Using a boat anchor receiver with an Elecraft K2

Having failed to source a matching transmitter for my Drake R4A, the easy solution was to utilize the transmit side of my K2 as it contained more than I was likely to need for casual “Sunday morning” operating. In addition the second receiver output can be used with other, more modern, receivers.

Options considered were either an external antenna relay, diode switched parallel receive or a buffered parallel receive. The latter solution seemed to be the most versatile as it also solved the problem of netting the K2 and outboard receiver by being able to listen to the same signal on both receivers. The downside of the buffered receiver option is that in order to provide a decent level of signal into the 50 Ohm input of an external receiver, a fairly robust transistor drawing several milli Amps of current is needed. The minimum design current is 12 mA, biasing the transistor for less current limits the strong signal handling and reduces the output level to the external receiver.

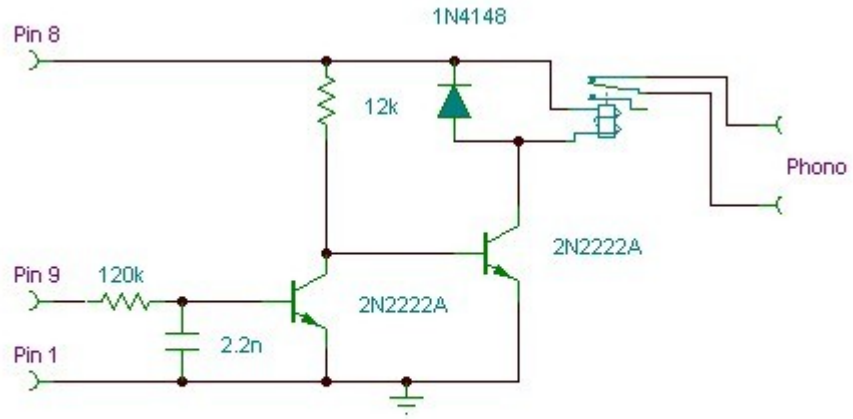
There is a very faint signal of around 0.3 uV from the K2 audible on the external receiver when tuned to the same frequency as the K2. This can be reduced to the point of being lost in the noise by selecting the pre-amp, or attenuator, on the K2.

Muting an external receiver, such as the Drake R4 series, can be a simple matter of driving a relay from the KIO2 or a slightly more elegant solid state switch using an opto isolator. Both options are detailed here. The relay unit will “work with anything” and is perhaps the safer bet if you want something that works first time. The opto isolator version has been tested with a Drake R4A which needs the external mute line grounding when the K2 is on receive.

<u>External mute, relay version</u>

By using a high impedance relay (1000 Ohm coil) it is possible to draw all the required current from the KIO2, thus simplifying the connections. Variable amounts of “VOX” delay can be set with the K2's “t – r” menu option to minimize relay noise when keying, a setting of 0.3 to 0.4 works well for me. It is important to use a high impedance 12 Volt relay, otherwise the 12 Volt source will have to be the supply to the K2 rather than the convenient KIO2 which can only supply 50 mA. The calculated current drain from the KIO2 socket, with the circuit shown is 13 mA.

The pin numbers on the external relay circuit refer to the pin connections of the KIO2 socket on a K2.

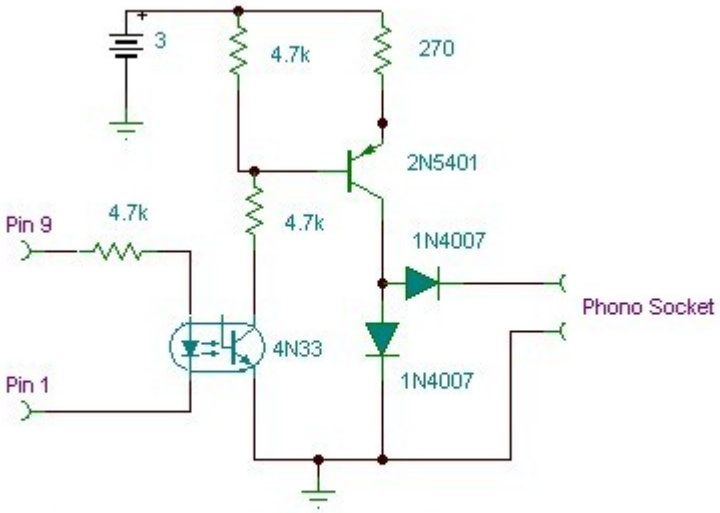


Elecraft K2 external mute relay option
By Dave Johnson, G4AON

External mute, opto isolator version

For those who prefer to not use a relay for smoother change over, I've included an opto-isolator switching unit. This works well with a Drake R4A where the mute rail sits at roughly -40 Volts, some experimentation may be needed with the emitter resistor value, and the resistor from supply to the transistor base, if the vintage receiver doesn't “unmute” fully on receive. The opto switching circuit is one that has been around for several years and was originally used to key valve transmitters from solid state keyers. My thanks to Dave, GM4EVS for sending me the circuit and some thoughts on variations on the components.

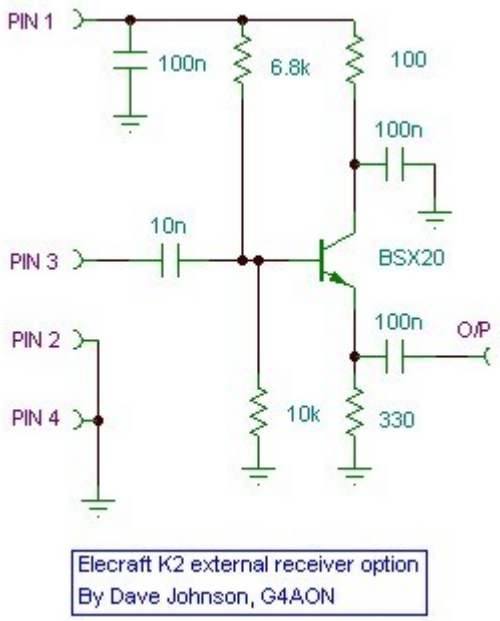
The supply comprises a pair of alkaline AA cells, the current drawn on receive is roughly 2.5 mA and zero when the K2 is turned off. Pin 9 and 1 shown on the left connect to the 9 pin KIO2 connector as per the relay version.

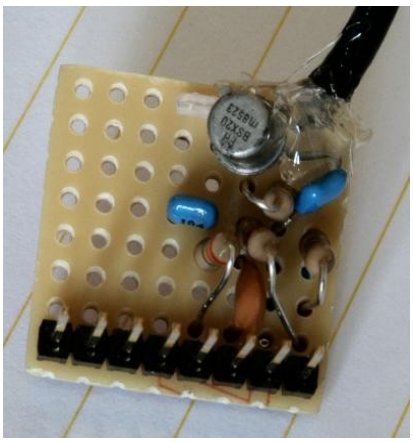


Elecraft K2 external mute, opto isolator version
By Dave Johnson, G4AON

Buffer amplifier – fits inside the K2

A BSX 20 transistor was used as a buffer amplifier simply because it was available in my junk box, any decent HF or switching transistor could be used. The pin numbers in the diagram below refer to socket J13 on the K2 main board.





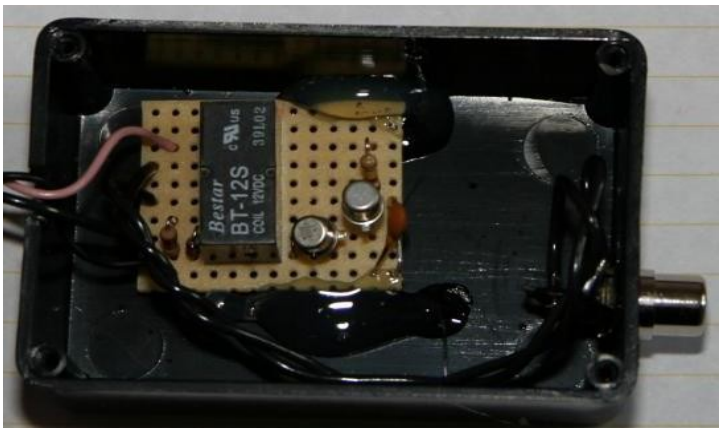
The image above left, shows the buffer amplifier built on Veroboad. At the time the image was taken, a coaxial lead was connected to the output for test purposes. The image above right, shows the completed board installed in a K2 with the output connected, via the black wire, to the adjacent BNC socket normally used for a receive only antenna.

Installation in a K2

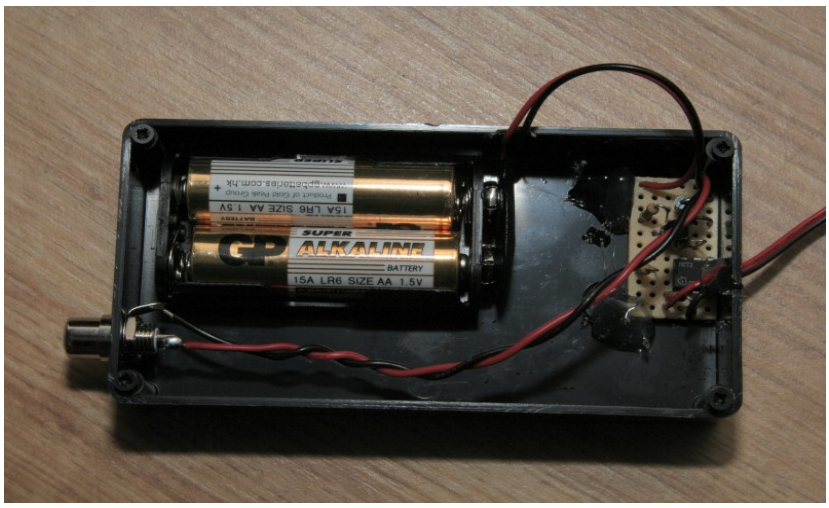
Assuming a socket hasn't been fitted at J13 in your K2, it will be necessary to remove the rear lower panel/heatsink taking care to avoid damaging the PA transistor insulators. Carefully solder an 8 pin socket at J13, this socket is not normally supplied as part of the basic K2 kit but is available as a spare part from Elecraft. Make sure the socket is mounted at right angles to the main K2 board. Re-fit the lower panel and check the PA transistors are not shorting to ground, details of how to check this are in the K2 assembly manual. This project doesn't use any pins except for 1, 2, 3 and 4, there is no need to add any of the wires or components described in the K60XV manual.

Component leads on the add-on board should be kept reasonably short to avoid contact with components mounted on the K2 main board. This “upside down” method of mounting the board, while seeming neat and simple, does prevent use of phono sockets fitted to the lower panel as per the Elecraft K60XV installation. If the BNC socket was needed for a transverter, or alternative receive antennas, the buffer board would have to be built differently. A short length of hookup wire connects the output of the board to a rear BNC socket which would normally be used for a receive only antenna input.

Switch on the K2 and check for any burning or excess current, the indicated current should be no more than 20 mA greater than without the buffer amplifier.



Above is the external relay switching box version. Below is the opto isolator version.



Parts list:

Relay unit.

2 x 2N2222A general purpose NPN transistors (in the UK Maplin part number UH54J)
1 x 1N4148 diode
1 x 120 K Ω resistor
1 x 22 K Ω resistor
1 x 2.2nF disc ceramic capacitor
1 x 1000 Ω, 12 Volt relay (Maplin N17AW)
1 x phono socket
1 x 9 pin DB9 connector to fit KIO2 socket
1 x small project box
Small piece of “Veroboard”

Opto isolator unit

1 x 2N5401 high voltage PNP transistor (Maplin UK47S)
1 x 4N33 or 4N25 opto isolator (not critical, Maplin AY44X or RA57M)
3 x 4K7 Ω resistors
1 x 270 Ω resistor
2 x 1N4007 diodes
1 x phono socket
1 x 9 pin DB9 connector to fit KIO2 socket
1 x small project box
1 x AA battery holder (make sure it will fit in the project box)
Small piece of “Veroboard”

Buffer amplifier.

1 x Elecraft part number E620005 (8 pin socket J13)
1 x Elecraft part number E620076 (8 pin plug to fit above)
1 x BSX20 or similar HF NPN transistor (could use 2N2222A, not tested with one though).
1 x 10nF disc ceramic capacitor
3 x 100nF disc ceramic capacitors
1 x 6K8 Ω resistor
1 x 10K Ω resistor
1 x 330 Ω resistor
1 x 100 Ω resistor
Small piece of “Veroboard”

1 x phono to phono lead, not critical.
1 x phono to BNC lead, suggest making one with RG58 coax.

Use

There is no “netting”, or “spotting”, facility as such. Short of replacing the operating software in the K2, turning a standard transceiver into a dual purpose transceiver and vintage transmitter is not easily done. However, the Drake 4 series has a dial readout to 1 Khz, which even nearly 40 years after being built is still accurate enough to place one of these receivers close enough to the same frequency as a K2. Other receivers may not be as accurate. By setting the function switch on the R4 to “ON” rather than “external mute” the R4 can be tuned into the signal transmitted by the K2, or if wishing to call another station both the K2 and R4 can be tuned to the same signal.

Setting the “t-r” option to “8r hold” makes for smoother operating when using the opto isolator version, with the relay version I use more delay so adding additional delay to the 8 Volt rail is not relevant.

The combination of K2 and R4 isn't intended to be any more than a means of using an old receiver as part of an active radio shack once more, it can certainly hold it's own for casual contacts and is better used in this way than purely as a receiver.

Now all I need to do is to make the R4A and K2 tune in the same direction!