KANGA PRODUCTS
Electronic Kits For The Radio Amateur

uOSK Pro Universal CW Memory Keyer (4 channel Memory Keyer)

This is a feature rich low-cost memory fully self-contained Keyer, offering features that you would expect from Keyers that are much more expensive. Unlike most keyers this is designed to work with all transistorised, Valve, or Hybrids rigs. Unlike many keyers we are using a high voltage mosfet solid state relay for the output and this will work with the older valve rigs like the TS530 and others of that period. Of course, this is also suitable for the most modern radio too plus homebrew rigs such as our Rooster transceiver or even a Pixie!.

The Keyer is built around a small but powerful microcontroller. The code for the chip is open source from Jan DK3LJ who developed the original program, later modified by Jack AL4SV and then further modified by Don WD9DMP who made some changes that polished Jacks code even more. The finial product rivals professional Keyers costing many times the price. With the amplified built in sounder the keyer is also suitable for use as a practice oscillator for use with a paddle key.

This open source code is now installed on a small but powerful microcontroller. The kit produces a pocket sized desktop mounting Keyer that has an internal battery pack.

Here is a list of some of its features.

Iambic A, B, Ultimatic modes
DAH Priority Mode
Paddle Swapping
Sidetone Toggle
Adjustable Sidetone Pitch
ATU Tune Feature (20 Sec Key Down) with one touch cancel
TX Keying Toggle (Sidetone only for practice)
WPM Speed feedback
4 x 100 char Memory's
Automatic Beacon (for FOX hunts extra)
Callsign CW Trainer (Sends random callsign, users send back)

Plus more…

For more details of each feature read the user guide at the end of this document.

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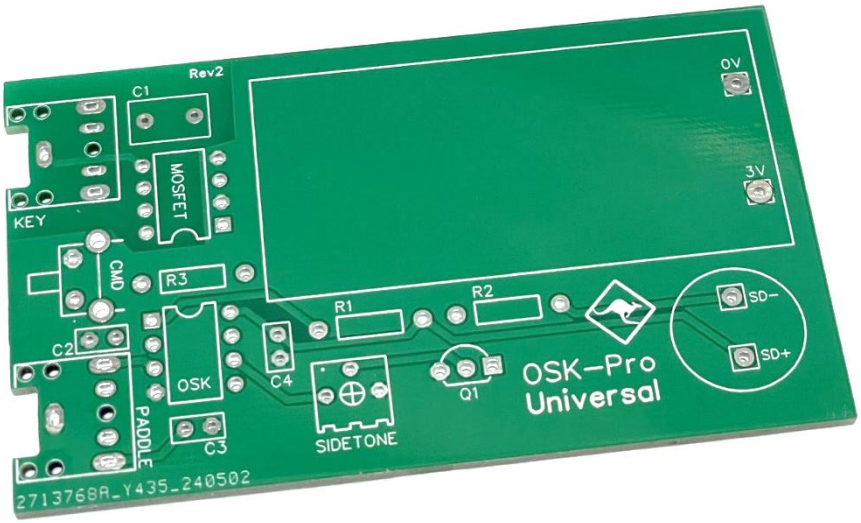
Parts List

uOSKpro PCB
Front panel
Rear Panel
Attiny85 OSK Code (modified version)
Mosfet Solid state relay
2 x DIP8 Socket
R1 4k7 1/4w Resistor
R2 10 ohm 1/4w Resistor
R3 270 ohm 1/4w Resistor
10K Trim Pot (Sidetone Volume)
C1 10nf High Voltage capacitor (Blue, Marked 103)
C2, C3 1nf MLCC capacitor (Yellow marked 102)
C4 10nF capacitor (Yellow marked 103)
Q1 2N2222 Transistors
2 x 3.5mm PCB Jack socket
Piezo Sounder
Tactile PCB push button
Tactile push button red cap
Keyer 2 part case
8 x Case fixing screws
4 x stick on feet

The circuit board.

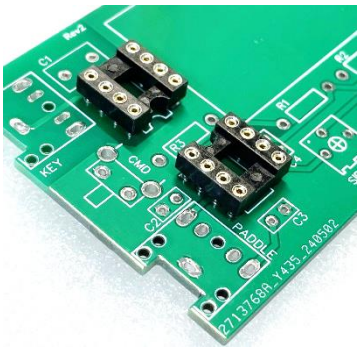


OK so let's make a start building the keyer.

Let me give you a word of warning before you go any further!

The keyer is fitted into a very small slim case. You need to be sure you trim the leads on the back of the board flush, the clearance is low and unless you trim the leads flush it is possible to cause short circuits. The kit should not prove very difficult to build.

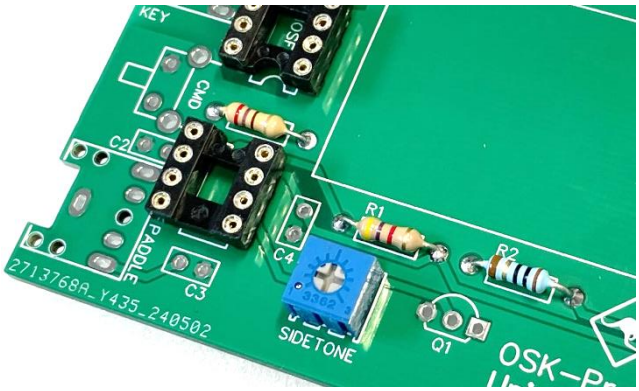
If you are new to kit building just be sure to follow the instructions below.



The first step is to fit the two 8 way DIP sockets

Stage 1 the DIP Sockets

You will note that the sockets have a notch on one end. The PCB shows the layout position for these sockets so make sure you align the sockets to match the outline, the two notches should be face towards the centre of the board.



Stage 2 The Resistors

There are three resistors to fit, start with: -

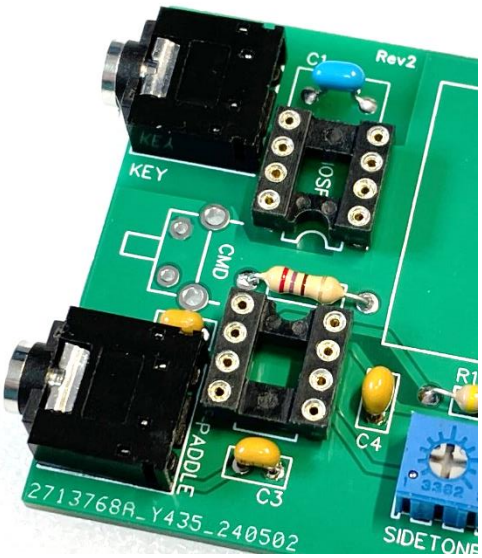
R1 4k7 (Colour bands Yellow, Voilet, Red)

R2 10 ohm (Colour bands Brown, Black, Black)

R3 270 ohm (Colour bands Red, Voilet, Brown)

Now the small blue trimmer resistor, this is used to adjust the level of sidetone volume.

This is 10k in value and marked 103, make sure that none of its three legs are folded under its body when you fit it. You can adjust this to suit your liking of the sidetone volume later when you test the keyer.



Stage 3 Fitting the capacitor

There are 4 capacitors in this keyer,

You can fit them either way round.

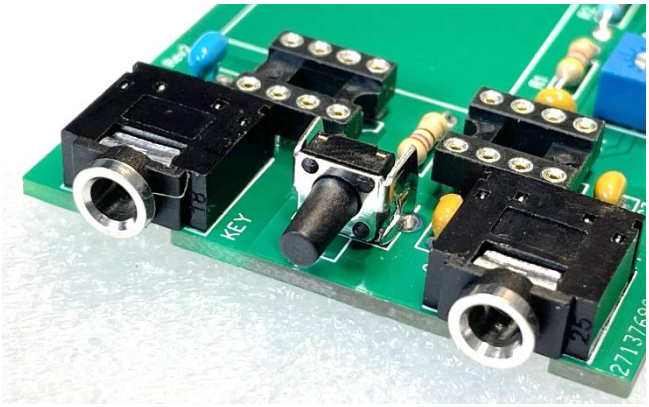
C1 is 10nf, this is a high voltage capacitor, it is important that you fit a high voltage rated component for this. It must be rated higher than the maximum switch voltage of the rig you are using it with. We have supplied 250v device for this. It is Blue and marked 103, it has legs that have a 5mm in pitch unlike the other capacitors in the kit.

C2 and C3 Next, their value is 1nf ,they will be marked 102, these are yellow and have a pitch of 2.5mm between the legs. Do not confuse these with the capacitor for C4 as that is a different value, make sure both are marked 102.

Finally C4, this looks the same as C2/C3 but is marked 103, that is 10nf as C1 but this one is yellow and 2.5mm pitch.

Stage 4, Fit the 3.5mm jack sockets.

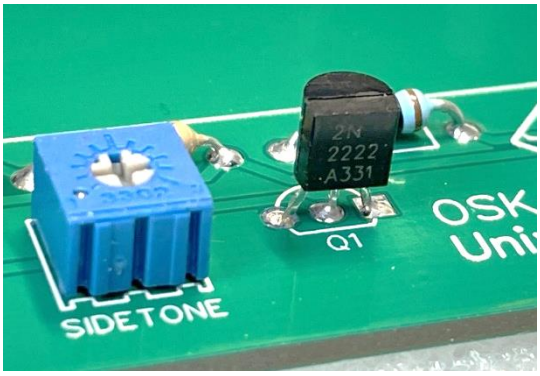
The Key and radio sockets are PCB mounting 3.5mm sockets that can only be fitted one way round, just make sure all the pins go through the board and none are folded under the socket when you push them though the board. Make sure the sockets are right down flush to the board and solder then trim the leads.



Stage 5, The push button

Between the two jack sockets the control push button needs to be fitted, this needs to be fitted right down flush to the board, make sure it sits squarely on the board.

Stage 6, The sidetone transistor



The side tone from the processor chip is at a low level. The transistor used here boosts the volume. With the trimmer set to full the volume may be excessive for your needs so the trimmer we have fitted before acts as a volume control. This transistor is marked 2N2222. It MUST be fitted the correct way round. The PCB shows the way the transistor must be fitted.

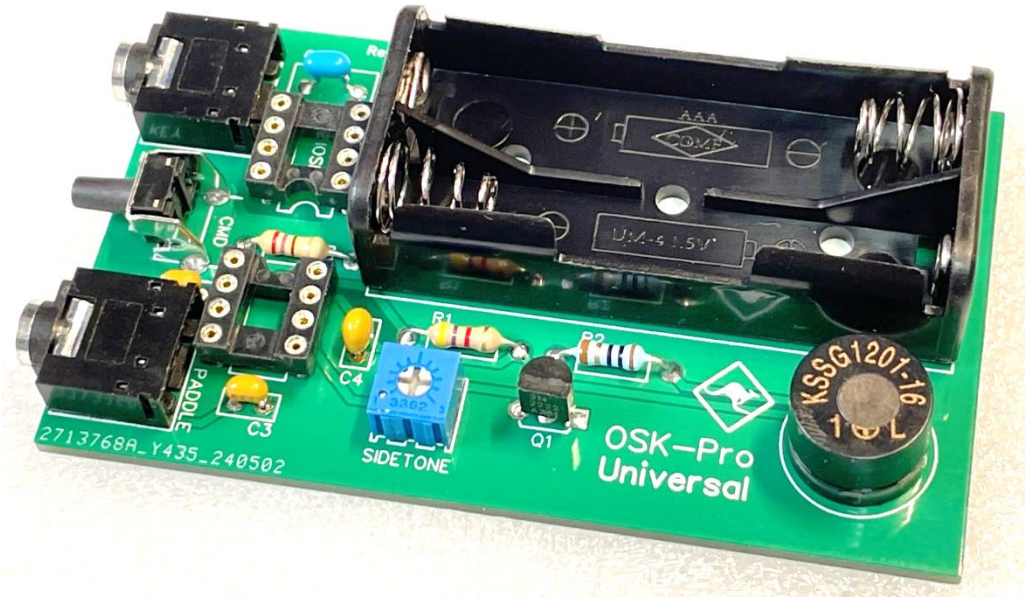
Stage 7, the Sounder

The side tone speaker is small but provides plenty of volume for the keyer. First thing, the sounder has a small black sticker covering the hole in its top. DO NOT remove this! It is there for a reason. Well two reasons in fact. The sounder can attract off cuts of wire as it has a small magnet inside and its easy to get an offcut stuck inside and causing a buzz when the sounder works. The other reason is that these sounders are designed to give max volume at a higher frequency than we would want for a side tone. The sticker causes more back pressure and reduces the optimum

frequency that the sounder will work at, the result is the volume is boosted around typical CW sidetone frequencies.

Look carefully at the printing on the top of the sounder and you will see a small circle with a '+' sign, this indicates which side of the sounder is positive. Look on the PCB at the position for the sounder, one hole for the sounder on the PCB is marked SD+, the positive pin of the sounder must be fitted in this hole.

Stage 8, the Battery holder



The keyer is powered by two AAA cells. These will be in the on-board battery holder we are about to fit. On the back of the battery holder there is a strip of sticky tape, remove the paper from this and CAREFULL position the battery holder to the board, be careful as once the holder is on the board it will be hard to move again. Once its in place don't forget to solder its pins!

Stage 9, Trim the leads!

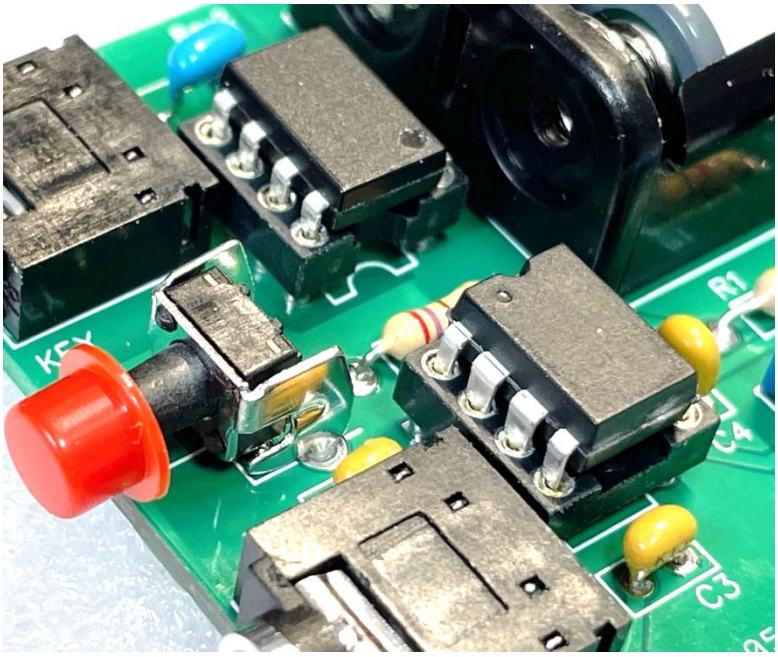
Now all the parts are fitted. We now must double check our work. Check the right capacitors and resistors have been fitted in the right place. Check all the soldering, you haven't missed any pins or caused and solder bridges. Now a **very important** job. Trim all the leads as flush as you can, there isn't much room under the board when fitted in the case.

Stage 10 Fit the chips

The uOSKpro uses an attiny85 processor and a mosfet solid state relay chip, these need to be fitted now, each chip must be fitted the right way round or damage is likely to be caused to them.

The chips have a ‘dot’ near one pin at the end of the chip

This tells us which pin is pin 1. Both of the chips need to be fitted so pin 1 is nearest to the centre of the board. Take care that no legs are folded under the chip when you fit them.



Stage 11, Testing the keyer

Before we fit this into its case it’s a good idea to test the keyer, fit two AAA cells taking care to fit them the right way round.

You will most likely hear ‘73’ in Morse. If so, great it’s looking good so far, if not check that the batteries have been fitted the right way and that the chips are the right way round.

The ‘73’ will only be heard when the batteries are fitted or changed.

Now adjust the trimmer to be about half way and press the button. You should hear a ‘?’ in Morse, press it again and you should hear ‘VA’, if you don’t press the button a second time after a delay of about 5 seconds you will hear the ‘VA’ anyway. If you wish you can connect a key to the keyer and test that. Be careful connecting the output to your rig at this stage, you may want to wait till it’s all boxed up for this test. Some rigs, (typically old valve rigs) can have high voltages >50v on their keying line and that could give you a nasty shock.

Ok now disconnect and external wiring to the keyer and its time to case this up.

Stage 12, Putting it into its case

The keyer comes with a slim case that the main board will slide into, the case is made up from two identical halves, one edge of each half has a raised ridge and the other side a small grove. When you put the two halves together its is important to make ensure that the ridge on one side fits into the grove on the other,

Now fit the front panel to the case, use four of the small M2 screw to secure this panel, DO NOT tighten the screws as you fit them, leave them loose until all four screws are fitted

,it is easy to cross thread these, they will go in easy if they are lined up correctly, if you start to feel resistance as you tighten them before they are fully in then you have probably got them cross threaded, just undo the screw, re-seat it and try again.

Now with the batteries already fitted, fit the red cap to the end of the push button, it's only a friction fit but will be held in place when fitted in the case, slide the PCB into the case (there is a machined slot on the base section of the case for the board to slot into), it should line up with the holes in the panel. If not loosen the four screws and 'jiggle' the panel to align it.

Now fit the rear panel the same way you did with the front panel.

All that's left is to fit the four stick on feet to the bottom of the case.

Congratulations your keyer is complete!

Now connect it to your radio and start sending Morse.

The features of this keyer are extensive see the list below.

The code for this keyer as been modified from standard, the function to invert the output switching as been removed. Since we use an opto isolated high voltage mosfet for the keying device the opto isolate LED would be always on and so the battery will be flattened in about 2 days. IF you really need this function, and to be honest I have never met anyone that has need for this, let me know and I can give you an unmodified code chip, you can turn the feature on and off with the command key but its easy to turn it on by accident if you're just practicing your sending and next time you come to use the keyer the battery will be flat! For 99.9% of people its an advantage to have this feature removed.

Don't forget that the sidetone level is adjustable if you find it to quiet or too loud.

I hope you enjoy building and using the uOSKpro keyer.

Kanga uOSKpro User Guide

The uOSKpro keyer uses open-source code with an advanced high performance solid state relay output. The keyer is just as much at home on an old valve rig or a modern state of the art radio. Ideal for use with any rig, commercial or homebrew.

Keyer Instructions

Version: 0.87 Usage (WD9DMP Fixes and Enhancements) Kanga Modified

After Powerup/reset in default mode, the keyer plays "73" to verify that the Code and EEPROM data are programmed correctly. The circuit operates as a regular IAMBIC keyer in IAMBIC B at 15 WPM (words per minute = 60 CPM), with 800 Hz side tone. By default, the transmitter keying signal is positive. The processor will automatically power off after 60 seconds into a low power mode to conserve power.

Speed Change

Speed can be changed by pressing and holding the command key while operating the DIT and DAH paddles, in any mode.

DIT reduces speed while DAH increases speed. The keyer plays an alternating sequence of dit and dah while changing speed without keying the transmitter.

Command mode

Pressing the command button without changing speed will switch the keyer into command mode. This will be confirmed with the '?' character. Another press of the same button takes the keyer back into regular keyer mode and will be confirmed by the 'VA' prosign.

During Command Mode the transceiver is never keyed and sidetone is always activated. Further functions can be accessed by keying one-letter commands as listed below. In general, changes made in Command Mode will be written to EEPROM after a short delay following input and confirmed by an "R"
acknowledgement, or by another short press of the Command button (for some commands). The unit will remain in Command Mode for subsequent commands, timing out to Normal Mode after a few more seconds with an "VA" indication. The keyer can also be returned to Normal Mode with an additional button press.

V -Version

The keyer responds with the current keyer software version number

P -Pitch

Allows modifying the sidetone pitch to a higher or lower level. A sequence of dits will be played and the pitch can be modified with the dit and dah paddles. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new pitch to EEPROM and leaving the user in command mode.

R -Reset

All settings are returned to their default values except for the stored messages in the message EEPROM area. Restored settings include speed and pitch, paddle swap, TX level inversion, sidetone Farnsworth setting, and TX keyer settings.

U -Tune

The transceiver is keyed for a duration of 20 seconds for tuning purposes. Tuning mode is aborted once either DIT or DAH paddles are touched or the control key is pressed.

A -Iambic A

Keyer sets IAMBIC A as permanent keying mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

B -Iambic B

Keyer sets IAMBIC B as permanent keying mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

L -Ultimatic

Sets the keyer into ULTIMATIC mode as permanent keying mode. In Ultimatic mode always the last paddle to be touched is repeated indefinitely when paddles are squeezed. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

D -DAH priority mode

Sets the keyer into DAH priority mode as permanent keying mode. In squeezed state a sequence of DAHs is sent. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request. Some of the first generation keyers exhibited this behaviour so the chip can simulate that.

X -Paddle swapping

DIT and DAH paddles are swapped. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

S -Sidetone toggle

The built-in sidetone generator setting is toggled (ON -> OFF or OFF -> ON). NOTE: This setting is only of relevance for regular keying mode. Sidetone is always on in Command Mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

K -TX keying toggle

Toggles the setting of the TX keyer output. In default state the keyer switches the output line when it is in keyer mode. Toggling this setting enables or disables that function. NOTE: Keying is always off in Command mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

Z -Set Farnsworth pause

Allows setting of an extended inter-character pause, which makes fast keying easier to understand. A series of "Dit-Dah" sequences will be played. Pressing the "Dah" paddle will decrease the Farnsworth intercharacter spacing. Pressing the "Dit" paddle will increase the Farnsworth Intercharacter spacing. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new setting to EEPROM and leaving the user in command mode. Note that this only affects

memory/program playback and transmission. If you desire Farnsworth mode in manual transmission, please manually pause between characters.

W -Query current WPM speed

Keyer responds with current keying speed in WPM.

1, 2, 3, 4 -Record internal messages 1, 2, 3 or 4

The keyer immediately responds with "1" or "2" or "3" or "4" after which a message up to 100 characters can be keyed at current WPM speed. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new setting to EEPROM and leaving the user in command mode. Choosing "1" or "2" or "3" or "4" but not keying a new message deletes the chosen message buffer content. A command key press during the recording function returns the keyer to command mode, leaving the memory unchanged.

E, I, T and M -Play back internal messages 1 or 2 or 3 or 4

The stored messages 1, 2, 3, or 4 are played back with keying enabled (if configured). A press of the command key aborts the message and immediately returns the keyer to Normal Mode for a QSO, with an "VA" confirmation. After the message plays to completion, the keyer remains in command mode with no "R" indication so another message playback sequence may be started. If no additional message is started, the keyer returns to Normal Mode with an "SK" confirmation.

N -Automatic beacon

The keyer responds with 'N' after which a number between 0 and 9999 can be keyed. After a 5 second timeout the keyer responds by repeating the number and 'R'. Once the keyer returns to keyer mode, the content of message buffer 4 is repeated in intervals of n seconds. The setting is preserved in EEPROM so the chip can be used as a fox hunt keyer. Returning to command mode and entering an interval of 0 (or none at all) stops beacon mode.

0 (zero) -Lock configuration

The 0 (zero) command locks or unlocks the main configuration items but not Version, Pitch, Tune, Callsign Training, WPM Query and Memory Playback functions.

C -Callsign trainer

The keyer plays a generated callsign (sidetone only) and the user must repeat it. If it was repeated correctly, 'R' is played and the next callsign is given. If a mistake was sensed, the error prosign (8 dits) is sounded and the current callsign is repeated again for the user to try once more. If nothing is keyed for 10 seconds, the keyer returns to command mode.

Handy Command Cards to print off

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Speed Change = Command + Paddle
V - Version
P - Pitch
R - Reset
U - Tune
A - Iambic A Mode
B - Iambic B Mode
C - Callsign trainer
L - Ultimatic Mode
D - DAH priority mode
X - Paddle Swap
S - Sidetone toggle
K - TX Keying toggle
Z - Set Farnsworth pause
W- Query current WPM speed
1, 2, 3, 4 – Record internal message
E, I, T & M – Play back message
N - Automatic beacon
0 (Zero) – Lock configuration

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