



## DEM TIK2 Universal Transverter Interface for the Elecraft K2

### CIRCUIT DESCRIPTION

The new DEM TIK2 transverter interface is designed to be installed in the Elecraft K2 transceiver. The kit comes complete with everything required to connect the interface to your transverter utilizing the IN XVTR OUT and the AUX I/O pre-punched holes in the K2's enclosure. All wiring, connectors, and switches are included in the kit for any possible configuration you require. You will not need to drill any extra holes in the case or accumulate any extra parts!

The TX drive level delivered through the XVTR OUT connector is nominally +3 dBm. The RXIF signal from a transverter is connected to the XVTR IN avoiding the use of the ANTENNA port. Using these IF connections (IN XVTR OUT) for transverters has many advantages. There is no need for an attenuator in the TX line to "Pad" the drive level. This in turn saves energy which can be very helpful if using the battery pack. It also eliminates stray 10 Meter RF radiation that will occur with poor quality attenuators. It will also eliminate the need for an extra relay to separate the TX and RX lines to by-pass the attenuation on receive or the need for the separate Elecraft RCV.ANT option in the K2.

The TIK2 connects internally to the J-13 connector and may be installed with all other K2 options. It can provide any possible IF or keying configuration required by your transverter system. The interface has a manual enable/disable switch installed in the INT.BATTERY position. When enabled, the interface bypass' and removes the bias from the final amplifier in the K2, This prevents the transceiver from transmitting on the 10 Meter band and wasting DC power when the transverter is in use. This switch also allows instant switching from transverter operation to the normal transceiver operation.

There are many possible interface combinations with the TIK2 allowing it to be utilized with many different transverters. It will provide the 28 MHz TX drive level through a common TX/RX port or through separate TX and RX ports (IN XVTR OUT). The keying signals, 8T or 8R, buffered or not, may be applied during transmit or receive through any IF port or both. You may also select to use the same signals through the AUX I/O port. You may also select to use the inverted and buffered signals or both. Consult the schematic for all possibilities

### PRE-ASSEMBLY

Before the assembly begins, read through this document completely! Then determine what type of configuration you require for your transverter. This determination will dictate what components may be eliminated from the assembly if desired. The main determination to be made is if you want a common or split IF connections. If you require a common IF (both TX and RX in the same connector) you will not need to install all of the components in the RF path after C1 because they are the PIN diode circuit that switches the TX and RX signals from the K2. If you assemble everything, you will be providing separate RX and TX ports to your transverter.

For keying your transverter, it is not recommended to send the raw 8R and 8T signals from the K2 to the outside world. Q1 and Q3 on the TIK2 are buffers for the 8R and 8T signals. Q2 inverts the 8R TX-H to 8R TX-L (ground on transmit) If you want to use the 8T signal to key your transverter and wish to invert it, do not install R1, R2, R3 and Q1. Then connect a jumper between the emitter of Q3 and R4. **CAUTION!** DEMI recommends only using the 8T signal for keying solid state switching transverters. The 8R signal, inverted or not, applies a delay that most relay



switched transverters require in CW operation. **REMEMBER!** This is a universal interface and as of this writing, all of the know options are covered but we are sure someone will find a different way or something different required for their specific transverter. Just study the schematic and configure it for your use.

### PCB ASSEMBLY

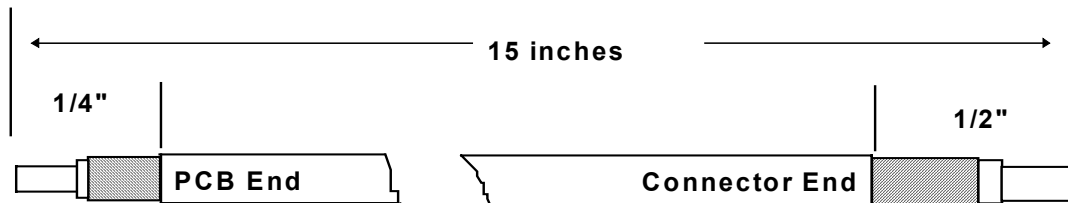
Mark the schematic and component placement document to indicate your desired configuration. Then install all of your required components in the topside of the PCB. The topside is indicated by the labeling "DEMI TIK2". L3 and C5 are isolated and are only used to conduct the 8R or 8T buffered signals to the TXIF connection. They may or may not be installed. If you are going to configure the interface for a common IF and wish to conduct the 8R or 8T signals through the coax, even though this kit can be configured for this, DEMI recommends exchanging this kit for the DEM-EKTI interface because it is designed for this use explicitly. It is smaller and more cost effective.

### PCB WIRING

Pre cut all wires and Coax to the following lengths: All wiring is to be done on the top side.

Coax	15" each depending on IF requirement
Red Wire	Two @ 8"
Black wire	One @ 8"
Twisted Wire	One @ 9"
White/Red	Two @ 3"
White/Red	One @ 2"

Strip and tin all wires at 1/4". Strip and tin Coax as shown in figure below.



Depending on if you have a common or split IF, solder the coax to the PCB where indicated on the PCB (XVTR IN, XVTR OUT). Solder the shields to the exposed ground plane. Install a 8" red wire to the +DC, (marked on the component placement) and the 8" black wire to the GND position on the PCB. Then install the 2" white/red wire from 8T to C connections. Now if required, install the twisted pair by connecting the white wire to the desired "Keying Signal" (8R TX-L, 8T TX-H, 8R TX-H or other) Connect the black to the nearest ground connection. The relay can now be tested by toggling it with a 12 volt DC supply if you wish. Follow the TIK2 Schematic Diagram for test points. Verify each header pin and relay contact.

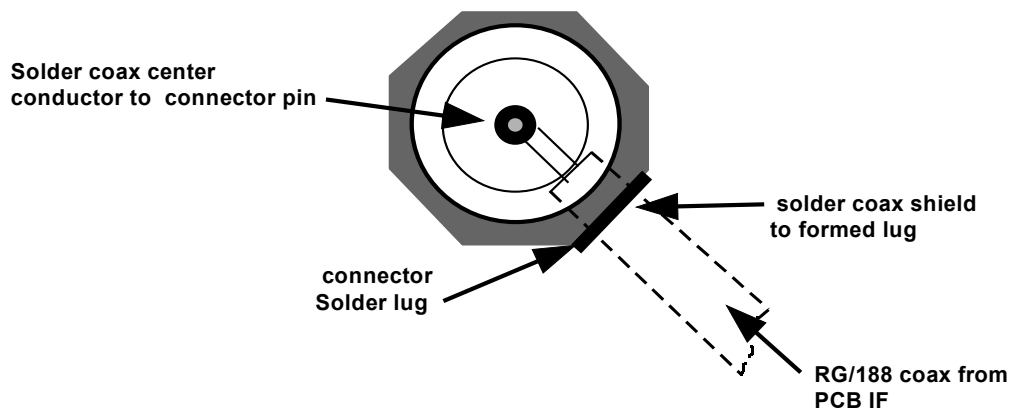
The final installation of the TIK2 starts with the DC power connection. If you do not have the battery pack option, you will need to install a header pin assembly (white with 2 pins) in the AUX 12V position on the K2 main PCB. This connector will be found in the hardware bag. Install it so the locking clip is by the "AUX 12V" lettering on the PCB. Find the mate and attach the unused 8"

red wire (positive) and the black wire (ground) from the TIK2. Verify which pin on the K2 board is positive (closest to the case) and ground.

Next, if you do not have the battery option installed, you will need to install the slide switch with two 4-40 x 3/8" screws with nuts and lock washers. Install the switch in the K2 top cover in the INT. BATTERY position. This is now the transverter enable/disable switch. Switch the switch to the "ON" position. The switch is a DPDT so attach the RED wire from the AUX +12V connector to any center connector on any pole. Then attach the red wire from the TIK2 to the connector that aligns with the "On" position on the same pole as the wire from the AUX 12V connector.

If you have the battery option installed, you will need to replace the switch and decide how you wish to wire it. You may even decide to install a different switch. This would require a hole drilled in the enclosure. You may wish to disable the battery option for transverter operation.

Install the required BNC connector (s) in the XVTR IN/OUT position (s) in the K2 top cover. Insert the connector from the outside, place the lock washer, the ground lug, then the nut and hand tighten in that order. Position both ground lugs so they point toward the ANTENNA TUNER connectors and tighten with a 7/16" wrench. Form the ground lug as shown below and attach the coax as shown. Be sure to connect the RXIF to the XVTR IN and the TXIF to the XVTR OUT.



If you do not have a DB-9 installed in the AUX. I/O port, install the female connector now with its hardware. Then pick 2 pins and wire the twisted pair if you are using the keying signals from the TIK2. If you require any additional connections, do them to the DB-9 now. If you have the ELECRAFT AUX. I/O option installed, verify the switching signals supplied or use an open pin for the desired signal.

Now find the male and female metal pins, two round plastic housings Connect the plastic housings together. They interlock one way. Please note the direction. Place any 3" White/Red wire end in any metal pin and crimp with pliers. Do the same with the other wire and pin. Solder both wires to the connectors. **Important!** Once you insert the pins in the housings, they are difficult to remove! Insert the male pin in the larger of the two plastic housings from the backside of the housing. (the non-connecting end) Be sure that the direction is correct before locking the pin. Insert the female pin in back side of the smaller housing. Be sure both pins lock. Connect them both for a trial fit.



## Prepare the K2

Remove the W6 jumper from the RF board in the K2. This connection is replaced by the relay on the TIK2 after it's installation. Now, this is where we ran into a problem. With the W6 jumper removed and the DEM TIK2 interface installed into the J13 connector, the bias to the power amplifier section, "8T", remains connected in transmit. In our opinion, there is a slight chance that while using the transverter, if the bias remains connected to the finals, it may transmit a low level signal on 10 meters or worst case, the amplifier section may break into oscillation. We tried but there wasn't a way we could get away without cutting a trace on the K2's RF board to solve this problem. The good news is that the DEM TIK2 will control the "8T" signal to the K2's amplifier section. When the transverter is enabled, the "8T" signal is removed from the K2's amplifier circuit. Disabling the transverter re-connects the "8T" signal.

The trace that connects the "8T" signal to the gate of Q10 needs to be cut. It can be done on the topside of the PCB. It is a small 10 mil trace. Use a sharp knife. Do not get creative and drill out the near by via!! You will disconnect the "8T" signal from the J13 connector. Cut the trace as close to Q10 as possible The gate lead is the lead closest to the Q10 silk screen indicator on the PCB. If the transverter interface is removed, the trace can be easily repaired.

If you decide not to modify the K2 in this fashion, install a 10 watt 50 ohm load on the Antenna port while using the transverter interface for safety and preventing unwanted transmitted signals.

Ok! That's all of the dirty work! Lets make the system work. Find the wire with the single female connector and attach the end to the leg of R61 that is closest to the silk screen indicator. Then install the male end in the NC connection of the TIK2. These are now called the "8T" connectors.

Insert the TIK2 in the J13 connector. Connect the "8T" connectors. Position the top cover of the K2 along side of the AUX 12V side of the transceiver. Connect the AUX 12V connection. Then use the supplied tie-wraps to bundle the wires together as needed. The assembly is done.

## Operation

Place the transverter enable switch to the OFF position. Power up the K2 and verify its normal performance on the 10 Meter band, both TX and RX. With a antenna installed, tune in a signal on the band. Now switch the transverter enable switch to the ON position. The signal should disappear. If the signal is very strong there may be some leakage . Remove the antenna to verify. Then connect the antenna to the RXIF port (XVTR IN). The signal should come back up. If you have a milliwatt power meter, connect it to the TXIF (XVTR OUT) If your K2 is normal. It should be between +0dBm and +5 dBm output. If OK you can check the keying signals if used. Verify that they switch correctly and that the 8R delay works in the CW mode. Consult the K2 manual for the 8R HOLD set up.

If you encounter any problems, review you assembly or consult the K2 manual if you have function problems with the switching circuits. If it all checks, connect it to your transverter with good quality 50 ohm BNC cables and install the male DB-9 connector for you switching needs if required. Addition switching signals may be wired to the AUX I/O connector if desired. Then set your levels in the transverter and test. Always use the 8R for any type of CW operation to avoid relay chatter! You are ready to go! Have fun!

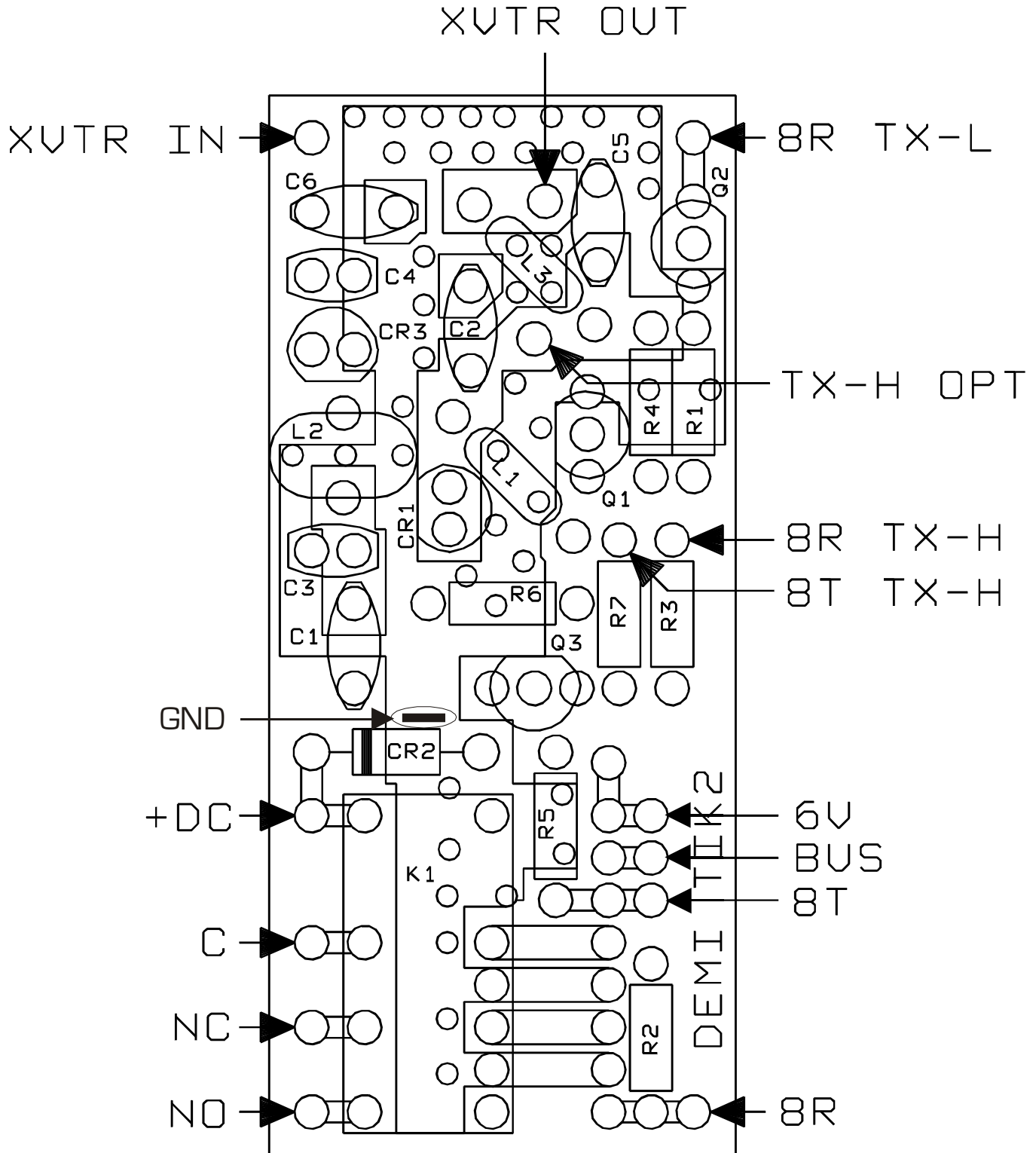


**Components List**

C1,C2,C5,C6	1000 pF
C3,C4	100 pF
CR1,CR3	MPN 3404
CR2	1N4000 type diode DPDT 12 volt relay, dip mount
K1	G5V DPDT 12 volt relay, dip mount
L1, L3	1.0 $\mu$ h choke
L2	12 turns, #28 on T25-10
R1,R2, R5, R6	10K 1/4 watt
R3	2.7K 1/4 watt
R4, R7	1K 1/4 watt
Q1,Q2, Q3	PN2222

**Hardware**

1- DPDT Slide Switch	1- DB-9 Female
2- BNC connectors and hardware	1- 8 pin header assembly
1- DB-9 Male	1- 2 pin Molex set
1- Single pin Molex set	2- 4-40 X3/8
2 - #4 lock washers	2 - 4-40 nuts
1' Black wire	2' Red wire
1' white/Red wire	1' twisted pair wire
30" Teflon coax	1 DB-9 hood
4 tie wraps	



# DEMI TIK2 ASSEMBLY

