**Serial-to-Parallel Converter**

L. Lemmens

This converter may help if just the serial port on a personal computer is free, whereas the printer needs a parallel (Centronics) port. It converts a serial 2400 baud signal into a parallel signal.

The TxD line, pin 3, CTS line, pin 8 and the DSR line, pin 6, of the serial port are used — see diagram. The CTS and DSR signals enable handshaking to be implemented.

Since the computer needs real RS232 levels, an adaptation from TTL to RS232 is provided in the converter by a MAX232. This is an integrated level converter that transforms the single +5 V supply into a symmetrical ±12 V one.

The serial-to-parallel conversion is effected by IC1. This is essentially a programmed PIC controller that produces a Centronics compatible signal from a 2400 baud serial signal (eight data bits, no parity, one stop bit). The IC also generates the requisite control signals. If there is a delay on the Centronics port, the RS232 bitstream from the computer may be stopped via the Flow signal (pin 17). This ensures that no data is lost. The controller needs a 4 MHz ceramic resonator, X1.

**Battery Discharger**

J. Friker

The battery discharger published in the June 1998 issue of this magazine may be improved by adding a Schottky diode (D3). This ensures that a NiCd cell is discharged not to 0.6–0.7 V, but to just under 1 V as recommended by the manufacturers. An additional effect is then that light-emitting diode D2 flashes when the battery connected to the terminals is flat.

The circuit in the diagram is based on an astable multivibrator operating at a frequency of about 25 kHz. When transistor T2 conducts, a current flows through inductor L1, whereupon energy is stored in the resulting electromagnetic field. When T2 is cut off, the field collapses, whereupon a counter-emf is produced at a level that exceeds the forward voltage (about 1.6 V) of D2. A current then flows through the diode so that this lights. Diode D1 prevents the current flowing through R4 and C2. This process is halted only when the battery voltage no longer provides a sufficient base potential for the transistors. In the original circuit, this happened at about 0.65 V. The addition of the forward bias of D3 (about 0.3 V), the final discharge voltage of the battery is raised to 0.9–1.0 V. Additional resistors R5 and R6 ensure that sufficient current flows through D3. When the battery is discharged to the recommended level, it must be removed from the discharger since, in contrast to the original circuit, a small current continues to flow through D3, R2, R3, and R5, R6 until the battery is totally discharged.

The flashing of D2 when the battery is nearing recommended discharge is caused by the increasing internal resistance of the battery lowering the terminal voltage to below the threshold level. If no current flows, the internal resistance is of no consequence since the terminal voltage rises to the threshold voltage by taking some energy from the battery. When the discharge is complete to the recommended level, the LED goes out. It should therefore be noted that the battery is discharged sufficiently when the LED begins to flash.