

KENWOOD

HF TRANSCEIVER

R-820

ALIGNMENT INSTRUCTIONS

TRIO-KENWOOD CORPORATION



ADJUSTMENT

TEST EQUIPMENT FOR ADJUSTMENT

1. Voltmeter

- 1) Input impedance:
Not less than 1 M Ω .
- 2) Voltage ranges:
1.5V to 1000V, AC and DC.

NOTE:

A high precision multimeter is permissible, but won't provide accurate reading for high-impedance circuit measurement.

2. RF Voltmeter

- 1) Input impedance:
Not less than 1 M Ω with input capacitance not more than 20pF.
- 2) Voltage range:
10mV through 300V full scale.
- 3) Frequency response:
Not less than 20 MHz.

NOTE:

For adjustments requiring less precision, detector output may be checked with a voltmeter or multimeter.

3. AF Voltmeter

- 1) Frequency response:
50 Hz ~ 10 kHz
- 2) Input impedance:
Not less than 1 M Ω .
- 3) Voltage range:
10 mV ~ 30V full scale.

2. AF dummy load

- 1) Impedance:
8 Ω non-inductive.
- 2) Power capacitor:
Not less than 3 watts.

5. Oscilloscope

High sensitivity with external sync in.

6. Sweep generator

- 1) Center frequency:
8.83 MHz.
- 2) Frequency deviation:
Max. +5 kHz.
- 3) Output voltage:
Not less than 0.1V.
- 4) Sweep rate:
Not less than 0.5 sec/cm.
- 5) Marker provision recommended.

7. SSG (Standard Signal Generator)

- 1) Output frequency range:
1.8 MHz ~ 30 MHz.
- 2) Output level:
0 dB/ μ V. -120 dB/ μ V.

NOTE:

- 1) The SSG must be stable output frequency and minimum frequency modulation component.
- 2) 0 dB = 1 μ V
Z = 50 Ω
Open Circuit Voltage

8. Frequency counter

- 1) Minimum input voltage:
50 mV.
- 2) Frequency response:
Not less than 40 MHz.

9. Noise generator

- 1) Noise component must be similar to automobile ignition noise, containing harmonics to above 30 MHz.
- 2) Output level should be adjustable.

PRELIMINARY SETTING

1. Prior to adjustment, remove the top and bottom covers from the unit and place it on its side.

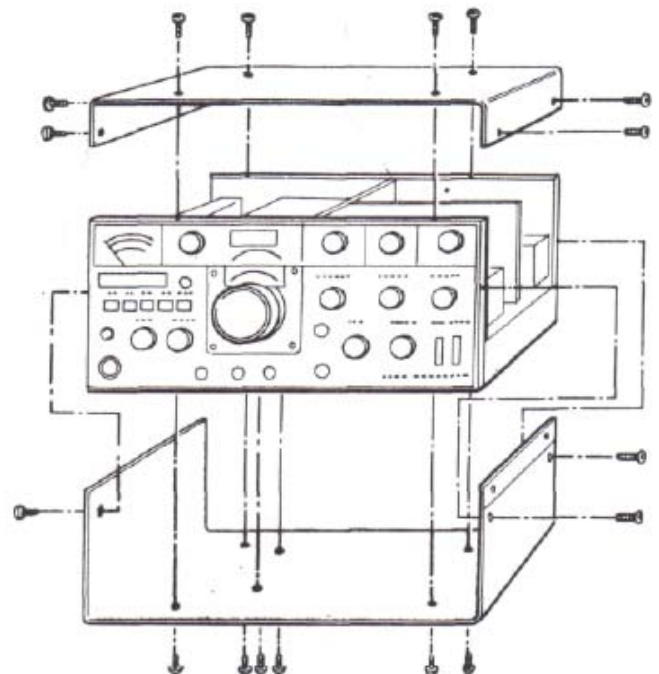


Fig. 26

ADJUSTMENT

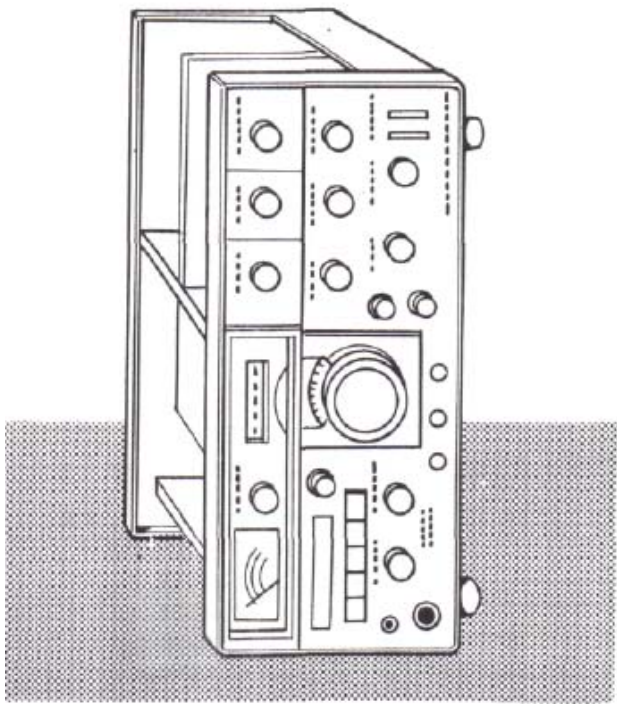


Fig. 27

2. Unless otherwise specified, set the front and rear panel controls as follows:

1) Front panel

Table 5

STBY	REC
CAL 25 kHz	OFF
NB	OFF
MONI	OFF
AGC	OFF
MODE	USB
RF ATT	0 dB
DH	OFF
FIX	VFO
NB LEVEL	FULL CLOCKWISE (CW)
MONITOR	FULL CLOCKWISE (CW)
TONE	FULL CLOCKWISE (CW)
RIT SW	OFF
NOTCH SW	OFF
BAND	1.8 NORM
TRCV SEP	SEP
NOTCH VR	CENTERED
RIT VR	CENTERED
IF SHIFT	CENTERED
AF GAIN	COUNTERCLOCK- WISE (CCW)
VBT	NORMAL
SELECTIVITY	AUTO
PRESELECTOR	CENTERED

2) Rear Panel

Table 6

FULL VFO	FULL
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1. POWER SUPPLY ADJUSTMENT

1-1. 9V DC line adjustment

- 1) Measuring instrument: Voltmeter.
- 2) Adjustment
Connect voltmeter between the AF-AVR 9V terminal and Ass'y (X49-1080-00) and chassis ground, and adjust VR4 on the AF-AVR Ass'y for 9.0 volts. (Refer to Fig. 2.8 and P-connector terminal callouts.)

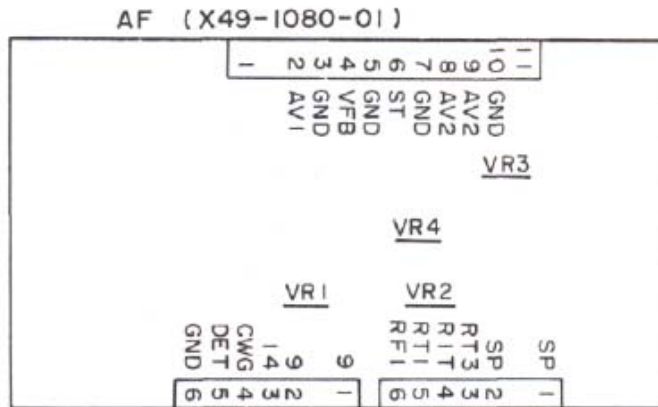


Fig. 28

1-2. RF-1 (3.5V) adjustment

- 1) Measuring instruments
 1. RF Voltmeter.
 2. Frequency Counter.
- 2) Adjustment

Before adjustment, set the IF Shift control to its center (detent) position.

1-3. Check points for voltage

- | | |
|---------------------|--------------------|
| 1) 14V terminal. | |
| AF (X49-1080-00) | RL (X43-1190-01) |
| Conv. (X60-1020-00) | IF•A (X48-1190-00) |
| RF (X44-1240-00) | IF•B (X48-1200-00) |
| Fix (X50-1450-00) | |
| 2) 5V terminal. | |
| PLL (X60-1010-01) | RL (X43-1190-01) |
| Conv. (X60-1020-00) | |
| 3) 6V terminal. | |
| RF (X44-1240-00) | Fix (X50-1450-00) |
| IF•B (X48-1200-00) | |

ADJUSTMENT

- 4) Control voltage for RF unit (X44-1240-00)

Table 7

STBY-REC. SW	REC	STBY
RB terminal	+ 2.2V	- 3.5V
RLR terminal	+ 9.0V	- 1.7V
RBC terminal	+ 2.2V	- 3.5V

2. ADJUSTMENT OF RECEIVER SECTION

2-1. Carrier adjustment

- 1) Measuring instruments
 1. RF VTVM.
 2. Frequency counter.

2) Adjustment

Before adjustment, set the IF-Shift control to its center position.

1. Connect the RF voltmeter to the IF-A Ass'y (X48-1190-00), CA1 or TP1 terminal and adjust T1 on the CAR-1 Ass'y to obtain $100 \text{ mV} \pm 1 \text{ dB}$. Then adjust T1 on the CAR-2 Ass'y to obtain $1 \text{ V} \pm 1 \text{ dB}$ at the IF-A Ass'y CA1 or TP3 terminal.
2. Connect the frequency counter to the IF-A Ass'y CA1 or TP1 terminal, and adjust frequencies per Fig. 29.

Table 8

MODE SW	Adjustment point	Setting freq.
AM	CAR-1 unit VR1	8.8300 MHz
CW	CAR-1 unit TC2	8.8315 MHz
USB	CAR-1 unit TC2	8.8315 MHz
LSB	CAR-1 unit TC1	8.8285 MHz
RTTY	CAR-1 unit TC1	8.8285 MHz

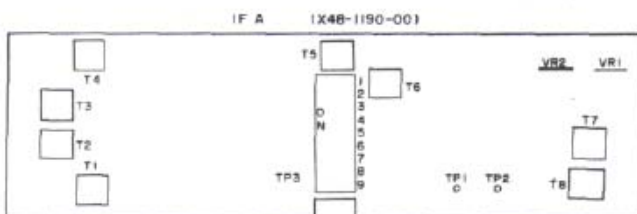


Fig. 29

After completing adjustments, return the VBT control to NORMAL (CW) position, and check that the IF-Shift control changes frequency over $\pm 1.5 \text{ kHz}$.

3. With the VBT control still at NORMAL (CW), and the IF-Shift control set at its center (Detent) position, connect the frequency counter to the IF-A Ass'y CA2 or TP3, and adjust TC-1 on the CAR-2 Ass'y to obtain 8.375 MHz. Then turn the VBT control through its range to check that the frequency changes more than -2.3 kHz .

2-2. VCO adjustment

- 1) Measuring instrument needed.

1. Voltmeter.
2. Frequency counter.

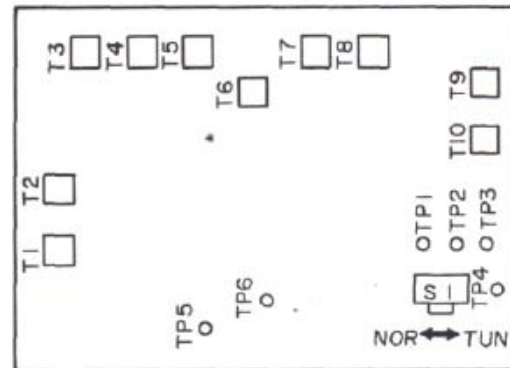


Fig. 30

2) Adjustment

1. Connect the voltmeter to the VCO Ass'y (X54-1330-00) TP4. Check that the slide switch in the VCO is set to the NORM position.
2. Set the VFO dial to "250", and adjust T1 through T10 to obtain a voltmeter reading of 2.9V to 3.5V for each band.

NOTES:

- 1) When the VFO dial is turned from "0" to "500", the voltmeter reading must reflect this change.
- 2) For 21 MHz and above, two different tuning points may give a reading of 3.2V. The "Correct" tuning point is with deeper core position. An incorrect tuning point won't give voltage change when the VFO dial is turned.
- 3) To check VCO frequencies, set the slide switch S1 on the VCO Unit to the TUN position, and connect a frequency counter across TP5 and TP6 (GND). First check frequencies with TP1 and TP2 bridged to each other (NORMAL), and then with TP1 and TP2 opened and TP2 and TP3 shorted to each other. The frequency differences between these two cases must range within the following frequency ranges, per Table 9.

ADJUSTMENT

Table 9

BAND	COIL	Setting freq.	Bandwidth
WWW/JJY	T1	24.08 MHz	More than ± 550 kHz
1.8	T2	10.88 MHz	More than ± 400 kHz
3.5	T3	12.58 MHz	More than ± 400 kHz
7.0	T4	16.08 MHz	More than ± 500 kHz
14.0	T5	23.08 MHz	More than ± 650 kHz
21.0	T6	30.08 MHz	More than ± 650 kHz
28.0	T7	37.08 MHz	More than ± 650 kHz
28.5	T8	37.58 MHz	More than ± 650 kHz
29.0	T9	38.08 MHz	More than ± 650 kHz
29.5	T10	38.58 MHz	More than ± 650 kHz
AUX	T11	X+8.83 MHz	More than ± 500 kHz

2-3. IF amplifier adjustment

1) Instruments:

1. SSG (or 25 kHz Marker).
2. AF Voltmeter.
3. AF dummy load.

2) Adjustment

1. Connect SSG output to the receiver antenna terminal.
Set the SSG to 1.9 MHz, 40 dB output.
2. Adjust the following coil(s) for maximum AF voltmeter reading.

- * Coil pack unit: L1, L12, and L16
- * RF unit: T2
- * IF A unit: T1 ~ T8
- * IF B unit: T2, and T3

NOTE:

After completing this adjustment, make sure to carry out the S-meter adjustment described in 2-10.

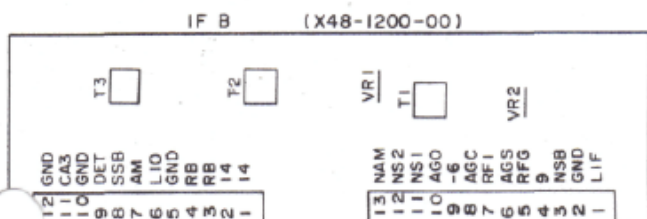


Fig. 31 IF B Unit

2-4. Coil pack adjustment

1) Instruments:

Same as item 2-3, IF Amplifier Adjustment.

2) Adjustment

1. Adjust SSG output to 40 dB, and connect to the receiver antenna terminal. Center the PRESELECTOR control. Adjust the coil Pack Unit per Table 10, for maximum AF output. SSG output should be reduced as sensitivity increases.

Table 10

BAND	VFO scale	SSG freq.	Adjustment coil
WWW/JJY	250	15.25 MHz	L1, L8, L15
1.8	100	1.90 MHz	L2, L9, L16
3.5	250	3.75 MHz	L3, L10, L17
7.0	250	7.25	L4, L11, L18
14.0	250	14.25	L5, L12, L19
21.0	250	21.25	L6, L13, L20
29.0	0	29.00	L7, L14, L21
29.5~49m	250	6.15 MHz	Conv. unit T15

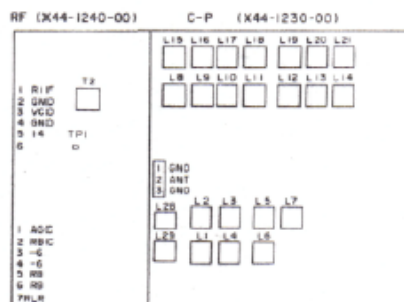


Fig. 32 RF Unit and Coil Pack

2-5. IF trap adjustment

1) Instruments:

Same as item 2-3, IF Amplifier Adjustment.

2) Adjustment

1. Adjust SSG output to 8.830 MHz, 100 dB, and connect to the receiver antenna terminal. Set the BAND switch to 7 MHz, and the VFO to "250".
2. Adjust L28 and L29 on the coil pack alternately to obtain minimum S-meter and audio reading.

2-6. Noise blanker circuit adjustment

1) Instruments:

1. Voltmeter.
2. Noise generator.
3. Oscilloscope.

ADJUSTMENT

2) Adjustment

* Initial adjustment.

Receive the 25 kHz marker signal, and adjust T1 and T2 on the NB Unit (X48-1150-00) to obtain minimum voltage at the TP terminal, with the NB switch turned ON.

* Full adjustment.

1. After completing initial adjustment, connect the noise generator to the receiver antenna terminal and adjust the Preselector for maximum receiver noise output.

Ideal S-meter reading at this time will be between 5 and 7.

2. With NB ON, connect the oscilloscope probe to D13 cathode, on the IF Unit.

Adjust T1 on the IF Unit, and T2 on the RF Unit for the waveform shown in Fig. 33b.

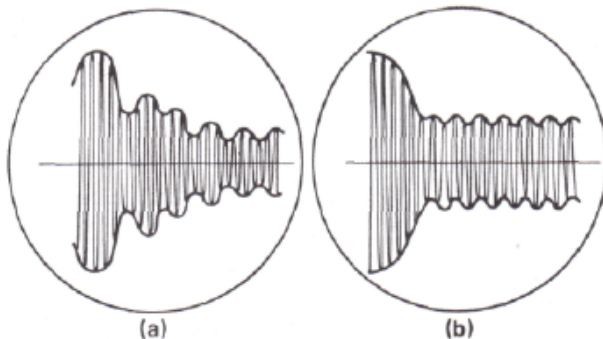


Fig. 33 Adjustment of Noise Blanker

3. Fine adjust T1 and T2 on the NB Unit and T3 on the IF A Unit within 1/4 turn for minimum receiver noise output, while using care to maintain waveform as shown in Fig. 33b.

4. Turn the RF ATT ON, and repeat fine adjustments. The Noise Blanker must be effective against noise below S-meter threshold.

5. Final check that receive gain is not greatly reduced.

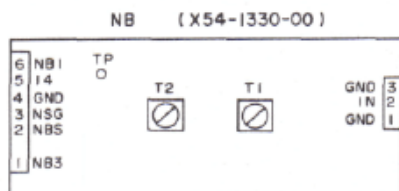


Fig. 34 NB Unit

2-7. NOTCH adjustment

1) Instruments:

1. AF voltmeter.
2. Frequency counter.
3. AF dummy load.

2) Adjustment

1. Center the NOTCH control, and connect the frequency counter to the CA3 terminal, on the Local OSC Unit. Adjust the Local OSC Unit per Table 11.

Table 11

MODE	NOTCH SW	Adj point	Adj freq.
LSB	ON	T4	51.5 kHz
USB	ON	TC2	48.5 kHz
—	OFF	IF • B unit VR2	51.5 kHz

2. Turn the NOTCH and AGC OFF, and receive the 25 kHz Marker signal. Connect the frequency counter to the IF2 OUT jack on the receiver rear, and adjust the VFO for a 50,000 kHz counter reading.

3. Turn the NOTCH switch ON, and adjust T1 on the IF B Unit for a 50,000 kHz counter reading.

4. Adjust VR1 (NULL) on the IF B Unit for minimum AF voltmeter reading.

5. Repeat this procedure 3 or 4 times, or until no further improvement is noted.

2-8. Frequency response (Carrier Point) adjustment

1) Instruments:

1. SSG (or Marker).
2. Frequency counter.

2) Adjustment

1. Set the controls as follows:

SELECTIVITY control: 0.5
IF SHIFT control: Centered
VBT control: NORMAL

DIP switches 1, 3, 6 and 8 on the IF A Unit: ON.
Jumper D15 and D16 (The 455 kHz filter is bypassed.)

2. Receive any frequency from the SSG or marker, and note the S-meter reading with FAST AGC.

3. Set the MODE switch to LSB. While reading the 25 kHz Marker AF output with the frequency counter, adjust TC-1 on the CAR-1 Unit for the same S-meter reading at both the 200 Hz and 2800 Hz beat points. Then set the MODE switch to USB, and adjust TC-2 on the CAR-1 Unit, again for the same S-meter reading at 200 Hz and 2800 Hz.

ADJUSTMENT

CAR 1,2 (X60-1040-00)

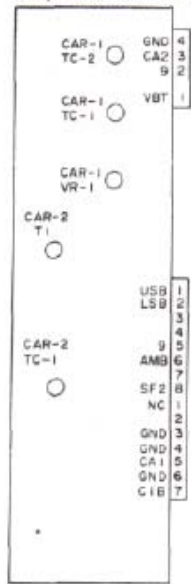


Fig. 35

4. Turn DIP switches 1, 4, 6, and 8 on the IF A Unit ON, and remove the jumper connecting D15 to D16. Set SELECTIVITY to the AUTO position, and adjust TC-1 on the CAR-2 Unit for equal S-meter reading at 200 Hz beat output when the MODE is switched between LSB and USB.
5. AM CAR adjustment
Connect the frequency counter to CA1 or TP1 on the IF A Unit, and set the MODE switch to AM. Adjust VR-1 on the CAR-1 unit for an 8,8300 MHz counter reading.

2-9. CONV BAND adjustment

1) Instruments:

1. Oscilloscope.
2. Sweep generator.
3. Detector.

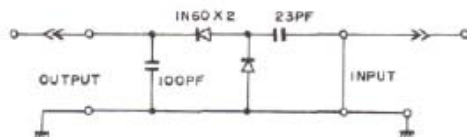
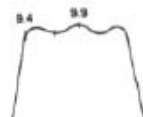


Fig. 36

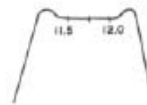
2) Adjustment

1. Set the sweep generator and marker output, and make the following adjustments for each SW BAND.

- a) 29.5 — 49m Adjust T11, T12, and T13.
- b) 29.5 — 31m Adjust T8, T9, and T10.



- c) 29.5 — 25m Adjust T5, T6, and T7.



- d) 29.5 — 16m Adjust T2, T3, and T4.



Fig. 37

AUX (X44-1250-00)

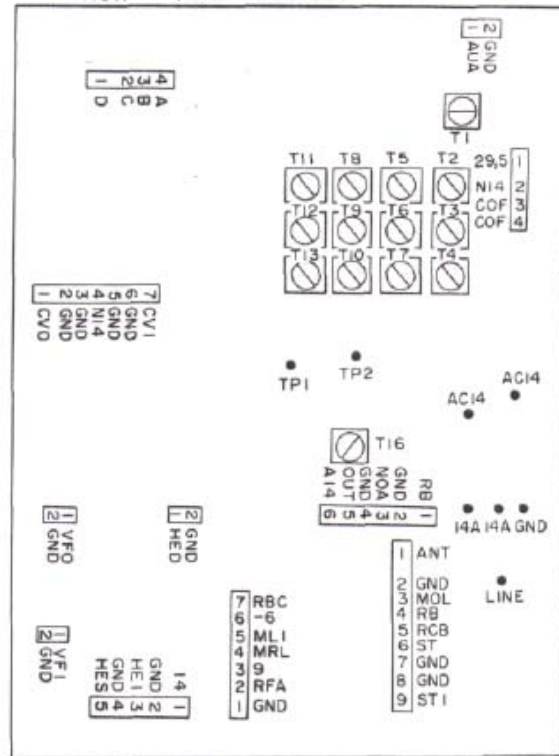


Fig. 38 CONV. Unit

2-10. S-meter adjustment

1) Instrument SSG:

2) Adjustment

1. After RF and IF alignment, zero the S-meter by adjusting VR1 on the IF A Unit with no input signal.
2. Adjust SSG output for 0 dB and connect to the receiver antenna terminal. On the IF A Unit, adjust T7 counterclockwise for S-meter start at 0 dB.
3. Increase SSG output to 40 dB, and adjust VR2 on the IF A Unit for an "S9" S-meter reading.

2-11. RIT adjustment

1) Instrument 25 kHz marker.

2) Adjustment

1. Set the RIT control exactly at "0" and turn the RIT switch ON.
2. Turn the VFO to the marker for a 1 kHz beat.
3. Turn the RIT switch OFF, and adjust VR2 on the AF AVR Unit (X49-1080-01) for no frequency change when the RIT switch is turned ON and OFF.

ADJUSTMENT

2-12. Marker frequency adjustment

- 1) Instrument:
Frequency counter.
- 2) Adjustment
 1. Connect the frequency counter to Q4 collector on the Marker Unit (X52-005-01), and open the MS terminal ground.
 2. Turn the CA1 25 kHz switch ON, and adjust TC-1 on the Marker Unit for a 100,000 Hz $\pm$ 1 Hz counter reading.

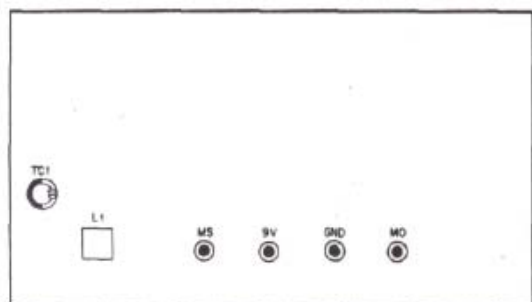


Fig. 39

2-13. VFO adjustment

- 1) Instruments:
 1. RF voltmeter.
 2. Frequency counter.
- 2) Adjustment
 - * Oscillator frequency adjustment
Set the FIX CH switch to the VFO position. Connect the frequency counter to the VFO terminal (1) on the FIX Unit (X50-1450-00). Tune the VFO to "0" and check that oscillator frequency is 5.50 MHz. Then turn the VFO to "500", and check that oscillator frequency is 5.00 MHz. If 5.50 MHz requires calibration, adjust TC1 in the VFO Unit. If the 5.00 MHz setting requires calibration, adjust L1. Since these adjustments interact, repeat the procedure several times, or until no improvement is noted.
 - * Output voltage adjustment
Set the VFO dial to "250". Connect the RF voltmeter to the VFO terminal (1) on the FIX Unit, and adjust TC2 in the VFO Unit for 0.8V output.

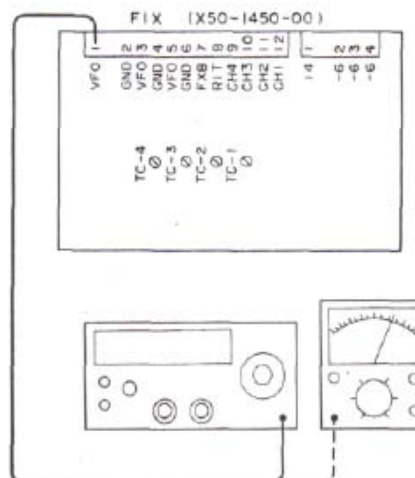


Fig. 40 FIX Unit

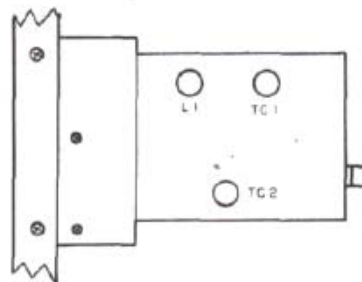


Fig. 41 VFO Unit

3. COUNTER ADJUSTMENT

3-1. Counter reference oscillator frequency adjustment

Simplified adjustment

- 1) Measuring instrument
Frequency counter and calibration cable.

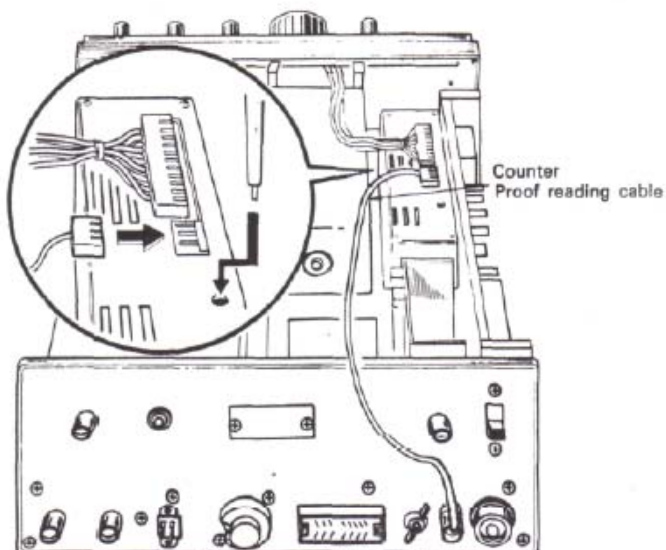


Fig. 42

ADJUSTMENT/OPTION

2) Adjustment

1. Turn the BAND selector to the JJY/WWV position. Connect an antenna to the antenna terminal on the receiver, and tune the 15 MHz JJY/WWV signal for Zero Beat.
2. Connect the counter calibration cable between the ANT-2 terminal on the receiver rear, and the 3P terminal on top of the Counter Unit. Adjust TC1 on top of the Counter Unit for a zero beat against WWV/JJY.

NOTES:

- 1) Zero-beat can be judged from the speaker output. For greater accuracy, read the S-meter. As zero-beat is approached, the S-meter pointer be seen to will oscillate at a frequency of 1 to 3 Hz. At exact zero-beat, the meter pointer will cease oscillation.
- 2) The TC1, adjustment covers a frequency range of approximately ± 400 Hz. For a rough adjustment, zero beat 15 MHz JJY/WWV and set TC1 for a counter reading of 14,999.9 to 15,000.0.

Complete adjustment

- 1) Instrument:
Frequency counter.

2) Adjustment

1. On the Counter Unit (X60-1020-00), short CL2 to G terminals and connect the frequency counter across CL1 and G terminals.
2. Adjust TC1 on the Counter Mixer Unit for a 1 MHz ± 5 Hz frequency counter reading.

Counter Mixer

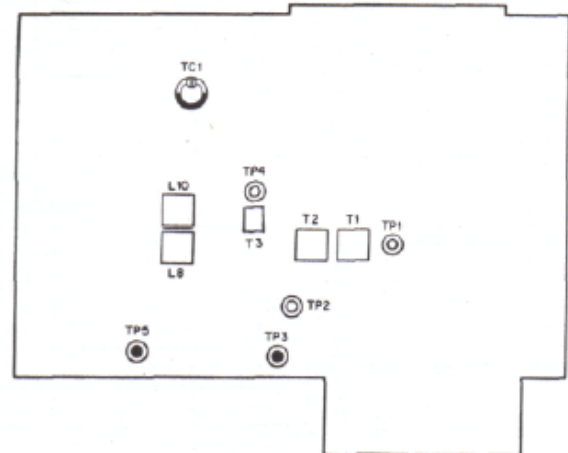


Fig. 43 Counter Mixer Unit

OPTIONAL FILTER

	Crystal filter (AM) YG-88A	Crystal filter (CW) YG-455C	Crystal filter (CW) YG-455CN
Center frequency	8830 kHz	455.7 kHz	455.7 kHz
Pass bandwidth	More than ± 3 kHz (−6 dB)	More than ± 250 Hz (−6 dB)	More than ± 125 Hz (−6 dB)
Attenuation bandwidth	Less than ± 6 kHz (−60 dB)	Less than ± 425 kHz (−60 dB)	Less than ± 250 Hz (−60 dB)
Guaranteed attenuation	More than 80 dB	More than 80 dB	More than 80 dB
Loss	Less than 6 dB	Less than 6 dB	Less than 6 dB
Impedances	470 Ω /5pF	2 k Ω /15pF	2 k Ω /15pF
Elements	8 elements	8 elements	8 elements

1088AM

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