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MANUAL NO. 13-220075

DATE: JULY 2, 1973



#### GENERAL

Circuitry: 32-Transistor, 2-FET, 57-Diode.  
Frequency Control: Crystals.  
Channels: 23  
Modes of Operation: AM, Lower Sideband-Upper Sideband.  
Controls: Volume-on/off, variable squelch, mode selector, SSB clarifier, PA-CB switch automatic noise blanker switch, illuminated channel selector.  
Jacks and connections: Microphone, antenna, PA speaker, external speaker and rear-mounted DC power cable.  
Power source: 12 volts DC.  
Speaker: 2-3/4" dynamic, 8 ohms.  
Microphone: Dynamic CB mike.  
PA Audio Output:  
Size: 2-1/4" (H) × 7-1/8" (W) × 9-1/4" (D).  
Weight: 5.4 Lbs.  
Accessories: 12 volts DC power cord, microphone, mike hanger and mounting bracket with hardware.  
Receiving system: Dual conversion superheterodyne.  
Sensitivity: More than 0.5 $\mu$ V (S/N 10dB)  
Selectivity: More than 50dB  
Clarifier: More than  $\pm$ 500Hz  
Audio output power: More than 4W  
Squelch range: 0.5 $\mu$ V - 500 $\mu$ V  
Intermediate Frequency: 1st, 11.2735 MHz. 2nd 455KHz

#### SSB TRANSMITTER

SSB Generation: Balance Modulation  
Frequency Response: 300 - 2700Hz  
RF Input Power: 15W  
Carrier Suppression: More than 40dB  
Unwanted Sideband Suppression: More than 50dB  
Harmonic Suppression: More than 50dB

#### AM TRANSMITTER

Modulation: High Level Class B  
RF Input Power: 5W  
RF Output Power: More than 3W  
Harmonic Suppression: More than 50dB

## ALIGNMENT INSTRUCTIONS

### 2-1-2 AM TRANSMITTER PERFORMANCE AND ALIGNMENT

- 2-1-2-1 Connect a 50 wattmeter to the antenna jack (Ant.)
- 2-1-2-2 Connect a current meter between T.P.1
- 2-1-2-3 Set channel Selector Switch to CH13.
- 2-1-2-4 Press the mike button.
- 2-1-2-5 Adjust coils. T13,T14,T14,T4,T5,T17,T18,T19,T20,L9 and L13 for maximum power output indication.
- 2-1-2-6 Adjust L11 counterclockwise to reduce current to 500mA on the current meter. The output reading should be more than 3.0W.
- 2-1-2-7 Repeat step 2-1-2-5.
- 2-1-2-8 VR12 may be used to calibrate RFD meter on unit.

### 2-1-3 AM TRANSMITTER TROUBLE SHOOTING

When testing this stage begin at the oscillator stage and move to final stage using oscilloscope and table 1.

### 2-1-4 Modulator performance check and alignment.

- 2-1-4-1 RF adaptor probe of oscilloscope to 50 ohm dummy load. Dummy load attached to antenna jack.
- 2-1-4-2 Connect audio generator to the microphone input circuit, injection frequency is 2.5 KHz.
- 2-1-4-3 Increase the audio generator output to produce 50% modulation. At this time the audio output voltage of generator must be 5mV or less.
- 2-1-5 MODULATOR TROUBLESHOOTING  
Modulator trouble shooting can be effectively carried out by careful use of table 2.

TABLE 2

LOCATION	LEVEL
Mike Jack	3mV
TR25 Base	1mV
TR25 Collector	16mV
TR26 Collector	1.2V
TR27 Collector	4.9V

- 2-2 SSB TRANSMITTER
- 2-2-1 SSB TRANSMITTER PERFORMANCE CHECK AND ALIGNMENT
  - 2-2-1-1 Mode switch to USB or LSB, channel selector to channel 13. Inject a 1KHz audio signal into microphone jack.
  - 2-2-1-2 Adjust Audio Generator output to saturate the RF output reading on wattmeter.
  - 2-2-1-3 Reduce Audio generator output, the RF output will begin to drop.
  - 2-2-1-4 Adjust L12 for maximum output on the wattmeter.
- 2-2-2 CARRIER BALANCE ALIGNMENT
  - 2-2-2-1 RF adaptor probe of oscilloscope across 50 ohm dummy load.
  - 2-2-2-2 Short a microphone input circuit and set mode switch on USB or LSB.
  - 2-2-2-3 Press the mike button and adjust VR8 and CT-17 for a minimum indication on the oscilloscope on both USB and LSB modes. A typical minimum indication will be 0.4mV P-P
- 2-2-3 FINAL TRANSISTOR BIAS ADJUST
  - 2-2-3-1 Same as 2-2-2
  - 2-2-3-2 Connect an ammeter to T.P.1.
  - 2-2-3-3 Press the mike button and adjust VR10 until the current is 10mA.
- 2-2-4 INJECTION VOLTAGE FOR OBTAINING RF OUTPUT SATURATION POINT

TABLE 3

LOCATION	INJECTION FREQUENCY	LEVEL
Mike Jack	1KHz Audio	3mV
TR21 Base	1KHz Audio	90mV
TR21 Emitter	1KHz Audio	110mV
Junction D29 T16 Secondary	11.2735MHz	45mV
TR10 Base	11.2735MHz	20mV
TR31 Base	28.115 MHz	12mV
TR32 Base	28.115 MHz	80mV

2-2-5 SSB TRANSMITTER TROUBLESHOOTING  
 Troubleshooting must be checked from an earlier stage to final stage using oscilloscope with tables 2 and 3.  
 In IF RF output on SSB is not obtained, but AM transmitter and PA system are working, carefully check from TR21 to TR23.

3. RECEIVER

3-1-1 AM Receiver performance check.

3-1-1-1 Connect RF Signal Generator to the antenna jack and set the generator output at 1uV, 1KHz, 30% modulation.

3-1-1-2 Connect audio voltmeter with 8 dummy load resistor to the external speaker jack on the set.

3-1-1-3 Set the volume control for maximum position and the squelch control for minimum position.

3-1-1-4 Set the channel selector switch to CH13 (27.115) and the signal generator also on 27.115 MHz output.

3-1-1-5 Adjust the volume control for 0dB indication on the audio voltmeter.

3-1-1-6 Switch the signal generator modulation off. The indication on the audio voltmeter should drop 10dB or more.

3-1-1-7 Repeat at all channels.

3-1-2 AM RECEIVER TRANSISTOR D.C. VOLTAGES

TABLE 4

STAGE	INPUT SIGNAL (uV)			
	0	100	10000	
TR1	E	0.4	0.1	0
	C	8.8	8.8	8.8
	B	1.1	0.7	0.56
TR2	E	0.7	0.23	0.06
	C	8.8	8.8	8.8
	B	1.3	0.8	0.6
TR10	E	1.1	0.55	0.3
	C	8.8	8.8	8.8
	B	1.7	1.15	0.8
TR5	E	0	0	0
	C	4	4	4
	B	0.7	0.7	0.7
TR6	E	3,4	3,4	3.4
	C	9	9	9
	B	4	4	4

All voltage measured with a 20K /V voltmeter through a 22uH inductor. Value may vary as much as 20%.

TABLE 5

## 3-1-3 AM RECEIVER ALIGNMENT

ALIGNMENT	SOURCE	SOURCE CONNECTION	ADJUST	OUTPUT METER CONNECT.	DIRECTION
AGC Voltage	No	No	VR3	20k /V DC Voltmeter to TR3 Source	6V
2nd IF Stage	SSG 455 KHz	TR10 Base	T8,T9	S.Meter Indication	Max.
1st IF Stage	SSG11.2735 MHz	TR2 Base	T3	"	Max.
RF Stage	SSG 27.115 MHz	Ant. Jack	T1,T2	"	Max.
S Meter	SSG 27.115 MHz Output 100 uV	Ant. Jack	VR2		S9

## 3-1-4 AM RECEIVER

TABLE 6  
INJECTION VOLTAGE

LOCATION	FREQUENCY	LEVEL
Ant. Jack	27.115 MHz	1uV
TR1 Emitter	27.115 MHz	3uV
TR2 Base	11.2735MHz	100uV
T5 Secondary	11.2735 MHz	10uV
TR5 Base	455 KHz	30uV
TR6 Base	455 KHz	2000uV

All values to produce 0.1 volts AC or greater reading at junction D13,R35,R36 and C34. The Signal to be injection through a 0.047uF capacitor.

## 3-1-5 AM RECEIVER TROUBLESHOOTING

3-1-5-1 If the "S" meter is working but no audio is detected then the receiver is probably OK. Trouble point could be in the audio, speaker or relay circuit.

3-1-5-2 If the "S" meter is not working, trouble point can be found by using Tables 3,4, and 5.

## 3-1-6 AM AGC PERFORMANCE CHECK

3-1-6-1 Same as 3-1-1-1 thru 3-1-1-4

3-1-6-2 Increase the signal generator output to 50K uV.

3-1-6-3 Adjust the volume control for 0dB indication on the audio voltmeter.

3-1-6-4 Reduce the signal generator output to 50uV. The audio voltmeter should not drop more than 10dB.

3-1-7 AM AGC TROUBLESHOOTING

3-1-7-1 Measure the AGC voltage of TR7 Source. Refer to Table 7 for a list of typical AGC voltage reading.

TABLE 7

RF INPUT (uV)	VOLTAGE OF TR7 SOURCE
0	6.0
10	5.0
100	3.8
1000	3.2

3-1-7-2 The AGC Voltage did not decrease. Check D16,17,R38,C39,40,D18,R39.

3-1-8 SQUELCH PERFORMANCE CHECK

3-1-8-1 Same as 3-1-1-1 thru 3-1-1-4.

3-1-8-2 Disconnect the signal generator from the antenna jack.

3-1-8-3 Adjust the squelch control for quieting.

3-1-8-4 Reconnect the signal generator and increase the signal output until squelch opens.

3-1-8-5 The signal generator output should be less than 1V.

3-1-8-6 Rotate the squelch control fully clockwise.

3-1-8-7 The signal generator output should be less than 250uV.

3-1-9 SQUELCH TROUBLESHOOTING

3-1-9-1 Check the voltage of transistors using table 8.

3-1-9-2 If Base of transistor TR12 voltage does not change when rotating squelch control then check VR5,6,R48.

3-1-9-3 Tight squelch level may be adjusted at VR5.

TABLE 8

STAGE	UNSQUELCH	FULL SQUELCH
TR12	E 0 V	0V
	C 5.3V	0.07 V
	B 0 V	0.7V
TR13	E 0 V	0 V
	C 0.07V	2.6V
	B 0.7V	0.03V

- 3-2-1 SSB RECEIVER PERFORMANCE CHECK
  - 3-2-1-1 Connect RF signal generator to the antenna jack. Set the signal generator output at 0.5uV.
  - 3-2-1-2 Connect audio voltmeter with 8 dummy load resistor to the external speaker jack on the unit.
  - 3-2-1-3 Set the mode switch to USB, volume control for maximum volume, and squelch control for minimum squelch.
  - 3-2-1-4 Set the channel selector switch to CH13
  - 3-2-1-5 Adjust the signal generator output frequency for approximately 1KHz.
  - 3-2-1-6 Adjust the volume control for 0dB indication on the audio voltmeter. In this case the audio output should be 0.5 Watt or more.
  - 3-2-1-7 Disconnect the signal generator from the antenna jack. The indication on the audio voltmeter should drop 10dB or more.
  - 3-2-1-8 Repeat on LSB and all the other channels.
- 3-2-2 SSB RECEIVER TRANSISTOR VOLTAGE

TABLE 9

STAGE	INPUT SIGNAL (uV)		
	0	100	10000
TR1	E	0.4	0.1
	C	8.8	8.8
	B	1.1	0.7
TR2	E	0.7	0.23
	C	8.8	8.8
	B	1.3	0.8
TR10	E	1.1	0.55
	C	8.8	8.8
	B	1.7	1.15
TR11	E	1.0	1.0
	C	7	7
	B	1.65	1.65

All transistor voltages measured with a 20K /V voltmeter through a 22uH inductor, values may vary as much as 20%.

- 3-2-3 SSB RECEIVER INJECTION VOLTAGE

TABLE 10

LOCATION	FREQUENCY	LEVEL
Ant. Jack	27 MHz	1uV
TR1 Emitter	27 MHz	3uV
TR2 Base	11.2735 MHz	100uV
TR10 Base	11.2735 MHz	3uV
TR11 Base	11.2735 MHz	100uV
Junction D29	11.2735 MHz	1000uV

All levels should produce 0.5 volt AC or greater across the volume control. The signal to be injected through a 0.047uF capacitor.

3-2-4 SSB RECEIVER ALIGNMENT

TABLE 11

ALIGNMENT	SOURCE	SOURCE CONNECT.	ADJUST.	OUTPUT METER CONNECT.	DIRECTION
AGC Voltage	No	No	VR3	20K /V DC Voltmeter TR7 Source	6V
IF Stage	SSG 11.2735 MHz	TR10 Base	T-7	S Meter Indication	Max.
RF Stage	The Same as AM				
S Meter	SSG 27 MHz 100uV	Ant. Jack	VR4		S9

3-2-5 SSB RECEIVER TROUBLESHOOTING

3-2-5-1 Check the RF and IF stage by signal injection. The signal injection level is listed in Table 10.

3-2-5-2 If AM receiver is functioning properly but SSB receiver section has no output, trouble points could be in the IF stage, TR11 thru TR21.

3-2-5-3 If USB is functioning properly but, no LSB, check D45, R90, and crystal 11.272 MHz.

3-2-6 SSB AGC PERFORMANCE CHECK

3-2-6-1 Same as 3/2/1/1 thru 3/2/1/6

3-2-6-2 Increase the signal generator output to 50000uV.

3-2-6-3 Reduce the signal generator output 10dB down on the audio voltmeter.

3-2-6-5 The AGC release time is measured by:

- a. Set signal generator output to 1000uV, adjust volume control for a convenient reading on the audio voltmeter. Decrease signal generator output to 100uV, approximately 1 second will pass before an indication is noted on output meter.

3-2-7 SSB AGC TROUBLESHOOTING

3-2-7-1 The source voltage of TR7 is adjusted at VR3.

3-2-7-2 Connect the D.C. voltmeter to TR7 source. Typical TR7 source is listed in Table 12.

TABLE 12

RF INPUT ( $\mu$ V)	TR7 SOURCE VOLTAGE
0	6V
10	5.2V
100	3.8V
1000	3.2V

- 3-2-7-3 If the voltage of TR7 source does not go down. Check the audio input voltage of AGC detector at TR8 emitter. The typical audio voltage is listed in Table 13.

TABLE 13

RF INPUT ( $\mu$ V)	AUDIO VOLTAGE (V) RMS
1	0.07
10	0.35
100	0.63
1000	0.76

- 3-2-8 SSB SQUELCH PERFORMANCE CHECK
- 3-2-8-1 Same as 3-2-1-1 from 3-2-1-6
- 3-2-8-2 Disconnect the signal generator from the antenna connector jack.
- 3-2-8-3 Adjust the squelch control for quieting.
- 3-2-8-4 Connect the signal generator, increase generator output until squelch opens.
- 3-2-8-5 The squelch threshold release time is approximately 0.5 second.
- 3-2-8-6 Rotate the squelch control fully clockwise.
- 3-2-8-7 Increase signal generator until the squelch opens. The typical RF voltage is 1000 $\mu$ V.
- 3-2-9 SSB SQUELCH TROUBLESHOOTING
- 3-2-9-1 When squelch action is faulty, check the AGC section first.
- 3-2-9-2 The tight squelch can be adjusted at VR5.
- 3-2-9-3 The squelch transistor D.C. voltage is the same as AM table 8.

- 4. OSCILLATOR
  - 4-1 SYNTHESIZER UNIT PERFORMANCE CHECK
    - 4-1-1 Connect RF watt meter to antenna jack.
    - 4-1-2 Connect frequency counter to antenna jack across a small capacitor.
    - 4-1-3 Feed a 1000Hz  $\pm$  0.1% audio signal into the microphone jack.
    - 4-1-4 Rotate the channel selector to CH-1, mode switch to USB.
    - 4-1-5 Key the transmitter and increase the audio output until the RF output is saturated.
    - 4-1-6 Rotate clarifier for correct frequency. The correct frequency for USB is the fundamental plus modulation frequency. (For Example: CH-1 26.965 MHz + 1000 Hz = 26.966 MHz)
    - 4-1-7 Check all channels on USB and LSB.
    - 4-1-8 Check the frequency variable frequency should be more than  $\pm$  300 Hz reference a correct frequency.
  - 4-2 SYNTHESIZER ALIGNMENT
    - 4-2-1 Connect frequency counter to T-12 secondary through a 560 ohm resistor.
    - 4-2-2 Rotate channel selector switch to CH1, mode switch to USB.
    - 4-2-3 Rotate clarifier  $\frac{1}{2}$  turn.
    - 4-2-4 Adjust trimmer CT7 for 14.910 MHz on frequency counter.
    - 4-2-5 Connect frequency counter leads to TR18 emitter.
    - 4-2-6 Adjust trimmer CT1 to obtain 38.240 MHz on the frequency counter.
    - 4-2-7 Remaining frequency adjustments are listed in Table 14.
    - 4-2-8 Remove counter leads from TR18 emitter and connect the oscilloscope to TR18 emitter through a RF pad probe.
    - 4-2-9 Rotate channel selector switch to 13.
    - 4-2-10 Peak T-13, T-14 and T-15 for maximum indication on the oscilloscope. Typical voltage is 3.4V p-p.

TABLE 14

CHANNEL	MODE SWITCH	ADJUSTMENT	FREQUENCY (MHz)
1	USB	CT1	38.240
2	USB	CT8	38.250
3	USB	CT9	38.260
4	USB	CT10	38.280
1	LSB	CT11	38.237
2	LSB	CT12	38.247
3	LSB	CT13	38.257
4	LSB	CT14	38.277
5	LSB	CT2	38.287
10	LSB	CT3	38.347
15	LSB	CT4	38.407
20	LSB	CT5	38.477
23	LSB	CT6	38.527

4-3 SYNTHESIZER TROUBLESHOOTING

4-3-1 Check the output voltage at each point using an oscilloscope. Typical voltages are shown in Table 15.

TABLE 15

LOCATION	VOLTAGE (Vp-p)
T12 Secondary	2.4
T10 Secondary	1.1
TR17 Base	0.56
TR18 Emitter	3.4

4-3-2 If a crystal is bad, see synthesizer crystal frequency chart to locate crystals in use.

4-4 CARRIER OSCILLATOR PERFORMANCE CHECK

4-4-1 Connect frequency counter lead to TR20 Emitter.

4-4-2 Rotate mode switch to USB.

4-4-3 The frequency reading obtained is 11.275 MHz  $\pm$  100Hz.

4-4-4 Rotate mode switch to LSB.

4-4-5 The frequency reading obtained is 11.272 MHz  $\pm$  100Hz.

4-5 CARRIER OSCILLATOR ALIGNMENT

The oscillator frequency is adjusted at Trimmer, CT-15-USB, CT-16-LSB.

SYNTHESIZER CRYSTAL FREQUENCY  
CHART

C-H	FREQUENCY (MHz)				
	14 MHz		23 MHz	SYNTHESIZER OUTPUT	
	USB (AM)	LSB		USB (AM)	LSB
1	14.910	14.907	23.330	38.240	38.237
2	14.920	14.917	23.330	38.250	38.247
3	14.930	14.927	23.330	38.260	38.257
4	14.950	14.947	23.330	38.280	38.277
5	14.910	14.907	23.380	38.290	38.287
6			23.380	38.300	38.297
7			23.380	38.310	38.307
8			23.380	38.330	38.327
9			23.430	38.340	38.337
10			23.430	38.350	38.347
11			23.430	38.360	38.357
12			23.430	38.380	38.377
13			23.480	38.390	38.387
14			23.480	38.400	38.397
15			23.480	38.410	38.407
16			23.480	38.430	38.427
17			23.530	38.440	38.437
18			23.530	38.450	38.447
19			23.530	38.460	38.457
20	14.950	14.947	23.530	38.480	38.477
21	14.910	14.907	23.580	38.490	38.487
22	14.920	14.917	23.580	38.500	38.497
23	14.950	14.947	23.580	38.530	38.527

