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900 MHz Transmitter Tuning instructions

General information:

The Nu-915 radio transmitter was developed to provide support for the 900 MHz series Groundhog products. It will effectively replace the older intellon style transmitter while allowing continued production and replacement of existing systems over the next few years. Its design is similar to that of the existing transmitter, but now there are some notable differences that improve its manufacturability.

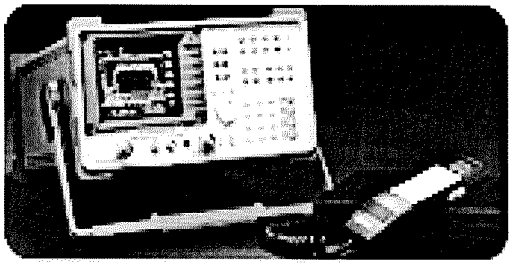
Key notes:

1. The Nu-915 uses the same pin out and footprint as the 2.45 GHz radio TX
2. Shielding the unit is not necessary since the oscillator is now more stable and the transmitter is installed in a safe, sealed environment (groundhog canister).
3. Tuning is accomplished using the helical resonators on the top right hand side of the TX unit.
4. Test procedures for the new TX are very similar to the original unit.
5. Antenna configurations for the 900 MHz versions of the G1, G2, and G4 are all compatible and the new 900 MHz antenna is also available.
6. Power level output is selectable via several solder jumpers on back side of PCB.

Test Procedure for RF analysis and FCC Compliance

Equipment needed:

Spectrum Analyzer HP8594E or equivalent with screen storage function
G2 or G4 unit modified with TX socket and TX switch control
Standard bladed tuning tool (ceramic if possible)
Power supply set at 3.6 Volts DC or Standard 3.6 V lithium battery used on Groundhogs
Power cable using molex style plug for groundhog
RF cable to connect Test G2 to Analyzer (typically a sma male to type-n male)



Example picture of Analyzer

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Unit Preparation:

1. Visually inspect Tx for any possible solder shorts, opens, cold solder joints of missing components.
2. Make sure unit has control marking for QC use (number using permanent marker if necessary)
3. Ensure the following jumpers are set.
   W1 Power control collector of Q4 to R3 (Q4 should be removed on this model)
   W2 Data from C32 to U1 pin 3
   W3 RF Level located above R9
   W4 RF Level located above R10

4. Check that the following components are set:
   R2 should be 15 ohms.
   C14 should be set at 1pF or C31 can be installed which is a variable cap.
   R1 should be set at 30 ohms.
   C37,1000pF it should be placed on top of R1.
   C38, 56pF is added. Next to R2 in open spot on the silkscreen.
   R9 and R10 should be set to 10.
   R27 will now be a 68 nH inductor, remove the 100 ohm resistor and replace.

Test Setup

Note: All equipment should be turned on and warmed up for at least 15 Minutes prior to testing.

1. Analyzer should be preset first then set to the following:

Frequency	= 915 MHz	Amplitude	= +10dBm
Span	= 50 MHz		
Trace	= Clear Write A		

2. Set power supply if used to 3.6VDC and current limit (if available0 to 300 mA.
3. Place transmitter under test into the socket on the test groundhog.
4. Verify that the unit is operating by following the tuning procedure.

Tuning Procedure

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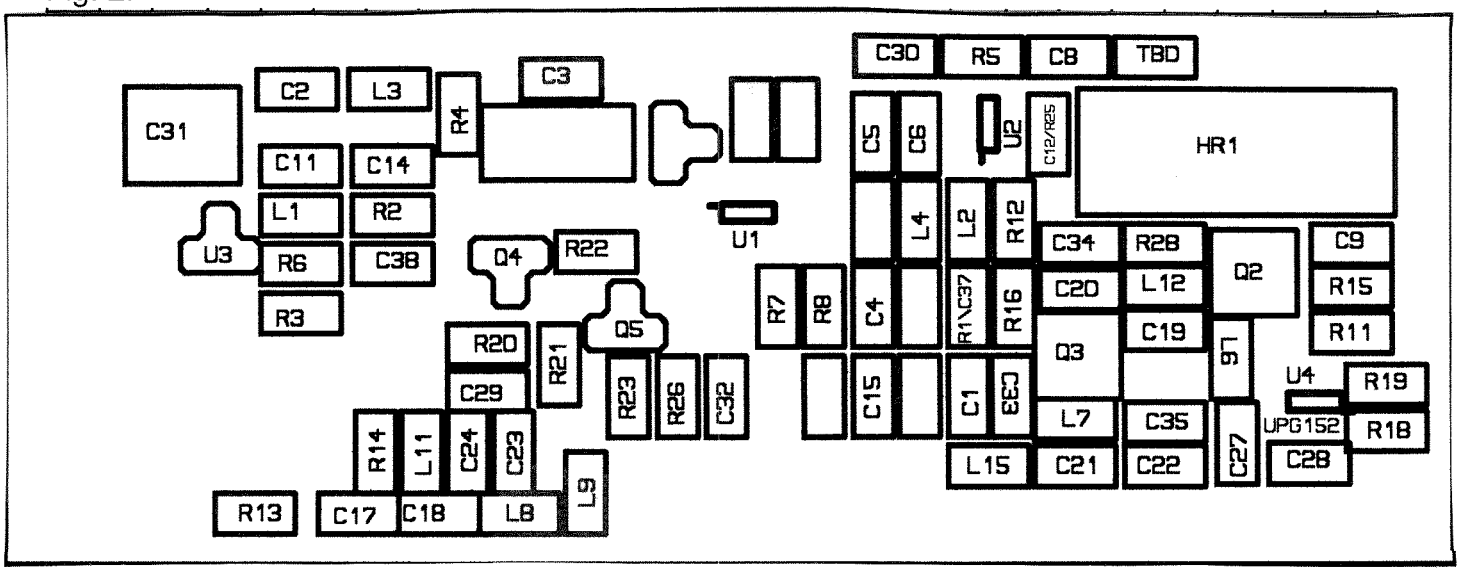
1. Key transmitter carrier by turning key switch to the on position.
2. Verify on Analyzer that the carrier is on frequency at 915 MHz. If it is not present then add an additional .5 pF to C14. Continue this process of adding .5pF until the carrier is present or you reach a total of 3.0 pF. Remember C14 starts at 1.0 pF and you will add capacitance when you stack the capacitors in parallel. Refer to fig. 2 below.
3. Once it is determined that the carrier is on you will need to check the frequency.
    a. Change the analyzer span to 1 MHz, place the marker control to peak search.
    b. Verify the center carrier is between 914.750 MHz and 915.250 MHz (915 MHz+/- 250 KHz, although being closer to 915.000 is better overall.
    c. If this is not correct, then remove the unit from the test and tag it with the frequency listed. (It will need troubleshot for frequency).

Fig. 2.



Output adjustment:

For this step you will need the bladed tuning tool.

1. Unkey the TX unit and allow it to run in the G2/G4 test mode.
2. Change the Analyzer back to 915 MHz, Span 50 MHz, Clear Write A, Amplitude +10dBm.
3. Adjust HR1 by carefully and slowly turning the set caps. The final output should be two co-equal signals at about 6-10dBm peak each. Refer to fig. 3.

4. Allow unit to run for several minutes and verify that it continues to pulse correctly.
5. Enter test data into log book and tag unit as ready for temperature test.

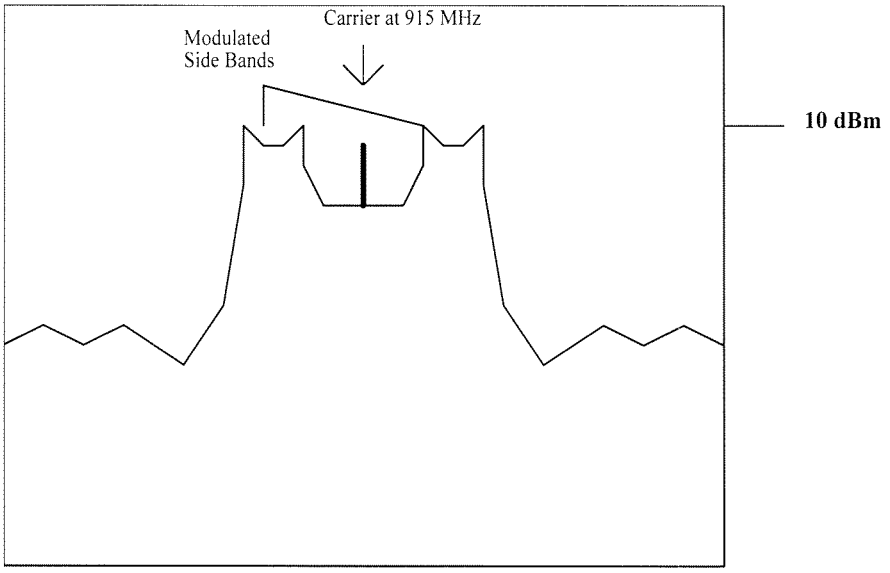


Fig. 3 example wave form not peak amplitude at +10dBm although actual range may vary from 6-10 dBm.