Keypad Control for the FT817

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This popular tiny multiband HF to UHF transceiver uses a pair of rotary controls to set frequency. One knob tunes the frequency in coarse steps, while the other main tuning knob is used for fine setting. Band change is made with up and down pushbuttons.   While this approach gives a compact and neat arrangement for casual portable operation, if you want to set a particular frequency it involves fiddly messing around with up to four controls.   The CAT Remote control interface, whose connections are accessed via the accessory socket on the rear of the radio, offers the possibility to set the frequency, as well as control other features, all under remote or computer, control. So how about a remote keypad allowing direct frequency entry, using a PIC microcontroller to format the CAT commands to send to the radio?
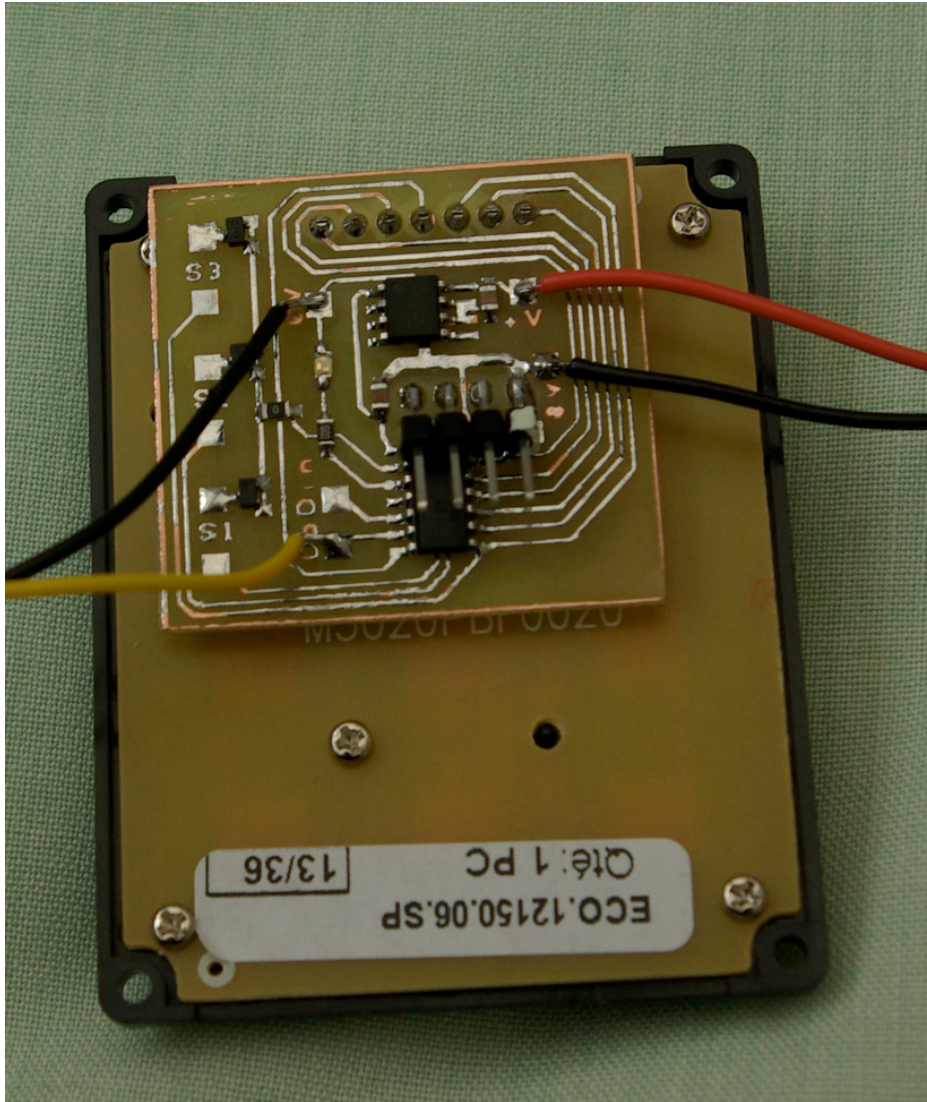
The FT817 handbook lists the commands needed for controlling the radio, but isn't very helpful about the actual voltage levels, merely stating that this "cannot be connected directly to a PC", and that "an interface cable needs to be obtained".   The circuit diagram in the manual shows the two input and output CAT connections going directly to the transceiver's controller chip, (via protection resistors) so it was a reasonable assumption that control levels were 0/5V and probably inverted from normal RS232 operation. After a bit of testing, this turned out to be the case. Their 'connection interface' probably just contains a MAX232 or similar level converter. This 5V logic level is exactly the same as the "Logic Level" RS232 that is delivered by the serial interfaces in PICs.   So it looks as if a PIC with internal UART could be connected directly to the CAT interface. A menu option on the FT817 allows the baud rate to be set and for the sake of compatibility with everything chez-'JNT,   I chose 9600 baud.
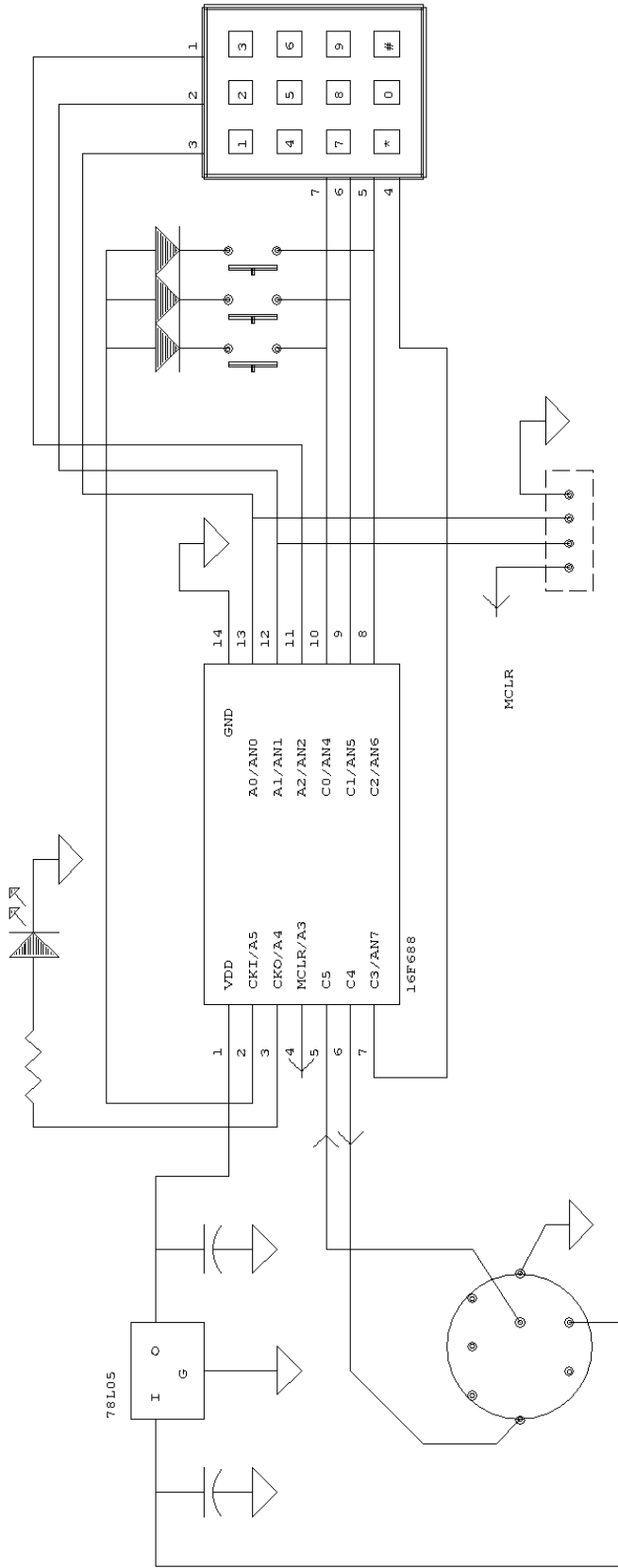
The command word structure is given in the transceiver manual and requires a hexadecimal representation of numbers packed two digits to a byte. When these are expressed in hex notation the serial command structure for setting any particular frequency is quite easy to visualise. For example, to set 144.79903MHz, the command requires the five bytes (in hexadecimal)   0x14 0x37 0x99 0x03 0x01 (the '0x' means the numbers are expressed in hex). Frequencies are defined in units of 10Hz and the final 0x01 is the command to set the frequency.   When frequencies are sent to the FT817 via CAT band changing is automatic, so there is no need to mess around with the band change buttons.

Figure 1 shows the circuit diagram of the remote controller.   A 16F688 PIC reads a 3x4 matrix keypad and converts typed digits to CAT commands.   Additional switches were included to allow future functionality but at the time of writing these do nothing.   One possibility (that may even be implemented by the time this appears in print) would be to use one of these as a manual Tx/Rx control; something the FT817 does not have on its front panel.   As the only non-numeric keys on the keypad are * and #, the former was used as a decimal point, allowing frequencies to be entered in MHz. The '#' key used for [enter].   The only particularly difficult part of writing this PIC code is correctly interpreting truncated entries.   The decimal point is used to align the MHz, and all digits are left shifted to allow any of these to be correctly interpreted:
144.905 , 1.8348 , 3.6 , 010 , 11.5 , 0.47586 , 434.9 , 007

I already had a suitable keypad whose connections and appearance were very nearly the same as a low cost unit from   www.farnell.co.uk (Look for ECO Keypad,   Order code 113-0805) A PCB was designed to interface directly to both of these.   A breadboard of the final unit can be seen in the photograph.   The FT817 delivers a positive voltage from a pin on its accessory socket for the 5V regulator.   A LED was included to assist in debugging any future PIC coding exercises – at the moment

it just flashes when any key is pressed.   If or when a Tx/Rx switch is implemented, the LED will 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/FT817Keypad.zip   The design for a smaller PCB of about 35mm square, is now also included.

16F688

VDD
CKI/A5
CKO/A4
MCLR/A3
C5
C4
C3/AN7

GND
A0/AN0
A1/AN1
A2/AN2
C0/AN4
C1/AN5
C2/AN6

78L05

MCLR

FT817 Acc. Socket