

## FT-757GXII TECHNICAL SUPPLEMENT



This manual is intended to serve as a supplement to the FT-757GXII Operating Manual. Detailed information regarding functions, installation, interconnections and operation has been provided in the Operating Manual, and is not reprinted herein. Therefore, this supplement is not intended to serve as an independent reference, but to be used in conjunction with the information provided in the Operating Manual.

Because there are nearly four hundred and fifty semiconductor devices in the FT-757GXII, circuit description information is provided in the form of numerous block diagrams and a complete Component Applications List. We hope that this manner of providing functional information proves to be more convenient for the owner and technician than would a lengthy verbal description. Those readers unfamiliar with the basic types of analog and digital circuits that serve as the building blocks of the FT-757GXII are encouraged to study instructional material, such as that provided in handbooks on amateur radio and digital circuit design, before attempting to understand the design of the FT-757GXII. Each block in the block diagrams represents one such basic circuit, while the Component Applications List provides additional details for each semiconductor. General information on integrated circuits and their applications is available in the data provided by the IC manufacturers. Specific circuit details are provided in the schematic diagrams in this manual.

While we believe the technical information in this manual is correct, Yaesu assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Yaesu Musen reserves the right to make changes in the circuitry of this transceiver, in the interest of technological improvement, without obligation to notify owners or to modify any sets produced prior to the modification.

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## **SOLDERING AND DESOLDERING TECHNIQUE**

The FT-757GX II circuit boards are tough, but mis-

**NOTES ON USE OF CMOS COMPONENTS:**

nancing during soldering can cause circuit traces to "lift." While this does not cause permanent damage to the board, much servicing trouble can result, because of the tendency for this lifted trace to break. A few simple precautions will keep your circuit boards in A-1 condition.

1. Use only a 12 to 30-watt chisel-tip soldering iron, with the tip grounded or isolated from AC and DC potential. Voltage at the tip can easily destroy CMOS components.
2. Use only the minimum amount of heat necessary to remove a component, or to cause the solder to "flow" when installing a new component.
3. USE ONLY 60/40 ROSIN CORE SOLDER.
4. Use solder removing braid and flux to absorb excess solder before installing a new component. A solder sucker can also be used, but must be handled with care to avoid lifting traces.
5. Do not attempt to remove DIP ICs without first cutting all of the pins on the component side of the board, unless you have the correct desoldering equipment (spring-loaded clamp and all-pin desoldering tip).

If you do lift a trace, don't worry! Read on to find out how to repair traces like a pro.

As CMOS devices are extremely sensitive to damage from static electricity, special precautions must be observed.

In storage, use only conductive sponge specially designed for CMOS components.

When installing a CMOS part in a socket, or on a circuit board, be certain that the power is off. In addition, the technician should rest his hand on the chassis as the component is inserted, so as to place his hand at the same potential as the chassis (better to discharge small amounts of static electricity through your fingers than through a \$5 IC !).

When soldering a CMOS part onto a circuit board, use a low-wattage iron, and be sure to ground the tip with a clip lead, if the tip is not grounded through a three-wire power cord.

## INSERTION OF PARTS ON CIRCUIT BOARDS

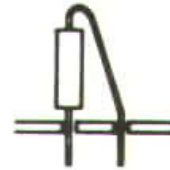
All of the below are acceptable ways of inserting components into circuit board mounting holes.



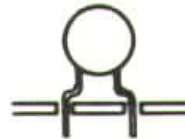
(a) Bend leads slightly



(b) Straight-in mounting



(c) Vertical mounting

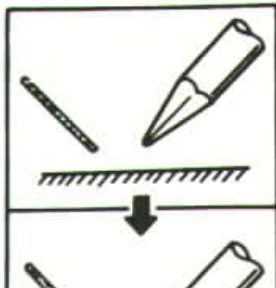


(d) Preformed disc ceramic capacitor



(e) Preformed resistor, diode, etc.

### BASIC SOLDERING PRACTICE



(1) Prepare soldering iron and solder. The tip of the iron should be thoroughly tinned and wiped clean of excess solder.

(2) Apply soldering iron to

### EXAMPLES OF POOR SOLDERING PRACTICE

Unwanted solder bridge connecting two tracks (caused by use of too much solder)

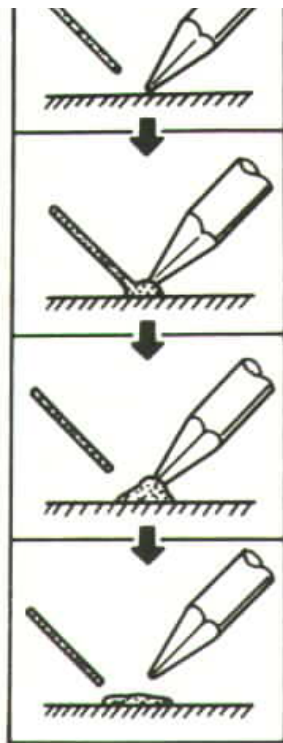


"Cold joint" (caused by insufficient heat to melt of



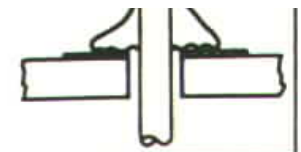
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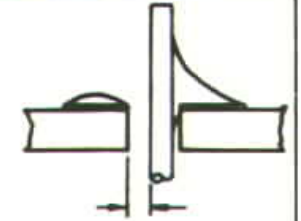


- surface to be soldered. Do not press the iron into the surface.
- (3) Apply solder to junction of iron and heated surface.
  - (4) When enough solder is applied, remove solder. Continue to apply heat just until solder flows cleanly.
  - (5) Remove iron from work. Do not apply more heat than necessary for good solder flow.

sufficient heat to part of work, resulting in poor solder flow)

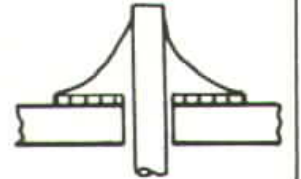


Unstable joint (caused by insufficient heat or solder)



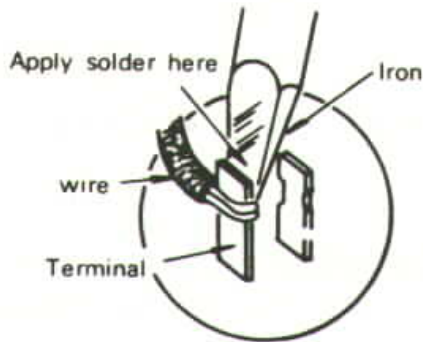
**Proper soldering:**

A smooth fillet of solder surrounds the lead and just covers the foil pad.

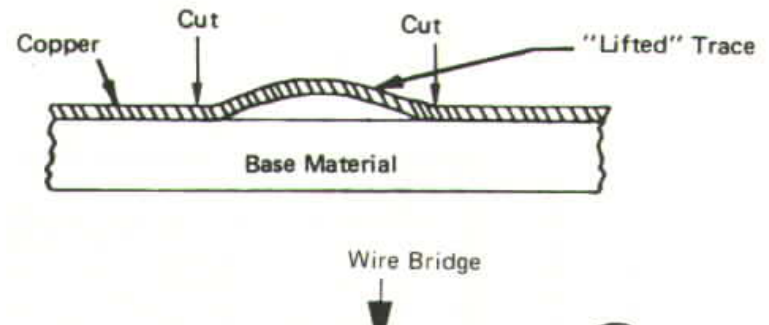


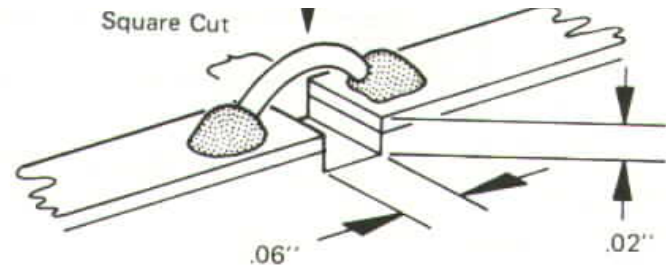
**Soldering to terminal posts:**

(Be certain to apply heat to both post and wire.)



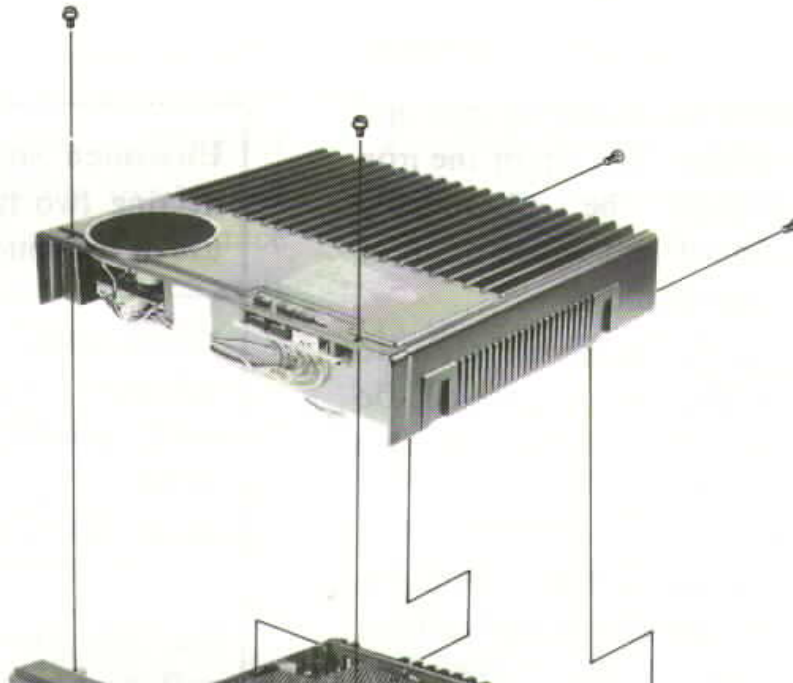
If you have previously lifted a trace, make an etch cut on each side of the lifted trace as shown in the drawing, and install a wire bridge.

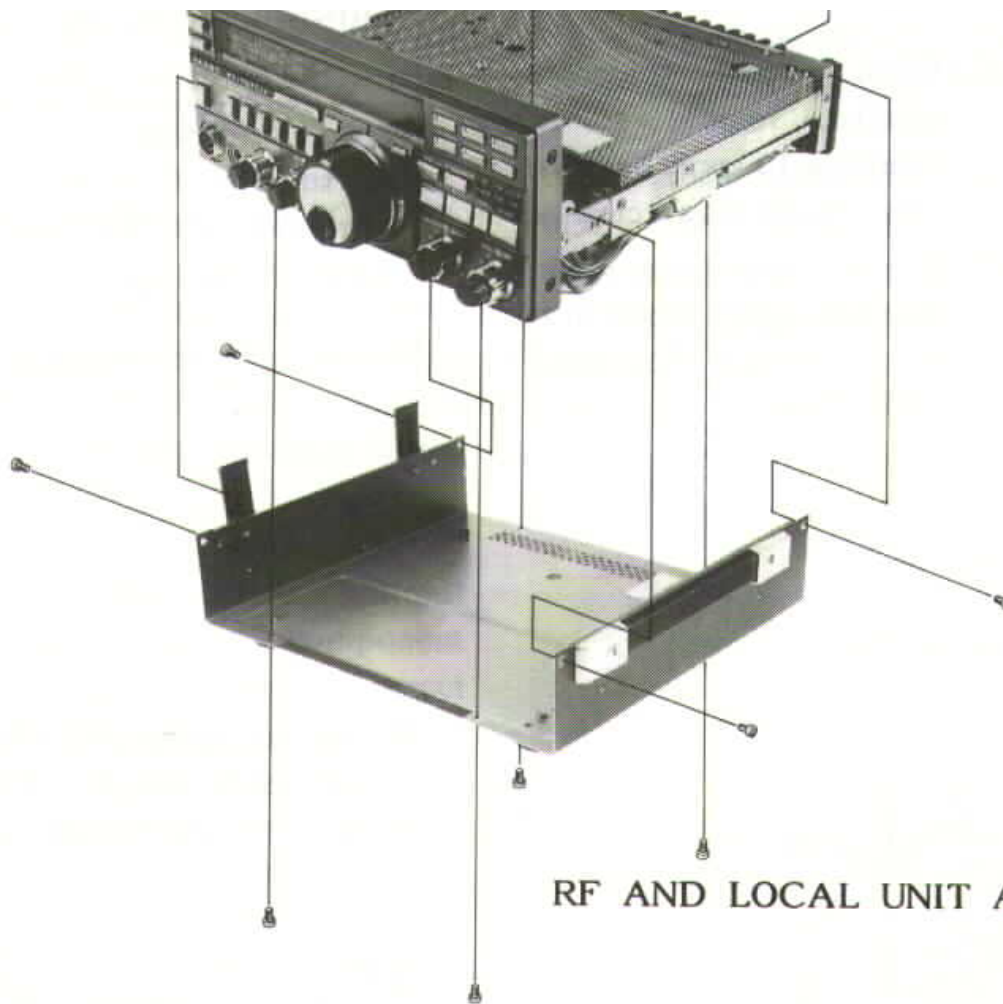




Coat Cut Area With Eastman 910  
After Soldering Wire Bridge

## OUTER COVER REMOVAL

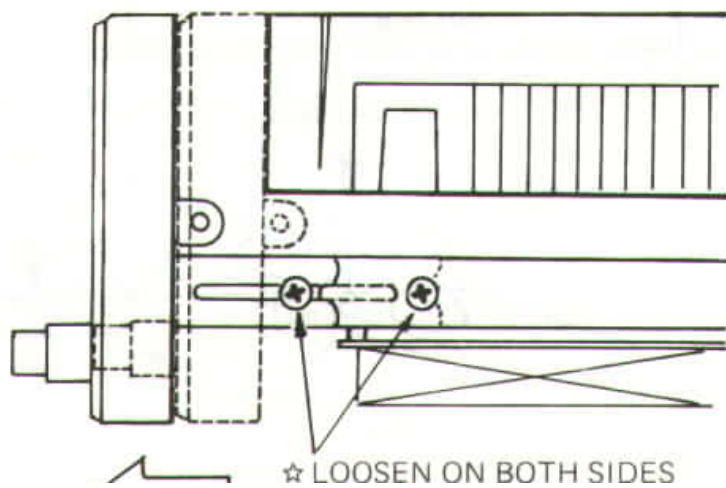




### RF AND LOCAL UNIT ACCESS

To access the solder sides of the RF and Local Units, loosen the screws (marked ☆) on each side and slide the front panel forward.

To remove the RF Unit, first note the positions of the DELAY, ANTI-TRIP, VOX GAIN, COMP LEVEL and FWD SET knobs on the rear panel, and remove them. Then remove the KEY jack nut using a special wrench (available from Yaesu agents). Disconnect the following plugs from their corresponding jacks on the RF Unit: J1027/B14, J1021/D08,



☆ LOOSEN ON BOTH SIDES



SLIDE FORWARD

JACKS ON THE RF UNIT: J1027/P14, J1021/P06, J1029/P05, J1003/P03, J1001/P01, J1034/P3003 and J1004/P35. Remove the 5 screws in the board.

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## SERVICE AND ALIGNMENT

The FT-757GXII is carefully designed to allow the knowledgeable operator to make all adjustments required for various station conditions, modes and operator preferences simply from the controls on the front and rear panels, without opening the case of the transceiver. These adjustments are described in the FT-757GXII Operating Manual.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver has left the factory. However, if damage occurs and some parts subsequently be replaced, realignment may be required. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced.

Under no circumstances should any alignment be attempted unless the normal function and operation of the transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and the need for realignment determined to be absolutely necessary.

The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy. While most steps do not require all of the equipment listed, the interactions of some adjustments may require that more complex adjustments be performed afterwards. Do not attempt to perform only a single step unless it is clearly



We recommend that servicing be performed only by authorized Yaesu service technicians who are experienced with the circuitry and fully equipped for repair and alignment. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair. Authorized Yaesu service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components.

Those who do undertake any of the following alignments are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, Yaesu must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

isolated electrically from all other steps. Rather, have all test equipment ready before beginning, and follow all of the steps in a section in the order they are presented.

A 50-ohm dummy load must be connected to the antenna jack in all procedures that call for transmission (closing the PTT line), except where specified otherwise. Correct alignment is not possible with an antenna.

The SHIFT control must be set to the 12 o'clock position, the NOTCH control set fully counterclockwise to OFF, the RF gain control fully clockwise (maximum), and the SQL control must be fully counterclockwise, unless stated otherwise.

After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, if connected) before proceeding.

### Alignment Equipment

Frequency counter with accuracy of 0.1 ppm to 100 MHz

DC voltmeter with at least 10-Megohm input impedance

RF voltmeter with at least 5% accuracy to 100 MHz, high impedance, and ranging from 10 mV to 3 Vrms

AF millivoltmeter

DC milliammeter ranging to 500 mA

X-Y oscilloscope with 60 MHz bandwidth

RF in-line wattmeter

Resistive dummy load, 50 ohms, 150W; three required for SWR Turndown alignment

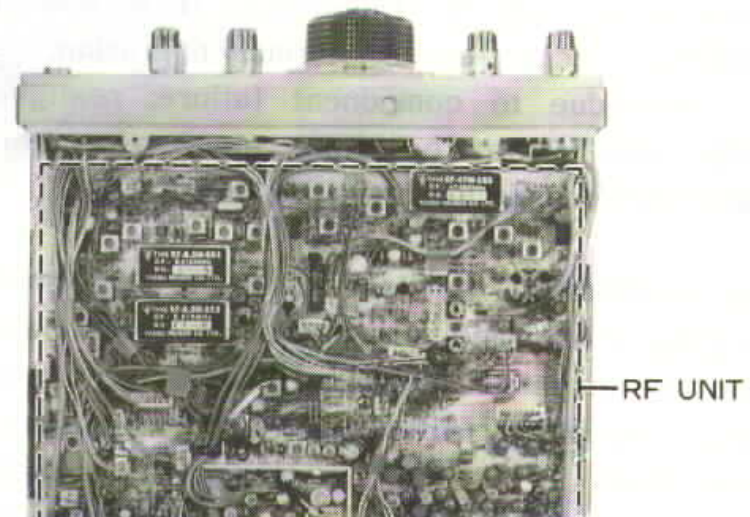
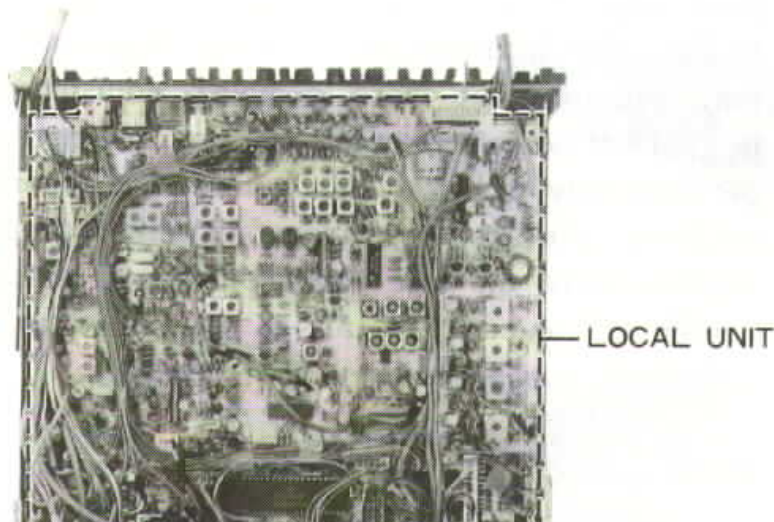
RF signal generator covering 1-30 MHz, with calibrated output levels from 5 dBμ to 100 dBμ

AF signal generator with calibrated output levels from 1 mV to 25 mV

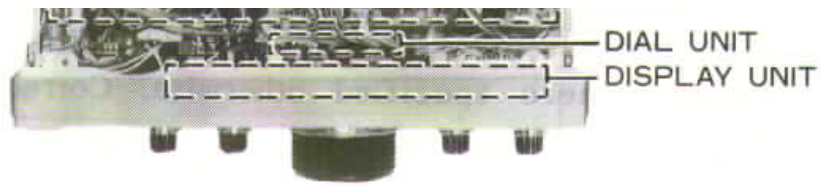
FM deviation meter/SINADer and RF sampling coupler ("T") for FM modulator alignment

Monitor scope for transmitter output display

Linear detector for 1-30 MHz



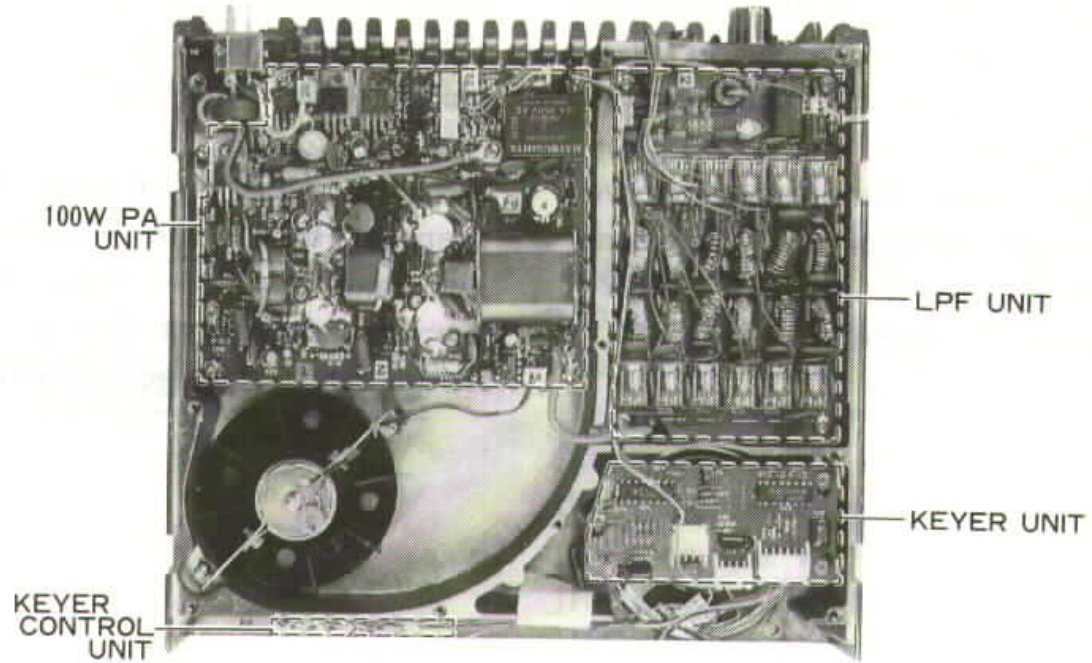
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Chassis Top View



Chassis Bottom View



Underside of Heatsink

### Alignment Precautions

Correct alignment requires that the ambient temperature be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 and 30 °C (68 to 86 °F). When the transceiver is brought into the shop from hot or cold air it should be allowed some time for thermal equalization before alignment.

Alignments must only be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Supply voltage during alignment must be held constant at 13.5V DC. Use a well-regulated power supply capable of at least 20A continuous load.

**Note:** Signal levels in dB referred to in the alignment procedure are based on 0dBu=0.5uV.

## I. LOCAL Unit

### A. Third LO BPF

Connect the RF voltmeter across 3rd LO OUT jack J2008. Set the transceiver to a CW mode, and while receiving, adjust T2001 and T2002 for maximum RF voltage (30 mVrms nominal).

### B. SSB, AM & CW Receive LO Level

Connect the RF voltmeter to pin 2 of

in the previous step, adjust T2011 and T2012 for maximum deflection (at least 80 mVrms).

### E. 45 MHz Tripler

Return the transceiver to the 14 MHz band, and connect the RF voltmeter to TP2002. Adjust T2006 and T2007 for maximum deflection (at least 80 mVrms).

### F. 15 MHz Reference Oscillator

Connect the frequency counter to TP2002 and adjust TC2006 for 45 MHz  $\pm$ 20 Hz.

### G. 2nd Local Oscillator Frequency

1. Connect the frequency counter to TP2007, and tune the transceiver so that the display indicates 14.000.0. Adjust VR2015 so that the counter shows 32.06000 MHz  $\pm$ 20 Hz.
2. Press the DOWN key on the microphone carefully so that the display just steps down to 13.999.9, and adjust VR2006, if necessary, to obtain 32.05901 MHz on the counter. Now press the UP key on the microphone once momentarily so that the display steps up to 14.000.0 and check that the difference in the frequencies shown on the counter are within 990 Hz  $\pm$ 5 Hz.

### H. Carrier Point (Coarse Adj.)

Q2012 and adjust TC2002 so that the difference in level between CW transmit and receive is less than 5 mVrms at this point (output level approximately 50 mVrms).

#### C. 45 MHz Bandpass Filter

With the transceiver set to the 14 MHz band, connect the RF voltmeter to TP2006 and adjust T2009 and T2010 for maximum voltmeter deflection (at least 80 mVrms).

#### D. 60 MHz Bandpass Filter

Set the transceiver to the 21 MHz band, and with the RF voltmeter connected as

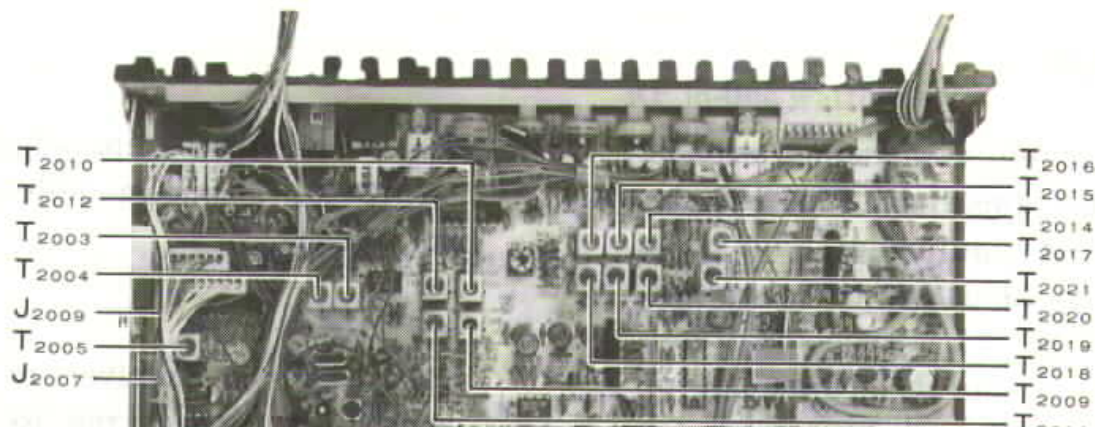
Connect the counter to J2008 and adjust the point indicated in the corresponding mode for the frequency shown below:

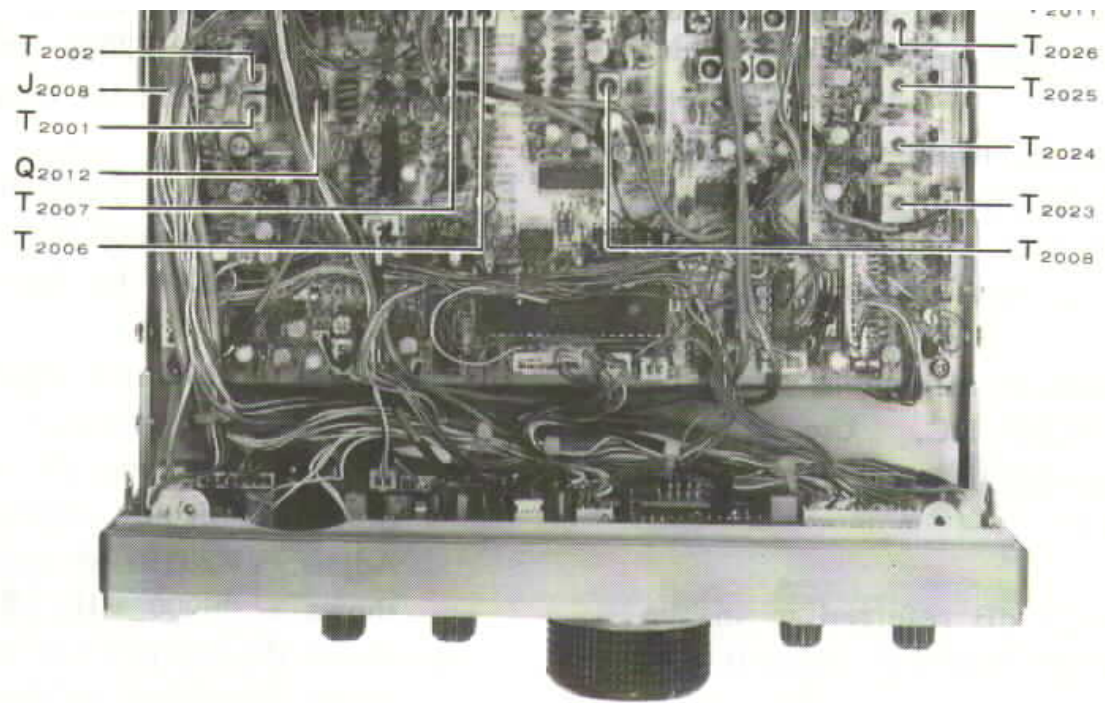
MODE	ADJUST	COUNTER FREQUENCY
LSB	TC2005	8213.4 kHz ( $\pm 50$ Hz)
CW	TC2004	8215.9 kHz ( $\pm 10$ Hz)
USB	VR2005	8216.6 kHz ( $\pm 50$ Hz)

#### I. BFO Frequency

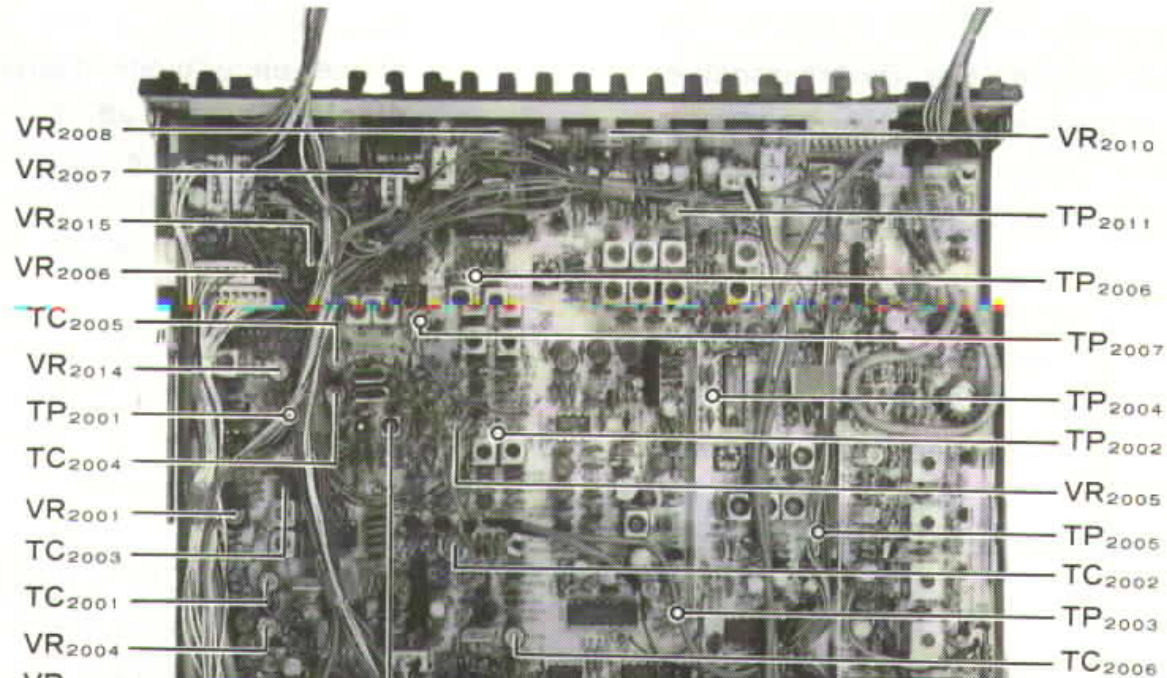
Set the transceiver to a CW mode, and connect the frequency counter to pin 2 of Q2012. Adjust TC2001 (while receiving) for 15.0007 MHz  $\pm 10$  Hz on the counter.

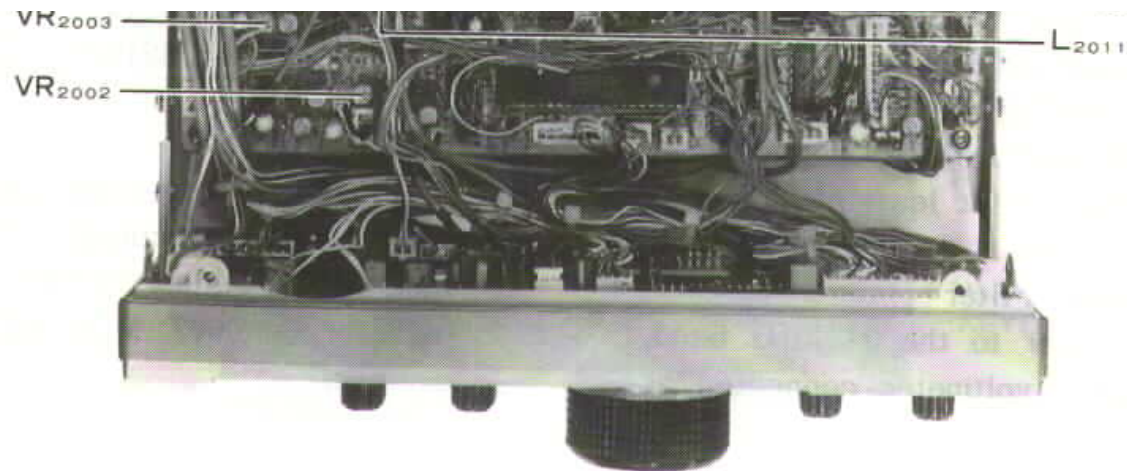
— 7 —





Chassis Top View :  
LOCAL Unit Adjustment Locations





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#### J. FM & AM Carrier Frequency

1. Rotate the AM CAR control (VR2008) fully clockwise, set the transceiver to the AM mode and connect the frequency counter to J2007. Close the PTT line and adjust VR2014 for 8.215 MHz  $\pm$ 100 Hz on the counter.
2. Set the transceiver to the FM mode. Adjust VR2004 while transmitting for 8.215 MHz  $\pm$ 100 Hz on the counter.

#### K. Carrier Level

Set the transceiver to the LSB mode and connect the RF voltmeter to TP2001. Close the PTT line and adjust TC2003

21.250.00, and adjust T2018 - T2021 for maximum RF voltage (at least 50 mVrms).

#### P. Main PLL (PLL-2) VCV

1. Connect the (Hi-Z) DC voltmeter to TP2005 and tune the transceiver to the frequencies shown in the following chart. Adjust the corresponding transformer for 1.5V on the meter. Then retune the transceiver to the corresponding 'Check' frequency, and confirm 5 to 6V on the meter.

for 50 ±5 mVrms.

#### L. Carrier Balance

With the transceiver set to LSB, connect the RF voltmeter to J2007 and adjust VR2001 for minimum voltage on the meter.

#### M. AM Carrier Level

1. With the RF voltmeter connected to J2007, set the mode to CW, key the transmitter, and note the voltage indicated on the meter (approx. 80 mVrms).
2. Return to receive, switch the mode to AM, close the PTT line and adjust AM CAR control VR2008 for exactly half of the voltage noted in the previous step.

#### N. PLL SubLoop (PLL-1) VCV

1. Connect the (Hi-Z) DC voltmeter to TP2003 and tune the transceiver for 14.499.99 on the display. Adjust T2008 for 5.5 volts on the meter.
2. Retune the transceiver for display of 14.500.00, and check for 2 to 3 volts on the meter.

#### O. 41 & 56 MHz Bandpass Filters

1. Connect the RF voltmeter to TP2004 and tune the transceiver for 14.250.00 on the display. Adjust T2014 - T2017 for maximum RF voltage (at least 50

ADJUSTMENT (for 1.5V)		CHECK (for 5-6V)
Freq. (MHz)	Transformer	Freq. (MHz)
0.500	T <sub>2023</sub>	7.499
7.500	T <sub>2024</sub>	14.499
14.500	T <sub>2025</sub>	21.499
21.500	T <sub>2026</sub>	29.999

2. Confirm proper VCV control by tuning between the 'Adjustment' and 'Check' frequencies in each of the four ranges, using the tuning knob or scanning buttons, while watching the voltmeter for smooth voltage change. Uneven or jumpy changes indicate a fault.

#### Q. 2nd Local Level

Connect the RF voltmeter to J2009. Adjust T2003 - T2005 for maximum RF voltage (at least 80 mVrms).

#### R. IF Shift Zero Point Set

1. Connect the frequency counter to J2009. Confirm that the SHIFT control is centered, and close the PTT line, and note the counter frequency. Open the PTT line and adjust VR2007, if necessary, so that the counter frequency is within 50 Hz of that which was shown while transmitting.
2. While receiving, check the total



mVrms).

2. Retune the transceiver for display of

adjustment range of the SHIFT control in USB, LSB and CW, which

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should be approximately  $\pm 1.3$  kHz (as shown on the counter. If not, adjust L2011 (not more than 90° in either direction), and then repeat steps H, I and J (Carrier Point, BFO Frequency and FM/AM Carrier Frequency). Then repeat this check again.

#### S. VOX Gain Preset

1. Press the VOX switch ON, preset VR2011 fully clockwise, and set the VOX GAIN control on the rear panel fully clockwise. Connect the AF generator to the PATCH jack, and apply 1 mV at 1 kHz to confirm that the transmitter activates.
2. Now rotate the VOX GAIN fully counterclockwise, and adjust VR2011 slowly counterclockwise until the transceiver returns to receive, and then a little further counterclockwise from that point.

(For 10-watt versions, divide all power figures by 10).

2. Reduce the AF generator frequency to 350 Hz. While watching the wattmeter, adjust TC2005 slightly for 20W output.
3. Retune the AF generator to 2600 Hz and confirm at least 20W output.
4. Return to receive, switch to USB mode, and retune the AF generator to 350 Hz. Then repeat steps 2 and 3, adjusting VR2005 in step 2.

#### U. FM Modulation

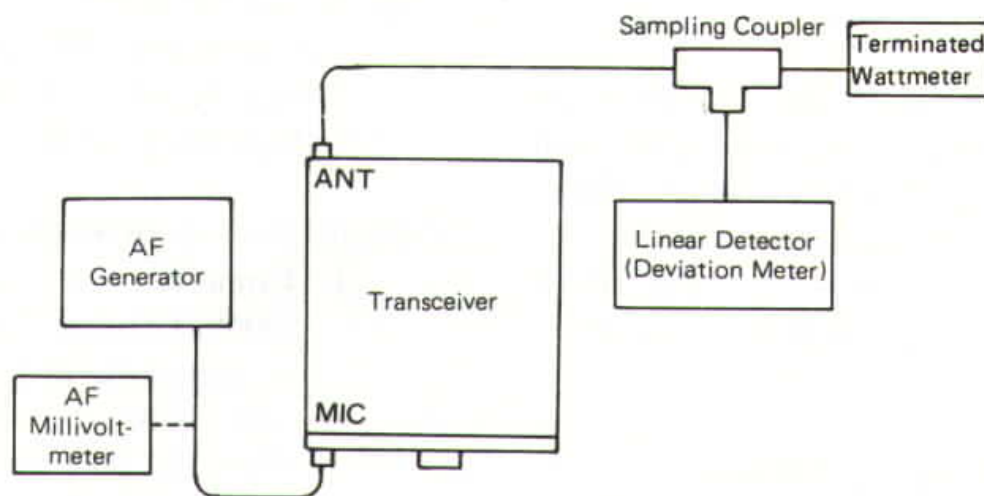
1. With the test equipment connected as shown in the diagram below, preset VR2002 fully clockwise, and set the AF generator for 10 mV output at 1 kHz. Tune the transceiver to 29.2 MHz, FM mode.
2. Adjust VR2003 for  $\pm 4.5$  kHz deviation (within  $\pm 100$  Hz) and then adjust

### T. SSB Carrier Point (Fine Adj.)

1. With the AF generator connected as in the previous step, set the transceiver to the 14 MHz band, LSB mode. Close the PTT line and adjust the MIC gain control for 80 watts output to the dummy load/wattmeter.

(within  $\pm 100$  Hz), and then reduce the AF generator level to 1.5 mV and adjust VR2002 for  $\pm 3.5$  kHz deviation (within  $\pm 100$  Hz).

3. Recheck deviation with 10 mV audio, and repeat the above steps until deviation is within the specified ranges for both audio levels.



## II. RF Unit: Receiver Circuits

### A. 3rd Local Buffer

Connect the RF voltmeter to the emitter of Q1028 and adjust T1019 for maximum RF voltage (at least 300 mVrms).

### B. 2nd Local Buffer

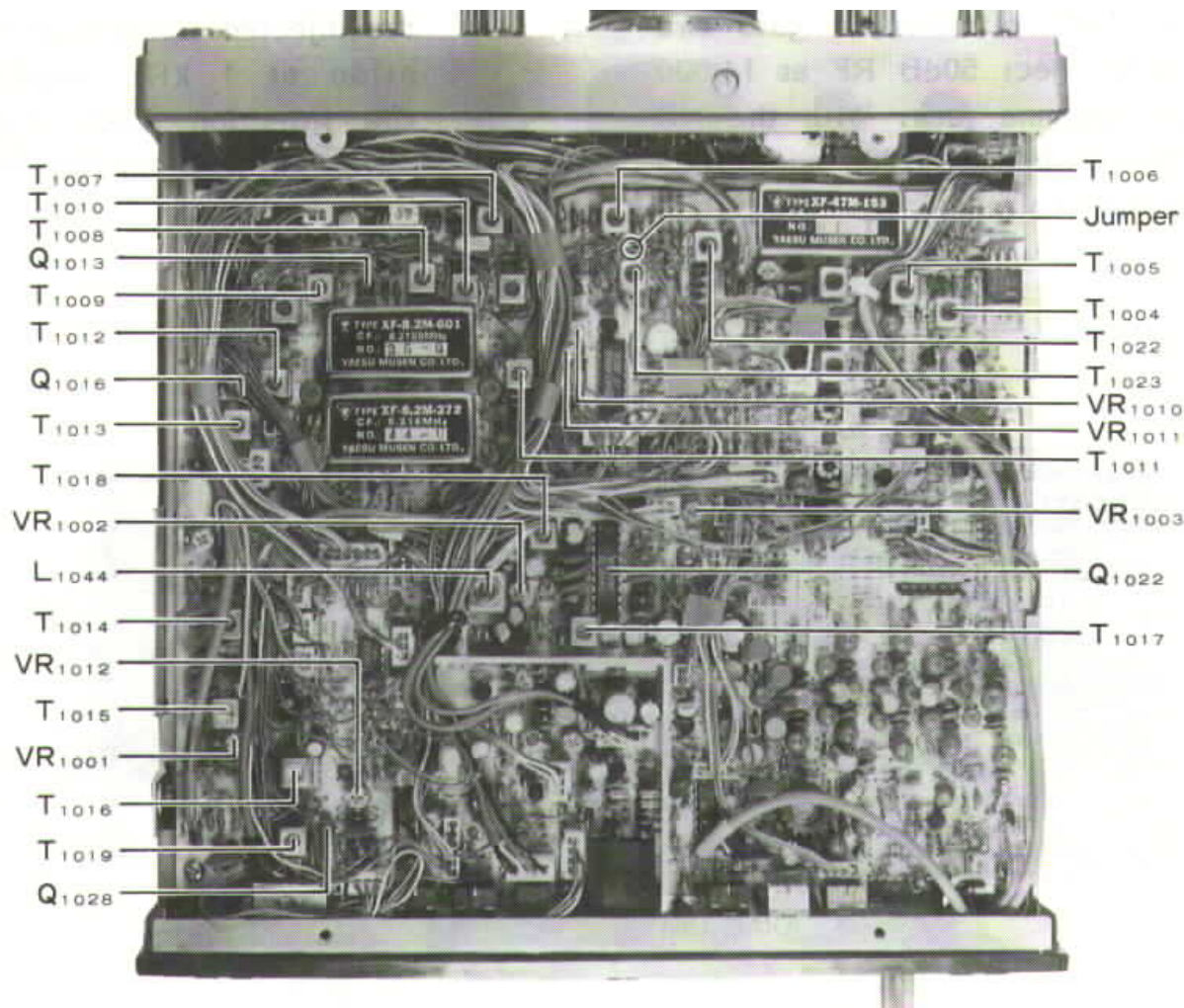
Connect the RF voltmeter to the jumper between T1006 and T1023 on the component side of the board, and adjust T1022 for maximum RF voltage (250 to 500 mVrms).

### C. 8.67 MHz Oscillator

1. Connect the frequency counter through a 0.01  $\mu$ F capacitor to pin 1 of Q1022. Confirm the NOTCH control is set to OFF, and adjust L1044 for 8.67 MHz  $\pm$ 100 Hz on the counter.
2. Connect the RF voltmeter to gate two of Q1016 and adjust T1018 for maximum RF voltage (at least 700 mVrms).

### D. Rx IF Transformers

1. Press the MARKER switch on the rear panel, select the USB mode, and tune for peak S-meter indication on the marker signal. Preset VR1001 fully clockwise and adjust VR1012 for minimum S-meter deflection.
2. Now turn the MARKER switch OFF and adjust VR1010 so that the S-meter just begins to deflect.
3. Connect the RF signal generator to the antenna jack, and inject 0dB at 14.000 MHz. Tune the transceiver for a 1.6 kHz heterodyne on the injected signal.
4. Connect the AF voltmeter to the EXT SP jack and adjust the AF gain for mid-scale deflection. Adjust T1016 and T1015 - T1010 and T1007 - T1004, in that order, for maximum AF voltage. Reduce the RF injection level, as necessary, to keep the AF meter reading on scale.



Chassis Bottom View : RF Unit  
RX Adjustment Locations

E. IF Notch Depth

1. Inject 40 dB RF at 14.000 MHz to

I. FM 3rd Local

Inject 50dB RF at 14.000 MHz to

the antenna jack, and tune the transceiver in the USB mode for a 1.6 kHz heterodyne near this frequency.

2. With the AF voltmeter connected to the EXT SP jack, adjust VR9001 and the NOTCH control alternately for minimum AF. Resulting Notch depth should be better than 45dB.

#### F. Noise Pitch

Set the NOTCH control to OFF, and confirm that the SHIFT control is centered. With no signal at the antenna jack, switch the mode between LSB and USB, and adjust L1015 for the same noise pitch.

#### G. IF Gain and S-Meter Sensitivity

1. Inject 6dB RF at 14.000 MHz to the antenna jack and adjust VR1001 for S-1 deflection on the S-Meter.
2. Increase the signal level to 100dB and adjust VR1011 for full scale on the S-Meter.

#### H. Noise Blanker

Connect the DC voltmeter to gate two of Q1013, and inject 50dB RF at 14.000 MHz to the antenna jack. With the NB button depressed, adjust T1008 and T1009 for minimum DC voltage.

Inject 50dB RF at 14.000 MHz modulated with  $\pm 3.5$  kHz deviation of a 1 kHz tone to the antenna jack. Set the transceiver to the FM mode and tune to the injected signal. With the AF voltmeter connected to the EXT SP jack, confirm that the SQL control is fully counter-clockwise, and adjust T1017 for maximum AF voltage.

#### J. Squelch Threshold

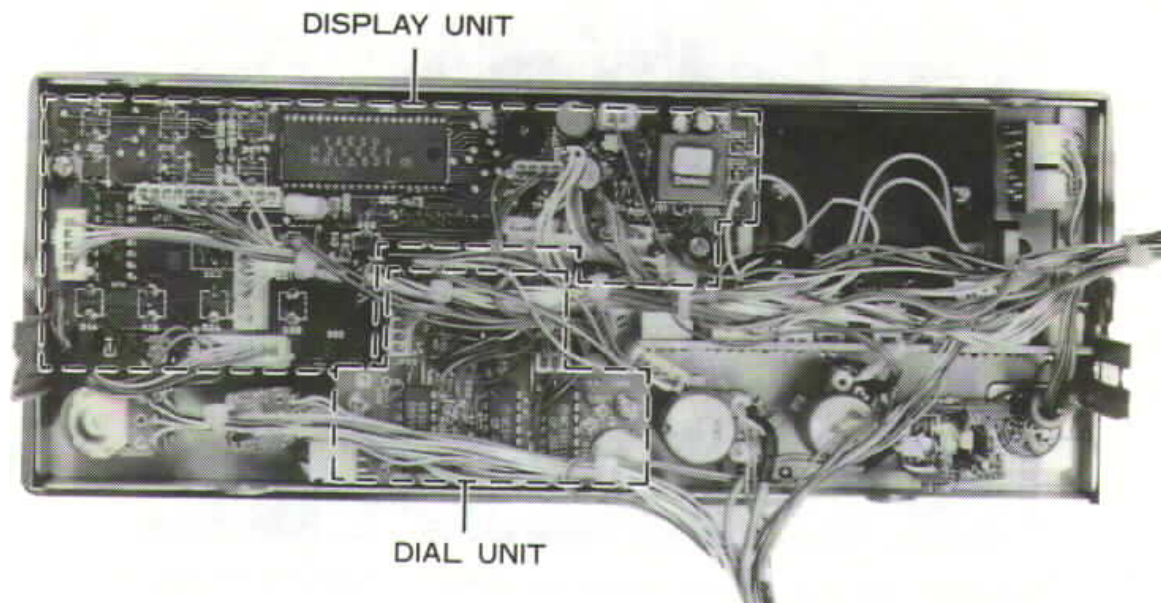
Set the transceiver to the AM mode. With no signal applied at the antenna jack, turn the SQL control gradually clockwise (from the fully CCW position) until the squelch just closes. Then tch o the FM mode and adjust VR1003 so that the squelch is just closed.

#### K. FM RX Audio Output Level

1. Inject 40 dB RF (without modulation) at 14.000 MHz to the antenna jack, and tune the transceiver in the USB mode for a heterodyne near this frequency. Adjust the AF gain control for 0.1V on the AF voltmeter.
2. Switch to the FM mode, and modulate the injected signal with  $\pm 5$  kHz deviation at 1 kHz, without changing the injection level. Adjust VR1002 for  $0.1 \pm 0.01V$  on the AF voltmeter.

A.

B.



### III. RF Unit: Transmitter Circuits

#### A. ALC Meter Zero Set

With the transceiver tuned to 14 MHz, USB mode, and with no microphone input, key the transmitter and adjust VR1008 to the threshold point where ALC just starts to produce meter deflec-

#### C. TX Power Output (exc. 10m)

At 14 MHz, CW mode, set the DRIVE control fully clockwise and adjust VR1006 for 100W output (10W for SXII model).

#### D. 10m Tx Power Output

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tion (the METER switch must be set to the ALC position).

B. Tx IF Transformers

At 14 MHz, CW-W mode, with the METER switch set to ALC, preset VR1006 to the center of its range. Press the MOX switch and adjust T1020, T1021 and T1023 - T1025 for maximum deflection on the ALC meter.

(If no deflection is found at first, set the METER switch to PO and the rear panel FWD/REV switch to FWD. Return the METER switch to ALC when the PO indication is maximum. If the ALC indication is over-scale, reduce the setting of the DRIVE control.)

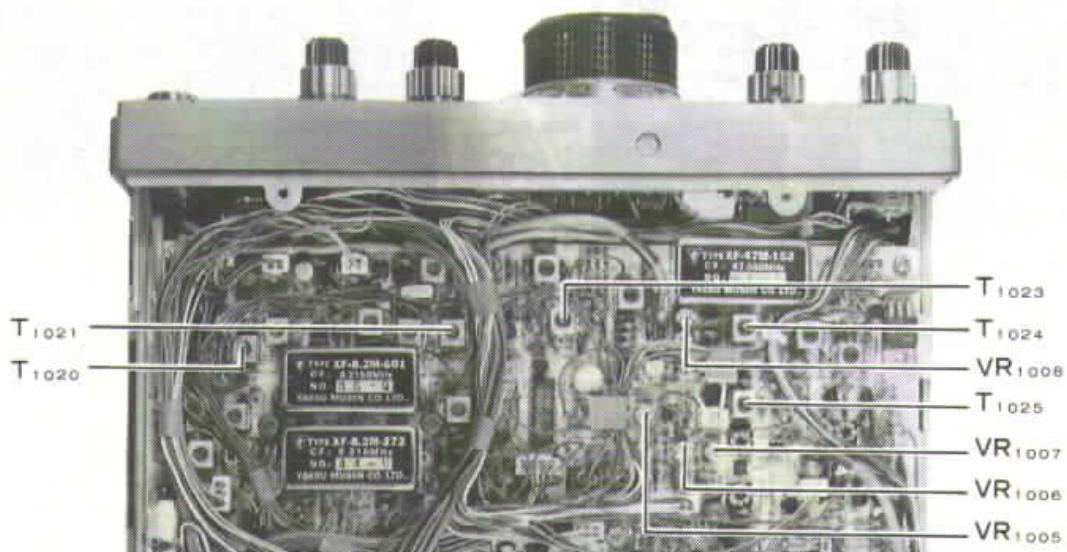
At 29 MHz, CW mode, set the DRIVE control fully clockwise and the set VR1005 fully clockwise (or for 10W output with the SXII model).

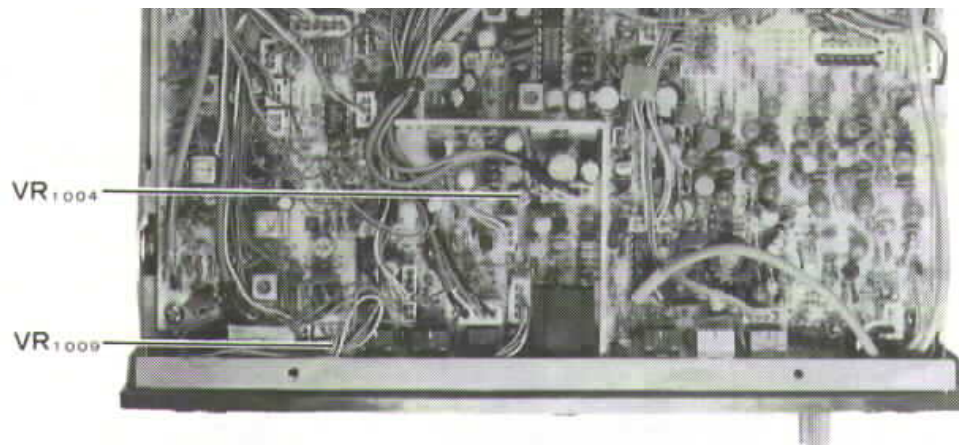
E. PO Meter Calibration

At 14 MHz, CW mode, press the MOX button and adjust the DRIVE control for 100W output on the wattmeter. Set the rear panel FWD/REV switch to FWD, and with the front panel METER switch set to PO, adjust the FWD SET control (VR1009) for 100W indication on the transceiver PO meter.

F. SWR Turndown (AFP)

At 14 MHz, CW mode, connect a 16.6-ohm dummy load (three 50-ohm loads in





Chassis Bottom View: RF Unit  
TX Adjustment Locations

— 13 —

parallel) and a thru-type wattmeter to the antenna jack. Rotate the DRIVE control fully clockwise, press the MOX button and adjust VR1007 to the point where power indication on the wattmeter just begins to drop.

#### G. CW Sidetone Level

With the AF voltmeter connected across the speaker terminals, in a CW mode with a key connected, close the key and adjust VR1004 for 0.3V sidetone output on the meter.

the antenna jack, connect the negative side of the DC voltmeter to pin 3 of J1027, and the positive side of the meter to chassis ground. Key the transmitter and adjust TC3001 for minimum DC voltage.

#### V. PA Unit: Idling Current

Remove the jumper shown in the figure below, and connect the DC milliammeter (500 mA range) in place of the jumper. With the transceiver set to an SSB mode and with no audio applied to the transmitter, close the PTT line and adjust

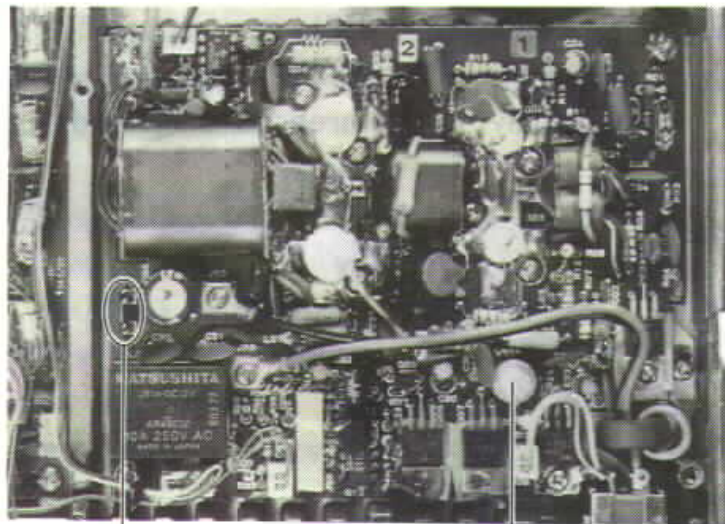




#### IV. LPF Unit: Directional Coupler Balance

At 14 MHz, CW mode, with the 50-ohm dummy load and wattmeter connected to

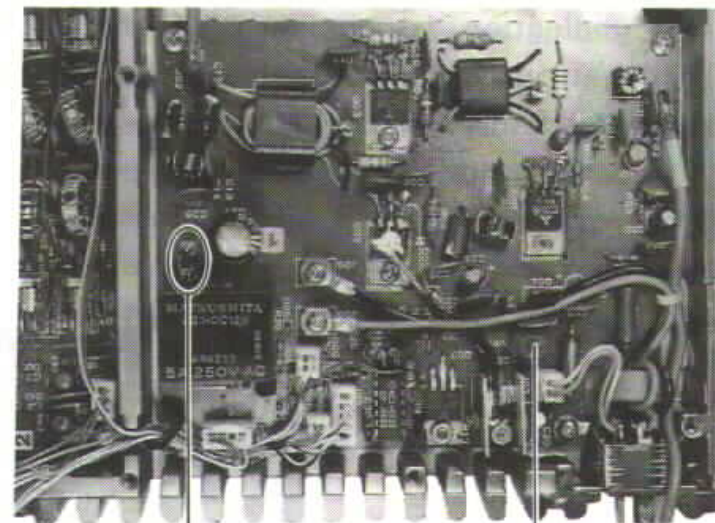
meter, cross the trimmer and adjust VR6001 for  $225 \pm 75$  mA on the milliammeter. (For the SXII model, adjust VR7001 for  $150 \pm 50$  mA).



Jumper

VR6001

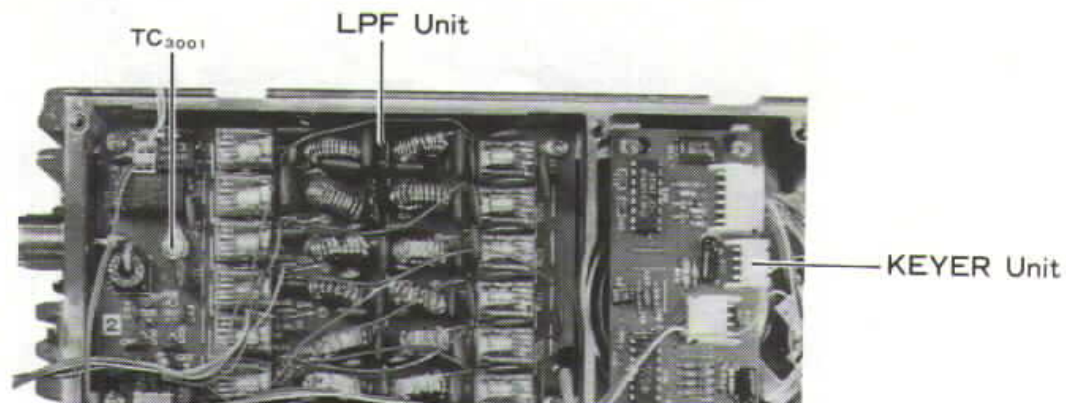
PA Unit: GX II model



Jumper

VR7001

PA Unit: SX II model



TC3001

LPF Unit

KEYSER Unit



LPF Unit

