The hardware is based on the Dallas DS5000 family of processor. It has an 8031 architecture with battery-backed static RAM replacing the internal ROM. The actual processor is the Dallas DS2250, which is a SIP stick version of the DS5000. Functionally, the DS5000 and the DS2250 are identical. The DS2250, however, uses lower cost packaging techniques.

The hardware design is simple and constitutes the minimum required to build an operating DS2250 board. Consequently, it is a general-purpose software development board that will be used as an ICE.

Circuit description of the ICE

The circuit diagram in Fig. 1 shows that the clock for the DS2250 (IC1) is generated with the aid of an 11.0592 MHz quartz crystal. The frequency of the crystal may be familiar to those constructors who have previously built MCS-51-based (8031, 8052, 8751) computers boards with RS-232 port hardware. The frequency of the quartz crystal is a multiple of the bit rate on the serial port, i.e., 11.0592 MHz divided by the bit rate is an integer. This particular crystal enables the highest bit rates (19.2 KBaud) to be generated at a clock frequency of 12 MHz were chosen, the timers would be able to count intervals aligned more accurately to 1 s, but the user would be restricted to a maximum serial port speed of 4.800 baud.

Depending on its position, link J1 on the board allows the user to use the crystal on the ICE board, or that on the target board. If a link is installed between pins 1-3 and 2-4, the ICE crystal is used. If link positions 3-5 and 4-6 are selected, the crystal in the target system is used.

All of the pins on the DS2250 are connected to a 40-pin DIL socket, US1, which is positioned at the underside of the PCB. The board can be inserted directly into the 8031DIL socket on the target board. The processor can be powered either from the target board (power supplies on pin 40 (+5 V) and pin 20 (ground) of the DIL socket, or via header PL1. The power applied to header PL1 is 5 V on pin 2, and 0 V on pins 1 and/or 4. If the supply connector is accidentally reversed, no harm should come to the ICE.

Communications, initialization and downloading of software is provided via the RS-232 port on the PC. As the ICE51 uses a single 5-V supply, a combined RS-232 buffer/voltage converter is required. The device selected was the MAX232 (IC2) from Maxim. Four 10µF capacitors, C4 to C7, are required for the voltage converter on board the MAX232. The RS-232 specification states that the high and low voltages must be more positive than +3 V and more negative than –3 V respectively. These voltages are provided by the MAX232 with typical values of +9 V and –9 V. A serial cable attached to PL2 connects the ICE51 and the PC serial port (PL2 is a 7x2 IDC connector). The 14-way connector was selected so that either a 9-way (AT-style) or a 25-way (XT-style) D-connector can be fitted at the PC end. Jumper J3 determines which D-type is in use. For an AT-style RS-232 connector, install links 7-6, 5-4 and 3-2. For an XT-style RS-232 connector, install links 7-8, 1-2 and 3-4.

Link J2 determines the source of the digital stream for the serial port to the receive pin on the processor. If J2 is connected in position 3-5, the data stream comes from the 8031 DIL header. In position 1-2, the data stream is connected to the output of the MAX232.

Download code to the ICE

The DS2250 has two modes of operation. The first mode executes code on reset from internal ROM. This ROM contains a small bootstrap loader program which is primarily designed to download code into the battery-backed RAM. Other operations include setting the memory configuration register, initialising the security keys and locking the RAM. To enter bootstrap mode, the PSEN line must be held low when the RST (reset) line is pulled high. The DS2250 then monitors the serial port, waiting for a 'carriage return' code, ASCII character 13. This operation is used to initialize the serial port baud rate. Thus, the sequence of actions to load a program into the DS2250 is:

1. Use a terminal emulator such as Procomm, or the ICE51 software.
2. Toggle the reset switch, ensuring that it finishes in the 'on' position.
3. Press the return key — the Dallas loader copyright message should then appear. You are now on line with the ICE.
4. Unlock the external RAM using the 'U' command.
5. Read the contents of the RAM configuration table by pressing 'R'. The configuration...