70-1494 Alignment Procedure

SETUP

1   Remove the ten securing screws from the bottom cover , and the cover itself.

2   Connect a resistive 50 Ω RF load and wattmeter to Antenna Connector J501.

3   Connect 13.4V DC power to transceiver J505.

4   Connect a 3.2 Ω, 20W resistor to pins 4 and 6 of the Accessory Plug. The jumper
    between pins 5 and 6 must be temporarily removed to make this connection.
    The resistor serves as a constant load to replace the speaker's inconsistencies.

     CAUTION: Both speaker terminals are LIVE. Never ground either
     one. Connect grounded receive-audio measuring-equipment to only
     one side of the speaker, and chassis ground. Normally, voltage
     measurement will be half of true values.

5   Turn the radio on (Push on and Push off switch), set the VOLUME control to
     a mid-position.

    Connect the Programmer to Programming Port Mic Jack J302.
    Upload the radio programming Data-Packet into the Programmer and
    initiate its Remote Control Mode. Refer to the appropriate manual for details.

SYNTHESIZER ALIGNMENT

•VCO Resonance

1   Select the Remote Control Mode of the Programmer and enter the following test
    frequencies:

	B-Band
RX Frequency	150.00
TX Frequency	150.00

2   Adjust Channel RX Tank L713 for 1.5V DC at VC   (VCO Steering) .

3   Active transmit mode (using the programmer) and adjust TX Tank
    L702 for 1.5V DC at VC   (VCO Steering) .

•Reference Oscillator

4   Initiate transmit on any channel. Measure transmitted RF carrier frequency
     without modulation and, if necessary, adjust REFERENCE OSCILLATOR X701
     for carrier frequency to within ±300Hz of channel frequency.

110-WATT PA MODULE ALIGNMENT

The 70-1494 should be adjusted to have a 24 MHz channel spread at 110W. To do so :

1   Remove the four screws on the PA cover.

2   Remove a cable from J501.

3   Adjust RV501,RV502 and RV503 counter-clockwise just until stop.

4   Activate transmit mode, measure current.

5   Adjust RV503 clockwise just until currents increase 0.5A.

6   Adjust RV501 clockwise just until currents increase 0.5A more.

7   Adjust RV502 clockwise just until currents increase 0.5A more.

8   Stop transmit mode. Change the TX test frequency to the desired frequency.

9   Connect the removed cable to J501.

10   Activate transmit mode, then adjust CV503 to obtain maxim RF power
      at Antenna Connector J502.

11   Set RF output power to 110W at J502 using the programmer.

MODULATOR ALIGNMENT

•Modulation Limiting

1   Disconnect the hand microphone from its front panel Mic Jack J302.
     Apply 3Vrms of 1000Hz signal to pin 1 of Mic Jack J302, then initiate transmit.

2   Measure total carrier deviation and, if needed adjust modulation limiting to obtain ±5KHz (wide) or ±2.5KHz (narrow) using the programmer.

•Microphone Gain

3   No alignment for Microphone gain is required.

•CTCSS/DCS

4   Remove the 1KHz audio signal from Mic Jack J302.

5   Add 250.3Hz CTCSS tone to the transmit test by testing frequency using the programmer.

6   Adjust CTCSS deviation to ±750 Hz ± 10 Hz (wide) or ± 375 Hz ± 10 Hz (narrow) deviation using the programmer.

7   Change 67.0 Hz CTCSS tone to the transmit test by testing frequency using in the programmer.

8   Adjust RV401 for ±750 Hz ± 10 Hz (wide) or ± 375 Hz ± 10 Hz (narrow) deviation.

9   Change the transmit DCS code +023 to the transmit test by testing frequency using the programmer.

10 Adjust RV401 so that modulation waveform from modulation analyzer matches the correct waveform shown in Figure 2-1.

11 Change 250.3 Hz CTCSS tone to the transmit test by testing frequency using the programmer. Carefully adjust RV401 for ± 750 Hz ± 10 Hz (wide) or ± 375 Hz ± 10 Hz (narrow) deviation.
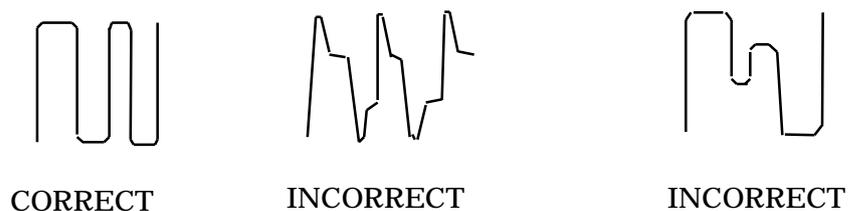
CORRECT   INCORRECT   INCORRECT

Figure 2-1 Modulation Waveforms

- DTMF

12 Clear the CTCSS tone, then initiate transmit test by testing frequency using the programmer.

13 Adjust DTMF deviation to $\pm$ 3.0KHz $\pm$ 10 Hz (wide) or $\pm$ 1.5KHz $\pm$ 10 Hz (narrow) deviation using the programmer.

RECEIVER ALIGNMENT

1   Change the RX test frequency to 162.3MHz for B-Band.

•First Injection

2   No adjustment for first injection is required.

•Preselector Alignment

3   No adjustment for the preselector (L201, L202, L204, L205, L206 and L207) is
       required.

•Quadrature Detector

4   No adjustment for the quadrature is required.

•First IF

5   Apply enough modulated (by 1KHz tone at ± 3KHz (wide) or ± 1.5KHz (narrow)
       deviation) on-channel carrier to maintain 12 to 15 dB SINAD. Adjust L215, L216,
       and L217.

• Tight Squelch

6   Squelch level set maximum (80). by using the front UP / DN switch

7   Apply 0.95 uV of modulated standard deviation on-channel RF signal to the 50 Ω
        antenna connector.
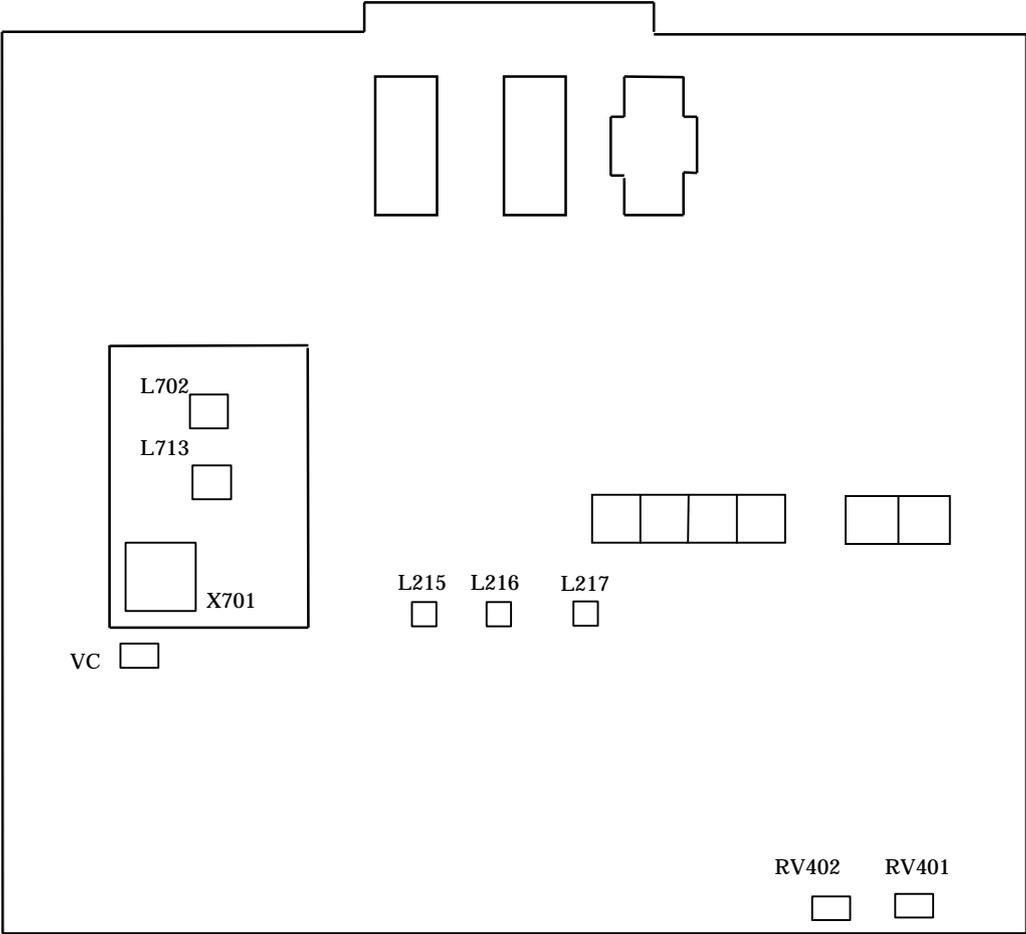   Adjust Squelch range RV402 counter-clockwise just until squelch opens (audio
        on).

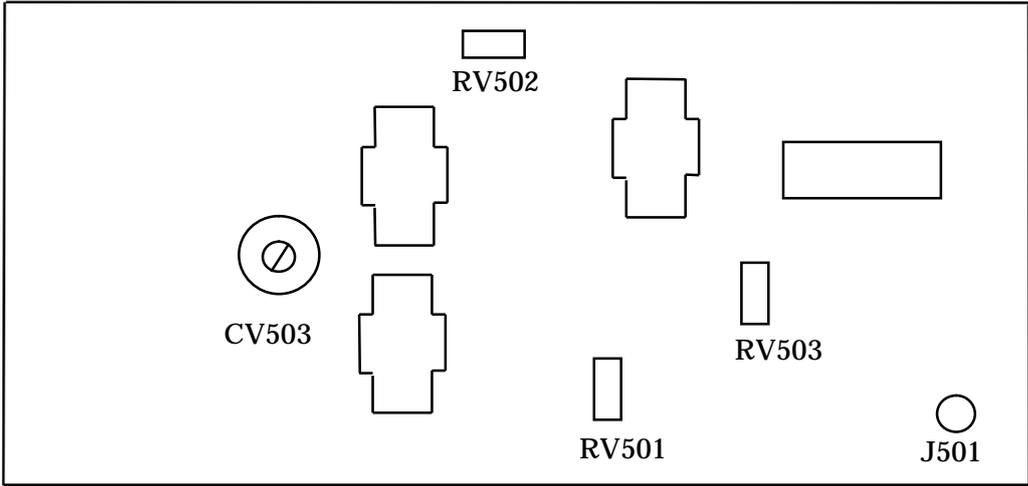Figure 2-2 Adjustment Map (TR-1529)

Figure 2-3 Adjustment Map (PA- -X0002)

Complete realignment is only needed when a component that affects alignment has been replaced.   RADIO REPROGRAMMING WITH TEST FREQUENCIES IS REQUIRED.

TEST EQUIPMENT REQUIRED

TEST INSTRUMENT	INSTRUMENT CAPABILITIES	USE
Regulated DC Power supply	13.4 V DC, 30 A	Radio power source
RF Wattmeter for 70-1491	150 W, 136 - 174MHz, 50 ohm circuit	Transmitter power measurements
RF Load Resistor	50 ohm, 150 W	Antenna dummy load
Frequency Modulation Meter	136 - 174 MHz, peak-responding, +/- 5KHz range	Modulation level measurements
Frequency Meter or Frequency Counter	136 - 174 MHz, 1.0 ppm accuracy	Carrier frequency measurements
Audio Generator	1,000KHz sine-wave 0-4 Vrms output	Modulation level measurements
RF Signal Generator	136 - 174 MHz range, 0.1 - 1 KuV output, 3KHz FM mod. With 1 KHz tone	All receiver measurements
Distortion Analyzer	1 KHz notch, 1% measuring range	Receiver performance test and IF alignment
Load Resistor (audio)	3.2 ohms, 20 W	Speaker load for all receiver measurements
AC Voltmeter	10mV to 10 Vrms	Audio level adjustments
Oscilloscope	DC to 500KHz bandwidth	
Digital Multimeter	0.1 to 20 V DC	Test point measurements and power supply setup
Programmer	PC Programming Software	Manual radio control