PIC2840A Prototype Board Construction for Use with QwikBug

References: PIC2840A schematic
PIC2840A Prototype Board Parts and Prices
QwikBug installation and use:
http://www.picbook.com/bookinfo/CA4.pdf
PBtest.asm — A little template program that generates a ten millisecond loop time using Timer2 and that blinks an "Alive" LED every 2½ seconds.

Board Description:
This board can be ordered directly from the designer, Mengjin Su, at http://www.geocities.com/mengjinsu. The board is almost perfect for use with QwikBug. It includes the required serial port and otherwise leaves almost all pins of the PIC18F452 free for the user. Only pins RB6, RB7, RC6, and RC7 are tied up with QwikBug support. All pins are brought to a strip that can be populated with a header if wirewrap sockets are to be used in the large 25x36 array of 0.1"-spaced holes. Otherwise, the strip can be left unstuffed and used for point-to-point wiring of extra circuitry using #30 wirewrap wire.

Parts:
The accompanying list of parts, while not very costly at less than $50, can perhaps be built for significantly less. If you have already populated the QwikFlash board that comes with the text, "Embedded Design with the PIC18F452 Microcontroller," then you have the socketed chips needed for this board: PIC18F452-I/P and MAX232ACPE. If you don't have these parts, then rather than purchasing them from Digi-Key, you may request a couple of samples of the former from the www.microchip.com website and of the latter from the www.maxim-ic.com website. To install QwikBug into the PIC18F452, refer to Sections A4.3 and A4.4 of the reference listed above (or in Appendix A4 of my book) and also my website, www.picbook.com.

The other two items that you already have, if you have a working QwikFlash board, are a 200 mA wall transformer and a serial cable. The 500 mA wall transformer listed on the attached "Parts and Prices" can be used to drive unusually hefty loads (e.g., a stepper motor). However, the resulting load will cause the voltage regulator, U4, to heat up somewhat whereas the 200 mA unit that comes with the QwikFlash list of parts will not.

The final two items on the list, a LED and its current-limiting resistor, are intended to add an "Alive" blinking indication that application code is running. These two parts can be added in the prototype area, at the bottom of the board. The circuit directions below and the template program, PBtest.asm, drive this LED from the RA4 pin of the PIC18F452.

Silk-screened part patterns that will not be stuffed:
U1 (This 28-pin pattern allows the board to be used with an alternative 28-pin PIC part.)

R2,R3, J3 (these provide nice support of the off-board use of SPI or I^{2}C peripherals.

Polarized parts:
The two electrolytic capacitors, E5 and E6, must have the lead marked with "-" inserted into the hole that is not marked "+".
The four capacitors, E1, E2, E3, and E4, are marked as polarized and were intended to be populated with the 10 µf polarized capacitors required by a MAX232 chip. However, I suggest

that you use a MAX232A chip and its much smaller 0.1 µf capacitors. These latter are not polarized.

The bridge rectifier, B1, must have its polarizing corner aimed "northeast," toward the hole that is labeled with a "+".

Construction:

Before you begin, use a 7/64" drill to enlarge the mounting hole for the U4 voltage regulator so that it will accommodate a 4-40 screw.

Stuff all the parts on the parts list into their corresponding silk-screened footprints on the board.. After you have done all this, there are several further things to do.

Add a 0.1 µf capacitor in the holes that would be pins 20 and 19 of the 28-pin U1 pattern. This will connect the capacitor to pins 32 and 31 of the 40-pin U2 pattern and will allow the capacitor to be mounted on the top side of the board, inside of the U2 socket. Another 0.1 µf capacitor should be connected to pins 11 and 12 of the 40-pin pattern. Cut the leads of the capacitor to a length of 1/4" or so and solder the ends directly to pins 11 and 12. Do not try to use the corresponding pins of the 28-pin U1 pattern since these *are not* connected to pins 11 and 12 of U2. I have found that the PIC18F452 may refuse to run, or refuse to run reliably, without these two capacitors mounted immediately adjacent to the PIC chip's VDD and VSS pins.

Instead of stuffing E7 with a capacitor between the PIC18F452's MCLR pin and ground, the PIC chip's brown-out reset provides a more reliable power-on reset. Mengjin had the creative idea of inserting the 2-pin header shown on the parts list in lieu of a capacitor. Then, shorting the two pins with a paper clip, a screwdriver, or a metal pen can be used to reset the PIC chip.

Connect pin 26 to pin 39 of the 40-pin U2 pattern using a piece of #30 wirewrap wire. This is an accommodation to QwikBug. It is used to break from the execution of a user program back to QwikBug simply by pressing any key of the PC keyboard. The two pins are among the four that QwikBug usurps for its use (RC7 and RB6).

Solder a 1kΩ resistor along the bottom row of prototyping holes, using holes 5 and 8, counting from the leftmost hole. This will put the right side of the resistor into the hole marked VCC. Solder the low-current LED just to the left of this, putting the long lead on the right, adjacent to the left lead of the resistor. Solder the right lead of the LED to the left lead of the resistor with a piece of #30 wirewrap wire. Connect the left lead of the LED to pin 6 of the 40-pin U2 pattern. This is RA4 of the PIC. Driving this pin low will turn on the LED, as is done periodically by the little **PBtest** program.

When you are done populating the board, be sure to wash away the solder flux from the board. If your solder employed water-soluble flux, rub the solder joints with a toothbrush under water flowing from a faucet. If you used resin-core solder, use rubbing alcohol and a toothbrush. Then finish up with water under a faucet and thoroughly dry the board, perhaps with a hair dryer.

QwikBug use:

Install the two chips in their sockets. Refer to Appendix A4 of my book (or the attached PDF file) on the use of QwikBug with the terminal emulator program, Tera Term Pro. Tera Term Pro can be downloaded from www.picbook.com.