

SECTION V MAINTENANCE

1. TROUBLE SHOOTING.

The table of voltage measurements located at the end of the alignment procedure will help in locating troubles which might arise in the 75A-4. Most normal receiver troubles such as burned-out tubes,

loose connections, noisy volume controls etc., are easily discovered and remedied. However, should more obscure troubles arise, only a trained and competent repairman should be allowed to service the receiver. The following table gives a few possible causes for failure that might be associated with tubes having unusual functions.

TUBE	FUNCTION	SYMPTOM	CAUSE AND REMEDY
V-7	"Q" Mult.	Insufficient rejection notch. Notch not centered on dial when signal is centered in passband.	Realign L-26 and L-36 per part 6. Set panel control to midscale and adjust L-26 for notch.
V-10	MUTING DIODE	Insufficient muting.	Check muting voltage; should be +20 volts for 40 db muting.
V-11	SSB-CW DET	Hum level high.	Heater-cathode leakage in V-11 or V-20. Replace tube.
V-12	NOISE LIMITER	Excessive hum.	Heater cathode leakage in V-12. Try new tube.
V-21	AVC AMPLR	Insufficient AVC.	Bad tube or misalignment of T-4. Leaky AVC by-pass.
V-19	BIAS RECTIFIER	Excessive distortion.	Low bias voltage. Try new tube.

2. FUSE.

The 75A-4 is supplied with a 2 ampere fuse. If the fuse blows, do not replace it until the trouble has been determined and remedied. Use only a type 3AG Slo-Blo fuse of 2 ampere capacity.

3. TEST EQUIPMENT REQUIRED FOR 75A-4 ALIGNMENT.

- a. Signal generator.
- b. Vacuum tube voltmeter.

4. PRELIMINARY CHECKS.

- a. 2 ampere fuse in holder.
- b. Output voltage of power supply at approximately 170-V. (Measure at C-94B to ground.) Unless specifically changed in the following procedures, keep the following controls in the positions noted:

PASSBAND TUNING to 0

NOISE LIMITER to OFF

REJECTION TUNING to 0

SELECTIVITY to 3 KC FILTER

OFF-STANDBY-ON CAL to ON

5. 455 KC IF ALIGNMENT.

- a. Set the REJECTION TUNING Control to OFF, RF GAIN to maximum, the AM CW-SSB switch to AM, the AVC switch to FAST and the OFF-STANDBY-ON CAL switch to ON.
- b. Connect the lead from the signal generator to pin 1 of V-9, and tune the signal generator to 455 KC.
- c. Connect the VTVM to the AVC TEST POINT.
- d. Increase the signal generator level until an increase above the static level is noted on the VTVM.
- e. Adjust tuning cores of T-4 for a maximum indication on the VTVM.
- f. Connect VTVM to DIODE LOAD TEST POINT and set AVC switch to OFF.
- g. Adjust tuning cores of T-3 for a maximum indication on the VTVM.
- h. Connect signal generator to pin 1 of V-8.
- i. Adjust L-27 for maximum indication on VTVM.

6. REJECTION TUNING ALIGNMENT.

- a. Tune in 1800 kc calibration signal with KILOCYCLES dial to exact center of passband by watching "S" meter.
- *b. Adjust ANT TRIM until an "S" meter reading of exactly S9+40 is obtained.
- c. Turn R-36 to full counterclockwise position.
- d. Turn REJECTION TUNING Control (C-72) to center of passband.
- e. Adjust L-26 for minimum "S" meter reading
- f. Turn R-36 clockwise until an S meter reading of S-7 is obtained.
- g. Recheck steps d. and e., readjust where necessary.

If difficulty in the final adjustment of L-26 is encountered, the REJECTION TUNING Control may be moved slightly to compensate for small errors in L-26.

A rejection notch which is deeper than S-7 may be obtained with a higher setting of R-36. This is not advisable, however, because of the resulting instability such as hum modulation and a tendency for the "Q" multiplier circuit to lock to a strong interfering signal.

*If it is not possible to adjust to exactly S-9+40, use S-9+20 and set R-36 so "S" meter reads "O" at null.

The effect is quite similar to that obtained by operating a regenerative receiver too near to the edge of oscillation.

As R-36 is advanced even further clockwise, the "Q" multiplier circuit will oscillate. This causes the depth of the rejection notch to decrease sharply as R-36 is rotated through the point where oscillation begins.

7. BFO ALIGNMENT.

There are several conditions that might cause a need for resetting the BFO to frequency.

The first is where a slight drift of frequency produces a need for resetting the BFO to frequency.

The second is where the front panel has been removed and where the BFO knob (BANDPASS TUNING) has been removed from the shaft.

The third condition is where the BFO coil assembly has been replaced and a tracking problem exists.

a. SIMPLE ALIGNMENT. Where simple alignment of BFO frequency is concerned:

- (1) Turn REJECTION TUNING to OFF, set AM CW-SSB to AM. Select 3-KC filter. Select FAST AVC.
- (2) Set OFF-STANDBY-ON CAL switch to CAL.
- (3) Tune in a calibration signal with KILOCYCLES DIAL to exact center of passband by watching "S" meter.
- (4) Set PASSBAND TUNING to 0. Set AM-CW SSB to CW SSB.
- (5) Remove plug from top of BFO can and adjust inductance slug for zero beat.

b. Where the front panel or BANDPASS TUNING knob has been removed and the calibration of the BANDPASS TUNING knob has been lost:

- (1) If the tracking between the VFO and the BFO has not been disturbed, merely set the VFO frame so that the tubes are straight up, tune in a CAL signal to zero beat and put the BANDPASS TUNING knob on shaft with the marker on zero. Tighten the setscrews.
- (2) If the tracking between the VFO and BFO has been disturbed, (BFO shaft out of track at the flexible coupler or at the metal belt pulley) see the paragraphs below.

c. Where the BFO coil assembly has been replaced and complete tracking is necessary:

- (1) The new BFO coil is very nearly aligned when it is purchased i. e., the trimmer capacitor and coil slug are set to produce 455 KC at the correct position in the pitch control capacitor C-117 and a blue dot is painted at the root of the shaft of C-117 to use in initially positioning C-117.

Section V
MAINTENANCE

(2) After the BFO coil is properly connected, connect up the metal belt but allow the pulley to remain free on the BFO shaft.

(3) Set the VFO frame with the tubes straight up and tune in a CAL signal to dead center on the KILOCYCLES dial and set the DIAL SET to 0.

(4) Turn the AM CW-SSB Control to CW-SSB and turn the BFO shaft to zero beat with the blue dot upward.

(5) Set the PASSBAND knob to zero and tighten its setscrews.

(6) Tighten the setscrews in the pulley.

(7) Turn the PASSBAND TUNING Control through its range and see if the BFO tone stays at reasonably close to zero beat throughout the range. If an error of over 50 cps is experienced, the BFO can be retracked as follows:

NOTE

Because the following procedure is difficult do not attempt it unless the BFO tracking error is really objectionable.

(9) Use 6 KC filter, setup for CW operation, tune PASSBAND TUNING to 0 and tune in a CAL signal to zero beat with KILOCYCLES dial on the 160-meter band.

(10) Peer down in the BFO can and note the positions of the two trimmer adjustment slots. Make a drawing if necessary.

(11) Turn the inductance trimmer (L-31) 10 degrees or so clockwise.

(12) Return to zero beat by turning the trimmer capacitor C-118.

(13) Now offset the KILOCYCLES dial on the low frequency side of 0 until a very low frequency tone is produced.

(14) Tune the PASSBAND TUNING Control through its range and see if the tone error is any better. (The change will be only in the order of a few cps so frequency measuring equipment should be used if available.)

(15) If the results are favorable return the KILOCYCLE dial to zero beat and repeat steps 11 through 14.

(16) If the error is greater, return the trimmers (L-31 and C-118) to their original positions and repeat steps 12 through 14 except turn the inductance trimmer L-31 in the other, or counterclockwise, direction.

(17) Repeat the alignment procedure until no better results can be obtained. The error should now be less than 50 cps.

NOTE

An error produced by backlash is possible. This error must not be included when checking for alignment, therefore when the end stops of the PASSBAND TUNING knob are reached, back up the knob very slightly to take up the backlash.

NOTE

It should be possible to swing the BAND-PASS TUNING knob 2.5 KC each side of center without being stopped either by the VFO frame hitting the chassis or by the BFO shaft end stops. If either of these occur, reset the BFO end stops and BAND-PASS TUNING knob as required and reset the BFO frequency to zero beat with L-31.

8. VARIABLE IF AND 160-METER BAND ALIGNMENT.

a. Connect signal generator to antenna input through a 100-ohm dummy antenna, and connect VTVM to DIODE LOAD test point.

b. Connect audio output meter to audio terminals 500 and G and rear of receiver.

c. Set AM CW-SSB switch to AM, AUDIO GAIN to maximum, and RF GAIN to maximum. Select 3 KC mechanical filter.

d. Set receiver dial and signal generator to 1.6 MC, and adjust tuning slugs L-18, L-22, and T-1 for maximum output indication.

e. Set receiver dial and signal generator to 2.4 MC, and adjust capacitor C-7, C-53, and C-56 for maximum output.

f. Repeat steps d. and e. until no further increase is noted in output.

9. ALIGNMENT OF CRYSTAL OSCILLATOR.

a. Connect VTVM through a 1 megohm resistor to pin 2 of V-3. Turn AM CW-SSB to AM.

b. Set BAND switch to 80 and adjust L-12 for maximum output indication.

c. Successively change BAND switch to 40, 20, 15, 11, 10, 10 and adjust L-13, L-14, L-15, L-16, L-17, and L-11 in that order for a maximum output indication. Adjust L-13 core one-quarter turn into coil from peaked position.

d. The frequency of the crystals may be adjusted over a limited range by the adjustments of steps b. and c. After other alignment operations are completed, this method may be used to reduce the calibration error between bands.

e. Turn on the CAL oscillator (100 KC crystal standard) being sure it is on frequency. (See part 5 of section II for adjustment), and tune the receiver to zero beat at exactly 2.0 MC.

NOTE

Do not turn tuning dial or PASSBAND TUNING during the remainder of this adjustment.

f. Turn BAND switch successively to the remaining bands, and adjust the receiver to zero beat by repeating steps b. and c. Be sure that the crystal oscillator does not stop oscillating or does not start oscillating at a spurious frequency.

10. RF ALIGNMENT.

a. Connect signal generator to antenna terminals on receiver, and VTVM to DIODE LOAD test point.

b. Rotate BAND switch to 160, and tune signal generator and receiver to 1.6 MC.

c. Adjust tuning core in T-1 for maximum diode load voltage.

NOTE

ANT TRIM shall be set to half capacity while aligning all bands.

d. Tune the signal generator and receiver to 2.4 MC, and adjust capacitor C-7 for maximum diode load voltage.

e. Repeat steps c. and d. until no further increase in output is noted. If the 160-meter coil was aligned along with the 1.5 to 2.5 MC IF, disregard the above and proceed with the remainder of the bands.

f. Repeat steps c., d., and e. for the other bands using the following table as a guide.

BAND	RECEIVER AND SIG. GEN. FREQ. LOW END	RF "L"	ANT "L"	RECEIVER AND SIG. GEN. FREQ. HIGH END	RF "C"	ANT "C"
160	1.6	-	T-1	2.4	-	C-7
80	3.3	L-6	T-2	4.1	C-23	C-8
40	6.9	L-7	L-1	7.7	C-26	C-11
20	14.1	L-8	L-2	14.9	C-28	C-13
15	20.9	L-9	L-3	21.7	C-30	C-15
*11	27.1	-	-		C-31	-
*10	28.1	L-10	T-7	28.9	C-32	C-16
*10	29.5				C-17	

*In performing the alignment of the 11 and the two 10-meter bands, a specific sequence is necessary. First, align the 28 to 29 MC band in the normal manner with the ANT TRIM at midscale. The 26.5 to 27.5 MC band and the 29 to 30 MC bands are aligned at one point only by RF trimmers, C-31 and C-17. It is necessary to retune the ANT TRIM for resonance on these bands since no alignment trimmers are provided in the antenna circuit. Any retuning of L-10 after alignment will affect the tracking of bands 11, 10 and 10.

11. VFO ADJUSTMENT.

The VFO is calibrated at the factory and should require adjustment at only widely separated intervals. If the calibration error becomes excessive for operation or beyond the point where the vernier dial corrector (ZERO SET Control) can correct, the following procedure should be followed to make correcting adjustments:

- a. Use the 100 KC/s calibrator. Allow the receiver to warm up from 1 to 2 hours.
- b. Set the BAND CHANGE switch to the 160-meter band. Tune KILOCYCLES dial to 1.5 MC/s. Set up in accordance with paragraph 9 of OPERATION section to zero beat with calibrator signal. Note the dial reading if fiducial line cannot be set to 0.
- c. Rotate KILOCYCLES dial to 2.5 MC/s and exactly tune until zero beat is obtained. Do not re-adjust BFO or ZERO SET Control. The calibration error is then the number of dial divisions more or less than the 10 turns it should take to cover the range. Usually, the error tends to be toward more rotation of the KILOCYCLES dial than the 10 turns that should be required. To correct this error, proceed as follows:

- (1) Rotate the KILOCYCLES dial towards and through dial zero until a total of 1.8 times the dial division error has been counted. Engage the trimmer adjusting stud with a strong thin wire and turn until zero beat is restored. The ZERO SET adjustment can now be rotated so that the ZERO SET is set to dial zero.

- (2) To check the accuracy of the adjustment retune the KILOCYCLES dial to 1.5 MC/s and check the calibration error. If the adjustments have been done carefully less than 1/2 division dial error will be found. The above procedure can be repeated until satisfactory results are obtained. This endpoint adjustment restores factory accuracy to the intermediate points, also.

- (3) If it is desired to recenter the dial vernier pointer the following additional procedure should be followed. Set the ZERO SET Control to midscale, loosen the two setscrews of the VFO dial-shaft coupler and carefully turn the oscillator shaft until zero beat is obtained. During the VFO adjustment, best results in frequency readings will be obtained if the AVC is OFF and the RF GAIN Control is used at a low value.

12. TWEET TRAP ADJUSTMENT.

- a. A third order tweet appears at 3.533 MC in the 80-meter band caused by the 5.7 crystal beating with the second harmonic of the VFO at the mixer V-5.
- b. Turn the AM CW-SSB switch to CW-SSB and tune in the tweet.
- c. Adjust the core of L-23 until the level of tweet is minimum.

13. AVC THRESHOLD (R-9).

- a. Connect VTVM to AVC test point and ground and set range switch to 5-volt range.
- b. Set RF GAIN to maximum. Select FAST AVC.
- c. Feed a 29.5 MC signal from a signal generator into the antenna terminals using a 100-ohm resistor in series with the signal generator.
- d. Tune in the signal "on the nose".
- e. Increase the input signal until a definite increase in AVC voltage is noted and record the input.
- f. Adjust R-9 so that the AVC threshold occurs with 3 uv input.

14. DIAL CORDS.

The front panel must be removed for replacement of the dial pointer cord or the drum rotator cord. Figure 5-1 shows both cords in place and the direction in which the restringing should proceed.

- a. REMOVING FRONT PANEL. (See figure 5-4).

- (1) Remove the six panel screws.
- (2) Remove the following knobs:

REJECTION TUNING

SELECTIVITY

PASSBAND TUNING (see CAUTION below)

ANT TRIM

BAND CHANGE

KILOCYCLES TUNING

CAUTION

Set the PASSBAND TUNING Control knob on the index mark (straight up) and do not move the control after the knob has been removed. If the control has been accidentally moved, see part 7 for instructions for adjusting the knob position.

b. **POINTER CORD.** Obtain a type 432 1018 00 Collins Dial Cord.

(1) Scribe a mark on the VFO shaft and the KILOCYCLES dial hub to mark their relative positions and remove the KILOCYCLES dial.

(2) Turn the tuning knob to the clockwise stop.

(3) Start at point X in the drawing with the cord hooked to one end of the spring (part number of spring is 503 1240 001).

(4) Bring cord around pulley C to pulley B.

(5) Wrap around pulley B clockwise, through the deep slot, around the tab, and back through the shallow slot. Wrap around pulley B two times clockwise.

(6) Wrap cord around pulley A and loop the end on the free end of the spring.

(7) Fasten the pointer to the cord, tune in a station of known frequency and adjust the pointer to the correct setting.

(8) Replace the KILOCYCLES tuning dial. Match up the scribe marks (see step (1)) and tighten setscrews.

(9) Replace the panel.

c. **DRUM CORD.** Obtain a 432 1020 00 Collins Dial Cord.

(1) Turn the band switch to the 1.5 - 2.5 MC band (pulley D at counterclockwise stop).

(2) Turn pulley E approximately one turn and hold the tension spring taut.

(3) Make approximately 3/4 turn around pulley D and hook cord to tab.

(4) Extend the cord around pulley E and hook to the tab. Release the tension spring.

(5) Replace the panel.

(6) Loosen the setscrew in the drum hub opposite the coil tension spring, and align the dial calibration to the 1.5 - 2.5 MC band. Then tighten the setscrew.

TABLE 5-1. VOLTAGE, AND RESISTANCE MEASUREMENTS

		Pin Number									
TUBE		1	2	3	4	5	6	7	8	9	PLATE CAP
V-1	DC V.	-22.5	7.5			88	64	8			
	AC V.			0	6.3						
	Ohms	680K	4700	0		00	140K	4700			
V-2	DC V.	-5.7	0			190	175	0			
	AC V.			0	6.3						
	Ohms	1.5 meg	0	0		20K	50K	0			
V-3	DC V.	140	-2.7	2.3			0	0	0	190	
	AC V.				6.3	0					
	Ohms	22K	25K	120		0	0	510K	0	21K	
V-4	DC V.	175	0	1.5			175	-2.6	1.8		
	AC V.				0	0				6.3	
	Ohms	21K	0	330	0	0	21K	10.5K	330		
V-5	DC V.	105	-3.8	1			0	0	0	190	
	AC V.				6.3	0					
	Ohms	27K	100K	68		0	0	0	0	21K	

Section V
MAINTENANCE

TABLE 5-1. VOLTAGE, AND RESISTANCE MEASUREMENTS (Cont.)

		Pin Number									PLATE CAP
TUBE		1	2	3	4	5	6	7	8	9	
V-6	DC V.	-2.8	0			190	100	*4			
	AC V. Ohms	1.8 meg	0	0	6.3	20K	35K	*2.6K			
V-7	DC V.	185	0	2.3			185	0	2.3		
	AC V. Ohms	21K	100K	470	0	0	20K	330K	470	6.3	
V-8	DC V.	-5.7	0			190	95	0.65			
	AC V. Ohms	1.4 meg	0	0	6.3	22K	36K	220			
V-9	DC V.	-.7	0			185	85	1.2			
	AC V. Ohms	420K	0	0	6.3	22K	68K	150			
V-10	DC V.	1.4	0			.85	0	0			
	AC V. Ohms	3.3K	70K	0	6.3	00	00	00			
V-11	DC V.	140	0	3.6			84	0	3.6	0	
	AC V. Ohms	33K	100K	820	0	0	75K	100K	820	6.3	
V-12	DC V.	*** -13.5	*** -13.5			*** -13.5	0	*** -13.2			
	AC V. Ohms	400K	470K	0	4.3	** 400K	00	250K			
V-13	DC V.	69	0	1.5			75	0	1.4	0	
	AC V. Ohms	240K	68K	3.3K	0	0	240K	510K	3.3K	6.3	
V-14	DC V. AC V. Ohms										
V-15	DC V. AC V. Ohms										
V-16	DC V.	0.1	0.1			15	0	-.5			
	AC V. Ohms	340K	340K	0	6.3	3.3K	00	2.2 meg			
V-17	DC V. AC V. Ohms	00	22K	00	68	00	72	00	22K		

TABLE 5-1. VOLTAGE, AND RESISTANCE MEASUREMENTS (Cont.)

Pin Number

TUBE		1	2	3	4	5	6	7	8	9	PLATE CAP
V-18	DC V. AC V. Ohms	0 00	0 0	0 00	0 00	160 23K	0 00	0 00			
V-19	DC V. AC V. Ohms		-135 30K	0 0	6.3 0	120AC 0	0 00				
V-20	DC V. AC V. Ohms	-5 150K	0 0	6.3 0	0 0 0	14 10K	42.5 00	0 0			
V-21	DC V. AC V. Ohms	0 1 meg	0 0	0 0	6.3 0	185 22K	75 82K	1.3 150			
V-22	DC V. AC V. Ohms	-11 168K	0 0	0 0	6.3 0	220 21K	205 20K	-11 168K			

NOTES:

1. AVC in OFF position.
2. Unless otherwise indicated RF GAIN adjusted until "S" meter needle rests at S-9 with no signal input.

* Depends upon setting of R-9.

** Depends upon setting of R-67.

*** AM CW-SSB at CW-SSB; NOISE LIMITER (R-67) at 1.

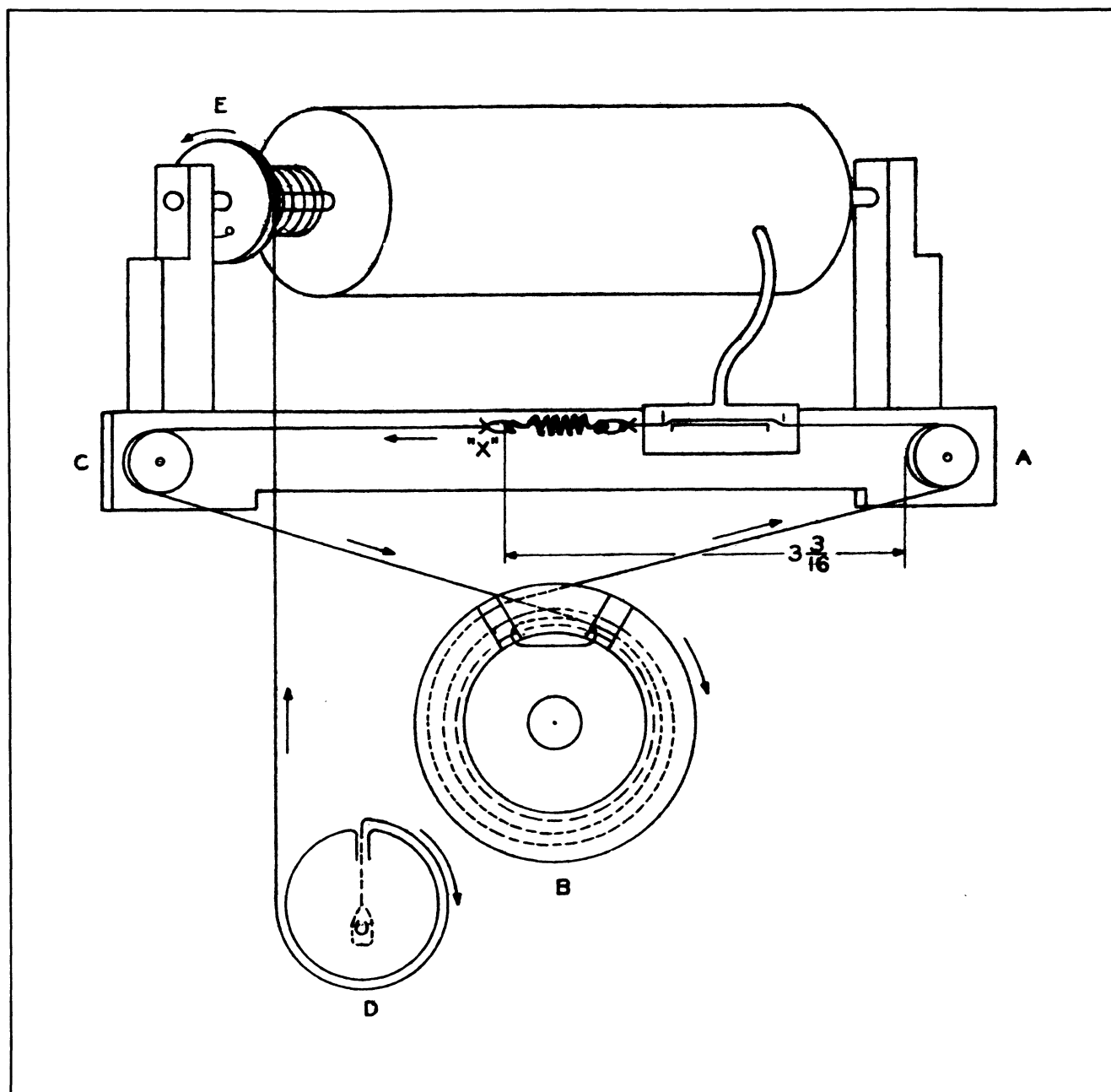


Figure 5-1. Dial Cord Replacement

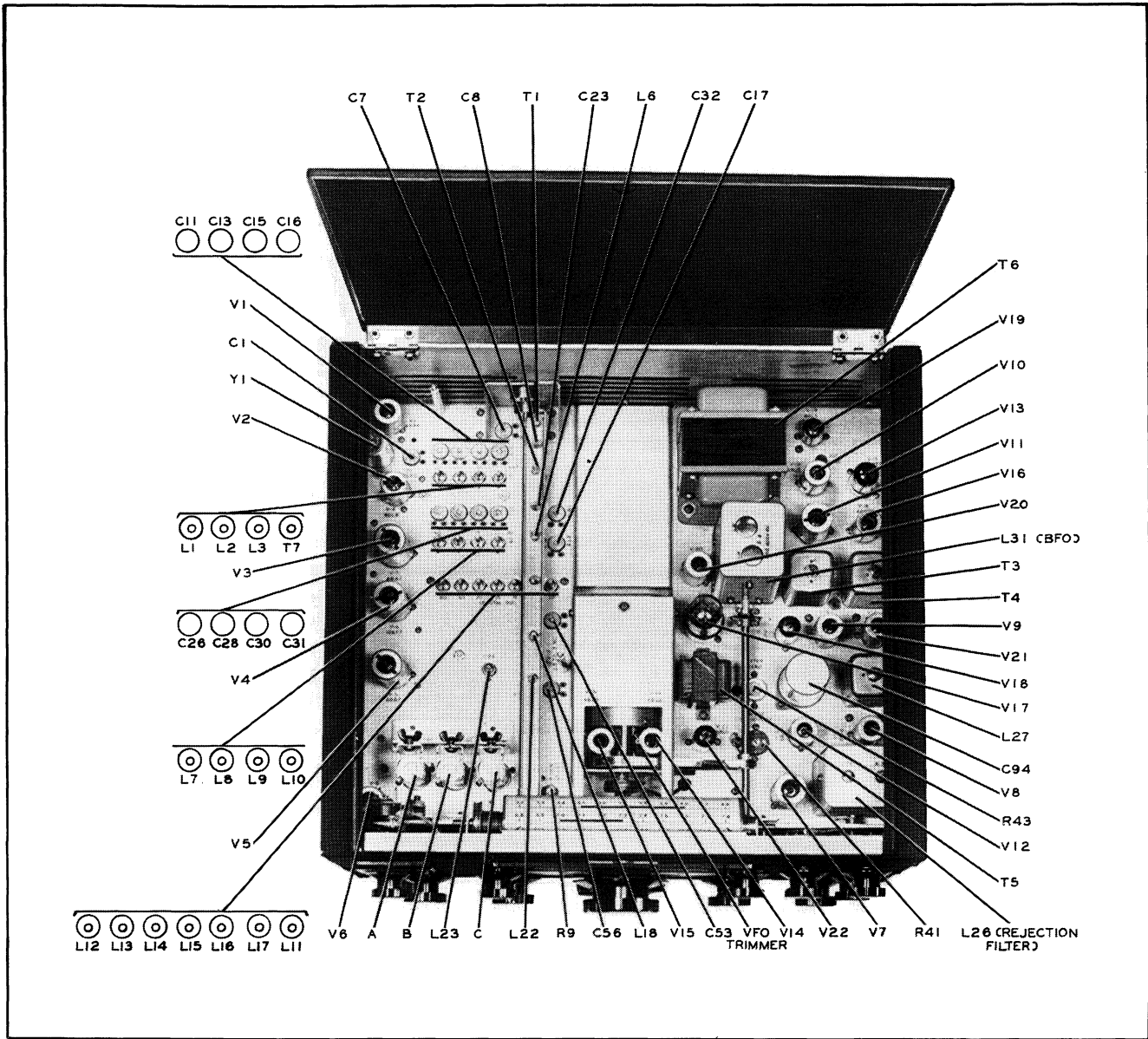


Figure 5-2. 75A-4, Top View

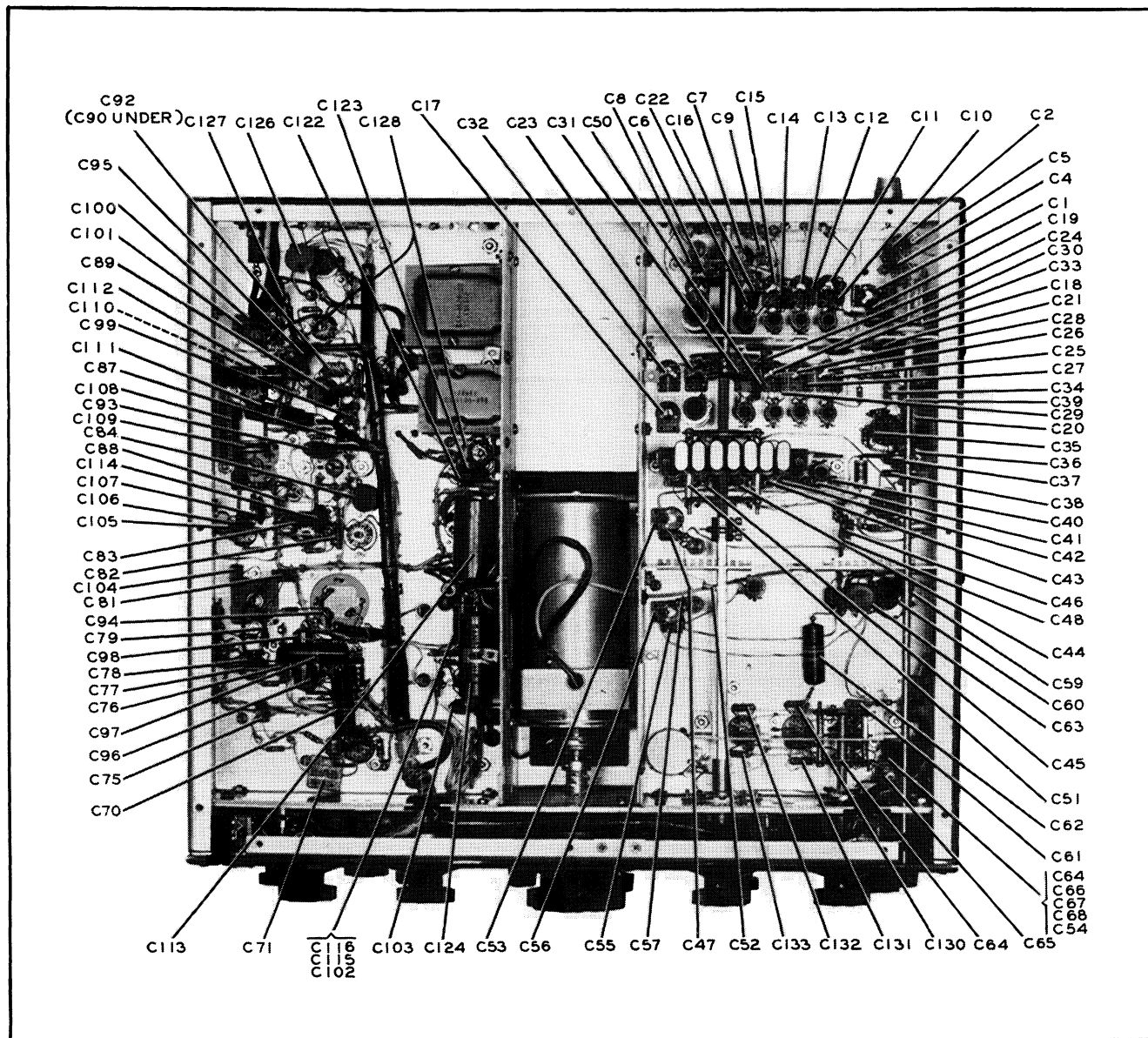


Figure 5-3. 75A-4, Bottom View, Page 1

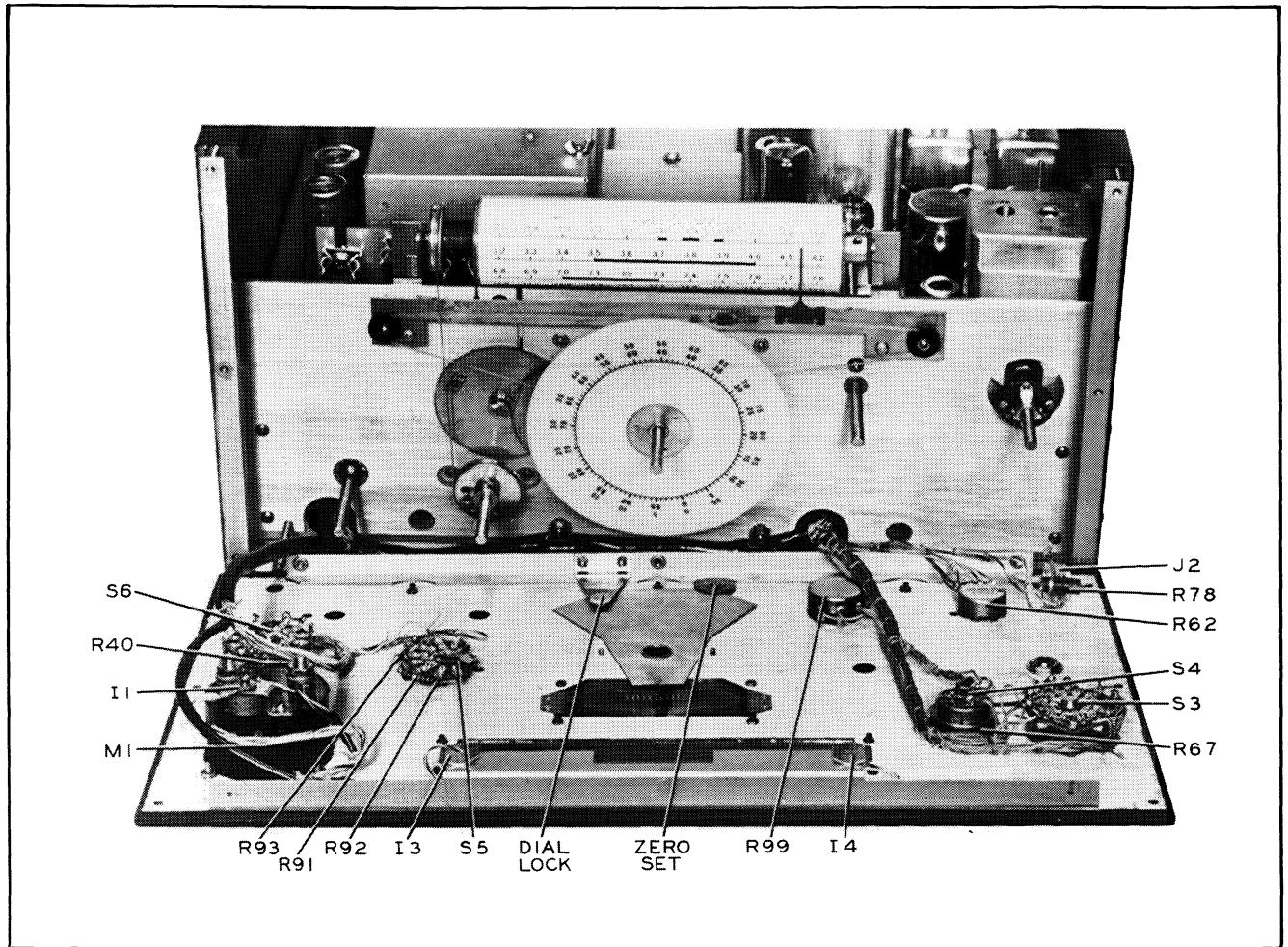


Figure 5-4. 75A-4, Front Panel Lowered

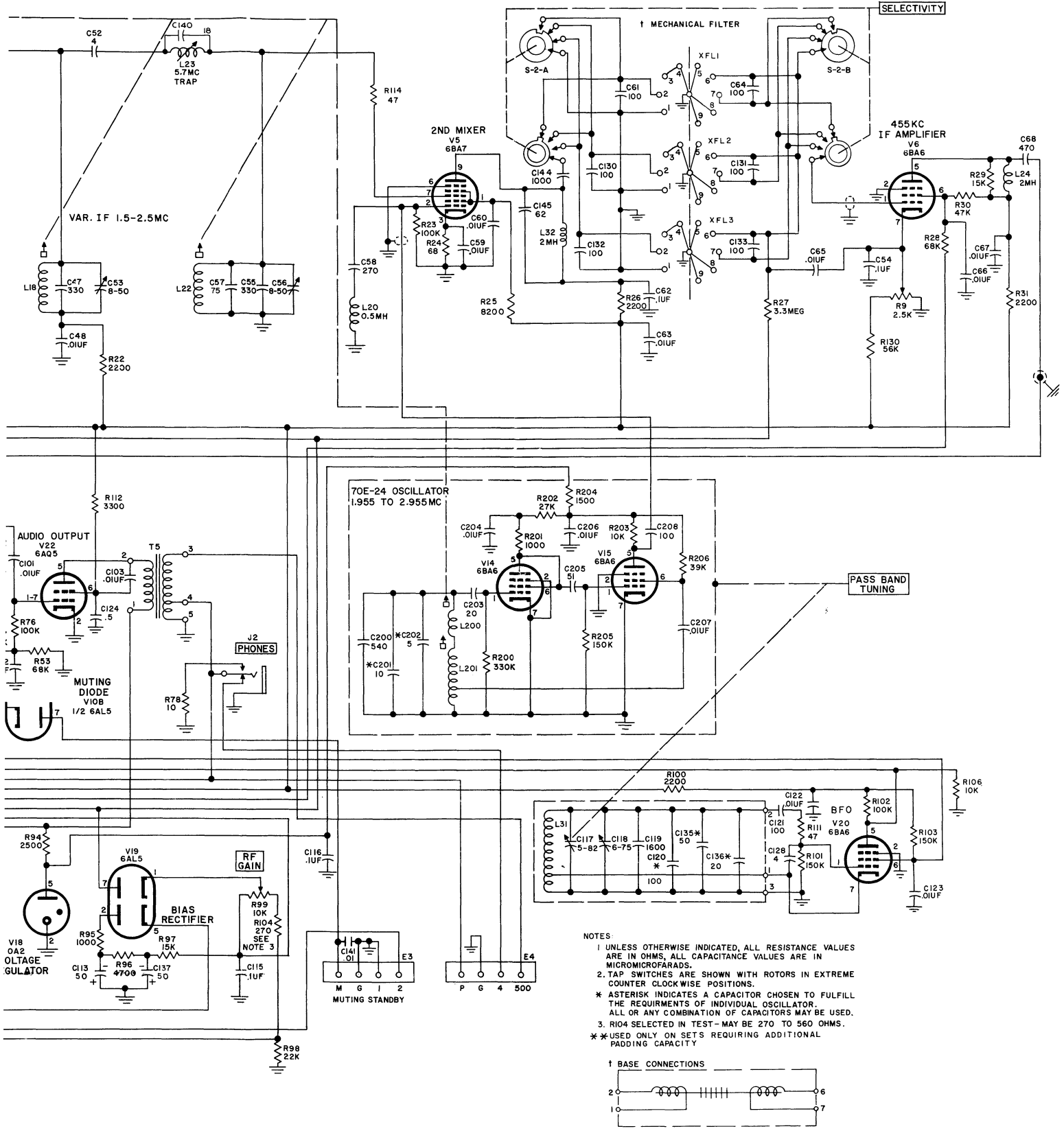
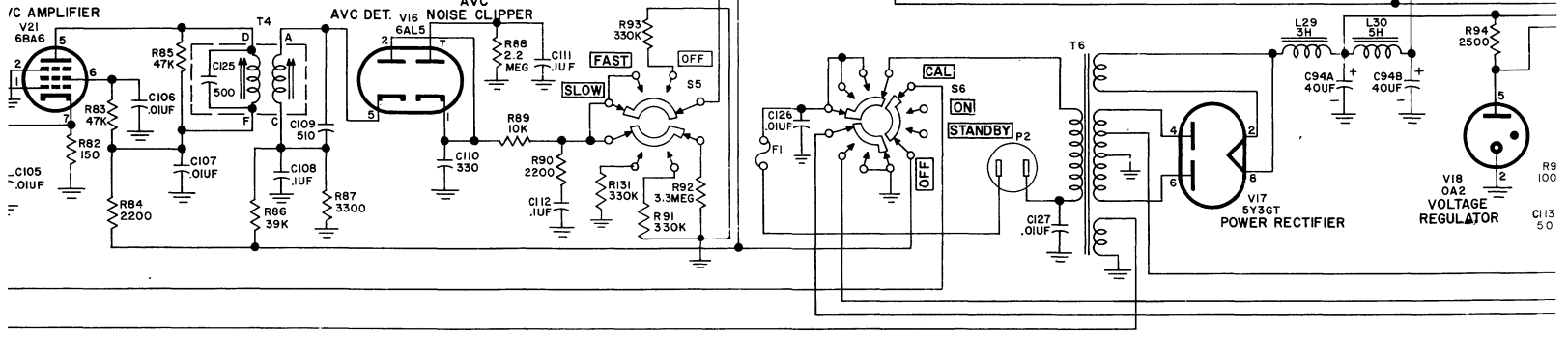
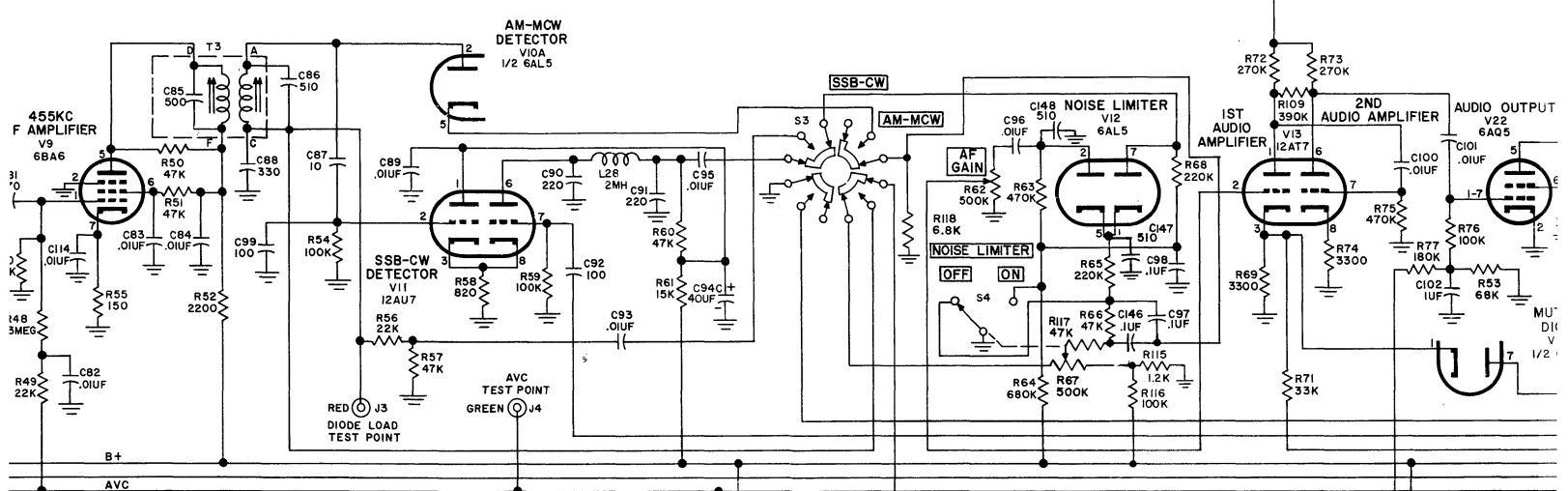
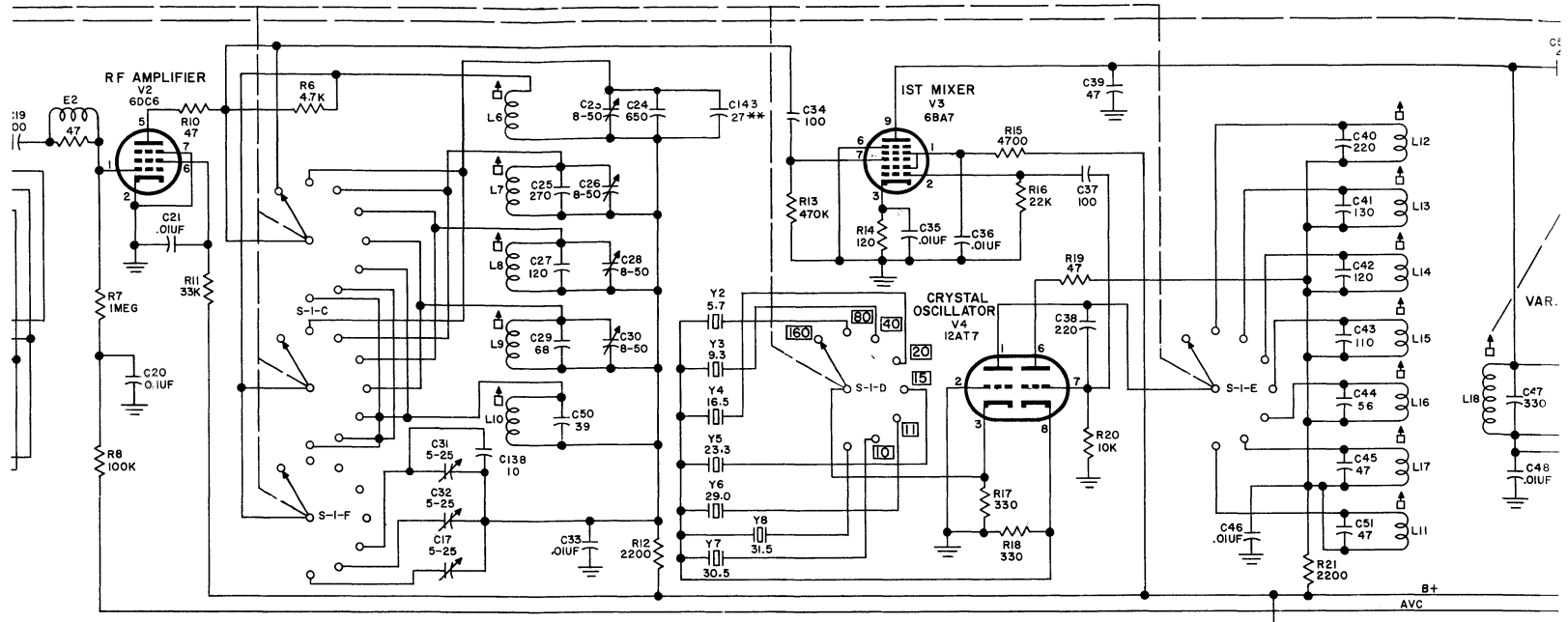
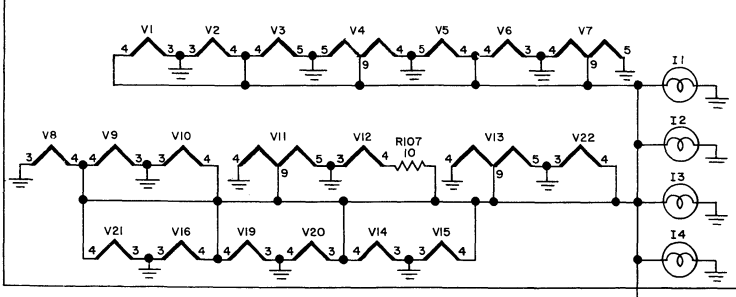
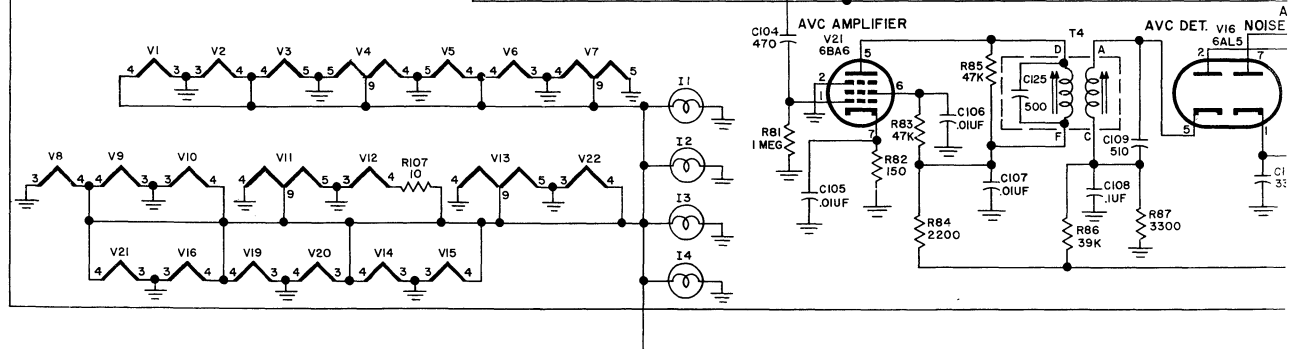
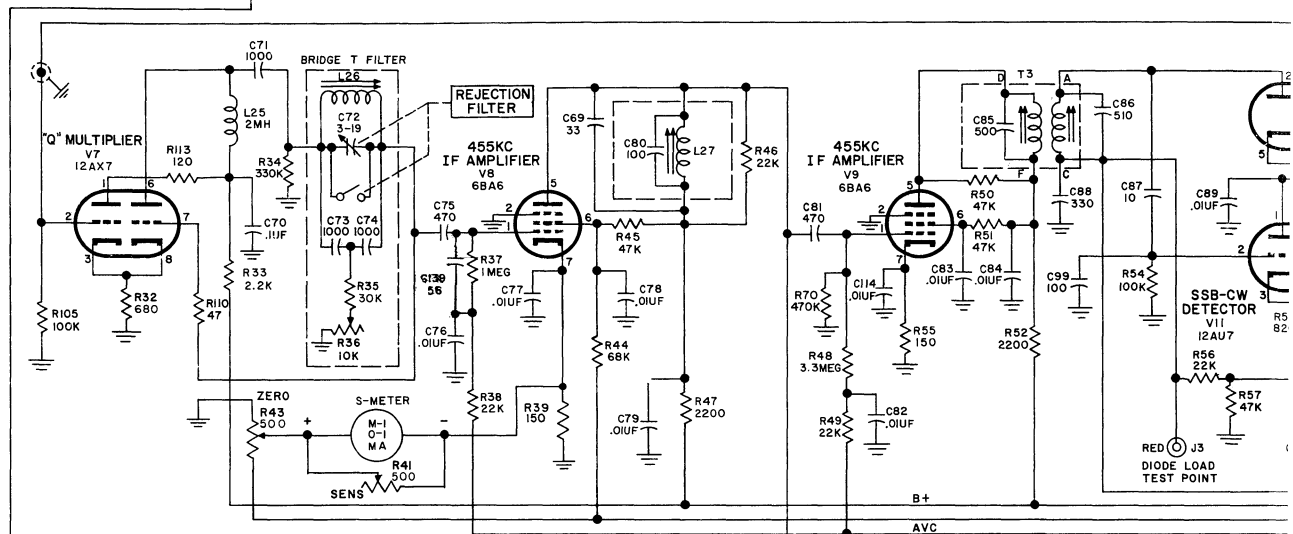
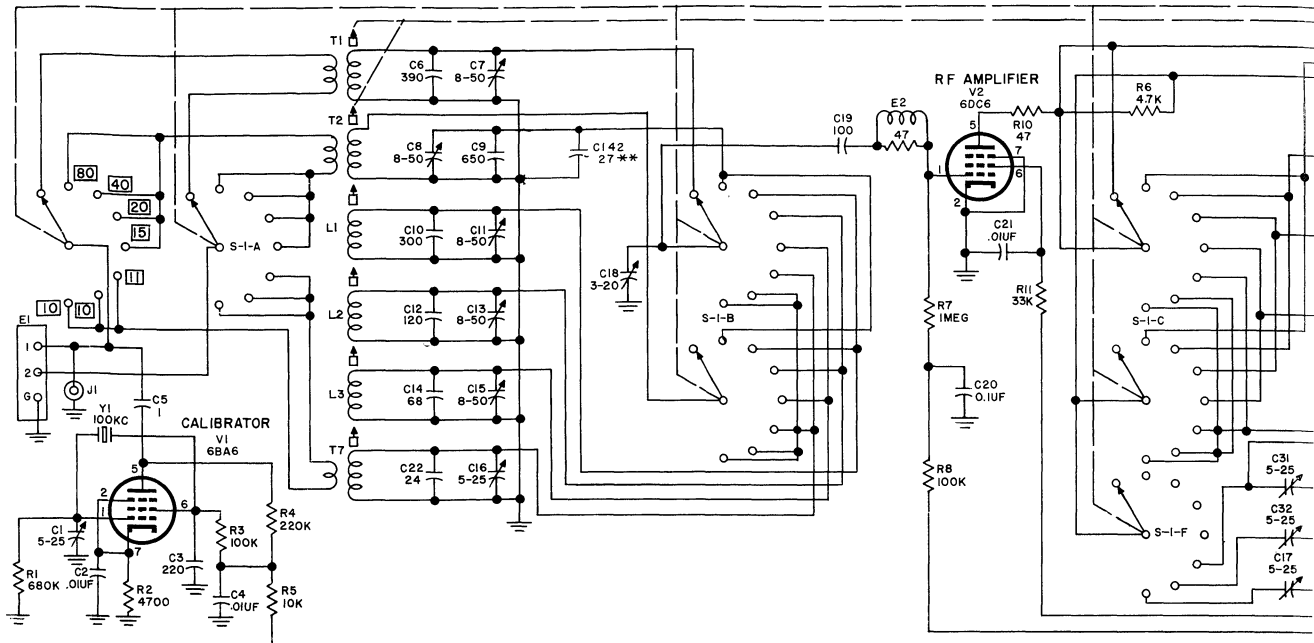


Figure 5-5. 75A-4 Receiver, Schematic Diagram





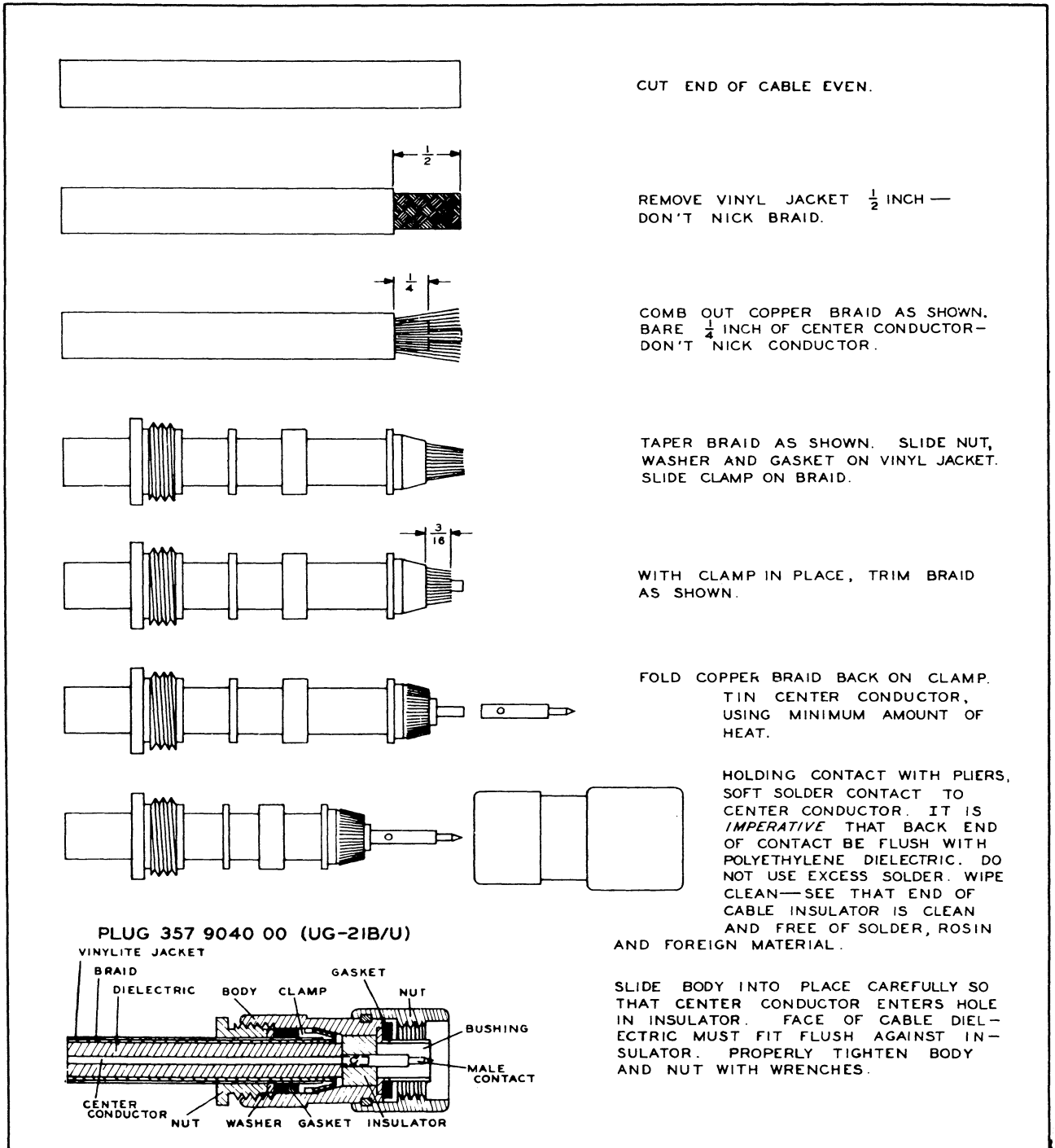


Figure 5-6. Assembling Plug UG-21B/U to Cable RG-8/U

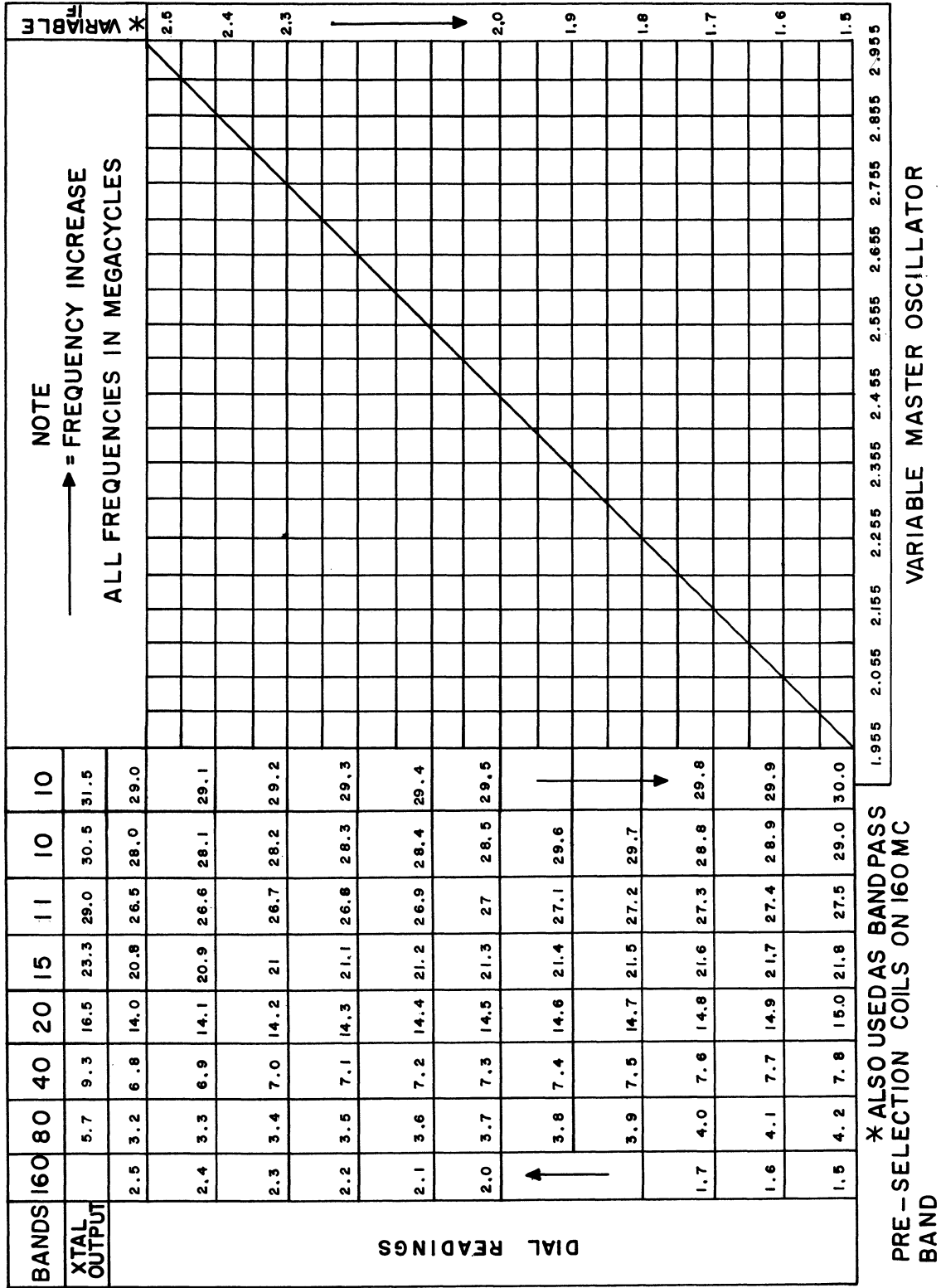
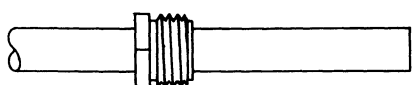
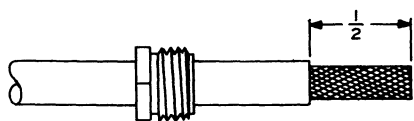


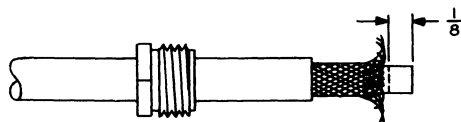
Figure 5-7. Dial Divisions Table



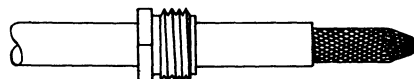
SLIDE NUT ONTO CABLE.
CUT END OF CABLE EVEN.



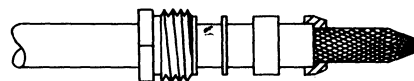
REMOVE VINYL JACKET FOR 1/2 INCH.
DO NOT NICK BRAID.



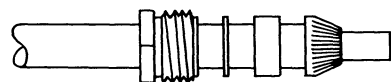
PUSH BRAID BACK AND REMOVE 1/8 INCH OF
DIELECTRIC AND CENTER CONDUCTOR



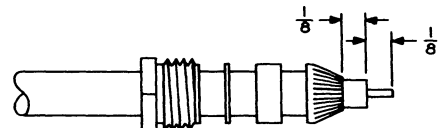
TAPER BRAID.



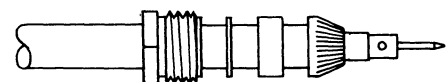
SLIDE WASHER, GASKET AND SLEEVE OVER TAPERED
BRAID. FIT INNER SHOULDER OF SLEEVE SQUARELY
AGAINST END OF JACKET.



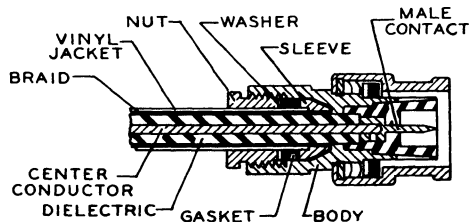
COMB OUT BRAID, FOLD BACK SMOOTH AS SHOWN
AND TRIM 3/32 INCH.



BARE CENTER CONDUCTOR 1/8 INCH.
DO NOT NICK CONDUCTOR.



TIN CENTER CONDUCTOR. SLIP MALE CONTACT IN
PLACE AND SOLDER. REMOVE EXCESS SOLDER. BE
SURE THAT CABLE DIELECTRIC IS NOT HEATED EX-
CESSIVELY AND SWOLLEN SO AS TO PREVENT DI-
ELECTRIC FROM ENTERING BODY.



PUSH INTO BODY AS FAR AS IT WILL GO. SLIDE
GASKET, WASHER AND NUT INTO BODY. SCREW INTO
PLACE, WITH WRENCH, UNTIL MODERATELY TIGHT.
HOLD CABLE AND BODY RIGIDLY AND ROTATE NUT.

Figure 5-8. Assembling Plug UG-260/U to Cable UG-58/U

NOTES