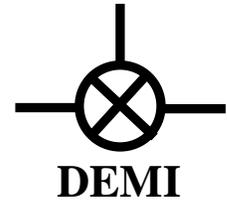


Design Note



From: DEMI R & D Dept.

DN#: 038

Date: March 20, 2021

Re: DEMI 3456 Transverter operating frequency change.

PREFACE: Since the introduction of "No-Tune" transverters in the late 1980's (yes it has been that long!) the basic design has not been changed. Yes, we have added circuitry of convenience to aid performance and assembly, but until the introduction of the A-32 synthesizer and the now utilized DigiLO, the transverter has been dependent on a Crystal multiplying Oscillator. Due to this "Harmonic Rich" signal being applied to the transverters mixers, adjustments have been made to the band pass filters (hairpin design) with the various production runs. With over 500 circuit boards produced, there is no straight forward answer to the question of changing the operating frequency of the transverter to comply with a new band plan when released.

EXPLANITION: Since the introduction of the two different synthesizers DEMI marketed in our microwave transverters, users have realized that frequency agility is simple and possible. Many found that operation on a mountain top on 10 GHz within a group, that by simply shifting the LO frequency of the Synthesizer it would allow the operator to utilize a different IF frequency to separate themselves for the others on the hilltop. As this became the norm, many realized that with a simple toggle switch on their transverter it will allowed them to operate on separate Transmit and Receive frequencies during an EME operation. This of course lead to many various experiments, some successful, some not. This brings us to the latest question. Can the DEM 3456 transverter be moved in frequency and how far with success?

EXPECTED RESULTS: When making a gross LO frequency change; without getting into the math to verify where certain harmonics or mixer products exist that may make your TWT or Toshiba amp produce 20 watts of output power by just keying the PTT line, one should expect results to vary. Some EME operators have simply changed the frequency of their local oscillator to operate on 3400 MHz and have great results. And the reason for producing this design note is to state that, some operators have not! So, following the ARRL band plan, and understanding that terrestrial weak signal operators can share the same general 300 kHz of bandwidth with EME operators as on 2 Meters by not pointing their antennas up, 3400 MHz becomes the logical choice to move to. In doing so, anyone with either a A-32 or a DigiLO synthesizer installed in their transverter can simply select the frequency required to produce a 3256 LO frequency and test to verify proper operation of their transverter.

As stated previously, results will vary and this is because of the topology of the filter design. As we were making the pass band of the filter design more narrow or skewed in certain directions, to eliminate harmonics and mixes generated by the crystal oscillator/multiplier circuits, we had no reason to change

or widen the filters with the non-harmonic related synthesizers. This results in an effective LO filter /amplifier chain (skewed lower in frequency) but does not benefit the RF filter/amplifier chain that has been purposely skewed higher in frequency. This RF filter design is utilized in the receive chain with two filters and in the TX chain with three filters. Due to the tolerance of the design and the actual printed circuit board material utilized; these RF filters may not allow efficient operation below 3420 MHz. Yes, there will be through put and some EME operators have just taken what they got and added the extra Receive or transmit gain stages, as needed, externally to the transverter.

Due to the MMIC design utilized in the transverter, most proficient operators added an external LNA to improve the receiver system noise figure to solve the problem. But on transmit, the chain may not produce more than -10 dBm for the Low power version. The 1W version transverter may only produce as little as 50 mW. And other transverters will work normally.

For those transverters that don't want to play at 3400 MHz, it is possible to extend the length of the hairpin filters just enough to allow enough output power for use. But, this should not be performed without being inspected with a spectrum analyzer. Just using a power meter and tuning for max power may result in allowing excessive LO power or some alternate mix, spur or oscillation caused by an impedance change of the filter or coupling of radiated LO power within the transverter enclosure. MMIC amplifiers are wonderful things but absolutely don't care what signal they amplify. So, if it is produced, it will be amplified and will cause problems!

RECOMENDATIONS: First, do not consider purchasing a new Crystal for your MICRO-LO oscillator. It would be difficult to find a manufacturer of a 7th over tone crystal in the frequency range required for under \$100 anymore, and it would be nothing but a headache trying to settle down all of the extra harmonics that would hamper your results. We recommend the purchase of a DigiLO Synthesizer that is basically a drop in modification. If our new band plan says 3400 MHz is the place to be, the synthesizer frequency is selected and testing is then started. The synthesizer is harmonic free and any spurious that shows up most likely is related to a different problem. A different design note will cover the installation of the DigiLO.

If your transverter already has one of the synthesizers installed, reselect the correct frequency and begin to test. Remember, if any filters require modification, verify proper operation with a spectrum analyzer and do not assume that if the output power increased, it is all Good! And of course, if you have developed your own custom LO chain for your transverter, it will work after you adjust it and retest the unit.

Then for those seeking instant gratification and the best possible results, you may send your 3456 transverter to us to upgrade to a DigiLO synthesizer or to change the frequency of your synthesized transverter and test and/or modify to the desired specifications for use. There is an established fee on our website for all transverter synthesizer upgrades. A retest and retune fee would be covered under our standard transverter repair fee.

FINNALLY: We hope this has cleared up some questions concerning frequency conversion of our 3456 MHz transverter and will allow our past customers some options of what to do with their equipment. BUT-- also understand that this band is under attack by commercial interests and most likely it will not stop with us moving to a lower frequency in the 9 cm band AND-- until we have to cease use of 3456 MHz, we should take advantage of the time left to utilize this band to it's fullest. .

Good luck, have fun and see you on the band

The Gang at Down East Microwave Inc.