

TM 11-5820-277-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL
MAINTENANCE MANUAL

OSCILLATOR, RADIO FREQUENCY 0-330A/FR



HEADQUARTERS, DEPARTMENT OF THE ARMY

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OSCILLATOR, RADIO FREQUENCY 0-330A/FR

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CHAPTER I

INTRODUCTION

Section I. GENERAL

1. Scope

This manual describes Oscillator, Radio Frequency O-330A/FR, (fig. 1) and covers its installation, operation, and operator's and second echelon maintenance. Throughout this manual, the front panel and chassis assembly is referred to as the variable frequency oscillator. The manual includes instructions for cleaning and inspection of the equipment, and replacement of parts available to first and second echelon maintenance personnel. Maintenance allocation charts are included in TM 11-5820-277-20P.

2. Forms and Records

a. *Unsatisfactory Equipment Reports.* Fill out and forward DA Form 468, Unsatisfactory Equipment Report, to the Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., as prescribed in AR 700-38.

b. *Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6, Report of Damaged or Improper Shipment, as prescribed in AR 700-58.

c. *Preventive Maintenance Forms.* Prepare DA Form 11-238 (fig. 13 and 14), (Mainten-

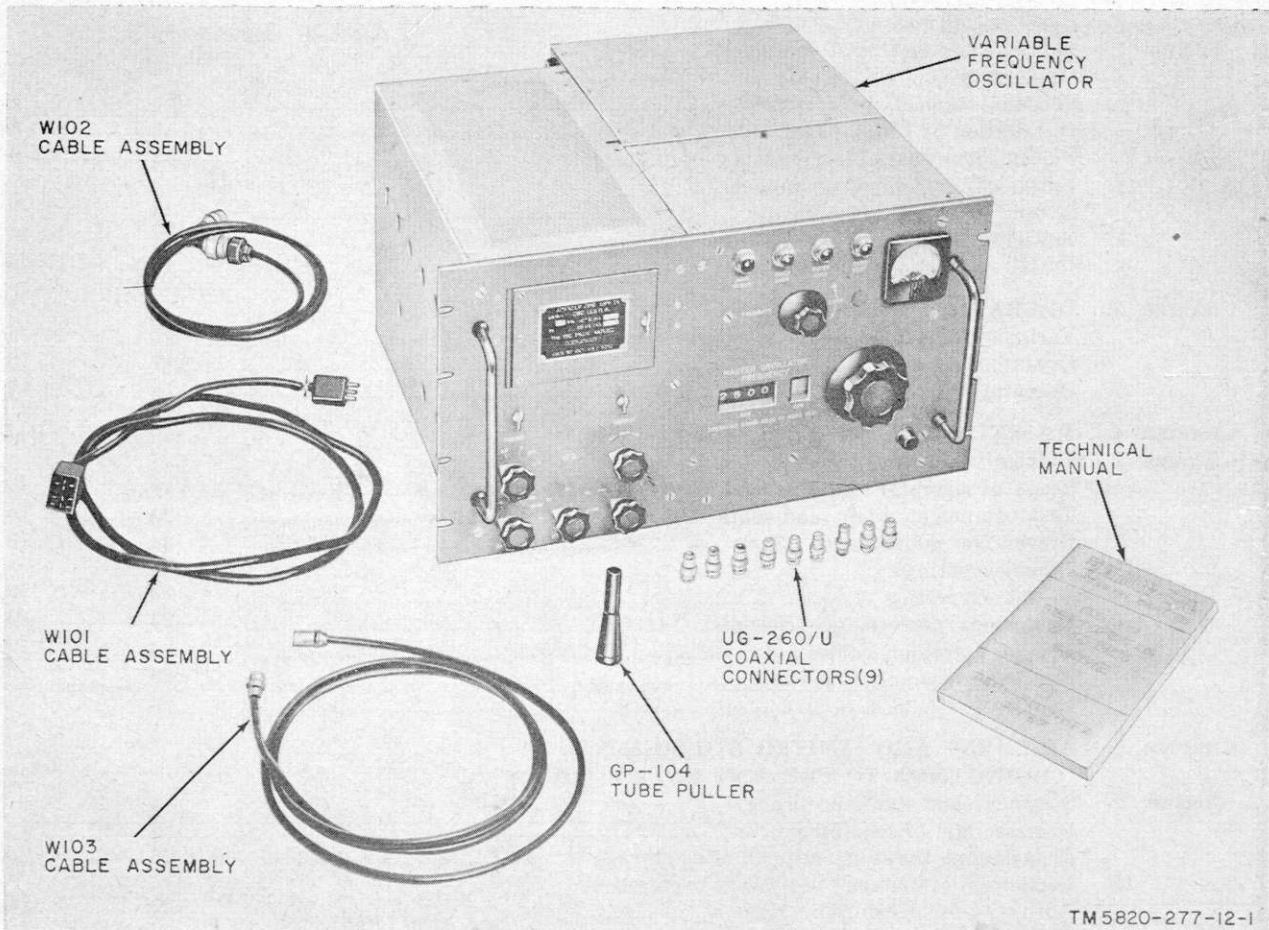


Figure 1. Oscillator, Radio Frequency O-330A/FR, less spare parts.

ance Check List for Signal Equipment (Sound Equipment, Radio, Direction Finding, Radar, Carrier, Radiosonde and Television)), in accordance with instructions on the form.

d. Comments on Manual. Forward all other comments on this publication directly to the Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

The variable frequency oscillator is a precision, high stability, direct indicating device.

a. The variable frequency oscillator can simultaneously provide the following:

- (1) Crystal-controlled or continuously variable radiofrequency (rf) output voltage from 2 to 64 megacycles (mc).
- (2) Crystal-controlled rf output voltage from 3.2 to 3.9 mc.
- (3) Crystal-controlled rf output voltage from 300 to 1,000 kilocycles (kc).

b. The variable frequency oscillator provides medium- and high-frequency oscillator injection voltage for the control of one or more receivers or for a transmitter exciter.

4. System Application

a. A typical application of the variable frequency oscillator is as the common oscillator for two receivers in a dual diversity reception system (fig. 2). This application assures that after both receivers have been tuned to exactly the same frequency, they will always remain

properly tuned unless manually changed.

b. A visual monitor across the outputs of the two receivers permits viewing the output signals to accurately tune both receivers to the same frequency. These outputs are compared in the diversity combining unit. The stronger of these two outputs is then applied to the frequency-shift converter where the signal is converted to direct current (dc) drive signals for the teletypewriters.

5. Technical Characteristics

a. Variable Frequency Oscillator.

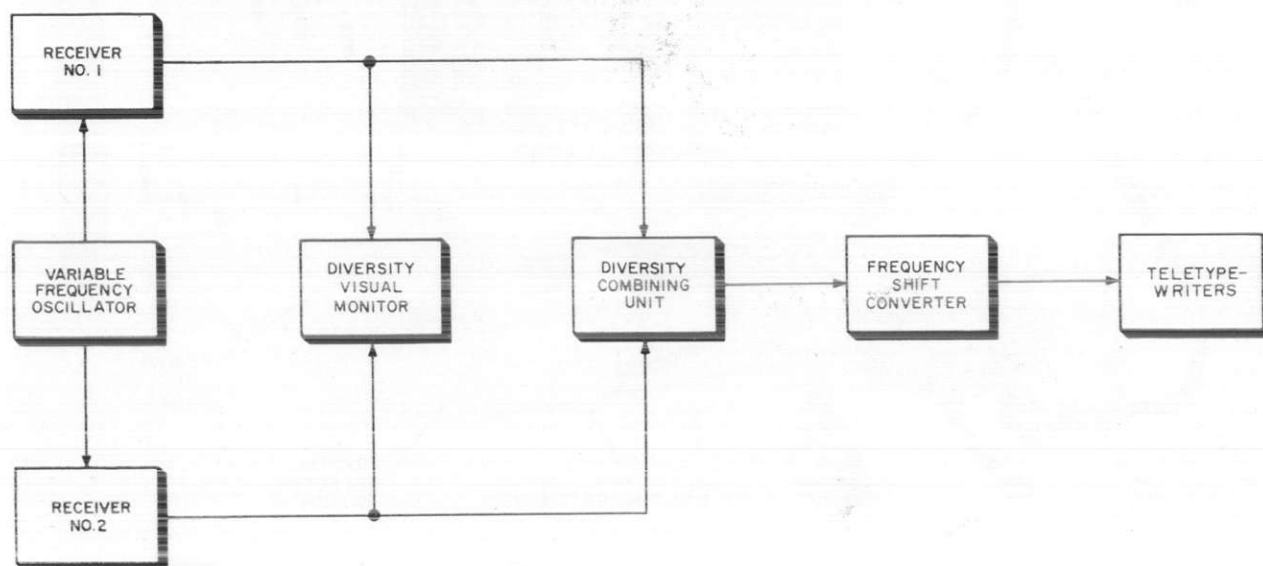
Number of tubes14
 Power requirements250 watts from a 115- or 230-volt, 50/60 cps, single-phase input.

b. High-Frequency Oscillator Section of Variable Frequency Oscillator.

Frequency range2 to 64 mc (either crystal-controlled or continuously variable).

Output impedance75 ohms.

Output level2 watts throughout range of 2 to 4 mc and 0.5 watt throughout range of 4 to 64 mc.



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Figure 2. Variable frequency oscillator in typical dual-diversity reception system.

Output terminals3 BNC rf connectors.
 Crystal frequencies2 to 4 mc.
 Output voltage waveform..Sinusoidal with no spurious frequencies.
 StabilityLess than 20 cycles per megacycle change in 0° to 50° temperature range.
 CalibrationDirect reading calibration in cps between 2 and 4 mc. Checked against 100-kc oscillator at 50-kc checkpoints.
 Dial accuracy20 cycles per megacycle.
 Line voltage change effectsMaximum change of 10 cps per megacycle for 10 percent change in line voltage.
 Humidity effectsNo appreciable change for humidities up to 95%.

c. Intermediate Frequency Oscillator Section of Variable Frequency Oscillator.

Frequency range3.2 to 3.9 mc (crystal-controlled oscillator).
 Output level2 volts across 75 ohms.
 Output terminals3 BNC rf connectors.

d. Beat Frequency Oscillator Section of Variable Frequency Oscillator.

Frequency range300 to 1,000 kc. (crystal-controlled oscillator).
 Output level6 volts across 1,000 ohms.
 Output terminals3 BNC rf connectors.

6. Table of Components
a. Components (fig. 1).

| Quantity | Item | Height (in.) | Depth (in.) | Width (in.) | Unit weight (lb) |
|----------|--------------------------------|--------------|-------------|-------------|------------------|
| 1 | Variable frequency oscillator. | 10½ | 16 | 19 | 75 |
| 1 | W101 cable assembly | | | 72 | .5 |
| 1 | W102 cable assembly | | | 72 | .5 |
| 1 | W103 cable assembly | | | 72 | .5 |
| 9 | Coaxial Connector UG-260/U | | | | .1 |
| 1 | GP-104 tube puller | | | | .3 |
| 2 | TM 11-5820-277-12 | | | | |
| 1 set | Running spares (b below) | | | | |

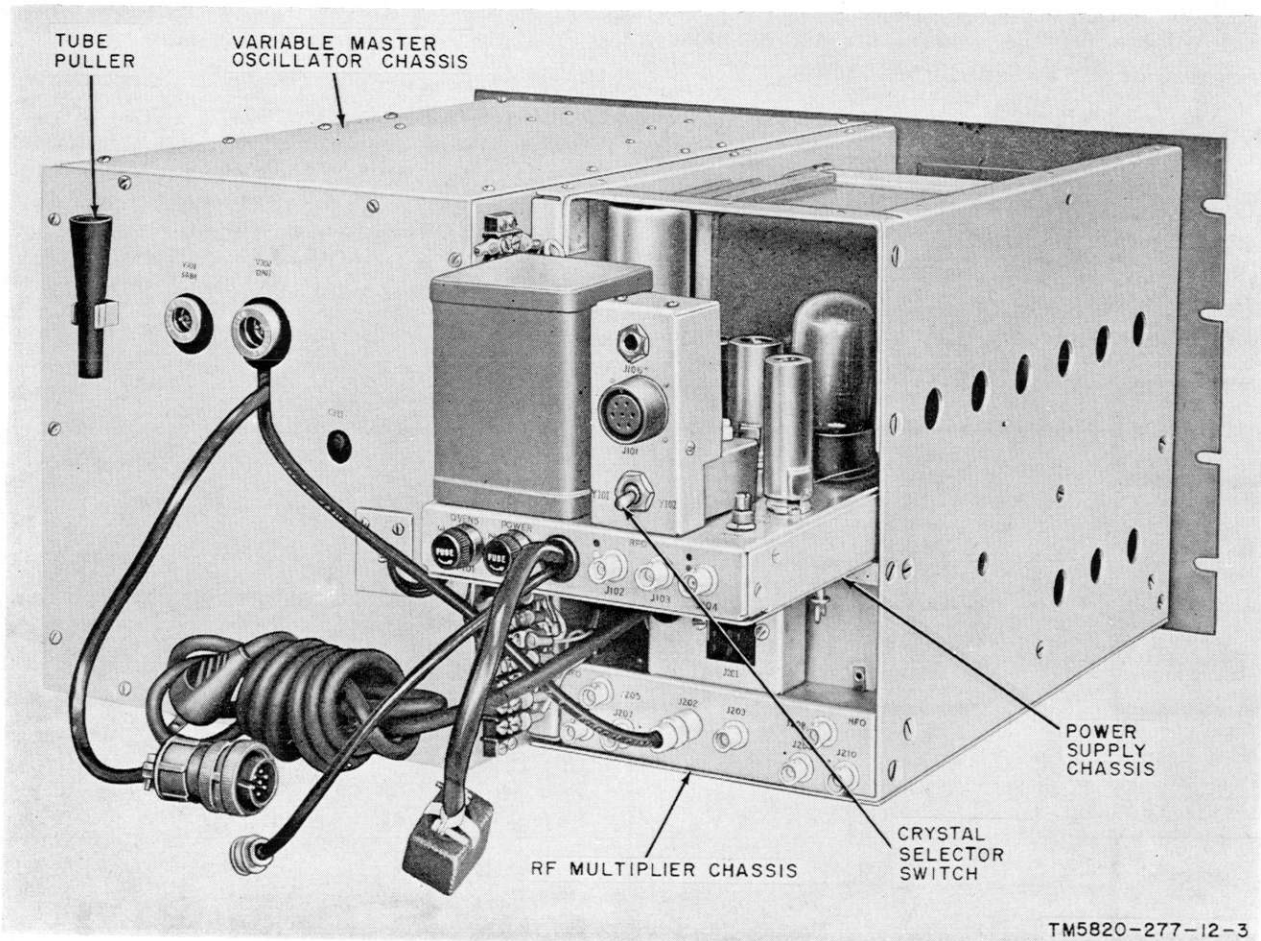


Figure 3. Variable frequency oscillator, with power supply chassis disconnected and partially removed, rear view.

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b. Running Spares

| Quantity | Item |
|----------|--------------------------|
| 1 | Electron tube, 5V4G |
| 1 | Electron tube, OA2 |
| 1 | Electron tube, 6BE6 |
| 2 | Electron tubes, 12AU7 |
| 3 | Electron tubes, 6AQ5 |
| 1 | Electron tube, 6C4 |
| 1 | Electron tube, 6AB4 |
| 6 | Fuses FU-100-3, 3-ampere |
| 6 | Fuses FU-100-2, 2-ampere |
| 2 | Neon lamps NE-51 |
| 1 | Lamp LM-44 |

7. Description

a. The variable frequency oscillator is designed for mounting in a standard 19-inch relay rack. It consists of a variable master oscillator chassis, an rf multiplier chassis, and a power supply chassis (fig. 3). Controls most frequently used are located on the front panel of the unit; seldom-used controls are on a subpanel mounted on the power supply chassis and can be reached through an access door on the upper left side of the front panel (fig. 10). Fuses for the crystal ovens and the power supply are located in fuseholders at the rear (fig. 5). One crystal selector switch is also located at the rear of the unity.

b. A set of tracks and four Dzus fasteners (two on the front panel and two under the rear of the power supply chassis (fig. 5)) allow for easy removal and reinsertion of the power supply chassis.

c. The left side of the variable frequency oscillator has a meshed top cover. This can be removed to reach the top of the power supply chassis (fig. 6) or, when the power supply chassis is removed, to reach the top of the rf multiplier chassis (fig. 7).

d. Cable assemblies W101, W102, and W103 (fig. 1) permit connection between the power supply chassis and the main unit while the power supply is removed from the main unit (par. 24). Each cable assembly is 6 feet in length and is composed of component parts as follows:

- (1) Cable assembly W101 consists of a length of 12-conductor cable with a rectangular 12-contact male plug at one end and a similar 12-contact female plug at the other end.
- (2) Cable assembly W102 consists of a length of six-conductor cable with a 7-pin round male plug at one end and a similar female plug at the other end.
- (3) Cable assembly W103 consists of a length of coaxial Radio Frequency Cable RG-59/U with a Coaxial Connector UG-260/U at each end.

8. Additional Equipment Required

The variable frequency oscillator cannot be used alone. The following items are required for use with associated receivers and/or transmitters:

a. A headset such as type HS-30/U.

b. Appropriate beat frequency oscillator (bfo), high frequency oscillator (hfo), and intermediate frequency oscillator (ifo) crystals if crystal-controlled operation is required. The crystal sockets accommodate type HC-6/U crystal holders. The hfo and ifo sections use type CR-18/U crystal units. The bfo section uses type CR-25/U crystal units in the 300-500 kc range; type CR-45/U crystal units for 455 kc; or type CR-18/U crystal units in the 800-1,000 kc range.

c. Coaxial cables for interconnections to associated equipment. These cables must be able to mate with the UG-625/U connector receptacles at the rear or with the UG-260/U coaxial connectors.

CHAPTER 2

INSTALLATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Unpacking

(fig. 4)

a. Packaging Data. When packed for shipment, the O-330A/FR is packed in one wooden box. This box is 24½ by 14 by 23½ inches and weighs 116 pounds.

b. Removing Contents. Unpack the equipment as follows:

- (1) Cut and fold back the metal straps.
- (2) Remove the nails from the top of the box with a nail puller, and lift off the top. Do not try to pry off the top; the equipment may become damaged.
- (3) Remove the nails from one side of the wooden box with a nail puller, and remove the side.
- (4) Remove the two retaining pieces of lumber and then remove the waterproof carton and spare parts carton from the crate.
- (5) Open the outer waterproof carton and remove the inner carton which is packed in a moisture-vaporproof barrier bag.
- (6) Open the bag and the inner carton, and remove the corrugated filler protective inserts.
- (7) Carefully remove the variable frequency oscillator, spare parts, technical manual, and all accessories.

10. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, refer to paragraph 2.

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check it against the table of components in paragraph 6.

c. If the equipment has been used or reconditioned, see if it has been changed by a modification work order (MWO). If modified,

the MWO number will appear on the front panel near the nomenclature plate.

11. Installation of Tubes, Fuses, Cables, and Crystals

The variable frequency oscillator is shipped with all tubes, interchassis cables, and fuses installed. With the exception of crystal Y301 (100 kc) located inside the oven enclosure, crystals for the BFO, HFO, and IFO sections are not supplied. Crystal selection is discussed in paragraph 17.

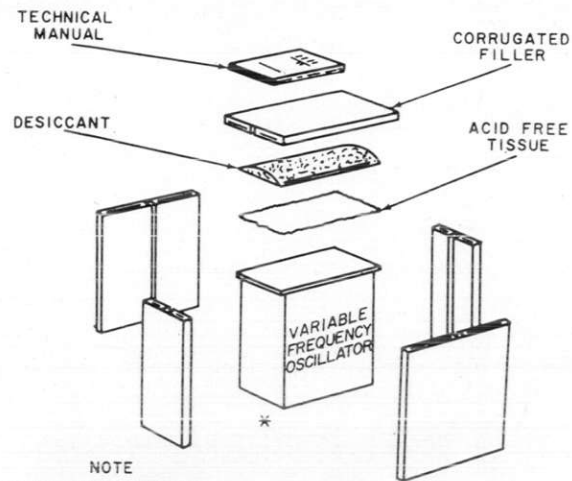
a. Install these crystals, when required, and check proper installation of tubes and fuses (fig. 5, 6, and 7). To reach tubes and crystal sockets, remove the power supply chassis as follows:

- (1) Remove the meshed cover plate on the frame over the power supply chassis.
- (2) Disconnect plug P301 from jack J101 (fig. 5).
- (3) Disconnect plug P101 from jack J201.
- (4) Disconnect plug P102 from jack J203.
- (5) Open the four Dzus fasteners (two on the front panel and two under the rear of the power supply chassis). Remove the power supply chassis from the variable frequency oscillator unit by sliding the chassis to the rear.

b. Check to see that the proper size fuses are used.

- (1) For 115-volt ac operation, a 3-ampere fuse is supplied in the OVENS fuseholder and a 2-ampere fuse is supplied in the POWER fuseholder.
- (2) For 230-volt ac operation, use a 1.5-ampere fuse in the OVENS fuseholder and a 1-ampere fuse in the POWER fuseholder.

c. Reinstall the power supply chassis; reconnect the interchassis cables as shown in figure 5.



12. Placement of Variable Frequency Oscillator

a. Install the variable frequency oscillator on a bench or in a standard 19-inch relay rack as required for the specific installation.

b. Place the variable frequency oscillator in such a position that the minimum length of coaxial cable is required between it and associated receivers and/or transmitter.

c. Allow sufficient space behind the unit to permit replacing tubes and checking connections.

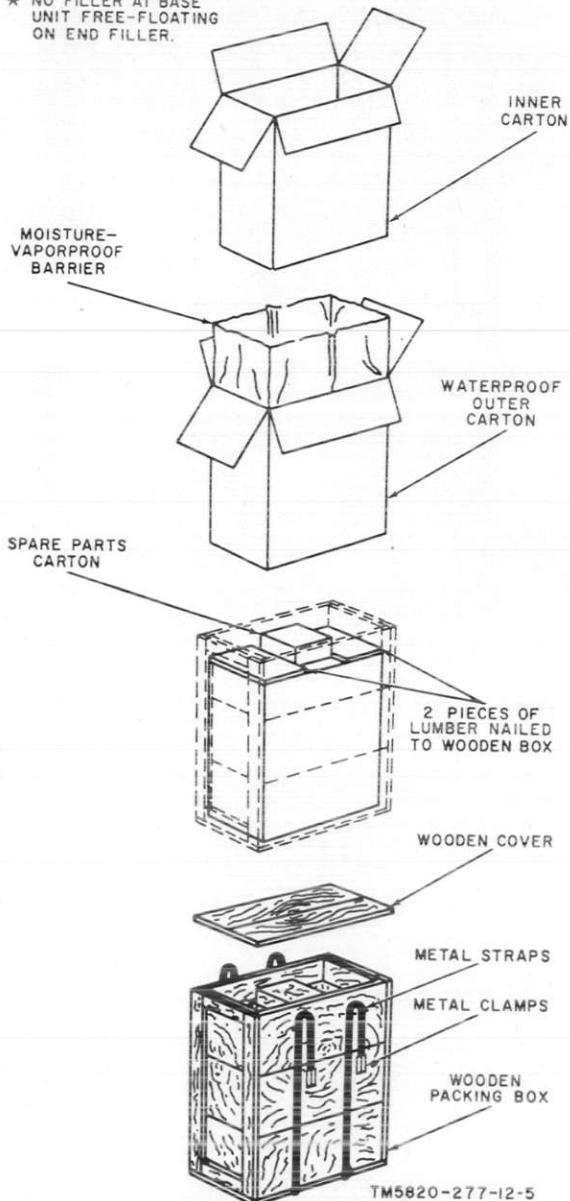


Figure 4. Typical packaging.

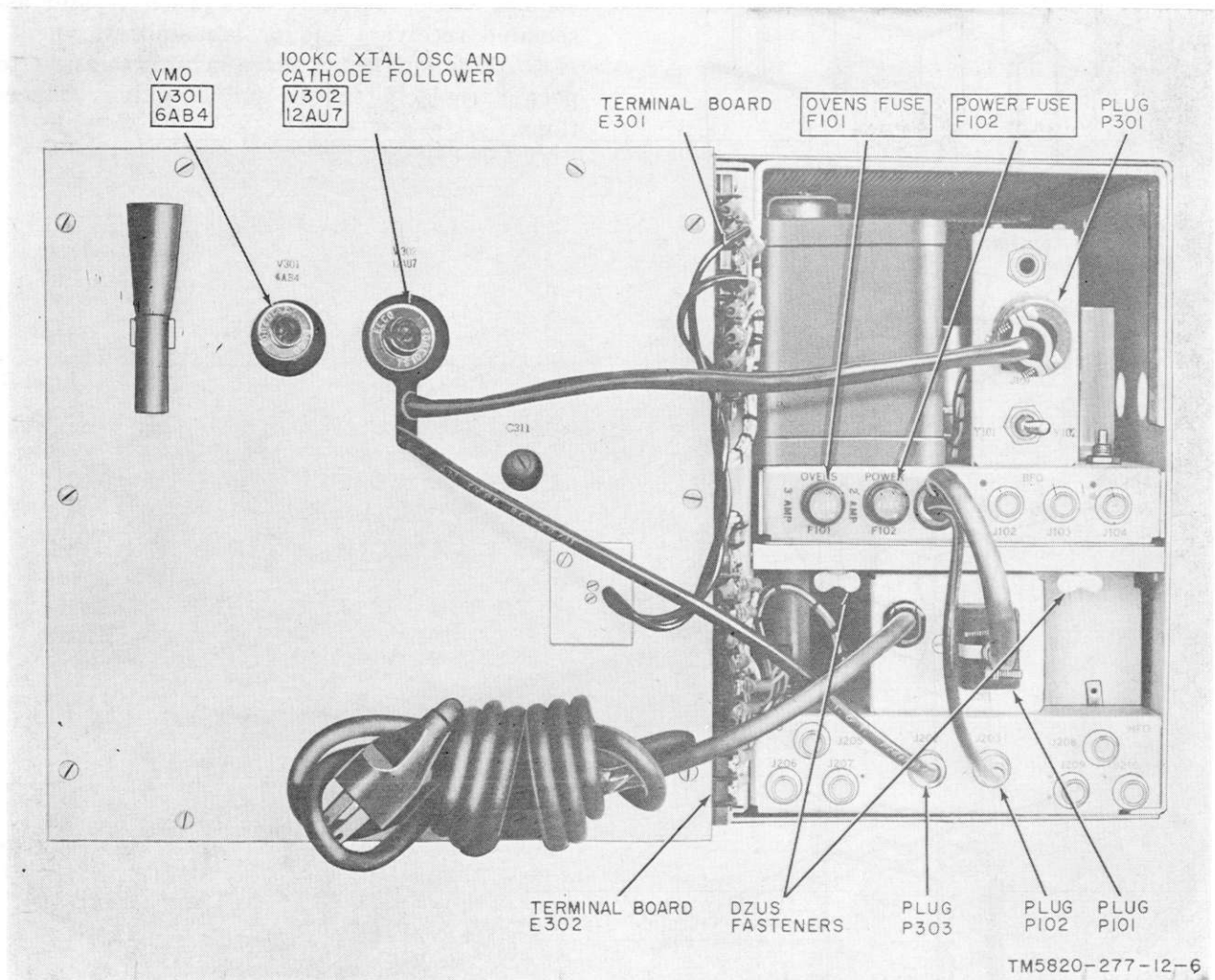


Figure 5. Variable frequency oscillator, rear view.

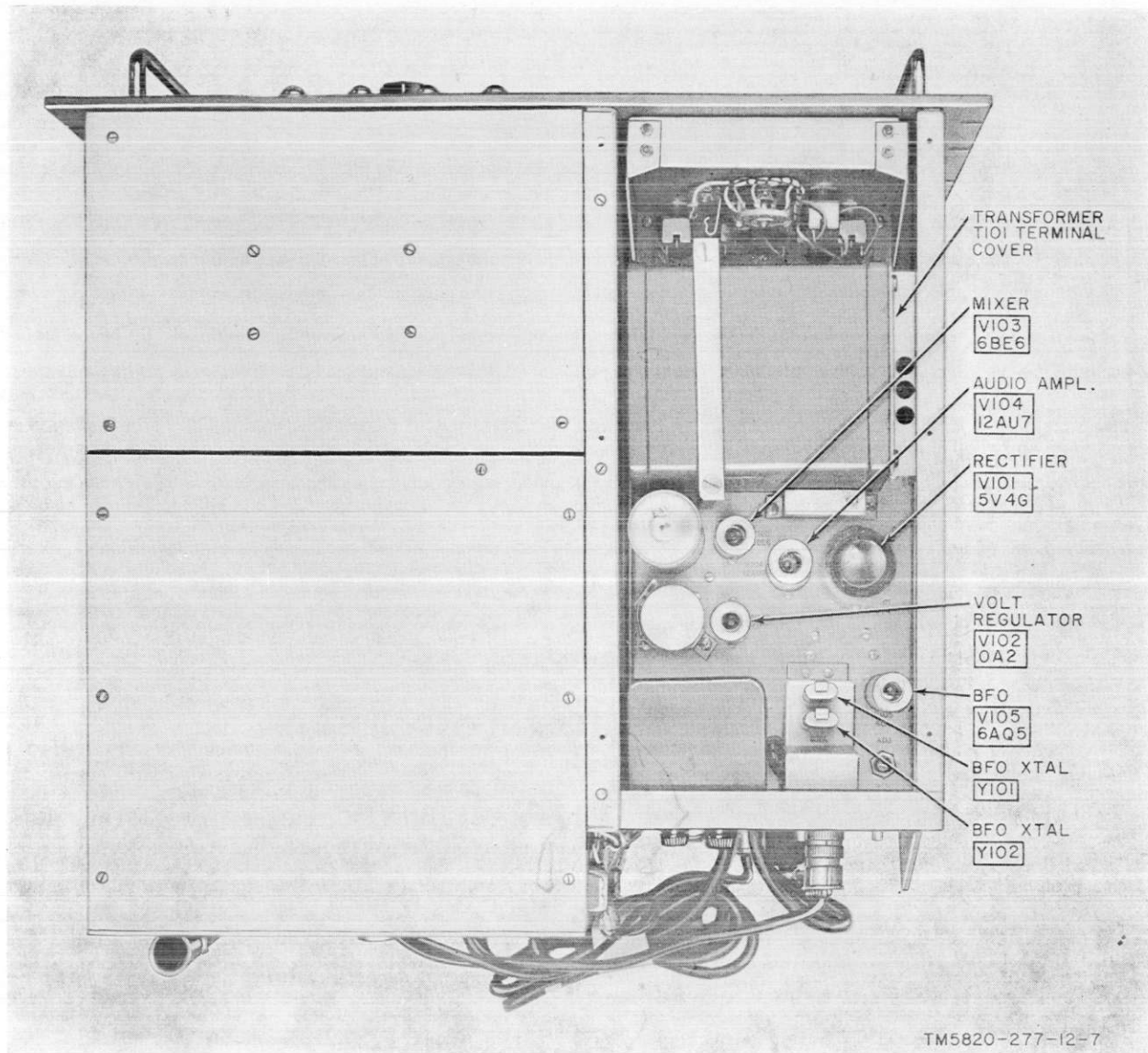


Figure 6. Variable frequency oscillator, top view.

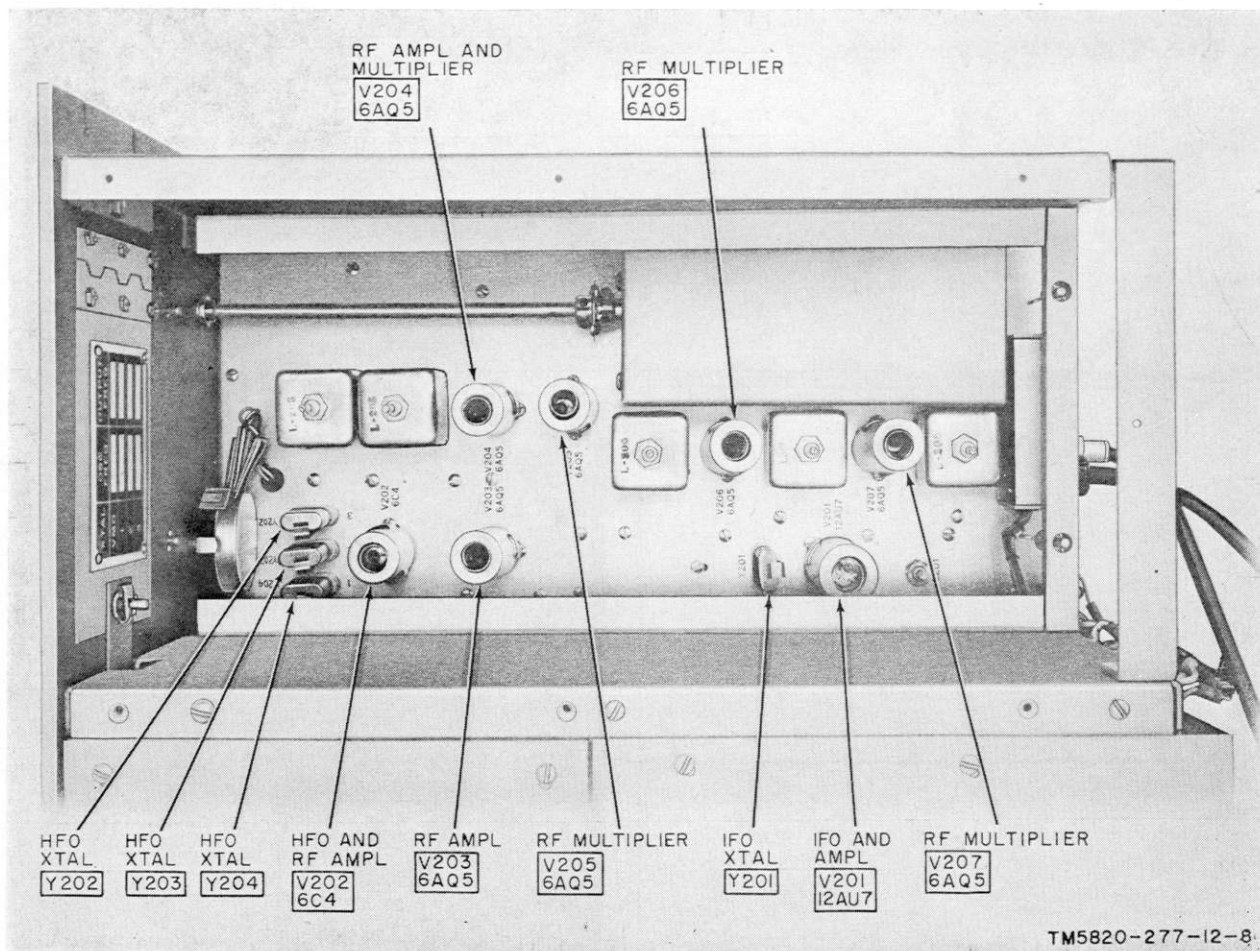


Figure 7. Rf multiplier chassis, top view.

Section II. INITIAL ADJUSTMENT OF EQUIPMENT

Note. The procedures described in this section should be performed by a Fixed Station Transmitter Repairman.

13. Extent of Initial Adjustments

a. Determine the voltage of the ac power source. The variable frequency oscillator is wired at the factory for 115-volt ac operation. Paragraph 14 gives instructions for rewiring for 230-volt ac operation.

b. The ifo and bfo frequency outputs of the variable frequency oscillator are determined by the crystals used. The same is true for the HFO section of the variable frequency oscillator when the XTAL switch is in any of the three positions other than VMO. When the XTAL switch is in the VMO (variable master oscillator) position, the HFO section can be ad-

justed to any frequency between 2 and 64 mc. The CALIBRATE control (par. 16) is used when changing frequencies. Initial tuning instructions in paragraph 15 result in an adjustment that sets the CALIBRATE control closest to its correct mean position.

14. Rewiring for 230-Volt Ac Operation (fig. 9 and 10)

If the variable frequency oscillator is to be used with a 230-volt 50/60 cps source, the input wiring to the crystal ovens and input transformer must be rewired and different size fuses substituted. Proceed as follows:

- a. Remove the power supply chassis from the variable frequency oscillator (par. 11a).
- b. Remove the transformer T101 terminal cover (fig. 6) by removing the four screws.

c. Remove the jumper wires between terminals 1 and 2 and between terminals 3 and 4. Add a jumper wire between terminals 2 and 3, as shown in figure 8.

d. Replace the transformer T101 terminal cover; replace the power supply chassis.

e. Refer to figure 5 for location of terminal boards E301 and E302, and to figure 9 for details of changes described in *f* and *g* below.

f. On terminal board E301, remove the jumper wires between terminals 6 and 8, between terminals 5 and 7, and between terminals 1 and 2. Add a jumper wire between terminals 6 and 7.

g. On terminal board E302, remove the jumper wires between terminals 3 and 6 and

between terminals 1 and 4. Add a jumper wire between terminals 1 and 6.

h. Reconnect the interchassis cables (fig. 5).

i. Replace the 3-ampere OVENS fuse with a 1.5-ampere fuse; replace the 2-ampere POWER fuse with a 1-ampere fuse.

15. Initial Tuning Adjustments

a. The variable frequency oscillator requires a warmup period of at least 48 hours. Connect the alternating current power cord, extending from rear of unit, to the ac power source. Turn the POWER switch (fig. 10) to the ON position and allow the necessary warmup period before making any other adjustments.

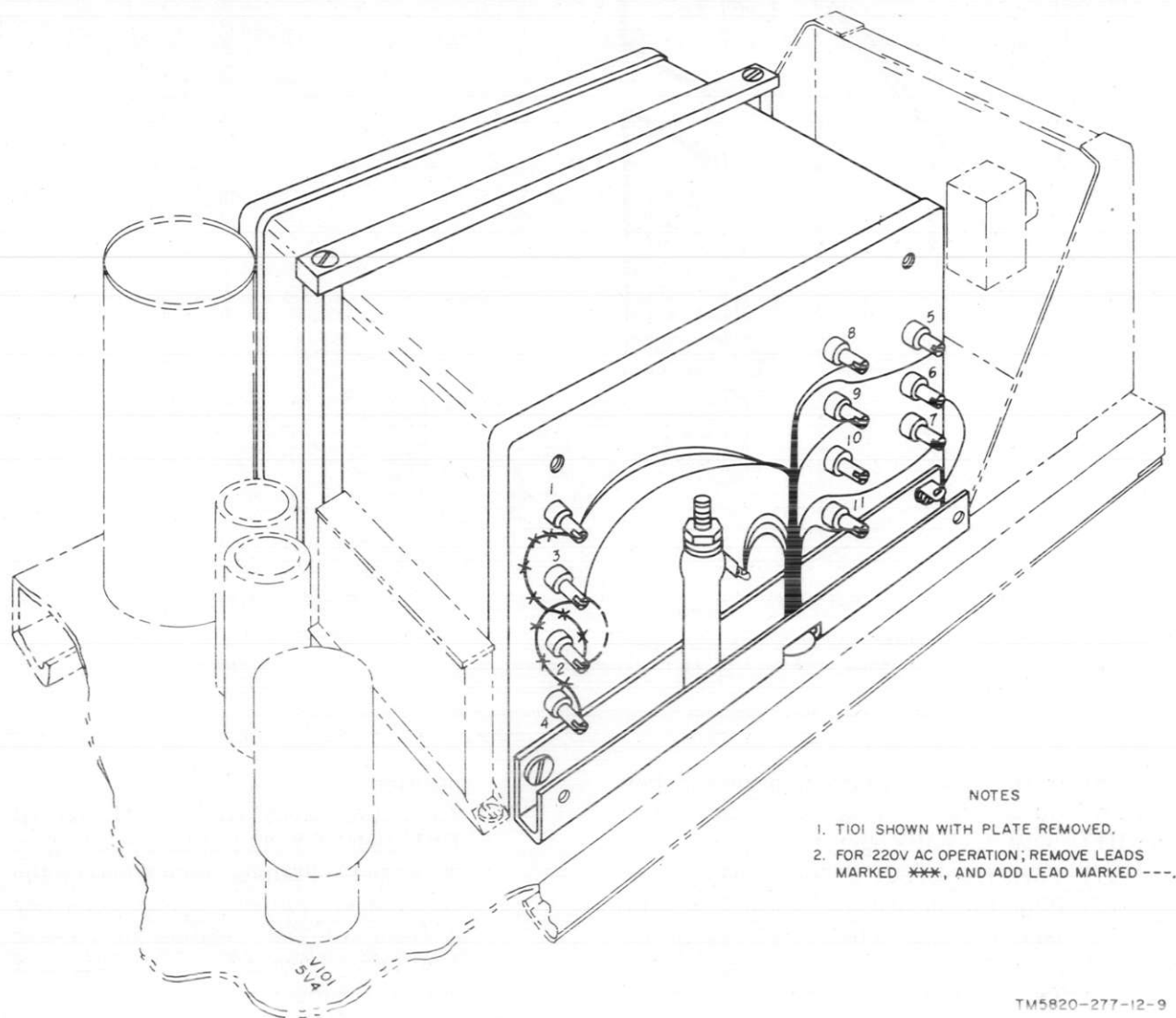


Figure 8. Power supply transformer, input voltage wiring modifications.

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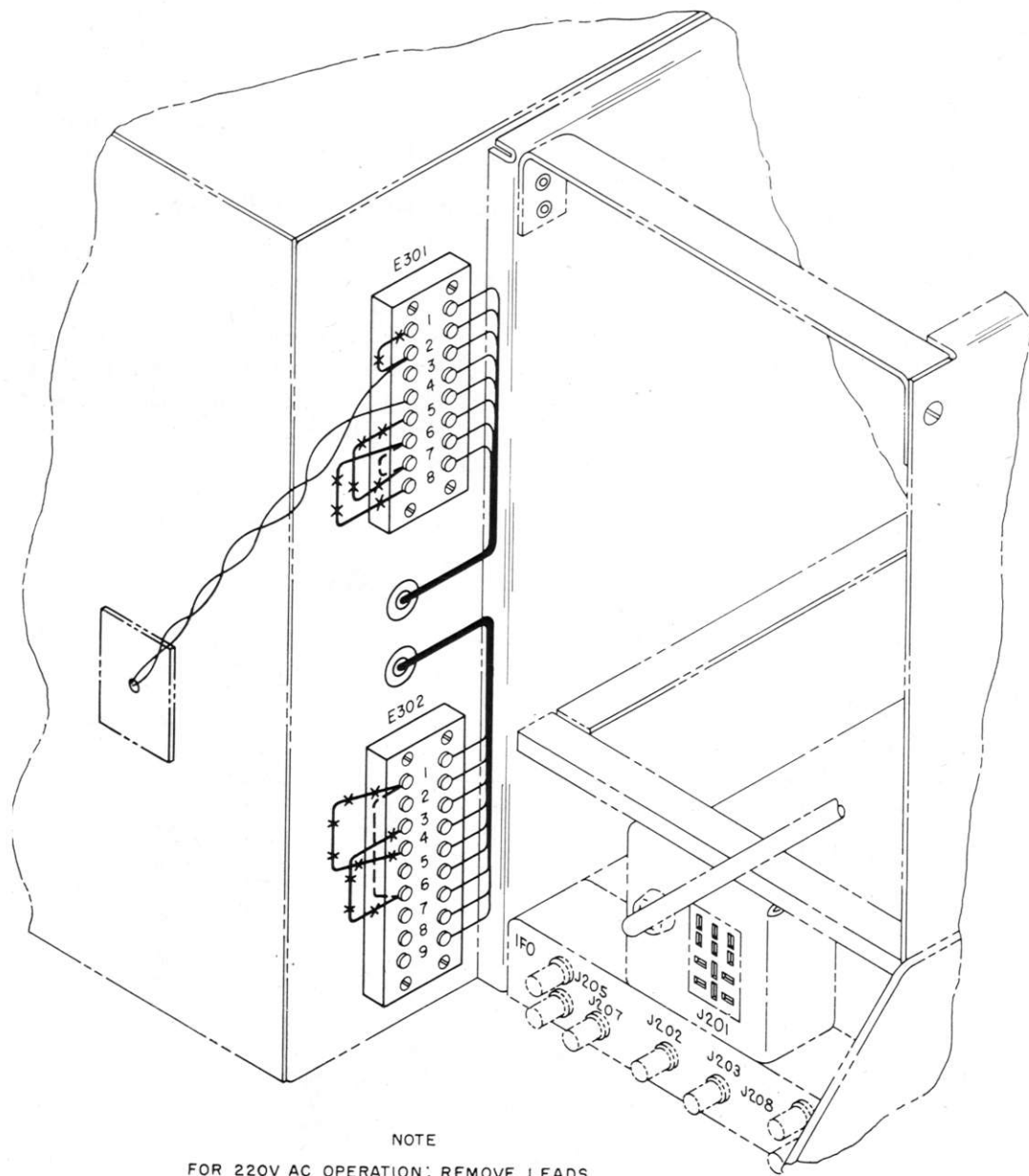


Figure 9. Oven terminal boards, input voltage wiring modifications.

b. After the initial warmup period, follow the procedures below for initial calibration of the HFO output (VMO operation).

- (1) Turn the BEAT switch to ON.
- (2) Plug the headset into the PHONES jack (or into J106 (fig. 12) at the rear of the power supply chassis).
- (3) Turn the BAND-MCS switch to the 2-4 position.
- (4) Turn the XTAL switch to the VMO

position.

- (5) Turn the MASTER OSCILLATOR FREQUENCY dial until a reading of 2,000 kc is obtained; note whether the direction of approach to this frequency is from a higher reading to a lower reading or from a lower reading to a higher reading.
- (6) Loosen the LOCK knob behind the CALIBRATE control. Vary the CALI-



Figure 10. Variable frequency oscillator, showing subpanel and trimmer C303 location.

- BRATE control until a zero beat null is obtained both in the headset and in the ZERO BEAT panel indicator. (The ZERO BEAT lamp is normally lighted. As zero beat is approached, it will blink on and off erratically. At zero beat, the lamp will be out.)
- (7) Turn the MASTER OSCILLATOR FREQUENCY knob until a reading of 4,000 kc is obtained; approach this frequency in the same direction as the 2,000 kc frequency was approached. (For example, if in (5) above, 2,000 kc was approached from a higher frequency, turn the knob until a reading over 4,000 kc is obtained. Then set to 4,000 kc.)
 - (8) Remove the front panel cap that covers trimmer C303 and adjust trimmer C303 with a screwdriver until a zero beat indication is obtained both in the headset and on the ZERO BEAT panel indicator.
 - (9) Repeat (5), (6), (7) and (8) above until adjustments of the CALIBRATE control and trimmer C303 produce zero beat at both 2,000 kc and 4,000 kc. Tighten the CALIBRATE control lock and check to see that the adjustment has not been disturbed.
 - (10) Replace the C303 trimmer cover.
 - (11) Turn the BEAT switch to the OFF position.

CHAPTER 3

OPERATING INSTRUCTIONS

16. Variable Frequency Oscillator, Controls and Indicators

a. Subpanel Controls and Jacks (fig. 11)

| Control or jack | Function |
|-----------------|--|
| POWER switch | Turns variable frequency oscillator on and off. |
| HFO switch | Activates HFO section. |
| IFO switch | Activates IFO section. |
| BFO switch | Activates BFO section. |
| BEAT switch | Activates 100-kc oscillator section. |
| METER switch | Connects meter to output of either HFO, IFO, BFO, or VMO section. |
| PHONES jack | With a headset, provides audible indication of zero beat during calibration. |

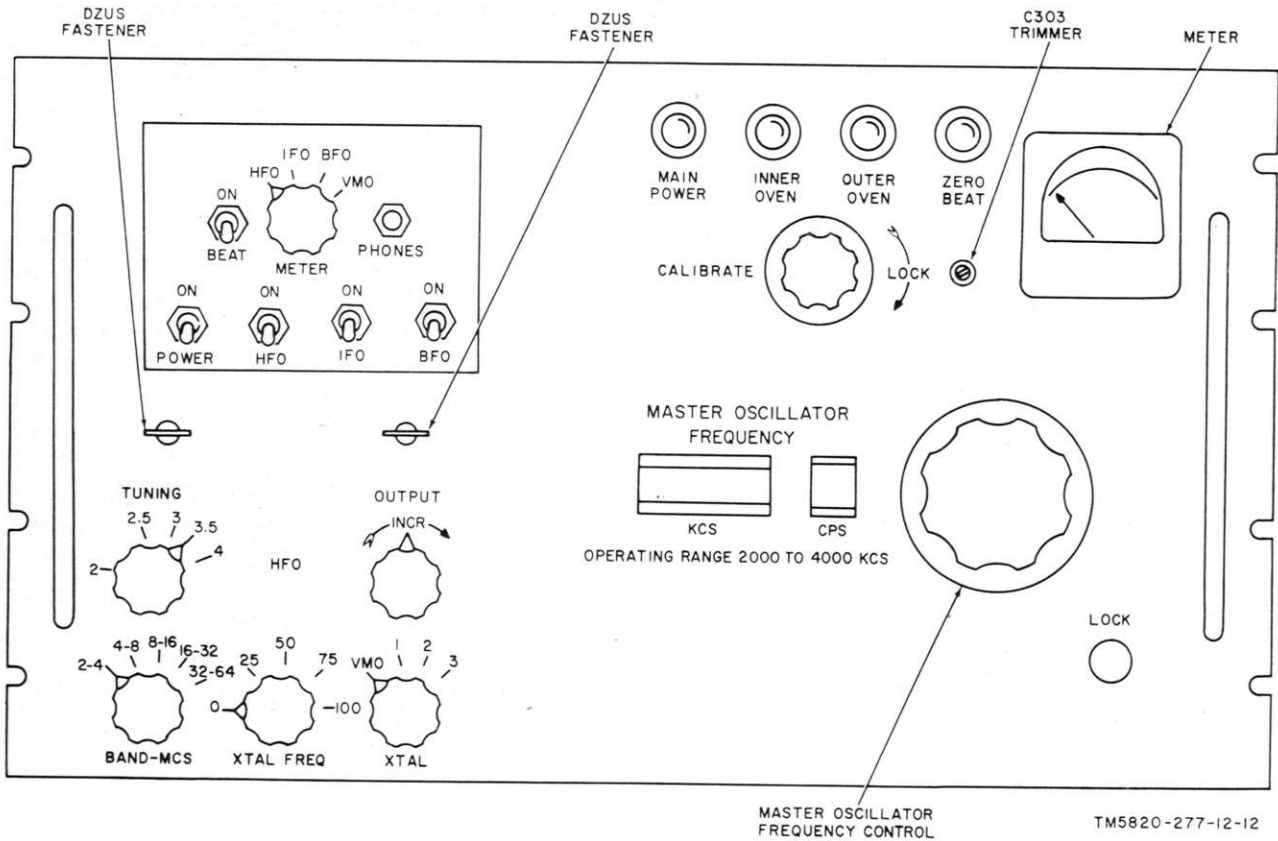


Figure 11. Variable frequency oscillator, front panel operating controls.

b. Front Panel Controls and Indicators (fig. 11).

| Control or indicator | Function |
|--|---|
| TUNING control | Tunes multiplier section of HFO. |
| OUTPUT control | Adjusts output voltage of HFO section. |
| BAND-MCS switch | Selects frequency range of HFO section output. |
| XTAL FREQ control | Trims the HFO section crystals to exact frequency. |
| XTAL switch | Selects VMO operation or one of three crystal-controlled frequencies. |
| CALIBRATE control | Calibrates frequency of VMO at calibration checkpoints. |
| LOCK | Locks CALIBRATE control. |
| Trimmer C303 | Balances CALIBRATE control adjustment (par. 15). |
| MASTER OSCILLATOR FREQUENCY control | Controls output frequency of VMO section. |
| LOCK | Locks master oscillator frequency control. |
| MAIN POWER pilot lamp | When lit, indicates power to variable frequency oscillator is on. |
| INNER OVEN pilot lamp | When lit, indicates power is applied to inner oven (par. 23c). |
| OUTER OVEN pilot lamp | When lit, indicates power is applied to outer oven (par. 23c). |
| ZERO BEAT pilot lamp | Provides visual indication of zero beat during calibration. |
| Meter | Indicates rf output voltage from circuit selected by METER switch. |

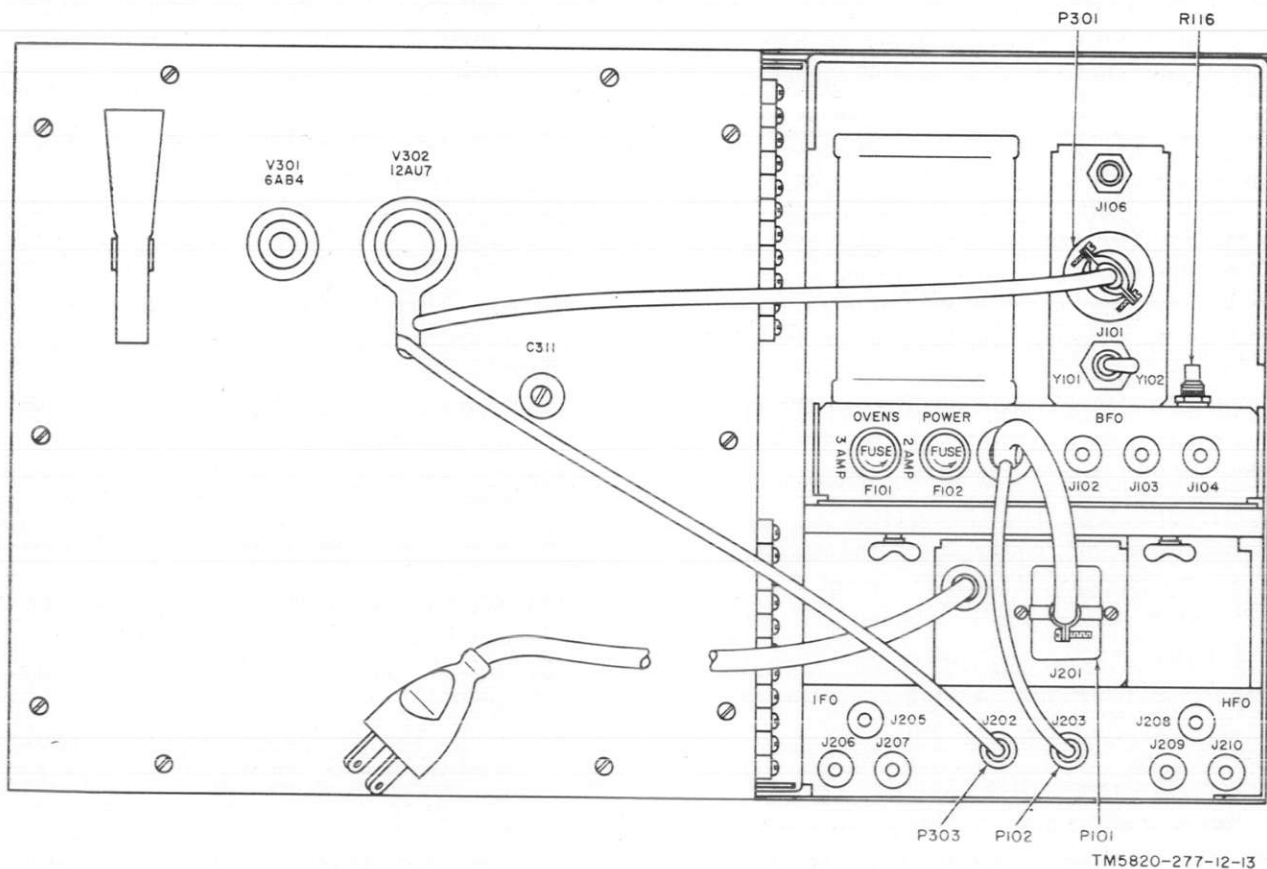


Figure 12. Variable frequency oscillator, rear operating controls.

c. Rear Panel Controls and Jacks (fig. 12)

| Controls and jacks | Function |
|------------------------|--|
| Y101-Y102 switch | Selects crystal in the BFO section. |
| J102, J103, J104 jacks | Provide BFO outputs. |
| J205, J206, J207 jacks | Provide IFO outputs. |
| J208, J209, J210 jacks | Provide HFO outputs. |
| R116 control | Adjusts level of BFO output. |
| J106 jack | With a headset, provides audible indication of zero beat during calibration. |

17. Crystal Selection

Note. No crystals, other than the 100-kc calibrating crystal, are supplied with the variable frequency oscillator.

a. HFO section. For crystal-controlled HFO operation, as an alternate to using the VMO, provision is made for inserting up to three crystals in the HFO section. These crystals, Y202, Y203, and Y204 (fig. 7), must be between 2 and 4 mc; the actual crystal frequencies are determined by the output frequencies required. The output frequency will be the same as the crystal frequency if the BAND-MCS switch is in the 2-4 position. The output frequency will be twice the crystal frequency when the BAND-MCS switch is in the 4-8 position; 4 times the crystal frequency when in the 8-16 position; 8 times the crystal frequency when in the 16-32 position; and 16 times the crystal frequency when in the 32-64 position. Record the crystal output frequencies in the space provided on the inside of the access door (fig. 10).

b. IFO section. The IFO section requires the use of crystal Y201 (fig. 7), in the range of 3.2 to 3.9 megacycles. The IFO output frequency is the same as the crystal frequency.

c. BFO section. The BFO section requires the use of a crystal. A choice of one of two crystals is provided by the crystal selector switch (fig. 3) on the rear panel. Crystals Y101 and Y102 (fig. 6) must be in the range of 300 to 1,000 kilocycles; the output frequencies are the same as the actual crystal frequencies used.

18. Operating Procedures

Note. The variable frequency oscillator requires an initial warmup period of at least 48 hours. The unit should never be turned off unless detailed repairs become necessary. The variable frequency oscillator provides one output voltage from the HFO section (available at connectors J208, J209, J210 (fig. 12)), one from the BFO section (available at connectors J102, J103, J104), and one from the IFO section (available at connectors J205, J206, J207). These output voltages are independent of each other, and may be obtained at the same time. Connect coaxial cable to the appropriate connectors as determined by the requirements of the using equipment.

a. BFO Section.

- (1) Use connectors J102, J103, and J104 as necessary.
- (2) Set the BFO switch to the ON position.
- (3) Turn the crystal selector switch to the Y101 or Y102 crystal position.
- (4) Turn the METER selector switch to the BFO position.
- (5) Adjust potentiometer R116 (fig. 12) until the required rf output level is obtained for the equipment being used; the output level is read on the meter.

b. IFO Section.

- (1) Use connectors J205, J206, and J207 as necessary.
- (2) Set the IFO switch to the ON position.
- (3) Turn the METER selector switch to the IFO position for reading of rf output level.

c. HFO Section Using VMO.

- (1) Use connectors J208, J209, and J210 as necessary.
- (2) Set the BEAT switch to the ON position.
- (3) Plug the headset into the PHONES jack.
- (4) Set the BAND-MCS switch to the desired band.
- (5) Set the XTAL switch to the VMO position.
- (6) Tune the MASTER OSCILLATOR FREQUENCY control to the check-out frequency (list below) closest to the desired frequency dial reading. To obtain the frequency dial reading, the desired operating fre-

quency must be divided by 2 for the 4-8 mc band; by 4 for the 8-16 mc band; by 8 for the 16-32 mc band; and by 16 for the 32-64 mc band. The frequency dial reading already reads the correct operating frequency for the 2-4 mc band. Note the direction of rotation used in approaching the checkout frequency. As an example, for operation at 32-445 mc, the desired dial reading is 2,027,811 ($32,445,000 \div 16$). Use checkpoint 2,028,571 in the list below.

- (7) In this list of checkout frequencies the two left-hand digits of the dial reading (these digits range from 20 to 40) are omitted. The listed last 5 digits hold true for any frequency from 2.0 to 4.0 mc.

| | |
|------------|------------|
| -, -00,000 | -, -50,000 |
| -, -05,000 | -, -55,000 |
| -, -10,000 | -, -60,000 |
| -, -12,500 | -, -66,667 |
| -, -20,000 | -, -71,428 |
| -, -25,000 | -, -75,000 |
| -, -28,571 | -, -80,000 |
| -, -30,000 | -, -83,333 |
| -, -33,333 | -, -85,714 |
| -, -40,000 | -, -90,000 |
| -, -45,000 | -, -95,000 |

- (8) Use the headset and the ZERO BEAT indicator and vary the CALIBRATE control for a zero beat. (At exact zero beat, the indicator should go out; near zero beat, it will flicker on and off.) At some checkout frequencies, zero-beat indication will be obtained only from the headset and not from the ZERO BEAT indicator. When the CALIBRATE control is set, use the LOCK knob to lock it in place.
- (9) Tune the MASTER OSCILLATOR FREQUENCY control to the desired operating frequency dial reading.

Note. For accurate calibration and re-settability, rotate the MASTER OSCILLATOR FREQUENCY control in the same

direction as in (6) above to prevent any error due to backlash in the gears.

- (10) Set the BEAT switch to the off (down) position.
- (11) Turn the METER switch to the HFO position.
- (12) Set the HFO switch to the ON position.
- (13) Set the TUNING control to the position numerically closest to the MASTER OSCILLATOR FREQUENCY dial reading.
- (14) Vary the OUTPUT control to obtain a one-quarter-scale (approximately) reading on the meter.
- (15) Adjust the TUNING control for the highest meter reading obtainable.
- (16) Adjust the OUTPUT control until the required rf output level for the equipment being used is obtained; this output level is read on the meter.

d. HFO Section Using Crystals.

- (1) Use connectors J208, J209, and J210 as necessary.
- (2) Set the HFO switch to the ON position.
- (3) Set the METER switch to the HFO position.
- (4) Turn the XTAL switch to 1, 2, or 3 to select the desired crystal. (Crystals in use are noted on inside of access door (fig.10).)
- (5) Turn the BAND-MCS switch to the proper band (*c*(6) above).
- (6) Set the TUNING control to the position numerically closest to the crystal frequency being used.
- (7) Use the XTAL FREQ trimmer to set exact frequency.
- (8) Adjust the OUTPUT control for a slight reading on the meter.
- (9) Adjust the TUNING control for the highest meter reading obtainable.
- (10) Adjust the OUTPUT control until the required rf output level for the equipment being used is obtained; this output level is read on the meter.

CHAPTER 4

MAINTENANCE INSTRUCTIONS

Note. Do not turn the variable frequency oscillator off for more than 5 minutes during preventive maintenance or organizational troubleshooting procedures. This avoids the necessity for a long warmup period to obtain stable operation. Before removing the power supply chassis (to gain access to the rf multiplier chassis), turn the POWER switch off. Disconnect the cables, remove the power supply, connect the extension service cables (W101, W102, and W103), and then turn the POWER switch to ON again (par. 24).

Warning: Be careful when inspecting tubes with the POWER switch at ON. Use the tube puller; the tubes are hot and may cause a painful burn. Be careful of exposed terminals and wires where dangerous voltages may exist.

Section I. PREVENTIVE MAINTENANCE

19. Scope of Operator's and Second Echelon Maintenance

a. The following is a list of maintenance duties normally performed by the operator of the frequency oscillator. These procedures do not require special tools or test equipment.

- (1) Preventive maintenance (par. 21).
- (2) Checking cable connections (par. 22).
- (3) Replacement of defective fuses (par. 22).
- (4) Replacement of defective pilot lamps (par. 26).
- (5) Replacement of defective tubes (par. 26).

b. The following is a list of maintenance duties performed by second echelon personnel.

- (1) Preventive maintenance (par. 21).
- (2) Equipment performance checklist (par. 23).
- (3) Replacement of defective tubes (par. 26).
- (4) Replacement of defective crystals (par. 26).
- (5) Sectionalization of troubles (par. 25).

20. Test Equipment, Tools, and Materials Required

a. Materials.

- (1) Cleaning Compound (Federal stock No. 7930-395-9542).
- (2) Cleaning cloth.
- (3) Fine sandpaper (No. 000).

b. Test Equipment and Tools.

- (1) Electron Tube Test Set TV-7/U.
- (2) Multimeter, Meter ME-26/U.
- (3) Tool Equipment TE-41.

21. Preventive Maintenance Form

DA Form 11-238 (fig. 13 and 14) is a preventive maintenance checklist used by the operator and second echelon repairman. Items 1 through 4 are checked daily, and items 5 through 12 are checked weekly, by the operator. Items 13 through 28 are checked at least once per month by second echelon personnel. Items not applicable to the variable frequency oscillator are lined out in the figures. Instructions for use of the form appear on the form.

a. First Echelon Items.

| Item | Maintenance procedures |
|------|---|
| 2 | Use lint-free cloth to remove dust, dirt, moisture, and grease from the front panel surfaces and controls. If necessary, wet the cloth with Cleaning compound. Wipe the parts with a dry clean cloth. |
| 6 | Remove any rust or corrosion from exposed metal surfaces using No. 000 sandpaper. Touch up bare spots with paint. |

Warning: Cleaning compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

b. Second Echelon Items.

| Item | Maintenance procedures |
|------|--|
| 15 | Remove the meshed cover on the top left-hand side of the variable frequency oscillator, exposing the power supply chassis. Remove the power supply chassis from the unit (par. 11a). Inspect the tubes and crystals (without removing them) in both the power supply and rf multiplier chassis for proper seating. Thoroughly inspect the tops of both chassis for signs of dirt, dampness, mold, charring, and corrosion. |

Section II. TROUBLESHOOTING

22. Visual Inspection

a. When the equipment fails to perform properly, check all the items listed below.

- (1) Incorrect settings of switches and controls (par. 18).
- (2) Disconnected or poorly connected coaxial cables to output jacks. Turn BFO, IFO, and HFO switches off while checking.
- (3) Disconnected or poorly connected interchassis power and signal cables.
- (4) Burned-out fuses (usually indicates some other fault).

Caution: Never replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, DO NOT replace it again. Troubleshooting at higher echelon is necessary.

b. If the above checks do not locate the trouble, proceed to the operational checklist (par. 23).

23. Equipment Performance Checklist

a. *General.* The operational checklist helps locate troubles quickly. Repairs are limited to plug-in parts. All corrective measures that the second echelon repairman can perform are given in the corrective measures column. If the measures suggested do not restore normal equipment performance, troubleshooting by higher echelon personnel is required. Note on the repair tag what corrective measures were

taken and how the equipment performed at the time of failure.

b. *Procedure.* Keep the variable frequency oscillator in operation. Perform the steps in the order given. Observe the equipment operation and perform any corrective measures necessary, as outlined in c below. If the power supply must be removed, use the service cables to maintain power to the ovens (par. 24).

c. (See chart c on following page)

24. Use of Extension Cables

During preventive maintenance, troubleshooting, or routine replacement of crystals, it may be necessary to remove the power supply from the variable frequency oscillator. When this chassis is removed, all power is automatically removed from the ovens. If the procedure involves 5 minutes or more, use the service cables to maintain power to the ovens. Turn off the POWER switch while making the connections and turn it ON again as soon as the cables are connected.

a. Connect cable W103 between P102 of the power supply chassis and J203 on the rf multiplier chassis.

b. Connect cable W101 between P101 of the power supply chassis and J201 on the rf multiplier chassis.

c. Connect cable W102 between P301 from the variable master oscillator chassis and J101 on the power supply chassis.

c. Checklist

| Step No. | Action or condition | Normal indication | Corrective measures |
|----------|---|--|---|
| 1 | Power switch in ON position for several hours. | MAIN POWER pilot lamp glows. OUTER OVEN pilot lamp blinks on for approximately 5 seconds, and off for approximately 30 seconds. INNER OVEN pilot lamp blinks on for approximately 90 seconds and off for approximately 90 seconds. | Check MAIN POWER pilot lamp. Check POWER fuse. Higher echelon repair required. Check OUTER OVEN pilot lamp. Higher echelon repair required. Check INNER OVEN pilot lamp. |
| 2 | Turn BFO switch to ON position. Turn METER switch to BFO. | Meter deflection indicates rf output level. | Higher echelon repair required. Adjust R116 (par 18a). Check tubes V101, V102, V105. Make substitution check of crystals Y101 and/or Y102 (par 25). Higher echelon repair required. |
| 3 | Turn IFO switch to ON position. Turn METER switch to IFO. | Meter deflection indicates rf output level. | Check tubes V101, V102, V201 (par 26). Make substitution check of crystal Y201. Higher echelon repair required. |
| 4 | Turn HFO switch to ON position. Turn METER switch to HFO. Turn XTAL switch to 1, 2, or 3. | Meter deflection indicates rf output level. | Tune HFO section (par. 18d). Check tubes V101, V102, and V202 through V207. Make substitution check of crystals Y202, Y203, or Y204 (par 25). Higher echelon repair required. |
| 5 | Turn HFO switch to ON position. Turn METER switch to HFO. Turn XTAL switch to VMO. | Meter deflection indicates rf output level. | Tune variable master oscillator (par 18c). Check tubes V101, V102, V202 through V207, V301 and V302. Higher echelon repair required. |
| 6 | Turn BEAT switch to ON position. Turn HFO switch to ON position. Turn XTAL switch to VMO. Tune MASTER OSCILLATOR FREQUENCY dial through entire frequency range. Turn MASTER OSCILLATOR FREQUENCY dial to 2,000 KCS (000) CPS reading. Adjust CALIBRATE control. Turn MASTER OSCILLATOR FREQUENCY dial to 2,500 KCS, then to 3,000 KCS, then to 3,500 KCS, and then to 4,000 KCS. Adjust CALIBRATE control at each frequency setting listed above, but DO NOT make more than 2 complete revolutions of the CALIBRATE control from its position at 2,000 KCS to effect calibration at any dial frequency. | Headset indicates zero beat at many intervals throughout frequency range. ZERO BEAT pilot lamp lights at all times except at many of the zero-beat intervals. Headset, and possibly ZERO BEAT pilot lamp, indicates zero beat when proper calibration is reached. Headset, and possibly ZERO BEAT pilot lamp, indicates zero beat within the limits of adjustment of the CALIBRATE control. | Check headset. Check tubes V301, V302, V103, and V104. Check ZERO BEAT pilot lamp. Higher echelon repair required. Higher echelon repair required. |

| | |
|--|--|
| <p style="text-align: center;">ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS</p> <p>26. INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.</p> <p>27. CHECK FOR NORMAL OPERATION.</p> <p>28. BEFORE SHIPPING OR STORING, REMOVE BATTERIES.</p> <p>IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.</p> <p>MARCH 8 ITEMS 1 AND 7 POWER CORD CUT-WIRE EXPOSED. REPORTED TO 2d ECHELON - C. HAM</p> <p>MARCH 8 POWER CORD REPAIRED - ALL OK - A. BAARIE</p> | <p style="text-align: center;">MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT SOUND EQUIPMENT, RADIO, DIRECTION FINDING RADAR, CARRIER, RADIOSONDE AND TELEVISION <small>(AR 750-625)</small></p> <p style="text-align: center;">EQUIPMENT NOMENCLATURE OSCILLATOR, RADIO FREQUENCY O-330A/FR</p> <p style="text-align: center;">EQUIPMENT SERIAL NUMBER 29</p> <p style="text-align: center;">INSTRUCTIONS</p> <p>This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.</p> <ol style="list-style-type: none"> 1. For detailed Preventive Maintenance instructions see: <ol style="list-style-type: none"> a. The Technical Manual (in TM 11 series) for the equipment. (See DA Pamphlet Number 310-4) b. The Supply Bulletin (SB 11-100 series) for the equipment. (See DA Pamphlet Number 310-4) c. The Department of the Army Lubrication Order. (See DA Pamphlet Number 310-4) 2. The following action will be taken by either the Communications Officer/Chief for 1st echelon, or the Inspector for higher echelon: <ol style="list-style-type: none"> a. Enter Equipment Nomenclature and Serial Number. b. Strike out items that do not apply to the equipment. 3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND. 4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor. |
|--|--|

FOLD

| TYPE OF INSPECTION | | DATE | SIGNATURE |
|-------------------------------------|-------------------------------------|----------|---------------------------|
| OPER- ATOR | 2/3 ECH- ELON | 4 MARCH | <i>1st Lt. Cecil Lamm</i> |
| <input checked="" type="checkbox"/> | | 11 MARCH | <i>1st Lt. Cecil Lamm</i> |
| | <input checked="" type="checkbox"/> | 14 MARCH | <i>Sgt. Roy Barrie</i> |
| | | | |
| | | | |

DA FORM 11-238
1 MAY 57

REPLACES DA FORMS 11-238, 1 NOV 55; 11-239, 11-244, 11-245, 11-248, 11-249, 11-250, AND 11-251; WHICH ARE OBSOLETE.

LEGEND for marking conditions:
 Satisfactory, ✓
 Adjustment, Repair or Replacement required, X
 Defect corrected, (X)

| NO. | DAILY ITEM | CONDITION EACH WEEK | | | | | 2D 3D ECH |
|---|---|---------------------|----|----|-----|-----|-----------------|
| | | 1ST | 2D | 3D | 4TH | 5TH | |
| 1. | COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT. (Transmission, receiver, carrying antenna, wire, cables, antennae, tubes, spare parts, technical manuals) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. | CLEAN DIRT AND MOISTURE FROM ANTENNA, WIRE, PHONE HEADSETS, REVS, JACKS, PLUGS, COMPONENT PANELS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3. | INSPECT CONTROLS FOR NORMAL OPERATION. 3AD CONTROLS - WHISTLE FOR EVIDENCE OF CUT-OUT FROM LOOSE CONTACTS | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4. | CHECK FOR NORMAL OPERATION OF EQUIPMENT. BE ALERT FOR UNUSUAL OPERATION OR CONDITION. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| WEEKLY | | 1ST | 2D | 3D | 4TH | 5TH | 2D 3D ECH |
| 5. | CLEAN AND TIGHTEN EXTERIORS OF CASES. RACKS, MOUNTS, TRANSMISSION LINES. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6. | INSPECT CASES. MOUNTS, ANTENNA TOWERS AND EXPOSED METAL SURFACES FOR RUST, CORROSION. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7. | INSPECT CORDS, CABLE, WIRE. HOOK MOUNTS FOR CUTS, KINKS, BREAKS, PRAYING, UNDOUE STRAIN. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8. | CHECK ANTENNA GUN WIRES FOR PROPER TENSION OR DAMAGE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9. | INSPECT GUNWAS AND LEATHER ITEMS FOR MILDew, TEARS, FRAYING | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10. | INSPECT ACCESSIBLE ITEMS FOR LOOSE. RELS: SWITCHES, KNOBS, JACKS, CONNECTORS, RELAYS, TRANSFORMER, MOTOR, PILOT LIGHTS, BLOWER, ETC. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11. | CLEAN AND/OR INSPECT AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12. | INSPECT STORAGE BATTERIES FOR DIRT. LOOSE TERMINALS, SPECIFIC GRAVITY, DAMAGED CASES. INSPECT DRY BATTERIES FOR LEAKAGE. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS | | | | | | | CONDITION |
| 13. | INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER PROOFING, TEARS, FRAYING. | | | | | | |
| 14. | CHECK TERMINAL BOX COVERS FOR BRACKETS DIRT, LEAKS, DAMAGED CABLES, CREASES | | | | | | |

2

DAILY CONDITION FOR MONTH OF

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 2D 3D ECH ELON |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-------------------------|
| 15. INSPECT SEATING OF READILY ACCESSIBLE PLUCK-OUT ITEMS: TUBES, LAMPS, FUSES, CRYSTALS. CONNECTORS. AMPLIFIERS, PLUG-IN COILS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 16. INSPECT RELAYS AND CIRCUIT BREAKERS FOR LOOSE MOUNTINGS, BAD CONTACTS, MIS-ALIGNMENT OF CONTACTS AND SPRINGS, PROPER SPRING TENSION. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17. INSPECT VARIABLE CAPACITORS FOR DIRT, MIS-ALIGNMENT OF PLATES, LOOSE MOUNTINGS, MOISTURE. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18. INSPECT RESISTORS, BUSHINGS AND INSULATORS FOR CRACKS, CHIPPING, BLISTERING, MOISTURE, DISCOLORATION. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19. CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES AND INTERIORS OF CHASSIS AND BATTERIES, NOT READILY ACCESSIBLE. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21. INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR DIRT, CORROSION, LOOSE CONTACTS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 22. INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR OVERHEATING AND OIL LEAKAGE. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 23. INSPECT GENERATORS, AMPLIFIERS, DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARcing AND FITTING OF COMMUTATOR. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 24. INSPECT CATHODE RAY TUBES FOR BURNT GREEN SPOTS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 25. INSPECT WATERPROOF BASKETS FOR LEAKS, WORN OR LOOSE PARTS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS | | | | | | | | | | | | | | | | | CONDITION |

3

CONTINUED ON PAGE 4

Figure 14. DA Form 11-238, pages 2 and 3.

25. Sectionalization of Troubles

a. The rectifier tube (V101) is functioning and need not be checked if output is obtained from any one of the variable frequency oscillator outputs (BFO, IFO, or HFO).

b. When abnormal operation occurs on only one position of positions 1, 2, or 3 of the XTAL switch, the fault is with the particular crystal involved (Y202, Y203 or Y204) or that crystal socket and its connecting wires. A tube check is not necessary.

c. When the BFO section appears inoperative, set the crystal selector switch (Y101-Y102), at the rear of the power supply chassis (fig. 3), to the alternate position. If there is an output indication in the new switch position, the BFO circuit tubes are functioning and the fault is in the crystal or associated socket and connecting wires of the original switch position.

d. When the VMO is inoperative and the HFO is functioning normally (check XTAL switch position 1, 2 or 3), the trouble is confined to tubes V301 and V302 (fig. 5) or associated circuitry.

26. Repairs

a. General

- (1) Before changing any tubes, crystals, or pilot lamps, turn off the BFO, HFO, and IFO switches. If the power supply chassis must be removed, use the service cables (par. 24).
- (2) Possible defective tubes, or pilot lamps should be replaced with spares one at a time, until the fault is cleared. Check tubes with Electron Tube Test Set TV-7/U. If no tube tester is available, discard a tube only if its defect is obvious or if replacement by a new tube causes the variable frequency oscillator to operate. When a substitution does not clear the fault, reinstall the original tube.

- (3) The POWER switch should be kept in the ON position at all times.

b. Replacement of Pilot Lamps

- (1) Turn the glass pilot lamp jewel counterclockwise and pull out to expose the pilot lamp.
- (2) Press in on the lamp and turn counterclockwise to unlock.
- (3) Pull out the lamp and replace it with a new one. Push the new lamp in and twist it clockwise to lock.
- (4) Replace the glass pilot lamp jewel and turn it clockwise to lock.

c. Replacement of Tubes.

- (1) Refer to figures 5, 6, and 7 for location of tubes. Remove power supply chassis when V200 series tubes are to be replaced (par. 24).
- (2) Press down on the tube shield, and turn it counterclockwise to unlock. Gently pull up on shield to remove.
- (3) Use the tube puller and pull tube out of socket.
- (4) Insert replacement tube firmly in socket.
- (5) Replace shield over tube. Press down and turn clockwise to lock.

d. Replacement of Crystals.

- (1) Refer to figures 6 and 7 for location of crystals.
- (2) Remove the power supply chassis when Y200 series crystals are to be replaced.
- (3) Push aside the crystal-holding spring for removal of Y100 and Y200 series crystals.
- (4) Pull up on the crystal holders to remove from socket.
- (5) Insert replacement crystals firmly into socket.
- (6) Push crystal-holding spring into place.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

27. Disassembly of Equipment

Disassembly procedures for the variable frequency oscillator consist of the following:

- a. Disconnect the ac power cord from the power receptacle.
- b. Disconnect coaxial cable between variable frequency oscillator and associated equipment.

28. Repackaging for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be stored. Use the procedures outlined below whenever circumstances permit. The information concerning the original packaging (par. 9) will also be helpful.

a. Material Requirements.

- (1) The following materials are required for packaging the variable frequency oscillator. For stock numbers of materials, consult SB 38-100 (Preser-

| Material | Quantity |
|----------------------|----------------|
| Waterproof paper | 24 square feet |
| Waterproof tape | 10 feet |
| Corrugated cardboard | 20 square feet |
| Adhesive tape | 8 feet |
| Filler material | 5 pounds |
| Flat steel strapping | 25 feet |
| Wooden shipping box | 1 |

vative, Packaging, and Packing Materials, Supplies, and Equipment used in the Army).

- (2) Construct a wooden box the inside dimensions of which are 24½ by 14 by 23½ inches.

b. Packaging.

- (1) Cushion the variable frequency oscillator on all surfaces with pads of filler material. Place the cushioned equipment within a wrap of corrugated cardboard. Secure the wrap with adhesive tape.
- (2) Tie the service cables in a small loop. Wrap the spare parts in corrugated cardboard and secure with adhesive tape.
- (3) Line the inside of the wooden box with waterproof paper.
- (4) Place the packaged variable frequency oscillator inside the lined box. Also place spare parts, service (extension) cables, and technical manuals within the lined wooden box. Fill excess space in the box with pads of corrugated cardboard and filler material. Secure the waterproof paper with waterproof tape.
- (5) Nail the cover onto the box and apply three bands of metal strapping around the box.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

29. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 30 will be used to prevent further use of the equipment.

30. Methods of Destruction

Use any of the following methods to destroy the equipment:

- a. *Smash.* Smash the variable frequency

oscillator, including oven, tubes, crystals, controls and indicators; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.

b. *Cut.* Cut the power cord and coaxial output cables; use axes, handaxes, or machetes.

c. *Burn.* Burn technical manuals; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. *Dispose.* Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

APPENDIX

REFERENCES

Following is a list of references applicable and available to the operator and second echelon repairman of Oscillator, Radio Frequency 0-330A/FR.

TM 11-5820-277-10P Operator's Maintenance Repair Parts and Special Tools List for Oscillator, Radio Frequency 0-330/FR

TM 11-5820-277-20P Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation chart for Oscillator, Radio Frequency 0-330/FR

TM 11-5083 Election Tube Test Sets TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U

TM 11-6625-200-12 Operation and Organizational Maintenance; Multimeter ME-26B/U

By Order of *Wilber M. Brucker*, Secretary of the Army:

L. L. LEMNITZER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

Active Army:

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Tech Stf, DA (1) except
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USA Armor Bd (1)
USA Armor Bd Test Sec (1)
USA Inf Bd (1)
USA Air Def Bd (1)
USA Armor Bd Test Sec (1)
USA Abn & Elct Bd (1)
USA Avn Bd (1)
USA Arctic Test Bd (1)
US ARADCOM (2)
US ARADCOM Rgn (2)
OS Maj Comd (5)
OS Base Comd (5)
Log Comd (5)
MDW (1)
Armies (5) except
 First US Army (7)
Ft. Belvoir (7)
Corps (3)
Div (2)
USATC (2)
Yuma Test Sta (2)
USA Elct PG (1)
Svc Colleges (5)
Br Svc Sch (5) except
 USASCS (25)
Gen Dep (2) except
 Atlanta (None)
 Sig Sec, Gen Dep (10)

USA Pictorial Cen (2)
USA Ord Msl Comd (3)
Def Atomic Spt Agcy (5)
Sig Dep (17)
AFIP (1)
WRAMC (1)
AMS (1)
Engr Maint Cen (1)
USA Comm Agcy (3)
USA Sig Engr Agcy (1)
USA Sig Pub Agcy (8)
USA Sig Eqp Spt Agcy (7)
USA Sig Msl Spt Agcy (13)
Trans Terminal Comd (1)
Army Terminals (1)
Ports of Emb (OS) (2)
OS Sup Agcy (1)
Sig Fld Maint Shops (3)
Sig Lab (5)
USASSA (15)
Mid-Western Rgn Ofc USASSA (1)
USA Corps (Res) (1)
JBUSMC (2)
Units org under fol TOE:
 11-7 (2)
 11-16 (2)
 11-57 (2)
 11-97 (2)
 11-117 (2)
 11-155 (2)
 11-500 (AA-AE) (2)
 11-557 (2)
 11-587 (2)
 11-592 (2)
 11-597 (2)

NG: None

USAR: None

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