

## 12 Alignment

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### 12.1 Adjustments

The following table lists the internal adjustments.

Reference Designator	Function
Rear Panel	Squelch/carrier detect threshold level.
Rear Panel	LCD Contrast.
R20	Receive audio level.
R16	RX audio bias.
R32	CTCSS encode level.
R34	Paging data level.
R41	Voice limiter.
R60	Microphone gain.
R52	Telco audio to transmitter level.
R69	Telco line driver level.

### 12.2 Alignment Procedure

#### 12.2.1 General Setup

1. Apply DC power to the unit. Connect the service monitor to the ANT port.
2. Download the Flash code to the unit if it is not already programmed. Hold down the "-" key while powering up the unit to enter Flash code programming mode. See the section on "Firmware Updating" for additional information.
3. Adjust the LCD contrast control on the rear panel of the unit.

#### 12.2.2 Radio Interface

This procedure assumes a properly tuned transceiver is installed in the unit. You will need a DC power source, service monitor, oscilloscope, and DVM. Full System Deviation = 5.0 kHz for wide-band versions, and FSD = 2.5 kHz for narrow-band versions. Depending upon the type bandwidth of the transceiver used, you will have to make slightly different adjustments.

1. Program the unit's transmit and receive frequencies. Disable sub-audible signaling.
2. Set the TX bandwidth to "wide band" or "narrow band" depending on the bandwidth of the transceiver unit installed.
3. Generate an RF carrier on the receive frequency, 1 kHz tone, 60% FSD = 3 kHz (wideband units) / 1.5 kHz. (narrowband units), RF level 10 uV.
4. Adjust R16 for a 1.5 V p-p (530 mV RMS) signal on TP8.
5. Adjust the RF generator to .35 uV. Adjust the squelch (located on the rear panel) so that the carrier detect LED is on, and so that it goes off when the RF level is below .25 uV.

### **12.2.3 Telco Interface - Receive Mode**

1. Generate an RF carrier on the receive frequency, 1 kHz tone, 60% FSD = 3 kHz / 1.5 kHz. RF level 10 uV.
2. Connect the TELCO line to the RX audio by holding the 1 button down on power up to bring-up the test mode, then enter the password and press 6 F1 and F2.
3. Adjust R69 (telco line level) for a level of -13 dBm on the line.
4. Disable the RX audio by pressing F2 twice more. Generate a DTMF tone from the by pressing 3 and then F4.
5. Verify that the line level is between -15 and -12 dBm. Then press the DOWN arrow to turn off the DTMF.

### **12.2.4 Telco Interface - Transmit Mode**

1. Set the service monitor to measure the transmitter's FM deviation.
2. Generate a 2500 Hz tone onto the TELCO line from an external test instrument with a power level of > 5 dBm into 600 ohms.
3. Connect the TELCO to the transmitter by pressing F1, then press F2 twice to key the transmitter.
4. Adjust R52 clockwise for maximum gain, then adjust R41 (limiter) for 4.5 kHz / 2.25 kHz deviation.
5. Adjust the TELCO signal to a power level of -15 dBm.
6. Adjust R52 so that the deviation is at half scale (2.25 kHz / 1.125 kHz).

### **12.2.5 Paging Modulation**

1. Turn the unit off.
2. Generate a 1200 baud paging test signal by holding the 1 button down upon power up, then entering the password and pressing 6 1 2. Specify an ON time of 30000 mS and an OFF time of 0 mS.
3. Adjust R34 for 5 kHz / 2.5 kHz (0 to peak) deviation.
4. Turn off the power to the unit.

### **12.2.6 Voice Modulation & CTCSS**

1. Turn the unit back on.
2. Key the transmitter using the F3 key. Adjust R160 so the carrier is on frequency.
3. Adjust R60 (mic gain) for 3 kHz / 1.5 kHz deviation when speaking into the mic with a normal voice level from a distance of about 1 foot away.
4. Enable a 100 Hz CTCSS encoder on the transmit frequency.
5. Key the transmitter with the F3 key. Adjust R32 for 500 Hz / 250 Hz deviation of the CTCSS tone.
6. Measure the transmitter's power level to verify that it is set to the desired level with the internal jumpers.