TKEY-K16

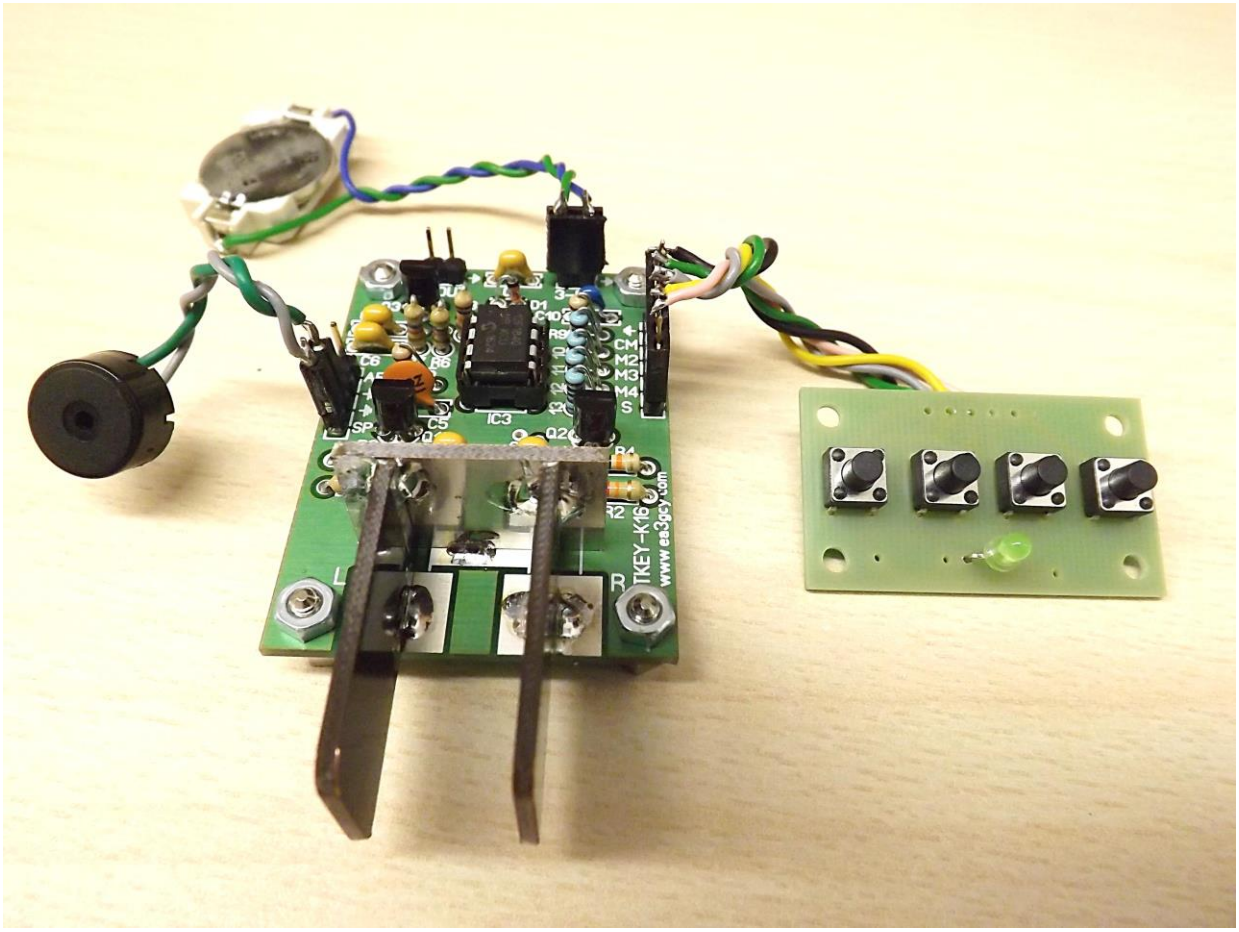
Touch CW automatic electronic keyer

(No moving parts no contacts)

Assembly manual

Last review: March 15, 2018

Commands and use manual of the K16 and Updates and news:
www.ea3gcy.com

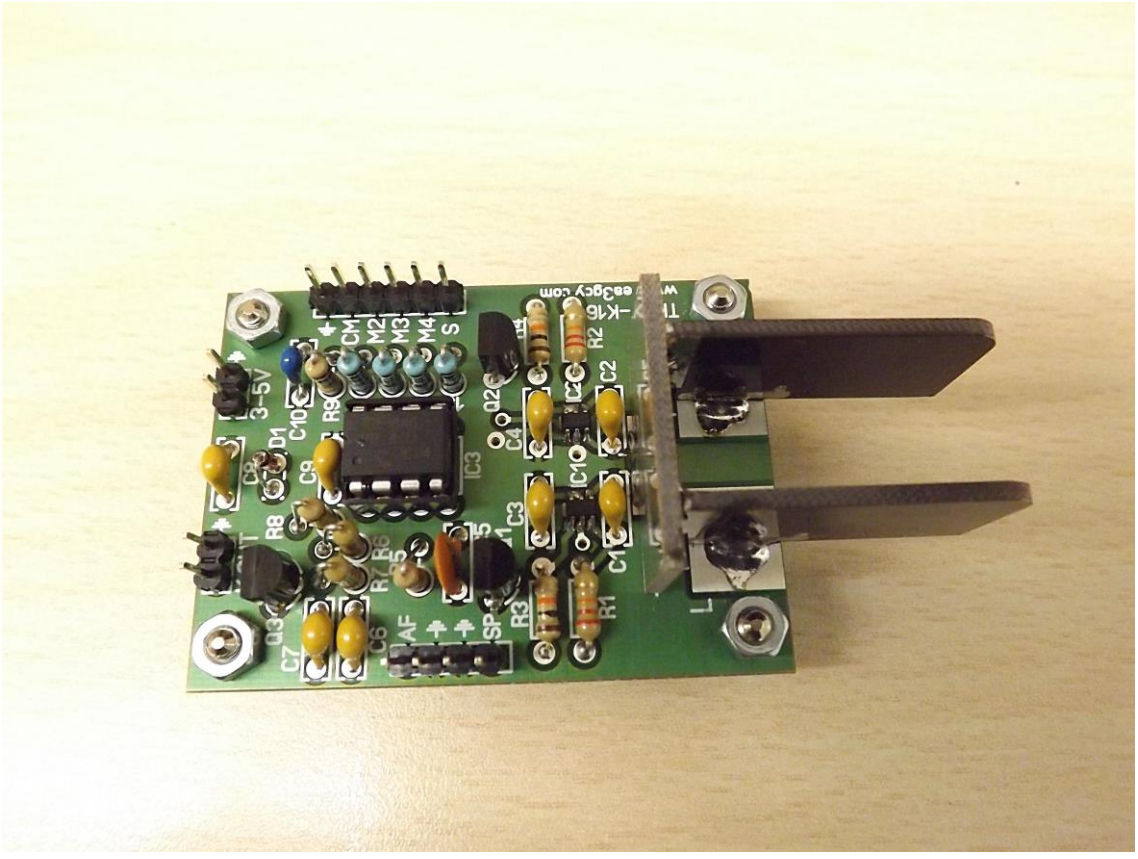


Thanks for purchasing the **"TKEY-K16"** kit

Enjoy building ! 73 Javier Solans, ea3gcy

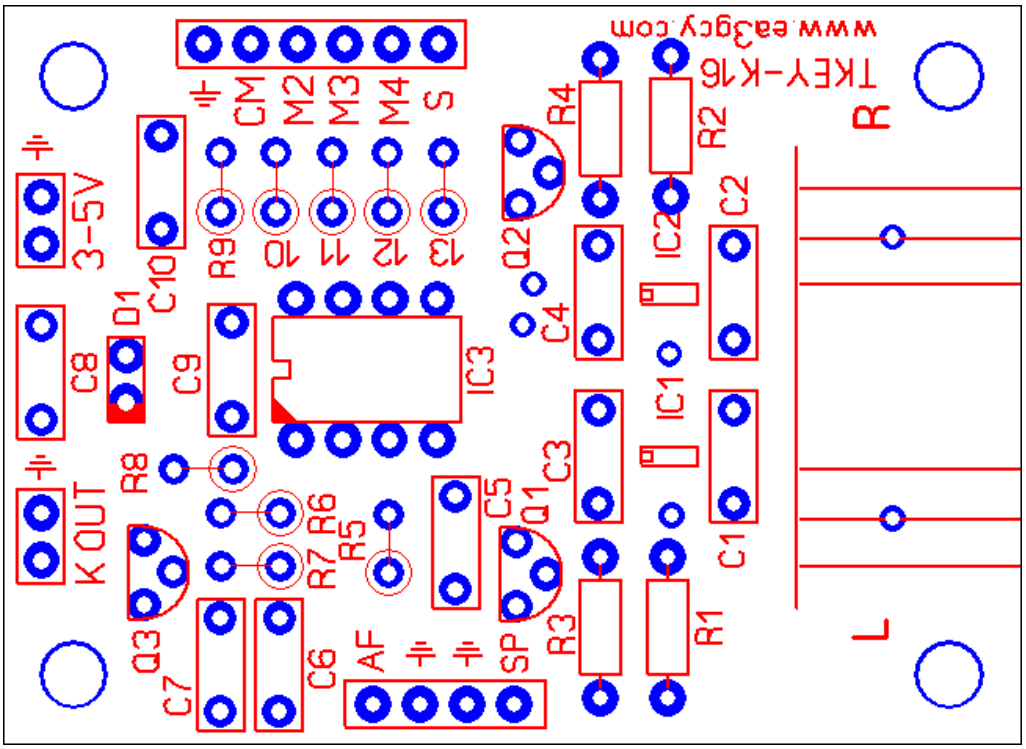
SPECIFICATIONS

- Switching: acting on touch surface.
- Operation: capacitative.
- It is not affected by moisture, dryness or dirt.
- Ideal for designs with custom paddles.
- SMT parts pre-installed
- Speed range: 5-50 WPM
- QRSS Speed LOWFER
- Messages: 236 letters/12 slots
- Modes: Bug, Iambic A or B and Ultimatic keyer
- Inter – letters space adjust
- Auto-space
- Weight adjustment
- Keying compensation
- Serial number with auto-increment
- Command for reversing blades
- Sidetone output
- Adjustable Sidetone frequency
- Quick change of the speed by paddles.
- Power supply: 3 to 5V
- KIT includes: 5 PCBs (base, switches and paddles) and all parts + Speaker for Sidetone + 3V battery and socket
- No included: Box, in/out connectors or wires.
- PCB Size: 55 x 40mm



PARTS LIST

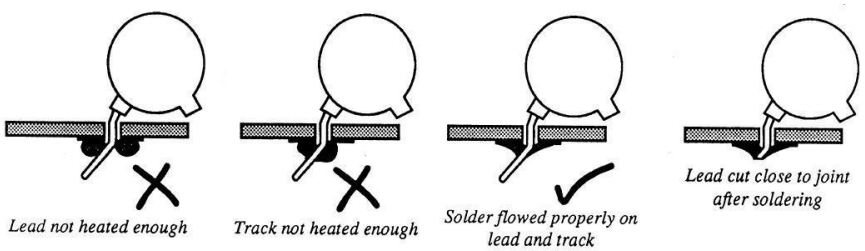
Electronic components						
		Qty	**Reference**	**Value**	**Component type**	**Ident.**
		2	R1,R2	22K	22K resistors	red-red-orange
		3	R3, R4, R8	10K	10K resistors	brown-black-orange
		2	R5, R9	100	100 Ω resistors	brown-black-brown
		1	R for Switches board	470	470 Ω resistor	yellow-violet-brown
		2	R6, R7	4K7	4K7 resistors 4K7	yellow-violet-red
		4	R10, 11, 12, 13	1K 1%	1K 1% resistors	brown-black-black-brown-brown
		2	C1, C2	2n2	2200pf capacitors	0.022, 2n2, 2K2 or 222K
		6	C3,C4,C6,C7,C8,C9	100nf	100n capacitors	104 or 0.1
		1	C5	10nf	10nf capacitor	103 or 0.01
		1	**C10**	10nf	10nf **5%** capacitor **BLUE**	**Blue** 103 or 0.01
		1	D1	1N4148	Diode	4148
		3	Q1, Q2, Q3	BC547	NPN transistors	BC547
		2	IC1,IC2	AT42QT1011	Touch sensor IC **(pre-installed)**	AT42QT1011
		1	IC3	K16 chip	K16 chip electronic keyer	--
		1	IC3 socket	--	4 pins Socket for IC3	--
		4	Push mini switches	--	Push micro switches	--
		1	Green led	--	3mm green Led	--
		14	Terminal-pins	--	Terminal-pins 6 + 4 + 2 + 2	--
		1	Battery and socket	--	3V Battery and socket	--
		1	Piezo speaker	--	Mini Piezo speaker	--
		4	M3 Spacers + screws	--	Hex spacers + M3x4 screws + M3 nuts	--
		4	M2x12 Screws	--	M2x12 srews	--
		4	M2 Nuts	--	M2 nuts	--
		1	TKEY-K16 PCB set	--	5 boards set TKEY-K16	--



TIPS FOR FIRST TIME BUILDERS

Tools required:
- Small tipped soldering iron of about 25-30 W rating, small side cutters, wire strippers, pliers, long nosed pliers, sharp hobby knife, and screw driver for the M3 bolt.
- You will also need good lighting and a magnifying glass to read the fine print on some parts.

Soldering:
There are two important things which need to be done to ensure the successful operation of a kit: one is to put the right part into the proper place on the board; the other is good soldering.



To properly solder you must use the correct type of iron and the right quality of solder. Use a small tipped soldering iron whose bit is short and pointed at the end. The iron should be about 25-30 W (if it is not thermostatically controlled). Only use multicored solder for electronics. NEVER use any extra flux. You should hold the hot iron in contact with both the board and the part lead for about two seconds to heat them up. Then, keeping the iron in place, touch the solder onto the junction of lead and track and wait about two seconds or so until the solder flows along the lead and track to form a good joint. Now remove the iron. The iron should have been in contact with the part and circuit track for a total time of about 4 seconds. It is a good idea to drag the tip of the iron up the component lead as you remove it from the joint, this helps to pull any excess solder up with it and enables good flow along the component lead.

Finding the right part:
IC's
The board outline for ICs has a "U" notch on one end. This indicates the pin 1 end of the IC. There is also a notch on one end of the sockets. This end goes over the "U" notch outline on the board. ICs have usually pin 1 marked with a round dimple or dot. This end of IC will go towards the notch on the socket or "U" on the outline.

Electrolytic capacitors:
These must be installed with the correct polarity. The positive (+) lead is always the long lead. The negative (-) lead is marked by a stripe on the body of the capacitor can. Make sure the plus end of the cap goes toward the hole labeled with the (+).

Transistors and diodes:
The transistors have the silhouette printed on the board. The diodes must be placed in the correct polarity position, they have a color band on their body that must match the printed drawing on the board.

RECOMMENDED ASSEMBLY SEQUENCE

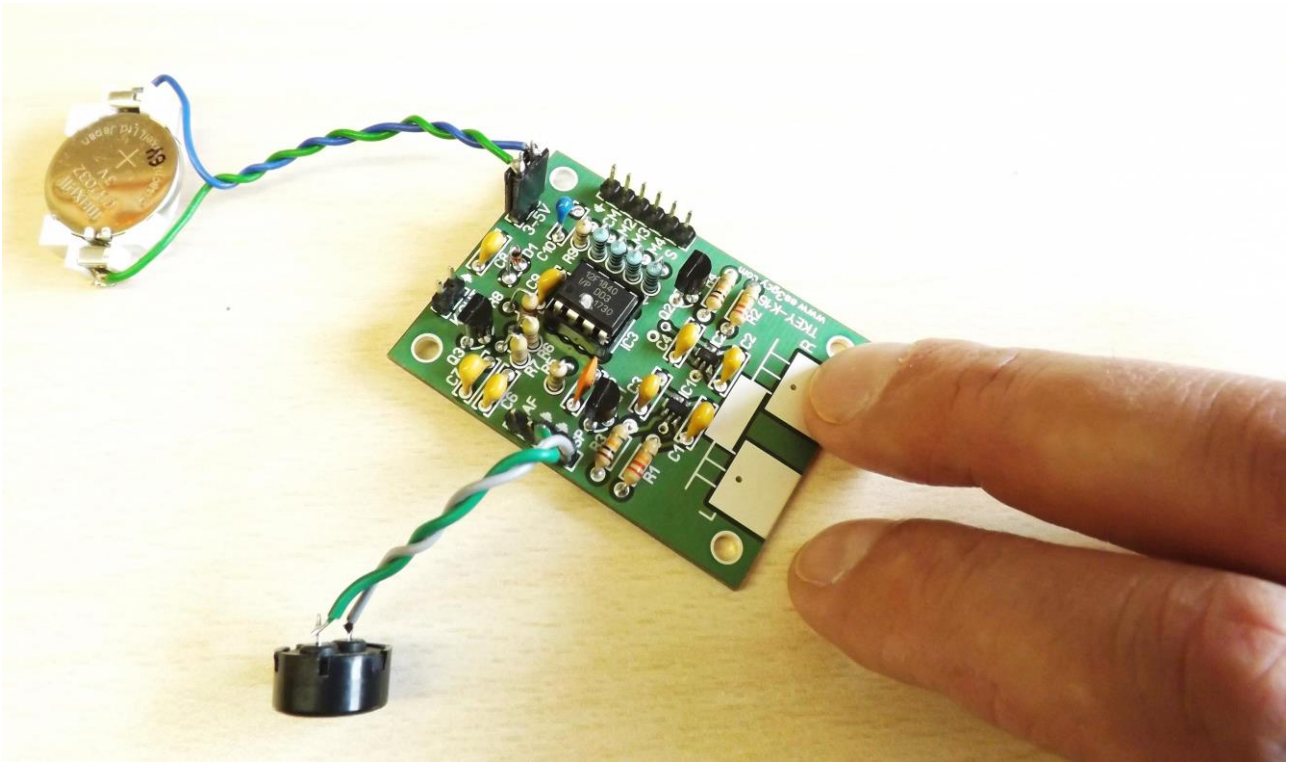
COMPONENT PLACEMENT

1.- Install and solder R1 to R13 resistors following the components list. R1 to R4 are placed horizontally, bend their terminals so that the resistance easily enters the space provided on the board and remains touching it. R5 to R13 are placed vertically, bend their terminals so that they remain as shown in the images. R10 to R13 are 1K and are marked only with the numbers from 10 to 13 (without R), these resistors are tolerance 1% and a little different from the rest.
2.- Place and solder D1 diode. This component are placed in a vertical position. Have a dark band around them that corresponds to the stripe printed on the board (see photos and board layout drawing). Before soldering them, make sure that this is placed in your correct position.
3.- Following the parts list, install and solder C1 to C10 capacitors. Note that there are two capacitors of 10nf (103) value, C5 and C10 but **C10 is a 5% precision capacitor and it is blue.**
4.- Place and solder Q1 to Q3 BC547 transistors in place printed on the board. Your printed silhouette should match the body of the transistor.
5.- Place the socket for IC3 and insert the integrated circuit K16. Pay attention to placing them in their correct position. The socket and the integrated circuit have a mark that must match the silhouette printed on the board.
7.- The IC1 and IC2 are of the SMT type and are pre-installed. The PCB already has these components soldered.
8.- Place and solder the terminals pin. Turn the board over and fasten them by holding them on the other side so they do not fall (use something to protect your fingers).
9.- Place and solder the miniature push-buttons on the small board, the 470 ohms resistor (yellow-violet-brown) and the led (optional) as seen in the images. Note that the long terminal of the led is positive “+” and goes to the drill next to the resistor.

Now you can run the TKEY-K16 and try it!

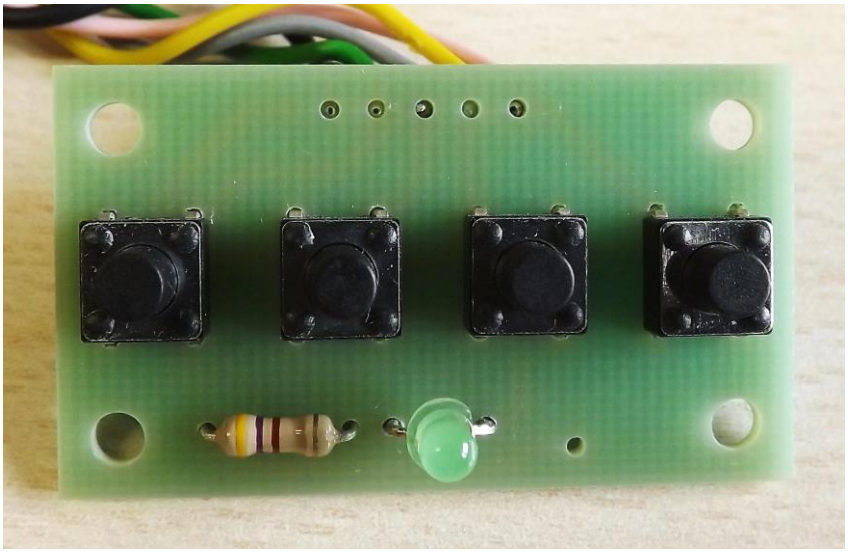
POWER-UP AND MOUNTING THE PADDLES

Turn on the power on the "3-5V" pins and the buzzer/speaker on the "SP" and GND pins. Do not yet solder the printed circuit board pieces that will be used as paddles. For now you can test it with your fingers directly touching the rectangular printed circuit board "islands" marked “L” and “R.” See the images.
You should hear the dots and dashes on the speaker.



PUSH BUTTONS BOARD

If this works correctly, you can place "push buttons" board as shown in the following image.



Place and solder the four miniature push buttons. Note that this board incorporates a Led and 470 ohms resistor (yellow-violet-brown), which can be used as an "ON" LED (optional), connect it to the positive “+” pole on the power switch. The long terminal of the Led is the "+" and it has to go in the drill next to the resistor.

ASSEMBLY OF THE PADDLES

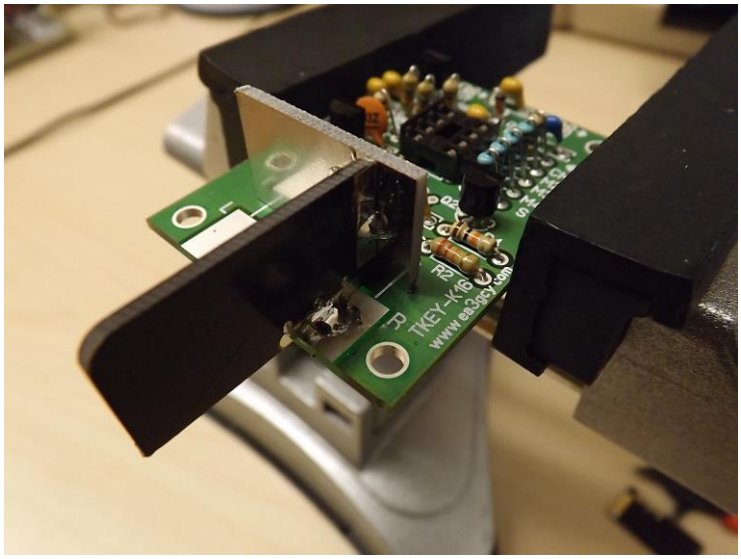
When you are sure that your key is working correctly and you have decided how you are going to use it, you can solder the three pieces of PCB that make up the key paddles.

You do not have to use the paddle system that is included in the kit; you can use your creativity and customize the type of paddles that you wish to use. Keep in mind that this circuit can be placed in many types of boxes and/or supports; it can be integrated with a transmitter of your own construction, etc.
If needed, you can use short pieces of cable (unshielded only) to connect the circuit to your custom paddles.
If you do a Google search, you will be able to see many ideas!

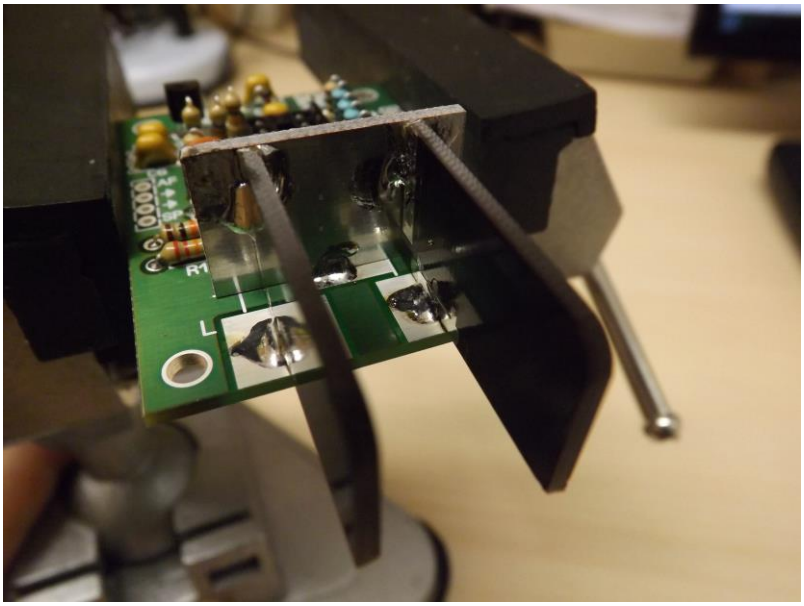
IMPORTANT NOTE: It is highly recommended that the box be metallic so that the circuit is shielded from the external RF fields.

The following work is easy, but you need to do it carefully and think about how you want the paddles positioned (how much separation between them) before soldering them in place.
Once they are soldered it is not easy remove them!

1.- With a drop of solder on each of the faces of the small piece of board that will connect to the two paddles, solder it to the main board. **Obviously, it is very important that it is as vertical as possible and centered on the main circuit board.**
There are lines printed on the circuit board to help you.



2.- Solder one of the paddles in its place (the two paddles are the same, because their two faces are the same). You may choose the separation between the two paddles. There are lines printed on the circuit board to help you. Decide on the position before soldering and place the two paddles so that they are centered and totally vertical with respect to the main board.
As the photos show, the paddles are soldered to the main board and to the vertical board which functions as the back wall.



CONNECTIONS

1.- The 3 to 5V power supply is connected to **"+"** and the symbol **"GND"** terminals on the board.
Note: The supplied "button" battery delivers up to about 200mA and is suitable to work close to 100 hours. If you are going to work a lot of time and every day with the TKEY-K16, it may be a good idea to use a 3.6V LS14250 battery that can supply 800-1200mA depending on the model.

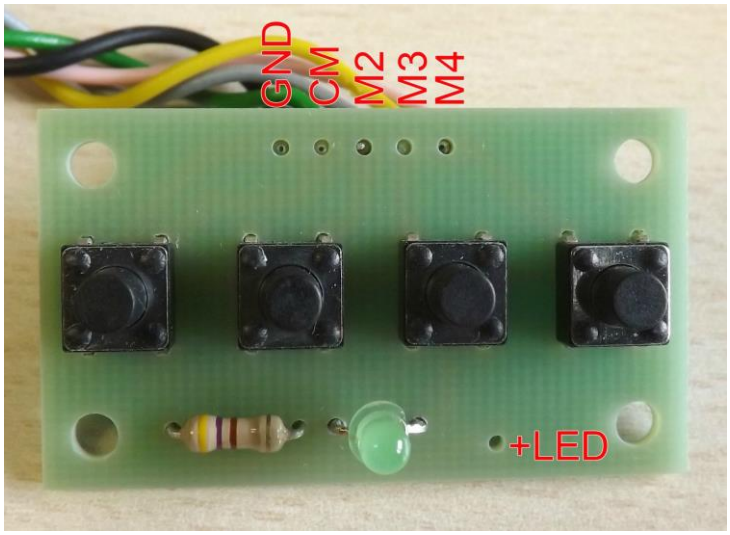
2.- The output to the KEY input of the transceiver is through the **"KOUT"** terminals.
You must prepare the right cable and jack for your equipment. Normally the equipment uses a Jack of 3.5 or 5 mm diameter. Theoretically, the output of the TKEY-K16 will be adapted with 99.9% of equipment on the market.
However, if you have any questions regarding the connection to your transceiver, you can email to EA3GCY kits at ea3gcy@gmail.com

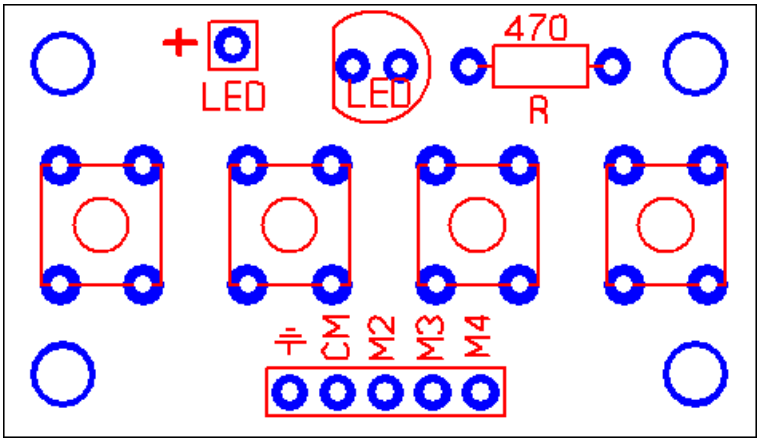
3.- The **"SP"** and **"AF"** outputs are for monitoring the keyer. In the **"SP"** terminal and in the **"GND"** symbol you can connect the piezoelectric speaker that is included in the kit or a small conventional speaker.

4.- The **"AF"** output it is low level and is intended to excite a separate amplifier or to drive the signal into the audio stage of the transceiver.

5.- The **"GND", "CM", "M2", "M3"** and **"M4"** terminals are for connecting to the push buttons. **"CM"** is used to enter command mode and also to activate Message 1. **"M2", "M3"** and **"M4"** are for activating Messages 2, 3 and 4. Connect these terminals to the "push button board" in its corresponding places as seen in the image.

The hole marked **"+ LED"** on the "push button board" can be used as an "ON" LED (optional), connect it to the positive pole on the power switch.

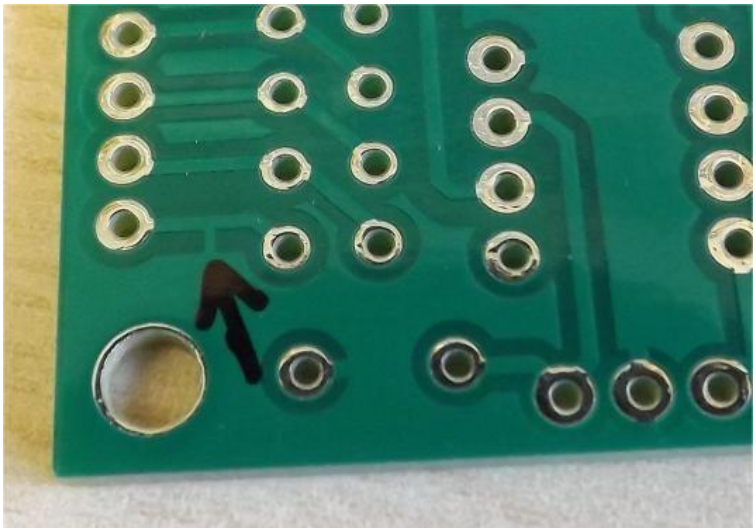




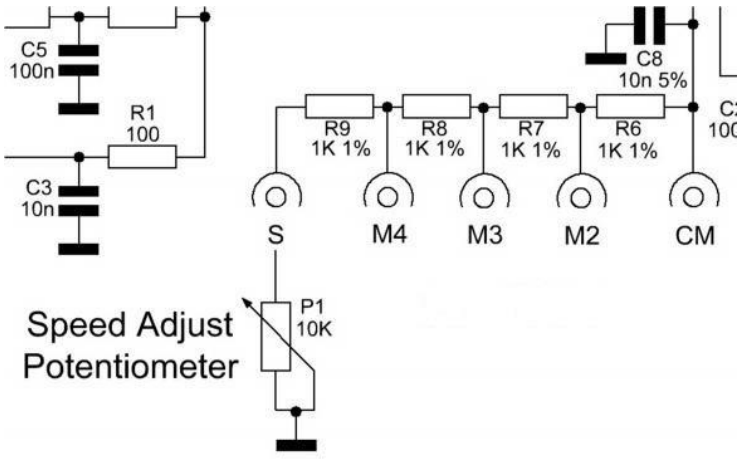
TERMINAL “S”

Use of potentiometer for speed adjustment

Normally, the "S" terminal is not used and this terminal is connected to GND through a small track on the PCB (see the following image). The speed adjustment is easily done through the K16 commands and it is not necessary to install the potentiometer.



If you wish to use the speed adjustment potentiometer you must connect a 10K potentiometer to the "S" terminal and **MUST cut the circuit board track** that connects the pin with GND.



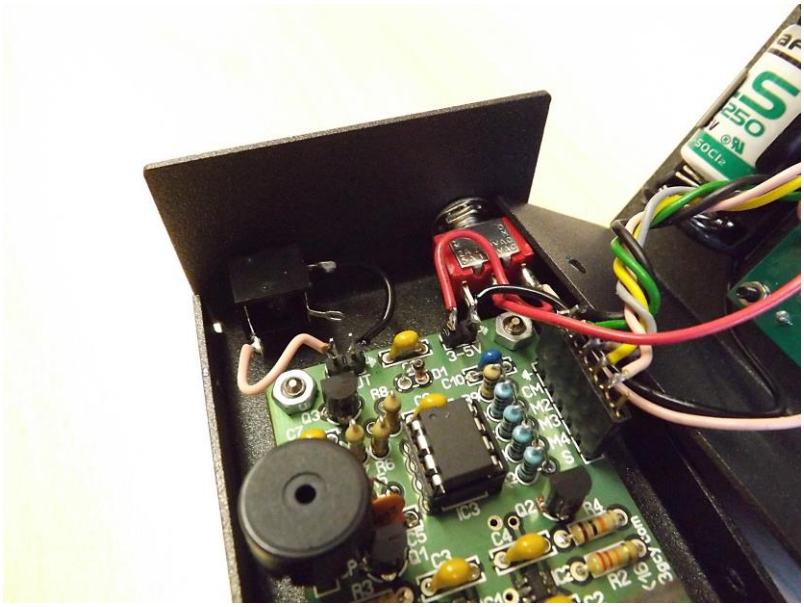
TKEY-K16 USE

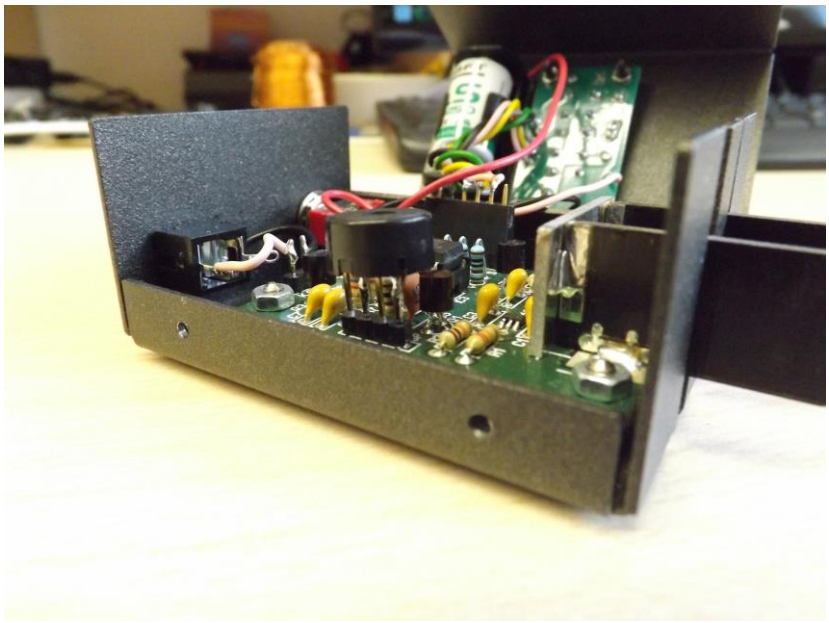
The basic use of the TKEY-K16 electronic keyer is very simple, however if you want to use all its functions you should read carefully the K16 user guide where you can see all the programming commands and functions in great detail.
You can download it from here:

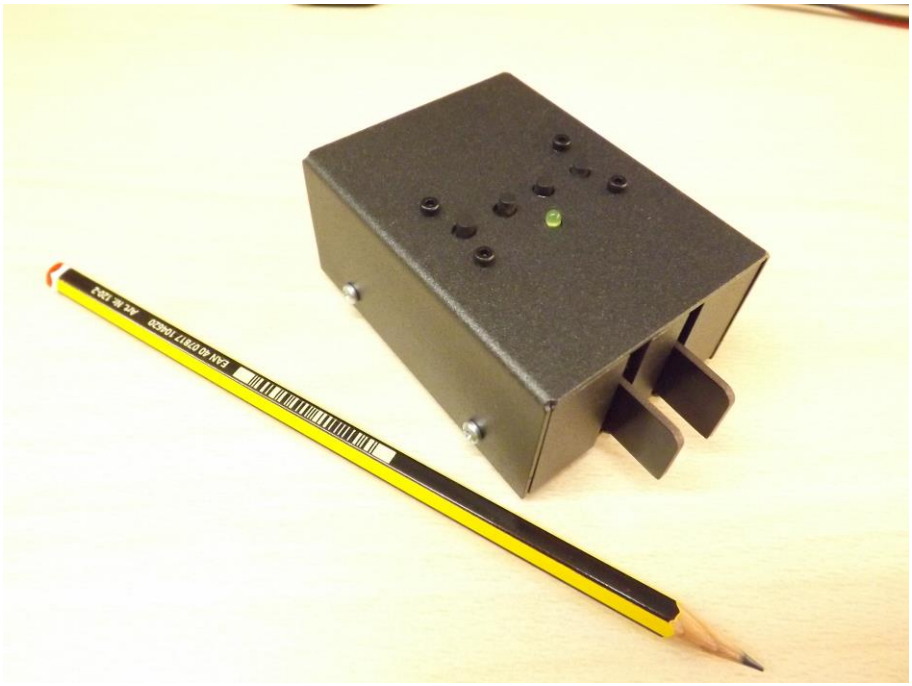
www.grphamradiokits.com

ANNEXED. INSTALLATION IN THE BOX

The installation of the TKEY-K16 in its box is a simple job. See the following images that give you an idea of how to make the wiring.
1.- The battery is glued with double-sided adhesive tape as shown in the images. The red (+) battery wire must go to the ON / OFF switch and the black wire (-) to the "GND" terminal of the "3-5V" input.
2.- The "K OUT" output will go to the output Jack connector.
3.- The led cable will go to the ON / OFF switch and the "3-5V" input.
4.- Solder the terminals wires "GND", "CMD", "M2", "M3", "M4" to the push-button panel.
5.- Solder the Piezo-speaker directly to the terminals "S" and "GND"
6.- For the fastening of the push-button board, 4 x M2 screws and nuts.







LIMITED WARRANTY

Please read carefully BEFORE building your kit

All electronic components and hardware supplied with the kit are under warranty in case of any manufacturing defect for the period of one year after purchase. The warranty does not include the transmitter final amplifier transistor.

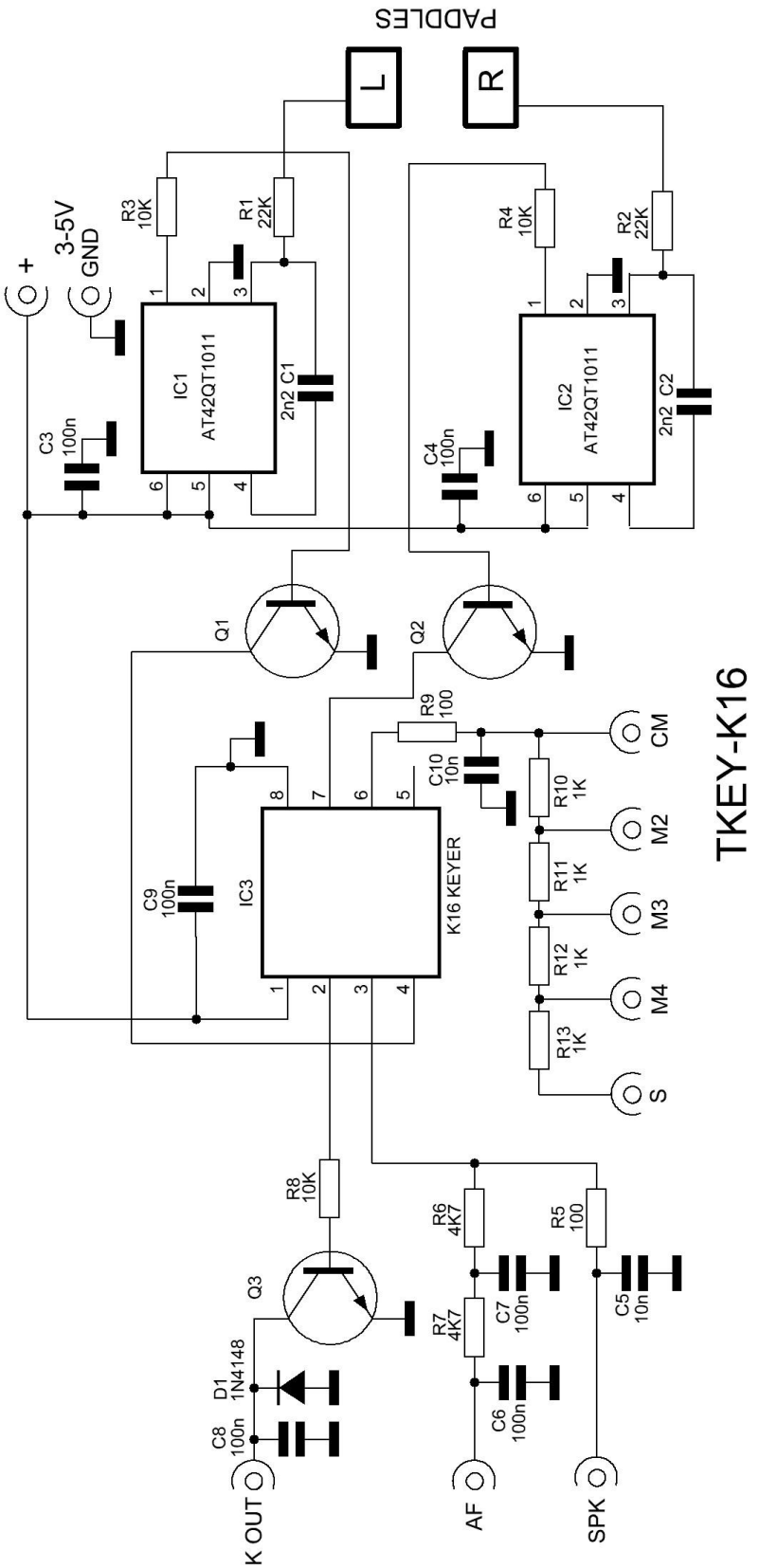
The original purchaser has the option of examining the kit and manual for 10 days. If, within this period, the buyer decides not to build the kit, he/she may return the entire unassembled kit at their own expense for the shipping expenses. The shipping expenses and sales commissions (i.e. bank, Ebay, and Paypal commissions) included in the purchase price will not be returned.
Please, BEFORE returning a product, request instructions by email at: ea3gcy@gmail.com

Javier Solans, EA3GCY, warrants this device to function according to the specifications, provided that it is assembled and adjusted as described in this documentation, and used correctly according to all provided instructions.
It is your responsibility to follow all the instructions in the manual, to identify all the components correctly, and to use good workmanship and proper tools and instruments in the construction and adjustment of this kit.
REMEMBER: This kit will not work as a commercially manufactured product; however, if can often give similar results. Do not expect great performance, BUT YOU ARE SURE TO HAVE LOTS OF FUN!

If you believe that there is a missing component for the kit, please do a thorough inventory of all parts using the parts list in the manual. Check all bags, envelopes and boxes carefully. If needed, you may email me and I will replace any component that you are missing. Even if you can find the exact part locally, please let me know so that we are aware of the problem to help other customers.
I can also supply any part that you have lost, damaged or broken accidently.
If you find any errors in this manual or would like to make a comment, please do not hesitate to contact me at: ea3gcy@gmail.com

THANK YOU for building the **TKEY-K16** kit.
Enjoy QRP!
73 Javier Solans, EA3GCY

SCHEMATIC


PADDLES
L
R
3-5V
+
GND
R3 10K
R1 22K
R4 10K
R2 22K
IC1 AT42QT1011
IC2 AT42QT1011
2n2 C1
2n2 C2
C3 100n
C4 100n
Q1
Q2
R9 100
C10 10n
C9 100n
IC3
K16 KEYER
R10 1K
R11 1K
R12 1K
R13 1K
CM
M2
M3
M4
S
TKEY-K16
R8 10K
R6 4K7
R5 100
Q3
R7 4K7
C7 100n
C5 10n
D1 1N4148
C8 100n
C6 100n
K OUT
AF
SPK