



# Phoenix Kits Online

## CW Memory Keyer OSK-Ver3 (4 channel Memory Keyer)

The OSK-Ver3 Keyer is a feature rich low cost memory Keyer, offering features that you would expect from Keyers much more expensive. The CW training mode is excellent and worth building the keyer just for this feature.

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 final product rivals professional Keyers costing many times the price.



This open source code is now installed it onto an Attiny85 chip. The kit produces a desktop mounting Keyer with many options.

Here is a list 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)

TX Level Inverter mode

WPM Speed feedback

4 x 100 char Memory's

Automatic Beacon (for FOX hunts extra)

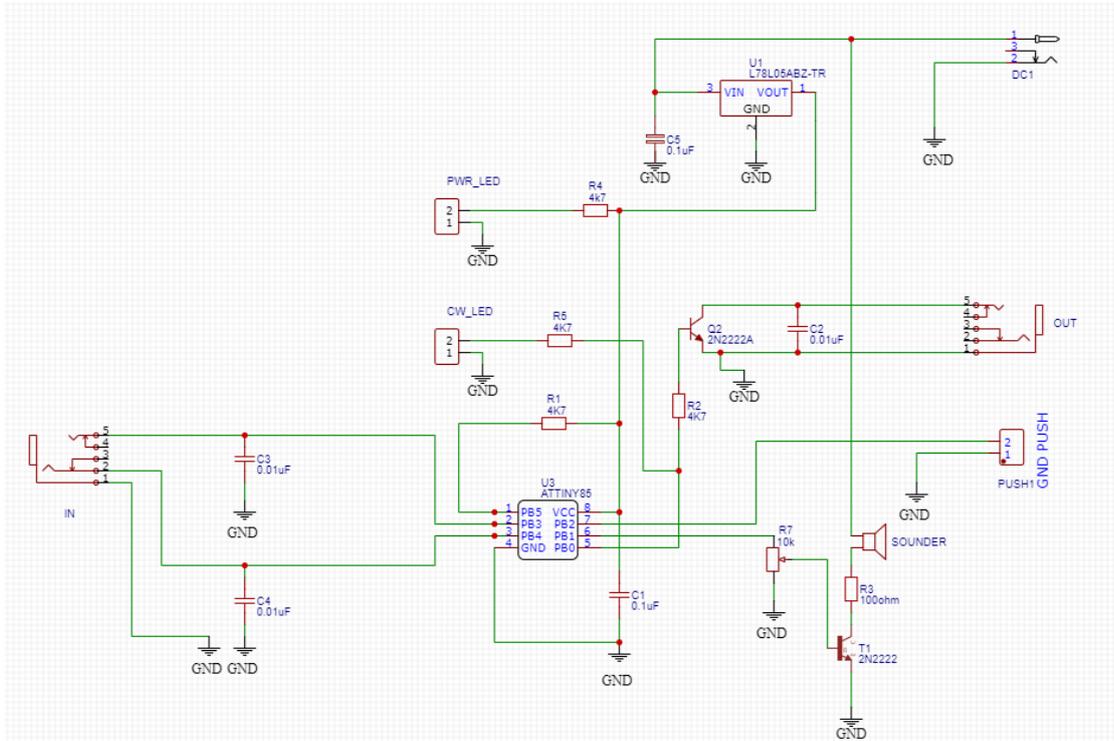
Callsign CW Trainer (Sends random callsign, users send back)

Plus more...

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



Let me show you the circuit for the keyer.



## Parts List

OSK cased PCB

Attiny85 OSK Code

DIP8 Socket

R1, R2, R4, R5 3K9 Resistor

R3 120 Ohm Resistor (was 100 ohm now increased to 120 ohm)

R6 NOW NOT NEEDED.

R7 10K Trim Pot (Sidetone Volume)

C1, C5 100nF (0.1uF) disk Marked 104

C2, C3, C4 10nF (0.01uF) disk Marked 103

U1 78L05 Voltage regulator

T1 and Q2 2N2222 amplifier Transistors

2 x 3.5mm PCB Jack socket

2.1mm DC Jack Socket

Piezo Sounder

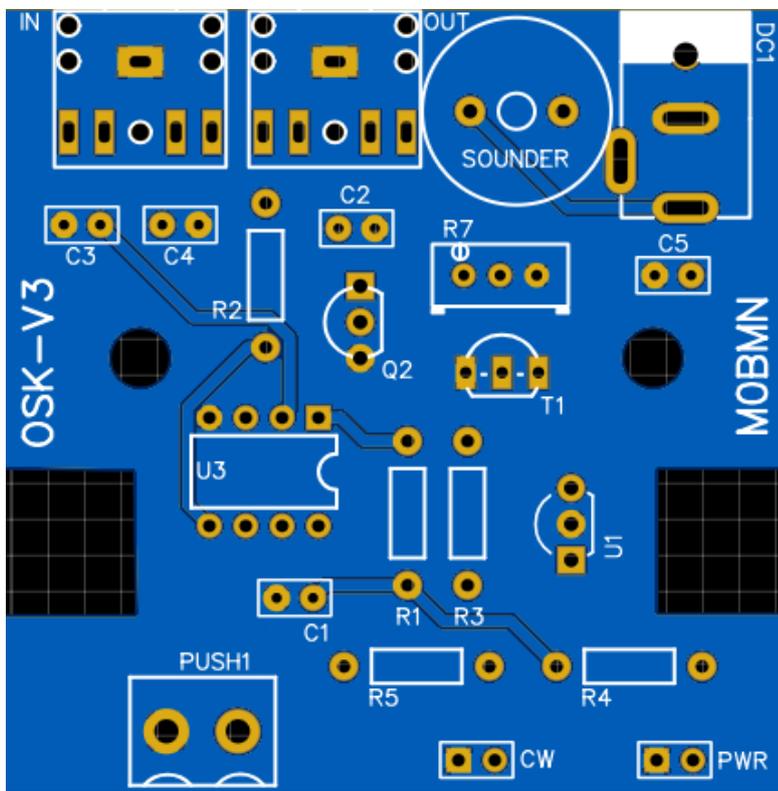
Push Button

2 x M3 PCB Screws



3mm Red LED  
3mm Orange LED  
Keyer 2 part case  
Case Front Panel  
Case Rear Panel  
Case Sticker  
2 x Case fixing screws  
4 x stick on feet

## The circuit board.



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

I have given an order to fit the parts below, if you are experienced in kit building you do not need to follow this, it's an easy build and the parts are widely spread over the board, it should not prove very difficult to build.

If you are new to kit building tick each part off in these instructions when you have it fitted.



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## First fit the larger parts,

There are two PCB mounting jack sockets, one for the key input and one for the output to the radio, both sockets are the same and will only fit on the board one way, just make sure they are pushed fully down flush on the board while soldering them.

**Jacks Fitted**

Now fit the DC power connector, again this will only fit in one position so you should have no problems with this (Famous last words)

**DC Socket Fitted**

Next fit the sounder, if you look at the top of the sounder you will see a '+' symbol on one side, this + should be inserted nearest to the DC socket. If you fit this the wrong way it will still work but the volume will be a little less, since this is only for sidetone and the volume can be adjusted it will most likely not be a problem anyway so don't damage the board trying to remove it if you fit it wrong.

**Sounder Fitted**

Now to fit the smaller parts.

## **Resistors**

R1, R2, R4, R5 :- 3K9 Resistors

Resistors can be fitted either way around. The kit has only two different values of resistors all but one are the same value, 3K9. Fit these 4 first

**R1, R2, R4, R5 fitted**

**Next Fit R3 (120 Ohm)**

**Now fit the blue trimmer, this is R7 (marked Volume on the PCB)**

## **Capacitors**

There are 5 capacitor's and 2 different values use, make sure you fit the right one in the right place, like the resistors they can be fitted either way around.

**C1 0.1uF (Marked 104)**

**C2 0.01uF (Marked 103)**

**C3 0.01uF (Marked 103)**

**C4 0.01uF (Marked 103)**

**C5 0.1uF (Marked 104)**



## Transistors and voltage regulator

The transistors and regulator can only be fitted one way. If you look at the body of these devices you will see one side is flat, this has the part number printed on it. This flat side **MUST** be fitted towards the Flat line indicated in position T1, Q2 and U1. Now be extra careful that you do not fit the 5V regulator in the wrong position. Fit the first transistor in T1. Use a magnifying glass if you must to make sure that the part you fit say's 2N2222 ( or 2N2222A) on the flat side and not 78L05 (that's the voltage regulator). Once that's fitted fit the Second transistor into the position marked Q2, then the regulator in position U1, make sure the flat side is towards the flat line on the PCB screening. See the pictures below to help identify the parts.



Image of 2N2222 ( 2N2222A may be supplied)



Image of 78L05 Don't get them mixed up!

Q2/T1 2N2222 Fitted

U1 78L05 Fitted

## The Brain of the Keyer

### The ATTINY85

This 8 legged little chip is the brain of the keyer, for its size it is very powerful. I had computers back in the 1970's that sat on the desk that did not have the power and speed of this chip, don't let its size fool you. This is also the most expensive part of the keyer. I have provided a socket for the chip that can be fitted onto the board first, this way the chip can be removed if there is any problem with the rest of the board and then reused, If soldered in place directly it can be very difficult to remove without damage.



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This must be fitted the right way on the board, if you look at the top of the chip you will see a small dot in one of the corners.



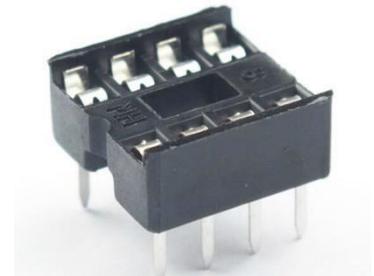
This tells us which pin is Pin 1

On the circuit board in position U3 you will see the outline of the chip and one of the corner pin hole is square, this is pin 1 the dot on the chip must be aligned with this hole on the board.

Now you know which way the chip needs to be

fitted fit the socket first and then the chip.

The socket *COULD* be fitted either way but if you look carefully one end has small notch, this should be at the end near pin 1, if you did fit this the wrong way, don't panic, as long as the chip is inserted so pin 1 of the chip is still near Q2 all will be fine.



**8 pin Socket**



**Attiny85**



## LED's

The Keyer has two LED's. One LED, the RED one is intended to show that the Keyer is connected to power and the Amber one will only active as the radio is keyed so can be considered as a CW key down indicator.

The LEDs both have two legs, one leg is shorter than the other. Take the RED led first, at the bottom edge of the PCB on the right hand side you will see the position the LED is to be fitted. This is marked 'PWR' the short leg will go into the square hole and the long leg into the round hole, IT IS IMPORTANT that you fit this the right way round so be sure before you solder it in place ,also note BEFORE you solder the LEDS that they should stand vertically off the board by about 12-15mm. The LEDS will be bent later to allow them to protrude the front panel as indicators.

The RED led goes into the position marked PWR and the AMBER LED goes into the position marked CW.

**LEDS fitted**



That's the module built, now just to wire the button and test it.



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The Keyer comes with a push button that will allow you to control the keyer, this button has two terminals, solder a wire to both terminals on the back, about 40mm long, at the bottom left hand side of the PCB, this is labelled MODE. Connect the other end of the wires to the two terminals in this position, either wire can go in either hole. Leave the leads the full length as you will need the free length to fit the button to the front panel.

Now the keyer can be tested if you wish before fitting it into the case. As soon as you plug power (7 to 15v DC) into the keyer the red LED should come on and you will hear the on board sounder send '73'. If you don't hear this check the chip is plugged in and the right way round. You can connect the key to the Keyer to test its working if you wish (make sure you plug the key into the correct hole, that's the 'IN' socket)

If all working it's time to box up the kit

Fix the switch to the front panel, put the back panel into the back slot of the bottom of the case and drop in the PCB, position the front panel and then use the screws provided to fix the PCB into the box.

Next bend the LEDs so that they protrude through their appropriate holes.

Drop the lid onto the case and use the two long screws to fix the two halves together.

If you wish fix the supplied Menu sticker in the lid's recess.

The only job left is to fit the 4 stick on feet to the bottom panel.

The supply voltage can be anything between 7 and 15v DC (The power plug must have a centre Positive pin)

Well done you have completed the OSK Keyer

## **So how well does it work?**

Very well! The Keyer has many features, it's VERY important to read ALL the instructions below before you try to use it, many of the options will be set once and forgotten, for example positive or negative keying output

One feature I really like is the CW training mode, at the selected keyer speed it will generate a callsign (not a real callsign but follows the typical format) and sends it to the user, the user sends back the callsign, if right you get a 'R' and a new callsign is sent. If you get it wrong you get the error signal (.....) and it resends the same callsign again until you get it right. It's a nice extra feature that makes practice more fun. BTW if you turn Farnsworth mode on it will use that in this mode which is a big help if learning the code.



## Keyer Instructions

Version: 0.87 Usage (WD9DMP Fixes and Enhancements)

After 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 ATTINY85 will automatically power off after 60 seconds into ultra-low power mode to conserve power. The unit draws only a few microamps in this state, making battery power from a single 3V lithium coin cell very practical.

### 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 'SK' 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 "SK" 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.

## **F (Flip) -TX level inverter toggle**

This function toggles whether the "active" level on the keyer output is VCC or GND. The default is VCC. This setting is dependent upon the attached keying circuit. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

## **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 "SK" 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.



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## **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.

**Speed Change = Command +Paddle**

**V -Version**

**P -Pitch**

**R -Reset**

**U -Tune**

**A -Iambic A**

**B -Iambic B**

**L -Ultimatic**

**D -DAH priority mode**

**X -Paddle swapping**

**S -Sidetone toggle**

**K -TX keying toggle**

**Z -Set Farnsworth pause**

**F (Flip) -TX level inverter toggle**

**W -Query current WPM speed**

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

**E, I, T and M -Play back messages**

**N- Automatic beacon**

**0 (zero) - Lock configuration**

Handy Command Card to print off