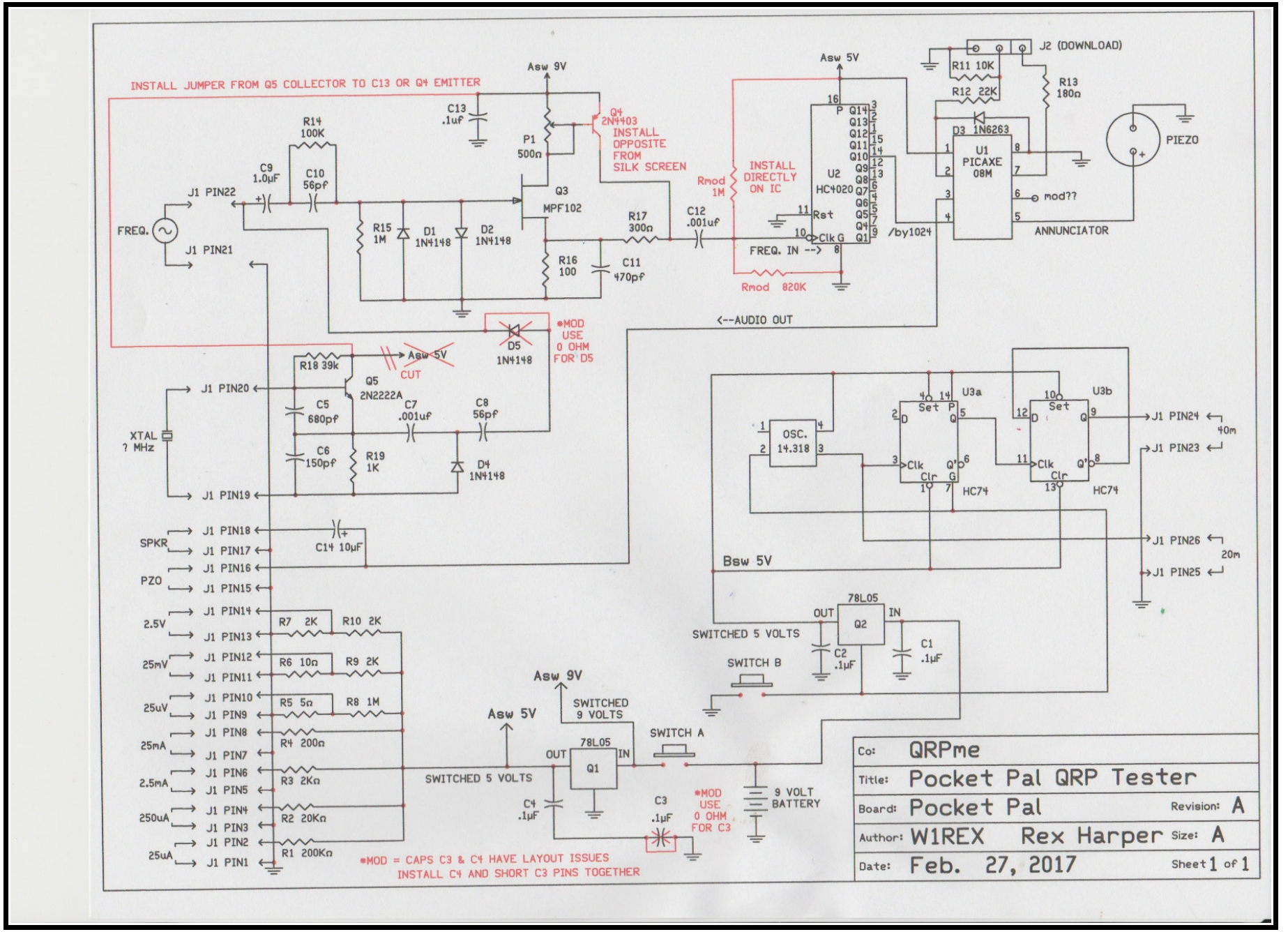
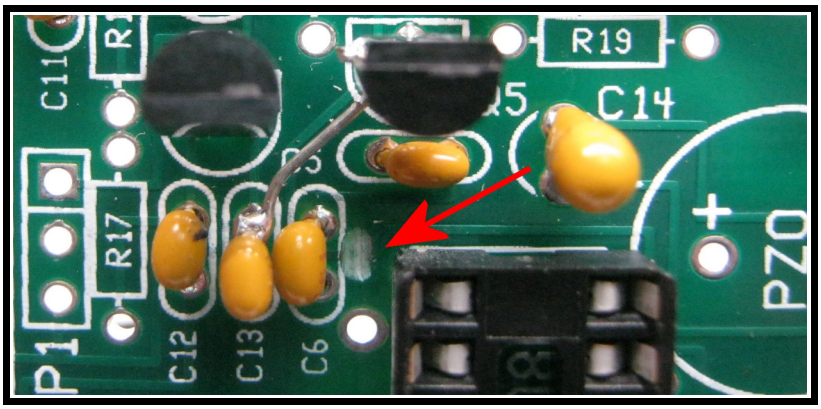
HURRAY!

The FINAL step for building the PocketPAL kit is finally here!

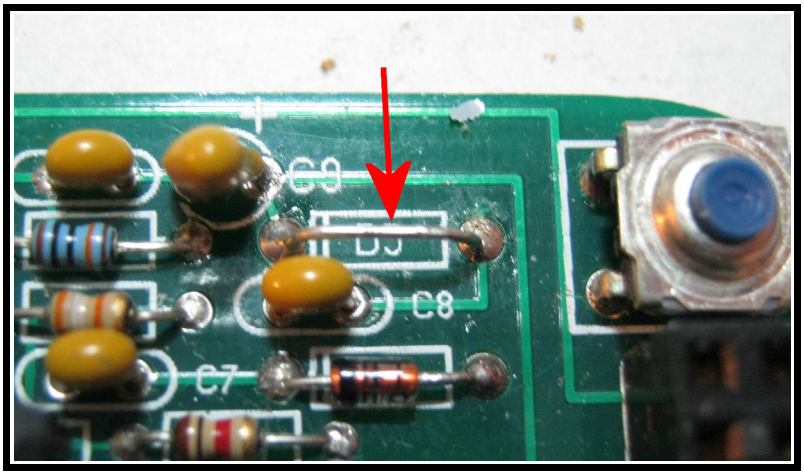
It has been a long journey of flooded basements, lost prototypes, dead laptop, clones that were not clones and a ton of other unexpected stuff. Anyway, I finally was able to coax my 18 year old laptop into limping along long enough to search for some long lost PAL files. Combined with some new-found notes, the reappearance of the long lost prototypes and a week of debugging and programming, I finally got the prototype to do what I intended it to do when I started the project many years ago. There are a few modifications that need to be done in order to make the circuitry function properly. They are noted in RED on the schematic so you need to study the schematic carefully.


INSTALL JUMPER FROM Q5 COLLECTOR TO C13 OR Q4 EMITTER
Asw 9V
Asw 5V
J2 (DOWNLOAD)
R11 10K
R12 22K
R13 180Ω
R14 100K
C13 .1uf
P1 500Ω
Q4 2N4403 INSTALL OPPOSITE FROM SILK SCREEN
C9 1.0µF
C10 56pf
J1 PIN22
FREQ.
J1 PIN21
Q3 MPF102
R15 1M
D1 1N4148
D2 1N4148
R17 300Ω
C12 .001uf
R16 100
C11 470pf
Rmod 1M
INSTALL DIRECTLY ON IC
U2 HC4020
Rst
Clk G
FREQ. IN -->
Rmod 820K
/by1024
D3 1N6263
U1 PICAXE 08M
mod??
ANNUNCIATOR
PIEZO
<--AUDIO OUT
*MOD USE 0 OHM FOR D5
D5 1N4148
R18 39k
Asw 5V
CUT
Q5 2N2222A
J1 PIN20
C5 680pf
C7 .001uf
C8 56pf
XTAL ? MHz
C6 150pf
R19 1K
D4 1N4148
J1 PIN19
U3a
U3b
OSC. 14.318
Set
Clk
Clr
HC74
J1 PIN24
40m
J1 PIN23
J1 PIN26
20m
J1 PIN25
Bsw 5V
SPKR
PZO
J1 PIN18
J1 PIN17
J1 PIN16
J1 PIN15
J1 PIN14
J1 PIN13
J1 PIN12
J1 PIN11
J1 PIN10
J1 PIN9
J1 PIN8
J1 PIN7
J1 PIN6
J1 PIN5
J1 PIN4
J1 PIN3
J1 PIN2
J1 PIN1
C14 10µF
2.5V
25mV
25uV
25mA
2.5mA
250uA
25uA
R7 2K
R10 2K
R6 10Ω
R9 2K
R5 5Ω
R8 1M
R4 200Ω
R3 2KΩ
R2 20KΩ
R1 200KΩ
78L05
Q2
OUT
IN
SWITCHED 5 VOLTS
C2 .1µF
C1 .1µF
SWITCH B
Asw 9V
SWITCHED 9 VOLTS
Asw 5V
SWITCH A
78L05
Q1
OUT
IN
SWITCHED 5 VOLTS
C4 .1µF
C3 .1µF
*MOD USE 0 OHM FOR C3
9 VOLT BATTERY
*MOD = CAPS C3 & C4 HAVE LAYOUT ISSUES
INSTALL C4 AND SHORT C3 PINS TOGETHER
Co: QRPme
Title: Pocket Pal QRP Tester
Board: Pocket Pal
Revision: A
Author: W1REX Rex Harper
Size: A
Date: Feb. 27, 2017
Sheet 1 of 1

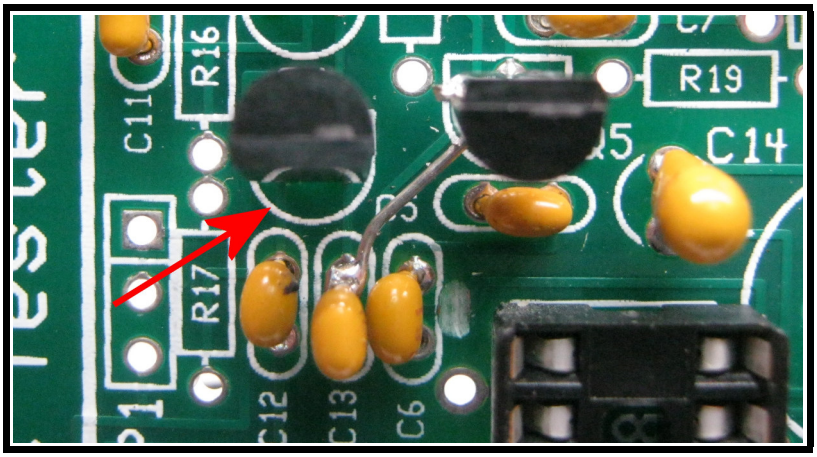
MODs required:



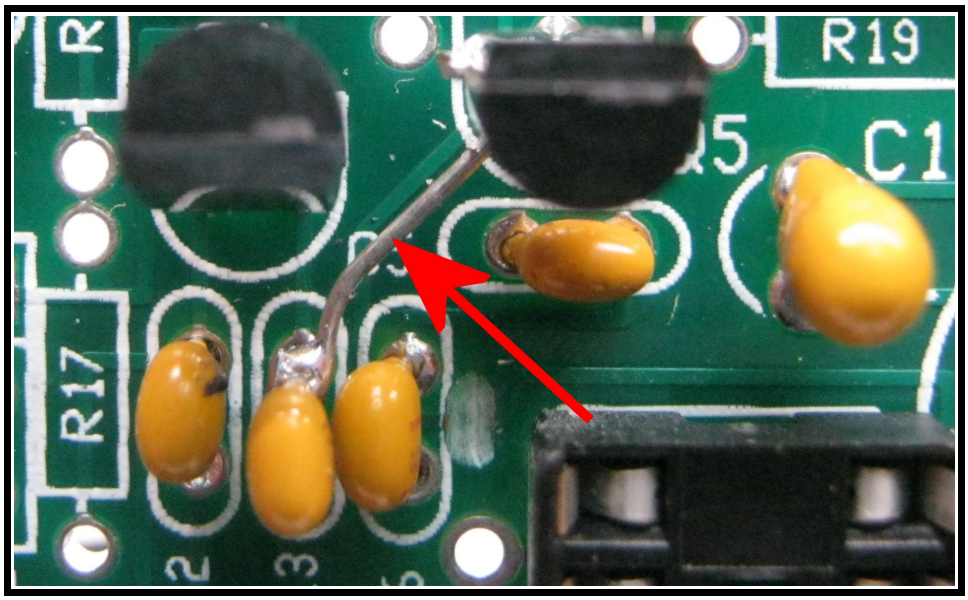
1. Cut the +5V feed to the collector of Q5 where it passes around U1, the Picaxe micro. Just to the left of the DIP socket, the trace passes underneath C6 and then on to the collector of Q5.



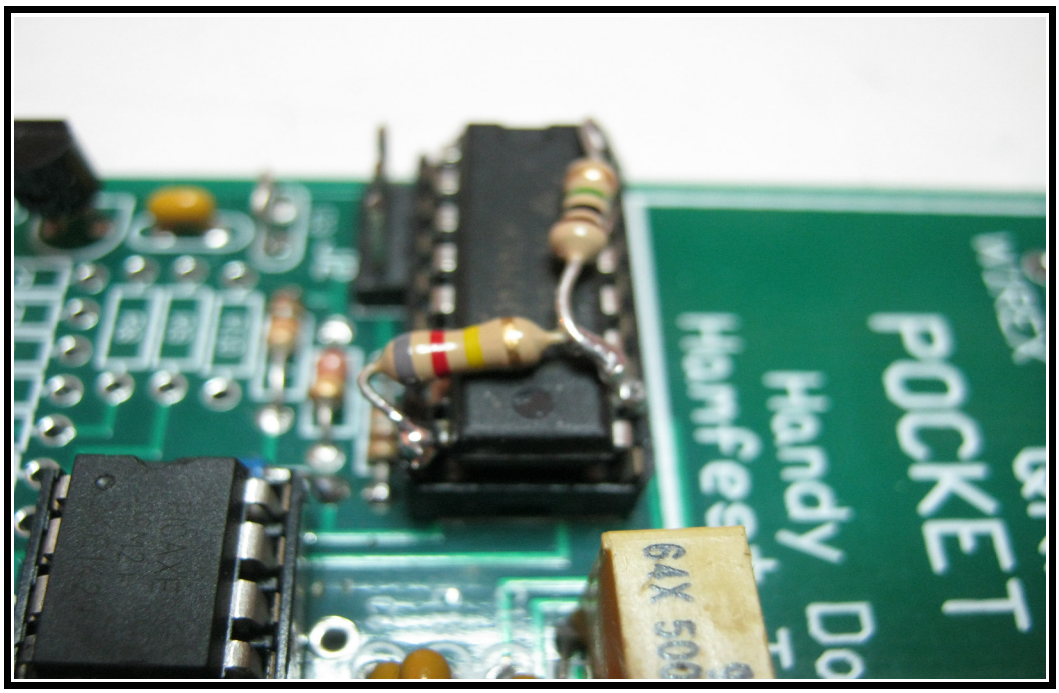
2. D5, a 1N4148 transistor, is not required so install a shorting jumper between the D5 pads instead of a diode.



3. The silk screen designator for Q4, the 2N4403 transistor, is backwards. When called for, install Q4 backwards from the silk screen.



4. When assembling the last stage, install Q2 and C13 first, with about 1/4" of component leads above the board. Then you use a short piece of cut off component lead to make a connection between C13 and Q5 as shown on the schematic. This mod will now cause the oscillator to generate a larger voltage swing on the output signal before it heads on to the signal shaping circuit.



5. A pair of biasing resistors are required for the ripple counter chip to clock properly. I soldered them VERY carefully directly to the pins of the counter chip.

6. When in operation, the trimmer potentiometer needs to be adjusted so that the output signal of the shaper circuit, comprised by Q3 & Q4, has a signal level high enough to create the clock pulses into the ripple counter. Once adjusted properly, the ripple counter takes the full oscillator frequency And divides it by 1024 thereby creating a signal slow enough to be counted by the Picaxe Count command. A 7030 crystal oscillates at approx 7,030,000 which goes into the ripple counter which then outputs a divided by 1024 frequency of 6865 Hz. The Picaxe program now needs to do a little math before reporting the crystal frequency....

The order of assembly steps that I did to finish my PAL were:

1. Cut the switched +5V trace just left of pin5 of the IC socket.
2. Install the 2N2222 transistor at Q5 and a .1uf cap at C13 keeping them about 1/4" up off the pcb.
3. Use a piece of clipped component lead to connect the +9V end of C13 to the collector of Q5.
4. Solder in the 16 pin IC socket for the counter chip.
5. Check the capacitor values and install the remaining capacitors: C5, C6, C7, C8, C9, C10, C11, and C12.
6. Solder in the resistors: R14, R15, R16, R17, R18 and R19
7. Now install diodes: D1, D2, D4 and a shorting wire across D5.
8. Solder in the MPF102 transistor at Q3.
9. Install the 2N4403 at Q4 transistor making sure you install it OPPOSITE the silk screen designator.
10. CAREFULLY solder the 820K resistor directly onto the 4020 counter chip between pins 8 & 10.
11. Again CAREFULLY, solder the 1M resistor directly between pins 10 & 16 of the 4020 chip.
12. Insert the modified 4020 counter IC into the 16 pin socket.

The counter circuit won't function properly unless the trimmer pot is properly adjusted. The proper trimmer setting will create a maximum signal level into the biased input of the counter chip. The biasing resistors set the DC level at the clock input of the 4020 right in the middle of the signal logic levels for 0 and 1 logic levels. Then the amplified level from the oscillator and shaper circuits is AC coupled onto the clock input creating a clock signal to the 4020 at the crystal frequency. The 4020 divides that rf

frequency by 1024 creating an output signal below 25Khz which is the maximum frequency countable by the Count command in the Picaxe. Therefor, the maximum frequency of a crystal that can be measured with the Pocket PAL is 25Mhz.

Your handy dandy PocketPAL tester should now output a 4 or 5 digit frequency in Morse Code when you power the tester up with a crystal in the XTAL socket. Without a crystal in the XTAL socket, the PocketPAL will sound AUDIO test tones on the INTERNAL piezo signal and also send those audio tones out the test connector to a piezo or speaker plugged into the test socket..

The Picaxe PocketPAL programs up on the site will complete your build AND provide the above functionality.

Hope everything works out for you.

If you have already installed the 2N4403 transistor and need to yank it out, you will probably not be able to save it for reuse. I had to change mine.... It is much easier to simply give up on trying to save it and just take it out and replace it with a new one. The 4020 biasing resistors are new to the design so you need to source those too. I will supply them for FREE to anyone who needs them for their PAL kits.