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Featured in the "Design Forum" of Circuit Cellar Magazine  
The Magazine for Computer Applications

How to build your own 8051 Development System  
[ without a small business loan.... ]

Click [HERE](#) for a color photo of the first development board.

Anyone writing code for microcontrollers has at one time or another run into a very frustrating and often time consuming problem. What is it?, you guessed it, everything looks perfect, but it simply doesn't work when you turn it on.

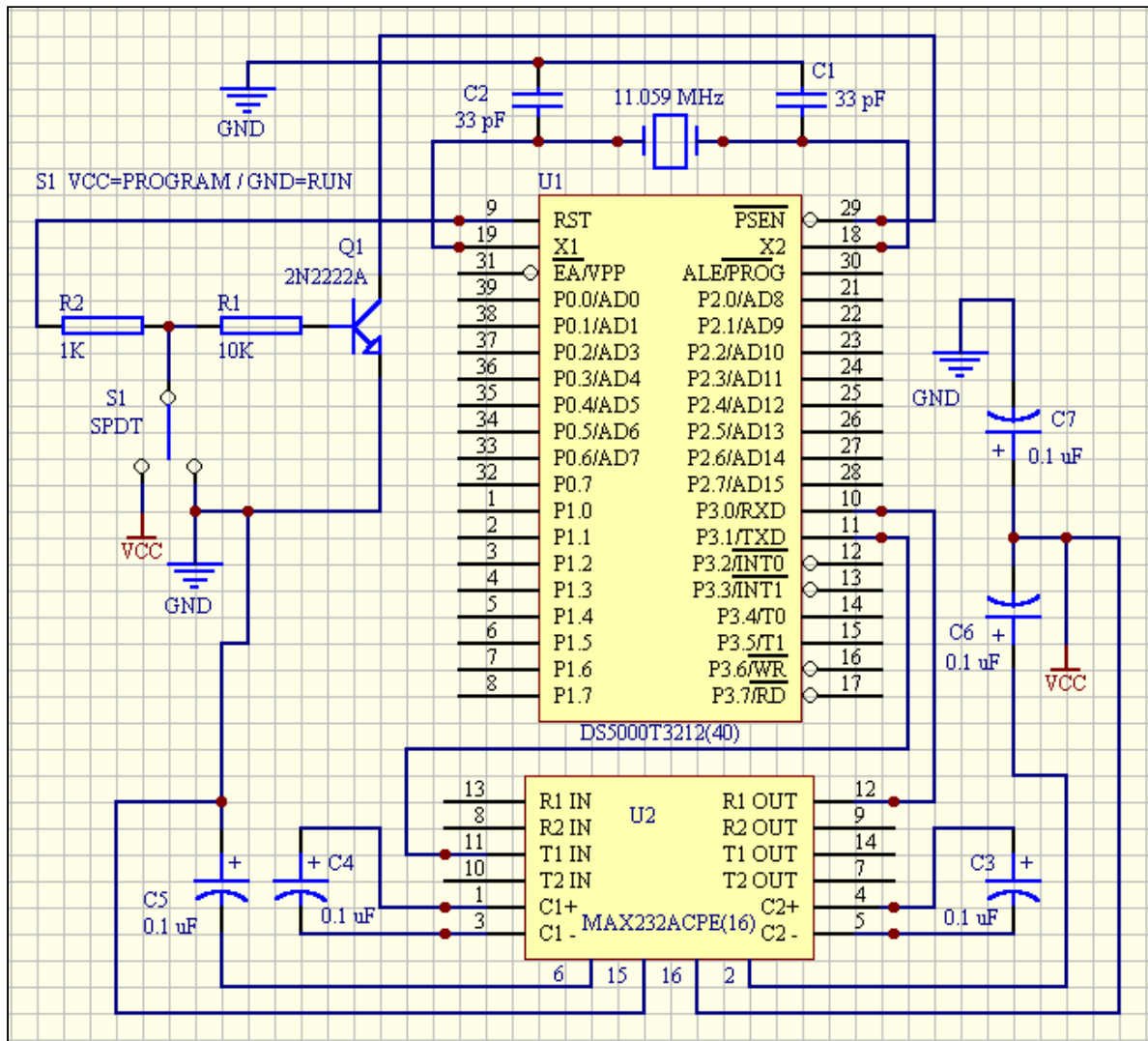
One answer to this problem is the ability to write, assemble, and download your code to your development platform in the least amount of time possible.

Here is an inexpensive aspirin for those development cycle headaches using the Dallas Semiconductors DS5000 series microcontroller. The DS5000 series microcontrollers can be programmed with a simple switch set up and a serial connection to your PC.

Another real bonus when using the DS5000 series microcontroller is it's unique ability to set internal partitions inside the microcontroller defining how much of the onboard memory is to be used for Program Memory, or Data Memory. This effectively lets you emulate many different memory schemes for 8051 variants.

This is handy when you use the DS5000 series to develop applications that will be targeted for older 8051 designs requiring external PROGRAM memory in EPROM, or for developing applications that target the EPROM (windowed) 87C51 variants with onboard program memory. By eliminating the need to burn and erase EPROMS, and the windowed versions of the 8051 like the 87C51 a considerable time savings can be realized.

If you have ever walked away and left five or six 87C51's in the ultraviolet eraser only to return and find them completely worthless, you will (really) appreciate this approach....:o)



Schematic for programming the DS5000 series microcontrollers

The diagram above shows how simple it is to set up the DS5000 series microcontrollers for programming. By taking the RESET pin high, a logic (1), and at the same time taking the PSEN pin to ground, a logic (0), we place the DS5000 in (serial) programming mode. The DS5000 is now ready to be programmed via its onboard uart, or serial port.

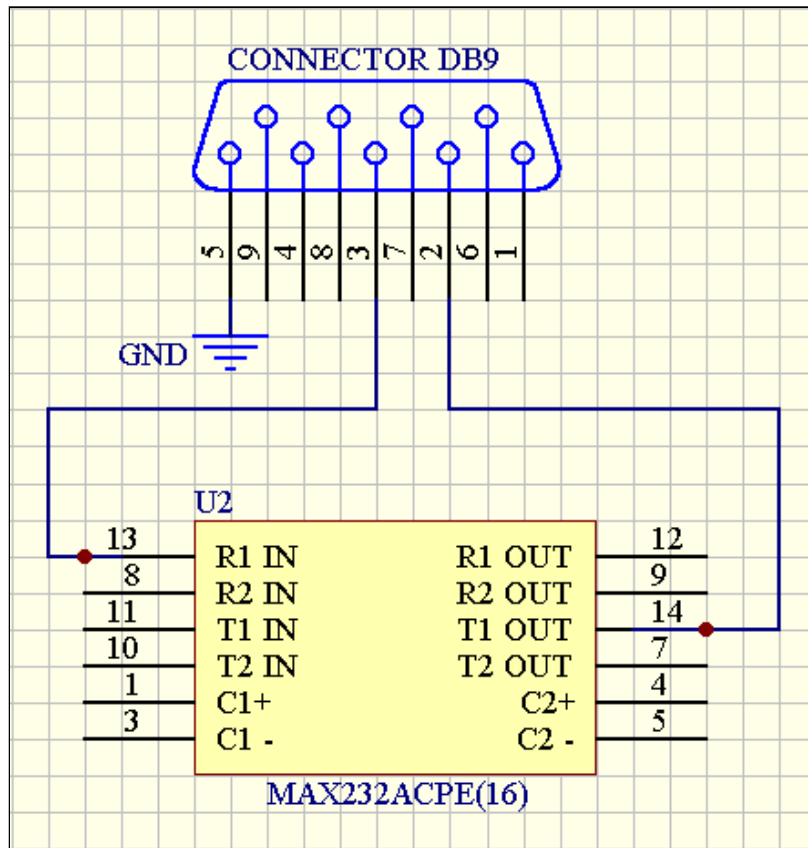
Click [HERE](#) to download:

- ▶ The *Data Sheet* for the DS5000 series microcontroller.
- ▶ The complete *Programming Software* for the DS5000 and our Development System.
- ▶ *Code Samples* for the DS5000.
- ▶ An *8051 Assembler* from Metalink Corp.
- ▶ *Other Goodies* for the DS5000 series from Dallas Semiconductors.

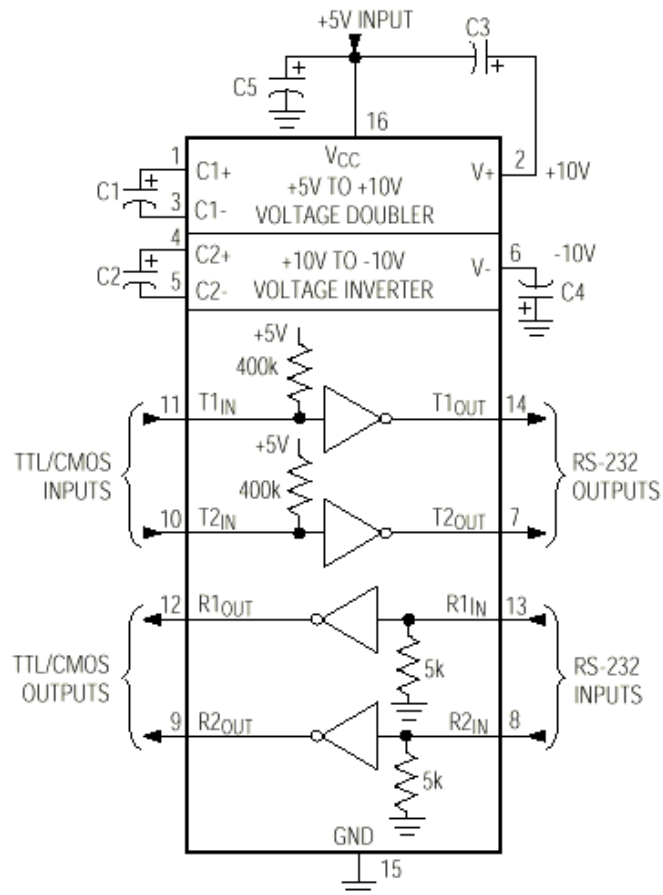
Click [HERE](#) to download Secure.pdf. This is the complete manual for the Dallas Semiconductors **Secure Microcontroller** line. This file is not small, it's approximately 2MB, but well worth the effort. This single file covers every detail of the internal clock registers and other aspects of the secure microcontroller line. If you're using the DS5000 series microcontroller and don't have this file, (**get it**), you'll be very glad you did. It's directly from the Dallas Semiconductors CD-Rom and contains numerous **code samples** that you'll find quite handy during development.

#### Serial Connection to the PC:

Here's an expanded drawing showing the actual connections to your PC from the MAX232A in the circuit above. T1 OUT, pin#14 on the MAX232A goes to pin#2 on the DB9 attached to the PC serial port. Pin# 13, R1 IN on the MAX232A goes to pin# 3 of the DB9 connector attached to your PC serial port. Make sure to connect pin#5 from the DB9 connector to your circuit GND. Below is a quick hookup diagram showing (only) the connections to the DB9 serial connector without the capacitors. Make these last three connections after you have built the circuit above to connect your programmer to your PC's serial port.



Serial connection to the PC



RS-232 Connections using the MAX232

Five capacitors are normally required for the MAX232A. If you don't mind the added expense, or you want to conserve board space, you can use the MAX233 that doesn't require the 5 external capacitors, however the MAX233 is considerably more expensive so I chose to use the 232 to keep the project costs to a minimum.

Once you have programmed the DS5000, you just flip the switch back to GND and your program will execute. Designers using the 87C51 type devices with onboard program memory used to spend considerable time and money using the windowed versions for application development. If your code didn't work the first time (and it rarely does), you were forced to erase the windowed version and try again. This old method is very costly and time consuming.

With a simple flip of the switch you go from Program to Run mode, and have access to all 32 I/O bits for your project once you have programmed the part. Now for the good part, the programming software is FREE, yep you heard right, it's FREE from Dallas Semiconductors.

The circuit is simple to build, in fact you can build it on a breadboard in about 1 hour (if you take regular coffee breaks), otherwise about twenty minutes. I use this system for all of my 8051 development jobs in the lab, and it saves me ton's of time & money. Since time=money, it's the only way to go. It's fast, clean, and SUPER EASY to use.

If you're like most of us, you just don't have several thousand dollars to shell out for a full-blown 8051 development system with all the bells and whistles. And why should we anyhow...? Dallas Semiconductors has given us an inexpensive answer to an old problem with the DS5000 series microcontrollers.

You have a full featured 8051 development board setup and operational in a very short time for less than 100 bucks, (if you build it yourself). This project is a real time saver for anyone involved in developing 8051 applications, and a really big hit with students and beginners just getting started with 8051 applications design & programming.

Click [HERE](#) for an article on "How to use the DS5000". This article shows you how easy it is to use & program the DS5000 series microcontrollers, including screen captures of the programming environment. If you have already constructed, or you plan to build your own programmer/development system, this article will help you get started.

**Note:** IO Pins P2.6 and P2.7 must float during programming.

Click [HERE](#) for the full schematic of our 8051 development system board

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