

Introduction:

There are many frequency counters, often PIC based, that can count no higher than 50 MHz or so. This kit is intended to extend the counting range of such a counter by dividing the signal of interest by 10. The counter reading just needs to be “multiplied” by 10 (shifted by 1 digit) by the operator to get the true frequency. The circuit is very simple, it uses an MC12080 prescaler IC to perform the frequency amplification and division.

General notes on building the Prescaler kit

One decision the builder should make before starting construction of the Prescaler kit is how the project will be mounted in the case. The Prescaler will work well either as a separate unit or built into an existing counter. A candy tin will make a good case for a Prescaler kit housed in a separate enclosure.

The kit is surface mount mainly due to the fact that the prescaler IC is only easily available in a surface mount package (8 pin SO). The passive components are small (1206 sized, 12 thousandths of an inch by 6 thousandths of an inch) but not too small. The 5 volt regulator is a normal TO-92 leaded part.

The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

The use of good quality desoldering braid or solder wick is suggested for cleaning up any short circuits between the IC leads. The cheap stuff isn't worth the trouble. I use the no-clean SODER WICK from Chemtronics, available from Digi-key.

Building the Prescaler

Step 1) Get the parts together: All of the board mounted components have been supplied but you will still have to provide off-board items to fully implement the kit. These items are mentioned at the end of the kit parts list

Step 2) Identify and orient the components: Most of the components should be fairly easy to identify and place - see the parts list and the parts placement diagram for descriptions. The ceramic capacitors are unmarked so keep them in the marked holders until ready to place them on the board. The resistors are marked but you may need to use a magnifying glass to see the markings clearly. On the top of the prescaler IC there is a stripe marked on the pin1+ pin 8 end of the device.

step 3) Place and solder the components on the main circuit board: Use the parts placement diagram for information on the placement and orientation of the parts. Clip the leads of the through hole part after soldering.

- a) C4, a .1 uF 1206 sized capacitor. Be certain that you have the .1 uF cap and not one of the 1000 pF caps. Place C4 as shown on the parts placement diagram, at the bottom left of the circuit board. When the leads are centered on the traces, use something like a screwdriver or a toothpick to hold C4 in place. Next, use a soldering iron to tack down one of the leads. Usually there is enough solder on both the board and part to allow this, if not, add a little extra solder to the tip of the iron and try again. Double check the lead alignment of the other pin, it's easier to move the part (if needed) with only one lead soldered. If the other lead is OK, then solder it down to the board. Use the solder wick to clean up any excess solder.
- b) C3, the other .1 uF capacitor. Place C3 as shown on the parts placement diagram, to the right of C4 and solder in place.
- c) R1, 820 ohm 1206 sized resistor. Place R1 as shown on the parts placement diagram, to the right of C3 and solder in place.
- d) R2, 51 ohm 1206 sized resistor. Place R2 as shown on the parts placement diagram, at the top left of the circuit board and solder in place.
- e) C2, 1000 pF 1206 sized capacitor. Place C2 as shown on the parts placement diagram, to the right of R2 and solder in place.
- f) U1, the SO packaged IC. place it down on the board per the diagram with the white striped end towards the top of the board. Adjust the leads until they all are aligned correctly with the pads on the board, then hold the part down while tack soldering one corner pin. Double check the alignment of the other pins and if they are OK, solder the rest of the pins down to the board. Don't worry if there are solder bridges, just use the solder wick to clean them up after you have soldered all the leads.
- g) C1, 1000 pF 1206 sized capacitor. Place C1 as shown on the parts placement diagram, to the right of U1 and solder in place.
- h) U2, the 78L05 5 volt regulator IC - place U2 between R2 and C3/C4 with the flat side of U2 towards the top of the board. Solder U2 in place and then trim the leads.

Building and Operating: Prescaler kit from Jackson Harbor Press

- i) Connect the 9V battery snap (or other power input connector to the ground and +Vin holes on the left side of the board, don't forget to add a power switch if necessary in series with the positive lead.
- j) Connect the input and output signal jacks. You may want to just use a short piece of wire as an antenna for the input. You may also want to make the connection to the output jack with a 1000 pF series capacitor if your counter doesn't have a series coupling capacitor on the input.

Step 4) Check the board: Before proceeding, take the time to check the top (mostly) and the bottom of the board for solder bridges. Use the parts placement and bottom view diagrams as a guide to visually check for these shorts. It may help to clean the flux from the board and then use a strong light in conjunction with a magnifying glass to see these problems. Also, double check the orientation of the critical components such as U2 and U1.. After you are convinced that the board is OK, connect the board to a 9V battery using a VOM to measure the current used, current should be less than 15 mA with no input signal present, if it's larger, or if it's too low (should be over 2 ma) power down and re-check the board for shorts and polarity problems.

Operation:

The easiest way to confirm operation of the prescaler is to connect the prescaler output to a counter, connect the input to some wire and then key an HT or FRS radio and see what the counter reads. Note that the input 50 ohm resistor is only 1/4 watt, so don't connect the prescaler directly to a high power source of RF.

Modification ideas:

- 1) an ON/OFF switch: especially if you are using a 9V battery as a power source, it won't last long connected to the prescaler. One other idea would be to use a battery saver circuit such as the kit of the same name from Jackson Harbor Press.
- 2) an input amplifier - if the sensitivity of the prescaler is not high enough, for your application, one of the new 50 ohm, MMIC super wide band amplifiers might be appropriate, connected to the input of the prescaler.
- 3) an output coupling capacitor - as mentioned previously, a 1000 pF series coupling cap on the output of the prescaler may be needed with some counters.

Please feel free to email with any questions, comments, suggestion or problems with this kit. My email address is:

jacksonharbor@att.net

Thanks for choosing the Prescaler kit and
Best Regards,

Chuck Olson, WB9KZY

Copyright 2005 by Charles J. Olson

List of parts included with the Prescaler kit

Ref	designation	Description
-----	-----	-----
C1,C2		1000 pf multilayer ceramic, 1206 sized surface mount capacitor
C3,C4		.1 uf multilayer ceramic, 1206 sized surface mount capacitor
R1	821	820 ohm, 1206 sized surface mount resistor
R2	51	51 ohm, 1206 sized surface mount resistor
U1	12080	8 pin SO, Prescaler IC circuit board

Items you may need to provide to complete the Prescaler kit

Metal case (an Altoids tin is fine)
4-40 sized mounting hardware
input power jack (9V battery snap connector OR other power connector)
SPST power switch (optional)
input and output signal jacks
solder, wire, good quality desoldering braid
1000 pF multilayer ceramic capacitor for output coupling