

This document describes the assembly, checkout, and hook up of the K1EL Winkey2 Serial Kit with a version V6 PCB. This design is powered directly off the PC's serial port and does not require an external power source. Current draw is minimal, a low dropout, low quiescent current voltage regulator helps in this regard. Open collector keying and PTT outputs are provided as well as speed pot and iambic paddle connections.

WinKey PCB Bill of Materials

___ R1, R2, R3 R4, R5, R6	4.7K ¼W resistor (yellow violet red)
___ R7	470 ohm ¼W resistor (yellow violet brown)
___ RN1	6 pin 4.7K SIP bussed resistor network
___ Rx	10K Linear Taper Speed potentiometer
___ Q1	2N3906 PNP transistor TO92
___ Q2	2N3904 NPN transistor TO92
___ Q3	2N2222A NPN transistor TO92
___ Q4, Q5	2N7000 MOSFET TO92 (2N2222A may be substituted)
___ D1, D3	1N5818 or 1N5817 Schottky Diode
___ D2, D4	1N4148 or 1N914 silicon diode
___ VR1	ST LP2950CZ-3.3 or equivalent TO92 3.3V LDO Regulator
___ U1	WinKey2 PIC processor version V25
___ C1, C2, C8, C9	.01 uF ceramic capacitor (103)
___ C3	4.7uF electrolytic capacitor
___ C4, C5, C6	.001 uF ceramic disc capacitor (102)
___ C7	.0047uF dipped ceramic capacitor (472 blue)
___ J1	DB9 9 pin female D connector
___ S1	14 pin DIP socket

Kit Assembly

- 1) Verify and check off components against the bill of materials listed above. If there are any parts missing, notify K1EL by email and we will send them to you.
- 2) The WinKey PCB does have a solder mask but it is quite easy to inadvertently bridge two etches or pads together. Please solder carefully and use the checkplots below to resolve any connections in question. 95% of all kits returned for repair have had soldering errors
- 3) Carefully check the PC board for any defects, although it's very rare it has happened.
- 4) Follow the silkscreen and carefully install all 7 resistors then solder and trim leads. Note that the 470 ohm resistor (yellow violet brown) is easily confused with the 4.7K resistors (yellow violet red).
- 5) Install resistor network RN1, **pin one of the network is marked with a dot**. If you are unsure you can verify pin one with an ohmmeter. You will measure 4.7K between pin 1 and 2. Between pin 5 and 6 you will measure 9.4K. Orient the network so that pin 1 goes into the square pad.
- 6) Observe polarity band markings and install the 4 diodes. Solder and trim leads
- 7) Install and solder the 14 pin socket, make sure the alignment marking matches the silkscreen.
- 8) Install the transistors and voltage regulator VR1, making sure the flat side of the component body lines up with the silkscreen, you may have to bend the leads of Q1 or Q2 to get it right. Try to keep all transistors the same height above the board for a professional appearance. Solder and trim leads.



- 9) Install the disc capacitors then solder and trim leads. The .001uF caps (C4, C5, and C6) are marked as 102 while the .01uF caps (C1, C2, C8, C9) are marked as 103.
- 10) Install C7, a blue dipped ceramic capacitor marked 472
- 11) Install the electrolytic cap C3, the longer lead is positive (+), and goes in the square hole, (silkscreen '+') Solder & trim.
- 12) Next, install the DB9 connector, it is a snug fit; carefully push it into place and solder. Make sure to solder the ground lugs, it takes some extra time and solder to get it right.
- 13) Now wire up the speed pot. Only two lugs are connected, one to ground **G** and the center lug to the **SP** pad. Looking at the pot from the back the lug clockwise from the center goes to ground. **If you are not using a speed pot be sure to install and solder a piece of resistor lead between pads SP and G.**
- 14) Now is a good time to wire up the paddle connector, there are three leads left paddle to **L**, right paddle to **R**, and common ground to **G**. (See page 3 for more details)
- 15) Finally install the WK2 chip U1, making sure the dimple in the top of the package lines up with pin 1 on the socket.

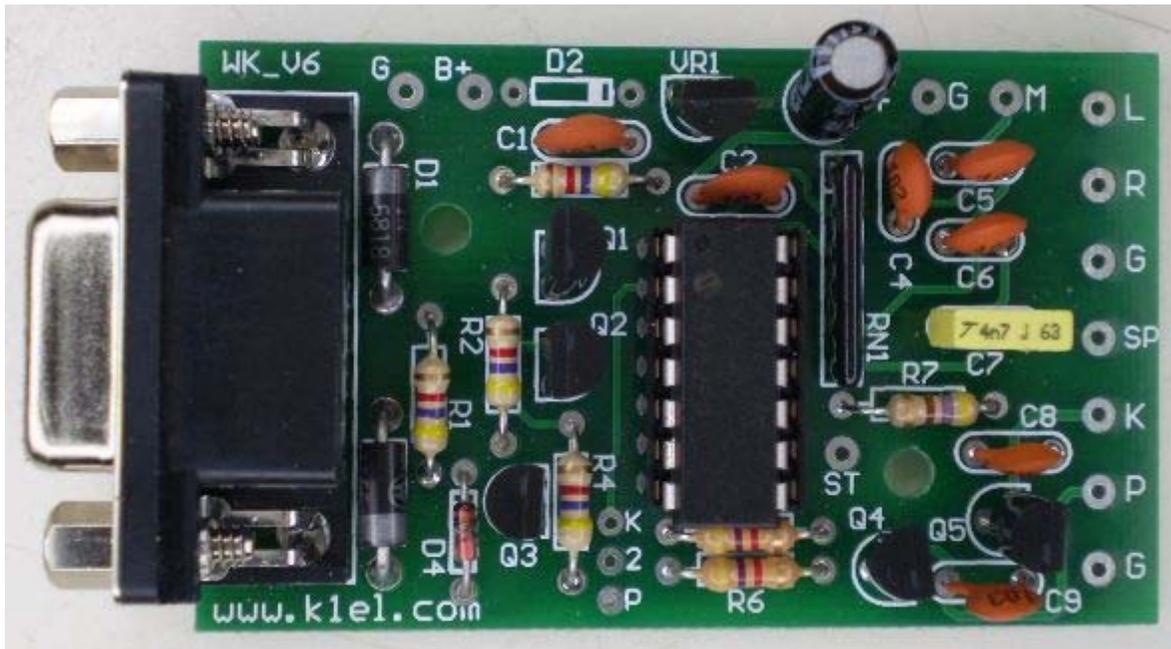
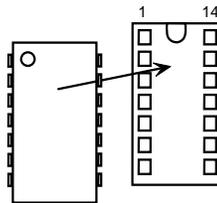


Figure 1 – WinKey V6 Picture, C7 will be different

Kit Wiring

Here is a handy table of all PCB connections:

Pad Label	Wire Connection
L	Left Paddle
R	Right Paddle
G	Paddle and Speed Pot Ground
SP	Speed Pot Wiper (10K Linear Taper)
K	Open collector keying output (50 VDC max)
P	Open collector PTT or Sidetone output
G	Bottom of Speed Pot (Ground)
	Optional Connections
M	Message Pushbutton Array
G	Message Ground
S	Sidetone Squarewave

Table 1 – WinKey V6 PCB Connection List

Speed Pot Hookup

Here is a diagram showing the speed pot hookup.

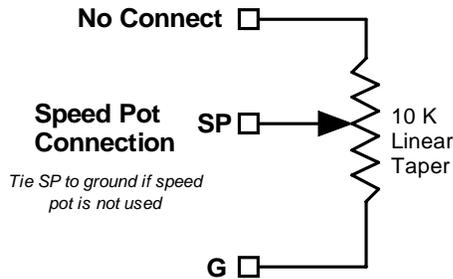


Figure 2 – Speed pot Connection

WinKey V6 Jumper Options

There is a jumper on the WK V6 board that is used to configure the PTT output port. There are two possible jumper settings:

2 -> K The PTT output port will be configured as Key output port 2

2 -> P The PTT output port will be configured as Key port 1's PTT output

This allows you the flexibility to key two different radios from the same keyer or use the PTT output port if you need it accurate an antenna relay or some other auxiliary function.

The limitation is that you can have it only one way or the other, in other words if you set the jumper to select PTT output you will be unable to key two radios. In the same way if you choose two key output ports you will not be able to take advantage of the PTT output.

WinKey V6 Paddle Cable Wiring

Although you can wire it any way you want, Fig 3 illustrates the standard way to wire up a paddle plug.

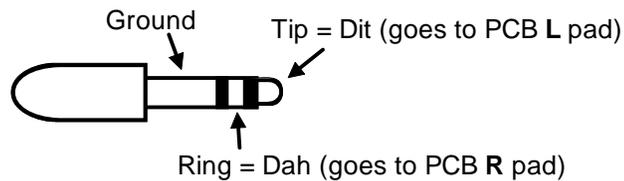


Figure 3 – Paddle Connector Pinout

Note that paddle connectors are not included in the kit.

WinKey V6 Keying Cable Wiring

Most amateur transceivers use a stereo ¼ inch phone plugs to connect to a keying paddle. Winkey expects the following connections as shown in Fig 3. There are some radios that use 1/8 inch stereo plugs so check your radio out to be sure.

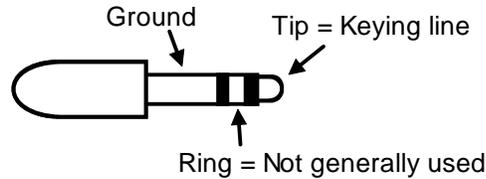


Figure 4 – Keying Cable Connections

If you are connecting to a transceiver that has an internal keyer, you will need to configure the radio to operate in straight key mode. This disables the internal keyer and allows you to key with one lead instead of two. In almost all cases, when you set the radio to straight key mode the TIP and Ground connector pins are used to key the radio. Again check you manual to be sure. Note that a keying connector is not included in the kit.

WinKey2 Serial RS232 Interface Cable

WinKey2 Serial should be connected via a straight through cable (not null modem). The cable will need a plug at one end and a socket at the other.

If you make up your own cable, note that WinKey2 Serial uses DTR and RTS to derive power, so these lines must be connected in addition to the normal TxD, RxD and Ground.

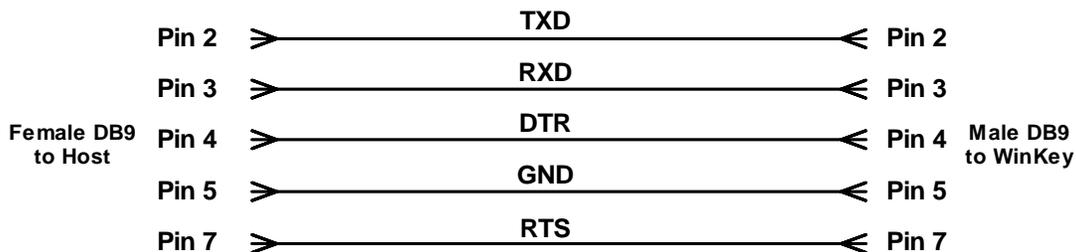


Figure 5 – WinKey RS232 Interface Cable Schematic

The WinKey2 Serial PCB does not require external power since it is powered from the PC's RS232 serial interface. Note carefully that WinKey2 Serial will not work unless an appropriate application is running and it is configured to use the correct serial port asserting the RTS and DTR lines properly. The V6 PCB provides an external battery connection, see details on page 10.

For Mac users, be sure your interface is RS232 not RS422, the Winkey V6 kit will not work with RS422 serial.

Kit Checkout

Take a look at the Winkey V6 PCB schematic on page 7 to familiarize yourself with the circuitry on the PCB. It is a fairly simple design. The PCB requires a positive and a negative power supply to operate. The positive supply comes from the RS232 signal DTR on Pin 4 of the DB9. This voltage is connected to a 3.3 volt regulator that powers the Winkey2 chip. It also provides the positive bias for the plus swing of RS232 transmit back to the PC. The negative supply comes from the RS232 signal RTS on pin 7 of the DB9. This supply is used only to provide negative swing on RS232 transmit. Transistor Q3, diode D4, and resistor R1 level convert the incoming bipolar RS232 receive signal to 3.3 volt LVTTTL suitable to drive the Winkey2 chip. The circuit made up of Q1, Q2 and associated resistors convert the 3.3 volt LVTTTL output of the Winkey2 serial transmit pin to a bipolar RS232 level which swings plus and minus around ground.

Winkey2 senses paddle action on pins 11 and 12, 4.7K pullup resistors set the off state to a high. The paddle input lines go low (ground) on paddle press. Two open collector transistors Q4 and Q5 provide a high current sinking capability for the Key and PTT outputs of the Winkey2 chip. Note that the keying outputs only provide a switch to ground and do not go to a positive voltage,

The best application to use to check out the winkey kit is the K1EL's WKtest or WKdemo which can be downloaded from the software area of the k1el website. Here is a link to the setup file for WKtest:

<http://k1el.tripod.com/WKtest.html>

There is a good help file included with the app that give details on how to run it but here is a brief procedure to follow:

- 1) Install the application and Start it up.
- 2) Tell the app which com port Winkey will be attached to; pull down the COM selection from the MenuBar to do this. If you are using a USB to serial adapter you will have to determine which COM port the USB serial port is installed on. You can find this by looking at: Control Panel->System->Hardware->Device Manager->Ports (COM & LPT)
- 3) Make sure you have Winkey connected to the configured port with a straight through cable, if you don't have a cable or unsure of it, you can remove the screw lugs on the WK DB9 connector and plug the PC board right into the PC comport.
- 4) Click on OpenWK.
- 5) The app will attempt to open Winkey and it will display a status message to let you know if it was successful. If successful, it will tell you the version of the Winkey chip it found. If not successful, an error message will be displayed. If it says comport open error, you probably didn't select the correct port, or there is another device using that port. Otherwise you will get either an echo or response error. This means the port opened properly but winkey did not respond.
- 6) If Winkey did not respond you can test the board using the Diags feature of the testbed. Click on the Debug menu pick and select power on. This will drive the DTR pin on the port interface and you can use a voltmeter to see if the voltage regulator is working. You should be able to measure 3.3 volts between pin 1 and 14 on the winkey IC. If 3.3V is not present, carefully check the voltage supply circuitry for a problem.

- 7) If you have 3.3 volts on winkey2 then you need to figure out why the PC can't talk to it. A good strategy at this point is to carefully go over the whole board looking for bad or missing solder connections, solder shorts or missing wrongly installed components. That is the most common problem at this stage. If you have a scope you can trace the receive data path from the connector through Q3 to winkey2 pin 5. Click on WKopen while looking... a short burst of serial data is sent every time you click on WKopen. If you see it reach the winkey chip, the next thing to do is trace transmit from the chip back to pin2 on the DB9 connector. You should see a clean swing from about -9 to +9 volts. This could be more or less depending on the PC, but should swing both plus and minus in order for the PC host to see it.
- 8) Once you get Winkey to open properly you can experiment with various controls on WKtest: Place the cursor into the Keyboard Entry Window and type, this will cause Winkey to transmit what you type. Click the paddle and serial echo checkboxes and winkey will echo what's sent to the Outgoing Morse Window. You can test the paddles at this point and you will see BreakIn status reported and also entered letters will be echoed. The last thing to check is the speed pot, click on PotLock and twist the speed pot, the scroll bar and WPM readout should track the twist.
- 9) If you change any of the settings in the Customize group make sure you press the Update button to force the app to write the new value to WK.

Precautions when connecting kit to a rig

NOTE!!! : The on-board keying circuit on the WinKey PCB is only capable of keying positive voltages up to 50 VDC and is not compatible with transmitters that use negative keying voltages.

RFI Immunity

There are several RF filter points included in the WinKey circuit design. Caps C8 and C9 on the Key and PTT lines attenuate RF coming in through the keying leads. C5 and C6 attenuate RF arriving over the paddle leads. C7 attenuates RF arriving over the speed pot leads. These components also reduce RF radiation from WinKey. No bypass is provided on the RS232 interface leads. For maximum RF immunity a shielded RS232 cable is recommended.

Even with good filtering the Winkey PCB is susceptible to problems if exposed to high RF potentials in the shack. Please observe standard RF grounding precautions to reduce RF at the operation position. This includes but is not limited to: multiple connection paths to a good earth ground, common grounding for all equipment, quarter wave stubs at particularly troublesome frequencies, and double checking all mechanical ground connections for oxidation. It is highly recommended that WK serial is housed in a metal enclosure that is grounded to shack ground.

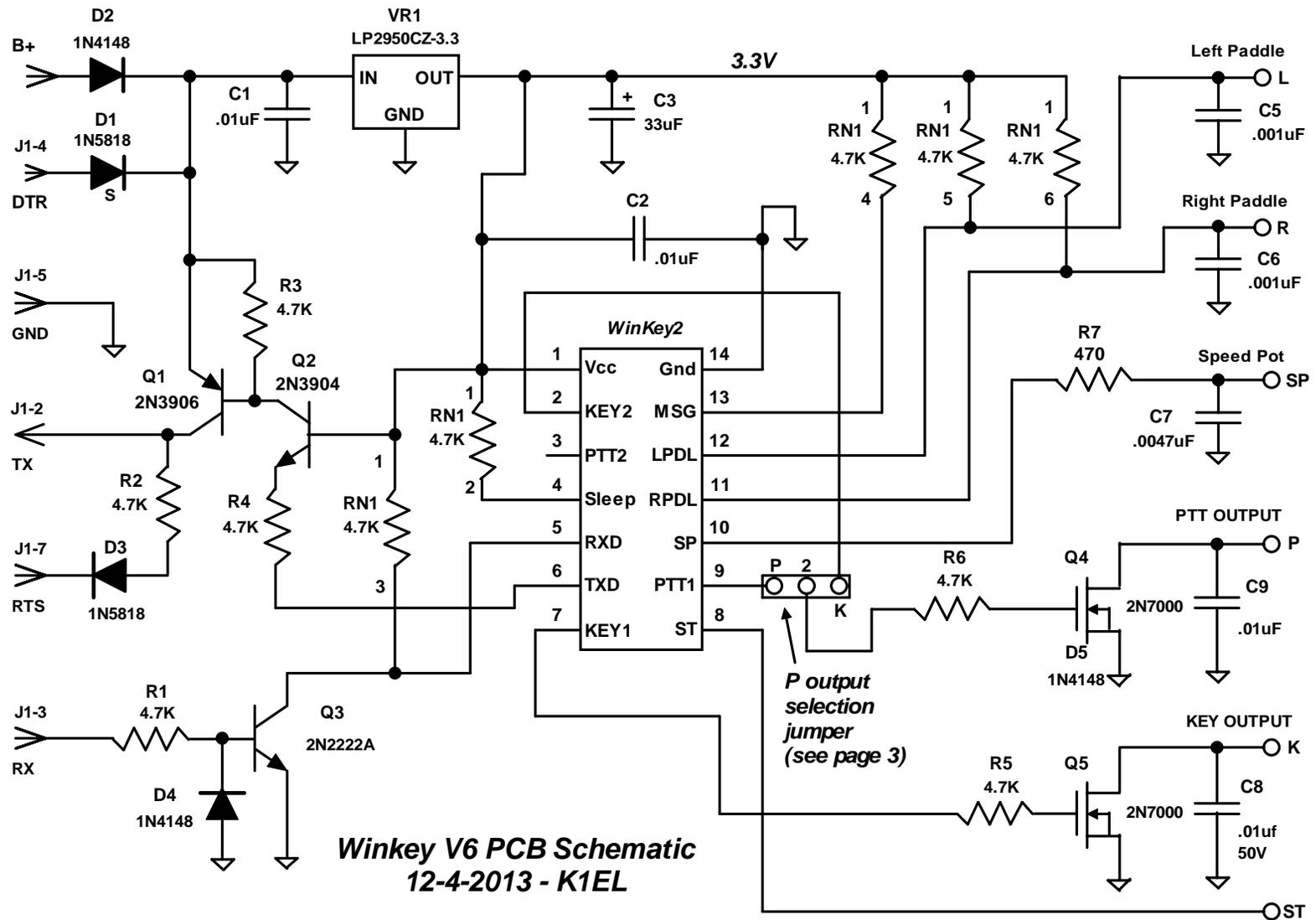


Figure 6 - WinKey V6 Schematic

Winkey PCB V6 Layout

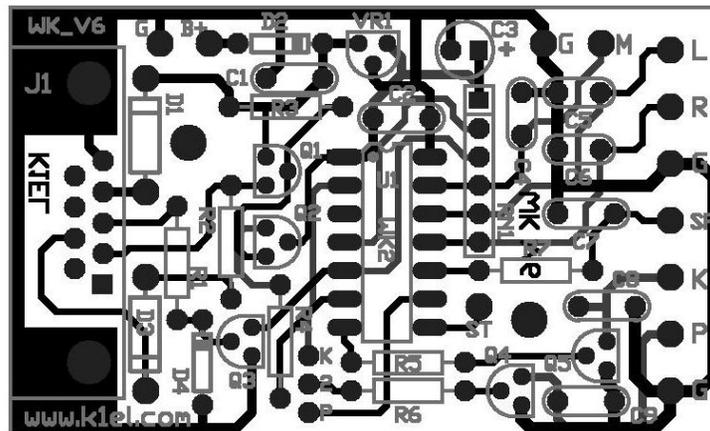


Figure 7 - WinKey V6 PCB Check Plot

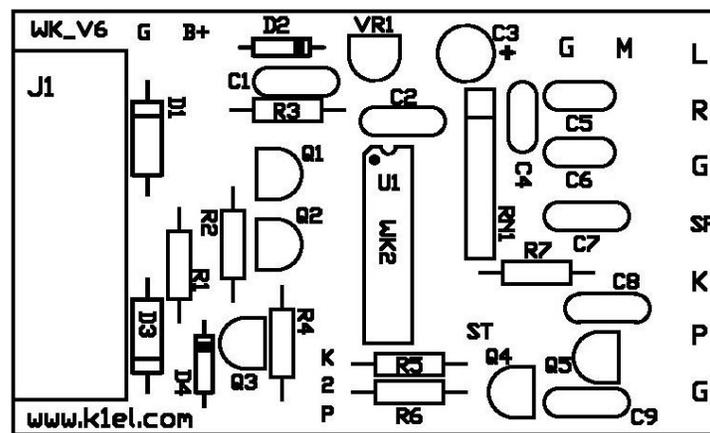


Figure 8 – WinKey V6 PCB Silkscreen

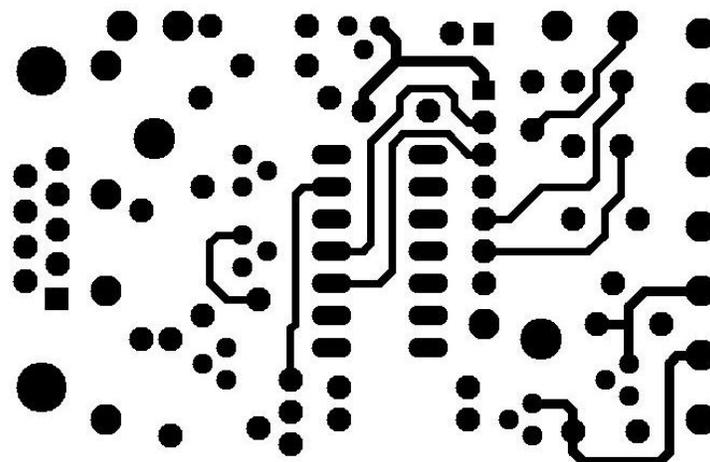


Figure 9 - WinKey V6 PCB Top Solder Side

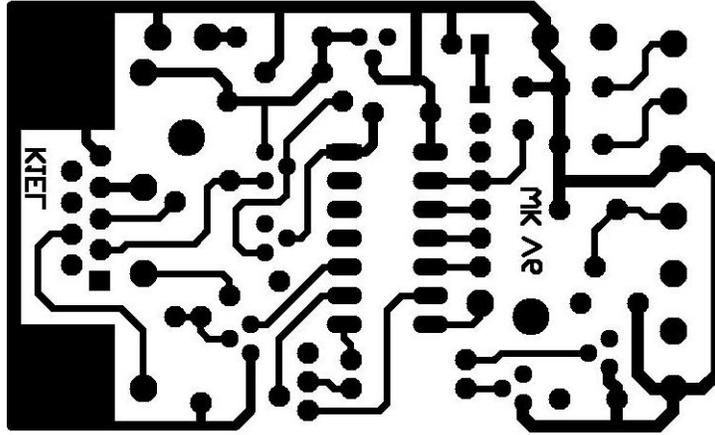


Figure 10 – WinKey V6 PCB Bottom Solder Side

What's Next?

Now it's time to make a more permanent installation.

The following diagrams illustrate Winkey2 Serial installed in a generic enclosure of your own choosing:

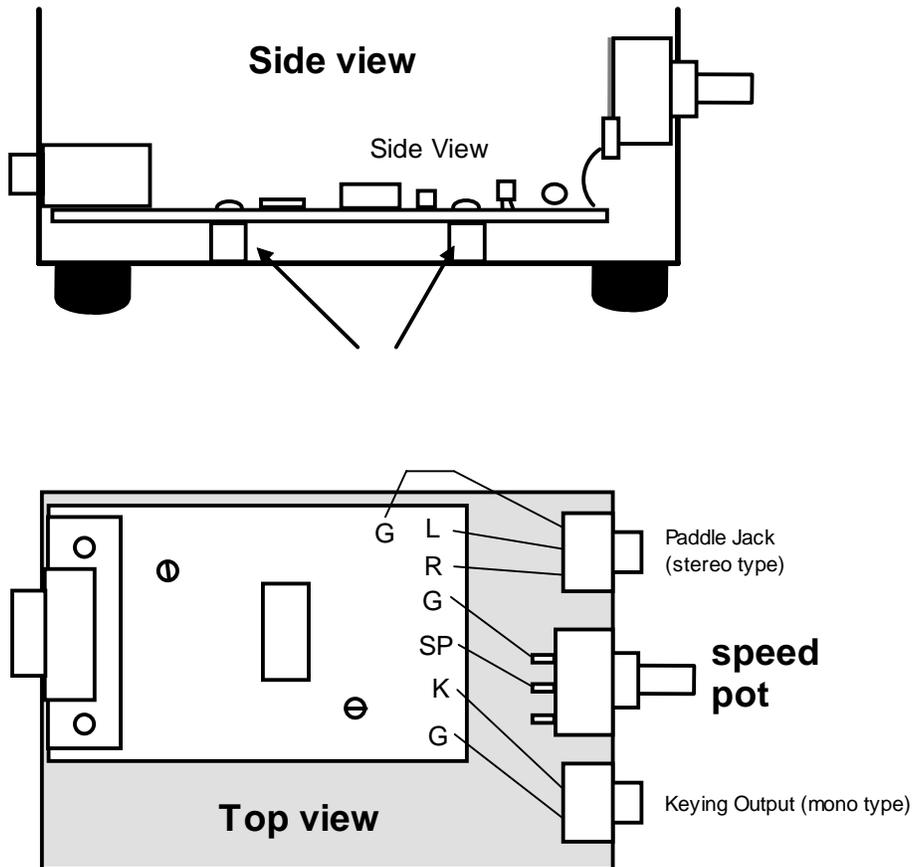


Figure 11 - Winkey2 Serial in an Enclosure

Sidetone Connection

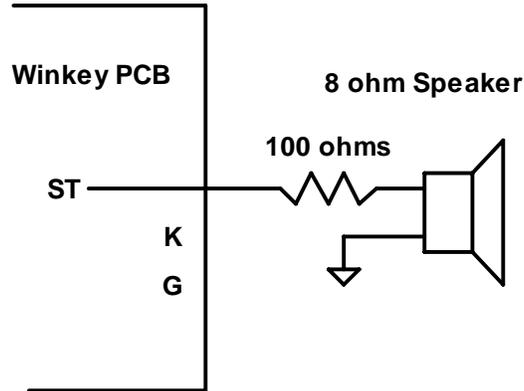


Figure 12 - Sidetone Connection for WinKey PCB

Although most users will want to use their rig's sidetone, the WK PCB does provide a sidetone output pin. The figure above illustrates how to hook up an external speaker. Note that Winkey powered from the PC's serial port may not have enough drive capability to run an external speaker. In this event, feed the sidetone output through an amplifier stage.

External Battery Connection

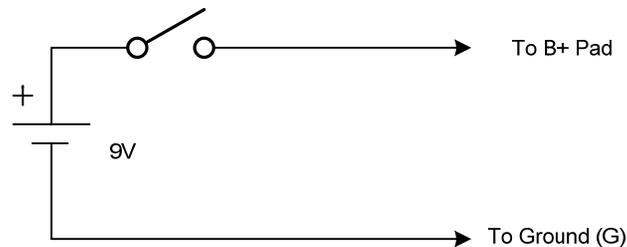


Figure 13 – External Battery Hookup

In the unlikely case that the PC serial port does not have sufficient voltage output to reliably run Winkey, an external battery can be connected to the V6 PCB. A power on switch should be used to prevent battery drain when Winkey2 Serial is not being used. An external power supply can be used instead of a battery but should not exceed 13 volts, 9 volts is recommended.

DISCLAIMER

While best efforts have been made to insure that the WK2SERIAL design is as complete and reliable as possible it is still possible to cause equipment damage or incur personal injury if the WK2SERIAL kit is not used as intended, is connected incorrectly, or modified in any way. K1EL can not be held responsible in these events.