INSTRUMENTATION AND WARNING SYSTEMS

GROUP 13

(10000 & 19000)

SECTION 13-01A Instrument Cluster—Electronic

VEHICLE APPLICATION

Taurus/Sable.

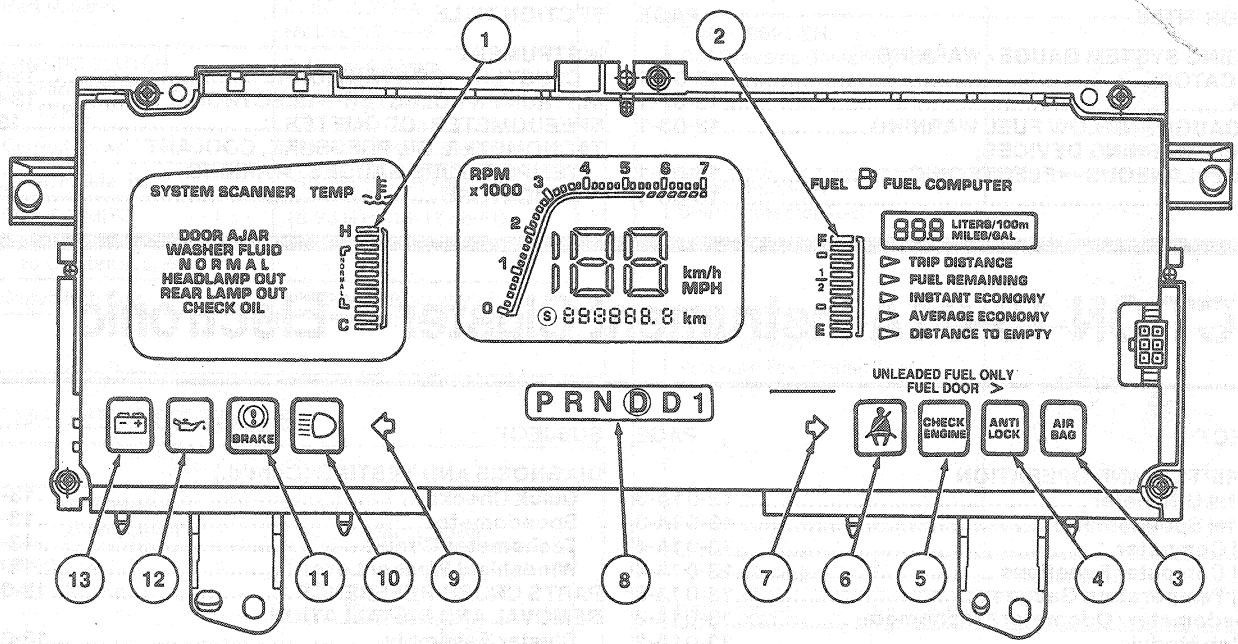
DESCRIPTION AND OPERATION

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)

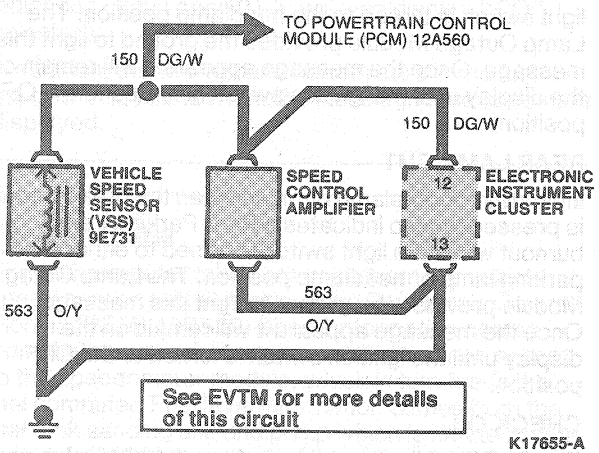
Speedometer

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

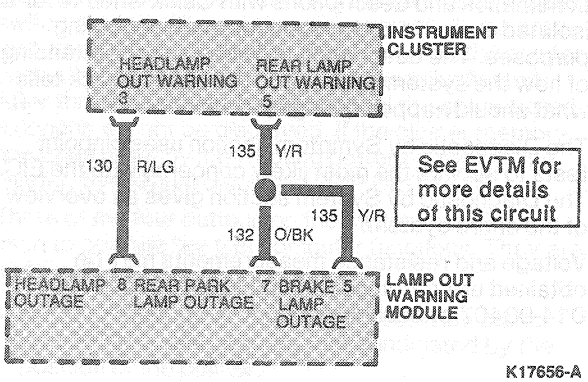
- Verify speedometer by road testing vehicle.
- If speedometer reads zero, high or erratic, then road test speed control. Speed control is performed by the powertrain control module. If speed control does not work properly, concern is not the speedometer.



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.



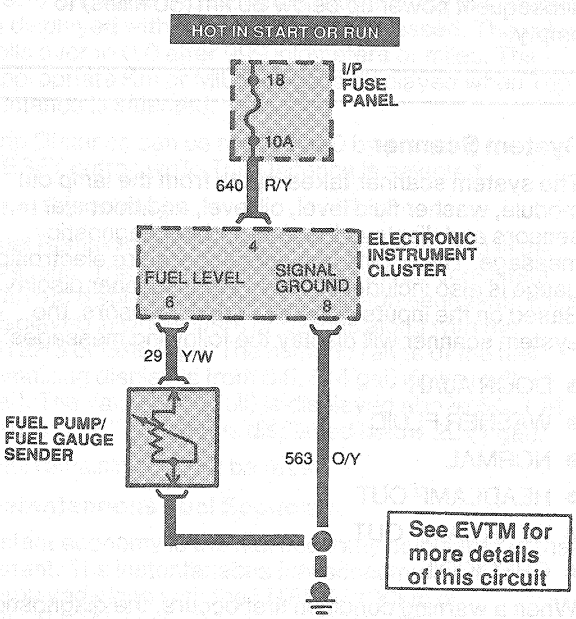
Fuel Gauge

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

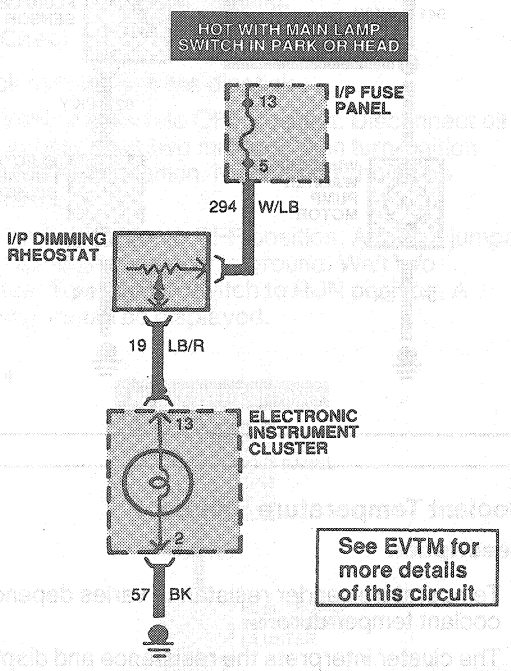
Description

- 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

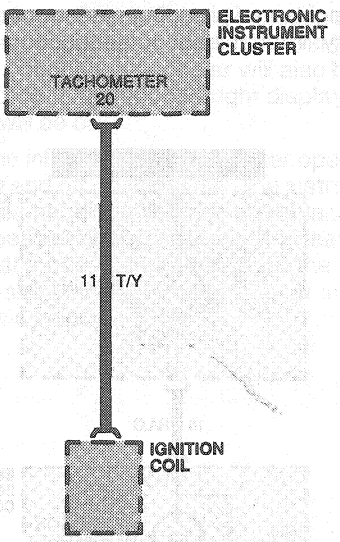
Tachometer Circuit

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

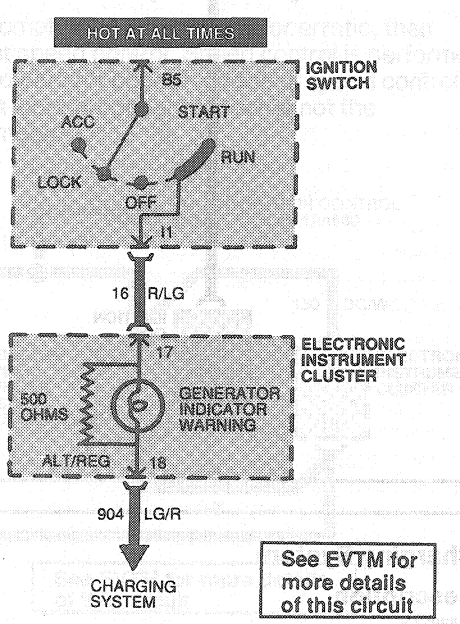
- Connected between Connector B, Pins 17 and 18 is the charge warning indicator and 422 ohm resistor (internal to the cluster). When a charging system concern occurs, Circuit 904 is grounded through the generator regulator and the warning indicator illuminates.

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.



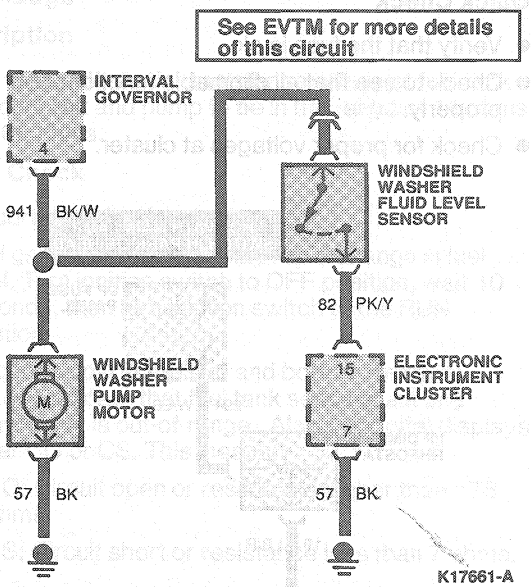
Windshield Washer Level

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.



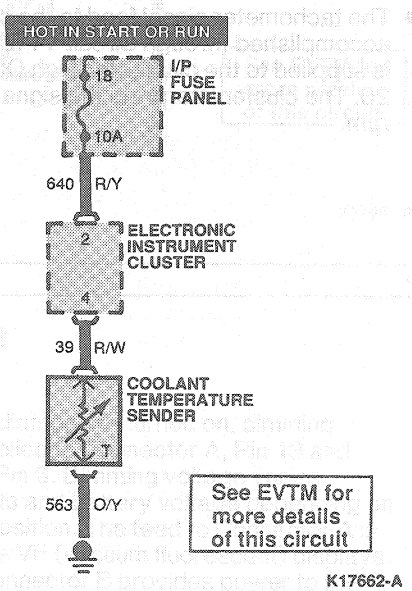
Coolant Temperature Sender

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)

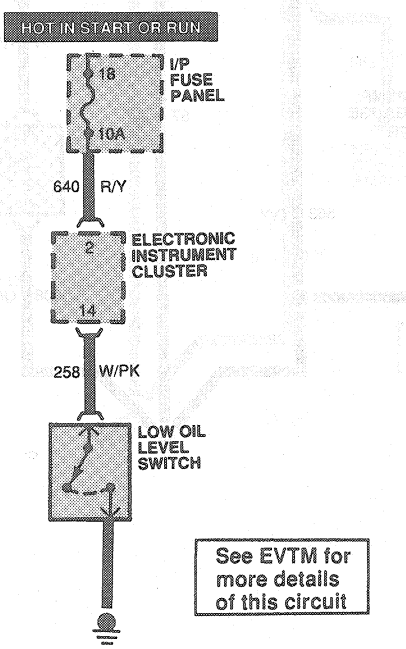
Oil Level Warning

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.



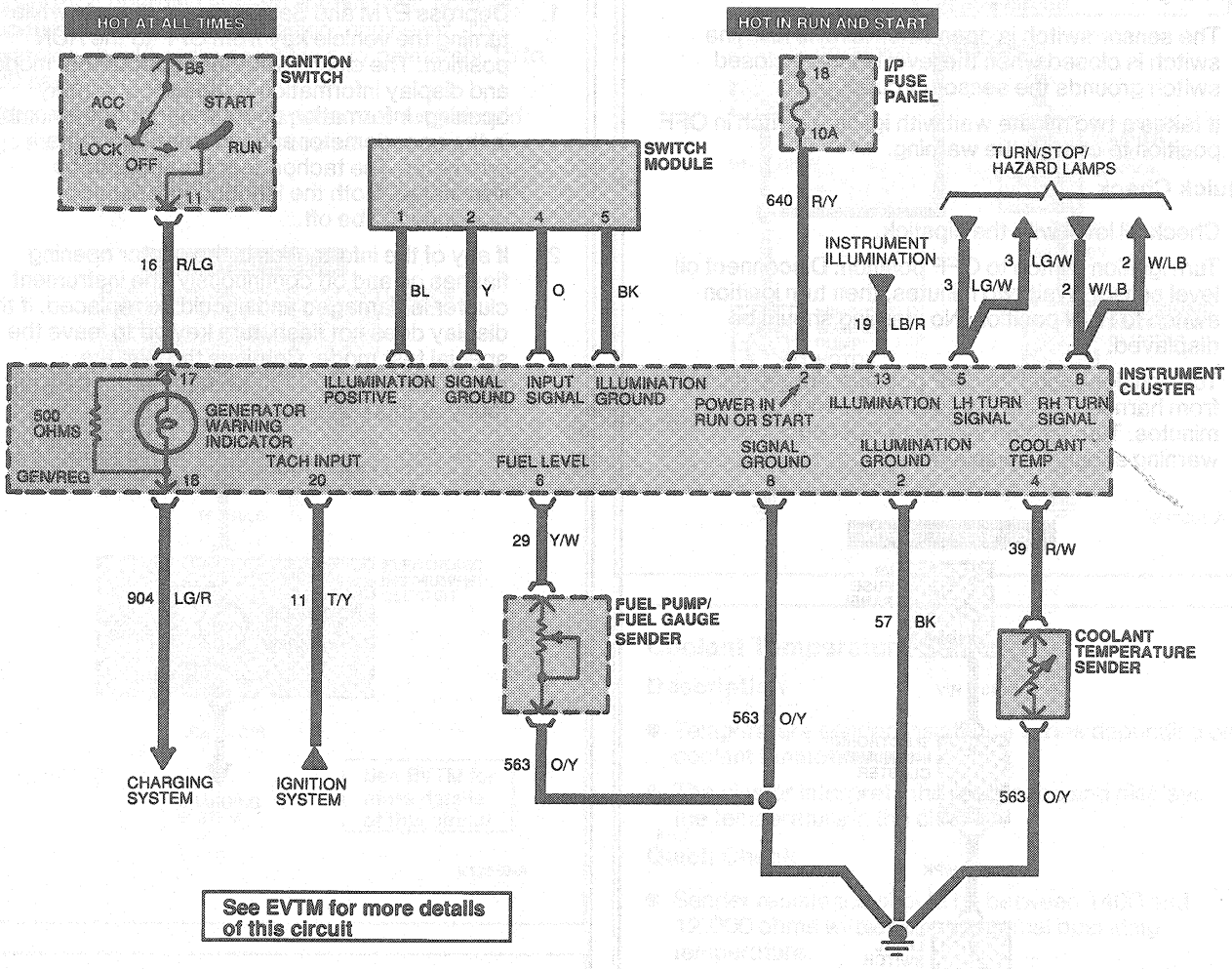
K17663-A

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

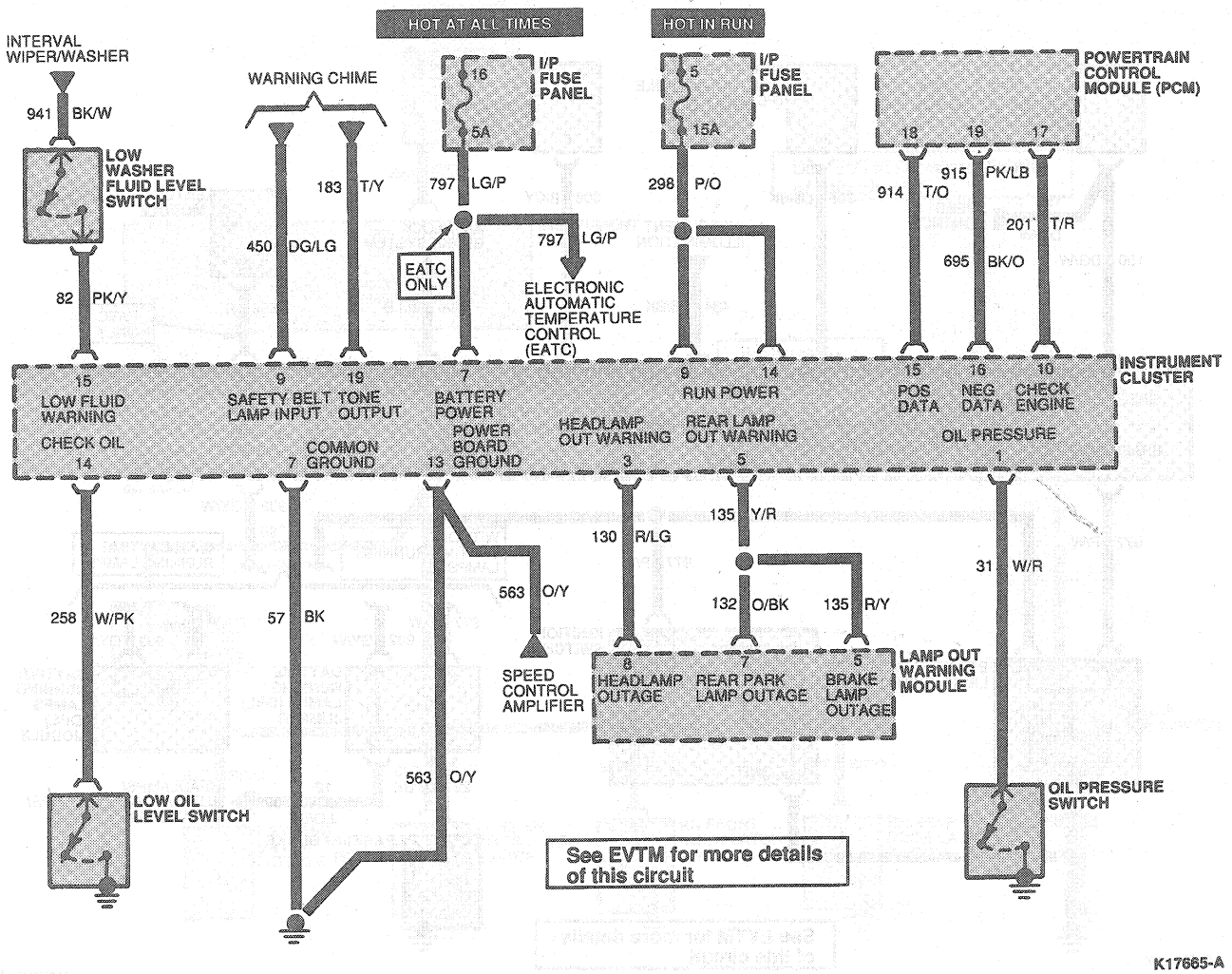
1. Depress E / M and Select simultaneously while turning the vehicle key from OFF to the RUN position. The cluster will enter special test mode and display information in the center display opening. Information displayed includes a number in the speedometer and two numbers in the odometer. The tachometer 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)

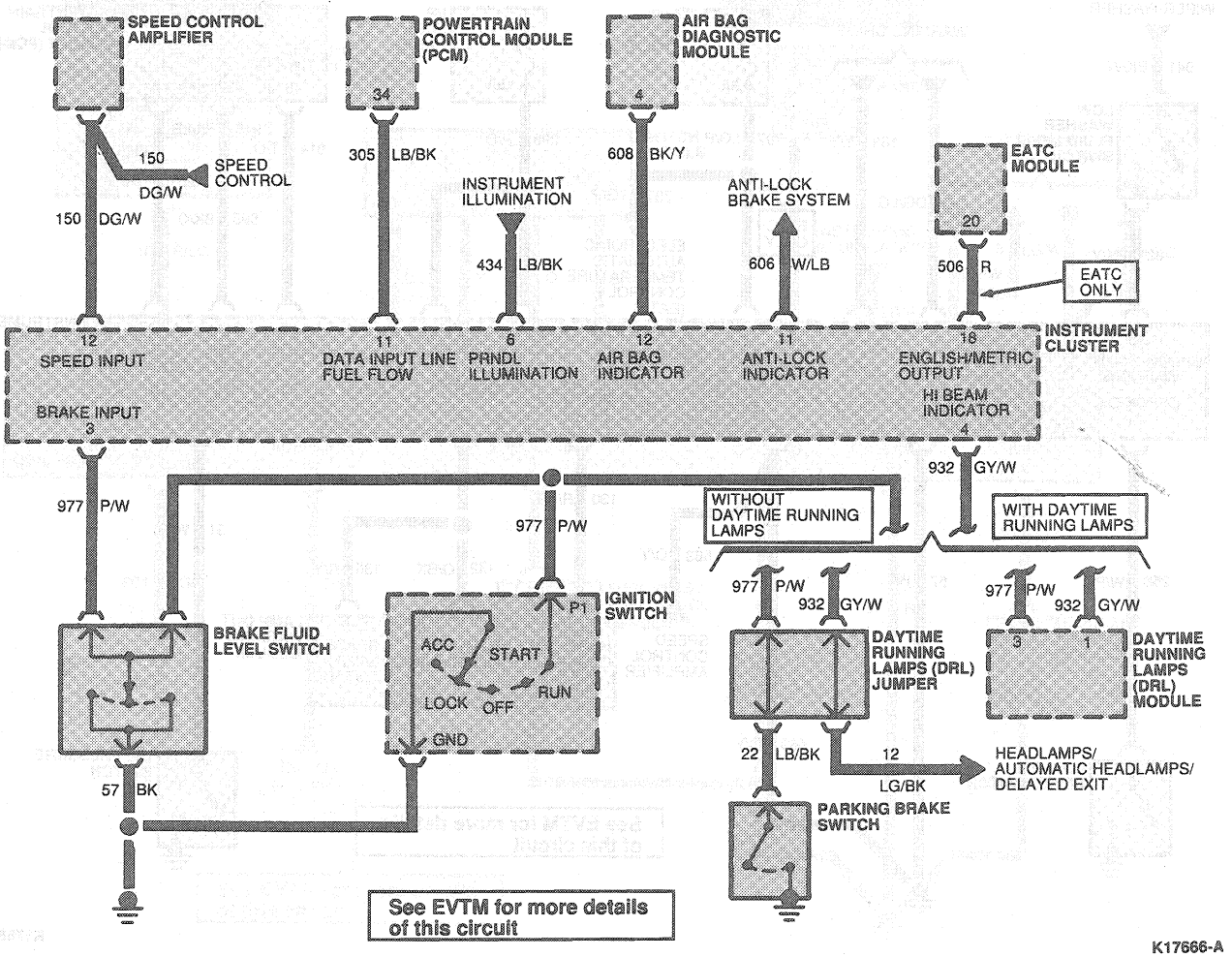
Wiring Schematic



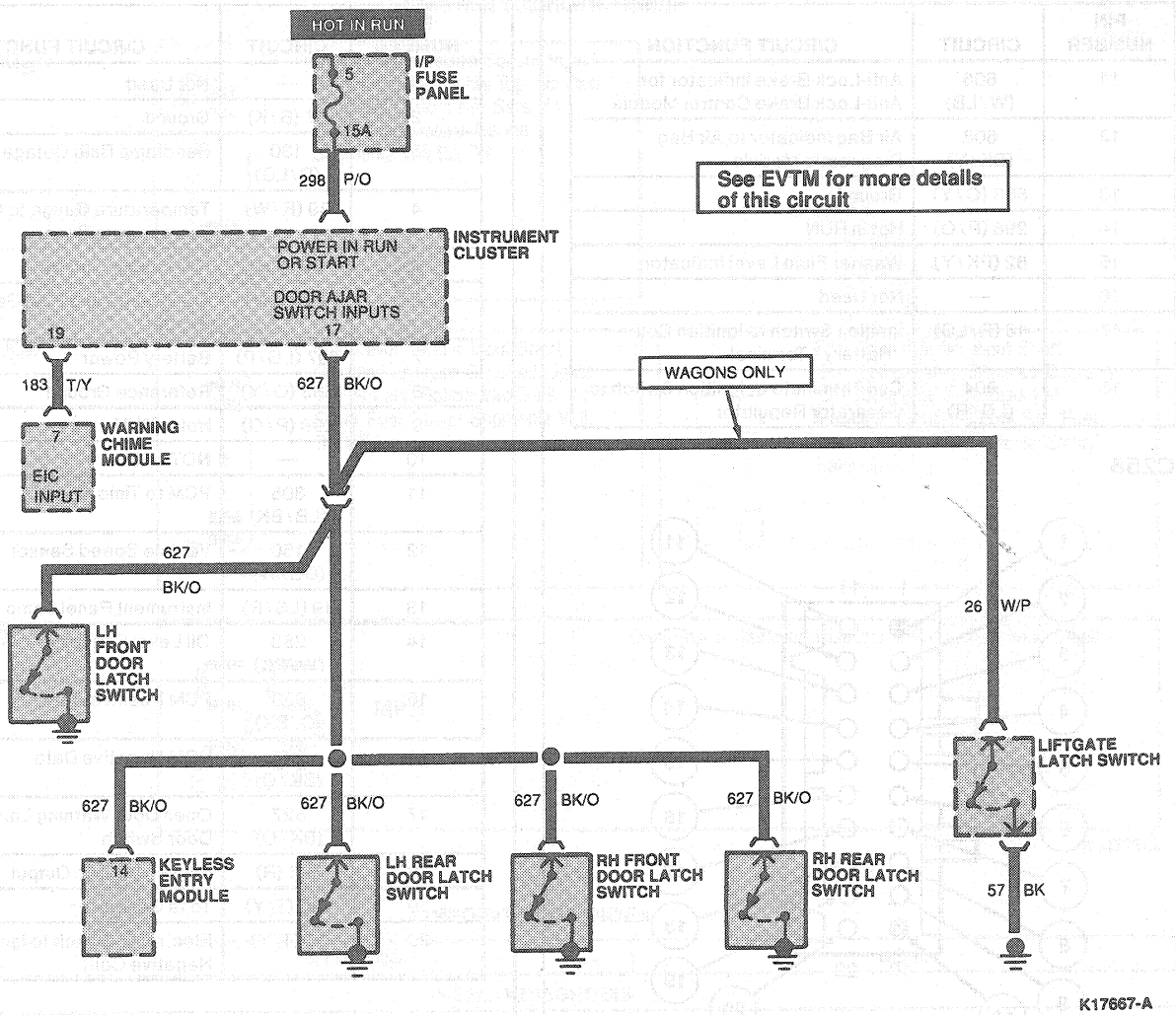
DIAGNOSIS AND TESTING (Continued)



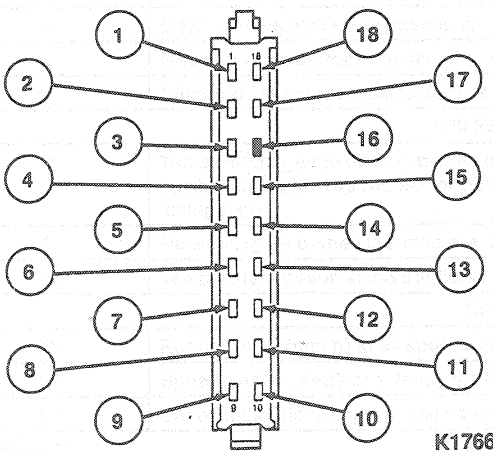
DIAGNOSIS AND TESTING (Continued)



DIAGNOSIS AND TESTING (Continued)



Wiring Harness Connectors C255



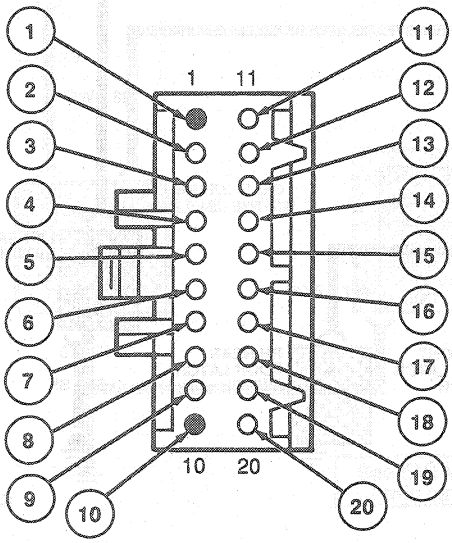
PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	31 (W/R)	Oil Pressure Indicator to Oil Pressure Sending Unit
2	640 (R/Y)	Warning Lamps Feed-Hot in RUN or START
3	977 (P/W)	Brake Warning Switch to Indicator Lamp
4	932 (GY/W)	Hi Beam Indicator
5	3 (LG/W)	LH Turn Signal Lamps
6	434 (LB/BK)	Instrument Panel Lamp Feed
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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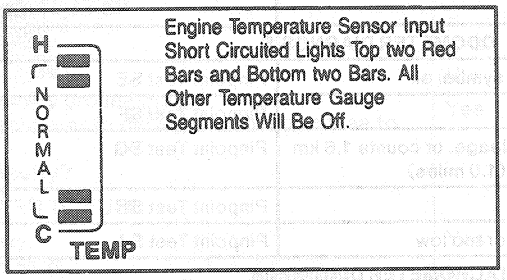
PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	—	Not Used
2	57 (B/K)	Ground
3	130 (R/LG)	Headlamp Bulb Outage
4	39 (R/W)	Temperature Gauge to Coolant Temperature Sensor
5	135 (Y/R)	Rear Lamp Outage
6	29 (Y/W)	Fuel Gauge and Fuel Gauge Sender
7	797 (LG/P)	Battery Power
8	563 (O/Y)	Reference Ground
9	298 (P/O)	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)

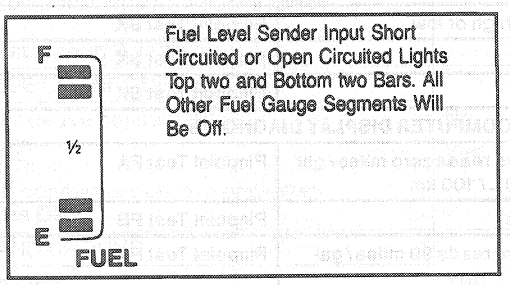
FUNCTION DIAGNOSTIC MODE

Temp Gauge

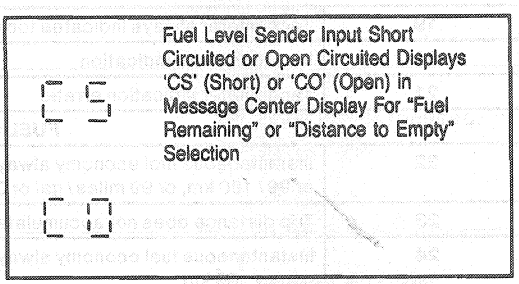


Engine Temperature Sensor Input Short Circuited Lights Top two Red Bars and Bottom two Bars. All Other Temperature Gauge Segments Will Be Off.

Fuel Gauge

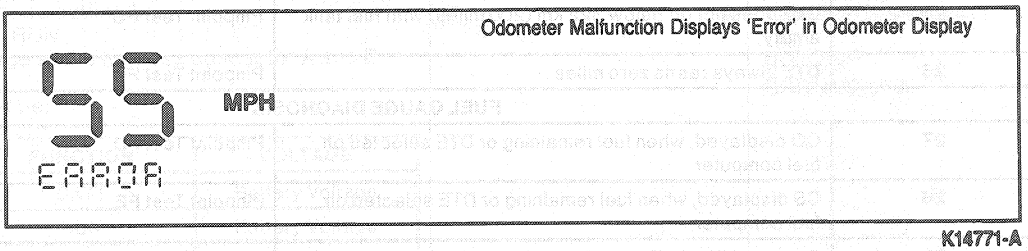


Fuel Level Sender Input Short Circuited or Open Circuited Lights Top two and Bottom two Bars. All Other Fuel Gauge Segments Will Be Off.



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: ● Check continuity of ground circuit Pins 8A and 13B to battery ground. ● **Are voltage and continuity present?**	Yes No	REPLACE cluster. SERVICE Circuit BATT 797 RUN 298 GROUND 359.
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.

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

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)

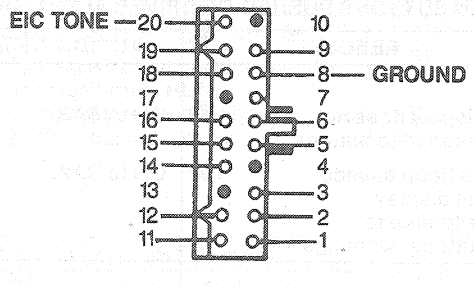
TEST STEP		RESULT ▶	ACTION TO TAKE
TF1	CHECK TEMPERATURE GAUGE WIRING		
	● Unplug connector to temperature sender and connect a jumper to ground in place of sender. ● Turn ignition to RUN. ● Gauge should give a short circuit indication. Top two and bottom two bars of gauge illuminated.	Top two and bottom 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. CCA CONNECTOR PLUG A ON EIC  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 ▶ Odometer not accurate ▶	System OK. 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 ▶ Incorrect gear installed ▶	GO to SC4. 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 ▶ Incorrect gear installed ▶	REPLACE cluster module.[2] INSTALL correct shaft / gear.

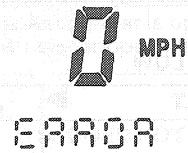
PINPOINT TEST SD: SPEED INDICATION JUMPS UP AND DOWN ERRATICALLY

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 ▶ Gear / clip not OK ▶	GO to SD3. 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 ▶ Resistance less than 500 ohms ▶	GO to SD4. 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 ▶ Resistance not as specified ▶	GO to SD5. 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 ▶ Resistance intermittent ▶	REPLACE cluster.[2] SERVICE connectors / wiring from cluster to vehicle speed sensor Circuit 150. CHECK speedometer operation.

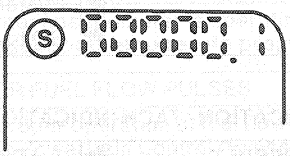
2 Affix odometer sticker to door pillar.

DIAGNOSIS AND TESTING (Continued)

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

TEST STEP		RESULT	ACTION TO TAKE
SE1	VERIFY CONDITION		
	 K16688-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)

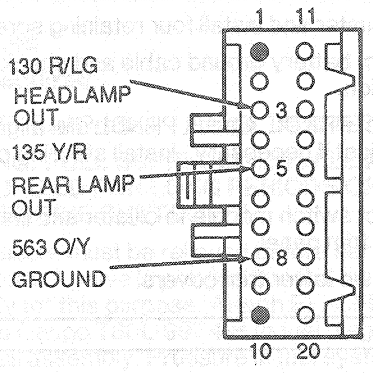
TEST STEP		RESULT	ACTION TO TAKE
FG5	CHECK WIRING		
	• Leave jumper wire connected as in FG3. • Turn ignition switch to OFF. • Remove electronic instrument cluster. • Check continuity between Pins 17 and 8 of Connector A. • **Is there continuity?**	Yes ▶ No ▶	REPLACE EIC. SERVICE Circuit 627 (BK/O) for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

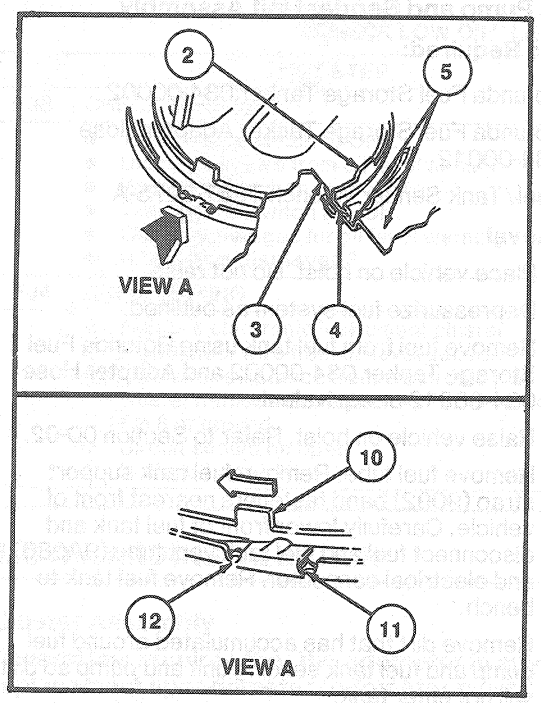
Tools Required:

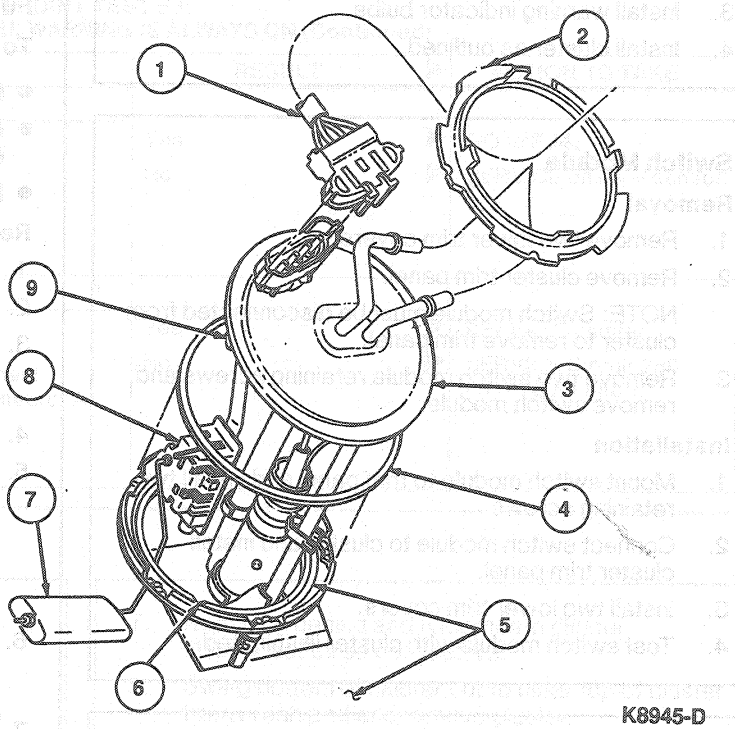
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Fuel Storage Tanker Adapter Hose 034-00012
- Fuel / Tank Sender Wrench T86T-9275-A

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

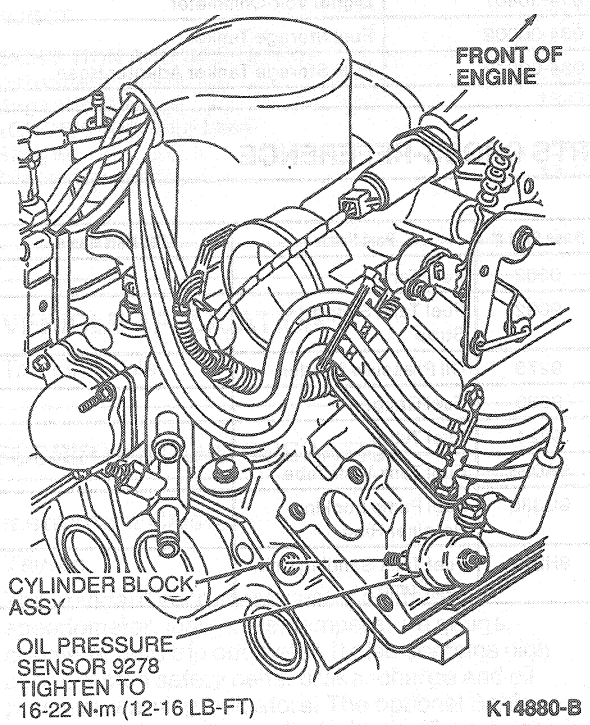
Removal and Installation

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.

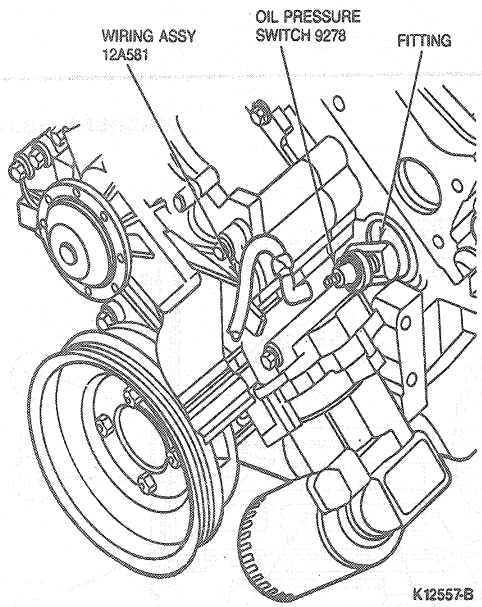
REMOVAL AND INSTALLATION (Continued)

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

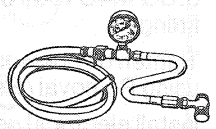
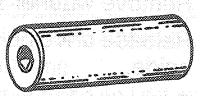
1. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194-A) or equivalent to threads of oil pressure sender. Install oil pressure sender using Removal / Replacer Tool T87L-9278-A. Tighten to 11-24 N·m (9-17 lb-ft).
2. Install idler pulley. Tighten bolt to 70-95 N·m (52-70 lb-ft).
3. Install drive 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

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

ROTUNDA EQUIPMENT

Model	Description
014-00407	Digital Volt-Ohmmeter
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	
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.

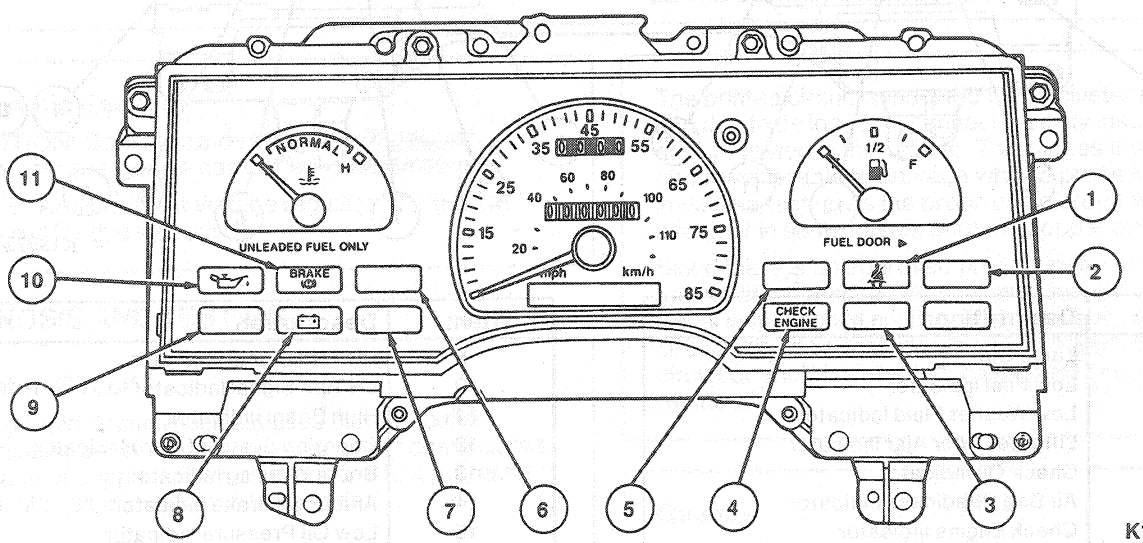
DESCRIPTION AND OPERATION

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)

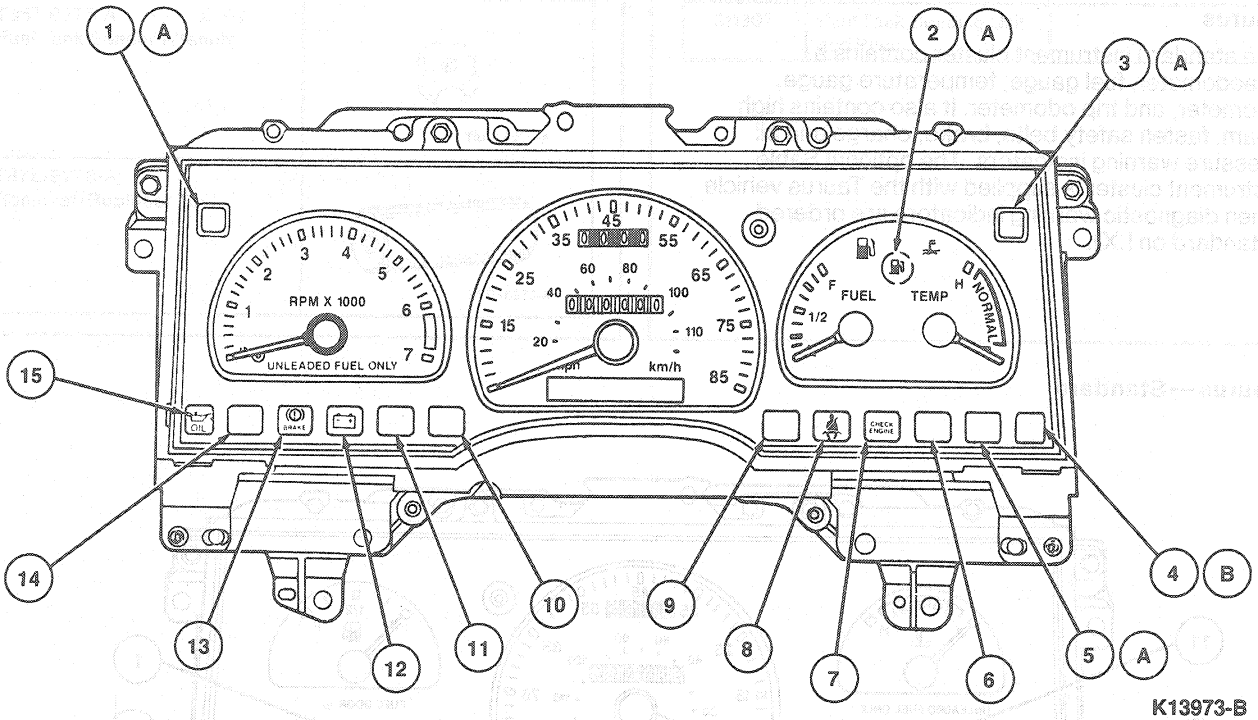
Item	Description
6	LH Turn Signal Indicator
7	High Beam Indicator
8	Charging System Indicator
9	Anti-Lock Brake Indicator
10	Low Oil Pressure Indicator
11	Brake System Indicator

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

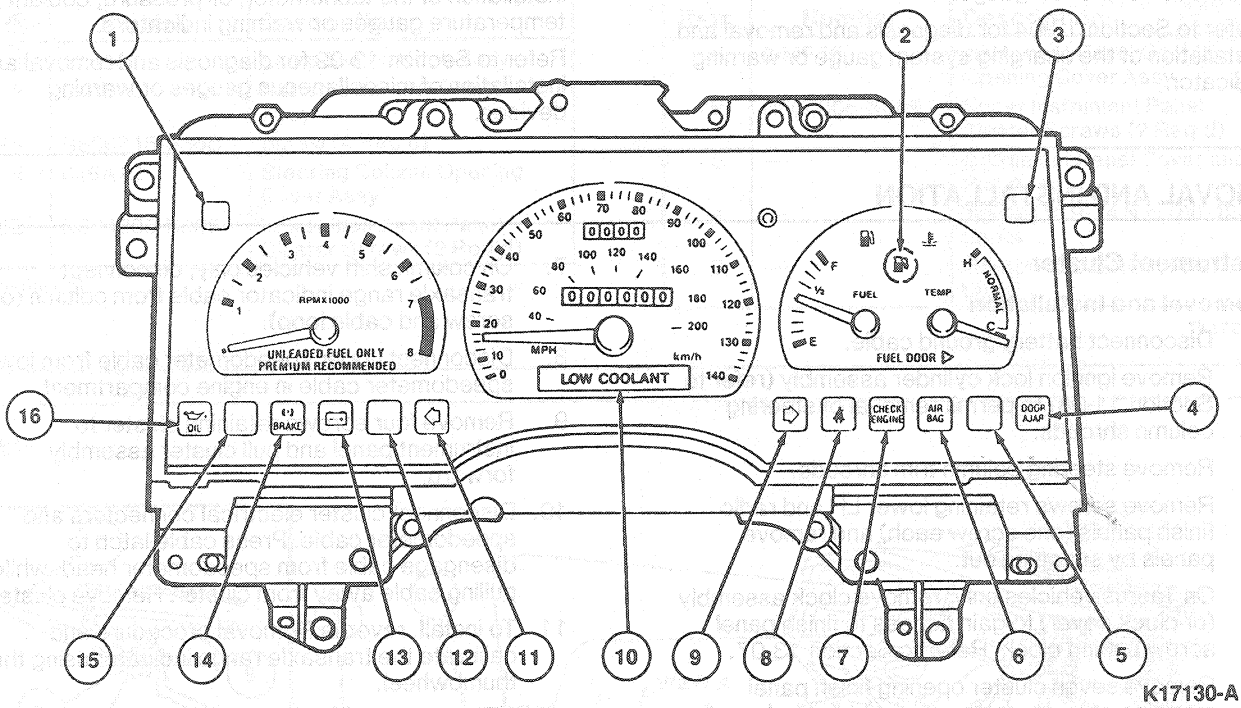
Item	Description
1A	Lamp Out
2A	Low Fuel Indicator
3A	Low Washer Fluid Indicator
4B	Liftgate / Door Ajar Indicator
5A	Check Oil Indicator
6	Air Bag Readiness Indicator
7	Check Engine Indicator
8	Safety Belt Indicator

(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



K17130-A

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.

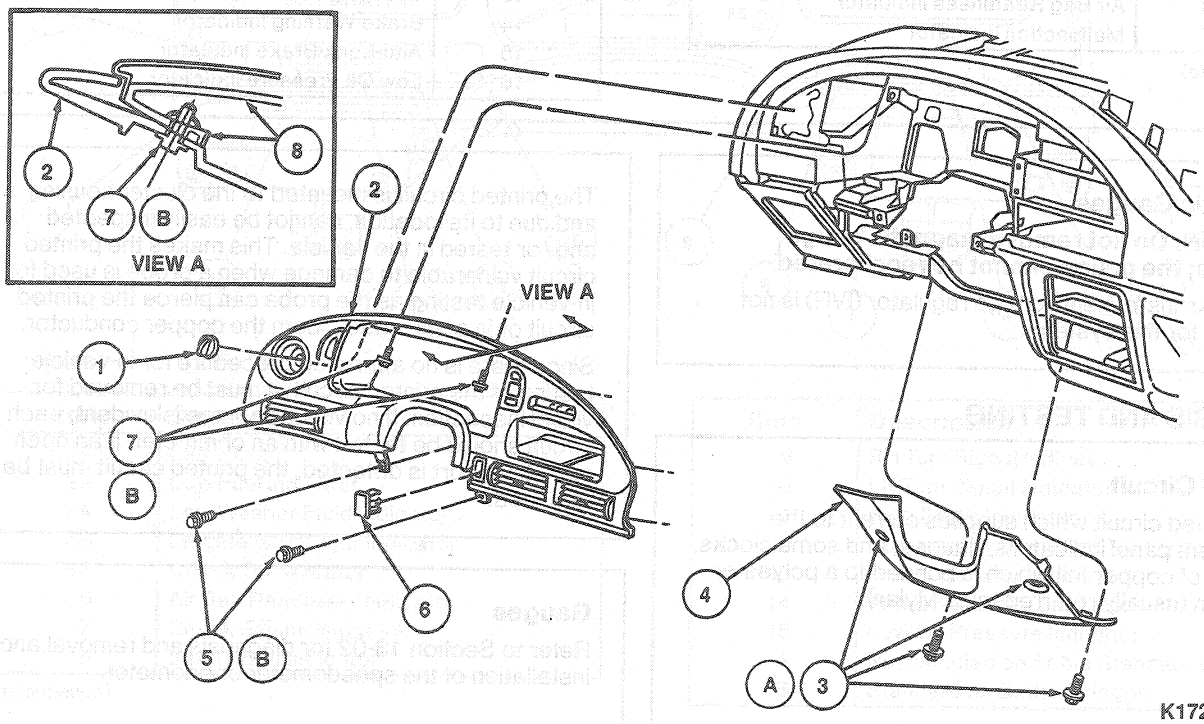
REMOVAL AND INSTALLATION

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)

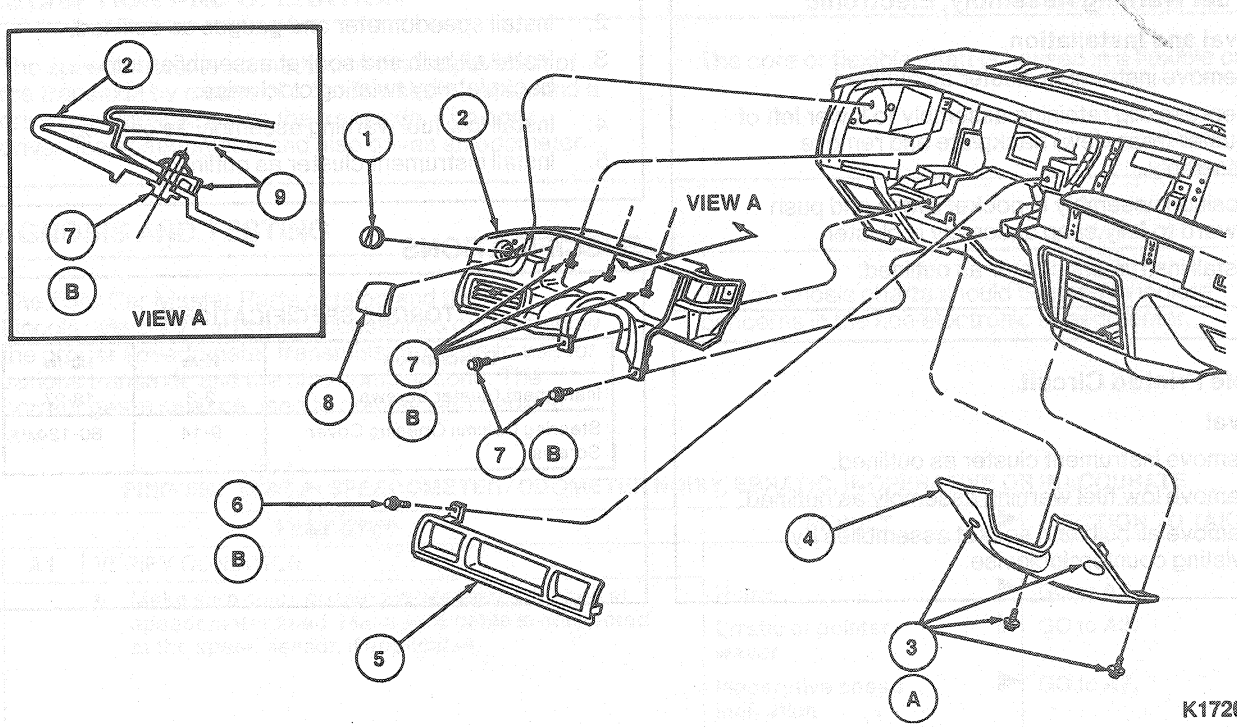
Item	Part Number	Description
1	11666	Lamp Switch Knob Assy
2	044D70	Instrument Panel Cluster Assy
3A	N806715-S36B	Screw (4 Req'd)
4	046A72	Steering Column Opening Cover Assy
5B	N804306-S36B	Lower Instrument Panel Cluster Screws (2 Req'd)

(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

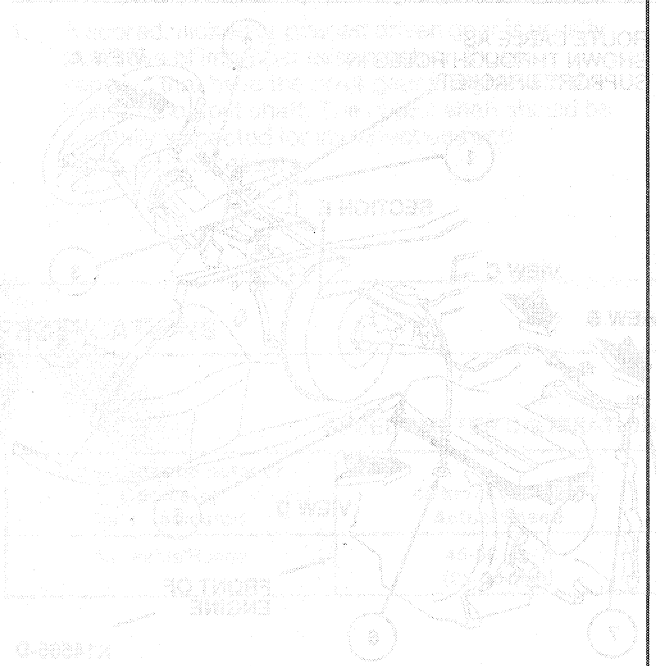
Federal law requires that the odometer in any replacement speedometer must register the same mileage as that registered in the removed speedometer.

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

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

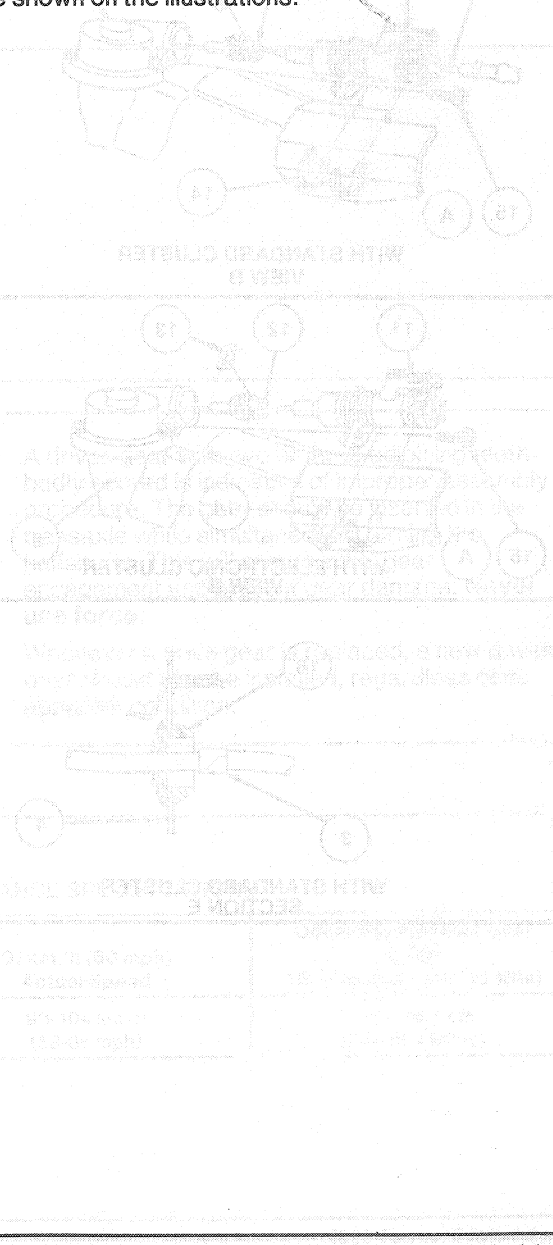
Vehicle Speed Sensor (VSS)

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.

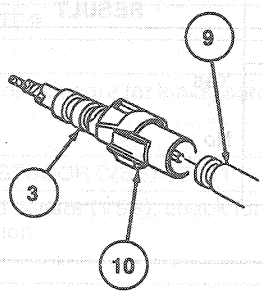


REMOVAL AND INSTALLATION (Continued)

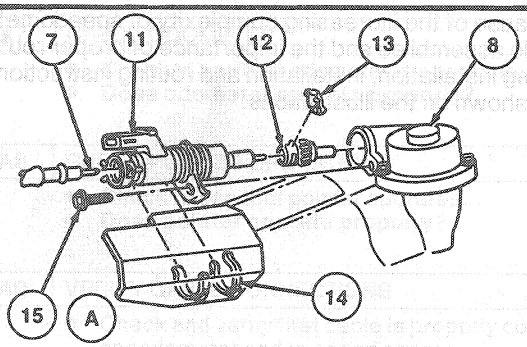
QUICK CONNECT CABLE ATTACHMENT AND REMOVAL

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

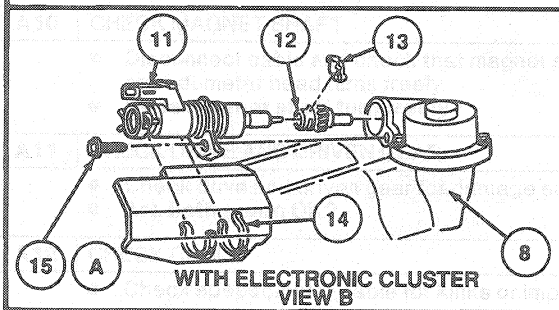
TO REMOVE:
PRESS THUMB LATCH TO DISENGAGE AND PULL CABLE AWAY FROM SPEEDOMETER HEAD.



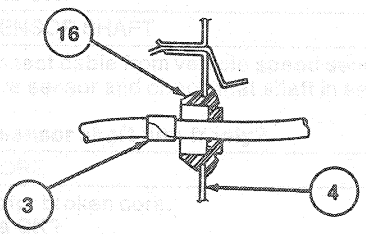
VIEW A



WITH STANDARD CLUSTER
VIEW B

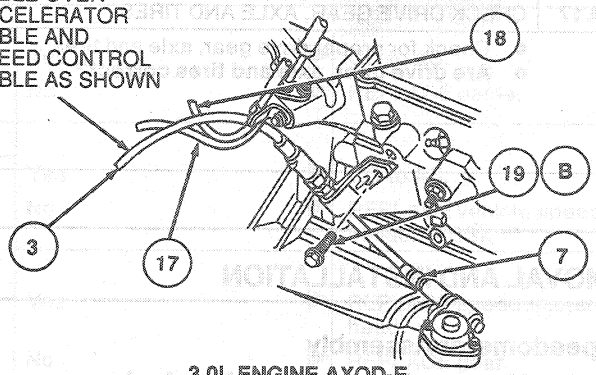


WITH ELECTRONIC CLUSTER
VIEW B

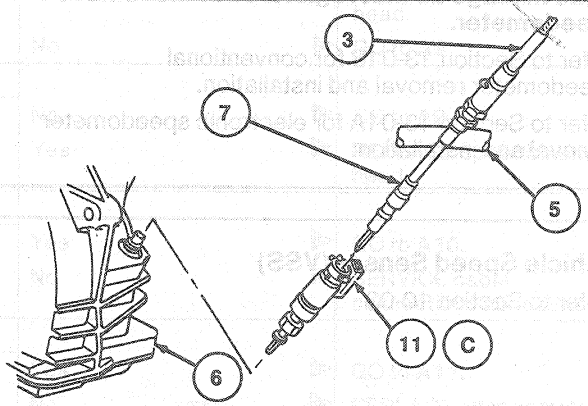


WITH STANDARD CLUSTER
SECTION E

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

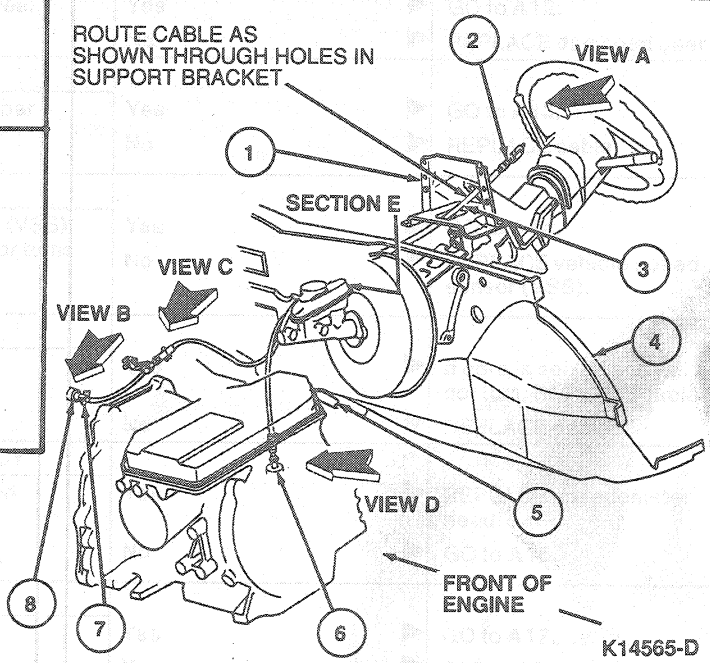


3.0L ENGINE AXOD-E TRANSAXLE
VIEW C



MANUAL TRANSAXLE
WITH STANDARD CLUSTER
VIEW D

ROUTE CABLE AS SHOWN THROUGH HOLES IN SUPPORT BRACKET



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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 Distance (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.

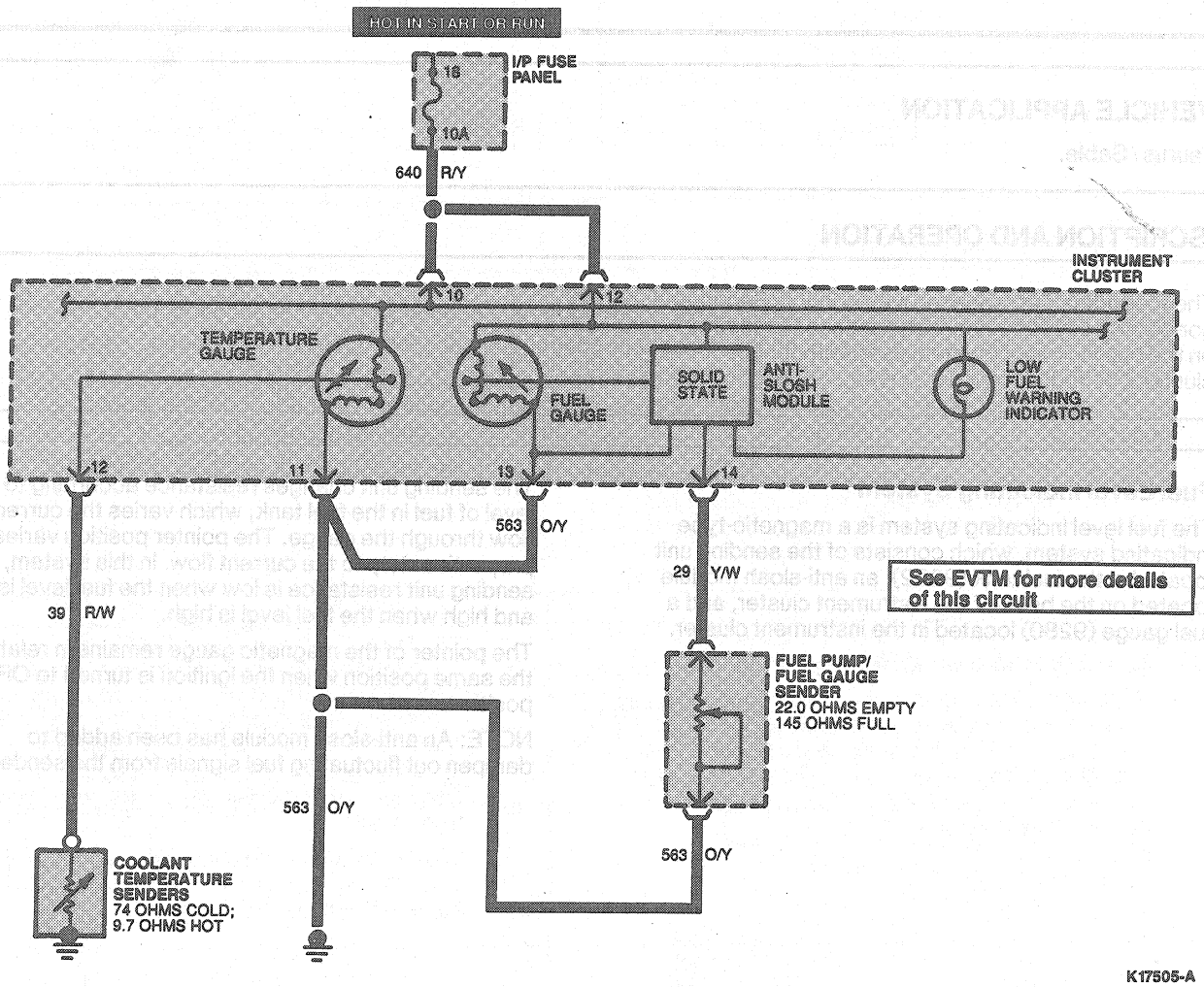
The pointer of the magnetic gauge remains in relatively the same position when the ignition is turned to OFF position.

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

DESCRIPTION AND OPERATION (Continued)

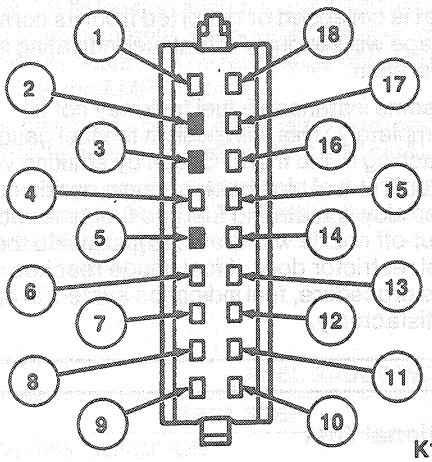
Fuel Sending Unit

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

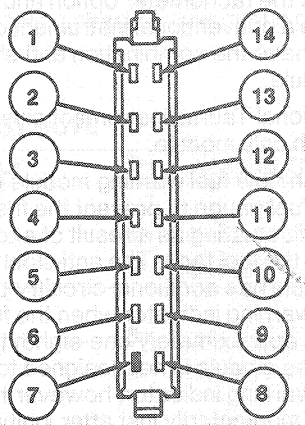


K18659-A

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

TK18659A

(Continued)



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

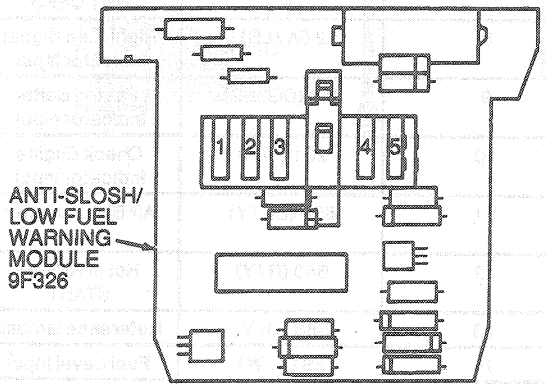
The low fuel warning feature is available on Taurus vehicles with the tachometer option and on Sable vehicles with a conventional instrument cluster. These clusters will have the combination anti-slosh / low fuel warning module.

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



K19355-A

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).

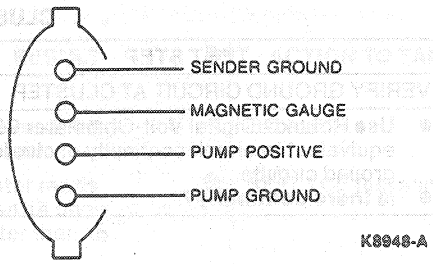
If the test is performed with a fuel sender of known quality, use the following procedure:

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:

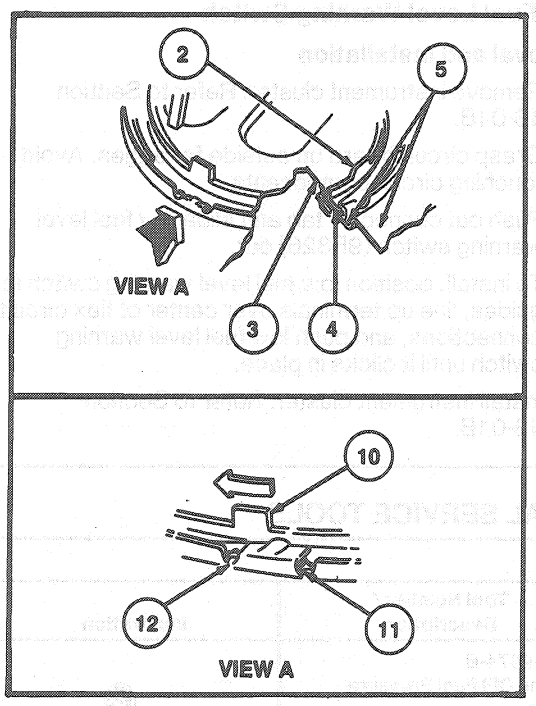
- EFI and CFI Fuel Pressure Gauge T80L-9974-B
- Fuel Tank Sender Wrench T86T-9275-A
- Rotunda Fuel Storage Tanker 034-00002
- Rotunda Fuel Storage Tanker Adapter Hose 034-00012

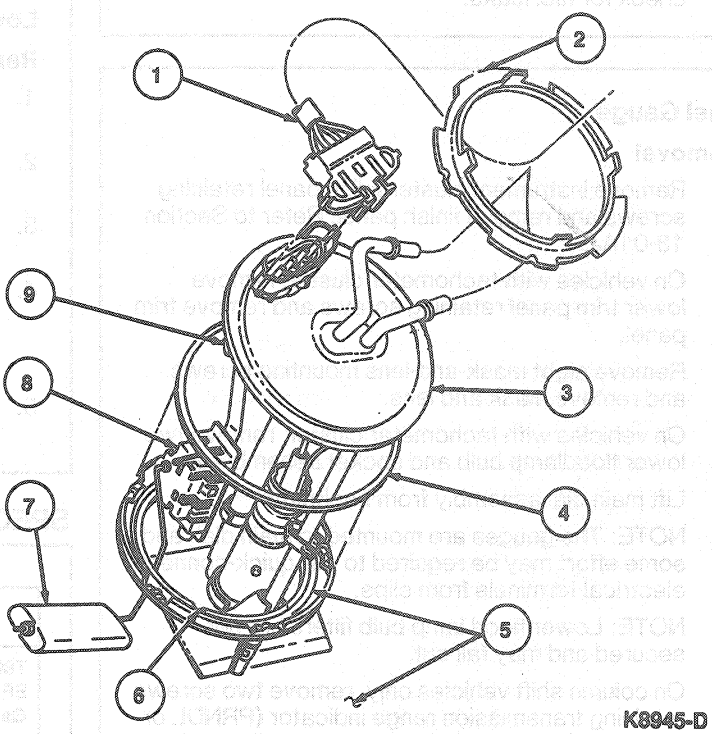
Removal

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.





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 PRN⓪D1) 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.

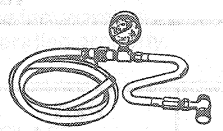
   NOTE: Lower flood lamp bulb filters are not secured and may fall out.
5. On vehicles with tachometer cluster, install two lower flood lamp bulb and socket assemblies.
6. Position mask-and-lens assembly and install eight mask-and-lens retaining screws.
7. On vehicles with tachometer cluster, install lower 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

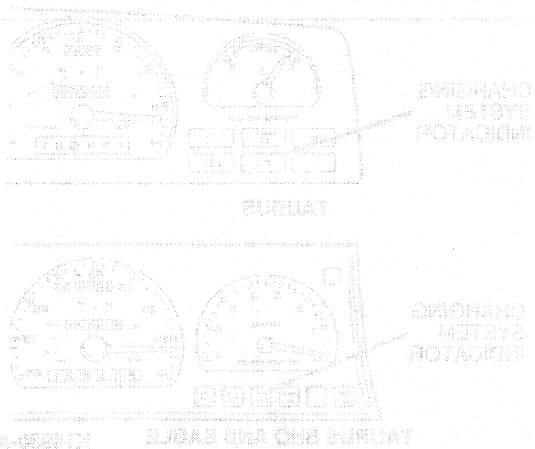
Model	Description
007-00001	Digital Volt-Ohmmeter
021-00055	Instrument Gauge System Tester
034-00002	Fuel Storage Tanker
034-00012	Fuel Storage Tanker Adapter Hose

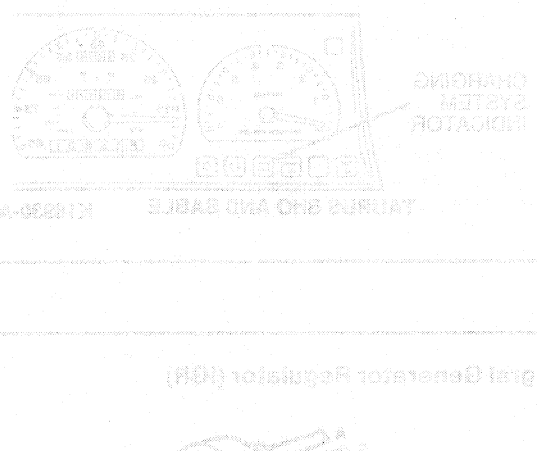
PARTS CROSS-REFERENCE

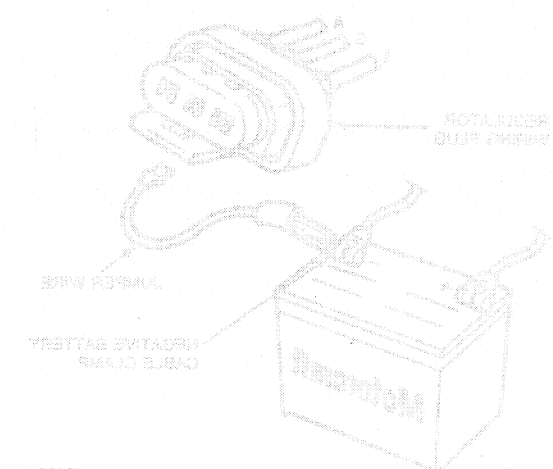
Base Part #	Part Name	Old Part Name
9002	Fuel Tank	
9092	Fuel Tank Support Strap	
9280	Fuel Gauge	
9291	Fuel Tube	
9A011	Fuel Tank Sender Filter	

(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

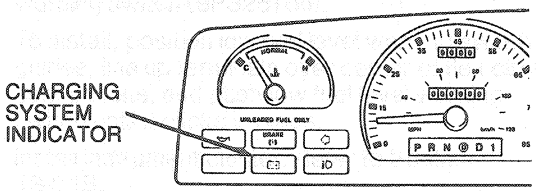
Taurus / Sable with conventional cluster.

DESCRIPTION AND OPERATION

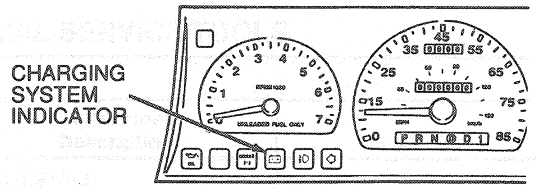
A red generator charge indicator is located in the instrument cluster. This indicator glows when there is no generator output.

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

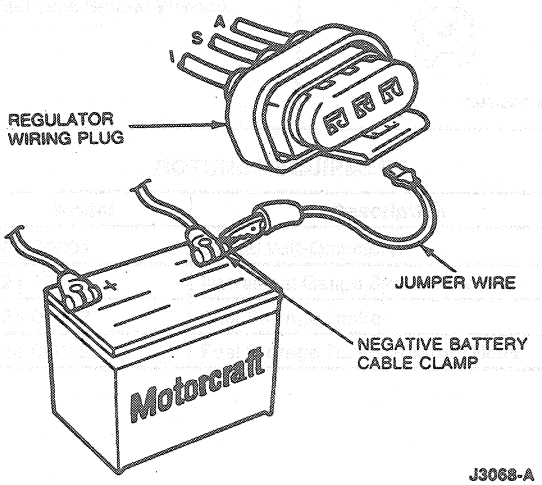


TAURUS SHO AND SABLE K16930-A

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.

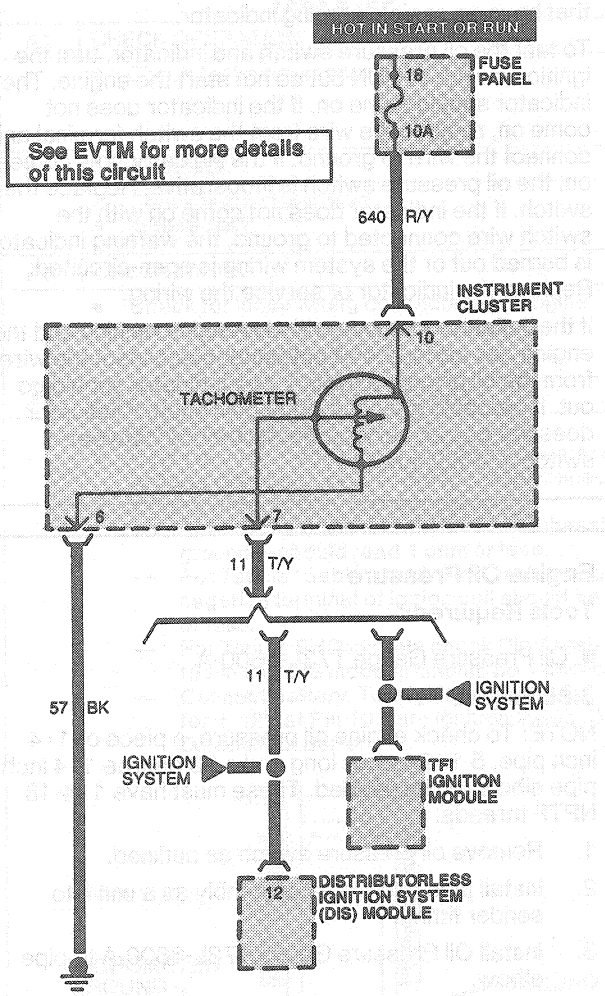
Tachometer

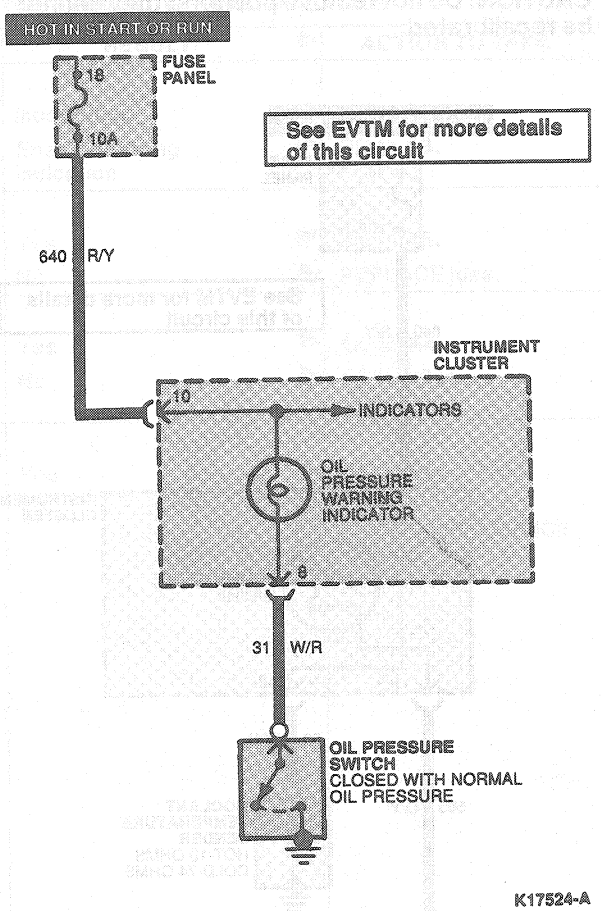
The tachometer is an electrically-operated instrument which indicates engine speed in revolutions per minute (rpm). The tachometer range is 0 to 7000 rpm, except Taurus SHO models which have a range of 0 to 8000 rpm.

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.

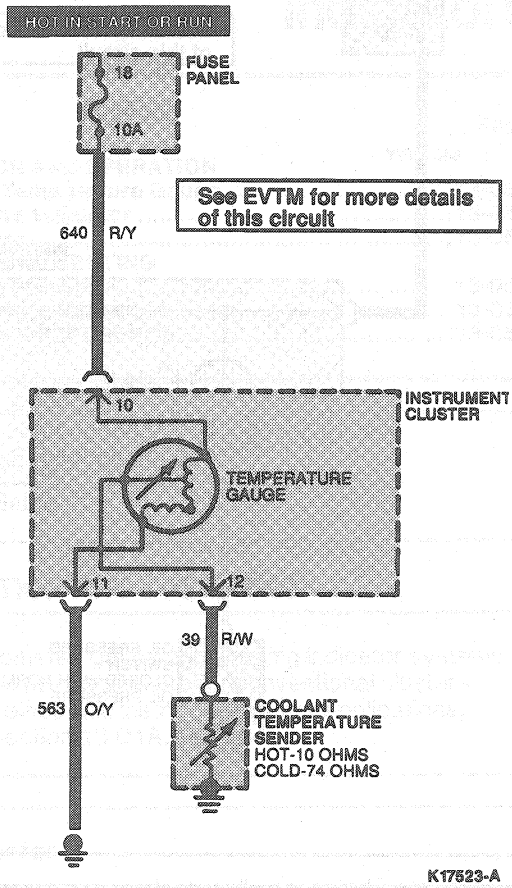
Magnetic Temperature Gauge

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

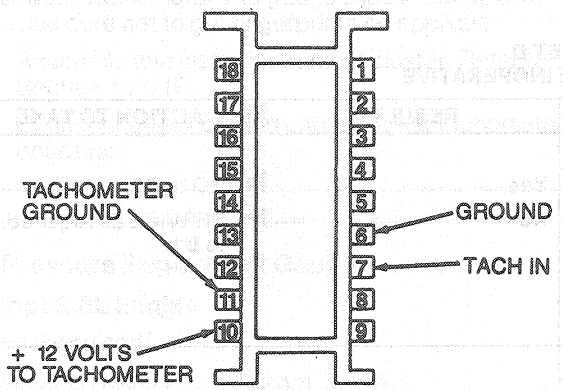
3.8L Engine

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 ▶ Erratic or wrong indication ▶	GO to A2. GO to A3.
A2	CHECK FUSE		
	• Check tachometer fuse. • **Is fuse OK?**	Yes ▶ No ▶	GO to A3. REPLACE fuse.
A3	CHECK WIRING		
	• Check for loose wiring connections in engine compartment and at instrument cluster. • **Are all connections OK?**	Yes ▶ No ▶	GO to A4. 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 ▶ No ▶	GO to A5. 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 ▶ No ▶	REPLACE tachometer. 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

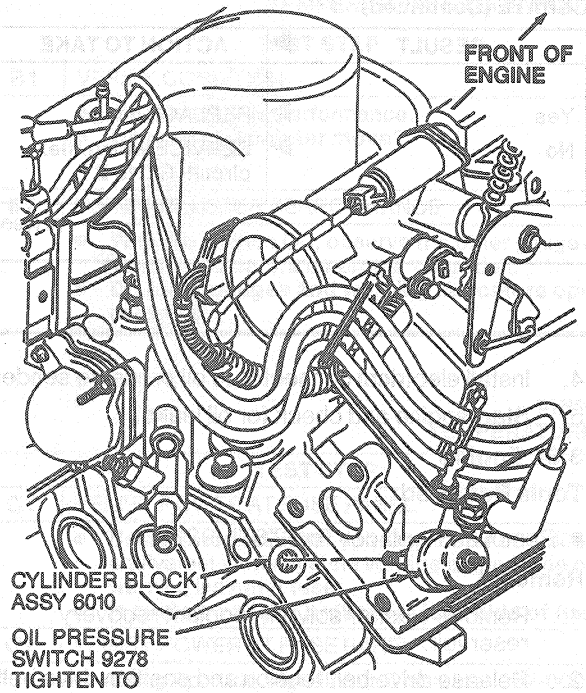
1. Apply Pipe Sealant with Teflon® D8AZ-19554-A (ESG-M4G194, ESR-M18P7-A) or equivalent to threads of oil pressure sender. Install oil pressure sender using Removal / Replacer Tool T87L-9278-A or equivalent. Tighten to 11-24 N·m (9-17 lb-ft).
2. Install idler pulley. Tighten bolt to 70-95 N·m (52-70 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.

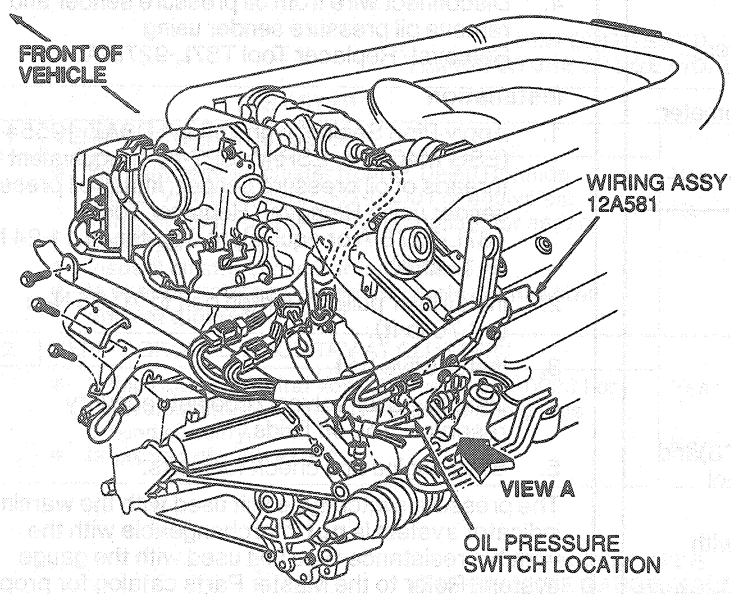
CAUTION: Installation of the wrong part will result in an inoperative oil pressure indicating system and a damaged sender unit or gauge.

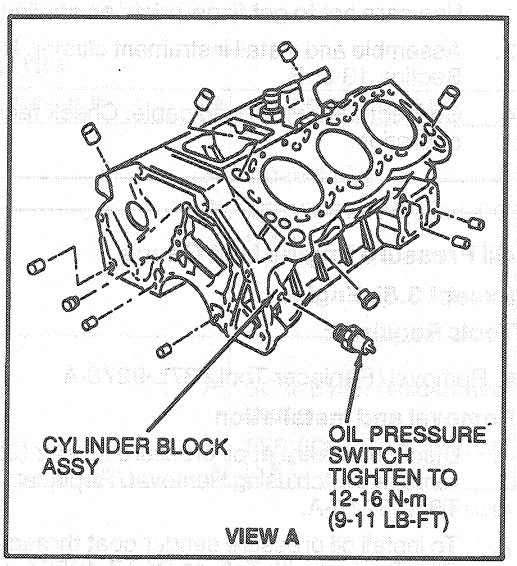
REMOVAL AND INSTALLATION (Continued)

3.0L MFI Engine



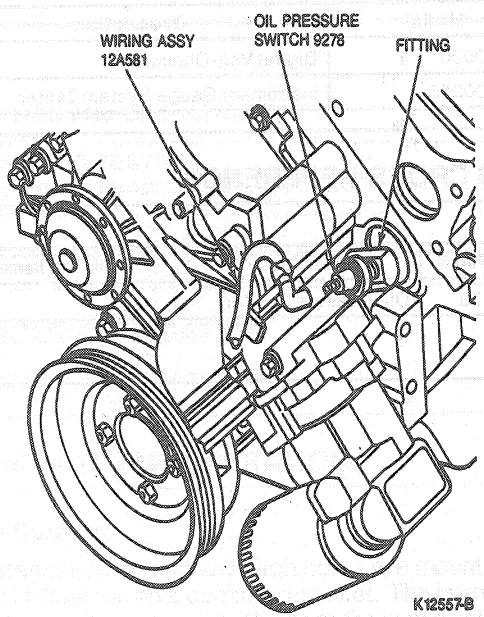
3.0L and 3.2L SHO Engine





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.

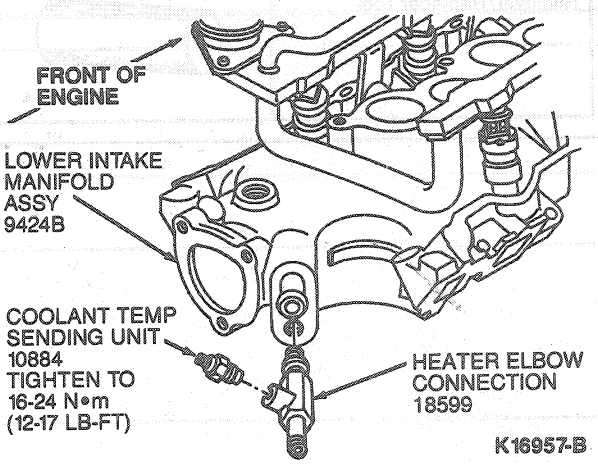
   WARNING: NEVER REMOVE THE RADIATOR CAP UNDER ANY CIRCUMSTANCES WHILE THE ENGINE IS OPERATING. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY FROM HOT COOLANT OR STEAM BLOW OUT (AND/OR DAMAGE TO THE COOLING SYSTEM OR ENGINE). SWITCH OFF THE ENGINE AND WAIT UNTIL IT HAS COOLED. 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.

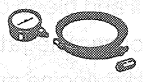
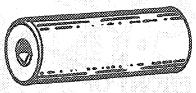
To remove the indicator bulb, turn the bulb and socket assembly one-quarter turn counterclockwise and remove. To install, position the new bulb and socket assembly to the printed circuit and turn it clockwise one-quarter turn.

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

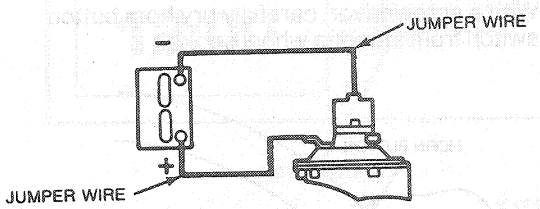
The standard high and low pitch horns are mounted to the LH frame rail on a common bracket. The horn switch closes the circuit to the horn through a relay.

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.



CIRCUIT CHECK L6379-A

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

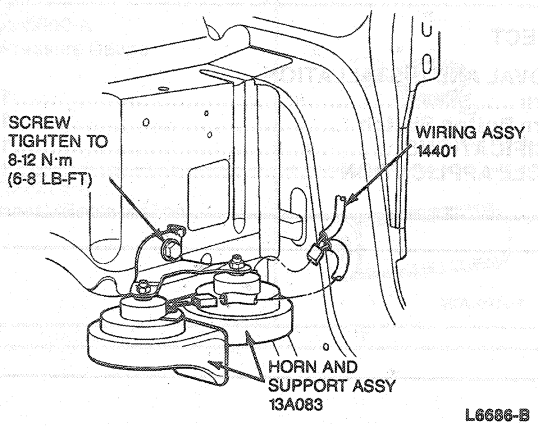
Horn

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)

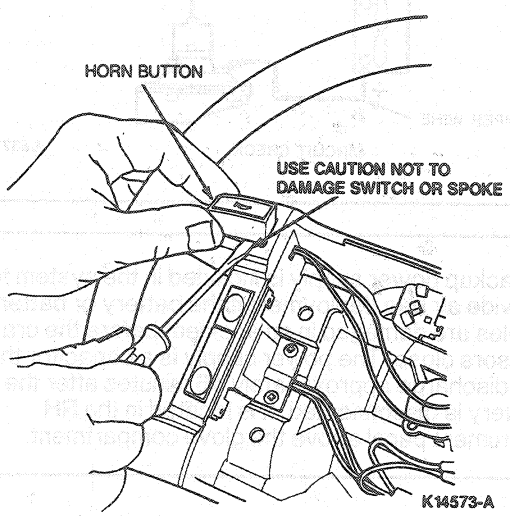
Taurus/Sable



Horn Button Switch

Removal

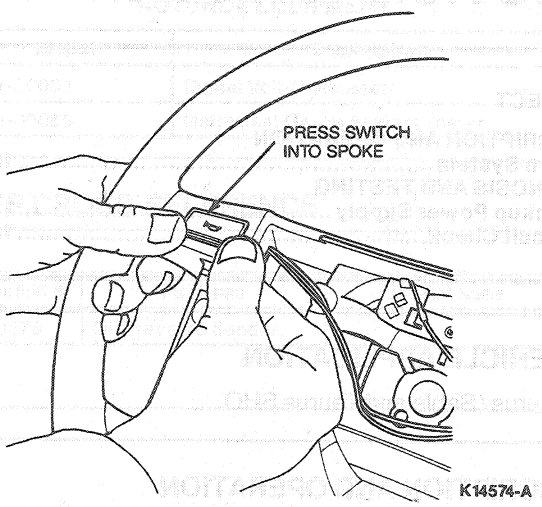
1. Disconnect battery ground cable.
2. Disconnect backup power supply.
3. Remove air bag module.
4. With a screwdriver, carefully pry horn button switch from steering wheel spoke.



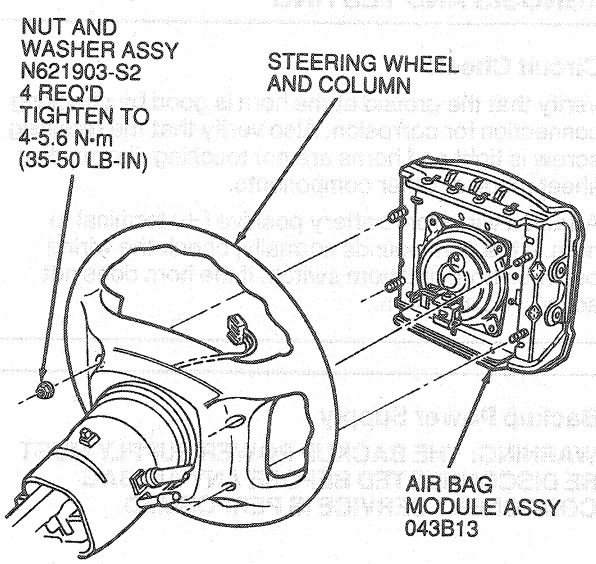
5. Disconnect electrical connectors, remove horn button switch and wires.

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

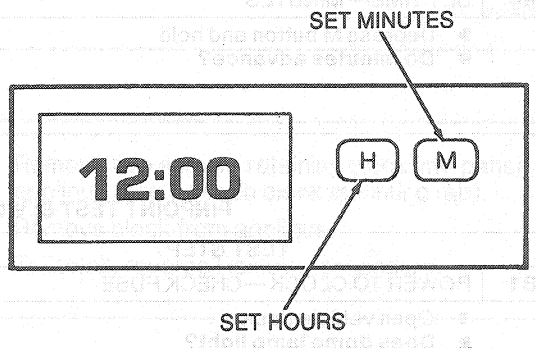
Taurus / Sable.

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.



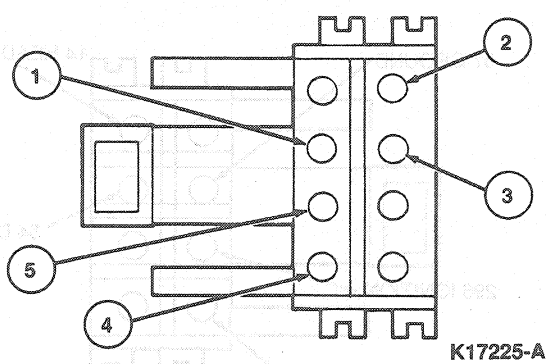
K17224-A

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

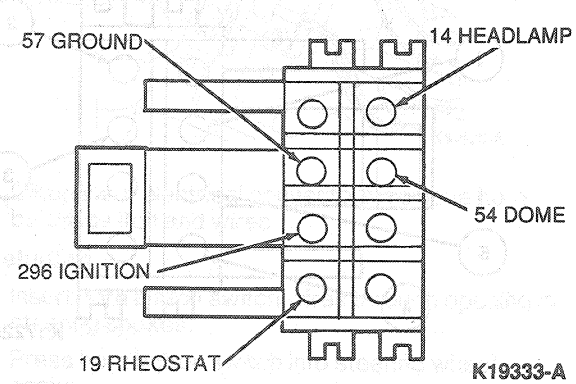
PINPOINT TEST A: ELECTRONIC DIGITAL CLOCK FUNCTIONAL TEST

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.**



K19333-A

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:

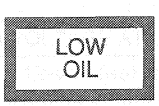
LAMP OUT: Combines the functions of REAR LAMP OUT and HEADLAMP OUT.

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.

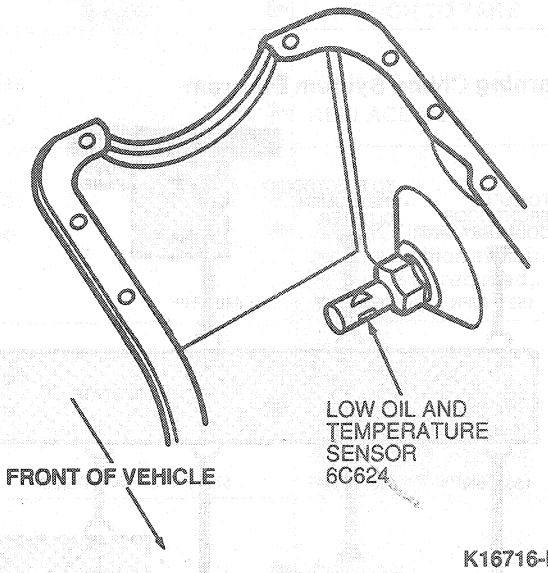
The warning indicator should come on during engine starting as a bulb prove-out. When the ignition switch is turned to the RUN or START position, the control module determines whether the sensor is grounded (oil low) or ungrounded (oil not low). If the oil level is adequate, the light will go out in 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



K19334-A

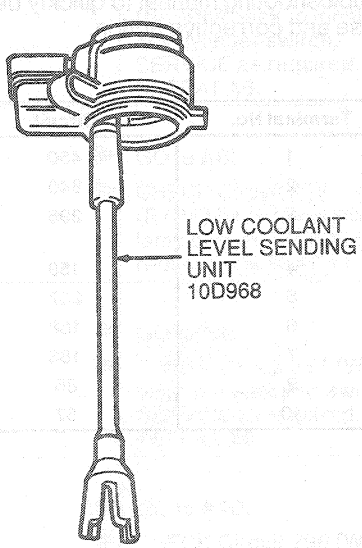
Sensor Installation



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.



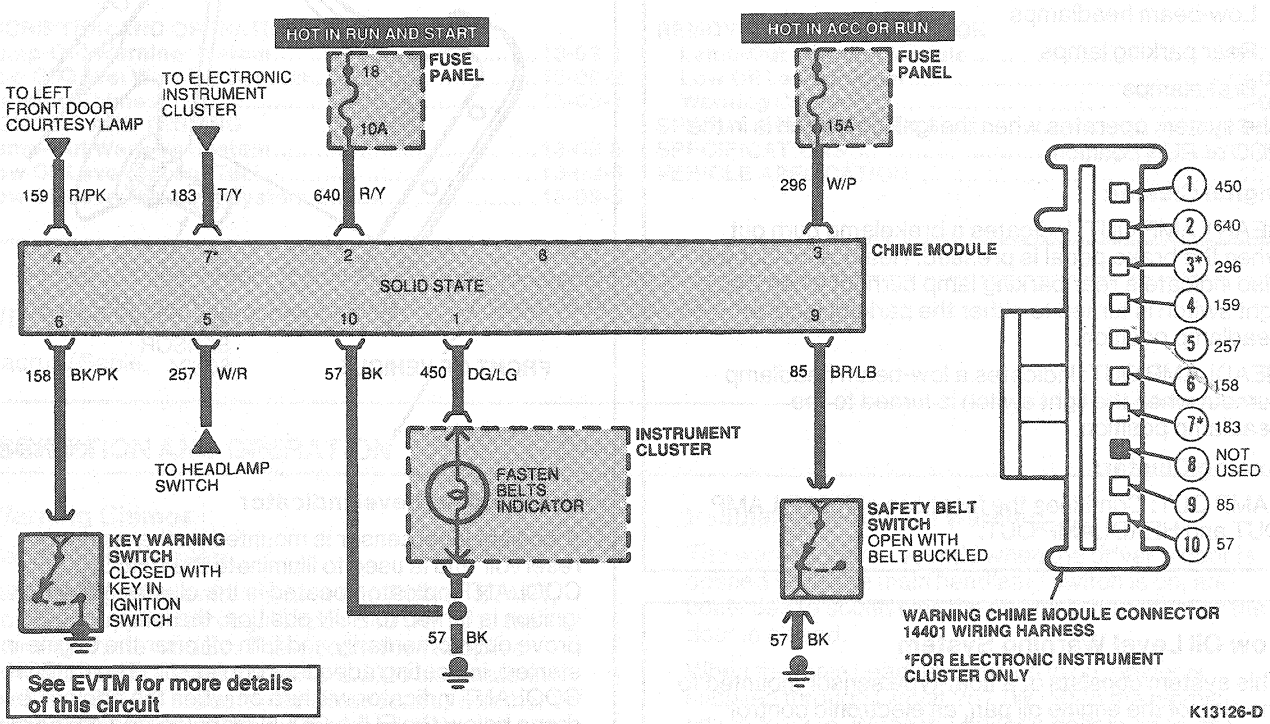
K17131-B

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

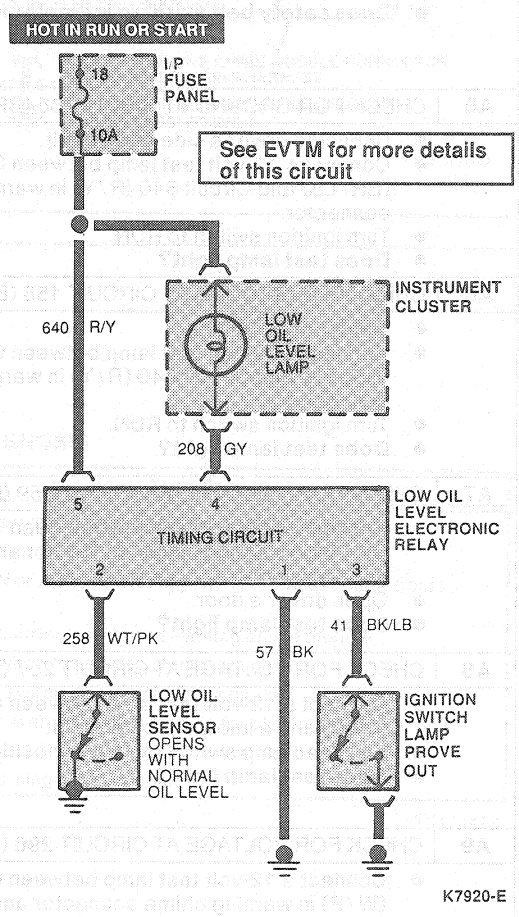
With oil at FULL mark on dipstick and the engine oil warm to ensure that the oil drains properly from the oil sensor, turn ignition switch to the RUN position and start engine. Warning indicator should come on briefly in START for bulb prove-out, then go out. Turn engine off. Drain 1.9L (2 qt) of oil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



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.

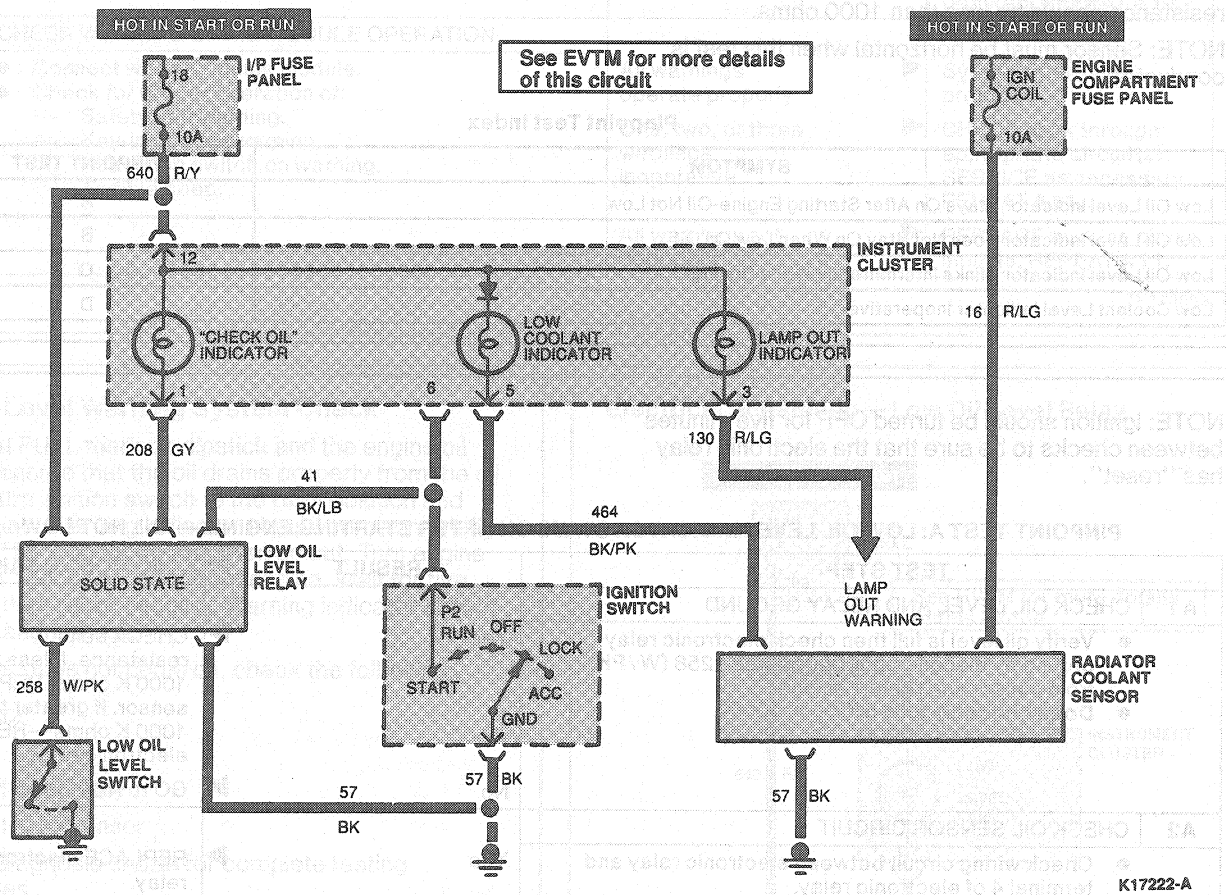
TK17143B

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



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).

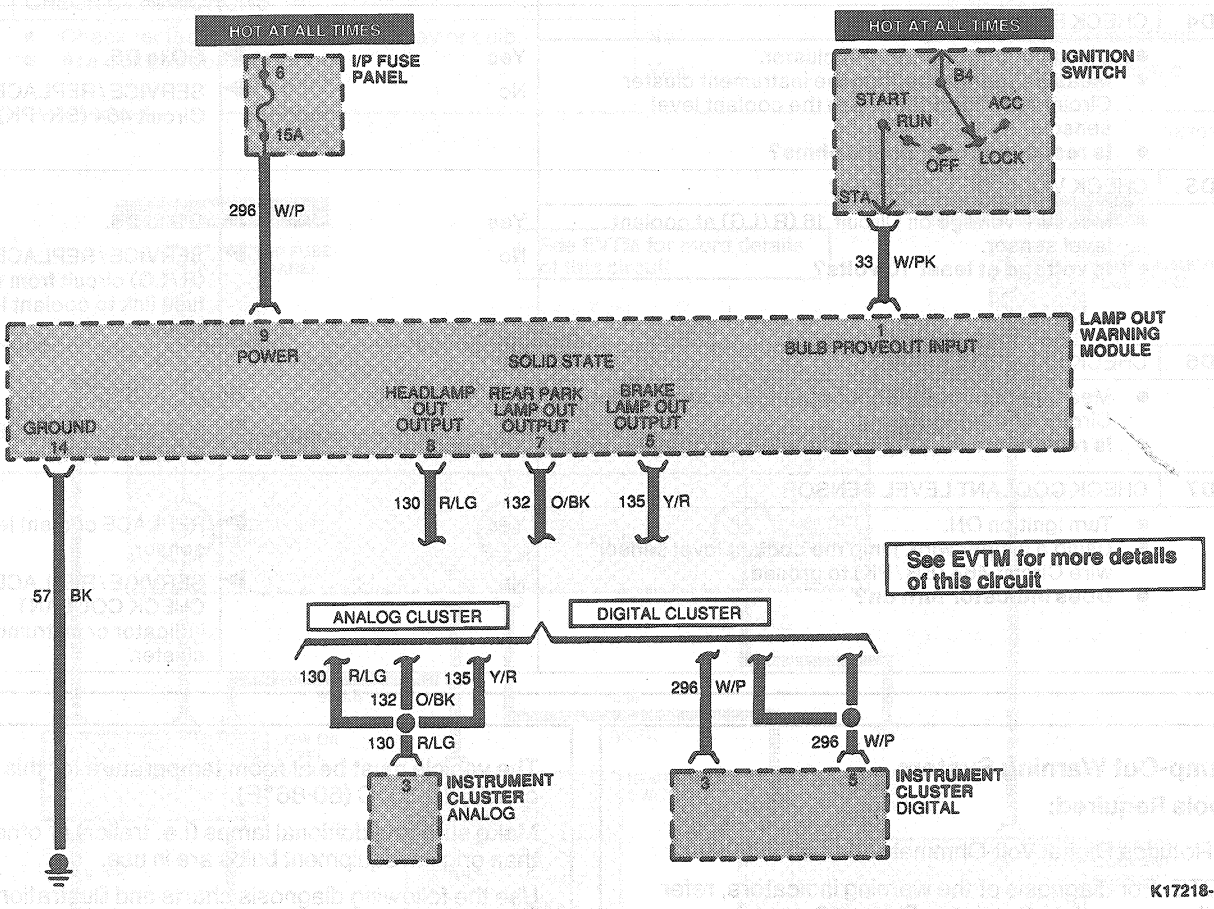
Make sure no additional lamps (i.e. trailer) or other than original equipment bulbs are in use.

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

DIAGNOSIS AND TESTING (Continued)

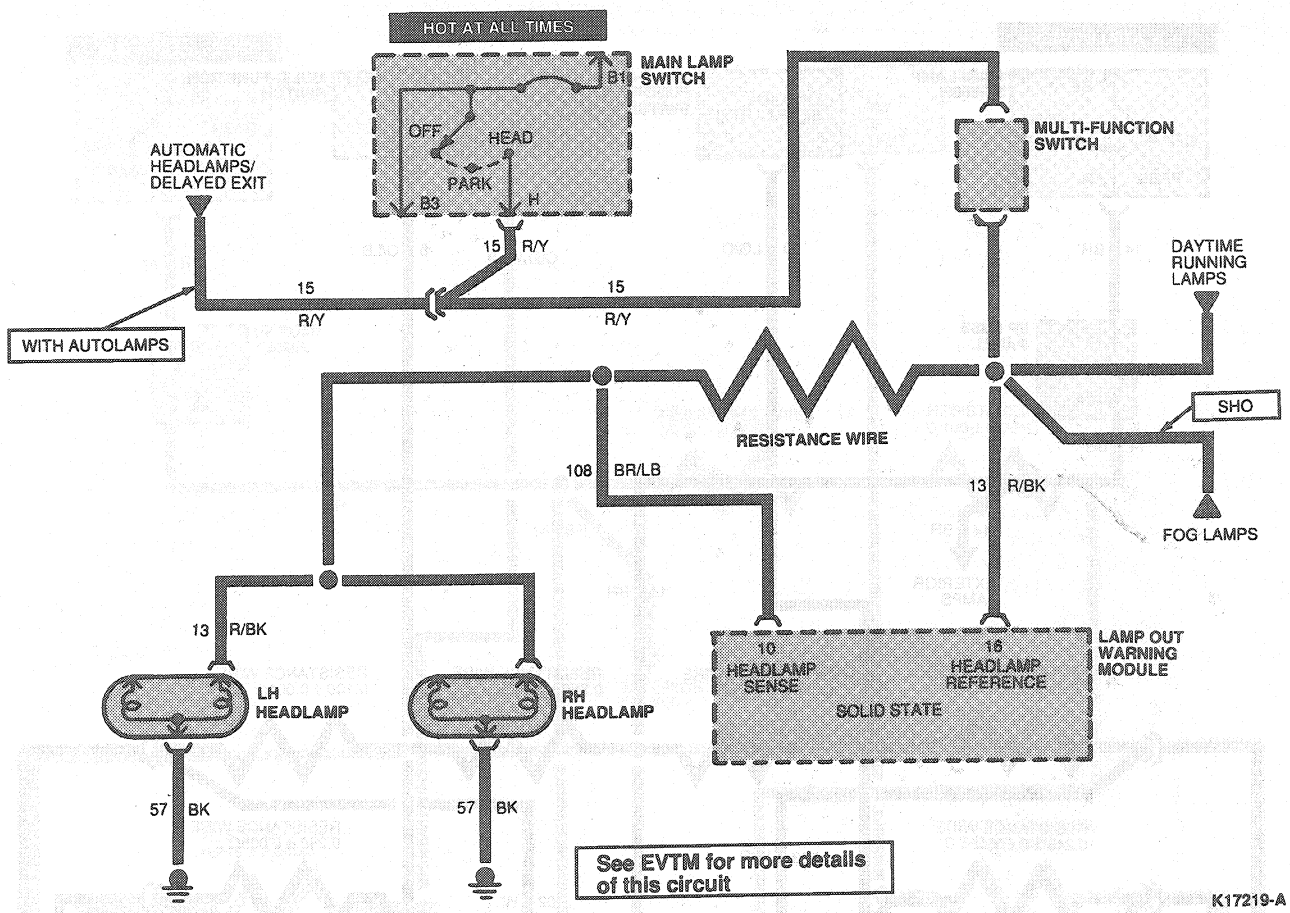
Lamp-Out Warning System

Module Power and Cluster Connections



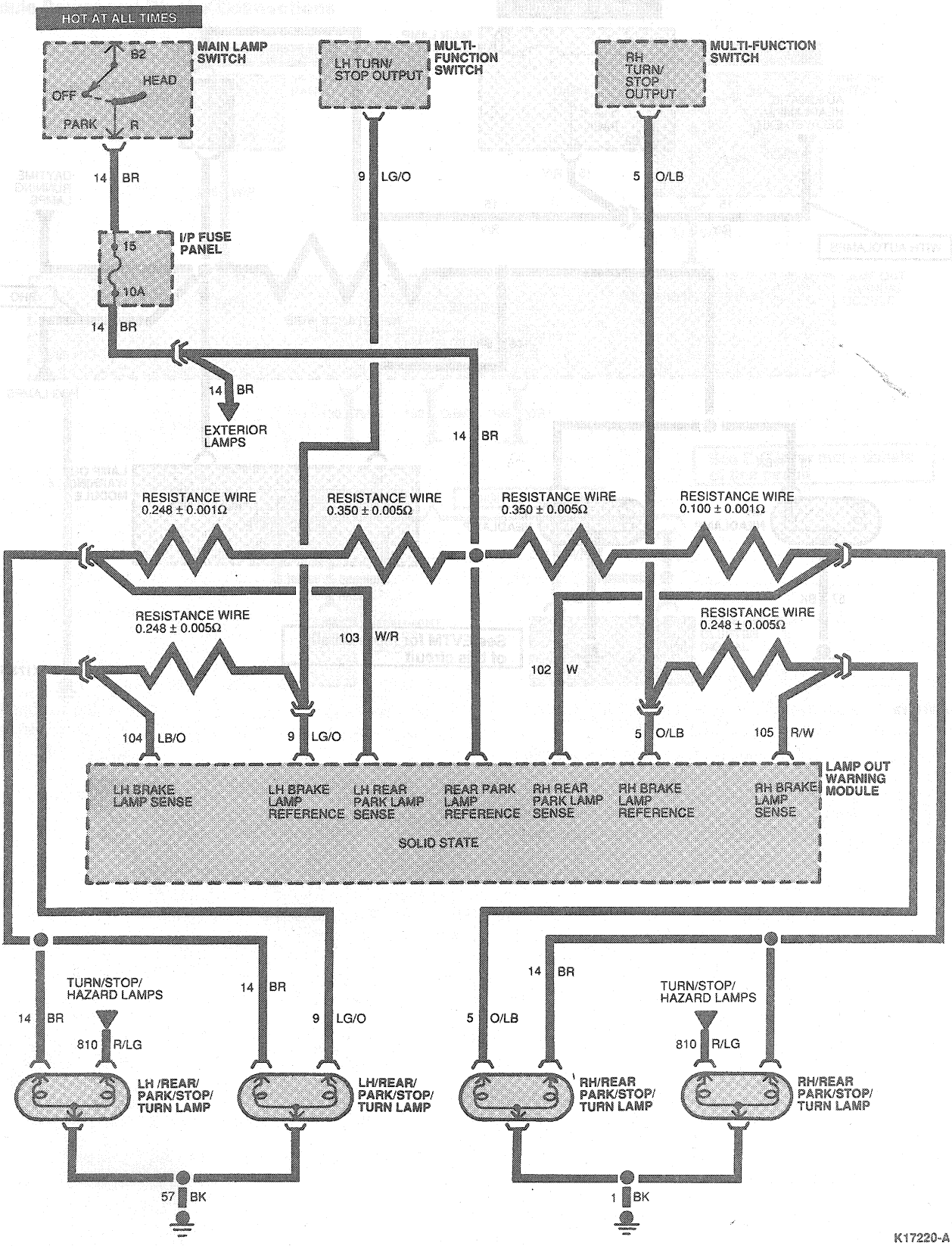
DIAGNOSIS AND TESTING (Continued)

Headlamp Circuit



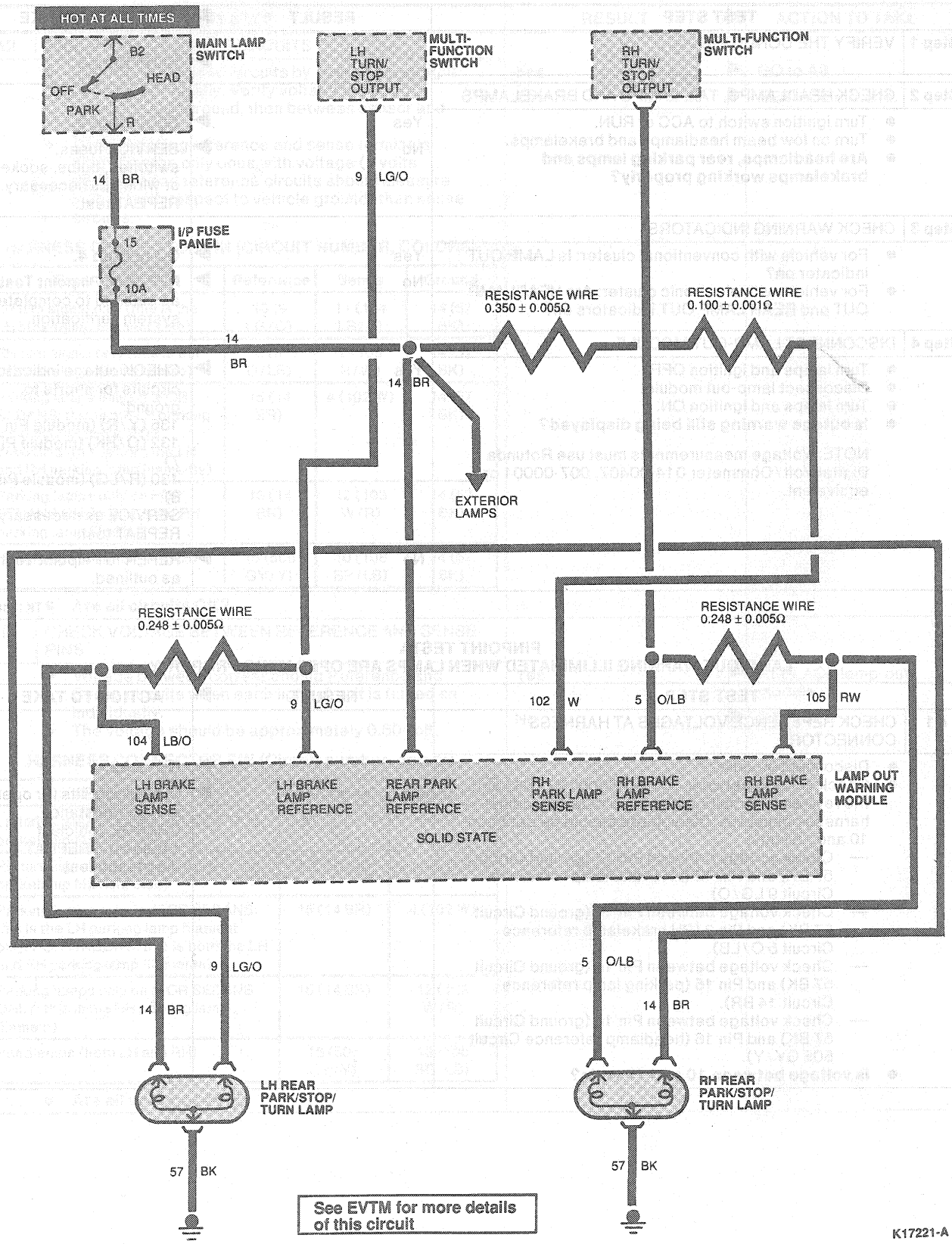
DIAGNOSIS AND TESTING (Continued)

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 TESTA
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.
	• **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.**
	• **Are all voltages OK?**		

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)

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)

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.

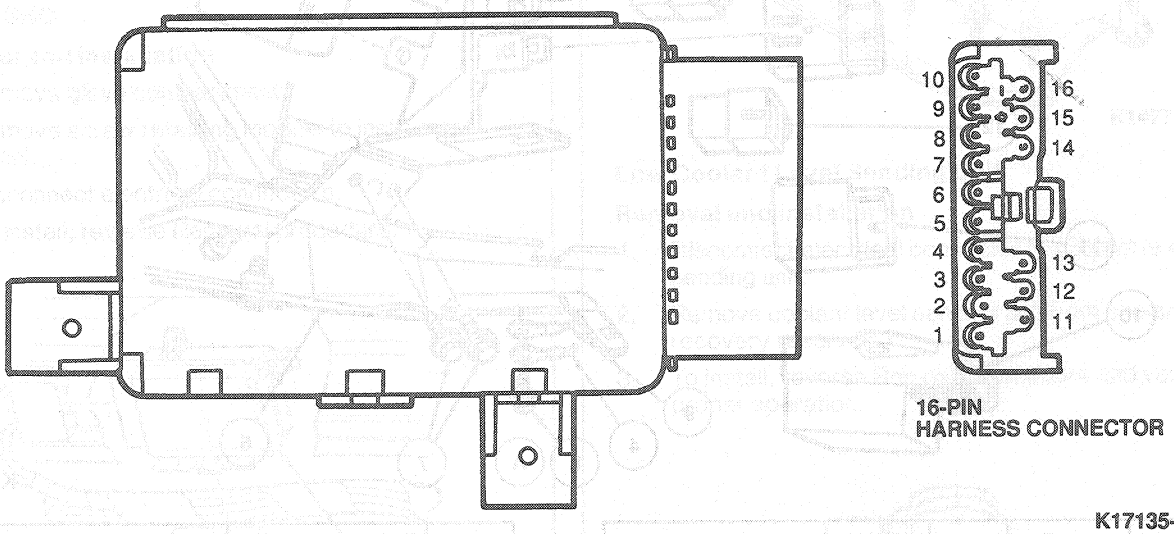
DIAGNOSIS AND TESTING (Continued)

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

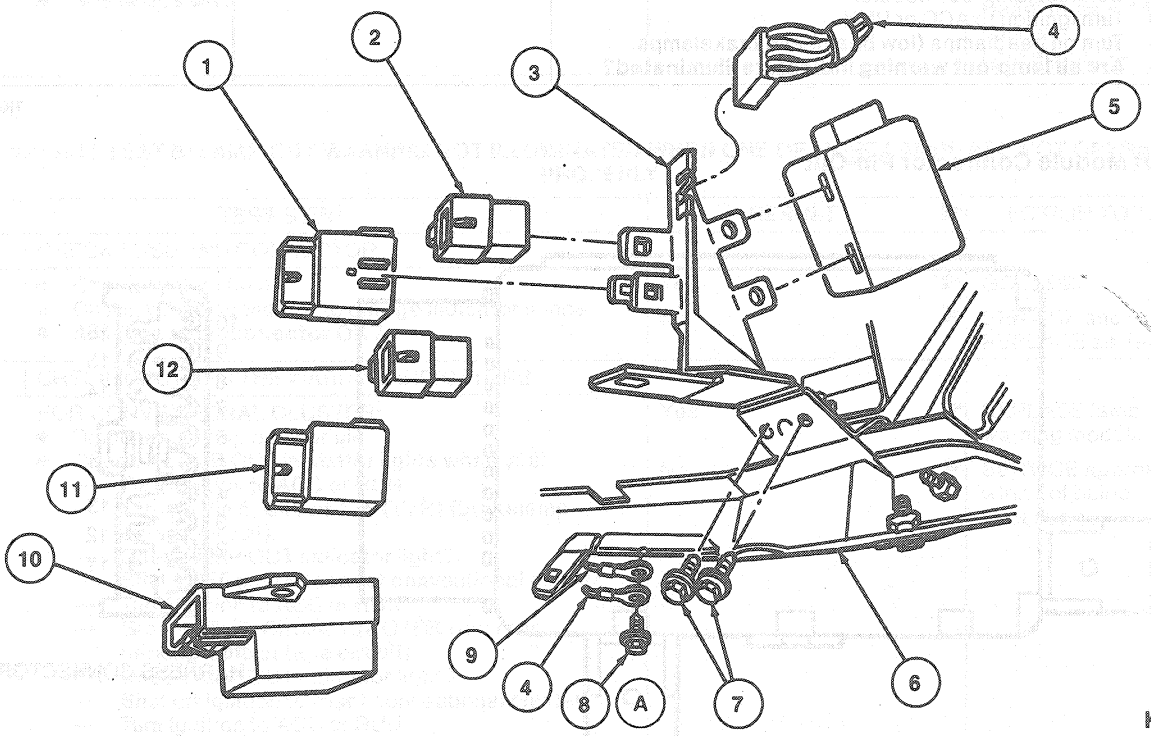
REMOVAL AND INSTALLATION

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

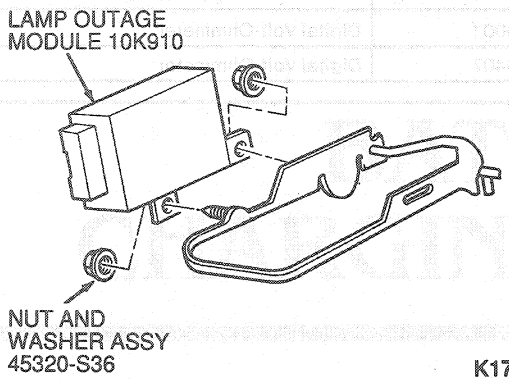
Except Taurus SHO

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.

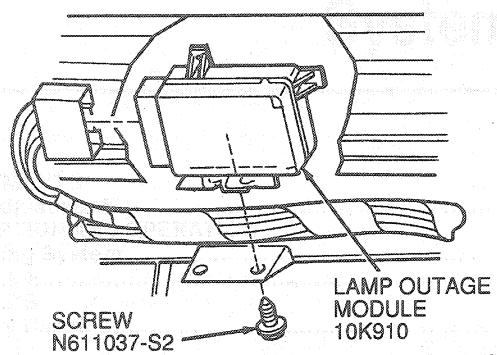


K17133-B

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.

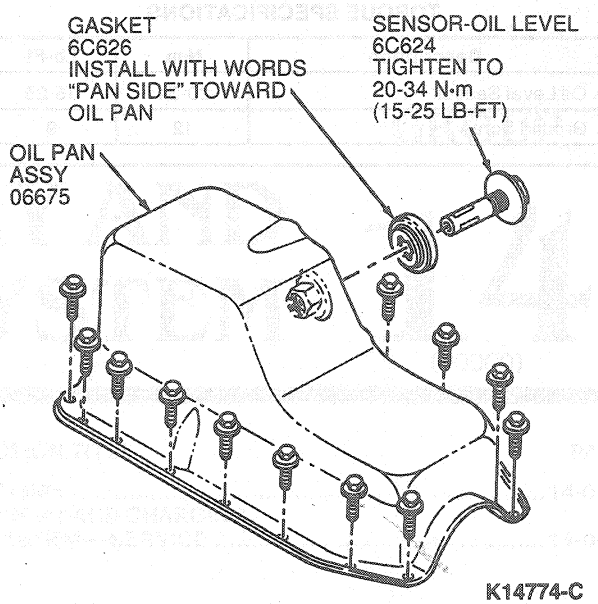


K17134-B

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.

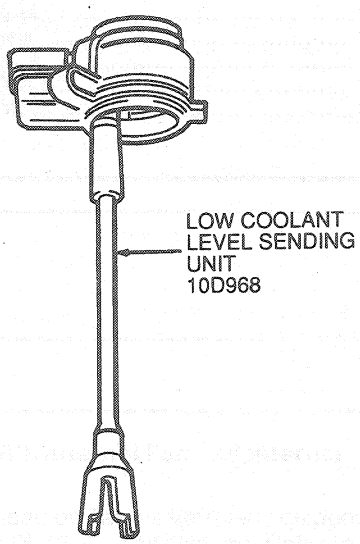


K14774-C

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.

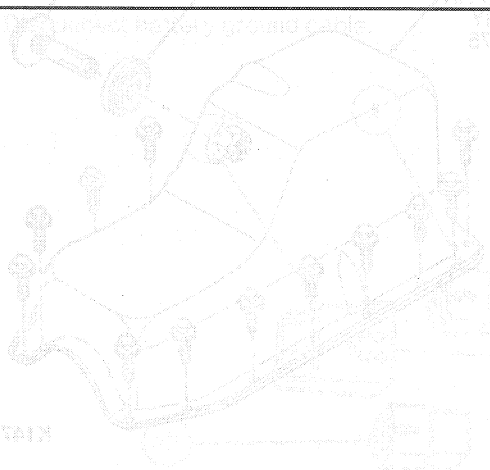


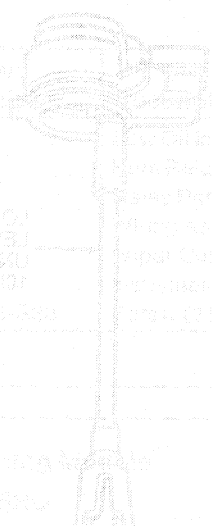
K17131-B

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