

ALIGNMENT PROCEDURE

6A-C	Alignment Procedure
1, Test Equipment	
Service Monitor	(HP8920B or equivalent)
Spectrum Analyzer	(HP8561E or equivalent)
DC Voltmeter	(Input Impedance > 1Megohms)
DC Power Supply	(13.6 Volts at 15A)
IBM Personal Computer	(or compatible equivalent)
Programming Interface	(TQ3370)
KME Radio Programming Software	()
KME Programming Cable	()
KME DC Power Cable	(U-PK-2223B)
KME Microphone Cable	()
BNC-BNC Cable	
50 ohm RF Power Attenuator	(10dB, 100watts)

<Initial setup>

Attach DC Power Cable to Radio and Power Supply.

Attach Programming Cable to Radio.

Attach Interface Cable to Programming Interface and personal Computer.

Set power supply to 13.6 Volts dc.

Apply power to Radio, and turn radio on/off switch to on position.

Execute radio programming software.

Under software direction, program radio for the following conventional test channels. See the Figure 1.

If test channel always set to figure 1, then it is not need to execute radio programming.

Turn radio on/off switch to off position. Remove programming cable. Attach test cable.

Remove the Top Cover, Bottom Cover and TRX shield Cover.

Attach RF coaxial cable (50 ohms) between antenna connector and RF power attenuator.

Attach second coaxial cable between attenuator and service monitor(RF port).

Attach Microphone Cable to Radio. Attach BNC-BNC Cable between Programming Interface (RX AUDIO and TX AUDIO) and Service Monitor.

Turn radio on/off switch to on position.

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Figure 1

	FREQ(MHz)						Band/Tx Power				Data Communication	
	403.000-440.000		440.000-470.000		470.000-512.000							
	RX	TX	RX	TX	RX	TX	W/N	Power (w)	CTCSS (Hz)	CDCSS Oct	Data Rate (bps)	BT
CH 1	403.10	403.00	440.10	440.00	470.10	470.00	W25	19				
CH 2	407.10	407.00	443.60	443.50	474.10	474.00	W25	19				
CH 3	410.75	410.85	446.75	446.85	477.75	477.85	W25	19				
CH 4	411.25	411.15	447.25	447.15	478.25	478.15	W25	19				
CH 5	415.60	415.50	450.60	450.50	483.10	483.00	W25	19				
CH 6	419.75	419.85	453.75	453.85	487.75	487.85	W25	19				
CH 7	420.25	420.15	454.25	454.15	488.25	488.15	W25	19				
CH 8	424.85	424.75	458.10	458.00	493.25	493.15	W25	19				
CH 9	429.45	429.35	461.75	461.85	498.75	498.85	W25	19				
CH10	429.75	429.65	462.25	462.15	499.25	499.15	W25	19				
CH11	434.85	434.75	466.10	466.00	505.60	505.50	W25	19				
CH12	439.90	440.00	469.90	470.00	511.90	512.00	W25	19				
CH13	403.10	403.00	440.10	440.00	470.10	470.00	N	19				
CH14	420.25	420.15	454.25	454.15	488.25	488.15	N	19				
CH15	439.90	440.00	469.90	470.00	511.90	512.00	N	19				
CH16	403.10	403.00	440.10	440.00	470.10	470.00	N	19				
CH17	420.25	420.15	454.25	454.15	488.25	488.15	N	19				
CH18	439.90	440.00	469.90	470.00	511.90	512.00	N	19				
CH19	420.45	420.35	454.45	454.35	488.45	488.35	W25	19	100			
CH20	420.45	420.35	454.45	454.35	488.45	488.35	W25	19		627		
CH21	420.85	420.75	454.85	454.75	488.85	488.75	N	19			9600	0.42
CH22	420.55	420.55	454.55	454.55	488.55	488.55	W25	19				

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- 2, Tx VCO Adjustment
 - a, Set the Radio to CH12.
 - b, Push PTT-key on Programming Interface.
 - b, Monitor DC Voltage at test point TP301
 - c, Adjust Rx VCO RV302 to 6.5 +/- 0.1V
- 3, Tx Modulation Adjustment
 - a. Set the Radio to CH5.
 - b. Set AF generator output level to 410mV.
 - c. Push PTT-key on Programming Interface.
 - d. Adjust TX Modulation RV305 until the FM Deviation is 4.5 ± 0.1 KHz.
 - e. Set the Radio to CH19 (CTCSS Tone 100 Hz).
 - f. Set AF generator output level to zero.
 - g. Push PTT-key on Programming Interface.
 - h. Adjust TX Modulation RV304 until the FM Deviation is 0.8 ± 0.1 KHz.
- 4, Tx Frequency Adjustment
 - a. Set the Radio to CH4.
 - b. Push PTT-key on Programming Interface.
 - c. Adjust Tx Frequency RV303 until the Frequency is $f_0 \pm 0.1$ KHz.
- 5, Transmitter Power Adjustment.
 - a, No tuning for the operation.
- 6, Rx VCO Adjustment
 - a, Set the Radio to CH12.
 - b, Monitor DC Voltage at test point TP301.
 - c, Adjust Rx VCO RV302 to 6.0 +/- 0.1V.
- 7, Rx 2'nd Local Frequency Adjustment
 - a, Set the Radio to CH12.
 - b, Set Center frequency of Spectrum Analyzer to 81.745 MHz and Band width to 1 kHz.
 - c, Monitor 2'nd Local frequency at test point TP202.
 - d, Adjust 2'nd Local CV204 to 81.745 MHz +/- 100 Hz..
- 8, Rx Audio distortion
 - a. Set the Radio to CH7.
 - b. Set RF generator level to -47dBm, frequency to CH7 in figure 1, deviation to 3 kHz and tone to 1 kHz.
 - c. Monitor the Rx Audio distortion at RX AUDIO.
 - d. Adjust CV203 until the Audio distortion is minimum.

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9, Rx BPF Tuning

- a. Set RF generator level to -110dBm , frequency to CH7 in figure 1, deviation to 3 kHz and Tone to 1kHz.
- b. Monitor DC voltage at test point TP203.
- c. Set the Radio to CH7.
- d. Adjust Rx BPF CV201-CV202 until the DC voltage at TP203 is maximum.

4, Rx Noise Squelch Tuning

- a. Monitor DC voltage at test point TP208.
- b. Set the Radio to CH7.
- c. Set RF generator frequency to CH7 in figure 1, deviation to 3 kHz and Tone to 1kHz.
- d. Set RF generator level until the Rx SINAD is $8\pm 2\text{dB}$ at RX AUDIO.
- e. Adjust Noise Squelch RV201 until the DC voltage at TP210 is 0.75 volts.

CIRCUIT AND DEVICE DESCRIPTION

(10) Oscillator and other Frequency Stabilizing Circuit Descriptions:

The frequency reference is a self-contained quartz crystal oscillator (TCXO) module, operating 12.8MHz.

The TCXO is compensated by internal temperature compensating circuit providing 2.5PPM stability from -30°C to +60°C.

(11) Circuit or devices employed for suppression of spurious radiation:

- a. The radio has metal cover and metal cabinet.
- b. Extensive use of discrete bypass capacitors in the Option and Remote Control Connector of the radio reduces radiation from remote cables.
- c. Low pass harmonic filter follows power amplifier output.
- d. Internal shields surround synthesizer, power amplifier and radio control logic circuitry.
- e. In addition the Control Unit package is metallized to suppress microprocessor radiation.
- f. During acquisition of the synthesizer phase lock loop, the transmitter output is inhibited by an RF gate and the removal of DC voltage to the gain control stage of the RF power chain.

(12) Circuit or Devices employed for limiting modulation:

- a. Reference is made to the schematic diagram XD00-TC-0099 in Exhibit 4.
- b. Instantaneous audio limiting is accomplished Audio IC (IC501).
The Audio IC provides both limiting and Post-Limiting filtering. The Audio IC runs from a regulated supply voltage, which prevents deviation changes vs. changes in radio power supply voltage. Following the Limiter, a summing amplifier is used to add in any optional tone modulation, such as CTCSS and CDCSS modulation, which is also temperature and voltage stable. The output from the summing amplifier then passes through the post-limiting filter to a modulation level adjust liner attenuator (also contain IC501), which is in turn coupled to the FM modulated oscillators. The attenuator insures maximum deviation $\pm 4.5\text{KHz}$ at Wide ($\pm 2.25\text{KHz}$ at Narrow).

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 - e. In addition the Panel Control Unit package is metallized to suppress microprocessor radiation.
 - f. During acquisition of the synthesizer phase lock loop, the transmitter output is inhibited by an RF gate and the removal of DC voltage to the gain control stage of the RF power chain.