

# IT9XXS QRP Pages

## Projects

### An External Keypad for the Yaesu FT-817



If you're the lucky owner of Yaesu FT-817 and you wish to change quick the most common operating functions, like frequency (with automatic selection of the most appropriate mode for that frequency), VFO (A/B), operating mode, repeater shift and split at the touch of a keypad, here is the project you were looking for !

Put the keypad near the dashboard of your car, for example. It will be safer and handy to play with your FT-817 while driving.

The keypad is connected to the ACC socket of the FT-817 through a two-wire shielded cable (one wire for the power supply and the other one for the serial port) and can be removed when not in use. No mods to the rig are needed.

#### ELECTRIC DIAGRAM

The hearth of the [circuit](#), beating at 4 MHz, is a popular **PIC16F84A** (U1). As most of the job is done by software, parts count is minimum. Little and cheap !

The pictures in this article shows the prototype I built, using a 12-keys keypad. Using the schematic and the p.c.b. published in this article you'll be able to build the full 16-keys version.

The program running inside the PIC scans the matrix keyboard (KP1), and sends the necessary serial commands to the FT-817 after interpreting your key presses.

The frequency is not shown on the FT-817 while you're typing on the number-keys, but is stored into the PIC after you press the star key (\*) and sent to the rig when you press the enter key (#). An LED (D1) and a tiny speaker you can mute (SP1 and SW1) will confirm each key press (one

beep and one flash, two beeps and two flashes when you press # or a function-key).

During the design phase of this project I put the maximum attention to protect the FT-817 when connected to this keypad. The resistors R2..R9 in series with the keyboard limits and protects the PIC and the rest of the circuit from static charges and Q1 (BC337 or equivalent) act as a buffer-separator for the serial connection to the rig. The inductors L1/L2, each made using a ferrite bead with a wire inside (one for the serial line and one for the supply line), limits the RF radiation through the wires from and to the unit.

The power supply for the keypad unit is taken from the FT-817. Watching the schematic of the rig I noticed that the 13.8 Volt pin on the ACC socket is connected to the main power rail through a current-limiting 10 ohm resistor (R1235, see a partial [schematic](#) taken from the rig's manual). As I don't know whether the protection resistor or any other component can suffer from any short to ground I added a p.c.b.-mount 100 mA fuse on the power wire of the keypad (it is easier and cheaper to change this fuse than sending the rig for any repairing !)

If you feel safer, as the current needed to supply the keypad unit is quite small, you can use a 9V battery instead of using the 13.8 Volts from the rig. SW2 is the power switch, useful to limit battery drain and RF radiation from the keypad (remember that the unit is a 4 MHz digital circuit !).

### BUILD YOUR KEYPAD

All the parts are mounted on a single-side [printed circuit board](#) (here is the [master](#)).

In order to reduce any RF radiation to/from the circuit, I suggest you to use of a double-sided copper-clad board. The component-side copper will work as a shield. Just solder the grounded leads of C1, C2, C3, C4, C5, C6, C7, U2, Q1 and the shield of the cable to both sides of the p.c.b., remembering to enlarge with a larger bit the remaining holes to avoid shorts between the leads and the copper on the component side of the board.

The 16-keys keypad is commonly available from several dealers. Before buying or using a keypad be sure it is a matrix keyboard (one key closes a connection between a row and a column). Prior to assembling the circuit, check the keyboard pinout because it is not standardized).

The pictures [1](#), [2](#), [3](#), and [4](#) shows the evolution of this project from the early experiments to the finished unit. The entire circuit board is housed inside a plastic box. The keyboard is glued behind the front panel together with the LED D1. The switches SW1/SW2 are on the upper side of the box. A small hole on the back lid helps the work of the little speaker SP1.

To lower thickness I used a low profile 4 MHz crystal for X1.

The PIC must be programmed (just once) before use. The file, **kp817.hex**, can be requested for free (for non-commercial use only) by e-mail.

This is a "no tune" project that will work immediately. Check carefully the connections after building and before powering it up. When you'll switch on the unit you should hear HI (.... ..), meaning that the keypad is alive.

### USING THE KEYPAD

**Enter a frequency :** press once the star-key **\*** and enter the frequency in the format **MMM.kkk.dd** then press the enter key **#** (**MMM** stands for hundreds, tens and unit of MHz, **kkk** stands for hundreds, tens and unit of kHz, **dd** means hundreds and tens of Hz) **Note:** you must enter the initial zeroes for the frequencies lower than 144 MHz. Examples: to enter **7.050.00 MHz** write **\*00705000#**, to enter **14.210.00 MHz** write **\*01421000#** and to enter **432.850.00 MHz** write **\*43285000#**. The most appropriate operating mode is automatically selected, according to the current band-plans (e.g. CW from 14.000 MHz to 14.070 MHz, AM for the airband, LSB on 40m and 80m phone, and so on).

At power-on the stored frequency inside the keypad registers is 000.000.00 MHz so you can even enter part of the frequency to speed up typing, e.g.: to enter **14.230.00 MHz** just write **\*01423#**.

**Change VFO (A/B) :** press the **\*** key **twice**. You will change from VFO A to B and vice-versa (# is not needed here)

**Set Split ON/OFF :** press the **A** key to enable/disable the SPLIT function of the (TX on VFO-A, RX VFO-B and vice-versa).

**Select AM/FM modes :** press the **B** key to select through AM/FM.

**Select LSB/USB/CW modes :** press the **C** key to select through LSB, USB, or CW.

**Select Repeater/simplex mode :** press the **D** key to select shift through +/-/simplex.

As no display is provided with the keypad unit, you have to check the rig's display for proper operation.

#### **Attention**

The 13.8 V voltage available at the ACC socket is present even when you switch-off the rig ! Be sure to remove the keypad plug from the ACC socket before doing any soldering work or whatever experiment within the keypad unit. Turn off the keypad when not in use, to save batteries and to avoid sending unwanted commands to the rig during transport.

I take no responsibility whatsoever for any damage to your FT-817 and/or to the user when using the described keypad unit.

Use of this project for commercial purposes is prohibited.

