MicroStar 2000
In Circuit Programming ICP
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This paper will outline the steps required to program the PIC mircrocontroller used in the MicroStar. This is done in circuit using the ICP interface shown on the ICP drawings. This is a simple circuit and I have a printed circuit board available to make fabrication simple. I recommend you build one of these, this will allow you to reprogram your PIC when new versions become available. New versions of the MicroStar will be made available on my web site, www.mstar2k.com.

The in circuit programming is done in serial mode using features of the PIC that MicroChip has documented in there document number DS30274B pages 38 through 98. I recommend that you get a copy of this document from their web site.

Here is a list for items you will need to do the in circuit programming:

1.) ICP module.
2.) A eprom eraser.
3.) PC with a parallel printer port.
4.) MicroStar 2000 Encoder, with a erased PIC installed.
5.) The ICP.exe utility program or version 1.1 of the MicroStar application.
6.) A MircoStar hex file.

The ICP module contains the voltage regulation necessary to generate the 13.5 volt programming voltage. The ICP module is powered using a low cost "wall wart" type supply, any supply between 14 to 15 volts DC will work. Do not install JM101, this jumper is provided for future options.

The ICP parts list provides part numbers for TO-92 package style voltage regulators for the 5 and 9 volt regulators, IC102 and IC103. The PC board was designed for a SO-89 package parts that are no longer available. To use these TO-92 regulators install them with the plastic body located where the body of the TO-89 parts are on the PCB with the flat surface toward the PC board. This will cause the three pins to line up with the three pads intended for the SO-89 parts. The pad on the PC board intended for the center pin on the opposite side of the SO-89 package will not have any connection.

Here are the steps involved in programming the Encoder PIC:

1.) Build the encoder and do the testing up to and including the PIC installation. Spend some time installing the PIC, this needs to be correct.
2.) Build the ICP module and use the Test function of the ICP program to make sure it is working. After you build the ICP perform a power up test. To do this, apply power with the ICP disconnected from the Encoder and your PC. Measure the DC regulated

voltages. You should measure 5 volts on pin 14 of IC101. The programming voltage should be between 12.8 and 13.5 volts and you can measure it on pin 3 of IC103. To performed the test function, connect the ICP to your PC and apply power, then start the ICP program. Do not connect to the Encoder, ignore the ICP program's request and just press any key. The test mode will ask you to measure several voltages. Do not use the ICP if you do not pass this test! The ICP PC board has an error and the ICP drawings will address how to correct this error. You will have to cut a trace on the back of the board and add one resistor across the cut trace. You will also have to add a capacitor in parallel with D102. The details are documented in the ICP drawings file.

3.) Start the ICP program and then power up the encoder and apply Vpp to the ICP module. The Buzzer should be making noise, this is normal. Put a piece of tape over the buzzer, if you have rev 3.0 or later of the Encoder, you can remove the buzzer jumper.

4.) Plug the ICP module into the encoder J4. This connector is not keyed, so make sure you plug it in the right way! On the PCB, pin 1 is the square pad, use the load maps to figure this out.

5.) Press any key on the PC to finish the program's startup.

6.) Blank check the PIC.

7.) Load the mstar.hex file into the buffer

8.) Program the PIC. This will take about 10 minutes to finish.

9.) Verify the programming.

10.)   Exit the utility.

11.)   Remove J4 from the encoder.

If all went well, the MicroStar software will now be running and the LCD will have the signon message displayed.

Because the PIC is so hard to get in and out of its socket, I like to erase and burn the PIC in place. I have modified a UV eraser so I can set it over the PIC after I remove the tape from its window.

The ICP program:

The ICP program is a simple DOS application written in Borland C. You can download the Borland C compiler from there web site, www.borland.com. The program is designed to use the parallel printer port at 0x378. If your PC uses a different address you will have to change the program. The source code is included in the download. This application will run under DOS, win95/98/me/ but it will not run under NT or 2000. These are protected operating system and will not allow the IO instructions.

The ICP can be used to program most of the MicroChip microcontrollers. To do this you will need to modify the ICP program and connect the ICP to the correct leads on the PIC of interest.