

LUBRICANTS	INTERVAL
OGP-MIL-L-7870-LUBRICATING OIL GENERAL PURPOSE	6 M-6 MONTHS
GL-MIL-G-3278-GREASE, AIRCRAFT AND INSTRUMENTS	

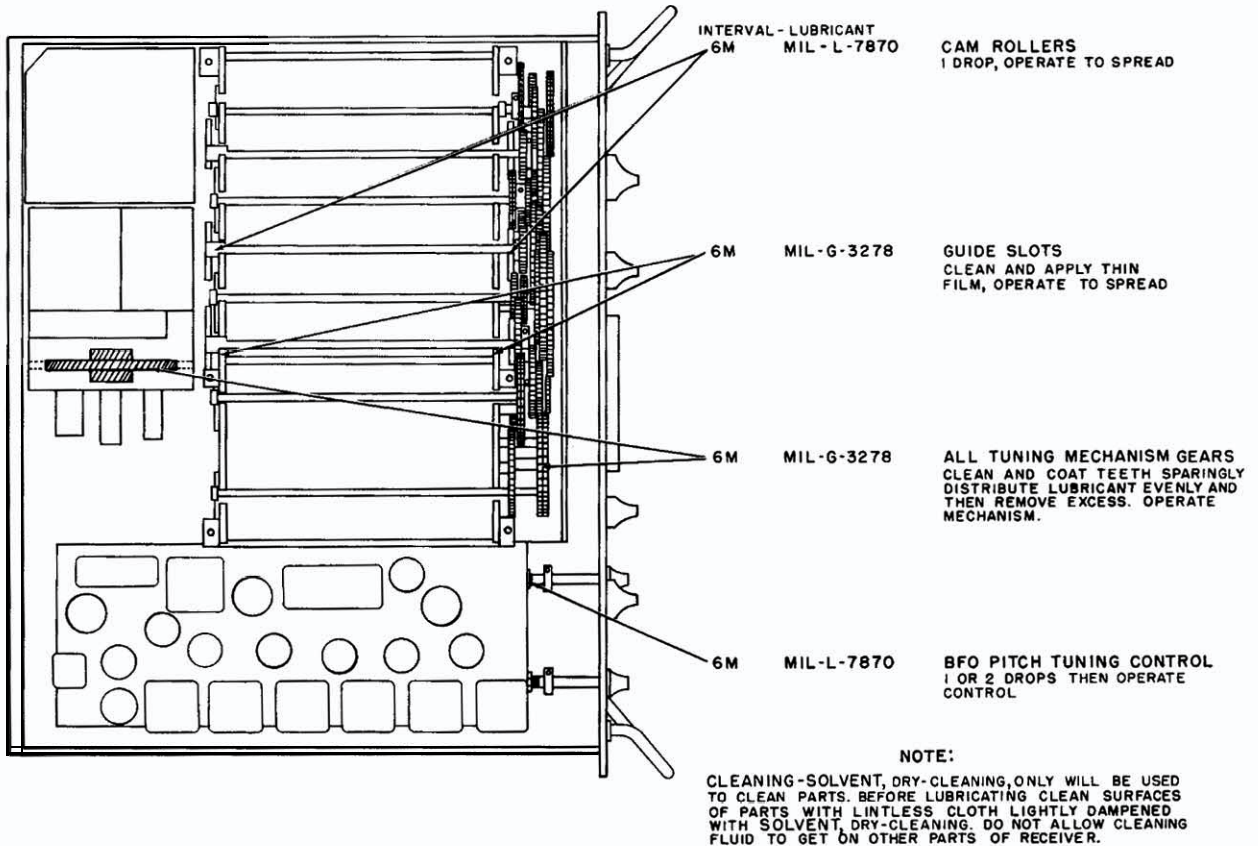


Figure 7. Lubrication.

Section II. TROUBLESHOOTING

12. Visual Inspection

a. General. Before operating the equipment, inspect it. This will save repair time and may also avoid further damage to the radio set. Inspect for the following:

- (1) Improperly connected, worn, or broken power cable.
- (2) Improperly connected, worn, or broken loudspeaker or headset cord.
- (3) Improperly seated or transposed subchassis connectors.

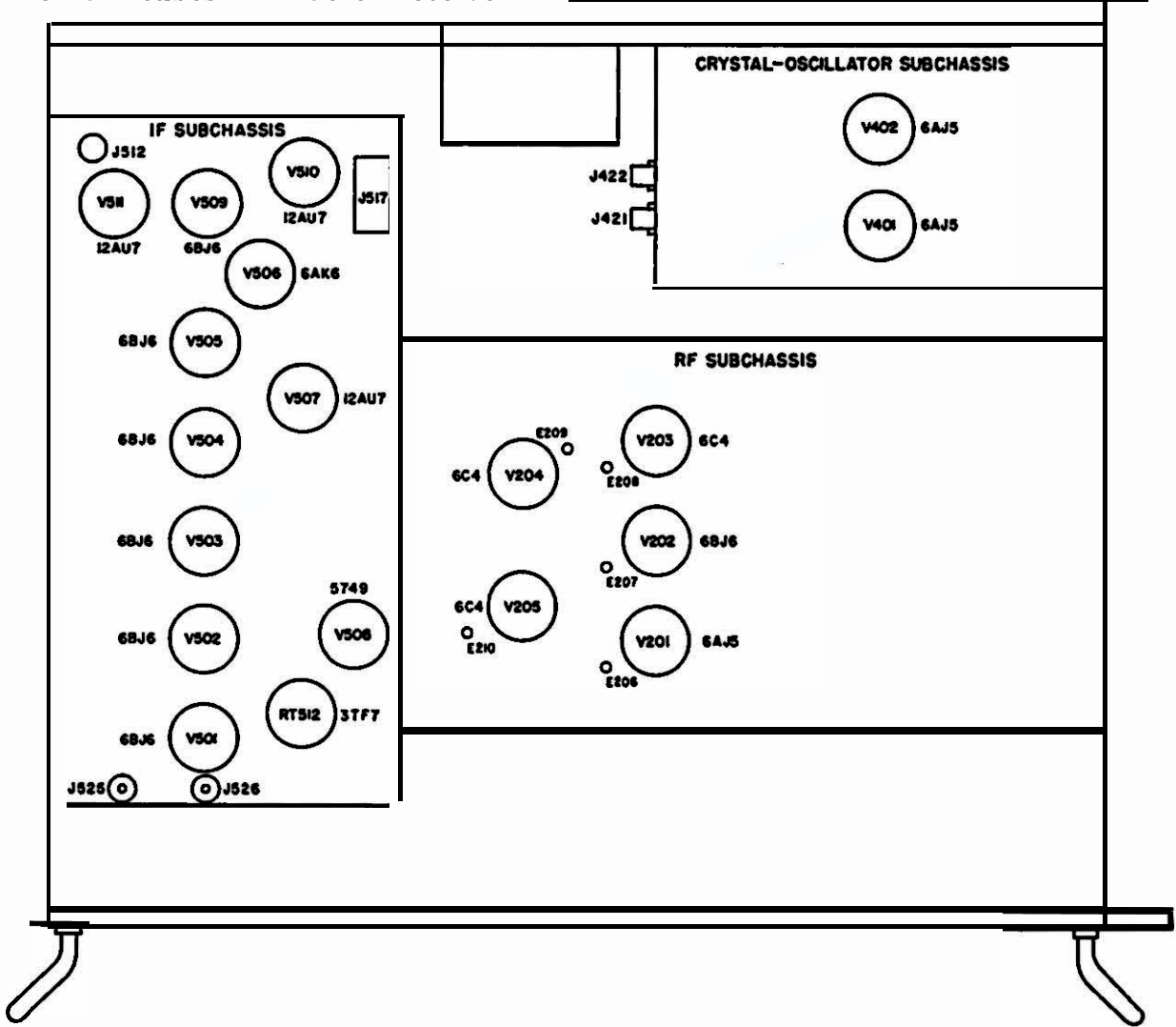
- (4) Loose or broken connections on terminal boards on the rear of the receiver.
- (5) Burned-out fuse.
- (6) Unlighted or broken tubes.

b. Detailed Tube Replacement Information. Visually inspect the tubes for burned-out filaments. This is indicated when one or more tubes are not lighted. This condition can be by one filament burning out in a circuit that has several filaments in series.

- (1) All filaments, except the four connected directly across the 25.2-volt filament supply, are connected in series circuits which include two, three, or four filaments.
- (2) In a series circuit, an open filament in one stage will cause another stage to appear defective. Tubes V605, V606, V801, and V802, oven heaters HR401, HR701, and HR901, and indicating lamps 1101 and 1102 are connected directly across the 25.2-volt filament supply. Cold-cathode, gas-filled tubes V608 and V609, also known as glow-discharge voltage regulators, do not require heated filaments.
- (3) Figures 8 and 9 show the locations of all tubes in Radio Receiver

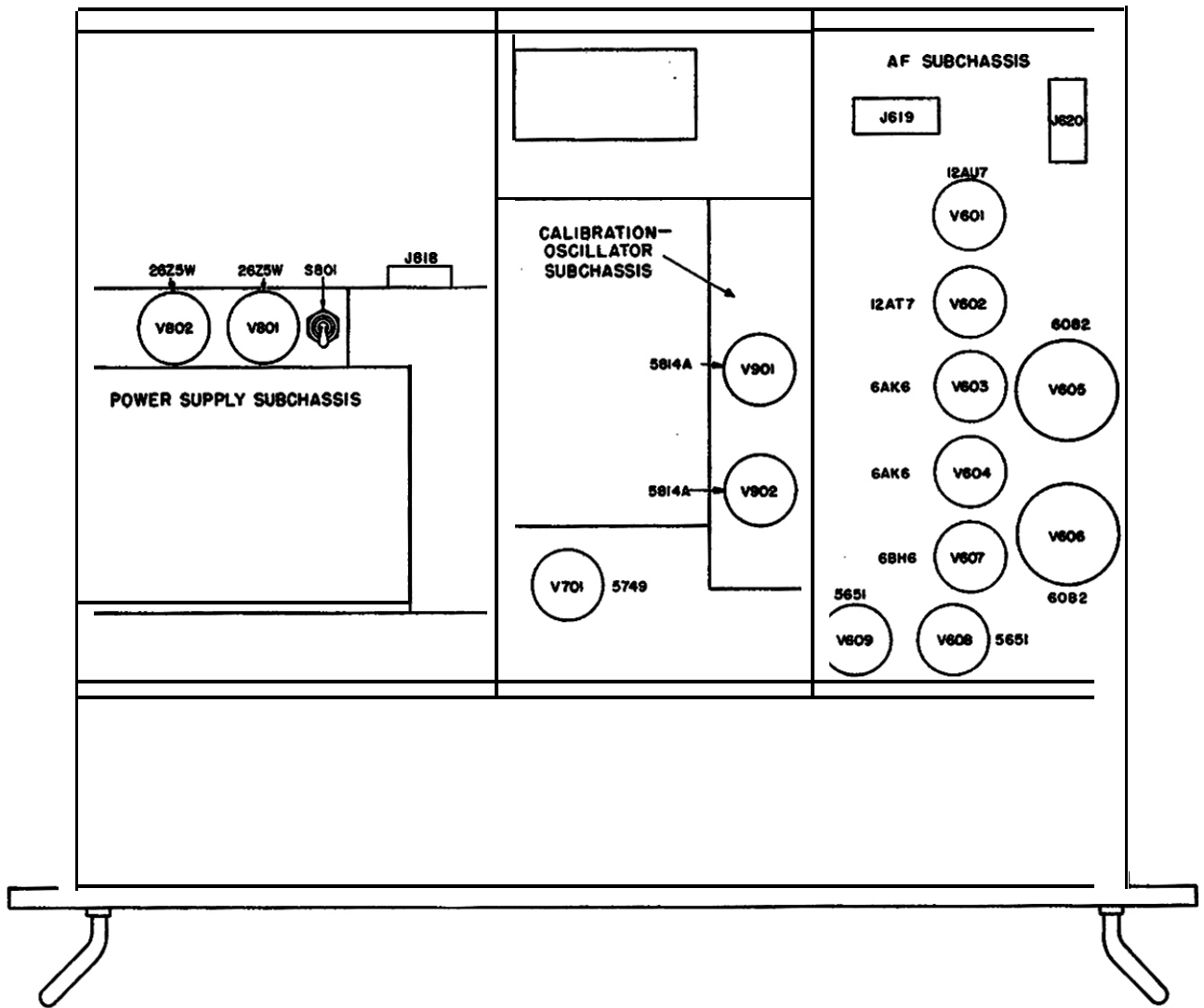
R390/URR. As an aid in locating trouble caused by an open filament circuit, the referenced designations of the tubes are listed in the chart below.

Series filament circuits	
V202.	V203, V204, and V205
V401.	V402, and V201
v501.	v502, v503, and v504
v505,	v506, and v511
V501,	and V510
RT512,	V506 and V701
V601	and V602
V603.	V604, V607 and V509
V901	and V902



TM5820-357-20-6

Figure 8. Tube locations, top deck.



TM5920-357-20-7

Figure 9. Tube locations, bottom deck.

13. Equipment Performance Checklist

a. **General.** The equipment performance checklist is a procedure to systematically check equipment performance. All corrective measures which organizational maintenance personnel can perform are given in the Corrective measures column. When using the checklist, start at the beginning and follow each step in order.

If the corrective measures indicated do not fix the equipment, troubleshooting is required by higher echelon. Note on the repair tag how the equipment performed and what corrective measures were taken.

b. **Procedure.** Place the set in operation. Allow the equipment to warm up for at least 5 minutes. Operate the equipment as shown in the checklist below.

c. Checklist.

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%J NO.	Item	Action or condition	Normal indications	Corrective measures
1	FUNCTION switch..	Turn to AGC	Dial lamp lights Rushing noise or signal heard in speaker or headset.	Check fuses F101 and F102. Check dial lamps. Check power cable.
2	MEGACYCLE CHANGE control.	Set to each band, in turn.	Normal signal output on each band.	Rotate control several times to clean contacts. Determine which band or bands are inoperative then check crystal used on the bands (para 16).
3	MLGCYCLE CHANGE control.	Tune across a band...	Signals received, CARRIER LEVEL meter indicates strength of signal.	Higher echelon repair required.
4	ANT. TRIM control.	Rotate control	Obtain peak indication on CARRIER LEVEL meter for each band.	Check antenna connector.
5	LOCAL GAIN control.	Rotate control in either direction.	Volume at loudspeaker increases or decreases.	Check V601, V602, and V603.
6	LINE GAIN control .	Rotate control in either direction.	Output level to 600-ohm line or headset and LINE LEVEL meter increases or decreases.	If headset level varies and pointer of meter is sticking, tap meter lightly. If local output is satisfactory but line output is weak, higher echelon repair is required.
7	RF GAIN control..	Rotate control	Audio output and CARRIER LEVEL meter Indication increases or decreases.	Check tubes V201 and V202.
8	FUNCTION switch..	Turn to MGC,	with no signal input, noise level should increase and CARRIER LEVEL meter does not indicate.	Check tubes V509, V510, and V511.
		Turn to AGC and tune through several different signals.	Output volume nearly constant.	Reset ANT. TRIM control. Check tubes V901 and V902.
		Turn to CAL, and then operate the KILOCYCLE CHANGE control.	Deflection on CARRIER LEVEL meter at each 100-kc reading	If noise is high, turn the RF GAIN control counter-clockwise until the squelch circuit is effective enough to reduce the noise. Check V601.
		Turn to SQUELCH and then operate the KILOCYCLE CHANGE control.	No reception of noise while tuning between stations.	
		Return FUNCTION switch to AGC and RF GAIN control to 10 at completion of this check.		
9	LIMITER control. . .	Turn clockwise	Noise peaks are reduced in amplitude.	Check tubes V507 and

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Step No.	Item	Action or condition	Normal indications	Corrective measures
10	BREAK IN switch . . .	Turn to ON. Short BRK IN terminal 9 on rear panel to ground momentarily.	LINE LEVEL meter is disabled and break in relay functions to silence receiver. line audio output circuits from receiver REMOTE CONTROL receptacle are disconnected from receiver output.	Refer to higher echelon.
11	LINE METER switch	Turn to +10 Turn to 0 Turn to -10 Turn to OFF	line level is 10 vu above LINE METER indication. LINE LEVEL METER indicates the line level controlled by the LINE GAIN control. line level is 10 vu below LINE LEVEL meter indication. LINE LEVEL meter is disconnected. Line audio output is still connected.	Refer to higher echelon.
12	BFO OFF-ON control and BFO PITCH control.	Turn the BFO control to ON. Tune in a cw signal and vary the BFO PITCH control.	tone of signal varies.	Refer to higher echelon.
13	BANDWIDTH	Turn from 16 to .1 KC.	selectivity becomes sharper. only low frequency audio tones are heard in the counterclockwise positions.	Refer to higher echelon.
14	AUDIO RESPONSE switch.	Operate through three positions.	Permits amplification of nearly full af range in WIDE position, middle and low frequencies in MED. position, and 600 cps in SHARP position.	Refer to higher echelon.
15	OVENS OFF-ON switch.	Turn to OFF	Oscillator ovens are turned off.	
16	FUNCTION switch. . .	Turn to STAND BY. . . Turn to OFF.	Receiver is silent. Filament circuits and oscillator circuits are kept on for immediate reception. Turns off all receiver circuits.	

EQUIPMENT PERFORMANCE

STOP

14. Troubleshooting Techniques

The procedures in **a** through **h** below are effective when isolating receiver faults to a specific subchassis. Replace any defective tubes; if this does not remedy

the trouble, higher echelon repair is required.

a. Presetting Receiver.

- (1) Turn the FUNCTION switch to AGC.

- (2) Turn the BANDWIDTH switch to 16 KC.
- (3) Turn the RF GAIN control to 10.
- (4) Turn the LOCAL GAIN control to 6.
- (5) Tune in a local station, or if no station can be heard, listen to the noise produced by the receiver.
- (6) Turn the LINE METER switch to
- (7) 0 adjust the LINE GAIN control for a midscale LINE LEVEL meter reading.

b. Power-Supply Subchassis Test. If all tubes light but the CARRIER LEVEL meter does not deflect and no sound or hum is heard in the headset or loudspeaker, check V801 and V802 (fig. 8) and fuses F101 and F102 (TM-11-5820-357-10).

c. Af Subchassis Test. (fig.8). While listening to a station or to noise, ground DIODE LOAD terminal 14 on the rear panel.

- (1) The signal or noise at the local output and the LINE LEVEL meter indication should be greatly reduced.
- (2) If only the local output is reduced, check V602, V603, and the seating of connector P120.
- (3) If only the remote output is reduced (LINE LEVEL meter pointer moves to the left), check V602, V604, and the seating of connector P119.
- (4) Remove tubes V507 and V510 and, with a pointed metallic probe that has an insulated handle, touch tube socket pin 1 of V510. A loud click in the loudspeaker or headset indicates that the power supply and audiofrequency (af) subchassis are functioning. Carefully replace the tubes after the test.

d. If Subchassis Test. (fig. 8). With the controls set as in a above, turn the BANDWIDTH switch from 16 to each lower position and listen to the signal or noise.

- (1) The output should decrease at each position, until it can hardly be heard at the .1 position.

- (2) If there is little or no change as the BANDWIDTH switch is turned, check V501 through V504 and V506 through V509.
- (3) Remove plug P226 (fig. 8) from receptacle 5526 and touch the contact of the receptacle with the probe. A loud click from the loudspeaker or headset indicates that the af and if. circuits are functioning. Carefully replace the plug.

e. Rf Subchassis Test. (fig. 8). Set the controls as in above. Start with the megacycle frequency indicator at 00 and turn the MEGACYCLE CHANGE control through its range to the highest frequency and listen to the noise in the headset or loudspeaker.

- (1) Across the tuning range, some adjustment of the ANT. TRIM control is necessary to produce maximum noise.
- (2) The noise at each detent position should be almost constant.
- (3) There should be a pronounced increase in noise as the control is seated in each detent.
- (4) If the rf tuner does not pass this test, check V201 through V204, V207 and V701.

Note. When V701 is replaced, the subchassis must be realigned at higher echelon.

- (5) If all bands except 00 through 08 operate, change crystal Y201.
- (6) Each crystal in crystal oven HR401 operates a megacycle band or a combination of 1-megacycle bands. To determine which crystal is defective, proceed as follows:
 - (a) Turn the MEGACYCLE CHANGE control to each band to determine which bands are inoperative.
 - (b) Record the numbers of the defective bands.
 - (c) Match the combination of defective bands with the combinations listed in the chart below. Replace the defective crystal (fig. 10).

Megacycle band affected	Crystal in use
00, 17	Y401
01, 18	Y402
02, 08, 19, 30	Y403
03, 20	Y404
04, 09, 21	Y405
05, 22	Y406
06, 10, 23	Y407
07, 15, 24	Y408
11, 25	Y409
12, 27	Y410
13, 29	Y411
14, 31	Y412
16	Y413
26	Y414
28	Y415

f. Noise at Grid Test Points. Set Multimeter AN/URM-105 to the highest resistance range. Connect one test lead to the chassis and, in turn, touch the prod on the other lead to grid test points (fig. 8 and 9) E210, E209, E208, E207, and E206 in that order. A click should be heard each time the prod touches the-test point.

g. Calibration Oscillator Test. To test the calibration oscillator, proceed as follows :

- (1) Turn the FUNCTION switch to CAL.
- (2) Turn the MEGACYCLE CHANGE control to band 00.
- (3) Tune the KILOCYCLE CHANGE control through its entire range.
- (4) Listen for a beat note at every 100-Kilocycle (Kc) point as the KILOCYCLE CHANGE control is tuned.
- (5) If the calibrator fails to operate, make the following tests in the order indicated:
 - (a) Check V205 and V206 (fig. 8).
 - (b) Replace Y203.
 - (c) If the fault cannot be remedied by this procedure, higher echelon repair is required.

h. Antenna Circuit Test. Rotate the ANT. TRIM control. The CARRIER LEVEL meter should peak at one particular point.

- (1) Disconnect the antenna and ground ANTENNA J107 UNBALANCED WHIP connector (TM 11-5820-357-10). A click should be heard and the noise should drop sharply.

- (2) Ground both contacts of ANTENNA 5108 BALANCED 125 OHM connector. A click should be heard and the noise should drop sharply.
- (3) If the receiver does not pass this test, check the connectors on the antenna relay box.

15. Tube-Replacement Techniques

a. Isolate the trouble to a specific sub-chassis of the receiver (para 14).

b. Inspect all interior cable connectors for proper seating before removing a tube.

c. Substitute a new tube for an original one. If no change is apparent in the operation of the receiver, replace the new tube with the original. Check each original tube until the equipment becomes operative or until all suspected tubes have been tested.

- (1) Some circuits, such as oscillator circuits (V206, V207, V401, V505, and V701 (fig. 8 and 9))) may function with one tube and not another, even though both tubes are new.
- (2) If a replacement tube soon becomes defective, higher echelon repair is required.
- (3) If tube substitution does not correct the trouble, **be sure that the original tubes are in the original sockets before forwarding the defective receiver for higher echelon repair.**
- (4) If another receiver of the same type is available, refer to the instructions in **b** below.

d. Discard tubes only in the cases given in (1) and (2) below. Do not discard them merely because they meet or are slightly above the lowest acceptable value listed in the tube tester chart. Do not discard tubes merely because they have been used for some time. Satisfactory operation in the receiver is the final proof of tube quality.

- (1) Discard a tube when a tube tester or other instrument shows the tube to be defective.
- (2) Discard a tube when the defect, such as a broken glass envelope or a broken connecting pin can be seen.

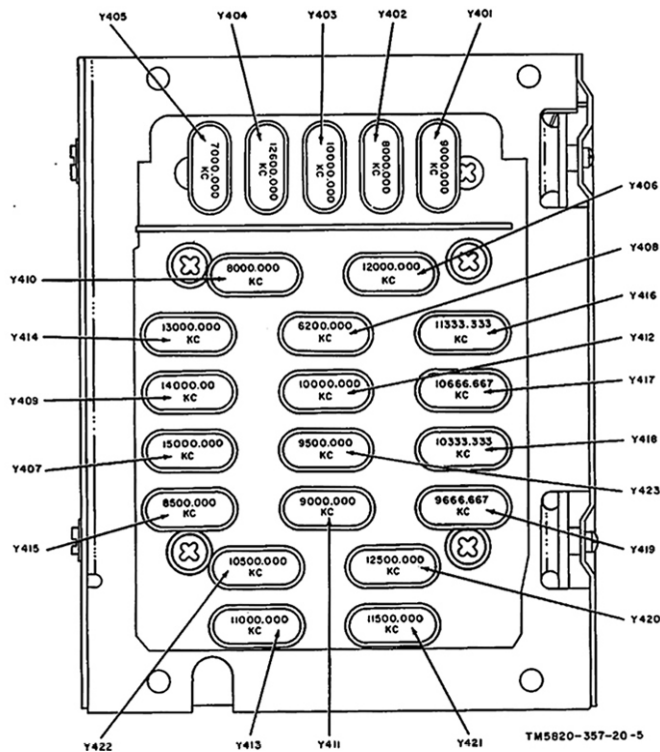


Figure 10. Location of crystals

e. Be careful when withdrawing a miniature tube from its socket. Do not twist or turn the tube; pull it straight up. The variable-frequency oscillator tube shield is held in place by a special clamp. Be sure that the metal insert is in place, and then replace the shield. Straighten the pins with the proper pin straightener (TM 11-5820-357-10) before replacing tubes in the receiver.

f. Tune a similar receiver, which is in good operating condition, to a voice signal that is not subject to fading; a signal on one of the lower frequency bands is preferred. Turn the FUNCTION switch to AGC and the RF GAIN control to 10. Make the substitutions from the faulty receiver

to a corresponding position in the good receiver, one tube at a time. Tap the tube under test; if noise or abnormal change in volume is observed, replace the tube. A considerable decrease in indication on the CARRIER LEVEL meter, or a noticeable decrease in volume or quality of the signal emitted from the speaker or headset indicates a weak or otherwise defective tube. However, different test results for the following tubes must be observed:

- (1) When automatic gain control (agc) tube V509 or V510 is weak, a decreased indication on the CARRIER LEVEL meter with an increase in volume may be noted. A weak V511 (agc time constant circuit) will

cause an increase in indication on the CARRIER LEVEL meter without any change in volume.

- (2) A weak section of V511 (if. cathode follower) will produce a weak signal at J106 IF OUTPUT 50 OHM connector.
- (3) To test tubes V507 and V510 (noise limiters), tune the receiver away from the test signal. If noise is received, rotate the LIMITER control clockwise; the tubes under test and tubes known to be good should be equally effective in reducing noise. After testing these tubes, return the LIMITER control to OFF and retune the receiver to the test signal.
- (4) To test beat frequency oscillator tube V508, turn the BFO OFF-ON switch to ON and, while turning the BFO PITCH control through its entire range, listen for the beat note.
- (5) Inspect tubes V801 and V802 of the power supply to see that all four heaters glow with equal brightness; a blue flash indicates an arcing tube.
- (6) Check V605, V606, and V607 of the audiofrequency subchassis and V701 of the vfo subchassis by listening to the audio output and observing the indication on the CARRIER LEVEL meter. Inspect V608 and V609; if they do not show a lighted filament, they will cause abnormal B+ voltage.
- (7) When testing calibration circuit tubes V901 and V902, turn the FUNCTION switch to CAL, tune through several 100-kc points, and observe the indication on the CARRIER LEVEL meter.
- (8) Test the tubes in the af circuits by listening to the volume and quality of the output signal of the af channels. When testing tubes V601, V602, and V603 (local af amplifier), listen to the output signal of the local audio channel. When testing tube V601, also test the squelch circuit by tuning between stations

to see if it is operating properly; that is, eliminating all interchannel noise and static.

- (9) When testing tubes V602 (line af amplifier) and V604, listen to the output signal from the balanced-line circuit and observe the indication on the LINE LEVEL meter. Generally, small changes in LINE LEVEL meter indication may be expected because of the differences between tubes.

16. Removal and Replacement of Power Supply PP-621/URR

(fig. 9)

a. To remove the power-supply subchassis, proceed as follows:

- (1) Remove the bottom dust cover from the receiver.
- (2) Disconnect large connector plug P118 from jack 5818 (fig. 9).
- (3) Loosen the two hidden screws, accessible through holes indicated by arrows marked MTG SCREWS INSIDE.
- (4) Loosen the green captive screw in the corner of the subchassis near tube V802.
- (5) Remove the four green, 7/16-inch screws that secure the power transformer to the side of the main frame.
- (6) Lift the subchassis straight up from the receiver.

b. To replace the power-supply subchassis, proceed as follows:

- (1) Lower the subchassis straight down into the receiver.
- (2) Replace and tighten the green captive screw in the corner of the subchassis near tube V802.
- (3) Replace and tighten the four green, 7/16-inch screws that secure the power transformer to the side of the main frame.
- (4) Replace and tighten the two hidden screws.
- (5) Connect large connector plug P118 to jack 5818.
- (6) Replace the bottom dust cover.

Note. Except for installations where extreme dust conditions exist, the bottom and top dust covers will not be used.

17. Removal and Replacement of Pilot Lamps

For location of pilot lamps, refer to TM 11-5820-35'7-10.

a. Removal.

- (1) Remove the four Phillips screws from the corners of the frequency-indicator window.

- (2) Move the frequency-indicator window a few inches from the front panel. Its connecting wires will hold it in position.
- (3) Remove the defective pilot lamp.

b. Replacement.

- (1) Insert the new pilot lamps.
- (2) Place the frequency-indicator window in position; line up the four screw holes.
- (3) Replace and tighten the four Phillips screws.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE

18. Disassembly

The following instructions are recommended as a guide for preparing the receiver for transportation and storage.

- a. Disconnect the antenna lead-in cable.
- b. Disconnect the power cable from the ac outlet, and from the back of the receiver. Neatly coil the power cable and secure with two lengths of pressure-sensitive tape.
- c. Remove all connections to the terminal boards on the rear panel of the receiver.

Unplug the headphone cord from the PHONES jack on the front panel.

- e. If dust covers and tube shields were removed from the receiver for ventilation purposes, reinstall them before packing.

19. Repacking for Shipment or Limited Storage

The exact procedure for repacking depends on the material available and the conditions under which the receiver is to be shipped or stored. Follow the procedure in through below whenever possible, as well as the information concerning the original packaging (para 3 and fig. 1).

a. Material Requirements.

Material	Quantity
Fiberboard, corrugated, single-faced.	40 sq
Tape, water-resistant, pressure-sensitive, 3-inch.	16 ft
Steel strapping, 5/8-inch by 0.020-inch.	13 ft
Wooden shipping crate, 22-1/4 x 20-1/2 x 14-3/4.	1

b. Packaging.

- (1) Enclose each technical manual in a close-fitting paper envelope. Seal the seams of the envelope with water-resistant, pressure-sensitive tape.
- (2) Cushion the receiver on all surfaces with pads made of single-faced corrugated fiberboard, in order to absorb shocks that might be caused by handling and shipping.
- (3) Securely pack the running spares.

c. Packing.

- (1) Line the wooden crate with enough material so that it may be sealed

over the receiver when it is placed in the crate.

- (2) Place the packaged receiver, the packaged manuals, and the running spares in the crate.
- (3) Seal the fiberboard carton with the water-resistant, pressure-sensitive tape.
- (4) Nail the top of the wooden crate.
- (5) On intertheater shipments only, apply two bands of steel strapping.

Mark the shipping crate according to the requirements of AR 220-10.

APPENDIX I REFERENCES

Following is a list of references applicable and available to the unit repairman of Radio Receiver R-390/URR.

AR 220-10	Preparation for Overseas Movement of Units (POM).
AR 750-5	Maintenance Responsibilities and Ship Operation.
DA Pam 108-I	Index of Army Motion Pictures, Film Strips, Slides, and Phono Recordings.
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
FM 21-5	Military Training.
FM 21-6	Techniques of Military Instruction.
FM 21-30	Military Symbols.
SR 320-5	Dictionary of United States Army Terms.
SR 320-50	Authorized Abbreviations and Brevity Codes.
TM 11-666	Antennas and Radio Propagation.
TM 11-2629	Antenna Kit for Double-Douplet Receiving Antenna (Drawing ES-E-276-F).
TM 1 I-5820-357-10	Operators Manual, Radio Receiver R -390/URR.
TM 1 I-6625-203-12	Operation and Organizational Maintenance: Multimeter AN/URM-105, including Multimeter ME-77/U..
TM 1 I-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.

By Order of the Secretary of the Army :

G. H. DECKER,
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Chief of Staff

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R. V. LEE,
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Units org under fol TOE:	1 1-697	
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11-7	32-56	
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NG: State AG (3) Units same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

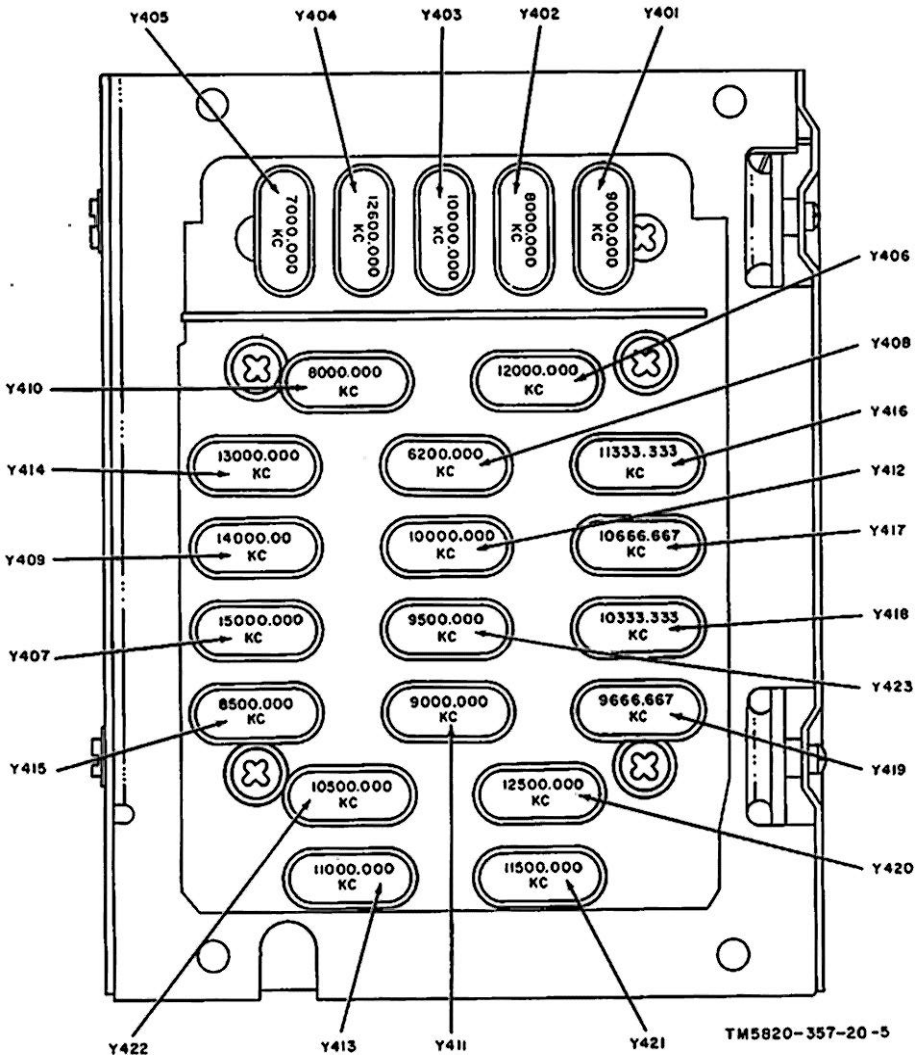


Figure 10. Location of crystals