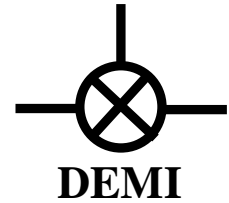


# Design Note



From: DEMI R & D Dept.

DN#: 029

Date: March, 15, 2012

Re: Installing the VHF ApoLO in the "L" series Transverters, the VHF ApoLO K

**PREFACE:** This document will aid the installation of the VHF ApoLO synthesizer in the new DEMI L144, L222, and L432 transverters. This installation will allow the option of switching between the original Local Oscillator and the new VHF ApoLO synthesizer when desired.

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**CIRCUIT UNDERSTANDING:** This document assumes this modification will be made to a functioning transverter. After reading and becoming familiar with the VHF ApoLO document, you should understand that there are a few frequency selection options. It is recommended to set the ApoLO to the same frequency or frequency range as the oscillator frequency in the "L" version transverter. You may opt for a different frequency only if you desire a different operating "IF" frequency.

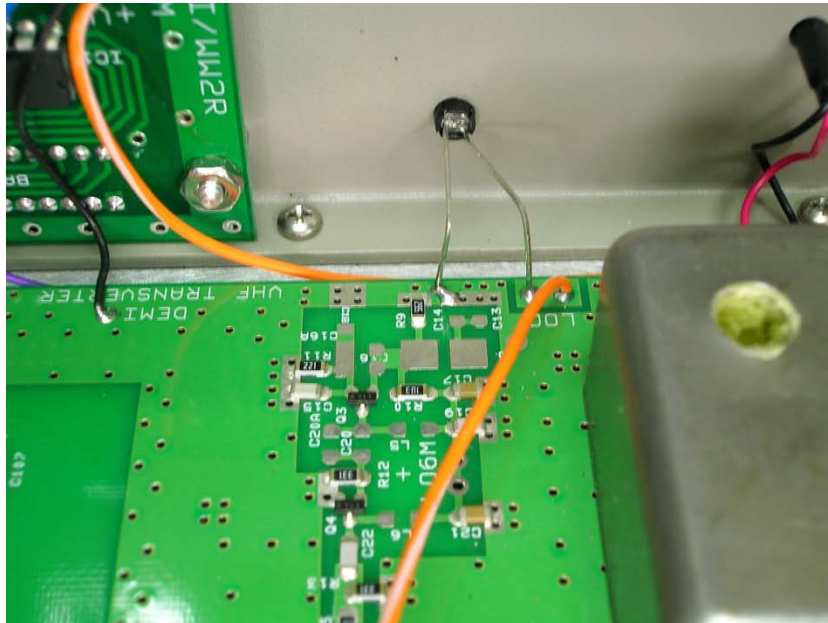
If you desire a different IF frequency from standard, select one that is band specific for your transverter (listed between 24 and 30 MHz IF), and understand that your 28 MHz IF transverter **will not** operate at the 50 MHz range just by changing the LO frequency. It would require other component changes that may include helical filters.

The circuit modification is straight forward but there are some details that should not be over looked. Understand that the standard transverter already has the pin switch installed that enables the switching between the standard LO and VHF ApoLO. Look on the component placement document for CR2 located near TP1. It is also marked on the circuit board. Near CR2 is the +SYNTH (+DC input) and SYNTH (RF input). Also note there is a Jumper wire between the +9 and +LO connections on the board. The following instructions assume that both VHF ApoLO and the standard oscillator will be utilized. If you just desire using the synthesizer only, you may use the following install guidelines but you do not need to replace the power switch.

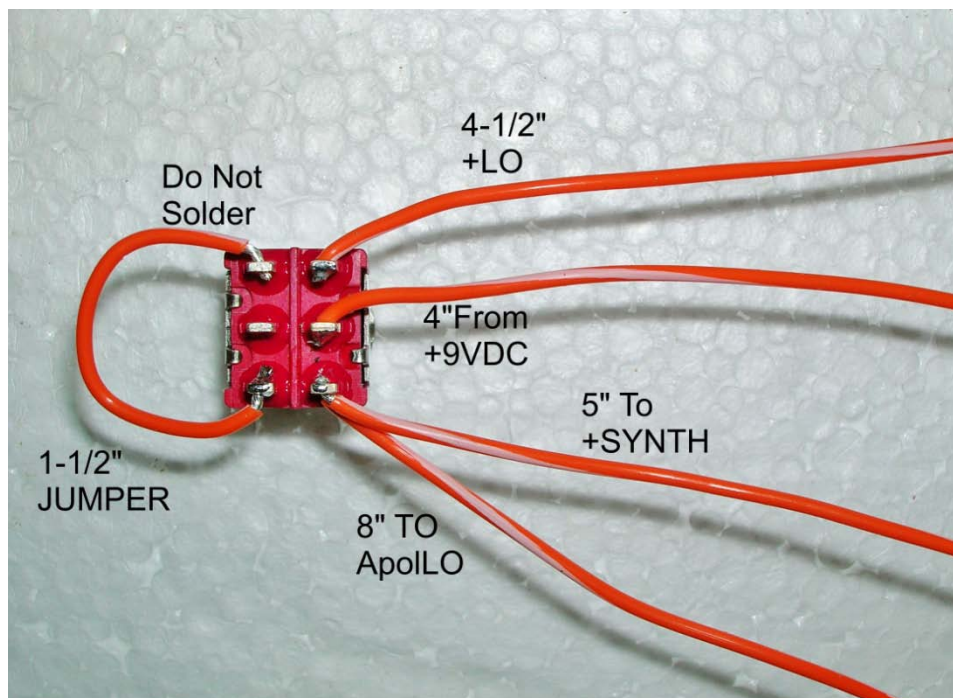
**CIRCUIT MODIFICATION:** Start by removing the jumper wire between the +9 and the +LO. Next, remove the power switch from the transverter by first removing the two wires. If you are not utilizing the standard oscillator (for dual oscillator function), just remove the "switched" wire from the switch leaving the center position connected to the +13.8VDC input. Next remove the 4-40 mounting screw near the mixer, M1 and the screw between IC9 in the sequencer and the IC the RF power module.

If you desire a LOC light, and if you have the first Revision transverter, a hole will need to be made in the front panel of the enclosure The hole size can be 1/8" if you do not want to use the LED holder or either a #16 or a 11/64<sup>th</sup> drill size with the supplied LED and holder. You may use any other color LED

or configuration you desire. It is not critical. The following picture shows it's placement with the second Revision board to use as a guide. Install the LED and solder in place.



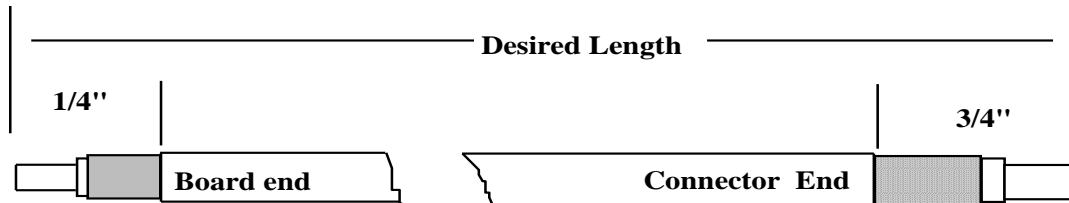
To ease final wiring, it is best to pre-wire the DPDT center off switch. See the following picture for correct placement and wire lengths. Again, if you chose not to have the dual oscillator, skip this step and all you will need is in the final wiring step covered later.



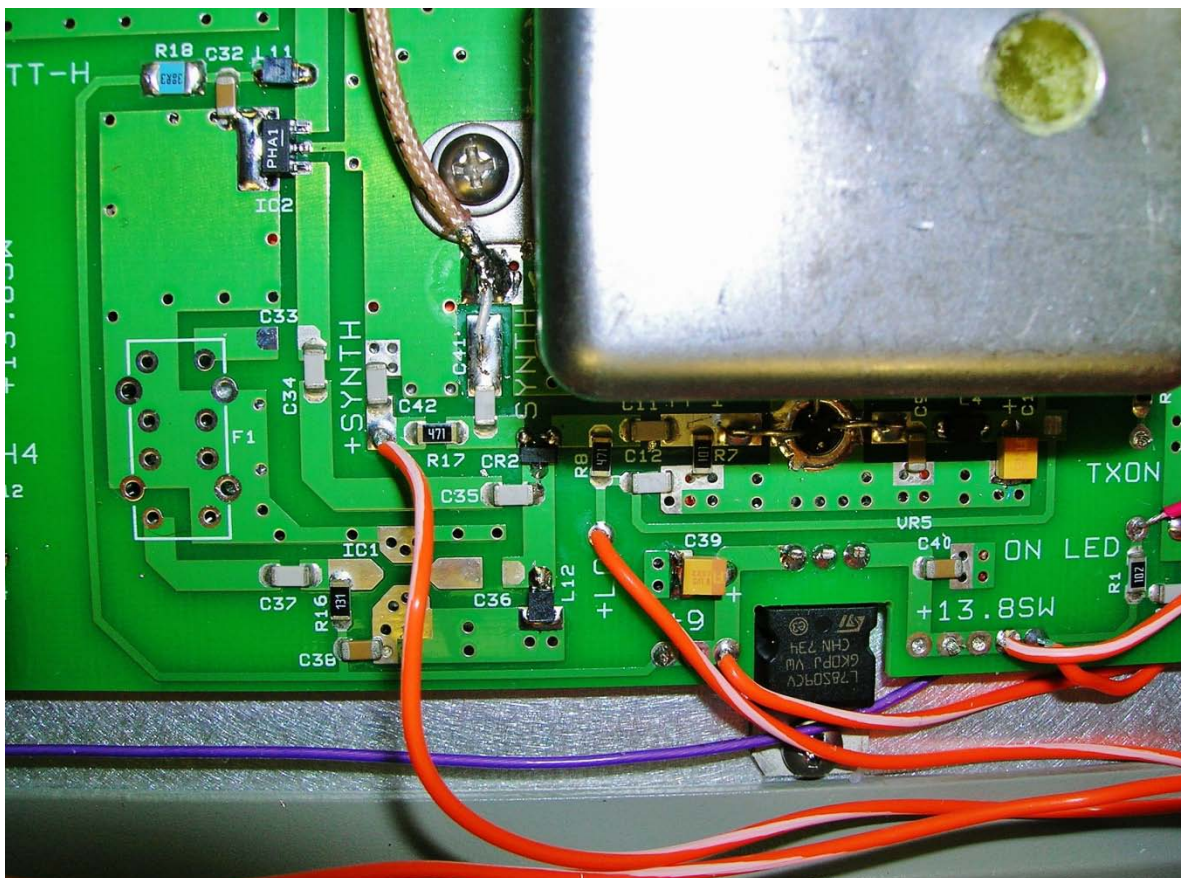
After completion, install the switch in the enclosure so that the +9VDC side of the switch (right hand side of the picture) is closest to the side wall of the transverter. The open center terminal of the switch connects to the +13.8 VDC wire from the transverter. The unsoldered wire connection gets doubled up with the +13.8SW wire on the transverter board. Wire and solder both of those connections now.

Next, install the BNC connector in the 10 MHz hole in the back panel with its lug towards the center of the panel. This is for the external reference. It is not suggested to use the on board 10 MHz TCXO in this application. The purpose of this "Upgrade" is to improve frequency accuracy and stability. If utilizing an internal 10MHz TCXO, it will be affected by the internal temperature change of the transverter and will not be an improvement over the standard oscillator and in some cases may be worse.

Now prep two lengths of coax, 3" and 8-1/2" as in the below diagram. The 3" needs two 1/4" ends and the 8-1/2" need both the 1/4" and 3/4" ends.

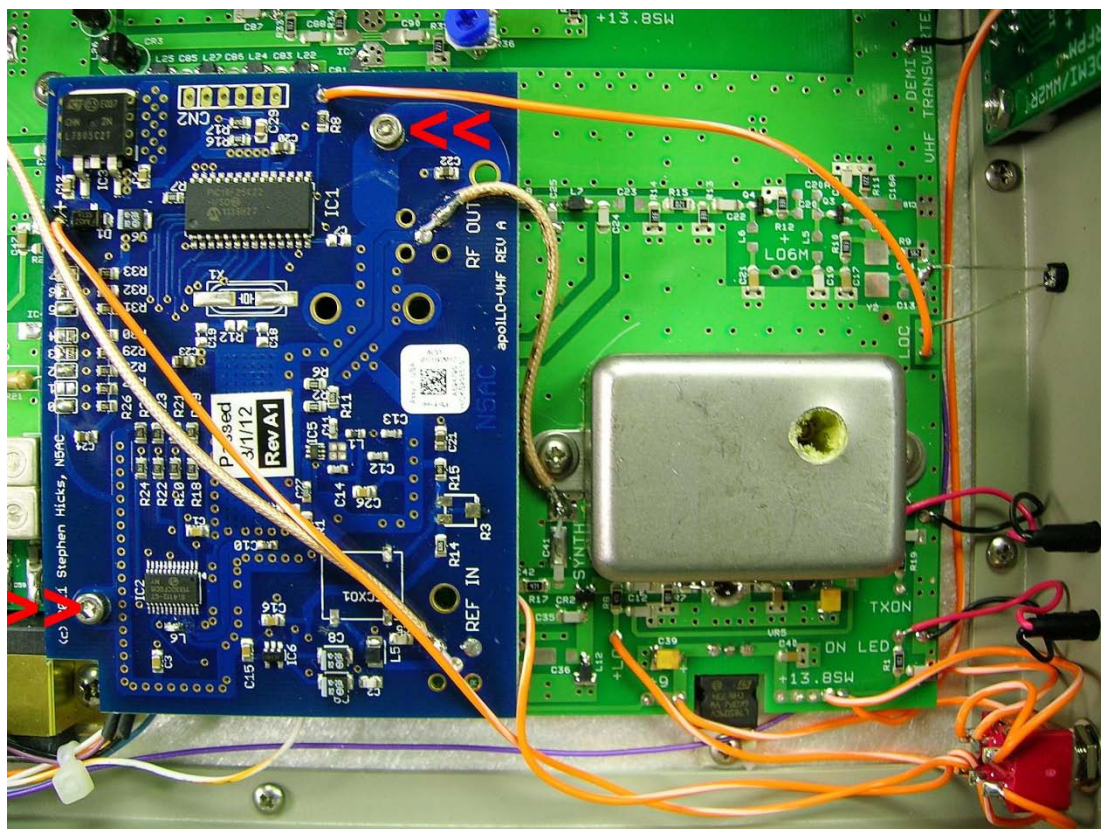


Connect the 3/4" end of the 8-1/2" coax to the BNC connector. Solder one end of the 3" coax to the SYNTH input on the transverter board as shown in the picture below. Then do some of the other wiring. Connect the 5" wire from the switch to the +SYNTH, the 4-1/2" to the +LO and the 4" to the +9.



If you are only utilizing the Apollo and not the standard oscillator, install a 2" jumper between the +SYNTH and the +9 connections.

Now find the 1/2" and 5/8" spacers and the 1-5/8" 4-40 screws, and then mount the VHF Apollo as shown in the next picture. The two screw holes are indicated with the <



Finish the wiring by attaching the 8-1/2" coax end to the REF IN, the 3" coax to the RF OUT and the 8" wire to the + all on the VHF Apollo board. If you do not desire the dual oscillator option, install a 8-1/2" wire from the + on the Apollo to the top side solder tab on the power switch. Finish all versions by connecting a 4-1/2" wire from the LOC pad on the transverter board to the via near R8 on the Apollo.

**TESTING:** If you desire, you may measure the level of injected signal into the mixer. It should be between +15 and +19 dBm. It can be measured with a calibrated RF probe or C28 or C29 depending on versions, can be removed and the level can be measured into a 50 Ohm system. BUT-If you have both oscillators, it is easier to make "A-B" comparisons.

First connect the 10 MHz source and then power up the transverter. With the switch towards the heatsink, it will enable the standard oscillator. With the switch towards the bottom, it enables the VHF Apollo. Remember, the switch has a center off position. In the Apollo position, the loc light should light. Disconnect the 10 MHz source, and the LOC light will diminish. Connecting the 10 MHz source back up may produce a blinking LOC light and will require the power to be cycled. All RX and TX functions will act normally except the only frequency error you will have will be because by your IF rig! If there is difficulty, the switching is basic. In one direction, it powers the standard oscillator and the PIN diode to allow the RF to pass. In the other direction, it only supplies the synthesizer and the other side of the PIN diode. The PIN diode and the Synthesizer should have +9 VDC switched to it. With the switch in either position, +13.8 is always supplied to the 9 VDC regulator, VR5 which also powers IC1 (if utilized) and IC2.

**OPTIONS:** The VHF ApOLLO may be installed in a separate enclosure and its output may be switch to different transverters in a single operator's station. Either a band switch or a computer generated switching mechanism may be utilized. It would require a quality RF switch to direct the RF output of the VHF ApOLLO at the same time the frequency selection was made. It is possible with a single inductor value, to supply the three DEMI VHF transverters the VHF ApOLLO was designed for on 144, 222 and 432 MHz.

It is possible to install a second switch to enable your transverter to be IF frequency agile or to keep the IF frequency for a different RF frequency. Remember the RF frequency of the transverters is not that agile because of the selective helical filters. It is possible to get full band coverage with the 144 and 222 MHz. units with slight re-tuning of the RF filters. A bandwidth of more than 8-10 MHz with the 432 transverter is about the limit so—adding a second frequency for the Satellite band is possible.

**CONCLUSION:** There will be future Design Notes as we discover the full potential of the VHF ApOLLO. There most likely will be frequency expansions as newer ideas and concepts are developed. We hope that this simple modification and install enables the use of a sidelined transverter of simply increases the performance of one that was on the air.

Have fun on the Bands!

#### **Component Parts List for the LVHFApoLK:**

2 - 1/2" hollow standoff

2 - 5/8" hollow standoff

2 - 4-40 x 1-5/8" screw

12" - Teflon coax

30" - Teflon wire # 26 or #24

1 - Blue LED and holder

1 - BNC connector and hardware.

1 - DPDT switch