the clamps, or pound the clamp onto the post.

Keep in mind that the connections on side terminal batteries are a bit more fragile than top terminal batteries; so exercise even more caution when tightening the cable connectors. Use a torque wrench designed for side terminals.

Finally, coat the cable connectors with petroleum jelly to help retard corrosion.

Battery Testing

How do you tell if a new battery is needed? In order to troubleshoot a problem, you'll need to run some tests. The tools are much the same as they've been in the past: a hydrometer, a load tester, a voltmeter, and your own common sense.

Before you begin, you'll need some information. What are the symptoms of the problem? Does the engine turn over but just not start? Does it turn over fast, or is it just a slow grind? Or is there no cranking at all when the key is turned on? For instance, if the car turns over with a slow grind, it could mean a defective battery, undercharging, or heavily corroded cable connections.

Start with a visual check. Look for corrosion on the posts and cable connectors that may be reducing the current flow. Check for broken cables, cracks, and missing parts. Check to see that the alternator belt is tight. Then proceed with testing the battery.

A computerized electrical system tester will enable you to test the entire electrical system by connecting the unit to the battery and one spark plug wire. Or if you don't have a computerized tester, check to see if the battery has sealed vents. If so, you can check the state of charge with a digital voltmeter. If the battery is below a 75% charge, slow charge the battery and then load test it.

Charged Level	Specific Gravity	Voltage
100%	1.265	12.7
75%	1.225	12.4
50%	1.190	12.2
25%	1.155	12.0
Discharged	1.120	11.9

(Figure 10) Typical Open Circuit Voltages and Specific Gravity Values

Never charge a frozen battery—it might rupture the container.

Not all batteries that look like they're sealed are really sealed. Some actually have access ports, though they may be hidden under labels. You can cut or remove the labels for the electrolyte check and hydrometer testing, but be careful you don't remove the warnings.

Remove the vent caps and check the fluid level. If any cell shows exposed plates, add water up to the bottom of the vent wells and slow charge for one hour. Any water suitable for drinking will do, but distilled water is best.

Insert the hydrometer into each cell, draw electrolyte into it and read the specific gravity at eye level. Then measure the battery temperature in a middle cell. For each ten degrees over 80 degrees Fahrenheit, add four points (.004) to the specific gravity reading. For example, if you have a reading of 1.235 at 90 degrees, add four points for a total of 1.239. Subtract four points from the reading for each ten degrees under 80 degrees.

If the cell readings average less than 1.235, recharge the battery and test again. If your readings after charge are still below 1.235, the battery should be replaced.

If some of the readings were above and some were below 1.235, and if the difference between the highest and the lowest adjusted readings is 50 or more points, the battery has failed and must be replaced.

For example: readings have been recorded from all the cells in a battery. The temperature in a middle cell is 60 degrees, so we subtract 8 points from each cell reading.

1.263	1.238	1.252	1.212	1.249	1.256
-.008	-.008	-.008	-.008	-.008	-.008
1.255	1.230	1.244	1.204	1.241	1.248

Subtract the lowest reading from the highest:

1.255
-1.204
.051

Because the result is more than 50 points, this particular battery must be replaced.