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NAVSHIPS 91756

INSTRUCTION BOOK

for

RADIO FREQUENCY OSCILLATOR
O-165/UR

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

BUREAU OF SHIPS

NAVY DEPARTMENT

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*Contracts: NObsr 57535 Approved by BuShips: 15 September 1952
NObsr 64825*

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title page	Original	4-1 to 4-25	Original
A to C	Original	5-0	Original
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2-1 to 2-8	Original	8-1 to 8-32	Original
3-1 to 3-6	Original	i-1 to i-3	Original

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.IN REPLY REFER TO
Code 993-100
15 September 1952

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

Subj: Instruction Book for Radio Frequency Oscillator
O-165/UR NAVSHIPS 91756

1. This 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 When superseded by a later edition, this publication shall be destroyed.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 Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

1 March 1953
Temporary Correction T-1
to Instruction Book for
Radio Frequency Oscillator O-165/UR
NAVSHIPS 91756

1. 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 "Reference Desig." will be (1) "Stock Numbers Signal Corps, Standard Navy, Air Force," (2) "Name and Description," (3) "Locating Function," (4).

Page 8-2:

Item C-1, column (1), add 3D9220V-2
Item C-2, column (1), add 3D9023V-4
Item C-3, column (1), add 3D9100-337
Item C-4, column (1), add 3K3010231
Item C-5, column (1), add 3D9010-223
Item C-6, column (1), add 3D9052V-5

Page 8-3:

Item C-8, column (1), add 3K3510221
Item C-9, column (1), add 3D9005-143
Item C-16, column (1), add 3D9010-222
Item C-18, column (1), add 3K3510321

Page 8-4:

Item C-22, column (1), add 3DA5-196
Item C-24, column (1), add 3D9266VE5
Item C-25, column (1), add 3D9050-188

Page 8-5:

Item C-34, column (1), add 3D9045V-1.2
Item C-37, column (1), add 3D9050-189
Item C-40, column (1), add 3DA500-860

Page 8-6:

Item C-44, column (1), add 3DB4-181
Item C-49, column (1), add 3D9050V-41
Item C-56, column (1), add 3D9020-87

Page 8-7:

Item C-57, column (1), add 3K3510332
Item CR-1, column (1), add 2J1N48

Page 8-8:

Item E-13, column (1), add 3G115-24.1
Item E-15, column (1), add 3G1250-12.8

Page 8-9:

Item E-21, column (1), add 3G350-10

Page 8-10:

Item E-37, column (1), add 2Z5822-627
Item E-43, column (1), add 2Z5788-46
Item E-44, column (1), add 2Z5822-801

Page 8-11:

Item E-46, column (1), add 2Z5822-219
Item E-1, column (1), add 3Z2604.1
Item F-2, column (1), add 3Z2592-2
Item I-1, column (1), add 2Z5952
Item I-2, column (1), add 2Z5888-5

Page 8-12:

Item I-6, column (1), add 6Z3417-55
Item J-1, column (1), add 6Z8364
Item J-2, column (1), add 2Z367-38
Item J-4, column (1), add 2Z3062-162
Item J-5, column (1), delete SO-239(-49194), add 2Z8799-239;
column (2), add "Sig Type No. SO-239, Navy Type No. -49194",
after "copper alloy contacts".
Item J-6, column (1), delete JK-34A, add 2Z5534; column (2),
add "Sig Type No. JK-34A" after "bakelite and ceramic insulation"

Page 8-13:

Item K-1, column (1), add 2Z7585.215 (adjusted), 2Z7587.297 (unadjusted)
Item L-1, column (1), add 3C575X-21
Item L-2, column (1), add 3C1084Z108-1
Item L-3, column (1), add 3C1084Z108-2

Page 8-14:

Item L-4, column (1), add 2Z9626.69
Item L-5, column (1), add 2Z9626.70
Item L-6, column (1), add 2Z9626.71
Item L-7, column (1), add 2Z9626.72

Page 8-15:

Item L-8, column (1), add 3Z1891A-22
Item M-1, column (1), add 3F891-5
Item O-1, column (1), add 2Z3295-185
Item O-2, column (1), add 2Z3295-200

Page 8-16:

Item O-7, column (1), add 4G393
Item O-9, column (1), add 2Z4878A-30
Item P-2, column (1), add 2Z7116.45
Item P-3, column (1), add 2Z7226-203
Item P-4, column (1), add 2Z3021-168

Page 8-17:

Item P-5, column (1), delete PL-259(-49190), add 2Z7226-259;
column (2), add "Sig Type No. PL-259, Navy Type No. -49190"
after "pin contact"
Item R-4, column (1), add 3RC4OBF103K

Page 8-18:

Item R-7, column (1), add 3RC2OBF101K
Item R-11, column (1), add 6Z5054-55
Item R-13, column (1), add 6Z5054-54

Page 8-19:

Item R-18, column (1), add 3RC4OBF153K
Item R-19, column (1), add 3RC4OBF102K
Item R-20, column (1), add 3RC2OBF372K
Item R-21, column (1), add 3RC2OBF471K
Item R-25, column (1), add 3Z7450-197

Page 8-20:

Item R-31, column (1), add 3RC2OBF243J
Item R-32, column (1), add 3RC2OBF103J
Item R-33, column (1), add 3RC2OBF120J
Item R-38, column (1), add 3Z710-81

Page 8-21:

Item R-41, column (1), add 3RC4OBF120K
Item R-42, column (1), add 3Z7498-50.210
Item R-47, column (1), add 3Z5473-15
Item R-49, column (1), add 3RC2OBF510J

Page 8-22:

Item R-51, column (1), add 3RC4OBF563K
Item R-58, column (1), add 3Z6035-51

Page 8-22 (cont'd):

Item R-59, column (1), add 3RC20BF681K
Item R-61, column (1), add 3Z6610-244
Item R-62, column (1), add 3RC20BF913J

Page 8-23:

Item S-1, column (1), add 3Z9858-8.241
Item S-2, column (1), add 3Z9858-8.242
Item S-5, column (1), add 3Z9825-55.86

Page 8-24:

Item S-7, column (1), add 3Z9825-58.22
Item S-8, column (1), add 3Z9858-8.240

Page 8-25:

Item S-9, column (1), add 3Z9695-46
Item T-1, column (1), add 2Z9621-429
Item U-1, column (1), add 2Z3876.149
Item U-2, column (1), add 2Z3876.169
Item V-1, column (1), add 2J6C4
Item V-3, column (1), add 2J6BE6
Item V-4, column (1), add 2J6AQ5

Page 8-26:

Item V-8A, column (1), add 2J5Y5GT
Item V-9, column (1), add V92J12AU7
Item W-11, column (1), add 3E7350.1-26.4
Item XF-1, column (1), add 3Z3282-42.9

Page 8-27:

Item XI-1, column (1), add 2Z5991-257
Item XI-1A, column (1), add 2Z5884-115
Item XI-1B, column (1), add 2Z6125-211
Item XV-1, column (1), add 2Z8677.220

Page 8-28:

Item XV-9, column (1), add 2Z8679.56
Item XY-1, column (1), add 2Z8761-48
Item XY-15, column (1), add 2Z8672.3
Item Y-1, column (1), add 2X244-100

1 June 1955
Temporary Correction T-2
to Instruction Book for
Radio Frequency Oscillator
0-165/UR Navships 91756

Temporary Correction T-2 is issued to correct an error in the schematic diagram.

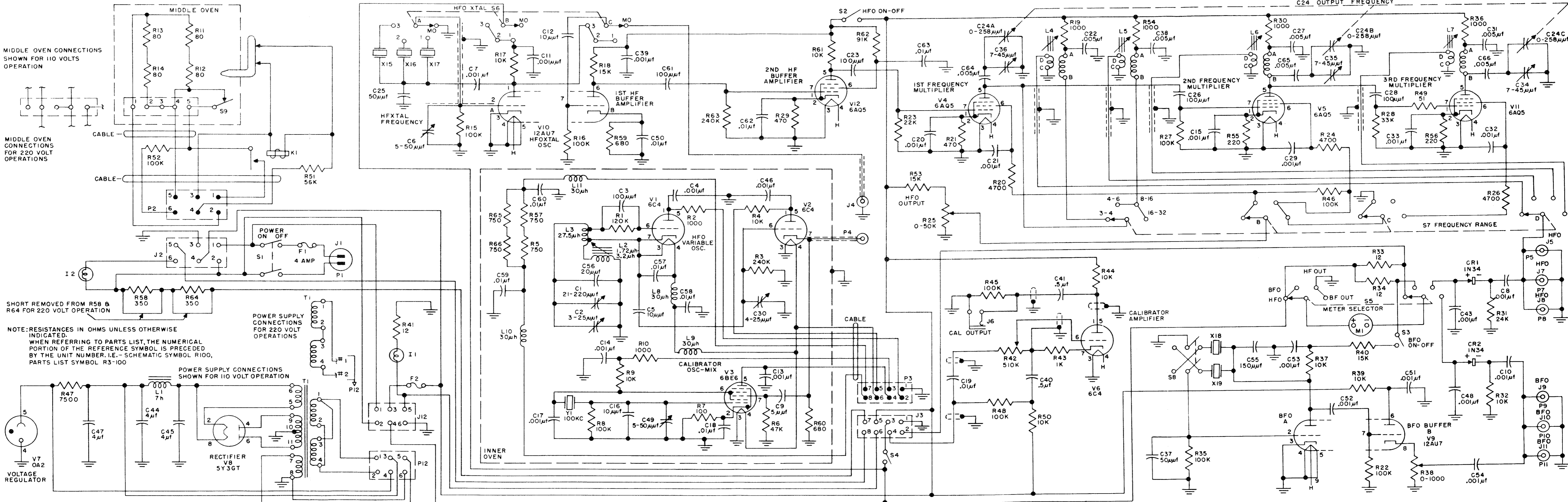
Make the following change in Section 7.

Pages 7-13--7-14.

Remove figure 7-12 and insert the attached, corrected figure 7-12.

Contracts: NObsr-57535
NObsr-64825

T-2 Pages 1-2
(of 4 pages)



MIDDLE OVEN CONNECTIONS SHOWN FOR 110 VOLTS OPERATION

MIDDLE OVEN CONNECTIONS FOR 220 VOLT OPERATIONS

SHORT REMOVED FROM R58 B R64 FOR 220 VOLT OPERATION

NOTE: 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 R3-100

V7 OA2 VOLTAGE REGULATOR

POWER SUPPLY CONNECTIONS FOR 220 VOLT OPERATIONS

POWER SUPPLY CONNECTIONS SHOWN FOR 110 VOLT OPERATION

Figure 7-12. RF Oscillator O-165/UR, Schematic Diagram

15 July 1955
Temporary Correction T-3
to Instruction Book for
Radio Frequency Oscillator
0-165/UR Navships 91756

Temporary Correction T-3 is issued to make a correction and an addition to the circuit diagrams and parts list.

Make the following changes in Section 2.

Page 2-8, Figure 2-9

Resistor R51 in series with the B supply to the thermostat is to be replaced by two resistors, R68 and R69, in series. This change is made to improve the heat dissipation.

Across the contacts of thermostat M2, connect a network consisting of R67 and C67 in series, with the capacitor connected to the hot side. This addition has been made in order to dissipate some of the transient produced at the mercury contacts of M2.

Make the following changes in Section 7.

Pages 7-13--7-14, Figure 7-12

In the middle oven circuit, resistor R51 in series with the B supply to the thermostat M2, is to be replaced by two resistors, R68 and R69, in series. This change is made to improve the heat dissipation.

Across the contacts of thermostat M2, connect a network consisting of R67 and C67 in series, with the capacitor connected to the hot side. This addition has been made in order to dissipate some of the transient produced at the mercury contacts of M2.

Make the following additions in Section 8.

Table 8-4. Table of Replaceable Parts

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C67		CAPACITOR, FIXED: 0.5 mfd, 200 V; Aerovox, Part No. P-282.	b.e.m.f. suppressor
R67		RESISTOR, FIXED, COMPOSI- TION: body style No. 14 MBCA Ref Dwg Group 1; 470 ohms total resistance, $\pm 10\%$ tolerance; 1/2 w power dissipation; F characteristic; 0.406 in lg max; 0.175 in dia max; insulated, resistant to humidity; 2 terminals, wire lead type; mfgs Part No. Allen Bradley EB4711.	b.e.m.f. suppressor
R68		RESISTOR, FIXED, COMPOSI- TION: 27k ohms $\pm 10\%$; 2 watts.	Thermostat series resistor
R69		Same as R68	Thermostat series resistor

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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 redesigned 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 57535

Date of Contract, 16 June, 1952

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 time 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.

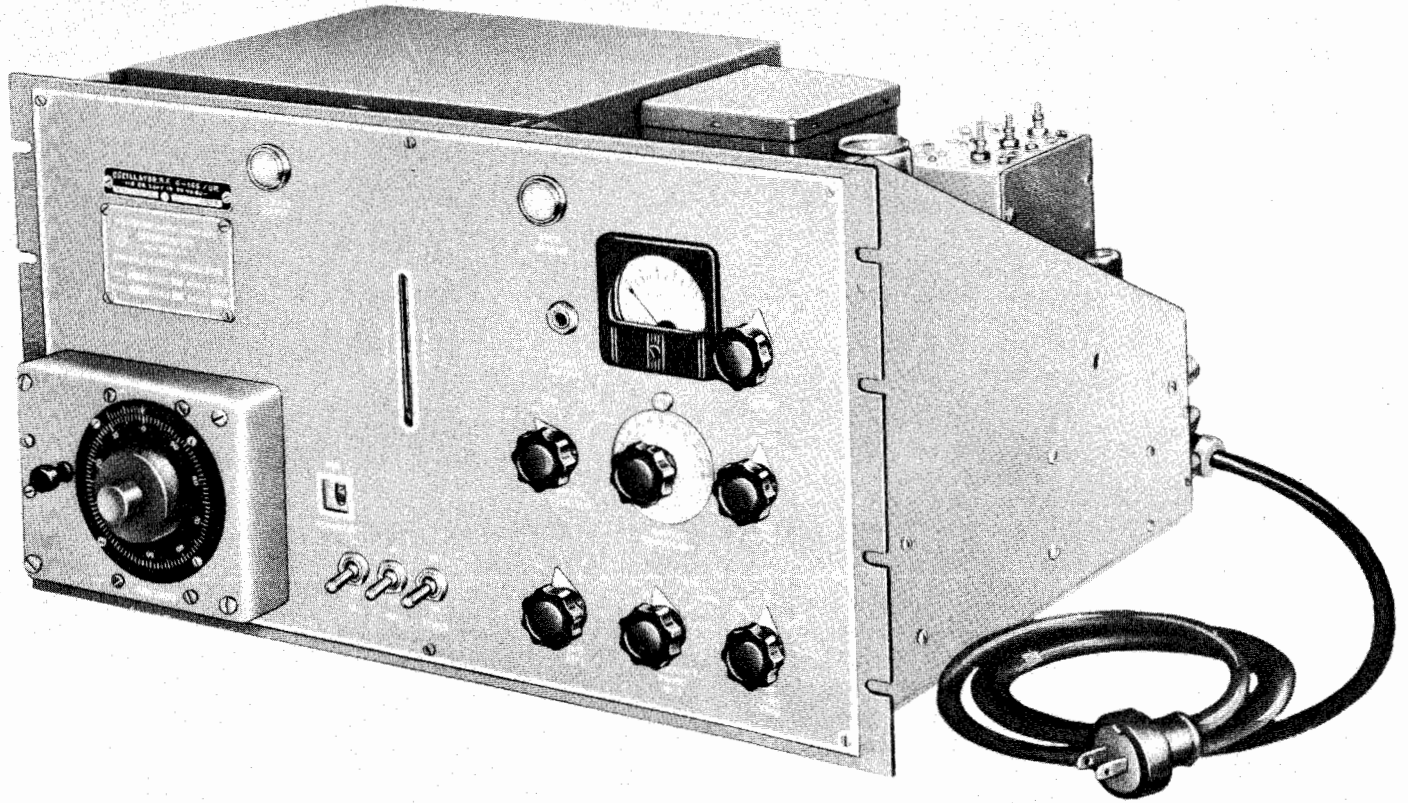


Figure 1-1. Radio Frequency Oscillator O-165/UR

SECTION 1

GENERAL DESCRIPTION

1. INTRODUCTION.

(See figure 1-1.)

This instruction book includes information necessary for the installation, operation, and maintenance of Radio Frequency Oscillator O-165/UR. The equipment supplied is listed in Table 1-1, and the equipment required but not supplied is listed in Table 1-2.

2. PURPOSE AND BASIC PRINCIPLES OF THE EQUIPMENT.

Radio Frequency Oscillator O-165/UR can be operated as a fixed or variable frequency exciter. As a fixed frequency exciter crystal oscillator, it operates with a degree of stability determined by the crystal design, and is used where pre-assigned frequencies are required. As a variable frequency exciter, it provides signals whose frequency stability is equivalent to that obtainable with crystal oscillators without requiring crystals.

The equipment can be used for exciting a transmitter, for supplying local oscillator injection voltage to receivers, or for other applications where r-f signals are required for testing and measuring purposes. Front panel controls are provided for the selection, adjustment, and control of the various r-f outputs which are available.

RF Oscillator O-165/UR consists of a high frequency oscillator (HFO) that can be operated at any one of three pre-set crystal frequencies in the range of 2 to 4 megacycles, or any continuously variable frequency in the same range. Either HFO output can be applied to a series of frequency multipliers that are connected in combinations suitable for obtaining frequencies in the range of 2 to 32 megacycles. A separate low-frequency crystal oscillator, operating in the range of 450 to 475 kc, supplies a stable output that can be used in a receiver as the beat frequency oscillator (BFO) signal for the reception of continuous wave (CW) signals.

3. CABLES.

A power cable, shown in figure 1-1, is provided for use with the RF Oscillator O-165/UR.

4. REFERENCE DATA.

a. Equipment designation:

Radio Frequency Oscillator O-165/UR.

- b. Contract number and date:
NObsr 57535 dated 16 June, 1952.
- c. Contractor:
Northern Radio Company, Inc.
New York, New York.
- d. Cognizant Inspector:
Inspector of Naval Material
250 Hudson Street
New York, New York.
- e. Number of packages per complete shipment:
1 plus spare parts package.
- f. Total cubical contents (excluding spares):
Crated: 3.3 cubic feet.
Uncrated: 1.6 cubic feet.
- g. Total weight (excluding spares):
Crated: 100 pounds.
Uncrated: 54 pounds.
- b. Frequency range:
Variable HFO: 2-32 Mc continuous.
BFO: 450-475 kc.
- i. Tuning 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:
Provision for 3 HFO and 2 BFO crystals.
- k. Types of frequency control:
Temperature-controlled variable oscillator,
or choice of 3 crystals.
- l. Number of outputs:
HFO: Three.
BFO: Three.
- m. Output connectors:
Type
- n. Output impedance:
Nominal 72 ohm coaxial (Type RG-11/U
cable).
- o. Output level:
HFO: For 2-4 Mc: 2 watts.
BFO: For 4-32 Mc: 0.5 watts.
- p. Crystals supplied:
(HFO and BFO crystals not supplied)
100-kc calibrating oscillator.

- q. Frequency stability data:
Variable HFO: ± 20 cps/Mc for ambient change of $+25$ or -25 degrees C. for any eight hour period. 5 cps/ Mc for 10% line voltage change.
Crystal HFO: Depends on type crystal used.
Crystal BFO: Depends on type crystal used.
- r. Power supply:
110/220 volts, 50/60 cycles per second, single phase AC.
- s. Power required:
200 watts.

- t. Mounting:
Standard 19-inch rack.

5. EQUIPMENT SUPPLIED.

The equipment supplied by the manufacturer is listed in Table 1-1.

6. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The additional equipment required for the operation of Oscillator O-165/UR, but not supplied by the manufacturer, is listed in Table 1-2.

7. SHIPPING DATA.

Table 1-3 gives the essential shipping data for the Radio Frequency Oscillator O-165/UR.

TABLE 1-1. EQUIPMENT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVERALL DIMENSIONS			VOLUME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Radio Frequency Oscillator O-165/UR, including power cable.	O-165/UR	10-1/2	19	14	1.6	54
2	Instruction Books						

Unless otherwise stated, dimensions in inches, cubic feet, pounds.

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
3	HFO crystals	Crystal type CR-18/U mounting base.	For providing RF Oscillator O-165/UR crystal HFO signal.	See Section 4, para- graph 3a(7) to de- termine frequencies.
2	BFO crystals	Crystal type CR-18/U mounting base.	For providing RF Oscillator O-165/UR crystal BFO signal.	See Section 4, para- graph 3c(1) to de- termine frequencies.

TABLE 1-3. SHIPPING DATA

CONTENTS	DESIGNATION	OVERALL DIMENSIONS			VOLUME	WEIGHT
		HEIGHT	WIDTH	DEPTH		
RF Oscillator including power cable, three coaxial (PL- 259) connectors (for HFO and BFO jacks), instruc- tions.	O-165/UR	13-1/2	28	15	3.3	100

Unless otherwise stated, dimensions in inches, cubic feet, pounds.

8. ELECTRON TUBE COMPLEMENT.

Table 1-4 lists the quantity and types of electron tubes in RF Oscillator O-165/UR.

TABLE 1-4. ELECTRON TUBE COMPLEMENT

TUBE TYPE	0A2	12AU7	6C4	6AQ5	5Y3/GT	6BE6	TOTAL
QUANTITY	1	2	3	4	1	1	12

**SECTION 2
THEORY OF OPERATION**

1. INTRODUCTION.

Radio Frequency Oscillator O-165/UR generates radio frequency (r-f) signals in the range of 2 to 32 megacycles. It also generates r-f signals in the range of 450 to 475 kilocycles. These essentially sinusoidal outputs can be used in any application or system that requires highly stable r-f inputs (i.e., local oscillator voltage in diversity receivers, transmitter exciter signal, BFO signal, and so forth).

2. BLOCK DIAGRAM DESCRIPTION.

(See figure 2-1.)

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 2-1 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.

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 frequency of two to four megacycles. The calibrator provides heterodyning signals at twenty-one main check points which are spaced at 100 kc intervals and at 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 other frequencies and are not used for calibration purposes.

TABLE 2-1. 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

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.

The beat frequency crystal oscillator stage V9A produces a signal which is fed through buffer stage V9B to the BFO output connector.

The power supply converts the external available power to power suitable for use in RF Oscillator O-165/UR.

3. DETAILED CIRCUIT ANALYSIS.

(See figure 7-12.)

a. VARIABLE OSCILLATOR VI.—The variable oscillator is a grounded plate Hartley circuit. The tuned circuit consists of the main tuning capacitor C1, fixed

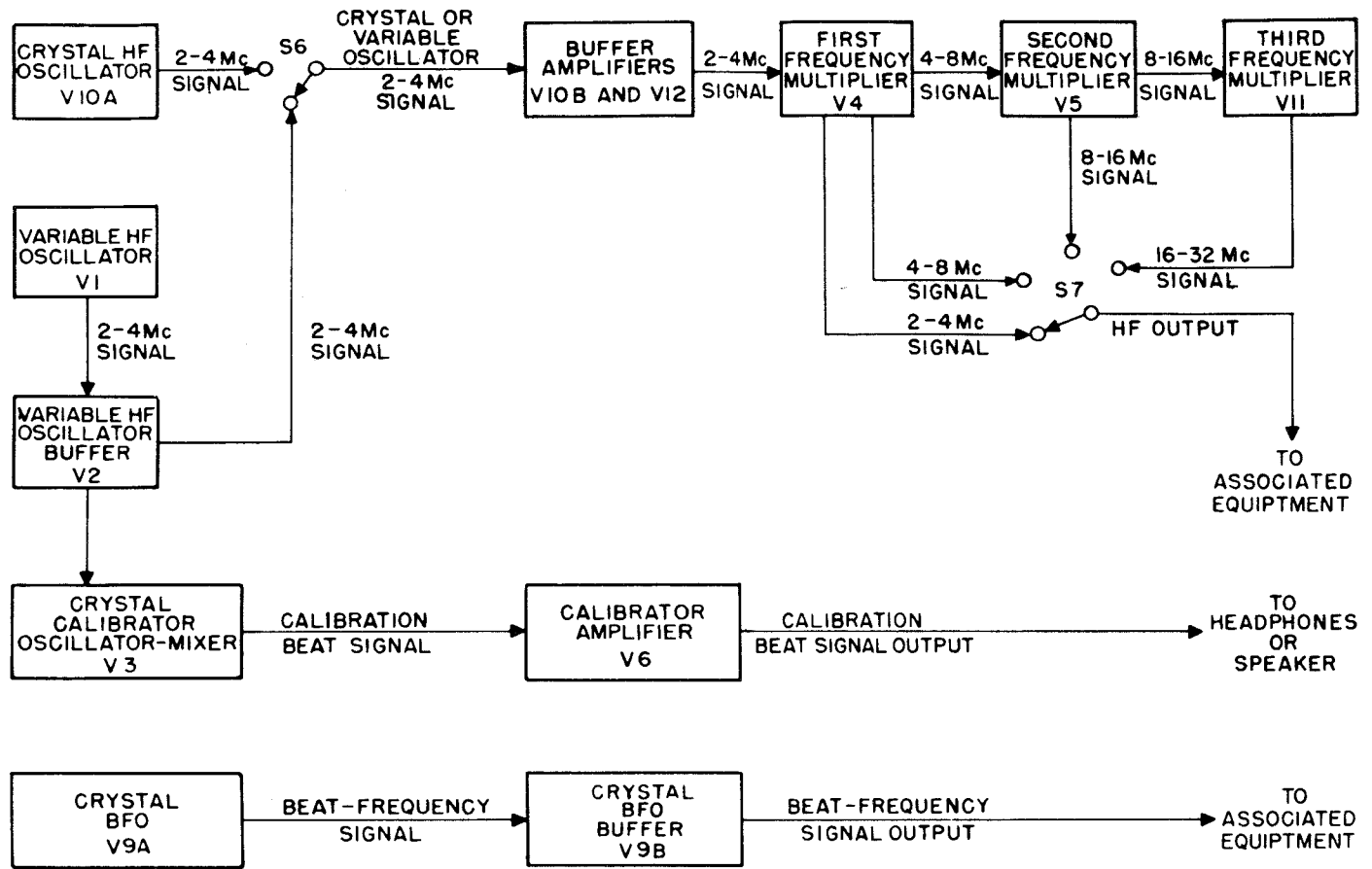


Figure 2-1. RF Oscillator O-165/UR, Block Diagram

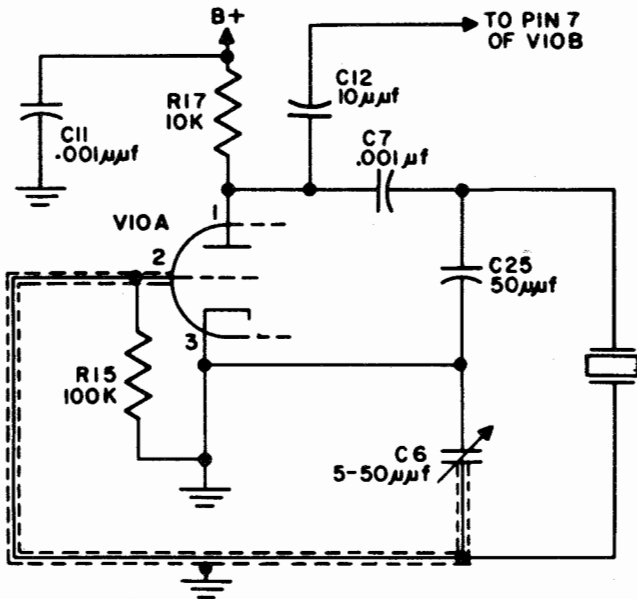
capacitor C56, trimmer capacitor C2, inductor L3, and slug-tuned inductor L2. One tap on inductor L3 is connected to the grid of tube V1 through coupling capacitor C3 and grid leak resistor R1. A second tap on inductor L3 is connected to the cathode of grid V1. The plate voltage is filtered by resistor 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.

b. 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.

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

d. 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



NOTE ALL RESISTANCES IN OHMS UNLESS OTHERWISE SPECIFIED.

Figure 2-2. Crystal HFO Circuit, Simplified Schematic

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.

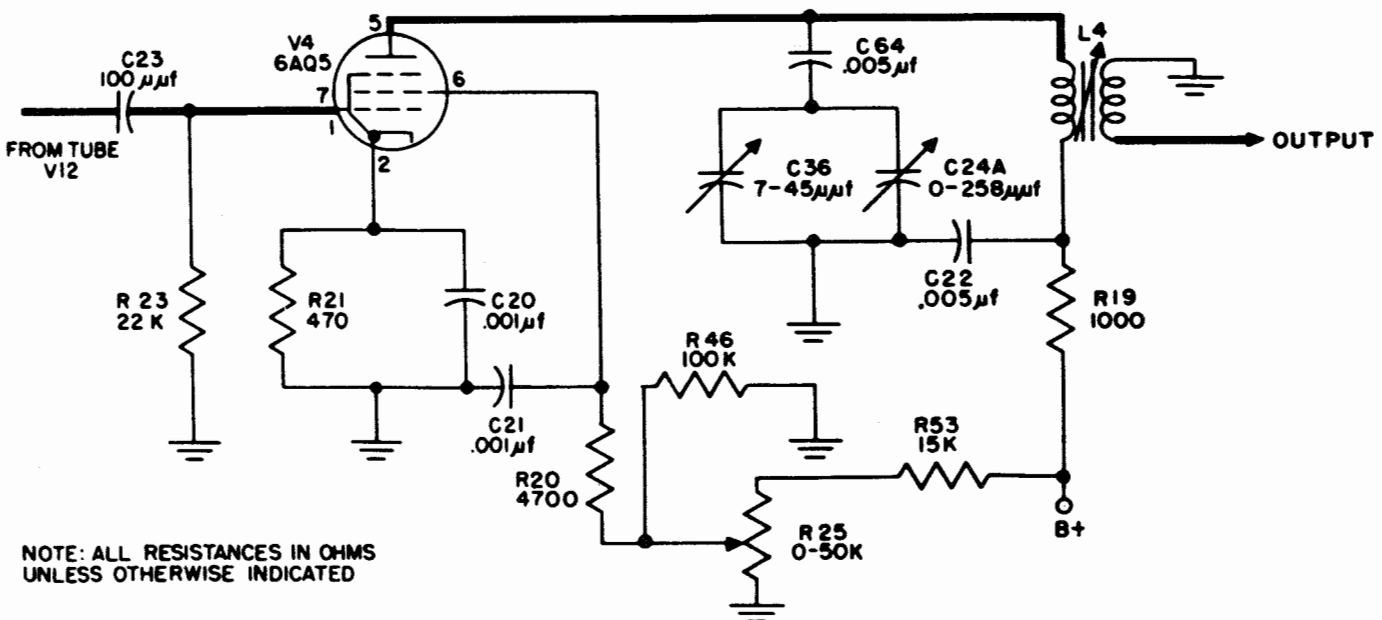
e. FREQUENCY MULTIPLIERS V4, V5 and V11.

(1) 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.

(2) 2-4 MEGACYCLES. (See figure 2-3.)—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 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.

(3) 4-8 MEGACYCLES. (See figure 2-4.)—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



NOTE: ALL RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED

Figure 2-3. FREQUENCY RANGE MC Switch in "2-4" Position, Simplified Schematic

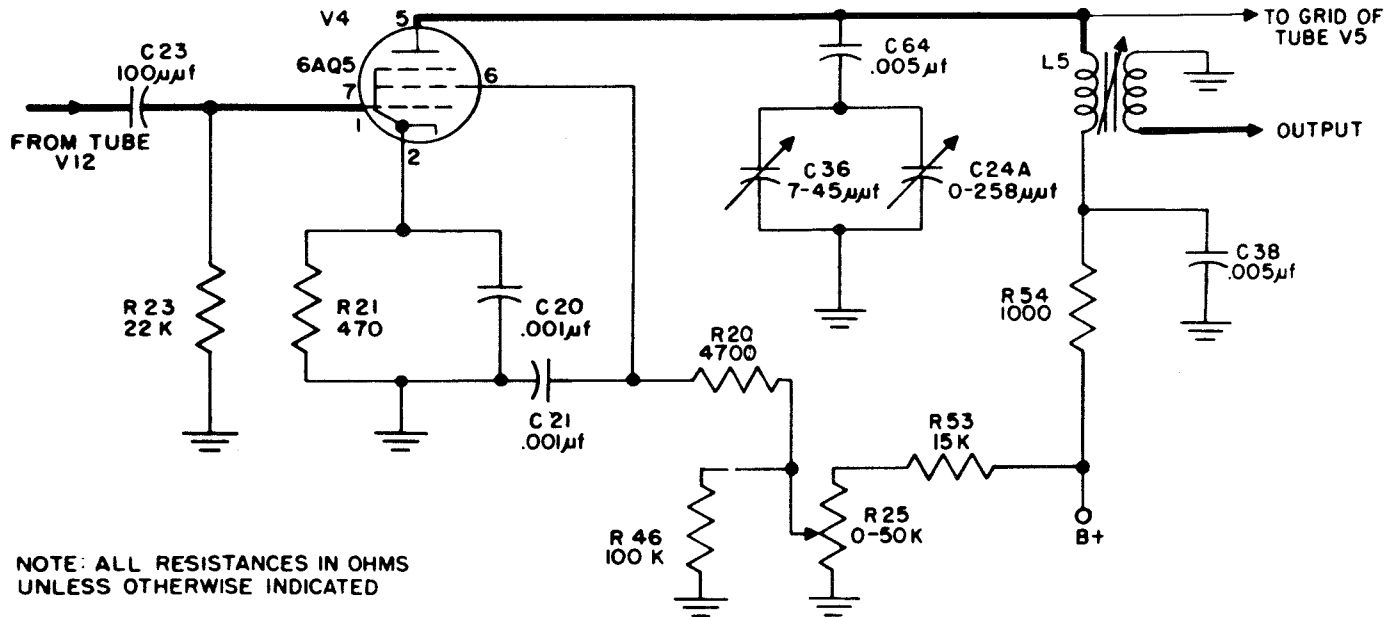


Figure 2-4. FREQUENCY RANGE MC Switch in "4-8" Position, Simplified Schematic

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.

(4) 8-16 MEGACYCLES. (See figure 2-5.)—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 VII. However, tube VII is inoperative because the screen grid is disconnected.

(5) 16-32 MEGACYCLES. (See figure 2-6.)—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 VII through coupling capacitor C28. Bias for tube VII

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 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 VII. The doubled frequency is applied to the output connectors from inductor L7 secondary.

f. CRYSTAL BEAT FREQUENCY OSCILLATOR V9A. (See figure 2-7.)—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 capacitor C52.

g. 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.

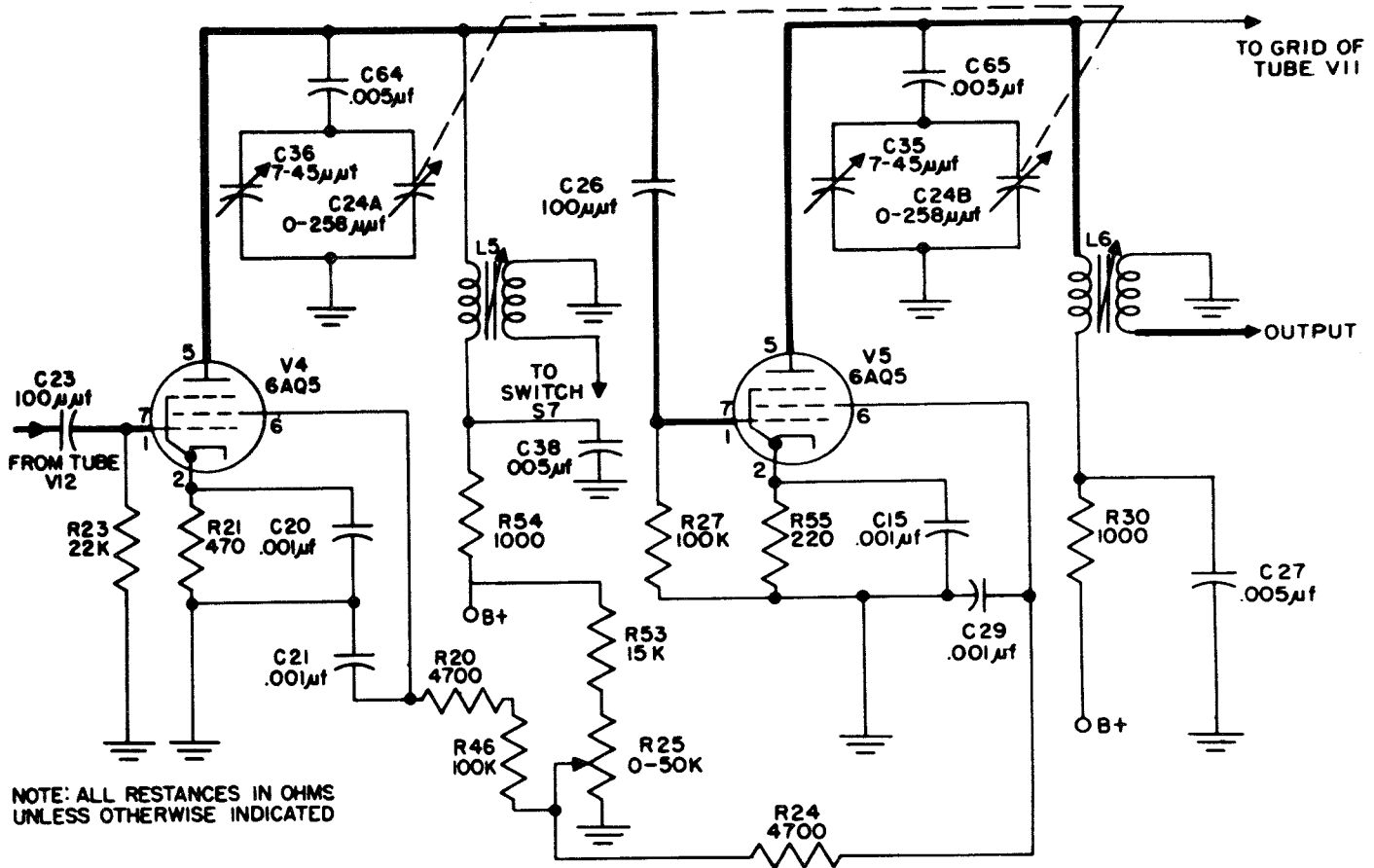


Figure 2-5. FREQUENCY RANGE MC Switch in "8-16" Position, Simplified Schematic

b. CRYSTAL CALIBRATION OSCILLATOR MIXER V3. (See figure 2-8.)—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 cathode. 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.

i. 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 unby-passed 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.

j. POWER SUPPLY V7 and V8.—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.

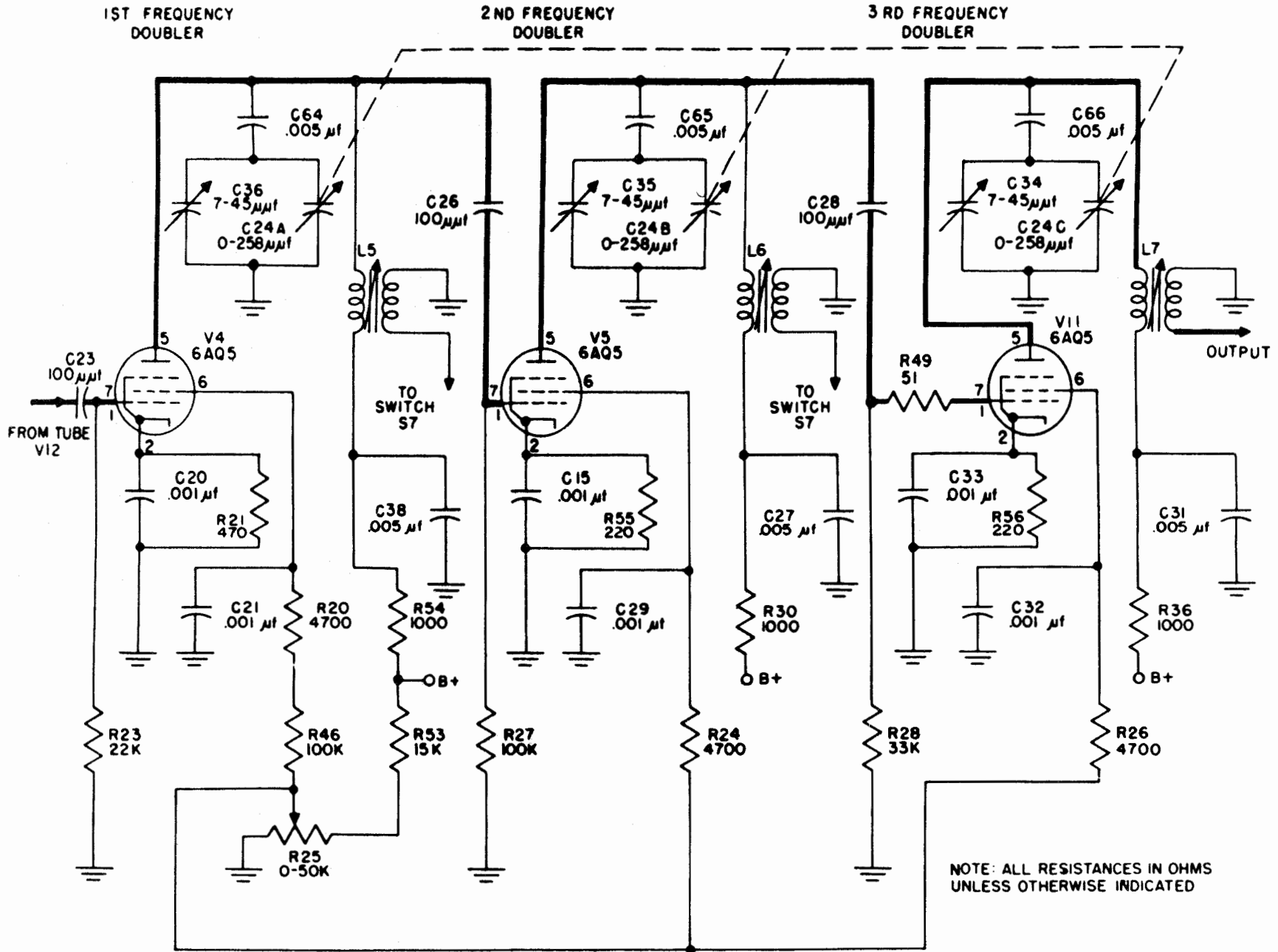


Figure 2-6. FREQUENCY RANGE MC Switch in "16-32" Position, Simplified Schematic

k. METER M1.—METER SELECTOR switch S5 is used to connect the meter into various circuits. Table 2-2 gives the meter readings at each setting of the switch S5.

TABLE 2-2. 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 oscillator 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.

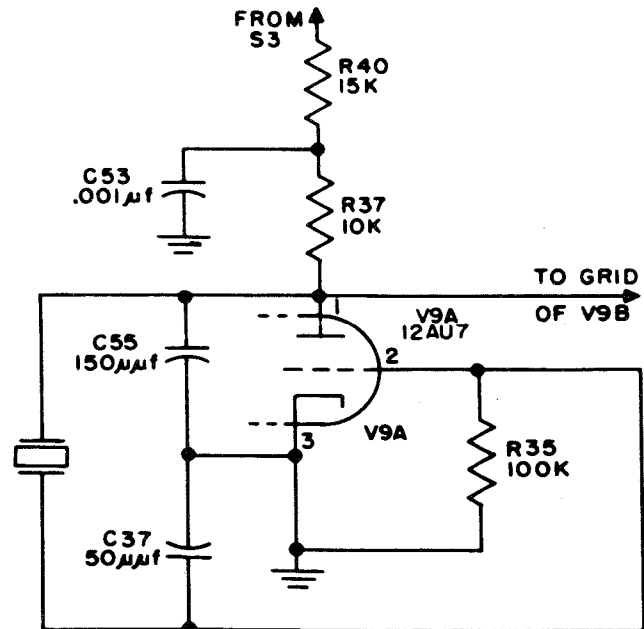


Figure 2-7. Crystal BFO Circuit, Simplified Schematic

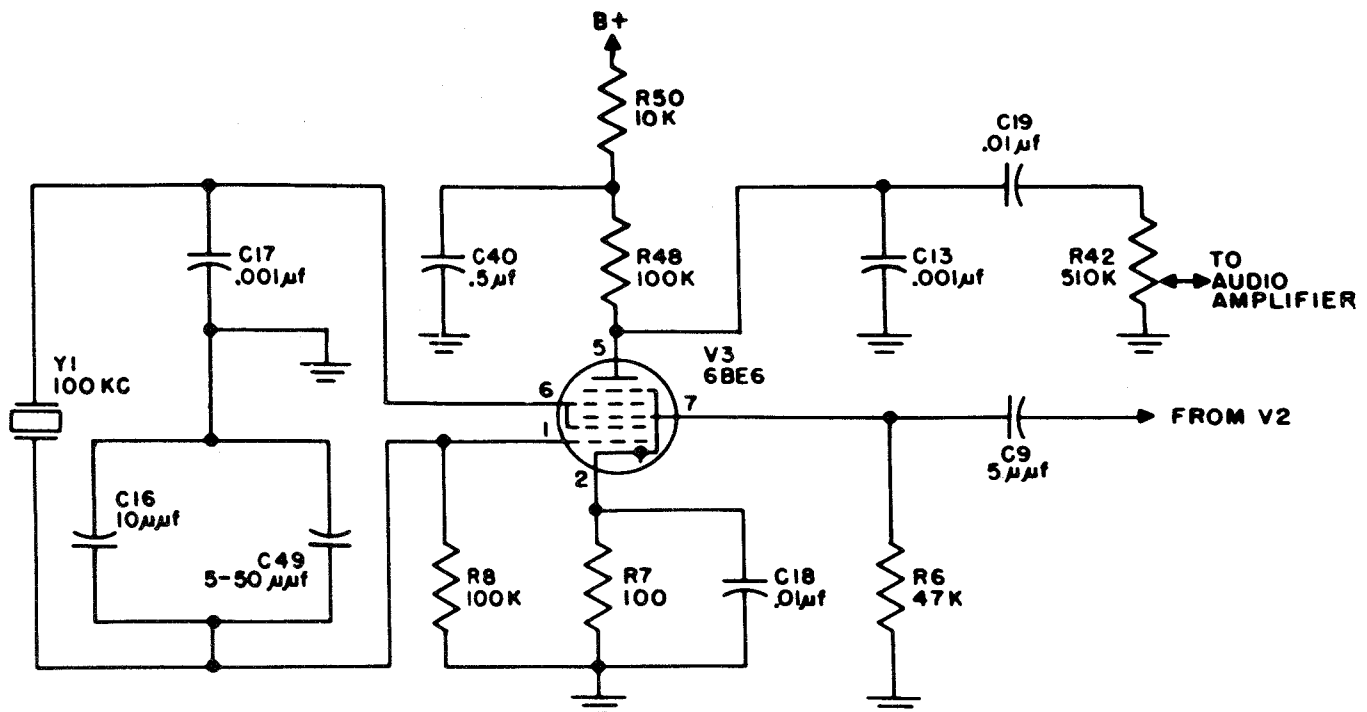


Figure 2-8. Calibrator Oscillator-Mixer, Simplified Schematic

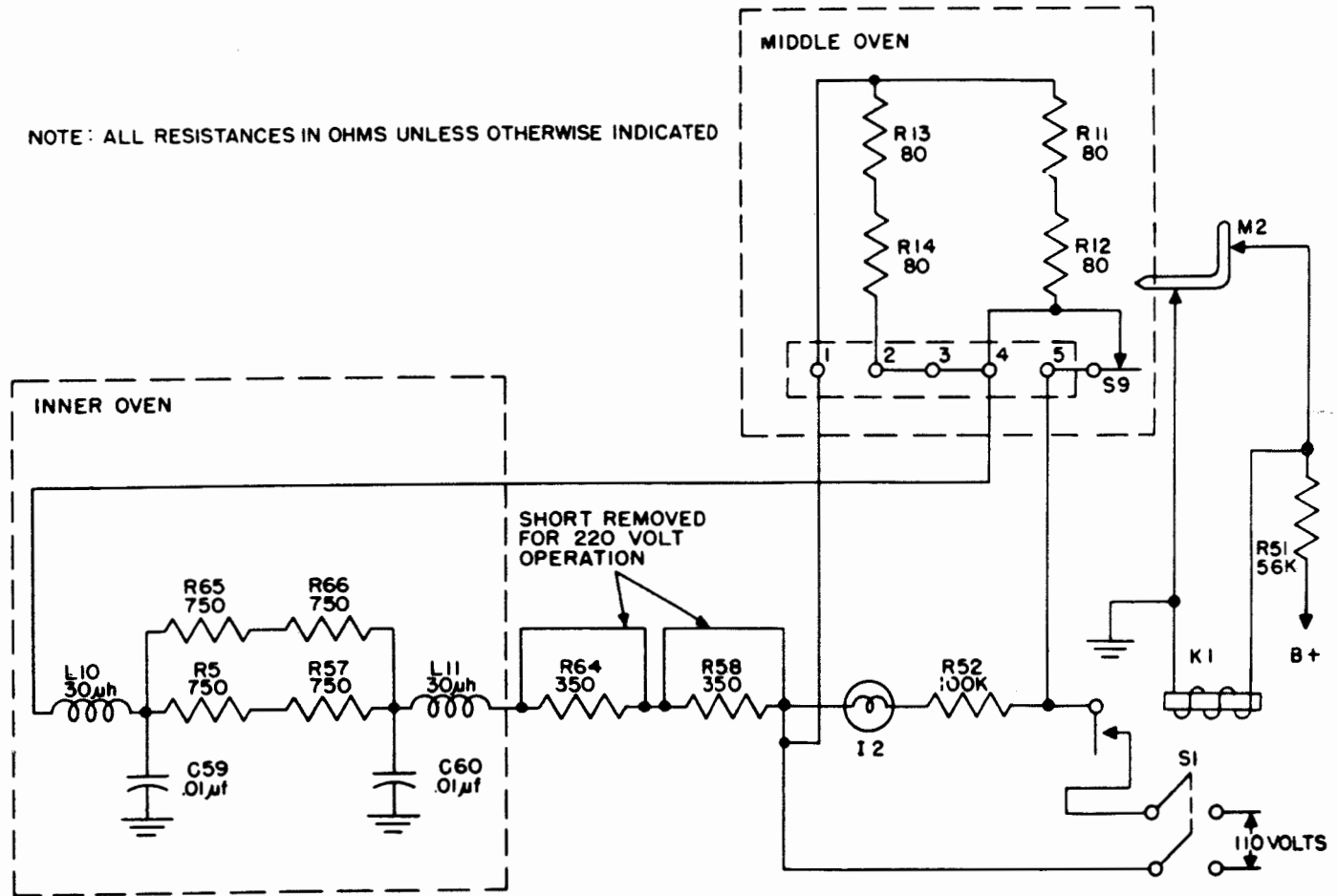


Figure 2-9. Temperature Control Circuit, Simplified Schematic

1. TEMPERATURE CONTROL. (See figure 2-9.)— A three-section oven in RF Oscillator O-165/UR is provided to control the temperature. The oven controls 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 oven sections from the POWER switch S1. The outer oven section 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.

SECTION 3 INSTALLATION

1. UNPACKING.

CAUTION

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

RF Oscillator O-165/UR is packed in a wooden export box. The dimensions and weight are given in Table 1-3 of Section 1. The following procedure should be used in unpacking:

- a. Remove the packing case top lid by removing the nails with a nail puller.
- b. Cut the tape and seals of the case liner. Be careful not to damage the liner more than is necessary.
- c. Cut the tape that seals the top flap of the inner container. Open the container and remove the moisture-vaporproof barrier.
- d. Open the innermost container. Remove RF Oscillator O-165/UR, the four envelopes, and the desiccant.
- e. Place the unit, the envelope that contains the power cord, the envelope that contains the six coaxial connectors and the special Allen wrench, and the two envelopes containing the instruction books, in a safe clean place.

2. INSTALLATION.

a. GENERAL.—RF Oscillator O-165/UR is designed to be mounted in a standard 19-inch relay rack or other suitable mounting device. Figure 3-4 is an outline dimension drawing of the unit. If the unit is to be mounted in a cabinet, allow sufficient ventilation to avoid overheating of parts. A firm, level base and suitable ground circuit should be provided, and a minimum working space of four feet in front and two feet in the rear of the equipment are required. The unit should be fastened to its mounting device by means of machine screws, lockwashers, and nuts.

b. ELECTRICAL CONNECTIONS.—RF Oscillator O-165/UR can be operated from either a 110-volt or 220-volt 50/60-cps a-c source. It leaves the factory wired for 110-volt operation. If operation from a 220-volt source is desired, make the necessary changes to the power transformer and oven thermal control system wiring, as follows:

(1) Separate the power supply sub-assembly from the electronic chassis by removing the eight screws that secure it. Lift the power supply up, taking care not to damage the connecting plug P12 or jack J12.

(2) Disconnect the strapping between terminals 1, 3, and 2, 4 on transformer T1. Do not unsolder the leads from plug P12 to terminals 1 and 4. See the wiring diagram, figure 7-13.

(3) Connect terminals 2 and 3 together.

(4) Replace the power supply sub-assembly.

(5) Remove the shorting straps across resistors R58 and R64 on terminal board E3 shown in figure 7-4.

(6) Disassemble the oven as described in Section 7, paragraph 4b.

(7) On terminal board E6 in the middle oven, shown in figure 7-6, unsolder the lead connected to terminal 1. Solder this lead to terminal 2. Remove the jumper between terminals 2 and 3. See the wiring diagram, figure 7-13.

(8) Reassemble and replace the oven as described in Section 7, paragraph 4c.

Connect the power cord to the recessed AC INPUT male connector at the rear of the unit and to the source of primary power. Fabricate r-f output cables as shown in figure 3-1, using the coaxial connectors provided. Connect these cables to the HFO or the BFO output jacks, as required. See figure 3-3. Each set of three jacks is parallel-connected.

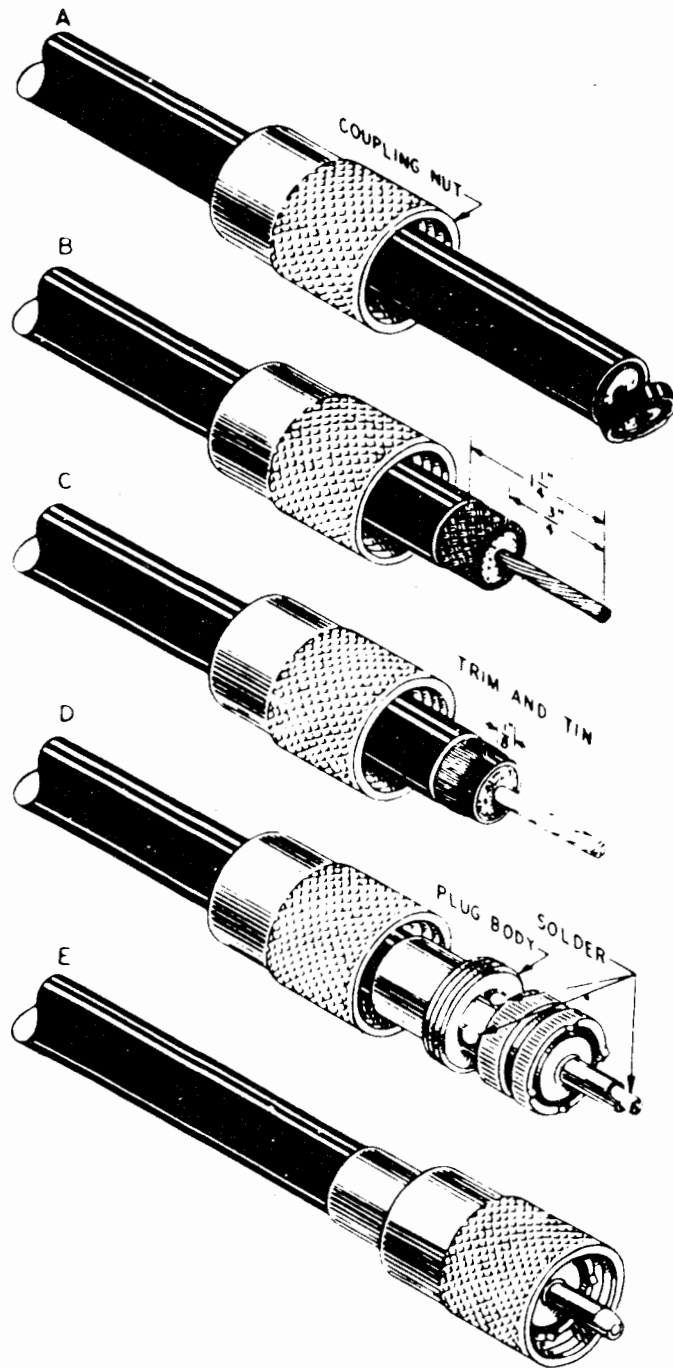
3. INITIAL ADJUSTMENTS AND OPERATIONAL CHECKS.

RF Oscillator O-165/UR must be turned on for a period of at least eight hours before its anticipated use, since that length of time is required to insure stable operation.

To make the equipment operative, turn the POWER switch S1 on the front panel to ON. After ten minutes, check to see that the thermometer reads 58° to 62°.

a. 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. The aging process is as follows:

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



(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 $1\frac{1}{4}$ " from the end. Be careful not to nick the copper braid underneath. Cut the copper braid and inner insulation $\frac{3}{4}$ " from the end.

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

(D) Screw the plug body over the outer jacket until $\frac{1}{16}$ " 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 3-1. Cable Fabrication Instructions

(2) Turn the POWER switch S1 off for about four hours.

(3) Repeat cycle as in (1) and (2) above.

(4) After running the unit through the two heat cycles, turn on the power and allow the unit to operate

for at least 12 to 18 hours.

b. CALIBRATION OF VARIABLE OSCILLATOR. (See figures 3-2 and 3-3.)—To calibrate the variable oscillator against the crystal oscillator for the entire range of the oscillator, adjust the CAL OUTPUT con-

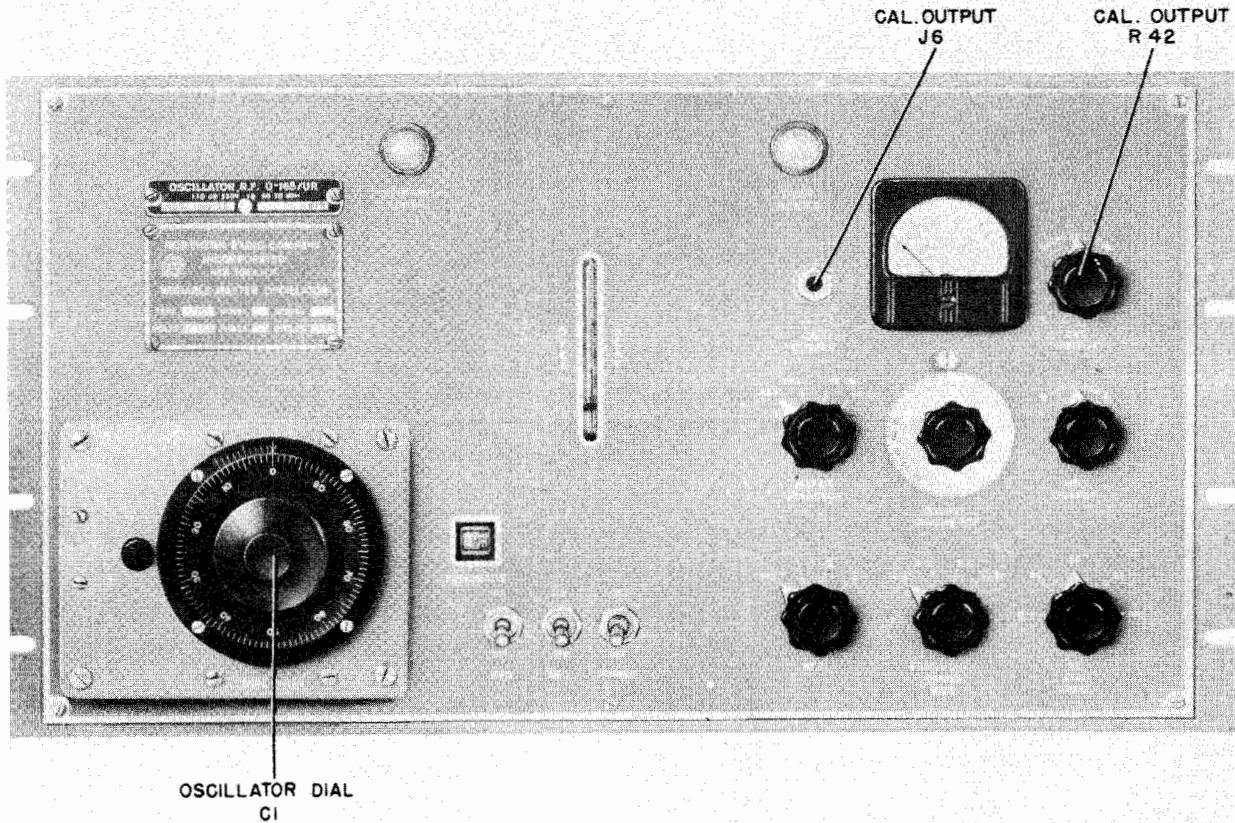


Figure 3-2. RF Oscillator O-165/UR, Front View, Pre-Operation Adjustments

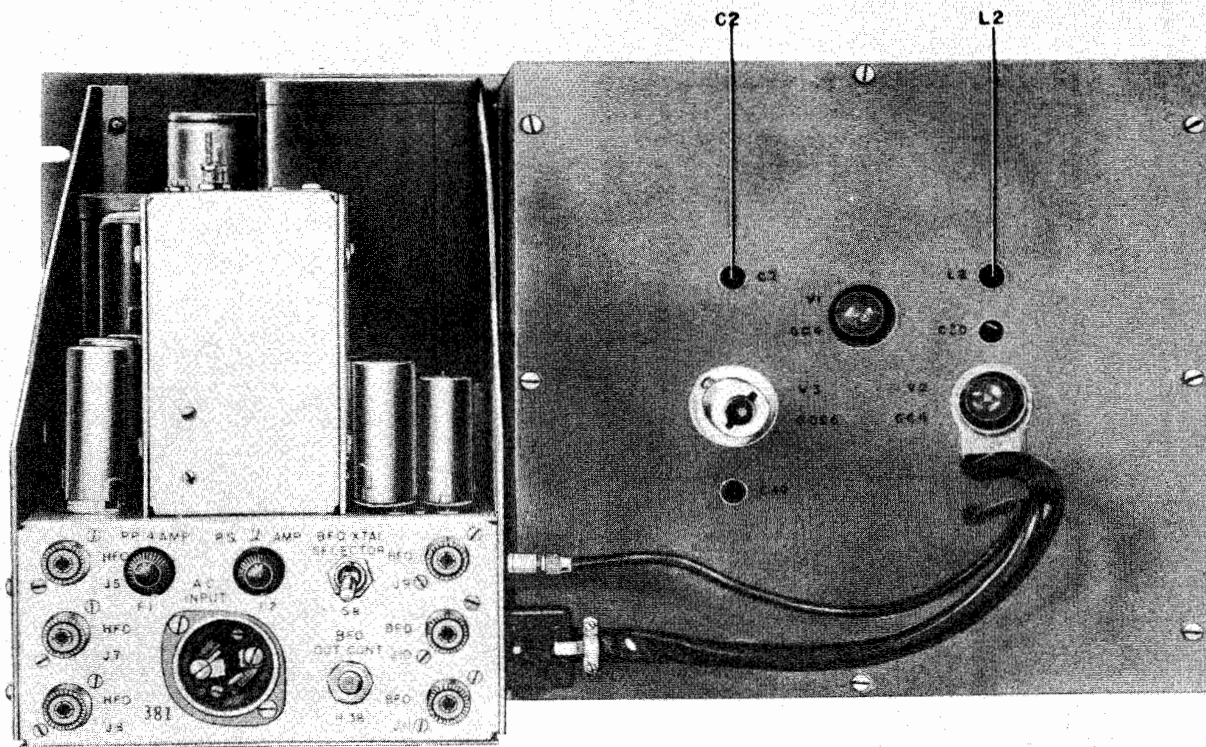
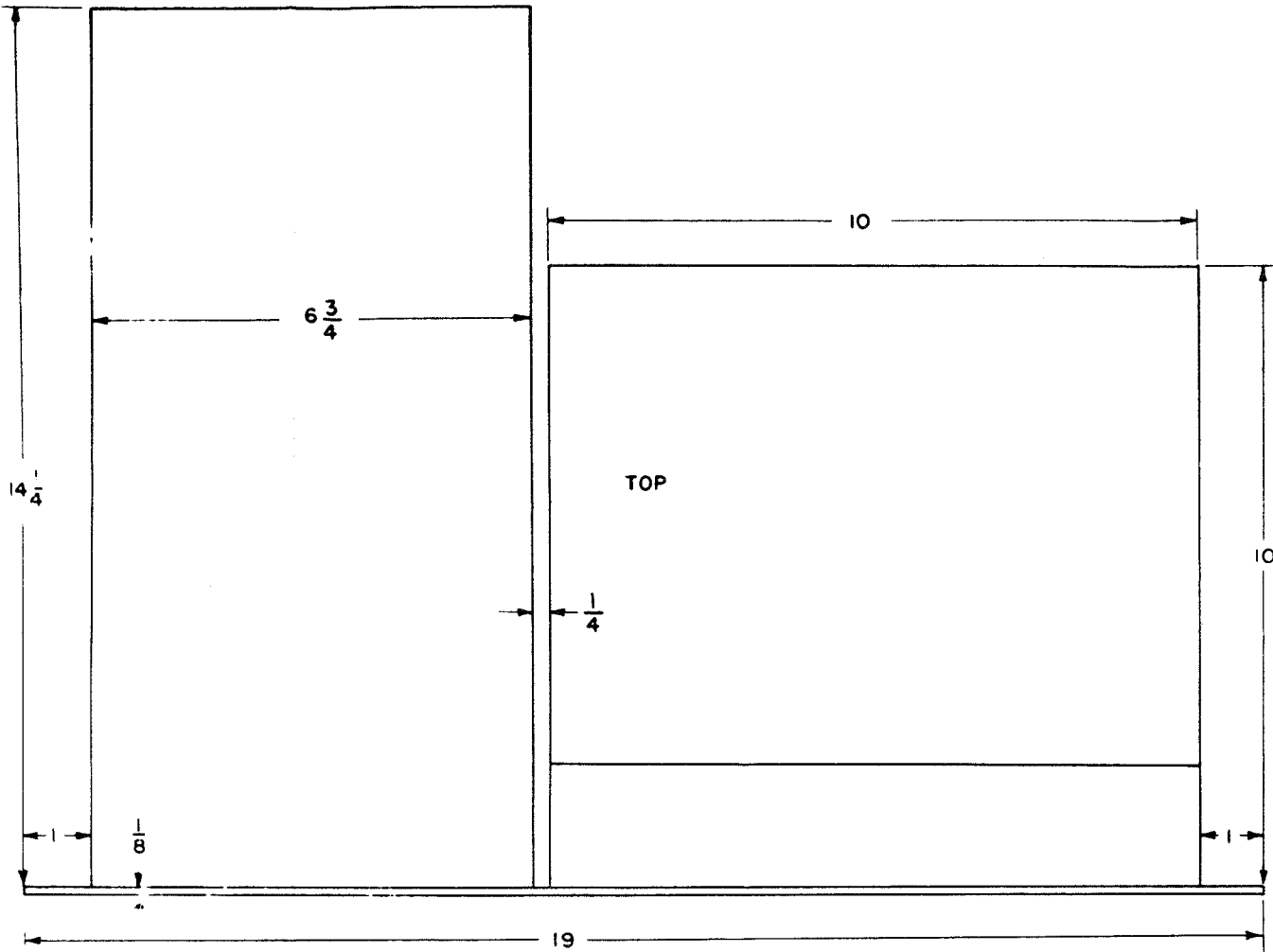


Figure 3-3. RF Oscillator O-165/UR, Rear View, Pre-Operation Adjustments



DIMENSIONS IN INCHES
WEIGHT 54 POUNDS

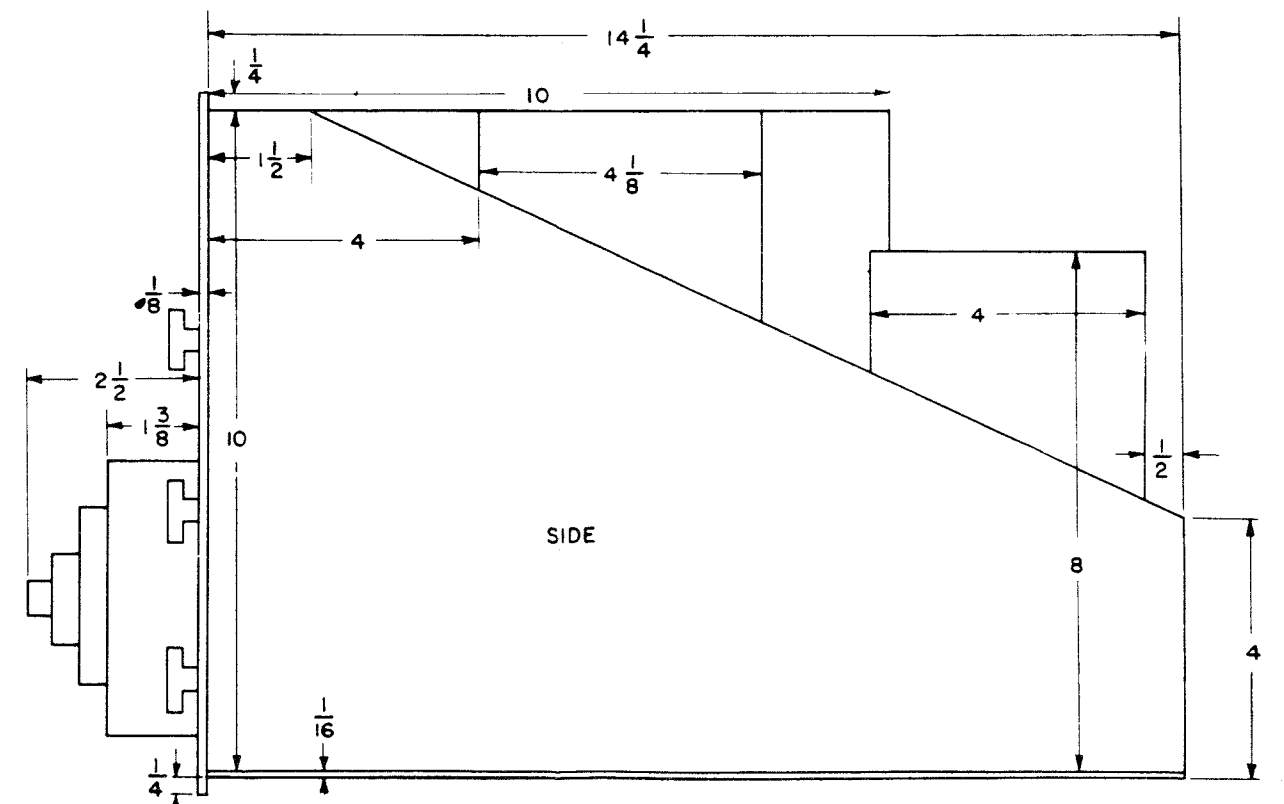
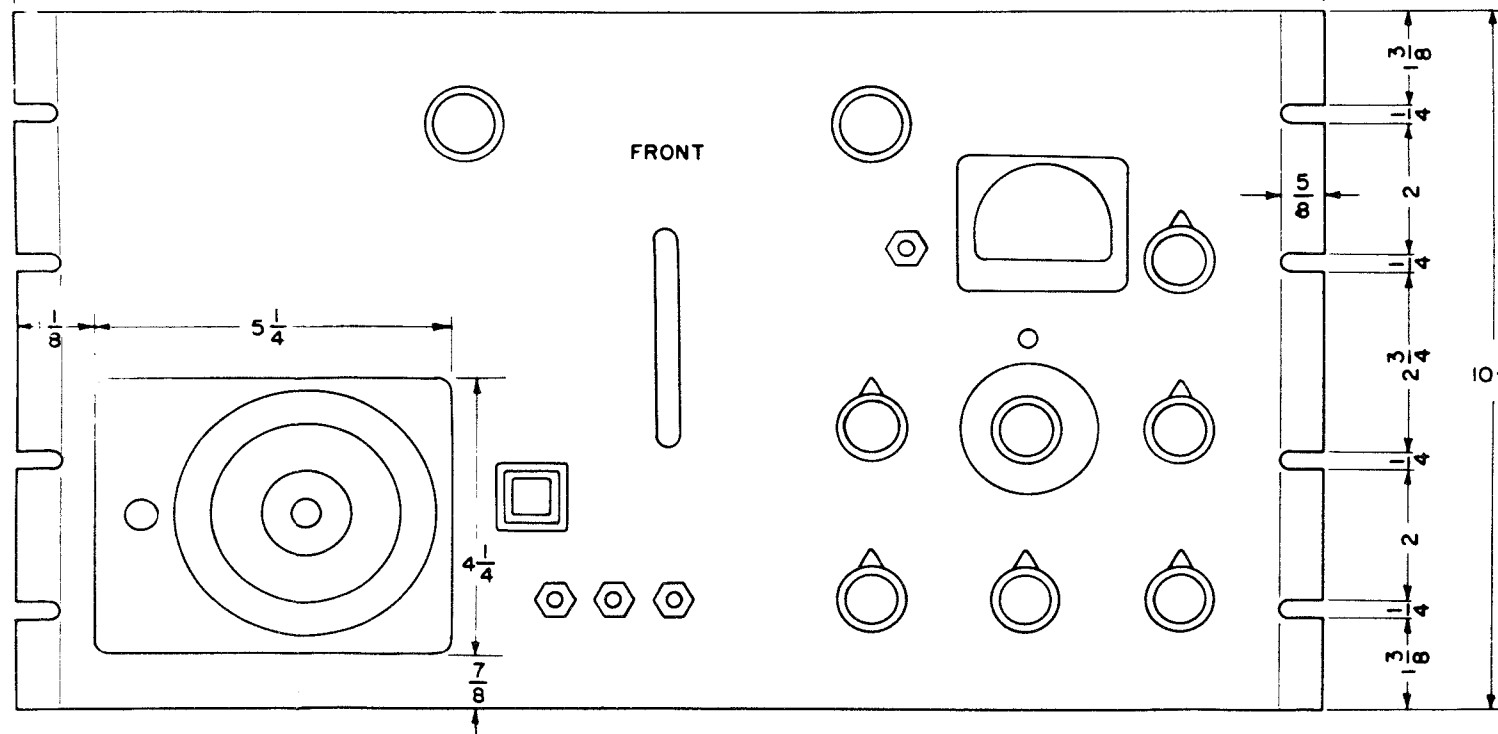


Figure 3-4. RF Oscillator O-165/UR, Outline Dimensions

SECTION 4
OPERATION

1. INTRODUCTION.

Radio Frequency Oscillator O-165/UR is designed primarily to supply local oscillator injection voltage to receivers in diversity reception systems. It can also be used in any application where highly stable r-f signals are required (i.e., BFO injection voltage in receivers, exciter signal voltage in transmitters, and for such uses as measuring, testing, and aligning).

2. LOCATION AND FUNCTION OF OPERATING CONTROLS.

The function and location of each operating control of RF Oscillator O-165/UR is given in Table 4-1.

3. OPERATION OF RF OSCILLATOR O-165/UR.

Before the RF Oscillator O-165/UR can be placed into operation, it must be ascertained that certain preliminary steps have been performed. These include the aging of the circuit components, and the calibration of

the variable oscillator. The procedures for performing these steps are given in Section 3, paragraph 3a and 3b.

CAUTION

The preliminary steps above are part of the pre-installation procedures, and should be accomplished only by the technician. The operator should perform these steps only when specifically authorized.

After the above preliminary steps have been accomplished, RF Oscillator O-165/UR is ready to be put into operation. There are several methods for tuning the unit, depending upon the desired application.

a. TUNING OF VARIABLE HFO. (See figure 4-1 and 4-2.)—The following procedure is used for tuning the variable HFO:

- (1) Turn POWER ON-OFF switch to ON.

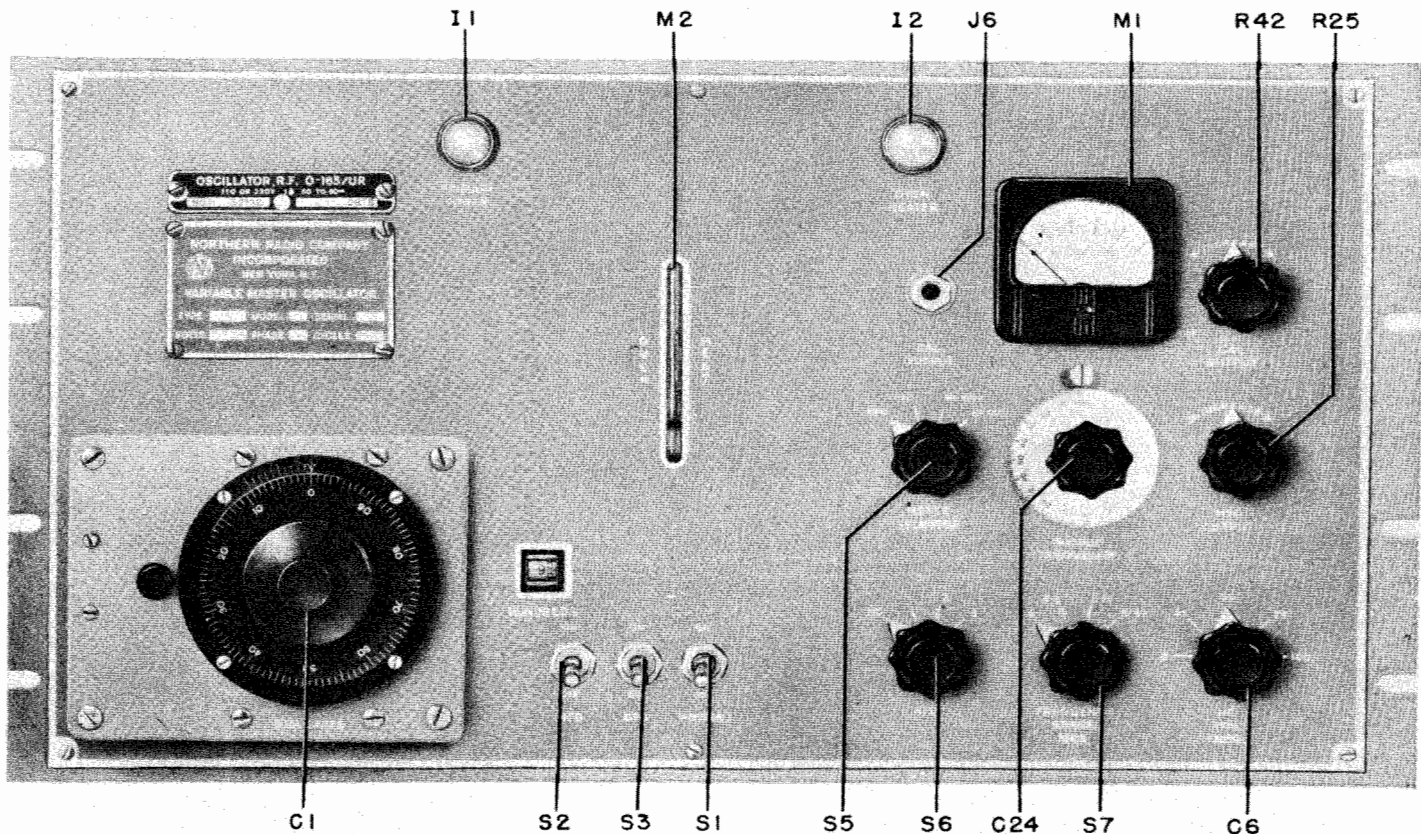


Figure 4-1. RF Oscillator O-165/UR, Front View, Operating Controls and Adjustments

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 ON-OFF switch to ON.
- (3) Turn HFO switch to MO.
- (4) Turn FREQUENCY RANGE MC switch to band containing desired frequency.
- (5) Turn OUTPUT FREQUENCY dial to its approximate setting according to Table 4-2.
- (6) Turn METER SELECTOR switch to HF OUT position.
- (7) The dial setting of RF Oscillator O-165/UR may be obtained from the calibration curves shown in figures 4-3 through 4-23 by dividing the desired output 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.
- (8) Turn to the calibration curve corresponding to the desired frequency of operation, as determined from step (8) above.

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

(10) 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.

(11) Turn on CAL. OUTPUT switch and insert a pair of headphones into the CAL. OUTPUT jack. Adjust the oscillator dial to the approximate check point.

The oscillator DIAL UNITS control 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.

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

(13) 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).

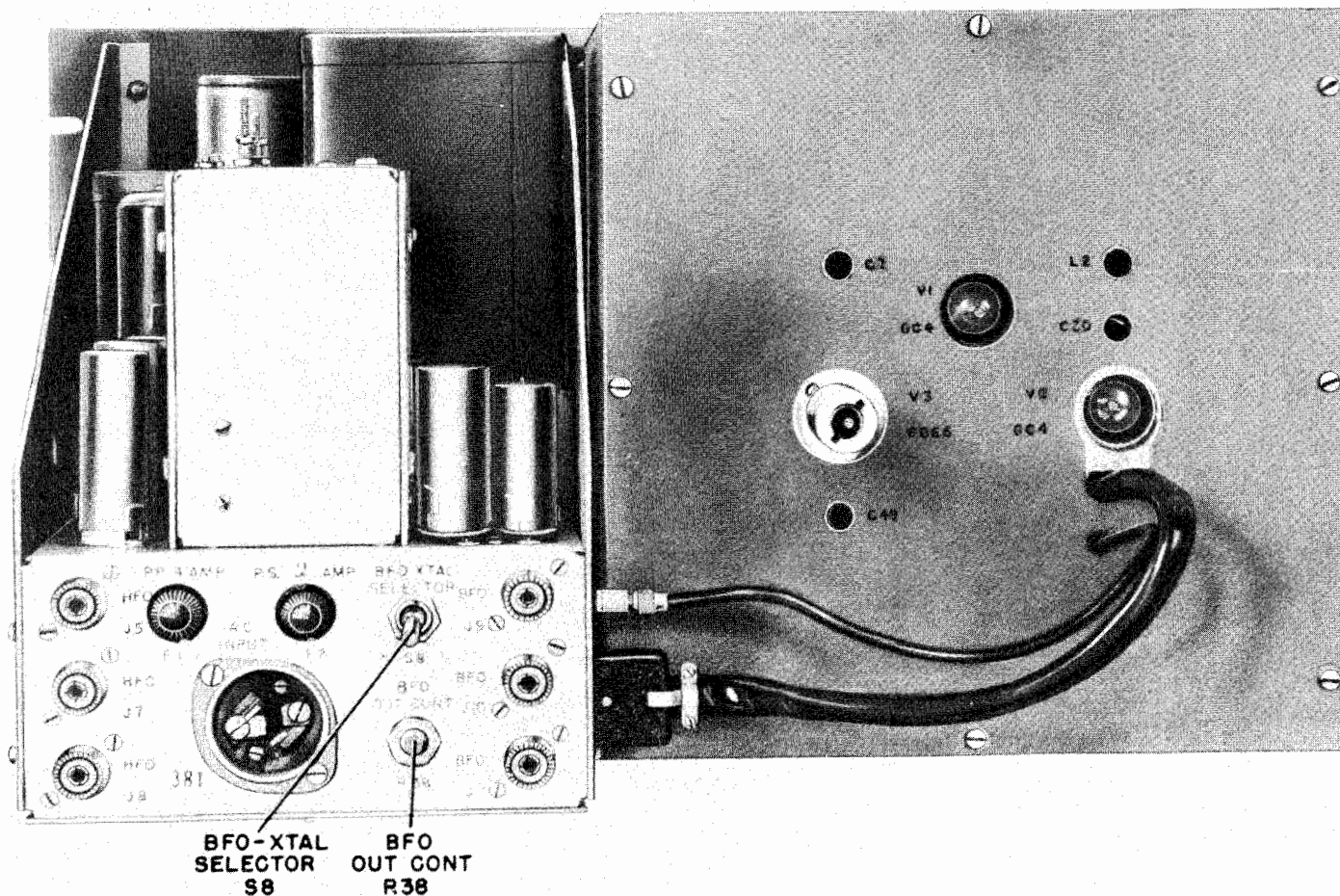


Figure 4-2. RF Oscillator O-165/UR, Rear View, Operating Controls and Adjustments

TABLE 4-1. LOCATION AND FUNCTION OF OPERATING CONTROLS

CONTROL	LOCATION	FUNCTION	FIGURE REFERENCE
DIAL UNITS	Front panel	Varies frequency of variable HFO.	4-1
HFO ON-OFF	Front panel	Turns HFO section on or off.	4-1
BFO ON-OFF	Front panel	Turns BFO section on or off.	4-1
POWER ON-OFF	Front panel	Switches power on and off.	4-1
HFO	Front panel	Switches either the variable HFO or one of three crystals of the fixed circuit into operation.	4-1
FREQUENCY RANGE MCS	Front panel	Connects frequency-doubling circuits, as required, to obtain given output frequency.	4-1
HF XTAL FREQ.	Front panel	Vernier frequency control for crystal HFO.	4-1
METER SELECTOR	Front panel	Switches various circuits across meter.	4-1
OUTPUT FREQUENCY	Front panel	Tunes HFO output circuit.	
HFO OUTPUT	Front panel	Varies HFO signal output level.	4-1
CAL. OUTPUT	Front panel	Varies calibration signal output level.	4-1
BFO-XTAL SELECTOR	Rear panel	Switches one of two BFO crystals into BFO circuit.	4-2
BFO OUT. CONT.	Rear panel	Controls amplitude of BFO output signal.	4-2

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

(15) Set HFO OUTPUT control to give desired output level as shown on meter. Disconnect phones and turn off the CAL. OUTPUT switch.

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

Step (7) Assume that desired output frequency = 2307.5 kc. Therefore, oscillator O-165/UR Fundamental Frequency = 2762.5 kc.

(8) Turn to Calibration Curve, figure 4-11, and find 2762.5 kc on scale at top of page.

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

(10) 2750 kc check point approximately 1772 divisions.

(11) Set dial for: "dial hundreds" = 17
"dial units" = 72

(12) Actual check point found at 1775.3 divisions.

(13) Desired setting of the dial will then be 1775.3 + 29.4 or 1804.7 divisions.

Set: "dial hundreds" = 18
"dial units" = 04.7

TABLE 4-2. 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 3a, 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 ON-OFF switch to ON.

(4) Turn HFO ON-OFF switch to ON.

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

(6) Turn the HFO 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 4-2.

(9) Turn METER SELECTOR switch to HF OUT 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 re-

ceiver, adjust HF XTAL FREQ. for maximum deflection of meter on receiver.

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

(1) The BFO crystal frequency as required for use with audio type frequency shift converters is determined by adding to or subtracting from the 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 the IF frequency ± 2550 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. OPERATING ADJUSTMENTS.

There are no adjustments to be made during operation.

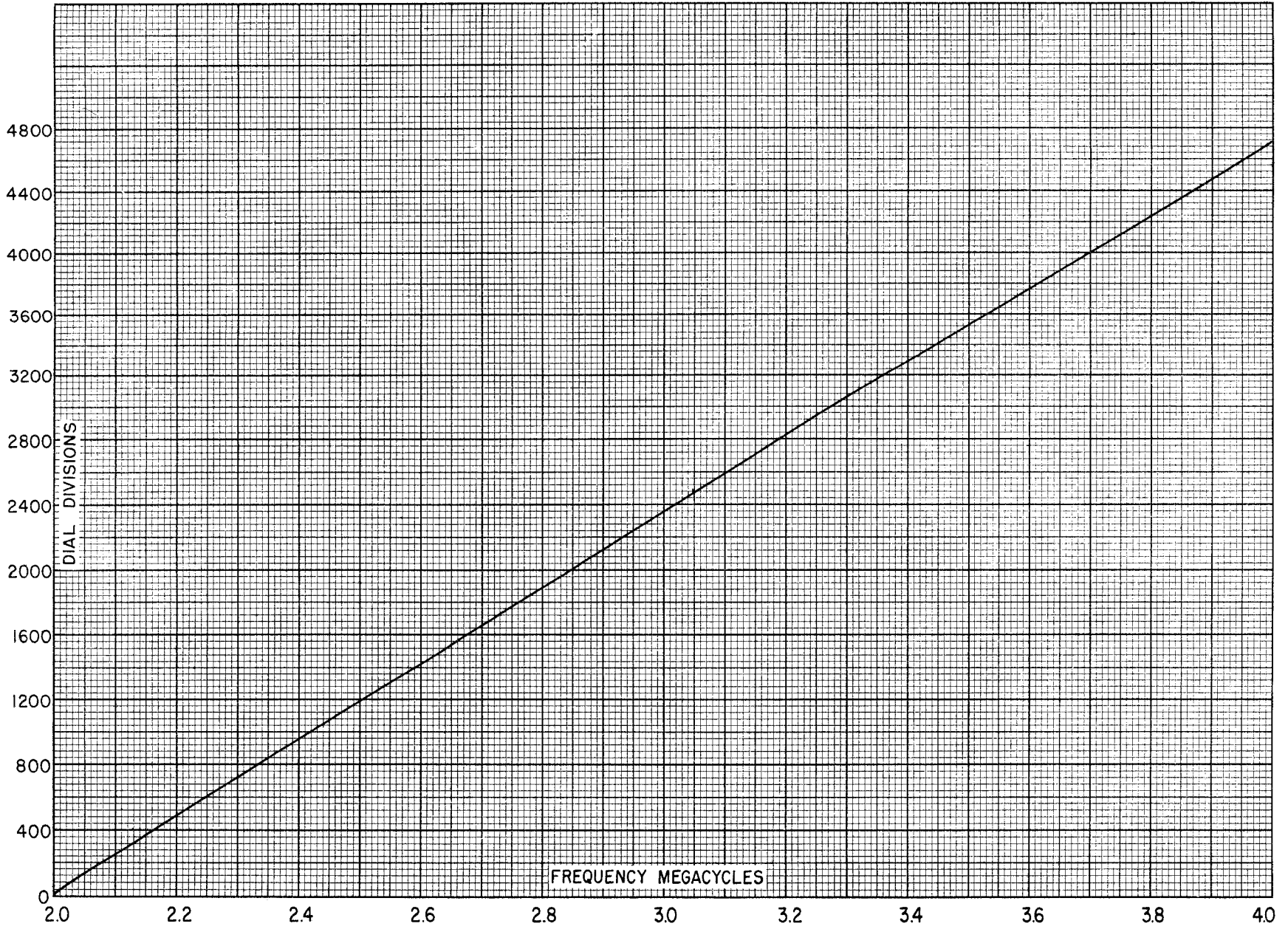


Figure 4-3. Overall Calibration Curve

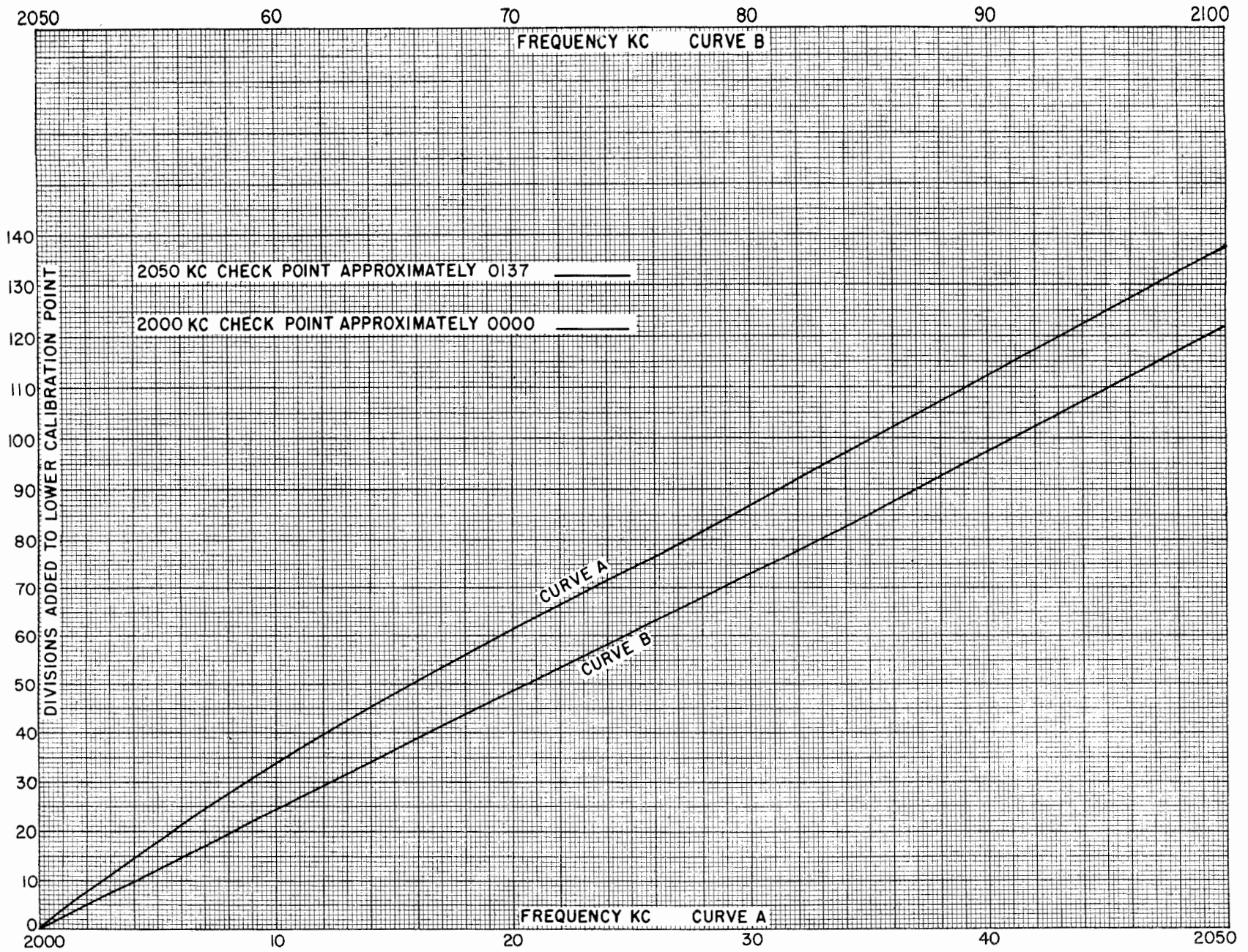


Figure 4-4. Calibration Curve, 2000-2100 kc

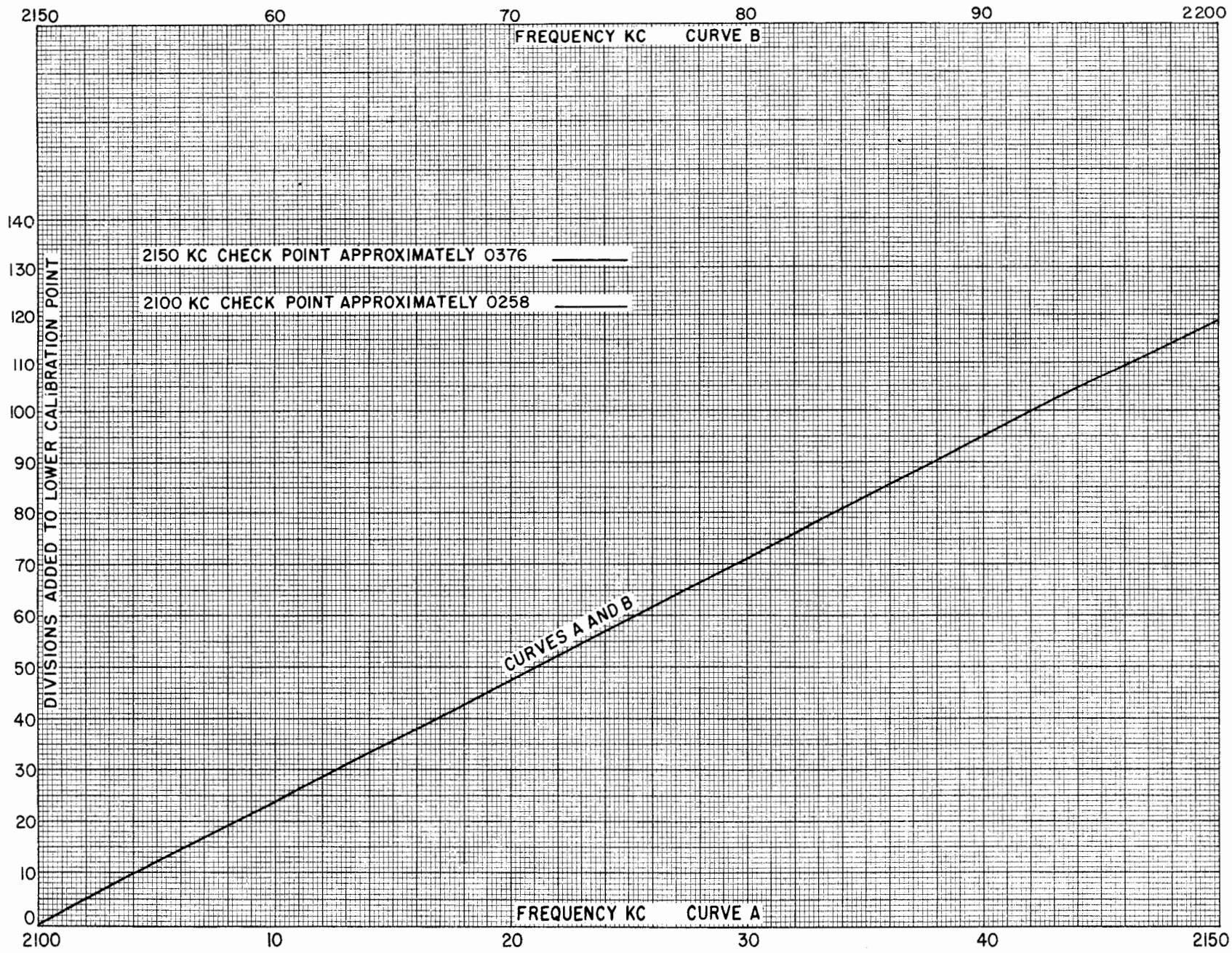


Figure 4-5. Calibration Curve, 2100-2200 kc

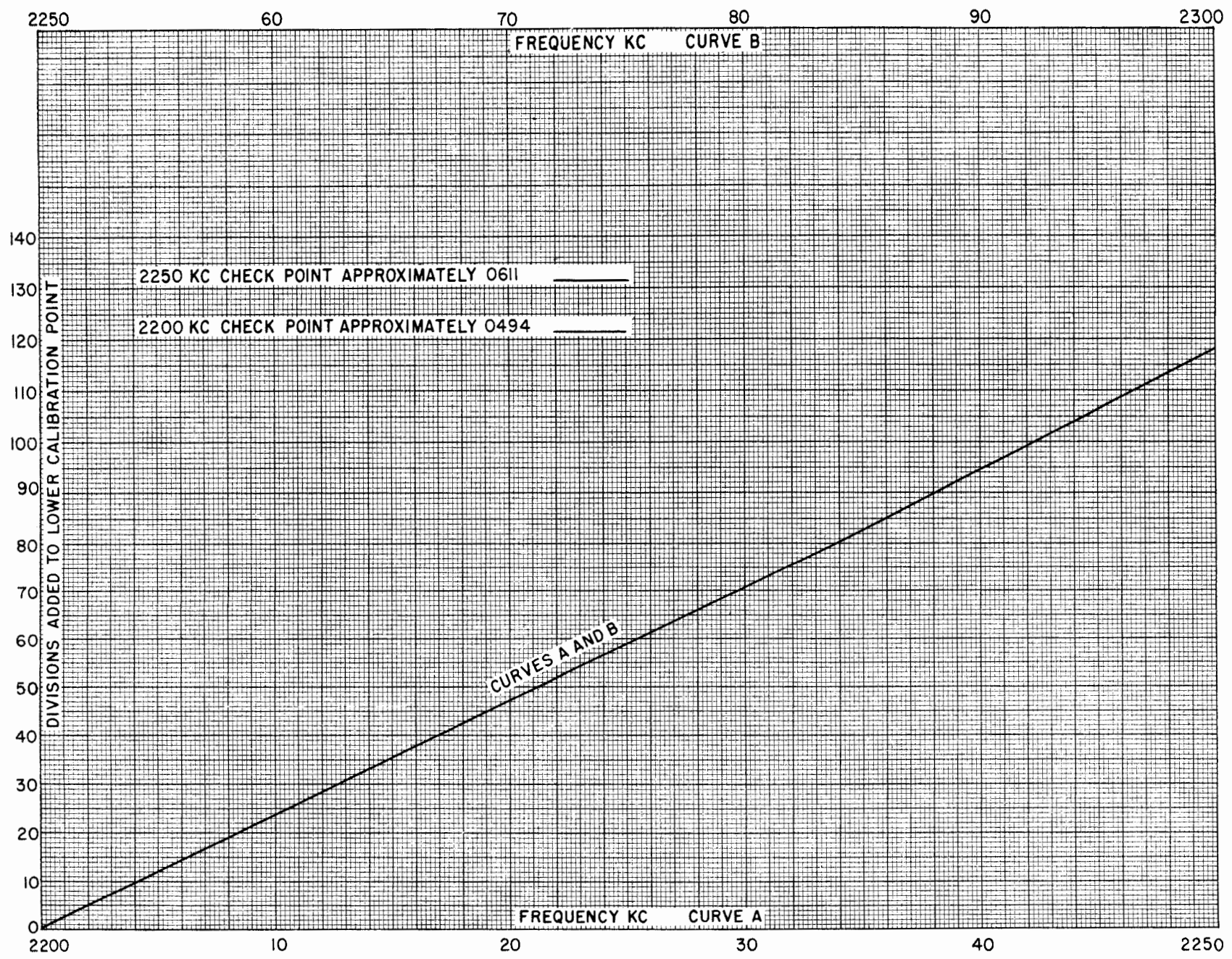


Figure 4-6. Calibration Curve, 2200-2300 kc

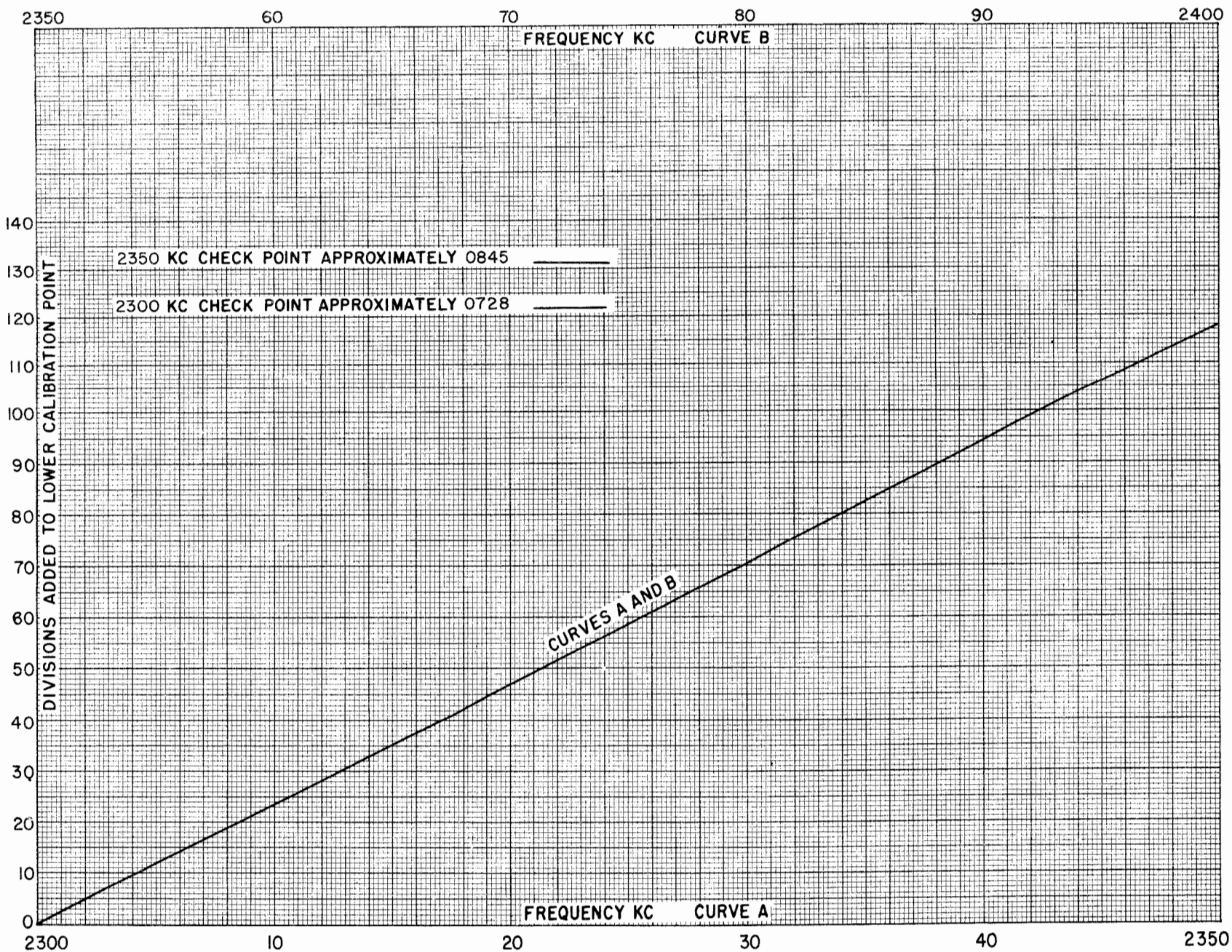


Figure 4-7. Calibration Curve, 2300-2400 kc

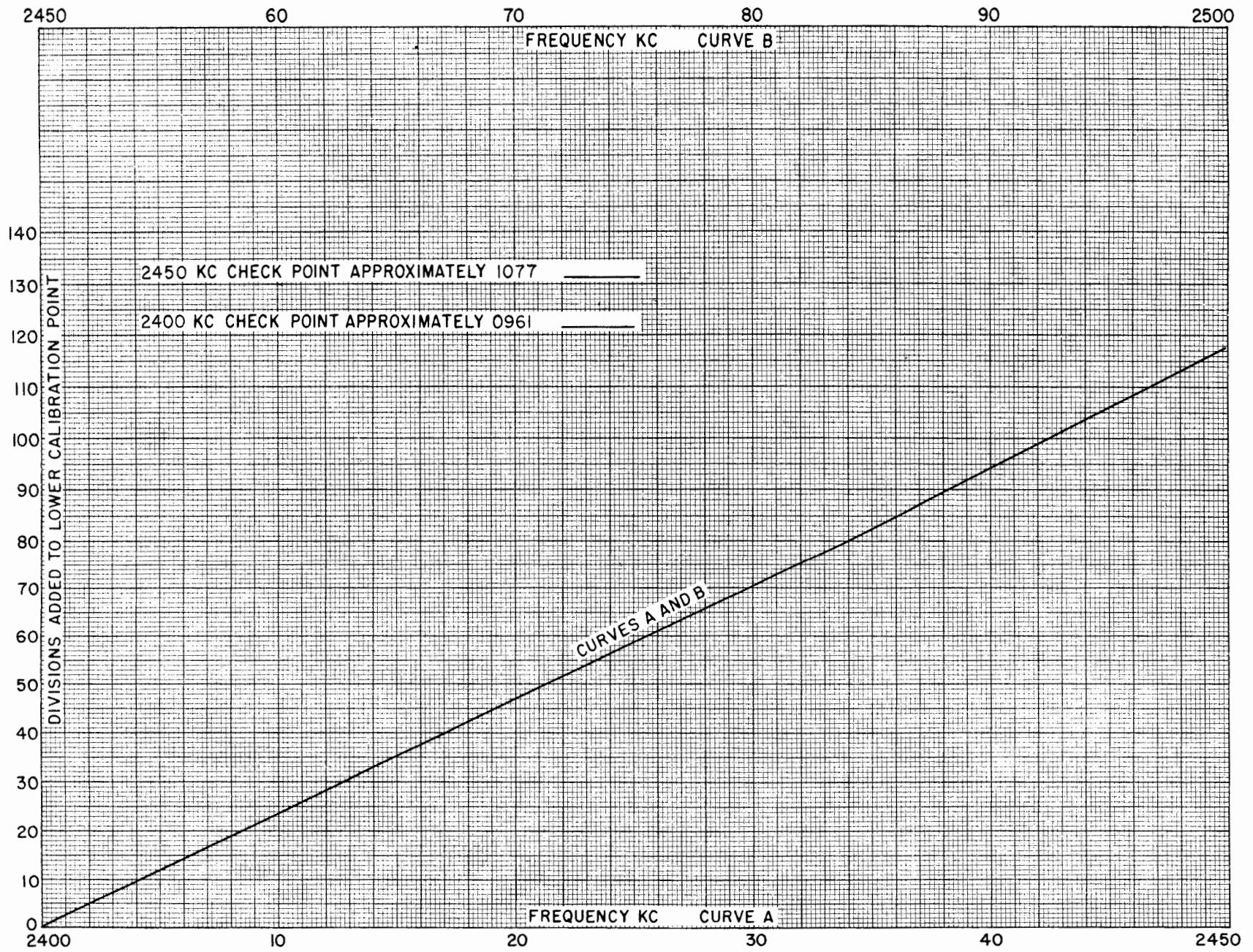


Figure 4-8. Calibration Curve, 2400-2500 kc

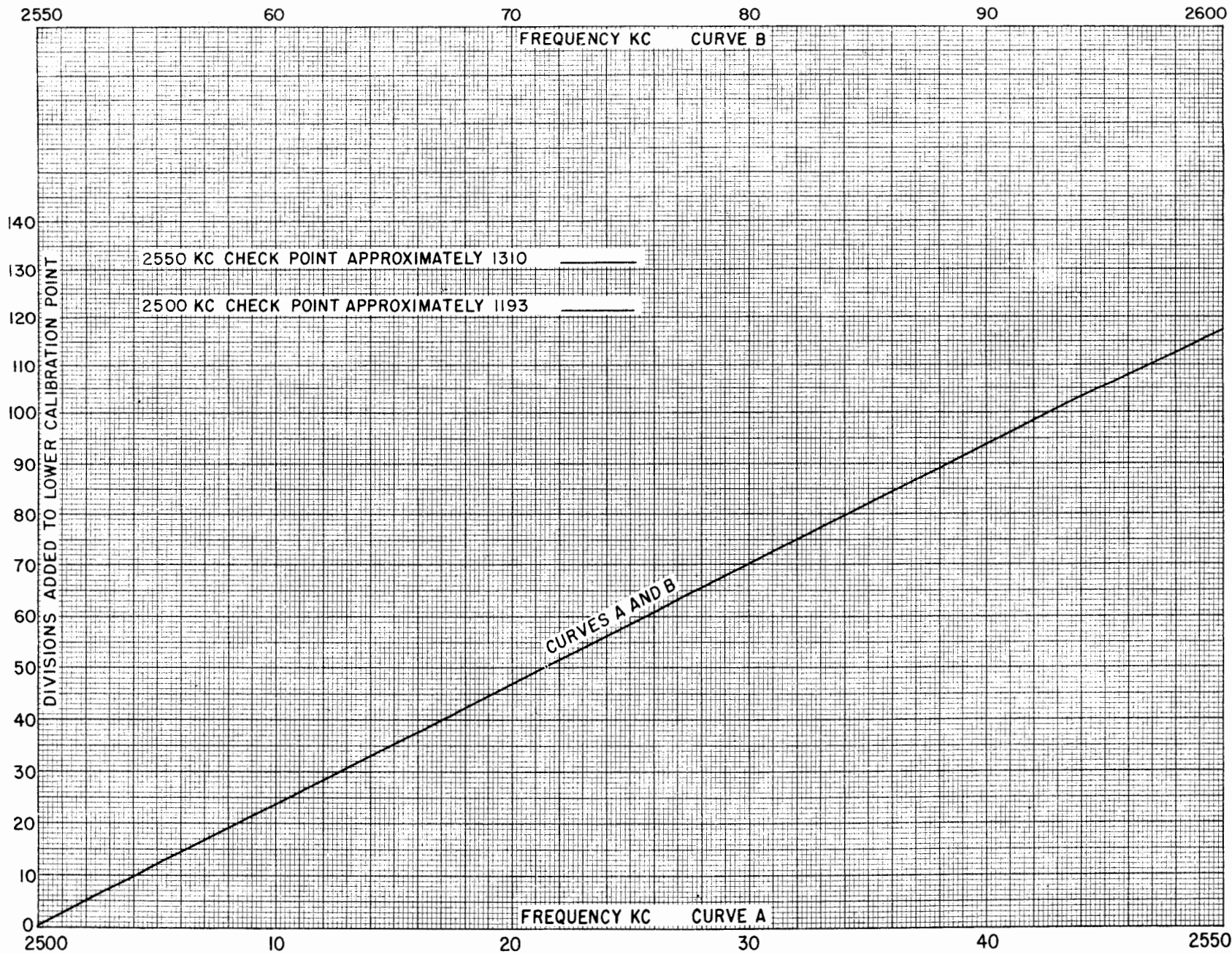


Figure 4-9. Calibration Curve, 2500-2600 kc

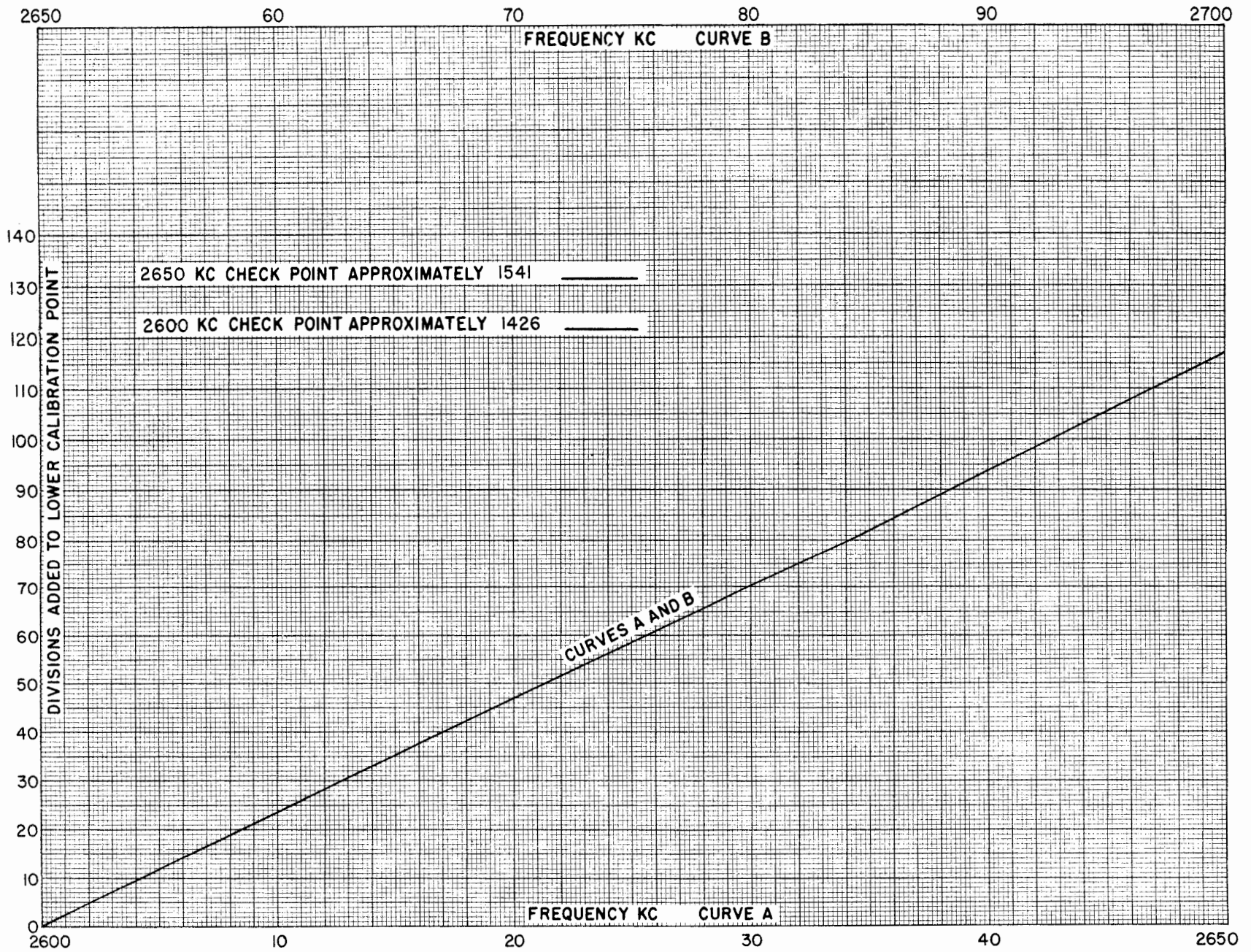


Figure 4-10. Calibration Curve, 2600-2700 kc

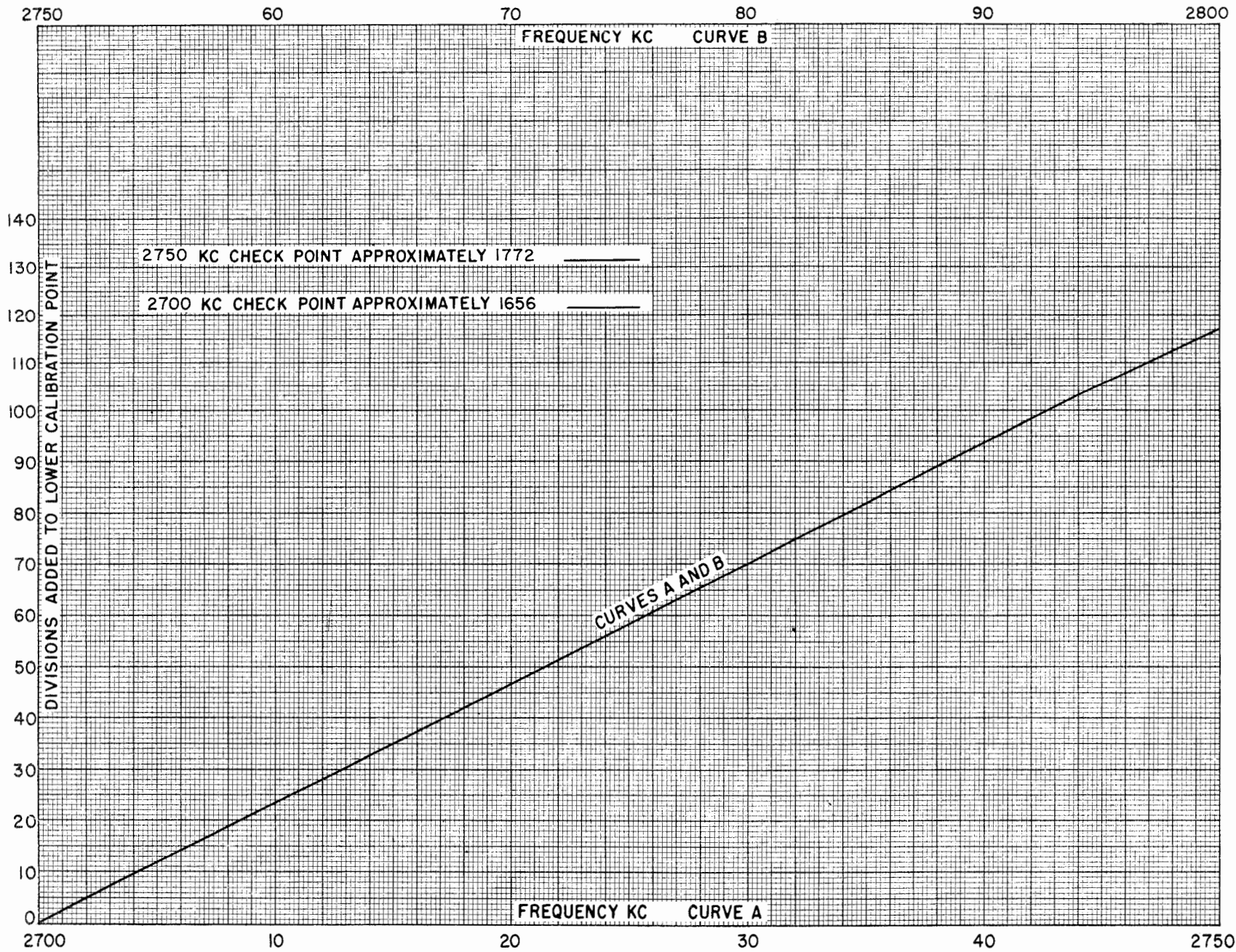


Figure 4-11. Calibration Curve, 2700-2800 kc

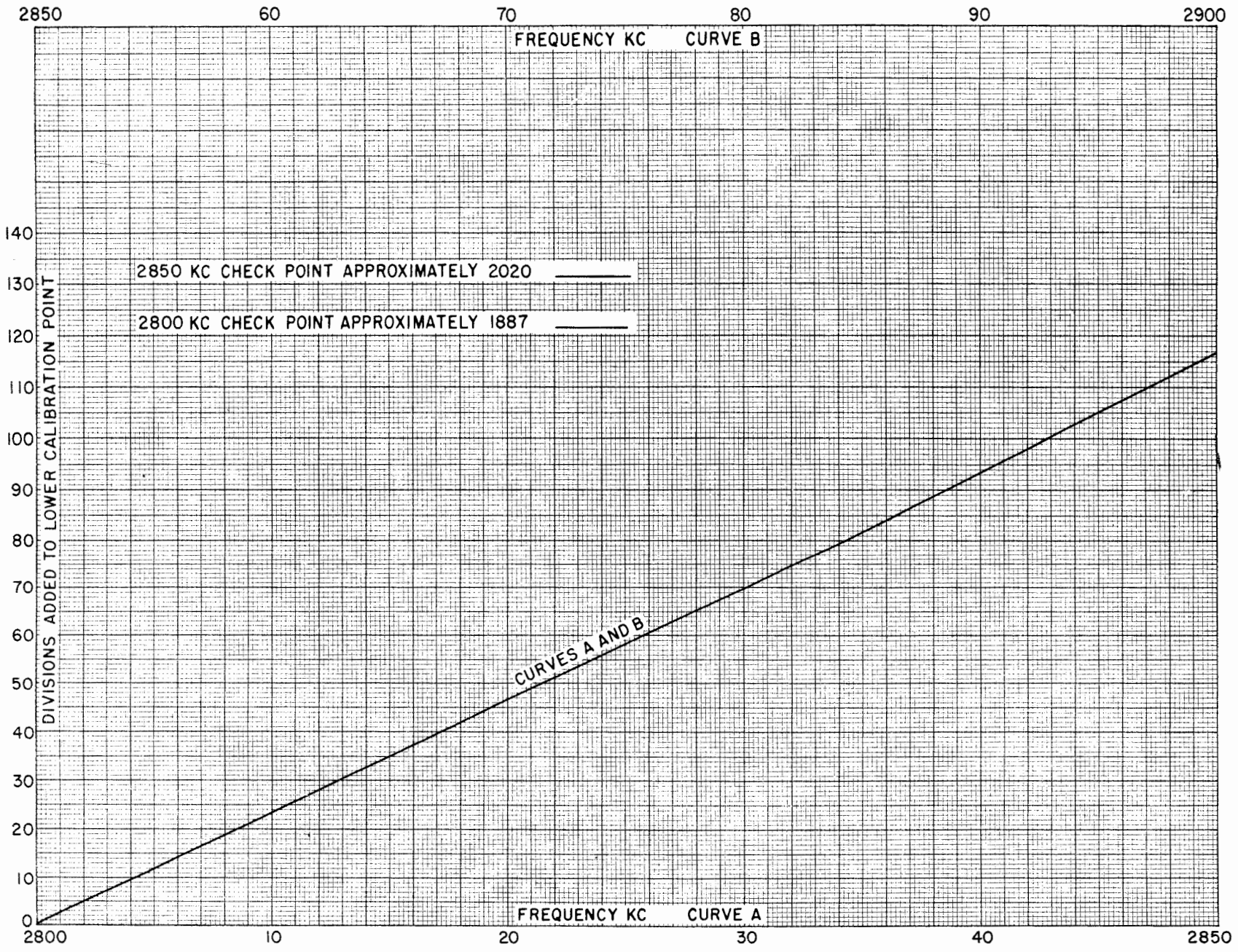


Figure 4-12. Calibration Curve, 2800-2900 kc

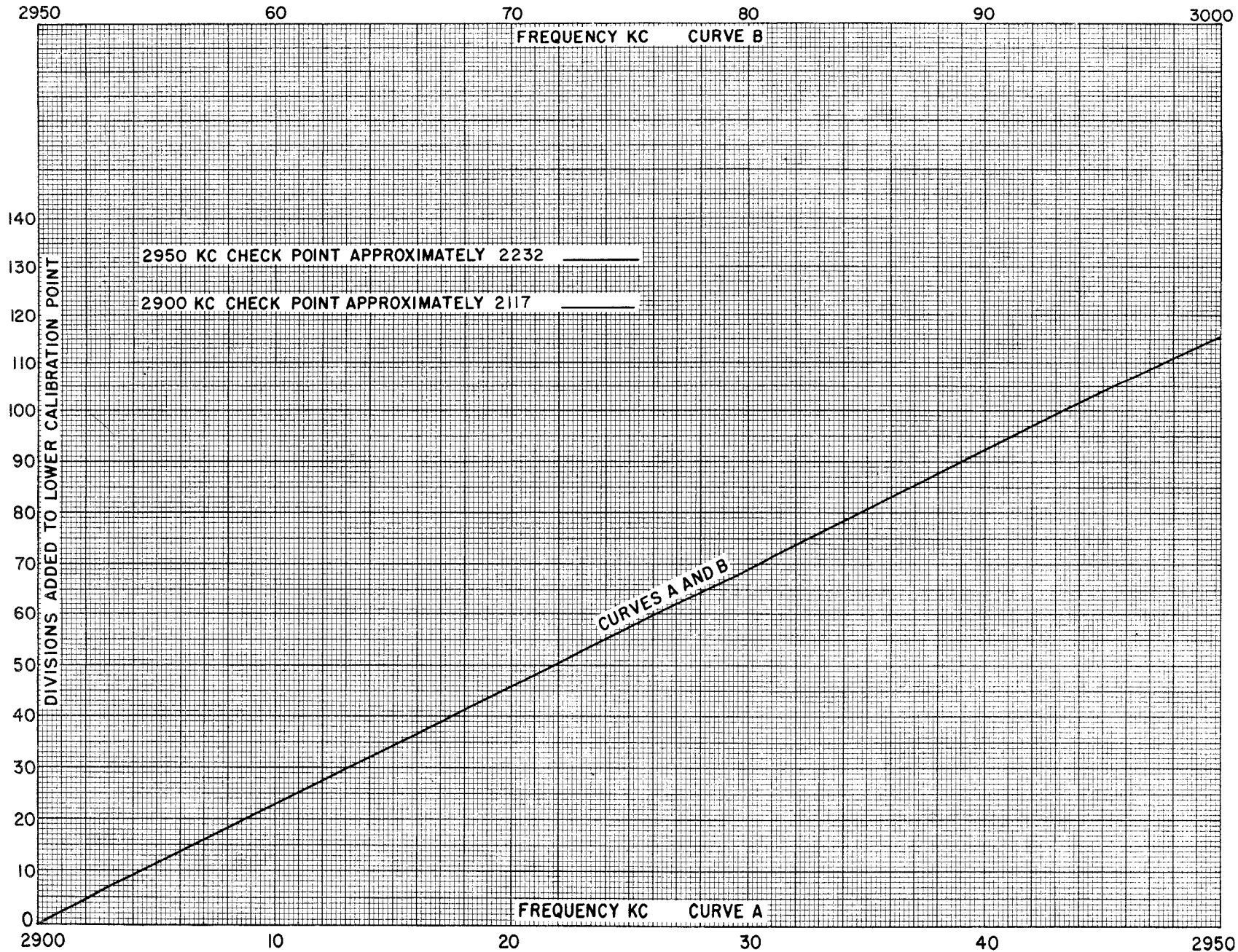


Figure 4-13. Calibration Curve, 2900-3000 kc

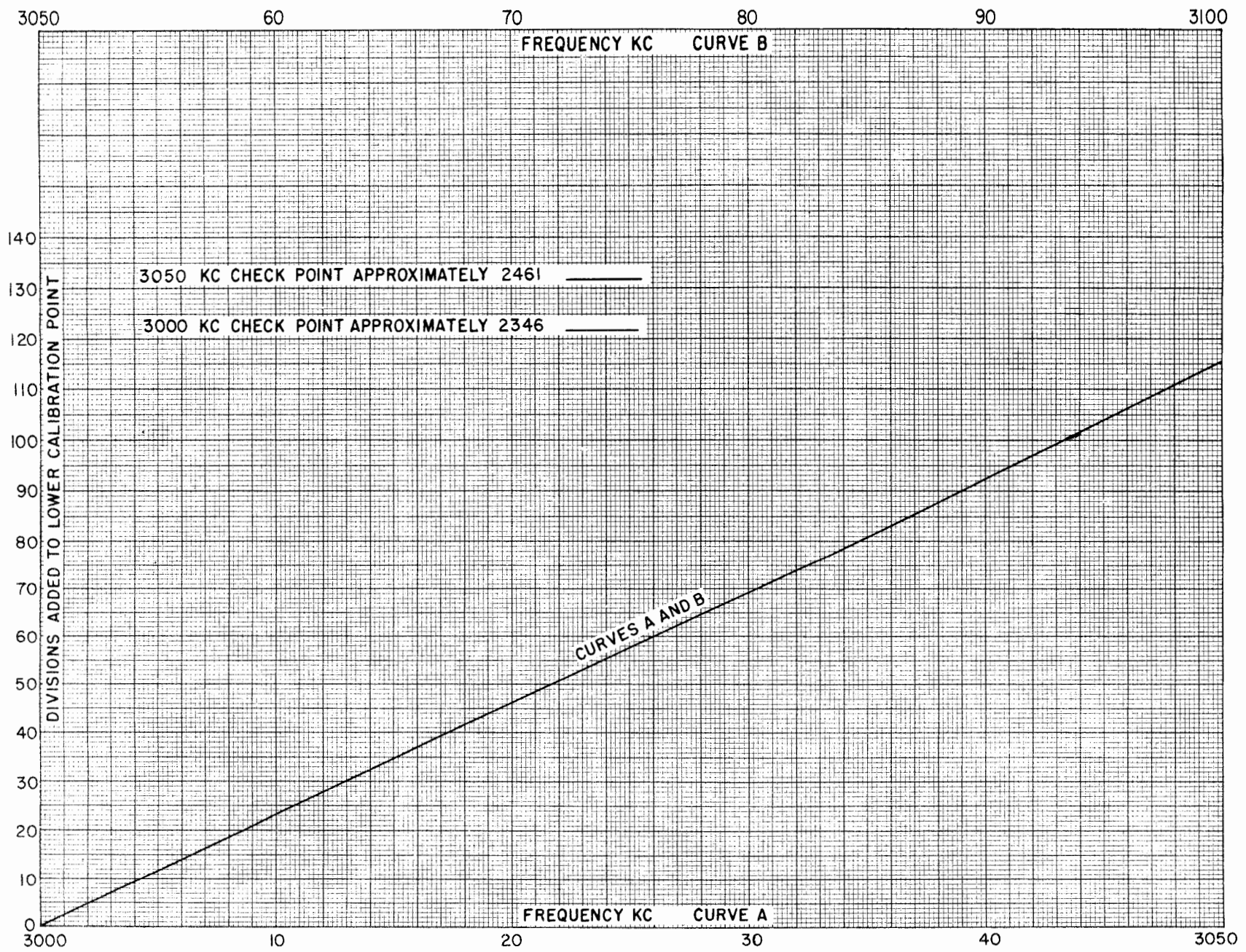


Figure 4-14. Calibration Curve, 3000-3100 kc

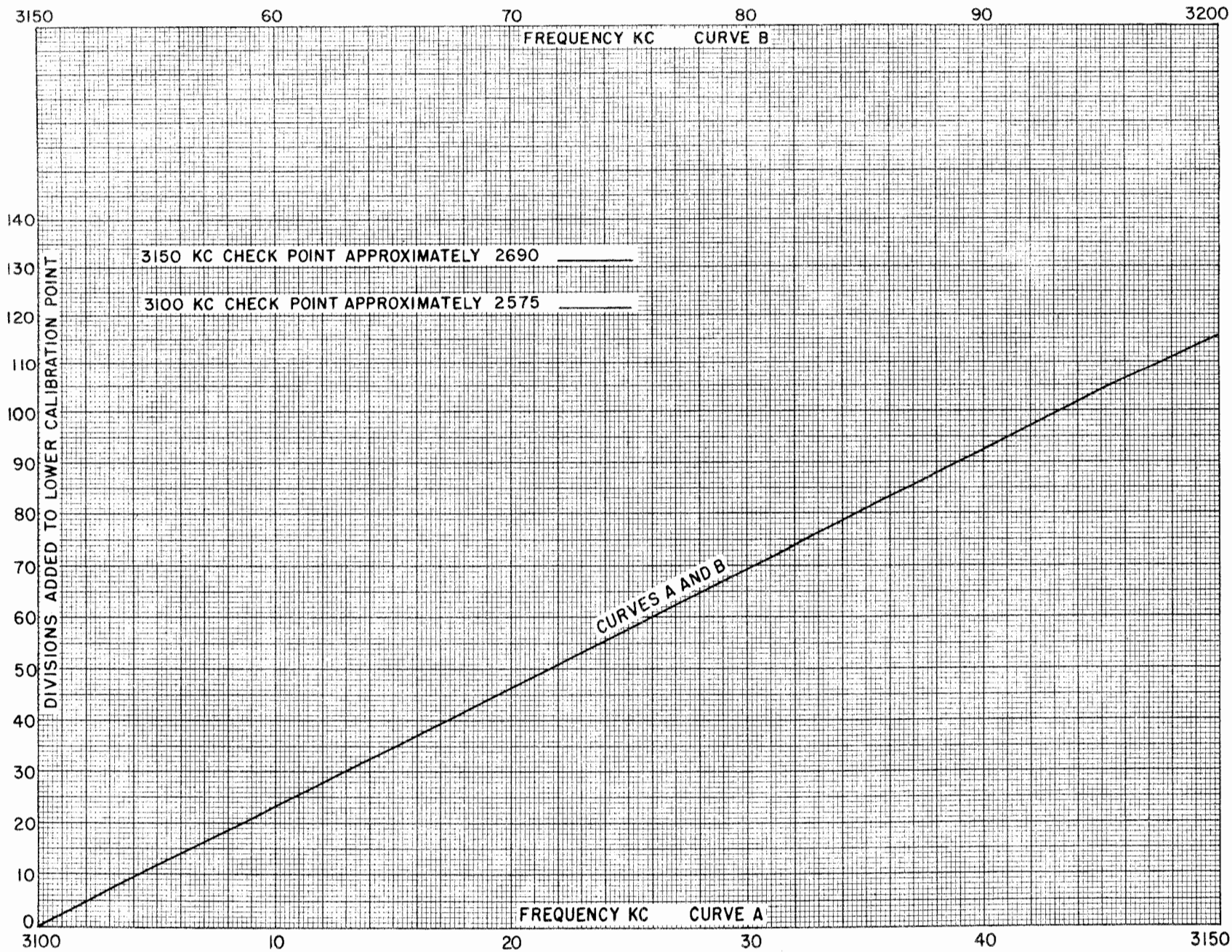


Figure 4-15. Calibration Curve, 3100-3200 kc

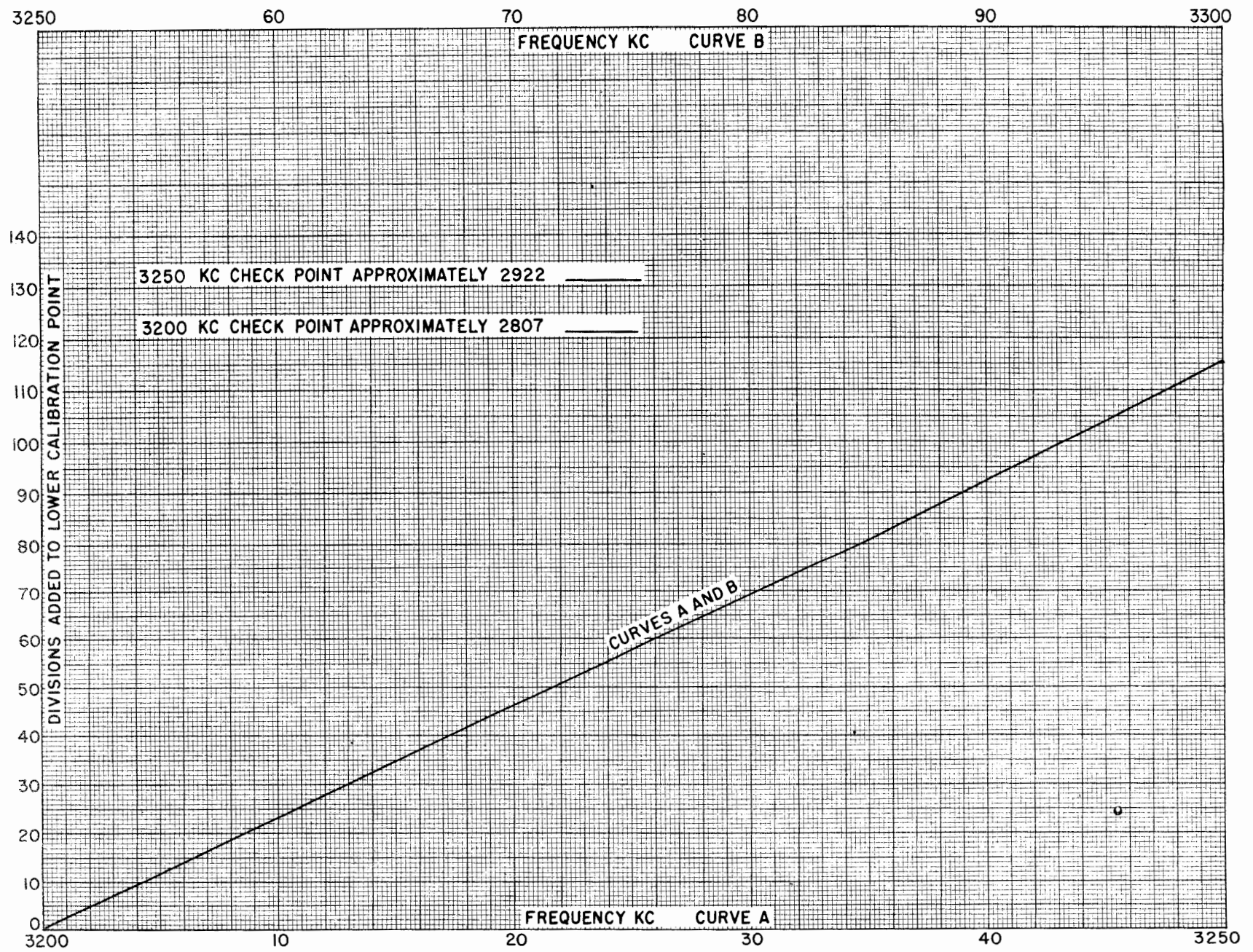


Figure 4-16. Calibration Curve, 3200-3300 kc

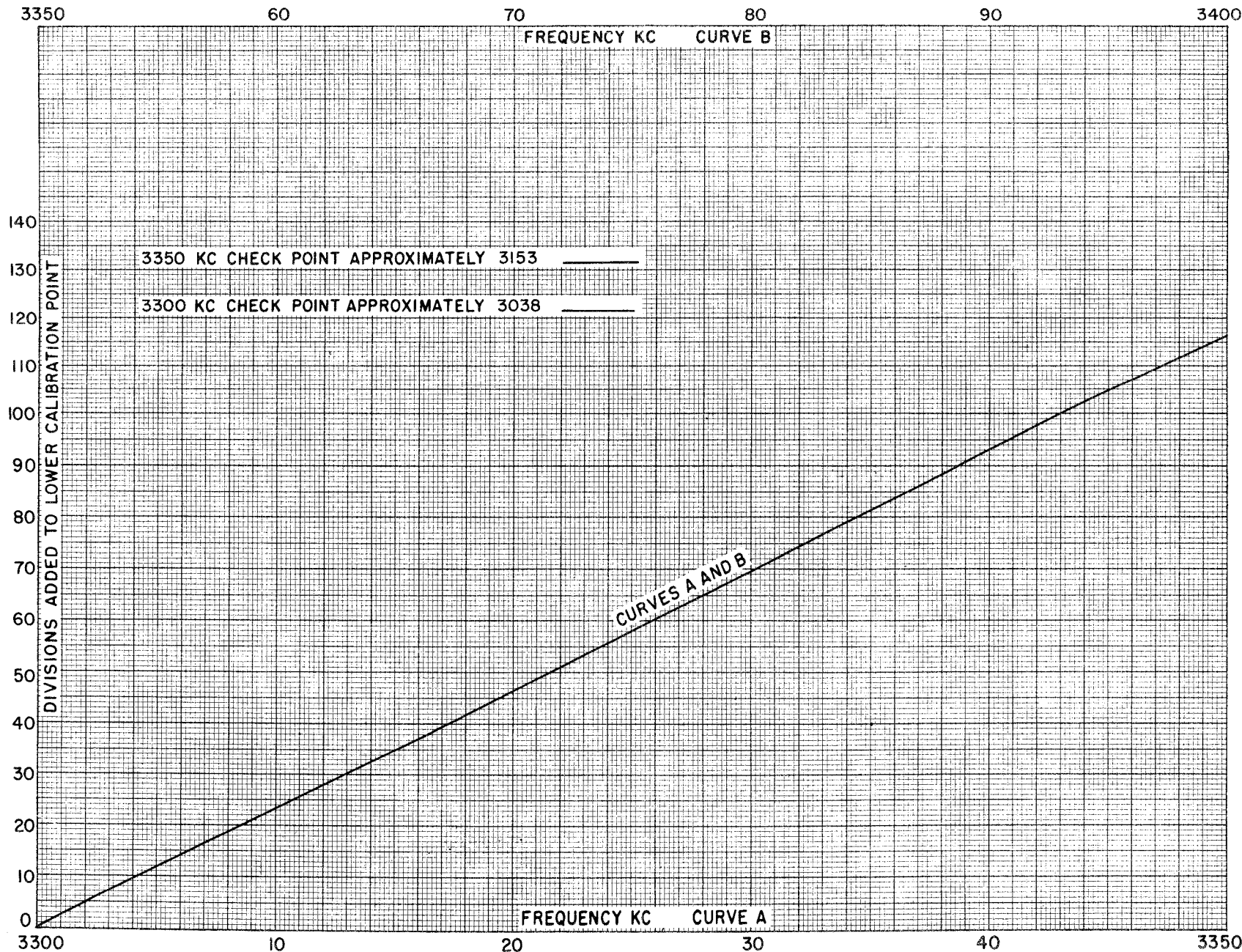


Figure 4-17. Calibration Curve, 3300-3400 kc

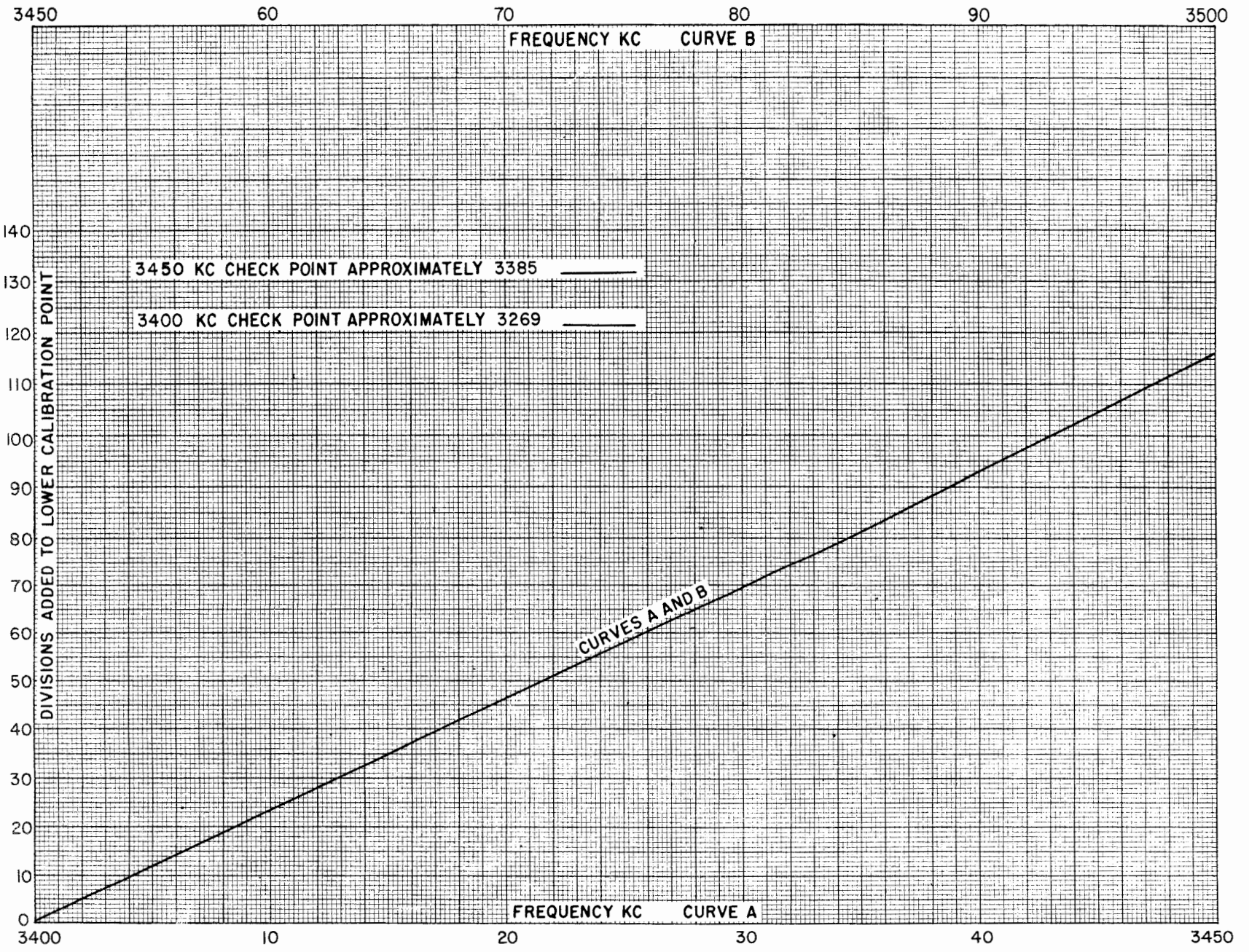


Figure 4-18. Calibration Curve, 3400-3500 kc

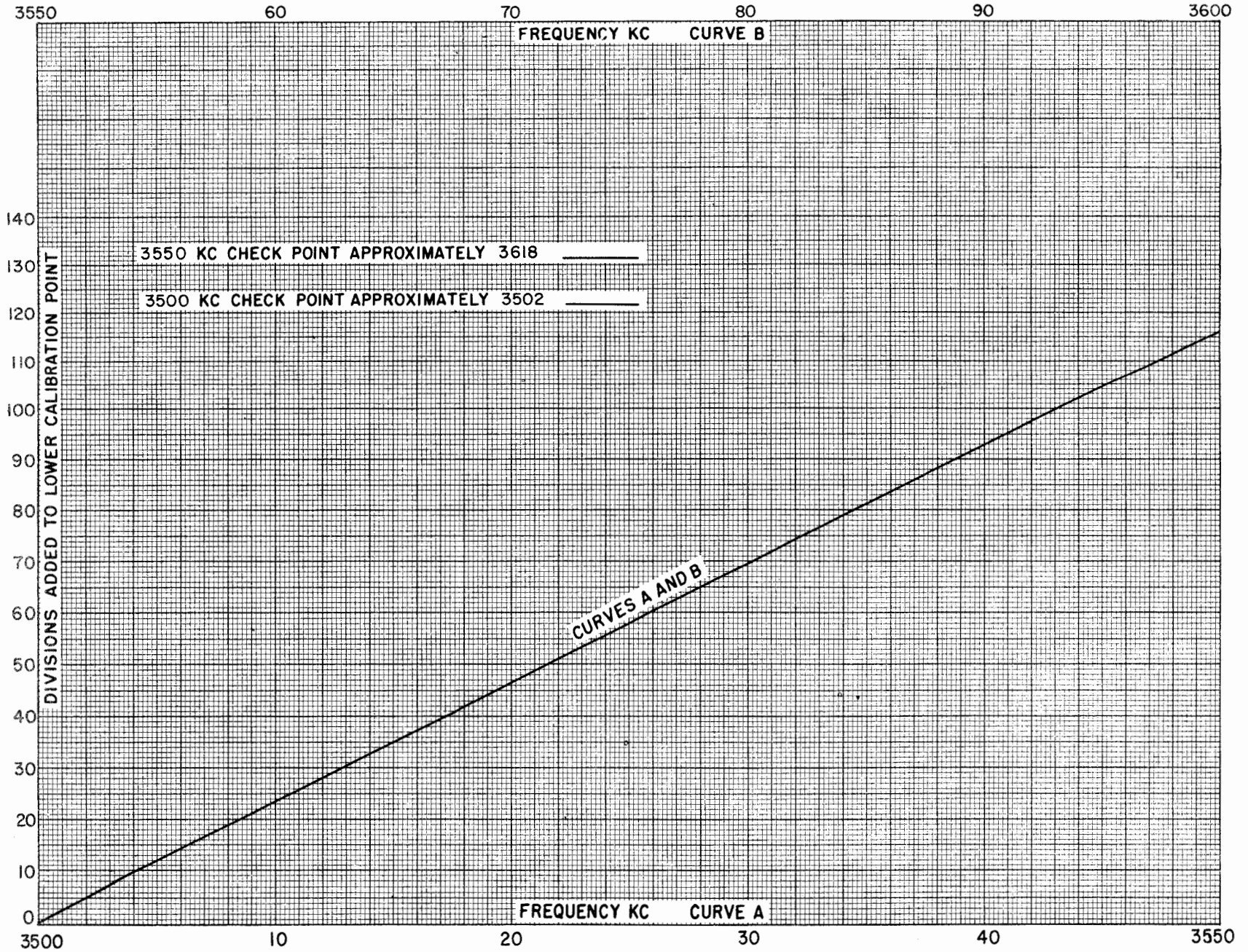


Figure 4-19. Calibration Curve, 3500-3600 kc

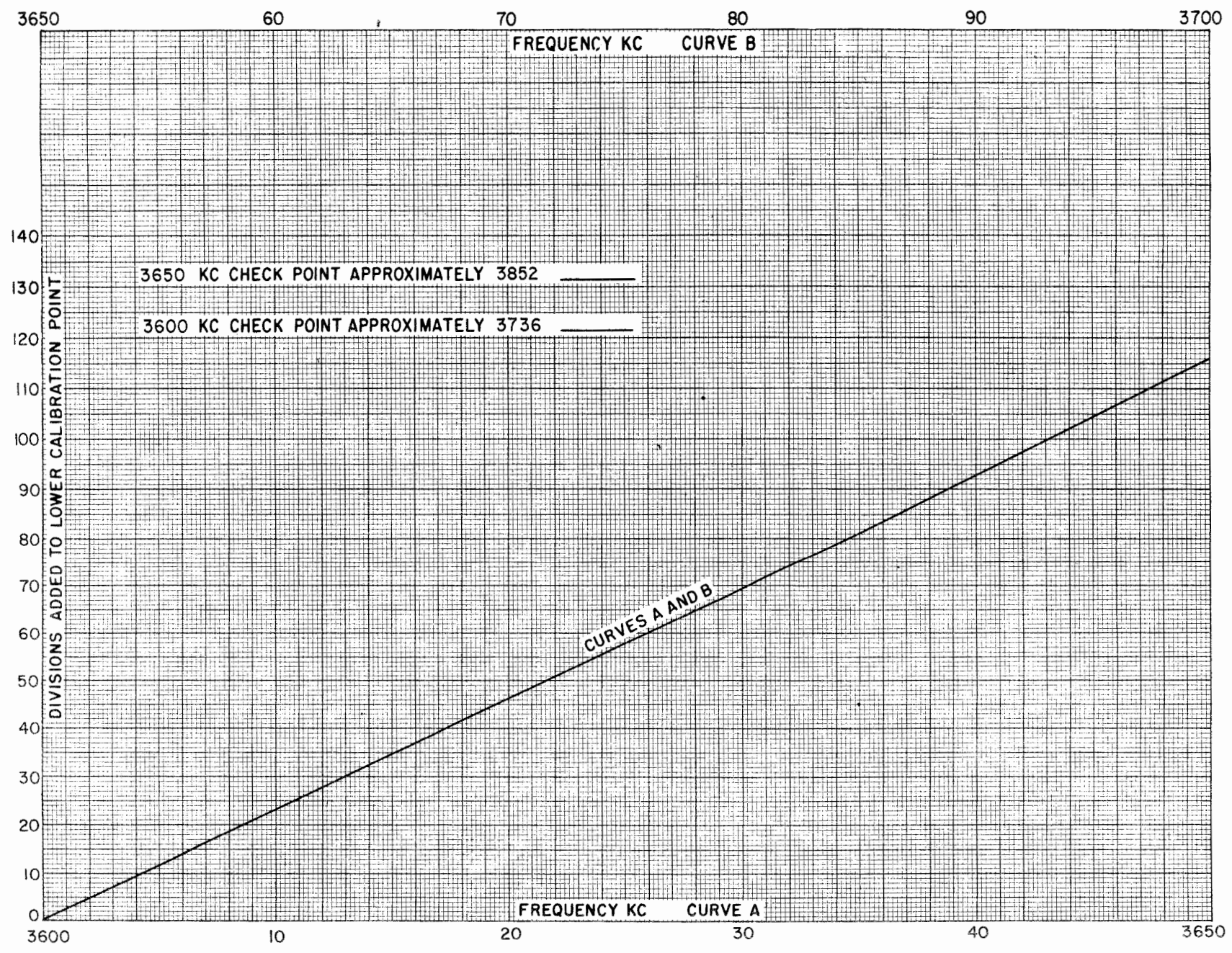


Figure 4-20. Calibration Curve, 3600-3700 kc

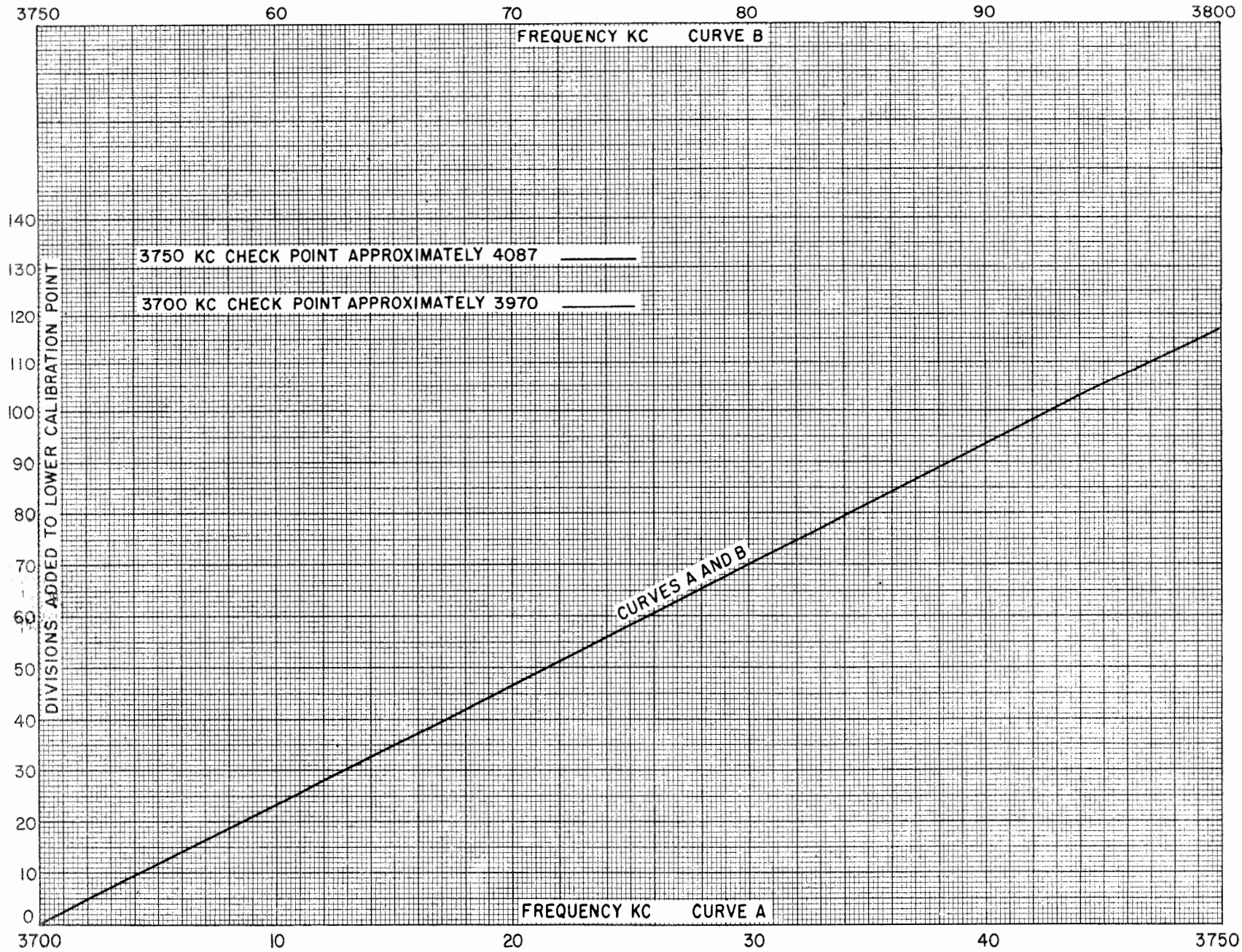


Figure 4-21. Calibration Curve, 3700-3800 kc

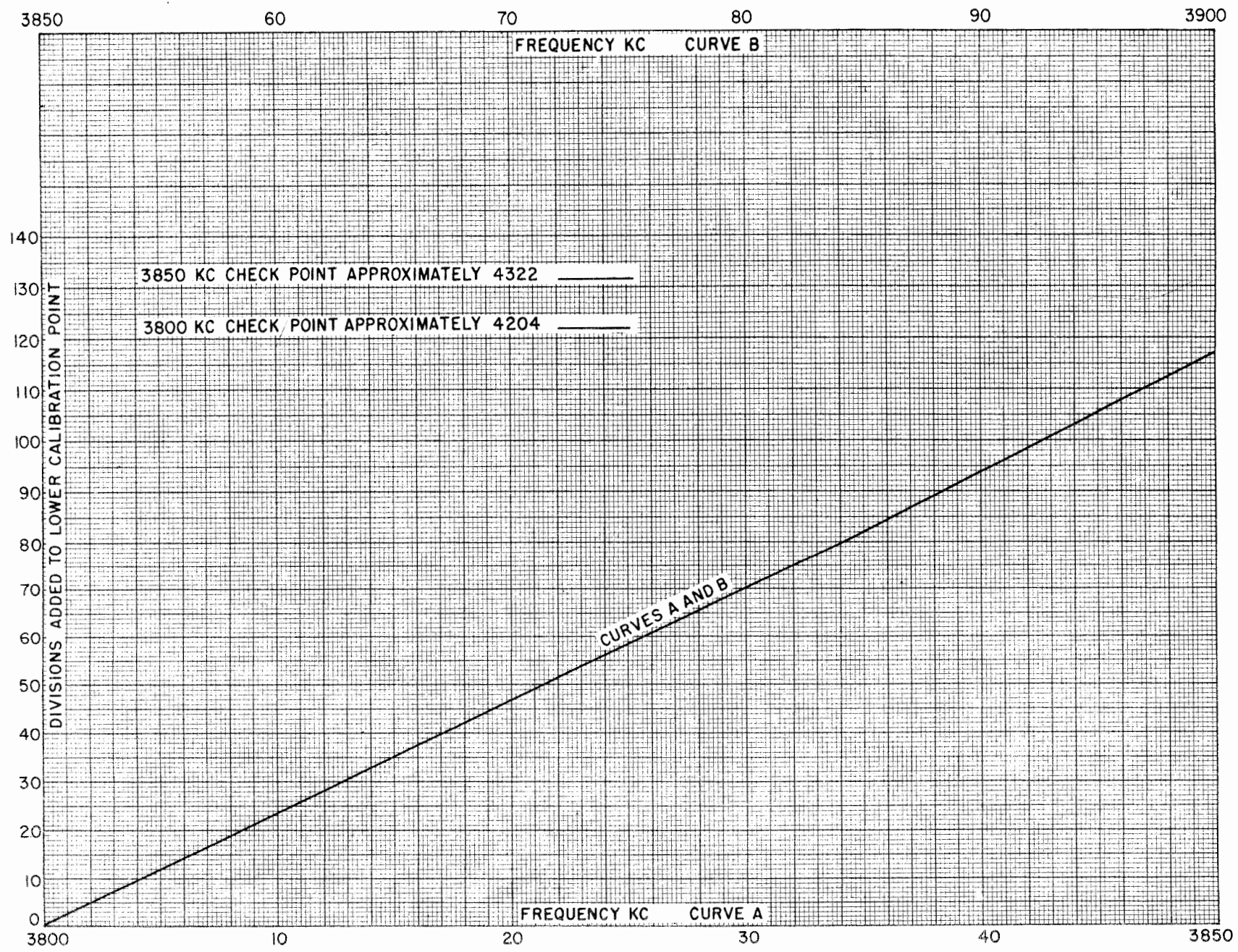


Figure 4-22. Calibration Curve, 3800-3900 kc

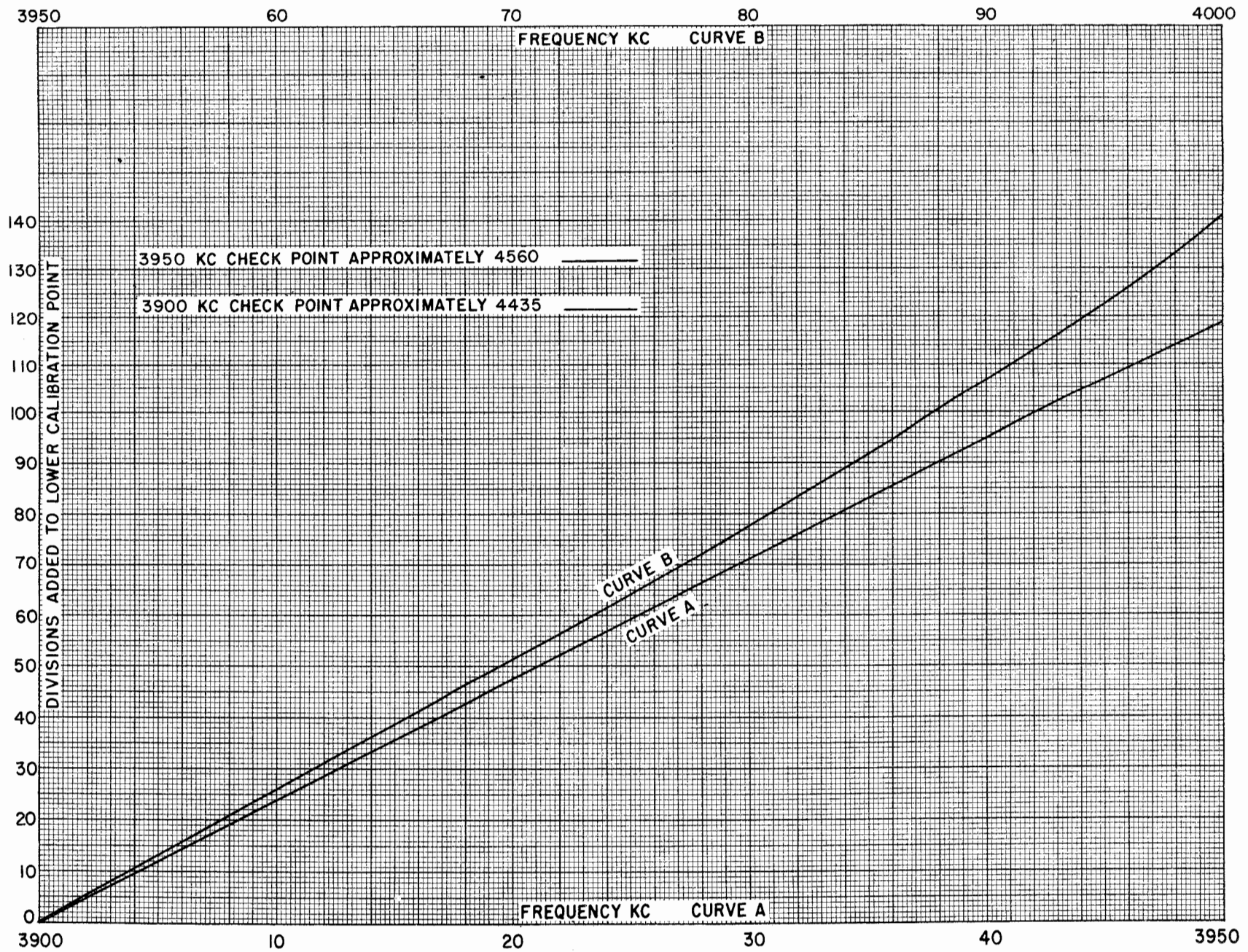


Figure 4-23. Calibration Curve, 3900-4000 kc

SECTION 5 OPERATOR'S MAINTENANCE

1. INTRODUCTION.

This section contains information on such maintenance procedures as can be performed by the operator.

2. ROUTINE CHECKS.

Table 5-1 lists the routine checks necessary with every watch to determine if the RF Oscillator O-165/UR is operating normally.

3. EMERGENCY MAINTENANCE.

Notice to Operators

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

a. REPLACEMENT OF 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 of failure has been found and corrected.

(1) SYMPTOMS OF FUSE FAILURE.—Table

5-2 contains a list of fuses in the RF Oscillator O-165/UR, their locations, the circuits protected, the symptoms of fuse failure, the ampere and voltage ratings of the fuses, and figure references.

(2) REPLACEMENT OF FUSES.—To replace either F1 or F2, unscrew fuse holder cap by turning it counterclockwise, pull blown fuse from cap, push new fuse into cap, insert cap into holder, and turn cap clockwise to secure.

b. REPLACEMENT OF ELECTRON TUBES.

WARNING

This equipment employs voltages which are dangerous and which 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 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. To check, inspect the tubes visually and by touch. Tubes that are cold and do not light up should be replaced.

TABLE 5-1. OPERATOR'S ROUTINE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Oven heater.	Read OVEN HEAT thermometer.	Mercury level should be visible and at approximately 60°C.
HFO section.	Read meter MI with METER SELECTOR switch at HF OUT.	Meter should read normal desired output level. If incorrect, adjust HF OUT control.
BFO section.	Read meter MI with METER SELECTOR switch at BF OUT.	Meter should read normal desired output level. If incorrect, adjust BF OUT. CONT.

TABLE 5-2. FUSE LOCATIONS AND SYMPTOMS OF FAILURE

FUSE	LOCATION	PROTECTS	SYMPTOM	AMPS	VOLTS	FIGURE REFERENCE
F1	Rear panel	Heater and primary power.	Oven heater and primary power pilot lights off.	4	110	4-2
F2	Rear panel	B + supply.	No outputs.	0.2	250	4-2

Note

Due to the long warm-up and stabilization time for the unit, do not shut off the power. Tube VI should not be replaced unless it is defective or erratic.

If tube VI is changed, a recheck of the calibration

of the unit must be made by the technician.

All tube shields are of the push and turn type. To remove the shield, push down, turn counterclockwise as far as possible, and lift off. Replace tube, slide shield down over locking pins, turn clockwise, and release.

SECTION 6 PREVENTIVE MAINTENANCE

1. 1000-HOUR ROUTINE MAINTENANCE CHECK.

The variable HFO of RF Oscillator O-165/UR should be checked every 1000 hours for proper calibration at two and four megacycles, which should correspond to dial settings at 0000.0 and 4700.0, respectively. Any error should be corrected according to the procedure in Section 3, paragraph 3*b* and 3*c*.

2. ANNUAL CHECK.

Once a year the primary power for RF Oscillator O-165/UR should be shut off and the unit removed to a bench. The bottom cover of the unit should be removed, and the inner oven opened and removed.

Note

Before removing the inner oven, read and follow the instructions given in Section 7, paragraph 4.

Clean, wherever necessary, with carbon tetrachloride.

Insert all connectors into their mates and measure tube socket and connector voltages as shown in figure 7-11.

After thorough inspection, reassemble the equipment and return to the rack. Turn on the primary power and allow to heat for 24 hours. Recalibrate as described in Section 3, paragraph 3*c*.

3. LUBRICATION.

RF Oscillator O-165/UR requires no lubrication.

4. RE-TROPICALIZATION.

RF Oscillator O-165/UR requires no re-tropicalization treatment.

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.

INSTRUCTIONS FOR ELECTRONIC FAILURE REPORT NAVSHIPS 383

1. This form must be used to report ALL FAILURES. Any electronic, electrical, or mechanical part (electron tube, transformer, resistor, motor, gear, etc.) found defective, due to operation, handling or stowage, must be reported to the Bureau on this form.
2. Mechanical parts, a speaker amplifiers, on this form.
3. Do not delay subm with TYPEWRIT envelope, seal, and
4. Mailing instructio (a) Naval Activi Electronics desired. (b) Marine Corp to Marine C Policies, C-tained for f
5. Additional form Publications an
6. This form is Ni parts in acco cedures.

7. If CONFIDENTIAL information is included in the report, follow proper SECURITY REGULATIONS. Model designations, type numbers, etc., are NOT confidential. A part (name, description, stock number, etc.) is rarely classified above RESTRICTED.

8. In block showing "Type of Activity Using Equipment" show mobile equipment as amphibious. "Equipment Category" is same as that on 145. Refer to instructions

**U. S. NAVY
FAILURE REPORT
NAVSHIPS 383 (REV. 4-68)**

REPORT NO.

NOTICE: 1. Read instructions interleafed in this pad prior to preparing report.
2. Report all failures (Electronic, electrical, and mechanical).
3. Use separate sheet to report each part failure.

DATE OF FAILURE:

EQUIPMENT INSTALLED IN: (Number and name of ship or station) REPAIRS MADE BY: (Number and name of ship, yard, tender, etc.) LEAVE BLANK REPAIRED BY: (Name and rate of person)

SERVICE USING EQUIPMENT (Check one)			TYPE ACTIVITY USING EQUIPMENT (Check one)			EQUIPMENT CATEGORY (Check one)				
1 <input type="checkbox"/> NAVY	2 <input type="checkbox"/> USCG	3 <input type="checkbox"/> USMC	1 <input type="checkbox"/> SHIP	2 <input type="checkbox"/> SHORE	3 <input type="checkbox"/> AMPHIBIOUS	1 <input type="checkbox"/> RADIO	2 <input type="checkbox"/> RADAR	3 <input type="checkbox"/> SONAR	4 <input type="checkbox"/> TEST	
4 <input type="checkbox"/> ARMY	5 <input type="checkbox"/> AIR FORCE		4 <input type="checkbox"/> AIR-BORNE	5 <input type="checkbox"/> OTHER	(Specify)	5 <input type="checkbox"/> ORDNANCE	6 <input type="checkbox"/> NANCY AND RADAR	8 <input type="checkbox"/> POWER	9 <input type="checkbox"/> OTHER (Specify)	

NAME PLATE DATA	MODEL DESIGNATION	SERIAL NO.	NAME OF CONTRACTOR	TYPE NO. AND NAME
EQUIPMENT	LEAVE BLANK	CONTRACT NO.	DATE INSTALLED	SERIAL NO.

PART FAILURE DATA (Check one)	COMPLETE TURN TYPE OR NAME AND NAVY TYPE NO. OF PART	STANDARD NAVY STOCK NO. (Use note 1)	MANUFACTURER'S DESIGNATION (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)	FAILED IN (Check one)	
	APPROXIMATE LIFE (2 hours)	LEAVE BLANK	MANUFACTURER'S NAME	1 <input type="checkbox"/> OPERATION	2 <input type="checkbox"/> FAULTY PACKAGING
				3 <input type="checkbox"/> HANDLING	4 <input type="checkbox"/> OTHER (Specify)

CHECK TYPE OF FAILURE

002 <input type="checkbox"/> AIRLEAK	130 <input type="checkbox"/> CHANGE OF VALUE	300 <input type="checkbox"/> GROUNDED	360 <input type="checkbox"/> INTERMITTENT OPERATION	225 <input type="checkbox"/> WFR'S DEFECT	003 <input type="checkbox"/> OPEN FILAMENT	540 <input type="checkbox"/> PUNCTURED	620 <input type="checkbox"/> SHORTED TO PRIMARY
007 <input type="checkbox"/> ARCING	170 <input type="checkbox"/> CORRODED	310 <input type="checkbox"/> HANDLING IMPROPER	380 <input type="checkbox"/> LEAKAGE	005 <input type="checkbox"/> MICROPHONIC	460 <input type="checkbox"/> OPEN PRIMARY	011 <input type="checkbox"/> SCREW IN DEFECTS	630 <input type="checkbox"/> SHORTED TO SECONDARY
010 <input type="checkbox"/> BROKEN	190 <input type="checkbox"/> CRACKED	320 <input type="checkbox"/> HIGH VOLTAGE BREAK-DOWN	013 <input type="checkbox"/> LOOSE BASE	008 <input type="checkbox"/> NOISE	470 <input type="checkbox"/> OPEN SECONDARY	006 <input type="checkbox"/> SHORTED INTERMITTENT	020 <input type="checkbox"/> UNSTABLE OPERATION
014 <input type="checkbox"/> BROKEN BASE	330 <input type="checkbox"/> EXCESSIVE HUM	340 <input type="checkbox"/> INSTALLED IMPROPERLY	012 <input type="checkbox"/> LOOSE ELEMENTS	022 <input type="checkbox"/> NO OXIDE LAYER	480 <input type="checkbox"/> OVERHEATED	009 <input type="checkbox"/> SHORTED PERMANENT	<input type="checkbox"/> OTHER (Specify in Remarks)
015 <input type="checkbox"/> BROKEN GLASS	001 <input type="checkbox"/> GASSY	350 <input type="checkbox"/> ISOLATION BREAK-DOWN	004 <input type="checkbox"/> LOW EMISSION	440 <input type="checkbox"/> OLD AGE (Specify in Remarks)	021 <input type="checkbox"/> OVERLOADED	600 <input type="checkbox"/> SHORTED TO CASE	
060 <input type="checkbox"/> BURNED	016 <input type="checkbox"/> GLASS STRAIN		014 <input type="checkbox"/> MECHANICAL BENDING	450 <input type="checkbox"/> OPEN	010 <input type="checkbox"/> MIRROR FOCUS	610 <input type="checkbox"/> SHORTED TO FRAME	

REMARKS: INCLUDE CAUSE OF FAILURE AND SUGGESTED CHANGES (Continue remarks on reverse side)

LEAVE BLANK

Figure 7-1. Failure Report

SECTION 7

CORRECTIVE MAINTENANCE

1. INTRODUCTION.

WARNING

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

Trouble shooting aids are provided in this section to assist in locating faults and facilitating their repair. These include the trouble shooting chart, Table 7-1; illustrations showing the location of parts, figures 7-2 through 7-10; the voltage and resistance chart, figure 7-11; the coil winding data table, Table 7-2; the unit schematic, figure 7-12; and the unit wiring diagram, figure 7-13.

In addition to the normal maintenance tools, the following equipment is necessary for trouble shooting, aligning, and repairing the Radio Frequency Oscillator O-165/UR.

- a. A 20,000 ohms/volt multimeter, such as the Navy Model OE series or equivalent.
- b. An electronic multimeter, such as the Navy Model OBQ series or equivalent.
- c. A set of headphones.

2. TROUBLE SHOOTING.

When it has been determined that the RF Oscillator O-165/UR is defective in the particular system in which it is being used, it is possible to trace the trouble and localize it within the unit. The trouble shooting chart, Table 7-1, serves as a guide in finding and clearing the trouble as quickly as possible. When the fault has been localized to a particular stage, the voltage and resistance chart, figure 7-11, provides a means for checking the correctness of the voltage and resistance measurements.

3. ELECTRICAL ADJUSTMENTS.

The electrical adjustments of the RF Oscillator O-165/UR are described in Section 3 as pre-installation adjustments.

4. 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 RF 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 approximately 0000.0 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 be performed from the bottom of RF 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 connectors P3 and P4 at the rear of the oven. Remove the rear cover and celotex 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. See figure 7-7.

The inductor-capacity assembly may be removed by first unsoldering the tube cathode and grid connections from the ends of the 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. See figure 7-4 for location of C22.

c. ASSEMBLY.—The RF Oscillator O-165/UR

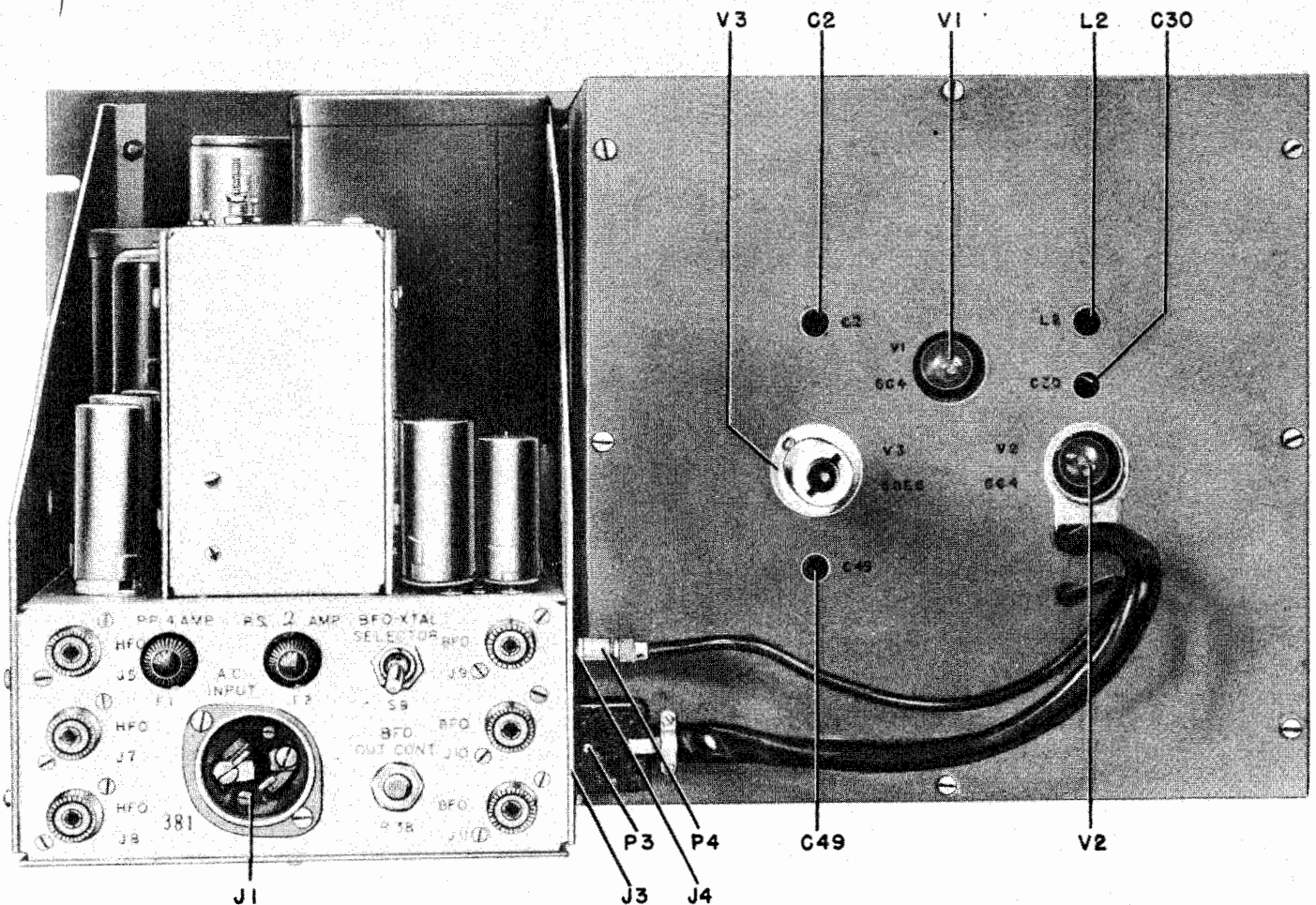


Figure 7-2. RF Oscillator O-165/UR, Rear View, Location of Parts

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.

(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 tips 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.

TABLE 7-1. RF OSCILLATOR O-165/UR
TROUBLE-SHOOTING CHART

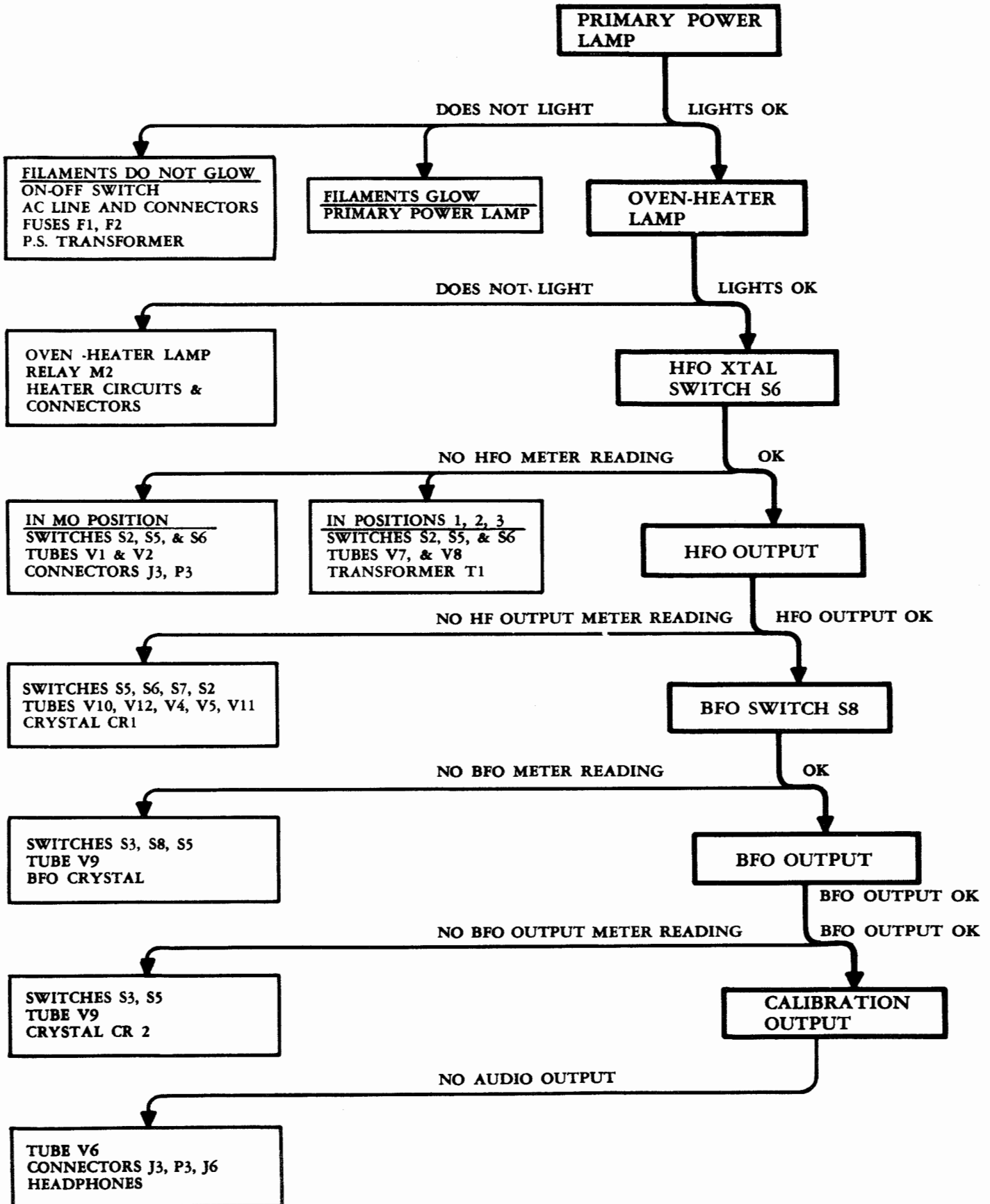
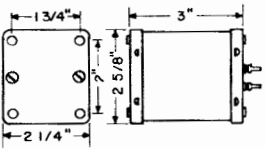
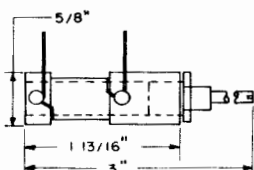
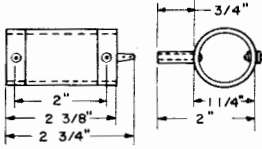
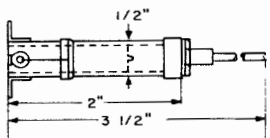
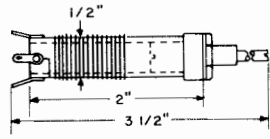
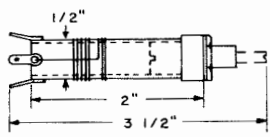
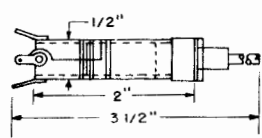
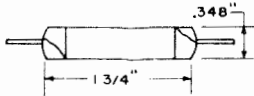


TABLE 7-2. WINDING DATA

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	REMARKS
L-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.
L-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.
L-3	NRCO AD5A43		Single layer	No. 22 AWG	38	0.22	Inductance: 27.5 μ h at 2.5 Mc.
L-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.
L-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.
L-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 16 Mc. Adjustable iron core.
L-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.
L-8 L-9 L-10	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.

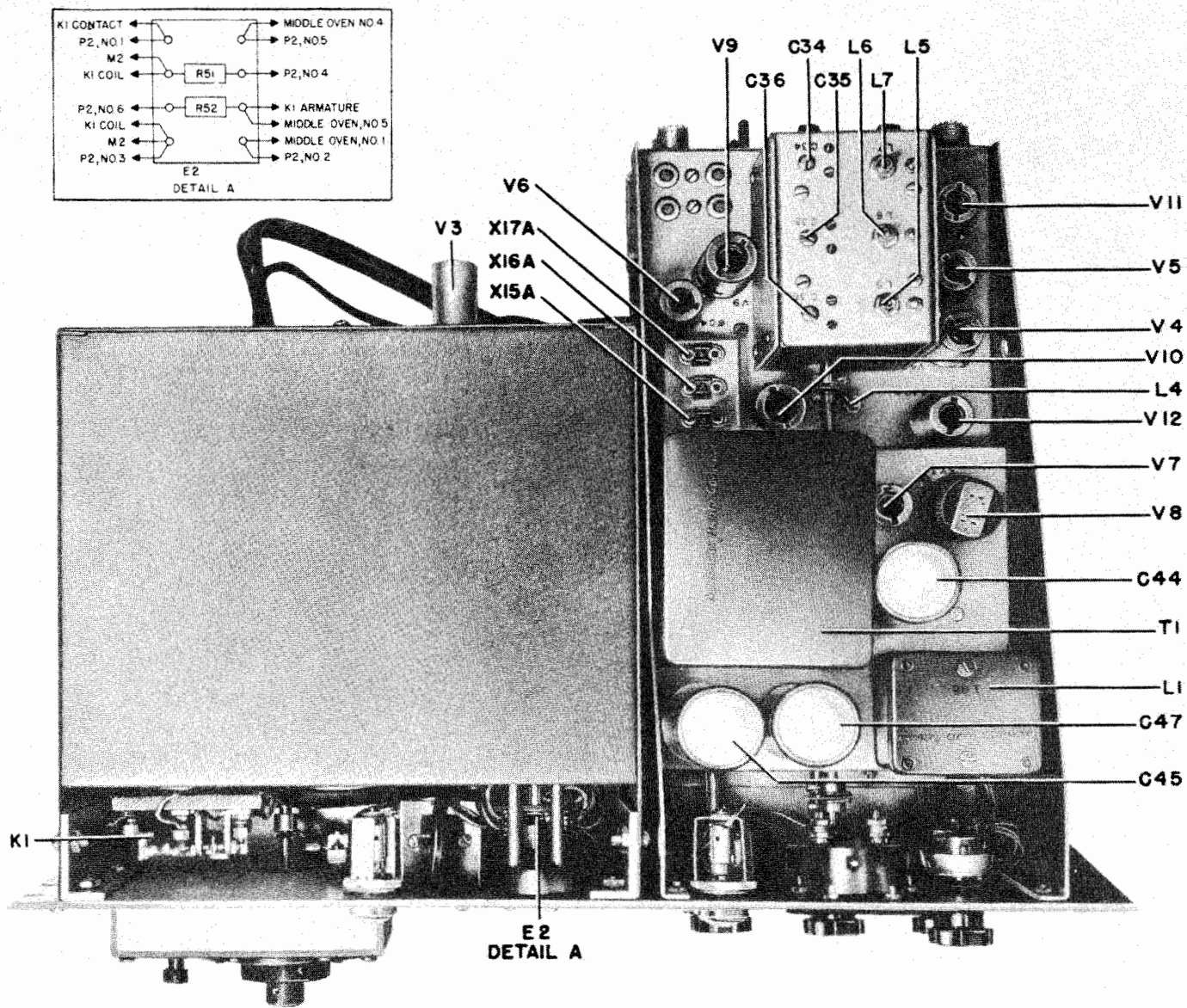


Figure 7-3. RF Oscillator O-165/UR, Top View, Location of Parts

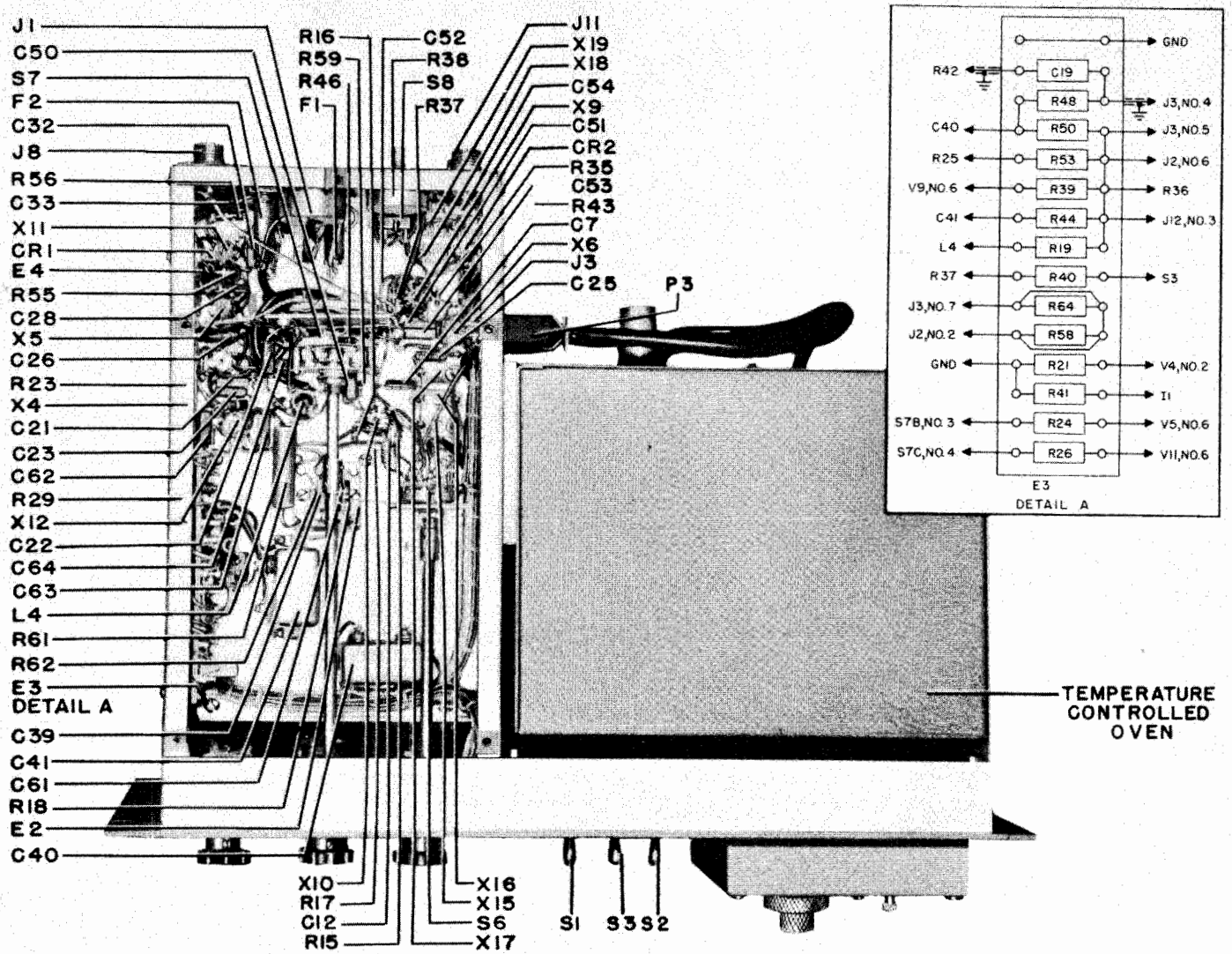


Figure 7-4. RF Oscillator O-165/UR, Bottom View, Location of Parts

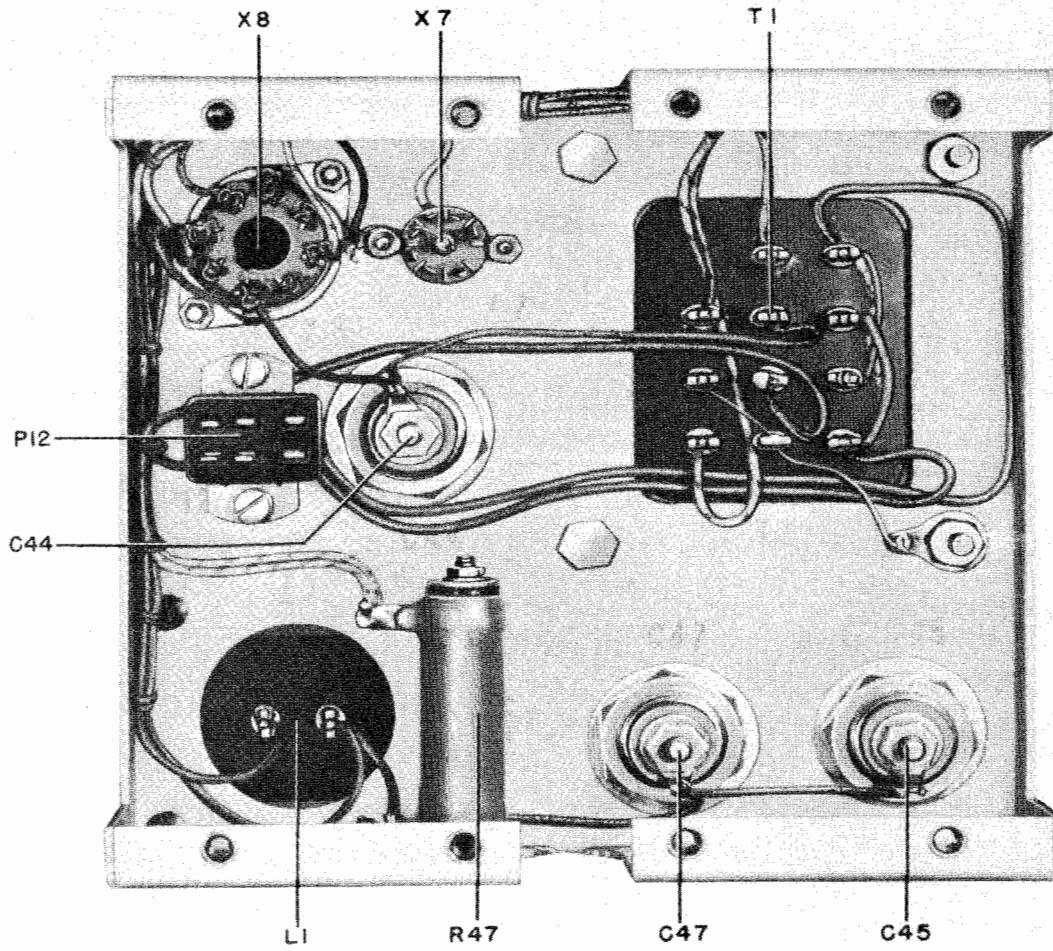


Figure 7-5. Power Supply Sub-Assembly, Bottom View, Location of Parts

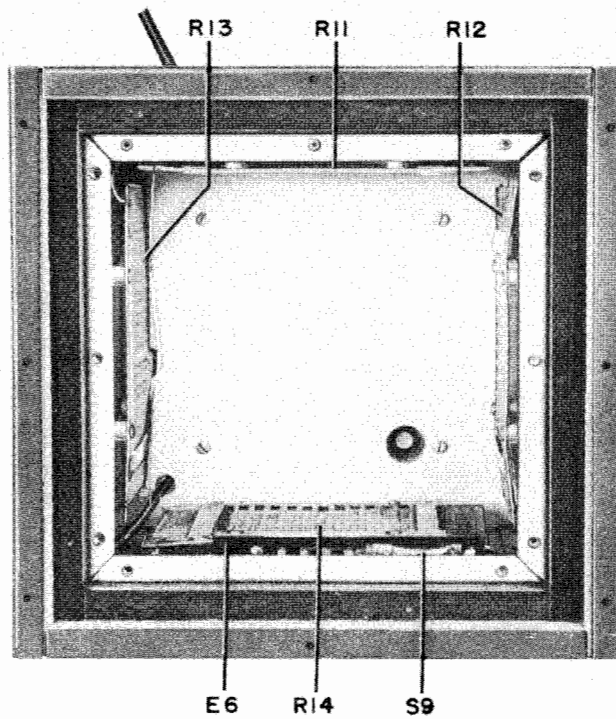


Figure 7-6. Middle Oven, Location of Parts

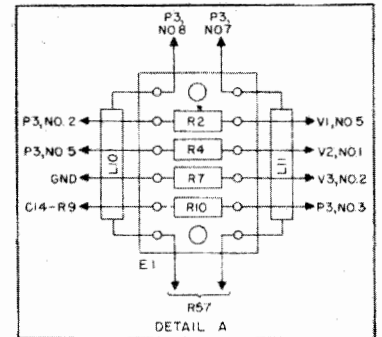
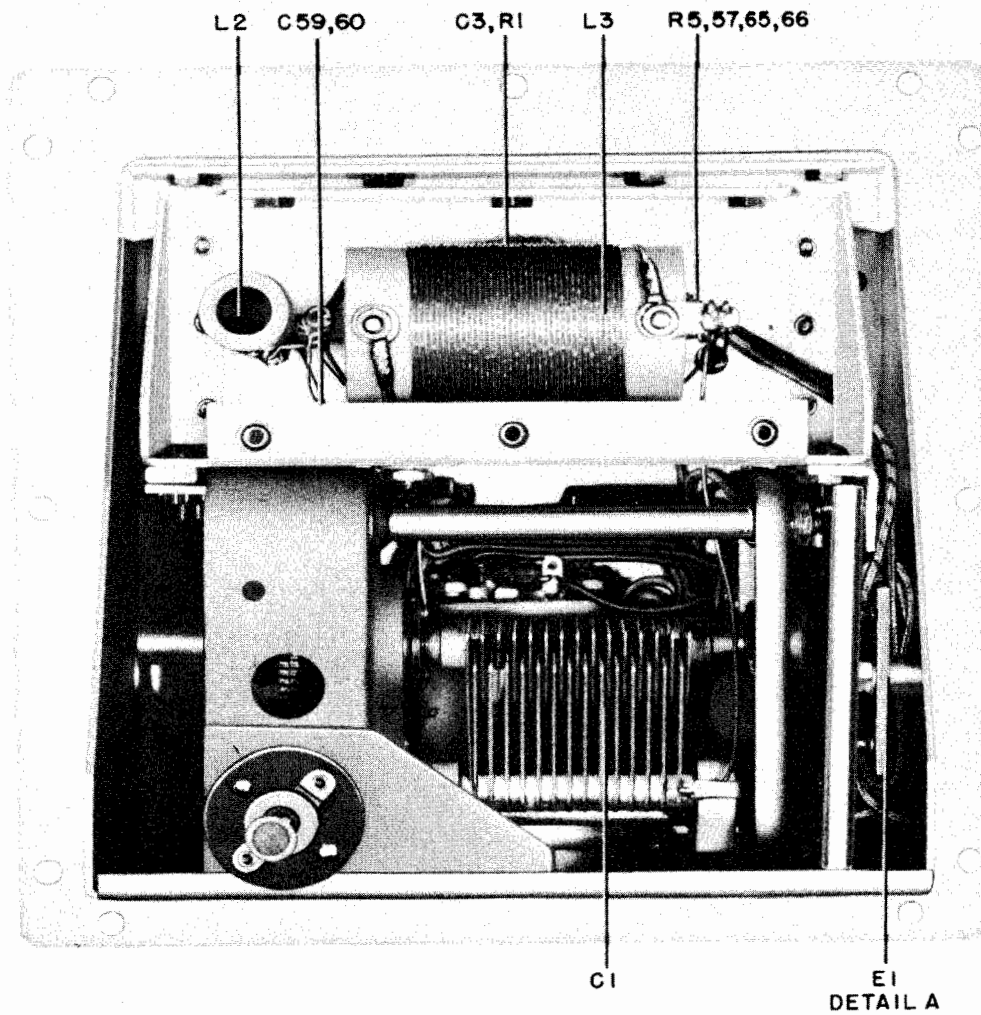


Figure 7-7. Inner Oven With Covers Removed, Location of Parts

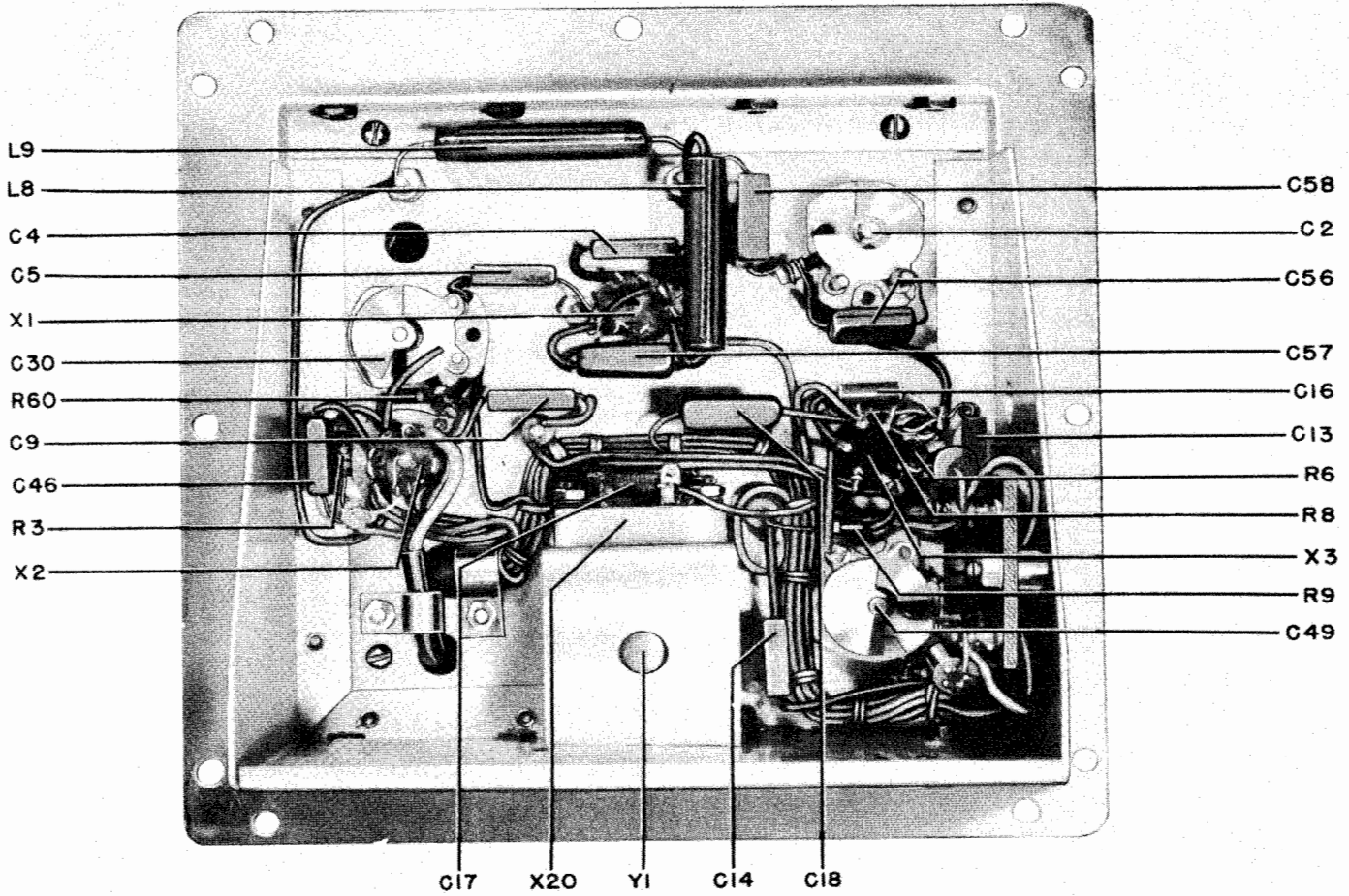


Figure 7-8. Inner Oven With Tuning Unit Removed, Location of Parts

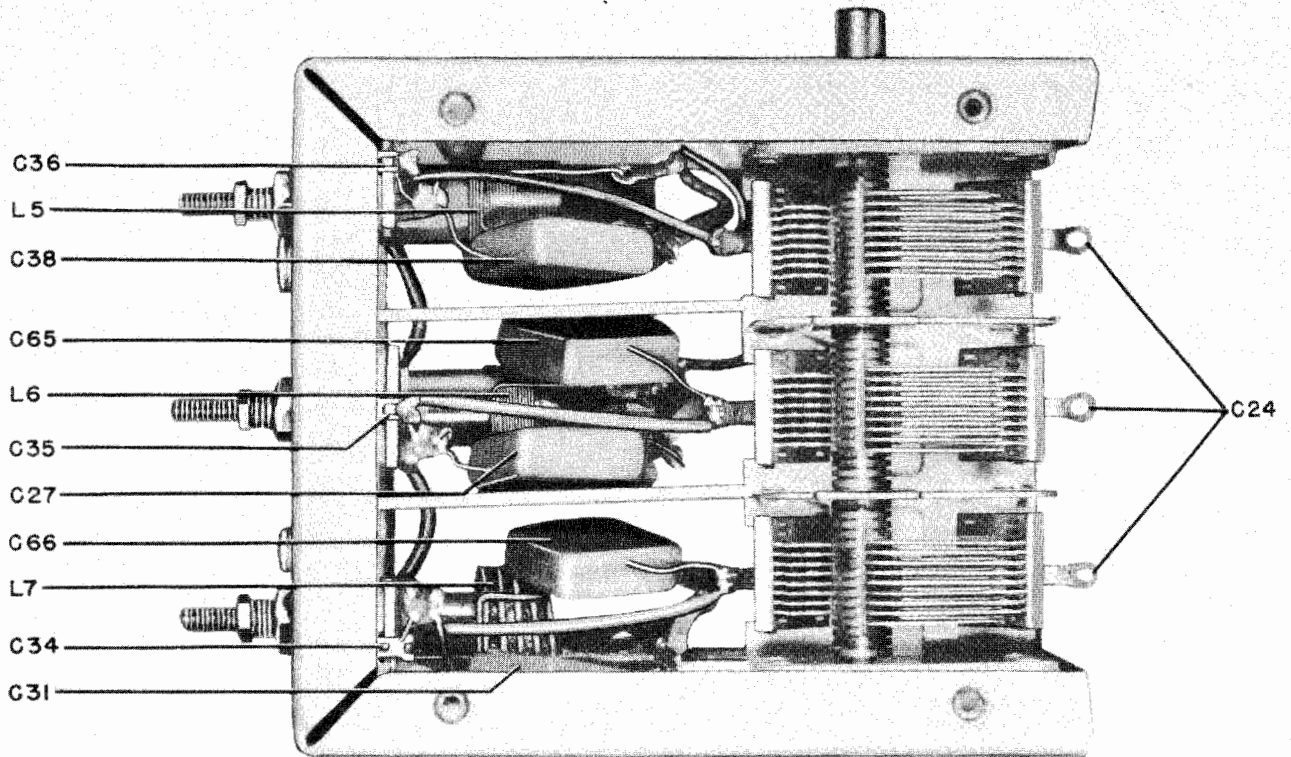


Figure 7-9. Multiplier Tuning Assembly, Right Side, Location of Parts

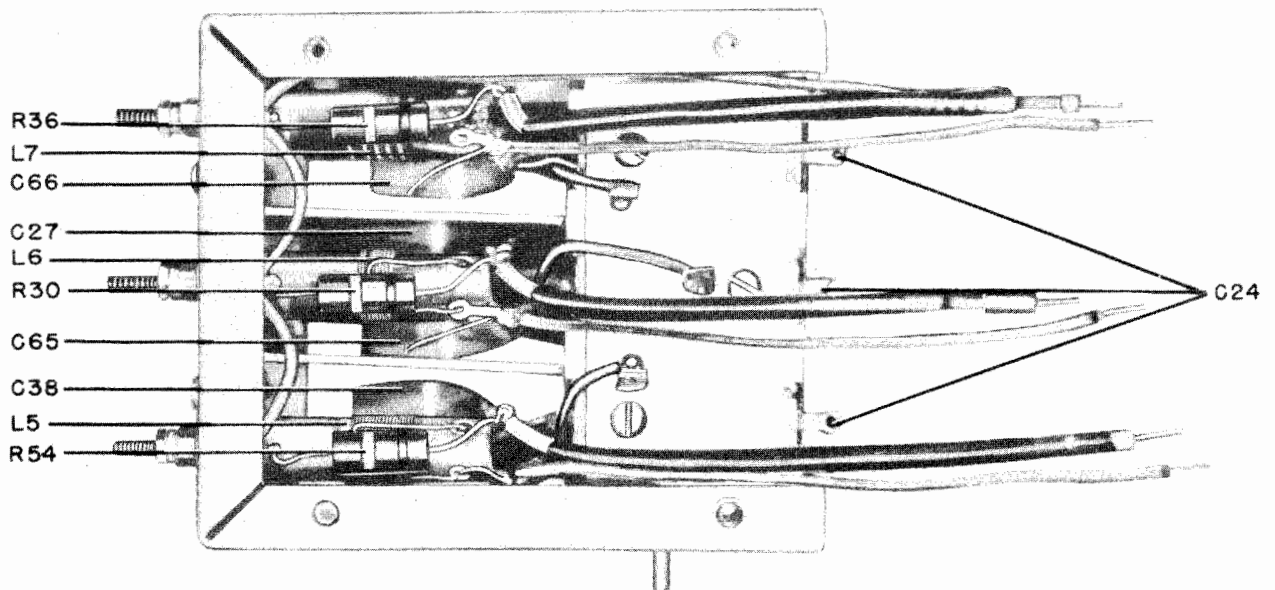
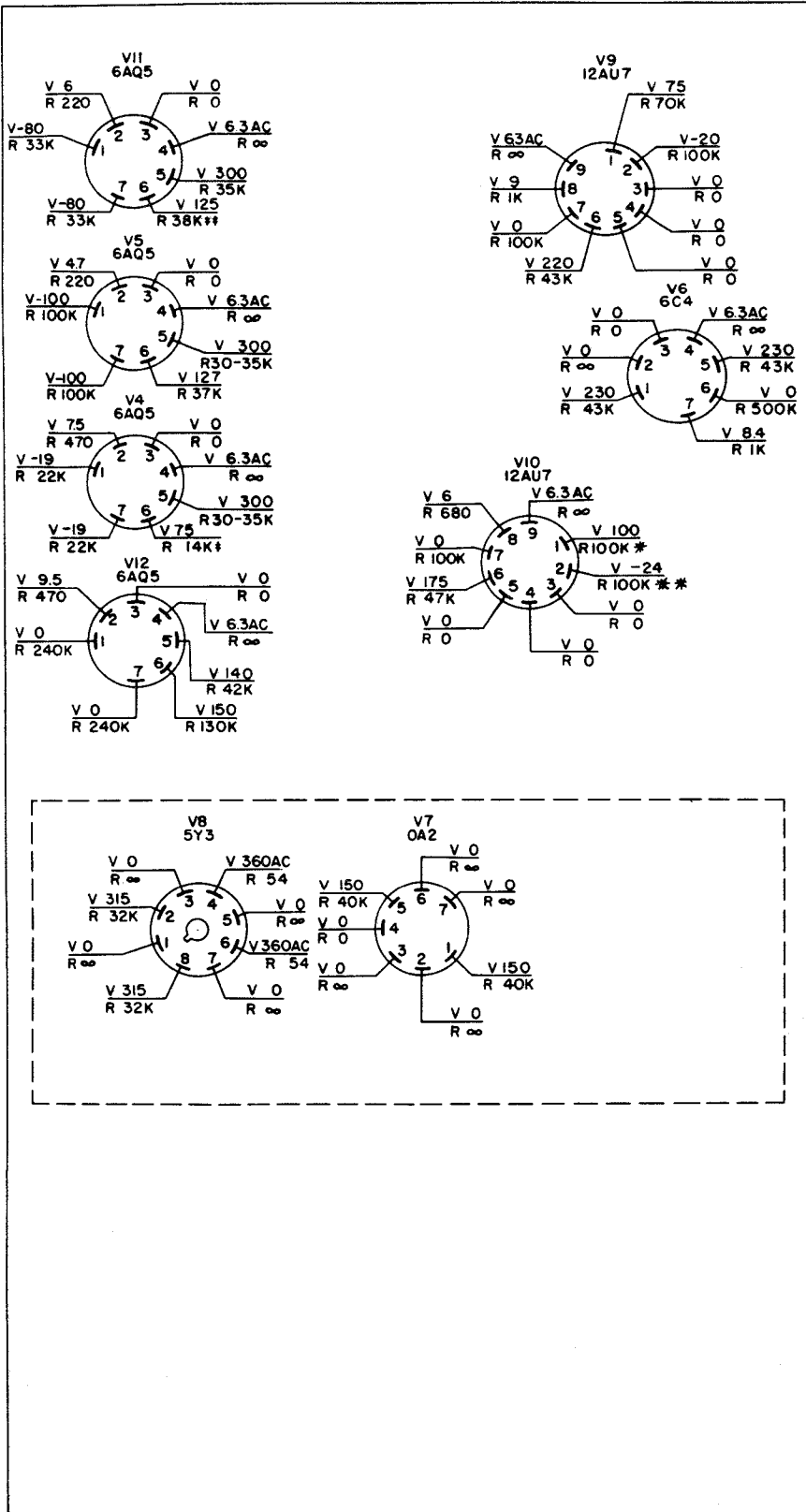


Figure 7-10. Multiplier Tuning Assembly, Left Side, Location of Parts



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 M0, VOLTAGE IS ZERO, RESISTANCE IS INFINITE
- **WITH HFO XTAL SWITCH AT M0, 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

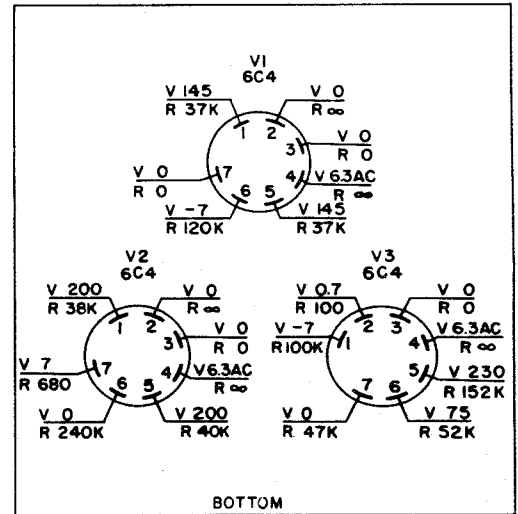


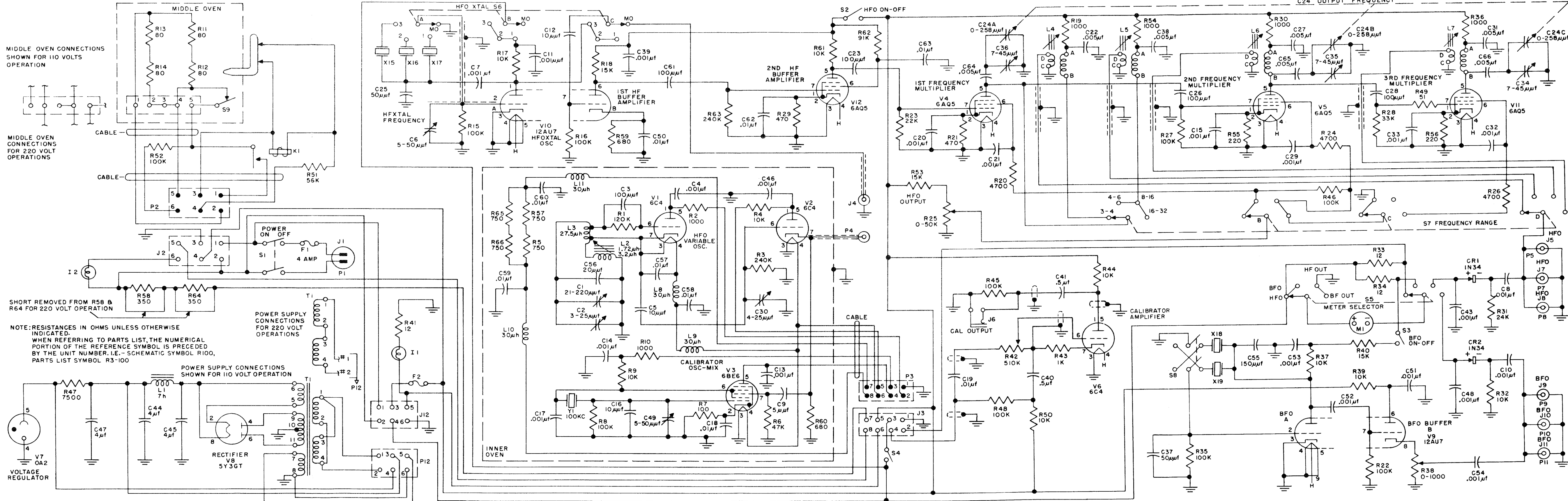
Figure 7-11. RF Oscillator O-165/UR, Voltage and Resistance Chart

NAVSHIPS 91756
O-165/UR

NAVSHIPS 91756
O-165/UR

NAVSHIPS 91756
O-165/UR

NAVSHIPS 91756
O-165/UR



MIDDLE OVEN CONNECTIONS SHOWN FOR 110 VOLTS OPERATION

MIDDLE OVEN CONNECTIONS FOR 220 VOLT OPERATIONS

SHORT REMOVED FROM R58 & R64 FOR 220 VOLT OPERATION

NOTE: 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 R3-100

POWER SUPPLY CONNECTIONS FOR 220 VOLT OPERATIONS

POWER SUPPLY CONNECTIONS SHOWN FOR 110 VOLT OPERATION

Figure 7-12. RF Oscillator O-165/UR, Schematic Diagram

Contracts: NObsr-57535
NObsr-64825

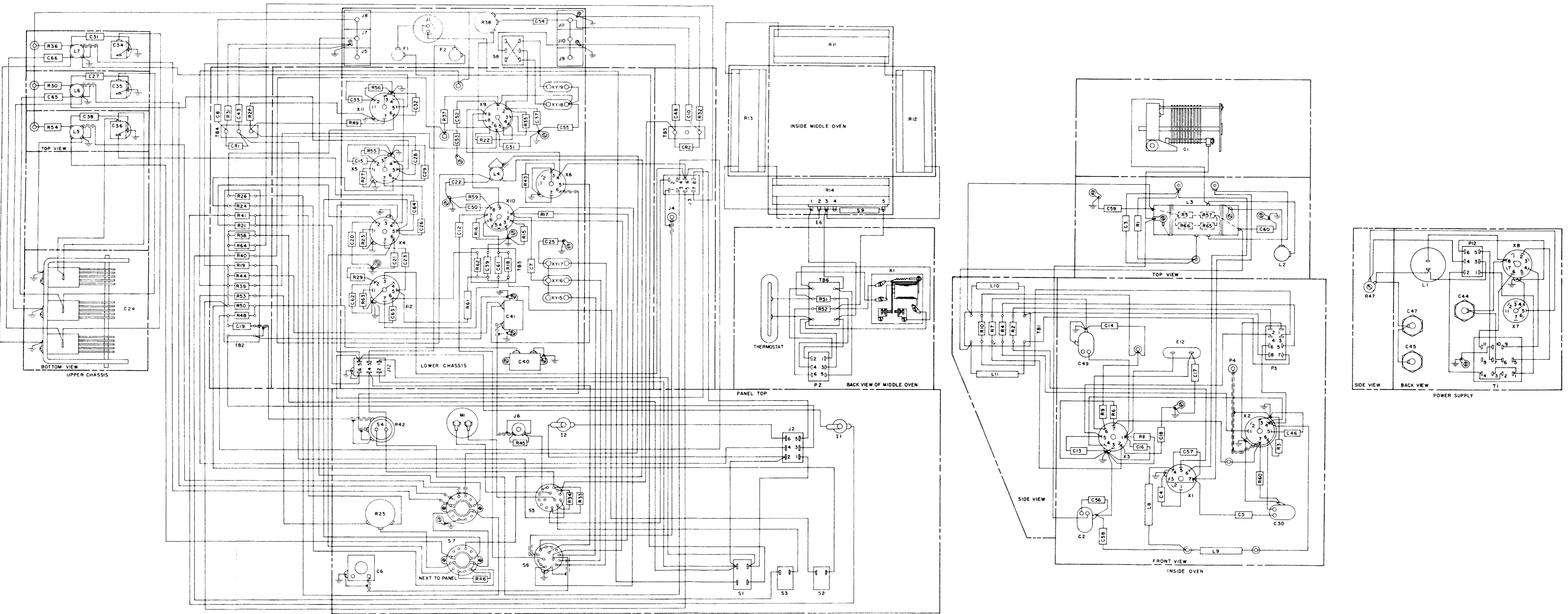


Figure 7-13. RF Oscillator O-165/UR, Wiring Diagram

SECTION 8
PARTS LISTS**TABLE 8-1. WEIGHT AND DIMENSIONS OF SPARE PARTS BOX**

EQUIPMENT SPARES					
SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. IN.	WEIGHT OZ.
	HEIGHT	WIDTH	DEPTH		
1	4-1/2	7-1/2	4-1/2	152	12

TABLE 8-2. SHIPPING WEIGHT AND DIMENSIONS OF SPARE PARTS BOX

EQUIPMENT SPARES						
SHIPPING BOX NO.	SPARE PARTS BOX	APPROX. OVERALL DIMENSIONS, IN.			VOLUME CU. IN.	WEIGHT OZ.
		HEIGHT	WIDTH	DEPTH		
1 of 1	1	4-1/2	7-1/2	4-1/2	152	16

TABLE 8-3. LIST OF MAJOR UNITS OF RADIO FREQUENCY OSCILLATOR O-165/UR

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	STANDARD NAVY STOCK NO.	NAVY TYPE DESIGNATION
1-99	1	Radio Frequency Oscillator	F16-C-15957-1248	O-165/UR

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
A-1	--- N17-M-87012-5951	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; NRCO Part No. BK7A2, Dwg No. A1104172.	Mounting for M-2
C-1	--- N16-C-61523-4801	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 (I-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; NRCO Dwg No. B1104115, CDN Part No. 4.080.	HF variable oscillator
C-2	--- N16-C-58836-5306	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; NRCO Dwg No. A1104126, HMM Part No. APC25; for general purpose use.	"DIAL UNITS" trimmer (HF oscillator)
C-3	--- N16-C-28553-1041	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; NRCO DWG No. A1104105-1; SMO Part No. RR1310; for general purpose use.	V-1 grid coupler
C-4	--- N16-C-31090-4169	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; JAN CM30C102K (JAN-C-5); SMO Type No. KR1210; for general purpose use.	V-1 plate bypass
C-5	--- N16-C-26020-7691	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 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; NRCO Dwg No. A1104105-2; SMO Part No. RR1410; for general purpose use.	V-2 input coupler
C-6	--- N16-C-60036-1604	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	"HF XTAL FREQ" adjustment

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C-6 (cont)		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 iso-lantite; 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; NRCO Dwg No. A1104145 HMM Part No. HF50; for general purpose use.	
C-7		Same as C-4.	"HF XTAL FREQ" adjustment
C-8	--- N16-C-31090-4208	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 1000 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; SMO Type No. K1210; for general purpose use.	M-1 HF output coupler
C-9	--- N16-C-25102-6276	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; NRCO Dwg No. A110495-3; SMO Type No. K1550; for general purpose use.	V-3 HF input coupler
C-10		Same as C-8.	M-1 BF output coupler
C-11		Same as C-8.	V-10A plate by-pass
C-12	3K2010021 N16-C-26025-8276 3300-376001000	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; JAN CM20B100K (JAN-C-5); SMO Type No. K1410; for general purpose use.	V-10B input coupler
C-13		Same as C-8.	V-3 plate bypass
C-14		Same as C-8.	V-3 screen filter
C-15		Same as C-8.	V-5 cathode by-pass
C-16	--- N16-C-15917-3301	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, NRCO Dwg No. A110455-1; CN Part No. TCZ10; for general purpose use.	V-3 grid to cathode feedback

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C-17		Same as C-4.	V-3 screen load
C-18	--- N16-C-33622-5222	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10,000 mmf \pm 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; JAN CM35B103K (JAN-C-5); SMO Type No. C06110; for general purpose use.	V-3 cathode by-pass
C-19		Same as C-18.	V-3 output coupler
C-20		Same as C-8.	V-4 cathode by-pass
C-21		Same as C-8.	V-4 screen bypass
C-22	--- N16-C-32699-4608	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 5,000 mmf \pm 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; NRCO Dwg No. A110496-1; SMO Type No. C1250; for general purpose use.	V-4 plate filter
C-23	3K2010121 N16-C-28558-1676	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 100 mmf \pm 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; JAN CM20B101K (JAN-C-5); SMO Type No. K1310; for general purpose use.	V-12 output coupler
C-24	--- N16-C-63286-9101	CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 3 sections (C-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, 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; NRCO Dwg No. A110485; RAD Series No. 25.	"OUTPUT FREQ" adjustment
C-24A		P/o C-24.	2 to 4 and 4 to 8 inc output frequency tuner
C-24B		P/o C-24.	8 to 16 mc output frequency tuner
C-24C		P/o C-24.	16 to 32 mc output frequency tuner
C-25	--- N16-C-27629-7215	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 50 mmf \pm 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; NRCO Dwg	V-10A plate load

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C-25 (cont)		No. A1104105-4; SMO Part No. RR1450; for general purpose use.	
C-26		Same as C-23.	V-4 output coupler
C-27		Same as C-22.	V-5 plate filter
C-28		Same as C-23.	V-5 output coupler
C-29		Same as C-8	V-5 screen bypass
C-30		Same as C-2.	P/o voltage divider input network to V-2
C-31		Same as C-22.	V-11 plate filter
C-32		Same as C-8.	V-11 screen bypass
C-33		Same as C-8.	V-11 cathode bypass
C-34	--- N16-C-64133-6625	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"; NRCO Dwg No. A110456; ERC Type No. TS2A; for general purpose use.	16 to 32 mc output frequency trimmer
C-35		Same as C-34.	8 to 16 mc output frequency trimmer
C-36		Same as C-34.	2 to 4 and 4 to 8 mc output frequency trimmer
C-37	--- N16-C-27634-8769	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 50 mf capacity, $\pm 5\%$ 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; mounting facilities, 2 wire leads, located one ea end; SMO Part No. KR1450; for general purpose use.	BF oscillator grid to cathode feedback coupler
C-38		Same as C-22.	V-4 plate filter
C-39		Same as C-8.	V-10B plate filter
C-40	--- N16-C-47327-7486	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 42, MBCA Ref Dwg Group 1; 500,000 mmf $\pm 20\%$ 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; NRCO Dwg No. A110491-1; SMO Type No. 5006R5-0.5; for general purpose use.	V-3 plate filter
C-41		Same as C-40.	V-6 output coupler
C-43		Same as C-8.	M-1 filter for HF output signal

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C-44	--- N16-C-49988-5295	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style No. 12, MBCA Ref Dwg Group 1; 4 mf \pm 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; NRCO Dwg No. A110448; CLD Part No. TLA6040; for general purpose use.	Power supply filter
C-45		Same as C-44.	Power supply filter
C-46		Same as C-4.	V-2 plate bypass
C-47		Same as C-44.	Power supply filter
C-48		Same as C-8.	M-1 filter for BF output signal
C-49	--- N16-C-59823-8206	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; NRCO Dwg No. A1104125; HMM Part No. APC50; for general purpose use.	Fine adjustment for calibrator output frequency
C-50		Same as C-18.	V-10B cathode bypass
C-51		Same as C-8.	V-9B plate bypass
C-52		Same as C-23.	V-9A to V-9B coupler
C-53		Same as C-8.	V-9A plate bypass
C-54		Same as C-8.	V-9B output coupler
C-55	3K2015132 N16-C-28975-1601 3300-376009000	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 150 mmf \pm 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; JAN CM20C151J (JAN-C-5); SMO Part No. KR1315; for general purpose use.	V-9A plate load
C-56	N16-C-26732-9439	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 20 mmf \pm 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; NRCO DWG No. A1104105-3; SMO Part No. RR1420; for general purpose use.	P/o variable HF oscillator

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
C-57	--- N16-C-33617-4746	CAPACITOR, FIXED, MICA DIELECTRIC: case style No. 22, MBCA Ref Dwg Group 1; 10,000 mmf \pm 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; JAN CM35C103J (JAN-C-5); SMO Part No. CR06110; for general purpose use.	V-1 filament filter
C-58		Same as C-57.	V-1 filament filter
C-59		Same as C-18.	Inner oven heater bypass
C-60		Same as C-18.	Inner oven heater bypass
C-61		Same as C-23.	V2-10B output coupler
C-62		Same as C-18.	V-12 cathode bypass
C-63		Same as C-18.	V-12 screen bypass
C-64		Same as C-22.	V-4 plate to tuned circuit coupler
C-65		Same as C-22.	V-5 plate to tuned circuit coupler
C-66		Same as C-22.	V-6 plate to tuned circuit coupler
CR-1	--- N17-T-51748	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; 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; NRCO Dwg No. All04135; GE Part No. G5 or IN48; for general purpose use.	HF output rectifier for M-1
CR-2		Same as CR-1.	BF output rectifier for M-1
E-1	--- *N17-B-77983-7610	TERMINAL BOARD: phenolic board; includes terminals, 12 terminals, solder post; w/o barriers; over-all 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; NRCO Part No. TB1A1-2, NRCO Dwg No. All04175-2.	Tiepoint for electrical components
E-2	--- *N17-B-77834-6345	TERMINAL BOARD: phenolic board; includes terminals, 8 terminals, solder post; w/o barriers; over-all 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; NRCO Part No. TB1A1-7, NRCO Dwg No. All04175-3.	Tiepoint for electrical components
		*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. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
E-3	--- *N17-B-78222-4517	TERMINAL BOARD: phenolic board; includes terminals, 30 terminals, solder post; w/o barriers, over-all 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; NRCO Part No. TB1A1-1, NRCO Dwg No. A1104175-1.	Tiepoint for electrical components
E-4	--- *N17-B-77585-5085	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; NRCO Part No. TB1A2-1, NRCO Dwg No. A1104176.	Tiepoint for electrical components
E-5		Same as E-4	Tiepoint for electrical components
E-6	--- *N17-B-77692-6063	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"; NRCO Part No. TB5A3, NRCO Dwg No. A1104177.	Middle oven tiepoint for electrical components
E-7	--- N17-T-28198-1065	TERMINAL, STUD: style No. 21, MBCA Ref Dwg Group 21; 4800v breakdown at 60 cycles; solder connection; brass; cadmium plated finish; over-all dim., 25/32 in. lg including terminal, 5/16 in. across flats of integral hex. nut; mounts by threaded stud 6-32, 1/4 in. lg; insulated with ceramic, grade L-5 as per JAN-I-10, silicone impregnated; CGT Type No. X1942-X; for general purpose use.	Standoff insulator
E-8		Same as E-7.	Standoff insulator
E-9		Same as E-7.	Standoff insulator
E-10		Same as E-7.	Standoff insulator
E-11		Same as E-7.	Standoff insulator
E-12		Same as E-7.	Standoff insulator
E-13	--- N17-I-81154-1121	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; NRCO Dwg No. A1104189; ANL Part No. 1172; for general purpose use.	Insulator bushing
E-14		Same as E-13.	Insulator bushing
E-15	--- N17-I-69175-6226	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; *NOTE: Not furnished as a maintenance part. If failure occurs, do not request replacement unless the part cannot be repaired or fabricated.	Standoff insulator

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
E-15 (cont)		NRCO Dwg No. A1104185; ANL Type No. 1402; for general purpose use.	
E-16		Same as E-15.	Standoff insulator
E-17		Same as E-15.	Standoff insulator
E-18		Same as E-15.	Standoff insulator
E-19		Same as E-15.	Standoff insulator
E-20		Same as E-15.	Standoff insulator
E-21	--- N17-I-69154-6206	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; NRCO Dwg No. A1104186; ANL Type No. 1700; for general purpose use.	Standoff insulator
E-22		Same as E-21.	Standoff insulator
E-23		Same as E-21.	Standoff insulator
E-24		Same as E-21.	Standoff insulator
E-25		Same as E-21.	Standoff insulator
E-26		Same as E-21.	Standoff insulator
E-27		Same as E-21.	Standoff insulator
E-28		Same as E-21.	Standoff insulator
E-29		Same as E-21.	Standoff insulator
E-30		Same as E-21.	Standoff insulator
E-31		Same as E-21.	Standoff insulator

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
E-32		Same as E-21.	Standoff insulator
E-33		Same as E-21.	Standoff insulator
E-34		Same as E-21.	Standoff insulator
E-35		Same as E-21.	Standoff insulator
E-36		Same as E-21.	Standoff insulator
E-37	--- N16-K-700314-573	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 60 deg apart; brass insert; marked "ICA" over-all dim. excluding pointer, 1-1/8 in. dia, 11/16 in. thick; finger indent grip, white plastic pointer; extends 23/32 in. from axis, NRCO Dwg No. A1104151; ICA Part No. 1166; for general purpose use.	"CAL. OUTPUT" knob
E-38		Same as E-37.	"HFO OUTPUT" knob
E-39		Same as E-37.	"METER SELECTOR" knob
E-40		Same as E-37.	"HFO XTAL" knob
E-41		Same as E-37.	"FREQUENCY RANGE MCS" knob
E-42		Same as E-37.	"HF XTAL FREQ" knob
E-43	--- N16-K-700314-526	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; NRCO Dwg No. A1104150; ICA Part No. 1165; for general purpose use.	"OUTPUT FREQUENCY" knob
E-44	--- N16-K-700374-243	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; NRCO Part No. KN1A1, NRCO Dwg No. A1104132.	Large "DIAL UNITS" knob
E-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; NRCO Part No. KN1A2.	Small "DIAL UNITS" knob

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
E-46	--- N17-K-700226-101	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; NRCO Part No. A1104192; ICA Part No. 1081; for general purpose use.	"3.5 MC OSC." knob
F-1	--- N17-F-16302-130	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; NRCO Dwg No. A110472-2; LTF Part No. 312004; for general purpose use.	Heater and power supply protection
F-2	--- N17-F-14310-330	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; NRCO Dwg No. A110474-1; LTF Part No. 313-200; for general purpose use.	Primary power protection
I-1	--- G17-L-6297	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; NRCO Dwg No. A110453; GE Part No. 47; for general purpose use.	"PRIMARY POWER" pilot lamp
I-2	--- G17-L-6806-130	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; NRCO Dwg No. A110452; GE Part No. NE51; for general purpose use.	"OVEN HEATER" pilot lamp
I-3	--- N16-S-117101-596	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; NRCO Part No. A50006, NRCO Dwg No. A1104157; SDL Part by description.	"OUTPUT FREQUENCY" scale dial
I-4	--- N16-S-117101-604	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; NRCO Part No. NP4A42, NRCO Dwg No. A1104174.	"DIAL UNITS" control dial
I-5	--- N16-S-117101-603	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; NRCO Part No. NP4A43, NRCO Dwg No. A1104173.	"DIAL UNITS" vernier scale dial

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
I-6	--- N18-R-268-160	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; NRCO Dwg No. A1104159; VEE Model No. AE114223; for general purpose use.	"DIAL HUNDREDS" counter
J-1	--- N17-C-73446-3401	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; NRCO Dwg No. A110458; HAW Part No. 6808; for general purpose use.	"A.C. INPUT" receptacle
J-2	--- N17-C-73224-1604	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; 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; NRCO Dwg No. A110470; JNS Part No. S306AB; for general purpose use.	Oven power receptacle
J-3	2Z8639-15 N17-C-73255-1511	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; NRCO Dwg No. A110471; JNS Part No. S308AB; for general purpose use.	Oven receptacle
J-4	--- N17-C-73107-7652	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, polystyrene; mounts by threaded section of body, body thread w/ 1/4 in.-32 thread, 15/32 in. lg incl 1 hex nut for mounting; NRCO Dwg No. A1104142; IPC Part No. MC20; for general purpose use.	Oven RF output receptacle
J-5	SO-239(-49194) N17-C-73108-5890	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; NRCO Dwg No. A110499; AMP Part No. 83-1R, KGE Part No. KV71-02; for general purpose use.	"HFO" receptacle
J-6	JK-34A N17-J-39248-4418	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. dia mounting hole required; mounting accessories c/o, 1 hex nut; 1 insul washer; phosphor bronze nickel plated spring, bakelite and ceramic insulation; NRCO Dwg No. A1104104; MAL Part No. SCIA; for general purpose use.	"CAL. OUTPUT" jack

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
J-7		Same as J-5.	"HFO" receptacle
J-8		Same as J-5.	"HFO" receptacle
J-9		Same as J-5.	"HFO" receptacle
J-10		Same as J-5	"BFO" receptacle
J-11		Same as J-5.	"BFO" receptacle
J-12		Same as J-2.	DC power supply receptacle
K-1	--- 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.	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, 2-1/8 in. by 2-1/8 in. mounting centers; sensitivity 0.014 W, 0.3v a, cut phenolic base; NRCO Dwg No. A1104101; KUE Part No. 210C40 (unadjusted), or No. N21005 (adjusted); for general purpose use.	Oven operation control relay
L-1	--- N16-R-29154-6381	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 E111-24 gauge-DYN core, varnish impregnated, pitch filled; NRCO Spec No. 108. NRCO Dwg No. A1104147; FTC Part No. 14800.	Power supply filter choke
L-2	--- N16-C-76548-4591	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; NRCO Part No. AD5A41, NRCO Dwg No. A110480.	P/o variable HF oscillator
L-3	--- N16-C-73390-5701	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 of coil form spaced 2 in. C to C; radio frequency oscillator coil; NRCO Part No. AD5A43, NRCO Dwg No. A110481.	P/o variable HF oscillator

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
L-4	--- N17-T-82183-1761	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 Litze 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; NRCO Part No. AD5A36, NRCO Dwg No. A110476.	P/o 2 to 4 mc output tuned circuit
L-5	--- N17-T-82189-1501	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 slug lock unit; NRCO Part No. AD5A37, NRCO Dwg No. A110477.	P/o 4 to 8 mc output tuned circuit
L-6	--- N17-T-82201-1758	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; NRCO Part No. AD5A38, NRCO Dwg No. A110478.	P/o 8 to 16 mc output tuned circuit
L-7	--- N17-T-82209-1001	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 impreg-	P/o 16 to 32 mc output tuned circuit

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
L-7 (cont)		nated w/ high temperature coil compound, incl 1 hex nut, lockwasher and tuning slug lock unit; NRCO Part No. AD5A39, NRCO Dwg No. A110476.	
L-8	--- N16-S-89776-6536	SUPPRESSOR, PARASITIC: resistor and coil type; 6.3v AC, 0.15 amp; 30 microhy inductance, 133 turns, No. 30 AWG enamel wire, 100,000 ohms, 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; NRCO Spec No. 183, NRCO Dwg No. A110482.	V-1 filament filter choke
L-9		Same as L-8.	V-1 filament filter choke
L-10		Same as L-8.	Inner oven heater filter choke
L-11		Same as L-8.	Inner oven heater filter choke
M-1	--- N17-M-19246-8951	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; NRCO Dwg No. A1104133; WS Model No. 506; for general purpose use.	HF and BF oscillator and output level meter
M-2	--- N17-S-69831-1217	SWITCH, THERMOSTATIC: glass body; SPST; body dim. excluding terminals, "L" shape, 1/4 in. dia, 3-11/16 in. lg, 5 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; NRCO Dwg No. B1104156; PTH Type No. VC325.	"OVEN HEAT" mercury switch
O-1	--- N17-C-98378-3805	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; NRCO Dwg No. A1104170; NAC Part No. TX22; for general purpose use.	S-7 shaft to extension shaft coupling
O-2	--- *N17-C-98378-3803	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; NRCO Dwg No. A1104171; NAC Part No. TX22 modified.	C-1 shaft to extension shaft coupling
*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. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
O-3		Same as O-1.	S-6 shaft to extension shaft coupling
O-4		Same as O-1.	C-24 shaft to extension shaft coupling
O-5		Same as O-1.	"OUTPUT FREQUENCY" knob to extension shaft coupling
O-6		Same as O-1.	"FREQUENCY RANGE MCS" knob to extension shaft coupling
O-7	--- N17-C-98431-2301	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; NRCO Dwg No. A1104141; BGW Type No. FA5.	"DIAL HUNDREDS" shaft rigid coupling
O-8		Same as O-7.	"DIAL UNITS" shaft rigid coupling
O-9	--- N16-G-402125-866	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; NRCO Dwg No. A1104162; CDCM Part No. 900; for general purpose use.	"DIAL UNITS" shaft bevel gear
O-10		Same as O-9.	"DIAL HUNDREDS" shaft bevel gear
P-1	6Z3150-4 N17-C-71126-5833	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; NRCO Dwg No. A110459; HAW Part No. 7257; for general purpose use.	Plug for J-1
P-2	--- N17-C-71515-8115	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; NRCO Dwg No. A110468; JNS Part No. P306CCT; for general purpose use.	Plug for J-2
P-3	--- N17-C-71542-6128	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 wrinkled molded bakelite insert; 1/2 in. dia max cable opening; brass contacts 5/32 in. wide, 3/64 in. thick; NRCO Dwg No. A110469; JNS Part No. P308CCT; for general purpose use.	Plug for J-3
P-4	--- N17-C-71408-2286	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 play; NRCO Dwg No. A1104144; IPC Part No. MC10; for general purpose use.	Plug for J-4

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
P-5	PL-259(-49190) N17-C-71412-8709	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; 11/16 in. OD coupling nut, 5/8 in.-24 coupling nut thread; integral non-rotating pin contact; NRCO Dwg No. A1104100; AMP Part No. 83-18P; KGE Part No. KV51-01; for general purpose use.	Plug for J-5
P-7		Same as P-5; p/o W12-7.	Plug for J-7
P-8		Same as P-5; p/o W12-8.	Plug for J-8
P-9		Same as P-5.	Plug for J-9
P-10		Same as P-5; p/o W12-5.	Plug for J-10
P-11		Same as P-5; p/o W12-6.	Plug for J-11
P-12	2Z3026-16 N17-C-73515-8322	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; NRCO Dwg No. A110467; JNS Part No. P306AB; for general purpose use.	Plug for J-12
P-13	--- N17-C-71435-8428	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; NRCO Dwg No. A110463; HAW Part No. 9972; for general purpose use.	Primary power plug
R-1	3RC20BF124K N16-R-50651-811	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; JAN RC20BF124K (JAN-R-11); AB Part No. EB1241; for general purpose use.	V-1 grid leak
R-2	3RC30BF102K N16-R-49923-231 3300-381316100	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; JAN RC30BF102K (JAN-R-11); AB Part No. GB1021; for general purpose use.	V-1 plate filter
R-3	3RC20BF244J N16-R-50722-431	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; JAN RC20BF244J (JAN-R-11); AB Part No. EB2445; for general purpose use.	V-2 grid leak
R-4	--- N16-R-50283-551	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; JAN RC40BF103K (JAN-R-11); AB Part No. HB1031; for general purpose use.	V-2 plate filter
R-5	3RC40BF751J N16-R-49859-171	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; JAN RC40BF751J (JAN-R-11); AB Part No. HB7517; for general purpose use.	Inner oven heater

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
R-6	3RC20BF473K N16-R-50480-811 3300-381169800	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 47,000 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF473K (JAN-R-11); AB Part No. EB4731; for general purpose use.	V-3 grid leak
R-7	--- N16-R-49580-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF101K (JAN-R-11); AB Part No. EB1011; for general purpose use.	V-3 cathode bias
R-8	3RC20BF104K N16-R-50633-811 3300-381166220	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 100,000 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF104K (JAN-R-11); AB Part No. EB1041; for general purpose use.	V-7 grid bias filter
R-9	3RC20BF103K N16-R-50282-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF104K (JAN-R-11); AB Part No. EB1041; for general purpose use.	V-3 screen voltage dropper
R-10		Same as R-2.	V-3 screen filter
R-11	--- N17-H-60034-7605	HEATING ELEMENT, ELECTRICAL: woven wire and asbestos yarn; 80 ohm total resistance, $\pm 5\%$ 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, four 3/16 in. dia holes on 2-3/4 by 4-1/16 in. mounting centers; non-inductive, resistance wire practically zero temp coefficient; NRCO Part No. RW9A1, NRCO Dwg No. B1104138; SAS Type No. WRS23; for general purpose use.	Middle oven heater
R-12		Same as R-11.	Middle oven heater
R-13	--- N17-H-60015-4601 When equipment spare has been expended, make from N17-H-60034-7605 (R-11)	HEATING ELEMENT, ELECTRICAL: woven wire and asbestos yarn; 80 ohm total resistance, $\pm 5\%$ 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, four 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; NRCO Modification Dwg No. RW9A2, NRCO Dwg No. B1104139.	Middle oven heater
R-14		Same as R-11.	Middle oven heater
R-15		Same as R-8.	V-10A grid leak

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
R-16		Same as R-8.	V-10B grid leak
R-17		Same as R-9	V-10A plate voltage dropper
R-18	--- N16-R-50337-551	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 15,000 ohm total resistance, $\pm 10\%$ 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; JAN RC40BF153K (JAN-R-11); AB Part No. HB1531; for general purpose use.	V-10B plate load
R-19	--- N16-R-49923-551	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 1,000 ohm total resistance, $\pm 10\%$ 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; JAN RC40BF102K (JAN-R-11); AB Part No. HB1021; for general purpose use.	V-4 plate filter
R-20	--- N16-R-50129-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 4,700 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF472K (JAN-R-11); AB Part No. EB4721; for general purpose use.	V-4 screen voltage dropper
R-21	--- N16-R-49769-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 470 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF471K (JAN-R-11); AB Part No. EB4711; for general purpose use.	V-4 cathode bias
R-22		Same as R-8.	V-9B grid leak
R-23	3RC20BF223K N16-R-50372-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 22,000 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF223K (JAN-R-11); AB Part No. EB2231; for general purpose use.	V2-13 bias voltage divider
R-24		Same as R-20.	V-5 screen voltage dropper
R-25	N16-R-91569-8714	RESISTOR, VARIABLE: wire-wound element; 1 section, 50,000 ohm, $\pm 10\%$ tolerance; 7 W nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 2-5/16 in. dia, 7/8 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; 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; NRCO Dwg No. A1104111-1; MAL Type No. E5OMP.	"HFO OUTPUT" adjustment
R-26		Same as R-20.	V-11 screen voltage dropper

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
R-27		Same as R-8.	V-5 grid leak
R-28	3RC20BF333K N16-R-50417-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 33,000 ohm total resistance, \pm 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; JAN RC20BF333K (JAN-R-11); AB Part No. EB3331; for general purpose use.	V-11 grid leak
R-29	3RC30BF471K N16-R-49770-231 3300-381319680	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 470 ohm total resistance, \pm 10% tolerance; 1/2 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; JAN RC30BF471K (JAN-R-11); AB Part No. GB4711; for general purpose use.	V-12 cathode bias
R-30		Same as R-19.	V-5 plate filter
R-31	--- N16-R-50380-431	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 24,000 ohm total resistance, \pm 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; JAN RC20BF243J (JAN-R-11); AB Part No. EB2435; for general purpose use.	M-1 series re- sistance for HF oscillator output signal
R-32	--- N16-R-50281-431	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 10,000 ohms total resistance, \pm 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; JAN RC20BF103J (JAN-R-11); AB Part No. EB1035; for general purpose use.	M-1 series re- sistance for BF oscillator output signal
R-33	--- N16-R-49255-431	RESISTOR, FIXED, COMPOSITION: body style No. 15, MBCA Ref Dwg Group 2; 12 ohm total resistance, \pm 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; JAN RC20BF120J (JAN-R-11); AB Part No. EB1205; for general purpose use.	M-1 shunt re- sistance for HF oscillator plate voltage
R-34		Same as R-33.	M-1 shunt re- sistance for BF oscillator plate voltage
R-35		Same as R-8.	V-9A grid leak
R-36		Same as R-19.	V-11 plate filter
R-37		Same as R-9.	V-9A plate load
R-38	--- N16-R-90754-2723	RESISTOR, VARIABLE: wire-wound element; 1 section, 1,000 ohm, \pm 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; NRCO Dwg No. A1104109-1; IRC Type No. W1000.	"BFO OUT. CONT" adjustment

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
R-39		Same as R-1.	V-9B plate filter dropper
R-40		Same as R-18.	V-9A plate filter
R-41	--- N16-R-49257-551	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 12 ohm total resistance, $\pm 10\%$ 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; JAN RC40BF120K (JAN-R-11); AB Part No. HB1201; for general purpose use.	I-1 series voltage dropper
R-42	--- N16-R-28179-4439	RESISTOR, VARIABLE: composition element; 1 section, 500.000 ohms, $\pm 10\%$ tolerance; 2.5 watt nominal power rating; std A taper, MBCA Ref Dwg Group 3; 3 terminals, solder lug type; metal case, enclosed, 15/16 in. dia. excluding terminals, 53/64 in. deep excluding terminals; metal shaft, round, 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 15/32 in. radius at 9 o'clock; single-pole, single throw switch, 3 amp, 125v AC, normally open, operates at start of rotation, 2 terminals, solder lug type; mechanical rotation 330°, electrical rotation 300°; IRC Type Q; for general purpose use.	"CAL. OUTPUT" adjustment
R-43		Same as R-2.	V-6 cathode bias
R-44		Same as R-9.	V-6 plate load
R-45		Same as R-8.	J-6 shunt resistance
R-46		Same as R-8.	Drops screen voltage of V-5 and V-11 below operating level
R-47	--- N16-R-70721-1375	RESISTOR, FIXED, WIRE WOUND: body style No. 23, MBCA Ref Dwg Group 2; inductively wound; 7,500 ohm total resistance, $\pm 10\%$ 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; NRCO Dwg No. A110487-1; WAL Part No. 20F7225; for general purpose use.	V-7 series load
R-48		Same as R-8.	V-3 plate load
R-49	--- N16-R-49444-431	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 51 ohm total resistance $\pm 5\%$ 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; JAN RC20BF510J (JAN-R-11); AB Part No. EB5105; for general purpose use.	V-11 grid circuit parasitic suppressor
R-50		Same as R-9.	V-3 plate filter

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
R-51	--- N16-R-50517-551	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 56,000 ohm total resistance, $\pm 10\%$ 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; JAN RC40BF563K (JAN-R-11); AB Part No. HB5631; for general purpose use.	K-1 series resistance
R-52		Same as R-8.	I-2 series resistance
R-53		Same as R-18.	V-4, V-5 and V-11 dropper
R-54		Same as R-19.	V-4 plate filter
R-55	3RC30BF221K N16-R-49662-231 3300-381318000	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 220 ohm total resistance $\pm 10\%$ 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; JAN RC30BF221K (JAN-R-11); AB Part No. GB2211; for general purpose use.	V-5 cathode bias
R-56		Same as R-55.	V-11 cathode bias
R-57		Same as R-5.	Inner oven heater
R-58	--- N16-R-70549-2335	RESISTOR, FIXED, WIRE WOUND: body style No. 23, MBCA Ref Dwg Group 2; inductively wound; 350 ohm total resistance, $\pm 10\%$ 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; NRCO Dwg No A110488-1; WAL Part No. 5F350; for general purpose use.	Inner oven heaters series resistance
R-59	--- N16-R-49841-811	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 680 ohm total resistance, $\pm 10\%$ 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; JAN RC20BF681K (JAN-R-11); AB Part No. EB6811; for general purpose use.	V-10B cathode bias
R-60		Same as R-59.	V-2 cathode load
R-61	--- N16-R-68441-2036	RESISTOR, FIXED, WIRE WOUND: body style No. 3, MBCA Ref Dwg Group 2; inductive winding; 10,000 ohm total resistance, $\pm 5\%$ 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; NRCO Dwg No. A110486-2; SPR Type No. 10KT; for general purpose use.	V-12 plate load
R-62	--- N16-R-50614-431	RESISTOR, FIXED, COMPOSITION: body style No. 14, MBCA Ref Dwg Group 2; 91,000 ohm total resistance, $\pm 5\%$ 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; JAN RC20BF913J (JAN-R-11); AB Part No. EB9135; for general purpose use.	V-12 screen voltage dropper

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signc! Corps Standard Navy Air Force	Name and Description	Locating Function
R-63		Same as R-3.	V-12 grid leak
R-64		Same as R-58.	Inner oven heaters series resistance
R-65		Same as R-5.	Inner oven heater
R-66		Same as R-5.	Inner oven heater
S-1	--- N17-S-73203-9821	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 surfaces; non-shorting silver plated contacts, incl 1 hex nut and knurled nut; NRCO Dwg No. A110440; AHH Part No. 81024CB; for general purpose use.	"POWER ON-OFF" switch
S-1A		P/o S-1.	On-off switch for one side of AC line
S-1B		P/o S-1.	On-off switch for one side of AC line
S-2	--- N17-S-70949-2052	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; NRCO Dwg No. A110441; AHH Part No. 81015AW; for general purpose use.	"HFO ON-OFF" switch
S-3		Same as S-2.	"HFO ON-OFF" switch
S-4		P/o R-42.	"OFF" position of "CAL OUTPUT" adjustment (R-42)
S-5	--- N17-S-62184-3978 When equipment spare has been expended, make from Standard Navy Stock No. N17-S-62205-6601 by cutting shaft to proper length	SWITCH, ROTARY: 1 section; 4 positions, max no. of switching positions possible; non-"pile-up" type, 3 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. 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; NRCO Dwg No. A1104120; MAL Type No. 3234J w/o No. 366 knob.	"METER SELECTOR" switch
S-5A		P/o S-5.	Connects M-1 to B + or ground
S-5B		P/o S-5.	Connects M-1 to plate of "HFO," plate of "BFO," rectified "HF OUT.," or rectified "BF OUT."

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
S-5C		P/o S-5. Not used.	
S-6		Same as S-5.	"HFO XTAL" switch
S-6A		P/o S-6.	V-10A grid to Y-15, Y-16, Y-17 (crystals not supplied) or ground
S-6B		P/o S-6.	V-10A, plate to B+ in positions "1, 2, 3"
S-6C		P/o S-6.	V-10B grid to V-10A output in "1, 2, 3" positions and to V-2 output in "MO" position
S-7	--- N17-S-65063-8758	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 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; NRCO Dwg No. A1104116; CN Type No. 2515.	"FREQUENCY RANGE MCS" switch
S-7A		P/o S-7.	V-4 plate to 2 to 4 mc tuned circuit in "2-4" position; V-4 plate to 4 to 8 mc tuned circuit in other positions
S-7B		P/o S-7.	V-4 screen to B+ in "2-4" positions; V-4, V-5, V-11 screen to B+ in "8-16" and "16-32" positions
S-7C		P/o S-7.	V-5 screen to ground in "2-4" and "4-8" positions; V-11 screen to B+ in "16-32" position
S-7D		P/o S-7.	L-4, -5, -6 or -7 to "HFO" output jacks
S-8	--- N17-S-74225-3356	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-shortening silver plated contacts, incl 1 hex nut and knurled nut; NRCO Dwg No. A110442; AHH Part No. 81027CE; for general purpose use.	"BFO-XTAL SELECTOR" switch

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
S-8A		P/o S-8.	Y-19 to ground and Y-18 to V-9A grid
S-8B		P/o S-8.	Y-18 to ground and Y-19 to V-9A grid
S-9	--- N17-S-69948-9101	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; NRCO Dwg No. A1104140; MCLO Type No. SUI00L.	Middle oven over-load thermostatic switch
T-1	--- N17-T-73902-4001	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, 1500v 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 - 26 gauge - Trans C core; NRCO Spec No. 181, NRCO Dwg No. B1104153; FTC Part No. 18287.	Primary power input
U-1	--- N16-D-901161-140	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 three 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, 1 to 1 sleeve has 3/8 in.-32 thread, 7/32 in. lg at end; NRCO Dwg No. A1104188; CPT Part No. 27067; for general purpose use	"DIAL UNITS" knob to extension shaft speed reducer
U-2	--- N16-D-901161-133	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 three 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; NRCO Dwg No. A1104187; CPT Part No. 599; for general purpose use.	"OUTPUT FREQUENCY" knob to extension shaft speed reducer
V-1	--- N16-T-56214	ELECTRON TUBE: triode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; amplifier-oscillator tube; JAN 6C4, (JAN-1a); GE Part No. 6C4; for general purpose use.	Variable HF oscillator
V-2		Same as V-1.	HF oscillator buffer
V-3	--- N16-T-56211-50	ELECTRON TUBE: pentagrid; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; converter tube; JAN 6BE6 (JAN-1a); GE Part No. 6BE6; for general purpose use.	Calibrator oscillator-mixer
V-4	--- N16-T-56198	ELECTRON TUBE: pentode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; amplifier tube; JAN 6AQ5 (JAN-1a); GE part No. 6AQ5; for general purpose use.	1st frequency multiplier

TABLE 8-4. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
V-5		Same as V-4	2nd frequency doubler
V-6		Same as V-1	Calibrator amplifier
V-7	2JOA2 N16-T-52001 3300-234005100	ELECTRON TUBE: diode; glass envelope, RMA T-5-1/2; 7 terminations, pin type, located on bottom; voltage regulator tube; JAN OA2 (JAN-1a); GE Part No. OA2; for general purpose use.	Voltage regulator
V-8	2J5W4 N16-T-55540	ELECTRON TUBE: twin diode; metal envelope, RMA MT-8; 5 terminations, pin type, located on bottom; rectifier tube; JAN 5W4 (JAN-1a); GE Part No. 5W4; for general purpose use.	AC power rectifier
V-8A	--- N16-T-55735	ELECTRON TUBE: twin diode; glass envelope, RMA T-9; 5 terminations, pin type, located on bottom; rectifier tube; JAN 5Y3-GT (JAN-1a); GE Part No. 5Y3-GT; for general purpose use.	Alternate for V-8
V-9	--- N16-T-58241-34	ELECTRON TUBE: twin triode; glass envelope, RMA T-6-1/2; 9 terminations, pin type, located on bottom; amplifier-phase inverter tube; JAN 12AU7 (JAN-1a); GE Part No. 12AU7; for general purpose use	
V-9A		P/o V-9.	BF oscillator
V-9B		P/o V-9.	BF oscillator buffer
V-10		Same as V-9.	
V-10A		P/o V-10.	Crystal HF oscillator
V-10B		P/o V-10.	1st HF buffer amplifier
V-11		Same as V-4.	3rd frequency multiplier
V-12		Same as V-4.	2nd HF buffer amplifier
W-11	--- *N17-C-48226-2040	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 (P-1), Part No. 7257, terminal fitting on second end, 1, Harvey Hubbel, Inc. Plug Connector (P-13), Part No. 9972; (marked "VMO Power Cable" on cable label), conductor, 26 strands, No. 30 AWG; NRCO Spec No. 232, NRCO Dwg No. B1104179-2.	Radio Frequency Oscillator, O-165/UR, power cable
XF-1	--- N17-F-74267-5401	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; NRCO Dwg No. A110475; LTF Part No. 342001; for general purpose use.	Holder for F-1
XF-2		Same as XF-1.	Holder for F-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. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
XI-1	--- *N17-L-76745-5892	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; NRCO Dwg No. A110447; DLC Part No. 67B161; for general purpose use.	Panel light for I-1
XI-1A	--- N17-L-76664-6164	LAMPHOLDER: accommodates miniature bayonet base lamp; electrical rating, 28v, 0.17 amp; steel, cadmium plated frame; over-all dim. w/ mounting nut, 1-1/16 in. lg, 1-1/16 in. wide, 1-13/32 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 hex nut and 3 plain washers; p/o Dial Light Co. of America, Pilot Light, Part No. 67B161; p/o XI-1; NRCO Dwg No. A1104194; DLC Part No. 67B.	Body for XI-1
XI-1B	--- N17-L-250666-481	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 XI-1; NRCO Dwg No. A1104193; DLC Part No. 65-161.	Lens for XI-1
XI-2		Same as XI-1.	Panel light for I-2
XI-2A		Same as XI-1A; p/o XI-2.	Body for XI-2
XI-2B		Same as XI-1B; p/o XI-2.	Lens for XI-2
XV-1	--- N16-S-62603-6701	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; NRCO Dwg No A110451; ELCP Part No. 235BC; for general purpose use	Socket for V-1
XV-2		Same as XV-1.	Socket for V-2
XV-3		Same as XV-1.	Socket for V-3
XV-4		Same as XV-1.	Socket for V-4
XV-5		Same as XV-1.	Socket for V-5
XV-6		Same as XV-1.	Socket for V-6
XV-7		Same as XV-1.	Socket for V-7
*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. TABLE OF REPLACEABLE PARTS

Reference Desig.	Stock Numbers Signal Corps Standard Navy Air Force	Name and Description	Locating Function
XV-8	2F8678.16 N16-S-63519-1931	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; one piece saddle mounting, 1-1/8 in. dia chassis hole required, 2 mounting holes, No. 4-40 tap insert spaced 1-1/2 in. C to C; steel saddle, cadmium plated CIN Part No. 9881.	Socket for V-8
XV-9	--- N16-S-64063-6709	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, shock shield, brass, nickel plated; NRCO Dwg No. A110450; ELCP Part No. 169BC; for general purpose use.	Socket for V-9
XV-10		Same as XV-9.	Socket for V-10
XV-11		Same as XV-1.	Socket for V-11
XV-12		Same as XV-1.	Socket for V-12
XY-1	--- N16-S-54548-7001	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, two 3/8 in. dia, 1/2 in. C to C, chassis holes required, 2 mounting holes, spaced 1-1/8 in.; 2 solder lug type terminals; NRCO Dwg No. A1104167; MLL Part No. 33102; for general purpose use.	Socket for Y-1
XY-15	--- N16-S-54524-6151	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, two 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; NRCO Dwg No. A1104160; AMP Part No. 33-2T; for general purpose use	Socket for Y-15
XY-16		Same as XY-15.	Socket for Y-16
XY-17		Same as XY-15.	Socket for Y-17
XY-18		Same as XY-15.	Socket for Y-18
XY-19		Same as XY-15.	Socket for Y-19
Y-1	--- N16-C-96176-8825	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; NRCO Dwg No. A1104124; PCL Type No. PL100.	100 kc calibrator oscillator crystal

TABLE 8-5. MAINTENANCE PARTS KIT

KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY	KEY SYMBOL	QUANTITY
F1	6	I2	1	V4	2
F2	6	V1	2	V7	1
I1	1	V3	2	V8	1
				V9	1

TABLE 8-6. CROSS REFERENCE PARTS LIST

JAN (OR AWS) DESIGNATION	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
CM20B100K	C-12	G17-L-6297	I-1	N16-R-49841-811	R-59
CM20B101K	C-23	G17-L-6806-130	I-2	N16-R-49859-171	R-5
CM20C151J	C-55	N16-C-15917-3301	C-16	N16-R-49923-231	R-2
CM35B103K	C-18	N16-C-25102-6276	C-9	N16-R-49923-551	R-19
CM35C103J	C-57	N16-C-26020-7691	C-5	N16-R-50129-811	R-20
IN48	CR-1	N16-C-26025-8276	C-12	N16-R-50281-431	R-32
JAN0A2	V-7	N16-C-26732-9439	C-56	N16-R-50282-811	R-9
JAN12AU7	V-9	N16-C-27629-7215	C-25	N16-R-50283-551	R-4
JAN5W4	V-8	N16-C-27634-8769	C-37	N16-R-50337-551	R-18
JAN5Y3-GT	V-8A	N16-C-28553-1041	C-3	N16-R-50372-811	R-23
JAN6AQ5	V-4	N16-C-28558-1676	C-23	N16-R-50380-431	R-31
JAN6BE6	V-3	N16-C-28975-1601	C-55	N16-R-50417-811	R-28
JAN6C4	V-1	N16-C-31090-4169	C-4	N16-R-50480-811	R-6
RC20BF101K	R-7	N16-C-31090-4208	C-8	N16-R-50517-551	R-51
RC20BF103J	R-32	N16-C-32699-4608	C-22	N16-R-50614-431	R-62
RC20BF103K	R-9	N16-C-33617-4746	C-57	N16-R-50633-811	R-8
RC20BF104K	R-8	N16-C-33622-5222	C-18	N16-R-50651-811	R-1
RC20BF120J	R-33	N16-C-47327-7486	C-40	N16-R-50722-431	R-3
RC20BF124K	R-1	N16-C-49988-5295	C-44	N16-R-68441-2036	R-61
RC20BF223K	R-23	N16-C-58836-5306	C-2	N16-R-70549-2335	R-58
RC20BF243J	R-31	N16-C-59823-8206	C-49	N16-R-70721-1375	R-47
RC20BF244J	R-3	N16-C-60036-1604	C-6	N16-R-90754-2723	R-38
RC20BF333K	R-28	N16-C-61523-4801	C-1	N16-R-91569-8714	R-25
RC20BF471K	R-21	N16-C-63286-9101	C-24	N16-S-117101-596	I-3
RC20BF472K	R-20	N16-C-64133-6625	C-34	N16-S-117101-603	I-5
RC20BF473K	R-6	N16-C-73390-5701	I-3	N16-S-117101-604	I-4
RC20BF510J	R-49	N16-C-76548-4591	L-2	N16-S-54524-6151	XY-15
RC20BF681K	R-59	N16-C-96176-8825	Y-1	N16-S-54548-7001	XY-1
RC20BF913J	R-62	N16-D-901161-133	U-2	N16-S-62603-6701	XV-1
RC30BF102K	R-2	N16-D-901161-140	U-1	N16-S-63519-1931	XV-8
RC30BF221K	R-55	N16-G-402125-866	O-9	N16-S-64063-6709	XV-9
RC30BF471K	R-29	N16-K-700314-526	E-43	N16-S-89776-6536	L-8
RC40BF102K	R-19	N16-K-700314-573	E-37	N16-T-52001	V-7
RC40BF103K	R-4	N16-K-700374-243	E-44	N16-T-55540	V-8
RC40BF120K	R-41	N16-L-250666-481	XI-1B	N16-T-55735	V-8A
RC40BF153K	R-18	N16-R-28179-4439	R-42	N16-T-56198	V-4
RC40BF563K	R-51	N16-R-29154-6381	L-1	N16-T-56211-50	V-3
RC40BF751J	R-5	N16-R-49255-431	R-33	N16-T-56214	V-1
		N16-R-49257-551	R-41	N16-T-58241-34	V-9
		N16-R-49444-431	R-49	N17-B-77585-5085	E-4
		N16-R-49580-811	R-7	N17-B-77692-6063	E-6
		N16-R-49662-231	R-55	N17-B-77834-6345	E-2
		N16-R-49769-811	R-21	N17-B-77983-7610	E-1
		N16-R-49770-231	R-29	N17-B-78222-4517	E-3
NAVY TYPE NO.	KEY SYMBOL				
-49190	P-5				
-49194	J-5				

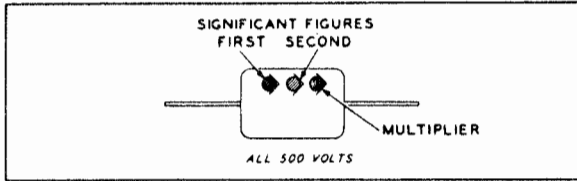
TABLE 8-6. CROSS REFERENCE PARTS LIST (Cont)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	SIGNAL CORPS STOCK NO.	KEY SYMBOL
N17-C-48226-2040	W-11	N17-S-62184-3978	S-5	2Z8639-15	J-3
N17-C-71126-5833	P-1	N17-S-62205-6601	S-5	2Z8678-16	XV-8
N17-C-71408-2286	P-4	N17-S-65063-8758	S-7	3K2010021	C-12
N17-C-71412-8709	P-5	N17-S-69831-1217	M-2	3K2010121	C-23
N17-C-71435-8428	P-13	N17-S-69948-9101	S-9	3K2015132	C-55
N17-C-71515-8115	P-2	N17-S-70949-2052	S-2	3RC20BF103K	R-9
N17-C-73107-7652	J-4	N17-S-73203-9821	S-1	3RC20BF104K	R-8
N17-C-73108-5890	J-5	N17-S-74225-3356	S-8	3RC20BF124K	R-1
N17-C-73224-1604	J-2	N17-T-28198-1065	E-7	3RC20BF223K	R-23
N17-C-73255-1511	J-3	N17-T-51748	CR-1	3RC20BF244J	R-3
N17-C-73446-3401	J-1	N17-T-73902-4001	T-1	3RC20BF333K	R-28
N17-C-73515-8322	P-12	N17-T-82183-1761	L-4	3RC20BF473K	R-6
N17-C-98378-3803	O-2	N17-T-82189-1501	L-5	3RC30BF102K	R-2
N17-C-98378-3805	O-1	N17-T-82201-1758	L-6	3RC30BF221K	R-55
N17-C-98431-2301	O-7	N17-T-82209-1001	L-7	3RC30BF371K	R-29
N17-F-14310-330	F-2	N18-R-268-160	I-6	3RC40BF751J	R-5
N17-F-16302-130	F-1			6Z3150-4	P-1
N17-F-74267-5401	XF-1				
N17-H-60015-4601	R-13				
N17-H-60034-7605	R-11				
N17-I-69154-6206	E-21				
N17-I-69175-6226	E-15				
N17-I-81154-1121	E-13				
N17-J-39248-4418	J-6				
N17-K-700226-101	E-46				
N17-L-76664-6164	XI-1A				
N17-L-76745-5892	XI-1				
N17-M-19246-8951	M-1				
N17-M-87012-5951	A-1				
N17-R-64855-2113	K-1				
		SIGNAL CORPS TYPE NO.	KEY SYMBOL	AIR FORCE STOCK NO.	KEY SYMBOL
		JK-34A	J-6	3300-234005100	V-7
		PL-259	P-5	3300-376001000	C-12
		SO-239	J-5	3300-376009000	C-55
		SIGNAL CORPS STOCK NO.	KEY SYMBOL	3300-381166220	R-8
		2J0A2	V-7	3300-381169800	R-6
		2J5W4	V-8	3300-381316100	R-2
		2Z3026-16	P-12	3300-381318000	R-55
				3300-381319680	R-29

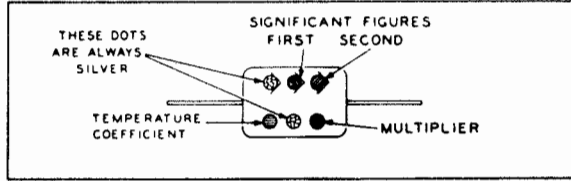
TABLE 8-7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

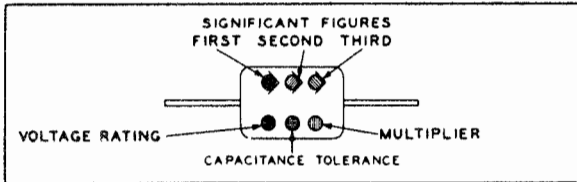
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



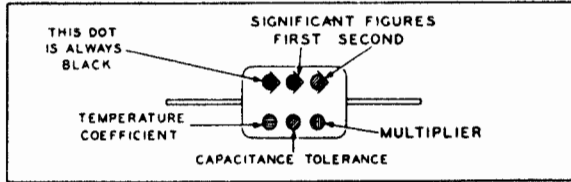
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



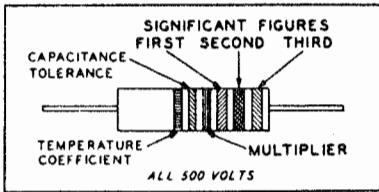
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

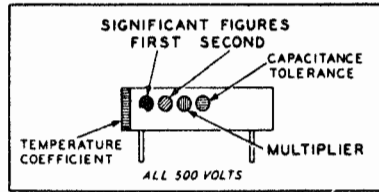


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

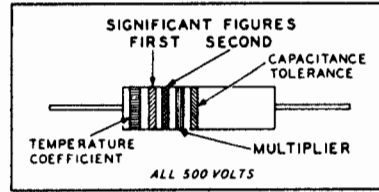


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

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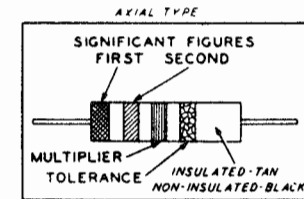
AXIAL TYPE INSULATED



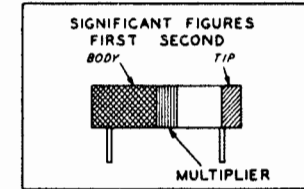
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

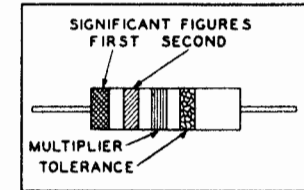


RADIAL TYPE

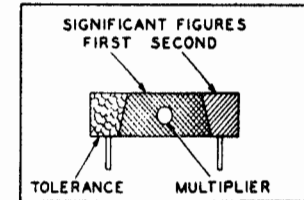


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED



RESISTORS				CAPACITORS				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	MULTIPLIER			VOLTAGE RATING	TEMPERATURE COEFFICIENT
				RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC		
	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
	10000	4	YELLOW	10000			400	E
	100000	5	GREEN	100000			500	F
	1000000	6	BLUE	1000000			600	G
	10000000	7	VIOLET	10000000			700	
	100000000	8	GRAY	100000000		0.01	800	
	1000000000	9	WHITE	1000000000		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	

TABLE 8-8. LIST OF MANUFACTURERS

ABBREVIATIONS	PREFIX	NAME	ADDRESS
AB	CBZ	Allen Bradley Co.	Milwaukee, Wis.
AHH	CHH	Arrow-Hart and Hegeman Electric Co.	Hartford, Conn.
AMP	CPH	American Phenolic Corp.	Chicago, Ill.
ANL	CAS	American Lava Corp.	Chattanooga, Tenn.
BGW	CBH	Boston Gear Works Div. Murray Co. of Texas	Quincy, Mass.
CDCM	—	Chicago Die Casting Mfg. Co.	Chicago, Ill.
CDN	CBK	Cardwell, Allen D, Mfg. Corp.	Wichita, Kans.
CGT	CAMQ	Cambridge Thermionic Corp.	Cambridge, Mass.
CIN	CMG	Cinch Mfg. Corp.	Chicago, Ill.
CLD	CD	Cornell-Dubilier Electric Corp.	South Plainfield, N. J.
CN	CBN	Centralab Div. Globe-Union, Inc.	Milwaukee, Wis.
CPT	CAHW	Croname, Inc.	Chicago, Ill.
DLC	CAYZ	Dial Light Co. of America, Inc.	New York, N. Y.
ELCP	—	Elco Corp.	Philadelphia, Pa.
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.
IRC	CIR	International Resistance Co.	Philadelphia, Pa.
JNS	CJC	Jones Howard B. Div. Cinch Mfg. Corp.	Chicago, Ill.
KGE	CANS	Kings Electronics Co.	Brooklyn, N. Y.
KUE	CKU	Kurman Electric Co., Inc.	Long Island City, N. Y.
LTF	CLF	Littlefuse, Inc.	Chicago, Ill.
MAL	CMA	Mallory Electric Corp.	Detroit, Mich.
MCLO	—	Mechanical Industries Production Co.	Akron, Ohio
MLL	CJA	Millen, James, Mfg. Co., Inc.	Malden, Mass.
NAC	CNA	National Co., Inc.	Malden, Mass.
NRCO	CBTB	Northern Radio Co., Inc.	New York, N. Y.
PCL	CL	Premier Crystal Laboratories, Inc.	New York, N. Y.
PTH	CPL	Philadelphia Thermometer Co.	Philadelphia, Pa.
RAD	CRK	Radio Condenser Co.	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.
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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