

### Equipment required for Alignment procedure:

- DC Power Supply ( 13.8 Vdc, 20A )
- Oscilloscope (50 MHz), with X10 probe
- 50  $\Omega$  dummy load
- Frequency Counter - 100 MHz
- Digital voltmeter or Multimeter
- RF Signal Generator
- Audio Generator
- Automatic Distortion Meter
- SINAD Meter
- RF Wattmeter ( 25–60 MHz, 100W )
- Automatic Modulation Meter

To view Main PCB Adjustment for location of adjustment points, please see this drawing After viewing, press "back" to return to this page.

The following steps are required to re-align the RCI-2950DX:

**Caution:** Alignment should only be attempted by personnel trained in RF product testing and alignment.

### PLL Synthesizer / Oscillator Frequency Alignment:

#### 1. PLL2 - VCO Voltage:

A. Set radio to 24.890 MHz, AM RX mode, connect multimeter to TP10.

Adjust L14 for 1.0 Vdc  $\pm$  0.1.

B. Set frequency to 29.699 MHz, AM RX mode, connect multimeter to TP10.

Adjust L14 for 4.5 Vdc  $\pm$  0.1.

#### 2. PLL1 - VCO Voltage:

A. Set radio to 24.890 MHz, AM RX mode, connect multimeter to TP10.

Adjust L13 for 1.0 Vdc  $\pm$  0.1.

B. Set frequency to 32.000 MHz, AM RX mode, connect multimeter to TP10.

Adjust L13 for 6.5 Vdc  $\pm$  0.1.

#### 2. AM Frequency:

Set radio to AM RX mode, clarifier to 12 o'clock,. Connect frequency counter to TP16.

Adjust VC2 to 10.1 MHz  $\pm$  10Hz.

#### 3. VCO Output:

Set radio to 28.000 MHz, AM RX mode, connect oscilloscope to TP3.

Adjust L17 to 38.6950 MHz (maximum output).

#### 4. AM OSC:

Set radio to AM TX mode, modulation off, connect frequency counter to TP5.

Adjust L18 to obtain 10.6950 MHz  $\pm$  10Hz.

#### 5. USB OSC:

Set radio to USB TX mode, modulation off, short TP6 to ground, connect frequency counter the TP5.

Adjust L20 to 10.6975 MHz  $\pm$  10Hz.

#### 6. LSB OSC:

Set radio to LSB TX mode, modulation off, connect frequency counter to TP5.

Adjust L19 to 10.6925 MHz  $\pm$  10Hz.

This completes this stage of the alignment procedure.

## Receiver Alignment:

**1. Receiver Setup:** Put the mode selector on AM, the RF gain fully clockwise (maximum gain), squelch to minimum (unsquelched), volume at 2 o'clock, set frequency to 28.295 MHz, and NB/ANL to OFF. Connect signal generator set at RF carrier frequency of 28.295 MHz, AM modulated with a 1 KHz audio tone at 30% modulation level.

### 2. AM Sensitivity:

Connect a SINAD meter to the external speaker jack.

Adjust L3, L4, L6, L7, L8, L10, L11 and L12 for best SINAD.

Increase the RF generator to 1mV RF carrier level.

Adjust L3, and L4 for minimum distortion.

Verify that the receiver AM sensitivity is better than 0.5 $\mu$ V for 10 db SINAD.

### 3. FM Distortion:

Change the RF generator to the FM mode, 1mV RF carrier level, FM modulated with a 1 KHz audio tone  $\pm$  3 KHz modulation level.

Adjust L5 for minimum distortion.

### 4. USB Sensitivity:

Turn off the audio modulation of the RF generator, and change it's frequency to 28.296 at an RF carrier level of .5  $\mu$ V. Set radio to USB RX mode.

Adjust L11 and L12 for audio output greater than 2V.

### 5. LSB Sensitivity:

Keep the audio modulation of the RF generator off, change frequency to 28.294 at an RF carrier level of 1mV, set radio to LSB mode.

Adjust L11, and L12 for audio output greater then 2V.

### 6. NB Adjust:

Set radio to 28.305 MHz AM RX mode, NB-ANL/OFF switch to ON, adjust RF generator to 28.305 MHz with an RF carrier level of 1mV, AM modulated with a 1 KHz audio signal at 30% modulation. Connect a digital voltmeter to TP1 (R11).

Adjust L1 and L2 for DC Voltage to max ( 1.3V ).

### 7. AM Scale Meter:

Turn NB-ANL switch to OFF, SWR/S/RF switch to S/RF position, set radio frequency to 28.305 AM RX mode, RF signal generator setting 28.305 MHz with a carrier level of 100  $\mu$ V, AM modulated with a 1KHz audio signal at 30%.

Adjust VR1 so that bar graph reads 6 bars.

### 8. USB Scale Meter:

SWR/S/RF switch to S/RF position, set radio frequency to 28.495 MHz USB RX mode, RF signal generator setting 28.496 MHz with a carrier level of 100  $\mu$ V, no audio modulation.

Adjust VR2 so that bar graph reads 6 bars.

### 9. AM Squelch:

Set radio frequency to 28.495 MHz AM RX mode, SQ control fully clockwise, RF signal generator setting to 28.495 MHz , RF carrier level at 1 mV, AM modulated with a 1 KHz audio signal at 30%.

Adjust VR4 very slowly until squelch noise just goes off.

### 10. SSB Squelch:

Set radio to 28.495 MHz USB RX mode, SQ control fully clockwise, RF signal generator setting to 28.496 MHz , RF carrier level at 1 mV, with audio modulation.

Adjust VR3 very slowly until squelch just goes off.

This completes the Receiver stage of the alignment procedure.

### **Transmitter Alignment:**

#### **1. Driver BIAS:**

Remove the "Shorting PCB" from TP7, TP8, and TP9. Set radio to USB mode, connect current meter to TP9 (+) and TP8 (-).

Adjust VR11 to obtain 50 mA.

#### **2. DRIVER BIAS:**

Set radio to USB mode, connect current meter to TP9 (-) and TP7 (+).

Adjust VR13 to obtain 10 mA.

#### **3. SSB & AM RF Power:**

Reconnect the "Shorting PCB" from TP7, TP8, and TP9. Connect a watt meter and a 50 Ohm load to the antenna connector, set radio to 28.495 MHz, USB mode, mic gain to maximum. Inject 30 millivolts of 1 KHz audio into the audio input pin of the mic jack (pin 2). Set SSB power control (VR12) to full counter clockwise position (maximum power position).

Adjust L18, L33, L40, L42, L43, and L44 to obtain maximum power output.

Adjust SSB power control (VR12) to 21 watts peak RF power output.

Change mode to AM

Adjust VR15 to obtain 10 watts RF power output.

#### **4. Power Meter:**

Set radio to 28.495 MHz, AM mode, mic gain control to maximum, meter switch to S/RF and key the transmitter.

Adjust VR10 until the RF meter reads 10 watts

#### **5. TX AM Modulation:**

Set radio to 28.495 MHz, AM mode, mic gain control to maximum, key the transmitter. Inject 30 millivolts of 1 KHz audio into the audio input pin of the mic jack (pin 2).

Adjust VR17 to 100% modulation.

#### **6. CW Side-Tone Signal:**

Connect a voltmeter directly across the speaker, key the transmitter using the CW jack in the rear of the radio.

Adjust VR9 to obtain 200mV across the speaker.

This completes the Transmitter stage of the alignment procedure.