

## Introduction

YACK is a universal CW keyer library and application for the AVR architecture that is designed to be reusable. It consists of a set of functions to read, play, record and decode CW input from a paddlekeyer (single or double lever). The library can be used to easily create keyers, CW decoders and trainers, beacons, door openers, alarm clocks and many more applications at very moderate cost. It can also be mixed with other applications in the same chip.

Components of the application can be left out or included on as needed, reducing the memory footprint. The library can be found in the file `yack.c`

This document describes the operation of the keyer from a user perspective

## Hardware

As is, the library is configured to run on a ATTINY85 cpu, as shipped, with its internal oscillator at 8MHz and prescaled to 1MHz.

The ATTINY85 comes with 8KB of Flash memory and 512 Byte each for RAM and EEPROM. It can be ported to other AVR chips if these have sufficient features to support the intended application. As the library was written in C, processors without internal stack will not work with this application unless significantly rewritten.

- Pin 1 : PB5 - RESET (Can be used for additional button)
- Pin 2 : PB3 - DIT (towards GND, buffer with 10nF cap)
- Pin 3 : PB4 - DAH (towards GND, buffer with 10nF cap)
- Pin 4 : GND
- Pin 5 : PB0 - TX key line (polarity configurable)
- Pin 6 : PB1 - Sidetone (Connect a piezo disc)
- Pin 7 : PB2 - Command button (towards GND)
- Pin 8 : VCC (5V)

## 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 inter-character 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.

### **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.