NAVSHIPS 91582

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-28

NORTHERN RADIO CO., INC.
143-5 WEST 22ND STREET
NEW YORK 11, NEW YORK

BUREAU OF SHIPS NAVY DEPARTMENT

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LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
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TEMPORARY CORRECTION T-2 TO INSTRUCTION BOOK FOR RADIO RECEIVING SET AN/FRR-28 (NAVSHIPS 91582)

In Table 8-4, "Combined Parts and Maintenance Parts List", make the following pen and ink corrections and then insert the temporary correction in front of the title page:

SYMBOL DESIG.	ITEM	ADD OR CORRECT TO:	REMARKS
C2-137	JAN No.	CP28A1EC254M	
C3-6	SNSN	N16-C-60036-1604	
C9-23	SNSN	-	The SNSN listed is for a capacitor without rounded plates - clarification pending.
E2-1	SNSN	N17-B-77536-1126	
E2-2	SNSN	N17-B-77639-2210	
E2-61	SNSN	N16-S-34520-3862	
E3-6	SNSN	N17-B-77692-6063	
E3-43	-	-	In description, change "8-32 set screws 90° apart" to read "8-32 set screws 60° apart".
E3-45	SNSN	-	No SNSN received to date.
E5-1	-	-	In description, change "7 in. lg." to read "6 in. lg."
F2-1	-	-	Correct letter prefix to read G17-F-16302-120.
F9-1	-	-	Correct letter prefix to read G17-F-16302-100.
F12-1	-	-	Change Mfg's part no. to read GE: #PY-15.
H2-7	SNSN	-	Correct SNSN to read G41-W-2449.
I2-1	-	-	Correct letter prefix to read G17-L-6297.
I2-7	SNSN	N16-D-46350-9258	
J3-4	SNSN	N17-C-73107-7652	
L2-53	SNSN	N16-C-74269-5501	
L3-7	-	-	Change NRCO dwg. no. in Column 7 to read A-110479.
O2-6	-	-	In Column 6, add #31004-1 to HMM part no.
O2-7	SNSN	N17-S-46770-3416	
O2-12	-	-	In description, change "approx 46¼ turns" to read "approx 46½ turns".
O2-19	SNSN	N17-S-46770-1901	
P2-9	SNSN	N17-C-71407-6585	
R3-25	SNSN	N16-R-91569-8072	
R10-20	SNSN	N16-R-50839-431	
R10-24	SNSN	N16-R-91031-4410	
S2-1AA	SNSN	N17-C-81977-6601	
S2-12	SNSN	N17-S-60683-2503	

SYMBOL DESIG.	ITEM	ADD OR CORRECT TO:	REMARKS
S10-5	-	-	In description, change "2 poles, 6 throws" to read "2 poles, 5 throws".
T2-6	-	-	In description, change "2 inductance units" to read "3 inductance units."
V9-1	SNSN	N16-T-56665	
V9-2	SNSN	N16-T-56611	
V10-4	SNSN	N16-T-56682	
V10-6	SNSN	N16-T-56677	
W12-1	-	-	In description, change "36 conductors 4 in. lg." to read "36 conductors 3 in. lg." Change "3 conductors 1-3/4 in. lg." to read "8 conductors 1-3/4 in. lg." Change "8 conductors 18-1/2 in. lg." to read "4 conductors 18-1/2 in. lg."
W12-10	SNSN	N16-C-11634-1272	
XF3-1	SNSN	N17-F-74267-5401	

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9 September 1952
Temporary Correction T-1
to Instruction Book for
Radio Receiving Set AN/FRR-28
NAVSHIPS 91582

NOTE

The changes noted in this Temporary Correction Sheet pertain to the following equipment Serial Numbers only:
For Radio Receiver R-450/FRR-28:
Serial No. 297 and up.
For Radio Receiving Set AN/FRR-28:
Serial No. 141 and up.

1. Make the following changes in Section 2:

Page 2-7:
In the last paragraph of the first column, delete "and coupling capacitor C45".

Page 2-9:
In the second column, the second paragraph from the bottom of the page should be changed to read: "The 455-kilocycle signal from the secondary of L32 in the tuned plate circuit of the first mixer stage, V5, is applied across resistors R32 and R33. The signal across resistor R32 is then applied to the control grid of the gate amplifier tube, V7. Cathode bias for the stage is supplied by the cathode resistor, R131. Screen voltage, which....".

Page 2-11:
Change the sentence beginning on the sixth line of paragraph 3c(9) to read: "The signal from the tuned grid circuit is developed across resistor R132 and applied to the control grid of the driver tube, V11, through parasitic suppressor resistor R55."

Change the second sentence in paragraph 3c(10) to read: "Bias is provided by the divider network consisting of resistors R78, R79, and R133".

Page 2-12:
Delete the following sentence from paragraph 3c(14): "If an external phone signal is fed to terminal E1, it is fed through potentiometer R84 to the grid of tube V16B."

Page 2-22:
Change the first sentence in the fourth paragraph of paragraph 6c(1)(a) to read: "When a keying signal is applied through grid limiting resistor R60 to the control grid of tube V6, plate current flows....".

Page 2-23:
Starting on the sixth line from the top of the first column, change the text to read: "....R45 to the plate of tube V6B. A small positive bias voltage is applied to the control grid of V6A from the voltage divider network consisting of R58 and R59. Resistor R48 limits the grid current. The cathode of V6A is connected directly to ground....".

Change the first sentence of the first paragraph in the second column to read: "When a negative keying signal is applied through resistor R60 to the control grid of tube V6A, the tube stops conducting."

Page 2-24:
Change the first sentence of the second paragraph of paragraph 6c(1)(d) to read: "When a mark signal is applied to Keyer KY-79/UR, resistor R60 is shorted by switch S2 and the grid of tube V5 is grounded....".

2. Make the following changes in Section 3:

Page 3-25:
In figure 3-15, delete the phono jack and relay jack on the rear panel of Receiver #1 and Receiver #2.

3. Make the following changes in Section 5:

Page 5-2:
Make the following changes to Table 5-2: The location of fuse F2-2 to "Left rear of receiver", and the ampere rating for F2-2 to "3/8".

4. In accordance with the above changes, the following illustrations have had the indicated corrections made. The corrected illustrations are shown at the end of this Temporary Correction:

Figure No.	Deleted	Added	Value Changed
2-11			C138, C140
2-25		R60	
2-26	R49	R58, R59, R60	
3-5	Phono and relay jacks deleted. Spare fuse deleted.	F2 Spare fuse holder for F1 and F2.	
4-2			
7-2			

4. (Cont'd)

Figure No.	Deleted	Added	Value Changed
7-4 7-5	F2, C100, R34, R102, J4	C185, C186, C187, R130, R131, R132, R133	
7-6	C45		
7-20		R58, R59, R60	
7-26			Voltage and resistance values for V7 (pins 1 and 7), V9 (pin 7), V10 (pin 7), V16 (pin 8).
7-30	C45, C100, R34, R102, E1, J4	C185, C186, C187, R130, R131, R132, R133	C138, C139, C140, C145, R65, R69, R103, R104, F2
7-31			R105 through R110
7-34		R58, R59, R60	
7-37	C100, R34, R102, E1, J4	C185, C186, C187, R130, R131, R132, R133	
7-38	C45		
7-39	(New illustration)		

5. Make the following changes in Section 8:

NOTE

For simplicity the columns in Table 8-4 will hereafter be referred to by number, reading left to right across the table. Thus the column headed "SYMBOL DESIG." will be (1) "NAME OF PART AND DESCRIPTION", (2) "FUNCTION", (3) "JAN AND (NAVY TYPE) NO.", (4) etc.

Page 8-4:
Item C2-3, column (8), delete C2-100; in (9) change quantity from 34 to 33.

Page 8-5:
Item C2-12, column (8), delete C2-138 and C2-145; in (9) change quantity from 3 to 1.

Item C2-15, column (8), delete C2-139 and add C2-145.

Page 8-10:
Item C2-92, column (8), add C2-138 and C2-139; in (9) change quantity from 1 to 3.

Page 8-11:
Item C2-100, all columns, delete information.

Item C2-102, column (8), add C2-185; in (9) change quantity from 11 to 12.

Page 8-13:
Items C2-138 and C2-139, column (2), change to read: "Same as C2-92".

Item C2-140, column (2), delete description and replace with "CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 430 mmf ±2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 15/32 in. wide, 7/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use."; in (4) change JAN type No. from CM35A102K to CM20C431G; in (5) change from N16-C-31090-4203 to N16-C-29998-6271; in (6) delete"AEV type No. 1467"; in (8) add C2-187; in (9) change quantity from 1 to 2.

Page 8-14:
Item C2-145, column (2), change from "Same as C2-12" to "Same as C2-15".

Page 8-18:
After symbol C2-184, add C2-185 in column (1); in (2) add "Same as C2-102"; in (3) add "Cathode By-pass V2-14B".

After symbol C2-185 add C2-186 in column (1); in (2) add "CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 18, MBCA Ref Dwg Group 1; 250,000 mmf ±10% tolerance; 600v DC working; hermetically sealed metal case; case dim., 2 in. lg, 1 in. dia; 1 axial wire lead type terminal, located on end; mineral oil impregnated; mineral oil filled; with internal ground connection; single hole mtg clamp; moisture and fungus proof; for general purpose use."; in (3) add "V2-1 plate and screen filter"; in (4) add "Spec No. JAN-C-25, JAN Type No. CP27A2EF254K"; in (8) add C2-186; in (9) add quantity 1.

After symbol C2-186 add C2-187 in column (1); in (2) add "Same as C140"; in (3) add "P/o AVC time constant circuit".

Page 8-31:
Item E2-1, all columns, delete information.

Page 8-45:
Item F2-2, column (2), delete description and replace with: "FUSE, CARTRIDGE: 3/8 amp, 250v; instantaneous; ferrule type, dim., 1/4 in. lg, 1/4 in. dia; glass covering; indicating clear window opaques; over-all dim., 1-1/4 in. lg,

Page 8-45 (Con'd)
1/4 in. dia; for general purpose use."; in (5) delete N17-F-16302-355; in (6) change from "BUS Type No, GJV-1/4" to "BUS Type No. AGC3/8"; in (8) add F2-4; in (9) change quantity from 1 to 2.

After F2-3, add F2-4 in column (1); in (2) add "Same as F2-2"; in (3) add "Spare for F2-2".

Page 8-50:
Item J2-4, column (1), change symbol from J2-4 to J2-5; in (3) delete function and replace with "'AC' outlet receptacle"; in (8) delete J2-4 and replace with J2-5; in (9) change quantity from 2 to 1.

Item J2-5, all columns, delete information.

Page 8-57:
Item L2-47, column 2, change from "....electrical data, coil ...." to "....electrical data, 3.0 mh, coil...."; in (5) delete N16-C-72680-2749; in (6) change from "ARTD Part No. 15616" to "HMM Part No. 15616G1".

Page 8-73:
Item R2-4, column (8), delete R2-102; in (9) change quantity from 11 to 10.

Item R2-5 column (8), delete R2-103 through R2-110; in (9) change quantity from 11 to 3.

Page 8-75:
Item R-2-22, column 8, delete R2-65; in (9) change quantity from 6 to 5.

Page 8-76:
Item R2-38, all columns, delete information.

Item R2-34, column (1), change symbol from R2-34 to R2-38; in (3), delete function and replace with "V2-8A plate voltage dropper"; in (8) delete R2-34 and add R2-130 and R10-60; in (9) change quantity from 28 to 29; shift the information contained in columns (1), (2), (3), (4), (5), (6), (8) and (9) so that item R2-38 follows item R2-37.

Page 8-77:
Items R2-43 and R2-51, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-78:
Item R2-56, column (2) change from "Same as R2-39" to "Same as R2-38".

Page 8-78 (Cont'd)
Items R2-62, R2-67, and R2-68, column (2), change from "Same as R2-34" to "Same as R2-38".

Item R2-63, column (8), add symbols R2-103 through R2-110; in (9) change quantity from 1 to 9.

Item R2-65, column (2), delete "Same as R2-22" and replace with "RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 22,000 ohm total resistance, ±5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use."; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF223J"; in (5) add N16-R-50371-431; in (6) add "AB Part No. EB2235; in (8) add R2-65 and R2-96; in (9) add the quantity 2.

Page 8-79:
Item R2-69, column (2), change from "....1 section, 1,000 ohms...." to "....1 section, 3,500 ohms"; in (4) change from "JAN Type No. RA20A1SA102AK" to "JAN Type No. RA20A1SA352AK"; in (5) and (6) delete all information; in (8) delete R2-74; in (9) change quantity from 2 to 1.

Item R2-74, column (2), delete "Same as R2-69" and replace with the full description of R2-69 before the changes have been carried out - that is with the description of the JAN Type No. RA20A1SA102AK resistor with a resistance value of 1,000 ohms; in (4) add "Spec No. JAN-R-19, JAN Type No. RA20A1SA102AK"; in (5) add N16-R-90754-3621; in (6) add CN; in (8) add R2-74; in (9) add the quantity 1.

Item R2-75, column (2), change to "Same as R2-38".

Page 8-80:
Item R2-81, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-82:
Item R2-100, column (2), change from "Same as R2-34" to "Same as R2-38".

Item R2-102, all columns, delete information.

Item R2-103, column (2), change from "Same as R2-5" to "Same as R2-63".

Item R2-96, column (2), delete description and replace with "Same as R2-65"; in (4), (5), (6), (8), and (9) delete information.

Page 8-83:
Items R2-104 through R2-110, column (2), change from "Same as R2-5" to "Same as R2-63".

Page 8-85:
Item R2-124, column (2), change from "Same as R2-39" to "Same as R2-38".

Page 8-86:
After R2-129 add R2-130 in column (1); in (2) add "Same as R2-38"; in (3) add "P/o AVC time constant circuit".

After R2-130 add R2-131 in column (1); in (2) add "RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref Dwg Group 2; 390 ohm total resistance, ±10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use."; in (3) add "V2-7 cathode resistor"; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF391J"; in (5) add "N16-R-49732-431"; in (6) add "AB Part No. EB3911"; in (8) add R2-131; in (9) add quantity 1.

After R2-131, add R2-132 in (1); in (2) add "RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 330,000 ohm total resistance, ±10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use."; in (3) add "V2-11 grid resistor"; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF334J"; in (5) add "N16-R-50758-431"; in (6) add "AB Part No. EB3341"; in (8) add R2-132; in (9) add quantity 1.

After R2-132, add R2-133 in (1); in (2) add "RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100 ohm total resistance, ±10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use".; in (3) add "Cathode resistor, tube V16A"; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF101K"; in (5) add N16-R-49580-811; in (6) add "AB Part No. EB1011", in (8) add R2-133 and R3-7; in (9) add quantity 2.

Page 8-87:
Item R3-7, columns (2), (4), (5), (6), (8), and (9), delete information; in (2) add "Same as R2-133".

Item R3-15, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-88:
Items R3-16 and R3-22, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-89:
Item R3-27, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-90:
Item R3-35, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-91:
Items R3-45, R3-46, and R3-48, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-92:
Item R3-52, column (2) change from "Same as R2-34" to "Same as R2-38".

Page 8-93:
Item R9-4, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-95:
Item R9-19, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-100:
Items R10-32, R10-34, and R10-35, column (2), change from "Same as R2-34" to "Same as R2-38".

Page 8-101:
Item R10-40, column (2), change from "Same R2-34" to "Same as R2-38".

Page 8-102:
After R10-57 add R10-58 in column (1); in (2) add "RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 270,000 ohm total resistance, ±10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use."; in (3) add "Keyer amplifier grid resistor"; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF274K"; in (5) add "N16-R-50741-811"; in (6) add "AB Part No. EB2741" in (8) add R10-58; in (9) add quantity 1.

After R10-58, add R10-59 in (1); in (2) add "RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10 megohm total resistance, ±10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia. max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use."; in (3) add "Negative DC keying grid bleeder"; in (4) add "Spec No. JAN-R-11, JAN Type No. RC20BF106K"; in (5) add "N16-R-51326-811"; in (6) add "AB Part No. EB1061"; in (8) add R10-59; in (9) add quantity 1.

Page 8-102 (Cont'd)
After R10-59 add R10-60 in (1); in (2) add "Same as R2-38".

Page 8-139:
Delete symbol R2-34 and quantity 2. Add symbol R2-38 and quantity 2.

Delete symbol R2-96 and quantity 1. Add symbol R2-65 and quantity 1.

Page 8-140:
Delete CM34A102K and symbol C2-140.

After CM20C330J add CM20C431J and symbol C2-140.

After CM35C103J add CP27A2EF254K and C2-186.

After RA20A1SA102AK add RA20A1SA352AK and R2-69.

After RC20BF105K add RC20BF106K and R10-59.

After RC20BF273K add RC20BF274K and R10-58.

After RC20BF333K add RC20BF334J and R2-132.

After RC20BF335K add RC20BF391J and R2-131.

For RA20A1SA102AK change symbol from R2-69 to R2-74.

For RC20BF101K change symbol from R3-7 to R2-133.

For RC20BF104K change symbol from R2-34 to R2-38.

For RC20BF223J change symbol from R2-96 to R2-65.

Page 8-141:
Delete N16-C-31090-4203 and C2-140. Delete N16-C-72680-2749 and L2-47.

After N16-C-29941-1543 add N16-C-29998-6271 and C2-140.

After N16-R-49723-751 add N16-R-49732-431 and R2-131.

Page 8-142:
Delete N17-B-77639-2210 and E2-2.

After N16-R-50722-431 add N16-R-50741-811 and R10-58.

After N16-R-50741-811 add N16-R-50758-431 and R2-132.

After N16-R-51110-811 add N16-R-51326-811 and R10-59.

Page 8-142 (Cont'd)
For N16-R-49580-811 change symbol from R3-7 to R2-133.

For N16-R-50371-431 change symbol from R2-96 to R2-65.

For N16-R-50633-811 change symbol from R2-34 to R2-38.

For N17-B-77536-1126 change symbol from E2-1 to E2-2.

Page 8-143:
Delete N17-F-16302-355 and F2-2.

For N17-C-73138-3593 change symbol from J2-4 to J2-5.

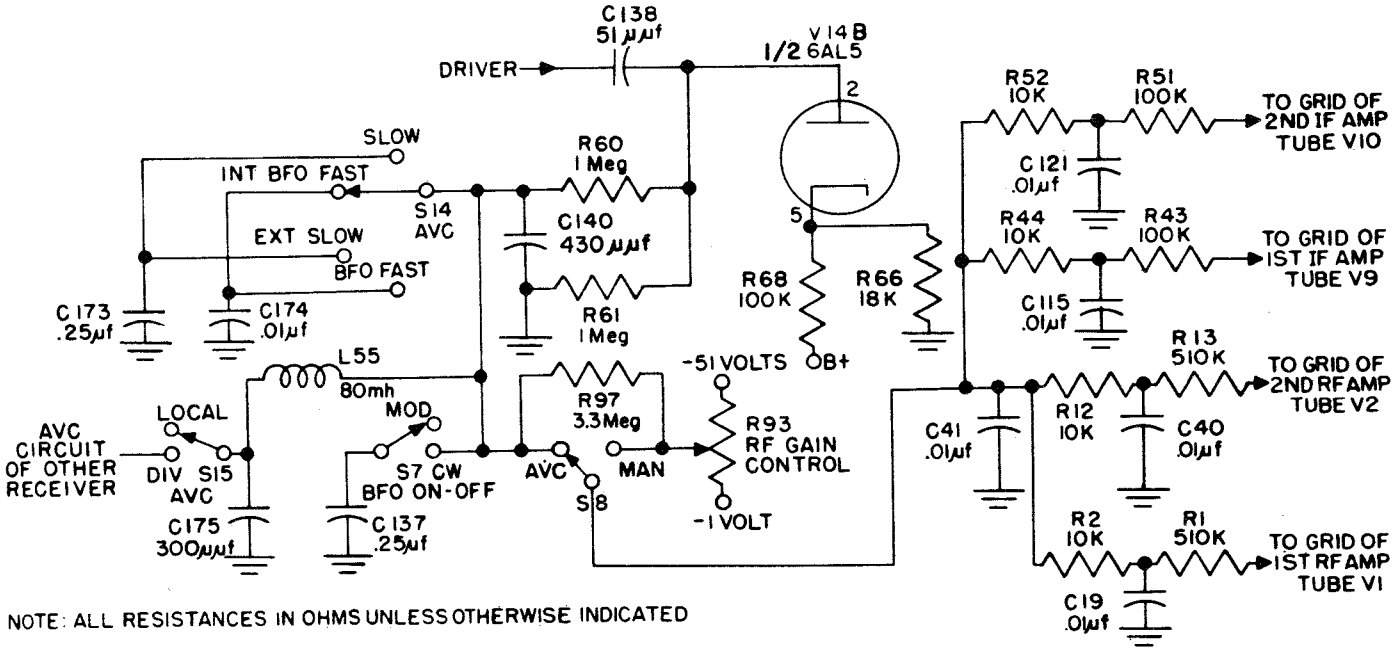


Figure 2-11. Radio Receiver R-450/FRR-28, AVC Circuit, Simplified Schematic

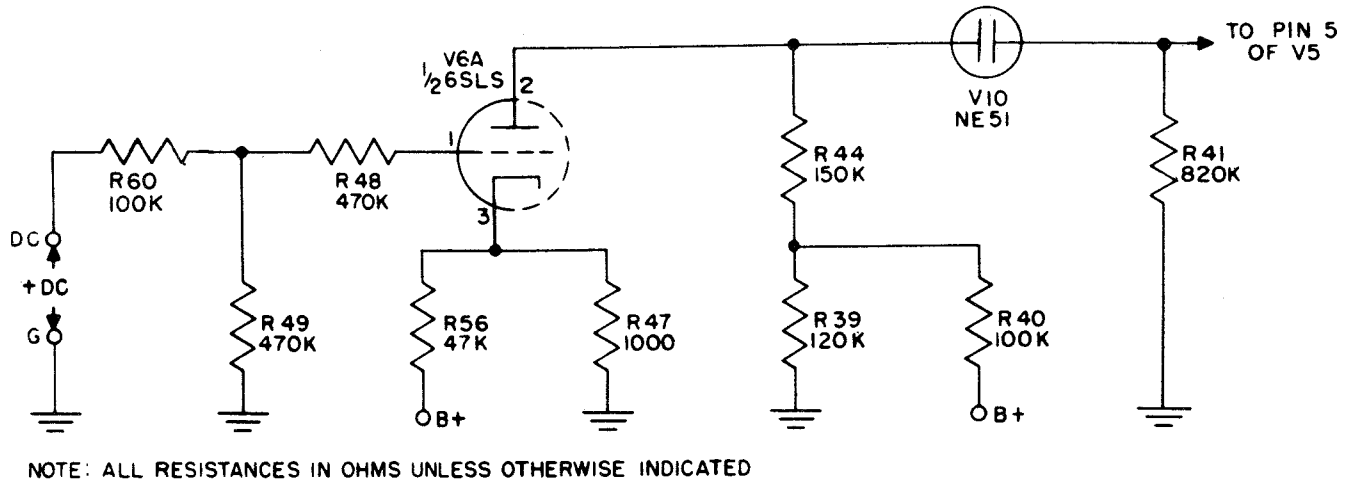


Figure 2-25. Keyer KY-79/UR, Positive Polar Keying, Simplified Schematic

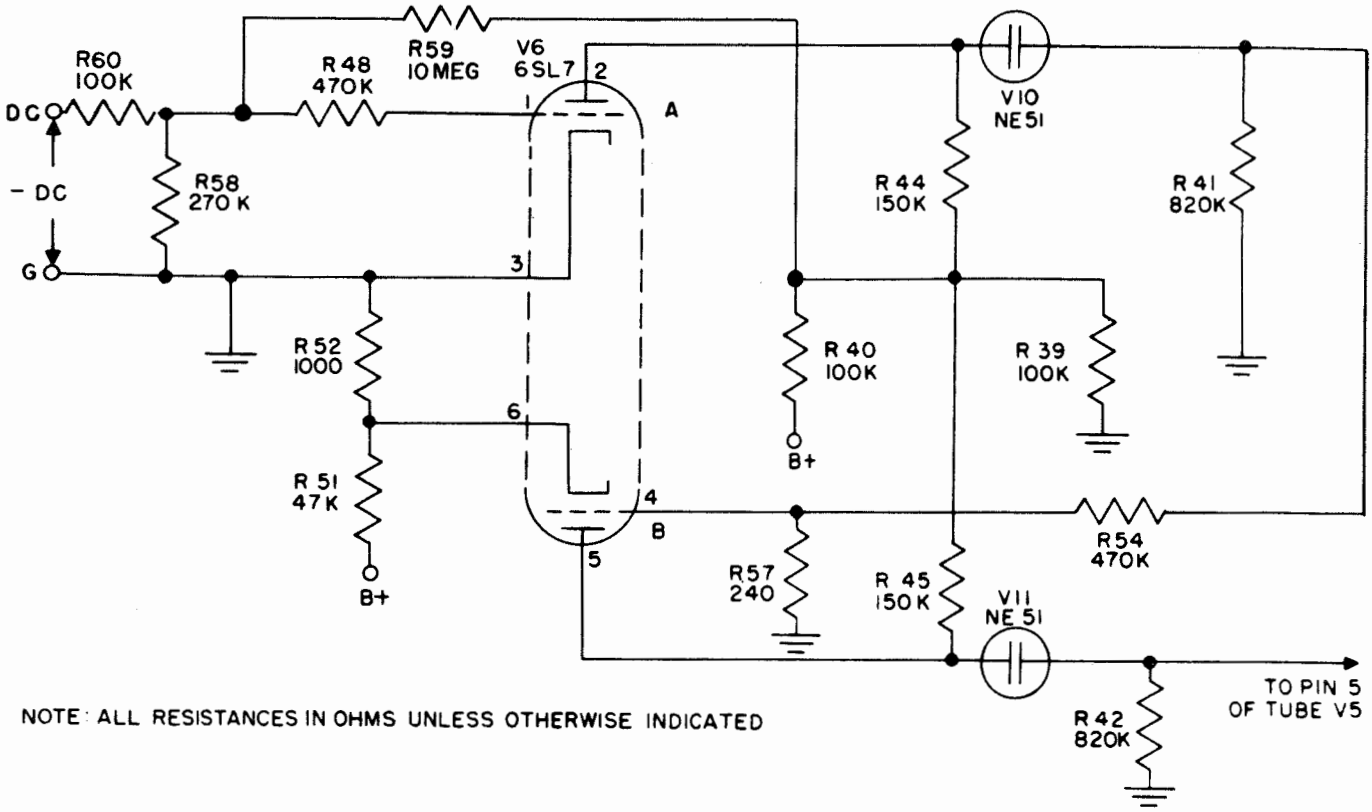


Figure 2-26. Keyer KY-79/UR, Negative Polar Keying, Simplified Schematic

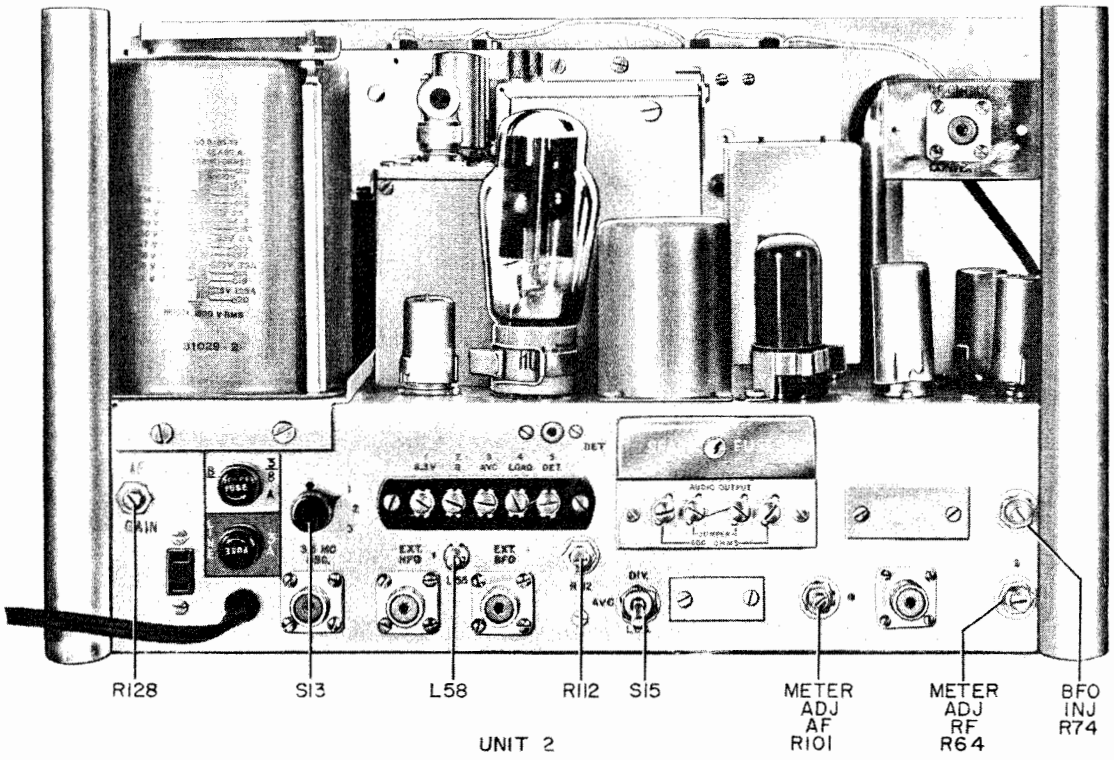


Figure 3-5. Receiver R-450/FRR-28, Rear View, Pre-Operation Adjustments

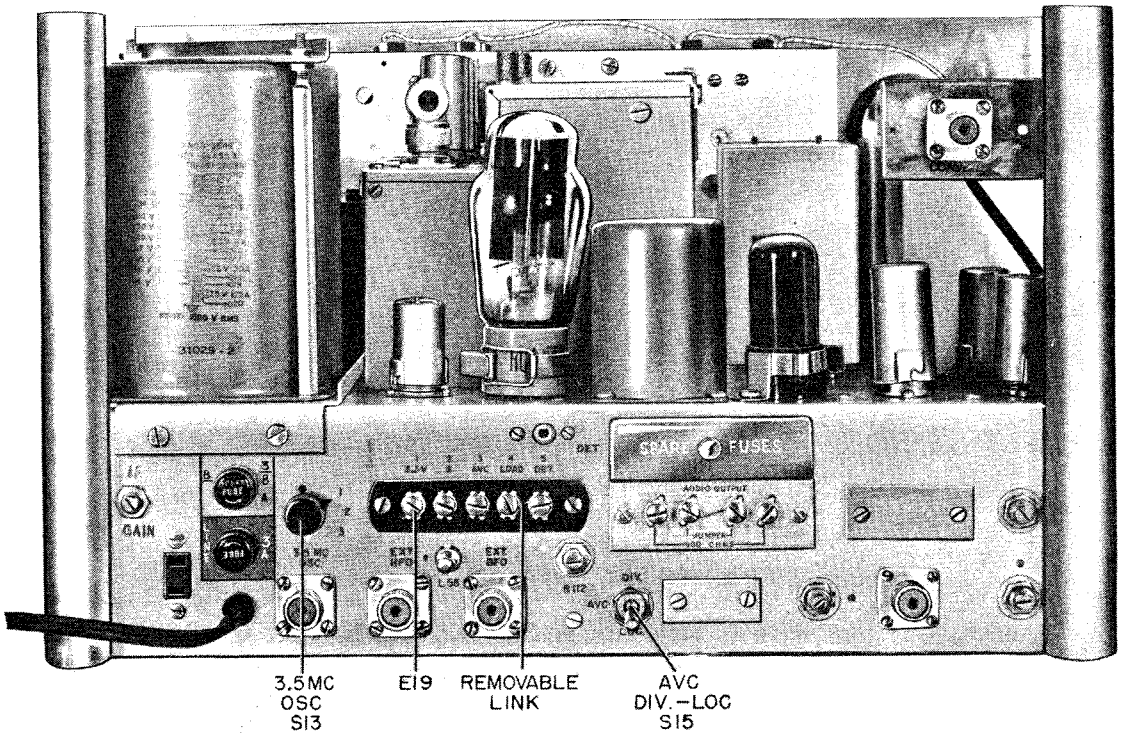


Figure 4-2. Radio Receiver R-450/FRR-28, Rear View, Controls and Adjustments

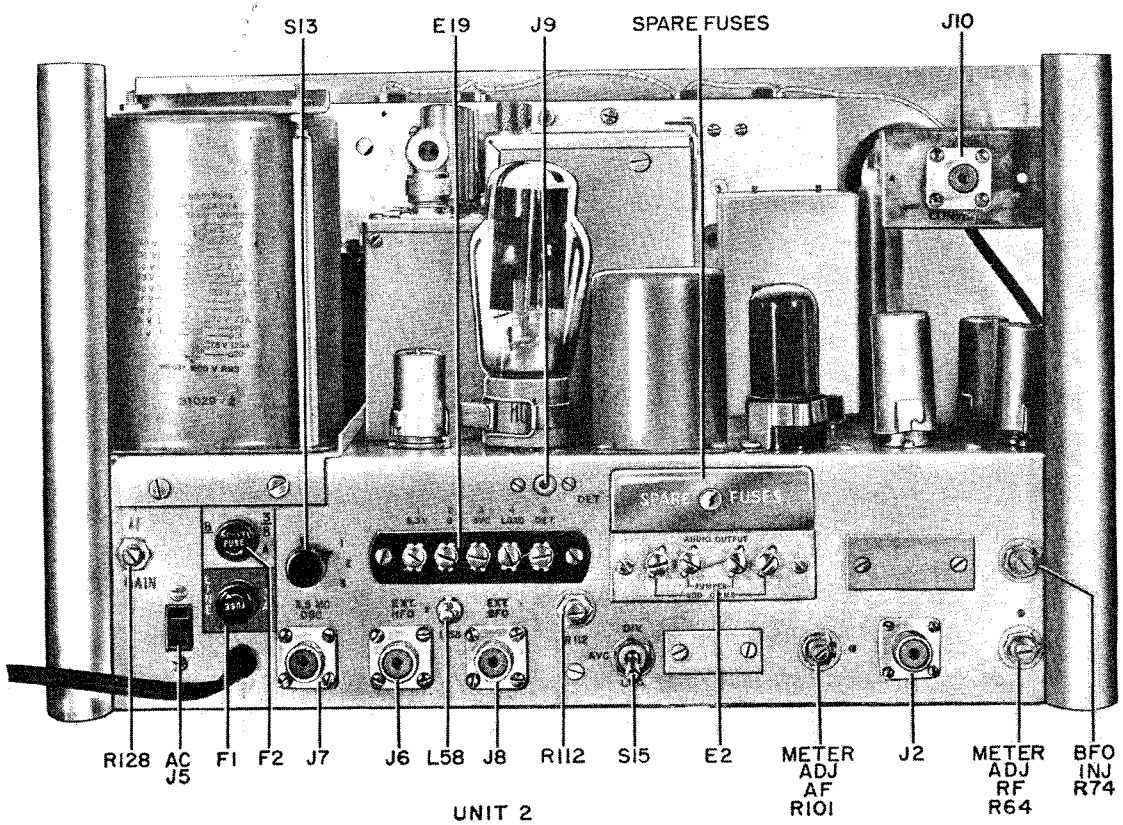


Figure 7-2. Receiver R-450/FRR-28, Rear View

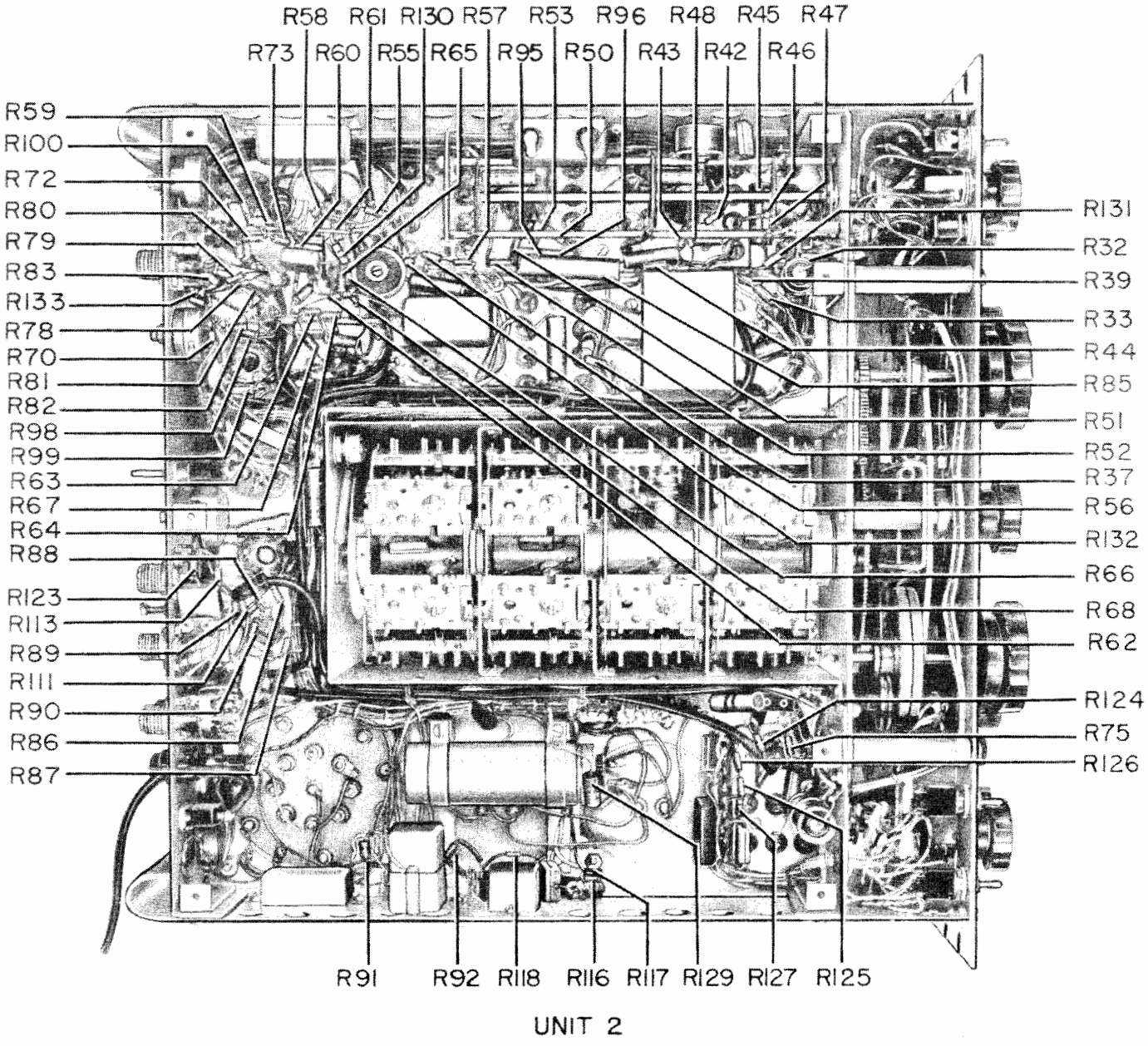
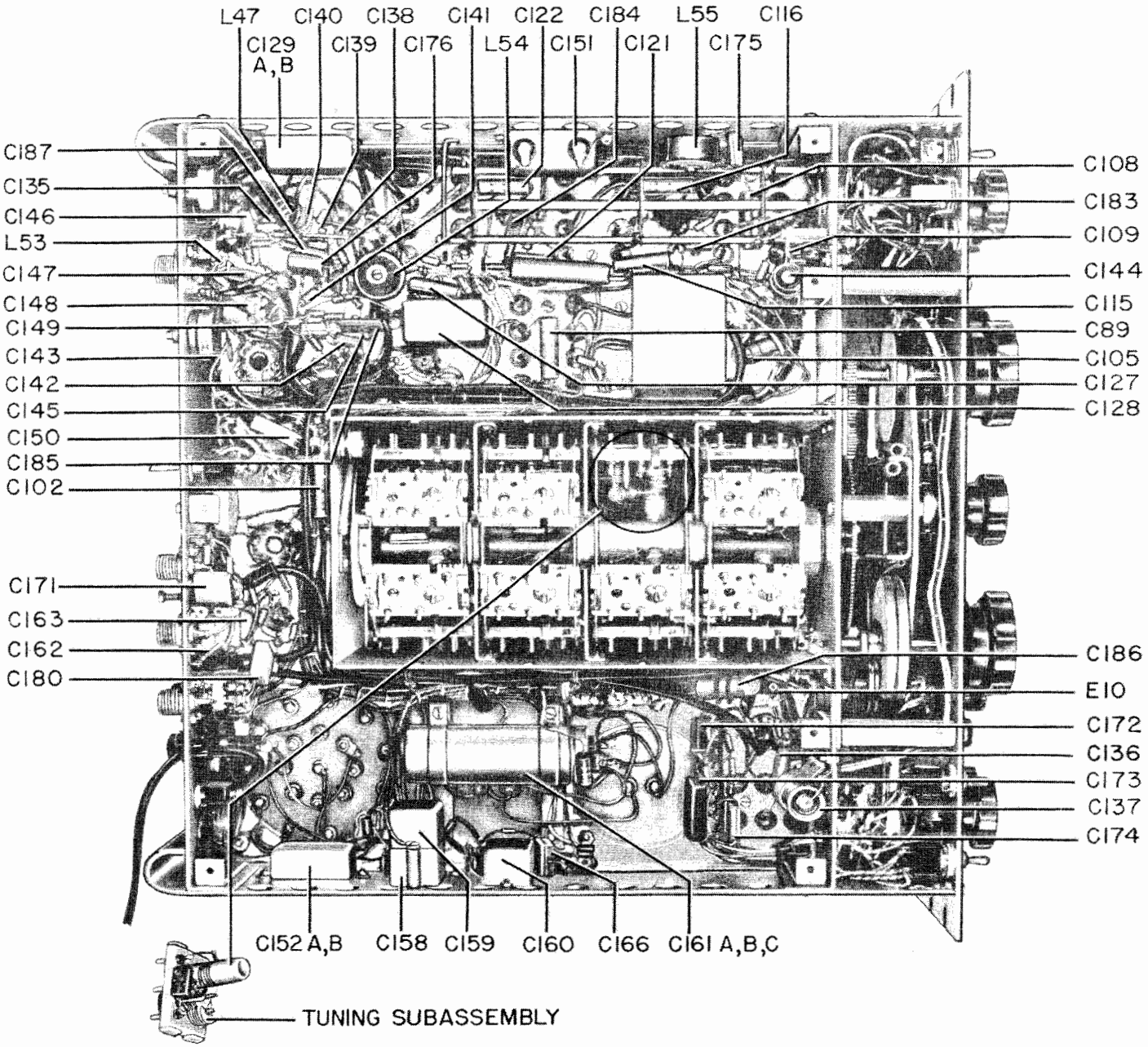


Figure 7-4. Receiver R-450/FRR-28, Bottom View, Location of Resistors



UNIT 2

Figure 7-5. Receiver R-450/FRR-28, Bottom View, Location of Components

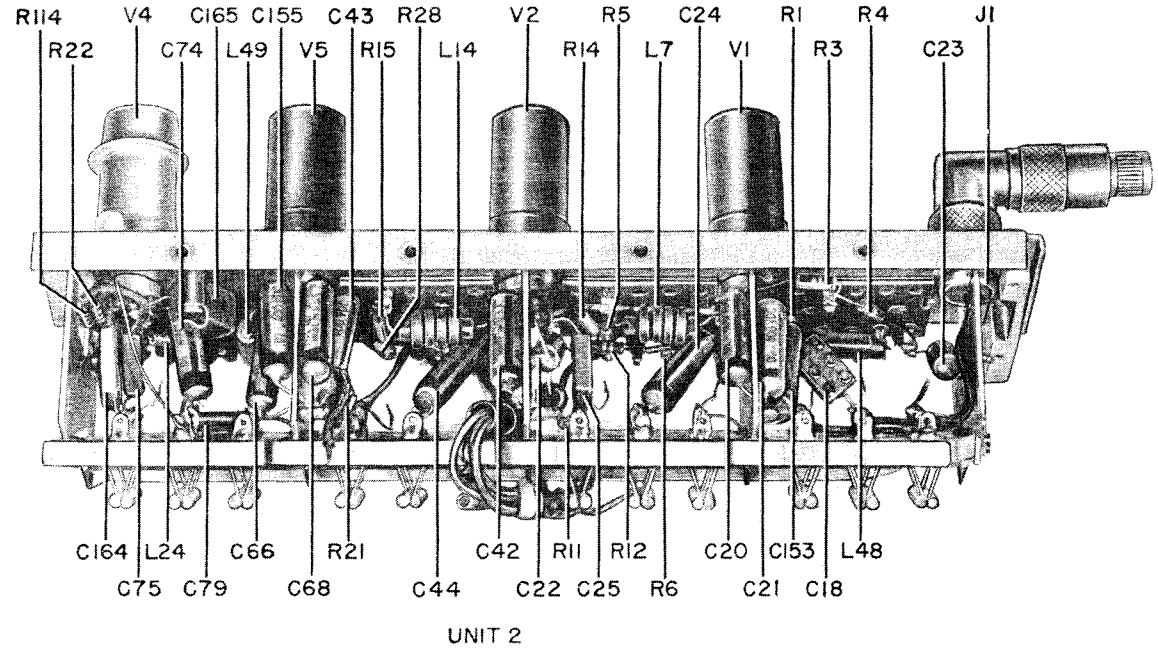


Figure 7-6. Receiver R-450/FRR-28, RF Strip, Right Side

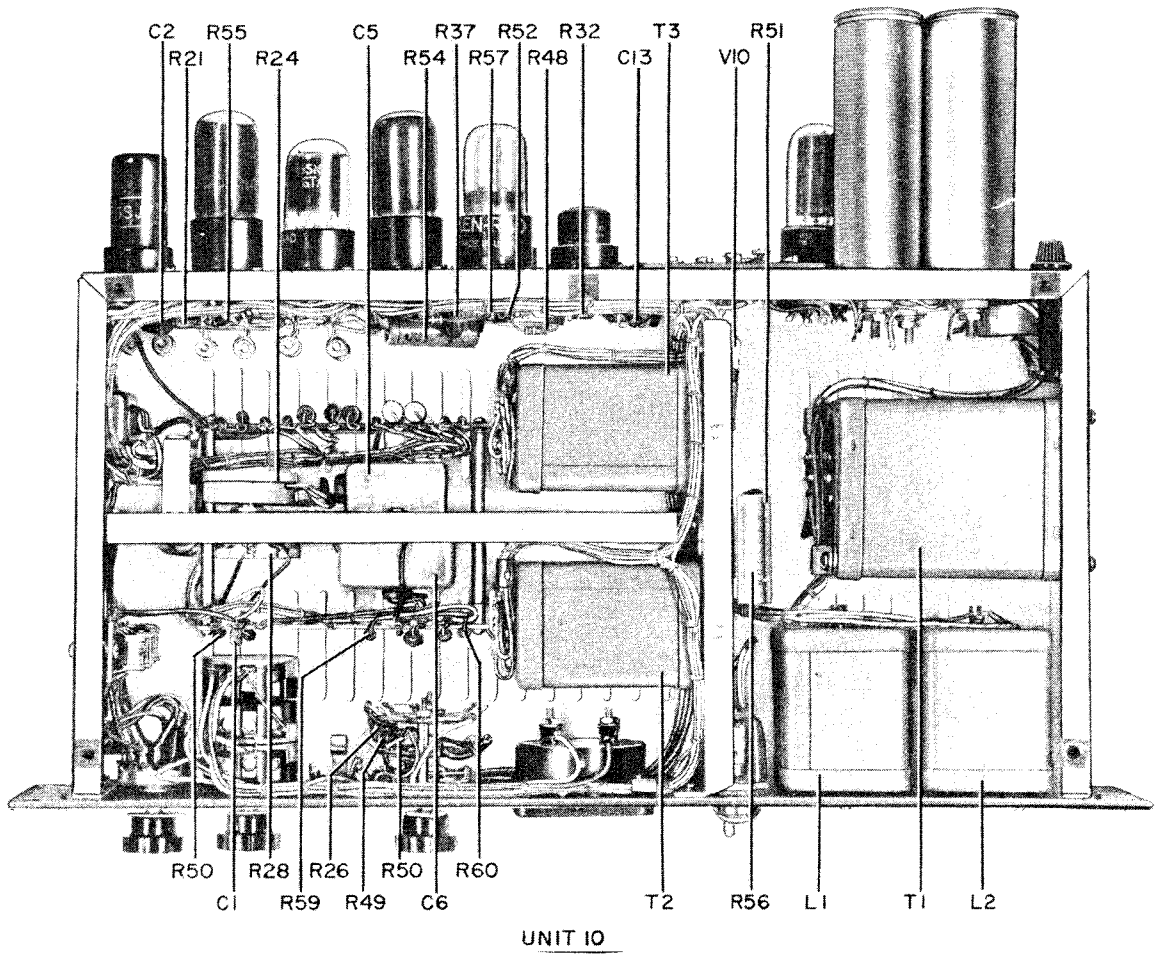
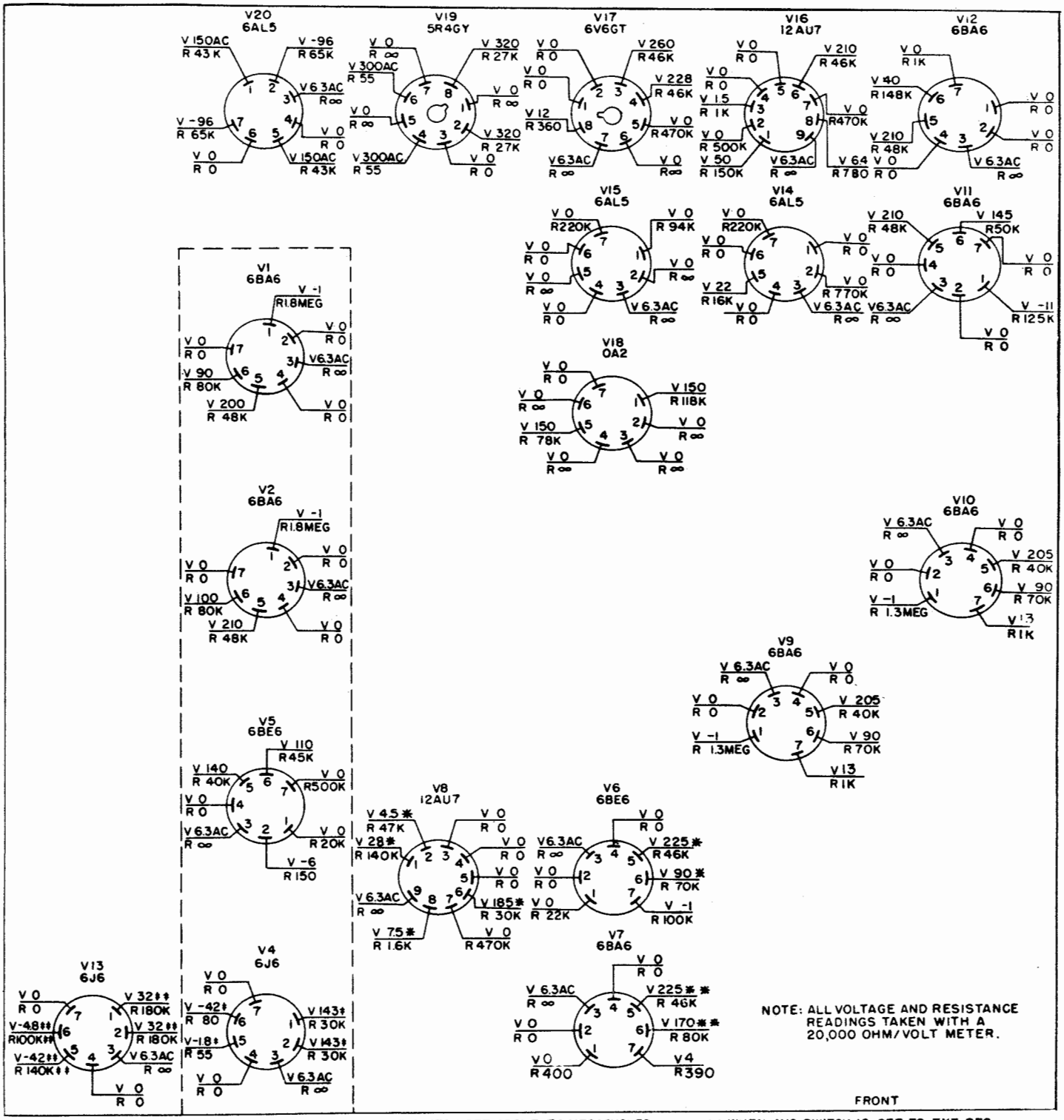


Figure 7-20. Keyer KY-79/UR, Top View



CONTROL SETTINGS

CONTROL	SETTING
RF GAIN	MAX
BFO	INT
3.5 MC OSC	1 OR 3
HFO	EXT
AVC	INT BFO
BFO INT	MAX
IF GAIN	MAX
AUDIO GAIN	MIN
MOD-CW	CW
SEND-RECEIVE	RECEIVE
AVC-MAN	AVC

* BANDCHANGE SWITCH SET ABOVE 7.4 MEGACYCLES

** BANDCHANGE SWITCH SET BELOW 7.4 MEGACYCLES

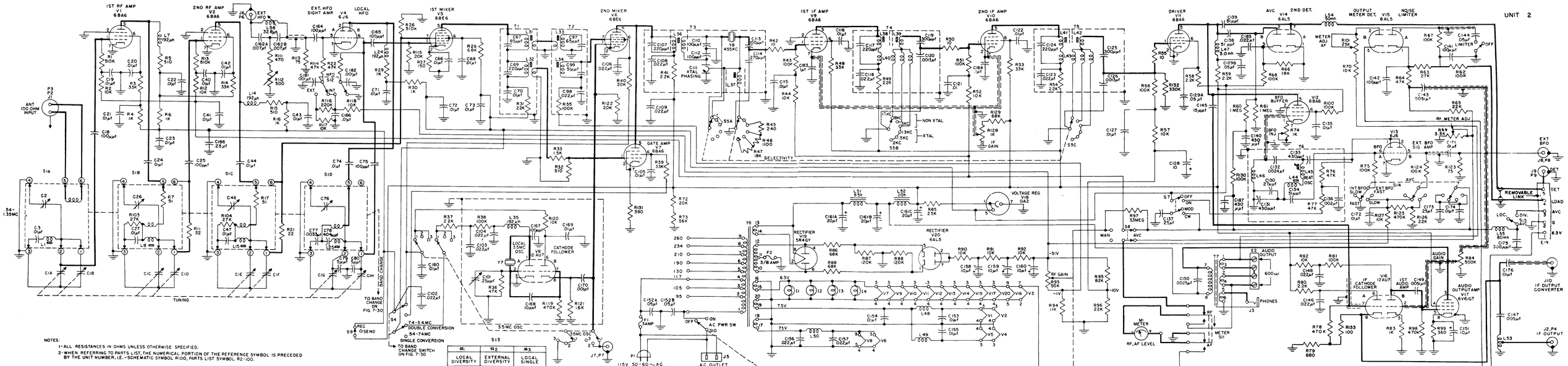
\# WHEN HFO SWITCH IS SET TO INT, THE READINGS FOR TUBE V4 ARE AS FOLLOWS:

PIN	V	R
1	152	30K
2	152	30K
3	6.3AC	∞
4	0	0
5	-42	80K
6	-5	47K
7	0	0

\#\# WHEN AVC SWITCH IS SET TO EXT BFO, THE READINGS FOR TUBE V13 ARE AS FOLLOWS:

PIN	V	R
1	54	180K
2	54	180K
3	6.3AC	∞
4	0	0
5	-2	120K
6	-42	140K
7	0	0

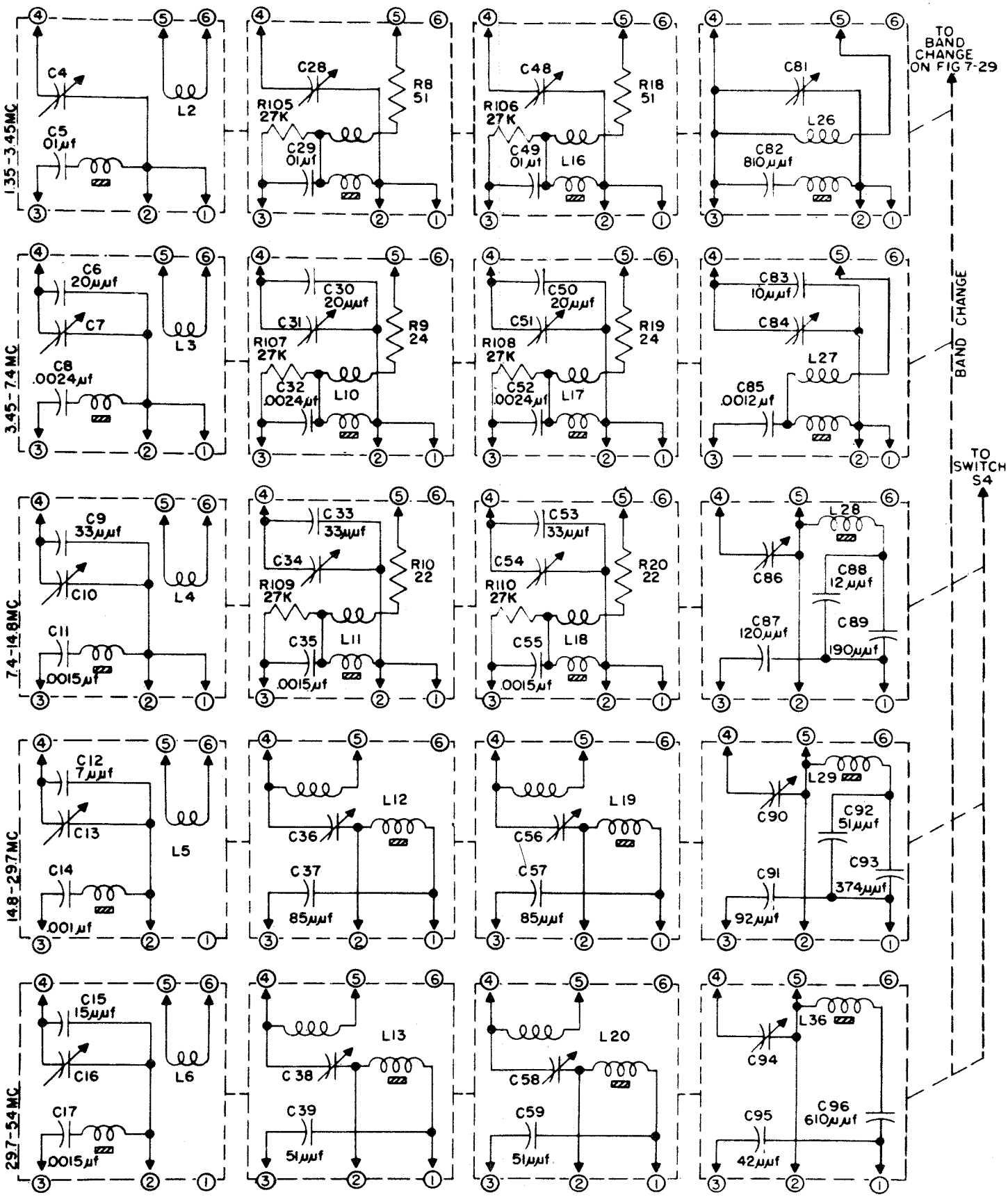
Figure 7-26. Receiver R-450/FRR-28, Voltage and Resistance Chart



NOTES:
1-ALL RESISTANCES IN OHMS UNLESS OTHERWISE SPECIFIED.
2-WHEN REFERRING TO PARTS LIST, THE NUMERICAL PORTION OF THE REFERENCE SYMBOL IS PRECEDED BY THE UNIT NUMBER, I.E.-SCHEMATIC SYMBOL R100, PARTS LIST SYMBOL R2-100.

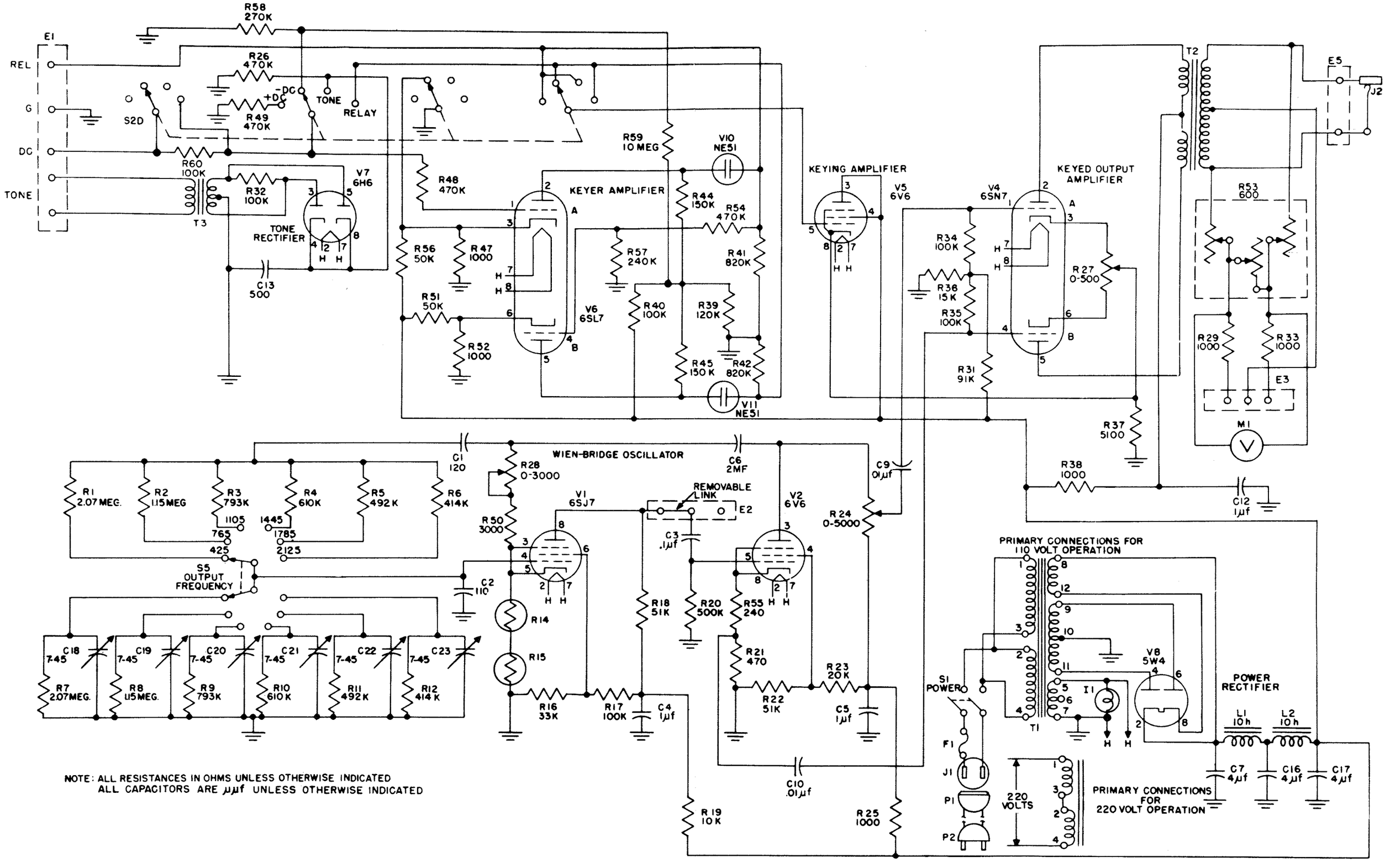
Figure 7-30. Radio Receiver R-450/FRR-28, Main Chassis Schematic Diagram

Contract NObsr-57519



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED.

Figure 7-31. Radio Receiver R-450/FRR-28, Turret Schematic Diagram



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED
ALL CAPACITORS ARE µµf UNLESS OTHERWISE INDICATED

Figure 7-34. Keyer KY-79/UR, Schematic Diagram

NOTE: SWITCH IS MOUNTED ON TUNING UNIT OPERATED BY BANDSWITCH
2-3 CLOSED BELOW 7.4MC
1-2 CLOSED ABOVE 7.4MC

OSCILLATOR TERMINAL BOARD LOCATED OVER V8 AND V6 SOCKETS ON BOTTOM OF CHASSIS. SHIELDED

* THESE NUMBERS ARE FOR REFERENCE ONLY. THEY DO NOT APPEAR ON TERMINAL STRIP.

Figure 7-37. Radio Receiver R-450/FRR-28, Main Chassis Wiring Diagram

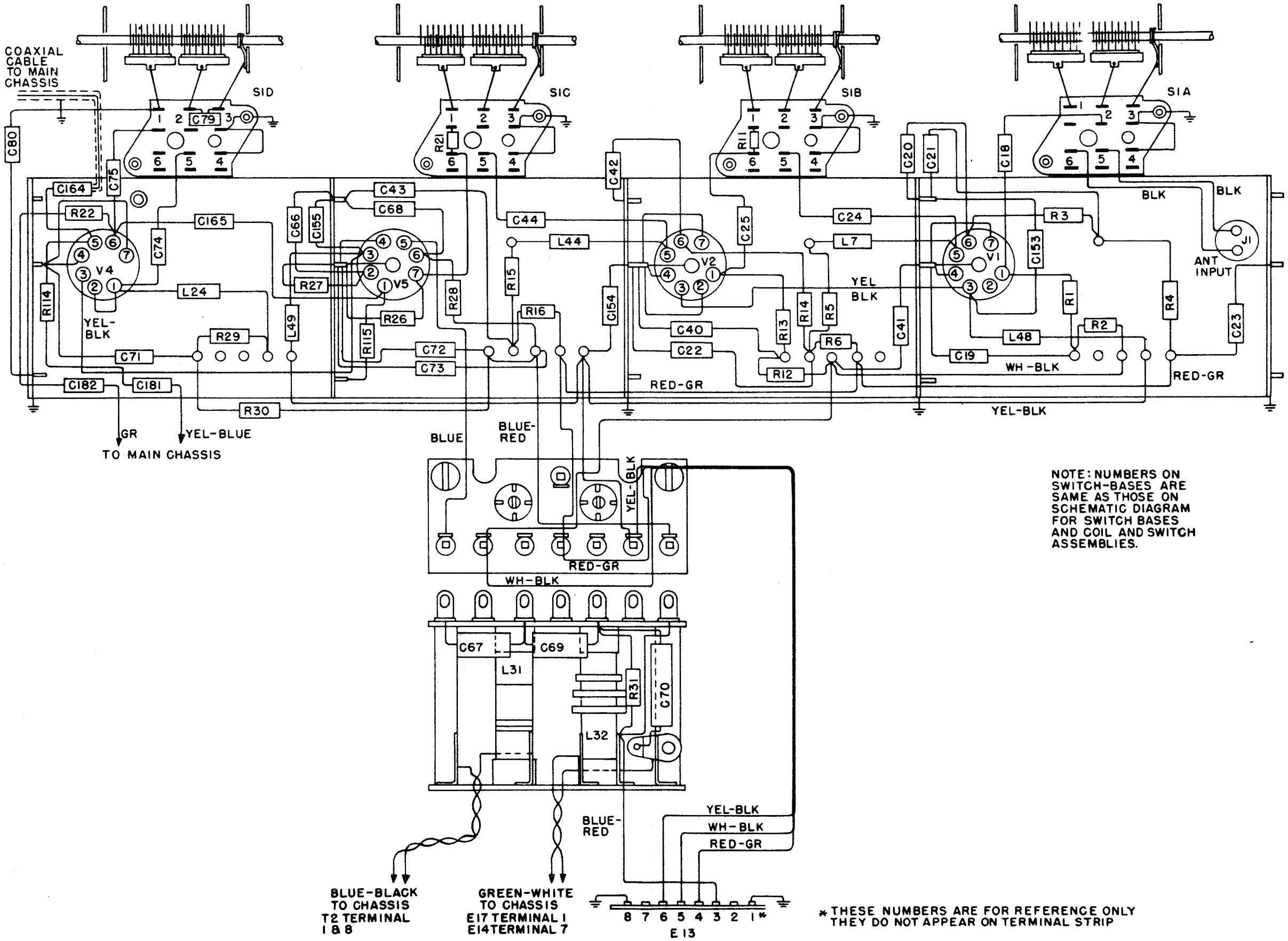


Figure 7-38. Radio Receiver R-450/FRR-28, Turret Wiring Diagram

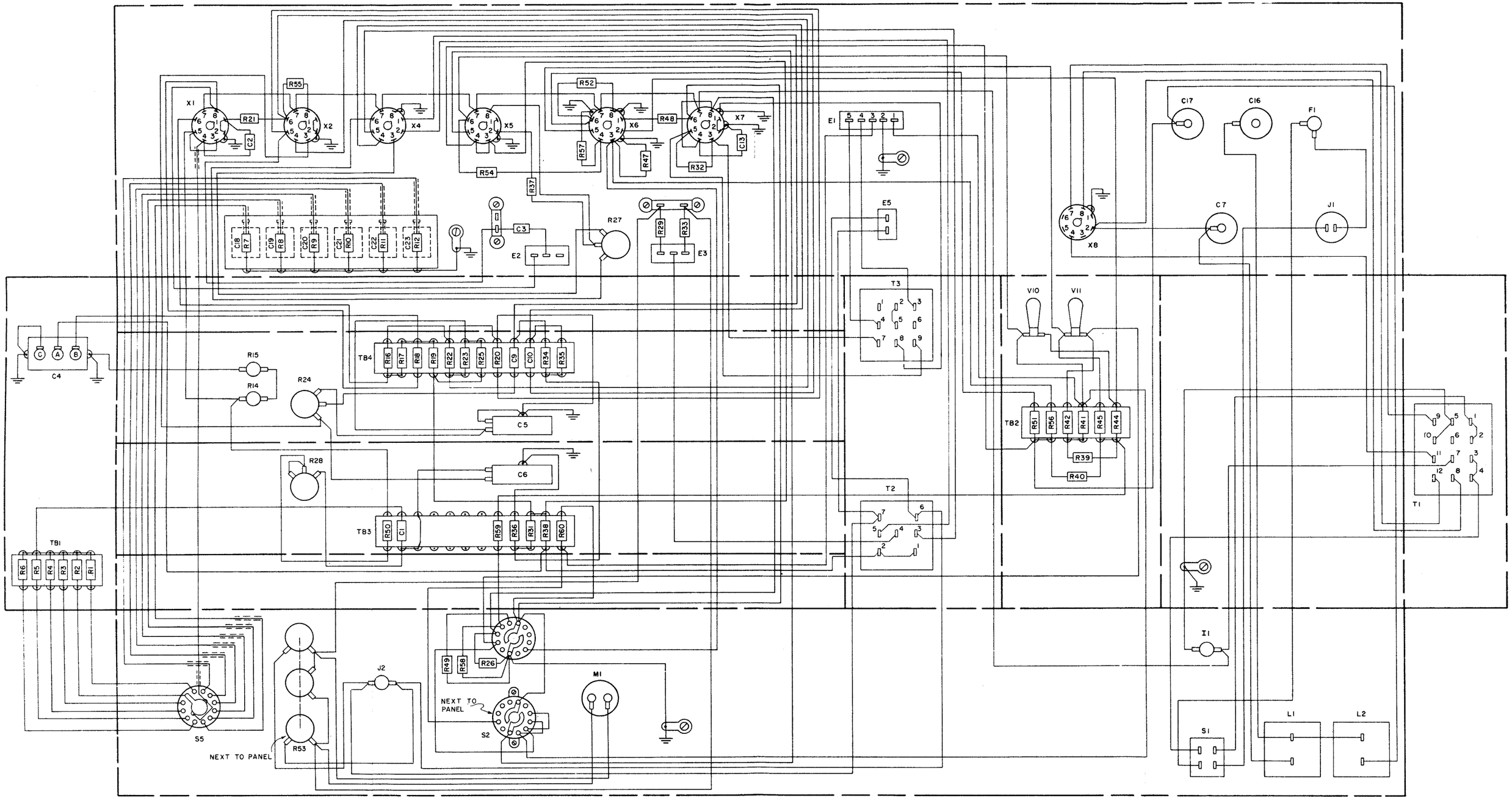


Figure 7-39. Keyer KY-79/UR, Wiring Diagram

NAVSHIPS 91582

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-28

NORTHERN RADIO CO., INC.
143-5 WEST 22ND STREET
NEW YORK 11, NEW YORK

BUREAU OF SHIPS NAVY DEPARTMENT

Contract: NObsr 52132
NObsr 57519

Approved by BuShips: 28 December 1951

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
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2–1 to 2–30	Original	8–1 to 8–146	Original
3–1 to 3–26	Original	i–1 to i–6	Original

Promulgating Lette

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
28 December 1951

From: Chief, Bureau of Ships
To: All Activities Concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Radio Receiving Set AN/FRR-28 NAVSHIPS 91582

1. This publication is the instruction book for the subject equipment and is in effect upon receipt.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the BUSHIPS ELECTRON and in the Index of BuShips General and Electronics Publications, NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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SECTION 4—OPERATION (Cont)

SECTION 7—CORRECTIVE MAINTENANCE

LIST OF ILLUSTRATIONS (Cont)

SECTION 7—CORRECTIVE MAINTENANCE (Cont)

SECTION 7—CORRECTIVE MAINTENANCE (Cont)

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SECTION 8—PARTS LISTS

GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber, and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship, or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably re-designed item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for effecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr 52132 or 57519 Date of Contract, 19 December, 1950

Serial Number of equipment .....

Date of acceptance by the Navy .....

Date of delivery to contract destination .....

Date of completion of installation .....

Date placed in service .....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "Date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised) except for Marine Corps equipment, in which case the "Signal Equipment Failure Report" form shall be used and distributed in accordance with instructions pertaining thereto. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high-voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor-generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

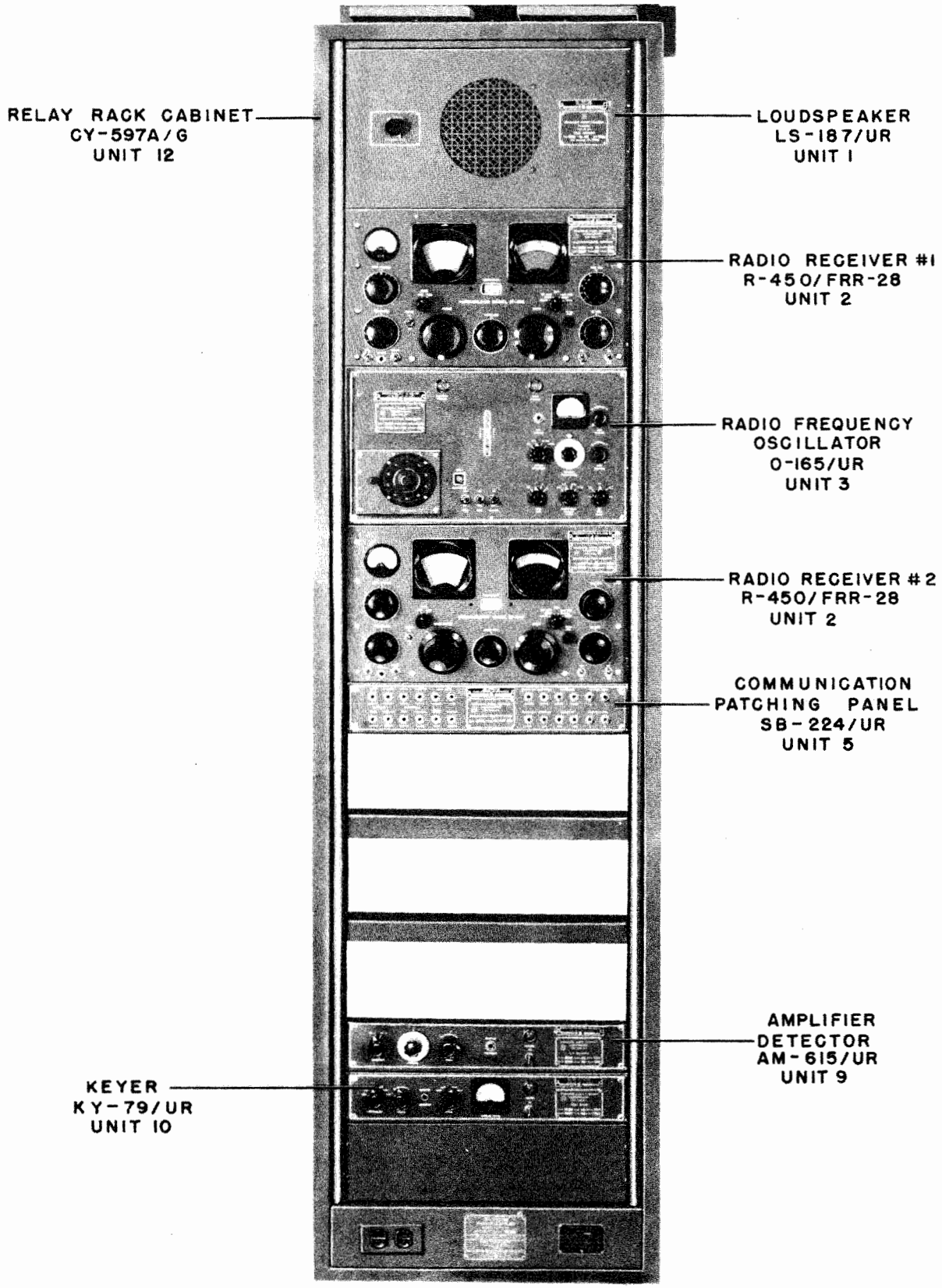


Figure 1–1. Radio Receiving Set AN/FRR–28 in Relay Rack Cabinet CY–597A/G

SECTION 1
GENERAL DESCRIPTION

1. INTRODUCTION.

(*See figure 1–1.*)

This instruction book includes information necessary for the installation, operation, and maintenance of the Radio Receiving Set AN/FRR–28. The units and parts that are supplied, and those that are not supplied but are used in conjunction with the receiving set, are listed in tables 1–1 and 1–2, respectively.

2. PURPOSE OF THE EQUIPMENT.

Radio Receiving Set AN/FRR–28 is a multi-purpose receiving equipment. It is specifically designed for dual "space diversity" reception of high speed radio teleprinter, telegraph, or telephone signals, but may be used for two single receivers or for dual "frequency diversity" reception of these signals. The receiving set is capable of receiving AM radiophone signals, amplitude modulated CW signals, or unmodulated CW signals, and when the receiving set is used in conjunction with a frequency-shift converter-comparator group, it is possible to receive "frequency-shift" signals.

The receiving set may be operated for local use of the received signal in conjunction with other equipment, such as a teleprinter, or for remote service, such as part of a relay link.

Diversity reception, either space or frequency, is used to overcome one of the causes of fading signals. When the ionosphere changes its position, it is possible for two signals arriving over different paths to effectively cancel each other at the receiving antenna.

It has been experimentally shown that signals received at antennas spaced five to ten wavelengths apart will fade independently. This fact is used in space diversity reception where the antennas for the two receivers are so spaced.

In frequency diversity reception, use is made of the fact that signals of different frequencies will fade independently. Each receiver is tuned to one of the two transmitted carrier frequencies which carry the same intelligence.

A frequency-shift signal is one whose normal frequency is shifted to another frequency for a period of time corresponding to the mark or space position of the transmitted signal.

3. DESCRIPTION OF UNITS.

(*See figure 1–1.*)

All units which are part of Radio Receiving Set AN/FRR–28 are mounted in Relay Rack Cabinet CY–597A/G by means of front panel screws. Provision is also made for mounting a converter-comparator group, such as Frequency Shift Converter-Comparator Group AN/URA–6, within the rack. Other converters with suitable characteristics may be used. Any frequency-shift converter group is provided as a separate allowance item. The unit functions are as follows:

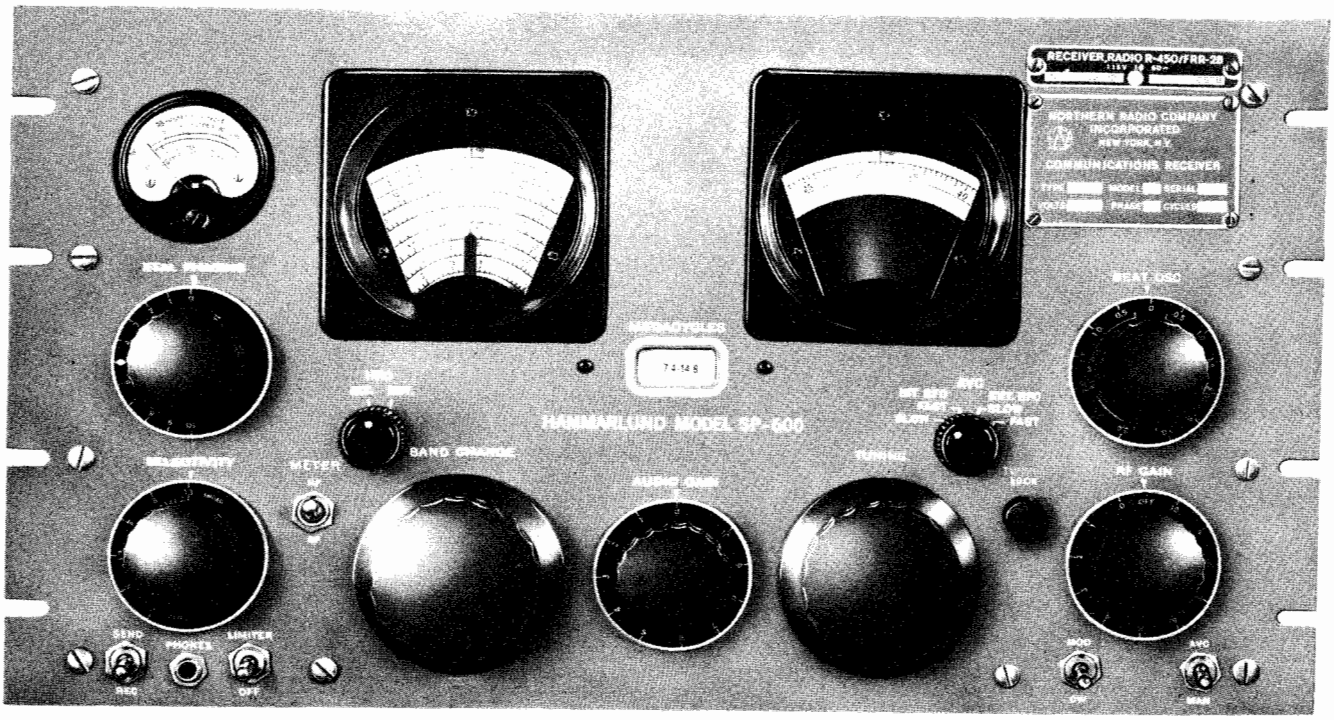
a. RADIO RECEIVERS R–450/FRR–28. (*See figure 1–2.*)—Two receivers are provided for diversity signal reception. Each receiver selects and amplifies the signals received at the antenna. Means are provided to use external HFO and BFO signals which are supplied by Oscillator O–165/UR. Three signal outputs are available from each receiver:

(1) The 455-kc signal is used in Amplifier-Detector AM–615/UR and may also be used if a converter-comparator group is provided.

(2) The d-c output from the second detector is used in Keyer KY–79/UR.

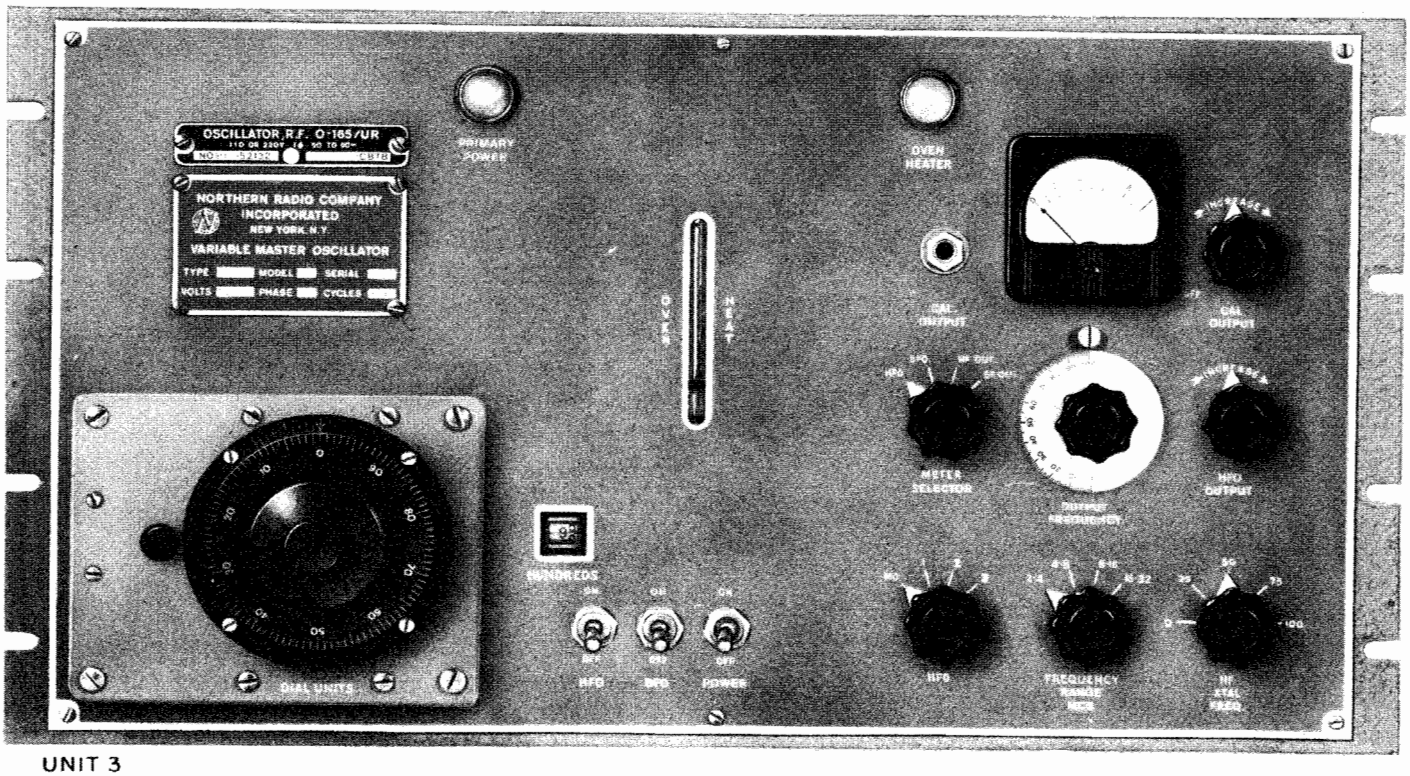
(3) The audio output is applied to Communication Patching Panel SB–224/UR for distribution to the external lines and loudspeaker. Headphones may also be used to monitor the output signal by plugging them into the PHONES jack on the receiver front panel.

b. RADIO FREQUENCY OSCILLATOR O–165/UR. (*See figure 1–3.*)—RF Oscillator O–165/UR may be used to provide HFO and BFO signals to replace the high frequency and beat frequency oscillators of each receiver. The HFO signal is either variable, with temperature-controlled high stability, or crystal controlled; the BFO signal is crystal-controlled. Use of Oscillator O–165/UR is particularly desirable when conditions warrant the use of crystal filters in the receivers, or when frequency-shift signals are received. Reception over the greater portion of the communication band is possible when the variable high-frequency HFO is used.



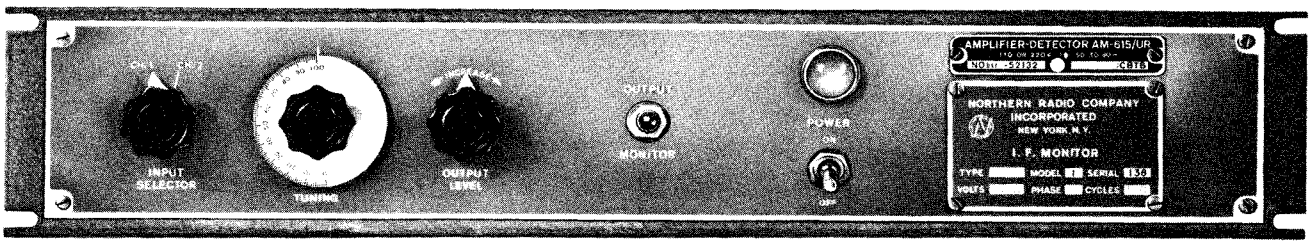
UNIT 2

Figure 1–2. Radio Receiver R–450/FRR–28



UNIT 3

Figure 1–3. Radio Frequency Oscillator O–165/UR



UNIT 9

Figure 1–4. Amplifier-Detector AM–615/UR

c. AMPLIFIER-DETECTOR AM–615/UR. (*See figure 1–4.*)—This unit is used to sample the IF frequency of each individual receiver in diversity reception. It is also useful in tuning each receiver accurately to CW signals in diversity reception when no receiver BFO is used. It consists of an RF amplifier stage and a local BFO oscillator stage producing an audio beatnote with the sampled IF frequency. This audio beatnote is amplified and applied to the OUTPUT MONITOR jack J1, where headphones are used for monitoring purposes. The INPUT SELECTOR switch on the front panel is provided to select the IF frequency of either of the two diversity receivers.

d. KEYER KY–79/UR. (*See figure 1–5.*)—This unit provides audio signals at certain preselected frequencies for external equipments, such as the teletypewriter, which are operated at these frequencies. These audio tones are keyed on and off in accordance with input intelligence signals such as positive or negative d-c signals, keyed tone input signals, or polar relay signals. The amplitude-modulated tones are then sent to Communication Patching Panel SB–224/UR for distribution to the external lines and the loudspeaker. Headphones may also be used to monitor the keyed tone by plugging them into the OUTPUT MONITOR jack on the Keyer KY–79/UR front panel.

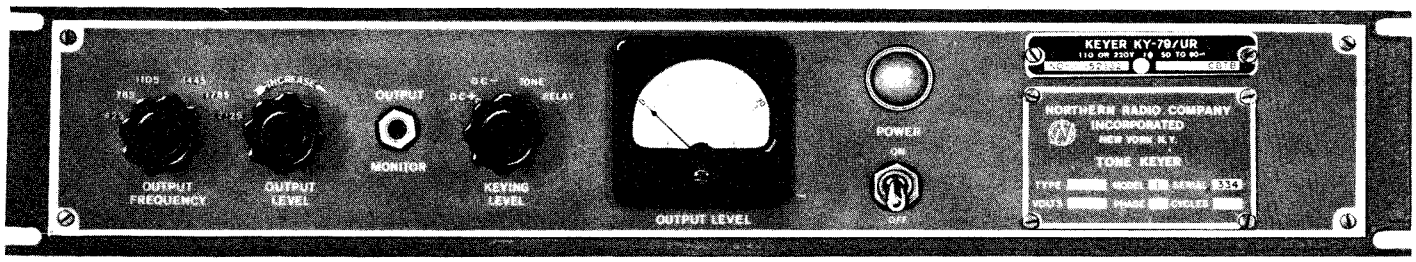
e. LOUDSPEAKER LS–187/UR. (*See figure 1–6.*)—This unit provides the means for listening to the signals being received, and is also used to monitor various audio tones produced in the units as described in the previous paragraphs.

f. COMMUNICATION PATCHING PANEL SB–224/UR. (*See figure 1–7.*)—This unit is used, in conjunction with patch cords, to make the various interconnections between units required for the different types of operation of the Radio Receiving Set AN/FRR–28.

4. CABLING.

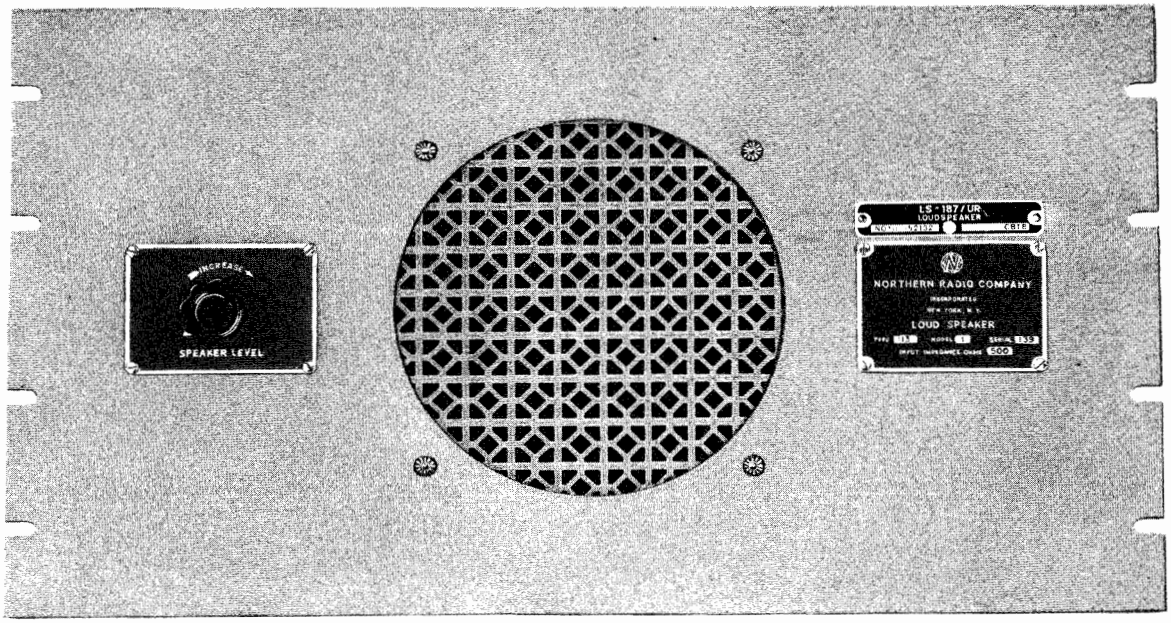
(*See figure 1–8.*)

Information regarding the cables used in Radio Receiving Set AN/FRR–28 is listed in Table 1–1.



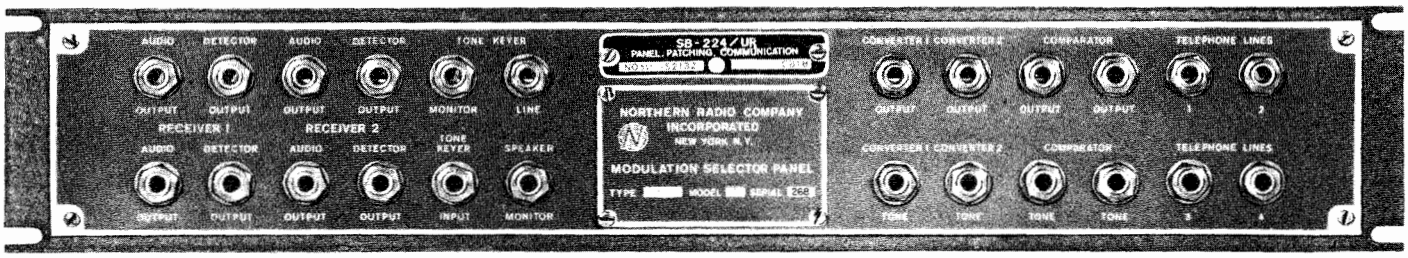
UNIT 10

Figure 1–5. Keyer KY–79/UR



UNIT 1

Figure 1–6. Loudspeaker LS–187/UR



FRONT VIEW

UNIT 5

Figure 1–7. Communication Patching Panel SB–224/UR

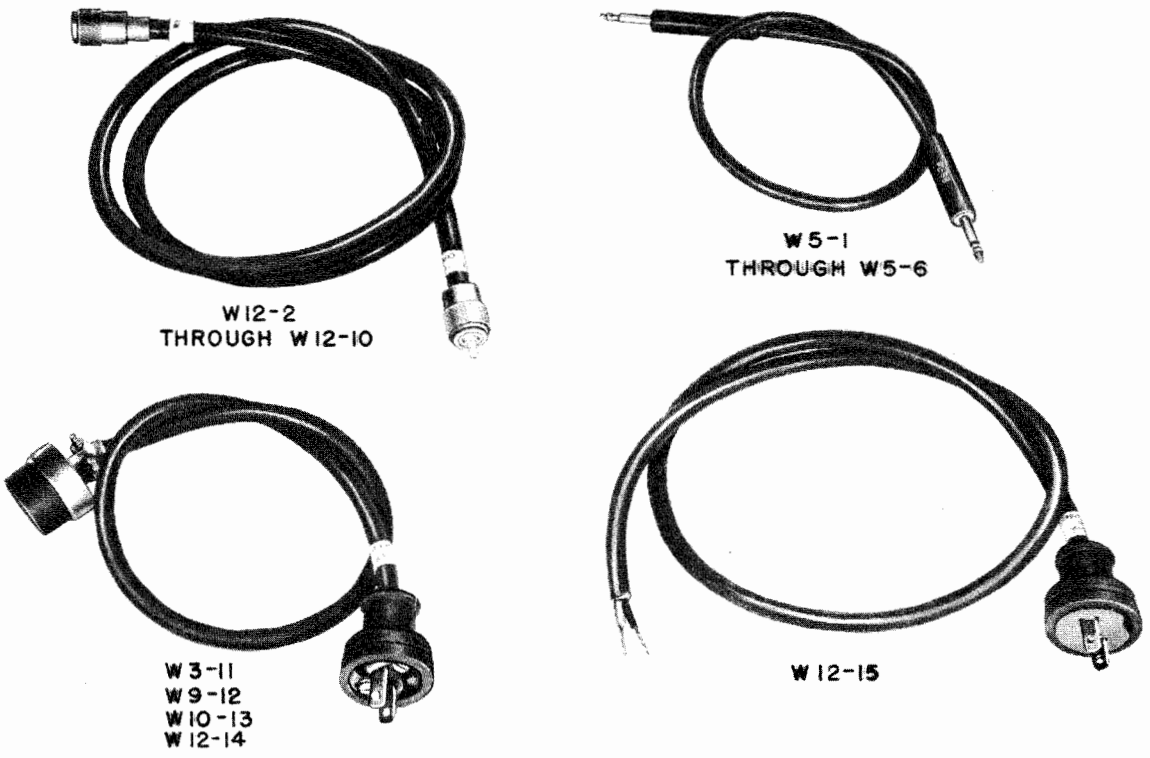


Figure 1–8. Cables for AN/FRR–28 Equipment

TABLE 1–1. CABLES USED IN RADIO RECEIVING SET AN/FRR–28

CABLE NUMBER	LENGTH IN INCHES	PURPOSE
W3–11	72	Power cable for RF Oscillator O–165/UR
W5–1	25	Patch cord
W5–2	25	Patch cord
W5–3	25	Patch cord
W5–4	25	Patch cord
W5–5	25	Patch cord
W5–6	25	Patch cord
W9–12	24	Power cable for Amplifier-Detector AM–615/UR
W10–13	24	Power cable for Keyer KY–79/UR
W12–1	—	Main relay rack cable
W12–2	27	Links the two receiver 3.5 Mc oscillators
W12–3	57	Connects receiver #1 IF output to the Amplifier-Detector AM–615/UR
W12–4	38	Connects receiver #2 IF output to the Amplifier-Detector AM–615/UR
W12–5	12	Connects Oscillator O–165/UR BFO output to receiver #1
W12–6	15	Connects Oscillator O–165/UR BFO output to receiver #2
W12–7	15	Connects Oscillator O–165/UR HFO output to receiver #1
W12–8	20	Connects Oscillator O–165/UR HFO output to receiver #2
W12–9	54	Connects receiver #1 IF output to FS converter #1
W12–10	44	Connects receiver #2 IF output to FS converter #2
W12–14	72	Utility servicing cable
W12–15	36	Converter-comparator group power cable

5. REFERENCE DATA.

a. Equipment Designation:
Radio Receiving Set AN/FRR–28.

b. Contract number and date:
NObsr–52132 dated December 19, 1950.
NObsr–57519 dated June 30, 1952.

c. Contractor:
Northern Radio Company, Inc.
New York, New York.

d. Cognizant Inspector:
Inspector of Naval Material,
New York Naval Shipyard,
New York, New York.

e. Number of packages per complete shipment:
5 plus spare parts packages.

f. Total cubical contents (excluding spares):
Crated: 78.8 cubic feet.
Uncrated: 34.3 cubic feet.

g. Total weight (excluding spares):
Crated: 1040 pounds.
Uncrated: 522 pounds.

h. Frequency range: 540 kilocycles to 54 megacycles.

i. Tuning bands:

(1) Radio Receiver R–450/FRR–28, 6 bands:

Band 1:	.54	to 1.35	Mc
Band 2:	1.35	to 3.45	Mc
Band 3:	3.45	to 7.4	Mc
Band 4:	7.4	to 14.8	Mc
Band 5:	14.8	to 29.7	Mc
Band 6:	29.7	to 54	Mc

(2) Radio Frequency Oscillator O–165/UR, 4 bands:

Band 1:	2	to 4	Mc
Band 2:	4	to 8	Mc
Band 3:	8	to 16	Mc
Band 4:	16	to 32	Mc

j. Number of pre-set frequencies:
RF Oscillator O–165/UR: Provision for 3 HFO crystals. Provision for 2 BFO crystals.

k. Types of frequency control:
Radio Receiver R–450/FRR–28: Internal variable oscillator or external oscillator.
RF Oscillator O–165/UR: Temperature-controlled variable oscillator or choice of 3 crystals.

l. Type receiver:
Single superheterodyne 0.5 to 7.4 Mc.
Double superheterodyne 7.4 to 54 Mc.

m. Intermediate frequencies:
Input signal below 7.4 Mc: 455 kc.
Input signal above 7.4 Mc: 3.955 Mc and 455 kc.

n. Radio Receiver R–450/FRR–28:
Input impedance: Nominal 72 ohms.
Output impedance: Loudspeaker or external lines 600 ohms. Front panel headphone jack 8000 ohms.
Output power: 2.5 watts maximum into 600 ohm load. 15 milliwatts into 8000 ohm resistive load when 600 ohm load is adjusted to 500 milliwatts.

o. Type of reception:
A–1, A–2, A–3, and FSK (when suitable converter is used).

p. Crystals Supplied:
(HFO and BFO crystals not supplied for Oscillator O–165/UR).
Receiver:
3.5 Mc heterodyning oscillator.
455 kc ±50 cps IF crystal filter.
RF Oscillator O–165/UR:
100 kc calibrating oscillator.

q. Frequency stability data:
RF Oscillator O–165/UR:
Variable HFO ±20 cps/Mc for ambient change of +25 or −25° C. over the range of 0—50° C. for any 8 hour period. 5 cps/Mc for 10% line voltage change.
Crystal HFO—Type 1N48 crystal.
Crystal BFO—Type 1N48 crystal.
Receiver:
Frequency drift ranges between 0.001 percent and 0.01 percent of frequency, depending on frequency used.

r. Input and/or output impedances:
(1) Antenna: Normal 72 ohms.
(2) Radio Receiver R–450/FRR–28:
IF output 100 ohms nominal.
Loudspeaker or external lines 600 ohms.
Front panel headphones jack 8000 ohms.
(3) Keyer KY–79/UR Output: 600 ohms tone.
(4) Amplifier-Detector:
1000 ohm input.
4000 ohm output.
(5) Loudspeaker: 500 ohm input.

s. Electrical characteristic of recommended antennas: 72 ohms nominal balanced or unbalanced transmission lines.

t. Power supply:
115/230 volts, 50/60 cycle, single phase AC.

u. Power required: 570 watts total.
(1) Receiver 1—130 watts.
(2) Receiver 2—130 watts.
(3) RF Oscillator O–165/UR—200 watts.
(4) Amplifier-Detector AM–615/UR—35 watts.
(5) Keyer KY–79/UR—75 watts.

6. EQUIPMENT SUPPLIED.

The complete Radio Receiving Set AN/FRR–28 equipment supplied by the manufacturer is listed in table 1–2.

TABLE 1–2. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS			VOLUME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Relay Rack Cabinet	CY–597A/G	87½	24	22⅜	27.2	275
2	Radio Receiver	R–450/FRR–28	10½	19	16½	1.9	66
1	Radio Frequency Oscillator, including cable W3–11	O–165/UR	10½	19	14	1.6	54
1	Communication Patching Panel, including 6 patch cords W5–1 through W5–6	SB–224/UR	3½	19	6	.20	7
1	Amplifier-Detector, including cable W9–12	AM–615/UR	3½	19	14	.54	15
1	Keyer, with cable W10–13	KY–79/UR	3½	19	13½	.52	22
2	Instruction books						
12	Cables W12–1 through W12–10, W12–14 and W12–15						
1	Loudspeaker	LS–187/UR	10½	19	3 13/16	.44	12
2	Fuses F12–1 and F12–2						

Unless otherwise stated, dimensions are inches, volume cubic feet, weight pounds.

7. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The additional equipment and publications required for operation of the receiving set equipment, but not supplied by the manufacturer, is listed in table 1–3.

TABLE 1–3. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Converter-Comparator Group	AN/URA–6 (recommended for communication purposes; other types may be employed)	Detection of frequency shift signals	455 kilocycles IF, 70 ohm, 2500 microvolt to 0.5 volt input or 600 ohm audio
1	Headphones			For monitoring purposes
3	HFO crystals	CR–18/U	For providing RF Oscillator O–165/UR crystal HFO signal	See Section 4, paragraph 3*a*(7) to determine frequencies
2	BFO crystals	CR–18/U	For providing RF Oscillator O–165/UR crystal BFO signal	See Section 4, paragraph 3*c*(1) to determine frequencies

8. SHIPPING DATA.

Table 1-4 gives the essential shipping data of the receiving set equipment.

9. ELECTRON TUBE COMPLEMENT.

Table 1-5 lists the quantity and types of electron tubes for each unit of the receiving set.

TABLE 1-4. SHIPPING DATA

CONTENTS		OVER-ALL DIMENSIONS				
NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	VOLUME	WEIGHT
Relay Rack Cabinet including: 1 Loudspeaker 1 Communication Patching Panel 2 blank Panels 1 blank Panel 6 Patch cords W5-1 through W5-6 2 Fuses, F12-1, F12-2 Miscellaneous hardware 12 cables, W12-1 through W12-10, W12-14, W12-15	CY-597A/G LS-187/UR S13-224/UR	96	32¼	31¾	58.6	515
RF Oscillator, including cable W3-11	O-165/UR	28½	23	15	5.7	100
Radio Receiver #1	R-450/FRR-28	27	22½	16½	5.4	176
Radio Receiver #2	R-450/FRR-28	27	22½	16½	5.4	176
Keyer, including cable W10-13, and Amplifier-Detector, including cable W9-12	KY-79/UR AM-615/UR	24	19½	13½	3.7	73

Unless otherwise stated, dimensions are inches, volume cubic feet, weight pounds.

TABLE 1-5. ELECTRON TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED																		
	6SJ7	6SA7	6J5	5W4	OA2	6V6/GT	6SN7	6SL7	6W6	NE51	12AU7	6C4	6AQ5	5Y3/GT	6BE6	6BA6	6J6	5R4/GY	6AL5	TOTAL
Radio Receiver #1					1	1					2				2	7	2	1	3	19
Radio Receiver #2					1	1					2				2	7	2	1	3	19

TABLE 1-5. ELECTRON TUBE COMPLEMENT (Continued)

UNIT	NUMBER OF TUBES OF TYPE INDICATED																			
	6SJ7	6SA7	6J5	5W4	OA2	6V6/GT	6SN7	6SL7	6W6	NE51	12AU7	6C4	6AQ5	5Y3/GT	6BE6	6BA6	6J6	5R4/GY	6AL5	TOTAL
RF Oscillator O-165/UR					1						2	2	4	1	1					11
Keyer KY-79/UR	1			1		2	1	1	1	2										9
Amplifier-Detector AM-615/UR	1	1	1	1	1															5
Total Number of Each Type	2	1	1	2	4	4	1	1	1	2	6	2	4	1	5	14	4	2	6	63

SECTION 2
THEORY OF OPERATION

1. INTRODUCTION.

Radio Receiving Set AN/FRR-28 is used for single or dual receiver reception of AM radiophone signals, amplitude modulated CW signals, or unmodulated CW signals. The dual receiver operational arrangement is for "diversity" signal reception. The received signals may be used locally or adapted for use in equipments, such as the teletypewriter, which may remote from the receiving set. Radio Receiving Set AN/FRR-28 includes the following units: Two Radio Receivers R-450/FRR-28, Radio Frequency Oscillator O-165/UR, Keyer KY-79/UR, Amplifier-Detector AM-615/UR Loudspeaker LS-187/UR, and Communication Patching Panel SB-224/UR. Provisions are made for the installation and use of a frequency-shift converter-comparator group in conjunction with the receiving set for frequency-shift reception. All of the equipment is mounted in Relay Rack Cabinet CY-597A/G.

Fading, or momentary loss of signal, at a receiving antenna may be caused by the variation of the position of the ionosphere. Fading occurs when two signals reach the receiving antenna out of phase and cancel each other. To overcome fading, "space diversity" or "frequency diversity" reception may be used.

In "space diversity" reception, the antennas for the two receivers in Radio Receiving Set AN/FRR-28 are spaced five to ten wavelengths apart. At this spacing it has been experimentally shown that the signals induced in the antennas will tend to fade independently. Since the two receiver outputs are combined, the effect of fading will be greatly reduced.

In "frequency diversity" reception, the same intelligence is transmitted at two different frequencies, making use of the observed fact that signals of different frequencies tend to fade independently. Each receiver in Radio Receiving Set AN/FRR-28 is tuned to one of the two transmitted frequencies, and the two receiver outputs are combined to reduce fading effects.

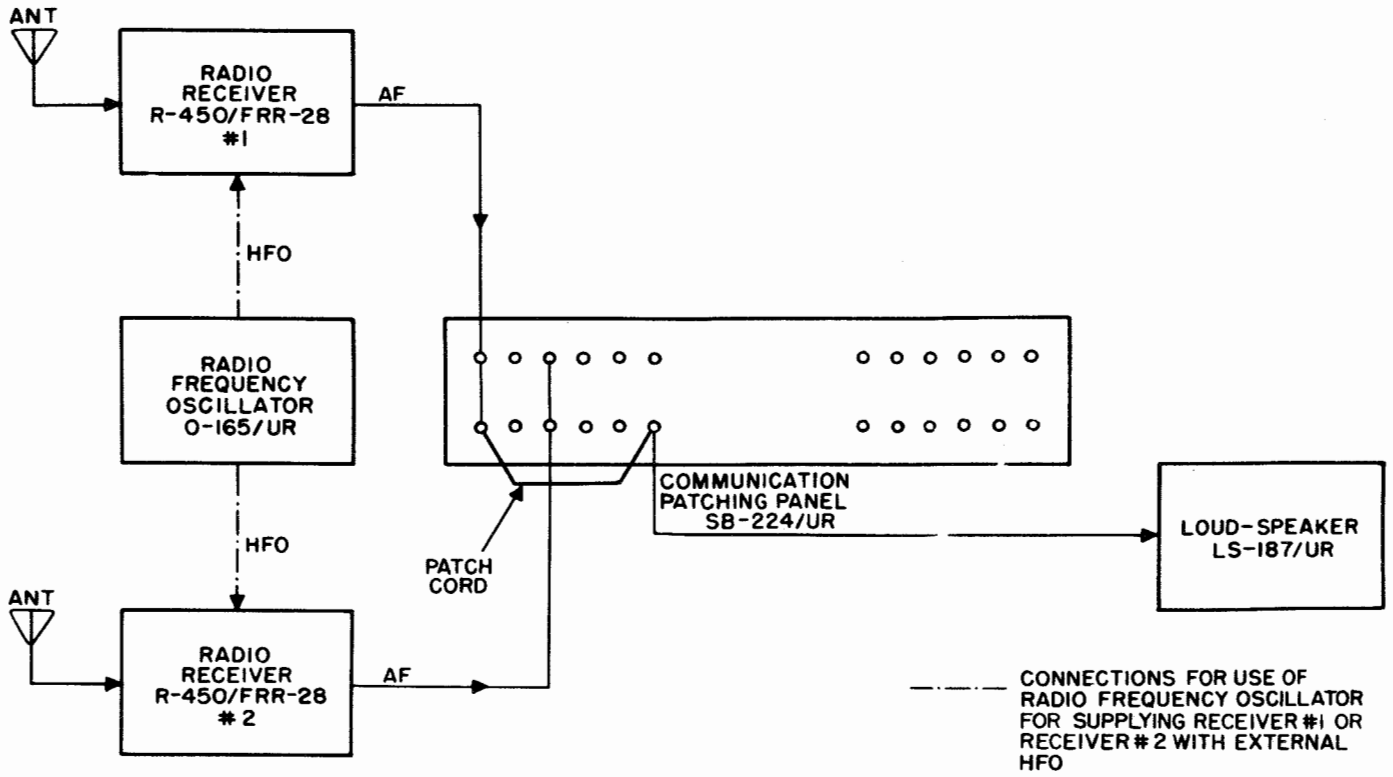


Figure 2–1. Radio Receiving Set AN/FRR–28, Block Diagram, Individual Reception of Phone Signals

2. BLOCK DIAGRAM DESCRIPTIONS.

a. INDIVIDUAL RECEPTION OF AM RADIOPHONE SIGNALS. (*See figure 2–1.*)—The AM radiophone signal from the antenna is preselected, amplified, and converted to an audio signal in one of the receivers. The audio output of either receiver is fed through Communication Patching Panel SB–224/UR and a patch cord to the speaker. The HFO section of RF Oscillator O–165/UR is used when the receiver HFO is inoperative, or when greater receiver stability is desired.

b. INDIVIDUAL RECEPTION OF CW SIGNALS. (*See figure 2–2.*)—The keyed telegraph signal from the antenna is preselected, amplified, and detected in the receiver. The detected signal is fed directly to Communication Patching Panel SB–224/UR in receiver #1. In receiver #2 the detected signal is mixed with a BFO voltage from the receiver or Oscillator O–165/UR, to produce an audio tone which is then fed to SB–224/UR. The detected signal from receiver #1 or the audio tone from receiver #2 is fed through SB–224/UR and a patch cord to Keyer KY–79/UR. The Keyer KY–79/UR monitoring output is fed through SB–224/UR and a patch cord to Loudspeaker LS–187/UR. The line output of Keyer KY–79/UR is applied to SB–224/UR and a patch cord to an external circuit, such as a teletypewriter, which operates on the tone signal produced by the Keyer KY–79/UR. The audio output of receiver #2 may be fed directly to Loudspeaker LS–187/UR instead of Keyer KY–79/UR. Since both receivers are identical, receiver #1 may be used to provide the audio tone and receiver #2 to provide the detected signal.

c. INDIVIDUAL RECEPTION OF FREQUENCY-SHIFT SIGNALS. (*See figure 2–3.*)—When a frequency-shift converter is supplied with the receiving set, frequency-shift signals can be received. A CW signal, whose normal frequency is shifted to another frequency for a period of time corresponding to the transmitted intelligence, is a frequency-shift signal.

The frequency-shift signal from the antenna is preselected, amplified, and mixed in the receiver with an HFO signal from either the receiver internal oscillator or RF Oscillator O–165/UR. Since a slight drift in HFO frequency may cause loss of the frequency-shifted signal, RF Oscillator O–165/UR, which gives greater stability, is preferred. The IF or AF signal output of the receiver, depending on the type of converter employed, is fed directly to the frequency-shift converter. The tone output of the converter is fed through the patching panel and a patch cord to the speaker and external lines, and the teletypewriter output is fed through the patching panel, a patch cord, and external lines to a teletypewriter.

d. DUAL SPACE OR FREQUENCY DIVERSITY RECEPTION OF RADIOPHONE SIGNALS. (*See figure 2–4.*)—The dual space, or frequency diversity, radiophone signals are fed from the antenna to the receivers. For dual space diversity reception, either the internal oscillator of the receivers or RF Oscillator

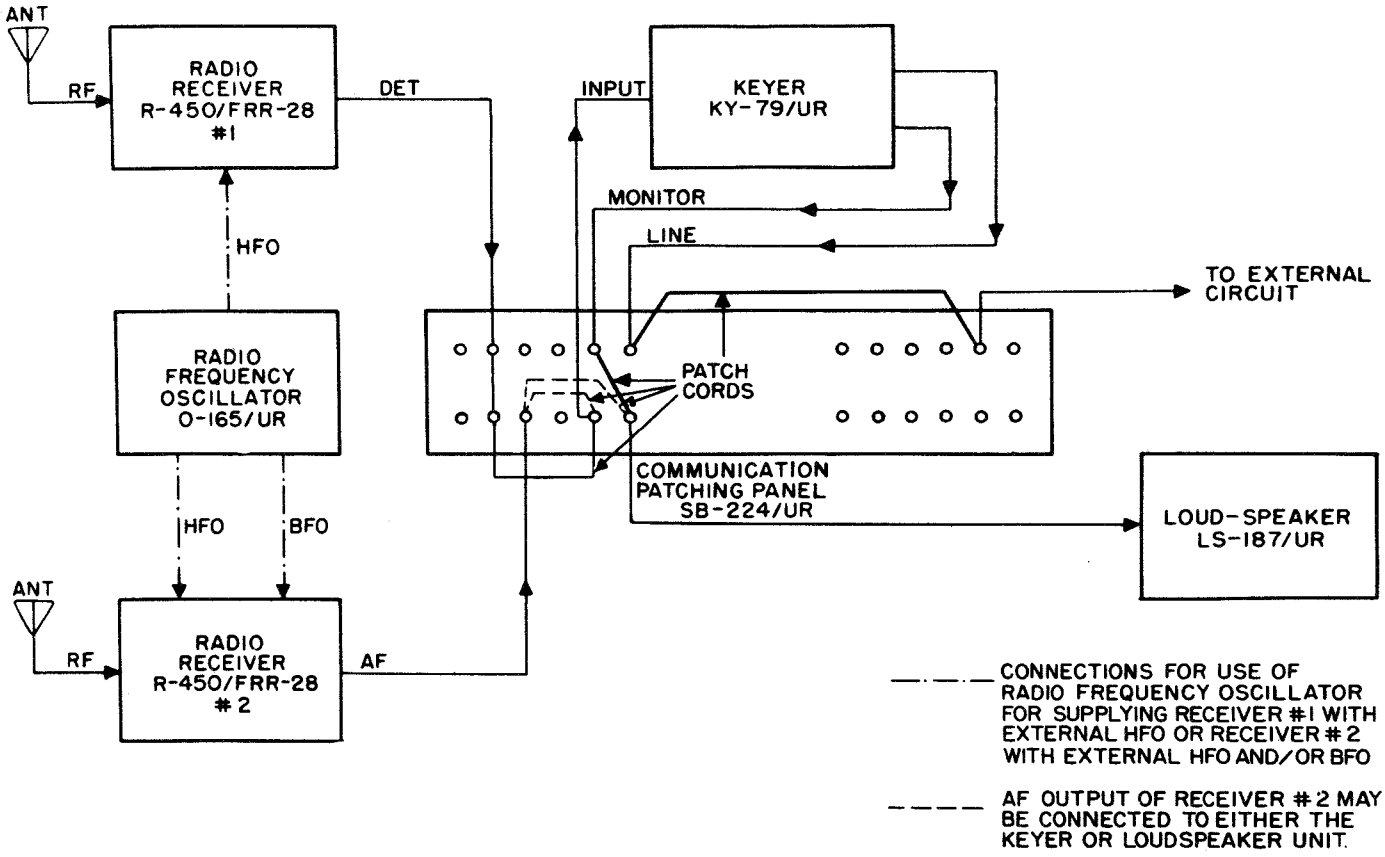


Figure 2–2. Radio Receiving Set AN/FRR–28, Block Diagram, Individual Reception of CW Signals

O–165/UR may be used, and for received signals over 7.4 megacycles a 3.5 megacycle signal from one receiver is used for both receivers. Amplifier-Detector AM–615/UR can be used for aligning both receivers to the same frequency. Since both receivers are tuned to different frequencies in frequency diversity reception, Oscillator O–165/UR cannot supply the HFO signal to both receivers, and either both internal oscillators or Oscillator O–165/UR and one internal oscillator are used. The AVC circuits of both receivers are tied together for common AVC action. The diversity signal is preselected, amplified, and detected in each receiver. The detector outputs of both receivers are patched together at the patch panel. The common detector signal is linked at one receiver to its audio section. The audio output of this receiver is fed to the speaker through the patch panel and a patch cord.

e. DUAL SPACE OR FREQUENCY DIVERSITY RECEPTION OF CW SIGNALS. (*See figure 2–5.*)—The dual space, or frequency diversity, CW signals are fed from the antenna to the receivers. In space diversity reception of AM CW signals, either the receiver internal oscillator or Oscillator O–165/UR is used. Amplifier-Detector AM–615/UR may be used to tune both receivers to the same frequency. In space diversity reception of unmodulated CW signals, common HFO and 3.5 megacycle signals are used to produce a single tone signal output from the receiver. In frequency diversity reception, each receiver is tuned to a different frequency, requiring either both receiver internal oscillators or one receiver internal oscillator and Oscillator O–165/UR to be used for the HFO signal. In space or frequency diversity reception of a CW signal the AVC circuits are tied together. The second detector outputs are combined on the patching panel with patch cords and fed to both Keyer KY–79/UR and external circuits. The Keyer KY–79/UR output is fed through the patching panel and a patch cord to the speaker, and the Keyer KY–79/UR line output is applied to an external circuit through the patching panel and patch cord.

f. DUAL SPACE AND FREQUENCY DIVERSITY RECEPTION OF FREQUENCY-SHIFT SIGNALS. (*See figure 2–6.*)—Frequency-shift signals are fed from the antenna to the receivers. Either Oscillator O–165/UR or the receiver internal oscillators are used to provide the HFO signal for space diversity reception. RF Oscillator O–165/UR is preferred, due to its greater stability in preventing receiver drift and loss of the frequency-shifted signal. When the receiver internal oscillators are used, the receivers are tuned with the Amplifier-Detector AM–615/UR. In frequency diversity reception of frequency-shift signals, Oscillator O–165/UR cannot provide the HFO signal for both

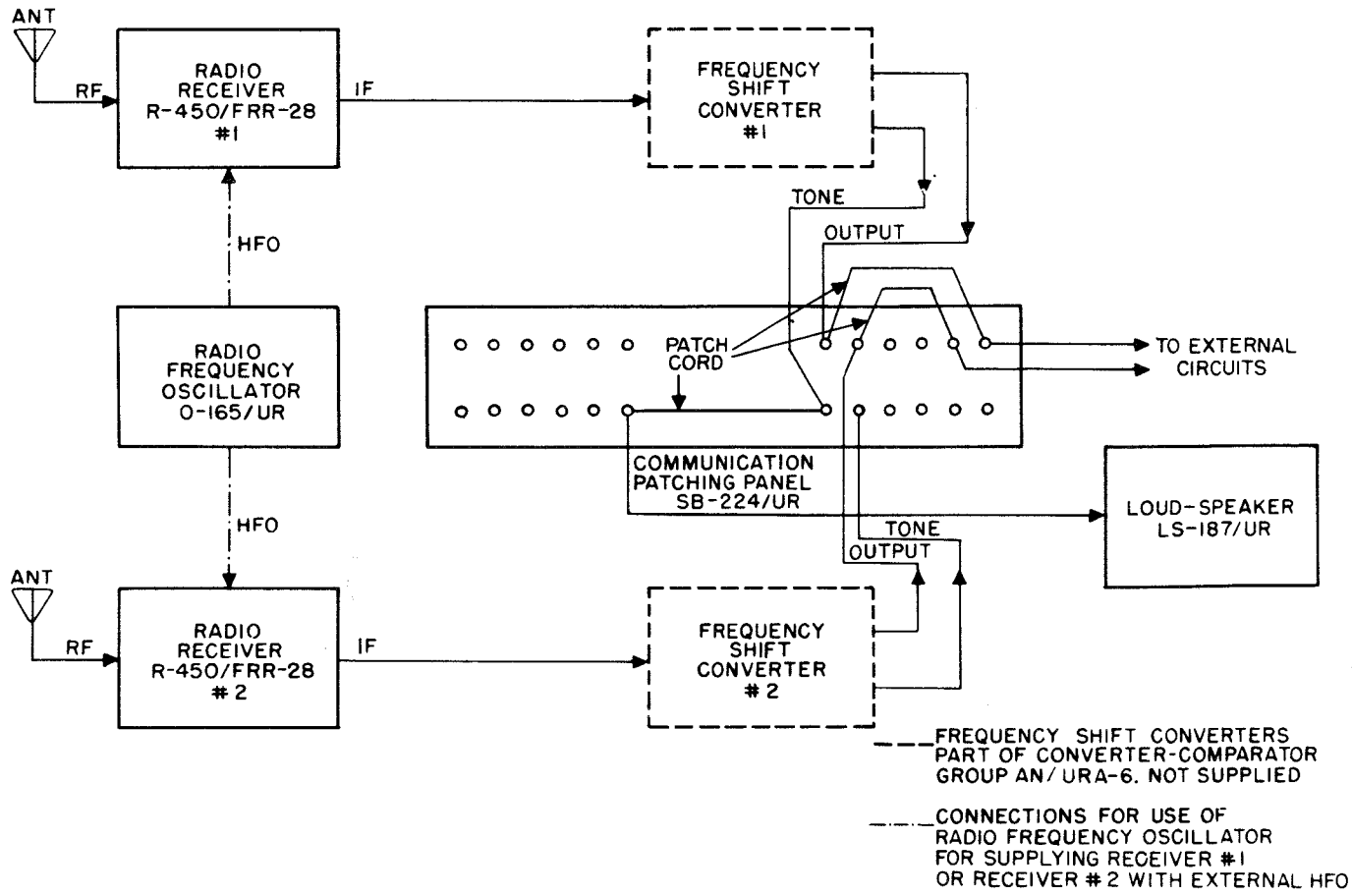


Figure 2–3. Radio Receiving Set AN/FRR–28, Block Diagram, Individual Reception of FS Signals

receivers, and either both receiver internal oscillators or one receiver internal oscillator and Oscillator O–165/UR are used. The frequency-shift signals are preselected, amplified, and converted to the intermediate frequency in the receiver. A signal from one receiver is applied to one of the frequency-shift converters that can be employed with the diversity equipment. The other receiver signal is applied to the other converter. The converter outputs are applied to the comparator. The stronger signal is converted to a tone and to a teletype signal, while the weaker signal is cut off. The tone output is fed through the patching panel and patch cords to the speaker and to external circuits. The teletype signal is fed through the patching panel and a patch cord through an external line to a teletypewriter.

3. RADIO RECEIVER R–450/FRR–28.

(See figures 1–1 and 1–2.)

a. GENERAL.—Two Radio Receivers R–450/FRR–28 are contained in the Radio Receiving Set AN/FRR–28. The receivers are used separately for reception of radiotelephone, CW, MCW, or frequency-shift signals, and are used together for reception of space or frequency diversity signals.

b. BLOCK DIAGRAM DESCRIPTION. *(See figure 2–31.)*—The RF signals from the antenna are applied to the RF amplifier stages V1 and V2 of the receiver, where the desired RF signal is preselected and amplified. The output signal of the RF amplifiers is applied to the first mixer stage V5.

An external HFO signal, from Oscillator O–165/UR which is amplified in the external HFO signal amplifier stage V4A, or a local HFO signal, which is produced in the local HFO stage V4B, is applied to the first mixer stage V5 through HFO switch S12. The HFO signal is mixed with the RF signal in the mixer tube V5 to form a beat frequency or IF signal.

When the RF signal is between .54 and 7.4 megacycles, the HFO signal frequency is such that the IF produced in the first mixer stage is 455 kilocycles. The first mixer stage output signal is fed through switch S4 to the gate amplifier tube V7, where it is amplified. The 455 kilocycle IF signal is then applied to the IF amplifier stages V9 and V10.

When the RF signal is between 7.4 and 54 megacycles, the HFO signal frequency is such that the frequency produced in the first mixer is 3.955 megacycles. The first mixer output is fed to the second mixer stage V6 through switch S4. A 3.5 megacycle

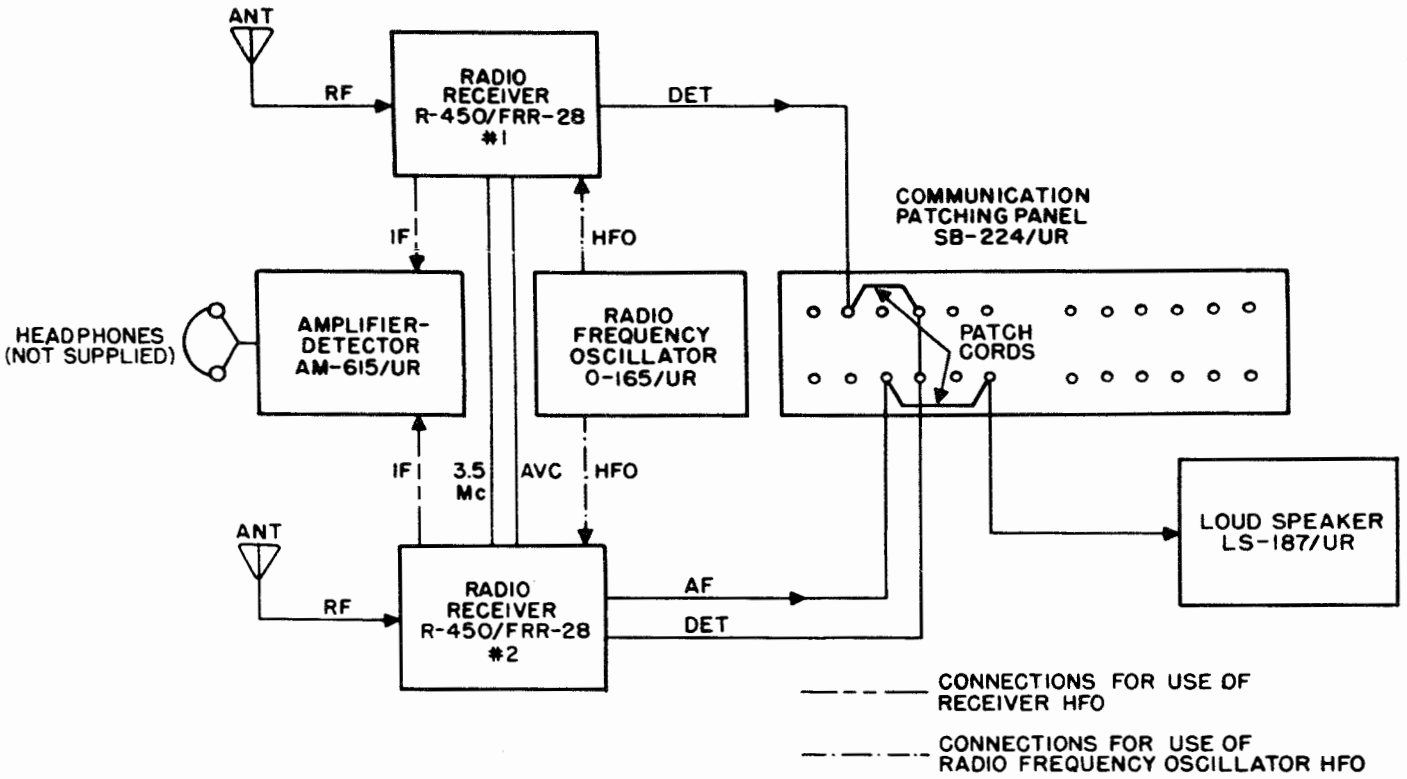


Figure 2–4. Radio Receiving Set AN/FRR–28, Block Diagram, Diversity Reception of Phone Signals

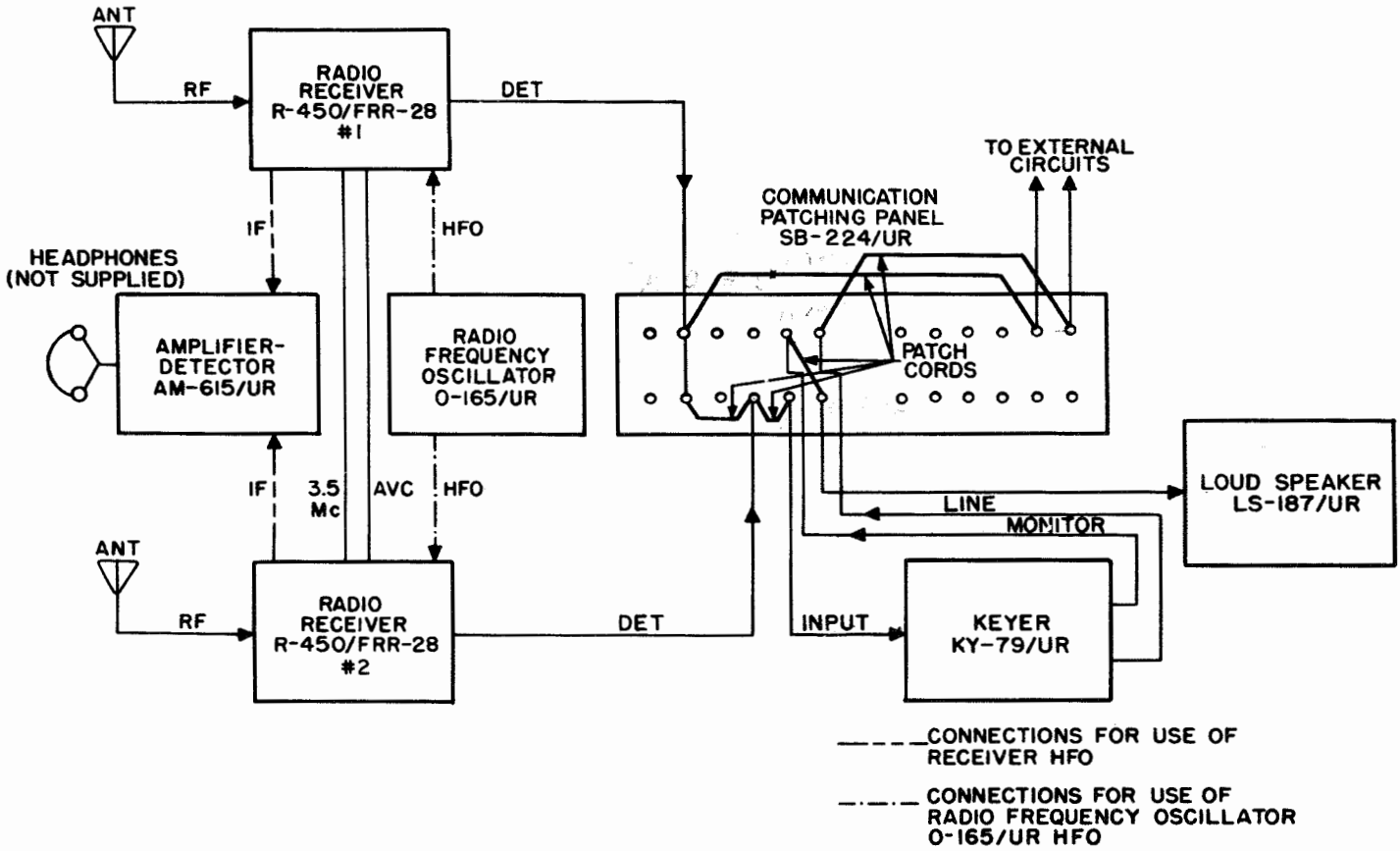


Figure 2–5. Radio Receiving Set AN/FRR–28, Block Diagram, Diversity Reception of CW Signals

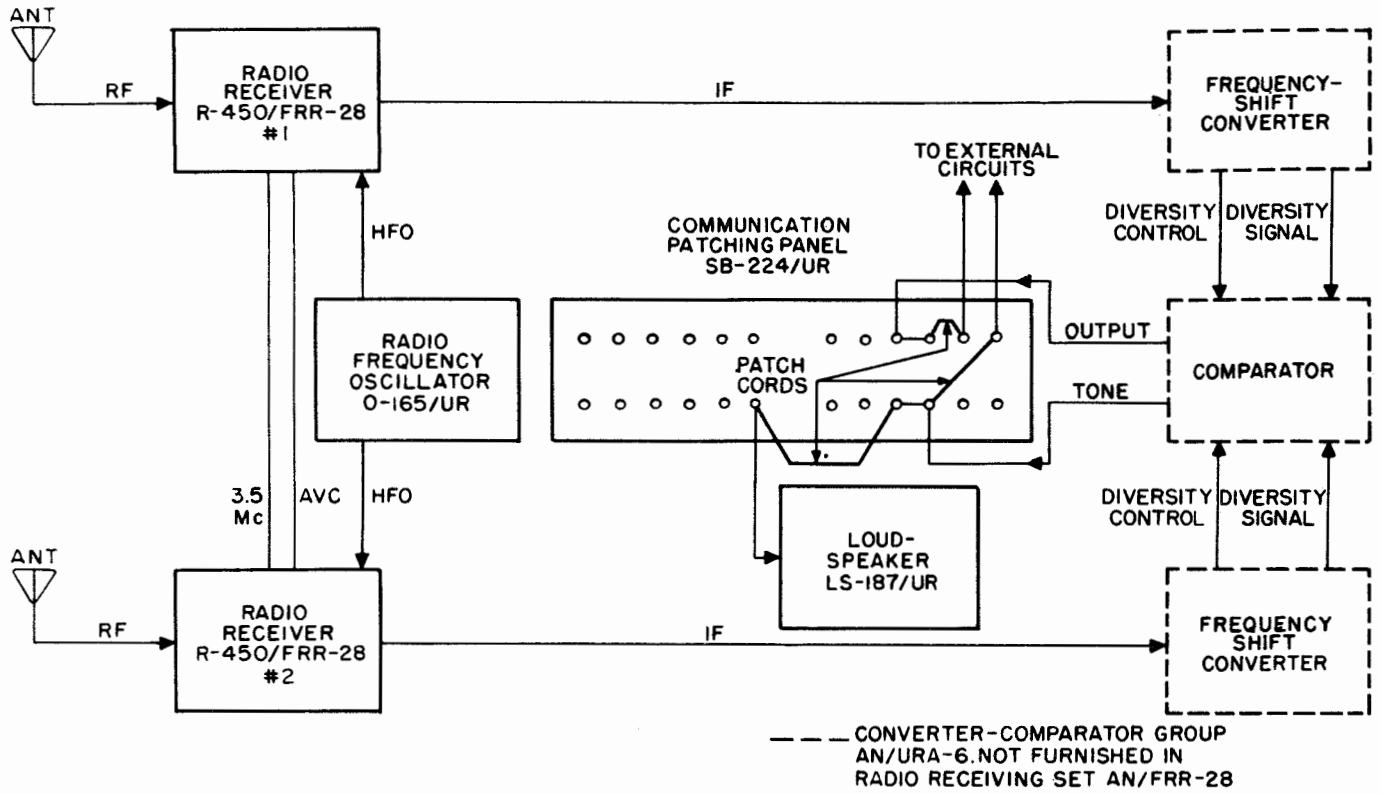


Figure 2–6. Radio Receiving Set AN/FRR–28, Block Diagram, Diversity Reception of FS Signals, Using IF Type Converter

signal from either an external source, or from the local 3.5 megacycle oscillator and buffer stage V8, is also applied to the second mixer stage V6 through switch S13. The first mixer output and 3.5 megacycle signal are mixed in the second mixer to produce a 455 kilocycle IF signal, which is applied to the IF amplifier stages V9 and V10.

The 455 kilocycle signal from either tube V6 or V7 is amplified in the amplifier stages V9 and V10, and in the driver stage V11. The output of the driver is fed to three different stages: the IF buffer stage, the AVC stage and the second detector stage. The IF signal from the IF buffer stage V16A is applied to the Amplifier-Detector AM–615/UR and Converter-Comparator Group AN/URA–6 if supplied. The AVC stage V14B provides a bias voltage to the RF and IF amplifier stages to maintain an automatic volume control. In diversity reception, the AVC stages of both receivers are combined with AVC switch S15 set in the DIV. position. The second detector stage V14A detects the amplitude modulation of the input RF signal, which is fed through the audio amplifier stage V16B and the audio output amplifier stage V17 to the speaker.

The noise limiter V15A is connected into the circuit by LIMITER switch S6. It provides a limiting action on noise pulses of higher amplitude than the signal.

To modulate a CW signal to produce an audio beat note for monitoring purposes, a beat frequency oscillator signal is provided. Either an external BFO signal from Oscillator O–165/UR is fed through the external BFO signal amplifier V13B, AVC switch S14, and BFO buffer stage V12 to the second detector input, or the internal BFO signal from the BFO stage V13A is fed through AVC switch S14, and BFO buffer stage V12 to the second detector input.

Meter M1 indicates the relative RF and AF signal strengths. The detected RF signal is applied to the meter through METER switch S11 from the second detector output. The AF signal from the output of the audio output amplifier is applied to the meter through meter rectifier stage V15B and METER switch S11.

c. DETAILED CIRCUIT ANALYSIS. (*See figures 7–30 and 7–31.*)

(1) RF AMPLIFIERS V1 AND V2.—The RF signal from the antenna is applied to an untuned primary and tuned secondary input transformer through jack J1 of the receiver. The capacitors and transformer that are connected into the circuit for each setting of BAND CHANGE switch S1 are listed in table 2–1.

The selected frequency is tuned in by means of TUNING capacitors C1A and C1B.

The RF signal is fed from the tuned secondary of the input transformer, through coupling capacitor C18, to the grid of the first RF amplifier tube V1. Grid bias voltage is filtered by resistor R2 and capacitors C19 and C41, and fed through grid leak resistor R1 to the

TABLE 2–1. TRANSFORMERS AND CAPACITORS PLACED INTO CIRCUIT BY BAND CHANGE SWITCH S1

Band	Frequency Range in Megacycles	Antenna to 1st RF Transformer	Capacitors in 1st RF Input	1st RF to 2nd RF Transformer	Capacitors in 2nd RF Input	2nd RF to 1st Mixer Transformer	Capacitors in 1st Mixer Input	HFO Transformer	HFO Capacitors
1	.54– 1.35	L1	C2,C3	L8	C26,C27	L15	C46,C47	L25	C76,C77,C78, C79,C80
2	1.35– 3.45	L2	C4,C5	L9	C28,C29	L16	C48,C49	L26	C79,C80,C81, C82
3	3.45– 7.4	L3	C6,C7,C8	L10	C30,C31,C32	L17	C50,C51,C52	L27	C79,C80,C83, C84,C85
4	7.4 –14.8	L4	C9,C10,C11	L11	C33,C34,C35	L18	C53,C54,C55	L28	C79,C80,C86, C87,C88,C89
5	14.8 –29.7	L5	C12,C13,C14	L12	C36,C37	L19	C56,C57	L29	C79,C80,C90, C91,C92,C93
6	29.7 –54	L6	C15,C16,C17	L13	C38,C39	L20	C58,C59	L30	C79,C80,C94, C95,C96

grid of tube V1. Screen grid voltage, which is filtered by capacitors C20 and C21, and resistor R4, is fed through voltage dropping resistor R3. Plate voltage is filtered by capacitors C22 and C23, resistors R5 and R6, and choke L7. The RF signal is amplified in the first RF amplifier, and fed through coupling capacitor C24 to an untuned primary and tuned secondary of a transformer. The transformer and capacitors used in the circuit for each position of BAND CHANGE switch S1 are listed in table 2–1. The transformer secondary circuit is tuned to the RF signal frequency by TUNING capacitors C1C and C1D.

The RF signal from the transformer secondary circuit is applied to the grid of the second RF amplifier tube V2 through parasitic suppressing resistor R11 and coupling capacitor C25. Bias voltage is applied to the grid through a filter consisting of capacitors C40 and C41, resistor R12, and grid leak resistor R13. Screen grid voltage is applied through voltage dropping resistor R14 and filtered by bypass capacitor C42. Plate voltage is filtered by choke L14, resistors R15 and R16, and capacitor C43. The amplifier RF signal is fed from the plate of tube V2 through coupling capacitor C44 to an untuned-primary and tuned-secondary transformer. The transformer and capacitors placed into the circuit at each position of BAND CHANGE switch S1 are listed in table 2–1. The transformer secondary circuit is tuned to the RF signal frequency by TUNING capacitors C1E and C1F.

The RF signal from the transformer secondary circuit is fed through parasitic suppressing resistor R21 and coupling capacitor C45 to pin 7 of the first mixer stage V5. The RF signal is mixed with a high frequency oscillator voltage in the mixer to produce an intermediate frequency signal.

(2) EXTERNAL HFO SIGNAL AMPLIFIER V4A AND LOCAL HFO V4B.

(*a*) GENERAL.—For improvement of image rejection the RF signals above 7.4 megacycles are converted twice to get the 455 kilocycle IF. Since the first conversion is to 3.955 megacycles, the HFO signal applied to the first mixer is 3.955 megacycles higher in frequency than the RF signal. Only single conversion is used for frequencies below 7.4 megacycles, and the HFO signal is 455 kilocycles above RF signal frequency.

(*b*) EXTERNAL HFO SIGNAL AMPLIFIER V4A.—An external HFO signal from Oscillator O–165/UR is applied to the receiver through jack J6 and a 455 kilocycle filter. The filter consists of choke L58, capacitors C162A and C162B, and resistors R111, R112, and R113. The HFO signal is applied to the external HFO signal amplifier tube V4A through coupling capacitor C164. HFO switch S12 is set to the EXT position. A low negative bias voltage, which is filtered by resistor R118 and capacitors C166 and C181, is applied to the grid through voltage-divider resistors R116 and R117, and grid leak resistor R114. Plate voltage is filtered by resistors R29 and R30, capacitors C71 and C72, and choke L24. The amplified HFO signal is fed from the plate of tube V4A, through coupling capacitor C74, to an untuned-primary and tuned-secondary transformer. The transformer and capacitors placed into the circuit by the position of BAND CHANGE switch S1 are listed in table 2–1. The transformer secondary circuit is tuned to the HFO frequency by TUNING capacitors C1G and C1H. The HFO signal is fed from the tuned transformer secondary circuit, through coupling capacitors C75 and C165, to pin 1 of the first mixer tube V5. When switch S12 is in the EXT position, tube V4B is biased beyond cut-off by the negative voltage applied to the grid from the rectifier V20 circuit.

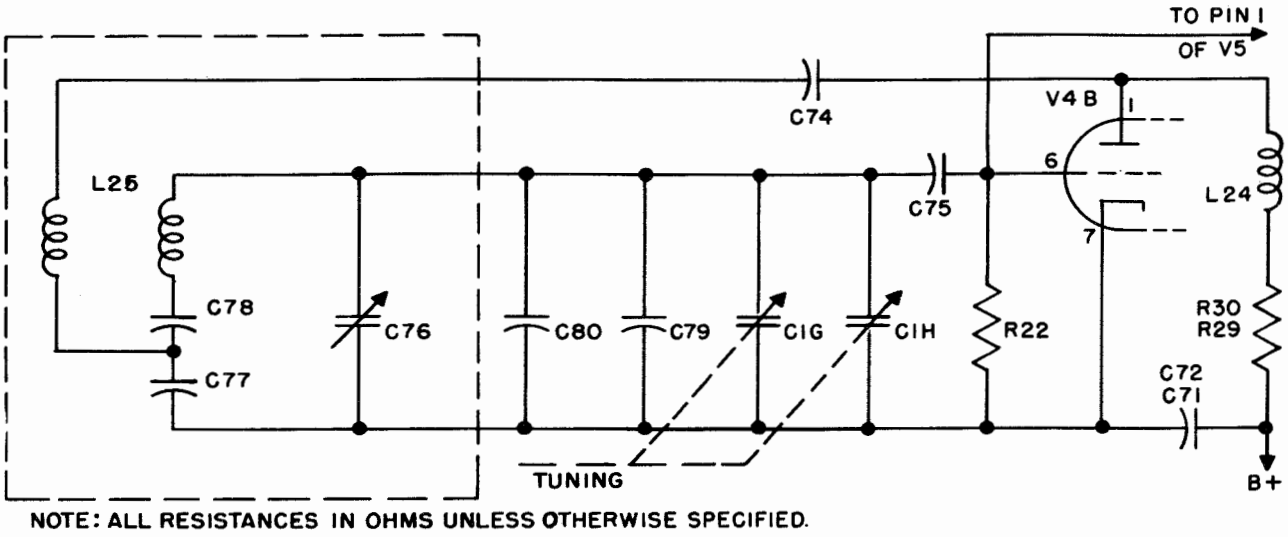


Figure 2–7. Radio Receiver R–450/FRR–28, Simplified Schematic of First Oscillator for Band 1

(*c*) LOCAL HFO V4B. (*See figures 2–7 and 2–8.*) —HFO switch S12 is set to the INT position. Bias for tube V4B is provided by grid leak resistor R22 to ground through switch S12. Capacitor C182 acts to bypass the RF present due to the comparitively long leads used in the circuit. Plate voltage is filtered by choke L24, capacitors C71 and C72, and resistors R29 and R30. The tuned grid-to-cathode circuit consists of the secondary of the transformer, and the capacitors listed in table 2–1, for each setting of BAND CHANGE switch S1. The circuit is tuned by TUNING capacitors C1G and C1H. The tuned circuit is coupled to the grid through capacitor C75. The feedback from the plate is provided to the tuned circuit through coupling capacitor C74. The HFO signal is fed from the grid of tube V4B to pin 1 of the first mixer tube V5. When switch S12 is in the INT position, tube V4A is biased beyond cut-off by the negative voltage applied to the grid from the rectifier V20 circuit.

(3) FIRST MIXER V5.—The RF signal from the second RF amplifier V2 is applied to pin 7 of the first mixer stage V5. The HFO signal is applied to pin 1 of tube V5 from either the external HFO signal amplifier tube V4A, or the local HFO tube V4B. Cathode bias for tube V5 is provided by resistor R27 in parallel with bypass capacitor C66. Grid bias for the HFO signal is provided by resistor R115, and for the RF signal by resistor R26. The voltage applied to the second and fourth grids is filtered by resistor R28 and

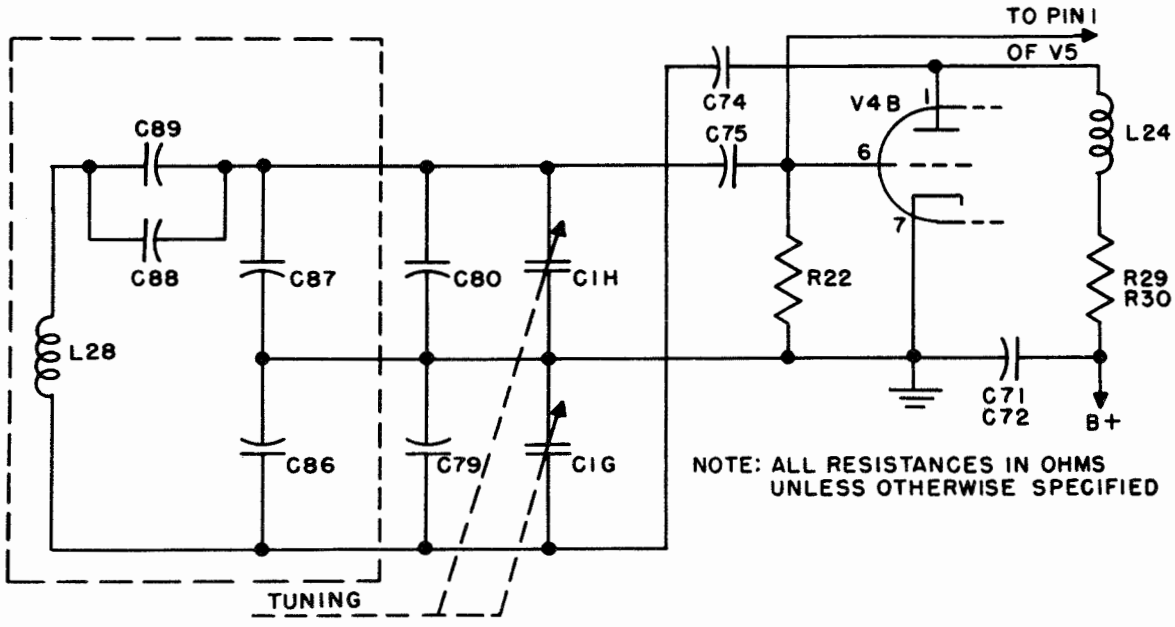


Figure 2–8. Radio Receiver R–450/FRR–28, Simplified Schematic of First Oscillator for Band 4

capacitors C68 and C73. The plate voltage is filtered by resistor R31 and capacitor C70.

When an RF signal above 7.4 megacycles is preselected in the RF amplifier stages, the HFO signal frequency is 3.955 megacycles higher than the RF signal, and the first mixer tube V5 plate output is a 3.955 megacycle IF signal. This signal is fed to a circuit tuned to 3.955 megacycles, consisting of the primary of transformer L31 and capacitor C67. The circuit consisting of capacitor C69 and coil L32 presents a low impedance and does not interfere with the transformer T1 operation.

When an RF signal below 7.4 megacycles is preselected in the RF amplifier stages, the HFO signal frequency is 455 kilocycles higher than the RF signal, and the first mixer plate output is a 455 kilocycle IF signal. This signal is fed to a circuit tuned to 455 kilocycles, consisting of the primary of L32 and capacitor C69.

(4) LOCAL 3.5 MEGACYCLE OSCILLATOR AND BUFFER V8.—When an RF signal above 7.4 megacycles is being received, BAND CHANGE switch S1 is set to the proper band and switch S4 is turned to the DOUBLE CONVERSION position by the same dial. Screen grid voltage is cut-off from the gate amplifier tube V7, which is used in single conversion only. Screen voltage is applied to tube V6 and plate voltage is applied to tube V8, which are used in double conversion.

The crystal of the local 3.5 megacycle oscillator is connected between the plate and grid of tube V8A. The signal from grid to cathode is applied by capacitor C101, which is made variable to allow for a slight adjustment of the oscillator frequency. Capacitor C167 provides the plate-to-cathode feedback necessary for oscillator operation. Bias for tube V8A is provided by grid leak resistor R36. Plate voltage is filtered by choke L35, resistors R37 and R38, and capacitors C102, C103, and C104. The 3.5 megacycle signal is fed from the grid of tube V8A, through coupling capacitor C168, to the grid of tube V8B.

The buffer stage V8B provides low impedance output for the 3.5 megacycle oscillator. Grid bias is provided by grid leak resistor R119. Plate voltage is filtered by resistor R120 and capacitor C169. The signal is fed from the cathode end of resistor R121, through coupling capacitor C170, to pin 1 of tube V6.

The 3.5 MC OSC switch S13, mounted on the rear of the receiver, permits receiver flexibility for either single or diversity operation. When switch S13 is in position "1", the local 3.5 megacycle oscillator functions, and the oscillator output is available at jack J7. In position "2", the 3.5 megacycle oscillator is disabled by removing plate voltage from tube V8, and the 3.5 megacycle signal must be externally supplied. In position "3" of switch S13 the oscillator again functions, but no oscillator output is available.

In dual diversity or single receiver operation, jack J7 on both receivers is connected together and switch S13 is set according to table 2–2.

TABLE 2–2. MODES OF OPERATION FOR DIFFERENT POSITIONS OF SWITCH S13

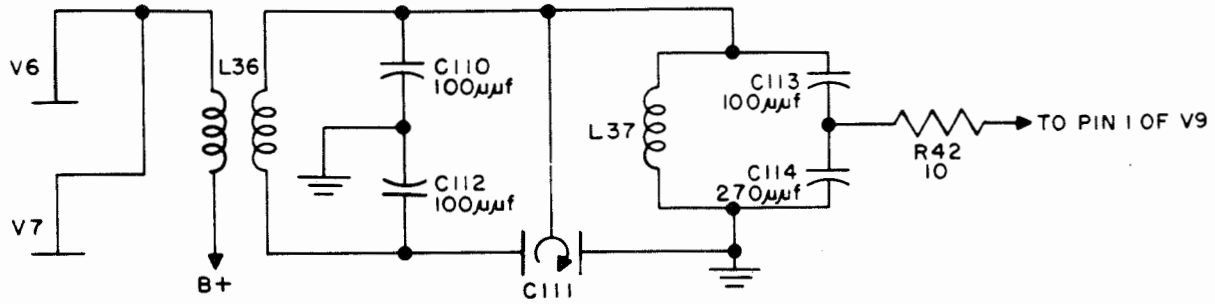
MODE OF OPERATION	SWITCH S13 POSITIONS	
	Receiver #1	Receiver #2
Diversity: Receiver #1 supplying 3.5 Mc signal.	1	2
Diversity: Receiver #2 supplying 3.5 Mc signal.	2	1
Single Receiver: Each receiver supplying own 3.5 Mc signal.	3	3

(5) SECOND MIXER V6.—The 3.955 megacycle signal from the tuned plate circuit of tube V5 is fed through the secondary of L31 to two tuned circuits, consisting of transformer L33 and capacitor C97, and inductor L34 and capacitor C99. Two tuned circuits are used for greater selectivity purposes. The signal is fed to pin 7 of the second mixer tube V6. The 3.5 megacycle signal from either the external source or the local 3.5 megacycle signal oscillator is applied to pin 1 of tube V6. The one-volt bias for pin 7 is filtered by resistor R35 and capacitor C98. Grid bias for pin 1 is supplied by grid leak resistor R122. Voltage to pin 6 is applied through voltage dropping resistor R40 and is filtered by bypass capacitors C102 and C106. Plate voltage is filtered by resistor R41 and capacitors C108 and C109. The two signal inputs to mixer tube V6 are mixed to form an IF difference frequency of 455 kilocycles. This IF signal is fed to the tuned plate circuit consisting of capacitor C107 and transformer L36 primary.

(6) GATE AMPLIFIER V7. — When BAND CHANGE switch S1 is set for the reception of signals below 7.4 megacycles, switch S4 is simultaneously set to the SINGLE CONVERSION position. Screen grid voltage is now applied to the gate amplifier tube V7. Plate voltages for tube V8 and screen voltage for tube V6, which are used in double conversion only, are cut-off, preventing their operation.

The 455 kilocycle signal from the tuned plate circuit of the first mixer stage V5 is fed to the grid of the gate amplifier tube V7 through the secondary of transformer L32 and grid current-limiting resistor R33. Capacitor C100 bypasses the IF signal to ground. Bias voltage is applied to the grid through grid leak resistors R32 and R34. Screen voltage, which is filtered by capacitors C105 and C102, is fed through voltage dropping resistor R39. Plate voltage is filtered by resistor R41 and capacitors C108 and C109, located in transformer T3. The amplified 455 kilocycle signal is applied to the tuned plate circuit, consisting of capacitor C107 and the primary of transformer L36, also contained in the T3 can.

(7) FIRST IF AMPLIFIER V9.—The IF signal from the tuned plate circuit of the second mixer tube V6, or from the gate amplifier tube V7, is fed by inductive coupling to a circuit which provides three



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED.

Figure 2–9. Radio Receiver R–450/FRR–28, Simplified Schematic of T3 for 3, 8, and 13 kc Positions

crystal and three non-crystal selectivity positions.

When the SELECTIVITY switch S5 is in one of the three non-crystal positions, the crystal is shorted out through the switch. See figure 2–9. The signal is fed from the secondary of transformer L36, tuned by capacitors C110 and C112, through the tuned circuit of capacitors C113 and C114 and inductor L37, and through parasitic suppressing resistor R42 to the grid of tube V9.

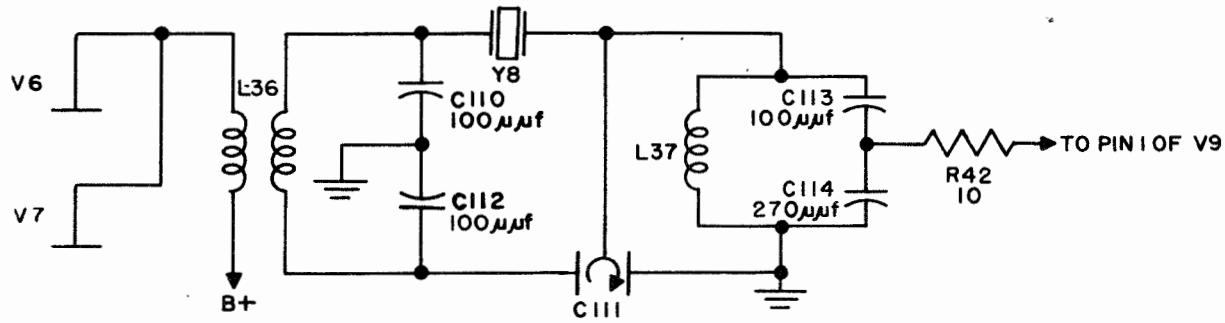
When switch S5 is in one of the crystal positions, the signal is fed from the tube V6 plate circuit, through the tuned circuit consisting of transformer L36 secondary and capacitors C110 and C112, through the crystal and the tuned circuit consisting of inductor L37 and capacitors C113 and C114, and through parasitic suppressing resistor R42 to the grid of tube V9. See figure 2–10.

The XTAL PHASING capacitor C111 is used to neutralize the crystal-holder capacity, and to maintain circuit balance so that the neutralization does not effect the resonant frequency of the tuned circuit of capacitors C110 and C112, and the secondary of transformer L36. The phasing control permits high attenuation of closely adjacent channel interference on either side of the signal frequency, when the crystal selectivity positions are used.

Figure 2–10 shows the simplified circuit of T3 when the SELECTIVITY switch S5 is set to the "1.3" kc position. Crystal Y8 has been added to the circuit, and resistor R45 has been added in series with coil L37 of the parallel resonant tuned circuit, thus decreasing the impedance of the tuned circuit. This impedance is in series with the crystal circuit. As the series impedance is decreased the selectivity becomes greater. As more resistance is added to the tuned circuit by setting switch S5 to the ".5" kc or ".2" kc position, the selectivity is further increased. At the same time, the amplitude of the IF output signal to the grid of V9 is kept fairly constant since the impedance of the parallel tuned circuit decreases with the increase in resistance in the tuned circuit. Capacitors C113 and C114 form a voltage divider. The voltage across C114 is applied to the grid of V9.

Cathode bias for the first IF amplifier tube V9 is provided by voltage divider resistors R128 and R129, and is filtered by capacitor C183. Cathode bias is adjusted by variation of the IF GAIN control R128 on the rear of the receiver. Grid bias is fed through grid leak resistor R43 and filtered by resistor R44 and capacitor C115. Screen voltage is applied through voltage dropping resistor R48 and filtered by capacitor C116. Plate voltage is filtered by resistor R49 and capacitor C118. The amplified IF signal at the plate of the first IF amplifier tube V9 is applied to a tuned circuit, consisting of the transformer primary, L38, and capacitor C117.

(8) SECOND IF AMPLIFIER V10.—The 455 kilocycle IF signal from inductor L38 is inductively



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

Figure 2–10. Radio Receiver R–450/FRR–28, Simplified Schematic of T3 for 1.3 kc Position

applied to a tuned circuit consisting of inductor L39, capacitors C119 and C120, and one of the tertiary windings. When switch S5 is in the "3" kilocycle, or one of the crystal positions, the "3" kilocycle winding is used. In the "8" kilocycle position, "8" kilocycle winding is used, and in the "13" kilocycle position the "13" kilocycle winding is used. The signal is fed from between the two capacitors C119 and C120, which are a part of the tuned circuit and also function as a voltage divider, to the grid of the second amplifier V10 through parasitic suppressing resistor R50. Grid bias is fed through grid leak resistor R51 and filtered by resistor R52 and capacitor C121. Screen grid voltage is fed through voltage dropping resistor R53 and filtered by bypass capacitor C122. Cathode bias is provided by voltage divider resistors R128 and R129, and filtered by capacitor C184. Adjustment of IF GAIN potentiometer R128 varies the cathode bias. Plate voltage is filtered by resistor R54 and capacitor C123. The IF signal, which is amplified in tube V10, is applied to the plate tuned circuit consisting of inductor L41, and capacitor C124. The signal is inductively fed from this tuned circuit to the tuned grid circuit of the driver stage V11.

(9) DRIVER STAGE V11.—The signal from the tuned plate circuit of tube V10 is applied to the tuned grid circuit of tube V11, consisting of capacitors C125 and C126, and inductor L42. One of the tertiary windings is added into the circuit, the winding used depending upon the position of switch S5. The signal is fed from the tuned grid circuit to the grid of the driver tube V11 through parasitic suppressor resistor R55. A negative ten-volt bias, which is supplied to the grid from the power supply, is filtered by resistor R57 and capacitors C127 and C128, and through grid leak resistor R56. Screen grid voltage is filtered by resistor R58 and capacitor C129A. Plate voltage is filtered by resistor R59, choke L47, and capacitor C129B. The output of the driver stage V11 is fed to the IF output buffer stage V16A, second detector stage V14A, and the AVC stage V14B.

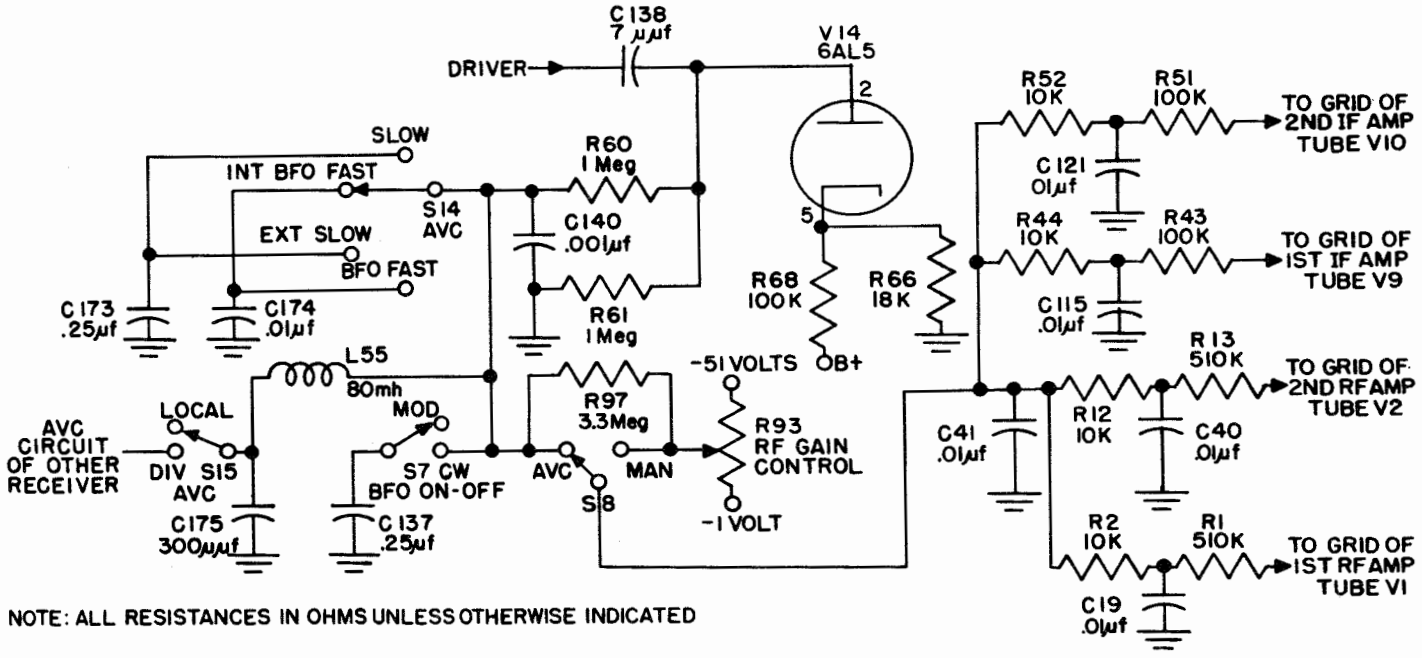
(10) IF OUTPUT BUFFER STAGE V16A. The IF signal is fed from the plate of the driver stage V11 to the grid of the IF buffer output stage V16A through coupling capacitor C145. Bias is provided by grid leak resistor R78. Plate voltage is filtered by resistor R80 and capacitor C146. The output of tube V16A, at the cathode end of cathode resistor R79, is fed to the IF OUTPUT MONITOR jack J2 through coupling capacitor C147 and autotransformer L53.

(11) VOLUME CONTROL CIRCUITS. (*See figure 2-11.*)—Three methods of volume control are provided in the receiver unit: manual volume control, diversity AVC, and local AVC.

Manual volume control is provided by variation of the RF GAIN potentiometer R93. This potentiometer provides a variation of bias between a negative one volt and a negative fifty volts to the grid circuits of both RF and both IF amplifier tubes, through filtering resistors and capacitors when AVC switch S8 is set to the MAN position.

Diversity AVC, which is applied to and fed from the receiver through switch S15, is filtered by capacitor C175 and inductor L55 before being fed to the RF and IF amplifiers. In diversity operation, the stronger AVC signal will cut off reception in the other receiver.

The local AVC voltage is supplied by AVC tube V14B. The IF signal from the plate of the driver tube is applied to the plate of the AVC tube where it is



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

Figure 2-11. Radio Receiver R-450/FRR-28, Simplified Schematic of AVC Circuit

rectified. A positive bias is provided to the cathode from the regulated 150-volt supply through voltage divider resistors R66 and R68. This bias causes a voltage delay in the AVC tube rectification until the signal is strong enough to overcome the bias. The rectified current flowing through resistor R61 produces a negative potential at the plate side of the AVC tube. This negative bias is filtered by resistor R60 and capacitor C140, and is again filtered by a resistor and capacitor network in the grid circuits of the IF and RF amplifiers.

The time constant of the resistor-capacitor combinations in the AVC circuit must be high enough to completely filter the signal modulation from the AVC signal, leaving only an average voltage which will follow the slow variations in the carrier signal, which are due to fading. Too high a time constant cannot be used since the AVC voltage would not follow rapid fading. The time constant of the AVC circuit is varied by switches S7 and S14.

(12) SECOND DETECTOR V14A.—The IF signal is fed from the plate of the driver tube V11, through coupling capacitor C139, to the plate of the second detector. The modulated IF signal is fed through RF choke L54, which passes only the modulation portion of the signal, to the detector jack J9, and through the link between screws 4 and 5 on E19, resistors R62, R63, R64 and R84, and coupling capacitor C143, to the grid of the audio amplifier tube V16B. Capacitors C141 and C142 are RF bypass capacitors.

(13) LIMITER V15A.—The output of the second detector, which is the negative portion of the modulated IF signal, is fed through inductor L54. Inductor L54 blocks the high IF signals and passes the lower modulating frequencies through resistor R62 to a parallel connection of resistor R63 and the limiter tube V15A. When capacitor C144 is connected into the circuit by switch S6, a negative charge equal to the average audio level signal is built up on the limiter plate end of the capacitor. When a pulse noise signal, whose amplitude is greater than the negative charge, is applied across R63, the cathode of the limiter will become negative in respect to its plate, since the time constant of resistor R67 and capacitor C144 is large. The tube will conduct and thereby limit the noise.

(14) AUDIO AMPLIFIER V16B.—The signal voltage from the second detector is voltage fed through coupling capacitor C143, and the AUDIO GAIN potentiometer R84 to the grid of the audio amplifier tube V16B. If an external phone signal is fed to terminal E1, it is fed through potentiometer R84 to the grid of tube V16B. Cathode bias is provided by resistor R83. Plate voltage, which is filtered by resistor R82 and capacitor C148, is fed through plate load resistor R81. The amplified audio signal is fed from the plate of tube V16B to the audio output amplifier tube V17.

(15) AUDIO OUTPUT AMPLIFIER V17.—The audio signal is applied from tube V16B, through coupling capacitor C149, to the grid of the audio amplifier tube V17. Bias for the tube is provided by grid leak resistor R98 and by cathode resistor R99 in parallel with bypass capacitor C151. The audio output amplifier amplifies the audio signal, which is then applied across the primary of transformer T7 and capacitor C150. The secondary of transformer T7 applies the signal to terminal board E2 and phone jack J3.

(16) BEAT FREQUENCY OSCILLATOR V13A. (*See figure 2–12.*)—When AVC switch S4 is in either of the INT BFO positions, tube V13B is inoperative due to the high negative bias applied to the grid through resistors R124 and R127. The oscillator tuned circuit between grid and cathode consists of capacitors C130, C131, and C132 and inductors L44, L45, L46. Feedback from the plate is provided through coupling capacitor C133. Grid coupling capacitor C134 couples the grid to the oscillator circuit. The cathode coupling is effected through ground. The signal output is tapped between capacitor C132 and inductor L46 which serve as a voltage divider to reduce the load effects on the oscillator. Inductor L46 also provides a dc path to ground for the grid of tube V12. Bias for tube V13A is provided by grid leak resistor R75. Plate voltage for both sections of tube V13 is filtered by resistor R77 and capacitor C136, and fed through load resistor R76 and switch S7 when in the CW position.

(17) EXTERNAL BFO AMPLIFIER V13B.—When switch S14 is in either of the EXT BFO positions, the bias for tube V13B is applied at normal operating level through voltage divider R127, R125, R126 and isolating resistor R124, and the bias obtained from the power supply through resistor R127 for tube V13A drives it beyond cut-off. An external BFO signal is applied to the grid of tube V13B through EXT BFO jack J8 and coupling capacitor C171. Resistor R123 is used to match the impedance of the coaxial line feeding the BFO signal into the receiver. The amplified external BFO signal in the plate circuit is directly coupled to the plate of tube V13A.

(18) BFO BUFFER V12.—The BFO signal from either section of tube V13 is fed to the grid of BFO buffer stage V12 through a divider network, consisting of capacitor C132 and inductor L46 and through a shielded lead which prevents the BFO signal from radiating and effecting the IF signal. A variable bias and degenerative feedback voltage is provided by BFO INJECTION potentiometer R74. Screen grid voltage is fed through voltage dropping resistor R100 and filtered by bypass capacitor C135. The plate of the BFO buffer tube V12 is coupled directly to the plate of the driver tube V11, so that both the BFO signal and the IF signal are applied to the second detector tube V14A.

(19) METER M1.—The meter M1 is used as an indicator of relative RF and AF signal strength. When METER switch S11 is in the RF position, the meter is connected across part of voltage divider R65, R69, and R102 which, along with R62, R63, and R64, form the second detector tube V14A plate load. The METER ADJ RF potentiometer R69 is used to set the meter to

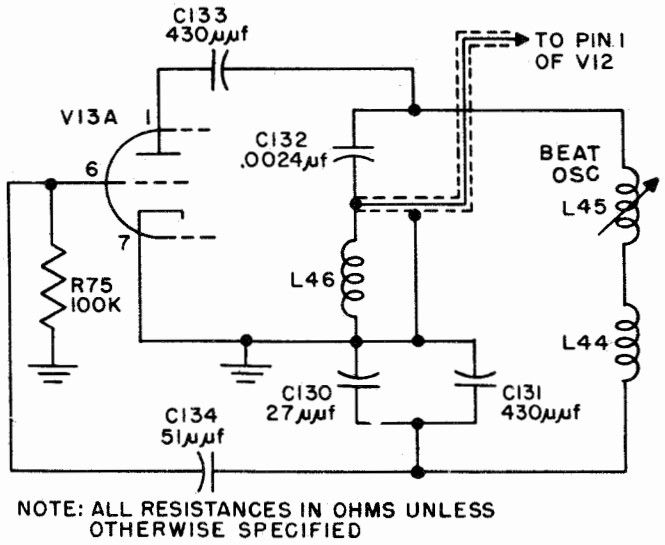


Figure 2–12. Radio Receiver R–450/FRR–28, Simplified Schematic of BFO Circuit

read plus 20 db on the RF scale when a ten-microvolt signal is applied to the receiver.

(20) OUTPUT METER RECTIFIER V15B.—When switch S11 is in the AF position, the audio signal from across terminals 1 and 4 of the transformer T7 secondary is fed through resistors R70 and R101, rectified in the output meter rectifier stage V15B, and then applied across meter M1. The METER ADJ AF potentiometer R101 provides adjustment of the zero db reading on the AF scale, which is made when the AF output power applied to the meter is six milliwatts, or 1.9 volts across a 600-ohm load.

(21) POWER SUPPLY V18, V19, AND V20.—Power is applied to the receiver through plug P1 and fuse F1 to the primary of power transformer T8. Capacitors C152A and C152B are RF filter capacitors. Transformer T8 secondary terminals 13 and 14 apply the a-c power to the cathode of rectifier tube V19, while terminals 12 and 10 apply a-c power to the plates. The center tap, terminal 11, of the secondary winding, which feeds the plates of tube V19, is grounded through fuse F2. The rectified positive voltage is filtered by chokes L51 and L52, and capacitors C161A, C161B and C161C, and regulated by voltage regulator tube V18. Resistor R85 is a plate load for tube V18. This circuit provides a regulated positive 150 volts.

Terminals 10 and 12 of transformer T8 also provide a-c power to the cathodes of the tube V20. The plates are tied together and the output rectified voltage is filtered by resistors R90, R91 and R92, and capacitors C158, C159 and C160. The negative voltage is used for negative biasing of various tubes in the receiver. Terminals 15 and 16 of transformer T8 provide 6.3 volts a-c to lamps I1, I2, I3 and I4, to the filaments of tubes V3, V7, V9, V10, V11, V12, V13, V14, V15, V16, V17 and V20, and to the 6.3 volt connection on terminal board E19. Terminals 17 and 18 of transformer T8 provide a 7.5 a-c voltage, which is filtered by capacitors C156 and C157, and choke L50, to the filaments of tubes V6 and V8. Terminals 19 and 20 of transformer T8 provide 7.5 volts, filtered by capacitors C153, C154 and C155, and chokes L48 and L49, to the filaments of tubes V1, V2, V4 and V5. The 7.5 volts is necessary to compensate for the 1.2 volts loss in each of filter chokes L48, L49, and L50, and leave 6.3 volts for the tubes.

(22) AUXILIARY EQUIPMENT.—An a-c outlet is provided for the use of an accessory such as a lamp or electric clock.

The SEND-REC switch S9 is used to desensitize the receiver during transmission time by removing plate and screen voltage from V1 and V2, screen voltage from V6 and V7, and plate voltage from V8B, but leaves the power on to provide for instant reception between transmitting periods. Jack J4 is provided to allow for remote SEND-REC relay control of the receiver.

4. RADIO FREQUENCY OSCILLATOR O–165/UR.

a. GENERAL.—The Radio Frequency Oscillator O–165/UR is used, in diversity reception, to supply a common HFO voltage and a common BFO voltage to both receivers. In individual receiver operation, the Oscillator O–165/UR provides a stable and accurate HFO and BFO voltage to the receiver.

b. BLOCK DIAGRAM DESCRIPTION. (*See figure 2–13.*)—The variable HF oscillator tube V1 produces a signal which can be varied in frequency between two and four megacycles. This signal is fed through buffer stage V2 to switch S6. One of three crystals in the crystal oscillator V10A applies a fixed frequency to switch S6. The variable frequency signal, or one of the crystal frequency signals, is fed from switch S6 to the buffer amplifiers V10B and V12, where it is amplified. The amplified HF signal is applied to the frequency multiplier stages V4, V5 and V11. Table 2–3 lists the output frequency range of each stage of the frequency multipliers, and of the entire high frequency section of the Oscillator O–165/UR when switch S7 is turned to each position.

TABLE 2–3. FREQUENCY RANGE OF FREQUENCY MULTIPLIER SECTIONS

Position of Switch S7 and HF Output Freq. Range (Mc)	Output Range of First Frequency Multiplier V4 (Mc)	Output Range of Second Frequency Multiplier V5 (Mc)	Output Range of Third Frequency Multiplier V11 (Mc)
2–4	2–4	—	—
4–8	4–8	—	—
8–16	4–8	8–16	—
16–32	4–8	8–16	16–32

Oscillator O–165/UR is equipped with a 100 Kc crystal oscillator calibrator which is used for calibration of the variable oscillator tube V1 fundamental fre-

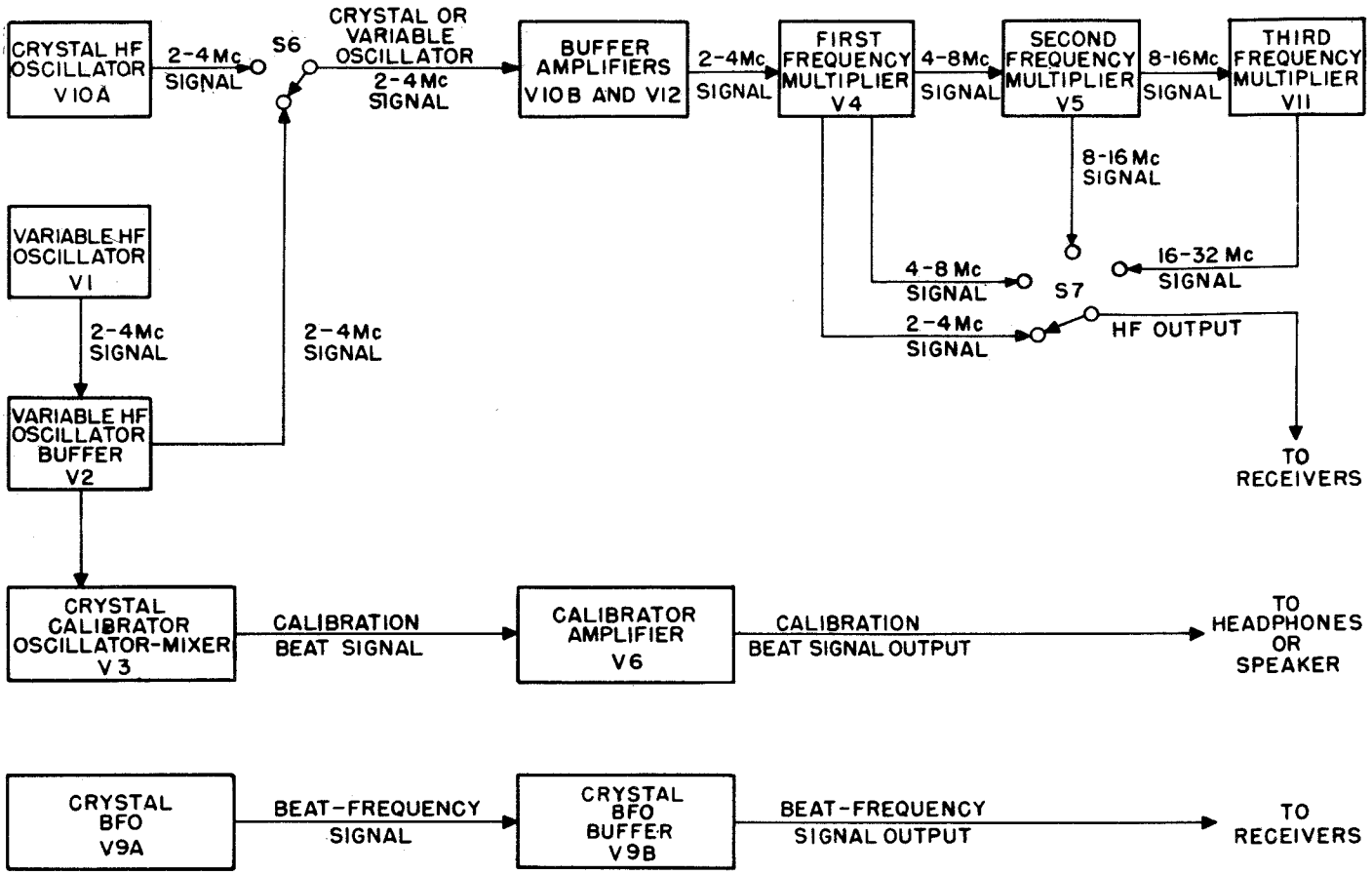


Figure 2–13. Radio Frequency Oscillator O–165/UR, Block Diagram

quency of two to four megacycles. The calibrator provides heterodyning signals at the twenty main check points which are spaced at 100 Kc intervals and at the sub-check points which lie approximately half way between the main check points. Calibration at these check points is accomplished by zero beating the heterodyning signals. Other heterodyning signals are produced at random frequencies and are not used for calibration purposes. These signals are considerably weaker and can be easily distinguished from the main and sub-check point signals. Calibration curves are provided which cover the range between each main and sub-check point.

The calibration frequency is produced and mixed with the variable oscillator frequency in the calibrator oscillator-mixer tube V3. The beat frequency output of tube V3 is amplified in calibrator amplifier tube V6 and fed to a pair of headphones.

A beat frequency signal is produced in the crystal BFO stage V9A. This frequency is fed through the buffer stage V9B to the receiver.

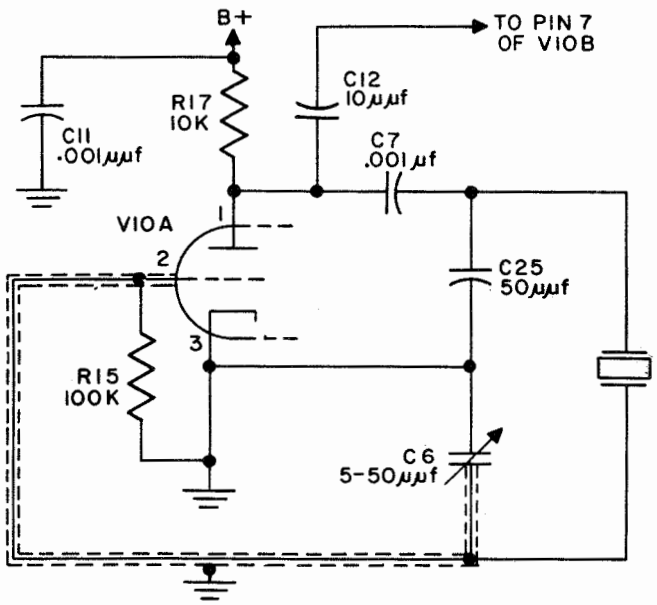
The power supply converts the external available power to power suitable for use in the RF oscillator.

c. DETAILED CIRCUIT ANALYSIS. (*See figure 7–32.*)

(1) VARIABLE OSCILLATOR V1.—The variable oscillator is a grounded plate Hartley circuit. The tuned circuit consists of the main tuning capacitor C1, fixed capacitor C56, trimmer capacitor C2, inductor L3, and slug-tuned inductor L2. One tap on inductor L3 is connected to the grid of tube V1 through coupling capacitor C3 and grid leak resistor R1. A second tap on inductor L3 is connected to the cathode of grid V1. The plate voltage is filtered by resistor R2 and capacitor C4. The ground side of the filament circuit for V1 is connected to the cathode. The circuit consisting of coil L8 and capacitor C57 acts as a filter for the filament circuit to prevent undesirable feedback.

(2) VARIABLE OSCILLATOR BUFFER V2.—The buffer stage V2 has a high input impedance to prevent variations of frequency in the oscillator due to load variations. The oscillator output voltage from the cathode of tube V1 is applied to the grid of tube V2 through coupling capacitor C5. Capacitors C5 and C30 act as a voltage dividing network for the voltage input to the buffer. Resistor R3 is a grid leak resistor for tube V2. The plate voltage is filtered by capacitor C46 and resistor R4. The output from the cathode of tube V2 is applied to contact MO of section C of switch S6.

(3) CRYSTAL OSCILLATOR V10A. (*See figure 2–14.*)—When the HFO XTAL selector switch S6 is set into position "1", "2" or "3", one of the crystals in



NOTE ALL RESISTANCES IN OHMS UNLESS OTHERWISE SPECIFIED.

Figure 2–14. Radio Frequency Oscillator O–165/UR, Simplified Schematic of Crystal HFO Circuit

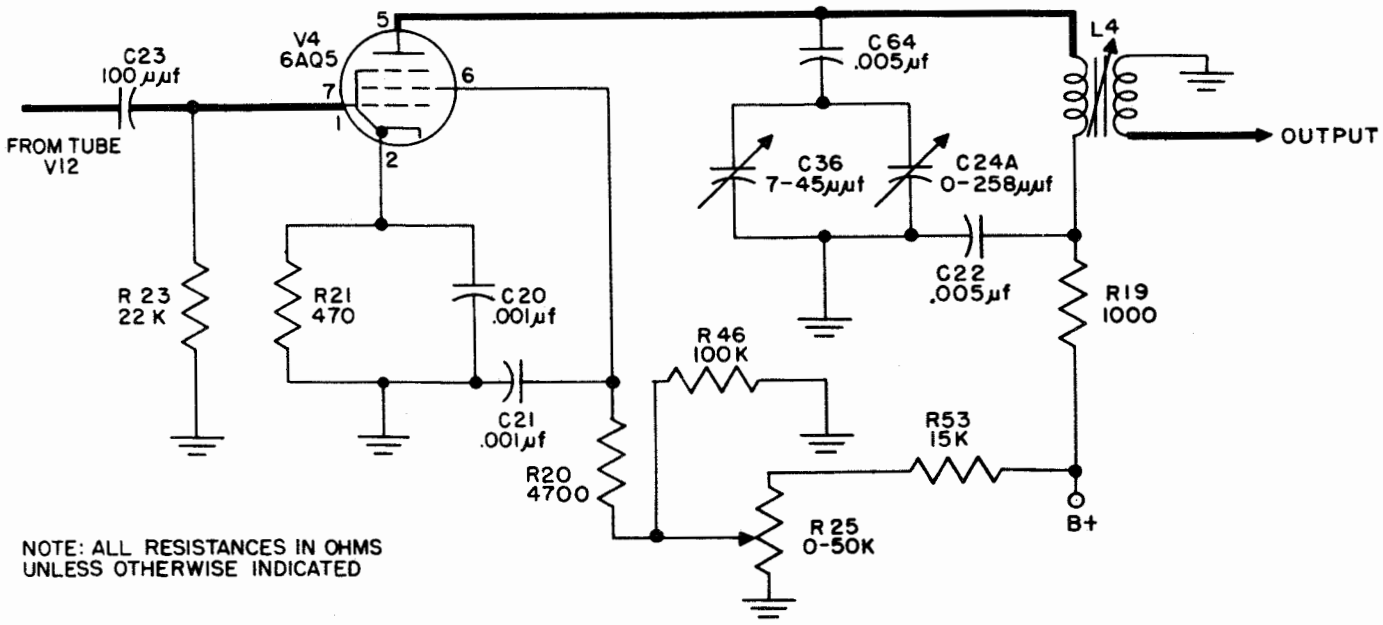
crystal holders XY15, XY16 and XY17 is placed into the circuit of tube V10A. The bias is supplied by grid leak resistor R15. Variable capacitor C6 provides the grid-to-cathode signal, and is used to vary the crystal oscillator frequency slightly. Capacitor C25 provides feedback to the cathode, and capacitor C7 is a d-c blocking condenser between the plate and the crystal. The plate voltage is filtered by resistor R17 and capacitor C11. The output of the oscillator is applied to contacts "1", "2" or "3" of section C of the HFO XTAL selector switch S6.

(4) BUFFER AMPLIFIERS V10B AND V12.—The signal from the crystal or variable oscillator is applied to the grid of buffer amplifier tube V10B through section C of switch S6 and coupling capacitor C12. Bias for the tube is supplied by grid leak resistor R16 and by cathode resistor R59 in parallel with bypass condenser C50. Plate voltage for tube V10B is fed from the power supply through the HFO ON-OFF switch S2, and is filtered by resistor R18 and capacitor C39. The output of tube V10B is applied to the second buffer amplifier V12 through coupling capacitor C61. Bias is supplied for this tube by cathode bias resistor R29 in parallel with bypass capacitor C62, and by grid leak resistor R63. Plate and screen voltages from the power supply are fed through the HFO-ON-OFF switch S2. Resistor R61 is the plate load resistor; resistor R62 is the screen grid voltage-dropping resistor, and capacitor C63 is the screen grid bypass. The output of the second buffer amplifier is applied to the frequency multipliers.

(5) FREQUENCY MULTIPLIERS V4, V5 AND V11.

(*a*) GENERAL.—Since the frequencies of the HF variable and crystal oscillators are between two and four megacycles, it is necessary to use frequency doubler stages V4, V5 and V11 to provide the entire frequency range of the unit. Each frequency doubler stage is an amplifier whose output is tuned to twice the input frequency to the grid.

(*b*) 2–4 MEGACYCLES. (*See figure 2–15.*)—FREQUENCY RANGE switch S7 is set to "2–4" megacycles. The output of the second buffer amplifier is fed to the grid of the first frequency multiplier tube V4 through coupling capacitor C23. Bias for the tube is



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

Figure 2–15. Radio Frequency Oscillator O–165/UR, Simplified Schematic, FREQUENCY RANGE MC Switch in "2–4" Position

supplied by cathode resistor R21 in parallel with bypass capacitor C20, and by grid leak resistor R23. The screen grid voltage from the power supply is fed through resistor R53, HFO OUTPUT potentiometer R25, and resistor R20. Resistor R46 is a screen bleeder resistor. Capacitor C21 is the screen bypass. Plate voltage is applied from the power supply through the primary winding of inductor L4, and is filtered by resistor R19 and capacitor C22. Capacitor C64 is a d-c blocking capacitor for the OUTPUT FREQUENCY capacitor C24A, and the trimmer capacitor C36. The tank circuit, which is tuned to the fundamental HF oscillator frequency, consists of inductor L4 and capacitors C36, C64, C24A, and C22. The secondary of inductor L4 supplies the two to four megacycle signal to the output connectors. The screen of tube V5 is connected to ground through resistor R24 and switch S7C, and the screen of tube V11 is disconnected, causing both tubes to become inoperative.

(*c*) 4–8 MEGACYCLES. (*See figure 2–16.*)—FREQUENCY RANGE switch S7 is set to "4–8" megacycles. The cathode, grid, and screen connections for tube V4 are the same in operation of four to eight megacycles as in two to four megacycles. The plate voltage is filtered by resistor R54 and capacitor C38. The plate voltage from the power supply is fed through the primary of inductor L5. Capacitor C64 is a d-c blocking capacitor. The tuned circuit, consisting of the primary of inductor L5, main tuning capacitor C24A, trimmer capacitor C36, C64, and C38 is tuned to twice the frequency of the signal applied to the grid of tube V4. The secondary of inductor L5 applies the four to eight megacycle voltage to the Oscillator O–165/UR output. Tubes V5 and V11 are inoperative.

(*d*) 8–16 MEGACYCLES. (*See figure 2–17.*)—FREQUENCY RANGE switch S7 is set to "8–16" megacycles. The grid, cathode, and plate connections of tube V4 are the same as in "4–8" megacycle operation. The screen grid voltage is applied through resistors R53, R25, R46 and R20. The plate of tube V4 feeds the four to eight megacycle signal to the grid of tube V5 through coupling capacitor C26. Bias for tube V5 is provided by grid leak resistor R27, and by cathode resistor R55 in parallel with capacitor C15. Screen voltage is applied through resistors R24, R25 and R53, and is filtered by capacitor C29. Capacitor C65 provides a d-c block to main tuning capacitor C24B and trimmer capacitor C35. Plate voltage, which is filtered by resistor R30 and capacitor C27, is fed through the primary of inductor L6. The resonant plate circuit, consisting of capacitors C24B, C35, C65, and C27, and the primary of inductor L6, is tuned to twice the frequency supplied to the grid of tube V5. The doubled frequency is fed to the output connectors from the secondary of inductor L6, and is also applied to the grid of tube V11. However, tube V11 is inoperative because the screen grid is disconnected.

(*e*) 16–32 MEGACYCLES. (*See figure 2–18.*)—FREQUENCY RANGE switch S7 is set to "16–32" megacycles. The connections to tubes V4 and V5 are the same as in "8–16" megacycle operation. The output from the plate of tube V5 is applied to the grid of tube V11 through coupling capacitor C28. Bias for tube V11 is supplied by grid leak resistor R28, and by cathode resistor R56 in parallel with capacitor C33. Resistor R49 acts as a parasitic suppressor. Screen voltage is applied through resistors R26, R25 and R53, and

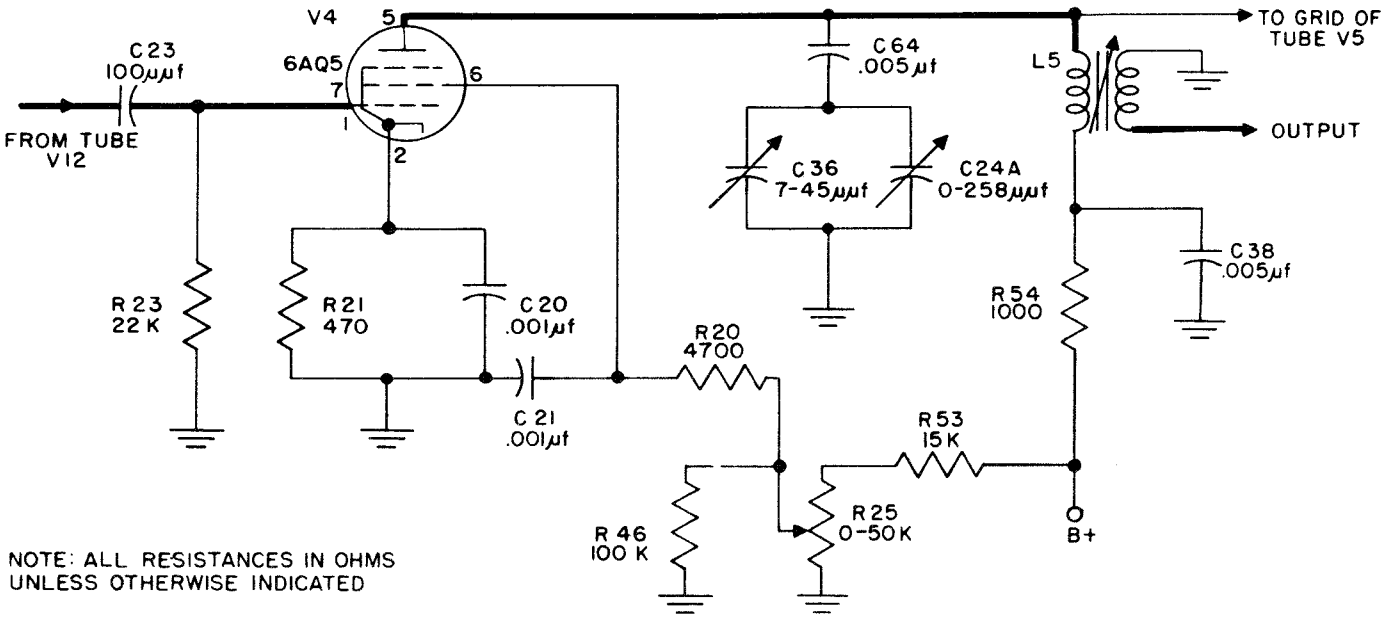


Figure 2–16. Radio Frequency Oscillator O–165/UR, Simplified Schematic, FREQUENCY RANGE MC Switch in "4–8" Position

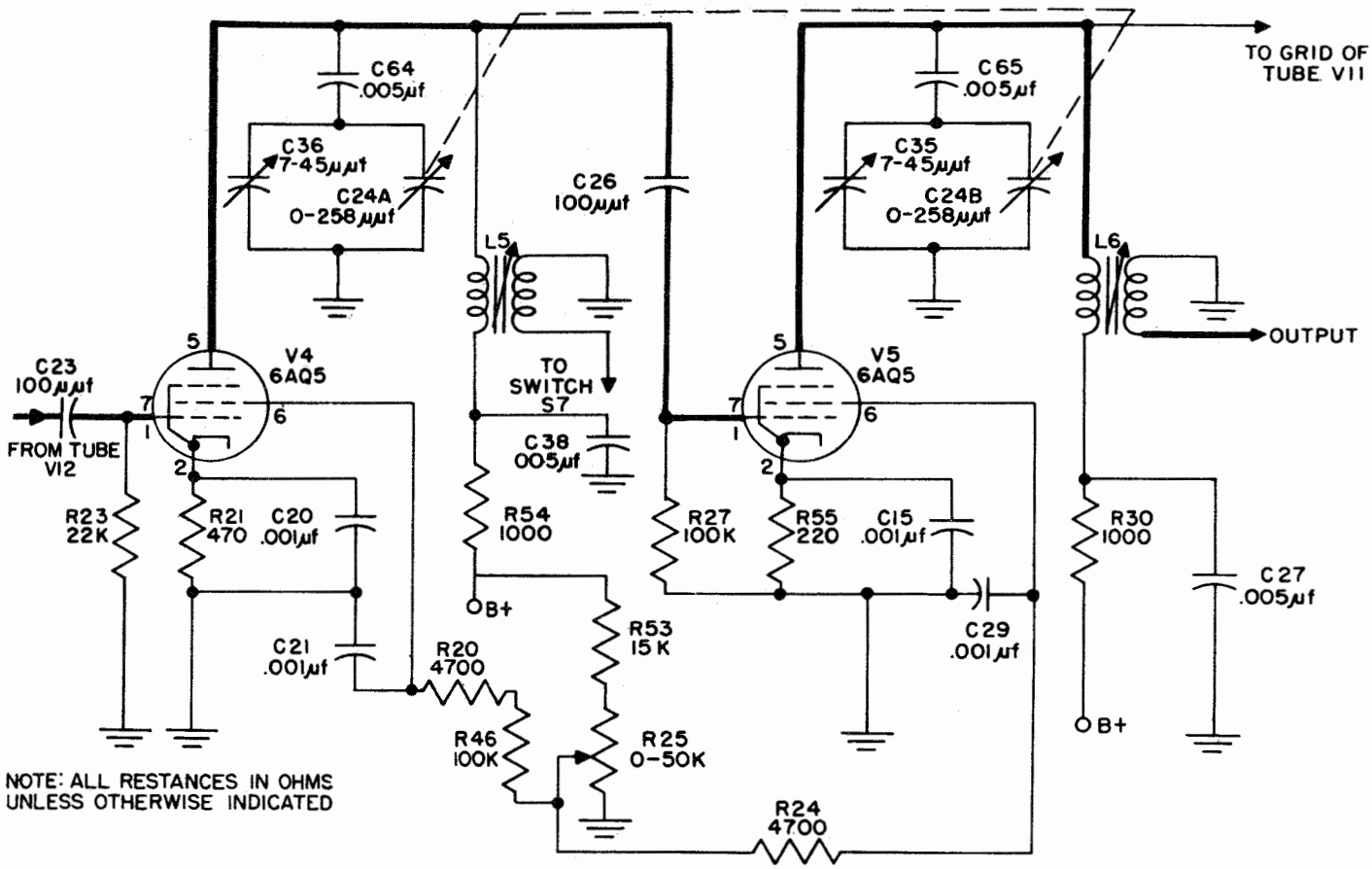


Figure 2–17. Radio Frequency Oscillator O–165/UR, Simplified Schematic, FREQUENCY RANGE MC Switch in "8–16" Position

is filtered by capacitor C32. Capacitor C66 blocks the plate voltage from main tuning capacitor C24 and trimmer C34. Plate voltage is filtered by resistor R36 and capacitor C31. The tuned plate circuit, consisting of capacitors C34, C24C, C66, and C31, and the primary of inductor L7, is tuned to twice the frequency of the signal applied to the grid of V11. The doubled frequency is applied to the output connectors from inductor L7 secondary.

(6) CRYSTAL BEAT FREQUENCY OSCILLATOR V9A. (*See figure 2–19.*)—One of the crystals is placed into the beat-frequency oscillator circuit by switch S8. Plate voltage from the power supply is fed through meter shunt resistor R34, BFO ON-OFF switch S3, and plate load resistor R37. The plate voltage is filtered by resistor R40 and capacitor C53. Capacitor C55 feeds part of the signal from plate to ground, while capacitor C37 provides the grid excitation. Bias is supplied by grid leak resistor R35. The beat-frequency signal is applied from the plate of tube V9A to the grid of tube V9B through coupling capacitor C52.

(7) BFO BUFFER V9B.—The buffer V9B, for the beat-frequency oscillator, offers a high impedance to the oscillator. This prevents load effects from varying the oscillator frequency. The oscillator signal is applied to the buffer tube V9B grid. Bias is provided by grid leak resistor R22. Plate voltage is filtered by resistor R39 and capacitor C51. The cathode load is potentiometer R38. The BFO output amplitude to jacks J9, J10 and J11 is varied by the arm of potentiometer R38.

(8) CRYSTAL CALIBRATION OSCILLATOR MIXER V3. (*See figure 2–20.*)—A 100 kilocycle crystal oscillator is used to calibrate the variable oscillator frequency.

Crystal Y1 is connected between the first grid, which is the oscillator grid, and the fourth grid of tube V3, which is the oscillator anode Capacitor C17 provides feedback to the cathodes, Capacitors C16 and C49 provide the grid excitation. Bias for the oscillator is provided by grid leak resistor R8 and by cathode resistor R7 in parallel with capacitor C18.

The output of the variable oscillator buffer stage V2 is applied to the third grid of tube V3 through coupling capacitor C9. The crystal calibration frequency and the variable oscillator frequency are mixed in tube V3 to produce a different beat signal. Bias for the variable oscillator signal is provided by grid leak resistor R6 and by cathode resistor R7, in parallel with the bypass capacitor C18. Tube V3 plate voltage is filtered by resistor R50 and capacitors C13 and C40. The plate load is resistor R48. The output of tube V3 is applied to the calibrator amplifier V6.

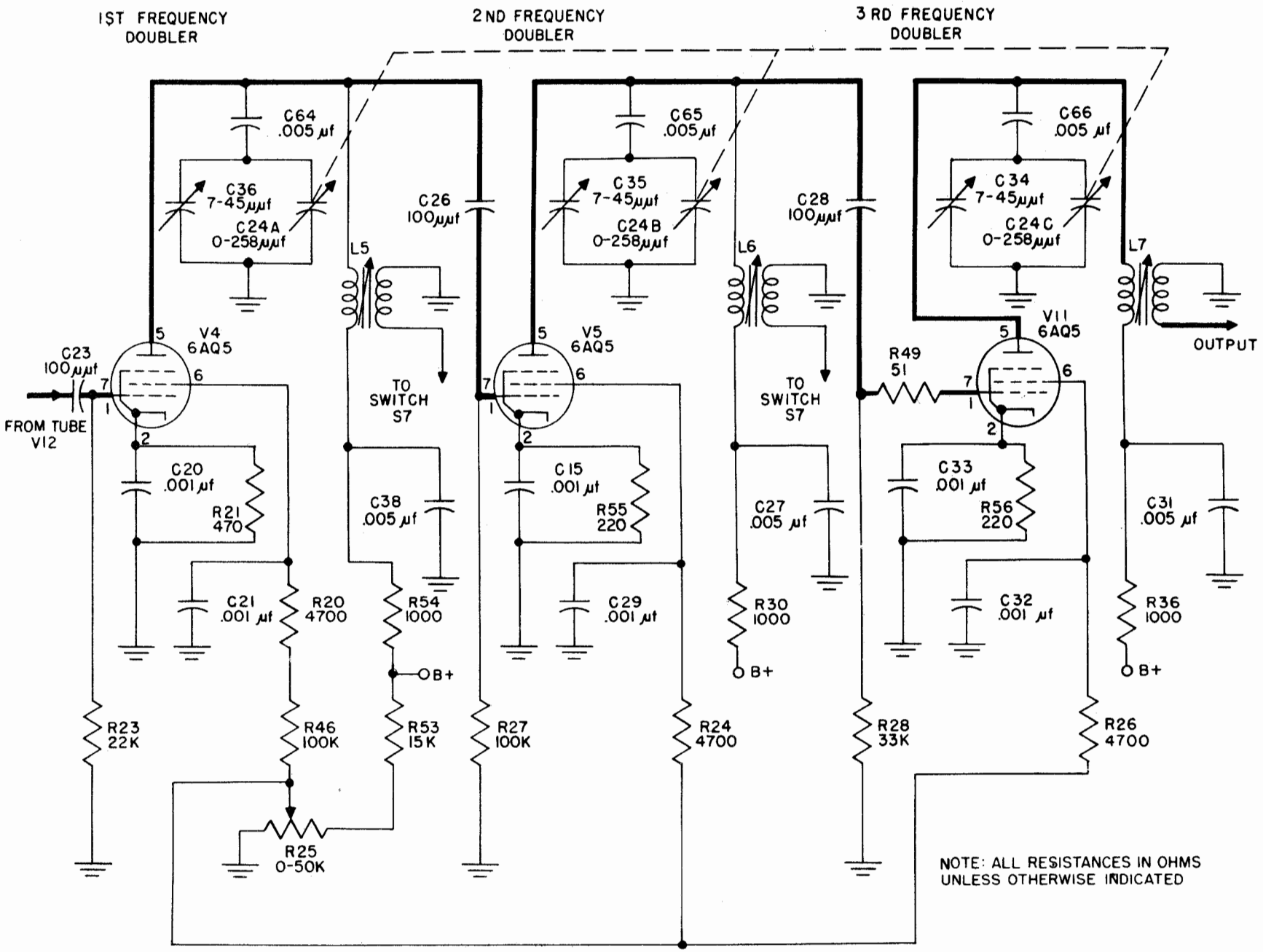


Figure 2–18. Radio Frequency Oscillator O–165/UR, Simplified Schematic, FREQUENCY RANGE MC Switch in "16–32" Position

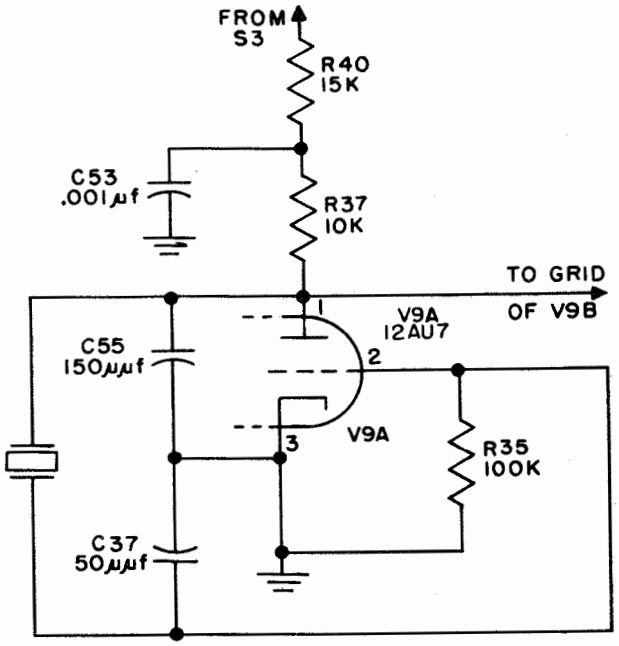


Figure 2–19. Radio Frequency Oscillator O–165/UR, Simplified Schematic of Crystal BFO Circuit

(9) CALIBRATOR AMPLIFIER V6.—The beat signal output is fed from the plate of tube V3 to the grid of tube V6 through coupling capacitor C19 and CAL OUTPUT potentiometer R42. Bias is supplied by unbypassed cathode resistor R43. Plate voltage is applied through load resistor R44. The amplified signal is fed from the plate of tube V6 to a parallel connection of CAL OUTPUT jack J6 and resistor R45 through coupling capacitor C41.

(10) POWER SUPPLY V8 AND V9.—The external a-c power is applied through jacks J1 and J12, plugs P1 and P12, fuses F1 and F2 and POWER switch S1 to the primary of transformer T1. The secondary winding terminals 7 and 8 supply filament voltage for all the tubes in the RF oscillator, and for pilot light I1, which is in series with R41.

Since the pilot light circuit is in parallel with the filament line, resistor R41 serves to limit the current in the light I1 circuit. Secondary winding terminals 9 and 11 are connected across the plate of full-wave rectifier tube V8, and terminals 5 and 6 are connected across the filament of the tube. The rectified voltage output of tube V8 is filtered by capacitors C44, C45 and C47, and choke L1. For stable voltage from the power supply, voltage regulator tube V7 is provided. The plate load is resistor R47. Plate and screen voltages are supplied from this regulated voltage.

(11) METER M1.-METER SELECTOR switch S5 is used to connect the meter into various circuits. Table 2–4 gives the meter readings at each setting of the switch S5.

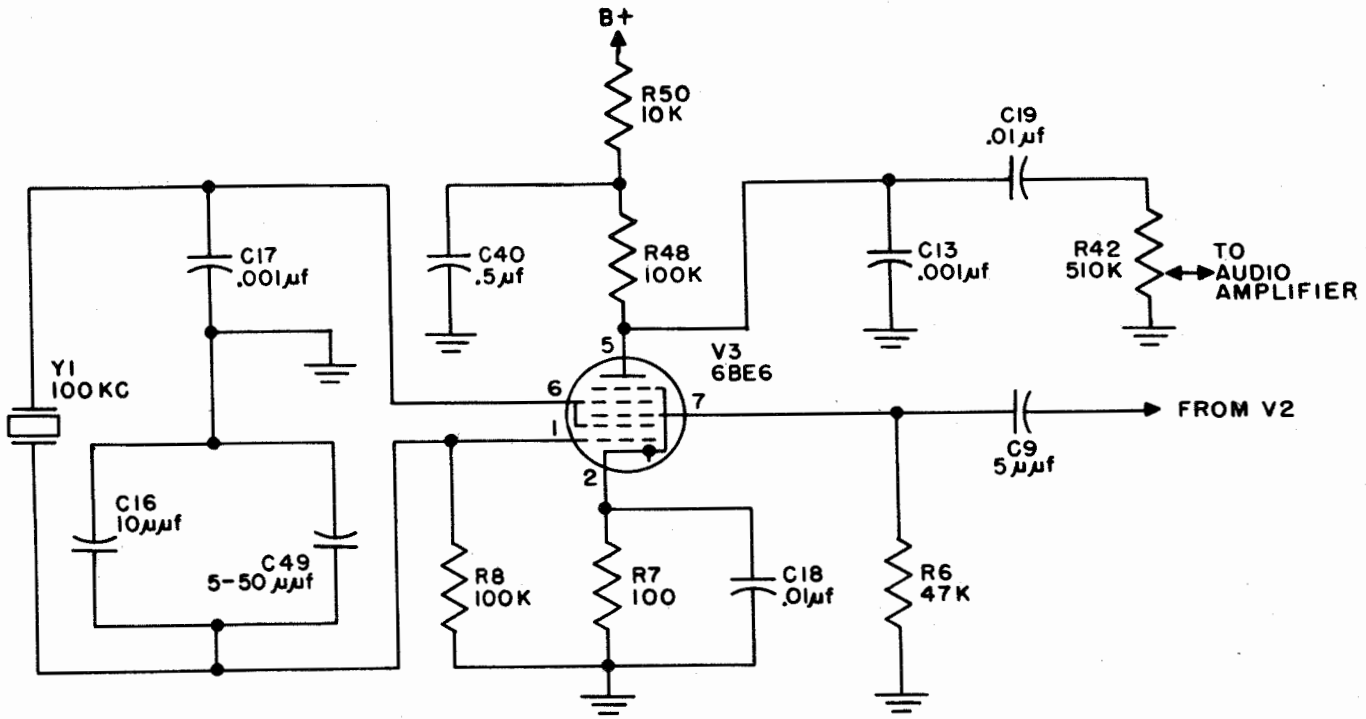


Figure 2–20. Radio Frequency Oscillator O–165/UR, Simplified Schematic of Calibrator Oscillator-Mixer

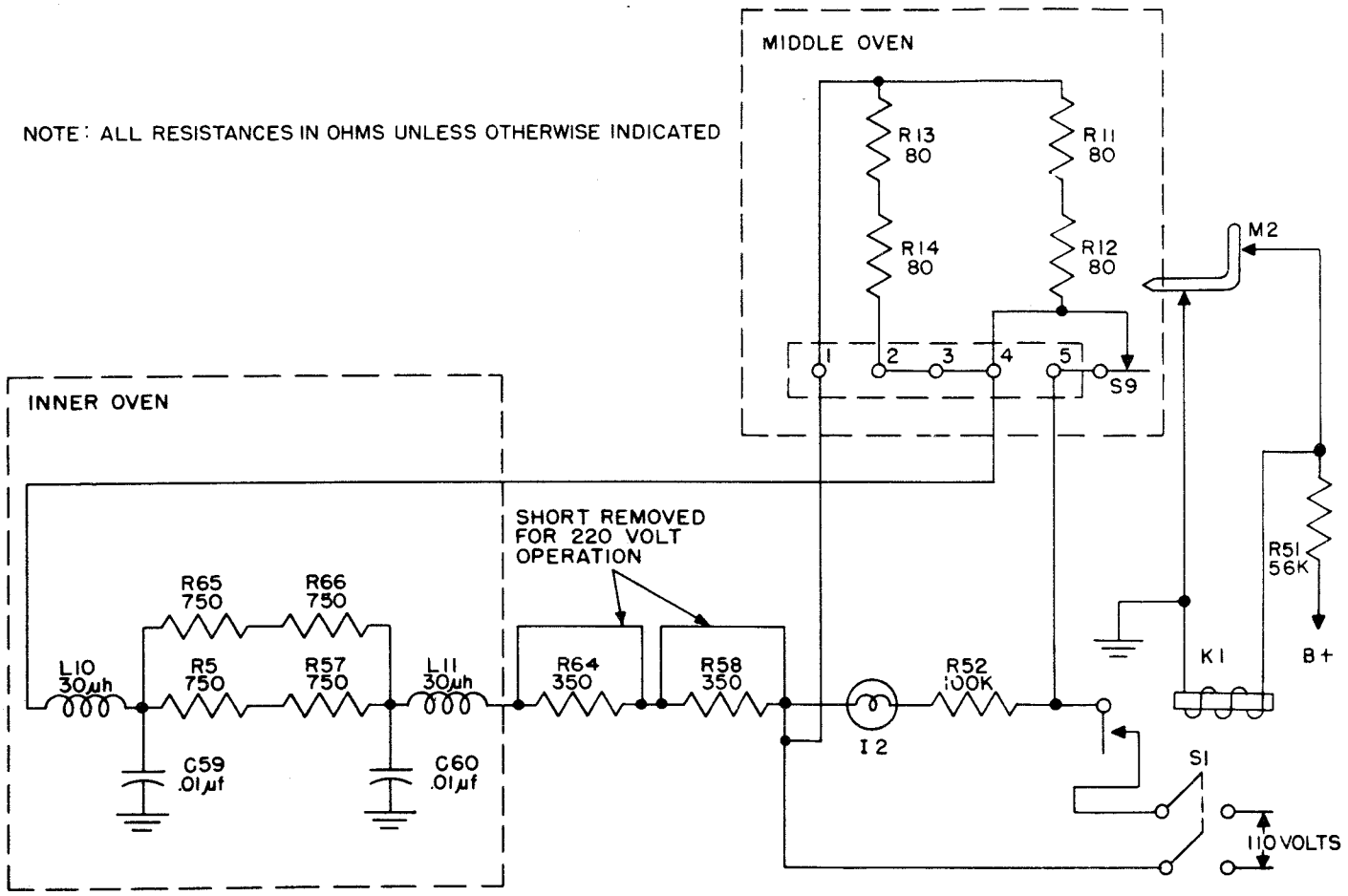


Figure 2–21. Radio Frequency Oscillator O–165/UR, Simplified Schematic, Temperature Control Circuit

TABLE 2–4. METER READINGS FOR VARIOUS POSITIONS OF SWITCH S5

POSITION OF SWITCHES	METER READING
HFO	Plate current of variable oscillator tube V1.
BFO	Plate current of beat frequency oscillalator tube V9A.
HF OUT	Rectified high frequency output signal current.
BF OUT	Rectified beat frequency output signal current.

Since the HFO and BFO outputs are ac, they cannot be read directly on the d-c meter, making it necessary to rectify the a-c outputs. The HFO output is applied to crystal rectifier CR1 through coupling capacitor C8. The meter is shunted by resistor R31. The rectified output of the crystal is filtered by capacitor C43 and then applied to the meter. The BFO output is applied through coupling capacitor C10 to crystal rectifier CR2 and shunt resistor R32. The rectified output of crystal CR2 is filtered by capacitor C48 and then applied to the meter.

(12) TEMPERATURE CONTROL. (*See figure 2–21.*)—Three ovens in RF Oscillator O–165/UR are provided to control the temperature. The ovens control the temperature of the variable oscillator V1, buffer tube V2, and the calibrator oscillator mixer tube V3. Power is applied to the inner and middle ovens from the POWER switch S1. The outer oven consists of insulation only and uses no power.

When the temperature of the middle oven goes below 60°C. (140°F.) thermostat M2 opens and relay K1 is energized. Pilot light I2, in series with resistor R52, middle oven heater resistors R11, R12, R13 and R14, and inner oven resistors R5, R57, R65, and R66 are connected into the circuit. Resistors R58 and R64 are added to drop the voltage to the inner oven resistors when operating from a 220 volt source.

When the temperature of the middle oven goes above 60°C. (140°F.), the main thermostat M2 closes. This shorts out relay K1, causing it to be de-energized. No current flows through the heater resistors of both ovens or the OVEN HEATER pilot light I2.

Thermostat S9 is provided to prevent overheating of Oscillator O-165/UR when thermostat M2 or relay K1 fails to function. Thermostat S9 opens the circuit at a slightly higher temperature than thermostat M2.

5. AMPLIFIER-DETECTOR AM-615/UR.

a. GENERAL.—The Amplifier-Detector AM-615/UR is used in the Radio Receiving set AN/FRR-28 to monitor the IF frequency of each receiver. It is particularly useful in tuning the receivers to the input frequencies.

b. BLOCK DIAGRAM DESCRIPTION. (*See figure 2-22.*)—The IF signal from one of the receivers is amplified in the input amplifier stage V1 of Amplifier-Detector AM-615/UR. An IF signal is locally produced and mixed with the amplified IF signal in the oscillator and mixer stage V2. The audio beat frequency tone, which is formed in tube V2, is amplified in the output amplifier stage V4 and fed to a pair of headphones for monitoring purposes. The power supply converts the available power to suitable power for use in Amplifier-Detector AM-615/UR.

c. DETAILED CIRCUIT ANALYSIS. (*See figure 7-33.*)

(1) INPUT AMPLIFIER STAGE V1.—The 455 kilocycle IF signal from each receiver is applied to the Amplifier-Detector AM-615/UR jacks J2 and J4. One of the two input signals is switched into the monitor circuit by setting the INPUT SELECTOR switch S2 to "CH 1" or "CH 2". This sample IF frequency is fed through coupling capacitor C7 to the grid of the input amplifier tube V1. Stage V1 is an untuned voltage amplifier. Grid leak bias is provided by resistor R1, and cathode bias is provided by resistor R2 in parallel with bypass capacitor C1. The plate and screen voltages are filtered by resistor R7 and capacitor C3. Plate voltage is applied through load resistor R4, and screen voltage is applied through divider resistors R3 and R19. Capacitor C2 is the screen bypass capacitor. The amplified IF signal is fed from the output of stage V1, through coupling capacitor C4, to the oscillator mixer tube V2.

(2) OSCILLATOR-MIXER STAGE V2. (*See figure 2-23.*)—The oscillator-mixer is a pentagrid tube in which a local oscillator frequency is produced and mixed with the IF frequency to form an audio beat note.

The local IF signal is produced in a tuned grid, plate tickler oscillator circuit. The tuned circuit, consisting of capacitors C22, C23 and C24, and the primary of transformer T2, is connected between ground and pin 5 of tube V2. The feedback signal, necessary to maintain oscillation, is fed to the secondary of transformer T2 from pin 4 of tube V2. The voltage to pin 4 is filtered by capacitor C11 and resistor R16.

The signal from tube V1 is applied to pin 8 of tube V2. Grid leak resistor R5 provides grid bias. Cathode bias is provided by resistor R6 in parallel with bypass capacitor C6. Plate voltage, which is filtered by resistor R8 and capacitor C14, is fed through load resistor R9. The IF signal is mixed with the local oscillator signal to produce audio beat frequency at the plate output. The audio frequency is passed through an RF filter, consisting of choke L2 and capacitors C12 and C21, and through coupling capacitor C13 to the output amplifier V4.

(3) OUTPUT AMPLIFIER V4.—The amplitude of the audio beat frequency applied to the output amplifier V4 is varied by the OUTPUT LEVEL potentiometer R11. Bias for the tube is supplied by cathode resistor R12. The amplified audio signal is fed through coupling capacitor C17 to a parallel connection of terminal board E1, OUTPUT MONITOR jack J1, and resistor R17. The output signal is about five volts ac across 4,000 ohm headphones.

(4) POWER SUPPLY V3 AND V5.—The primary of transformer T1 is connected to either a 110 or 220 volt a-c source. There are three secondary windings on the transformer. Terminals 5 and 7 provide 6.3 volts to the filaments of tubes V1, V2 and V4. Terminals 9 and 11 are connected to the plates of tube V3, and terminals 8 and 12 are connected to the cathodes of tube V3. The a-c voltage is rectified in tube V3 and

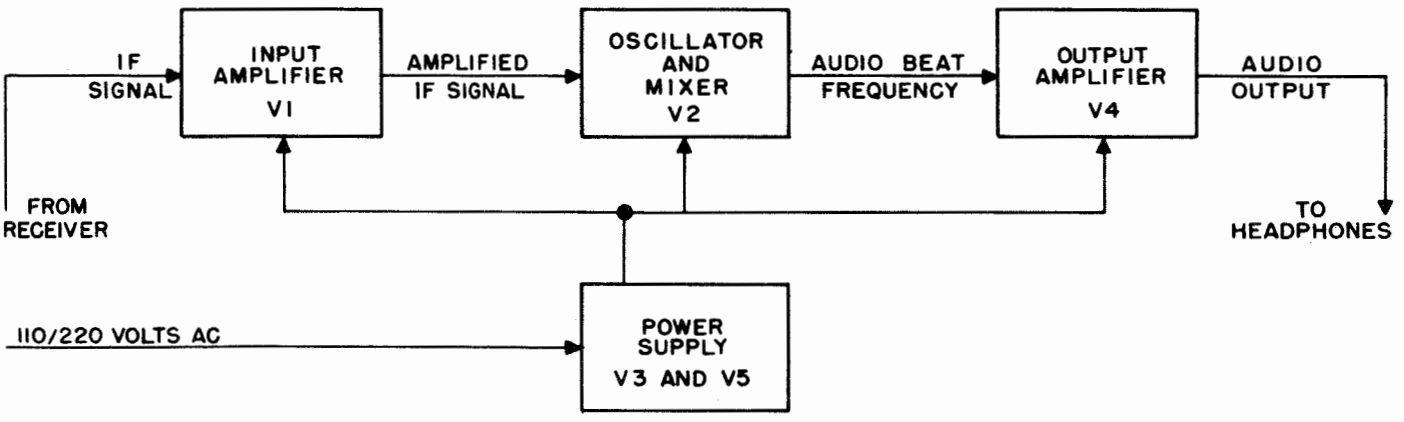


Figure 2-22. Amplifier-Detector AM-615/UR, Block Diagram

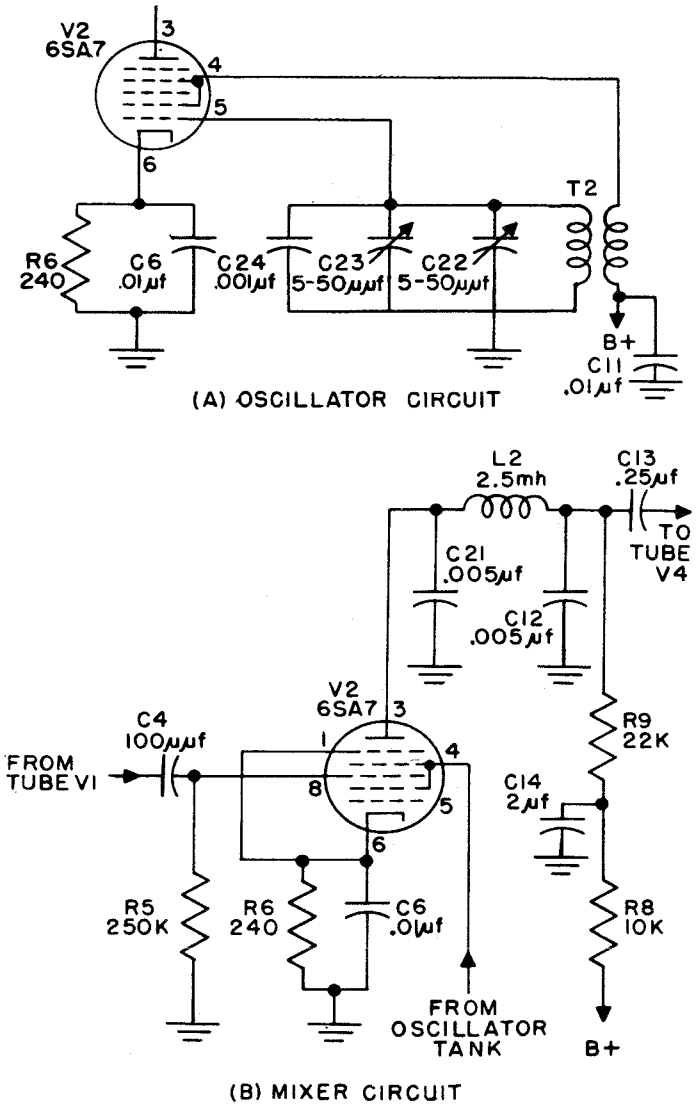


Figure 2–23. Amplifier-Detector AM–615/UR, Simplified Schematic, Oscillator-Mixer Circuit

filtered by capacitors C18, C19 and C20, and by chokes L1 and L2. The rectified voltage is regulated by tube V5 whose plate load is resistor R14.

6. KEYER KY–79/UR.

a. GENERAL.—The Keyer KY–79/UR provides a keyed audio tone of a selected frequency for use in a circuit external to the receiving set. The keying signal supplied to Keyer KY–79/UR is combined with a locally produced tone to form a tone signal which is keyed on and off. The keyed tone signal is used for remote keying of a radio transmitter or teletypewriter, and for monitoring purposes.

b. BLOCK DIAGRAM DESCRIPTION. (*See figure 2–24.*)—The keying input signal is applied to the keyer circuit, consisting of tubes V6, V7, V10 and V11, where it is converted to suitable keying control voltage for the output stage. The control voltage is amplified in the keying amplifier tube V5, and fed to the output amplifier stage V4. An audio tone produced in the oscillator tubes V1 and V2 is also applied to the output amplifier stage V4. The keying control voltage keys the audio tone in tube V4 on and off. The power supply converts the available electrical power to power suitable for use in Keyer KY–79/UR.

c. DETAILED CIRCUIT ANALYSIS. (*See figure 7–34.*)

(1) KEYING CIRCUIT V6, V7, V10 AND V11.—Four different types of keying signals can be applied to Keyer KY–79/UR to key the tone signal: *positive polar keying,* in which a positive voltage is applied to represent the mark condition and zero voltage to represent the space condition; *negative polar keying,* in which a negative voltage is applied to represent the mark condition and zero voltage to represent the space condition; *keyed tone,* in which an audio frequency voltage is applied to represent the mark condition and no signal to represent the space condition; *polar relay keying,* in which a single-pole double-throw relay is connected to ground one terminal to represent the mark condition, and to ground a second terminal to represent the space condition. Since the keying circuit functions differently for each type of keying signal, they are discussed separately.

(*a*) POSITIVE POLAR KEYING. (*See figure 2–25.*)—When a positive polar keying signal is applied to Keyer KY–79/UR, KEYING LEVEL switch S2 is set to the DC + position.

Plate voltage is applied to tube V6A through plate load resistor R44 and voltage divider resistors R39 and R40. Resistor R48 limits the grid current and resistor R49 is a grid leak. Cathode bias is applied through voltage divider resistors R56 and R47.

When no signal is applied to the grid, no plate current will flow in tube V6A since the tube is normally cut-off. Current flowing through the circuit, consisting of neon tube V10 and resistors R40, R44 and R41, will drive the grid of V5 positive.

When a keying signal is impressed on the grid of tube V6, plate current flows through resistors R40 and R44. The voltage drop in these two resistors reduce the voltage across neon tube V10 sufficiently to extinguish it. When tube V10 is not conducting, the grid of tube V5 is at zero potential.

When no signal is impressed on Keyer KY–79/UR, a positive voltage is applied to the grid of tube V5 from the keying circuit. When signal is impressed on Keyer KY–79/UR, no grid voltage is applied to tube V5.

(*b*) NEGATIVE POLAR KEYING. (*See figure 2–26.*)—KEYING LEVEL switch S2 is turned to the

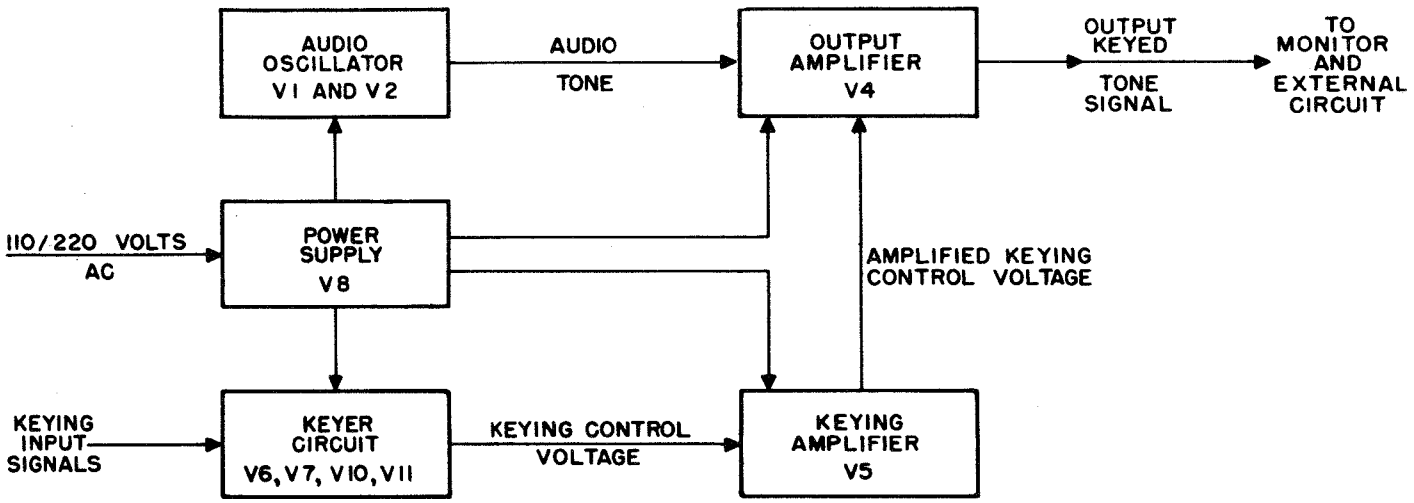


Figure 2–24. Keyer KY–79/UR, Block Diagram

DC — position when a negative polar keying signal is being received by Keyer KY–79/UR.

Plate voltage for both sections of tube V6 is supplied from divider resistors R39, and R40, through plate load resistor R44 to the plate of tube V6A, and through plate load resistor R45 to the plate of tube V6B. Resistor R48 limits the grid current, and resistor R49 is a grid leak bias resistor for tube V6A. The cathode of tube V6A is connected directly to ground through switch S2B. Cathode bias for tube V6B is supplied from voltage divider resistors R51 and R52.

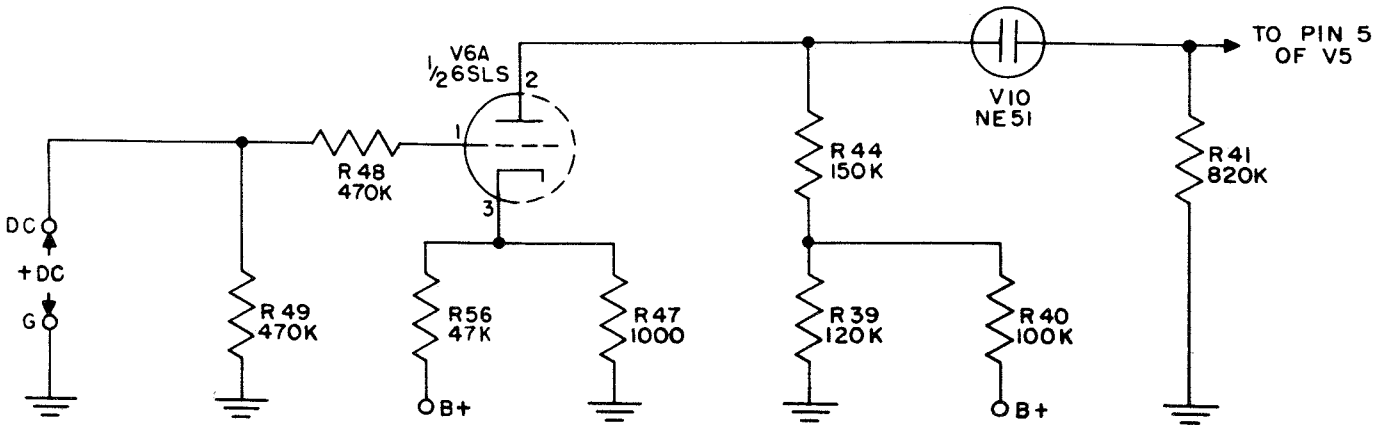
When no keying signal is applied to the grid of tube V6A, the tube conducts and plate current flows through resistors R44 and R40. Due to the voltage drop in these resistors, no current flows in tube V10. Since tube V6B is biased beyond cut-off by resistors R51 and R52 when no positive voltage is applied to its grid, it will not conduct. The current flowing through resistors R40, R45 and R42, and neon tube V11, causes the grid of tube V5 to become positive.

When a negative keying signal is applied to the grid of tube V6A, the tube stops conducting. Current flows through resistors R40, R44 and R41, and neon tube V10, causing the grid of tube V6B to become positive. The plate current of tube V6B flowing through resistors R45 and R40 causes tube V11 to cut off. The positive voltage to the grid of tube V5 is thereby removed.

When no keying signal is applied to Keyer KY–79/UR, a positive voltage is applied to the grid of tube V5. When a negative signal is applied to Keyer KY–79/UR, no voltage is applied to the grid of tube V5.

(*c*) KEYED TONE. (*See figure 2–27.*)—When a keyed tone signal is applied to Keyer KY–79/UR, the KEYING LEVEL switch S2 is turned to the TONE position.

When a tone signal is fed into the primary of transformer T3, the secondary output is rectified in tube



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

Figure 2–25. Keyer KY–79/UR, Simplified Schematic, Positive Polar Keying

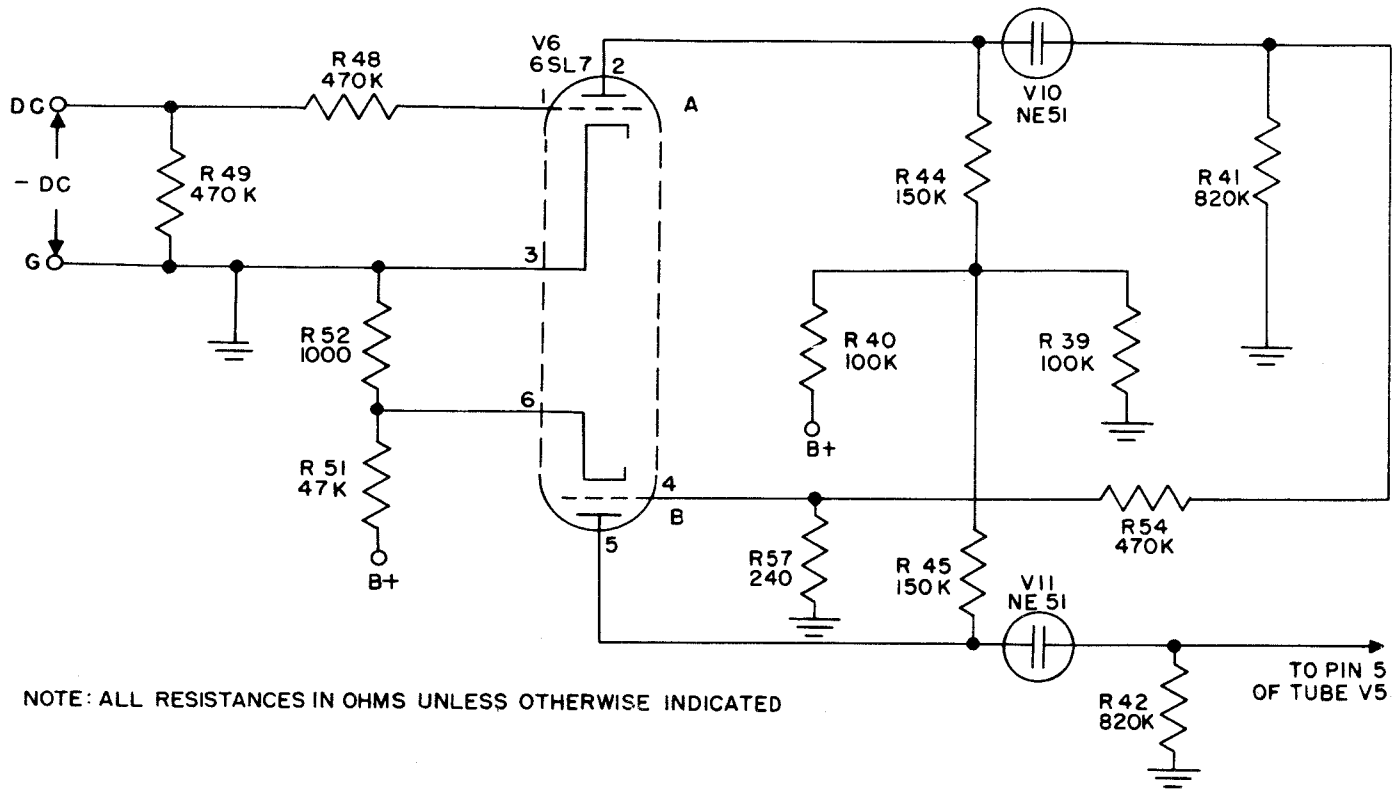


Figure 2–26. Keyer KY–79/UR, Simplified Schematic, Negative Polar Keying

V7. Resistor R32 is the plate load of tube V7. The rectified tone is filtered by capacitor C13 and applied to the grid of tube V6A through current limiting resistor R48. The grid input is sufficient to overcome the cut-off bias from grid leak resistor R26, and cathode resistor R47, to cause tube V6A to conduct. The voltage drop in resistors R44 and R40, due to the plate current of tube V6A, extinguishes tube V10. When tube V10 does not conduct, the voltage drop across R41 and the grid potential of tube V5 becomes zero.

When the keyed tone input signal is off, no voltage is applied to the grid of tube V6A and it will not conduct. Current flows through resistors R40, R44 and R41, and neon tube V10, causing the grid of tube V5 to become positive.

When a keyed tone signal is applied to Keyer KY–79/UR, no grid voltage is applied to tube V5, and when no signal is applied, a positive voltage is applied to the grid of V5.

(*d*) POLAR RELAY KEYING. (*See figure 2–28.*)—When polar relay keying mark and space signals are applied to Keyer KY–79/UR, the KEYING LEVEL switch S2 is turned to the RELAY position.

When a mark signal is applied to Keyer KY–79/UR, the grid of tube V5 is grounded through the external relay and terminals DC and G of terminal board E1. Tubes V6A, V6B, V10, and V11 are normally used to control the grid potential of tube V5. These tubes have no effect on the operation of tube V5 when a polar relay mark signal is received since the grid of tube V5 is already grounded.

When a space signal is applied to Keyer KY–79/UR, the grid of tube V6B is connected to ground through resistor R54, the external relay, and terminals 1 and 2 of terminal board E1. When the grid of tube V6B is grounded, it will not conduct since it is biased beyond cut-off. The current flowing through resistors R40, R42 and R45, and neon tube V11, produces a positive voltage on the grid of tube V5. Tubes V6A and V10, which normally establish the grid potential of tube V6B, have no effect on the circuit operation because the grid of tube V6B is already grounded.

When a mark signal is applied to Keyer KY–79/UR, the grid of tube V5 is at zero potential, and when a space signal is applied, the grid of tube V5 is positive.

(2) KEYING AMPLIFIER V5. (*See figure 2–29.*)—The keying amplifier tube V5 applies the keying signal to the output amplifier tube V4, by driving the output amplifier beyond cut-off when a space signal is applied to Keyer KY–79/UR.

When a mark signal is applied to Keyer KY–79/UR, the grid of tube V5 is at zero potential. Since tube V5 is biased beyond cut-off, no plate voltage will flow through cathode resistor R37. Tube V4, which is normally conducting, will provide an audio tone to the Keyer KY–79/UR output.

When a space signal is applied to Keyer KY–79/UR, the grid of tube V5 is driven sufficiently positive to

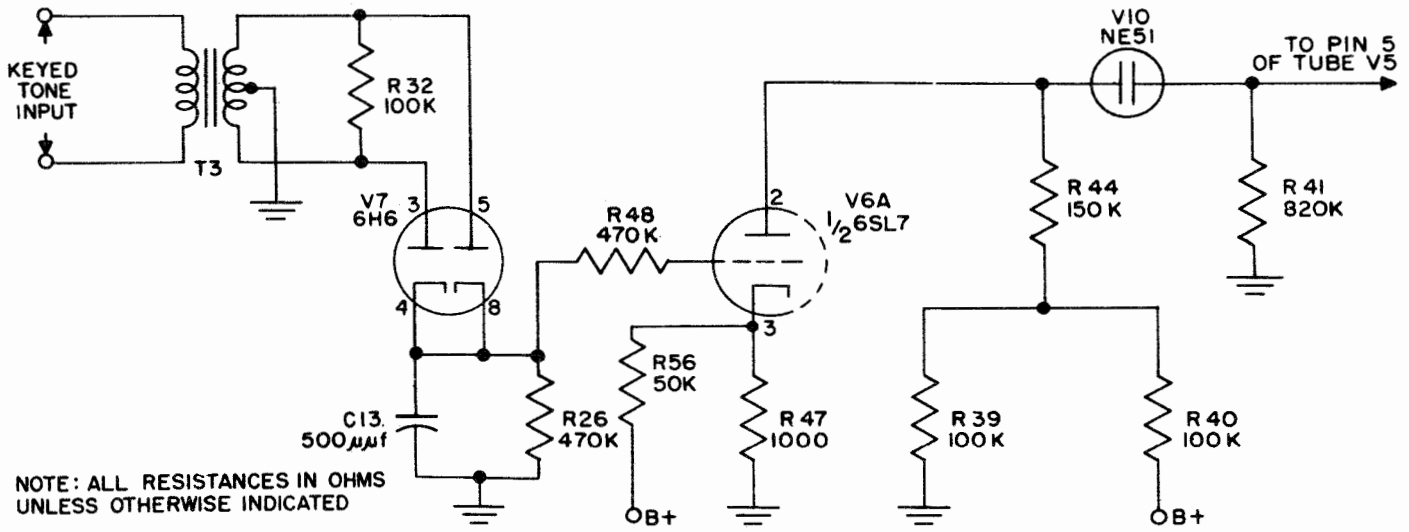


Figure 2–27. Keyer KY–79/UR, Simplified Schematic, Keyed Tone Input

cause it to conduct. The plate current of tube V5 produces a voltage drop in common cathode resistor R37, causing the cathode of tube V4 to become positive. Tube V4 stops conducting, and no audio tone is provided to the Keyer KY–79/UR output.

(3) OSCILLATOR V1 AND V2. (*See figure 2–30.*) —The Keyer KY–79/UR audio oscillator is of the Wien-bridge type. This oscillator has excellent frequency stability, and produces almost a pure sine wave output whose amplitude is nearly constant over a wide frequency range.

A simplified schematic of the Wien-bridge oscillator used at a frequency of 2125 cps is shown in figure 2–30. The oscillator contains tubes V1 and V2. Tube V1 is the oscillator stage, and tube V2 provides the amplified and inverted voltage used in the bridge feedback network. If the bridge network was not in the circuit, the feedback voltage from tube V1 to tube V2 would reinforce the initial signal appearing at the grid of tube V1, and cause oscillations to be set up and main-

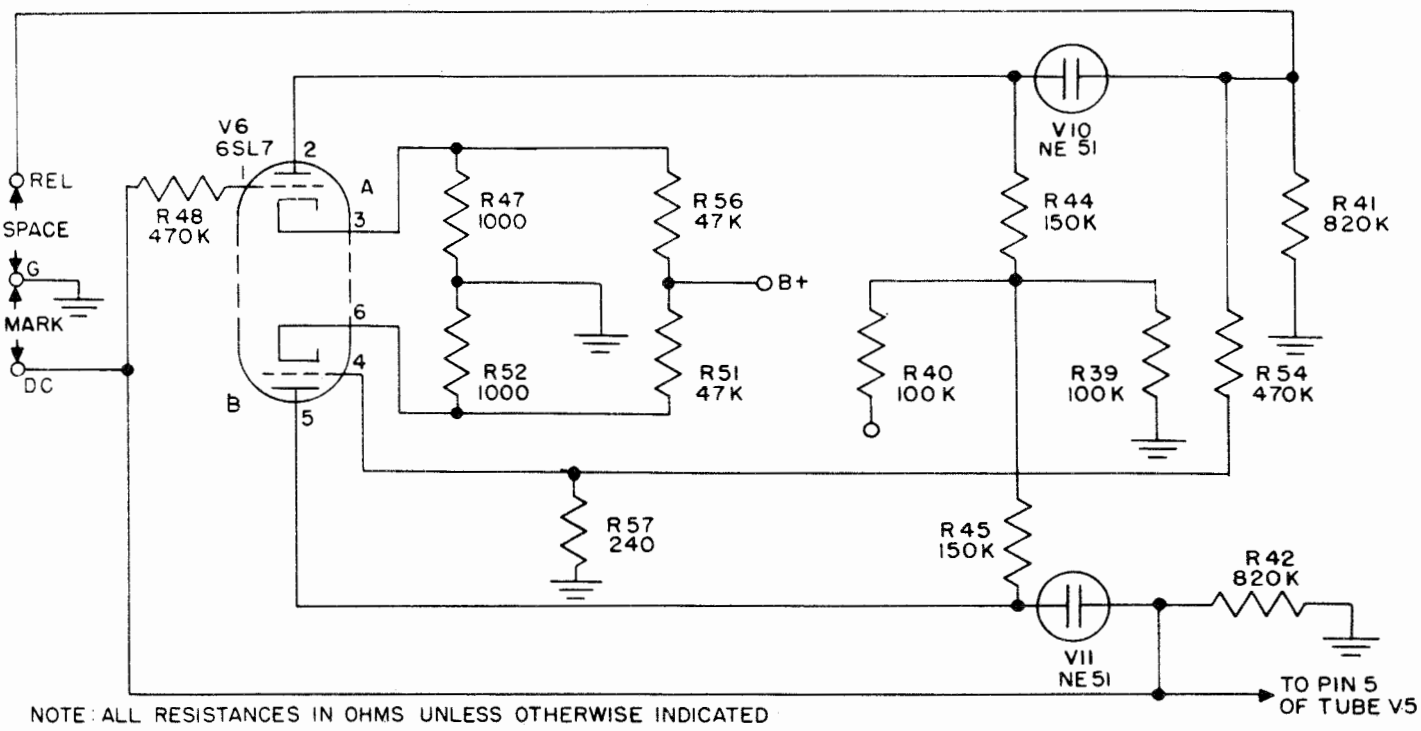


Figure 2–28. Keyer KY–79/UR, Simplified Schematic, Polar Relay Keying

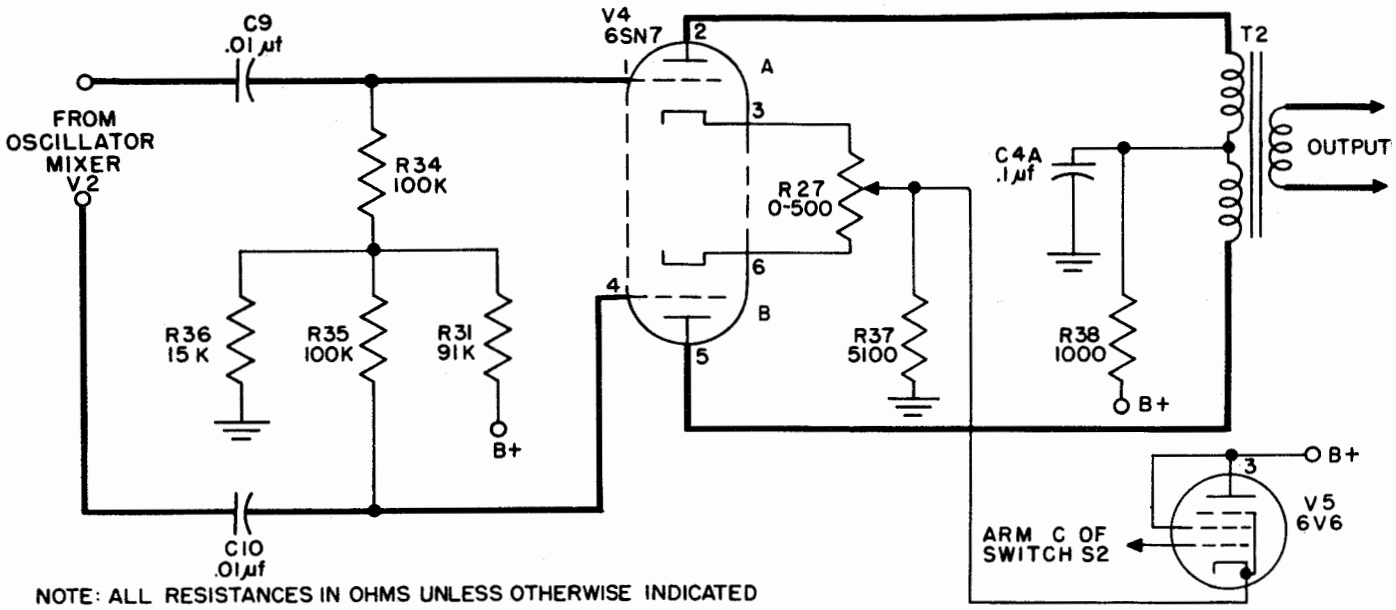


Figure 2–29. Keyer KY–79/UR, Simplified Schematic, Keying Amplifier and Keyed Audio Output Amplifier

tained. The bridge network provides de-generation and phase-shift, which allows the voltage of only one frequency to be effective in the oscillator. Oscillations only occur at the frequency fc, which permits the voltage across resistor R12, which is the input signal to tube V1, to be in phase with the output of tube V2, and for which the positive feedback voltage exceeds the negative feedback voltage.

A degenerative feedback voltage is provided in the bridge network by the voltage divider, consisting of resistors R50, R28, R14 and R15. Since the resistance is practically constant for all frequencies, the negative feedback voltage is constant for all frequencies, and there is no phase-shift caused by the resistors. The curve of the negative feedback is plotted in figure 2–30.

A positive feedback voltage is provided in the bridge network by the voltage divider, consisting of resistors R6 and R12, and capacitors C1, C2, and C23. At very high frequencies, capacitors C2 and C23 have almost no reactance, and the voltage between the grid of tube V1 and ground is almost zero. When the frequency is reduced toward zero, the reactance of capacitor C1 becomes very high thus reducing the feedback voltage available at the grid of tube V1, causing the grid to operate at close to zero potential.

At intermediate frequencies, positive feedback voltage is present. As shown in figure 2–30, the curve of the positive feedback is rather flat in the vicinity of frequency fc and slopes down at low and high frequencies.

The phase-shift effects of the positive feedback network, as shown in figure 2–30, can be seen by considering the capacitive reactance as the frequency varies. At very low frequencies the capacitive reactance is very high and the feedback circuit can be assumed to be composed of capacitor C1 in series with the feedback voltage and resistor R12 in parallel. This results in a 90 degree leading voltage at the grid of tube V1. At very high frequencies the capacitive reactance is very low and the feedback circuit can be assumed to consist of resistor R6 in series with the feedback voltage and capacitors C2 and C23 in parallel. This results in a 90 degree lagging voltage at the grid of tube V1. At intermediate frequencies all of the positive feedback components have an effect on the circuit and the phase-shift angle varies from the extremes until, at frequency fc, the leading and lagging effects balance each other, and the voltage at the grid of tube V1 is in phase with the output voltage of tube V2.

Resistors R14 and R15 are lamps which are used as cathode resistors of tube V1 to stabilize the oscillation amplitude. When the amplitude of oscillation increases, the current through the lamps increase. This causes the lamp filaments to get hotter, which increases the resistance of the lamps and the amplitude of the negative feedback voltage. The additional degeneration reduces the gain of tube V1, causing the amplitude of oscillation to remain almost constant. Since the waveform of the oscillator output is sinusoidal only at a small amplitude, the lamps prevent distortion of the waveform of the output audio tone.

Referring to the overall schematic, figure 7–34, the OUTPUT FREQUENCY selector switch S5 varies the oscillator frequency by varying the positive feedback voltage. The positive feedback voltage is fed through the voltage divider, consisting of capacitors C1 and C2, one resistor of resistors R1 through R6, one capacitor of capacitors C18 through C23, and one resistor of resistors R7 through R12. The plate voltage of tube V2

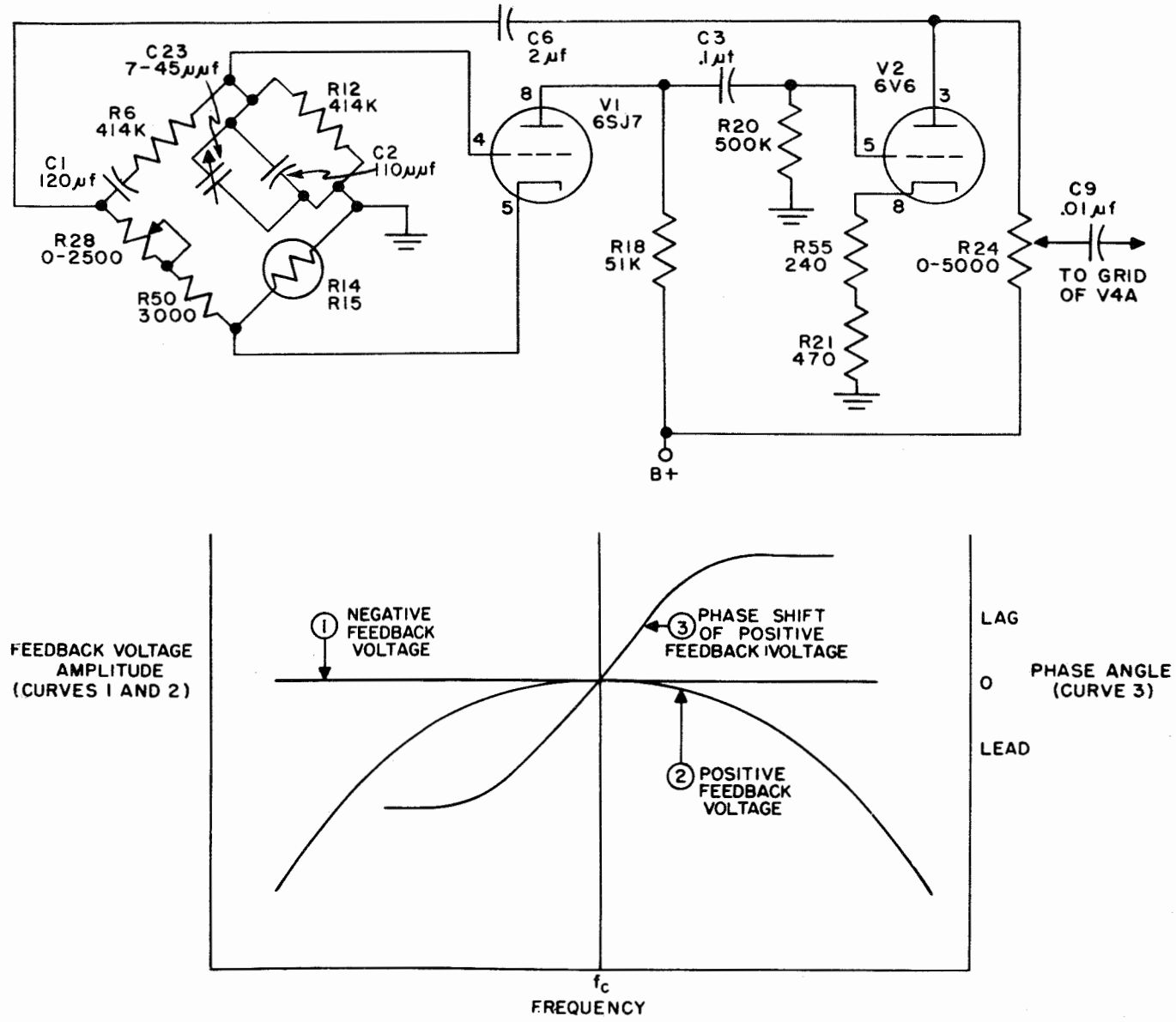


Figure 2–30. Keyer KY–79/UR, Simplified Schematic, Wien-Bridge Oscillator Circuit and Curves

is applied to both feedback networks through capacitor C6. The plate of tube V1 is coupled to the grid of tube V2 through capacitor C3. Plate voltage from the power supply is filtered by capacitor C4 and resistor R19 for tube V1, and by capacitor C5 and resistor R25 for tube V2. It is fed through load resistor R18 to the plate of tube V1, and through load resistor R24 to the plate of tube V2. Screen voltage for tube V1 is applied through voltage divider resistors R16 and R17, and screen voltage for tube V2 is applied through voltage divider resistors R22 and R23. Bias for tube V2 is provided by grid leak resistor R20 and cathode resistors R55 and R21.

When an external source of tone is provided, the link on terminal board E2 is removed, and the external signal is applied between ground and the center terminal of the terminal board. Tube V2 amplifies the external signal, and tube V1 output is removed from the circuit.

The tone signal is applied to both grids of tube V4 from tube V2. The amplitude of the signal applied to tube V4A, from the arm of plate load potentiometer R24, is adjustable to provide means of balancing the two input signals to tube V4.

(4) KEYED AUDIO OUTPUT AMPLIFIER V4. (*See figure 2–29.*)—The output amplifier is a push-pull class A amplifier. Audio signals from tube V2 are fed through potentiometer R24 and coupling capacitor C9 to the grid of tube V4A, and through the connection of resistors R21 and R55 to the grid of tube V4B. Grid and cathode biasing are used in both sections of the tube. Voltage divider resistors R31 and R36 apply grid bias to tube V4A through resistor R34, and to tube V4B through resistor R35. Cathode bias for both sec-

tions of tube V4, and for tube V5, is supplied by resistor R37. The variations in the bias of tube V4 due to the keying signal's effect on the operation of tube V5 are described in paragraph 6*c*(2). The amount of cathode bias provided to each section of tube V4 is adjusted by means of balance control potentiometer R27. The plate voltages are filtered by capacitor C42 and resistor R38, and fed to the plates of tube V4 through the primary winding of transformer T2.

The keyed audio tone output of tube V4 is fed through transformer T2 to a parallel connection of an attenuator, which controls the output at terminal board E3, monitoring jack J2, and meter M1.

(5) POWER SUPPLY V8.—External a-c power is applied to the Keyer KY–79/UR transformer T1 primary. The transformer connections are shown for both 110 and 220 volts. The pilot light I1, and the heaters of tubes V1, V2, V4, V5, V6 and V7, are supplied with 6.3 volts from terminals 5 and 7 of the secondary of transformer T1. The plates of rectifier tube V8 are connected to terminals 9 and 11, and the cathodes are connected to terminals 8 and 12. The filter network for the rectified voltage consists of capacitors C7, C16 and C17, and chokes L1 and L2.

7. LOUDSPEAKER LS–187/UR.

(*See figure 7–35.*)

The Loudspeaker LS–187/UR input is designed to receive audio signals from a 600-ohm source. The signal is connected across the terminals of terminal board E1, and then fed to a combination of resistors R1, R2 and R3, which form a balanced H-pad attenuator. The signal output of the attenuator is fed to primary terminals 6 and 7 of audio transformer T1. The signal is inductively coupled to the secondary of transformer T1, and from terminals 1 and 4 of this transformer the signal is applied across the speaker.

8. COMMUNICATION PATCHING PANEL SB–224/UR.

(*See figure 7–36.*)

The Communication Patching Panel SB–224/UR is provided in Radio Receiving Set AN/FRR–28 for simplifying inter-unit connections. The important inputs and outputs of all units that require connection changes when switching from one mode of operation to another, are permanently connected to the rear of the patching panel. Patch cords are provided to interconnect these units in the front of the patching panel.

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AN/FRR-28
NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28

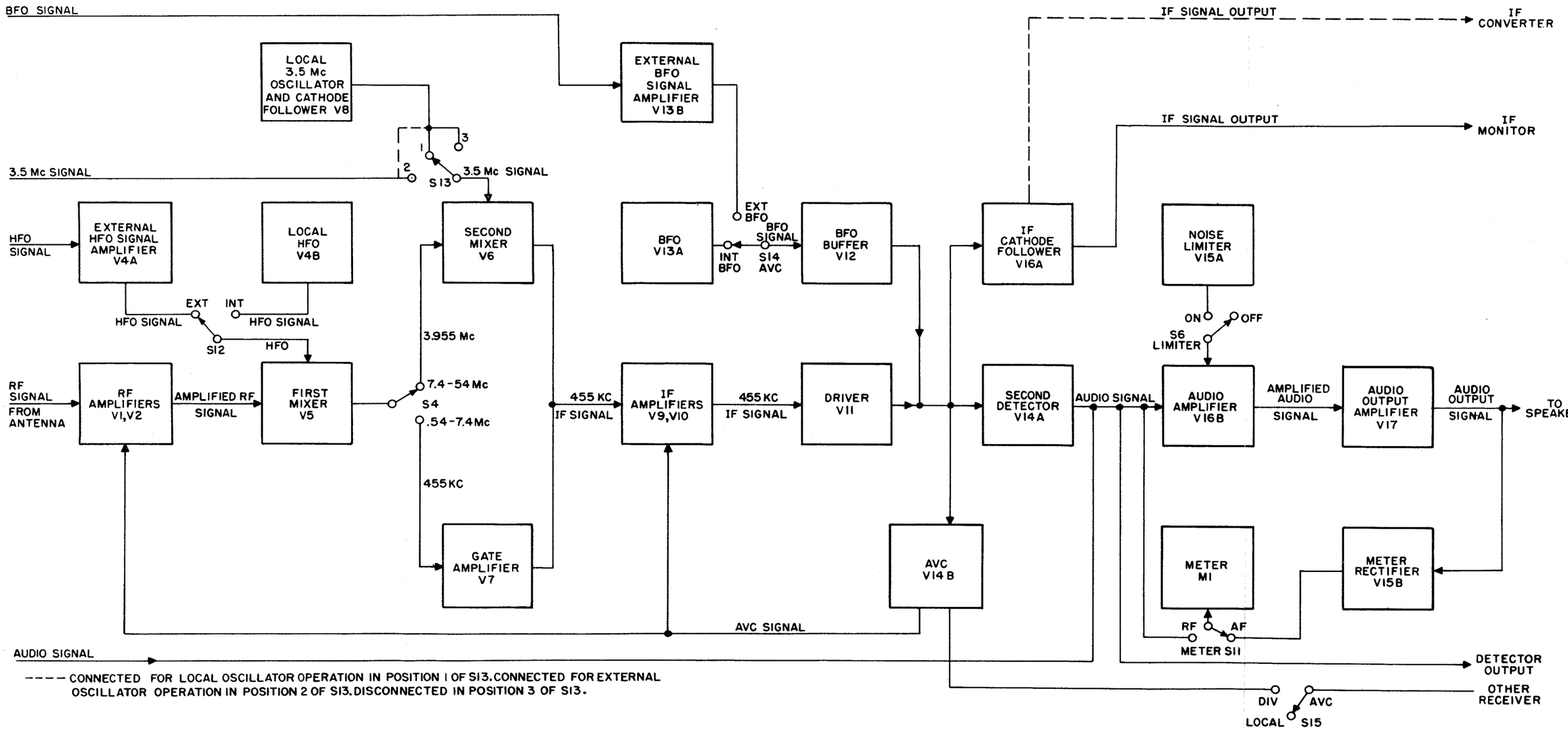


Figure 2-31. Radio Receiver R-450/FRR-28, Block Diagram

SECTION 3
INSTALLATION

1. UNPACKING.

CAUTION

The equipment is supplied with the electron tubes in place. It is therefore very important that all mechanical shocks be avoided when unpacking and installing equipment to prevent damage to any parts.

The following special precautions should be observed:

Keep boxes and crates containing equipment in an upright position at all times.

Remove at least three sides of the boxes or crates with a nail puller. Do not use a hammer or pinch bar for this purpose.

Radio Receiving Set AN/FRR–28 is shipped in five cases, excluding the spare parts, as follows:

a. 1 Relay Rack Cabinet CY–597A/G including:
- 1 Loudspeaker LS–187/UR
- 1 Communication Patching Panel SB–224/UR
- 6 Audio patch cords, W5–1 through W5–6
- 9 Coaxial cables, W12–2 through W12–10
- 1 Power cable for converter-comparator group, W12–1
- 1 Utility servicing cable, W12–14
- 1 Service lamp
- 2 Front panel chrome trim strips
- 1 Set blank panels
- 1 Can touch-up paint

Miscellaneous hardware

b. 1 Radio Receiver R–450/FRR–28. (Number 1.)

c. 1 Radio Receiver R–450/FRR–28. (Number 2.)

d. 1 Radio Frequency Oscillator O–165/UR, with power cable W3–11.

e. 1 Amplifier-Detector AM–615/UR and 1 Keyer KY–79/UR, with power cables W9–12 and W10–13.

2. INSTALLATION.

a. GENERAL.—In selecting a location for the equipment, consideration should be given to the availability and accessibility of two good antennas, a suitable base and ground circuit for the system, and minimum working space of four feet in front and two feet in the rear of the rack. Additional working space is desirable.

b. INSTALLATION OF RELAY RACK CABINET CY–597A/G. (*See figure 3–8.*)—Remove the relay rack from its crate and set up in the operating location. Bolt the rack to the base with the lag screws and expansion shields provided in the rack crate. The power cable is usually brought in from the bottom of the rack, but it may also come in from the top through the channel provided, or through one of the sides. The installation drawing in figure 3–8 indicates the work necessary on the mounting base; this illustration also shows the wiring to Switch Panel SA–238/G.

c. INSTALLATION OF EQUIPMENT IN RACK.—Remove all units from packing cases and carefully inspect for broken, loose, or damaged tubes, sockets, switches, fuses, and wiring. Check to see that all controls move freely. Repair or replace all damaged parts.

CAUTION

The following procedure involves lifting of the units to place into the rack. Some of the units are heavy and require two men to lift in order to avoid possible injury to personnel and/or damage to the equipment.

Figures 3–8 through 3–14, which are outline drawings of the various units, are provided as aids in installing the equipment in the relay rack cabinet.

Mount each unit into its position, according to figure 1–1, by bolting the front panel of each unit to the rack with the one-inch 10 x 32 screws provided. Special type washers are used on every fourth mounting screw. These washers are rectangular and have raised lips on two sides which serve as clips for the chrome plated trim strips that are used to cover the rows of mounting screws.

Note

The two Radio Receiver R–450/FRR–28 units are identical and therefore their positions in the relay rack cabinet are interchangeable.

If Converter-Comparator Group AN/URA–6 or any other converter-comparator group is employed, install in the available space in the relay rack in accordance with instructions in the pertinent manual.

Install front panel trim strips.

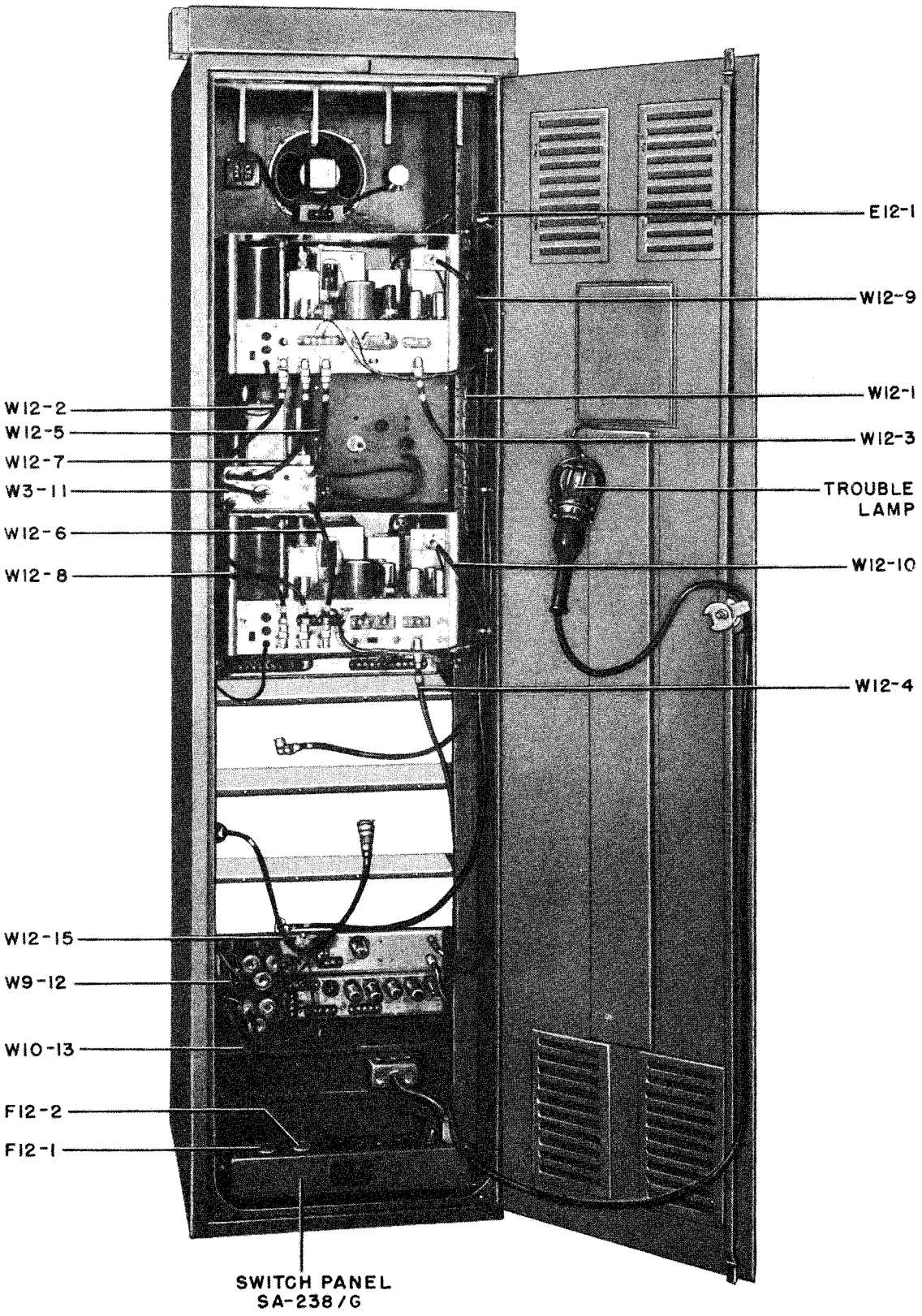


Figure 3–1. Radio Receiving Set AN/FRR–28, Rear View with Door Open

d. ADDITION OF FILTER Z1 TO RADIO RECEIVER R–450/FRR–28.—When Converter-Comparator Group AN/URA–6 is used with Radio Receiving Set AN/FRR–28, it may be desirable to add the IF filter Z1 to the receiver under adverse signal-to-noise conditions. A bracket for the filter is mounted on the receiver, as shown in figures 7–2 and 7–3. Jack J10, coupling capacitor C176, and the coaxial lead from tube V16 are provided in the receiver. Filter Z1 is part of Receiver Coupling kit, Type 10563, supplied with Converter-Comparator Group AN/URA–6.

To install filter Z1, unsolder coaxial lead from jack J10, and solder filter connections to the coaxial lead and jack J10.

e. CONVERSION TO 220-VOLT OPERATION.—The various units of Radio Set AN/FRR–28 are normally connected for nominal 110-volt operation except for Radio Receiver R–450/FRR–28, which is normally connected for nominal 117-volt operation. In order to operate the units from a 220-volt source of power, it is necessary to rearrange the power transformer connections in Radio Receiver R–450/FRR–28, RF Oscillator O–165/UR, Keyer KY–79/UR, and Amplifier-Detector AM–615/UR.

(1) The change necessary for Radio Receiver R–450/FRR–28 is indicated on the schematic diagram, figure 7–30, the wiring diagram, figure 7–37, and the location of the power transformer T8 is shown in figure 7–3.

(2) The RF Oscillator O–165/UR power transformer T1 must be re-connected as shown in the schematic diagram, figure 7–32, and the short across resistors R58 and R64 must be removed. The location of transformer T1 is shown in figure 7–9, and resistors R58 and R64 are on terminal board E3, shown in figure 7–10.

(3) The circuit changes necessary for Keyer KY–79/UR are indicated on the schematic diagram, figure 7–34. The location of power transformer T1 is shown in figure 7–20.

(4) The connections of power transformer T1 for Amplifier-Detector AM–615/UR are rearranged for 220-volt operation as indicated on the schematic diagram, figure 7–33. The location of transformer T1 is shown in figure 7–18.

f. CONNECTING CABLES.—All power and coaxial cables are labeled so as to indicate the unit connections. Figures 3–1 and 3–15 show the cable connections.

For proper primary power distribution in Radio Receiving Set AN/FRR–28 refer to figure 3–2. The power cable for Oscillator O–165/UR, W3–11, must be plugged into the outlet on Switch Panel SA–238/G. The power at this outlet cannot be turned off by the power switch on the switch panel. The reason for this arrangement is that, due to the time necessary to prepare Oscillator O–165/UR for operation, it should never be turned off except for repair or for an extended period of idleness.

The cabling furnished with the receiving set are complete in fabrication, including those cables which connect to Converter-Comparator Group AN/URA–6. If any other converter-comparator group is employed, it may be necessary to fabricate a new cable. Refer to figure 3–3 for cable fabrication information. Power cable W12–15, with no connector at one end, is supplied for use with the converter-comparator group.

All external signal lines are connected to terminal block E12–1. See figure 3–1. Terminals 1 and 2 on E12–1 correspond to LINE 1 on Communication Patching Panel SB–224/UR, terminals 3 and 4 to LINE 2, terminals 5 and 6 to LINE 3, and terminals 7 and 8 to LINE 4. When unbalanced grounded signal lines are employed, the grounded side of the line must be connected to terminals 1, 3, 5, and 7.

3. ANTENNA REQUIREMENTS.

The input impedance at the antenna terminals is designed to match a 72-ohm transmission line. This transmission line may enter the relay rack from either the top, bottom, or sides. The angle plug adapter and connector, supplied with the receiver, is designed for use with a small diameter "TWINAX" transmission line. If it is desired to operate with an unbalanced coaxial transmission line, such as RG12/U, the center conductor should be connected to one terminal of the connector plug, and the shield and armor should be connected to the other terminal of the connector plug. See figure 3–4.

The choice of an antenna is usually governed by the space available for installing it. The following comments are offered as a guide to some basic antenna design considerations. Detailed information on antennas for naval installations may be requested from the Bureau of Ships.

For space diversity operation, each receiver R–450/FRR–28 must have its own antenna system. The location of the two antennas can only be determined from the local conditions of reception and the available space. However, it is recommended that there be a nominal separation of 1000 to 2000 feet between antennas to insure optimum results from space diversity operation.

For reception in the range from 2 to 30 megacycles, diversity becomes of great importance. Directive antennas, such as the rhombic, V, and fishbone, are useful in that they discriminate against signals off the bearing line of the antennas, reduce noise, and increase signal pick-up in the favored direction of reception. The rhombic and the fishbone are essentially non-resonant or wide band antenna and are useful over a wide frequency range without any readjustment whatever.

For VHF reception above 30 megacycles, the principal problem is the abstraction of a sufficient energy from the passing radio waves. Highly directive, reso-

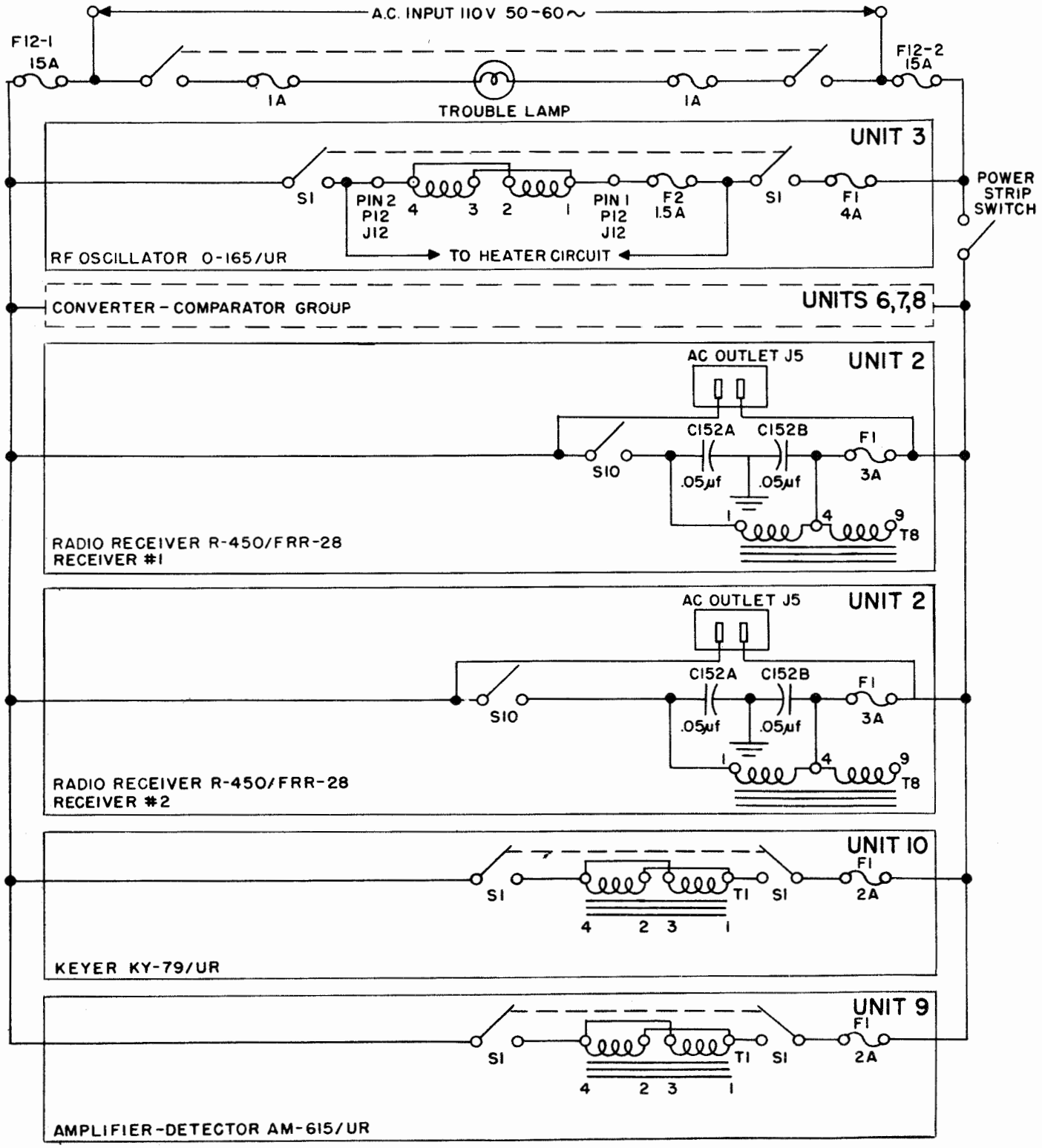
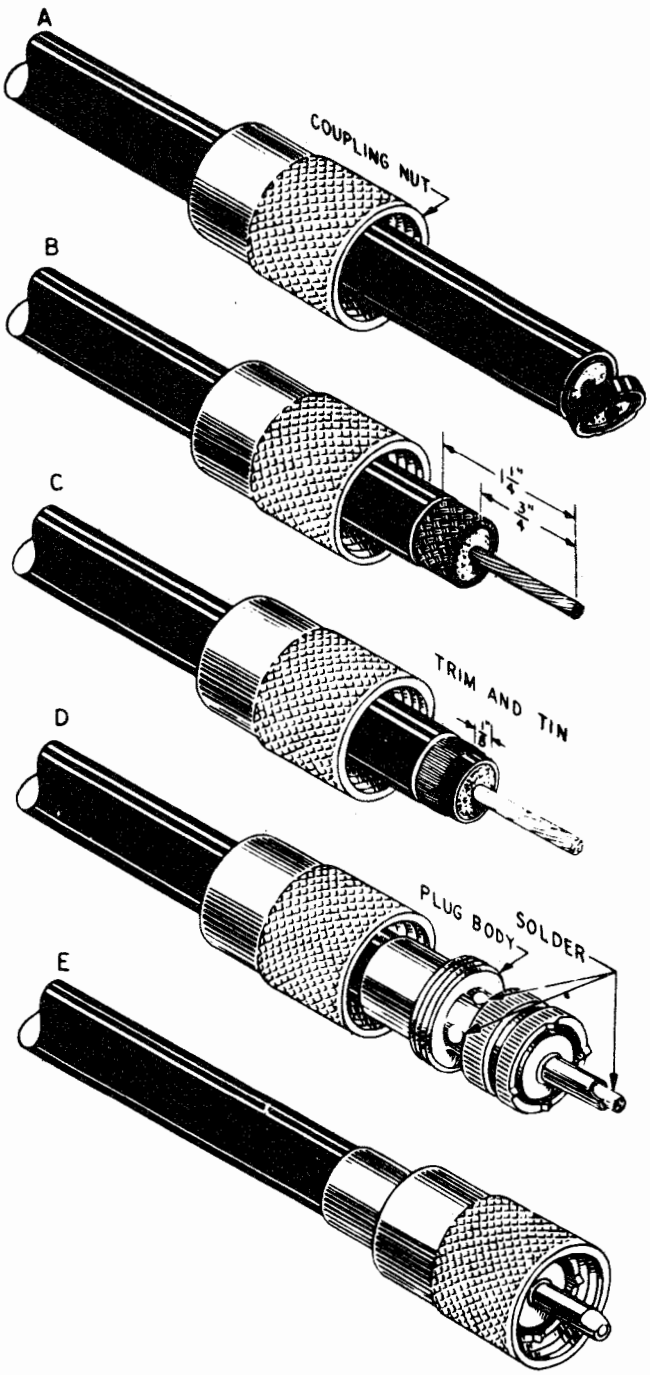


Figure 3–2. Radio Receiving Set AN/FRR–28, Power Distribution Diagram



(A) Square off the end of the RG-11/U cable. Slide the coupling nut over the cable.

(B) Cut the outer jacket of the cable 1¼" from the end. Be careful not to nick the copper braid underneath. Cut the copper braid and inner insulation ¾" from the end.

(C) Fan out, trim, and tin the copper braid.

(D) Screw the plug body over the outer jacket until 1/16" of the inner conductor is exposed. Be careful not to push back the copper braid. Solder the plug body to the copper braid through the 4 holes provided. Solder the inner conductor to the contact sleeve. Remove any excess solder and cut off the inner conductor where it projects past the contact sleeve.

(E) Slide the coupling nut forward until it is free from the internal thread.

Figure 3–3. Cable Fabrication Instructions

nant V's, rhombic antennas, and arrays of half wave radiators must always be used.

4. INITIAL ADJUSTMENTS AND OPERATIONAL CHECKS.

a. GENERAL.—After the rack, units, and all cabling have been checked for obvious defects, and have been assembled, the initial adjustments and operational checks may be made. Turn Switch Panel SA–238/G on. (See figure 3–1.)

b. INITIAL ADJUSTMENT OF RADIO RECEIVER R–450/FRR–28. (*See figures 3–5, 4–1.*)

(1) ADJUSTMENT OF METER ADJ RF CONTROL.—Apply a 10-microvolt RF signal, within the frequency range of the receiver, to the antenna terminals. Set receiver controls as follows:

3.5 MC OSC switch S13 to position 3.
AVC DIV–LOC switch S15 to LOC position.
RF GAIN control R93 to maximum clockwise.
IF GAIN control R128 to maximum counterclockwise.

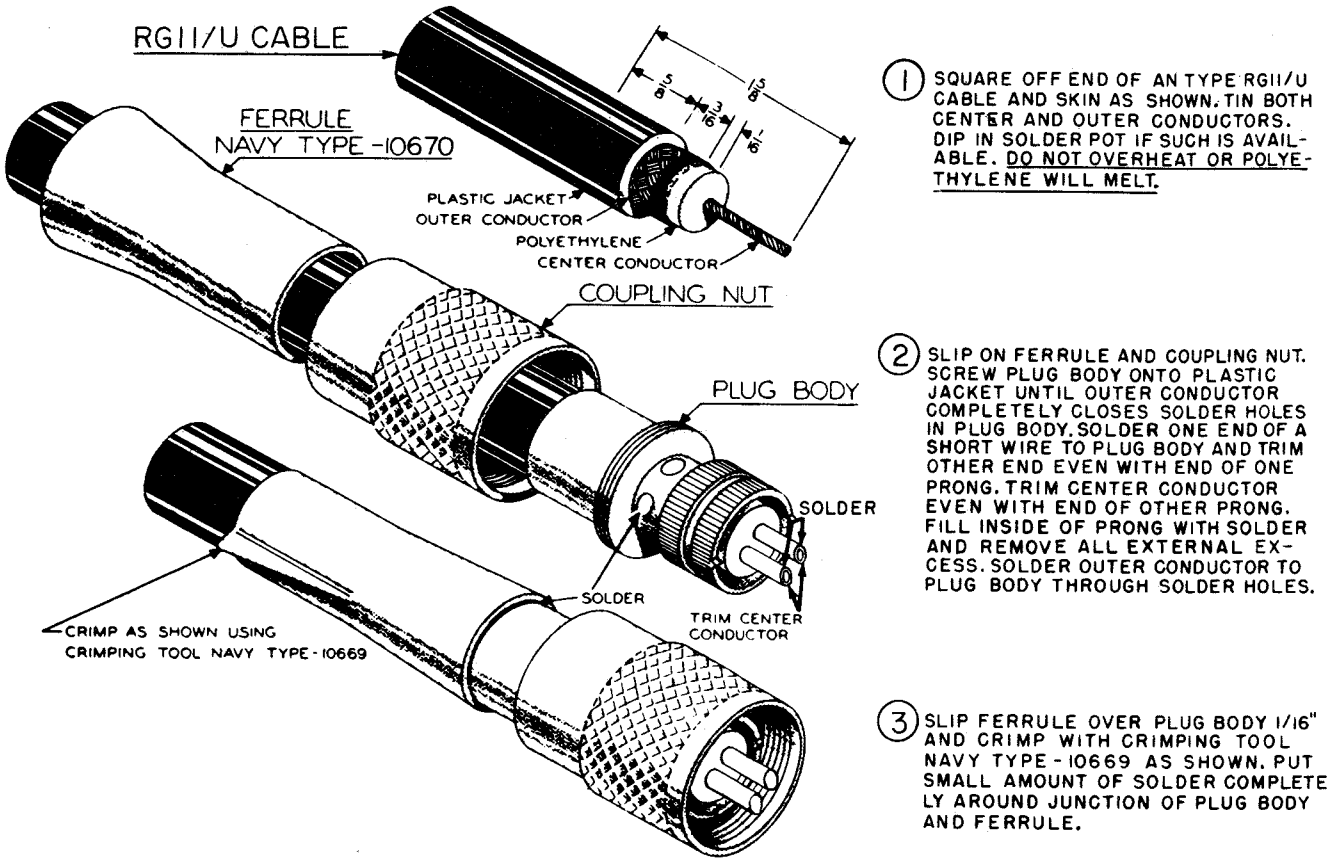


Figure 3–4. Cable Fabrication Instructions

BAND CHANGE switch S1 to band containing RF signal input.
TUNING control C1 to RF signal input frequency.
METER switch S11 to RF.
SEND–REC switch S9 to REC.
HFO switch S12 to INT.
AVC–MAN switch S8 to AVC.
AVC switch S14 to INT BFO, FAST position.
MOD–CW switch S7 to MOD.
SELECTIVITY switch S5 to "1.3".

The position of the XTAL PHASING and BEAT OSC controls is unimportant.

Readjust TUNING control C1 for maximum meter deflection.

Check that receiver is tuned to signal generator output by turning off signal generator momentarily.

Set METER ADJ RF R64 control, located at the rear of the receiver, as shown in figure 3–5, to position where meter reads "20 db". Failure to obtain 20 db indicates possible misalignment of the receiver. The alignment procedure is given in Section 7.

(2) ADJUSTMENT OF METER ADJ AF CONTROL. (*See figure 3–5.*)

CAUTION

Do not depress METER switch for AF scale unless audio output has been adjusted for low power output by means of headphones or speaker. Failure to observe this precaution may result in damage to the meter.

To set the METER ADJ AF control, use the same settings of controls as noted in paragraph *4b*(1) of this section. Apply modulated RF signal within frequency range of the receiver. Tune the receiver to this frequency. Connect electronic voltmeter across 600-ohm audio output terminals. Adjust AUDIO GAIN control for 1.9 volt reading on voltmeter. Depress METER ADJ AF control R101 for reading of "0 db" on receiver front panel meter.

(3) BFO INJECTION CONTROL ADJUSTMENT. (*See figure 3–5.*)—Set controls and connections according to procedure in paragraph *4b*(1) of this section. Turn BFO INJECTION control R74 on rear of receiver to the maximum clockwise position for maximum injection.

(4) IF GAIN CONTROL ADJUSTMENT. (*See figure 3–5.*)—The setting of this control, R128, depends on the terminal equipment used. Connect ter-

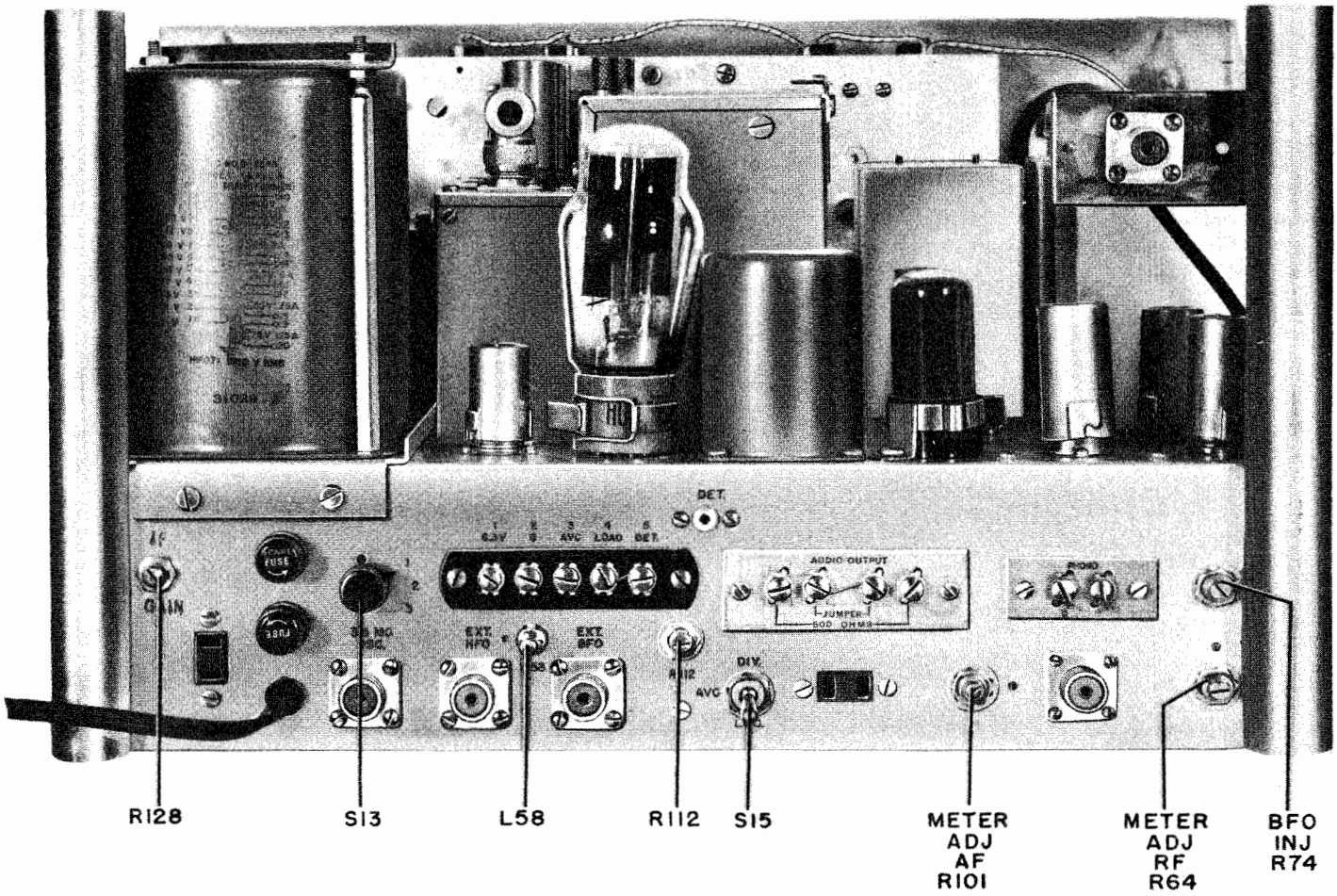


Figure 3–5. Receiver R–450/FRR–28, Rear View, Pre-Operation Adjustments

minal equipment and short-circuit the antenna. Turn RF GAIN control R93 to maximum clockwise position, and turn IF GAIN control R128 counterclockwise until terminal equipment does not operate improperly.

c. INITIAL ADJUSTMENT OF RADIO FREQUENCY OSCILLATOR O–165/UR. (*See figures 4–3, 4–4.*)—Since the power for the RF Oscillator O–165/UR does not go through the switch on the rack Switch Panel SA–238/G, it is not necessary to turn this switch on for the initial adjustment of the unit. Due to the length of time necessary to prepare RF Oscillator O–165/UR for operation, it is never turned off except for repair or if the equipment is not to be used for a long period of time.

Turn the POWER switch on the front panel of Oscillator O–165/UR to the ON position. After about ten minutes check to see that the thermometer reads 58° to 62°.

(1) RF OSCILLATOR O–165/UR AGING PROCESS.—Proper aging is necessary for stable operation. RF Oscillator O–165/UR, though aged by the manufacturer, may be subject to vibration, shock, and large variations of temperature and humidity. If the unit is not aged prior to actual use, it may be found that dial settings and unit calibrations have changed considerably in relatively short periods of time. The aging process is as follows:

(*a*) Turn the POWER switch S1 on and allow to operate for about four hours.

(*b*) Turn POWER switch S1 off for about four hours.

(*c*) Repeat cycle as in (*a*) and (*b*) above.

(*d*) After running the Oscillator O–165/UR through the two heat cycles, turn on the power and allow the unit to operate for at least 12 to 18 hours.

(2) FREQUENCY STABILITY CHECK OF VARIABLE OSCILLATOR.—When the aging process has been completed, the frequency stability of the variable oscillator is checked. This is done by first rotating the oscillator dial to approximately 0000.0 and turning on the calibrator by rotating CAL OUT-

PUT control clockwise. Readjust the oscillator dial for a convenient output zero-beat frequency at the CAL OUTPUT jack. If drift greater than five cycles-per-second per hour is observed, then a longer aging period is necessary for proper oscillator stability.

(3) CALIBRATION OF VARIABLE OSCILLATOR.—To calibrate the variable oscillator against the crystal oscillator for the entire range of the oscillator, adjust CAL OUTPUT control to full clockwise position and follow the procedure outlined below:

Note

To reduce the effect of dial backlash, make all approaches to dial settings in a clockwise direction.

(*a*) Turn oscillator tuning dial to exactly 0000.0. Adjust the oscillator trimmer inductance L2, accessible at the rear of the oven, until zero beat is noted at the calibrator output.

(*b*) Turn the oscillator tuning control to exactly 4700.0 and adjust the oscillator trimmer capacitor C2, accessible at the rear of the oven for zero beat note at the calibrator output.

(*c*) Repeat adjustments of the trimmer inductance and capacitance until, at 0000.0 and at 4700.0, zero beat note is obtained without further adjustments.

(*d*) Determine the oscillator dial reading for 2.1 megacycles from the typical oscillator calibration table, and set the oscillator dial to approximately that position. Readjust the oscillator dial in a clockwise direction only, until zero beat is obtained from the calibrator output, always approaching zero-beat in the clockwise direction.

(*e*) Following the same procedure as in (*d*) above, obtain oscillator dial readings for all 100 kilocycle points between two and four megacycles and record on table 3–1.

d. INITIAL ADJUSTMENT OF AMPLIFIER-DETECTOR AM–615/UR. (*See figure 4–6.*)—Turn on power switches on relay rack Switch Panel SA–238/G, Amplifier-Detector AM–615/UR, and one of the receivers. Set the receiver front panel controls as follows: HFO to INT; SELECTIVITY to ".2"; MOD–CW to MOD; AVC–MAN to MAN; SEND–RECEIVE to RECEIVE; LIMITER to OFF; PHASING to ARROW; RF GAIN to maximum. Set the rear controls as follows: AVC to LOC, and 3.5 MC OSC to "3". Plug headphones not supplied with this equipment into OUTPUT MONITOR jack J1 on Amplifier-Detector AM–615/UR. Set Amplifier-Detector AM–615/UR controls as follows: INPUT SELECTOR to "CH.1" if the first receiver is used, or to "CH.2" if the second receiver is used; TUNING to "50", and OUTPUT LEVEL to maximum.

TABLE 3–1. VARIABLE OSCILLATOR CALIBRATION TABLE

Ser. No._____* Calibrated By_____* Date_____*

Oscillator Frequency	Typical Oscillator Dial Reading		Actual Oscillator Dial Reading†	
KCS	Hundreds	Units	Hundreds	Units
2000	00	00.0	00	00.0
2100	02	58.4		
2200	04	94.4		
2300	07	28.0		
2400	09	61.2		
2500	11	93.4		
2600	14	26.2		
2700	16	56.3		
2800	18	87.1		
2900	21	16.7		
3000	23	46.1		
3100	25	75.1		
3200	28	07.5		
3300	30	38.2		
3400	32	69.4		
3500	35	02.3		
3600	37	36.2		
3700	39	70.5		
3800	42	04.4		
3900	44	35.0		
4000	47	00.0	47	00.0

* To be filled in by person performing actual calibration.
† To be obtained after installation and procedure.

Tune the receiver accurately to any good CW signal, and reset the RF GAIN control on the receiver so that the beat note heard in the headphones is just audible. Adjust the Amplifier-Detector AM–615/UR BFO trimmer capacitor C22, which is located on top of the Z1 assembly as shown in figure 3–6, for zero beat. The trimmer is accessible through an opening in the end of the AM–615/UR chassis and can be reached from the rear when the AM–615/UR is installed in rack CY–597A/G.

e. INITIAL ADJUSTMENT OF KEYER KY–79/UR. (*See figures 3–7, 4–5.*)

(1) AUDIO OSCILLATOR FREQUENCY ADJUSTMENTS.—Turn on power switches on relay rack Switch Panel SA–238/G and on Keyer KY–79/

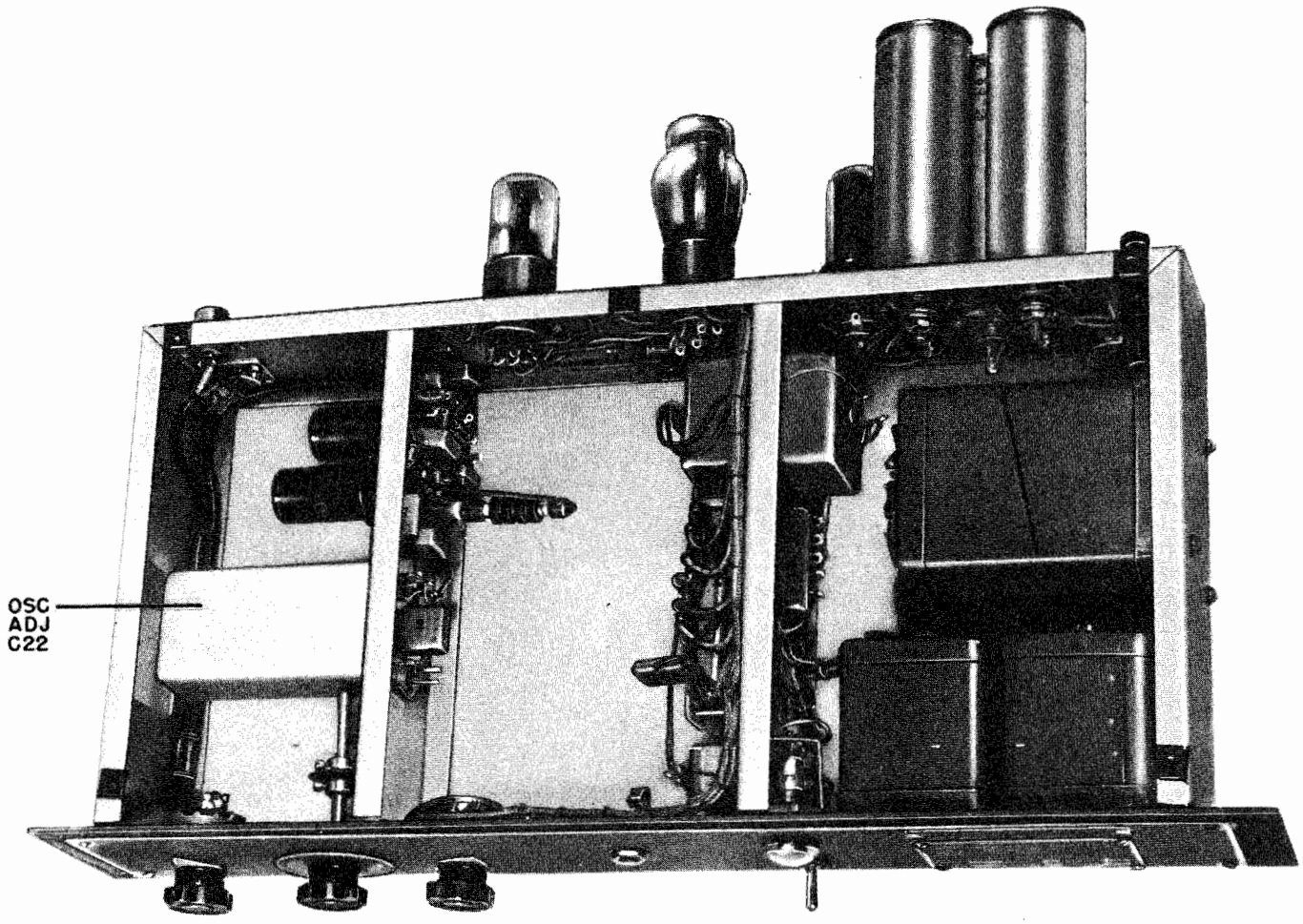


Figure 3–6. Amplifier-Detector AM–615/UR, Top View, Pre-Operation Adjustments

UR. To check the frequencies of the internal audio oscillator, a suitable standard of audio frequencies, such as a signal generator, is necessary. Compare audio output of Keyer KY–79/UR to standard frequencies and adjust the proper trimmer capacitor, located at the rear of Keyer KY–79/UR as shown in figure 3–7, until the desired accuracy is obtained.

(2) BALANCE ADJUSTMENT.—In Keyer KY–79/UR it is necessary to balance the keyed amplifier to eliminate the DC transients of the keyed tone signal being fed to an external circuit. For balancing proceed as follows:

(*a*) Connect an oscilloscope across terminals marked MONITOR on rear of unit or at front panel jack marked OUTPUT MONITOR. See figures 1–5 and 3–7.

(*b*) Connect a low frequency audio tone of approximately 60 cps to terminals DC and G of terminal board E1. The tone level should be high, preferably up to 50 to 125 volts.

(*c*) Set the KEYING LEVEL switch S2 on the front panel to either DC+ or DC—.

Note

A low frequency audio tone of sufficient level is equivalent to a square wave of corresponding frequency in this application. This allows the Keyer to be keyed in the "DC" switch position.

(*d*) Disable the local audio oscillator of Keyer KY–79/UR. This may be accomplished by opening the link on terminal board E2 at the rear of the unit or by setting the OUTPUT FREQUENCY switch S5 between detents.

(*e*) Adjust BAL potentiometer R27 at the rear of the Keyer KY–79/UR, as shown in figure 3–7, for

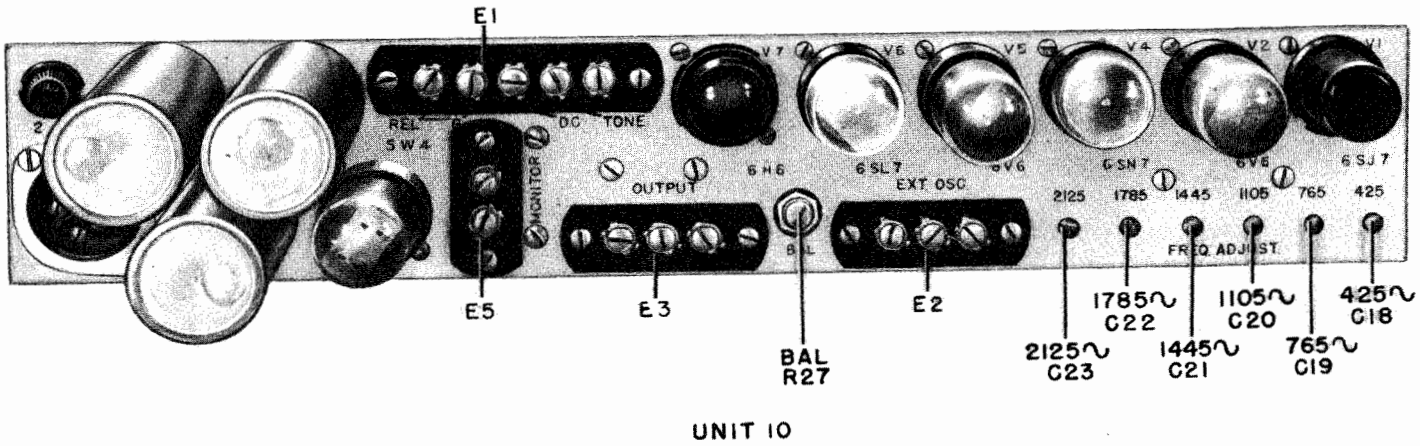
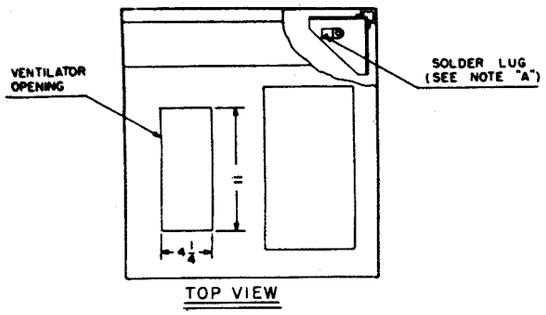


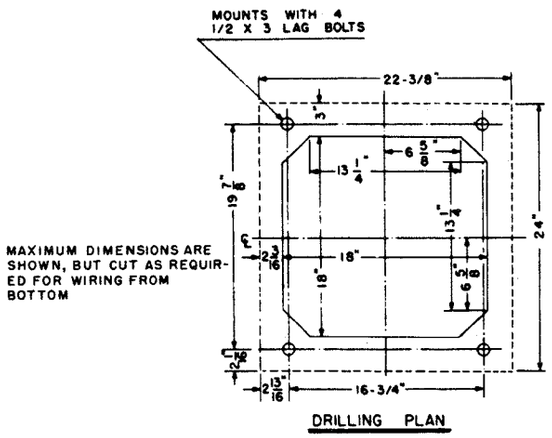
Figure 3–7. Keyer KY–79/UR, Rear View, Pre-Operation Adjustments

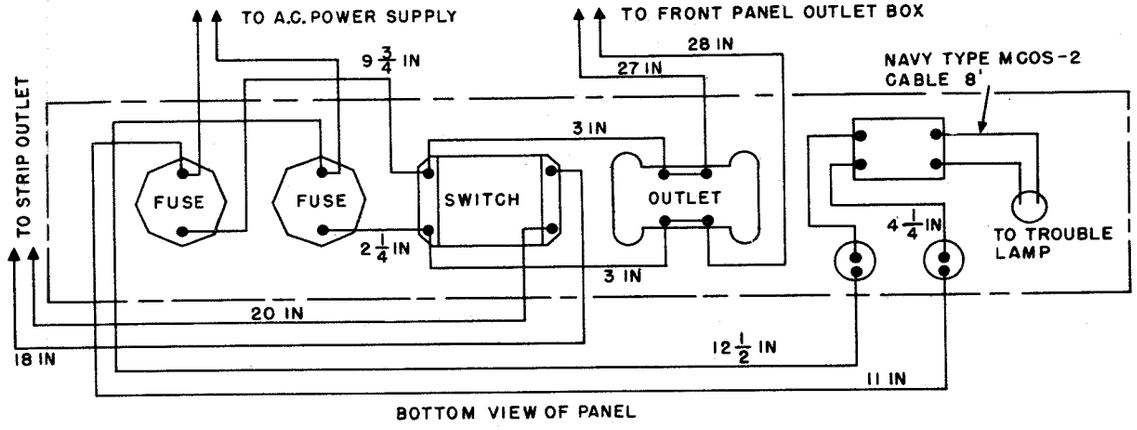
minimum transient output indicated by the oscilloscope. If a reasonably good balance is unobtainable, then change tube V4, and readjust the BAL control.

f. OVERALL EQUIPMENT CHECK.—There is no one mode of operation that uses all sections of all the units in the receiving set. To check the functioning of the equipment it is necessary to operate the receiving set according to the various methods described in Section 4.

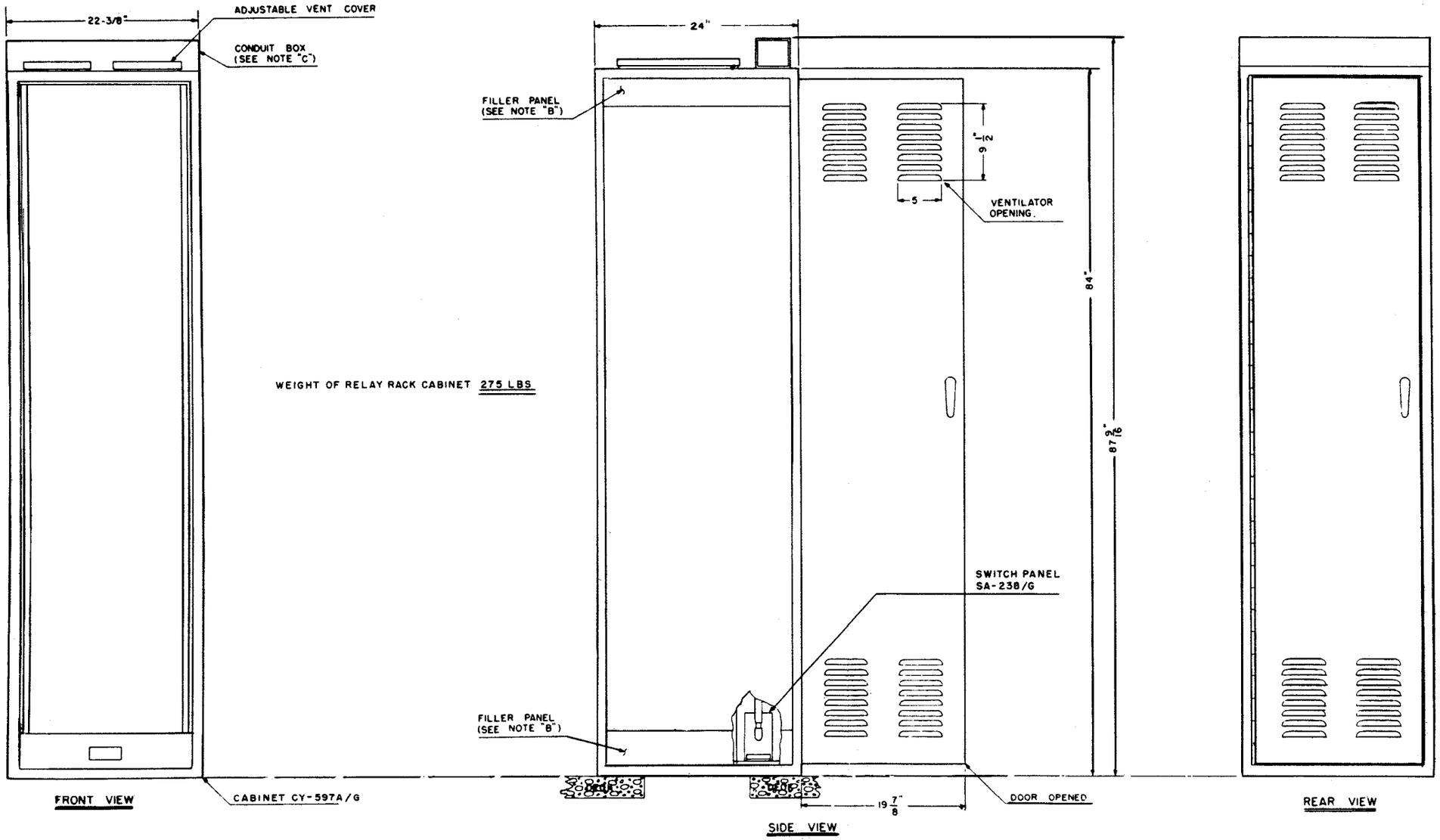
NAVSHIPS 91582
AN/FRR-28







WIRING DIAGRAM OF SWITCH PANEL SA-238/G



NOTE "A" – PROVIDED FOR GROUNDING CABINET INSTALLATION ACTIVITY TO MAKE SUITABLE CONNECTION.

NOTE "B" – FILLER PANELS CAN BE REMOVED FOR ALTERNATE CABLE ENTRANCE.

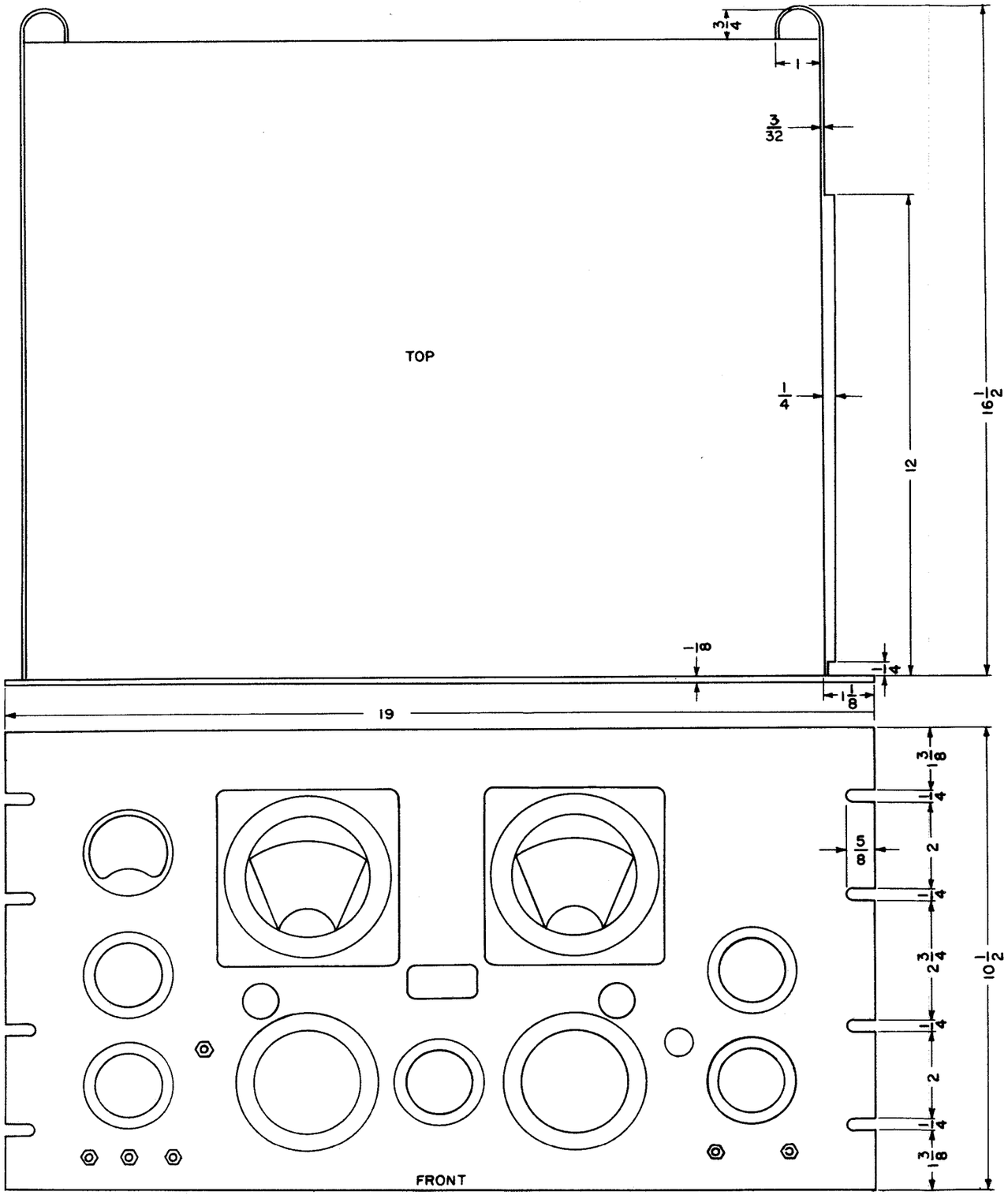
NOTE "C" – PROVIDED FOR ENTRANCE OF CABLES INTO UNIT.

Figure 3–8. Relay Rack Cabinet CY–597A/G, Outline Dimensions

NAVSHIPS 91582
AN/FRR–28

UNITS 2 AND 4

DIMENSIONS IN INCHES
WEIGHT 65 POUNDS



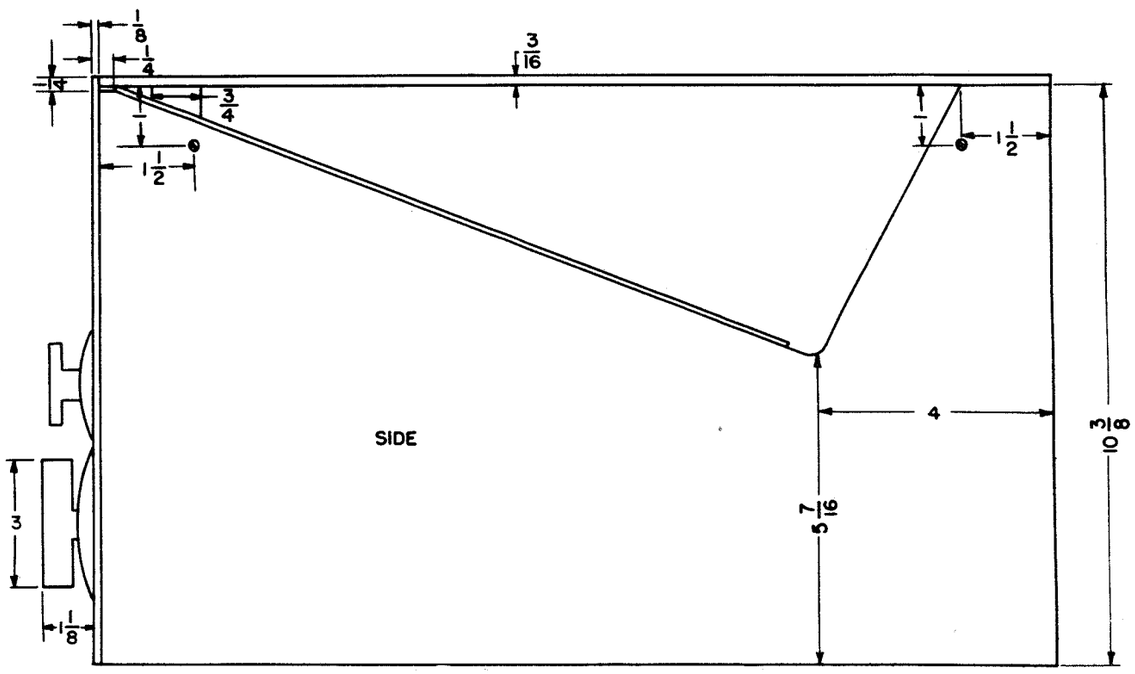
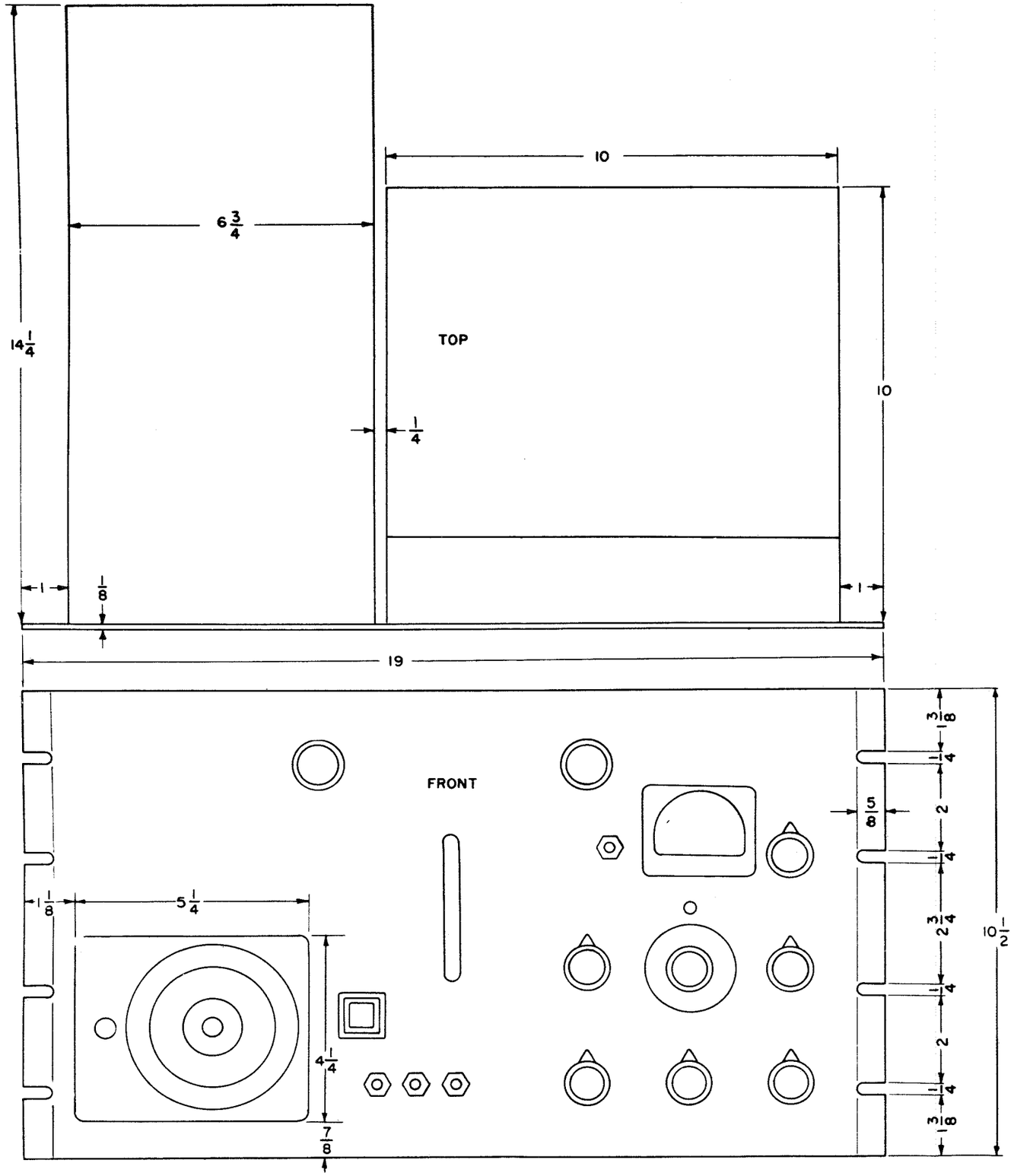


Figure 3–9. Radio Receiver R–450/FRR–28, Outline Dimensions

NAVSHIPS 91582
AN/FRR-28

UNIT 3

DIMENSIONS IN INCHES
WEIGHT 54 POUNDS



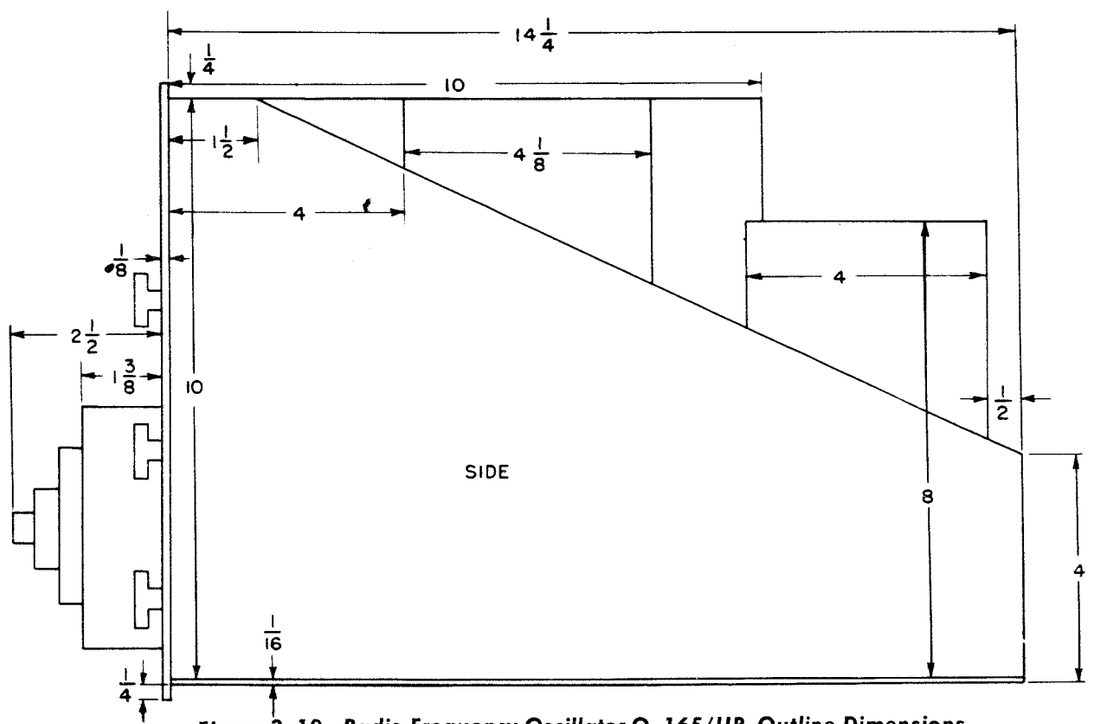


Figure 3–10. Radio Frequency Oscillator O–165/UR, Outline Dimensions

NAVSHIPS 91582
AN/FRR–28

UNIT 9

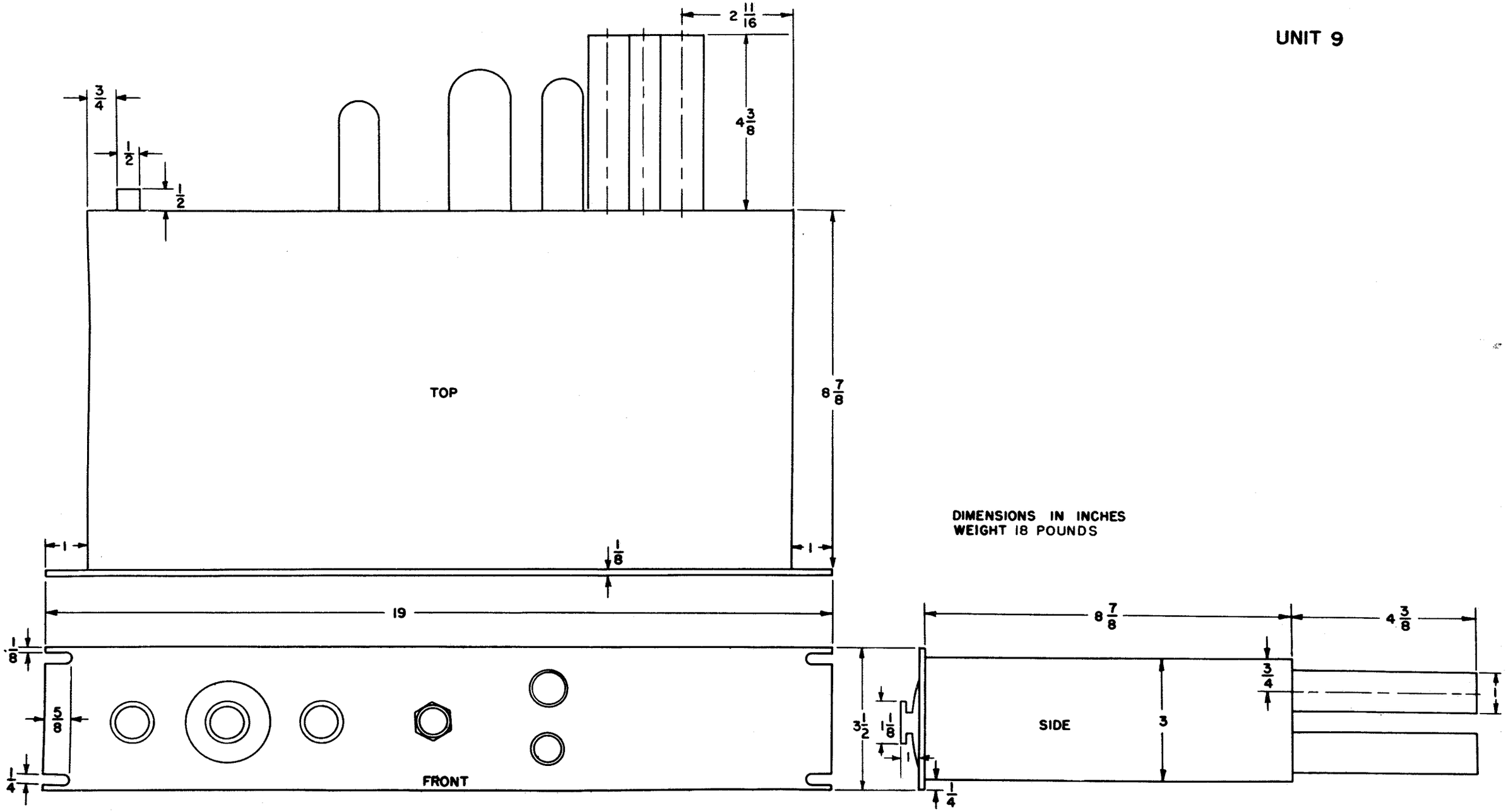


Figure 3–11. Amplifier-Detector AM–615/UR, Outline Dimensions

NAVSHIPS 91582
AN/FRR–28

UNIT IO

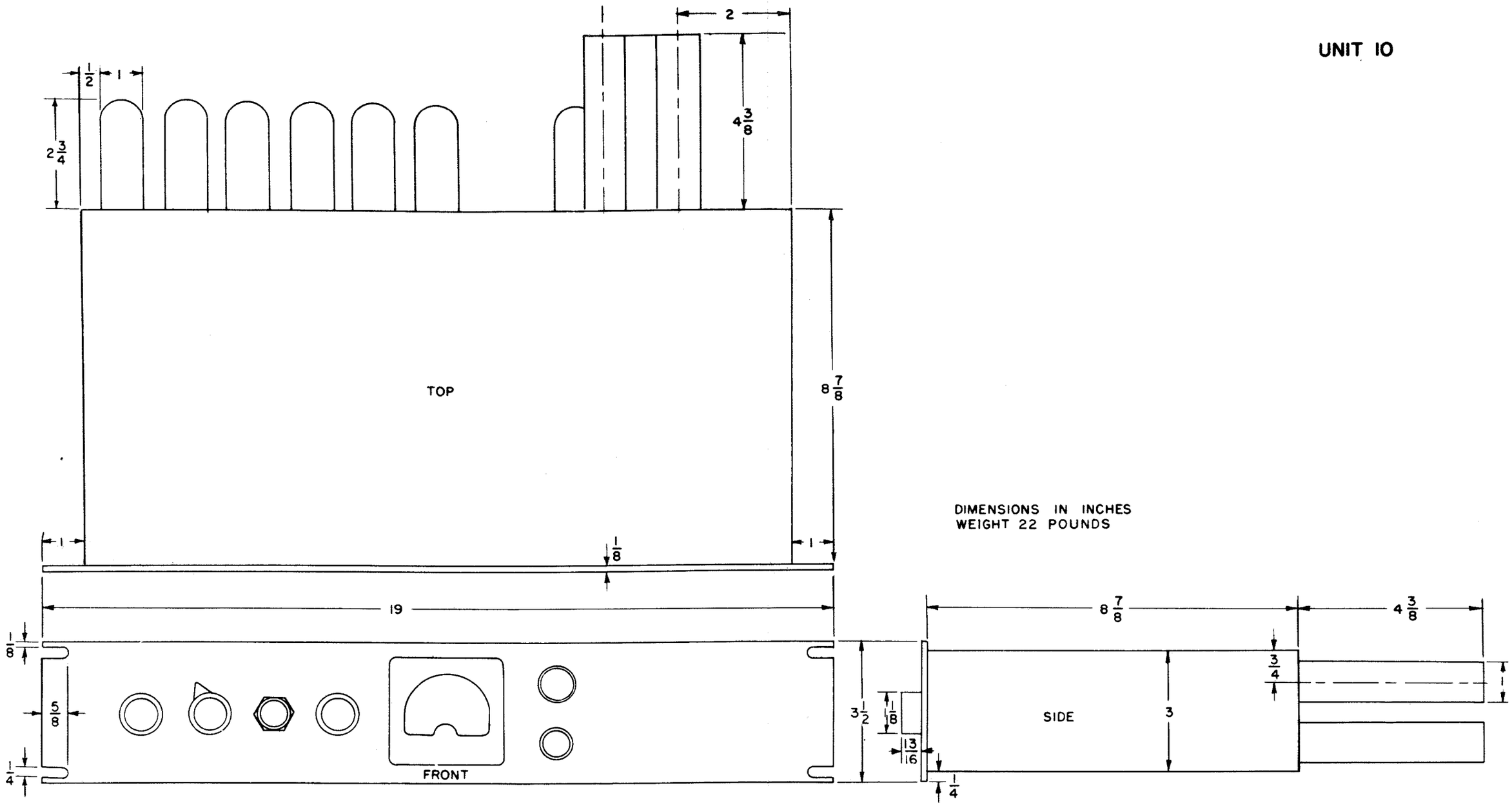


Figure 3–12. Keyer KY–79/UR, Outline Dimensions

NAVSHIPS 91582
AN/FRR-28

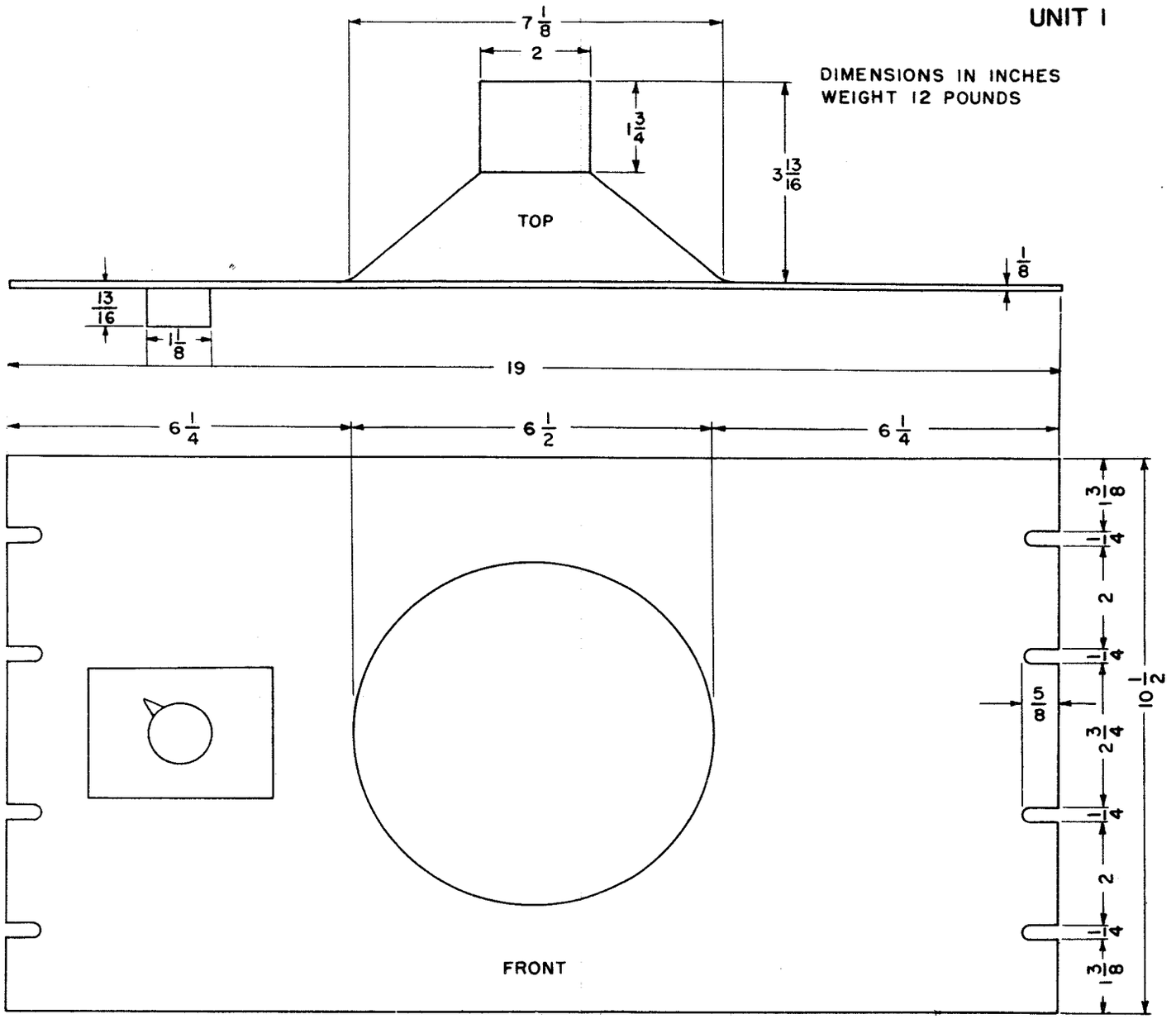


Figure 3–13. Loudspeaker LS–187/UR, Outline Dimensions

NAVSHIPS 91582
AN/FRR–28

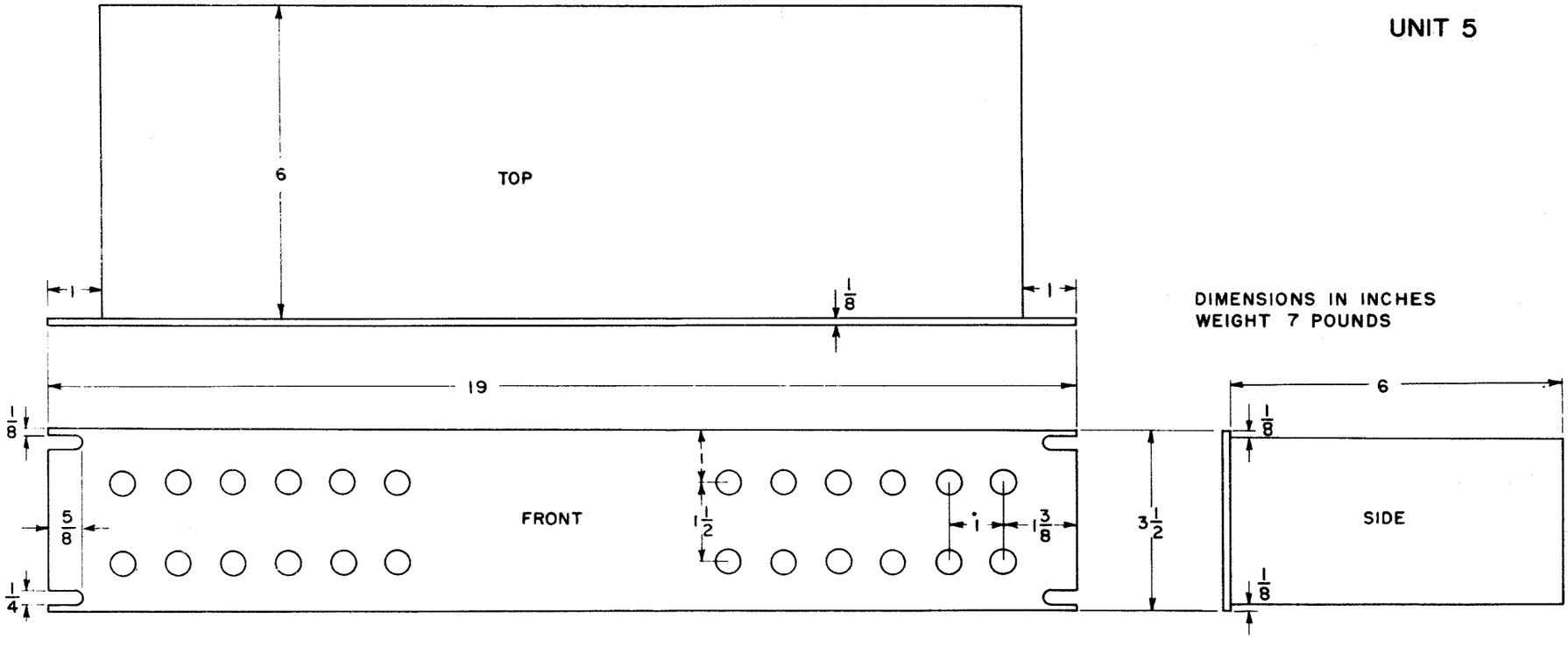


Figure 3–14. Communication Patching Panel SB–224/UR, Outline Dimensions

NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28

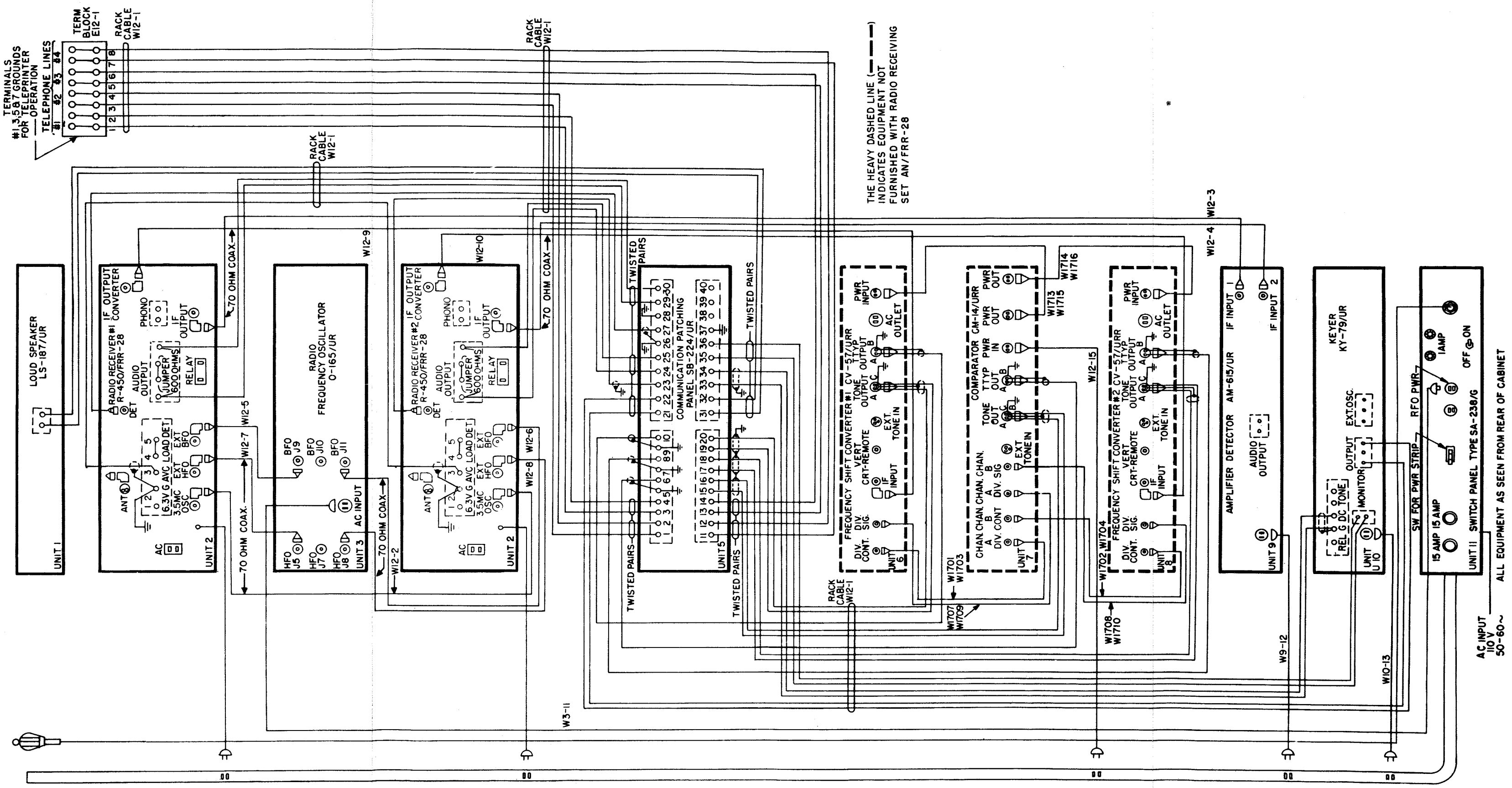


Figure 3–15. Radio Receiving Set AN/FRR–28, Interconnecting Wiring Diagram

SECTION 4
OPERATION

1. INTRODUCTION.

Radio Receiving Set AN/FRR–28 is used for individual, "space diversity", or "frequency diversity" reception of radiophone, CW, or frequency-shift signals. The control settings and interunit connections depend on the type of signal being received and where the signal is to be used. Communication Patching Panel SB–224/UR, provided with patch cords, is supplied to simplify the interconnecting of units. All units, except the receiver and RF Oscillator O–165/UR have front panel controls only. The receiver and RF Oscillator O–165/UR contain a number of rear panel controls, in addition to those on the front panel.

2. LOCATION AND FUNCTION OF OPERATING CONTROLS.

The location and function of each operating control in Radio Receiving Set AN/FRR–28 are given in Table 4–1.

CAUTION

Do not tamper with non-operating controls since this may upset proper functioning of the equipment.

TABLE 4–1. LOCATIONS AND FUNCTIONS OF OPERATING CONTROLS

CONTROL	LOCATION	FUNCTION	FIGURE REFERENCE
Radio Receiver R–450/FRR–28			
RF GAIN	Front panel	Switch for receiver a-c power and manual RF gain control.	4–1
BAND CHANGE	Front panel	Changes tuned circuits for HFO and RF amplifiers.	4–1
TUNING	Front panel	Varies frequency of HFO and RF amplifier tuned circuits.	4–1
TUNING LOCK	Front panel	Locks tuning capacitor into position when tuned to signal.	4–1
BEAT OSC	Front panel	Varies BFO frequency.	4–1
XTAL PHASING	Front panel	Controls attenuation of close signal interference.	4–1
METER SWITCH	Front panel	Switches signal strength meter between RF and AF signal.	4–1
SEND-RED	Front panel	Desensitizes receiver in SEND position, when transmitting.	4–1
SELECTIVITY	Front panel	Varies receiver selectivity from 13 kc to 200 cycles in six steps.	4–1
AUDIO GAIN	Front panel	Varies audio signal input to audio amplifier.	4–1
AVC	Front panel	Controls AVC time constant, and switches between internal and external BFO.	4–1
HFO	Front panel	Switches between internal and external HFO.	4–1
LIMITER	Front panel	Switches pulse type noise limiter into circuit.	4–1
AVC-MAN	Front panel	Switches between AVC and manual volume control.	4–1
MOD-CW	Front panel	Turns BFO on in CW position.	4–1

TABLE 4-1. LOCATIONS AND FUNCTIONS OF OPERATING CONTROLS (Continued)

CONTROL	LOCATION	FUNCTION	FIGURE REFERENCE
Radio Receiver R-450/FRR-28			
AVC DIV-LOC	Rear panel	Switch for local or diversity AVC voltage.	4-2
3.5 MC OSC	Rear panel	Switch for local or diversity 3.5 megacycle oscillator.	4-2
RF Oscillator O-165/UR			
TUNING DIAL	Front panel	Varies frequency of variable HFO.	4-3
POWER	Front panel	Switches power on and off.	4-3
HFO	Front panel	Turns ON-OFF HFO section.	4-3
BFO ON-OFF	Front panel	Turns BFO section on and off.	4-3
HF XTAL FREQ	Front panel	Varies crystal HFO frequency slightly.	4-3
HFO OUTPUT	Front panel	Varies HFO signal output level.	4-3
CAL OUTPUT	Front panel	Varies calibration signal output level.	4-3
OUTPUT FREQUENCY	Front panel	Tunes HFO output circuit.	4-3
FREQUENCY RANGE	Front panel	Switches in frequency doubling circuits.	4-3
HFO	Front panel	Switches between variable HFO circuit and circuit of crystals.	4-3
METER SELECTOR	Front panel	Switches various circuits across meter.	4-3
BFO-XTAL SELECTOR	Rear panel	Switches one of two BFO crystals into circuit.	4-4
BFO OUT CONT	Rear panel	Controls amplitude of BFO output signal.	4-4
Keyer KY-79/UR			
POWER	Front panel	Switches Keyer KY-79/UR power on.	4-5
KEYING LEVEL	Front panel	Switches in circuits used for various types of input signal.	4-5
OUTPUT FREQUENCY	Front panel	Changes audio oscillator frequency by switching tuned circuits.	4-5
OUTPUT LEVEL	Front panel	Varies audio output signal level.	4-5
Amplifier-Detector AM-615/UR			
POWER ON-OFF	Front panel	Switches amplifier-detector power on.	4-6
INPUT SELECTOR	Front panel	Selects receiver to be monitored.	4-6
TUNING	Front panel	Varies local BFO frequency.	4-6
OUTPUT LEVEL	Front panel	Varies output signal level.	4-6
Loudspeaker LS-187/UR			
SPEAKER LEVEL	Front panel	Varies audio signal amplitude to speaker.	4-7

Table 4–2 lists the expected non-operating controls that are *not* to be handled by the operator.

TABLE 4–2. NON-OPERATING CONTROLS

CONTROL	LOCATION
IF GAIN	Rear of receiver
BFO INJ	Rear of receiver
METER ADJ AF	Rear of receiver
METER ADJ RF	Rear of receiver
RESISTOR R112	Rear of receiver
INDUCTOR L58	Rear of receiver
BALANCE	Rear of Keyer KY–79/UR

3. TUNING OF RADIO FREQUENCY OSCILLATOR O–165/UR.

(*See figures 4–3 and 4–4.*)

a. TUNING OF VARIABLE HFO. The following procedure is used for tuning the variable HFO:

(1) Turn POWER switch to ON.

Note

This switch should not be turned off except when Oscillator O–165/UR is removed for maintenance, or when there is to be an extended period of idleness, since several hours may be required for this unit to stabilize after it has been turned off.

(2) Turn HFO switch to ON.

(3) Turn HFO XTAL switch to MO.

(4) Turn FREQUENCY RANGE switch to band containing desired frequency.

(5) Turn OUTPUT FREQUENCY dial to its approximate setting according to Table 4–3.

(6) Turn METER switch to RF OUTPUT position.

(7) The required frequency of RF Oscillator O–165/UR may be obtained by adding 455 kc to the assigned operating frequency for frequencies below 7.4 Mc, and by adding 3.955 Mc to the assigned operating frequency for frequencies above 7.4 Mc.

(8) The dial setting of RF Oscillator O–165/UR may be obtained from the calibration curves shown in figures 4–8 through 4–28 by dividing the Oscillator O–165/UR frequency by 8 if it is between 16 and 32 Mc, dividing by 4 if it is between 8 and 16 Mc, dividing by 2 if it is between 4 and 8 Mc, and using directly if it is between 2 and 4 Mc.

(9) Turn to the calibration curve corresponding to the desired frequency of operation, as determined from steps (7) and (8) above.

(10) Read the number of "Divisions Added to Lower Calibration Point" corresponding to the desired operating frequency.

(11) Note the approximate check point corresponding to Curve A or Curve B which is printed at the upper left hand corner of the curve sheet.

(12) Turn on CAL OUTPUT switch and insert a pair of head-phones into the CAL OUTPUT jack. Adjust the oscillator dial to the approximate check point.

The oscillator dial is set to the check point number by rotating the dial until the first two digits of the check point number are indicated by the "dial hundreds", and the remaining digits of the check point number are recorded by the dial itself in "dial units". Always approach the dial setting by rotating the knob in a clockwise direction.

(13) Find the actual check point by zero beating the oscillator with the calibrator, approaching the dial setting in a clockwise direction. Record this actual check point on the curve sheet.

(14) The desired setting of the dial will then be the actual check point dial reading plus the "Divisions Added to the Lower Calibration Point" as found in step (10).

(15) Readjust OUTPUT FREQUENCY dial for maximum meter deflection.

(16) Set HFO OUTPUT control to maximum clockwise position. Disconnect phones and turn off the CAL OUTPUT switch.

(17) An example following the above procedure is now given:

Step (7) Assigned operating frequency = 2307.5 kc
RF Oscillator O–165/UR frequency = 2307.5 kc ± 455 kc = 2762.5 kc

(8) Oscillator O–165/UR Fundamental Frequency = 2762.5 kc

(9) Turn to Calibration Curve, figure 4–16, and find 2762.5 kc on scale at top of page.

(10) Read "Divisions Added to Lower Calibration Point" on scale at left side of page. (Curve B) = 29.4

(11) 2750 kc check point approximately 1772 divisions

(12) Set dial for "dial hundreds" = 17
"dial units" = 72

(13) Actual check point found at 1775.3 divisions

(14) Desired setting of the dial will then be 1775.3 + 29.4 or 1804.7 divisions
Set "dial hundreds" =18
Set "dial units" =04.7

TABLE 4–3. APPROXIMATE "OUTPUT FREQUENCY" DIAL SETTINGS

OUTPUT FREQUENCY (in megacycles)				DIAL SETTING
2.0	4.0	8.0	16.0	90
2.5	5.0	10.0	20.0	65
3.0	6.0	12.0	24.0	46
3.5	7.0	14.0	28.0	29
4.0	8.0	16.0	32.0	10

b. TUNING OF CRYSTAL HFO. The following procedure is used for tuning the crystal HFO:

(1) The frequency of the crystal required is found by following the procedure outlined in paragraph 3*a*, steps (7) and (8) of this section.

(2) Insert the proper crystal into any one of the three HFO crystal sockets, X15, X16, or X17, which are located at the top of the chassis.

(3) Turn POWER switch to ON.

(4) Turn HFO switch to ON.

(5) Set HF XTAL FREQ switch to "50".

(6) Turn the HFO XTAL switch to the position which will place the crystal into the oscillator circuit. When the switch is in position "1" the crystal in crystal socket X15 is in the circuit. When the switch is in position "2" the crystal in crystal socket X16 is in the circuit. When the switch is in position "3" the crystal in crystal socket X17 is in the circuit.

(7) Set the FREQUENCY RANGE switch to the band containing the desired output frequency. In position "2–4" the output frequency is equal to the crystal frequency. In position "4–8" the output frequency is twice the crystal frequency. In position "8–16" the output frequency is four times the crystal frequency. In position "16–32" the output frequency is eight times the crystal frequency.

(8) Set the OUTPUT FREQUENCY dial to its approximate setting according to table 4–3.

(9) Turn METER switch to HF OUTPUT position.

(10) Readjust OUTPUT FREQUENCY dial for maximum deflection of meter.

(11) Set HFO OUTPUT to maximum clockwise position.

(12) After connecting the HFO signal to receiver, adjust HF XTAL FREQ for maximum deflection of meter on receiver.

c. TUNING OF THE BFO.—The procedure for tuning the BFO is as follows:

(1) The BFO crystal frequency as required for audio frequency shift signal is determined by adding to or subtracting from the 455 kc IF frequency, the frequency corresponding to the center of the frequency shift audio band. As an example, for desired audio frequency shift limits of 2125 to 2975 cps (850 cps shift), the center of the audio band is 2550 cps. Therefore, the BFO crystal frequency required is 455,000 cps ± 2550 cps, or 457,550 cps or 452,450 cps.

(2) Place the proper crystal into one of the two BFO crystal sockets, X18 or X19. Set the BFO-XTAL SELECTOR switch S8, located on the rear of the unit, to the proper position. In the up position, socket X18 is in the circuit; in the down position, socket X19 is in the circuit. Set the BFO OUT CONT control, located on the rear of the unit, to maximum clockwise position.

4. RADIO RECEIVING SET AN/FRR–28 OPERATING PROCEDURE.

(*See figures 4–1 through 4–7.*)

a. GENERAL.—The control settings on the various units in the Radio Receiving Set AN/FRR–28, and the interunit connections, are dependent upon the type of signal being received, the source of HFO signal, and the final use of the signal.

For all types of reception, the main power switch on SA–238/G is turned on.

b. OPERATING PROCEDURE FOR INDIVIDUAL RECEPTION OF RADIO PHONE SIGNALS. (*See figures 2–1, 4–1.*)

(1) Set RF GAIN control on receiver front panel to approximately "5".

(2) Set SELECTIVITY switch on receiver front panel to position "13".

(3) Set receiver front panel XTAL PHASING control to arrow indicator.

(4) Set receiver front panel SEND-REC switch to REC.

(5) Turn LIMITER switch on receiver front panel to OFF.

(6) Set receiver front panel AUDIO GAIN control to about center position.

(7) Set receiver front panel MOD-CW switch to MOD.

(8) Set receiver front panel AVC-MAN switch to AVC.

(9) Turn receiver front panel BEAT OSC switch to zero.

(10) Set receiver front panel AVC switch to INT BFO FAST.

(11) Set METER switch on receiver front panel to RF.

(12) Set receiver front panel BAND CHANGE switch to band containing signal frequency to be received.

(13) Set receiver front panel TUNING control to desired signal frequency.

(14) For easier and faster tuning use internal BFO. Turn HFO and BFO switches of RF Oscillator O–165/UR to OFF position. Set HFO switch on receiver to INT position.

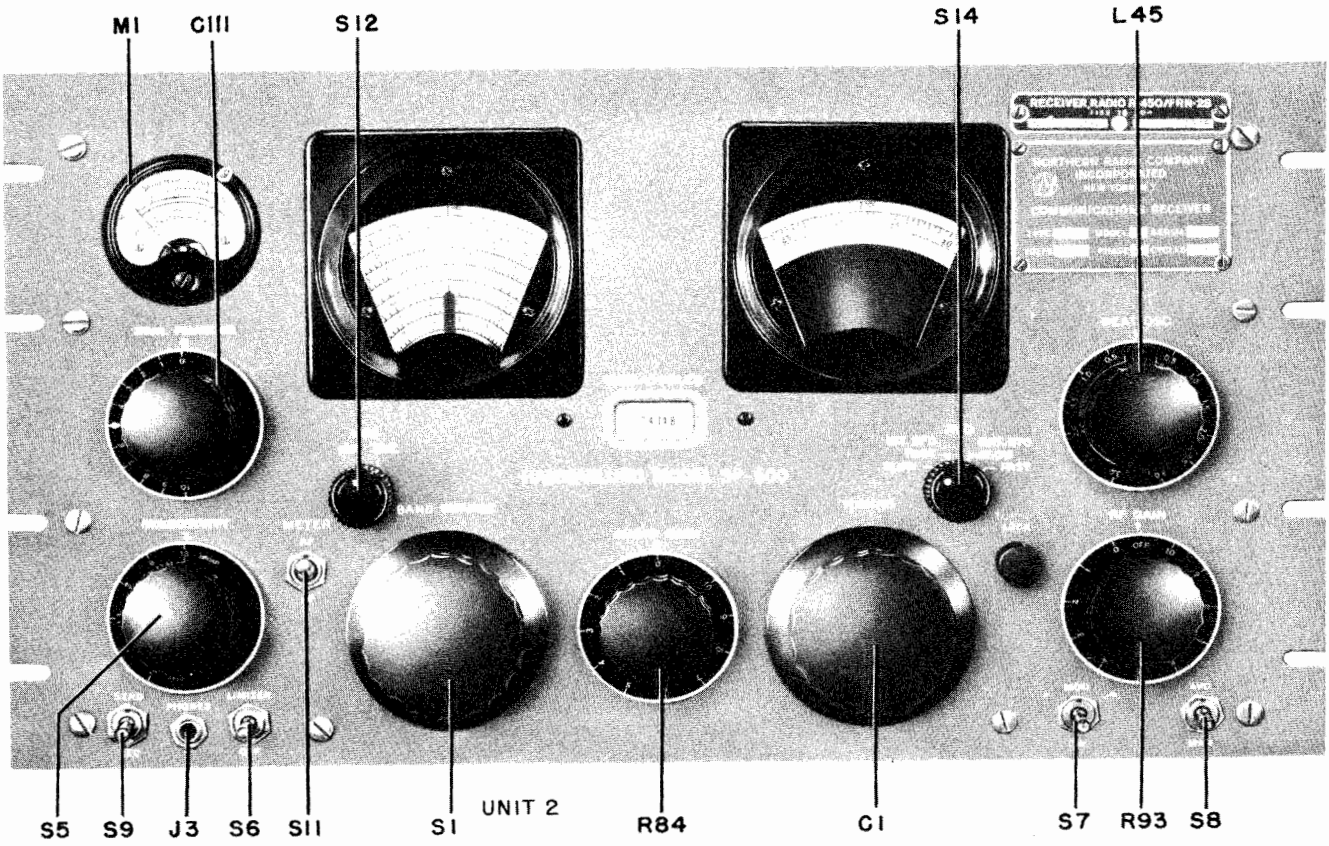


Figure 4–1. Radio Receiver R–450/FRR–28, Front View, Operating Controls and Adjustments

For more accurate tuning and greater stability, or for operation when internal oscillator is non-operative, use the HFO of Oscillator O–165/UR. Set HFO switch on receiver front panel to EXT position. Tune RF Oscillator O–165/UR according to procedure in paragraph 3 of this section. (See figures 4–3, 4–4.)

(15) Patch the speaker to the receiver audio output at the patch panel, and set speaker level to maximum. See figure 2–1.

(16) Link terminals 4 and 5 on terminal board E19 on receiver rear panel. See figure 4–2.

(17) Set AVC DIV-LOC switch on receiver rear panel to LOC.

(18) Set "3.5 MC OSC" on receiver rear panel to position "3".

(19) Slightly readjust TUNING control on receiver front panel for maximum meter deflection.

(20) Readjust RF GAIN for a reading at approximately the center of the meter, and set AUDIO GAIN for desired speaker output level.

(21) If noise is excessive, turn LIMITER switch to ON.

(22) If interference between the two receivers is experienced, disconnect the external HFO coaxial connector from jack J2 on rear of receiver not being controlled by Oscillator O–165/UR.

c. OPERATING PROCEDURE FOR INDIVIDUAL RECEPTION OF TONE MODULATED CW SIGNALS. (*See figure 2–1.*)

For individual receiver reception of tone modulated signals, follow the procedure used for individual reception of radiophone signals. Reset SELECTIVITY control to the narrowest position that will provide undistorted tone output at speaker. Adjust XTAL PHASING to reduce or eliminate any whistle that may be present in the output signal.

d. OPERATING PROCEDURE FOR INDIVIDUAL RECEPTION OF UNMODULATED CW SIGNALS. (*See figures 2–2, 4–1.*)

(1) Set RF GAIN control on receiver front panel to approximately "5".

(2) Set SELECTIVITY switch on receiver front panel to "13".

(3) Set XTAL PHASING control on receiver front panel to arrow indicator.

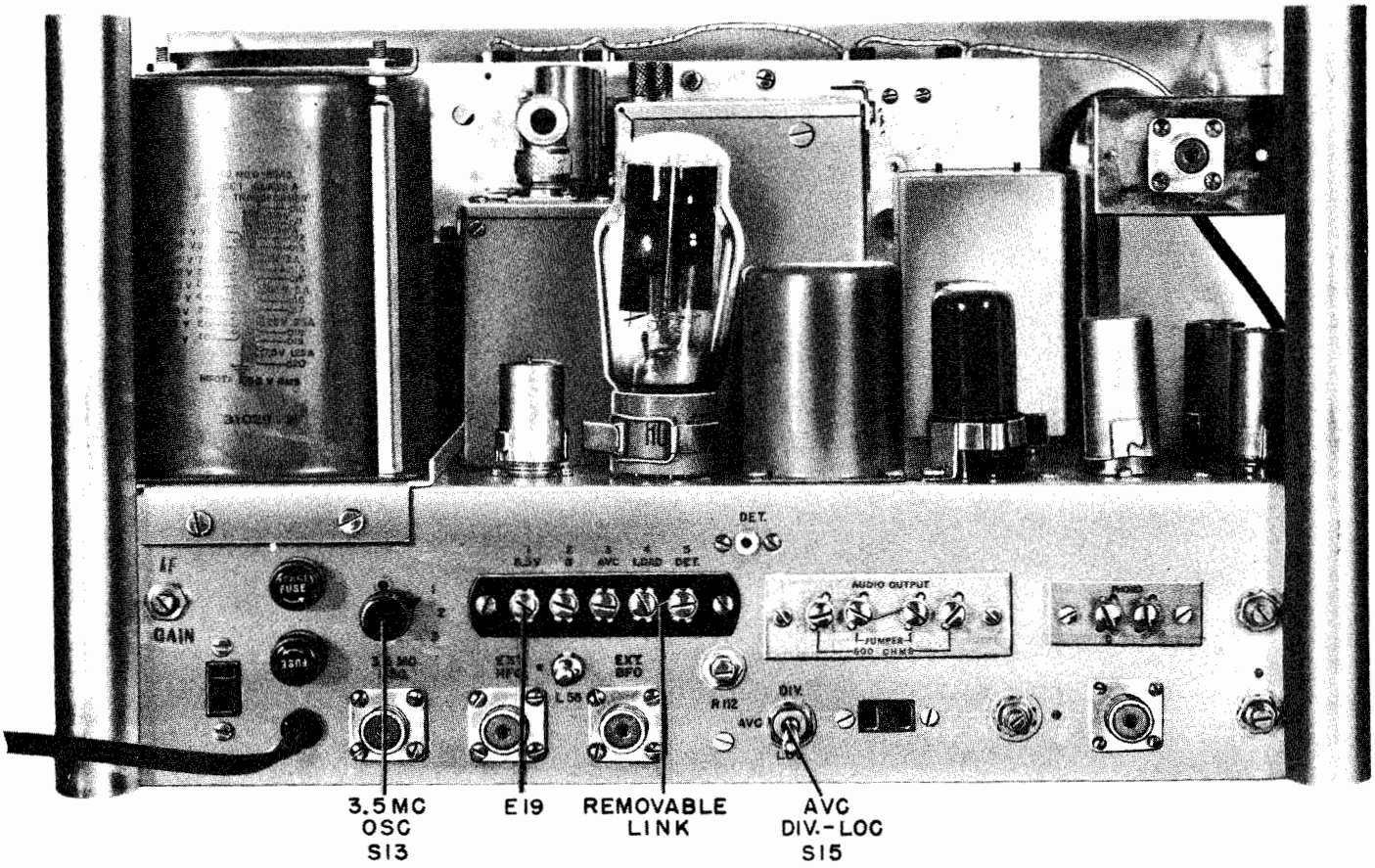


Figure 4–2. Radio Receiver R–450/FRR–28, Rear View, Operating Controls and Adjustments

(4) Set SEND-REC switch on receiver front panel to REC.

(5) Turn LIMITER switch on receiver front panel to OFF.

(6) Set AUDIO GAIN control on receiver front panel to about center position.

(7) Set MOD-CW switch on receiver front panel to CW.

(8) Set AVC-MAN switch on receiver front panel to MAN.

(9) Set BEAT OSC control on receiver front panel to approximately "1.0".

(10) Set AVC switch on receiver front panel to INT BFO SLOW. If greater stability is desired, set switch to EXT BFO SLOW and adjust RF Oscillator O–165/UR BFO section according to procedure in Section 4, paragraph 3.

(11) Observe that METER switch on receiver front panel is set to RF.

(12) Set BAND CHANGE switch to band containing desired signal frequency.

(13) Adjust TUNING control on receiver front panel to desired signal frequency.

(14) For simpler and faster tuning use internal HFO. Set receiver front panel HFO switch to INT.

For more accurate tuning and more stable operation, or for replacement of a non-operating internal oscillator, use the HFO of RF Oscillator O–165/UR. Set receiver front panel HFO switch to EXT. Tune Oscillator O–165/UR according to instructions in Section 4, paragraph 3. (See figures 4–3, 4–4.)

(15) Patch the speaker to the receiver audio output at the patching panel and set speaker level to maximum.

(16) Link terminals 4 and 5 on terminal board E19 on rear of receiver. (See figure 4–2.)

(17) Set AVC DIV-LOC switch on rear of receiver to LOC position.

(18) Set 3.5 MC OSC on rear of receiver to position "3".

(19) Slightly readjust TUNING control on receiver front panel for maximum meter deflection.

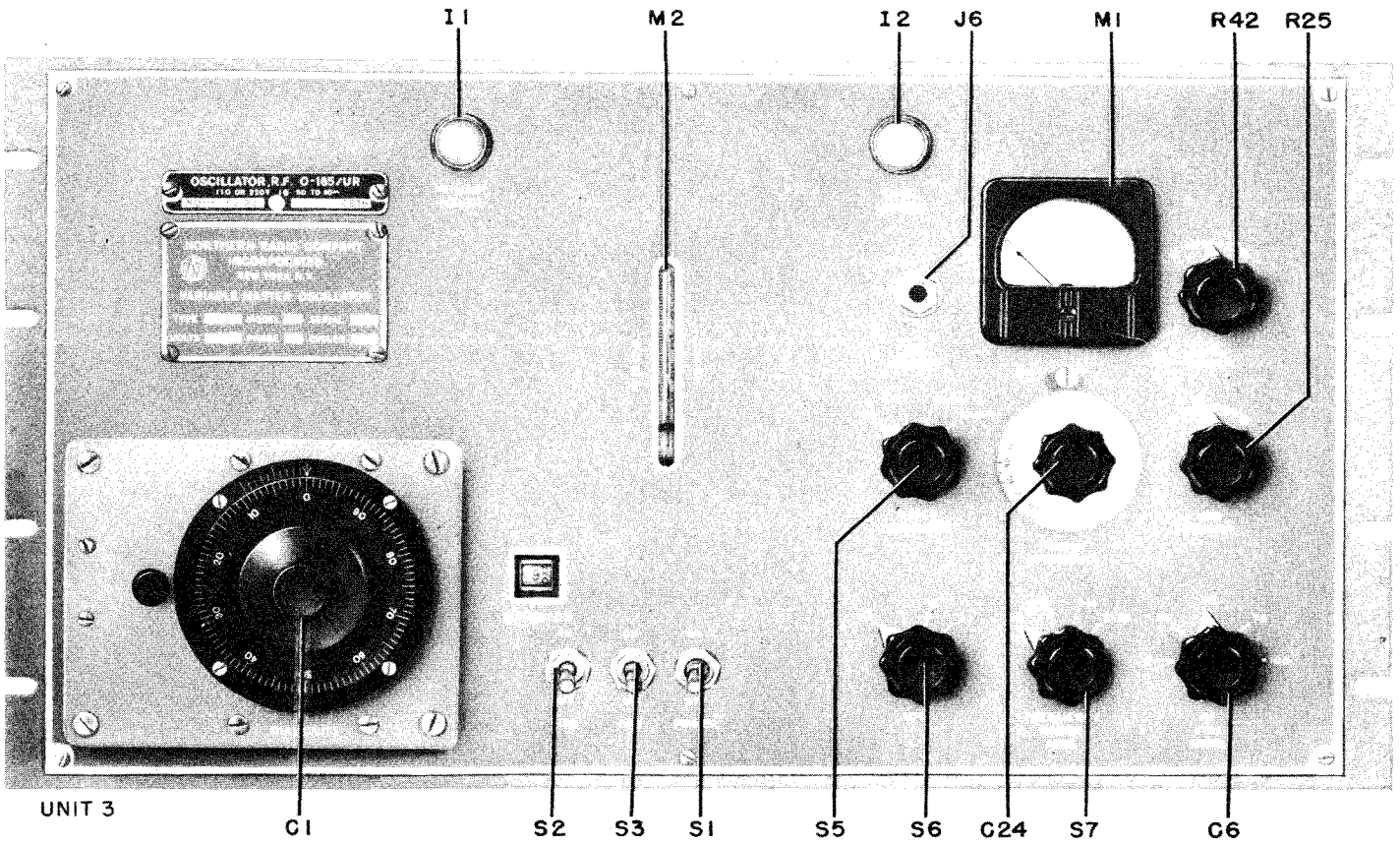


Figure 4–3. Radio Frequency Oscillator O–165/UR, Front View, Operating Controls and Adjustments

(20) Reset RF GAIN control on receiver front panel to an intermediate point between high noise to signal level and distortion of output signal.

(21) Reset SELECTIVITY switch on receiver front panel to narrowest position that will allow satisfactory reception.

(22) Adjust XTAL PHASING control on receiver front panel to reduce or eliminate any whistle that may be present in the output signal.

(23) To reduce excess signal fading, AVC-MAN switch may be turned to AVC.

(24) If noise is excessive, set LIMITER OFF switch on receiver front panel to LIMITER position.

(25) If interference between the two receivers is experienced, disconnect external HFO coaxial connector from J2 on rear of the receiver not being controlled by Oscillator O–165/UR.

e. OPERATING PROCEDURE FOR INDIVIDUAL RECEPTION OF UNMODULATED CW SIGNALS USING KEYER UNIT KY–79/UR. (*See figures 2–2, 4–5.*)—Keyer KY–79/UR is used in the reception of CW signals where external circuits operate on a keyed tone signal, or on a detected unmodulated signal. For this operation set up equipment according to directions in paragraph *d,* and then readjust the following:

(1) Disconnect terminals 4 and 5 on terminal board E19 on rear of receiver. See figure 4–2.

(2) Connect plug P9 to DET jack on receiver rear panel.

(3) On the patching panel, connect the following:

(*a*) TONE KEYER MONITOR to SPEAKER MONITOR.

(*b*) TONE KEYER LINE to TELEPHONE LINES 1, 2, 3, or 4.

(*c*) RECEIVER 1 or RECEIVER 2 (depending on which is used) DETECTOR OUTPUT to TONE KEYER INPUT.

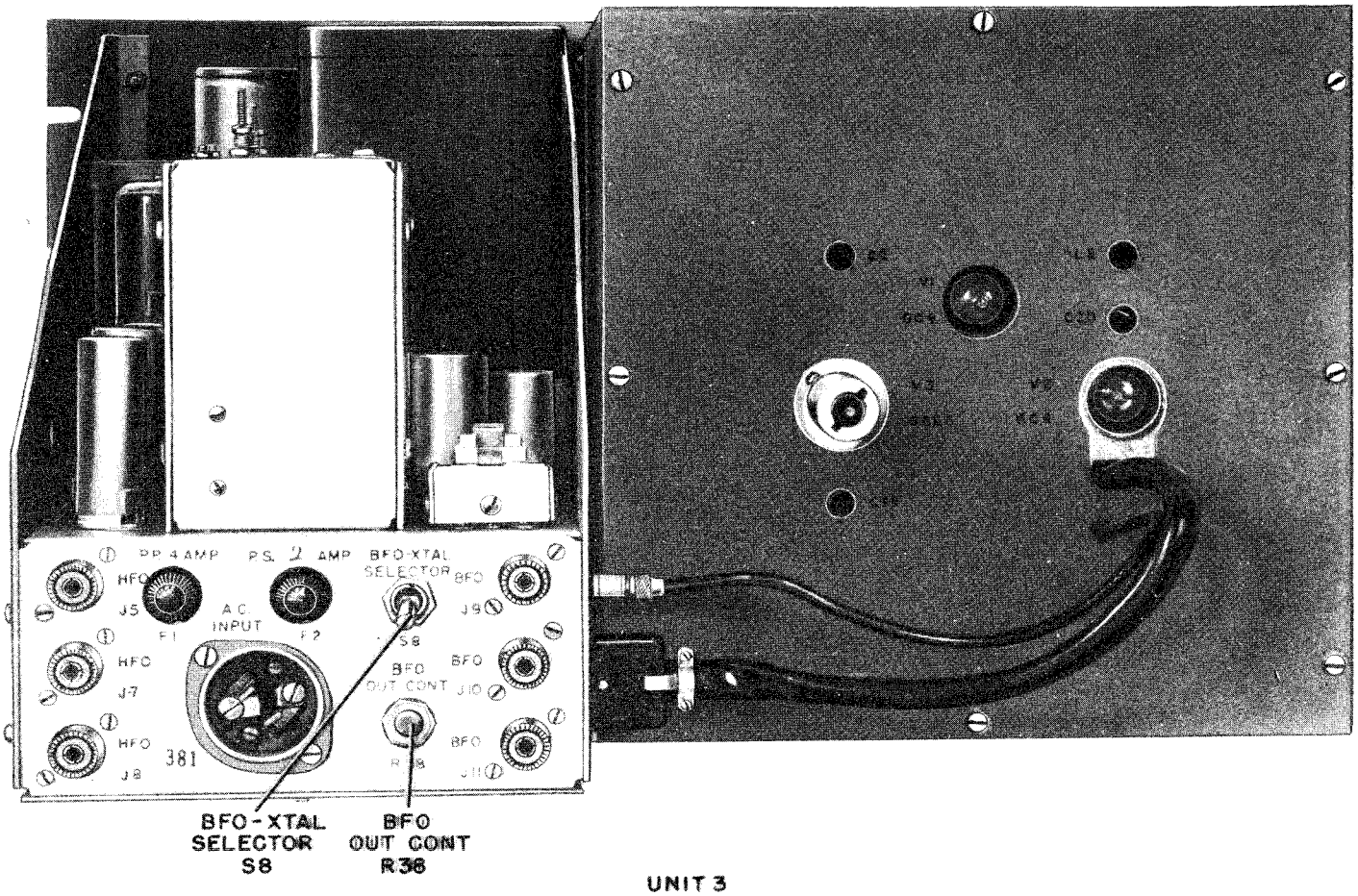


Figure 4–4. Radio Frequency Oscillator O–165/UR, Rear View, Operating Controls and Adjustments

(4) Connect external equipment to proper terminals of terminal board E12–1. (See figure 3–1.)

(5) Set MOD-CW switch on receiver front panel to MOD.

(6) Set AVC switch on receiver front panel to INT BFO FAST.

(7) Set BEAT OSC control on receiver front panel to zero.

f. INDIVIDUAL RECEPTION OF FREQUENCY-SHIFT SIGNALS. (*See figures 2–3, 4–1.*)

(1) Set RF GAIN control on front panel of receiver to approximate center position.

(2) Set SELECTIVITY switch on receiver front panel to "13".

(3) Set XTAL PHASING control on receiver front panel to arrow indicator.

(4) Set SEND-REC switch on receiver front panel to REC.

(5) Turn LIMITER switch on receiver front panel to OFF.

(6) Set AUDIO GAIN switch to any position except zero.

(7) Turn MOD-CW switch on receiver front panel to MOD.

(8) Turn AVC-MAN switch on receiver front panel to AVC.

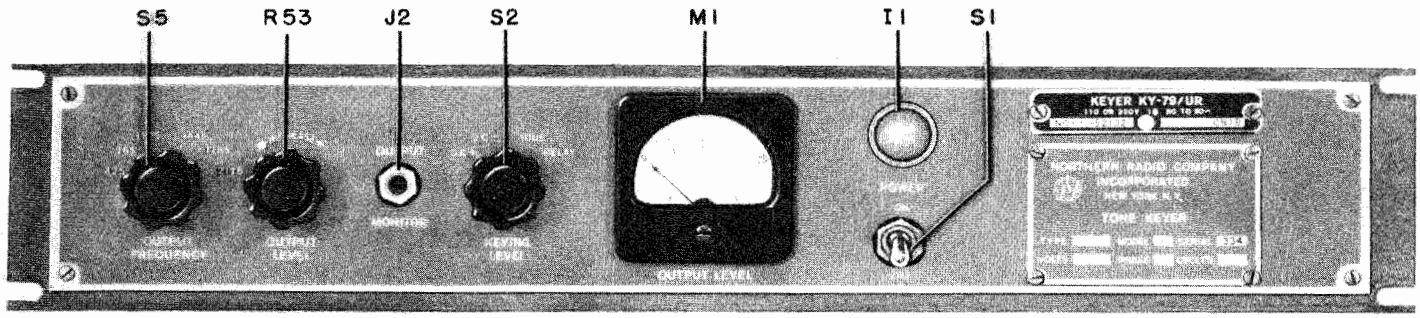
(9) Turn BEAT OSC switch on receiver front panel to zero.

(10) Set AVC switch on receiver front panel to INT BFO SLOW.

(11) Set METER switch on receiver front panel to RF.

(12) Set BAND CHANGE switch on receiver front panel to band containing desired signal frequency.

(13) Set TUNING control on receiver front panel to desired frequency.



UNIT 10

Figure 4–5. Keyer KY–79/UR, Operating Controls and Adjustments

(14) For simple and fast tuning use internal oscillator. Set HFO switch on front of receiver to INT position. Turn HFO and BFO switches on RF Oscillator O–165/UR to OFF.

For the more accurate tuning and greater stability, which is necessary for the reception of frequency-shift signals, use the HFO of Oscillator O–165/UR. Set receiver front panel HFO switch to EXT. Tune Oscillator O–165/UR according to instructions in Section 4, paragraph 3. (See figures 4–3, 4–4.)

(15) At the patching panel, patch CONVERTER OUTPUT of the converter being used to TELEPHONE LINES 1, 2, 3, or 4 for use of the signal in the external circuit, and patch CONVERTER TONE output to SPEAKER MONITOR.

(16) Set AVC DIV-LOC switch on rear of receiver to LOC.

(17) Set "3.5 MC OSC" switch on rear of receiver to "3".

(18) Slightly readjust TUNING control on receiver front panel for maximum meter deflection.

(19) Set speaker volume control to maximum.

(20) Disconnect plug P9 from DET jack at rear of receiver, and remove the link between terminals 4 and 5, on terminal board E19 on the rear of the receiver. The link must be connected if an audio type converter is used. (See figure 4–1.)

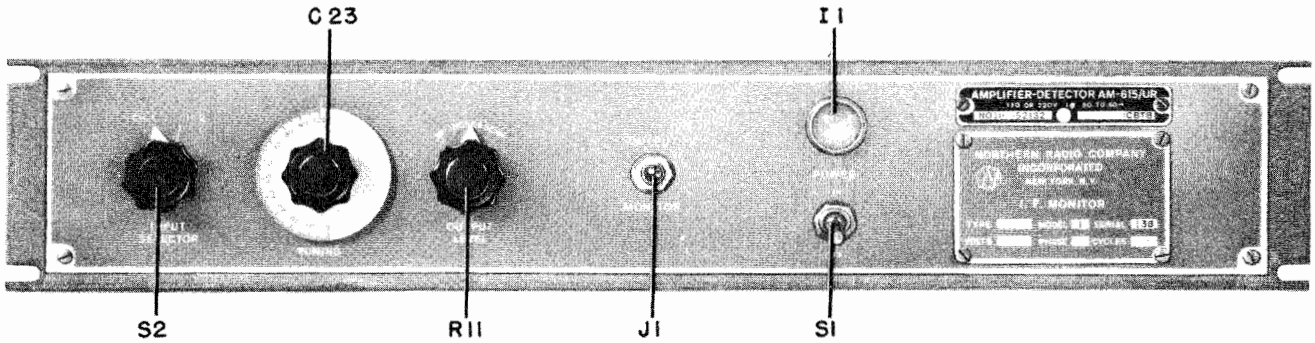
g. DUAL SPACE DIVERSITY RECEPTION.

(1) GENERAL.—In dual space diversity reception, it is recommended that RF Oscillator O–165/UR be used to supply the HFO signal for both receivers. If the internal oscillators are used, then Amplifier-Detector AM–615/UR should be connected and used for aligning the two IF signals.

(2) IF ALIGNMENT WITH AMPLIFIER-DETECTOR AM–615/UR. (*See figure 4–6.*)

(*a*) Turn on power switch for Amplifier-Detector AM–615/UR.

(*b*) Turn INPUT SELECTOR switch on Amplifier-Detector AM–615/UR front panel to either channel. If switch is in the "CH.1" position, the IF from receiver "1" is fed in. If switch is in the "CH.2"



UNIT 9

Figure 4–6. Amplifier-Detector AM–615/UR, Operating Controls and Adjustments

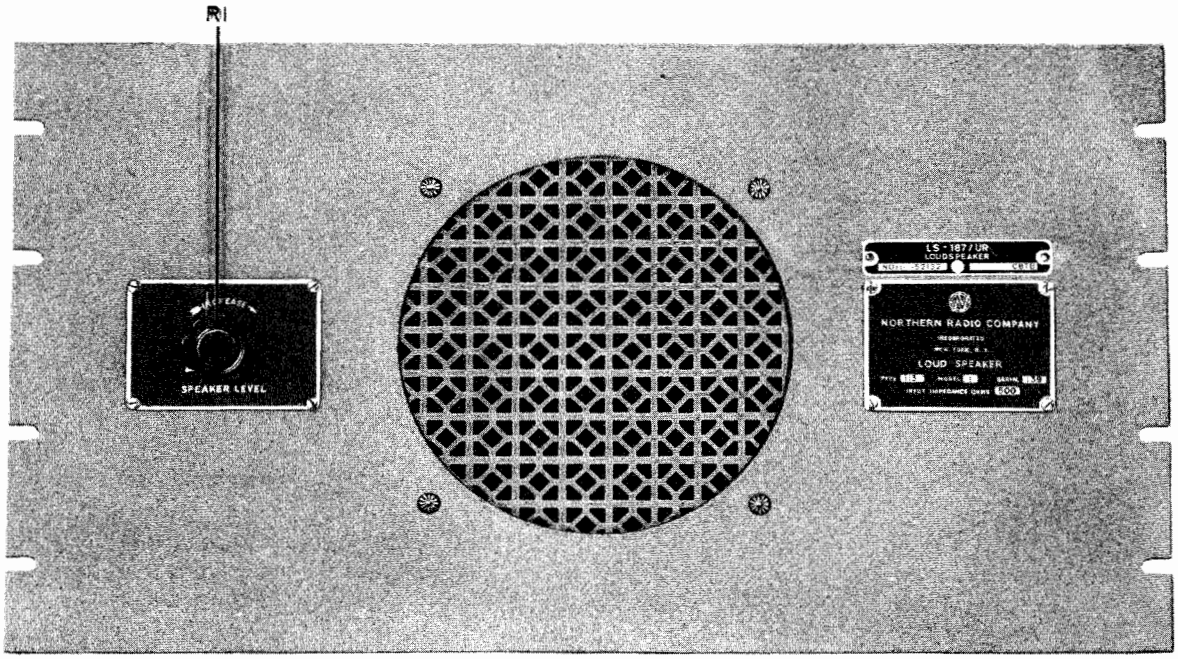


Figure 4–7. Loudspeaker LS–187/UR, Operating Control

position, the IF from receiver "2" is fed in.

(*c*) Plug a set of headphones into OUTPUT jack J1 on Amplifier-Detector AM–615/UR front panel.

(*d*) Adjust OUTPUT LEVEL control on Amplifier-Detector AM–615/UR front panel for comfortable hearing level.

(*e*) Adjust TUNING control on Amplifier-Detector AM–615/UR front panel until the local oscillator zero-beats with the receiver IF signal.

(*f*) Switch INPUT SELECTOR on Amplifier-Detector AM–615/UR front panel to channel containing the IF signal from the other receiver. Adjust the TUNING control on this receiver until the IF signal zero-beats with the Amplifier-Detector AM–615/UR oscillator signal. Do not move Amplifier-Detector AM–615/UR TUNING control from previous setting.

(3) DUAL SPACE DIVERSITY RECEPTION OF RADIOPHONE SIGNALS. (*See figures 2–4, 4–1.*) —In dual space diversity reception of radiophone signals, the equipment is arranged as described in Section 4, paragraph 4*b*. Each receiver is tuned separately. Make the following control and connection changes:

(*a*) Set each receiver rear panel AVC DIV-LOC switch to DIV.

(*b*) Connect plug P9 to DET jack J9 on rear of each receiver.

(*c*) Disconnect terminals 4 and 5 on terminal board E19 on the rear of one receiver. Link terminals 4 and 5 on terminal board E19 on the other receiver.

(*d*) Set receiver rear panel "3.5 MC OSC" switch on one receiver to position "1", and on the other to position "2".

(*e*) If the internal HFO signals are used, then set up the Amplifier-Detector AM–615/UR unit. If the RF Oscillator O–165/UR HFO signal is used, connect the HFO coaxial cables to jack J2 on each receiver.

(*f*) Patch the DETECTOR OUTPUT jacks of both receivers together at Communication Patching Panel SB–224/UR. Patch the SPEAKER MONITOR to the AUDIO OUTPUT of the receiver that has terminals 4 and 5 linked on terminal board E19.

(*g*) Readjust AUDIO GAIN control of the receiver patched to the speaker for comfortable hearing level.

(4) DUAL SPACE DIVERSITY RECEPTION OF CW SIGNALS. (*See figure 2–5.*)—In dual space diversity reception of CW signals, the equipment is arranged according to the procedure in Section 4, paragraphs 4*c*, 4*d*, or 4*e*. Each receiver is tuned to the incoming signal separately. The following changes are made in the control and connection arrangements:

(*a*) Set each receiver rear panel AVC DIV-LOC switch to DIV.

(*b*) Connect plug P9 to DET jack J9 on the rear of each receiver.

(*c*) If Keyer KY–79/UR is used, remove links from terminals 4 and 5 on terminal boards E19 of both receivers. If Keyer KY–79/UR is not used, connect terminals 4 and 5 on terminal board E19 for one receiver only. These terminals are not connected on the other receiver. (See figure 4–2.)

(*d*) Set receiver rear panel "3.5 MC OSC" switch on one receiver to position "1", and on the other to position "2".

(*e*) If the individual receiver internal HFO signals are used, use Amplifier-Detector AM–615/UR unit for tuning both signals to the same frequency. If RF Oscillator O–165/UR HFO signal is used for both receivers, connect the HFO coaxial cable to jack J2 on each receiver.

(*f*) Patch the receiver DETECTOR OUTPUT jacks together at the patch panel. If Keyer KY–79/UR is not used, patch the audio output of the receiver that has terminals 4 and 5 linked on terminal board E19.

(*g*) Readjust the receiver AUDIO GAIN control, when Keyer KY–79/UR is not used, for comfortable listening level. Readjust the Keyer KY–79/UR OUTPUT LEVEL, when Keyer KY–79/UR is used, for comfortable listening level.

(5) DUAL SPACE DIVERSITY RECEPTION OF FREQUENCY-SHIFT SIGNALS. (*See figure 2–6.*)—In dual space diversity reception of frequency-shift signals, the equipment is arranged as given in the procedure in Section 4, paragraph 4*f*. Each receiver is separately tuned to the incoming signal. The following changes are made in control settings and connections:

(*a*) Set each receiver rear panel AVC DIV-LOC switch to DIV.

(*b*) Set the "3.5 MC OSC" switch on the rear of one receiver to position "1", and on the other receiver to position "2".

(*c*) If the individual receiver HFO signals are used, use Amplifier-Detector AM–615/UR for accurately tuning both receivers to the same frequency. For normal operation of the equipment, it is more advisable to use the RF Oscillator O–165/UR HFO signal due to its greater stability. For the external HFO signal to be used, connect the HFO coaxial cable to jack J2 on each receiver.

(*d*) Patch the applicable COMPARATOR TONE output on the patch panel to the speaker, and the COMPARATOR OUTPUT to TELEPHONE LINES 1, 2, 3, or 4, which is tied to the external equipment used in conjunction with the receiving set.

(6) DUAL FREQUENCY DIVERSITY RECEPTION.—In dual frequency diversity reception, the two receivers are tuned to the different frequencies of the transmitted signals. The equipment connections and control settings are the same as those for dual space diversity reception except that the RF Oscillator O–165/UR, if used, can supply only one receiver with an HFO signal. For the procedure of setting up equipment, refer to Section 4, paragraphs 4*g*(3), 4*g*(4) and 4*g*(5).

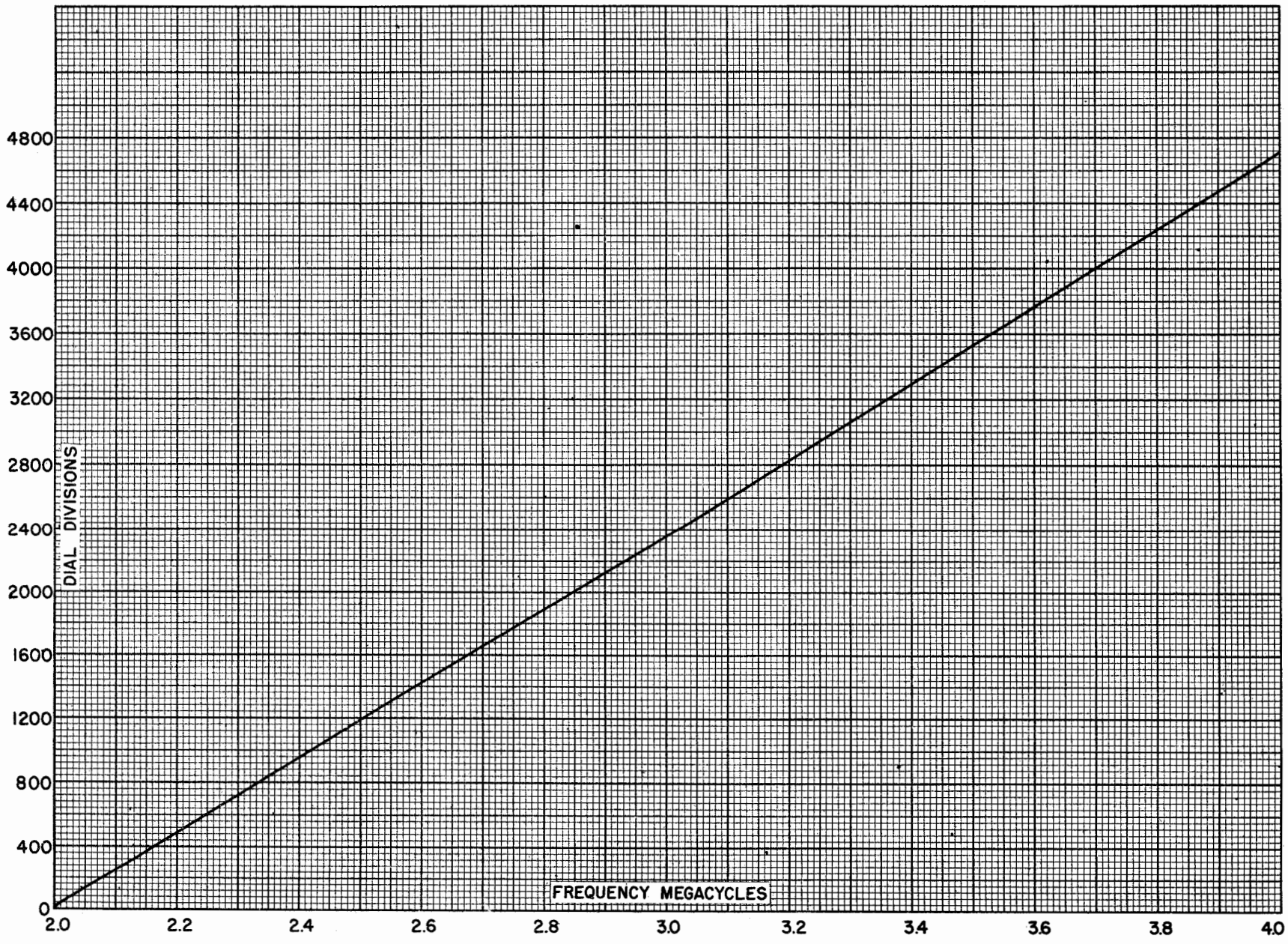


Figure 4–8. Radio Frequency Oscillator O–165/UR, Overall Calibration Curve

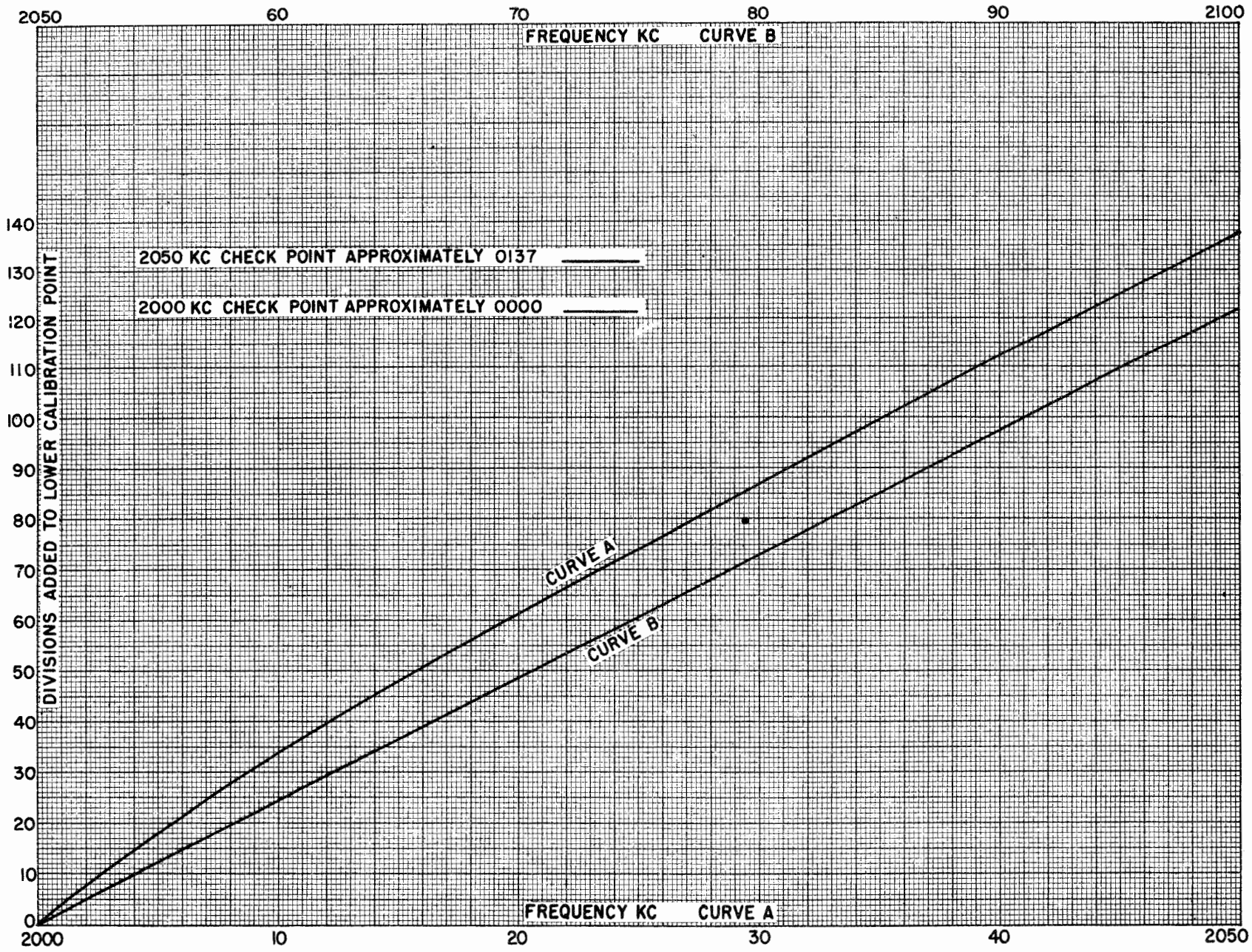


Figure 4–9. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2000–2100 kc

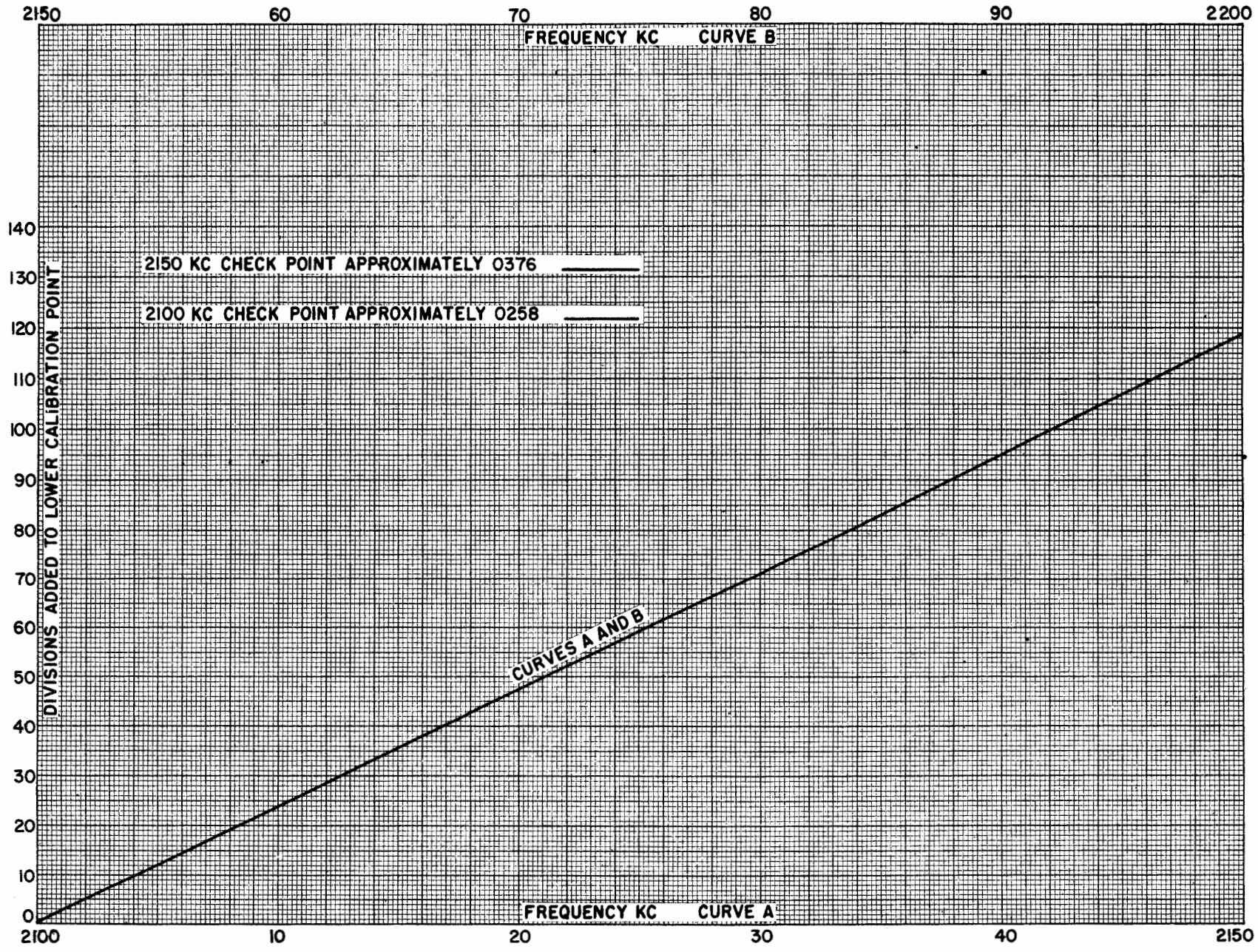


Figure 4–10. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2100–2200 kc

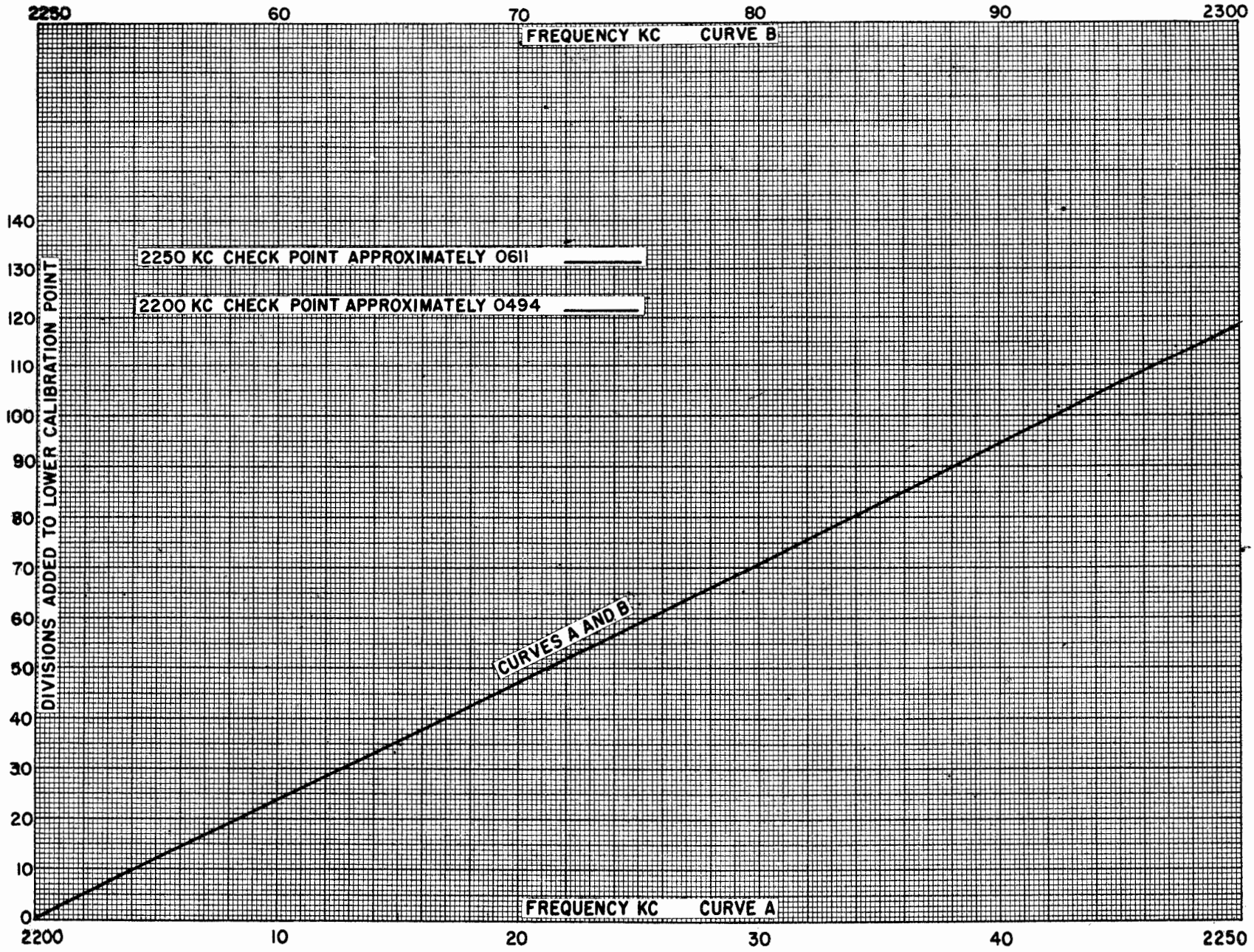


Figure 4–11. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2200–2300 kc

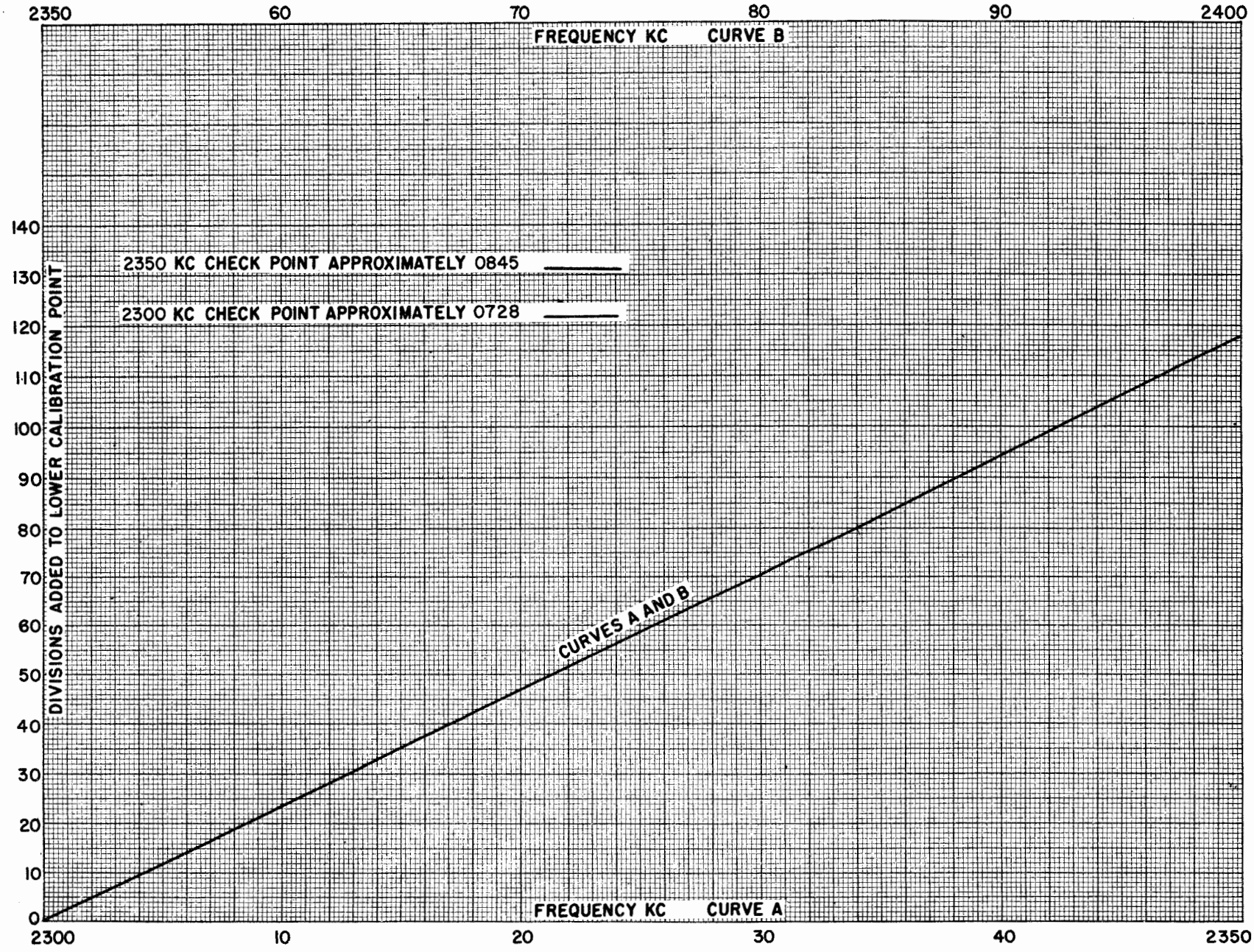


Figure 4–12. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2300–2400 kc

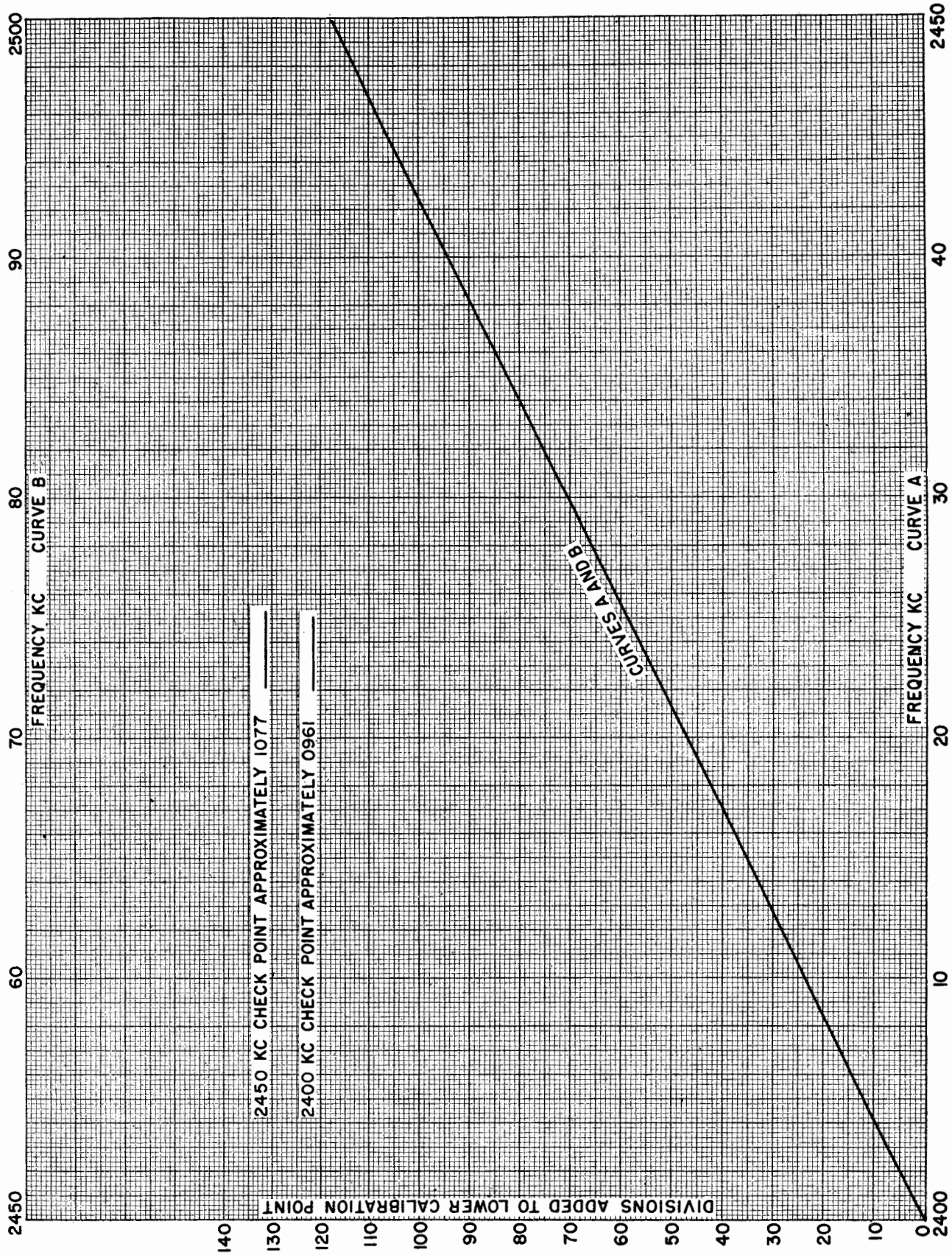


Figure 4–13. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2400–2500 kc

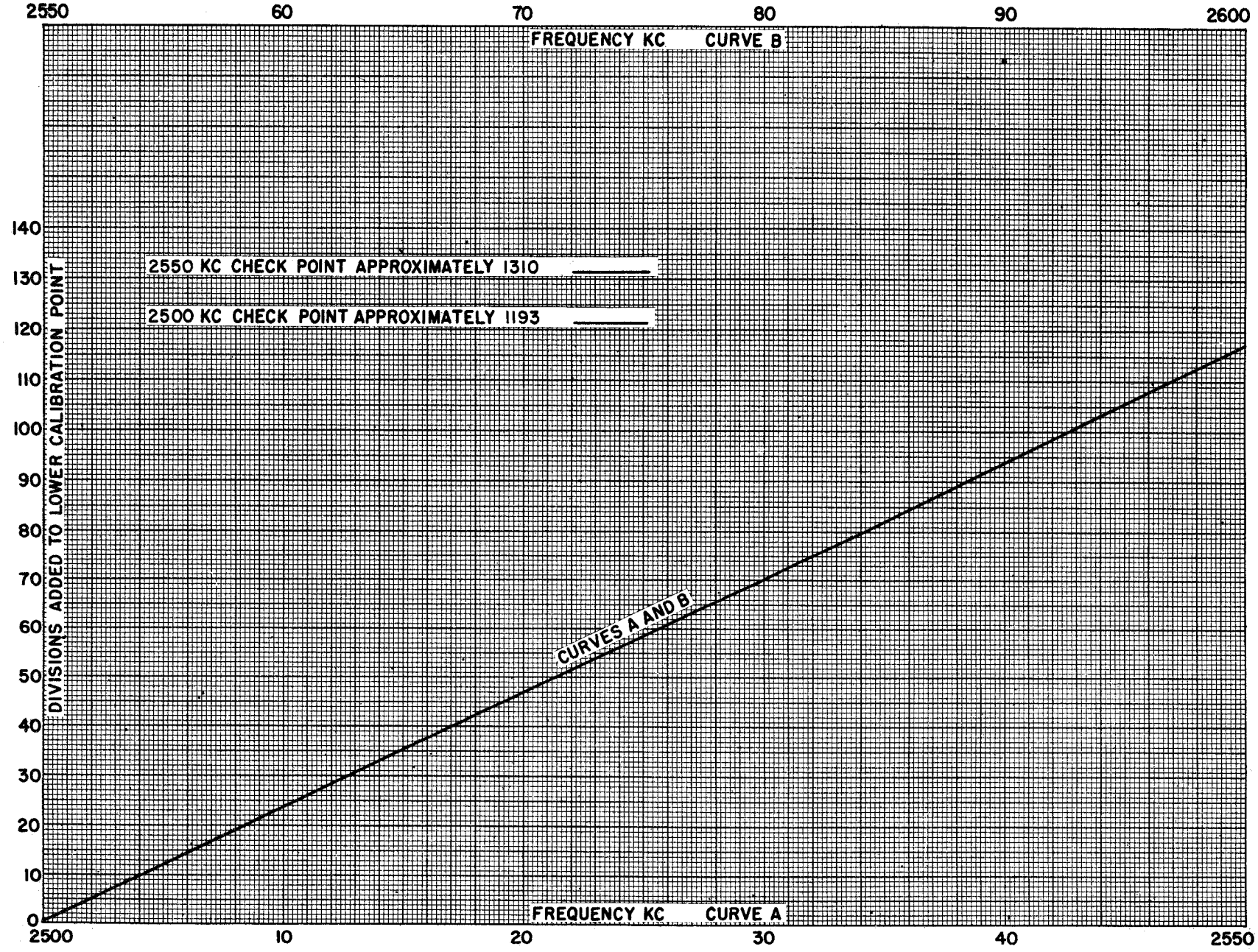


Figure 4–14. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2500–2600 kc

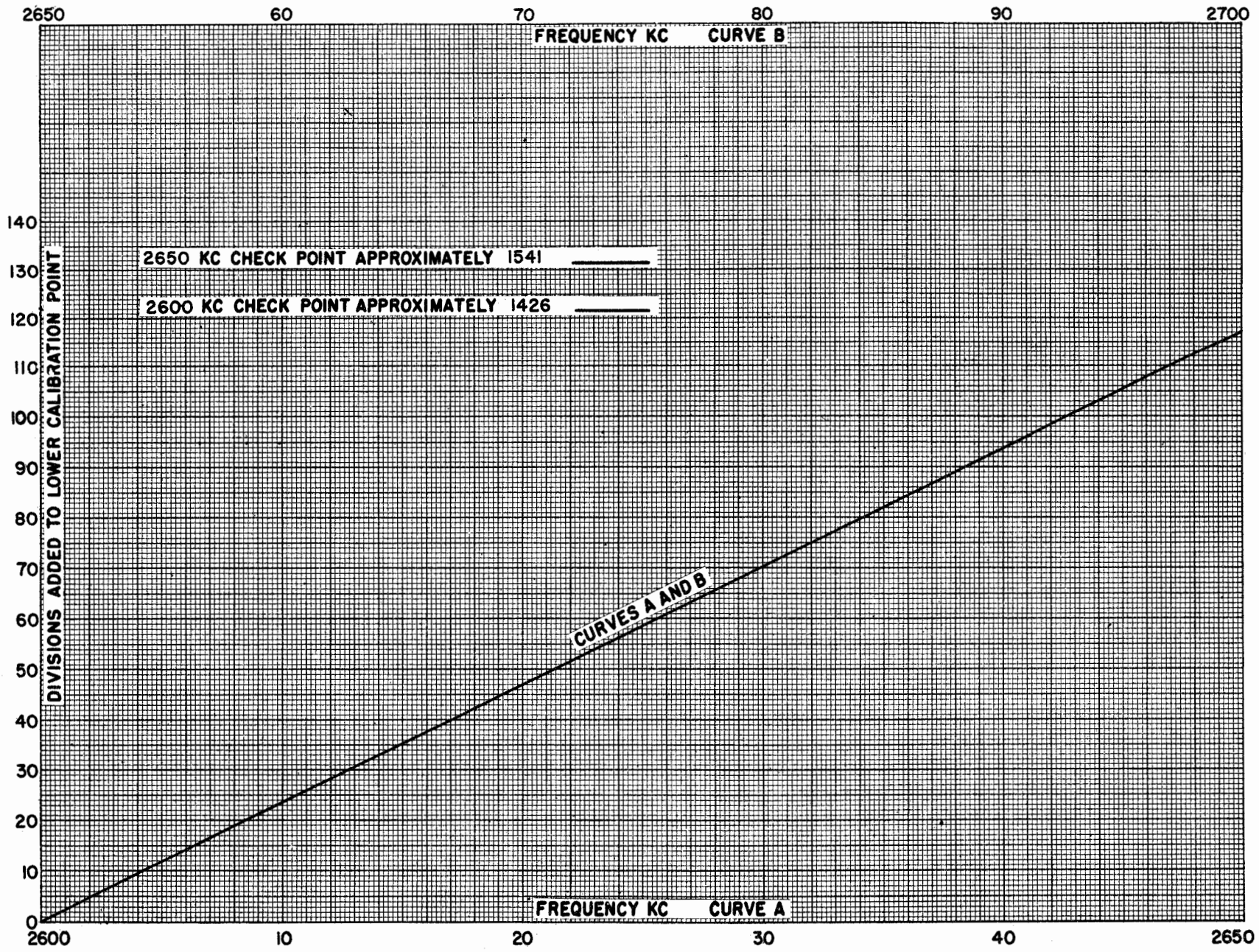


Figure 4–15. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2600–2700 kc

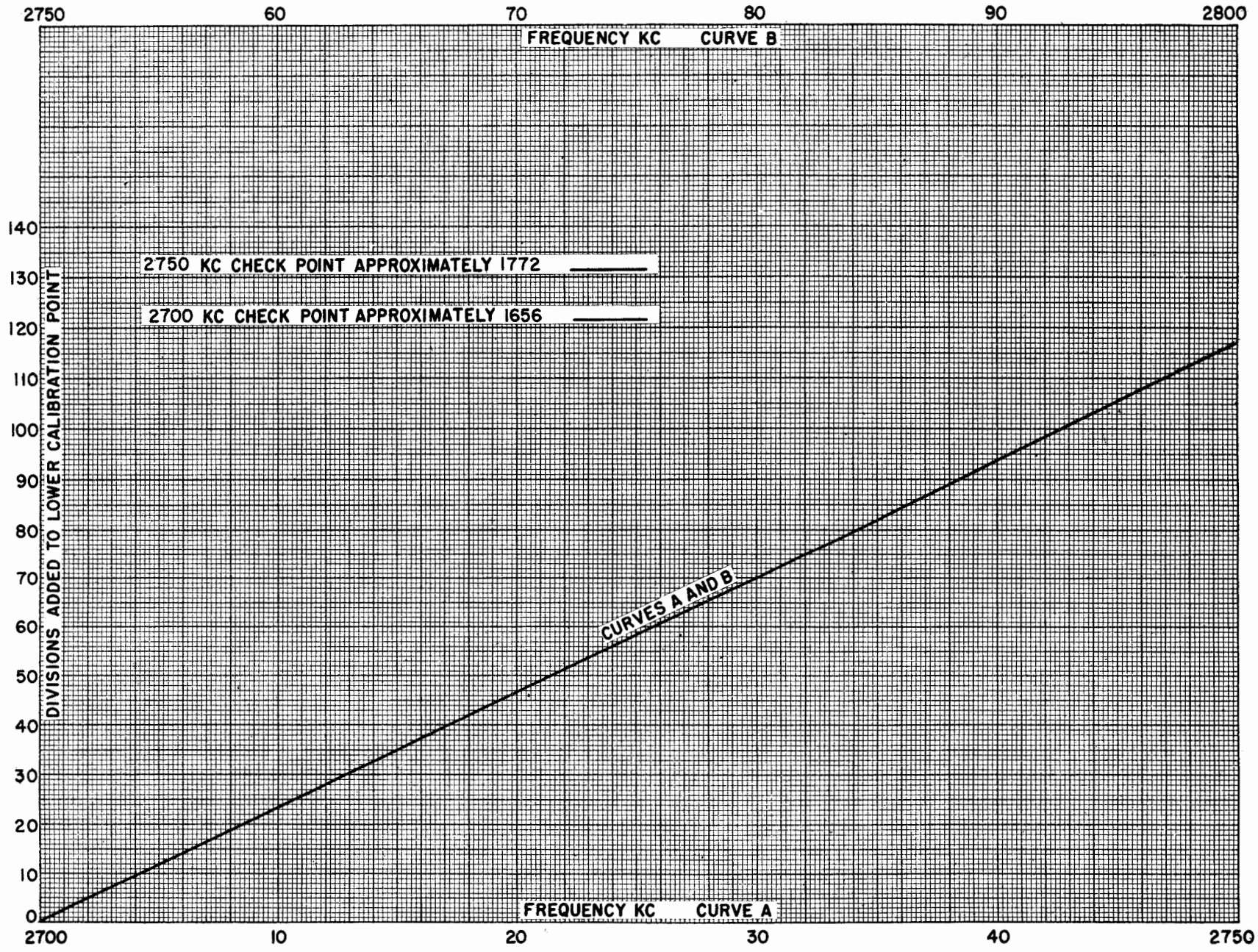


Figure 4–16. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2700–2800 kc

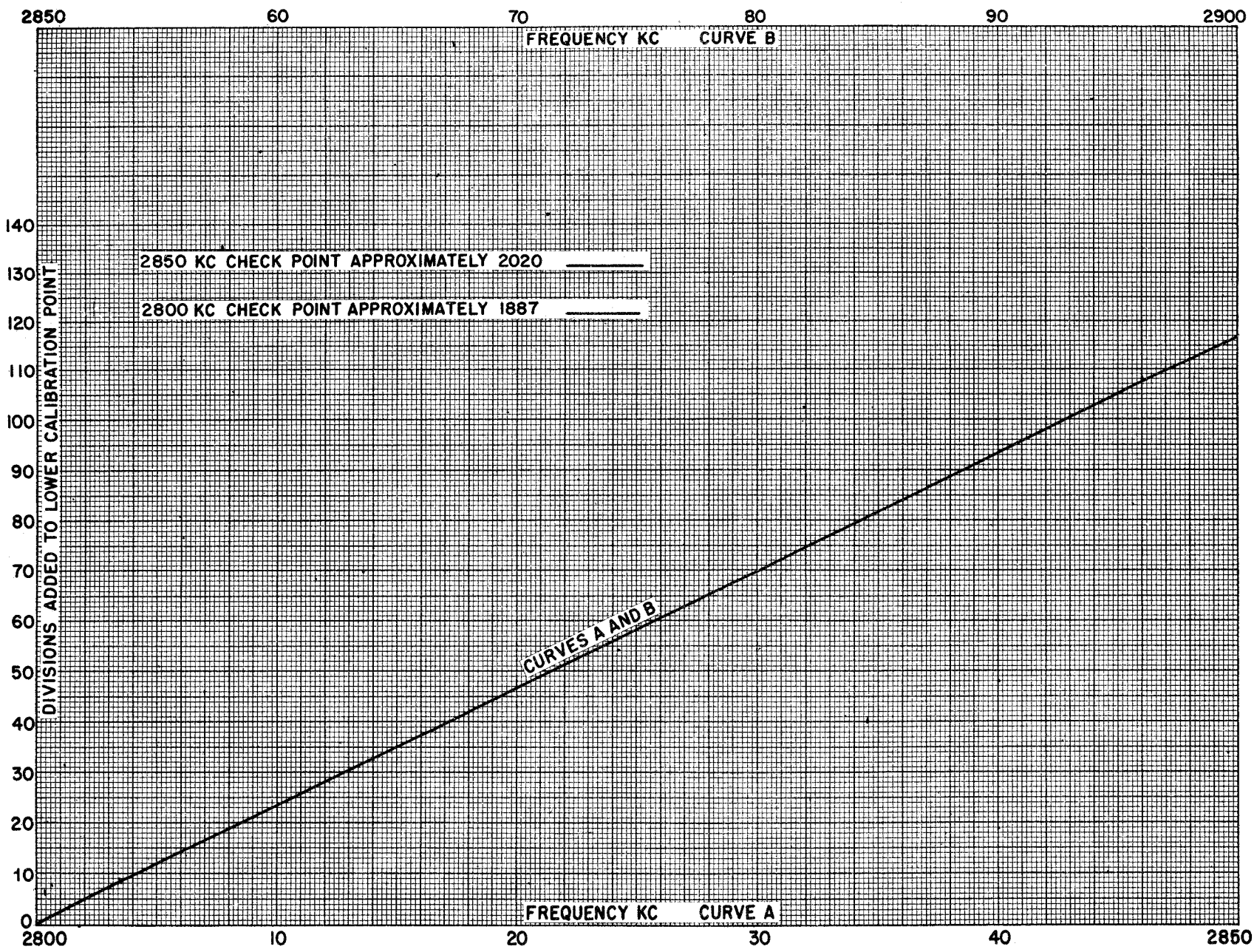


Figure 4–17. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2800–2900 kc

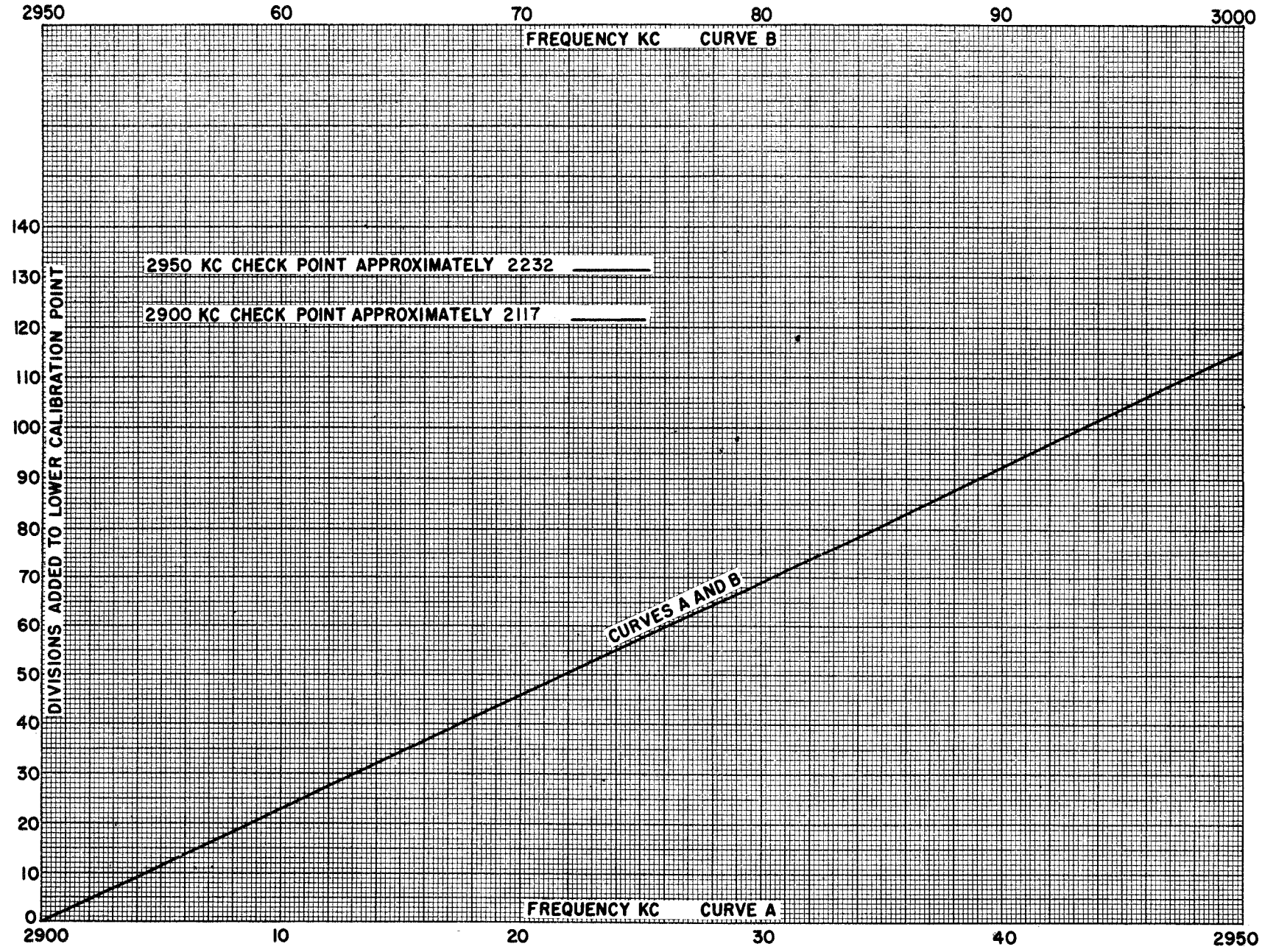


Figure 4–18. Radio Frequency Oscillator O–165/UR, Calibration Curve, 2900–3000 kc

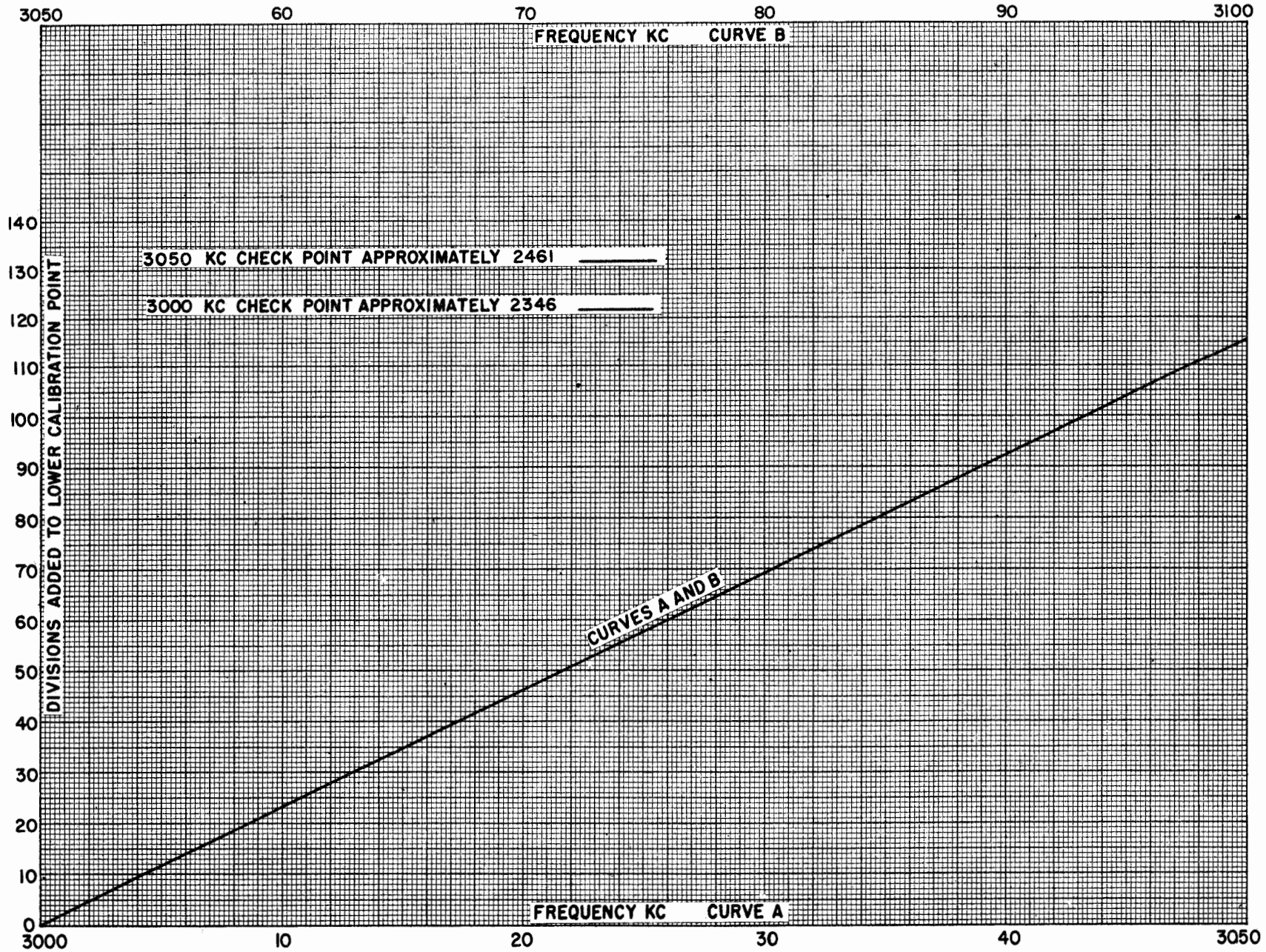


Figure 4–19. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3000–3100 kc

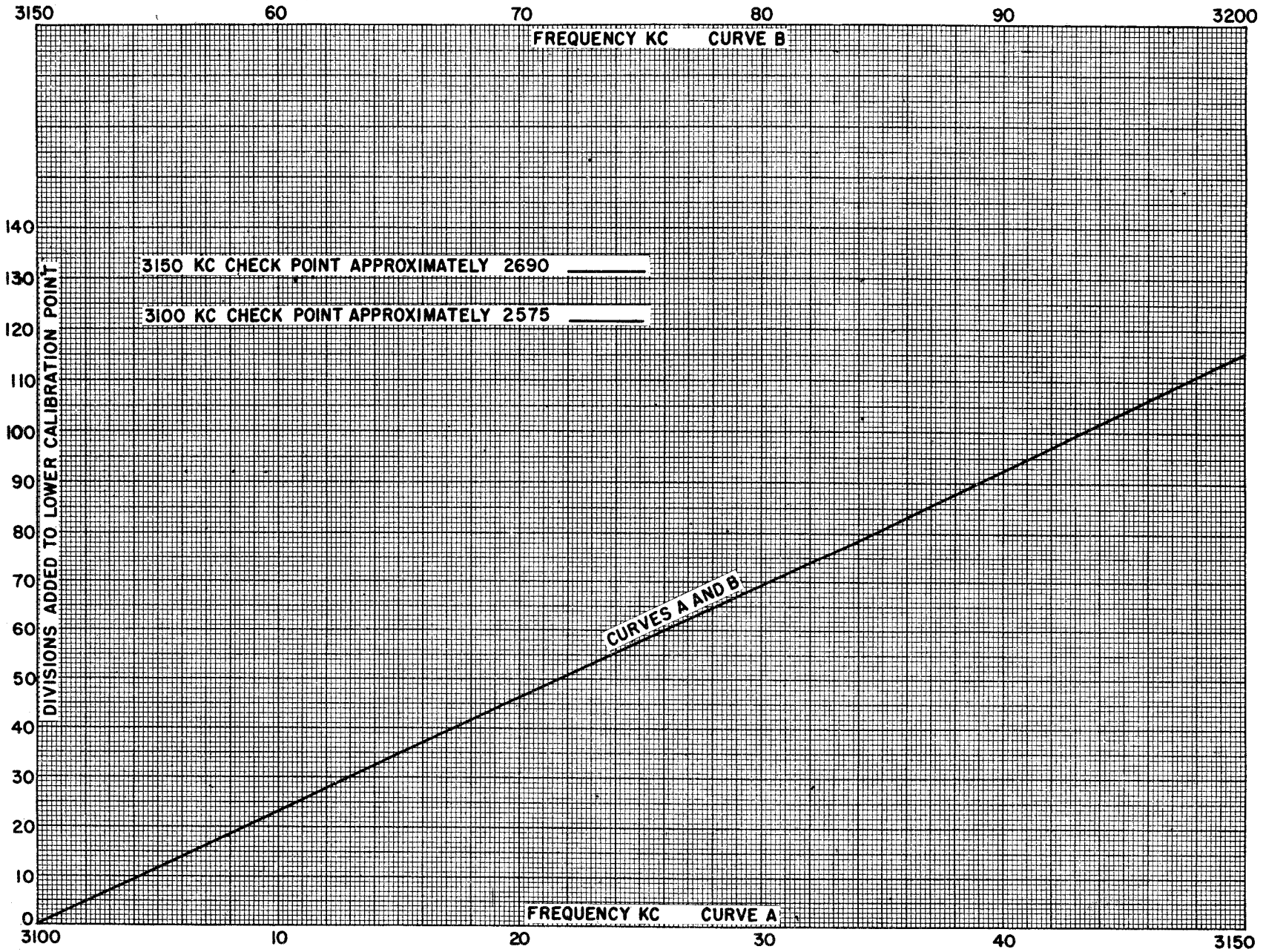


Figure 4–20. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3100–3200 kc

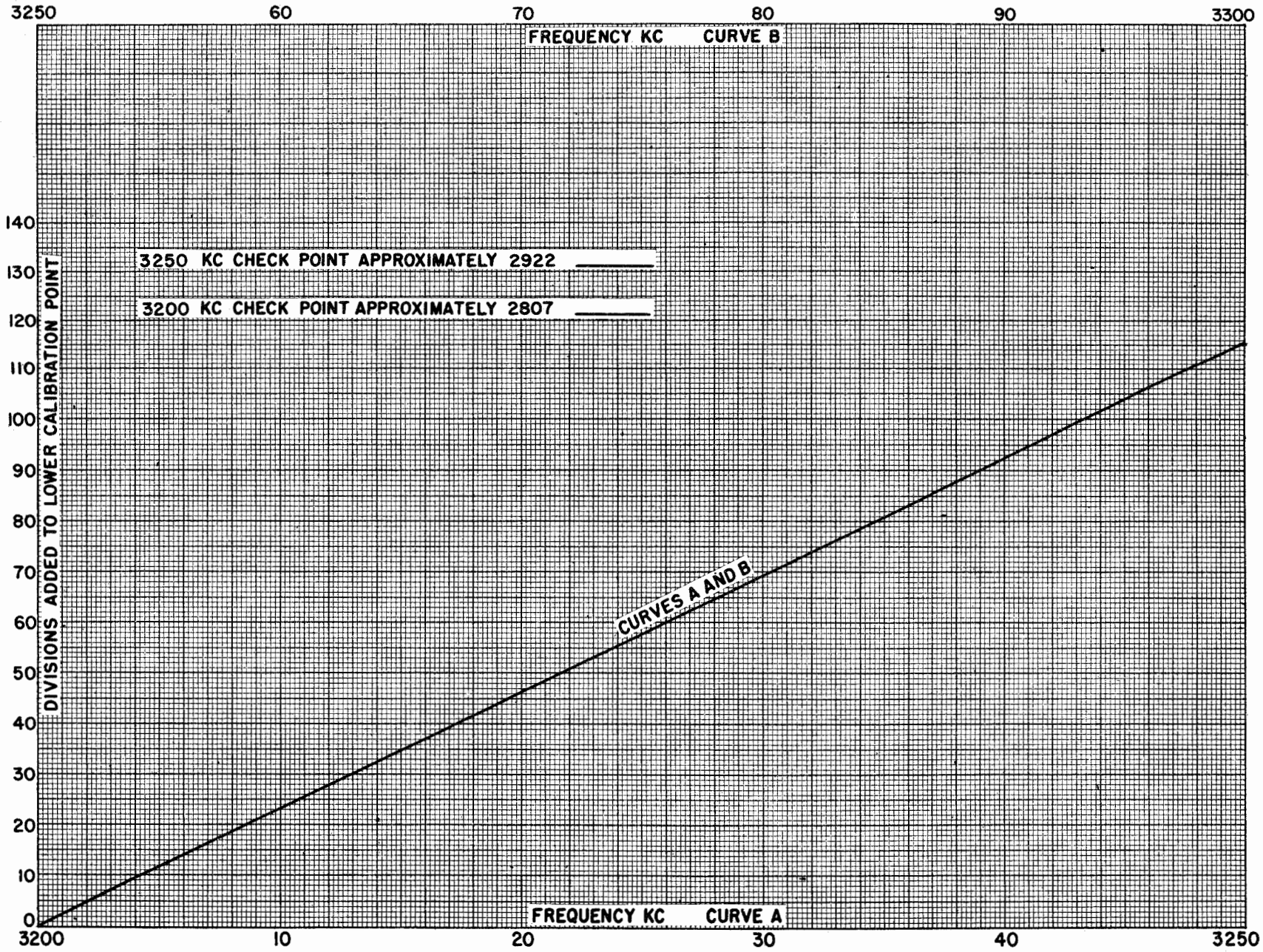


Figure 4–21. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3200–3300 kc

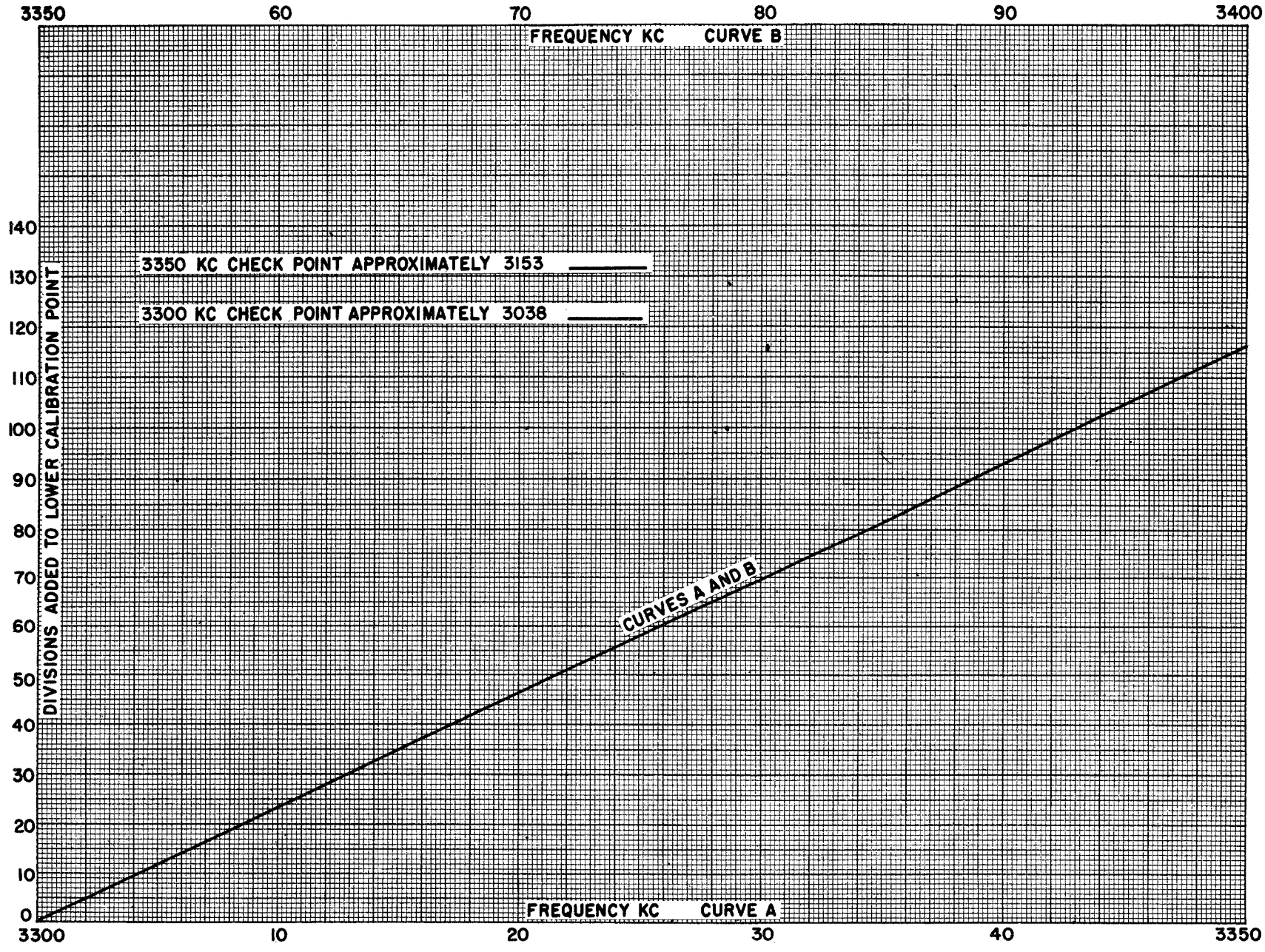


Figure 4–22. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3300–3400 kc

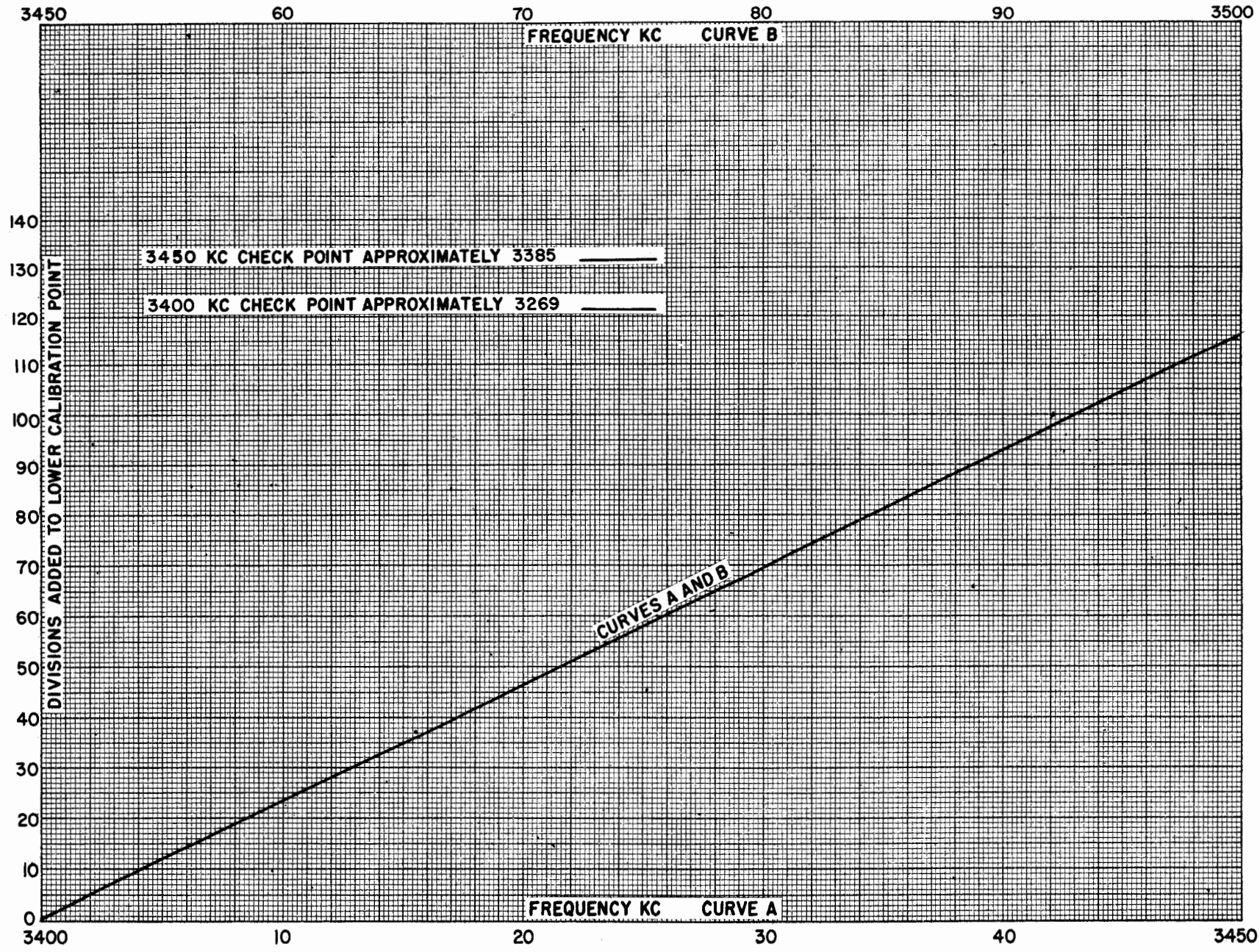


Figure 4–23. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3400–3500 kc

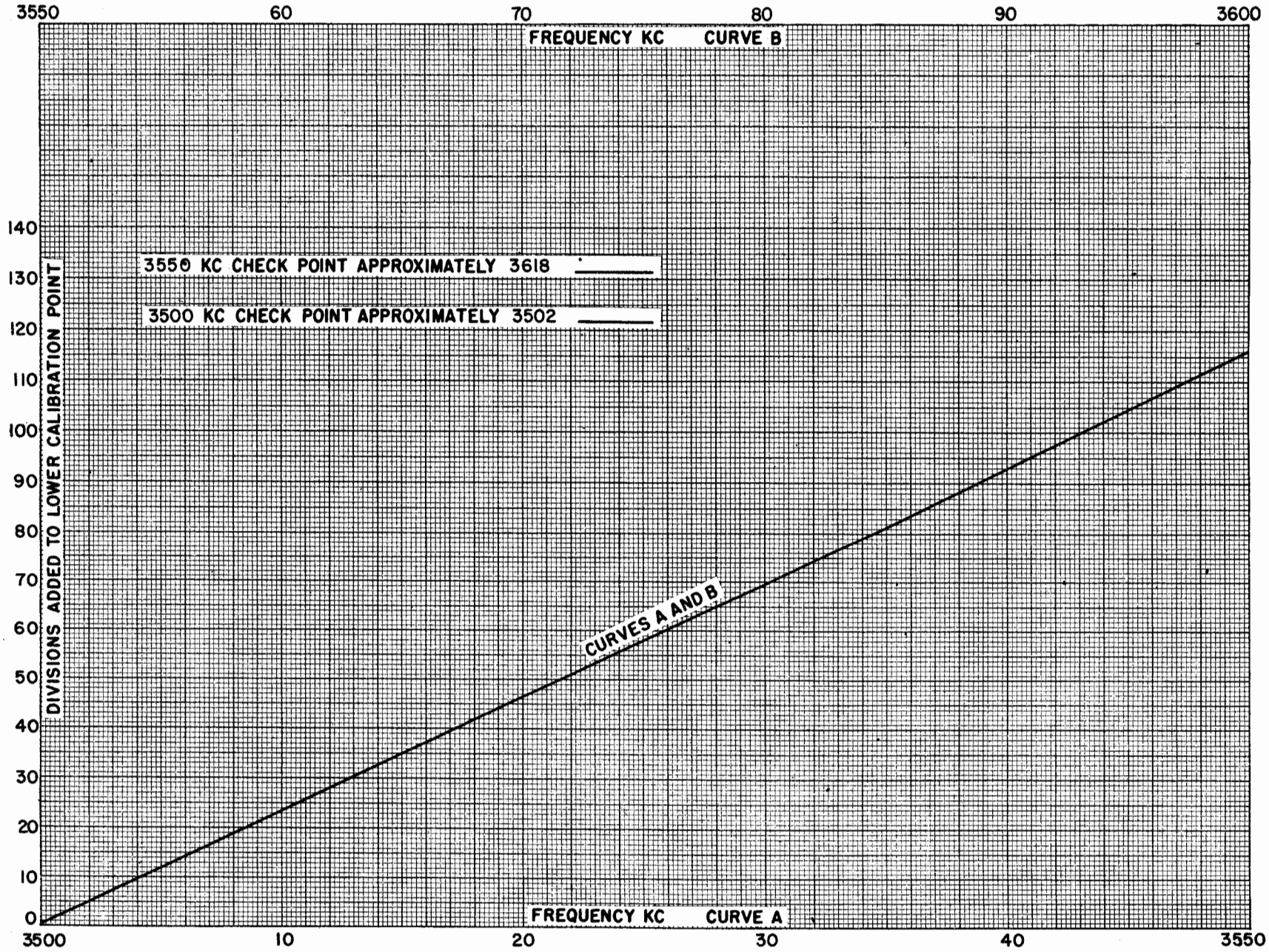


Figure 4–24. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3500–3600 kc

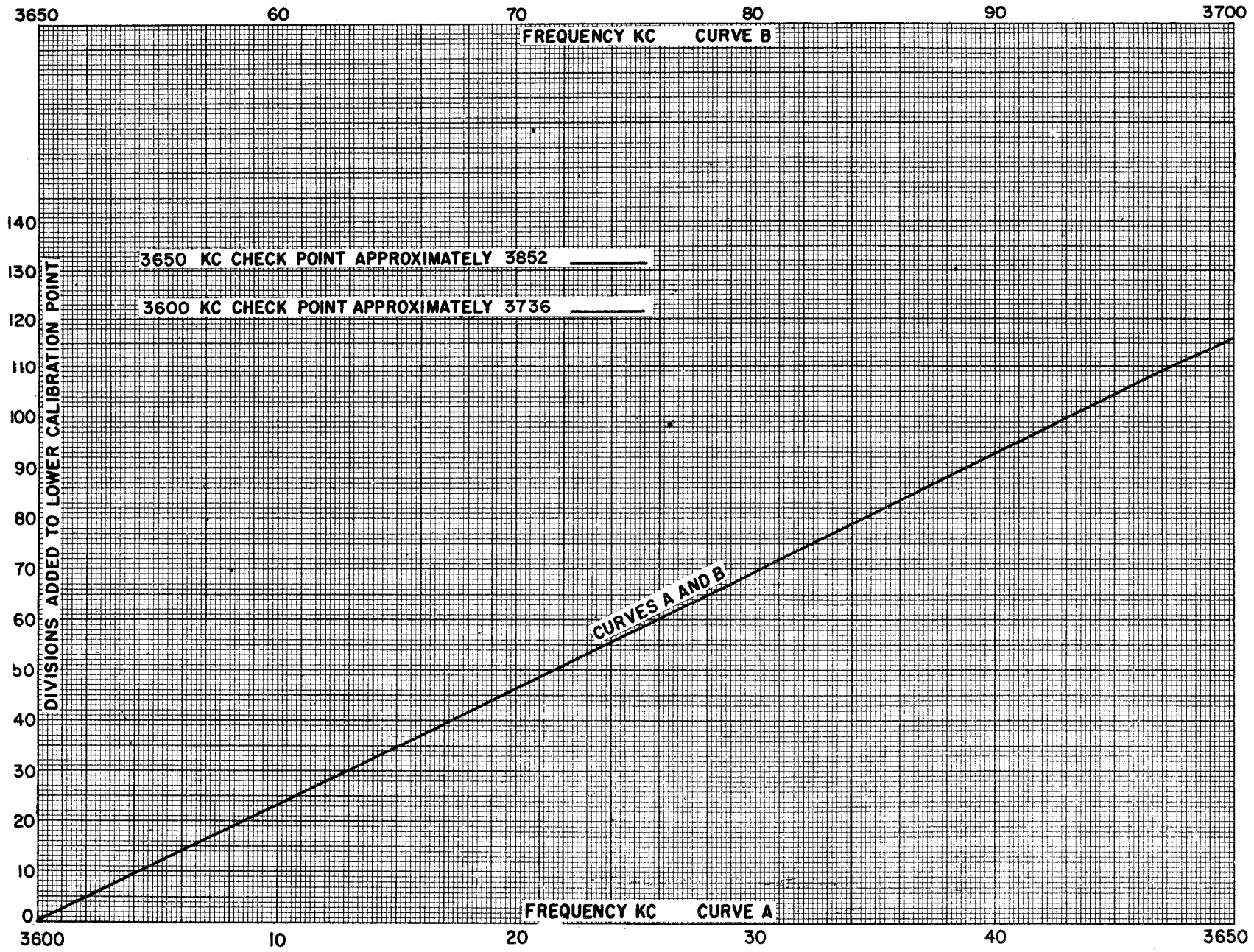


Figure 4–25. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3600–3700 kc

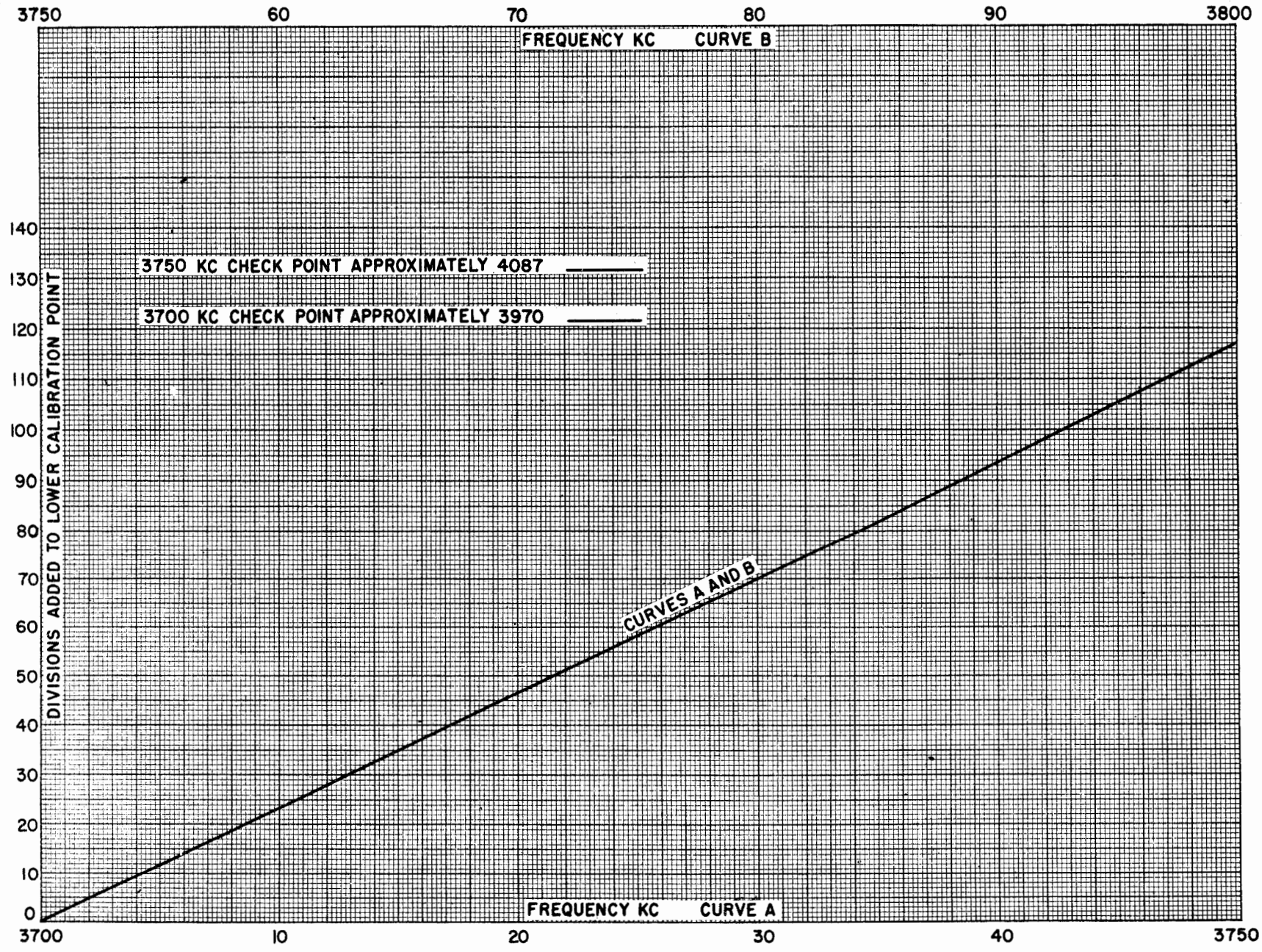


Figure 4–26. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3700–3800 kc

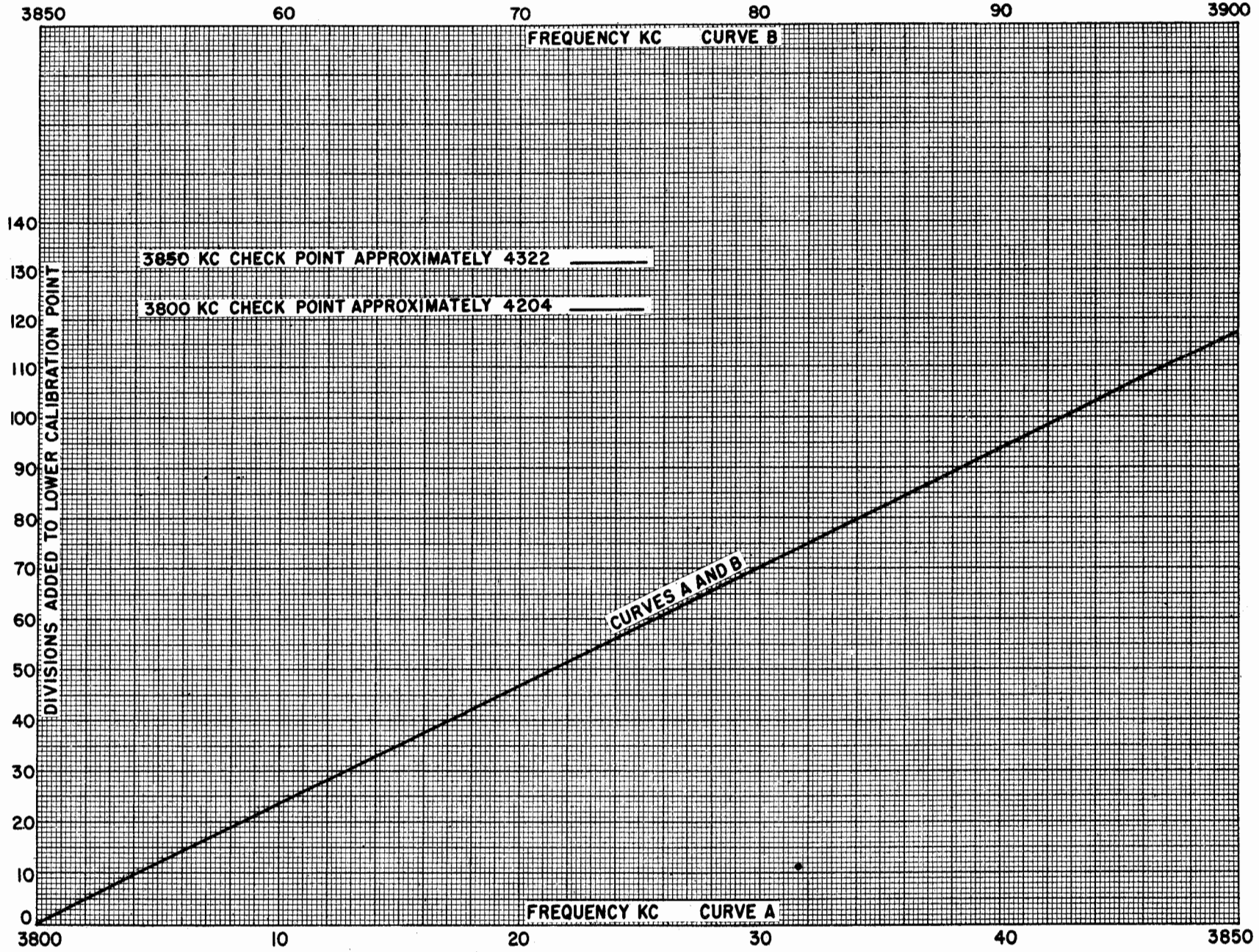


Figure 4–27. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3800–3900 kc

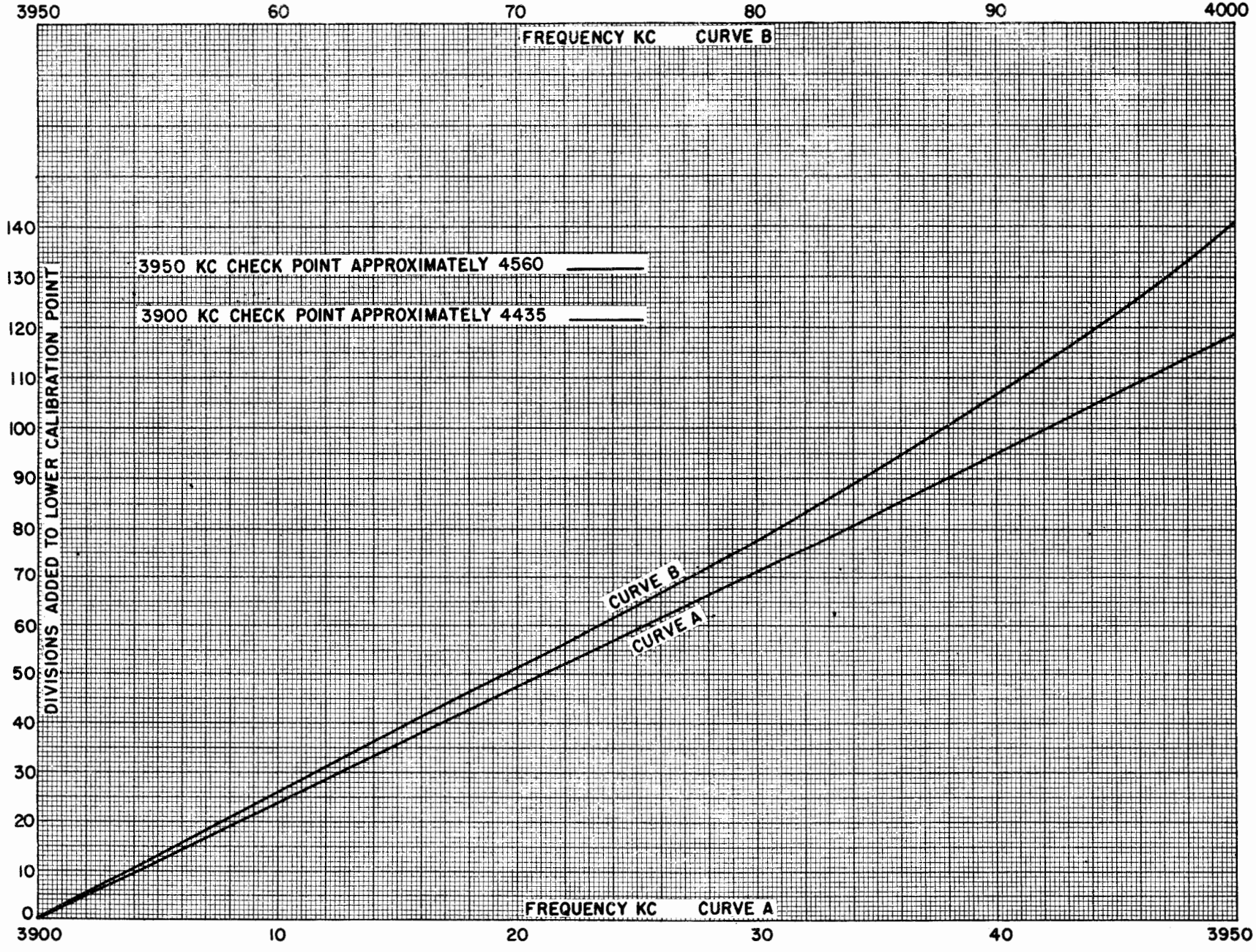


Figure 4–28. Radio Frequency Oscillator O–165/UR, Calibration Curve, 3900–4000 kc

SECTION 5
OPERATOR'S MAINTENANCE

1. INTRODUCTION.

The Radio Receiving Set AN/FRR–28, having a number of different uses, does not have all of its equipment in use in any one operation. Because of this, it is impossible to check the entire receiving set in operation at any one time. However, the equipment that is being used should be given routine checks as described in paragraph 2 of this section.

2. ROUTINE CHECKS.

Table 5–1 lists the routine checks necessary every watch to determine if the AN/FRR–28 is operating normally.

3. EMERGENCY MAINTENANCE.

Notice to Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

a. REPLACING FUSES.

WARNING

Never replace a fuse with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected.

(1) SYMPTOMS OF FUSE FAILURE.—Table 5–2 contains a list of fuses in the receiving set, their locations, the circuits protected by the fuses, the symptoms of fuse failure, their ampere and voltage ratings, and figure references.

(2) REPLACEMENT OF FUSES.

To replace fuses F12–1 or F12–2, remove primary power cable from power source, unscrew blown fuse by rotating counterclockwise, and screw new fuse in place.

TABLE 5–1. OPERATOR'S ROUTINE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
1. Radio Receiver R–450/FRR–28 *a.* RF section.	With METER switch at RF, and AVC-MAN switch at AVC, read meter with signal tuned in.	Meter should read in approximate center of scale. If meter reads low, check tuning and RF GAIN setting. If meter reads high, lower RF GAIN control.
b. AF section.	When AF section is used, read meter with meter switch at AF.	Meter should read in approximate center. If meter reads too high or low, adjust AUDIO GAIN control.
c. Limiter.	When AF section is used, switch LIMITER to OFF.	Background noise should be higher than when limiter is on.
2. RF Oscillator O–165/UR *a.* Oven heater.	Read OVEN HEAT METER.	Mercury level should be visible.
b. HFO section.	Read meter with METER SELECTOR switch at HF OUTPUT.	Meter should read approximately 0.5 ma. If incorrect, adjust HFO OUTPUT.
c. BFO section.	Read meter with METER SELECTOR switch at BFO OUTPUT.	Meter should read approximately 0.5 ma. If incorrect, adjust BFO OUTPUT.
3. Amplifier-Detector AM–615/UR.	Plug-in headphones and listen for beat note.	
4. Keyer KY–79/UR.	Listen to monitor signal at all audio frequencies.	

TABLE 5-2. FUSE LOCATIONS AND SYMPTOMS OF FAILURE

FUSE	LOCATION	PROTECTS	SYMPTOM	AMPS	VOLTS	FIGURE REFERENCE
F12-1	Rack Switch Panel. SA-238/G.	Power supply to all units except the RF Oscillator O-165/UR.	Pilot lights not lighted on all units except the RF Oscillator O-165/UR.	15	110	3-1
F12-2	Rack Switch Panel. SA-238/G.	Same as above.	Same as above.	15	110	3-2
F2-1	Left rear of receiver.	Filament and plate voltage of receiver.	Dial lights not lighted.	3	110	7-2
F2-2	Bottom of receiver.	Plate voltage of receiver.	No audio output. No meter reading. Tube V18 not lighted.	¼	110	7-5
F3-1	Left rear of RF Oscillator O-165/UR.	Heater and primary power of RF Oscillator O-165/UR.	Primary power and oven heater pilot lights not lighted.	4	110	7-8
F3-2	Left rear of RF Oscillator O-165/UR.	Primary power of RF Oscillator O-165/UR.	Primary power pilot light not lighted.	1½	110	7-8
F9-1	Left rear of Amplifier-Detector AM-615/UR.	Primary power of Amplifier-Detector AM-615/UR.	Primary power pilot light not lighted.	2	110	7-17
F10-1	Left rear of Keyer KY-79/UR.	Primary power of Keyer KY-79/UR.	Primary power pilot light not lighted.	2	110	7-19

To replace all fuses except F2-2, F12-1, and F12-2, locate fuse from table 5-2, unscrew fuse holder cap by turning cap counterclockwise, pull blown fuse from cap, push new fuse into cap, insert cap into holder, and turn cap clockwise to secure.

CAUTION

Replacement of fuse F2 in Radio Receiver R-450/FRR-28 requires removal of the unit from the rack. Two men are necessary for this procedure. Extreme care should be used in the handling of the unit and in replacing the fuse. Avoid contacting any parts in the receiver, except the fuse, with the soldering iron.

To replace fuse F2-2 in the receiver, remove receiver from rack. Unsolder blown fuse and replace and solder in new fuse. When soldering in new fuse, do not keep soldering iron on fuse for a long period since the fuse is of a thermal type and heat will cause it to blow.

b. REPLACEMENT OF ELECTRON TUBES.

WARNING

This equipment employs voltages which are dangerous and may prove fatal if contacted. Always observe all safety regulations and precautions. Refer to safety notices and high voltage warning in the front of this instruction book.

CAUTION

In the replacement of tubes, use extreme care in handling tube pins. To avoid breaking the pins, do not force tubes into sockets.

Most tube defects will be found to be due to burned out filaments. Since some of the tubes cannot be seen or removed without removal of the chassis from the rack, the following methods of tube checking are recommended:

(1) Inspect all available tubes by sight and touch without removing the unit from the rack. Tubes that fail to glow, and also feel cold, should be replaced.

(2) Radio Receiver R-450/FRR-28, Amplifier-Detector AM-615/UR, and Keyer KY-79/UR contain tubes which require removal of the units to inspect and replace. The receiver unit is heavy and, therefore, requires two men to remove from the rack. All tubes in the receiver are located on top of the chassis. Keyer KY-79/UR and Amplifier-Detector AM-615/UR contain tubes which can be inspected only by removing the top or bottom cover plates.

Before replacing tubes in any unit, except RF Oscillator O-165/UR, turn the power for the individual unit off.

Note

Due to the long warm-up time necessary for Oscillator O-165/UR, do not shut off unit power. Tube V1 in Oscillator O-165/UR,

and tubes V1, V2, V4, V8, V9 and V10 in the radio receiver, must not be changed unless they appear defective or erratic.

If tube V1 in Oscillator O–165/UR is changed, a new calibration of the unit must be made by a maintenance technician.

All tube shields, except those on tubes V4, V17 and V19 of the receiver, are of the push and turn type. To remove shield, push down, turn counterclockwise as far as possible, and lift off. Replace tube, slide shield down over locking pins, turn clockwise, and release.

To remove shield on receiver tube V4, remove thumbscrew located on adjacent capacitor cover, and lift shield off. Replace tube, push shield down into place with flange in proper position, and secure with thumbscrew.

Tubes V17 and V19 in the receiver are secured to the chassis with spring clamps. To remove one of these tubes, pull exposed end of clamp away from tube until it snaps open. Replace tube and secure by pressing the loose end of the clamp towards tube.

SECTION 6
PREVENTIVE MAINTENANCE

1. 1000 HOUR ROUTINE MAINTENANCE CHECKS.

a. Table 6–1 lists the routine maintenance checks to be made by a technician every 1000 hours of operation.

b. The variable HFO of Oscillator O–165/UR is checked for proper calibration at two and four megacycles, which should correspond to dial settings at 0000.0 and 4700.0, respectively. Any appreciable error should be corrected according to procedure in Section 3, paragraph 4*b*(2).

CAUTION

Tube V1 in RF Oscillator O–165/UR must not be removed from its socket unless it appears defective or erratic.

c. A check of proper receiver IF and AF operation is made by feeding various signals into different circuits, and measuring the receiver output. An electronic voltmeter is placed across the speaker terminals, which are the outer terminals on terminal board E2. The signal is supplied to the AF stages by an audio signal generator, and to the IF stages by a high frequency signal.

The signals are applied to the IF tube grids through a 0.1 microfarad capacitor from the signal generator, and are modulated 30 percent at 400 cycles. The switches on the receiver are set as follows:

SELECTIVITY switch at three kilocycles; AVC-MAN switch to MAN; MOD-CW switch to MOD; RF GAIN and AUDIO GAIN controls to maximum.

Table 6–2 gives the BAND CHANGE switch setting, the signal frequency applied to the receiver, the point of signal application, and the approximate input voltage necessary for a 20-volt output at the speaker terminals.

2. ANNUAL CHECK.

a. ANNUAL CHECK OF RADIO FREQUENCY OSCILLATOR O–165/UR.—Once a year the primary power for RF Oscillator O–165/UR shall be shut off and the unit removed to a bench. The bottom cover of the chassis shall be removed and the inner oven opened and removed.

Note

Before removing the inner oven, read and follow the instructions in Section 7, paragraph 6.

Clean, wherever necessary, with carbon tetrachloride.

Insert all connectors into their mates and measure tube socket and connector voltages shown on figure 7–27.

After thorough inspection, reassemble the equipment and return to the rack. Turn on primary power and allow to heat for 24 hours.

Check for oscillator drift and recalibrate as described in Section 3, paragraph 4*b*.

b. ANNUAL CHECK OF RADIO RECEIVER R–450/FRR–28, AMPLIFIER-DETECTOR AM–615/UR AND KEYER KY–79/UR. An annual check of the tube pin voltages in these units against the values given in figures 7–26, 7–28, and 7–29 should be made.

3. LUBRICATION.

The equipment provided in Radio Receiving Set AN/FRR–28 requires no lubrication.

4. RE-TROPICALIZATION.

The Radio Receiving Set AN/FRR–28 requires no re-tropicalization treatment.

TABLE 6–1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
1. All tubes in Radio Receiving Set AN/FRR–28.	Remove all tubes, except tube V1 in Oscillator O–165/UR, and check in a tube tester. (See paragraph 1*b*.)	All tubes not up to specifications should be replaced.
2. Power and coaxial cabling.	Visually inspect all cabling for wear.	Replace and reroute worn cabling to prevent continued wear on one spot.
3. Oscillator O–165/UR.	Check variable HFO calibration at 2 and 4 megacycles. (See paragraph 1*b*.)	If error is excessive, recalibrate according to procedure in Section 3.
4. Receiver R–450/FRR–28		
a. IF and AF operation.	Check receiver operation. (See paragraph 1*c*.)	
b. IF cathode bias.	Check IF bias following procedure in Section 3, paragraph 4*e*(5).	
c. AF and RF meter adjustment.	Check and correct errors in meter adjustments following procedure in Section 3, paragraphs 4*e*(2) and 4*e*(3).	
d. BFO signal level.	Check and adjust injected BFO signal level following procedure in Section 3, paragraph 4*e*(4).	
5. Keyer KY–79/UR		
a. Balance	Check and adjust balance of output stage following procedure in Section 3, paragraph 4*d*(2).	
b. Audio frequencies	Check and adjust audio oscillator frequencies following procedure in Section 3, paragraph 4*d*(1).	
6. Amplifier-detector AM–615/UR.	Check and adjust oscillator frequency following procedure in Section 3, paragraph 4*c*.	

TABLE 6–2. APPROXIMATE SIGNAL INPUT AT IF AND AF STAGES FOR 20-VOLT OUTPUT

BAND CHANGE SWITCH POSITION	FREQUENCY	INPUT APPLIED TO	APPROXIMATE INPUT VOLTAGE
Any	Audio 400 cycles	Pin 5, tube V17	3.5 volts
Any	Audio 400 cycles	Pin 2, tube V16B	0.3 volts
1.35–3.45 Mc	Modulated 455 kc	Pin 1, tube V11	0.35 volts
1.35–3.45 Mc	Modulated 455 kc	Pin 1, tube V10	6000 microvolts
1.35–3.45 Mc	Modulated 455 kc	Pin 1, tube V9	110 volts
1.35–3.45 Mc	Modulated 455 kc	Pin 1, tube V7	40 microvolts
1.35–3.45 Mc	Modulated 455 kc	Pin 7, tube V5	65 microvolts
7.40–14.8 Mc	Modulated 3.955 Mc	Pin 7, tube V5	40 microvolts
7.40–14.8 Mc	Modulated 3.955 Mc	Pin 7, tube V6	250 microvolts

SECTION 7
CORRECTIVE MAINTENANCE

1. INTRODUCTION.

WARNING

This equipment employs voltages which are dangerous and may prove fatal if contacted. Always observe all safety regulations and precautions. Refer to the safety notices and high voltage warning printed in the front of this instruction book.

The trouble shooting charts, tables 7–5 through 7–9; figures 4–1 through 4–7 and 7–2 through 7–23, showing the parts positions; the voltage and resistance charts, figures 7–26 through 7–30; winding data table 7–4; unit schematics, figures 7–30 through 7–36; and the wiring diagrams, figures 7–37 and 7–38, are provided as aids in locating faults and facilitating their repair.

The following equipment, in addition to the normal maintenance tools, is necessary for trouble shooting, repair, and alignment of Radio Receiving Set AN/FRR–28.

a. A 20,000 ohms/volt multimeter, such as Navy Model OE series or equivalent.

b. An electronic multimeter, such as Navy Model OBQ series or equivalent.

c. An oscilloscope, such as Navy Models OBL or OBT series or equivalent.

d. One set of headphones.

e. An AF frequency meter.

f. An AF signal generator.

g. An RF signal generator range 400 kc-55 Mc.

h. A seven-pin miniature tube socket adapter.

2. THEORY OF LOCALIZATION.

Since the Radio Receiving Set AN/FRR–28 is used in different arrangements, and not all the units or parts of units are used for every operation, there is no one method of localizing the trouble to one unit. However, the meter readings and monitoring output signals, which are available at various points within the equipment, will provide a means for locating defective units. The various trouble shooting charts, tables 7–5 through 7–9, should provide adequate information for localizing the trouble to a point where, by use of the voltage and resistance charts, the faulty parts can be located.

3. SYSTEM TROUBLE SHOOTING.

For locating a faulty or weak unit, a visual check of the meters and an audio check of the monitoring signals that are provided will normally be sufficient. A trouble shooting chart, table 7–5, is provided for aiding in systematically checking the equipment. Since not all of the units are in use in any one operation, it is only necessary to check those units that are in use at the time the trouble develops.

4. UNIT TROUBLE SHOOTING.

The many meter and audio signal checkpoints that are provided in the equipment should be used fully in locating faulty components. Adequate use should also be made of the various substitution sections, such as the external BFO, as replacements. By making complete use of the available means within the equipment itself, it is possible to trace a source of trouble to a particular section. The unit trouble shooting charts, tables 7–6 through 7–9, are provided as an aid in localizing the trouble. By means of the voltage and resistance charts figures 7–26 through 7–29, the inoperative components may be located.

5. ELECTRICAL ADJUSTMENTS.

a. GENERAL.—The electrical adjustments of all the units included in the radio receiving set, except for the alignment of the receiver, are described in detail in Section 3. For the electrical adjustments of the converter-comparator group that may be supplied, refer to the appropriate NAVSHIPS instruction book.

b. RECEIVER R–450/FRR–28 ALIGNMENT.

(1) GENERAL.—The alignment of a modern communications receiver requires precision instruments and a thorough knowledge of the circuits involved. Since this receiver is a double superheterodyne, the alignment procedure is even more involved than usual.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS–383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Reference Symbol" use the proper circuit identification taken from the schematic drawings, such as T–803, in the case of a transformer, or R–207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards, and envelopes on board. They may be obtained from any Electronics Officer.

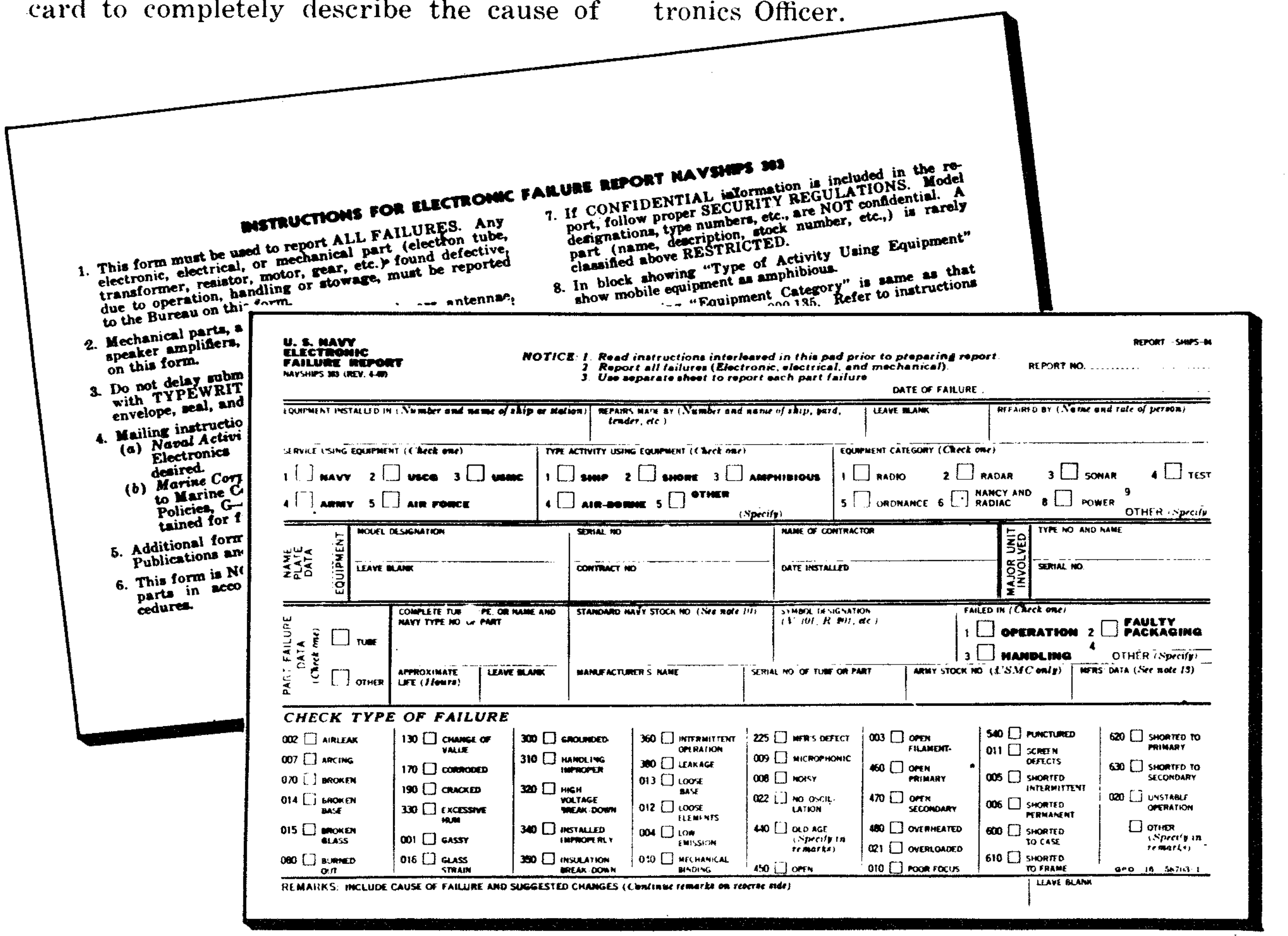


Figure 7–1. Failure Report

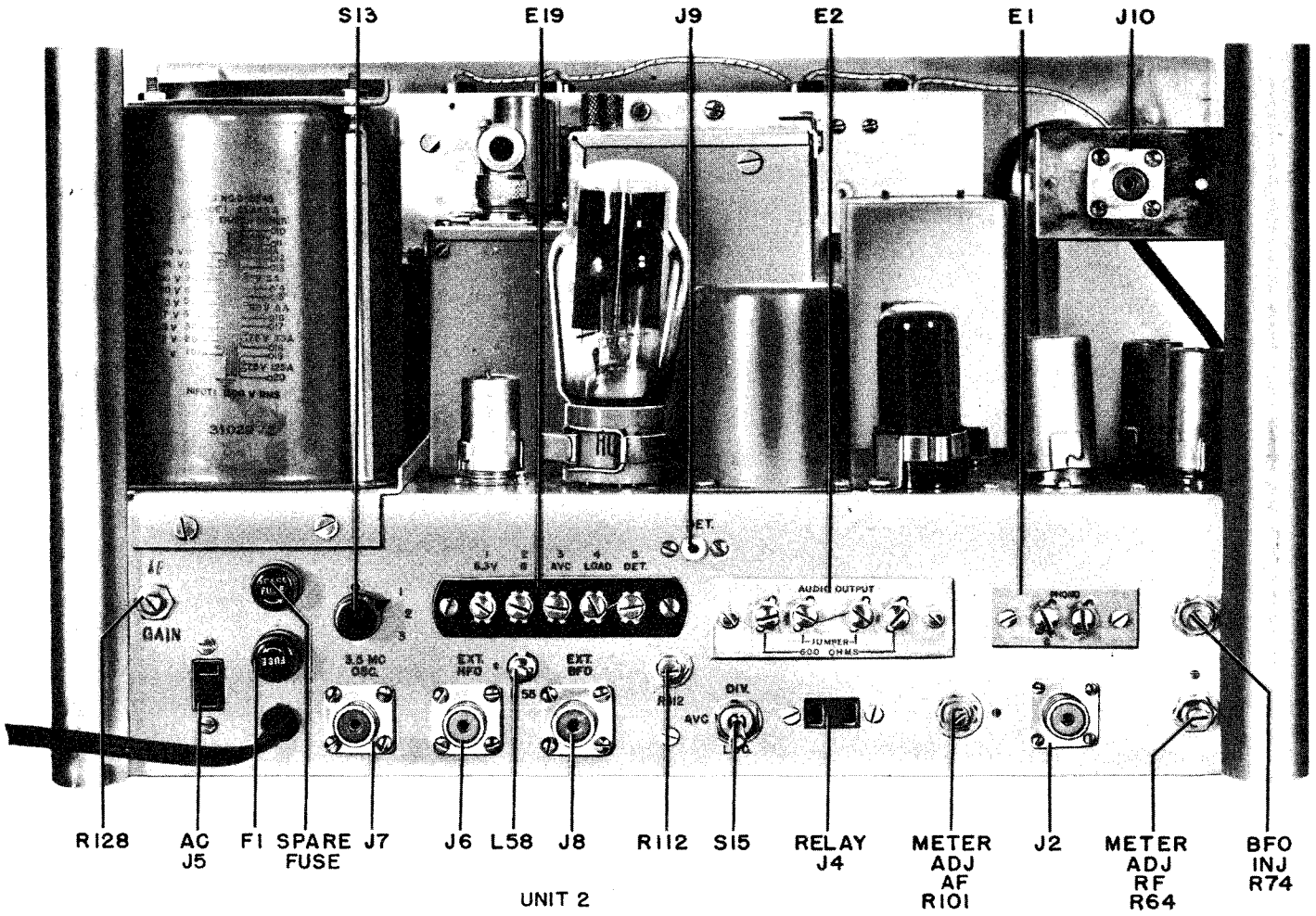


Figure 7–2. Receiver R–450/FRR–28, Rear View

Under normal service the receiver will stay in alignment for extremely long periods of time; consequently, realignment should not be attempted unless all other possible causes of a particular trouble have been eliminated. When it has been determined that any realignment should be attempted, a great deal of caution should be exercised in making the adjustments, as any required readjustment should not entail more than a slight angular motion of the adjusting screw.

(2) ALIGNMENT OF THE IF STAGES.—The low frequency IF should be aligned first. The recommended method for aligning the low frequency IF involves the use of a sweep frequency signal generator and an oscilloscope. Since these instruments may not be available, the alternate method using an amplitude modulated signal generator and an output meter will be described first.

The signal generator should be coupled to the grid of mixer tube V5 through a capacitance of approximately .01 microfarad. A miniature tube adapter will be required to make the mixer grid connection available. An output meter should be connected across the output terminals of the receiver or the speaker voice coil. The receiver controls should be set according to table 7–1.

TABLE 7–1. RECEIVER CONTROL SETTINGS FOR IF ALIGNMENT

CONTROL	POSITION
SEND-REC	REC
CW-MOD	MOD
XTAL PHASING	Arrow
AVC-MAN	MAN
AUDIO GAIN	Set for approximately 20 volts
RF GAIN	See text
BAND SWITCH	1.35 - 3.45 Mc
DIAL	2.5 Mc
HFO	INT.
AVC	INT. BFO FAST
3.5 MC OSC.	3
IF GAIN	Max

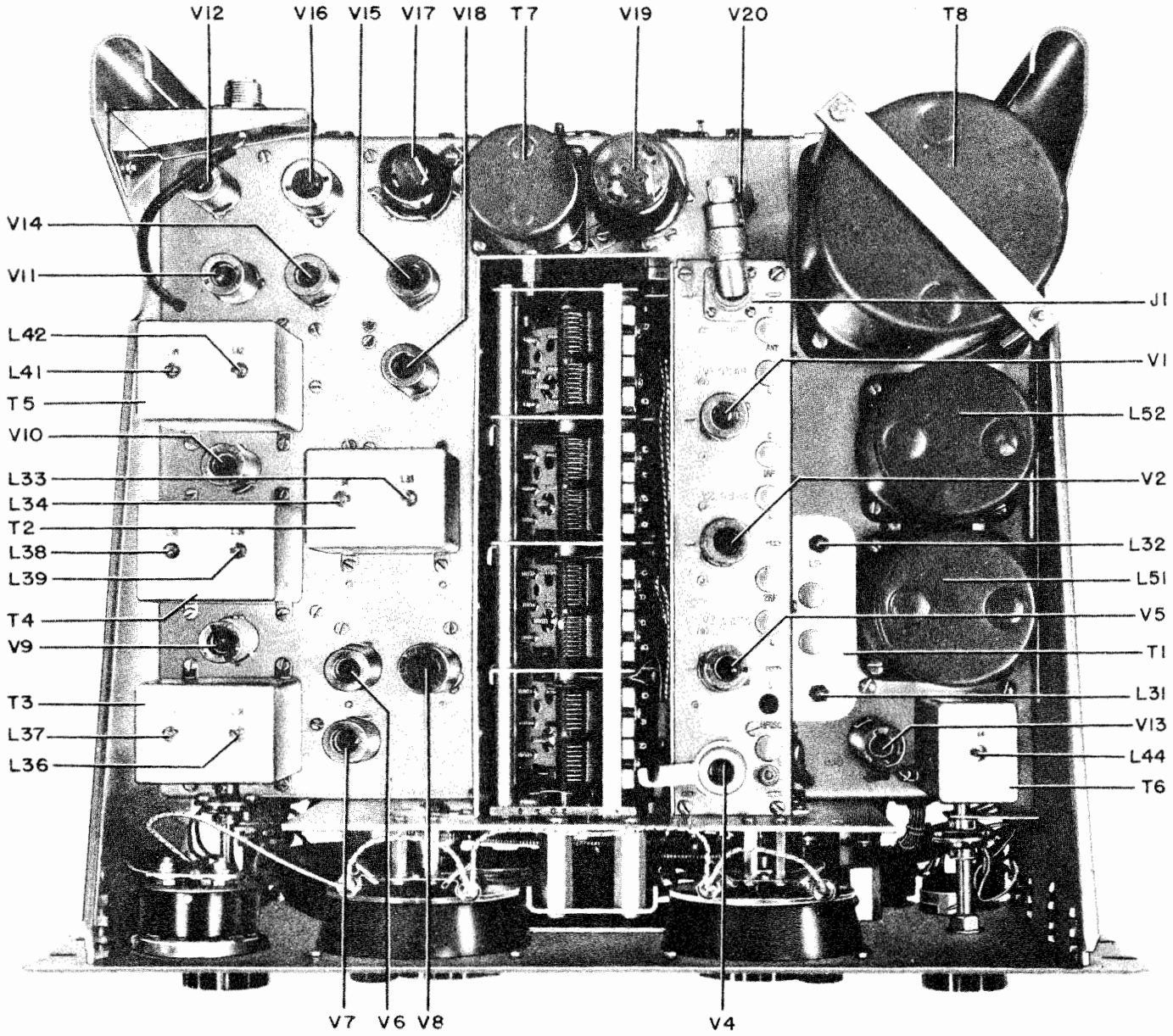


Figure 7–3. Receiver R–450/FRR–28, Top View

The signal generator should be modulated 30 percent at 400 cycles. Turn the SELECTIVITY switch to the "3 kc" position and advance the RF GAIN control to maximum. Set the signal generator frequency to 455 kc and adjust its output until some deflection is noted on the output meter. Refer to figure 7–3 for the location of the various alignment adjustments. Adjust inductors L42, L41, L39, L38, L36 and L32 for maximum output, reducing the signal generator output and the RF GAIN control as required to prevent overload or excessive output. Now turn the SELECTIVITY switch to the narrowest position, "2 kc", and adjust the signal generator frequency for the maximum output. This establishes the correct signal frequency by the 455 kc crystal for the IF amplifier; the frequency of the signal generator should not be disturbed for the remainder of the low frequency IF alignment, unless it should be to recheck this establishment of crystal frequency to make sure that the signal generator frequency has not drifted during the alignment. The SELECTIVITY switch is now turned to the "3 kc" position and inductors L42, L41, L39, L38, L36, and L32 are again adjusted for maximum output. Now turn the SELECTIVITY switch to the "1.3 kc" posi-

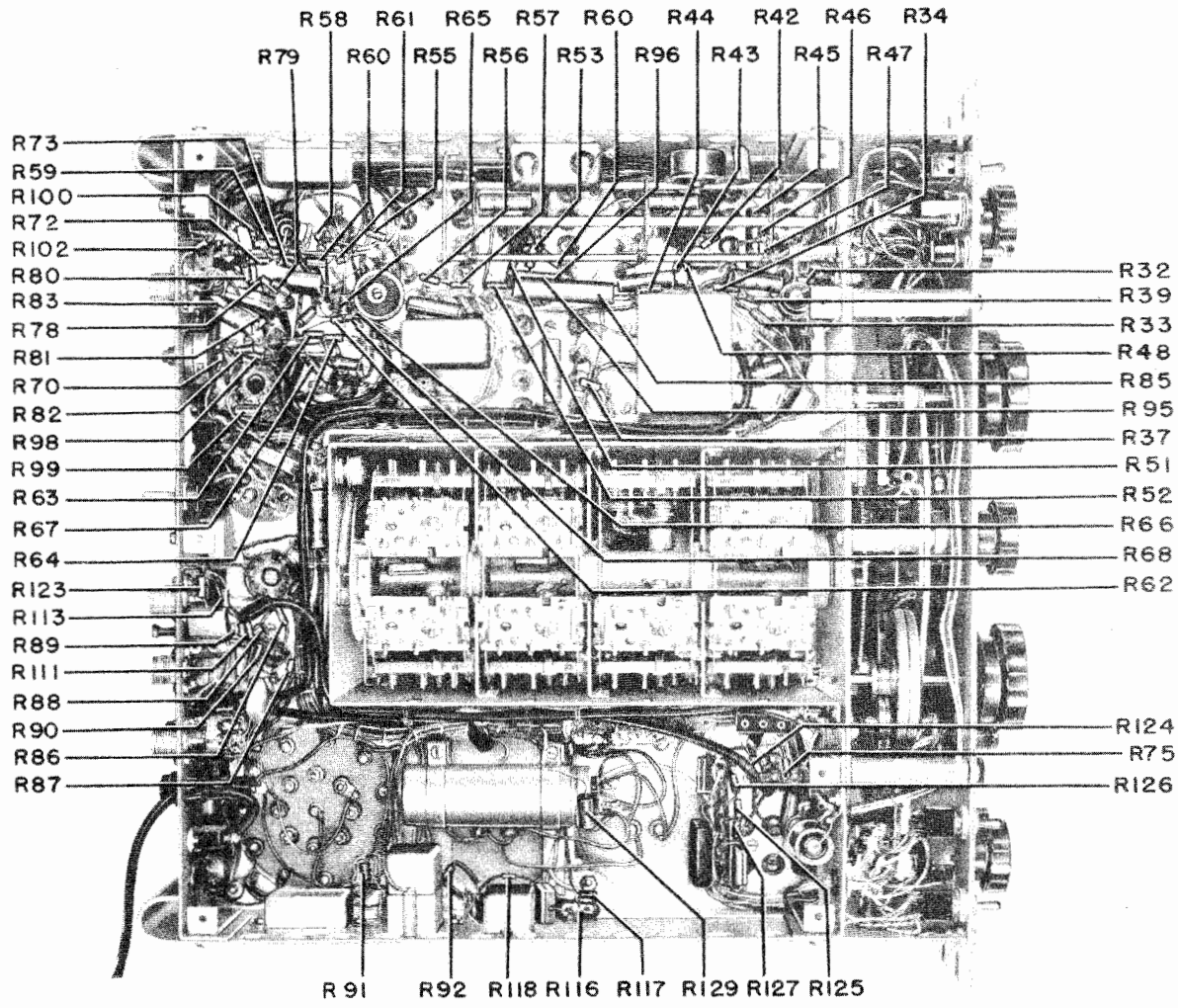


Figure 7–4. Receiver R–450/FRR–28, Bottom View, Location of Resistors

tion and adjust inductor L37 for maximum output. Before changing this set-up, the BFO should be turned on by throwing the CW-Mod switch to CW and checked for zero beat with the BFO knob dial at its zero reading. If necessary inductor L44 should be adjusted for zero output. This check and adjustment of the BFO should be done with the signal generator carrier unmodulated.

The procedure for the visual method of aligning the low frequency IF should be the same as the above except that the adjustments are made for both maximum amplitude and coincidence of the oscilloscope images. The oscilloscope vertical input should be connected across the diode detector lead resistance, from the junction of resistors R64 and R65 to chassis.

The 3.5 Mc crystal oscillator used in the second conversion oscillator circuit may be accurately adjusted to frequency by use of oscillator trimmer capacitor C101. To adjust the oscillator frequency, zero beat a harmonic of a 500 kc or 100 kc crystal with WWV at 2.5 or 5 megacycles. A crystal harmonic may then be used as a secondary standard against which the 3.5 megacycle crystal may be zero beat.

The high frequency IF should be aligned next. Set the band switch to the 7.4 - 14.8 Mc band. The SELECTIVITY switch should be in the "3 kc" position. Adjust the signal generator frequency to 3.955 megacycles and adjust inductors L31, L33, and L34 for maximum output.

The 3.5 megacycle crystal used in the second conversion oscillator circuit may be used as a frequency standard at multiples of 3.5 Mc from 10.5 Mc upwards. In order to do this, in view of the complete shielding against radiation from this oscillator, it will be necessary to temporarily connect a two foot length of insulated wire to the antenna terminal and dress the

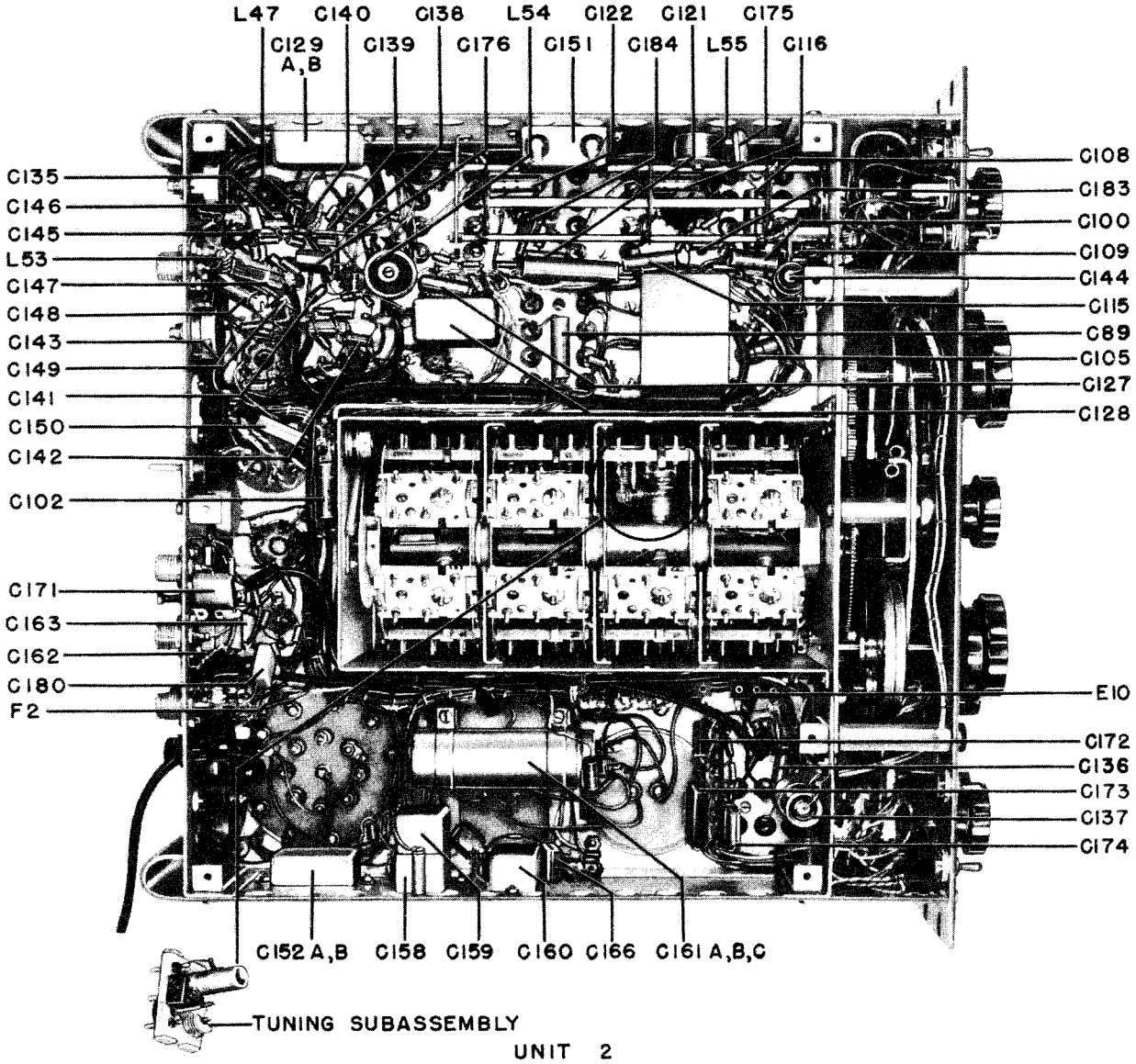


Figure 7–5. Receiver R–450/FRR–28, Bottom View, Location of Components

free end of this lead around the tube shield on the 3.5 Mc oscillator tube V8. This test lead should, of course, be removed except while in use as a frequency standard.

Upon completion of IF alignment procedure, adjust IF gain control potentiometer R128 on rear of chassis. The setting will depend on the terminal equipment used. Connect the terminal equipment and short-circuit the antenna. Turn the RF GAIN control to maximum and the IF GAIN down until the terminal equipment does not operate improperly.

(3) ALIGNMENT OF THE RF AMPLIFIER AND HFO ALIGNMENT.—To adequately align the RF Amplifier and HF Oscillator an accurately calibrated signal generator and output meter are required. The frequencies required are shown in table 7–3. The location of the adjustments is shown in figure 7–3. The adjusting screws are located under the holes, which are covered with snap type buttons. The use of figure 7–3 should be made in following this part of the alignment which will now be described for one frequency band. The same procedure should then be followed for the other frequency bands.

To align the .54-1.35 Mc band the signal generator is coupled to the antenna input terminal through a 100 ohm carbon resistor. The generator should be modulated 30 percent at 400 cycles and the output meter connected across the receiver output terminals. The receiver controls should be set according to table 7–2.

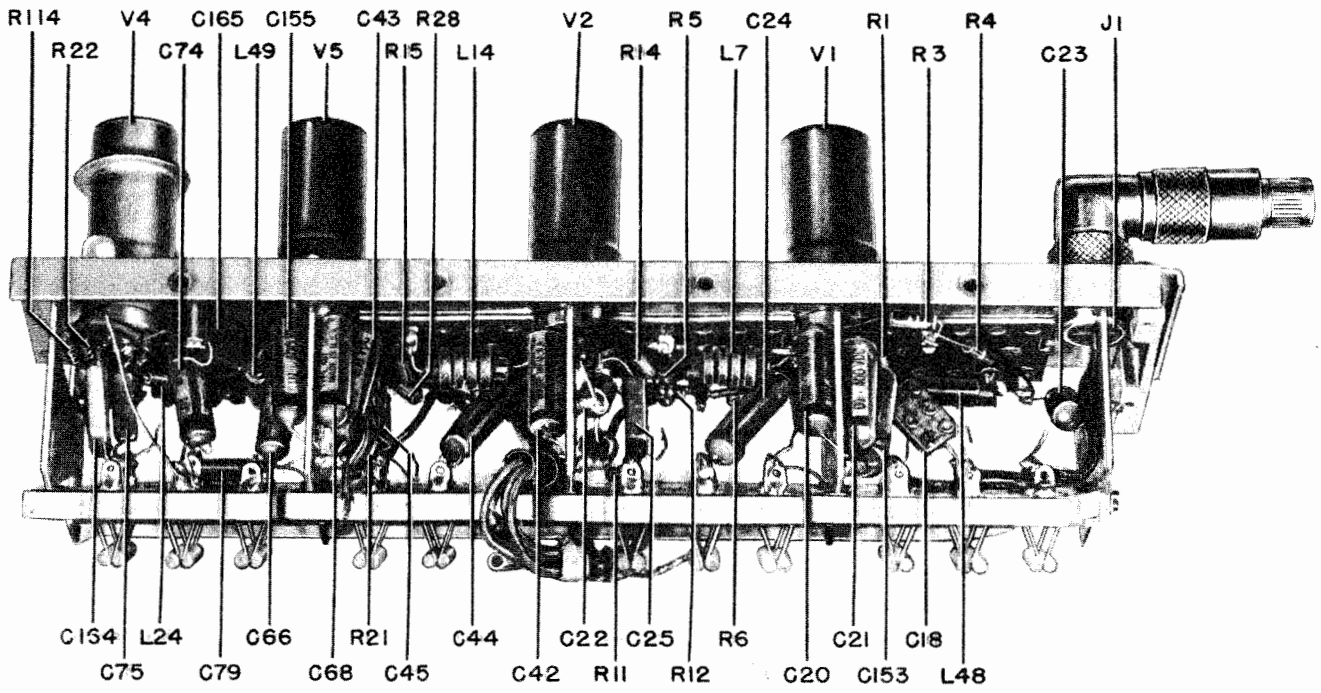


Figure 7–6. Receiver R–450/FRR–28, RF Strip, Right Side

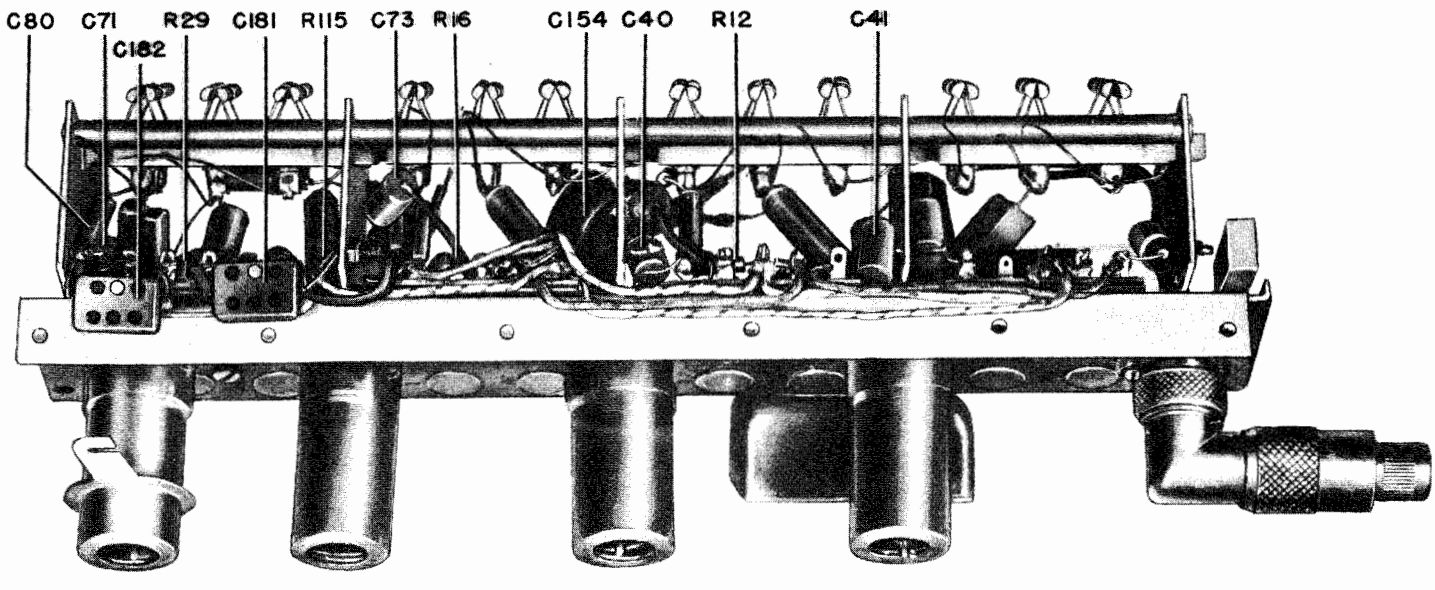


Figure 7–7. Receiver R–450/FRR–28, RF Strip, Left Side

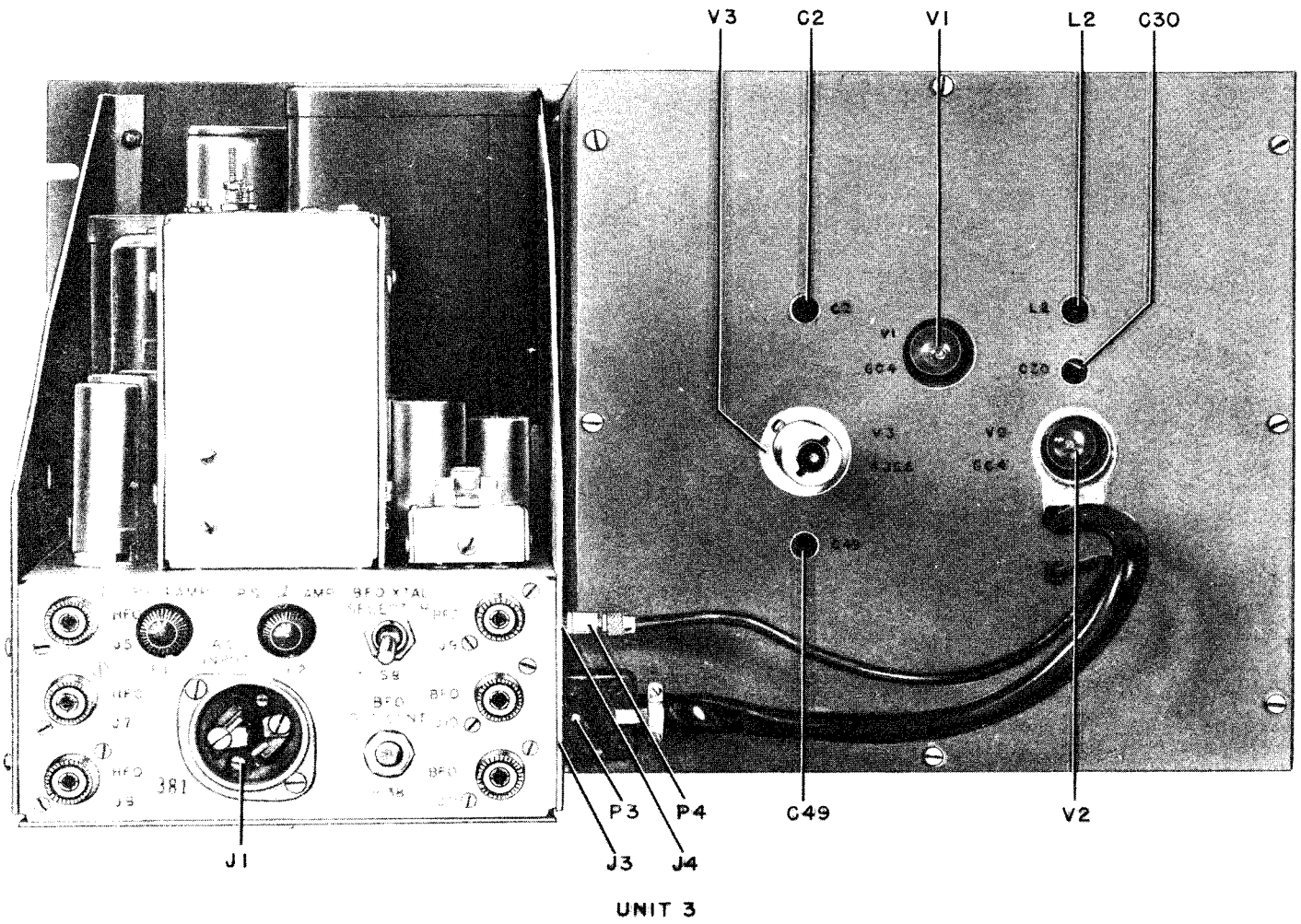


Figure 7–8. Radio Frequency Oscillator O–165/UR, Rear View

TABLE 7–2. RECEIVER CONTROL SETTINGS FOR RF AMPLIFIER AND HFO ALIGNMENT

CONTROL	POSITION
SELECTIVITY	3 kc
SEND-REC	REC
CW-MOD	MOD
AF GAIN	Set for approx. 20 volts
BAND SWITCH	Set for band to be aligned
LIMITER-OFF	OFF
HFO	INT.
AVC	INT. BFO FAST
3.5 MC OSC.	3

Set the receiver and signal generator dials to .56 Mc. The RF GAIN control should be set at maximum and the AVC-MAN switch set on AVC. The HF Osc. L adjustment should now be set for maximum output. Then the Ant., 1st RF and 2nd RF L adjustments should be set for maximum output. The receiver and signal generator dials are now set to 1.3 Mc, and the C adjustments should be adjusted for maximum output in the same order, beginning with the Osc. C adjustment and then making the C adjustments for the Ant., 1st RF and 2nd RF. This procedure should be carefully repeated until no increase in output can be realized.

For the frequencies shown in table 7–3, align the remaining bands using the same procedure as above.

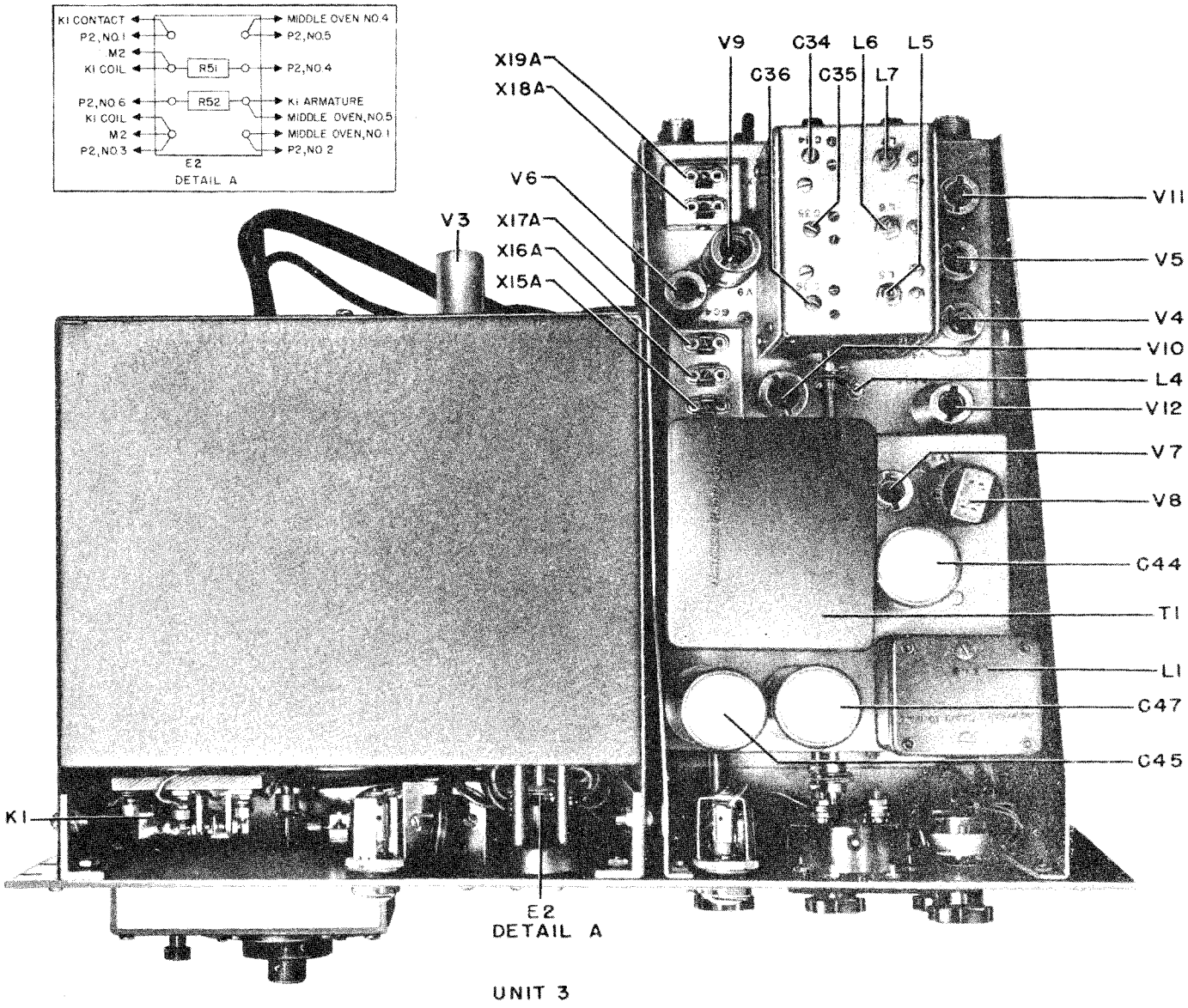


Figure 7–9. Radio Frequency Oscillator O–165/UR, Top View

TABLE 7–3. RF AND HFO ALIGNMENT FREQUENCIES AND ADJUSTMENT DESIGNATIONS

FREQ. BAND IN MEGACYCLES	RF & HF OSC. ADJUST L AT	RF & HF OSC. ADJUST C AT
.54– 1.35	.56	1.3
1.35– 3.45	1.4	3.4
3.45– 7.4	3.75	7.15
7.4 –14.8	7.5	14.5
14.8 –29.7	15.0	29.0
29.7 –54.0	30.0	52.0

(4) EXTERNAL HFO SIGNAL 455 KC ATTENUATOR ADJUSTMENT.—When an external HFO signal is applied to the receiver through EXT HFO jack J6 it may contain some 455 kc signal voltage. To avoid possible troublesome beat notes at the receiver output from this 455 kc signal, it is removed from the input HFO signal by an attenuator network. To adjust this attenuator for maximum impedance at 455 kc the following procedure is used: Feed a 455 kc signal from a signal generator into EXT HFO jack J6 and connect an oscilloscope across resistor R113. (See figure 7–4.) Vary inductor L58 and resistor R112, shown in figure 7–2, until a null point is reached and none of the 455 kc signal appears across resistor R113.

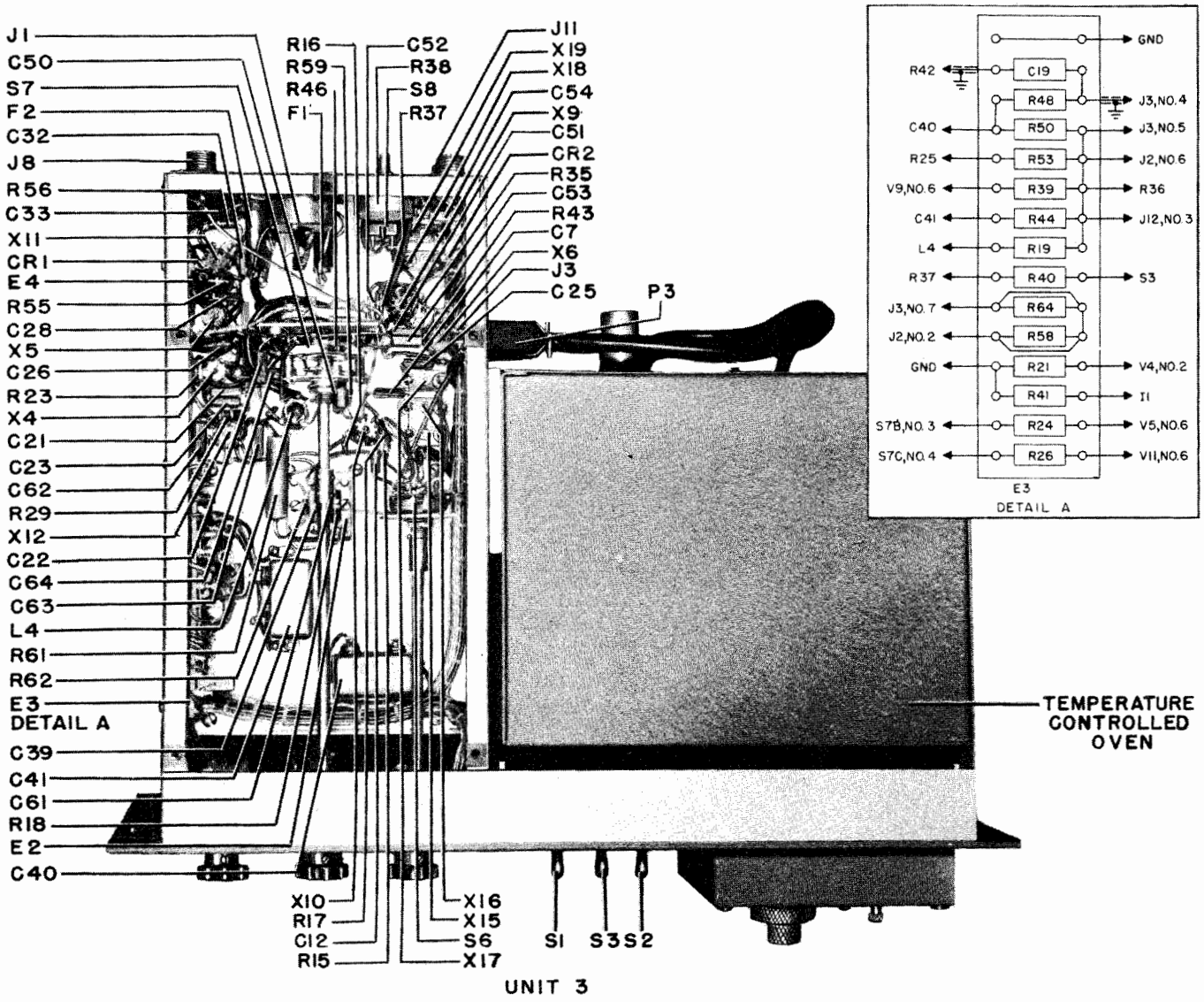


Figure 7–10. Radio Frequency Oscillator O–165/UR, Bottom View

6. ASSEMBLY AND DISASSEMBLY OF RF OSCILLATOR O–165/UR OVEN.

a. GENERAL.—The oscillator and dial assembly of RF Oscillator O–165/UR are comparatively delicate and must be handled carefully. During assembly and disassembly no excess force need be used, since each unit is made to fit together and operate smoothly. While the inductor capacity assembly can be removed from its position in Oscillator O–165/UR, the assembly itself must never be taken apart. If the assembly becomes defective it should be replaced with a new one.

b. DISASSEMBLY.—When it becomes necessary to dismantle the oven, care should be taken to follow the instructions below:

(1) Rotate the oscillator dial to a position between 0000.0 and 10000.0 so that one of the shaft screws on the flexible coupling located between the outside wall of the oven and the counter bevel-gear is accessible. Loosen the coupler set-screw on the side closest to the oven. Rotate the oscillator dial to make the other set-screw, 90° from the first one, accessible.

Lock the oscillator with the dial lock, then loosen the coupling set-screw. This operation can easily be performed from the bottom of Oscillator O–165/UR.

CAUTION

After the second coupling set screw is loosened, neither the oscillator dial nor the variable condenser shaft must be turned.

(2) Disconnect the oven connector P3 and P4 at the rear of oven. Remove the rear cover and celotex

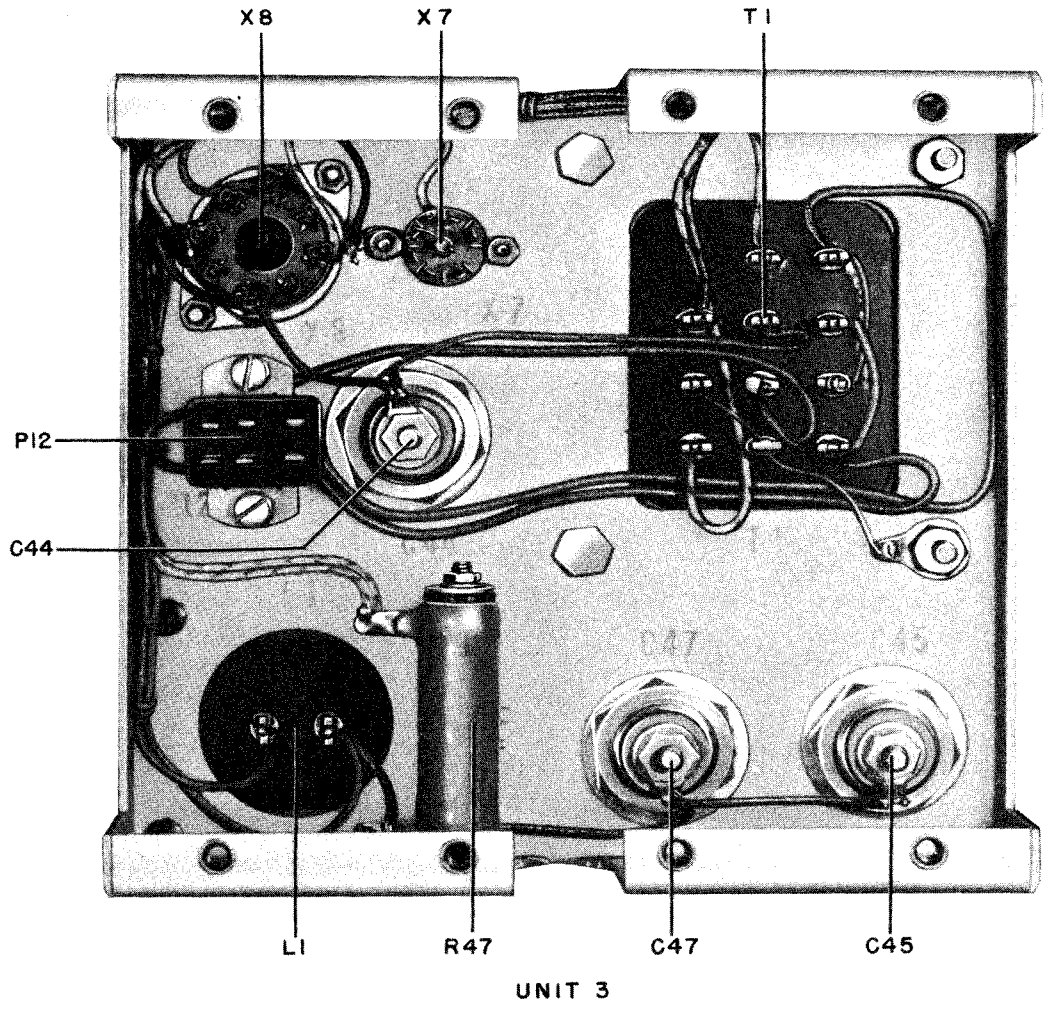


Figure 7–11. Radio Frequency Oscillator O–165/UR, Power Supply, Bottom View

insulation from the oven.

Remove oven mounting screws near the edges of the nickel plated middle oven rear cover, then gently draw out entire oven assembly.

CAUTION

Do not rotate the tuning condenser shaft.

(3) Remove the four screws at the top of the inner oven shield, then remove the four screws at the bottom of the shield. Gently remove the oven shield.

(4) To inspect the inductors L2 and L3, remove the three screws on the top and three on the front of the small shield box attached to the condenser.

The inductor-capacity assembly may be easily removed by first unsoldering the tube cathode and grid connections from the ends of the bakelite feed-through connectors, unsoldering the trimmer condenser C22 lead and removing the three counter-sunk screws from the bottom of the oscillator assembly. The assembly may be pulled out and moved to one side to the extent allowed by the inductor heater leads, terminated at the resistor terminal board.

c. ASSEMBLY.—The Oscillator O–165/UR oven may be reassembled by following the directions below:

(1) Install inductor capacity assembly by first inserting the three mounting screws at the bottom of the assembly. Resolder the cathode, grid, and trimmer condenser leads.

(2) Install the inductor shield cover by inserting the six cover screws.

(3) Place oven shield in position and insert the four top and four bottom mounting screws.

(4) Carefully insert oven assembly into the middle oven, so that the tuning condenser shaft slips into the shaft coupling.

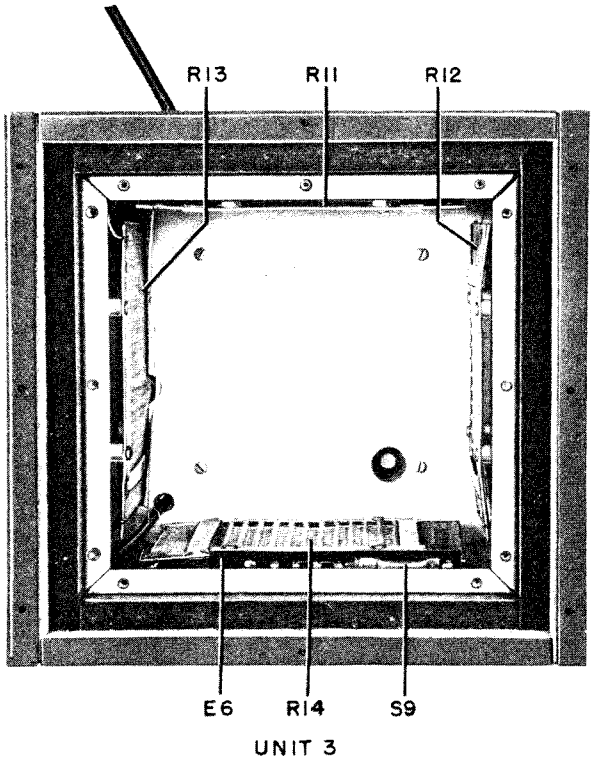


Figure 7–12. Radio Frequency Oscillator O–165/UR, Middle Oven

(5) Insert all rear middle oven mounting screws.

(6) Tighten the shaft coupling set-screw that is accessible, while keeping oscillator dial locked.

(7) Loosen the oscillator dial lock, rotate the other set-screw into accessible position, and tighten set-screw.

(8) Replace rear celotex and cover plate.

(9) Insert oven connectors in place.

d. REPOSITIONING OF VARIABLE CAPACITOR.—In case the relative position of the tuning capacitor and the dial is changed, either by accident or by necessity, it is important that prior to assembly, the position of the variable capacitor and dial be fixed properly.

Accordingly, close the variable capacitor so that the tip of the rotor plates are 1/16″ above the tip of the stator plates. Rotate the oscillator dial to 0000.0 and lock it into position with the dial lock. Insert the oscillator assembly into the oven and install middle oven rear mounting screws.

Tighten the shaft coupling screw, which is in accessible position. The shaft coupling screw is accessible at the bottom of the equipment, between the oven front and the front panel bottom brace. Loosen the dial lock, rotate the other coupling set-screw into accessible position, then tighten it. The rear insulation cover plate and connectors may then be attached and the equipment is ready to be put into service.

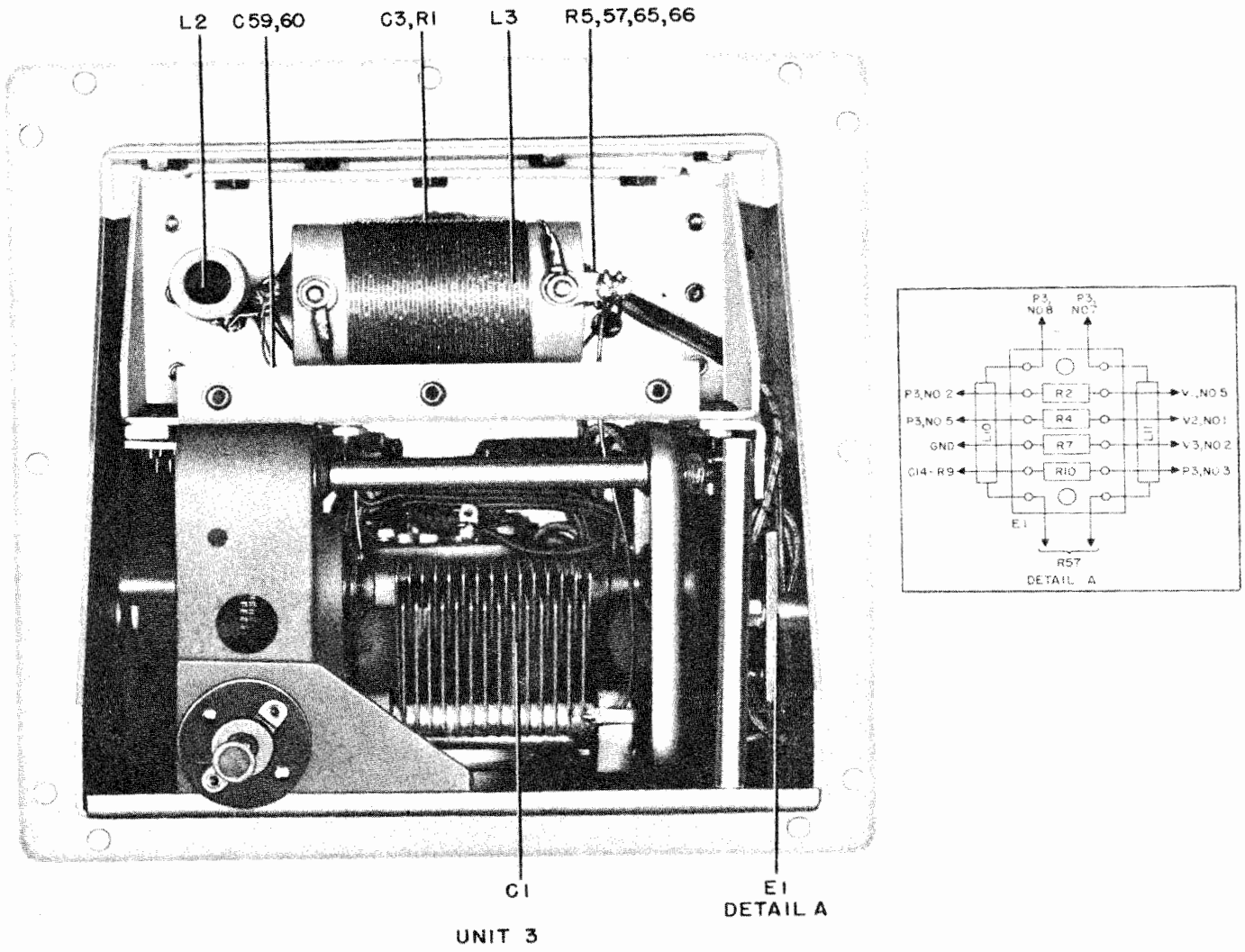


Figure 7–13. Radio Frequency Oscillator O–165/UR, Inner Oven, Covers Removed

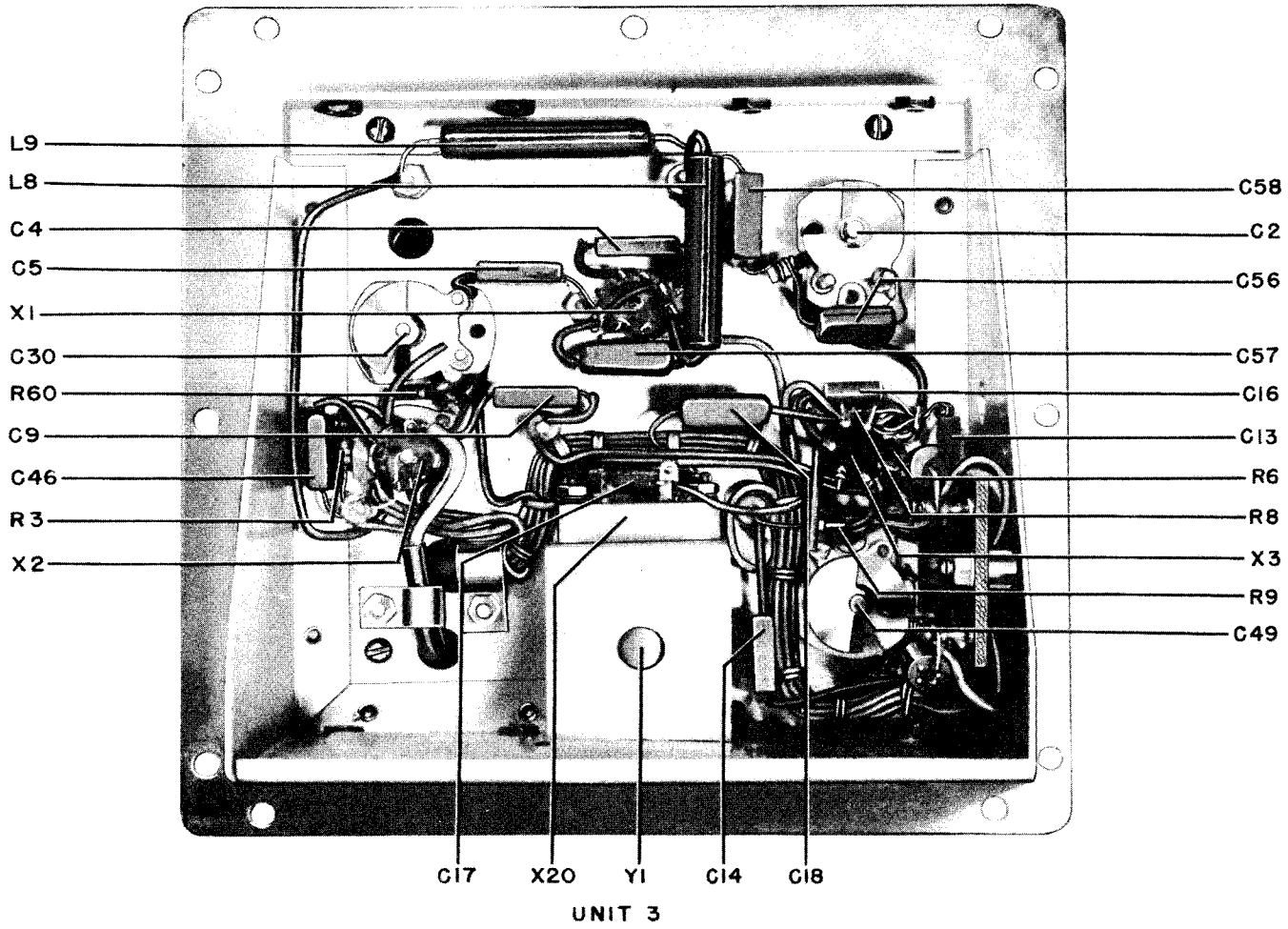


Figure 7-14. Radio Frequency Oscillator O-165/UR, Inner Oven, Tuning Unit Removed

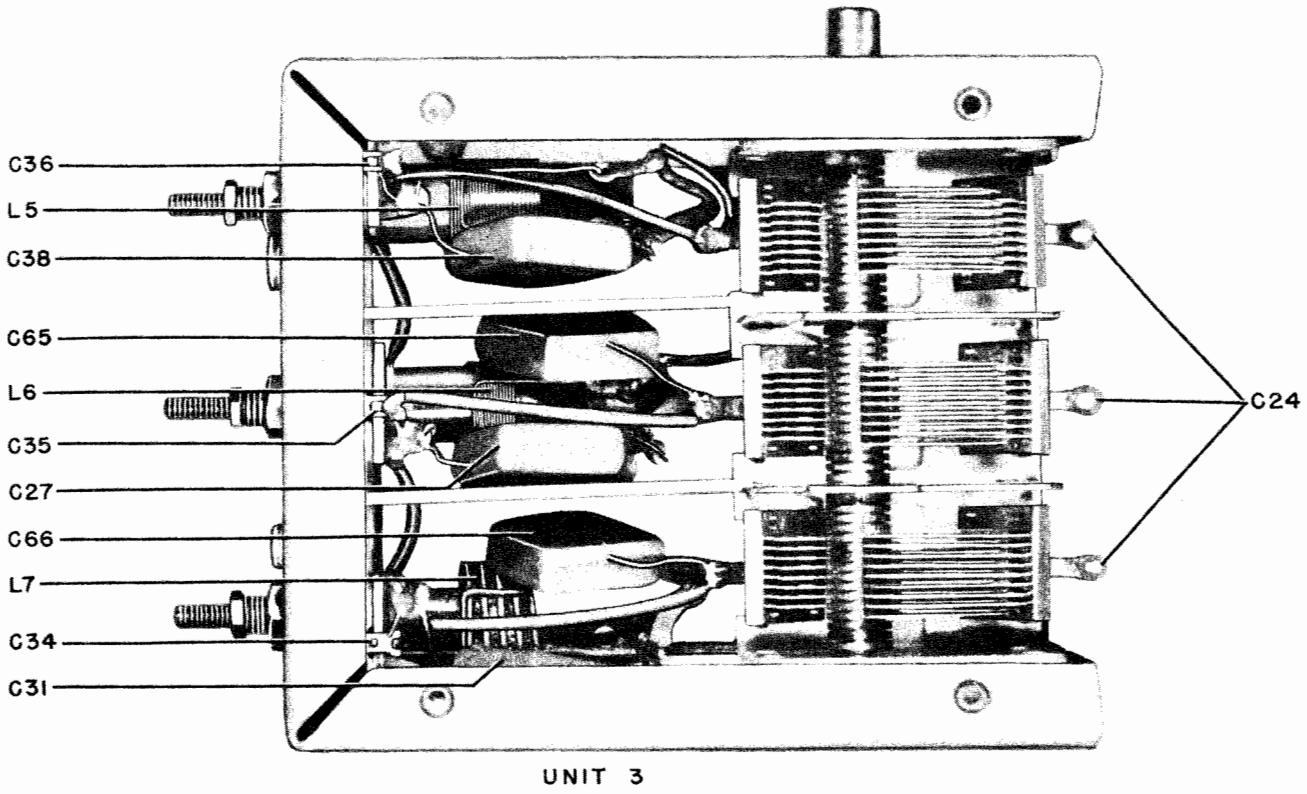


Figure 7–15. Radio Frequency Oscillator O–165/UR, Multiplier Tuning Assembly, Right Side

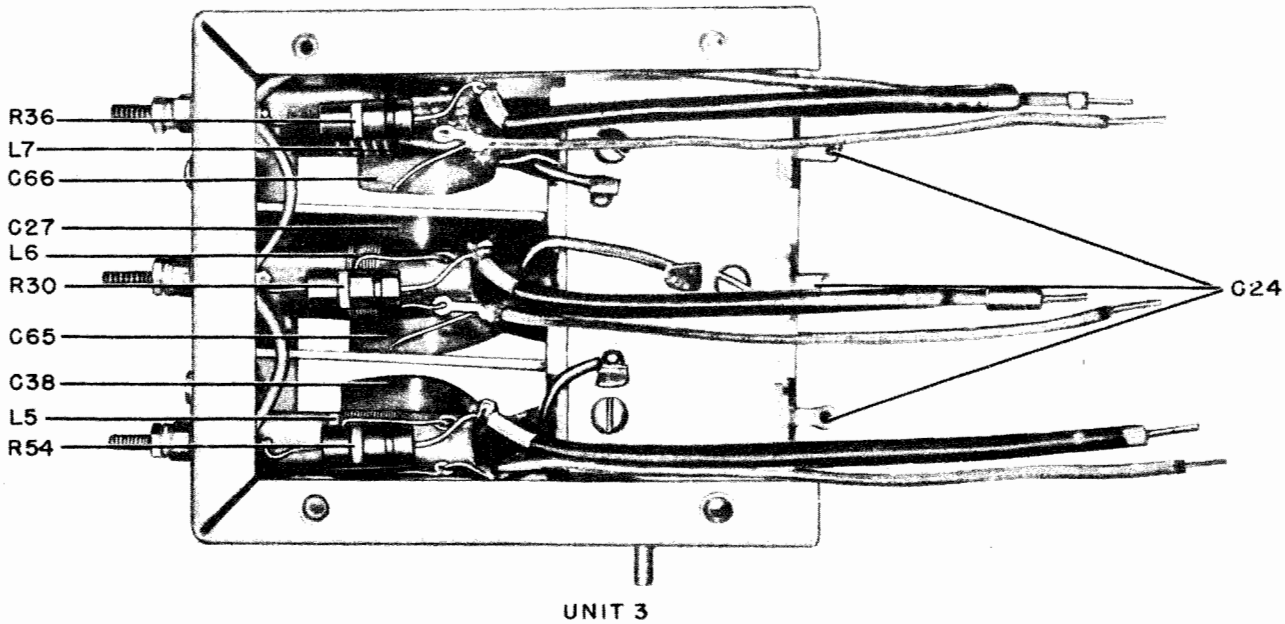
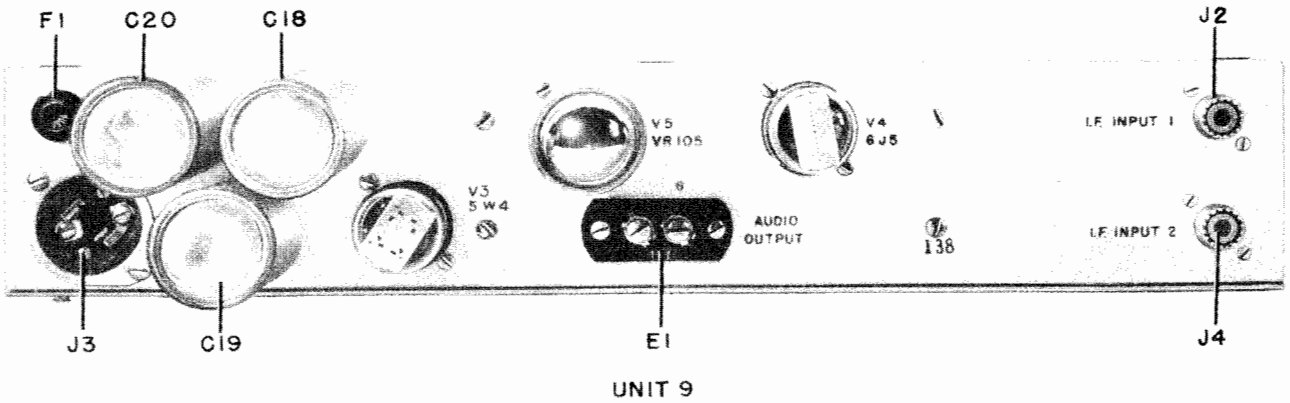
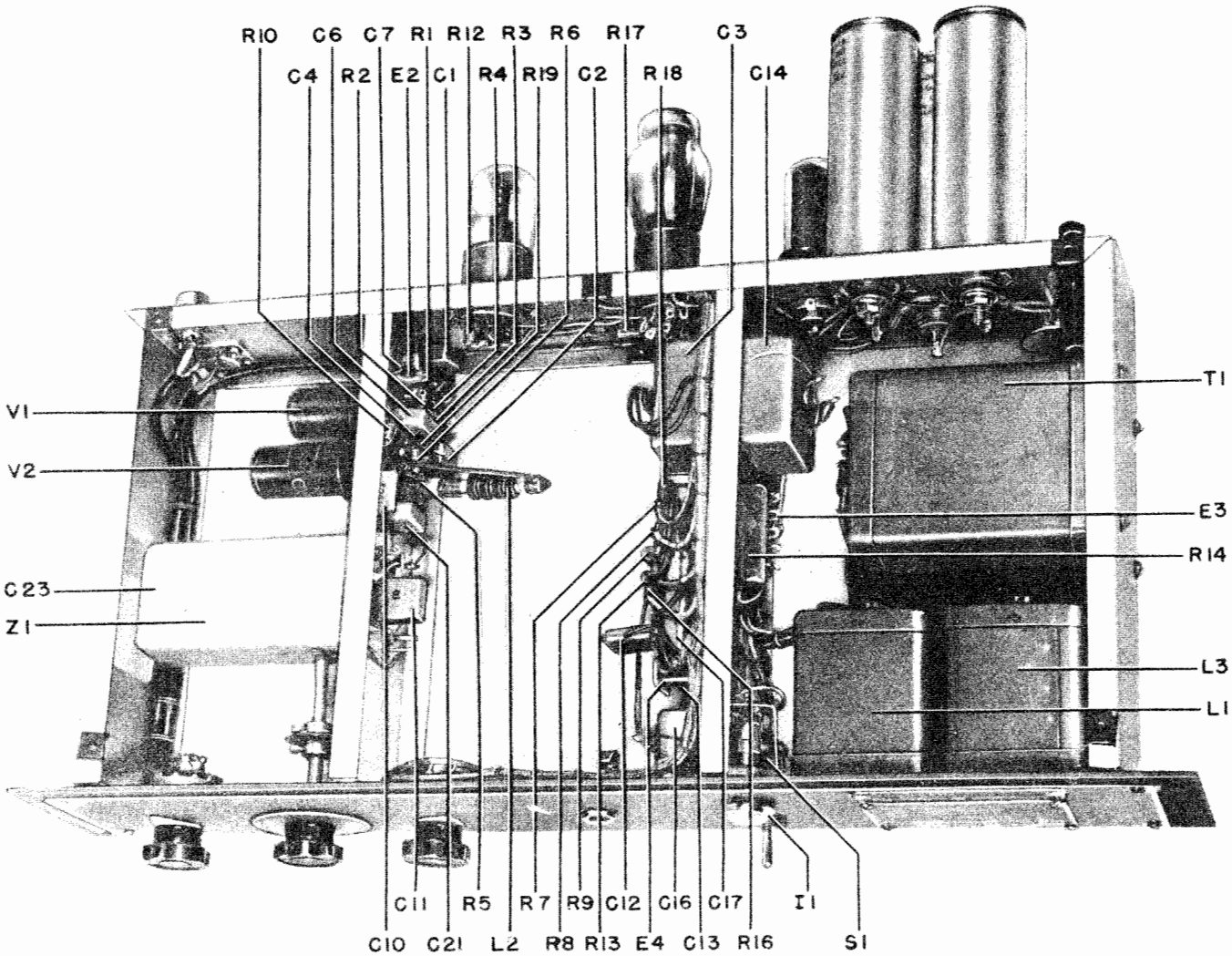


Figure 7–16. Radio Frequency Oscillator O–165/UR, Multiplier Tuning Assembly, Left Side



UNIT 9

Figure 7–17. Amplifier-Detector AM–615/UR, Rear View



UNIT 9

Figure 7–18. Amplifier-Detector AM–615/UR, Top View

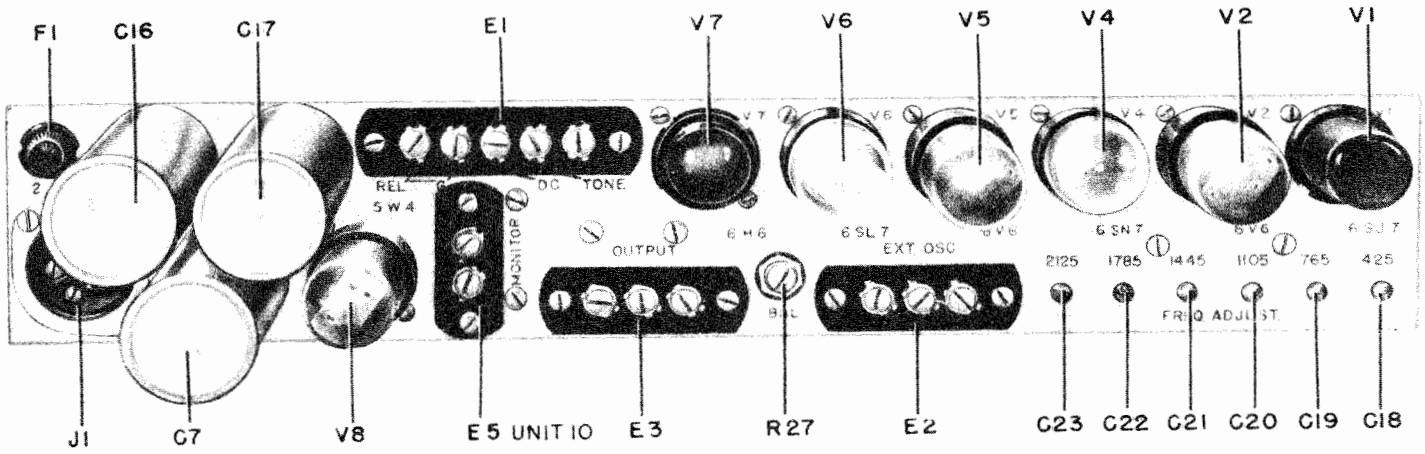


Figure 7–19. Keyer KY–79/UR, Rear View

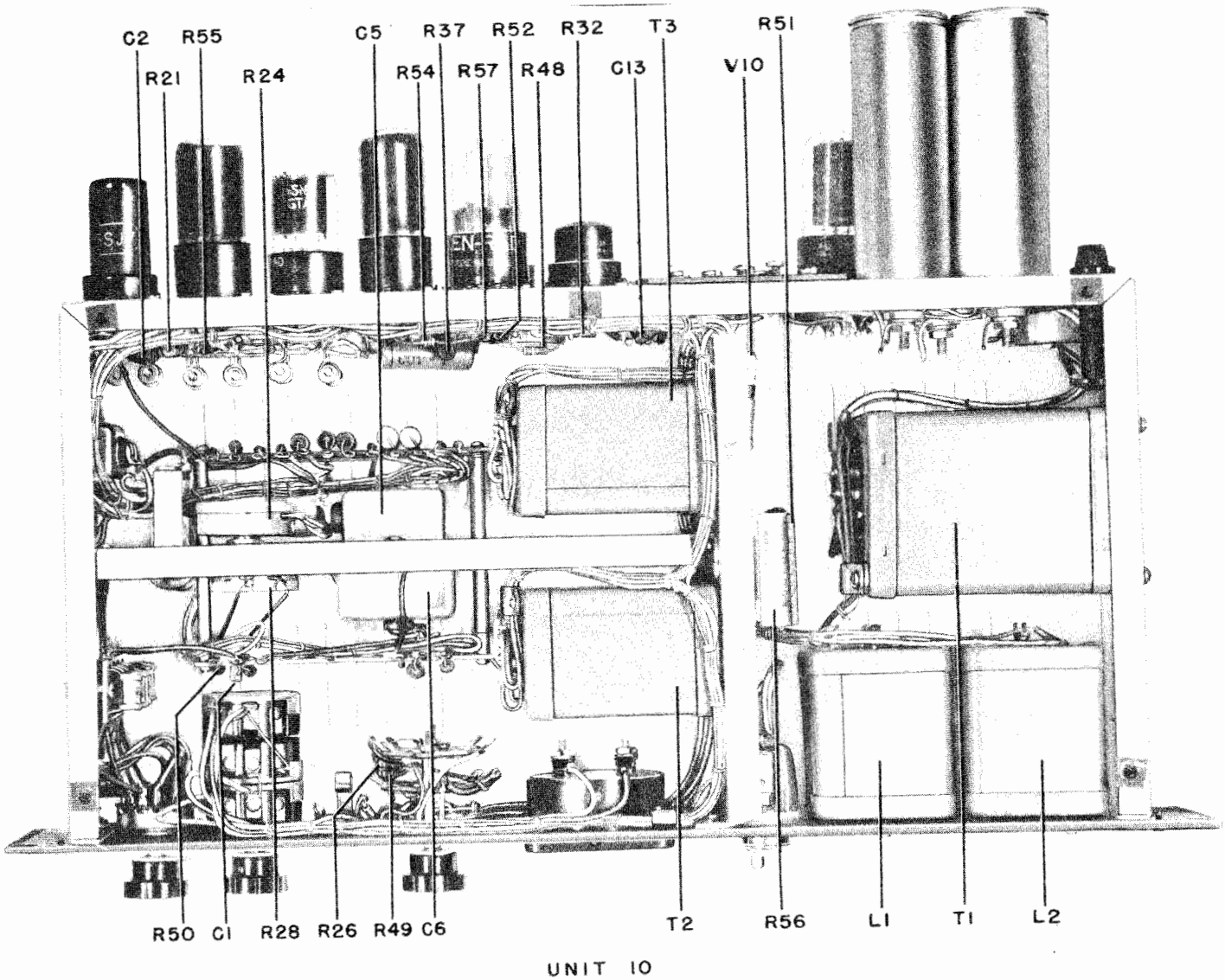


Figure 7–20. Keyer KY–79/UR, Top View

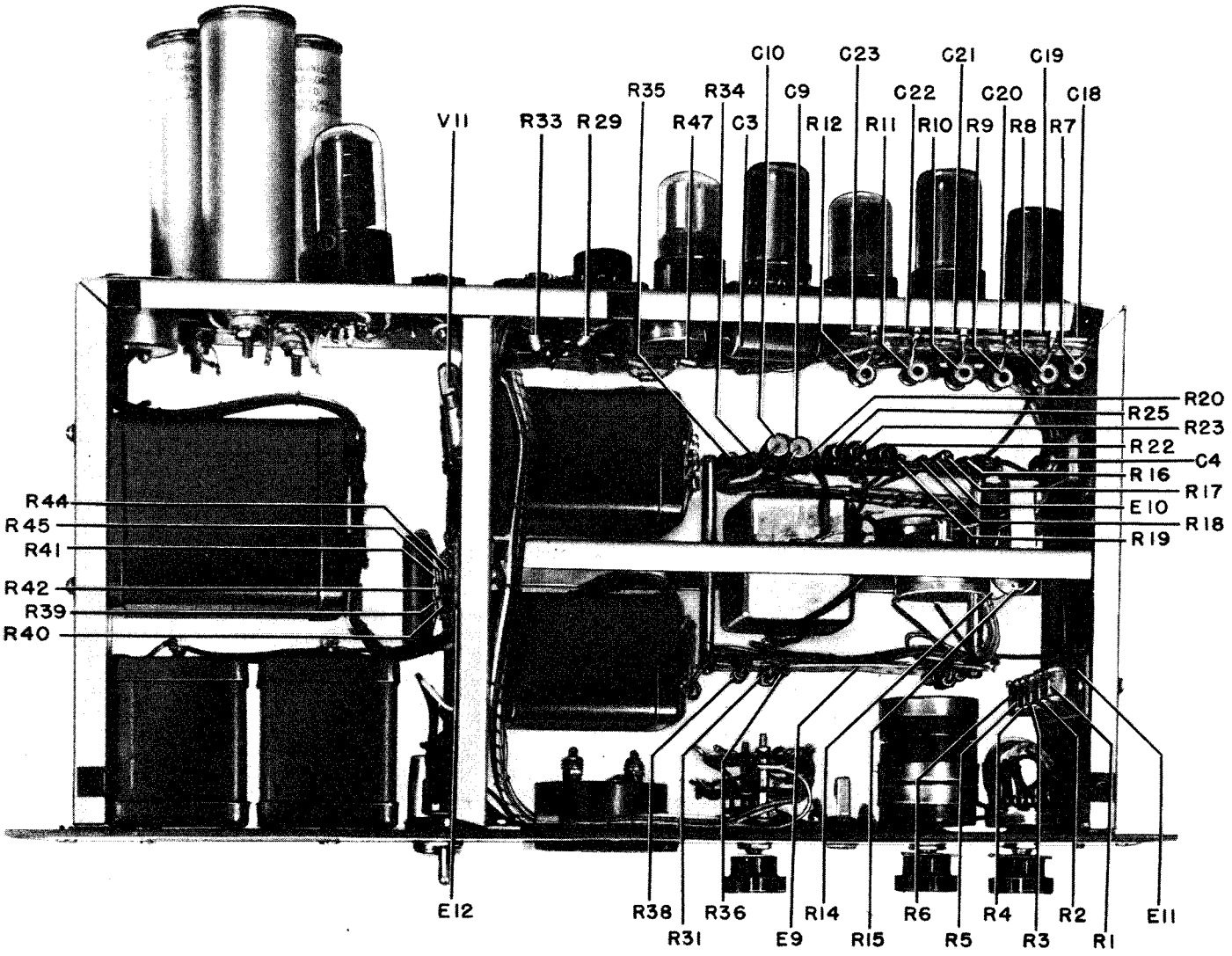


Figure 7-21. Keyer KY-79/UR, Bottom View

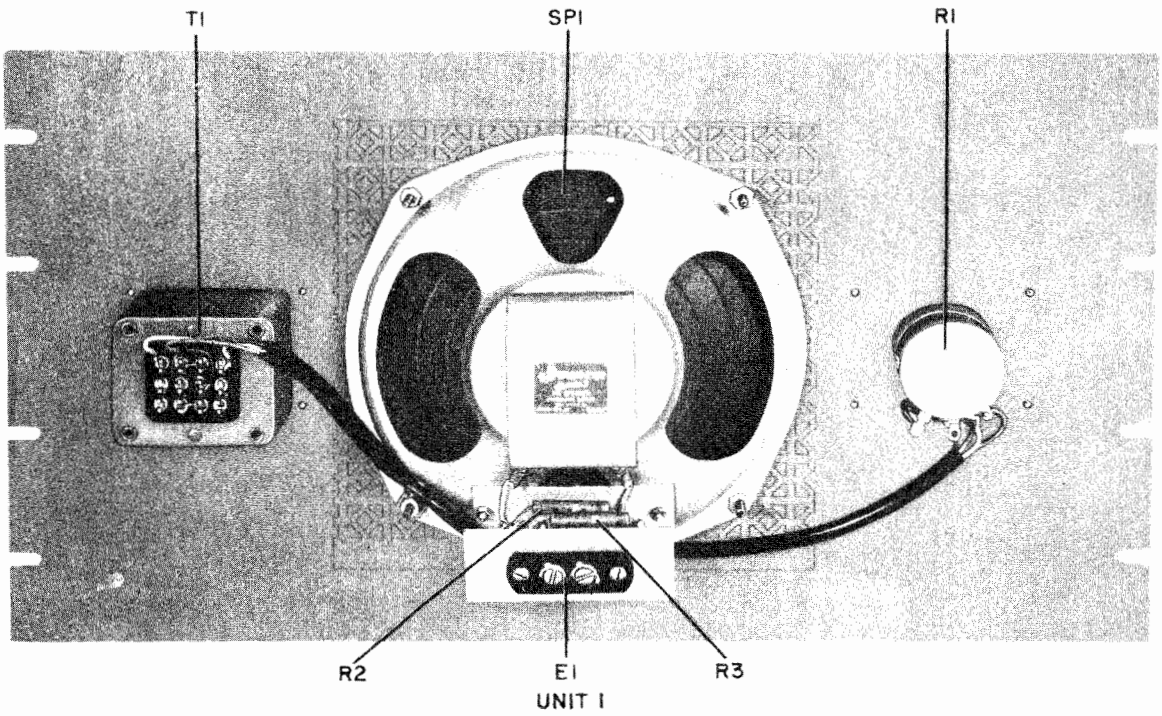
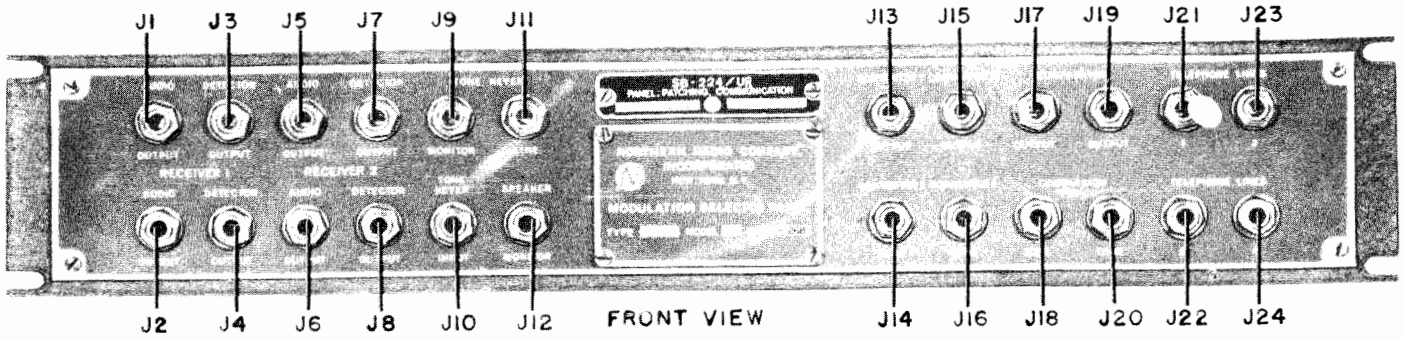
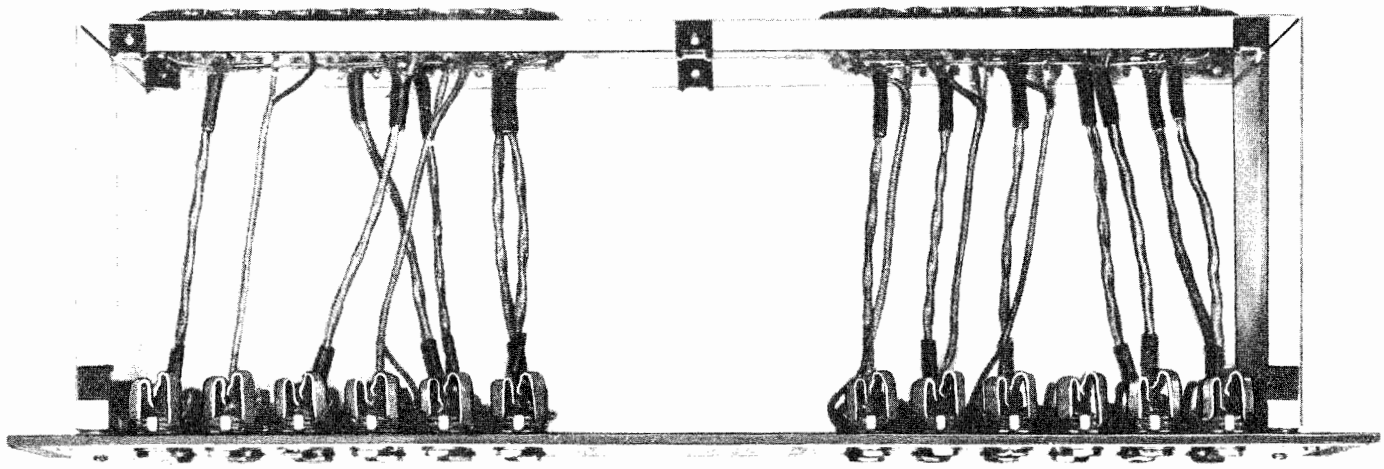


Figure 7–22. Loudspeaker LS–187/UR, Rear View





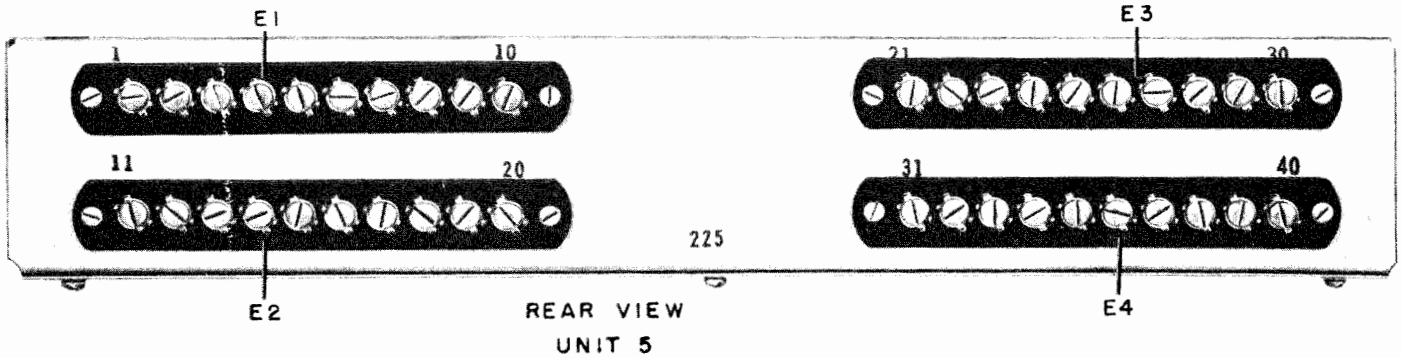


Figure 7–23. Communication Patching Panel SB–224/UR, Front, Top, and Rear Views

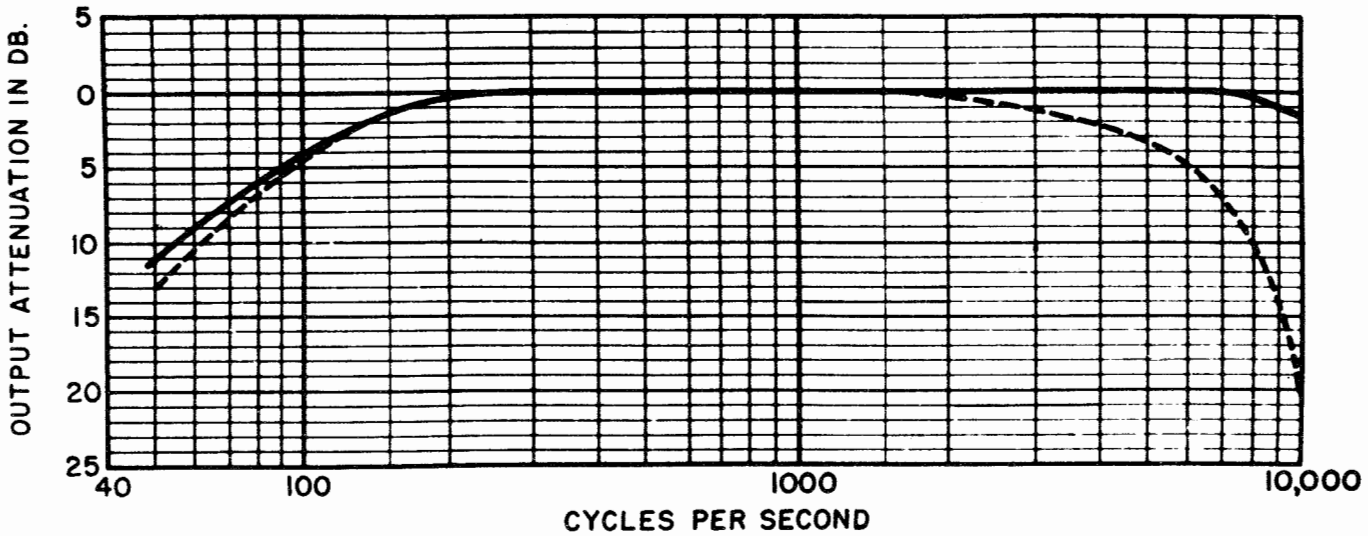


Figure 7–24. Receiver R–450/FRR–28, Frequency Response Curves

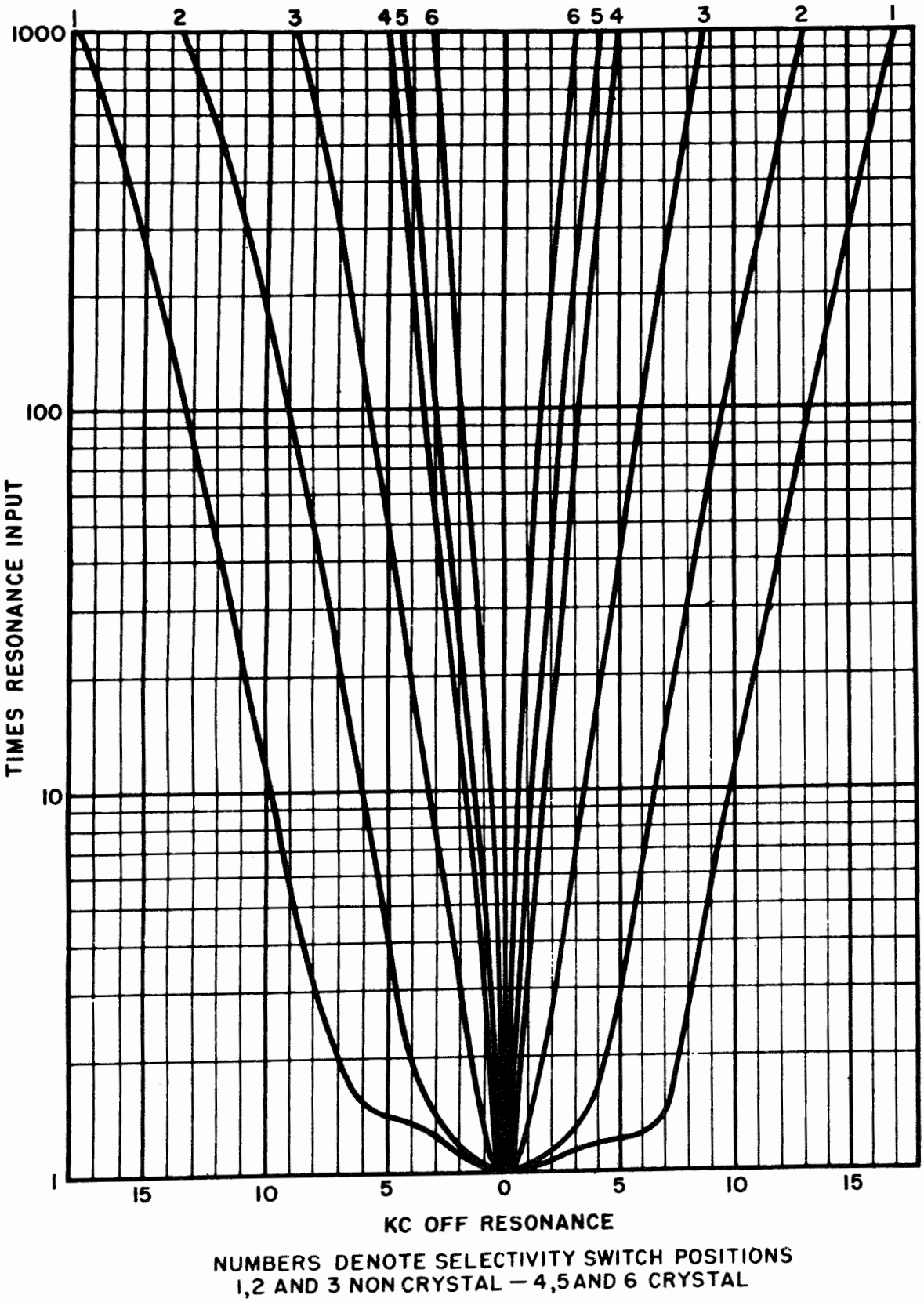
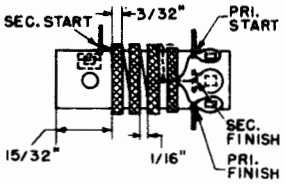
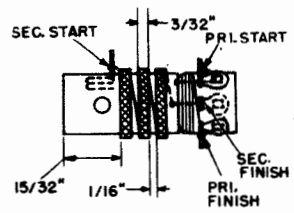
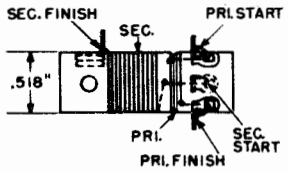
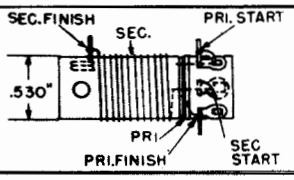
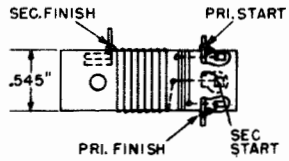
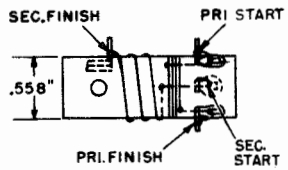
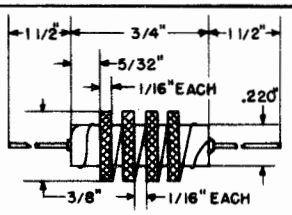
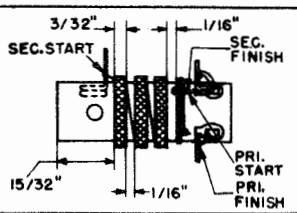


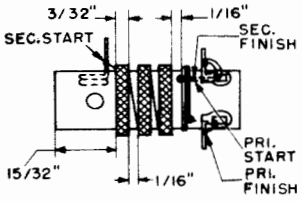
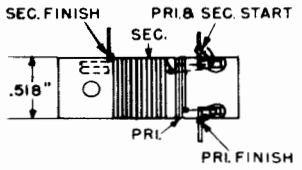
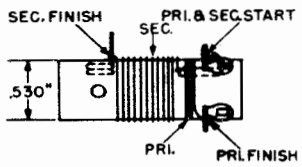
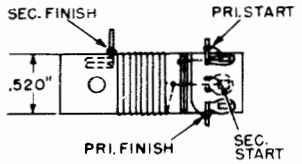
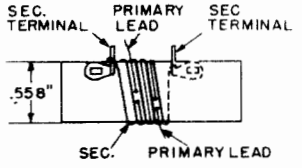
Figure 7–25. Receiver R–450/FRR–28, Overall Selectivity at 2 Megacycles

TABLE 7-4. WINDING DATA

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L2-1	HMM 31245		Primary: single pie Secondary: 3 pies	No. 36 AWG SSE No. 36 AWG SSE	23 50/pie			Primary inductance: 11 μ h. Primary Q = 30 at 2.26 Mc. Secondary inductance: 237 μ h. Secondary Q = 45 at 505 Kc
L2-2	HMM 31249		Primary: single layer Secondary: 3 pies	No. 34 AWG DSC 15/44 SSE Litz	10-1/4 23/pie			Primary close wound. Secondary inductance: 36 μ h. Secondary Q = 90 at 1280 kc.
L2-3	HMM 31252		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 28 AWG E	5-1/4 56			Primary: close wound. Primary and secondary wound in clockwise direction.
L2-4	HMM 31255		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 22 AWG Bare tinned copper	4-1/4 11 5/6			Primary close wound. Primary and secondary wound in clockwise direction.
L2-5	HMM 31258		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 20 AWG Bare tinned copper	3-1/4 7-5/6			Primary close wound. Primary and secondary wound in clockwise direction.
L2-6	HMM 31261		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 20 AWG Bare tinned copper	2-1/4 2-5/6			Primary close wound. Primary and secondary wound in clockwise direction.
L2-7	ARTD 15612		4 pie universal	No. 36 AWG SSE	60/pie			Inductance: total coil 192 μ h.
L2-8	HMM 31246		Primary: single layer Secondary: 3 pies	No. 34 AWG DSC No. 36 AWG SSE	4-1/4 50/pie			Primary close wound. Secondary inductance: 237 μ h. Secondary Q = 45 at 505 kc.

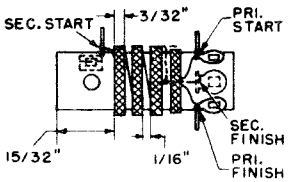
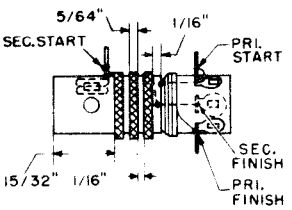
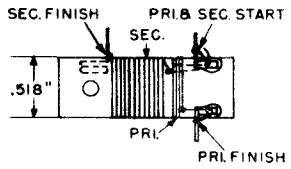
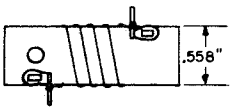
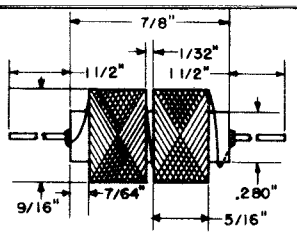
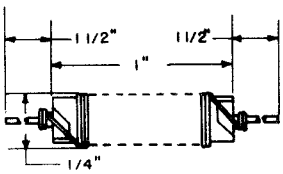
Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE	REMARKS
L2-9	HMM 31250		Primary: single layer Secondary: 3 pies	No. 34 AWG DSC 15/44 SSE Litz	3-1/4 23/pie			Primary close wound. Secondary inductance: 36 μ h. Secondary Q = 90 at 1280 kc.
L2-10	HMM 31253		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 28 AWG E	3-1/4 25-5/24			Primary close wound. Primary and secondary wound in clockwise direction.
L2-11	HMM 31256		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 22 AWG Bare tinned copper	2-1/4 12-5/24			Primary close wound. Primary and secondary wound in clockwise direction.
L2-12	HMM 31259		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 22 AWG Bare tinned copper	6-1/4 9-5/6			Primary close wound. Primary and secondary wound in clockwise direction.
L2-13	HMM 31262		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 20 AWG Bare tinned copper	2-1/12 4-2/3			Primary turns interwound between secondary turns.
L2-14 (Same as L2-7)								
L2-15 (Same as L2-8)								
L2-16 (Same as L2-9)								
L2-17 (Same as L2-10)								
L2-18 (Same as L2-11)								
L2-19 (Same as L2-12)								
L2-20 (Same as L2-13)								

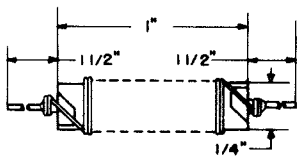
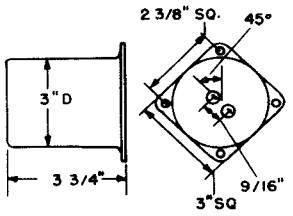
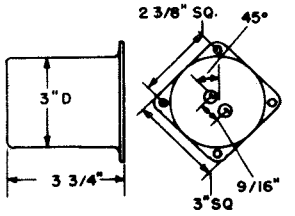
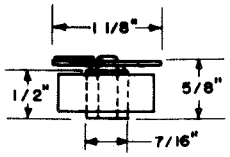
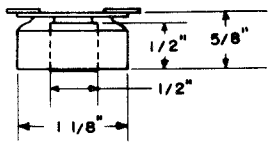
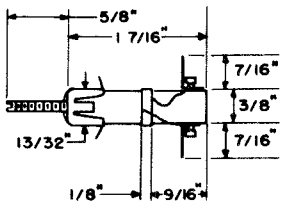
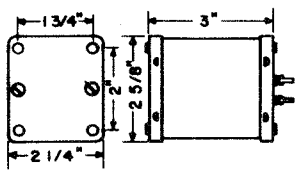
Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L2-25	HMM 31244		Primary: single pie Secondary: 3 pies	No. 36 AWG SSE No. 36 AWG SSE	18 36/pie			Primary inductance: 8 μ h. Primary Q= 35 at 2760 kc Secondary inductance: 128 μ h. Secondary Q = 45 at 710 kc.
L2-26	HMM 31248		Primary: single layer Secondary: 3 pies	No. 34 AWG E 15/44 SSE Litz	16-1/4 18/pie			Primary close wound. Secondary inductance: 26 μ h. Secondary Q = 82 at 1480 kc.
L2-27	HMM 31251		Primary: single layer Secondary: single layer	No. 34 AWG DSC No. 28 AWG E	5-1/4 23-5/24			Primary close wound. Primary and secondary wound in clockwise direction.
L2-28	HMM 31254		Single layer	No. 24 AWG Bare tinned copper	17-5/6			Wound in clockwise direction.
L2-29	HMM 31257		Single layer	No. 20 AWG Bare tinned copper	8-5/6			Wound in clockwise direction.
L2-30	HMM 31260		Single layer	No. 20 AWG Bare tinned copper	4-2/3			Wound in clockwise direction.
L2-35 (Same as L2-7)								
L2-47	ARTD 15616		2 pie universal	No. 36 AWG SSE	493/pie			Q = 45 at 200 kc.
L2-48	JFE 15611		Single layer	No. 34 AWG E	110	2		Inductance = 22 μ h. close wound.

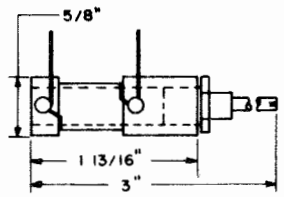
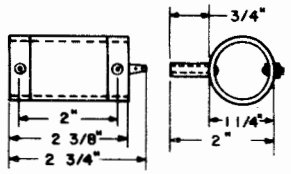
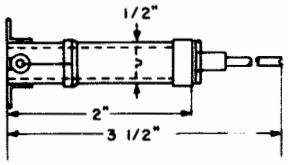
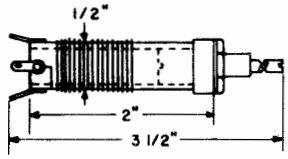
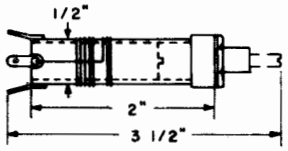
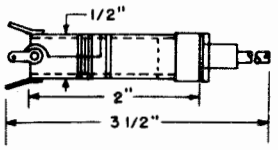
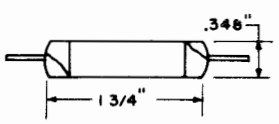
Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE	REMARKS
L2-49	ARTD 15613		Single layer	No. 35 AWG E	117	2.7		Inductance = 26 μ h. close wound.
L2-50 (Same as L2-49)								
L2-51	UNT 31030					150		Inductance: 8.5 h at 60 cps. Current rating: 150 ma.
L2-52	UNT 31031					354		Inductance: 20 h at 60 cps. Current rating: 115 ma.
L2-54	MLR 958		Pie duo-lateral	No. 36 AWG SCCE	1,560	130		Inductance: 50 mh at 1,000 cycles. Current rating: 100 ma.
L2-55	MLR 694		Pie duo-lateral	No. 36 AWG SNCE	2,430	230		Inductance: 80 mh at 1,000 cycles. Current rating: 100 ma.
L2-58	NRCO A159118		Pie universal	No. 40 AWG SCC	37	2.3		Inductance: 21 to 51 mh at 2.5 mc. Adjustable iron core.
L3-1	FTC 14800 per NRCO spec. 108		Single layer	No. 31 AWG PE	2,820	160		Inductance: 7 henries. Current rating: 110 ma. RMS test voltage: 1,500. Varnish impregnated, pitch filled.

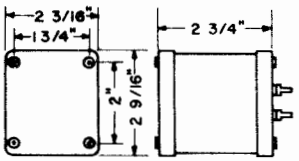
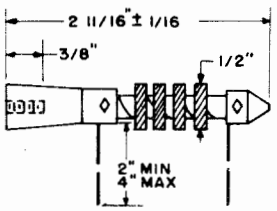
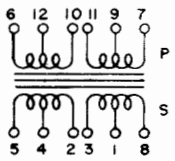
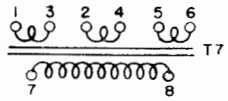
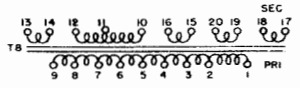
Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L3-2	NRCO AD5A41		Single layer	No. 24 AWG E	14	0.045		Inductance: 1.72 μ h to 3.2 μ h at 7.9 Mc. Adjustable iron core.
L3-3	NRCO AD5A43		Single layer	No. 22 AWG	38	0.22		Inductance: 27.5 μ h at 2.5 Mc.
L3-4	NRCO AD5A36		Primary: universal Secondary: single layer	7/41 Litz No. 28 AWG	30 4	0.88 0.18		Primary inductance: 26 μ h at 2.5 Mc. Secondary inductance: not critical. Frequency range: 2 to 4 Mc. Adjustable iron core.
L3-5	NRCO AD5A37		Primary: single layer Secondary: single layer	No. 36 AWG No. 36 AWG	20 3-1/4	0.2 0.05		Primary inductance: 6.5 μ h at 7.9 Mc. Secondary inductance: not critical. Frequency range: 4 to 8 Mc. Adjustable iron core.
L3-6	NRCO AD5A38		Primary: single layer Secondary: single layer	No. 28 AWG No. 28 AWG	8-1/4 2-1/4	0.10 0.04		Primary inductance: 1.6 μ h at 7.9 Mc. Secondary inductance: not critical. Frequency range 8 to 16Mc. Adjustable iron core.
L3-7	NRCO AD5A39		Primary: single layer Secondary: single layer	No. 20 AWG No. 20 AWG	5-1/4 1-1/4	0.02 0.015		Primary inductance: 0.4 μ h at 2.5 Mc. Secondary inductance: not critical. Frequency range: 16 to 32 Mc. Adjustable iron core.
L3-8	NRCO A110482 per Spec. 183		Single	No. 30 AWG E	133			Resistor and coil type parasitic suppressor. AC volts: 6.3 Amp. 0.15 Inductance: 30 mh. Resistor: 100,000 ohm, 2W.
L3-9 (Same as L3-8)								
L3-10 (Same as L3-8)								

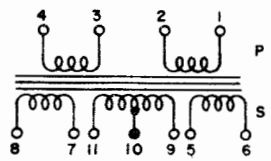
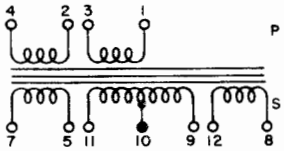
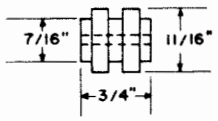
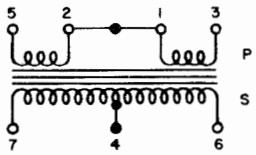
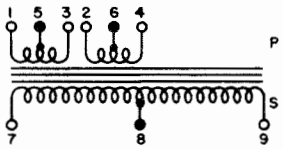
Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE	REMARKS
L9-1	FTC 14801 per NRCO spec. 11?		Layer	No. 33 AWG PE	3,210	250		Inductance: 10 henries. Current rating: 75 ma. RMS test voltage: 1,500 V. Varnish impregnated, pitch filled.
L9-2	NAC R100 U		4 pie universal	No. 36 AWG SNCE	878	44 ± 15%		Inductance: 2.5 mh at 1,000 cycles. Current rating: 100 ma.
L9-3 (Same as L9-1)								
L10-1 (Same as L9-1)								
L10-2 (Same as L9-1)								
T1 1	FTC 14803 per NRCO spec. 191		Primary Secondary	No. 34 AWG PE No. 26 AWG PE	924 320	68 3		Primary impedance: 500/333/250/200/125/50 ohms. Secondary impedance: 60/38/30/22/15/10/5.5/2.5 ohms. RMS test voltage: 500 V. Wax impregnated, pitch filled.
T2 7	UNT 31086-2							Primary impedance: 10,000 ohms. Primary current rating: 40 ma. Secondary impedance: 8,000 ohms tapped at 600 ohms. Secondary current rating: 60 ma. Turns ratio: 3:1. Electrostatic shield. Oil filled.
T2-8	UNT 31029-2							Input: 95/105/117/130/190/210/234/260 v AC. Output: Secondary No. 1; 5.0 v. Secondary No. 2; 6.0v CT. Secondary No. 3; 6.3v Secondary 4 & 5; 7.5 v. Oil impregnated

Note: For Manufacturers Designation Symbols see Table 8-7.

TABLE 7-4. WINDING DATA (Continued)

DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE RATIO	REMARKS
T8-1	FTC 18287 per NRCO spec. 181		Primary: No. 1 Primary: No. 2 Secondary: No. 1 Secondary: No. 2 Secondary: No. 3	No. 23 AWG PE No. 23 AWG PE No. 30 AWG PE 2 No. 20 AWG PE 2 No. 18 AWG PE	230 230 1550 tap at 775 11 14			Input: 110/220 v AC, 50/60 cycles, single phase. Output: Secondary No. 1; 700 v CT, 120 ma. Secondary No. 2; 5V, 3 amp. Secondary No. 3; 6.3V, 3 amp. Insulation: Varnish impregnated, pitch filled.
T9-1	FTC 14798 per NRCO spec. 109		Primary: No. 1 Secondary: No. 1 Secondary: No. 2 Secondary: No. 3	No. 29 AWG PE No. 36 AWG PE No. 20 AWG PE No. 20 AWG PE	453 2770 tap at 1385 22 28 tap at 14			Input: 110/220 v AC, 50/60 cycles, single phase. Output: Secondary No. 1; 590 v CT, 50 ma. Secondary No. 2; 5V, 2 amp. Secondary No. 3; 6.3V, 2 amp. Insulation: Varnish impregnated, pitch filled.
T9-2	NRCO A111114		Primary: Pie universal Secondary: Pie universal	7/41 Litz 7/41 Litz	86 57	2.4 1.5		Primary inductance: 0.122 mh at 7.9 kc. Secondary inductance: 0.056 mh at 2.5 Mc.
T10-1 (Same as T9-1)								
T10-2	FTC 14797 per NRCO spec. 111		Primary Secondary	No. 40 AWG PE No. 34 AWG PE	5860 tap at 2930 922 tap at 461	1300 60		Primary impedance: 20,000 ohms. Secondary impedance: 600 ohms CT. RMS test voltage: 500 V. Wax impregnated, pitch filled.
T10-3	FTC 14795 per NRCO spec. 110		Primary Secondary	No. 36 AWG PE No. 42 AWG PE	1060 16,400 tap at 8200	1.25 7000		Primary impedance: 500/333/250/200/125/50 ohms. Secondary impedance: 120,000 ohms CT. RMS test voltage: 500 V. Wax impregnated, pitch filled.

Note: For Manufacturers Designation Symbols see Table 8-7.

NAVSHIPS 91582
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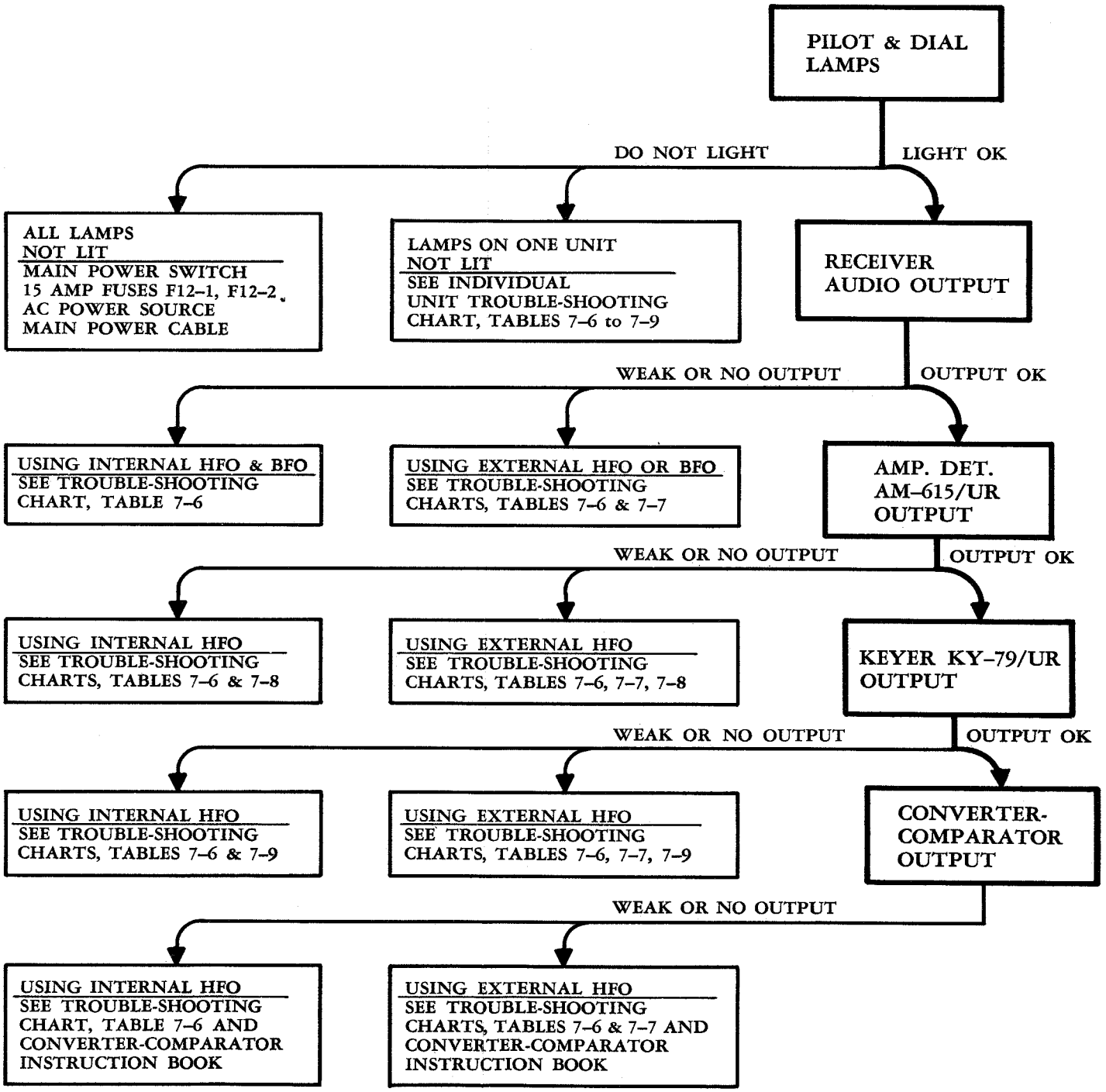


Table 7–5. Overall Trouble-Shooting Chart

NAVSHIPS 91582
AN/FRR–28

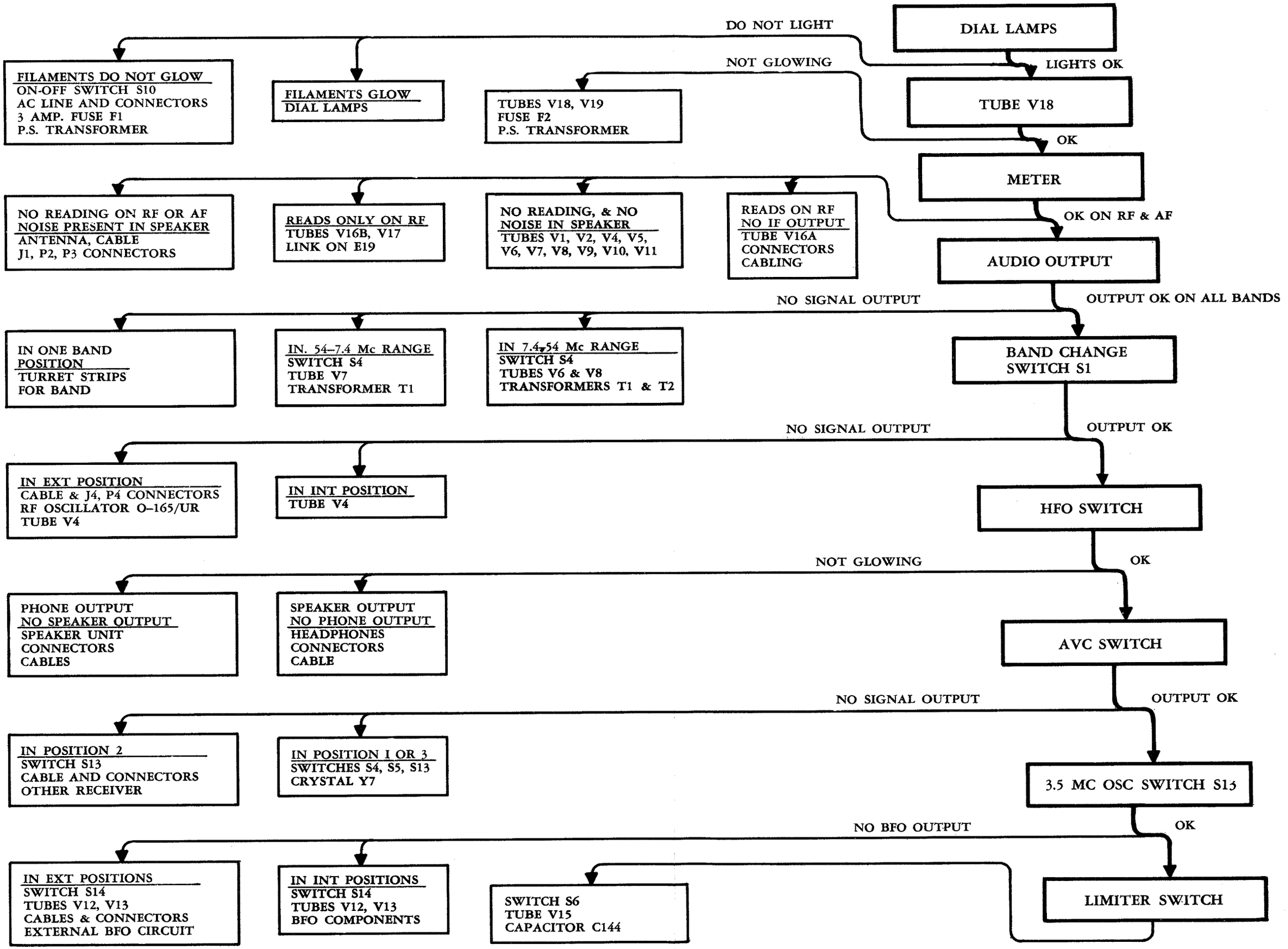


Table 7–6. Receiver R–450/FRR–28 Trouble-Shooting Chart

NAVSHIPS 91582
AN/FRR–28

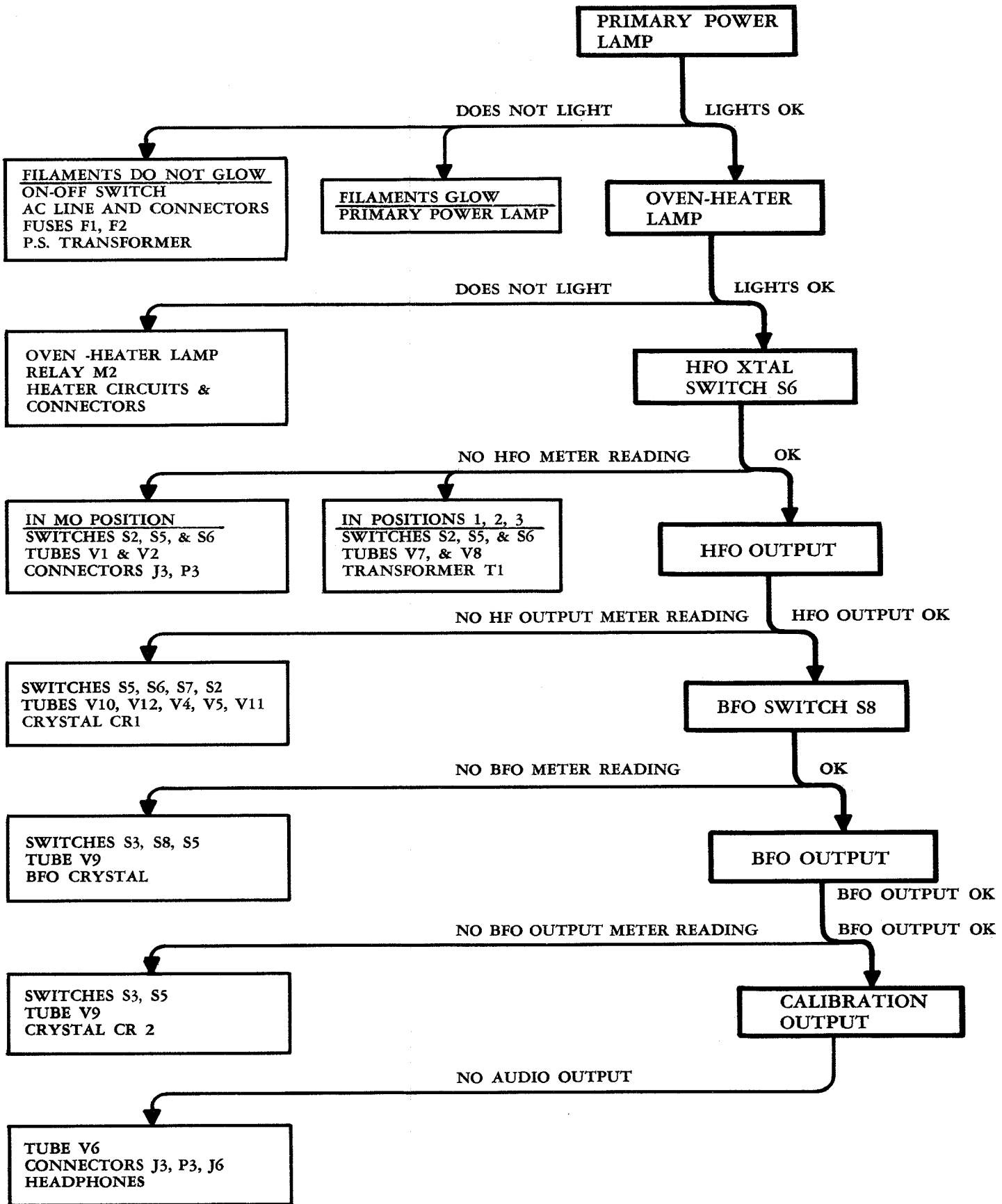
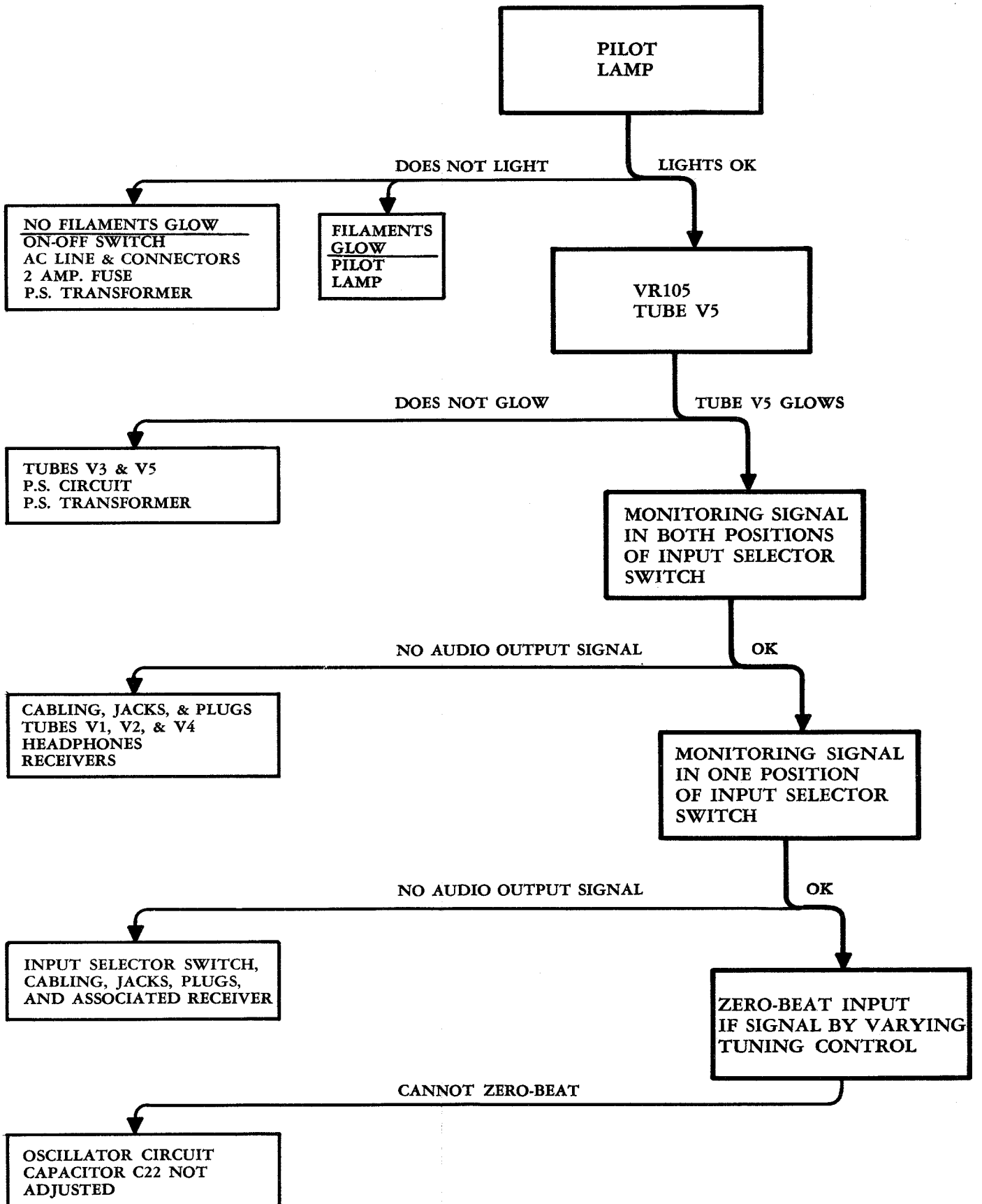


Table 7–7. RF Oscillator O–165/UR Trouble-Shooting Chart

NAVSHIPS 91582
AN/FRR–28



Trouble 7–8. Amplifier-Detector AM–615/UR Trouble-Shooting Chart

NAVSHIPS 91582
AN/FRR-28

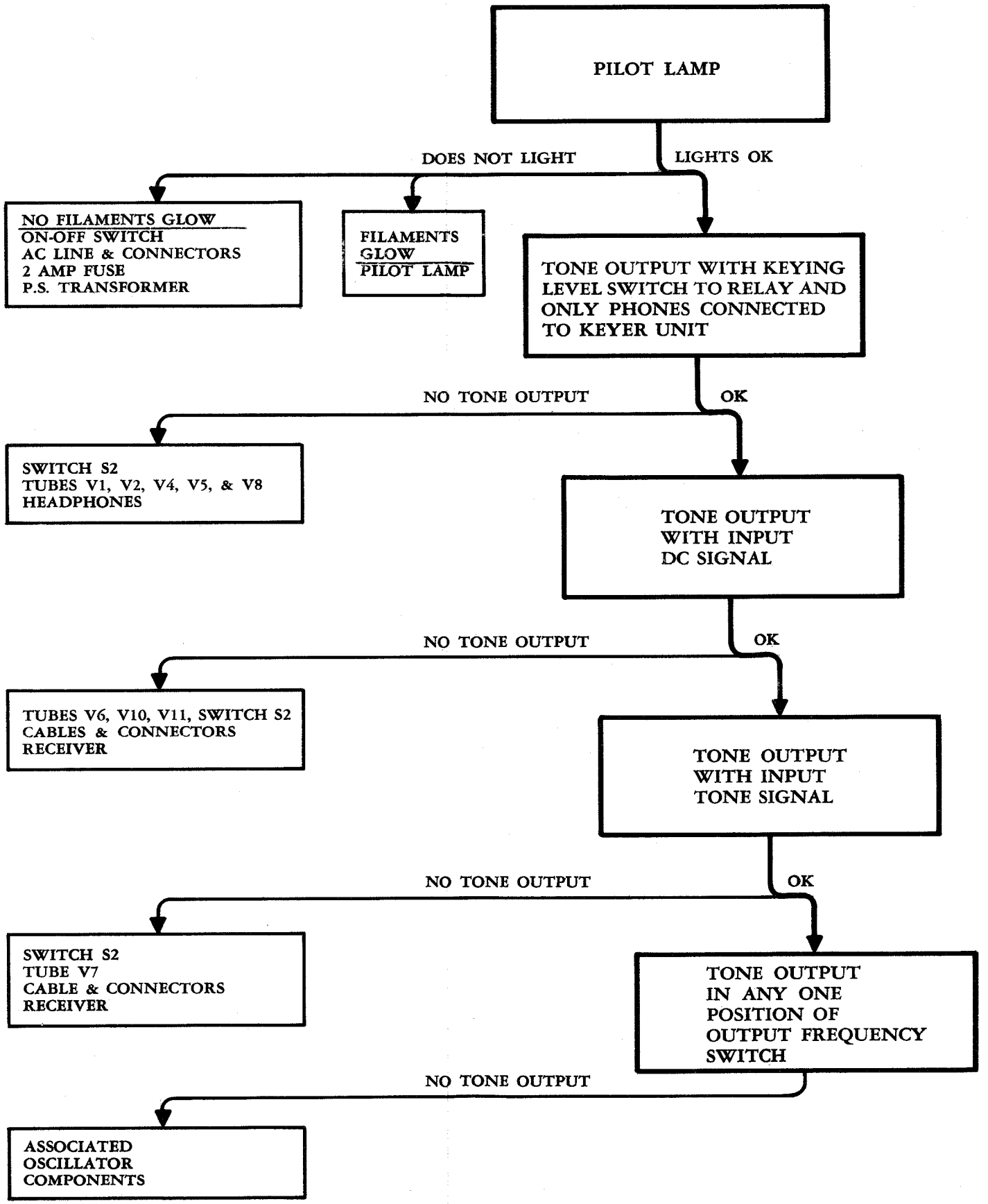
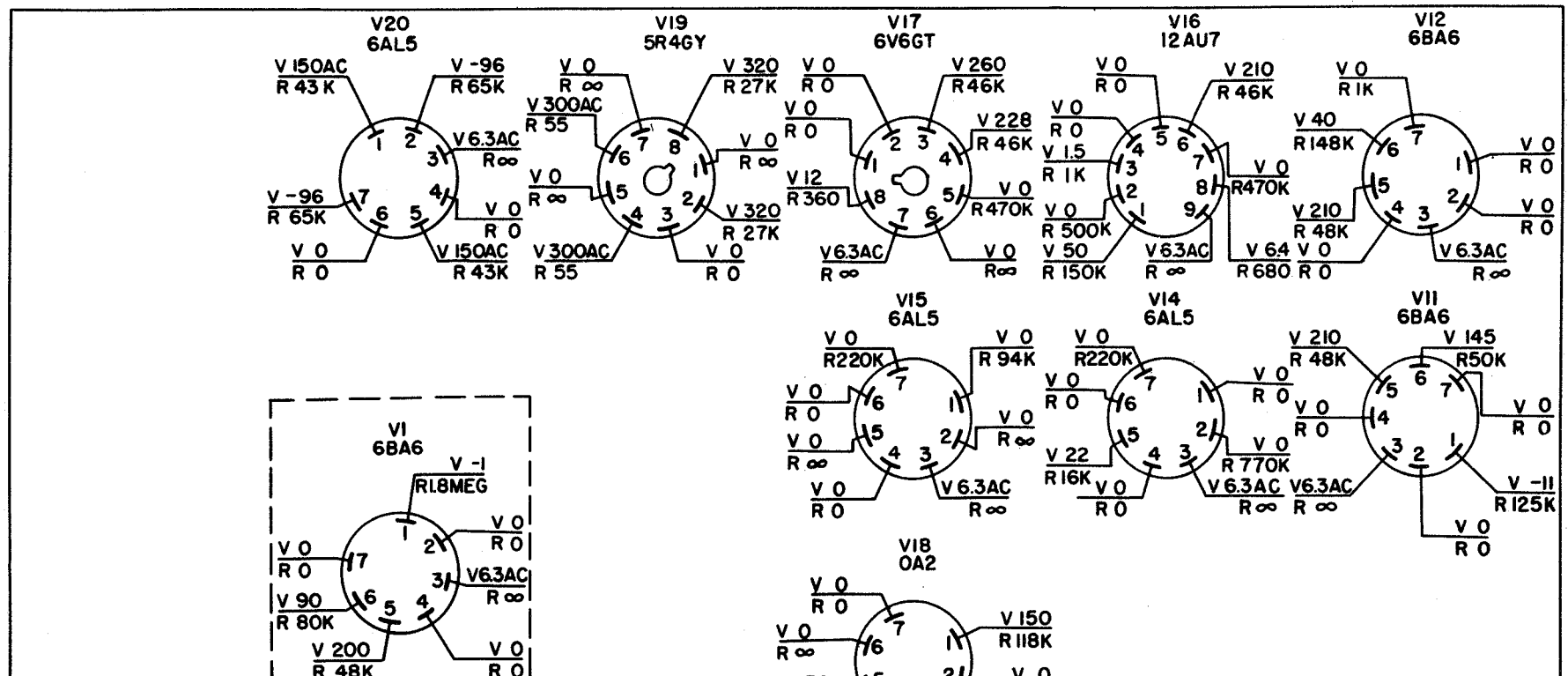


Table 7-9. Keyer KY-79/UR Trouble-Shooting Chart



NOTE: ALL VOLTAGE AND RESISTANCE READINGS TAKEN WITH A 20,000 OHM/VOLT METER.

CONTROL SETTINGS

CONTROL	SETTING
RF GAIN	MAX
BFO	INT
3.5 MC OSC	1 OR 3
HFO	EXT
AVC	INT BFO
BFO INT	MAX
IF GAIN	MAX
AUDIO GAIN	MIN
MOD-CW	CW
SEND-RECEIVE	RECEIVE
AVC-MAN	AVC

* BANDCHANGE SWITCH SET ABOVE 7.4 MEGACYCLES

** BANDCHANGE SWITCH SET BELOW 7.4 MEGACYCLES

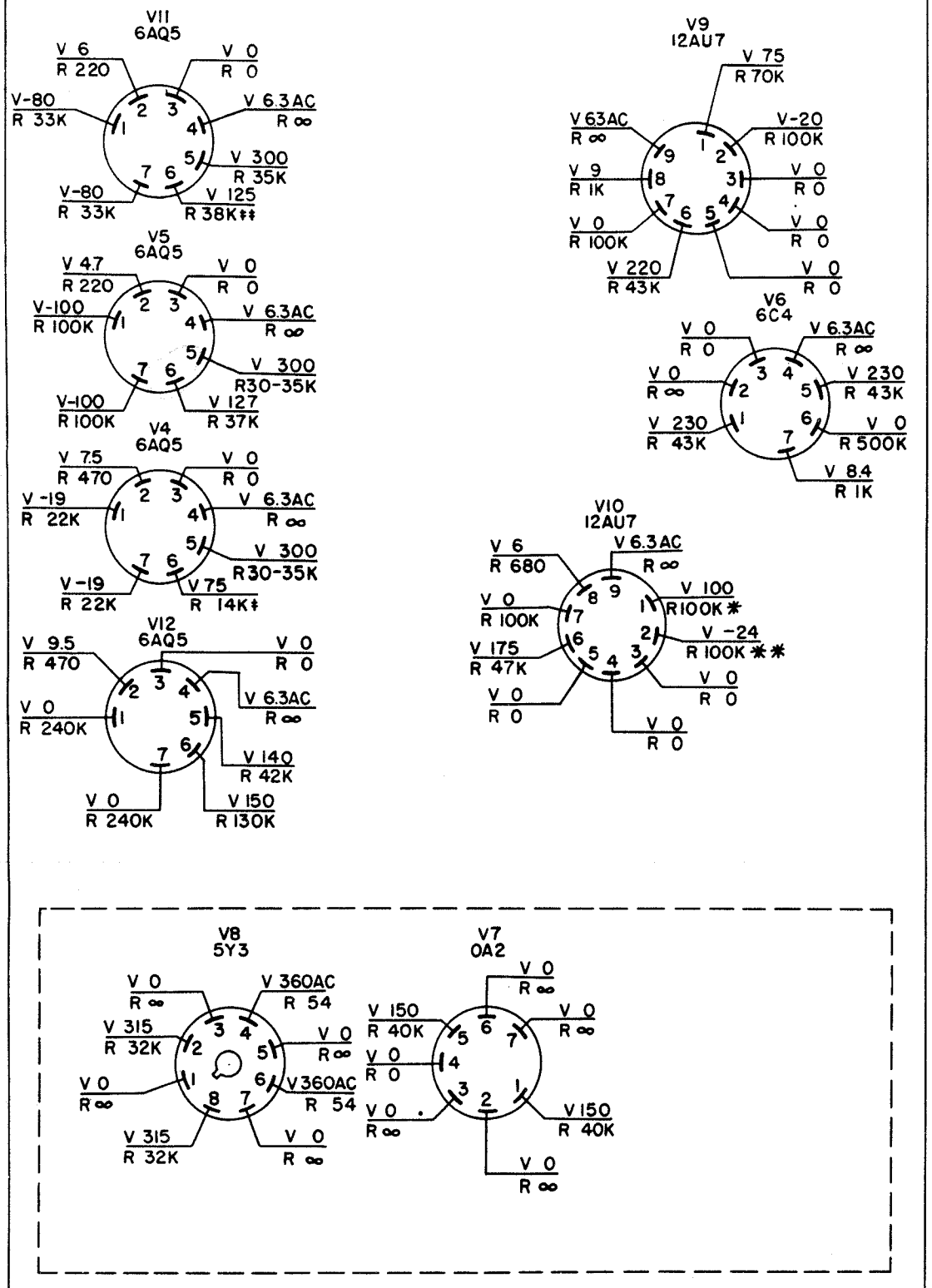
‡ WHEN HFO SWITCH IS SET TO INT, THE READINGS FOR TUBE V4 ARE AS FOLLOWS:

PIN	V	R
1	152	30K
2	152	30K
3	6.3AC	∞
4	0	0
5	-42	80K
6	-5	47K
7	0	0

‡‡ WHEN AVC SWITCH IS SET TO EXT BFO, THE READINGS FOR TUBE V13 ARE AS FOLLOWS:

PIN	V	R
1	54	180K
2	54	180K
3	6.3AC	∞
4	0	0
5	-2	120K
6	-42	140K
7	0	0

Figure 7-26. Receiver R-450/FRR-28, Voltage and Resistance Chart



CONTROL SETTINGS

CONTROL	SETTING
DIAL UNITS	0000.0
HFO	ON
BFO	ON
HFO-XTAL	1,2 OR 3
OUTPUT FREQUENCY	2MC
FREQUENCY RANGE	16-32MC
HF OUTPUT	MAXIMUM
CAL OUTPUT	MAXIMUM

*WITH HFO XTAL SWITCH AT MO, VOLTAGE IS ZERO, RESISTANCE IS INFINITE

**WITH HFO XTAL SWITCH AT MO, VOLTAGE AND RESISTANCE ARE ZERO

‡ WITH FREQUENCY RANGE SWITCH AT "2-4" OR "4-8", AND HF OUTPUT AT MAXIMUM, RESISTANCE IS 30K. WITH FREQUENCY SELECTOR SWITCH AT "8-16" OR "16-32", AND HF OUTPUT AT MINIMUM, RESISTANCE IS 105 K. WITH FREQUENCY RANGE SWITCH AT "2-4" OR "4-8," AND HF OUTPUT SWITCH AT MINIMUM, RESISTANCE IS 4.7 K.

‡‡ WITH HF OUTPUT AT MINIMUM AND FREQUENCY SELECTOR SWITCH AT "16-32" RESISTANCE IS 4.7K. WITH FREQUENCY SELECTOR SWITCH AT "2-4", "4-8", OR "8-16", RESISTANCE IS INFINITE.

NOTE: ALL VOLTAGE AND RESISTANCE READINGS TAKEN WITH A 20,000 OHM/VOLT METER

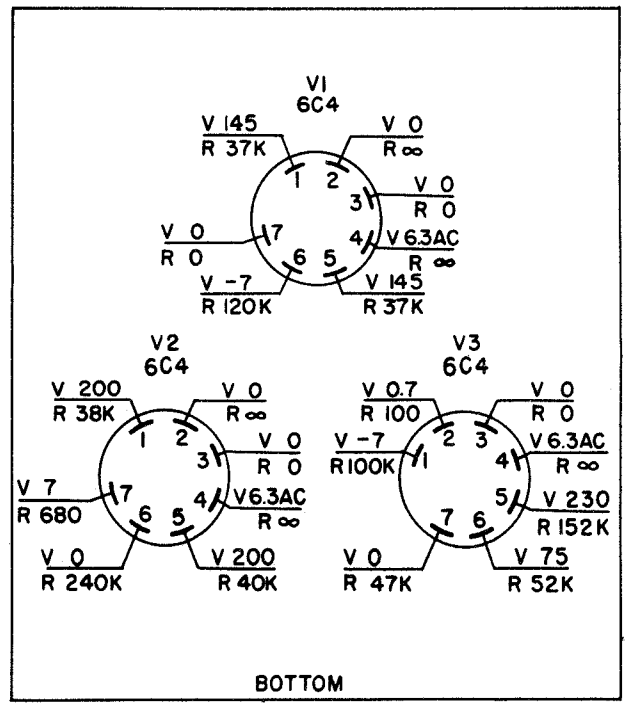
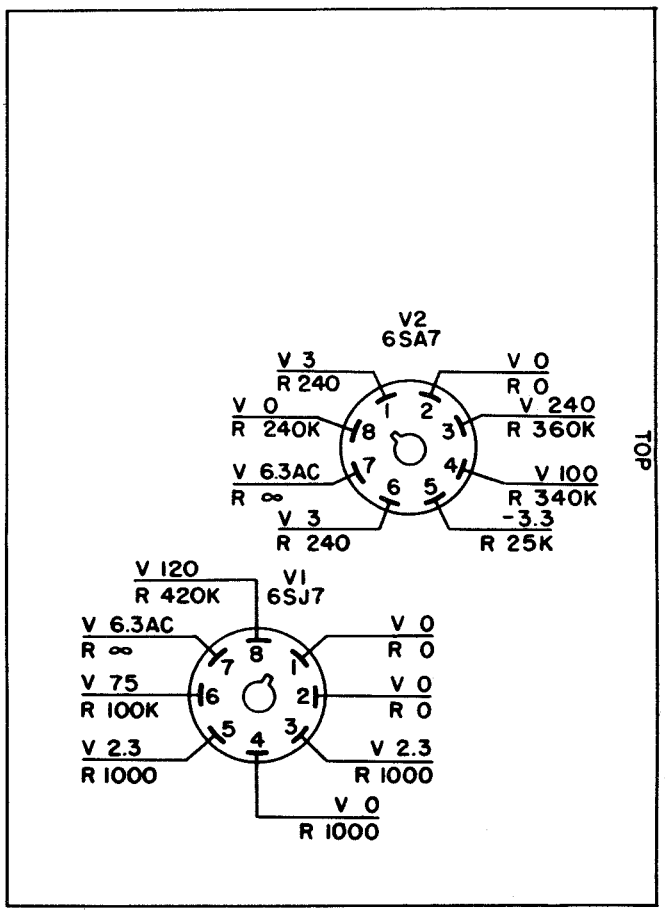


Figure 7-27. Radio Frequency Oscillator O-165/UR, Voltage and Resistance Chart



OUTPUT LEVEL SWITCH AT MAXIMUM POSITION

* WHEN OUTPUT LEVEL SWITCH IS AT MINIMUM POSITION READING IS 0 VOLTS

* * VOLTAGE MEASURED BETWEEN PINS 2 AND 8

NOTE: ALL VOLTAGE AND RESISTANCE READINGS TAKEN WITH A 20,000 OHM/VOLT METER.

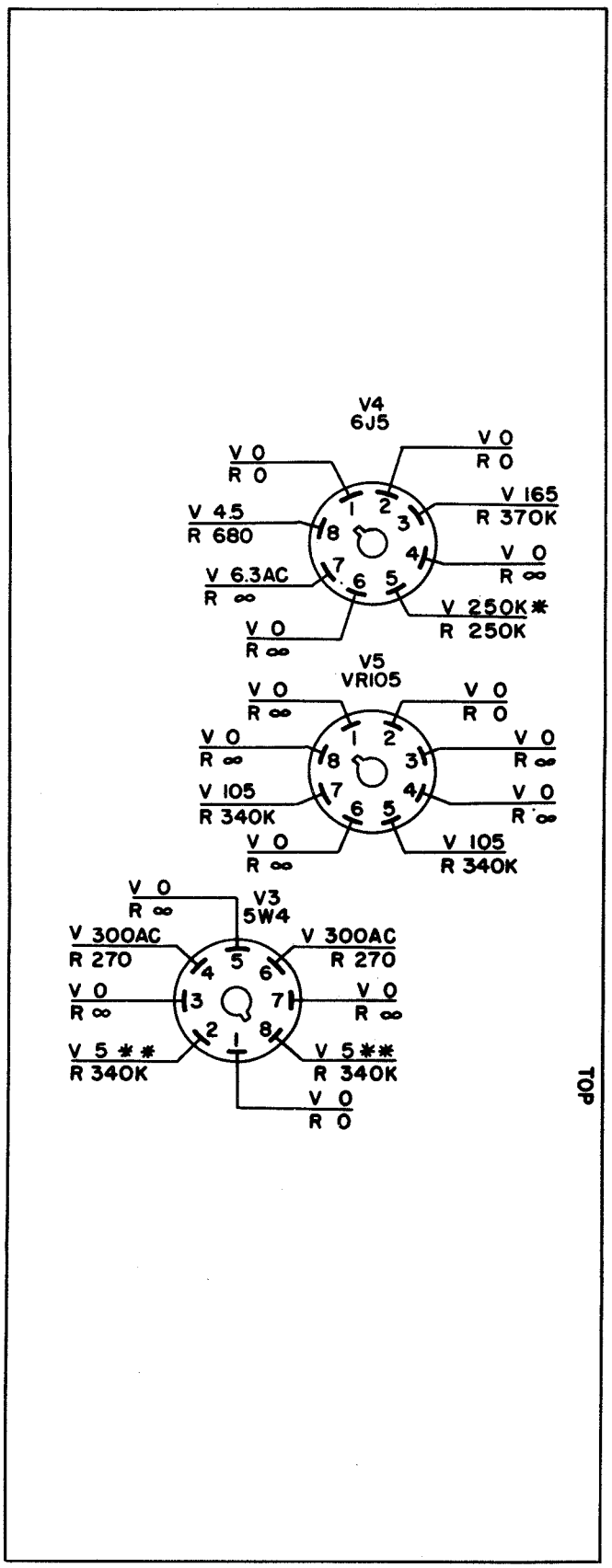
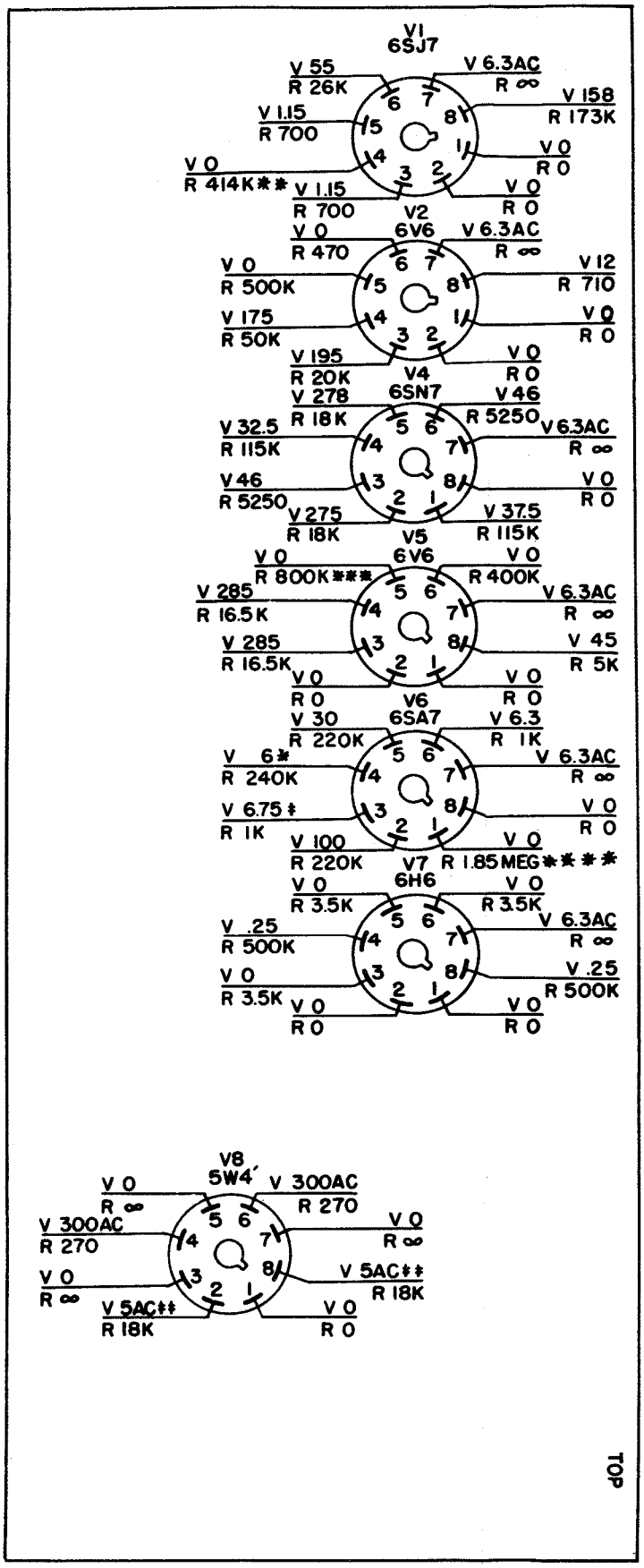


Figure 7-28. Amplifier-Detector AM-615/UR, Voltage and Resistance Chart

NAVSHIPS 91582
AN/FRR-28



NOTE: ALL VOLTAGE AND RESISTANCE READINGS TAKEN WITH A 20,000 OHM/VOLT METER.

OUTPUT FREQUENCY SWITCH AT "2125" CPS
OUTPUT LEVEL CONTROL AT MAXIMUM
KEYING WAVE SWITCH AT RELAY

* ON 50 VOLT SCALE

** READING WITH OUTPUT FREQUENCY SWITCH AT "2125" CPS. WITH SWITCH AT OTHER POSITIONS, THE FOLLOWING ARE THE RESISTANCE READINGS:

OUTPUT FREQ. SWITCH POS.	RESISTANCE
425	2.07 MEGOHMS
765	1.15 MEGOHMS
1105	793 K
1445	610 K
1785	492 K

*** RESISTANCE IS 400K WHEN KEYING WAVE SWITCH IS AT TONE OR DC +

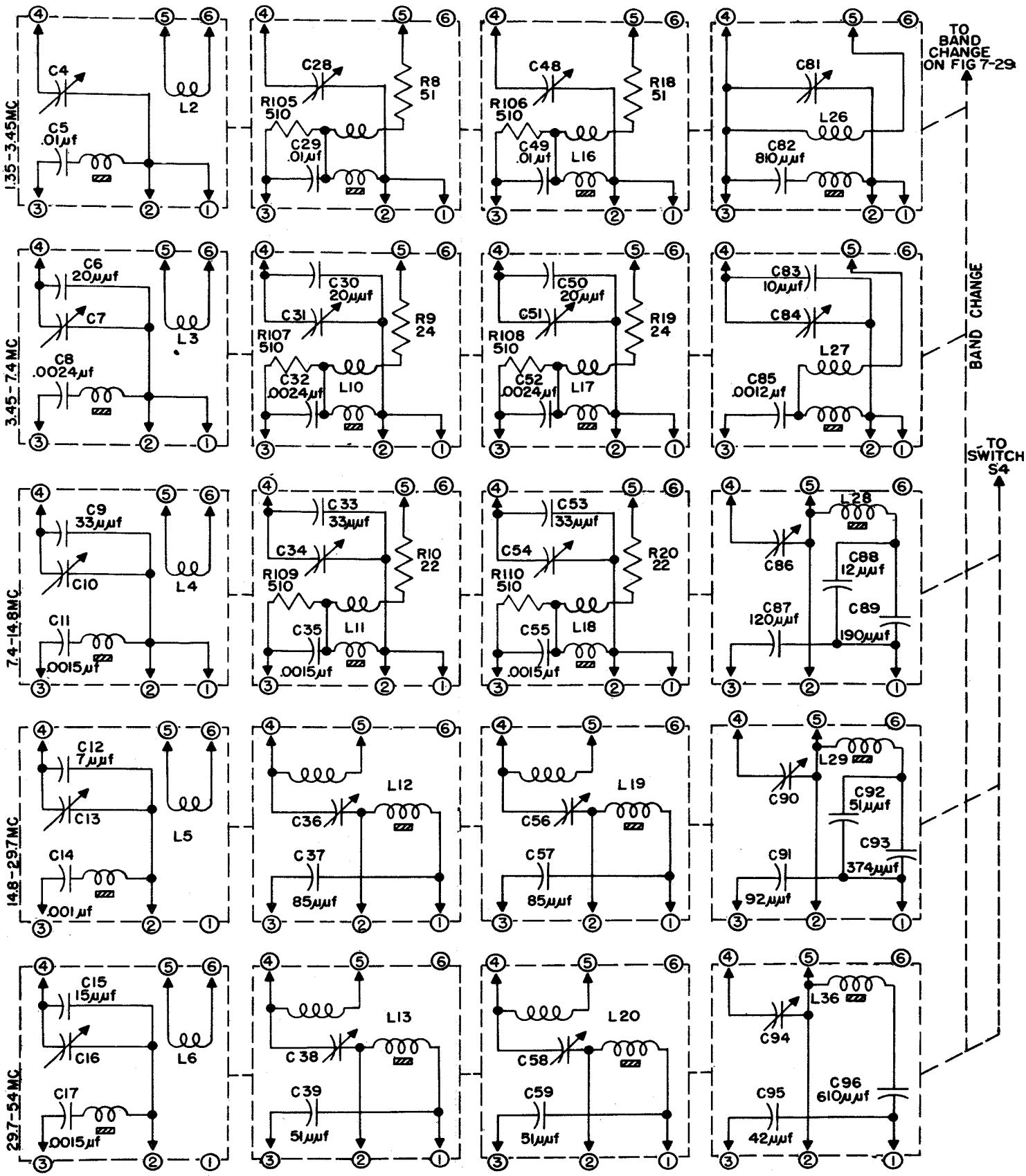
**** RESISTANCE IS 940K IN ALL OTHER POSITIONS OF KEYING WAVE SWITCH

‡ RESISTANCE IS 0 WHEN KEYING WAVE SWITCH IS AT DC-

‡‡ VOLTAGE MEASURED BETWEEN PINS 2 AND 8

Figure 7-29. Keyer KY-79/UR, Voltage and Resistance Chart

NAVSHIPS 91582
AN/FRR-28



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED.

Figure 7-31. Radio Receiver R-450/FRR-28, Turret Schematic Diagram

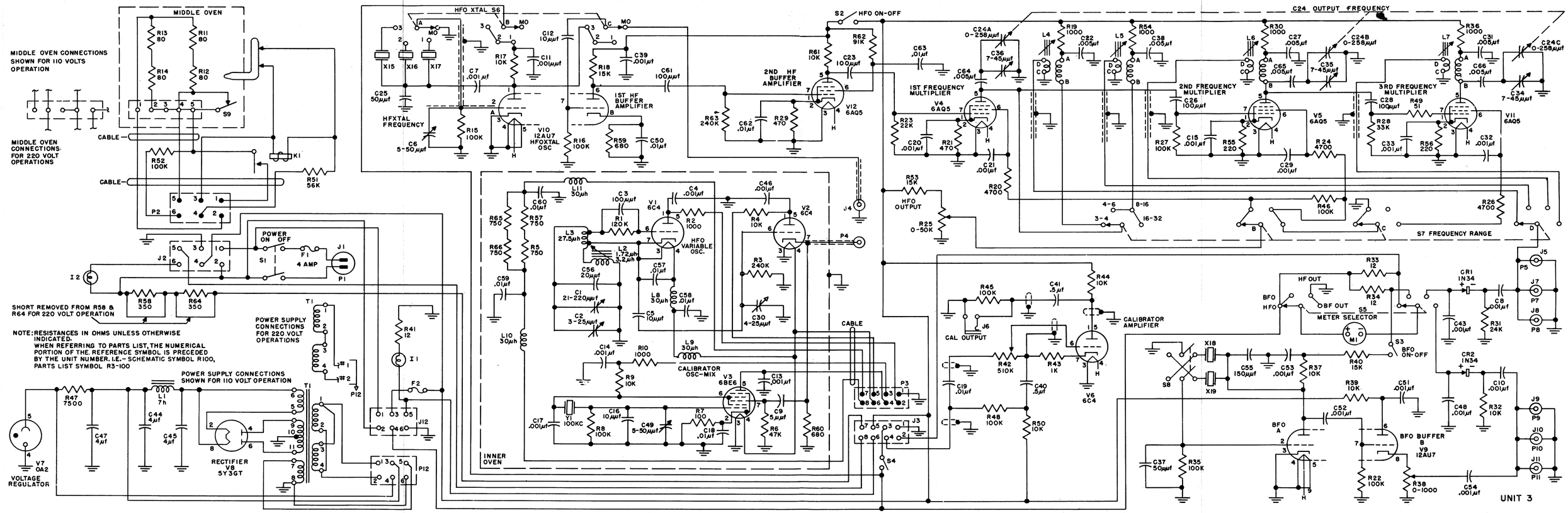
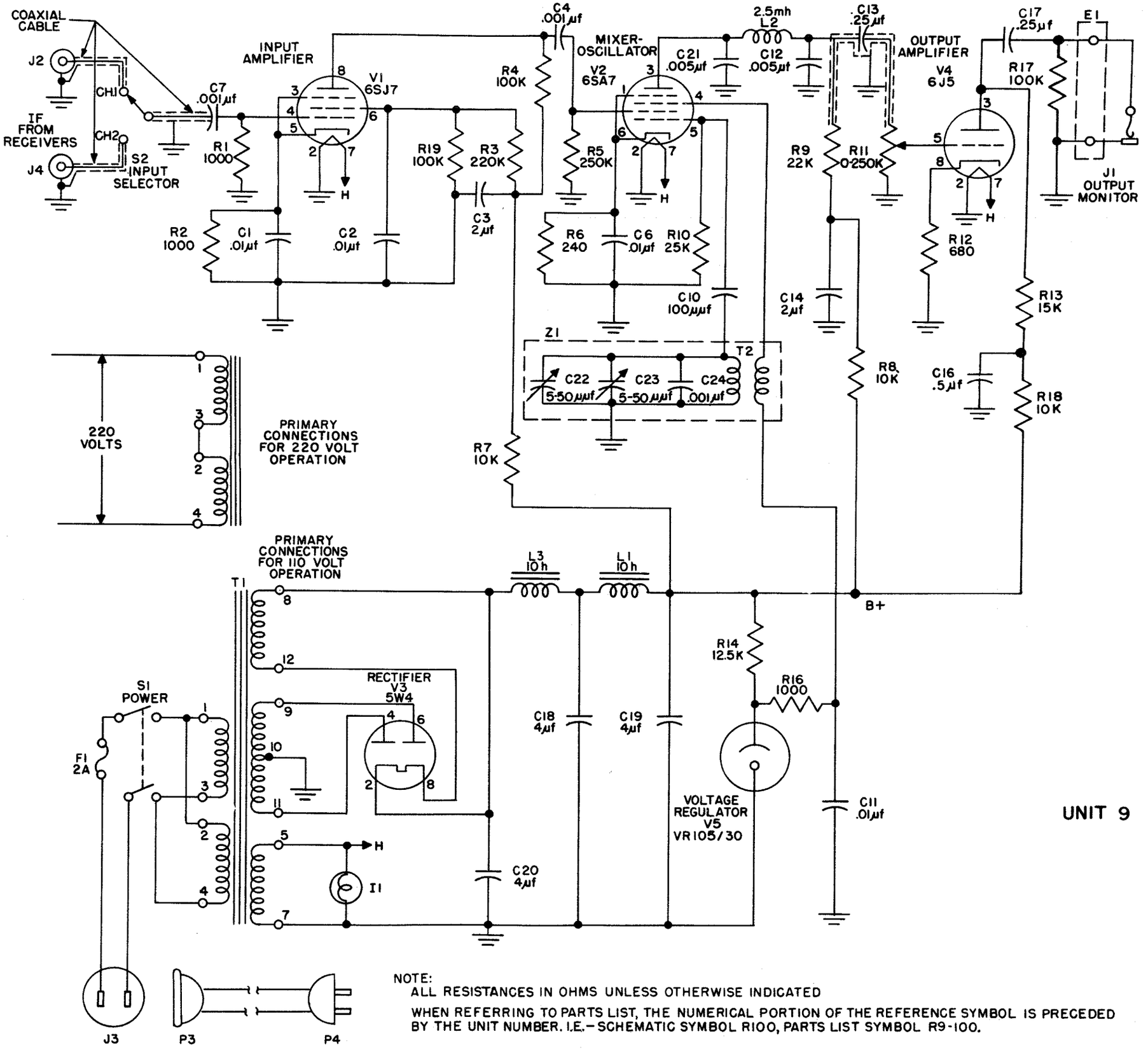


Figure 7–32. Radio Frequency Oscillator O–165/UR, Schematic Diagram

NAVSHIPS 91582
AN/FRR-28

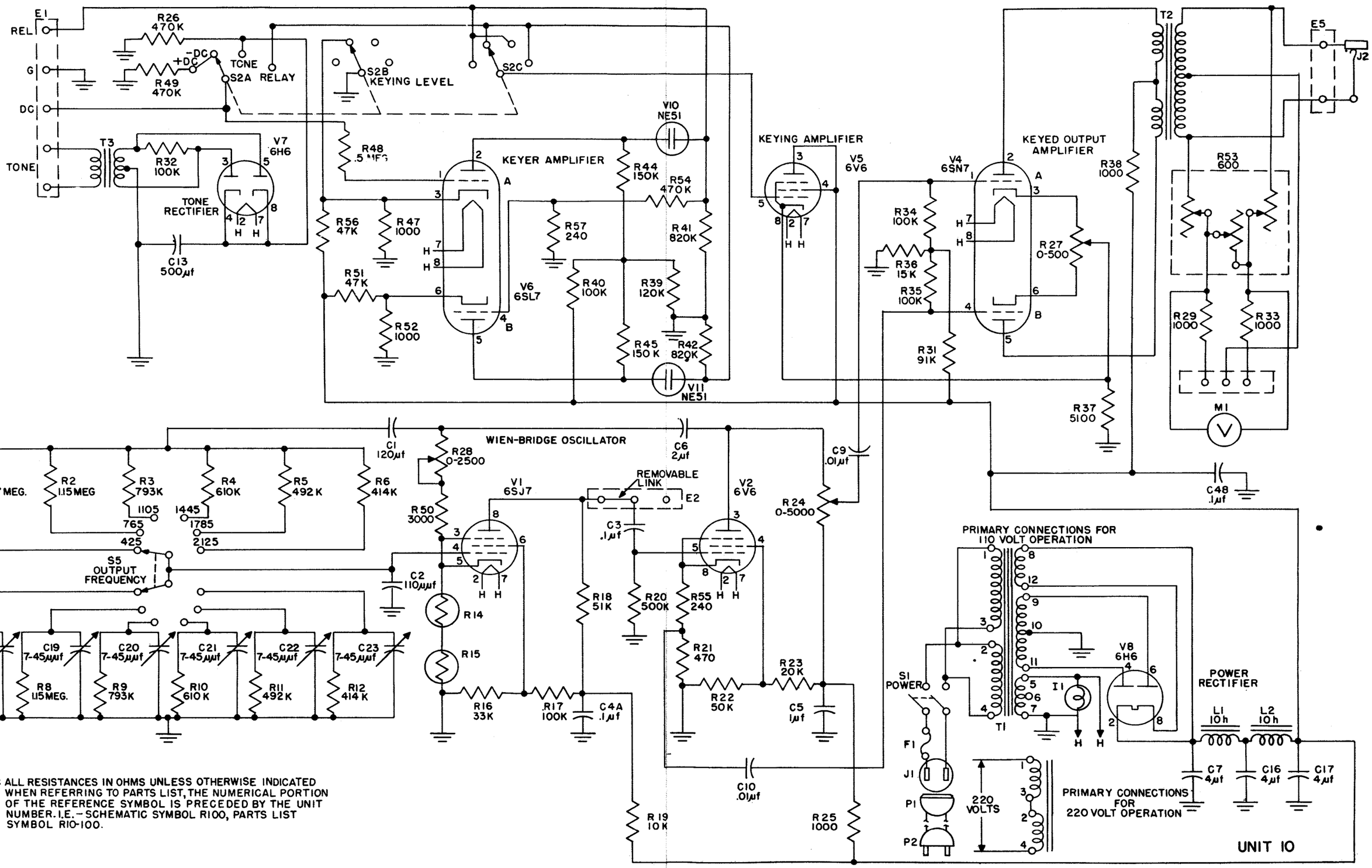


NOTE:
ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

WHEN REFERRING TO PARTS LIST, THE NUMERICAL PORTION OF THE REFERENCE SYMBOL IS PRECEDED BY THE UNIT NUMBER. I.E.–SCHEMATIC SYMBOL R100, PARTS LIST SYMBOL R9-100.

Figure 7–33. Amplifier-Detector AM–615/UR, Schematic Diagram

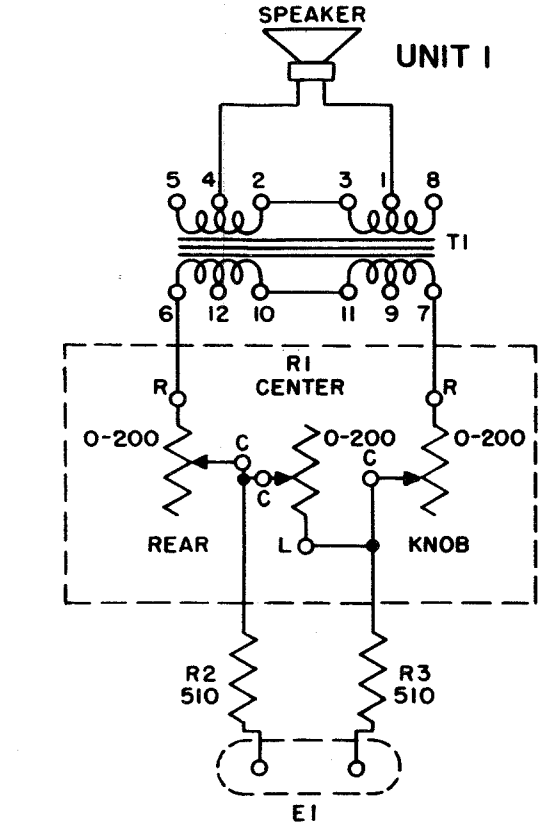
NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED WHEN REFERRING TO PARTS LIST, THE NUMERICAL PORTION OF THE REFERENCE SYMBOL IS PRECEDED BY THE UNIT NUMBER. I.E. – SCHEMATIC SYMBOL R100, PARTS LIST SYMBOL R10-100.

Figure 7–34. Keyer KY–79/UR, Schematic Diagram

NAVSHIPS 91582
AN/FRR-28

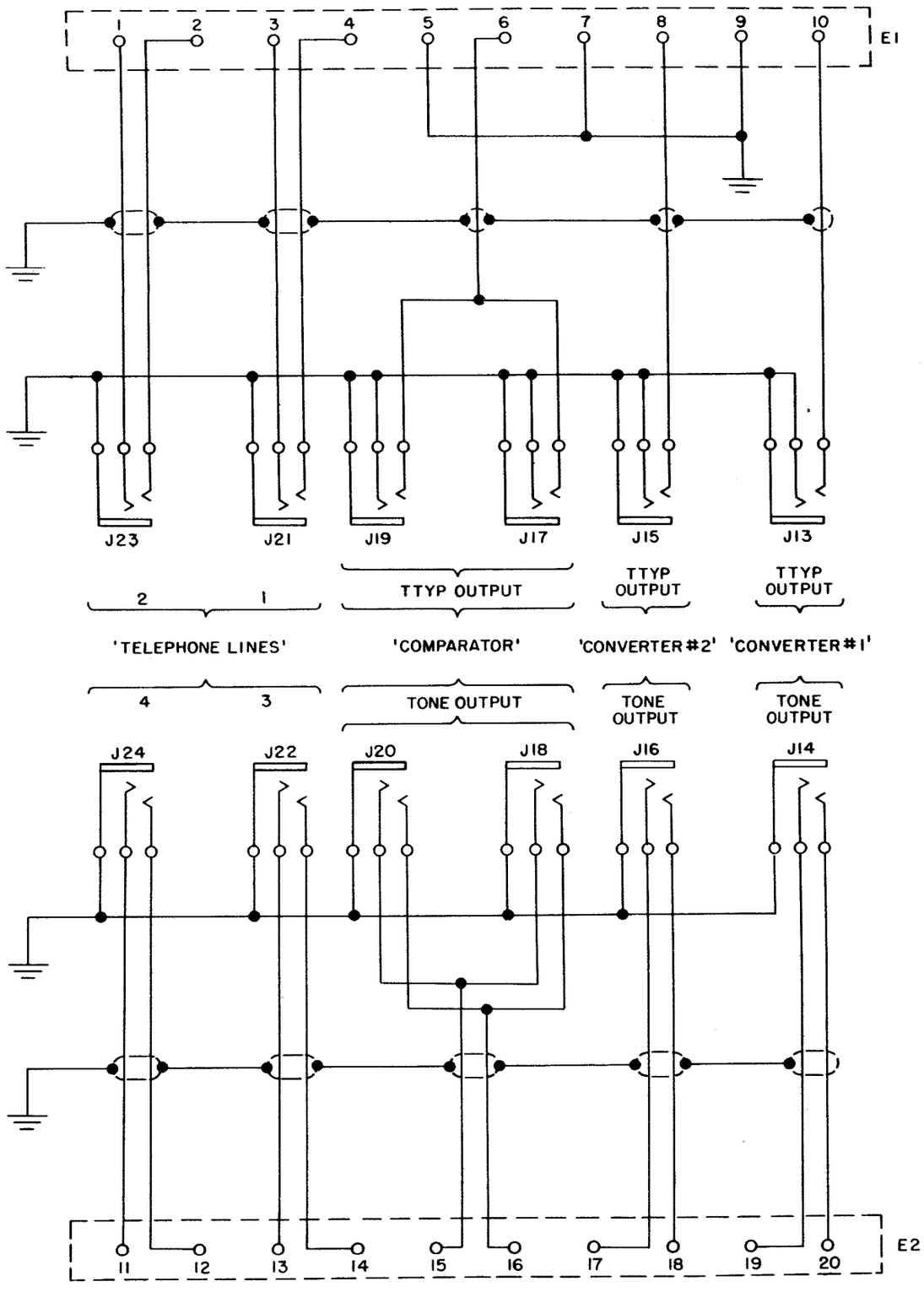


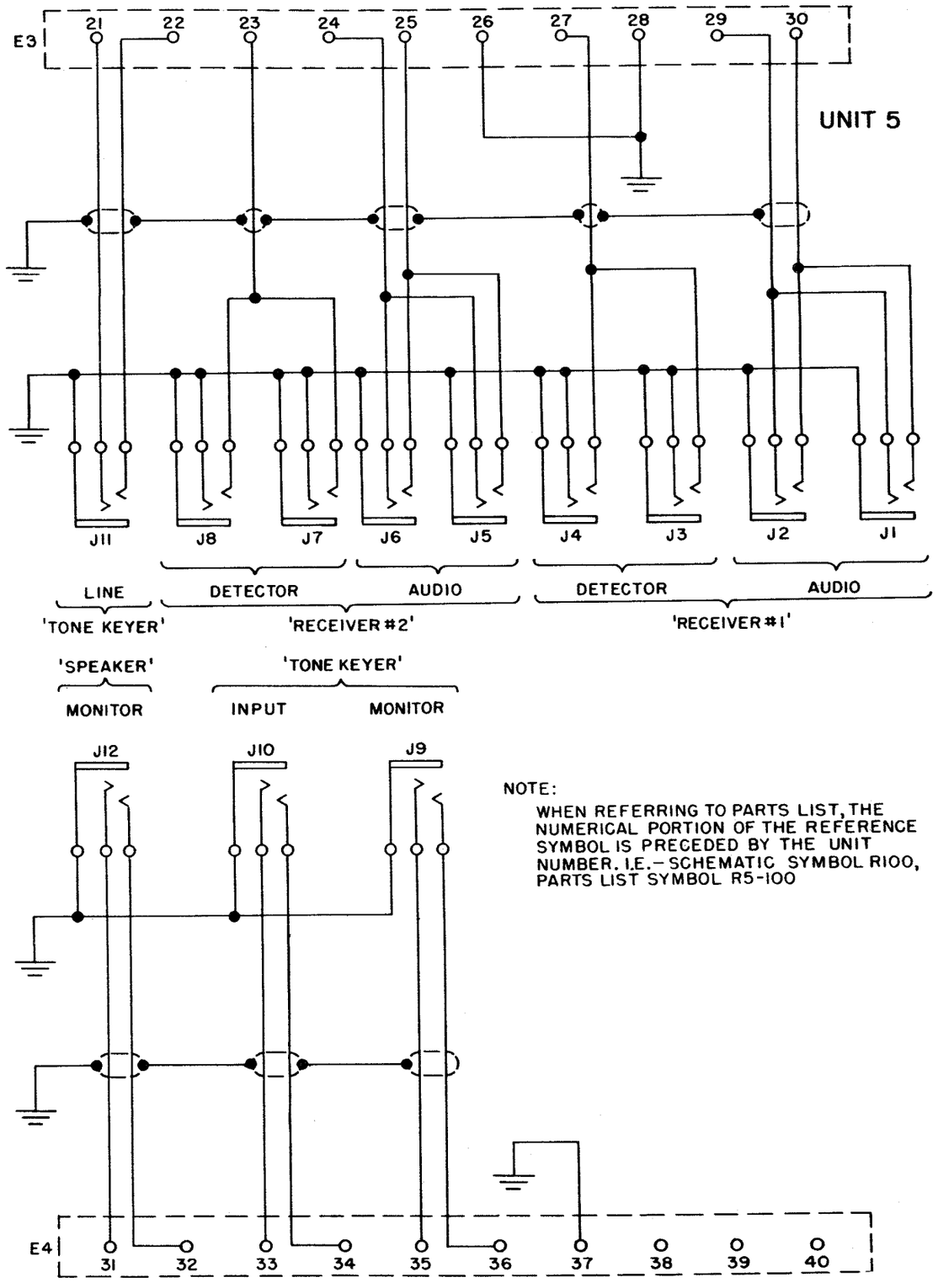
NOTE:
ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED.

WHEN REFERRING TO PARTS LIST, THE NUMERICAL PORTION OF THE REFERENCE SYMBOL IS PRECEDED BY THE UNIT NUMBER. I.E.- SCHEMATIC SYMBOL R100, PARTS LIST SYMBOL R1-100

Figure 7-35. Loudspeaker LS-187/UR, Schematic Diagram

NAVSHIPS 91582
AN/FRR-28





NOTE:
WHEN REFERRING TO PARTS LIST, THE NUMERICAL PORTION OF THE REFERENCE SYMBOL IS PRECEDED BY THE UNIT NUMBER. I.E.– SCHEMATIC SYMBOL R100, PARTS LIST SYMBOL R5-100

Figure 7–36. Communication Patching Panel SB–224/UR, Schematic Diagram

NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28
NAVSHIPS 91582
AN/FRR-28

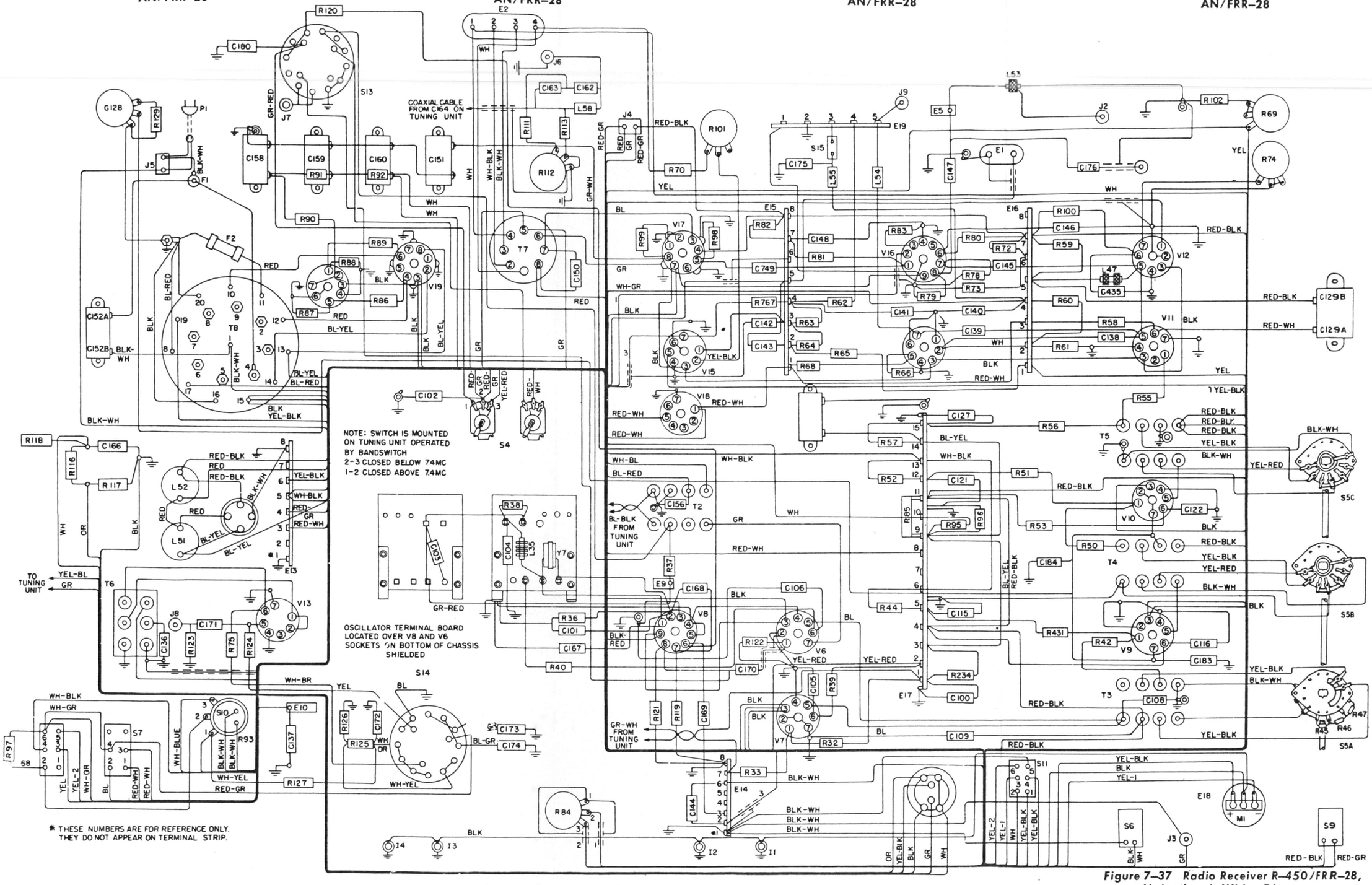
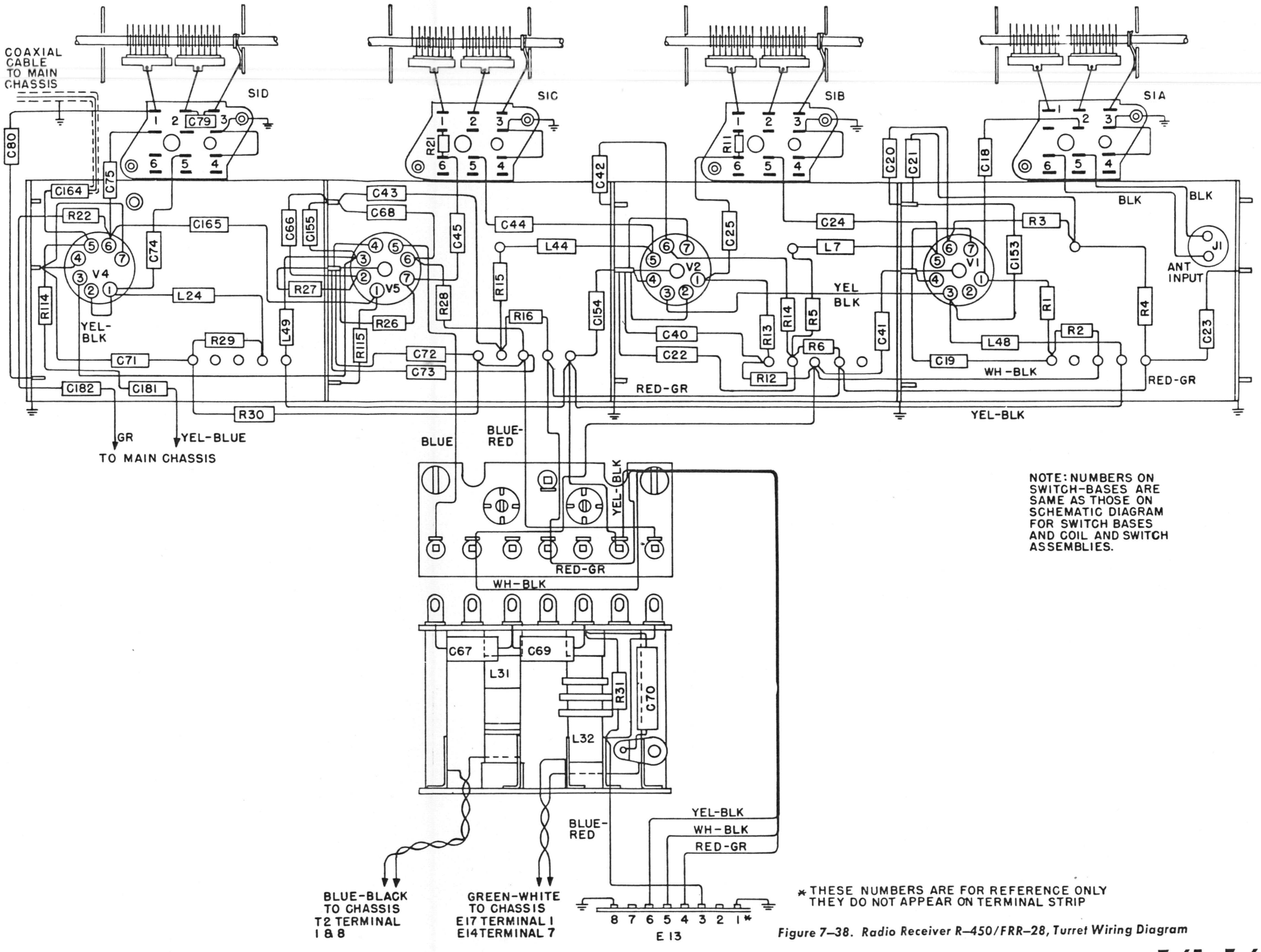


Figure 7–37 Radio Receiver R–450/FRR–28, Main Chassis Wiring Diagram

NAVSHIPS 91582
AN/FRR-28



NOTE: NUMBERS ON SWITCH-BASES ARE SAME AS THOSE ON SCHEMATIC DIAGRAM FOR SWITCH BASES AND COIL AND SWITCH ASSEMBLIES.

Figure 7–38. Radio Receiver R–450/FRR–28, Turret Wiring Diagram

SECTION 8
PARTS LIST

NOTE

All reference symbols used in this section are to be interpreted in the following manner. The unit number, as listed in column one, Table 8-3, has been placed after the alphabetical portion, and before the numerical part of the reference symbol. For instance, R1 in the oscillator (Unit 3) is designated R3-1 to distinguish it from R1 in the Keyer (Unit 10) which is listed as R10-1.

TABLE 8-1. WEIGHT AND DIMENSIONS OF SPARE PARTS BOX

EQUIPMENT SPARES					
SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. FT.	WEIGHT
	HEIGHT	WIDTH	DEPTH		
1	15	30	21	5.47	75

TABLE 8-2. SHIPPING WEIGHT AND DIMENSIONS OF SPARE PARTS BOX

EQUIPMENT SPARES						
SHIPPING BOX NO.	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. FT.	WEIGHT
		HEIGHT	WIDTH	DEPTH		
1 of 1	1	17	33	23	7.46	160

TABLE 8–3. LIST OF MAJOR UNITS OF RADIO RECEIVING SET AN/FRR–28

UNIT NO.	QUANTITY	NAME OF MAJOR UNIT	STANDARD NAVY STOCK NO.	NAVY TYPE DESIGNATION
1	1	Loudspeaker	F17–C–48237–5551	LS–187/UR
2	2	Radio Receiver	F16–C–16585–6061	R–450/FRR–28
3	1	Radio Frequency Oscillator	F16–C–15957–1248	O–165/UR
5	1	Communication Patching Panel	F16–C–15986–3009	SB–224/UR
9	1	Amplifier-Detector	F16–C–15761–5301	AM–615/UR
10	1	Keyer	F16–C–15753–7083	KY–79/UR
11	1 (GFE)	Relay Rack Cabinet		CY–579A/G
12	—	Miscellaneous		

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
A2-1	MOUNTING, INDICATOR LIGHT: steel; cadmium plate; holds two dial lights by spring clips, two 0.144 dia holes; holds dial pointers; for mounting dial lights; approx 2 in. lg, 1-3/8 in. wide, 3/8 in. deep; p/o AN Radio Receiver, Type No. R-450/FRR-28.	Dial light mounting clip		*N17-M-83010-1001	HMM Part No. 31276		A2-1	1						
A3-1	MOUNTING, SWITCH: p/o AN Radio Frequency Oscillator, Type No. O-165/UR; u/w Philadelphia Thermometer Co No. VC325 Mercury Switch; black bakelite; rectangular shape w/ rd ends; over-all dim., 4-3/4 in. lg, 1 in. wide, 1/2 in. high; four 1/8 in. dia holes on 3/4 in. by 2-3/4 in. mounting centers.	Mounting for M3-2		N17-M-87012-5951		NRCO Part No. BK7A2 Dwg No. A1104172	A3-1	1							
C2-1	CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type; 8 sections (C2-1A thru C2-1H); 152 mmf max, 10 mmf min; each section straight line frequency tuning; 1000v AC peak voltage; over-all dim., excluding shaft and bushings, 9-5/8 in. lg, 3-1/8 in. wide, 2-5/8 in. high; shaft adjustment, 180° ccw rotation; base not insulated; 20 terminals, solder lug type; 2 steel dowel pins on 2-5/8 in., centers; both ends of rotor shaft are mounted on ball bearing centers; 9 rotors and 8 stators each section, brass, bright dip finish, p/o AN Radio Receiver, Type No. R-450/FRR-28.			N16-C-63688-2204	HMM Part No. 34001G1		C2-1	1							
C2-1A	P/o C2-1.	Tuned circuit adjustment for input to V2-1													
C2-1B	P/o C2-1.	Tuned circuit adjustment for input to V2-1													
C2-1C	P/o C2-1.	Tuned circuit adjustment for input to V2-2													
C2-1D	P/o C2-1.	Tuned circuit adjustment for input to V2-2													
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-1E	P/o C2-1.	Tuned circuit adjustment for input to V2-5													
C2-1F	P/o C2-1.	Tuned circuit adjustment for input to V2-5													
C2-1G	P/o C2-1.	HF oscillator adjustment													
C2-1H	P/o C2-1.	HF oscillator adjustment													
C2-3	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 18, MBCA Ref Dwg Group 1; 10,000 mmf -10 +20% tolerance; 400v DC working; molded phenolic case; 1-1/8 in. lg, 11/32 in. dia; 2 terminals, axial lead type, located one ea end; aerolene filled; no internal ground connections; terminal mounted; resistant to humidity; for general purpose use.	Main capacitor in 0.54 to 1.35 mc tuned circuit input to V2-1		N16-C-42761-8708	AEV Part No. P488-.01 +20-10		C2-3 C2-5 C2-19 C2-20 C2-21 C2-22 C2-23 C2-24 C2-27 C2-29 C2-40 C2-41 C2-42 C2-43 C2-44 C2-47 C2-49 C2-66 C2-68 C2-71 C2-72 C2-73 C2-74 C2-100 C2-105 C2-115 C2-116 C2-121 C2-122 C2-127 C2-135 C2-153 C2-154 C2-155	34						
C2-5	Same as C2-3.	Main capacitor in 1.35 to 3.45 mc tuned circuit input to V2-1													
C2-6	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 20 mmf ± 5% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 15/32 in. wide, 7/32 in.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-1	Spec No. JAN-C-5, JAN Type No. CM20C200J	N16-C-26732-9601	EMM Type No. CM-20-200		C2-6 C2-30 C2-50	3							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-6 (cont)	deep; 2 terminals, wire lead type, located one ea end; terminal mounted; for general purpose use.														
C2-8	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 2400 mmf + 5% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 25/32 in. wide, 9/32 in. deep; 2 terminals, axial lead type, located one ea end; terminal mounted; moisture and fungus proof; for general purpose use.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-1	Spec No. JAN-C-5, JAN Type No. CM30C242J	N16-C-31982-2289	AEV Type No. 1467		C2-8 C2-32 C2-52	3							
C2-9	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 33 mmf + 5% tolerance; 500v DC working; molded low-loss bakelite case; 51/64 in. lg, 15/32 in. wide, 7/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; for general purpose use.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-1	Spec No. JAN-C-5, JAN Type No. CM20C330J	N16-C-27181-4401	EMM Type No. CM-20-330		C2-9 C2-33 C2-53	3							
C2-11	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1500 mmf + 2% tolerance; 500v DC working; molded low-loss bakelite case; 53/64 in. lg, 53/64 in. wide, 9/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; moisture and fungus proof; for general purpose use.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-1	Spec No. JAN-C-5, JAN Type No. CM30C152G	N16-C-31502-2609	EMM Type No. CM-30-152		C2-11 C2-17 C2-35 C2-55	4							
C2-12	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 1, MBCA Ref Dwg Group 1; 7 mmf ± 1 mmf tolerance; 500v DC working; zero temp coefficient, 0 to +120 parts/m/°C tolerance; non-insulated, phenolic; case dim., 0.400 in. lg max, 0.200 in. dia max; 2 terminals, radial wire leads; terminal mounted; for general purpose use.	Capacitor in 14.8 to 29.7 mc tuned circuit input to V2-1	Spec No. JAN-C-20A, JAN Type No. CC20CJ070F	N16-C-15761-5301	ERC Type No. NP0		C2-12 C2-138 C2-145	3							
C2-14	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1000 mmf + 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 53/64 in. lg, 53/64 in. wide, 9/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; for general purpose use.	Capacitor in 14.8 to 29.7 mc tuned circuit input to V2-1	Spec No. JAN-C-5, JAN Type No. CM30C102G	N16-C-31080-2209	EMM Type No. CM-30-102		C2-14	1							
C2-15	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 1, MBCA Ref Dwg Group 1; 15 mmf + 5% tolerance; 500v DC working; -30 mmf/mf/°C,	Capacitor in 29.7 to 54.0 mc tuned circuit input to V2-1	Spec No. JAN-C-20A, JAN Type No. CC20HJ150J	N16-C-15986-3009	ERC		C2-15 C2-139	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-15 (cont)	+120 tolerance, +120-188 tolerance; uninsulated; case dim., 0.400 in. lg max, 0.200 in. dia max; 2 terminals, radial wire leads; terminal mounted; for general purpose use.														
C2-17	Same as C2-11.	Capacitor in 29.7 to 54.0 mc tuned circuit input to V2-1													
C2-18	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf ± 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 15/32 in. wide, 7/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	Input coupling to V2-1	Spec No. JAN-C-5, JAN Type No. CM20C101G	N16-C-28547-8721	EMM Type No. CM-20-101		C2-18	1							
C2-19	Same as C2-3.	V2-1 grid bias filter													
C2-20	Same as C2-3.	V2-1 screen bypass													
C2-21	Same as C2-3.	V2-1 screen filter													
C2-22	Same as C2-3.	V2-1 plate filter													
C2-23	Same as C2-3.	V2-1 plate and screen filter													
C2-24	Same as C2-3.	V2-1 output coupler													
C2-27	Same as C2-3.	Capacitor in 0.54 to 1.35 mc tuned circuit input to V2-2													
C2-29	Same as C2-3.	Capacitor in 1.35 to 3.45 mc tuned circuit input to V2-2													
C2-30	Same as C2-6.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-2													
C2-32	Same as C2-8.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-2													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-33	Same as C2-9.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-2													
C2-35	Same as C2-11.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-2													
C2-37	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 85 mmf ± 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 45/64 in. lg, 29/64 in. wide, 3/16 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	Capacitor in 14.8 to 29.7 mc tuned circuit input to V2-2		N16-C-28284-1722	AEV Type No. 1469		C2-37 C2-57	2							
C2-39	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 51 mmf ± 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 15/32 in. wide, 7/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	Capacitor in 29.7 to 54.0 mc tuned circuit input to V2-2	Spec No. JAN-C-5, JAN Type No. CM20C510G	N16-C-27651-1121	EMM Type No. CM-20-510		C2-39 C2-59	2							
C2-40	Same as C2-3.	V2-2 grid bias filter													
C2-41	Same as C2-3.	V2-1 and V2-2 grid bias filter													
C2-42	Same as C2-3.	V2-2 screen bypass													
C2-43	Same as C2-3.	V2-2 plate filter													
C2-44	Same as C2-3.	V2-2 output coupler													
C2-47	Same as C2-3.	Capacitor in 0.54 to 1.35 mc tuned circuit input to V2-5													
C2-49	Same as C2-3.	Capacitor in 1.35 to 3.45 mc tuned circuit input to V2-5													
C2-50	Same as C2-6.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-5													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-52	Same as C2-8.	Capacitor in 3.45 to 7.4 mc tuned circuit input to V2-5													
C2-53	Same as C2-9.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-5													
C2-55	Same as C2-11.	Capacitor in 7.4 to 14.8 mc tuned circuit input to V2-5													
C2-57	Same as C2-37.	Capacitor in 14.8 to 29.7 mc tuned circuit input to V2-5													
C2-59	Same as C2-39.	Capacitor in 29.7 to 54.0 mc tuned circuit input to V2-5													
C2-66	Same as C2-3.	V2-5 cathode bypass													
C2-68	Same as C2-3.	V2-5 screen bypass													
C2-71	Same as C2-3.	V2-4 plate filter													
C2-72	Same as C2-3.	V2-4 plate filter													
C2-73	Same as C2-3.	V2-5 screen bypass													
C2-74	Same as C2-3.	V2-4 plate coupler													
C2-77	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 3300 mmf ± 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 53/64 in. lg, 53/64 in. wide, 9/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; for general purpose use.	P/o HF oscillator 0.54 to 1.35 mc tuned circuit	Spec No. JAN-C-5, JAN Type No. CM30C332G	N16-C-32240-7809	EMM Type No. CM-30-332		C2-77	1							
C2-78	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 404 mmf ± 1% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 45/64 in. lg, 29/64 in. wide, 3/16 in. thick; 2 termi-	P/o HF oscillator 0.54 to 1.35 mc tuned circuit		N16-C-29941-1543	AEV Type No. 1469		C2-78	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-78 (cont)	nals, wire lead type, located one ea end; terminal mounted; for general purpose use.														
C2-79	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 1, MBCA Ref Dwg Group 1; 7 mmf ± 0.25 tolerance; 500v DC working; negative (-750) temp coefficient, letter J tolerance; insulated, phenolic; case dim., 0.562 in. lg max, 0.250 in. dia max; 2 terminals, axial lead type; terminal mounted; for general purpose use.	P/o HF oscillator 0.54 to 1.35 mc tuned circuit	Spec No. JAN-C-20A, JAN Type No. CC21UJ070C	N16-C-15753-7083	ERC Type No. 750		C2-79 C2-80	2							
C2-80	Same as C2-79.	P/o HF oscillator 0.54 to 1.35 mc tuned circuit													
C2-82	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 810 mmf ± 1% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals 53/64 in. lg, 53/64 in. wide, 9/32 in. thick; 2 terminals, wire lead type, located one ea end; resistant to humidity; for general purpose use.	P/o HF oscillator 1.35 to 3.45 mc tuned circuit		N16-C-30728-1925	AEV Type No. 1464		C2-82	1							
C2-83	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10 mmf ± 10% tolerance; 500v DC working; temp characteristic B per JAN-C-5; molded low-loss bakelite case; case dim., excluding terminals, 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	P/o HF oscillator 3.45 to 7.4 mc tuned circuit	Spec No. JAN-C-5, JAN Type No. CM20B100K	N16-C-26025-8276	SMO Type No. K1410		C2-83 C3-12	2							
C2-85	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1200 mmf ± 2% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 53/64 in. lg, 53/64 in. wide, 9/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 3.45 to 7.4 mc tuned circuit	Spec No. JAN-C-5, JAN Type No. CM30C122G	N16-C-31264-8009	EMM Type No. CM-30-122		C2-85	1							
C2-87	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 120 mmf ± 2% tolerance; 500v DC working; ±200 to +200 parts/million/°C; molded low-loss bakelite case; case dim., exclud-	P/o HF oscillator 7.4 to 14.8 mc tuned circuit	Spec No. JAN-C-5, JAN Type No. CM20C121G	N16-C-28732-5521	SMO Type No. KR1312		C2-87 C10-1	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-87 (cont)	ing terminals, 51/64 in. lg max, 15/32 in. wide max, 7/32 in. thick max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.														
C2-88	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 2, MBCA Ref Dwg Group 2; 12 mmf ± 5% tolerance; 500v DC working; −750 mmf/mf/°C, ± 120 mmf tolerance; insulated, phenolic case; case dim., 9/16 in. lg, 1/4 in. dia; 2 terminals, wire lead type; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 7.4 to 14.8 mc tuned circuit	Spec No. JAN-C-20A, JAN Type No. CC21UJ120J	N16-C-15957-1248	ERC Type No. N-750		C2-88	1							
C2-89	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 190 mmf ± 1% tolerance; 500v DC working; −200 to +200 parts/million/°C; molded low-loss bakelite case; 51/64 in. lg, 15/32 in. wide, 7/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 7.4 to 14.8 mc tuned circuit		N16-C-29206-5993	AEV Type No. 1469		C2-89	1							
C2-91	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 92 mmf ± 1% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 51/64 in. lg, 15/32 in. wide, 7/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 14.8 to 29.7 mc tuned circuit		N16-C-28415-2810	AEV Type No. 1469		C2-91	1							
C2-92	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 1, MBCA Ref Dwg Group 1; 51 mmf ± 1% tolerance; 500v DC working; negative (-750) temp coefficient, Letter J tolerance; insulated, phenolic; case dim., excluding terminals, 0.562 in. lg max, 0.250 in. dia max; 2 terminals, axial wire lead type; terminal mounted; for general purpose use.	P/o HF oscillator 14.8 to 29.7 mc tuned circuit	Spec No. JAN-C-20A, JAN Type No. CC21UJ510F	N16-C-16585-6061	ERC Type No. N-750		C2-92	1							
C2-93	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 379 mmf ± 1% tolerance; 500v DC working; case dim., excluding terminals, 45/64 in. lg, 29/64 in. wide, 3/16 in. thick;	P/o HF oscillator 14.8 to 29.7 mc tuned circuit		N16-C-29864-2470	AEV Type No. 1469		C2-93	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
C2-93 (cont)	2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.														
C2-95	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 42 mmf ± 1% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 51/64 in. lg 15/32 in. wide, 7/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 29.7 to 54.0 mc tuned circuit		N16-C-27439-301)	AEV Type No. 1469		C2-95	1							
C2-96	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 610 mmf ± 1% tolerance; 500v DC working; molded low-loss bakelite case; case dim., excluding terminals, 53/64 in. lg, 53/64 in. wide. 9/32 in. thick; 2 terminals, wire lead type, located one ea end; terminal mounted; resistant to humidity; for general purpose use.	P/o HF oscillator 29.7 to 54.0 mc tuned circuit		N16-C-30333-8470	AEV Type No. 1464		C2-96	1							
C2-100	Same as C2-3.	V2-7 grid bias filter													
C2-101	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 1 section; 23 mmf max, 4 mmf min; straight line frequency tuning characteristic; 0.015 in. between plates; over-all dim., excluding shaft, 63/64 in. lg, 15/16 in. wide, 1-7/32 in. high; shaft, 5/16 in. lg to base, 7/32 in. lg to mounting face, 1/4 in. dia; screwdriver adjustment, 360° cw or ccw rotation; base insulated; 3 terminals, rotor terminal, solder lug type, stator terminals, grooved extension of shafts; 2 No. 4-40 tapped mounting holes 21/32 in. C to C; 3 rotor and 4 stator plates, brass, cadmium plated; for general purpose use.	Fine frequency adjustment for 3.5 mc oscillator		N16-C-58836-5306	HMM Part No. APC25	NRCO Dwg No. A1104126	C2-101 C3-2 C3-30	3							
C2-102	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 18, MBCA Ref Dwg Group 1; 22,000 mmf ± 20% tolerance; 400v DC working; molded phenolic case; case dim., excluding terminals, 1-3/8 in. lg, 11/32 in. dia; 2 terminals, axial lead type, located one ea end; aerolene impregnated; aerolene filled; no internal ground connections; terminal mounted; resistant to humidity; for general purpose use.	V2-8B plate filter		N16-C-40105-7442	AEV Part No. P488-.022±20		C2-102 C2-103 C2-104 C2-106 C2-109 C2-136 C2-146 C2-147 C2-148 C2-156 C2-157	11							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-103	Same as C2-102.	V2-8A plate filter													
C2-104	Same as C2-102.	V2-8A plate filter													
C2-105	Same as C2-3.	V2-7 screen bypass													
C2-106	Same as C2-102.	V2-6 screen bypass													
C2-109	Same as C2-102.	V2-6 plate filter													
C2-115	Same as C2-3.	V2-9 grid bias filter													
C2-116	Same as C2-3.	V2-9 screen bypass													
C2-121	Same as C2-3.	V2-10 grid bias filter													
C2-122	Same as C2-3.	V2-10 screen bypass													
C2-127	Same as C2-3.	V2-11 grid bias filter													
C2-128	CAPACITOR, FIXED, ELECTROLYTIC: case style No. 43, MBCA Ref Dwg Group 1; 1 section; 10 mf per section; 100v DC working; -20°C to +65°C working temp range; hermetically sealed metal can; case dim., 1-13/16 in. lg, 1 in. wide, 15/16 in. high; 2 terminals, solder lug type, located on side, 1-1/16 in. C to C, phenolic insulation; both terminals insulated from can; mounted by 2 feet on bottom, 1 mounting hole each foot, 3/16 in. hole dia, spaced 2-1/8 in. C to C; resistant to humidity; for general purpose use.	V2-11 grid bias filter	Spec No. JAN-C-62, JAN Type No. CE63D100H	N16-C-19561-3951	CLD		C2-128 C2-151 C2-158 C2-159 C2-160	5							
C2-129	CAPACITOR, FIXED, PAPER DIELECTRIC: 2 section (C2-129A and B); case style No. 43, MBCA Ref Dwg Group 1; 50,000 mmf/section +20-10% tolerance; 600v DC working; hermetically sealed metal case; case dim., 1-13/16 in. lg, 1 in. wide, 3/4 in. high; 2 terminals, solder lug type, located on side, 1-1/16 in. C to C, phenolic insulation; wax impregnated; wax filled; internally grounded; 2 mounting feet with 3/16 in. dia holes in each, spaced 2-1/8 in. C to C; resistant to fungus and humidity; for general purpose use.		Spec No. JAN-C-25, JAN Type No. CP53B6EF503V	N16-C-53010-6070	CLD Type No. NIJ		C2-129 C2-152	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
C2-129A	P/o C2-129.	V2-11 screen bypass													
C2-129B	P/o C2-129.	V2-11 plate filter													
C2-135	Same as C2-3.	V2-12 screen bypass													
C2-136	Same as C2-102.	V2-13B plate filter													
C2-137	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 18, MBCA Ref Dwg Group 1; 250,000 mmf + 20% tolerance; 200v DC working; hermetically sealed metal case; case dim., 2-5/16 in. lg, 13/16 in. dia; 2 terminals, axial wire lead type, located on ends; mineral oil impregnated; mineral oil filled; no internal ground connection; single hole mtg clamp; moisture and fungus proof; for general purpose use.	AVC time constant increase	Spec No. JAN-C-25, JAN Type No. CP28A1EF254M	N16-C-46373-5764	SMO Type No. 21		C2-137	1							
C2-138	Same as C2-12.	V2-14A input coupler													
C2-139	Same as C2-15.	V2-14B input coupler													
C2-140	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1000 mmf + 10% tolerance; 500v DC working; molded low-loss bakelite case; case dim., 51/64 in. lg, 25/32 in. wide, 9/32 in. deep; 2 terminals, wire lead type, located one on ea end; terminal mounted; moisture and fungus proof; for general purpose use.	P/o AVC time constant circuit	Spec No. JAN-C-5, JAN Type No. CM35A102K	N16-C-31090-4203	AEV Type No. 1467		C2-140	1							
C2-141	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 2, MBCA Ref Dwg Group 1; 100 mmf + 10% tolerance; 500v DC working; ±330 parts/million /°C, +120 mmf tolerance; insulated, phenolic jacket; case dim., 13/16 in. lg, 1/4 in. dia; 2 terminals, axial lead type; terminal mounted; resistant to humidity; for general purpose use.	V2-14B output RF bypass	Spec No. JAN-C-20A, JAN Type No. CC26SL101K	N16-C-17085-7060	ERC Type No. N-330		C2-141 C2-142	2							
C2-142	Same as C2-141.	V2-14B output RF bypass													
C2-143	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 5100 mmf + 5% tolerance; 500v DC working; molded low-loss	V2-14B output coupler	Spec No. JAN-C-5, JAN Type No. CM35A512J	N16-C-32720-7523	AEV Type No. 1467		C2-143 C2-149	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
C2-143 (cont)	bakelite case; case dim., 51/64 in. lg, 25/32 in. wide, 9/32 in. deep; 2 terminals, axial lead type, located on each end; terminal mounted; moisture and fungus proof; for general purpose use.														
C2-144	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 18, MBCA Ref Dwg Group 1; 50,000 mmf + 20% tolerance; 600v DC working; hermetically sealed metal case; case dim., 1-9/16 in. lg, 11/16 in. dia; 2 terminals, axial wire leads, located on ends; mineral oil impregnated; mineral oil filled; no internal ground connection; single hole mounting clamp; moisture and fungus proof; for general purpose use.	V2-15 voltage limiter	Spec No. JAN-C-25, JAN Type No. CP28A1EP503M	N16-C-44287-7160	SMO Type No. 21		C2-144	1							
C2-145	Same as C2-12.	V2-16A input coupler													
C2-146	Same as C2-102.	V2-16A plate filter													
C2-147	Same as C2-102.	V2-16A output coupler													
C2-148	Same as C2-102.	V2-16B plate filter													
C2-149	Same as C2-143.	V2-16B output coupler													
C2-150	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 2500 mmf + 10% tolerance; 800v DC working; temp characteristic letter B; molded low-loss bakelite case; case dim., 1-1/32 in. lg max, 41/64 in. wide max, 11/32 in. deep max; 2 terminals, located on each end; terminal mounted; resistant to humidity; for general purpose use.	Bypass for high audio frequencies		N16-C-32013-9810	AEV Type No. 1441LWP		C2-150	1							
C2-151	Same as C2-128.	V2-17 cathode bypass													
C2-152	Same as C2-129.														
C2-152A	P/o C2-152.	AC input power filter													
C2-152B	P/o C2-152.	AC input power filter													
C2-153	Same as C2-3.	V2-1 and V2-2 filament filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
C2-154	Same as C2-3.	V2-1, V2-2, V2-4 and V2-5 filament filter													
C2-155	Same as C2-3.	V2-4 and V2-5 filament filter													
C2-156	Same as C2-102.	V2-6 and V2-8 filament filter													
C2-157	Same as C2-102.	V2-6 and V2-8 filament filter													
C2-158	Same as C2-128.	V2-20 output filter													
C2-159	Same as C2-128.	V2-20 output filter													
C2-160	Same as C2-128.	V2-20 output filter													
C2-161	CAPACITOR, FIXED, ELECTROLYTIC: case style No. 20, MBCA Ref Dwg Group 1; 3 sections (C2-161A,B,C); 20 mf/section; 450v DC working; +85°C working temp range; sealed metal can; case dim., 3-7/8 in. lg, 1-3/8 in. dia; 4 terminals, solder lug type, located on bottom, phenolic insulation, terminals insulated from can; 1 clamp, Universal clamp type; for general purpose use.		Spec No. JAN-C-26, JAN Type No. CE33D200R	N16-C-22643-8295	CLD Part No. 1815768		C2-161	1							
C2-161A	P/o C2-161	V2-19 output filter													
C2-161B	P/o C2-161.	V2-19 output filter													
C2-161C	P/o C2-161.	V2-19 output filter													
C2-162	CAPACITOR ASSEMBLY: individual capacitor data, 2 capacitors, 7,000 mmf ± 5% tolerance, 600v DC working; matched pair, 3,500 mmf, ± 5% tolerance, 600v DC working voltage; series connected; over-all dim. excluding leads, 53/64 in. lg, 53/64 in. wide, 11/16 in. deep; 2 capacitors (C2-162A, C2-162B) matched to ea other within ± 1%; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	External HF oscillator input signal filter		N16-C-66203-4770		NRCO Dwg No. A1104195	C2-162	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-162A	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 7,000 mmf + 5% tolerance; 300v DC; temp characteristic letter B per JAN-C-5; molded low-loss phenolic case; case dim., 53/64 in. lg, 53/64 in. wide, 11/32 in. deep, 2 terminals, wire lead type, located one ea end; terminal mounted; special features, wax impregnated externally, matched w/C2-162B within 1%; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o C2-162; listed for reference only.	P/o external HF oscillator input signal filter		N16-C-33116-3142	SMO Type No. C06270	NRCO Dwg No. A110497-1	C2-162A C2-162B	2							
C2-162B	Same as and matched within 1% of C2-162A; listed for reference only.	P/o external HF oscillator input signal filter														
C2-164	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf + 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-4A input coupler	Spec No. JAN-C-5, JAN Type No. CM20B101K	N16-C-28558-1676	SMO Type No. K1310		C2-164 C3-23 C3-26 C3-28 C3-52 C3-61	6								
C2-165	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf + 10% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-4B output coupler	Spec No. JAN-C-5, JAN Type No. CM20C101K	N16-C-28558-1681	SMO Part No. KR1310		C2-165	1								
C2-166	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10,000 mmf + 10% tolerance; 300v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 53/64 in. lg max, 53/64 in. wide max, 11/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-4 grid bias filter	Spec No. JAN-C-5, JAN Type No. CM35B103K	N16-C-33622-5222	SMO Type No. C06110		C2-166 C2-169 C2-171 C2-172 C2-174 C2-176 C3-18 C3-19 C3-50 C3-59 C3-60 C3-62 C3-63 C9-1 C9-2 C9-6	16								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-167	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf ± 5% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	P/o 3.5 mc oscillator circuit	Spec No. JAN-C-5; JAN Type No. CM20B101J	N16-C-28553-1196	SMO Type No. K1310		C2-167	1							
C2-168	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10 mmf ± 5% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss phenolic case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-8A output coupler		N16-C-26020-7796	SMO Type No. K1410	NRCO Dwg No. A110495-4	C2-168	1							
C2-169	Same as C2-166.	V2-8B plate filter													
C2-170	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1,000 mmf ± 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-8B output coupler		N16-C-31090-4208	SMO Type No. K1210		C2-170 C2-181 C2-182 C3-8 C3-10 C3-11 C3-13 C3-14 C3-15 C3-20 C3-21 C3-29 C3-32 C3-33 C3-39 C3-43 C3-48 C3-51 C3-53 C3-54	20							
C2-171	Same as C2-166.	V2-13B input coupler													
C2-172	Same as C2-166.	V2-13 grid bias filter													
C2-173	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 22, MBCA Ref Dwg Group 1; 250,000 mmf ± 10% tolerance; 120v DC; molded phenolic case; case dim., excluding terminals, 1-7/16 in. lg, 3/4 in. wide, 3/8 in. deep; 2 terminals,	P/o AVC time constant circuit		N16-C-46339-4870	MIC Type No. 345-20	NRCO Dwg No. A1104108-1	C2-173	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C2-173 (cont)	wire lead type, located one ea end; wax impregnated; no internal ground connections; terminal mounted; for general purpose use.														
C2-174	Same as C2-166.	P/o AVC time constant circuit													
C2-175	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 300 mmf ± 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss phenolic case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally, for general purpose use.	AVC filter		N16-C-29665-9476	SMO Type No. K1330	NRCO Dwg No. A1l0495-6	C2-175	1							
C2-176	Same as C2-166.	V2-16A output coupler													
C2-180	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10,000 mmf ± 20% tolerance; 300v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 53/64 in. lg max, 53/64 in. wide max, 11/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V2-8B plate filter	Spec No. JAN-C-5, JAN Type No. CM35B103M	N16-C-33627-7705	SMO Part No. C06110		C2-180 C9-11	2							
C2-181	Same as C2-170.	V2-4A grid bias filter													
C2-182	Same as C2-170.	V2-4B grid bias filter													
C2-183	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 2, MBCA Ref Dwg Group 1; 100,000 mmf ± 20% tolerance; 200v DC; cardboard case; case dim., excluding terminals, 3/8 in. dia, 5/8 in. lg; 2 terminals, wire lead type, located one ea end; Hyvol K impregnated; no internal ground connections; terminal mounted; -40°C to +50°C operating temp, wax impregnated case, metalized paper dielectric; for general purpose use.	V2-9 cathode bias filter		N16-C-45803-1084	AEV Part No. P82-10,C00±20	NRCO Dwg No. A1l04182-1	C2-183 C2-184	2							
C2-184	Same as C2-183.	V2-10 cathode bias filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-1	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 1 section; 220 mmf max, 21 mmf min; straight line frequency tuning characteristic; over-all dim , excluding shaft, 4-9/32 in. lg, 3-5/32 in. wide, 3-5/32 in. high, shaft dim. beyond gear hub and retaining plate respectively, 9/16 in. lg, 5/16 in. dia, 5/8 in. lg, 0.247 in. dia; scale dial (I3-3) adjustment 360° ccw rotation on spur gear shaft; base not insulated; 3 terminals, solder lug type; mounted by 3 holes on 2-11/16 by 1-15/16 in. mounting centers; 2 shafts running perpendicular to ea other connected w/worm and 99 tooth spur gear; 15 rotor and 14 stator plates, brass, silver plate; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	HF variable oscillator trimmer		N16-C-61523-4801	CDN Part No. 4.080	NRCO Dwg No. B1104115	C3-1	1							
C3-2	Same as C2-101.	"DIAL UNITS" trimmer (HF oscillator)														
C3-3	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf ± 5% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 1/2 in. lg, 9/32 in. wide, 3/16 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-1 grid coupler		N16-C-28553-1041	SMO Part No. RR1310	NRCO Dwg No. A1104105-1	C3-3	1							
C3-4	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1000 mmf ± 10% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; 53/64 in. lg max, 53/64 in. wide max, 9/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-1 plate bypass	Spec No. JAN-C-5, JAN Type No. CM30C102K	N16-C-31090-4169	SMO Type No. KR1210		C3-4 C3-7 C3-17	3							
C3-5	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10 mmf ± 5% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite	V3-2 input coupler		N16-C-26020-7691	SMO Part No. RR1410	NRCO Dwg No. A1104105-2	C3-5	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-5 (cont)	case; case dim., 1/2 in. lg, 9/32 in. wide, 3/16 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.														
C3-6	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 1 section; 52 mmf max, 3.7 mmf min; straight line capacity characteristics; 0.015 in. between plates; over-all dim. excluding shaft and bushing, 1 in. lg approx, 1-5/16 in. wide, 1-9/32 in. high, including bracket, 1-3/16 in. high less bracket; bushing dim. 1/4 in. lg, 5/16 in. high 24 threads per in.; shaft 1/2 in. lg beyond bushing, 7/8 in. lg from base approx, 1/4 in. dia; shaft extension knob adjustment, 360° cw or ccw rotation; base isolantite; 3 terminals, 1 rotor terminal, solder lug type, 2 stator terminals, post type; single No. 6-32 thread tapped hole in bracket, two 1/8 in. dia holes 1 in. C to C, or single hole bushing mounted; incl 1 hex nut and washer; 7 rotor and 7 stator plates, brass, cadmium plated; for general purpose use.	"HF XTAL FREQ" adjustment		N17-C-60036-1604	HMM Part No. HF50	NRCO dwg No. A1104145	C3-6	1							
C3-7	Same as C3-4.	HF crystal oscillator feedback coupler													
C3-8	Same as C2-170.	M3-1 HF output coupler													
C3-9	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 5 mmf + 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-3 HF input coupler		N16-C-25102-6276	SMO Type No. K1550	NRCO Dwg No. A110495-3	C3-9	1							
C3-10	Same as C2-170.	M3-1 BF output coupler													
C3-11	Same as C2-170.	V3-10A plate bypass													
C3-12	Same as C2-83.	V3-10B input coupler													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-13	Same as C2-170.	V3-3 plate bypass													
C3-14	Same as C2-170.	V3-3 screen filter													
C3-15	Same as C2-170.	V3-5 cathode bypass													
C3-16	CAPACITOR, FIXED, CERAMIC DIELECTRIC: case style No. 1, MBCA Ref Dwg Group 1; 10 mmf ± 0.5 mmf tolerance; 600v DC; 0 mmf per mf per deg C, tol ± 30 mmf per mf per deg C; body, non-insulated, lacquer coating; case dim., 0.400 in. lg, 0.200 in. dia; 2 terminals, radial wire lead type; terminal mounted; color coded; for general purpose use.	V3-3 grid to cathode feedback		N16-C-15917-3301 *	CN Part No. TCZ10	NRCO Dwg No. A110455-1	C3-16	1							
C3-17	Same as C3-4.	V3-3 screen load													
C3-18	Same as C2-166.	V3-3 cathode bypass													
C3-19	Same as C2-166.	V3-3 output coupler													
C3-20	Same as C2-170.	V3-4 cathode bypass													
C3-21	Same as C2-170.	V3-4 screen bypass													
C3-22	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 5,000 mmf ± 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 13/16 in. lg, 25/32 in. wide, 11/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-4 plate filter		N16-C-32699-4608	SMO Type No. C1250	NRCO Dwg No. A110496-1	C3-22 C3-27 C3-31 C3-38 C3-64 C3-65 C3-66	7							
C3-23	Same as C2-164.	V3-12 output coupler													
C3-24	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 3 sections (C3-24A,B,C); 266.5 mmf max, 8 mmf min, 266.5 mmf max, 8 mmf min, 266 mmf max, 8 mmf min; MLF tuning characteristic; 0.0125 in. nominal airgap over-all dim. excluding shaft, 3-3/16 in. lg, 2-5/32 in. wide max w/ plates unmeshed, 1-13/16 in. wide min w/ plates meshed; 2-3/16 in. high max w/ plates unmeshed,	"OUTPUT FREQ" adjustment		N16-C-63286-9101	RAD Series No. 25	NRCO Dwg No. A110485	C3-24	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-24 (cont)	1-5/8 in. high min w/ plates meshed; shaft, 27/32 in. lg max from front end plate, 1/4 in. dia; extension shaft adjustment, 180° ccw rotation; base not insulated; 6 terminals, solder lug type; 3 No. 6-32 thread tapped mounting legs in triangle layout on 1 in. by 1 in. by 7/8 in. mounting centers; no trimmers, steel frame, standard calibration; 9 rotor and 8 stator plates per section, aluminum; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.														
C3-24A	P/o C3-24.	2 to 4 and 4 to 8 mc output frequency tuner													
C3-24B	P/o C3-24.	8 to 16 mc output frequency tuner													
C3-24C	P/o C3-24.	16 to 32 mc output frequency tuner													
C3-25	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 50 mmf ± 5% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 1/2 in. lg, 9/32 in. wide, 3/16 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-10A plate load		N16-C-27629-7215	SMO Part No. RR1450	NRCO Dwg No. A1104105-4	C3-25	1							
C3-26	Same as C2-164.	V3-4 output coupler													
C3-27	Same as C3-22.	V3-5 plate filter													
C3-28	Same as C2-164.	V3-5 output coupler													
C3-29	Same as C2-170.	V3-5 screen bypass													
C3-30	Same as C2-101.	P/o voltage divider input network to V3-2													
C3-31	Same as C3-22.	V3-11 plate filter													
C3-32	Same as C2-170.	V3-11 screen bypass													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-33	Same as C2-170.	V3-1 cathode bypass													
C3-34	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: rotary type, single section, 500 mmf per mf per degree C neg temp coefficient; 7 to 45 mmf capacity; DC, 500v; over-all dim. excluding terminals, 27/32 in. lg, 21/32 in. wide, 3/8 in. high; 2 terminals, solder lug type, located radially one ea end; two 0.120 in. dia mounting holes in base spaced 0.445 in. C to C; screwdriver slot adjustment; steatite base; Q = 500 at approx 1 mc, marked "N500 7-45"; for general purpose use.	16 to 32 mc output frequency trimmer		N16-C-64133-6625	ERC Type No. TS2A	NRCO Dwg No. A110456	C3-34 C3-35 C3-36 C10-18 C10-19 C10-20 C10-21 C10-22 C10-23	9							
C3-35	Same as C3-34.	8 to 16 mc output frequency trimmer													
C3-36	Same as C3-34.	2 to 4 and 4 to 8 mc output frequency trimmer													
C3-37	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 50 mmf ± 10% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	BF oscillator grid to cathode feedback coupler		N16-C-27634-8769	SMO Type No. KR1450	NRCO Dwg No. A110495-2	C3-37	1							
C3-38	Same as C3-22.	V3-4 plate filter													
C3-39	Same as C2-170.	V3-10B plate filter													
C3-40	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 42, MBCA Ref Dwg Group 1; 500,000 mmf ± 20% tolerance; 600v DC; hermetically sealed metal case; case dim. excluding terminals, 1 in. wide, 1-13/16 in. lg, 1 in. high; 2 terminals, riveted solder lug type 7/16 in. lg, located on side, 1 in. C to C; mineral oil impregnated; mineral oil filled; no internal ground connections; 2 mounting feet w/ 3/16 in. dia mounting hole in ea, holes spaced 2-1/8 in. C to C; non-inductively wound; for general purpose use.	V3-3 plate filter		N16-C-47327-7486	SMO Type No. 5006R5-0.5	NRCO Dwg No. A110491-1	C3-40 C3-41 C9-16	3							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
C3-41	Same as C3-40.	V3-6 output coupler													
C3-43	Same as C2-170.	M3-1 filter for HF output signal													
C3-44	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 12, MBCA Ref Dwg Group 1; 4 mf + 20% tolerance; 600v DC; hermetically sealed metal can; case dim. excluding terminals, 1-1/2 in. dia, 4-1/2 in. high; 1 terminal, solder lug type, located on bottom; Dykanol "G" impregnated; Dykanol "G" filled; internally grounded; 1 mounting stud w/ 3/4 in. -16 thread; supplied w/ 2 insulating washers, nut and lock washer for mounting; for general purpose use.	Power supply filter		N16-C-49988-5295	CLD Part No. TLA6040	NRCO Dwg No. A110448	C3-44 C3-45 C3-47 C9-18 C9-19 C9-20 C10-7 C10-16 C10-17	9							
C3-45	Same as C3-44.	Power supply filter													
C3-46	Same as C3-4.	V3-2 plate bypass													
C3-47	Same as C3-44.	Power supply filter													
C3-48	Same as C2-170.	M3-1 filter for BF output signal													
C3-49	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 1 section; 50 mmf max, 5 mmf min; straight line capacity tuning characteristic; 0.015 in. between plates; over-all dim. excluding shaft, 1-1/16 in. lg, 15/16 in. wide, 1-7/32 in. high; shaft, 5/16 in. lg to base, 7/32 in. lg to mounting face, 9/32 in. dia; screwdriver adjustment, 360° cw or ccw rotation; base isolantite; 3 terminals, 1 rotor terminal, solder lug type, stator two terminals, grooved post type; 2 No. 4-36 tapped mounting holes 21/32 in. C to C; 7 rotor and 7 stator plates, brass, cadmium plated; for general purpose use.	Fine adjustment for calibrator output frequency		N16-C-59823-8206	HMM Part No. APC50	NRCO Dwg No. A1104125	C3-49 C9-22	2							
C3-50	Same as C2-166.	V3-10B cathode bypass													
C3-51	Same as C2-170.	V3-9B plate bypass													
C3-52	Same as C2-164.	V3-9A to V3-9B coupler													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-53	Same as C2-170.	V3-9A plate bypass													
C3-54	Same as C2-170.	V3-9B output coupler													
C3-55	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 150 mmf + 5% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted, wax impregnated externally; for general purpose use.	V3-9A plate load	Spec No. JAN-C-5, JAN Type No. CM20C151J	N16-C-28975-1601	SMO Part No. KR1315		C3-55	1							
C3-56	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 20 mmf, + 5% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 1/2 in. lg, 9/32 in. wide, 3/16 in. deep; 2 terminals, wire lead type, located one ea end, terminal mounted; wax impregnated externally; for general purpose use.	P/o variable HF oscillator		N16-C-26732-9439	SMO Part No. RR1420	NRCO Dwg No. A1104105-3	C3-56	1							
C3-57	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1, 10,000 mmf + 5% tolerance, 300v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 53/64 in. lg max, 53/64 in. wide max, 11/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V3-1 filament filter	Spec No. JAN-C-5, JAN Type No. CM35C103J	N16-C-33617-4746	SMO Part No. CR06110		C3-57 C3-58	2							
C3-58	Same as C3-57.	V3-1 filament filter													
C3-59	Same as C2-166.	Inner oven heater bypass													
C3-60	Same as C2-166.	Inner oven heater bypass													
C3-61	Same as C2-164.	V2-10B output coupler													
C3-62	Same as C2-166.	V3-12 cathode bypass													
C3-63	Same as C2-166.	V3-12 screen bypass													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C3-64	Same as C3-22.	V3-4 plate to tuned circuit coupler													
C3-65	Same as C3-22.	V3-5 plate to tuned circuit coupler													
C3-66	Same as C3-22.	V3-6 plate to tuned circuit coupler													
C9-1	Same as C2-166.	V9-1 cathode bypass													
C9-2	Same as C2-166.	V9-2 screen bypass													
C9-3	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 42, MBCA Ref Dwg Group 1; 2 mf ± 20% tolerance; 600v DC; hermetically sealed metal case; case dim. excluding terminals, 2 in. lg, 2 in. wide, 1-1/4 in. high; 2 terminals, lug type 7/16 in. high, located on top, spaced 1 in. C to C, composition insulation; mineral oil impregnated; mineral oil filled; no internal ground connections; 2 mounting feet w/ 3/16 in. dia mounting hole in ea; holes spaced 2-3/8 in. C to C; non-inductively wound; for general purpose use.	V9-1 plate filter		N16-C-49227-7960	SMO Type No. 5006RT-2	NRCO Dwg No. A110494-1	C9-3 C9-14	2							
C9-4	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf ± 20% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V9-1 output coupler	Spec No. JAN-C-5, JAN Type No. CM20B101M	N16-C-28563-4156	SMO Type No. K1310		C9-4	1							
C9-6	Same as C2-166.	V9-2 cathode bypass													
C9-7	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1000 mmf ± 20% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 53/64 in. lg max, 53/64 in. wide max, 11/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V9-1 input coupler	Spec No. JAN-C-5, JAN Type No. CM35B102M	N16-C-31095-6688	SMO Part No. K1210		C9-7	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C9-10	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf ± 10% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; meets 1,000v DC test; for general purpose use.	V9-2 grid to oscillator coupler		N16-C-28558-1676	CLD Type No. 5W5T1		C9-10	1							
C9-11	Same as C2-180.	V9-2 screen bypass													
C9-12	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 5,000 mmf ± 20% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 13/16 in. lg, 25/32 in. wide, 11/32 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V9-2 plate bypass		N16-C-32704-7088	SMO Part No. C1250	NRCO Dwg No. A110496-2	C9-12 C9-21	2							
C9-13	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 2, MBCA Ref Dwg Group 1; 250,000 mmf ± 20% tolerance; 400v DC; laminated paper case; case dim. excluding terminals, 2 in. lg, 3/4 dia; 2 terminals, wire lead type, located one ea end; wax impregnated; no internal ground connections; terminal mounted; moisture proof; for general purpose use.	V9-2 output coupler		N16-C-46375-7552	CLD Part No. DT4P25	NRCO Dwg No. A110445-1	C9-13 C9-17	2							
C9-14	Same as C9-3.	V9-2 plate filter													
C9-16	Same as C3-40.	V9-4 plate filter													
C9-17	Same as C9-13.	V9-4 output coupler													
C9-18	Same as C3-44.	Power supply filter													
C9-19	Same as C3-44.	Power supply filter													
C9-20	Same as C3-44.	Power supply filter													
C9-21	Same as C9-12.	V9-2 plate bypass													
C9-22	Same as C3-49.	Oscillator trimmer													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C9-23	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 1 section; 50 mmf max, 5 mmf min; straight line capacity tuning characteristic; 0.015 in. between plates; over-all dim. excluding shaft, 1-1/16 in. lg, 15/16 in. wide, 1-7/32 in. high; shaft, 5/16 in. lg to base, 7/32 in. lg to mounting face, 9/32 in. dia; screwdriver adjustment, 360° cw or ccw rotation; base isolantite; 3 terminals, 1 rotor terminal, solder lug type, stator two terminals, grooved post type; 2 No. 4-36 tapped mounting holes 21/32 in. C to C; 7 rotor and 7 stator plates, brass, cadmium plated; w/rounded plates; for general purpose use.	"TUNING" adjustment		N16-C-59761-6276	HMM Part No. APC50B	NRCO Dwg No. A1104125	C9-23	1							
C9-24	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1,000 mmf + 1% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, axial wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	P/o oscillator		N16-C-31079-4268	SMO Type No. KR1210	NRCO Dwg No. A110495-1	C9-24	1							
C10-1	Same as C2-87.	P/o positive feedback network for V10-1													
C10-2	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 110 mmf + 2% tolerance; 500v DC; -200 to +200 parts per million per deg C temp coefficient; molded low-loss bakelite case; case dim., 51/64 in. lg max, 15/32 in. wide max, 7/32 in. deep max; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	P/o positive feedback network for V10-1	Spec No. JAN-C-5, JAN Type No. CM20C111G	N16-C-28653-4321	SMO Type No. KR1311		C10-2	1							
C10-3	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 2, MBCA Ref Dwg Group 1; 100,000 mmf + 10% tolerance; 400v DC; molded phenolic case; case dim. excluding terminals, 9/16 in. dia, 1-5/8 in. lg; 2 terminals, wire lead type, located one ea end; wax impregnated; no internal ground connections; terminal mounted; operating temp 85° C max; for general purpose use.	V10-2 input coupler		N16-C-45773-8706	SMO Part No. 300401	NRCO Dwg No. A110489-1	C10-3	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C10-4	CAPACITOR, FIXED, PAPER DIELECTRIC: 2 sections (C10-4A and C10-4B); case style No. 42, MBCA Ref Dwg Group 1; 100,000/100,000 mmf +20% tolerance; 600v DC; hermetically sealed metal case; case dim. excluding terminals, 3/4 in. lg, 1-13/16 in. wide, 1 in. high; 3 terminals, lug type, located on front, on insulated pillars; mineral oil impregnated; mineral oil filled; no internal ground connections; 2 mounting feet w/ 3/16 in. dia mounting hole in ea, holes spaced 2-1/8 in. C to C; non-inductively wound; for general purpose use.			N16-C-53214-7497	SMO Type No. 5006-.1x2	NRCO Dwg No. A1104102-1	C10-4	1							
C10-4A	P/o C10-4.	V10-1 plate filter														
C10-4B	P/o C10-4.	V10-1 plate filter														
C10-5	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 42, MBCA Ref Dwg Group 1; 1 mf + 20% tolerance; 600v DC; hermetically sealed metal case; case dim. excluding terminal, 7/8 in. lg, 2 in. wide, 1-3/4 in. high; 2 terminals, lug type, located on front, on insulated pillers; mineral oil impregnated; mineral oil filled; no internal ground connections; 2 mounting feet w/ 3/16 in. dia mounting hole in ea, holes spaced 2-3/8 in. C to C; non-inductively wound; for general purpose use.	V10-2 plate filter		N16-C-48847-7935	SMO Type No. 5006-1	NRCO Dwg No. A110493-1	C10-5	1							
C10-6	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 42, MBCA Ref Dwg Group 1; 2 mf + 20% tolerance; 600v DC: hermetically sealed metal case; case dim. excluding terminals, 2 in. lg, 2 in. wide, 1-1/8 in. high; 2 terminals, lug type, located on front, on insulated pillers; mineral oil impregnated; mineral oil filled; no internal ground connections; 2 mounting feet w/ 3/16 in. dia mounting hole in ea, holes spaced 2-3/8 in. C to C; non-inductively wound; for general purpose use.	V10-2 output coupler		N16-C-49227-7935	SMO Type No. 5006-2	NRCO Dwg No. A110492-1	C10-6	1							
C10-7	Same as C3-44.	Power supply filter														
C10-9	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 2, MBCA Ref Dwg Group 1; 10,000 mmf ± 20%	V10-4A input coupler		N16-C-42765-5354	SMO Part No. 300411	NRCO Dwg No. A110490-1	C10-9 C10-10	2								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
C10-9 (cont)	tolerance; 400v DC; molded phenolic case; case dim. excluding terminals, 3/8 in. dia, 1-1/8 in. lg; 2 terminals, wire lead type, located one ea end; wax impregnated; no internal ground connections; terminal mounted; 85° max operating temp; for general purpose use.														
C10-10	Same as C10-9.	V10-4B input coupler													
C10-13	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 500 mmf ± 20% tolerance; 500v DC; temp characteristic letter B per JAN-C-5; molded low-loss bakelite case; case dim., 23/32 in. lg, 15/32 in. wide, 13/64 in. deep; 2 terminals, wire lead type, located one ea end; terminal mounted; wax impregnated externally; for general purpose use.	V10-7 filter		N16-C-30172-4556	SMO Part No. K1350	NRCO Dwg No. A110495-5	C10-13	1							
C10-16	Same as C3-44.	Power supply filter													
C10-17	Same as C3-44.	Power supply filter													
C10-18	Same as C3-34.	P/o positive feedback network for V10-1													
C10-19	Same as C3-34.	P/o positive feedback network for V10-1													
C10-20	Same as C3-34.	P/o positive feedback network for V10-1													
C10-21	Same as C3-34.	P/o positive feedback network for V10-1													
C10-22	Same as C3-34.	P/o positive feedback network for V10-1													
C10-23	Same as C3-34.	P/o positive feedback network for V10-1													
CR3-1	CRYSTAL UNIT, RECTIFYING: germanium type; 50 ma max continuous forward rectified current; 150 ma max peak forward rectified current; 85v peak inverse voltage; 0.8 mmf max shunt capacitance; body dim. excluding terminals, 7/16 in. lg, 13/64 in. dia; terminal mounted;	HF output rectifier for M3-1		N17-T-51748	GE Part No. G5 or IN48	NRCO Dwg No. A1104135	CR3-1 CR3-2	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
CR3-1 (cont)	2 terminations, wire lead type, located axially one ea end; 40 ma max surge current for 1 sec, -50° to +80° C ambient temp range, high moisture resistance, 10,000 hr min life; for general purpose use.														
CR3-2	Same as CR3-1.	BF output rectifier for M3-1													
E1-1	TERMINAL BOARD: phenolic board; 2 terminals, screw type; w/o barriers; over-all dim., 2 in. lg, 7/8 in. wide, 11/16 in. high; 2 9/64 in. dia mounting holes spaced 1-1/2 in. C to C; terminals nickel plated; for general purpose use.	Input terminal board		N17-B-77536-6761	ICA Part No. 2420	NRCO Dwg No. A110464	E1-1 E9-1 E10-5	3							
E2-1	TERMINAL BOARD: melamine; includes 2 terminals, single screw type; w/o barriers; over-all dim., 2 in. lg, 7/8 in. wide, 1/8 in. thick; two 5/32 in. dia mounting holes spaced 1-1/2 in. C to C; marked "phono"; p/o AN, Radio Receiver, Type No. R-450/FRR-28.	Phono terminal board		N17-B-77639-2210	JNS Type No. 2-50		E2-1	1							
E2-2	TERMINAL BOARD: melamine board; includes 4 terminals, single screw type; w/o barriers; over-all dim., 3-1/4 in. lg, 1-1/8 in. wide, 1/8 in. thick; two 5/32 in. mounting holes spaced 2-3/4 in. C to C; "Audio output"; 2 terminals marked "jumper"; 2 terminals marked "600 ohms"; p/o AN, Radio Receiver Type No. R-450/FRR-28.	Audio output terminal board		N17-B-77536-1126	JNS per HMM Part No. 31141	HMM Part No. 31141	E2-2	1							
E2-3	KNOB: round; phenolic; black; designed to accommodate shaft, rd 1/4 in. dia, 3/4 in. deep shaft hole, set screw; brass insert; w/o markings; over-all dim., 3 in. dia, 1-1/8 in. thick; fluted finger grip; for general purpose use.	"BAND CHANGE" knob		N16-K-700439-676	GE Part No. 31215		E2-3 E2-4	2							
E2-4	Same as E2-3.	"TUNING" knob													
E2-5	TERMINAL BOARD: melamine insulation; 1 terminal, solder lug type; w/o barriers; over-all dim., 3/4 in. lg, 23/32 in. wide, 1/16 in. thick; one 5/32 in. dia mounting hole; for general purpose use.	Tiepoint for electrical connections		N17-B-77482-8671	ICA Part No. 2423		E2-5 E2-6	2							
E2-7	TERMINAL BOARD: melamine insulation; 2 terminals, solder lug type; w/o barriers; over-all dim., 1-1/8 in. lg, 11/16 in. high, 1/16 in. thick; single 5/32 in. dia mounting hole; for general purpose use.	Tiepoint for electrical connections		N17-B-77533-8524	CIN Part No. 1520		E2-7	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E2-8	Same as E2-5.	Tiepoint for electrical connections													
E2-9	TERMINAL BOARD: melamine insulation; 1 terminal, solder lug type; w/o barriers; over-all dim., 3/4 in. lg, 23/32 in. high, 1/16 in. thick; mounting data single 5/32 in. dia mounting hole; for general purpose use.	Tiepoint for electrical connections		N17-B-77482-8666	CIN Part No. 51B		E2-9 E2-10 E2-11 E2-12	4							
E2-10	Same as E2-9.	Tiepoint for electrical connections													
E2-11	Same as E2-9.	Tiepoint for electrical connections													
E2-12	Same as E2-9.	Tiepoint for electrical connections													
E2-13	TERMINAL BOARD: melamine insulation; 6 terminals, solder lug type; w/o barriers; over-all dim., 3 in. lg, 11/16 in. high, 1/16 in. thick; two 5/32 in. dia mounting holes spaced 2-5/8 in. C to C; for general purpose use.	Tiepoint for electrical connections		N17-B-77738-4951	CIN Part No. 56A		E2-13 E2-14	2							
E2-14	Same as E2-13.	Tiepoint for electrical connections													
E2-15	TERMINAL BOARD: melamine insulation; 8 terminals, solder lug type; w/o barriers; over-all dim., 3-11/16 in. lg, 1-3/4 in. high, 1/16 in. thick; two 5/32 in. dia mounting holes spaced 3-3/8 in. C to C; p/o AN Radio Receiver, Type No. R-450/FRR-28.	Tiepoint for electrical connections		N17-B-77840-2970	LTJI Part No. 31163G1		E2-15 E2-16	2							
E2-16	Same as E2-15.	Tiepoint for electrical connections													
E2-17	TERMINAL BOARD: melamine insulation; 15 terminals, solder lug type; w/o barriers; over-all dim., 7-1/16 in. lg, 1-1/16 in. high, 1/16 in. thick; four 5/32 in. dia mounting holes spaced 2-1/4 in. C to C; p/o AN Radio Receiver, Type No. R-450/FRR-28.	Tiepoint for electrical connections		N17-B-78064-7701	LTJI Part No. 31162G1		E2-17	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E2-18	TERMINAL BOARD: melamine insulation; 3 terminals, solder lug type; w/o barriers; over-all dim., 3-1/4 in. lg, 1-13/16 in. wide, 1/16 in. thick; two 7/16 in. dia mounting holes spaced 2 in. C to C; mounted directly on meter M2-1; p/o AN Radio Receiver, Type No. R-450/FRR-28.	Tiepoint for electrical connections		N17-B-77589-2261	LTJI Part No. 3145401		E2-18	1							
E2-19	TERMINAL BOARD: phenolic board; includes terminals, 5 terminals, screw type; w/o barriers; over-all dim., 3-1/2 in. lg, 7/8 in. wide, 11/16 in. high; two 9/64 in. dia mounting holes spaced 3 in. C to C; terminals nickel plated; for general purpose use;	"6.3v, G, AVC, LOAD, DET." terminal board		N17-B-77691-1076	ICA Part No. 2405	NRCO Dwg No. A1104461	E2-19 E10-1	2							
E2-20	TERMINAL BOARD: phenolic board; includes terminals, 7 terminals, solder lug type; w/o barriers; over-all dim., 2-7/8 in. lg, 5/16 in. wide, 7/8 in. high; one 1/8 in. dia hole in ea of 2 mounting lugs spaced 2-9/16 in. C to C; terminals tin plated; for general purpose use.	Tiepoint for electrical connections		N17-B-77788-2789	JNS Part No. 2007	NRCO Dwg No. A1104149	E2-20	1							
E2-21	TERMINAL BOARD: phenolic board; includes terminals, 2 terminals, solder lug type; w/o barriers; 1-1/8 in. lg, 15/32 in. wide, 3/4 in. high; 0.140 in. dia mounting hole in mounting lug; terminals nickel plated; for general purpose use.	Tiepoint for electrical connections		N17-B-77533-5680	ICA Part No. 2435	NRCO Dwg No. A1104106	E2-21 E2-22	2							
E2-22	Same as E2-21.	Tiepoint for electrical connections													
E2-23	TERMINAL BOARD: phenolic board; includes terminal, 1 terminal, solder lug type; w/o barriers; over-all dim. including terminal and mounting lug, 29/64 in. lg, 3/8 in. wide, 1-1/16 in. high; single 9/64 in. dia mounting hole in mounting lug; terminal and lug fastened to board w/ eyelets; for general purpose use.	Tiepoint for electrical connections		N17-B-77483-7057	CIN Part No. 51F	NRCO Dwg No. A1104163	E2-23 E2-24 E2-25 E2-26 E2-27 E2-35	6							
E2-24	Same as E2-23.	Tiepoint for electrical connections													
E2-25	Same as E2-23.	Tiepoint for electrical connections													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E2-26	Same as E2-23.	Tiepoint for electrical connections													
E2-27	Same as E2-23.	Tiepoint for electrical connections													
E2-28	CONNECTOR, ADAPTER: 1 contact, male, rd; angle type; 90° angle; over-all dim., 1-7/32 in. deep, 3/4 in. wide, 1-3/16 in. high, 3/4 in. max dia; radio frequency connector; body data, "L" shape, zinc, silver plate; polysterene insert; 3/4 in. OD brass coupling nut, 5/8-24 coupling nut thread; integral non-rotating pin contact; for general purpose use.	J2-7 adapter	(-49192)	N17-C-67444-1285	AMP Part No. 83-1AP	NRCO Dwg No. A1104158	E2-28 E2-29 E2-30 E2-31 E2-32 E2-33	6							
E2-29	Same as E2-28.	J2-4 adapter													
E2-30	Same as E2-28.	J2-8 adapter													
E2-31	Same as E2-28.	J2-6 adapter													
E2-32	Same as E2-28.	J2-10 adapter													
E2-33	Same as E2-28.	"ANT." jack adaptor													
E2-34	KNOB: rd; phenolic; black; designed to accommodate shaft, rd, 1/4 in. dia, 5/8 in. deep, set screw, brass insert; single white dot marking; over-all dim., 13/16 in. lg, 59/64 in. dia; for general purpose use.	"HFO, INT., EXT." knob		N16-K-700295-876	NAC Type HR	NRCO Dwg No. A1104168	E2-34 E2-36	2							
E2-35	Same as E2-23.	Tiepoint for electrical connections													
E2-36	Same as E2-34.	"AVC, INT, BFO, EXT. BFO, FAST, SLOW" knob													
E2-37	CORE, ADJUSTABLE TUNING: iron material, smooth finish, over-all dim., 1-1/8 in. lg, 0.250 in. dia; supplementary part consists of integral brass nickel plated threaded stud w/screwdriver slot; mounted by No. 6-32 spring nut; end of core coated w/red lacquer, p/o 22-1	Used to tune coil L2-1		N16-C-600701-165	CHL Part by description		E2-37 E2-38 E2-39 E2-40 E2-41 E2-42 E2-43 E2-44 E2-45 E2-46 E2-47 E2-48 E2-49 E2-50 E2-51 E2-52	24							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E2-37 (cont)							E2-53 E2-54 E2-55 E2-56 E2-57 E2-58 E2-59 E2-60								
E2-38	Same as E2-37; p/o Z2-2.	Used to tune coil L2-2													
E2-39	Same as E2-37; p/o Z2-3.	Used to tune coil L2-3													
E2-40	Same as E2-37; p/o Z2-4.	Used to tune coil L2-4													
E2-41	Same as E2-37; p/o Z2-5.	Used to tune coil L2-5													
E2-42	Same as E2-37; p/o Z2-6.	Used to tune coil L2-6													
E2-43	Same as E2-37; p/o Z2-8.	Used to tune coil L2-8													
E2-44	Same as E2-37; p/o Z2-9.	Used to tune coil L2-9													
E2-45	Same as E2-37; p/o Z2-10.	Used to tune coil L2-10													
E2-46	Same as E2-37; p/o Z2-11.	Used to tune coil L2-11													
E2-47	Same as E2-37; p/o Z2-12.	Used to tune coil L2-12													
E2-48	Same as E2-37; p/o Z2-13.	Used to tune coil L2-13													
E2-49	Same as E2-37; p/o Z2-15.	Used to tune coil L2-15													
E2-50	Same as E2-37; p/o Z2-16.	Used to tune coil L2-16													
E2-51	Same as E2-37; p/o Z2-17.	Used to tune coil L2-17													
E2-52	Same as E2-37; p/o Z2-18.	Used to tune coil L2-18													
E2-53	Same as E2-37; p/o Z2-19.	Used to tune coil L2-19													
E2-54	Same as E2-37; p/o Z2-20.	Used to tune coil L2-20.													
E2-55	Same as E2-37; p/o Z2-25.	Used to tune coil L2-25													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E2-56	Same as E2-37; p/o Z2-26.	Used to tune coil L2-26													
E2-57	Same as E2-37; p/o Z2-27.	Used to tune coil L2-27													
E2-58	Same as E2-37; p/o Z2-28.	Used to tune coil L2-28													
E2-59	Same as E2-37; p/o Z2-29.	Used to tune coil L2-29													
E2-60	Same as E2-37; p/o Z2-30.	Used to tune coil L2-30													
E2-61	SHIELD, ELECTRON TUBE: brass; cylindrical; over-all dim., 1-3/8 in. lg, 27/32 in. dia; spring mounted; nickel plated; for general purpose use.	Electron tube protective shield	Spec No. JAN-S-28A, JAN Type No. TS102U01	N16-S-34520-3852	EBY		E2-61 E2-62 E2-63	3							
E2-62	Same as E2-61.	Electron tube protective shield													
E2-63	Same as E2-61.	Electron tube protective shield													
E2-64	SHIELD, ELECTRON TUBE: brass; cylindrical; over-all dim., 2-1/4 in. lg, 27/32 in. dia; spring mounted; nickel plated; for general purpose use.	Electron tube protective shield	Spec No. JAN-S-28A, JAN Type No. TS102U03	N16-S-34607-8400	EBY		E2-64	1							
E2-65	SHIELD, ELECTRON TUBE: brass; cylindrical; over-all dim., 1-3/4 in. lg, 27/32 in. dia; spring mounted; nickel plated; for general purpose use.	Electron tube protective shield	Spec No. JAN-S-28A, JAN Type No. TS102U02	N16-S-34557-8350	EBY		E2-65 E2-66 E2-67 E2-68 E2-69 E2-70 E2-71 E2-72 E2-73 E2-74	10							
E2-66	Same as E2-65.	Electron tube protective shield													
E2-67	Same as E2-65.	Electron tube protective shield													
E2-68	Same as E2-65.	Electron tube protective shield													
E2-69	Same as E2-65.	Electron tube protective shield													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
E2-70	Same as E2-65.	Electron tube protective shield													
E2-71	Same as E2-65.	Electron tube protective shield													
E2-72	Same as E2-65.	Electron tube protective shield													
E2-73	Same as E2-65.	Electron tube protective shield													
E2-74	Same as E2-65.	Electron tube protective shield													
E3-1	TERMINAL BOARD: phenolic board; includes terminals, 12 terminals, solder post; w/o barriers; overall dim., 2-3/16 in. lg, 1-1/2 in. wide, 15/32 in. high; 5/32 in. dia mounting holes spaced 1-7/8 in. C to C; terminals tin plated; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Tiepoint for electrical components		*N17-B-77983-7610		NRCO Part No. TB1A1-2 NRCO Dwg No. A1104175-2	E3-1	1							
E3-2	TERMINAL BOARD: phenolic board; includes terminals, 8 terminals, solder post; w/o barriers; overall dim., 1-7/16 in. lg, 1-1/2 in. wide, 15/32 in. high; two 5/32 in. dia mounting holes spaced 1-1/8 in. C to C; terminals tin plated; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Tiepoint for electrical components		*N17-B-77834-6345		NRCO Part No. TB1A1-7 NRCO Dwg No. A1104175-3	E3-2	1							
E3-3	TERMINAL BOARD: phenolic board; includes terminals, 30 terminals, solder post; w/o barriers, overall dim., 5-9/16 in. lg, 1-1/2 in. wide, 15/32 in. high; two 5/32 in. dia mounting holes spaced 5-1/4 in. C to C; terminals tin plated; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Tiepoint for electrical components		*N17-B-78222-4517		NRCO Part No. TB1A1-1 NRCO Dwg No. A1104175-1	E3-3	1							
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E3-4	TERMINAL BOARD: phenolic board; includes terminals, 3 terminals, solder post type; w/o barriers; over-all dim., 1-25/32 in. lg, 1/2 in. wide, 15/32 in. high; two 5/32 in. dia mounting holes spaced 1-1/2 in. C to C; terminals tin plated; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Tiepoint for electrical components		*N17-B-77585-5085		NRCO Part No. TB1A2-1 NRCO Dwg No. A1104176	E3-4 E3-5	2								
E3-5	Same as E3-4.	Tiepoint for electrical components														
E3-6	TERMINAL BOARD: phenolic board, aluminum frame; includes terminals, 5 terminals, 7/32 in. high; solder post type; w/o barriers; over-all dim., 4-5/8 in. lg, 13/16 in. wide, 9/16 in. high; two 5/32 in. dia mounting holes spaced 2-3/4 in. C to C; terminals tin plated and marked "1," "2," "3," "4" and "5"; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Middle oven tie point for electrical components		*N17-B-77692-6062		NRCO Part No. TB5A3 NRCO Dwg No. A1104177	E3-6	1								
E3-7	TERMINAL, STUD: style No. 21, MBCA Ref Dwg Group 21; 5,000 to 6,000v breakdown at 60 cycles; solder connection; brass; nickel plated finish; over-all dim., 3/8 in. lg, 5/16 in. wide, 13/16 in. high; mounted by No. 6-32 thread stud 1/4 in. lg; insulated w/phenolic; for standoff terminal; for general purpose use.	Standoff insulator		N17-T-28198-1065	PRME Part No. 5000	NRCO Dwg No. A1104169	E3-7 E3-8 E3-9 E3-10 E3-11 E3-12	6								
E3-8	Same as E3-7.	Standoff insulator														
E3-9	Same as E3-7.	Standoff insulator														
E3-10	Same as E3-7.	Standoff insulator														
E3-11	Same as E3-7.	Standoff insulator														
E3-12	Same as E3-7.	Standoff insulator														
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.															

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E3-13	INSULATOR ASSEMBLY: 2 insulators in assembly; one, American Lava Corp, round counterbore, bowl insulator, ceramic, grade L-4, white, glazed finish, 240v working per mil, style No. 125, MBCA Ref Dwg Group 9, one American Lava Corp, conical round shank bushing insulator, steatite, grade L-4, white, glazed finish, 240v working per mil, style No. 73, MBCA Ref Dwg Group 9; over-all dim., 1/2 in. dia, 3/4 in. high; screw mounted through 0.140 in. dia hole; for supporting and insulating connecting wire leads; for general purpose use.	Insulator bushing		N17-I-81154-1121	ANL Part No. 1172	NRCO Dwg No. A1104189	E3-13 E3-14	2							
E3-14	Same as E3-13.	Insulator bushing														
E3-15	INSULATOR, STANDOFF: ceramic, grade A196, white; glazed finish; 240v working per mil; cylindrical pillar shape, item code No. 10, MBCA Ref Dwg Group 9; dim., MBCA Ref Dwg Group 9, D-1/2 in. dia, L-1-3/4 in. lg; No. 6-32 thread tapped hole ea end, 1/4 in. deep min; 10,000 lb per sq in. tensile strength; for general purpose use.	Standoff insulator		N17-I-69175-6226	ANL Type No. 1402	NRCO Dwg No. A1104185	E3-15 E3-16 E3-17 E3-18 E3-19 E3-20	6							
E3-16	Same as E3-15.	Standoff insulator														
E3-17	Same as E3-15.	Standoff insulator														
E3-18	Same as E3-15.	Standoff insulator														
E3-19	Same as E3-15.	Standoff insulator														
E3-20	Same as E3-15.	Standoff insulator														
E3-21	INSULATOR, STANDOFF: steatite, Alsimag grade L-4; white; glazed, except ends; 240v working per mil; cylindrical pillar shape, item code No. 10, MBCA Ref Dwg Group 9; dim., MBCA Ref Dwg Group 9, D-3/8 in. dia, L-1/2 in. lg; No. 6-32 thread tapped hole ea end, 3/16 in. deep min; 10,000 lb per sq in. tensile strength; for general purpose use.	Standoff insulator		N17-I-69154-6206	ANL Type No. 1700	NRCO Dwg No. A1104186	E3-21 E3-22 E3-23 E3-24 E3-25 E3-26 E3-27 E3-28 E3-29 E3-30 E3-31 E3-32 E3-33 E3-34 E3-35 E3-36	16							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E3-22	Same as E3-21.	Standoff insulator													
E3-23	Same as E3-21.	Standoff insulator													
E3-24	Same as E3-21.	Standoff insulator													
E3-25	Same as E3-21.	Standoff insulator													
E3-26	Same as E3-21.	Standoff insulator													
E3-27	Same as E3-21.	Standoff insulator													
E3-28	Same as E3-21.	Standoff insulator													
E3-29	Same as E3-21.	Standoff insulator													
E3-30	Same as E3-21.	Standoff insulator													
E3-31	Same as E3-21.	Standoff insulator													
E3-32	Same as E3-21.	Standoff insulator													
E3-33	Same as E3-21.	Standoff insulator													
E3-34	Same as E3-21.	Standoff insulator													
E3-35	Same as E3-21.	Standoff insulator													
E3-36	Same as E3-21.	Standoff insulator													
E3-37	KNOB: rd; bakelite; black; designed to accommodate shaft, rd, 1/4 in. dia, 1/2 in. deep shaft hole, 2 no. 8-32 set screws 90 deg apart; brass insert; marked "ICA" overall dim. excluding pointer, 1-1/8 in. dia, 11/16 in. thick; finger indent grip, white plastic pointer; extends 23/32 in. from axis, for general purpose use.	"CAL. OUTPUT" knob		N16-K-700314-573	ICA Part No. 1166	NRCO Dwg No. A1104151	E3-37 E3-38 E3-39 E3-40 E3-41 E3-42 E9-5 E9-6 E10-6 E10-7 E10-8	11							
E3-38	Same as E3-37.	"HPO OUTPUT" knob													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E3-39	Same as E3-37.	"METER SELECTOR" knob													
E3-40	Same as E3-37.	"HFO XTAL" knob													
E3-41	Same as E3-37.	"FREQUENCY RANGE MCS" knob													
E3-42	Same as E3-37.	"HF XTAL FREQ" knob													
E3-43	KNOB: rd; bakelite; black; designed to accommodate shaft, rd, 1/4 in. dia, 5/8 in. deep shaft hole, 2 no. 8-32 set screws 90 deg apart; brass insert; marked "ICA"; over-all dim., 1-1/8 in. dia, 5/8 in. thick; finger indent grip with projecting insert; for general purpose use.	"OUTPUT FREQUENCY" knob		N16-K-700314-526	ICA Part No. 1165	NRCO Dwg No. A1104150	E3-43 E9-7	2							
E3-44	KNOB: rd; brass; black; designed to accommodate shaft, rd, 13/32 in. dia, through hole, set screw, 2 no. 6-32 tapped holes, 90 deg apart; w/o markings; over-all dim., 1-3/4 in. dia, 33/64 in. thick; diamond knurl, nickel plate; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Large "DIAL UNITS" knob		N16-K-700374-243		NRCO Part No. KN1A1 NRCO Dwg No. A1104132	E3-44	1							
E3-45	KNOB: rd; brass; black; designed to accommodate shaft, rd, 1/4 in. dia, 3/8 in. deep shaft hole, set screw; over-all dim., 3/4 in. dia, 1/2 in. thick; diamond knurl grip, w/o No. 6-32 thread set screw; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Small "DIAL UNITS" knob				NRCO Part No. KN1A2	E3-45	1							
E3-46	KNOB: round w/ integral pointer; plastic; black; attachment data, designed to accommodate shaft, round shaft, 1/4 in. dia, 11/32 in. deep shaft hole, set screw; w/o markings; over-all dim., 29/32 in. lg, 13/16 in. wide, 13/32 in. high; for general purpose use. *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.	"3.5 MC OSC." knob		N17-K-700226-101	ICA Part No. 1081	NRCO Part No. A1104192	E3-46	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E3-47	ADAPTER, CRYSTAL SOCKET: fits 3 crystal units w/ 0.50 in. dia pins, 0.486 in. C to C to 3 crystal sockets (XY3-15, XY3-16, XY3-17) w/ accommodations for 1/8 in. dia pins, 3/4 in. C to C; material data, aluminum, alkalite etch, body w/ bakelite insulation plate, male contacts, brass, nickel plated, female contacts, phosphor bronze; rectangular shape; over-all dim., 2 in. lg, 1-1/2 in. wide, 2 in. high; plugs into 3 crystal sockets, Amphenol Part No. 33-2T, spaced 5/8 in. C to C; has 3 clamps for holding crystal unit in adapter, contains 3 crystal sockets, EBY Part No. CR7 (XY3-15A, XY3-16A, XY3-17A); p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Adapts XY3-15, XY3-16, XY3-17 for use w/ crystals w/ different spaced pins		N16-A-16183-9915		NRCO Dwg No. A1104190	E3-47	1							
E3-48	ADAPTER, CRYSTAL SOCKET: fits 2 crystal units w/ 0.50 in. dia pins, 0.486 in. C to C, to 2 crystal sockets (XY3-18, XY3-19) w/ accommodations for 1/8 in. dia pins, 3/4 in. C to C; material data, aluminum, alkalite etch, body w/ bakelite insulation plate, male contacts, brass, nickel plated, female contacts, phosphor bronze; rectangular shape; over-all dim., 1-1/2 in. lg, 1-1/4 in. wide, 1-27/32 in. high; plugs into 2 crystal sockets, Amphenol Part No. 33-2T, spaced 3/4 in. C to C; has 2 clamps for holding crystal unit in adapter, contains 2 crystal sockets, EBY Part No. CR-7 (XY3-18A, XY3-19A); p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Adapts XY3-18, XY3-19 for use w/ crystals w/ different spaced pins		N16-A-16178-2415		NRCO Dwg No. A1104191	E3-48	1							
E5-1	TERMINAL BOARD: bakelite board; 10 terminals, screw type; w/o barriers; over-all dim., 7 in. lg, 7/8 in. wide, 11/16 in. high; 2 9/64 in. dia mounting holes spaced 5-1/2 in. C to C, terminals nickel plated; for general purpose use. *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.	"1, 10" terminal board		*N17-B-77938-5643	ICA Part No. 2422	NRCO Dwg No. A1104465	E5-1 E5-2 E5-3 E5-4	4							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E5-2	Same as E5-1.	"11,20" terminal board													
E5-3	Same as E5-1.	"21,30" terminal board													
E5-4	Same as E5-1.	"31,40" terminal board													
E9-1	Same as E1-1.	"AUDIO OUTPUT" terminal board													
E9-2	TERMINAL BOARD: bakelite board; includes terminals, 2 terminals, solder lug type; w/o barriers; over-all dim., 1-5/16 in. lg, 5/16 in. wide, 7/8 in. high; 1/8 in. dia hole in ea of 2 mounting lugs spaced 1 in. C to C; terminals tin plated; for general purpose use.	Tiepoint for electrical connections		N17-B-77534-3730	JNS Part No. 2002	NRCO Dwg No. A1104146	E9-2	1							
E9-3	TERMINAL BOARD: bakelite board; includes terminals, 5 terminals, solder lug terminals; w/o barriers; over-all dim., 2-1/4 in. lg, 5/16 in. wide, 7/8 in. high; one 1/8 in. dia hole in ea of 2 mounting lugs spaced 1-15/16 in. C to C; terminal tin plated; for general purpose use.	Tiepoint for electrical connections		N17-B-77686-6753	JNS Part No. 2005	NRCO Dwg No. A1104148	E9-3	1							
E9-4	TERMINAL BOARD: bakelite board; includes terminals, 18 terminals, solder lug type; w/o barriers; over-all dim., 3-7/8 in. lg, 1-11/16 in. wide, 3/32 in. thick; two 9/64 in. dia mounting holes spaced 3-1/2 in. C to C; 9 terminals ea top and bottom; p/o, AN Amplifier-Detector, Type No. AM-615/UR.	Tiepoint for electrical components		*N17-B-78113-9025	MLR Part No. 440 modified (28 terminals, 5-3/4 in. lg standard)	NRCO Dwg No. A1104165	E9-4	1							
E9-5	Same as E3-37.	"INPUT SELECTOR" knob													
E9-6	Same as E3-37.	"OUTPUT LEVEL: knob													
E9-7	Same as E3-43.	"TUNING" knob													
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E10-1	Same as E2-19.	"REL, G, DC, TONE" terminal board													
E10-2	TERMINAL BOARD: bakelite board; includes terminals, 3 terminals, screw type; w/o barriers; over-all dim., 2-1/2 in. lg, 7/8 in. wide, 11/16 in. high; two 9/64 in. dia mounting holes spaced 2 in. C to C; terminals nickel plated; for general purpose use.	"EXT. OSC" terminal board		N17-B-77587-8996	ICA Part No. 2414	NRCO Dwg No. A1104162	E10-2 E10-3	2							
E10-3	Same as E10-2.	"OUTPUT" terminal board													
E10-5	Same as E1-1.	"MONITOR" terminal board	*												
E10-6	Same as E3-37.	"OUTPUT FREQUENCY" knob													
E10-7	Same as E3-37.	"OUTPUT LEVEL" knob													
E10-8	Same as E3-37.	"KEYING LEVEL" knob													
E10-9	TERMINAL BOARD: bakelite board; includes terminals, 24 terminals, solder lug type; w/o barriers; over-all dim. including terminals, 4-7/8 in. lg, 1-11/16 in. wide, 3/32 in. thick; two 9/64 in. dia mounting holes spaced 4-1/2 in. C to C; 12 terminals ea top and bottom; p/o, AN Keyer, Type No. KY-79/UR.	Tiepoint for electrical components		*N17-B-78178-5025	MLR Part No. 440 modified (28 terminals, standard)	NRCO Dwg No. A1104166	E10-9 E10-10	2							
E10-10	Same as E10-9.	Tiepoint for electrical components													
E10-11	TERMINAL BOARD: bakelite board; includes terminals, 12 terminals, solder lug type; w/o barriers; over-all dim. including terminals, 3 in. lg, 1-11/16 in. wide, 3/32 in. thick; two 9/64 in. dia mounting holes spaced 2-5/8 in. C to C; 6 terminals ea top and bottom; for general purpose use.	Tiepoint for electrical components		*N17-B-77984-8028	MLR Part No. 420	NRCO Dwg No. A1104164	E10-11 E10-12	2							
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
E10-12	Same as E10-11.	Tiepoint for electrical components													
E12-1	TERMINAL BOARD: molded phenolic board; includes terminals, 8 terminals, double screw type; barrier type; over-all dim., 4-1/4 in. lg, 1-1/8 in. wide, 1/2 in. high; four 0.175 in. dia holes on 27/64 in. by 3-15/16 in. mounting centers; terminals and No. 6-32 screws brass, nickel plated; for general purpose use.	Telephone lines terminal board		N17-B-77841-6726	JNS Part No. 8-141	NRCO Dwg No. A1104154	E12-1	1							
F2-1	FUSE, CARTRIDGE: 3 amp, 250v; instantaneous; ferrule type, dim., 1/4 in. lg, 1/4 in. dia; glass covering; indicating clear window opaques; over-all dim., 1-1/4 in. lg, 1/4 in. dia; for general purpose use.	Primary power protection		N17-F-16302-120	BUS Type No. AGC3		F2-1 F2-3	2							
F2-2	FUSE, CARTRIDGE: 1/4 amp, 250v, instantaneous; wire lead type terminals, dim., 1-1/2 in. lg; enclosed type glass covering; one time; indicating clear window opaques; over-all dim. excluding leads, 1-1/4 in. lg, 1/4 in. dia; for general purpose use.	High voltage protection		N17-F-16302-355	BUS Type No. GJV-1/4		F2-2	1							
F2-3	Same as F2-1.	Spare for F2-1													
F3-1	FUSE CARTRIDGE: 4 amp, 250v; time delay, 110% for life, 135% for 0-1 hr and 200% for 0-2 min; ferrule type, dim., 1/4 in. lg, 1/4 in. dia; enclosed type, glass body; one time; non-indicating; over-all dim., 1-1/4 in. lg, 1/4 in. dia; diagonal, protective coated element; unit pkg, 100 per box; for general purpose use.	Heater and power supply protection		N17-F-16302-130	LTF Part No. 312004	NRCO Dwg No. A110472-2	F3-1	1							
F3-2	FUSE, CARTRIDGE: 0.2 amp, 250v; time delay, 110% for life, 135% for 0-1 hr and 200% 5 sec min, 60 sec max; ferrule type, dim., 1/4 in. lg, 1/4 in. dia; enclosed type, glass body; one time; non-indicating; over-all dim., 1-1/4 in. lg, 1/4 in. dia; compound element w/ spring and resistor, slow blow; unit pkg, 100 per box; for general purpose use.	Primary power protection		N17-F-14310-330	LTF Part No. 313-200	NRCO Dwg No. A110474-1	F3-2	1							
F9-1	FUSE, CARTRIDGE: 2 amp, 250v; time delay, 110% for life, 135% for 0-1 hr and 200% for 0-2 min; ferrule type, dim., 1/4 in. lg, 1/4 in. dia; enclosed type, glass body;	Primary power protection		N17-F-16302-100	LTF Part No. 312002	NRCO Dwg No. A110472-1	F9-1 F10-1	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
F9-1 (cont)	one time; non-indicating; over-all dim., 1-1/4 in. lg, 1/4 in. dia; diagonal protective coated element; unit pkg, 100 per box; for general purpose use.														
F10-1	Same as F9-1.	Primary power protection													
F12-1	FUSE, PLUG: 15 amp; 125v; NEC type std screw base; instantaneous; continuous at 110% of rated load; 10 to 60 min blowing time at 125% of rated load; non-indicating; one-time; over-all dim., 1-1/4 in. lg, 1-1/8 in. dia; clear window top; for general purpose use.	Protection for receiving set equipment primary power		N17-F-16468-550	BUS Part No. W15	NRCO Dwg No. A1104161	F12-1 F12-2	2							
F12-2	Same as F12-1.	Protection for receiving set equipment primary power													
H2-1	CLAMP, ELECTRICAL: stainless steel; 1, snap spring type fastener; over-all dim., 1-5/8 in. lg, 1-1/4 in. wide, 3/4 in. high; mounted by 1 elongated mounting hole (for No. 10 machine screw) in mounting bracket; designed to hold 1-1/4 in. dia electron tube; for general purpose use.	Electron tube retaining clamp		N16-C-300798-631	BHE Part No. 926B16		H2-1	1						
H2-2	CLAMP, ELECTRICAL: stainless steel; 1, snap spring type fastener; over-all dim., 2-1/4 in. lg, 1-3/8 in. dia, 3/4 in. high; mounted by 1 elongated hole (for No. 10 machine screw) in mounting bracket; designed to hold 1-3/8 in. dia electron tube; for general purpose use.	Electron tube retaining clamp		N16-C-300798-868	BHE Part No. 926C13		H2-2	1						
H2-3	CLAMP, ELECTRICAL: stainless steel; 1, snap spring type fastener; over-all dim., 1-31/32 in. lg, 1-13/32 in. wide, 5/8 in. high; mounted by 1 elongated mounting hole (for No. 10 machine screw) in mounting bracket; designed to hold 1-1/4 in. dia electron tube; for general purpose use.	Electron tube retaining clamp		N16-C-300563-799	BHE Part No. 926B31		H2-3	1						
H2-4 (24)	NUT, SHEET SPRING: cup shape; phosphor bronze; cadmium plated; over-all dim., 0.117 in. thick, 0.500 in. across flats; for no. 6-32 machine screw; for general purpose use.	Retaining nut for E2-37 to E2-60		N43-N-9708-1025		HMM Part No. 6053-1	H2-4 (24)	24							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
H2-5	WRENCH: Allen set screw; 1/16 in. across flats; 1-27/32 in. lg by 21/32 in. wide by 1/16 in. high; alloy steel, tool hardened; 90 deg head offset; hexagonal straight handle.	No. 6 Allen screw wrench		G41-W-2445	AHF	HMM Part No. 11806-2	H2-5	1							
H2-6	WRENCH: Allen set screw; 5/64 in. across flats; 1-31/32 in. lg by 45/64 in. wide by 5/64 in. high; alloy steel, tool hardened; 90 deg offset; hexagonal straight handle.	No. 8 Allen screw wrench		G41-W-2446	AHF	HMM Part No. 11806-3	H2-6	1							
H2-7	WRENCH: Allen set screw; 3/32 in. across flats; 2-3/32 in. lg by 3/4 in. wide by 3/32 in. high; alloy steel, tool hardened; 90 deg head offset; hexagonal straight handle.	No. 10 Allen screw wrench		G41-W-2447	AHF	HMM Part No. 11806-4	H2-7	1							
I2-1	LAMP, INCANDESCENT: 6 to 8v, 0.9 to 1.2 W, 0.15 amp; lamp data, MBCA Ref Dwg Group 7, min bayonet base, T-3-1/4, clear, white, 1 fil, tungsten, C-2R; 1-3/16 in. max over-all height; over 25 hrs rated life; any burning position; unit pkg, 10 in a case; for general purpose use.	Dial lamp		N17-L-6297	GE Part No. 47	NRCO Dwg No. A110453	I2-1 I2-2 I2-3 I2-4 I3-1 I9-1 I10-1	7							
I2-2	Same as I2-1.	Dial lamp													
I2-3	Same as I2-1.	Dial lamp													
I2-4	Same as I2-1	Dial lamp													
I2-5	DIAL CONTROL: knob type; scale data, kc - 3 kc to 0 to + 3 kc, left to right, graduated every half and full kc, marked "kc-minus" and "kc plus," 320° arc; direct drive, 1/4 in. dia shaft; dim., 2-3/8 in. dia, 1 in. thick; set screw mounted; dial not illuminated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"BEAT OSC" dial control		N16-D-46552-9984	GE Part No. 3122704		I2-5	1							
I2-6	DIAL CONTROL: knob type; units, 10 to 0 left to right, graduated in 10 scale div. "off," 270° arc; direct drive, 1/4 in. dia shaft; 2-3/8 in. dia, 1 in. thick; set screw mounted; dial not illuminated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"RF GAIN" dial control		N16-D-46548-8725	GE Part No. 3122701		I2-6	1							
I2-7	DIAL CONTROL: knob type; units, 10 to 0 left to right, graduated in 10 scale div, 270° arc; direct drive, 1/4 in. dia shaft; 2-3/8 in. dia, 1 in. thick; set screw mounted; dial not illuminated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"AUDIO GAIN" dial control		N16-D-46548-8923	GE Part No. 3122702		I2-7	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
I2-8	DIAL CONTROL: knob type; units, 10 to 0 left to right, graduated in 10 scale div, 180° arc; direct drive, 1/4 in. dia shaft; 2-3/8 in. dia, 1 in. high; set screw m mounted; dial not illuminated; p/o AN Radio Receiver, Type No. R-450/FRR-28.	"XTAL PHASING" dial control		N16-D-46350-9238	GE Part No. 31227G3		I2-8	1							
I2-9	DIAL CONTROL: knob type; kc, .2 to 13 left to right, graduated .2 .5/1.3/3/5/13 kc, band width in kc, 150° arc; direct drive, 1/4 in. dia shaft; dim., 2-3/8 in. dia, 1 in. high; set screw mounted; dial not illuminated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"SELECTIVITY" dial control		N16-D-46539-3251	GE Part No. 31227G5		I2-9	1							
I3-1	Same as I2-1.	"PRIMARY POWER" pilot lamp													
I3-2	LAMP, GLOW: 1/25 W, 105v AC striking voltage, 105v DC striking voltage; lamp data, MBCA Ref Dwg Group 7, miniature bayonet base, bulb data, T-3-1/4, clear, orange-red, 2 electrodes, W-11; 1-3/16 in. max over-all height; over 25 hr rated life; any burning position; neon gas, external resistance required, 2 meg for 105-125v operation; for general purpose use.	"OVEN HEATER" pilot lamp		N17-L-6806-130	GE Part No. NE51	NRCO Dwg No. A110452	I3-2 V10-10 V10-11	3							
I3-3	DIAL, SCALE: 0 to 100 cw, graduated in increments of 1 (small), 5 (medium) and 10 (long lines): 180° arc; rd; 2 in. dia, 3/8 in. dia center hole; center hole mounted; aluminum; lacquered; black inscriptions; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	"OUTPUT FREQUENCY" scale dial		N16-S-117101-596	SDL Part by description	NRCO Part No. A50006 NRCO Dwg No. 1104157	I3-3 I9-2	2							
I3-4	DIAL, CONTROL: movable scale type; 100 to 0 cw, graduated in increments of 1, 360° arc; manual drive; 2.980 in. dia; 3 No. 31 drill mounting holes spaced 120° apart on 3/4 in. dia circle; dial not illuminated; 3/32 in. aluminum, black finish; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	"DIAL UNITS" control dial		N16-S-117101-604		NRCO Part No. NP4A42 NRCO Dwg No. A1104174	I3-4	1							
I3-5	DIAL, SCALE: 0 to 10 ccw, graduated in increments of "1" (3' 15 min), 32 deg 24 min arc; rd; 3.500 in. dia, 2.984 in. dia center hole; four 1/8 in. dia mounting holes spaced 90° apart on 3.250 in. dia circle; aluminum; black finish; 1/8 in. thick; p/o, AN Radio Fre-	"DIAL UNITS" vernier scale dial		N16-S-117101-603		NRCO Part No. NP4A43 NRCO Dwg No. A1104173	I3-5	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
I3-5 (cont)	quency Oscillator, Type No. O-165/UR.														
I3-6	COUNTER, MECHANICAL: direct drive; polished Veeder metal; over-all dim., excluding countershaft arm, 1-23/64 in. high, 27/32 in. wide, 13/16 in. deep; 3 digit space, 2 digits, 1 blank; non-resetting; 360° ccw rotation for 1 digit addition; 1,000 rpm of countershaft arm max speed; subtracts in cw rotation; 1/8 in. dia mounting hole in ea of two lugs spaced 1-1/16 in. C to C; incl 1-5/16 in. lg by 5/16 in. wide by 7/32 in. high countershaft arm and 3 screws, no lubrication required; for general purpose use.	"DIAL HUNDREDS" counter		N18-R-268-160	VEE Model No. AE114223	NRCO Dwg No. 1104159	I3-6	1							
I9-1	Same as I2-1.	"POWER" pilot lamp													
I9-2	Same as I3-3.	"TUNING" scale dial													
I10-1	Same as I2-1.	"POWER" pilot lamp													
J2-1	CONNECTOR, RECEPTACLE: 2 contacts, female, round; straight type; pin type connector; over-all dim., 27/32 in. lg, 1 in. wide, 1 in. high; radio frequency connector, 100 ohms nominal impedance, constant frequency impedance characteristic; round body, brass, silver plated, screw type; mica filled bakelite insert; 4 holes, 1/8 in. dia, 23/32 in. C to C; for general purpose use.	"ANT." input receptacle	SigC SO-264	N17-C-73127-5741	AMP Part No. 83-22R		J2-1	1							
J2-2	CONNECTOR, RECEPTACLE: 1 contact, female, rd; straight type; over-all dim. excluding terminals, 27/32 in. lg, 1 in. wide, 1 in. high; radio frequency connector; 50 ohms, constant frequency impedance data; cylindrical shape w/ square mounting flange; die-cast zinc, silver plated; mica filled bakelite insert; 4 holes 0.120 in. dia, 23/32 in. by 23/32 in. mounting centers; copper alloy contacts; for general purpose use.	"IF OUTPUT" monitor receptacle	SigC SO-239 (-49194)	N17-C-73108-5890	AMP Part No. 83-1R KGE Part No. KV71-02	NRCO Dwg No. A110499	J2-2 J2-6 J2-7 J2-8 J2-10 J3-5 J3-7 J3-8 J3-9 J3-10 J3-11 J9-2 J9-4	13							
J2-3	JACK, TELEPHONE: for 2 conductor plug, shank dim., 1/4 in. dia, 1-7/32 in. lg min, contact arrangement J1, MBCA Ref Dwg Group 4, over-all dim., 1-1/4 in. lg, 13/16 in. dia, 31/32 in. deep; 3/8 in.	"PHONES" Jack	SigC JK-34A	N17-J-39248-4418	MAL Part No. SCIA	NRCO Dwg No. A1104104	J2-3 J3-6 J9-1 J10-2	4							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
J2-3 (cont.)	1in. dia mounting hole required; mounting accessories c/o, 1 hex nut; 1 insul washer; phosphor bronze nickel plated spring, bakelite and ceramic insulation; for general purpose use.														
J2-4	CONNECTOR, RECEPTACLE: 2 contacts, female, flat; straight type; over-all dim., 13/16 in. lg, 1-9/16 in. wide, 3/8 in. high; rectangular shape w/ oval mounting shaft, bakelite, polished, flange type; molded bakelite insert; 2 holes, 0.140 dia, 1-1/8 in. C to C; for general purpose use.	"RELAY" receptacle		N17-C-73138-3593	ALP Part No. 402AC		J2-4 J2-5	2							
J2-5	Same as J2-4.	"AC" outlet receptacle													
J2-6	Same as J2-2.	"EXT. HFO" receptacle													
J2-7	Same as J2-2.	"3.5 MC OSC." receptacle													
J2-8	Same as J2-2.	"EXT. BFO" receptacle													
J2-9	JACK, TELEPHONE: for 1-conductor plug, shank dim., 1/8 in. dia, 11/16 in. lg; contact arrangement J1, MBCA Ref Dwg Group 4, over-all dim., 7/8 in. lg, 15/16 in. dia; 7/16 in. dia mounting hole required; bakelite mounting disc w/2 1/8 in. dia mounting holes, 11/16 in. C to C; for general purpose use.	"DET." Jack		N17-C-73108-3753	CIN Part No. 81A	NRCO Dwg No. A1104137	J2-9	1							
J2-10	Same as J2-2.	"IF OUTPUT CONVERTER" receptacle													
J3-1	CONNECTOR, RECEPTACLE: 2 contacts, male, flat; straight type; over-all dim., 1-3/32 in. lg, excluding protruding contacts, 2-1/32 in. wide, 1-5/8 in. high; 10/15 amp, 250/125v; cylindrical body w/ elliptical mounting flange, brass, corrosion resistant finish; black composition insert; 0.406 in. dia max cable opening; 2 holes, 0.146 in. dia, 1-5/8 by 1-3/4 in. C to C; for general purpose use.	"A.C. INPUT" receptacle		N17-C-73446-3401	HAW Part No. 6808	NRCO Dwg No. A110458	J3-1 J9-3 J10-1	3							
J3-2	CONNECTOR, RECEPTACLE: 6 contacts, female, flat; polarized; straight type; over-all dim. excluding terminals, 1 in. lg, 1-5/16 in. wide. 0.525 in. deep; 5 amp max, 45v max;	Oven power receptacle		N17-C-73224-1604	JNS Part No. S306AB	NRCO Dwg No. A110470	J3-2 J3-12	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
J3-2 (cont)	rectangular body, molded bakelite; 2 holes, 0.152 in. dia, 1 in. C to C; phosphor bronze contacts 5/32 in. wide, 3/64 in. thick; for general purpose use.														
J3-3	CONNECTOR, RECEPTACLE: 8 contacts, female, flat; polarized; straight type; over-all dim. excluding terminals, 1-1/4 in. lg, 1-5/16 in. wide, 0.525 in. deep; 5 amp max, 45v max; rectangular body, molded bakelite; 2 holes, 0.152 in. dia, 1 in. C to C; phosphor bronze contacts 5/32 in. wide, 3/64 in. thick; for general purpose use.	Oven receptacle		N17-C-73255-1511	JNS Part No. S308AB	NRCO Dwg No. A110471	J3-3	1							
J3-4	CONNECTOR, RECEPTACLE: 1 contact, female, rd; straight type; over-all dim. excluding terminals and nut, 1/2 in. lg, 5/16 in. wide, 3/8 in. high; 50 W; radio frequency connector, 50 ohms nominal impedance, constant frequency impedance characteristic; cylindrical shape w/ hex mounting flange, brass, silver plate, polystrene; mounts by threaded section of body, body thread w/1/4 in.-32 thread, 15/32 in. lg, incl 1 hex nut for mounting; for general purpose use.	Oven RF output receptacle		N17-C-73107-3652	IPC Part No. MC20	NRCO Dwg No. A1104142	J3-4	1							
J3-5	Same as J2-2.	"HFO" receptacle													
J3-6	Same as J2-3.	"CAL. OUTPUT" jack													
J3-7	Same as J2-2.	"HFO" receptacle													
J3-8	Same as J2-2.	"HFO" receptacle													
J3-9	Same as J2-2.	"HFO" receptacle													
J3-10	Same as J2-2.	"BFO" receptacle													
J3-11	Same as J2-2.	"BFO" receptacle													
J3-12	Same as J3-2.	DC power supply receptacle													
J5-1	JACK, TELEPHONE: for 3 conductor plug, shank dim., 3/16 in. dia, 1-1/8 in. lg; contact arrangement J2, MBCA Ref Dwg Group 4; over-all dim., excluding terminals, 3/4 in. dia, 1-3/16 in. lg; 13/32 in. dia	Receiver 1 "AUDIO OUTPUT" jack	SigC JK-33A	N17-J-39435-6234	MAL Part No. SCA2B	NRCO Dwg No. A1104127	J5-1 J5-2 J5-3 J5-4 J5-5 J5-6	24							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
J5-1 (cont)	mounting hole required; mounting accessories c/o, 1 hex nut; 3 solder lug terminals; for general purpose use.						J5-7 J5-8 J5-9 J5-10 J5-11 J5-12 J5-13 J5-14 J5-15 J5-16 J5-17 J5-18 J5-19 J5-20 J5-21 J5-22 J5-23 J5-24								
J5-2	Same as J5-1.	Receiver 1 "AUDIO OUTPUT" jack													
J5-3	Same as J5-1.	Receiver 1 "DETECTOR OUTPUT" jack													
J5-4	Same as J5-1.	Receiver 1 "DETECTOR OUTPUT" jack													
J5-5	Same as J5-1.	Receiver 2 "AUDIO OUTPUT" jack													
J5-6	Same as J5-1.	Receiver 2 "AUDIO OUTPUT" jack													
J5-7	Same as J5-1.	Receiver 2 "DETECTOR OUTPUT" jack													
J5-8	Same as J5-1.	Receiver 2 "DETECTOR OUTPUT" jack													
J5-9	Same as J5-1.	Keyer "MONITOR" jack													
J5-10	Same as J5-1.	"TONE KEYER, INPUT" jack													
J5-11	Same as J5-1.	Keyer "LINE" jack													
J5-12	Same as J5-1.	"SPEAKER, MONITOR" jack													
J5-13	Same as J5-1.	"CONVERTER 1, OUTPUT" jack													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
J5-14	Same as J5-1.	"CONVERTER 1, TONE" jack													
J5-15	Same as J5-1.	"CONVERTER 2, OUTPUT" jack													
J5-16	Same as J5-1.	"CONVERTER 2, TONE" jack													
J5-17	Same as J5-1.	Comparator "OUTPUT" jack													
J5-18	Same as J5-1.	Comparator "TONE" jack													
J5-19	Same as J5-1.	Comparator "OUTPUT" jack													
J5-20	Same as J5-1.	Comparator "TONE" jack													
J5-21	Same as J5-1.	Telephone line "1" jack													
J5-22	Same as J5-1.	Telephone line "3" jack													
J5-23	Same as J5-1.	Telephone line "2" jack													
J5-24	Same as J5-1.	Telephone line "4" jack													
J9-1	Same as J2-3.	"OUTPUT, MONITOR" jack													
J9-2	Same as J2-2.	"I.F. INPUT 1" receptacle													
J9-3	Same as J3-1.	Primary power receptacle													
J9-4	Same as J2-2.	"I.F. INPUT 2" receptacle													
J10-1	Same as J3-1.	Primary power receptacle													
J10-2	Same as J2-3.	"OUTPUT, MONITOR" jack													
K3-1	RELAY, ARMATURE: armature activated type, SPDT, single break, DC, 110v, 2 amp; 1 inductive winding, DC, 4,700 ohm resistance, 8.5 operating voltage, 1.8 ma operating current; 1 terminal on ea contact, 2 terminals on coil; time delay; intermittent duty; over-all dim. including mounting board, 2-5/8 in. lg, 2-5/8 in. wide, 1-1/2 in. high; mounted by 2 holes 0.196 in. dia,	Oven operation control relay		N17-R-64855-2113 (unadjusted) Adjust control pressure to 20 gram min., gap contact to 0.008 in. min, pull piece gap to 0.005 in. min.	KUE Part No. 210C40 (unadjusted) or No. N21005 (adjusted)	NRCO Dwg No. A1104101	K3-1	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
K3-1 (cont)	2-1/8 in. by 2-1/8 in. mounting centers; sensitivity 0.014 W, 0.3v a, cut phenolic base; for general purpose use.														
L2-1	COIL, RF: antenna; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 19/32 in. dia over-all; phenolic form, iron core; mounts by two spring clips on ceramic base; coil marked 31245; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-1.	RF coil in 0.54 to 1.35 mc tuned circuit input to V2-1		N17-T-81921-4150	HMM Part No. 31245		L2-1	1						
L2-2	COIL, RF: antenna; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 9/16 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31249; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-2.	RF coil in 1.35 to 3.45 mc tuned circuit input to V2-1		N17-T-82064-2301	HMM Part No. 31249		L2-2	1						
L2-3	COIL, RF: antenna; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31252; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-3.	RF coil in 3.45 to 7.4 mc tuned circuit input to V2-1		N17-T-82062-6811	HMM Part No. 31252		L2-3	1						
L2-4	COIL, RF: antenna; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all, phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31255; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-4.	RF coil in 7.4 to 14.8 mc tuned circuit input to V2-1		N17-T-82062-4120	HMM Part No. 31255		L2-4	1						
L2-5	COIL, RF: antenna; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31258; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-5.	RF coil in 14.8 to 29.7 mc tuned circuit input to V2-1		N17-T-82062-1411	HMM Part No. 31258		L2-5	1						
L2-6	COIL, RF: antenna; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by two spring clips on ceramic base; coil marked 31261; impregnated for tropical use; p/o,	RF coil in 29.7 to 54.0 mc tuned circuit input to V2-1		N17-T-82061-7711	HMM Part No. 31261		L2-6	1						

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L2-6 (cont)	AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-6.														
L2-7	COIL, RADIO FREQUENCY: electrical data, 192 microhenries at 1000 cycles; physical data, 60 turns per pie, 4 pies, no. 36 AWG, copper conductor, single silk enameled, 1 winding, universal wound untapped unshielded, bakelite form, molded bakelite (Stackpole DR-1), coil dim., excluding termination leads, 3/4 in. lg, 3/8 in. dia; termination data, 2 wire pigtail type, located 1 ea end; moisture and fungas treated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	V2-1 plate filter choke		N16-C-73953-8363	ARTD Part No. 15612		L2-7 L2-14 L2-24 L2-35	4							
L2-8	COIL, RF: 1st RF grid; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 19/32 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31246; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-8.	RF coil in 0.54 to 1.35 mc tuned circuit input to V2-2		N16-C-72667-6871	HMM Part No. 31246		L2-8 L2-15	2							
L2-9	COIL, RF: 1st RF grid; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 9/16 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31250; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-9.	RF coil in 1.35 to 3.45 mc tuned circuit input to V2-2		N16-C-72666-4238	HMM Part No. 31250		L2-9 L2-16	2							
L2-10	COIL, RF: 1st RF grid; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31253; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28, p/o Z2-10.	RF coil in 3.45 to 7.4 mc tuned circuit input to V2-2		N16-C-72431-9251	HMM Part No. 31253		L2-10 L2-17	2							
L2-11	COIL, RF: 1st RF grid; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31256; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-11.	RF coil in 7.4 to 14.8 mc tuned circuit input to V2-2		N16-C-72174-9245	HMM Part No. 31256		L2-11 L2-18	2							
L2-12	COIL, RF: 1st RF grid; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron	RF coil in 14.8 to 29.7 mc tuned circuit input to V2-2		N17-T-82062-9511	HMM Part No. 31259		L2-12 L2-19	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOL-VED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L2-12 (cont)	core; mounts by 2 spring clips on ceramic base; coil marked 31259; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-12.														
L2-13	COIL, RF: 1st RF grid; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31262; impregnated for tropical use; p/o, AN Radio Receiver, Type R-450/FRR-28; p/o Z2-13.	RF coil in 29.7 to 54.0 mc tuned circuit input to V2-2.		N17-T-82061-8101	HMM Part No. 31262		L2-13 L2-20	2							
L2-14	Same as L2-7.	V2-2 plate filter choke													
L2-15	Same as L2-8; p/o Z2-15.	RF coil in 0.54 to 1.35 mc tuned circuit input to V2-5													
L2-16	Same as L2-9; p/o Z2-16.	RF coil in 1.35 to 3.45 mc tuned circuit input to V2-5													
L2-17	Same as L2-10; p/o Z2-17.	RF coil in 3.45 to 7.4 mc tuned circuit input to V2-5													
L2-18	Same as L2-11; p/o Z2-18.	RF coil in 7.4 to 14.8 mc tuned circuit input to V2-5													
L2-19	Same as L2-12; p/o Z2-19.	RF coil in 14.8 to 29.7 mc tuned circuit input to V2-5													
L2-20	Same as L2-13; p/o Z2-20.	RF coil in 29.7 to 54.0 mc tuned circuit input to V2-5													
L2-24	Same as L2-7.	V2-4 plate filter choke													
L2-25	COIL, RF: oscillator; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 19/32 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31244; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-25.	P/o HF oscillator 0.54 to 1.35 mc tuned circuit		N17-T-81915-1451	HMM Part No. 31244		L2-25	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L2-26	COIL, RF: oscillator; 2 windings for 1 band, universal pie wound; unshielded; 1-7/16 in. lg x 9/16 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31248; impregnated for tropical use; p/o AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-26.	P/o HF oscillator 1.35 to 3.45 mc tuned circuit		N17-T-86205-9511	HMM Part No. 31248		L2-26	1							
L2-27	COIL, RF: oscillator; 2 windings for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31251; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-27.	P/o HF oscillator 3.45 to 7.4 mc tuned circuit		N16-C-72431-9256	HMM Part No. 31251		L2-27	1							
L2-28	COIL, RF: oscillator; 1 winding for 1 band; single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31254; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-28.	P/o HF oscillator 7.4 to 14.8 mc tuned circuit		N16-C-72236-8001	HMM Part No. 31254		L2-28	1							
L2-29	COIL, RF: oscillator; 1 winding for 1 band, single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31257; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-29.	P/o HF oscillator 14.8 to 29.7 mc tuned circuit		N16-C-71979-5199	HMM Part No. 31257		L2-29	1							
L2-30	COIL, RF: oscillator; 1 winding for 1 band; single layer wound; unshielded; 1-7/16 in. lg x 1/2 in. dia over-all; phenolic form, iron core; mounts by 2 spring clips on ceramic base; coil marked 31260; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28; p/o Z2-30.	P/o HF oscillator 29.7 to 54.0 mc tuned circuit		N16-C-71785-6977	HMM Part No. 31260		L2-30	1							
L2-35	Same as L2-7.	V2-8A plate filter choke														
L2-47	COIL, RADIO FREQUENCY: electrical data, coil on "Q" meter tunes to 200 kc w/ capacity of 43 mmf ± 1 mf; physical data, 493 turns per pie, 2 pies; no. 36 AWG, copper conductor, single silk enameled, 1 winding, 2 pie universal winding, untapped, unshielded, bakelite form, molded bakelite (Stackpole	V2-11 plate filter choke		N16-C-72680-2749	ARTD Part No. 15616		L2-47	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
L2-47 (cont)	DR-2) coil dim., excluding termination leads, 7/8 in. lg, 33/64 in. dia; termination data, 2, wire pigtail type, located 1 ea end; plate choke; moisture and fungas treated; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
L2-48	CHOKE, RADIO FREQUENCY: 1 amp current rating; filament lead radio frequency choke; frequencies above 60 mcs; cylindrical shape; over-all dim. excluding terminals 1 in. lg, 1/4 in. dia; 2 terminals, axial lead type, located on each end; finished in accordance with JAN-T-152 and JAN-C-173 specs; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	V2-1 and V2-2 filament filter choke		N16-C-73328-6923	JFE Part No. 15611		L2-48	1							
L2-49	COIL, RADIO FREQUENCY: electrical data, 26 microhenries at 1000 cycles, 2.7 ohms DC resistance; physical data, 117 turns, no. 35 AWG, copper conductor, enameled wire, 1 winding, single layer winding close wound, untapped, unshielded, bakelite form, air core, coil dim., excluding term leads, 1 in. lg, 1/4 in. dia; 2 terminations, wire pigtail type, located 1 ea end; ± 5% DC resistance tolerance, p/o, AN Radio Receiver, Type No. R-450/FRR-28.	V2-4 and V2-5 filament filter choke		N16-C-73378-6793	ARTD Part No. 15613		L2-49 L2-50	2							
L2-50	Same as L2-49.	V2-6 and V2-8 filament filter choke													
L2-51	REACTOR: filter choke; 1 section; 8.5 henries inductance, 150 ma DC; 150 ohms DC resistance; 2500v rms test voltage; hermetically sealed, metal; over-all dim., 3-3/4 in. lg, 3 in. wide, 3 in. deep; 4 0.173 in. dia holes 2-3/8 in. C to C; 2 terminals, solder lug type, located on bottom; finished in accordance with JAN-T-27 spec; for general purpose use.	Power supply filter choke		N16-R-29205 3471	UNT Type No. 31030		L2-51	1							
L2-52	REACTOR: filter choke; 1 section; 20 henries inductance, 115 ma DC; 354 ohms DC resistance; 2500v rms test voltage; hermetically sealed, metal; over-all dim., 3-3/4 in. lg, 3 in. wide, 3 in. deep; 4 0.173 in. dia holes 2-3/8 in. C to C; 2 terminals, solder lug type, located on bottom; finished in accordance with JAN-T-27 spec; for general purpose use.	Power supply filter choke		N16-R-29385-7601	UNT Type No. 31031		L2-52	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L2-53	TRANSFORMER, INTERMEDIATE FREQUENCY: 455 kc, untuned; unshielded; over-all dim., 2-1/4 in. lg, 27/64 in. dia; material data, wound on core, powdered iron core; termination data, 3 terminations, axial wire lead type; impregnated for tropical use; p/o, AN Radio Receiver, Type No. R-450/FRR-28.			N16-C-74289-5301	JFE Part No. 1369		L2-53	1							
L2-54	COIL, RADIO FREQUENCY: 50 mh at 1,000 cycles, 130 ohms DC resistance, 100 ma; 1,560 turns, No. 36 AWG wire, copper wire, single silk enameled conductor, 1 winding, pie duo-lateral wound, unshielded, iron form, iron core, coil dim. excluding terminals, 1-1/8 in. dia, 5/8 in. high, over-all coil form dim., 1/2 in. lg, 7/16 in. dia; 2 terminals, solder lug type, located on bakelite terminal plate; mounted by single No. 6-32 thread screw through center of coil form; choke coil; for general purpose use.	Detector RF choke		N16-C-75460-6969	MLR Part No. 958	NRCO Dwg No. A1104184	L2-54	1							
L2-55	COIL, RADIO FREQUENCY: 80 mh at 1,000 cycles, 230 ohms DC resistance, 100 ma; 2,430 turns, No. 36 AWG wire, copper wire, single nylon, enameled, conductor, 1 winding, pie duo-lateral wound, unshielded, ceramic form, air core, coil dim. excluding terminals, 1-1/8 in. dia, 5/8 in. high, over-all coil form dim., 1/2 in. lg, 1/2 in. dia; 2 terminals, solder lug type, located on bottom bakelite terminal plate; mounted by single No. 6-32 screw through center of coil form; choke coil; for general purpose use.	AVC filter choke		N16-C-75526-3921	MLR Part No. 694	NRCO Dwg No. A1104122	L2-55	1							
L2-58	COIL, RADIO FREQUENCY: electrical data; 0.023 to 0.054 mh at 2.5 mc, 2.3 ohms DC resistance, 0.006 amp rating; physical data, 37 turns, no. 40 AWG, copper conductor, cotton insulator, 1 winding, pie universal wound, untapped, unshielded, impregnated paper form, powdered iron core, coil dim. excluding terminals and tuning device, 3/8 in. dia, 1-1/16 in. lg, over-all coil form dim., 1-7/16 in. lg, 3/8 in. dia; adjustable tuning, adjustable iron core, hex nut adjustment, through bottom of coil; terminal data, solder lug type, located 180° apart at end of coil form, clamp mounted (includes	P/o HF oscillator signal filter		N16-C-76520-3850		NRCO Part No. A159118	L2-58	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L2-58 (cont)	clamp); choke coil; special features data, ± 5% DC resistance, 6.9 and 11.7 mc self resonent frequency; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
L3-1	REACTOR: filter choke; 1 section; 7 henries over-all inductance, 110 ma DC; 160 ohms DC resistance; 1500v rms test voltage; enclosed case, steel; over-all dim. excluding terminals, 2-5/8 in. lg, 2-1/4 in. wide, 3 in. high; 4 no. 6-32 thread inserts on 1-3/4 in. by 2 in. mounting centers, located top and bottom; 2 terminals, solder post type, located on bottom; 2820 turns No. 31 AWG wire layer wound on EI11-24 gauge-DYN core, varnish impregnated, pitch filled; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Power supply filter choke		N16-R-29154-6381	FTC Part No. 14800	NRCO Spec No. 108 NRCO Dwg No. A1104147	L3-1	1							
L3-2	COIL, RADIO FREQUENCY: 0.00172 to 0.0032 mh at 7.9 mc, 0.045 ohms DC resistance; 14 turns, no. 24 AWG copper conductor, enamel insulated conductor, 1 winding, single layer winding, untapped, unshielded, bakelite form, iron core, coil dim. excluding terminals and tuning device, 5/8 in. dia. 1-13/16 in. lg, over-all coil form dim., 1-13/16 in. lg max, 5/8 in. dia w/ 5/32 in. lg radial solder post terminal protrusion; adjustable iron core, screwdriver adjustment, bottom of coil; 2 terminals, axial wire lead; 1 ea end winding; bushing mounted; radio frequency oscillator coil; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	P/o variable HF oscillator		N16-C-76548-4591		NRCO Part No. AD5A41 NRCO Dwg No. A110480	L3-2	1							
L3-3	COIL, RADIO FREQUENCY: 0.0275 mh total inductance at 2.5 mc, 0.22 ohm DC resistance; 38 turns, no. 22 AWG, copper conductor, bare copper tinned conductor, 1 winding, single layer winding, tapped at 8-1/2 and 13-1/2 turns from ground end, unshielded, isolantite form, air core, coil dim. excluding terminals and mounting provisions, 1-1/4 in. dia, 2-3/8 in. lg, over-all coil form dim., 2-3/8 in. lg, 1-1/4 in. dia; 4 terminals, 2 wire lead and 2 solder lug type, 2 wire leads are coil taps, 2 solder lug located axially one ea end of coil form; 2 no. 6-32 tapped bushings 3/4 in. lg on periphery	P/o variable HF oscillator		N16-C-73390-5701		NRCO Part No. AD5A43 NRCO Dwg No. A110481	L3-3	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
L3-3. (cont)	of coil form spaced 2 in. C to C; radio frequency oscillator coil; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.														
L3-4	TRANSFORMER, RADIO FREQUENCY: 2 windings, primary, universal wound, secondary, single layer wound, primary, 0.026 mh at 2.5 mc per sec, secondary mh not critical; primary, 30 turns no. 7/41 Litz wire, secondary, 4 turns no. 28 AWG copper wire, DC resistance, primary, 0.88 ohm, secondary, 0.18 ohm; 2 to 4 mc frequency range; untapped; unshielded; dim., 2 in. lg over-all max, 1/2 in. dia approx; XXX paper base bakelite coil form, powdered iron core; over-all dim. of coil form, 1/2 in. OD, 2 in. high; adjustable iron core screwdriver adjustment, adjusted by shaft on bottom of coil form; 1/4 in.-28 threaded brass bushing for single hole mounting; 4 terminals, solder lug type, located axially on periphery of coil form at end opposite tuning slug; terminals marked "A," "B," "C," "D"; windings impregnated w/ high temperature coil compound, incl 1 hex nut, lockwasher and tuning slug lock unit; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	P/o 2 to 4 mc output tuned circuit		N17-T-82183-1761		NRCO Part No. AD5A36 NRCO Dwg No. A110476	L3-4	1							
L3-5	TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound, inductance, primary, 0.0065 mh at 7.9 mc per sec, primary, 20 turns no. 28 AWG copper wire, secondary, 3-1/4 turns no. 28 AWG copper wire, DC resistance, primary, 0.2 ohm, secondary, 0.05 ohm; 4 to 8 mc frequency range; untapped; unshielded; dim., 2 in. lg over-all max, 9/16 in. dia approx; XXX paper base bakelite coil form, powdered iron core; over-all dim. of coil form, 1/2 in. OD, 2 in. high; adjustable iron core, screwdriver adjustment, adjusted by shaft on bottom of coil form; 1/4 in.-28 threaded brass bushing for single hole mounting; terminal data, 4 terminals, solder lug type, located axially on periphery of coil form at end opposite tuning slug; terminals marked "A," "B," "C," "D"; windings impregnated, w/ high temperature coil compound, incl 1 hex nut, lockwasher and	P/o 4 to 8 mc output tuned circuit		N17-T-82189-1501		NRCO Part No. AD5A37 NRCO Dwg No. A110477	L3-5	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L3-5 (cont)	slug lock unit; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.														
L3-6	TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound, inductance, primary, 0.0016 mh at 7.9 mc per sec, primary, 8-1/4 turns No. 28 AWG copper wire, secondary, 2-1/4 turns No. 28 copper wire, DC resistance, primary, 0.10 ohm, secondary 0.04 ohm; 8 to 16 mc frequency range; untapped; unshielded, dim., 2 in. lg over-all max, 9/16 in. dia; XXX paper base bakelite coil form; powdered iron core; over-all dim. of coil form, 1/2 in. OD, 2 in. high; adjustable iron core, screwdriver adjustment, adjusted by shaft on bottom of coil form; 1/4 in.-28 threaded brass bushing for single hole mounting; 4 terminals, solder lug type, located axially on periphery of coil form at end opposite tuning slug; terminals marked "A," "B," "C," "D"; windings impregnated w/ high temperature coil compound, incl 1 hex nut, lockwasher and tuning slug lock unit; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	P/o 8 to 16 mc output tuned circuit		N17-T-82201-1758		NRCO Part No. AD5A38 NRCO Dwg No. A110478	L3-6	1							
L3-7	TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound, inductance, primary, 0.0004 mh at 25 mc per sec, primary, 5-1/4 turns No. 20 AWG copper wire, secondary, 1-1/4 turns No. 20 AWG copper wire, DC resistance, primary, 0.02 ohm, secondary, 0.015 ohm; 16 to 32 mc frequency range; untapped; unshielded; dim., 2 in. lg over-all max, 9/16 in. dia approx; XXX paper base bakelite coil form, powdered iron core; over-all dim. of coil form, 1/2 in. OD, 2 in. lg; adjustable iron core, screwdriver adjustment, adjusted by shaft on bottom of coil form; 1/4 in.-28 threaded brass bushing for single hole mounting; 4 terminals, solder lug type, located axially on periphery of coil form at end opposite tuning slug; terminal marked "A," "B," "C," "D"; windings impregnated w/ high temperature coil compound, incl 1 hex nut, lockwasher and tuning slug lock unit; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	P/o 16 to 32 mc output tuned circuit		N17-T-82209-1001		NRCO Part No. AD5A39 NRCO Dwg No. A110476	L3-7	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
L3-8	SUPPRESSOR, PARASITIC: resistor and coil type; 6.3v AC, 0.15 amp; 30 microhy inductance, 133 turns, No. 30 AWG enamel wire, 100,000 ohm, 2 W; over-all dim. excluding terminals, 1-3/4 in. lg, 0.348 in. dia; uncased; terminal mounted; 2 terminals, wire lead type, located axially one ea end; high temp varnish impregnated; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	V3-1 filament filter choke		N16-S-89776-6536		NRCO Spec No. 183 NRCO Dwg No. A110482	L3-8 L3-9 L3-10 L3-11	4							
L3-9	Same as L3-8.	V3-1 filament filter choke													
L3-10	Same as L3-8.	Inner oven heater filter choke													
L3-11	Same as L3-8.	Inner oven heater filter choke													
L9-1	REACTOR: filter choke; 1 section; 10 henries over-all inductance, 75 ma DC; 250 ohms DC resistance; 1500v rms test voltage; enclosed case, steel; over-all dim. excluding terminals, 2-9/16 in. lg, 2-3/16 in. wide, 2-3/4 in. high; 4 No. 6-32 thread inserts on 1-3/4 in. by 2 in. mounting centers, located top and bottom; 2 terminals, solder post type, located on bottom; 3210 turns No. 33 AWG wire layer wound on EI75-24 gauge-DYN core, varnish impregnated, pitch filled; p/o, AN Amplifier-Detector, Type No. AM-615/UR.	Power supply filter choke		N16-R-29235-6361	FTC Part No. 14801	NRCO Spec No. 112 NRCO Dwg No. A1104128	L9-1 L9-3 L10-1 L10-2	4							
L9-2	COIL, RADIO FREQUENCY: 2.5 mh at 1,000 cycles, 44 ohms DC resistance, 100 ma; 878 turns, No. 36 AWG, copper conductor, single nylon, enameled, 4 windings, pie universal winding, untapped, unshielded, ceramic form, air core, coil dim., 1/2 in. dia, 2 in. lg, over-all coil form dim. including molded lead ends, 2 in. lg, 11/32 in. dia; 2 terminations, wire lead type, located radially one ea end; ceramic mounting bushing w/ No. 6-32 screw hole; choke coil, ± 15% DC resistance tolerance of coil; for general purpose use.	V9-2 plate filter choke		N16-C-74716-4521	NAC Part No. R100U	NRCO Dwg No. A1104123	L9-2	1							
L9-3	Same as L9-1.	Power supply filter choke													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
L10-1	Same as L9-1.	Power supply filter choke													
L10-2	Same as L9-1.	Power supply filter choke													
M2-1	METER, "S" UNITS: panel mounting; 250 micro-amps full scale deflection; db, db from 1 microvolt and db from 6 milliwatts, -6 to +100 db, -10 to +15 db; round case, metal, style No. 15, MBCA Ref Dwg Group 27; flange, 2-1/4 in. dia, 1/16 in. thick, body 2-1/16 in. dia, 1-5/16 in. deep from mounting flange excluding terminals; black scale, white background; mounts by 2-1/16 in. mounting ring; 2 terminals, screw stud type, No. 10-32 thread, 9/16 in. lg; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	RF and AF output level meter		N17-M-21874-1601	BEI Type No. 4903		M2-1	1						
M3-1	AMMETER: panel mounted; DC; marked "MILLIAMPERES," 0 to 1 ma, graduated in increments of 0.05 ma, marked "D.C."; cylindrical case w/ square mounting flange, plastic, style No. 16 MBCA Ref Dwg Group 27; dim. data MBCA Ref Dwg Group 27, flange, 2.38 in. wide, 2.38 in. high, 3/16 in. thick, 2.20 in. body dia, 1.02 in. body depth from mounting surface, excluding terminals; ± 2% accuracy at full scale reading; 105 ohm resistance across terminals; calibrated for non-magnetic panel; black pointer and scale markings, white background; self-contained; 4 mounting studs No. 4-40 thread, 1/2 in. lg on 1-7/8 in. by 1-7/8 in. mounting centers; 2 terminals screw stud type, No. 8-32 thread, 0.63 in. lg; incl 4 mounting nuts and terminal nuts; for general purpose use.	HF and BF oscillator and output level meter		N17-M-19246-8951	WS Model No. 506	NRCO Dwg No. A1104133	M3-1	1						
M3-2	SWITCH, THERMOSTATIC: glass body; SPST; body dim. excluding terminals, "L" shape, 1/4 in. dia, 3-11/16 in. lg, 3-11/16 in. high; temperature operated, actuating "mechanism" included, rising mercury column type; 2 terminations, wire lead type, located radially on 5 in. leg; clip mounted, clip not included; contact at 60° C, graduated 0.1° C from 50° to 62° C, 1° C per 17/32 in. length sensitivity, p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	"OVEN HEAT" mercury switch		N17-S-69831--1217	PTH Type No. VC325	NRCO Dwg No. B1104156	M3-2	1						

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
M10-1	VOLTMETER: panel mounted; AC, rectifier type, single phase, marked "VOLTS," 0 to 20v, graduated in increments of 1/2v, marked "A.C."; cylindrical w/ square mounting flange, plastic, style No. 16, MBCA Ref Dwg Group 27; dim. data, MBCA Ref Dwg Group 27; flange, 2.38 in. wide, 2.38 in. high, 3/16 in. thick, 2.20 in. body dia, 1.02 in. body depth from mounting surface, excluding terminals; 5% accuracy at full scale reading, calibrated for non-magnetic panel; black pointer and scale markings, white background; self-contained; 4 mounting studs No. 4-40 in. thread, 1/2 in. lg on 1-7/8 in. by 1-7/8 in. mounting centers; 2 terminals, screw stud type, No. 8-32 thread, 0.63 in. lg; incl 4 mounting nuts and terminal nuts; p/o, AN Keyer, Type No. KY-79/UR.	Signal "OUTPUT LEVEL" meter		N17-M-33967-7401	WS Model No. 506	NRCO Dwg No. A1104134	M10-1	1							
02-1	COUPLING, FLEXIBLE: shaft; assembly c/o, 2 spider springs, 2 collars, ea w/ two No. 6-32 set screws, 1 center ring; circular shape; approx over-all dim., 1-1/8 in. dia, 3/4 in. wide; held on 1/4 in. dia shaft by set screws; for general purpose use.	Shaft coupling		N17-C-98378-4008	HMM Part No. PL415-3		02-1 02-2 02-3	3							
02-2	Same as 02-1.	Shaft coupling													
02-3	Same as 02-1.	Shaft coupling													
02-4	COUPLING, FLEXIBLE: shaft; assembly c/o 2 spider springs, 2 collars, ea w/ two No. 6-32 set screws; 1 center ring; circular shape; approx over-all dim., 1-1/8 in. dia, 3/4 in. wide; held on 1/4 in. dia shaft by set screws; for general purpose use.	Shaft coupling		N17-C-98378-4011	HMM Part No. PL415-2		02-4	1							
02-5 (48)	SPRING: flat type; retainer for RF tuner unit (Z2-1 to Z2-6, Z2-8 to Z2-13, Z2-15 to Z2-20, Z2-25 to Z2-30), 0.025 in. thick carbon annealed spring steel, cadmium plated, 0.937 in. lg, 0.218 in. wide over-all; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	RF tuner units retaining springs		N17-S-46766-2603	HMM Part No. 31003-1		02-5 (48)	48							
02-6 (48)	SPRING: flat type; retainer for RF tuner unit (L2-1 to L2-6, L2-8 to L2-13, L2-15 to L2-20, L2-25 to L2-30), 0.012 in. thick carbon annealed spring steel, cadmium plated; 0.351 in. lg, 0.281 in. wide, over-all; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	RF tuner units retaining springs		N17-S-46763-9156	HMM Part No.		02-6 (48)	48							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
02-7	SPRING: flat type; grounding for IF transformer shields; 0.010 in. thick, 1/2 in. wide beryllium copper, cadmium plated; 1-15/32 in. lg, 1/2 in. wide over-all; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Ground spring for T2-2		N17-S-46774-3416	HMM Part No. 31023-1		02-7 02-8 02-9 02-10 02-11	5							
02-8	Same as 02-7.	Ground spring for T2-3													
02-9	Same as 02-7.	Ground spring for T2-4													
02-10	Same as 02-7.	Ground spring for T2-5													
02-11	Same as 02-7.	Ground spring for T2-6													
02-12	SPRING: helical compression type; conversion switch; 0.024 in. dia music wire, cadmium plated; 1-13/32 in. lg. 3/16 in. OD, over-all; approx 46-1/4 turns; two hook terminals, one offset; squared ends; mounts by hook ends; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Conversion switch spring		N17-S-46757-9323	HMM Part No. 31125-1		02-12	1							
02-13	SPRING: helical compression type; indicator slide; 0.016 in. dia music wire, cadmium plated; 2-11/16 in. lg. 5/32 in. OD, over-all; approx 145 turns; two hook terminals; squared ends; mounts by hook ends; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Indicator compression slide spring		N17-S-46762-1651	HMM Part No. 31126-1		02-13	1							
02-14	SPRING: helical compression type; band change detent; 0.041 in. dia music wire, cadmium plated; 1-1/2 in. lg 0.307 in. OD, over-all; approx 25-3/4 turns; two hook terminals, one offset; squared ends; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Band change detent compression spring		N17-S- 46742-6241	HMM Part No. 31205-1		02-14 02-15	2							
02-15	Same as 02-14.	Band change detent compression spring													
02-16	SPRING: spider loop type; for anti-backlash in gear-train assy. 0.037 in. dia music wire, cadmium plated; 1-1/32 in. lg 21/32 in. wide, over-all; mounts by ends; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Gear-train anti-backlash spring		N17-S-46802-1933	HMM Part No. 31239-1		02-16 02-17 02-18	3							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
02-17	Same as 02-16.	Gear-train anti-backlash spring													
02-18	Same as 02-16.	Gear-train anti-backlash spring													
02-19	SPRING: flat type; for turret rotor shaft grounding; 0.010 in. thick beryllium copper, silver plated; 1-7/16 in. lg 5/16 in. wide, over-all; two slotted ends 5/32 in. lg 0.070 in. wide for mtg; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Turret rotor shaft grounding spring		N17-S-46700-1901	HMM Part No. 31279-1		02-19 02-20 02-21	3							
02-20	Same as 02-19.	Turret rotor shaft grounding spring													
02-21	Same as 02-19.	Turret rotor shaft grounding spring													
02-22	SPRING: flat type; crystal holding spring; 0.010 in. thick beryllium copper, nickel plated; 25/32 in. lg 3/16 in. wide, over-all; one 0.120 in. dia hole for mtg; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Crystal holding spring		N17-S-46765-2696	HMM Part No. 31417-1		02-22 02-23 02-24 02-25 02-26 02-27	6							
02-23	Same as 02-22.	Crystal holding spring													
02-24	Same as 02-22.	Crystal holding spring													
02-25	Same as 02-22.	Crystal holding spring													
02-26	Same as 02-22.	Crystal holding spring													
02-27	Same as 02-22.	Crystal holding spring													
03-1	COUPLING, FLEXIBLE: flanged type; 1/4 in. dia shaft opening ea end; 2 screw mounting ea end; over-all dim., 1-1/16 in. OD, 1/4 in. ID, 9/16 in. lg; brass, nickel plated; incl 4 mounting screws; coupling made up of 1/2 in. OD by 7/32 in. high hub riveted to each side of 1-1/16 in. thin metal disk; for general purpose use.	S3-7 shaft to extension shaft coupling		N17-C-98378-3805	NAC Part No. TX22	NRCO Dwg No. A1104170	03-1 03-3 03-4 03-5 03-6 09-1								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
O3-2	COUPLING, FLEXIBLE: flanged type; 1/4 in. dia shaft opening one end, 5/16 in. dia shaft opening other; 2 screw mounting ea end; over-all dim., 1-1/16 in. OD, 1/4 in. min ID, 9/16 in. lg; brass, nickel plated; incl 4 mounting screws, 5/16 in. dia shaft opening is modification of standard part; coupling made up of 1/2 in. OD by 7/32 in. high hub riveted to ea side of 1-1/16 in. thin metal disk; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	C3-1 shaft to extension shaft coupling		*N17-C-98378-3803	NAC Part No. TX22 modified	NRCO Dwg No. A1104171	O3-2	1							
O3-3	Same as O3-1.	S3-6 shaft to extension shaft coupling														
O3-4	Same as O3-1.	C3-24 shaft to extension shaft coupling														
O3-5	Same as O3-1.	"OUTPUT FREQUENCY" knob to extension shaft coupling														
O3-6	Same as O3-1.	"FREQUENCY RANGE MCS" knob to extension shaft coupling														
O3-7	COUPLING, RIGID: multi-jaw type; 1/4 in. dia shaft hole ea end, 3/16 in. dia shaft accommodation, 2 set screw mounting; over-all dim., 1/2 in. dia, 1-1/8 in. lg; steel; incl 2 set screws; ea hub 7/16 in. dia, 7/16 in. extension.	"DIAL HUNDREDS" shaft rigid coupling		N17-C-98431-2301	BGW Type No. FA5	NRCO Dwg No. A1104141	O3-7 O3-8	2							
O3-8	Same as O3-7.	"DIAL UNITS" shaft rigid coupling														
O3-9	GEAR: bevel; zinc; manual control dial power transmission gear; straight teeth; 12 teeth; 21 pitch, 0.571 in. pitch dia; over-all dim., 21/32 in. OD, 1/4 in. ID, 1/2 in. high; hub, 15/32 in. OD, 19/64 in. high; shaft mounted, set screw secured; for general purpose use.	"DIAL UNITS" shaft bevel gear.		N16-G-402125-866	CDCM Part No. 900	NRCO Dwg No. A1104162	O3-9 O3-10	2							
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.															

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
O3-10	Same as O3-9.	"DIAL HUNDREDS" shaft bevel gear													
O9-1	Same as O3-1.	"TUNING" shaft coupling													
P2-1	CABLE ASSEMBLY, POWER, ELECTRICAL: type designation, Underwriters Lab Inc, Type POSJ; 2 conductors, stranded, No. 18 AWG, rubber insulated, rubber jacket; 7-1/2 in. lg over-all; terminal fittings on first end, 1, Belden Mfg Co, Plug, Part No. H1047; conductors extend 1/2 in. beyond insulation and tinned on second end; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	Primary power plug		*N17-C-48237-5551	ALW Part No. 6143		P2-1	1							
P2-2	CONNECTOR, PLUG: 2 contacts, male, rd; non-polarized; straight type; over-all dim. excluding terminals, 1-1/2 in. lg, 23/32 in. dia; radio frequency connector, 100 ohms impedance, constant frequency impedance characteristic; body, cylindrical, brass, silver plated; mica filled bakelite insert; 7/16 in. cable opening; for general purpose use.	Plug for J2-1	SigC PL-284	N17-C-71435-7292	AMP Part No. 83-22SP		P2-2	1							
P2-3	CONNECTOR, ADAPTER: contact data, both ends, 4 contacts, male and female, round; non-polarized; angle type; 90° angle; over-all dim., 1-7/32 in. lg, 3/4 in. dia, 1-3/16 in. deep; radio frequency connector, 100 ohms impedance, non-constant frequency impedance characteristic; body, cylindrical, brass, silver plated; mica filled bakelite inserts; for general purpose use.	Adapter for J2-1	SigC PL-293	N17-C-67460-2909	AMP Part No. 83-22AP		P2-3	1							
P2-4	CONNECTOR, PLUG: 1 contact, male, rd, straight type; over-all dim., 1-1/2 in. lg, 11/16 in. dia; radio frequency connector; body, cylindrical shape, brass, silver plate; mica filled bakelite insert; 0.410 in. dia max cable opening; 1 1/16 in. OD coupling nut, 5/8 in.-24 coupling nut thread; integral non-rotating pin contact; for general purpose use. *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.	Plug for J2-2	SigC PL-259 (-49190)	N17-C-71412-8709	AMP Part No. 83-1SP KGE Part No. KV51-01	NRCO Dwg No. A1104100	P2-4 P2-6 P2-7 P2-8 P2-10 P3-5 P3-7 P3-8 P3-9 P3-10 P3-11 P9-2 P9-5	13							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
P2-6	Same as P2-4; p/o W12-7.	Plug for J2-6													
P2-7	Same as P2-3; p/o W12-2.	Plug for J2-7													
P2-8	Same as P2-4; p/o W12-5.	Plug for J2-8													
P2-9.	CONNECTOR, PLUG: 1 conductor; single shank, dim., 1/8 in. dia, 11/16 in. lg; metal shell w/ laminated phenolic insert, silver, tubular, dim., 3/8 in. dia; 31/32 in. over-all length of plug; for stripped wire termination; nickel plated shank; for general purpose use.	Plug for J2-9		N17-C-714-07-6585	CIN Part No. 1336	NRCO Dwg No. A1104136	P2-9	1							
P2-10	Same as P2-4; p/o W12-9.	Plug for J2-10													
P3-1	CONNECTOR, PLUG: 2 contacts, female, flat; polarized; straight type; over-all dim., 1-21/32 in. lg, 1-3/8 in. dia; contact ratings, 10/15 amp, 250-125v; body, cylindrical shape, brass, corrosion resistant finish; black composition insert; 5/8 in. dia max cable opening; armored cord grip; for general purpose use.	Plug for J3-1		N17-C-71126-5833	HAW Part No. 7257	NRCO Dwg No. A110459	P3-1 P9-3 P10-1	3							
P3-2	CONNECTOR, PLUG: 6 contacts, male, flat; polarized; straight type; over-all dim. excluding contacts, 1 in. lg, 11/16 in. wide, 1-1/32 in. high; contacts, 5 amp max, 45v max; body, rectangular shape, steel, black wrinkle; molded bakelite insert; 7/16 in. dia max cable opening; brass contacts 5/32 in. wide, 3/64 in. thick; for general purpose use.	Plug for J3-2		N17-C-71515-8115	JNS Part No. P306CCT	NRCO Dwg No. A110468	P3-2	1							
P3-3	CONNECTOR, PLUG: 8 contacts, male, flat; polarized; straight type; over-all dim. excluding contacts, 1-1/4 in. lg, 11/16 in. wide, 1-1/16 in. high; contacts, 5 amp max, 45v max; body, rectangular shape, steel, black wrinkle; molded bakelite insert; 1/2 in. dia max cable opening; brass contacts 5/32 in. wide, 3/64 in. thick; for general purpose use.	Plug for J3-3		N17-C-71542-6128	JNS Part No. P308CCT	NRCO Dwg No. A110469	P3-3	1							
P3-4	CONNECTOR, PLUG: 1 contact, male, rd; straight type; o/a dim. 7/8 in. lg max, 5/16 in. dia; contact, 50 W; radio frequency connector, 50 ohms nominal impedance; body cylindrical shape, brass, silver plate; 5/16 in. OD coupling nut, 1/4 in.-36 coupling nut thread; coupling nut has 1/32 in. axial	Plug for J3-4		N17-C-71408-2286	IPC Part No. MC10	NRCO Dwg No. A1104144	P3-4	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
P3-4 (cont)	play; for general purpose use.														
P3-5	Same as P2-4.	Plug for J3-5													
P3-7	Same as P2-4; p/o W12-7.	Plug for J3-7													
P3-8	Same as P2-4; p/o W12-8.	Plug for J3-8													
P3-9	Same as P2-4.	Plug for J3-9													
P3-10	Same as P2-4; p/o W12-5.	Plug for J3-10													
P3-11	Same as P2-4; p/o W12-6.	Plug for J3-11													
P3-12	CONNECTOR, PLUG: 6 contacts, male, flat; polarized; straight type; over-all dim. excluding contacts and terminals, 1 in. lg, 1-5/16 in. wide, 0.525 in. deep; contacts, 5 amp max, 45v max; body, rectangular body, molded bakelite; 2 holes, 0.152 in. dia, 1 in. C to C; brass contacts 5/32 in. wide, 3/64 in. thick; for general purpose use.	Plug for J3-12		N17-C-73515-8322	JNS Part No. P306AB	NRCO Dwg No. A110467	P3-12	1							
P5-1	PLUG, TELEPHONE: 3 conductors; single shank, dim., 3/16 in. dia, 1-1/8 in. lg; shell, cellulose acetate, black, tubular, dim., 1/2 in. dia; 3-1/4 in. over-all length of plug; for bare wire cable terminations; "PL-68" stamped on shell; Sig, Spec No. 71-805-F; p/o, Northern Radio Co, Inc, Telephone Cord, Part No. A50015; p/o W5-1.	W5-1 termination	SigC PL-68	N17-P-61400-5186	ICA Part No. AN-PL68	NRCO Dwg No. A110460	P5-1 P5-2 P5-3 P5-4 P5-5 P5-6 P5-7 P5-8 P5-9 P5-10 P5-11 P5-12	12							
P5-2	Same as P5-1; p/o W5-1.	W5-1 termination													
P5-3	Same as P5-1; p/o W5-2.	W5-2 termination													
P5-4	Same as P5-1; p/o W5-2.	W5-2 termination													
P5-5	Same as P5-1; p/o W5-3.	W5-3 termination													
P5-6	Same as P5-1; p/o W5-3.	W5-3 termination													
P5-7	Same as P5-1; p/o W5-4.	W5-4 termination													
P5-8	Same as P5-1; p/o W5-4.	W5-4 termination													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
P5-9	Same as P5-1; p/o W5-5.	W5-5 termination													
P5-10	Same as P5-1; p/o W5-5.	W5-5 termination													
P5-11	Same as P5-1; p/o W5-6.	W5-6 termination													
P5-12	Same as P5-1; p/o W5-6.	W5-6 termination													
P9-2	Same as P2-4; p/o W12-3.	Plug for J9-2													
P9-3	Same as P3-1; p/o W9-12.	Plug for J9-3													
P9-4	CONNECTOR, PLUG: 2 contacts, male, flat; straight type; over-all dim., 1-1/2 in. lg excluding protruding contacts, 1-7/16 in. dia; contacts, 10/15 amp, 250/125v; body, stepped cylindrical shape, rubber; 7/16 in. dia max cable opening; for general purpose use.	Primary power plug		N17-C-71435-8428	HAW Part No. 9972	NRCO Dwg No. A110463	P9-4 P10-2 P12-1 P12-2	4							
P9-5	Same as P2-4; p/o W12-4.	Plug for J9-4													
P10-1	Same as P3-1; p/o W10-13.	Plug for J10-1													
P10-2	Same as P9-4; p/o W10-13.	Primary power plug													
P12-1	Same as P9-4; p/o W3-11.	Switch panel SA-238/G termination of W3-11													
P12-2	Same as P9-4; p/o W12-15.	Comparator CM-14/URR primary power plug													
R1-1	RESISTOR, VARIABLE: resistive type, balanced "T," MBCA Ref Dwg Group 16, wire wound resistors; 200 ohms input impedance, 200 ohms output impedance; 2.5 W rating; 0.5 to 30 db in 90% rotation, 10% rotation infinite, ± 5% max tolerance, continuously variable; over-all dim. excluding terminals, 1-21/32 in. dia, 2-1/4 in. deep; 6 terminals, solder lug type, located radially on periphery of body; mounted by 3/8 in. lg, 3/8 in.-32 thread bushing; includes 1 hex nut, shaft 3/8 in. lg from bushing; for general purpose use.	"SPEAKER LEVEL" adjustment		N16-R-92939-7898	CLR Type No. CIT200	NRCO Dwg No. A1104107	R1-1 R10-53	2							
R1-2	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 510 ohm total resistance, ± 5% tolerance; 2 W power dissipation;	Audio signal attenuator	Spec No. JAN-R-11, JAN Type No. RC40BF511J	N16-R-49767-171	AB Part No. HB5115		R1-2 R1-3	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R1-2 (cont)	F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.														
R1-3	Same as R1-2.	Audio signal attenuator													
R2-1	RESISTOR, FIXED, COMPOSITION: body stylie No. 14, MBCA Ref Dwg Group 2; 510,000 ohms resistance, ± 5% tolerance; 1/3 W power dissipation; F characteristic; body dim. excluding terminals, 13/32 in. lg, 3/32 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-1 grid leak	Spec No. JAN-R-11, JAN Type No. RC10BF514J	N16-R-50839-111	IRC Type No. BTR-1/3		R2-1 R2-13 R2-26	3							
R2-2	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohms total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-1 grid bias filter	Spec No. JAN-R-11, JAN Type No. RC20BF103J	N16-R-50281-431	AB Part No. EB1035		R2-2 R2-12 R2-44 R2-52 R2-57 R2-70 R2-82 R2-90 R2-91 R2-92 R3-32	11							
R2-4	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-1 screen filter	Spec No. JAN-R-11, JAN Type No. RC20BF102K	N16-R-49922-811	AB Part No. EB1021		R2-4 R2-6 R2-16 R2-29 R2-30 R2-83 R2-102 R10-29 R10-33 R10-47 R10-52	11							
R2-5	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 510 ohms total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-1 plate filter	Spec No. JAN-R-11, JAN Type No. RC20BF511J	N16-R-49786-431	AB Part No. EB5115		R2-5 R2-15 R2-32 R2-103 R2-104 R2-105 R2-106 R2-107 R2-108 R2-109 R2-110	11							
R2-6	Same as R2-4.	V2-1 plate filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-7	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 51 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-1 plate circuit parasitic suppressor in 0.54 to 1.35 mc range	Spec No. JAN-R-11, JAN Type No. RC20BF510J	N16-R-49444-431	AB Part No. EB5105		R2-7 R2-8 R2-17 R2-18 R3-49	5							
R2-8	Same as R2-7.	V2-1 plate circuit parasitic suppressor in 1.35 to 3.45 mc range													
R2-9	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 24 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-1 plate circuit parasitic suppressor in 3.45 to 7.4 mc range	Spec No. JAN-R-11, JAN Type No. RC20BF240J	N16-R-49327-431	AB Part No. EB2405		R2-9 R2-19	2							
R2-10	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 240 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-1 plate circuit parasitic suppressor in 7.4 to 14.8 mc range	Spec No. JAN-R-11, JAN Type No. RC20BF241J	N16-R-49669-431	AB Part No. EB2415		R2-10 R2-11 R2-20 R2-21 R2-45 R9-6 R10-55	7							
R2-11	Same as R2-10.	V2-2 grid circuit parasitic suppressor													
R2-12	Same as R2-2.	V2-2 grid bias filter													
R2-13	Same as R2-1.	V2-2 grid leak													
R2-15	Same as R2-5	V2-2 plate filter													
R2-16	Same as R2-4.	V2-2 plate filter													
R2-17	Same as R2-7.	V2-2 plate circuit parasitic suppressor in 0.54 to 1.35 mc range													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-18	Same as R2-7.	V2-2 plate circuit parasitic suppressor in 1.35 to 3.45 mc range													
R2-19	Same as R2-9.	V2-2 plate circuit parasitic suppressor in 3.45 to 7.4 mc range													
R2-20	Same as R2-10.	V2-2 plate circuit parasitic suppressor in 7.4 to 14.8 mc range													
R2-21	Same as R2-10.	V2-5 grid circuit parasitic suppressor													
R2-22	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 47,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; for general purpose use.	V2-4B grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF473K	N16-R-50480-811	AB Part No. EB4731		R2-22 R2-64 R2-65 R2-77 R2-114 R3-6	6							
R2-26	Same as R2-1.	V2-5 grid leak													
R2-27	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 150 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-5 cathode bias	Spec No. JAN-R-11, JAN Type No. RC20BF151J	N16-R-49624-431	AB Part No. EB1515		R2-27	1							
R2-28	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 6,800 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-5 screen voltage dropper	Spec No. JAN-R-11, JAN Type No. RC20BF682K	N16-R-50201-811	AB Part No. EB6821		R2-28	1							
R2-29	Same as R2-4.	V2-4 plate filter													
R2-30	Same as R2-4.	V2-4 plate filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-32	Same as R2-5.	V2-7 grid leak													
R2-34	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-7 grid bias filter	Spec No. JAN-R-11, JAN Type No. RC20BF104K	N16-R-50633-811	AB Part No. EB1041		R2-34 R2-38 R2-43 R2-51 R2-56 R2-62 R2-67 R2-68 R2-75 R2-81 R2-100 R2-124 R3-8 R3-15 R3-16 R3-22 R3-27 R3-35 R3-45 R3-46 R3-48 R3-52 R9-4 R9-19 R10-32 R10-34 R10-35 R10-40	28							
R2-36	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 47,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-8A grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF473J	N16-R-50479-431	AB Part No. EB4735		R2-36	1							
R2-37	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 2,200 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-8A plate filter	Spec No. JAN-R-11, JAN Type No. RC20BF222K	N16-R-50012-811	AB Part No. EB2221		R2-37 R2-58 R2-80	3							
R2-38	Same as R2-34.	V2-8A plate voltage dropper													
R2-40	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 20,000 ohm total resistance, ± 5% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 9/16 in. lg,	V2-6 screen voltage dropper	Spec No. JAN-R-11, JAN Type No. RC30BF203J	N16-R-50362-751	AB Part No. GB2035		R2-40	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK		
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-40 (cont)	7/32 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.														
R2-42	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-9 grid circuit parasitic suppressor	Spec No. JAN-R-11, JAN Type No. RC20BF100K	N16-R-49238-811	AB Part No. EB1001		R2-42 R2-50 R2-55	3							
R2-43	Same as R2-34.	V2-9 grid leak													
R2-44	Same as R2-2.	V2-9 grid bias filter													
R2-45	Same as R2-10.	V2-10 grid circuit voltage divider at 1.3 kc IF bandpass													
R2-46	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,100 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-10 grid circuit voltage divider at 0.5 kc IF bandpass	Spec No. JAN-R-11, JAN Type No. RC20BF112J	N16-R-49930-431	AB Part No. EB1125		R2-46 R2-94	2							
R2-47	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 18,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-10 grid circuit voltage divider at 0.2 kc IF bandpass	Spec No. JAN-R-11, JAN Type No. RC20BF183K	N16-R-50354-311	AB Part No. EB1831		R2-47 R2-66	2							
R2-50	Same as R2-42.	V2-10 grid circuit parasitic suppressor													
R2-51	Same as R2-34.	V2-10 grid leak													
R2-52	Same as R2-2.	V2-10 grid bias filter													
R2-55	Same as R2-42.	V2-11 grid circuit parasitic suppressor													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-56	Same as R2-39.	V2-11 grid leak													
R2-57	Same as R2-2.	V2-11 grid bias filter													
R2-58	Same as R2-37.	V2-11 screen filter													
R2-59	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 2,200 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; 9/16 in. lg, 7/32 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-11 plate filter	Spec No. JAN-R-11, JAN Type No. RC30BF222K	N16-R-50013-231	AB Part No. GB2221		R2-59	1							
R2-60	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1 meg resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-14A voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF105K	N16-R-50975-811	AB Part No. EB1051		R2-60 R2-61	2							
R2-61	Same as R2-60.	V2-14A voltage divider													
R2-62	Same as R2-34.	V2-14B plate load													
R2-63	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 27,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-14B plate load	Spec No. JAN-R-11, JAN Type No. RC20BF273K	N16-R-50399-811	AB Part No. EB2731		R2-63	1							
R2-64	Same as R2-22.	V2-14B plate load													
R2-65	Same as R2-22.	V2-14B plate load													
R2-66	Same as R2-47.	V2-14A cathode bias divider													
R2-67	Same as R2-34.	V2-15B plate load													
R2-68	Same as R2-34.	V2-14A cathode bias divider													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE)NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-69	RESISTOR, VARIABLE: wire-wound element; 1 section, 1,000 ohms, ± 10% tolerance; 1 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 1-1/4 in. dia by 5/8 in. deep; metal shaft, screwdriver slotted, 1/16 in. slot, 1/4 in. dia, 1/2 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg, incl lockwasher and nut; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"METER ADJ RF" adjustment	Spec No. JAN-R-19, JAN Type No. RA20AISA102AK	N16-R-90754-3621	CN		R2-69 R2-74	2							
R2-70	Same as R2-2.	V2-15B plate load														
R2-72	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 20,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	Power supply voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF203J	N16-R-50362-431	AB Part No. EB2035		R2-72 R2-115 R2-122	3							
R2-73	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 56,000 ohm total resistance, ± 5% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 9/16 in. lg, 7/32 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	Power supply voltage divider	Spec No. JAN-R-11, JAN Type No.RC30BF563J	N16-R-50515-751	AB Part No. GB5635		R2-73	1							
R2-74	Same as R2-69.	"BFO INJ" adjustment														
R2-75	Same as R2-34.	V2-13A grid leak														
R2-77	Same as R2-22.	V2-13B plate filter														
R2-78	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 470,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-16A grid leak	Spec No. JAN-R-11,JAN Type No.RC20BF474K	N16-R-50822-811	AB Part No. EB4741		R2-78 R2-98 R2-119 R2-125 R10-26 R10-48 R10-49 R10-54	8							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R2-79	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 680 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; for general purpose use.	V2-16A cathode load	Spec No. JAN-R-11, JAN Type No. RC20BF681K	N16-R-49841-811	AB Part No. EB6811		R2-79 R3-59 R3-60 R9-12	4							
R2-80	Same as R2-37.	V2-16A plate filter													
R2-81	Same as R2-34.	V2-16B plate load													
R2-82	Same as R2-2.	V2-16B plate filter													
R2-83	Same as R2-4.	V2-16B cathode bias													
R2-84	RESISTOR, VARIABLE: composition element; 1 section, 500,000 ohms resistance, ± 20% tolerance; 2 W power dissipation; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed dim., 1-1/16 in. dia, 9/16 in. deep; metal shaft, rd, 1/4 in. dia, 1 in. lg from mtg surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 1/4 in. lg, non-turn device located on 17/32 in. radius at 9 o'clock; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"AUDIO GAIN" adjustment		N16-R-88182-5251	AB Part No. JU5042-P2100		R2-84	1							
R2-85	RESISTOR, FIXED, WIRE-WOUND: body style No. 20, MBCA Ref Dwg Group 2: non-inductive winding; 2,500 ohms resistance, ± 5% tolerance; 12 W power dissipation; body dim. excluding terminals, 2 in. lg, 19/32 in. dia max; vitreous enamel coated, resistant to humidity; 2 terminals, solder lug type; terminal mounted; for general purpose use.	V2-18 series load	Spec No. JAN-R-26A, JAN Type No. RW32G252	N16-R-66140-8326	WAL Type 10F		R2-85	1							
R2-86	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2: 68,000 ohm total resistance ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-20 input voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF683K	N16-R-50552-811	AB Part No. EB6831		R2-86 R2-89	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R2-87	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 120,000 ohms resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia, insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	V2-20 input voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF124J	N16-R-50650-431	AB Part No. EB1245		R2-87 R2-88	2							
R2-88	Same as R2-87.	V2-20 input voltage divider													
R2-89	Same as R2-86.	V2-20 input voltage divider													
R2-90	Same as R2-2.	V2-20 plate load and filter													
R2-91	Same as R2-2.	V2-20 plate load and filter													
R2-92	Same as R2-2.	V2-20 plate load and filter													
R2-93	RESISTOR, VARIABLE: composition element; 1 section, 50,000 ohms resistance, ± 10% tolerance; 2 W power dissipation; std F taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, dim., 1-1/16 in. dia, 15/16 in. deep; metal shaft, rd, 1/4 in. dia, 3/4 in. lg from mtg surface, normal torque; insulated contact arm, no "off" position, switch open at ccw end of rotation; mounted by bushing, 3/8 in. dia, 32 threads per in., 1/4 in. lg, non-turn device located on 17/32 in. radius at 9 o'clock; SPST switch, 2 amp, 125v AC, normally open, operates at start of rotation, 2 terminals, solder lug type; for general purpose use.	"RF GAIN" adjustment		N16-R-87849-4406	AB Part No. JSU5031-P2048		R2-93	1							
R2-94	Same as R2-46.														
R2-95	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 82,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	Negative bias divider	Spec No. JAN-R-11, JAN Type No. RC20BF823J	N16-R-50587-431	AB Part No. EB8235		R2-95	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-96	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 22,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	Negative bias divider	Spec No. JAN-R-11, JAN Type No. RC20BF223J	N16-R-50371-431	AB Part No. EB2235		R2-96	1							
R2-97	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 3.3 meg resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 3/8 in. lg, 9/64 in. dia; insulated, resistant to humidity and salt water immersion; 2 terminals, axial lead type; for general purpose use.	P/o AVC time constant circuit	Spec No. JAN-R-11, JAN Type No. RC20BF335K	N16-R-51110-811	AB Part No. EB3351		R2-97	1							
R2-98	Same as R2-78.	V2-17 grid leak													
R2-99	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 360 ohm total resistance, ± 5% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 9/16 in. lg, 7/32 in. dia; insulated, resistant to humidity; 2 terminals, axial lead type; for general purpose use.	V2-17 cathode bias	Spec No. JAN-R-11, JAN Type No. RC30BF361J	N16-R-49723-751	AB Part No. GB3611		R2-99	1							
R2-100	Same as R2-34.	V2-12 screen voltage dropper													
R2-101	RESISTOR, VARIABLE: composition element; 1 section, 25,000 ohm total resistance, ± 20% tolerance; 2 W power dissipation; A taper, Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, dim., 1-1/16 in. dia, 9/16 in. deep; metal shaft, rd, screwdriver slotted 3/64 in. wide by 1/16 in. deep, 1/4 in. dia, 1/2 in. lg from mtg surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg, non-turn device located on 17/32 in. radius; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	"METER ADJ AF" adjustment		N16-R-87752-5365	AB Part No. JU2532-SD3032		R2-101	1							
R2-102	Same as R2-4.	V2-16B load resistance													
R2-103	Same as R2-5.	V2-1 plate circuit resistance in 0.54 to 1.35 mc range													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-104	Same as R2-5.	V2-2 plate circuit resistance in 0.54 to 1.35 mc range													
R2-105	Same as R2-5.	V2-1 plate circuit resistance in 1.35 to 3.45 mc range													
R2-106	Same as R2-5.	V2-2 plate circuit resistance in 1.35 to 3.45 mc range													
R2-107	Same as R2-5.	V2-1 plate circuit resistance in 3.45 to 7.4 mc range													
R2-108	Same as R2-5.	V2-2 plate circuit resistance in 3.45 to 7.4 mc range													
R2-109	Same as R2-5.	V2-1 plate circuit resistance in 7.4 to 14.8 mc range													
R2-110	Same as R2-5.	V2-2 plate circuit resistance in 7.4 to 14.8 mc range													
R2-111	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 680 ohm total resistance, ± 20% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	P/o external HF oscillator signal filter	Spec No. JAN-R-11, JAN Type No. RC20BF681M	N16-R-49843-291	AB Part No. EB6812		R2-111	1							
R2-112	RESISTOR, VARIABLE: wire-wound element; 1 section, 500 ohm, ± 10% tolerance; 2 W normal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; combination metal and plastic case, enclosed, dim., 1-1/4 in. dia, 9/16 in. deep; metal shaft, rd, screwdriver slotted w/ 1/32 in. wide, 3/32 in. deep slot in end, 1/4 in. dia, 3/4 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg; removable cover; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	P/o external HF oscillator signal filter		N16-R-90493-7823	IRC Type No. W500	NRCO Dwg No. A1104110-1	R2-112 R10-27	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-113	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 75 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	P/o external HF oscillator signal filter	Spec No. JAN-R-11, JAN Type No. RC20BF750J	N16-R-49516-431	AB Part No. EB7505		R2-113 R2-123	2							
R2-114	Same as R2-22.	V2-4A grid leak													
R2-115	Same as R2-72.	V2-5 grid leak													
R2-116	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 220,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion, 2 terminals, wire lead type; for general purpose use.	V2-4 bias voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF224K	N16-R-50714-811	AB Part No. EB2241		R2-116 R9-3	2							
R2-117	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-4 bias voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF103K	N16-R-50282-811	AB Part No. EB1031		R2-117 R2-118 R2-127 R3-9 R3-17 R3-37 R3-44 R3-50 R9-7 R10-19	10							
R2-118	Same as R2-117.	V2-4 bias voltage divider													
R2-119	Same as R2-78.	V2-8B grid leak													
R2-120	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-8B plate voltage dropper	Spec No. JAN-R-11, JAN Type No. RC30BF103K	N16-R-50283-231	AB Part No. GB1031		R2-120	1							
R2-121	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 16,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire	V2-8B cathode load	Spec No. JAN-R-11, JAN Type No. RC20BF163J	N16-R-50344-431	AB Part No. EB1635		R2-121	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-121 (cont)	lead type; for general purpose use.														
R2-122	Same as R2-72.	V2-6 grid leak													
R2-123	Same as R2-113.	External BF oscillator impedance matcher													
R2-124	Same as R2-39.	V2-13B grid leak													
R2-125	Same as R2-78.	V2-13 bias voltage divider													
R2-126	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 22,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V2-13 bias voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF223K	N16-R-50372-811	AB Part No. EB2231		R2-126 R3-23	2							
R2-127	Same as R2-117.	V2-13 bias voltage divider													
R2-128	RESISTOR, VARIABLE: composition element; 1 section, 1,000 ohm total resistance, ± 10% tolerance; 2.25 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, dim., 1-1/16 in. dia, 9/16 in. deep; metal shaft, rd, w/ 3/64 in. wide, 1/16 in. deep slot in end, 1/4 in. dia, 3/8 in. lg from mounting surface, normal torque, w/ split bushing and shaft locking nut; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., non-turn device located on 17/32 in. radius at 9 o'clock; incl 1 hex mounting nut and lockwasher, max rotation, 333 deg, effective electrical rotation, 312 deg; for general purpose use.	"IF GAIN" adjustment		N16-R-87349-4560	AB Part No. JLU1021-SD2024	NRCO Dwg No. A1104183-1	R2-128	1							
R2-129	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 68,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.175 in. dia max, 0.406 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire	IF gain voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF683K	N16-R-50552-811	AB Part No. EB6831		R2-129	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R2-129 (cont)	lead type; for general purpose use.														
R3-1	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 120,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-1 grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF124K	N16-R-50651-811	AB Part No. EB1241		R3-1 R10-39	2							
R3-2	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,000 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-1 plate filter	Spec No. JAN-R-11, JAN Type No. RC30BF102K	N16-R-49923-231	AB Part No. GB1021		R3-2 R3-10 R3-43 R10-38	4							
R3-3	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 240,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-2 grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF244J	N16-R-50722-431	AB Part No. EB2445		R3-3 R3-63 R9-5 R10-57	4							
R3-4	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohm total resistance ± 10% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-2 plate filter	Spec No. JAN-R-11, JAN Type No. RC40BF103K	N16-R-50283-551	AB Part No. HB1031		R3-4 R3-39	2							
R3-5	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 750 ohm total resistance, ± 5% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	Inner oven heater	Spec No. JAN-R-11, JAN Type No. RC40BF751J	N16-R-49859-171	AB Part No. HB7515		R3-5 R3-57 R3-65 R3-66	4							
R3-6	Same as R2-22.	V3-3 grid leak													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R3-7	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-3 cathode bias	Spec No. JAN-R-11, JAN Type No. RC20BF101K	N16-R-49580-811	AB Part No. EB1011		R3-7	1							
R3-9	Same as R2-137.	V3-3 screen voltage dropper													
R3-10	Same as R3-2.	V3-3 screen filter													
R3-11	HEATING ELEMENT, ELECTRICAL: woven wire and asbestos yarn; 80 ohm total resistance, ± 5% tolerance; 80 ohms power dissipation; dim. data, 6 in. lg, 4-7/16 in. wide, 5/32 in. thick; 2 terminals, bus type, 6 in. lg, 3/8 in. wide, 5/32 in. thick; "Cupron" resistive element; 2 terminal bars nickel plated w/ 1/8 in. dia holes in ends; screw mounted, 4 3/16 in. dia holes on 2-3/4 by 4-1/16 in. mounting centers; non-inductive, resistance wire practically zero temp coefficient; for general purpose use.	Middle oven heater		N17-H-60034-7605	SAS Type No. WRS23	NRCO Part No. RW9A1 NRCO Dwg No. B1104138	R3-11 R3-12 R3-14	3							
R3-12	Same as R3-11.	Middle oven heater													
R3-13	HEATING ELEMENT, ELECTRICAL: woven wire and asbestos yarn; 80 ohm total resistance, ± 5% tolerance; 80 W power dissipation; 6 in. lg, 4-7/16 in. wide, 5/16 in. thick; 2 terminals, bus type, 6 in. lg, 3/8 in. wide, 5/32 in. thick; "Cupron" resistive element; 2 terminal bars nickel plated w/ 1/8 in. dia holes in ends; screw mounted, 4 3/16 in. dia holes on 2-3/4 in. by 4-1/16 in. mounting centers; non-inductive, resistance wire practically zero temp coefficient, crimp in 1 terminal bar, Part No. WRS23 modified; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	Middle oven heater		N17-H-60015-4601 When equipment spare has been expended, make from N17-H-60034-7605 (R3-11)		NRCO Modification Dwg No. RW9A2 NRCO Dwg No. B1104139	R3-13	1							
R3-14	Same as R3-11.	Middle oven heater													
R3-15	Same as R2-34.	V3-10A grid leak													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R3-16	Same as R2-34.	V3-10B grid leak													
R3-17	Same as R2-117.	V3-10A plate voltage dropper													
R3-18	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 15,000 ohm total resistance, ± 10% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-10B plate load	Spec No. JAN-R-11, JAN Type No. RC40BF153K	N16-R-50337-551	AB Part No. HB1531		R3-18 R3-40 R3-53	3							
R3-19	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,000 ohm total resistance, ± 10% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-4 plate filter	Spec No. JAN-R-11, JAN Type No. RC40BF102K	N16-R-49923-551	AB Part No. HB1021		R3-19 R3-30 R3-36 R3-54 R10-25	5							
R3-20	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 4,700 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-4 screen voltage dropper	Spec No. JAN-R-11, JAN Type No. RC20BF472K	N16-R-50129-811	AB Part No. EB4721		R3-20 R3-24 R3-26	3							
R3-21	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 470 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-4 cathode bias	Spec No. JAN-R-11, JAN Type No. RC20BF471K	N16-R-49769-811	AB Part No. EB4711		R3-21	1							
R3-22	Same as R2-34.	V3-9B grid leak													
R3-23	Same as R2-126.	V3-4 grid leak													
R3-24	Same as R3-20.	V3-5 screen voltage dropper													
R3-25	RESISTOR, VARIABLE: wire-wound element; 1 section, 50,000 ohm, ± 10% tolerance; 7 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug	"HFO OUTPUT" adjustment		N16-R-91569-8714	MAL Type No. E50MP	NRCO Dwg No. A1104111-1	R3-25	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R3-25 (cont)	type; metal case, enclosed, 2-5/16 in. dia, 7/8 in. deep; metal shaft, rd, screw driver slotted w/ 3/64 in. wide, 1/16 in. deep slot in end, 1/4 in. dia, 3/4 in. lg from mounting surface, normal torque; grounded contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 13/32 in. lg; total rotation, 310 degrees, effective electrical rotation, 299 degrees, incl 1 hex nut and lockwasher, standard shaft length 3/4 in. lg; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.														
R3-26	Same as R3-20.	V3-11 screen voltage dropper													
R3-27	Same as R2-34.	V3-5 grid leak													
R3-28	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 33,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-11 grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF333K	N16-R-50417-811	AB Part No. EB3331		R3-28	1							
R3-29	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 470 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 5/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-12 cathode bias	Spec No. JAN-R-11, JAN Type No. RC30BF471K	N16-R-49770-231	AB Part No. GB4711		R3-29 R10-21	2							
R3-30	Same as R3-19.	V3-5 plate filter													
R3-31	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 24,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	M3-1 series resistance for HF oscillator output signal	Spec No. JAN-R-11, JAN Type No. RC20BF243J	N16-R-50380-431	AB Part No. EB2435		R3-31 R9-10	2							
R3-32	Same as R2-2.	M3-1 series resistance for BF oscillator output signal													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R3-33	RESISTOR, FIXED, COMPOSITION: body style No. 15, MBCA Ref Dwg Group 2; 12 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	M3-1 shunt resistance for HF oscillator plate voltage	Spec No. JAN-R-11, JAN Type No. RC20BF120J	N16-R-49255-431	AB Part No. EB1205		R3-33 R3-34	2							
R3-34	Same as R3-33.	M3-1 shunt resistance for BF oscillator plate voltage													
R3-35	Same as R2-34.	V3-9A grid leak													
R3-36	Same as R3-19.	V3-11 plate filter													
R3-37	Same as R2-117.	V3-9A plate load													
R3-38	RESISTOR, VARIABLE: wire-wound element; 1 section, 1,000 ohm, ± 10% tolerance; 2 W normal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; combination metal and plastic case, enclosed, 1-1/4 in. dia, 9/16 in. deep; metal shaft, rd, screwdriver slotted w/ 1/32 in. wide, 3/32 in. deep slot in end, 1/4 in. dia, 5/8 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg; removable cover; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	"BFO OUT. CONT" adjustment		N16-R-90754-2723	IRC Type No. W1000	NRCO Dwg No. A1-04109-1	R3-38	1							
R3-39	Same as R3-4.	V3-9B plate filter dropper													
R3-40	Same as R3-18.	V3-9A plate filter													
R3-41	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 12 ohm total resistance, ± 10% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	I3-1 series voltage dropper	Spec No. JAN-R-11, JAN Type No. RC40BF120K	N16-R-49257-551	AB Part No. HB1201		R3-41	1							
R3-42	RESISTOR, VARIABLE: composition element; 1 section, 500,000 ohm, ± 10% tolerance; 2 W nominal power	"CAL. OUTPUT" adjustment		N16-R-88179-4439	AB Part No. JUS5041-P3056	NRCO Dwg No. A1-04114-1	R3-42	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R3-42 (cont)	rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 1-1/16 in. dia, 3/4 in. deep; metal shaft, rd, 1/4 in. dia, 7/8 in. lg from mounting surface, normal torque, insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg, non-turn device located on 17/32 in. radius at 9 o'clock; SPST, switch S3-4, 2 amp, 125v AC, normally open, operates at start of rotation, 2 terminals, solder lug type; incl 1 hex nut and lockwasher, max rotation, 333 degrees, effective electrical rotation, 312 degrees, p/o, AN Radio Frequency Oscillator, Type No. O-165/UR; u/w knob E3-37.														
R3-43	Same as R3-2.	V3-6 cathode bias													
R3-44	Same as R2-117.	V3-6 plate load													
R3-45	Same as R2-34.	J3-6 shunt resistance													
R3-46	Same as R2-34.	Drops screen voltage of V3-5 and V3-11 below operating level													
R3-47	RESISTOR, FIXED, WIRE WOUND: body style No. 23, MBCA Ref Dwg Group 2; inductively wound; 7,500 ohm total resistance, + 10% tolerance; 20 W power dissipation, 340° C max continuous operating temp; body dim. excluding terminals, 9/16 in. OD, 25/64 in. ID, 2 in. lg; vitreous enamel coated, resistant to humidity; 2 terminals, one No. 18 AWG, 1-1/2 in. lg, axial wire lead attached to radial solder lug ea end, 3/16 in. wide, 7/16 in. high; terminal mounted; green finish; for general purpose use.	V3-7 series load		N16-R-70721-1375	WAL Part No. 20F7225	NRCO Dwg No. A110487-1	R3-47	1							
R3-48	Same as R2-34.	V3-3 plate load													
R3-49	Same as R2-7.	V3-11 grid circuit parasitic suppressor													
R3-50	Same as R2-117.	V3-3 plate filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R3-51	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 56,000 ohm total resistance, ± 10% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	K3-1 series resistance	Spec No. JAN-R-11, JAN Type No. RC40BF563K	N16-R-50517-551	AB Part No. HB5631		R3-51	1							
R3-52	Same as R2-34.	I3-2 series resistance													
R3-53	Same as R3-18.	V3-4, V3-5 and V3-11 dropper													
R3-54	Same as R3-19.	V3-4 plate filter													
R3-55	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 220 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-5 cathode bias	Spec No. JAN-R-11, JAN Type No. RC30BF221K	N16-R-49662-231	AB Part No. GB2211		R3-55 R3-56	2							
R3-56	Same as R3-55.	V3-11 cathode bias													
R3-57	Same as R3-5.	Inner oven heater													
R3-58	RESISTOR, FIXED, WIRE WOUND: body style No. 23, MBCA Ref Dwg Group 2; inductively wound; 350 ohm total resistance, ± 10% tolerance; 5 W power dissipation, 340° C max continuous operating temp; body dim. excluding terminals, 5/16 in. OD, 7/32 in. ID, 1 in. lg; vitreous enamel coated, resistant to humidity; 2 terminals, one axial wire lead attached to radial solder lug ea end, 3/16 in. wide, 7/16 in. high; terminal mounted; green finish; for general purpose use.	Inner oven heaters series resistance		N16-R-70549-2335	WAL Part No. 5F350	NRCO Dwg No. A110488-1	R3-58 R3-64	2							
R3-59	Same as R2-79.	V3-10B cathode bias													
R3-60	Same as R2-79.	V3-2 cathode load													
R3-61	RESISTOR, FIXED, WIRE WOUND: body style No. 3, MBCA Ref Dwg Group 2; inductive winding; 10,000 ohm	V3-12 plate load		N16-R-68441-2036	SPR Type No. 10KT	NRCO Dwg No. A110486-2	R3-61	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R3-61 (cont)	total resistance, + 5% tolerance; 10 W power dissipation, 240°C max continuous operating temp; body dim. excluding terminals, 1-27/32 in. lg, 15/32 in. dia; ceramic coating, resistant to humidity; 2 terminals, wire lead type, No. 20 AWG, 2-1/2 in. lg, terminal mounted; resistance wire insulated; for general purpose use.														
R3-62	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 91,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V3-12 screen voltage dropper	Spec No. JAN-R-11, JAN Type No. RC20BF913J	N16-R-50614-431	AB Part No. EB9135		R3-62	1							
R3-63	Same as R3-3.	V3-12 grid leak													
R3-64	Same as R3-58.	Inner oven heaters series resistance													
R3-65	Same as R3-5.	Inner oven heater													
R3-66	Same as R3-5.	Inner oven heater													
R9-1	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,000 ohm total resistance, + 20% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals wire lead type; for general purpose use.	V9-1 grid leak	Spec No. JAN-R-11, JAN Type No. RC20BF102M	N16-R-49924-291	AB Part No. EB1022		R9-1 R9-2 R9-16	3							
R9-2	Same as R9-1.	V9-1 cathode bias													
R9-3	Same as R2-16.	V9-1 screen voltage divider													
R9-4	Same as R2-34.	V9-1 plate load													
R9-5	Same as R3-3.	V9-2 grid leak													
R9-6	Same as R2-10.	V9-2 cathode bias													
R9-7	Same as R2-117.	V9-1 plate and screen filter													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R9-8	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohm total resistance, ± 20% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V9-2 plate filter	Spec No. JAN-R-11, JAN Type No. RC20BF103M	N16-R-50284-291	AB Part No. EB1032		R9-8 R9-18	2								
R9-9	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 22,000 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V9-2 plate load	Spec No. JAN-R-11, JAN Type No. RC30BF223K	N16-R-50373-231	AB Part No. GB2231		R9-9	1								
R9-10	Same as R3-31.	V9-2 screen voltage dropper														
R9-11	RESISTOR, VARIABLE: composition element; 1 section, 250,000 ohm, ± 10% tolerance; 2.25 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 1-1/16 in. dia, 9/16 in. deep; metal shaft, rd, 1/4 in. dia, 7/8 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 3/8 in. lg, non-turn device located on 17/32 in. radius at 9 o'clock; incl 1 hex nut and lockwasher, max rotation, 333 degrees, effective electrical rotation, 312 degrees, p/o, AN Amplifier-Detector, Type No. AM-615/UR; u/w knob E9-6.	"OUTPUT LEVEL" adjustment		N16-R-88079-4270	AB Type No. JU2541 w/ shaft P3056	NRCO Dwg No. A1104113-1	R9-11	1								
R9-12	Same as R2-79.	V9-4 cathode bias														
R9-13	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 15,000 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V9-4 plate voltage dropper	Spec No. JAN-R-11, JAN Type No. RC30BF153K	N16-R-50337-231	AB Part No. GB1531		R9-13	1								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R9-14	RESISTOR, FIXED, WIRE WOUND: body style No. 3, MBCA Ref Dwg Group 2; inductive winding; 13,000 ohm total resistance, + 5% tolerance; 5 W power dissipation, 185° C max continuous operating temp; body dim. excluding terminals, 1-7/32 in. lg, 15/32 in. dia; ceramic covering, resistant to humidity; 2 terminals, wire lead type, No. 20 AWG, 2-1/2 in. lg; terminal mounted; resistance wire insulated; for general purpose use.	V9-5 series load		N16-R-68444-1001	SPR Type No. 5KT	NRCO Dwg No. A110498-1	R9-14	1							
R9-16	Same as R9-1.	V9-2 oscillator plate filter													
R9-17	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100,000 ohm total resistance, + 20% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	J9-1 shunt resistance.	Spec No. JAN-R-11, JAN Type No. RC20BF104M	N16-R-50635-291	AB Part No. EB1042		R9-17	1							
R9-18	Same as R9-8.	V9-4 plate filter													
R9-19	Same as R2-34.	V9-1 screen voltage divider													
R10-1	RESISTOR, FIXED, FILM: body style No. 25, MBCA Ref Dwg Group 2; resistance data, 2.07 meg total resistance, + 1% tolerance; 1/2 W power dissipation; 500v voltage rating; F resistance temp characteristic, 0.280 in. OD max, 5/32 in. ID, 0.780 in. lg max; insulation data, insulated, resistant to humidity; terminal data, two terminals, radial wire lead type; metal film resistance hermetically sealed by vitreous enamel layer, rubberized enamel protective coating; for general purpose use.	P/o V10-1 positive feedback network		N16-R-73535-7442	CLO Type No. X-1/2	NRCO Dwg No. A110444-6	R10-1 R10-7	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R10-2	RESISTOR, FIXED, FILM: body style No. 25, MBCA Ref Dwg Group 2; resistance data, 1.15 meg total resistance, ± 1% tolerance; 1/2 W power dissipation; 500v voltage rating; F resistance temp characteristic, 0.280 in. OD max, 5/32 in. ID, 0.780 in. lg max; insulation data, insulated, resistant to humidity; terminal data, two terminals, radial wire lead type; metal film resistance hermetically sealed by vitreous enamel layer, rubberized enamel protective coating; for general purpose use.	P/o V10-1 positive feedback network		N16-R-73532-3893	CLO Type No. X-1/2	NRCO Dwg No. A110444-5	R10-2 R10-8	2							
R10-3	RESISTOR, FIXED, FILM: body style No. 25, MBCA Ref Dwg Group 2; resistance data, 793,000 ohm total resistance, ± 1% tolerance; 1/2 W power dissipation; 500v voltage rating; F resistance temp characteristic, 0.280 in. OD max, 5/32 in. ID, 0.780 in. lg max; insulation data, insulated, resistant to humidity; terminal data, two terminals, radial wire lead type; metal film resistance hermetically sealed by vitreous enamel layer, rubberized enamel protective coating; for general purpose use.	P/o V10-1 positive feedback network		N16-R-73529-7647	CLO Type No. X-1/2	NRCO Dwg No. A110444-4	R10-3 R10-9	2							
R10-4	RESISTOR, FIXED, COMPOSITION: body style No. 42, MBCA Ref Dwg Group 2; 610,000 ohm total resistance, ± 1% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 9/32 in. OD, 5/32 in. ID, 5/8 in. lg; insulated, resistant to humidity; 2 terminals, wire lead type; metal film resistance w/ vitreous enamel coating; for general purpose use.	P/o V10-1 positive feedback network		N16-R-73526-9435	CLO Type No. X-1/2	NRCO Dwg No. A110444-3	R10-4 R10-10	2							
R10-5	RESISTOR, FIXED, FILM: body style No. 25, MBCA Ref Dwg Group 2; resistance data, 492,000 ohm total resistance, ± 1% tolerance; 500v max continuous voltage rating; 1/2 W power dissipation; resistance temp characteristic, F characteristic; body dim. excluding terminals, 0.280 in. OD max, 5/32 in. ID, 0.780 in. lg max; insulation data, insulated, resistant to humidity; terminal data, two ter-	P/o V10-1 positive feedback network		N16-R-73525-2764	CLO Type No. X-1/2	NRCO Dwg No. A110444-2	R10-5 R10-11	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R10-5 (cont)	minals, radial wire lead type; metal film resistance hermetically sealed by vitreous enamel layer, rubberized enamel protective coating; for general purpose use.														
R10-6	RESISTOR, FIXED, FILM: body style No. 25, MBCA Ref Dwg Group 2; resistance data, 414,000 ohm total resistance, ± 1% tolerance, 500v max continuous voltage rating; 1/2 W power dissipation; resistance temp characteristic, F characteristic; body dim. excluding terminals, 0.280 in. OD max, 5/32 in. ID, 0.780 in. lg max; insulation data, insulated, resistant to humidity; terminal data, two terminals, radial wire lead type; metal film resistance hermetically sealed by vitreous enamel layer, rubberized enamel protective coating; for general purpose use.	P/o V10-1 positive feedback network		N16-R-73524-2996	CLO Type No. X-1/2	NRCO Dwg No. A110444-1	R10-6 R10-12	2							
R10-7	Same as R10-1.	P/o V10-1 positive feedback network													
R10-8	Same as R10-2.	P/o V10-1 positive feedback network													
R10-9	Same as R10-3.	P/o V10-1 positive feedback network													
R10-10	Same as R10-4.	P/o V10-1 positive feedback network													
R10-11	Same as R10-5.	P/o V10-1 positive feedback network													
R10-12	Same as R10-6.	P/o V10-1 positive feedback network													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R10-14	LAMP, INCANDESCENT: 120v, 6 W, 0.052 amp; MBCA Ref Dwg Group 7, candelabra screw base, S-6 bulb, clear, white, 1 tungsten fil, C-7A; 1-7/8 in. max over-all height; over 25 hr rated life; any burning position; unit pkg, 10 or 120 to a case; for general purpose use.	P/o V10-1 degenerative feedback network		N17-L-3916-100	GE Type No. 686	NRCO Dwg No. A110454	R10-14 R10-15	2							
R10-15	Same as R10-14.	P/o V10-1 degenerative feedback network													
R10-16	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 33,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-1 screen voltage divider	Spec No. JAN-R-11, JAN Type No. RC20BF333J	N16-R-50416-431	AB Part No. EB3335		R10-16	1							
R10-17	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100,000 ohm total resistance, ± 10% tolerance; 1 W power dissipation; F characteristic; body dim. excluding terminals, 0.280 in. dia max, 3/4 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-1 screen voltage divider	Spec No. JAN-R-11, JAN Type No. RC30BF104K	N16-R-50634-231	AB Part No. GB1041		R10-17	1							
R10-18	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 51,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-1 plate load	Spec No. JAN-R-11, JAN Type No. RC20BF513J	N16-R-50497-431	AB Part No. EB5135		R10-18	1							
R10-19	Same as R2-117.	V10-1 plate filter													
R10-20	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 510,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and	V10-2 grid bias	Spec No. JAN-R-11, JAN Type No. RC20BF514J	N16-R-50837-431	AB Part No. EB5145		R10-20	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
R10-20 (cont)	salt water immersion; 2 terminals, wire lead type; for general purpose use.														
R10-21	Same as R3-29.	V10-2 cathode resistance													
R10-22	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 51,000 ohm total resistance, ± 5% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-2 screen voltage divider	Spec No. JAN-R-11, JAN Type No. RC40BF513J	N16-R-50498-171	AB Part No. HB5135		R10-22	1							
R10-23	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 20,000 ohm total resistance, ± 5% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-2 screen voltage divider	Spec No. JAN-R-11, JAN Type No. RC40BF203J	N16-R-50363-171	AB Part No. HB2035		R10-23	1							
R10-24	RESISTOR, VARIABLE: wire-wound element; 1 section, 5,000 ohm, ± 10% tolerance; 4 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 1-5/8 in. dia, 9/16 in. deep; metal shaft, rd, screwdriver slotted w/ 3/64 in. wide, 1/16 in. deep slot in end, 1/4 in. dia, 3/4 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 13/32 in. lg; total rotation 294 degrees, effective electrical rotation, 274 degrees, incl 1 hex nut and lockwasher; for general purpose use.	V10-2 plate load		N16-R-91031-4464	MAL Part No. M5MP	NRCO Dwg No. No. A1104112-2	R10-24	1						
R10-25	Same as R3-19.	V10-2 plate filter													
R10-26	Same as R2-78.	V10-6A grid resistance													
R10-27	Same as R2-112.	V10-4 balancing variable resistance													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN* AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R10-28	RESISTOR, VARIABLE: wire wound element; 1 section, 3,000 ohm, ± 10% tolerance; 4 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 1-5/8 in. dia, 9/16 in. deep; metal shaft, rd, screwdriver slotted w/ 3/64 in. wide, 1/16 in. deep slot in end, 1/4 in. dia, 3/4 in. lg from mounting surface, normal torque; insulated contact arm, no "off" position; mounted by bushing, 3/8 in. dia, 32 threads per in., 13/32 in. lg; total rotation, 294 degrees, effective electrical rotation, 274 degrees, incl 1 hex nut and lockwasher; for general purpose use.	P/o V10-1 degenerative feedback network		N16-R-90901-2375	MAL Part No. M3MP	NRCO Dwg No. A1104112-1	R10-28	1								
R10-29	Same as R2-4.	Series leg of output H- attenuator														
R10-31	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 91,000 ohm total resistance, ± 5% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-4 grid bias	Spec No. JAN-R-11, JAN Type No. RC40HF913J	N16-R-50615-171	AB Part No. HB9135		R10-31	1								
R10-32	Same as R2-34.	V10-7 plate load														
R10-33	Same as R2-4.	Series leg of output H- attenuator														
R10-34	Same as R2-34.	V10-4A grid leak														
R10-35	Same as R2-34.	V10-4B grid leak														
R10-36	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 15,000 ohm total resistance, ± 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.175 in. dia max, 0.406 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-4 grid bias	Spec No. JAN-R-11, JAN Type No. RC20HF153K	N16-R-50336-811	AB Part No. EB1531		R10-36	1								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOL-VED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R10-37	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 5,100 ohm total resistance, + 5% tolerance; 2 W power dissipation; F characteristic; body dim. excluding terminals, 0.405 in. dia max, 1.41 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-4 and V10-5 cathode bias	Spec No. JAN-R-11, JAN Type No. RC40BF512J	N16-R-50147-171	AB Part No. HB5125		R10-37	1							
R10-38	Same as R3-2.	V10-4 plate filter													
R10-39	Same as R3-1.	V10-6 plate voltage divider													
R10-40	Same as R2-34.	V10-6 plate voltage dropper													
R10-41	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 820,000 ohm total resistance, + 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-5 grid resistance	Spec No. JAN-R-11, JAN Type No. RC20BF824K	N16-R-50930-811	AB Part No. EB8241		R10-41 R10-42	2							
R10-42	Same as R10-41.	V10-11 grid resistance													
R10-44	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 150,000 ohm total resistance, + 10% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max; 15/32 in. lg max, insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	V10-6A plate load	Spec No. JAN-R-11, JAN Type No. RC20BF154K	N16-R-50678-811	AB Part No. EB1541		R10-44 R10-45	2							
R10-45	Same as R10-44.	V10-6B plate load													
R10-47	Same as R2-4.	V10-6A cathode bias													
R10-48	Same as R2-78.	V10-6A grid resistance													
R10-49	Same as R2-78.	V10-6A grid resistance													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
R10-50	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 3,000 ohm total resistance, ± 5% tolerance; 1/2 W power dissipation; F characteristic; body dim. excluding terminals, 0.249 in. dia max, 15/32 in. lg max; insulated, resistant to humidity and salt water immersion; 2 terminals, wire lead type; for general purpose use.	P/o V10-1 degenerative feedback network	Spec No. JAN-R-11, JAN Type No. RC20BF302J	N16-R-50047-431	AB Part No. EB3025		R10-50	1								
R10-51	RESISTOR, FIXED, COMPOSITION: body style No. 3, MBCA Ref Dwg Group 2; inductive winding; 50,000 ohm total resistance; ± 5% tolerance; 10 W power dissipation, 240°C max continuous operating temp; body dim. excluding terminals, 1-27/32 in. lg, 15/32 in. dia; ceramic coating, resistant to humidity; 2 terminals, wire lead type, no. 20 AWG, 2-1/2 in. lg; terminal mounted; resistance wire insulated; for general purpose use.	V10-6B cathode bias		N16-R-68462-7801	SPR Type No. 10KT	NRCO Dwg No. A110486-1	R10-51	2								
R10-52	Same as R2-4.	V10-6B cathode bias														
R10-53	Same as R1-1; u/w knob E10-7.	"OUTPUT LEVEL" adjustment														
R10-54	Same as R2-78.	V10-6B grid current limiter														
R10-55	Same as R2-10.	V10-2 cathode resistance														
R10-56	Same as R10-51.	V10-6A cathode bias voltage divider														
R10-57	Same as R3-3.	V10-6B grid resistance														
S2-1A	RECEIVER CONTACT, ASSEMBLY: principal parts c/o, 1 ceramic base, 6 spring contacts; over-all dim., 2-5/16 in. lg, 1-21/32 in. wide, 1/4 in. thick; mounting data, 2 3/16 in. holes on 2-1/2 in. centers; impregnated for tropical use; used as stationary contacts for rotary radio frequency coil assemblies; p/o AN, Radio Receiver, Type No. R-450/FRR-28.	Selects band circuit components between antenna and V2-1 grid		N17-C-83787-3401	HMM Part No. 31234		S2-1A S2-1B S2-1C S2-1D	4								

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S2-1AA (6)	CONTACT, ELECTRICAL: p/o switch; beryllium copper; silver plated finish; over-all dim., 31/32 in. lg, 1/2 in. wide, 0.239 in. high; AC; 2 terminals, solder lug type, located on end; contact surface location data, 7/16 in. from mounting holes, located below mounting hole; two 1/4 in. lg by 1/32 in. wide mounting holes spaced 13/32 in. C to C; high interrupting capacity; p/o S2-1A.	Makes contact between antenna and V2-1 grid			HMM Part No. M31089-1		S2-1AA (6) S2-1BA (6) S2-1CA (6) S2-1DA (6)	24							
S2-1B	Same as S2-1A.	Selects band circuit components between V2-1 plate and V2-2 grid													
S2-1BA (6)	Same as S2-1AA; p/o S2-1B.	Makes contact between V2-1 plate and V2-2 grid													
S2-1C	Same as S2-1A.	Selects band circuit components between V2-2 plate and V2-5 grid													
S2-1CA (6)	Same as S2-1AA; p/o S2-1C.	Makes contact between V2-2 plate and V2-5 grid													
S2-1D	Same as S2-1A.	Selects band circuit components for HF oscillator													
S2-1DA (6)	Same as S2-1AA; p/o S2-1D.	Makes contact with circuit components for HF oscillator													
S2-4	SWITCH, ROTARY: 1 section; positioning data, 2 positions, max no. of switching positions possible; contact arrangement data, non-"pile-up" type, 2 poles, 2 throws; spring brass contacts; silver plated contact finish; phenolic section; physical dim. excluding terminals 0.433 in. lg, 1-1/32 in. wide, 1-33/64 in. high; mounted by 3/8 in. lg, 3/8 in.-32 thread bushing; shaft data, rd type, 1 in. lg, 1/4 in. dia; solder lug terminals; incl 1 hex nut, lockwasher; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	Single to double conversion		N17-S-60906-5821 When equipment spare has been expended, make from Standard Navy Stock No. N17-S-60519-8608 by cutting shaft to proper length.	CN Type No. 1462	NRCO Dwg No. A1104143	S2-4	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S2-4A	P/o S2-4.	B+ switching to V2-7 screen or to V2-6 screen and V2-8B plate													
S2-4B	P/o S2-4.	V2-8A plate voltage on-off switch													
S2-5	SWITCH, ROTARY: 3 sections; non-"pile-up" type, 4 poles, 24 throws; brass contacts; silver plated; bakelite body; physical dim., 8-3/64 in. lg, 1-5/8 in. wide, 1-7/8 in. high; mounted by 3/8 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 5/16 in. lg, 1/4 in. dia; solder lug type terminals; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	"SELECTIVITY" selector switch		N17-S-66042-8763	OAK Type H No. 34171-H3		S2-5	1							
S2-5A	P/o S2-5.	Varies resistances in tuned input circuit for V2-9 and inserts crystal into circuit when switch is in crystal positions													
S2-5B	P/o S2-5.	Varies inductance in tuned input circuit for V2-10 in non-crystal positions .													
S2-5C	P/o S2-5.	Varies inductance in tuned input circuit for V2-10 in non-crystal positions													
S2-6	SWITCH, TOGGLE: SPST; 3 amp, 125v AC; phenolic body; over-all dim., 9/16 in. lg, 17/32 in. wide, 1 in high; bat type handle, 1/2 in. lg 2 terminals, solder lug type, located on back; single hole mounting, 15/32 in. dia bushing, 32 thread per in., 15/32 in. lg from mounting surface; for general purpose use.	"LIMITER-OFF" switch		N17-S-71351-9057	CUT Part No. 8280		S2-6 S2-9	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
S2-7	SWITCH, TOGGLE: DPST; 2 amp, 125v AC; phenolic body; over-all dim. excluding terminals, 21/32 in. lg, 11/16 in. wide, 1-3/32 in. high; bat type handle, 1/2 in. lg; 4 terminals, solder lug type, located on back; single mounting hole, 15/32 in. dia bushing, 32 threads per in., 15/32 in. lg from mounting surface; for general purpose use.	"MOD-CW" switch		N17-S-73489-3103	CUT Part No. 8360		S2-7	1							
S2-7A	P/o S2-7.	Connect B+ to V2-12 screen in "CW" position													
S2-7B	P/o S2-7.	Changes AVC time delay													
S2-8	SWITCH, TOGGLE: DPDT; 3 amp, 125v AC; phenolic body; over-all dim., excluding terminals, 21/32 in. lg, 11/16 in. wide, 1-3/32 in. high; bat type handle, 1/2 in. lg, 4 terminals, solder lug type, located on back; single mounting hole, 15/32 in. dia bushing, 32 threads per in., 15/32 in. lg from mounting surface; for general purpose use.	"AVC-MAN" switch		N17-S-74040-1125	CUT Part No. 8363		S2-8	1							
S2-8A	P/o S2-8.	Inserts manual or automatic volume control bias voltage into various tubes													
S2-8B	P/o S2-8.	Connects M2-1 to RF circuit in "AVC" position													
S2-9	Same as S2-6.	"SEND-REC" switch													
S2-11	SWITCH, TOGGLE: DPDT; 3 amp, 125v AC; phenolic body; over-all dim., 5/8 in. lg, 5/8 in. wide, 1-1/8 in. high; bat type handle, 7/16 in. lg; momentary action, normally closed, spring locking device; 6 terminals, solder lug type, located on back; single mounting hole, 15/32 in. dia bushing, 32 thread per in., 15/32 in. lg from mounting surface; for general purpose use.	"METER RF-AF" switch		N17-S-74040-1051	AHH Part No. 81057N		S2-11	1							
S2-11A	P/o S2-11.	Connects RF circuit to M2-1													
S2-11B	P/o S2-11.	Connects AF circuit to M2-1													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S2-12	SWITCH, ROTARY: 1 section; 2 positions max no. of switching positions possible; non-"pile-up" type, 2 poles, 1 throw; phosphor bronze contacts; silver plated contact finish; metal case; physical dim. exc̀luding terminals, 7/16 in. lg, 1-1/4 in. dia; mounted by 13/32 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 3/4 in. lg, 0.249 in. dia; solder lug terminals; shaft grooved 1/2 1-1/4 and 1-5/8 in. from end for easy cutting, incl No. 232 nut and No. 227 lockwasher; p/o AN, Radio Receiver, Type No. R-450/FRR-28; u/w knob, E2-34.	"HFO" selector switch		N17-S-60683-2501 When equipment spare has been expended, make from Standard Navy Stock No. N17-S-60909-8438 by cutting shaft to proper length.	MAL Type No. 3222J w/o No. 366 knob	NRCO Dwg No. A1104118	S2-12 S9-2	2							
S2-12A	P/o S2-12.	V2-4A grid bias normal or cut-off switch													
S2-12B	P/o S2-12.	V2-4B grid bias normal or cut-off switch													
S2-13	SWITCH, ROTARY: 1 section; 3 positions, max no. of switching positions possible; non-"pile-up" type, 4 poles, 3 throws; phosphor bronze contacts; silver plated contact finish; metal case; physical dim. excluding terminals, 7/16 in. lg, 1-1/4 in. dia; mounted by 13/32 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 25/32 in. lg, 0.249 in. dia; solder lug terminals; incl 1 No. 232 nut and No. 277 lockwasher; p/o, AN, Radio Receiver, Type No. R-450/FRR-28; u/w knob E2-36.	"3.5 MC OSC." selector switch		N17-S-62575-2966	MAL Type No. 3243J w/o No. 366 knob	NRCO Dwg No. A1104121	S2-13	1							
S2-13A	P/o S2-13.	V2-8B plate voltage on-off-on switch													
S2-13B	P/o S2-13.	V2-8A plate voltage on-off-on switch													
S2-13C	P/o S2-13.	Not connected													
S2-13D	P/o S2-13.	Switches 3.5 mc oscillator signals for diversity-diversity-local use													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
S2-14	SWITCH, ROTARY: 1 section; 4 positions, max no. of switching positions possible; non-"pile-up" type, 3 poles, 4 throws; phosphor bronze contacts; silver plated contact finish; metal case; physical dim. excluding terminals, 7/16 in. lg, 1-1/4 in. dia; mounted by 13/32 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 1 in. lg, 0.249 in. dia; solder lug terminals; shaft grooved 1/2, 1-1/4 and 1-5/8 in. from end for easy cutting, incl 1 No. 232 nut and No. 227 lockwasher; p/o, AN, Radio Receiver, Type No. R-450/FRR-28; u/w knob E2-36.	"AVC" selector switch		N17-S-62184-3987 When equipment spare has been expended, make from Standard Navy Stock No. N17-S-62205-6601 by cutting shaft to proper length.	MAL Type No. 3234J w/o No. 366 knob	NRCO Dwg No. A1104120	S2-14 S3-5 S3-6	3							
S2-14A	P/o S2-14.	V2-13A grid bias normal or cut-off switch													
S2-14B	P/o S2-14.	V2-13B grid bias normal or cut-off switch													
S2-14C	P/o S2-14.	AVC time constant variation switch													
S2-15	SWITCH, TOGGLE: SPST; 6 amp, 250/125v; phenolic body, steel frame plate; over-all dim. excluding terminals, bushing and handle, 1-1/4 in. lg, 11/16 in. wide, 13/16 in. high; bat type handle, 27/32 in. lg from pivot to end; locking action; 2 terminals, solder lug type, located axially 1 ea end at back; single hole mounting, 15/32 in. dia bushing, 32 threads per in., 1/2 in. lg from mounting surfaces; non-shorting silver plated contacts, incl 1 hex nut and knurled nut; for general purpose use.	"AVC DIV. LOC." selector switch		N17-S-70949-2052	AHH Part No. 81015AW	NRCO Dwg No. A110441	S2-15 S3-2 S3-3	3							
S3-1	SWITCH, TOGGLE: DPST, 3/6 amp, 250/125v; phenolic body, steel frame plate; over-all dim. excluding terminals, bushing and handle, 1-1/4 in. lg 11/16 in. wide, 13/16 in. deep; bat type handle, 27/32 in. lg from pivot to end; locking action; 4 terminals, solder lug type, located axially 2 ea end at back; single hole mounting, 15/32 in. dia bushing, 32 threads per in., 1/2 in. lg from mounting surface; non-shorting silver plated contacts, incl 1 hex nut and knurled nut; for general purpose use.	"POWER ON-OFF" switch		N17-S-73203-9821	AHH Part No. 81024GB	NRCO Dwg No. A110440	S3-1 S9-1 S10-1	3							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S3-1A	P/o S3-1.	On-off switch for one side of AC line													
S3-1B	P/o S3-1.	On-off switch for one side of AC line													
S3-2	Same as S2-15.	"HFO ON-OFF" switch													
S3-3	Same as S2-15.	"BFO ON-OFF" switch													
S3-4	P/o R3-42.	"OFF" position of "CAL OUTPUT" adjustment (R3-42)													
S3-5	Same as S2-14.	"METER SELECTOR" switch													
S3-5A	P/o S3-5.	Connects M3-1 to B+ or ground													
S3-5B	P/o S3-5.	Connects M3-1 to plate of "HFO," plate of "BFO," rectified "HF OUT.", or rectified "BF OUT."													
S3-5C	P/o S3-5.	Not used													
S3-6	Same as S2-14.	"HFO XTAL" switch													
S3-6A	P/o S3-6.	V3-10A grid to Y3-15, Y3-16, Y3-17 (crystals not supplied) or ground													
S3-6B	P/o S3-6.	V3-10A, plate to B+ in positions "1,2,3"													
S3-6C	P/o S3-6.	V3-10B grid to V3-10A output in "1,2,3" positions and to V3-2 output in "MO" position													
S3-7	SWITCH, ROTARY: 2 sections, 5 positions, max no. of switching positions possible, adjustable stop included; non-"pile-up" type; 4 poles, 5 throws; spring brass contacts; silver plated contact finish; steatite sections; physical dim. excluding terminals, 1-1/2	"FREQUENCY RANGE MCS" switch		N17-S-65063-8758	CN Type No. 2515	NRCO Dwg No. A1104116	S3-7	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S3-7 (cont)	in. lg approx, 1-5/8 in. wide, 1-7/8 in. high; mounted by 3/8 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 2 in. lg from mounting surface, 1/4 in. dia; solder lug terminals; index positive w/ 30 degrees between positions, incl 1 hex nut, lockwasher; p/o, AN, Radio Frequency Oscillator, Type No. O-165/UR; u/w knob E3-41.														
S3-7A	P/o S3-7.	V3-4 plate to 2 to 4 mc tuned circuit in "2-4" position; V3-4 plate to 4 to 8 mc tuned circuit in other positions													
S3-7B	P/o S3-7.	V3-4 screen to B+ in "2-4" and "4-8" positions; V3-4, V3-5, V3-11 screen to B+ in "8-16" and "16-32" positions													
S3-7C	P/o S3-7.	V3-5 screen to ground in "2-4" and "4-8" positions; V3-11 screen to B+ in "16-32" position													
S3-7D	P/o S3-7.	L3-4, -5, -6 or -7 to "HFO" output jacks													
S3-8	SWITCH, TOGGLE: DPDT; 3/6 amp, 250/125v; phenolic body, steel frame plate, over-all dim. excluding terminals, bushing and handle, 1-1/4 in. lg, 11/16 in. wide, 13/16 in. high; bat type handle; 27/32 in. lg from pivot to end; locking action; 6 terminals, solder lug type, located on back; single hole mounting, 15/32 in. dia bushing, 32 threads per in., 1/2 in. lg from mounting surface; non-shorting silver plated contacts, incl 1 hex nut and knurled nut; for general purpose use.	"HFO-XTAL SELECTOR" switch		N17-S-74225-3356	AHH Part No. 81027CE	NRCO Dwg No. A110442	S3-8	1							
S3-8A	P/o S3-8.	Y3-19 to ground and Y3-18 to V3-9A grid													
S3-8B	P/o S3-8.	Y3-18 to ground and Y3-19 to V3-9A grid													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
S3-9	SWITCH, THERMOSTATIC: SPST; nickel case; over-all dim. excluding terminals, 1-1/2 in. lg, 5/16 in. dia, max operating temp, 72°C, + 2°C tolerance, no specified temp differential; 2 amp AC, 115v; 2 terminals, 2 solder lugs, located one ea end; mounted by wire leads soldered to terminals; fibre-glass insulation, silicone impregnated, silver contacts normally closed; p/o, AN, Radio Frequency Oscillator, Type No. O-165/UR.	Middle oven overload thermostatic switch		N17-S-69948-9101	MCLO Type No. SU100L	NRCO Dwg No. A1104140	S3-9	1							
S9-1	Same as S3-1.	"POWER ON-OFF" switch													
S9-1A	P/o S9-1.	On-off switch for one side of AC line													
S9-1B	P/o S9-1.	On-off switch for one side of AC line													
S9-2	Same as S2-12.	"INPUT SELECTOR" switch													
S9-2A	P/o S9-2.	V9-1 grid to "CH.1" or "CH.2" input													
S9-2B	P/o S9-2.	Not used													
S10-1	Same as S3-1.														
S10-1A	P/o S10-1.														
S10-1B	P/o S10-1.														
S10-2	SWITCH, ROTARY: 2 sections; 6 positions, max no. of switching positions possible, adjustable stop incl; non-"pile-up" type, 4 poles, 5 throws; phosphor bronze contacts; silver plated contact finish; phenolic section; physical dim., 1-1/2 in. lg, 1-3/4 in. wide, 2-3/8 in. high; mounted by 13/32 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 3/4 in. lg; 0.249 in. dia; solder lug terminals; shaft grooved 1/2, 1-1/4 and 1-5/8 in. from end for easy cutting, incl one No. 232 nut, and No. 227 lockwasher; p/o, AN, Keyer, Type No. KY-79/UR; u/w knob E10-8.	"KEYING LEVEL" switch		N17-S-65078-2887 When spare has been expended, make from Standard Navy Stock No. N17-S-65076-4701 by cutting shaft to proper length.	MAL Type No. 1325L w/o No. 366 knob	NRCO Dwg No. A1104117	S10-2	1							
S10-2A	P/o S10-2.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP. BOX	EQUIP. QUAN.	TENDER BOX	TENDER QUAN.	STOCK BOX	STOCK QUAN.
S10-2B	P/o S10-2.														
S10-2C	P/o S10-2.														
S10-2D	P/o S10-2.														
S10-5	SWITCH, ROTARY: 1 section; 6 positions, max no. of switching positions possible; non-"pile-up" type, 2 poles, 6 throws; phosphor bronze contacts; silver plated contact finish; metal case; physical dim. excluding terminals, 7/16 in., lg, 1-1/4 in. dia; mounted by 13/32 in. lg, 3/8 in.-32 thread bushing; rd type shaft, 3/4 in. lg, 0.249 in. dia; solder lug terminals; shaft grooved 1/2, 1-1/4 and 1-5/8 in. from end for easy cutting, incl 1 No. 232 nut and No. 227 lockwasher; p/o, AN, Keyer, Type No. KY-79/UR; u/w knob E10-6.	"OUTPUT FREQUENCY" switch		N17-S-61594-7601	MAL Type No. 3226J w/o No. 366 knob	NRCO Dwg No. A1104119	S10-5	1							
S10-5A	P/o S10-5.														
S10-5B	P/o S10-5.														
SP1-1	LOUDSPEAKER, DYNAMIC: 6-8 ohms voice coil impedance; 8 W normal, cone type, 8 in. dia cone; output transformer not included; over-all dim., 8-1/8 in. dia, 3-13/16 in. deep; 4 7/32 in. wide by 19/64 in. lg slotted holes spaced evenly on 7-43/64 in. dia circle; for general purpose use.	Converts electrical energy to audio tones		N17-L-91354-1299	JRM Part No. P88	NRCO Dwg No. B110466	SP1-1	1							
T1-1	TRANSFORMER, AUDIO FREQUENCY: line type; primary, 500/333/250/125/50 ohm impedance; secondary 60/38/30/22/15/10/5.5/2.5 ohm impedance; primary and secondary DC ratings, not rated; 500v rms test voltage; closed case, steel, 1/2 E175 - 29 gauge ATA core; over-all dim., MBCA Ref Dwg Group 12, 2-5/8 in. lg, 2-1/4 in. wide, 3-1/16 in. high; 2.88 to 1 ratio of turns primary to secondary; not tuned; 12 terminals, solder post type, located axially on bottom; 8 No. 6-32 thread inserts on 1-3/4 in. by 2 in. mounting centers, 4 on top, 4 on bottom; terminals on bakelite board; wax impregnated, pitch filled, not shielded; p/o, AN, Loudspeaker, Type No. LS-187/UR.	SP1-1 audio frequency transformer		N17-T-62478-5001	FTC Part No. 14803	NRCO Spec No. 191 NRCO Dwg No. A1104152	T1-1	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
T2-1	TRANSFORMER, INTERMEDIATE FREQUENCY: 3955 kilocycles peak frequency; input shielded; over-all dim., 2 in. lg, 2-1/2 in. wide, 1-1/8 in. deep; bakelite coil form, powdered iron core; double tuned; adjustable iron core tuning; 6 No. 6-32 tapped holes, spaced 1-3/16 in. C to C; 8 terminals, solder lug type; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	V2-5 plate load and coupling to T2-2 and V2-7 grid		N17-T-67590-1416	HMM Part No. 31183		T2-1	1							
T2-2	TRANSFORMER, INTERMEDIATE FREQUENCY: 3955 kilocycles peak frequency; mixer input; shielded; over-all dim., 4 in. lg, 2-1/2 in. wide, 1-15/16 in. deep; bakelite coil forms, powdered iron cores; double tuned; adjustable iron core tuning, 6 No. 6-32 tapped holes, spaced 2 in. C to C; 8 terminals, solder lug type; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	V2-6 input transformer		N17-T-67633-4320	HMM Part No. 31116		T2-2	1							
T2-3	TRANSFORMER, INTERMEDIATE FREQUENCY: 455 kilocycles peak frequency; crystal filter; shielded; over-all dim., 4 in. lg, 2-1/2 in. wide, 1-15/16 in. deep; bakelite coil form, powdered iron cores; double tuned; adjustable iron core tuning; 4 No.6-32 tapped holes, spaced 2 in. C to C; 8 terminals, solder lug type; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	V2-6 plate load, IF crystal filter and coupling to V2-9 grid		N17-T-67633-4295	HMM Part No. 31114		T2-3	1							
T2-4	TRANSFORMER, INTERMEDIATE FREQUENCY: 455 Kilocycles peak frequency; interstage; shielded; over-all dim., 4 in. lg, 2-1/2 in. wide, 1-15/16 in. deep; bakelite coil form, powdered iron cores; double tuned; adjustable iron core tuning; 4 No. 6-32 tapped holes, spaced 2 in. C to C; 8 terminals, solder lug type; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	V2-9 plate load and coupling to V2-10 grid		N17-T-67621-8996	HMM Part No. 31102		T2-4 T2-5	2							
T2-5	Same as T2-4.	V2-10 plate load and coupling to V2-11 grid													
T2-6	TRANSFORMER SUBASSEMBLY: principal parts c/o, 5 mica capacitors, 2 inductance units, 1 phenolic base, 1 shield can, 2 powdered iron cores, one (1) variable; over-all dim., 4 in. lg, 1-7/8 in. wide, 1-15/32 in. deep; 4 No. 6-32 tapped holes, moisture and fungus proofed; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	V2-13 plate resistances and oscillator circuit		N16-R-33591-1265	HMM Part No. 31106		T2-6	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
T2-7	TRANSFORMER, AUDIO FREQUENCY: plate coupling type; impedance, 10,000 ohm primary, 8,000 ohm secondary, tapped at 600 ohms; primary, 40 ma, secondary, 60 ma; round upright steel case, hypersil core; over-all dim., 2-7/8 in. high, 2-3/16 in. dia; 5 W operating level; turns ratio, 3 to 1; ± 0.5 db from 300-3500 cps, not tuned; 8 terminals, solder lug type, located on bottom; 4 0.169 in. dia holes, 1-3/16 in. C to C; electrostatic shield, oil filled; MIL-T-27; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	Audio output transformer		N17-T-64538-6791	UNT Part No. 31086-2		T2-7	1							
T2-8	TRANSFORMER, POWER, STEP-UP: hermetically sealed steel case; input, 95/105/117/130/190/210/234/260v AC, 50-60 cycles, single phase; output, 5 output windings, No. 1 secondary 5.0v, No. 2 secondary 610v, No. 3 secondary 6.3v, No. 4 secondary 7.5v, No. 5 secondary 7.5v, No. 1 secondary 3.0 amp, No. 2 secondary 150 ma, No. 3 secondary 5.0 amp, No. 4 secondary 2.0 amp, No. 5 secondary 2.0 amp, No. 2 secondary center-tapped; oil impregnated; dim., 5-1/2 in. high, 4-1/2 in. dia; 20 terminals, 12 solder lug type, 8 screw terminals, located on bottom; four 3/16 in. dia mounting holes on 3-3/4 in. by 3-3/4 in. mounting centers; no internal shieldings; JAN-T-27; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	Primary power input		N17-T-69588-7001	UNT Part No. 31029-2		T2-8	1							
T3-1	TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: enclosed case, steel; 110/220v AC, 50/60 cycles, single phase; 3 output windings, No. 1 secondary, 700v, No. 2 secondary, 5v, No. 3 secondary, 6.3v, No. 1 secondary, 120 ma, No. 2 secondary, 3 amp, No. 3 secondary, 3 amp; primary and No. 3 secondary, 1,500v insulation, No. 1 and No. 2 secondary, 1,700v insulation; varnish impregnated, pitch filled; dim., MBCA Ref Dwg Group 12, 4-1/8 in. lg, 3-1/2 in. wide, 4-7/8 in. high; 11 terminals, solder post type, located axially on bottom; 4 No. 10-32 thread studs on 2-5/8 in. by 3-1/8 in. mounting centers; no internal shielding; No. 1 secondary center tapped, EI125 -	Primary power input		N17-T-73902-4001	FTC Part No. 18287	NRCO Spec No. 181 NRCO Dwg No. B1104153	T3-1	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
T3-1 (cont)	26 gauge - Trans C core; p/o, AN, Radio Frequency Oscillator, Type No. 0-165/UR.														
T9-1	TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: enclosed steel case, 110/220v AC, 50/60 cycles frequency, single phase; 3 output windings, No. 1 secondary, 590v, No. 2 secondary, 5v, No. 3 secondary 6.3v, No. 1 secondary, 50 ma, No. 2 secondary, 2 amp, No. 3 secondary, 2 amp, No. 1 secondary, center tapped, No. 3 secondary, center tapped; 1,500v insulation; varnish impregnated, pitch filled; dim., MBCA Ref Dwg Group 12, 3-1/16 in. lg, 2-15/16 in. wide, 3-3/4 in. high; 12 terminals, solder post type, 7/16 in. high, located on bottom; 4 No. 8-32 thread inserts on 2-1/2 in. by 2-1/2 in. mounting centers, located top and bottom, MBCA Ref Dwg Group 12; no internal shielding; No. 1 secondary, 2,770 turns No. 36 AWG wire, No. 2 secondary, 22 turns No. 20 AWG wire, No. 3 secondary, 28 turns No. 20 AWG wire; p/o, AN, Amplifier-Detector, Type No. AM-615/UR.	Primary power input transformer		N17-T-73901-9983	FTC Part No. 14798	NRCO Spec No. 109 NRCO Dwg No. A1104131	T9-1 T10-1	2							
T9-2	TRANSFORMER, RADIO FREQUENCY: 2 windings, 2 pie universal wound, primary, 0.122 mh at 790 kc per sec, secondary, 0.056 mh at 2.5 mc per sec, primary, 86 turns of No. 7/41 Litz wire, secondary, 57 turns of No. 7/41 Litz wire, primary, 2.4 ohm DC resistance, secondary, 1.5 ohm DC resistance; 455 kc peak frequency; untapped; unshielded; dim., excluding terminations, 3/4 in. lg, 11/16 in. dia; ceramic coil form, air core; over-all dim. of coil form, 3/4 in. lg, 7/16 in. dia; no adjustable tuning; single No. 6-32 tapped hole primary end of coil form; 4 terminations, wire lead type, 2 located either end of ea coil winding; no special markings; wire for coils single conductor celanese; p/o, Northern Radio Co, Oscillator Subassembly, Z9-1, Part No. B111113.	Oscillator circuit transformer		N17-T-81934-6001		NRCO Part No. A111114 NRCO Dwg No. A110483	T9-2	1							
T10-1	Same as T9-1.	Primary power input transformer													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
T10-2	TRANSFORMER, AUDIO FREQUENCY: plate coupling type; primary, 20,000 ohms, over-all (2-5000 ohm windings), secondary, 600 ohms, secondary center tapped, 150 ohms; primary split, 10 ma per side, secondary, not so rated; 500v rms test voltage; enclosed steel case, 1/2 E175 - 29 gauge - ATA core; over-all dim., MBCA Ref Dwg Group 12, 2-9/16 in. lg, 2-3/16 in. wide, 3 in. high; 6.36 to 1 ratio of turns, primary to secondary; ± 2 db from 60 to 10,000 cycles per sec frequency response, not tuned; 7 terminals, solder post type, located on bottom; 4 No. 6-32 thread inserts on 1-3/4 in. by 2 in. mounting centers, located top and bottom, MBCA Ref Dwg Group 12; + 10 db power level; wax impregnated, pitch filled, not shielded; p/o, AN, Keyer, Type No. KY-79/UR.	Audio output transformer		N17-T-65936-7125	FTC Part No. 14797	NRCO Spec No. 111 NRCO Dwg No. A1104130	T10-2	1							
T10-3	TRANSFORMER, AUDIO FREQUENCY: input type; primary, 500, 333, 250, 200, 125, 50 ohms, secondary, 120,000 ohms, secondary center tapped, 30,000 ohms; primary and secondary DC ratings not rated; 500v rms test voltage; hermetically sealed steel case, 1/2 E175 - 29 gauge - ATA core; over-all dim., MBCA Ref Dwg Group 12; 2-9/16 in. lg, 2-3/16 in. wide, 3 in. high; 1 to 15.46 ratio of turns, primary to secondary; ± 2 db from 60 to 10,000 cycles per sec frequency response, not tuned; 9 terminals, solder post type, 7/16 in. lg, located on bottom; 4 No. 6-32 thread inserts on 1-3/4 in. by 2 in. mounting centers, located top and bottom, MBCA Ref Dwg Group 12; 0 db power level; wax impregnated, pitch filled, not shielded; p/o, AN, Keyer, Type No. KY-79/UR.	Tone input transformer		N17-T-61514-7835	FTC Part No. 14795	NRCO Spec No. 110 NRCO Dwg No. A1104129	T10-3	1							
U3-1	DRIVE, TUNING: mechanically operated; continuous rotation; selector knob actuation; over-all dim. excluding mounting bracket, 1-13/16 in. lg over-all, 7/8 in. dia excluding mounting bracket 1-9/16 in. wide over-all; mounts by 3 5/32 in. dia holes in mounting bracket 120° apart on 5/8 in. radius circle; transmits manual power from knob to tuning capacitor at slow speed rate of 5 to 1 and/or high speed rate of 1 to 1,	"DIAL UNITS" knob to extension shaft speed reducer		N16-D-901161-140	CPT Part No. 27067	NRCO Dwg No. A1104188	U3-1	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
U3-1 (cont)	1 to 1 sleeve has 3/8 in.-32 thread, 7/32 in. lg at end; for general purpose use.														
U3-2	DRIVE, TUNING: mechanically operated; continuous rotation; selector knob actuation; over-all dim. excluding mounting bracket, 2-1/64 in. lg over-all, 7/8 in. dia excluding mounting bracket 1-9/16 in. wide over-all; mounts by 3 5/32 in. dia holes in mounting bracket spaced 120° apart on 5/8 in. radius circle; transmits manual power from knob to tuning capacitor at slow speed ratio of 5 to 1 and/or high speed ratio of 1 to 1; for general purpose use.	"OUTPUT FREQUENCY" knob to extension shaft speed reducer		N16-D-901161-133	CPT Part No. 599	NRCO Dwg No. A1104187	U3-2	1							
V2-1	ELECTRON TUBE: pentode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; receiving tube; for general purpose use.	1st RF amplifier	Spec No. JAN-1a, JAN Type No. 6BA6	N16-T-56211	VD Part No. 6BA6		V2-1 V2-2 V2-7 V2-9 V2-10 V2-11 V2-12	7							
V2-2	Same as V2-1.	2nd RF amplifier													
V2-4	ELECTRON TUBE: twin triode; glass envelope, RMA T-5-1/2; 6 terminations, pin type, located on bottom; amplifier-oscillator tube; for general purpose use.		Spec No. JAN-1a, JAN Type No. 6J6	N16-T-56360	GE Part No. 6J6		V2-4 V2-13	2							
V2-4A	P/o V2-4.	HF oscillator													
V2-4B	P/o V2-4.	External HF oscillator signal amplifier													
V2-5	ELECTRON TUBE: pentagrid; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; converter tube; for general purpose use.	1st mixer	Spec No. JAN-1a, JAN Type No. 6BE6	N16-T-56211-50	GE Part No. 6BE6		V2-5 V2-6 V3-3	3							
V2-6	Same as V2-5.	2nd mixer													
V2-7	Same as V2-1.	Gate amplifier													
V2-8	ELECTRON TUBE: twin triode; glass envelope, RMA T-6-1/2; 9 terminations, pin type, located on bottom; amplifier-phase inverter tube; for general purpose use.		Spec No. JAN-1a, JAN Type No. 12AU7	N16-T-58241-34	GE Part No. 12AU7		V2-8 V2-16 V3-9 V3-10	4							
V2-8A	P/o V2-8.	3.5 mc oscillator													
V2-8B	P/o V2-8.	3.5 mc oscillator buffer													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
V2-9	Same as V2-1.	1st IF amplifier													
V2-10	Same as V2-1.	2nd IF amplifier													
V2-11	Same as V2-1.	Driver													
V2-12	Same as V2-1.	HF oscillator buffer													
V2-13	Same as V2-4.														
V2-13A	P/o V2-13.	HF oscillator													
V2-13B	P/o V2-13.	External HF oscillator signal amplifier													
V2-14	ELECTRON TUBE: dual diode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; receiving tube; for general purpose use.		Spec No. JAN-1a, JAN Type No. 6AL5	N16-T-56195	VD Part No. 6AL5		V2-14 V2-15 V2-20	3							
V2-14A	P/o V2-14.	AVC													
V2-14B	P/o V2-14.	2nd detector													
V2-15	Same as V2-14.														
V2-15A	P/o V2-15.	Audio meter detector													
V2-15B	P/o V2-15.	Limiter													
V2-16	Same as V2-8.														
V2-16A	P/o V2-16.	IF cathode follower buffer													
V2-16B	P/o V2-16.	1st audio amplifier													
V2-17	ELECTRON TUBE: beam pentode; glass envelope, RMA T-9; 8 terminations, pin type, located on bottom; receiving tube; for general purpose use.	Audio output amplifier	Spec No. JAN-1a, JAN Type No. 6V6GT	N16-T-56758	VD Part No. 6V6GT		V2-17	1							
V2-18	ELECTRON TUBE: diode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; voltage regulator tube; for general purpose use.	Voltage regulator	Spec No. JAN-1a, JAN Type No. 0A2	N16-T-52001	GE Part No. 0A2		V2-18 V3-7	2							
V2-19	ELECTRON TUBE: diode, glass envelope, RMA ST-16; 5 terminations, pin type, located on bottom; rectifier; for general purpose use.	AC power rectifier	Spec No. JAN-1a, JAN Type No. 5R4GY	N16-T-55444	VD Part No. 5R4GY		V2-19	1							
V2-20	Same as V2-14.	Negative power rectifier													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
V3-1	ELECTRON TUBE: triode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; amplifier-oscillator tube; for general purpose use.	Variable HF oscillator	Spec No. JAN-1a, JAN Type No. 6C4	N16-T-56214	GE Part No. 6C4		V3-1 V3-2 V3-6	3								
V3-2	Same as V3-1.	HF oscillator buffer														
V3-3	Same as V2-5.	Calibrator oscillator-mixer														
V3-4	ELECTRON TUBE: pentode, glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; amplifier tube; for general purpose use.	1st frequency multiplier	Spec No. JAN-1a, JAN Type No. 6AQ5	N16-T-56198	GE Part No. 6AQ5		V3-4 V3-5 V3-11 V3-12	4								
V3-5	Same as V3-4.	2nd frequency doubler														
V3-6	Same as V3-1.	Calibrator amplifier														
V3-7	Same as V2-18.	Voltage regulator														
V3-8	ELECTRON TUBE: twin diode; metal envelope, RMA MT-8; 5 terminations, pin type, located on bottom; rectifier tube; for general purpose use.	AC power rectifier	Spec No. JAN-1a, JAN Type No. 5W4	N16-T-55540	GE Part No. 5W4		V3-8 V9-3	3								
V3-8A	ELECTRON TUBE: twin diode; glass envelope, RMA T-9; 5 terminations, pin type, located on bottom; rectifier tube; for general purpose use.	Alternate for V3-8	Spec No. JAN-1a, JAN Type No. 5Y3-GT	N16-T-55735	GE Part No. 5Y3-GT											
V3-9	Same as V2-8.															
V3-9A	P/o V3-9.	HF oscillator														
V3-9B	P/o V3-9.	HF oscillator buffer														
V3-10	Same as V2-8.															
V3-10A	P/o V3-10.	Crystal HF oscillator														
V3-10B	P/o V3-10.	1st HF buffer amplifier														
V3-11	Same as V3-4.	3rd frequency multiplier														
V3-12	Same as V3-4.	2nd HF buffer amplifier														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
V9-1	ELECTRON TUBE: pentode; metal envelope, RMA MT-8; 8 terminations, pin type, located on bottom; amplifier-detector tube; for general purpose use.	Input amplifier	Spec No. JAN-1a, JAN Type No. 6SJ7	N16-T-56370	GE Part No. 6SJ7		V9-1 V10-1	2							
V9-2	ELECTRON TUBE: pentagrid; metal envelope, RMA MT-8; 8 terminations, pin type, located on bottom; converter tube; for general purpose use.	Oscillator-mixer	Spec No. JAN-1a, JAN Type No. 6SA7	N16-T-56107	GE Part No. 6SA7		V9-2	1							
V9-3	Same as V3-8.	AC power rectifier													
V9-4	ELECTRON TUBE: triode; metal envelope, RMA MT-8; 5 terminations, pin type, located on bottom; amplifier-detector-oscillator tube; for general purpose use.	Output amplifier	Spec No. JAN-1a, JAN Type No. 6J5	N16-T-56350	GE Part No. 6J5		V9-4	1							
V9-5	ELECTRON TUBE: diode; glass envelope, RMA ST-12; 5 terminations, pin type, located on bottom; voltage regulator tube; for general purpose use.	Voltage regulator	Spec No. JAN-1a, JAN Type No. 0C3	N16-T-53050	GE Part No. 0C3/VR105		V9-5	1							
V10-1	Same as V9-1.	Oscillator													
V10-2	ELECTRON TUBE: pentode; metal envelope, RMA MT-8; 7 terminations, pin type, located on bottom; amplifier tube; for general purpose use.	Oscillator amplifier-inverter	Spec No. JAN-1a, JAN Type No. 6V6	N16-T-56756	GE Part No. 6V6		V10-2 V10-5	2							
V10-4	ELECTRON TUBE: twin triode; glass envelope, RMA T-9; 8 terminations, pin type, located on bottom; amplifier-phase inverter; for general purpose use.	Keyed output amplifier	Spec No. JAN-1a, JAN Type No. 6SN7GT	N16-T-56490	GE Part No. 6SN7GT		V10-4	1							
V10-5	Same as V10-2.	Keying amplifier													
V10-6	ELECTRON TUBE: twin triode; glass envelope, RMA T-9; 8 terminations, pin type, located on bottom; amplifier-phase inverter tube; for general purpose use.	Keyer amplifier	Spec No. JAN-1a, JAN Type No. 6SL7GT	N16-T-56470	GE Part No. 6SL7GT		V10-6	1							
V10-7	ELECTRON TUBE: twin diode; metal envelope, RMA MT-8; 7 terminations, pin type, located on bottom; rectifier-detector-avc tube; for general purpose use.	Tone rectifier	Spec No. JAN-1a, JAN Type No. 6H6	N16-T-56346	GE Part No. 6H6		V10-7	1							
V10-8	Same as V3-8.	Power rectifier													
V10-10	Same as I3-2.	Keyer coupler													
V10-11	Same as I3-2.	Keyer coupler													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W3-11	CABLE ASSEMBLY, POWER, ELECTRICAL: cable, Whitney Blake Co, Type No. SJ, 2 conductors, stranded, No. 16 AWG, rubber insulated, materials in sequence from insulated conductors out, jute fillers, cotton binder, rubber jacket, 300v max rated working voltage; 6 ft lg over-all; terminal fitting on first end, 1, Harvey Hubbel, Inc, Plug Connector (P3-1), Part No. 7257, terminal fitting on second end, 1, Harvey Hubbel, Inc, Plug Connector (P12-1), Part No. 9972; (marked "VMO Power Cable" on cable label), conductor, 26 strands, No. 30 AWG; p/o, AN, Radio Frequency Oscillator, Type No. O-165/UR.	Radio Frequency Oscillator, O-165/UR, power cable		*N17-C-48226-2040		NRCO Spec No. 232 NRCO Dwg No. B1104179-2	W3-11	1							
W5-1	CORD ASSEMBLY, ELECTRICAL (CORD SWITCHBOARD): conductor data, 3 conductor, stranded, No. 20 AWG, cotton wrapped, rubber insulated individual conductors, color coded, black, white, cotton wrap, rubber jacket, metal shielded; 2 ft 1 in. lg over-all; termination data on first end, 1, Sig, Insuline Corp of America, Plug (P5-1) Type No. PL68, Part No. AN-PL68, termination data on second end, 1, Sig, Insuline Corp of America, Plug (P5-2), Type No. PL68, Part No. AN-PL68; black cable; plugs stamped "PL-68"; p/o, AN, Communication Patching Panel, Type No. SB-224/UR.	Unit connecting patch cord		*N17-C-920441-251		NRCO Part No. A50015 NRCO Dwg No. A110473	W5-1 W5-2 W5-3 W5-4 W5-5 W5-6	6							
W5-2	Same as W5-1; incl P5-3 and P5-4.	Unit connecting patch cord													
W5-3	Same as W5-1; incl P5-5 and P5-6.	Unit connecting patch cord													
W5-4	Same as W5-1; incl P5-7 and P5-8.	Unit connecting patch cord													
W5-5	Same as W5-1; incl P5-9 and P5-10.	Unit connecting patch cord													
W5-6	Same as W5-1; incl P5-11 and P5-12.	Unit connecting patch cord													
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W9-12	CABLE ASSEMBLY, POWER, ELECTRICAL: cable, Whitney Blake Co, Type No. SJ, 2 conductors, stranded, No. 16 AWG, rubber insulated, materials in sequence from insulated conductors out, jute fillers, cotton binder, rubber jacket, 300v max rated working voltage; 2 ft lg over-all; terminal fitting on first end, 1, Harvey Hubbel, Inc, Plug Connector (P3), Part No. 7257; terminal fitting on second end, 1, Harvey Hubbel, Inc, Plug Connector (P4), Part No. 9972; (marked "IFMON. Power Cable" on cable label), conductor, 26 strands, No. 30 AWG; p/o AN, Amplifier-Detector, Type No. AM-615/UR.	Amplifier-Detector, AM-615/UR, power cable		*N17-C-48201-1078		NRCO Spec No. 232 NRCO Dwg No. B1104179-1	W9-12 W10-13	2							
W10-13	Same as W9-12 except incl P10-1 and P10-2, marked "Tone Keyer Power Cable" on cable label.	Keyer, KY-79/UR, power cable													
W12-1	WIRING HARNESS: 19 conductors at heaviest point broken down as follows; 9 twisted pairs, 6 single conductor shielded, 3 double conductor shielded, No. 22 AWG, copper, stranded; all conductors break out, vinylite insulation on each conductor w/ terminal lug; over-all length, approx 9 ft 2 in. lg, 6 conductors 19-1/2 in. lg breakouts, 36 conductors 4 in. lg breakouts, 15 conductors 14-1/2 in. lg breakouts, 3 conductors 1-3/4 in. lg breakouts, 7 conductors 20-3/4 in. lg breakouts, 8 conductors 18-1/2 in. lg breakouts, 2 conductors 26-3/4 in. lg breakouts; waxed twine laced 1-1/4 in. apart binds conductors together; 61 terminations, Zierick Mfg Corp, Terminal Lug, Part No. 83; 2 terminations, Cinch Mfg, Plug (P2-9 and P4-9), Part No. 13a; color coded conductors w/ paper no. tabs; ea plug takes single conductor w/ shield; for connecting all components that make a radio receiving set; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	Relay Rack Cabinet, CY-597A/G main harness		*N17-W-300921-120		NRCO Part No. 230 NRCO Dwg No. B1104155	W12-1	1							
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless part cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W12-2	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 2 ft 3 in. lg over-all, assy 2 ft lg excluding terminations, Connector Plug, Navy, Type No. -49190, 2(P2-7), located one ea end; marked "W2", "Rec. #1 3.5 MCS Osc." and "Rec #2 3.5 MCS Osc." on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Rec. #1 3.5 MCS Osc." to "Rec. #2 3.5 MCS Osc."		*N16-C-11633-6346		NRCO Spec No. 231 NRCO Dwg No. B1104178-1	W12-2	1							
W12-3	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 4 ft 9 in. lg over-all, assy 4 ft 6 in. lg excluding terminations, Connector Plug, Navy, Type No. -49190, 2(P2-4 and P9-2), located one ea end; marked "W3", "Rec. #1 IF Out. - Mon." and "Mon. IF Input #1" on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Rec. #1 IF Out.-Mon." to "Mon. IF Input #1" connecting cable		*N16-C-11634-3377		NRCO Spec No. 231 NRCO Dwg No. B1104178-2	W12-3	1							
W12-4	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 3 ft 2 in. lg over-all, assy 2 ft 11 in. lg excluding terminations; Connector Plug, Navy, Type No. -49190, *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.	"Rec. #2 IF Out.-Mon." to "Mon. IF Input #2" connecting cable		*N16-C-11633-8623		NRCO Spec No. 231 NRCO Dwg No. B1104178-3	W12-4	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W12-4 (cont)	2(P2-4 and P9-5), located one ea end; marked "W4", "Rec. #2 IF Out. - Mon." and "Mon. IF Input #2" on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.														
W12-5	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 12 in. lg over-all, assy 9 in. lg excluding terminations; Connector Plug, Navy, Type No. -49190, 2(P2-8 and P3-10), located one ea end; marked "W5", "Rec. #1 EXT HFO" and "VMO HFO Out. J9" on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Rec. #1 EXT HFO" to "VMO HFO Out. J9" connecting cable		*N16-C-11636-4889		NRCO Spec No. 231 NRCO Dwg No. B1104178-4	W12-5	1							
W12-6	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 1 ft 3 in. lg over-all, assy 1 ft lg excluding terminations; Connector Plug, Navy, Type No. -49190, 2(P3-11 and P2-8), located one ea end; marked "W6", "Rec. #2 EXT HFO" and "VMO HFO Out. J11" on cable labels, p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Rec. #2 EXT HFO" to "VMO HFO Out. J11" connecting cable		*N16-C-11633-4021		NRCO Spec No. 231 NRCO Dwg No. B1104178-5	W12-6 W12-7	2							
W12-7	Same as W12-6 except incl P3-7 and P2-6, marked "W7", "Rec. #1 EXT HFO" and "VMO HFO Out. J5" on cable labels.	"Rec. #1 EXT HFO" to "VMO HFO Out. J5" connecting cable													
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W12-8	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 1 ft 8 in. lg over-all, assy 1 ft 5 in. lg excluding terminations; Connector Plug, Navy, Type No. -49190, 2(P3-8 and P2-6), located one ea end; marked "W8", "Rec. #2 EXT HF0" and "VMO HF0 Out. J18" on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Rec. #2 EXT HF0" to "VMO HF0 Out. J18" connecting cable		*N16-C-11633-5023		NRCO Spec No. 231 NRCO Dwg No. B1104178-6	W12-8	1							
W12-9	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 4 ft 6 in. lg over-all, assy 4 ft 3 in. lg excluding terminations; Connector Plug, Navy, Type No. -49190, 2(Receiver termination P2-10), located one ea end; marked "W9", "Conv. #1 IF Input" and "Rec. #1 IF Out. - Conv." on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Conv. #1 IF Input" to "Rec. #1 IF Out. - Conv." connecting cable		*N16-C-11634-2855		NRCO Spec No. 231 NRCO Dwg No. B1104178-7	W12-9	1							
W12-10	CABLE ASSEMBLY, RADIO FREQUENCY: JAN, Radio Frequency Cable, Type No. RG-11/U, coaxial, 75 ohm characteristic impedance, 4,000v rms max operating voltage, single conductor, 7 strands, No. 26 AWG, copper wire, tinned finish, polyethylene dielectric, 0.285 in. OD, single shield, copper, plain finish, rd shape, 0.405 in. dia, black vinyl jacket; assy 3 ft 8 in. lg over-all, assy 3 ft 5 in. lg excluding terminations; Connector Plug, Navy, Type No. -49190, 2(Receiver termination *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.	"Conv. #2 IF Input" to "Rec. #2 IF Out. - Conv." connecting cable		*N16-C-11634-1275		NRCO Spec No. 231 NRCO Dwg No. B1104178-8	W12-10	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
W12-10 (cont)	P2-10), located one ea end; marked "W10", "Conv. #2 IF Input" and "Rec. #2 IF Out. - Conv." on cable labels; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.														
W12-14	CABLE ASSEMBLY, POWER, ELECTRICAL: cable data, type identification, Whitney Blake Co, Type No. SJ, conductor details, 2 conductors, stranded, No. 16 AWG, rubber insulated, materials in sequence from insulated conductors out, jute fillers, cotton binder, rubber jacket, 300v max rated working voltage; 6 ft lg over-all; termination data, terminal fitting on first end, 1, Harvey Hubbel, Inc, Plug Connector, Part No. 7257, terminal fitting on second end, 1, Harvey Hubbel, Inc, Plug Connector, Part No. 9972; special features data, (marked "Utility Power Cable" on cable label), conductor stranding, 26 strands, No. 30 AWG; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	Utility power cable		*N17-C-48226-2039		NRCO Spec No. 232 NRCO Dwg No. B1104179-4	W12-14 W12-15	2							
W12-15	CABLE ASSEMBLY, POWER, ELECTRICAL: cable, Whitney Black Co, Type No. SJ, 2 conductors, stranded, No. 16 AWG, rubber insulated, materials in sequence from insulated conductors out, jute fillers, cotton binder, rubber jacket, 300v max rated working voltage; 3 ft lg over-all; terminal fitting on first end, 1, Harvey Hubbel, Inc, Plug Connector (P12-2), Part No. 9972, conductors on second end extend 1 in. beyond end of jacket; (marked "Comp. Power Input Cable" on cable label), conductor, 26 strands, No. 30 AWG; p/o, AN, Radio Receiving Set, Type No. AN/FRR-28.	"Comp. Power Input Cable"		*N17-C-48209-1014		NRCO Spec No. 233 NRCO Dwg No. B1104181	W12-15	1							
XF2-1	FUSEHOLDER: plug type; accommodates 1 fuse, cartridge type, 1-1/4 in. lg, 1/4 in. dia; phenolic body; tinned brass contacts; over-all dim., 2-1/16 in. lg, 11/16 in. dia; 2 terminals, solder lug type; single hole 1/2 in. dia mounting; for general purpose use.	Holder for F2-1		N17-F-74265-1001	BUS Part No. HKM		XF2-1 XF2-2	2							
	*NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.														

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XF2-2	Same as XF2-1.	Holder for F2-2													
XF3-1	FUSEHOLDER: extractor post type; 250v, 15 amp; accommodates 1 fuse, cartridge type, 1-1/4 in. lg, 1/4 in. dia; phenolic body; beryllium copper contact, disk type; over-all dim., 2-7/32 in. lg, 23/32 in. dia; 2 terminals, solder lug type; single 0.495 in. dia mounting hole; includes finger operated knob, 1 hex nut and 1 washer; for general purpose use.	Holder for F3-1		N17-F-74267-5441	LTF Part No. 342001	NRCO Dwg No. A110475	XF3-1 XF3-2 XF9-1 XF10-1	4							
XF3-2	Same as XF3-1.	Holder for F3-2													
XF9-1	Same as XF3-1.	Holder for F9-1													
XF10-1	Same as XF3-1.	Holder for F10-1													
XI3-1	LIGHT, INDICATOR: lens data, supplied w/ lens, 3/4 in. dia, clear, frosted back, slotted-push-on type lens mounting; lamp data, MBCA Ref Dwg Group 7, accommodates T - 3-1/4 lamp, miniature bayonet base; electrical rating, 28v, 0.17 amp; frame data, steel frame, cadmium plated, open; over-all dim. w/ mounting nut, 1-25/32 in. lg, 1-1/8 in. wide, 1-1/8 in. high; mounting hole data, 1 mounting hole required, 13/16 in. dia; accommodates up to 9/32 in. thick panel; lampholder data, lampholder normally horizontally mounted, lamp replaceable from front of panel; terminal data, 2 terminals, solder lug type, located radially on opposite sides of lampholder base, both insulated from frame; includes red color disk, 3/4 in. dia lens; for general purpose use.	Panel light for I3-1		*N17-L-76745-5892	DLC Part No. 67B161	NRCO Dwg No. A110447	XI3-1 XI3-2 XI9-1 XI10-1	4							
XI3-1A	LAMPHOLDER: accommodates miniature bayonet base lamp; electrical rating, 28v, 0.17 amp; steel, cadmium plated frame; over-all dim. w/ mounting nut, 1-7/16 in. lg, 1-1/8 in. wide, 1-1/8 in. high; terminal data, 2 terminals, solder lug type; mounts by single 13/16 in.-27 thread by 7/16 in. lg bushing; w/ provisions for attachment of lens Dialco Part No. 161; incl 1 *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.	Body for XI3-1		N17-L-76664-6164	DLC Part No. 67B	NRCO Dwg No. A1104194	XI3-1A XI3-2A XI9-1A XI10-1A	4							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XI3-1A (cont)	hex nub and 3 plain washers; p/o, Dial Light Co of America, Pilot Light, Part No. 67B161; p/o XI3-1.														
XI3-1B	LENS, INDICATOR LIGHT: lens data, clear, 3/4 in. dia, convex type, glass, frosted back; over-all dim., 7/8 in. dia, 19/32 in. deep, glass, frosted back; mounted, bezel, brass, chrome plated finish; mounting data, slotted-push-on type mounting, dim. of bezel, 7/8 in. dia, 7/16 in. deep; incl red color disk; p/o, Dial Light Co of America, Pilot Light, Part No. 67B161; p/o XI3-1.	Lens for XI3-1		N17-L-250666-481	DLC Part No. 65-161	NRCO Dwg No. A1104193	XI3-1B XI3-2B XI9-1B XI10-1B	4							
XI3-2	Same as XI3-1.	Panel light for I3-2													
XI3-2A	Same as XI3-1A; p/o XI3-2.	Body for XI3-2													
XI3-2B	Same as XI3-1B; p/o XI3-2.	Lens for XI3-2													
XI9-1	Same as XI3-1.	Panel light for I9-1													
XI9-1A	Same as XI3-1A; p/o XI9-1.	Body for XI9-1													
XI9-1B	Same as XI3-1B; p/o XI9-1.	Lens for XI9-1													
XI10-1	Same as XI3-1.	Panel light for I10-1													
XI10-1A	Same as XI3-1A; p/o XI10-1.	Body for XI10-1													
XI10-1B	Same as XI3-1B; p/o XI10-1.	Lens for XI10-1													
XR10-14	LAMPHOLDER: single holder; accommodates candelabra screw base lamp, MBCA Ref Dwg Group 7; 125v max, 75 W; brass socket; over-all dim. (incl terminals and mounting bracket), 1-1/2 in. lg, 1-1/4 in. wide, 1/2 in. high; 2 terminals, solder lug type; "V" bracket w/ mounting tongues for mounting; socket insulated from mounting bracket; for general purpose use.	Socket for R10-14		N17-L-50843-5351	DLC Part No. 615	NRCO Dwg No. A110446	XR10-14 XR10-15	2							
XR10-15	Same as XR10-14.	Socket for R10-15													
XV2-1	SOCKET, ELECTRON TUBE: 7 contacts, beryllium, silver plated; miniature size; includes metal shock shield, 51/64 in. dia, 3/4 in. high; includes center shield, 1/8 in. dia; oval shape; over-all dim. excluding terminals, 1-1/8 in. lg, 3/4 in. wide, 1/4 in. deep; ceramic body; molded in mounting plate, 5/8 in. dia chassis hole, 2 mounting	Socket for V2-1	Spec No. JAN-S-28A, JAN Type No. TS102C01	N16-S-62603-6676	EBY Part No. 103M		XV2-1 XV2-2 XV2-6 XV2-7 XV2-9 XV2-10 XV2-11 XV2-12 XV2-13 XV2-14	13							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XV2-1 (cont)	holes, 0.128 dia; for general purpose use.						XV2-15 XV2-18 XV2-20								
XV2-2	Same as XV2-1.	Socket for V2-2													
XV2-3	SOCKET, ELECTRON TUBE: 8 contacts, phosphor bronze, silver plated; octal; rd; over-all dim. excluding terminals, 1-13/16 in. lg; 1-3/16 in. wide, 1/2 in. deep; mica filled bakelite; one piece saddle mounting, 1-1/8 in. chassis hole, 2 mounting holes, 0.144 in. dia, spaced 1-1/2 in. C to C; for general purpose use.	Socket for V2-3	Spec No. JAN-S-28A, JAN Type No. TS101C01	N16-S-63529-1961	CIN Part No. 9859		XV2-3 XV2-17 XV2-19	3							
XV2-4	SOCKET, ELECTRON TUBE: 7 contacts, beryllium, silver plated; miniature size; includes metal shock shield, excludes center shield; oval shape; over-all dim. excluding terminals, 1-1/8 in. lg, 3/4 in. wide, 1/4 in. deep; ceramic body; molded in mounting plate, 5/8 in. dia chassis hole, 2 mounting holes, 0.128 in. dia, spaced 7/8 in. C to C; for general purpose use.	Socket for V2-4	Spec No. JAN-S-28A, JAN Type No. TS102P01	N16-S-62603-6692	EBY Part No. 102M w/o center-shield		XV2-4	1							
XV2-5	SOCKET, ELECTRON TUBE: 7 contacts, beryllium, silver plated; miniature size; includes metal shock shield, 51/64 in. dia, 3/4 in. high; includes center shield; oval shape; over-all dim. excluding terminals, 1-1/8 in. lg, 3/4 in. wide, 1/4 in. deep; molded in mounting plate, 5/8 in. dia chassis hole, 2 mounting holes, 0.128 in. dia; for general purpose use.	Socket for V2-5	Spec No. JAN-S-28A, JAN Type No. TSE7T101	N16-S-62603-6692	EBY Part No. 102M		XV2-5	1							
XV2-6	Same as XV2-1.	Socket for V2-6													
XV2-7	Same as XV2-1.	Socket for V2-7													
XV2-8	SOCKET, ELECTRON TUBE: 9 contacts, beryllium copper, silver plated; miniature size base; incl metal shock shield, 0.940 in. dia, 5/8 in. high; incl center shield, 3/16 in. OD; cylindrical shape w/ oval mounting flange; over-all dim. excluding terminals, 1-3/8 in. lg, 0.940 in. wide, 27/32 in. high incl base shield excl term; mica filled phenolic body; one piece saddle top mounting, mounting dim., 3/4 in. dia chassis hole required, 2 mounting holes, 0.125 in. dia, spaced 1-1/8 in. C to C; center shield, brass, cadmium plated,	Socket for V2-8		N16-S-64063-6709	ELCP Part No. 169BC	NRCO Dwg No. A110450	XV2-8 XV3-9 XV3-10	3							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XV2-8 (cont)	shock shield, brass, nickel plated; for general purpose use.														
XV2-9	Same as XV2-1.	Socket for V2-9													
XV2-10	Same as XV2-1.	Socket for V2-10													
XV2-11	Same as XV2-1.	Socket for V2-11													
XV2-12	Same as XV2-1.	Socket for V2-12													
XV2-13	Same as XV2-1.	Socket for V2-13													
XV2-14	Same as XV2-1.	Socket for V2-14													
XV2-15	Same as XV2-1.	Socket for V2-15													
XV2-16	SOCKET, ELECTRON TUBE: 9 contacts, beryllium copper, silver plated; noval size; includes metal shock shield, 3/4 in. dia, 5/8 in. high; includes center shield, 1/8 in. dia; oval shape; over-all dim. excluding terminals, 1-11/32 in. lg, 47/64 in. wide, 1/4 in. deep; mica filled bakelite body; molded in mounting plate, 3/4 in. dia chassis hole, 2 mounting holes, 0.128 in. dia, 1-1/8 in. C to C; for general purpose use.	Socket for V2-16	Spec No. JAN-S-28A, JAN Type No. TS103P01	N16-S-64063-6718	CIN Part No. 53F12875		XV2-16	1							
XV2-17	Same as XV2-3.	Socket for V2-17													
XV2-18	Same as XV2-1.	Socket for V2-18													
XV2-19	Same as XV2-3.	Socket for V2-19													
XV2-20	Same as XV2-1.	Socket for V2-20													
XV3-1	SOCKET, ELECTRON TUBE: 7 contacts beryllium copper, silver plated; miniature size base; incl metal shock shield, 0.800 in. dia, 5/8 in. high; incl center shield, 3/16 in. OD; cylindrical shape w/ oval mounting flange; over-all dim. excluding terminals, 1-3/32 in. lg, 0.800 in. wide, 27/32 in. high excl term; mica filled phenolic body; one-piece saddle top mounting, mounting dim., 5/8 in. dia chassis hole required, 2 mounting holes, 0.125 in. dia, spaced 7/8 in. C to C; center shield brass, cadmium plated, shock shield, steel base; cadmium plated; for general purpose use.	Socket for V3-1		N16-S-62603-6701	ELCP Part No. 235BC	NRCO Dwg No. A110451	XV3-1 XV3-2 XV3-3 XV3-4 XV3-5 XV3-6 XV3-7 XV3-11 XV3-12	9							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XV3-2	Same as XV3-1.	Socket for V3-2													
XV3-3	Same as XV3-1.	Socket for V3-3													
XV3-4	Same as XV3-1.	Socket for V3-4													
XV3-5	Same as XV3-1.	Socket for V3-5													
XV3-6	Same as XV3-1.	Socket for V3-6													
XV3-7	Same as XV3-1.	Socket for V3-7													
XV3-9	Same as XV2-8.	Socket for V3-9													
XV3-10	Same as XV2-8.	Socket for V3-10													
XV3-11	Same as XV3-1.	Socket for V3-11													
XV3-12	Same as XV3-1.	Socket for V3-12													
XV9-1	SOCKET, ELECTRON TUBE: 8 contacts, phosphor bronze, silver plated; octal; oval shape; over-all dim. excluding terminals, 1-25/32 in. lg, 1-1/4 in. wide, 1/2 in. high; mica filled phenolic body; 1 piece saddle mounting, 1-1/8 in. dia chassis hole required, 2 mounting holes, No. 4-40 tap, spaced 1-1/2 in. C to C; saddle steel, cadmium plated; for general purpose use.	Socket for V9-1		N16-S-63519-1931 (228678.16)	CIN Part No. 9881	NRCO Dwg No. A110443	XV9-1 XV9-2 XV9-3 XV9-4 XV9-5 XV10-1 XV10-2 XV10-4 XV10-5 XV10-6 XV10-7 XV10-8	12							
XV9-2	Same as XV9-1.	Socket for V9-2													
XV9-3	Same as XV9-1.	Socket for V9-3													
XV9-4	Same as XV9-1.	Socket for V9-4													
XV9-5	Same as XV9-1.	Socket for V9-5													
XV10-1	Same as XV9-1.	Socket for V10-1													
XV10-2	Same as XV9-1.	Socket for V10-2													
XV10-4	Same as XV9-1.	Socket for V10-4													
XV10-5	Same as XV9-1.	Socket for V10-5													
XV10-6	Same as XV9-1.	Socket for V10-6													
XV10-7	Same as XV9-1.	Socket for V10-7													
XV10-8	Same as XV9-1.	Socket for V10-8													
XV10-10	LAMPHOLDER: single holder; accommodates miniature bayonet base lamp, MBCA Ref Dwg Group 7; 125v max, 75 W; brass socket; over-all dim. incl terminals at 60° to ea other, 1-13/32 in. lg, 25/32 in. wide, 25/32 in. high; 2 terminals,	Socket for V10-10		N17-L-51625-3285	DLC Part No. 705	NRCO Dwg No. A110449	XV10-10 XV10-11	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XV10-10 (cont)	solder lug type; bracket mounted; socket insulated from mounting bracket; for general purpose use.														
XV10-11	Same as XV10-10.	Socket for V10-11													
XY2-21	SOCKET, CRYSTAL: 3/32 in. dia pins accommodated, 1/2 in. C to C; rectangular shape w/ rounded ends; over-all dim. excluding terminals, 1-5/16 in. lg, 7/16 in. wide, 15/32 in. high; ceramic body, above or below chassis mounting, 2 3/8 in. dia, 1/2 in. C to C, chassis holes required, 2 mounting holes, spaced 1-1/8 in. dia; 2 solder lug type terminals; for general purpose use.	Socket for Y2-21		N16-S-54548-7001	MLL Part No. 33102	NRCO Dwg No. A1104167	XY2-21 XY3-1	2							
XY3-1	Same as XY2-21.	Socket for Y3-1													
XY3-15	SOCKET CRYSTAL: 1/8 in. dia pins accommodated, spaced 3/4 in. C to C; rectangular shape w/ rd ends; over-all dim. excluding terminals, 1-3/16 in. lg, 7/16 in. wide, 3/8 in. high; mica filled bakelite body; above or below chassis mounting, 2 3/8 in. dia chassis holes, 3/4 in. C to C, required, 1 mounting hole, 1/8 in. dia, spaced on center line between 3/8 in. dia chassis holes; tin plated contacts; for general purpose use.	Socket for Y3-15		N16-S-54524-6151	AMP Part No. 33-2T	NRCO Dwg No. A1104160	XY3-15 XY3-16 XY3-17 XY3-18 XY3-19	5							
XY3-15 A	SOCKET, CRYSTAL: 0.050 in. dia pin accommodated, spaced 0.486 in. C to C; rectangular shape w/ rd ends; over-all dim. excluding terminals, 55/64 in. lg, 3/8 in. wide, 3/8 in. high; steatite body; above or below chassis mounting, mounting dim., 2 1/4 in. dia chassis holes, 0.486 in. C to C, required, 1 mounting hole, 1/8 in. dia, spaced on center line between 1/4 in. dia chassis holes; phosphor bronze contacts; for general purpose use; p/o E3-47.	Adapter socket for XY3-15		N16-S-54287-5101	EBY Type No. CR7	NRCO Dwg No. A1104103	XY3-15A XY3-16A XY3-17A XY3-18A XY3-19A	5							
XY3-16	Same as XY3-15.	Socket for Y3-16													
XY3-16 A	Same as XY3-15A; p/o E3-47.	Adaptor socket for XY3-16													
XY3-17	Same as XY3-15.	Socket for Y3-17													
XY3-17 A	Same as XY3-15A; p/o E3-47.	Adaptor socket for XY3-17													

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION.	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
XY3-18	Same as XY3-15.	Socket for Y3-18													
XY3-18 A	Same as XY3-15A; p/o E3-48.	Adaptor socket for XY3-18													
XY3-19	Same as XY3-15.	Socket for Y3-19													
XY3-19 A	Same as XY3-15A; p/o E3-48.	Adaptor socket for XY3-19													
Y2-7	CRYSTAL UNIT QUARTZ: 1 crystal plate included; 3,500 kc nominal frequency, 2 contacts, located on bottom, spaced 0.350 in. C to C, solder lug type, 0.110 in. wide, 0.315 in. lg, rectangular shaped body, dim., 0.740 in. lg, 0.625 in. wide, 0.335 in. thick; air gap not adjustable; hermetically sealed; ± 0.005% tolerance, stability 2 parts per million per °C, crystal plate etched; p/o, AN, Radio Receiver, Type No. R-450/FRR-28.	3.5 mc oscillator crystal		N16-C-96966-7076	BLY Type No. VX2		Y2-7	1							
Y2-8	CRYSTAL UNIT, QUARTZ: 1 crystal plate included; 455 kc nominal frequency; Bliley Electric Co, Crystal Holder, Type No. VX4, 2 pins, located on bottom, spaced 1/2 in. C to C, solid type, 1/16 in. max dia, 1/4 in. lg, rectangular shape body w/ rounded ends, cadmium plated steel container, dim. excluding pins, 3/4 in. lg; 11/16 in. wide, 5/16 in. thick; air gap not adjustable; self supporting, pigtail ground lead from top of container and one pigtail lead from ea pin; ± 50 cycles tolerance at 20° C, crystal plate etched, temp data, 20° C to 50° C, 0.016% per deg C max frequency deviation; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	455 kc IF filter crystal		N16-C-96420-1376	BLY Type No. VX4		Y2-8	1							
Y3-1	CRYSTAL UNIT, QUARTZ: 1 crystal plate included; 100 kc nominal frequency; 2 pins, located on bottom, spaced 31/64 in. C to C, solid type, 3/32 in. dia, 1/2 in. lg, cylindrical shape body, metal, bakelite base, dim. excluding pins, 1 in. dia, 1-1/2 in. high, marked "TYPE-PL-100"; air gaps not adjustable; red body; ± 0.0025% nominal frequency tolerance; p/o, AN Radio Frequency Oscillator, Type No. O-165/UR.	100 kc calibrator oscillator crystal		N16-C-96176-8825	PCL Type No. PL100	NRCO Dwg No. A1104124	Y3-1	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-1	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 melamine capacitor, 1 inductance form having two (2) windings, 1 powdered iron tuning slug, 1 variable tuning capacitor, 1 ceramic mounting base, 6 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	0.54 to 1.35 mc tuned circuit input to V2-1		N17-T-82166-3884	HMM Part No. 31387		Z2-1	1							
Z2-2	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 melamine capacitor, 1 inductance form having two (2) windings, 1 powdered iron tuning slug, 1 variable tuning capacitor, 1 ceramic mounting base, 6 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	1.35 to 3.45 mc tuned circuit input to V2-1		N17-T-82181-1179	HMM Part No. 31390		Z2-2	1							
Z2-3	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 inductance form with two (2) windings, 1 powdered iron tuning slug, 1 variable tuning capacitor, 1 ceramic mounting base, 6 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps, soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R450/FRR-28.	3.45 to 7.4 mc tuned circuit input to V2-1		N17-T-82187-3884	HMM Part No. 31393		Z2-3	1							
Z2-4	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 inductance form with two (2) windings, 1 powdered iron tuning slug, 1 variable tuning capacitor, 1 ceramic mounting base, 6 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-	7.4 to 14.8 tuned circuit input to V2-1		N17-T-82199-3884	HMM Part No. 31396		Z2-4	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOL-VED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-4 (cont)	1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
Z2-5	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica capacitor, 1 ceramic capacitor, 1 inductance form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	14.8 to 29.7 mc tuned circuit input to V2-1		N17-T-82208-5901	HMM Part No. 31399		Z2-5	1							
Z2-6	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica capacitor, 1 ceramic capacitor, 1 inductance form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	29.7 to 54.0 mc tuned circuit input to V2-1		N17-T-82212-8384	HMM Part No. 31405		Z2-6	1							
Z2-8	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 melamine capacitor, 2 carbon resistors 1/2 W, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated brass contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	0.54 to 1.35 mc tuned circuit input to V2-2		N17-T-82166-3879	HMM Part No. 31386		Z2-8 Z2-15	2							
Z2-9	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 melamine capacitor, 2 carbon resistors 1/2 W, 1 coil form with two (2) windings,	1.35 to 3.45 mc tuned circuit input to V2-2		N17-T-82181-1174	HMM Part No. 31389		Z2-9 Z2-16	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-9 (cont)	1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
Z2-10	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 2 carbon resistors 1/2 W, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver Type No. R-450/FRR-28.	3.45 to 7.4 mc tuned circuit input to V2-2		N17-T-82187-3879	HMM Part No. 31392		Z2-10 Z2-17	2							
Z2-11	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 2 carbon resistors 1/2 W, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	7.4 to 14.8 mc tuned circuit input to V2-2		N17-T-82199-3879	HMM Part No. 31395		Z2-11 Z2-18	2							
Z2-12	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica capacitor, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	14.8 to 29.7 mc tuned circuit input to V2-2		N17-T-82208-5895	HMM Part No. 31398		Z2-12 Z2-19	2							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TENDER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-13	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica capacitor, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6BA6 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	29.7 to 54.0 mc tuned circuit input to V2-2		N17-T-82212-8379	HMM Part No. 31404		Z2-13 Z2-20	2							
Z2-15	Same as Z2-8.	0.54 to 1.35 mc tuned circuit input to V2-5													
Z2-16	Same as Z2-9.	1.35 to 3.45 mc tuned circuit input to V2-5													
Z2-17	Same as Z2-10.	3.45 to 7.4 mc tuned circuit input to V2-5													
Z2-18	Same as Z2-11.	7.4 to 14.8 mc tuned circuit input to V2-5													
Z2-19	Same as Z2-12.	14.8 to 29.7 mc tuned circuit input to V2-5													
Z2-20	Same as Z2-13.	29.7 to 54.0 mc tuned circuit input to V2-5													
Z2-25	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	HF oscillator 0.54 to 1.35 mc tuned circuit		N17-T-82166-3874	HMM Part No. 31385		Z2-25	1							
Z2-26	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica capacitor, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated con-	HF oscillator 1.35 to 3.45 mc tuned circuit		N17-T-82181-1169	HMM Part No. 31388		Z2-26	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	EQUIP.		TENDER		STOCK	
										BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-26 (cont)	tacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
Z2-27	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	HF oscillator 3.45 to 7.4 mc tuned circuit		N17-T-82187-3874	HMM Part No. 31391		Z2-27	1							
Z2-28	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 ceramic capacitor, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	HF oscillator 7.4 to 14.8 mc tuned circuit		N17-T-82199-3874	HMM Part No. 31394		Z2-28	1							
Z2-29	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 ceramic capacitor, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1 ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; 2 spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.	HF oscillator 14.8 to 29.7 mc tuned circuit		N17-T-82208-5891	HMM Part No. 31397		Z2-29	1							
Z2-30	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 2 mica capacitors, 1 coil form with two (2) windings, 1 powdered iron slug, 1 variable tuning capacitor, 1	HF oscillator 29.7 to 54.0 mc tuned circuit		N17-T-82212-8374	HMM Part No. 31403		Z2-30	1							

TABLE 8-4. COMBINED PARTS AND MAINTENANCE PARTS LIST

PARTS									SPARE PARTS						
										EQUIP.		TEN-DER		STOCK	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	FEDERAL AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL PER EQUIP.	ITEM NO.	BOX	QUAN.	BOX	QUAN.	BOX	QUAN.
Z2-30 (cont)	ceramic mounting base, 5 silver plated contacts; over-all dim., 2-1/16 in. lg, 1-1/4 in. wide, 2 in. high; spring clip mounting straps; soldered connections moisture and fungus proofed; used as a tuning assembly in conjunction with a 6C4 tube; p/o, AN Radio Receiver, Type No. R-450/FRR-28.														
Z9-1	TRANSFORMER, RADIO FREQUENCY: principal parts c/o, 1 mica dielectric fixed capacitor (C9-24), 2 air dielectric variable capacitors (C9-22, C9-23), 1 radio frequency transformer (T9-2), 1 shield can, 1 variable capacitor mounting bracket, 1 component mounting frame; over-all dim., 2 in. lg, 1-7/16 in. wide, 4-1/2 in. high; 2 1/2 in. lg, No. 6-32 thread studs on 1 in. by 1-3/8 in. mounting centers on bottom of shield can; 5 No. 16 AWG tinned copper wire terminations at bottom of can; tuned circuit for radio frequency oscillator; p/o, AN Amplifier-Detector, Type No. AM-615/UR.	Oscillator circuit		N17-T-81559-8326		NRCO Part No. B111113 NRCO Dwg No. A110484	Z9-1	1							

TABLE 8-5. MAINTENANCE PARTS KIT

KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY
C2-3	3	C3-57	1	R2-22	1	R3-13	1	R10-37	1
C2-6	1	C9-24	1	R2-34	2	R3-18	1	R10-44	1
C2-8	1	C10-2	1	R2-37	1	R3-19	1	R10-51	1
C2-9	1	CR3-1	1	R2-42	1	R3-20	1	S2-1AA	6
C2-11	1	F2-2	10	R2-46	1	R3-21	1	S2-4	1
C2-12	1	F3-1	2	R2-59	1	R3-25	1	S2-12	1
C2-14	1	F3-2	2	R2-60	1	R3-29	1	S2-13	1
C2-15	1	F9-1	2	R2-63	1	R3-33	1	S2-14	1
C2-18	1	K3-1	1	R2-69	1	R3-38	1	S3-7	1
C2-37	1	L2-1	1	R2-72	1	R3-41	1	S3-9	1
C2-39	1	L2-2	1	R2-73	1	R3-42	1	S10-2	1
C2-77	1	L2-3	1	R2-79	1	R3-47	1	S10-5	1
C2-78	1	L2-4	1	R2-84	1	R3-51	1	T1-1	1
C2-79	1	L2-5	1	R2-85	1	R3-55	1	T10-2	1
C2-82	1	L2-6	1	R2-86	1	R3-58	1	Z2-1	1
C2-85	1	L2-7	1	R2-87	1	R3-61	1	Z2-2	1
C2-87	2	L2-47	1	R2-93	1	R3-62	1	Z2-3	1
C2-89	1	L2-48	1	R2-95	1	R9-8	1	Z2-4	1
C2-91	1	L2-49	1	R2-96	1	R9-9	1	Z2-5	1
C2-92	1	L2-52	1	R2-99	1	R9-11	1	Z2-6	1
C2-93	1	L2-54	1	R2-101	1	R9-13	1	Z2-8	1
C2-95	1	L2-55	1	R2-112	1	R9-14	1	Z2-9	1
C2-96	1	L2-58	1	R2-113	1	R9-17	1	Z2-10	1
C2-102	2	L3-1	1	R2-116	1	R10-1	1	Z2-11	1
C2-129	1	L3-8	1	R2-117	2	R10-2	1	Z2-12	1
C2-141	1	L9-1	1	R2-120	1	R10-3	1	Z2-13	1
C2-143	1	L9-2	1	R2-121	1	R10-4	1	Z2-25	1
C2-162	1	O3-9	1	R2-126	1	R10-5	1	Z2-26	1
C2-164	1	R1-1	1	R2-128	1	R10-6	1	Z2-27	1
C2-166	3	R2-1	1	R2-129	1	R10-14	2	Z2-28	1
C2-170	3	R2-2	1	R3-2	1	R10-16	1	Z2-29	1
C2-183	1	R2-4	1	R3-3	1	R10-17	1	Z2-30	1
C3-22	1	R2-5	1	R3-4	1	R10-18	1	Z9-1	1
C3-34	1	R2-7	1	R3-5	1	R10-22	1		
C3-40	1	R2-9	1	R3-7	1	R10-23	1		
C3-44	1	R2-10	1	R3-11	1	R10-24	1		

TABLE 8–6. CROSS REFERENCE PARTS LIST

JAN (OR AWS) DESIGNATION	KEY SYMBOL	JAN (OR AWS) DESIGNATION	KEY SYMBOL	JAN (OR AWS) DESIGNATION	KEY SYMBOL	JAN (OR AWS) DESIGNATION	KEY SYMBOL
CC20CJ070F	C2–12	RC20BF100K	R2–42	RC20BF474K	R2–78	TSE7T101	XV2–5
CC20HJ150J	C2–15	RC20BF101K	R3–7	RC20BF510J	R2–7	TS101C02	XV2–3
CC21UJ070C	C2–79	RC20BF102K	R2–4	RC20BF511J	R2–5	TS102C02	XV2–1
CC21UJ120J	C2–88	RC20BF102M	R9–1	RC20BF513J	R10–18	TS102P01	XV2–4
CC21UJ510F	C2–92	RC20BF103J	R2–2	RC20BF514J	R10–20	TS103P01	XV2–16
CC26SL101K	C2–141	RC20BF103K	R2–117	RC20BF681K	R2–79	TS102U01	E2–61
CE33D200R	C2–161	RC20BF103M	R9–8	RC20BF681M	R2–111	TS102U02	E2–65
CE63D100H	C2–128	RC20BF104K	R2–34	RC20BF682K	R2–28	TS102U03	E2–64
CM20B100K	C2–83	RC20BF104M	R9–17	RC20BF683K	R2–86	OA2	V2–18
CM20B101J	C2–167	RC20BF105K	R2–60	RC20BF750J	R2–113	OC3	V9–5
CM20B101K	C2–164	RC20BF112J	R2–46	RC20BF823J	R2–95	12AU7	V2–8
CM20B101M	C9–4	RC20BF120J	R3–33	RC20BF824K	R10–41	5R4GY	V2–19
CM20C101G	C2–18	RC20BF124J	R2–87	RC20BF913J	R3–62	5W4	V3–8
CM20C101K	C2–165	RC20BF124K	R3–1	RC30BF102K	R3–2	5Y3–GT	V3–8A
CM20C111G	C10–2	RC20BF151J	R2–27	RC30BF103K	R2–120	6AL5	V2–14
CM20C121G	C2–87	RC20BF153K	R10–36	RC30BF104K	R10–17	6AQ5	V3–4
CM20C151J	C3–55	RC20BF154K	R10–44	RC30BF153K	R9–13	6BA6	V2–1
CM20C200J	C2–6	RC20BF163J	R2–121	RC30BF203J	R2–40	6BE6	V2–5
CM20C330J	C2–9	RC20BF183K	R2–47	RC30BF221K	R3–55	6C4	V3–1
CM20C510G	C2–39	RC20BF203J	R2–72	RC30BF222K	R2–59	6H6	V10–7
CM30C102G	C2–14	RC20BF222K	R2–37	RC30BF223K	R9–9	6J5	V9–4
CM30C102K	C3–4	RC20BF223J	R2–96	RC30BF361J	R2–99	6J6	V2–4
CM30C122G	C2–85	RC20BF223K	R2–126	RC30BF471K	R3–29	6SA7	V9–2
CM30C152G	C2–11	RC20BF224K	R2–116	RC30BF563J	R2–73	6SJ7	V9–1
CM30C242J	C2–8	RC20BF240J	R2–9	RC40BF102K	R3–19	6SL7GT	V10–6
CM30C332G	C2–77	RC20BF241J	R2–10	RC40BF103K	R3–4	6SN7GT	V10–4
CM35A102K	C2–140	RC20BF243J	R3–31	RC40BF120K	R3–41	6V6	V10–2
CM35A512J	C2–143	RC20BF244J	R3–3	RC40BF153K	R3–18	6V6GT	V2–17
CM35B102M	C9–7	RC20BF273K	R2–63	RC40BF203J	R10–23		
CM35B103K	C2–166	RC20BF302J	R10–50	RC40BF511J	R1–2		
CM35B103M	C2–180	RC20BF333J	R10–16	RC40BF512J	R10–37		
CM35C103J	C3–57	RC20BF333K	R3–28	RC40BF513J	R10–22	NAVY TYPE NO.	KEY SYMBOL
CP28A1EF254M	C2–137	RC20BF335K	R2–97	RC40BF563K	R3–51		
CP28A1EF503M	C2–144	RC20BF471K	R3–21	RC40BF751J	R3–5		
CP53B6EF503V	C2–129	RC20BF472K	R3–20	RC40BF913J	R10–31	–49190	P2–4
RA20A1SA102AK	R2–69	RC20BF473J	R2–36	RC42BF683K	R2–129	–49192	E2–28
RC10BF514J	R2–1	RC20BF473K	R2–22	RW32G252	R2–85	–49194	J2–2

TABLE 8-6. CROSS REFERENCE PARTS LIST (Cont'd)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
G41-W-2445	H2-5	N16-C-28558-1676	C2-164	N16-C-45773-8706	C10-3	N16-C-76520-3850	L2-58
G41-W-2446	H2-6	N16-C-28558-1681	C2-165	N16-C-45803-1084	C2-183	N16-C-76548-4591	L3-2
G41-W-2447	H2-7	N16-C-28563-4156	C9-4	N16-C-46339-4870	C2-173	N16-C-96176-8825	Y3-1
N16-A-16178-2415	E3-48	N16-C-28653-4321	C10-2	N16-C-46373-5764	C2-137	N16-C-96420-1376	Y2-8
N16-A-16183-9915	E3-47	N16-C-28732-5521	C2-87	N16-C-46375-7552	C9-13	N16-C-96966-7076	Y2-7
N16-C-11633-4021	W12-6	N16-C-28975-1601	C3-55	N16-C-47327-7486	C3-40	N16-D-46350-9238	I2-8
N16-C-11633-5023	W12-8	N16-C-29206-5993	C2-89	N16-C-48847-7935	C10-5	N16-D-46539-3251	I2-9
N16-C-11633-6346	W12-2	N16-C-29665-9476	C2-175	N16-C-49227-7935	C10-6	N16-D-46548-8725	I2-6
N16-C-11633-8623	W12-4	N16-C-29864-2470	C2-93	N16-C-49227-7960	C9-3	N16-D-46548-8923	I2-7
N16-C-11634-1275	W12-10	N16-C-29941-1543	C2-78	N16-C-49988-5295	C3-44	N16-D-46552-9984	I2-5
N16-C-11634-2855	W12-9	N16-C-300563-799	H2-3	N16-C-53010-6070	C2-129	N16-D-901161-133	U3-2
N16-C-11634-3377	W12-3	N16-C-300798-631	H2-1	N16-C-53214-7497	C10-4	N16-D-901161-140	U3-1
N16-C-11636-4889	W12-5	N16-C-300798-868	H2-2	N16-C-59761-6276	C9-23	N16-G-402125-866	O3-9
N16-C-15753-7083	C2-79	N16-C-30172-4556	C10-13	N16-C-59823-8206	C3-49	N16-K-700295-876	E2-34
N16-C-15761-5301	C2-12	N16-C-30333-8470	C2-96	N16-C-60036-1604	C3-6	N16-K-700314-526	E3-43
N16-C-15917-3301	C3-16	N16-C-30728-1925	C2-82	N16-C-600701-165	E2-37	N16-K-700314-573	E3-37
N16-C-15957-1248	C2-88	N16-C-31079-4268	C9-24	N16-C-61523-4801	C3-1	N16-K-700374-243	E3-44
N16-C-15986-3009	C2-15	N16-C-31080-2209	C2-14	N16-C-63286-9101	C3-24	N16-K-700439-676	E2-3
N16-C-16585-6061	C2-92	N16-C-31090-4169	C3-4	N16-C-63688-2204	C2-1	N16-R-29154-6381	L3-1
N16-C-17085-7060	C2-141	N16-C-31090-4203	C2-140	N16-C-64133-6625	C3-34	N16-R-29205-3471	L2-51
N16-C-19561-3951	C2-128	N16-C-31090-4208	C2-170	N16-C-66203-4770	C2-162	N16-R-29235-6361	L9-1
N16-C-22643-8295	C2-161	N16-C-31095-6688	C9-7	N16-C-71785-6977	L2-30	N16-R-29385-7601	L2-52
N16-C-25102-6276	C3-9	N16-C-31264-8009	C2-85	N16-C-71979-5199	L2-29	N16-R-33591-1265	T2-6
N16-C-26020-7691	C3-5	N16-C-31502-2609	C2-11	N16-C-72174-9245	L2-11	N16-R-49238-811	R2-42
N16-C-26020-7796	C2-168	N16-C-31982-2289	C2-8	N16-C-72236-8001	L2-28	N16-R-49255-431	R3-33
N16-C-26025-8276	C2-83	N16-C-32013-9810	C2-150	N16-C-72431-9251	L2-10	N16-R-49257-551	R3-41
N16-C-26732-9439	C3-56	N16-C-32240-7809	C2-77	N16-C-72431-9256	L2-27	N16-R-49327-431	R2-9
N16-C-26732-9601	C2-6	N16-C-32699-4608	C3-22	N16-C-72666-4238	L2-9	N16-R-49444-431	R2-7
N16-C-27181-4401	C2-9	N16-C-32704-7088	C9-12	N16-C-72667-6871	L2-8	N16-R-49516-431	R2-113
N16-C-27439-3010	C2-95	N16-C-32720-7523	C2-143	N16-C-72680-2749	L2-47	N16-R-49580-811	R3-7
N16-C-27629-7215	C3-25	N16-C-33116-3142	C2-162A	N16-C-73328-6923	L2-48	N16-R-49624-431	R2-27
N16-C-27634-8769	C3-37	N16-C-33617-4746	C3-57	N16-C-73378-6793	L2-49	N16-R-49662-231	R3-55
N16-C-27651-1121	C2-39	N16-C-33622-5222	C2-166	N16-C-73390-5701	L3-3	N16-R-49669-431	R2-10
N16-C-28284-1722	C2-37	N16-C-33627-7705	C2-180	N16-C-73953-8363	L2-7	N16-R-49723-751	R2-99
N16-C-28415-2810	C2-91	N16-C-40105-7442	C2-102	N16-C-74289-5301	L2-53	N16-R-49769-811	R3-21
N16-C-28547-8721	C2-18	N16-C-42761-8708	C2-3	N16-C-74716-4521	L9-2	N16-R-49770-231	R3-29
N16-C-28553-1041	C3-3	N16-C-42765-5354	C10-9	N16-C-75460-6969	L2-54	N16-R-49786-431	R2-5
N16-C-28553-1196	C2-167	N16-C-44287-7160	C2-144	N16-C-75526-3921	L2-55	N16-R-49787-171	R1-2

TABLE 8-6. CROSS REFERENCE PARTS LIST (Cont'd)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-R-49841-811	R2-79	N16-R-50515-751	R2-73	N16-R-90493-7823	R2-112	N16-T-56370	V9-1
N16-R-49843-291	R2-111	N16-R-50517-551	R3-51	N16-R-90754-2723	R3-38	N16-T-56470	V10-6
N16-R-49859-171	R3-5	N16-R-50552-811	R2-86	N16-R-90754-3621	R2-69	N16-T-56490	V10-4
N16-R-49922-811	R2-4	N16-R-50587-431	R2-95	N16-R-90901-2375	R10-28	N16-T-56756	V10-2
N16-R-49923-231	R3-2	N16-R-50614-431	R3-62	N16-R-91031-4464	R10-24	N16-T-56758	V2-17
N16-R-49923-551	R3-19	N16-R-50615-171	R10-31	N16-R-91569-8714	R3-25	N16-T-58241-34	V2-8
N16-R-49924-291	R9-1	N16-R-50633-811	R2-34	N16-R-92939-7898	R1-1	N17-B-77482-8666	E2-9
N16-R-49930-431	R2-46	N16-R-50634-231	R10-17	N16-S-117101-596	I3-3	N17-B-77482-8671	E2-5
N16-R-50012-811	R2-37	N16-R-50635-291	R9-17	N16-S-117101-603	I3-5	N17-B-77483-7057	E2-23
N16-R-50013-231	R2-59	N16-R-50650-431	R2-87	N16-S-117101-604	I3-4	N17-B-77533-5680	E2-21
N16-R-50047-431	R10-50	N16-R-50651-811	R3-1	N16-S-34520-3852	E2-61	N17-B-77533-8524	E2-7
N16-R-50129-811	R3-20	N16-R-50678-811	R10-44	N16-S-34557-8350	E2-65	N17-B-77534-3730	E9-2
N16-R-50147-171	R10-37	N16-R-50714-811	R2-116	N16-S-34607-8400	E2-64	N17-B-77536-1126	E2-1
N16-R-50201-811	R2-28	N16-R-50722-431	R3-3	N16-S-54287-5101	XY3-15A	N17-B-77536-6761	E1-1
N16-R-50281-431	R2-2	N16-R-50822-811	R2-78	N16-S-54524-6151	XY3-15	N17-B-77639-2210	E2-2
N16-R-50282-811	R2-117	N16-R-50837-431	R10-20	N16-S-54548-7001	XY2-21	N17-B-77585-5085	E3-4
N16-R-50283-231	R2-120	N16-R-50839-111	R2-1	N16-S-62603-6676	XV2-1	N17-B-77587-8996	E10-2
N16-R-50283-551	R3-4	N16-R-50930-811	R10-41	N16-S-62603-6692	XV2-4	N17-B-77589-2261	E2-18
N16-R-50284-291	R9-8	N16-R-50975-811	R2-60	N16-S-62603-6701	XV3-1	N17-B-77686-6753	E9-3
N16-R-50336-811	R10-36	N16-R-51110-811	R2-97	N16-S-63510-1931	XV9-1	N17-B-77691-1076	E2-19
N16-R-50337-231	R9-13	N16-R-66140-8326	R2-85	N16-S-63529-1961	XV2-3	N17-B-77692-6062	E3-6
N16-R-50337-551	R3-18	N16-R-68441-2036	R3-61	N16-S-64063-6709	XV2-8	N17-B-77738-4951	E2-13
N16-R-50344-431	R2-121	N16-R-68444-1001	R9-14	N16-S-64063-6718	XV2-16	N17-B-77788-2789	E2-20
N16-R-50354-811	R2-47	N16-R-68462-7801	R10-51	N16-S-89776-6536	L3-8	N17-B-77834-6345	E3-2
N16-R-50362-431	R2-72	N16-R-70549-2355	R3-58	N16-T-52001	V2-18	N17-B-77840-2970	E2-15
N16-R-50362-751	R2-40	N16-R-70721-1375	R3-47	N16-T-53050	V9-5	N17-B-77841-6726	E12-1
N16-R-50363-171	R10-23	N16-R-73524-2996	R10-6	N16-T-55444	V2-19	N17-B-77938-5643	E5-1
N16-R-50371-431	R2-96	N16-R-73525-2764	R10-5	N16-T-55540	V3-8	N17-B-77983-7610	E3-1
N16-R-50372-811	R2-126	N16-R-73526-9435	R10-4	N16-T-55735	V3-8A	N17-B-77984-8028	E10-11
N16-R-50373-231	R9-9	N16-R-73529-7647	R10-3	N16-T-56107	V9-2	N17-B-78064-7701	E2-17
N16-R-50380-431	R3-31	N16-R-73532-3893	R10-2	N16-T-56195	V2-14	N17-B-78113-9025	E9-4
N16-R-50399-811	R2-63	N16-R-73535-7442	R10-1	N16-T-56198	V3-4	N17-B-78178-5025	E10-9
N16-R-50416-431	R10-16	N16-R-87349-4560	R2-128	N16-T-56211	V2-1	N17-B-78222-4517	E3-3
N16-R-50417-811	R3-28	N16-R-87752-5365	R2-101	N16-T-56211-50	V2-5	N17-C-48201-1078	W9-12
N16-R-50479-431	R2-36	N16-R-87849-4406	R2-93	N16-T-56214	V3-1	N17-C-48209-1014	W12-15
N16-R-50480-811	R2-22	N16-R-88079-4270	R9-11	N16-T-56346	V10-7	N17-C-48226-2039	W12-14
N16-R-50497-431	R10-18	N16-R-88179-4439	R3-42	N16-T-56350	V9-4	N17-C-48226-2040	W3-11
N16-R-50498-171	R10-22	N16-R-88182-5251	R2-84	N16-T-56360	V2-4	N17-C-48237-5551	P2-1

TABLE 8-6. CROSS REFERENCE PARTS LIST (Cont'd)

STANDARD NAVY STOCK NO.	KEY SYMBOL
N17-C-67444-1285	E2-28
N17-C-67460-2909	P2-3
N17-C-71126-5833	P3-1
N17-C-71407-6585	P2-9
N17-C-71408-2286	P3-4
N17-C-71412-8709	P2-4
N17-C-71435-7292	P2-2
N17-C-71435-8428	P9-4
N17-C-71515-8115	P3-2
N17-C-71542-6128	P3-3
N17-C-73107-3652	J3-4
N17-C-73108-3753	J2-9
N17-C-73108-5890	J2-2
N17-C-73127-5741	J2-1
N17-C-73138-3593	J2-4
N17-C-73224-1604	J3-2
N17-C-73255-1511	J3-3
N17-C-73446-3401	J3-1
N17-C-73515-8322	P3-12
N17-C-83787-3401	S2-1A
N17-C-920441-251	W5-1
N17-C-98378-3803	O3-2
N17-C-98378-3805	O3-1
N17-C-98378-4008	O2-1
N17-C-98378-4011	O2-4
N17-C-98431-2301	O3-7
N17-F-14310-330	F3-2
N17-F-16302-100	F9-1
N17-F-16302-120	F2-1
N17-F-16302-130	F3-1
N17-F-16302-355	F2-2
N17-F-16468-550	F12-1
N17-F-74265-1001	XF2-1
N17-F-74267-5441	XF3-1
N17-H-60015-4601	R3-13
N17-H-60034-7605	R3-11
N17-I-69154-6206	E3-21
N17-I-69175-6226	E3-15
N17-I-81154-1121	E3-13
N17-J-39248-4418	J2-3
N17-J-39435-6234	J5-1
N17-K-700226-101	E3-46
N17-L-250666-481	XI3-1B
N17-L-3916-100	R10-14
N17-L-50843-5351	XR10-14
N17-L-51625-3285	XV10-10
N17-L-6297	I2-1
N17-L-6806-130	I3-2
N17-L-76664-6164	XI3-1A
N17-L-91354-1299	SP1-1
N17-L-96745-5892	XI3-1
N17-M-19246-8951	M3-1
N17-M-21874-1601	M2-1
N17-M-33967-7401	M10-1
N17-M-83010-1001	A2-1
N17-M-87012-5951	A3-1
N17-P-61400-5186	P5-1
N17-R-64855-2113	K3-1
N17-S-46700-1901	O2-19
N17-S-46742-6241	O2-14
N17-S-46757-9323	O2-12
N17-S-46762-1651	O2-13
N17-S-46763-9156	O2-6
N17-S-46765-2696	O2-22
N17-S-46766-2603	O2-5
N17-S-46774-3416	O2-7
N17-S-46802-1933	O2-16
N17-S-60519-8608	S2-4
N17-S-60683-2501	S2-12
N17-S-60909-8438	S2-12
N17-S-61594-7601	S10-5
N17-S-62184-3987	S2-14
N17-S-62205-6601	S2-14
N17-S-62575-2966	S2-13
N17-S-65063-8758	S3-7
N17-S-65076-4701	S10-2
N17-S-65078-2887	S10-2
N17-S-66042-8763	S2-5
N17-S-60906-5821	S2-4
N17-S-69831-1217	M3-2
N17-S-69948-9101	S3-9
N17-S-70949-2052	S2-15
N17-S-71351-9057	S2-6
N17-S-73203-9821	S3-1
N17-S-73489-3103	S2-7
N17-S-74040-1051	S2-11
N17-S-74040-1125	S2-8
N17-S-74225-3356	S3-8
N17-T-28198-1065	E3-7
N17-T-51748	CR3-1
N17-T-61514-7835	T10-3
N17-T-62478-5001	T1-1
N17-T-64538-6791	T2-7
N17-T-65936-7125	T10-1
N17-T-67590-1416	T2-1
N17-T-67621-8996	T2-4
N17-T-67633-4295	T2-3
N17-T-67633-4320	T2-2
N17-T-69588-7001	T2-8
N17-T-73901-9983	T9-1
N17-T-73902-4001	T3-1
N17-T-81559-8326	Z9-1
N17-T-81915-1451	L2-25
N17-T-81921-4150	L2-1
N17-T-81934-6001	T9-2
N17-T-82061-7711	L2-6
N17-T-82061-8101	L2-13
N17-T-82062-1411	L2-5
N17-T-82062-4120	L2-4
N17-T-82062-6811	L2-3
N17-T-82062-9511	L2-12
N17-T-82064-2301	L2-2
N17-T-82166-3874	Z2-25
N17-T-82166-3879	Z2-8
N17-T-82166-3884	Z2-1
N17-T-82181-1169	Z2-26
N17-T-82181-1174	Z2-9
N17-T-82181-1179	Z2-2
N17-T-82183-1761	L3-4
N17-T-82187-3874	Z2-27
N17-T-82187-3879	Z2-10
N17-T-82187-3884	Z2-3
N17-T-82189-1501	L3-5
N17-T-82199-3874	Z2-28
N17-T-82199-3879	Z2-11
N17-T-82199-3884	Z2-4
N17-T-82201-1758	L3-6
N17-T-82208-5891	Z2-29
N17-T-82208-5895	Z2-12
N17-T-82208-5901	Z2-5
N17-T-82209-1001	L3-7
N17-T-82212-8374	Z2-30
N17-T-82212-8379	Z2-13
N17-T-82212-8384	Z2-6
N17-T-86205-9511	L2-26
N17-W-300921-120	W12-1
N18-R-268-160	I3-6
N43-N-9708-1025	H2-4

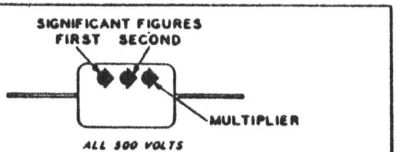
SIGNAL CORPS TYPE NO.	KEY SYMBOL
JK-33A	J5-1
JK-34A	J2-3
PL-259	P2-4
PL-284	P2-2
PL-293	P2-3
PL-68	P5-1
SO-239	J2-2
SO-264	J2-1

SIGNAL CORPS STOCK NO.	KEY SYMBOL
2Z8678.16	XV9-1

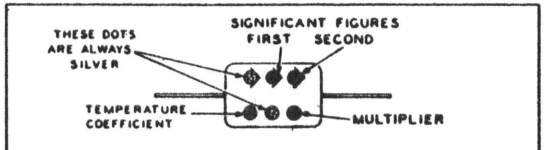
TABLE 8–7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

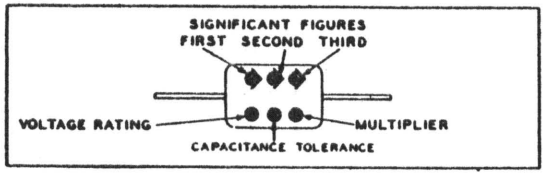
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



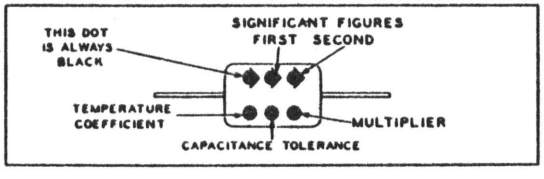
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



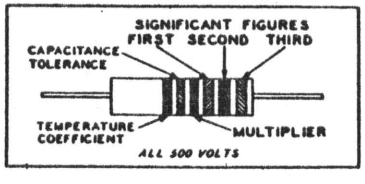
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

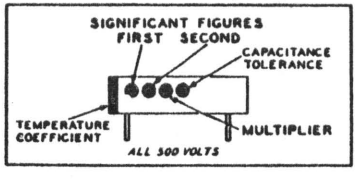


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



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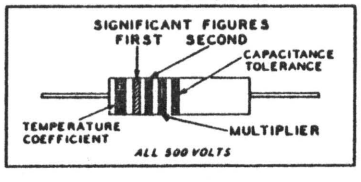


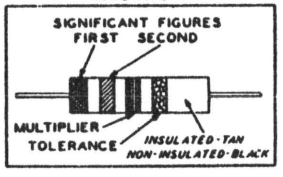
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS				CAPACITORS				
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1000	3	ORANGE	1000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

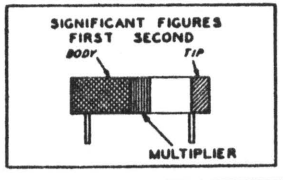
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

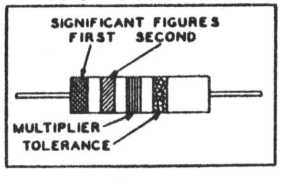


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

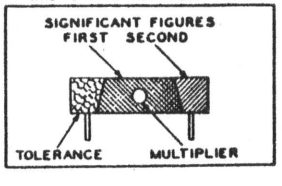


TABLE 8-8. LIST OF MANUFACTURERS

ABBREVIATIONS	PREFIX	NAME	ADDRESS
AB	CBZ	Allen Bradley Co.	Milwaukee, Wis.
AEV	CAW	Aerovox Corp.	New Bedford, Mass.
AHF	——	Allen, H. F., Co., Inc.	Bristol, Conn.
AHH	CHH	Arrow-Hart and Hegeman Electric Co.	Hartford, Conn.
ALP	CIA	Alden Products Co.	Boston, Mass.
ALW	——	Alpha Wire Corp.	Greenwich, Conn.
AMP	CPH	American Phenolic Corp.	Chicago, Ill.
ANL	CAS	American Lava Corp.	Chattanooga, Tenn.
ARTD	CBIA	Arted Co.	Springfield, Mass.
BEI	CATX	Beede Electric Instrument Co.	Penacook, N. H.
BGW	CBH	Boston Gear Works Div. Murray Co. of Texas	Quincy, Mass.
BLY	CQB	Bliley Electric Co.	Erie, Pa.
BUS	CFA	Bussman Mfg. Co.	St. Louis, Mo.
BWA	——	Barnes, Wallace, Co., Div. Associated Spring Corp.	Bristol, Conn.
CDCM	——	Chicago Die Casting Mfg. Co.	Chicago, Ill.
CDN	CBK	Cardwell, Allen D, Mfg. Corp.	Wichita, Kans.
CHL	CCJ	Crowley, Henry L., and Co., Inc.	West Orange, N. J.
CIN	CMG	Cinch Mfg. Corp.	Chicago, Ill.
CLD	CD	Cornell-Dubilier Electric Corp.	South Plainfield, N. J.
CLO	CCC	Continental Carbon Co.	New York, N. Y.
CLR	CMC	Clarostat Mfg. Co., Inc.	Dover, N. H.
CN	CBN	Centralab Div. Globe-Union, Inc.	Milwaukee, Wis.
CPT	CAHW	Croname, Inc.	Chicago, Ill.
CUT	CAE	Cutler-Hammer, Inc.	Milwaukee, Wis.
DLC	CAYZ	Dial Light Co. of America, Inc.	New York, N. Y.
EBY	CEB	Eby Hugh H, Inc.	Philadelphia, Pa.
ELCP	——	Elco Corp.	Philadelphia, Pa.
EMM	CMF	Electro-Motive Mfg. Co.	Willimantic, Conn.
ERC	CER	Erie Resistor Corp.	Erie, Pa.
FTC	CFX	Freed Transformer Co.	New York, N. Y.
GE	CG	General Electric	Schenectady, N. Y.
HAW	CHU	Hubbell, Harvey, Inc.	Bridgeport, Conn.
HMM	CHC	Hammarlund Mfg. Co.	New York, N. Y.
ICA	CAXD	Insuline Corp. of America	Long Island City, N. Y.
IPC	CARO	Industrial Products Co. Div. of Knudsen, Inc.	Danbury, Conn.

TABLE 8-8. LIST OF MANUFACTURERS (Cont'd)

ABBREVIATIONS	PREFIX	NAME	ADDRESS
IRC	CIR	International Resistance Co.	Philadelphia, Pa.
JFE	CAUZ	Jeffers Electronics	St. Marys, Pa.
JNS	CJC	Jones Howard B. Div. Cinch Mfg. Corp.	Chicago, Ill.
JRM	CJS	Jensen Mfg. Co.	Chicago, Ill.
KGE	CANS	Kings Electronics Co.	Brooklyn, N. Y.
KUE	CKU	Kurman Electric Co., Inc.	Long Island City, N. Y.
LTF	CLF	Littelfuse, Inc.	Chicago, Ill.
LTJI	——	Long, Thomas J., Inc.	Brooklyn, N. Y.
MAL	CMA	Mallory Electric Corp.	Detroit, Mich.
MCLO	——	Mechanical Industries Production Co.	Akron, Ohio
MIC	CMR	Micamold Radio Corp.	Brooklyn, N. Y.
MLL	CJA	Millen, James, Mfg. Co., Inc.	Malden, Mass.
MLR	CMM	Miller, J. W. Co.	Los Angeles, Calif.
NAC	CNA	National Co., Inc.	Malden, Mass.
NRCO	CBIB	Northern Radio Co., Inc.	New York, N. Y.
OAK	COC	Oak Mfg. Co.	Chicago, Ill.
PCL	CL	Premier Crystal Laboratories, Inc.	New York, N. Y.
PRME	——	Precision Metal Products Co.	Malden, Mass.
PTH	CPL	Philadelphia Thermometer Co.	Philadelphia, Pa.
RAD	CRK	Radio Condenser Co.	Camden, N. J.
VD	CRV	RCA Victor Div. Radio Corp. of America	Camden, N. J.
SAS	CSO	States Co., The	Hartford, Conn.
SDL	——	Sun Dial Corp.	Essex Falls, N. J.
SMO	CAN	Sangamo Electric Co.	Springfield, Ill.
SPR	CSF	Sprague Electric Co.	North Adams, Mass.
UNT	CUT	United Transformer Co., Industrial Div.	New York, N. Y.
VEE	CASV	Veeder-Root, Inc.	Hartford, Conn.
WAL	CAO	Ward Leonard Electric Co.	Mount Vernon, N. Y.
WS	CV	Weston Electrical Instr. Corp.	Newark, N. J.

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