

FIELD TUNING PROCEDURE OR FREQUENCY CHANGING RPL-2T



A. Field Service/Conversion RPL-2 Transmitter Equipment Requirements.

Simpson 260 or equivalent

Bird Wattmeter or equivalent with 50 W $\frac{1}{2}$ 50Ω dummy load.

1 W element @ 150 MHz

50 W element @ 150 MHz

High Impedance R.F. probe (grid dip meter, optional)

Oscilloscope or other suitable indicator with 100 mV full scale capability (for use in conjunction with R.F. probe).

Frequency meter or counter - readout capability to $\pm 0.0005\%$ @ 150 MHz or better.

Tools Required:

- 1 pair longnosed pliers
- 1 screwdriver ($\frac{1}{4}$ " blade)
- 1 screwdriver - recessed 1/8" blade (tuning)
- 1 screwdriver - insulated (tuning).

Frequency Calculation Formula:

$$150 \text{ MHz to } 165 \text{ MHz} - \frac{f_{\text{carrier}}}{36} + (.00001) = F_{\text{xtal}}$$

$$165 \text{ MHz to } 170 \text{ MHz} - \frac{f_{\text{carrier}}}{36} + (.00002) = F_{\text{xtal}}$$

Carry division out through 6 places and add factor as shown above.

Example: $\frac{161.640}{36} = 4.490000$
 $\frac{.00001}{4.490010}$

B. Field Tuneup Procedure for VCXO-Multiplier

1. Turn off power switch. Remove power plug, audio control plug and antenna connector.
2. Remove top cover and bottom cover plate.
3. Using long-nose pliers, reach in between main chassis and R.F. A. and remove coaxial fitting from J-201. Connect this line to 50Ω dummy load (in series with wattmeter, if available).

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Field Tuning Procedure or Freq. Changing RPL-2T	
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FIELD TUNING PROCEDURE OR FREQUENCY CHANGING RPL-2T (Continued)

4. Plug crystal into socket and switch SW-101 to proper position (toward crystal in use). Set C-105 or C-156 half-meshed.
5. Connect voltmeter (50 volt DC scale) to VCXO B+ point and ground, install power plug and turn on power. Voltmeter should read between 11 and 13 volts.
6. Move voltmeter to TP-102 (10 V scale).

7. If frequency is being changed not more than approximately 100 kHz no further adjustments should be necessary except to set frequency with C-105 or C-156. Wattmeter should read 600 to 800 mW or the voltmeter should read +6 to +8 volts at TP-102.

8. If a new channel is being added, it will be necessary to alternately set frequency on each one until they are both on frequency as a small amount of interaction occurs between them.

9. If changing to a new frequency more than 100 kHz away, use the following procedure:

With new crystal installed and SW-101 in correct position, connect oscilloscope probe to top of L-107 and adjust L-103 and L-104 for maximum indication. (No need to adjust L-105.) Turn clockwise if going lower in frequency. Keep shaft lengths approximately equal on these two coils.

Tune L-107 for peak indication and move scope probe to top of L-106.

Peak L-106 and move scope probe to top of L-109.

Peak L-109 and move scope probe to top of L-110.

Peak L-110 and repeak L-107, L-106, and L-109 and move scope probe to bottom of L-111.

Repeak L-101, peak L-111 and move scope probe to L-112. Increase oscilloscope probe sensitivity 10:1 and move to L-113. Carefully repeak L-112 and peak L-113. Remove probe. Wattmeter should now indicate 100 or more milliwatts (+1 or more volts at TP-102). Repeak L-113 and alternately tune C-145 and C-146 for maximum output indication. Alternately tune C-151 and C-152 for maximum indication. Repeak L-113 and retune C-145, C-146, C-151, and C-152 for maximum output. Wattmeter should

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now indicate between 600 and 800 mW (+6 to +8 volts on voltmeter at TP-102). Recheck frequency with frequency counter or frequency meter.

10. Turn off power, disconnect wattmeter, remove 1 watt element from wattmeter and disconnect voltmeter. Reconnect coaxial line to R.F.A. This completes all tuning of VCXO. No further tuning adjustment is necessary.

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C. Field Tuneup Procedure for R.F.A.

1. Install 50 W element with wattmeter and connect to J-403.
 2. Connect voltmeter (50 V DC scale) to either red lead on regulator board underneath chassis and ground.
 3. Plug in AC power connector. Meter should read approximately 12 volts, or same as "(Coll. Q-301)" on final test data sheet. Move the positive voltmeter lead to term 6 (gray wire reg. bd.).
 4. If frequency has been changed less than 1 MHz, it may not be necessary to retune R.F.A. Turn on power switch and observe meter readings as compared to final test data sheet. If readings are within 10%, no tuning will be necessary.
 5. If readings are not within these limits, proceed as follows.
 6. Turn off power switch.
 7. Remove R.F.A. cover.
 8. Turn on power switch.
 9. Tune C-202 for maximum indication on wattmeter.
Tune C-206 for maximum indication on wattmeter.
Tune C-210 for maximum indication on wattmeter.
Alternately tune C-213 and C-214 for maximum indication on wattmeter.
 10. Tune C-225 and C-228 for maximum indication on wattmeter. Keep capacitors meshed approximately same amount.
Tune C-231 for maximum indication on wattmeter.
Tune C-224 for maximum indication on wattmeter.
- Observing collector over voltage (term. 6 - reg. bd.) and wattmeter, tune C-224, C-225, C-228, and C-231 for maximum indication on wattmeter and minimum collector over voltage.

When proper balance between these capacitors is achieved, maximum indication on wattmeter should occur with minimum over voltage indication on meter. At this time over voltage meter should indicate between +25 and +35 volts and wattmeter should indicate between 30 and 35 watts.

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11. Install cover on R.F.A. observing wattmeter and over voltage meter. This should result in less than 5% change in power output and over voltage, when properly tuned. This completes all R.F. tuning.

D. Audio Checking

Additional equipment required:

RPL-2 Receiver

Audio Signal Generator (50 Hz to 10 kHz minimum range with flat response and distortion .1% or less).

Distortion Analyzer

Antenna for Receiver

Suitable cable to convert RPL-2 Transmitter to Audio Generator.

1. Connect antenna to receiver (not more than 10 feet from transmitter).
2. Connect transmitter to dummy load.
3. Connect audio generator to transmitter and set generator to +10 dBm measured @ 1000 Hz.
4. Connect distortion analyzer to receiver output terminals. Terminate with $560\ \Omega$ $\frac{1}{2}$ W resistor.
5. Remove Q-401 from receiver (2N2924 squelch transistor).
6. Turn on receiver and with no signal, noise should read +10 dBm. If not, set receiver audio control, R-405, to this figure.
7. Turn on transmitter. Distortion meter should still read +10 dBm. If not, set transmitter audio control, R-107, to this figure.
8. Remove audio signal from transmitter by disconnecting audio cable. Reading should drop approximately 60 dB. This is equivalent to 60 dB SNR. If the SNR is less than 56 dB, check for ground loops by grounding all the equipment together and re-orienting the antenna.
9. Reset distortion analyzer to +10 dBm.
10. Reconnect audio generator to transmitter.
11. Reduce output of audio generator to 0 dBm as indicated at receiver output terminals.

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12. Check the system response by varying the frequency of the audio generator from 50 Hz through 10 kHz. Output variation at the receiver terminals should not exceed ± 1.5 dB or a total of 3 dB through this range. If the system does not meet these specifications, proceed as follows: Using the oscilloscope, set the vertical range to 100 mV DC, ground the probe and center the trace. Connect probe to TP-201. Remove audio signal from transmitter. Trace should be centered on scope indicating that the system is on frequency. A variation of ± 100 mV should result in very minor degradation of system performance. Reapply audio signal. Note position of envelope on scope. Adjust L-103 clockwise one full turn. Adjust L-104 counterclockwise the amount required to correct frequency to original position as indicated on scope. Recheck response. After using this procedure to achieve optimum response curve, check distortion @ 1000 Hz. Should be 1% or better (0.5% typical). Check distortion at 10 kHz. Carefully tune L-106, L-107, L-109 and L-110 on transmitter VCXO for a null indication on distortion analyzer. $\pm .5$ turn should be sufficient. It may be necessary to slightly broadband coils L-208, L-209, L-210 and L-211 on 455 kHz I.F. strip of receiver to bring distortion within specification at 10 kHz, being careful not to degrade receiver performance. Check distortion at 1000 Hz and 50 Hz and recheck response. Replace Q-401. This completes all tests and system is now ready for use.

NOTE: While making these measurements, be sure R.F. signal sources other than transmitter are off as very low level beats can produce misleading indications.

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