FIGURE 33.1 Engine coolant temperature is too high.

FIGURE 33.2 Engine oil pressure too low.
FIGURE 33.3 Water detected in fuel. Notice to drain the water from the fuel filter assembly on a vehicle equipped with a diesel engine.

FIGURE 33.4 Maintenance required. This usually means that the engine oil is scheduled to be changed or other routine service items need to be replaced or checked.

FIGURE 33.5 Malfunction indicator lamp (MIL), also called a check engine light. The light indicates that the engine control computer has detected a fault.
FIGURE 33.6 Charging system fault detected.

FIGURE 33.7 Fasten safety belt warning light.

FIGURE 33.8 Fault detected in the supplemental restraint (airbag) system.
Chapter 33
Driver Information and Navigation Systems

FIGURE 33.9 Fault detected in base brake system.

FIGURE 33.10 Brake light bulb failure detected.

FIGURE 33.11 Exterior light bulb failure detected.
FIGURE 33.12 Worn brake pads or linings detected.

FIGURE 33.13 Fault detected in antilock brake system.

FIGURE 33.14 Low tire pressure detected.
FIGURE 33.15 Door open or ajar.

FIGURE 33.16 Windshield washer fluid level.

FIGURE 33.17 Low fuel level.
Chapter 33
Driver Information and Navigation Systems

FIGURE 33.18
Headlights on.

FIGURE 33.19
Low traction detected. Traction control system is functioning to restore traction (usually flashes when actively working to restore traction).

FIGURE 33.20
Vehicle stability control system either off or working (flashing).
FIGURE 33.21 Traction control system has been turned off.

FIGURE 33.22 Indicates that the cruise control is on and able to maintain vehicle speed set.

FIGURE 33.23 A typical oil pressure sending unit provides a varying amount of resistance as engine oil pressure changes. The output from the sensor is a variable voltage.
FIGURE 33.24 A temperature gauge showing normal operating temperature between 180°F and 215°F, depending on the specific vehicle and engine.

FIGURE 33.25 Typical brake warning light switch located on or near the master brake cylinder.

FIGURE 33.26 The red brake warning lamp can be turned on if the brake fluid level is low.
FIGURE 33.27 Electromagnetic fuel gauge wiring. If the sensor wire is unplugged and grounded, the needle should point to \( E \) (empty). If the sensor wire is unplugged and held away from ground, the needle should point to \( F \) (full).

FIGURE 33.28 A typical instrument display uses data from the sensors over serial data lines to the individual gauges.

FIGURE 33.29 Most stepper motors use four wires which are pulsed by the computer to rotate the armature in steps.
Even though the buffer is connected to an oil-level sensor, the buffer also takes into consideration the amount of time the engine has been stopped and the temperature of the engine. The only way to properly diagnose a problem with this circuit is to use the procedures specified by the vehicle manufacturer. Besides, only the engineer who designed the circuit knows for sure how it is supposed to work.

FIGURE 33.30

A typical head-up display shows speed in miles per hour, which is actually projected on the windshield behind the head-up display in the dash.
FIGURE 33.33 A typical head-up display (HUD) unit.

FIGURE 33.34 A night vision camera behind the grille of a Cadillac.

FIGURE 33.35 (a) Symbol and line drawing of a typical light-emitting diode (LED). (b) Seven-segment display: seven segments, this array is called a seven-segment LED display with a common anode (positive connection). The dash computer toggles the cathode (negative) side of each individual segment to display numbers and letters. (c) When all segments are turned on, the number 8 is displayed.
FIGURE 33.36 A typical navigation system. This Honda/Acura system uses some of the climate control functions as well as the trip information on the display. This particular unit uses a DVD unit in the trunk along with a global positioning satellite (GPS) display to map and your exact location for the entire country.

FIGURE 33.37 (a) View of the vehicle dash with the instrument cluster removed. Sometimes the dash instruments can be serviced by removing the padded dash cover (crash pad) to gain access to the rear of the dash. (b) The front view of the electronic analog dash display. (c) The rear view of the dash display showing that there are a few bulbs that can be serviced, but otherwise the unit is serviced as an assembly.

FIGURE 33.38 Typical ignition switch positions. Notice the bulb check position between on (run) and start. These inputs are often just voltage signals to the body control module and can be checked using a scan tool.
FIGURE 33.39 Many newer vehicles place the ignition switch on the dash and incorporate antitheft controls. Note the location of the accessory position.

FIGURE 33.40 A vehicle speed sensor located in the extension housing of the transmission. Some vehicles use the wheel speed sensors for vehicle speed information.

FIGURE 33.41 (a) Some odometers are mechanical and are operated by a stepper motor. (b) Many vehicles are equipped with an electronic odometer.
FIGURE 33.42 A fuel tank module assembly that contains the fuel pump and fuel level sensor in one assembly.

FIGURE 33.43 Global positioning systems use 24 satellites in high earth orbit whose signals are picked up by navigation systems. The navigation system computer then calculates the location based on the position of the satellite overhead.

FIGURE 33.44 A typical GPS display screen showing the location of the vehicle.
Chapter 33

FIGURE 33.45 A typical navigation display showing various options. Some systems do not allow access to these functions if the vehicle is in gear while driving.

FIGURE 33.46 A screen display of a navigation system that is unable to acquire usable signals from GPS satellites.

FIGURE 33.47 The three-button OnStar control is located on the inside rearview mirror. The left button (telephone handset icon) is pushed if a hands-free cellular call is to be made. The center button is depressed to contact an OnStar advisor and the right emergency button is used to request that help be sent to the vehicle’s location.
FIGURE 33.48 A typical view displayed on the navigation screen from the backup camera.

FIGURE 33.49 A typical fisheye-type backup camera usually located near the center on the rear of the vehicle near the license plate.

FIGURE 33.50 A typical backup sensor display located above the rear window inside the vehicle. The warning lights are visible in the inside rearview mirror.
FIGURE 33.51 The small round buttons in the rear bumper are ultrasonic sensors used to sense distance to an object.

FIGURE 33.52 A lane departure warning system often uses cameras to sense the road lines and warns the driver if the vehicle is not staying within the lane, unless the turn signal is on.

FIGURE 33.53 Observe the fuel gauge. This General Motors vehicle shows an indicated reading of slightly above one-half tank.
UNFIGURE 33.2 Consult the factory service manual for the specifications, wire color, and recommended test procedures.

UNFIGURE 33.3 From the service manual, the connector for the fuel gauge-sending unit was located under the vehicle near the rear. A visual inspection indicated that the electrical wiring and connector were not damaged or corroded.

UNFIGURE 33.4 To test resistance of the sending unit (tank unit), use a 4-digit/multimeter and select ohms (Ω).
UNFIGURE 33.5 Following the schematic in the service manual, the sending unit resistance can be measured between the pink and the black wires in the connector.

UNFIGURE 33.6 The meter displays 50 ohms or slightly above the middle of the normal resistance values for the vehicle on a dime empty to 90 ohms full.

UNFIGURE 33.7 To check if the dash unit can move, the connector is unplugged with the ignition key on (engine off).
As the connector is disconnected, the needle of the dash unit moves toward full.

After a couple of seconds, the needle disappears above the full reading. The open connector represented infinity ohms, and normal maximum reading occurs when the tank unit reads 90 ohms. If the technician does not realize that the needle could disappear, an incorrect diagnosis could be made.

To check if the dash unit is capable of reading empty, a fuse jumper wire is connected between the signal wire at the dash end of the connector and a good chassis ground.
A check of a dash unit indicated that the needle is not accurately indicating.

After testing, reconnect the electrical connectors and verify for proper operation of the fuel level gauge.