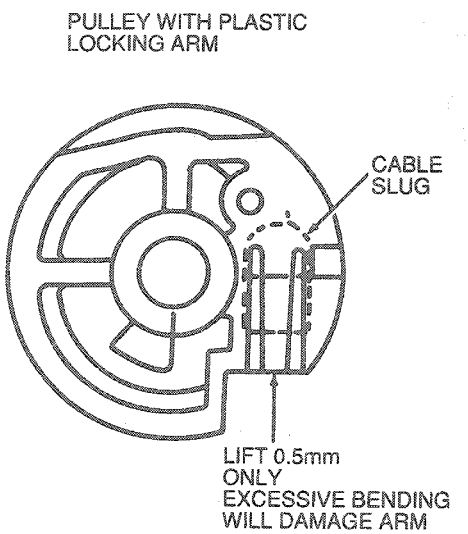
(Continued)

Item	Part Number	Description
5	14290	Wiring Assy
6	N620481-S2	Nut (3 Req'd)
7	—	Throttle Control Assy
8	N611057-S2	Screw
9	9728	Accelerator Shaft Bracket

Removal

1. Remove screw attaching actuator assembly cable to accelerator shaft bracket.
2. Remove actuator assembly cable from throttle control.
3. Remove actuator cable cap from the speed control servo by depressing cap locking arm and rotating the cap counterclockwise.
4. Remove cable slug from servo pulley. Gently pry-up the arm **slightly** with a small screwdriver, and at the same time push the cable slug out of the pulley slot.

   CAUTION: Excessive bending of the arm will cause it to break. DO NOT USE servos with damaged or missing locking arms.



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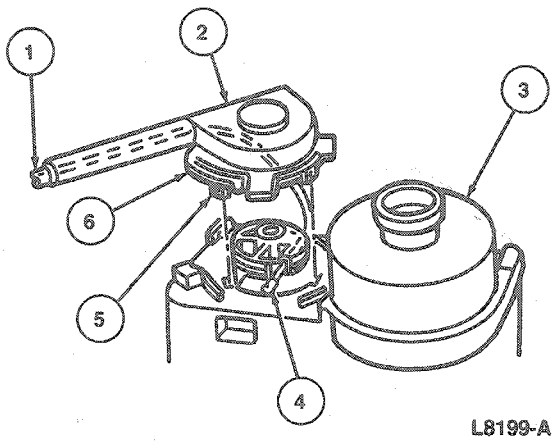


L8199-A

Item	Part Number	Description
1	—	Actuator Assy
2	—	Actuator Cable Cap
3	9C735	Speed Control Servo
4	—	Cable Ball Slug
5	—	Cap Locking Tabs
6	—	Locking Arm

Installation

1. Make sure that rubber seal is fully seated on actuator cable cap.
2. Lock cable ball slug into servo pulley slot.
3. Pull on throttle attachment end of cable to draw cable cap onto servo pulley.
4. Align cable cap tabs with slots in servo housing. Insert cap into the speed control servo and rotate clockwise until the locking arm engages.
5. Snap actuator assembly cable onto throttle control and install screw at accelerator shaft bracket. Tighten to 3-4 N·m (27-35 lb-in).
6. Check cable adjustment as outlined.
7. Ensure that cable is routed properly. Position into retaining clips.

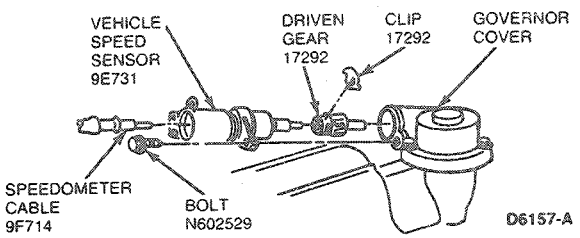
   NOTE: Incorrect wrapping of cable core wire around servo pulley may result in a high idle condition. Ensure that throttle lever is at idle position after cable installation and adjustment.

REMOVAL AND INSTALLATION (Continued)

Vehicle Speed Sensor (VSS) AX4S Transaxle

Removal

1. Raise vehicle on a hoist. Refer to Section 00-02.
2. Remove Y-pipe and heated oxygen sensors (H02S)(9F472) from the exhaust system.
3. Remove VSS exhaust heat shield.
4. Remove bolt retaining VSS mounting clip to transaxle.
5. Remove VSS and driven gear from transaxle.



6. Disconnect electrical connector and speedometer cable from VSS.

   NOTE: Do not attempt to remove spring retaining clip from driven gear with speedometer cable in VSS.
7. Remove driven gear retainer and driven gear from VSS.

Installation

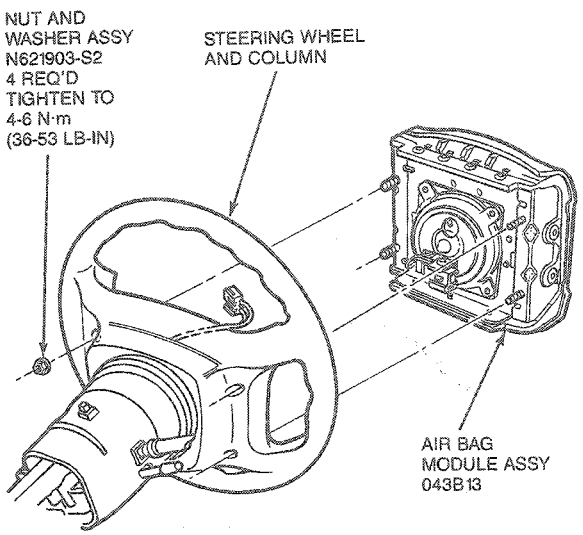
1. Position driven gear to VSS. Install gear retainer.
2. Connect electrical connector to VSS.
3. Ensure internal O-ring is seated properly in VSS housing. Snap speedometer cable into VSS housing.
4. Install VSS into transaxle and secure with retaining bolt.
5. Install VSS exhaust heat shield.
6. Install Y-pipe and heated oxygen sensors to exhaust system.
7. Lower vehicle and verify proper speedometer / odometer operation.

Control Switches

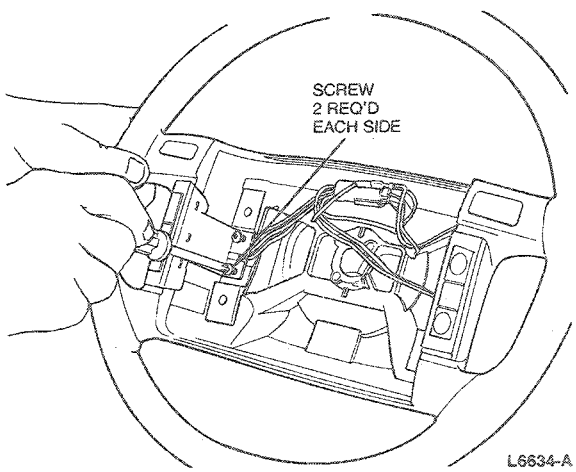
Removal

1. Disconnect battery ground cable and air bag backup power supply. Refer to Section 01-20B.
2. Remove four nut and washer assemblies retaining air bag module to steering wheel.
3. Disconnect air bag electrical connector from clockspring contact connector.
4. Remove air bag module from steering wheel.

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

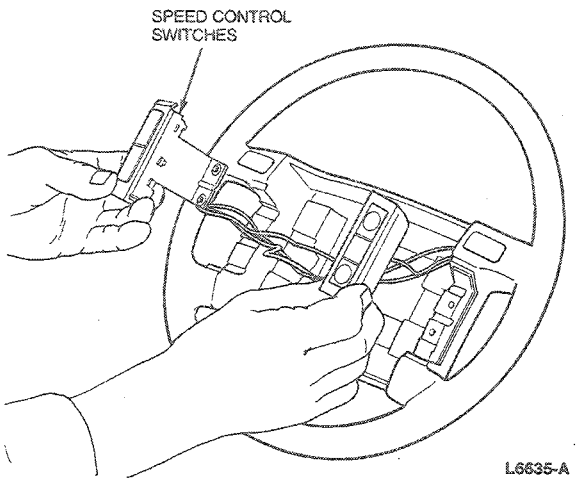


5. Remove horn buttons by gently prying with a small screwdriver. Disconnect horn wiring harness connector.
6. Remove Phillips head screws from speed control switch assemblies.



REMOVAL AND INSTALLATION (Continued)

7. Disconnect speed control switches from wiring harness and remove switches.



Installation

1. Position speed control switches onto steering wheel and install Phillips head screws.
2. Connect wiring harness to horn buttons and install horn buttons.
3. Connect speed control switches. Ensure wires are positioned so that no interference is encountered when installing air bag module.
4. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
5. Install air bag module on steering wheel and install four nut and washer assemblies. Tighten to 4-5.6 N·m (35-50 lb-in).
6. Connect battery air bag backup power supply and ground cable.

Clockspring Assembly

Tools Required:

- Steering Wheel Puller T67L-3600-A

Removal

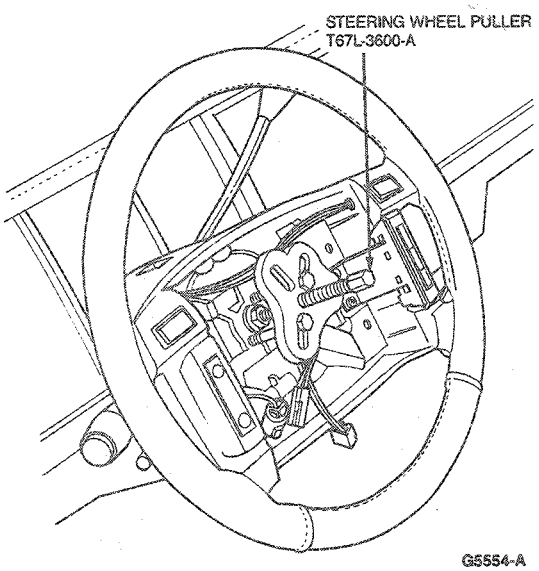
1. Center vehicle front wheels in the straight ahead position.

   WARNING: THE BACKUP POWER SUPPLY MUST BE DISCONNECTED BEFORE ANY AIR BAG COMPONENT SERVICE IS PERFORMED.

2. Disconnect battery ground cable and air bag backup power supply.
3. Remove four nut and washer assemblies retaining air bag module to steering wheel.
4. Disconnect air bag electrical connector from clockspring contact connector. (Refer to Section 11-04 for clockspring Removal and Installation procedure.)

   WARNING: PLACE AIR BAG MODULE ON BENCH WITH TRIM COVER FACING UP.

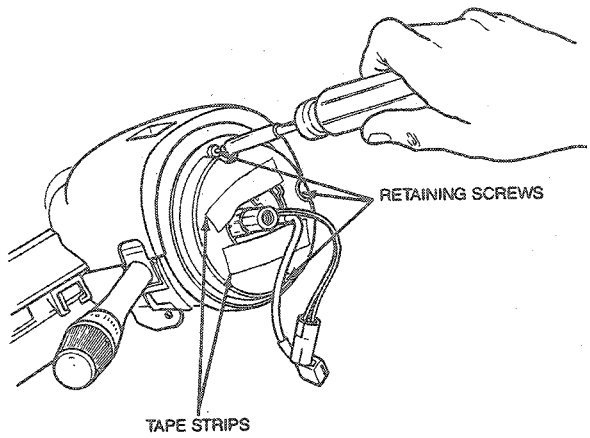
5. Remove air bag module from steering wheel.
6. Disconnect speed control switches and horn switches from contact assembly.
7. Remove steering wheel retaining bolt.
8. Install Steering Wheel Puller T67L-3600-A or equivalent and remove steering wheel.



9. Remove tilt lever if equipped.
10. Remove lower trim panel and lower steering column shroud.
11. Disconnect contact assembly wiring harness.
12. Apply two pieces of tape across contact assembly stator and rotor to prevent accidental rotation.

REMOVAL AND INSTALLATION (Continued)

13. Remove three contact assembly retaining screws and lift contact assembly off steering column shaft.



Installation

1. Ensure that vehicle front wheels are in the straight ahead position and that steering column shaft alignment mark is at the 12 o'clock position.
2. Align contact assembly to column shaft and mounting bosses and slide contact assembly onto the shaft.
3. Install three screws that retain the contact assembly and tighten to 2-3 N·m (18-26 lb-in). Remove tape from contact assembly.
4. Route the contact assembly harness down the column and connect to main wiring.

   NOTE: If a new contact assembly is installed, remove the lock mechanism.
5. Install steering column shroud.
6. Install lower trim panel.
7. Install tilt lever if equipped.
8. Position steering wheel on steering shaft and install new steering wheel retaining bolt. Tighten to 31-45 N·m (23-33 lb-ft).

   NOTE: Route contact assembly wiring through steering wheel as wheel is being positioned.
9. Connect speed control and horn switches to contact assembly.

   CAUTION: Ensure wiring is positioned so that no interference is encountered when installing air bag module.
10. Position air bag module on steering wheel so that clockspring contact connector can be connected to the air bag module.
11. Install air bag module on wheel and install four nut and washer assemblies.
12. Connect air bag backup power supply and battery ground cable.
13. Verify air bag warning indicator.

ADJUSTMENTS

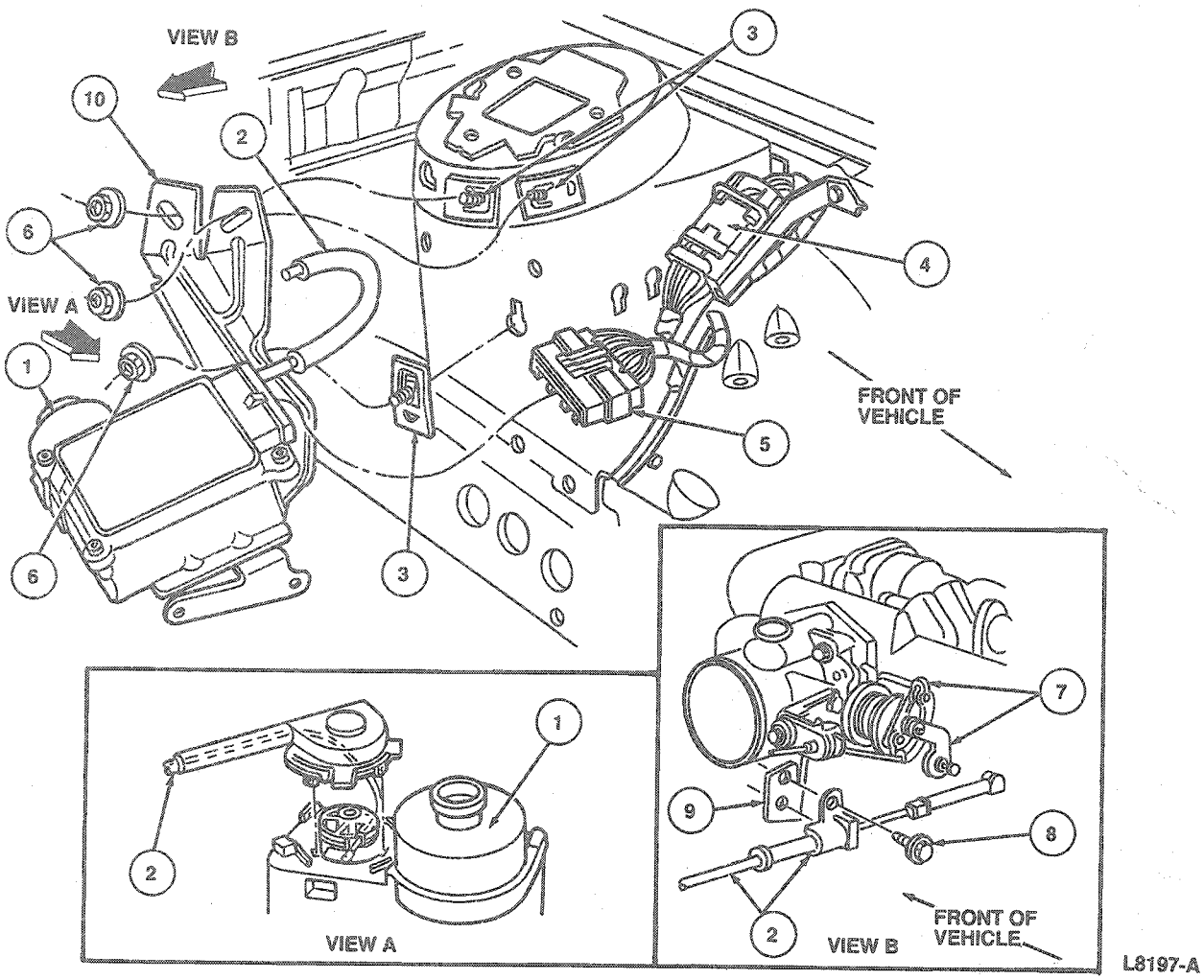
Actuator Cable

1. Remove retaining clip from actuator cable adjuster at throttle.
2. Ensure throttle is in fully closed position.
3. Pull on actuator cable to take up slack. Loosen at least one notch so there is approximately 3mm (0.118 inch) of slack in the cable.

   CAUTION: The cable must not be pulled tight, otherwise speed control may not operate properly.
4. Insert cable retaining clip and snap into place.
5. Check that throttle linkage operates freely and smoothly.

ADJUSTMENTS (Continued)

Speed Control Actuator and Servo



Item	Part Number	Description
1	9C736	Speed Control Servo Bracket
2	—	Actuator Assy
3	N804526-S100	Bolt and Retainer (3 Req'd)
4	14401	Wiring Assy

(Continued)

Item	Part Number	Description
5	14290	Wiring Assy
6	N620481-S2	Nut (3 Req'd)
7	—	Throttle Control Assy
8	N611057-S2	Screw
9	9728	Accelerator Shaft Bracket

SPECIFICATIONS

TORQUE SPECIFICATIONS

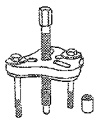
Description	N·m	Lb-In
Servo Nut	5-7	45-61
Cable Cover Nut	4-6	36-53
Air Bag Module Nut	4-5.6	35-50
Contact Brush Assembly Screw	2-3	18-26

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-In
Steering Wheel Bolt	31-45	23-33 (Lb-Ft)
Wheel Lug Nuts	115-142	85-104 (Lb-Ft)
Servo Nut	9.5-12	7-8 (Lb-Ft)
Sensor Retaining Nut	3.4-4.5	31-39

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T67L-3600-A Steering Wheel Puller	 T67L-3600-A

ROTUNDA EQUIPMENT

Model	Description
007-00013	Speed Control Sensor
014-00407	Digital Volt-Ohmmeter
059-00010	Inductive Dwell-Tach-Volts-Ohms Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9C735	Speed Control Servo	
9C736	Speed Control Servo Bracket	
9D843	Speed Control Amplifier	
9E731	Vehicle Speed Sensor	Speed Sensor
9F472	Heated Oxygen Sensor	Exhaust Gas Oxygen Sensor
9F479	Manifold Absolute Pressure Sensor	