


# Microcontroller drives LCD with just one wire

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 HD44780 LCDs are the most popular alphanumeric displays in embedded systems. The only downside is that they use six I/O pins in 4-bit nibble mode and as many as 11 pins in 8-bit mode. Earlier Design Ideas have described many approaches to saving or expanding I/O pins (references 1, 2, and 3). In driving an HD44780-compatible LCD, it would be better to

use a baseline microcontroller instead of logic chips, because the microcontroller is lower cost, uses less board space, and has programming features. Microchip ([www.microchip.com](http://www.microchip.com)) has introduced the smallest PIC10F microcontroller family, which comes in a six-pin SOT-23 package.

The circuit in **Figure 1** proves useful for any pin-limited embedded system

that must interface with an HD44780-compatible display through a one-wire serial link using an asynchronous, simplified RS-232 protocol at 9600 baud. It uses a PIC10F202, but any member of the PIC10F family is suitable, because the highly optimized source code in **Listing 1**, which is available with the Web version of this Design Idea at [www.edn.com/071203di1](http://www.edn.com/071203di1), allows the program code to take fewer than 256 words. It is useless to try higher baud rates than 9600, because the PIC10F202 uses an RC internal oscillator with 1%-frequency tolerance, and the LCD requires a delay as long

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as 1.6 msec for some instructions, such as "clear display."

**Listing 1** is the fully commented assembler source code for the LCD232 module; the main routine consists of the display of a 2-sec-delay "splash screen," and then it enters an endless loop to wait for 1 byte as a command for the LCD, a maximum of 16 bytes as data for the LCD, and an ASCII zero. For test purposes with an external PIC microcontroller embedded system, **Listing 2**, also available at [www.edn.com/071203di1](http://www.edn.com/071203di1), is a simple assembler source code, which sends another splash screen. **EDN**

## REFERENCES

■ Raynus, Abel, "Squeeze extra

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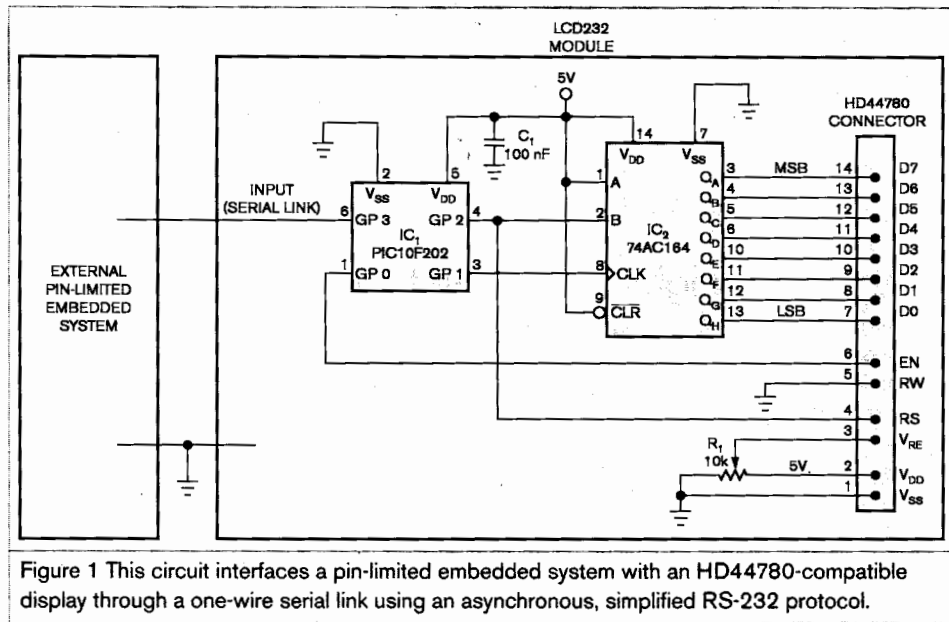


Figure 1 This circuit interfaces a pin-limited embedded system with an HD44780-compatible display through a one-wire serial link using an asynchronous, simplified RS-232 protocol.