FIGURE 18–1 A visual inspection on this battery shows the electrolyte level was below the plates in all cells.

FIGURE 18–2 Corrosion on a battery cable could be an indication that the battery itself is either being overcharged or is sulfated, creating a lot of gassing of the electrolyte.

FIGURE 18–3 Besides baking soda and water, a sugar-free diet soft drink can also be used to neutralize the battery acid.

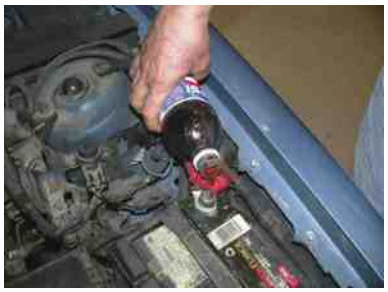

FIGURE 18–4 (a) A battery voltage of 12.28 volts is definitely not fully charged and should be charged before testing. (b) A battery that measures 12.6 volts or higher after the surface charge has been removed is 100% charged.

FIGURE 18–5 When testing a battery using a hydrometer, the reading must be corrected if the temperature is above or below 80°F (27°C).

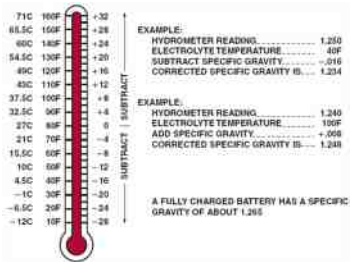

FIGURE 18–6 This battery has cold-cranking amperes (CCA) of 550 A, cranking amperes (CA) of 680 A, and load test amperes of 270 A listed on the top label. Not all batteries have this complete information.

FIGURE 18–7 An alternator regulator battery starter tester (ARBST) automatically loads the battery with a fixed load for 15 sec. to remove the surface charge, then removes the load for 30 sec. to allow the battery to recover, and then reapplies the load for another 15 sec. The results of the test are then displayed.

FIGURE 18–8 Most light-duty vehicles equipped with two batteries are connected in parallel as shown. Two 500 A, 12 volt batteries are capable of supplying 1,000 A at 12 volts, which is needed to start many diesel engines.

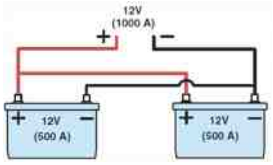

FIGURE 18–9 Many heavy-duty trucks and buses use two 12 volt batteries connected in series to provide 24 volts.

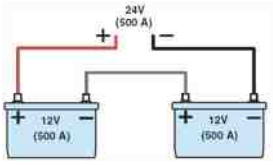

FIGURE 18–10 A conductance tester is very easy to use and has proved to accurately determine battery condition if the connections are properly made. Follow the instructions on the display exactly for best results.

FIGURE 18–11 A typical industrial battery charger. Be sure that the ignition switch is in the off position before connecting any battery charger. Connect the cables of the charger to the battery before plugging the charger into the outlet. This helps prevent a voltage spike that could occur if the charger happened to be accidentally left on. Always follow the battery charger manufacturer' s instructions.

FIGURE 18–12 Adapters should be used on side terminal batteries whenever charging.

FIGURE 18–13 A typical battery jump box used to jump start vehicles. These hand-portable units have almost made jumper cables obsolete.

FIGURE 18–14 Jumper cable usage guide. Notice that the last connection should be the engine block of the disabled vehicle to help prevent the spark that normally occurs from igniting the gases from the battery.

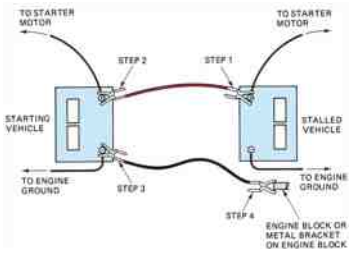

FIGURE 18–15 The code on the Delphi battery indicates that it was built in 2005 (5), in February (B), on the eleventh day (11), during third shift (C), and in the Canadian plant (Z).

FIGURE 18–16 This mini clamp-on digital multimeter is being used to measure the amount of battery electrical drain that is present. In this case, a reading of 20 mA (displayed on the meter as 00.02 A) is within the normal range of 20 to 30 mA. Be sure to clamp around all of the positive battery cable or all of the negative battery cable, whichever is easiest to get the clamp around.

FIGURE 18–17 After connecting the shut-off tool, start the engine and operate all accessories. Stop the engine and turn off everything. Connect the ammeter across the shut-off switch in parallel. Wait 20 minutes. This time allows all electronic circuits to "time out" or shut down. Open the switch—all current now will flow through the ammeter. A reading greater than specified (usually greater than 50 mA, or 0.05 A) indicates a problem that should be corrected.

FIGURE 18–18 The battery was replaced in this Acura and the radio displayed "code" when the replacement battery was installed. Thankfully, the owner had the five-digit code required to unlock the radio.

FIGURE 18–19 (a) Memory saver. The part numbers represent components from Radio Shack. (b) A schematic drawing of the same memory saver. Some experts recommend using a 12 volt lantern battery instead of a small 9 volt battery to help ensure that there will be enough voltage in the event that a door is opened while the vehicle battery is disconnected. Interior lights could quickly drain a small 9 volt battery.

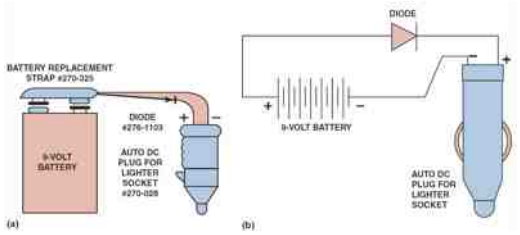

FIGURE 18–20 Many newer vehicles have batteries that are sometimes difficult to find. Some are located under plastic panels under the hood, under the front fender, or even under the rear seat. The jump-start instructions indicate that the spare tire hold-down bolt is to be used as the ground connection if jump starting is necessary.