NAVSHIPS 92121(A)

INSTRUCTION BOOK

for

RADIO TRANSMITTING SETS

AN/SRT-14, AN/SRT-14A, AN/SRT-15, AN/SRT-15A, AN/SRT-16 AND AN/SRT-16A

SECTION 6

PREVENTIVE MAINTENANCE

FEDERAL TELEPHONE AND RADIO COMPANY

A division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

CLIFTON, NEW JERSEY

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SECTION 6
PREVENTIVE MAINTENANCE

1. GENERAL.

Preventive maintenance is routine procedure that is used to check needless breakdown of running equipment and to keep it working efficiently for as long a period as possible. If wear is noticed and checked at an early stage, a serious shutdown may be avoided. Constant and careful inspection, care in replacement and handling procedures, together with the use of proper methods of assembly and disassembly of parts, are all necessary in contributing to the over-all efficient maintenance of the equipment. Accurate records must be kept and a series of routine checks instituted. These will be explained in more detail later in this section. Figure 6–1 illustrates a typical Radio Transmitting Set AN/SRT–15 installation.

Note

The AN/SRT–14A, 15A and 16A are nonmagnetic versions of the AN/SRT–14, 15 and 16 respectively. As the nonmagnetic versions vary from the standard types only in the material used for cabinet panels, all information on preventive maintenance for AN/SRT–14, 15 and 16, as set forth in this section, applies equally as well to AN/SRT–14A, 15A and 16A.

Note

Where, throughout this section, reference is made to either low level radio modulator or high level radio modulator, it should not be interpreted as meaning the technique of modulation known as grid modulation or low level modulation, but rather as referring to the operating *power* level.

2. INITIAL CHECKS.

Certain fundamental precautions should be observed before actually placing the equipment in operation. Every effort should be made to become familiar with the equipment in order to recognize and anticipate avoidable defects. Table 6–1 should be used to assist in making these fundamental observations.

3. RFA METER READINGS.

All the readings should be taken under the same conditions and with the same antenna or dummy load. Weekly readings are to be made and compared with those of the previous week, so as to check the various conditions existing. It should be borne in mind that various production line tubes will vary considerably in their current output readings. A definite trend or fluctuation in the readings is to be interpreted as an indication of trouble. By charting these fluctuations, a reliable record of tube performance is available for ready reference, and trouble may be avoided by changing tubes before a critical stage is reached.

TABLE 6–1. INITIAL CHECKS

ITEM	CHECK
1. Primary Power	The ship power supply must be available at all times.
2. Control Equipment	Radiophone, teletype, facsimile, hand keys and other control equipment must be in good working order and connected properly.
3. Insulators	Antenna and line insulators must be kept clean and free of unwanted grounds.
4. Cables	All internal and external cables must be firmly and properly connected.
5. Dirt and Moisture	Leakage paths are often provided by dirt and moisture, resulting in arc-overs and loss of efficiency.
6. Loose Parts	In operation, some mountings or fittings may work loose or become damaged. Correct this condition as quickly as possible.
7. Visual Check	Check for broken, damaged, or loose hardware, meters, knobs, dials or lamps. Replace damaged parts without delay.

a. 100-WATT OPERATION.—With the equipment operating at the 100-watt level, the readings on the various meters associated with Radio Frequency Amplifier AM–1008/SRT (RFA) should read approximately as in table 6–2. The following conditions prevailed for these typical readings:

(1) Line voltage—110/220 volts.

(2) Load—50 ohms (resistive).

(3) Phone modulation—100 percent.

(4) TEST KEY Ⓣ—energized.

(5) Frequency—2 mc.

Note

The nominal readings in table 6–2 are to be used for reference only. Some of the readings are dependent on the setting of the EXCITATION control ㉒.

b. 500-WATT OPERATION.—With the equipment operating at the 500-watt level, the readings on the RFA meters should read approximately as in table 6–3 under the following conditions:

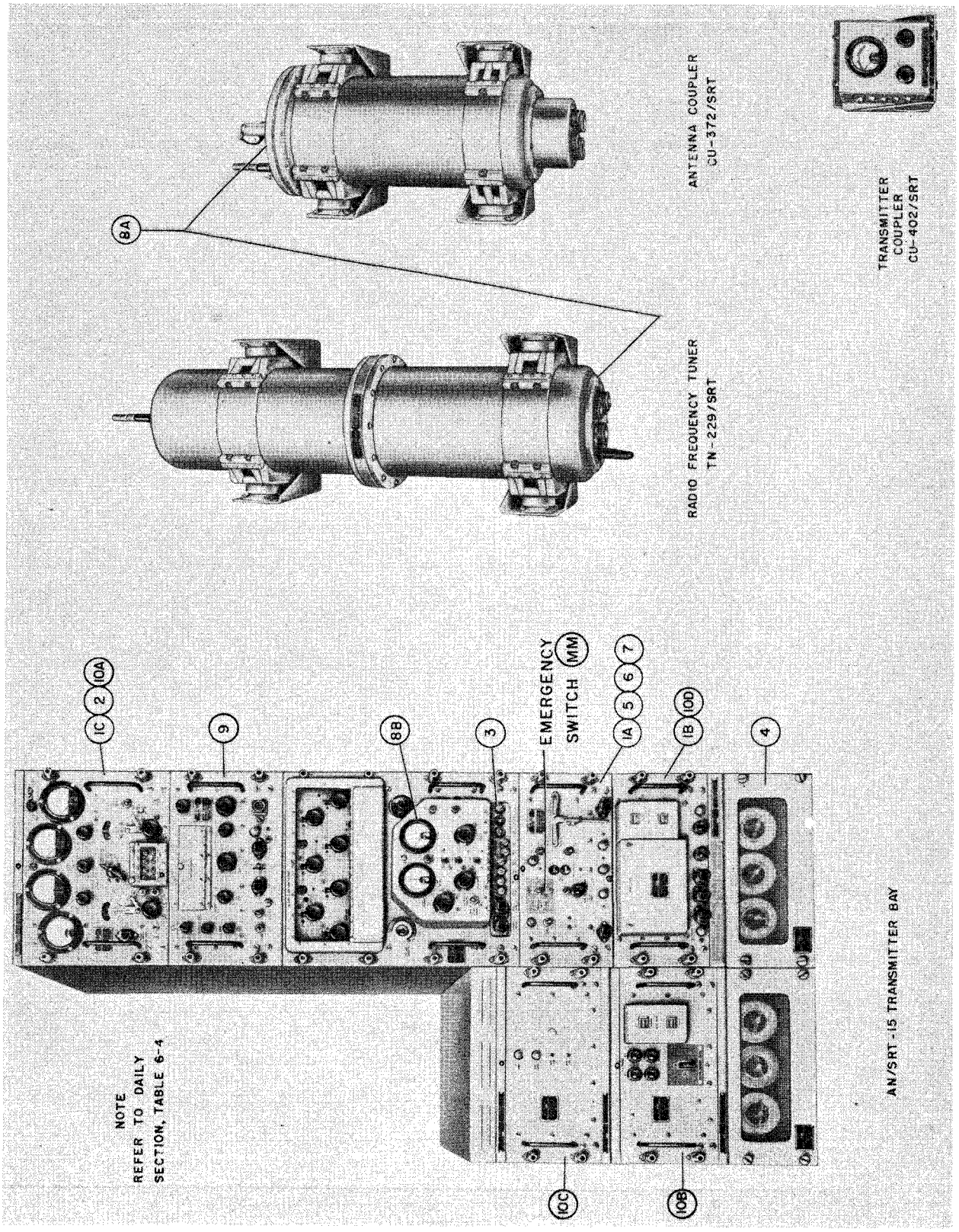

Figure 6–1. Daily Routine Maintenance Checks, AN/SRT–15

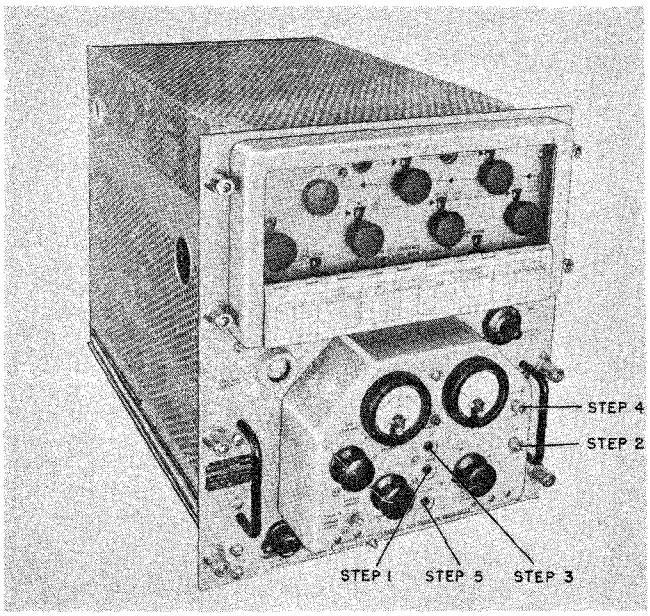

Figure 6–2. Control-Indicator C–1352/SRT, Adjustments for R-f Tuner Control

TABLE 6–2. RFA METER READINGS, 100-WATT OPERATION

CONTROL SETTINGS	VOLTMETER READINGS	
	PHONE	CW
VOLTMETER Ⓙ Switch:		
RF IN (5 V)	2.5–5.0 V	2.5–5.0 V
BIAS (500 V)	200–215 V	200–215 V
LV (500 V)	260–315 V	260–315 V
MV (1000 V)	430–525 V	430–525 V
PA E_{c2} (1000 V)	220–300 V	220–300 V
PA E_b (5000 V)	900–1100 V	1100–1365 V
	IPA CURRENT METER READINGS	
IPA Ⓖ Switch:		
I_{c1} (5 MA)	0.5–3.5 ma	0.5–3.5 ma
I_{c2} (10 MA)	5–8 ma	5–8 ma
I_k (500 MA)	50–80 ma	50–80 ma
	PA CURRENT METER READINGS	
PA Ⓗ Switch:		
I_{c1} (50 MA)	15–25 ma	18–30 ma
I_{c2} (100 MA)	50–80 ma	40–70 ma
I_k (1 A)	200–350 ma	200–350 ma

(1) Line voltage—110/220 volts.

(2) Load—50 ohms (resistive).

(3) Phone modulation—100 percent.

(4) TEST KEY Ⓣ—energized.

(5) Frequency—2 mc.

Note

The nominal readings in table 6–3 are to be used for reference only. Some of the readings are dependent on the setting of the EXCITATION control ㉒. The BAND SWITCH Ⓒ must be in the 2–5 MC position. A lower band position will prevent 500-watt operation.

TABLE 6–3. RFA METER READINGS, 500-WATT OPERATION

CONTROL SETTINGS	VOLTMETER READINGS	
	PHONE	CW
VOLTMETER Ⓙ Switch:		
RF IN (5 V)	2.5–5.0 V	2.5–5.0 V
BIAS (500 V)	200–215 V	200–215 V
LV (500 V)	285–315 V	285–315 V
MV (1000 V)	475–525 V	475–525 V
PA E_{c2} (1000 V)	390–500 V	400–525 V
PA E_b (5000 V)	2280–2520 V	2850–3150 V
	IPA CURRENT METER READINGS	
IPA Ⓖ Switch:		
I_{c1} (5 MA)	0.5–3.5 ma	0.5–3.5 ma
I_{c2} (10 MA)	6–9 ma	6–9 ma
I_k (500 MA)	50–80 ma	50–80 ma
	PA CURRENT METER READINGS	
PA Ⓗ Switch:		
I_{c1} (50 MA)	15–25 ma	12–20 ma
I_{c2} (100 MA)	20–60 ma	15–50 ma
I_k (1 A)	300–450 ma	300–450 ma

4. MAINTENANCE CHECKS.

a. ROUTINE MAINTENANCE CHECK CHART.

Note

For the following checks and adjustments, make sure that the equipment is not being operated from the remote location, except for the item specifically called "Remote Operation". Refer to Section 5, table 5–1, which may be used to check nomenclature references.

Table 6–4 will enable the technician to check and adjust the equipment in a regular, orderly manner.

Note

The attention of maintenance personnel is invited to the requirements of chapter 67 of the *Bureau of Ships Manual*, of the latest issue. Personnel are also requested to read the safety instructions included in the front matter of this book.

TABLE 6–4. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
WARNING Dangerous voltages exist in the AN/SRT–14, 15 and 16 equipment. The technician should familiarize himself with the voltages present in any chassis in which a check for adjustment is to be made. Before removing a chassis in the transmitter group, turn the EMERGENCY SWITCH (MM) (see figure 6–1) on the front panel of the LVPS to OFF. This will shut down the equipment.		
	DAILY	
1. General Sequence 100-Watt Operation	(See figure 6–1.) **Note** The short or common names used in this section are taken from Section 5, table 5–1.	**Note** Refer to table 5–2, Preliminary Control Positions, before starting these checks. The equipment is presumed to be not operating at this time.
a. Power Supply PP–1094/SRT (LVPS)	(See 1A, figure 6–1.) *Step 1.* Place EMERGENCY SWITCH (MM) in ON position.	
	Step 2. Place STANDBY-OPERATE switch (PP) in OPERATE.	
	Step 3. Press START button of MAIN POWER switch (RR).	The MAIN POWER INDICATOR will be illuminated only after the START button of the MAIN POWER switch (RR) is energized. After time delay, the following lamps will light: (1) TIME DELAY (LVPS) (2) +250 V (3) +300 V (4) –220 V (5) 500 V PRI. (MVPS) (6) 500 V OUTPUT (7) 1300 V OUTPUT (8) 1300 V PRI.
b. Power Supply PP–1095/SRT (MVPS)	(See 1B, figure 6–1.) TOTAL HOURS-FILAMENT meter begins to operate when MAIN POWER switch (RR) is energized.	
	Note The readings on the TOTAL HOURS-FILAMENT meter may be co-ordinated with a record of RFA meter changes to give significant data of tube life expectancy. Record the meter readings at time of tube changes. (Refer to table 6–13.)	TOTAL HOURS-FILAMENT meter is protected by fuse marked FILAMENTS (F–503) on front panel. Meter will operate with the OPERATE-STANDBY switch (PP) (LVPS) in either position. **Note** The meter reads in tenths-of-an-hour and operates during the time filament power is applied.
	TOTAL HOURS-PLATE meter will begin to register when the 500-volt plate supply is energized after time delay.	Meter will not operate when STANDBY-OPERATE switch (PP) (LVPS) is in STANDBY.
c. Radio Frequency Amplifier AM–1008/SRT (RFA)	(See 1C, figure 6–1.)	The 100 W-READY lamp on the RFA will be illuminated.
2. RFA Blower	(See 2, figure 6–1.) The RFA blower starts when the MAIN POWER switch (RR) on the LVPS is energized.	Check blower by listening for operation.

TABLE 6—4. ROUTINE MAINTENANCE CHECK CHART (Cont'd)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
3. RFO Oven Heaters (HEATER ON)	(See 3, figure 6—1.) The indicators for the oven heaters are marked: *a.* INT. *b.* X-TAL *c.* F.S.	These lamps have their own supply and operate intermittently. Always check lamps first, if trouble is suspected.
4. Base Mount Blowers	(See 4, figure 6—1.) After the time delay, the base mount blowers will operate.	Listen for blower operation, after time delay.
5. Cabinet Heater	(See 5, figure 6—1.) Turn CABINET HEATER switch (NN) to its ON position.	The CABINET HEATER lamp will be illuminated. If trouble is suspected, check lamp first. **Note** Keep CABINET HEATER switch (NN) in OFF position, unless the heaters are needed.
6. INTERLOCK BATTLE SHORT switch (JJ)	(See 6, figure 6—1.) Place switch in ON position; the lamp marked INTERLOCK SHORTED WHEN ON will be illuminated.	The INTERLOCK BATTLE SHORT switch (JJ) bypasses the drawer interlocks and allows operation of the equipment even with a component removed from its drawer.
7. INT. TEST jacks (Interlock Continuity)	(See 7, figure 6—1.) Place ohmmeter leads across test jacks as a check for continuity.	The INTERLOCK BATTLE SHORT switch (JJ) is in OFF position for this check. If no continuity is indicated, check the various chassis interlocks or their cheater switches.
8. R-F Tuner and Antenna Coupler *a.* Pressure Gauges *b.* R-F Tuner control	(See 8A, figure 6—1.) Check readings on pressure gauges. (See figure 6—2.) *Step 1.* Press DOWN button on control-indicator until pointer of POSITION meter stops at bottom of scale.	Each gauge should read 20 psi. Refer to paragraph *6m* for pressurizing information. **Note** Reading of these gauges daily is based on the premise that the units are readily available. Should these units be placed in remote positions a revision of the schedule may be needed.
	Step 2. Zero the POSITION meter by loosening the nut on the ZERO ADJ. control and set the pointer on 0.	
	Step 3. Press UP button until POSITION meter shows maximum.	
	Step 4. Adjust for full scale deflection by loosening locknut on FULL SCALE ADJ. control and set pointer on 100.	
	Note Repeat the preceding steps, if needed, to trim to optimum.	**Note** Be sure to relock the nuts on the adjustment controls after trimming and adjusting.
	Step 5. After the trimming adjustments, check speed of traverse when the SLOW button is pressed simultaneously with UP or DOWN.	

TABLE 6—4. ROUTINE MAINTENANCE CHECK CHART (Cont'd)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
9. Remote Operation	(See 9, figure 6—1.) Place LOCAL-REM switch Ⓚ in REM position.	In remote operation, the equipment is operated from the remote Navy radiophone unit.
10. General Sequence 500-Watt Operation *a.* Radio Frequency Amplifier AM–1008/SRT (RFA)	(See 10A, figure 6—1.) *Step 1.* Energize the PUSH FOR 500 W switch Ⓔ.	**Note** At this time, the equipment is presumed to be in 100-watt operation.
b. Power Supply PP–1096/SRT (HVPS)	(See 10B, figure 6—1.) *Step 2.* Place BOOSTER EMERGENCY SWITCH Ⓢ in ON position.	The following lamps will be illuminated: (1) ϕ1 (2) ϕ2 (3) H.V. ϕ3 The TOTAL HOURS-500 W elapsed-time meters will operate.
c. Radio Modulator MD–230/SRT (HLRM)	(See 10C, figure 6—1.)	The following lamp will also light: (1) 3000 V (HLRM)
d. Power Supply PP–1095/SRT (MVPS)	(See 10D, figure 6—1.)	The following lamps will be extinguished: (1) 1300 V OUTPUT (MVPS) (2) 1300 V PRI.
	WEEKLY	
1. Radio Frequency Amplifier AM–1008/SRT (RFA) Meter Readings	(See 1, figure 6—3.) **Note** A form should be prepared to record the weekly meter readings. A comparison of the week-by-week readings will be useful for checking tube performance.	Refer to paragraph 4*b*, table 6—5, for typical example of form to be used. Table 6—2 gives typical RFA meter readings.
2. Radio Frequency Oscillator O–275/SRT (RFO): Metering Socket, E–2919	(See 2, figure 6—3.) Measure from each pin to pin 1 (GND.). These test points are found on the left side of the RFO, just forward of unit 8, under the cover plate. (See figure 6—4.)	Refer to paragraph 4*c*, table 6—6, RFO Metering Socket Voltages, for typical form to be used.
3. Radio Modulator MD–229/SRT (LLRM)	(See 3, figure 6—3.) Check from test point (250 V.P.S.) on LLRM front panel to ground.	Refer to paragraph 4*d*, table 6—7, Front Panel Test Point Voltages.
4. Power Supply PP–1094/SRT (LVPS)	(See 4, figure 6—3.) Check from test points to ground: *a.* +250 V *b.* +300 V *c.* −220 V	
5. Radio Modulator MD–230/SRT (HLRM)	(See 5, figure 6—3.) Grid No. 1 — V–1601 Grid No. 1 — V–1602	
6. Power Supply PP–1095/SRT (MVPS)	(See 6, figure 6—3.) **CAUTION** 500 V OUTPUT Check from test jack to ground.	

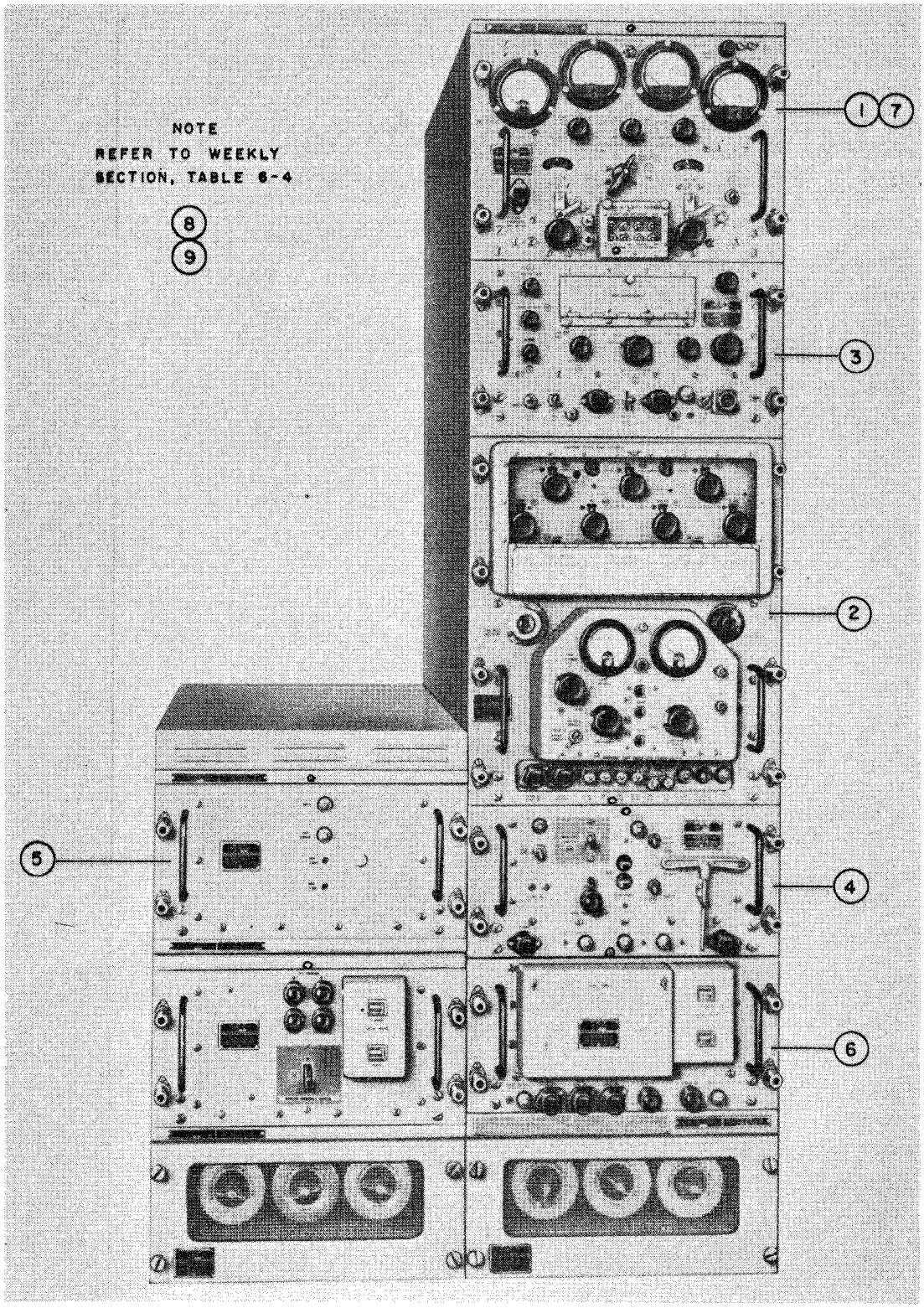

Figure 6—3. Weekly Routine Maintenance Checks, AN/SRT—15 Transmitter Bay

TABLE 6—4. ROUTINE MAINTENANCE CHECK CHART (Cont'd)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
7. Modulation Check: (LLRM)	(See 7, figure 6—3.) Talk or whistle into the microphone. Observe the ANT CURRENT meter.	The ANT CURRENT meter will show an increase in antenna current with an increase in modulation. When the ANT CURRENT meter shows a decrease in antenna current with an increase in modulation, it is an indication of overmodulation.
8. Temperature and Ventilation	Check temperatures in and around the equipment.	The blowers in the RFA and the base mounts must be working when the equipment is energized. If humidity is excessive, use CABINET HEATER switch (NR) on LVPS.
9. Deck and Lead-in Insulators	Check these insulators for dust and dirt.	Dirty insulators may be cleaned with Dry Cleaning Solvent P-S-661b. Replace insulators that cannot be cleaned.
	MONTHLY	
1. Radio Modulator MD-229/SRT (LLRM) Keying Voltages	(See 1, figure 6—5.) *Step 1.* Refer to paragraph 2*a*, Section 5, table 5—2, Preliminary Control Positions, and check transmitter controls against this table.	
	Step 2. Connect Multimeter ME-25A/U between pin 7 (VOLTS MARK-SPACE) of metering socket E-2919, and pin 1, GND.	The metering socket E-2919 is located on the left side of the RFO. (See figure 6—4.)
	Step 3. With SERVICE SELECTOR switch (U) of LLRM in FSK, a reading of (—)10 volts should be obtained.	
	Step 4. Place SPACE-OPER.-MARK switch (V) in MARK. A reading of (+)10 volts should be obtained.	Section 7 of this instruction book provides for corrective measures. Consult Section 7 when meter readings show deviations from normal.
	Step 5. Check other LLRM keying voltages as shown in table 6—8, LLRM Keying Voltages.	
2. Radio Frequency Oscillator O-275/SRT (RFO) *a.* Test Jack Voltages	(See 2, figure 6—5.) Refer to paragraph 4*f*, table 6—9, RFO Unit Test Jack Voltages.	
b. Unit Checks and Adjustments	(See 2, figure 6—5.)	
(1) Unit 1.	Refer to paragraph 4*g*(1) for unit 1 check and adjustment.	
(2) Unit 3.	Refer to paragraph 4*g*(2) for unit 3 check and adjustment.	
(3) Unit 6.	Refer to paragraphs 4*g*(3)(*a*) and 4*g*(3)(*b*) for unit 6 checks and adjustments.	
(4) Unit 8.	Refer to paragraphs 4*g*(4)(*a*) and 4*g*(4)(*b*) for unit 8 checks and adjustments.	
(5) Unit 12.	Refer to paragraph 4*g*(5) for unit 12 check and adjustment.	

TABLE 6—4. ROUTINE MAINTENANCE CHECK CHART (Cont'd)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
3. Blower Motors	(See 3A and 3B, figure 6—5.)	
a. RFA Blower		
b. Base Mount Blowers	With equipment turned on, check motors for abnormal or noisy operation.	Refer to Section 7 for disassembly procedures, if necessary.
4. Ventilators and Louvers	Check all air passages, screens and ducts for dirt and obstructions.	Air should flow freely through all louvers and screens during operation of the equipment.
5. Variable Capacitors	Refer to paragraph 6*b*.	
6. Relays	Refer to paragraph 6*c*.	
7. Jacks and Plugs	Refer to paragraph 6*d*.	
8. Transmitter Group Gears and Racks	Refer to paragraph 6*e*.	
9. Lubrication	Refer to paragraph 5*d*(2).	
	QUARTERLY	
1. Cleaning	Refer to paragraph 5*b*.	
2. Lubrication	Refer to paragraph 5*d*(1).	
3. Shafts	Refer to paragraph 6*a*.	
	ANNUALLY	
1. Chains	Refer to paragraph 6*g*.	
2. R-F Tuner and Coupler Gears and Racks	Refer to paragraph 6*e*.	
3. Motors	Refer to paragraph 6*j*.	
4. Lubrication	Refer to paragraph 5*d*(3), for annual lubrication procedures.	
	BIENNIALLY	
1. Lubrication	Refer to paragraph 5*d*(4).	
	THREE YEARS	
1. R-F Tuner and Antenna Coupler Bearings	Refer to paragraph 6*b*.	
2. Lubrication	Refer to paragraph 5*d*(5).	
	MAJOR OVERHAUL	
1. Cleaning and Checking Equipment	Refer to paragraph 5*b*.	Replace burred or damaged hardware. Replace frayed insulation or repair with tape or spaghetti. Check tube sockets and terminal boards.
2. Lubrication	Refer to paragraph 5*d*(6).	Refer to Section 7 for disassembly of the parts involved in these procedures.
3. Wafer Switches and Detents	Refer to paragraph 6*f*.	

b. RFA METER READINGS, WEEKLY RECORD. —Table 6–5 is a form which may be used to record the weekly readings of the RFA panel meters. Observe the following:

(1) The equipment controls are to be in the positions designated in Section 5, table 5–2.

(2) Three different frequencies should be chosen, one in each of the following bands:

(*a*) f_1—0.3 to 6.0 mc

(*b*) f_2—6.0 to 16.0 mc

(*c*) f_3—16.0 to 26.0 mc

(3) The following conditions should be the same each week:

(*a*) Frequencies

(*b*) Mode of transmission

(*c*) Output power (100-watt operation)

(*d*) Antenna or dummy load

(*e*) EXCITATION control ㉒ position 180° clockwise from minimum position.

(4) For trouble-shooting procedures, refer to Section 7 of this instruction book.

(5) Include date and TOTAL HOURS - FILAMENT meter reading as indicated in space at top of table 6–5.

TABLE 6—5. RFA METER READINGS, WEEKLY RECORD

DATE: ( )	TOTAL HOURS-FILAMENT: ( )		
	VOLTMETER		
VOLTMETER Switch Ⓙ Positions:	f_1	f_2	f_3
RF IN (5 V)			
BIAS (500 V)			
LV (500 V)			
MV (1000 V)			
PA E_{c2} (1000 V)			
PA E_b (5000 V)			
	IPA CURRENT METER		
IPA Switch Ⓖ Positions:	f_1	f_2	f_3
I_{c1} (5 MA)			
I_{c2} (10 MA)			
I_k (500 MA)			
	PA CURRENT METER		
PA Switch Ⓗ Positions:	f_1	f_2	f_3
I_{c1} (50 MA)			
I_{c2} (100 MA)			
I_k (1 A)			
	ANT CURRENT METER		
Antenna Current Readings	f_1	f_2	f_3

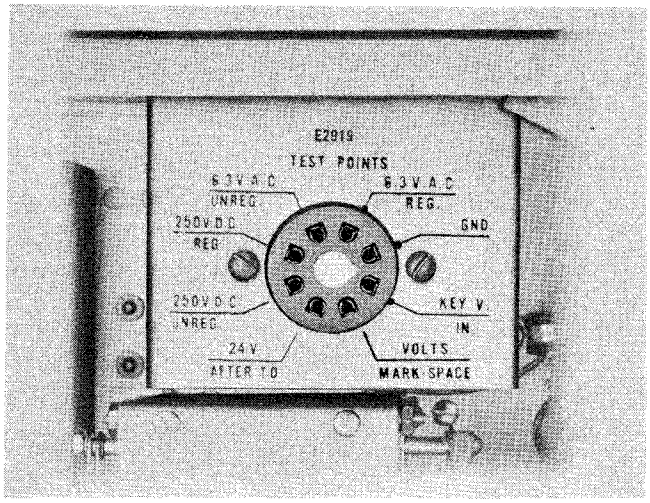

Figure 6—4. Radio Frequency Oscillator O—275/SRT (RFO), Metering Socket, E—2919

c. RFO METERING SOCKET VOLTAGES, WEEKLY RECORD.—Table 6–6 is a chart which may be used to record the RFO weekly readings at the metering socket, E–2919. (See figure 6–4.)

Observe the following:

(1) Place equipment controls in the positions suggested in Section 5, table 5–2.

(2) Take readings with Multimeter ME–25A/U.

(3) For trouble-shooting procedures, refer to Section 7 of this instruction book.

(4) Make a record of date and TOTAL HOURS-FILAMENT meter reading as indicated in space at top of table 6–6.

TABLE 6—6. RFO METERING SOCKET VOLTAGES, WEEKLY RECORD

E–2919 PIN NO. (See figure 6—4.)	PIN DESIGNATIONS	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )
1	GND.			
2	6.3 V. A.C. REG.			
3	6.3 V. A.C. UNREG.			
4	250 V. D.C. REG.			
5	250 V. D.C. UNREG.			
6	24 V AFTER TD			
7	VOLTS MARK-SPACE			
8	*KEY V. IN			

* Refer to table 6–8.

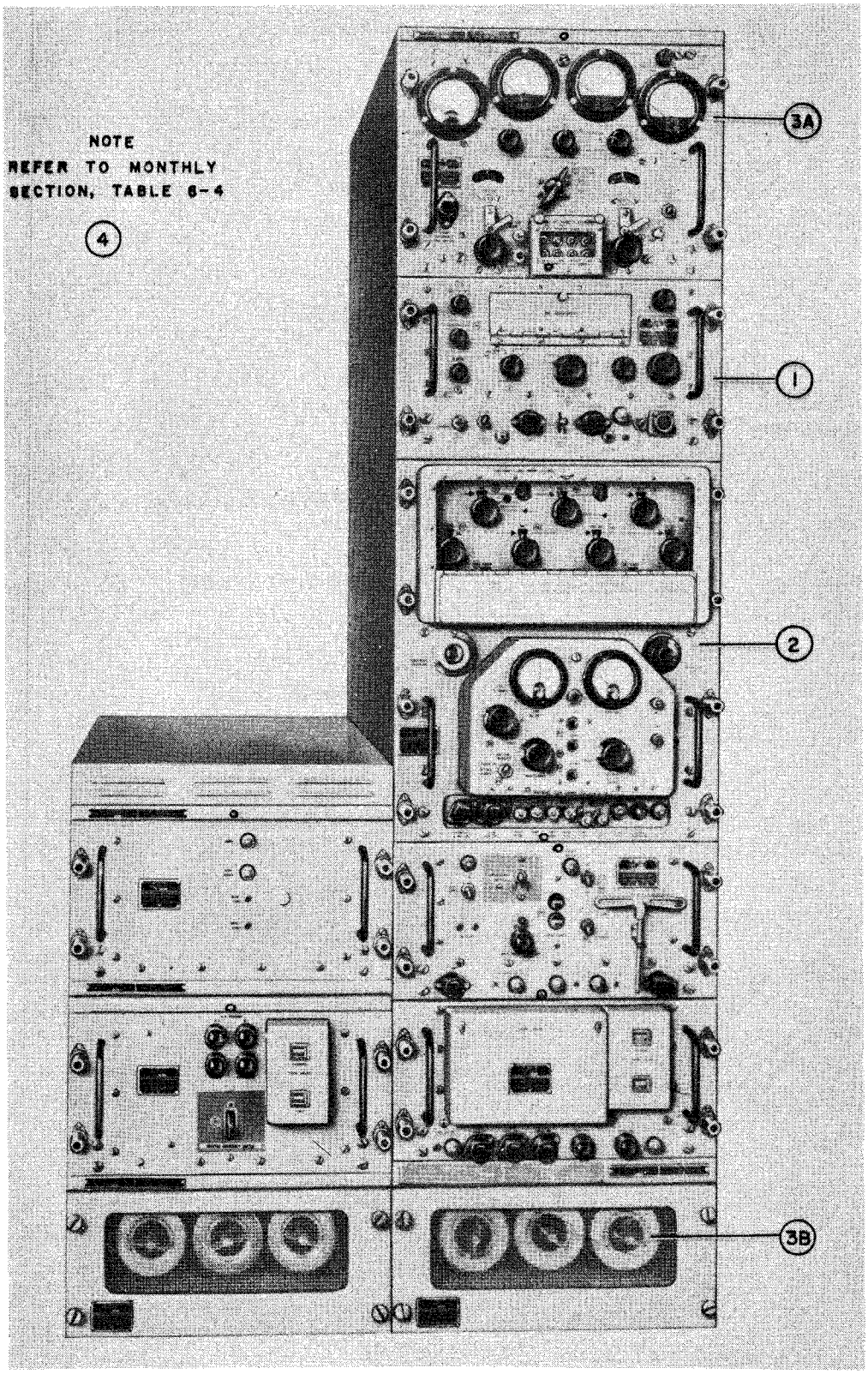

Figure 6—5. Monthly Routine Maintenance Checks, AN/SRT—15 Transmitter Bay

TABLE 6–7. FRONT PANEL TEST POINT VOLTAGES, WEEKLY RECORD

FIGURE REFERENCE	TEST POINT	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )
See 3, figure 6–3, (LLRM)	250 V. P.S.				
See 4, figure 6–3, (LVPS)	+250 V				
	+300 V				
	–220 V				
See 5, figure 6–3, (HLRM)	*GRID #1 – V–1601				
	GRID #1 – V–1602				
See 6, figure 6–3, (MVPS)	CAUTION 500 V OUTPUT				

* 500-Watt Operation: Record TOTAL HOURS-FILAMENT reading on HVPS.

d. FRONT PANEL TEST POINT VOLTAGES, WEEKLY RECORD.—Table 6–7 is a typical chart which may be used to check the weekly front panel test point readings.

Observe the following:

(1) Use Multimeter ME–25A/U.

(2) For trouble shooting, refer to Section 7 of this instruction book.

(3) Make a record of the date and the reading on the TOTAL HOURS-FILAMENT meter as indicated in the space at the top of table 6–7.

e. LLRM KEYING VOLTAGES, MONTHLY RECORD.—Table 6–8 is a form that may be used to check the monthly keying voltage readings.

Observe the following:

(1) Place equipment controls in the positions suggested in Section 5, table 5–2.

(2) Take readings with Multimeter ME–25A/U.

(3) For trouble-shooting procedures, refer to Section 7 of this instruction book.

(4) Make a record of date and TOTAL HOURS-FILAMENT meter reading as indicated in space at top of table 6–8.

f. RFO UNIT TEST JACK VOLTAGES, MONTHLY RECORD.—Table 6–9 is a form that may be used to check some significant voltages in the RFO.

Observe the following:

(1) Place the equipment controls in the positions suggested in Section 5, table 5–2.

(2) Use Multimeter ME–25A/U.

(3) For trouble-shooting procedures, refer to Section 7 of this instruction book.

(4) Make a record of date and TOTAL HOURS-FILAMENT reading as indicated in space at top of table 6–9.

g. RFO UNIT ADJUSTMENTS.

(1) UNIT 1.—R-F Oscillator Z–2001 (unit 1) is commonly called the crystal oscillator. It contains an oven-controlled 100-kc crystal. For purposes of this section, unit 1 has one routine check and adjustment (see figure 6–10).

TABLE 6–8. LLRM KEYING VOLTAGES, MONTHLY RECORD

METERING SOCKET (See figure 6–4.)	SERVICE SELECTOR SWITCH Ⓤ	NOMINAL VOLTAGES	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )	DATE: ( ) TOTAL HOURS-FILAMENT: ( )
E–2919, Pin 8 to GND. (Key V. IN)	HAND	(–)17.5 V			
	MACH	(–)17.5 V			
	FSK	(–)30 V			
	FAX	(–)30 V			
	PHONE	(–)17.5 V			

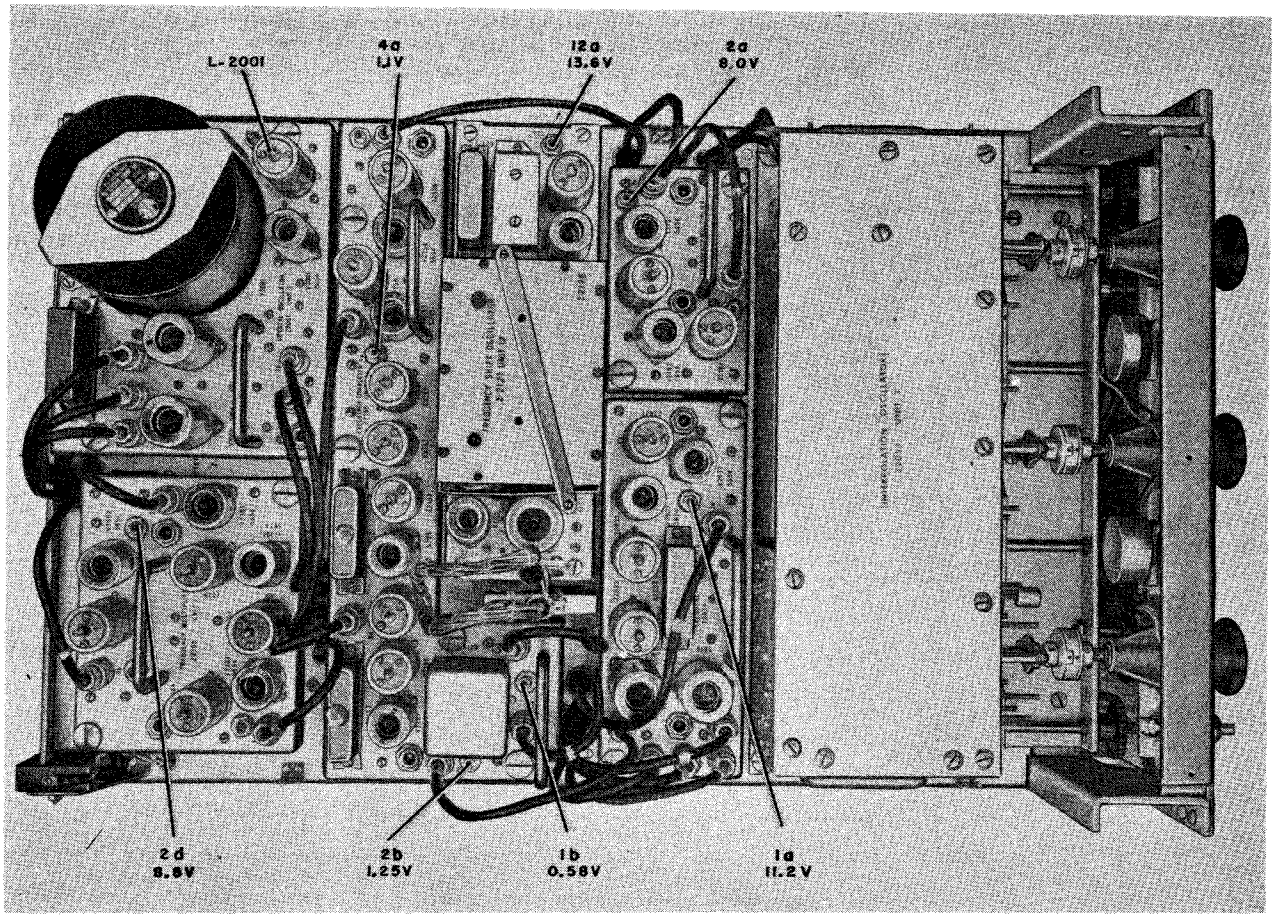

Figure 6–6. RFO, Top View, Unit Test Jacks, Voltages

Step 1. Tune suitable receiver (RBA, RBB, RBC series or equivalent) to 2.5 mc. Keep RFO turned off at this time.

Step 2. Place transmitter in stand-by for at least one hour to allow crystal ovens to stabilize.

Step 3. Connect "T" type of BNC connector to 100 KC X–TAL test jack and couple output of one arm directly to receiver input.

Note

The output of 100 KC X–TAL test jack is 100 kc at all times, regardless of setting of frequency knobs.

Step 4. Connect ship receiving antenna to other arm of "T" connector. Use variable attenuator in series with this signal to reduce it to level of the 25th harmonic of 100-kc crystal.

Step 5. Adjust L–2001 on unit 1 for zero beat. (See figure 6–7 for location of L–2001.) Rotate L–2001 clockwise until beat is heard, then counterclockwise through null until beat is heard again.

Step 6. Set L–2001 at midposition between two beats, which will then be the center of the null.

Note

Zero beat these signals only when WWV is not modulating, to avoid false beats.

Step 7. Carefully observe meter. At high beat frequencies, the indicator will not respond and will seemingly remain at a null. However, as the zero beat is more closely approached, the meter indicator will begin to oscillate rapidly. In continuing towards zero beat, these oscillations will become slower and slower, until, finally, at zero beat, the pointer will come to rest.

Note

This procedure may be used after replacement of V–2001 in unit 1.

(2) UNIT 3.—R-F Oscillator Z–2053 (unit 3) is commonly called the interpolation oscillator. For purposes of this section, unit 3 requires one routine check and adjustment—the 100-kc adjustment (see figure 6–10).

Step 1. Turn the KC knob (CC) to 9; the 100 knob (DD) to 9, the 10 knob (EE) to 10.

TABLE 6–9. RFO UNIT TEST JACK VOLTAGES, MONTHLY RECORD

ILLUSTRATION REFERENCE	RFO UNIT	TEST JACK	NOMINAL VOLTAGE (AC)	TOTAL HOURS-FILAMENT: ( ) DATE: ( )	TOTAL HOURS-FILAMENT: ( ) DATE: ( )	TOTAL HOURS-FILAMENT: ( ) DATE: ( )	TOTAL HOURS-FILAMENT: ( ) DATE: ( )
RFO, Top View (See figure 6–6.)	2	1a	11.2				
	5	1b	0.58				
		2b	1.25				
	7	2d	8.8				
	4	2a	8.0				
	12	12a	13.6				
	5	4a	1.1				
RFO, Right Side (See figure 6–7.)	3	3a	0.28				
	11B	10b	0.35				
		9b	1.40				
	11C	9c	1.20				
		10c	0.35				
	6	1c	6.45				
		2c	1.25				
		5a	1.17				
RFO, Left Side (See figure 6–8.)	8	1d	11.10				
		6b	1.00				
		7a	1.20				
	9	7b	1.90				
		8b	0.90				
	10	2e	8.80				
RFO, Bottom View (See figure 6–9.)	11A	9a	1.40				
		10a	0.47				
RFO, Front Panel (See figure 6–10.)	14	100 KC X-TAL	1.00				
		100 KC STEP	0.8				

Note

At this setting, the output of unit 3 will be 100 kc, available at INT. OSC. test jack on the front panel of the RFO.

Step 2. Place ZERO ADJ. toggle switch ⓩ in INT. OSC. position.

CAUTION

Do not confuse this switch with the ZERO ADJ. controls behind the access door.

Step 3. Place the output of INT. OSC. test jack on vertical plates of Oscilloscope OS–8/U.

Step 4. Place output of 100 KC X–TAL test jack on horizontal plates of scope. Trim scope controls for equal amplitudes on scope screen. A steady 1:1 ratio pattern should be seen.

Step 5. Open the access door on the front of the RFO and adjust the control marked INT. OSC.—ZERO ADJ. to obtain a correct 1:1 Lissajous pattern, if necessary. (See figure 6–10 for location of this control.)

Note

This procedure may be used after replacement of V–2051 in unit 3.

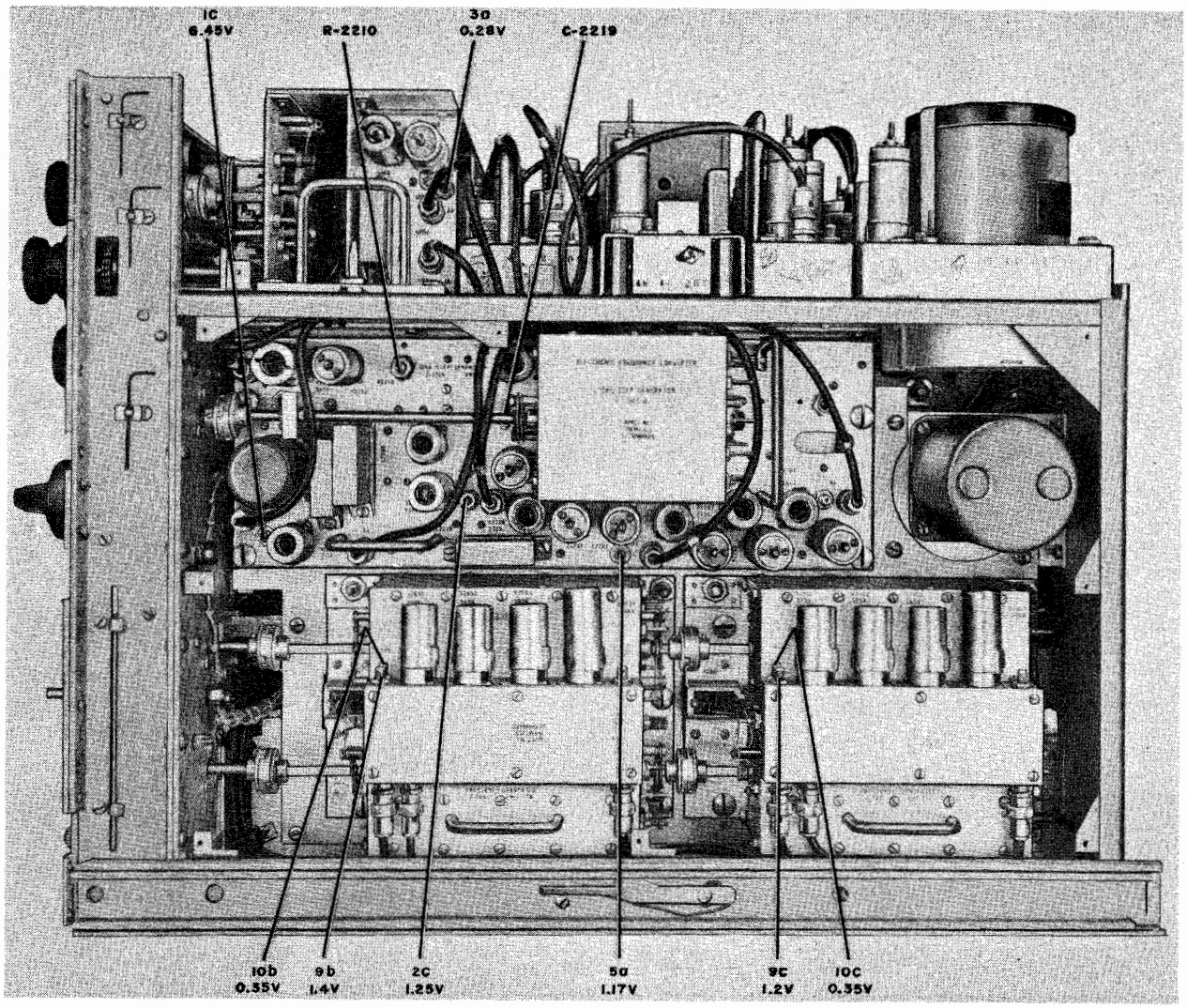

Figure 6–7. RFO, Right Side, Unit Test Jacks, Voltages

(3) UNIT 6.—Electron Frequency Converter Z–2204 (unit 6) is commonly called the 10-kc step generator. For purposes of this section, unit 6 requires two routine checks and adjustments.

(*a*) 10-KC ADJUSTMENT.
(See figure 6–10.)

Step 1. Connect the output of the 10-kc test jack to the vertical plates of Oscilloscope OS–8/U.

Note

The output of the 10 KC test jack is 10 kc, regardless of the setting of the frequency knobs.

Step 2. Place the output of the 100 KC X–TAL test jack on the horizontal plates of the scope. A 10:1 Lissajous pattern will be seen if the 10-kc step generator is properly adjusted.

Step 3. Adjust R–2210 (see figure 6–7 for location of R–2210) for proper Lissajous pattern, if necessary, as follows:

Note

R–2210 may be adjusted without removing unit 6 from its mounting. Unit 1 must be properly aligned before adjusting R–2210.

Step a. Place the equipment in stand-by condition, switch (PP) in STANDBY.

Step b. Connect a cable to jack 10 KC on the front panel of the RFO to the vertical input of Oscilloscope OS–8A/U (or equivalent).

Step c. Connect a cable to jack 100 KC X–TAL on the RFO front panel to the horizontal input of the oscilloscope.

Step d. Loosen locknut and set R–2210 completely counterclockwise, and then turn it clockwise until the 10-kc blocking oscillator "locks-in" (i.e., until a 10:1 Lissajous pattern appears on the CRT; refer to figure 7–2).

Step e. Note the position of R–2210 shaft.

Step f. Set R–2210 completely clockwise, and then turn it counterclockwise until the 10-kc blocking oscillator again "locks-in" at a 10:1 frequency ratio.

Step g. Again, note the position of R–2210 shaft.

Step h. Center shaft of R–2210 between the positions noted in steps 5 and 7.

Note

This procedure may be used after replacement of V–2202 in unit 6.

(*b*) 300-KC ADJUSTMENT.
(See figure 6–10.)

Step 1. Place 10 KC knob ⑪ in position 9.

Note

At this setting the output of the 10 KC STEP test jack will be 300 kc.

Step 2. Connect the output of the 10 KC STEP test jack to vertical plates of Oscilloscope OS–8/U.

Step 3. Place the output of the 100 KC X–TAL test jack on the horizontal plates of the scope. A steady 3:1 Lissajous pattern will be seen if the 10-kc step generator is properly adjusted.

Step 4. Disconnect the cable to the 100 KC X–TAL jack on the RFO front panel. Connect this cable to the 10 KC jack on the RFO front panel. Check positions 0–8 of the 10-kc step switch for correct Lissajous pattern count as indicated in table 6–10.

Step 5. Adjust C–2219 (see figure 6–7 for location of C–2219) for correct Lissajous pattern, if necessary, as follows:

Note

C–2219 may be adjusted without removing unit 6 from mounting by pulling RFO drawer out.

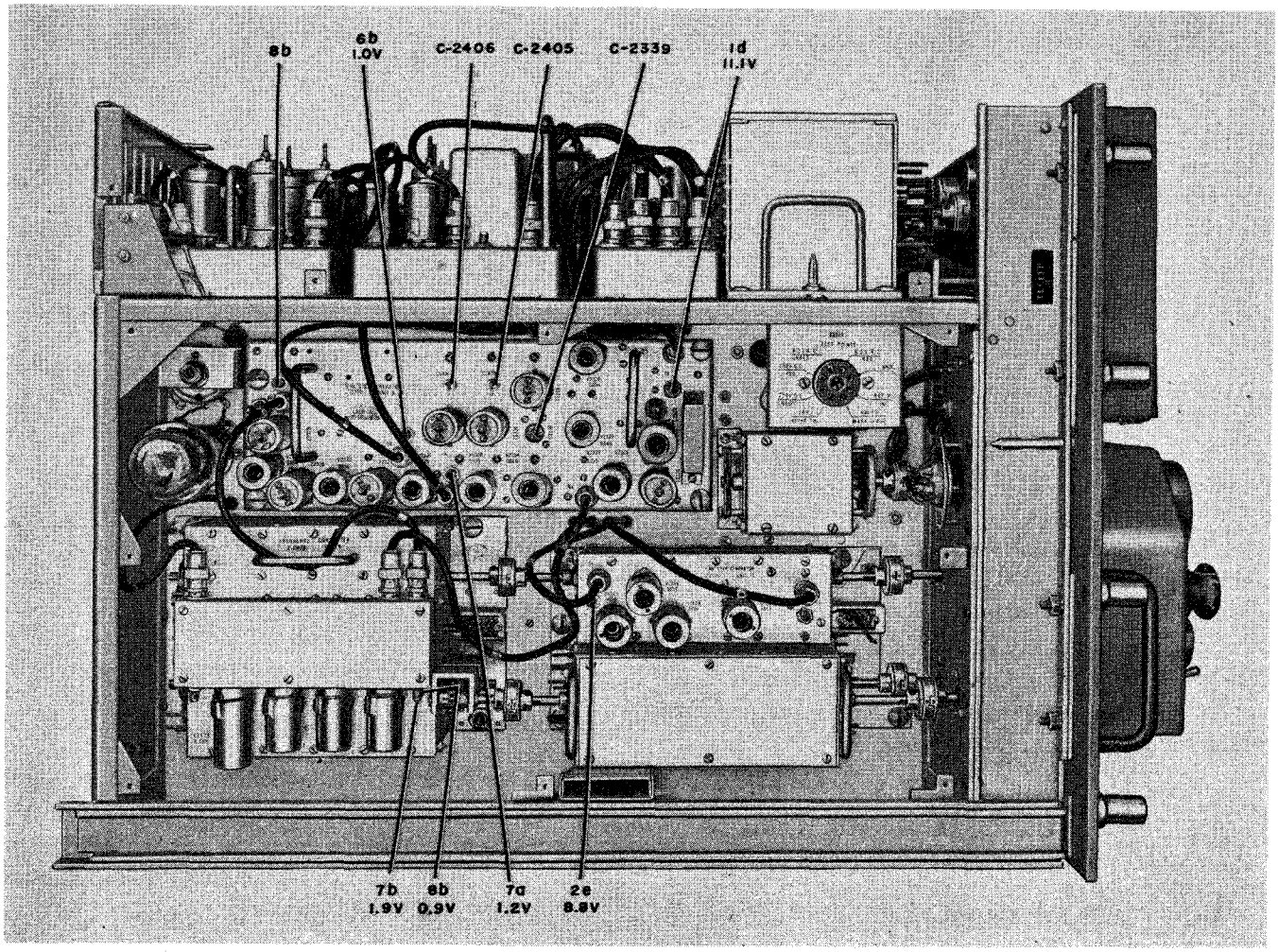

Figure 6–8. RFO, Left Side, Unit Test Jacks, Voltages

TABLE 6–10. UNIT 6 10-KC STEP OSCILLATOR CHECK

POSITION OF S–2201	LISSAJOUS PATTERN
8	29:1
7	28:1
6	27:1
5	26:1
4	25:1
3	24:1
2	23:1
1	22:1
0	21:1

Units 1, 2, 3, 4, 5 and R–2210 must be properly aligned before making this adjustment.

Step a. Place equipment in stand-by condition, switch (PP) in STANDBY.

Step b. Place knob (JJ) at 9. (Position of other knobs is immaterial.)

Step c. Connect a cable from the 100 KC X–TAL jack on the RFO front panel to the horizontal input of an oscilloscope (OS–8A/U or equivalent).

Step d. Connect a cable from 10 KC STEP jack on RFO front panel to the vertical input of the oscilloscope.

Step e. Turn C–2219 clockwise until the oscillator unlocks, then turn slowly counterclockwise until the oscillator locks at the Lissajous pattern of 3:1. Note the position of the adjustment slot.

Step f. Turn C–2219 counterclockwise until oscillator unlocks, then turn slowly clockwise until the oscillator locks at the Lissajous pattern of 3:1. Note the position of the adjustment slot. Set the slot at the mid-range point of the "lock-in" range

Note

This procedure may be used after replacement of any or all of the following unit 6 tubes:

1. V–2203
2. V–2204
3. V–2205

(4) UNIT 8.—Electron Frequency Converter Z–2330 (unit 8) is commonly called the 100-kc step generator. For purposes of this section, unit 8 requires two routine checks and adjustments.

(*a*) 100-KC ADJUSTMENT.
(See figure 6–10.)

Step 1. Set 100 KC knob (HH) in position 9.

Step 2. Place the output of the 100 KC STEP test jack on the vertical plates of the Oscilloscope OS–8/U.

Note

At this setting the output of the 100 KC STEP test jack will be 2.5 mc.

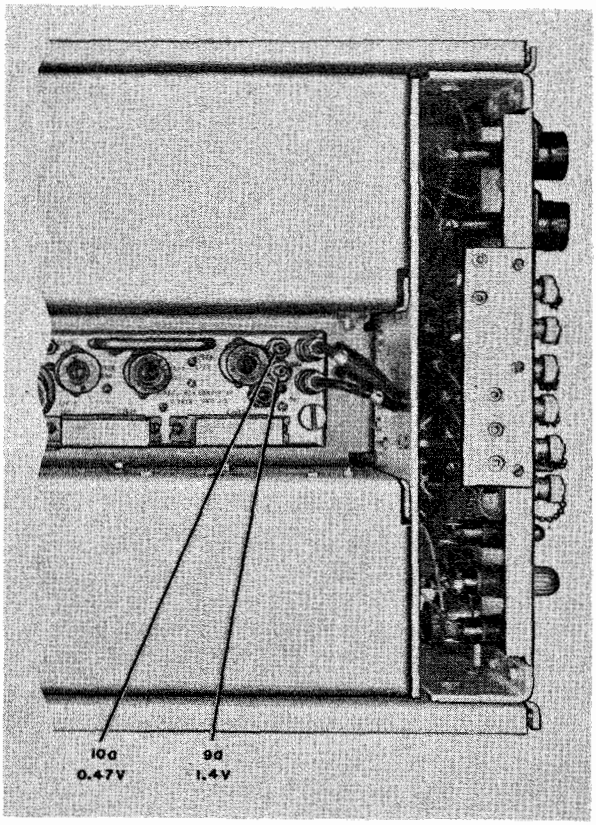

Figure 6–9. RFO, Bottom View, Unit Test Jacks, Voltages

Step 3. Place this output of the 100 KC X–TAL jack on the horizonal plates of the scope. A Lissajous pattern with a ratio of 1:25 will be seen. Check positions 0–8 of the 100-kc step switch for correct Lissajous pattern count as indicated in table 6–11.

TABLE 6–11. UNIT 8 100-KC STEP OSCILLATOR CHECK

POSITION OF (HH) POINTER	LISSAJOUS PATTERN
8	24:1
7	23:1
6	22:1
5	21:1
4	20:1
3	19:1
2	18:1
1	17:1
0	16:1

Step 4. Adjust C–2339 (see figure 6–8 for location of C–2339), if necessary, to obtain a steady pattern as follows:

Note

C–2339 may be adjusted without removing unit 8 from the mounting, by pulling the RFO

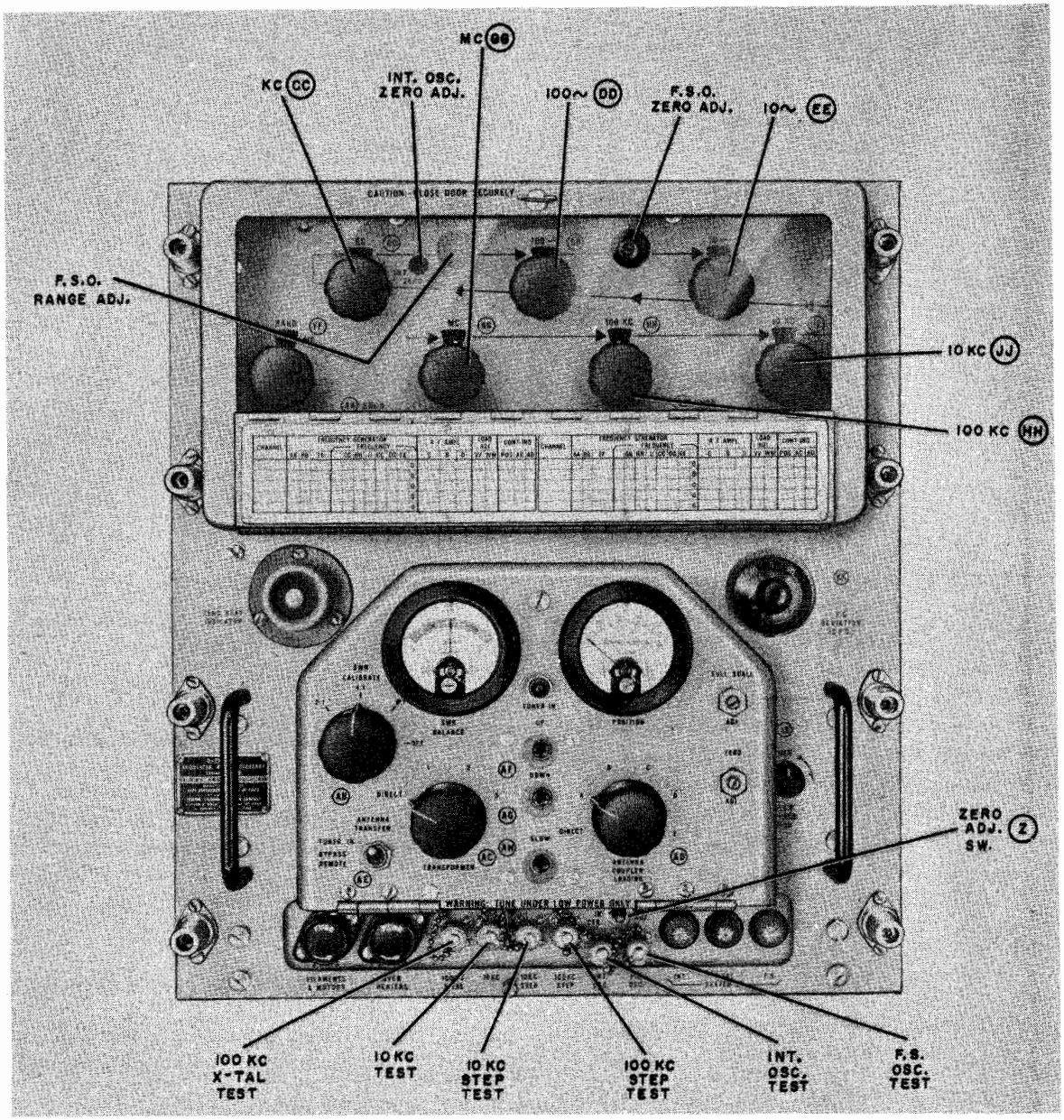

Figure 6—10. RFO, Front Panel Unit Adjustments

drawer out and removing its left side cover. Units 1, 2, 3, 4, 5, 6 and 7 must be properly aligned before making this adjustment.

Step a. Switch (PP) in STANDBY. Frequency selection knob as follows: (HH) at position 9. (The position of other knobs immaterial.)

Step b. Connect a cable from the 100 KC X–TAL jack on the RFO front panel to the horizontal input of an oscilloscope (OS–8A/U or equivalent).

Step c. Connect a cable from the 100 KC jack on the RFO front panel to the vertical input of the oscilloscope.

Step d. Turn C–2339 clockwise until the oscillator unlocks, then turn slowly counterclockwise until the oscillator locks at the Lissajous pattern of 25:1. Note position of adjustment slot.

Step e. Turn C–2339 counterclockwise until the oscillator unlocks, then turn slowly clockwise until the oscillator locks at the Lissajous pattern of 25:1. Note position of adjustment slot. Set slot at the midrange point of the "lock-in" range.

Note

This procedure may be used after replacement of any or all of the following:

1. V–2327
2. V–2328
3. V–2329

(*b*) MAXIMUM AMPLITUDE ADJUSTMENT. *(See figure 6–10.)*

Step 1. Turn the 100 KC knob ⓗⓗ to position 9.

Step 2. Connect Multimeter ME–25A/U to test point 8b on unit 8. (See figure 6–8 for location of test point 8b. Use test jack marked 8b on unit 8, not the one on unit 9.)

Step 3. Adjust C–2405 and C–2406 for a maximum reading on the meter. (See figure 6–8 for location of C–2405 and C–2406.)

Note

This procedure may be used for unit 8 after replacement of the following tubes:

1. V–2330
2. V–2331

(5) UNIT 12.—R-F Oscillator Z–2127 (unit 12) is commonly called the frequency shift oscillator (FSO). For purposes of this section, unit 12 requires one routine check and adjustment—the 100-kc adjustment (see figure 6–10).

The output of the frequency shift oscillator is 100 kc when no frequency shift or facsimile signal is present. Be sure that the F. S. DEVIATION control ⓚⓚ is at the 0 position. This output is taken at the F. S. OSC. test jack.

Step 1. Place ZERO ADJ. switch ⓩ in the F. S. OSC. position.

CAUTION

Do not confuse the ZERO ADJ. switch ⓩ with the ZERO ADJ. controls behind the access door on the RFO front panel.

Step 2. Connect the output of the F. S. OSC. test jack to the vertical plates of Oscilloscope OS–8/U. A steady 1:1 Lissajous pattern should be seen.

Step 3. Adjust the F.S.O ZERO ADJ. control for the steady 1:1 pattern, if necessary.

Note

This procedure may be used after replacement of any or all of the following tubes:

1. V–2126
2. V–2127
3. V–2128

5. MAINTENANCE PROCEDURES.

a. DISASSEMBLY.—Section 7 of this instruction book describes major disassembly procedures. Obvious disassembly or dismounting sequences will not be specially treated, but will be left to the discretion of technical personnel.

b. CLEANING AND INSPECTION.—As a preliminary to cleaning and inspecting, it is advisable to remove all the plug-in components and other parts which may be removed without unsoldering any of the wires. These parts include such items as tubes, crystals, and pilot lamps. This work should be done unit by unit to avoid a mix-up of the various parts removed. Some of the tubes, of course, will require loosening of clamps and tube shields.

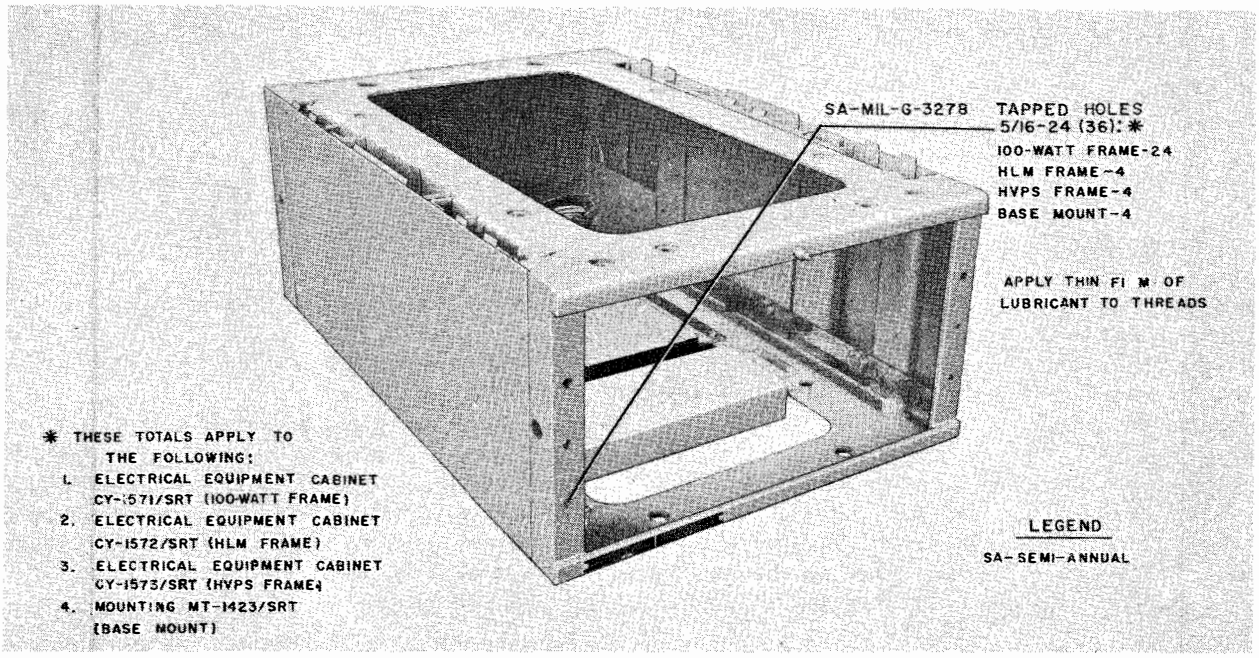

Figure 6–11. Electrical Equipment Cabinet and Base Mount Tapped Holes, Lubrication

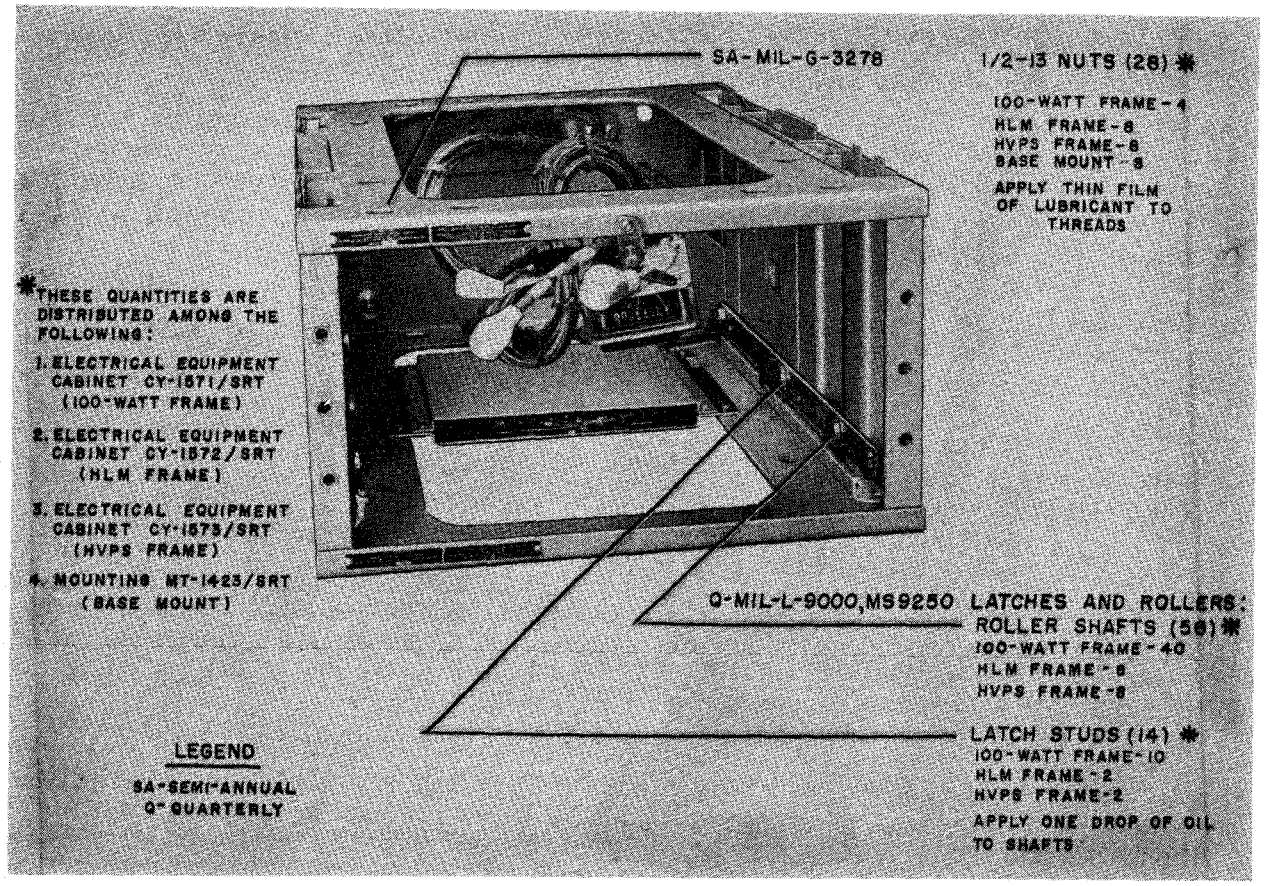

Figure 6—12. Electrical Equipment Cabinet and Base Mount Latches, Rollers and Nuts, Lubrication

Check for unusual odors, such as potting compound, which might indicate an overloaded transformer; burning paint—overheated resistors; burning rubber—defective insulation.

An air hose may be used to remove dust, dirt, and foreign particles. Be sure to use extreme care when using the air hose around delicate parts, such as tuning capacitors. As a precautionary measure, the air line is purged of moisture by directing the nozzle towards the floor and releasing the air in the line.

A rag or brush dipped in dry-cleaning solvent (refer to paragraph 5*b*) will remove dirt or grease. When used as a spray, use solvent sparingly. Ball bearings and other small parts may be dipped in the solvent and brushed to loosen any grease residue. They may then be air-dried by spinning.

Do not disturb the layout of the wiring, if possible. If wiring must be removed, however, be sure to return it to its original position after the cleaning procedure to prevent oscillation, feedback, and other circuit disturbances. Check all the sockets, and remove any dirt or corrosion with solvent or with fine sandpaper or crocus cloth.

After cleaning, the equipment is inspected for faulty or damaged parts. Some of these parts include tube sockets and contacts, springs, gears, tuning capacitors, potentiometers, bandswitches, insulators, terminal strips, jacks, plugs, and hinges. Check for and replace or secure loose or damaged hardware.

The operating controls should be given a careful visual inspection and then checked for correct operation and setting. Turn each control slowly to its maximum clockwise limit, then to its maximum counterclockwise limit. Binding or scraping should be noted and referred to the proper department for correction, if it involves more than a simple adjustment.

In gear assemblies and in tuning mechanisms, backlash must be held to a minimum. Hence, trouble of this sort should be noted and corrected or reported as soon as possible.

Replace damaged parts, such as shorted or leaky capacitors or burned-out resistors. However, before actual replacement of the damaged part, the circuit should be carefully inspected to find the cause of the trouble. Only in extreme emergencies should replacement be made without a check-up.

The plug-in parts which had been previously removed must be cleaned and inspected before replacing. Dirt and grease may be removed with dry-cleaning solvent (paragraph 5*b*).

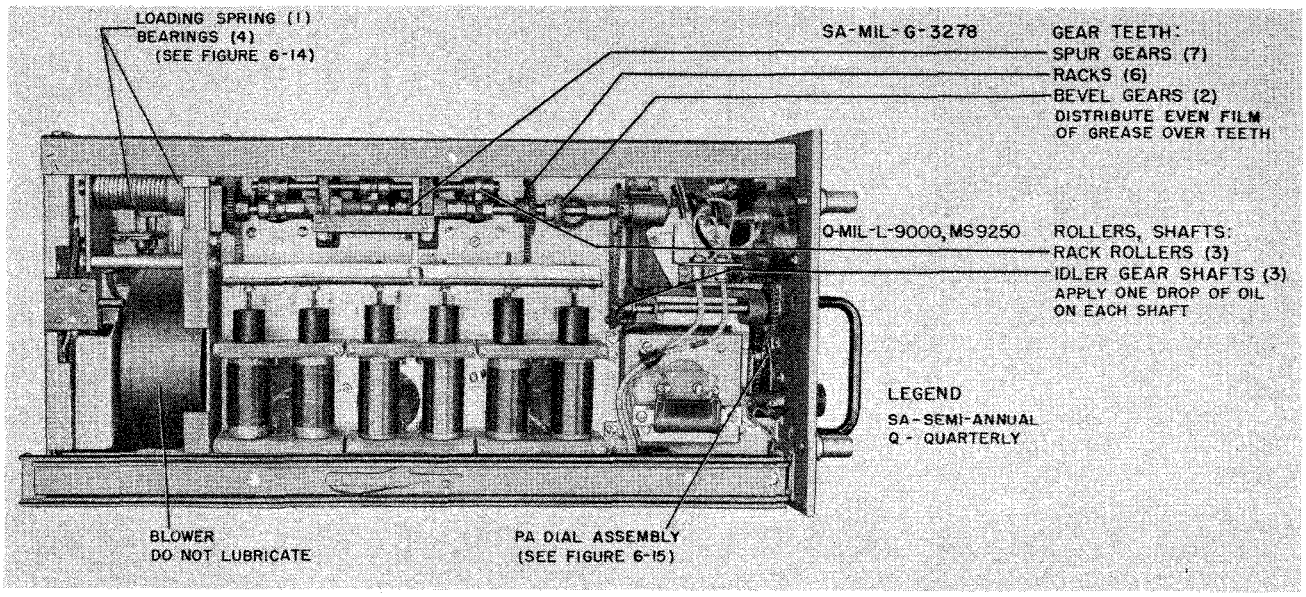

Figure 6–13. Radio Frequency Amplifier AM–1008/SRT (RFA), Left Side, Lubrication

Note

It is important to remove dirt or corrosion on the prongs of plug-in parts, such as tubes, jacks, and plugs, to avoid a high resistance connection between the prong and its socket. Use crocus cloth or fine sandpaper.

Tubes are to be tested in a tube checker before replacing. Cables and cords and their jacks and plugs must be checked for damage to their inserts and insulation. Look for opens, shorts, and intermittent contacts. The latter may often be found by wiggling the plugs in their sockets. If damage is found or if trouble is suspected, use an ohmmeter to check for continuity in the cords and cables.

c. LUBRICATION PROCEDURES.—The lubricants described in table 6–12, Lubricating Greases, and table 6–13, Lubricating Oils, are to be used on this equipment. It is recommended that certain tools be used for lubricating purposes (refer to table 6–14, Lubricating Tools). A small oil can is particularly convenient in most applications. For the more inaccessible points, the lubricant may be applied on the end of a long rod. The latter method is useful for one-drop applications, such as required at shaft-ends. Grease may be applied by hand or with a small paddle or rag. A small brush may be used, if convenient.

When dispensing a lubricant, wipe all dirt, dust, or moisture from around the opening of the container. The containers must be kept closed when not in use, to prevent moisture condensation on the surface of the lubricant and to keep dust and dirt out of the container. It is extremely important that lubricants be kept free of foreign matter.

Note

Many of the bearings used in the equipment are made of oil-impregnated bronze and require no lubrication; hence, in certain cases, no lubrication information will be needed.

Lubricants are effective in reducing friction, but it must be borne in mind that the effects of overlubrication are almost as serious as those of poor lubrication. Too much lubricant in ball and roller bearings prevents efficient operation and may cause a good deal of harm from the pressure which is built up in the bearings as they become warm.

An excess will cause an overflow of the lubricant onto the machine. The overflow not only collects harmful dirt and grit, but necessitates more cleaning time.

In some equipments, break-downs have been traced to overlubrication. The oil tends to destroy electric insulation. Careless handling of the lubricant can result in dirt being carried into bearings with the lubricant.

Under certain conditions, it is possible that the lubrication directions may seem inadequate, while under other circumstances they may seem excessive. Personal observation under working conditions must decide this important factor. The period of the lubrication procedure may then be changed and written into the routine maintenance checks.

(1) FRAMES AND BASE MOUNTS. — Figures 6–11 and 6–12 refer to the lubrication procedures that are used on the equipment frames. The various tapped holes, nuts, latches, and rollers are shown, with references to the lubricants to be used.

(2) RADIO FREQUENCY AMPLIFIER AM–1008/SRT (RFA).

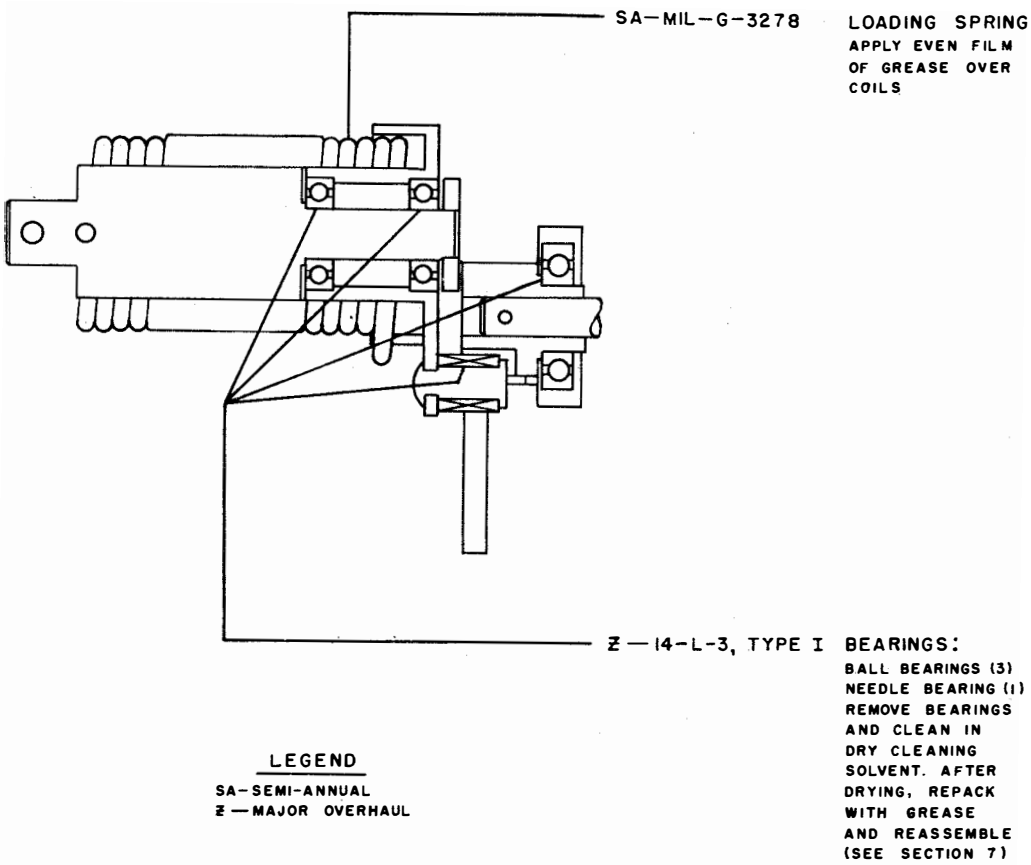

Figure 6–14. RFA, Loading Spring and Actuating Arm, Lubrication

(*a*) PA TUNING MECHANISM (RFA).—The left side of the radio frequency amplifier is shown in figure 6–13. The lubrication procedures for the gears, racks, rollers, and idlers used in this assembly are described. References to the loading spring, blower, and PA dial assembly are also included. As noted in figure 6–14, the bearings in the actuating arm assembly need be serviced only at the time of a major overhaul. Section 7 describes the pertinent disassembly procedure.

(*b*) PA DIAL ASSEMBLY.—The PA dial assembly is shown in figure 6–15 as a line drawing which calls out the necessary lubrication points.

(*c*) BANDSWITCH MECHANISM (RFA).—A portion of the right side of the RFA is shown in figure 6–16. This illustration describes the procedure used to lubricate the detent roller, arm shaft, and idler. Reference to the IPA dial drive is also made.

(*d*) IPA DIAL ASSEMBLY. — Figure 6–17 shows the lubrication points on the IPA dial assembly.

(3) RADIO FREQUENCY OSCILLATOR O–275/SRT (RFO).

(*a*) TYPICAL UNIT LUBRICATING POINTS. —Certain parts of the RFO are shown in detail in figure 6–18 to clarify subsequent unit lubrication procedures.

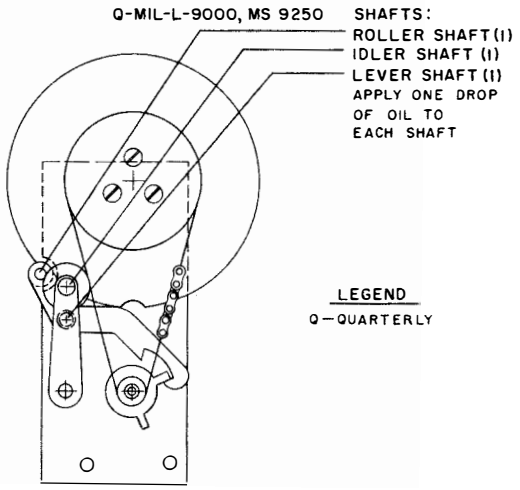

Figure 6–15. RFA, PA Dial Assembly, Lubrication

(*b*) LEFT SIDE.—Figure 6–19 shows the left side of the RFO and brings out the lubricating points in unit 9, unit 10, and S–2998. Reference to unit 8 is also included here.

(*c*) UNIT 8.—A partially disassembled unit 8 is shown in figure 6–20 to direct attention to the lubrication points.

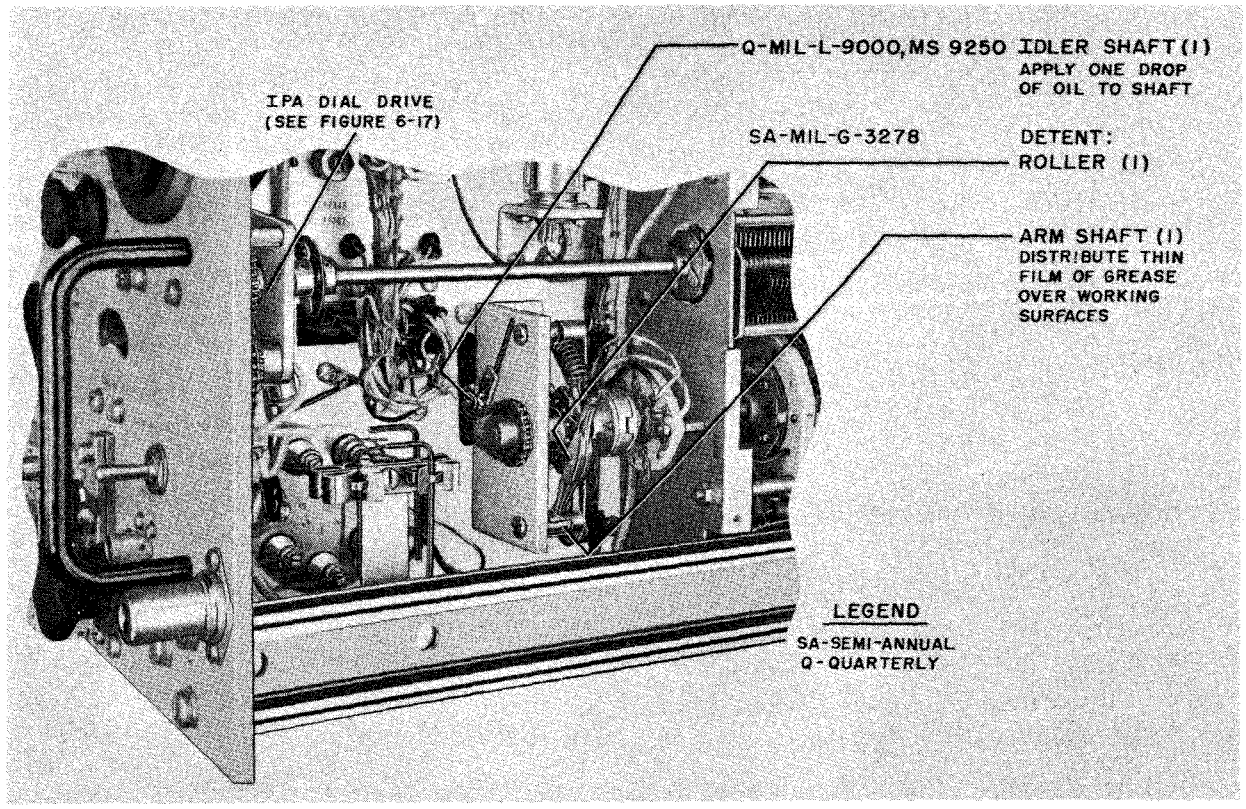

Figure 6–16. RFA, Right Side, Bandswitch Lubrication

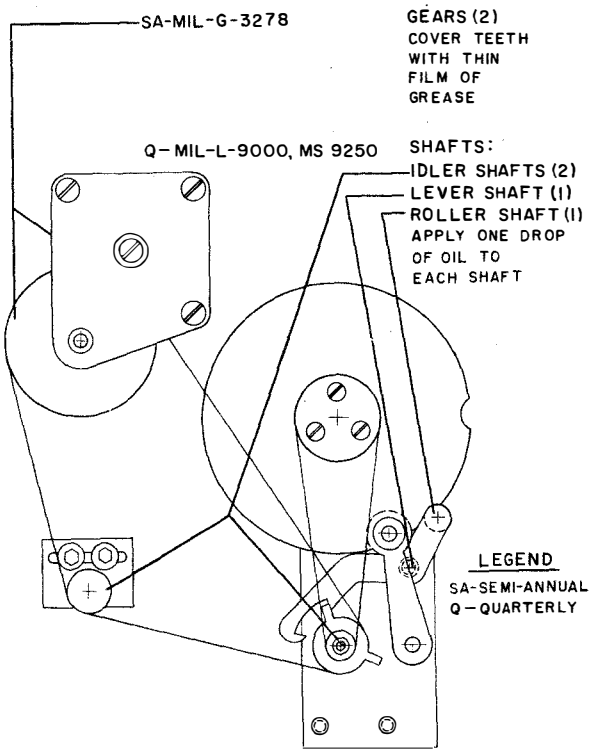

Figure 6–17. RFA, IPA Dial Assembly, Lubrication

1. UNIT 8 REMOVAL PROCEDURE.—To remove unit 8 from the RFO, proceed as follows:

Step 1. Place the 100 KC knob Ⓗ in its 0 position. (See figure 6–10 for location of 100 KC knob.)

Step 2. Disconnect all cables to unit 8.

Step 3. Loosen the four mounting studs.

Step 4. Carefully pull unit 8 straight out.

2. UNIT 8 REPLACEMENT PROCEDURE. —To replace unit 8:

Step 1. Place 100 KC knob Ⓗ at 0. (See figure 6–10.)

Step 2. Place the red indicator stud on unit 8 detent at 0. (See figure 6–20 for location of unit 8 detent.)

Step 3. Carefully place unit 8 in position in the RFO.

Step 4. Secure the four mounting studs.

Step 5. Replace unit 8 cables.

(d) CONTROL PANEL REMOVED. — The chains and gears are shown in figure 6–21, a view of the RFO with its front panel removed. Lubrication of the fixed and adjustable idler gears is included in this illustration.

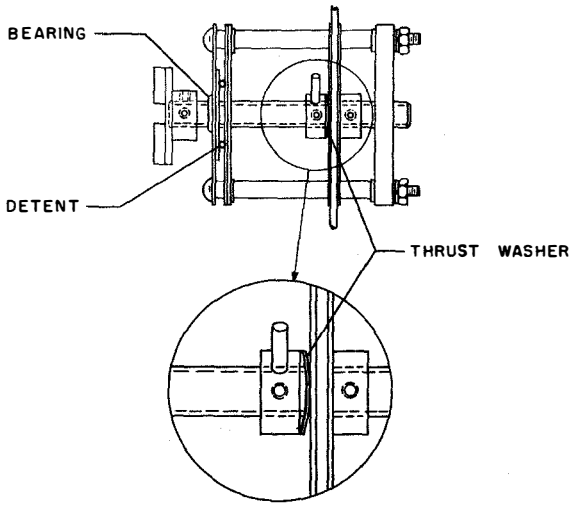

Figure 6–18. Typical Lubrication Points in the RFO

(*e*) RIGHT SIDE.—In figure 6–22 the right side of the RFO is shown, with the lubrication points on unit 6, unit 11B, and unit 11C pointed out. Reference to unit 3 is included in this illustration.

(*f*) UNIT 3.—Lubricating points in unit 3 are shown in figure 6–23, a partially disassembled view of the unit.

(4) RADIO MODULATOR MD–229/SRT (LLRM).—The location of the front panel switches and their lubrication are shown in figure 6–24, a view behind the front panel of the LLRM.

(5) MOUNTING MT–1423/SRT (BASE MOUNT).—The air filters in the base mounts must be removed for cleaning and relubricating. Figure 6–25 describes the procedure to be used.

(6) CONTROL-INDICATOR C–1352/SRT.—For lubrication of the control-indicator positioning studs and insert threads see figure 6–26.

(7) CHASSIS SLIDES.—Figure 6–27 refers to the lubrication of the chassis slides. As noted, this lubrication procedure applies to one left and one right chassis slide on each of the following:

(*a*) Radio Frequency Amplifier AM–1008/SRT (RFA)

(*b*) Radio Modulator MD–229/SRT (LLRM)

(*c*) Radio Frequency Oscillator O–275/SRT (RFO)

(*d*) Power Supply PP–1094/SRT (LVPS)

(*e*) Power Supply PP–1095/SRT (MVPS)

(*f*) Power Supply PP–1096/SRT (HVPS)

(*g*) Radio Modulator MD–230/SRT (HVPS)

(8) RADIO FREQUENCY TUNER TN–229/SRT.

(*a*) JACKS.—The mating threads in the following jacks are to be lubricated as shown in figure 6–28:

1. J–301
2. J–302
3. J–303

(*b*) GEARS AND RACKS.—To check lubrication of the gears and racks in the r-f tuner, see figure

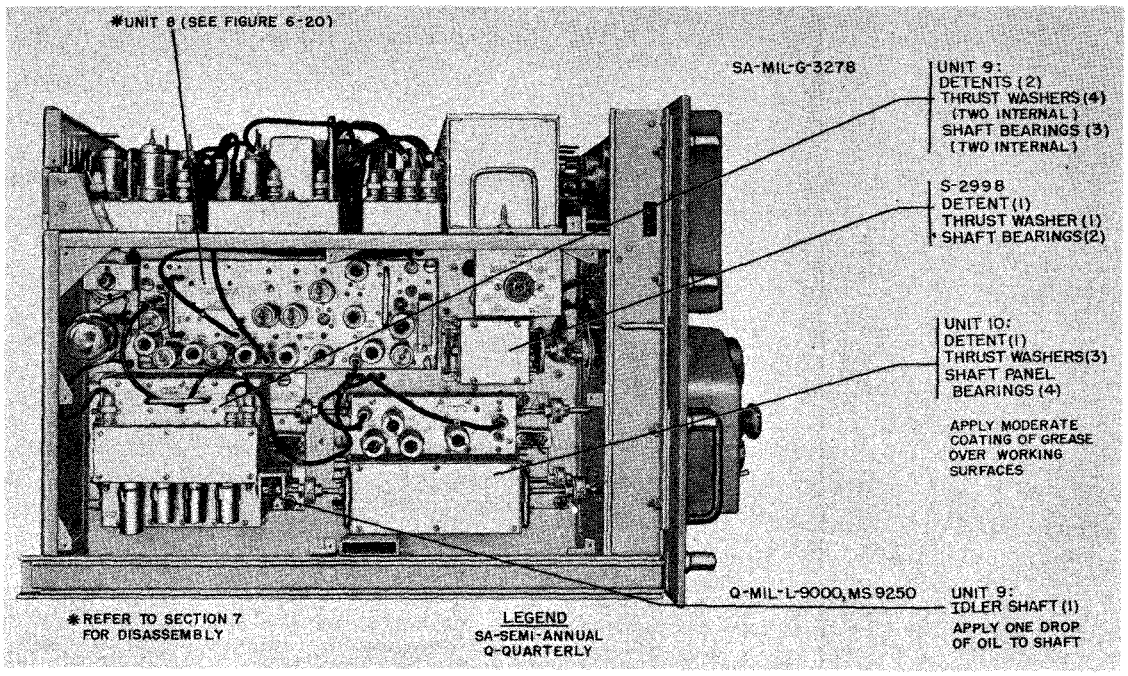

Figure 6–19. RFO, Left Side, Lubrication

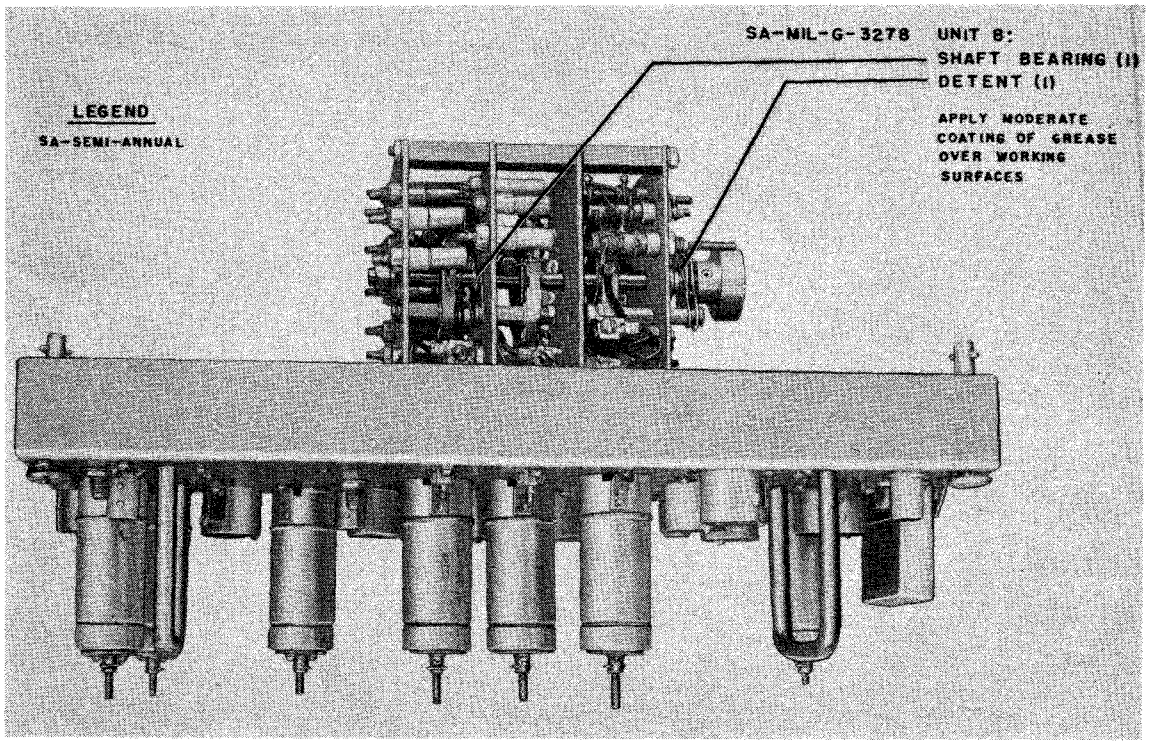

Figure 6–20. RFO, Unit 8 (Z–2330), Lubrication

6–29. In addition, this illustration may serve as a reference guide to other lubrication procedures in the r-f tuner.

(*c*) DRIVE MOTOR SHAFT EXTENSION.—See figure 6–30 for a cross-sectional view of the r-f tuner drive-motor extension-shaft with its lubrication instructions.

(*d*) CLUTCH-BRAKE.—The clutch-brake assembly, as shown in figure 6–31, must be disassembled before lubrication. Refer to Section 7 for disassembly, when necessary.

(*e*) MAIN DRIVE BALL BEARINGS.—For a detailed view of the main drive, see the cross-section line drawing of figure 6–32. Disassembly of the bearings is simple and obvious. No explanation is needed.

(*f*) ACTUATOR MOTOR. — There are three actuator motors in the equipment. One is in the r-f tuner and the other two are in the antenna coupler. These motors require some lubrication, as shown in figure 6–33.

(9) ANTENNA COUPLER CU–372/SRT.

(*a*) DRIVE GEARS.—Figure 6–34 shows lubricating procedures for the drive gears in the coupler. This illustration may serve as a guide to other lubrication procedures in the coupler.

(*b*) ANTENNA TRANSFER SWITCH.—Three bearings and four sliding switch contacts associated with antenna transfer switch S–3512 are called out in figure 6–35, showing the points of lubrication.

(*c*) LOAD SELECTOR SWITCH.—Figure 6–36 shows six sliding switch contacts and three ball bearings, with the lubrication procedures for these parts.

(*d*) ACTUATOR MOTORS.—The two actuator motors in the coupler are to be lubricated as noted in figure 6–33.

(*e*) JACKS.—The mating threads on the jacks in the antenna coupler are to be lubricated as directed in figure 6–28. These jacks are as follows:

1. J–3501
2. J–3502
3. J–3503
4. J–3504
5. J–3505
6. J–3506
7. J–3507

d. LUBRICATION PERIODS.—The lubrication periods mentioned on the lubrication illustrations are not intended to be absolutely inflexible. They are intended for use on the equipment under normal conditions. For extreme operating conditions, these periods may possibly be reduced to a fraction of the original. Some abnormal conditions encountered may be: (a) extremely wide ranges of temperature, (b) prolonged high-speed operation, (c) immersion in water, (d) operation in dust or sand, (e) exposure to moisture. Contamination of the lubricant will certainly take place under any of these conditions. Thus, the protective qualities of the lubricant applied will be lost.

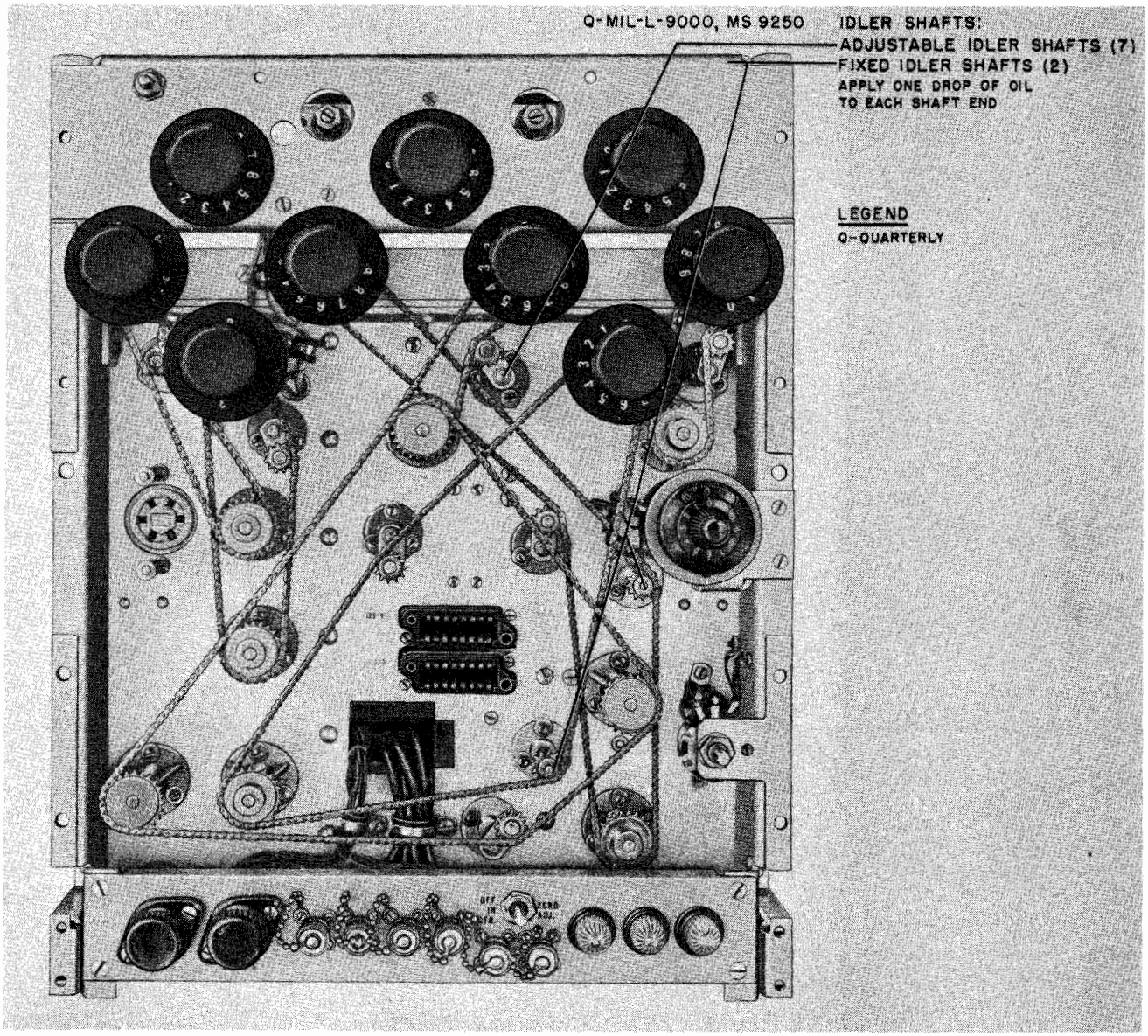

Figure 6–21. RFO, Control Panel Removed, Idler Gear Lubrication

Individual or on-the-spot judgment can lead to a reduction of the lubricating period in some borderline cases. In other cases, it may be obvious that the lubricant is not performing its task of keeping the equipment operating at optimum efficiency and that break-down will follow. Immediate relubrication of the part will be in order, with revision of the lubricating schedule to follow.

(1) QUARTERLY LUBRICATION.—Check the following illustrations for quarterly lubrication instructions:

(*a*) Figure 6–12
(*b*) Figure 6–13
(*c*) Figure 6–15
(*d*) Figure 6–16
(*e*) Figure 6–17
(*f*) Figure 6–19
(*g*) Figure 6–21
(*h*) Figure 6–25
(*i*) Figure 6–27

(2) SEMIANNUAL LUBRICATION.—The following illustrations cover lubrication instructions for the semiannual interval:

(*a*) Figure 6–11
(*b*) Figure 6–12
(*c*) Figure 6–13

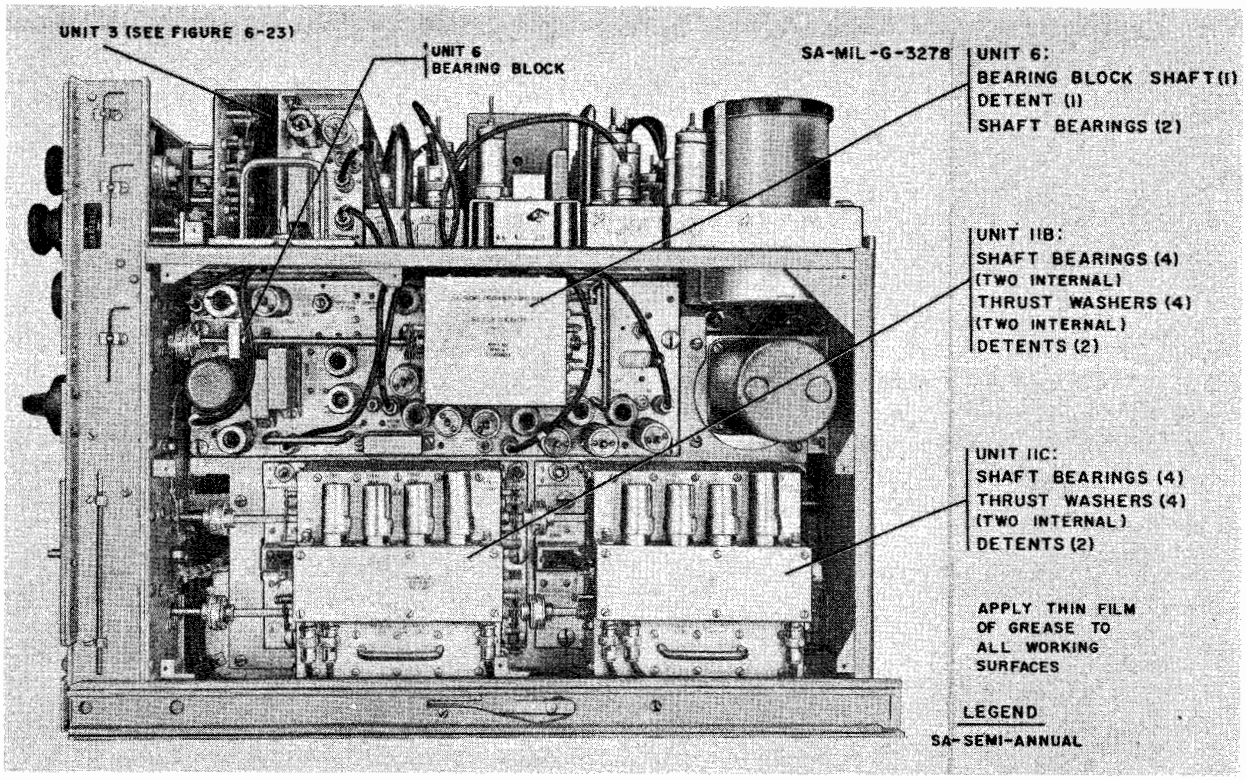

Figure 6—22. RFO, Right Side, Lubrication

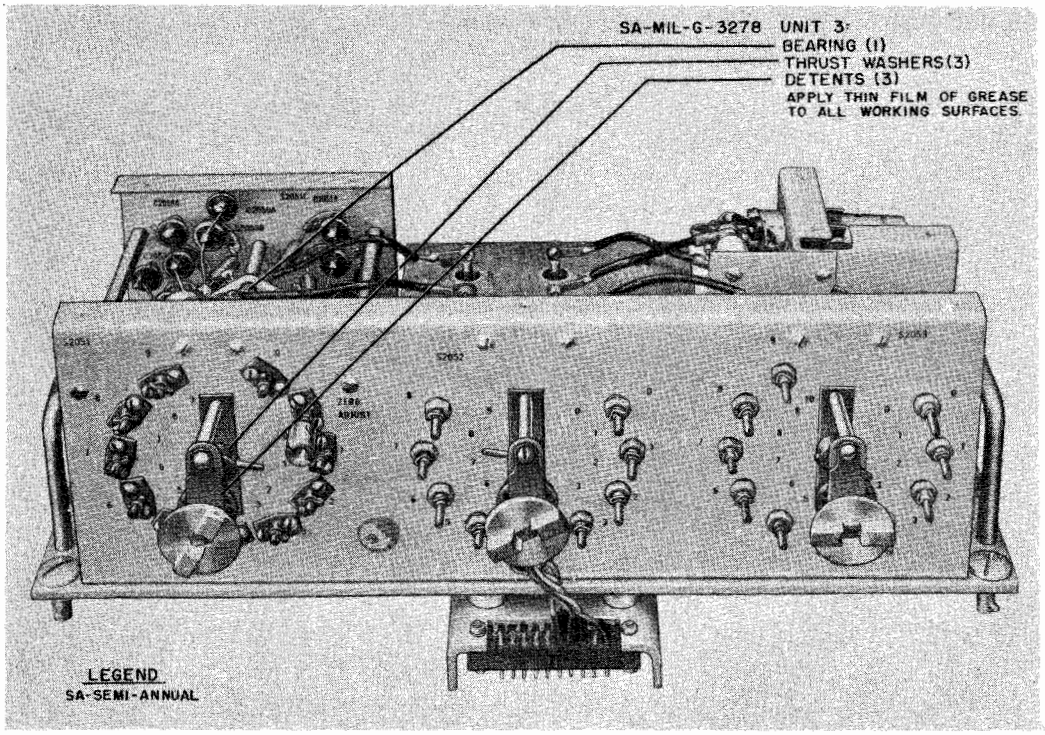

Figure 6—23. RFO, Unit 3 (Z—2053), Lubrication

(*d*) Figure 6–14
(*e*) Figure 6–16
(*f*) Figure 6–17
(*g*) Figure 6–19
(*h*) Figure 6–20
(*i*) Figure 6–22
(*j*) Figure 6–23
(*k*) Figure 6–24
(*l*) Figure 6–26
(*m*) Figure 6–27

(3) ANNUAL LUBRICATION.—The following illustrations contain lubrication procedures to be followed for the annual lubrication interval:

(*a*) Figure 6–28
(*b*) Figure 6–29
(*c*) Figure 6–33
(*d*) Figure 6–35
(*e*) Figure 6–36

(4) BIENNIAL LUBRICATION.—The following illustrations contain lubrication procedures to be followed for the biennial lubrication interval:

(*a*) Figure 6–30
(*b*) Figure 6–31
(*c*) Figure 6–34

(5) THREE-YEAR LUBRICATION.—The following are the lubrication illustrations that cover the three-year lubrication intervals:

(*a*) Figure 6–32
(*b*) Figure 6–35
(*c*) Figure 6–36

(6) MAJOR OVERHAUL LUBRICATION.—The following are the lubrication illustrations that cover major overhaul intervals:

(*a*) Figure 6–14
(*b*) Figure 6–24
(*c*) Figure 6–27

e. LUBRICATING GREASES.—Table 6–12 is a list of the greases to be used on the equipment. They are listed in the Navy Stock List of General Stores, FSC Group 91.

f. LUBRICATING OILS.—Table 6–13 is a list of the oils to be used on the equipment. They are catalogued in the Navy Stock List of General Stores, FSC Group 91.

g. LUBRICATING TOOLS.—Table 6–14 is a list of tools which may be used for lubricating purposes. The brushes are catalogued in Class 38, General Stores Section. The oil can is listed in General Stores Section, Class 53, Group 2.

h. DRY CLEANING SOLVENT.—Grease, oil, and dirt may be removed with Dry Cleaning Solvent P–S–661b. It is packed in commercial units for distribution and is furnished in 1-gallon, 5-gallon, and 55-gallon metal containers. The solvent may be used as a dip or a spray, or it may be applied with a rag or brush. This specification covers two types of solvent, referred to commercially as "Stoddard Solvent" and "140°F. Solvent".

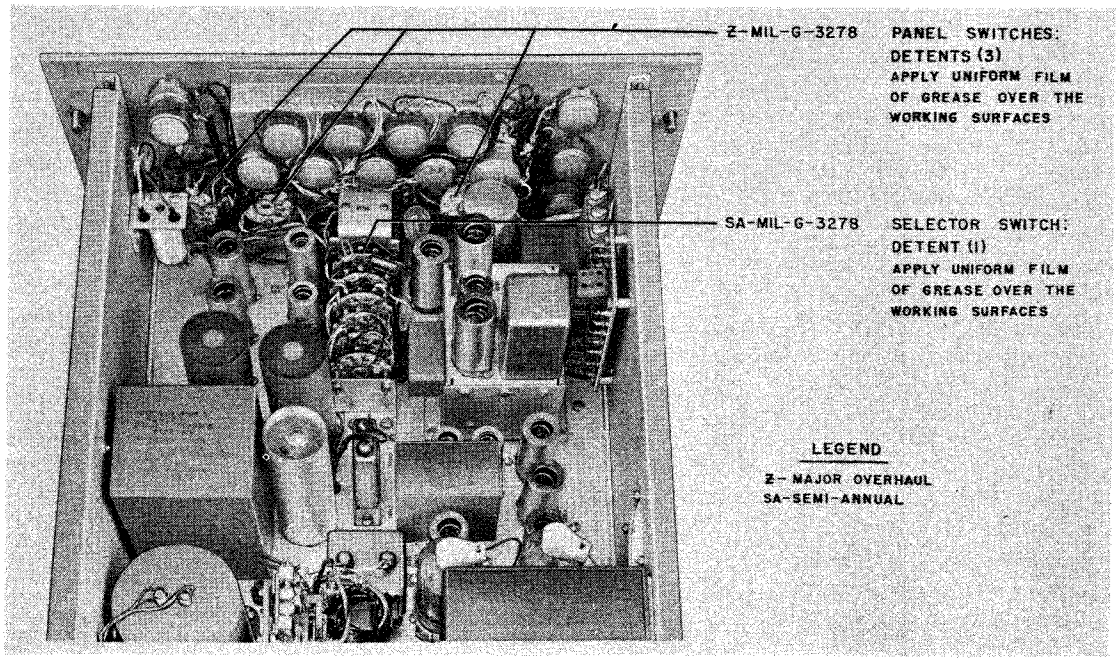

Figure 6–24. Radio Modulator MD–229/SRT (LLRM), Front Panel Switch Lubrication

TABLE 6—12. LUBRICATING GREASES

ITEM	SPECIFICATION NUMBER AND TITLE	TYPE	STANDARD NAVY STOCK NUMBER					
			8 oz.	1 lb.	5 lb.	25 lb.	35 lb.	100 lb.
1.	MIL–G–3278; Grease, Aircraft and Instrument		WS9150–261–8297	WS9150–261–8298	WF9150–223–4012	WR9150–190–0897	WF9150–190–0898	WS9150–190–0899
2.	14–L–3; Grease, Ball and Roller Bearing	I		WM9150–235–5564	WF9150–235–5544			
3.	MIL–L–15719; Grease, Silicone Insulated Electric Motor	HTG	WS9150–257–5358					

TABLE 6—13. LUBRICATING OILS

ITEM	SPECIFICATION NUMBER AND TITLE	MS	STANDARD NAVY STOCK NUMBER				
			Bulk	1 pt.	1 gal.	5 gal.	55 gal.
1.	MIL–L–9000; Lubricating Oil, Diesel (SAE 30)	9250	WF9150–231–6656			WF9150–231–6653	WF9150–231–6655
2.	MIL–L–17331; Lubricating Oil, Turbine (SAE 30)	2190T	WM9150–235–9064			WM9150–235–9061	WF9150–235–9063
3	14–O–20; Lubricating Oil, Instrument			WS9150–223–8898	WS9150–261–7902		

TABLE 6—14. LUBRICATING TOOLS

ITEM	SPECIFICATION NUMBER AND TITLE	NAVY STOCK NO.	USE	DESCRIPTION
1.	Wash-out Brush, Acid Swabbing	G38–B–5569–675	Use with solvents for cleaning away oil and grease	Plastic; one piece; curved with rounded ends; 6¾ in. over-all; medium stiff nylon
2.	Fed. H–B–643, Type II; Brush, Acid Swabbing	G38–B–4480	(Same as item 1, above)	Sheet tin tube; bristles secured by clinching; 5¾ in. over-all
3.	Fed. H–B–118, Type II; Brush, Artists	G38–B–774	Use for applying oil	Hardwood handle; round, tapered metal ferrule; solvent resistant
4.	Fed. H–B–241; Fitch, Brush, Artists	G38–B–1375	(Same as item 3, above)	Hardwood handles; steel ferrule with corrosion-resistant coating
5.	Fed. H–B–212, Type II; Brush, Dusting	G38–B–1305	Dusting surfaces	Round; 8¼ in. long
6.	Brush, Dusting	G38–B–5566	(Same as item 5, above)	One piece; over-all length 10½ in.
7.	Fed. RR–C–87 Can, Oil	G53–C–490	Use as oil dispenser	½ oz. capacity with spout and screw cap

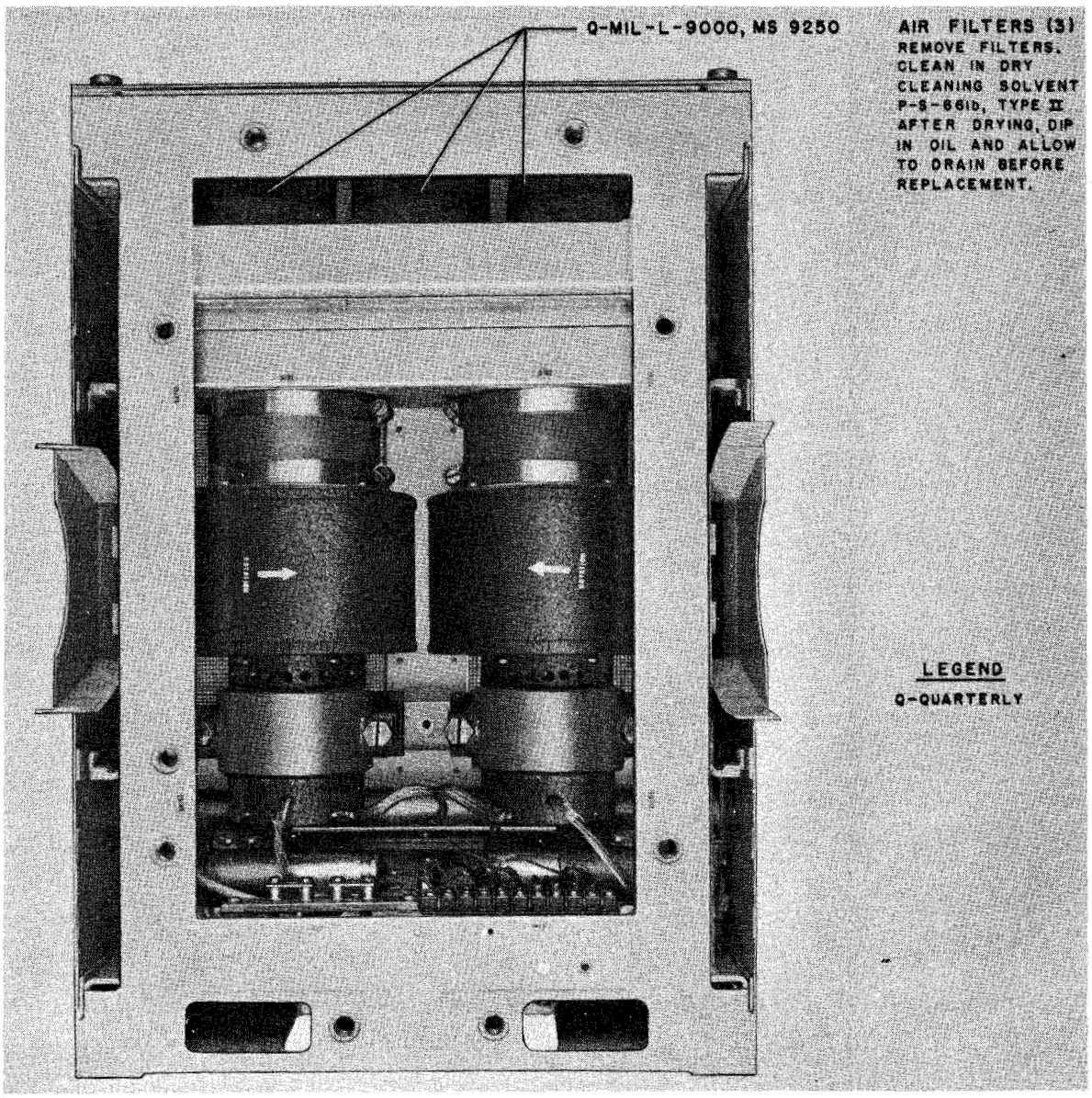

Figure 6—25. Mounting MT—1423/SRT (Base Mount), Air Filters, Lubrication

6. SPECIAL MAINTENANCE.

a. SHAFTS.—Shafts should be checked for dirt and corrosion. Remove dirt with dry-cleaning solvent (refer to paragraph 5*b*). The shafts may also be cleaned with fine crocus cloth to remove obstinate dirt marks. Use a fine file or fine sandpaper to remove burrs. After cleaning, the shafts should be relubricated according to the procedures listed in the lubrication illustrations.

b. VARIABLE CAPACITORS.—Noise, loss of sensitivity, and improper tuning may be caused by faulty or dirty tuning capacitors. Serious losses may occur, as well, in certain types of tuned circuits.

Rotor contacts, bearings and plates may be cleaned with dry-cleaning solvent. Pipe cleaners are especially useful for cleaning between capacitor plates, if available. A small, soft brush, dipped in solvent, may also be used for this purpose. Be careful not to damage or bend any of the plates.

c. RELAYS.—Some relay contacts are plated with thin coats of silver. In cleaning this type of contact, avoid the use of abrasives, which may damage the contact surfaces. These surfaces are cleaned with dry-cleaning solvent.

Pitted contacts on heavier relays, such as those used for power control circuits, are cleaned with a fine grade of crocus cloth. Badly pitted contacts should be replaced singly, if possible. If not, a complete new relay may have to be installed. After cleaning, the contacts of both types of relays are finished with a burnishing tool.

Check the working parts of the relays, as follows:

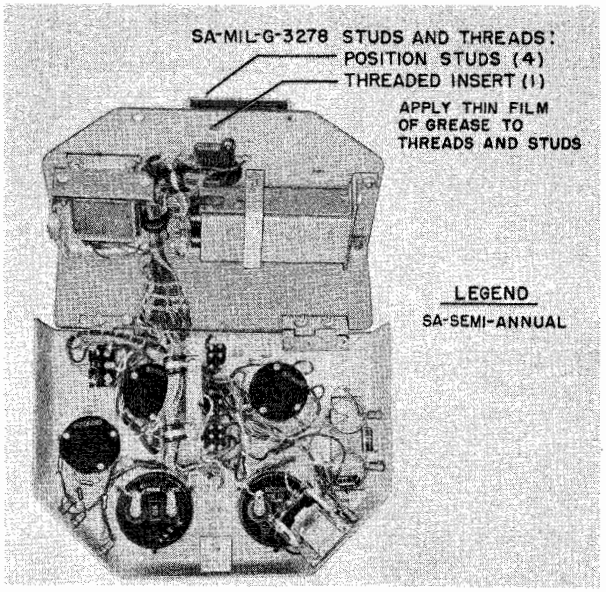

Figure 6–26. Control-Indicator, Lubrication

Step 1. Check the armature pivot points. They should be free of burrs, rust, corrosion, or any other defect that may prevent free movement. Remove burrs or corrosion with a fine file or fine sandpaper.

CAUTION

Be sure that the shape and location of the pivot points have not been changed.

Step 2. The return spring should be inspected for good tension. Replace the spring if rusted or damaged.

Step 3. Examine the relay winding for damage to the insulation. Damaged wires or insulation may be repaired with tape or insulated tubing (spaghetti).

Step 4. Check the relay core for corrosion. If corroded, the relay should be replaced to avoid possible future failure.

Step 5. Check the frame. Repair or replace if damaged.

Note

All parts of the relay may be cleaned with dry-cleaning solvent. (Refer to paragraph 5*b*.)

d. JACKS AND PLUGS.—Particular care should be used in checking the mating threads when examining jacks and plugs. Any damage to the threads will make it difficult, if not impossible, to mate the connectors. Clean off grease and dirt with dry-cleaning solvent, using a firm, bristle brush. After cleaning and checking the plug or jack, it should be relubricated by covering the threads with a thin film of grease, specification MIL–G–3278 (item 1, table 6–12). Avoid overlubrication.

e. GEARS AND RACKS.—The gears and racks must be checked for dirt and other foreign particles in the gear teeth. Clean off dirt or caked lubricant with a small brush dipped in dry-cleaning solvent.

The gear shafts may also be cleaned with the solvent. Polish the shaft with a piece of fine crocus cloth, if necessary.

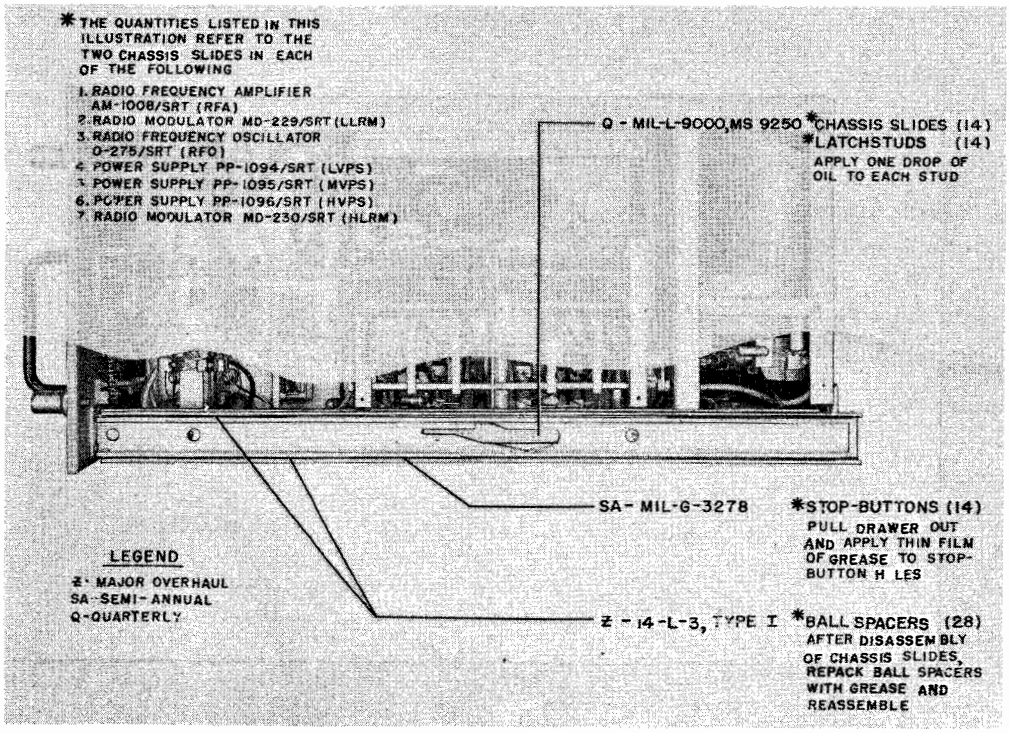

Figure 6–27. Chassis Slide, Lubrication

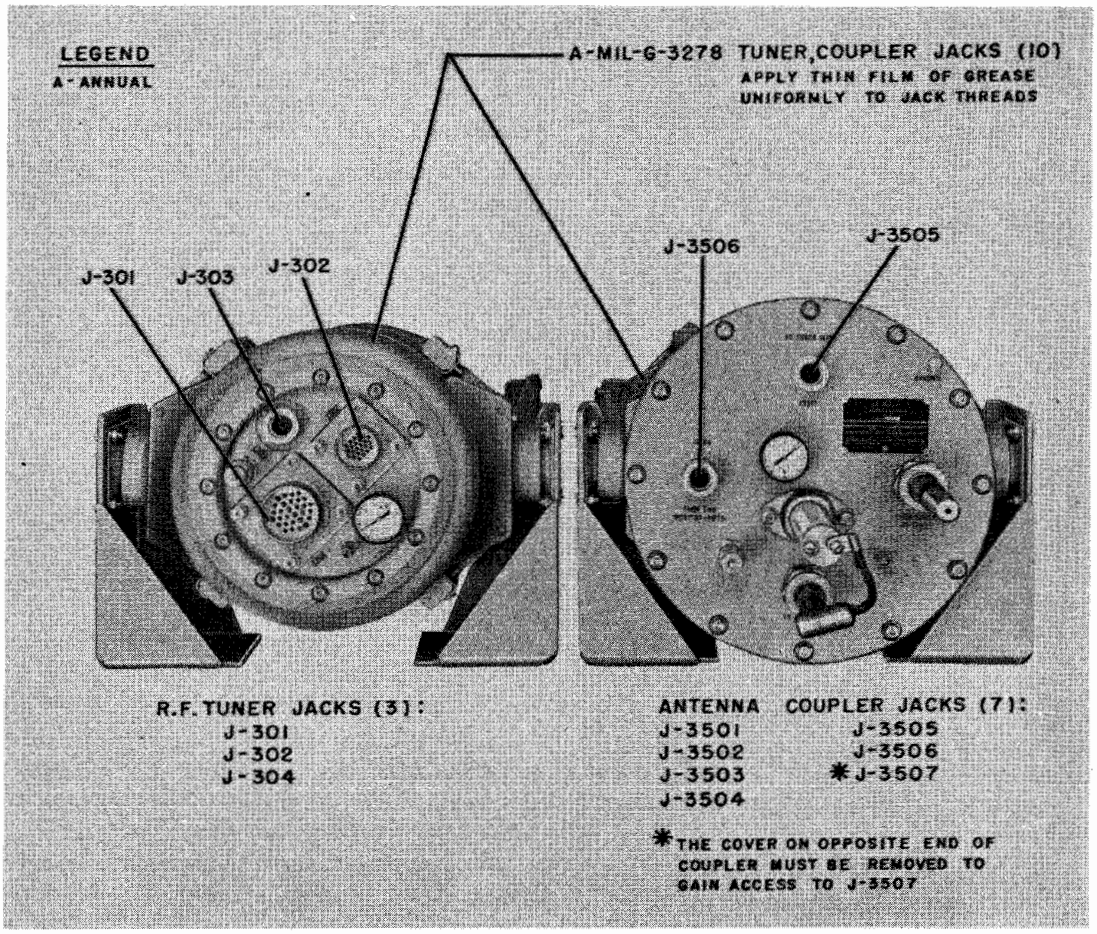

Figure 6—28. Radio Frequency Tuner TN—229/SRT and Antenna Coupler CU—372/SRT Jacks and Plugs, Lubrication

After cleaning, the gears and racks are to be relubricated, according to the procedures described in the lubrication illustrations.

f. WAFER SWITCHES AND DETENTS.—Examine the contacts for good spring tension. Weak spots require restoration of spring tension. However, long, telephone-type switch or relay contacts should never be bent. These contacts should be replaced, if possible. If the contacts cannot be replaced singly, the entire switch may have to be replaced, as poor contact pressure leads to trouble and eventual failure.

Check the detent actions and the switch shaft. These parts, as well as the switch contacts, may be cleaned with dry-cleaning solvent.

The various detent assemblies, especially those in the various subunits of the RFO, need careful attention. They should be repaired immediately or replaced if repair is not practical.

After cleaning a switch or detent, the part should be relubricated as directed in the lubrication instruction illustrations.

g. CHAINS.—When inspecting the chains, be sure to check the adjustment of the idlers. Proper tension on the chains must be maintained at all times. To achieve correct tension, a balance must be found which is a compromise between ease of operation and minimum back lash. In case of severe damage to the chain, it should be replaced. Remove dirt and grease with the dry cleaning solvent.

h. CLEANING BEARINGS.—Before relubricating, the bearings should be cleaned and inspected. They may be cleaned by swishing in dry-cleaning solvent. Use a small brush to clean out any stubborn dirt or grease which tends to cling to the bearings. Dry by spinning in air.

i. LUBRICATING BEARINGS.—Examine all polished rubbing surfaces for cracks or pits. Pitted or cracked bearings must be replaced. After cleaning and examination, the bearings are to be lubricated according to the instructions in the lubrication illustrations.

j. MOTORS.—Section 7 of this instruction book describes disassembly procedures in detail. Refer to Section 7 for the more complex assembly or reassembly procedures.

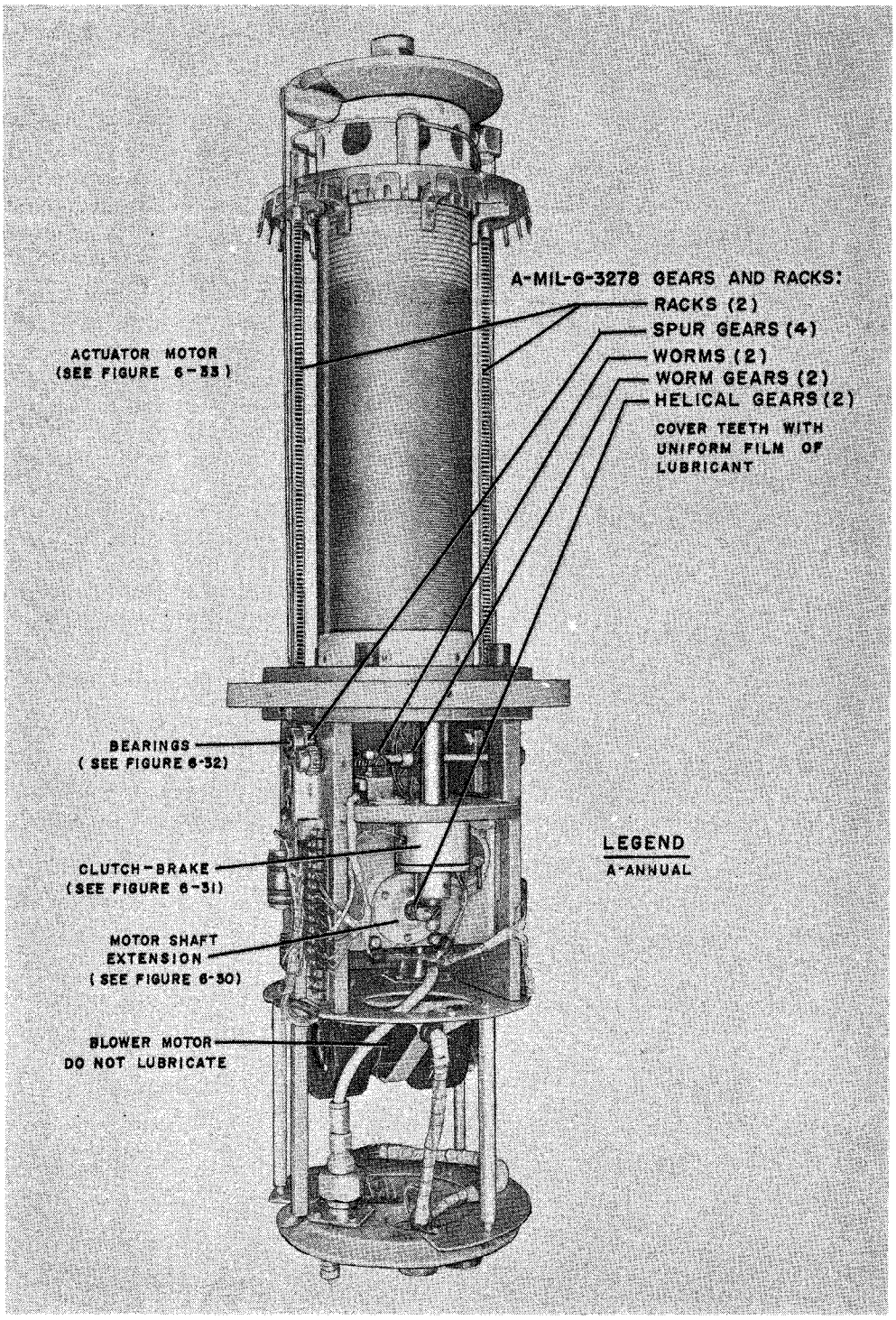

Figure 6—29. R-f Tuner, Gears and Racks, Lubrication

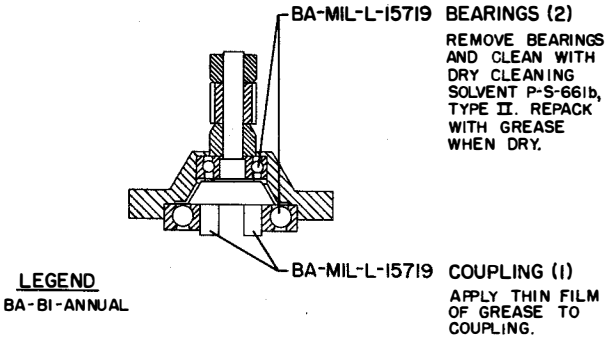

Figure 6—30. R-f Tuner, Cross Section of Drive Motor Shaft Extension, Lubrication

(1) GENERAL. — Some general motor maintenance procedures follow:

(*a*) Motor brushes are to be replaced in the same relative positions they occupied previously.

(*b*) Commutators should be dressed, if necessary, with sandpaper (not emery cloth).

(*c*) After undercutting mica, clean and polish as a finishing operation.

(*d*) Bearings are to be treated as described in paragraph 6*b* of this section.

(*e*) Clean and polish motor shafts with a piece of fine crocus cloth.

(*f*) When reassembling, be sure to check for excessive shaft end play.

(*g*) Avoid overlubrication. Run the motor for a few minutes after assembly to check. No lubricant should be thrown off when the motor is running.

(2) RFA BLOWER MOTOR B–1306.—A check period of 1,000 hours, as noted on the TOTAL HOURS-FILAMENT counter on the front panel of the Power Supply PP–1095/SRT (MVPS), should be the maximum for this motor. Since the motor is in continuous operation this check period should not be exceeded by more than 50 percent. Check for noise and/or excessive heating.

(3) BASE MOUNT MOTORS B–701 AND B–702.—Check these motors every 10,000 hours as noted on the TOTAL HOURS-FILAMENT meter. Bearings must be carefully cleaned and inspected, if necessary. Refer to the bearing information of Section 6, paragraph 6*b*, and any pertinent disassembly procedures in Section 7.

(4) R-F TUNER AND COUPLER MOTORS.—The r-f tuner has drive motor B–301, blower motor B–306, and actuator motor B–303. The coupler has actuator motors B–3501 and B–3502. An annual inspection of these motors is required. Check Section 7 for the disassembly procedures necessary to gain access to these motors. The drive motor (B–301) and the blower motor (B–306) require no lubrication but should be examined for operating defects. The three actuator motors (B–303, B–3501, and B–3502) require some lubrication. This procedure is outlined in figure 6–33. Refer to Section 6, paragraph 6*b*, for bearing information.

k. RECORD OF TUBE CHANGES.—When it becomes necessary to change any of the tubes, the date and the reading of the TOTAL HOURS-FILAMENT meter should be recorded, as provided in the space at the top of table 6–15.

l. HAIR AND BRISTLE BRUSHES.—Some of the brushes listed in table 6–14 are made of hair or bristle.

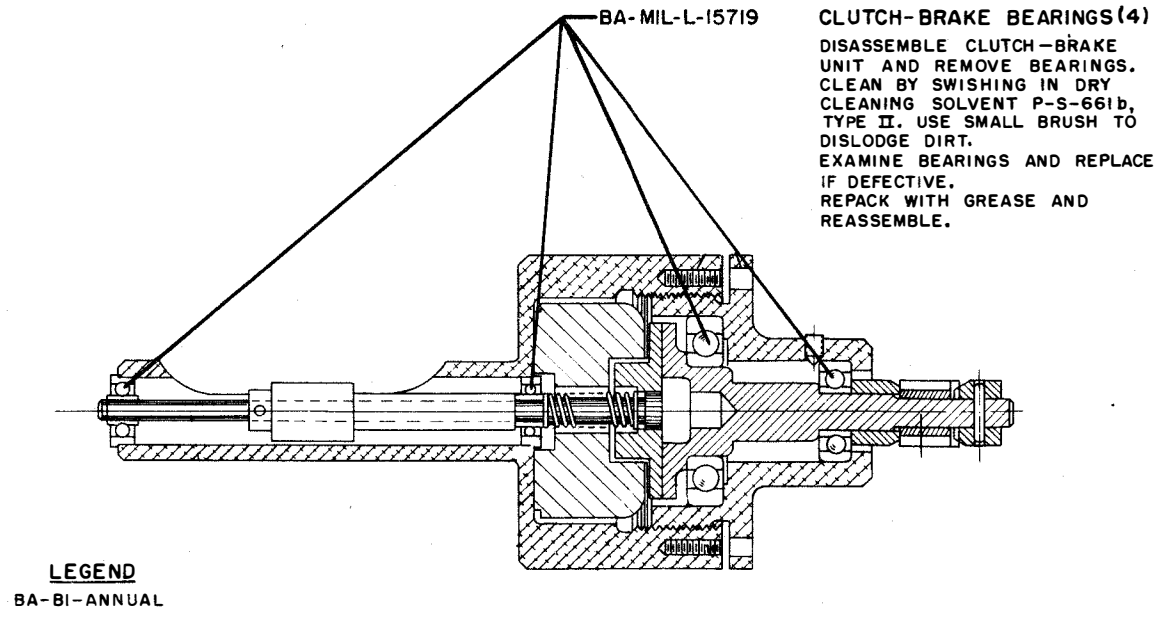

Figure 6—31. R-f Tuner, Cross Section of Clutch-Brake Assembly, Lubrication

TABLE 6–15. RECORD OF TUBE CHANGES

TUBE TYPE	CHANGE DATA			CHANGE DATA			CHANGE DATA		
	DATE	METER READING	TUBE CHANGE	DATE	METER READING	TUBE CHANGE	DATE	METER READING	TUBE CHANGE
OA2									
OB2									
3B28									
4–400A									
4D21									
5R4WGB									
6AG5									
6AG7									
6AK6									
6AS7G									
6E5									
12AU7									
5651									
5654									
5687									
5725									
5726									
5751									
5814									
5933									
6201									

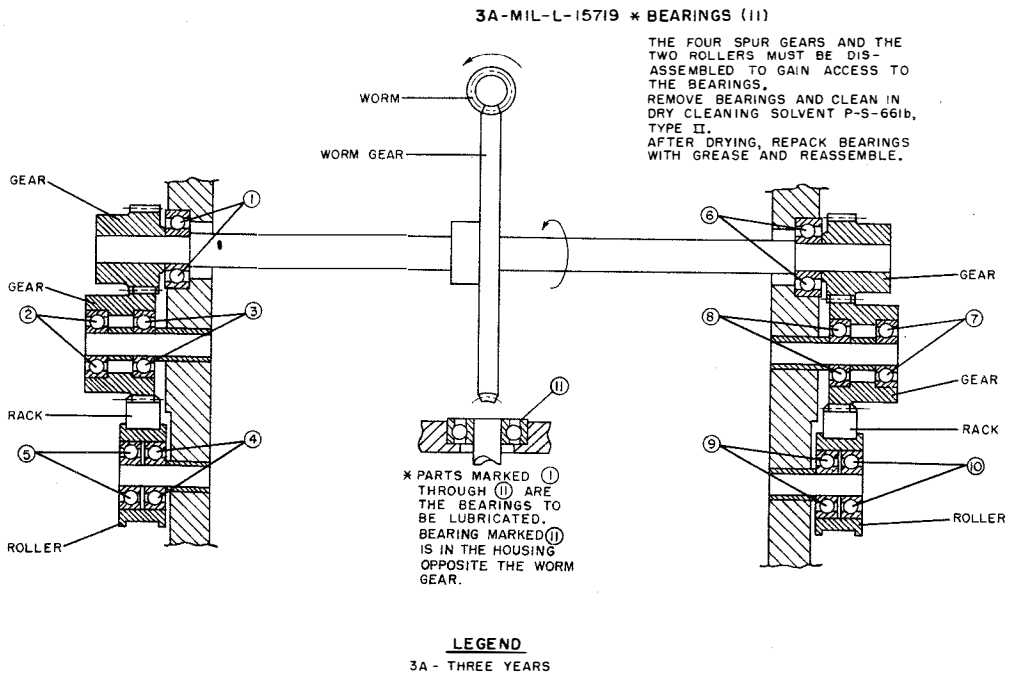

Figure 6–32. R-f Tuner, Cross Section of Main Drive Bearings, Lubrication

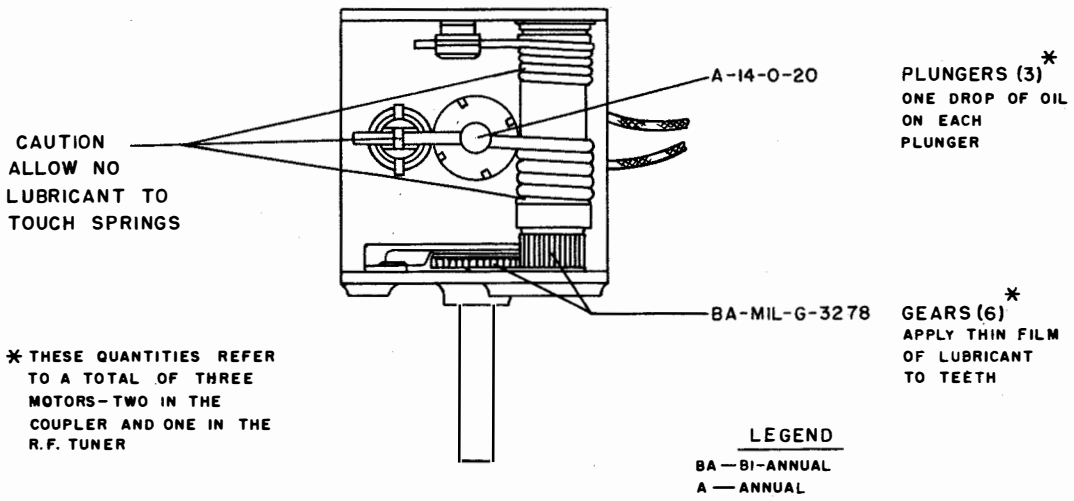

Figure 6–33. Actuator Motor, Lubrication

Brushes of this type are highly susceptible to insect infestation. Since insect repellents are highly volatile, they must be replenished as they wear off. To protect the brushes, when a partial issue is made, the repellent must be replaced and the package must be resealed. Inspect these packages periodically (3 to 6 months).

Brushes should be cleaned immediately after using. Do not stand a brush on its bristles or it will become distorted. Prolonged immersion in water will destroy the resilience of bristles, rust the ferrule, and swell the block.

m. PRESSURIZING THE R-F TUNER AND COUPLER.—When it becomes necessary to recharge either of these units, it is important that only fresh, dry gas be used. Refer to Section 7 for recharging, purging, and exhausting procedures.

n. CHARGING R-F TUNER OR COUPLER. *(See figure 6–37.)*—When pressure in the r-f tuner or the coupler falls below 15 psi, it will be necessary to add more nitrogen to bring the pressure up to its normal 20 psi. A method for charging those units follows:

Note

This procedure, with its accompanying illustration, pertains to the r-f tuner. However, the antenna coupler is treated in exactly the same manner.

Step 1. Check the regulator (1) to be sure that the adjusting screw (2) and the needle valve (3) are closed at this time.

Step 2. Fasten the delivery hose (4) securely to the regulator (1) by means of the hose-coupling nut (5).

Step 3. Attach the regulator (1) to the gas cylinder and secure the hexagonal inlet coupling nut (6).

Step 4. Connect the delivery hose (4) to the r-f tuner intake valve (7).

Step 5. Open the cylinder valve (8).

Note

With a full 9-cubic-foot nitrogen gas cylinder, the cylinder-pressure gauge (9) on the regulator (1) should read about 1,600 psi.

Step 6. Open the adjusting screw (2) until the delivery-pressure gauge (10) reads 20 psi.

Note

The relief valve (11) is not used, except for purging or exhausting the cylinder as outlined in Section 7.

Step 7. Open the needle valve (3) and bring the pressure up to 20 psi as indicated on the pressure gauge (12). When the desired pressure is attained, the cylinder valve (8) is closed. The regulator (1) may then be removed from the gas cylinder.

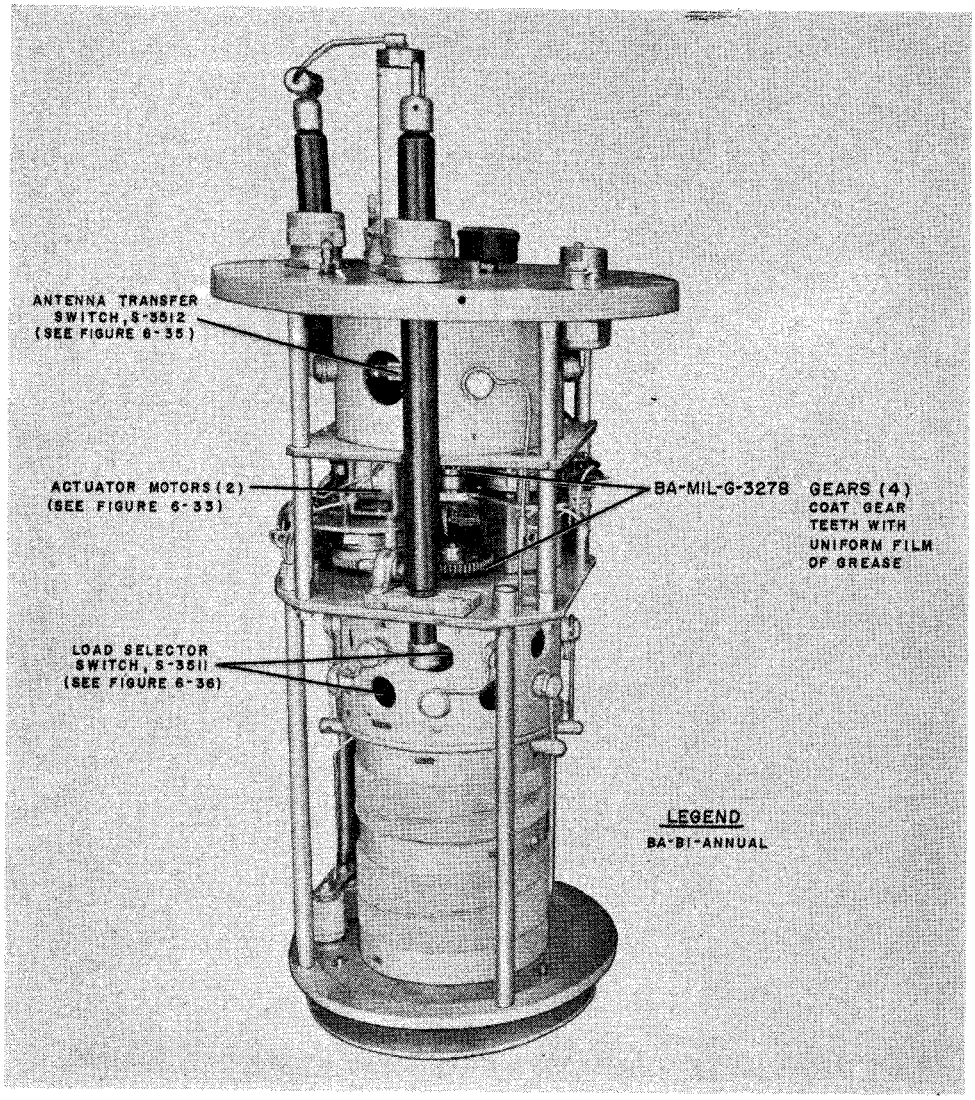

Figure 6—34. Antenna Coupler, Lubrication

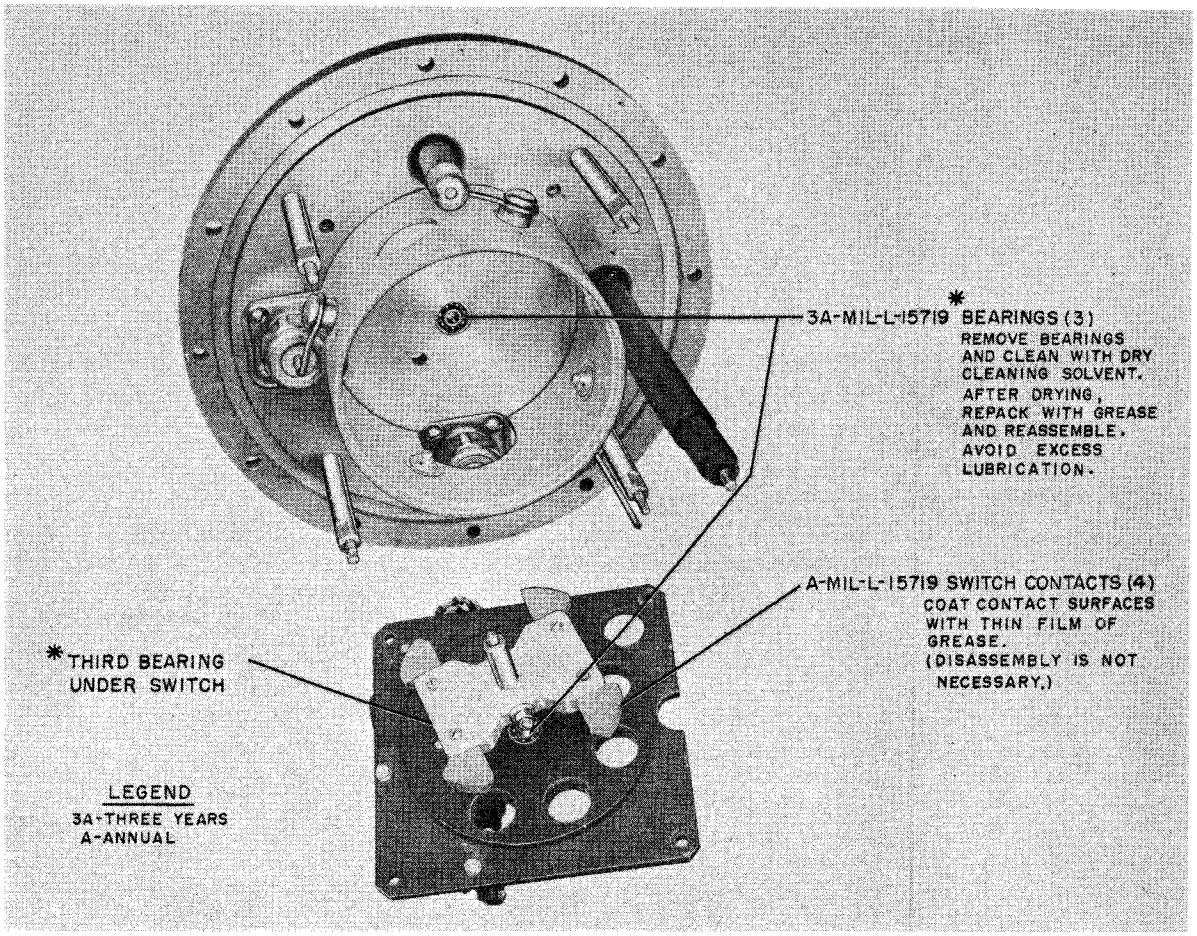

Figure 6—35. Antenna Transfer Switch S—3512 and Bearings, Lubrication

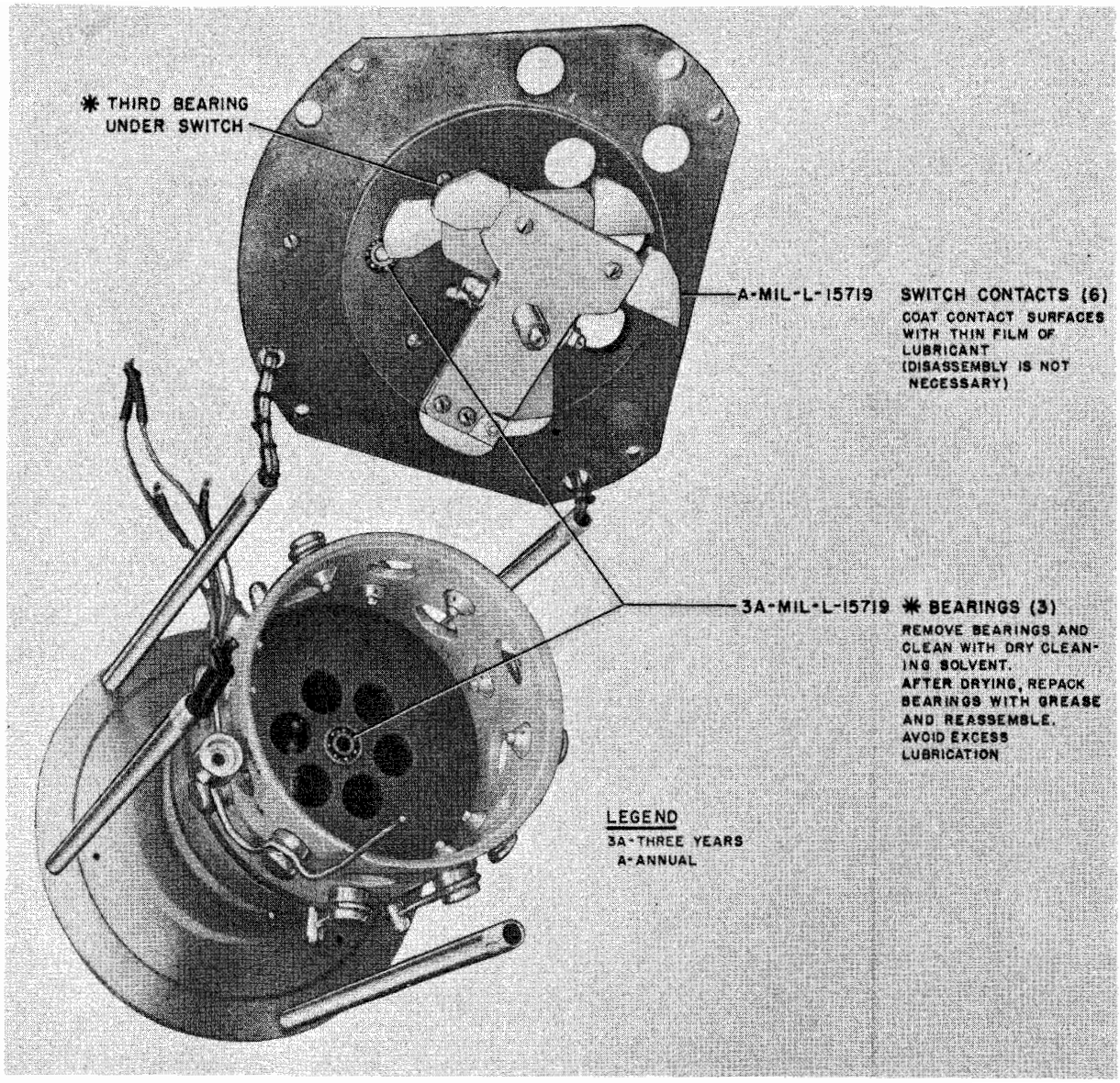

Figure 6—36. Load Selector Switch S—3511 and Bearings, Lubrication

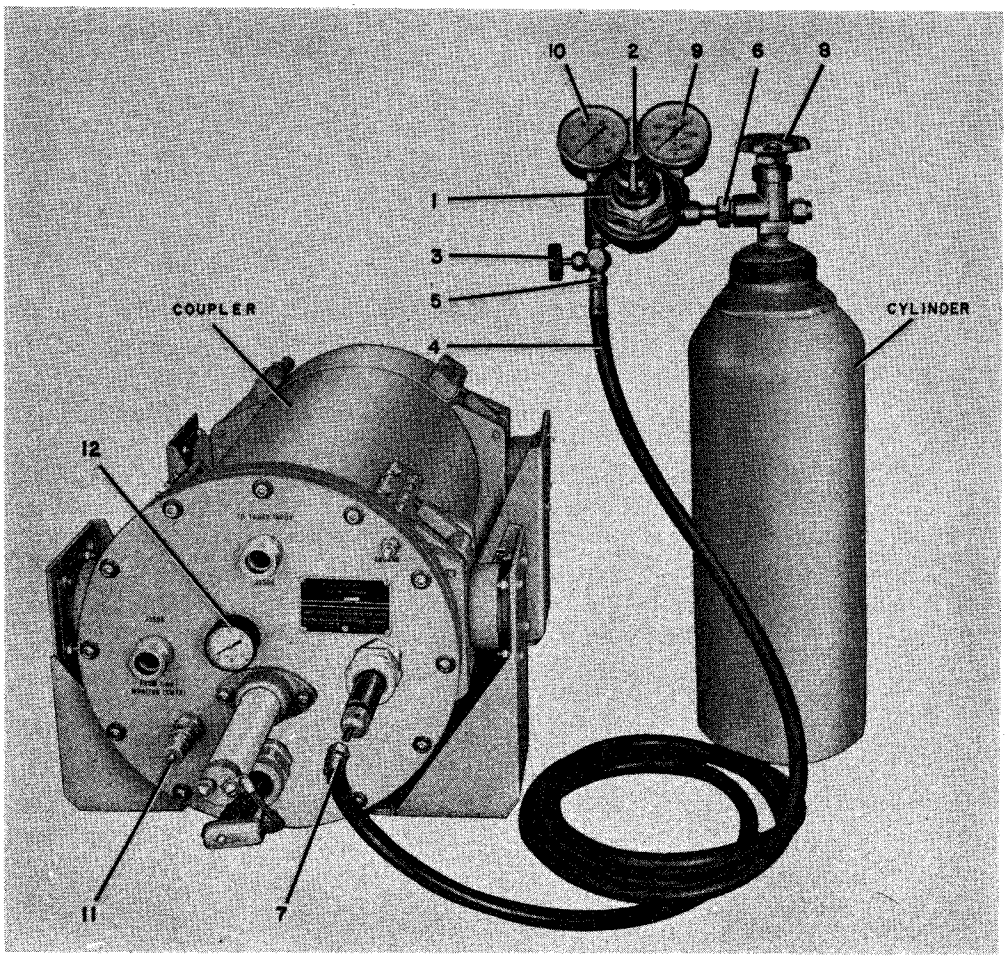

Figure 6–37. Typical Pressurizing Procedure