

PIC Freq Counter Mods

By G8MNY

(Updated Feb 09)

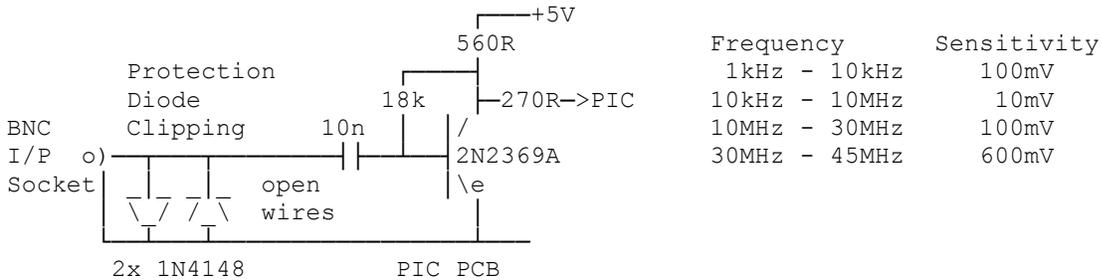
After making a PIC frequency counter from EI9GQ's design in October 2006 Radcom, as an "on the night club construction contest", I found some faults with it/the club kit provided.

USELESS PREAMP

The original circuit has very poor gain up to 1V RMS input was needed to get the 4V p-p logic level needed to drive the PIC properly. I could not discover exactly why, it was not just the biasing, as the HF frequency response was also very poor!

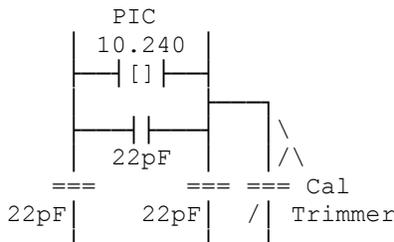
So I replaced the supposedly 550MHz BF199, for a 500MHz 2N2369A and rebiased it to give the best input sensitivity (around 18k base to collector).

I also protected it from overload (when the display goes funny & needs repowering to reboot the PIC) with 2 back to back signal diodes on the input BNC socket. And I increased the LF range by changing the 470pF input cap to a 10nF so that frequencies down to 1kHz could be measured (software disabled below that!)



FREQUENCY ACCURACY

On the construction day, all the kits read a 10MHz reference about 1.5kHz high. This meant the 10.240MHz timebase crystal has to be slowed down. EI9GQ's write up mentions the 2 fixed 22pF caps need to be selected for your crystal. I changed my original crystal for a recovered surplus one (different batch) & again had the same frequency. So I swapped the 22pF caps for slightly larger values, but I found the best result was to add a small ceramic 22pF across the crystal. This gave a nice +/- 200Hz range @ 10MHz on the fine Cal trimmer.



As there is no temperature compensation of the reference crystal, I also tried some negative temperature 22pF caps, but these would not tune on frequency for me! :-)

SOFTWARE PRECALLER

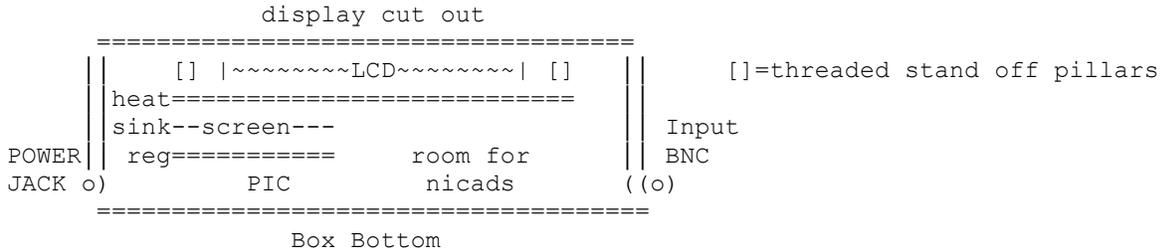
I did find that there is a software problem affecting the accuracy when the counter uses its software selected PIC prescaler. E.g. if you calibrate the counter at say 4MHz & retest it at 40MHz, there is a small under read error of greater than 10x the count. This may be due to the software losing some counts cycles when it does its clever stuff counting buffer over loads etc. But

normal counters also connected behave quite normally on this test.

BOXING UP

I found a second hand plastic box that was just big enough (120 x 65 x 40mm), as the smaller plastic and diecast ones I had were all too small.

I mounted the display with 6BA stand off pillars that were exactly the same depth as the LCD display, but I had to drill out the metric PCB holes to 6BA clearance.

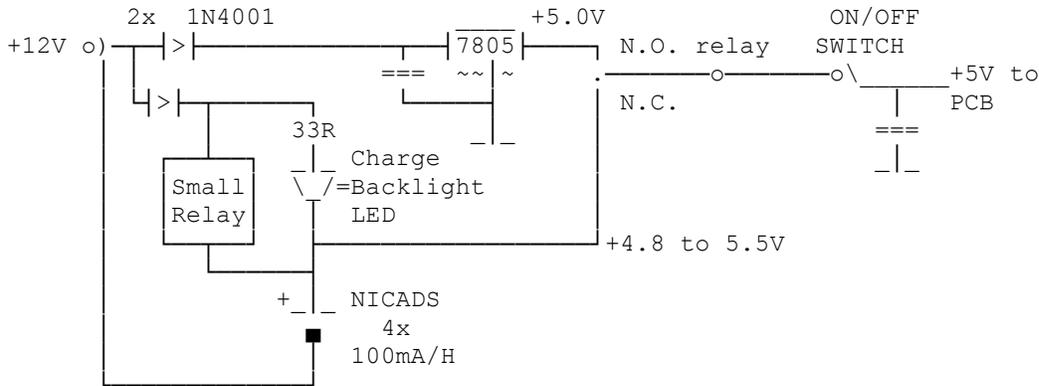


I then stacked the PIC PCB with long 6BA bolts on that. But that was actually a mistake & I needed a double insulated screening plate between the 2 PCBs with 6BA nut separators, to stop the display crosstalk noise from upsetting the counter reading.

POWERING

I added a series idiot diode on the 12V feed & initially a heatsinked the regulator as I was powering bright backlight LED from 5V.

But later I used a small nicad battery option with no LED, but charging via the LED. PCB track cuts were needed for this circuit arrangement.



When the relay is released with no 12V, power comes from the wired in nicads.

Charging is through the Relay & the bright LCD display LED, & is enough current to recharge in 24 hrs. Also running the LED only from 12V via a 1W 33R to the nicad battery instead of the original 10R from 5V will remove the need for a regulator heatsink.

Why don't U send an interesting bul?

73 de John G8MNY @ GB7CIP