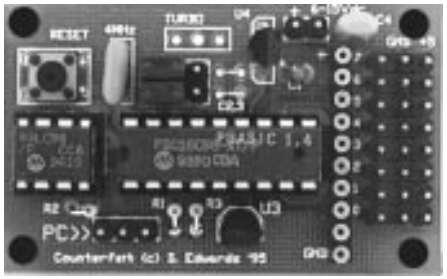
Building and Using the

Counterfeit
(BASIC-programmable Controller)



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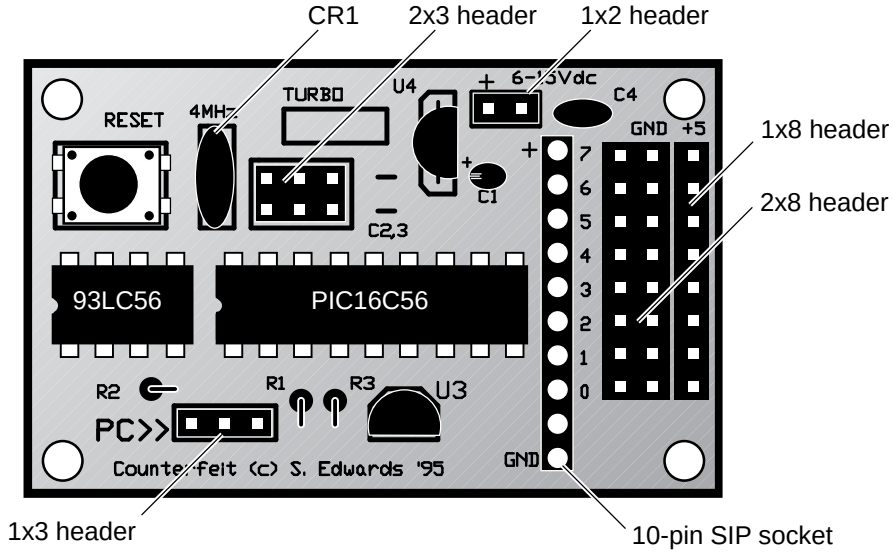
Assembling the Counterfeit



U1—93LC56 serial EEPROM (may substitute 93LC66) in 8-pin DIP socket
U2—PIC16C56XT “PBASIC” 1.4 or greater in 18-pin DIP socket
U3—MN1381 or TC44VC4303 reset circuit (flat side as shown)
U4—LP2950 5V regulator (flat side as shown)
R1, R2—4.7k (yellow-violet-red) 1/8W resistor mounted on end
R3—1k (brown-black-red) 1/8W resistor mounted on end
C1—1µF tantalum cap (longer + lead in hole marked +)
C2, C3—15pF axial ceramic capacitors (use only if crystal installed at “Turbo”)
C4—0.1µF monolithic capacitor
CR1—3-terminal 4MHz ceramic resonator (marked 4.00)
CR2 or XTAL—mount at “Turbo” location or install socket; see instructions
S1—miniature pcb-mount pushbutton switch
Header stakes—mount the 2x3, 2x8, 1x8, and 1x2, and 1x3 header strips as shown
SIP—mount the 10-pin SIP socket as shown
9V clip—socket connects to 1x2 header; red to +
Shunts—shorting jumpers on 2x3 header enable switching clock source

When you are finished soldering the components in their places and prepare to test the completed Counterfeit, install the shorting blocks on the left side of the 2x3 header to connect the 4 MHz resonator.

2x3 header with jumpers installed correctly; near CR1, the 4-MHz resonator.

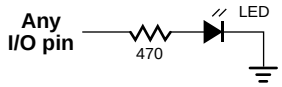
Using the Counterfeit Controller Kit

The Counterfeit controller is a kit alternative to the Parallax BASIC Stamp® single-board computer. The Counterfeit uses a genuine Parallax PBASIC interpreter chip and a circuit that is very similar to those of the assembled Parallax products. To program the Counterfeit, you need either the Parallax BASIC Stamp Programming Package, or the Counterfeit Development System, sold separately. This user's guide covers only the Counterfeit hardware itself.

Assembly and Checkout of the Counterfeit

Assemble the Counterfeit according to the diagram on the facing page, soldering the components to the board in the marked locations. When you are done, review your soldering and correct any unsoldered or shorted connections.

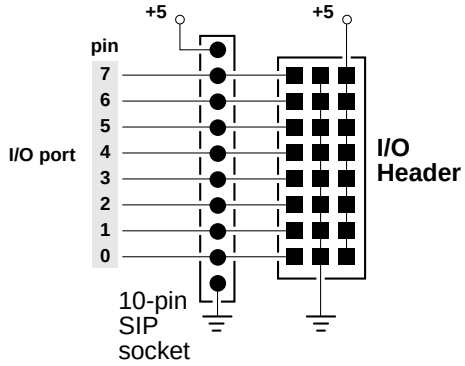
The 93LC56 EEPROM included with the Counterfeit kit is preprogrammed with a simple test routine that will help you check your kit for correct assembly. Connect a 9V battery to the power header (marked "6–15Vdc") with the red wire to the + terminal (see alert notice below). Connect an LED through a series resistor to any of the Counterfeit's I/O pins. The test routine will flash the LED.



Using the Counterfeit

The Counterfeit's 8 I/O pins, numbered 0 through 7, are connected to header stakes on the righthand edge of the circuit board. As the drawing shows, each pin is paired with both ground and +5-volt connections.

The Counterfeit's I/O lines are electrically identical to those of the Stamp. When set to output, a pin can source 20 mA and sink 25 mA, for a total of up to 40 mA (source) or 50 mA (sink).



When set to input, the pins have very high impedance, leaking no more than 1 µA of current in or out, provided input voltages aren't more negative than ground, or more positive than the + power supply.
the I/O-pin header is a 10-conductor inline socket (SIP). This socket is also connected to the I/O pins, but has an additional connection at each end for +5 Vdc (top) and ground (bottom). This arrangement lets you conveniently install resistors between the I/O pins and +5 Vdc or ground using SIP resistor packs. If you want to exclude one of the I/O pins from the pullup or pulldown connection, you can simply cut the corresponding pin off the resistor pack

Alert! Reversing the battery or power-supply leads can damage the voltage regulator. The regulator will withstand brief (1–2-second) reversals, but prolonged connection will damage it and other ICs.

Using the Turbo option

The Counterfeit printed-circuit board features two mounting locations for clock sources; one marked 4MHz for the default ceramic resonator, and a second marked turbo for an optional high-speed ceramic resonator or crystal. A pair of jumper blocks on the nearby 2x3 header selects which resonator will run the PBASIC chip. For programming and normal-speed operation, both blocks must be on the left pair of pins. For turbo operation (if a turbo resonator/crystal is installed) the blocks must be on the right pair of pins.

The Counterfeit can only be programmed at 4 MHz. See the schematic diagram for more information on turbo options. Suitable 8- and 16-MHz turbo resonators and crystals are available from Scott Edwards Electronics.

Note that during turbo operation, the timebase of all PBASIC operations changes. For example, if a serial-output command specifies 2400 baud, but the Counterfeit is running at 16 MHz (4x normal speed), the actual baud rate will be 9600.

Differences between the Counterfeit and the BASIC Stamp I

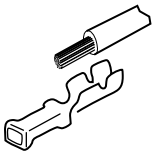
The Counterfeit uses the same PBASIC interpreter chip used in the BASIC Stamp I, so it is entirely compatible with programs written for the Stamp.

There are minor differences in hardware between the Counterfeit and the Stamp, however. The Counterfeit uses a somewhat huskier voltage regulator—the LP2950—to provide more than twice the current for driving external circuitry; up to 100 mA continuous. This regulator draws 75µA for its own purposes, about twice the quiescent current of the Stamp regulator. Programs that use Sleep or Nap modes will experience somewhat shortened battery life compared to the Stamp. If battery endurance is unsatisfactory, you may substitute an LM2936 regulator.

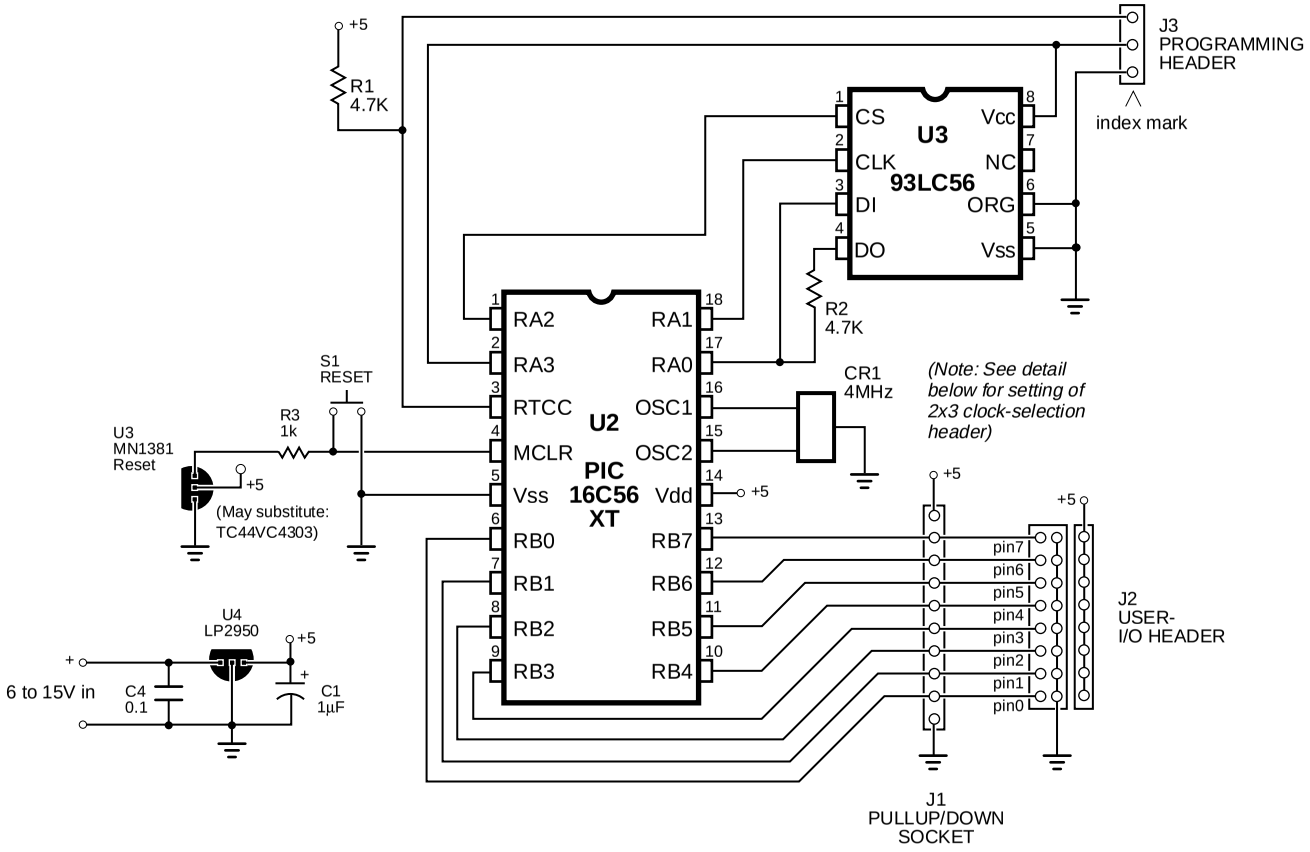
Like the Stamp, the Counterfeit employs a brownout reset circuit. If the supply voltage falls below a preset threshold, the PBASIC interpreter chip will be held in reset. The Stamp's threshold voltage is 4.0; the Counterfeit's is in the range of 3.4 to 4.3. The difference should not be noticeable in normal operation.

Using the header posts

You can conveniently connect external circuitry to the header posts using crimp-on sockets, as shown in the drawing. The sockets are available from Jameco (phone: 1-800-831-4242 or 1-415-592-8097; fax: 1-415-592-2503) as part number 100765. A tool, part number 99442, makes the crimping job easy. Jameco also carries plastic housings that align the sockets at standard 0.1" intervals, such as part number 100811. An excellent alternative is to cover the individual header sockets with pieces of heat-shrink tubing. If you prefer not to make your own jumpers, preassembled units called *Connectamundos* are available from Scott Edwards Electronics.



Schematic diagram of the Counterfeit

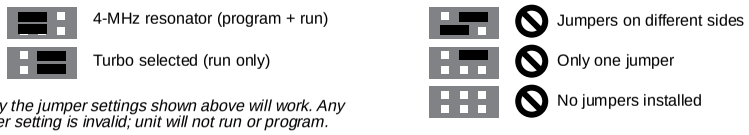


Detail: Using the Turbo clock option

The Counterfeit has a 2x3 header next to CR1 that serves as a switch to connect the normal 4-MHz resonator or another resonator or crystal (marked “Turbo”) to the controller. This allows you to program the Counterfeit at 4 MHz, then switch to another clock speed to run. To program or run using the 4-MHz resonator, install the jumpers on the left pair of pins on the 2x3 header. To run at Turbo speed, install the jumpers on the right pair of pins. Any other setting of the jumpers stops the controller clock; nothing happens. You cannot program the Counterfeit when the clock speed is set for anything other than 4 MHz.

Installing a Turbo clock: If your Turbo clock element is a ceramic resonator with three terminals, omit capacitors C2 and C3. If Turbo is a crystal or ceramic resonator with two terminals, install 15-pF caps at C2 and C3. The controller will not operate above 20 MHz or below 500 kHz.

Jumper setup



Only the jumper settings shown above will work. Any other setting is invalid; unit will not run or program.