Battery Interconnections

There are three basic methods for electrically connecting batteries to power a device. They are pressure contact, soldering and welding.

The use of pressure contacts is the most common method for connecting to batteries. Energizer recommends the use of nickel plated steel for fabricating contacts since the battery contacts are made of the same material. The force that the contacts place on the batteries needs to be sufficient to insure constant contact but not so great as to deform the battery. Energizer recommends about one half to two pounds of force for sufficient contact pressure. Battery compartments should be designed around battery dimensions from the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) standards.

Soldering to batteries can cause problems due to the intense heat that needs to be applied to the battery during this process. Energizer does not recommend that any button cells be soldered due to the potential damage to the seal and inner components. When soldering to cylindrical cells, it is important that the lowest wattage iron possible be used to limit the heat transferred to the battery. The soldering time should also be kept to a minimum to avoid potential battery damage. The use of 60 / 40 solder is recommended due to its lower melting point (188° C).

Resistance welding is preferred to soldering due to the significantly reduced battery heating. The weld is controlled by a combination of heat, time and pressure. The proper settings need to be determined for any particular weld operation. The battery should not deform when weld pressure is applied. The surface needs to be clean and relatively even (flat). Arcing should be kept to a minimum during the welding process to prevent battery damage. To optimize weld quality, select the shortest time, the lowest transformer voltage tap, and the highest percent heat setting that yields the desired weld characteristic. Destructive testing is often the best method for determining a quality weld.

Electrically testing a soldered or welded battery pack is recommended. The open circuit voltage reading of a battery or pack can be helpful in detecting bad connections. A closed circuit voltage (CCV) test is used to create a voltage drop and gives a better indication of the overall battery pack condition. The load for the CCV test needs to be determined by the number of cells in the pack and their size. The following table gives a general guideline for a CCV test for fresh cells.

	Load per cell	Duration (Seconds)	Min. Voltage per cell to Pass
D Alkaline	10 W	2 to 5	1.4
C Alkaline	10 W	2 to 5	1.35
AAA Alkaline	43 W	2 to 5	1.35
AA Alkaline	10 W	2 to 5	1.4
AA Lithium	3.9 W	2 to 5	1.4