

Design Note



From: DEMI R&D Dept.
To: ALL DEM 2304,3456,5760, and 10368 MHz transverter owners
DN#: 016
Date: September 19, 2002
Re: Low Frequency of Local Oscillators in all Microwave transverters

PROBLEM: In some instances, due to the nature of a crystal oscillators, the base local oscillator frequency can not be adjusted to produce a transverter that will have a “Zero” frequency offset. This design note will only cover oscillators that exhibit low frequency operation. A low frequency oscillator, requires a “+” frequency offset adjustment to the IF transceiver used. An example of a low frequency “LO” would be if the IF transceiver is required to be adjusted to 144.150 to operate on 2304.100. Simple subtraction shows the low frequency oscillator operation. ($2304.100 - 144.150 = 2159.950$)

DISCUSSION: Very few oscillators, including Down East Microwave MICRO-LO, run with the crystal operating at its true series resonant frequency. Most oscillator circuits look capacitive to the crystals used. The newer design DEM MICRO-LO circuit looks inductive to the standard series resonate crystals that are used in all DEM local oscillator circuits. It has been found that to properly match the true series resonate frequency of the crystal to the inductive nature of the oscillator, some type of capacitive loading is required. This will allow the oscillator circuit to operate near the true series resonate frequency of the crystal and allow a the user a better opportunity to “Net” the design frequency of the MICRO-LO.

Please note that this Design Note covers low frequency operation only. This fix will not solve high frequency operation, operation on the wrong overtone, start-up problems, frequency drift over temperature, frequency wandering in a stable temperature environment ,excessive spurious response and should not be applied to a non operating MICRO-LO . Most of these problems are caused by incorrect assembly or failed components. Design Notes will be established at a later date to address some of the problems stated above. If any of these problem do exist in your MICRO-LO, please consult us with symptoms for suggestions of repair.

SOLUTION: The solution for a low frequency MICRO-LO is to add some loading capacitance (5-15pF) to the base circuit. It is simple one but does require a circuit modification. To add loading capacitance to the circuit, the crystal and its shunt inductor need to be separated from the original circuit and then attached back to the circuit through a series capacitor. As indicated in the pictorial which is a copy of a segment of the MICRO-LO component placement diagram, you should wick off all excess solder in the area before cutting the trace. This will allow easy use of a razor knife to cut the trace. You may find that removing the L2 inductor (a .1uH molded choke) will provide extra space to cut the trace and install a 1206 chip capacitor. You will need to remove approximately 0.05" of trace to avoid a solder bridge while attaching the capacitor. The chip capacitor quality is not that important. A standard NPO 1206 size chip will be more than adequate. You could use a better quality chip such as a ceramic microwave type with a smaller foot print but it is not necessary. Do not use a leaded capacitor!

After installation, re-start and adjust the MICRO-LO as stated in the MICRO-LO document. You will need to adjust C2 for maximum voltage at the test point and then re-adjust for frequency if required. You should also recheck the frequency of operation after the MICRO-LO is installed in its enclosure and has completely warmed to its operating temperature. Re-adjust as necessary and then check for cold re-start after the LO and/or transverter have completely cooled down.

