

DEM Part Number TCK
NEW DEM TRANSVERTER CONTROL

The DEM Transverter Control (DEM TC) has been redesigned in 2009 to perform with both separate IF and common IF microwave transverter boards or Mixers and to accommodate the connections for the A32 synthesizer such as frequency switching and "LOC" indication. It is still the basic "TC" board with the extra hooks incorporated. It is now used in every DEMI microwave transverter 2304 and up and provides the regulated +9VDC, IF switching and attenuation functions, DC switching functions and external 24 VDC relay driver. This new TC assembly manual supersedes the A32RFK assembly that may or may not accompany the A32 circuit in your complete kit.

Circuit Description:

The DEM TC circuit board measures 3.75" x 2.15", which is designed to fit all new DEMI microwave enclosures. It is not designed to be a drop in replacement for the original TC board. The TC offers all of the functions the microwave transverters require such as providing a common or split IF operation with up to a 10 watt IF drive level with either a PTT High or Low for keying. It also incorporates adjustable attenuators for both transmit and receive and can be connected to a 1 or 2 mixer system. It has an option for additional receive gain if required and will perform all dc switching functions for the transverter. A new feature for the TC now includes a PIN diode switch network that connects the TC to a single mixer transverter while still allowing the TX and RX gain independent adjustments. Another feature included on the new TC circuit board is connection points for the "LOC" led and frequency switching of the A32 synthesizer. With this new design, this circuit more versatile and will accommodate other makes of microwave transverters or offer more flexibility for homebrew equipment.

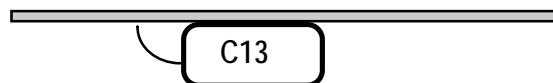
Construction:

Before construction, read the complete document and review the component placement document and schematic. Depending on your system design, or the type of transceiver to be used, you will need to make a few decisions about the assembly of the TC.

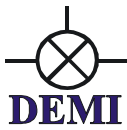
Most components are thru-hole except for IC1, SMD capacitors and Pin diodes used for common mixer transverters. All DEMI transverters will need the standard TC and not the common mixer configuration. This configuration will be shown as an option at the end of the document.

Referring to the provided schematic, parts list, and component placement diagram, install and solder all components in this order: All SMD chip capacitors, C1-C8 on the top side All leaded components, R1- R3, R5 - R12, D1 - D6, C9-C11 and Q1 on the topside. Install K1 and C13 on the bottom side of the PCB. Refer to the pictorial for the installation of C13 and check it's polarity. This capacitor is mounted so that the case is against the bottom of the PCB. If it is mounted in the traditional manner, the TC will not fit in the Complete Kit enclosure.

TC PCB TOP



If this TC is to be installed in a 5760 or 10368 transverter, install K2 and K3 on the bottom side. If the TC is to be installed in a 2304 or a 3456 transverter, install K2 and K3 on the topside.



The reason is that all DC control wires may be added or removed with ease if the relays are not in the way. Also Damage may occur to the relays if they come in contact with a solder iron inadvertently. Final assembly step is to install the required jumpers. Connect the +9, and the +13TX with 2 short Teflon wires on the bottom side of the board. It is designed to be mounted on the bottom side. If it was mounted on the top side, the transmit and receive functions would be reversed from the rest of the TC

You may install the optional RXIF gain stage but it is a judgment call. If you do not need the extra receive gain, do not install it. This gain stage will not affect the final system noise figure in our standard transverters. Refer to the transverters operation guide to decide to install or not. To install it, cut and remove the trace where IC1 is located and install IC1 as shown.

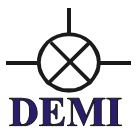
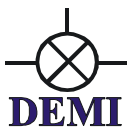
If you are using less than 100 mW of IF drive, install the extra.01chip capacitor in the R4 position. If you wish to use up to 1 watt, install R4 by surface mounting the leads. If you plan to use 1 - 10 watts of IF drive, install the 1pF capacitor in the R4 position. You may experiment with higher drive levels and a variable capacitor may be used in the R4 position. It is not supplied in this kit. In most cases, all drive levels between 1 mW and 10 watts will work with these configurations.

If you are using the TC with a different system other than a DEMI transverter, you may choose not to assemble certain components. If you wish to use the TC with separate TX and RX ports, do not install C3 and C5 or do not assembly K1. If you do not have a use for the 9 VDC circuit, do not install VR1. You may also install any other value regulator you wish. If you do not desire the 24 Volt relay driver, do not install K3, C13, and D3-D6. You may also use the K3 relay for other switching circuits. Just wire it as you desire. There are many possibilities so plan ahead but if you assemble everything, you have the options in the future. If the TC is not placed in a DEMI Transverter enclosure, you will need to make a decision on how to provide heat sinking to VR1 and the 50-ohm load if used. Also a determination will need to be made about how to install the switch and the 3 LED's. Also—K1 should always be installed on the bottom side of the board. It is designed to be mounted on the bottom side. If it was mounted on the top side, the transmit and receive functions would be reversed.

Installation:

When installing the TC in a DEM transverter enclosure, refer to the transverters complete kit document for the location of the TC. To install, mount the TC in place with two 4-40 x 3/16 screws. Insert the switch, LED's, and VR1. Do not solder! The groundside of the LED is the shorter lead. Bend the LED's in a position to face the front panel that will be installed on the transverter. Place the front panel on the transverter and align the LED's and the switch to fit in their mounting holes. Attach the front panel with 2 flat head screws. Now solder the switch and, LED's in place. You will not be able to solder the 2 front isolated leads on the switch. Attach VR1 to the front panel with a 4-40 x 1/4 screw and nut. Solder at least one lead of VR1. Now remove the front panel from the transverter and solder the two isolated leads on the switch along with any other unsoldered leads and check all other solder joints that were just made. Clip off the excess leads from the newly installed components and replace the panel.

If you desire a multiple frequency configuration in your transverter, a switch should be installed in the remaining 1/4" hole in the front panel. Trial fit to be sure of its clearance. The A32 frequency selection or connected to ground. So, run a short wire from the TC ground plane to be the "Common" connection on the switch and then connect up to 5 wires (depending on your switch



or desired amount of frequencies) to the "Frequency Select" bus on the TC. This "Bus" is just a tie point for the connections from the A32 to the switch.

If you TX drive level is higher than 250 mW, the 50 Ohm load should be installed now by bending the lead up on the package then placing it aligned with the mounting hole. Bolt it to the panel with a 5/16" or longer 4-40 screw and nut. Solder one lead to the ground and the other to the active circuit, Then should be surface mounted so cut excess lead as you see fit.

The TC is designed to have all DC interconnects on the topside in a 5760 or 10368 transverter and the bottom side in a 3456 or 2304 transverter. If the wires are to be installed on the top side, you are ready to attach. If it is a 2304/3456, remove the TC from the enclosure by unbolting the Load and VR1 then the two mounting screws.

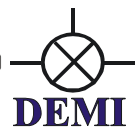
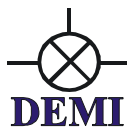
Now for both wiring schemes do the following. If you are using a 24 volt TR relay, connect the AUX connector wire on the transverter, to the +R on the TC. If you desire to have either +13 or +9 voltage during receive or transmit connected to the AUX connection, do so. Depending on the Push-to talk scheme of you transceiver, either connect the PTT-H (voltage to transmit) or PTT-L (ground to transmit) connection of the TC to the PTT connector of the transverter. Connect the +DC input connector of the transverter to the +13.8 connection on the TC board. Connect all of the Receive, Transmit, and +9VDC connections from the transverter to the TC board at the VTX, VRX and +9 connections. Now at this time, if you wish to add any extra connections to the outside of the transverter, install the connector and hook it up to the connection on the TC. Be sure that all connections except for the IF cables, are connected between the TC and transverter. If complete, and all wires are installed on the bottom side, install the TC on the 1/4" standoffs using 4-40 x 1/4" screws.

All IF coax connections now need to be made. The 5760 and 10368 transverters have coax jumpers installed in the pallets. Just trim and connect to where they belong. For the 2304 and 3456, cut and trim short coax jumpers and solder between the mixers and the correct RX and TX connections on the TC. Soldering the coax on the RX and TX side of the TC is straight forward. Solder the center conductor to the path and the shield to the ground plane. The transceiver input/output connection to K1 should now be made. Make these connections as desired or as shown in the transverter document. If you require separate transmit and receive connections, two coaxes will be required. Solder both ends of the shield to the lugs or ground plane of the circuit board. If your IF rig has a PTT voltage on the coax, The L1 choke can be installed between C4 and the PTT-H connection on the TC.

Final connections for the A32 synthesizer need to be made. With the A32 positioned in the enclosure, make the +DC connection to the +9 via located by VR1. Then, the LOC wire connected from the A32 connects to the via that is on the same pad as the LOC led. If you desire to have a multiple frequency configuration .The transverter is now ready to test unless the complete kit transverter document says other wise.

Operation:

Before powering up and actuating, refer to the transverter's testing procedure. RF Input power to the TC is dependent on the attenuation installed on the C3 side of the K1 relay. The 50 ohm load resistor is designed to handle 35 watts with proper heat sinking. When mounted to the front panel of the transverter, it will not tolerate more than 10 watts reliably for a long period of time. You may experiment with external heat sinking if you desire additional external attenuation. External attenuation may be used in the transceive path. The added attenuation on the receive



signals may be overcome by adding the RXIF gain stage. The level may be adjusted with the RXIF adjustment.

The RX/TX IF isolation is $\approx 60\text{dB}$. The adjustable RXIF and TXIF controls have 15 -20 dB of range. Simply grounding the PTT-H line or applying a voltage between 1-15V to the PTT-L input will switch all RX/TX functions in your transverter and provide external DC switching functions. If you transceiver has +voltage on the coax during transmit, the addition of the L1 inductor will perform the TX/RX switching functions of the transverter. The output of the +24 volt relay driver should measure +24 to +28 VDC with no load. It will only measure the DC input voltage of the transverter if it is loaded with a common type SMA relay.

The TC is not designed to be a RF sensed switch. It has 3 relays and it may be connected to external mechanical relays. If any RF sensing scheme is added to the circuit, it will cause excessive relay chatter that will not only wear out the relays prematurely, but could cause other failures to external preamplifiers and or power amplifiers if used in your system. RF sensing circuits are not recommended with any circuit that contains mechanical relays at RF frequencies!!

Parts List

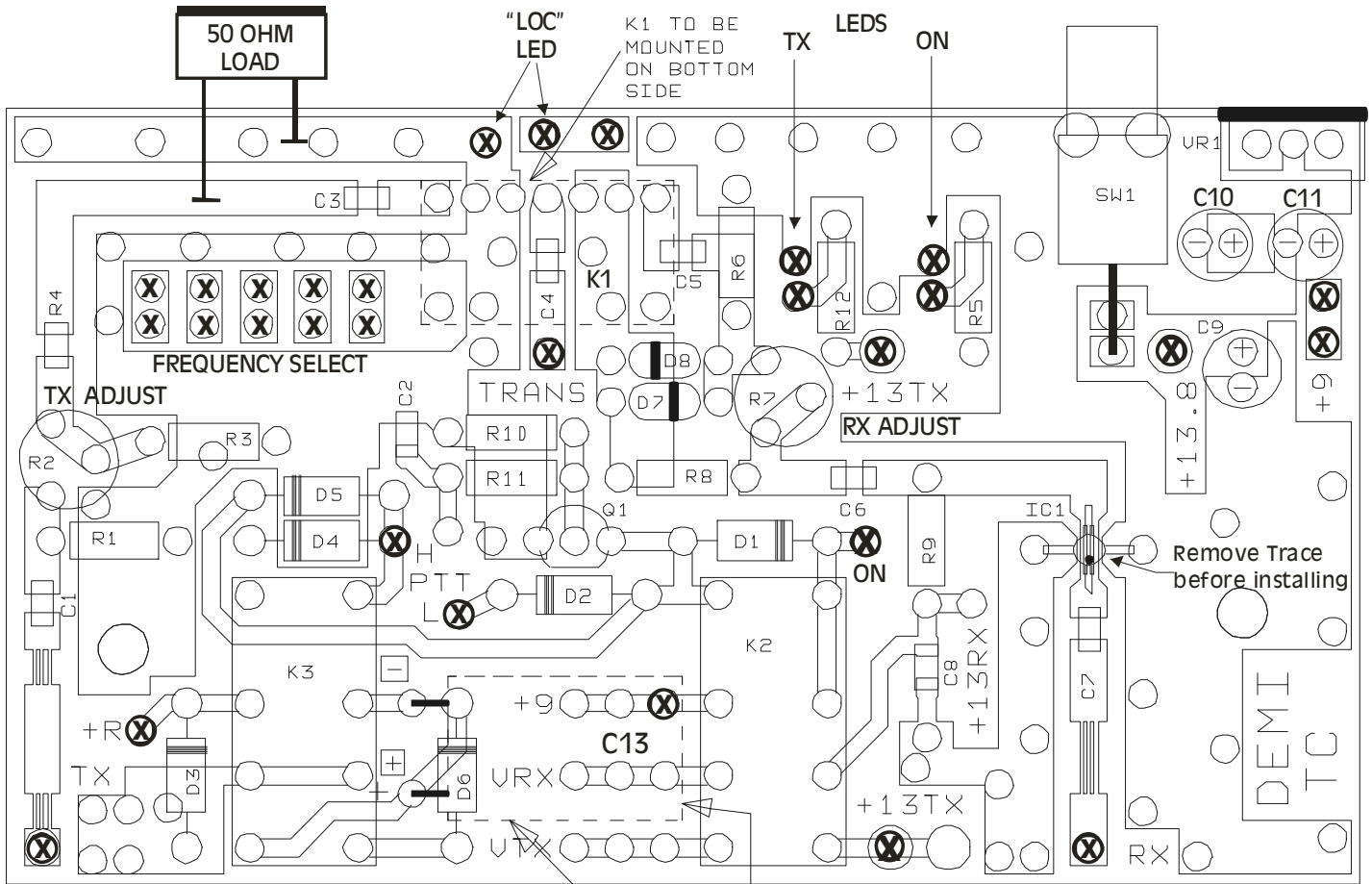
C1 0.01 μF	C11 2.2 μF elect.	Q1 PN2222	R10 5.1K Ω
C2 0.01 μF	C13 330 μF elect.	R1 220 Ω	R11 5.1K Ω
C3 0.01 μF	D1 -D6 1N4000	R2 1K pot	R12 330 Ω
C4 0.01 μF	D7 1N914 or 1N4148	R3 220 Ω	2 - Red LED
C5 0.01 μF	D8 1N914 or 1N4148	R4 220 Ω ③	VR1 78S09
C6 0.01 μF	IC 1 MAR6 ①	R5 1K Ω	50 Ω load
C7 0.01 μF	K1 G6Y relay	R6 220 Ω	1 pF ③
C8 0.01 μF	K2 G5V or AZ8222 relay	R7 1K pot	
C9 100 μF elect.	K3 G5V or AZ8222 relay	R8 220 Ω	
C10 2.2 μF elect.	L1 1.0 μh (Brown/Black) ②	R9 330 Ω	

- ① To add RXIF gain, the circuit board trace is cut before installation if IC1.
- ② L1 is used with transceivers that have + DC voltage on RF line during transmit
- ③ Depending on the drive level used, R4 may be replaced with a 0.01chip, a 1pF leaded capacitor, a 220 ohm leaded resistor or a variable capacitor. See text for description.

Single Mixer Option Parts List for 144MHz IF

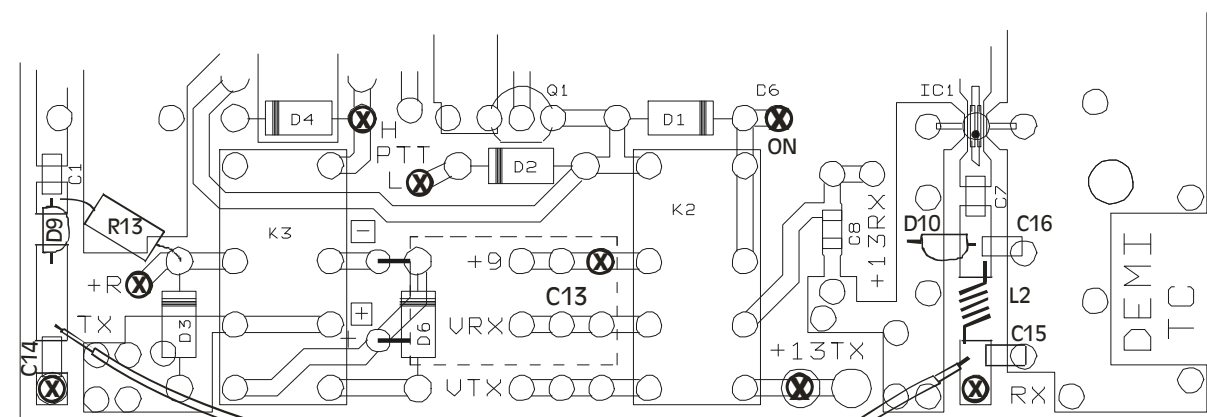
C14 0.01 μF	C16 18pF ①	D10 MPN3404	R13 1K Ω
C15 18pF ①	D9 MPN3404	L2 5T 1/8" dia. ①	

- ① For 70cm IF operation use 6.8 pF and 3 turn inductor.



C13 TO BE MOUNTED ON BOTTOM SIDE LAYING DOWN

DEMI TC



COMMON MIXER IN/OUT

COAX

TC Single Mixer Option