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DEM Part Number 10368-144CK
10 GHz. Transverter Complete Kit

Description:

This document is the last part of the complete kit assembly manual. It includes the final assembly and testing instructions for implementing the 10368-144BK transverter, the MICRO-LOK and the DEM TC, in our supplied hardware and enclosure kit, the 10368-144 HK. The HK assembly manual is a continuation of the BK assembly manual after step 3 of the RF testing instructions. These instructions are very specific and they will produce a transverter exactly like our factory production unit. This kit and assembly manual will only work with the 10368-144 BK. If you have already assembled the a 10368-144 PCB with your own components, then wish to use our hardware kit to complete your project, you results will not be guarantied unless you have used our machined mounting plate for mounting the PCB! There is also no guaranty of your results unless all of the 10368-144BK assembly and test procedures have been completed and the MICRO-LO and TC sub-assembles are used.

Assembly:

Verify that all steps of the 10368-144BK up to No. 3 of the RF testing have been completed. If it is ready for the next step in construction, review the Hardware parts list below by identifying and verifying that all of the components are there. It is important to be sure of the size of all of the screws for ease of assembly. Four of the five 3-48 x 3/16" screws from the BK are required for the CK completion. They were the screws that held the SMA test connectors. They will be used to hold the New SMA connectors to the connector panel.

10368-144 Hardware Parts List

6- 4-40 x 1/4"	5- 3-48 x 3/8" screws	3- 8-32 feed thru	1- Hole plug
2- 4-40 nut	1 - # 4 Ground Lug	2- BNC connector	18"- RG-188 coax
2 -4-40 x 9/16"	2- #4 x 1/8" spacer	2- SMA connector	2'- # 26 Teflon wire
2- 4-40 x 3/8"	2- 1/4" threaded standoff	1- SPDT switch	
2- #4 split washers	8- Flat head screws	2- Machined End Plates	

1. Verify that the RF end of the PCB is trimmed flush with the pallet. If the circuit board hangs over the edge of the pallet when the panel is mounted, the PCB will buckle up and possible damage will occur. Trim it flush with a sharp knife using the pallet as a guide. If the PCB was not aligned correctly, do not attempt to re-align the PCB to the pallet. Just use the pallet as a guide and trim off the excess PCB material even if you need to cut circuitry. Be sure the rear panel will mount flush.

2. Refer to Figure 1 and install the rear panel to the PCB by first prepping the SMA connectors so that the Teflon will not interfere with the circuit board. Insert the SMA connectors through the panel and using the panel as a guide, trim the excess Teflon with a sharp knife flush with the panel. Make a clean, square cut. Now trim the center pins to 1/16" extending from the

Teflon. Attach the SMA connectors to the panel with four of the #3-48 x 3/16" screws left over from the BK. Then attach the panel to the pallet with five 3-48 x 3/8" screws. Note that the ground lug is mounted under one of these screws. Look for any gaps or bulges between the pallet and the panel. Tighten the 5 screws evenly and be sure the cut center pins do not interfere with the circuit board. If needed, disassemble and re-trim the Teflon and try again to obtain a perfect fit.

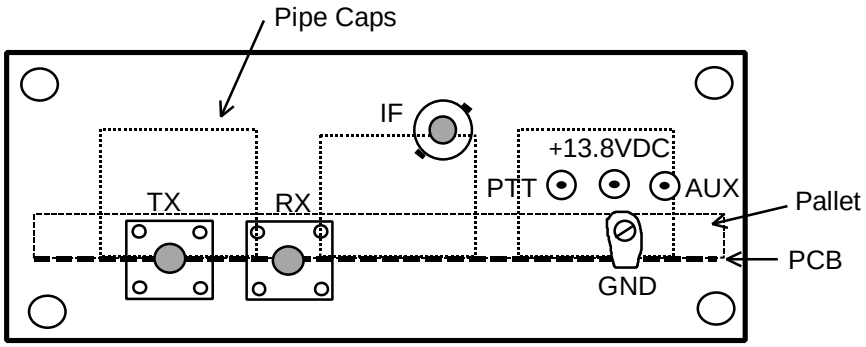

Figure 1.

3. Attach all of the 8-32 feed thru connectors and the required BNC connectors. If you desire a common IF (receive and transmit through a single connector) only install 1 BNC. If you desire separate Receive and Transmit IF connections, install both BNC connectors. Be sure to install the lock washer and the ground lug on all BNC connectors.

4. Examine the 2 enclosure halves. Notice that in one half, the 4 taped holes are closer to each other than the other half. This is the transverter side. The installation of the transverter assembly is easier and there is less strain on the MICRO-LO coax if the coax is detached from the MICRO-LO board. Install the pallet assembly in the housing using the two 4-40 x 9/16" screws and 1/8 spacers. Be sure not to pinch any wires. Seat the pallet in place and start the screws. Then start the two flat head panel screws. When everything lines up and you are sure about the spacers being in place, tighten all four screws. Refer to Figure 2. if needed.

5. Install the two 4-40 standoffs with the split lock washers in the two remaining holes that are in the transverter side of the enclosure. Make them snug but do not over tighten. The threads are Aluminum. Now refer to the Installation section of the TC assemble document and proceed with the installation. Be sure of your IF configuration and continue to step 6. Of this document after completion.

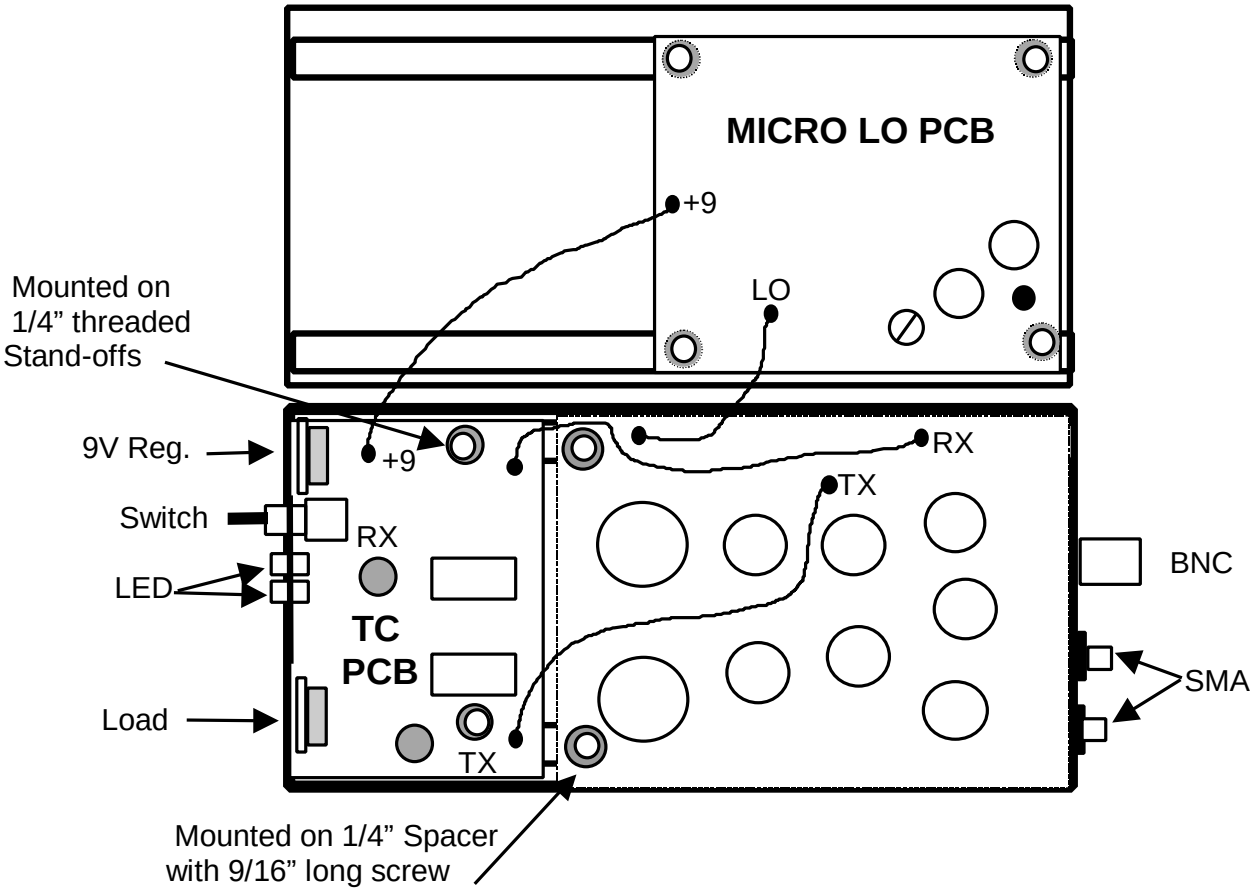

Figure 2.

6. Install the MICRO-LO in the other housing half as shown in Figure 2 using four 4-40 x 3/16" screws. When both halves are aligned as in the pictorial, solder the LO coax to its position and connect the +9VDC wire from the LO to any +9 connection on the TC board. Then re-check all connections and verify that there are no lose wires, if so identify and connect if needed. Check all mounting hardware and connectors to be sure nothing is lose.

Testing:

1. Start by getting the same equipment ready that was used for the LO tune-up. Preset the IF pots on the TC board by turning them counter clockwise. Connect 13.8VDC to the transverter and switch the power on. The LED should light. If OK, check voltages on the TC board. There should be +9VDC on the VRX and the +9 points. There should also be +13.8VDC where indicated on the TC. Now toggle the TC board by activating the PTT circuit. The relay will click and the TX LED will light. VRX drops to zero volts and the VTX will now be +9VDC. The unit should now be ready for RF testing.

2. For testing the completed transverter, the TX level at 144 MHz. will depend on the configuration of the TC board. So depending on the level required, connect your TX signal source to the correct BNC connector on the transverter. For initial testing, the TXIF pot is in the maximum

attenuation position. What ever level you use into the transverter, just don't exceed the level of 1 mW to the mixer. If you do, excessive drive will produce spurious and make aligning the TX chain more difficult. Connect a RF power detector to the TXRF port of the transverter. Position the transverter so the filter adjustments are accessible. Key the PTT circuit and apply the 144 MHz. TX signal to the transverter. If the adjustment screws of the filters were pre-set, monitor the power detector and adjust F5, F6 and F7 in order. Start by turning them ***IN***, 1/8 of a turn at a time maintaining lock nut pressure. Power should be detected eventually. When power is detected, remove the 144 MHz. IF signal to verify that the detected signal vanishes. You may also want to adjust the TXIF pot on the TC board to verify operation. If the power doesn't change, you have tuned the filters for the LO frequency. If so, continue adjusting the screws 1/8 turn at a time in the same ***IN*** direction until the next power peak is detected. Verify that it is the desired signal by removing the 144 MHz. IF signal. When you are sure you have the desired signal, peak all filters one at a time starting with F5. After each filter is peaked, remove the 144 MHz. IF signal and re-verify that the detected signal vanishes. Final output power should be greater than +5dBm with your desired IF drive level but will depend on the loss of the filters. Toggle the PTT with the IF drive off and check for oscillations. If none proceed to the RX testing.

If output power is less than +5 dBm, check the following in this order: Low or High voltage. Verify that the LO multiplier and/or LO is connected to +9VDC. C35 not installed in the operating position (need to remove pallet to check this). IF drive power level (To low, or To High could cause tuning on wrong mixed product). IF coax cable short or open. Damaged C28 from connector installation. Filter Probes (length, shorted, missing) D2 blown from excessive drive. Suspect defective MMIC last. Always Question Construction.

3. To test the 10368 RX, a signal source at the desired receive frequency is required. This may be a signal generator, a harmonic from a transmitted signal source, or a on the air signal transmitted from a 10.368 GHz. transmitter. The IF port should be connected to a 144MHz. receiver with an "S" meter, though a low level power meter, spectrum analyzer, noise figure meter or service monitor may be used. The transmitted signal from the transverter should not be used because of the use of the same IF frequency. It would be very difficult to determine what was the desired signal versus the radiated 144 MHz signal being detected in the IF receiver, no mater what level it was. At the factory, a 10368 signal generator set for 0 dBm with a 50 load on the output connector is used as the signal source and the transverter, with a 50 ohm load on it's input, is adjusted for maximum gain into a 144 MHz. receiver. Then we test it with a noise figure meter.

Actual testing and alignment starts with generating a 10368 MHz. signal and detecting it on a 144 MHz. receiver through the RXIF connector on the transverter. Be sure that the 10368 RX port is terminated with a 50 ohm device while adjusting the filters. If connecting a signal generator directly to the RX port, do not exceed -20 dBm. A signal source higher than that will compress all of the gain stages, possibly generate harmonics, and make alignment difficult. With the DC power applied to the transverter, adjust F8 and F9 filters by turning the screws ***IN*** to maximize the IF level signal strength. Adjust 1/8 of a turn at a time while maintaining lock nut pressure. Keep adjusting until peaked. When complete, lock the nuts.

Completion:

When you become satisfied with the operation of the 10368-144, you may want to bundle all of the control wires and coaxes together to make a neat appearance. It is not necessary, but it will contain the wires to make closing the enclosure easier. Do not restrict the movement of the LO coax and DC supply wire. Do a final check on the TX and RX IF levels and if you are satisfied, close the enclosure and bolt it with the four remaining flat-head screws. Be sure not to pinch the LO coax and DC wire between a filter screw and the MICRO-LO PCB. Be sure to re-test the transverter after closing.

This completes the assembly and testing of the 10368-144. You now have enough knowledge of how this assembly works that implementing it into a complete working system should not be a technical problem. Remember that the unit is designed to operate from a +13.8VDC source but any voltage between 11 and 16.5 VDC will work making it perfect for portable operation. You may wish to test this before going portable.

Its receive conversion gain is limited to the RX section specifications and still may require some IF amplification to over come your switching scheme when interfacing the transverter with a 144 MHz. transceiver. That may be done by adding the MMIC to the TC board. If the transverter is to be used in a high performance terrestrial or EME set up, a Low Noise Amplifier may be desired. If so, additional filtering and isolation may be required and/ or the use of the RX OPT may need to be omitted. If a higher power amplifier is added, consider and additional filter and/or isolator. Also consider some attenuation if using a high gain TWT amplifier for +5dBm may be too much driving power.

As for portable operation, the transverter can be interfaced with our AOS144 RF sensed IF switch attenuator that may be used with transceivers up to 25 watts output. Higher output power transceivers are not recommended unless modified. Addition of external power amplifiers and LNA's can be accomplished with the AUX output of the transverter or by implementing a sequencing scheme. Remote location mounting is possible with this unit in is stock form. It would just need to be installed in a weather proof enclosure.

Conclusion:

We hope you had fun with this kit and that you enjoy many hours of operation with your completed 10368-144. Please take time to read the papers published by W1GHZ (N1BWT) for other operation tips and suggestions including antenna designs and a similar 5760 MHz transverter design.

The goal of this kit was to provide the radio amateur with a cost effective alternative to commercially manufactured units and to provide a compact and more portable transverter than assembled from large sized surplus equipment.

Good luck with the DX and have fun!