

# Vinicio Coletti IK0WRB PIC Projects

## IK0WRB Keyer

Old version 1.0

### What is a keyer?

A keyer is an electronic circuit connected to a two-paddle Morse key (a.k.a. bench key or horizontal key or automatic key or iambic key) and to a radio transmitter. Left paddle transmits dots, while right paddle transmits dashes. Pushing the right paddle while keeping pressed the left one, transmits a dot, then a dash and another dot. Keeping pressed the two paddles, continues the dot-dash sequence, until one of the paddles is released.

The same thing happen if you press the right dash and then the left, resulting in a dash-dot sequence.

Transmitting this way is far more simple and quick than using a standard vertical Morse key, thus many radio amateurs use iambic keys. Modern transmitters have the keyer circuit built in. An external keyer, like this one, is useful for old transmitters and also for new ones, because of the other features it delivers: the message memory, the beacon mode, the possibility to practice Morse.



### How to build the IK0WRB Keyer

My keyer is based on a Microchip PIC 16F84 microcontroller and it uses a small number of components. You only need a quartz crystal, a transistor and a few capacitors, resistors and connectors, plus a small speaker and a button.

By the way you also need a small box and some batteries, just to give the 3.5 to 5 Volt DC the keyer need. The current is below 30 mA at most, with led glowing yellow and the speaker on. During pauses current drops to less than 20 mA and to only a few microamperes in sleep mode (there is no on/off switch).

A printed circuit board is not mandatory for this circuit, because of the small number of components.

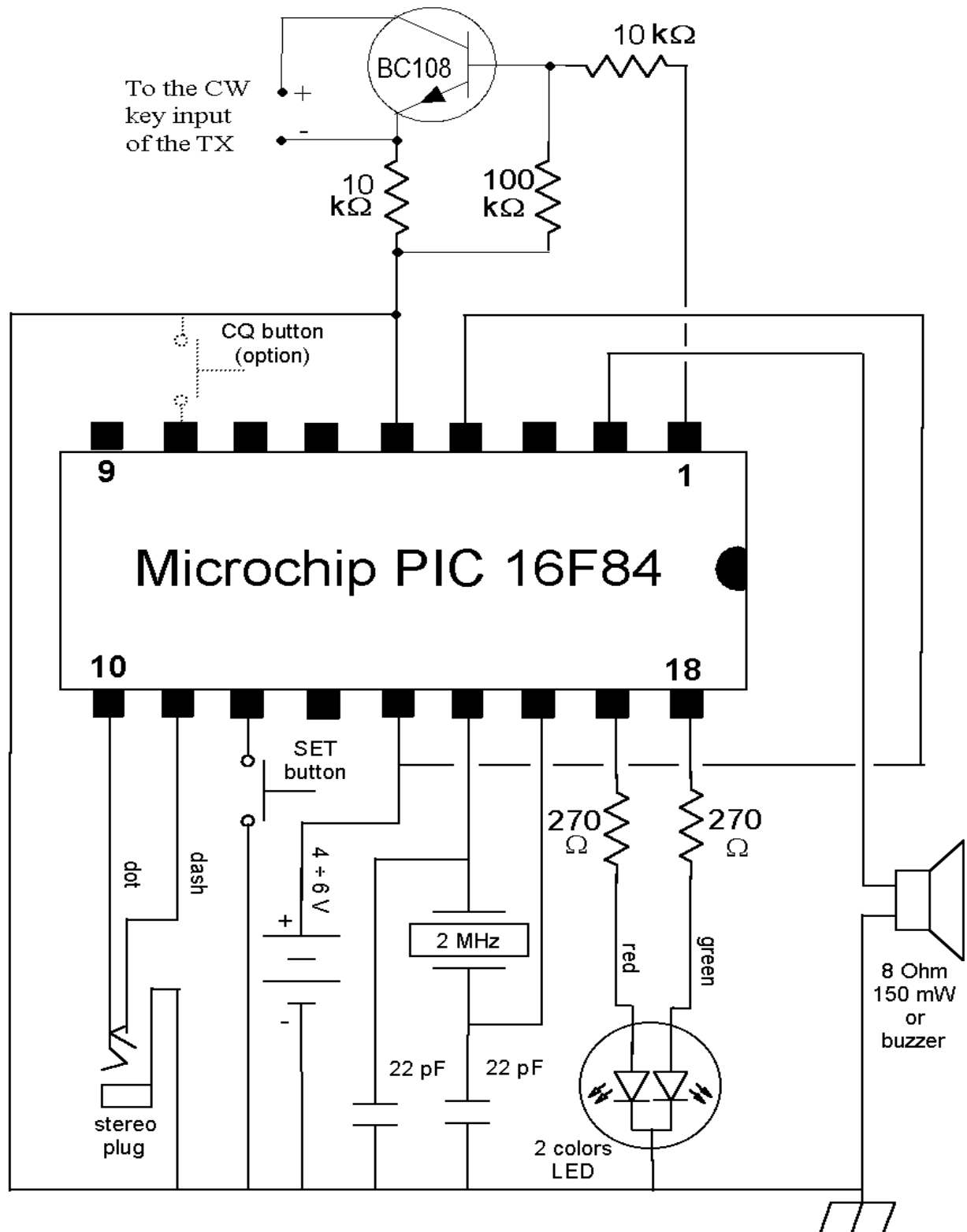
### How do I program the 16F84?

If you are lucky enough to live not too far from my home (which is unlikely if you are reading in English), I'd be happy to give you one chip programmed with the **keyer software** I developed for this project.

Otherwise, keep reading and you will find the **hex module** you must put inside the 16F84 chip. If you don't have a chip programmer circuit, normally connected to the serial or parallel port of your computer, you can buy it or look for a radio amateur owning it and kind enough to program the chip for you.

## The circuit

What follows is the scheme of the IK0WRB Keyer



## The components list

- A Microchip PIC 16F84, in the 18 pins package
- A quartz crystal of 2 MHz, parallel resonance
- 2 capacitors 22 pF, 15 VL
- 2 resistors 270 Ohm, 1/4 Watt
- A resistor 100 kOhm, 1/4 W
- 2 resistors 10 kOhm, 1/4 W
- A 2-colors LED, common cathod, red and green
- A button, normally open
- 2 jack plugs, 3 poles (stereo)
- A loudspeaker, 4 - 8 Ohm 150 mW, or a buzzer
- A BC108 transistor or similar
- One more button (optional) normally open

## The program

The the hex module you need to program the Microchip PIC 16F84 chip is in the file named **keyer10.hex**. This is the software for **version 1.0** of the keyer. New versions of the circuit (and the related software) may be released in the future.

## How to use the keyer

When you connect batteries (4 NiCd AA or AAA size are perfect), the keyer will sound my call sign (I K O W R B) and then, after a short pause, the letter R, signaling that it is in the Ready state, with the green led lit.

Manipulating the iambic key will produce the result you expect, keying the transmitter (the led becomes red when the carrier is transmitted). Base speed is set at 20 wpm and the weighting is set to 3, speaker is enabled and CQ mode disabled. Pressing one or more times the SET button, will move the keyer to different states and the paddle can thus be used to change speed and weight, to enable or disable the trasmitter (you may want to practice Morse or test CQs offline), enable or disable the speaker while transmitting (for example if you hear in the headphone the monitor tone of your rtx), store a message in the memory and recall it as a repeating CQ message, possibly in the beacon mode.

All the parameters are changed using only the CW key and the SET button and they are immediately stored in the EEPROM memory onboard, so they are never lost, even when batteries are totally dead.

The following table shows how to change the keyer parameters.

Operating the keyer				
Status	Speaker prompt	Left paddle	Right paddle	SET button
Ready	R	Dot	Dash	Go to Speed
Speed	Snn	Decrease speed	Increase speed	Go to Read (if speed has been changed), otherwise go to Weight
Weight	Wn or Wn.5	Decrease weight	Increase weight	Go to TX
TX	TX?	Enable transmitter	Disable transmitter, enable speaker	Go to Monitor (if tx enabled), otherwise go to Message
Monitor	MO?	Enable speaker	Disable speaker	Go to Message
Message	MSG?	Store a dot	Store a dash	End of recording
		Store an inter-character space when pausing 0.25 sec.		
CQ	CQ?	Enable CQ calls (message memory)	Disable CQ calls	Go to Ready (if CQ enabled), otherwise go to Beacon
Beacon	BC?	Enable beacon mode during CQ	Disable beacon mode during CQ	Go to Ready

## Notes

**Speed** can be changed with a 1 wpm step, from 4 to 66 wpm (too much?).

**Weighting** can be set from 2 to 5, with a step of 0.5

**CQ message** stored in the memory can be about 230 *signs* long, where a sign can be a dot, a dash or an inter-character space. If the memory is full while storing, the keyer go back to Ready mode, retaining the message stored up to that point. The message is in the EEPROM, so it's never lost, unless you decide to store another one.

**CQ mode:** when you enable CQ mode and go back to Ready, the keyer starts transmitting what is inside the message memory, then waits 10 seconds, then trasmits the message again. If you press the right paddle, the keyer stops cycling, while the left paddle (while receiving) sends immediately another CQ.

**Beacon mode** is an option of CQ mode. The keyer transmits the message memory, but waiting each time 20 seconds, with carrier ON, like a beacon is supposed to do. In this state, if there is a black out (you change batteries or they are dead or an external supply fails) and then the power comes back, the keyer will start transmitting immediately. This is thought for unattended beacon stations, mainly.

**The optional second button** lets you go to CQ mode and start transmitting with just a single button press, instead of cycling through parameters and enable CQ mode. If you do contests, this is very nice! But you can also wait a little for the second version of the keyer, where you probably will not need a second button for this feature.

**There is no on/off switch**, because the keyer goes into sleep mode after about 33 seconds of inactivity. A press of one of the paddles or the SET button, awakes the chip and the keyer continues its activity, as if it had been always on. In sleep mode the circuit drains less than 10 microamperes, comparable to the auto-discharge of batteries.

### **What you can expect in the future**

That I release a second version of the keyer, with improved performance and more ease when changing parameters.

I am working at it, stay tuned!