INSTRUMENTATION AND WARNING SYSTEMS

GROUP 13

(10000 & 19000)

SECTION 13-01A Instrument Cluster—Electronic

VEHICLE APPLICATION

Taurus/Sable.

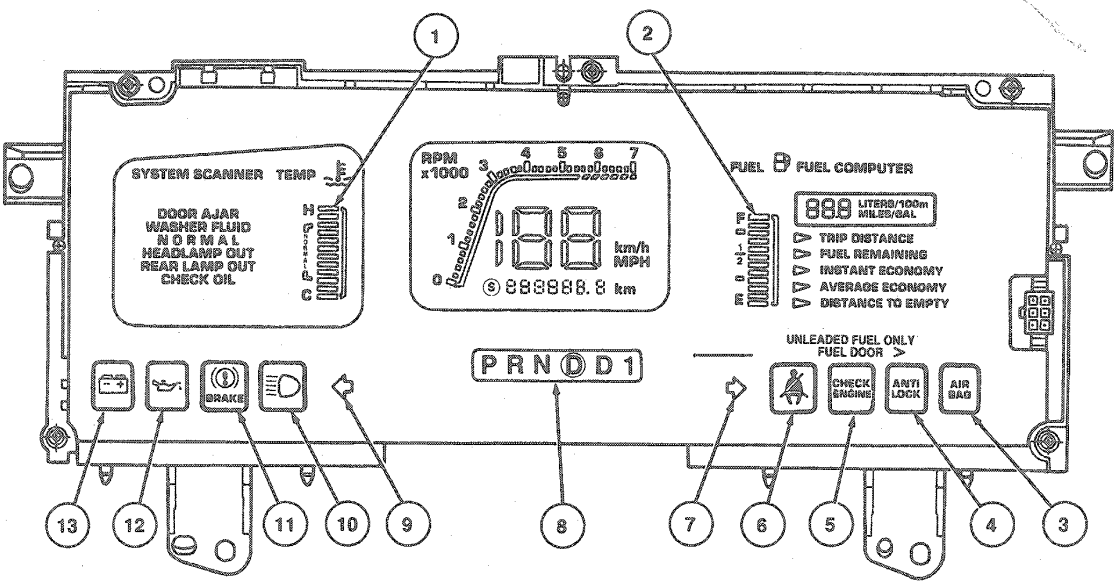
DESCRIPTION AND OPERATION

The electronic instrument cluster is a single module which contains an electronic speedometer / odometer / tachometer fuel computer, system scanner and electronic fuel and engine coolant temperature gauges. It also contains the following warning indicators:

- Battery
- Safety belt
- Brakes
- High beams
- Oil pressure
- Left turn signal
- Right turn signal
- Check engine (Malfunction Indicator Lamp - MIL)
- ANTI-LOCK
- AIR BAG

The electronic cluster is operational only when the ignition is in the RUN position. The electronic vacuum fluorescent displays are powered by a non-serviceable internal power supply (illumination bulbs are not used). When the headlamps are turned on, the cluster will dim according to the rheostat position (except warnings which will not dim).

Each time the ignition is first turned from OFF to RUN position, the electronic displays of the modules will prove out by momentarily lighting all of the display segments and then momentarily turning all display segments off. After the prove out, the modules return to normal operation.



K14572-B

Item	Description
1	Temperature Gauge
2	Fuel Gauge
3	Air Bag Indicator
4	Anti-Lock Indicator
5	Check Engine Indicator (MIL)
6	Safety Belt Indicator

(Continued)

Item	Description
7	RH Turn Signal
8	Transmission Selector Indicator
9	LH Turn Signal
10	High Beam Indicator
11	Brake Indicator
12	Oil Pressure Indicator
13	Charging System Indicator

Switch Module

The switch module is located immediately to the RH side of the instrument cluster. The switch module consists of the following four buttons:

SELECT: Moves cursor from top to bottom.

E/M: Alternately switches EIC information from English to Metric mode.

TACH: Activates and deactivates tachometer.

DESCRIPTION AND OPERATION (Continued)

RESET: Resets function selected in fuel computer. Two successive depressions of reset button within two seconds will cause all resettable functions to reset.

All buttons are white with headlamp switch off and are illuminated in green with the headlamp switch on. Dimming is controlled by the rheostat.

The button actuations are accompanied by an audible tone generated by the vehicle chime module which is activated by the instrument cluster.

Speedometer/Odometer/Tachometer

The electronic instrument cluster goes through prove out when powered up and then goes into normal operation, displaying speed and the regular odometer.

Two of the four buttons on the switch module are used to operate speedometer functions. They are:

- E/M: Displays in either English mode (MPH, MILES, MPG) or metric mode (Km/h, Km, L/100Km). This switch controls both the speedometer and fuel computer.
- TACH: Activates and deactivates tachometer display.

Digital Speedometer

The electronic speedometer gets a speed/distance signal from the cableless transmission-mounted vehicle speed sensor (VSS) (9E731).

The speedometer portion of the display consists of 2-1/2 digits which indicate vehicle speed. The mode (English or metric) will also be indicted by displaying either the MPH or Km/h legends. The display units (English or metric) will be consistent with the odometer and fuel computer, and will be the same at power up as they were at power down.

The maximum speed indicated will be limited to 193 Km/h (120 mph). These readings will be displayed for all vehicle speeds exceeding 193 Km/h (120 mph). It is normal for the speedometer to display consecutive numbers during slow acceleration or deceleration, and to skip consecutive numbers during quick starts and stops.

Digital Odometer

The digital odometer displays either miles or kilometers depending on the selection made with the E/M button. The odometer display, as well as the units (English or metric), will be the same at power up as at power down.

Accumulated mileage is stored in a non-volatile memory (NVM) every 1.6 Km (1.0 mi) and when the ignition switch is turned to the OFF position. The NVM saves both the total odometer mileage as well as the trip odometer mileage.

The total odometer display consists of 7 digits and a decimal point (leading zeros are displayed). The digit to the right of the decimal point represents tenths of a unit. The total odometer range is from 000000.0 to 858993.4 Km in the metric mode and to 925691.9 miles in the English mode. The displays will stop at these modes once attained and not roll over to zero.

When in the metric mode, the legend km will appear near the odometer.

Service Alert: If a condition exists where the speedometer module cannot read a valid odometer memory value from the non-volatile memory the word ERROR will be displayed.

Replacement, Odometer/Service: Replacement clusters may be obtained with odometers programmed with the actual vehicle mileage. When the S is displayed it indicates that the instrument cluster has been replaced with a service cluster with no mileage. The S can only be displayed when a service instrument cluster, programmed to light the S, is installed. Previous accumulated mileage is recorded on a door jamb sticker.

Tachometer Bargraph

The tachometer gets its signal from the coil and displays engine rpm. The tachometer display consists of 36 bars and will indicate engine rpm from 0 to 7000 rpm. Engine rpm is indicated by the number of bars lit. Each bar represents 200 rpm.

For all engine speeds above 6600 rpm, the tach bargraph will indicate 7000 rpm.

Fuel Temperature Gauges

Engine Coolant Temperature Gauge: The temperature gauge identifier, in addition to the H, C, and NORM graduations are illuminated when the cluster is powered. The H graduation is located just left of the top segment (No. 12) and the C graduation is located just left of the bottom segment (No. 1). The NORM graduation is centered vertically between the H and C graduations and two lines indicating normal range of operation. Specific temperature sender resistance ranges correspond to a specific number of illuminated segments in "fill up" format. When the coolant temperature exceeds the NORM range the temperature gauge indicator will begin to flash at a one Hz rate. A one-second audible tone will also be given to alert the driver of the abnormal condition. The audible alert will be repeated every five seconds.

DESCRIPTION AND OPERATION (Continued)

Fuel Gauge (9280): The fuel gauge identifier, in addition to the fuel level graduations are illuminated when the cluster is powered. Increasing fuel level will cause the display bars to illuminate from the E (No. 1) to F (No. 12). Specific fuel tank sending unit and pump (9H307) resistances correspond to a specific number of illuminated segments. When the fuel level falls below 8.7L (2.3 gal) the ISO will begin to flash at a one Hz rate to provide a low fuel warning. Two fuel sender diagnostics are included in the Fuel Computer display. They are indicated by alphabetic displays as follows:

Fuel Tank Sending Unit and Pump Shorted: FUEL REMAINING is displayed on power up with a value of "CS" indicating circuit shorted (DTE will also display "CS" if selected).

Fuel Tank Sending Unit and Pump Open: FUEL REMAINING on power up with a value of "CO" indicating circuit open (DTE will also display "CO" if selected).

In addition, the two top and bottom bars in the fuel gaugewill illuminate when the fuel diagnostic codes are displayed.

Fuel Computer

The fuel computer takes in signals from the vehicle speed sensor, fuel sender and the Powertrain Control Module (PCM) 12B529. Speed information comes from the transmission-mounted vehicle speed sensor to the speedometer module, which in turn feeds the fuel computer. Fuel level information comes from the fuel tank sending unit and pump which is located in the fuel tank (9002), and the fuel flow information comes from the powertrain control module.

The fuel computer calculates and displays trip distance, fuel remaining, instantaneous economy, average economy, and distance to empty.

The fuel computer display consists of the fuel gauge, three digits with a decimal point, the legends LITERS / 100km and MILES / GAL, and the menu functions TRIP DISTANCE, FUEL REMAINING, INSTANT ECONOMY, AVERAGE ECONOMY, and DISTANCE TO EMPTY.

The fuel computer goes through prove out when powered up and then goes into normal mode by displaying the function selected before the last ignition switch turn off. All menu functions remain illuminated for three seconds following prove out, and the pointer preceding the selected function is also illuminated. After three seconds, the pointer and the nonselected functions will not be displayed. If the cluster memory has been reset by interrupting battery power to the cluster, the default display is TRIP DISTANCE.

Three of the four buttons on the switch module are used to operate the fuel computer functions. They are as follows:

- SELECT: Will move the menu cursor from top to bottom. The selected function is indicated by the position of the pointer.
- E / M: Will alternately cause the fuel computer information to be displayed in English or Metric units with successive depressions.
- RESET: Will reset the TRIP DISTANCE and AVERAGE ECONOMY functions when they are selected. Two successive depressions of the RESET button within two seconds will reset both of these functions regardless of the function currently selected. No other function can be reset.

Fuel Computer Functions

Each of the following functions may be selected by pressing the SELECT button on the switch module until the pointer preceding the desired function is illuminated. The appropriate numeric information is displayed with units in the three digit display above the menu.

Trip Distance

Trip distance is the distance travelled in tenths of kilometers or (miles) up to 99.0 (whole numbers above 99.9) since the Trip Distance was last reset. The value is displayed with leading zeros suppressed. The value rolls over to 0.0 after 999 kilometers or miles. The appropriate Km or MILES logo is displayed when Trip Distance is selected.

Trip Distance can be reset to 0.0 by pressing the RESET button while Trip Distance is selected.

Fuel Remaining

Fuel Remaining is the amount of fuel remaining in the fuel tank. The fuel remaining value will be consistent with the display of the FUEL bargraph segments. It is displayed in whole liters or gallons along with the LITERS or GAL logo. The numeric range of the fuel remaining display is from 54L (14 gal) down to 3L (1 gal). The value "F" (Full) is displayed above 54L (14 gal) and "E" (Empty) is displayed below 2L (1 gal).

Fuel remaining cannot be reset.

Instantaneous Fuel Economy

Instant economy is the fuel economy calculated at that instant. The instantaneous fuel economy value is displayed along with the LITERS / 100km or MILES / GAL logo. The range of Instant Economy which can be displayed is from 99 to 0 LITERS / 100km or from 0 to 99 MILES / GAL.

When the vehicle is not moving, Instant Economy is displayed as 99.9 to 0.0 LITERS / 100km or 0.0 to 99.9 MILES / GAL.

Instantaneous Fuel Economy cannot be reset.

Average Fuel Economy

Average economy is the fuel economy obtained since the Average Economy function was last reset. The average fuel economy value is displayed along with the LITERS / 100km or MILES / GAL logo. The range of average economy which can be displayed is from 99.9 to 0.0 LITERS / 100km (0.0 to 99.9 MILES / GAL).

DESCRIPTION AND OPERATION (Continued)

Average economy can be reset by pressing the RESET button while Average Economy is displayed. A reset causes the current instantaneous fuel economy value to be displayed as the average fuel economy. This value is then updated according to continuing changes in vehicle speed and fuel consumption.

Distance To Empty

Distance to empty (DTE) is the distance that can be travelled before the fuel tank becomes empty. The Distance To Empty value is displayed in whole kilometers or miles along with the km or MILES logo. The range of distance to empty which can be displayed is from 0 to 999 kilometers or miles.

NOTE: Distance to empty cannot be reset.

Low DTE Alert

At 80 km (50 miles) to empty, the fuel computer self selects the Distance To Empty function, provides a one second audible tone, and flashes the DTE value for approximately five seconds. The display continues to indicate DTE (not flashing) until another function is selected. This alert will reoccur at 40 km (25 miles) and at 16 km (10 miles) to empty and at every subsequent power up below 80 km (50 miles) to empty.

System Scanner

The system scanner takes inputs from the lamp out module, washer fluid level, oil level, and door ajar sensors and displays the appropriate diagnostic message. The engine coolant temperature electronic gauge is also included in the system scanner display. Based on the inputs from the various sensors, the system scanner will display the following messages:

- DOOR AJAR
- WASHER FLUID
- NORMAL
- HEADLAMP OUT
- REAR LAMP OUT
- CHECK OIL

When a warning condition first occurs, the diagnostic message is displayed accompanied by a one-second tone. The message will remain on the display as long as it is active, but no further tones are issued.

If more than one warning condition occurs, each message will be displayed simultaneously. When the message first appears it will be accompanied by a one second tone.

DOOR AJAR

The door ajar signal comes from switches located in the door jamb. When any door is open, the appropriate wire to the system scanner will be grounded and the words DOOR AJAR will appear on the scanner display. The message will be cleared from the display when the warning condition is removed (the door is closed).

WASHER FLUID LOW

The low washer fluid level signal comes from a switch located in the washer fluid reservoir. When the washer fluid level is low and the washer / wiper switch is activated, the wire to the system scanner will be pulled high and the words WASHER FLUID LOW will appear on the display. The message will remain displayed until key OFF.

NORMAL

If no system faults are present at power up, the display will indicate NORMAL for five seconds following prove out before blanking. If a fault is present, the appropriate message is displayed immediately following prove out.

HEADLAMP OUT

Indicates a Low-Beam Headlamp burnout when the light switch is turned to the headlamp position. The Lamp Outage Module provides the ground to light this message. Once the message appears it will remain on the display until the ignition switch is turned to the OFF position.

REAR LAMP OUT

Indicates a Brakelamp burn out when the brake pedal is pressed. It also indicates a Rear Parking Lamp burnout when the light switch is turned to either the parking lamp or headlamp position. The Lamp Outage Module provides the ground to light this message. Once the message appears it will remain on the display until the ignition switch is turned to the OFF position.

CHECK OIL

The CHECK OIL signal comes from the oil level sensor in the oil pan. The CHECK OIL message is illuminated when the oil level is low. Refer to Section 13-09 for information on the low oil level indicator.

DIAGNOSIS AND TESTING

Quick Checks

Tool Required:

- Rotunda Digital Volt Ohmmeter 014-00407

Use the electronic instrument cluster (EIC) system schematics and descriptions with Quick Checks for an isolated view of each system for troubleshooting purposes. The description provides an understanding of how the system works, and the Quick Check tells what should happen during operation.

The Diagnostic by Symptom section uses pinpoint tests to service the most likely concerns with the EIC. The Diagnostic by System section gives an overview of the entire system.

Voltage and resistance measurements may be obtained using Rotunda Digital Volt Ohmmeter 014-00407 or equivalent.

DIAGNOSIS AND TESTING (Continued)

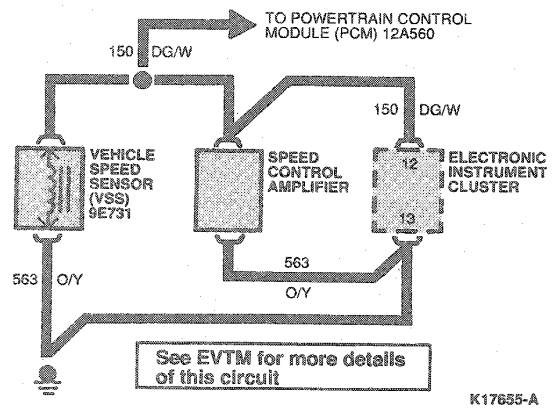
Speedometer

Description

- A vehicle speed sensor (VSS) (9E731) mounted on the transaxle sends pulses to the instrument cluster. The pulses also go to the powertrain control module and variable assist power steering (VAPS) module, if so equipped.

Quick Check

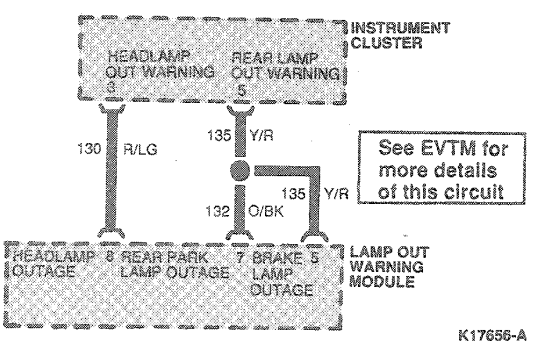
- Verify speedometer by road testing vehicle.
- If speedometer reads zero, high or erratic, then road test speed control. Speed control is performed by the powertrain control module. If speed control does not work properly, concern is not the speedometer.



Lamp Out Warning

Description

- There is a Lamp Outage Module that monitors the brakelamps, rear park lamps and low beam headlamps. If any of these lamps are burned out, the lamp outage module will ground the appropriate circuit when the lamp is turned on. This signals the message center to display a warning message.



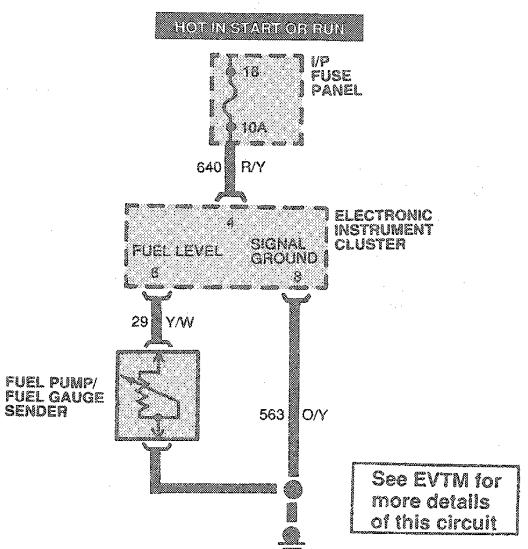
Fuel Gauge

Description

- The cluster looks for resistance values at fuel tank sending unit and pump to be in the range of 11 ohms to 168 ohms.

Quick Check

- Be certain of fuel level.
- Fuel gauge does not display rapid change in fuel level. Turn ignition switch to OFF position, wait 10 seconds, then turn ignition switch to the RUN position.
- Diagnostic bars (top two and bottom two bars lighted) indicate that fuel tank sending unit and pumpcircuit is out-of-range. Also the digital displays either CO or CS. This means:
  - CO: Circuit open or resistance higher than 178 ohms.
  - CS: Circuit short or resistance less than 7 ohms.



Dimmer Circuit

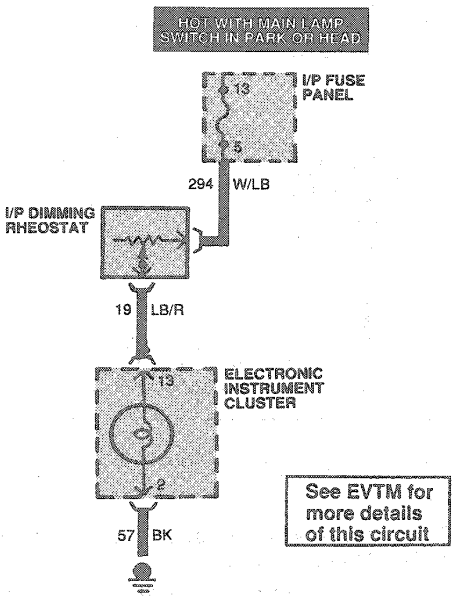
Description

- When the headlamps are turned on, dimming voltage is supplied to Connector A, Pin 13 and Connector B, Pin 6. Dimming voltage varies between 5 volts and battery voltage depending on the rheostat position. The feed to Connector A is used to dim the VF (vacuum fluorescent) displays. The feed to Connector B provides power to the PRNDL bulb only.

DIAGNOSIS AND TESTING (Continued)

Quick Check

- Verify that the fuse is ok.
- Check to see that all dimmable functions dim properly.
- Check for proper voltages at cluster.



K17658-A

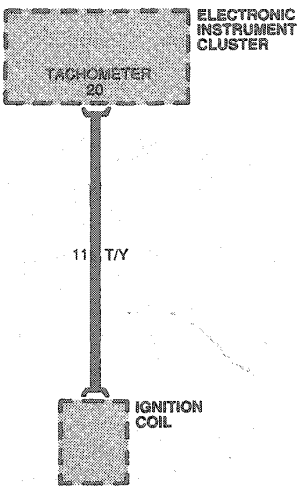
Tachometer Circuit

Description

- The tachometer signal feed to the cluster is accomplished through Circuit 11 (DG-4). The signal is supplied to the cluster through Connector A, Pin 20. The cluster interprets the signal and displays rpm.

Quick Check

- Verify signal to cluster.
- Service Circuit 11 or replace cluster as required.



K17659-A

Charging System

Description

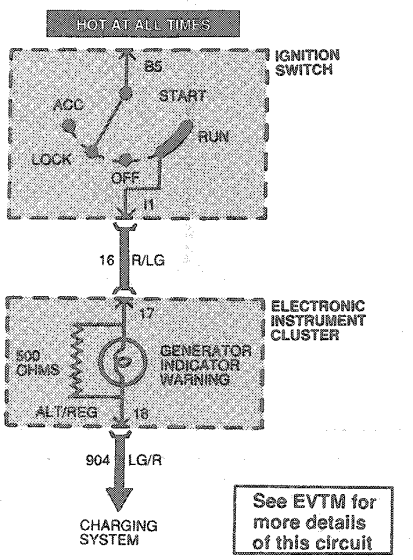
- Connected between Connector B, Pins 17 and 18 is the charge warning indicator and 422 ohm resistor (internal to the cluster). When a charging system concern occurs, Circuit 904 is grounded through the generator regulator and the warning indicator illuminates.

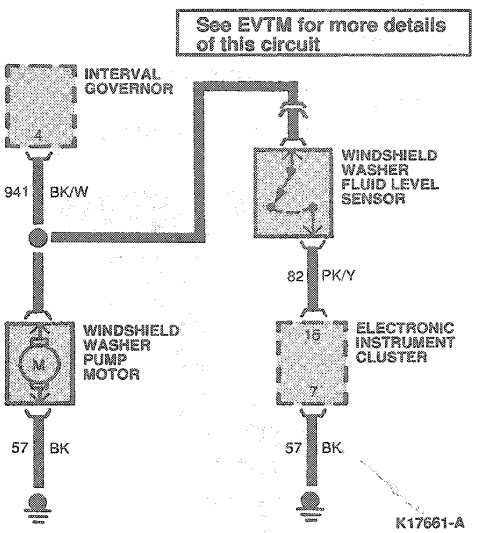
NOTE: If Connector B is disconnected, the vehicle will not produce a charge. The 422 ohm resistor allows the charging system to operate with a burned out warning indicator bulb.

DIAGNOSIS AND TESTING (Continued)

Quick Check

- Look for a charging system warning that normally occurs with key in RUN position, engine off. The warning should come on within approximately 15 to 20 seconds.
- Start engine and charging system warning should go away. Wait at least 15 seconds.





Windshield Washer Level

Description

- The fluid level sensor is open when level is full. When fluid is low the sensor switch closes. The next time washer fluid is used, run voltage is fed to Connector B, Pin 15 through the sensor. Washer fluid will then light and remain on until the next key cycle.

Quick Check

- Turn ignition switch to OFF position. Disconnect harness connector near sensor. Turn ignition switch to RUN position. No warning should be displayed.
- Turn ignition switch to OFF position. Place jumper across signal and ground at harness connector. Turn ignition switch to RUN position. A warning should be displayed.

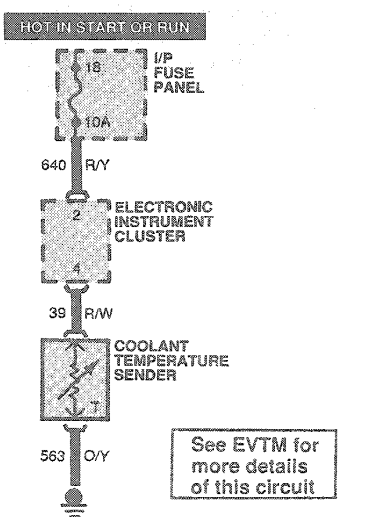
Coolant Temperature Sender

Description

- Temperature sender resistance varies depending on coolant temperature.
- The cluster interprets the resistance and displays the temperature in the cluster.

Quick Check

- Sender resistance should be between 1400 and 12,000 ohms with engine at normal operating temperature.
- Verify continuity in Circuit 39.



DIAGNOSIS AND TESTING (Continued)

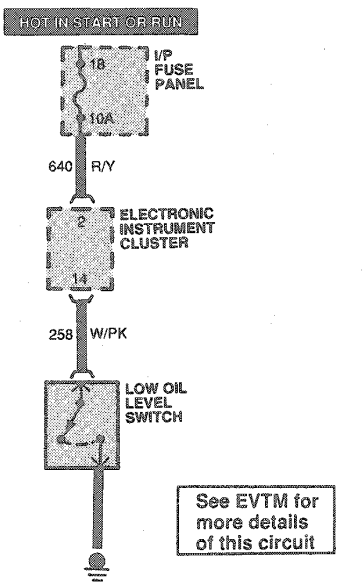
Oil Level Warning

Description

- The sensor switch is open when level is full. The switch is closed when the level is low. A closed switch grounds the sensor circuit.
- It takes a two minute wait with ignition switch in OFF position to charge the warning.

Quick Check

- Check oil level with the dipstick.
- Turn ignition switch to OFF position. Disconnect oil level sensor. Wait two minutes, then turn ignition switch to RUN position. No warning should be displayed.
- Turn ignition switch to OFF position. Attach a jumper from harness connector to ground. Wait two minutes. Turn ignition switch to RUN position. A warning should be displayed.



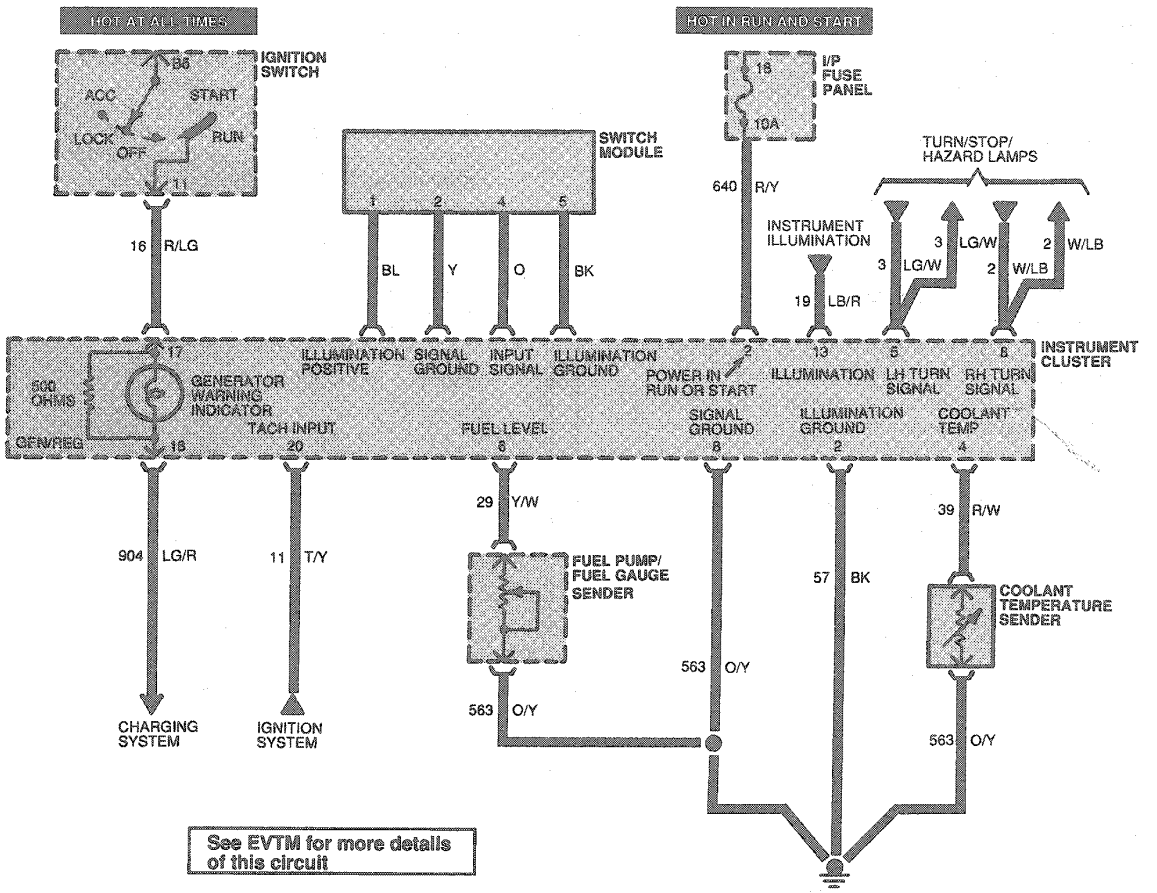
K17663-A

NOTE: Prior to following symptoms chart, check instrument cluster as follows:

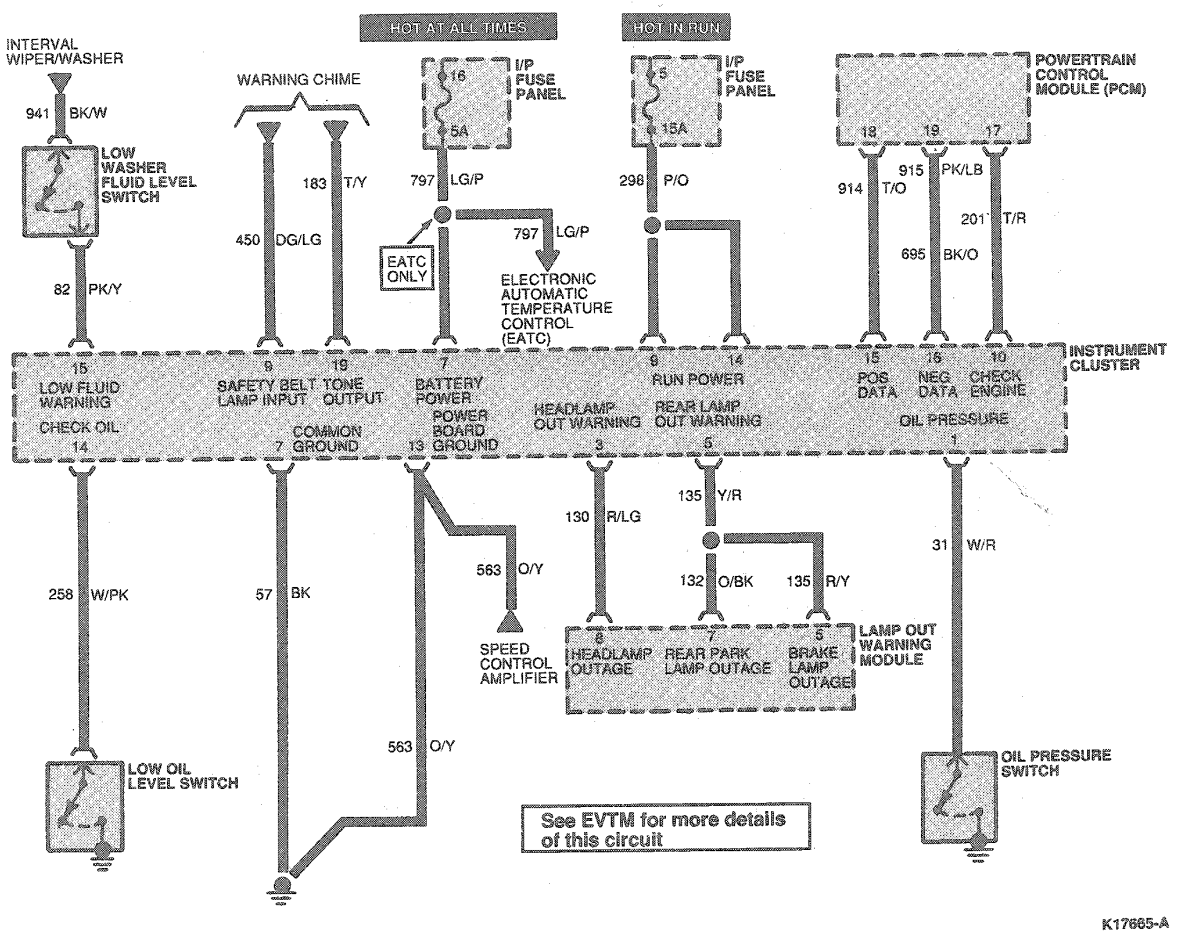
1. Depress E/M and Select simultaneously while turning the vehicle key from OFF to the RUN position. The cluster will enter special test mode and display information in the center display opening. Information displayed includes a number in the speedometer and two numbers in the odometer. The tachometer bar will also be illuminated. Both the left and right display openings will be off.
2. If any of the information in the center opening flashes on and off continuously, the instrument cluster is damaged and should be replaced. If the display does not flash, turn key off to leave the special test mode. Continue through the diagnosis section. (The cluster may or may not be faulty at this point).

DIAGNOSIS AND TESTING (Continued)

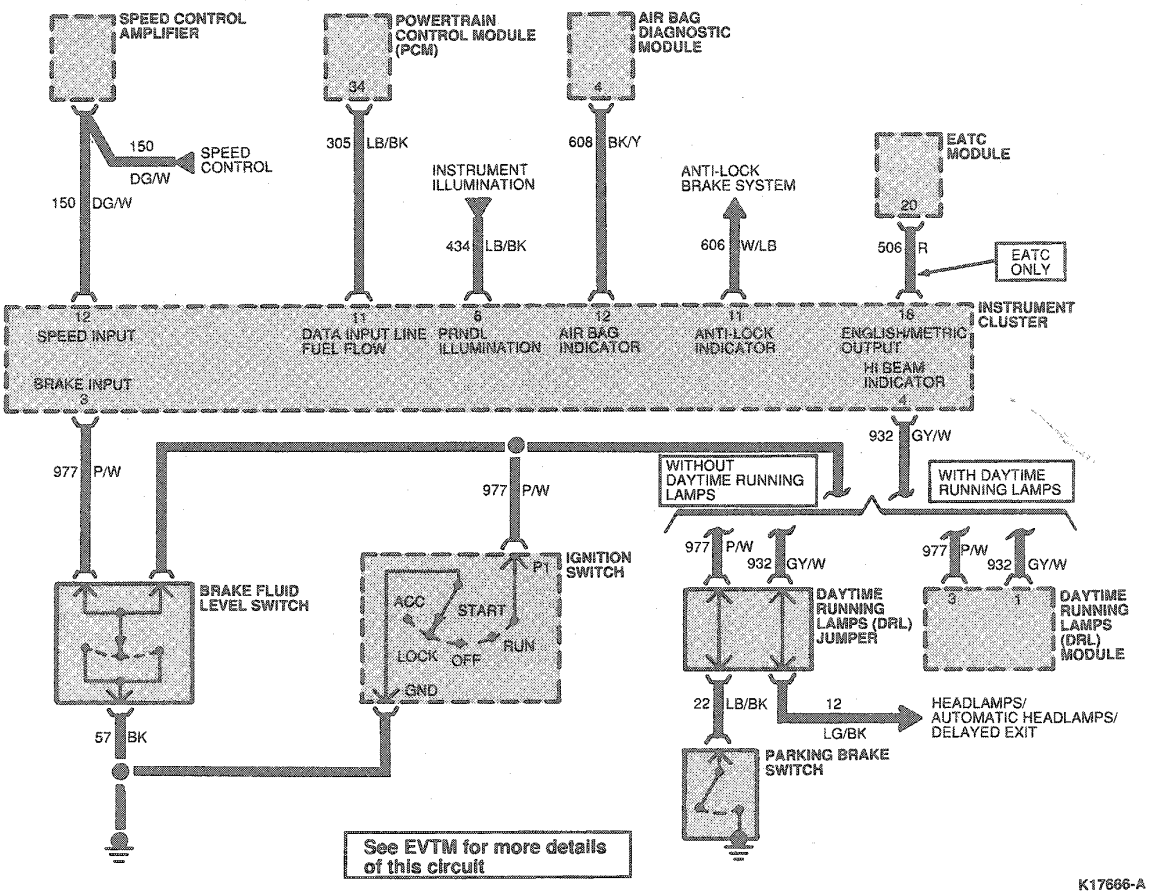
Wiring Schematic



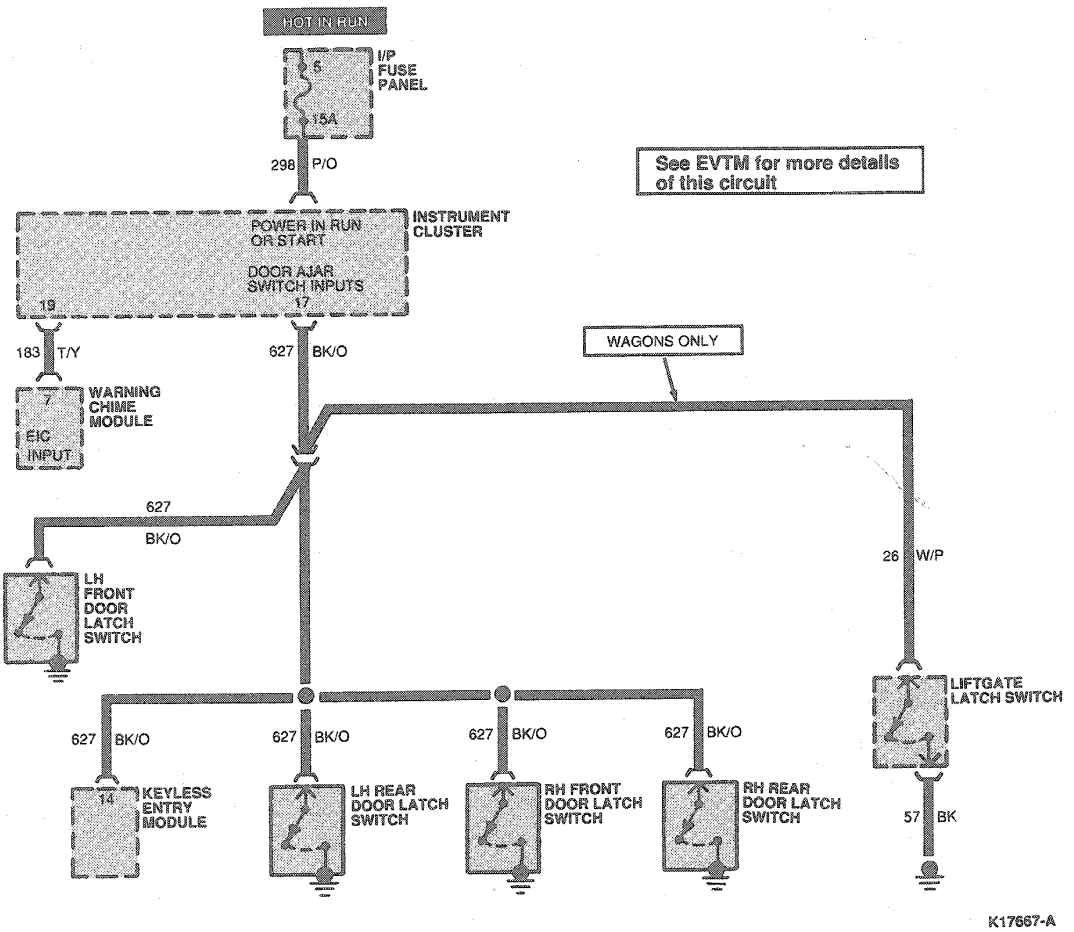
DIAGNOSIS AND TESTING (Continued)



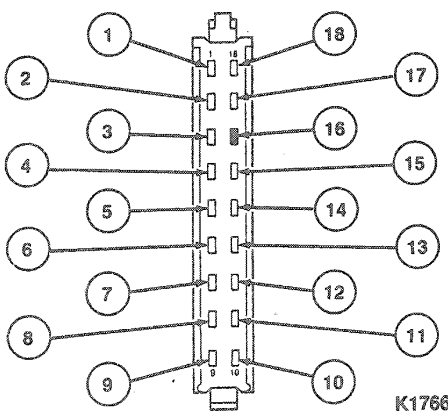
DIAGNOSIS AND TESTING (Continued)



DIAGNOSIS AND TESTING (Continued)



Wiring Harness Connectors C255



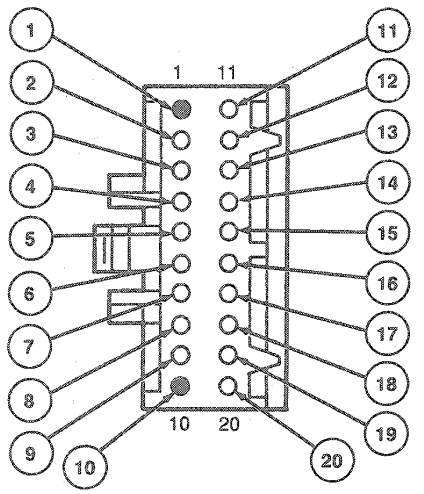
PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	31 (W/R)	Oil Pressure Indicator to Oil Pressure Sending Unit
2	640 (R/Y)	Warning Lamps Feed-Hot in RUN or START
3	977 (P/W)	Brake Warning Switch to Indicator Lamp
4	932 (GY/W)	Hi Beam Indicator
5	3 (LG/W)	LH Turn Signal Lamps
6	434 (LB/BK)	Instrument Panel Lamp Feed
7	57 (BK)	Ground
8	2 (W/LB)	RH Turn Signal Lamps
9	450 (DG/LG)	Safety Belt Warning Indicator Lamp Feed
10	201 (T/R)	PCM to Check Engine Lamp

(Continued)

DIAGNOSIS AND TESTING (Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
11	606 (W/LB)	Anti-Lock Brake Indicator for Anti-Lock Brake Control Module
12	608 (BK/Y)	Air Bag Indicator to Air Bag Diagnostic Module
13	563 (O/Y)	Ground
14	298 (P/O)	Hot in RUN
15	82 (PK/Y)	Washer Fluid Level Indicator
16	—	Not Used
17	16 (R/LG)	Ignition Switch to Ignition Coil "Battery" Terminal
18	904 (LG/R)	Coil Terminate or Ignition Switch to Generator Regulator

C256



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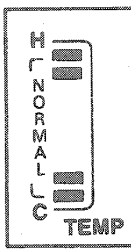
PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	—	Not Used
2	57 (B/K)	Ground
3	130 (R/LG)	Headlamp Bulb Outage
4	39 (R/W)	Temperature Gauge to Coolant Temperature Sensor
5	135 (Y/R)	Rear Lamp Outage
6	29 (Y/W)	Fuel Gauge and Fuel Gauge Sender
7	797 (LG/P)	Battery Power
8	563 (O/Y)	Reference Ground
9	298 (P/O)	Hot in RUN
10	—	NOT USED
11	305 (LB/BK)	PCM to Time Meter
12	150 (DG/W)	Vehicle Speed Sensor
13	19 (LB/R)	Instrument Panel Lamp Feed
14	258 (W/PK)	Oil Level Sensor
15	696 (O/BK)	PCM Positive Data
16	695 (BK/O)	PCM Negative Data
17	627 (BK/O)	Open Door Warning Lamp to Open Door Switch
18	506 (R)	English/Metric Output
19	183 (T/Y)	Tone Generator
20	11 (T/Y)	Electronic Switch to Ignition Coil Negative Coil

DIAGNOSIS AND TESTING (Continued)

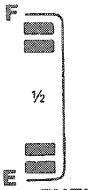
FUNCTION DIAGNOSTIC MODE

Temp Gauge



Engine Temperature Sensor Input Short Circuited Lights Top two Red Bars and Bottom two Bars. All Other Temperature Gauge Segments Will Be Off.

Fuel Gauge



Fuel Level Sender Input Short Circuited or Open Circuited Lights Top two and Bottom two Bars. All Other Fuel Gauge Segments Will Be Off.

Fuel Level Sender Input Short Circuited or Open Circuited Displays 'CS' (Short) or 'CO' (Open) in Message Center Display For "Fuel Remaining" or "Distance to Empty" Selection

Odometer

Odometer Malfunction Displays 'Error' in Odometer Display

K14771-A

PINPOINT TEST INDEX

	SYMPTOM	GO to
	DISPLAY DIAGNOSIS	
1	Display totally black	Pinpoint Test TA
2	Cluster will not dim	Pinpoint Test TD
3	Display lit but too dim	Pinpoint Test TB
4	Display scrambled, segments half lit (ghost segments), segments blinking or missing, display incorrect all the time	Pinpoint Test TC
5	Display stuck with all segments on	Pinpoint Test TC
6	No beep when buttons pushed or driver alert given	Pinpoint Test SA
7	Cluster does not respond to buttons	Pinpoint Test SA
	TEMPERATURE GAUGE DIAGNOSIS	
8	Temperature gauge display blanks out thermometer symbol and lights top two and bottom two bars of multigauge	Pinpoint Test TE
9	No warning tone when thermometer symbol is blinking	Pinpoint Test TX
10	Temperature gauge always indicates cold temperature	Pinpoint Test TF
	SPEEDOMETER DIAGNOSIS	
11	Reads 0 mph (km/h) at all speeds when vehicle in motion	Pinpoint Test SB
12	Speedometer reads constantly too high or too low	Pinpoint Test SC
13	Speed indication jumps up and down erratically	Pinpoint Test SD

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST INDEX (Cont'd)

	SYMPTOM	GO to
	ODOMETER DIAGNOSIS	
14	Display reads "Error" and service symbol on	Pinpoint Test SE
15	Display has "S" illuminated	Pinpoint Test SF
16	Odometer does not accumulate mileage, or counts 1.6 km (1.0 miles) and jumps back 1.6 km (1.0 miles)	Pinpoint Test SG
17	Odometer reading incorrect	Pinpoint Test SH
18	Mileage constantly reads too high or too low	Pinpoint Test SJ
	TACHOMETER DIAGNOSIS	
19	Tachometer always indicates too high or low	Pinpoint Test SK
20	No tachometer indication	Pinpoint Test SK
21	Tachometer indication erratic	Pinpoint Test SK
	FUEL COMPUTER DISPLAY DIAGNOSIS	
22	Instantaneous fuel economy always reads zero miles / gal or 99 / 100 km, or 99 miles / gal or 0 L / 100 km	Pinpoint Test FA
23	Trip distance does not accumulate	Pinpoint Test FB
24	Instantaneous fuel economy always reads 99 miles / gal or 0 L / 100 km	Pinpoint Test FA
25	DTE does not go below 322 km (200 miles) with fuel tank empty	Pinpoint Test FC
26	DTE always reads zero miles	Pinpoint Test FC
	FUEL GAUGE DIAGNOSIS	
27	CO displayed, when fuel remaining or DTE selected on fuel computer	Pinpoint Test FD
28	CS displayed, when fuel remaining or DTE selected on fuel computer	Pinpoint Test FE
29	Does not display F when fuel tank is full	Pinpoint Test FF
30	Does not display E when fuel tank is empty	Pinpoint Test FF
31	Inaccurate fuel indication	Pinpoint Test FF
	SYSTEM SCANNER DIAGNOSIS	
32	Door ajar on at all times or never illuminates when doors are open	Pinpoint Test FG
33	Washer fluid illuminated at all times or never illuminates	Pinpoint Test FP
34	Lamp out warnings do not function properly	Pinpoint Test FI
35	Check oil does not function properly	Pinpoint Test FJ

PINPOINT TEST TA: DISPLAY PARTIALLY ILLUMINATED OR COMPLETELY BLACK

TEST STEP		RESULT ▶	ACTION TO TAKE
TA1	VERIFY CONDITION		
	• Turn ignition to the RUN position.	Cluster partially illuminated ▶	GO to TA2.
		All displays black ▶	GO to TA3.
TA2	VERIFY ABNORMAL CONDITION		
	• Check to see if all choices (segments) except the one selected go black.	All segments except one selected go black ▶	System OK.
		Cluster partially black ▶	REPLACE cluster.
TA3	CHECK FUSES		
	• Check Circuits 797 and 298 for blown fuses (battery and run voltage to cluster). • Is fuse OK?	No ▶	GO to TA4.
		Yes ▶	GO to TA5.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST TA: DISPLAY PARTIALLY ILLUMINATED OR COMPLETELY BLACK (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
TA4	CHECK FOR SHORTS		
	• Turn ignition to OFF. • Disconnect battery ground cable. • Connect an ohmmeter from circuit with blown fuse to ground. • **Is there continuity?**	No ▶ Yes ▶	REPLACE fuse. SERVICE circuit as required.
TA5	CHECK FOR POWER TO FUSE		
	• Connect battery. • Turn ignition to RUN. • Measure voltage from Circuits 797 and 298 to ground. • **Is voltage greater than 9 volts?**	Yes ▶ No ▶	GO to **TA6.** SERVICE open in fuse holder.
TA6	CHECK FOR LOOSE CONNECTIONS		
	• Remove cluster (leave connected). • Connect battery. • Turn ignition to RUN. • Wiggle A and B connectors on rear of cluster. • **Are connectors OK?**	No ▶ Yes ▶	SERVICE as required. GO to **TA7.**
TA7	CHECK POWER AND GROUND		
	• Turn ignition to OFF. • Remove cluster as outlined. • Turn ignition to RUN. • Measure voltage at the harness connector A and B of the cluster. • Voltage should be:	Yes ▶ No ▶	REPLACE cluster. SERVICE Circuit BATT 797 RUN 298 GROUND 359.

PIN	FUNCTION	VOLTAGE
7A	BATT	Battery Voltage
9A	RUN	Battery Voltage
14B	RUN	Battery Voltage

	• Check continuity of ground circuit Pins 8A and 13B to battery ground. • **Are voltage and continuity present?**		
TA8	CHECK FLEX CIRCUIT BOARD		
	• Disconnect battery ground cable. • Remove cluster as outlined. • Inspect flexible circuit traces (traces are double thick) connected to Circuits 13B and 14B (ground and run circuits) • **Are traces OK?**	Yes ▶ No ▶	REPLACE cluster. REPLACE Flexible circuit.

PINPOINT TEST TB: CLUSTER TOO DIM

TEST STEP		RESULT ▶	ACTION TO TAKE
TB1	VERIFY CONDITION		
	• Check to see if part of cluster is dim or all displays are dim.	Part of cluster dim and part of cluster illumination OK ▶ All displays too dim ▶	REPLACE cluster. GO to **TB2.**
TB2	ENSURE HEADLAMPS ARE OFF		
	• Cluster will dim from 65 percent to almost off with headlamps on. • **Are headlamps off?**	No ▶ Yes ▶	TURN headlamps OFF. GO to **TB3.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST TB:
CLUSTER TOO DIM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
TB3	CHECK DIMMER VOLTAGE		
● Disconnect battery ground cable. ● Remove cluster as outlined and disconnect Connectors A and B. ● Connect battery ground and turn ignition to RUN. ● Ensure headlamps are off. Measure dimmer voltage to ground (Connector A, Pin 19). ● **Is voltage greater than 3 volts?**		No ▶ Yes ▶	REPLACE cluster. SERVICE Circuit 19 and dimmer for short to battery or run circuits.

PINPOINT TEST TC:
DISPLAY SCRAMBLED, SEGMENTS HALF ILLUMINATED (GHOST SEGMENTS), SEGMENTS BLINKING OR MISSING, DISPLAY INCORRECT ALL THE TIME, DISPLAY STUCK WITH ALL SEGMENTS ON.

TEST STEP		RESULT ▶	ACTION TO TAKE
TC1	VERIFY CONDITION		
● Turn ignition switch from OFF to RUN and observe the display prove out. All segments on one second, all segments off one second followed by a normal display.		Prove out operates ▶ Prove out does not operate properly ▶	System OK. REPLACE cluster.

PINPOINT TEST TD:
CLUSTER WILL NOT DIM OR DOES NOT DIM PROPERLY

TEST STEP		RESULT ▶	ACTION TO TAKE
TD1	VERIFY CONDITION		
● Turn ignition to RUN. ● Turn headlamps on. ● Dimmer should control cluster illumination from 65 percent to almost off. ● **Does cluster dim properly?**		Yes ▶ No ▶	System OK. GO to TD2.
TD2	CHECK DIMMER VOLTAGE		
● Disconnect battery ground cable. ● Remove cluster as outlined. ● Connect battery ground cable. ● Turn ignition to RUN. ● Turn headlamps on. ● Voltage at Connector A, Pin 13 should vary from 5 volts to battery voltage while operating dimmer. ● **Does voltage vary within range?**		Yes ▶ No ▶	System OK. REPLACE cluster.

PINPOINT TEST TE:
TEMPERATURE GAUGE DISPLAY BLANKS OUT THERMOMETER SYMBOL AND LIGHTS TOP TWO AND BOTTOM TWO BARS OF GAUGE

TEST STEP		RESULT ▶	ACTION TO TAKE
TE1	VERIFY CONDITION		
		▶	GO to TE2.
TE2	CHECK FOR TEMPERATURE SENDER SHORT		
● Unplug wire temperature sender. ● Turn ignition to RUN. ● Temperature gauge should indicate COLD with bottom bar illuminated.		Temperature gauge indicates as specified ▶ Temperature gauge does not indicate as specified ▶	REPLACE temperature sender. GO to TE3.
TE3	CHECK FOR SHORT IN WIRING		
● Disconnect battery ground cable. ● Unplug wire temperature sender. ● Remove cluster. ● Measure resistance between Pin 4A and Pin 8A (GND).		Resistance greater than 15,000 ohms ▶ Resistance less than 15,000 ohms ▶	REPLACE cluster. SERVICE wiring Circuit 39 for shorts.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST TX: NO WARNING TONE WHEN THERMOMETER SYMBOL IS BLINKING

TEST STEP		RESULT ▶	ACTION TO TAKE
TX1	REVIEW OPERATION / VERIFY CONDITION		
	• The gauge driver alert tone is not active until at least 300 rpm or valid oil pressure has been detected, (i.e. vehicle was started). • Warning chime module will not beep if another sound is being produced. • Driver alert only given for temperatures above normal band.	▶	GO to **TX2.**
TX2	CHECK WARNING CHIME		
	• Turn ignition to RUN. • Press any cluster control button and listen for beep. • **Does chime beep?**	Yes ▶ No ▶	System OK. GO to Pinpoint Test **SA.**

PINPOINT TEST TF: TEMPERATURE GAUGE ALWAYS INDICATES COLD TEMPERATURE (BOTTOM BAR ILLUMINATED)

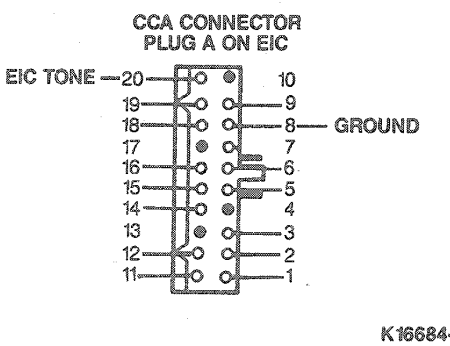
TEST STEP		RESULT ▶	ACTION TO TAKE
TF1	CHECK TEMPERATURE GAUGE WIRING		
	• Unplug connector to temperature sender and connect a jumper to ground in place of sender. • Turn ignition to RUN. • Gauge should give a short circuit indication. Top two and bottom two bars of gauge illuminated.	Top two and bottom two bars illuminate ▶ Bars do not illuminate as specified ▶	GO to **TF3.** REMOVE jumper. GO to **TF2.**
TF2	CHECK WIRING AT CLUSTER		
	• Disconnect ground cable to battery. • Remove cluster. • Connect jumper in place of temperature sender. • Verify continuity between Pins 4A and 8A of harness. • **Is there continuity?**	Yes ▶ No ▶	REPLACE cluster. SERVICE wiring Circuit 39 and / or temperature sender ground line for open circuit.
TF3	CHECK SENDER		
	• Warm up engine to normal operating temperature. • Measure resistance of temperature sender.	Resistance less than 8,000 ohms ▶ Resistance greater than 8,000 ohms ▶	REPLACE cluster. GO to **TF4.**
TF4	CHECK COOLING SYSTEM		
	• Check thermostat, coolant level, etc. for proper operation.	Cooling system OK ▶ Cooling system not OK ▶	REPLACE temperature sender. SERVICE cooling system as required.

PINPOINT TEST SA: DISPLAY DOES NOT RESPOND TO BUTTONS—NO BEEP WHEN BUTTONS PUSHED OR DRIVER ALERT GIVEN

TEST STEP		RESULT ▶	ACTION TO TAKE
SA1	VERIFY CONDITION		
	• Cluster only responds to buttons when ignition is in RUN. • Warning chime module will not beep if another sound is being produced.	Display does not respond to buttons ▶ No beep sounds but display response to buttons / warnings ▶	GO to **SA3.** GO to **SA2.**
SA2	CHECK WARNING CHIME MODULE		
	• Check for fasten safety belt reminder chime or key left in ignition reminder chime. • **Does chime sound?**	Yes ▶ No ▶	GO to **SA6.** SERVICE warning chime module.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST SA:
DISPLAY DOES NOT RESPOND TO BUTTONS—NO BEEP WHEN BUTTONS PUSHED OR DRIVER ALERT GIVEN (Continued)

TEST STEP	RESULT	ACTION TO TAKE
SA3 CHECK SWITCH WIRING CONNECTIONS ● Remove finish panel to expose cluster. ● Verify that connections at switch assembly are securely connected. ● **Are connections secure?**	Yes ▶ No ▶	GO to **SA4.** Secure connections and RECHECK.
SA4 CHECK SWITCH ASSEMBLY (BUTTON PRESSED) ● Unplug switch assembly from electronic instrument cluster (6-pin connector is located at front face of cluster to the far right). ● Measure resistance between Pin 2 (Y) and Pin 4 (O) of connector unplugged. ● The resistance should be: BUTTON / RESISTANCE (in ohms): E/M 4900-5400; SELECT 2200-2400; SPEED 320-360; RESET 980-985; NO BUTTON PRESSED 17000-17800 NOTE: Press only one button at a time. Wiggle wire at 6-pin switch connector and at switch module and check for loose connections. ● **Is resistance within range?**	Yes ▶ No ▶	GO to **SA5.** REPLACE switch assembly.
SA5 CHECK CLUSTER WIRING CONNECTIONS ● Visually inspect 6-pin switch connector for poor/damaged or missing connections.	Cluster pin damaged/missing ▶ Switch module pins damaged/missing ▶ All pins OK ▶	REPLACE cluster. REPLACE switch module. REPLACE cluster.
SA6 CHECK TONE CIRCUIT ● Disconnect battery ground cable. ● Remove cluster. ● Turn ignition switch to RUN and wait for the fasten safety belt reminder chime to end. ● Place jumper wire between harness Connector A, Pin 19 and ground. Listen for chime.  K16684-A ● **Does chime sound?**	Yes ▶ No ▶	REPLACE cluster. SERVICE wiring Circuit 183 for open. CHECK for correct warning chime module part number or operation.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST SB:
SPEEDOMETER READS 0 MPH (km/h) AT ALL SPEEDS WHEN VEHICLE IN MOTION

TEST STEP		RESULT ▶	ACTION TO TAKE
SB1	VERIFY CONDITION	▶	GO to SB2.
SB2	VERIFY DISPLAY PROVE OUT • Turn ignition switch to RUN. • Observe display (all segments ON, then OFF, and then normal display). • **Does display prove out properly?**	Yes ▶ No ▶	GO to SB3. REPLACE cluster.[1]
SB3	CHECK ODOMETER • Verify that odometer advances when vehicle is driven forward. • **Does odometer advance?**	No ▶ Yes ▶	GO to SB4. REPLACE cluster.[1]
SB4	CHECK FUEL COMPUTER • Test drive vehicle. • Select TRIP DISTANCE on fuel computer. • Distance should advance as vehicle is driven. • **Does distance advance?**	Yes ▶ No ▶	REPLACE cluster.[1] GO to SB5.
SB5	CHECK SPEED CONTROL • Test drive vehicle and check operation of speed (control, if so equipped. • **Does speed control operate properly?**	Yes ▶ No ▶	GO to SB10. GO to SB6.
SB6	CHECK WIRING TO SPEED SENSOR • Disconnect connector to vehicle speed sensor. • Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, measure the resistance between the two wires in the harness to the vehicle speed sensor. • Resistance should be greater than 500 ohms. • **Is resistance greater than 500 ohms?**	Yes ▶ No ▶	GO to SB7. SERVICE wiring Circuit 150, speed control, cluster for shorts.
SB7	CHECK VEHICLE SPEED SENSOR RESISTANCE • Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, measure the resistance between the two wires in the harness to the vehicle speed sensor. • Resistance should be 200 - 230 ohms. • **Is resistance within range?**	Yes ▶ No ▶	GO to SB8. REPLACE vehicle speed sensor. CHECK speedometer operation.
SB8	CHECK DRIVEN GEAR AND RETAINER CLIP • Disconnect vehicle speed sensor from transmission. Verify presence of driven gear with all teeth in good condition and the presence of retainer clip. • **Are driven gear and retainer clip OK?**	Drive gear / clip OK ▶ Drive gear / clip not OK ▶	GO to SB9. REPLACE with proper gear and / or clip.
SB9	CHECK DRIVE GEAR ON TRANSMISSION • Verify presence of drive gear on transaxle output shaft. • **Is drive gear OK?**	Drive gear present ▶ Drive gear not present ▶	GO to SB10. SERVICE gear.
SB10	CHECK WIRING TO CLUSTER • Reconnect vehicle speed sensor wiring. • Disconnect battery ground cable. • Remove cluster as outlined. • Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, measure the resistance between Pins 12 and 8 (ground) of Connector A. • Resistance should be 160 - 230 ohms. • **Is resistance within range?**	Resistance between 160 and 230 ohms ▶ Resistance not as specified ▶	REPLACE cluster.[1] SERVICE connectors / wiring from cluster to vehicle speed sensor Circuit 150. CHECK speedometer operation.

1 Affix odometer sticker to door pillar.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST SC:
SPEEDOMETER READS CONSTANTLY TOO HIGH OR LOW

TEST STEP		RESULT ▶	ACTION TO TAKE
SC1	VERIFY CONDITION	▶	GO to SC2.
SC2	CHECK ODOMETER ACCURACY		
	• Over a known distance, compare the odometer reading with the distance traveled.	Odometer accurate ▶	System OK.
		Odometer not accurate ▶	GO to SC3.
SC3	CHECK VEHICLE SPEED SENSOR DRIVE GEAR		
	• Remove vehicle speed sensor from transmission and verify that correct drive gear is installed for vehicle transmission / axle / tire combination.	Correct gear installed ▶	GO to SC4.
		Incorrect gear installed ▶	INSTALL correct gear with retaining clip.
SC4	CHECK DRIVE GEAR ON TRANSMISSION OUTPUT SHAFT		
	• Check that correct drive gear is installed on transaxle output shaft.	Correct gear installed ▶	REPLACE cluster module.[2]
		Incorrect gear installed ▶	INSTALL correct shaft / gear.

PINPOINT TEST SD:
SPEED INDICATION JUMPS UP AND DOWN ERRATICALLY

TEST STEP		RESULT ▶	ACTION TO TAKE
SD1	VERIFY CONDITION	▶	GO to SD2.
SD2	CHECK VEHICLE SPEED SENSOR DRIVE GEAR		
	• Remove vehicle speed sensor from transmission. • Check that all gear teeth are in good condition, retainer clip is installed and gear does not slip on shaft.	Gear / clip OK ▶	GO to SD3.
		Gear / clip not OK ▶	REPLACE drive gear and / or retaining clip.
SD3	CHECK WIRING TO VEHICLE SPEED SENSOR		
	• Disconnect connector to vehicle speed sensor. • Using Rotunda Digital Volt Ohmmeter 014-00407 or equivalent, check for intermittent resistance between the two wires in the harness to the vehicle speed sensor. • Resistance should be greater than 500 ohms.	Resistance greater than 500 ohms ▶	GO to SD4.
		Resistance less than 500 ohms ▶	SERVICE wiring Circuit 150, speed control for intermittent shorts or opens. CHECK speedometer operation.
SD4	CHECK VEHICLE SPEED SENSOR RESISTANCE		
	• Using Rotunda Digital Volt Ohmmeter 014-00407 or equivalent, check for intermittent resistance at vehicle speed sensor. • Resistance should be 200-230 ohms.	Resistance between 200 and 230 ohms ▶	GO to SD5.
		Resistance not as specified ▶	REPLACE vehicle speed sensor. CHECK speedometer operation.
SD5	CHECK WIRING TO CLUSTER		
	• Reconnect vehicle speed sensor wiring. • Disconnect battery ground cable. • Remove cluster. • Using Rotunda Digital Volt-Ohmmeter 014-00407 or equivalent, measure the resistance between Pin 12 and 8 (ground) of Connector A. • Resistance should be between 200 and 300 ohms.	Resistance constant ▶	REPLACE cluster.[2]
		Resistance intermittent ▶	SERVICE connectors / wiring from cluster to vehicle speed sensor Circuit 150. CHECK speedometer operation.

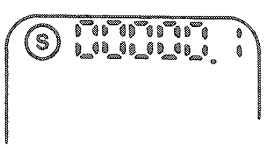
2 Affix odometer sticker to door pillar.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST SE:
ODOMETER DISPLAY READS "ERROR" AND SERVICE SYMBOL ON

TEST STEP	RESULT ▶	ACTION TO TAKE
SE1 VERIFY CONDITION		
 K16686-A	▶	REPLACE cluster.

PINPOINT TEST SF:
DISPLAY HAS "S" ILLUMINATED

TEST STEP	RESULT ▶	ACTION TO TAKE
SF1 VERIFY CONDITION		
 K16689-A	▶	GO to **SF2.**
SF2 DETERMINE IF SPEEDO/ODO MODULE IS ORIGINAL		
• Check for mileage sticker on door pillar. • **Is module original?**	Original ▶	Display damaged. REPLACE cluster. S should be illuminated and odometer should indicate zero miles.
	Replacement ▶	System OK. Label on door pillar should indicate mileage at which the replacement cluster was installed.

PINPOINT TEST SG:
ODOMETER DOES NOT ACCUMULATE MILEAGE, OR COUNTS 16 KM (10 MILES) AND JUMPS BACK 16 KM (10 MILES)

TEST STEP	RESULT ▶	ACTION TO TAKE
SG1 VERIFY CONDITION		
	Odometer will not accumulate ▶	GO to **SG1.**
	Odometer accumulates 16 Km (10 miles), then loses 16 Km (10 miles) ▶	REPLACE cluster.
SG2 VERIFY SPEEDOMETER		
• Verify that speedometer works properly. • **Does speedometer operate properly?**	Yes ▶	REPLACE cluster.
	No ▶	GO to Pinpoint Test **SB.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST SH: ODOMETER READING INCORRECT

TEST STEP		RESULT ▶	ACTION TO TAKE
SH1	VERIFY CONDITION		
	• Enter self-diagnosis as outlined. • **Does cluster flash?**	No ▶ Yes ▶	REPLACE cluster. GO to Pinpoint Test **SB1.**

PINPOINT TEST SJ: MILEAGE CONSTANTLY READS TOO HIGH OR LOW

TEST STEP		RESULT ▶	ACTION TO TAKE
SJ1	VERIFY CONDITION	▶	GO to **SJ2.**
SJ2	CHECK SPEEDOMETER		
	• Perform Pinpoint Test **SC.** • **Is system OK?**	Yes ▶ No ▶	GO to **SJ3.** GO to Pinpoint Test **SC.**
SJ3	CHECK DISPLAY		
	• Perform Pinpoint Test **TB.** • **Is system OK?**	Yes ▶ No ▶	GO to **SJ4.** GO to Pinpoint Test **TB.**
SJ4	CHECK ODOMETER MEMORY		
	• Perform Pinpoint Test **SH.** • **Is system OK?**	Yes ▶ No ▶	System OK GO to Pinpoint Test **SH.**

PINPOINT TEST SK: TACH ALWAYS INDICATES TOO HIGH OR TOO LOW—NO TACH INDICATION/TACH INDICATION ERRATIC

TEST STEP		RESULT ▶	ACTION TO TAKE
SK1	VERIFY CONDITION		
	• Make sure engine is operating properly and is not misfiring.	▶	GO to **SK2.**
SK2	CHECK WIRING		
	• Disconnect battery ground cable. • Remove cluster as outlined. • Measure resistance between Connector A, Pin 20 and coil. • Wiggle connections and wiring near coil to check for intermittent connection. • **Is resistance less than 100 ohms?**	Yes ▶ No ▶	REPLACE cluster. RECHECK operation. SERVICE wiring Circuit 11 for open circuit.

PINPOINT TEST FA: INSTANTANEOUS FUEL ECONOMY ALWAYS READ 0 MILES/GAL OR 99 L/100 KM OR 99 MILES/GAS OR 0 L/100 KM

TEST STEP		RESULT ▶	ACTION TO TAKE
FA1	VERIFY CONDITION	▶	GO to **FA2.**
FA2	CHECK SPEEDOMETER OPERATION		
	• Verify that speedometer is operating properly. • **Does speedometer operate properly?**	Yes ▶ No ▶	GO to **FA3.** GO to Pinpoint Test **SF.**
FA3	CHECK CONTINUITY OF CIRCUIT 305 (FUEL FLOW)		
	• Verify continuity and absence of shorts in Circuit 305.	Continuity and no shorts ▶ No continuity and/or shorts ▶	GO to Pinpoint Test **FD4.** SERVICE wiring Circuit 305 as required.
FA4	CHECK FOR FUEL FLOW PULSES		
	• Verify proper operation of fuel flow function in PCM. Refer to Powertrain Control/Emissions Diagnosis Manual.[3] • **Does fuel flow operate properly?**	Yes ▶ No ▶	REPLACE EIC. SERVICE or REPLACE EIC or fuel flow sensor system as required.

3 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FB: TRIP DISTANCE DOES NOT ACCUMULATE

TEST STEP		RESULT ▶	ACTION TO TAKE
FB1	VERIFY CONDITION	▶	GO to FB2.
FB2	CHECK SPEEDOMETER OPERATION ● Verify that speedometer is operating properly. ● **Does speedometer operate properly?**	Yes ▶ No ▶	REPLACE cluster. GO to Pinpoint Test SF.

PINPOINT TEST FC: DTE DOES NOT GO BELOW 322 KM (200 MILES) WITH FUEL TANK EMPTY DTE ALWAYS READS ZERO

TEST STEP		RESULT ▶	ACTION TO TAKE
FC1	VERIFY CONDITION	▶	GO to FC2.
FC2	CHECK FUEL GAUGE ● Verify that fuel gauge is operating properly. ● **Does fuel gauge operate properly?**	Yes ▶ No ▶	GO to FC3. GO to Pinpoint Test FD or FE.
FC3	CHECK SPEEDOMETER ● Verify that speedometer is operating properly. ● **Does speedometer operate properly?**	Yes ▶ No ▶	GO to FC4. GO to Pinpoint Test SB.
FC4	CHECK FOR FUEL FLOW PULSES ● Verify proper operation of fuel flow function in PCM. Refer to Powertrain Control / Emissions Diagnosis Manual.[4]	Yes ▶ No ▶	REPLACE EIC. SERVICE or REPLACE PCM or fuel flow sensor system as required.

PINPOINT TEST FD: CO DISPLAYED, GAUGE BLANKS OUT FUEL TANK SYMBOL AND LIGHTS TOP TWO AND BOTTOM TWO BARS OF GAUGE

TEST STEP		RESULT ▶	ACTION TO TAKE
FD1	VERIFY CONDITION ● **Does CO display?**	Yes ▶	GO to FD2.
FD2	CHECK FUEL TANK SENDING UNIT AND PUMP WIRING AT FUEL TANK SENDING UNIT AND PUMP ● Disconnect ground cable to battery. ● Lower fuel tank to gain access to fuel tank sending unit and pump connector. ● Unplug fuel sender connector. ● Jumper variable resistance terminal and ground terminal of harness together. ● Reconnect battery. ● Turn ignition switch from OFF to RUN. ● Check digital fuel remaining display for CO or CS. NOTE: It may take several minutes for the fuel gauge to respond.	CO displayed ▶ CS displayed ▶	GO to FD4. GO to FD3. REMOVE jumper.
FD3	CHECK FUEL TANK SENDING UNIT AND PUMP ● Turn ignition switch to OFF. ● Measure the resistance of the fuel tank sending unit and pump at the sender terminals. ● Verify that the resistance is between 11 and 168 ohms.	Resistance between 11 and 168 ohms ▶ Resistance not as specified ▶	INSPECT fuel tank sending unit and pump wiring connector female terminals for flash or loose fit. SERVICE as required. REPLACE fuel tank sending unit and pump.

4 Can be purchased as a separate item.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FD:
CO DISPLAYED, GAUGE BLANKS OUT FUEL TANK SYMBOL AND LIGHTS TOP TWO AND BOTTOM TWO BARS OF GAUGE (Continued)

TEST STEP		RESULT	ACTION TO TAKE
FD4	CHECK FUEL TANK SENDING UNIT AND PUMP WIRING AT CLUSTER		
	• Disconnect ground cable to battery. • Remove cluster and secure connectors from shorting. • Jumper variable resistance terminal and ground terminal of harness together at sender. • Verify condition between Pins 6 and 8 (ground) of cluster Connector A.	Yes ▶ No ▶	REPLACE cluster. AFFIX odometer sticker to door pillar. SERVICE fuel tank sending unit and pump wiring for open circuit.

PINPOINT TEST FE:
CS DISPLAYED, GAUGE BLANKS OUT TANK SYMBOL AND LIGHTS TOP TWO AND BOTTOM TWO BARS OF GAUGE

TEST STEP		RESULT	ACTION TO TAKE
FE1	VERIFY CONDITION		
	• **Does CS display?**	Yes ▶	GO to FE2.
FE2	CHECK FUEL TANK SENDING UNIT AND PUMP WIRING AT CLUSTER		
	• Disconnect ground cable to battery. • Remove cluster and secure connectors from shorting. • With an ohmmeter, measure resistance between Pins 6A and 8A (SIG GND) of harness. • Verify that the resistance is 11 ohms or greater (normally 11 to 168 ohms). • **Is resistance at least 11 ohms?**	Resistance between 11 and 168 ohms ▶ Resistance not as specified ▶	REPLACE cluster.[5] Short exists in harness or fuel tank sending unit and pump. GO to FE3.
FE3	CHECK FUEL TANK SENDING UNIT AND PUMP WIRING		
	• Disconnect ground cable to battery. • Lower fuel tank to gain access to fuel tank sending unit and pump connector. • Unplug connector to fuel tank sending unit and pump. • Measure resistance between Pins 6 and 8 (GND) of harness Connector A. • Verify that resistance is greater than 10,000 ohms.	Resistance between 11 and 168 ohms ▶ Resistance not as specified ▶	REPLACE fuel tank sending unit and pump. SERVICE fuel tank sending unit and pump wiring for short circuit.

PINPOINT TEST FF:
INACCURATE FUEL INDICATION—FULL NOT INDICATED WHEN FUEL TANK IS FULL—EMPTY NOT INDICATED WHEN FUEL TANK IS EMPTY

TEST STEP		RESULT	ACTION TO TAKE
FF1	VERIFY CONDITION		
		▶	GO to FF2.
FF2	CHECK FUEL GAUGE RESPONSE		
	• Disconnect ground cable to battery. • Lower fuel tank (if necessary) to gain access to fuel tank sending unit and pump connections. • Connect a 43 ohm (± 1 percent) resistor in place of fuel tank sending unit and pump. Verify resistance of resistor prior to test. • Reconnect battery. • Turn ignition key to RUN. • Fuel gauge should illuminate 2 to 3 bars. • Fuel remaining should read 13 to 15L (3 to 4 gal). • **Does gauge read properly?**	Yes ▶ No ▶	GO to FF4. TURN ignition OFF. GO to FF3. TURN ignition OFF.

5 Affix odometer sticker to door pillar.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FF:
INACCURATE FUEL INDICATION—FULL NOT INDICATED WHEN FUEL TANK IS FULL—EMPTY NOT INDICATED WHEN FUEL TANK IS EMPTY (Continued)

TEST STEP		RESULT	ACTION TO TAKE
FF3	CHECK HARNESS RESISTANCE		
	• Disconnect ground cable to battery. • Remove cluster and secure connectors from shorting. • With a 43 ohm resistor in place of fuel sender, measure resistance between Pins 6 and 8 of Connector A.	42-45 ohms ▶ Not between 42 and 45 ohms ▶	REPLACE cluster. SERVICE Circuit 29 as required.
FF4	CHECK FUEL TANK SENDING UNIT AND PUMP		
	• Disconnect ground cable to battery. • Check fuel tank sending unit and pump for binding, sticking, misalignment, etc. • **Is sender OK?**	Yes ▶ No ▶	GO to FF5. SERVICE or REPLACE fuel tank sending unit and pump as required.
FF5	CHECK FUEL TANK		
	• Check fuel tank for dents, bulges or other damage. • Check for proper installation of fuel tube. • **Are fuel tank or fuel tube OK?**	Yes ▶ No ▶	GO to FF6. REPLACE fuel tank or fuel tube.
FF6	CHECK FUEL VAPOR SYSTEM		
	• Check for blockage of fuel tank vapor valve, tubing or carbon canister. Refer to Section 10-00. • **Is system OK?**	Yes ▶ No ▶	System OK. Fault caused by other vehicle system. SERVICE or REPLACE as required.

PINPOINT TEST FG: DOOR AJAR WARNING NEVER/ALWAYS COMES ON

TEST STEP		RESULT	ACTION TO TAKE
FG1	VERIFY CONDITION		
		Always on ▶ Never on ▶	GO to FG2. GO to FG4.
FG2	CHECK SWITCHES		
	• The following steps are to be repeated for each door ajar switch. Start with the drivers door, then front passenger, then rear passengers. • Turn ignition switch to OFF. This resets the warning. • Pull connector off of the door ajar switch. • Turn ignition switch to RUN. • Check message center for warning. • Repeat until no warning is displayed or all door switches are disconnected. • **Is warning still displayed?**	Yes ▶ No ▶	GO to FG3. SERVICE the last switch tested.
FG3	CHECK CIRCUIT 627 (BK/O)		
	• Turn ignition switch to OFF. • Remove electronic instrument cluster. • Check continuity between Pins 17 and 8 of Connector A. • **Is there continuity?**	No ▶ Yes ▶	REPLACE cluster.[6] SERVICE Circuit 627 (BK/O) for short.
FG4	CHECK SWITCH		
	• Turn ignition switch to OFF. • Pull connector off of the problem door ajar switch. • Connect a jumper wire from Circuit 627 (BK/O) at the harness connector to ground. • Turn ignition switch to RUN. • Check message center for warning. • **Is warning displayed?**	Yes ▶ No ▶	SERVICE door ajar switch. GO to FG5.

6 Affix odometer sticker to door pillar.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FG: DOOR AJAR WARNING NEVER/ALWAYS COMES ON (Continued)

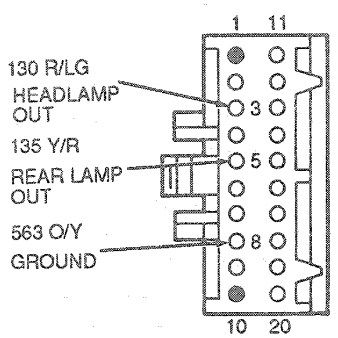
TEST STEP		RESULT ▶	ACTION TO TAKE
FG5	CHECK WIRING		
	• Leave jumper wire connected as in FG3. • Turn ignition switch to OFF. • Remove electronic instrument cluster. • Check continuity between Pins 17 and 8 of Connector A. • **Is there continuity?**	Yes ▶ No ▶	REPLACE EIC. SERVICE Circuit 627 (BK/O) for open.

PINPOINT TEST FP:
WASHER FLUID NEVER ILLUMINATES OR ILLUMINATED AT ALL TIMES

TEST STEP		RESULT ▶	ACTION TO TAKE
FP1	VERIFY CONDITION		
	• Warning never on. Drain fluid from reservoir. • Warning on at all times. Fill reservoir. • Turn ignition to RUN and actuate wiper/washer switch. • Check system scanner for washer fluid warnings.	Warning never on ▶ Warning on at all times ▶ Warning always illuminates when washer fluid is used ▶	GO to **FP2.** GO to **FP6.** GO to **FP7.**
FP2	CHECK SENSOR		
	• Ensure washer fluid is drained from reservoir. • Disconnect electrical connector from windshield washer fluid sensor. • Check sensor for continuity. • **Is there continuity?**	No ▶ Yes ▶	REPLACE sensor. GO to **FP3.**
FP3	SENSOR VOLTAGE CHECK		
	• Reconnect sensor. • Turn ignition to RUN and actuate wiper/washer switch. • Measure voltage (with respect to ground) at wiper washer fluid sensor. • **Is voltage greater than 9 volts?**	No ▶ Yes ▶	TEST wiper/washer switch. Refer to Section 11-05. CHECK for an open between sensor and switch. GO to **FP4.**
FP4	CHECK FOR INTERMITTENT CONNECTION AT CLUSTER		
	• Remove cluster from dash. Do not disconnect. • Turn ignition to RUN and actuate wiper switch. • With wiper switch activated, wiggle Connector B and check connection. • **Is connection intermittent?**	Yes ▶ No ▶	SERVICE Connector B or flexible circuit on cluster. GO to **FP5.**
FP5	CHECK VOLTAGE AT CLUSTER		
	• Remove cluster as outlined. • Turn ignition to RUN. • Actuate washer fluid switch and measure voltage at Connector B, Pin 15 to ground. • **Is voltage greater than 9 volts?**	No ▶ Yes ▶	CHECK Circuit 298 for an open or short. REPLACE cluster.
FP6	CHECK VOLTAGE AT CLUSTER		
	• Remove cluster as outlined. • Turn ignition to RUN and measure voltage at connector B, Pin 15 to ground. • **Is voltage greater than 3 volts?**	No ▶ Yes ▶	REPLACE cluster. CHECK Circuit 298 for a short to battery or run circuits.
FP7	CHECK SENSOR		
	• Ensure reservoir is full. • Disconnect electrical connector and windshield washer fluid reservoir. • Check continuity across sensor. • **Is there continuity?**	No ▶ Yes ▶	CHECK for an open or short in Circuit 941. REPLACE sensor.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FI:
HEADLAMP, REAR LAMP OUT WARNING ALWAYS ON

TEST STEP		RESULT	ACTION TO TAKE
FI1	VERIFY CONDITION		
		▶	GO to FI2.
FI2	CHECK EXTERIOR BULBS		
	• Check low beam headlamp bulbs. • Check brake lamp bulbs. • Check rear park lamp bulbs. • **Are bulbs OK?**	Yes ▶ No ▶	GO to FI3. SERVICE bulbs.
FI3	CHECK LAMP OUTAGE MODULE INPUT TO ELECTRONIC INSTRUMENT CLUSTER		
	• Disconnect lamp outage module from wiring harness. (Refer to Section 13-09 for location and removal procedure.) • Turn ignition switch to RUN. • **Does warning message remain on?**	Yes ▶ No ▶	GO to FI4. GO to Section 13-09 to troubleshoot lamp outage module.
FI4	CHECK FOR SHORT TO GROUND IN ELECTRONIC CLUSTER HARNESS		
	• With lamp outage module disconnected, disconnect electronic instrument cluster. • Turn ignition switch to RUN. • Check continuity between Ground, Pin 8, Circuit 563 (O/Y) and the "Headlamp Out" warning, Pin 3 (130 R/LG) on the cluster harness connector. • Check continuity between Ground, Pin 8 (563 O/Y) and the "Rear Lamp Out" warning, Pin 5 (125 Y/R). • Check continuity between Ground, Pin 8 (563 O/W) and the "Rear Lamp Out" warning, Pin 5 (135 Y/R). **Electronic Instrument Cluster Harness Connector**  K18675-A • **Is there continuity?**	Yes ▶ No ▶	SERVICE circuit shorted to ground. REPLACE electronic instrument cluster.

PINPOINT TEST FJ:
"CHECK LOW OIL" LEVEL WARNING IS ALWAYS ON

TEST STEP		RESULT	ACTION TO TAKE
FJ1	VERIFY CONDITION		
		▶	GO to FJ2.
FJ2	CHECK TIME-OUT		
	• Park vehicle on level surface. • Check engine oil level with dipstick. Fill to FULL mark with proper motor oil. • Turn ignition switch to OFF. • Wait for more than **two** minutes. • Turn ignition switch to RUN. • Check messages for oil level warning. • **Is warning displayed?**	Yes ▶ No ▶	GO to FJ3. System operating properly.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST FJ:
"CHECK LOW OIL" LEVEL WARNING IS ALWAYS ON (Continued)

TEST STEP		RESULT	ACTION TO TAKE
FJ3	CHECK SENSOR		
	• Turn ignition switch to OFF. • Disconnect wire from oil level sensor. • Wait for more than two minutes. • Turn ignition switch to RUN. • Check messages for oil level warning. • **Is warning displayed?**	Yes ▶ No ▶	GO to FJ4. SERVICE oil level sensor.
FJ4	CHECK WIRING		
	• Remove electronic instrument cluster. • Disconnect wire from oil level sensor. • Measure resistance from electronic instrument cluster harness Connector A, Pin 14 to Connector A, Pin 8 or ground. • Circuit should be open. • **Is circuit open?**	Yes ▶ No ▶	REPLACE cluster. SERVICE Circuit 258 (W/PK) for short.

REMOVAL AND INSTALLATION

Cluster Assembly

Federal law requires that the odometer in any replacement speedometer/odometer must register the same mileage as that registered on the removed speedometer/odometer. Service replacement speedometer/odometers and odometer modules with the mileage preset to actual vehicle mileage are available through Ford Electronic Service Centers. In nearly all instances, the mileage continues to accumulate in the odometer memory even if the odometer does not display mileage. This mileage can usually be verified by the electronic service centers. Contact the service center for instructions to receive a replacement speedometer/odometer or odometer module with the mileage preset to actual mileage.

If the actual vehicle mileage cannot be verified, the service center will supply a speedometer/odometer or odometer module with the odometer display preset to zero ("0") miles and the service odometer segment "S" illuminated in the vicinity of the odometer display. In addition, an odometer mileage sticker is supplied with the replacement odometer. This sticker must display the estimated vehicle mileage and is to be affixed to the driver's door.

Removal

1. Disconnect battery ground cable.
2. Remove two lower trim covers.
3. Remove steering column cover and disconnect two screws retaining PRNDL cable to cluster.
4. Remove cluster trim panel.

   NOTE: Switch module must be disconnected from cluster to remove trim panel.
5. Remove four cluster retaining screws.
6. Pull bottom of cluster toward steering wheel.
7. Reaching behind and underneath cluster, disconnect three connectors.
8. Swing bottom of cluster out to clear top of cluster from crash pad and remove cluster.

Installation

1. Insert top of cluster under crash pad, leaving bottom out.
2. Connect three connectors.
3. Seat cluster and install four retaining screws.
4. Connect battery ground cable and check cluster operation.
5. Connect PRNDL. Check PRNDL dial alignment and adjust if necessary. Install steering column cover.
6. Connect switch module to cluster and install cluster trim panel.
7. Install two lower trim covers.

Mask Assembly

Removal

1. Remove instrument cluster as outlined.
2. Set cluster on clean surface facing up.
3. Remove warning indicator bulbs.

   NOTE: Mask will not remove from backplate unless bulbs are removed.
4. Remove five screws retaining mask to backplate.
5. Disconnect switch connector from backplate and remove mask.

Installation

1. Insert switch connector into mask.
2. Place mask on backplate and install five retaining screws.

REMOVAL AND INSTALLATION (Continued)

3. Install warning indicator bulbs.
4. Install cluster as outlined.

Switch Module

Removal

1. Remove two lower trim covers.
2. Remove cluster trim panel.

   NOTE: Switch module must be disconnected from cluster to remove trim panel.
3. Remove two switch module retaining screws and remove switch module.

Installation

1. Mount switch module to trim panel and install two retaining screws.
2. Connect switch module to cluster and install cluster trim panel.
3. Install two lower trim covers.
4. Test switch module with cluster illuminated.

Vehicle Speed Sensor

Refer to Section 10-03.

Fuel Lines

Tools Required:

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

WARNING: FUEL SUPPLY LINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN.

This pressure must be relieved before servicing the fuel system. A valve is provided on the fuel rail assembly for this purpose. Attach EFI-CFI Fuel Pressure Gauge T80L-9974-B to fuel diagnostic valve on fuel rail assembly. Pressure in fuel system may now be released.

Fuel Pump and Sender Unit Assembly

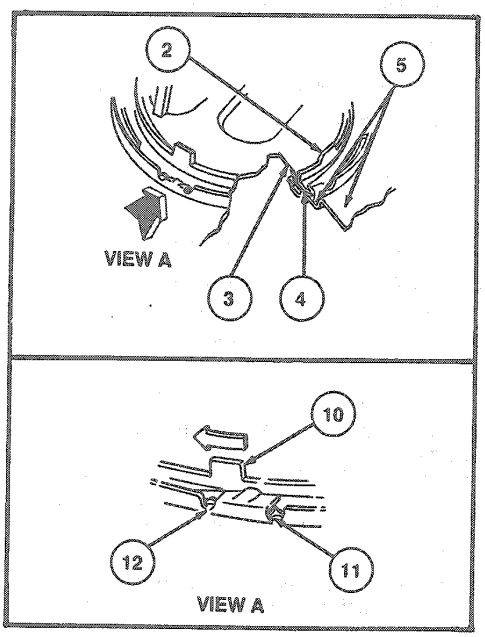
Tools Required:

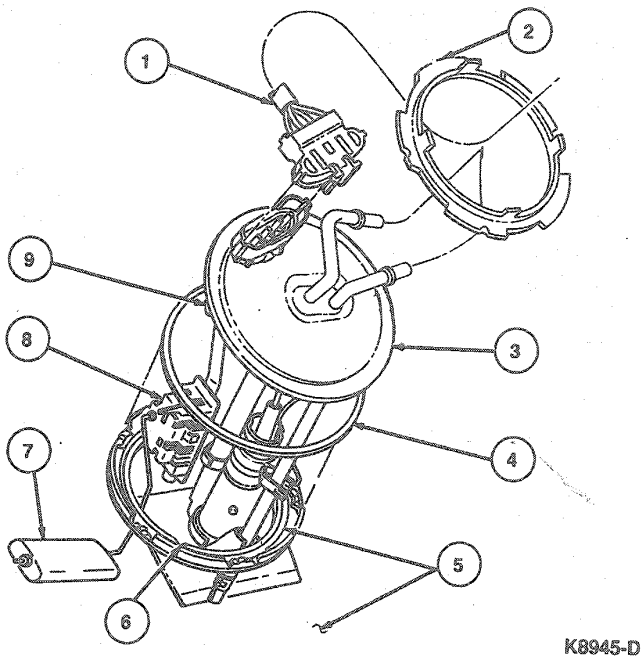
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Fuel Storage Tanker Adapter Hose 034-00012
- Fuel / Tank Sender Wrench T86T-9275-A

Removal

1. Place vehicle on hoist. Do not raise.
2. Depressurize fuel system as outlined.
3. Remove fuel from fuel tank using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.
4. Raise vehicle on hoist. Refer to Section 00-02.
5. Remove fuel tube. Remove fuel tank support strap (9092) band fasteners nearest front of vehicle. Carefully lower front of fuel tank and disconnect fuel and fuel tank vent tube (9A086) and electrical connector. Remove fuel tank to bench.
6. Remove dirt that has accumulated around fuel pump and fuel tank sending unit and pump so dirt will not enter tank.
7. Turn fuel pump locking retainer ring (9C385) counterclockwise using Fuel Tank Sender Wrench T86T-9275-A. Remove locking ring, fuel pump and fuel tank sending unit and pumpassembly.

REMOVAL AND INSTALLATION (Continued)





K8945-D

Item	Part Number	Description
1	14405	Wiring Harness Assembly
2	9C385	Locking Ring
3	9H307	Fuel Tank Sending Unit and Pump
4	N803861-S	O-Ring
5	—	Retainer Ring, Part of 9002 Fuel Tank
6	—	Locking Slots

(Continued)

Item	Part Number	Description
7	—	Float, Part of 9H307 Fuel Tank Sending Unit and Pump
8	—	Variable Resistor, Part of 9H307 Fuel Tank Sending Unit and Pump
9	—	Locking Tabs
10	—	Locating Tab
11	—	Stop
12	—	Detent

TK8945D

Installation

1. Clean fuel tank sending unit and pump mounting surface at fuel tank.
2. Apply a light coating of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent on a new seal ring and install seal ring and fuel tank sending unit and pump assembly. Secure by rotating locking ring clockwise against stop. Ensure seal remains in place.
3. Support fuel tank under vehicle and connect fuel and vent lines and electrical connector.
4. Install fuel tank. Secure fuel tank support strap.
5. Install fuel tube. Fill fuel tank with a minimum of 38 L (10 gal) of fuel.
6. Turn ignition switch to ON then OFF at three second intervals (with EFI-CFI Fuel Pressure Gauge T80L-9974-B or equivalent), until fuel pressure builds to 270 kPa (30 psi).
7. Start vehicle, check fuel gauge operation and check for fuel leaks.

Electronic Low Fuel Warning Assembly

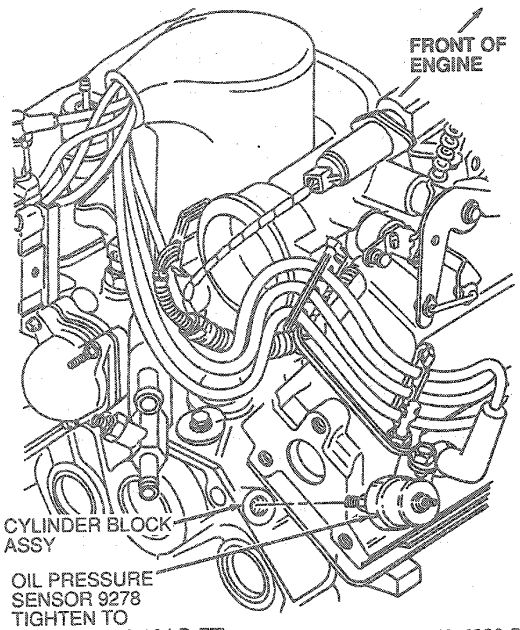
Removal and Installation

1. Remove instrument cluster as outlined.
2. Remove screw retaining assembly to cluster and remove assembly.
3. To install, position assembly on cluster and install retaining screw. Tighten screw to 0.8-1.4 N·m (8-12 lb-in).
4. Install instrument cluster as outlined in Section 13-00.

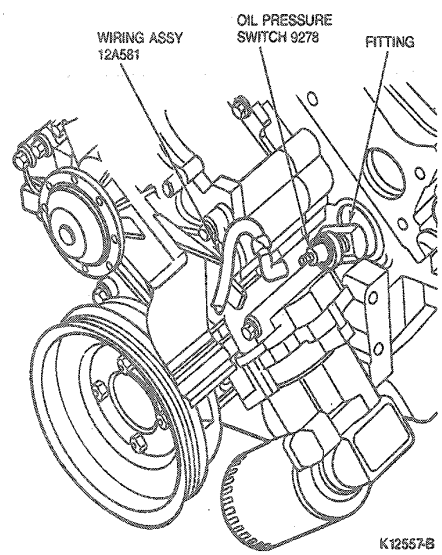
REMOVAL AND INSTALLATION (Continued)

Oil Pressure Switch

3.0L Multiport Fuel Injection (MFI) Engine



3.8L MFI Engine



CAUTION: Installation of the wrong part will result in an inoperative oil pressure indicating system and a damaged sender unit or gauge.

The pressure switch-type unit used with the warning indicator systems is not interchangeable with the variable resistance-type unit used with the gauge system. Refer to the Master Parts catalog for proper parts usage.

3.0L Engine

Tool Required:

- Remover / Replacer Tool 87L-9278-A

Removal and Installation

1. Disconnect wire at oil pressure sender (9278) and remove oil pressure sender using Removal / Replacer Tool T87L-9278-A.
2. To install oil pressure sender, coat threads with Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent and install in fitting.
3. Tighten oil pressure sender to 19 N·m (14 lb-ft) using Removal / Replacer Tool T87L-9278-A.
4. Install electrical connector to switch.
5. Start engine and check for oil leaks.

3.8L Engine

Tool Required:

- Remover / Replacer Tool 87L-9278-A

Removal

1. Remove washer solvent / coolant recovery bottle.
2. Release drive belt tension and position drive belt aside.
3. Remove belt idler pulley below power steering pump.
4. Disconnect wire from oil pressure sender and remove oil pressure sender using Removal / Replacer Tool T87L-9278-A.

Installation

1. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent to threads of oil pressure sender. Install oil pressure sender using Removal / Replacer Tool T87L-9278-A. Tighten to 11-24 N·m (9-17 lb-ft).
2. Install idler pulley. Tighten bolt to 70-95 N·m (52-70 lb-ft).
3. Install drive belt.
4. Install washer solvent / coolant recovery bottle. Top off fluids.
5. Start engine and check for leaks.

SPECIFICATIONS

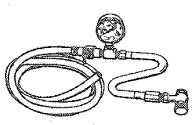
TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Cluster Retaining Screw	0.8-1.4	8-12 (Lb-In)
Oil Pressure Switch 3.0L MFI	19	14
Oil Pressure Switch 3.8L	11-24	9-17
Idler Pulley Bolt	70-95	52-70

ROTUNDA EQUIPMENT

Model	Description
014-00407	Digital Volt-Ohmmeter
034-00002	Fuel Storage Tanker
034-00012	Fuel Storage Tanker Adapter Hose

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T80L-9974-B EFI-CFI Fuel Pressure Gauge	 T80L-9974-B
T86T-9275-A Fuel Tank Sender Wrench	 T86T-9275-A
T87L-9278-A Removal/Replacer Tool	 T87L-9278-A

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9002	Fuel Tank	
9092	Fuel Tank Support Strap	
9278	Oil Pressure Sender	
9280	Fuel Gauge	
9291	Fuel Tube	
9A086	Fuel Tank Vent Tube	
9C385	Fuel Pump Locking Retainer Ring	
9H307	Fuel Tank Sending Unit and Pump	

SECTION 13-01B Instrument Cluster—Conventional

VEHICLE APPLICATION

Taurus / Sable.

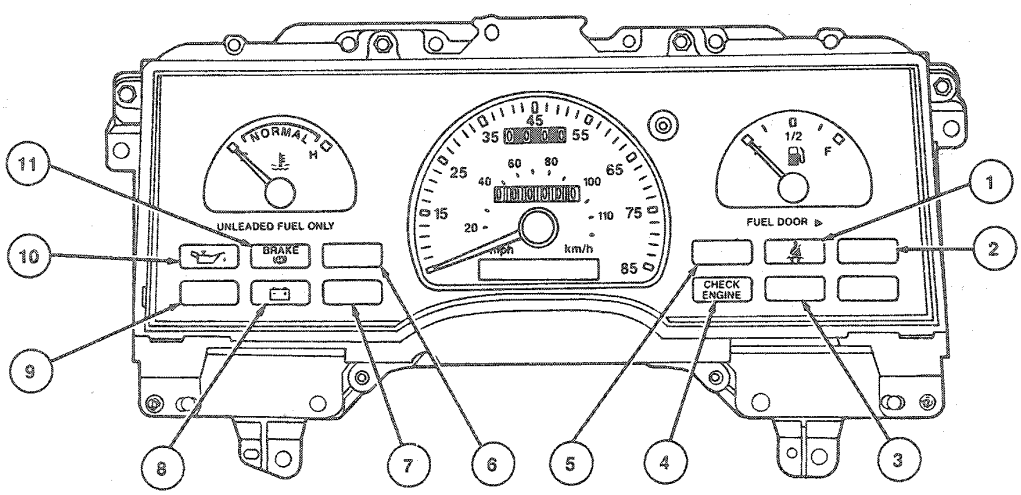
DESCRIPTION AND OPERATION

Instrument Cluster

Taurus

The standard instrument cluster contains a speedometer, fuel gauge, temperature gauge, odometer, and trip odometer. It also contains high beam, fasten safety belts, brake, charge and oil pressure warning indicators. The optional Sable instrument cluster is supplied with the Taurus vehicle when diagnostic warning indicators are ordered (Standard on LX).

Taurus—Standard



K13972-B

DESCRIPTION AND OPERATION (Continued)

Item	Description
1	Safety Belt Indicator
2	Liftgate Ajar Indicator
3	Air Bag Readiness Indicator
4	Check Engine / Malfunction Indicator Lamp (MIL)
5	RH Turn Signal Indicator

(Continued)

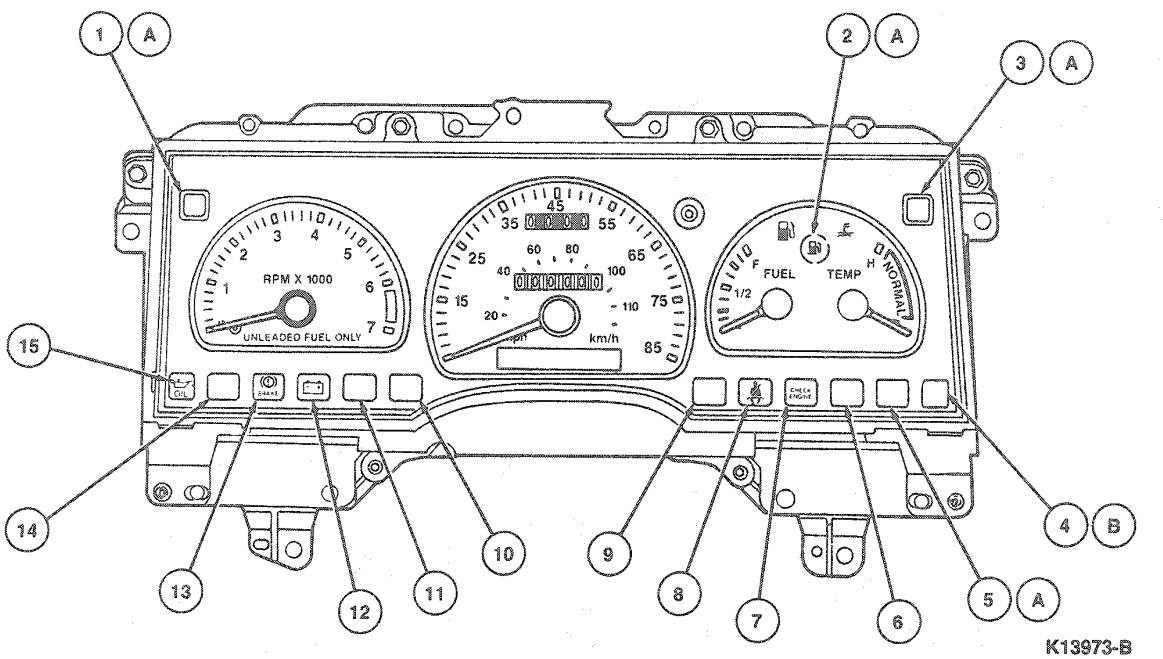
Item	Description
6	LH Turn Signal Indicator
7	High Beam Indicator
8	Charging System Indicator
9	Anti-Lock Brake Indicator
10	Low Oil Pressure Indicator
11	Brake System Indicator

TK13972B

Sable

The Sable instrument cluster contains a speedometer with trip odometer, fuel gauge, temperature gauge and tachometer. The cluster also contains a high beam, turn signals, fasten safety belts, brake, oil pressure, liftgate ajar (station wagon only) and charge warning indicators. An optional cluster with diagnostic warning indicators is also available (standard on LS).

Sable LS / Taurus LX (Standard) Sable / Taurus (Optional)



K13973-B

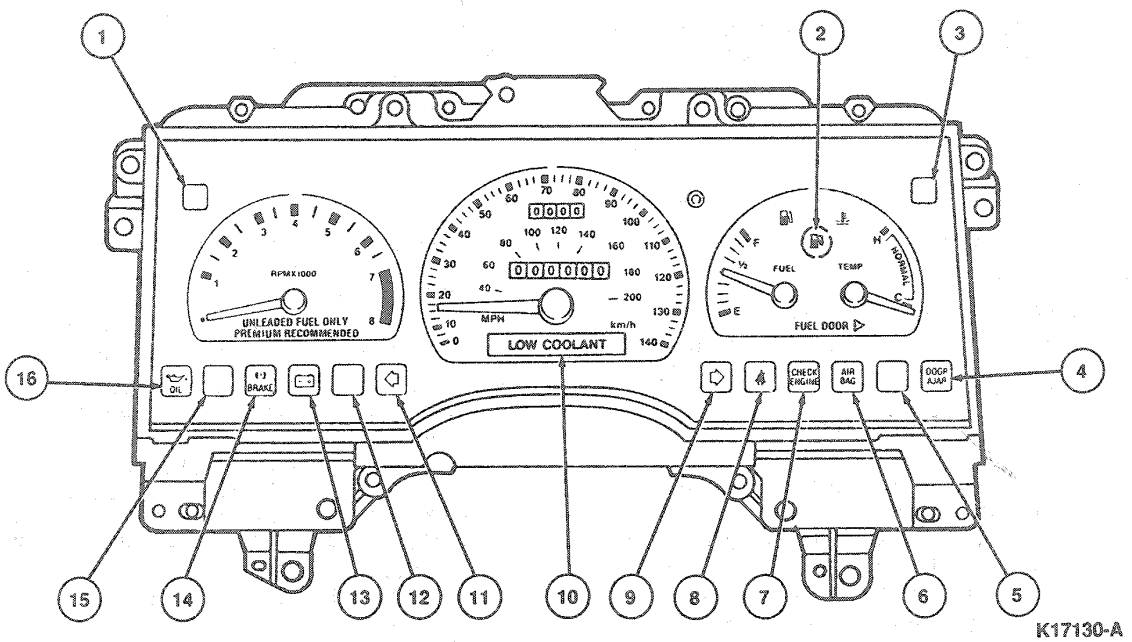
Item	Description
1A	Lamp Out
2A	Low Fuel Indicator
3A	Low Washer Fluid Indicator
4B	Liftgate / Door Ajar Indicator
5A	Check Oil Indicator
6	Air Bag Readiness Indicator
7	Check Engine Indicator
8	Safety Belt Indicator

(Continued)

Item	Description
9	RH Turn Signal Indicator
10	LH Turn Signal Indicator
11	High Beam Indicator
12	Charging System (Amp) Indicator
13	Brake Warning Indicator
14	Anti-Lock Brake Indicator
15	Low Oil Pressure Indicator
A	Not Included on Sable Standard Cluster
B	Standard on Station Wagon

DESCRIPTION AND OPERATION (Continued)

Taurus SHO



Item	Description
1	Lamp Out
2	Low Fuel Indicator
3	Low Washer Fluid Indicator
4	Liftgate / Door Ajar Indicator
5	Check Oil Indicator
6	Air Bag Readiness Indicator
7	Malfunction Indicator

(Continued)

Item	Description
8	Safety Belt Indicator
9	RH Turn Signal Indicator
10	Low Coolant Indicator
11	LH Turn Signal Indicator
12	High Beam Indicator
13	Charging System (Amp) Indicator
14	Brake Warning Indicator
15	Anti-Lock Brake Indicator
16	Low Oil Pressure Indicator

Magnetic Gauges

CAUTION: Do not remove magnetic gauge pointers; the gauge cannot be recalibrated.

NOTE: An instrument voltage regulator (IVR) is not required for this system.

DIAGNOSIS AND TESTING

Printed Circuit

The printed circuit which supplies current to the instrument panel indicators, gauges, and some clocks, is made of copper foil which is bonded to a polyester base film (usually referred to as Mylar).

The printed circuit is mounted to the cluster housing and due to its location, cannot be easily inspected and / or tested in the vehicle. This makes the printed circuit vulnerable to damage when a probe is used for in-vehicle testing as the probe can pierce the printed circuit or in some cases, burn the copper conductor.

Since there is no approved procedure for in-vehicle testing of the printed circuit, it must be removed for visual inspection. If no visual damage is evident, each circuit should be tested with an ohmmeter. If an open circuit or short is detected, the printed circuit must be replaced.

Gauges

Refer to Section 13-02 for diagnosis and removal and installation of the speedometer or odometer.

DIAGNOSIS AND TESTING (Continued)

Refer to Section 13-03 for diagnosis and removal and installation of the fuel gauge.

Refer to Section 13-04 for diagnosis and removal and installation of the charging system gauge or warning indicator.

Refer to Section 13-05 for diagnosis and removal and installation of the tachometer, oil pressure, coolant temperature gauges or warning indicators.

Refer to Section 13-09 for diagnosis and removal and installation of miscellaneous gauges or warning devices.

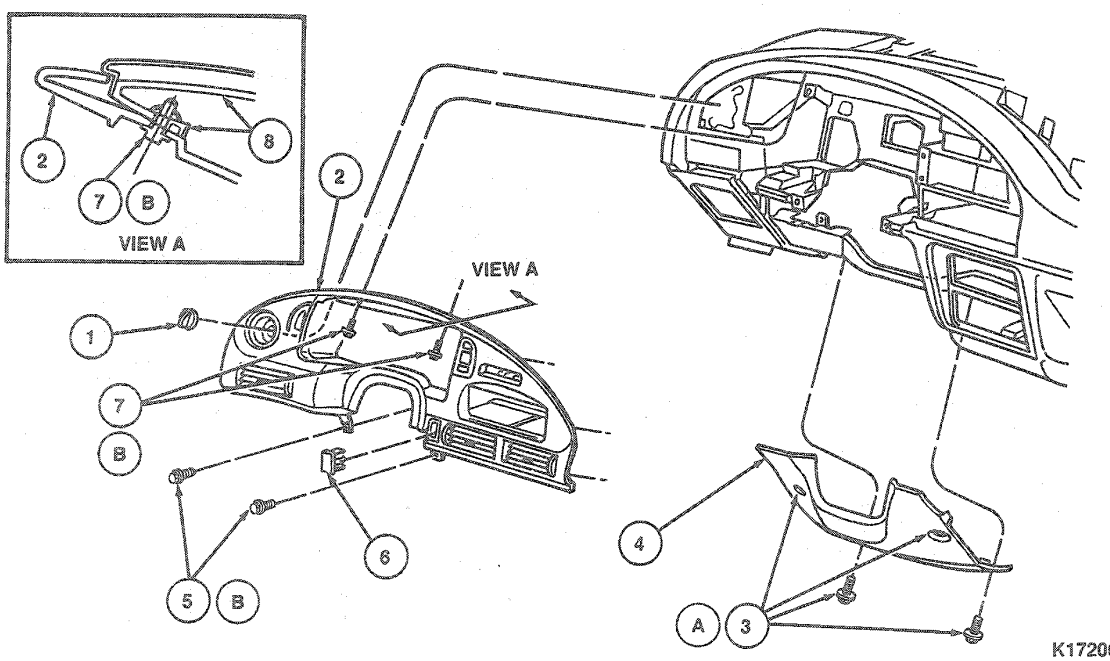
REMOVAL AND INSTALLATION

Instrument Cluster

Removal and Installation

1. Disconnect battery ground cable.
2. Remove ignition lock cylinder assembly (refer to Section 11-04) to permit removal of steering column shrouds.
3. Remove steering column trim shrouds.
4. Remove screws retaining lower LH and radio finish panels (one screw each) and remove panels by snapping out.
5. On Taurus vehicles only, remove clock assembly (or clock cover) to gain access to finish panel screw behind clock. Refer to Section 13-07.
6. Remove seven cluster opening finish panel retaining screws, and one jam nut behind headlamp switch. Remove finish panel by rocking upper edge toward driver.
7. On column shift vehicles only, disconnect transaxle range indicator cable from column (one screw and cable loop).
8. Disconnect upper speedometer cable from lower speedometer cable in engine compartment.
9. Remove four screws retaining cluster to instrument panel and pull cluster assembly forward.
10. Disconnect cluster electrical connectors and speedometer cable. Press cable latch to disengage cable from speedometer head, while pulling cable away from cluster. Remove cluster.
11. To install, reverse Removal procedure and calibrate the transaxle range indicator using the thumbwheel.

Taurus



REMOVAL AND INSTALLATION (Continued)

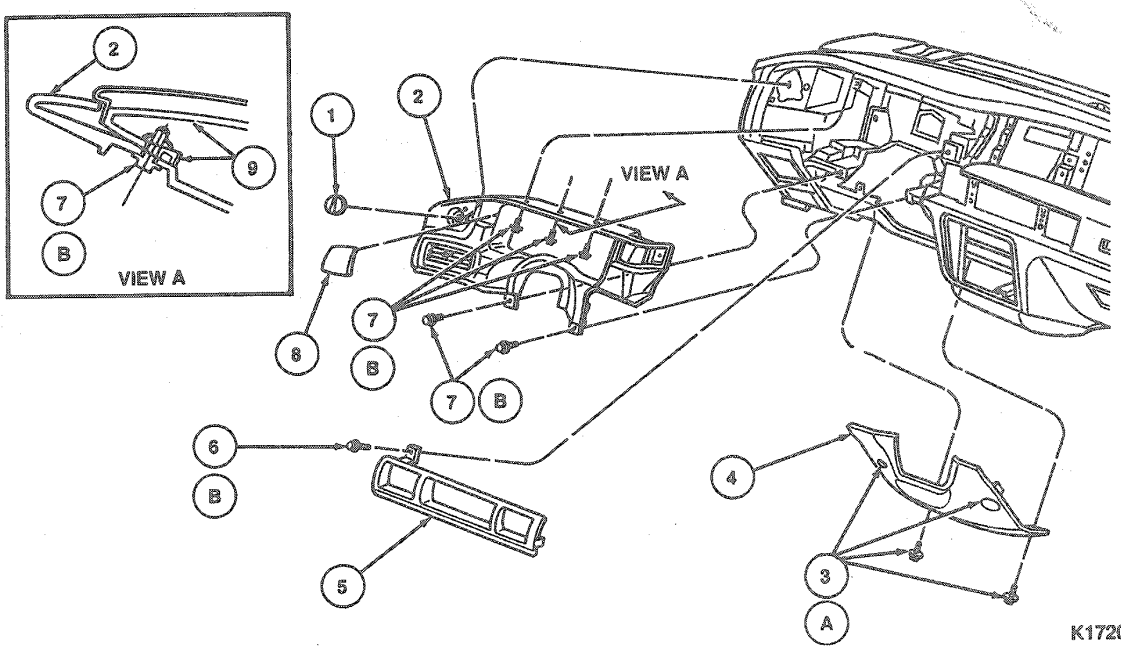
Item	Part Number	Description
1	11666	Lamp Switch Knob Assy
2	044D70	Instrument Panel Cluster Assy
3A	N806715-S36B	Screw (4 Req'd)
4	046A72	Steering Column Opening Cover Assy
5B	N804306-S36B	Lower Instrument Panel Cluster Screws (2 Req'd)

(Continued)

Item	Part Number	Description
6	044F58	Instrument Panel Control Opening Cover Assy
7B	N804306-S36B	Upper Instrument Panel Cluster Screws (2 Req'd)
8	—	Instrument Panel Cover and Pad Assy
A	—	Tighten to 9-14 N·m (80-124 Lb-in)
B	—	Tighten to 2-3 N·m (18-27 Lb-in)

TK17206A

Sable



K17207-A

Item	Part Number	Description
1	11666	Lamp Switch Knob Assy
2	044D70	Instrument Panel Cluster Assy
3A	N804306-S36B	Screw (4 Req'd)
4	046A72	Steering Column Opening Cover Assy
5	044A92	Instrument Panel Upper Center Finish Panel Assy
6B	N804306-S36B	Instrument Panel Upper Center Finish Panel Screw

(Continued)

Item	Part Number	Description
7B	N804306-S36B	Instrument Panel Cluster Assy Screws (5 Req'd)
8	044F58	Instrument Panel Control Opening Cover
9	—	Instrument Panel Cover and Pad Assy
A	—	Tighten to 9-14 N·m (80-124 Lb-in)
B	—	Tighten to 2-3 N·m (18-27 Lb-in)

TK17207A

REMOVAL AND INSTALLATION (Continued)

Bulb, Illumination

Removal and Installation

WARNING: ILLUMINATION BULBS ARE PRESSURIZED AND MAY SHATTER IF IMPROPERLY HANDLED. WEAR EYE PROTECTION WHEN SERVICING ILLUMINATION BULBS.

1. Remove instrument cluster as outlined.
2. Allow illumination bulbs to cool before servicing.
3. Remove bulb and socket assembly. Dispose of carefully.
4. Install new bulb and socket assembly.
5. Install instrument cluster as outlined. Check instrument panel illumination.

Low Fuel Warning Assembly, Electronic

Removal and Installation

1. Remove instrument cluster as outlined.
2. Depress clip retaining assembly to lower left of cluster (rear view) backplate and remove assembly.
3. Position assembly in pocket slides and push inward to fully snap assembly in cluster.
4. Install instrument cluster as outlined.

Flexible Printed Circuit

Removal

1. Remove instrument cluster as outlined.
2. Remove low fuel warning assembly as outlined.
3. Remove all bulb and socket assemblies by twisting counterclockwise.
4. Remove speedometer and gauges. Refer to Section 13-02.
5. Remove clips using long-nose pliers. Squeeze both ends of clip equally so that locking ears will slide through clip opening in backplate. Push clip through opening.

   CAUTION: Do not overbend clips as they may break.
6. After all clips are removed, printed circuit can be removed.

Installation

1. Position printed circuit on backplate and install clips by bending tabs on clips with fingers. Push clip into clip opening until locking ears are locked into backplate.

   NOTE: An audible click will be heard when clips are locked into position.
2. Install speedometer and gauges as outlined.
3. Install all bulb and socket assemblies into backplate by twisting clockwise.
4. Install low fuel warning assembly as outlined.
5. Install instrument cluster as outlined.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Instrument Cluster Screws	2-3	18-27
Steering Column Opening Cover Screws	9-14	80-124

SECTION 13-02 Speedometer/Odometer

VEHICLE APPLICATION

Taurus/Sable.

DESCRIPTION AND OPERATION

The speedometer is connected to the output shaft of the transaxle by means of a flexible shaft (core), and a drive gear located inside the transaxle. The core drives the speedometer and also drives an odometer.

The core or flexible shaft is housed in a flexible casing.

DIAGNOSIS AND TESTING

The Ford Car Master Parts catalog and the Lincoln/Mercury Parts and Accessories catalog show the proper speedometer transmission gears to use for various transaxle and tire size combinations. The correct gears must be used to comply with Federal law.

The diagnosis charts should be used to isolate concerns in the non-electronic speedometer.

PINPOINT TEST A: SPEEDOMETER/ODOMETER NOISY, ERRATIC, INOPERATIVE OR INACCURATE

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VERIFY CONDITION		
	• Make sure quick connect is properly attached at speedometer head. Make sure cable is connected at the speed sensor, if applicable.	Noisy ▶	GO to A2.
		Erratic or pointer waver ▶	GO to A3.
		Inoperative speed indication ▶	GO to A7.
		Inoperative odometer ▶	GO to A8.
		Inaccurate speed indication ▶	GO to A15.
A2	CHECK FOR NOISE		
	• With engine running in NEUTRAL, check for noise. • **Is noise present?**	Yes ▶	CHECK for other causes of vehicle noise.
		No ▶	GO to A3.
A3	CHECK CABLE		
	• Check cable for kinks or bends. • **Is cable OK?**	Yes ▶	GO to A4.
		No ▶	If kinks are severe, REPLACE cable. For minor bends, ADJUST cable routing to obtain generous curves and RECHECK for condition resolution.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SPEEDOMETER/ODOMETER NOISY, ERRATIC, INOPERATIVE OR INACCURATE (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A4	CHECK CABLE		
	• Disconnect cable and check core for kinks, burrs or bent tips. • **Is cable OK?**	Yes ▶ No ▶	GO to A5. REPLACE cable.
A5	CHECK VEHICLE SPEED SENSOR (VSS) 9E731		
	• Remove vehicle speed sensor (VSS), check for erratic or noisy operation. • **Is speed sensor OK?**	Yes ▶ No ▶	GO to A6. REPLACE vehicle speed sensor (VSS).
A6	CHECK DRIVEN GEAR		
	• Check for damaged driven gear. • **Is driven gear OK?**	Yes ▶ No ▶	REPLACE speedometer head. REPLACE gear.
A7	CHECK ODOMETER		
	• Check to see that odometer is operating. • **Does odometer operate properly?**	Yes ▶ No ▶	REPLACE speedometer head. GO to A9.
A8	CHECK POINTER OPERATION		
	• Check to see that pointer operates. • **Does pointer operate properly?**	No ▶ Yes ▶	GO to A9. REPLACE speedometer head.
A9	VERIFY CABLE CONNECTIONS		
	• Check and verify that cable is properly connected to speedometer and to speed sensor. • **Is cable connected properly?**	Yes ▶ No ▶	GO to A10. SERVICE cable connections as required.
A10	CHECK MAGNET SHAFT		
	• Disconnect cable and check that magnet shaft in speedometer head turns freely. • **Does magnet shaft turn freely?**	Yes ▶ No ▶	GO to A11. REPLACE speedometer head.
A11	CHECK DRIVE AND DRIVEN GEAR		
	• Check drive and driven gear for damage or wear. • **Are both gears OK?**	Yes ▶ No ▶	GO to A12. REPLACE damaged gear.
A12	CHECK CABLE		
	• Check speedometer cable for kinks or improper routing. • **Is cable OK?**	Yes ▶ No ▶	GO to A13. REPLACE cable.
A13	CHECK SENSOR SHAFT		
	• Disconnect cable from vehicle speed sensor (VSS). Remove sensor and check that shaft in sensor turns freely. • **Does sensor shaft turn freely?**	Yes ▶ No ▶	GO to A14. REPLACE vehicle speed sensor (VSS).
A14	CHECK CORE		
	• Check for broken core. • **Is core OK?**	Yes ▶ No ▶	If core is seized and will not turn, REPLACE cable. REPLACE cable.
A15	CHECK ODOMETER/SPEEDOMETER ACCURACY		
	• Check accuracy of odometer over a measured distance. Refer to Speedometer Calibration Tolerance Specifications. • **Is odometer accurate?**	Yes ▶ No ▶	REPLACE speedometer head. GO to A16.
A16	CHECK DRIVEN GEAR		
	• Check for proper driven gear. • **Is driven gear correct?**	Yes ▶ No ▶	GO to A17. REPLACE gear.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SPEEDOMETER/ODOMETER NOISY, ERRATIC, INOPERATIVE OR INACCURATE (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A17	CHECK DRIVE GEAR, AXLE AND TIRES		
	• Check for proper drive gear, axle and tires. • **Are drive gear, axle and tires correct?**	Yes ▶	REPLACE speedometer assembly.
		No ▶	REPLACE incorrect component or driven gear.

TK5966E

REMOVAL AND INSTALLATION

Speedometer Assembly

Federal law requires that the odometer in any replacement speedometer must register the same mileage as that registered in the removed speedometer.

Refer to Section 13-01B for conventional speedometer removal and installation.

Refer to Section 13-01A for electronic speedometer removal and installation.

Vehicle Speed Sensor (VSS)

Refer to Section 10-03.

Speedometer Cables

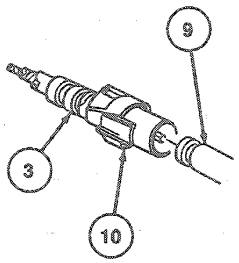
Because of the increasing complexity of speedometer cable assemblies and the importance of proper routing during installation, installation and routing instructions are shown on the illustrations.

REMOVAL AND INSTALLATION (Continued)

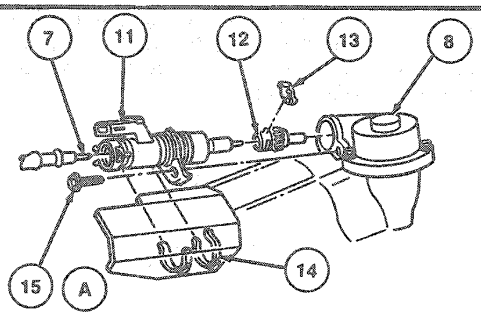
QUICK CONNECT CABLE ATTACHMENT AND REMOVAL

TO INSTALL:
PUSH CABLE FITTING ON WITH A ROTATING MOTION UNTIL CONNECTOR ENGAGES INTO SPEEDOMETER HEAD DETENT.

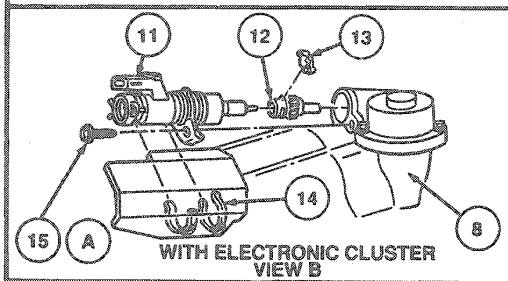
TO REMOVE:
PRESS THUMB LATCH TO DISENGAGE AND PULL CABLE AWAY FROM SPEEDOMETER HEAD.



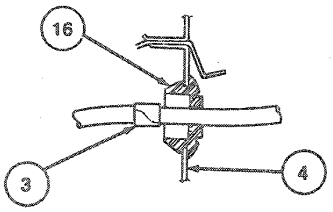
VIEW A



WITH STANDARD CLUSTER
VIEW B

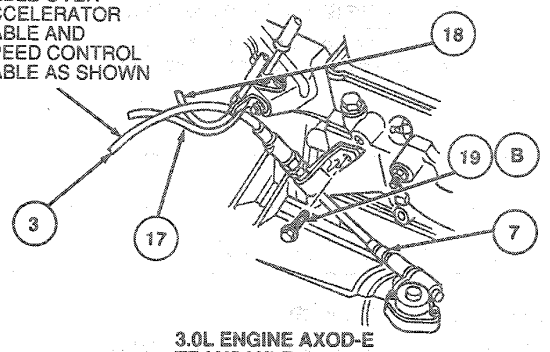


WITH ELECTRONIC CLUSTER
VIEW B

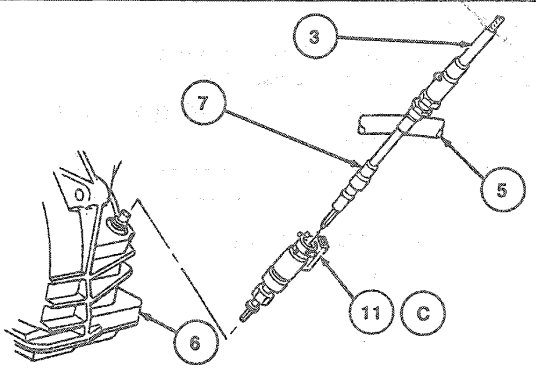


WITH STANDARD CLUSTER
SECTION E

ROUTE SPEEDOMETER CABLE OVER ACCELERATOR CABLE AND SPEED CONTROL CABLE AS SHOWN

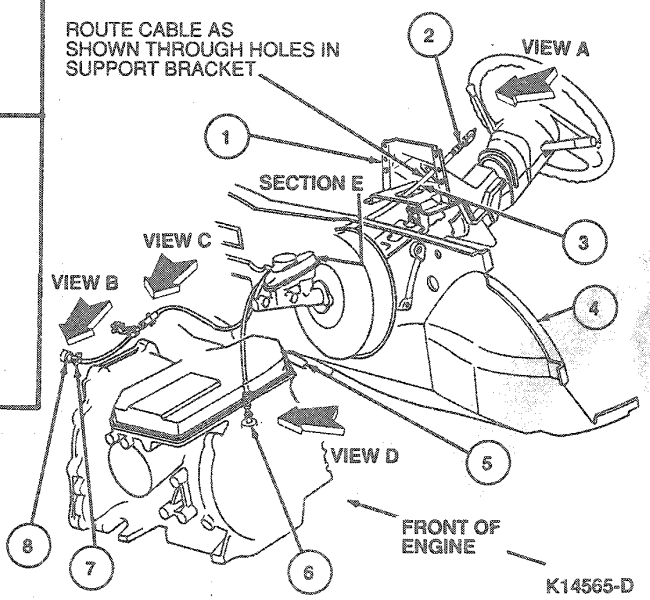


3.0L ENGINE AXOD-E TRANSAXLE
VIEW C



MANUAL TRANSAXLE
WITH STANDARD CLUSTER
VIEW D

ROUTE CABLE AS SHOWN THROUGH HOLES IN SUPPORT BRACKET



K14565-D

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	03678	Support Bracket
2	—	To Speedometer
3	9A820	Speed Control Speedometer Cable
4	04304	Dash Panel
5	07A246	Pulse Air Tube
6	—	To MTX Transaxle
7	9F714	Speed Control Cable and Sensor
8	—	To AXOD-E Transaxle
9	17255	Speedometer Assy
10	—	Thumb Latch Part of 9A820 Speedometer Cable Assy
11C	9E731	Vehicle Speed Sensor (VSS)

(Continued)

Item	Part Number	Description
12	17271	Speedometer Gear
13	17292	Clip
14	9F829	Speed Sensor Shield
15A	N620529-S2	Bolt
16	389847-S	Grommet
17	9A758	Throttle Cable
18	9A820	Speed Control Speedometer Cable
19B	N605798-S2	Bolt
A		Tighten to 4-6 N·m (36-53 Lb-In)
B		Tighten to 18-27 N·m (14-19 Lb-Ft)
C		Tighten to 3-4 N·m (27-35 Lb-In)

MAJOR SERVICE OPERATIONS

Speedometer System Noisy

Applying heavy amounts of lubricant to the cable core will only stop the noise temporarily unless the actual source of noise is found and corrected. If the speed sensor or speedometer head is replaced, ensure that the square drive holes contain a sufficient amount of Speedometer Cable Grease E6TZ-19581-A (ESF-M1C160-A) or equivalent. If not, apply a 4.6mm (3/16 inch) diameter ball of damping grease into the drive holes as required.

Drive and Driven Gears, Damaged

1. A scored, nicked or gouged driven gear is usually indicative of improper gear mesh on those vehicles that have the drive gear integral with the transaxle output shaft. The output shaft should be carefully inspected for imperfections and replaced if necessary.
2. A driven gear with two or three adjoining teeth badly scored is indicative of improper assembly procedure. The gear should be inserted in the transaxle while simultaneously turning the halfshafts. This will ensure initial gear engagement and prevent gear damage. **Never use force.**
3. Whenever a drive gear is replaced, a new driven gear should also be installed, regardless of its apparent condition.

SPECIFICATIONS

SPEEDOMETER CALIBRATION TOLERANCE SPECIFICATIONS

Actual Speedometer or Odometer Value Indicated	48 km/h (30 mph) Actual Speed	97km/h (60 mph) Actual Speed	Odometer Measure Over Actual 16.1 km Distence (10 Mile)
Allowable Range	45-56 km/h (28-35 mph)	93-104 km/h (58-65 mph)	15.4-16.7 km (9.6-10.4 Miles)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Speed Senor Bolt (3.8L)	4-6	36-53
Transaxle Bolt (3.0L)	18-27	14-19 (Lb-Ft)
Vehicle Speed Sensor	3-4	27-35

SECTION 13-03 Fuel Gauge and Low Fuel Warning

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

The fuel indicating system covered in this Section is for conventional cluster applications only. For information on the fuel indicating system used with the electronic clusters, refer to Section 13-01A.

Fuel Level Indicating System

The fuel level indicating system is a magnetic-type indicating system, which consists of the sending unit located in the fuel tank (9002), an anti-slosh module located on the back of the instrument cluster, and a fuel gauge (9280) located in the instrument cluster.

The sending unit changes resistance according to the level of fuel in the fuel tank, which varies the current flow through the gauge. The pointer position varies proportionately to the current flow. In this system, the sending unit resistance is low when the fuel level is low and high when the fuel level is high.

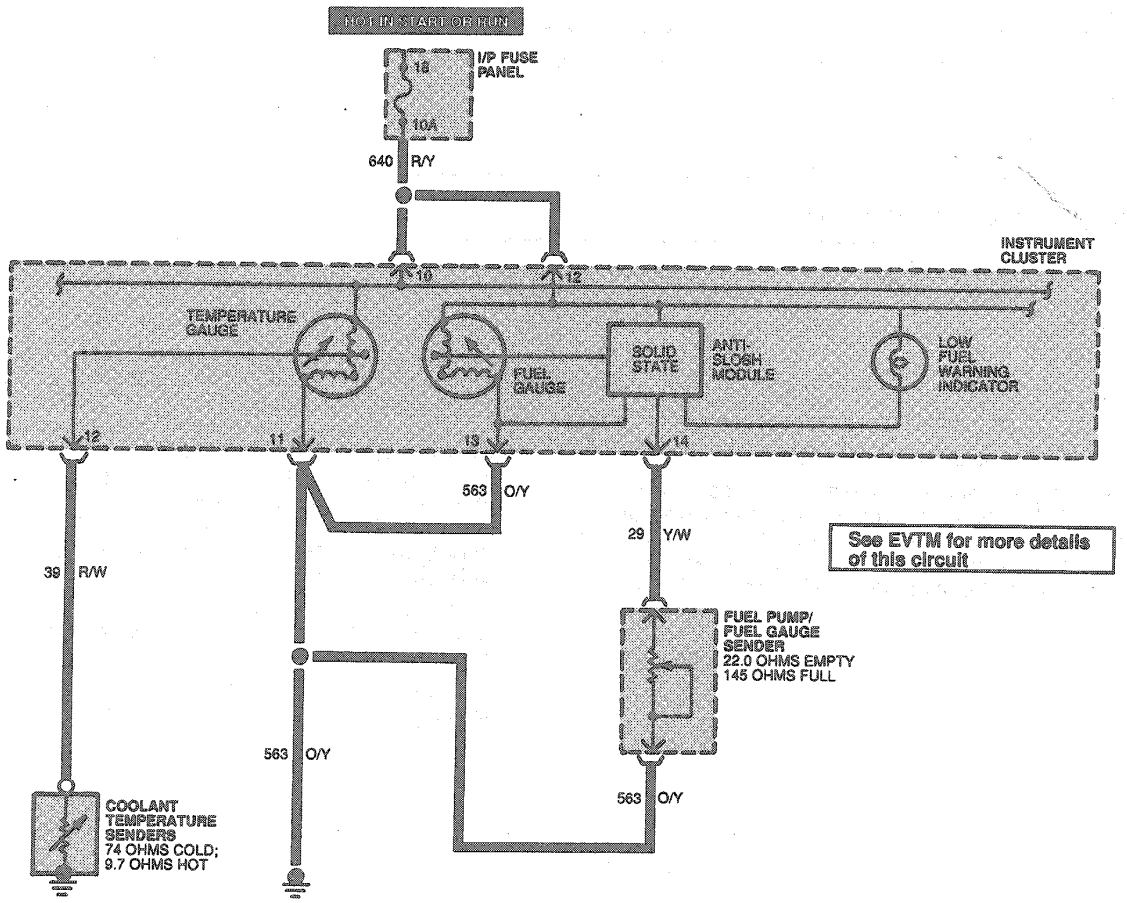
The pointer of the magnetic gauge remains in relatively the same position when the ignition is turned to OFF position.

NOTE: An anti-slosh module has been added to dampen out fluctuating fuel signals from the sender.

DESCRIPTION AND OPERATION (Continued)

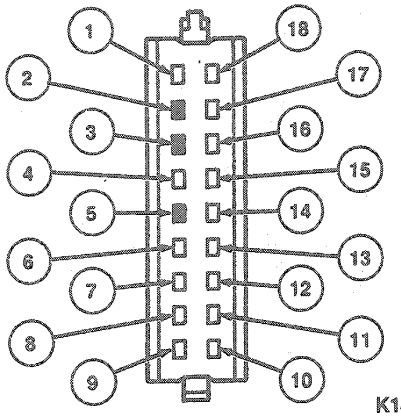
Fuel Sending Unit

The fuel sending unit is combined with the fuel pump assembly, and consists of a variable resistor controlled by the level of an attached float in the fuel tank. When the fuel level is low, resistance in the sender is low and movement of the fuel gauge indicator dial is minimal (from EMPTY position). When the fuel level is high, the resistance in the sender is high and gauge indicator dial movement is greater (further from the EMPTY position).



DESCRIPTION AND OPERATION (Continued)

Instrument Cluster Connections



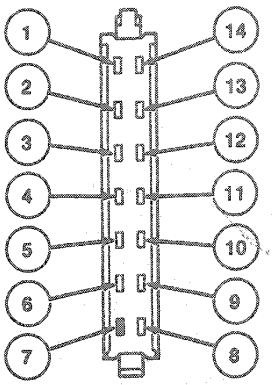
K18659-A

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	19 (LB/R)	Instrument Panel Lamp Feed
2	—	Not Used
3	—	Not Used
4	82 (PK/Y)	Low Washer Fluid Indicator
5	—	Not Used
6	397 (BK/W)	Tachometer Ground
7	11 (T/Y)	Ignition Coil Neg. Terminal
8	31 (W/R)	Low Oil Pressure Indicator
9	606 (W/LB)	Temperature Gauge to Temperature Sending Unit
10	640 (R/Y)	Hot in RUN or START
11	563 (O/Y)	Ground Reference
12	39 (R/W)	Temperature Gauge to Coolant Temperature Sensor
13	977 (P/W)	Brake Warning Switch to Brake Warning Indicator
14	904 (LG/R)	Coil Terminal of Ignition Switch to Alternator/Regulato
15	16 (R/LG)	Ignition Switch to Ignition Coil "Battery" Terminal
16	19 (LB/R)	Instrument Panel Lamp Feed
17	3 (LG/W)	Left Turn Signals

(Continued)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
18	932 (GY/W) 12 (LG/BK)	Hi Beam Indicator to Daytime Running Lamps (DRL) Module Hi Beam of Headlamps

TK18659A



K18660-A

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	208 (GY)	Low Oil Level Indicator Input
2	627 (BK/O)	Door/Liftgate Ajar Indicator to Warning Chime
3	130 (R/LG)	Lamp Out Indicator Input
4	57 (BK)	Ground
5	464 (BK/PK)	Radiator Coolant Sensor
6	41 (BK/LB)	Ignition Switch
7	—	NOT USED
8	2 (W/LB)	Right Turn Signal Indicator Input
9	450 (DG/LG)	Fasten Belts Indicator Input
10	201 (T/R)	Check Engine Indicator Input
11	608 (BK/Y)	Air Bag Indicator Input
12	640 (R/Y)	Hot in RUN or START
13	563 (O/Y)	Reference Ground
14	29 (Y/W)	Fuel Level Input

TK18660A

DESCRIPTION AND OPERATION (Continued)

Fuel Filter

The fuel tank sender filter (9A011) used on the fuel pump / sender assemblies is not serviceable. Should it become clogged or inoperative, the pump must be replaced.

Low Fuel Level Warning and Anti-Slosh Module

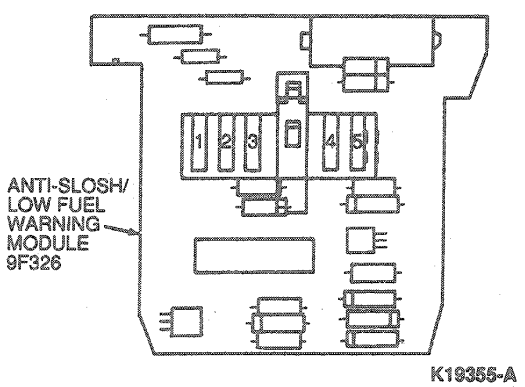
The low fuel warning feature is available on Taurus vehicles with the tachometer option and on Sable vehicles with a conventional instrument cluster. These clusters will have the combination anti-slosh / low fuel warning module.

The conventional Taurus instrument cluster contains a fuel anti-slosh only module.

The anti-slosh / low fuel warning module provides a delay to the fuel gauge to prevent the fuel gauge pointer from fluctuating as a result of excessive movement in the fuel tank. The anti-slosh / low fuel warning module has additional circuitry to turn on a LOW FUEL warning indicator when the fuel gaugeshows approximately one-eighth tank of fuel remaining. The module is not designed to prove-out the LOW FUEL warning indicator, however the indicator may flash on momentarily just after ignition ON. In both cases, the module is a small printed circuit board which latches into a pocket on the back of the instrument cluster. The electrical connections for ignition, ground, input from fuel sender, output to fuel gauge and Low Fuel warning output (where equipped) are made through a spring-type connector on the module to the flex circuit on the cluster. There are no provisions for calibration or adjustment of the module.

Before troubleshooting low fuel warning symptoms, first observe fuel gauge indication. If fuel indication is erroneous, proceed to fuel gaugediagnosis then to low fuel warning diagnosis. If fuel indication is correct proceed directly to low fuel warning diagnosis.

Anti-Slosh/Low Fuel Level Warning Module



DIAGNOSIS AND TESTING

Preliminary Checks

1. Visually inspect fuel tank for damage. A fuel tank that is collapsed or distorted from its normal shape will seriously affect fuel indicating system operation.
2. in some instances a fuel tankmay not fill completely. This will result in the fuel gauge not reaching FULL mark. Check by shaking vehicle after first fuel blowback or pump nozzle cutoff and then slowly metering fuel into fuel tank with shut-off nozzle withdrawn to just inside the leaded fuel restrictor door. If fuel gauge reaches full after this procedure, fuel indication system is operating satisfactorily.

Operational Test

Tools Required:

- Rotunda Instrument Gauge System Tester 021-00055

Follow the instructions with Rotunda Instrument Gauge System Tester 021-00055 or equivalent. If a tester is not available, refer to Pinpoint Tests A and B.

Calibration Test

Tools Required:

- Rotunda Instrument Gauge System Tester 021-00055

The required test equipment consists of a Rotunda Instrument Gauge System Tester 021-00055 or equivalent, a pair of 22 ohm and 145 ohm resistors or another fuel sender of known quality.

If test is performed with the resistors: Disconnect the wiring connector at the sender unit, connect the resistor between the gauge lead and a suitable ground, and turn ignition switch to the ON position. With the 145 ohm resistor, the gauge pointer should contact the FULL mark at minimum edge of pointer to edge of mark. With the 22 ohm resistor, the gauge pointer should contact the EMPTY mark (edge of pointer to edge of mark).

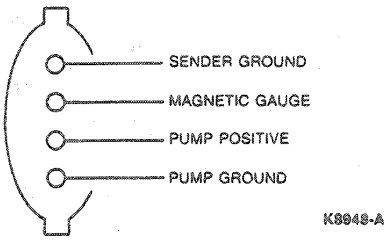
If the test is performed with a fuel sender of known quality, use the following procedure:

1. Turn ignition switch to the OFF position.
2. Disconnect the wiring connector from the sender and connect it to the test sender.
3. Move the float rod away from the fuel tank sender filter against the FULL stop position (approximately 145 ohms). Wait approximately 30 seconds and turn ignition switch to the ON position. The fuel gauge should read on or above the FULL mark.

DIAGNOSIS AND TESTING (Continued)

4. Move the float rod toward the fuel filter against the EMPTY stop position (approximately 22 ohms). Turn ignition switch to the OFF position. Wait approximately 30 seconds and turn ignition to the ON position. The fuel gauge should read on or below the EMPTY mark.
5. If the fuel gauge performs as indicated, perform the fuel sender unit test(s), Pinpoint Test D.
6. If the fuel gauge is out of calibration at the EMPTY mark, or both the EMPTY and FULL mark, replace the gauge.

Sender Unit Connector Pin Locations



Refer to the following charts for magnetic gauge diagnosis.

PINPOINT TEST A
FUEL GAUGE INOPERATIVE—POINTER DOES NOT MOVE

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VERIFY CONDITION		
	• Verify condition. • **Does pointer move?**	Yes ▶ No ▶	GO to D1. GO to A2.
A2	CHECK OTHER GAUGES		
	• Check power to cluster. With ignition ON, observe other gauges and warning indicators for proper operation. If necessary, use Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent or a test lamp to verify voltage at B+ terminal of cluster connector. • **Do gauges and warning indicators operate properly and is voltage present at cluster?**	Yes ▶ No ▶	GO to C1. GO to B1.

TK8572C

PINPOINT TEST B
FUEL GAUGE INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY POWER AT FUSE PANEL		
	• Use voltmeter to verify system voltage at load side of warning indicator fuse. • **Is voltage present at load side of fuse?**	Yes ▶ No ▶	GO to C1. GO to B2.
B2	VERIFY POWER AT FUSE PANEL		
	• Use voltmeter to verify system voltage at feed side of warning indicator fuse. • **Is voltage present at feed side of fuse?**	Yes ▶ No ▶	REPLACE fuse. GO to A1. SERVICE wiring to fuse panel. GO to A1.

TK16216C

PINPOINT TEST C
CLUSTER DIAGNOSIS

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	VERIFY POWER AT CLUSTER		
	• Cluster connectors installed. • Partially remove cluster. • Check for voltage at cluster connector and gauge terminal. • Use Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent. • **Is voltage at cluster connector and gauge terminal?**	Yes ▶ No ▶	GO to C2. SERVICE circuit. GO to A1.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C
CLUSTER DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
C2	VERIFY GROUND CIRCUIT AT CLUSTER		
	• Use Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent to check continuity of cluster and gauge ground circuits. • **Is there continuity?**	Yes No	GO to D1. SERVICE circuit. GO to A1.

TK16217B

PINPOINT TEST D
FUEL GAUGE DIAGNOSIS

TEST STEP		RESULT	ACTION TO TAKE
D1	CHECK TEST BOX (LOW)		
	• Turn ignition to OFF position. • Insert Rotunda Instrument Gauge System Tester 021-00055 or equivalent in sender circuit. • Disconnect 14405 connector under instrument panel and connect tester to cluster side of connector. • Set tester to 22 ohms. • Turn ignition to RUN position, wait 60 seconds and read fuel gauge. • **Does gauge read EMPTY?**	Yes No	GO to D4. GO to D2.
D2	CHECK TEST BOX (RETEST)		
	• Turn ignition switch to OFF position. • Turn ignition switch to RUN position. • Tap lightly on instrument panel, wait 60 seconds and read fuel gauge. • **Does fuel gauge read EMPTY?**	Yes No	GO to D4. GO to D3.
D3	ANTI-SLOSH MODULE BYPASS TEST		
	• Turn ignition switch to OFF position. • Remove instrument cluster and inspect flexible circuit. • Remove anti-slosh module and connect a jumper wire from Gauge Tester directly to fuel gauge 'SIG' terminal. • Install instrument cluster. • Turn ignition switch to RUN position and read fuel gauge. • **Does fuel gauge read EMPTY?**	Yes No	REPLACE anti-slosh module. GO to D1. REPLACE fuel gauge. INSTALL anti-slosh module. GO to D1.
D4	CHECK TEST BOX (HIGH)		
	• Turn ignition switch to OFF position. • With Rotunda Gauge System Tester 021-00055 or equivalent connected as in Step D1, set tester to 145 ohms. • Turn ignition switch to RUN position. • Wait 60 seconds and read fuel gauge. • **Does fuel gauge read FULL?**	Yes No	GO to D6. GO to D5.
D5	ANTI-SLOSH MODULE BYPASS TEST		
	• Turn ignition switch to OFF position. • Remove instrument cluster and inspect flexible circuit. • Remove anti-slosh module. • Connect a jumper wire from tester to fuel gauge 'SIG' terminal. • Turn ignition switch to RUN position and read fuel gauge. • **Does gauge read FULL?**	Yes No	REPLACE anti-slosh module. GO to D1. REPLACE fuel gauge. GO to D1.
D6	INSPECT FUEL TANK		
	• Inspect fuel tank for damage or distortion. • **Is there damage?**	Yes No	REPLACE fuel tank. GO to E1.

TK16218C

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E
FUEL SENDER DIAGNOSIS

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	CHECK TEST BOX — EMPTY STOP		
	• Connect one lead of Digital Volt-Ohmmeter 007-00001 or equivalent to the fuel sender signal lead and the other lead to ground. NOTE: Float rod is against empty stop (closest to filter).	Ohmmeter reads 14-18 ohms ▶ Ohmmeter reads less than 14 ohms or greater than 18 ohms ▶	GO to E2. REPLACE fuel sender.
E2	CHECK TEST BOX — FULL STOP		
	• Connect one lead of Digital Volt-Ohmmeter 007-00001 or equivalent to the fuel sender signal lead and the other lead to sender ground. NOTE: Float rod is against full stop.	Ohmmeter reads 155-165 ohms ▶ Ohmmeter reads less than 155 ohms or greater than 165 ohms ▶	GO to E3. REPLACE fuel sender.
E3	CHECK TEST BOX — FLOAT ROD LEVEL		
	• Connect one lead to Digital Volt-Ohmmeter 007-00001 or equivalent to the fuel sender signal lead and the other lead to sender ground. • Slowly move float rod from full stop to empty stop.	Ohmmeter reading jumps to open condition while decreasing ▶ Ohmmeter reading decreases slowly ▶	REPLACE fuel sender. GO to E4.
E4	FUEL SENDER INSPECTION		
	• Inspect fuel sender. • Inspect float and float rod.	Float rod is distorted ▶ Float is badly distorted / damaged hitting the filter ▶	REPLACE sender. REPLACE sender. GO to E5.
E5	CHECK HARNESS CONNECTOR — EMPTY STOP		
	• Attach all fuel indication connectors. • Move float rod to EMPTY STOP position. • Turn ignition to RUN position. • Wait 60 seconds. • Read fuel gauge. • **Does fuel gauge read EMPTY?**	Yes ▶ No ▶	GO to E6. GO to A1.
E6	CHECK HARNESS CONNECTOR — FULL STOP		
	• Attach all fuel indication connectors. • Move float rod to FULL STOP position. • Turn ignition to RUN position. • Wait 60 seconds. • Read fuel gauge. • **Does fuel gauge read FULL?**	Yes ▶ No ▶	Fuel sender OK. GO to A1.

TK13201E

NOTE: Low fuel warning feature is only in instrument clusters with a tachometer.

PINPOINT TEST F
LOW FUEL INDICATOR STAYS ON CONTINUALLY — MORE THAN 1/4 TANK OF FUEL

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	VERIFY CONDITION		
	• Verify condition.	Indicator stays on with more than 1/4 tank showing on gauge ▶	GO to F2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F
LOW FUEL INDICATOR STAYS ON CONTINUALLY—MORE THAN 1/4 TANK OF FUEL (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
F2	CHECK ELFW MODULE		
	● Turn ignition to the OFF position. ● Disconnect Circuit 14405 connector under instrument panel and connect a 56 ohm resistor between fuel sender feed to gauge and ground. ● Turn ignition to the RUN position. ● Wait two minutes.	Indicator off, Gauge at approximately 1/4 ▶	GO to F3.
		Indicator on ▶	INSPECT instrument cluster flexible circuit. REPLACE ELFW/Anti-Slosh module at instrument cluster.
F3	CHECK GAUGE AND INDICATOR		
	● Turn ignition to the OFF position. ● Replace the resistor from test F2 with a 33 ohm resistor. ● Turn ignition to the RUN position. ● Wait two minutes.	Indicator off ▶	GO to G3.
		Indicator on. Gauge pointer indicator at 1/4 tank or above ▶	GO to A1.
		Indicator on. Gauge indicates approximately 1/8 tank ▶	ELFW/Anti-Slosh module operating properly.

TK16101B

PINPOINT TEST G
INDICATOR STAYS OFF CONTINUALLY

	TEST STEP	RESULT ▶	ACTION TO TAKE
G1	VERIFY CONDITION		
	● Verify condition.	Indicator stays off ▶	GO to G2.
G2	CHECK ELFW MODULE		
	● Turn ignition to the OFF position. ● Disconnect circuit 14405 connector under instrument panel and connect a 33 ohm resistor between fuel sender feed to gauge and ground. ● Turn ignition to ON position. ● Wait two minutes, read gauge.	Indicator off ▶	GO to G3.
		Indicator on, gauge at 1/4 or above ▶	GO to A1.
		Indicator on, gauge at approximately 1/8 ▶	Low fuel warning operating properly.
G3	CHECK INDICATOR		
	● With ignition switch in the ON position, ground indicator circuit between indicator and low fuel module. ● Is indicator ON?	Yes ▶	REPLACE ELFW/Anti-Slosh module on instrument cluster.
		No ▶	CHECK power circuit to lamp. REPLACE lamp.

TK13203B

REMOVAL AND INSTALLATION

WARNING: FUEL SUPPLY LINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUTDOWN.

This pressure must be relieved before servicing the fuel system. A valve is provided on the fuel injection supply manifold (9F792) assembly for this purpose. Attach EFI and CFI Fuel Pressure Gauge T80L-9974-B to fuel diagnostic valve on fuel injection supply manifold assembly. Pressure in fuel system may now be released.

Fuel Pump and Sender Assembly

Tools Required:

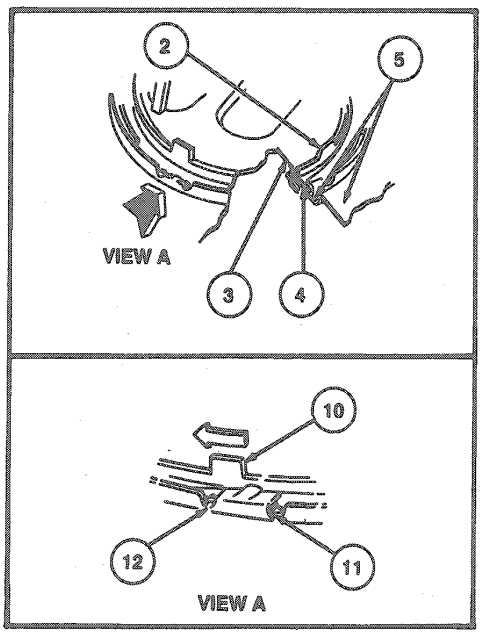
- EFI and CFI Fuel Pressure Gauge T80L-9974-B
- Fuel Tank Sender Wrench T86T-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Fuel Storage Tanker Adapter Hose 034-00012

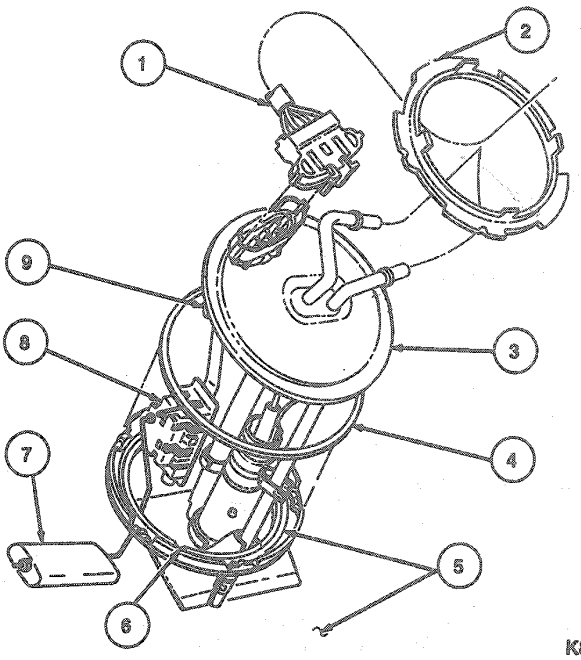
Removal

1. Place vehicle on hoist. Do not raise.

REMOVAL AND INSTALLATION (Continued)

2. Depressurize fuel system as outlined.
3. Remove fuel from fuel tank using Rotunda Fuel Storage Tanker 034-00002 and Adapter Hose 034-00012 or equivalent.
4. Raise vehicle on hoist. Refer to Section 00-02.
5. Remove fuel tube (9291). Remove fuel tank support strap (9092) nearest front of vehicle. Carefully lower front of fuel tankand disconnect fuel and vent lines and electrical connector. Remove fuel tank to bench.
6. Remove dirt that has accumulated around sending unit so dirt will not enter fuel tank.
7. Turn locking ring counterclockwise using Fuel Tank Sender Wrench T86T-9275-A. Remove fuel pump locking retainer ring (9C385), pump and sending unit assembly.





K8945-D

Item	Part Number	Description
1	14405	Wiring Harness Assembly
2	9C385	Locking Ring
3	9H307	Fuel Tank Sending Unit and Pump
4	N803861-S	O-Ring
5	—	Retainer Ring, Part of 9002 Fuel Tank
6	—	Locking Slots

(Continued)

Item	Part Number	Description
7	—	Float, Part of 9H307 Fuel Tank Sending Unit and Pump
8	—	Variable Resistor, Part of 9H307 Fuel Tank Sending Unit and Pump
9	—	Locking Tabs
10	—	Locating Tab
11	—	Stop
12	—	Detent

TK8945D

Installation

1. Clean fuel gauge sending unit mounting surface at fuel tank .

2. Apply a light coating of Premium Long-Life Grease XG-1-C (ESA-M1C75-B) or equivalent on a new seal ring and install seal ring and sending unit assembly. Secure by rotating locking ring clockwise against stop. Ensure seal remains in place.

REMOVAL AND INSTALLATION (Continued)

3. Support fuel tank under vehicle and connect fuel and vent lines and electrical connector.
4. Install fuel tank. Secure fuel tank support strap.
5. Install fuel tube. Fill fuel tank with a minimum of 38 l (10 gal) of fuel.
6. Turn ignition switch to ON then OFF at three second intervals (with EFI and CFI Fuel Pressure Gauge T80L-9974-B), until fuel pressure builds to 270 kPa (30 psi).
7. Start vehicle, check fuel gauge operation and check for fuel leaks.

Fuel Gauge

Removal

1. Remove instrument cluster finish panel retaining screws and remove finish panel. Refer to Section 13-01A.
2. On vehicles with tachometer cluster, remove lower trim panel retaining screws and remove trim panel.
3. Remove eight mask-and-lens mounting screws and remove mask and lens.
4. On vehicles with tachometer cluster, remove two lower floodlamp bulb and socket assemblies.
5. Lift main dial assembly from backplate.

   NOTE: The gauges are mounted to main dial, and some effort may be required to pull quick-connect electrical terminals from clips.

   NOTE: Lower flood lamp bulb filters are not secured and may fall out.
6. On column shift vehicles only, remove two screws retaining transmission range indicator (PRNDL or PRN©D1) to main dial and remove indicator from cluster.
7. Manually rotate pointer to align it with slot in dial. Remove mounting screws and carefully pull gauge away from dial, guiding pointer through slot.

Installation

1. Carefully position pointer parallel to rectangular raised portion of dial.

   CAUTION: The gauges are calibrated at the factory. Excessive rough handling could disturb the calibration.
2. Guide the pointer carefully through slot in main dial. Then, position gauge on mounting bosses and install mounting screws. Tighten screws to 0.8-1.4 N·m (8-12 lb-in).
3. On column shift vehicles, install transmission range indicator.
4. Install main dial assembly to cluster backplate by aligning it on guides. Press carefully and firmly to seat all electrical terminals.

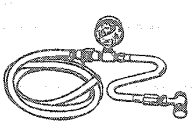
   NOTE: Lower flood lamp bulb filters are not secured and may fall out.
5. On vehicles with tachometer cluster, install two lower flood lamp bulb and socket assemblies.
6. Position mask-and-lens assembly and install eight mask-and-lens retaining screws.
7. On vehicles with tachometer cluster, install lower trim panel.
8. Install instrument cluster finish panel as outlined in Section 13-01B.

Low Fuel Level Warning Switch

Removal and Installation

1. Remove instrument cluster. Refer to Section 13-01B.
2. Grasp circuit board on outside far edges. Avoid touching circuit components.
3. Push out connector tab and slide low fuel level warning switch (9F326) out.
4. To install, position low fuel level warning switch in guides, line up terminals over center of flex circuit connections, and push low fuel level warning switch until it clicks in place.
5. Install instrument cluster. Refer to Section 13-01B.

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T80L-9974-B EFI and CFI Fuel Pressure Gauge	 T80L-9974-B
T86T-9275-A Fuel Tank Sender Wrench	 T86T-9275-A

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
021-00055	Instrument Gauge System Tester
034-00002	Fuel Storage Tanker
034-00012	Fuel Storage Tanker Adapter Hose

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9002	Fuel Tank	
9092	Fuel Tank Support Strap	
9280	Fuel Gauge	
9291	Fuel Tube	
9A011	Fuel Tank Sender Filter	

(Continued)

Base Part #	Part Name	Old Part Name
9C385	Fuel Pump Locking Retainer Ring	
9F326	Low Fuel Level Warning Switch	
9F792	Fuel Injection Supply Manifold	

SECTION 13-04 Charging System Gauge/Warning Indicator

VEHICLE APPLICATION

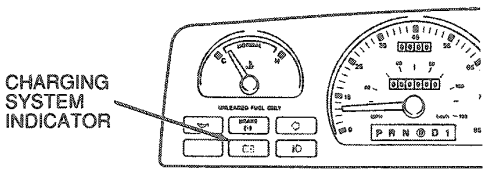
Taurus/Sable with conventional cluster.

DESCRIPTION AND OPERATION

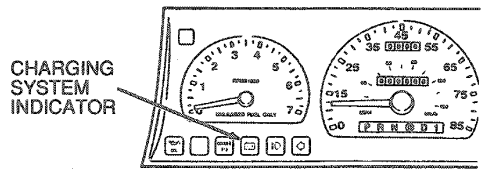
A red generator charge indicator is located in the instrument cluster. This indicator glows when there is no generator output.

When the ignition switch contacts are closed (switch turned on), battery current flows through the charge indicator and the parallel resistor (500 ohm) to the regulator and the indicator comes on.

When the generator builds up enough voltage to energize a circuit in the voltage regulator, the charge indicator goes out.



TAURUS

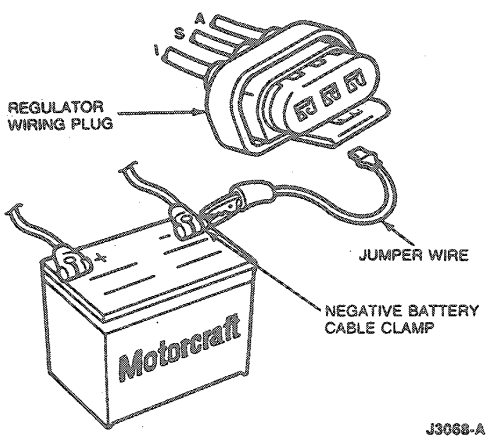


TAURUS SHO AND SABLE K16930-A

DIAGNOSIS AND TESTING

1. If the charge indicator does not come on (key ON, engine OFF), disconnect the wiring plug connector from the regulator. Connect a jumper wire from wiring connector 'I' terminal to the negative battery post cable clamp.

Integral Generator Regulator (IGR)



J3068-A

DIAGNOSIS AND TESTING (Continued)

2. Turn ignition to RUN position with engine off. If indicator does not light, check for presence of bulb socket. If bulb is present, check for contact of bulb socket leads to the flexible printed circuit. If good, check indicator bulb for continuity and replace bulb if burned out. If bulb checks good, check wiring from regulator to bulb socket and bulb socket to battery (through ignition switch) for opens or shorts.
3. If indicator does light, remove jumper wire and reconnect wiring plug to regulator.

   NOTE: Refer to Section 14-02 for complete charging system diagnosis.

REMOVAL AND INSTALLATION

On some vehicles it is necessary to remove instrument cluster to gain access to the indicator bulb. Refer to Section 13-01B.

Bulb, Indicator

Removal and Installation

To remove indicator bulb, turn bulb and socket assembly one-quarter turn counterclockwise and remove. To install, position new bulb and socket assembly to printed circuit and turn it clockwise one-quarter turn.

SECTION 13-05 Tachometer, Oil Pressure, Coolant Temperature Gauges / Warning Indicators

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

The tachometer, gauge and warning indicator systems covered in this section are for conventional clusters only. For electronic instrument cluster applications, refer to Section 13-01A.

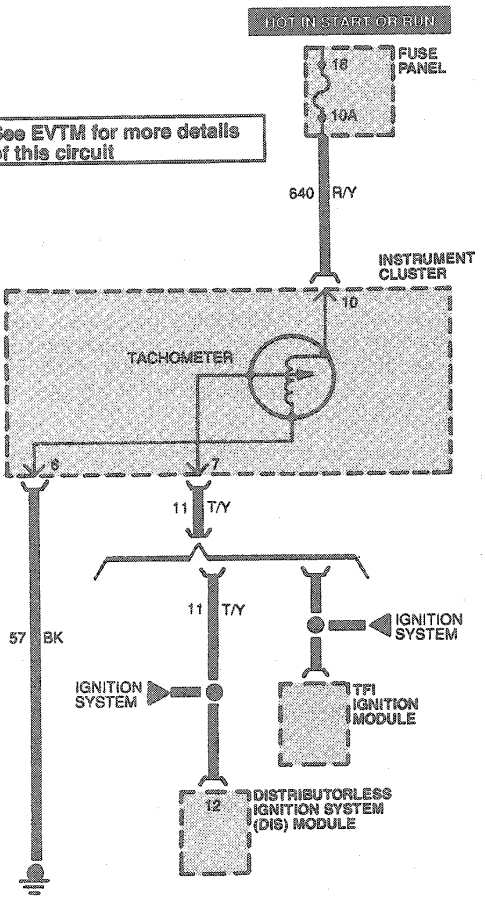
Tachometer

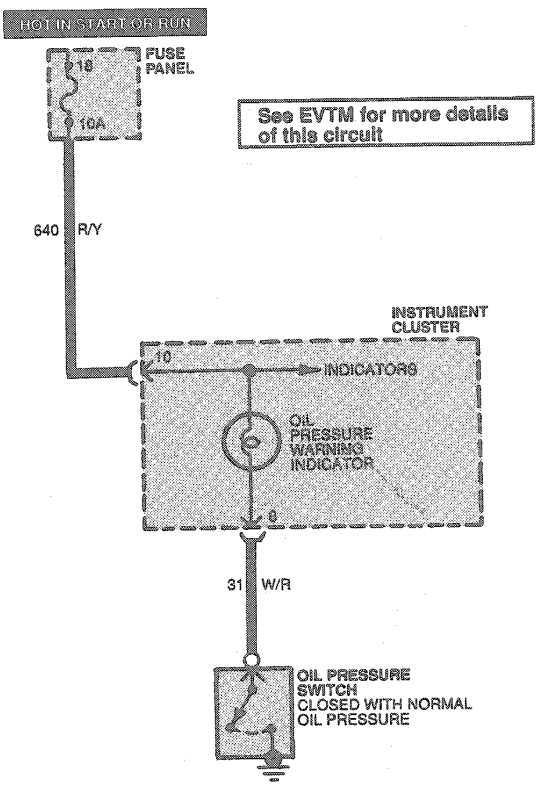
The tachometer is an electrically-operated instrument which indicates engine speed in revolutions per minute (rpm). The tachometer range is 0 to 7000 rpm, except Taurus SHO models which have a range of 0 to 8000 rpm.

The tachometer is mounted in the instrument cluster assembly. The schematic wiring diagram shows the tachometer system.

DESCRIPTION AND OPERATION (Continued)

Wiring Diagrams





Oil Pressure Indicator

A red warning indicator glows when the oil pressure is below a prescribed value. The indicator should come on when the ignition switch is first turned to the RUN position. The indicator should go out within a few seconds after the engine starts, signaling that the oil pressure is OK.

The oil switch is installed into a fitting in the engine block. The switch is calibrated to close between 26-44 kPa (4.5-7.5 psi).

The indicator is connected between the oil pressure switch unit (mounted on the engine) and the coil terminal of the ignition switch.

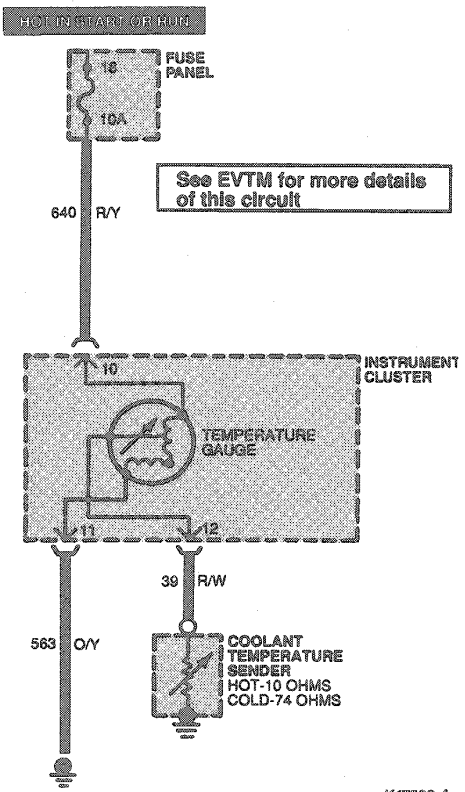
Magnetic Temperature Gauge

The magnetic temperature gauge movement consists of three primary coils, one of which is wound at a 90 degree angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet, to which a shaft and pointer are attached, rotates to align to this primary field, resulting in pointer position. The bobbin / coil assembly is pressed into a metal housing which has two holes for dial mounting. There is no adjustment, calibration or maintenance required for these gauges.

NOTE: An instrument voltage regulator (IVR) is not required for this system.

DESCRIPTION AND OPERATION (Continued)

CAUTION: Do not remove pointers; they cannot be recalibrated.



DIAGNOSIS AND TESTING

Oil Pressure Indicator

To test the indicator, turn the ignition switch to RUN. Do not start the engine. The indicator should come on. Start the engine. The indicator should go out, signaling that the oil pressure is OK.

Disconnect the temperature switch wire before testing the oil pressure indicating system on those vehicles that have an engine warning indicator.

To test the oil pressure switch and indicator, turn the ignition switch to RUN but do not start the engine. The indicator should come on. If the indicator does not come on, remove the wire from the switch terminal and connect the wire to ground. If the indicator now comes on, the oil pressure switch is inoperative. Replace the switch. If the indicator does not come on with the switch wire connected to ground, the warning indicator is burned out or the system wiring is open-circuited. Replace the indicator or service the wiring.

If the indicator stays on with the engine running and the engine has adequate oil pressure, disconnect the wire from the oil pressure switch. The indicator should go out. If indicator goes out, replace switch. If indicator does not go out, service shorted wiring between switch and indicator.

Engine Oil Pressure

Tools Required:

- Oil Pressure Gauge T73L-6600-A

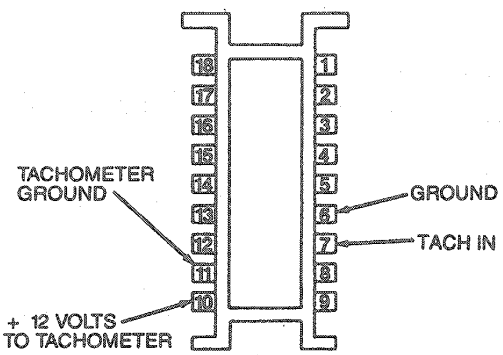
3.8L Engine

NOTE: To check engine oil pressure, a piece of 1 / 4 inch pipe, 5 1 / 2 inches long and a 90 degree 1 / 4 inch pipe elbow will be needed. These must have 1 / 4-18 NPTF threads.

1. Remove oil pressure switch as outlined.
2. Install pipe and elbow assembly as a unit into sender fitting.
3. Install Oil Pressure Gauge T73L-6600-A to pipe elbow.
4. Run engine to normal operating temperature and read pressure gauge. Gauge should read a minimum of 62 kPa (9 psi) at hot idle.
5. Remove gauge and pipe assembly.
6. Install oil pressure switch as outlined.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: TACHOMETER INOPERATIVE, ERRATIC, WRONG INDICATION

TEST STEP		RESULT	ACTION TO TAKE
A1	CHECK OPERATION		
	• Check tachometer operation.	Inoperative ▶	GO to A2.
		Erratic or wrong indication ▶	GO to A3.
A2	CHECK FUSE		
	• Check tachometer fuse. • **Is fuse OK?**	Yes ▶	GO to A3.
		No ▶	REPLACE fuse.
A3	CHECK WIRING		
	• Check for loose wiring connections in engine compartment and at instrument cluster. • **Are all connections OK?**	Yes ▶	GO to A4.
		No ▶	SECURE loose connections.
A4	CHECK RESISTANCE AND VOLTAGE		
	• Disconnect battery. • Remove instrument cluster and make resistance and voltage checks at 14401 wire harness connector as follows (refer to pin locations below): — Check Pins 6 and 11 resistance to chassis ground—should read 1 ohm or less. — For Taurus / Sable check Pin 7 resistance to negative terminal of igition coil should be 1 ohm or less. — For Taurus SHO models check Pin 7 resistance to Pin 6 of DIS module. Should be 1 ohm or less. — Connect battery. Turn ignition switch ON. Check for + 12V at Pin 10. Turn ignition switch OFF. Disconnect battery.	Yes ▶	GO to A5.
		No ▶	Condition is not in tachometer. SERVICE wiring.
	 14401 HARNESS CONNECTOR TO INSTRUMENT CLUSTER AS VIEWED FROM REAR OF HARNESS K19356-A		
	• **Is all voltage and resistance within specifications?**		
A5	CHECK CONNECTOR CLIPS		
	• Check for loose tachometer connector clips on rear of instrument cluster, or damaged printed circuit. • **Are connector clips OK?**	Yes ▶	REPLACE tachometer.
		No ▶	TIGHTEN or REPLACE clips. REPLACE printed circuit.

TK16970B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B
TEMPERATURE GAUGE INOPERATIVE—POINTER DOES NOT MOVE

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY CONDITION		
	• Observe gauge performance. • **Does gauge pointer move?**	Yes ▶ No ▶	GO to C1 for temperature gauge. GO to B2.
B2	VERIFY CLUSTER PERFORMANCE		
	• With the ignition ON, observe the other gauges and warning indicators for proper operation. • **Do other gauges and warning indicators operate properly?**	Yes ▶ No ▶	GO to D1. GO to C1.

TK16967B

PINPOINT TEST C
TEMPERATURE GAUGE INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	VERIFY POWER AT FUSE PANEL		
	• Using Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent verify system voltage at load side of warning indicator fuse. • **Is system voltage present at load side of fuse?**	Yes ▶ No ▶	GO to D1. GO to C2.
C2	VERIFY POWER AT FUSE PANEL		
	• Using Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent verify system voltage at feed side of warning indicator fuse. • **Is system voltage present at feed side of fuse?**	Yes ▶ No ▶	REPLACE fuse. GO to B1. SERVICE wiring to fuse panel. GO to B1.

TK16972B

PINPOINT TEST D
TEMPERATURE GAUGE INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	VERIFY POWER AT CLUSTER		
	• Partially remove cluster from IP. Using Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent verify system voltage at cluster connector and/or gauge terminal. • Inspect cluster connector for damage. • **Is system voltage present at cluster connector and/or gauge terminal?**	Yes ▶ No ▶	GO to D2. SERVICE as required. GO to B1.
D2	VERIFY GROUND CIRCUITRY AT CLUSTER		
	• Using Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent check continuity of cluster and gauge ground circuitry. • **Is ground circuitry OK?**	Yes ▶ No ▶	GO to E1 for temperature gauge. SERVICE as required. GO to B1.

TK17129A

PINPOINT TEST E
TEMPERATURE GAUGE INACCURATE

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	TEST SENDER CIRCUIT AT LOW		
	• Insert Rotunda Instrument Gauge, System Tester 021-00055 or equivalent. Disconnect connector at sender and connect tester to cluster side of connector. Set to 74 ohms. • **Does gauge read 'C'?**	Yes ▶ No ▶	GO to E2. GO to E3.
E2	TEST SENDER CIRCUIT AT HIGH		
	• Set Gauge System Tester to 10 ohms. • **Does gauge read 'H'?**	Yes ▶ No ▶	REPLACE sender. GO to E3.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E
TEMPERATURE GAUGE INACCURATE (Continued)

TEST STEP		RESULT	ACTION TO TAKE
E3	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flex circuit for shorts or opens with Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent. • **Is wiring OK?**	Yes ▶ No ▶	REPLACE gauge. SERVICE wiring / flex circuit. GO to **B1.**

TK16968A

REMOVAL AND INSTALLATION

Tachometer

Removal

1. Disconnect battery ground cable.
2. Remove and disassemble instrument cluster. Refer to Section 13-01B.
3. Remove tachometer from gauge clips by pulling tachometer from backplate.

Installation

1. Carefully position tachometer over gauge clips.
   CAUTION: Tachometer is calibrated at factory. Excessive rough handling could disturb calibration.
2. Press tachometer into gauge clips in backplate. Use care not to get fingerprints on applique.
3. Assemble and install instrument cluster. Refer to Section 13-01B.
4. Connect battery ground cable. Check tachometer operation.

Oil Pressure Engine Unit Gauge

Except 3.8L Engine

Tools Required:

- Removal / Replacer Tool T87L-9278-A

Removal and Installation

1. Disconnect wire at oil pressure sender (9278)and remove switch using Removal / Replacer Tool T87L-9278-A.
2. To install oil pressure sender coat threads with Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194, ESR-M18P7-A) or equivalent and install fitting.
3. Tighten oil pressure sender to 16-22 N·m (12-16 lb-ft) using Removal / Replacer Tool T87L-9278-A or equivalent. The 3.0L and 3.2L SHO oil oil pressure sender torque is 12-16 N·m (9-11 lb-ft).
4. Install electrical connector to oil pressure sender.
5. Start engine and check for oil leaks.

3.8L Engine

Tools Required:

- Removal / Replacer Tool T87L-9278-A

Removal

1. Remove washer solvent / coolant recovery reservoir.
2. Release drive belt tension and position drive belt aside.
3. Remove belt idler pulley below power steering pump.
4. Disconnect wire from oil pressure sender and remove oil pressure sender using Removal / Replacer Tool T87L-9278-A.

Installation

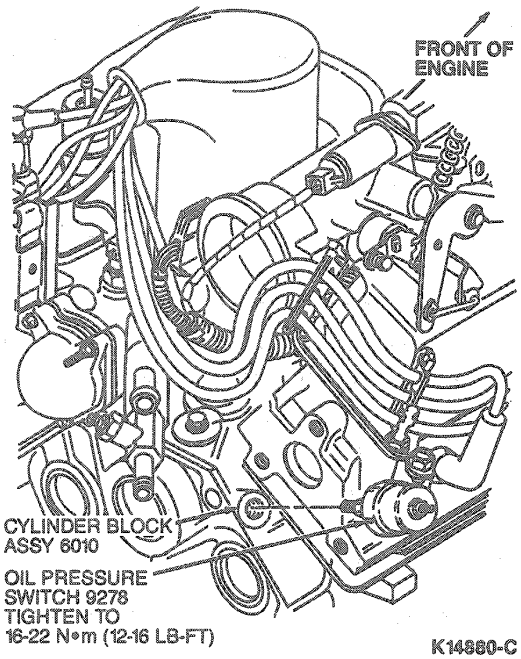
1. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194, ESR-M18P7-A) or equivalent to threads of oil pressure sender. Install oil pressure sender using Removal / Replacer Tool T87L-9278-A or equivalent. Tighten to 11-24 N·m (9-17 lb-ft).
2. Install idler pulley. Tighten bolt to 70-95 N·m (52-70 lb-ft).
3. Install drive belt.
4. Install washer solvent / coolant recovery reservoir. Top off fluids.
5. Start engine and check for leaks.

The pressure switch-type unit used with the warning indicator system is **not** interchangeable with the variable resistance-type unit used with the gauge system. Refer to the Master Parts catalog for proper parts usage.

CAUTION: Installation of the wrong part will result in an inoperative oil pressure indicating system and a damaged sender unit or gauge.

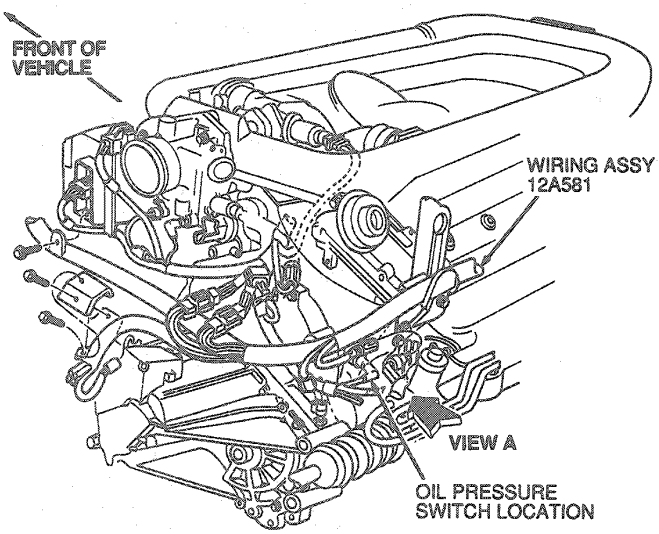
REMOVAL AND INSTALLATION (Continued)

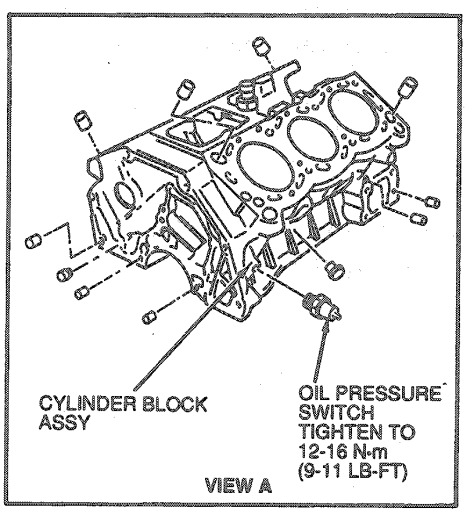
3.0L MFI Engine



K14880-C

3.0L and 3.2L SHO Engine





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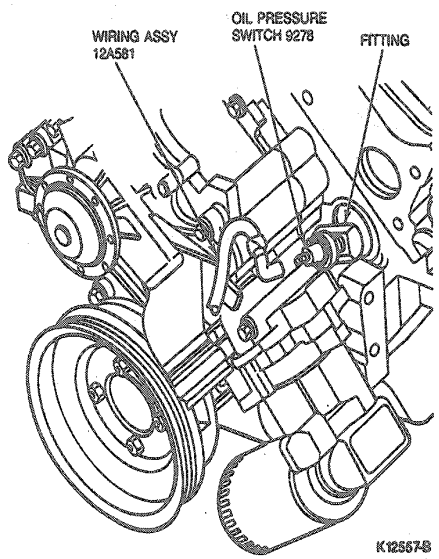
REMOVAL AND INSTALLATION (Continued)

3.8L MFI Engine



Coolant Temperature Sending Unit

3.0L Engine

CAUTION: Misuse of the sending units will result in inoperative temperature indicating system.

Removal

1. Disconnect negative battery terminal.

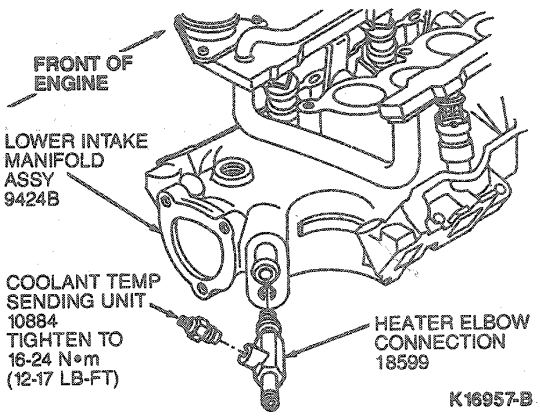
   WARNING: NEVER REMOVE THE RADIATOR CAP UNDER ANY CIRCUMSTANCES WHILE THE ENGINE IS OPERATING. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY FROM HOT COOLANT OR STEAM BLOW OUT (AND/OR DAMAGE TO THE COOLING SYSTEM OR ENGINE). SWITCH OFF THE ENGINE AND WAIT UNTIL IT HAS COOLED. EVEN THEN, USE EXTREME CARE WHEN REMOVING THE CAP FROM A HOT RADIATOR. WRAP A THICK CLOTH AROUND THE CAP AND TURN IT SLOWLY TO THE FIRST STOP. STEP BACK WHILE THE PRESSURE IS RELEASED FROM THE COOLING SYSTEM. WHEN CERTAIN ALL THE PRESSURE HAS BEEN RELEASED, PRESS DOWN ON THE CAP WITH A CLOTH, TURN AND REMOVE IT.

2. Drain engine cooling system.
3. Disconnect electrical connector to sending unit.
4. Loosen and remove sending unit.

Installation

1. Apply teflon tape or Pipe sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent to threads of sending unit.
2. Install sending unit. Tighten to 16-24 N·m (12-17 lb-ft).
3. Connect electrical connector to sending unit.
4. Fill and bleed cooling system.
5. Connect negative battery terminal.
6. Start engine and check for coolant leaks.

3.0L MFI Engine



Indicator Bulb

Removal and Installation

It is necessary to remove the instrument cluster to gain access to the indicator bulb. Refer to Section 13-01B.

To remove the indicator bulb, turn the bulb and socket assembly one-quarter turn counterclockwise and remove. To install, position the new bulb and socket assembly to the printed circuit and turn it clockwise one-quarter turn.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Oil Pressure Switch (3.0L)	16-22	12-16
Oil Pressure Switch (3.0L/3.2L SHO)	12-16	9-11
Oil Pressure Switch (3.8L)	11-24	9-17
Coolant Temperature Sending Unit	16-24	12-17
Idler Pulley Bolt	70-95	52-70

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T73L-6600-A Oil Pressure Gauge	 T73L-6600-A
T87L-9278-A Removal / Replacer Tool	 T87L-9278-A

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
021-00055	Instrument Gauge System Tester

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9278	Oil Pressure Sender	

SECTION 13-06 Horn

VEHICLE APPLICATION

Taurus / Sable and Taurus SHO.

DESCRIPTION AND OPERATION

Horn System

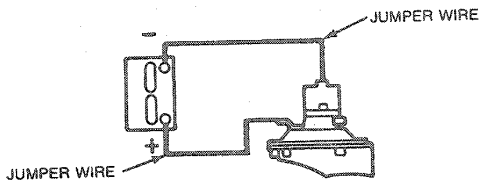
The standard high and low pitch horns are mounted to the LH frame rail on a common bracket. The horn switch closes the circuit to the horn through a relay.

DIAGNOSIS AND TESTING

Circuit Check

Verify that the ground at the horn is good by checking connection for corrosion. Also verify that the retaining screw is tight and horns are not touching surrounding sheet metal or other components.

Attach a wire from battery positive (+) terminal to horn. If the horn sounds normally, check the wiring between horn and horn switch. If the horn does not sound, replace horn.



Backup Power Supply

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

A backup power supply is included in the system to provide air bag deployment if the battery or battery cables are damaged in an accident before the crash sensors close. The power supply is a capacitor that will discharge approximately 15 minutes after the battery is disconnected. It is located in the RH instrument panel above the glove compartment.

REMOVAL AND INSTALLATION

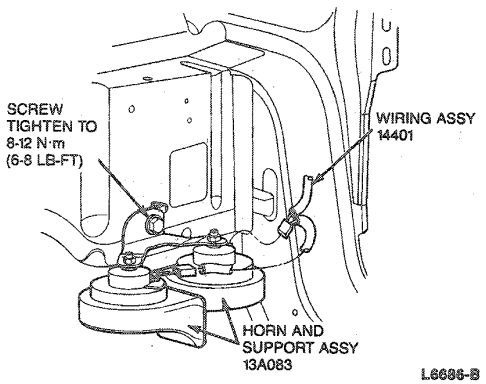
Horn

Removal and Installation

1. Disconnect horn wire from terminal.
2. Remove retaining screw.
3. Remove horn.
4. To install, reverse Removal procedure. Tighten retaining screw to 8-12 N·m (6-8 lb-ft).

REMOVAL AND INSTALLATION (Continued)

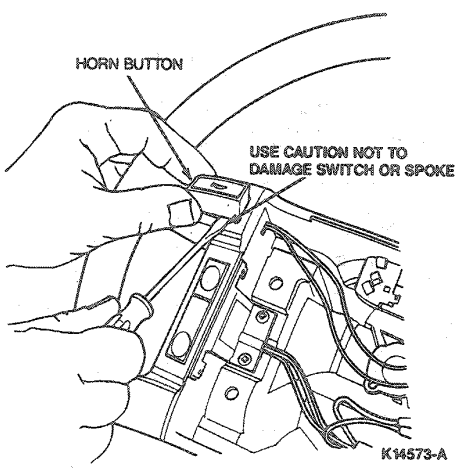
Taurus / Sable



Horn Button Switch

Removal

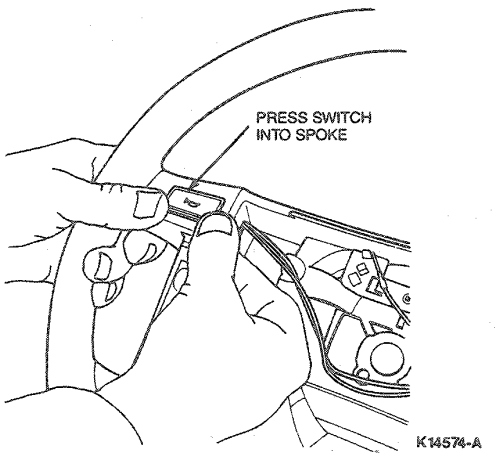
1. Disconnect battery ground cable.
2. Disconnect backup power supply.
3. Remove air bag module.
4. With a screwdriver, carefully pry horn button switch from steering wheel spoke.



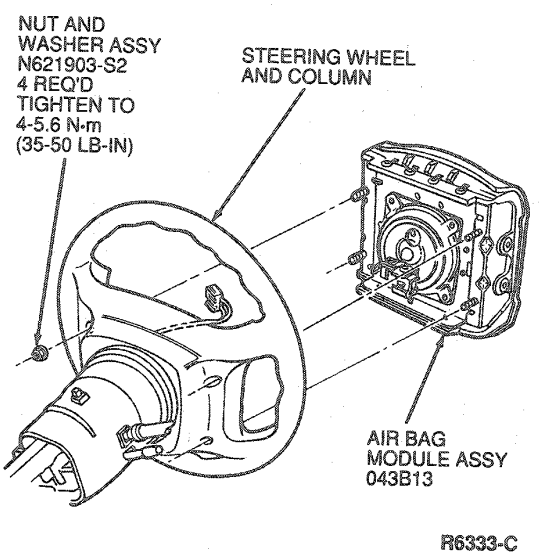
5. Disconnect electrical connectors, remove horn button switch and wires.

Installation

1. Insert horn button switch wires through opening in steering spokes.
2. Press horn button switch into steering wheel spoke.



3. Connect electrical connectors.
4. Position air bag module on steering wheel and install four nut and washer assemblies. Tighten to 4-5.6 N·m (35-53 lb-in).
5. Connect backup power supply.
6. Connect battery ground cable.



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Air Bag Module Retaining Nuts	4-5.6	35-53 (Lb-In)
Horn Retaining Screw	8-12	6-8

SECTION 13-07 Clock

VEHICLE APPLICATION

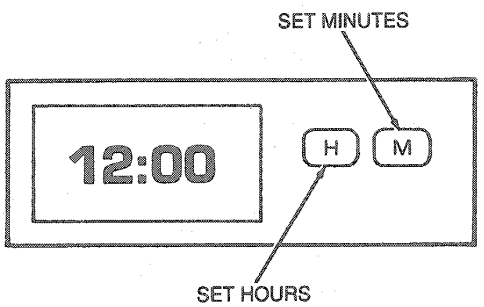
Taurus / Sable.

DESCRIPTION AND OPERATION

The electronic digital clock displays time in a 12-hour format. Display dims when headlamps are on.

Setting Time

1. Press and hold H button until desired hour is displayed.
2. Press and hold M button until desired minute is displayed.



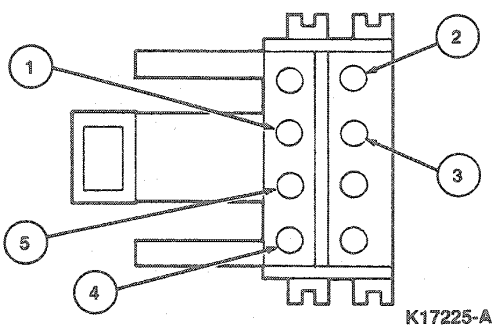
K17224-A

DIAGNOSIS AND TESTING

The clock is serviced as an assembly. An inoperable clock should be removed and returned to a service center (shown on part number label on clock case) to be serviced. The clock will be replaced with a functioning clock.

NOTE: Display illuminates with the ignition switch in the ACC or RUN position.

Clock Connector



K17225-A

DIAGNOSIS AND TESTING (Continued)

ITEM NO.	CIRCUIT	DESCRIPTION
1	57	Ground
2	14	Headlamp

(Continued)

ITEM NO.	CIRCUIT	DESCRIPTION
3	54	Dome Lamp
4	19	Rhehostat
5	296	Ignition

TK17225A

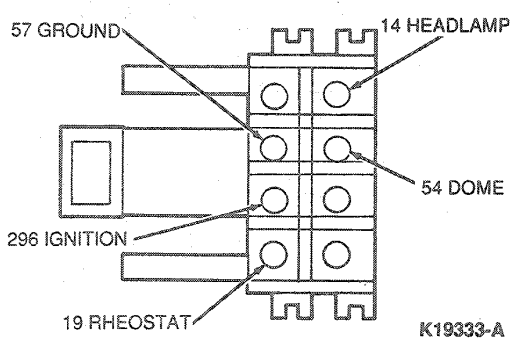
PINPOINT TEST A: ELECTRONIC DIGITAL CLOCK FUNCTIONAL TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CLOCK FUNCTION		
	• Turn ignition to RUN or ACC. • **Does display come on?**	Yes ▶ No ▶	GO to **A2.** GO to **B1.**
A2	DIMMING FUNCTION		
	• Turn headlamps ON. • **Does display dim?**	Yes ▶ No ▶	GO to **A3.** GO to **B4.**
A3	SET TIME—HOURS		
	• Depress H button and hold. • **Do hours advance?**	Yes ▶ No ▶	GO to **A4.** REPLACE unit and VERIFY. GO to **A1,** Functional Test.
A4	SET TIME—MINUTES		
	• Depress M button and hold. • **Do minutes advance?**	Yes ▶ No ▶	Clock OK. REPLACE unit and VERIFY. GO to **A1,** Functional Test.

TK16948B

PINPOINT TEST B: WIRING HARNESS CHECK SUBRUTINE B

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	POWER TO CLOCK—CHECK FUSE		
	• Open vehicle door. • **Does dome lamp light?**	Yes ▶ No ▶	GO to **B2.** CHECK fuse. VERIFY dome lamp works. GO to **A1.**
B2	POWER TO CLOCK HARNESS CHECK		
	• Put non-powered test lamp between vehicle ground and Circuit 54 on back of male clock connector. • **Does test lamp light?**	Yes ▶ No ▶	GO to **B3.** Concern in Circuit 54, SERVICE and VERIFY clock operation. GO to **A1.**



DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: WIRING HARNESS CHECK SUBRUTINE B (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B3	POWER TO GROUND CIRCUIT CHECK		
	• Put test lamp between Circuit 57 (GND) and 54. • **Does test lamp light?**	Yes ▶	REPLACE and VERIFY clock opertaion. GO to **A1.**
		No ▶	Concern in Circuit 57. SERVICE and VERIFY clock operation. GO to **A1.**
B4	HEADLAMP SWITCH TO CLOCK HARNESS CHECK		
	• Put test lamp between Circuit 57 and Circuit 14 on back of clock connector. Turn headlamps ON. • **Does test lamp light?**	Yes ▶	GO to **B5.**
		No ▶	Concern in Circuit 14. SERVICE and VERIFY clock operation. GO to **A1.**
B5	CHECK POWER TO IGNITION		
	• Connect test lamp between Circuit 57 and Circuit 296. • Turn ignition to ACC. • **Does test lamp light?**	Yes ▶	REPLACE and VERIFY clock operation.
		No ▶	SERVICE open in Circuit 296, and VERIFY clock operation. GO to **A1.**

TK19287A

REMOVAL AND INSTALLATION

Clock

Removal and Installation

1. Remove instrument panel applique.
2. Disconnect clock electrical connector.
3. Remove two screws retaining clock into panel applique (one on each clock mounting tab).
4. Remove clock from applique.
5. To install, reverse Removal procedure.

SECTION 13-09 Gauges, Warning Devices, Miscellaneous — Electronic

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

Warning Chimes

Safety Belt Warning

When the ignition switch is turned to RUN or START, power is supplied through Circuit 640 (R / Y) to the warning chime module. The module then supplies power through Circuit 450 (DG / LG) to illuminate the FASTEN BELTS indicator for six seconds, whether or not the driver's safety belt is fastened. If the driver's safety belt is not fastened during this time, the safety belt buckle switch remains closed, supplying ground through Circuit 85 (BR / LB) to the warning chime module and causing it to sound for six seconds.

Key-In-Ignition Warning

The warning chime sounds when the driver's door is opened, with the key in the ignition switch, and continues to sound until the key is removed or the door is closed. When the key is in ignition, the key-in-ignition switch is closed and ground is supplied through Circuit 158 (BK / PK) to the warning chime module. When the driver's door is open, the driver's door courtesy lamp switch closes and power is supplied through Circuit 159 (R / PK) to the module.

Headlamp Switch On Warning

The warning chime sounds when the driver's door is opened while the main headlamp switch is on, and continues to sound until the switch is turned off or the door is closed.

When the main headlamp switch is on, power is supplied through Circuit 257 (W / R) to the warning chime module. When the driver's door is open, the driver's door courtesy lamp switch is closed and power is supplied through Circuit 159 (R / PK) to the module.

Electronic Instrument Cluster Beep Tone

On vehicles with an electronic instrument cluster only. When a cluster button is pressed, the cluster momentarily grounds Circuit 183 (T / Y) to the warning chime module, causing it to emit a momentary beep tone as acknowledgement.

Whenever selected visual warning messages are displayed on the electronic instrument cluster, the cluster grounds Circuit 183 (T / Y) to the warning chime module for one second. This causes it to emit a one second beep tone to attract attention to the electronic cluster display.

Lamp-Out Warning System

A lamp outage is sensed by measuring the change in voltage drop across a special section of the wiring harness.

The unique wiring harnesses associated with the lamp-out warning system use special resistance wire for proper system operation.

CAUTION: Do not alter lengths of these wires, unless otherwise directed. Do not hook up additional lamps (i.e. trailer tow lamps). Do not replace bulbs with any type different from original equipment. Doing so may result in a false warning or no warning.

DESCRIPTION AND OPERATION (Continued)

The Lamp-Out Warning System consists of a lamp-out warning module, a unique wiring harness and one warning indicator in the conventional instrument cluster, or two warning indicators in the digital instrument cluster. The lamp-out warning system monitors three functions:

- Low-beam headlamps
- Rear parking lamps
- Brakelamps

The system operates when the ignition switch is in the ACC or RUN position.

Digital Cluster:

REAR LAMP OUT: Indicates a brakelamp burn out when the brake pedal is pressed. Rear Lamp Out will also indicate a rear parking lamp burnout when the light switch is turned to either the parking lamp or headlamp position.

HEADLAMP OUT: Indicates a low-beam headlamp burnout when the light switch is turned to the headlamp position.

Analog Cluster:

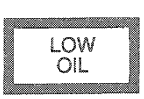
LAMP OUT: Combines the functions of REAR LAMP OUT and HEADLAMP OUT.

Low Oil Level Warning System

This system consists of a float-type sensor mounted to the side of the engine oil pan, an electronic control module (an electronic relay) and an instrument panel warning indicator.

The warning indicator should come on during engine starting as a bulb prove-out. When the ignition switch is turned to the RUN or START position, the control module determines whether the sensor is grounded (oil low) or ungrounded (oil not low). If the oil level is adequate, the light will go out in RUN. If oil level is approximately 1.4L (1.5 qt) low or lower, the relay keeps the warning indicator on. The indicator remains on until the oil level is adequate or the ignition switch is turned to the OFF position. After the ignition switch is turned to the OFF position, the module will not reset for approximately five minutes. The delay allows time for oil drainback before another reading is allowed to occur. If the engine is restarted during this delay period, the indicator will stay off, unless it was previously on and sensor is still grounded.

Low Oil Level Warning Indicator



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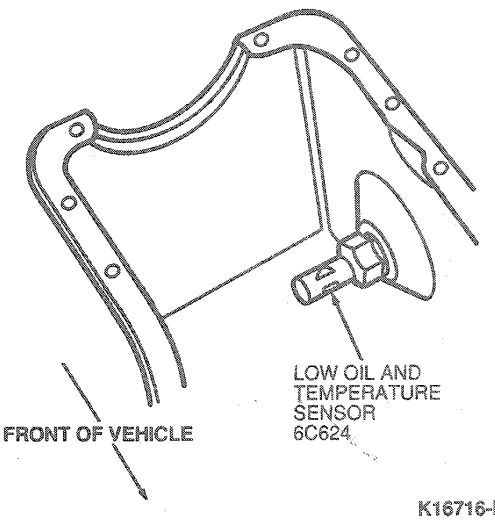
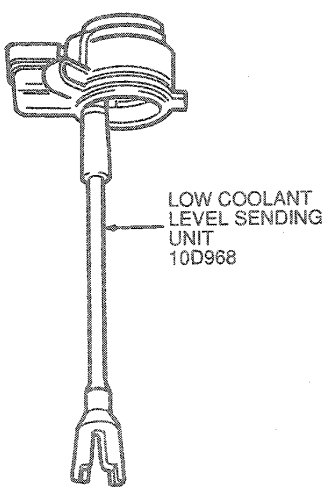
Sensor Installation



K16716-B

Low Coolant Level Indicator

A coolant level sensor is mounted on the recovery reservoir and is used to illuminate the CHECK COOLANT indicator located in the cluster. When the ignition is turned to RUN position, the indicator will prove out momentarily and turn off after the engine is started, indicating adequate coolant fill. The CHECK COOLANT indicator will turn on when the coolant level drops below the FULL COLD mark located on the side of the recovery reservoir. When indicating a low coolant condition, the indicator will illuminate and remain on until the coolant is filled to the FULL HOT mark and vehicle ignition is turned off and then cycled back on.



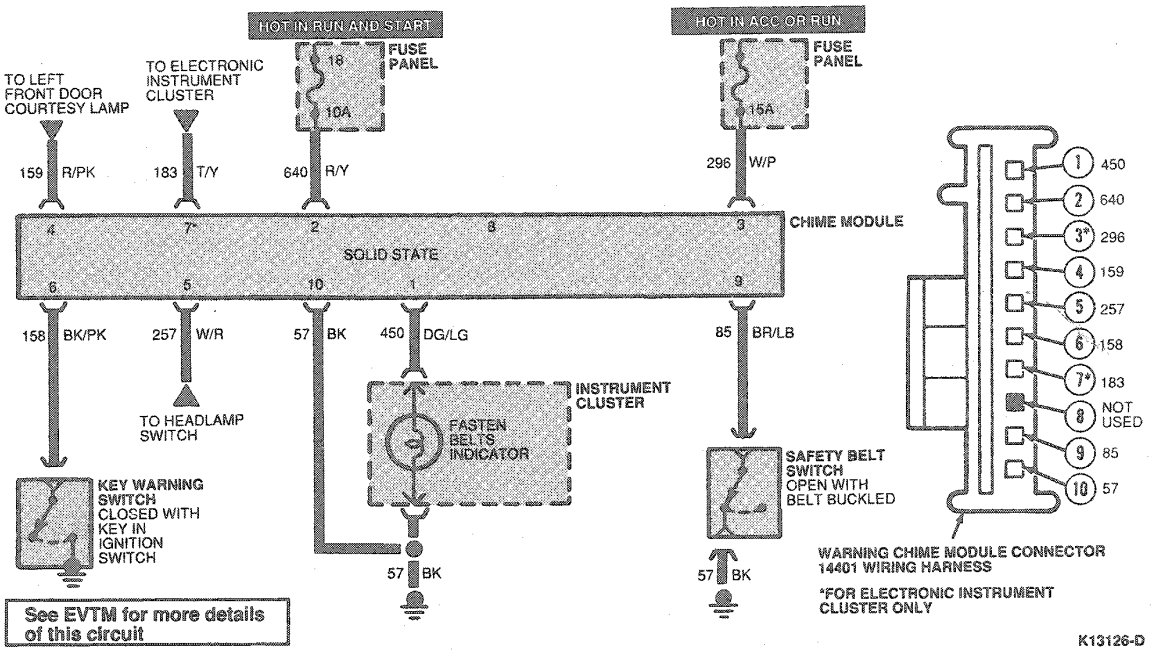
K17131-B

DIAGNOSIS AND TESTING

Check system fuse before proceeding.

- Equipment: 12-volt test lamp or ohmmeter
- When necessary to trace and / or service the various circuits, refer to the vehicle wiring diagrams and diagnostic chart.

Warning Chime System Diagram



NOTE: The following step-by-step diagnosis must be performed to obtain reliable results. If a specific failure condition is known, refer to the Electrical and Vacuum Troubleshooting manual to quickly determine root cause and corrective action.

ELECTRONIC WARNING CHIME DIAGNOSIS

Terminal No.	Circuit	Wire Color	Function
1	450	DG/LG	Warning chime module to safety belt warning indicator
2	640	R/Y	Ignition (RUN or START) to warning chime module
3	296	W/P	Ignition (RUN or ACC) to warning chime module for electronic cluster only
4	159	R/PK	Dirver door courtesy switch to warning chime module
5	257	R/W	Headlamp switch to warning chime module
6	158	BK/PK	Key warning switch to warning chime module
7	183	T/Y	Tripminder to warning chime module for electronic cluster only
9	85	BR/LB	Safety belt switch to warning chime module
10	57	BK	Ground to warning chime module

TK17147B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
ELECTRONIC WARNING CHIME DIAGNOSIS

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CHECK WARNING CHIME SYSTEM FUSE ● If warning chime module is properly connected, check the warning chime system fuse. ● **Is fuse OK?**	Yes ▶ No ▶	GO to **A2.** REPLACE fuse.
A2	CHECK FOR VOLTAGE AT CIRCUIT 640 (R/Y) ● Disconnect warning chime module. ● Connect a 12-volt test lamp between Circuit 640 (R/Y) in warning chime connector and ground. ● Turn ignition switch to RUN. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A3.** CHECK Circuit 640 (R/Y) back to ignition switch. SERVICE as required. REPEAT **A2.**
A3	CHECK FOR GROUND AT CIRCUIT 57 (BK) ● Connect a 12-volt test lamp between Circuit 640 (R/Y) and 57 (BK) in warning chime connector. ● Turn ignition switch to RUN. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A4.** CHECK Circuit 57 (BK) back to body ground. SERVICE as required. REPEAT **A3.**
A4	CHECK CKT 450 (DG/LG) AND SAFETY BELT WARNING LAMP BULB ● Connect jumper between Circuit 450 (DG/LG) and Circuit 640 (R/Y) in warning chime module connector. ● Turn ignition switch to RUN. ● **Does safety belt warning indicator light?**	Yes ▶ No ▶	GO to **A5.** CHECK Circuit 450 (DG/LG) back to safety belt warning indicator bulb. CHECK bulb. SERVICE as required. REPEAT **A4.**
A5	CHECK FOR GROUND AT CIRCUIT 85 (BR/LB) ● Unbuckle driver's side safety belt. ● Connect a 12-volt test lamp between Circuit 85 (BR/LB) and Circuit 640 (R/Y) in warning chime connector. ● Turn ignition switch to RUN. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A6.** CHECK Circuit 85 (BR/LB) back to safety belt switch. SERVICE as required. REPEAT **A5.**
A6	CHECK FOR GROUND AT CIRCUIT 158 (BK/PK) ● Insert key in ignition. ● Connect a 12-volt test lamp between Circuit 158 (BK/PK) and Circuit 640 (R/Y) in warning chime connector. ● Turn ignition switch to RUN. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A7.** CHECK Circuit 158 (BK/PK) back to ignition key cylinder switch. SERVICE as required. REPEAT **A6.**
A7	CHECK FOR VOLTAGE AT CIRCUIT 159 (R/PK) ● Connect a 12-volt test lamp between Circuit 159 (R/PK) in warning chime connector and a known good ground. ● Open driver's door. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A8.** CHECK Circuit 159 (R/PK) back to courtesy lamp switch. SERVICE as required. REPEAT **A7.**
A8	CHECK FOR VOLTAGE AT CIRCUIT 257 (W/R) ● Connect a 12-volt test lamp between Circuit 257 (W/R) and a known good ground. ● Pull headlamp switch to the ON position. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A9.** CHECK Circuit 257 (W/R) back to headlamp switch. SERVICE as required. REPEAT **A8.**
A9	CHECK FOR VOLTAGE AT CIRCUIT 296 (W/P) ● Connect a 12-volt test lamp between Circuit 296 (W/P) in warning chime connector and ground. ● Turn ignition switch to the ACC position. ● **Does test lamp light?**	Yes ▶ No ▶	GO to **A10.** CHECK Circuit 296 (W/P) back to ignition switch. SERVICE as required. REPEAT **A9.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
ELECTRONIC WARNING CHIME DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A10	CHECK FOR GROUND AT CIRCUIT 183 (T/Y)		
	• Connect a 12-volt test lamp between Circuit 183 (T/Y) and Circuit 296 (W/P) of warning chime connector. • Turn ignition switch to RUN position and press a button on the electronic instrument cluster. • **Does test lamp light momentarily?**	Yes ▶ No ▶	GO to A11. REFER to electronic instument cluster diagnostics, Section 13-01. SERVICE as required. REPEAT A10.
A11	CHECK WARNING CHIME MODULE OPERATION		
	• Connect warning chime module. • Check for proper operation of: — Safety belt warning. — Key-in-ignition warning. — Headlamp switch on warning. — Audible beep.	All warnings operate properly ▶ One, two, or three warnings inoperative ▶ All warnings not operating ▶	System operating properly. CHECK back through appropriate circuit(s). SERVICE as necessary. REPEAT A11. REPLACE warning chime module. REPEAT A11.

TK17155A

Low Oil Level Warning System Check

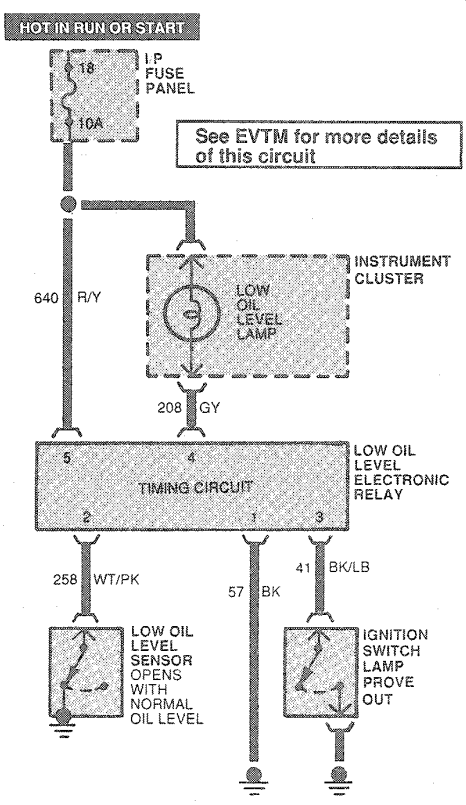
With oil at FULL mark on dipstick and the engine oil warm to ensure that the oil drains properly from the oil sensor, turn ignition switch to the RUN position and start engine. Warning indicator should come on briefly in START for bulb prove-out, then go out. Turn engine off. Drain 1.9L (2 qt) of oil from engine. Wait for five minutes, then restart engine. Warning indicator should come on and stay on.

If indicator does not come on, check the following:

- Indicator
- Fuse
- Low oil level relay
- Low oil level sensor

Refer to diagnosis charts for complete testing procedures.

Electrical Schematic—Low Oil Level Relay



K7920-E

DIAGNOSIS AND TESTING (Continued)

Low Oil Level Sensor Test

Tools Required:

- Rotunda Digital Volt-Ohmmeter 007-00001

Connect positive lead of a Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent to sensor terminal and negative lead to sensor housing. With sensor submerged in oil (engine full), meter should read "open." Resistance should be greater than 100,000 ohms. With sensor out of oil (oil drained), resistance should be less than 1000 ohms.

NOTE: Sensor must be horizontal when this test is conducted.

It is best to conduct test with sensor in pan with hot oil to ensure that oil properly drains from sensor. If removed from pan, sensor must first be submerged in warm oil to ensure proper positioning of the float before testing. The sensor must be held horizontally during bench testing to ensure that the float remains correctly positioned.

NOTE: The module is located on the instrument panel shake brace.

Pinpoint Test Index

SYMPTOM	PINPOINT TEST
Low Oil Level Indicator Stays On After Starting Engine-Oil Not Low	A
Low Oil Level Indicator Does Not Stay On When Low On Oil	B
Low Oil Level Indicator Blinks Intermittently While Driving	C
Low Coolant Level Indicator Inoperative	D

NOTE: Ignition should be turned OFF for five minutes between checks to be sure that the electronic relay has "reset".

PINPOINT TEST A: LOW OIL LEVEL INDICATOR STAYS ON AFTER STARTING ENGINE — OIL NOT LOW

	TEST STEP	RESULT ▶	ACTION TO TAKE
A1	CHECK OIL LEVEL AND RELAY GROUND		
	• Verify oil level is full then check electronic relay ground by disconnecting wire Circuit 258 (W/PK) from sensor and restart engine. • **Does indicator turn off?**	Yes ▶	CHECK sensor resistance. If less than 1000 K ohms, REPLACE sensor. If greater than 1000 K ohms—REPLACE electronic relay.
		No ▶	GO to **A2.**
A2	CHECK OIL SENSOR CIRCUIT		
	• Check wiring circuit between electronic relay and terminal 4 of electronic relay. • **Is wire OK?**	Yes ▶	REPLACE electronic relay.
		No ▶	SERVICE wiring.

TK17142B

PINPOINT TEST B: LOW OIL LEVEL INDICATOR DOES NOT STAY ON WHEN LOW ON OIL 1.9 LITERS (TWO QUARTS)

	TEST STEP	RESULT ▶	ACTION TO TAKE
B1	CHECK ELECTRONIC RELAY		
	• Check electronic relay by disconnecting wire Circuit 258 (W/PK) from terminal 4. Wait approximately five minutes. Then short terminal to ground. Start engine. • **Does indicator stay on?**	Yes ▶	RECONNECT wire. GO to **B2.**
		No ▶	REPLACE electronic relay.
B2	CHECK SENSOR RESISTANCE		
	• Check sensor resistance between sensor terminal and ground. • **Is resistance greater than 1000K ohms?**	Yes ▶	REPLACE sensor.
		No ▶	CHECK wiring or connector to sensor for open circuit.

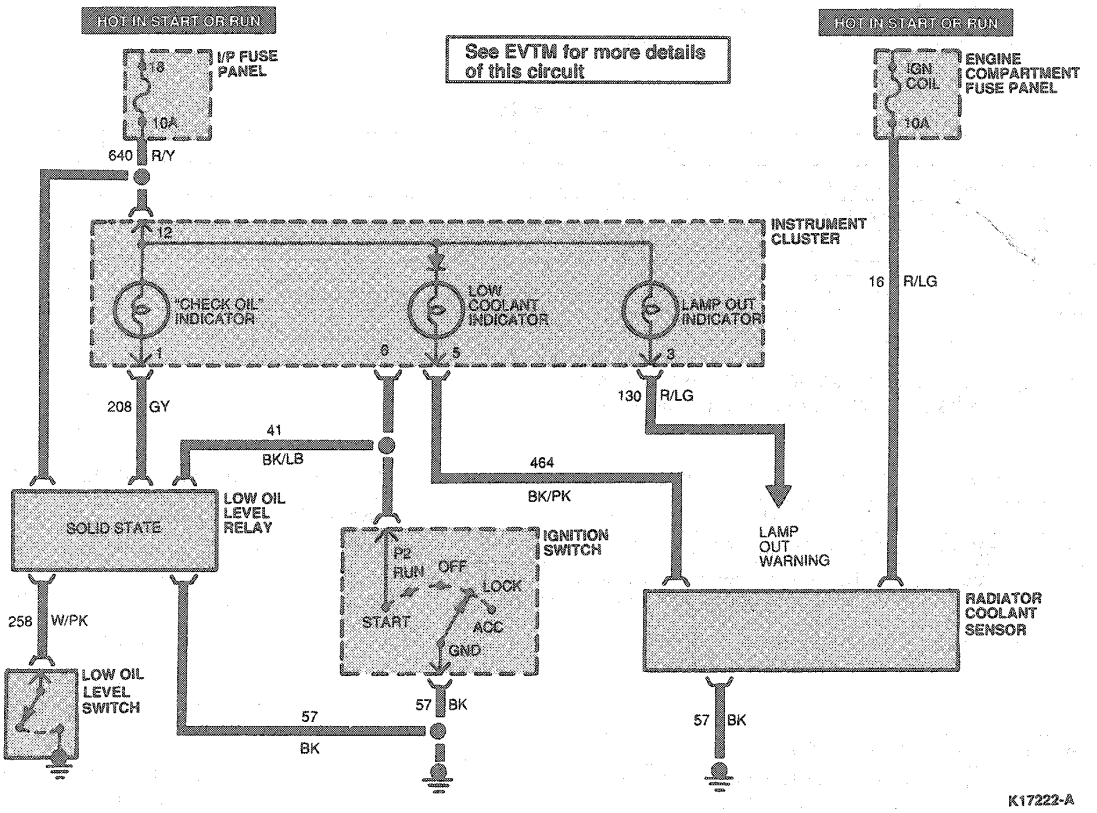
TK17143B

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: LOW OIL LEVEL INDICATOR BLINKS INTERMITTENTLY WHILE DRIVING

TEST STEP		RESULT	ACTION TO TAKE
C1	CHECK CONNECTIONS		
	• Check for loose connections to relay or bulb. • **Are connections OK?**	No Yes	SERVICE connections. REPLACE electronic relay.

TK7921F



K17222-A

PINPOINT TEST D:
LOW COOLANT LEVEL INDICATOR INOPERATIVE

TEST STEP		RESULT	ACTION TO TAKE
D1	VERIFY COOLANT LEVEL		
	• When the engine is cold observe level of coolant in recovery reservoir. • **Is coolant level below FULL HOT mark?**	Yes No	GO to **D2.** GO to **D3.**
D2	VERIFY COOLANT LEVEL		
	• Fill coolant to the FULL HOT mark on the recovery reservoir. • Start vehicle and observe CHECK COOLANT indicator. • **Does indicator illuminate then stay off?**	Yes No	System OK. GO to **D3.**
D3	CHECK INDICATOR		
	• Turn ignition ON. • Using a jumper wire, ground Circuit 464 (BR/PK) wire at instrument cluster connector. • **Does indicator turn on?**	Yes No	GO to **D4.** REPLACE and CHECK COOLANT indicator or instrument cluster.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D:
LOW COOLANT LEVEL INDICATOR INOPERATIVE (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
D4	CHECK RESISTANCE		
	● Disconnect the instrument cluster. ● Measure resistance from the instrument cluster Circuit 464 (BR/PK) wire to the coolant level sensor. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to D5. SERVICE/REPLACE Circuit 464 (BR/PK) wire.
D5	CHECK VOLTAGE TO SENSOR		
	● Measure voltage on Circuit 16 (R/LG) at coolant level sensor. ● **Is voltage at least 10 volts?**	Yes ▶ No ▶	GO to D6. SERVICE/REPLACE 16 (R/LG) circuit from the 20 fuse link to coolant level sensor.
D6	CHECK SENSOR GROUND		
	● Measure resistance from coolant level sensor wire, Circuit 57 (BK) to ground. ● **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to D7. SERVICE/REPLACE Circuit 57 (BK).
D7	CHECK COOLANT LEVEL SENSOR		
	● Turn ignition ON. ● Using a jumper wire, jump the coolant level sensor wire Circuit 464 (BR/PK) to ground. ● **Does indicator turn on?**	Yes ▶ No ▶	REPLACE coolant level sensor. SERVICE/REPLACE the CHECK COOLANT indicator or instrument cluster.

Lamp-Out Warning System

Tools Required:

- Rotunda Digital Volt-Ohmmeter 014-00407

NOTE: For diagnosis of the warning indicators, refer to the appropriate Section in Group 13.

When performing diagnosis on the Lamp-Out Warning System, the voltage measurements must be taken using Rotunda Digital Volt/Ohmmeter 014-00407 or equivalent. While taking measurements **do not** touch metal probes. Doing so will cause incorrect readings.

The vehicle must be at room temperature for this check, 16-30°C (60-86°F).

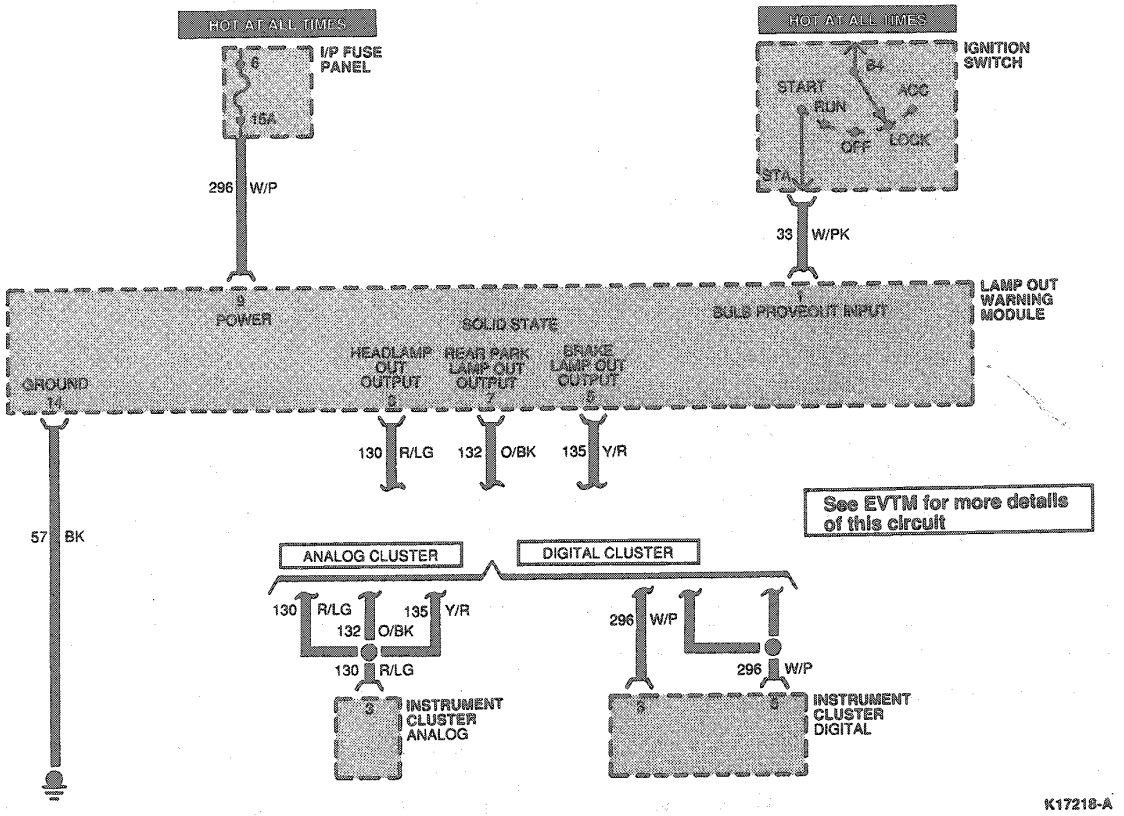
Make sure no additional lamps (i.e. trailer) or other than original equipment bulbs are in use.

Use the following diagnosis charts and illustrations to diagnose concerns in the Lamp-Out Warning System.

DIAGNOSIS AND TESTING (Continued)

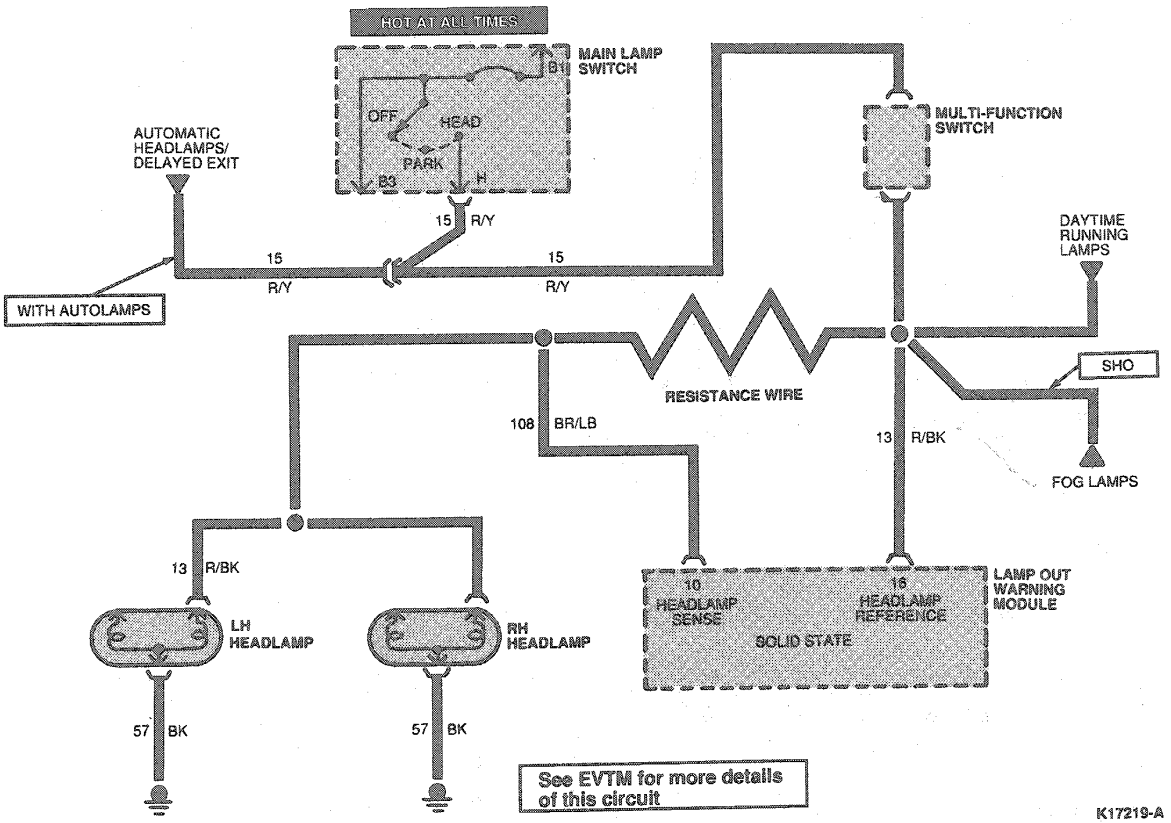
Lamp-Out Warning System

Module Power and Cluster Connections



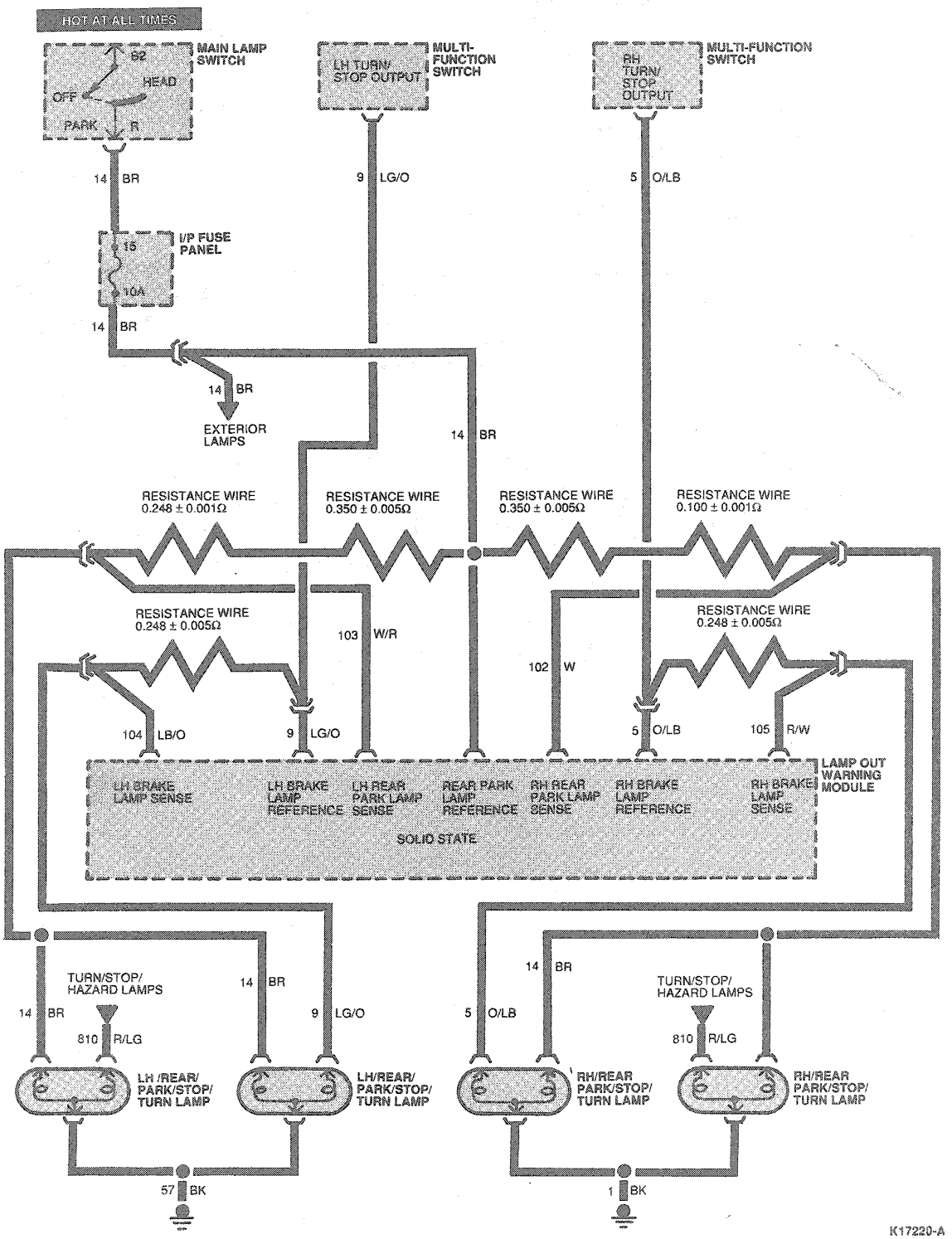
DIAGNOSIS AND TESTING (Continued)

Headlamp Circuit



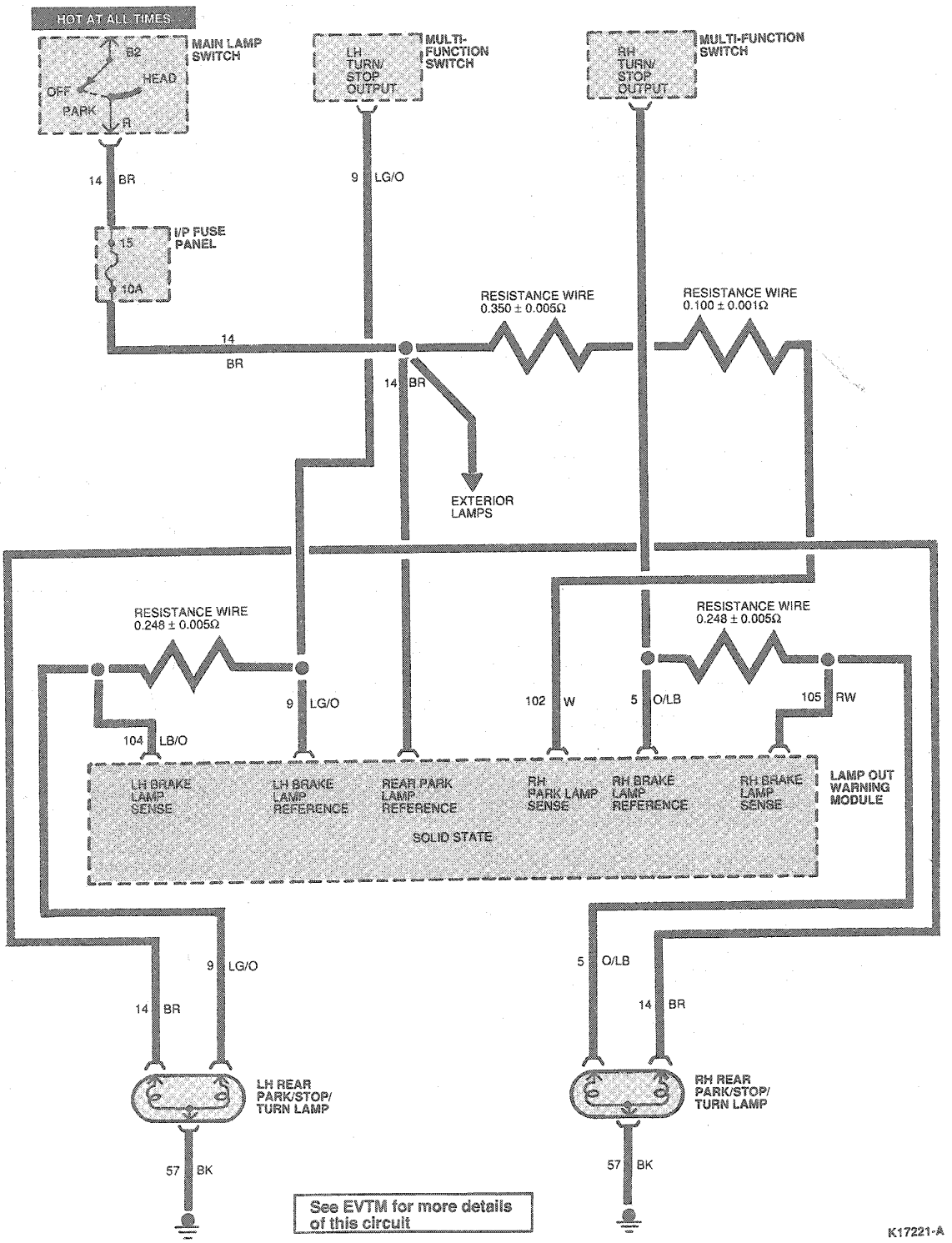
DIAGNOSIS AND TESTING (Continued)

Parking/Stop/Turn Lamp—Sedan



DIAGNOSIS AND TESTING (Continued)

Parking/Stop/Turn Lamp—Wagon



DIAGNOSIS AND TESTING (Continued)

LAMP-OUT WARNING SYSTEM: QUICK TEST Lamp-out warning not displayed when a lamp is burned out OR Lamp-out warning is displayed without an actual lamp failure

TEST STEP		RESULT	ACTION TO TAKE
Step 1	VERIFY THE CONDITION	▶	GO to **Step 2.**
Step 2	CHECK HEADLAMPS, TAIL LAMPS AND BRAKELAMPS		
	• Turn ignition switch to ACC or RUN. • Turn on low beam headlamps and brakelamps. • **Are headlamps, rear parking lamps and brakelamps working properly?**	Yes ▶ No ▶	GO to **Step 3.** SERVICE fuses, switches, bulbs, sockets or wiring as necessary. REPEAT test.
Step 3	CHECK WARNING INDICATORS		
	• For vehicle with conventional cluster: Is LAMP OUT indicator on? • For vehicle with electronic cluster: Are HEADLAMP OUT and REAR LAMP OUT indicators on?	Yes ▶ No ▶	GO to **Step 4.** REFER to Pinpoint Test B as outlined to complete system verification.
Step 4	DISCONNECT LAMP-OUT MODULE		
	• Turn lamps and ignition OFF. • Disconnect lamp-out module. • Turn lamps and ignition ON. • **Is outage warning still being displayed?** NOTE: Voltage measurements must use Rotunda Digital Volt/Ohmmeter 014-00407, 007-00001 or equivalent.	Yes ▶ No ▶	CHECK outage indicator circuits for shorts to ground: 135 (Y/R) (module Pin 5) 132 (O/BK) (module Pin 7) 130 (R/LG) (module Pin 8) SERVICE as necessary. REPEAT test. REFER to Pinpoint Test A as outlined.

TK13184C

PINPOINT TESTA
LAMP-OUT WARNING ILLIMINATED WHEN LAMPS ARE OPERATING PROPERLY

TEST STEP		RESULT	ACTION TO TAKE
A1	CHECK REFERENCE VOLTAGES AT HARNESS CONNECTOR		
	• Disconnect module. • Check voltage between ground Circuit 57 (BK) and the reference circuits of the lamp outage module harness connector. The voltage should be between 10 and 15 volts: — Check voltage between Pin 14 (ground Circuit 57 BK) and Pin 13 (LH brake lamp reference Circuit 9 LG/O). — Check voltage between Pin 14 (ground Circuit 57 BK) and Pin 3 (RH brakelamp reference Circuit 5 O/LB). — Check voltage between Pin 14 (ground Circuit 57 BK) and Pin 15 (parking lamp reference Circuit 14 BR). — Check voltage between Pin 14 (ground Circuit 57 BK) and Pin 16 (headlamp reference Circuit 505 GY/Y). • **Is voltage between 10 and 15 volts?**	Yes ▶ No ▶	GO to **A2.** CHECK circuits for opens or high resistance. CHARGE vehicle if necessary. REPEAT diagnostic test.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
LAMP-OUT WARNING ILLIMINATED WHEN LAMPS ARE OPERATING PROPERLY (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	CHECK FOR CROSSED CIRCUITS		
• Checks for crossed circuits by energizing all light circuits individually. Verify voltage between reference and ground, then between sensor and ground. • Corresponding reference and sense terminals should be the only ones with voltage (9 volts minimum) and reference circuits should measure higher (with respect to vehicle ground) than sense circuits. **HARNESS CONNECTOR PIN (CIRCUIT NUMBER, COLORS)**		Yes ▶ No ▶	GO to A3. SERVICE circuits.

Exterior Light	Reference	Sense	Ground
LH turn signal only (this is the LH brakelamp filament also)	13 (9 LG/O)	11 (104 LB/O)	14 (57 BK)
RH turn signal only (this is the RH brakelamp filament also)	3 (5 O/LB)	2 (105 R/W)	14 (57 BK)
Parking lamps only on (FOR SEDANS: this is the LH parking lamp filament only. FOR WAGONS: this is both the LH and RH parking lamp filaments)	15 (14 BR)	4 (102 W)	14 (57 BK)
Parking lamps only on FOR SEDANS ONLY: this is the RH parking lamp filament	15 (14 BR)	12 (103 W/R)	14 (57 BK)
Headlamps (both LH and RH)	16 (505 GY/Y)	10 (108 BR/LB)	14 (57 BK)

• **Are all circuits OK?**

A3	CHECK VOLTAGE BETWEEN REFERENCE AND SENSE PINS		
• Voltage between corresponding Reference and Sense circuits when each light circuit is turned on individually. • The voltage should be approximately 0.50 volt. **HARNESS CONNECTOR PIN (Circuit number, colors)**		Yes ▶ No ▶	REPLACE lamp-out module. GO to A4.

Exterior Light	Reference	Sense
LH turn signal only (this is the LH brakelamp filament also)	13 (9 LG/O)	11 (104 LB/O)
RH turn signal only (this is the RH brakelamp filament also)	3 (5 O/LB)	2 (105 R/W)
Parking lamps only on (FOR SEDANS: this is the LH parking lamp filament only. FOR WAGONS: this is both the LH and RH parking lamp filaments)	15 (14 BR)	4 (102 W)
Parking lamps only on (FOR SEDANS ONLY: this is the RH parking lamp filament)	15 (14 BR)	12 (103 W/R)
Headlamps (both LH and RH)	16 (505 GY/Y)	10 (108 BR/LB)

• **Are all voltages OK?**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TESTA
LAMP-OUT WARNING ILLIMINATED WHEN LAMPS ARE OPERATING PROPERLY (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A4	SUBSTITUTE NEW BULBS		
	• Substitute new bulbs for lamps indicated by warning. • Reconnect lamp-out module and re-test. • **Are lamps OK?**	Yes ▶ No ▶	LEAVE in new bulbs. SERVICE affected wiring harness: Headlamps—14401 Tail lamps or Brakelamps—14405

TK17157B

PINPOINT TEST B: LAMP-OUT WARNING NOT ILLUMINATED WHEN ONE OF MORE LAMPS ARE NOT OPERATING PROPERLY

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	CHECK FUSE AND CONNECTOR		
	• Check system fuse. • Check wiring connector to outage indicator lamps. • **Are fuse and connector OK?**	Yes ▶ No ▶	GO to B2. SERVICE and/or REPLACE as necessary.
B2	CHECK INPUTS TO THE WARNING INDICATORS		
	FOR CONVENTIONAL CLUSTER: • Disconnect lamp out module. • Check if LAMP OUT indicator lights when you: — Turn ignition to ACC or RUN. — Ground Pin 5, Circuit 135 (Y/R) (brakelamp outage circuit). — Does LAMP OUT indicator light? — Shut OFF ignition to reset conventional cluster. — Turn ignition to ACC or RUN. — Ground Pin 7, Circuit 132 O/BK (the rear parking lamp outage circuit). — Does LAMP OUT indicator light? — Shut off ignition to reset conventional cluster. — Turn ignition to ACC or RUN. — Ground Pin 8, Circuit 130 R/LG (the headlamp outage circuit). — Does LAMP OUT indicator light? • **Does LAMP OUT indicator light when circuits are individually grounded?** FOR ELECTRONIC CLUSTER: • Disconnect lamp out module. • Check if warning indicator lights when you: — Turn ignition to ACC or RUN. — Ground Pin 5, Circuit 135 (Y/R) (the brakelamp outage circuit). — Does REAR LAMP OUT indicator light? — Shut OFF ignition to reset electronic cluster. — Turn ignition to ACC or RUN. — Ground Pin 7, Circuit 132 (O/BK) (the rear parking lamp outage circuit). — Does REAR LAMP OUT indicator light? — Shut OFF ignition to reset electronic cluster. — Turn ignition to ACC or RUN. — Ground Pin 8, Circuit 130 (R/LG) (the head lamp outage circuit). — Does HEADLAMP OUT indicator light? • **Does LAMP OUT indicator appear when circuits are individually grounded?**	Yes ▶ No ▶	REPLACE lamp out warning module. SERVICE appropriate wiring of bulbs as necessary.

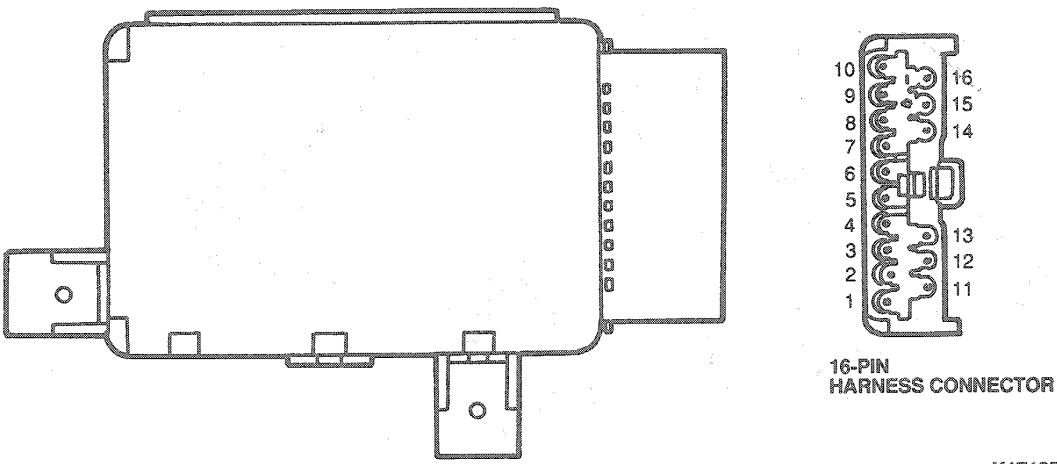
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: LAMP OUT WARNING SYSTEM: Verification if outage is detected if lamps are disconnected

TEST STEP		RESULT	ACTION TO TAKE
C1	CHECK WARNING INDICATORS		
	• Turn OFF headlamps, tail lamps and brakelamps. • Disconnect one headlamp and two tail lamps (includes brakelamp filaments), one from left and right. • Connect lamp-out module. • Turn ignition to ACC or RUN. • Turn on headlamps (low beam) and brakelamps. • **Are all lamp-out warning indicators illuminated?**	Yes ▶ No ▶	System OK. Test complete. GO to Pinpoint Test A, Step A1.

TK5980H

Lamp-Out Module Connector Pin-Out



K17135-A

Pin	Circuit	Color	Function
1	33	W/P	Start (Prove-Out)
2	105	R/W	RH Stop Lamp Sense
3	5	O/LB	RH Stop Lamp Reference
4	102	W	LH Park Lamp Sense (LH and RH Rear Park Lamp Sense for Wagons)
5	135	Y/R	Brakelamp Outage
6	573	BK/O	Center Tail Lamp Sense (Sable Sedan)
7	132	O/BK	Tail Lamp Outage
8	130	R/LG	Headlamp Outage
9	296	W/P	RUN/ACC
10	108	BR/LB	Headlamp Sense
11	104	LB/O	LH Stop Lamp Sense
12	103	W/R	RH Rear Park Lamp Sense (Sedan Only)
13	9	LG/O	LH Stop Lamp Reference
14	57	BK	Ground
15	14	BR	Rear Park Lamp Reference
16	505	GY/Y	Headlamp Reference

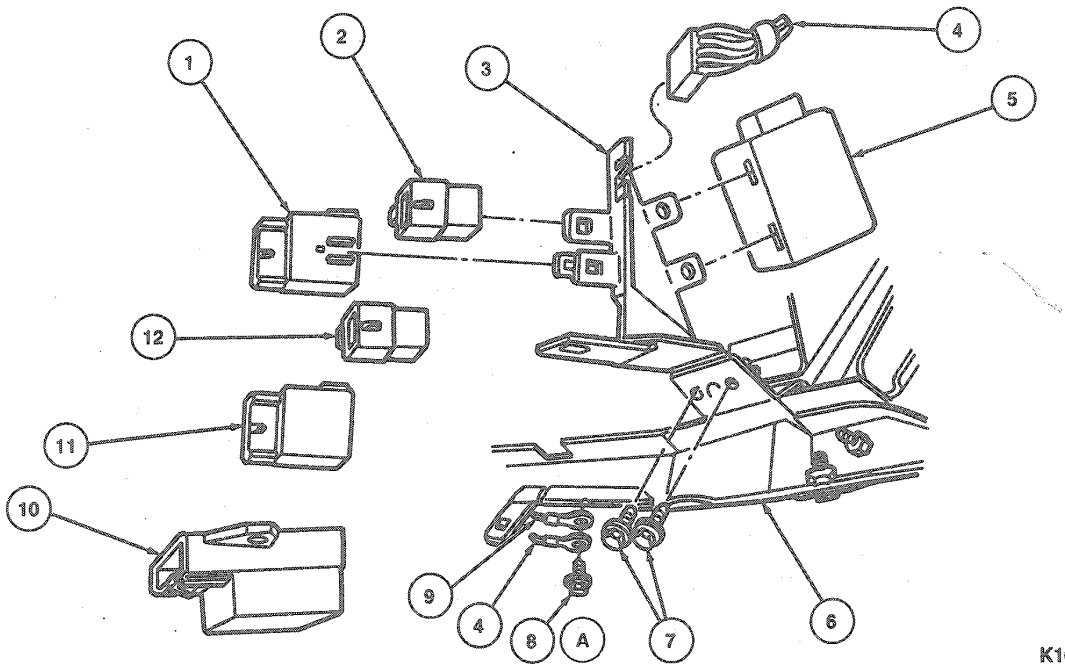
REMOVAL AND INSTALLATION

Warning Chime

Removal and Installation

The warning chime module is mounted on a bracket to the RH side of the steering column, on the instrument panel reinforcement.

1. Disconnect battery ground cable.
2. Depress tab on warning chime module and slide module off bracket.
3. Disconnect electrical connector to warning chime.
4. Remove chime.
5. To install, reverse Removal procedure.



K16929-B

Item	Part Number	Description
1	6C625	Low Oil Indicator Assy
2	14B193	Horn Relay Assy
3	14A323	Relay Panel Bracket Assy
4	14401	Wiring Assy
5	17D539	Wiper Control Module
6	5404304	Instrument Panel Assy
7	N803876-S36	Screw (2 Req'd)

(Continued)

Item	Part Number	Description
8A	N805375-S36MG	Ground Screw
9	14401	Wiring Assy Ground (for Canadian Vehicles Only)
10	10D840	Chime Assy
11	18C641	Rear Window Defroster Timer (Sable)
12	14B193	Horn Relay Assy
A		Tighten to 12 N·m (9 Lb-Ft)

Lamp-Out Warning Module

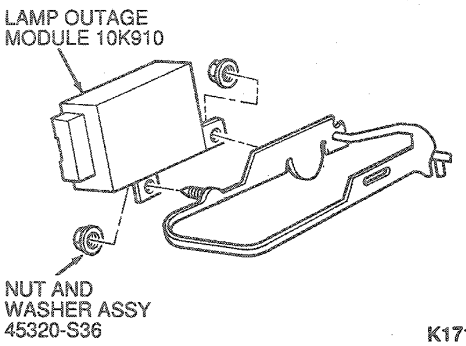
Except Taurus SHO

Removal and Installation

1. Pull down fuse panel.
2. Remove two nuts retaining lamp outage module.
3. Disconnect electrical connector.

REMOVAL AND INSTALLATION (Continued)

4. To install, reverse Removal procedure.

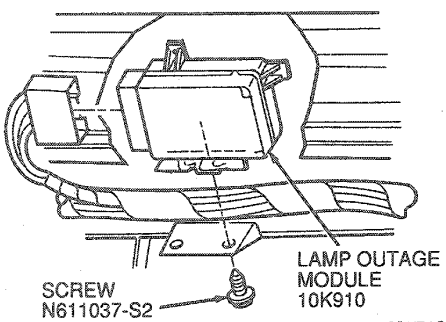


K17133-B

Taurus SHO

Removal and Installation

1. Remove glove compartment.
2. Remove screw retaining module to instrument panel.
3. Disconnect electrical connectors.
4. To install, reverse Removal procedure.

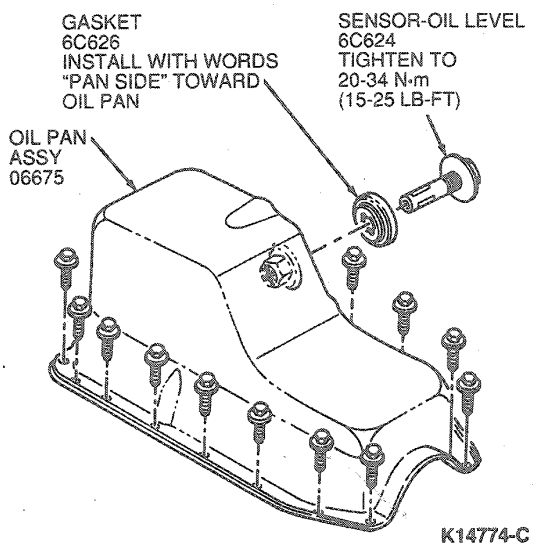


K17134-B

Low Oil Level Sensor

Removal and Installation

1. With engine off, drain at least 1.9L (2 qt) of oil from engine.
2. Disconnect electrical connection.
3. Remove sensor with a 26mm (1 inch) socket or end wrench. Discard old gasket.
4. To install, reverse Removal procedure.

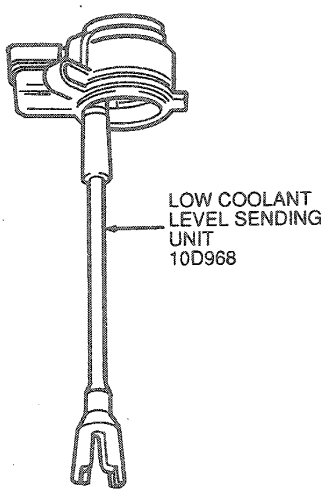


K14774-C

Low Coolant Level Sending Unit

Removal and Installation

1. Disconnect electrical connector to coolant level sending unit.
2. Remove coolant level sending unit from coolant recovery reservoir.
3. To install, reverse Removal procedure and verify proper operation.



K17131-B

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Oil Level Sensor	20-34	15-25
Ground Screw	12	9

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
014-00407	Digital Volt-Ohmmeter

GROUP

BATTERY AND CHARGING SYSTEM 14

(10000)

SECTION 14-00 Battery and Charging System—Service

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

Charging System

The charging system consists of a generator (GEN) (10300), voltage regulator, charge indicator, storage battery, fuse links and associated wiring.

This section contains general information applicable to all charging systems and generators. For information on batteries, refer to Section 14-01. For information specific to the generator / charging system being tested or serviced, refer to the appropriate section in this group.

The generators used on these vehicles and their specific application follows:

IGR Generator With Internal Fan and Internal Regulator

This generator is used on Taurus vehicles equipped with the optional 3.0L / 3.2L SHO engine. Refer to Section 14-02B for testing and servicing of this system.

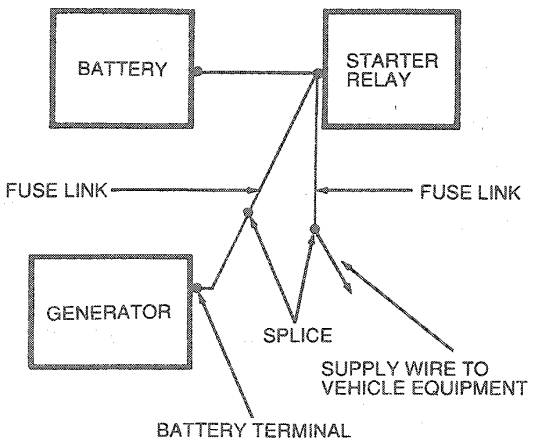
IGR Generator With Internal Fan and Rear Mounted Regulator

This generator is used on vehicles equipped with the 3.0L or 3.8L engine. Refer to Section 14-02A for testing and servicing of this system.

DESCRIPTION AND OPERATION (Continued)

Fuse Link

The fuse link is a short length of insulated wire integral with the engine compartment wiring harness. It is several wire gauges smaller than the circuit that it protects. The fuse link for the generator is a 12-gauge gray wire.



Service fuse links are brown, green or black depending on usage. All fuse links have a flag moulded on the wire or on the terminal insulator. Color identification of the flag or connector for the external voltage regulator system is brown 18-gauge wire or gray 12-gauge wire. The illustration shows a typical fuse link installation.

The fuse link is designed to burn out, thus protecting the generator and wiring when heavy reverse current flows, such as when a booster battery is connected incorrectly, or a short to ground occurs in the wiring harness.

A burned-out link may have bare wire ends protruding from the insulation, or bubbled insulation with illegible identification. If it is hard to determine if the link is burned out, perform a continuity test.

Refer to Diagnosis, for testing procedures for fuse links used in the charging system.

DIAGNOSIS

Preliminary Checks

Before performing charging or starting system tests on the vehicle, note the complaint such as: slow cranking, battery discharged or using an excessive amount of water, top of battery wet, generator warning lamp does not come on or never goes out. This information will aid in isolating the part of the system causing the symptom.

Next, visually inspect as follows:

1. Check the fuse link located between the power distribution box and the generator. Replace the fuse link if burned.
2. Make certain that the battery is OK; then turn on the headlamps or any other accessory. If the headlamps or accessory do not operate, the fuse link is probably burned out.
3. On some vehicles there are several fuse links. Use the same procedure as in Step 1 to test the fuse link that protects vehicle equipment.

To test the fuse link that protects the generator, make certain the battery is OK. Then check with a voltmeter for voltage at the BAT terminal of the generator. No voltage indicates that the fuse link is probably burned out.

4. Check battery posts and battery cable terminals for clean and tight connections. Remove the battery cables (if corroded), clean and install them securely.
5. Check for clean and tight wiring connections at the generator, voltage regulator and engine ground.
6. Check the generator belt tension. Refer to Section 03-05.

- When a relatively new battery is discharged, test for current drain. Refer to Section 14-01 for proper procedures. The following are some of the most common current drain problems:
  - — Glove compartment lamp stays on with the door closed
  - — Hood lamp stays on constantly
  - — License plate lamp or interior lamp stays on constantly
  - — Other electronic component malfunctions
- Check for secure ground connections at the engine and body. Also check for proper connections at the generator and voltage regulator.
- Check the testing equipment and instructions. If the equipment is malfunctioning or the instructions for use are incorrect, use the equipment on a vehicle you know to be operating properly.
- Only test the charging system with a fully charged, properly operating battery. Make sure cable connections are clean and secure.

DIAGNOSIS (Continued)

In order to check the charging system, the use of Rotunda Starting / Charging VAT-40 Tester 078-00005 or equivalent is suggested. Connect the tester to the battery positive and negative posts and also connect the current probe to the generator + output lead (to measure generator output). (When measuring generator output, the tester can also be connected to the battery positive or negative cable. In this case, all electrical accessories must be turned off and 10-15 amps added to the reading on the tester due to the engine operation). With the engine running at 2000 rpm, adjust the tester load bank to determine the output of the generator. The generator output should be near to, or exceed the generator rating (27°C (80°F) ambient). Checkout the charging system as indicated and service if required.

NOTE: Refer to the tester test procedure manual for complete directions on checking out the charging system.

Isolating the Concern

Battery and starting system concerns can be caused by poor charging system performance. It is also reasonable to suspect the charging system because of an overload in another area of the electrical system.

To avoid guesswork, it is necessary to isolate the battery, the charging system, and the electrical circuits to correctly identify the area where the difficulty lies. Check the battery first before performing any electrical system diagnosis. The battery must be in proper state of change and operation before the other areas of the electrical system can perform normally.

Battery Check

Check battery to see if it has the capacity and ability to accept and hold a charge. Refer to Section 14-01, Battery. If the battery is good, then the charging system should be checked to see that it performs its function of keeping the battery charged.

The battery capacity, specific gravity and cell comparison test (low-maintenance batteries only) will determine the ability of a battery to accept and hold a charge. If the battery cannot meet the specifications, replace it with a new fully charged battery before further diagnosis of other areas of the electrical system.

If the battery is found to meet the required specifications, it should be fully charged before proceeding with the diagnosis of other electrical system components.

Charging System Test

The Charging System Test should be performed before testing any of the individual charging system components. Its "road-map" type of layout should reduce confusion in determining "what to do next" and speed up diagnosis. The component tests will determine the type of component service to be performed.

Use Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent and a test lamp to test the system. Special care should be given when using the ohmmeter near "hot" circuits. The component to be checked should be disconnected from the circuit or the battery terminals should be disconnected.

CAUTION: Damage to the component could occur, if the circuit is allowed to remain intact.

Rotunda Charging / Starting Analyzer 059-00002 or equivalent is available for testing the charging system. Test instructions are provided with the analyzer.

NOTE: When checking generator output current with the Rotunda Analyzer at the battery cable, add 10 to 15 amps to the reading because of charge current removed for engine operation.

DIAGNOSIS (Continued)

CHARGING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Battery Does Not Stay Charged—Engine Starts OK	• Battery. • Loose or worn generator belt. • Damaged or worn wiring or cables. • Generator. • Voltage regulator. • Other vehicle electrical systems.	• Test battery, replace if necessary. • Adjust or replace belt. Refer to Section 03-05. • Service as required. Refer to Section 18-01. • Test and / or replace components as required. • Test, replace if necessary[1]. • Check other systems for current draw. Service as required[1].
• Generator Noisy	• Loose or worn generator belt. • Bent pulley flanges. • Generator.	• Adjust tension or replace belt. Refer to Section 03-05. • Replace pulley[1]. • Service or replace generator[1].
• Lamps and / or Fuses Burn Out Frequently	• Damaged or worn wiring. • Generator / voltage regulator. • Battery.	• Service as required. Refer to Section 18-01. • Test, service, replace if necessary[1]. • Test, replace if necessary[1].
• Charge Indicator Lamp Flickers After Engine Starts or Comes On While Vehicle Is Being Driven	• Loose or worn generator belt. • Generator. • Field circuit ground. • Voltage regulator. • Lamp circuit wiring and connector.	• Adjust tension or replace. Refer to Section 03-05. • Service or replace[1]. • Service or replace wiring. Refer to Section 18-01. • Test, replace if necessary[1]. • Service as required[1].
• Charge Indicator Lamp Flickers While Vehicle Is Being Driven	• Loose or worn generator belt. • Loose or improper wiring connections. • Generator. • Voltage regulator.	• Adjust tension or replace belt. Refer to Section 03-05. • Service as required. Refer to Section 18-01. • Service or replace[1]. • Test, replace if necessary[1].
• Charge Indicator Gauge Shows Discharge	• Loose or worn generator belt. • Damaged or worn wiring (battery to generator for ground or open). • Field circuit ground. • Generator. • Voltage regulator. • Charge indicator gauge wiring and connections. • Damaged or worn gauge. • Other vehicle electrical system malfunction.	• Adjust tension or replace belt. Refer to Section 03-05. • Service or replace wiring. Refer to Section 18-01. • Service or replace wiring. Refer to Section 18-01. • Service or replace[1]. • Test, replace if necessary[1]. • Service as required[1]. • Replace gauge. Refer to Group 13. • Service as required.

TJ2205K

ADJUSTMENTS

Belt Adjustment

Refer to Section 03-05 for generator belt tensioning procedure.

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
059-00002	Charging / Starting Analyzer
078-00005	Starting / Charging Tester VAT-40

TJ4475A

1 Refer to the appropriate generator Section in this Group.

SECTION 14-01 Battery

VEHICLE APPLICATION

Taurus / Sable.

TESTING

Before attempting to test a battery, it is important to give it a thorough examination to determine if it has been damaged.

Tests are made on a battery to determine the state of charge and also its capacity or ability to crank an engine. The ultimate result of these tests is to show that the battery is good, needs recharging, or must be replaced.

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

WARNING: KEEP OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH SKIN OR EYES, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF 15 MINUTES AND GET PROMPT MEDICAL ATTENTION. IF ACID IS SWALLOWED, CALL A PHYSICIAN IMMEDIATELY.

Battery State of Charge

Maintenance-Free Batteries

Read the battery open circuit terminal voltage with a digital voltmeter such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent, capable of reading 1 / 100 of a volt. If open circuit voltage of battery is below 12.4 volts and the battery has passed the capacity test, charge the battery.

Low-Maintenance Batteries

Use a hydrometer such as Rotunda Battery and Anti-Freeze Tester 021-00046 or equivalent to check the specific gravities of all cells.

In order to obtain an accurate specific gravity reading, it must be corrected to the standard temperature of 26°C (78°F). The correction factor of four points (0.004) is used for each 6°C (10°F) change in temperature. Four points (0.004) are added to the indicated reading for each 6°C (10°F) increment above 26°C (78°F) and four points (0.004) are subtracted for each 6°C (10°F) increment below 26°C (78°F).

If the difference between cells is 50 points (0.050) or more, the battery is not satisfactory for service and should be replaced.

If the difference between cells is less than 50 points (0.050) and one or more cells are less than 1.225, charge the battery for 20 minutes at 35 amps and conduct the capacity test. If the battery fails, replace the battery. If it passes, add water if necessary and charge the battery.

TESTING (Continued)

If the difference between cells is less than 50 points (0.050) and all cells are above 1.225, conduct the capacity test. If the battery fails, replace the battery. If it passes, return to service.

BATTERY TESTING PROCEDURE — TEST A

TEST STEP		RESULT	ACTION TO TAKE
A1	VISUAL INSPECTION		
	• Remove negative cable, then positive cable. • Check for dirty or corroded connections. • Are connections OK?	No Yes	CLEAN terminals and clamps. GO to A2. GO to A2.
A2	LOOSE BATTERY POST		
	• Check for loose battery posts. • Are posts OK?	No Yes	REPLACE battery. GO to A3.
A3	CRACKED BATTERY COVER		
	• Remove holddowns and shields. • Check for broken / cracked case or cover. • Is cover OK?	No Yes	REPLACE battery. GO to A4.
A4	BATTERY CAPACITY AND LOAD TEST		
	NOTE: Whenever possible, test and charge battery at or near room temperature. • Use a high rate discharge tester with a variable rate control or a fused rate tester with meter compensation for different battery electrical sizes. Follow instructions supplied with tester for the battery capacity test. • Recommended discharge rate at 27°C (80°F): one-half of the cold cranking amps.	Passed the minimum load voltage and OCV above 12.40 Passed the minimum load voltage and OCV below 12.40 Failed the minimum load voltage and OCV above 12.40 Failed the minimum load voltage and OCV below 12.40	Battery OK. Battery OK but **needs charging.** Battery worn out. REPLACE battery. CHARGE battery for 20 minutes at 35 amps. REPEAT Step A4 (load test).

Cold Cranking Amps	Discharge Rate Amps
650	325
540	270

• Voltage readings at 15 seconds for good battery (Battery Capacity Test).

Approximate Battery Temperature	Minimum Load Voltage
27°C (80°F) and above	9.6
21°C (70°F)	9.6
16°C (60°F)	9.5
10°C (50°F)	9.4
4°C (40°F)	9.3
-1°C (30°F)	9.1
-7°C (20°F)	8.9
-12°C (10°F)	8.7
-18°C (0°F)	8.5

• Wait 2 minutes and check the Open Circuit Voltage (OCV).
• Measure OCV with a digital voltmeter capable of reading 1 / 100 volt.

Passed the minimum load voltage. Battery OK but **needs charging.**

Failed the minimum load voltage. REPLACE battery.

TJ4553A

TESTING (Continued)

Battery Drain Test

With Clamp-On DC Ammeter

Test Procedure

1. Turn the ignition to the OFF position and make sure there are no electrical loads. After determining that the underhood lamp is turning off properly, disconnect the bulb.
2. Clamp the meter clip securely around positive or negative battery cable (all cables if two or more lead to post).

   NOTE: Do not start vehicle with clip on cable.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it exceeds 0.05 it indicates a constant current drain which could cause a discharged battery. Possible sources of current drain are vehicle lamps (underhood, glove compartment, luggage compartment, etc.) that do not shut off properly.

If the drain is not caused by a vehicle lamp, remove fuses from the fuse panel, one at a time, until the cause of the drain is located. If drain is still undetermined, remove fusible links one at a time at the power distribution box to find the problem circuit.

With Voltmeter

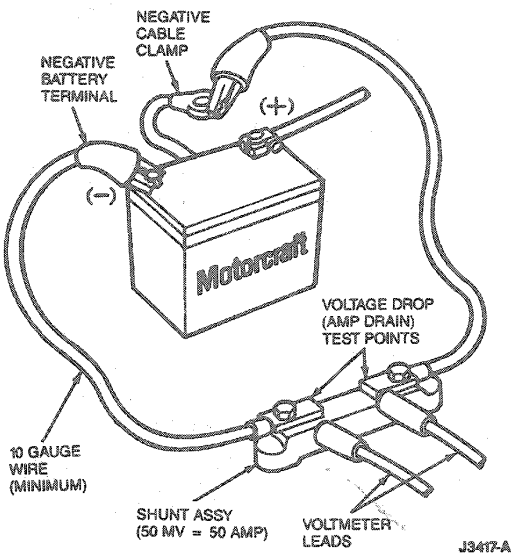
This test requires a digital volt-ohmmeter with an appropriate low voltage scale such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent. The meter must read within 0.01 millivolt. Also required is a shunt assembly similar to that shown in the illustration.

Test Procedure

1. Turn ignition switch to the OFF position and make sure there are no electrical loads. After determining the underhood lamp is turning off properly, disconnect the bulb.
2. Check battery voltage. If voltage is under 11.5 volts, charge the battery to above 11.5.
3. Disconnect negative battery cable.

   NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM) relearns its adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.
4. Connect shunt assembly as shown.

   CAUTION: Do not crank the engine, it could destroy the shunt. Also do not use the shunt to measure starting currents.
5. Set volt-ohmmeter to 200 or 300 mv scale for an accurate reading (must be within 0.01 millivolt).
6. Connect meter leads to shunt as shown. With this size shunt (50 mv = 50 amps) and meter, a direct current drain measurement can be made.



Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If the reading is between 0.2 and 0.9 a possible drain may be a vehicle lamp (glove compartment, underhood, luggage compartment, etc.) that does not turn off. If the problem is not a lamp, remove the fuses from the fuse panel one at a time until the cause of the drain is located. If drain is still undetermined, remove fuses one at a time at the power distribution box to find the problem circuit.

To Test Vehicles with Major Key-Off Loads such as Air Suspension or Load Leveling

Vehicles equipped with these features will have temporary current drains that may last up to 70 minutes after ignition is switched OFF. These drains can range from 0.1 to 20 amps if the compressor is cycling. This action can often mask a problem and must be considered when evaluating test results. To test for this kind of drain proceed as follows.

1. Repeat Steps 1 through 5 of the battery drain test.
2. Turn ignition to RUN for a moment and then OFF again.
3. Disconnect major key-off load circuits.
4. Make sure illuminated entry is off, if applicable.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it is higher, disconnect fuses and fusible links as in the previous test to locate the problem circuit.

If the drain is less than 0.05 amps, reconnect the major key-off load circuits, turn ignition to RUN and then OFF, and wait 70 minutes to make sure they shut off properly. If current drain is still greater than 0.05 amps after 70 minutes, disconnect each of the components one at a time until the cause of the current drain is located.

TESTING (Continued)

To Check for Electronic Drains Which Shut Off When the Battery Cable is Disconnected

1. Repeat Steps 1 through 5 of the Voltmeter Drain Test.
2. Without starting engine, turn ignition switch to the RUN position for a moment and then OFF. If applicable, wait one minute for the illuminated entry lamps to turn off.
3. Connect voltmeter and read voltage.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it exceeds 0.05 after a few minutes, and if this drain did not show in previous tests, the drain is most likely caused by a malfunctioning electronic component. As in previous tests, remove fuses in power distribution box one at a time to locate the problem circuit.

Battery Charging

Before recharging a discharged battery, inspect and service the following conditions, if they exist:

1. Loose generator belt.
2. Pinched or grounded generator / voltage regulator wiring harness.
3. Loose harness connections at the generator and / or voltage regulator.
4. Loose or corroded connections at battery and / or engine ground.
5. Excessive battery drain due to:
   a. Hood, luggage compartment, glove compartment and courtesy lamps remaining energized (damaged or misadjusted switch, glove compartment left open, etc).
   b. Luggage compartment solenoid continuously energized on vehicles equipped with keyless entry system.
   c. Inoperative autolamp module causing approximately 2 amp drain with ignition switch in the OFF position and autolamp off.

Maintenance-Free and Low-Maintenance Batteries

Cold batteries will not readily accept a charge. Therefore, batteries should be allowed to warm up to approximately 5°C (41°F) before charging. This may require four to eight hours at room temperature depending on the initial temperature and battery size.

A battery which has been completely discharged may be slow to accept a charge initially, and in some cases may not accept a charge at the normal charger setting. When batteries are in this condition, charging can be started by use of the dead battery switch on chargers so equipped.

Completely discharged batteries, which have been discharged for a prolonged period of time (over one month) or which have an open circuit voltage of less than two volts, may show no indication of accepting a charge even when the battery switch is used. The initial charge rate accepted by batteries in this condition is so low that the ammeter on some chargers will not show any indication of charge for up to 10 minutes.

To determine whether a battery is accepting a charge follow the charger manufacturer's instructions for use of dead battery switch. If dead battery switch is the spring-loaded type, it should be held in the ON position for up to three minutes.

After releasing dead battery switch and with charger still on, measure battery voltage. If it shows 12 volts or higher, the battery is accepting a charge and is capable of being recharged. However, it may require up to two hours of charging with batteries colder than 5°C (41°F) before the charge rate is high enough to show on the charger ammeter. It has been found that all non-damaged batteries can be charged by this procedure. If a battery cannot be charged by this procedure, it should be replaced.

Once it has been determined that the battery has begun to accept a charge, it can be charged to a serviceable state or a full state of charge by one of two methods:

- The **first method** is to use the AUTOMATIC setting on chargers so equipped. This setting maintains the charging rate within safe limits by adjusting voltage and current to prevent excessive gassing and spewing of electrolyte. Approximately two to four hours will be required to charge a completely discharged battery to a serviceable state. If a full state of charge is desired, the charge can be completed by a low current rate of 3-5 amps for several hours.
- The **second method** is to use the MANUAL or constant current setting on the charger. Initially set the charging rate for 30-40 amps and maintain this setting for approximately 30 minutes or as long as there is no excessive gassing and electrolyte spewing. If gassing results, the charge rate must be reduced to a level where gassing will stop. This is particularly true for maintenance-free batteries where excessive gassing will result in non-replaceable loss of electrolyte, thus shortening battery life.

The total charge required will vary with battery size and its initial state of charge. In general, to bring a discharged battery to a serviceable state of charge, current-time input should equal the battery amp-hour capacity. For example: a 45 AH battery will require 15 amps of charge for three hours, or 9 amps of charge for five hours. If a full state of charge is desired, the charge can be completed by a low constant current of 3 to 5 amps for several hours.

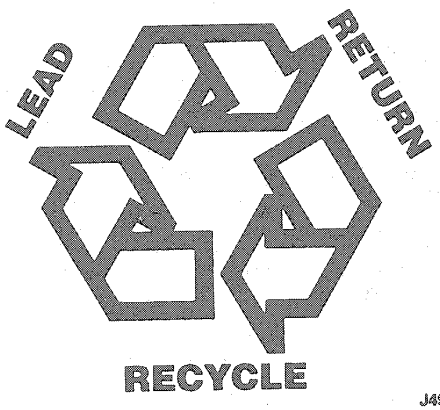
If the battery has failed, or is low in charge, it may be necessary to refer to Diagnosis, Section 14-00.

TESTING (Continued)

Jump Starting
Refer to Section 03-06.

REMOVAL AND INSTALLATION

Help Us Protect Our Environment
Ford Motor Company strongly recommends that lead-acid batteries be returned to an authorized recycling facility for disposal.



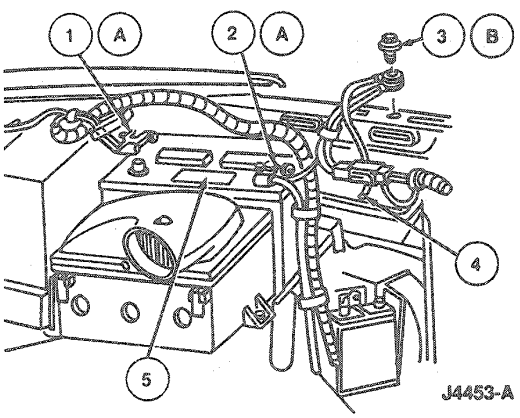
J4961-A

Removal

1. Remove battery cables from battery terminals (negative first).

3.0L EFI and 3.8L EFI

Battery

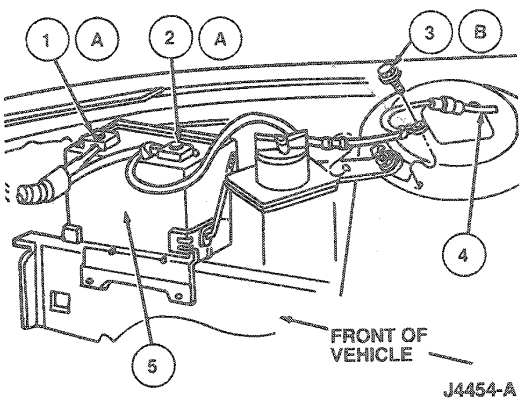


J4453-A

Item	Part Number	Description
1A	—	Positive Battery Terminal
2A	—	Negative Battery Terminal
3B	N803991-S39	Screw (3 Req'd)
4	2C054	Wiring Assy
5	10655	Battery
A		Tighten to 6-10 N·m (60-90 Lb-In)
B		Tighten to 3.4-4.8 N·m (31-42 Lb-In)

TJ4453A

3.0L/3.2L SHO



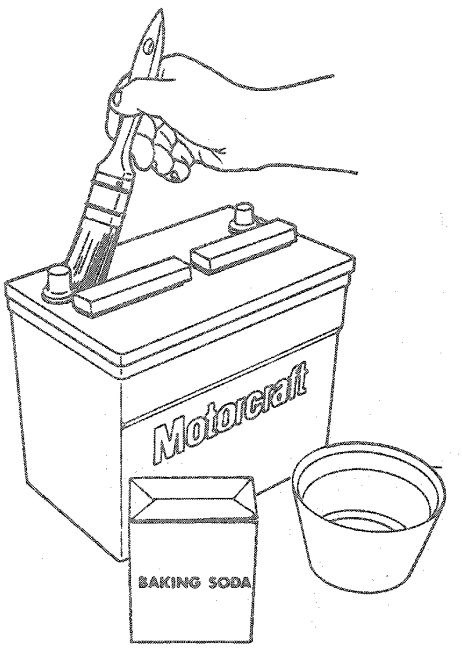
J4454-A

Item	Part Number	Description
1A	—	Positive Battery Terminal
2A	—	Negative Battery Terminal
3B	N803991-S3	Screw
4	12A581	Wiring Harness
5	10655	Battery
A		Tighten to 7.6-10.4 N·m (68-92 Lb-In)
B		Tighten to 3.4-4.8 N·m (31-42 Lb-In)

TJ4454A

REMOVAL AND INSTALLATION (Continued)

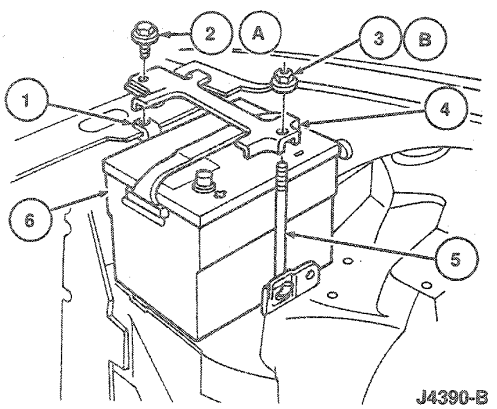
2. Clean cable terminals using an acid neutralizing solution and terminal cleaning brush.



J2847-A

3. Remove hold-down clamps.

Battery Hold Down



J4390-B

Item	Part Number	Description
1	N623333-S2	U-Nut
2A	N606690-S2	Bolt (1 Req'd)
3B	N801521-S2	Nut (1 Req'd)
4	10755	Bracket
5	10K700	J-Bolt

(Continued)

Item	Part Number	Description
6	10655	Battery Assy
A		Tighten to 7-10 N·m (62-88 Lb-In)
B		Tighten to 3-5 N·m (27-44 Lb-In)

4. Remove battery from vehicle.

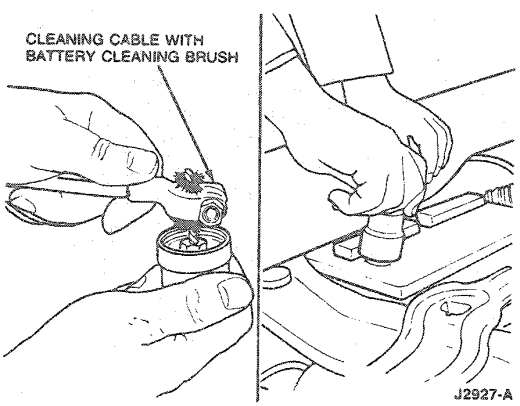
WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

5. Test battery and determine if it should be:
   - Placed back in service
   - Recharged before placing back in service
   - Replaced with a Motorcraft or equivalent battery

Installation

1. Clean cable terminals and hold-down with a wire brush. Replace all cables or parts that are worn or frayed.



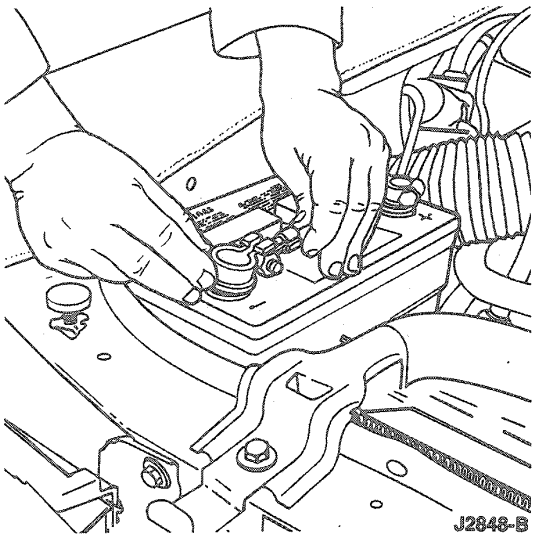
J2927-A

2. Clean battery tray with a wire brush and scraper.
3. Place battery in tray with positive and negative terminals in same position as previous battery. Assemble and tighten hold-down hardware so battery is secure. Do not over-tighten.

REMOVAL AND INSTALLATION (Continued)

4. Secure cables (positive first) to proper terminals. **Do not over-tighten.** Apply petroleum jelly to terminals.

   NOTE: When the battery is disconnected and reconnected, some abnormal driving symptoms may occur while the powertrain control module (PCM) relearns it adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.



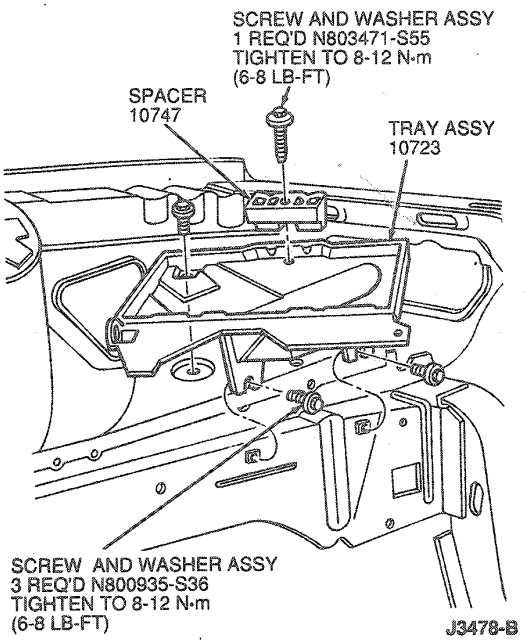
Battery Tray

Removal

1. Remove battery from vehicle as outlined.
2. Remove retaining bolts, screws and washers from battery tray.
3. Remove battery tray from vehicle.

Installation

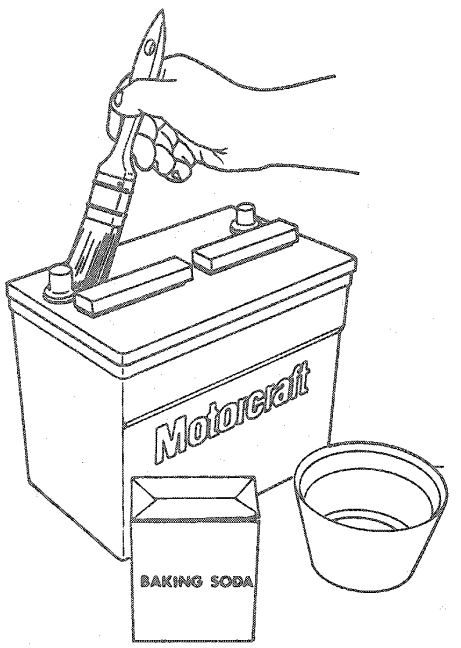
1. Position battery tray to inside fender in engine compartment.
2. Install retaining bolts and washers. Tighten each to 8-12 N·m (6-8 lb-ft).
3. Install battery in engine compartment as outlined.
4. Tighten hold-down bracket bolt to 7-10 N·m (6-7 lb-ft).



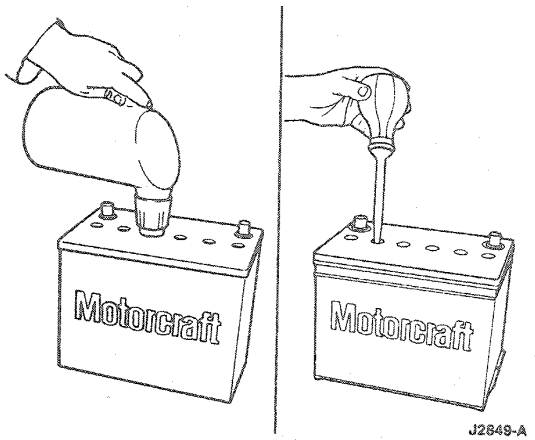
MAINTENANCE

Battery Cleaning

Keeping the battery top clean and dry reduces the need for service and extends battery life. Also, make certain the cable clamps are tightly fastened to the battery posts. If corrosion is found, disconnect the cables and clean clamps and posts with a wire brush. Neutralize the corrosion with a solution of baking soda and water. After installing cables, apply a small quantity of Premium Long-Life Grease XG-1-C or -K (ESA-M1C75-B) or equivalent to each battery post to help prevent corrosion.



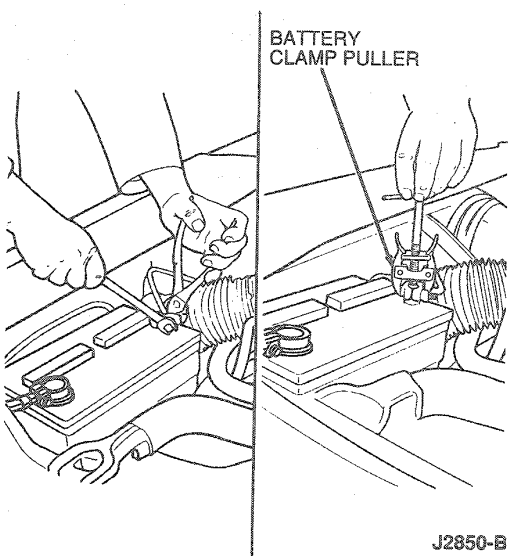
J2847-A



J2849-A

Battery Pliers

Battery pliers have jaws specifically designed for gripping cable clamp bolts securely. Care should be taken when removing or replacing the cable clamp bolts so that the battery terminal is not subjected to any excessive lateral or twisting forces. Such forces could cause major damage to the internal components of the battery, and leakage at the terminals.



J2850-B

Battery Clamp Puller

Use a clamp puller to remove a cable clamp from the battery terminal. With the jaws gripping the underside of the cable clamp, pull the clamp up by means of pressure exerted against the top of the battery terminal. Proper use of this tool avoids the damaging lateral or twisting forces that result when using a pry bar or pliers.

CLEANING AND INSPECTION

Tools

Anyone working with a battery needs the proper tools. Using the right tools will prevent damage to the battery, battery cables and hold-down bracketry.

Tools and equipment manufactured for servicing batteries have parts insulated to help prevent arcing should the tool be dropped or placed accidentally between a terminal and some other contact surface.

Battery Filling Devices

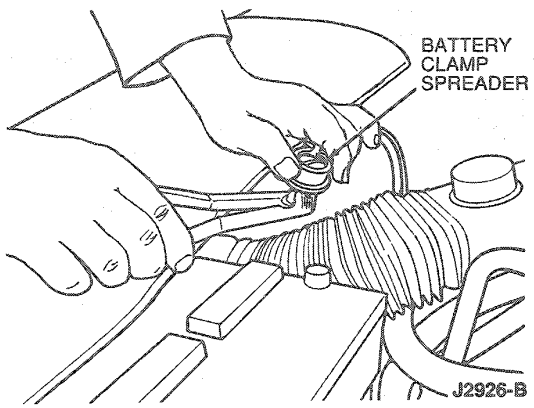
Batteries with Removable Vent Caps

One of the most important on-vehicle services is to maintain the correct electrolyte level. Two devices are available for this purpose: a self-leveling filler which allows the battery to be filled to a predetermined level automatically, and a syringe-type filler.

CLEANING AND INSPECTION (Continued)

Battery Clamp Spreader

The spreader is used to expand the cable clamp after it has been removed from the terminal and the clamp bolt has been loosened. The cable clamp can then be easily placed in its correct position completely on the terminal.



Terminal Cleaning Brush

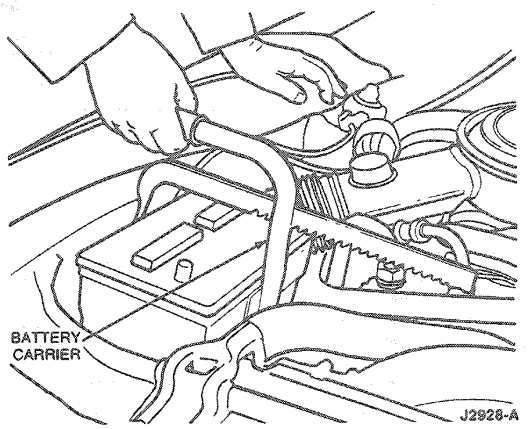
The terminal cleaning brush is designed with units to clean both the tapered battery terminal and the mating surface of the cable clamp. Refer to illustration under Battery Installation, Step 1.

Battery Carrier

Use a suitable battery carrier for lifting and transporting the battery. The illustration shows a clamp-type carrier used to grip the sidewalls of the container just below the lip of the cover. The carrier is used on the sidewalls, rather than the endwalls, since the sidewalls have additional strength from the inner cell partitions. This is particularly important with the plastic-cased battery which has endwalls that are flexible.

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.



Adding Water

Some batteries have removable vent caps and may occasionally require the addition of water. If the electrolyte level is below the level indicator in any cell, add enough pure water to bring the level up to the indicator. In batteries without a level indicator, maintain electrolyte level at 6.3 to 12.7mm (1/4 to 1/2 inch) above the plates. **Never add electrolyte ("battery acid") to the battery.** This could shorten the life of the battery.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Battery Tray Retaining Bolts	8-12	6-8 (Lb-Ft)
Battery Tray Hold-Down Bracket Bolt	7-10	6-7 (Lb-Ft)
Battery Terminal Clamps (3.0L/3.8L EFI)	6-10	60-90
Screw	3.4-4.8	31-42
Battery Terminal Clamps (3.0L/3.2L SHO)	7.6-10.4	68-92

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
021-00046	Battery and Anti-Freeze Tester

SECTION 14-02A Generator, Integral Rear Mount Regulator—Internal Fan Type

VEHICLE APPLICATION

Taurus / Sable Vehicles with 3.0L and 3.8L EFI Engines.

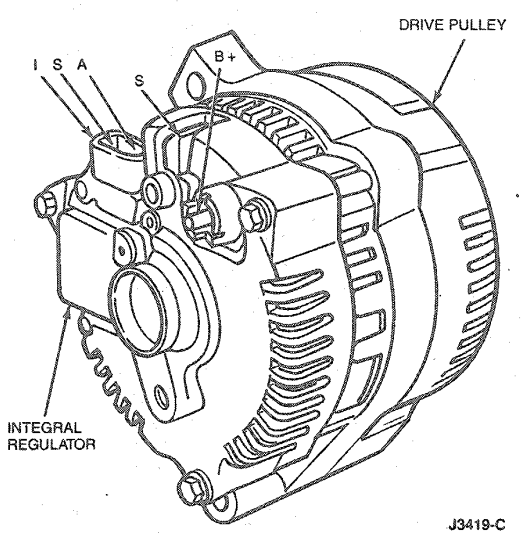
DESCRIPTION AND OPERATION

The electrical charging system is a negative ground system consisting of an integral generator / voltage regulator (IGR), charge indicator, storage battery, and the necessary wiring and cables. Refer to the Electrical and Vacuum Troubleshooting manual for schematics and locations of components and wiring.

With the ignition key in the RUN position, voltage is applied through the charge indicator lamp 'I' circuit to the voltage regulator. This turns the regulator on allowing current to flow from the battery sense 'A' circuit to the generator field coil. When the engine is started, the generator begins to generate alternating (AC) current which is converted to direct (DC) current by the rectifier assembly internal to the generator. This current is then supplied to the vehicle's electrical system through the output connector Battery Positive Voltage (B+) located on the rear of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the regulator 'S' circuit, turning off the charge indicator.

With the system functioning normally, the generator output current is determined by the voltage at the 'A' circuit (battery sense voltage). The 'A' circuit voltage is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain proper generator output. The set voltage will vary with temperature and is typically higher in the winter than in the summer, allowing for better battery recharge in the winter and reducing the chance of overcharging the battery in the summer.



DESCRIPTION AND OPERATION (Continued)

Generator Circuit

Circuit Description

Battery Positive Voltage (B+) Output

The generator output is supplied through the Battery Positive Voltage (B+) output connection to the battery and electrical system.

'I' Circuit

The 'I' circuit, or ignition circuit, is used to turn on the voltage regulator. This circuit is powered up with the ignition key in the RUN position. This circuit is also used to turn the indicator on if there is a fault in the charging system operation or associated wiring circuits.

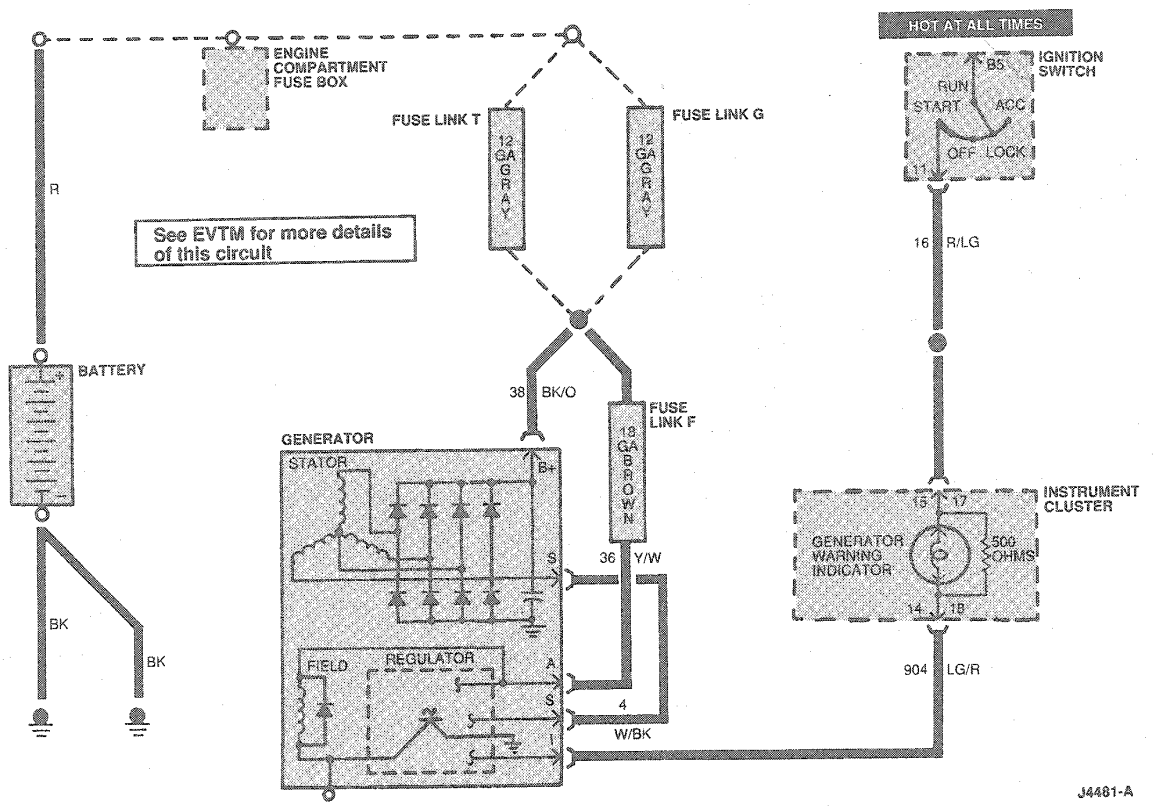
'A' Circuit

The 'A' circuit, or battery sense circuit, is used to sense the battery voltage. This voltage is used by the regulator to determine the generator output. This circuit is also used to supply power to the generator field coil. This circuit is connected back to the load distribution point and is a protected circuit.

'S' Circuit

The 'S' circuit, or stator circuit, is used to feedback a voltage signal from the generator to the regulator. This voltage, typically 1 / 2 battery voltage, is used by the regulator to turn off the indicator.

Generator Circuit



DIAGNOSIS AND TESTING

Before performing charging system tests on the vehicle, note conditions such as: slow cranking, discharged battery, generator / battery charge indicator stays on with engine running or generator / battery charge indicator does not light with ignition switch in RUN and engine not running. This information will aid in isolating the part of the system causing the symptom.

Visual Inspection

Preliminary checks to the charging system should be made regardless of the inoperable condition. These checks include:

1. Check battery posts and cable terminals for clean and tight connections. Clean the posts and the cables to ensure good electrical contact.

DIAGNOSIS AND TESTING (Continued)

2. Check for secure connections at the generator output, regulator, and engine ground connections. Also check the connection at the load distribution point.
3. Check the generator belt to ensure proper tension and no slip between the generator pulley and the belt.
4. Check the fuses / fuse links to the generator to ensure that they are not burned or damaged. This condition, resulting in an open circuit or high resistance, can cause erratic or intermittent charging system concerns.

Isolating the Concern

Battery, starting system and lamp system problems can be caused by poor charging system performance. It is also reasonable to suspect the charging system if an overload condition has occurred in another area of the electrical system.

To avoid guesswork, it is necessary to isolate battery, charging system, and electrical circuits to correctly identify the area where the difficulty lies. Check the battery first before beginning any electrical system diagnosis. The battery must be in proper state of charge and operation before the other areas of the electrical system can perform normally.

Battery Check

Check battery to see if it has the capacity and ability to accept and hold a charge. Refer to Section 14-01. If battery is OK, the charging system should then be checked to see that it performs its function of keeping the battery charged.

The battery capacity, specific gravity and cell comparison test (non-maintenance free batteries only) will determine the ability of a battery to accept and hold a charge. If the battery does not meet specification, replace it with a new, fully charged battery before further diagnosis of other areas of the electrical system.

If the battery meets required specifications, it should be fully charged before proceeding with the diagnosis of other electrical system components.

Charging System Check

The charging system test should be performed before testing any individual charging system components. The component tests will determine the type of component service required.

Test instruments used in the charging system test are a voltmeter (0-20- or 0-30-volt scale) and an ohmmeter.

WARNING: SPECIAL CARE SHOULD BE TAKEN WHEN USING THE OHMMETER NEAR "HOT" CIRCUITS. DISCONNECT THE COMPONENT TO BE CHECKED ON THE BATTERY CABLES TO PREVENT DAMAGE TO THE OHMMETER.

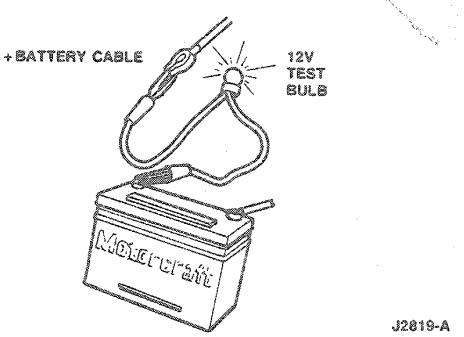
Battery Drain Test

Tools Required:

- Rotunda Digital Volt-Ohmmeter 007-00001

Check for current drains on the battery in excess of 100 milliamps with all the electrical accessories off and the vehicle at rest. Current drains can be tested one of three ways:

1. Connect a 12-volt test lamp in series with battery positive terminal. If lamp glows, then a drain exists.
2. Use an in-line ammeter between the battery positive or negative post and its respective cable.
3. Use a clamp-on current probe to the battery positive or negative cable. Make sure that the probe is properly calibrated to prevent false readings.



J2819-A

Typically, a drain of approximately one amp can be attributed to an underhood lamp, glove compartment lamp, or rear deck lid lamp staying on continually. Other component failures or wiring shorts may be located by selectively pulling fuses or disconnecting fuse links to pinpoint the location of the current drain. When the current drain is found, the test lamp will go out or the meter reading will fall to an allowable level. If the short is still not located, after checking all the fuses and fuse links, the drain may be due to the generator / regulator. Disconnect the generator output wire from the output stud and the regulator connector. If this eliminates the drain, check the charging system to locate the concern.

NOTE: A voltmeter is sometimes used for this test but it will react to a very small normal drain caused by "always-on" electronic systems such as starter interlock, anti-theft alarm, illuminated entry, etc, which cause no concern. The test lamp shows only drains which are large enough to cause a concern.

NOTE: For vehicles with electronic instrument cluster or message center, when the Message Center is initially powered up (after a battery disconnect), the Message Center "computer" may be energized for as long as one minute causing a 0.25 amp current draw before returning to the normal 0.010-0.012 amp current draw. Therefore, it is important to allow at least one minute to pass (after ammeter hookup) before observing any current measurements.

DIAGNOSIS AND TESTING (Continued)

Charging System Tests

Tools Required:

- Rotunda Starting and Charging System Tester (VAT-40) 078-00005

Generator Output Test

When performing charging system tests, turn off all lamps and electrical components. Place transmission in PARK and apply parking brake.

CAUTION: Do not make jumper wire connections except as directed. Making improper jumper connections may damage the regulator or fuse links.

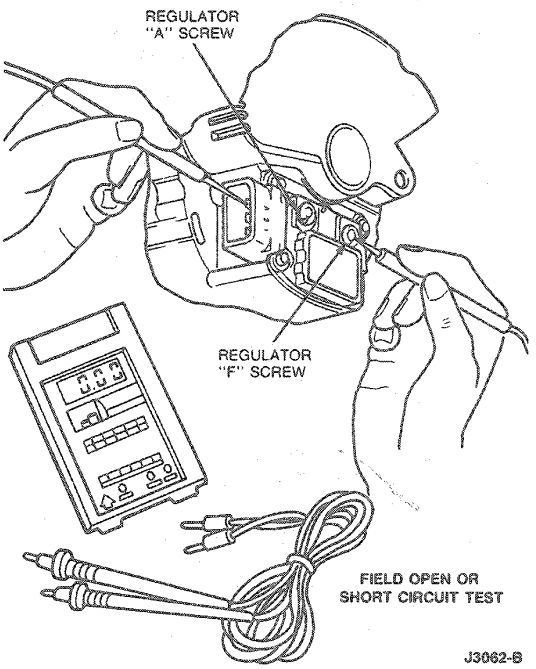
NOTE: Battery posts and cable clamps must be clean and tight to ensure accurate meter indications. Reference measurements to ground should be made to the battery negative post.

In order to check the charging system, the use of Rotunda Starting and Charging System Tester (VAT-40) 078-00005 or equivalent, is recommended.

1. Connect the positive and negative leads of the tester to battery.
2. Connect current probe to generator output lead (to measure generator output).
3. With the engine running at approximately 2000 rpm, set the load adjustment to determine generator output (with an ambient temperature of less than 27°C [80°F]).

   NOTE: When measuring generator output, the tester can be connected to the battery positive or negative cable. In this case all electrical accessories must be turned off and 10-15 amps must be added to the reading on the tester to compensate for engine operation.

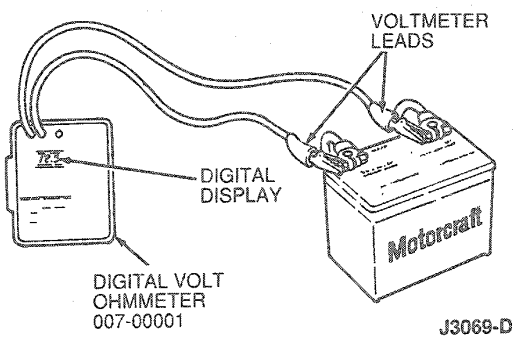
   NOTE: Refer to the tester procedure manual for complete directions on checking the charging system.



Base Voltage Test

NOTE: Prior to running this test, turn the headlamps on for 10-15 seconds to remove any surface charge from the battery. Then, wait until the voltage stabilizes prior to performing the base voltage test.

1. With ignition switch in OFF position and no electrical loads operating, measure voltage across the battery positive and negative posts.
2. Record battery voltage reading shown on voltmeter scale. This reading is called base voltage.



No-Load Test

1. Connect a tachometer to engine.

DIAGNOSIS AND TESTING (Continued)

2. Start engine and increase speed to approximately 1500 rpm. With no other electrical load (foot off brake pedal and doors closed), voltmeter pointer should move upward (increase) but not more than 3.0 volts above base voltage.

   NOTE: The reading should be taken when voltmeter pointer stops rising. It may take a few minutes to reach this point. If voltage increases to proper level, perform Load Test. If the pointer continues to rise, perform the Over Voltage Tests. If the voltage does not rise to proper level, perform Under Voltage Tests.

Load Test

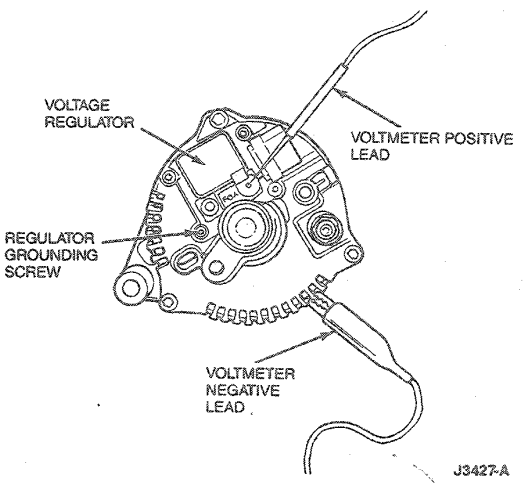
1. With engine running, turn heater / air conditioner blower motor on (high speed) and headlamps on high beam.
2. Increase engine speed to approximately 2000 rpm. Voltmeter should indicate a minimum of 0.5 volt above base voltage. If not, perform Under Voltage Tests.

   If above tests indicate proper voltage readings, charging system is operating normally. Proceed to the following tests if one or more of the readings is different than shown above and use a test lamp to check for battery drain.

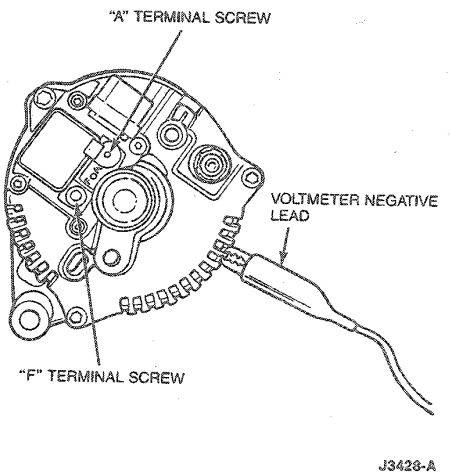
Over Voltage Tests

If voltmeter indicates more than 3.0 volts above base voltage in No-Load Test, follow these procedures:

1. With ignition switch in RUN position (engine not running), connect voltmeter negative lead to ground. Contact voltmeter positive lead first to generator output connection at load distribution point and then to regulator 'A' screw head.
2. If voltage difference between two locations is greater than 0.25 volt, service 'A' terminal wiring circuit to eliminate high resistance condition indicated by excessive voltage drop.
3. If over voltage condition still exists, check for loose regulator and generator grounding screws. Tighten loose regulator grounding screws to 1.7-2.8 N·m (16-24 lb-in).



4. If over voltage condition still exists, connect voltmeter negative lead to ground. With ignition switch in OFF position, contact voltmeter positive lead first to regulator 'A' screw head and then to regulator 'F' screw head. Different voltage readings at two screw heads indicate a malfunctioning regulator grounded brush lead or a grounded rotor coil. Replace regulator / brush holder or generator assembly.
5. If same voltage reading (battery voltage) is obtained at both screw heads in Step 4 then there is no short to ground through the generator field / brushes. Replace the regulator.

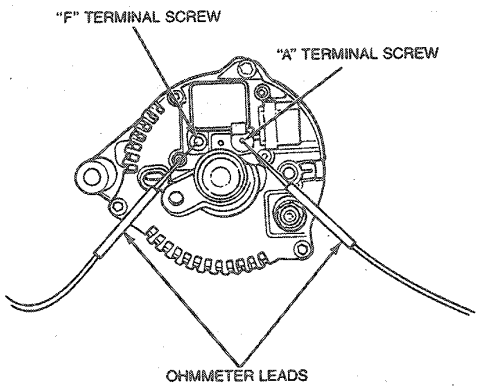


Under Voltage Tests

If voltmeter does not indicate more than 0.5 volt above base voltage, follow these procedures:

DIAGNOSIS AND TESTING (Continued)

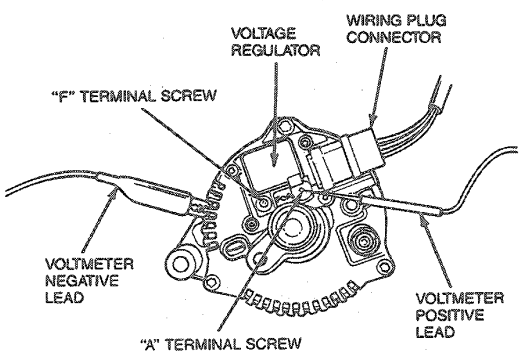
1. Disconnect wiring plug from regulator and connect an ohmmeter between regulator 'A' and 'F' terminal screws. The meter should indicate more than 2.4 ohms. If less than 2.4 ohms is indicated, check the generator for shorted rotor to field coil or shorted brushes. Replace the brush holder, if needed. Perform Load Test after servicing.



J3429-A

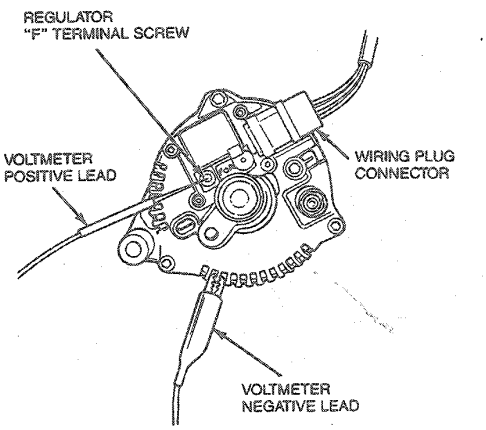
CAUTION: Do not replace the regulator if a shorted rotor coil or field circuit has been diagnosed. Regulator damage could result. Replace the generator assembly.

2. If above ohmmeter reading is greater than 2.4 ohms, connect regulator wiring plug and connect voltmeter negative lead to ground. Contact voltmeter positive lead to regulator 'A' terminal screw. The meter should indicate battery voltage. If there is no voltage, service the 'A' wiring circuit. Perform Load Test after servicing.



J3430-A

3. If voltmeter indicates battery voltage, connect voltmeter ground lead to ground. With the ignition switch in OFF position, contact voltmeter positive lead to regulator 'F' terminal screw. The meter should indicate battery voltage. If there is no voltage, replace generator assembly. Perform Load Test after servicing.

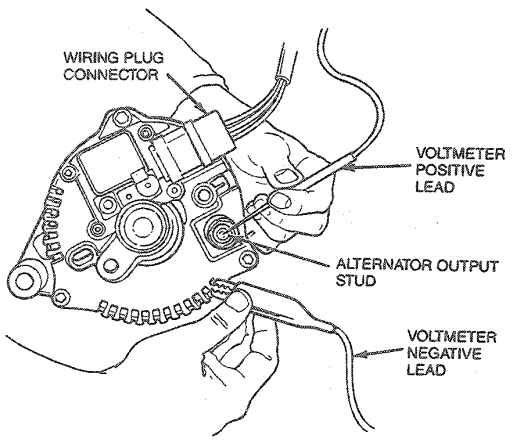


J3431-A

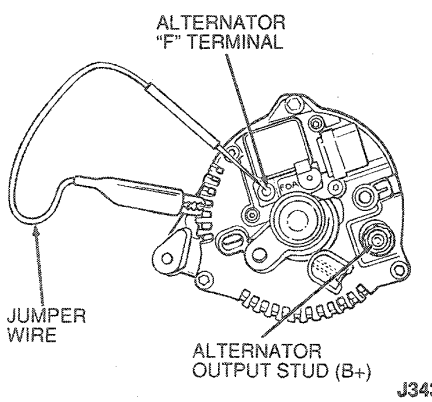
4. If voltmeter indicates battery voltage, connect voltmeter negative lead to ground. Turn ignition switch to RUN position (engine off) and contact voltmeter positive lead to regulator 'F' terminal screw. Refer to illustration under Step 3. The voltmeter should indicate 2 volts or less. If more than 2 volts is indicated, perform 'I' circuit tests and service 'I' circuit if needed. If 'I' circuit checks normal, replace regulator if needed and perform Load Test after servicing.

DIAGNOSIS AND TESTING (Continued)

5. If 2 volts or less is indicated, perform Load Test, but connect voltmeter positive to generator output stud. If voltage rises more than 0.5 volt above base voltage, service wiring from generator to load distribution point. Repeat Load Test, measuring voltage at battery cable clamps after servicing.



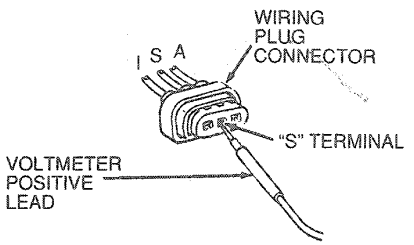
6. If voltage does not rise above 0.5 volt above base voltage, perform Load Test and measure voltage drop from the battery to the 'A' terminal of the regulator (with regulator connected). If the voltage drop exceeds 0.5 volt, service wiring from 'A' terminal to load distribution point.
7. If voltage drop does not exceed 0.5 volt, connect a jumper wire from the generator rear housing to regulator 'F' terminal. Repeat Load Test with voltmeter positive lead connected to the generator output stud. If voltage rises more than 0.5 volt, replace regulator.

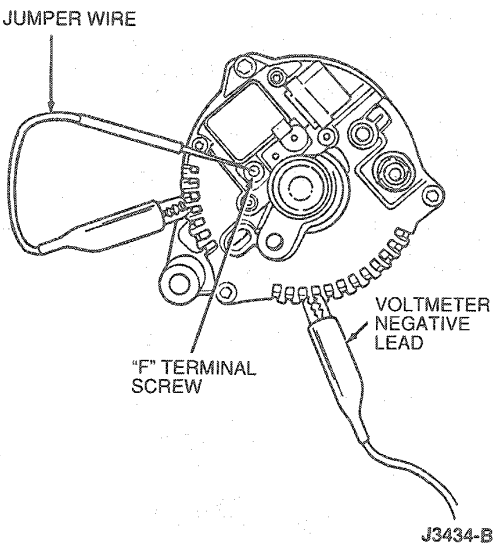


8. If voltage does not rise more than 0.5 volt, replace generator assembly.

Regulator S and / or I Circuit Test

1. Disconnect the wiring plug from the regulator. Connect a jumper wire from the regulator A terminal to the wiring plug A lead. Add a jumper wire from the regulator F screw to the generator rear housing.
2. With the engine idling and the voltmeter negative lead connected to ground, connect the voltmeter positive lead to the S terminal and then to the A terminal of the regulator wiring plug. The voltage at the S circuit should read approximately one-half that of the A circuit. If voltage readings are normal, remove the jumper wire. Replace the regulator and connect the wiring plug to the regulator. Repeat the Load Test after servicing.





3. If no voltage is present, remove the jumper wire and service the faulty wiring circuit or generator.
4. Connect the voltmeter positive lead to the positive battery terminal. Connect the wiring plug to the regulator. Repeat Load Test.

Fuse Link Continuity

1. Ensure first that battery is OK, then turn on headlamps or any accessory. If headlamps or an accessory do not operate, fuse link is probably burned out.

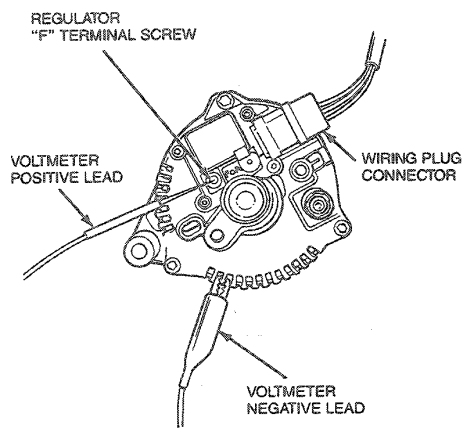
DIAGNOSIS AND TESTING (Continued)

2. On some vehicles there are several fuse links. Use same procedure as in Step 1 to test fuse link that protects vehicle equipment.
3. To test fuse link that protects generator, ensure that battery is OK, then check with a voltmeter for voltage at BAT terminal of generator and 'A' terminal of voltage regulator. No voltage indicates that fuse link is probably burned out. Refer to Section 18-01 for fuse link replacement procedures.

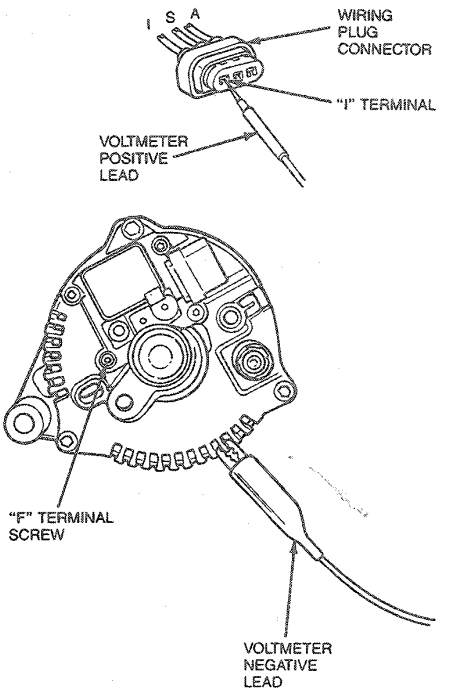
Field Circuit Drain

Connect the voltmeter negative lead to the generator rear housing for all of the following voltage readings:

1. With ignition switch turned to OFF position, contact voltmeter positive lead to regulator 'F' terminal screw. The meter should indicate battery voltage if system is operating normally. If less than battery voltage is indicated, proceed with Step 2 to find cause of current drain.
2. Measure voltage at 'I' terminal (ignition OFF). If voltage is indicated, service 'I' circuit from ignition switch to eliminate voltage source.
3. If no voltage was indicated in Step 2, contact voltmeter positive lead to wiring plug 'S' terminal. No voltage should be indicated. If no voltage is indicated, replace the regulator.
4. If voltage was indicated in Step 3, disconnect the one pin 'S' terminal connector. Again, contact voltmeter positive (+) lead to regulator wiring plug 'S' terminal. If voltage is indicated, service 'S' lead wiring to eliminate voltage source. If no short is found, replace generator assembly.



J3431-A



J3435-A

Diagnosis Charts

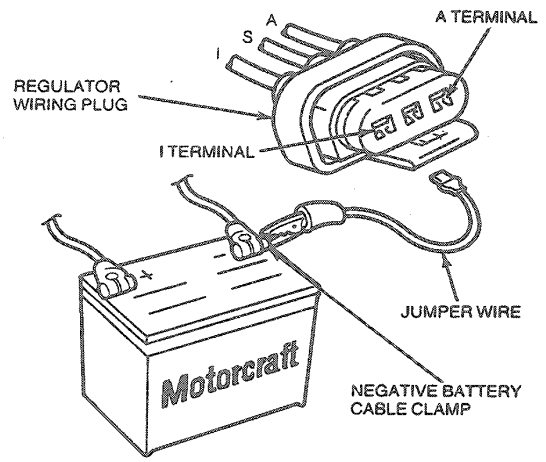
Continue through Diagnosis charts until service is completed. Then, test system again to see if service has corrected the condition.

PINPOINT TEST A: CHARGE INDICATOR — DIAGNOSIS

TEST STEP		RESULT	ACTION TO TAKE
A1	LAMP CHECK NO. 1		
	• Engine OFF. • Key in OFF position. • **Is charge indicator on?**	Yes ▶ No ▶	GO to **A4.** GO to **A2.**

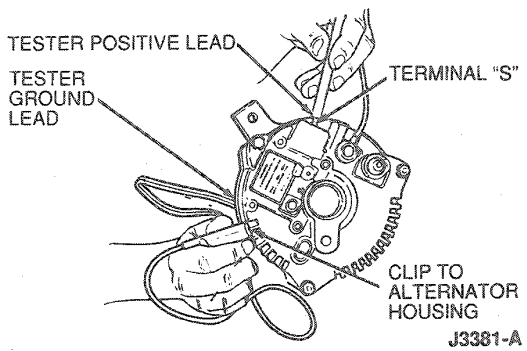
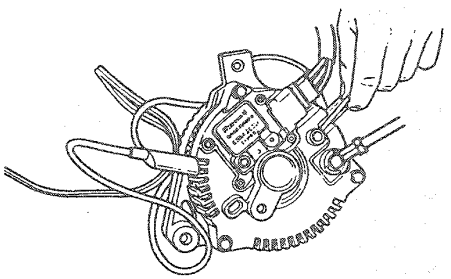
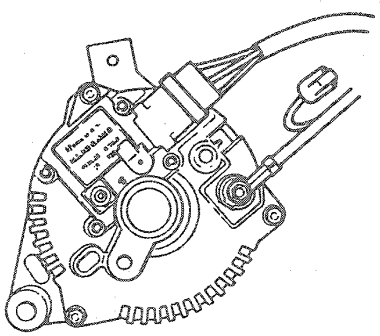
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: CHARGE INDICATOR — DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A2	LAMP CHECK NO. 2		
	• Engine OFF. • Key in RUN position. • **Is charge indicator on?**	Yes ▶ No ▶	GO to A3. GO to A5.
A3	LAMP CHECK NO. 3		
	• Key in RUN position. • Engine running. • **Is charge indicator on?**	No ▶ Yes ▶	Lamp test complete. GO to A9.
A4	IMPROPER 'I' CIRCUIT WIRING		
	• Key in OFF position. • Check for voltage at 'I' circuit. • **Is voltage present?**	Yes ▶ No ▶	CHECK for voltage feed from always hot circuit to I circuit. CHECK for damaged or improper wiring to indicator lamp at instrument cluster.
A5	INOPERATIVE INDICATOR LAMP		
	• Key in ON position. • Engine OFF. • Disconnect regulator connector and ground 'I' terminal. • **Is charge indicator on?**  J3333-A	Yes ▶ No ▶	GO to A7. GO to A6.
A6	RESISTANCE / BULB TEST		
	• Check for voltage at 'I' terminal of regulator connector. • **Is voltage present?**	Yes ▶ No ▶	CHECK for burned out indicator lamp or high resistance in lamp circuit. CHECK for an open in 'I' circuit wiring.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: CHARGE INDICATOR — DIAGNOSIS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A7 STATOR VOLTAGE FAULT ● Reconnect voltage regulator. ● Engine OFF. ● Check voltage 'S' terminal. ● **Is voltage present?**  J3381-A	Yes ▶ No ▶	GO to A8. REPLACE regulator.
A8 PINPOINT STATOR VOLTAGE FAULT ● Disconnect 1-pin stator connector. ● Key in ON position. ● Engine OFF. ● **Is charge indicator on?**   J3382-A	Yes ▶ No ▶	REPLACE generator assembly. REPLACE regulator.
A9 OPEN CIRCUIT CHECK ● Check voltage regulator, stator and Battery Positive Voltage (B+) output terminal connections for looseness or corrosion and service before checking voltage. ● With key in ON position, engine off, check voltage at Battery Positive Voltage (B+) and 'A' terminal. ● **Is battery voltage present?**	Yes ▶ No ▶	GO to A10. SERVICE wiring or fuse/fuse link for an open circuit between battery and generator or regulator.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: CHARGE INDICATOR — DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A10	VOLTAGE DROP TEST — 'A' TERMINAL		
	• Key in ON position. • Engine OFF. • Measure voltage between battery positive post and voltage regulator 'A' terminal. • **Is voltage difference more than 0.25 volt?**	Yes ▶ No ▶	CHECK for high resistance in wiring between voltage regulator 'A' terminal and battery. SERVICE as required. GO to **A11.**
A11	VOLTAGE DROP TEST — BATTERY POSITIVE VOLTAGE (B+) TERMINAL		
	• Key in ON position. • Engine running. • Blower on HIGH, headlamps ON. • Measure voltage between generator Battery Positive Voltage (B+) output terminal and battery positive terminal. • **Is difference less than 1.5 volts?**	Yes ▶ No ▶	GO to **A12.** CHECK for high resistance in wiring between generator Battery Positive Voltage (B+) output terminal and battery. SERVICE as required.
A12	'I' CIRCUIT CHECK		
	• Key in ON position. • Blower on HIGH. • Engine running. • Disconnect voltage regulator connector. • **Is charge indicator on?**	Yes ▶ No ▶	SERVICE 'I' circuit for a short to ground. GO to **A13.**
A13	'S' CIRCUIT CHECK		
	• Reconnect voltage regulator connector. • Engine running. • Measure voltage at 'S' circuit at generator and at regulator.	Voltage approximately 1/2 'A' circuit battery voltage at both locations ▶ Voltage approximately 1/2 'A' circuit battery voltage at generator but not at regulator ▶ No voltage at either location ▶	GO to **A14.** SERVICE open in 'S' circuit wiring. GO to **A15.**
A14	VOLTAGE OUTPUT CHECK		
	• Engine running at 2000 rpm. • Measure battery voltage. • **Is battery voltage above 16 volts?**	Yes ▶ No ▶	CHECK generator for brush or rotor short to ground. CHECK regulator screws for tightness, or high resistance in 'A' circuit. If no concern found, REPLACE voltage regulator. REPLACE voltage regulator.
A15	NO VOLTAGE CHECK		
	• Ground 'F' screw on voltage regulator. • Check for voltage at 'S' terminal. • **Is voltage approximately 1/2 battery voltage?**	Yes ▶ No ▶	REPLACE regulator. REPLACE generator assembly.

TJ3426D

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: CHARGING SYSTEM TEST — IAR GENERATOR

	TEST STEP	RESULT ▶	ACTION TO TAKE
B1	PRELIMINARY CHECKS		
	• Preliminary Checks: — Fuse link — Battery terminals and cable clamps — Wiring and ground connections to generator, regulator and engine — Generator belt tension • **Are components OK?**	Yes ▶ No ▶	GO to **B2.** SERVICE and / or REPLACE as necessary. GO to **B2.**
B2	BASE VOLTAGE AND NO LOAD TEST		
	• Connect voltmeter to battery posts. Read battery voltage — this is base reading. • Start engine, run at 1500 rpm with no electrical load. Voltage should increase but not more than 3 volts. • **Does voltage increase more than 3 volts?**	No ▶ No increase ▶ Yes ▶	GO to **B3.** GO to **B5.** GO to **B12.**
B3	LOAD TEST		
	• Increase engine speed to 2000 rpm. • Turn heater-A / C blower and headlamps on HIGH. • **Is voltage a minimum of 0.5 volt over base voltage?**	Yes ▶ No ▶	GO to **B4.** GO to **B5.**
B4	BATTERY DRAIN TEST — KEY OFF		
	• Concern can still be battery drain. Turn OFF ignition, install test lamp in series with positive battery cable and check to isolate problem circuit. • **Is there a battery drain?**	Yes ▶ No ▶	CHECK vehicle circuits for drain. REFER to Section 14-01.
B5	UNDER-VOLTAGE TEST		
	• Disconnect regulator. • Check resistance between regulator 'A' and 'F' terminals on regulator. • **Is resistance more than 2.4 ohms?**	Yes ▶ No ▶	GO to **B6.** CHECK generator for shorted field circuit and REPLACE generator assembly if required. If generator is OK, REPLACE regulator. GO to **B2.**
B6	'A' TERMINAL VOLTAGE CHECK		
	• Reconnect regulator. • Measure 'A' terminal voltage. • **Is there battery voltage?**	Yes ▶ No ▶	GO to **B7.** SERVICE 'A' circuit wiring.
B7	'F' TERMINAL VOLTAGE CHECK — IGNITION OFF		
	• Voltage regulator connected. • Key OFF. • Measure regulator 'F' terminal voltage with ignition off. • **Is there battery voltage?**	Yes ▶ No ▶	GO to **B8.** REPLACE generator assembly. GO to **B2.**
B8	'F' TERMINAL VOLTAGE CHECK — IGNITION ON		
	• Turn ignition to RUN position (engine not running). • Measure regulator 'F' terminal voltage. • **Is voltage more than 1.5 volts?**	Yes ▶ No ▶	GO to **B9.** GO to **B10.**
B9	'I' CIRCUIT TESTS		
	• Perform 'I' circuit tests. • **Is circuit OK?**	Yes ▶ No ▶	REPLACE regulator. GO to **B2.** SERVICE 'I' circuit wiring. GO to **B2.**
B10	JUMPERED LOAD TEST		
	• Repeat Load Test measuring voltage to generator Battery Positive Voltage (B+) output terminal from battery negative clamp. • **Does voltage rise 0.5 volt or more?**	Yes ▶ No ▶	SERVICE generator to starter relay wiring. GO to **B2.** GO to **B11.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: CHARGING SYSTEM TEST — IAR GENERATOR (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B11	LOAD TEST REPEAT — 'F' TERMINAL		
	• Connect a jumper wire from generator rear housing to regulator 'F' terminal. • Repeat load test measuring voltage at Battery Positive Voltage (B+) output terminal. • **Does voltage rise 0.5 volt or more?**	Yes ▶ No ▶	REPLACE regulator. GO to B2. REPLACE generator assembly. GO to B2.
B12	OVER-VOLTAGE TEST		
	• Turn ignition to RUN position (engine not running). • Measure voltage at regulator 'A' terminal and starter solenoid. • **Is voltage difference 0.5 volt or less?**	Yes ▶ No ▶	GO to B13. SERVICE A circuit wiring. GO to B2.
B13	REGULATOR GROUND CHECK		
	• Check for loose regulator ground screws. • **Is ground OK?**	Yes ▶ No ▶	GO to B14. SERVICE ground screws. GO to B2.
B14	ENGINE GROUND CHECK		
	• Check for bad engine ground. • **Is ground OK?**	Yes ▶ No ▶	GO to B15. SERVICE engine ground. GO to B2.
B15	GENERATOR GROUND CHECK		
	• Check generator ground. • **Is ground OK?**	Yes ▶ No ▶	GO to B16. SERVICE generator ground. GO to B2.
B16	REPEAT NO LOAD TEST		
	• Start engine, run at 1500 rpm with no electrical load. • Voltage should increase but not more than 3 volts. • **Does voltage increase more than 3 volts?**	No ▶ Yes ▶	GO to B3. GO to B17.
B17	'A' AND 'F' VOLTAGE CHECKS		
	• Turn ignition OFF. • Measure voltage at regulator 'A' and 'F' terminals. • Terminal voltages should be the same as battery voltage. • **Is there battery voltage at both terminals?**	Yes ▶ No ▶	REPLACE regulator. GO to B2. REPLACE generator assembly. GO to B2.

TJ3058E

REMOVAL AND INSTALLATION

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

WARNING: KEEP BATTERIES OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH THE SKIN, EYES OR CLOTHING, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIFTEEN MINUTES. IF ACID IS SWALLOWED, DRINK LARGE QUANTITIES OF MILK OR WATER, FOLLOWED BY MILK OF MAGNESIA, A BEATEN EGG, OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.

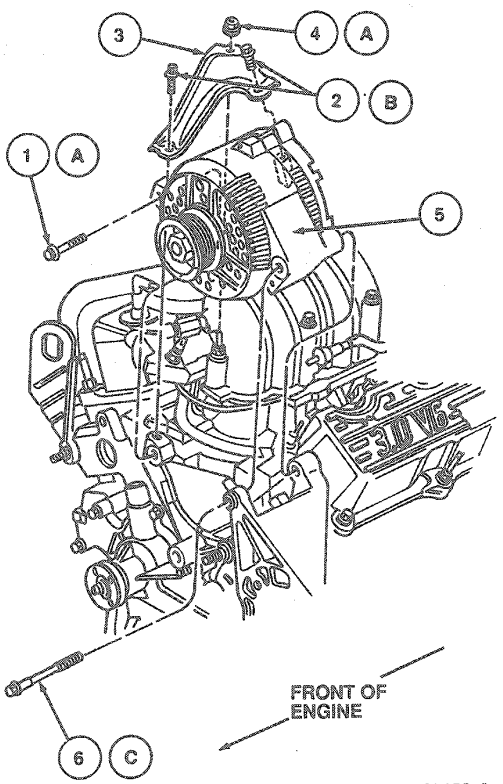
REMOVAL AND INSTALLATION (Continued)

Generator

Removal

1. Disconnect battery ground cable.
2. Disconnect the wire harness attachments to the integral generator / regulator assembly.
3. Loosen the generator pivot bolt. Remove the adjustment arm bolt from the generator.
4. Disengage the accessory drive belt from the generator pulley.
5. Remove the generator pivot bolt and generator / regulator assembly.

3.0L / 3.8L



J4452-A

Item	Part Number	Description
1A	N807274-S309B	Adjusting Arm Bolt
2B	N605892-S8	Bolt (2 Req'd)
3	10B315	Alternator Brace
4A	N621939-S53B	Nut and Washer
5	10300	Alternator
6C	N807241-S36B	Pivot Bolt
A		Tighten to 20-30 N·m (15-22 Lb-Ft)
B		Tighten to 8.5-11N·m (7-8 Lb-Ft)
C		Tighten to 40-55 N·m (30-41 Lb-Ft)

TJ4452A

(Continued)

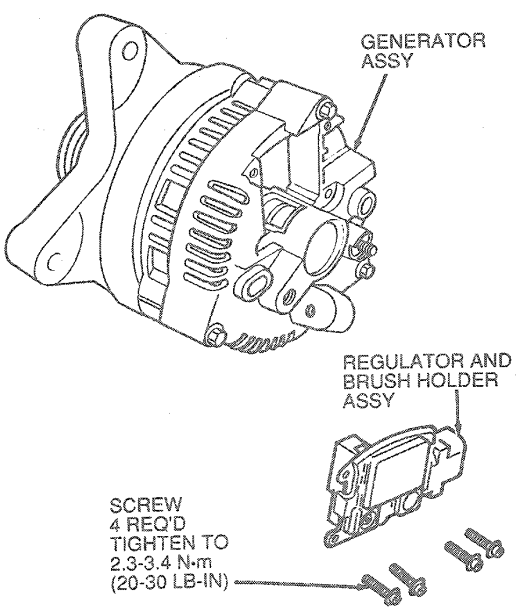
Installation

1. Position the integral generator / regulator assembly on the engine.
2. Install the generator pivot and adjustment arm bolts, but do not tighten the bolts until the belt is tensioned.
3. Install the accessory drive belt over the generator pulley.
4. Tighten the adjustment arm bolt to 20-30 N·m (15-22 lb-ft) and pivot bolt to 40-55 N·m (30-41 lb-ft).
5. Connect the wiring harness to the generator / regulator assembly.
6. Connect battery ground cable.

Regulator

Removal

1. Remove the four screws (T20 TORX®-type head) attaching the regulator to the generator rear housing. Remove the regulator, with brush holder attached, from the generator.

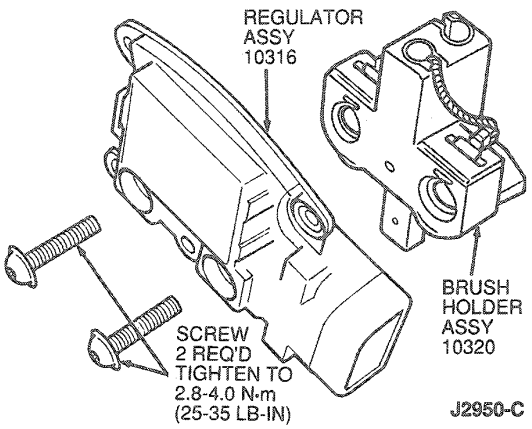


J4486-A

2. Hold the regulator in one hand and pry off the cap covering the 'A' screw head with a screwdriver.

REMOVAL AND INSTALLATION (Continued)

3. Remove two screws (T20 TORX® type head) attaching the regulator to the brush holder. Separate the regulator from brush holder assembly.



Installation

1. Replace brush holder to regulator and install attaching screws.
2. Replace cap on the head of the 'A' terminal screw.
3. Depress the brushes into the holder and hold the brushes in position by inserting a standard size paper clip (or equivalent) through both the location hole in the regulator and through the holes in the brushes.
4. Install the regulator and brush holder assembly to the generator assembly with attaching screws.

   NOTE: Remove paper clip (or equivalent) from the regulator.

DISASSEMBLY AND ASSEMBLY

NOTE: The regulator, brush holder, fan and pulley are serviceable. If the generator assembly needs further service, it must be replaced as an assembly.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Regulator Grounding Screws	1.76-2.8	16-24 (Lb-in)
Adjustment Arm Bolt	20-30	15-22
Pivot Bolt	40-55	30-41
Adjusting Brace Bolts	8.5-11	7-8
Generator Brace Nut	20-30	15-22

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt Ohmmeter
078-00005	Starting and Charging System Tester

SECTION 14-02B Generator, Integral Regulator — Internal Fan and Regulator Type

VEHICLE APPLICATION

Taurus with 3.0L, 3.2L Super High Output (SHO) Engine.

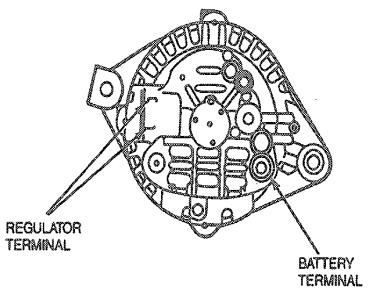
DESCRIPTION

Charging System

The electrical charging system is a negative ground system consisting of an integral generator / voltage regulator (IGR), charge indicator, storage battery and the necessary wiring and cables. Refer to the Electrical and Vacuum Troubleshooting manual for schematics and locations of components and wiring.

Generator

The integral generator / regulator (IGR) is belt-driven from the engine. Field current is supplied from the generators internally mounted voltage regulator, to the rotating field of the generator through two brushes and two slip rings.



J3437-A

OPERATION

With the ignition key in the RUN position, voltage is applied through the charge indicator 'I' circuit to the voltage regulator. This turns on the regulator and the indicator. When the engine is started, the generator begins to generate alternating (AC) current which is converted to direct (DC) current by the rectifier assembly internal to the generator. This current is then supplied to the vehicles electrical system through the generator Battery Positive Voltage (B+) connection located on the rear of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the regulator warning circuit, turning off the charge indicator.

With the system functioning normally, the generator output current is determined by the voltage of the 'A' circuit (battery sense voltage). The 'A' circuit voltage is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain proper generator output. The set voltage will vary with temperature and is typically higher in the winter than in the summer, allowing for better battery recharge in the winter and reducing the chance of overcharging the battery in the summer.

Circuit Description

Battery Positive Voltage (B+) Output

The generator output is supplied through the Battery Positive Voltage (B+) output connection to the battery and electrical system.

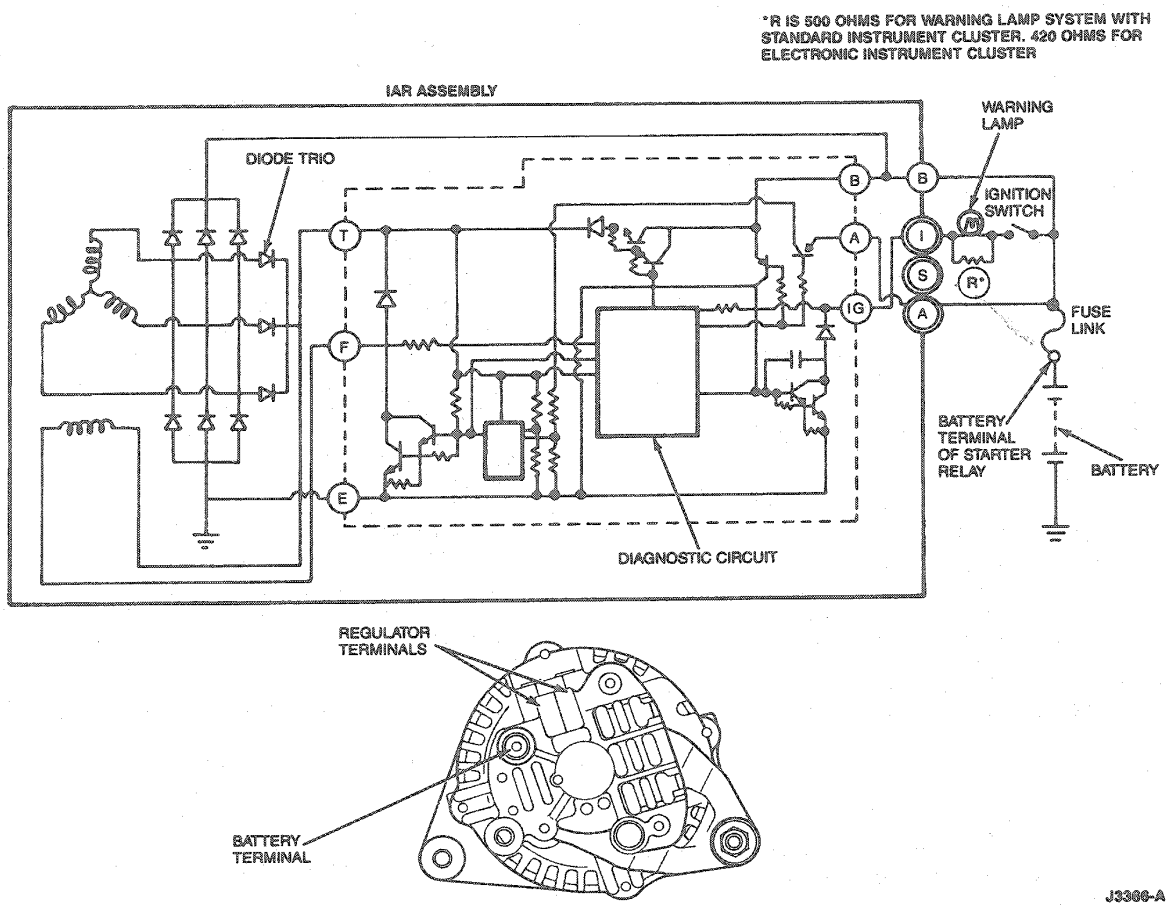
'I' Circuit

The 'I' circuit, or ignition circuit, is used to turn on the voltage regulator. This circuit is powered up with the ignition key in the RUN position. This circuit is also used to turn the indicator on if there is a fault in the charging system operation or associated wiring circuits.

OPERATION (Continued)

'A' Circuit

The 'A' circuit, or battery sense circuit, is used to sense the battery voltage. This voltage is used by the regulator to determine the generator output. This circuit is connected back to the load distribution point and is a protected circuit.



DIAGNOSIS AND TESTING

Certain tests outlined in this Section are illustrated in schematic and in pictorial form. A schematic drawing of the charging system is shown under Operation.

NOTE: The tests are divided into On-Vehicle and On-Bench test procedures. The On-Bench procedures follow the On-Vehicle tests in this Section.

A volt ohmmeter (0- to 20-volt scale), such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent, jumper wire and a test lamp (12-volt) are the only tools required to perform on-vehicle tests of the complete charging system. Test meter calibration should be checked once a year and the date of calibration stamped on the meter face. It is recommended that this practice be followed by all technicians to maintain test meters at acceptable accuracy.

On-Vehicle Tests

Tools Required:

- Rotunda Digital Volt-Ohmmeter 007-00001

DIAGNOSIS AND TESTING (Continued)

Troubleshooting or diagnosis is required before actual service can be made in the electrical system. Even where an obvious condition makes replacement of a unit necessary, find out why the unit failed. When a condition is diagnosed correctly, unnecessary service is prevented, the time the vehicle is out of service will be decreased, and the condition will be properly corrected the first time.

Visual Inspection

Preliminary checks to the charging system should be made regardless of the fault condition. These checks include:

- Check battery posts and cable terminals for clean and tight connections. Clean the posts and the cables to ensure good electrical contact.
- Check for secure connections at the generator output, regulator and engine ground. Also check the connection at the load distribution point (starter relay).
- Check the generator belt to ensure proper tension and no slip between the generator pulley and the belt.
- Check the fuses / fuse links to the generator to ensure that they are not burned or damaged. This condition, resulting in an open circuit or high resistance, can cause erratic or intermittent charging system concerns.

Before performing charging system tests on the vehicle, note conditions such as: slow cranking, discharged battery, top of battery wet, generator / battery charge indicator stays on with engine running, generator / battery charge indicator does not illuminate with ignition switch in RUN and engine not running. This information will aid in isolating the part of the system causing the symptom.

Isolating the Concern

Battery, starting system, and lamp system concerns can be caused by poor charging system performance. It is also reasonable to suspect the charging system if an overload condition has occurred in another area of the electrical system.

To avoid guesswork, it is necessary to isolate battery, charging system, and electrical circuits to correctly identify the area where the difficulty lies. Check the battery first before beginning any electrical system diagnosis. The battery must be in proper state of charge and operation before the other areas of the electrical system can perform normally.

Battery Check

Check battery to see if it has the capacity and ability to accept and hold a charge. Refer to Section 14-01. If battery is OK, the charging system should then be checked to see that it performs its function of keeping the battery charged.

The battery capacity, specific gravity and cell comparison test (non-maintenance free batteries only), will determine the ability of a battery to accept and hold a charge. If the battery does not meet specification, replace it with a new, fully charged battery before further diagnosis of other areas of the electrical system.

If the battery meets required specifications, it should be fully charged before proceeding with the diagnosis of other electrical system components.

Constant Current Drain Test

Tools Required:

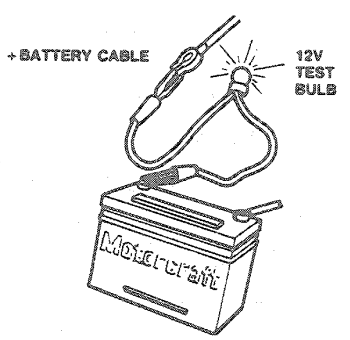
- Rotunda Dwell-Tach-Volts Ohm Tester 059-00010

NOTE: A voltmeter is sometimes used for this test but it will react to a very small normal drain caused by "always-on" electronic systems such as starter interlock, anti-theft alarm, illuminated entry, etc., which are so small they cause no concern. The test lamp shows only drains which are large enough to cause a concern.

NOTE: When the electronic instrument cluster is initially powered-up (after a battery disconnect), the "computer" may be energized for as long as one minute causing a 0.25 amp current draw before returning to the normal 0.010-0.012 amp current draw. Therefore, it is important to allow at least one minute to pass (after ammeter hookup) before observing any current measurements.

Check for current drains on the battery in excess of 50 milliamps with all the electrical accessories off and the vehicle in PARK. This test can be performed one of three ways:

- Use a clamp-on current probe to the battery positive or negative cable.
- Use an in-line ammeter between the battery positive or negative post and its respective cable.
- Use a 12-volt test lamp between the battery positive post and the positive cable. If the lamp illuminates, then there is a drain somewhere in the electrical system.



DIAGNOSIS AND TESTING (Continued)

Typically, a drain of approximately one amp can be attributed to an underhood lamp, glove compartment lamp, or rear deck lid lamp staying on continually. Other component failures or wiring shorts may be located by selectively pulling fuses or disconnecting fuse links to pinpoint the location of the current drain. When the current drain is found, the current will drop below 50 milliamps or the test lamp will go out. If the short is still not located, after checking all the fuses and fuse links, the drain may be due to the generator / regulator. Disconnect the generator output wire from the output stud and the regulator connector. If this eliminates the drain, check the charging system to locate the concern.

Charging System

Tools Required:

- Rotunda Starting and Charging Tester (VAT-40) 078-00005

In order to check the charging system, the use of Rotunda Starting and Charging Tester (VAT-40) 078-00005 or equivalent tester is suggested. Connect the tester to the battery positive and negative posts and also connect the current probe to the generator output lead (to measure generator output). (When measuring generator output, the tester can also be connected to the battery positive or negative cable. In this case, all electrical accessories must be turned off and 10-15 amps added to the reading on the tester due to the engine operation). With the engine running at 2000 rpm, adjust the tester load bank to determine the output of the generator. The generator output should be near to, or exceed the generator rating at 27°C (80°F). Checkout the charging system as indicated and service if required.

NOTE: Refer to the Rotunda VAT-40 test procedure manual for complete directions on checking out the charging system.

Indicator System

Normal Charge Indication

With this IGR system four conditions can cause the charge indicator to come on during vehicle operation:

1. No generator output: damaged generator or regulator.
2. Over-voltage condition: shorted generator rotor or regulator.
3. No connection at generator output terminal (B+).
4. No connection at battery voltage sensing terminal ('A' terminal).

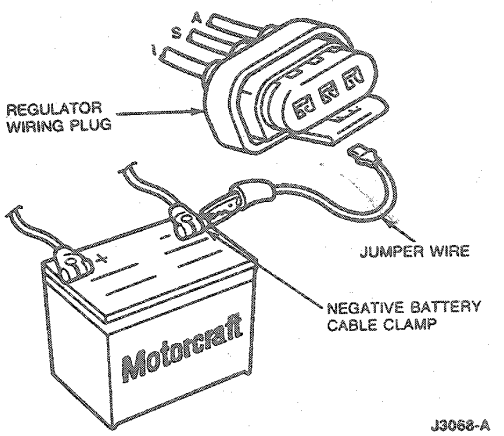
With ignition switch in the OFF position, charge indicator (generator or battery) is off.

With ignition switch in the RUN position (engine not running), charge indicator (generator or battery) is on.

With ignition switch in the RUN position (engine running), charge indicator (generator or battery) is off.

Indicator Testing

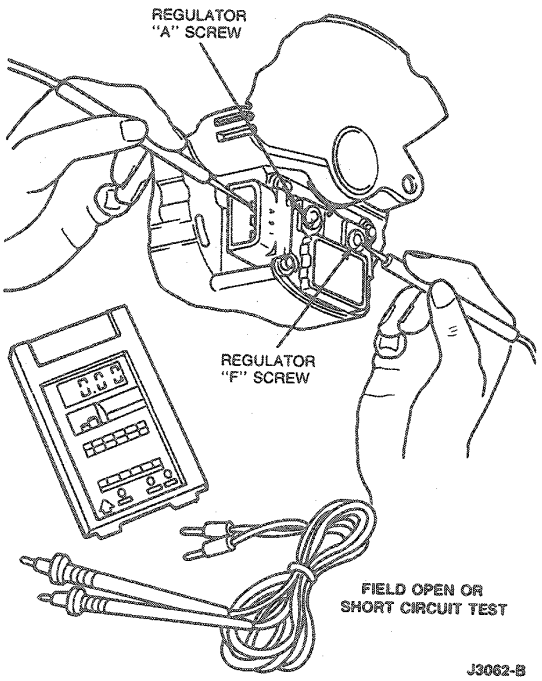
1. If charge indicator does not come on, disconnect wiring connector from regulator.
2. Connect a jumper wire from wiring connector 'I' terminal to battery negative (-) post cable clamp.



3. Turn ignition switch to RUN position with engine off. If indicator does not light, check for presence of lamp socket resistor. If resistor is present, check for contact of lamp socket leads to the flexible printed circuit. If good, check indicator for continuity and replace if burned out. If indicator checks good, perform Regulator 'I' Circuit Test.
4. If indicator does light, remove jumper wire and reconnect wiring plug to regulator. Connect voltmeter negative lead to battery negative post cable clamp and contact voltmeter position lead to regulator 'A' terminal. Battery voltage should be indicated. If battery voltage is not indicated, service 'A' circuit wiring.
5. If battery voltage is indicated, clean and tighten ground connections to engine, generator and regulator.

DIAGNOSIS AND TESTING (Continued)

6. Turn ignition to RUN position with engine off. If indicator still does not light, replace regulator.



Charging System Tests

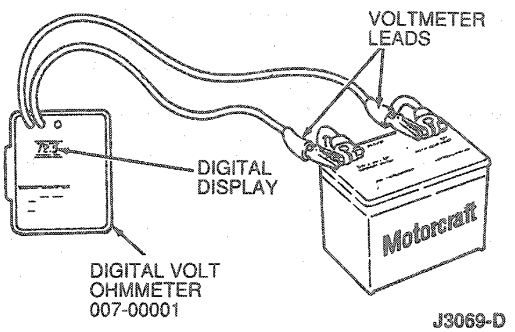
When performing charging system tests, turn OFF all lamps and electrical components. Place transmission in NEUTRAL and apply parking brake.

CAUTION: Do not make jumper wire connections except as directed. To do so may damage regulator.

NOTE: Battery posts and cable clamps must be clean and tight to ensure accurate meter indications.

Base Voltage Test

1. With ignition switch in OFF position and no electrical load, connect negative lead of voltmeter to negative battery cable clamp.
2. Connect positive lead of voltmeter to positive battery cable clamp.
3. Record battery voltage reading shown on voltmeter scale. This reading is called base voltage.



No-Load Test

1. Connect a tachometer to engine.
2. Start engine and increase speed to approximately 1500 rpm. With no other electrical load (foot off brake pedal and doors closed), voltmeter pointer should move upward (increase) but not more than 2.5 volts above base voltage.

   NOTE: The reading should be taken when voltmeter pointer stops rising. It may take a few minutes to reach this point. If voltage increases to proper level, perform Load Test. If the pointer continues to rise, perform the Over Voltage Tests. If the voltage does not rise to proper level, perform Under Voltage Tests.

Load Test

1. With engine running, turn heater / air conditioner blower motor on (high speed) and headlamps on high beam.
2. Increase engine speed to approximately 2000 rpm. Voltmeter should indicate a minimum of 0.5 volt above base voltage. If not, perform Under Voltage Tests.

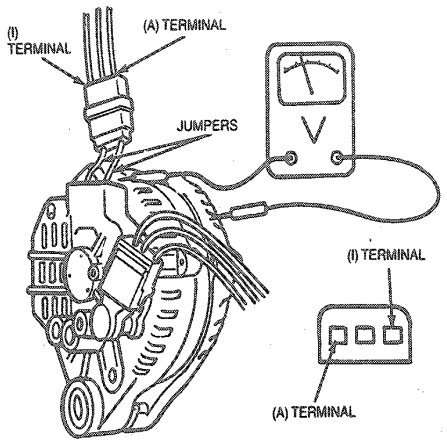
   If above tests indicate proper voltage readings, charging system is operating normally. Proceed to the following tests if one or more of the readings is different than shown above and use a test lamp to check for battery drain.

Over-Voltage Tests

If voltmeter indicates more than 2 volts above base battery voltage, disconnect regulator (ASI) harness connector and insert jumper wires for 'A' and 'I' circuits. With ignition switch in ON position and engine off, connect voltmeter negative lead to generator rear housing. Contact voltmeter positive lead first to generator output connection at starter solenoid and then to regulator harness connector 'A' pin. If voltage difference between the two locations is greater than 0.5 volts, service 'A' wiring circuit to eliminate high resistance condition indicated by excessive voltage drop. Perform Regulator 'A' or 'I' Circuit Test.

DIAGNOSIS AND TESTING (Continued)

If the same voltage reading (battery voltage), is obtained at both locations, replace regulator portion of generator assembly.



J3332-A

Under-Voltage Tests

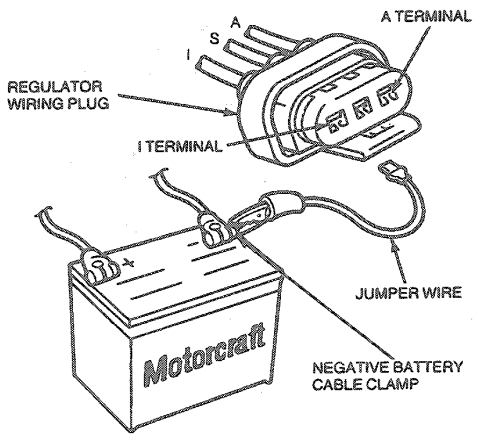
If voltmeter indicates less than 0.5 volt above base voltage, perform Regulator 'A' and/or 'I' Circuit Test.

NOTE: If under voltage condition still exists, replace integral generator assembly.

Regulator 'A' and/or 'I' Circuit Test

With ignition switch in the RUN position (engine not running), charge indicator (generator or battery) should be on.

1. Disconnect wiring connector from regulator and connect a jumper wire from wiring connector 'I' terminal to battery negative post cable clamp.



J3333-A

2. Turn ignition to RUN position with engine off. If indicator does not light, check indicator bulb for continuity and replace bulb if burned out. If bulb checks good, service open in 'I' circuit of vehicle and check for normal operation.
3. If indicator does light, remove jumper wire and connect voltmeter negative lead to battery negative post cable clamp and contact voltmeter positive lead to regulator wiring connector 'A' terminal. Battery voltage should be indicated. If battery voltage is not indicated, service 'A' circuit wiring.
4. If battery voltage is indicated, clean and tighten ground connections to engine and generator.
5. Turn ignition to RUN position with engine off. If indicator still does not light, replace complete generator assembly.

Fuse Link Continuity

1. Ensure first that battery is OK, then turn on headlamps or any accessory. If headlamps or an accessory do not operate, fuse link is probably burned out.
2. On some vehicles there are several fuse links. Use same procedure as in Step 1 to test fuse link that protects vehicle equipment.
3. To test fuse link that protects generator, ensure that battery is OK, then check with a voltmeter for voltage at Battery Positive Voltage (B+) terminal of generator and 'A' terminal of regulator. No voltage indicates that fuse link is probably burned out.

Charging System Check

The charging system test should be performed before testing any individual charging system components. The component tests will determine the type of component service required.

Test instruments used in the charging system test are a voltmeter (0-20- or 0-30-volt scale) and an ohmmeter.

WARNING: SPECIAL CARE SHOULD BE TAKEN WHEN USING THE OHMMETER NEAR "HOT" CIRCUITS. DISCONNECT THE COMPONENT TO BE CHECKED OR THE BATTERY CABLES TO PREVENT DAMAGE TO THE OHMMETER.

Continue through Diagnosis and Testing charts until service is completed. Then, test system again to see if service has corrected the condition.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: CHARGING SYSTEM TEST—IAR GENERATOR

TEST STEP		RESULT	ACTION TO TAKE
A1	PRELIMINARY CHECKS		
	• Check the following: • Fuse link. • Battery terminals and cable clamps. • Wiring connections at generator, integral voltage regulator (IAR) and engine-to-body grounds. • Generator belt tension. • **Are components OK?**	Yes ▶ No ▶	GO to **A2.** SERVICE and / or REPLACE as necessary. GO to **A2.**
A2	BASE VOLTAGE AND NO-LOAD TEST		
	• Connect voltmeter to battery posts. Record battery voltage (base voltage). • Start engine and run at 1500 rpm with no electrical load. Voltage should increase, but not more than 2 volts.	Increases, but not more than 2 volts ▶ No increase ▶ Increases more than 2 volts ▶	GO to **A3.** GO to **A5.** GO to **A7.**
A3	LOAD TEST		
	• Increase engine speed to 2000 rpm. • Turn heater / A / C blower and headlamps on HIGH. • Voltage should read a minimum of 0.5 volt over base 'A' circuit voltage.	Increases 0.5 volt or more ▶ Increases 0.5 volt or more, but generator indicator stays on ▶ Increases less than 0.5 volt ▶	GO to **A4.** GO to **A7.** GO to **A5.**
A4	BATTERY DRAIN TEST—KEY OFF		
	• Perform battery drain test. Refer to Section 14-01. • **Is there a battery drain?**	Yes ▶ No ▶	CHECK other vehicle circuits for drain. REFER to Section 14-01.
A5	'I' CIRCUIT VOLTAGE TEST		
	• Disconnect regulator. • Turn ignition switch to RUN (engine off). • Measure voltage at 'I' terminal of IAR. Voltage should be same as battery voltage. • **Is there battery voltage?**	Yes ▶ No ▶	GO to **A6.** SERVICE 'I' circuit for open or short to ground. GO to **A2.**
A6	'I' CIRCUIT CURRENT TEST		
	• Jumper 'I' terminal at IAR connector to battery negative post. • Turn ignition switch to RUN (engine off). • **Does charge indicator light?**	Yes ▶ No ▶	GO to **A7.** SERVICE 'I' circuit (high resistance). GO to **A2.**
A7	'A' CIRCUIT TEST		
	• Disconnect IAR. • Connect voltmeter negative lead to battery negative post. • Connect voltage positive lead to 'A' terminal of IAR connector. • **Is voltage same as battery?**	Yes ▶ No ▶	GO to **A8.** SERVICE 'A' circuit (open / high resistance). GO to **A2.**
A8	CHECK GENERATOR OUTPUT LEAD		
	• Stop engine. • Connect voltmeter positive lead to B+ terminal of generator. • Connect voltmeter negative lead to battery negative post. • **Is voltage same as battery?**	Yes ▶ No ▶	SERVICE or REPLACE generator. GO to **A2.** SERVICE or REPLACE circuit from generator to battery. GO to **A2.**

TJ3334C

DIAGNOSIS AND TESTING (Continued)

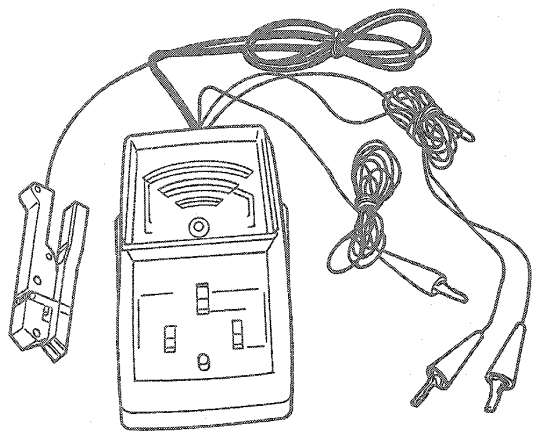
On-Bench Tests

Tools Required:

- Rotunda Dwell-Tach-Volts Ohms Tester 059-00010

If system diagnosis has isolated a concern in the integral generator / regulator assembly, remove it from vehicle for bench testing and service or replace. Refer to Removal and Installation.

The following tests are performed with an analog (needle-type) ohmmeter. Test values shown are referenced to Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent. THESE VALUES MAY BE DIFFERENT FOR OTHER OHMMETERS. If you do not have Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent, use known good parts to establish reference values for your own meter. These values can be written into the spaces provided in the meter reading charts for future reference.



DWELL-TACH-VOLTS
OHMS TESTER 059-00010

J2934-C

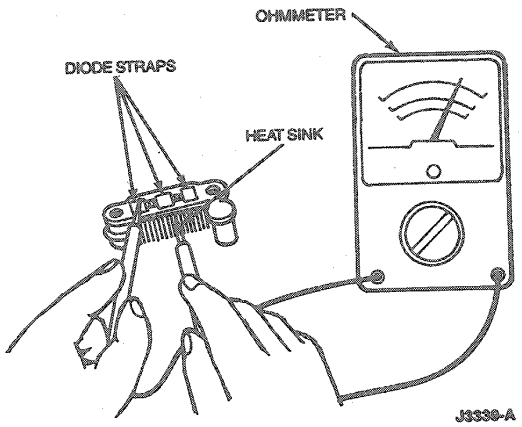
Rectifier Assembly Test

Remove the rectifier assembly from the generator. Place the ohmmeter, Rotunda Dwell-Tach-Volts Ohms Tester 059-00010 or equivalent, Multiply-By setting at 1 and calibrate the meter as directed.

CAUTION: Digital meters cannot be used to perform these tests.

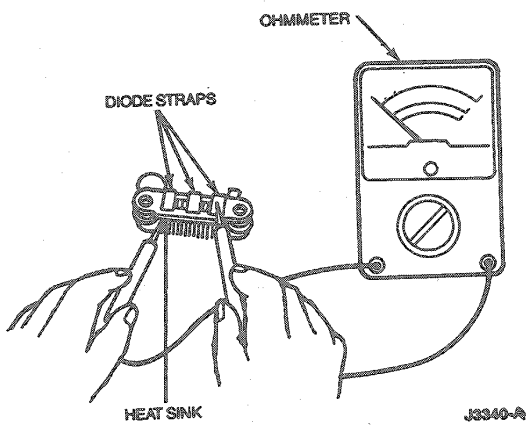
Rectifier

1. Positive Diode (non-grounded)—Check for continuity between the positive diode lead and the heat sink at the positive side, using an ohmmeter. There should be continuity only in the direction from the diode lead to the heat sink.



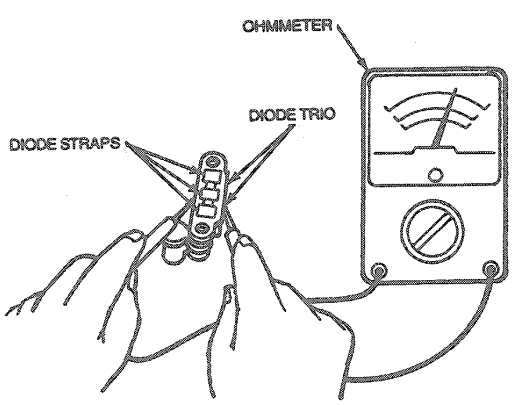
J3339-A

2. Negative Diode (grounded)—Check for continuity between the negative diode lead and the heat sink at the negative side, using an ohmmeter. There should be continuity only in the direction from the heat sink to the negative diode.



J3340-A

3. Diode Trio—Check for continuity using an ohmmeter. There should be continuity in one direction only.



J3341-A

DIAGNOSIS AND TESTING (Continued)

METER READING		
Set meter at Ohms x 1. Make readings in both probe directions to all three phase terminals.		
Resistance Measurement	Acceptable Reading	
Heat Sink to Diode Lead	Model 059-00010	Reference For Another Meter
One probe direction to each diode	About 7.0 ohms	About ____ ohms
Other probe direction to each diode	∞	∞

CJ3342-A

4. If the meter readings are not as specified, replace the generator assembly.

Radio Suppression Capacitor Open or Short Test

NOTE: This is an open or short circuit test only and does not measure capacitance value. Actual capacitance value should be measured on a capacitance bridge at 1 kHz at a maximum voltage of 350 mV rms.

The radio noise suppression capacitor is built into the rectifier assembly and cannot be serviced by itself. To test the capacitor, place the ohmmeter, Multiply-By setting at 1000 and zero the meter. Text values shown in brackets [ ] __ are referenced to Rotunda Model 059-00010 and may be different if another tester is used.

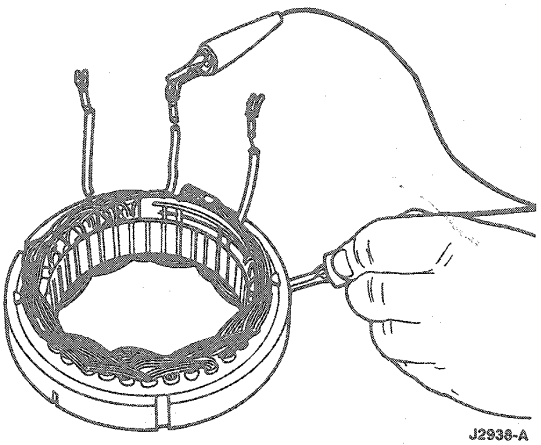
CAUTION: Digital meters cannot be used to perform this capacitor test. The rectifier assembly must be dry.

1. Contact one probe to the rectifier assembly B+ terminal and contact the other probe to the rectifier assembly ground. Reverse the probes and repeat the test. One position should give an infinite reading, indicating the reverse current direction through the diodes and the other position should give a reading of about [1000] __ ohms, indicating the forward current direction. The same reading in both directions indicates an inoperative rectifier assembly.
2. To check the capacitor, contact the probes to the rectifier assembly B+ terminal and ground in the forward current [1000] __ ohms reading direction. While observing the meter indicator needle, reverse the probes and again contact them to the rectifier assembly B+ terminal and ground. The indicator needle should jump slightly (indicating that the ohmmeter batteries are charging the capacitor) and then return to its original position (infinite reading). If the needle does not jump, the capacitor is open. Replace the generator assembly.

Stator Coil Grounded Test

These tests are made to determine if the stator coil is shorted to ground. Remove the stator from the generator and disconnect it from the rectifier assembly as outlined. Place the ohmmeter Multiply-By setting at 1000.

1. Connect the ohmmeter probes to one of the stator lead terminals and to the stator laminated core. Ensure that the probe makes a good electrical connection with the stator core. The meter should show an infinite reading (no needle movement).
2. If the meter does not indicate an infinite reading (needle moves), the stator winding is grounded to the core and the generator assembly must be replaced.



J2938-A

METER READING		
Set meter at Ohms x 1000. Make readings for all stator leads. DO NOT TOUCH LEADS WITH HANDS.		
Resistance Measurement	Acceptable Reading	
Stator Terminal to Stator Core	Model 059-00010	Reference For Another Meter
All Stator lead combinations: Probe polarity optional	∞	∞

CJ2610-B

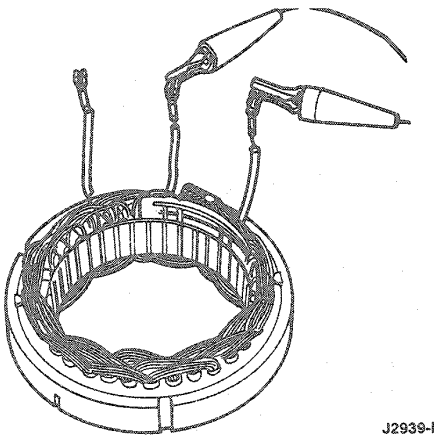
Stator Coil Open Test

This test determines if there is an open stator circuit. Disconnect the stator from the rectifier assembly. Place the ohmmeter Multiply-By setting at 1.

1. Connect one ohmmeter probe to a stator phase lead terminal and touch the other probe to another stator lead terminal. Check the meter reading.

DIAGNOSIS AND TESTING (Continued)

2. Repeat this test with the other two stator lead combinations. If no meter movement occurs (infinite resistance) on a lead paired with either of the other phase leads, that phase is open and the generator assembly must be replaced.



J2939-B

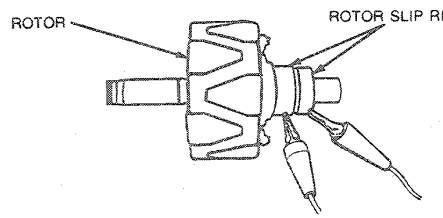
METER READING			
Set meter at Ohms x 1. Make readings for all stator lead combinations.			
Resistance Measurement		Acceptable Reading	
Stator Terminal	to Stator Terminal	Model 059-00010	Reference For Another Meter
All lead combinations; Probe polarity optional		Less than 0.5 ohms	Less than 0.5 ohms

CJ2811-B

Rotor Open or Short Test

Remove the rotor from the generator. Place the ohmmeter Multiply-By setting at 1 and calibrate the meter as directed.

1. Contact each ohmmeter probe to a rotor slip ring. The meter reading should be [2.0-3.9] __ ohms.
2. A higher reading indicates a damaged slip ring, welded connection or a broken wire. A lower reading indicates a shorted wire or slip ring. Replace the generator assembly.

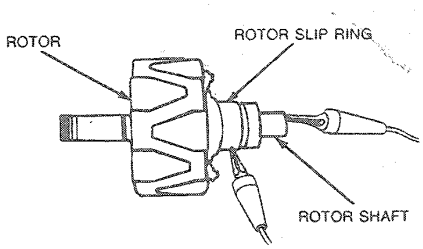


J2818-A

METER READING			
Set meter at Ohms x 1.			
Resistance Measurement		Acceptable Reading	
Slip Ring	to Slip Ring	Model 059-00010	Reference For Another Meter
Probe polarity optional		2.0 to 3.9 ohms	2.0 to 3.9 ohms

CJ2612-B

3. Contact one ohmmeter probe to a slip ring and the other probe to the rotor shaft. The meter reading should be infinite (no needle movement).
4. A reading other than infinite indicates the rotor coil is grounded to the shaft. Replace the generator assembly if the rotor is grounded.



J2817-A

METER READING			
Set meter at Ohms x 1.			
Resistance Measurement		Acceptable Reading	
Slip Ring	to Rotor Shaft	Model 059-00010	Reference For Another Meter
Either slip ring; Probe polarity optional		∞	∞

CJ2813-B

REMOVAL AND INSTALLATION

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED TOBACCO TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

REMOVAL AND INSTALLATION (Continued)

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

WARNING: KEEP BATTERIES OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH THE SKIN OR EYES, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIFTEEN MINUTES. IF ACID IS SWALLOWED, DRINK LARGE QUANTITIES OF MILK OR WATER, FOLLOWED BY MILK OF MAGNESIA, A BEATEN EGG, OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.

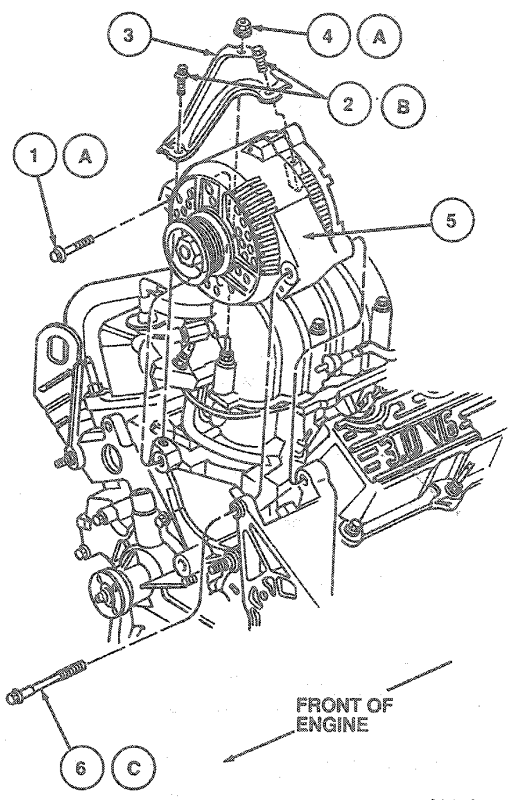
Generator

Tools Required:

- Belt Tension Gauge T63L-8620-A
- Generator Pulley Remover T65P-10300-B
- Rotunda Belt Tension Gauge 021-00019

Removal

1. Remove battery and battery tray. Refer to Section 14-01.
2. Disconnect electrical harness connector and output terminal wiring.
3. Loosen belt tensioner and remove generator belt from pulley.
4. Remove one mounting bolt at front of generator and two bolts at rear.
5. Remove generator from vehicle.



J4452-A

Item	Part Number	Description
1A	N807274-S309B	Adjusting Arm Bolt
2B	N605892-S8	Bolt (2 Req'd)
3	10B315	Alternator Brace
4A	N621939-S53B	Nut and Washer
5	10300	Alternator
6C	N807241-S36B	Pivot Bolt
A		Tighten to 20-30 N·m (15-22 Lb-Ft)
B		Tighten to 8.5-11N·m (7-8 Lb-Ft)
C		Tighten to 40-55 N·m (30-41 Lb-Ft)

TJ4452A

Installation

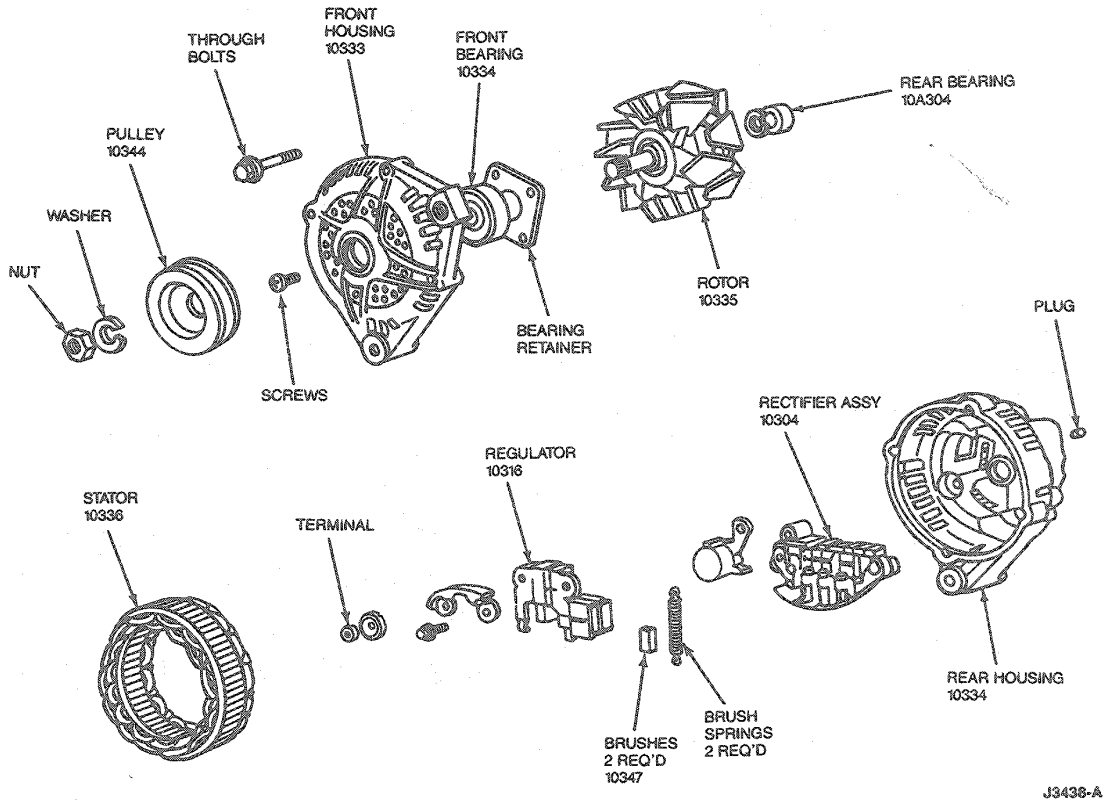
1. Position generator in vehicle and install three mounting bolts. Tighten front bolt to 48-72 N·m (36-53 lb-ft). Tighten rear bolts to 34-50 N·m (26-36 lb-ft).
2. Install generator belt and set belt tension to 658-854 N (148-191 lb) for a used belt, or to 978-1178 N (220-264 lb) for a new belt.
3. Connect output terminal wire and electrical harness connector.

REMOVAL AND INSTALLATION (Continued)

4. Install battery tray and battery. Refer to Section 14-01.

DISASSEMBLY AND ASSEMBLY

NOTE: All of the following Disassembly Steps may not be necessary to perform a particular test or service. Perform only those steps that apply. The following illustration is a disassembled view of the integral generator / regulator assembly.

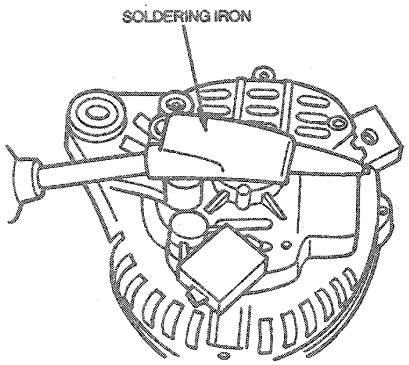


DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

1. Place a soldering iron (200W class) on the bearing box for three or four minutes to heat to about 50-60°C (122-144°F).

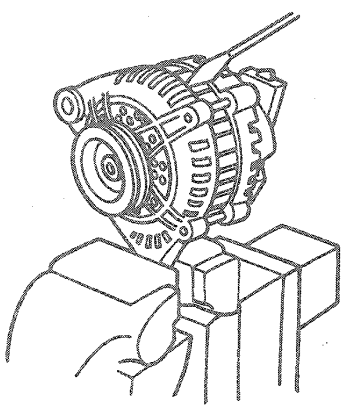
   NOTE: If the bearing box is not heated, the bearing may not be pulled out, because the rear bearing and rear bracket fit together very tightly.



J3343-A

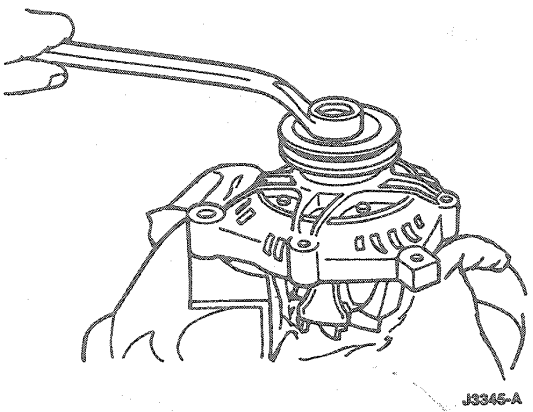
2. Remove the four bolts, and insert a flat-tip screwdriver between the stator core and front bracket and separate them.

   NOTE: Be careful not to force the screwdriver in too far, because the stator may be scratched.



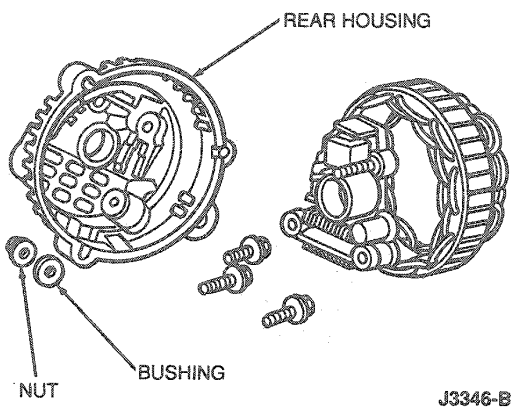
J3344-A

3. Remove the locknut, pulley, rotor and front bracket.



J3345-A

4. Remove the following rear bracket and stator parts:
   - The nut of the 'B+' terminal
   - Insulation bushing
   - Rectifier retaining screws
   - Brush holder retaining screw

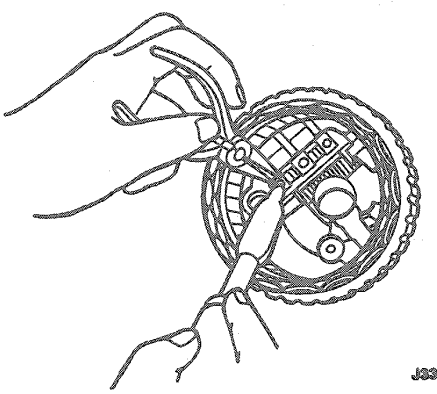


J3346-B

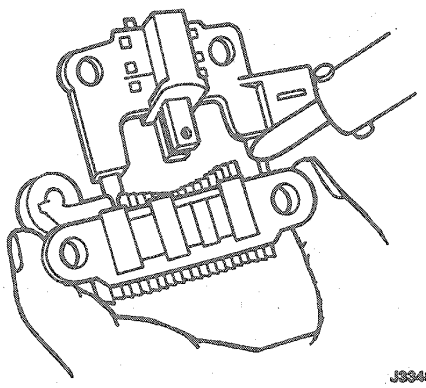
DISASSEMBLY AND ASSEMBLY (Continued)

5. Use a soldering iron to remove the solder from the rectifier and the stator lead.

   CAUTION: Disconnect quickly, use the soldering iron no more than about five seconds, because the rectifier may become damaged if it is overheated.

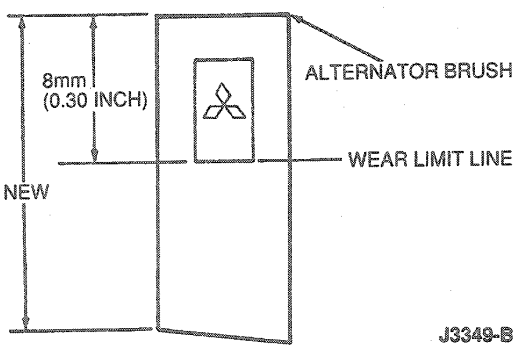


6. Use a soldering iron to remove the IC regulator from the rectifier.

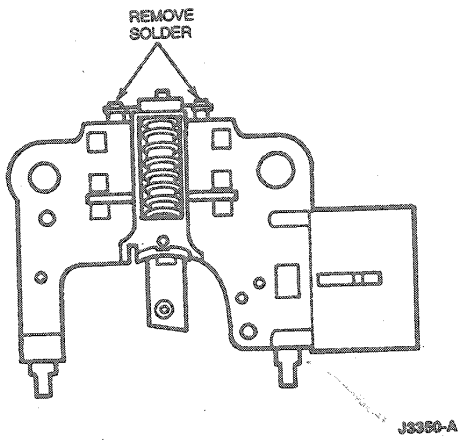


Brush Replacement

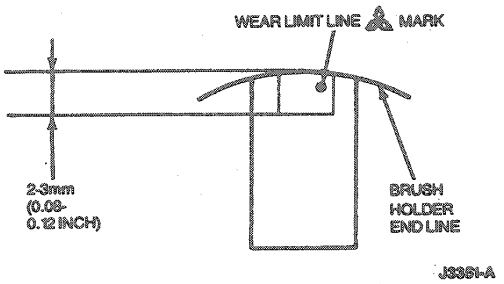
1. Replace the brushes if they are worn at or near the wear line as shown.



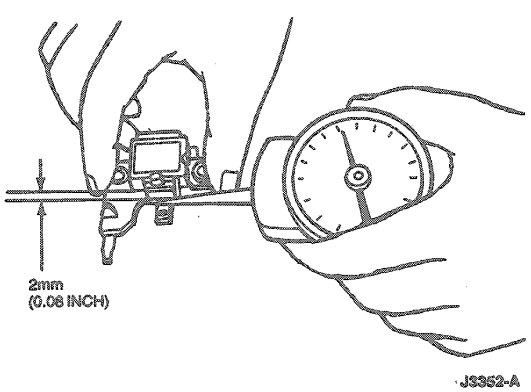
2. If it is necessary to replace the brushes, remove the solder from the brush pigtails at the points shown. Remove the brushes.



3. When soldering the brush, solder the pigtail so that the wear limit line of the brush projects 2 or 3mm (0.08-0.12 inch) out from the end of the brush holder.



4. Brush springs may be checked by using a spring pressure gauge to push the brush into the brush holder until the tip of the brush projects 2mm (0.080 inch). Read the force at this time. Replace the spring if the force is less than 2.0N (200g or 7.1 oz). For a new brush the force should be 3 to 4.4N (310-450g or 10.9-15.9 oz).



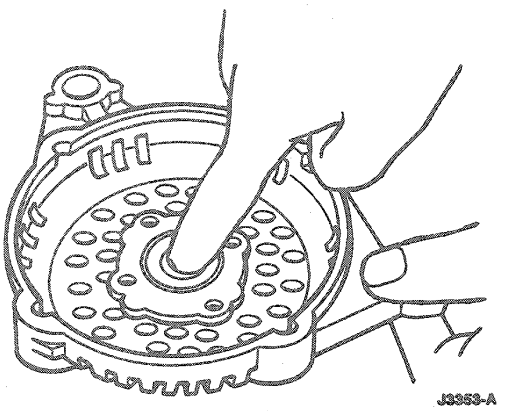
DISASSEMBLY AND ASSEMBLY (Continued)

Bearing Replacement

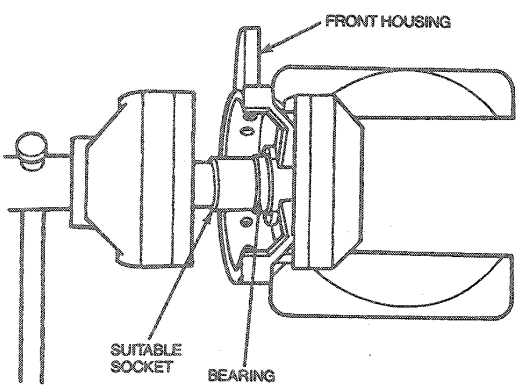
Tools Required:

- Bearing Puller D80L-1002-L

1. Check front bearing for abnormal noise, looseness, binding or insufficient lubrication. Replace the bearing if there is any concern.

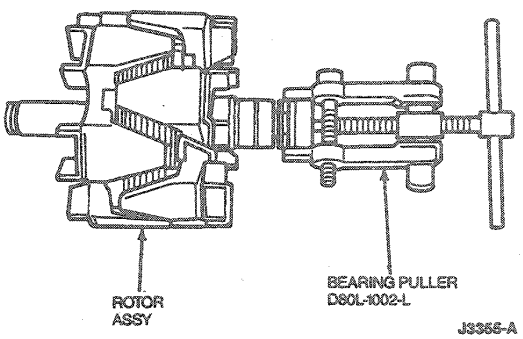

J3353-A

2. To replace the generator front bearing, use a socket or driver which fits the outer race of the generator front bearing, and carefully press a new bearing into the generator front housing using a press or vise.



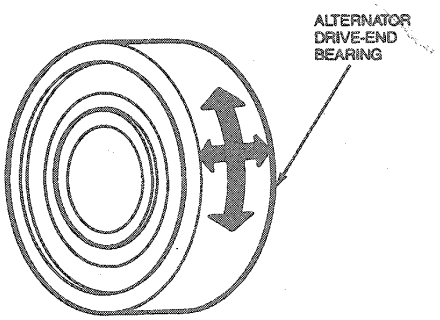
J3354-A

3. Check for rear bearing abnormal noise, looseness, binding, or insufficient lubrication. Replace the bearing if there is any concern.
4. To replace the generator rear bearing, first remove the old bearing from the rotor using two-jaw Bearing Puller D80L-1002-L or equivalent as shown.



J3355-A

5. Check the bearings for abnormal noise, looseness or insufficient lubrication. Replace as necessary.



J3356-A

Cleaning and Inspection

CAUTION: When rebuilding an integral generator, use only high-temperature bearings. Use of standard parts will result in generator failure.

1. Wipe the stator, rotor and front bearing with a clean cloth. Do not clean these parts with solvent.
2. Rotate the front bearing on the drive end of the rotor shaft. Check for any scraping noise, looseness or roughness. Look for excessive lubricant leakage. If any of these conditions exist, replace the bearing.
3. Inspect the rotor shaft rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.
4. Place the rear bearing on the end of the rotor shaft and rotate the bearing. Make the same check for noise, looseness and roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the rear bearing if these conditions exist or if the lubricant is lost or contaminated.
5. Check all wire leads on both the rotor and stator assemblies for loose or broken connections. Check the windings for burned insulation. Replace parts that show signs of burned insulation.

DISASSEMBLY AND ASSEMBLY (Continued)

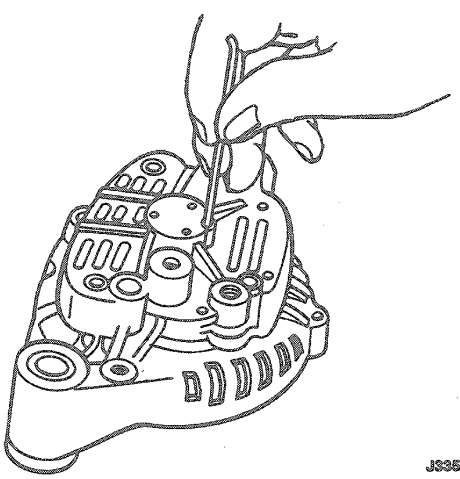
6. Check the pulley and fan for excessive looseness on the rotor shaft and for cracks or other damage. Replace any pulley or fan that is loose, cracked or bent out of shape.
7. Check both the front and rear housings for cracks, particularly in the webbed areas at the mounting ear. Replace a damaged or cracked housing.
8. Replace the brushes if they are at or are worn shorter than the wear limit line, 8mm (0.30 inch).

Assembly

Assembly is in the reverse order of disassembly. There is no lubrication required. Tighten generator assembly through bolts to 4.0-6.7 N·m (35-59 lb-in). Tighten generator pulley locknut to 82-135 N·m (60-100 lb-ft).

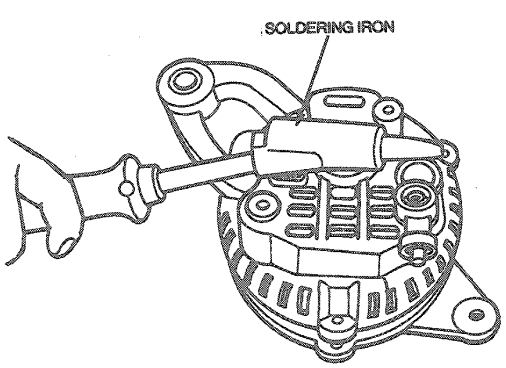
1. Before assembly, push the brush into the brush holder and pass a wire (2 mm, 40-50mm (0.08 inch, 1.6-2 inch)) through the hole shown to secure the brush in position.

   NOTE: Be sure to pull the wire out after the assembly is completed.



J3357-A

2. When the rear bearing is pressed into the rear bracket, heat the bracket before pressing it in.



J3358-A

3. After assembly is completed, rotate the pulley manually and check that the rotor turns easily.

ADJUSTMENTS

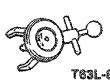
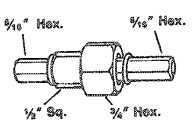
Refer to Section 03-05 for drive belt adjustments.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Generator Front Mounting Bolts	48-72	36-53
Generator Rear Mounting Bolts	34-50	26-36

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T63L-8620-A Belt Tension Gauge	 T63L-8620-A
T65P-10300-B Generator Pulley Remover	 T65P-10300-B

Tool Number	Description
D80L-1002-L	Bearing Puller

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt Ohmmeter
021-00019	Belt Tension Gauge
059-00010	Dwell-Tach-Volts Ohms Tester
078-00005	Starting and Charging Tester (VAT-40)

GROUP

AUDIO SYSTEMS 15

(17000 & 18000)

SECTION 15-00 Audio Systems—Service

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

Radio

Radio Reception

Antenna Position

The automatic antenna, if so equipped, will adjust to the full extended height for best FM reception.

FM Stereo has a range of about 32 km (20 mile) before interference noises are heard. This means that in concern areas with tall buildings or hills, it is necessary to select the strongest possible station. The electronic radio automatically tunes to the center of any given station, eliminating the need for manual fine tuning.

Tone Control

Favoring the rear speakers in noisy areas will help to reduce noise.

Antennas and Mobility

Although an automobile radio will give outstanding mobile reception, it cannot provide the continuous reception of home audio components. The home receiver is not limited by the vehicle operating characteristics and certain geographical effects as is the mobile unit. For example, for the best FM reception, the automobile antenna should be designed like a TV antenna and pointed in the direction of the station. The best AM antenna is a long piece of wire, the higher the wire the better the reception. However, because of design necessity, the automobile antenna is restricted in size, height and direction and must receive both AM and FM stations. This means that a limited amount of the station's signal reaches the vehicle radio.

DESCRIPTION AND OPERATION (Continued)

Interfering Noise

The vehicle ignition system is a possible source of radio interference. This high-voltage switching system produces a radio frequency electromagnetic field that radiates at AM, FM and CB frequencies. Although components have been designed into the vehicle to minimize this concern, the noise is more noticeable if the radio is tuned slightly off channel when listening to FM programs. Vehicle electrical accessories and owner add-on accessories may also contribute to radio interference. Furthermore, there are many noise sources which are external to the vehicle. These include power lines, communication systems, ignition systems of other vehicles, neon signs, etc.

Noise or static may result from many causes. Two of the most common sources of radio noise are listed below:

Ignition Noise

The most effective method of evaluating ignition noise is to compare the radio performance with the engine on, versus engine off. If ignition noise is present with engine running:

- Check to see that the spark plug wires are the suppressor type and that the spark plugs are the correct resistor type.
- If so equipped, check to see that the carbon center insert in distributor cap is secure.
- If so equipped, check distributor cap and rotor electrodes for silicone grease as this may cause ignition noise on FM. This noise is characterized by a "motor boat" type sound on weak to moderate strength stations. The noise can only be eliminated by replacing the distributor cap and rotor with a cap and rotor that does not have grease.

NOTE: Silicone grease must not be removed from vehicles equipped with powertrain control module (12A650) PCM.

Missing or Malfunctioning Noise Suppression Components

- Noise suppression components may be malfunctioning or missing.
- Check bond strap grounding effectiveness by wedging a large file between metal parts to ensure proper ground, such as between the tail pipe and body, or between the fender and frame, while radio is playing and engine is running. Listen for a decrease in the objectionable radio noise. If a reduction in radio noise is noted, first try tightening body and exhaust system clamps and brackets. Then, if necessary, install a new bond strap between the two metal parts to ensure proper ground.

FM Flutter

Flutter can best be described as repeated pops and hissing bursts heard in the speaker, during an otherwise good broadcast. Usually this condition exists while traveling in the fringe area of the station. Flutter will become more severe beyond approximately 40 km (25 mile) of the station. The signal loss becomes greater away from the station, until finally noise takes over and reception becomes impossible. Flutter may also be noticed near the station because of the line-of-sight characteristics of FM radio waves. This condition can happen when a building or large structure is between the radio receiver and the station being received. Some of the FM signal bends around the building, but certain spots have almost no signal. Some of these signal losses are only a few inches wide and if the vehicle is parked in one of these dead spots, you will only hear noise from the speaker. After moving out of the shadow of the structure, the station will return to normal. Flutter will not occur on AM because the AM radio waves are much longer than FM waves.

FM Multi-Path Cancellation

Another effect caused by the line-of-sight characteristic is called cancellation. This condition exists when the radio waves are reflected from objects or structures. The noise produced by cancellation is similar to flutter, with the addition of distortion in the program. A more familiar description of cancellation is its similarity to the multiple ghosts and picture jumping that occurs on television when a low flying plane passes. The same condition exists in the vehicle, except that the vehicle is moving and the reflecting structure is stationary. The reflected signal cancels the normal signal, causing the antenna to pick up noise and distortion. Cancellation effects are most prominent in metropolitan areas, but can also become quite severe in hilly terrain and depressed roadways.

FM Strong Signal Capture and AM Overloading

FM capture is an unusual condition that occurs when traveling in the vicinity of a broadcast tower. If listening to a weak FM station, when passing the broadcast tower, a stronger station may interfere without changing the tuning control. When passing the tower, the station may switch back and forth a few times before returning to the station originally tuned. When several broadcast towers are present (common in metropolitan areas) several stations may overload the receiver resulting in considerable station changing, mixing and distortion. Fortunately, this condition is localized and it will not harm the receiver. Some overloading may also be noticed on AM, but usually to a lesser degree.

DESCRIPTION AND OPERATION (Continued)

Receiving FM Stereo

Because more data is carried in the FM Stereo waves than in the monaural FM broadcasts, flutter, cancellation and capture are even more noticeable. The FM Stereo noise-free broadcast range is approximately 8 km (5 mile) less than that received with the monaural FM radio. The AM/FM, FM Stereo radio may never encounter any of these troublesome conditions as they are more prominent in metropolitan areas, hilly terrain and depressed roadways. However, when diagnosing FM Stereo concerns, it is recommended to accurately tune to the strongest FM Stereo station.

Stereo Indicator Inoperative or Flickering (AM and FM Reception are OK)

- Verify that customer is listening to stereo stations.
- A weak or distant signal may cause the stereo indicator to flicker. Tune radio to a nearby FM stereo station. If reception is good, but stereo indicator is still intermittent, remove radio chassis for service.

DIAGNOSIS AND TESTING

Radio Tests

Internal diagnostic examination of the radio should be left to the authorized radio service center. However, the automotive technician should be able to analyze and isolate radio reception conditions to the proper area or component causing the condition. All radio conditions can be isolated to one of five general areas. The trouble will be found in the antenna system, radio chassis (receiver), speaker system, radio noise suppression equipment, or premium sound system.

The diagnosis charts and tests should be used with the Wiring Diagram Book and an appropriate Radio Tester to accurately diagnose and quickly service most radio system concerns.

Diagnosis Charts

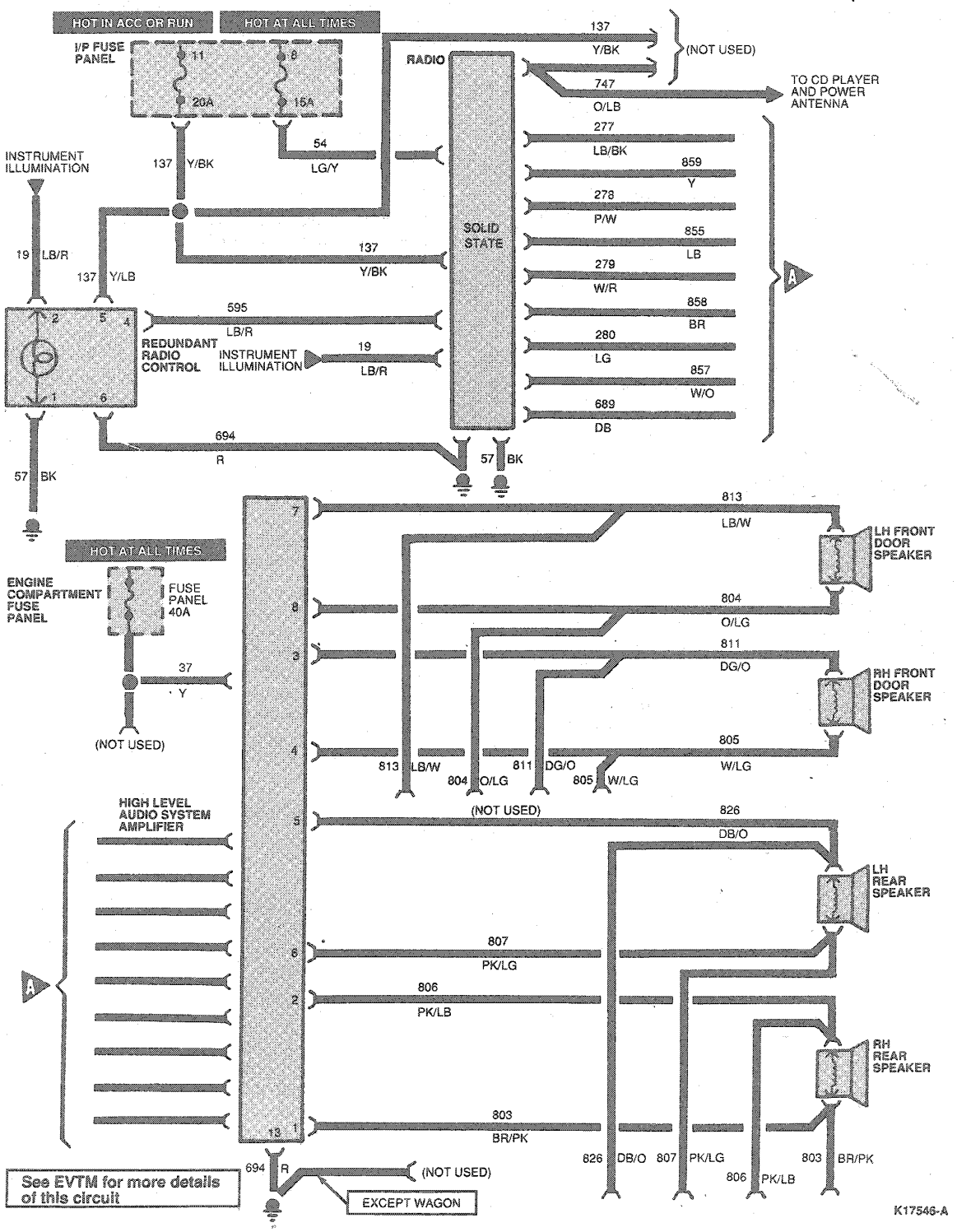
Tools Required:

- Intermittent Ignition Analyzer 007-00035

Refer to the wiring diagrams and to the diagnosis charts to isolate radio concerns.

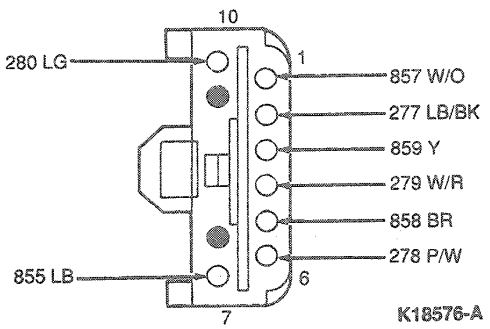
DIAGNOSIS AND TESTING (Continued)

Premium Analog Cassette (PAC) with Amplifier (Sable)



DIAGNOSIS AND TESTING (Continued)

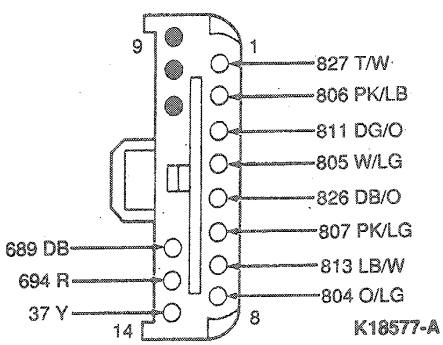
Amplifier



K18576-A

Pin Number	Circuit	Circuit Function
1	857 (W/O)	LH Front Speaker Signal (-)
2	277 (LB/BK)	LH Rear Speaker Signal (+)
3	859 (Y)	LH Rear Speaker Signal (-)
4	279 (W/R)	RH Front Speaker Signal (+)
5	858 (BR)	RH Front Speaker Signal (-)
6	278 (P/W)	RH Rear Speaker Signal (+)
7	855 (LB)	RH Rear Speaker Signal (-)
8	—	NOT USED
9	—	NOT USED
10	280 (LG)	LH Front Speaker Signal (+)

TK18576A



K18577-A

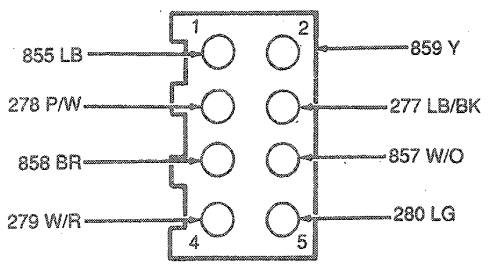
Pin Number	Circuit	Circuit Function
1	827 (T/W)	RH Rear Speaker Signal (-)
2	806 (PK/LB)	RH Rear Speaker Signal (+)
3	811 (DG/O)	RH Front Speaker Signal (-)

(Continued)

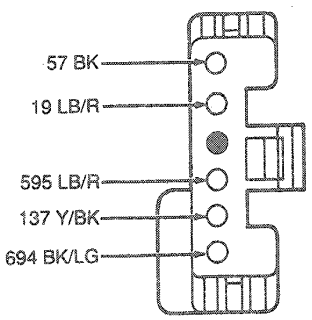
Pin Number	Circuit	Circuit Function
4	805 (W/LG)	RH Front Speaker Signal (+)
5	826 (DB/O)	LH Rear Speaker Signal (-)
6	807 (PK/LG)	LH Rear Speaker Signal (+)
7	813 (LB/W)	LH Front Speaker Signal (-)
8	804 (O/LG)	LH Front Speaker Signal (+)
9	—	NOT USED
10	—	NOT USED
11	—	NOT USED
12	689 (DB)	Logic Mute
13	694 (R)	Ground
14	37 (Y)	12 Volt Power Feed

TK18577A

Radio

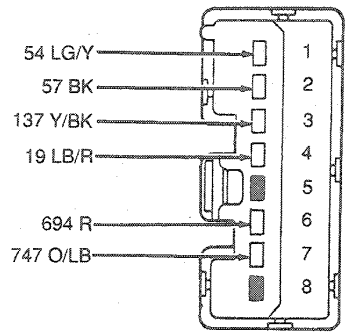


K18580-A



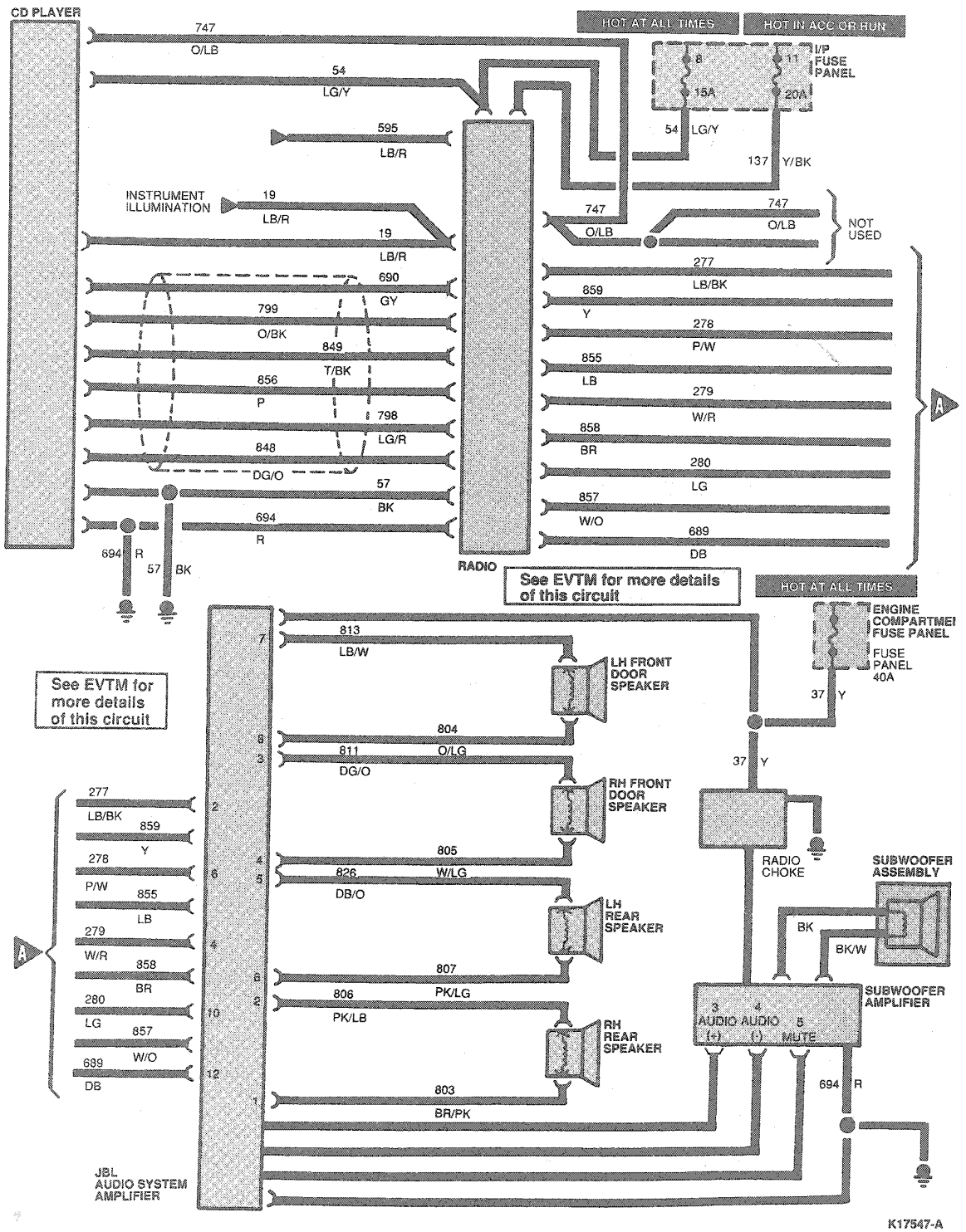
K18582-A

DIAGNOSIS AND TESTING (Continued)



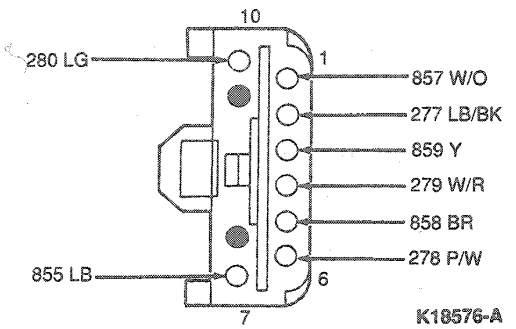
DIAGNOSIS AND TESTING (Continued)

Premium Analog Cassette (PAC) with JBL Amplifier and With Audio Disc Player



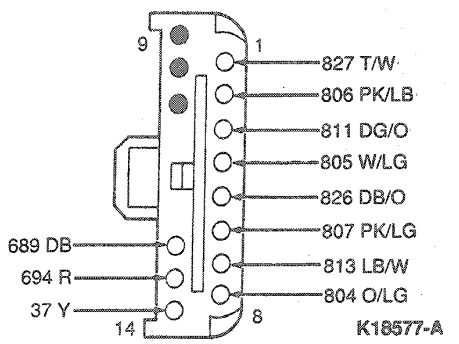
DIAGNOSIS AND TESTING (Continued)

Amplifier



Pin Number	Circuit	Circuit Function
1	857 (W/O)	LH Front Speaker Signal (-)
2	277 (LB/BK)	LH Rear Speaker Signal (+)
3	859 (Y)	LH Rear Speaker Signal (-)
4	279 (W/R)	RH Front Speaker Signal (+)
5	858 (BR)	RH Front Speaker Signal (-)
6	278 (P/W)	RH Rear Speaker Signal (+)
7	855 (LB)	RH Rear Speaker Signal (-)
8	—	NOT USED
9	—	NOT USED
10	280 (LG)	LH Front Speaker Signal (+)

TK18576A



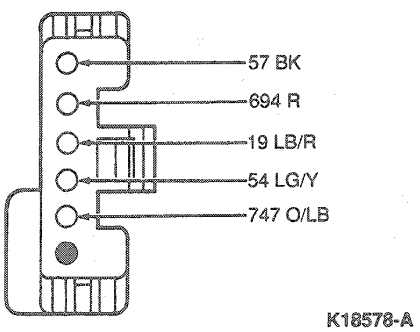
Pin Number	Circuit	Circuit Function
1	827 (T/W)	RH Rear Speaker Signal (-)
2	806 (PK/LB)	RH Rear Speaker Signal (+)
3	811 (DG/O)	RH Front Speaker Signal (-)

(Continued)

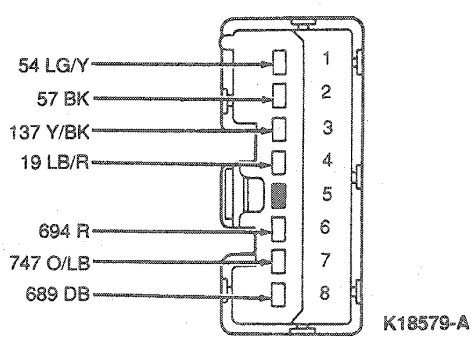
Pin Number	Circuit	Circuit Function
4	805 (W/LG)	RH Front Speaker Signal (+)
5	826 (DB/O)	LH Rear Speaker Signal (-)
6	807 (PK/LG)	LH Rear Speaker Signal (+)
7	813 (LB/W)	LH Front Speaker Signal (-)
8	804 (O/LG)	LH Front Speaker Signal (+)
9	—	NOT USED
10	—	NOT USED
11	—	NOT USED
12	689 (DB)	Logic Mute
13	694 (R)	Ground
14	37 (Y)	12 Volt Power Feed

TK18577A

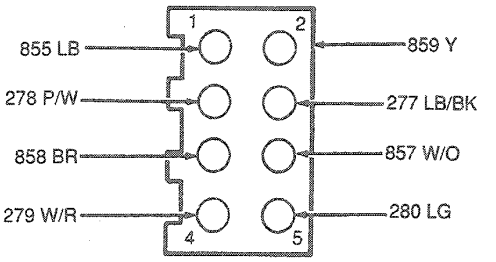
Compact Disc



Radio

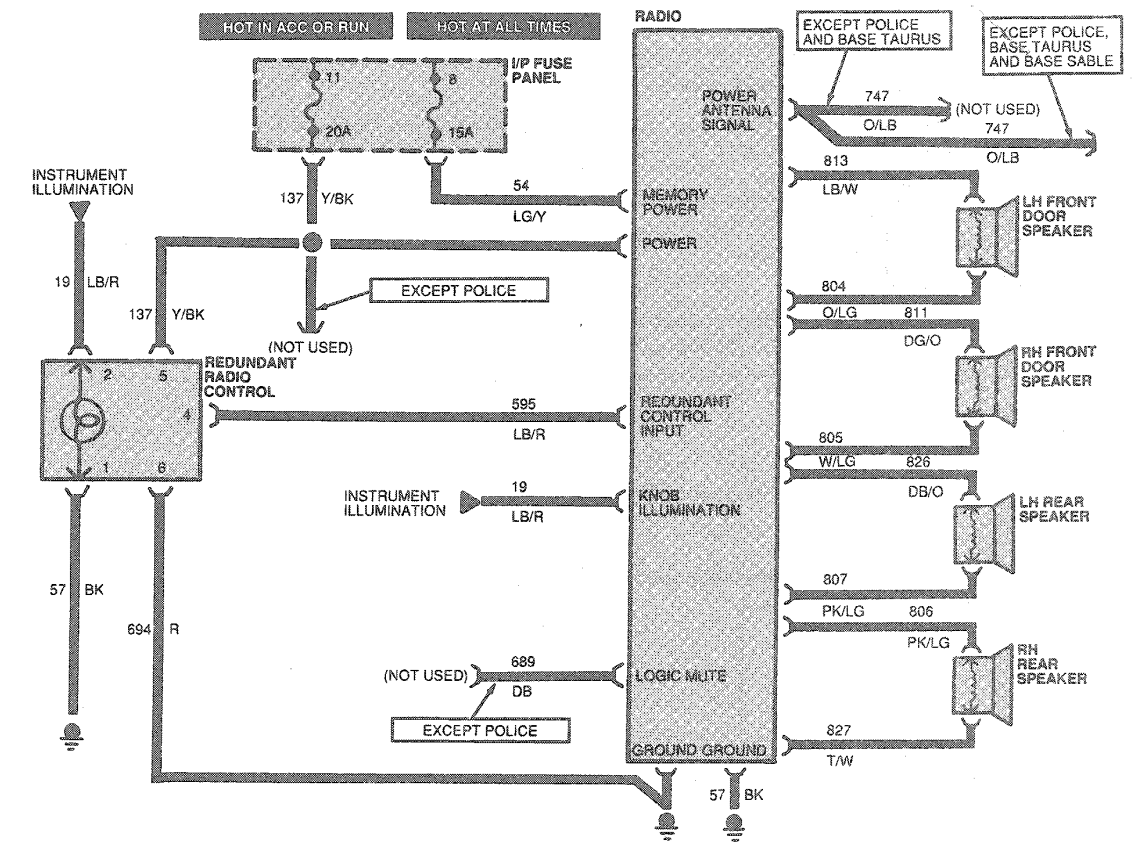


DIAGNOSIS AND TESTING (Continued)



K18580-A

Electronic Search Radio (ESR) and Electronic Cassette Radio (ECR)

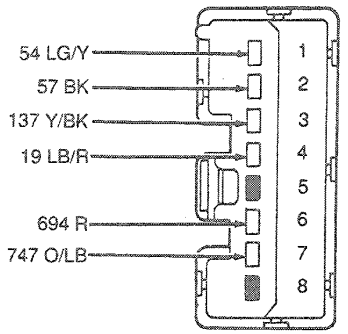


See EVTM for more details of this circuit

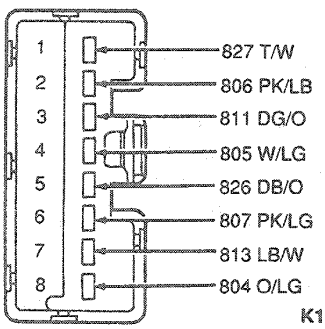
K17548-A

DIAGNOSIS AND TESTING (Continued)

Radio



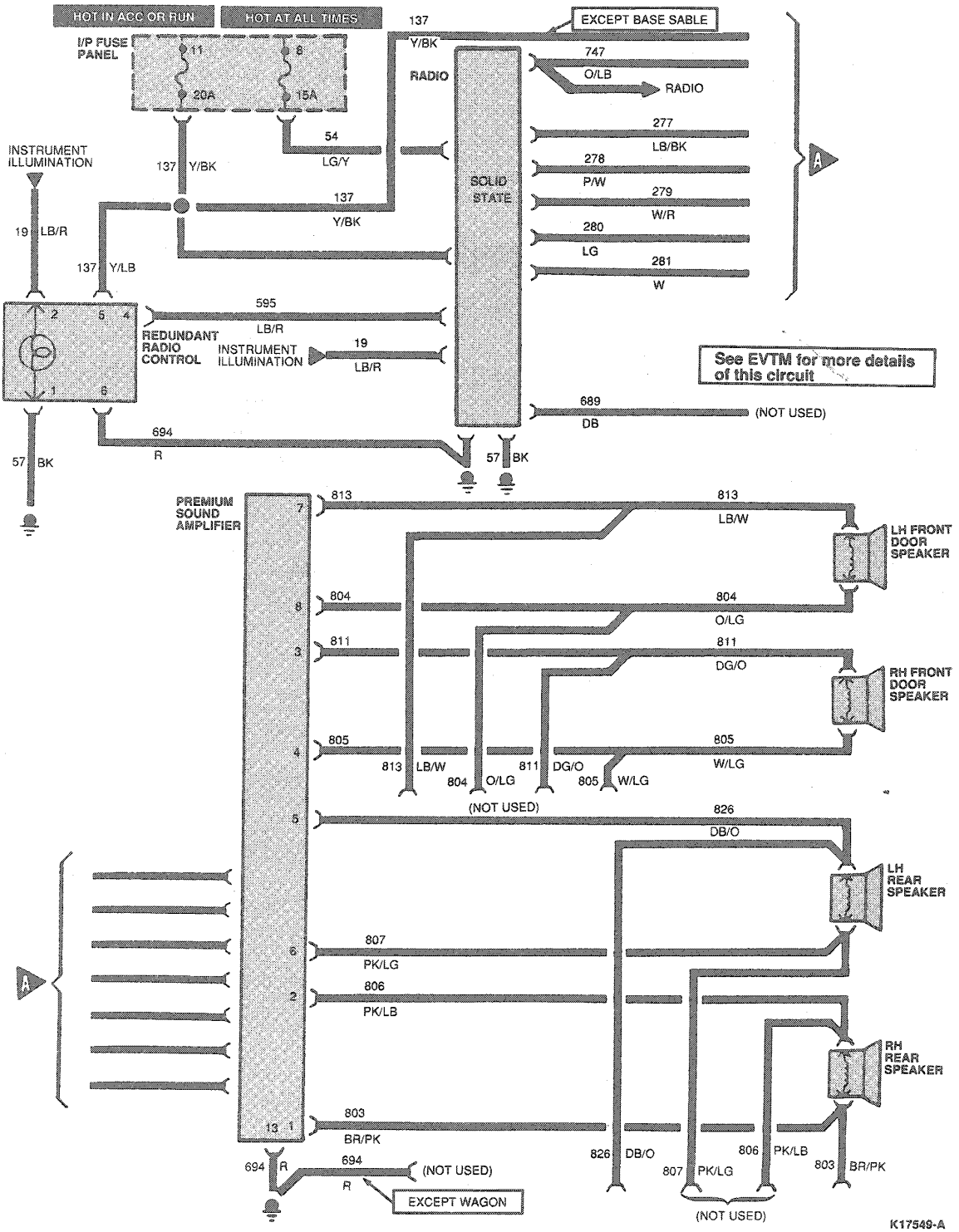
K17652-A



K17654-A

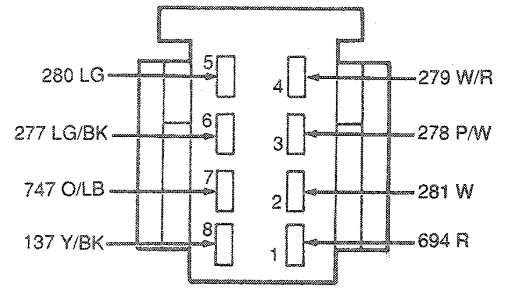
DIAGNOSIS AND TESTING (Continued)

Electronic Search Radio (ESR), (ESC) with Premium Sound Amplifier (Sable)

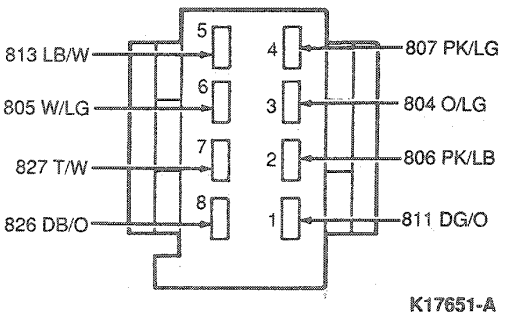


DIAGNOSIS AND TESTING (Continued)

Amplifier

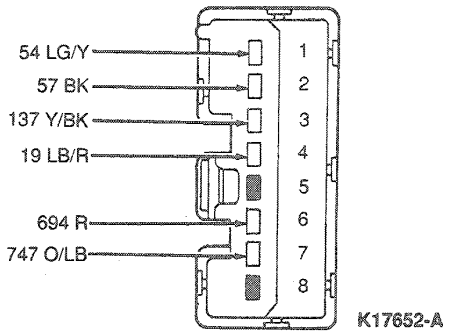


K17575-A



K17651-A

Radio



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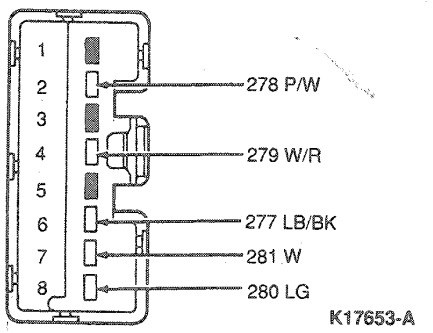

K17653-A

DIAGNOSIS AND TESTING (Continued)

Circuit Description Chart

Circuit No.	Description	Gauge	Color		Stripe
746	Antenna Down Travel	18	Dk Green	Yellow	X
745	Antenna Up Travel	18	Red	Pink	X
*137B	Input to P.S.A. From Filter (12 V)	14	Yellow	Black	X
*137A	Input to Filter (12 V. D.C.)	14	Yellow	Black	X
694	Amplifier Power Return	14	Red		
372	Memory	18	Brown	Orange	X
370	Seek Down	18	Orange	Black	X
368	Seek Up	18	Red	Black	X
281	Speaker Voice Coil Return Amplifier Input	18	White		
280	Speaker Voice Coil Feed Front (LH Channel) Amp Input	18	Lt. Green		
279	Speaker Voice Coil Feed Front (RH Channel) Amp Input	18	White	Green	X
278	Speaker Voice Coil Feed Rear (RH Channel) Amp Input	18	Purple	White	X
277	Speaker Voice Coil Feed Rear (LH Channel) Amp Input	18	Lt. Blue	Black	X
785	Speaker Voice Coil Return LH Channel	18	Yellow	White	X
784	Speaker Voice Coil Return RH Channel	18	Violet		
835	Speaker Voice Coil Feed (LH Channel)	18	Red		
834	Speaker Voice Coil Feed (RH Channel)	18	Blue		
827	Amplifier Switch Feed to LH Rear Speaker	18	Tan	White	X
826	Amp Switch Ground to LH Rear Speaker	18	Dk. Blue	Orange	X
825	Amplifier Switch Feed to RH Rear Speaker	18	Tan	Lt. Green	X
824	Amp Switch Ground to RH Rear Speaker	18	White	Lt. Blue	X
820	Amplifier Switch Feed to LH Front Speaker	18	Dk. Blue	Yellow	X
819	Amp Switch Ground to LH Front Speaker	18	Lt. Green	White	X
816	Amplifier Switch Feed to RH Front Speaker	18	Lt. Green	Purple	X
815	Amp Switch Ground To RH Front Speaker	18	Lt. Green	Orange	X
814	Speaker Switch Feed To LH Front Speaker	18	Pink	White	X
813	Speaker Switch Ground To LH Front Speaker	18	Lt. Blue	White	X
812	Speaker Switch Feed to RH Front Speaker	18	Pink	Orange	X
37	Battery to Load	14	Yellow		

Circuit No.	Description	Gauge	Color		Stripe
811	Speaker Switch Ground To RH Front Speaker	18	Dk. Green	Orange	X
831	Switch to Fader LH Channel Feed	18	Tan		
830	Switch to Fader RH Channel Feed	18	Pink	Yellow	X
829	Power Feed-Switch to Front Amplifier	18	White	Purple	X
747	Radio Receiver Assy to Foot Control Switch	18	Orange	Lt. Blue	X
822	Speaker Voice Coil Feed	18	Black	Green	X
807	Speaker Voice Coil Feed Rear (LH Channel)	18	Pink	Lt. Pink	X
806	Speaker Voice Coil Feed Rear (RH channel)	18	Pink	Lt. Blue	X
805	Speaker Voice Coil Feed Front (RH Channel)	18	White	Lt. Green	X
804	Speaker Voice Coil Feed Front (LH Channel)	18	Orange	Lt. Green	X
803	Speaker Voice Coil Return Rear (RH Channel)	18	Dk. Green	Orange	X
801	Speaker Voice Coil Return Rear (LH Channel)	18	Pink	Lt. Blue	X
802	Amp/Speaker Switch Feed to RH Rear Speaker	18	Orange	Red	X
800	Amp/Speaker Switch Feed to LH Rear Speaker	18	Gray	Lt. Blue	X
57	Ground	20	Black		
287	Speaker Voice Coil Return	18	Black	White	X
*137	Radio and Antenna Switch Feed	18	Yellow	Black	X
54	Memory Feed	18	Lt. Green	Yellow	X
19	Instrument Panel Lamps Feed	18	Lt. Blue	Red	X
689	Logic Mute	18	Dk Blue		
857	LH Front Amp Input Return	18	White	Orange	X
858	RH Front Amp Input Return	18	Brown		
859	LH Rear Amp Input Return	18	Yellow		
855	RH Rear Amp Input Return	18	Lt. Blue		
586	Remote Return	18	Black		
595	Remote In	18	Lt. Blue	Red	X
856	LH Channel Signal In	18	Purple		
690	RH Channel Signal In	18	Gray		
798	LH Channel Signal Out	18	Lt. Green	Red	X
799	RH Channel Signal Out	18	Orange	Black	X
848	Processor Loop Signal Return	18	Dk. Green	Orange	X
849	Digital Audio Disc Logic Sense	18	Tan		

CL6680-B

DIAGNOSIS AND TESTING (Continued)

Remote Radio Control Functional Test

Verify operation of remote radio control.

Step 1. Turn ignition to RUN or ACC. Turn radio on and verify radio operation.

Step 2. Test the following switch buttons:

MEMORY: Will advance to the previously stored stations in the preset buttons.

VOLUME: Volume will decrease when button is pressed on left (-) side and increase when pressed on right (+) side.

SEEK: Will advance the display forward only.

If any of these functions are inoperative but radio is otherwise functional, replace remote radio control switch.

PINPOINT TEST A: ALL ELECTRONIC RADIO CONTROL FUNCTIONAL TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VERIFY OPERATION OF RADIO		
	• Turn ignition to ON or ACC. Turn radio on. • **Is radio display lit?**	Yes ▶ No ▶	GO to **A3.** GO to **A2.**
A2	VERIFY SOUND FROM SPEAKERS		
	• **Is sound coming from speakers?**	Yes ▶ No ▶	GO to **A17.** REFER to radio inoperative procedure.
A3	AM INDICATOR TEST		
	• Push the band or AM button. • **Is "AM" indicator lit?**	Yes ▶ No ▶	GO to **A4.** REMOVE radio for service.
A4	UP TEST		
	• Depress "seek (>)" or "scan" button and verify that number on display increases (if display reads 1610 AM or 107.9 FM display will not increase and the "seek (>)" button should be depressed until display reads less than 1610 AM or 107.9 FM). • **Is "up" function OK?**	Yes ▶ No ▶	GO to **A5.** REMOVE radio for service.
A5	DOWN TEST		
	• Depress "seek (<)" button and verify that number on display decreases (if display reads 530 AM or 88.1 FM, display will not decrease and the "seek (<)" button should be depressed until display reads greater than 530 AM or 88.1 FM). • **Is "down" function OK?**	Yes ▶ No ▶	GO to **A6.** REMOVE radio for service.
A6	FAST UP TEST		
	• Push AMS then SEEK (>) button. • **Is "fast up" function OK?**	Yes ▶ No ▶	GO to **A7.** REMOVE radio for service.
A7	FAST DOWN TEST		
	• Push AMS then SEEK (<) button. • **Is "fast down" function OK?**	Yes ▶ No ▶	GO to **A8.** REMOVE radio for service.
A8	SCAN TEST		
	• Press SCAN button. • **Is radio scanning to the next stations for five second samplings?**	Yes ▶ No ▶	GO to **A9.** REMOVE radio for service.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: ALL ELECTRONIC RADIO CONTROL FUNCTIONAL TEST (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A9	STATION RECALL MEMORY TEST		
	• Depress seek or scan tuning to select desired station. When station is tuned, depress and hold a memory button. When memory button is depressed, station's sound will be interrupted. Depress button for approximately two seconds. When station's sound returns, button is "set" and may be released. This process is repeated for each memory button. Turn radio off then on. Depress each station recall button and verify that stations indicated are the same as stations stored above. • **Is memory test successful?**	Yes ▶ No ▶	GO to **A10.** REMOVE radio for service.
A10	FM INDICATOR TEST		
	• Push the band or FM button. • **Is FM indicator lit?**	Yes ▶ No ▶	REPEAT the following tests described earlier on the FM band: **A4, A5, A6, A7 and A9.** GO to **A11.** REMOVE radio for service.
A11	FM STEREO INDICATOR TEST		
	• Tune radio to a known FM stereo station. • **Is stereo indicator lit?**	Yes ▶ No ▶	GO to **A12.** REMOVE radio for service.
A12	VOLUME CONTROL TEST		
	• Tune radio to a local station. Press VOLUME + and verify that an increase in the sound level occurs. Press VOLUME - and verify a decrease in the sound level. • **Does volume change properly?**	Yes ▶ No ▶	GO to **A13.** CHECK speaker connection and PERFORM speaker test. REPEAT volume vehicle test. If volume still is not OK, REMOVE radio to service. If volume OK, GO to **A13.**
A13	TONE CONTROL TEST		
	• Push AUDIO button repeatedly until BASS is displayed. Push the RH (+) side of VOLUME button to increase low frequency sound or LH (-) side to decrease low frequency sounds. • Push AUDIO button repeatly until TREB is displayed. Push the RH (+) side of VOLUME button to increase high frequency sound or LH (-) side to decrease high frequency sounds. • **Does bass and treble change properly?**	Yes ▶ No ▶	GO to **A14.** REMOVE radio for service.
A14	BALANCE CONTROL TEST		
	• Push AUDIO button repeatedly until BAL is displayed. Push the RH (+) side of VOLUME button to shift sound to RH speakers or LH (-) side to shift sound to LH speakers. • **Does balance change properly?**	Yes ▶ No ▶	GO to **A15.** CHECK speakers and speaker connections. REPEAT balance control test. If balance still is not OK — REMOVE radio for service. If balance OK, GO to **A15.**
A15	FADER CONTROL TEST		
	• Push AUDIO button repeatedly until FADE is displayed. Push the RH (+) side of VOLUME button to shift sound to rear speakers or LH (-) side to shift sound to front speakers. • **Does fader change properly?**	Yes ▶ No ▶	GO to **A16.** CHECK speakers and speaker connections. REPEAT fader control test. If fader is not OK, REMOVE radio for service. If fader is OK, GO to **A16.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: ALL ELECTRONIC RADIO CONTROL FUNCTIONAL TEST (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A16	SEEK TEST		
	• Depress seek button (>) and verify that radio stops on next station. Repeat for SEEK (<). • **Does radio stop on next station?**	Yes ▶ No ▶	GO to **A17.** TURN radio off and then on to determine if seeking stops. If seek does not stop, REMOVE radio for service. If seek does stop, GO to **A17.**
A17	SCAN TEST		
	• Tune radio on AM band (should be done outside of any building). Press scan button and count the number of listenable stations that can be tuned. Compare to a vehicle with a known, good radio system. • **Are normal number of stations received?**	Yes ▶ No ▶	GO to **A18** PERFORM antenna system check. REFER to Section 15-02. REPEAT scan test. If still not receiving normal number of stations, REMOVE radio for service. If normal number of stations received GO to **A18**
A18	DISPLAY TEST		
	• Tune radio to 1000 AM. • **Is display correct and "AM" indicator lit?**	Yes ▶ No ▶	GO to **A19** Remove radio for service.
A19	DISPLAY TEST (Continued)		
	• Tune radio to 88.9 FM. • **Is display correct and "FM" indicator lit?**	Yes ▶ No ▶	GO to **A20** REMOVE radio for service.
A20	DISPLAY TEST (Continued)		
	• Tune radio to FM stereo station. • **Is display correct and "ST" indicator lit?**	Yes ▶ No ▶	End of electronic radio controls function test. If other concerns exist, i.e., poor reception or noisy reception, REFER to appropriate diagnostic procedures. REMOVE radio for service.

TK16933B

NOTE: When performing the following PAC radio test, keep in mind that bass, treble, balance and fade are adjusted using the AUDIO and VOLUME buttons. Volume level is normally displayed by the function bar below the station frequency. Each successive push on the AUDIO button sequentially selects bass, treble, balance , fade and returns to normal (frequency and volume) mode. The selected item is indicated in the display by the word BASS, TREB, BAL or FADE.

After selecting the appropriate mode, push the VOLUME button to adjust to the left (-) or right (+). In fade mode, the LH side represents the front speakers and the RH side represents the rear speakers. The normal volume and frequency mode will return five seconds after the last bass, treble, balance or fade adjustment. For additional control features, refer to Section 15-01.

PINPOINT TEST B: PAC RADIO CONTROL FUNCTIONAL TEST

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	FM STEREO INDICATOR TEST		
	• Tune radio to a known FM stereo station. • **Does stereo indicator come on?**	Yes ▶ No ▶	GO to **B2.** REMOVE radio for service.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: PAC RADIO CONTROL FUNCTIONAL TEST (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
B2	VOLUME CONTROL TEST • Tune radio to a local station. Adjust volume control to the right and verify volume increase. Adjust volume control to the left and verify volume decrease. • **Does volume change properly?**	Yes ▶ No ▶	GO to **B3.** CHECK speaker connection and perform speaker test. REPEAT volume control test. If it is still not OK, REMOVE radio for service. If volume OK, GO to **B3.**
B3	TONE CONTROL TEST • Adjust bass control to right and verify an increase in low frequency content. • Adjust treble control to right and verify an increase in high frequency content. • **Do bass and treble change properly?**	Yes ▶ No ▶	GO to **B4.** REMOVE radio for service.
B4	BALANCE CONTROL TEST • Adjust balance control to right and then to left. • **Does balance change properly?**	Yes ▶ No ▶	GO to **B5.** CHECK speakers and speaker connections. REPEAT balance control test. If balance is still not OK, REMOVE radio for service. If balance OK, GO to **B5.**
B5	FADER CONTROL TEST • Adjust fade control to right and then to left. • **Does fade change properly?**	Yes ▶ No ▶	GO to **B6.** CHECK speakers and speaker connections. REPEAT fader control test. If fader is not OK, REMOVE radio for service. If fader is OK, GO to **B6.**
B6	SEEK TEST • Depress SEEK button. • **Does radio stop on next station?**	No ▶	TURN radio off and then on to determine if seeking stops. If seek does not stop, REMOVE radio for service. If seek does stop, GO to **B7.**
B7	SEEK / SCAN TEST • Tune radio on AM band (should be done outside of any building). Press SCAN button and count the number of listenable stations that can be tuned. Compare to a vehicle with a known good radio system. • **Are number of stations received normal?**	Yes ▶ No ▶	GO to **B8.** PERFORM antenna system check. REFER to Section 15-02. REPEAT SEEK / SCAN test. If still not receiving normal number of stations, REMOVE radio for service. If normal number of stations received, GO to **B8.**
B8	DISPLAY TEST • Tune radio to 1000 AM. • **Is display correct and AM displayed?**	Yes ▶ No ▶	GO to **B9.** REMOVE radio for service.
B9	DISPLAY TEST (CONTINUED) • Tune radio to 88.9 FM. • **Is display correct and FM displayed?**	Yes ▶ No ▶	GO to **B10.** REMOVE radio for service.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: PAC RADIO CONTROL FUNCTIONAL TEST (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B10	DISPLAY TEST (CONTINUED)		
• Tune radio to FM stereo station. • **Is "ST" indicator on?**		Yes ▶ No ▶	End of PAC radio control test. If other concerns exist, REFER to appropriate diagnostic procedures. REMOVE radio for service.

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PINPOINT TEST C: NOISY AM RECEPTION— ENGINE RUNNING, VEHICLE IN/NOT IN MOTION

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	CHECK ANTENNA CABLE CONNECTIONS		
• Verify condition by operating radio while engine is running, with vehicle in or not in motion. • Check antenna cable connections including extension cable (if so equipped). • **Are connections clean and secure?**		Yes ▶ No ▶	GO to **C2.** CLEAN and/or SECURE antenna cable connections as required.
C2	CHECK ANTENNA MOUNTING		
• Check to make sure antenna is securely mounted to body at ground points. (Manual antenna — mounting screws to fender. Electric antenna — mounting nut above fender; and also, make sure that prongs of grounding collar at fender underside are contacting metal.) • **Are contacts clean and have metal-to-metal contact?**		Yes ▶ No ▶	GO to **C3.** CLEAN and/or SECURE connections as required.
C3	CHECK SUPPRESSION EQUIPMENT		
• Check for presence of all required suppression equipment, body grounding strap and hood bonding strap (if so equipped) for security, cleanliness and metal-to-metal connection. • **Are connections OK?**		Yes ▶ No ▶	GO to **C4.** REPLACE missing equipment and/or CLEAN connections as required.
C4	CHECK MOUNTING AND CONNECTING WIRES OF FOLLOWING COMPONENTS		
• Check the mounting and connecting wires of the generator's voltage regulator capacitor (if so equipped) and ignition coil capacitor for secureness, cleanliness and metal-to-metal contact. (Refer to Group 14). • **Are connections OK?** NOTE: The capacitor mounting points are used to complete the electrical circuit and must be mounted securely to clean surfaces.		Yes ▶ No ▶	GO to **C5.** CLEAN and/or SECURE connections as required.
C5	CHECK OPERATION OF THE FOLLOWING COMPONENTS		
• Check the operation of the generator's regulator capacitor and voltage regulator capacitor by replacing with known good components. • Check generator by disconnecting wiring harness from voltage regulator. • Verify radio reception. • **Is noise eliminated?**		Yes ▶ No ▶	GO to **C6.** SERVICE or REPLACE damaged components as required.
C6	CHECK SPARK PLUG WIRES		
• Check spark plug wires for proper routing, grounding and secureness of connections. • **Are wires OK?**		Yes ▶ No ▶	GO to **C7.** REROUTE or REPLACE spark plug wires or SECURE connections as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: NOISY AM RECEPTION— ENGINE RUNNING, VEHICLE IN/NOT IN MOTION (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
C7	CHECK IGNITION SYSTEM • Check ignition system for proper operation. (Use EEC-IV Intermittent Ignition Analyzer (007-00035) or equivalent or check for open circuit spark plug wires using ohmmeter.) Also, check spark plugs for cracked insulators. • **Is ignition system OK?**	Yes ▶ No ▶	GO to C8. SERVICE or REPLACE components as required.
C8	CHECK CHASSIS MOUNTING POINTS • Check all radio chassis mounting points for secureness, cleanliness and metal-to-metal contact. • **Are mounting points OK?**	Yes ▶ No ▶	GO to C9. CLEAN and/or SECURE as required.
C9	SUBSTITUTE ANTENNA • Substitute a known good speaker and antenna being sure to ground antenna base to an unpainted metal surface. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPLACE or SERVICE speaker or antenna. GO to C10.
C10	SUBSTITUTE ANTENNA EXTENSION CABLE • Substitute a known good antenna cable. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPLACE antenna extension cable. GO to C11.
C11	SUBSTITUTE RADIO • Substitute known good radio. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	Have radio unit serviced at an authorized service center. GO to C12.
C12	CHECK AMPLIFIER • Substitute a known good amplifier (PAC system only). • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	Have amplifier serviced at an authorized service center. GO to C13.
C13	REPOSITION THE FOLLOWING COMPONENTS • Check if noise can be eliminated by repositioning antenna, speaker or radio power feed wires away from other wires and/or brackets. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPOSITION permanently by taping. GROUND various parts of the vehicle to the frame using a jumper cable. For example, engine, fenders, quarter panels, stone deflectors, air cleaner, body sheet metal. When noise is eliminated, provide a permanent ground where required.

TK6031E

PINPOINT TEST D: NOISY FM RECEPTION— ENGINE RUNNING, VEHICLE NOT IN MOTION

	TEST STEP	RESULT ▶	ACTION TO TAKE
D1	DETERMINE IF CONCERN IS WITH FM RECEPTION LIMITATION • Verify condition by operating radio with engine running and vehicle not in motion. • If noise is on FM stereo, determine if customer concern is due to FM stereo reception limitation. Refer to normal operation description. • **Is reception normal?**	Yes ▶ No ▶	EXPLAIN and DEMONSTRATE to customer. INFORM customer of methods for obtaining best reception. GO to D2.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: NOISY FM RECEPTION— ENGINE RUNNING, VEHICLE NOT IN MOTION (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
D2	CHECK ANTENNA CABLE CONNECTIONS		
	• Check antenna cable connections. • **Are connections clean and tight?**	Yes ▶ No ▶	GO to **D3.** CLEAN and / or SECURE as required.
D3	CHECK ANTENNA MOUNTING		
	• Check to make sure antenna is securely mounted to body and base screws are tight. • **Are mounting points tight?**	Yes ▶ No ▶	GO to **D4.** CLEAN and / or SECURE as required.
D4	CHECK SPARK PLUG WIRES ROUTING		
	• Check spark plug wires for proper routing and secureness of connections. • **Are wires OK?**	Yes ▶ No ▶	GO to **D5.** REROUTE and / or SECURE connections as required.
D5	CHECK TYPE OF SPARK PLUG / WIRES		
	• Check if wires are suppressor type and if spark plugs are the correct type. • **Are wires and plugs correct?**	Yes ▶ No ▶	GO to **D6.** REPLACE spark plug or wires with the correct type.
D6	CHECK IGNITION SYSTEM		
	• Check ignition system for proper operation. (Use EEC-IV Intermittent Ignition Analyzer (007-00035) or check for open circuit spark plug wires using ohmmeter.) Also, check spark plugs for cracked insulators. • **Is ignition system OK?**	Yes ▶ No ▶	GO to **D7.** SERVICE or REPLACE components as required.
D7	CHECK CHASSIS MOUNTING		
	• Check all radio chassis mounting points for secureness, cleanliness and metal-to-metal contact. • **Are radio mounting points OK?**	Yes ▶ No ▶	GO to **D8.** CLEAN and / or SECURE as required.
D8	SUBSTITUTE ANTENNA		
	• Substitute a known good antenna being sure to ground antenna base to an unpainted metal surface. NOTE: All surfaces used for grounding must be clean to ensure good electrical contact. Remove any dirt, rust, grease, paint, etc. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPLACE antenna. GO to **D9.**
D9	SUBSTITUTE ANTENNA CABLE		
	• Substitute a known good antenna cable. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPLACE antenna extension cable. GO to **D10.**
D10	CHECK GENERATOR		
	• Check generator by disconnecting wiring from voltage regulator. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	CHECK generator. REFER to Section 14-02. SERVICE or REPLACE as required. GO to **D11.**
D11	SUBSTITUTE RADIO		
	• Substitute a known good radio. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	Have radio serviced at an authorized service center. GO to **D12.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: NOISY FM RECEPTION— ENGINE RUNNING, VEHICLE NOT IN MOTION (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
D12	CHECK AMPLIFIER		
	• Substitute a known good amplifier. (PAC system only). • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	Have amplifier serviced at an authorized service center. GO to D13.
D13	REPOSITION THE FOLLOWING COMPONENTS		
	• Check if noise can be eliminated by repositioning antenna, speaker or radio power feed wires away from other wires and / or brackets. NOTE: All surfaces used for grounding must be clean to ensure good electrical contact. Remove any dirt, rust, grease, paint, etc. • Verify operation of radio. • **Is noise eliminated?**	Yes ▶ No ▶	REPOSITION permanently by taping. GROUND various parts of the vehicle to the frame using a jumper cable for example, engine, fenders, quarter panels, stone deflectors, air cleaner, body sheet metal. When noise is eliminated, provide permanent ground where required.

TK16916B

PINPOINT TEST E: RADIO IS INOPERATIVE OR INTERMITTENT

TEST STEP		RESULT ▶	ACTION TO TAKE
E1	CHECK RADIO OPERATION		
	• Check operation of radio to determine if radio is inoperative or intermittent.	Radio inoperative ▶ Radio intermittent ▶	GO to E2. GO to E4.
E2	CHECK FUSE		
	• Check fuse to see if it is blown. • **Is fuse OK?**	Yes ▶ No ▶	GO to E4. TURN OFF ignition switch. REPLACE fuse. Turn ignition switch ON. RECHECK fuse. If fuse is bad, GO to E3. If fuse is still OK, OPERATE radio, tape player and compact disc (if so equipped). If fuse fails, have radio serviced at an authorized service center. If fuse is still good, OPERATE other systems supplied by radio fuse. REFER to Section 18-01 for fuse listing. If fuse fails, SERVICE system identified to cause fuse failure using appropriate diagnostic chart. If fuse OK, radio system OK. NOTE: For a repeated customer complaint perform the above test while driving on rough road conditions to isolate the system exhibiting an intermittent short circuit condition.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: RADIO IS INOPERATIVE OR INTERMITTENT (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
E3	DETERMINE LOCATION OF GROUNDED POWER FEED		
	• Turn ignition switch to OFF position. • Determine location of grounded power feed to radio (common circuit to premium sound control, CB radio and power antenna, if so equipped).	Grounded power feed found ▶	SERVICE or REPLACE as required.
E4	CHECK POWER FEED		
	• Check power feed for proper connections. • **Are connections OK?**	Yes ▶ No ▶	GO to **E5.** CONNECT power feed properly.
E5	CHECK CONTINUITY PLUG		
	• Check to be sure that the continuity plug is present. It should be inserted at the top RH side of the connector block at the rear of the radio chassis. • Press in firmly on the plug, making sure it is fully seated. Check for proper audio operation. • **Is the continuity plug present?**	Yes ▶ No ▶	GO to **E6.** REPLACE continuity plug.
E6	CHECK FOR POWER TO RADIO		
	• Check for power to radio using a test lamp or a voltmeter. • **Is there power to radio?**	Yes ▶ No ▶	GO to **E7.** SERVICE harness as required.
E7	CHECK SPEAKERS TO SEE IF CONDITION IS PRESENT ON ALL SPEAKERS		
	• With radio operating, check if condition is present on all speakers. • **Is condition present at all speakers?**	Yes ▶ No ▶	GO to **E8.** GO to **E9.**
E8	CHECK ANTENNA SYSTEM		
	• Check antenna system. Refer to Section 15-02. • **Is antenna system OK?**	Yes ▶ No ▶	GO to **E8.** CONNECT, SERVICE or REPLACE antenna components as required.
E9	CHECK RADIO CHASSIS		
	• Check radio chassis. • Connect a known good speaker directly to radio chassis. • Verify operation of radio. • **Is radio OK?**	Yes ▶ No ▶	REPLACE speaker or CONNECT, SERVICE or REPLACE speaker wiring as required. NOTE: Use premium sound diagnostic chart to service if vehicle is so equipped. Have radio chassis serviced at authorized service center.

TK19303A

PINPOINT TEST F
RADIO HAS WEAK RECEPTION

TEST STEP		RESULT ▶	ACTION TO TAKE
F1	EXTEND POWER ANTENNA		
	• Extend power antenna (if so equipped) and position vehicle in an open area away from steel buildings. • Check radio reception. • **Is reception OK?**	Yes ▶ No ▶	EXPLAIN to customer limitations of radio. GO to **F2.**
F2	CHECK ANTENNA CONNECTIONS		
	• Check antenna connections. • **Are connections OK?**	Yes ▶ No ▶	GO to **F3.** CLEAN and / or TIGHTEN antenna connections as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F
RADIO HAS WEAK RECEPTION (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
F3	CHECK ANTENNA SYSTEM		
	• Check antenna system using appropriate diagnostic procedure. Refer to Section 15-02. • **Is antenna system OK?**	Yes ▶ No ▶	GO to F4. SERVICE antenna as required.
F4	CHECK RECEPTION OF RADIO ON AM AND FM		
	• Check for poor reception on both AM and FM.	Reception weak on AM only ▶ Reception weak on FM or both AM/FM ▶	VERIFY radio reception. If reception is OK, RETURN radio to service. If reception is still weak, have radio chassis serviced at an authorized service center. Have radio serviced at authorized service center.

TK16934B

PINPOINT TEST G: PREMIUM ANALOG CASSETTE (PAC) SOUND SYSTEM—NO RADIO SOUND FROM ANY SPEAKERS (RADIO TURNED ON)

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	CHECK OPERATION OF RADIO		
	• Turn ignition to ACC or RUN and radio to ON. • Observe radio for digital display. • **Is radio display lit?**	Yes ▶ No ▶	GO to G2. REFER to Pinpoint Test E.
G2	CHECK AMPLIFIER CONTROL CIRCUITS		
	• **Check power and control to amplifier as follows:** • Ensure all harnesses are connected. • Turn ignition to ACC and radio to ON. • Check for battery voltage at the amplifier yellow wire and at orange, light blue striped wire. • Check for ground at the amplifier on the red wire. • Check shorting plug (PACs used without a CD player must have a fully seated plug). • **Is amplifier control circuit OK?**	Yes ▶ No ▶	GO to G3. Vehicle wiring or speaker is damaged. Follow procedure for diagnosing and servicing of damage.
G3	CHECK FOR SHORT TO GROUND AT SPEAKER(S)		
	• Check for short to ground at one or more speakers, which can cause amplifier to shut down. • **Are any shorts found?**	Yes ▶ No ▶	CHECK terminals at connector for solder bridge, stray wire strands, bent terminals, or pinched shorted speaker wire. SERVICE or REPLACE as necessary. REPLACE EPC Sound Amplifier.

TK19304A

PINPOINT TEST H: ELECTRONIC SEARCH RADIO (ESR) SOUND SYSTEM—NO RADIO SOUND FROM ANY SPEAKERS (RADIO TURNED ON)

TEST STEP		RESULT ▶	ACTION TO TAKE
H1	CHECK OPERATION OF RADIO		
	• Turn ignition to ACC or RUN and radio to ON. • Observe radio for digital display. • **Is radio display lit?**	Yes ▶ No ▶	GO to H2. REFER to Pinpoint Test E.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST H: ELECTRONIC SEARCH RADIO (ESR) SOUND SYSTEM—NO RADIO SOUND FROM ANY SPEAKERS (RADIO TURNED ON) (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
H2	CHECK AMPLIFIER CONTROL CIRCUITS		
	• **Check power and control to amplifier as follows:** — Ensure all harnesses are connected. — Turn ignition to ACC and radio to ON. — Check for battery voltage at the amplifier yellow wire and at orange / light blue striped wire. — Check for ground at the amplifier on the red wire. • **Is amplifier control circuit OK?**	Yes ▶ No ▶	GO to H3. SERVICE wiring as required.
H3	CHECK FOR SHORT TO GROUND AT SPEAKER(S)		
	• Check for short to ground at one or more speakers, which can cause amplifier to shut down. • **Are any shorts found?**	Yes ▶ No ▶	CHECK terminals at connector for solder bridge, stray wire strands, bent terminals, or pinched shorted speaker wire. SERVICE or REPLACE as necessary. REPLACE Premium Sound Amplifier.

TK10003E

PINPOINT TEST I: PAC AND ESR SOUND SYSTEMS—NO SOUND FROM ONE OR MORE SPEAKERS

TEST STEP		RESULT ▶	ACTION TO TAKE
I1	VERIFY CONDITION AT EACH SPEAKER		
	• Check for sound at each speaker. • **Are all speakers out?**	Yes ▶ No ▶	GO to I2. GO to I3.
I2	CHECK FOR POWER TO AMPLIFIER		
	• **Check power and control circuits to amplifier as follows:** — Connect all connectors of radio and sound system. — Turn ignition to ACC and radio to ON. — Check for battery voltage at the amplifier on yellow wire and orange / light blue striped wire. • **Is amplifier power circuit OK?**	Yes ▶ No ▶	REFER to PAC Sound System Procedure or ESR Sound System Procedure (depending on PAC or ESR equipped vehicles). SERVICE wiring as required.
I3	CHECK CONTINUITY OF INOPERATIVE SPEAKER(S)		
	• Disconnect amplifier from radio and speakers. • Check continuity of inoperative speaker wiring harness from amplifier. • **Is there continuity?**	Yes ▶ No ▶	GO to I4. CHECK for broken wires or connector pins. SERVICE or REPLACE control assembly as necessary.
I4	CHECK FOR SHORT AT SPEAKER		
	• Check for short between inoperative speaker wires at the speaker connector. • **Are any shorts found?**	Yes ▶ No ▶	CHECK terminals at connector for solder bridge, stray wire strands, or bent terminals. SERVICE or REPLACE as necessary. GO to I6.
I5	CHECK CONNECTOR AT AMPLIFIER		
	• Check amplifier wiring for damage. • Check connector at amplifier for broken pins or wires or for shorts caused by stray wire strands between pins. • **Is amplifier connector OK?**	Yes ▶ No ▶	Amplifier is damaged. SEND to authorized service station for service. SERVICE open or shorted circuits as required.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST I: PAC AND ESR SOUND SYSTEMS—NO SOUND FROM ONE OR MORE SPEAKERS (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
I6	CHECK RADIO-TO-AMPLIFIER HARNESS		
	• Check radio-to-amplifier wiring harness for damage and connectors for broken terminal pins, solder bridge or stray wire strands. • **Is harness OK?**	Yes ▶ No ▶	GO to I7. SERVICE harness as necessary.
I7	CHECK WIRING AND CONNECTORS ON AMPLIFIER		
	• Check wiring on amplifier for damage. • Check connectors on amplifier for broken pins., solder bridge or shorts caused by stray wire strands. • **Are connectors and wiring OK?**	Yes ▶ No ▶	Amplifier is damaged. RETURN to authorized service station for service. SERVICE open or shorted circuits as necessary.

TK10004E

PINPOINT TEST J: PAC AND ESR SOUND SYSTEMS—DISTORTED SOUND FROM ONE OR MORE SPEAKERS

TEST STEP		RESULT ▶	ACTION TO TAKE
J1	CHECK FOR:		
	• Loose trim panels, grilles, or attachments which might cause rattles in the area of the speaker which is considered distorted. • Pinched or broken wires at or near the radio. • Pinched or broken wires elsewhere in the vehicle wiring to the speaker. • **Are wires and attachments OK?** NOTE: In PAC installations neither wire to the speaker can be grounded. Grounding of either wire will cause distortion.	Yes ▶ No ▶	GO to J2. SERVICE and / or REPLACE as necessary.
J2	CONNECT A TEST SPEAKER		
	• Connect a test speaker to the wiring for the distorted speaker. • **Is sound OK?**	Yes ▶ No ▶	Speaker is damaged. REPLACE speaker. REFER to Test Step I4.

TK10006E

PINPOINT TEST K: COMPACT DISC PLAYER IS INOPERATIVE OR INTERMITTENT

TEST STEP		RESULT ▶	ACTION TO TAKE
K1	VERIFY CD PLAYER IS INOPERATIVE OR HAS INTERMITTENT OPERATION		
K2	CHECK CD PLAYER OPERATION		
	• Determine if CD player is inoperative or intermittent.	CD player inoperative ▶ CD player intermittent ▶	GO to K3. GO to K4.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST K: COMPACT DISC PLAYER IS INOPERATIVE OR INTERMITTENT (Continued)

TEST STEP		RESULT	ACTION TO TAKE
K3	CHECK FUSE		
	• Check fuse to see if it is blown. • **Is fuse blown?**	Yes ▶	TURN OFF ignition switch, radio, premium sound system, and CB radio (if so equipped). REPLACE fuse. TURN ignition switch on. RECHECK fuse. If fuse is bad, GO to **K5.** If fuse is still OK, OPERATE radio and tape player (if so equipped). If fuse fails, have radio serviced at authorized service center. If fuse still good, OPERATE power antenna, premium sound, and CB radio (if so equipped). If fuse fails, SERVICE system identified to cause fuse failure using appropriate diagnostic chart. If fuse OK, radio system OK. NOTE: For a repeated customer complaint, perform the above test while driving on rough road conditions to isolate the system exhibiting an intermittent short circuit condition.
		No ▶	GO to **K4.**
K4	CHECK POWER FEED		
	• Check power feed for proper connections. • **Are connections OK?**	Yes ▶	GO to **K6.**
		No ▶	CONNECT power feed properly.
K5	DETERMINE LOCATION OF GROUNDED POWER FEED		
	• Turn ignition switch to OFF position. • Determine location of grounded power feed to CD player (common circuit to premium sound control, CB radio, and power antenna, if so equipped).	Grounded power feed found ▶	SERVICE or REPLACE as required.
K6	CHECK FOR POWER TO CD PLAYER		
	• Check for power to CD player using a test lamp or a voltmeter. • **Is there power?**	Yes ▶	GO to **K7.**
		No ▶	SERVICE harness as required.
K7	CHECK SPEAKERS TO SEE IF CONDITION PRESENT ON ALL SPEAKERS		
	• With CD player operating, check if condition is present on all speakers. • **Is condition present at all speakers?**	Yes ▶	Have CD player chassis serviced at authorized service center.
		No ▶	GO to **K8.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST K: COMPACT DISC PLAYER IS INOPERATIVE OR INTERMITTENT (Continued)

TEST STEP		RESULT	ACTION TO TAKE
K8	CHECK CD PLAYER CHASSIS		
	• Check CD player chassis. • Connect a known good speaker directly to CD player chassis. • Verify operation of CD player. • **Does CD player operate properly?**	Yes ▶	REPLACE speaker or connect, SERVICE or REPLACE speaker wiring as required. NOTE: Use premium sound diagnostic chart to service if vehicle is so equipped.
		No ▶	Have CD player chassis serviced by authorized service center.

TK19305A

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00035	EEC-IV Intermittent Ignition Analyzer

SECTION 15-01 Radio and Tape Chassis

VEHICLE APPLICATION

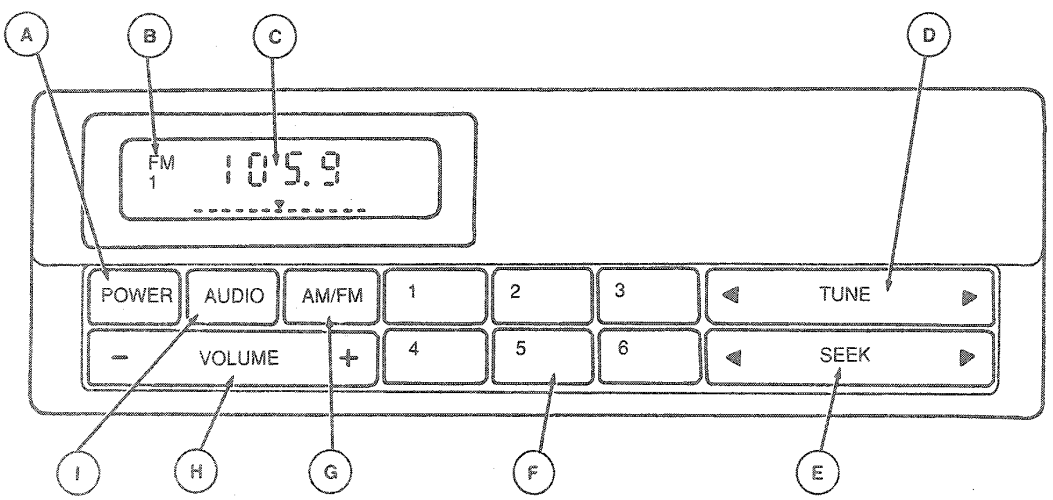
Taurus / Sable.

DESCRIPTION AND OPERATION

The premium low level sound system is available on Sable vehicles only. It consists of two premium front door speakers and two premium rear speakers. Separate signal return wiring to each speaker is used. The amplifier is in operation and is part of the circuit at all times.

Control Functions

Electronic Stereo Radio (ESR)



K16902-A

The following is a description of the various controls:

DESCRIPTION AND OPERATION (Continued)

A. **POWER:** Push to turn ON, push again to turn OFF.

B. **BAND INDICATOR:** Indicates if band is in AM, FM1 or FM2 setting.

C. **STATION INDICATOR:** Indicates radio station frequency in radio mode.

D. **TUNE:** This button is used to change the frequency up or down one increment at a time by pressing the right (>) or left (<) side of button. To change frequencies quickly, press and hold either right or left side of button.

E. **SEEK:** Push right (>) side of SEEK button to tune radio to the next higher frequency station. Push left (<) side of SEEK button to tune radio down to next lower frequency station.

F. **MEMORY BUTTONS:** The six memory buttons are used to store preferred broadcast stations in radio memory. To store a station, tune to desired station, push memory button in and hold for approximately two seconds until station sound returns, then release button. Repeat process for each memory button. Once a station is stored in memory, pushing a memory button for less than two seconds will cause radio to turn to stored station. All six memory buttons will store a station on AM, FM1 or FM2 for a total of 18 storable radio stations.

G. **AM/FM:** Each successive push, when in radio mode, will select AM, FM1 or FM2 as indicated by band indicator in display window.

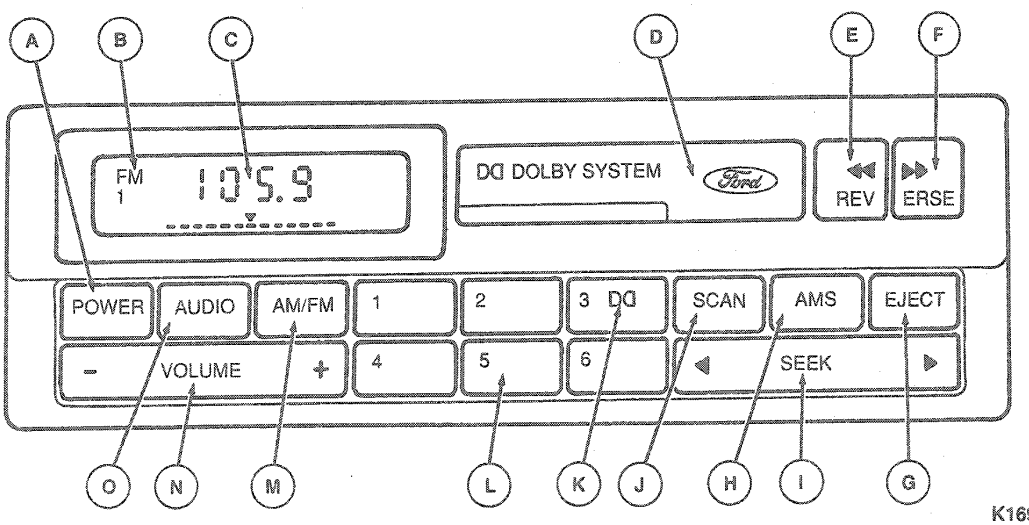
H. **VOLUME:** Push right (+) side of VOLUME button to increase volume. Push left (-) side to decrease volume. If VOLUME button is held to the right or left, the volume will continuously increase or decrease (bars in display will show relative volume) until button is released.

NOTE: If the VOLUME button is set above a preset listening level when ignition switch is turned off, when ignition switch is turned back on, the volume will return to a nominal listening level. However, if radio power is turned off with the POWER button before ignition is turned off, volume will return to the position it was set at previously, when radio power is switched back on.

I. **AUDIO:** The AUDIO button is used to adjust bass, treble, speaker balance and fade. Illuminated bars in display will show relative positions.

- **Bass:** Push AUDIO button repeatedly until BASS is displayed. Push the right (+) side of VOLUME button to increase low frequency sound or left (-) side to decrease low frequency sounds.
- **Treble:** Push AUDIO button repeatedly until TREB is displayed. Push the right (+) side of VOLUME button to increase high frequency sound or left (-) side to decrease high frequency sounds.
- **Speaker Balance:** Push AUDIO button repeatedly until BAL is displayed. Push the right (+) side of VOLUME button to shift sound to right speakers or left (-) side to shift sound to left speakers.
- **Speaker Fade:** Push AUDIO button repeatedly until FADE is displayed. Push the right (+) side of VOLUME button to shift sound to rear speakers or left (-) side to shift sound to front speakers.

Electronic Stereo Cassette (ESC)



DESCRIPTION AND OPERATION (Continued)

The following explains various features of controls:

A. **POWER:** Push to turn ON, push again to turn OFF.

B. **BAND INDICATOR:** Indicates if band is in AM, FM1 or FM2 setting.

C. **STATION INDICATOR:** Indicates radio station frequency in radio mode. When a tape is played, arrows indicate direction of tape removal.

D. **TAPE OPENING:** When tape is inserted (with open edge to the right) and radio power is ON, tape begins to play.

E. **REVERSE:** Push the left (<) side of REVERSE button to rewind a tape playing forward. To return tape play, push right (>) side of REVERSE button momentarily. Pushing both sides of REVERSE button simultaneously will reverse tape to opposite side (track).

F. **REVERSE:** Push the right (>) side of REVERSE button to fast forward a tape playing forward. To return tape play, push left (<) side of REVERSE button momentarily. Pushing both sides of REVERSE button simultaneously will reverse tape to opposite side (track).

G. **EJECT:** Press the EJECT button to stop the tape and eject cassette. The radio will resume playing if power is on.

H. **AMS:** The automatic music search (AMS) button is used to change frequency up or down one increment at a time in radio mode. After pushing the AMS button, push and release either the right (>) or left (<) side of SEEK button. To change frequencies quickly, press and hold down either right or left side of SEEK button. In tape mode, use AMS button to change tape to next selection. First push and hold AMS button, then push either left or right side of REWIND button to find beginning of next tape selection.

I. **SEEK:** Push right (>) side of SEEK button to tune radio to the next higher frequency station. Push left (<) side of SEEK button to tune radio down to next lower frequency station.

J. **SCAN:** Press SCAN button to enter scan mode. The radio will begin to scan up to the next radio station for a five second sampling.
To stop scan mode on presently sampled radio station, press the SCAN button a second time.

K. **DOLBY:** Push No. 3 memory button to select Dolby® Noise Reduction in tape mode.

L. **MEMORY BUTTONS:** The six memory buttons are used to store preferred broadcast stations in radio memory. To store a station, tune to desired station, push memory button in and hold for approximately two seconds until station sound returns, then release button. Repeat process for each memory button. Once a station is stored in memory, pushing a memory button for less than two seconds will cause radio to turn to stored station. All six memory buttons will store a station on AM, FM1 or FM2 for a total of 18 storable radio stations.

M. **AM/FM:** Each successive push, when in radio mode, will select AM, FM1 or FM2 as indicated by band indicator in display window.

N. **VOLUME:** Push right (+) side of VOLUME button to increase volume, push left (-) side to decrease volume. If VOLUME button is held to the right or left, the volume will continuously increase or decrease (bars in display will show relative volume) until button is released.

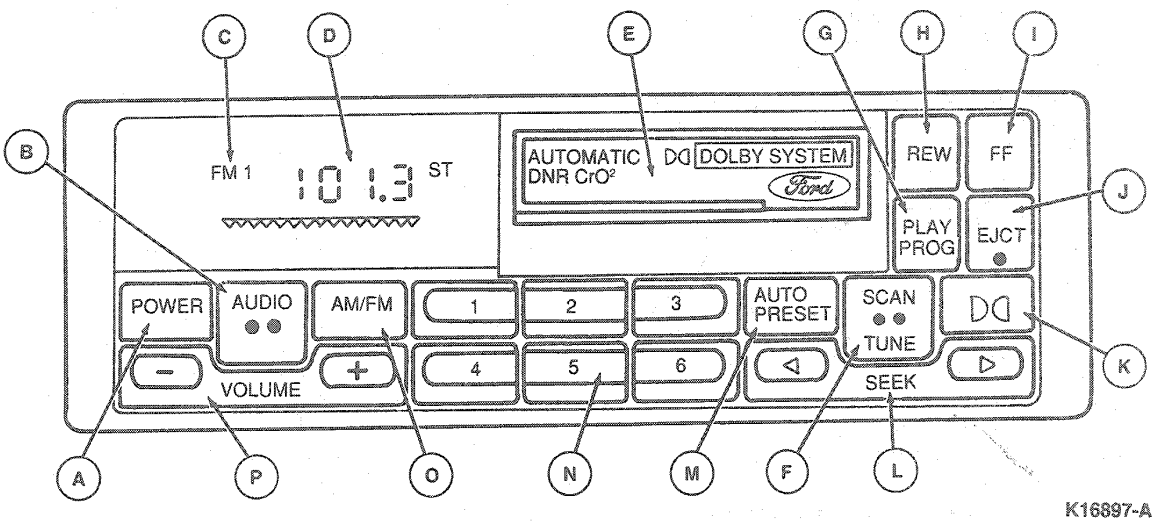
NOTE: If the VOLUME button is set above a preset listening level when ignition switch is turned off, when ignition switch is turned back on, the volume will return to a nominal listening level. However, if radio power is turned off with the POWER button before ignition is turned off, volume will return to the position it was set at previously, when radio power is switched back on.

O. **AUDIO:** The AUDIO button is used to adjust bass, treble, speaker balance and fade. Illuminated bars in display will show relative positions.

- **Bass:** Push AUDIO button repeatedly until BASS is displayed. Push the right (+) side of VOLUME button to increase low frequency sound or left (-) side to decrease low frequency sounds.
- **Treble:** Push AUDIO button repeatedly until TREB is displayed. Push the right (+) side of VOLUME button to increase high frequency sound or left (-) side to decrease high frequency sounds.
- **Speaker Balance:** Push AUDIO button repeatedly until BAL is displayed. Push the right (+) side of VOLUME button to shift sound to right speakers or left (-) side to shift sound to left speakers.
- **Speaker Fade:** Push AUDIO button repeatedly until FADE is displayed. Push the right (+) side of VOLUME button to shift sound to rear speakers or left (-) side to shift sound to front speakers.

DESCRIPTION AND OPERATION (Continued)

Premium Analog Cassette Radio (PAC)



The features described are identical on all PAC radios.

A. **POWER:** Push to turn radio ON, push again to turn OFF.

B. **AUDIO:** The audio button is used to adjust bass, treble, speaker balance and fade. Illuminated bars in display will show relative positions.

- **BASS:** Push AUDIO button repeatedly until BASS is displayed. Push the right (+) side of VOLUME button to increase low frequency sounds or left (-) side to decrease low frequency sounds.
- **TREBLE:** Push AUDIO button repeatedly until TREB is displayed. Push the right (+) side of VOLUME button to increase high-frequency sounds or left (-) side to decrease high-frequency sounds.
- **SPEAKER BALANCE:** Push AUDIO button repeatedly until BAL is displayed. Push the right (+) side of VOLUME button to shift sound to right speakers or left (-) side to shift sound to left speakers.
- **SPEAKER FADE:** Push AUDIO button repeatedly until FADE is displayed. Push the right (+) side of VOLUME button to shift sound to rear speakers or left (-) side to shift sound to front speakers.

C. **BAND INDICATOR:** Indicates if band is in AM, FM1 or FM2 setting.

D. **STATION INDICATOR:** Indicates radio station frequency in radio mode. When tape is played, whirling sprockets indicate direction of tape travel.

E. **TAPE OPENING:** Cassette tape player is equipped with power loading. When tape is inserted (with open edge to the right) the loading mechanism draws the tape in the rest of the way and begins to play.

F. **SCAN TUNE:** Press SCAN TUNE button to enter scan mode (display will blink SCN). Pushing the right (>) side of SEEK button will begin forward scan mode up to the next radio station for a five second sampling, or a five second sampling of the next tape selection on tape currently playing. Pushing left (<) side of SEEK button will begin reverse scan mode to previous radio station for a five second sampling or a five second sampling of previous tape selection on tape currently playing. To stop scan mode on presently sampled radio station, press the side of SEEK button which matches the direction the radio is currently scanning or re-press SCAN TUNE button. To stop scan mode on presently sampled tape selection, press the side of SEEK button which matches the direction tape is currently scanning. To change radio stations up or down by one increment, push SCAN TUNE button twice (display reads TUNE), then within five seconds press and release either right (>) or left (<) side of SEEK button. To change stations quickly, press and hold either the right or left side of SEEK button.

G. **PLAY PROGRAM:** Push and hold PLAY PROG button for 1 second to stop the tape player and resume radio play. The cassette will be stored in the tape player and the symbol will display until PLAY PROG button is pushed to resume tape play.

DESCRIPTION AND OPERATION (Continued)

H. **REVERSE:** Push REV button to rewind tape. The radio will automatically begin playing until rewind is manually stopped by pushing PLAY PROG button or tape is completely rewound.

I. **FAST FORWARD:** Push the FF button to forward tape. The radio will automatically begin playing until fast forward is manually stopped by pushing PLAY PROG button or tape reaches end.

J. **EJECT:** Press EJCT button to stop tape and eject cassette. The radio will resume playing if power is ON. The tape cartridge can be ejected whether radio power or ignition is on or off.

K. **DOLBY:** Push to select Dolby® noise reduction in tape mode or Dynamic Noise Reduction® in radio mode. A second push will turn off active Noise Reduction System and lighted symbol from display. The audio system is designed to automatically activate Dynamic Noise Reduction® when under a weak FM signal and will automatically deactivate when it is not needed for signal strength.

L. **SEEK:** Push right (>) side of SEEK button to tune radio to the next higher frequency station or to beginning of next tape selection on tape currently playing. Push left (<) side of SEEK button to tune radio down to next lower frequency station or to the beginning of tape selection currently playing.

M. **AUTO PRESET:** Push the AUTO PRESET button for three seconds to use automatic memory store feature. The radio will automatically seek six strong stations and set them sequentially on memory buttons 1 through 6.

N. **MEMORY BUTTONS:** The six memory buttons are used to store preferred broadcast stations in radio memory. To store a station, tune to desired station, push memory button in and hold for approximately two seconds until station sound returns, then release button. Repeat process for each memory button. Once a station is stored in memory, pushing a memory button for less than two seconds will cause radio to turn to stored station. All six memory buttons will store a station on AM, FM1 or FM2 for a total of 18 storable radio stations.

O. **AM/FM:** Each successive push, when in radio mode, will select AM, FM1 or FM2 as indicated by band indicator in display window.

P. **VOLUME:** Push right (+) side of VOLUME button to increase volume. Push left (-) side to decrease volume. If VOLUME button is held to the right or left, the volume will continuously increase or decrease (bars in display will show relative volume) until button is released.

NOTE: If the VOLUME button is set above a preset listening level when ignition switch is turned off, when ignition switch is turned back on, the volume will return to a nominal listening level. However, if radio power is turned off with the POWER button before ignition is turned off, volume will return to the position it was set at previously, at when radio power is switched back on.

Tape Error Messages

The PAC radio is designed to diagnose certain inoperative cassette player conditions. The error codes are as follows:

- Error 0—Communication error between radio controller and tape controller.
- Error 1—Possible tape cartridge jam.
- Error 2—Tape eject or load concern.

Cassette Tape Player

CAUTION: Before turning off radio or the ignition of vehicle, always eject any cassette being played. Leaving the tape mechanism stopped while a tape is engaged can result in damage to the tape, pinch roller or capstan.

Insert the tape cassette, open edge to the right, to play (radio on, ignition in RUN or ACC position). Adjust volume, tone and speaker balance as for radio programs. At the end of the tape, the cassette automatically reverses and plays the other side of the tape. At any time the tape transport mechanism can be changed to play the other side of the tape by pressing the REVERSE button (ESC).

The Dolby® System is a noise reduction system manufactured under license from Dolby Laboratories. Dolby® and the double-D symbol® are trademarks of Dolby Laboratories Licensing Corporation.

Operating Precautions

NOTE: Do not leave a tape cassette engaged in the tape player slot when not in use. Remove it completely to permit the slot door to close and keep out airborne dirt.

When inserting a tape cassette into the tape slot, it should be firmly pushed in and down to ensure that it is properly seated. To play a full tape, insert the cassette so the empty hub of the cassette goes into the slot first.

Take care to protect the open edge of the cassette from damage, dirt, oil and grease. When not in use, store cassettes in their protective cases with hub locks in place. Otherwise, there will be a risk of having the tape loosen on its hubs, which could cause the tape to spill or jam in the player. If a cassette is found with loose tape, ensure it is rewound firmly around the hubs before using it. Never try to open a cassette or try to pull the tape out of it. To avoid tape damage, do not use cassettes that have been soiled by liquid spills.

Cassette Irregularities

Cassette tapes can vary in performance and size, resulting in occasional concerns with certain specific cassettes.

If any one cassette gives continual trouble because of this, it is best to discontinue use.

DESCRIPTION AND OPERATION (Continued)

For best results, use cassette tapes with no more than 90 minutes of playing time. The thinness of the tapes used in C120 and C180 cassettes makes the tape more likely to stretch and break. A stretched tape will result in poor sound quality.

Tape Player Will Not Accept Cartridge, Eats Tape, Plays Too Fast or Too Slow, Etc. (AM and FM Operating Properly)

- Ensure cassette has not come to the end of the tape.
- Check operation of the tape player by using a known good cassette / cartridge.
- If the condition is not corrected by the substitution of a known good cassette / cartridge, the radio chassis must be removed and sent to an authorized service facility for service.

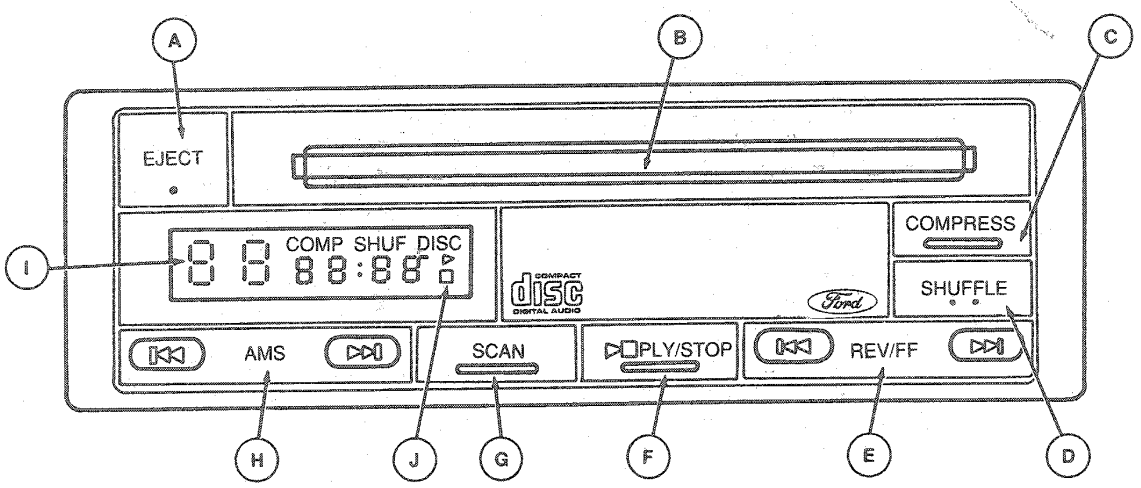
Temperature Extremes

Do not expose tape cassettes to intense sunlight or other temperature extremes. If they do become exposed to high or low temperatures, allow each cassette to reach a moderate temperature before playing. During cold weather, it is advisable to take cassettes indoors overnight to protect them.

In extremely cold weather, the tape player may need a few minutes to warm up before delivering full sound quality.

Compact Disc Player

The following is a description of the various controls.



K18588-A

NOTE: The compact disc player operates when the high level or JBL Audio System is on and a disc is inserted (label-side up). Handle the disc by its edge only.

NOTE: Three inch compact disc singles are not recommended for use with the Ford Compact Disc Player.

NOTE: The CD player has heat protection circuitry to protect the laser diode. If the temperature of the player reaches 80°C (176°F), the heat detection circuit will shut off the player and "H" will appear in the display. When the temperature is within normal operating range the "H" indicator will turn off and the CD player will again be operational.

WARNING: USE OF CONTROLS AND ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD AS THE LASER BEAM USED IN THE COMPACT DISC PLAYER IS HARMFUL TO THE EYES. DO NOT ATTEMPT TO DISASSEMBLE THE CASE. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

Once a disc is inserted, the operation of the disc will override that of the cassette player or radio. The volume, tone and fader controls on the radio are used to control the sound of the compact disc player.

A. **EJECT:** This button ejects the disc and stops the unit. The radio or cassette tape will resume playing.

DESCRIPTION AND OPERATION (Continued)

B. **DISC SLOT:** When inserted, the disc automatically loads into the unit and play starts at the beginning of the first selection. The play indicator illuminates and the number "1" (track) and "0: 00" (elapsed time) are shown on the digital display (I). When the disc reaches the end, the disc player automatically returns to the beginning of the disc and resumes playing.

NOTE: Once a disc is inserted, the disc opening door locks to prevent the accidental insertion of a second disc.

C. **COMPRESS:** Because of the wide dynamic range of the compact disc player, soft passages may be difficult to hear under certain driving conditions while maintaining a reasonable volume level in the louder passages. The compression feature will bring the softer and louder passages closer together for a more consistent listening level. To activate the compression feature, press the COMPRESS button, the compression indicator (COMP) will illuminate in the display.

D. **SHUFFLE:** When this feature is activated, the CD player will randomly select and play music tracks on the inserted disc. The shuffle indicator (SHUF) in the display will be on when shuffle is selected.

E. **REVERSE/FAST FORWARD:** Press fast forward or reverse to quickly search for a particular point in a selection. While either button is pressed, the disc playing goes forward or backward at two different speeds depending on how long the button is pressed. Release the button at the desired point found by observing the elapsed playing time on the display or by monitoring the sound during fast forward or reverse. When the end of the disc has been reached by keeping the fast forward button pressed, the elapsed playing time and track number indicators will flash. The indicator returns to normal display when the reverse button is pressed. A "1" and "0: 00" will appear when the beginning of the disc is reached by pressing the reverse button.

F. **PLAY/STOP:** When a disc is loaded the unit automatically enters the play mode (play indicator illuminates). To stop temporarily, press the PLAY/STOP button. The stop indicator (J) in the display illuminates and operation returns to the radio or tape mode. To resume CD play, press this button once again. If the ignition key is turned OFF during play but is set to RUN or ACCESSORY at any time later, play will resume.

G. **SCAN:** When this feature is activated, the CD player will scan up to next selection and play a five second audition, then advance to next selection unless button is repressed. During scan mode, elapsed time indicators will activate and track number will flash on display.

H. **AMS CONTROL:** To search for a previous or later selection, press the left or right side of the AMS control respectively during either the play or stop mode.

I. **DISPLAY:** The digital display shows the track number, elapsed time, compression on, shuffle, disc in, play and stop indicators.

DIAGNOSIS AND TESTING

Refer to Section 15-00.

WARNING: USE ONLY PROPERLY INSTALLED FCC APPROVED RADIO TRANSMITTING EQUIPMENT. USE OF OTHER TRANSMITTING EQUIPMENT MAY CAUSE THE VEHICLE TO MALFUNCTION OR STALL. IF THE ENGINE STALLS, POWER BRAKE AND POWER STEERING ASSIST WILL STOP. CONSULT YOUR AUTHORIZED DEALER BEFORE INSTALLING ANY RADIO TRANSMITTER.

REMOVAL AND INSTALLATION

Tool Required:

- Radio Removing Tool T87P-19061-A

Radio and Digital Disc Player

Location of radio fuses are shown in Section 18-01.

Removal

1. Disconnect battery ground cable.
2. Install Radio Removal Tool T87P-19061-A into radio and/or compact disc player face plate. Push tools in approximately 25.4mm (1 inch) to release retaining clips.

   CAUTION: Do not use excessive force when installing radio removing tool as this will damage retaining clips, making radio removal difficult and may cause damage.
3. Apply a light spreading force on tools and pull radio and/or compact disc player out of dash.
4. Disconnect wiring connectors and antenna cable.

Installation

1. Connect wiring connectors and antenna cable to radio.
2. Slide radio into instrument panel ensuring that radio and/or compact disc player rear bracket is engaged on upper support rail.
3. Push radio and/or compact disc player inward until retaining clips are fully engaged.
4. Connect battery ground cable. Test radio and/or compact disc player for operation.

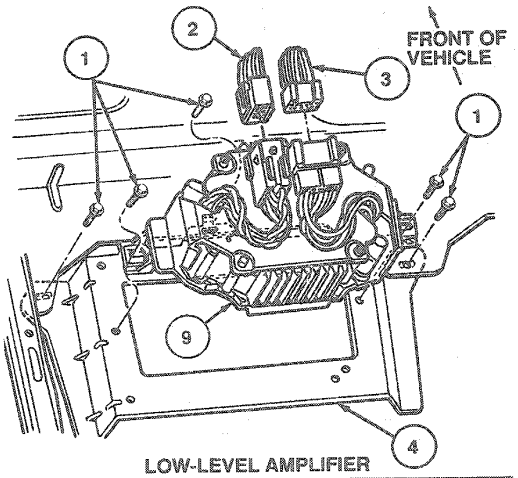
REMOVAL AND INSTALLATION (Continued)

Premium Sound Amplifier (Low and High-Level)

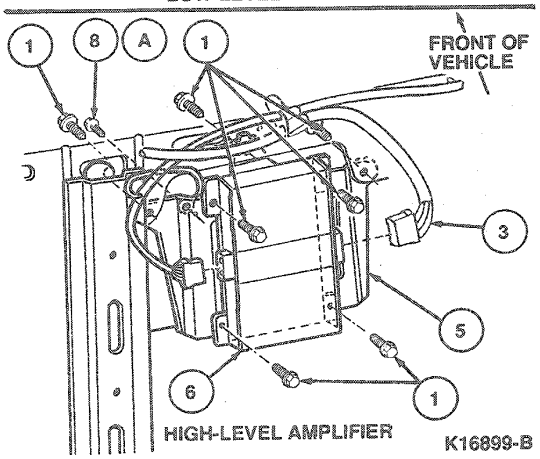
Sedan

Removal and Installation

1. Remove amplifier trim cover.
2. Remove two (low-level amplifier) or four (high-level amplifier) screws retaining amplifier to rear of package tray in luggage compartment.
3. Disconnect electrical connectors and remove amplifier.
4. To install, reverse Removal procedure.



LOW-LEVEL AMPLIFIER



HIGH-LEVEL AMPLIFIER K16899-B

Item	Part Number	Description
1	56910-S36	Screw (5 Req'd, 7 Req'd)
2	19B113	Wiring Assy
3	14405	Wiring Assy
4	18B860	Bracket Assy
5	19B180	Bracket Assy
6	18C807	Amplifier Assy
7	14588	Wiring Assy
8A	N801846-53M6	Screw
9	18B849	Amplifier Assy
A		Tighten to 3.4-4.8 N·m (30.1-42.5 Lb-In)

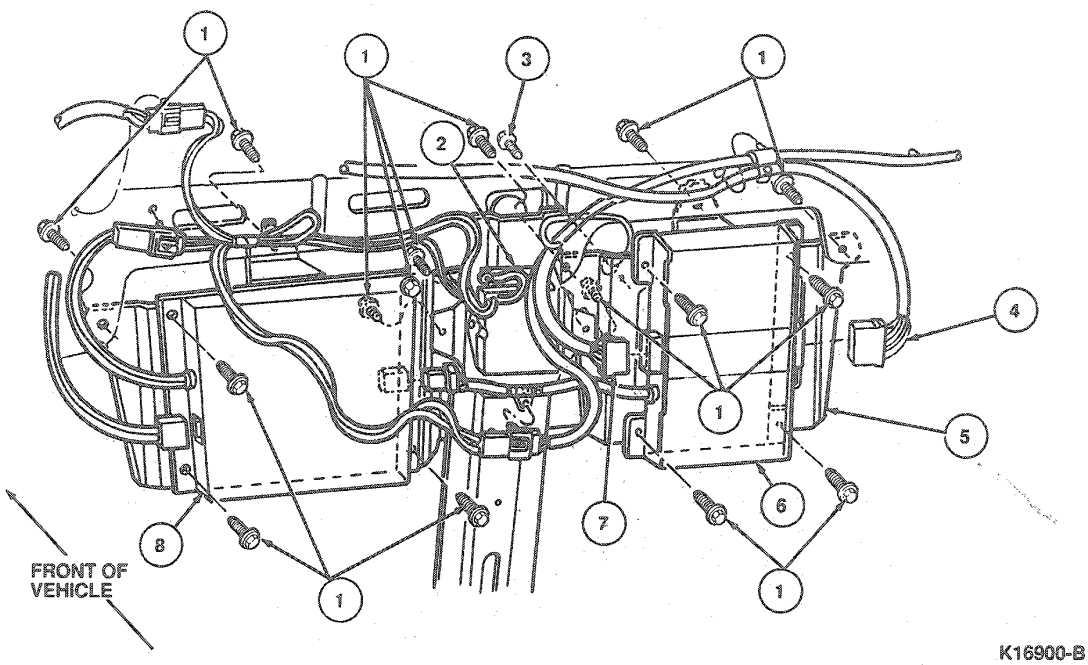
JBL Amplifier

Sedan

Removal and Installation

1. From inside luggage compartment remove amplifier trim cover.
2. Remove four screws retaining each amplifier to rear of package tray in luggage compartment.
3. Disconnect electrical connectors and remove amplifier.
4. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	56910-S36	Screw (16 Req'd)
2	19A087	Choke and Capacitor Assy
3	N801846-S36MG	Screw (1 Req'd)

(Continued)

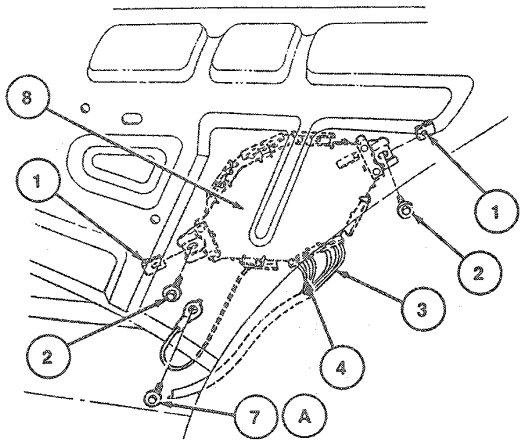
Item	Part Number	Description
4	14405	Wiring Assy
5	19B180	Bracket Assy
6	18C807	Amplifier Assy
7	14588	Wiring Assy
8	18C808	Subwoofer Amplifier Assy

Station Wagon

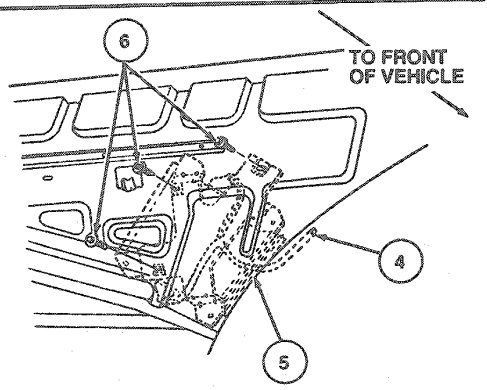
Removal and Installation

1. Remove LH rear quarter trim panel. Refer to Section 01-05.
2. Reach into upper quarter panel area and hold amplifier assembly while removing two (low-level amplifier) or three (high-level amplifier) mounting screws.
3. Disconnect electrical connectors and remove amplifier.
4. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)



LOW-LEVEL AMPLIFIER



HIGH-LEVEL AMPLIFIER K11619-D

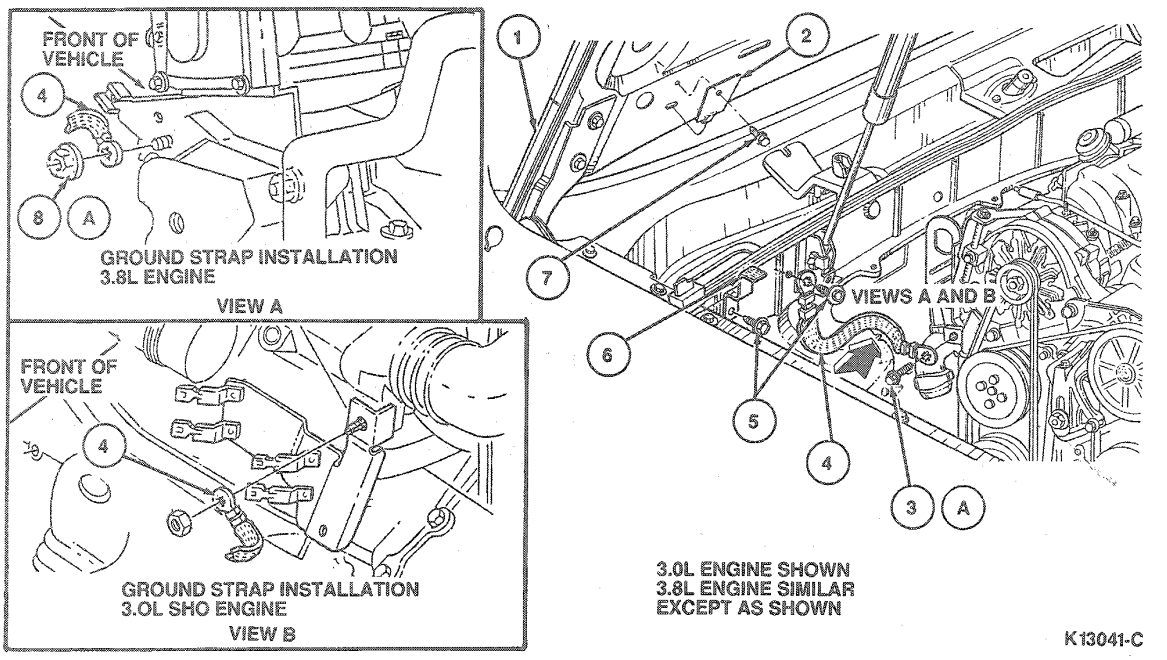
Item	Part Number	Description
1	N802538-S100	Nut (2 Req'd)
2	N802141-S36	Screw (2 Req'd)
3	14405	Wiring Assy
4	19B113	Wiring Assy
5	18T805	Amplifier Assy
6	56910-S36	Screw
7A	N801846-S36MG	Screw
8	18P849	Amplifier Assy
A		Tighten to 3.4-4.8 N·m (30.1-42.5 Lb-In)

Radio Interference Suppression

The following illustrations show the radio interference suppression equipment installations.

REMOVAL AND INSTALLATION (Continued)

Engine and Hood Ground Strap



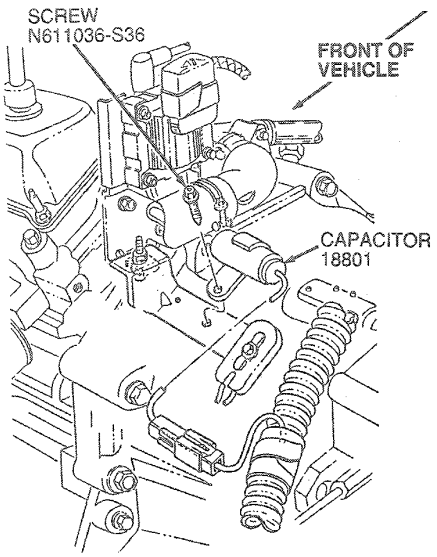
Item	Part Number	Description
1	—	Hood
2	19B136	Suppression Bracket Choke
3A	N605799-S36	Bolt
4	19A095	Ground Strap

(Continued)

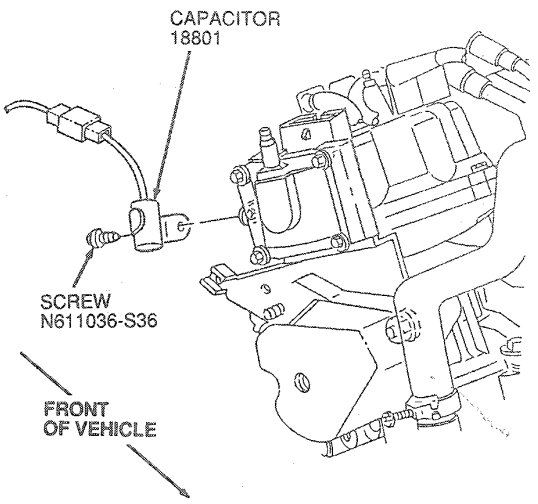
Item	Part Number	Description
5	N801846-S36MG	Screw (2 Req'd)
6	18870	Suppression Strap
7	N801846-S36	Screw
8A	N620482-S36	Nut and Washer Assy
A		Tighten to 46.7-63.3 N·m (34.4-46.7 Lb-Ft)

REMOVAL AND INSTALLATION (Continued)

Ignition Capacitor



3.0L ENGINE



3.8L ENGINE

K13042-B

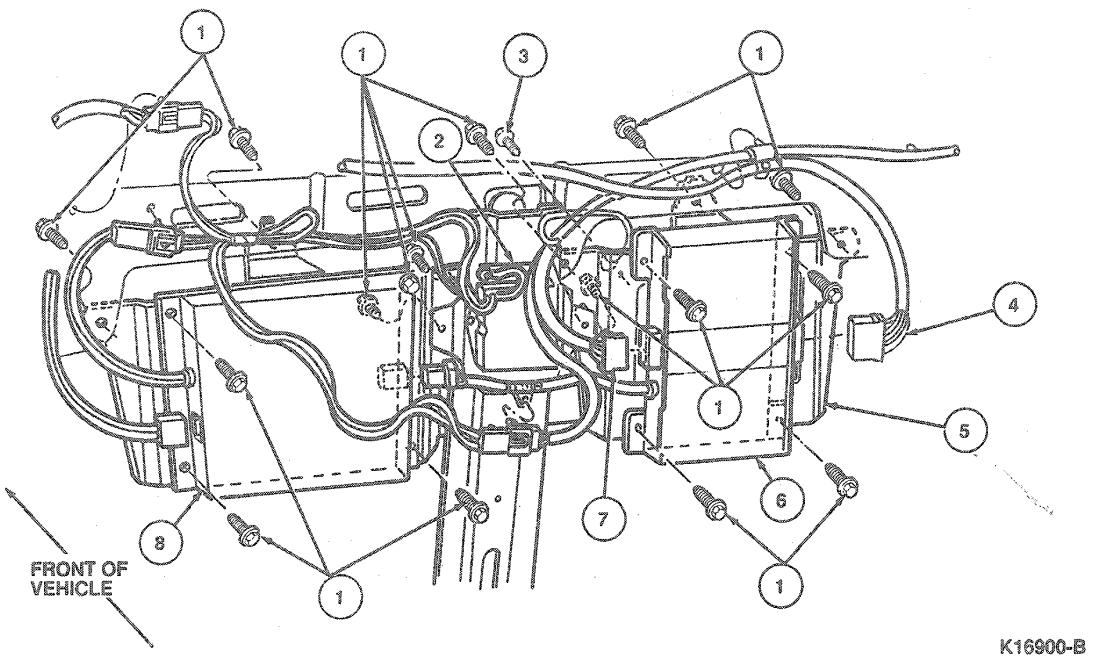
JBL Suppression Choke

Sedan

Removal and Installation

1. Remove rear seat cushion and seat back.
2. Remove sound insulation material.
3. Remove two screws retaining choke bracket.
4. Remove ground wire screw.
5. Remove amplifier trim cover from inside luggage compartment.
6. Disconnect electrical connectors and remove choke and bracket assembly.
7. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	56910-S36	Screw
2	19A087	Choke and Cap Assy
3	N801846-S36MG	Screw

(Continued)

Item	Part Number	Description
4	19B113	Wiring Assy
5	19B180	Bracket Assy
6	18C807	Amplifier Assy
7	18C808	Subwoofer Amplifier Assy

CLEANING

Cassette Tape Player

Head

The playback head, capstans and pinch rollers may accumulate an oxide residue as the tape passes through the components while playing. Depending on the quality used, more or less oxide will accumulate. Oxide accumulation can cause weak or wavering sound and damage to the cassette tape and/or player.

It is recommended for best performance that the tape player be cleaned after every 10 to 12 hours of playing time with a Ford Cassette Cleaning Cartridge or equivalent.

CAUTION: The use of other cassette cleaners is not recommended. Damage to the cassette player could result.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Amplified Assy Screw	3.4-4.8	30.1-42.5
Ground Strap Bolt and Ground Strap Nut	46.7-63.3	34.4-46.7 (Lb-Ft)

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T87P-19061-A Radio Removing Tool	 T87P-19061-A

SECTION 15-02 Antenna

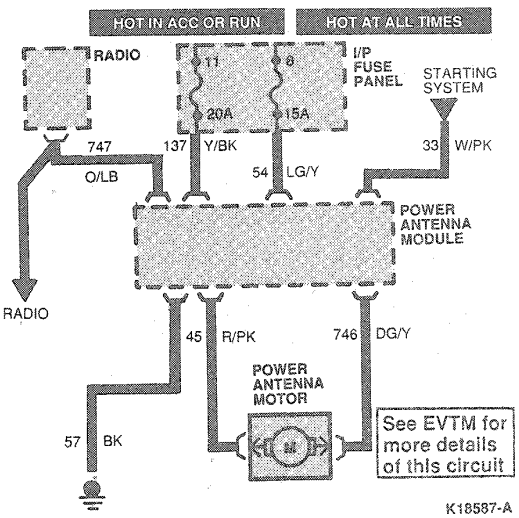
VEHICLE APPLICATION

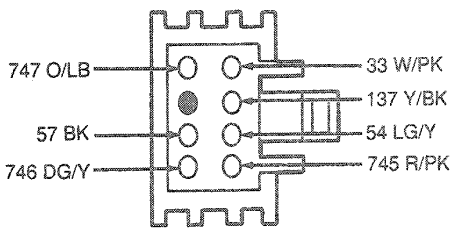
Taurus / Sable.

DIAGNOSIS AND TESTING

- The automatic power antenna, if equipped, will extend when the radio is turned on with the ignition in the RUN or ACC position. The antenna will retract when the ignition in turned to the OFF position even if the radio is ON.
- If AM reception is extremely poor and FM reception "spits" or appears to have trouble holding stations, ensure that the antenna and antenna connectors are properly mated. If the antenna connectors are properly mated but the reception is still poor, replace the antenna cable.
- If only FM reception is poor, it is unlikely that the antenna is at fault. Remove the radio chassis for service.
  NOTE: Many customers do not understand the limitations of FM reception. Refer the customer to the Owner Guide for information about the limitations of FM radio performance.

Power Antenna Wiring Schematic

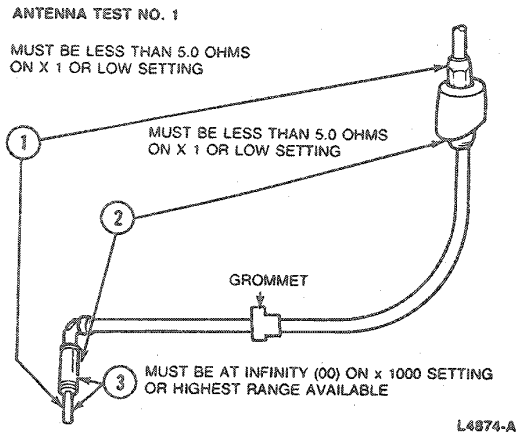




DIAGNOSIS AND TESTING (Continued)

Antenna with Cable and Mast

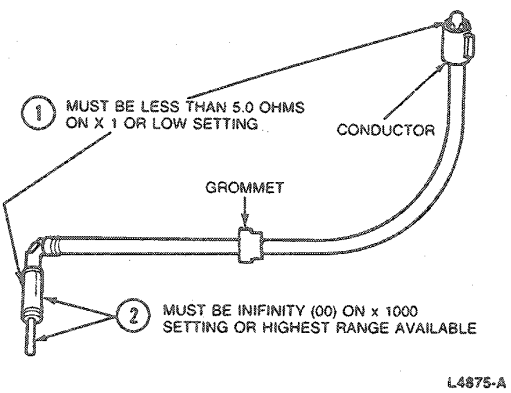
With antenna cable installed on vehicle and cable unplugged from radio, check resistance with ohmmeter test probes contacting antenna at indicated points. If results are satisfactory, antenna assembly is in good condition. If not, check antenna cable and base separately.



Antenna Cable and Base

Mast Removed

With antenna cable unplugged from radio, check resistance at indicated points on cable. If results are satisfactory, cable is in good condition. If not, replace with new cable.



REMOVAL AND INSTALLATION

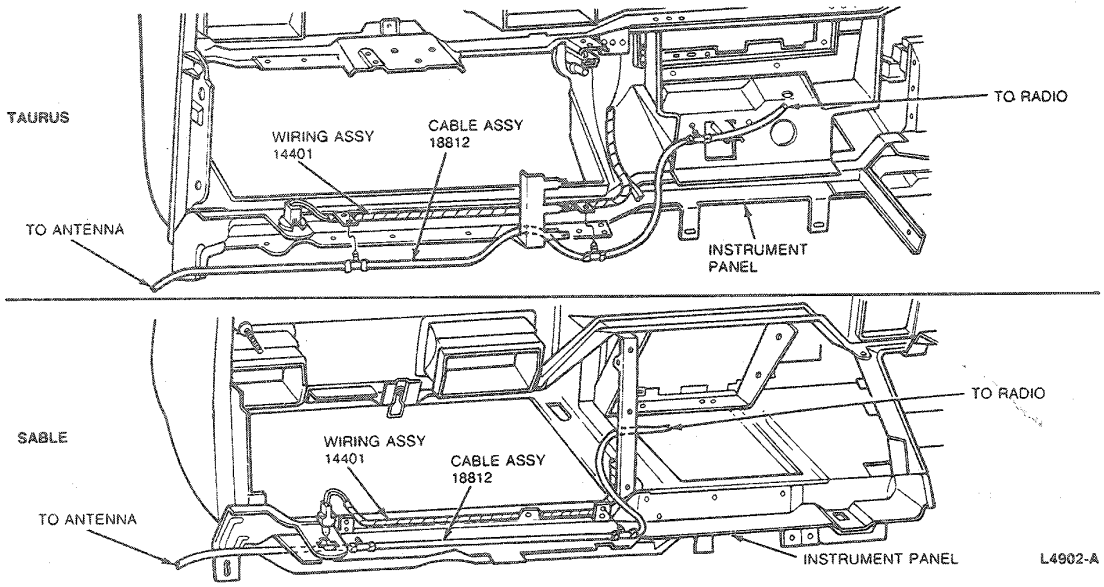
Antennas, Manual and Power

Removal and Installation

1. Push in on sides of glove compartment door and place door in hinged downward position.

REMOVAL AND INSTALLATION (Continued)

2. Disconnect antenna lead from RH rear of radio receiver and remove cable from heater or A/C cable retaining clips.



3. Remove RH front fender liner. Unplug coaxial cable from power antenna assembly or manual antenna base assembly. Unplug power lead from power antenna.

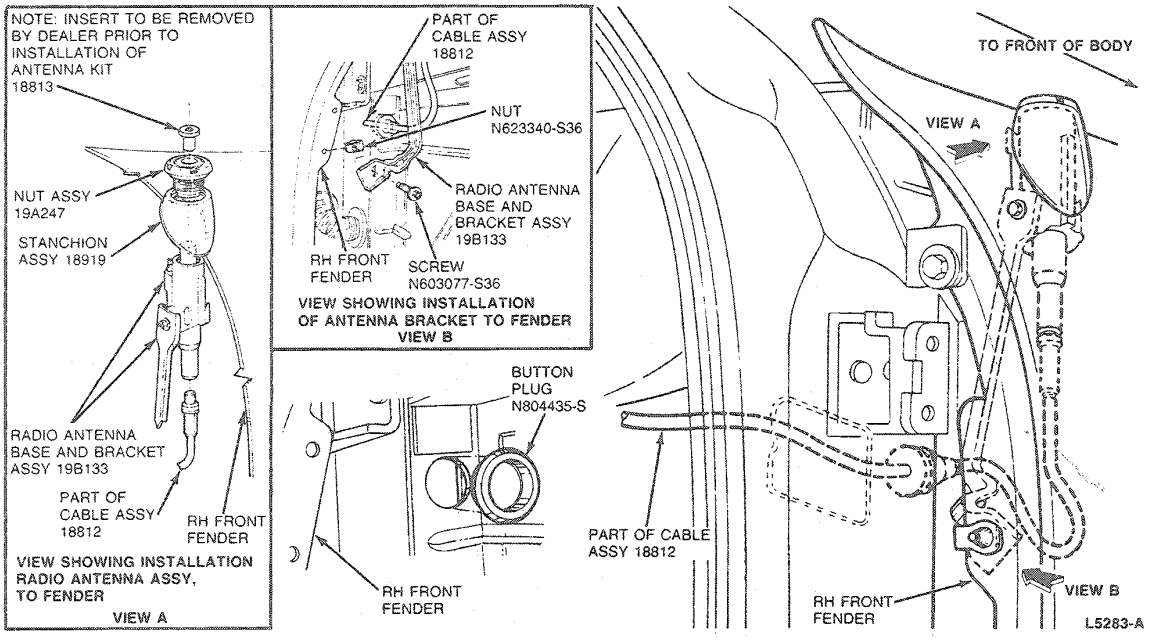
   NOTE: The manual antenna mast is detachable from the base and cable assembly.

4. Under RH front fender, pull antenna cable through hole in door hinge pillar and remove antenna cable assembly from wheel well area.

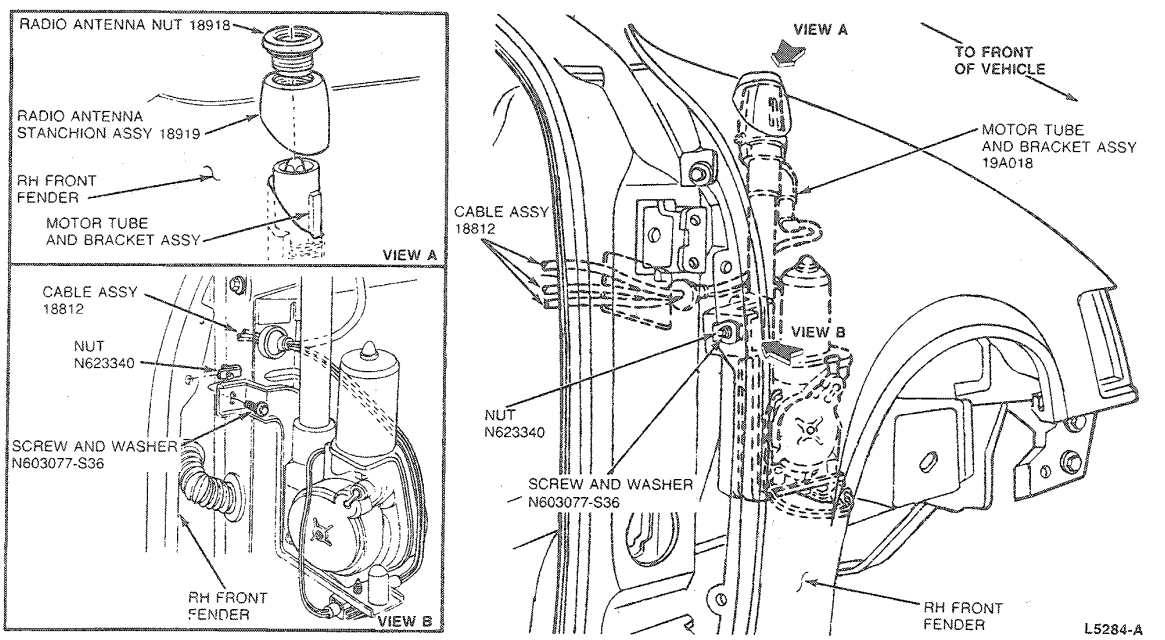
5. To remove manual or power antenna base, remove antenna nut and stanchion on RH front fender.
6. Remove lower antenna base screw and remove either manual antenna base or power antenna.
7. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)

Manual Antenna



Power Antenna

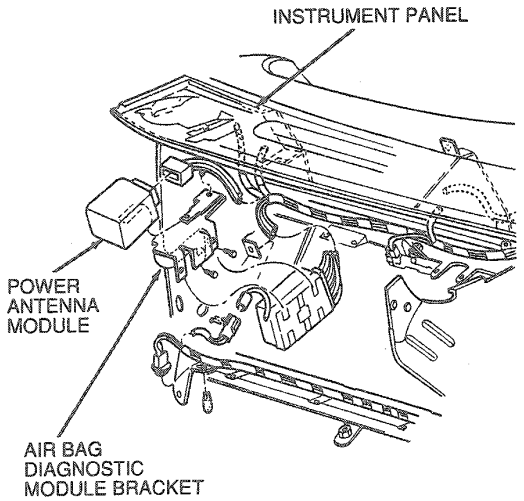


REMOVAL AND INSTALLATION (Continued)

Automatic Power Antenna Module

Removal and Installation

1. Push in on sides of glove compartment door and place in hinged downward position.
2. Remove antenna module from air bag diagnostic module bracket.
3. Disconnect wire assembly from module.
4. To install, reverse Removal procedure.



Mast, Power

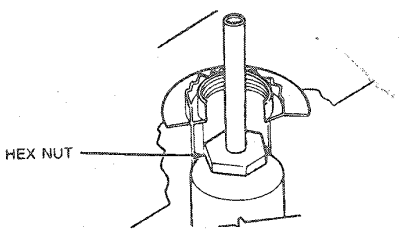
NOTE: A power antenna mast which is bent or broken can be replaced without replacing the motor and tube assembly.

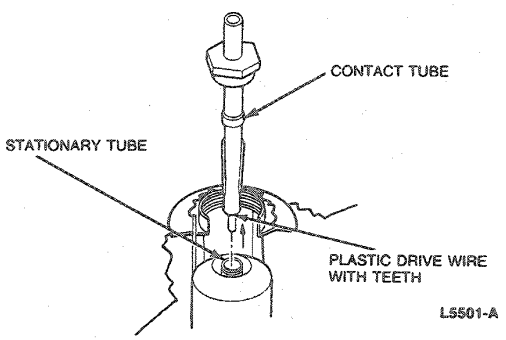
Removal

1. Remove antenna nut and stanchion.
2. Slide 14mm (9 / 16 inch) socket over mast.
3. Loosen retaining nut inside tube and slide it part-way up mast.
4. Raise antenna to run plastic drive wire at bottom of mast out of motor. Note direction of teeth on plastic drive wire.
5. Saw off damaged portion of antenna mast. Remove burrs from mast and slide nut and contact tube off stationary tube.

Installation

1. With the teeth on plastic drive wire facing toward motor on antenna, push end of plastic drive wire of replacement mast assembly down into tube. Push it around curve at bottom of tube until end enters drive mechanism.
2. Run motor down while pushing on plastic drive wire until about 305mm (12 inch) of wire has been drawn into the tube. Stop motor and insert bottom of antenna mast into tube. Lower mast.
3. Slide contact tube and nut down antenna mast. Tighten nut to 0.45 N·m (4 lb-in).
4. Raise and lower antenna several times to ensure proper operation.





SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Contact Tube and Nut	0.45	4

SECTION 15-03 Speakers

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

All premium speakers have "6.0 ohms" printed on the magnet. JBL sound speakers have Ford / JBL Audio System printed on the magnet. Speakers used in JBL sound installations are removed and installed in the same manner as premium speakers.

DIAGNOSIS AND TESTING

NOTE: Electronic radio rear speakers are powered separately from the front speakers. Therefore, if only one speaker is inoperative, the radio chassis is not damaged. For vehicles with Premium Sound, refer to Section 15-00.

PINPOINT TEST A
SPEAKER DIAGNOSIS
ONE OR MORE SPEAKERS DISTORTED OR INOPERATIVE

	TEST STEP	RESULT ▶	ACTION TO TAKE
A1	CHECK HOW RADIO IS EQUIPPED		
	• Check equipment on radio. • **Is vehicle equipped with factory-installed premium sound?**	Yes ▶ No ▶	REFER to Section 15-00. GO to **A2.**
A2	SUBSTITUTE SPEAKER AND BYPASS SPEAKER WIRING HARNESS		
	• Unplug radio from speaker wiring harness. Set radio balance and fader controls to their mid-position. Using a speaker of known good quality, jumper the pins corresponding to the suspect speaker of the radio connector to the test speaker. • **Is sound OK?**	Yes ▶ No ▶	GO to **A3.** REMOVE radio for service.
A3	SUBSTITUTE SPEAKER USING SPEAKER WIRING HARNESS		
	• Reconnect radio to speaker wiring. Disconnect suspect speaker from speaker wiring harness and connect test speaker of known good quality. • **Is sound OK?**	Yes ▶ No ▶	REPLACE speaker. SERVICE speaker wiring harness.

TK5491G

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: BUZZING SOUND FROM SPEAKER

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	CHECK FOR FOREIGN MATERIAL IN SPEAKER CONE		
	• **Is there foreign material in speaker cone?**	Yes ▶	REMOVE speaker, CLEAN foreign material. INSTALL speaker. RETEST system.
		No ▶	GO to **B2.**
B2	CHECK SPEAKER MOUNTING HARDWARE		
	• **Is speaker mounting hardware tight?**	Yes ▶	REPLACE speaker.
		No ▶	TIGHTEN mounting hardware. RETEST system.

TL6671C

PINPOINT TEST C: NO SOUND FROM FRONT (F), BACK (B), LEFT (L) OR RIGHT (R) CHANNEL PREMIUM (PAC) AND JBL SYSTEMS ONLY

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	CHECK SPEAKER OPERATION		
	• Set Balance and Fade control to mid-position. • **Are all speakers working properly?**	Yes ▶	System OK. STOP test.
		No ▶	GO to **C2.**
C2	CHECK CONNECTIONS TO RADIO, AMPLIFIER AND SPEAKERS		
	• **Are connections OK?**	Yes ▶	GO to **C3.**
		No ▶	SERVICE connections. RETEST system.
C3	CHECK AUDIO INPUT LINE TO AMPLIFIER		
	• Install test cassette tape. • Set Volume to MAX. • Set Tone, Balance and Fade controls to mid-positions. • Check for AC voltage (greater than 1.0 V RMS) between Circuits 278 and 855, 279 and 858, 277 and 859 or 280 and 857. • **Is AC voltage greater than 1 volt (RMS)?**	Yes ▶	GO to **C4.**
		No ▶	REPLACE radio.
C4	CHECK EACH SPEAKER FOR SHORT BETWEEN INPUT AND RADIO CHASSIS GROUND		
	• **Are any speaker circuits shorted?**	Yes ▶	GO to **C5.**
		No ▶	REPLACE amplifier.
C5	LOCATE SHORT		
	• **Is short internal to speaker?**	Yes ▶	REPLACE speaker.
		No ▶	SERVICE shorted wiring. RETEST system.

TK18678A

PINPOINT TEST D: DISTORTION PREMIUM (PAC) AND JBL SYSTEMS ONLY

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	CHECK ALL CHANNELS FOR DISTORTION		
	• **Is distortion in all channels?**	Yes ▶	GO to **D2.**
		No ▶	GO to **D3.**
D2	CHECK VOLUME RANGE FOR DISTORTION		
	• **Is distortion only at high volume?**	Yes ▶	System OK. STOP TEST.
		No ▶	REPLACE radio. GO to **D4.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: DISTORTION PREMIUM (PAC) AND JBL SYSTEMS ONLY (Continued)

TEST STEP		RESULT	ACTION TO TAKE
D3	CHECK FOR FOREIGN MATERIAL IN SPEAKER CONE		
	• **Is there foreign material in speaker cone?**	Yes ▶	REMOVE foreign material. RETEST system.
		No ▶	GO to **D5.**
D4	CHECK SOUND QUALITY		
	• **Is distortion still present?**	Yes ▶	REPLACE amplifier.
		No ▶	System OK. STOP test.
D5	CHECK AUDIO INPUT LINE TO AMPLIFIER		
	• Install test cassette tape. • Set Volume to MAX. • Set Tone, Balance and Fade controls to mid-position. • Check for AC voltage (greater than 1.0V RMS) between Circuits 278 and 855, 279 and 858, 277 and 859 or 280 and 857. • **Is AC voltage greater than 1 volt (RMS)?**	Yes ▶ No ▶	GO to **D6.** REPLACE radio.
D6	CHECK AUDIO OUTPUT FROM AMPLIFIER		
	• Install test cassette tape. • Set Volume to MAX. • Set Tone, Balance and Fade controls to mid-position. • Check for AC voltage (greater than 5.0V RMS) between Circuits 804 and 813, 800 and 801, 805 and 811 or 802 and 803. • **Is AC voltage greater than 5 volts (RMS)?**	Yes ▶ No ▶	REPLACE speaker. REPLACE amplifier.

TK18679A

Two or More Speakers Do Not Work

Balance and Fader Controls Adjusted to Mid-Position

It is unlikely that two speakers would be damaged at one time. The most probable cause is in the radio chassis or wiring.

- Verify balance and fader controls are adjusted to mid-position.
- Inspect wiring connectors at the rear of the radio chassis for proper mating. Verify electrical continuity of wiring between the radio chassis connector and the inoperative speaker connector using an ohmmeter.
- If wiring connections are properly mated and the condition persists, remove radio chassis for service.

Poor Sound Quality

NOTE: Shorted wiring does not always result in a total loss of sound from the speaker. If diagnosis indicated condition is associated with speaker or wiring, refer to Section 15-00.

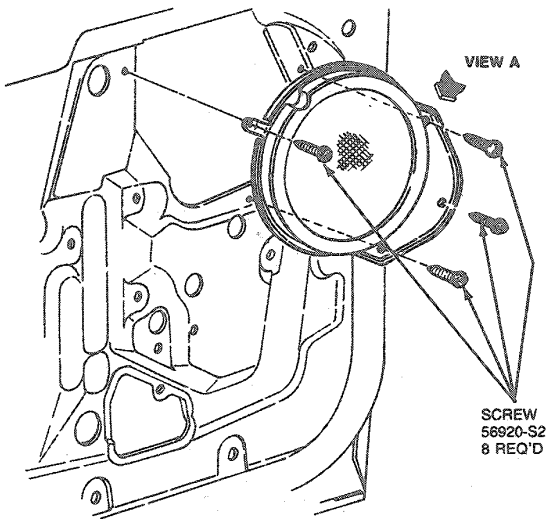
- Experience has shown that rattles and buzzes are most often caused by loose speakers or speaker mountings, speaker grilles or trim panels than by damaged or worn speakers. Check for tightness of mountings and trim pieces.
- Distortion can be caused by the speaker, radio chassis or wiring. If the fault is in the radio chassis, both speakers on the same side of the vehicle will exhibit poor quality. Distortion caused by damaged wiring is most often accompanied by lower than normal sound output.
- Buzzes, rattles, or distorted or weak sound from package tray speakers are sometimes caused by bent package tray sheet metal around the speaker opening if mounting brackets are not used, or missing or loose attaching hardware or speaker covers. Bent sheet metal should be straightened and the speaker installed. Loose attaching hardware should be tightened. Be careful not to over-tighten hardware as this may bend or deform speaker basket causing buzzes or distorted sound.

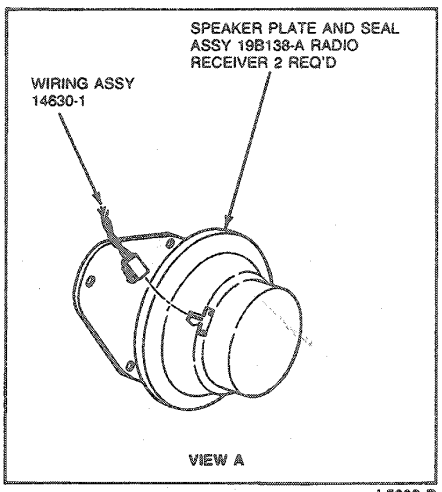
REMOVAL AND INSTALLATION

Speakers, Door Mounted

Removal and Installation

1. Remove inner door trim panel. Refer to Section 01-05.
2. Remove three screws retaining speaker to bracket assembly.
3. Pull speaker away from bracket far enough to disconnect speaker wires and remove speaker.
4. To install, reverse Removal procedure.





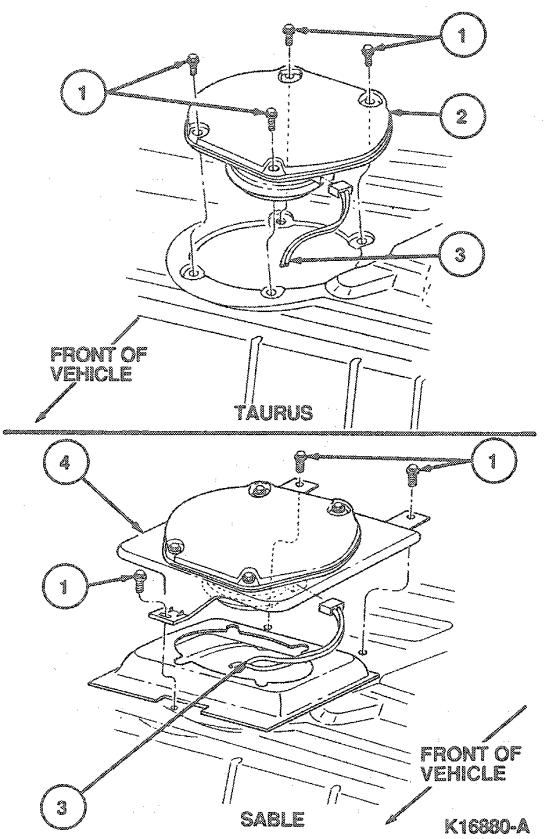
Speakers, Rear

Sedan

Removal and Installation

1. Remove speaker grille from package tray.
2. Remove four speaker retaining screws.
3. Lift speaker and disconnect speaker wire.
4. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)

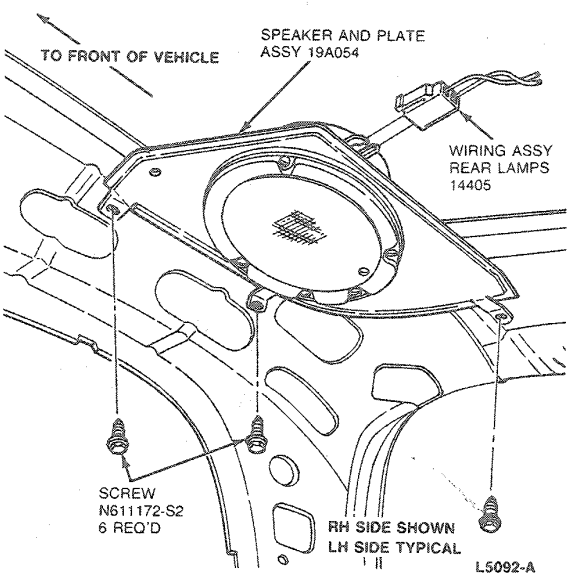


Item	Part Number	Description
1	—	Screw
2	—	Speaker
3	—	Speaker Wire
4	—	Speaker Mounting Bracket

Station Wagon

Removal and Installation

1. Remove rear corner upper finish panel. Refer to Section 01-05.
2. Remove three screws retaining speaker bracket and speaker.
3. Disconnect speaker wires and slide speaker bracket edge out from under headliner.
4. To install, reverse Removal procedure.

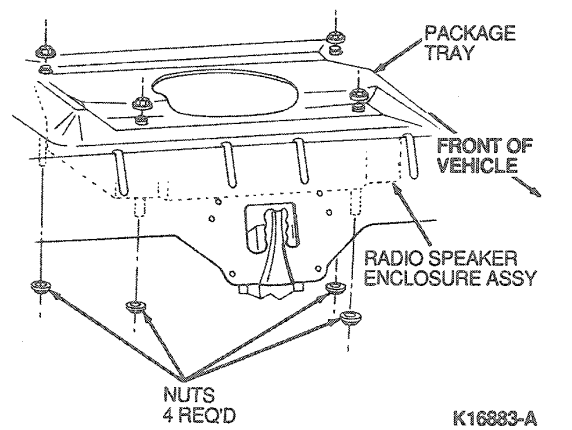


Package Tray Mount

JBL Subwoofer Enclosure

Removal and Installation

1. Disconnect wire assembly from subwoofer amplifier from luggage compartment.
2. Remove four retaining nuts.
3. Remove subwoofer enclosure from package tray.
4. To install, reverse Removal procedure.



SECTION 15-04 Phone, Cellular

VEHICLE APPLICATION

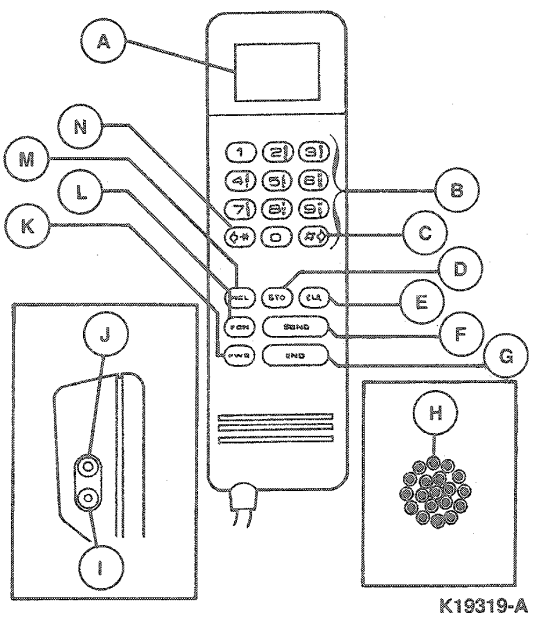
Taurus / Sable.

DESCRIPTION AND OPERATION

The cellular phone system consists of these major components:

- Speaker interrupt module
- Headliner microphone
- Power cable and fuse
- Glass mounted antenna with antenna wire
- Transceiver
- Power feed and audio system mute interface (PAC radio only)
- Phone handset

Some features of the cellular phone include voice activation, hands-free operation, speed dialing of up to 30 numbers and PAC radio muting during phone operation.



K19319-A

A. **DISPLAY**
Provides a visual indication of dialed numbers and messages including:
In Use Indicator — Turns on when a call is placed or answered. Turns off when a call is ended.
No Service Indicator — Turns on when unit is out of the range of a cellular service area.
Roam Indicator — Turns on when the unit is within range of a cellular system other than its home system.
- Home type system: steady
- Non-Home type system: blinking

B. **NUMERIC KEYPAD**
Used to enter phone numbers prior to initiating a call.

DESCRIPTION AND OPERATION (Continued)

C. **POUND KEY / >**
Used in conjunction with other keys.

D. **STORE**
Used to store phone numbers into the memory.

E. **CLEAR**
Press and release to clear last digit entered. Press and hold to clear display in the event of misdial (does not affect numbers stored in memory).

F. **SEND**
Press to initiate a call after entering the phone number on the keypad or to answer a call. Press for switchhook flash when a call is in progress.

G. **END**
Press to end a call.

H. **MICROPHONE**
Direct Hands Free conversation and all voice commands toward the microphone.

I. **VOLUME-**
Press to decrease volume.

J. **VOLUME+**
Press to decrease volume.

K. **POWER**
Press to turn on. Press again to turn off.

L. **FUNCTION**
Used in combination with other keys for specific user-programmed operations.

M. **RECALL**
Press to recall and display numbers stored in memory.

N. **STAR KEY / <**
Used in combination with other keys.

Programming

The following instructions describe the procedure to program the telephone numbers into the transceiver using the handset.

After supplying the security code and the lock code:

1. Turn the phone on by pressing the PWR button.
2. Get into programming mode by pressing FCN + 0 000 000 000 000 + RCL.

   NOTE: Once the customer enters a user security code, you will need to change this number to 0-security code-security code to re-enter the programming mode. Example if security code is 123456, enter: FCN + 0123456123456 + RCL.
3. The handset will display 01. This indicates Step one.
4. Press * so that handset displays the contents of Step one. The display should show the system I.D. number (five digits). Enter the system I.D.
5. Press * to advance to the second programming step. The display should show 02.
6. Press * again to show the contents of the second step, which is the area code. Enter the area code.
7. Press * to advance to the next programming step and so on. Enter the information in all the programming steps. Edit the information as follows:

   - Pressing CLR while the contents of a programming step are displayed will change the contents to the previously stored value.
   - Pressing # while a programming step is being displayed (i.e., 01, 02, etc.) will exit the programming mode without altering any information. This will not increment the three time USER MODE PROGRAMMING counter.

   NOTE: In Step 7 of the programming, the six-digit security code is used to access certain call restriction and advanced security functions. (For example, you may use this code, in conjunction with selecting a service level, to limit other users of your cellular telephone to local or incoming calls). Select any six-digit code that you will remember but one that will not be compromised easily. (You may wish to spell out a six-letter word on the keypad, or use the last six digits of your Social Security number, etc.) Consult your User's Manual for further information.

   NOTE: In Step 8 of the programming, the three-digit unlock code is used to lock your mobile telephone to prevent unauthorized usage. With many models, this number can be programmed as often as desired. Consult your User's Manual, under the topic "Changing Your Unlock Code".

   NOTE: To program the phone with a second phone number, enter 1XX110 instead of 1XX100, during Step 10. Then press the <* button after Step 11 to continue programming the scond phone number.

This is a complete list of all the programming steps and contents:

STEP	DESCRIPTION	STD. DEFAULT (First Phone Number)	STD. DEFAULT (Second Phone Number)
01	System I.D. number	00000	00000
02	Cellular area code	111	111
03	Cellular phone number	1110111	1110111
04	Station class mark	00	00
05	Access overload class	00	00
06	Group I.D. mark	00	00
07	User security code	000000	000000
08	Unlock code	123	123

(Continued)

DESCRIPTION AND OPERATION (Continued)

STEP	DESCRIPTION	STD. DEFAULT (First Phone Number)	STD. DEFAULT (Second Phone Number)
09	Initial paging channel (usually 0333 for 'A' system or 0334 for 'B' system)	0XXX	0XXX
10	OPTION PROGRAMMING	1XX100 (1XX110, if a second phone number is desired)	XXX000
10	For FORD telephones set to: 1XX100 (replace the X's by 1 or 0 depending on the requirements from the local service provider / carrier)		
	Internal speaker disable bit (set to 1 for FORD)	1	1
	Local Use 1 = enable Local Use 0 = disable	X	X
	MIN MARK 1 = enable MIN MARK 0 = disable	X	X
	Auto recall (always one) last 2 least significant digits set 0 for FORD	1 0	0 0
11	OPTION PROGRAMMING Ford FORD telephones set to 1100	0 XXXX	0 XXXX

TK19316A

8. After all information has been entered, press * to go through all the entries to verify that the information entered is correct. To store the information, press * so that the display shows any entry number (i.e. 01, 02, etc.), then press SEND. The transceiver should power down and power-up to indicate that the programming is done.
9. Verify that the information was stored by pressing RCL + #. The just programmed phone number should be displayed.
   - Any subsequent programming attempts will require that you enter FCN + 6 digit security code twice + RCL in order to enter the programming mode (Step 1).
   - You can program the telephone three times. After that, you will not be able to enter the programming mode using the security code.
10. If the telephone cannot make calls within a few hours, verify that the local service provider / carrier has the correct Electronic Serial Number (ESN) for the user's telephone. The ESN should be available from the selling dealer.

Dual Phone Numbers

Your cellular telephone is equipped with a feature that allows you to maintain two different telephone numbers. Both numbers can be from separate carriers, and are accessed separately in your telephone. Your phone must be programmed by your dealer with both phone numbers. To arrange for dual phone numbers, contact your Lincoln dealer or call the Ford Cellular System at 1-800-367-3013.

Your phone can only be active in one phone number at a time. Calls will be placed and received on the active phone number only. To determine which phone number is active press RCL + # to display the number.

To operate with the phone number in the display press END. To switch your telephone to the other phone number press RCL + # + RCL. The original telephone number will disappear from the display and the new number will appear.

DIAGNOSIS AND TESTING

If there is a concern making calls on the cellular telephone, check the following information first:

1. Make sure the telephone is turned ON. With the power button on, the system should be on while the ignition is on.
2. Make sure the customer is calling within the service area. NO SVC will appear in the display if the customer is calling from outside the service area.
3. Check to see if the ROAM indicator is ON. If so, follow the roaming instructions in the operating guide.
4. Make sure the display does not read LOC'D. If it does, the phone must be unlocked using the customer's three-digit code.
5. Make sure the handset is securely cradled.
6. Check the antenna and power cable connections at the transceiver, located in the luggage compartment. Also check the fuse located on the wiring harness in the luggage compartment, near the 4-way connector.
7. Check the handset modular connector.
8. Check the telephone system registration. Also check to make sure that the telephone is properly programmed. Incorrect programming can result in single system scanning, loss of speed dialing, loss of hands-free audio, loss of auto redial, loss of DTMF tones, and the loss of other keypad / handset functions.

DIAGNOSIS AND TESTING (Continued)

9. Check the customer's account status with the cellular carrier.

System / Carrier Concerns

Dropped calls, bad connections, noisy audio and other intermittent symptoms usually indicate a system or cellular carrier concern, and are not the fault of the phone itself. Such symptoms may occur in situations similar to the following:

- In certain geographic areas (excessive foliage, hills, etc.) or at the edge of service areas.
- At the same place each day.
- At the same time each day.
- Under bridges, tunnels, in lower freeways and in congested downtown areas.

If the customer's phone exhibits any of the above symptoms or symptoms occur under the above conditions, the customer and / or the dealer should contact customer service at their particular cellular service provider / carrier, or call the 1-800 service number provided in your Ford Cellular System Dealer kit.

Other Possible Concerns

1. If for some reason the customer's ESN number was incorrectly recorded in the carrier switch, the phone will not work. Call the 1-800 number in your dealer kit to check the ESN number.
2. A customer's initial call must be made in his home service area for proper activation of the Ford Cellular System.
3. A customer must wait until after 24 hours of the service activation before making a call outside of his / her home service area or the phone might be reported stolen and service stopped.
4. There may be a slight delay in activation after leaving dealership from initial delivery.
5. If the radio does not work when the cellular phone is in use, it is because of the Audio-Mute feature which will mute the audio system when a call is placed or received.

   If, after checking these possibilities, the phone still does not function, DO NOT ATTEMPT to fix the phone. Call the local cellular distributor. A confidential listing of cellular distributors can be found in the dealer kit.

DIAGNOSIS AND TESTING (Continued)

CELLULAR PHONE FUNCTIONAL TEST

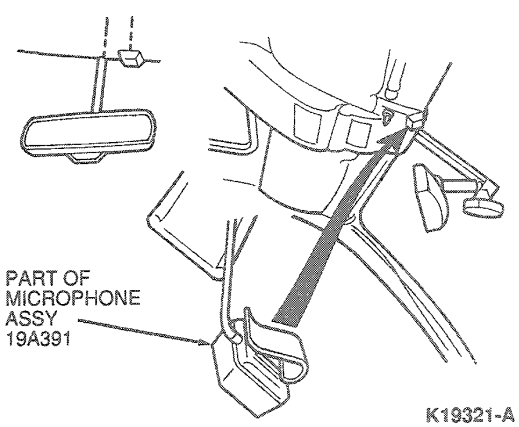
TEST STEP		RESULT ▶	ACTION TO TAKE
A1	STEP 1		
	• Basic system operation.	Telephone will not turn on ▶	ENSURE ignition is ON.
		▶	ENSURE PWR is ON. If not, press PWR button.
		▶	CHECK modular connector on the handset cord to make sure that the handset is plugged in properly.
		Unable to make a call ▶	ENSURE your phone is unlocked.
		▶	ENSURE the NO SVC indicator is off. If it is on, you may be outisde of a cellular service area.
		▶	ENSURE you have pushed the SEND key after entering the number you are calling.
		▶	CHECK your antenna system for problems: Bent or missing antenna, a loose or corroded antenna base, loose or damaged antenna cable.
		▶	CHECK to see if you are "roaming". If so, FOLLOW roaming procedures in User's Manual.
		An alternating tone signal (siren) sounds on your phone handset ▶	CHECK the display panel to make sure you've entered the correct number. If not, PRESS END, wait a few seconds and try the number again.
		Audio feedback during Hands Free operation ▶	REDUCE phone speaker volume.

NOTE: If you have difficulty placing your call, try several times. If all checks fail to solve the problem, call your local cellular carrier or call the Ford Cellular System at 1-800-367-3013 for assistance. If further assistance is required, go to your nearest Lincoln Dealer.

COMPONENT LOCATION

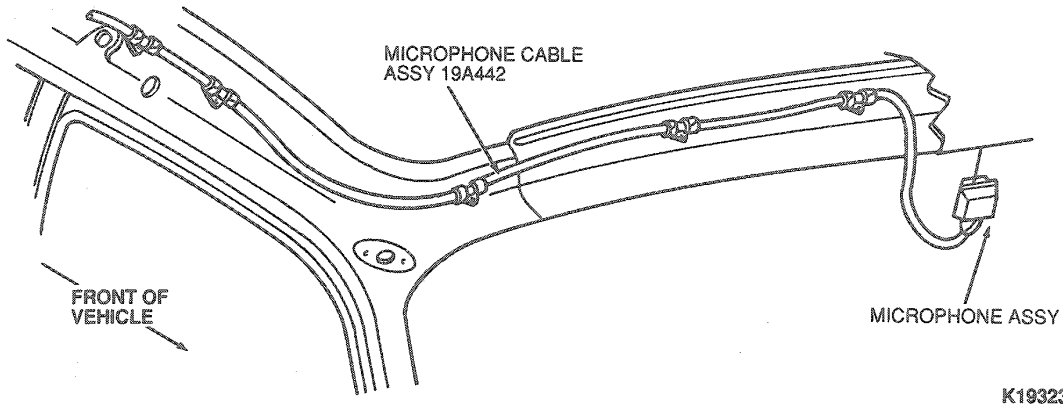
The following illustrations are provided to show component location only. Service to these components should only be done by the local cellular distributor.

Microphone



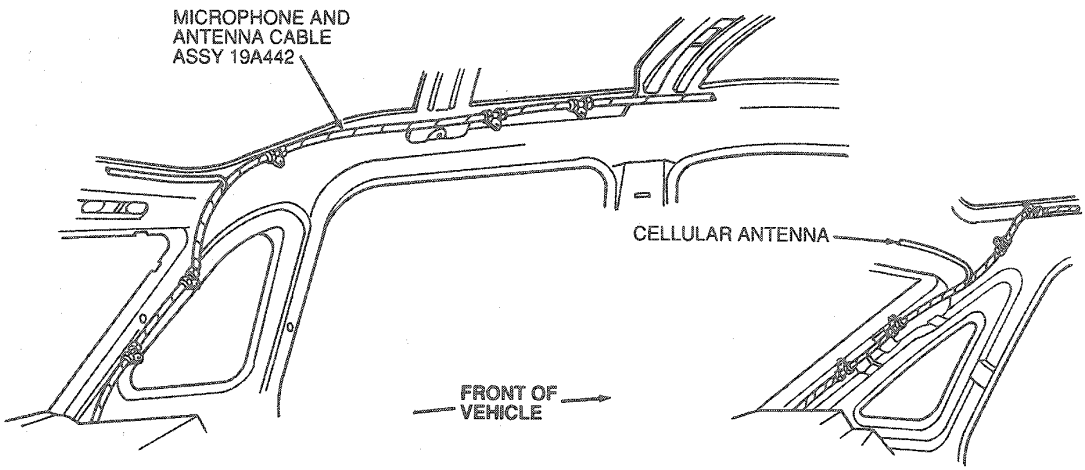
COMPONENT LOCATION (Continued)

Microphone Cable



K19323-A

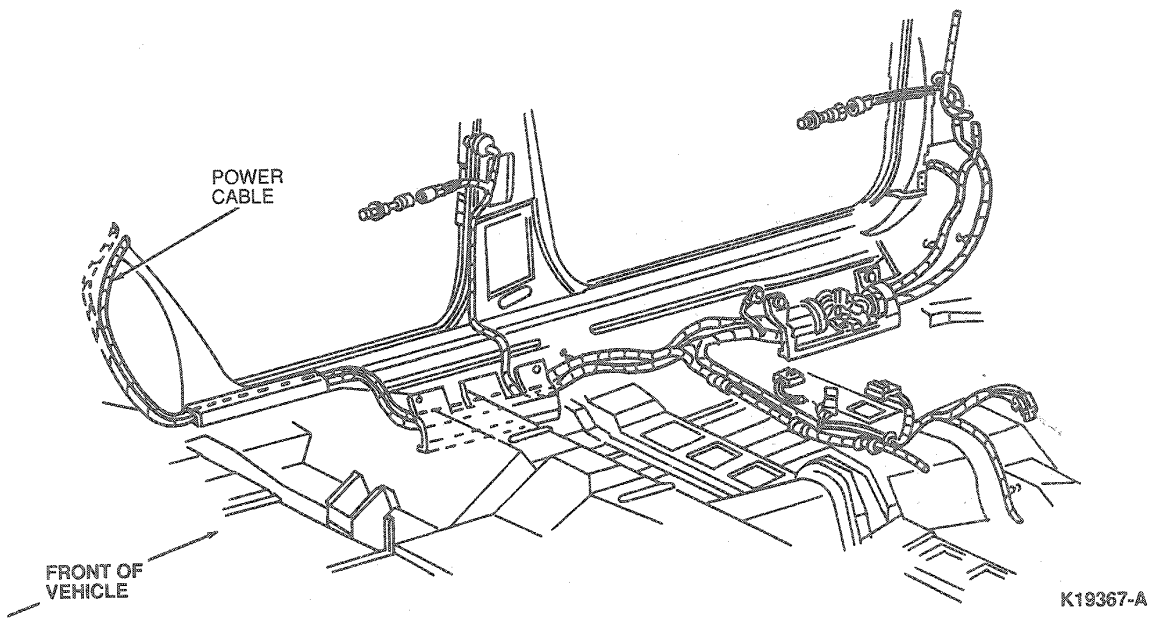
Microphone and Antenna Cable, Sedan



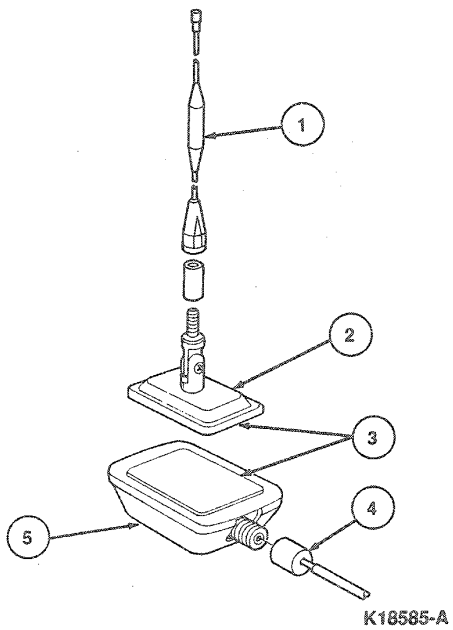
K19324-A

COMPONENT LOCATION (Continued)

Power Cable, Sedan



Antenna

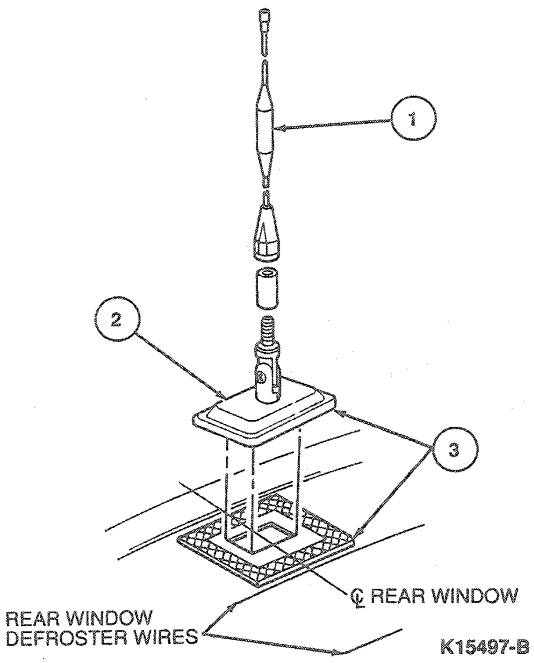


Item	Part Number	Description
1	12298	Antenna
2	—	Antenna Base, Outside
3	—	Double-Side Tape
4	—	Antenna Cable
5	—	Antenna Base, Inside

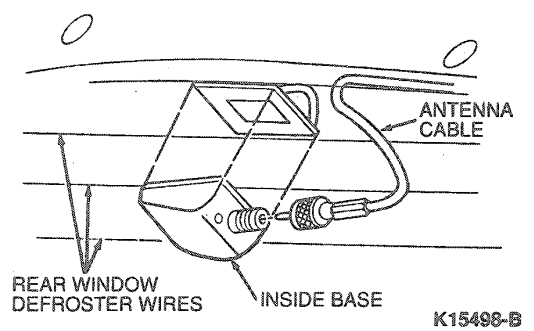
TK18585A

COMPONENT LOCATION (Continued)

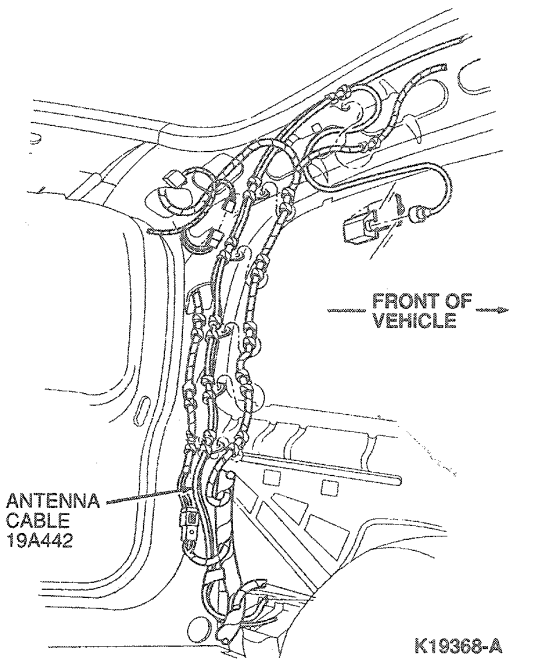
Outside Attachment, Antenna (Sedan)



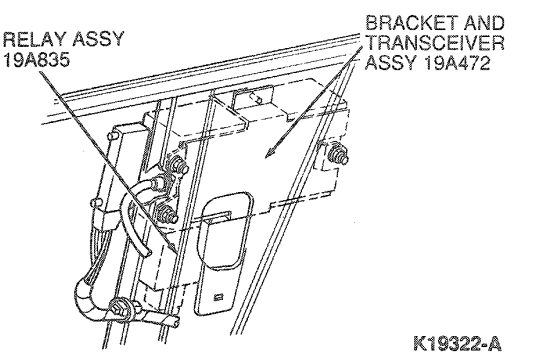
Inside Attachment, Antenna (Sedan)



Antenna, Wagon

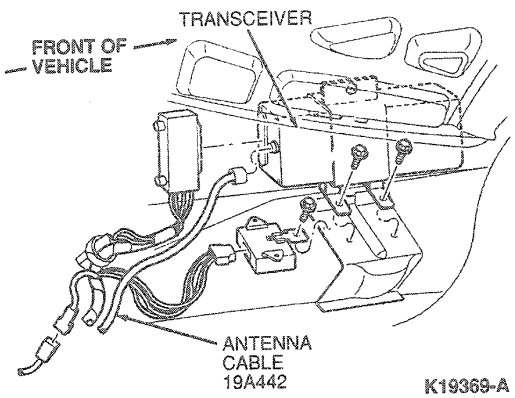


Transceiver and Relay (Sedan)



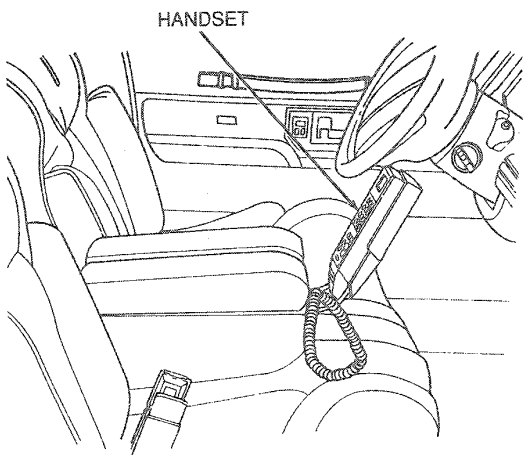
COMPONENT LOCATION (Continued)

Transceiver and Relay



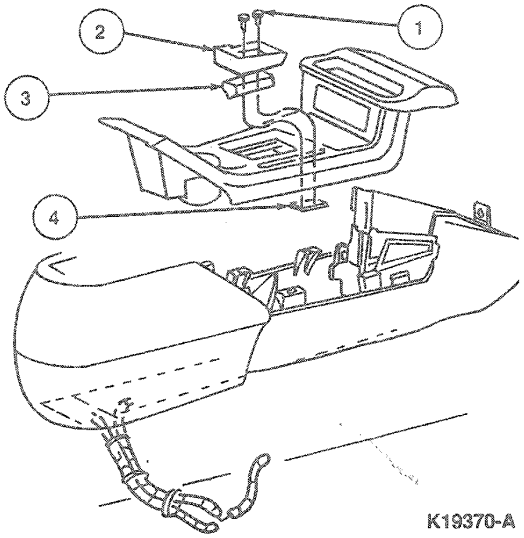
K19369-A

Phone Handset Without Console



K16887-A

With Console



K19370-A

Item	Part Number	Description
1	56908-S36B	Screw (2 Req'd)
2	19A384	Holder Assy
3	19A445	Plate
4	19A443	Bracket

GROUP

LIGHTING 17

(13000)

SECTION 17-01 Lighting, Exterior

VEHICLE APPLICATION

Taurus/Sable and Taurus SHO.

DESCRIPTION AND OPERATION

Headlamps, Aerodynamic

The aerodynamically styled headlamp system uses replaceable halogen bulbs. A burned out bulb may be replaced without removing the headlamp body.

CAUTION: Do not interchange halogen headlamp bulbs with conventional bulbs.

DESCRIPTION AND OPERATION (Continued)

Daytime Running Lamps

Canadian Vehicles Only

The Daytime Running Lamp (DRL) system is designed to turn the high-beam headlamps of the vehicle on, with a reduced light output and without illuminating the high-beam indicator in the instrument panel when the following conditions are met:

- The ignition switch is in the RUN position.
- The parking brake is fully released.
- The headlamp system is in the OFF position.

The DRL system incorporates a module and bracket assembly located on the LH fender apron, directly under the battery. The wiring is connected to the 14290 wiring assembly, and is routed through a hole in front of the battery. The DRL output cannot be measured using most multi-meters nor, can the DRL module be adjusted.

Headlamp and Dimmer Switch

A combination three-position lighting switch, mounted in the instrument panel, controls circuits to the headlamps, parking lamps / marker lamps, tail lamps, license plate lamp, courtesy lamp, instrument panel lamps and ash receptacle lamps. A fuse panel protects all lamps described above except headlamps. A separate circuit breaker in the switch protects the headlamps. Refer to Section 18-01 for location of fuse and circuit breaker.

The instrument panel lamp circuit is routed through a rheostat, which is controlled by rotating the thumbwheel.

A dome lamp switch is also a part of the rheostat switch. It is actuated by rotating the thumbwheel to the extreme up position. The courtesy lamps are also illuminated by the switch in the pillar when the doors are opened.

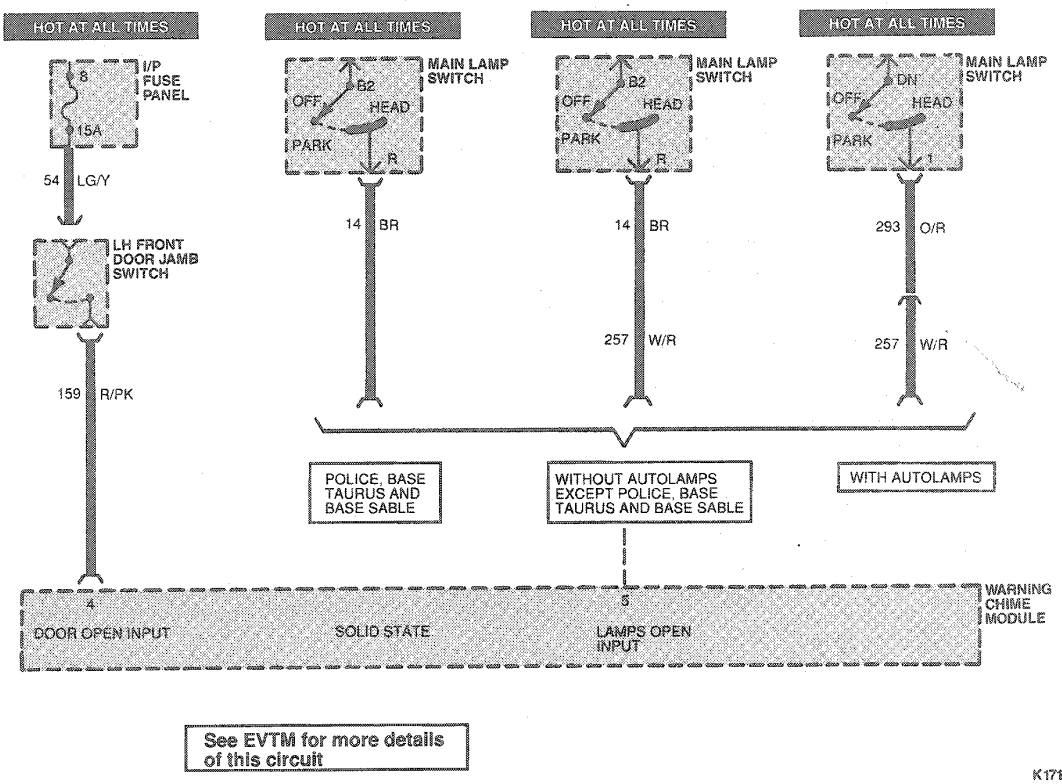
Refer to the headlamp switch diagnosis procedure before attempting to replace the headlamp switch.

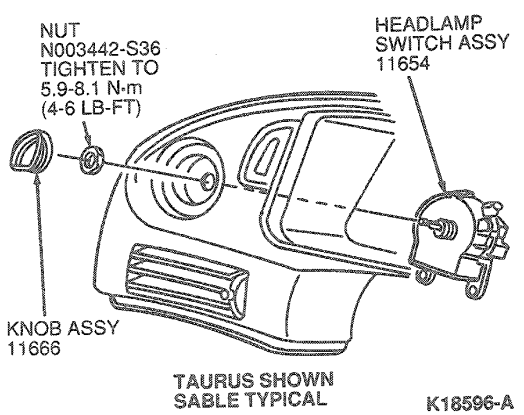
Headlamps ON Warning Chime

The warning chime will sound when the LH front door is opened with the headlamp switch on, and will continue until the door is closed or the headlamp switch is turned off.

DESCRIPTION AND OPERATION (Continued)

When the headlamp switch is on and the LH front door is opened, power is supplied through Circuits 159 and 257 to the warning chime.





Headlamp Delay System—Autolamp

The autolamp system provides light sensitive automatic on-off control of the exterior lamps normally controlled by the regular headlamp switch. This system also provides increased visibility for occupants leaving the vehicle. The autolamp system keeps the lamps on for a preselected period of time after the ignition is turned off. The preselected time lapse can be adjusted by the operator up to approximately 3 minutes.

The system consists of a light sensitive photocell / amplifier assembly, one dual-coil relay, and a time-delay control which includes an ON / OFF switch. Connections to the vehicle lamps parallel the regular headlamp switch connections, requiring the headlamp switch be turned to the OFF position for the automatic control feature.

DESCRIPTION AND OPERATION (Continued)

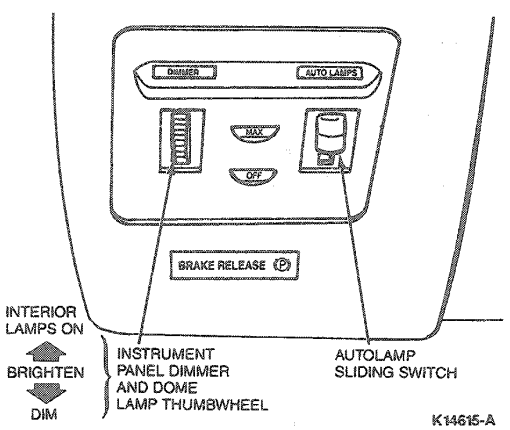
In normal operation, the system will turn the exterior lamps on when the natural outside light available to the photocell decreases below a predetermined level, such as at sunset. Also, the lamps will automatically turn off when the level of outside light exceeds a predetermined level during daylight hours.

The system photocell / amplifier assembly is mounted under the RH speaker grille. The photocell must always be exposed to outside light to function properly.

Do not place any items in the RH corner of the windshield which may block light to the photocell.

The autolamp control sliding switch is located to the left of the steering wheel in the lower finish panel. The autolamp system is functional for automatic operation when the on-off control is moved from the OFF position. The closer the control is moved toward the max-delay, the longer the lamps will stay on after the ignition is turned off.

Turning on the headlamp switch will override the autolamp. Automatic operation will not be possible until the regular headlamp switch is turned off.



Fog Lamp and Switch

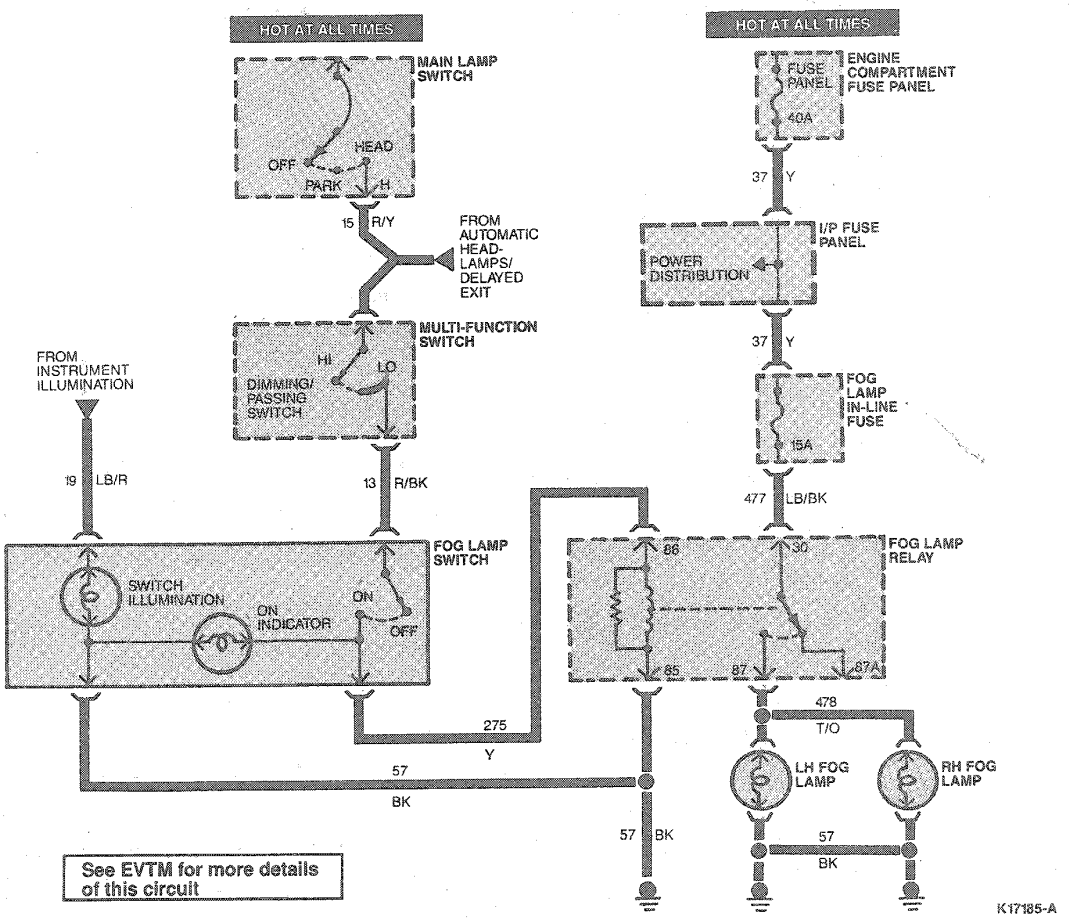
Taurus SHO

The fog lamp assembly is mounted to the front bumper fascia. The lamp circuit is controlled by a push button switch on the instrument panel. A fuse in the fuse panel protects the fog lamp circuit. Fog lamps can only be operated with the headlamp switch in the low beam position. The fog lamp circuit will not be completed with the headlamps in the high beam or off positions.

Switch illumination is controlled by the instrument panel dimmer rheostat.

DESCRIPTION AND OPERATION (Continued)

Taurus SHO



DIAGNOSIS AND TESTING

Before performing any lighting systems test, check that the battery is fully charged and all battery cable connections are clean and tight.

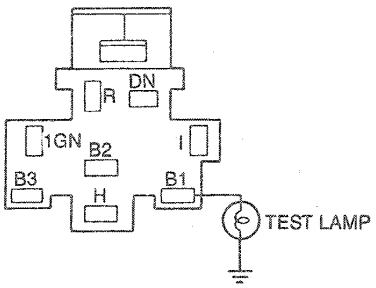
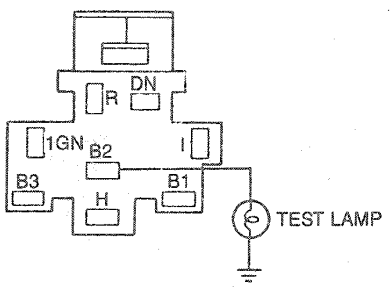
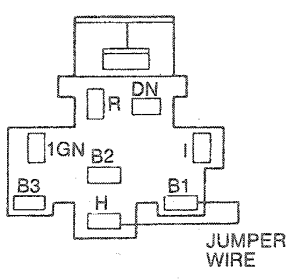
Visual inspection is an important part of the lighting system test. Check for wires with frayed or damaged insulation, loose connections and improper harness routing. Any problems found by visual inspection should be corrected before performing lighting system tests.

Use the following diagnosis charts to diagnose the headlamp system.

Headlamp Switch Connector Checkout

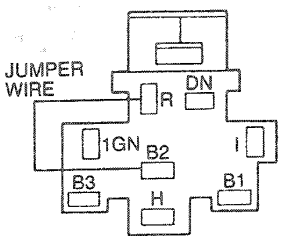
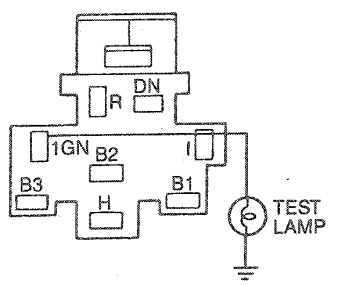
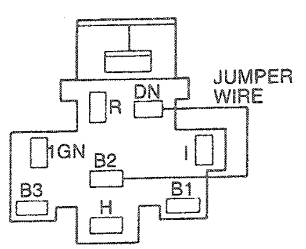
1. Replace burned out bulbs and fuses before proceeding.
2. A 12-volt test lamp and jumper wire will be required.
3. When necessary to trace and / or service the various circuits, refer to the respective vehicle wiring diagrams.
4. Terminal identification used on connector checkout procedure corresponds with actual identification on headlamp switch.
5. Perform checks in sequence as shown.

DIAGNOSIS AND TESTING (Continued)

OPERATION	RESULT
1 Connect a 12-volt test lamp between Terminal B1 and a good ground.  K16633-A	Test lamp should light. If not, trace circuit back to fuse link and service as necessary.
2 Connect a 12-volt test lamp between Terminal B2 and a good ground.  K16634-A	Test lamp should light. If not, trace circuit back to fuse panel and service as necessary.
3 Connect a jumper wire betwen Terminals B1 and H.  K16635-A	Headlamps should light. If not, trace Circuit H back to headlamps and service. If circuit is OK, check ground circuit from headlamps to ground.

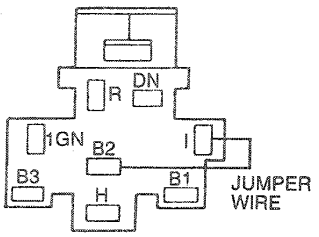
(Continued)

DIAGNOSIS AND TESTING (Continued)

OPERATION	RESULT
4 Connect a jumper wire between Terminals B2 and R.  K16636-A	**NOTE: The liquid crystal display will not come on during this test.** A. Parking lamps, rear lamps, and marker lamps should light. If not, trace Circuit R and service as necessary, If Circuit R is OK, check ground circuit from lamps to ground. B. Slowly rotate panel dimmer control. Instrument panel illumination lamps will vary from full bright to dim. If not, trace Circuit R to panel dimmer control and service as necessary.
5 Connect a 12-volt test lamp between Terminal IGN and a good ground.  K16637-A	With ignition switch in the RUN position, the test lamp should light. If not, trace circuit back to ignition switch and service as necessary.
6 Connect a jumper wire between Terminals B2 and DN.  K16638-A	**NOTE: No other instrument panel lamps will light during this test.** Liquid crystal display lamps only, should come on full bright. If cluster lamps do not light, trace Circuit DN back to lamps and service as necessary. If Circuit is OK, check ground circuit from lamps to ground.

(Continued)

DIAGNOSIS AND TESTING (Continued)

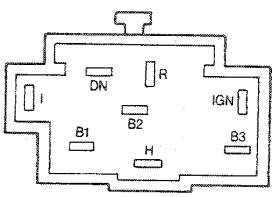
OPERATION	RESULT
7 Connect a jumper wire between Terminals B2 and I.  K16639-A	**NOTE: The liquid crystal displays will not light during this test.** Instrument panel illumination lamps only, should come on, full bright. If panel lamps do not light, trace I circuit back to lamps and service as necessary. If circuit is OK, check ground circuit from lamps to ground.

TK12574B

CONTINUITY TEST FOR HEADLAMP SWITCH

NOTE: A self-powered test lamp or ohmmeter will be required. Terminal identification used in test procedure corresponds to that on headlamp switch.

Switch Terminals	Switch Positions		
	Off	Park	Headlamp
B1 to H	No Cont.	No Cont.	Continuity
B2 to R	No Cont.	Continuity	Continuity
DN to IGN	Continuity	No Cont.	No Cont.
DN to I	No Cont.	Continuity	Continuity
B1 to B3	Continuity	Continuity	Continuity
All Other Terminals	No Cont.	No Cont.	No Cont.



CK7422-B

Headlamp Delay System

Quick Checks

1. Make sure photocell lens of photo amplifier unit is clean and unobstructed.
2. Make sure there is a clean, tight ground connection for Circuit 57 from the potentiometer control unit at headlamp switch.
3. Make sure that headlamps operate normally from the manual headlamp switch.
4. Remember, it is normal to have a slight delay between turning the switch on or off (or covering or uncovering the photo unit lens) and the response of the headlamps.

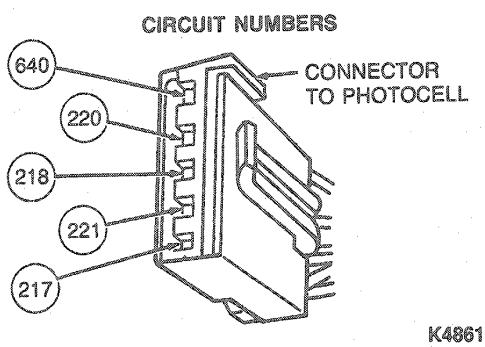
DIAGNOSIS AND TESTING (Continued)

5. Make sure that autolamp relay connector is properly attached to relay.

CONDITION	RESOLUTION
• The autolamp system will not operate. • The autolamp system will not delay long enough after the vehicle has been shut down.	Problems resulting from Operator Error are caused by failure to follow operating procedure or sequence requirements that have been designed into the AUTOLAMP (ON/OFF DELAY SYSTEM).
SYMPTOMS AND QUICK CHECKS OF THE ELECTRICAL SYSTEM CONDITIONS: • Headlamps do not turn on when it gets dark outside. • Headlamps turn on too late at evening. • Headlamps turn on too early at evening. • Headlamps turn off too late in the morning. • Headlamps turn off too early in the morning.	**QUICK CHECKS:** • Place autolamp control in the OFF position. Turn on headlamps using standard headlamp switch control. • If headlamps do not operate, check out and correct the standard headlamp circuit. • If headlamp operation is OK using the standard headlamp switch, check the autolamp fuse. If the fuse is OK, proceed with a complete checkout procedure. • Refer to autolamp amplifier adjustment.

CK4062-E

Autolamp Connector (On/Off Delay System)



K4861-E

CIRCUIT	WIRE COLOR CODE
640	R/Y (Ignition)
220	P/O (Autolamp Sensor Amplifier to Control Switch)
218	W/P (Autolamp Sensor Amplifier to Relay)
221	O/W (Headlamp Switch to Autolamp Sensor Amplifier)
217	DB/O (Autolamp Sensor Amplifier to Rheostat)

TK4861E

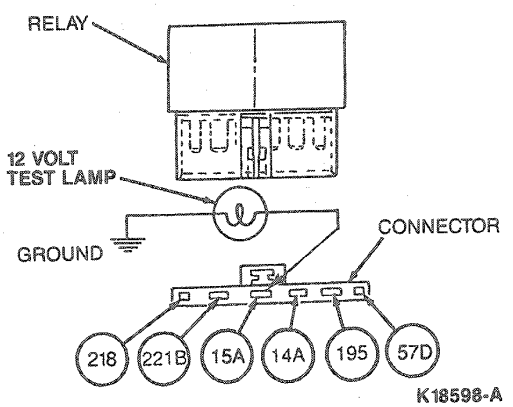
Autolamp (On/Off Delay System)

Test and Result

Connect a 12 volt test lamp between Circuit 15A, R/Y and a good ground.

With manual headlamp switch in PARK or full ON position, voltage should be measured at autolamp relay connector Circuit 15A, R/Y. This checks for correct wiring to tail lamp circuit.

If not OK, check continuity of Circuit 15A, R/Y between the autolamp relay connector and the common point with the rear lamp circuit.



K18598-A

Headlamp Circuit

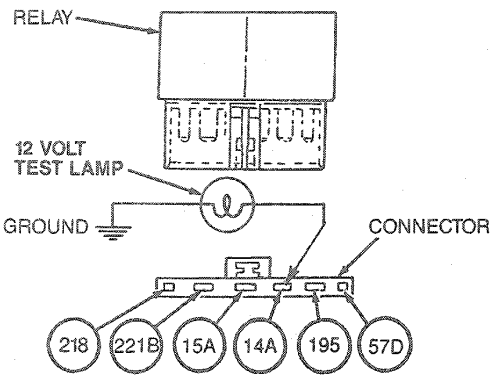
Test and Result

Connect a 12 volt test lamp between Circuit 14A, BR and a good ground.

With manual headlamp switch in full ON position, voltage should be measured at autolamp relay connector. This checks for correct wiring to headlamp Circuit 14A, BR.

DIAGNOSIS AND TESTING (Continued)

If not OK, check continuity of Circuit 14A, BR between the headlamp switch connector and the autolamp relay connector.



K18599-A

On-Off Control Switch

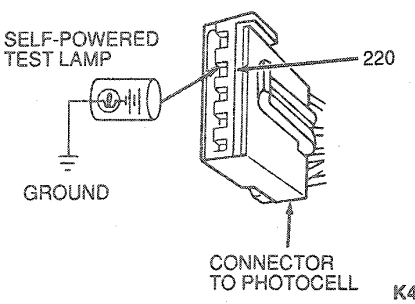
Test and Result

Connect a self-powered test lamp between Circuit 220, P/O and a good ground.

Check for system ground through driver delay control switch. Ground should be measured with autolamp switch in ON position. Circuit is open with switch in OFF position.

If not OK, perform Steps 1 and 2 of the potentiometer test.

If potentiometer tests OK. Check Circuit 220, P/O between the potentiometer connector and autolamp amplifier connector.



K4067-F

Delay Control Potentiometer

Test and Result

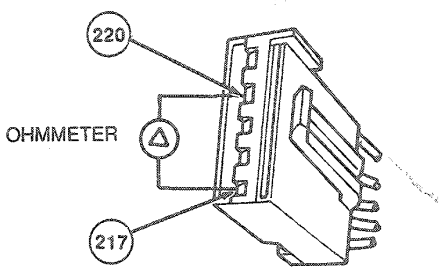
Connect an ohmmeter between Circuits 217, DB/O and 220, P/O.

Test for continuity to driver delay control with control in MAXIMUM delay position. Reading should be approximately 200,000 ohms.

If not OK, perform Step 3 of the potentiometer test. If potentiometer tests OK, check Circuit 217, DB/O between potentiometer connector and autolamp amplifier connector.

If potentiometer test not OK, replace the potentiometer assembly.

If all of the proceeding tests check out OK, and the autolamp (On/Off delay) system is malfunctioning. The autolamp amplifier is the cause of the problem. It will be necessary to replace the amplifier assembly.

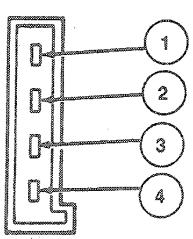


K4754-C

1. Using either a self-powered test lamp or an ohmmeter, check the autolamp ON/OFF switch function. Check continuity between points 2 and 4. Refer to chart.
2. Using an ohmmeter, check resistance through the range of the potentiometer. Resistance should gradually increase as the sliding switch is moved from OFF to MAX. Check resistance between points 3 and 4. Refer to chart for correct resistance values.
3. If either of the above tests is not OK, replace the potentiometer assembly.

FRONT VIEW

REAR VIEW



K12897-C

DIAGNOSIS AND TESTING (Continued)

Resistance	3 and 4	In Detent (Off Position) In Max. ON Position	2.5 Ohms to 4.5K Ohms 140K Ohms to 250K Ohms
On / Off	2 and 4	In Detent (OFF Position) Any Position Out of Detent	No Continuity Continuity—Zero Ohms

Taurus SHO

TROUBLESHOOTING FOG LAMP SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
• Fog Lamps Do Not Operate	• Worn, damaged or malfunctioning switch. • No voltage to fog lamps.	• If indicator light is also out, check fuse 7 and Circuit 477, LB / BK. • If indicator light works, check Circuit 478, T / O.
• Only One Fog Lamp Illuminates	• Open in circuit.	• Check bulb. • Check for voltage at inoperative fog lamp. • Check continuity of Circuit 57, BK to ground.
• Fog Lamp Indicator Does Not Operate, Fog Lamps Do Operate	• Poor ground circuit. • No voltage to lamp. • Bulb burned out.	• Check fog lamp switch Circuit 57, BK for continuity. • Check fuse 7 and check for voltage at switch connector Circuit 477, LB / BK. • Replace switch assembly.
• Fog Lamp Nomenclature Does Not Illuminate	• Poor ground circuit. • No voltage to lamp. • Lamp burned out.	• Check Circuit 57, BK at switch connector. • Check fuse 8 and check Circuit 19 LB / R for voltage at switch connector. • Replace switch.

DAYTIME RUNNING LAMP (DRL) — DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
With ignition in Run, parking brake fully released, and the headlamp switch Off or in the parking lamp positon:	• DRL module is not installed.	• Install module.
• High beams are not on at all	• Poor connection at module.	• Check and service as necessary.
• High beam indicator ON	• Open or shorted wiring.	• Check wiring to low beams.
• High beams are on at FULL intensity	• Damaged DRL module.	• Check for 12 volts to Pins 2 (Circuit 640, R / Y) and 4 (Circuit 296, W / P) of connector.
• Cornering lamps are on at reduced intensity when using turn signal	• Multi-function switch is in high beam position. This is expected for NON AutoLamp / AutoDim vehicles.	• Check parking brake switch, the wire to the switch should not be grounded. • Replace module. • None required.
With ignition OFF, parking brake fully released, and the headlamp switch Off or in the parking lamp position: • High beams are on at reduced intensity	• Damaged ignition switch. • Shorted wiring. • Damaged DRL module.	• Check the ignition switch and replace as necessary. • Check Pin 2 (Circuit 640, R / Y) on DRL connector. If 12 volts exists, service wiring. • Check Pin 2 (Circuit 640 R / Y) on DRL connector. If 12 volts does not exist, replace DRL module.

DIAGNOSIS AND TESTING (Continued)

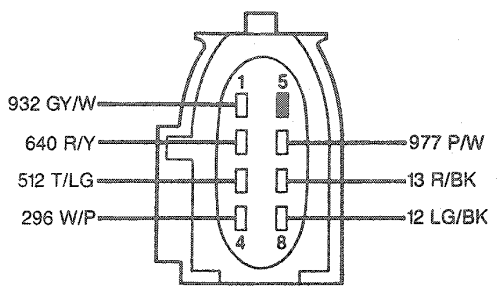
DAYTIME RUNNING LAMP (DRL) — DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
With ignition in RUN, parking brake applied, and the headlamp switch Off or in the parking lamp position: • High beams are on at reduced intensity	• Open wiring or poor ground. • Damaged parking brake switch. • Damaged DRL module.	• Check wiring and connections between DRL module and parking brake switch (Pin 6 Circuit 977, P/W). • Check switch and replace as necessary. • Replace as necessary.
With headlamp switch On: • High beams are on at reduced intensity	• Damaged headlamp switch. • Damaged DRL module.	• Remove module. If no headlamps, refer to Headlamp Switch Diagnosis. • Remove module. If headlamps are on, replace module.
With headlamps in the high beam position: • High beams on, but there is not an indicator in instrument panel	• Burned out bulb. • Open in wiring. • Damaged DRL module.	• Check and replace as necessary. • Check wiring and connections between DRL module and the indicator lamp. • Place a jumper wire between Pins 1 (Circuit 932, GY/W) and 8 (Circuit 12, LG/BK) in the DRL connector. If indicator turns On, replace the DRL module.

TK14672C

Daytime Running Lamp (DRL) Module Harness Connector

NOTE: Prior to beginning test, turn ignition off, apply parking brake and turn off all lamps (including autolamp and auto dim).



K18592-A

DAYTIME RUNNING LAMP (DRL) WIRING — DIAGNOSIS

Test Step	Voltage by Pin Number
1. Disconnect module.	Pin 4 should be 12 volts. Pins 1, 2, 3, 6, 7 and 8 should be 0 volts.
2. Start vehicle.	Pins 2, 3 and 4 should be 12 volts. Pins 1, 6, 7 and 8 should be 0 volts.
3. Release parking brake.	Pins 2, 3 and 4 should be 12 volts. Pins 1, 6, 7 and 8 should be 0 volts.
4. Turn on headlamps (LO beams).	Pins 2, 3, 4 and 7 should be 12 volts. Pins 1, 6 and 8 should be 0 volts.
5. Turn on headlamps (HI beams).	Pins 2, 3, 4 and 8 should be 12 volts. Pins 1, 6, and 7 should be 0 volts.
6. Connect Pins 1 and 8.	Pins 1, 2, 3, 4, and 8 should be 12 volts. The HI beam indicator should be illuminated. Pins 6 and 7 should be 0 volts.

(Continued)

DIAGNOSIS AND TESTING (Continued)

DAYTIME RUNNING LAMP (DRL) WIRING — DIAGNOSIS (Cont'd)

Test Step	Voltage by Pin Number
7. Connect Pins 3 and 6.	Pins 1, 2, 3, 4, 6 and 8 should be 12 volts. The HI beam indicator should be illuminated. Pin 7 should be 0 volts.
8. Apply parking brake.	Pins 1, 2, 4 and 8 should be 12 volts. The Hi beam indicator should be illuminated. Pins 3, 6 and 7 should be 0 volts.

TK14673B

HEADLAMP SWITCH DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Headlamps Do Not Work Park and Tail Lamps OK	• Open or shorted wiring. • Poor ground connections. • Damaged dimmer switch. • Damaged DRL relay. • Damaged headlamp switch.	• Check wiring and connections between power source and headlamp switch and between headlamp switch and lamps. Service as necessary. • Check and service as necessary. • Check dimmer switch, replace if necessary. • Refer to DRL diagnosis. • Check headlamp switch, replace if necessary.
• All Exterior Lamps Do Not Work	• Open or shorted wiring. • Damaged headlamp switch.	• Check wiring and connections between power source and headlamp switch and between headlamp switch and dash panel connector. • Check headlamp switch, replace if necessary.
• Headlamps Flash On and Off	• Shorted circuit. • Overloaded headlamp switch. • Damaged headlamp switch. • Damaged terminals.	• Check wiring and connections between headlamp switch and headlamps. • Check headlamp load. • Replace headlamp switch. • Service / replace damaged terminals.
• All Exterior Lamps Do Not Work Headlamps OK	• Blown Fuse. • Open wiring or poor ground. • Damaged headlamp switch.	• Replace fuse. • Check wiring and connections between power source and headlamp switch and between headlamp switch and lamps. Service as necessary. • Check headlamp switch, replace if necessary.
• Instrument Panel Lamps Do Not Work or Will Not Dim	• Blown fuse. • Open or shorted wiring. • Damaged headlamp switch.	• Replace fuse. • Check wiring between headlamp switch and lamps. • Check headlamp switch, replace if necessary.
• Dome Lamps Will Not Work	• Blown fuse. • Open or shorted wiring. • Damaged instrument panel dimmer switch.	• Replace fuse. • Check wiring and connections between headlamp switch and dome lamp and between headlamp switch and fuse panel. • Check headlamp switch, replace if necessary.

TK10723C

DIAGNOSIS AND TESTING (Continued)

ELECTRICAL — LAMPS

CONDITION	POSSIBLE SOURCE	ACTION
Headlamps		
• All Exterior Lamps Do Not Light	• Loose wiring connections. • Open wiring. • Damaged headlamp switch.	• Check and secure connection at headlamp switch and dash panel connector. • Check power to and from headlamp switch. Service as necessary. • Replace headlamp switch.
• One Headlamp Does Not Work	• Loose connection. • Bad ground. • Bulb burned out. • Corroded or damaged connector.	• Secure connection at headlamp. • Check ground at headlamp. • Replace bulb. • Replace as required.
• All Headlamps Out. Park and Tail Lamps OK	• Loose connections. • Damaged dimmer switch. • Damaged headlamp switch. • Open wiring or poor ground.	• Check and secure connections at dimmer switch and headlamp switch. • Check dimmer switch operation. Inspect for corroded connector. Replace if necessary. • Replace if necessary. • Service as necessary.
Tail Lamps		
• One Tail Lamp Out	• Bulb burned out. • Open wiring or poor ground. • Corroded bulb socket.	• Replace bulb. • Service as necessary. • Service or replace socket.
• All tail lamps, park lamps, and instrument panel lamps out—headlamps OK	• Blown fuse in fuse panel. • Loose connections. • Open wiring. • Damaged headlamp switch.	• Service as necessary. • Secure wiring connections where accessible. • Service as necessary. • Service headlamp switch.
Backup Lamps		
• Backup Lamps — One Does Not Function	• Blown fuse in fuse panel. • Bulb burned out. • Loose connections. • Open wiring.	• Replace fuse. • Replace bulb. • Tighten connectors. • Service as necessary.
• Both Lamps Do Not Function	• Fuse burned out. • Backup lamp switch out of adjustment. • Damaged backup lamp switch. • Loose connections. • Open wiring.	• Check a circuit that shares the same fuse. Replace fuse. • Adjust switch. • Replace switch. • Tighten connectors. • Service as required.
Parking Lamps		
• One Parking Lamp Does Not Light	• Loose connections. • Bulb burned out. • Open wiring or poor ground.	• Tighten connections. • Replace bulb. • Check for corroded socket. Service as required.
• Both Parking Lamps Do Not Light	• Loose connections. • Open wiring. • Bulbs burned out.	• Tighten connections. • Check for corroded socket. Service as required. • Replace bulbs.
Front Side Marker Lamps		
• Front Side Marker Lamp Does Not Light—Tail Lamps OK	• Loose connections. • Bulb burned out. • Open wiring.	• Tighten connections. • Replace bulb. • Check socket for corrosion and good ground. Service as required.
Stoplamps		

DIAGNOSIS AND TESTING (Continued)

ELECTRICAL — LAMPS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Stoplamps Do Not Light	• Fuse burned out. • Problem in turn signal circuit or switch. • Loose connections. • Stoplamp switch inoperative. • Open wiring.	• Replace fuse or CB. If device blows again, check for short circuit. • Service turn signal circuit or replace turn signal. • Secure connections at stoplamp switch. • Replace stoplamp switch. • Service as required.
• Hi-Mount Stoplamp Out	• Bulb burned out. • Open wiring or poor ground. • Corroded bulb socket.	• Replace bulb. • Service as necessary. • Service or replace socket.
Turn Signal Lamps		
• One or More Lamps Inoperative	• Bulb burned out. • Loose connections. • Open wiring. • Turn signal switch inoperative.	• Replace bulb. • Secure connections. • Service as required. • Replace turn signal switch.
• All Lamps Inoperative	• Fuse burned out. • Turn signal flasher inoperative. • Loose connections. • Open wiring. • Turn signal switch inoperative.	• Replace fuse or CB. If device blows again, check for short circuit. • Replace flasher. • Tighten connections. • Service as required. • Replace turn signal switch.
Hazard Flasher Lamps		
• Lamps Do Not Flash	• Turn signal operation improper. • Fuse burned out. • Hazard flasher inoperative. • Open wiring. • Hazard flasher switch inoperative.	• Service turn signal system. • Replace fuse. If fuse blows again, check for a short circuit. • Replace flasher. • Service as required. • Service or replace the turn signal switch assembly, which includes the hazard flasher switch.

TK18605A

REMOVAL AND INSTALLATION

Headlamp Assembly

WARNING: THE REPLACEABLE HALOGEN HEADLAMP BULB CONTAINS GAS UNDER PRESSURE. THE BULB MAY SHATTER IF THE GLASS ENVELOPE IS SCRATCHED OR THE BULB IS DROPPED. HANDLE BULB CAREFULLY. GRASP BULB ONLY BY ITS PLASTIC BASE. AVOID TOUCHING GLASS ENVELOPE. KEEP BULB OUT OF REACH OF CHILDREN.

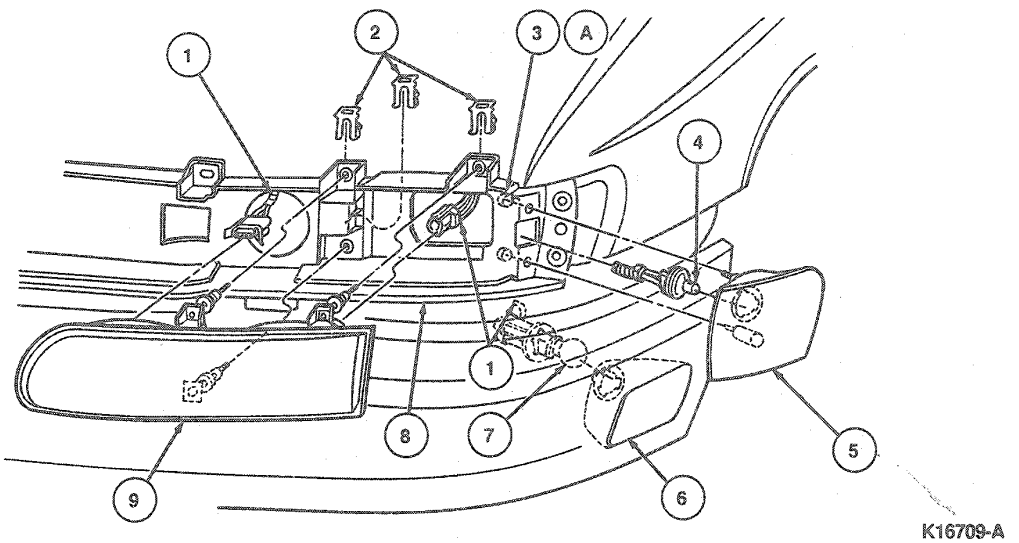
Removal and Installation

NOTE: The headlamp on this vehicle does not need replacement when the bulb burns out. Refer to Bulb Replacement, in this Section, for removal and installation of headlamp bulb.

1. Position headlamp switch in the OFF position.
2. Remove electrical connector from headlamp bulb by grasping wires firmly and snapping connector rearward.
3. Remove park / turn lamp bulb and connector.

   NOTE: Use snap ring pliers to spread the retainer.
4. Remove three retainers attaching headlamp to grille opening panel.
5. To install, reverse Removal procedure.
6. Aim headlamp as outlined.

REMOVAL AND INSTALLATION (Continued)



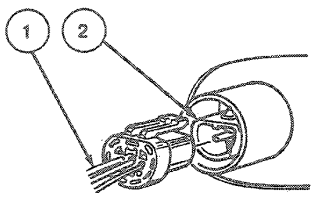
Item	Part Number	Description
1	14290	Wiring Assy
2	13N020	Headlamp Retainer (6 Req'd)
3A	N621906-S54	Nut (4 Req'd)
4	13465	Side Marker Bulb Assy (2 Req'd)
5	15A424 (RH) 15A425 (LH)	Front Side Marker Lamp Assy

(Continued)

Item	Part Number	Description
6	—	Cornering Lamp, Part of Bumper Assy
7	13465	Cornering Lamp Bulb Assy (2 Req'd)
8	—	Grille Opening Panel
9	13005 (RH) 13006 (LH)	Headlamp Assy
A		Tighten to 5.2-7.2 N·m (47-63 Lb-In)

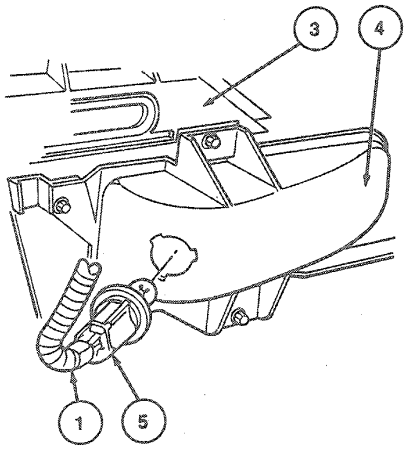
REMOVAL AND INSTALLATION (Continued)

Taurus Except SHO



VIEW SHOWING INSTALLATION OF WIRING ASSY TO HEADLAMP ASSY

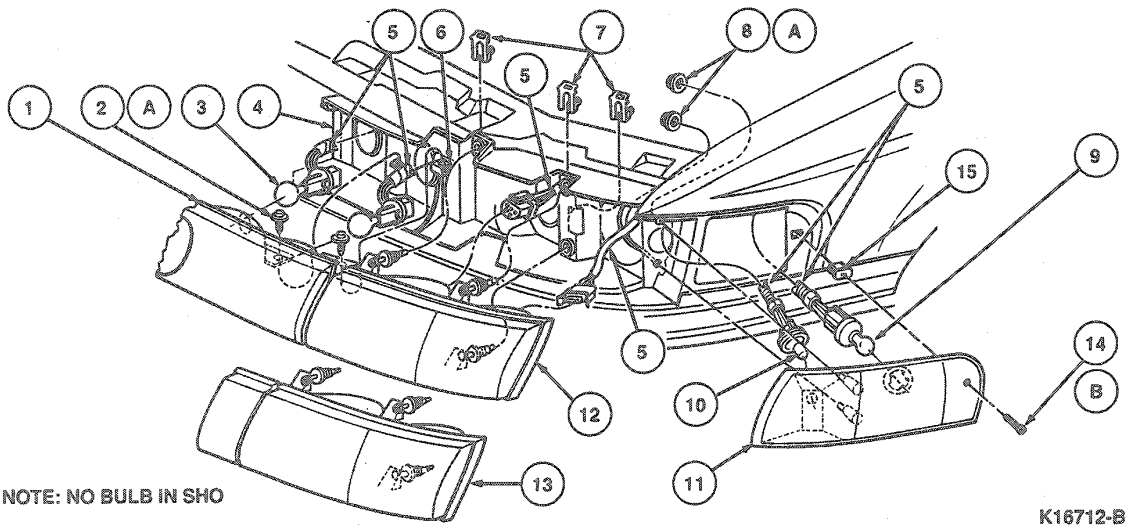
Item	Part Number	Description
1	14290	Wiring Assy
2	13005 (RH) 13006 (LH)	Headlamp Assy
3	—	Bumper Assy
4	—	Cornering Lamp Assy
5	—	Cornering Lamp Socket Assy



RH CORNERING LAMP SHOWN
LH TYPICAL

K12990-D

Sable and Taurus SHO



NOTE: NO BULB IN SHO

K16712-B

REMOVAL AND INSTALLATION (Continued)

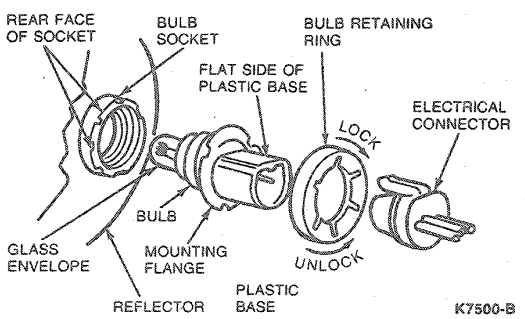
Item	Part Number	Description
1	13A278A	Lamp Assy Parking Inner (Sable)
2A	N606676-S55	Screw (4 Req'd)
3	13465A	Bulb Assy Parking (4 Req'd)
4	—	Grille Opening Panel Reinforcement
5	14290	Wiring Assy for Continuation
6	N623332-S100	Nut (4 Req'd) (Sable)
7	13N020-A	Retainer/Headlamp (6 Req'd)
8A	N621905-S54	Nut (4 Req'd)
9	13465A	Bulb Assy Cornering (2 Req'd)
10	13465A	Bulb Assy Cornering/Side Marker (2 Req'd)
11	15A201A (RH) 15A202A (LH)	Lamp Assy Cornering/Side Marker Lamp Assy Cornering/Side Marker
12	13005A (RH) 13006A (LH)	Headlamp Assy (Sable) Headlamp Assy (Sable)
13	13005B (RH) 13006B (LH)	Headlamp Assy (Taurus SHO) Headlamp Assy (Taurus SHO)
14B	55999-S45	Screw
15	N800503-S	Nut (2 Req'd)
A	—	Tighten to 5.2-7.2 N·m (47-63 Lb-In)
B	—	Tighten to 0.8-1.7 N·m (7-15 Lb-In)

(Continued)

Bulb Replacement, Headlamp

Removal

1. Make sure headlamp switch is in OFF position.
2. Lift hood and locate bulb installed in rear of headlamp body.
3. Remove electrical connector from bulb by grasping wires firmly and snapping connector rearward.
4. Remove bulb retaining ring by rotating counterclockwise (when viewed from rear) about one-eighth turn and sliding ring off plastic base. Keep ring as it may be used again to retain new bulb.
5. Carefully remove headlamp bulb from socket in reflector by gently pulling straight out of socket. Do not rotate bulb during removal.



Installation

1. With flat side of plastic bulb base facing upward, insert glass envelope of bulb into socket. Turn base slightly to left or right, if necessary, to align grooves in forward part of plastic base with corresponding locating tabs inside socket. When grooves are aligned, push bulb firmly into socket until mounting flange on base contacts rear face of socket.
2. Slip bulb retaining ring over rear of plastic base against mounting flange. Lock ring into socket by rotating ring clockwise. A stop will be felt when retaining ring is fully engaged.
3. Push electrical connector into rear of plastic base until it snaps and locks into position.

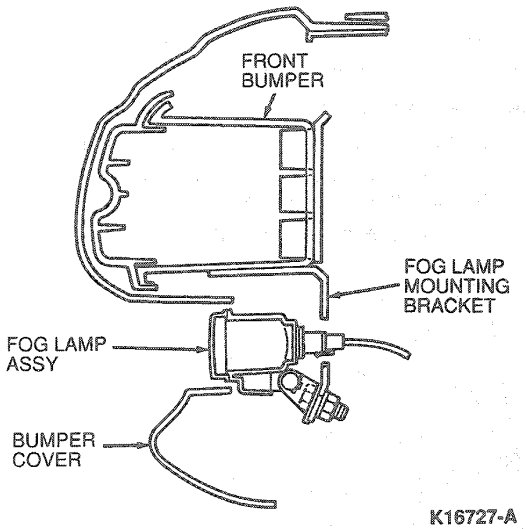
   NOTE: A properly aimed headlamp normally need not be re-aimed after installation of this bulb. A burned out bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed. Removal of a bulb for an extended period of time may allow contaminants (dust, moisture, smoke) to enter the headlamp body and affect the performance of the headlamp. When servicing the headlamp bulb, energize the bulb only while it is contained within the headlamp body.
4. Turn headlamps on and check for proper operation.

REMOVAL AND INSTALLATION (Continued)

Fog Lamp Assembly

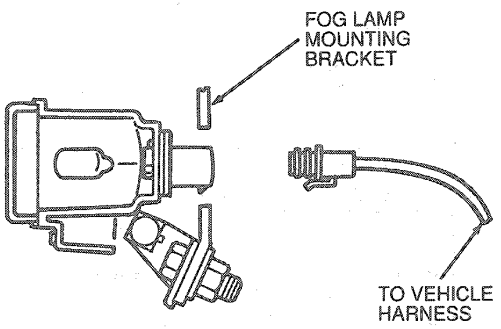
Taurus SHO

Removal and Installation



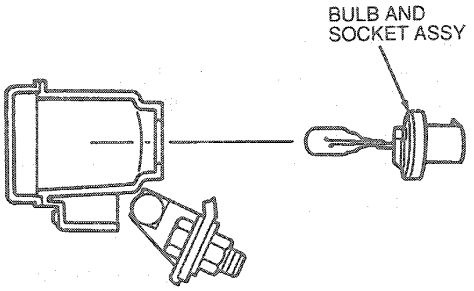
K16727-A

1. Disconnect electrical connector from fog lamp bulb.
2. From under the front fascia, remove nut retaining lamp to mounting bracket.



K16550-A

3. Slide fog lamp out of mounting bracket assembly.



K16726-A

4. If replacing fog lamp mounting bracket remove screw retaining bracket to bumper and retain bracket and screw for transfer of parts.
5. To install, reverse Removal procedure. Check fog lamp operation.

Bulb Assembly

Removal and Installation

NOTE: If performing bulb replacement only, it is not necessary to remove mounting bracket or lamp assembly.

1. Disconnect wiring connector from fog lamp bulb.
2. Rotate bulb and socket to remove from lamp.

   CAUTION: Grasp bulb and socket by its plastic base only. Do not touch glass part of bulb.

   NOTE: Socket assembly is indexed and can only be installed one way.
3. To install, reverse Removal procedure.

Lamps, Parking/Turn Signal Combination

The parking and turn signal lamps share the same dual filament bulb.

Removal and Installation

Bulb

1. Using access hole in radiator support, or from above, rotate bulb socket counterclockwise to disengage from lamp housing and remove bulb.
2. To install, reverse the removal procedure. Rotate bulb socket clockwise to engage in lamp housing.

Lamp, Parking/Turn Signal

The parking/turn signal lamp is part of the headlamp assembly. Refer to Headlamp for removal and installation.

REMOVAL AND INSTALLATION (Continued)

Side Marker Lamp, Front

Taurus

Removal and Installation

1. Remove two nuts and washers from retaining studs at back of lamp assembly.
2. Pull lamp outboard until clear of grille opening reinforcement.
3. Remove bulb socket by twisting counterclockwise and remove bulb by pulling.
4. To install, reverse Removal procedure.

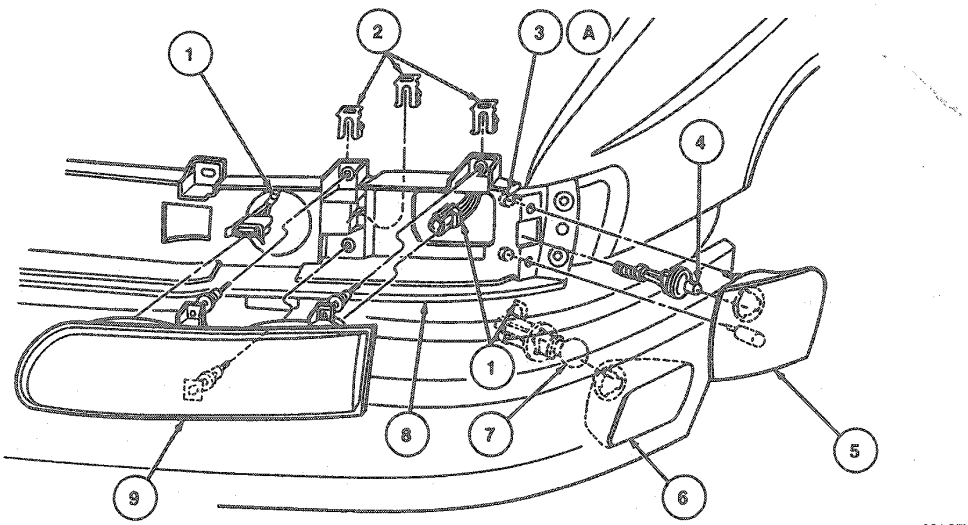
Headlamp Assembly, Auxiliary

Taurus SHO

NOTE: There is no bulb replacement possible in this assembly.

Removal and Installation

1. Remove headlamp assembly as outlined.
2. Remove two screws attaching auxiliary headlamp to headlamp assembly.
3. To install, reverse Removal procedure.



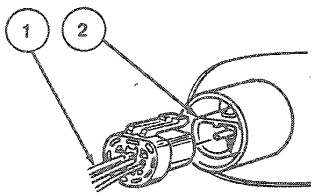
K16709-A

Item	Part Number	Description
1	14290	Wiring Assy
2	13N020	Headlamp Retainer (6 Req'd)
3A	N621906-S54	Nut (4 Req'd)
4	13465	Side Marker Bulb Assy (2 Req'd)
5	15A424 (RH) 15A425 (LH)	Front Side Marker Lamp Assy

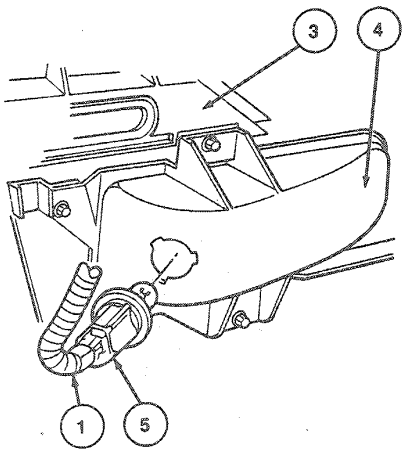
(Continued)

Item	Part Number	Description
6	—	Cornering Lamp, Part of Bumper Assy
7	13465	Cornering Lamp Bulb Assy (2 Req'd)
8	—	Grille Opening Panel
9	13005 (RH) 13006 (LH)	Headlamp Assy
A		Tighten to 5.2-7.2 N·m (47-63 Lb-In)

REMOVAL AND INSTALLATION (Continued)



VIEW SHOWING INSTALLATION OF WIRING ASSY TO HEADLAMP ASSY



RH CORNERING LAMP SHOWN
LH TYPICAL K12990-D

Item	Part Number	Description
1	14290	Wiring Assy
2	13005 (RH) 13006 (LH)	Headlamp Assy
3	—	Bumper Assy
4	—	Cornering Lamp Assy
5	—	Cornering Lamp Socket Assy

(Continued)

Cornering Lamp

Taurus Except SHO

Removal

1. Remove three screws retaining cornering lamp to bumper.
2. Remove bulb and socket assembly by twisting counterclockwise.

Installation

1. Install bulb, if removed and install socket assembly into cornering lamp by twisting clockwise.
2. Position cornering lamp assembly and install three retaining screws.

Sable and Taurus SHO

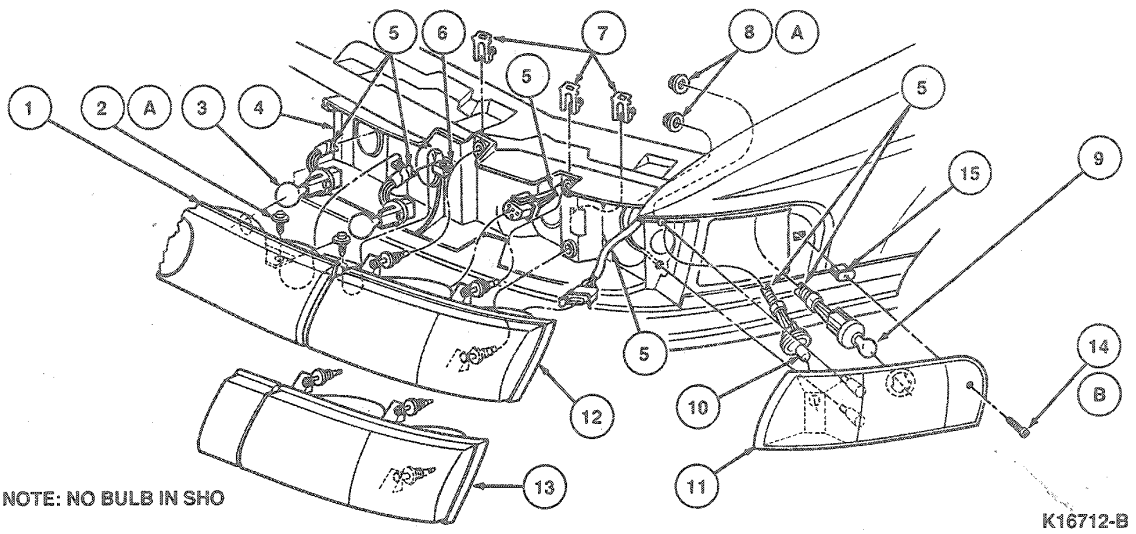
Removal

1. Remove two nuts and screw retaining cornering lamp assembly, and lift out.
2. Remove bulb and socket assembly by twisting counterclockwise.

Installation

1. Install bulb, if removed, and install socket into lamp assembly by twisting clockwise.
2. Position cornering lamp in place, and install two nuts and screw.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	13A278-A	Parking Lamp Assy (Inner) (Sable)
2A	N606676-S55	Screw (4 Req'd) (Sable)
3	13465A	Bulb Assy Parking (4 Req'd)
4	—	Grille Opening Panel Reinforcement
5	14290	Wiring Assy
6	N623332-S100	Nut (4 Req'd) (Sable)
7	13N020A	Retainer/Headlamp (4 Req'd)
8A	N621905-S54	Nut (4 Req'd)
9	13465A	Cornering Bulb Assy (2 Req'd)
10	13465A	Cornering/Side Marker Bulb Assy (2 Req'd)

(Continued)

Item	Part Number	Description
11	15A201A (RH) 15A202A (LH)	Cornering/Side Marker Lamp Assy Cornering/Side Marker Lamp Assy
12	13005A (RH) 13006A (LH)	Headlamp Assy (Sable) Headlamp Assy (Sable)
13	13005B (RH) 13006B (LH)	Headlamp Assy (Taurus SHO) Headlamp Assy (Taurus SHO)
14B	55999-S45	Screw
15	N800503-S	Nut (2 Req'd)
A		Tighten to 5.2-7.2 N·m (47-63 Lb-In)
B		Tighten to 0.8-1.7 N·m (7-15 Lb-In)

Lamp and Bulb Assembly Replacement, Rear

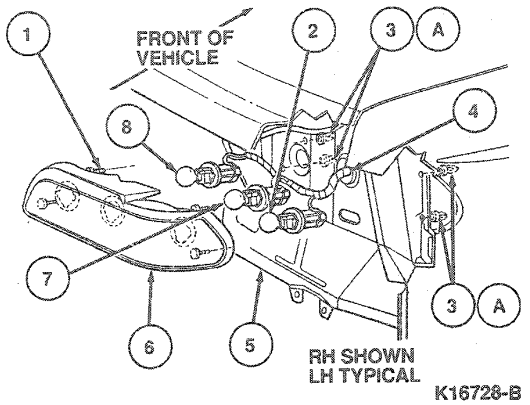
Sedan

Removal and Installation

1. From inside luggage compartment, remove lower back panel trim cover, if so equipped.
2. Remove nuts retaining lamp body to lower back panel and pull lamp away from vehicle.
3. Remove lamp sockets from lamp body.
4. To install, reverse Removal procedure.

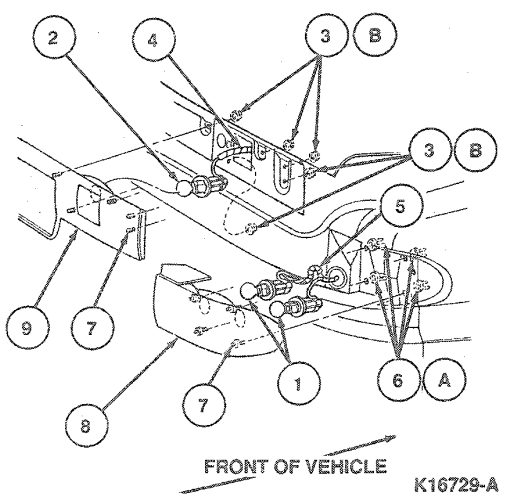
REMOVAL AND INSTALLATION (Continued)

Taurus



Item	Part Number	Description
1	—	Stud, Part of Lamp Assy
2	13465	Tail / Stop / Turn / Sidemarker Bulb Assy Lamp (2 Req'd)
3A	N806298-S	Nut
4	13407AA	Wiring Assy Rear Lamp
5	—	Lower Back Panel
6	13404A (RH) 13405A (LH)	Lamp Assy Lamp Assy
7	13465	Tail / Stop Bulb Assy (2 Req'd)
8	13465	Backup Bulb Assy (2 Req'd)
A		Tighten to 1.6-2.2 N·m (15-19 Lb-In)

Sable



Item	Part Number	Description
1	13465	Bulb Assy (4 Req'd)
2	13465	Bulb Assy (2 Req'd)
3B	N620375-S36	Nut (10 Req'd)
4	13412	Wire and Socket Assy
5	13407AA	Rear Lamp Wiring Assy
6A	N806298-S	Nut (8 Req'd)
7	—	Stud
8	13404A (RH) 13405A (LH)	Lamp Assy Lamp Assy
9	13B433A	Reflector Plate Assy
A		Tighten to 1.6-2.2 N·m (15-19 Lb-In)
B		Tighten 1.2-1.8 N·m (11-15 Lb-In)

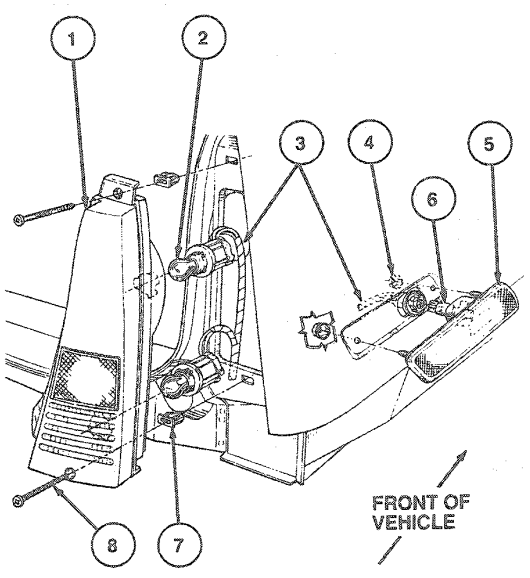
Wagon

Removal

1. Remove two screws retaining lamp assembly to quarter panel.
2. Remove lamp assembly.

Installation

1. Position new lamp assembly to quarter panel.
2. Install two screws retaining lamp assembly to quarter panel.



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	13404-A (RH) 13405-A (LH)	Rear Lamp Assy
2	13465-A	Bulb (2 Req'd Each Lamp Assy)
3	14405	Wiring Assy
4	N800335-S36M	Nut (2 Req'd Each Lamp Assy)
5	15A456-A (RH) 15A457-A (LH)	Side Marker Lamp Assy
6	13465-B	Bulb
7	N800503-S	Nut (2 Req'd Each Lamp Assy)
8	382886-S49	Screw (2 Req'd Each Lamp Assy)

Side Marker Lamp Replacement, Rear

Sedan

NOTE: Taurus and Sable side marker lamp assembly is an integral part of the rear lamp assembly.

Wagon

Refer to illustration under Lamp Assembly Replacement, Rear—Wagon.

Removal

1. Remove two nuts retaining lamp assembly to quarter panel.
2. Remove lamp assembly.

Installation

1. Position lamp assembly to quarter panel.
2. Install two nuts retaining lamp assembly to quarter panel.

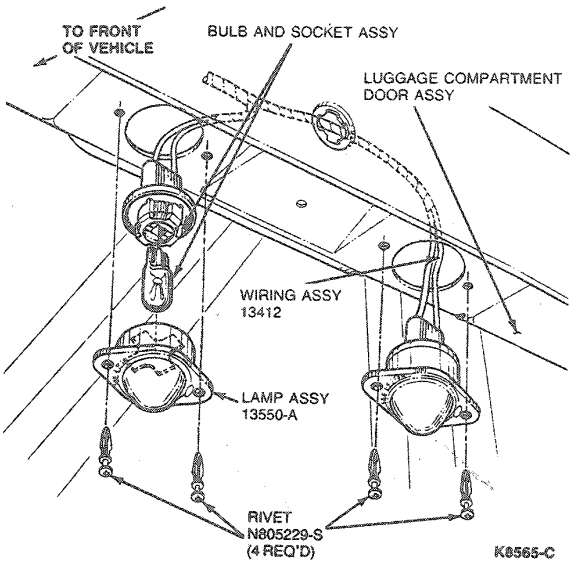
Lamp Replacement, License Plate

Removal and Installation

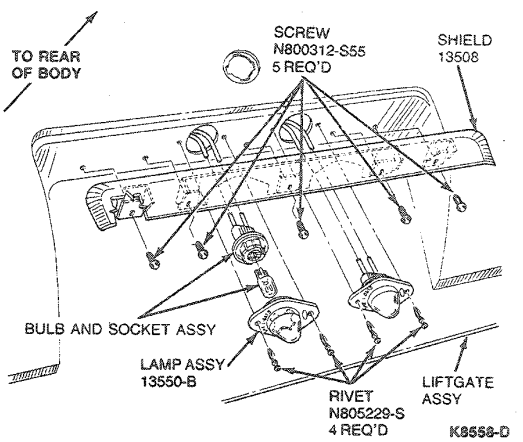
NOTE: Two license plate lamp bulbs are located under rear lip of luggage compartment doors.

To replace license plate lamp assembly or bulb, remove two lamp body plastic retaining rivets. Remove the lamp assembly. Remove socket and bulb from back of lamp body to replace bulb.

Sedan



Wagon



Bulb Replacement, Backup

Removal and Installation

NOTE: Backup lamps are part of rear lamp assembly.

To replace a bulb, perform the Rear Lamp Assembly Replacement procedure.

NOTE: Backup lamps are part of rear lamp assembly.

REMOVAL AND INSTALLATION (Continued)

High-Mount Stoplamp

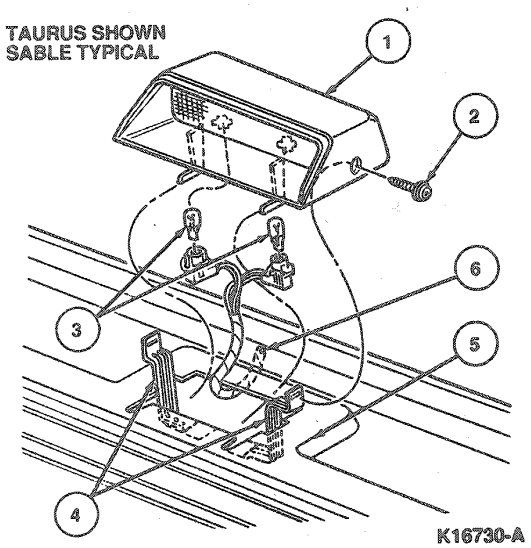
Sedan

Removal

1. Remove two screws which retain lamp assembly to retainer.
2. Remove lamp assembly.

Installation

1. Position lamp assembly to retainer.
2. Install two screws which retain lamp assembly to package tray.



Item	Part Number	Description
1	13A613	Rear High-Mount Lamp Assy
2	N610127-S2	Screw (2 Req'd)
3	13465A	Bulb (2 Req'd)
4	13A621A	Rear High-Mount Retainer Lamp
5	—	Package Tray Trim Panel
6	14405	Wiring Assy

(Continued)

Taurus SHO

The Taurus SHO is equipped with a high mounted stoplamp that is part of the deck lid spoiler. The lamp contains Light Emitting Diodes (LED) that are integral and **cannot** be changed like a light bulb. If the lamp is not (functioning) lighting properly the entire lamp assembly should be replaced.

Removal

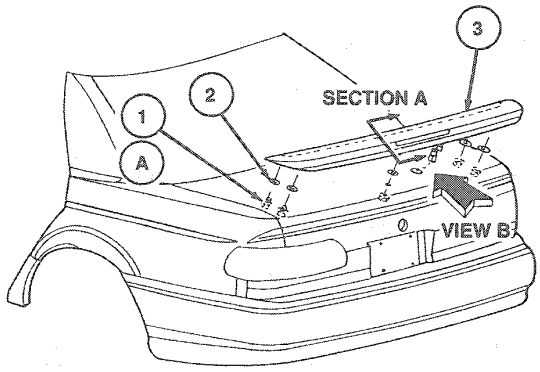
1. From inside the luggage compartment disconnect the wiring connector and remove the five nuts retaining the deck lid spoiler to the deck lid.
2. Lower the deck lid and carefully lift up the spoiler and pull the wiring grommet out of the deck lid and remove the spoiler from the vehicle.
3. Turn the spoiler over and lay it on a protective surface.
4. Remove the three nuts retaining the high mount stoplamp to the spoiler.
5. Remove the lamp from the spoiler.

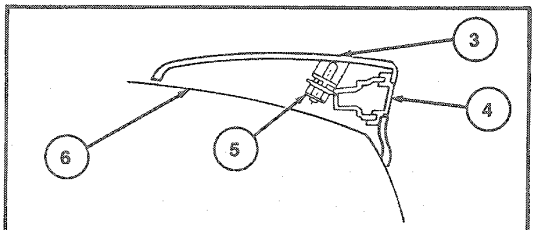
Installation

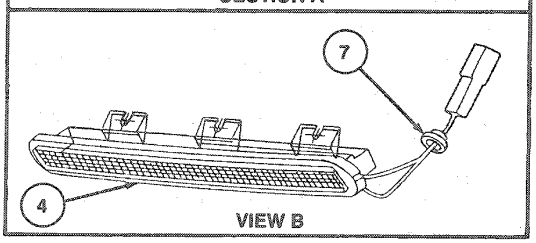
1. Position the lamp to the spoiler.
2. Install the three retaining nuts and tighten lamp securely to the spoiler.

   NOTE: Make sure the sealer washers are on the five studs before setting it on the deck lid.
3. Carefully position the spoiler over the deck lid, route the wiring through the hole in the deck lid and install the grommet.
4. Align the studs on the spoiler to the holes in the deck lid and set it in position.
5. Install the five spoiler retaining nuts and tighten to 8.0-9.0 N·m (71-80 lb-in).
6. Connect the wiring connector.
7. Depress brake pedal to make sure lamp comes on.

REMOVAL AND INSTALLATION (Continued)







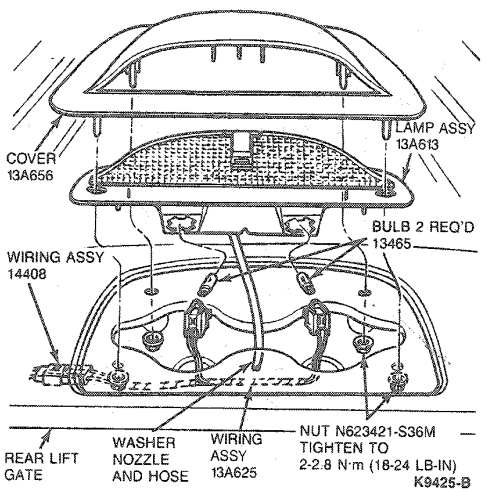
K18601-A

Item	Part Number	Description
1A	N621926-S36	Nut and Washer Assy (5 Req'd)
2	N805203-S	Washer Sealer (5 Req'd)
3	41602	Spoiler Assy
4	13A613	High Mount Stoplamp Assy
5	N612926-S36	Nut and Washer Assy (3 Req'd)
6	40110	Deck Lid Assy
7		Grommet, Part of 13A613 High Mount Stoplamp Assy

Wagon

Removal and Installation

1. Remove screws and trim cover, located at top of liftgate frame.
2. Remove the two plugs.
3. Remove four nuts retaining lamp trim cover.
4. Remove lamp assembly from mounting studs.
5. To install, reverse Removal procedure.



K9425-B

Lamp Assembly Replacement, Backup

Removal and Installation

The backup lamps are part of the rear lamp assembly. Refer to Lamp Assembly Replacement, Rear.

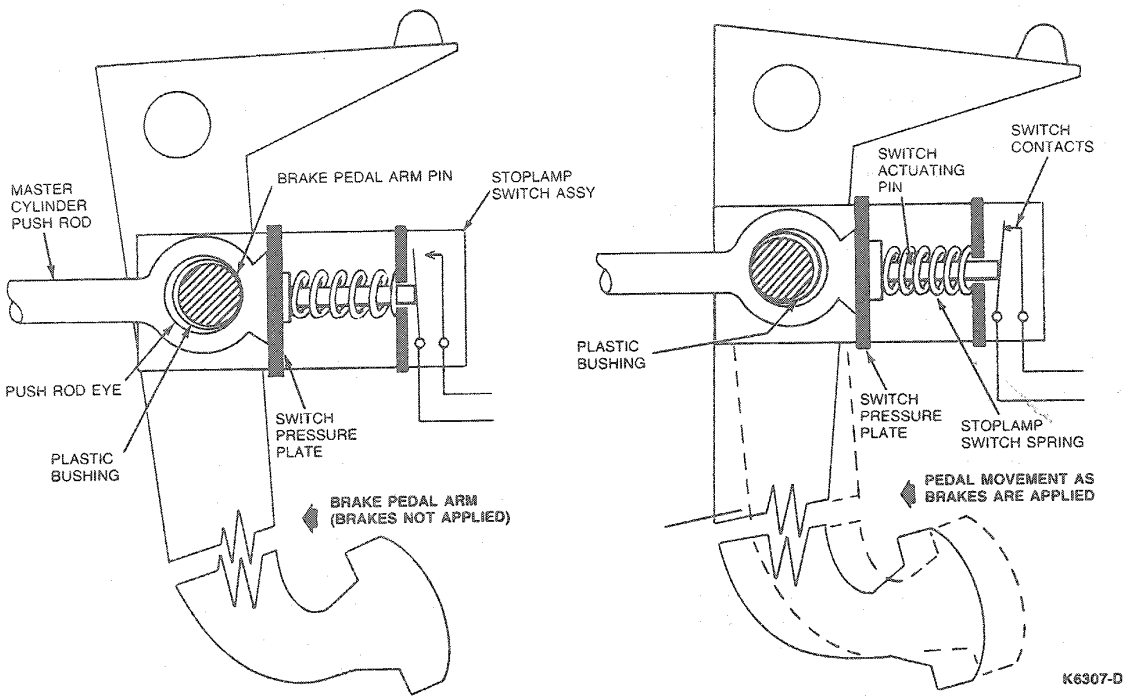
Stoplamp Switch, Mechanical

The mechanical stoplamp switch assembly is installed on the pin of the brake pedal arm, so that it straddles the master cylinder push rod. The switch assembly is slip fit on the pedal arm pin, and the switch pressure plate mates with the flat on the master cylinder push rod. The switch assembly travels with the pedal arm but maintains alignment with the flat on the push rod at all times.

The brake pedal arm pin and plastic bushing have a designed-in clearance with the eye of the master cylinder push rod. Because of this clearance, whenever the brake pedal is pushed forward, the stoplamp switch frame moves forward, pulling the whole assembly forward. During that movement, the push rod flat pushes the switch pressure plate and actuating pin rearward, closing the switch contacts. This completes the circuit to the stoplamps.

REMOVAL AND INSTALLATION (Continued)

When the brake pedal is released, the spring in the stoplamp switch returns the actuating pin to its normal position and the circuit to the stoplamp opens.



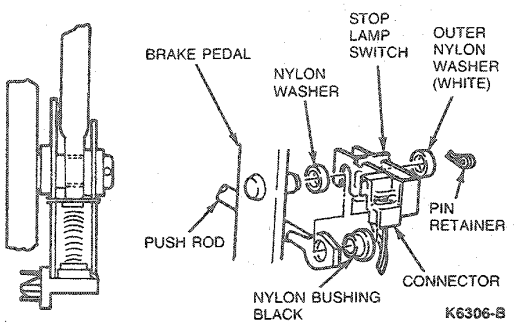
Removal

NOTE: Locking tab must be lifted before connector can be removed.

1. Disconnect the wire harness at connector from the switch.

   NOTE: Since the switch side plate nearest the brake pedal is slotted, it is not necessary to remove the brake master cylinder push rod black bushing and one white spacer washer nearest the pedal arm from the brake pedal pin.

2. Remove hairpin retainer and white nylon washer. Slide stoplamp switch and push rod away from pedal. Remove switch by sliding switch up / down.



Installation

1. Position switch so that U-shaped side is nearest pedal and directly over / under pin. The black bushing must be in position in push rod eyelet with washer face on side away from brake pedal arm.

   CAUTION: Do not substitute other types of pin retainers. Replace only with production hairpin retainer.

REMOVAL AND INSTALLATION (Continued)

2. Slide switch up / down trapping master cylinder push rod and black bushing between switch side plates. Push switch and push rod assembly firmly toward brake pedal arm. Assemble outside white plastic washer to pin. Install hairpin retainer to trap whole assembly.
3. Assemble wire harness connector to switch.

   NOTE: Stoplamp switch wire harness must have sufficient length to travel with switch during full stroke at pedal. If wire length is insufficient, reroute harness or service as required.
4. Check stoplamp switch for proper operation. Stoplamps should illuminate with less than 27N (6 lbs) applied to brake pedal at pad.

Headlamp Switch

Taurus / Sable

Removal and Installation

1. Pull off headlamp switch knob.
2. Remove retaining nut.
3. Remove instrument cluster finish panel. Refer to Section 01-12.
4. Remove two screws retaining headlamp switch to instrument panel. Pull switch out of instrument panel, disconnect electrical connector and remove switch.
5. To install, reverse Removal procedure.

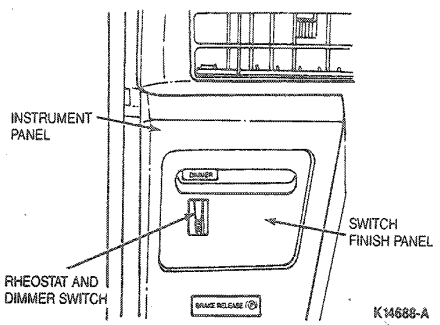
Headlamp Dimmer Switch

The headlamp dimmer switch is part of the multi-function switch. Refer to Section 11-05.

Rheostat and Dimmer Switch—Instrument Panel Illumination and Interior Lamps

Removal and Installation

1. Remove lower LH switch finish panel.
2. Disconnect electrical connector.
3. Remove two screws retaining rheostat switch to instrument panel and remove switch.
4. To install, reverse Removal procedure.



Photocell / Amplifier Assembly

Removal and Installation

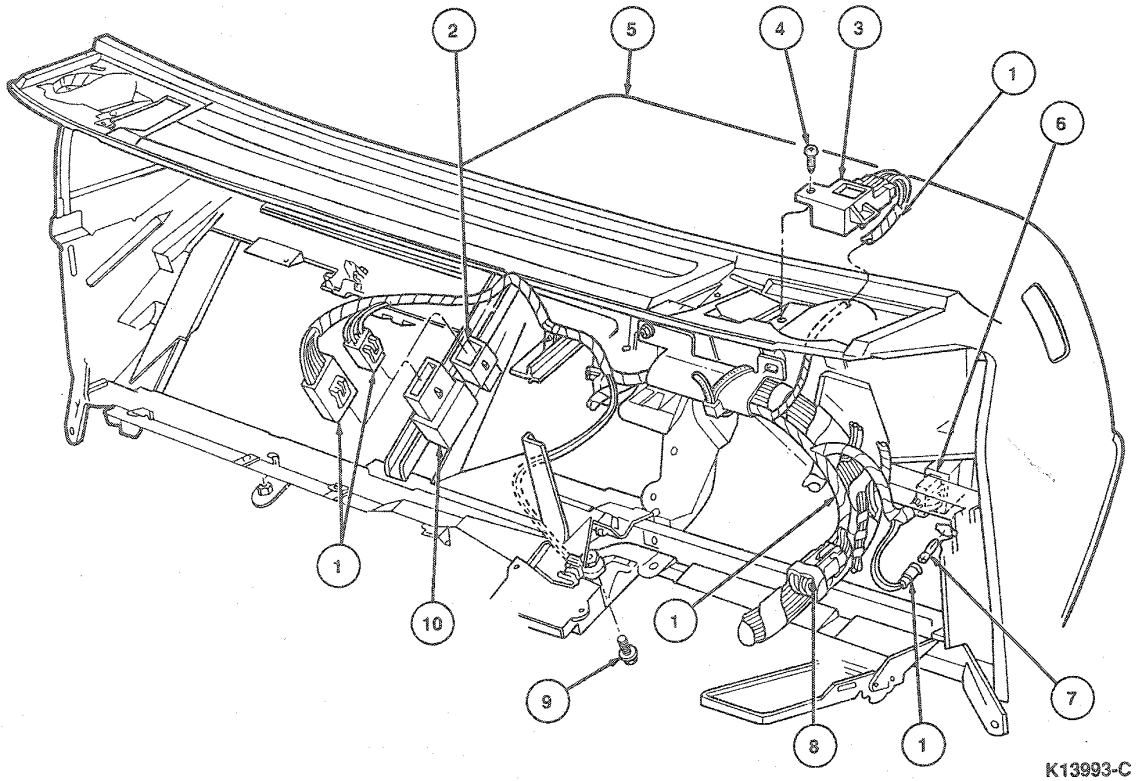
1. Remove RH speaker grille (snaps out).
2. Remove screw retaining photocell / amplifier to upper instrument panel.
3. Remove connector from photocell / amplifier assembly.
4. To install, reverse Removal procedure.

Potentiometer

Removal and Installation

1. Remove lower LH finish panel (snaps out).
2. Disconnect wiring connector from potentiometer..
3. Remove the two potentiometer retaining screws and remove potentiometer from finish panel.
4. To install, reverse Removal procedure.

REMOVAL AND INSTALLATION (Continued)



Item	Part Number	Description
1	13A090	Wiring Assy
2	14B193	Headlamp Dimmer Relay
3	14A597	Light Sensor Amplifier
4	N803876	Screw

(Continued)

Item	Part Number	Description
5	04320	Instrument Panel
6	13A024	Autolamp Switch
7	13465	Bulb Assy
8	14401	Wiring Assy
9	N801846-S36MG	Screw
10	14A672	Autolamp Relay

Headlamp Control Relay

Removal and Installation

1. Disconnect battery ground cable.
2. Remove relay from bracket mounted on instrument panel to the LH side of the glove compartment. Refer to the illustration following Potentiometer.
3. Disconnect the connector from relay.
4. To install, reverse Removal procedure.

Fog Lamp Switch

Removal

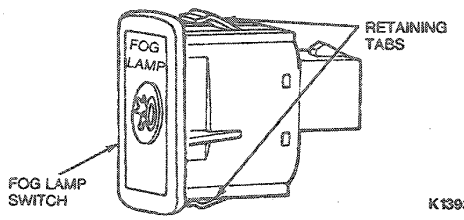
1. Using a flat-bladed tool, separate switch assembly from instrument panel.
2. Pull switch out from panel and disconnect electrical connector.

Installation

1. Connect electrical connector to switch.

REMOVAL AND INSTALLATION (Continued)

2. Push switch into instrument panel, seating tabs.



Module and Bracket Assembly, DRL

Removal and Installation

1. Remove screws retaining the front side of fender liner.
2. Disconnect DRL electrical connector.
3. Remove two nuts retaining module to the fender apron.
4. To install, reverse Removal procedure.

CLEANING

Clean headlamps by spraying with Ford Ultra-Clear Spray Glass Cleaner E4AZ-19C507-AA (ESR-M14P5-A) or equivalent and wiping with a soft, clean cloth.

ADJUSTMENTS

Headlamp Aim

Tools Required:

- Rotunda Headlamp Aiming Kit 107-00003
- Rotunda Headlamp Aiming Kit Adapter Kit 107-00011

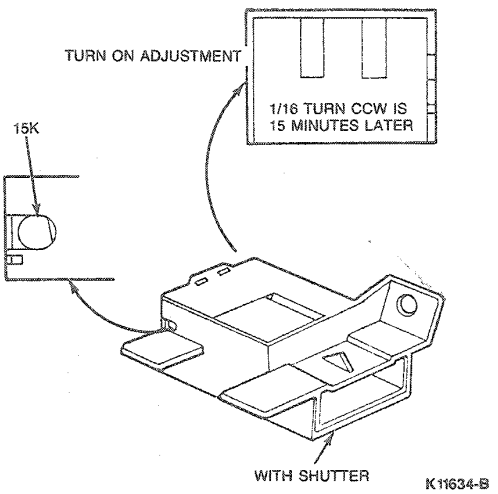
All headlamp adjustments should be made with a half full fuel tank, empty luggage compartment (except for the spare tire and jack equipment) and correct tire pressures.

To aim the aerodynamically styled headlamps, use Rotunda Headlamp Aiming Kit 107-00003 with Adapter Kit 107-00011 or equivalent. The equipment in the aiming kit can be calibrated to accommodate a slight floor slope, however, it should be reasonably flat. The adjusted adapter positions are moulded into the lower face of the headlamp lens.

Set and lock the adjustable adapter. Attach each adapter to its mechanical aimer, and aim headlamps using latest instructions in Rotunda Kit.

Photocell/Amplifier

If it is necessary to have the headlamps turned on earlier or later than that of the original manufacturer's calibration, the unit contains an adjustment screw and is marked with the direction and amount of rotation for the required adjustment.



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N-m	Lb-In
Rear Lamp Assembly Nuts	1.6-2.2	15-19
High-Mount Stoplamp Nuts (Wagon)	2-2.8	18-24
Lamp Assy Nuts/Screws-Front	5.2-7.2	47-63
Reflector Plate Nuts-Rear	1.2-1.8	11-15
Cornering Lamp Assy Screws	0.8-1.7	7-15
Fog Lamp Bracket-to-Bumper Nuts	19-27	14-20 (Lb-Ft)
Fog Lamp-to-Bracket Nut	13.5-16.5	10-12 (Lb-Ft)
Spoiler Retaining Nuts	8-9	71-80

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
107-00003	Headlamp Aiming Kit
107-00011	Aero-Dynamic Headlamp Aiming Adapters
107-00001	Digital Volt-Ohmmeter

SECTION 17-02 Lighting, Interior

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

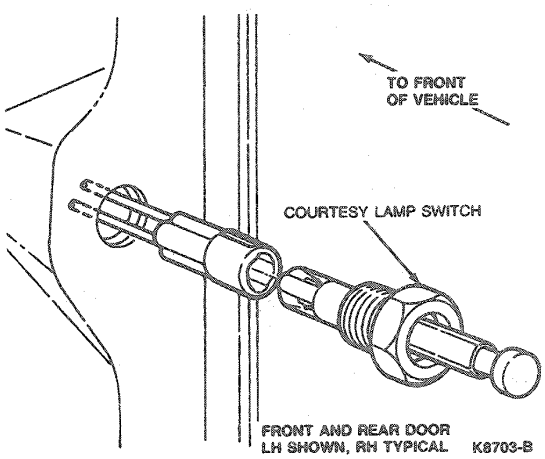
Lamp, Dome/Map Combination

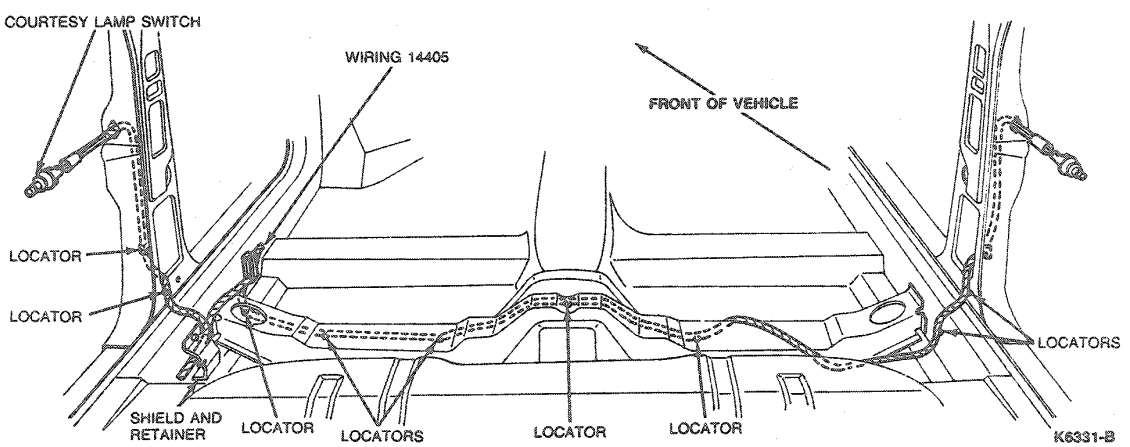
Without Moon Roof

The two map lamps are located on each side of the dome/map lamp housing. The map lamps are operated independently of the dome lamp by two switches located on lamp housing. The dome lamp is illuminated by turning the thumbwheel rheostat to the detented UP position. The dome lamp also illuminates when the doors are opened (switch in the pillar).

With Moon Roof

The roof console contains two lamps which function as door courtesy lamps when the doors are open. These lamps also function as map lamps when the doors are closed and the lamp switch is activated.





DESCRIPTION AND OPERATION (Continued)

Illuminated Entry

The illuminated entry system assists vehicle entry during the hours of darkness by illuminating the door lock cylinder, so it may be easily located for key insertion. The vehicle interior will also be illuminated by the courtesy lamps.

Activation of the system is accomplished by raising the outside door handle or by pressing a code button on the keyless entry system.

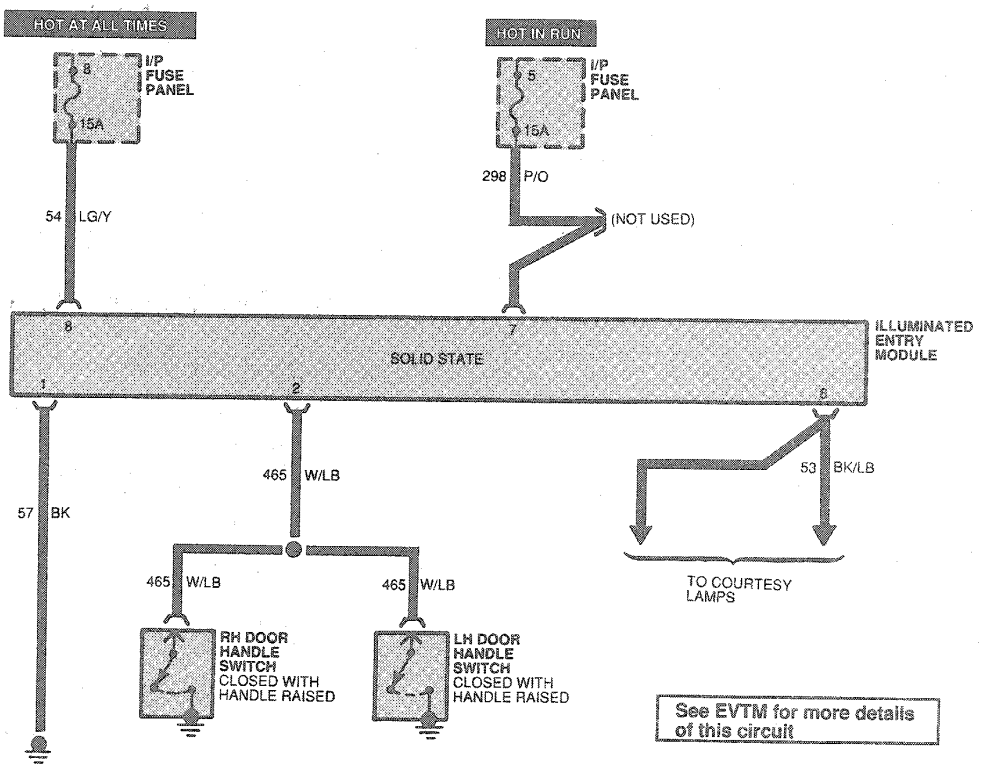
This action momentarily closes a switch mounted on the door latch mechanism, which completes the ground circuit of the electronic actuator module and switches the system on. The vehicle interior lamps turn on, and both front door lock cylinders are illuminated by a ring of light around the area where the key enters. This illumination will remain on for approximately 25 seconds, then automatically turn off. During this 25 second period, the system can be manually deactivated by turning the ignition switch to either RUN or ACC position.

The system will be activated every time the outside front door handles are operated, whether the vehicle is locked or not. Opening the doors from the inside of the vehicle will not activate the system.

If the outside door handle is held up indefinitely so that the latch switch is continuously closed, the system will operate as normal and turn off after 25 seconds. At the completion of this cycle, if the door handle is still in the raised position, the system will remain off, and it will be impossible to activate the system from the other front door handle until the raised handle is returned to its normal position. This function is built into the logic circuitry of the system to prevent battery discharge, should the outside door handle be intentionally propped up or become jammed in any way.

The system consists of four main components: electronic actuator module, illuminated door lock cylinder, door latch switch and wiring harness.

Refer to the following illustration for location of these components.



The module is located on the package tray of sedans and the LH quarter panel on wagons.

DESCRIPTION AND OPERATION (Continued)

Housed within the module is a printed circuit board, the logic circuitry, and a relay to switch battery positive voltage (B+) to the various circuits. The normal operating voltage is 9 to 16 volts, but the unit will withstand voltage up to 24 volts for a period of 15 minutes. It cannot be damaged by reverse voltages and is unaffected by vehicle transients.

The rectangular door lock cylinder is unique to this system. A light-emitting diode (LED) provides the light source to a lens system built into the cylinder. Normal operating voltage for the LED is 3 volts. A resistor built into the harness protects the LED. It is important when checking the lock cylinder illumination that 12 volts is applied only to the connector terminals. If the resistor is bypassed and 12 volts is applied to the wires between the resistor and the lock cylinder by the use of needle-type probes, the LED will be instantly destroyed. Correct polarity must be observed by applying B+ to the orange wire; otherwise the LED will not light. If leads are reversed, no damage will be done to the assembly.

The lens system built into the cylinder is made of clear polycarbonate with a highly polished lustrous surface and will retain its fine appearance if given proper care. A mild soap and water solution is all that is usually required to keep the lens in its original condition. Should the lens become contaminated with oil or grease, clean with approved solvents such as hexane, dry cleaning naphtha, kerosene or methanol. Since these solvents are flammable as well as toxic, use with adequate ventilation and away from open flames. Solvents such as benzene, gasoline, acetone, carbon tetrachloride or denatured alcohol should **never** be used, as they will soften and deteriorate the lens surface, causing a permanent loss in light output.

The latch switch is a grounding-type leaf switch and is retained to the latch mechanism by one screw.

DIAGNOSIS AND TESTING

PINPOINT TEST A: COURTESY LAMP(S) DOES NOT TURN ON WHEN ONE DOOR IS OPENED — OK WHEN OTHER DOORS ARE OPENED

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CHECK POWER		
	● Check for power at door switch. ● **Does power show at door switch?**	No ▶ Yes ▶	SERVICE power circuit back to fuse. GO to **A2.**
A2	CHECK THE DOOR SWITCH		
	● Check the door switch for proper operation. ● **Does door switch operate properly?**	No ▶ Yes ▶	REPLACE switch. SERVICE the circuit from the switch to the lamp(s).

TK5998B

PINPOINT TEST B: COURTESY LAMP(S) DOES NOT COME ON WHEN ROTATING THE DIMMER SWITCH UPWARD TO STOP

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	VERIFY CONDITION		
	● Check bulbs. ● **Are bulbs good?**	No ▶ Yes ▶	REPLACE bulb(s). GO to **B2.**
B2	CHECK OPERATION OF DOOR SWITCHES		
	● Check to see if courtesy lamps operate from door switches. ● **Are lamps activated by door switches?**	No ▶ Yes ▶	PERFORM Pinpoint Test C. GO to **B3.**
B3	CHECK FOR POWER		
	● Check for power at headlamp switch. ● **Does headlamp switch have power?**	No ▶ Yes ▶	SERVICE circuits back to fuse panel. GO to **B4.**
B4	CHECK FOR CONTINUITY		
	● Check continuity of headlamp switch. ● **Is there continuity?**	No ▶ Yes ▶	REPLACE headlamp switch. SERVICE circuits from switch to lamp(s).

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: COURTESY LAMP(S) DOES NOT COME ON WHEN ALL DOORS ARE OPEN

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	VERIFY CONDITION		
	• Check courtesy lamps. • **Is there more than one courtesy lamp?**	No ▶ Yes ▶	GO to C2. GO to C5.
C2	CHECK OPERATION OF FUSE CIRCUIT		
	• Check operation of other circuits that share the same fuse. • **Are all circuits from same fuse good?**	No ▶ Yes ▶	GO to C5. GO to C3.
C3	CHECK FOR POWER		
	• Check for power to bulb. • **Does bulb illuminate?**	No ▶ Yes ▶	SERVICE circuit between bulb and common point with other circuits. GO to C4.
C4	CHECK CONTINUITY		
	• Check continuity of bulb. • **Is there continuity?**	No ▶ Yes ▶	REPLACE bulb. SERVICE bulb ground.
C5	CHECK FUSE		
	• Check courtesy lamp fuse(s). • **Are courtesy lamp fuse(s) good?**	No ▶ Yes ▶	REPLACE fuse. If fuse blows again, CHECK for shorted circuit(s). GO to C6.
C6	CHECK FOR POWER		
	• Check for power through the fuse. • **Is there power to the fuse?**	No ▶ Yes ▶	SERVICE power feed circuit. SERVICE open circuit between fuse and common point in courtesy lamp power circuit(s).

TK6000C

NOTE: Before performing diagnosis, verify that the system is malfunctioning. The illuminated entry module will not turn off the courtesy lamp if the lamp is turned on by the headlamp rheostat or if the door is open. For diagnosis of Illuminated Entry on vehicles with Keyless Entry, refer to Section 01-14B.

Quick Checks

1. Verify that courtesy lamp circuit is working properly. If not, check fuse.
2. With ignition switch in ACC or RUN position, verify that other systems which share same accessory fuse are functional. If not, check fuse.
3. If any above systems are not working properly, service inoperative circuit and check operation of illuminated entry system before proceeding with the following complete check-out procedure.

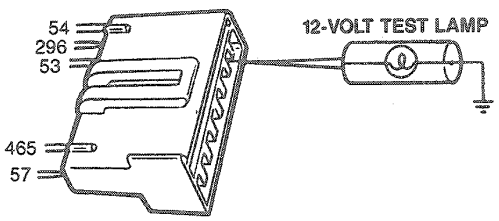
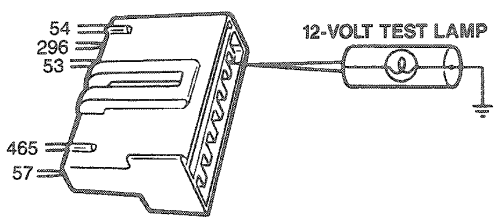
Check-Out Procedure

1. Terminal numbers referred to in the following procedure relate to illuminated entry actuator connector. The terminals are numbered from left to right (when the connector is held as shown).
2. Any malfunctions diagnosed in Steps 4 and 5 in the charts could be located in either front door.
3. When necessary to trace and/or service various circuits, refer to vehicle wiring diagrams in Group 18.
4. Check system fuses (two) before proceeding.

After Testing

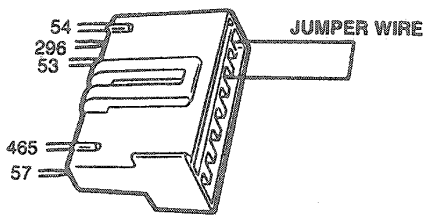
If all of the following tests check out OK and the illuminated entry system is still malfunctioning, the actuator assembly is the cause of the concern and must be replaced.

DIAGNOSIS AND TESTING (Continued)

OPERATION	RESULT
Step 1 — Connect a 12-volt test lamp between terminal No. 8 and a good ground.  K15987-A	Whether ignition is on or off, the test lamp should glow. If not, trace Circuit 54 (light green with yellow stripe) back to fuse panel and service.
Step 2 — Connect a 12-volt test lamp between terminal No. 7 and a good ground.  K15988-A	The test lamp should glow when the ignition switch is in ACC or RUN and go out when the switch is turned to OFF or LOCK. If not, trace Circuit 296 (white with purple stripe) back to fuse panel and service.

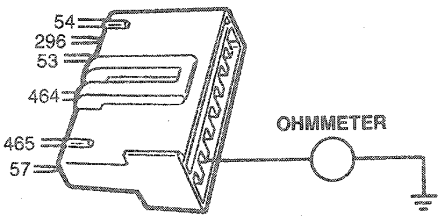
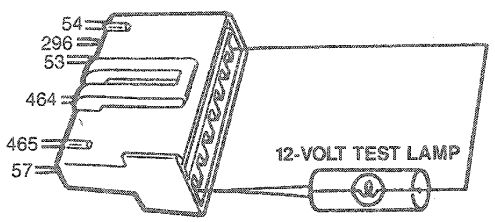
(Continued)

DIAGNOSIS AND TESTING (Continued)

OPERATION	RESULT
Step 3 — Connect a jumper wire between terminals No. 6 and 8.  K15989-A	With vehicle doors closed, interior courtesy and door lock cylinder lamps should be on. If not, trace Circuit 53 (black with light blue stripe) and service.

(Continued)

DIAGNOSIS AND TESTING (Continued)

OPERATION	RESULT
Step 4 — Connect an ohmmeter between terminal No. 2 and a good ground.  K15991-A	The ohmmeter should show over 10,000 ohms (open). Then, operate each outside door handle in turn, ohmmeter should show not more than 50 ohms (closed). If either readings are incorrect, then trace Circuit 465 (white with light blue stripe) back to latch switches and service. **NOTE: When operating door handle, hold in raised position.**
Step 5 — Connect a 12-volt test lamp between terminal No. 1 and terminal No. 8.  K15992-A	The test lamp should glow. If not, trace Circuit 57 (black) back to ground and service.

REMOVAL AND INSTALLATION

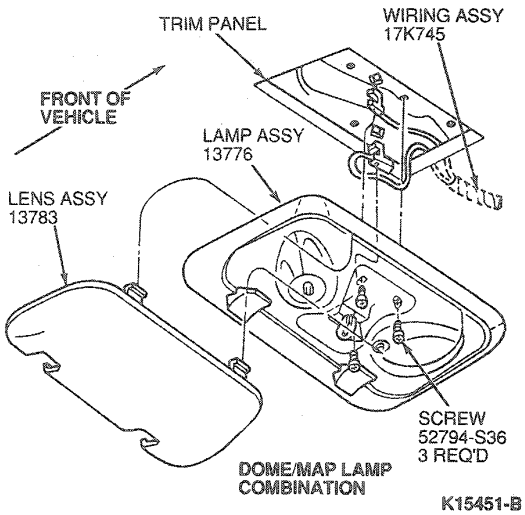
Lamp, Dome/Map Combination

Without Moon Roof

To replace the dome lamp bulb, carefully squeeze lens inward to release locking tabs and remove the lens from the lamp body. Pull the wedge base bulb directly out of its socket.

REMOVAL AND INSTALLATION (Continued)

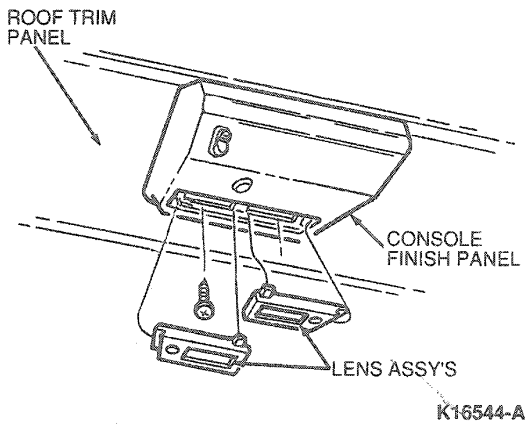
To replace the map lamp bulbs, remove the lens and three screws that retain the lamp assembly to its mounting surface. Lower the lamp assembly and replace the bulbs from rear of lamp using a thin-bladed screwdriver to remove the bulb(s).



With Moon Roof

To replace the bulb(s) remove the map lens assembly by holding lens in, switch depressed position. Use a thin-bladed screwdriver and carefully pry out lens assembly at center gap between two lens assemblies. Remove bulb from socket.

To remove lamp assembly, carefully pry out center section of lamp and remove two retaining screws. Disconnect electrical connector.

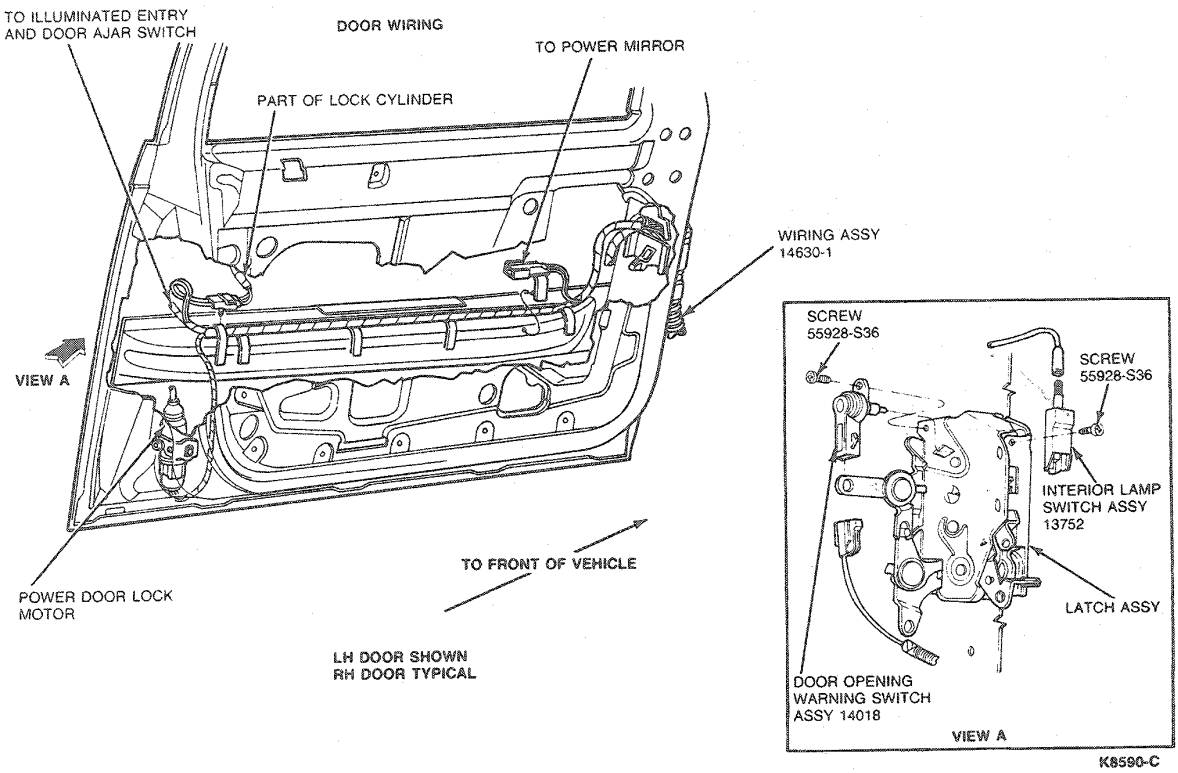


Install the map lamp lens assembly by engaging lens retaining tab at outboard edge of opening and snapping center edge of lens into console.

REMOVAL AND INSTALLATION (Continued)

Illuminated Entry

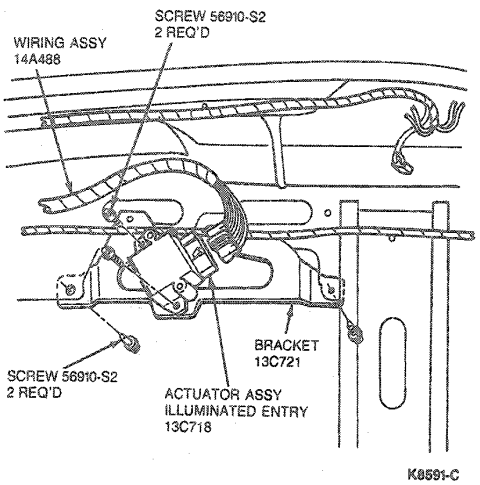
Refer to the illustrations for Removal and Installation and electrical disconnect points.



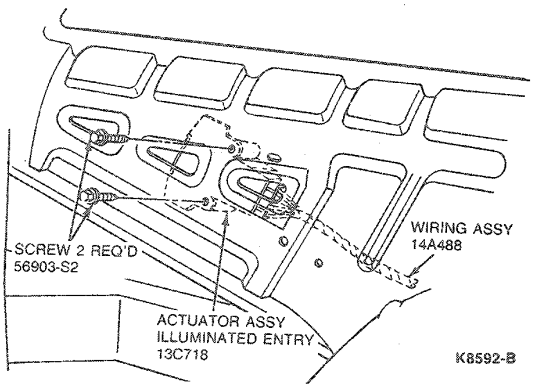
REMOVAL AND INSTALLATION (Continued)

Actuator Module

Sedan



Wagon



Removal

1. Disconnect battery ground cable.
2. Open door.
3. Using a deep well socket, remove switch from door pillar.

   NOTE: Hold connector so it cannot slip back into A-pillar.
4. Disengage electrical connector.

Installation

1. Engage electrical connector to switch and twist wiring and switch four turns counterclockwise.
2. Install switch in door pillar. Tighten to 14-19 N·m (11-14 lb-ft).
3. Connect battery ground cable.
4. Check operation of switch.

Lamp, Transmission Control Selector

Floor Mounted

Removal and Installation

1. Remove four retaining screws from selector lever cover and dial indicator on floor.
2. Lift lever cover assembly and replace bulb.
3. Position cover to floor. Install four cover retaining screws.

Console Mounted

Removal and Installation

1. Remove finish panel from the console.
2. Remove quadrant bezel.
3. Position selector lever in first position (LOW) and remove lamp socket and bulb from its retainer.
4. Replace bulb and install socket in retainer.
5. Install quadrant bezel.
6. Position finish panel and install retaining screws.

Lamp Switch, Courtesy/Dome

Refer to the illustrations under Description and Operation.

CAUTION: Retention of courtesy lamp switch to the wiring connector is by one of three tabs positioned 120 degrees apart on the switch. If, when the switch is disconnected from the wiring connector, the engaged locking tab breaks off, the switch must be rotated 120 degrees to engage a new tab. When all three tabs have been broken, replace the switch.

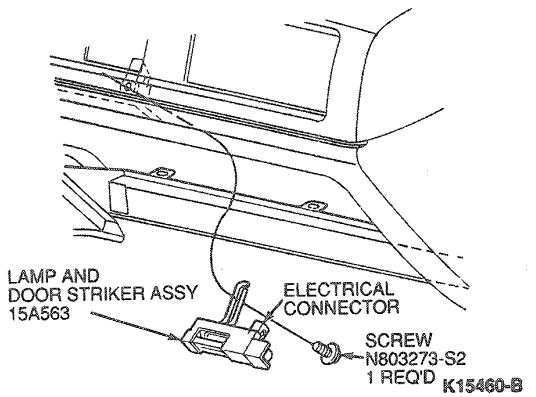
Lamp Switch, Glove Compartment

Removal and Installation

1. Remove one screw retaining lamp assembly and door striker.
2. Disconnect electrical connector.

REMOVAL AND INSTALLATION (Continued)

3. To install, reverse Removal procedure. Check and adjust door margin and fit as needed.



Lamp, Front Door

Bulb Replacement

Removal and Installation

1. Use thin, flat-bladed screwdriver in notch at front edge of lens to remove lens.
2. Remove and install bulb.
3. To install, position rear edge of lens under reflector and snap into position.

Lamp, Cargo

Bulb Replacement

Wagon

Removal

1. Use thin, flat-bladed screwdriver in notch between lens and lamp body to disengage lens from lamp body.
2. Remove and install bulb.

Installation

Position lens into three slots in lamp body and push in until it snaps in place.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Courtesy Lamp Switch	14-19	11-14

GROUP

ELECTRICAL DISTRIBUTION 18

(1000)

SECTION 18-01 Wiring and Circuit Protection

VEHICLE APPLICATION

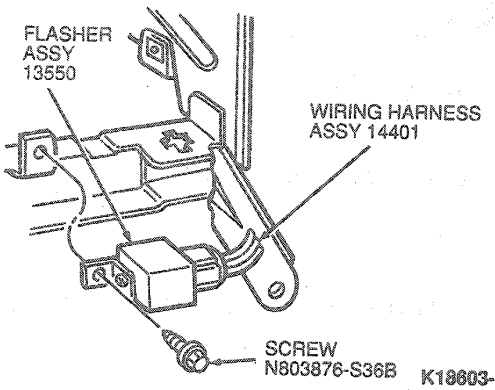
Taurus / Sable.

DESCRIPTION AND OPERATION

Fuses and Circuit Breakers

Flasher Location

An electronic combination turn signal and emergency warning flasher is secured to the lower LH instrument panel reinforcement by one screw (above fuse panel).

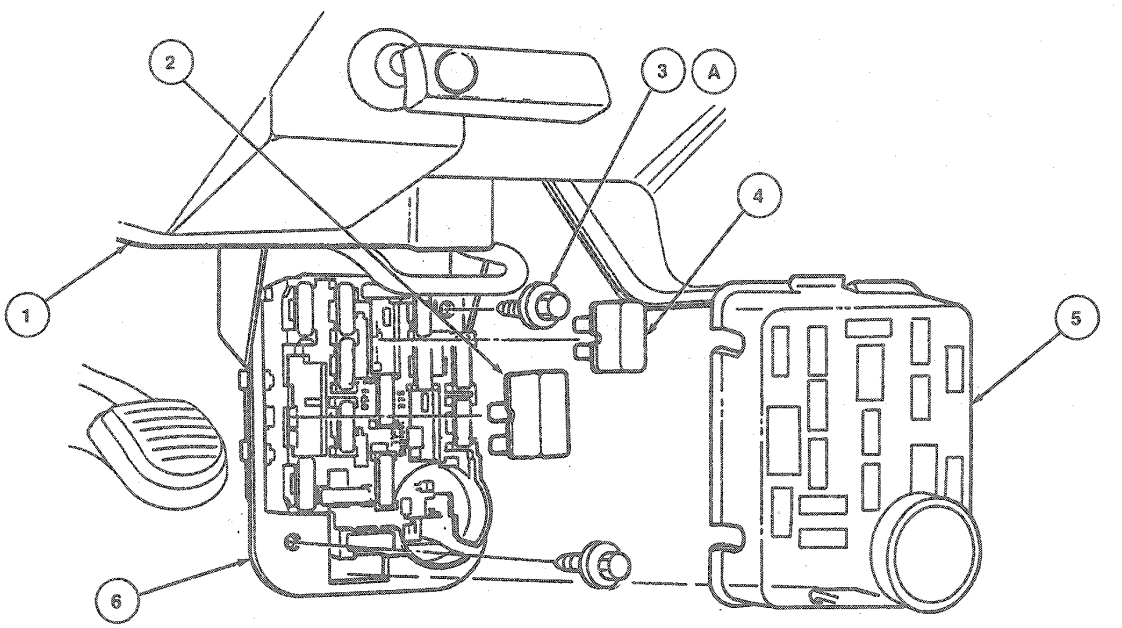


Location and Values

A combination fuse and circuit breaker panel contains most of the fuses and circuit breakers used in the system. Refer to the panel illustration shown under Fuse Panel Location.

Fuse Panel Location

The fuse panel is located to the left of the steering column, and is hung from the instrument panel. To expose the fuse panel, pull the release bar up with right hand and pull panel down with left hand and remove cover.



Item	Part Number	Description
1	4320	Instrument Panel
2	14526C	Windshield Wiper Circuit Breaker
3A	N803875-S2	Screw (2 Req'd)

(Continued)

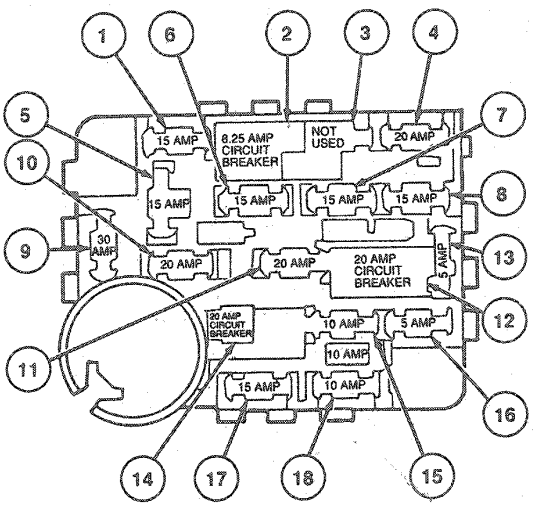
Item	Part Number	Description
4	14526B	Horn / Cigar Lighter Circuit Breaker
5	14A075	Cover Panel
6	—	Fuse Panel, Part of 14401 Wiring Harness Assy
A		Tighten to 2.1-2.9 N·m (19-26 Lb-In)

DESCRIPTION AND OPERATION (Continued)

The fuses are color-coded by amp rating.

Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

TK6459A



K8692-F

Cavity Number	Fuse Rating	Circuit Protected
1	15 Amp	High-Mount Stoplamp, Stoplamps, Front and Rear Turn Signals, Instrument Panel Turn Indicator Lamps
2	8.25 Amp Circuit Breaker	Windshield Wiper Motor, Intermittent Wiper Module, Windshield Washer Motor
3		Not Used
4	20 Amp	Front Park, Side Marker and Tail Lamps, "Headlamps On" Warning Buzzer / Chime, Front Laser Lamp (Sable)
5	15 Amp	Electronic Cluster, Rear / Window Defroster Switch, Electronic Flasher, Backup Lamps, Heated Oxygen Sensor (HO2S), Illuminated / Keyless Entry Module, Brake Interlock Solenoid
6	15 Amp	Rear Window Wiper and Washer Motors (Wagons), Diagnostic Warning Lamp Module, Warning Chime, Headlamp Switch Illumination (Sable), Clock Illumination, Radio Illumination, EATC Control Illumination, Power Window Relay, Speed Control Amplifier
7	15 Amp	Air Bag Module
8	15 Amp	Clock, Radio Memory, Glove Compartment Lamp, Luggage Compartment Lamp, Instrument Panel Courtesy Lamps, Interior Lamps, Illuminated / Keyless Entry Module, Power Mirrors
9	30 Amp	Blower Motor
10	20 Amp	Flash-to-Pass, High Beam Headlamps and Indicator Lamp
11	20 Amp	Radio, Premium Sound Amplifier, Power Antenna Motor, Redundant Radio Switch
12	20 Amp Circuit Breaker	Cigar Lighters, Horn Relay, Horns
13	5 Amp	Cluster Illumination, Radio Display, Ash Receptacle Illumination, EATC Control Display, Rear Window Defroster Switch Illumination, Rear Wiper Switch Illumination, Headlamp Switch Illumination, Clock Display, PRNDL Illumination
14	—	Not Used
15	10 Amp	License Lamps, Side Marker and Tail Lamps
16	5 Amp	Electronic Cluster, EATC Control
17	15 Amp	EATC Compressor Clutch, Blend Door Actuator, A / C Compressor Clutch
18	10 Amp	Autolamp Module, Cluster Warning Lamps, Low Oil Level Relay, Buzzer / Chime

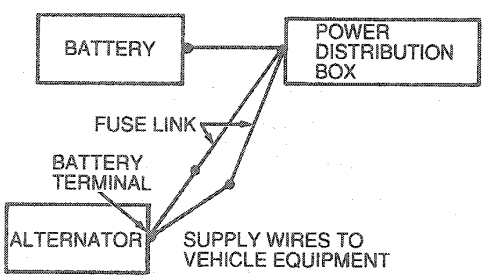
DESCRIPTION AND OPERATION (Continued)

The locations and values of the fuses and circuit breakers not contained in the panels are shown in the following circuit protection chart.

FUSE LINK	GAUGE	LOCATION
Alternator Output	12	Near Power Distribution Box
Alternator Voltage Sensing Circuit	18	Near Power Distribution Box
Heated Windshield	18	Near Heated Windshield Relay

Fuse Links

A fuse link is a short length of insulated wire integral with the engine compartment wiring harness. It is several wire gauges smaller than the circuit which it protects and generally located in-line directly from the positive terminal of the battery.



WITHOUT AMMETER K16740-A

Production fuse links are color-coded:

- 12-gauge: GY
- 14-gauge: DG
- 16-gauge: BK
- 18-gauge: BR
- 20-gauge: DB

NOTE: Replacement fuse link color coding may vary from production fuse link color coding.

When heavy current flows, such as when a booster battery is connected incorrectly or when a short to ground occurs in the wiring harness, the fuse link burns out and protects the alternator or wiring.

A burned out fuse link may have bare wire ends protruding from the insulation, or it may have only expanded or bubbled insulation with illegible identification. When it is hard to determine if the fuse link is burned out, perform the continuity test.

DIAGNOSIS AND TESTING

Fuse Link Continuity Test

1. Make certain that battery is OK, then turn on headlamps or any accessory. If headlamps or an accessory do not operate, a fuse link is probably burned out.
2. When there are two fuse links, use same procedure as in Step 1 to test each link separately.

To test fuse link that protects alternator, make certain that battery is OK, then check with a voltmeter or 12 volt test lamp for voltage at the BAT terminal of the alternator. No voltage indicates that alternator fuse link is probably burned out.

REMOVAL AND INSTALLATION

Fuses and Circuit Breakers

To check or replace a fuse or circuit breaker:

1. Locate and remove the malfunctioning fuse or circuit breaker by pulling it out of its cavity.
2. Replace the blown fuse or circuit breaker with one of proper amp rating for the circuit by pushing straight in until the fuse or circuit breaker seats itself fully in the cavity.

Fuse Panel

The fuse panel is a part of the instrument panel-to-dash panel (14401) wiring harness. The fuse panel cannot be replaced separately from harness.

To remove the wiring harness, of which the fuse panel is a part, refer to Removal and installation as outlined.

Fuse Link

Tools Required:

- Wire Fitting Crimping Tool T67S-17018-A

CAUTION: Do not fabricate a fuse link from ordinary wire because the insulation may not be flame proof.

REMOVAL AND INSTALLATION (Continued)

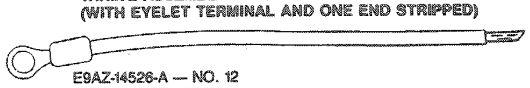
If it becomes necessary to replace a fuse link in a wiring assembly, make sure the replacement fuse link is a duplicate of one removed with respect to gauge, length and insulation. Original and Ford replacement fuse links have insulation that is flame proof.

WARNING: ALWAYS DISCONNECT BATTERY GROUND CABLE PRIOR TO SERVICING ANY FUSE LINK.

If a circuit protected by a fuse link becomes inoperative, inspect for a blown fuse link. If the fuse link wire insulation is burned or opened, disconnect the feed as close as possible behind the splice in the harness. If the damaged fuse link is between two splices (weld points in the harness), cut out the damaged portion as close as possible to the weld points.

NOTE: Some fuse links shown have an eyelet terminal for an 8mm (5 / 16 inch) stud on one end.

WIRING ASSEMBLY — FUSE LINK (WITH EYELET TERMINAL AND ONE END STRIPPED)



E9AZ-14526-A — NO. 12 GAUGE WIRE (GRAY)

D3AZ-14A526-D — NO. 14 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (GREEN INSULATION) AS REQ'D

D3AZ-14A526-E — NO. 16 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (ORANGE INSULATION) AS REQ'D

D3AZ-14A526-F — NO. 18 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (RED INSULATION) AS REQ'D

D3AZ-14A526-G — NO. 20 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (BLUE INSULATION) AS REQ'D

K8502-B

When an eyelet terminal is not required, use one of fuse links with insulation stripped from both ends.

WIRING ASSEMBLY — FUSE LINK (WITH INSULATION STRIPPED BOTH ENDS)

D3AZ-14A526-H — NO. 14 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (GREEN INSULATION)

D3AZ-14A526-J — NO. 16 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (ORANGE INSULATION) AS REQ'D

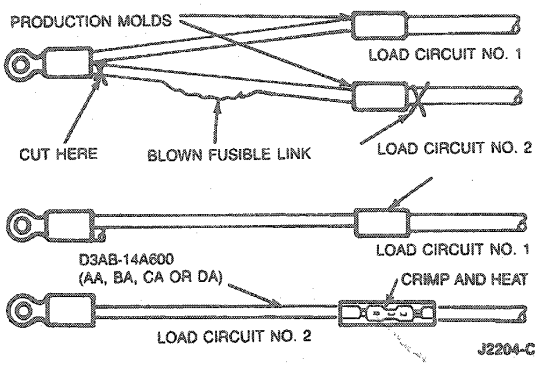
D3AZ-14A526-K — NO. 17 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (YELLOW INSULATION) AS REQ'D (SPECIAL USED WITH AIR CONDITIONING SYSTEM)

D3AZ-14A526-L — NO. 18 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (RED INSULATION) AS REQ'D

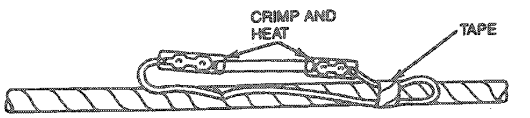
D3AZ-14A526-M — NO. 20 GAUGE WIRE — APPROX. 230mm (9 INCHES) LENGTH (BLUE INSULATION) AS REQ'D

K8503-A

1. To service a two-link group when only one link has blown and other link is not damaged proceed as follows:
   a. Cut out blown fusible link (two places).
   b. Position correct eyelet type service fusible link with bare end to correct size wire connector and crimp to wire end. Use Wire Fitting Crimping Tool T67S-17018-A. Heat splice insulation until tubing shrinks and adhesive flows from each end of connector.

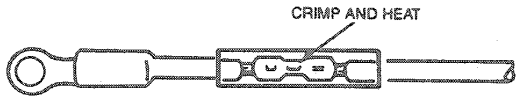


2. To service a fuse link in a multi-feed or single circuit, proceed as follows:
   a. Determine which circuit is damaged, its location and cause of open fuse link. If damaged fuse link is one of three fed by common 10- or 12-gauge feed wire, determine specific affected circuit.
   b. Cut damaged fuse link from wiring harness and discard it. If fuse link is one of three circuits fed by single feed wire, cut it out of harness at each splice end and discard.
   c. Identify and procure proper fuse link and butt connectors for attaching fuse link to harness.
   d. Strip wires 7.6mm (5 / 16 inch) and insert into proper size wire connector. Crimp and heat splice insulation until tubing shrinks and adhesive flows from each end of connector.
   e. To replace any fuse link on a single circuit in a harness, cut out damaged portion. Strip approximately 12.7mm (1 / 2 inch) of insulation from two wire ends and attach correct size fuse link to each wire end with proper gauge wire connectors. Crimp and heat splice insulation until tubing shrinks and adhesive flows from each end of connector.



REMOVAL AND INSTALLATION (Continued)

3. To service any fuse link which has an eyelet terminal on one end such as the charging circuit, proceed as follows:
   a. Cut off open fuse link behind weld. Strip approximately 12.7mm (1/2 inch) of insulation from cut end and attach appropriate new eyelet fuse link to cut stripped wire with an appropriate size connector.
   b. Crimp and heat splice insulation until tubing shrinks and adhesive flows from each end of connector.



TYPICAL REPAIR USING THE EYELET TERMINAL FUSE LINK OF THE SPECIFIED GAUGE FOR ATTACHMENT TO A CIRCUIT WIRE END
J2323-C

DO NOT MISTAKE A RESISTOR WIRE FOR A FUSE LINK. The resistor wire is generally longer and has print stating: "Resistor—do not cut or splice."

When attaching a No. 16-, 18-or 20-gauge fuse link to a heavy gauge wire, always double the stripped wire end of the fuse link before inserting and crimping it into the wire connector for positive wire retention.

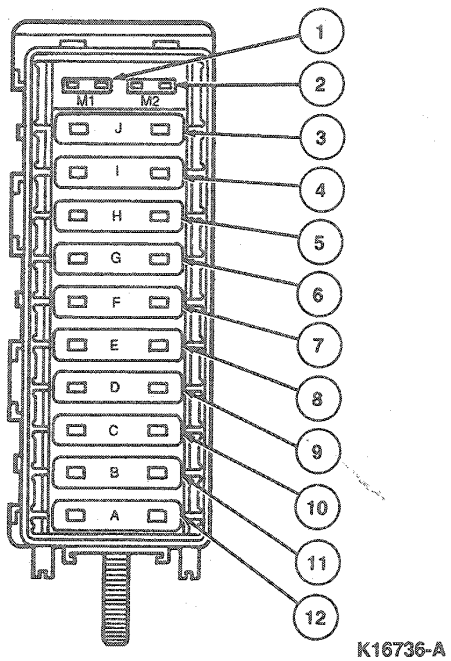
NOTE: If the damaged fuse link is between two splices (weld points in a harness), cut out damaged portion as close to splices as possible.

The following illustrations show typical electrical connectors and their disengagements.

Power Distribution Box

The power distribution box is located in the engine compartment on the LH fender apron.

WARNING: ALWAYS DISCONNECT THE BATTERY BEFORE SERVICING THE HIGH CURRENT FUSES IN THE POWER DISTRIBUTION BOX.



K16736-A

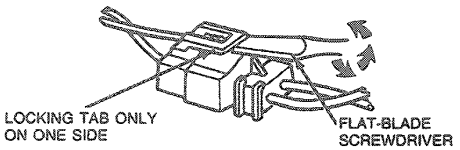
Power Distribution Box

ITEM	RATING	COLOR	CIRCUIT
1	10A	R	Ignition Coil
2	10A	R	Accessory Feed
3	40A	GR	Power Lock / Window
4	40A	GR	Anti-Lock
5	40A	GR	Rear Defroster
6	30A	PK	Anti-Lock Module
7	60A	Y	Headlamps
8	40A	GR	Fuse Panel
9	60A	Y	Engine Cooling Fan
10	30A	PK	Electronic Engine Control
11	60A	Y	Ignition Switch / Blower Motor
12	60A	Y	Ignition Switch / Blower Motor

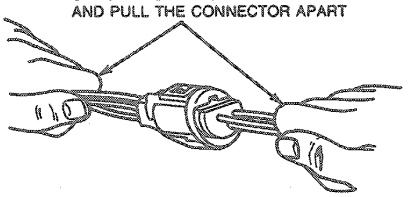
REMOVAL AND INSTALLATION (Continued)

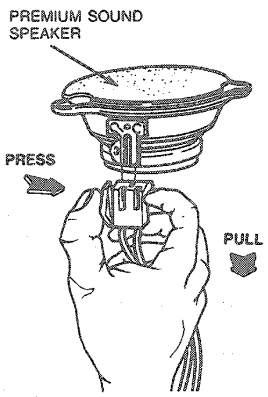
In-Line Connectors

INSERT A FLAT-BLADE SCREWDRIVER IN THE LOCKING TAB AND TWIST, GRASP THE WIRES AND PULL TO SEPARATE.

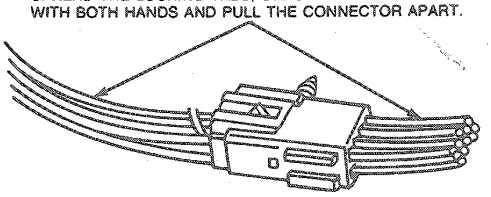


GRASP THE WIRES WITH BOTH HANDS AND PULL THE CONNECTOR APART

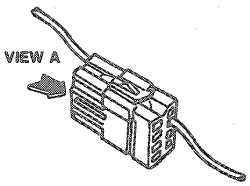




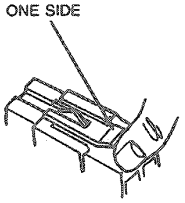
SPREAD THE LOCKING TABS, GRASP THE WIRES WITH BOTH HANDS AND PULL THE CONNECTOR APART.



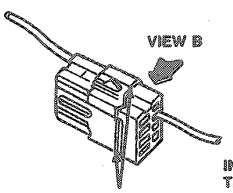
PLACE A THUMB UNDER THE LOCKING TAB AND PUSH UP. GRASP THE WIRES AND PULL TO SEPARATE.



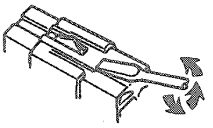
LOCKING TAB ONLY ON ONE SIDE



VIEW A



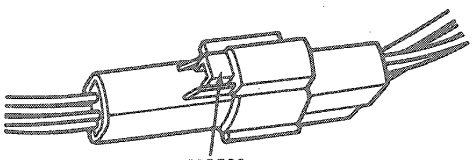
LOCKING TABS ARE ON BOTH SIDES OF THE CONNECTOR



INSERT A FLAT-BLADE SCREWDRIVER IN THE LOCKING TAB AND TWIST. GRASP THE WIRES AND PULL UNTIL THE LOCKING TAB IS ON THE RAMP. TURN THE CONNECTOR OVER AND REPEAT THE PROCEDURE ON THE OPPOSITE SIDE OF THE CONNECTOR. THEN GRASP THE WIRES AND PULL APART

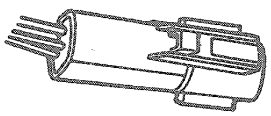
K7030-D

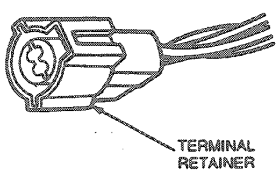
In-Line Connector, Submersible

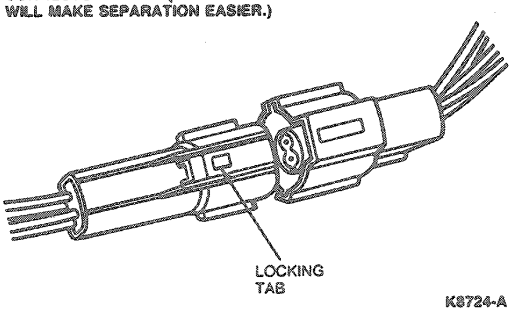


IN LINE CONNECTOR DISENGAGEMENT PROCEDURE

1. GRASP EACH END OF CONNECTOR BODY.
2. WHILE HOLDING CONNECTOR BODY, USE THUMB PRESSURE TO DEPRESS LOCKING TAB AND PULL CONNECTOR APART (NOTE: "WIGGLING" THE PARTS WILL MAKE SEPARATION EASIER.)



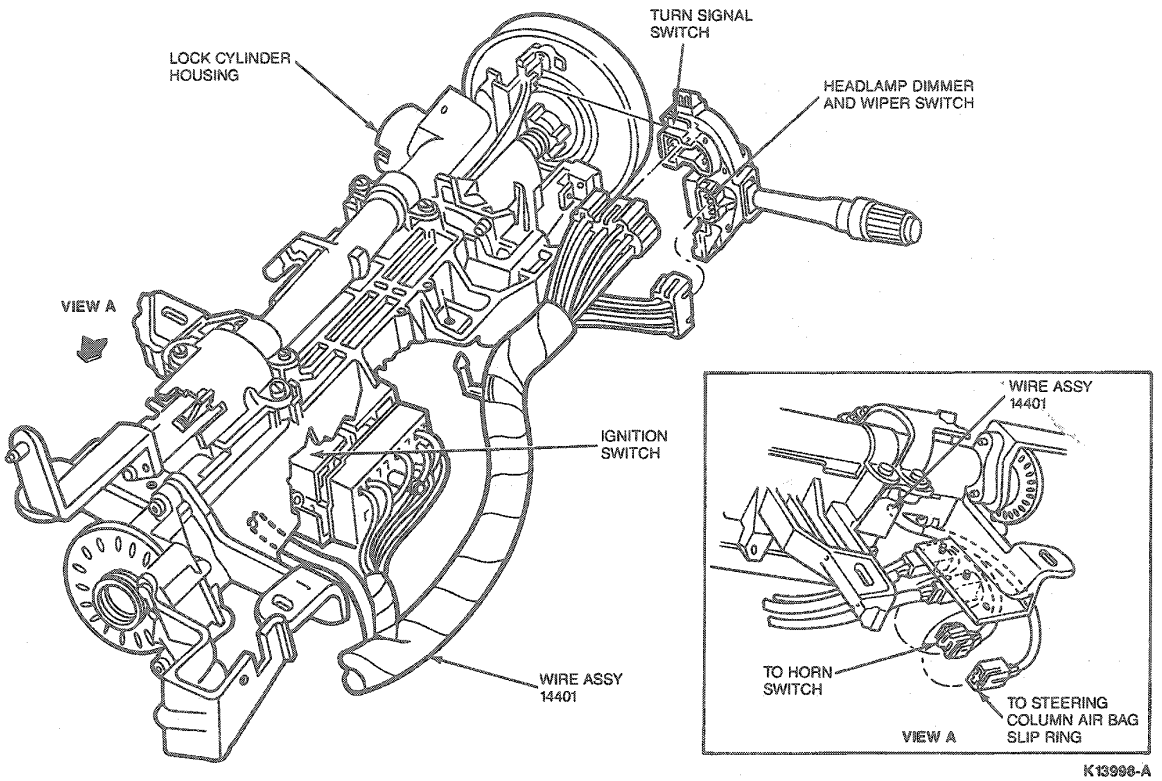




K8724-A

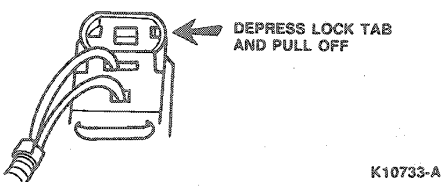
REMOVAL AND INSTALLATION (Continued)

Component Connectors



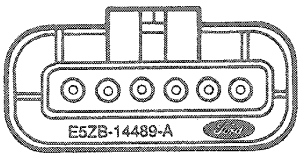
Alternator Connectors

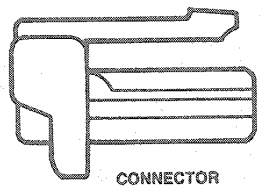
3.0L and 3.8L Engines, 130 Amp Alternator

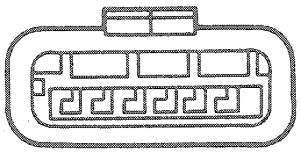


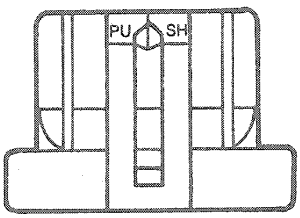
REMOVAL AND INSTALLATION (Continued)

Distributor Ignition (DI) Module 12A297 Connector







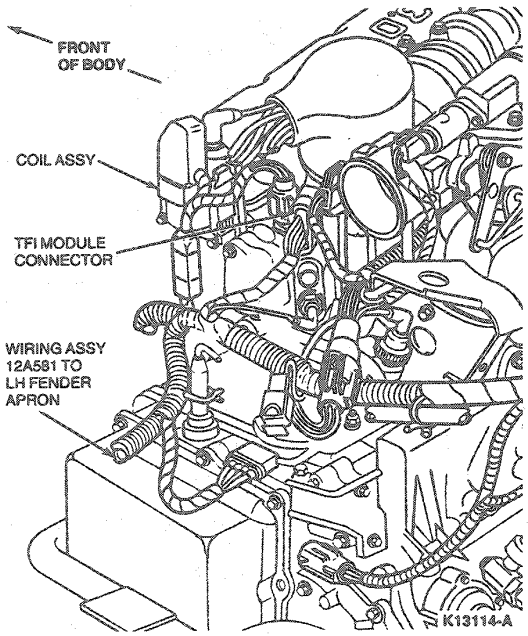


DI CONNECTOR DISENGAGEMENT PROCEDURE

1. GRASP CONNECTOR PLACING THUMB ON TAB MARKED "PUSH".
2. WHILE HOLDING CONNECTOR BODY, USE THUMB PRESSURE TO DEPRESS LOCKING TAB AND PULL CONNECTOR FROM MODULE. (NOTE: "WIGGLING" THE CONNECTOR WILL MAKE SEPARATION EASIER).

K13109-B

3.0L Engine Module Connector Shown
3.8L Engine Similar



The illustrations show the complete wiring harness installation for Taurus / Sable vehicles. Refer to the illustrations for the harness being replaced while performing the following Removal and Installation procedures.

Removal

1. Disconnect battery ground cable.

   NOTE: Refer to Section 01-05 if it is necessary to remove any trim panels to gain access to the harness.
2. Disconnect all wiring harness connectors.
3. Disengage harness from all locators, straps and / or clips as necessary, including ground wire eyelets. Remove harness from vehicle.

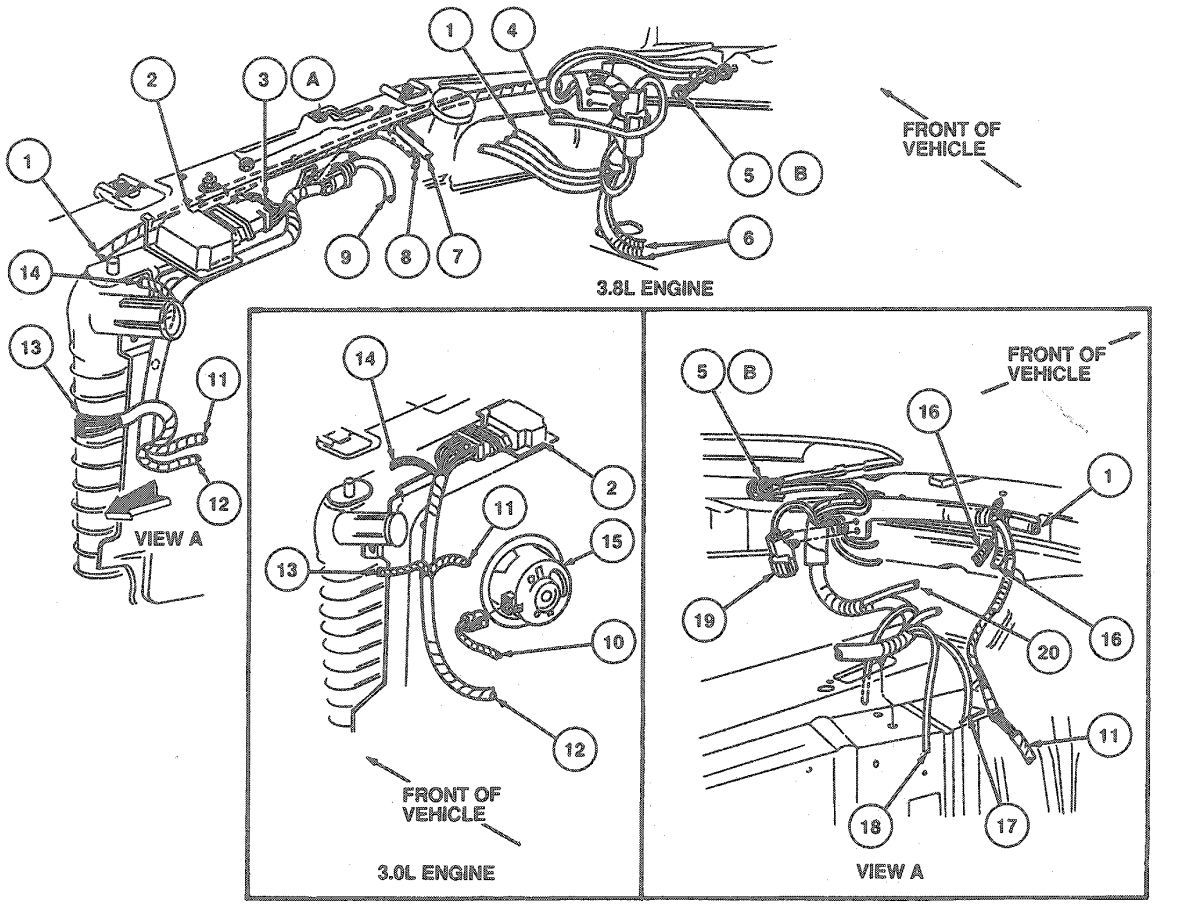
Installation

1. Position harness in vehicle. Ensure that harness is engaged in all locators, straps and / or clips.
2. Connect all harness connectors to components or other harnesses as necessary.
3. Secure ground eyelets to body as necessary.
4. Connect battery ground cable. Check all applicable circuits for proper operation.
5. Install any trim removed during harness removal. Refer to Section 01-05.

REMOVAL AND INSTALLATION (Continued)

Radiator Support Wiring

Taurus/Sable (Except SHO)



K17198-A

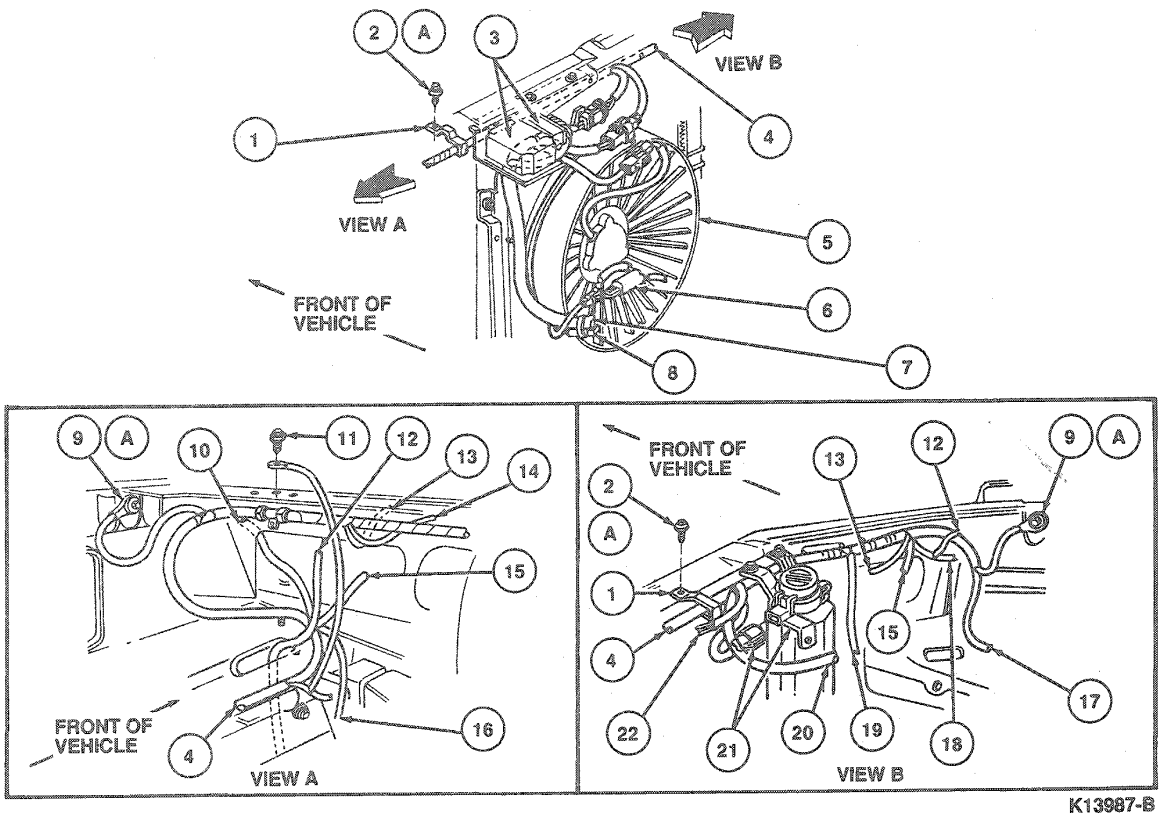
Item	Part Number	Description
1	14290	Wiring Harness Assy
2	12B581	Integrated Relay Controller Assy
3A	12B581	Connector Retaining Bolt
4	15A434	Cornering Lamp Wiring Harness Assy
5B	N801846-S36MG	Ground Screw
6	—	To Windshield Washer Reservoir
7	—	Fluid Sensor and Pump
8	—	To Alternator Wiring Assy
9	—	To Front Center Air Bag Sensor Assy
10	—	To Engine Cooling Fan
11	—	To Canister Purge Solenoid

(Continued)

Item	Part Number	Description
12	—	To 12A581 Wiring Harness Assy
13	—	To 14290 Wiring Harness Assy
14	—	To 14B060 Wiring Harness Assy
15	—	Engine Cooling Fan
16	—	To Laser Lamp (Sable)
17	—	To Ambient Temperature Sensor
18	—	To Horns
19	—	To 15A434 Wiring Harness Assy
20	—	To Anti-Lock Brake Pump
A		Tighten to 1.4-2 N·m (12-18 Lb-In)
B		Tighten to 3.4-4.8 N·m (30-42 Lb-In)

REMOVAL AND INSTALLATION (Continued)

Radiator Support Wiring, 3.0L SHO



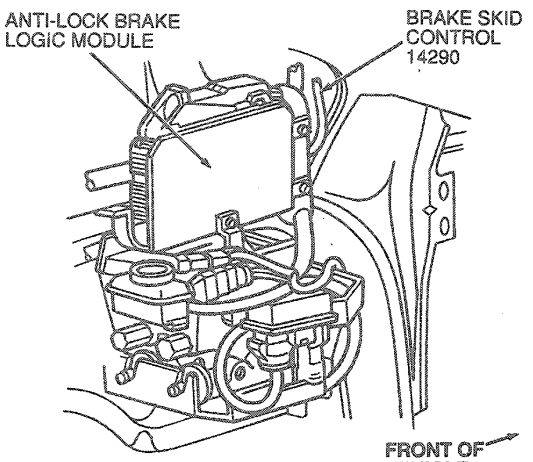
Item	Part Number	Description
1	14536	Bracket
2A	56910-S2	Screw (2 Req'd)
3	12B581	Integrated Relay Controller Assy
4	14290	Wiring Harness Assy
5	—	Cooling Fan and Shroud Assy
6	—	Canister Purge Solenoid
7	12A581	Wiring Harness Assy
8	—	To Shorting Plug
9A	N801846-S36MG	Ground Screw
10	—	To LH Side Marker and Cornering Lamps
11	N803991-S36	Screw
12	—	To Park and Turn Signal Lamp

(Continued)

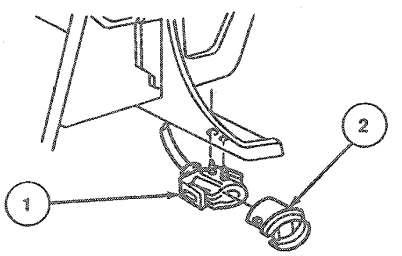
Item	Part Number	Description
13	—	To Fog Lamp
14	—	To Ambient Temperature Sensor
15	—	To AERO Headlamp
16	—	To Horns
17	—	To RH Brake Sensor Assy
18	—	To Windshield Washer Pump Reservoir Fluid Level Sensor, RH Side Marker and Cornering Lamps
19	—	To A/C Pressure Switch
20	—	To Alternator
21	—	Low Coolant Level Sensor
22	—	To Central Air Bag Sensor Assy
A		Tighten to 3.4-4.8 N·m (30-42 Lb-In)

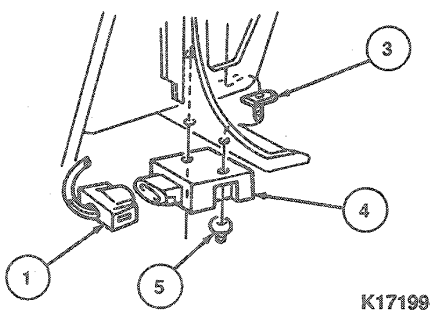
REMOVAL AND INSTALLATION (Continued)

Anti-Lock Hydraulic Brake Control



Running Lamp Control Module

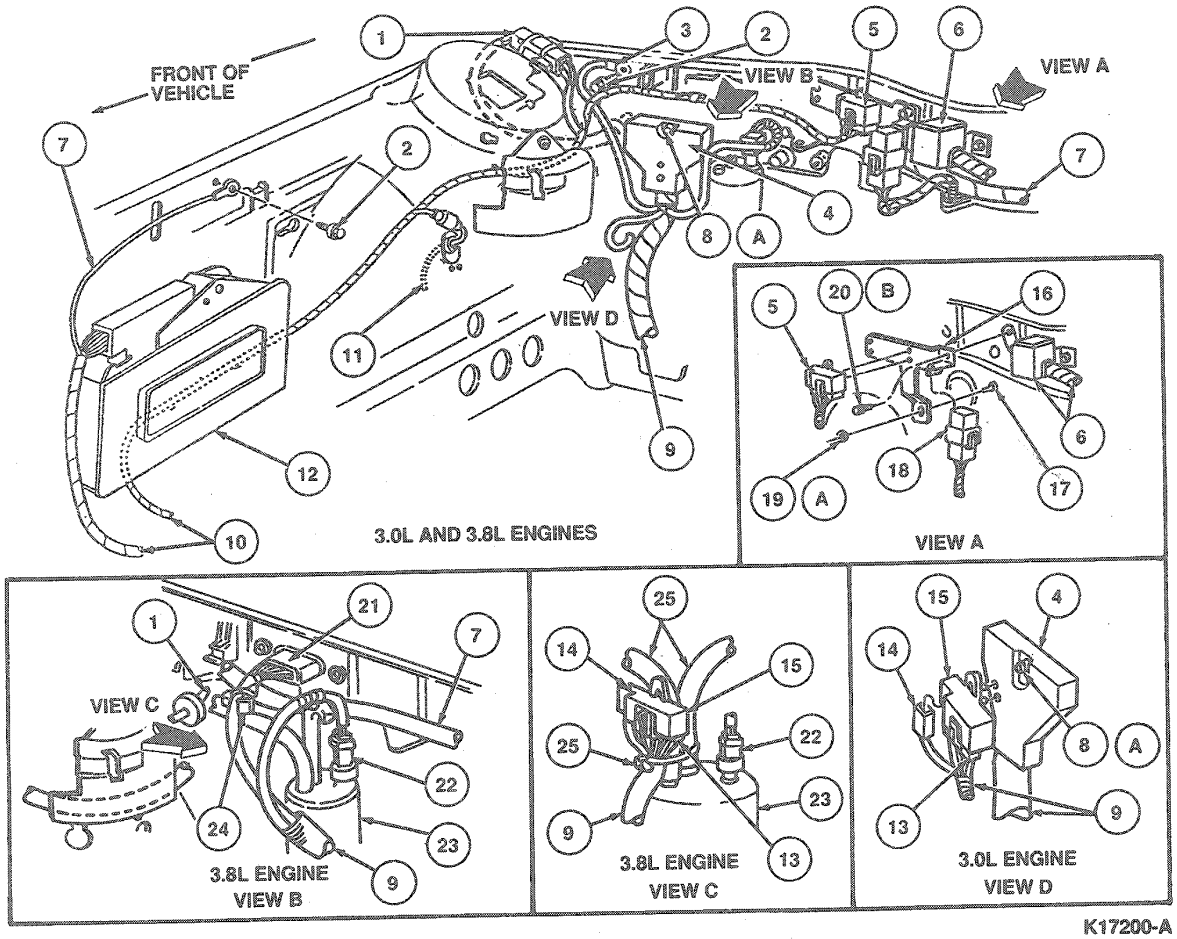




Item	Part Number	Description
1	14290	Wiring Harness Assy
2	14A624	Shorting Bar
3	N800320-S32	Screw and Retainer Assy
4	15A270	Light System Control and Bracket Assy
5	620391-S36	Nut and Washer Assy

REMOVAL AND INSTALLATION (Continued)

Fender Apron, RH 3.0L and 3.8L Engine



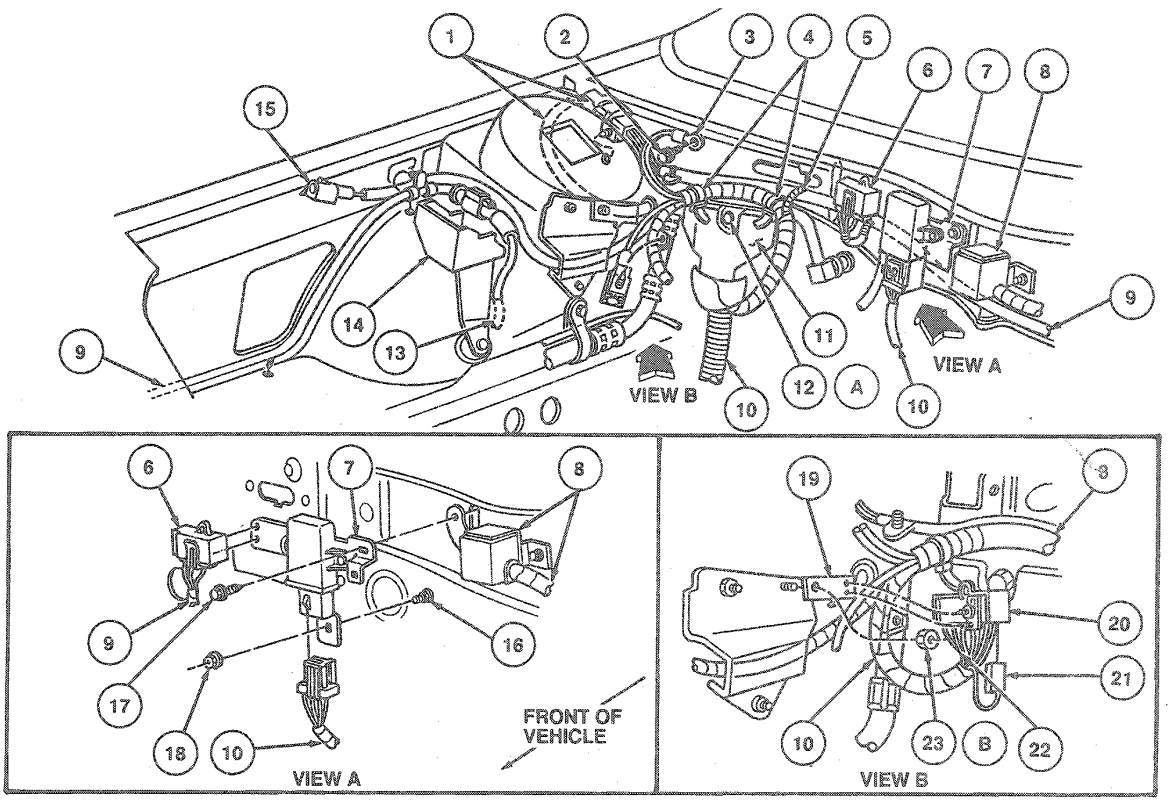
Item	Part Number	Description
1	2C055	Wiring Harness Assy
2	N805375-S36MG	Ground Screw (2 Req'd)
3	—	Wiring Harness Ground
4	—	To Powertrain Control Module
5	—	ABS Test Connector
6	—	Crash Sensor Assy
7	—	Ground Connection Wire for 14290 Wiring Harness Assy
8A	12A581	Connector Retaining Bolt
9	12A581	Wiring Harness Assy
10	14290	Wiring Harness Assy
11	—	To RH Front Anti-Lock Brake Wheel Sensor
12	—	Anti-Lock Brake Control Module

(Continued)

Item	Part Number	Description
13	14489	Data Link Connector
14	—	STI Test Connector
15	14A593	Connector Cover Assy
16	14A301	Bracket
17	—	Existing Stud From Evaporator
18	14B193	Anti-Lock Brake Relay
19A	N621905-S56B	Nut
20B	N806941-S40B	Screw
21	—	To TPI Module
22	—	A/C Pressure Switch
23	—	A/C Accumulator
24	12A581	Shorting Plug
25	95873-S	Strap
A		Tighten to 5.2-7.2 N·m (46-64 Lb-In)
B		Tighten to 7.6-10.4 N·m (6-8 Lb-Ft)

REMOVAL AND INSTALLATION (Continued)

Fender Apron, RH 3.0L SHO



K17201-A

Item	Part Number	Description
1	2C055	Wiring Harness Assy to Rear Anti-Lock Brake Sensors
2	N801846-S36MG	Ground Screw
3	12A581	Wiring Harness Ground
4	95873-S	Strap (2 Req'd)
5	—	To A/C Pressure Switch
6	—	To Anti-Lock Brake Tester
7	12B583	Bracket and BAP Sensor
8	—	Air Bag Sensor
9	14290	Wiring Harness Assy
10	12A581	Wiring Harness Assy
11	—	Connector to Powertrain Control Module
12A	12A581	Connector Retaining Bolt

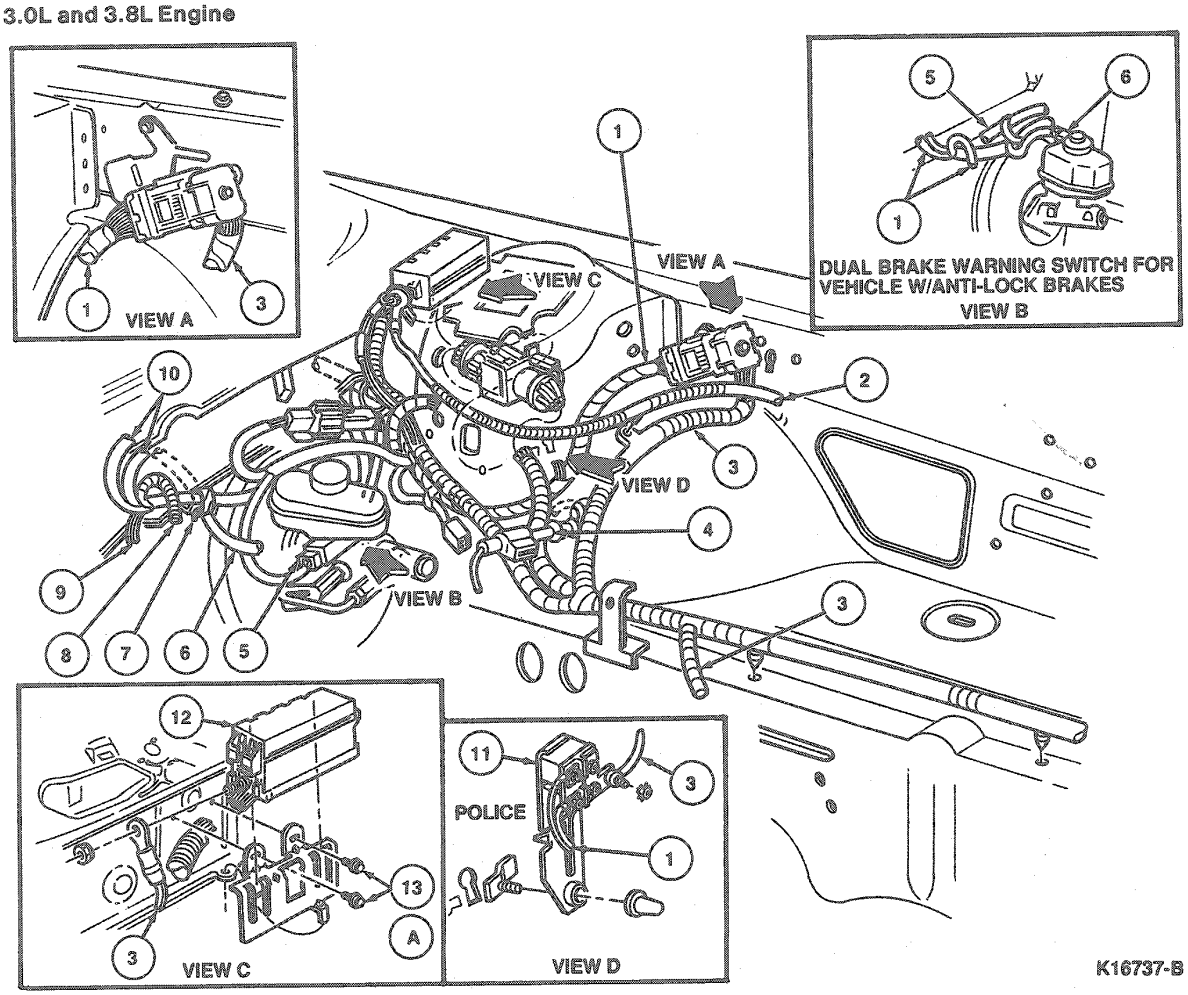
(Continued)

Item	Part Number	Description
13	—	To RH Anti-Lock Brake Sensor
14	—	Power Steering Pump Reservoir
15	14B060	To Starter Cable Assy
16	—	Existing Stud
17	N806941-S36MG	Screw
18	N621905-S56B	Nut
19	14A163	Retainer
20	14A593	Cover Assy
21	—	STI Test Connector
22	14489	Data Link Connector
23B	—	Existing Nut
A		Tighten to 5.2-7.2 N·m (46-64 Lb-In)
B		Tighten to 29.7-40.3 N·m (22-30 Lb-Ft)

REMOVAL AND INSTALLATION (Continued)

Fender Apron, LH

3.0L and 3.8L Engine



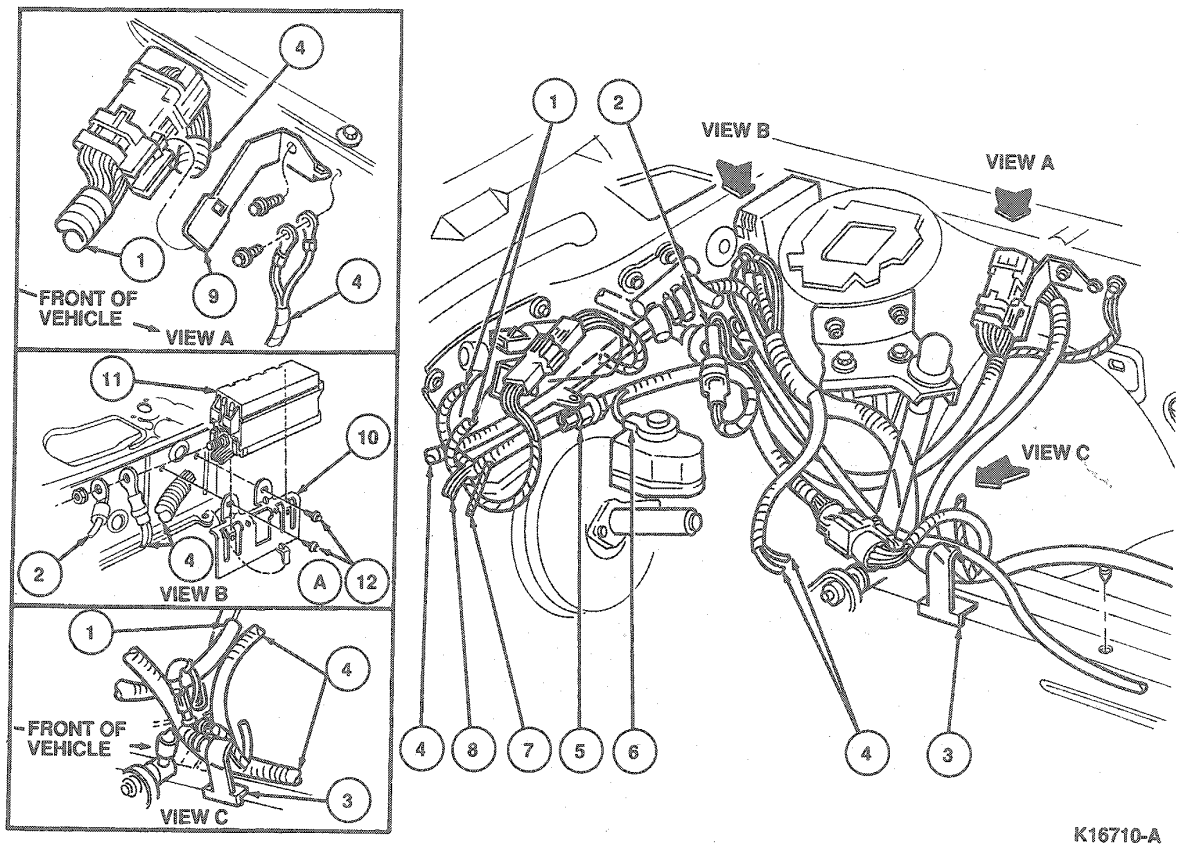
Item	Part Number	Description
1	14401	Wiring Assy
2	14B060	Battery Cable
3	14290	Wiring Assy
4	—	To Brake Sensor
5	2B264	Brake Fluid Level Switch
6	3F720 or 18D273	Wiring Assy Heated Windshield and/or Variable Assist Power Steering (VAPS)
7	—	To Engine Compartment Lamp

(Continued)

Item	Part Number	Description
8	—	To Cold Lock Out for Vehicles with (EATC)
9	—	To Rear Air Bag Sensor
10	—	To Windshield Wiper Motor
11	14A065	Circuit Breaker and Bracket Assy (3.8L Police Only)
12	—	Power Distribution Box—Part of 14290 Wiring Harness Assy
13A	N610957-S36	(2 Req'd)
A		Tighten to 3.6-4.1 N·m (32-36 Lb-In)

REMOVAL AND INSTALLATION (Continued)

3.0L SHO



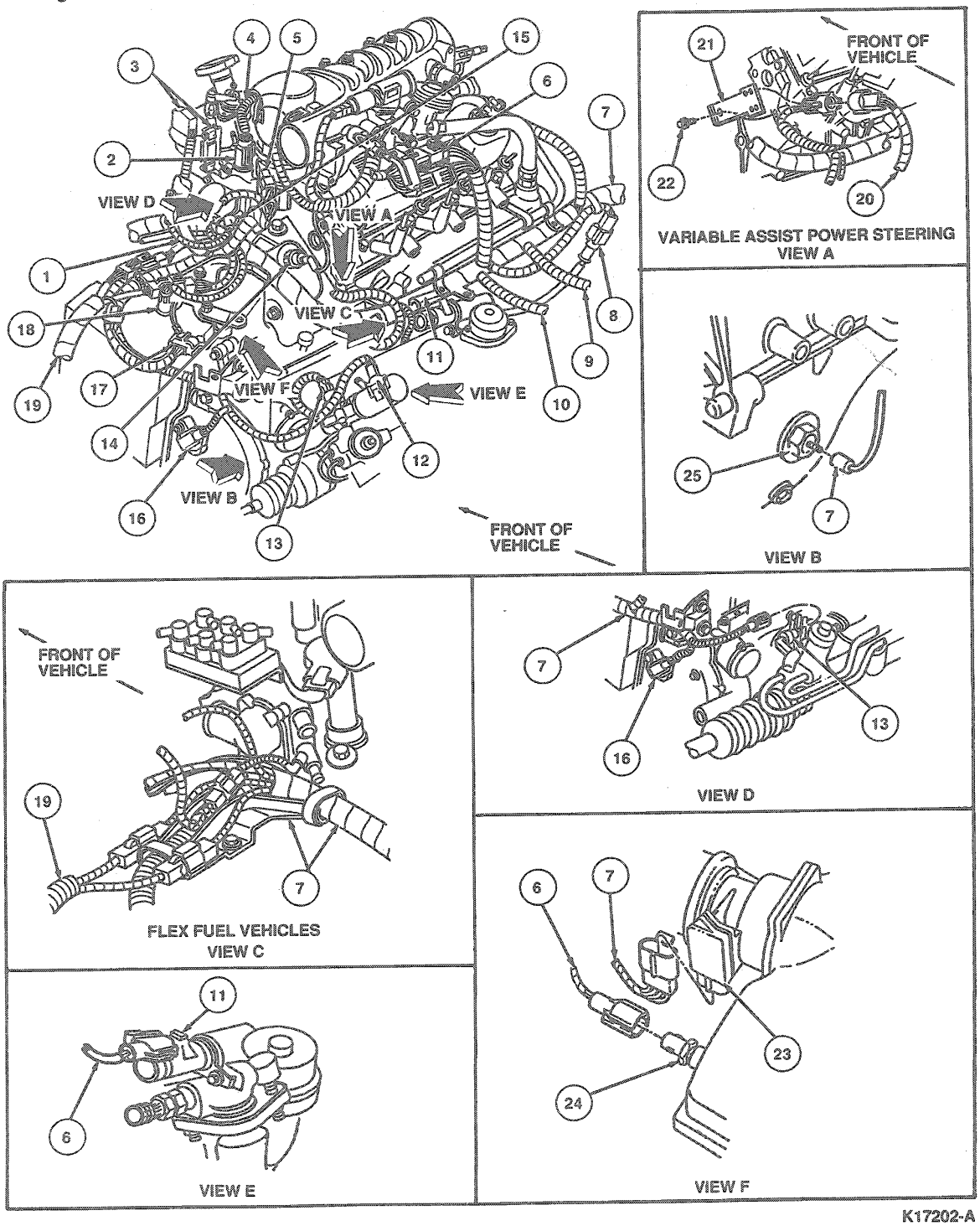
Item	Part Number	Description
1	14401	Wiring Assy
2	14431	Wiring Assy
3	—	Existing Clip for Brake Lines
4	14290	Wiring Assy
5	—	To Engine Compartment Lamp
6	2B264	Brake Fluid Level Switch
7	—	To Cold Lock Out for Vehicles with (EATC)
8	—	To Rear Air Bag Sensor
9	14A206	Bracket
10	14A254	Bracket Fuse Panel
11	—	Power Distribution Box — Part of 14290 Wiring Harness Assy
12A	N610957	Screw (2 Req'd)
A		Tighten to 3.6-4.1 N·m (32-36 Lb-In)

(Continued)

REMOVAL AND INSTALLATION (Continued)

Engine Wiring

3.0L Engine



REMOVAL AND INSTALLATION (Continued)

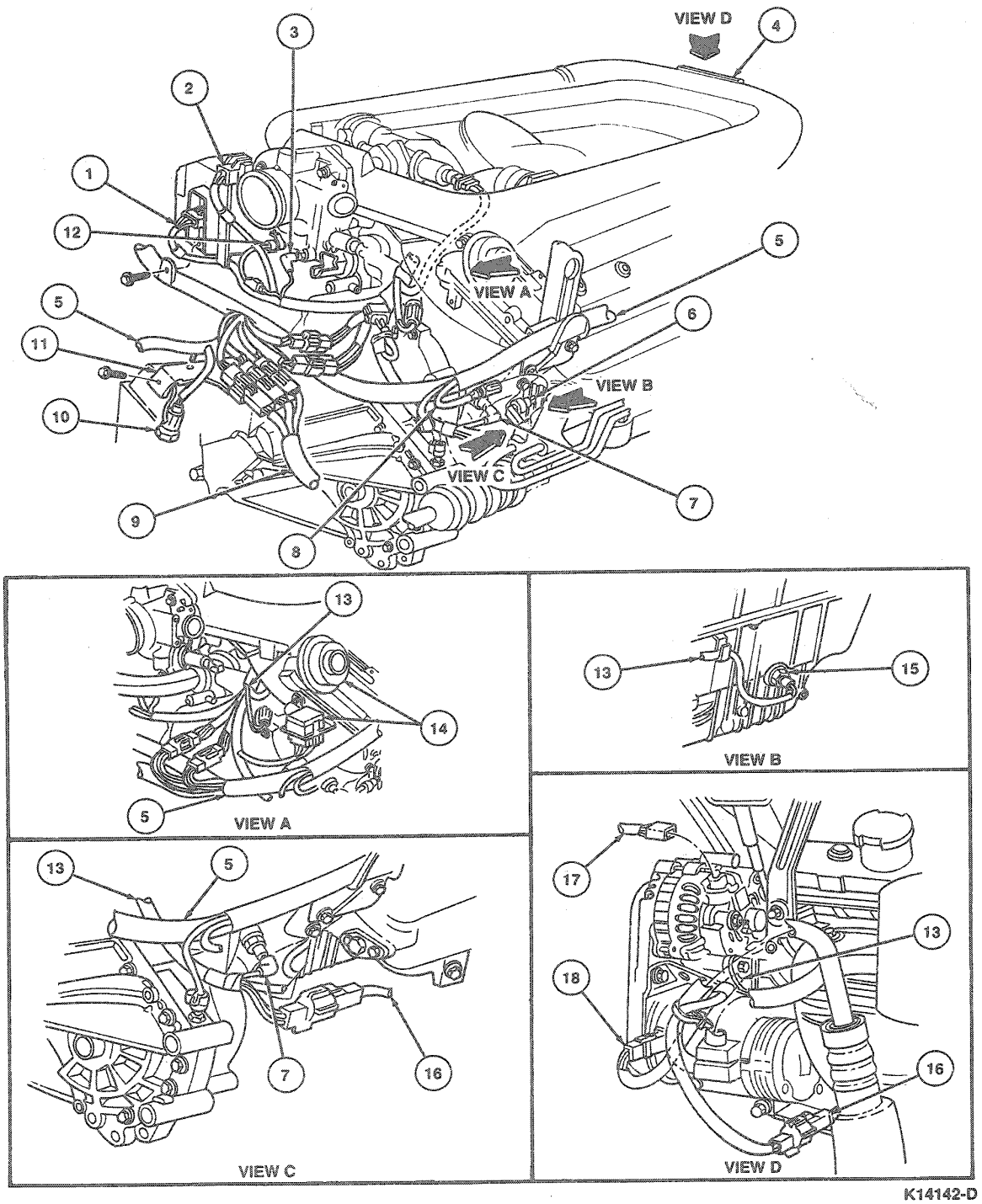
Item	Part Number	Description
1	10B886	Wiring Harness Assy
2	12A648	Engine Coolant Temperature Sensor
3	12029	Ignition Coil Assy
4	9D930	Fuel Charging Wiring
5	—	To Distributor Ignition
6	12A581	Wiring Harness Assy Flex Fuel With VPS
7	12A581	Wiring Harness Assy
8	—	To Rear Heated Oxygen Sensor
9	—	To Electronic Ignition Module
10	—	To Vapor Management Valve
11	9E731	Vehicle Speed Sensor
12	—	To Variable Assist Power Steering Motor

(Continued)

Item	Part Number	Description
13	—	To Power Steering Pressure Switch
14	—	To Oil Pressure Switch
15	—	To Engine Coolant Temperature Switch
16	—	To Turbine Speed Sensor
17	—	To Neutral Start Switch
18	—	To AXOD Sensor
19	14290	Wiring Harness Assy
20	3F720	Wiring Harness Assy (For Vehicles With VAPS)
21	14536	Bracket
22	N605798-S36	Bolt
23	—	Mass Air Flow Sensor
24	12697	Intake Air Temperature Sensor
25	—	Oil Level Sensor

REMOVAL AND INSTALLATION (Continued)

3.0L SHO



REMOVAL AND INSTALLATION (Continued)

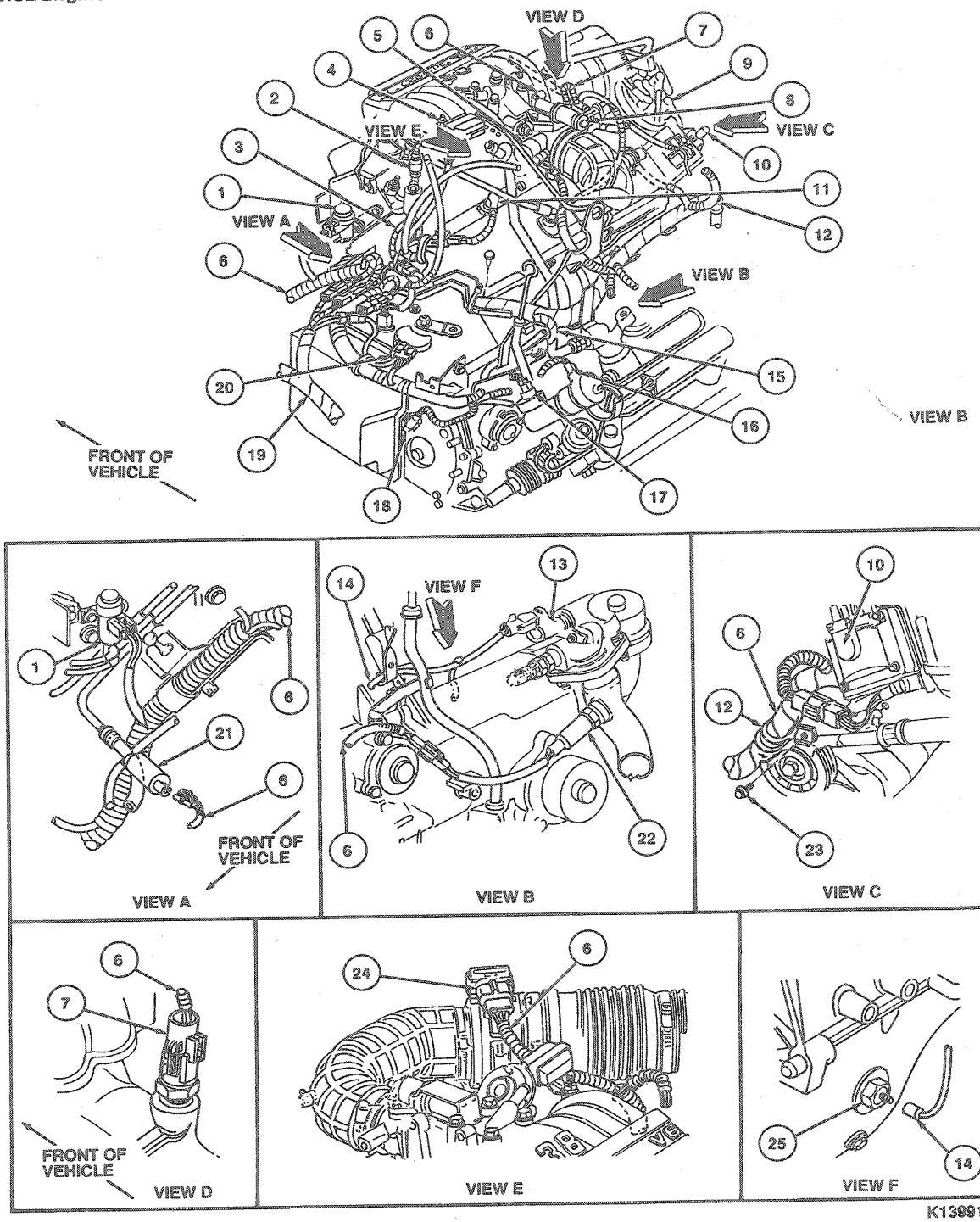
Item	Part Number	Description
1	12029	Ignition Coil
2	9B989	Throttle Position Sensor
3	12A648	Engine Coolant Temperature Sensor
4	9F715	Idle Air Control Valve
5	12A581	Wiring Harness Assy
6	—	To Power Steering Pressure Switch
7	9278	Oil Pressure Sender
8	—	To Vehicle Speed Sensor

(Continued)

Item	Part Number	Description
9	14401	Wiring Harness Assy
10	15520	Backup Lamp Switch
11	14A099	Shield
12	18832	Radio Noise Capacitor
13	9D930	Fuel Charging Wiring
14	9J460	Pressure Feedback EGR (PFE) Sensor
15	6C624	Low Oil Sensor
16	—	To Heated Oxygen Sensor
17	14290	Wiring Harness Assy
18	—	To A/C Compressor Clutch

REMOVAL AND INSTALLATION (Continued)

3.8L Engine



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	9J459	PFE Vacuum Regulator
2	12A648	Engine Coolant Sensor
3	9D930	Fuel Charging Wiring
4	9J460	Pressure Feedback EGR (PFE) Sensor
5	9B989	Throttle Position Sensor
6	12A581	Wiring Harness Assy
7	12697	Intake Air Temperature Sensor
8	9F715	Idle Air Control Valve
9	12127	Distributor Assy
10	12029	Coil and Bracket Assy
11	12A648	Coolant Temperature Sensor
12	—	Clamp, Part of 12A581 Wiring Harness Assy

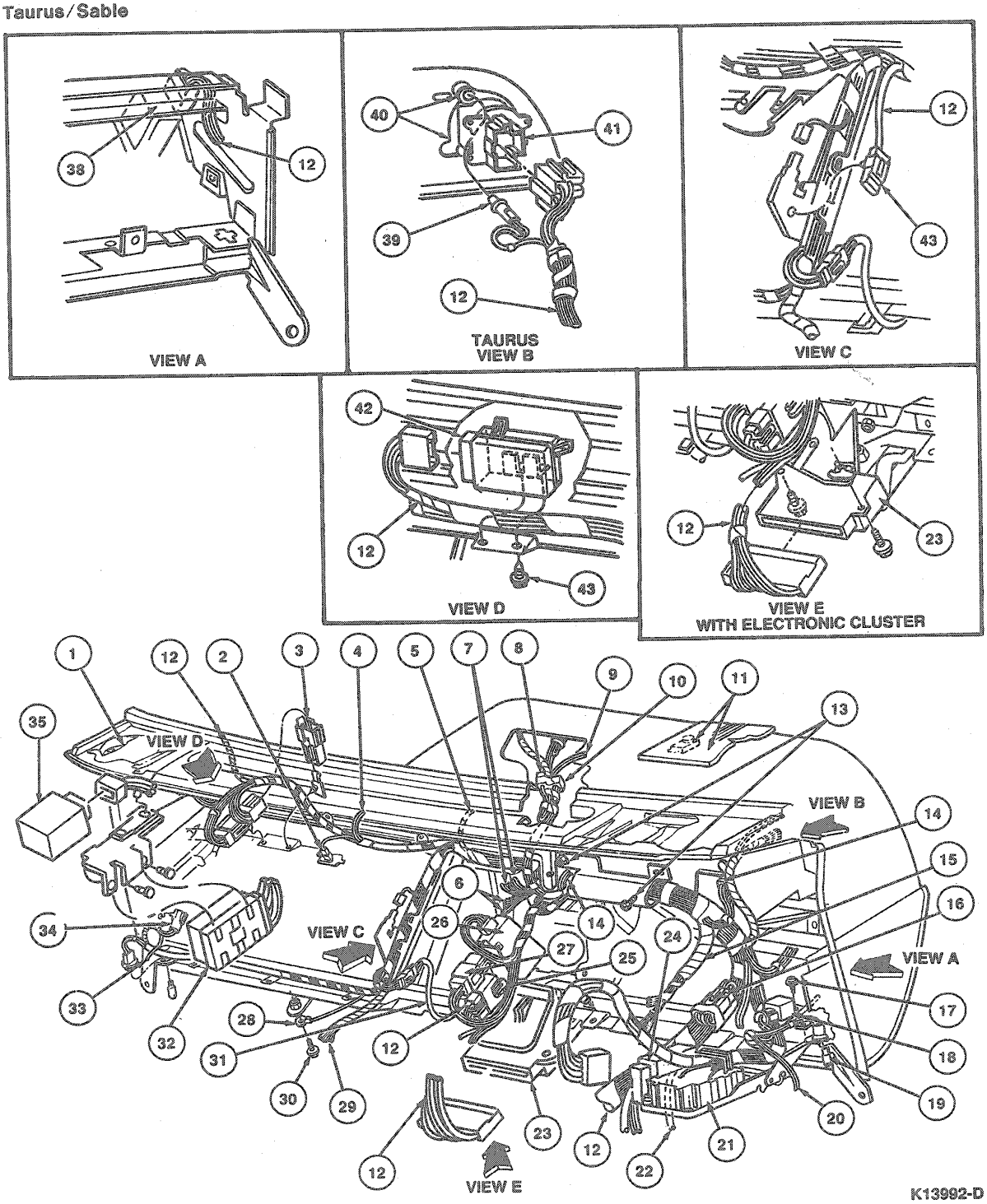
(Continued)

Item	Part Number	Description
13	9E731	Vehicle Speed Sensor
14	9D878	Speed Sensor Wiring
15	—	To Heated Oxygen Sensor
16	—	To Variable Assist Power Steering Motor
17	3N824	Power Steering Pressure Sensor
18	7M101	Turbine Speed Sensor
19	14401	Wiring Harness Assy
20	15520	Neutral Start Switch
21	9C915	Fuel Vapor Canister Purge Regulator Valve
22	9F472	Heated Oxygen Sensor
23	N611057-S2	Screw
24	12860	Mass Air Flow Sensor
25	6C624	Oil Level Sensor

REMOVAL AND INSTALLATION (Continued)

Instrument Panel, Main

Taurus/Sable



REMOVAL AND INSTALLATION (Continued)

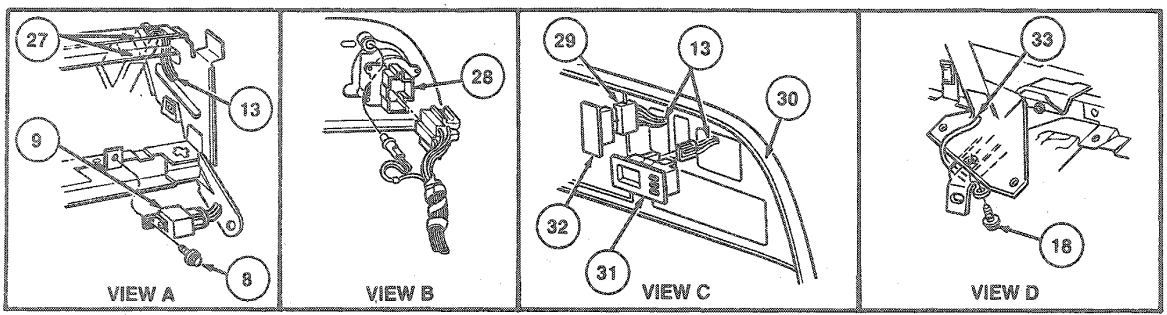
Item	Part Number	Description
1	—	Speaker
2	14413	Glove Compartment Lamp
3	14A459	Sleeve Assy
4	—	To In Car Temperature Sensor
5	—	To A/C Heater Switch
6	—	To Radio
7	—	To Control Head
8	—	To Rear Wiper Washer Switch (Wagon Only)
9	—	To Fog Lamp Switch
10	—	To Power Antenna Switch
11	19C734	Sun Load Sensor and Grille
12	14401	Wiring Assy
13	N803875-S2	Screw (2 Req'd)
14	—	To Cluster
15	—	To Steering Column
16	14A320	Wire Assy (With Autolamp)
17	N804234-S36	Screw (2 Req'd)
18	13350	Flasher Assy
19	13730	Bulb Assy (2 Req'd)
20	—	To Parking Brake Switch
21	—	Fuse Panel, Part of 14401 Wiring Harness Assy

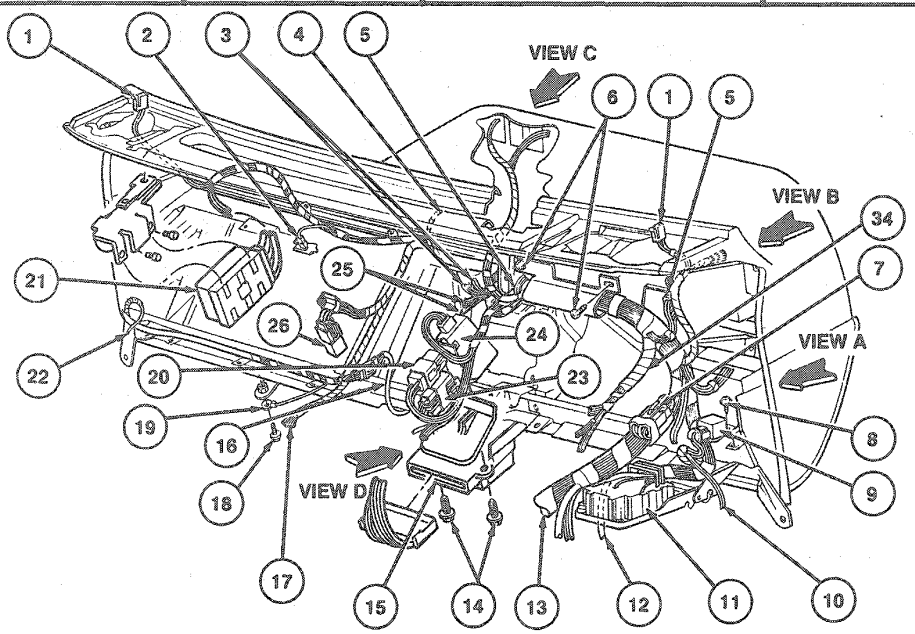
(Continued)

Item	Part Number	Description
22	—	To Stoplamp and Anti-Lock Brake Switches
23	10D840	Chime Assy
24	10K910	Lamp Outage Module (Non SHO)
25	16C625	Low Oil Indicator Assy
26	17D539	Wiper Control Module
27	14N089	Horn Relay
28	—	A/C Heater Ground
29	—	To Evaporator Assy
30	N805375-S36MG	Screw
31	—	To Ash Receptacle Wiring
32	14B056	Air Bag Diagnostic Module Monitor Assy
33	19A170	Wire Assy
34	18850	Power Antenna
35	12B577	Power Antenna Module
36	13350	Turn Signal Flasher
37	14401	Connector for Mechanical Cluster
38	13A024	Dimmer Switch
39	—	Passenger Air Bag Assy
40	45A98	Finish Panel
41	11654	Headlamp Switch
42	10K910	Lamp Outage Module
43	14A459	Retainer
44	—	Radio Ground

REMOVAL AND INSTALLATION (Continued)

Police





K13995-B

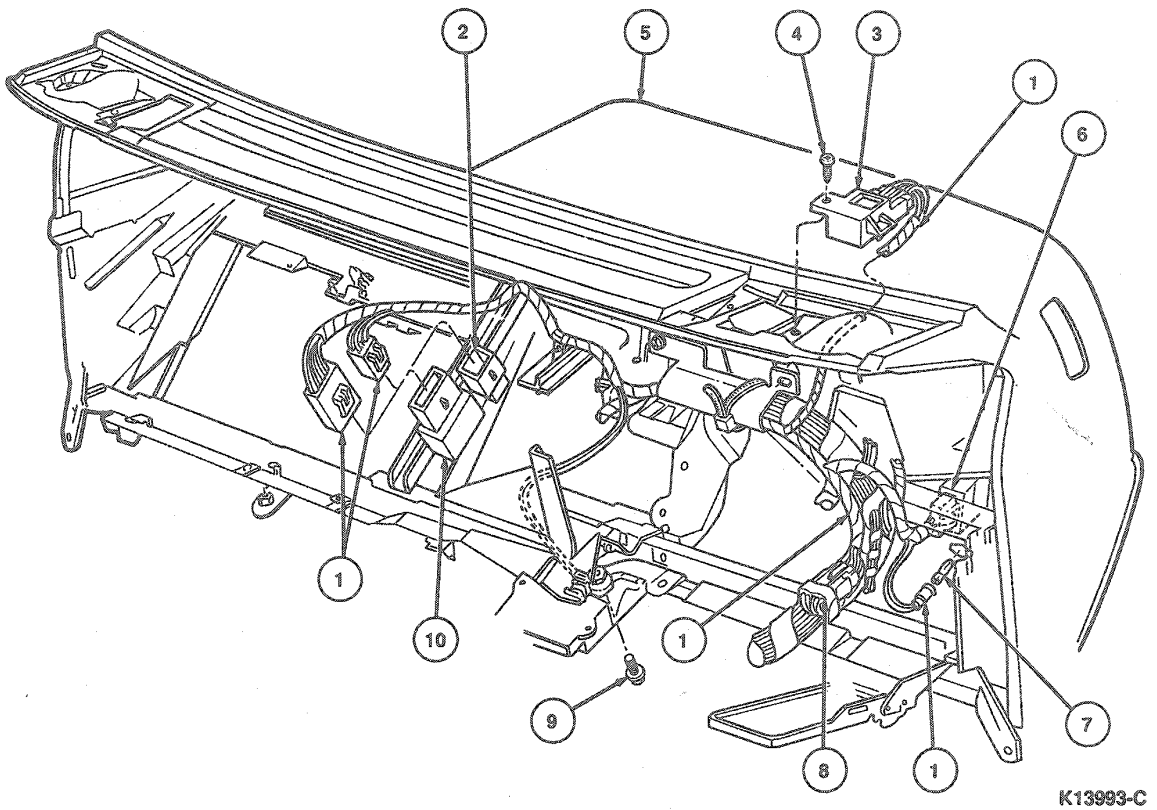
Item	Part Number	Description
1	—	To Speaker
2	—	Glove Compartment Lamp
3	—	To A/C Control Head
4	—	To A/C Heater Switch
5	—	To Cluster
6	N803875-S2	Screw (2 Req'd)
7	—	To Steering Column
8	14A320	Wiring Assy
9	N804234-S2	Screw
10	13350	Flasher Assy
11	—	To Parking Brake Switch
12	—	Fuse Panel Part of 14401 Wiring Harness Assy
13	—	To Stoplamp and Anti-Lock Brake Switch
14	14401	Wiring Assy
15	N803876-S2	Screw (2 Req'd)
16	10D840	Chime Assy

(Continued)

Item	Part Number	Description
17	—	To Ash Receptacle Wiring
18	—	To Evaporator Assy
19	N803875-S36MG	Screw
20	—	A/C Heater Ground
21	13A025	Horn Relay
22	14B056	Air Bag Diagnostic Module Monitor Assy
23	19A170	Wiring Assy
24	—	To Low Oil Indicator Assy
25	—	To Wiper Control Module
26	—	To Radio
27	13A025	Horn Relay Assy
28	13A024	Dimmer Switch
29	11654	Headlamp Switch
30	—	To Rear Window Defroster
31	45A98	Finish Panel
32	15000	Clock
33	—	Cover (Standard Production)
34	—	Radio Ground

REMOVAL AND INSTALLATION (Continued)

Auto Lamp/Auto Dimmer



K13993-C

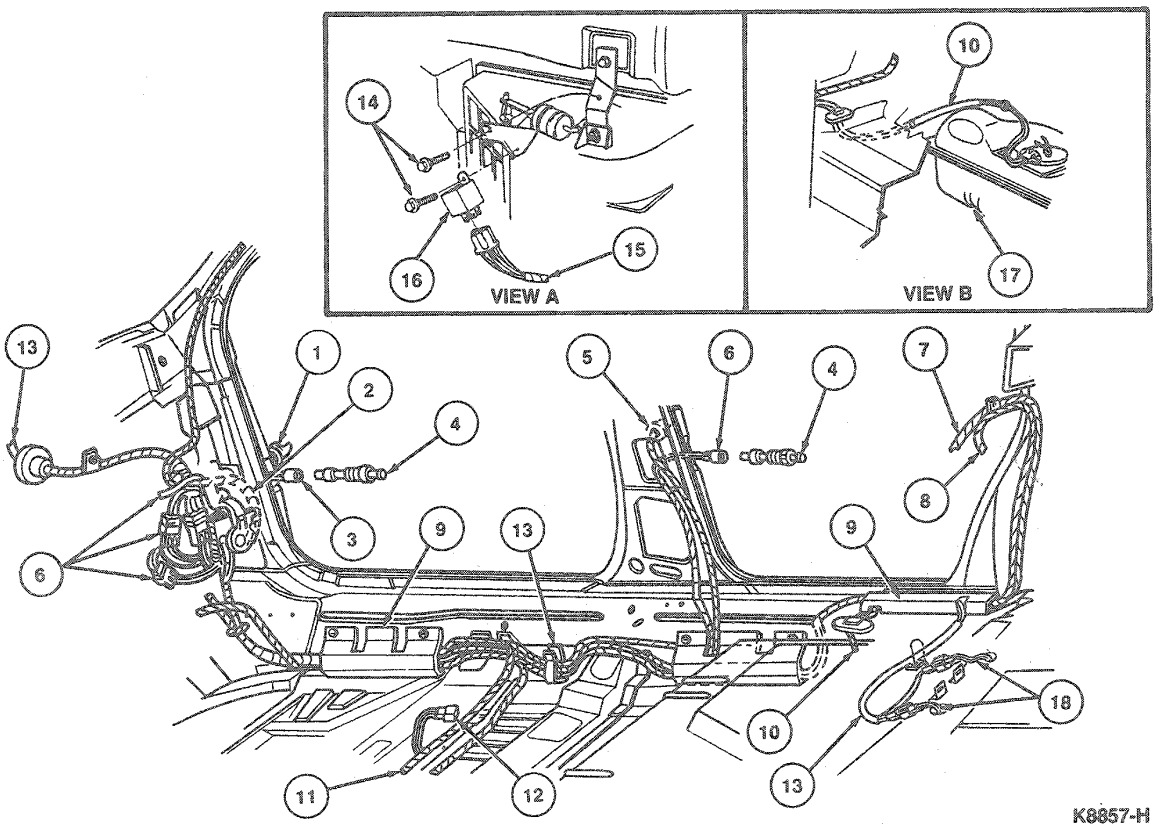
Item	Part Number	Description
1	13A090	Wiring Assy
2	14B193	Headlamp Dimmer Relay
3	14A597	Light Sensor Amplifier
4	N803876	Screw

(Continued)

Item	Part Number	Description
5	45A98	Instrument Panel
6	13736	Autolamp Switch
7	13465	Bulb Assy
8	14401	Wiring Assy
9	N801846-S36MG	Screw
10	14A672	Autolamp Relay

REMOVAL AND INSTALLATION (Continued)

Floorpan, RH



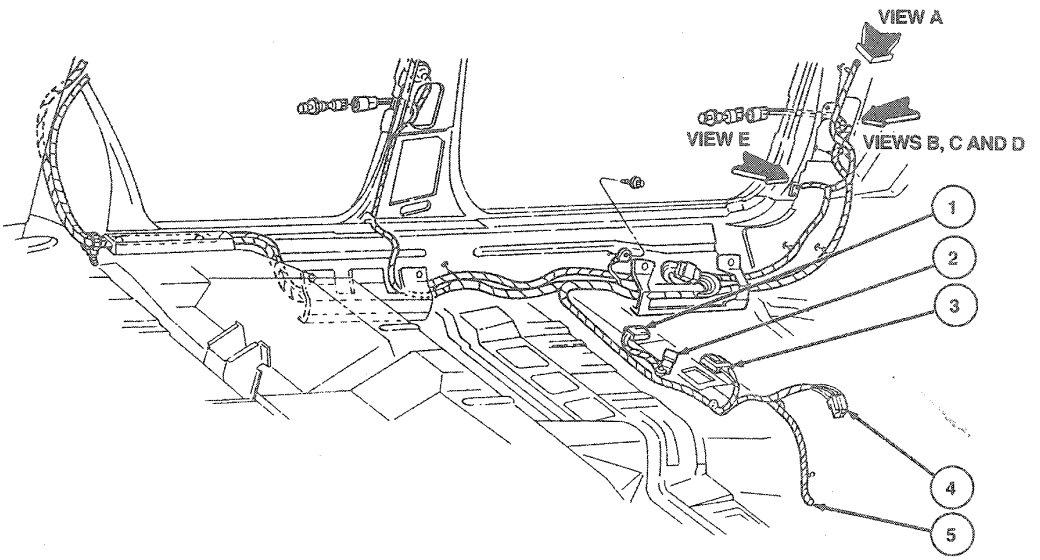
Item	Part Number	Description
1	14630	Wiring Assy
2	15A657	Roof Sliding Panel Control
3	14405	Wiring Assy
4	13713	Courtesy Lamp Switch
5	—	Wiring Assy To RH Rear Door
6	14A488	Wiring Assy
7	19B113	Wiring Assy
8	2C055	Wiring Harness Assy
9	—	Shield

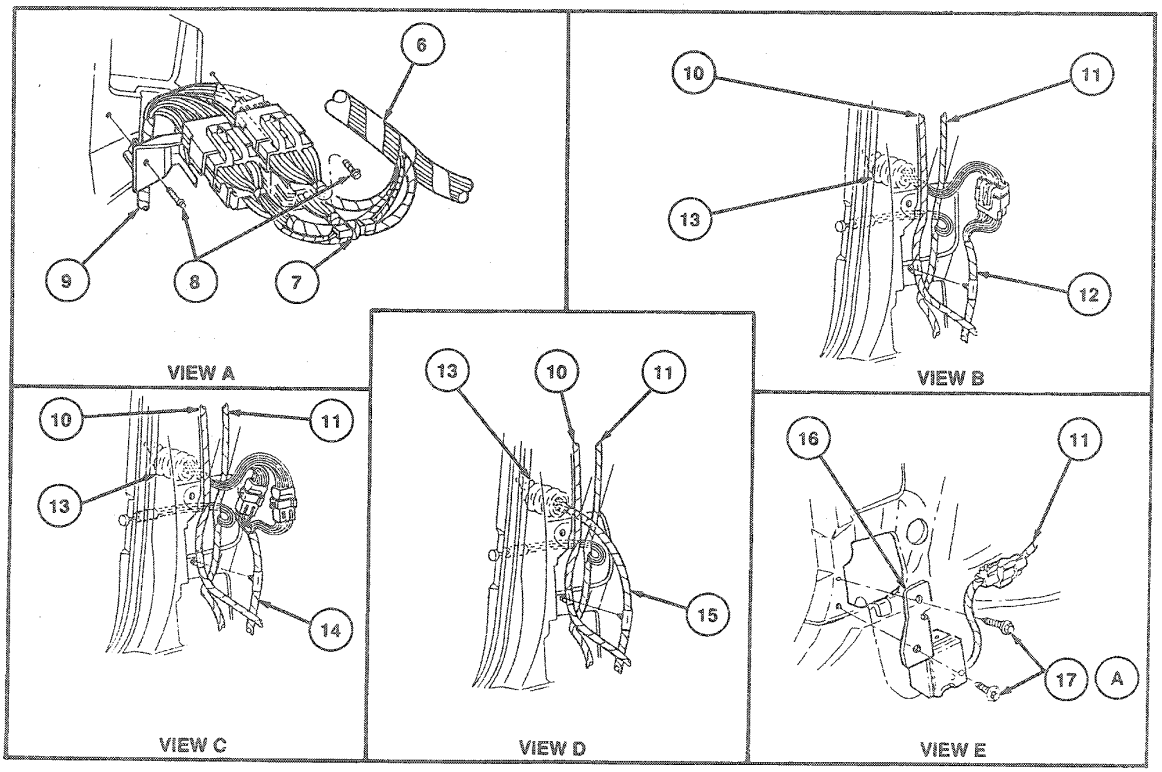
(Continued)

Item	Part Number	Description
10	14405	Wiring Assy To Fuel Pump Sender
11	—	Wiring Assy To LH Floorpan
12	—	Wiring Assy To Seat Wiring
13	—	To Rear Brake Skid Control
14	N801846-S36MG	Screw
15	15A657	Wiring Assy
16	15B683	Moon Roof Motor Relay
17	9002	Fuel Tank
18	—	To LH, RH Rear Anti-Lock Wheel Sensors

REMOVAL AND INSTALLATION (Continued)

Floorpan, LH





K8858-G

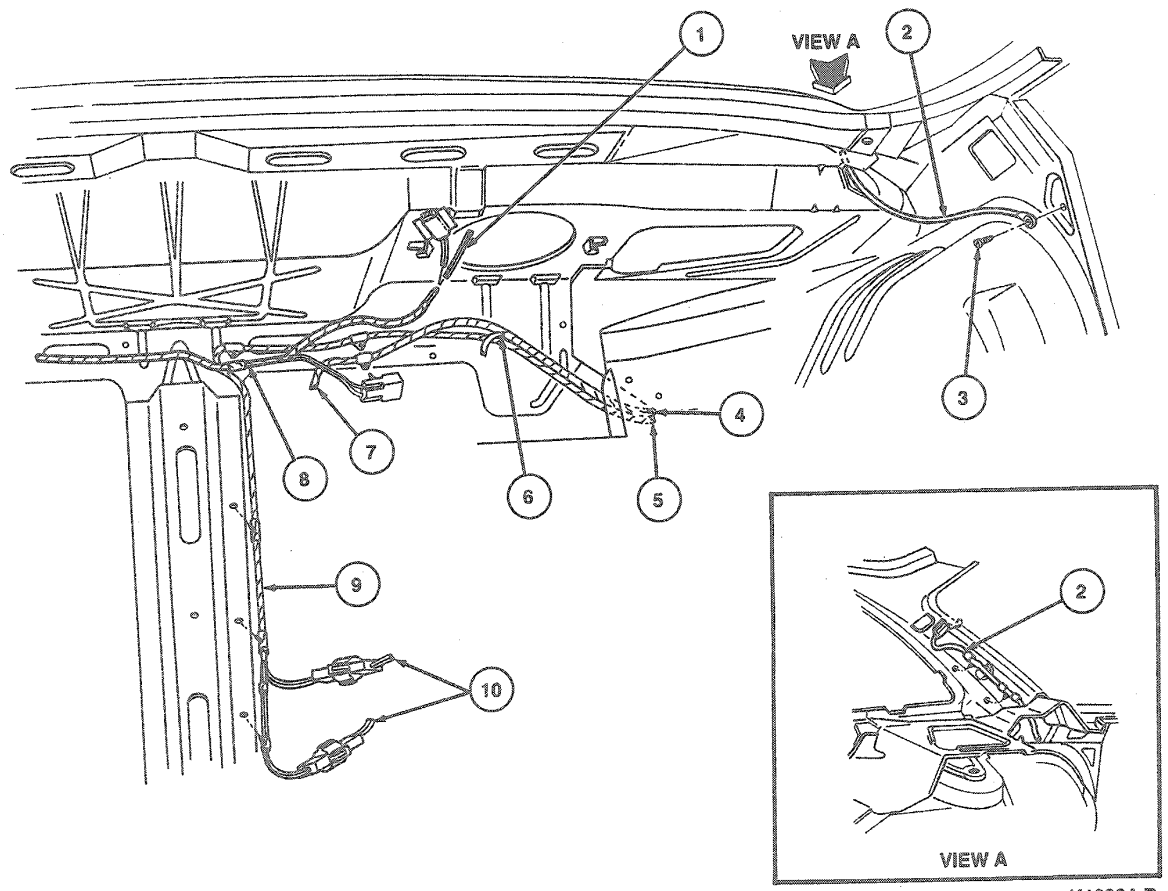
REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	—	To Seat Switch
2	—	To Power Seat
3	—	To Safety Belt
4	—	To Console
5	14A488	Wiring Assy
6	14401	Wiring Assy
7	—	To Anti-Theft Wiring
8	N804690-S36	Screw (2 Req'd)
9	—	To Rear Lamps
10	17A409	Wiring Assy
11	14405	Wiring Assy

(Continued)

Item	Part Number	Description
12	14A488	Wiring Assy Window Regulator Jumper with Power Mirror, Premium Sound and / or Curb Lamps and / or Moon Roof
13	14631	Wiring Assy Window Regulator
14	14A468	Wiring Assy Window Regulator Jumper Illuminated Entry and / or Power Locks
15	14A488	Wiring Assy without Illuminated Entry or Power Locks
16	14B007	Air Bag Sensor
17A	N803953-S36MG	Screw
A		Tighten to 4-5.6 N·m (36-49 Lb-In)

Package Tray



K13994-B

REMOVAL AND INSTALLATION (Continued)

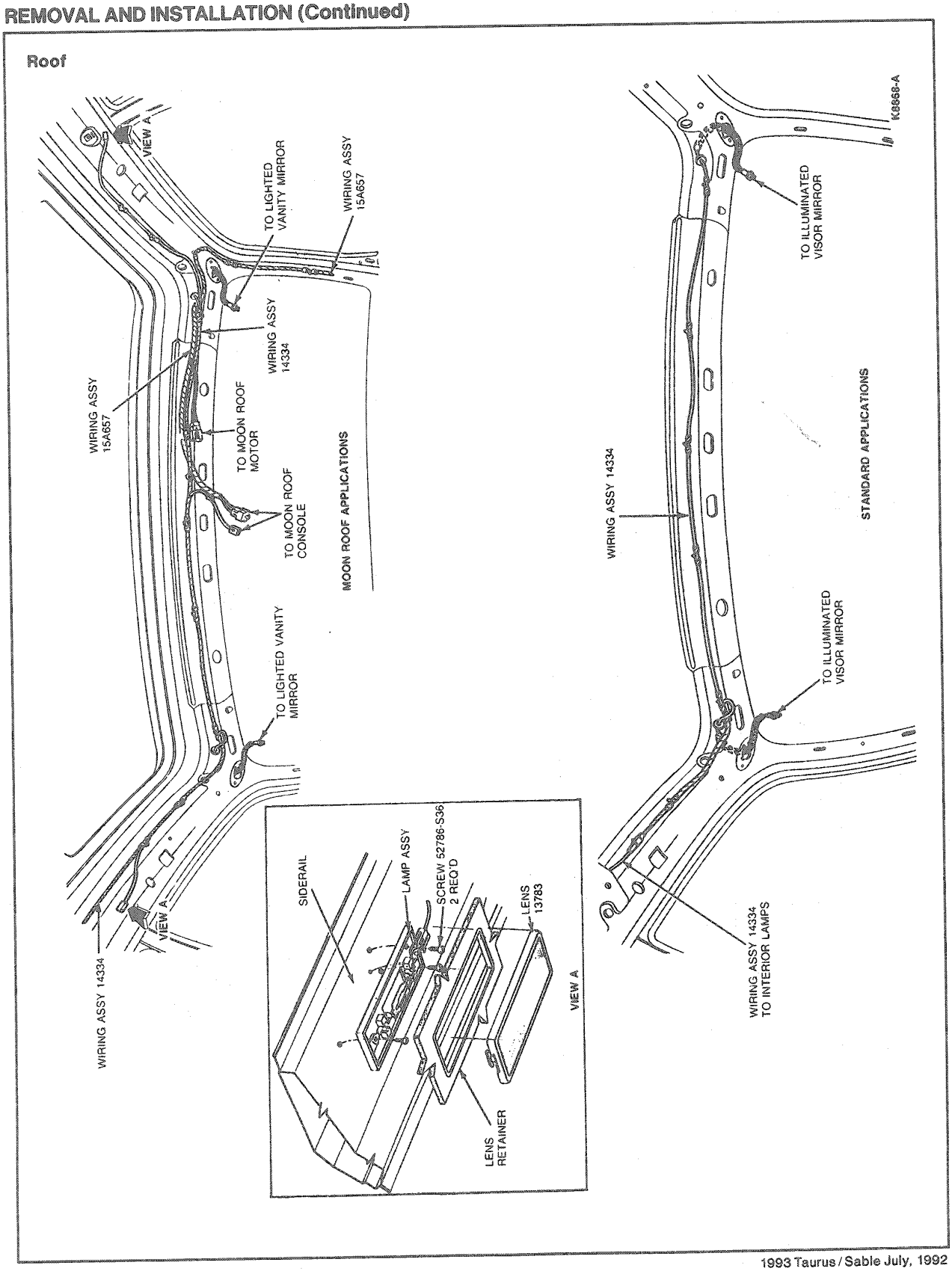
Item	Part Number	Description
1	—	To Rear Speaker
2	18C620	Wiring Harness Assy
3	N801846-S36MG	Screw
4	—	To Floorpan Wiring

(Continued)

Item	Part Number	Description
5	2C055	Wiring Harness Assy
6	19B113	Wiring Harness Assy
7	—	To Premium Sound Amplifier
8	14405	Wiring Harness Assy
9	14290	Wiring Harness Assy
10	—	To Anti-Lock Brake Sensors

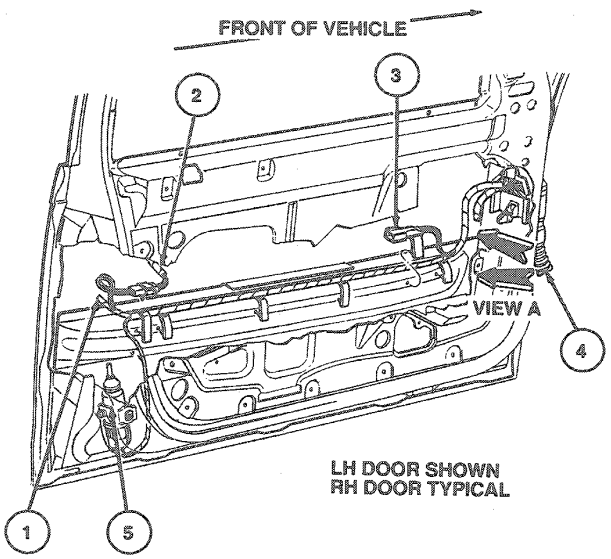
REMOVAL AND INSTALLATION (Continued)

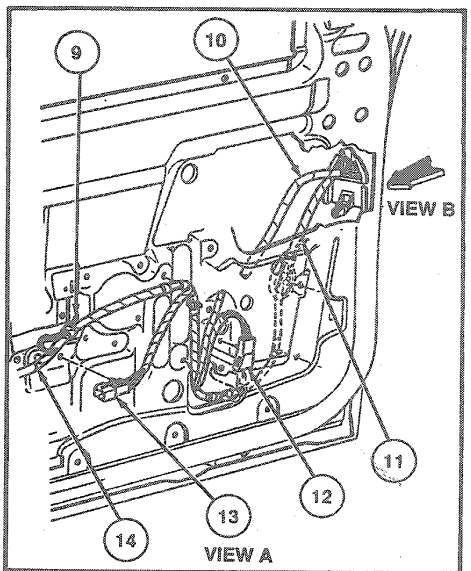
Roof

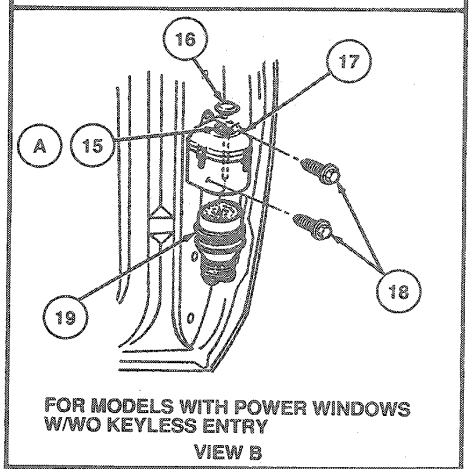


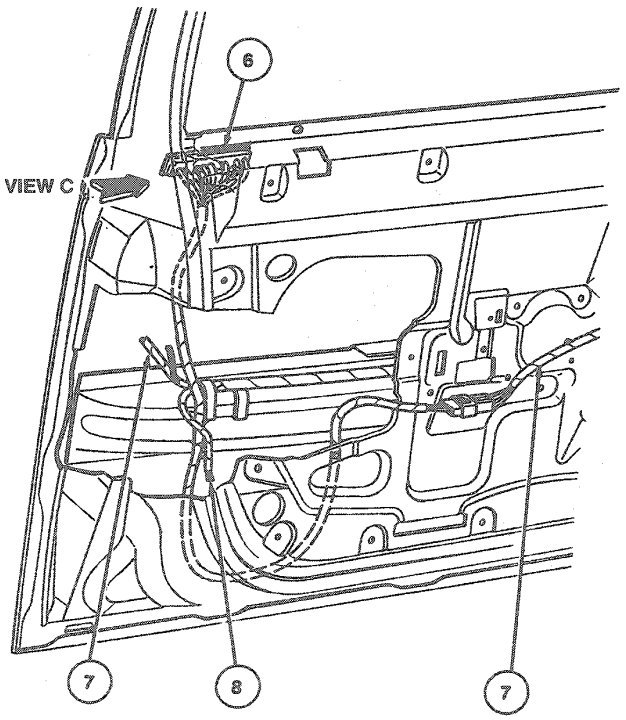
REMOVAL AND INSTALLATION (Continued)

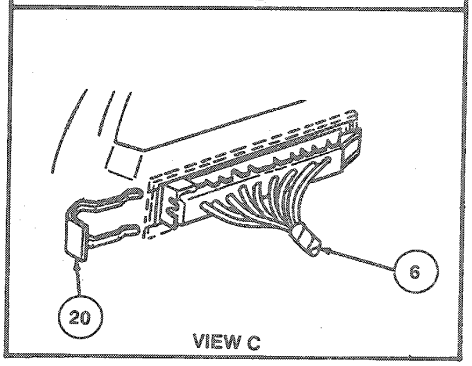
Door, Front











K8866-D

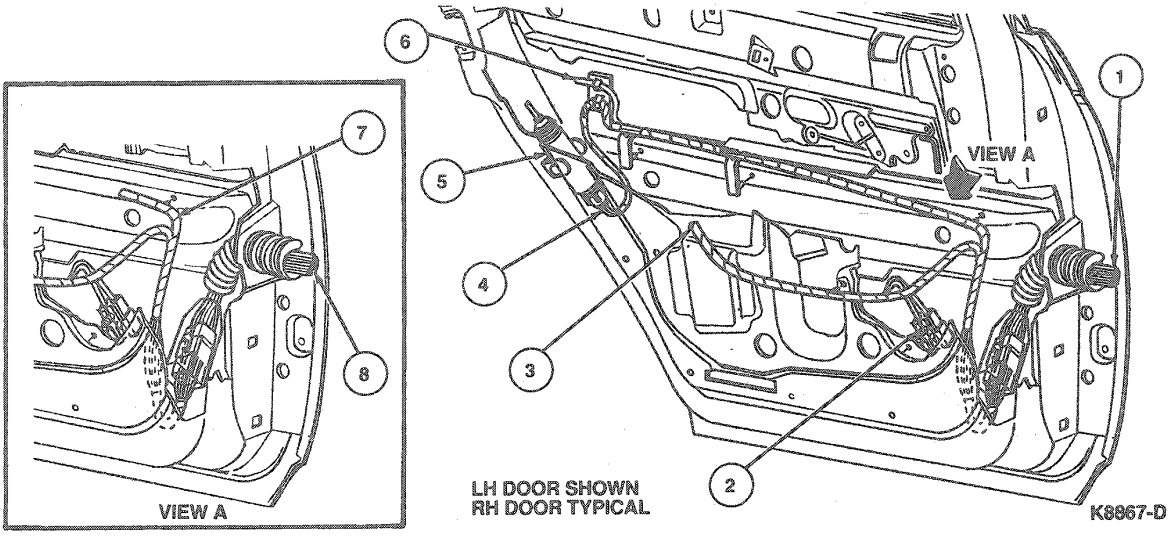
REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	—	To Illuminated Entry and Door Ajar Switch
2	—	To Lock Cylinder
3	—	To Power Mirror
4	14630 11463	Wiring Assy
5	—	Power Door Lock Actuator Motor
6	14A626	Keyless Entry Keypad
7	14631	Wiring Assy
8	—	To Door Lock Actuator Motor
9	14631	Wiring Assy to Courtesy Lamp
10	14630 14631	Wiring Assy Standard / Optional

(Continued)

Item	Part Number	Description
11	14630 11463	Wiring Assy to Door Speaker
12	14630	Wiring Assy to Power Window Regulator Motor
13	—	To Keyless Entry Keypad
14	—	To Power Mirror Switch Assy
15A	—	Screw
16	14A666	Cap
17	14631	Wiring Assy Connector
18	801164-S43	Screw (2 Req'd)
19	14A488	Wiring Assy to Floorpan Wiring
20	14A667	Retainer Clip
A		Tighten to 4.1-5.4 N·m (37-47 Lb-In)

Door, Rear



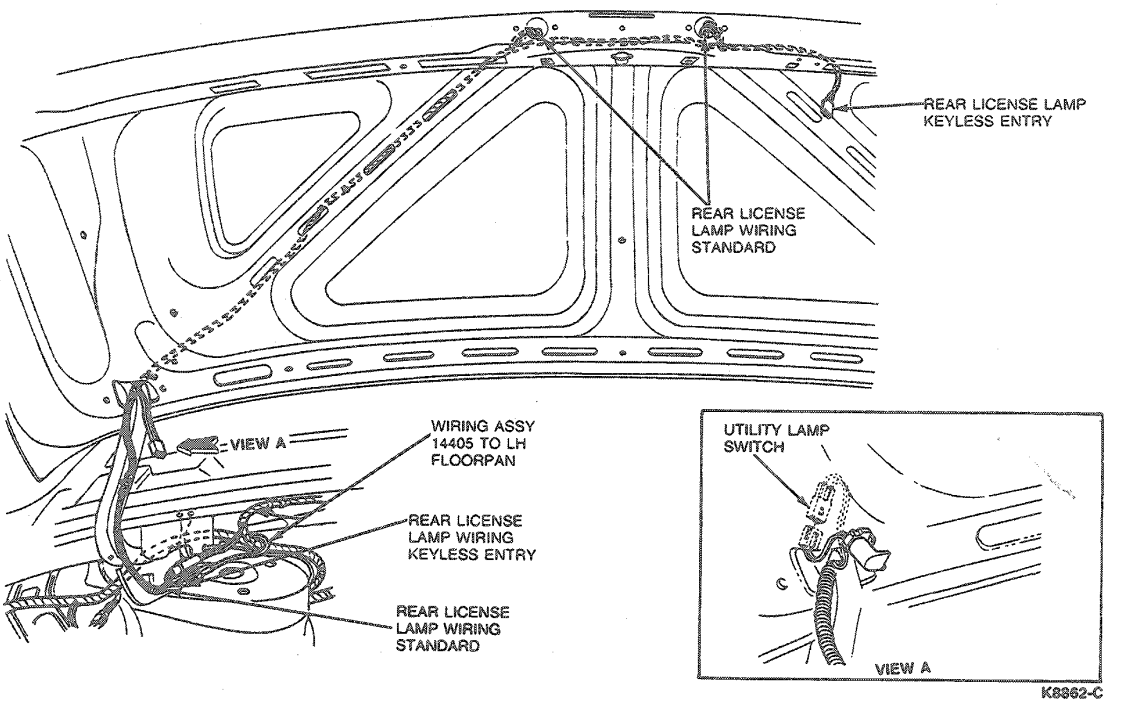
Item	Part Number	Description
1	14A488	Wiring Assy To LH Floorpan
2	14632 14633	Wiring Assy To Power Window Regulator Motor
3	14632 14633	Wiring Assy To Power Window Switch Assy
4	14026	Wiring Assy

(Continued)

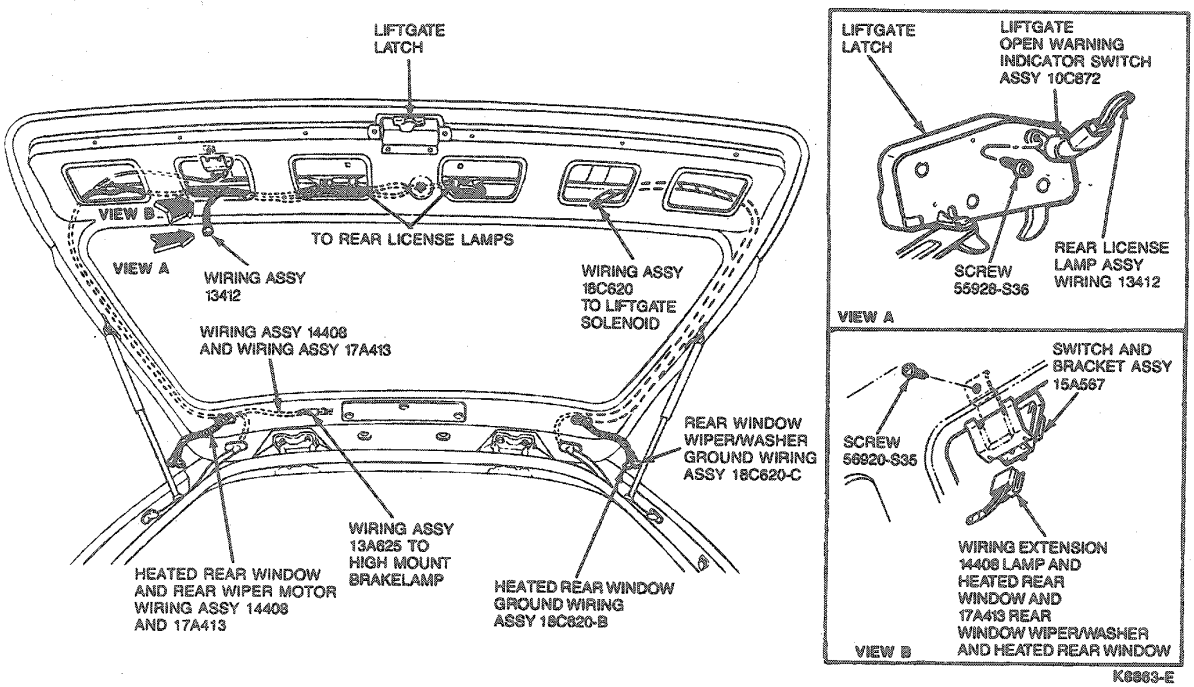
Item	Part Number	Description
5	14A626	Lock Actuator
6	—	To Door Ajar Switch
7	14632	Wiring Assy with Power Windows-With and W / Out Locks and Door Ajar
8	14A488	Wiring Assy Window Regulator Jumper

REMOVAL AND INSTALLATION (Continued)

Deck Lid



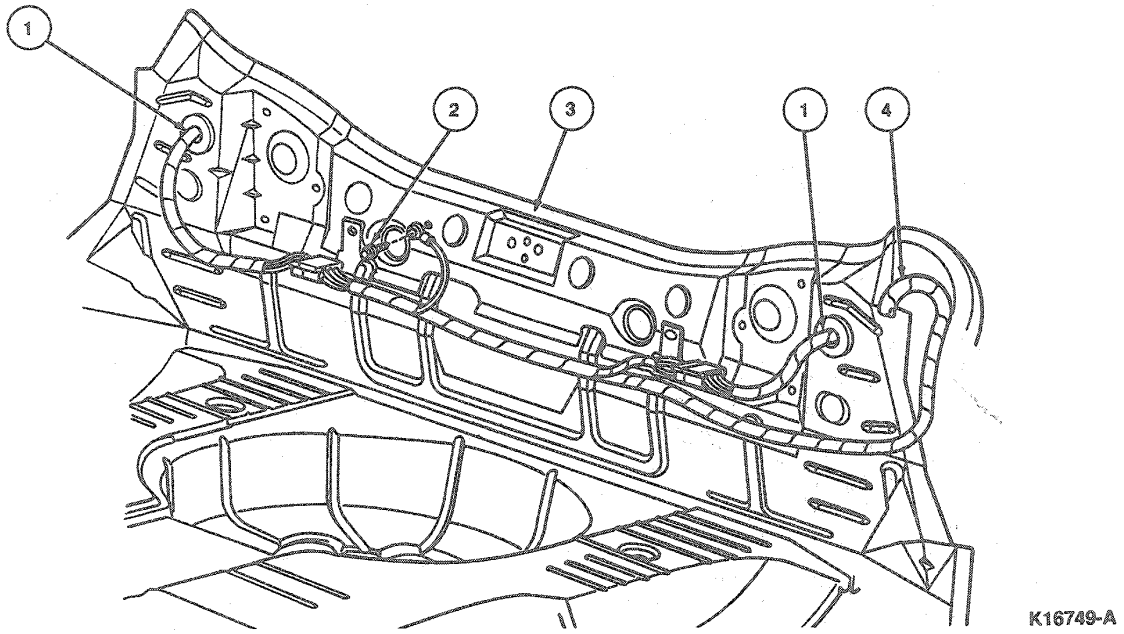
Liftgate



REMOVAL AND INSTALLATION (Continued)

Lower Back Panel—Sedan

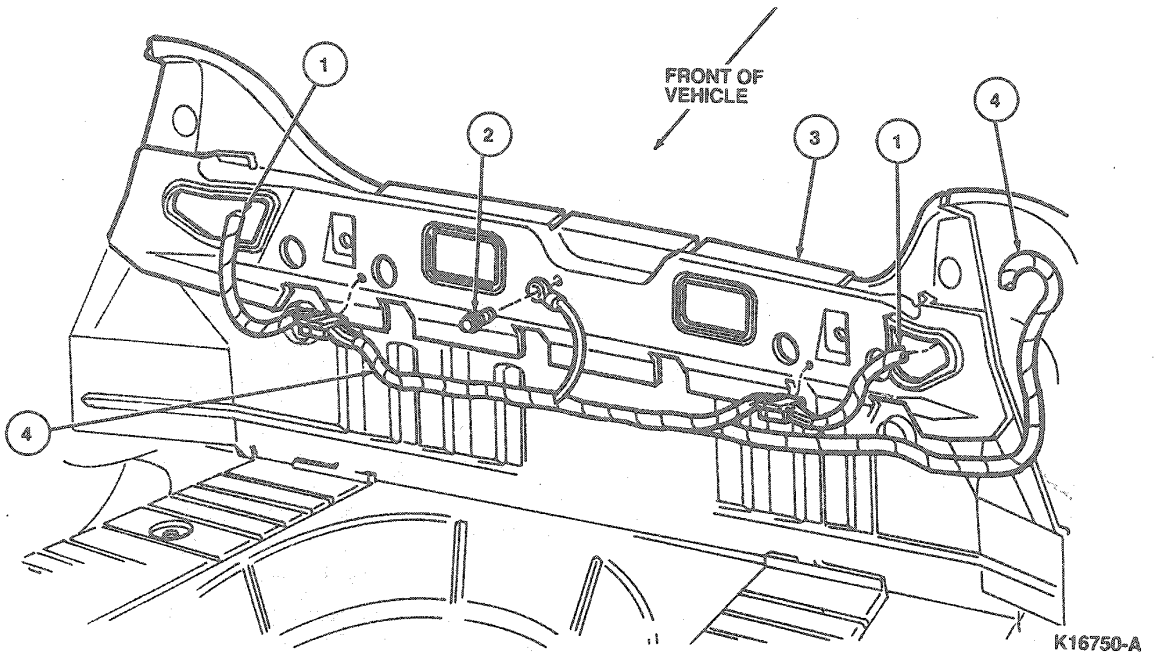
Taurus



Item	Part Number	Description
1	13407	Wiring Assy to Rear Lamps
2	N801846	Screw
3	—	Lower Back Panel
4	14405	Wiring Assy

REMOVAL AND INSTALLATION (Continued)

Sable

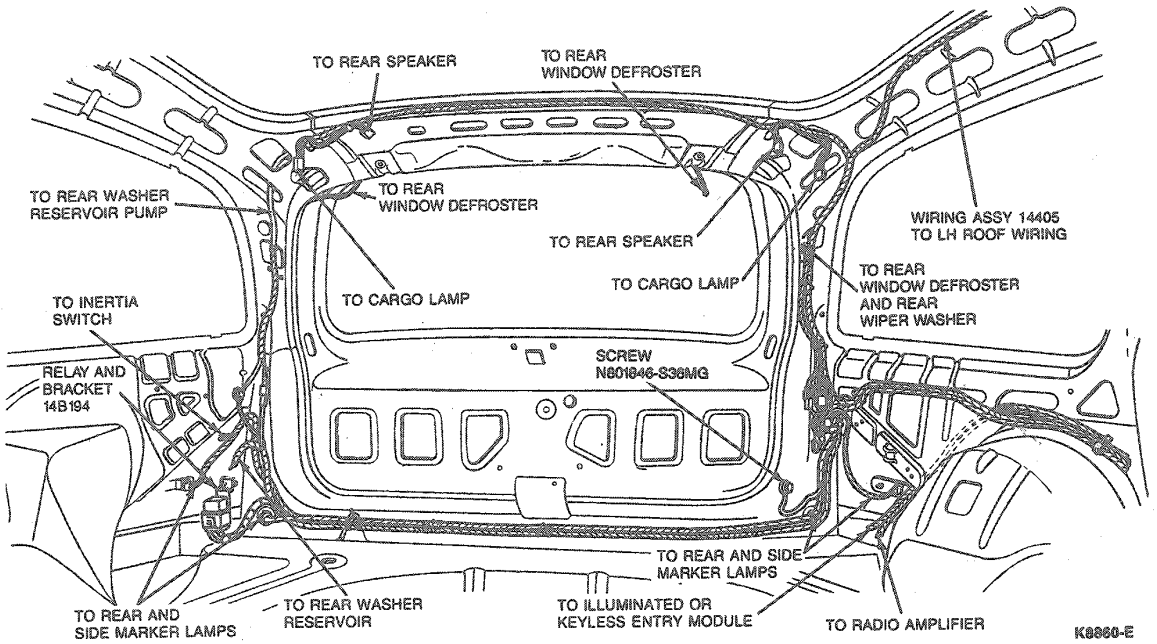


Item	Part Number	Description
1	13407	Wiring Assy to Rear Lamps
2	N801846	Screw
3	—	Lower Back Panel
4	14405	Wiring Assy

REMOVAL AND INSTALLATION (Continued)

Rear Quarter Back Panel

Wagon

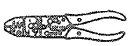


SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N-m	Lb-in
Dropping Resistor Mounting Screw	5.2-6.7	47-59
Air Bag Sensor Mounting Screw	4-5.6	36-49
Power Distribution Box Mounting Screw	3.6-4.1	32-36
Wiring Assembly Connector Screw	4.1-5.4	37-47
Connector Retaining Bolt	1.4-2	12-18
Ground Screw	3.4-4.8	30-42
Connector Retaining Bolt	5.2-7.2	46-64
Bracket Mounting Screw	7.6-10.4	6-8 (Lb-Ft)
Bracket Mounting Nut	29.7-40.3	22-30 (Lb-Ft)
Fuse Panel Retaining Screws	2.1-2.9	19-26 (Lb-Ft)

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T67S-17018-A Wire Fitting Crimping Tool	 T67S-17018-A

SECTION 18-04 Electrical Devices—Miscellaneous

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

The cigar lighter element has a low resistance heating coil which operates similar to the coil used in a portable heater.

When the element is pushed completely in, the circuit is closed and current flows through the heating coil to the ground. When sufficient heat is generated, the element will overcome the spring pressure of the bimetal retaining fingers and be released.

The ash receptacles are located in the center of the instrument panel and in the rear armrests. The cigar lighter is located in the front ash receptacle.

DIAGNOSIS

Refer to the diagnosis chart for cigar lighter diagnosis.

CIGAR LIGHTER INOPERATIVE

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	INSPECT LIGHTER		
	• Inspect lighter for burned out coil or other physical damage. • **Is lighter OK?**	Yes ▶ No ▶	GO to A2. REPLACE element or socket as required.
A2	CHECK FOR VOLTAGE		
	• Using a voltmeter check for voltage at feed wire. • **Is there voltage?**	Yes ▶ No ▶	SERVICE ground circuit as required. CHECK feed circuit for an open or blown fuse. REPLACE or SERVICE as required.

TK5490C

REMOVAL AND INSTALLATION

Ash Receptacle and Retainer Assembly

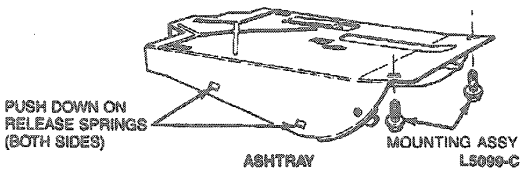
Instrument Panel Mounted

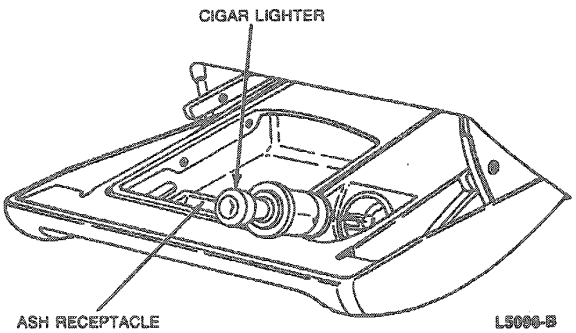
Removal and Installation

1. To remove ash receptacle, push up on receptacle through opening in bottom of retainer housing.
2. To remove ash receptacle retainer, depress spring stops on both sides with screwdriver and pull retainer out. Disconnect lamp and lighter wiring.
3. To remove ash receptacle track assembly, remove ash receptacle, receptacle retainer, and coin tray / cupholder (refer to Section 01-12) or CD player (refer to Section 15-01). Remove two retaining screws and two nuts.

REMOVAL AND INSTALLATION (Continued)

4. Disconnect wiring harness.
5. To install, reverse Removal procedure.





Rear Seat

Removal and Installation

1. Remove ash receptacle by depressing spring stop and pulling receptacle up and out.
2. To remove ash receptacle retainer, remove ash receptacle, and four screws retaining receptacle retainer to trim panel and remove retainer. Remove wiring harness.
3. To install, reverse Removal procedure.

Cigar Lighter

Instrument Panel

Removal

1. Disconnect battery ground cable.
2. Remove cigar lighter knob and element assembly.
3. Remove cigar lighter lead wire. Remove ash receptacle, if necessary, and ground wire, if so equipped.
4. Remove cigar lighter socket retainer and remove socket.

Installation

1. Install cigar lighter socket retainer and tighten.
2. Install cigar lighter lead and ground wire, if so equipped.
3. Install ash receptacle, if removed.
4. Install cigar lighter knob and element assembly.
5. Connect battery ground cable and test cigar lighter for proper operation.

Index/ Important Information

METRICS

J1930 TERMINOLOGY LIST

GLOSSARY

ALPHABETICAL INDEX

WE WANT TO HEAR FROM YOU

INTRODUCTION

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, as well as the correct nominal diameter, thread pitch, length, and finish.

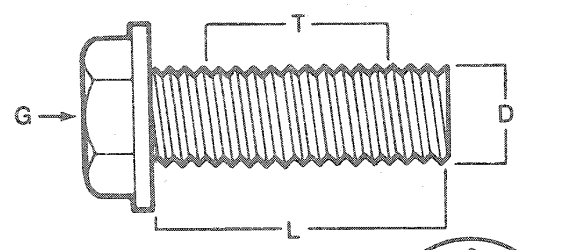
Most original equipment fasteners (English system or Metric) are identified with markings or numbers indicating the strength of the fastener. These markings are described in the pages that follow. Attention to these markings is important in assuring that the proper replacement fasteners are used.

Further, some metric fasteners, especially nuts, are colored blue. This metric blue identification is in most cases a temporary aid for production start-up, and color will generally revert to normal black or bright after start-up.

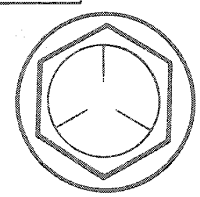
English system and metric system fasteners are available through your Ford Parts and Service operation.

NOMENCLATURE FOR BOLTS

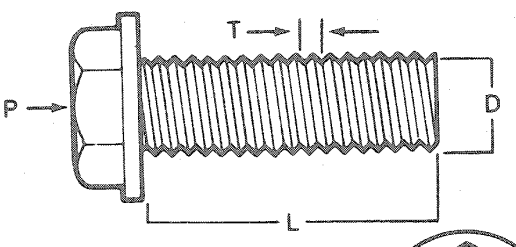
(ENGLISH) INCH SYSTEM
Bolt, 1/2-13x1



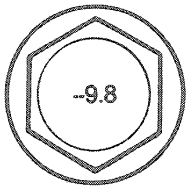
G—Grade Marking (bolt strength)
L—Length, (inches)**
T—Thread Pitch (thread/inch)
D—Nominal Diameter (inches)



METRIC SYSTEM
Bolt M12-1.75x25



P—Property Class* (bolt strength)
L—Length (millimeters)**
T—Thread Pitch (thread width crest to crest mm)
D—Nominal Diameter (millimeters)

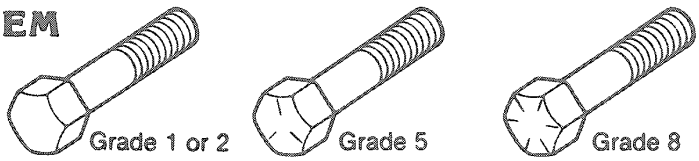


*The property class is an Arabic numeral distinguishable from the slash SAE English grade system.

**The length of all bolts is measured from the underside of the head to the end.

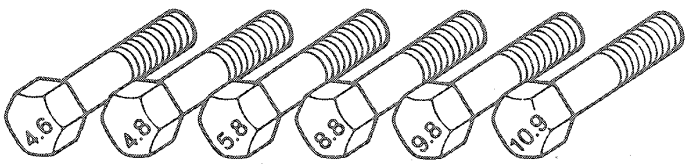
BOLT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM



English (Inch) bolts—Identification marks correspond to bolt strength—increasing number of slashes represent increasing strength.

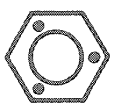
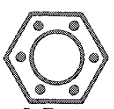
METRIC SYSTEM



Metric bolts—Identification class numbers correspond to bolt strength—increasing numbers represent increasing strength. Common metric fastener bolt strength property are 9.8 and 10.9 with the class identification embossed on the bolt head.

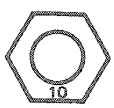
HEX NUT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM

Grade	Hex Nut Grade 5	Hex Nut Grade 8
Identification		
	3 Dots	6 Dots

Increasing dots represent increasing strength.

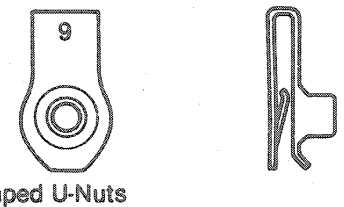
METRIC SYSTEM

Class	Hex Nut Property Class 9	Hex Nut Property Class 10
Identification		
	Arabic 9	Arabic 10

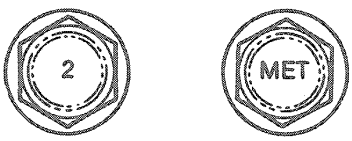
May also have blue finish or paint daub on hex flat. Increasing numbers represent increasing strength.

OTHER TYPES OF PARTS

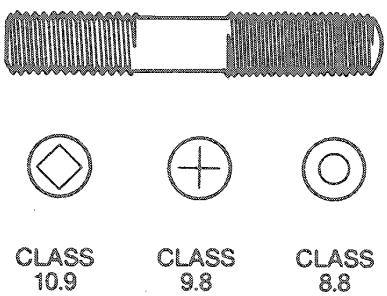
Metric identification schemes vary by type of part, most often a variation of that used of bolts and nuts. Note that many types of English and metric fasteners carry no special identification if they are otherwise unique.



—Stamped U-Nuts



—Tapping, thread forming and certain other case hardened screws



—Studs, Large studs may carry the property class number. Smaller studs use a geometric code on the end.

ENGLISH METRIC CONVERSION

Description	Multiply	By	For Metric Equivalent
ACCELERATION	Foot/sec²	0.304 8	metre/sec² (m/s²)
	Inch/sec²	0.025 4	metre/sec²
TORQUE	Pound-inch	0.112 98	newton-metres (N·m)
	Pound-foot	1.355 8	newton-metres
POWER	horsepower	0.746	kilowatts (kw)
PRESSURE or STRESS	inches of water	0.2491	kilopascals (kPa)
	pounds/sq. in.	6.895	kilopascals (kPa)
	pounds/sq. in.	0.069	bar
ENERGY or WORK	BTU	1 055.	joules (J)
	foot-pound	1.355 8	joules (J)
	kilowatt-hour	3 600 000. or 3.6×10^6	joules (J = one W's)
LIGHT	foot candle	10.764	lumens/metre² (lm/m²)
FUEL PERFORMANCE	miles/gal	0.425 1	kilometres/litre (km/l)
	gal/mile	2.352 7	litres/kilometre (l/km)
VELOCITY	miles/hour	1.609 3	kilometres/hr. (km/h)
LENGTH	inch	25.4	millimetres (mm)
	foot	0.304 8	metres (m)
	yard	0.914 4	metres (m)
	mile	1.609	kilometres (km)
AREA	inch²	645.2	millimetres² (mm²)
		6.45	centimetres² (cm²)
	foot²	0.092 9	metres² (m²)
	yard²	0.836 1	metres²
VOLUME	inch³	16 387.	mm³
		16.387	cm³
		0.016 4	litres (1)
	quart	0.946 4	litres
	gallon	3.785 4	litres
	yard³	0.764 6	metres³ (m³)
MASS	pound	0.453 6	kilograms (kg)
	ton	907.18	kilogram (kg)
	ton	0.90718	tonne (t)
FORCE	kilogram	9.807	newtons (N)
	ounce	0.278 0	newtons
	pound	4.448	newtons
TEMPERATURE	degree farenheit	(°F – 32) 0.556	degree Celsius (°C)

DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal Inch	Metric mm
1/64	.015625	.397
1/32	.03125	.794
3/64	.046875	1.191
1/16	.0625	1.588
5/64	.078125	1.984
3/32	.09375	2.381
7/64	.109375	2.778
1/8	.125	3.175
9/64	.140625	3.572
5/32	.15625	3.969
11/64	.171875	4.366
3/16	.1875	4.763
13/64	.203125	5.159
7/32	.21875	5.556
15/64	.234375	5.953
1/4	.250	6.35
17/64	.265625	6.747
9/32	.28125	7.144
19/64	.296875	7.54
5/16	.3125	7.938
21/64	.328125	8.334
11/32	.34375	8.731
23/64	.359375	9.128
3/8	.375	9.525
25/64	.390625	9.922
13/32	.40625	10.319
27/64	.421875	10.716
7/16	.4375	11.113
29/64	.453125	11.509
15/32	.46875	11.906
31/64	.484375	12.303
1/2	.500	12.7

Fractions	Decimal Inch	Metric mm
33/64	.515625	13.097
17/32	.53125	13.494
35/64	.546875	13.891
9/16	.5625	14.288
37/64	.578125	14.684
19/32	.59375	15.081
39/64	.609375	15.478
5/8	.625	15.875
41/64	.640625	16.272
21/32	.65625	16.669
43/64	.671875	17.066
11/16	.6875	17.463
45/64	.703125	17.859
23/32	.71875	18.256
47/64	.734375	18.653
3/4	.750	19.05
49/64	.765625	19.447
25/32	.78125	19.844
51/64	.796875	20.241
13/16	.8125	20.638
53/64	.828125	21.034
27/32	.84375	21.431
55/64	.859375	21.828
7/8	.875	22.225
57/64	.890625	22.622
29/32	.90625	23.019
59/64	.921875	23.416
15/16	.9375	23.813
61/64	.953125	24.209
31/32	.96875	24.606
63/64	.984375	25.003
1	1.00	25.4

TORQUE CONVERSION

NEWTON METRES (N·m)	POUND-FEET (LB-FT)
1	0.7376
2	1.5
3	2.2
4	3.0
5	3.7
6	4.4
7	5.2
8	5.9
9	6.6
10	7.4
15	11.1
20	14.8
25	18.4
30	22.1
35	25.8
40	29.5
50	36.9
60	44.3
70	51.6
80	59.0
90	66.4
100	73.8
110	81.1
120	88.5
130	95.9
140	103.3
150	110.6
160	118.0
170	125.4
180	132.8
190	140.1
200	147.5
225	166.0
250	184.4

POUND-FEET (LB-FT)	NEWTON METRES (N·m)
1	1.356
2	2.7
3	4.0
4	5.4
5	6.8
6	8.1
7	9.5
8	10.8
9	12.2
10	13.6
15	20.3
20	27.1
25	33.9
30	40.7
35	47.5
40	54.2
45	61.0
50	67.8
55	74.6
60	81.4
65	88.1
70	94.9
75	101.7
80	108.5
90	122.0
100	135.6
110	149.1
120	162.7
130	176.3
140	189.8
150	203.4
160	216.9
170	230.5
180	244.0

J1930 Terminology List

NOTE: Certain Ford component names have been changed in this Service Manual to conform to Society of Automotive Engineers (SAE) directive J1930.

SAE J1930 standardizes automotive component names for all vehicle manufacturers.

This chart lists new 1993 SAE J1930 component names and the obsolete 1992 component names.

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
4X4 Low	4X4L	– 4X4L – 4X4 Low
Air Conditioning	A/C	– A/C – Air Conditioning
Air Conditioning Clutch	ACC	– ACC – Air Conditioning Clutch
Air Conditioning Cyclic Switch	ACCS	– ACCS – Air Conditioning Cyclic Switch
Air Conditioning Demand	ACD	– ACD – Air Conditioning Demand
Air Conditioning On	ACON	– ACON – Air Conditioning On
Automatic Ride Control	ARC	– ACL – Acceleration Signal
Barometric Pressure	BARO	– BP – Barometric Pressure
Battery Positive Voltage	B+	– BATT+ – Battery Positive
Blower	BLR	– BLR – Blower
Brake On/Off	BOO	– BOO – Brake On/Off
Bypass Air	BPA	– BPA – Bypass Air
Canister Purge	CANP	– CANP – Canister Purge
Charge Air Cooler	CAC	– Intercooler
Clutch Pedal Position switch	CPP switch	– CES – CIS – Clutch Engage Switch – Clutch Interlock Switch
Coast Clutch Solenoid	CCS	– CCS – Coast Clutch Solenoid
Computer Control Dwell	CCD	– CCD – Computer Control Dwell
Constant Control Relay Module	CCRM	– IRCM – Integrated Relay Control Module
Crankshaft Position sensor	CKP sensor	– CPS – VRS – Variable Reluctance Sensor

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Cylinder Identification	CID	– CID – Cylinder Identification
Data Link Connector	DLC	– Self-Test connector
Data Negative	DATA-	– DATA- – Data Negative
Data Output Line	DOL	– DOL – Data Output Line
Data Positive	DATA+	– DATA+ – Data Positive
Daytime Running Lamps	DRL	– DRL – Daytime Running Lamps
Defroster	DEF	– DEF – Defroster
Diagnostic Test Mode	DTM	– Self-Test mode
Diagnostic Trouble Code	DTC	– Self-Test code
Differential Pressure Feedback EGR	DPFE	– DPFE – Differential Pressure Feedback EGR
Distributor Ignition	DI	– CBD – DS – TFI – Closed Bowl Distributor – Duraspark Ignition – Thick Film Ignition
Dual Overhead Cam	DOHC	– DOHC – Dual Overhead Cam
Dual Plug Inhibit	DPI	– DPI – Dual Plug Inhibit
EGR Pressure Transducer	EPT	– EPT – EGR Pressure Transducer
EGR Temperature	EGRT	– EGRT – EGR Temperature
EGR Vacuum Regulator	EVR	– EVR – EGR Vacuum Regulator
EGR Valve Position	EVP	– EVP – EGR Valve Position
Electronic Air Pump	EAP	– EAP – Electronic Air Pump
Electronic Engine Control	EEC	– EEC – Electronic Engine Control
Electronic Ignition	EI	– DIS – EDIS – Distributorless Ignition System – Electronic Distributorless Ignition System
Electronic Pressure Control	EPC	– EPC – Electronic Pressure Control
Electronic Secondary Air Injection	EAIR	– EAM – Electronic Air Management

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Engine Coolant Temperature	ECT	– ECT – Engine Coolant Temperature
Engine RPM sensor	RPM sensor	– RPMS – Engine RPM sensor
Exhaust Gas Recirculation	EGR	– EGR – Exhaust Gas Recirculation
Fan Control	FC	– EDF – Electro-Drive Fan
Flexible Fuel sensor	FF sensor	– FCS – FFS – FFV – Fuel Compensation Sensor – Flex Fuel Sensor
Flexible Fuel vehicle	FF vehicle	– FFV – Flexible Fuel Vehicle
Fuel Pressure Regulator Control	FPRC	– FPRC – Fuel Pressure Regulator Control
Fuel Pump	FP	– FP – Fuel Pump
Fuel Pump Monitor	FPM	– FPM – Fuel Pump Monitor
Governor Control Module	GCM	– GEM – Governor Electronic Module
Ground	GND	– GND – Ground
Headlamp	HDL	– HDL – Headlamp
Heated Oxygen Sensor	HO2S	– HEGO – Heated Exhaust Gas Oxygen Sensor
High Fan Control	HFC	– HEDF – High Speed Electro-Drive Fan
High Fuel Pump	HFP	– HFP – High Fuel Pump
High Output	HO	– HO – High Output
High Swirl Combustion	HSC	– HSC – High Swirl Combustion
Idle Air Control	IAC	– ISC – Idle Speed Control
Idle Air Control Bypass Air	IAC BPA	– ISC-BPA – Idle Speed Control — Bypass Air
Ignition Control Module	ICM	– DIS module – EDIS module – TFI module
Ignition Diagnostic Monitor	IDM	– IDM – Ignition Diagnostic Monitor
Inertia Fuel Shutoff switch	IFS switch	– Inertia Switch

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Intake Air Temperature	IAT	– ACT – Air Charge Temperature
Intake Manifold Runner Control	IMRC	– IAC – Inlet Air Control
Keep Alive Memory	KAM	– KAM – Keep Alive Memory
Keep Alive Power	KAPWR	– KAPWR – Keep Alive Power
Knock Sensor	KS	– KS – Knock Sensor
Low Fan Control	LFC	– EDF – Electro-Drive Fan
Low Fuel Pump	LFP	– LFP – Low Fuel Pump
Malfunction Indicator Lamp	MIL	– CEL – "CHECK ENGINE" Light – "SERVICE ENGINE SOON" Light
Manifold Absolute Pressure	MAP	– MAP – Manifold Absolute Pressure
Manifold Absolute Pressure Per Altitude	MAPPA	– GMAPPA – Governor Manifold Absolute Pressure Per Altitude
Manual Lever Position	MLP	– MLP – Manual Lever Position
Mass Air Flow	MAF	– MAF – Mass Air Flow
Mass Air Flow Return	MAF RTN	– MAF RTN – Mass Air Flow Return
Multiport Fuel Injection	MFI	– EFI – Electronic Fuel Injection
Octane Adjust	OCT ADJ	– OCT ADJ – Octane Adjust
Overhead Cam	OHC	– OHC – Overhead Cam
Oxidation Catalytic Converter	OC	– COC – Conventional Oxidation Catalyst
Park/Neutral Position switch	PNP switch	– NDS – NGS – TSN – Neutral Drive Switch – Neutral Gear Switch – Transmission Select Switch Neutral
Positive Crankcase Ventilation	PCV	– PCV – Positive Crankcase Ventilation
Power Ground	PWR GND	– PWR GND – Power Ground

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Power Steering Pressure switch	PSP switch	– PSPS – Power Steering Pressure Switch
Powertrain Control Module	PCM	– ECA – ECM – ECU – EEC processor – Engine Control Assembly – Engine Control Module – Engine Control Unit
Pressure Feedback EGR	PFE	– EPT – Exhaust Pressure Transducer
Profile Ignition Pickup	PIP	– PIP – Profile Ignition Pickup
Programmable Speedometer/Odometer Module	PSOM	– PSOM – Programmable Speedometer/ Odometer Module
Pulsed Secondary Air Injection	PAIR	– MPA – PA – Thermactor II – Managed Pulse Air – Pulse Air
Reduction Oxidation Catalytic Converter	REDOX	– REDOX – Reduction Oxidation Catalytic Converter
Scan Tool	ST	– GST – NGS – Generic Scan Tool – New Generation STAR Tester
Secondary Air Injection	AIR	– AM – CT – MTA – Air Management – Conventional Thermactor – Managed Thermactor Air – Thermactor
Secondary Air Injection Bypass	AIRB	– AM1 – TAB – Air Management 1 – Thermactor Air Bypass
Secondary Air Injection Diverter	AIRD	– AM2 – TAD – Air Management 2 – Thermactor Air Diverter
Self-Test Input	STI	– STI – Self-Test Input
Self-Test Output	STO	– STO – Self-Test Output
Sequential Multiport Fuel Injection	SFI	– SEFI – Sequential Electronic Fuel Injection

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Shift Indicator Lamp	SIL	– SIL – Shift Indicator Lamp
Shift Solenoid	SS	– SS – Shift Solenoid
Signal Return	SIG RTN	– SIG RTN – Signal Return
Solid State Relay	SSR	– SSR – Solid State Relay
Spark Output	SPOUT	– SAW – Spark Angle Word
Speed Density	SD	– SD – Speed Density
Super High Output	SHO	– SHO – Super High Output
Supercharger/Supercharged	SC	– SC – Supercharger/Supercharged
Tachometer	TACH	– TACH – Tachometer
Three Way Catalytic Converter	TWC	– TWC – Three Way Catalytic Converter
Three Way + Oxidation Catalytic Converter	TWC+OC	– TWC & COC – Three Way Catalyst and Conventional Oxidation Catalyst
Throttle Body	TB	– TB – Throttle Body
Throttle Body Injection	TBI	– CFI – Central Fuel Injection
Throttle Position	TP	– TP – Throttle Position
Throttle Position Output	TPOUT	– TPOUT – Throttle Position Output
Torque Converter Clutch	TCC	– CCC – CCO – MCCC – Converter Clutch Control – Converter Clutch Override – Modulated Converter Clutch Control
Torque Converter Clutch solenoid	TCC solenoid	– LUS – MLUS – Lock Up Solenoid – Modulated Lock Up Solenoid
Transmission Control Module	TCM	– 4EAT Module
Transmission Control Switch	TCS	– TCS – Transmission Control Switch

J1930 Terminology List

New Term	New Acronyms/ Abbreviations	Old Acronyms/ Term
Transmission Control Indicator Lamp	TCIL	– TCIL – Transmission Control Indicator Lamp
Transmission Oil Temperature	TOT	– TOT – Transmission Oil Temperature
Transmission Range Reverse	TRR	– TSR – Transmission Select Switch Reverse
Transmission Range Overdrive	TROD	– TSOD – Transmission Select Switch Overdrive
Transmission Range Drive	TRD	– TSD – Transmission Select Switch Drive
Transmission Range Low	TRL	– TSL – Transmission Select Switch Low
Transmission Speed Sensor	TSS	– TSS – Transmission Speed Sensor
Turbocharger/Turbocharged	TC	– TC – Turbocharger/Turbocharged
Variable Control Relay Module	VCRM	– VRCM – Variable Relay Control Module
Vehicle Power	VPWR	– VPWR – Vehicle Power
Vehicle Speed Sensor	VSS	– VSS – Vehicle Speed Sensor
Wide Open Throttle	WOT	– WOT – Wide Open Throttle

Glossary

The glossary is a list of technical terms or acronyms and their definitions. It is not intended to be a dictionary of components and their functions. If you desire a detailed description of a specific component, refer to the related Service Manual Group.

2V: Two Valve.

4EAT: 4-speed Electronic Automatic Transaxle.

4V: Four Valve.

4x4 Low (4x4L): Indicates that the 4x4 Low range of the transfer case has been selected.

4x4L: 4x4 Low.

A/C: Air Conditioning.

A/T: Automatic Transmission / Transaxle.

A4LD: Automatic 4-speed Lock-up-convertor Drive transmission.

Absolute Pressure: The pressure referenced to a perfect vacuum.

ACC: Air Conditioning Clutch.

ACCS: Air Conditioning Cyclic Switch.

ACD: Air Conditioning Demand.

ACON: Air Conditioning On.

ACP: Air Conditioning Pressure.

Actuator: A mechanism for moving or controlling something indirectly instead of by hand.

Air Conditioning (A/C): A vehicular accessory system that modifies the passenger compartment air by cooling and drying the air.

Air Conditioning Clutch (ACC): Indicates status of the A/C clutch.

Air Conditioning Cyclic Switch (ACCS): Indicates status of the A/C cyclic switch.

Air Conditioning Demand (ACD): Indicates status of the A/C demand switch.

Air Conditioning On (ACON): Indicates status of the A/C system.

Air Conditioning Pressure (ACP): Indicates pressure in the A/C system.

AIR: Secondary Air Injection.

AIRB: Secondary Air Injection Bypass.

Glossary

AIRD: Secondary Air Injection Diverter.

Ambient Temperature: Temperature of the air surrounding an object.

AOD: Automatic Overdrive transmission.

AODE: Automatic Overdrive Electronic transmission.

AODE-W: Automatic Overdrive Electronic Wide-ratio transmission.

ARC: Automatic Ride Control.

ATDC: After Top Dead Center.

Automatic Ride Control (ARC): A system that automatically adjusts the suspension system to accommodate varying road and driving conditions.

AVOM: Analog Volt-Ohm Meter.

AX4S: Automatic 4-speed Synchronous transaxle.

AXODE: Automatic Overdrive Electronic transaxle.

B+: Battery Positive Voltage.

BARO: Barometric Pressure.

Barometric Pressure (BARO): *formerly BP* The pressure of the surrounding air at any given temperature and altitude.

Base Idle: Idle rpm determined by the throttle lever hardset on the throttle body with the IAC solenoid disconnected.

Base Timing: Spark advance in degrees before top dead center of the base engine without any control from the PCM or ICM.

Battery: An electrical storage device designed to produce a DC voltage by means of an electrochemical reaction.

Battery Positive Voltage (B+): *formerly VBATT or BATT+* The positive voltage from the battery or any circuit connected directly to the battery. Compare "Vehicle Power (VPWR)."

Blower (BLR): A device designed to supply a current of air at a moderate pressure. A blower usually consists of an impeller assembly, a motor and a suitable case. The blower case is designed as part of the ventilation system.

BLR: Blower.

BOO: Brake On / Off.

BPA: Bypass Air.

Glossary

Brake On/Off (BOO): Indicates the position of the brake pedal.

Breakout Box: A service tool that "tees" between the PCM and the 60-pin harness connector. The breakout box contains 60 test pins that can be probed for EEC system testing.

BTDC: Before Top Dead Center.

Bypass Air (BPA): Mechanical control of throttle bypass air.

CAC: Charge Air Cooler.

Camshaft: A shaft on which phased cams are mounted. The camshaft is used to regulate the opening and closing of the intake and exhaust valves.

Camshaft Position (CMP): *formerly CID sensor, hall sensor, or dual hall sensor* Indicates camshaft position.

Canister: A device designed to hold dry material. An evaporative emission canister contains activated charcoal which absorbs fuel vapors and holds them to be purged at an appropriate time.

Canister Purge (CANP): Controls purging of the EVAP canister.

CANP: Canister Purge.

Case Ground (CSE GND): PCM case ground.

Catalytic Convertor: An in-line, exhaust system device used to reduce the level of engine exhaust emissions.

CCD: Computer Controlled Dwell.

CCRM: Constant Control Relay Module.

CCS: Coast Clutch Solenoid.

Charge Air Cooler (CAC): *formerly Intercooler* A device that lowers the temperature of the pressurized intake air.

CID: Cylinder Identification.

Circuit: A complete electrical path or channel, usually includes the source of electrical energy. Circuit may also describe the electrical path between two or more components. May also be used with fluids, air or liquids.

CKP: Crankshaft Position.

Clutch: A mechanical device which uses mechanical, magnetic or friction type connections to facilitate engaging or disengaging of two shafts or rotating members.

Clutch Pedal Position (CPP): *formerly CES or CIS* Indicates clutch pedal position.

CMP: Camshaft Position.

Glossary

CO: Carbon Monoxide.

CO_2: Carbon Dioxide.

Coast Clutch Solenoid (CCS): Controls the coast clutch in the transmission.

Computed Timing: The total spark advance in degrees before top dead center. Equals base timing plus / minus an additional factor calculated by the PCM based on input from a number of sensors.

Constant Control Relay Module (CCRM): *formerly IRCM* A relay module that provides on-off control of various EEC components.

Continuous Memory: The portion of KAM used to store DTC's generated during Continuous Self-Test.

Continuous Self-Test: A continuous test of the EEC system conducted by the PCM whenever the vehicle is operating.

Control: A means or a device to direct and regulate a process or guide the operation of a machine, apparatus or system.

Coolant: A fluid used for heat transfer. Coolants usually contain additives such as rust inhibitors and antifreeze.

CPP: Clutch Pedal Position.

Crankshaft: The part of an engine which converts the reciprocating motion of the pistons to rotary motion.

Crankshaft Position (CKP): *formerly CPS or VRS* Indicates crankshaft position.

CSE GND: Case Ground.

Curb Idle: PCM controlled idle rpm.

Cylinder Identification (CID): Provides crankshaft or camshaft position information for fuel injection synchronization.

Data: General term for information, usually represented by numbers, letters, or symbols.

Data Link Connector (DLC): *formerly Self-Test connector* Connector providing access and / or control of the vehicle information, operating conditions, and diagnostic information.

Data Output Line (DOL): A circuit that sends certain information from the PCM to the instrument cluster.

Data Positive or Negative (DATA+ or DATA-): Circuits that carry data to the DLC, Message Center, or VCRM.

DATA+ or DATA-: Data Positive or Negative.

Daytime Running Lamps (DRL): A system that keeps the vehicle running lamps on at all times while the vehicle is operating.

Glossary

DEF: Defroster.

Defroster (DEF): An electrically heated device designed to remove frost, ice, or snow from the rear window of the vehicle.

DI: Distributor Ignition.

Diagnostic Test Mode (DTM): *formerly Self-Test mode* A level of capability in an On-Board Diagnostic (OBD) system. This may include different functional states to observe signals, a base level to read Diagnostic Trouble Codes, a monitor level which includes information on signal levels, bi-directional control with on / off board aids, and the ability to interface with remote diagnosis.

Diagnostic Trouble Code (DTC): *formerly Self-Test code* An alpha / numeric identifier for a fault condition identified by the On-Board Diagnostic System.

Differential Pressure: The pressure difference between two regions, such as between the intake manifold and the atmospheric pressures.

Differential Pressure Feedback EGR (DPFE): An EGR system that monitors differential EGR pressure across a remote orifice to control EGR flow.

Distributor: A mechanical device designed to switch a high voltage secondary circuit from an ignition coil to spark plugs in the proper firing sequence.

Distributor Ignition (DI): *formerly TFI, CBD, or Duraspark* A system in which the ignition coil secondary circuit is switched by a distributor in proper sequence to various spark plugs.

DLC: Data Link Connector.

DOHC: Dual Overhead Cam.

DOL: Data Output Line.

DPFE: Differential Pressure Feedback EGR.

DPI: Dual Plug Inhibit.

DRL: Daytime Running Lamps.

DTC: Diagnostic Trouble Code.

DTM: Diagnostic Test Mode.

Dual Overhead Cam (DOHC): An engine configuration that uses two camshafts positioned above the valves.

Dual Plug Inhibit (DPI): A circuit that inhibits the operation of the second plug in each cylinder on dual plug vehicles.

DVOM: Digital Volt-Ohm Meter.

Glossary

E4OD: Electronic 4-speed Overdrive transmission.

EAIR: Electronic Secondary Air Injection.

EAP: Electric Air Pump.

ECT: Engine Coolant Temperature.

EEC: Electronic Engine Control.

EEC-IV: Ford's fourth generation EEC system.

EGR: Exhaust Gas Recirculation.

EGR Pressure Transducer (EPT): An EGR system that uses a mechanical pressure transducer to control EGR flow.

EGR Temperature (EGRT): Sensing EGR function based on temperature change. Primarily in systems with mechanical flow control devices.

EGR Vacuum Regulator (EVR): Controls EGR flow by changing vacuum to the EGR valve.

EGR Valve Position (EVP): An EGR system that directly monitors EGR valve position to control EGR flow.

EGRT: EGR Temperature.

EI: Electronic Ignition.

Electric Air Pump (EAP): An electric pump used in EAIR systems.

Electronic Engine Control (EEC): The system that provides electronic control of engine operation.

Electronic Ignition (EI): *formerly DIS or EDIS* A system in which the ignition coil secondary circuit is dedicated to specific spark plugs without the use of a distributor. Ford currently has two types of EI systems, Low Data Rate (formerly DIS) and High Data Rate (formerly EDIS).

Electronic Pressure Control (EPC): Controls fluid pressure in the transmission.

Electronic Secondary Air Injection (EAIR): A pump-driven system for providing secondary air using an electric air pump.

Engine: A machine designed to convert thermal energy into mechanical energy to produce force or motion.

Engine Coolant Temperature (ECT): The temperature of the engine coolant.

Engine RPM (RPM): *formerly RPMS* Indicates engine rpm.

Engine Running Self-Test: A test of the EEC system conducted by the PCM with the engine running and the vehicle at rest.

Glossary

EPC: Electronic Pressure Control.

EPT: EGR Pressure Transducer.

EVAP: Evaporative Emission.

Evaporative Emission (EVAP): A system to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal canister to store fuel vapors.

EVP: EGR Valve Position.

EVR: EGR Vacuum Regulator.

Exhaust Gas Recirculation (EGR): Reducing NOx emissions levels by adding exhaust gas to the incoming air / fuel mixture.

Failure Mode Effects Management (FMEM): An alternative vehicle operation strategy that protects vehicle function from the adverse effect of an EEC system failure.

Fan: A device designed to supply a current of air. A fan may also have a frame, motor, wiring harness and the like.

Fan Control (FC): *formerly EDF* Controlling the engine cooling fan.

FC: Fan Control.

FF: Flexible Fuel.

Flexible Fuel (FF): *formerly Flex Fuel or FFV* A system capable of using a variety of fuels for vehicle operation.

FMEM: Failure Mode Effects Management.

Four Valve (4V): Four valves, two intake and two exhaust, per cylinder.

FP: Fuel Pump.

FPM: Fuel Pump Monitor.

FPRC: Fuel Pressure Regulator Control.

Fuel: Any combustible substance burned to provide heat or power. Typical fuels include gasoline and diesel fuel. Other types of fuel include ethanol, methanol, natural gas, propane or in combination.

Fuel Pressure Regulator Control (FPRC): Controls the fuel pressure regulator. Used primarily to provide extra fuel during cold starts.

Fuel Pump (FP): A pump used to deliver fuel to the engine.

Fuel Pump Monitor (FPM): Monitors operation of the fuel pump.

Glossary

Fuel Rich/Lean: A qualitative evaluation of air/fuel ratio based on an A/F ratio known as stoichiometry or 14.7:1. In the EEC system, rich/lean is determined by a voltage signal from the HO2S. An excess of oxygen (lean) is indicated by an HO2S voltage of less than .4 volts; a rich condition is indicated by an HO2S voltage of greater than .6 volts.

FWD: Front Wheel Drive.

GCM: Governor Control Module.

GEN: Generator.

Generator (GEN): *formerly Alternator* A rotating machine designed to convert mechanical energy into electrical energy.

GND: Ground.

Goose: A brief opening and closing of the throttle (Dynamic Response test).

Governor: A device designed to automatically limit engine speed.

Governor Control Module (GCM): *formerly GEM* The module that controls the governor.

Ground (GND): An electrical conductor used as a common return for an electric circuit(s) and with a relative zero potential.

GVW: Gross Vehicle Weight.

Hall Effect: A process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field to produce a small voltage in the semi-conductor.

Hard Fault: A fault currently present in the system.

Hardware Limited Operating Strategy (HLOS): A mode of operation where the PCM replaces output commands with fixed values in response to certain PCM malfunctions.

HC: Hydrocarbon.

HDL: Headlamp.

Headlamp (HDL): Indicates status of the headlamps.

Heated Oxygen Sensor (HO2S): *formerly HEGO* An Oxygen Sensor (O2S) that is electrically heated.

HFC: High Fan Control.

HFP: High Fuel Pump.

High Fan Control (HFC): *formerly HEDF* Controlling the high speed cooling fan.

High Fuel Pump (HFP): Controls the high speed fuel pump.

Glossary

High Swirl Combustion (HSC): A cylinder and piston configuration that causes swirling of the air / fuel mixture in the cylinder.

HLOS: Hardware Limited Operating Strategy.

HO: High Output.

HO2S: Heated Oxygen Sensor.

HSC: High Swirl Combustion.

IAC: Idle Air Control.

IAT: Intake Air Temperature.

ICM: Ignition Control Module.

Idle Air Control (IAC): *formerly ISC* Electrical control of throttle bypass air.

IDM: Ignition Diagnostic Monitor.

IFS: Inertia Fuel Shutoff.

IGN GND: Ignition Ground.

Ignition: System used to provide high voltage spark for internal combustion engines.

Ignition Control Module (ICM): *formerly TFI module, DIS module, or EDIS module* The module that controls the ignition system.

Ignition Diagnostic Monitor (IDM): Monitors operation of the ignition system.

IMRC: Intake Manifold Runner Control.

Inertia Fuel Shutoff (IFS): *formerly Inertia switch* An inertia system that shuts off the fuel delivery system when activated by predetermined force limits.

Injector: A device for delivering metered pressurized fuel to the intake system or the cylinders.

Intake Air: Air drawn through a cleaner and distributed to each cylinder for use in combustion.

Intake Air Temperature (IAT): *formerly ACT* The temperature of the intake air.

Intake Manifold Runner Control (IMRC): *formerly IAC* Controls airflow through runners in the intake manifold.

Intermittent: A fault that may not be present or identifiable at the present time.

KAM: Keep Alive Memory.

KAPWR: Keep Alive Power.

Glossary

Keep Alive Memory (KAM): A portion of the memory within the PCM that must maintain power even when the vehicle is not operating.

Keep Alive Power (KAPWR): Dedicated, unswitched power circuit that maintains KAM.

Key On Engine Off Self-Test: A test of the EEC system conducted by the PCM with power applied and the engine at rest.

Knock: The sharp metallic sound produced when two pressure fronts collide in the combustion chamber of an engine.

Knock Sensor (KS): Detects engine knock.

KOEO: Key On Engine Off.

KOER: Key On Engine Running.

KS: Knock Sensor.

L: Liters.

LFC: Low Fan Control.

LFP: Low Fuel Pump.

Low Fan Control (LFC): *formerly EDF* Controlling the low speed cooling fan.

Low Fuel Pump (LFP): Controls the low speed fuel pump.

M/T: Manual Transmission / Transaxle.

MAF: Mass Air Flow.

MAF RTN: Mass Air Flow Return.

Malfunction Indicator Lamp (MIL): A required on-board indicator to alert the driver of an emission related malfunction. May read either "CHECK ENGINE" or "SERVICE ENGINE SOON."

Manifold: A device designed to collect or distribute fluid, air or the like.

Manifold Absolute Pressure (MAP): The absolute pressure of the intake manifold air.

Manifold Absolute Pressure Per Altitude (MAPPA): *formerly GMAPPA* Manifold absolute pressure value adjusted for altitude.

Manual Lever Position (MLP): Indicates the position of the manual lever in electronically controlled transmissions.

MAP: Manifold Absolute Pressure.

Glossary

MAPPA: Manifold Absolute Pressure Per Altitude.

Mass Air Flow (MAF): A system which provides information on the mass flow rate of the intake air to the engine.

Mass Air Flow Return (MAF RTN): A return circuit for the MAF sensor.

MFI: Multiport Fuel Injection.

MIL: Malfunction Indicator Lamp.

MLP: Manual Lever Position.

Module: A self-contained group of electrical / electronic components, which is designed as a single replaceable unit.

Monitor Box: An optional EEC system test device which connects in series with the PCM and its harness and permits measurements of PCM inputs and outputs.

Multiport Fuel Injection (MFI): *formerly EFI* A fuel-delivery system in which each cylinder is individually fueled.

NAAO: North American Automotive Operations.

NC: Normally Closed.

NO: Normally Open.

NOx: Nitrous Oxides.

O2S: Oxygen Sensor.

OASIS: On-line Automotive Service Information System.

OBD: On-Board Diagnostic.

OC: Oxidation Catalytic Convertor.

OCT ADJ: Octane Adjust.

Octane Adjust (OCT ADJ): Can alter engine strategy to compensate for changes in fuel octane.

OHC: Overhead Cam.

On-Board Diagnostic (OBD): A system that monitors some or all computer input and control signals. Signal(s) outside of the predetermined limits imply a fault in the system or in a related system.

Open Circuit: A circuit which does not provide a complete path for flow of current.

Overhead Cam (OHC): An engine configuration that uses a single camshaft positioned above the valves.

Glossary

Overlay Card: A plastic card used with the monitor box to identify EEC signals for each engine. The card also programs the monitor box for auto mode measurements.

Oxidation Catalytic Convertor (OC): *formerly COC*A catalytic convertor system that reduces levels of HC and CO.

Oxygen Sensor (O2S): *formerly EGO* A sensor which detects oxygen (O2) content in the exhaust gases.

PAIR: Pulsed Secondary Air Injection.

Park/Neutral Position (PNP): *formerly NDS, NGS, or TSN* Indicates the selected non-drive modes of the transmission.

PCM: Powertrain Control Module.

PCV: Positive Crankcase Ventilation.

PFE: Pressure Feedback EGR.

PIP: Profile Ignition Pickup.

PNP: Park / Neutral Position.

Positive Crankcase Ventilation (PCV): A system that vents vapors from the crankcase.

Power Ground (PWR GND): The main ground circuit in the EEC system.

Power Steering: A system which provides additional force to the steering mechanism, reducing the driver's steering effort.

Power Steering Pressure (PSP): *formerly PSPS* Indicates the pressure in the power steering system.

Powertrain: The elements of a vehicle by which motive power is generated and transmitted to the driven axles.

Powertrain Control Module (PCM): *formerly EEC processor, ECA, ECM, or ECU* The module that controls the EEC system.

Pressure Feedback EGR (PFE): An EGR system that monitors EGR pressure across a remote orifice to control EGR flow.

Profile Ignition Pickup (PIP): Provides crankshaft or camshaft position information for ignition synchronization.

Programmable Speedometer / Odometer Module (PSOM): A module that processes vehicle speed information for use in various electronic systems. The PSOM can be programmed to accommodate various tire and axle combinations.

PSOM: Programmable Speedometer / Odometer Module.

PSP: Power Steering Pressure.

Glossary

Pulsed Secondary Air Injection (PAIR): *formerly Thermactor II* A pulse-driven system for providing secondary air without an air pump by using the engine exhaust system pressure fluctuations or pulses.

Pump: A device used to raise, transfer, or compress fluids by suction, pressure or both.

PWR GND: Power Ground.

QSB: Quarterly Service Bulletin.

Quick Test: A functional diagnostic test of the EEC system consisting of vehicle preparation and hookup, KOEO and KOER Self-Tests.

RABS: Rear Antilock Brake System.

Recorder: An optional EEC system test device which works jointly with the monitor box. It allows up to eight EEC signals to be electronically recorded over a 50 second period.

REDOX: Reduction Oxidation Catalytic Convertor.

Reduction Oxidation Catalytic Convertor (REDOX): A catalytic convertor system that is designed to operate at high temperatures. At low temperatures, it reduces levels of HC and CO. At high temperatures, it reduces levels of HC, CO, and NOx.

Reference Voltage (VREF): A dedicated circuit that provides a 5.0 volt signal used as a reference by certain sensors.

Relay: A generally electromechanical device in which connections in one circuit are opened or closed by changes in another circuit.

Relay Module (RM): A module containing two or more relays.

Return (RTN): A dedicated sensor ground circuit.

RM: Relay Module.

RPM: Engine RPM.

RTN: Return.

RWD: Rear Wheel Drive.

SC: Supercharged.

Scan Tool (ST): A device that interfaces with and communicates information on a data link.

SD: Speed Density.

Secondary Air: Air provided to the exhaust system.

Glossary

Secondary Air Injection (AIR): *formerly Thermactor or Air Management* A pump driven system for providing secondary air.

Secondary Air Injection Bypass (AIRB): *formerly TAB or AM1* Vents secondary air to atmosphere.

Secondary Air Injection Diverter (AIRD): *formerly TAD or AM2* Diverts secondary air to either the catalyst or the exhaust manifold.

Self-Test: One of three subsets of the EEC system Quick Test; Key On Engine Off, Engine Running, and Continuous.

Self-Test Input (STI): A dedicated circuit used to initiate the PCM Self-Test.

Self-Test Output (STO): A dedicated circuit used to output PCM diagnostic information pulses.

Sensor: The generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure or flow rate, and converts that change into an electrical quantity signal.

Sequential Multiport Fuel Injection (SFI): *formerly SEFI* A multiport fuel delivery system in which each injector is individually energized and timed relative to its cylinder intake event. Normally fuel is delivered to each cylinder once per two crankshaft revolutions in four cycle engines and once per crankshaft revolution in two cycle engines.

SFI: Sequential Multiport Fuel Injection.

Shift Indicator Lamp (SIL): A lamp that indicates the preferred shift points for manual transmission / transaxle vehicles.

Shift Solenoid (SS): Controls shifting in an automatic transmission / transaxle.

SHO: Super High Output.

Short Circuit: An undesirable connection between a circuit and any other point.

SIG RTN: Signal Return.

Signal Return (SIG RTN): A dedicated sensor ground circuit that is common to two or more sensors.

SIL: Shift Indicator Lamp.

Solenoid: A device consisting of an electrical coil which, when energized, produces a magnetic field in a plunger which is pulled to a central position. A solenoid may be used as an actuator in a valve or switch.

Spark Output (SPOUT): Desired spark timing information sent from the PCM to the ICM.

Speed: The magnitude of velocity (regardless of direction).

Speed Density (SD): A system which infers information from various sensor inputs on the flow rate of the intake air to the engine.

Glossary

SPOUT: Spark Output.

SS: Shift Solenoid.

ST: Scan Tool.

STI: Self-Test Input.

STO: Self-Test Output.

Supercharged (SC): An intake system that utilizes a supercharger.

Supercharger: A mechanically driven device that pressurizes the intake air, thereby increasing the density of charge air and the consequent power output from a given engine displacement.

Switch: A device for making breaking, or changing the connections in an electrical circuit.

System: A group of interacting mechanical or electrical components serving a common purpose.

TACH: Tachometer.

Tachometer (TACH): A circuit that provides input for an electronic tachometer display.

TB: Throttle Body.

TCC: Torque Convertor Clutch.

TCIL: Transmission Control Indicator Lamp.

TCS: Transmission Control Switch.

Test: A procedure whereby the performance of a product is measured under various conditions.

Three Way + Oxidation Catalytic Convertor (TWC+OC):"formerly TWC & COC" A catalytic convertor system that has both Three Way Catalyst (TWC) and Oxidation Catalyst (OC). Usually secondary air is introduced between the two catalysts.

Three Way Catalytic Convertor (TWC): A catalytic convertor system that reduces levels of HC, CO, and NOx.

Throttle: A valve for regulating the supply of a fluid, usually air or an air / fuel mix, to an engine.

Throttle Body (TB): The device containing the throttle.

Throttle Position (TP): Indicates the position of the throttle plate.

Throttle Position Output (TPOUT): Communicates throttle position information from the PCM to the GCM.

Timing: Relationship between spark plug firing and piston position usually expressed in crankshaft degrees before (BTDC) or after (ATDC) top dead center of the compression stroke.

Glossary

Torque Convertor: A device which by its design multiplies the torque in a fluid coupling between an engine and transmission / transaxle.

Torque Convertor Clutch (TCC): *formerly CCC, CCO, LUS, MLUS, or MCCC* Controlling the torque convertor clutch.

TOT: Transmission Oil Temperature.

TP: Throttle Position.

TPOUT: Throttle Position Output.

TR: Transmission Range.

Transaxle: A device consisting of a transmission and axle drive gears assembled in the same case. Compare "Transmission."

Transmission: A device which selectively increases or decreases the ratio of relative rotation between its input and output shafts. Compare "Transaxle."

Transmission Control Indicator Lamp (TCIL): Indicates that the TCS has been activated.

Transmission Control Switch (TCS): Modifies the operation of electronically controlled transmissions.

Transmission Oil Temperature (TOT): Indicates temperature of transmission fluid.

Transmission Range (TR): The range in which the transmission is operating.

Transmission Range Drive (TRD): *formerly TSD* Indicates operator selection of the Drive transmission range.

Transmission Range Low (TRL): *formerly TSL* Indicates operator selection of the Low transmission range.

Transmission Range Overdrive (TROD): *formerly TSOD* Indicates operator selection of the Overdrive transmission range.

Transmission Range Reverse (TRR): *formerly TSR* Indicates operator selection of the Reverse transmission range.

Transmission Speed Sensor (TSS): Indicates rotational speed of the transmission output shaft or turbine shaft.

TRD: Transmission Range Drive.

TRL: Transmission Range Low.

TROD: Transmission Range Overdrive.

TRR: Transmission Range Reverse.

TSB: Technical Service Bulletin.

Glossary

TSS: Transmission Speed Sensor.

TWC: Three Way Catalytic Convertor.

TWC+OC: Three Way + Oxidation Catalytic Convertor.

Two Valve (2V): Two valves, one intake and one exhaust, per cylinder.

Valve: A device by which the flow of liquid, gas, vacuum, or loose material in bulk may be started, stopped or regulated by a movable part that opens, shuts or partially obstructs one or more ports or passageways. A "Valve" is also the moveable part of such a device.

Variable Control Relay Module (VCRM): A relay module that provides variable control of various EEC components.

VCRM: Variable Control Relay Module.

VECI Label: Vehicle Emission Control Information Label.

Vehicle Power (VPWR): A switched circuit that provides power to the EEC system. Compare "Battery Positive Voltage (B+)."

Vehicle Speed Sensor (VSS): A sensor which provides vehicle speed information.

VOM: Volt-Ohm Meter.

VPWR: Vehicle Power.

VREF: Reference Voltage.

VSS: Vehicle Speed Sensor.

WAC: Wide Open Throttle A/C Cutoff.

Warm Up Oxidation Catalytic Convertor (WU-OC): A catalytic convertor system designed to lower HC and CO emissions during engine warm up. Usually located in or near the exhaust manifold.

Warm Up Three-Way Catalytic Convertor (WU-TWC): A catalytic convertor system designed to lower HC, CO, and NOx emissions during engine warm up. Usually located in or near the exhaust manifold.

Wide Open Throttle (WOT): A condition of maximum airflow through the throttle body.

Wide Open Throttle A/C Cutoff (WAC): Turns A/C system off during wide open throttle or certain other operating conditions.

WOT: Wide Open Throttle.

WU-OC: Warm Up Oxidation Catalytic Convertor.

WU-TWC: Warm Up Three-Way Catalytic Convertor.

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