Keypad Control for the Elad FDM-DUO

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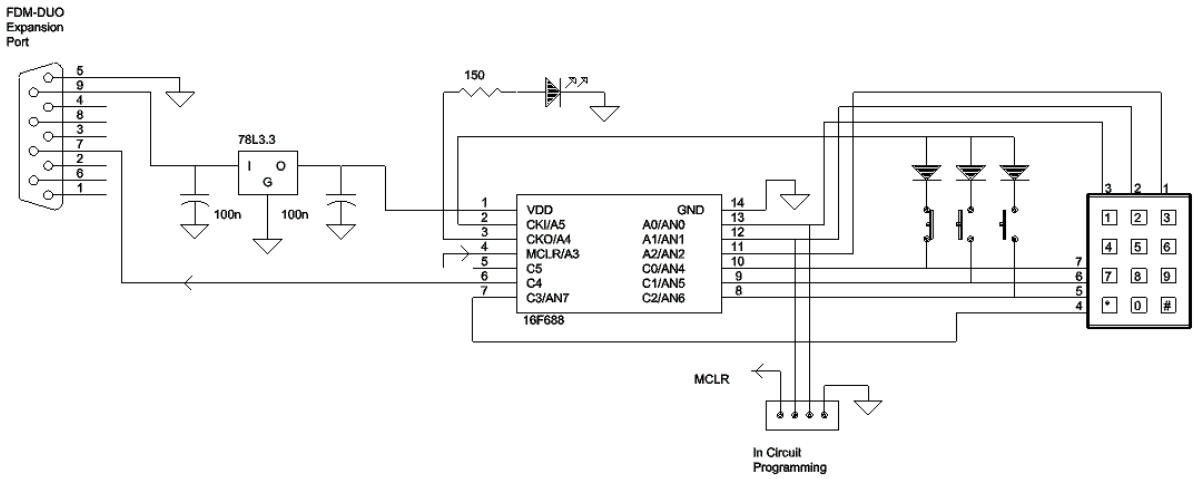
Some time ago I designed an interface to allow a numeric keypad to be used to directly set the frequency on an FT817 via the CAT interface. The normal frequency setting on that radio is a bit tedious having to make use of band switches and coarse and fine tuning controls. Full details of the keypad interface can be seen at http://www.g4jnt.com/FT817_Keypad.pdf .

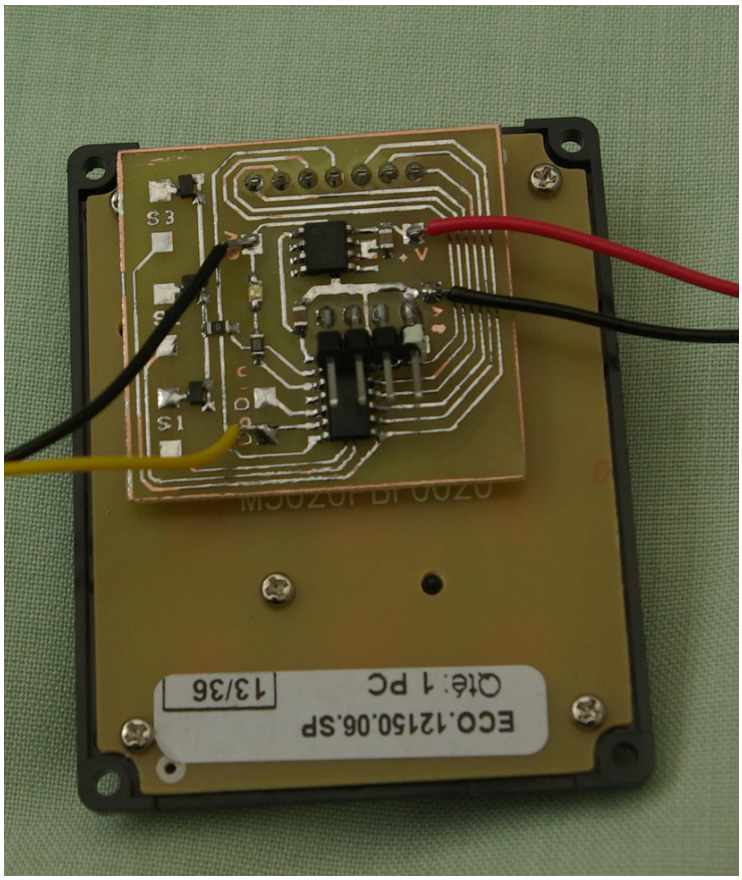
The Elad FDM-DUO transceiver, when operated standalone, also has a somewhat cumbersome digit-by-digit means of setting any arbitrary frequency, so a similar keypad arrangement was needed.
CAT control on the Elad is via a USB connection so the simple PIC interface carrying TTL levels can't be used with that. However, the 9 pin D connector, labelled 'Expansion Port' on the rear is designed for connecting peripherals and carries a number of different digital signal types as well as a +5V supply. The two pins labelled 'Rx-DUO' (pin 7) and 'Tx-DUO' (pin 6) carry serial data in stop-start format at 115200 baud with 3.3V logic levels. They are not equivalents to the CAT signalling, although the Rx input will accept the same commands. The Tx output is completely different and carries a multitude of signals relating to spectrum display and transceiver settings and won't be considered further.
More details can be found here: http://sdr.eladit.com/FDM-DUO/ELAD%20FDM-DUO%20-%20EXTIO%20Serial%20Protocol%20-%202017-09-08.pdf

So a similar interface to that for the FT817 is feasible, provided the waveform sent to pin 7 has 3.3V logic levels. Figure 1 shows the circuit diagram of the remote controller. A 16F688 PIC reads a 3x4 matrix keypad and converts entered digits to CAT commands. There is provision for additional switches to allow future functionality but at the time of writing these do nothing. Diodes have been added to the matrix for these so latching switches can be used instead of pushbuttons. One possibility could be to use one of the switches as a manual Tx/Rx control.
As the only non-numeric keys on the keypad are * and #, the former is used as a decimal point, allowing frequencies to be entered in MHz. The '#' key is used for [enter]. The only particularly difficult part of writing the PIC code is correctly interpreting entry data, especially truncated values. The decimal point is used to align the entry and if no DP is entered, it is assumed to be an integral MHz value. Any of these entry formats will be correctly interpreted:
5.29, 50.965005 , 1.8348 , 3.6 , 6, 10 , 11.5 , 0.47586 , 44.9

A suitable keypad is the low cost unit from www.farnell.co.uk (Look for ECO Keypad, Order code 113-0805) A PCB was designed to interface directly to this and an early version of the PCB can be seen in the photograph. The +5V supply from pin 9 of the transceiver's accessory socket supplies a 3.3V regulator for the PIC. A LED has been included to assist in debugging any future PIC coding exercises, or indicating future functionality – at the moment it just flashes when any key is pressed. If a tune switch were implemented, the LED could be used to indicate Tx operation.

More details including PIC source and object code, as well as a PDF file of the PCB layout for home construction can be obtained from www.G4JNT.com/EladKeypad.zip The design for a PCB of about 35mm square is now also included as a mirrored 1:1 image for homebrew construction.


FDM-DUO
Expansion
Port
5
9
4
8
3
7
2
6
1
78L3.3
I
O
G
100n
100n
150
1
2
3
4
5
6
7
VDD
CKI/A5
CKO/A4
MCLR/A3
C5
C4
C3/AN7
GND
A0/AN0
A1/AN1
A2/AN2
C0/AN4
C1/AN5
C2/AN6
14
13
12
11
10
9
8
16F688
3
2
1
1
2
3
4
5
6
7
8
9
*
0
#
7
6
5
4
MCLR
In Circuit
Programming


S3
S1
ECO.12150.06.SP
Qté: 1 PC
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