NAVSHIPS 93806(A) (Non-Registered)

TECHNICAL MANUAL

for

FREQUENCY STANDARD AN/URQ-9

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

Contract: N600(24)-61039 *Approved: 6 May 1965*

Change: 1

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Change 1	4-23 to 4-30	Original
ii	Change 1	5-1 to 5-22	Original
iii to vii	Original	5-23 to 5-25	Change 1
1-0 to 1-3	Original	5-26 to 5-42	Original
2-0 to 2-6	Original	5-43	Change 1
3-1 to 3-3	Original	5-44 to 5-46	Original
4-0 to 4-3	Original	6-1 to 6-3	Change 1
4-4	Change 1	6-4	Original
4-5 to 4-20	Original	6-5 to 6-28	Change 1
4-21/4-22	Change 1	i-1 to i-4	Original

GEO SPACE CORPORATION
A DIVISION OF WESTERN EQUITIES, INC.

MELBOURNE
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N600 (24)-61039

TEMPORARY CHANGE T-3 to TECHNICAL MANUAL for Frequency Standard AN/URQ-9, NAVSHIPS 0967-077-8010 (Formerly NAVSHIPS 93806A).

This temporary change contains information originally published as separate articles (Technical Manual Corrections) in the Electronics Information Bulletin, (EIB), numbers 670 and 675.

The instructions, described herein, for making these changes shall be followed only if they have not been previously accomplished at the time the EIB, in which the information appeared, was received.

The purpose of this temporary change is to assure that publications drawn from stock, subsequent to publication of this information in the EIB, can be corrected.

Insert this temporary change in the technical manual immediately behind the front cover and preceding the title page or preceding the latest change or correction in effect.

Make pen-and-ink corrections or changes to the technical manual as follows:

Page 6-19, line one;

Change "Ammeter 0-50 MA" to read "Ammeter 0-50 microamps(ya).'

Page 2-5, paragraph 2-7b, Insert the following warning in the blank space, under paragraph 2-7b:

WARNING

"Do not leave switch S701 in position 12 (Battery Charge Current). In the event of power failure, the meter M701 will be pegged to the left by reverse current and possibly damaged."

U.S. GOVERNMENT PRINTING OFFICE: 1969-- 346700/A-2102A

JUN 29 1967

TEMPORARY CHANGE T-2
TO TECHNICAL MANUAL FOR

FREQUENCY STANDARD
AN/URQ-9

NAVSHIPS 0967-077-8010
(Formerly NAVSHIPS 93806(A))

This change is being issued to enable better correlation between test data taken on units and actual operating characteristics.

1. Make the following pen and ink changes to NAVSHIPS 93806(A)

Page 2-5, add the following to paragraph 2-7c.

"The TEST SWITCH should be left in POSITION 12 when other tests are not being made. If an increase in battery charge current is noted for no particular reason, i.e. battery hasn't been discharged, the battery has a weak or faulty cell and maintenance should be performed according to paragraph 5-2b."

Page 5-15, paragraph 5-16(5)(a), Oven Temperature Control Circuits

(a) Inner Oven Temperature Control

The oscillator stability is dependent upon the operating temperature of the inner oven. Replacement of components in the temperature bridge circuit will necessitate adjustment of the oven temperature controls.

NOTE

Adjustments should not be attempted until sufficient checks have been made to determine that the oven temperature is incorrect.

To check for the proper operating temperature, use another reference frequency standard and a phase comparator. An oscilloscope with the proper frequency response may be used for a phase comparator by triggering externally with the reference frequency standard and observing URQ-9 under test. Adjust the URQ-9 under test to the same frequency as the reference standard.

CAUTION

Both frequency standards must have had sufficient time to stabilize, approximately seven to ten days, before this adjustment is attempted.

To change the inner oven temperature, turn variable resistor (adjustment hole shown in Figure 5-10) one-quarter turn clockwise and wait one-half hour for temperature to stabilize. Use fine frequency control on URQ-9 under test to again set standards to same frequency and note if microdial reading is higher or lower than previous reading. If higher, continue turning R207 clockwise in quarter-turn steps until change in reading reverses, i.e. highest reading of microdial is obtained. It may be necessary to adjust the coarse frequency control to get same frequency. If reading on microdial decreased after first clockwise adjustment of R207, the variable resistor should then be turned counterclockwise to get highest reading on microdial.

2. The following are part corrections to Section 6 of the manual.

Page 6-14, Ref. Des. T501 and T502 - In Name and Description column change 96791 number to 00775.

Page 6-16, Ref. Des. L601 - In Name and Description column change 96791 number to 74042.

Page 6-19, Ref. Des. M701 - In Name and Description column change 79500 number to 94916.

Page 6-20, Ref. Des. BT801 - In Name and Description column change 96791 number to 09052.

Page 6-22, Ref. Des. L901 - In Name and Description column change 96791 number to 74042.

Page 6-23, Ref. Des. L903 - In Name and Description column change 96791 number to 74042.

Page 6-23, Ref. Des. R913 - In Name and Description column change 96791 number to 76055.

Page 6-24, Ref. Des. T901 - In Name and Description column change 96791 number to 74042.

Page 6-24, Ref. Des. T902 - In Name and Description column change 96791 number to 00775.

Page 6-25, Ref. Des. J1404 - In Name and Description column change 07795 number to 94197.

Page 6-26, Ref. Des. L1401 - In Name and Description column change 96791 number to 00775.

3. Add the following to the List of Manufacturers, Table 6-2, Page 6-28.

27.	00775	Bulova Research and Development	Woodside, Long Island, N. Y.
28.	94916	WAC Line	35 S. St. Clair St. Dayton, Ohio
29.	94197	Curtiss Wright Corp.	Electronic Div. Carlstadt, N. J.
30.	74042	Merit Coil and Transformer	2027 Sherman Hollywood, Fla.
31.	76055	Mallory Control Div.	State Road Frankfort, Ind.
32.	09052	Gulton Industries	212 Durham Ave. Metuchen, N. J.

TEMPORARY CHANGE T-1

TECHNICAL MANUAL
NAVSHIPS 0967-077-8011
(formerly NAVSHIPS 93806(A))

FREQUENCY STANDARD
AN/URQ-9

This change consists of four pages inclusive of this page.

This change is in effect as of 30 September 1966.

This change is being issued to enable better correlation between test data taken on units and actual operating characteristics.

1. Make the following pen and ink changes to NAVSHIPS 93806(A):

Page 4-4, Table 4-1. Front Panel Test Meter indications.

Position	Nominal Indications* (In Microamperes)		Nominal Indications* (In Microamperes)
1	20	Change to	20 ± 10
2	20	"	20 ± 10
3	19	"	19 ± 5
4	40	"	40 ± 6
5	38	"	38 ± 6
6	50	"	50 ± 1
7	20	"	20 ± 1
8	12	"	12 ± 2
9	0	"	0
10	26	"	26.8 approx.
11	8	"	10 approx.
12	0	"	0.2 approx.

Add the following to the note at the bottom of the table:

"Variations in readings of positions 1, 2 and 3 from those listed on function card are common due to aging and load variations. In position 12, meter reading will approach zero for a fully charged battery and will be considerably higher for a discharged battery."

Page 5-4, Table 5-4. Monthly Reference Tests.

In Step No. 1, change Reference Standard from "26.0 ± 1" to "26.8 approx."

In Step No. 2, change Reference Standard from "10±2" to "10 approx."

Page 5-5, Table 5-4. Monthly Reference Tests (Sheet 2 of 4)

In Step No. 6, change Reference Standard from "21.5±1 VDC" to "20.0±2 VDC"

In Step No. 7, change Reference Standard
from "0±0.5" to "1.0±0.5"

Add Note: "Meter reading will approach zero for a fully charged battery, and will be considerably higher for a discharged battery."

In Step No. 10, change Reference Standard
from "14±2" to "12±2"

In Step No. 11, change Reference Standard
from "26.2±0.3 VDC" to "26.8±0.8 VDC"

Page 5-6, Table 5-4. Monthly Reference Tests (Sheet 3 of 4)

In Step No. 15, change Reference Standard
from "30±10" to "23±10"

In Step No. 16, change Reference Standard
from "43±5" to "38±6"

In Step No. 17, change Reference Standard
from "43±5" to "38±6"

In Step No. 20, change Reference Standard
from "30±10" to "20±10"

In Step No. 21, change Reference Standard
from "24±5" to "19±5"

In Step No. 22, change Reference Standard
from "14±3 VAC" to "12±5 VAC"

Page 5-7, Table 5-4. Monthly Reference Tests (Sheet 4 of 4)

In Step No. 23, change Reference Standard
from "$\overline{20\pm5}$ VAC" to "$\overline{18\pm6}$ VAC"

In Step No. 24, change Reference Standard
from "$\overline{15\pm4}$ VAC" to "$\overline{13\pm6}$ VAC"

In Step No. 25, change Reference Standard
from "$\overline{27\pm5}$ VAC" to "$\overline{25\pm7}$ VAC"

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

IN REPLY REFER TO
Code 242-100

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

Subj: Technical Manual for Frequency Standard AN/URQ-9, NAVSHIPS 93806(A)

1. This is the Technical Manual for the subject equipment and is in effect upon receipt. It supersedes NAVSHIPS 93806. Upon receipt hereof, NAVSHIPS 93806 shall be destroyed.

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. Errors found in this publication (other than obvious typographical errors), which have not been corrected by means of Temporary Corrections or Permanent Changes should be reported. Such reports should include the complete title of the publication and the publication number (short title); identify the page and line or figure and location of the error; and be forwarded to the Publications Section of the Bureau of Ships.

5. All Navy requests for Bureau of Ships electronic publications should be directed to the Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania.

R. K. JAMES
Chief of Bureau

RECORD OF ENTRIES AND CORRECTION

CORRECTION OR CHANGE	PURPOSE OF REVISION	ENTERED BY	DATE

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SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

This manual provides complete service instructions for Frequency Standard AN/URQ-9 (figure 1-1), referred to hereinafter as the frequency standard. The manual contains a functional description of the equipment, installation information, operating procedures, trouble-shooting data, maintenance information, and a list of all replaceable parts.

1-2. GENERAL DESCRIPTION.

a. The frequency standard is a highly stable, multiple-purpose frequency standard designed for continuous-duty use aboard ship and at shore facilities. It provides three output frequencies (5.0 mc, 1.0 mc, and 100 kc) and a regulated power output of 26.5 volts dc at 0.5 amp for use by other equipment.

b. The frequency standard can be used for laboratory frequency measurements and to drive precision timing devices such as a time comparator. It can also be used as a standby oscillator unit for other frequency/time-base standards such as Frequency-Time Standard AN/BSQ-2A.

c. The equipment is designed to operate from a nominal 115 volt, 60 cps, single-phase external power source capable of providing 240 watts (approximately 2.0 amps) during periods of maximum battery charging. A battery, which is built into the equipment, is automatically switched into the circuit to maintain operation in the event the external power source fails or is disconnected. When fully charged, the battery is capable of operating the frequency standard for two hours.

d. The frequency standard consists of three major assemblies — a radio-frequency oscillator assembly (Oscillator, Radio Frequency O-471/U), a power supply assembly (Power Supply PP-2223/U), and a standby battery assembly (Battery Power Supply BB-265/U). The three assemblies are housed in an interference free aluminum equipment case. Figure 1-2 identifies the major assemblies and shows their relative locations in the equipment case. Carrying handles are

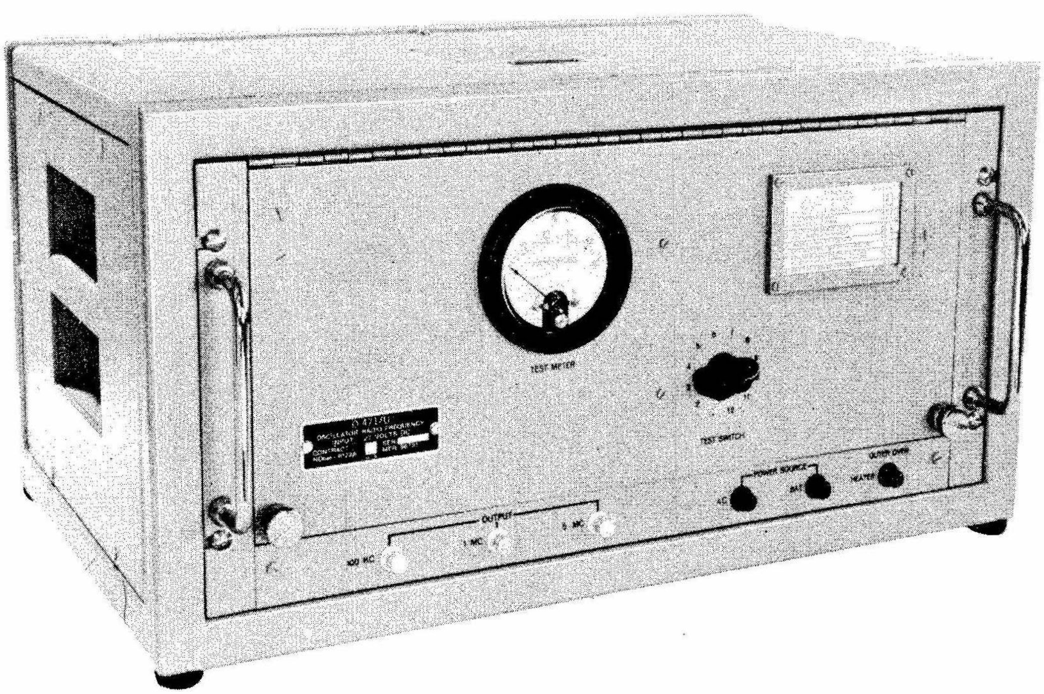


Figure 1-1. Frequency Standard AN/URQ-9

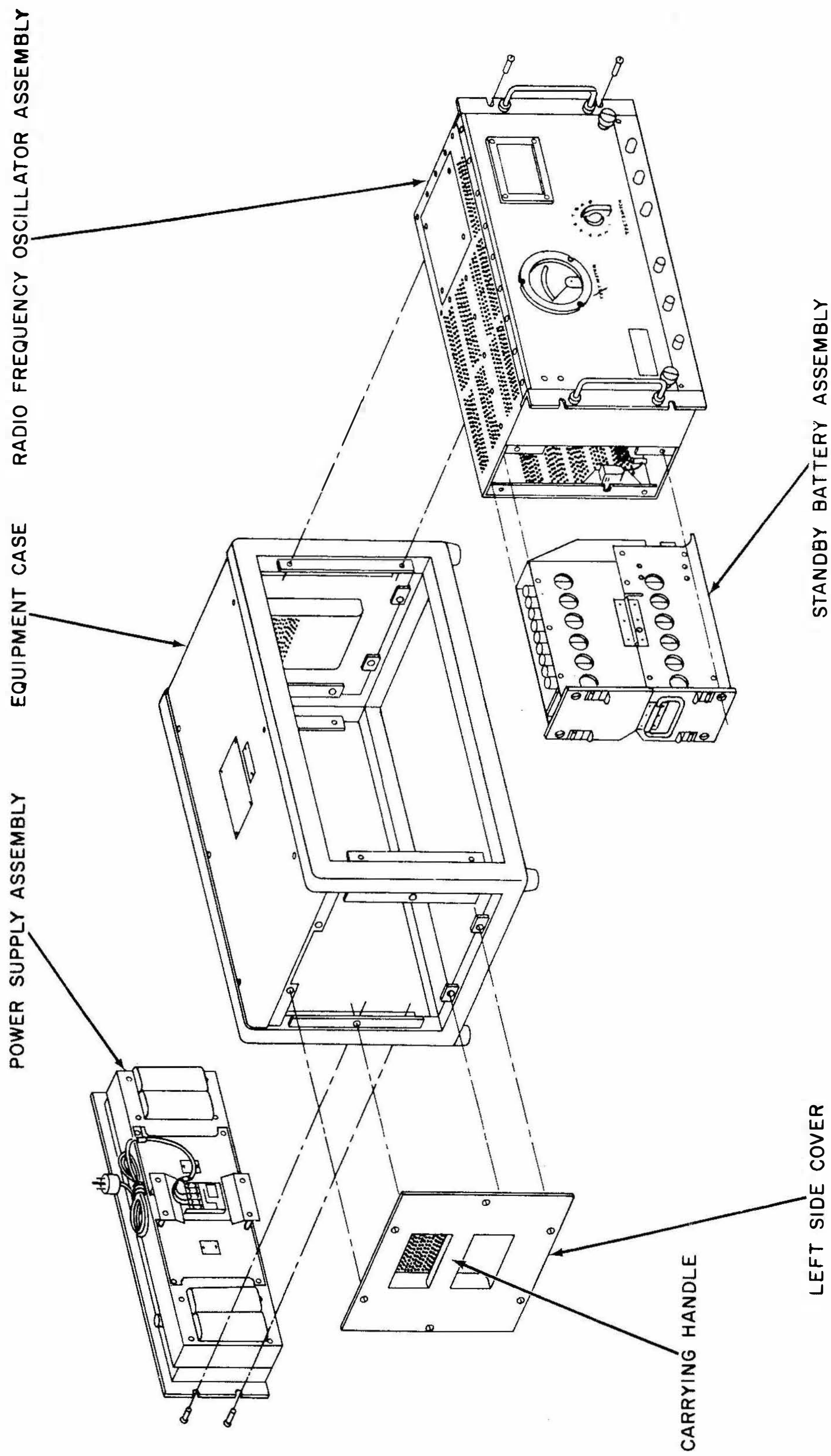


Figure 1-2. Locations of Major Assemblies

built into each side of the equipment case for lifting or moving the set.

CAUTION

Do not attempt to carry or support the frequency standard by the handles projecting from the front of the equipment. These handles are provided for removing and replacing the radio-frequency oscillator assembly only.

e. The radio-frequency (r-f) oscillator assembly is mounted in the front of the equipment case and contains the frequency-determining circuits and amplifiers. It consists of a crystal-controlled oscillator-amplifier, two frequency dividers, a regulator-converter, an inner and outer oven and temperature control circuits, and built-in circuits.

f. EXTERNAL STATUS AND ALARM and CLOCK POWER connectors are provided on the back of the r-f oscillator assembly. The EXTERNAL STATUS AND ALARM connector supplies outputs of 5.0 mc, 1.0 mc, and 100 kc, and an indication of ac or battery operation to allow remote monitoring of the equipment. The CLOCK POWER connector provides 26.5 vdc and a 100 kc signal to operate an external clock (time comparator).

g. The power supply assembly mounts into the rear of the equipment case. It converts the 115 volt, 60 cycle input to 27 vac and a regulated 26.5 vdc. These outputs are used to power the r-f oscillator assembly and to charge the standby battery.

h. The standby battery assembly (figure 1-3) is housed in the left side of the r-f oscillator assembly chassis. It consists of a nickel-cadmium battery and an automatic drop-out circuit. A switch (S801) is provided to turn the battery off for storage or shipping. In case of loss of ac power, the standby battery assembly automatically supplies 26.5 vdc to the r-f oscillator assembly.

1-3. QUICK REFERENCE DATA.

a. Output frequencies — 5.0 mc, 1.0 mc, and 100 kc.

b. Type of frequency control — crystal oscillator.

c. Frequency control crystal data:

(1) Government designation — CR-71/U.

(2) Type of cut — AT.

(3) Frequency adjustment range of crystal oscillator circuit — coarse control - 500 parts per 10^9 parts minimum; fine control - 100 parts per 10^9 parts.

(4) Oscillator frequency — 5.0 mc.

(5) Crystal operating temperature — 65° to 75°C (149° to 167°F) (factory set to turning point of crystal).

d. Frequency stability — frequency drift is less than 1 part in 10^9 parts per day.

e. Electrical input and output data:

(1) Input — 115 v (±10%) at 60 cps (±3 cps).

(2) Output — 1 v (minimum) across 50 ohms at all three output frequencies.

(a) External status and alarm output — 5.0 mc, 1.0 mc, and 100 kc.

(b) Clock power outputs — 100 kc and 26.5 vdc.

f. Ambient temperature limitations — 0° to 50°C (32° to 122°F).

g. Operating characteristics of power supply:

(1) Government type designation — PP-2223/U.

(2) Output voltages — 27 vrms at 60 cps and regulated 26.5 vdc.

(3) Power input — 56 watts during normal operation; 240 watts during maximum battery charging.

(4) Power factor required at each specified supply voltage:

(a) Starting (outer oven heater on) — 0.74.

(b) Continuous duty cycle — outer oven heater on - 0.75; outer oven heater off - 0.61.

(c) Battery charging — 0.75.

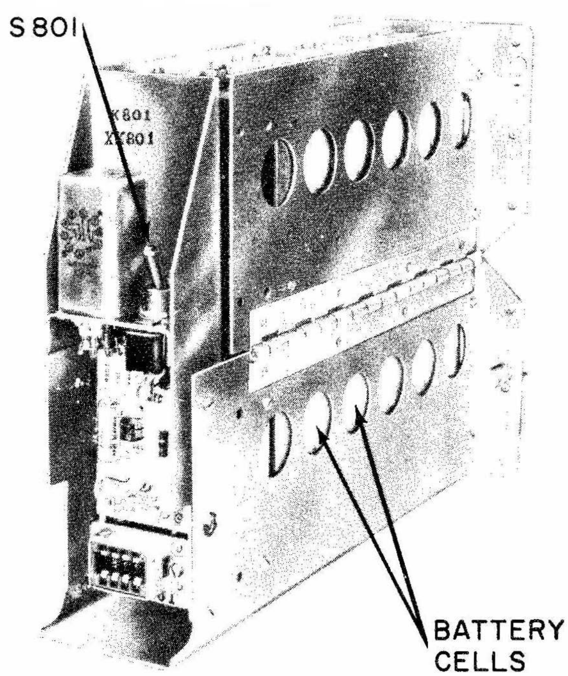


Figure 1-3. Battery Power Supply BB-265/U

TABLE 1-1. EQUIPMENT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		OVER-ALL DIMENSIONS (IN)*			VOLUME* (CU FT)	WEIGHT* (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
	FREQUENCY STANDARD	AN/URQ-9	11	21	13	1.78	70.8
	- including -						
1	Oscillator, Radio - Frequency	O-471/U	8-3/4	19	10-3/4	0.818	24.9
1	Battery Power Supply	BB-265/U	8-1/2	10-3/4	4	0.203	11.9
1	Power Supply	PP-223/U	5-1/4	19	4-5/8	0.253	19.4
1	Equipment Case		11	21	13	1.78	14.6
	--*--						
1	Operating Instructions Chart for AN/URQ-9	NAVSHIPS 93806.21	11	8.5			
1	Crystal Data Sheet						
2	Technical Manual for AN/URQ-9	NAVSHIPS 93806(A)					

* Includes mounting materials.

1-4. EQUIPMENT AND PUBLICATIONS SUPPLIED.

The frequency standard is a complete, self-contained unit and is not supplied with accessory equipment, tools, or test fixtures. Table 1-1 lists the equipment and publications supplied and gives pertinent information about each item. No additional equipment or publications are required for normal operation of the set. Refer to Section 5 of this manual for a list of test equipment required.

1-5. FIELD CHANGES.

At the time of publication of this technical manual, no changes have been made to the equipment. To be cognizant of any field changes that may be made in the future, however, refer to NAVSHIPS 900,000, Electronics Installation and Maintenance Book (EIMB), for the complete field change identification guide index.

1-6. EQUIPMENT SIMILARITIES.

The frequency standard is an improved and modified version of Frequency Standards AN/URQ-9 (XN-2) and AN/URQ-9 (XN-3). The present equipment differs from the XN-2 model in that it has a usable 5.0 mc output, external alarm provisions, and a slightly modified equipment case. It differs from both of the earlier models in that minor improvements have been incorporated in the circuits, some test points have been removed, and many reference designation numbers have been changed. Information contained in this manual pertaining to installation and operation of the AN/URQ-9 is equally applicable to the XN-2 and XN-3 models. Maintenance information contained in this manual is also applicable to the XN-2 and XN-3 models for the most part, but indicated test measurements and locations and values of components will not be the same in all cases.

1-7. PREPARATION FOR RESHIPMENT.

a. When preparing to reship the frequency standard, special care must be given to the standby battery assembly. Unless the set is going to be shipped while still operating, this assembly should be removed from the equipment and packed separately. Switch S801 (figure 1-3) should be put in the OFF position momentarily and returned to the ON position to prevent slow discharging of the battery through the automatic dropout circuit. The standby battery assembly should be adequately protected with an approved packing material and the outside of the packing box clearly marked to indicate the side that should be kept up to prevent leakage of the electrolyte.

CAUTION

Do not pack desiccants in with the standby battery assembly as this may cause the electrolyte to dry out.

b. The rest of the frequency standard (the power supply assembly, the r-f oscillator assembly, and the equipment case) should be packed with desiccant and adequately protected with an approved shock-absorbing filler material. No tube removal or other disassembly is necessary. The equipment technical manuals and any other documents pertaining to the equipment should be placed in the packing box on top of the equipment case and the box should be marked: "TECHNICAL MANUALS INSIDE."

SECTION 2

INSTALLATION

2-1. GENERAL INFORMATION.

The frequency standard will be received by a calibration laboratory prior to being installed at the using activity. The calibration laboratory technicians will perform initial operation and calibration tests on the set and it will then be transferred to the using activity without being turned off (operating on the standby battery). When the set is received by the using activity, it must be plugged into the external power source as soon as possible to avoid completely discharging the battery. Do not wait until the equipment is permanently installed to connect it to the external power source.

CAUTION

Once the frequency standard is in operation and is calibrated, it must not be allowed to stop operating as this will cause the ovens to cool and will alter the operating frequency of the crystal. If the set does get turned off, it should be returned to the calibration laboratory for re-calibration; or, if the set is installed at a shore facility or aboard a ship that is in port, it may be allowed to run for one week and checked for stability and correct frequency before being placed in service. Refer to Section 5 for check-out procedure.

Note

When the frequency standard is plugged into the external power source, it will automatically switch from battery operation to ac operation.

2-2. UNPACKING AND HANDLING.

a. The frequency standard is shipped in two corrugated cardboard boxes. One box contains the standby battery assembly and the other contains the rest of the set, an operating instruction chart, a crystal data sheet, and two technical manuals.

b. No special precautions are necessary in unpacking the equipment.

c. After the equipment has been unpacked, check to see that all items have been supplied and that no external damage has been done to the equipment during shipment. If the frequency standard has been damaged, or any item is missing, reject the equipment.

d. Check the standby battery assembly to see that it is not leaking electrolyte and that the battery switch, S801 (figure 1-3), is in the ON position. Place the assembly in the set by removing the left side of the equipment case or by removing the r-f oscillator assembly (figure 1-2). Lock the battery in place with the four sliding clips and replace the left side of the equipment case or the r-f oscillator assembly.

Note

The frequency standard will not operate on the standby battery until a relay (K801) in the automatic drop-out circuit is closed. This relay will close when ac power is supplied to the set. Once the relay is closed, battery current will keep it closed even after the ac power is removed.

2-3. POWER REQUIREMENTS.

The frequency standard requires a nominal 115 volt, 60 cps, 240 watt, single-phase external power source.

2-4. INSTALLATION LAYOUT.

a. The frequency standard may be used as movable, bench-top equipment, or it may be permanently mounted to an equipment bench or other suitable support by securing it with four 1/4-inch bolts through the mounting holes provided in the lower side rails of the equipment case.

b. The frequency standard may also be installed in a standard 19-inch mounting rack. To do this, the r-f oscillator assembly (with the standby battery assembly in it) and the power supply assembly must be removed from the equipment case and mounted separately. The r-f oscillator assembly should be mounted into the front of the rack and the power supply assembly into the back of the rack, directly behind the r-f oscillator assembly, to enable the direct-contact connectors (J708 and J901) on the two assemblies to make contact. The two assemblies may also be placed in separate racks, or mounted one above the other in the front of the same rack, by using an extending patch cord (not supplied) to provide contact between the two connectors. Installation dimensions for the equipment are shown in figure 2-1.

2-5. INSTALLATION POINTERS.

a. For the greatest stability of operation when used aboard ship, the frequency standard should be placed facing the bow or stern, if possible, rather than either side of the ship. (The longest dimension of the equipment should be perpendicular to the centerline of the ship.)

b. The set can be installed in any convenient location where it will be adequately protected from moisture and extreme temperatures. Temperature limitations are 0° to 50°C (32° to 122°F).

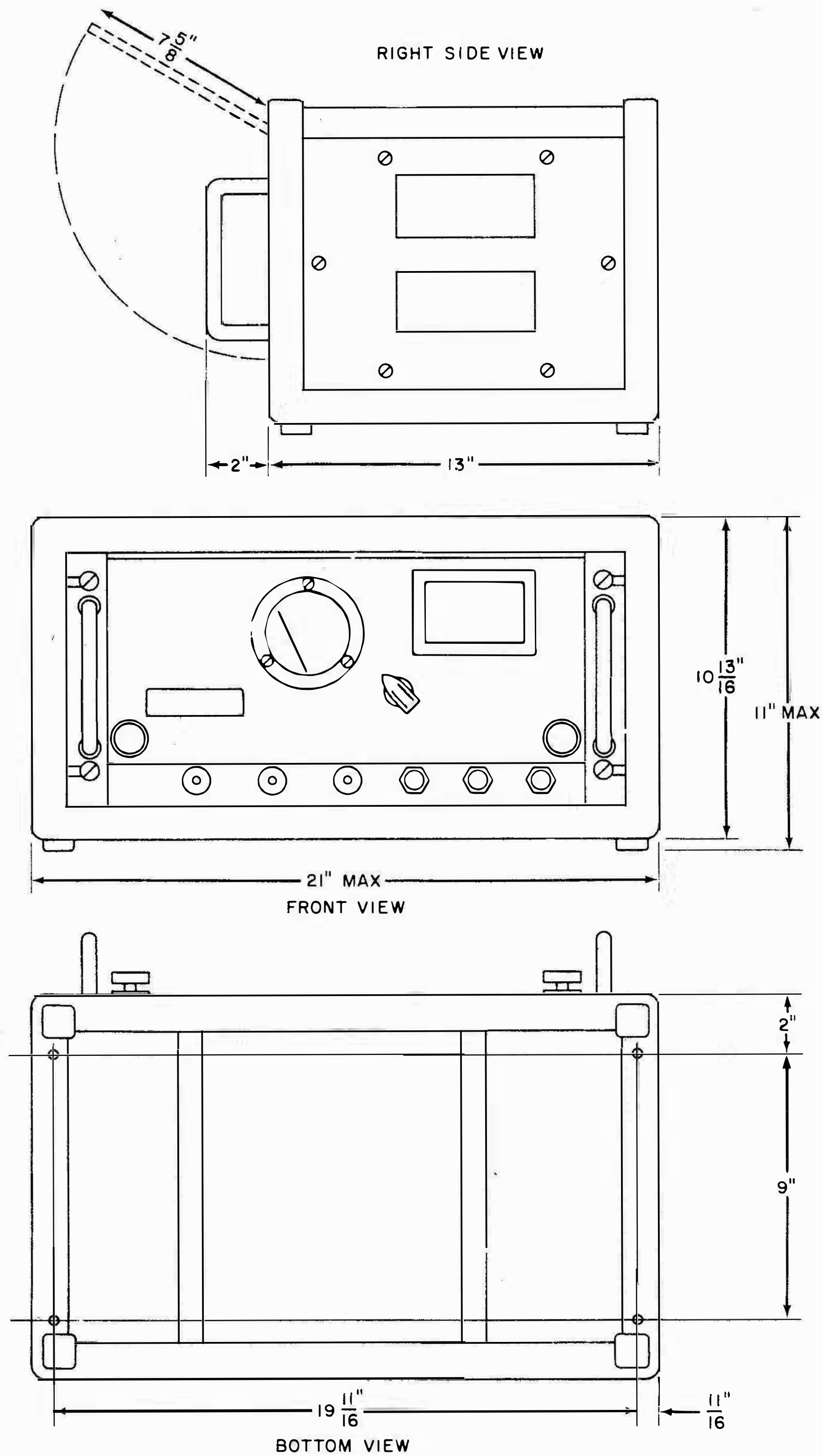


Figure 2-1. Frequency Standard, Installation Dimensions (1 of 2)

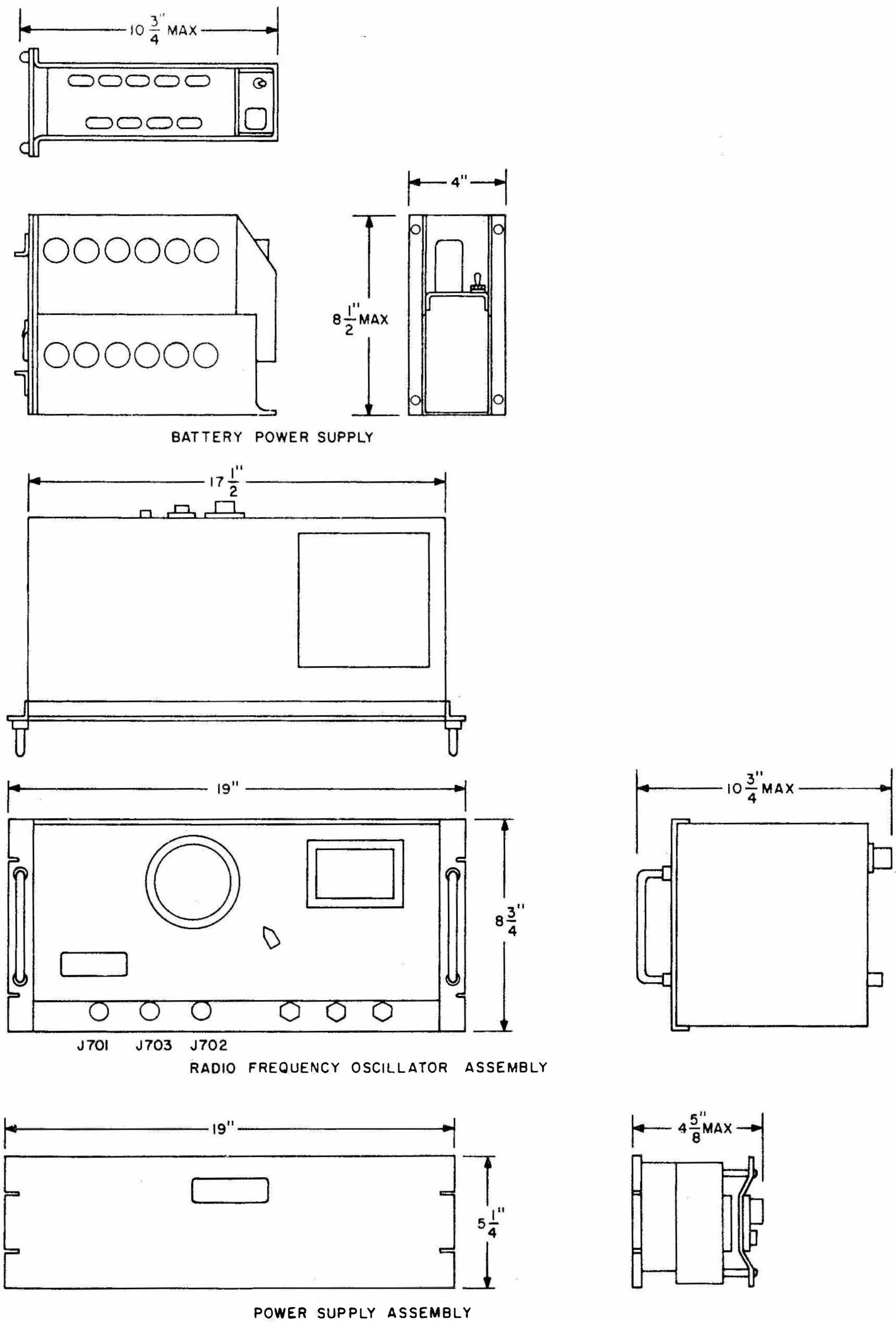


Figure 2-1. Frequency Standard, Installation Dimensions (2 of 2)

c. The front panel on the r-f oscillator assembly should be kept closed during operation to reduce interference. When the frequency standard is used in the equipment case with the front panel closed, it does not produce interference in nearby equipment, and it will be free of interference generated by other equipment in the area.

d. Whether the set is installed in a rack or in the equipment case, enough space must be left behind the power supply assembly to allow its removal, and enough space must be left in front of the r-f oscillator assembly to allow its removal (and to allow the front panel to be raised to its open position). Sufficient space should also be provided on the left side of the equipment to allow removal of the standby battery assembly without removing the r-f oscillator assembly. When the set is to be installed in the equipment case, a minimum clearance of one inch from any bulkhead must be maintained to permit the circulation of air.

2-6. INSPECTION.

a. The following over-all visual inspection should be made by the calibration laboratory technicians before turning the equipment on for the first time.

b. Remove the r-f oscillator assembly from the equipment case and check the TEST METER on the front panel (figure 2-2) for possible damage. Rotate the TEST SWITCH to see that it is firmly attached to the shaft and that it is not cracked. Check the three indicating lamps for breakage and inspect the connectors on the front and back panels of the assembly for bent pins or loose mountings.

c. Remove the standby battery assembly from the left side of the r-f oscillator assembly and check the level of the electrolyte. The electrolyte should be approximately 1/8 inch above the plates in each cell, as seen through the holes in the sides of the battery case. (See figure 1-3.) If the electrolyte is low, add just enough distilled water to bring it to the top of the plates. To gain access to the bottom row of cells, remove the

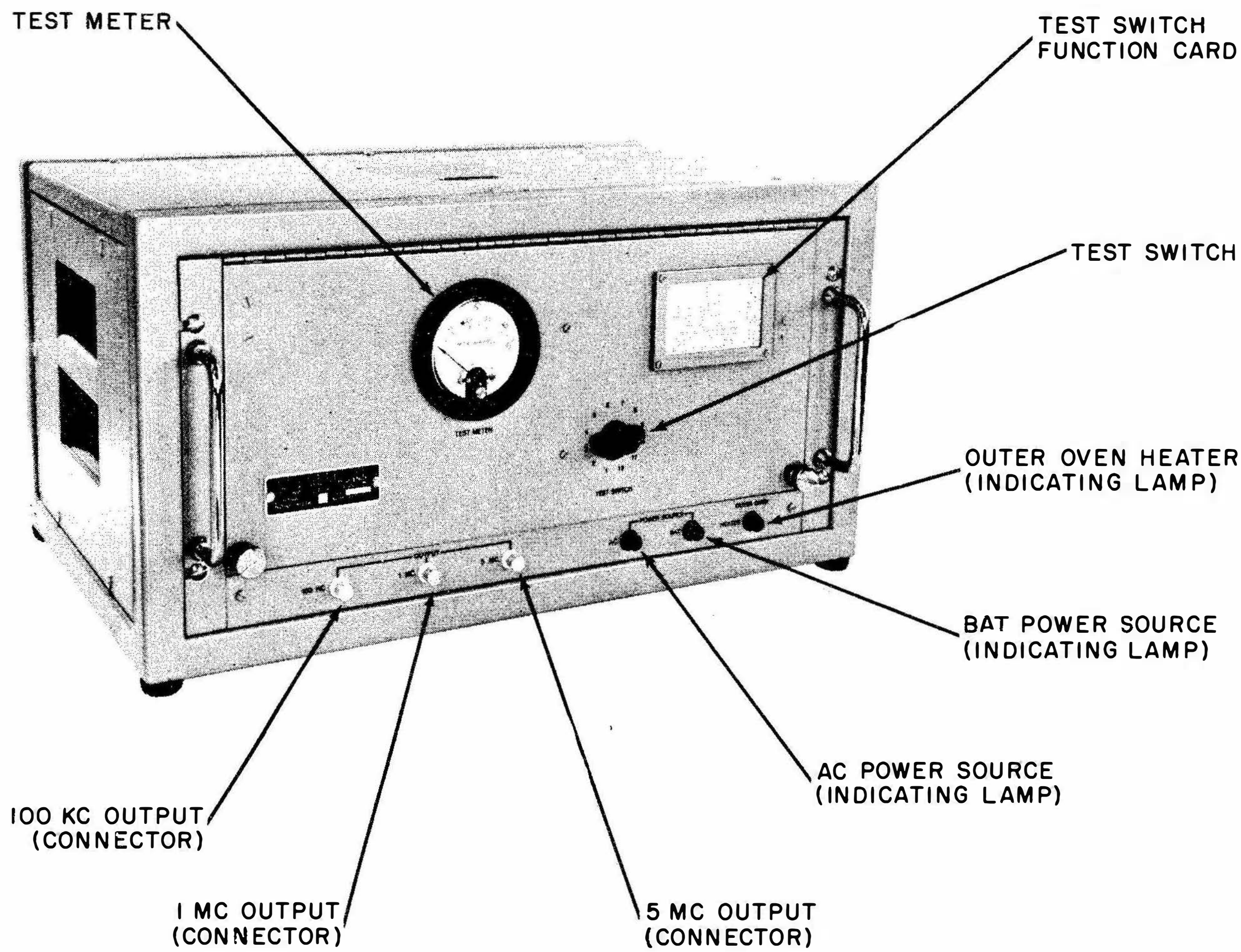


Figure 2-2. Frequency Standard, Front Panel Control Locations

retaining pin on the side of the battery case and tilt the top row of cells back.

CAUTION

When replacing the retaining pin, insert it so that the bent end is away from the pull handle on the front of the assembly. This will prevent the possibility of the pin becoming jammed when the assembly is being pulled from the r-f oscillator assembly chassis.

After the battery has been placed in the frequency standard and allowed to charge for approximately 24 hours, more distilled water can be added, if needed, to bring the electrolyte to the proper level of 1/8 inch above the plates.

Note

After adding distilled water, the battery should be briefly charged and discharged several times to mix the water with the electrolyte. To do this, unplug the frequency standard from the external power source and then plug it back in.

d. The electrolyte used in this battery is potassium hydroxide, a base (alkaline). The specific gravity should be approximately 1.3 when the battery is fully charged. However, battery condition cannot be satisfactorily determined by measuring the specific gravity, since this changes very little with changes in battery charge condition.

CAUTION

As the electrolyte is a base, do not measure the specific gravity with a hydrometer that has been used previously in an acid battery.

e. Inspect the direct-contact connectors on the back of the standby battery assembly and in the r-f oscillator assembly chassis for bent pins or looseness.

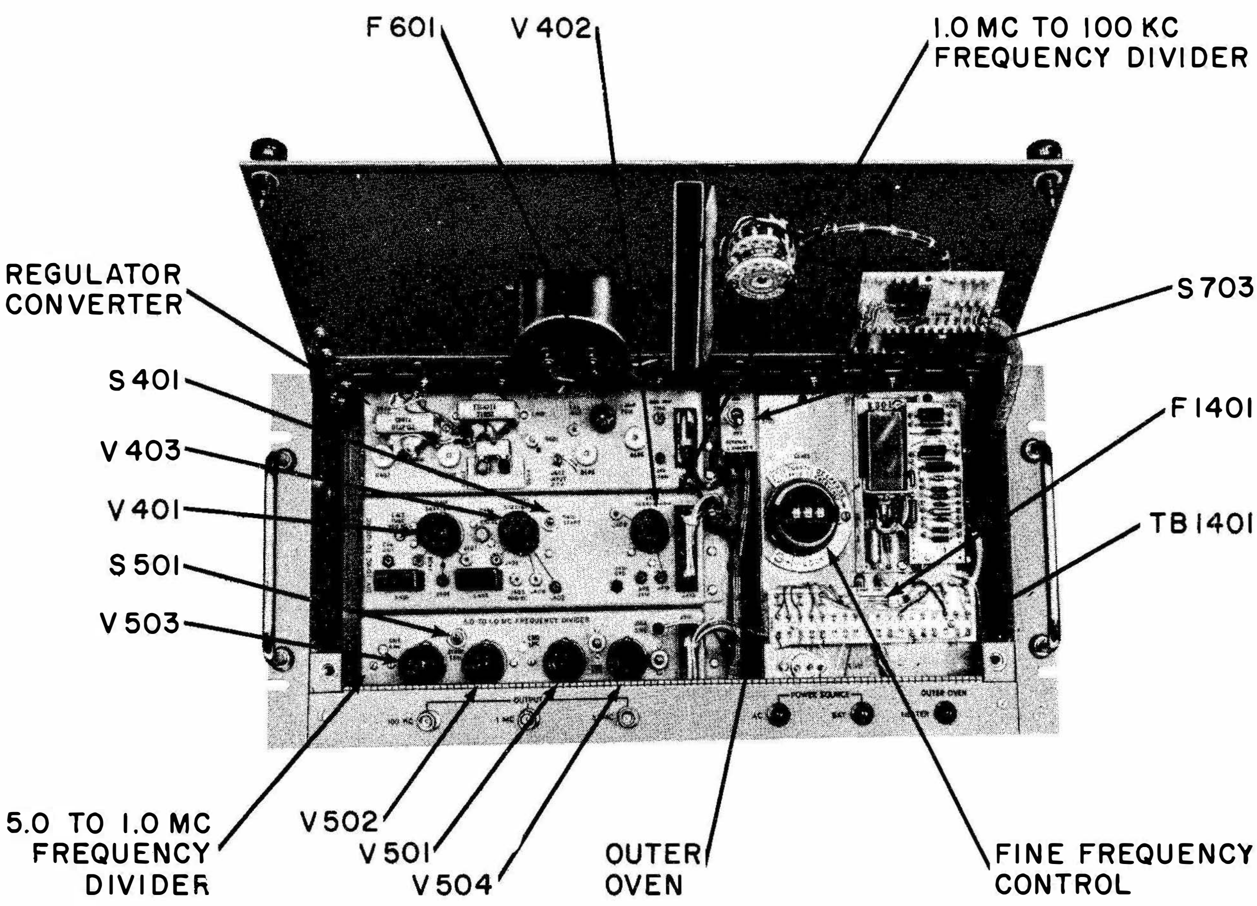


Figure 2-3. R-F Oscillator Assembly, Front Panel Raised

Tighten all of the cell caps and wipe off any electrolyte or white powder present.

WARNING

The electrolyte is corrosive. Do not allow it to come in contact with your eyes or skin. If it does, immediately wash it off with large quantities of cold running water. Mild acid solutions, such as boric acid or vinegar, may be used to counteract the base after washing. Do not use basic solutions such as baking soda in water.

Note

The white powder that may be seen around the cell caps is potassium carbonate. If it formed when the electrolyte is exposed to carbon dioxide in the air and is not corrosive.

f. Inspect the direct-contact connector on the front of the power supply assembly for bent pins or looseness. See that the assembly is firmly secured in the equipment case or the mounting rack. Pull the power cord to its full length and inspect it for cracks or breaks in the insulation.

g. Raise the front panel of the r-f oscillator assembly and visually inspect all exposed wiring and components (figure 2-3). See that all subassemblies are securely mounted and that all connectors are tightly mated. Remove the tube covers and inspect the tube envelopes for cracks. See that the correct tube is used in each tube socket. Check to see that the frequency divider filaments switch (S703) is in the ON position and that the fine frequency control is locked.

h. Replace the tube covers and close and secure the front panel; place the standby battery assembly back into its position in the r-f oscillator assembly chassis and lock it in place. Slide the r-f oscillator assembly back into the equipment case or mounting rack and secure it in place. Be sure that the direct-contact connectors on the back of the r-f oscillator assembly and front of the power supply assembly are fully mated.

2-7. INITIAL OPERATION.

a. There is no on-off switch on the frequency standard. To place the equipment in operation, plug the power cord into a proper external power source. (Refer to paragraph 1-2c.) This will energize all sections of the equipment except the frequency divider sections. The AC POWER SOURCE and OUTER OVEN HEATER indicating lamps will be energized.

b. Rotate the TEST SWITCH (S701) through all twelve positions and observe the indications on the TEST METER (M701) at each position. (See figure 2-2.) The meter indication for each switch position, except 2, 3, 8, 9, and 12, should be the value listed for that position on the test switch function card mounted on the front panel. The test switch function card shows what is being measured in each test switch position, and indicates the normal meter reading for each position. The values indicated apply to the particular frequency standard to which the card is attached and may be slightly different for other sets. The correct readings will not be obtained on switch positions 2, 3, 8, and 9 until the frequency dividers are turned on and the inner oven has reached its proper operating temperature.

c. If the standby battery is not fully charged, the TEST METER will indicate a high charge current in position 12 of the TEST SWITCH. This charge current will gradually diminish to the value indicated on the test switch function card as the battery becomes charged.

d. A 5 mc signal should be available at the 5.0 MC OUTPUT connectors (J702 and J704) on the front and back panels of the equipment (figures 2-2 and 2-4) as indicated by the correct meter reading in position 1 of the TEST SWITCH.

e. Raise the front panel of the frequency standard and initiate operation of the 5.0 mc to 1.0 mc frequency divider (figure 2-3) by momentarily pressing switch S501. With the TEST SWITCH in position 2, the TEST METER should indicate that a 1.0 mc output is available at the 1 MC OUTPUT connectors (J703 and J705) on the front and back panels of the equipment.

f. Initiate operation of the 1.0 mc to 100 kc frequency divider (figure 2-3) by momentarily pressing switch S401. With the TEST SWITCH in position 3, the TEST METER should indicate that a 100 kc output is available at the 100 kc OUTPUT connectors (J701 and J706) on the front and back panels of the equipment.

g. All operating procedures are now accomplished, and the frequency standard should be operating normally. After seven to ten days of continuous operation, the output frequencies must be checked against a precision laboratory standard. If adjustment is required, follow the procedure described in Section 5.

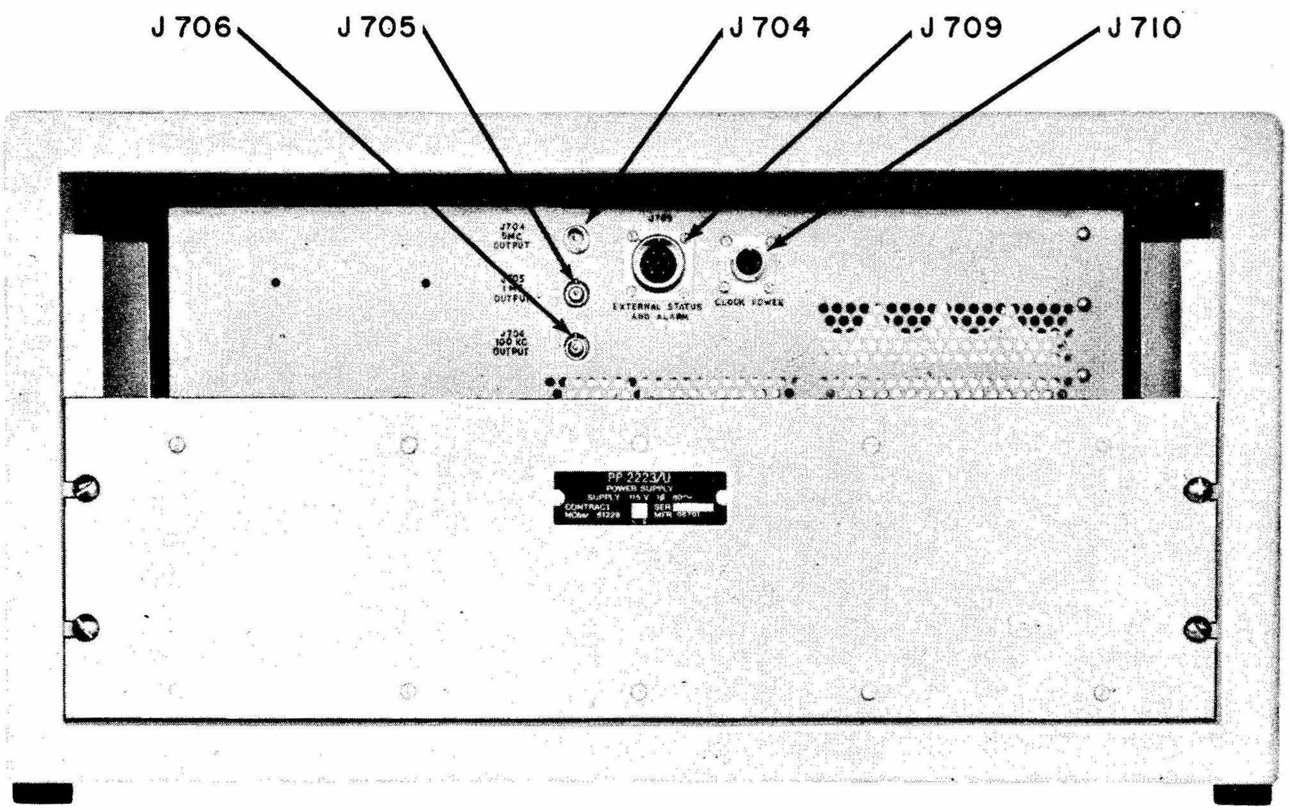


Figure 2-4. Frequency Standard, Back Panel Connectors

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

a. The frequency standard is designed for continuous duty, unattended by an operator. It provides three fixed-frequency outputs (5.0 mc, 1.0 mc, and 100 kc) with frequency drift rate of less than 1 part in 10^9 parts per day. It can be used to check frequencies of other equipment or to drive precision time comparators.

b. The frequency standard is a complete self-contained unit. It consists of three major assemblies: a r-f oscillator assembly, a power supply assembly, and a standby battery assembly. The r-f oscillator assembly contains the frequency-determining circuits and amplifiers. The crystal which produces the primary signal is housed in a small oven that is contained in a larger oven. The outer oven also contains an oscillator-amplifier and a temperature control circuit that regulates the temperature of the inner oven. In addition to the circuits inside the two ovens, the r-f oscillator assembly contains a regulator-converter, two frequency dividers, test circuits, and a temperature control circuit that regulates the temperature of the outer oven.

c. Figure 3-1 is a simplified block diagram showing the signal paths through the equipment. The oscillator-amplifier generates a 5.0 mc signal which is fed to the first frequency divider. There the signal is amplified and a portion of it fed to output connectors on the front and back panels of the set. The other portion of the 5.0 mc signal is reduced to a 1.0 mc signal by the frequency divider circuits. The 1.0 mc signal is then amplified and a portion is fed to output connectors on the front and back panels of the set. The other portion of the 1.0 mc signal is carried to the second frequency divider where it is reduced to a 100 kc signal. The 100 kc signal is amplified and fed to output connectors on the front and back panels of the frequency standard.

d. The power supply assembly and the regulator-converter in the r-f oscillator assembly provide the regulated and unregulated voltages required by the set. The equipment normally operates on an external power source of 115 volts, 60 cps, single phase. If the external power source fails, or the power supply assembly develops a trouble, the set automatically switches

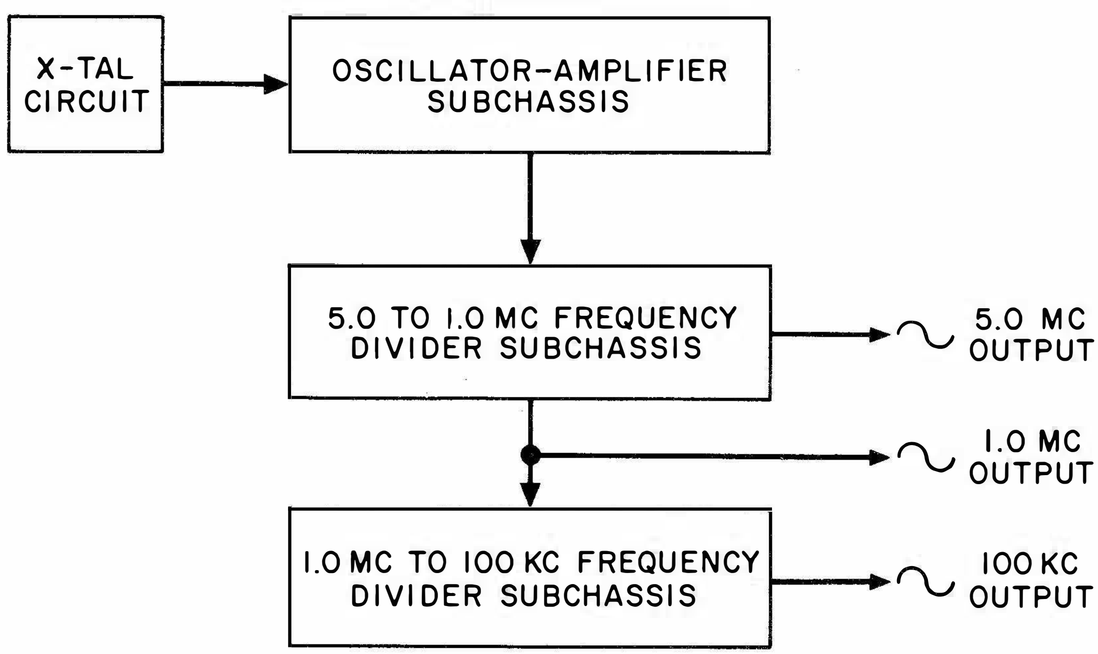


Figure 3-1. Frequency Standard, Signal Block Diagram

over to battery operation. The standby battery assembly will maintain operation of the set for a minimum of two hours when the battery is fully charged.

e. Three indicating lamps are on the front panel of the frequency standard (figure 2-2). These lamps indicate when the outer oven is heating and whether the equipment is operating on external power (ac) or on the internal battery.

f. A test switch and test meter are provided on the front panel for monitoring the operation of various circuits in the set. (See figure 2-2.)

g. Two connectors on the back panel of the frequency standard (figure 204) provide outputs for driving an external timing device (not supplied) and for remote monitoring of the frequency standard.

3-2. OPERATING PROCEDURES.

a. Operating procedures for the frequency standard are limited to initial operation and emergency operation. When the set is operating normally, an operator is not required.

b. Initial operation of the set will normally be performed by calibration laboratory technicians. For initial operation procedures refer to paragraph 2-7.

c. Information on tuning and adjustment of the set is contained in Section 5.

3-3. EMERGENCY OPERATION.

a. If the external power fails (indicated by the AC POWER SOURCE lamp going out), the equipment will automatically switch to battery power (indicated by the BAT POWER SOURCE lamp coming on). (See figure 2-2.) The loss of external power will also be indicated by any external alarm device that may be connected to the EXTERNAL STATUS AND ALARM connector (J709). The frequency standard will operate from the battery for approximately two hours.

b. If it can be determined that the primary power will not be restored within two hours, connect the equipment to another source of 115 volt, 60 cps, single-phase power if one is available.

c. If an alternate source of ac power cannot be obtained and the original source cannot be repaired within two hours, or in the event of a power supply assembly failure, the equipment may be energized by an external power source capable of supplying a regulated 27 vdc at three amperes. This emergency power can be applied to the frequency standard on pins 1 (+) and 5 (-) of J708 (EXTERNAL POWER) on the back of the r-f oscillator assembly.

CAUTION

The standby battery assembly should be removed from the frequency standard when an external source of 27 vdc is used to avoid the possibility of cell damage by overcharging. The battery should not be removed, however, until after the external power has been applied so that the equipment will be continuously energized.

d. If an external source of 27 vdc is not available and the ac power source cannot be repaired within two hours, conserve battery power for the crystal ovens by turning the divider filaments switch (S703) OFF. (See figure 2-3.) This will place the equipment in a standby condition. The ovens will continue to operate and will maintain the correct crystal temperature, but both frequency dividers will be shut off and no output frequencies will be available.

e. When the battery charge drops to 18 volts, the equipment will not function properly. At this point the battery will be turned off by the automatic drop-out circuit in the standby battery assembly. If a spare assembly is available, replace the standby battery assembly before it cuts off. The replacement should be accomplished as rapidly as possible to keep the off time to a minimum.

f. If necessary, the r-f oscillator can be removed from the equipment case or the mounting rack, while operating on the standby battery, and carried to a remote source of external power.

g. After the external power source has been restored, flip the divider filaments switch (S703) ON. Start the 5.0 mc to 1.0 mc frequency divider by momentarily pressing switch S501 (figure 2-3); then start the 1.0 mc to 100 kc frequency divider by momentarily pressing switch S401. Check the set, as described in paragraph 3-4a, to ascertain that it is operating normally.

h. To stop the frequency standard, unplug it from the external power source and remove the standby battery assembly.

CAUTION

Do not stop the frequency standard unless an emergency exists or unless it must be turned off for repairs.

3-4. OPERATOR'S MAINTENANCE.

a. OPERATING CHECKS. - Operating checks are limited to use of the test switch and test meter and observation of the three indicating lamps on the front panel. (See figure 2-2.)

(1) Rotate the TEST SWITCH through all 12 positions and note the indication on the TEST METER at each position. The TEST METER should indicate the value listed on the test switch function card for each position.

(2) Observe the indicating lamps. The AC POWER SOURCE lamp should be on, and the BAT POWER SOURCE lamp should be off. The OUTER OVEN HEATER lamp should cycle on and off at regular intervals (usually about 1.0 minute off and 0.5 minute on) which will vary in relation to the ambient temperature.

(3) If the correct meter reading is not obtained at each test switch position, or if the indicating lamps do not give the correct indications, a malfunction exists in the frequency standard. See Section 4 of this manual for trouble-shooting procedures.

b. PREVENTIVE MAINTENANCE. - Preventive maintenance information is contained in Section 5.

c. EMERGENCY MAINTENANCE. - Emergency maintenance is limited to the replacement of the power supply and standby battery assemblies, the frequency dividers, the electron tubes in the frequency dividers, and the fuses.

(1) To replace the power supply assembly, unplug the frequency standard from the external power source so that it will be operating on battery power. Remove the four mounting screws and pull the unit out of the equipment case (figure 1-2) or the mounting rack. Put the new power supply in place, being careful not to jam the pins on the direct-contact connector. Replace the four mounting screws and plug the equipment into the external power source.

(2) To replace the standby battery assembly, check that the equipment is operating on the external power source. Remove the left side of the equipment case (figure 1-2), release the four sliding clips, and pull the battery out by the handle provided on the battery case. Slide the new standby battery assembly into the r-f oscillator chassis, being careful not to jam the pins on the direct-contact connector. Lock the battery in place with the four sliding clips, and replace the left side of the equipment case.

(3) To replace the 5.0 mc to 1.0 mc frequency divider or the 1.0 mc to 100 kc frequency divider, raise the front panel of the r-f oscillator assembly and turn switch S703 to OFF. (See figure 2-3.) Disconnect the plug-in connector (P702 or P701), loosen the three mounting screws on the left side of the frequency divider chassis, remove the three screws on the right side, slide the unit to the right, and lift it out. Place the new frequency divider in position and tighten all six mounting screws. Connect the plug-in connector and turn switch S703 ON. Start both frequency dividers. (Refer to paragraph 3-3g.) Close and secure the front panel.

Note

The 1.0 mc to 100 kc frequency divider must be removed before the 5.0 mc to 1.0 mc frequency divider can be removed.

(4) When replacing tubes in the frequency dividers, turn switch S703 off. Check and replace each tube individually before checking the next tube. Locations of the frequency divider tubes are shown in figure 2-3. When the tubes have been checked, turn switch S703 on and start both frequency dividers.

(5) The frequency standard contains three fuses. A 10 ampere fuse (F901) is located on the top side of the power supply assembly. A one ampere fuse (F601) is located on the front of the regulator-converter and a three ampere fuse (F1401) is located on terminal board TB1401. (See figure 2-3.) No spare fuses are supplied with the set.

SECTION 4

TROUBLE-SHOOTING

4-1. LOGICAL TROUBLE-SHOOTING.

Trouble-shooting for this equipment should be based on the six steps of logical trouble-shooting. These six steps are:

a. SYMPTOM RECOGNITION. - This is the first step in the trouble-shooting procedure. All equipment troubles are not the direct result of component failure. Therefore, recognizing a trouble in an equipment is not always easy to do since all conditions of less than peak performance are not always apparent. This type of equipment trouble is usually discovered while accomplishing preventive maintenance procedures, such as the POMSEE checks. It is important that the "not so apparent" troubles, as well as the apparent troubles, be recognized.

b. SYMPTOM ELABORATION. - After an equipment trouble has been "recognized", all the available aids designed into the equipment should be used to further elaborate the original trouble symptom. Use of equipment front panel controls and other built-in indicating or testing aids should provide a better identification of the original trouble symptom. Also, checking or otherwise manipulating the operating controls may eliminate the trouble.

c. FORMULATION OF "EDUCATED GUESSES". - The next logical step in trouble-shooting is to formulate a number of "educated guesses" as to the cause and likely location (functional section wise) of the trouble. The "educated guesses" are mental decisions which are based on a full identification of the trouble symptom, knowledge of the equipment operation, and information supplied by the technical manual. The over-all equipment functional discussion and block diagram should be referred to when selecting possibly faulty functional sections.

d. LOCALIZING TROUBLE TO THE FUNCTIONAL SECTION. - For the greatest efficiency in localizing trouble, the functional sections which have been selected by the "educated guess" method should be tested in the order that will require the fewest number of tests to find the faulty section. This requires a mental selection to determine which section to test first. The selection should be based on two factors: the validity of the "educated guess" and the difficulties in making the necessary tests to check the functional section. The required tests should now be made on the selected functional section. If the tests do not prove the selected functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process, the technical manual contains a functional description for each functional section and an over-all servicing block diagram. Waveforms or other pertinent indications are included on the servicing block diagram to serve as aids in isolating the faulty section. Also, the test data supplied to augment the over-all servicing block diagram and the functional description of each functional section provides such information as pertinent control settings, critical adjustments, a test equipment list, and other necessary information which will aid in testing the functional section.

e. LOCALIZING TROUBLE TO THE CIRCUIT. - After the faulty functional section has been isolated, it is necessary to make additional "educated guesses" as to which circuit or group of circuits within the functional section is at fault. The servicing block diagram and individual functional circuit groups (when required) provide the signal flow and test location information needed to bracket and then isolate the faulty circuit. Functional descriptions, simplified schematics, and pertinent test data for individual circuits or groups of circuits comprising the functional unit are all placed together in one area of the manual. Insofar as practical, this information is contained on facing pages. This arrangement greatly increases the efficiency of using the trouble-shooting information. Information which is too lengthy in nature to be included in this arrangement is readily referenced from the test data portion of the trouble-shooting information.

f. EXPLANATION OF THE TROUBLE. - After the trouble has been located and corrected, the next step is to review the steps taken and decide exactly why the trouble affected the equipment in the manner it did. If a technically correct reason can be given, it can be assumed that the process of trouble-shooting followed a logical system of isolation and was not just the result of a lucky guess.

4-2. OVER-ALL FUNCTIONAL DESCRIPTION.

a. The frequency standard produces fixed-frequency outputs of 5.0 mc, 1.0 mc, and 100 kc. Frequency error is held to less than one part error in 10^9 parts of output signal for all three frequencies. The output level for each frequency is at least 1.0 vrms across 50 ohms.

b. The frequency standard consists of seven functional sections:

(1) Power Supply

(2) Standby Battery

(3) Regulator-Converter

(4) Ovens

(5) Oscillator-Amplifier

(6) 5.0 mc to 1.0 mc frequency divider

(7) 1.0 mc to 100 kc frequency divider

In addition to these functional sections, the frequency standard contains test circuits, switching circuits, and external connector circuits.

c. Figure 4-1 is a functional block diagram showing the relationship of the seven functional sections. Refer to Section 5 for information which will aid in determining over-all equipment operation. Refer to figure 4-1 and the over-all equipment schematic (figure 5-32) during the following functional descriptions.

(1) POWER SUPPLY FUNCTION SECTION.

(a) The power supply functional section receives a 115 volt, 60 cps, single phase input from an external power source and provides outputs of 27 volts ac and a regulated 26.5 volts dc.

(b) The 27 volt ac power output operates the transfer relay (K701) that switches the equipment to battery operation if the external power source fails. The 27 volt ac is also fed to the outer oven main heater winding (HR1402) by way of the outer oven temperature control circuit.

(c) The regulated 26.5 volt dc output is connected in parallel to the standby battery assembly; the regulator-converter; the outer oven temperature control circuit; the 5.0 mc to 1.0 mc frequency divider; and the 1.0 mc to 100 kc frequency divider. From the 1.0 mc to 100 kc frequency divider section, the 26.5 volts are fed to the oscillator-amplifier section.

(d) The 26.5 volt dc output of the power supply section maintains the battery in a fully charged condition and provides the operating voltage for the transistors in the regulator-converter section and the outer oven temperature control circuits. In the two frequency divider sections, the 26.5 volt dc output is used to heat the tube filaments. In the oscillator-amplifier section, the filament of one tube (V104) is heated by the 26.5 volt dc from the power supply section.

(2) STANDBY BATTERY FUNCTIONAL SECTION.

(a) The standby battery functional section is connected to the regulated 26.5 volt dc output from the power supply section. The battery has an output of 26.5 volts, when fully charged, and therefore it "floats' across the power supply output, using only a small current (normally about 0.5 microamperes) to maintain a full charge. The standby battery section feeds a control signal back to the power supply section to regulate the 26.5 volt dc output. This control signal increases the output voltage when it drops below 26.5 volts and decreases it if the voltage rises above this value. This action reduces ripple in the regulated 26.5 volt dc output.

(b) The function of the standby battery is to supply 26.5 volt dc to the r-f oscillator assembly if the external power source or the power supply section fails.

(c) If the external power source or the power supply section fails, transfer relay K701 is de-energized. This switches the outer oven temperature control circuit to battery power and causes the AC POWER SOURCE lamp (DS702) on the front panel to go out, and the BAT POWER SOURCE lamp (DS703) to illuminate. Since the standby battery section is in parallel with the other functional sections that are connected to the 26.5 volt dc power line, it automatically supplies power to these sections upon power failure. (For emergency operating procedures, refer to paragraph 3-3.)

(3) REGULATOR-CONVERTER FUNCTIONAL SECTION.

(a) The regulator-converter functional section has a regulated input of 26.5 volt dc from the power supply section. It provides double regulated outputs of 18 volt dc, 20 volt dc, and 100 volt dc.

(b) The 18 volt output is used to heat the filaments of all tubes in the oscillator-amplifier section except the cathode follower, V104. The 20 volt output is fed to the inner oven to provide the operating voltage for the transistors and the inner oven heater winding (HR1401). The 100 volt output provides the operating voltage for tubes within the oscillator-amplifier, the 5.0 mc to 1.0 mc frequency divider, and the 1.0 mc to 100 kc frequency divider.

(4) OVENS FUNCTIONAL SECTION.

(a) The ovens functional section consists of double ovens with separate temperature control circuits for each oven.

(b) The outer oven temperature control circuit receives inputs of 26.5 volt dc and 27 volt ac from the power supply section. The 26.5 volt dc is the operating voltage for the transistors in the temperature control circuit. The 27 volt ac input is fed to the outer oven main heater winding (HR1402) through the contacts of relay K301. Relay K301 intermittently switches the outer oven heater on and off.

(c) The inner oven temperature control circuit receives a doubly regulated 20 volt dc input from the regulator-converter section. This voltage is used to operate the transistors in the inner oven temperature control circuit and to heat the inner oven heater winding (HR1401).

(5) OSCILLATOR-AMPLIFIER FUNCTIONAL SECTION.

(a) The oscillator-amplifier functional section receives inputs of 100 volt dc and 18 volt dc from the regulator-converter section. It also receives an input of 26.5 volt dc from the power supply section.

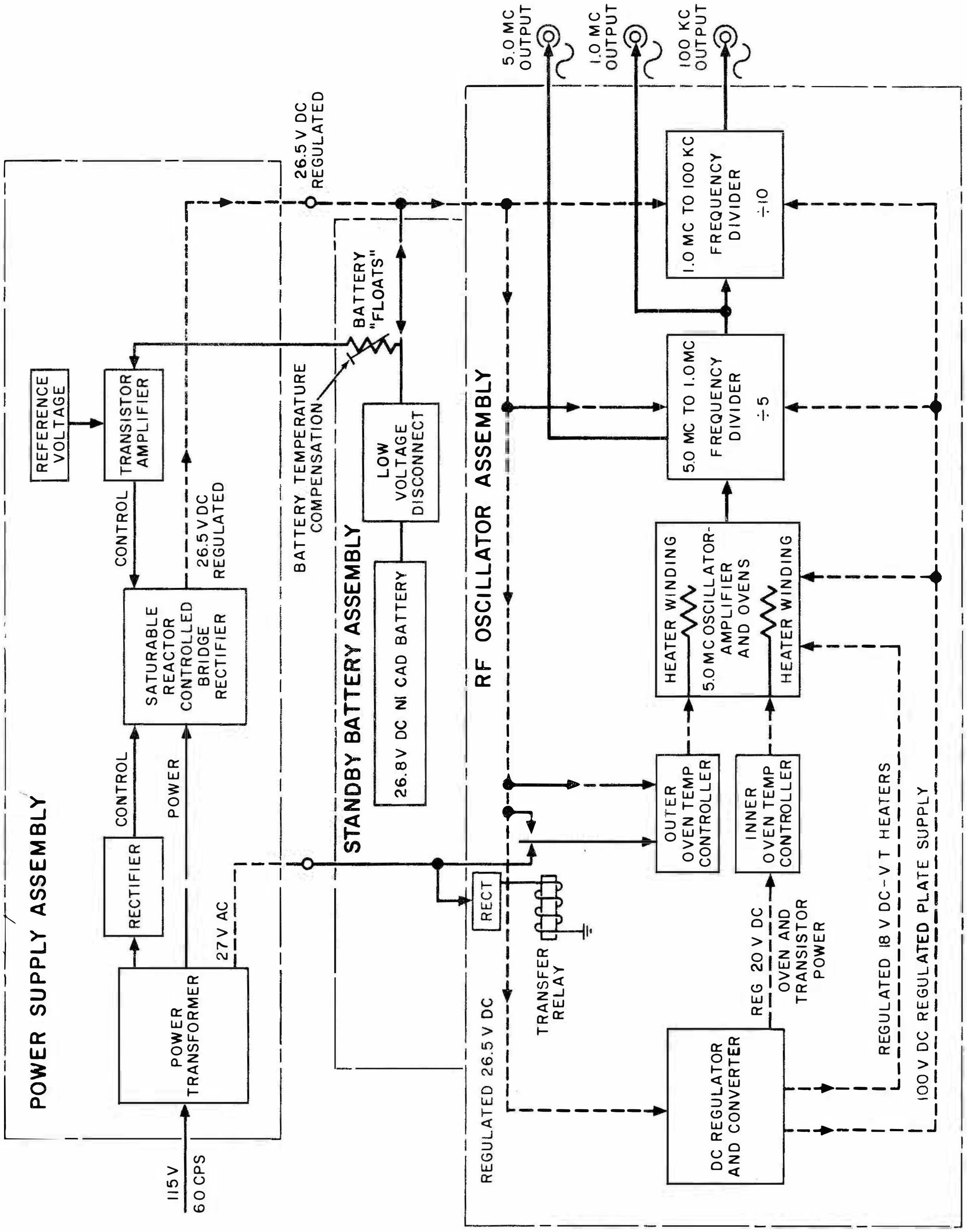


Figure 4-1. Frequency Standard, Functional Block Diagram

(b) The doubly regulated 100 volt dc input provides operating voltage for all the tubes in the oscillator-amplifier section. The doubly regulated 18 volt dc input heats the filaments of all the tubes in the section except V104. The filament of tube V104 is heated by the regulated 26.5 volt dc.

(c) The oscillator-amplifier section produces a 5.0 mc output signal which is fed to the 5.0 mc to 1.0 mc frequency divider section.

(6) 5.0 MC TO 1.0 MC FREQUENCY DIVIDER FUNCTIONAL SECTION.

(a) The 5.0 mc to 1.0 mc frequency divider functional section operates on 100 volt dc from the regulator-converter section and 26.5 volt dc from the power supply section. It receives a 5.0 mc input signal from the oscillator-amplifier section.

(b) The doubly regulated 100 volt dc provides operating voltage for all the tubes in the section and the regulated 26.5 volt dc heats the filaments of all the tubes. The 5.0 mc input signal is amplified in the frequency divider and a portion of it is fed to the 5 MC OUTPUT connectors on the front and back panels of the frequency standard. The other portion of the signal is divided by five to provide a 1.0 mc output signal.

(c) The 1.0 mc signal produced by the 5.0 mc to 1.0 mc frequency divider is fed to the 1.0 MC OUTPUT connectors on the front and back panels of the frequency standard and to the 1.0 mc to 100 kc frequency divider section.

(7) 1.0 MC TO 100 KC FREQUENCY DIVIDER FUNCTIONAL SECTION.

(a) The 1.0 mc to 100 kc frequency divider functional section operates on 100 volt dc from the regulator-converter section and 26.5 volt dc from the power supply section. It receives a 1.0 mc input signal from the 5.0 mc to 1.0 mc frequency divider section.

(b) The doubly regulated 100 volt dc provides operating voltage for all the tubes in the section and the regulated 26.5 volt dc heats the filaments of all the tubes. The 1.0 mc input signal is divided by ten to provide a 100 kc output signal.

(c) The 100 kc output signal is fed to the 100 KC OUTPUT connectors on the front and back panels of the frequency standard.

d. AUXILIARY CIRCUITS.

(1) Auxiliary circuits in the frequency standard consist of built-in test circuits, automatic switching circuits, and external connector circuits.

(2) The built-in test circuits provide meter indications of voltages and currents at key points throughout the equipment. These circuits are used for monitoring the operation of the frequency standard and for trouble-shooting purposes. A test switch and a test meter are mounted on the front panel of the frequency standard. (See figure 2-2.) Table 4-1 lists the nominal meter indication and the equipment function being tested at each test switch position. Since the meter indications will vary slightly for different sets, a test switch function card listing the correct meter indications for the individual equipment is mounted on the front panel of each frequency standard.

(3) The switching circuits provide automatic changeover to battery operation in event the external power source or the power supply assembly fails. These circuits include a manually operated toggle switch (S703, figure 2-3) that can be used to turn off the frequency divider filaments to conserve battery power in emergencies. (Refer to paragraph 3-3d.)

(4) The external connector circuits provide outputs that allow the frequency standard to drive an external time comparator and allow remote monitoring of the equipment. (Refer to paragraph 1-3e.)

4-3. POWER SUPPLY SECTION FUNCTIONAL DESCRIPTION.

a. The power supply section is controlled by self-saturating saturable reactors. Two full-wave bridge rectifiers, consisting of six rectifier units, rectify the ac input power. Bias and control currents are used in the saturable reactors to maintain a relatively constant output voltage. A schematic of the power supply section is shown in figure 4-2. Refer to figure 4-2, the servicing block diagram (figure 4-12), and the over-all equipment schematic (figure 5-32) during the following functional description.

b. The power supply section input power circuit is provided with an interlock between pins 7 and 8 of J708 in the r-f oscillator. This interlock completes the input power circuit when the power supply assembly is connected to the r-f oscillator assembly. When the power supply assembly is disconnected from the r-f oscillator assembly, the input power circuit is opened and the power supply is turned off. This a safety measure to avoid the hazard of electrical shock to personnel and to prevent damage to the power supply that might result if it continued to operate after being disconnected from its load.

c. Input transformer T901 provides outputs of 27 vrms (between terminals 5 and 6) and 53 vrms (between terminals 3 and 4). The 27 volt ac output is fed directly to the r-f oscillator through pin 3 of J901. The 53 volt output is regulated by controlled saturable reactors and rectified to provide a 26.5 volt dc output at pin 1 of J901.

d. The saturable reactors (T902 and T903) are connected in two arms of a full-wave bridge rectifier consisting of diodes CR903, CR904, CR905, and CR906. The power winding of each reactor is in series with the power supply load for one-half of the ac cycle. The load current through the bridge rectifier

TABLE 4-1. FRONT PANEL TEST METER INDICATIONS

POSITION	FUNCTION	NOMINAL INDICATION * (in microamperes)	REMARKS
1	5 mc output	20	
2	1 mc output	20	
3	100 kc output	19	
4	Tube V102 plate current	40	
5	Tube V103 plate current	38	
6	100 volt plate supply	50	
7	Tube V101, V102, and V103 regulated heater supply	20	
8	Voltage across inner oven heater	12	Does not indicate final voltage until inner oven has reached proper operating temperature.
9	Current through outer oven monitor thermal resistor	0	Does not indicate zero current until outer oven heater has reached proper operating temperature.
10	Power supply output voltage	26	
11	Power supply output current	8	
12	Battery charging current	0	Fully charged indication. Up to 50 ua when batteries have been discharged.

* NOTE: The correct meter indication for each individual frequency standard is listed on the test switch function card mounted on the front panel.

always flows in the same direction through the power windings of the reactors (terminals 1 and 2). A relatively small load current in the power windings can cause saturation of the reactor cores. During the period that the reactor cores are not saturated, the load windings present a large inductive reactance, or impedance, to current flow. Most of the voltage impressed across the reactor arms of the bridge rectifier circuit is dropped across the reactors and very little voltage is dropped across the series diode. This results in a lower output voltage. After the magnetic flux has built up to the point of saturation, the impedance of the reactors to current flow becomes small. At this time very little voltage is dropped across the reactors and a large voltage is dropped across the series diode. This results in a higher output voltage. The magnetic condition of the reactor cores at the start of each cycle determines the length of time before the core saturates and before full voltage is applied to the series diode. By aiding saturation of the cores, the output voltage can be increased; by opposing saturation of the cores, the output voltage can be reduced.

e. Direct currents passing through the bias windings (terminals 3 and 4) and control windings (terminals 5 and 6) of T902 and T903 are used to control the saturation of the cores. The current through the bias windings creates magnetic flux that opposes saturation of the reactors. The current through the control windings creates magnetic flux that aids saturation of the reactors. (See the simplified schematic, figure 4-3.) That is, an increase in bias current (terminals 3 and 4) decreases output voltage and an increase in control current (terminals 5 and 6) increases output voltage.

f. BIAS CURRENT. - The full-wave bridge rectifier consisting of CR903, CR904, CR905 and CR906 produces an output voltage that is dependent upon input

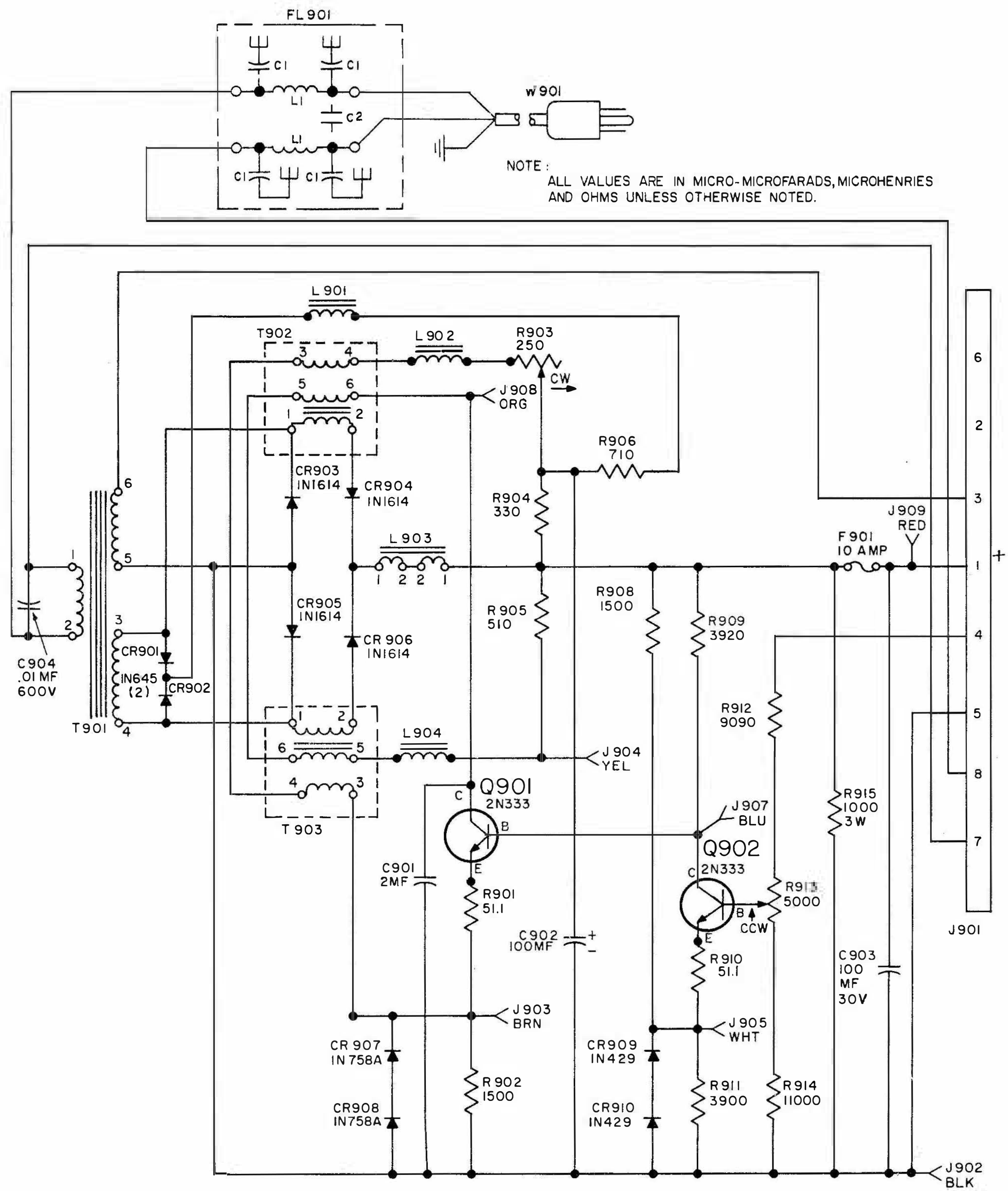


Figure 4-2. Power Supply Section Schematic

voltage and the loading on transformer T901. The bias current through terminals 3 and 4 of reactors T902 and T903 is directly proportional to the input voltage from T901. If the input voltage increases, the bias current also increases, further opposing saturation of the reactor cores and decreasing the output, thereby offsetting the increased input voltage. If the input voltage decreases, the opposite effect is produced. In this way the fluctuations in input voltage are compensated for and the output is maintained at a relatively constant level.

(1) Bias current flows from ground through the zener diodes CR907 and CR908 and through the bias windings of reactors T903 and T902 to the junction of resistors R906 and R904, which make up a voltage divider. From this point, the bias current has a parallel circuit back to the positive side of the secondary of T901. One path of this current is through R906, L901, and CR901 or CR902. The other path is through R904, L903, CR904 or CR906, and the power winding of T902 or T903. Zener diodes CR907 and CR908 drop 10 volts each and maintain a constant potential of 20 volts positive with respect to ground at terminal three of T903. The junction of R904 and R906 is usually kept at +26 volts by the 53 volts across the secondary of T901. Therefore, a nominal current constantly flows through the bias windings of T902 and T903. The nominal bias current is adjusted by variable resistor R903 to obtain an output of 26.5 volts under normal operating conditions. If the input voltage increases, the voltage at the junction of R904 and R906 also increases, causing a greater current flow through the bias windings and decreasing the output voltage. If the input voltage decreases, the voltage at the junction of R904 and R906 decreases, causing less current through the bias windings and thus increasing the output voltage. In this way, changes in the output voltage due to changes in input voltage are reduced to a minimum by the bias circuit.

(2) Changes in the output voltage caused by changes in the load are also compensated for by the bias circuit. If the output voltage increases due to a decrease in load, the current flow through R904 and back to T901 is increased, thus increasing the bias current and effectively increasing the resistance (reactance) of the power windings of T902 and T903. This reduces the output voltage, keeping it at a relatively constant 26.5 volts. If the load increases, causing a decrease in output voltage, the opposite reaction is induced.

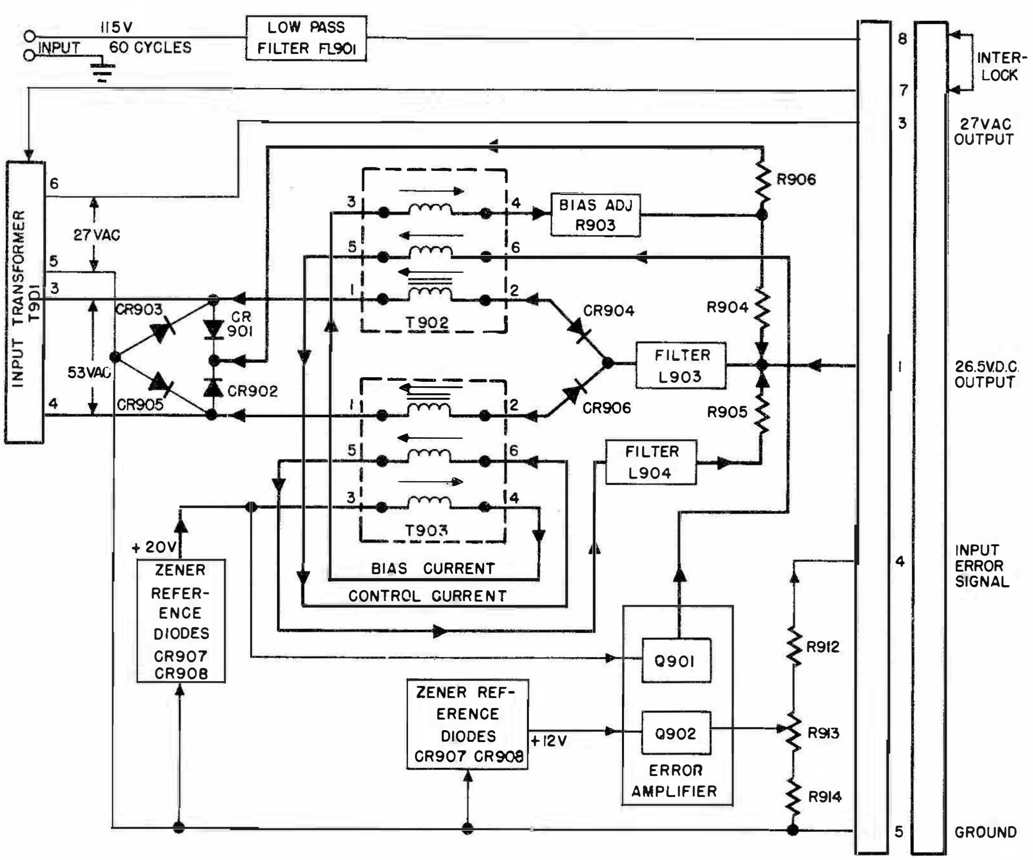


Figure 4-3. Power Supply Section Simplified Schematic

g. CONTROL CURRENT. - The standby battery "floats" across the 26.5 volt dc output from the power supply. The battery is maintained at a full 26.5 volt charge by this output and it helps reduce ripple in the 26.5 volt line. The small charging current normally received by the standby battery warms the cells. If the output from the power supply drops below 26.5 volts, the battery begins discharging slightly and it cools off. If the output from the power supply rises above 26.5 volts, the battery receives a higher charging current than usual and its temperature rises. A thermistor, RT801, is located between two cells in the standby battery where it can quickly sense changes in battery temperature. This thermistor increases in resistance if the battery cools and decreases if the battery gets warmer. R807, which is in parallel with RT801, is used to pad the thermistor so that a given amount of temperature change will produce the proper degree of resistance change. RT801 and R807 comprise a temperature-compensating circuit connected across pins 1 and 4 of J901, the power supply connector. When the battery temperature rises (or when the power supply output voltage rises) more current flows through the temperature compensating circuit. Current flows from ground through the voltage divider consisting of R914, R913, and R912 to pin 4 of J901. The voltage on the wiper of R913 biases the base of transistor Q902 slightly positive with respect to the emitter. The emitter is kept at +12 volts by zener diodes CR909 and CR910. The positive voltage on the base causes the transistor to conduct with the collector current flowing through R909 to the 26.5 volt line. The resulting voltage drop across R909 puts a negative bias on the base of Q901. The more Q902 conducts, the less Q901 will conduct since the emitter is held at +20 volts by CR907 and CR908. The collector current from Q901 flows through the control windings of T902 and T903 (terminals 5 and 6) and through R905 back to the 26.5 volt line. This current flows through the control windings in a direction that aids core saturation and thus increases output voltage. By increasing the bias on the base of Q902, the control current can be reduced, causing a decrease in output voltage. Potentiometer R913 is set so that during proper output of the power supply, sufficient current will flow through R905 to drop 1.75 volts across it.

(1) If the output voltage rises above 26.5 volts, more current will flow through the voltage divider consisting of R914, R913, and R912 and through the temperature compensating circuit consisting of RT801 and R807. This current flow will also be increased by a rise in temperature of RT801 in the battery. (With a rise in temperature, the resistance of RT801 decreases.) The increased current will raise the bias voltage on the base of Q902, causing the transistor to conduct more than usual. The increased collector current will cause a greater drop in voltage across R909, biasing the base of Q901, more negatively and reducing current flow through the transistor. This results in less current through the control windings of saturable reactors T902 and T903. A reduction in control current will delay saturation of the power windings of the reactors, causing a reduction in output voltage and offsetting the initial rise.

(2) If the output voltage decreases or if the battery cools down slightly, the reverse action will take place, increasing the control current and therefore increasing the output voltage from the power supply section. In this way, the temperature compensating circuit in the standby battery and the error amplifiers consisting of Q902 and Q901 with their associated circuits, regulate the power supply output to keep it relatively constant at 26.5 volts.

h. Switch S702 in the r-f oscillator is mechanically operated by pressure from the standby battery assembly chassis when it is mounted in the r-f oscillator chassis. This switch connects pin 4 of J708 (which is connected to the power supply), to pin 4 of J707 (which is connected to the standby battery). This provides a return path to the power supply from the temperature compensating circuit in the standby battery. If the standby battery assembly is removed, switch S702 springs back to connect R718 across pins 4 and 1 of J708. This resistor approximates the resistance of the temperature-compensating circuit and allows the power supply to operate normally with the standby battery assembly removed.

4-4. POWER SUPPLY SECTION TEST DATA.

a. Refer to paragraph 5-1 of this manual for information which will aid in determining the over-all performance of the frequency standard. If performance of the set does not meet the minimum requirements, the trouble can be isolated to a particular functional section by use of the front panel test switch, test meter, and indicating lamps. See Table 4-1 for a listing of the function being checked in each test switch position and the nominal meter indication that should be obtained.

b. If a trouble develops in the power supply section, the equipment will automatically switch to battery operation. The front panel indications will be:

(1) AC indicator lamp out.

(2) BAT indicator lamp on.

(3) Low or zero meter indication with the test switch in position 11.

(4) Negative meter indication with the test switch in position 12.

(5) All other front panel indications normal.

c. To isolate the trouble within the power supply functional section to a particular circuit, take readings at all test points. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit locations of the test points and to the parts location illustrations (figures 5-15 and 5-18) for the physical locations.

d. Test equipment required to perform these checks is:

(1) Oscilloscope AN/USM-105A.

(2) Multimeter AN/USM-116.

(3) Variac CN-16 A/U.

(4) Capacitance, Inductance, Resistance Bridge ZM-11 A/U.

See Table 5-1 for a complete list of all test equipment.

e. Primary checks should be made to see that the proper input is being supplied to the section from the external power source and that fuse F901 is not blown. If the fuse is blown, find and repair the trouble before placing another fuse in the circuit.

f. If the output at pin 3 of J901 is normal, and the output at pin 1 (test jack J909) is low, the section may need to be adjusted. (See paragraph 4-4h for the adjustment procedure.)

g. When the trouble has been traced to a particular circuit, use voltage and resistance checks to pinpoint the faulty part. Refer to Section 5 for information on location and replacement of parts. All significant voltages are recorded on the over-all schematic (figure 5-32.) The resistance to ground from each lead of all transistors in the power supply section is listed in the chart below.

CAUTION

Do not take resistance measurements across the transistors.

RESISTANCE CHART

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q901	1.25K	4.4K	800
Q902	4.4K	13K	1.4K

h. ADJUSTMENT. - Adjustment of the power supply is accomplished by alternately varying resistors R903 and R913.

(1) R903 regulates the bias current through terminals 3 and 4 of the saturable reactors T902 and T903. It should be adjusted to obtain an output of 26.5 volts dc at J909. Refer to paragraph 5-1b for the adjustment procedure.

(2) R913 regulates the base bias of Q902 and thereby regulates current flow through the control windings (terminals 5 and 6) of T902 and T903. It should be adjusted to cause enough current to flow through R905 to drop 1.75 volts across the resistor. (The reading between J904 and J902 should be 24.75 volts.)

(3) These two adjustments interact with each other and must be alternately repeated until the required voltages are obtained.

4-5. STANDBY BATTERY SECTION FUNCTIONAL DESCRIPTION.

a. A schematic diagram of the standby battery section is shown in figure 4-4. Refer to figure 4-4, figure 4-12 (servicing block diagram), and to figure 5-32 over-all schematic during the following circuit descriptions.

b. The standby battery section consists of a 26.5 volt battery, a low-voltage drop-out circuit, and a temperature-compensating circuit.

c. The battery contains 19 nickel-cadmium cells in series. It provides a power output that will operate the frequency standard for a minimum of two hours when fully charged. As the battery discharges, the output voltage drops gradually. When the battery output falls to about 18 volts, it will no longer maintain satisfactory operation of the frequency standard.

d. The low-voltage drop-out circuit automatically turns the battery off when it discharges to 18 volts. This prevents further discharge and possible damage to the battery. The drop-out circuit consists of a transistor, Q801, a relay, K801, and a voltage divider.

(1) The 26.5 volt output from the power supply is connected to pin 1 of J801. Battery switch S801 is closed at all times during equipment operation and current flows from ground (pin 6 of J801) to the 26.5 volt line through the voltage divider, consisting of R803, R804, and R805. A constant +10 volts is maintained at the emitter of Q801 by the zener diode, CR801. With a more positive voltage applied to the base and the collector connected to +26.5 volts through K801, the transistor conducts. The collector current energizes relay K801, connecting the battery to the 26.5 volt output from the power supply.

(2) If the power supply develops a trouble, the battery will automatically supply power to the set. As the battery discharges, the output voltage drops, causing less current to flow through the voltage divider. With less current flowing through the voltage divider, the voltage drop across R804 is less and the bias on the base of Q801 becomes less positive, diminishing the collector current through K801. When the battery drops to approximately 18 volts, the bias on the base of Q801 becomes so low that insufficient current flows through K801 to keep the relay closed. At this point, the relay opens and disconnects the battery from the equipment load.

e. The function of the temperature-compensating circuit is described in paragraph 4-3g.

4-6. STANDBY BATTERY SECTION TEST DATA.

a. If a trouble develops in the standby battery functional section, and the power supply section is still operating normally, the only front panel indication may be a meter reading that is too low or too high with the test switch in position 12. All other test switch checks and the indicator lamps will be normal.

A trouble in the standby battery assembly will not alter operation of the frequency standard as long as the power supply is unaffected. A trouble of this kind will normally be detected while performing the maintenance tests described in paragraph 5-1.

b. To isolate the trouble within the standby battery section, check to see that the battery switch, S801, is in the ON position and that the battery is charged and in good condition. Use voltage and resistance checks to locate the faulty part. All significant voltages are recorded on the over-all schematic (figure 5-32). The resistance from each lead of transistor Q801 to ground is listed in the chart below.

CAUTION

Do not take resistance measurements across the transistor.

RESISTANCE CHART

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q801	18K	8. 5K	100

c. Test equipment required to perform these checks is:

(1) Multimeter AN/USM-116.

(2) Capacitance, Inductance, Resistance Bridge AM-11 A/U.

See Table 5-1 for a complete list of all test equipment.

d. ADJUSTMENT. - Adjustment of the standby battery section consists of setting R804 to control the point at which the low-voltage drop-out circuit will function and setting R807 to obtain the proper resistance across the temperature-compensating circuit

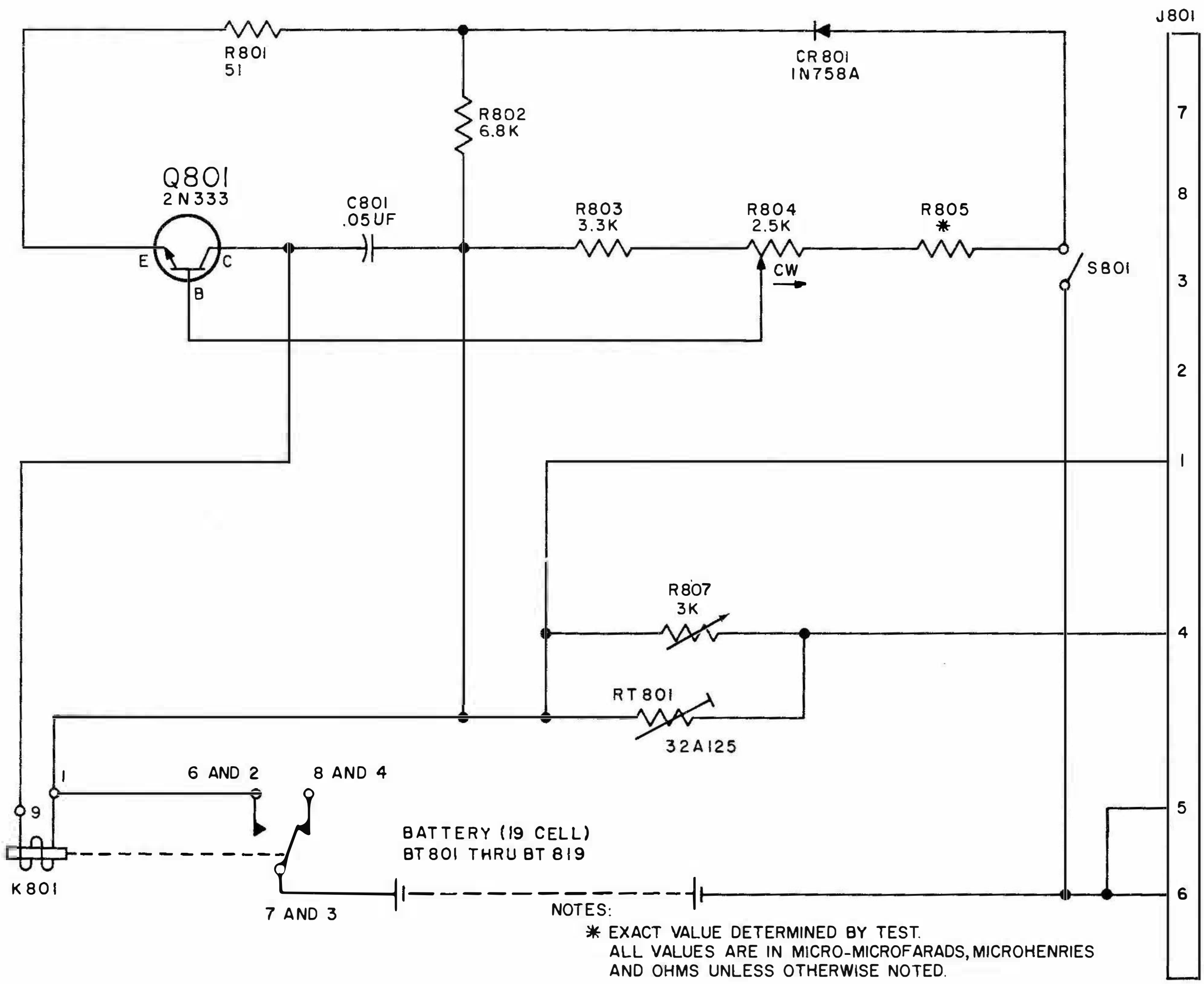


Figure 4-4. Standby Battery Section Schematic

(R807 and RT801). R804 should be set to cause K801 to be de-energized at 18 volts. R807 is a factory adjustment which is set to cause a resistance of 1000 ohms across the parallel circuit of R807 and RT801 (terminals 1 and 4 of J801) when the battery temperature is held at a constant 25°C (77°F).

4-7. REGULATOR-CONVERTER SECTION FUNCTIONAL DESCRIPTION.

a. A schematic diagram of the regulator-converter is shown in figure 4-5. Refer to figure 4-5, the servicing block diagram (figure 4-12) and the over-all equipment schematic (figure 5-32) during the following functional description.

b. The regulator-converter consists of separate regulator and converter circuits. The regulator circuit receives an input of 26.5 volt dc from the power supply or battery and produces a regulated 20 volt dc output. The doubly regulated 20 volt output is fed to pins E and C of J605 for distribution to the other functional sections and is also fed to the converter circuit. The converter portion of the regulator-converter section uses the 20 volt dc input to produce a 100 volt dc output at pin H of J605.

c. Regulating action in the regulator portion of the section is initiated by variations in the 26.5 volt input or the 100 volt output. If the voltage input or output of the converter circuit rises, the voltage across the voltage divider (resistors R629, R601, R602, and R627) becomes more positive. A portion of this voltage, at the wiper terminal of variable resistor R601, appears at the base of transistor Q603. Since the voltage at the emitter of this transistor is kept nearly constant by reference diode CR604, an increase in base voltage produces an increase in collector current. This increase in current causes a decrease in voltage at the collector of transistor Q603 and at the base of transistor Q604. The emitter of transistor Q604 is kept nearly constant by reference diodes CR605 and CR606. Any decrease in voltage at the transistor base decreases the current through collector resistor R625. This produces an increasing voltage at the collector of transistor Q604, and at the bases of transistors Q605 and Q606. An increase in the voltage on the bases of these transistors, decreases the collector current and lowers the collector voltage so that the following converter circuit has a lower input voltage. A lower input voltage to the converter circuit results in a lower output voltage, which counteracts the initial rise in voltage.

d. When the converter input or output voltage decreases, the regulator circuit operation is the reverse of the action which took place during an increasing voltage. Capacitor C602 eliminates circuit hunting.

e. The converter circuit consists of a transistorized (transistors Q601 and Q602) vibrator circuit, and a full-wave bridge rectifier, utilizing rectifiers CR608, CR601, CR602, and CR603. Oscillation within the vibrator circuit is produced by coupling a portion of the output ac voltage which appears across the secondary (pins 6, 7, and 8) of transistor T601, to the bases of the transistors. The transistors, operating as a vibrator, alternately conduct through the other secondary winding (pins 3, 4, and 5), each time saturating the transformer core and producing a square-wave output across the full-wave rectifier. The transistor bases are returned through resistor R603 and diode CR607 to the regulated 20 volt line. The ac in the secondary of T601 appears across the full-wave bridge rectifier to produce an output of 80 volts. This 80 volts added to the 20 volts produced by the regulator, provides a total of 100 volts at pin H of J605. The voltage is filtered by the combination of choke L601 and capacitor C607, and is applied as the operating voltage to all 11 tubes in the frequency standard.

4-8. REGULATOR-CONVERTER SECTION TEST DATA.

a. If a trouble develops in the regulator-converter section, the front panel indications will be:

(1) OUTER OVEN HEATER lamp not cycling on and off normally. (See paragraph 3-4a(2).)

(2) Low or high meter indication with test switch in position 6.

(3) Low or high meter indication with test switch in position 7.

(4) Abnormal meter indications in test switch positions 1, 2, 3, 4, 5, 8, and 9.

(If the meter indications in test switch positions 6 and 7 are low or zero, meter readings for positions 1, 2, 3, 4, 5, 8, and 9 will also be low or zero; if the meter indications in test switch positions 6 and 7 are high, the indications for the other test switch positions will also be high.) See Table 4-1 for a listing of the function being checked in each test switch position and the nominal meter indications that should be obtained.

b. To isolate the trouble within the regulator-converter functional section to a particular circuit, take readings at all test points. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit locations of the test points and to the parts location illustrations (figures 5-13 and 5-31) for the physical locations.

c. Test equipment required to perform these checks is:

(1) Oscilloscope AN/USM-105A.

(2) Multimeter AN/USM-116.

(3) Capacitance, Inductance, Resistance Bridge ZM-11 A/U.

See Table 5-1 for a complete list of all test equipment.

d. Primary checks should be made to see that the proper input is being supplied to the section from the

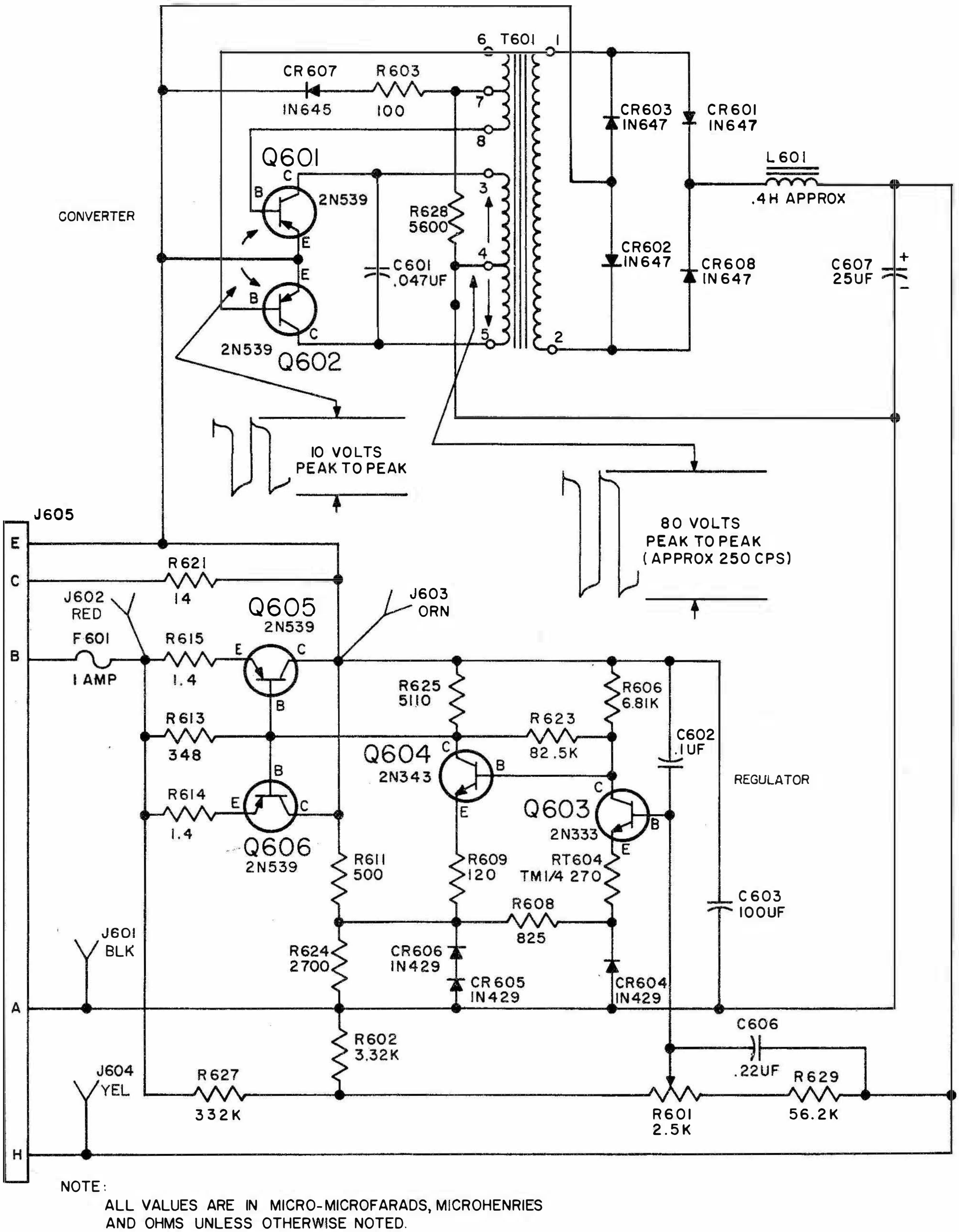


Figure 4-5. Regulator-Converter Section Schematic

power supply and that fuse F601 is not blown. If the fuse is blown, find and repair the trouble before placing another fuse in the circuit.

e. If the input at pin B of J605 is normal (26.5 volts dc) but the outputs at pins E and H are too high or too low, the section may need to be adjusted. (See step g for information on adjustments.)

f. When the trouble has been traced to a particular circuit, use voltage and resistance checks to pinpoint the faulty part. Refer to Section 5 of this manual for information on location and replacement of parts. All significant voltages are recorded on the over-all schematic (figure 5-32). The resistance to ground from each lead of all transistors in the section is listed in the chart below.

CAUTION

Do not take resistance measurements across the transistors.

RESISTANCE CHART

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q601	3.5	13	14
Q602	4	11.5	14
Q603	6K	4K	1.3K
Q604	22	6K	5.5K
Q605	14	21.5	14.5
Q606	14	14	14.5

g. ADJUSTMENT. - To adjust the regulator-converter, vary R601 to obtain 100 volts dc at J604. When the 100 volt output is obtained, the 20 volt and 18 volt output should also be correct. The 100 volt output can be measured by the front panel test meter with the test switch in position 6. A full-scale deflection of 50 microamperes on the meter will indicate a 100 volt output from the regulator-converter.

4-9. OVENS SECTION FUNCTIONAL DESCRIPTION.

a. The inner oven temperature control circuit feeds current through the inner oven heater winding at all times. This is a proportional or constantly-searching type of control. When stabilized, the searching action is so slight that it is practically undetectable. The outer oven temperature control circuit feeds current to the outer oven main heater winding intermittently. This is an on-off type of control. These two temperature control circuits work together as a functional system to maintain the frequency-determining circuits at an almost constant temperature.

b. The temperature control system uses three bridge circuits. Since these circuits are not drawn in the popular bridge configuration on the over-all schematic (figure 5-32), a simplified schematic is shown in figure 4-6 to clarify their function. Refer to figure 5-32, figure 4-6, and figure 4-12 (servicing block diagram) during the following functional description.

c. The inner and outer oven temperature control circuits both use feedback control loops consists of an unbalanced bridge circuit and a transistor oscillator. A thermistor forms one arm of each bridge circuit. The thermistors have a negative temperature coefficient of resistance so that with a drop in temperature their resistance increases. This change in resistance changes the unbalance point of the sensitive bridge circuits. The resulting unbalance voltage from the bridge circuit is applied to the base of the transistor oscillator, increasing the amplitude of oscillation. The increased oscillator voltage is rectified, amplified, and applied to the heater winding (in the case of the inner oven temperature control circuit) or the on-off switching relay (in the case of the outer oven temperature control circuit.) The increased current raises the temperature of the oven and of the thermistor. When the thermistor is brought up to the proper temperature, the unbalance of the bridge circuit is returned to normal, decreasing oscillation and heater current (or relay current).

d. INNER OVEN TEMPERATURE CONTROL CIRCUIT. - Thermistor RT1401, in the inner oven, senses temperature changes for the inner oven temperature control circuit. This thermistor forms one arm of a resistance bridge made up of additional resistors R206, R207, and R209. The bridge operates slightly off balance during normal operation so that the temperature control circuit will supply enough power to the inner oven heater winding to balance normal oven heat loss.

(1) Whenever the temperature of the inner oven drops, the increased resistance of RT1401, further unbalances of the resistance bridge. This additional unbalance in the bridge circuit increases the oscillation in the collector circuit of transistor Q203. The increased amplitude of oscillation is impressed on the secondary of T202 that is connected to the base of Q202. The increased positive pulses on the base of Q202 cause increased collector current through the primary of T201. The positive pulses appearing in the secondary (pins 3 and 4) of T201 cause an increase in the charge on capacitor C201, due to current flow through C201 and diode CR201. With a increase in positive bias on the base of Q201, the transistor conduction increases thereby increasing the current through HR1401 and raising the temperature of the inner oven. As the inner oven temperature increases, the thermistor is warmed and its resistance decreases, reducing the amount of unbalance in the resistance bridge and returning the temperature control circuit to normal operation.

(2) If the temperature of the inner oven rises above normal, due to action of the outer oven or to an increase in room temperature, the resistance of RT-1401 decreases, reducing the normal amount of unbalance in the resistance bridge and reducing current through HR1401 to limit the temperature of the oven.

e. OUTER OVEN TEMPERATURE CONTROL CIRCUIT. - Thermistor RT1403, in the outer oven, senses the temperature of the outer oven for the outer oven temperature-control circuit. This thermistor forms one arm of the bridge made up of additional resistors R306, R307, R308, R309 and thermal resistor RT301 (which compensates for variations in ambient temperature). The outer oven temperature control circuit operates in the same manner that the inner oven temperature control does, except that it controls current flow through the winding of relay K301 instead of a heater. When relay K301 energizes, the 27 volt ac input from the power supply (pin M of J301) is switched to the main heater winding (HR1402). As the outer oven temperature rises, the resistance of RT1403 decreases, reducing the amount of unbalance in the resistance bridge and causing less current to flow through the winding of K301. When this current reaches the cut-off value, the relay de-energizes, switching the outer oven off. This on-off process is repeated at relatively regular periods. Each time the outer oven is switched on by K301, the front panel indicator lamp, DS701 is also turned on.

(1) Thermal switch S1401 closes whenever the ambient temperature is below 20°C (68°F) and applies power to auxiliary heater HR1403 to help maintain the correct outer oven temperature.

(2) Thermal switch S1402 is a safety thermostat which closes if the temperature of the outer oven exceeds 100°C (212°F). When the thermostat closes, fuse F1401 blows to prevent further heating of the oven and consequent damage to the equipment.

f. An extra thermistor, RT1402, is placed in the inner oven but not connected in the circuit. This thermistor is provided for use as a monitor of inner oven operation during trouble-shooting, and can be substituted for RT1401 in the inner oven temperature control circuit if necessary in an emergency. RT1402 is connected across terminals 28 and 29 of TB1401.

g. Thermistor RT1404, in the outer oven, is provided as a monitor of outer oven operation. This thermistor is connected across the test meter when the test switch is in position 9. In an emergency, RT1404 can be substituted for RT1403 to maintain proper operation of the outer oven.

4-10. OVENS SECTION TEST DATA.

a. If a trouble develops in the ovens section, the front panel indications will be:

(1) OUTER OVEN HEATER lamp not cycling on and off normally. (Refer to paragraph 3-4a(2).)

(2) Low or high meter indication with test switch in position 8.

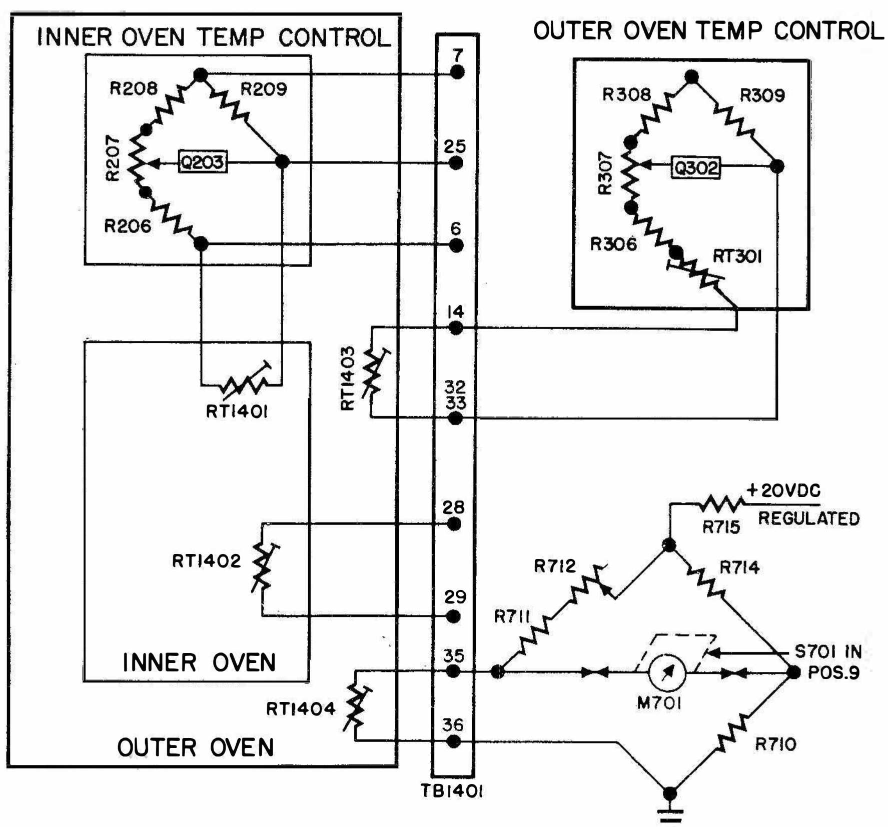


Figure 4-6. Ovens Section Simplified Schematic

(3) Low or high meter indication with test switch in position 9.

(4) All other front panel indications normal.

See Table 4-1 for a listing of the function being checked in each test switch position and the nominal meter indications that should be obtained. When the test switch is in position 8, the meter measures the voltage across the inner oven heater. This voltage decreases while the inner oven is warming and reaches its final value when the inner oven has reached the proper operating temperature. When the switch is in position 9, the meter indicates the resistance of the outer oven monitor thermistor RT1404 by means of a bridge circuit which was balanced by variable resistor R712 at the factory while the oven was at the correct temperature. While the outer oven is warming, the meter indication decreases until, when the outer oven has reached the proper temperature, the meter indicates zero.

b. To isolate the trouble within the ovens section to a particular circuit, take readings at all test points. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit-wise locations of the test points and to the parts location illustrations (figures 5-23 and 5-24) for the physical locations.

c. Test equipment required to perform these checks is:

(1) Oscilloscope AN/USM-117.

(2) Voltmeter AN/USM-116.

(3) Capacitance, Inductance, Resistance Bridge ZM-11/U.

See Table 5-1 for a complete list of all test equipment.

d. Primary checks should be made to see that the proper inputs are being supplied to the section from the power supply and the regulator-converter and that fuse F1401 is not blown. If the fuse is blown, find and repair the trouble before placing another fuse in the circuit.

e. If the ovens section seems to be operating properly but the meter readings in test switch positions 8 and 9 indicate over-heating or under-heating of the ovens, the temperature control circuits may need to be adjusted. (Refer to step g for the adjustment procedures.)

f. When the trouble has been traced to a particular circuit, use voltage and resistance checks to locate the faulty part. Refer to Section 5 for information on the location and replacement of parts. All significant voltages are recorded on the over-all schematic (figure 5-32). The resistance to ground from each lead of all transistors in the ovens section is listed in the chart below.

CAUTION

Do not take resistance measurements across the transistors.

RESISTANCE CHART

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q201	40	22	10
Q202	175	11	14
Q203	1.1K	3.8K	1.5K
Q301	2.6K	22	26
Q302	1.15K	2.7K	1.3K

g. ADJUSTMENT. - The ovens section is adjusted to maintain the temperature of the inner oven at the turning-point temperature of the particular crystal used in the frequency standard. The turning-point temperature for a crystal is that temperature at which the crystal frequency is lowest and therefore most stable. Any increase or decrease in this temperature will cause an increase in crystal frequency. Figure 4-7 shows a graph of frequency - vs - temperature characteristics at the turning point of a typical crystal.

(1) Variable resistor R307 in the outer oven temperature control circuit is adjusted at the factory to maintain the turning-point temperature in the inner oven when the inner oven heater winding has a preselected voltage (generally 10 to 15 volts) across it.

(2) To adjust the ovens section, place the front panel test switch in position 8 and observe the test meter. If the meter indication is low (relative to the value listed on the test switch function card, figure 2-2) rotate R307 counterclockwise. If it is high, rotate R307 clockwise. (Access to this resistor is through a small hole in the upper left-hand corner of the right side of the r-f oscillator assembly chassis.)

(3) If the correct meter reading cannot be obtained by adjusting R307, variable resistor R207 in the inner oven temperature control circuit may need to be reset. Turn R207 clockwise to increase current through HR-1401 and counterclockwise to decrease it.

Note

After each adjustment of R307 and R207 allow approximately 15 minutes for the inner oven temperature to change before taking a reading and making further adjustments.

It will take at least one hour, after final adjustment is made, for the inner oven temperature to stabilize at a relatively constant temperature.

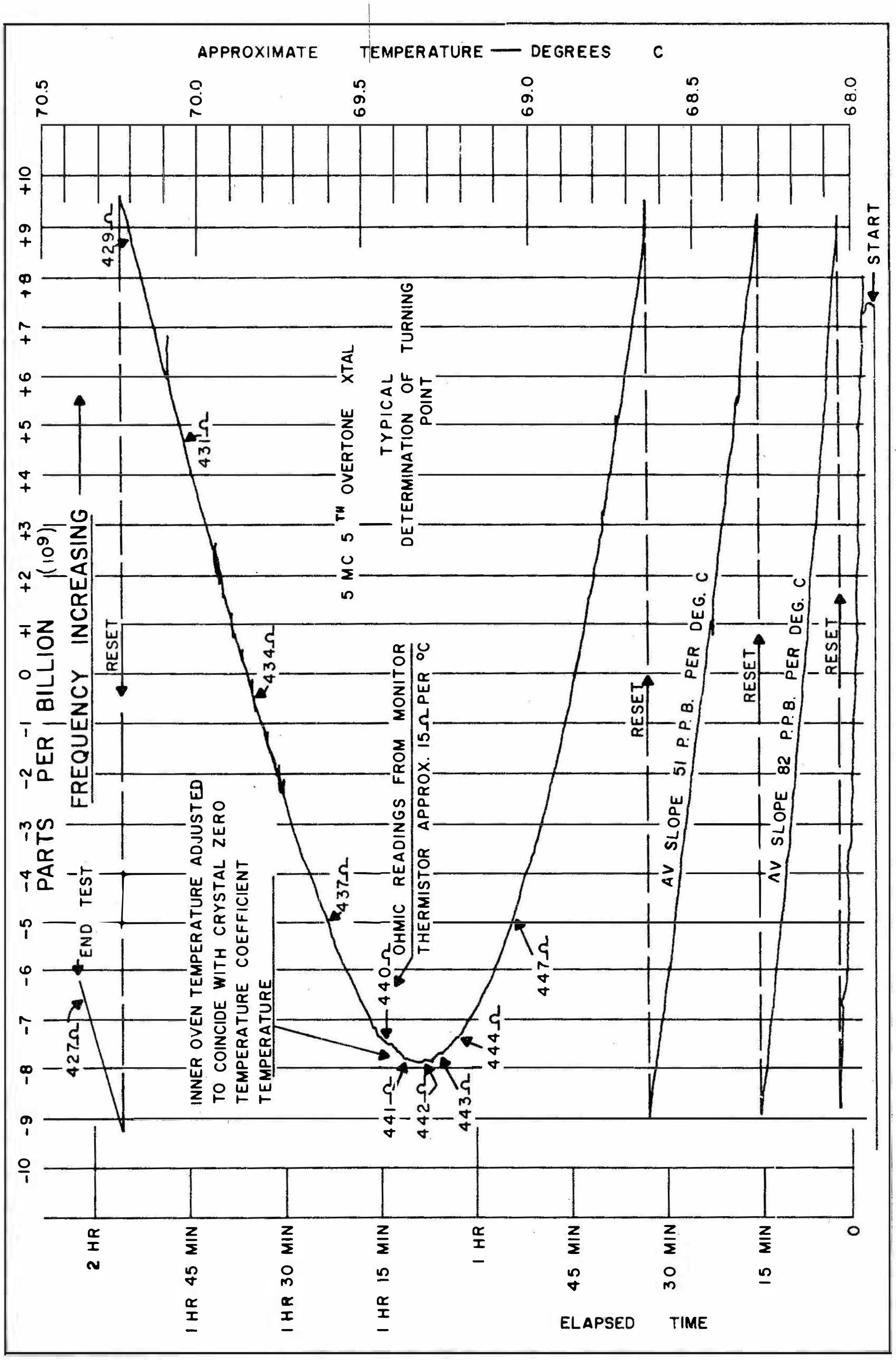


Figure 4-7. Graph of Frequency -vs- Temperature Characteristics of Typical Crystal

4-11. OSCILLATOR-AMPLIFIER SECTION FUNCTIONAL DESCRIPTION.

a. A schematic diagram of the oscillator-amplifier section is shown in figure 4-8. Refer to figure 4-8, the servicing block diagram (figure 4-12), and the over-all equipment schematic (figure 5-32) during the following functional description.

b. The oscillator-amplifier consists of a crystal controlled oscillator, two wide-band amplifiers, and a cathode follower. The crystal controlled oscillator, V101, develops the basic 5.0 mc frequency from which all other frequencies of the equipment are derived. The 5.0 mc frequency signal is amplified by the wide-band amplifiers V102 and V103. Output from the last amplifier is coupled to cathode follower V104 which provides isolation and a low impedance output to the 5.0 mc to 1.0 mc frequency divider.

c. The oscillator, V101, a modified Pierce type, is a sharp-cutoff r-f pentode with feedback coupled from the plate to the control grid through a pi-type network (series connected L1402, Y1401, and L1401 connecting the two legs, C102 in series with paralleled C1401 and C1402, and paralleled C106, C108, and C1403). This pi-type network provides the 180 degree phase shift in the feedback required to maintain the oscillation. The frequency of the oscillator is determined by an especially cut ("AT"-cut) quartz crystal having a natural frequency of 1 mc. The crystal, located in the inner oven, operates in series with the tuned circuit at its fifth overtone mode (5 megacycles). Within the circuit, fixed resistor R1401 suppresses oscillation at all modes except the fifth. Coarse tuning of the circuit is accomplished by variable capacitor C1401 (screwdriver adjusted). The fine tuning is adjusted by variable capacitor C1403 which is mechanically connected to the fine frequency dial on the front of the oven. The trimmer capacitor (C108), across the fine frequency control (C1403), is used to adjust the span of the fine frequency adjustment. Capacitors C106 and C1402 and inductor L1401 are the fixed parts in the tuned oscillator circuit to assure an oscillation effect at all times. Inductor L1402 may be used with some crystals to lower the natural oscillating frequency of the tuned circuit. The lowering of the natural frequency is used to bring the oscillator frequency within the upper limits of the coarse frequency adjustment. A negative AGC voltage for controlling gain of the tube is applied to the control grid through R102.

d. The 5 mc output from the oscillator is coupled to the wide-band amplifiers V102 and V103. The plate circuit of each amplifier stage is tuned, by a capacitor (C122 in amplifier V102 plate circuit and C116 in amplifier V103 plate circuit), to provide maximum coupling of the 5 mc frequency. In addition, the unbypassed cathode resistors R107 and R112 are used to provide negative feedback in the amplifiers.

e. The automatic gain control (agc) voltage is developed by a portion of the output frequency, from amplifier V103, which appears across capacitors C120 and diodes CR102. These two parts (C120 and CR102) along with diode CR101 and capacitor C119 are connected in a voltage doubler circuit which provides the negative agc voltage to oscillator V101. During the positive half of the cycle, current flow from ground through diode CR102 charges capacitor C120. Capacitor C120 discharges, during the negative half cycle, through CR101, C119, and tube V103, charging C119. The negative voltage (across R116 developed when capacitor C119 discharges) appears at the control grid of V101 as agc voltage. Resistor R121 and capacitor C123 provide additional filtering and minimize any loading of the oscillator when the agc voltage is measured at test point E1401.

f. Cathode follower V104 provides isolation of the amplifiers and a low output impedance. The output signal is coupled through series connected C124 and peaking coil L104 to increase the drive to the 5.0 mc to 1.0 mc frequency divider.

4-12. OSCILLATOR-AMPLIFIER SECTION TEST DATA.

a. If a trouble develops in the oscillator-amplifier section, the front panel indications will be:

(1) Low or no meter indication with test switch in positions 1, 2, 3, 4, or 5.

(2) A normal meter indication with test switch in the remaining positions.

See Table 4-1 for a listing of normal meter indications that should be obtained in each test switch and the functions being checked.

b. Test equipment required to perform checks on the oscillator-amplifier section is:

(1) Oscilloscope AN/USM-105A.

(2) Multimeter AN/USM-116.

(3) Capacitance, Inductance, Resistance Bridge ZM-11 A/U.

See Table 5-1 for a complete list of all test equipment.

c. To isolate the trouble within this section to a particular circuit, take readings at all tube pins. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit locations, and to the parts location illustration (figure 5-22) for the physical locations. The resistance to ground from each pin of all tubes in the oscillator-amplifier section is listed in the chart below.

RESISTANCE CHART

TUBE	PIN							
	1	2	3	4	5	6	7	8
V101	200K	-	6	0	28K	10	28K	-
V102	100K	-	6	332	4.4K	0	14K	-
V103	100K	-	14	464	4.4K	10	26K	-
V104	110K	-	6	10.3K	15K	0	15K	-

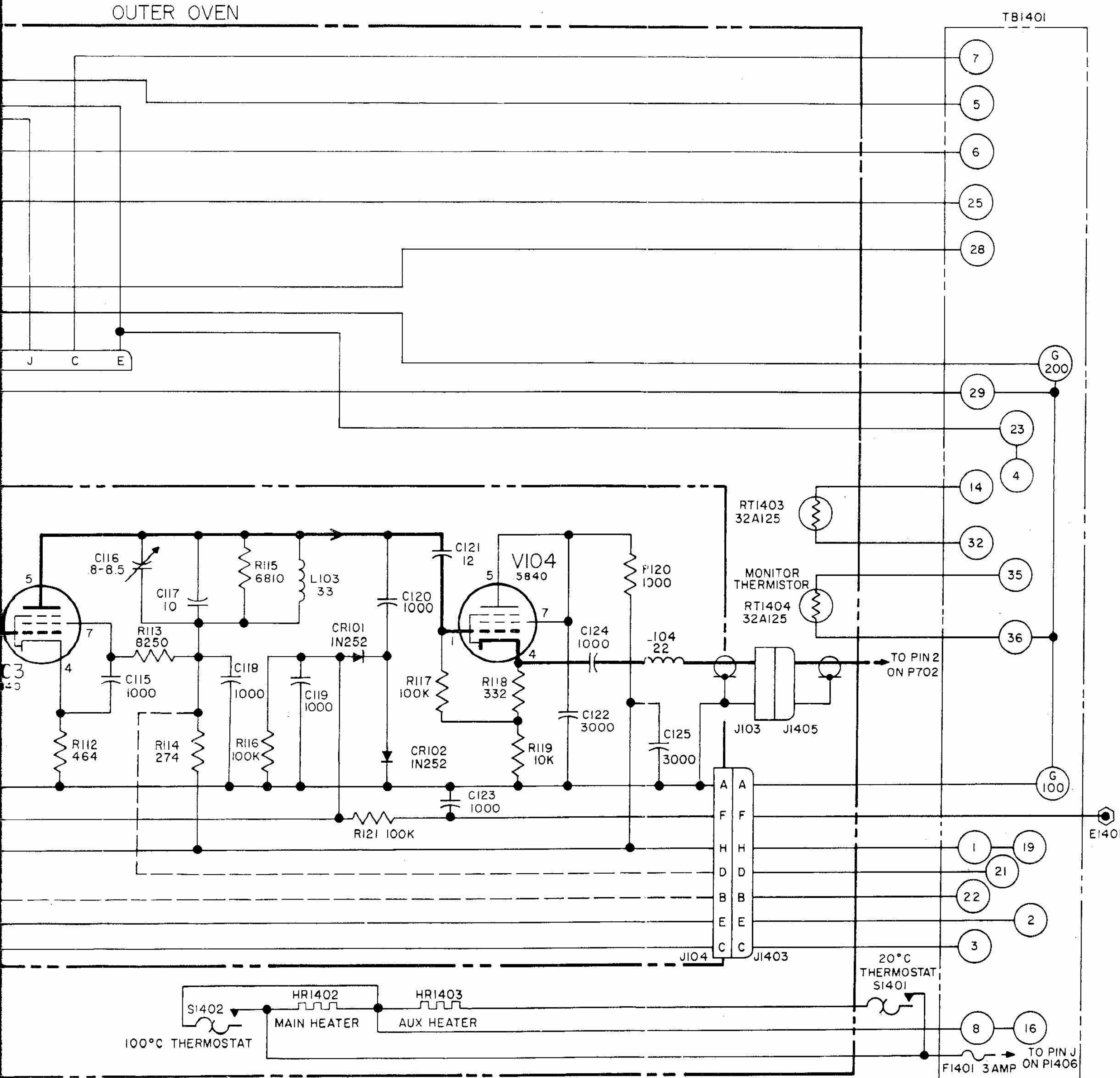
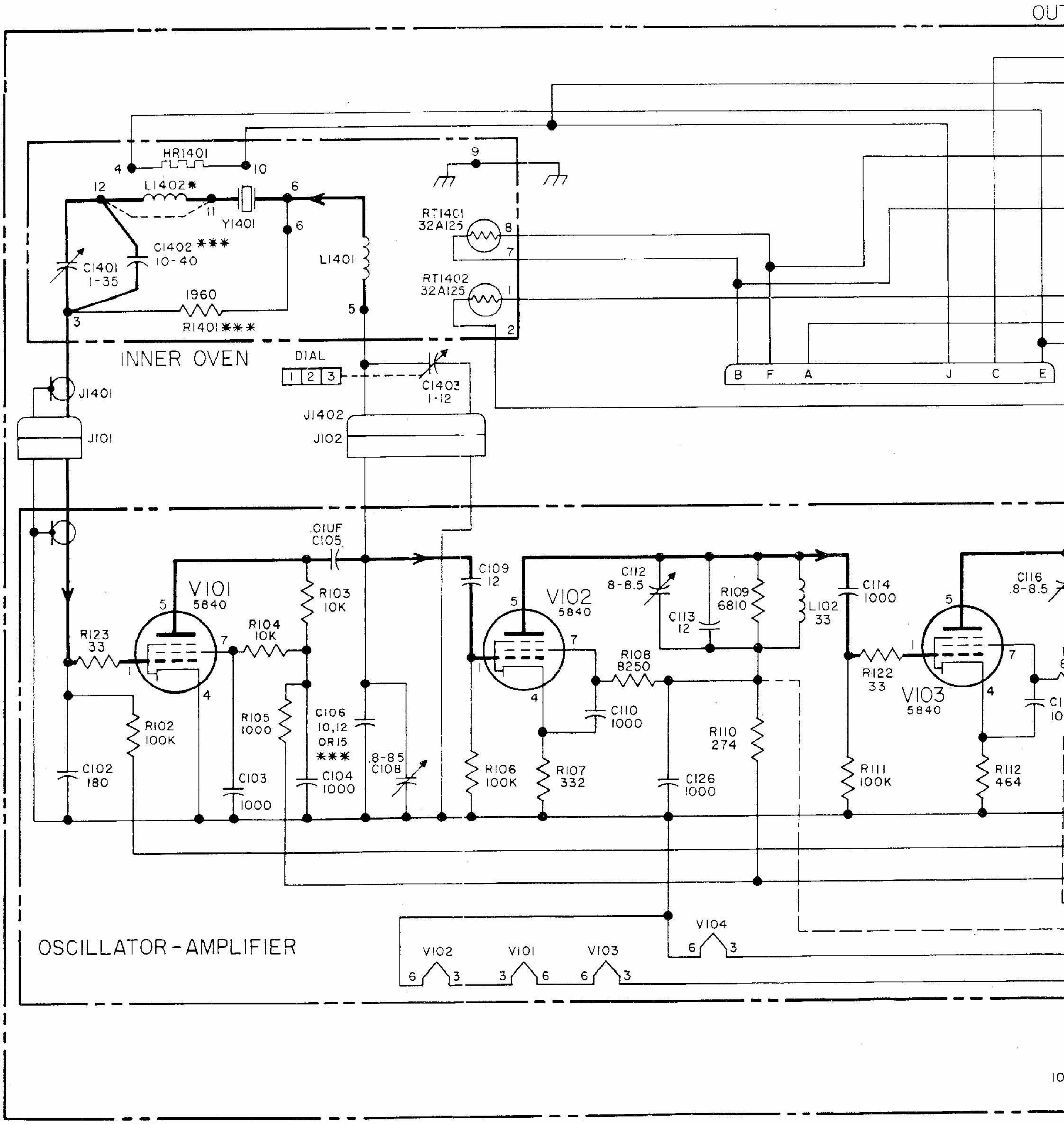


Figure 4-8. Oscillator-Amplifier Section Schematic



NOTES:

* IF NEEDED, VALUE DETERMINED BY TEST - OTHERWISE JUMPER WIRE IS USED IN PLACE OF COMPONENT.

** IF NEEDED, VALUE DETERMINED BY TEST - OTHERWISE NO COMPONENT IS USED.

*** EXACT VALUE DETERMINED BY TEST.

ALL VALUES ARE IN MICRO-MICROFARADS, MICROHENRIES AND OHMS UNLESS OTHERWISE NOTED.

d. ADJUSTMENT. - To adjust the oscillator-amplifier, unlock the fine frequency control knob by pushing the lock on the lower left side counterclockwise. Rotate the knob counterclockwise to decrease frequency or clockwise to increase frequency. Since one unit or count on the dial represents a frequency change of one part per 10^{10} parts, the knob should be rotated ten dial counts for each part per 10^{9} parts of frequency error. If the oscillator frequency cannot be corrected with the fine frequency control, see the tuning and adjustment in paragraph 5-1b(2).

4-13. 5.0 MC TO 1.0 MC FREQUENCY DIVIDER SECTION FUNCTIONAL DESCRIPTION.

a. The 5.0 to 1.0 mc frequency divider uses the 5.0 mc output of cathode follower tube V104 to produce a 1.0 mc output signal. This is done by mixing the 5.0 mc signal with a 4.0 mc signal and selecting the 1.0 mc difference frequency as an output. Initially, the 4.0 mc signal is obtained by inducing a pulse in a circuit tuned to 4.0 mc. After the circuit has been put into operation, the 4.0 mc signal is obtained by multiplying the 1.0 mc signal by four. A schematic diagram of the 5.0 to 1.0 mc frequency divider is shown in figure 4-9. Refer to figure 4-9, figure 4-12 (servicing block diagram), and figure 5-32 (over-all schematic) during the following functional circuit descriptions.

b. The 5.0 mc signal from cathode follower, V104, is fed to the grid of amplifier tube V501. The tube has a tuned output transformer (T501) in its plate circuit. One winding of transformer T501 and capacitors C503 and C504 are parallel tuned for 5.0 mc. All signals except 5.0 mc pass through the resonant circuit and through capacitor C502 to ground. The secondary of output transformer T501 feeds the signal to the 5.0 mc connector (J702) on the front panel and to connector J704 on the rear panel of the 0-471/U oscillator.

c. Part of the output signal from the 5.0 mc amplifier is also fed to the control grid of mixer tube V502. In the mixer tube, the 5.0 mc signal on the control grid is combined with a 4.0 mc signal introduced on the suppressor grid. The plate circuit of V502 contains the two original frequencies, the sum of the two original frequencies, and the difference between the two original frequencies (1.0 mc). The plate circuit (consisting of inductor L503 and capacitors C511 and C510) is tuned for 1.0 mc and all frequencies except 1.0 mc pass through the resonant circuit and capacitor C512 to ground. The 1.0 mc signal passes through capacitor C519 and resistor R514 to the control grid of output tube V504, and through capacitor C513 to the control grid of multiplier tube V503.

d. The output of the multiplier tube is rich in harmonics. The plate circuit of the multiplier tube, consisting of inductor L504 and capacitors C515 and 516, is parallel tuned to the 4th harmonic of the 1.0 mc signal (4.0 mc) and all signals except 4.0 mc pass through the resonant circuit and capacitor C517 to ground. The 4.0 mc signal is fed through capacitor C518 to the suppressor grid of mixer tube V502. Because operation of mixer tube V502 requires that the 4.0 mc signal be supplied to it before it can supply the 1.0 mc signal required for multiplier tube operation, a temporary 4.0 mc signal must be obtained to start circuit operation. The temporary signal is produced by momentarily closing switch S501 which is normally open. This shorts cathode resistor R512 of the multiplier tube and pulses the multiplier circuit sufficiently to start the plate circuit oscillating at its 4.0 mc resonant frequency. After the circuit has been started, the multiplier stage obtains its drive from the 1.0 mc signal produced by the mixer tube and the circuit continues to operate after S501 opens.

e. Output tube V504 is an amplifier with a tuned output transformer (T502) in its plate circuit. The output transformer and capacitors C522 and C523 are tuned for 1.0 mc. All signals except 1.0 mc pass through the resonant circuit and capacitor C524 to ground. The secondary of T502 applies the signal to a voltage divider consisting of resistors R518 and R519. From the junction of these resistors the 1.0 mc signal is fed to front panel connector J703 and to rear panel connector J705. Part of the 1.0 mc signal is also fed to the 1.0 mc to 100 kc frequency divider section.

4-14. 5.0 MC TO 1.0 MC FREQUENCY DIVIDER SECTION TEST DATA.

a. If a trouble develops in the 5.0 mc to 1.0 mc frequency divider section, the front panel indications will be:

(1) Possibly a low meter indication with test switch in position 1.

(2) Low or zero meter indication with test switch in positions 2 and 3.

(3) All other front panel indications normal.

See Table 4-1 for a listing of the function being checked in each test switch position and the nominal meter indications that should be obtained.

b. To isolate the trouble within the 5.0 mc to 1.0 mc frequency divider section to a particular circuit, take readings at all test points. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit locations of the test points and to the parts location illustrations (figures 5-11 and 5-30) for the physical locations.

c. Test equipment required to perform these checks is:

(1) Oscilloscope AN/USM-105A.

(2) Multimeter AN/USM-116.

(3) Capacitance, Inductance, Resistance Bridge ZM-11A/U.

See Table 5-1 for a complete list of all test equipment.

d. Primary checks should be made to see that the proper 5.0 mc input signal is being obtained and that the operating voltages are correct. If these inputs are normal but the 5.0 mc output and/or the 1.0 mc output is weak, the section may need to be adjusted. (See step f. for information on adjustments.) Check waveforms throughout the section with an oscilloscope to isolate the trouble to a circuit or tube stage. (Refer to Section 5.)

e. When the trouble has been traced to a particular circuit, use voltage and resistance checks to locate the faulty part. Tube substitution may quickly locate the trouble. Refer to Section 5 of this manual for information on location and replacement of parts.

Note

If the input signal to a frequency divider circuit is interrupted, the circuit will not automatically resume operation after the signal is returned. To restore operation of the 5.0 mc to 1.0 mc frequency divider, press siwtch S501 momentarily.

All significant voltages are recorded on the over-all schematic (figure 5-32). The resistance to ground from each pin of all tubes in the section is listed in the chart below.

RESISTANCE CHART

TUBE	PIN						
	1	2	3	4	5	6	7
V501	7.14K	332	14	12	16K	16K	332
V502	46.4K	681	15	14.5	16K	16K	46.4K
V503	46.4K	3.32K	15	14.5	14.2K	14.2	3.32K
V504	100K	332	5	0	16K	16K	332

f. ADJUSTMENT. - To adjust the 5.0 mc to 1.0 mc frequency divider, place the front panel test switch in position 1 and tune T501 to obtain a maximum test meter indication. Then place the test switch in position 2 and tune T502 to obtain a maximum test meter indication. (Refer to paragraph 5-1b(6) for the complete tuning procedures.)

4-15. 1.0 MC TO 100 KC FREQUENCY DIVIDER SECTION FUNCTIONAL DESCRIPTION.

a. The 1.0 mc to 100 kc frequency divider uses the 1.0 mc output of the 5.0 mc to 1.0 mc frequency divider to produce a 100 kc output signal. This is done by mixing the 1.0 mc signal with a 900 kc signal and selecting the 100 kc difference frequency as an output. Initially, the 900 kc signal is obtained by inducing a pulse in a circuit tuned to 900 kc. After the circuit has been put into operation, the 900 kc signal is obtained by multiplying the 100 kc signal by nine. A schematic diagram of the 1.0 mc to 100 kc frequency divider is shown in figure 4-10. Refer to figure 4-10, figure 4-12 (servicing block diagram), and figure 5-32 (over-all schematic) during the following functional circuit descriptions.

b. The principle of operation of the 1.0 mc to 100 kc frequency divider is basically the same as for the 5.0 mc to 1.0 mc frequency divider, except for the absence of a preliminary amplifying stage. The 1.0 mc signal from the 5.0 to 1.0 mc frequency divider subchassis is fed to the control grid of mixer tube V403. In mixer tube V403, the 1.0 mc signal on the control grid is combined with a 900 kc signal introduced on the suppressor grid. The plate circuit of tube V403, consisting of inductor L402 and capacitors C404, C405, and C406, is tuned for the difference frequency of 100 kc, and all signals except 100 kc pass through the resonant circuit and capacitor C407 to ground. The 100 kc signal is fed through capacitor C408 to the grid of multiplier tube V401.

c. The output of the multiplier tube is rich in harmonics. The plate circuit of the multiplier tube, consisting of inductor L401 and capacitors C411 and C412, is tuned for 900 kc (the 9th harmonic of the 100 kc signal), and all signals except 900 kc pass through the resonant circuit and capacitor C410 to ground. The 900 kc signal flows through capacitor C402 to the suppressor grid of mixer tube V403. However, since operation of mixer tube V403 requires that the 900 kc signal be supplied to it before it can provide the 100 kc frequency required for multiplier tube operation, a temporary 900 kc signal must be obtained to start circuit operation. The temporary signal is produced by momentarily closing switch S401. This shorts cathode resistor R407, and pulses the multiplier circuit sufficiently to start the plate circuit oscillating at its 900 kc resonant frequency. After the circuit has been started, the multiplier stage obtains its drive from the 100 kc signal produced by the mixer tube and a continuous output signal is maintained. Output tube V402 receives the 100 kc signal through capacitor C413, and resistors R411 and R416.

d. Tube V402 is an amplifier with an output transformer (T401) in its plate circuit to provide proper impedance matching for the output terminals. A negative feedback capacitor C414 is employed to reduce the harmonic content and improve the waveshape of the output signal. From a secondary winding of T401, the 100 kc output signal is fed to front panel connector J701 and to the rear panel connector J706.

4-16. 1.0 MC TO 100 KC FREQUENCY DIVIDER SECTION TEST DATA.

a. If a trouble develops in the 1.0 mc to 100 kc frequency divider section, the front panel indications will be:

(1) Low or zero meter indication with test switch in position 3.

(2) All other front panel indications normal.

See Table 4-1 for a listing of the function being checked in each test switch position and the nominal meter indications that should be obtained.

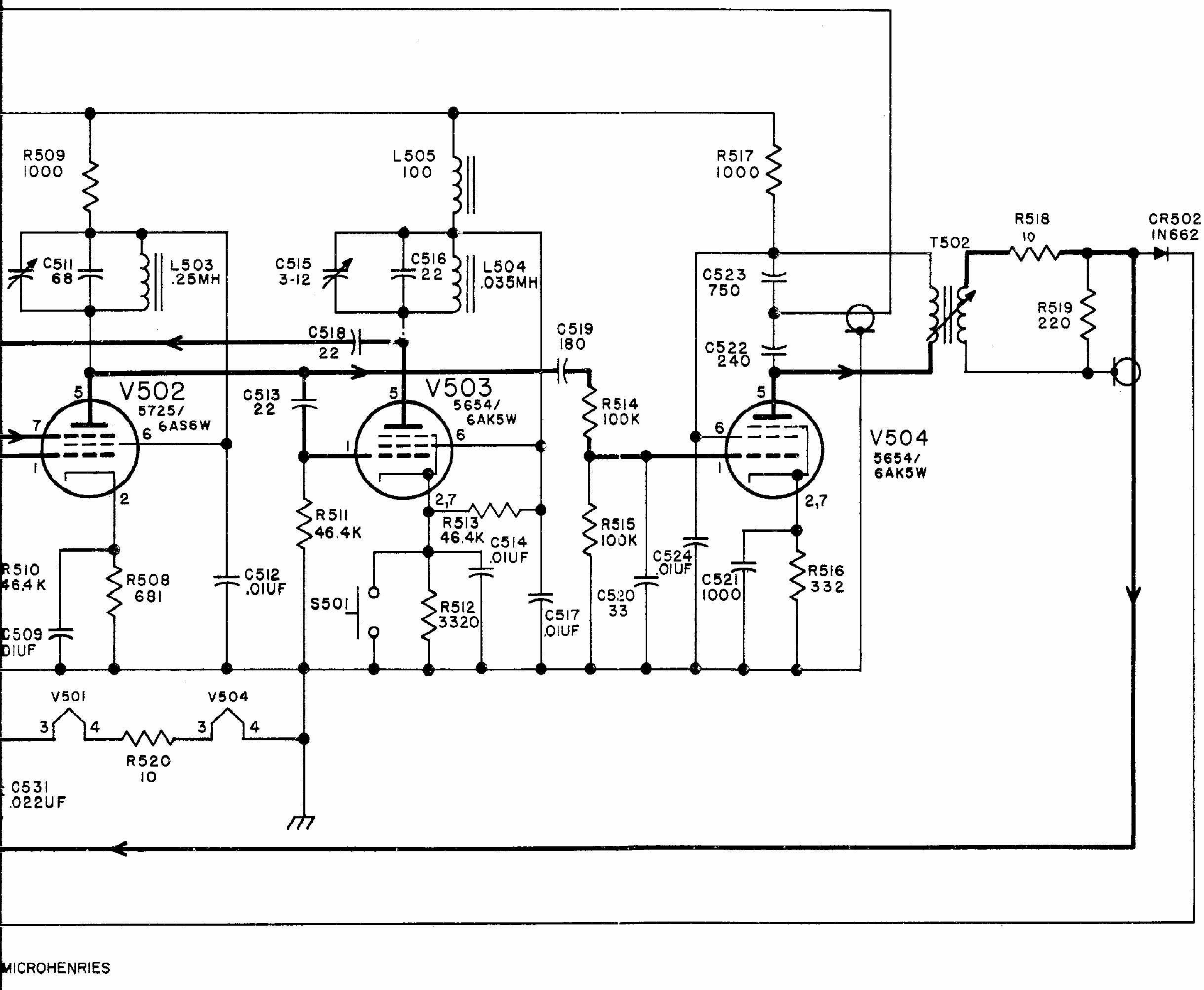
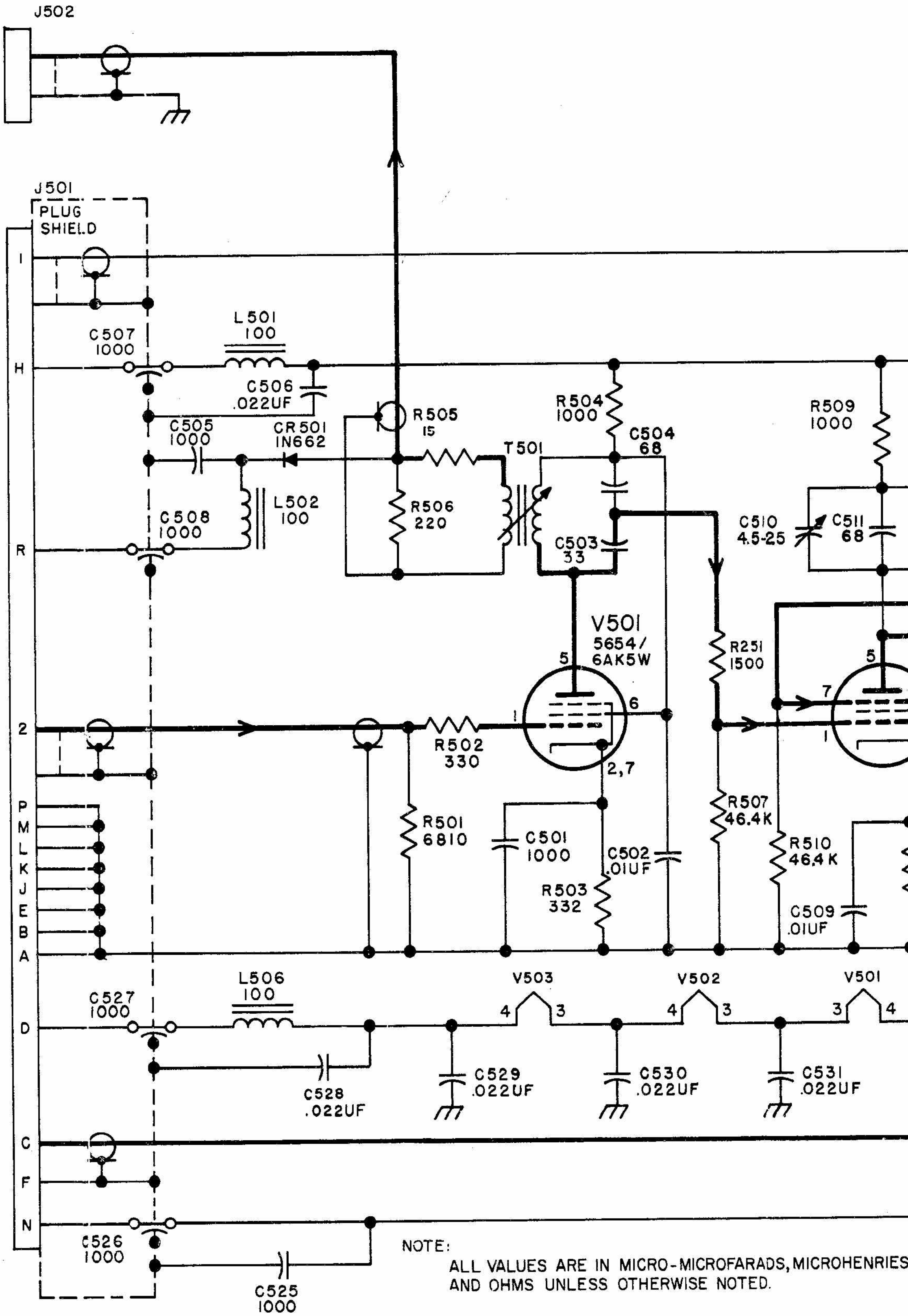
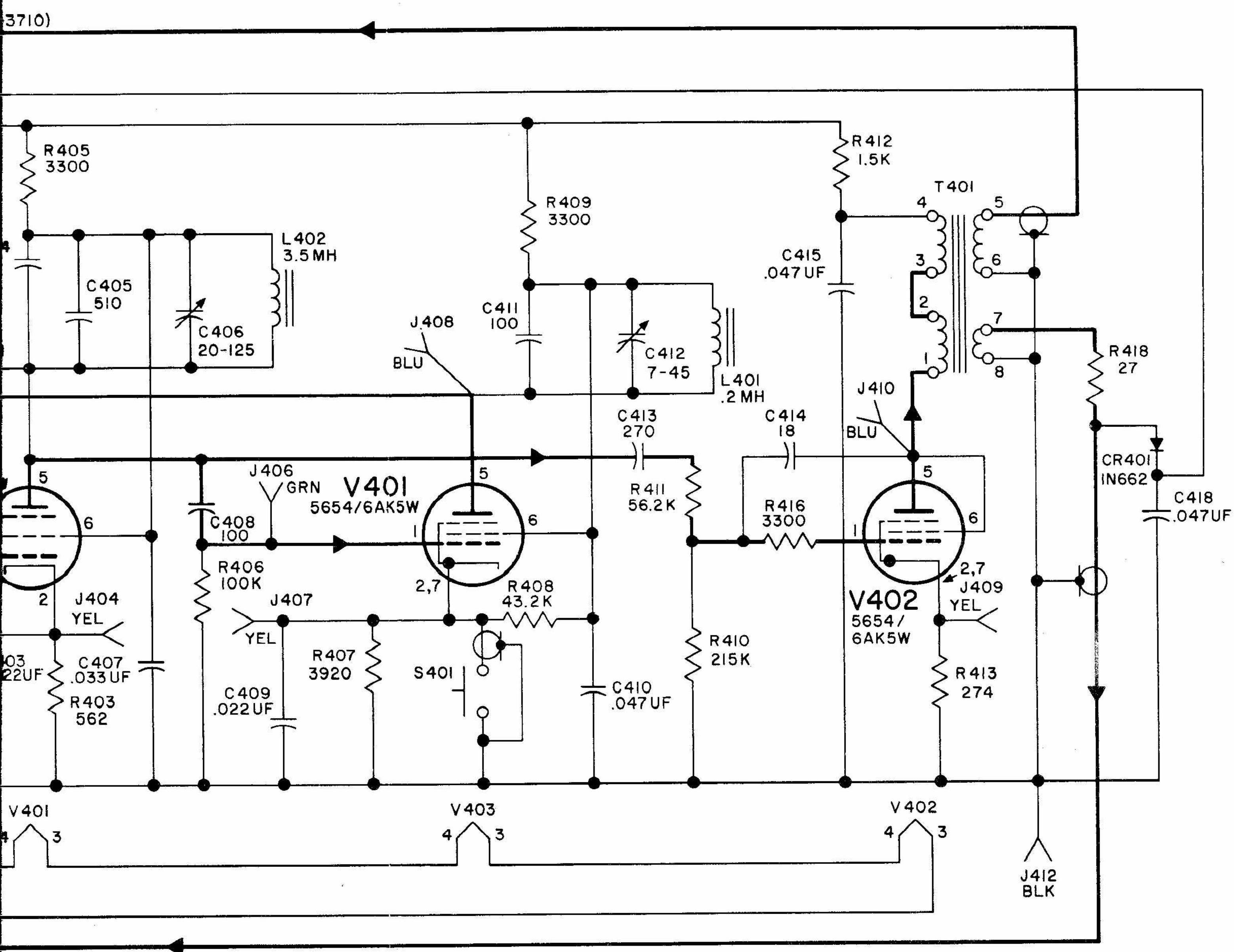


Figure 4-9. 5.0 to 1.0 MC Frequency Divider Section Schematic



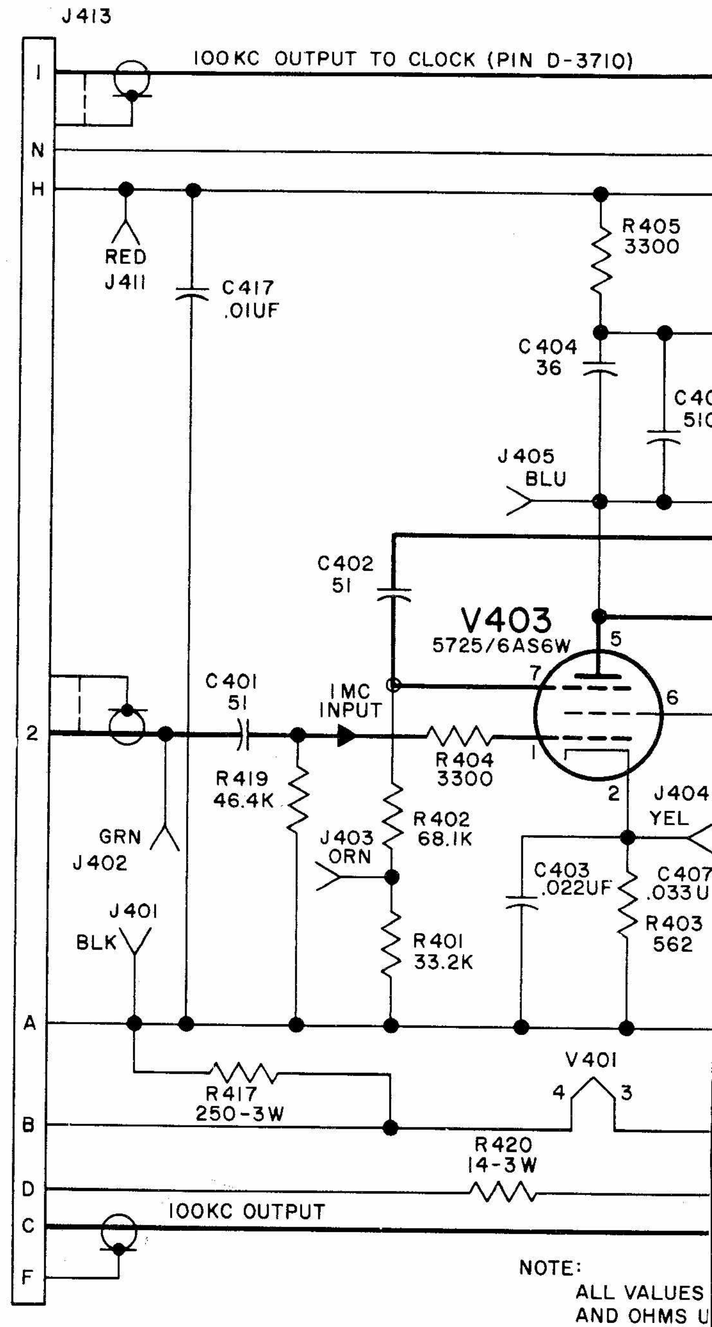
NOTE:

ALL VALUES ARE IN MICRO-MICROFARADS, MICROHENRIES AND OHMS UNLESS OTHERWISE NOTED.



NOTE:
ALL VALUES ARE IN MICRO-MICROFARADS, MIRCROHENRIES AND OHMS UNLESS OTHERWISE NOTED.

Figure 4-10. 1.0 MC to 100 KC Frequency Divider Section Schematic


J413
100KC OUTPUT TO CLOCK (PIN D-3710)
I
N
H
RED
J411
C417
.01UF
R405
3300
C404
36
J405
BLU
C402
51
V403
5725/6AS6W
C401
51
IMC
INPUT
R419
46.4K
R404
3300
GRN
J402
J403
ORN
R402
68.1K
C403
.022UF
J404
YEL
R403
562
J401
BLK
R401
33.2K
2
A
B
D
C
F
V401
R417
250-3W
R420
14-3W
100KC OUTPUT
NOTE:
ALL VALUES
AND OHMS U

b. To isolate the trouble within the 1.0 to 100 kc frequency divider section to a particular circuit, take readings at all test points. Refer to the servicing block diagram (figure 4-12) and the over-all schematic (figure 5-32) for circuit locations of the test points and to the parts location illustrations (figures 5-12 and 5-29) for the physical locations.

c. Test equipment required to perform these checks is:

(1) Oscilloscope AN/USM-105A.

(2) Multimeter AN/USM-116.

(3) Capacitance, Inductance, Resistance Bridge ZM-11A/U.

See Table 5-1 for a complete list of all test equipment.

d. Primary checks should be made to see that the proper 1.0 mc input signal is being obtained and that the operating voltages are correct. If these inputs are normal but the 100 kc output is weak, the section may need to be adjusted as described in paragraph 4-16f. Check waveforms throughout the section with an oscilloscope to isolate the trouble to a circuit or tube stage. (Refer to Section 5.)

e. When the trouble has been traced to a particular circuit, use voltage and resistance checks to locate the faulty part. Tube substitution may quickly locate the trouble. Refer to Section 5 for information on location and replacement of parts.

Note

If the input signal to a frequency divider circuit is interrupted, the circuit will not automatically resume operation after the signal is returned. To restore operation of the 1.0 mc to 100 kc frequency divider, press switch S501 momentarily.

All significant voltages are recorded on the over-all schematic (figure 5-32). The resistance to ground from each pin of all tubes in the section is listed in the chart below:

RESISTANCE CHART

TUBE	PIN						
	1	2	3	4	5	6	7
V401	100K	3.8K	10	6	17K	17K	3.8K
V402	220K	274	13	15	16.5	16.5	274
V403	49.7K	562	13	10	19K	19K	101.3K

f. ADJUSTMENT. - To adjust the 1.0 mc to 100 kc frequency divider, place the front panel test switch in position 3 and tune C406 and C412 to obtain a maximum test meter indication. Refer to paragraph 5-1b(6) for the complete tuning procedure.

4-17. AUXILIARY CIRCUITS FUNCTIONAL DESCRIPTION.

a. Auxiliary circuits consist of testing circuits, switching circuits, and external connector circuits. A schematic diagram of the auxiliary circuits is shown in figure 4-11. Refer to figures 4-11 and 5-32 (over-all equipment schematic) during the following functional descriptions.

b. TEST METER CIRCUITS. - The front panel test meter, in conjunction with a test switch and various meter-calibrating resistors, provides indications of equipment operation for maintenance and trouble-shooting purposes. All of the calibrating resistors, except two, are mounted on the rear of the front panel. Nominal meter indications for proper operation are listed in Table 4-1. Actual meter indications for the equipment are given on a card mounted on the front panel (test switch function card). In switch position 1, the meter indicates the dc voltage developed by the 5.0 mc signal. The dc voltages developed by the 1.0 mc and 100 kc signals are indicated at switch positions 2 and 3 respectively. In switch positions 4 and 5, the meter indicates the amount of conduction in tubes V102 and V103 respectively. In switch position 6, the meter indicates the nominal 100 volt plate supply. In switch position 7, the meter indicates the nominal 20 volt supply used by the heaters of tubes V101, V102, and V103; by the inner oven temperature control circuits; and by the inner oven heater. In switch position 8, the meter indicates the voltage across the inner oven heater. In switch position 9, the meter indicates a null when the bridge circuit is balanced.

(1) One arm of the bridge is thermal resistor RT1404 in the outer oven. The other arms of the bridge consist of resistors R711, R712, R714, and R710, and are part of the meter circuitry.

(2) As the outer oven warms, the unbalance current in the bridge decreases until, when the outer oven has reached the proper operating temperature, the meter indicates zero current flow. In this manner, the meter gives an indication that the outer oven is at the correct temperature.

c. In switch position 10, the meter indicates the nominal 26.5 volt dc power supply or battery voltage. In switch position 11, the meter indicates the current through shunt resistor R720. Resistor R720 is a calibrated heavy wire mounted on a terminal board above the standby battery chassis connector (J707). In position 12, the meter indicates the standby battery charge current across R719. Resistor R719 is also a calibrated meter shunt identical to resistor R720. These shunt resistors can not be readjusted after manufacture.

d. CLOCK POWER AND EXTERNAL STATUS AND ALARM CIRCUITS. - Clock power connector J710 provides a connection for a time comparator system. A 100 kc output from the 1.0 mc to 100 kc frequency divider is fed to pin D of connector J710. The time or phase difference between the 100 kc frequency and other signals may then be compared and the difference displayed on an integral indicator. Pin A of connector J710 supplies 26.5 volt dc power to the external comparator system and pin B provides the ground return.

(1) Capability for monitoring operation of the frequency standard by means of external status indicators is provided by the external status and alarm connector, J709. Monitoring is accomplished by four circuits within the r-f oscillator section. Three of the circuits indicate whether the oscillator-amplifier and frequency dividers are producing 5.0 mc, 1.0 mc, and 100 kc outputs, and one circuit indicates whether the equipment is operating from power supplied by the external ac power source or from power supplied by the standby battery. Each of the three output indicator circuits consists of a half-wave rectifier which rectifies and filters the output frequency. The resulting dc signal may be used as an input to an external status indication or alarm system.

(2) The indicator circuit for the 5.0 mc output consists of diode CR501 and capacitor C505, which rectify and filter part of the output from the secondary of transformer T501. The resulting dc signal is fed through L502 and feed-through capacitor C508 to pin E of the external status and alarm connector, J709. The 1.0 mc output indicator circuit consists of diode CR502 and capacitor C525. This circuit provides a dc signal which is fed through capacitor C526 to pin F of connector J709. Diode CR401 and capacitor C418 form the indicator circuit for the 100 kc output. This circuit provides a dc signal which is fed to pin G of connector J709. Part of the dc signal from each output indicator circuit is also supplied to the front panel test meter to provide meter indications of oscillator-amplifier and frequency divider operation.

e. SWITCHING CIRCUITS. - Status indications for the 115 volt ac power source or standby battery are provided by relay K702. The coil of this relay is in parallel with relay K701.

(1) Whenever the ac power is interrupted, these relays are de-energized and the contacts of relay K702 close a circuit between pins D and A of connector J709. When the equipment is receiving normal input power from the ac source, relays K701 and K702 are both energized, and the contacts of K702 close a circuit between pins D and C of connector J709. Thus, the source of power for the equipment can be indicated by external status indicators connected to pins A, C, and D of connector J709.

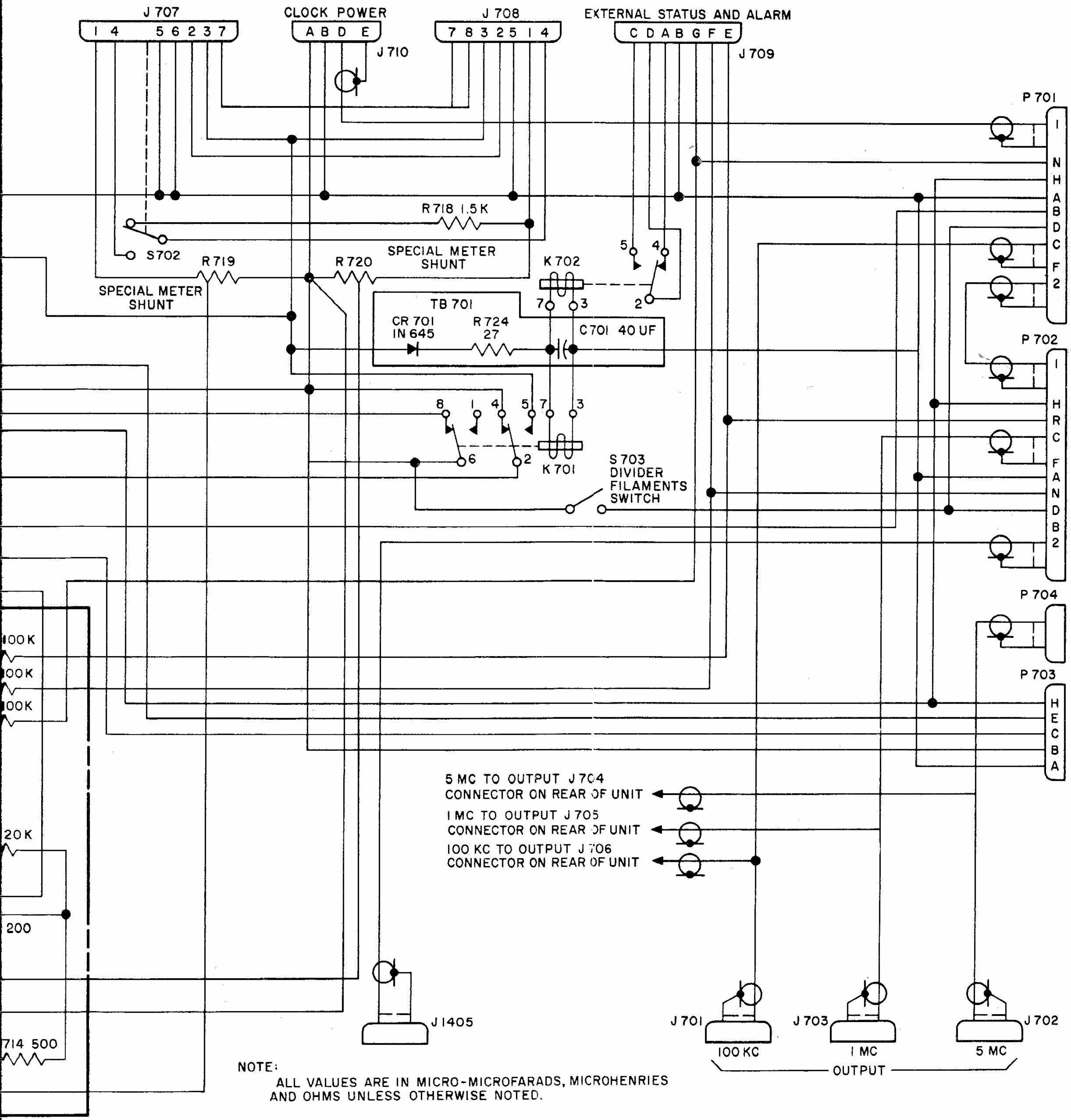
(2) The front panel indicating lamps, DS702 and DS703, are connected to relay K701 to provide an indication of which power source, ac or battery, the equipment is using.

4-18. AUXILIARY CIRCUITS TEST DATA.

a. Voltage measurements and, if necessary, resistance measurements, should isolate any trouble in the auxiliary circuits. Use Multimeter AN/USM-116 and Capacitance, Inductance, Resistance Bridge ZM-11A/U to trouble-shoot the auxiliary circuits. Voltages are indicated on the over-all schematic (figure 5-32).

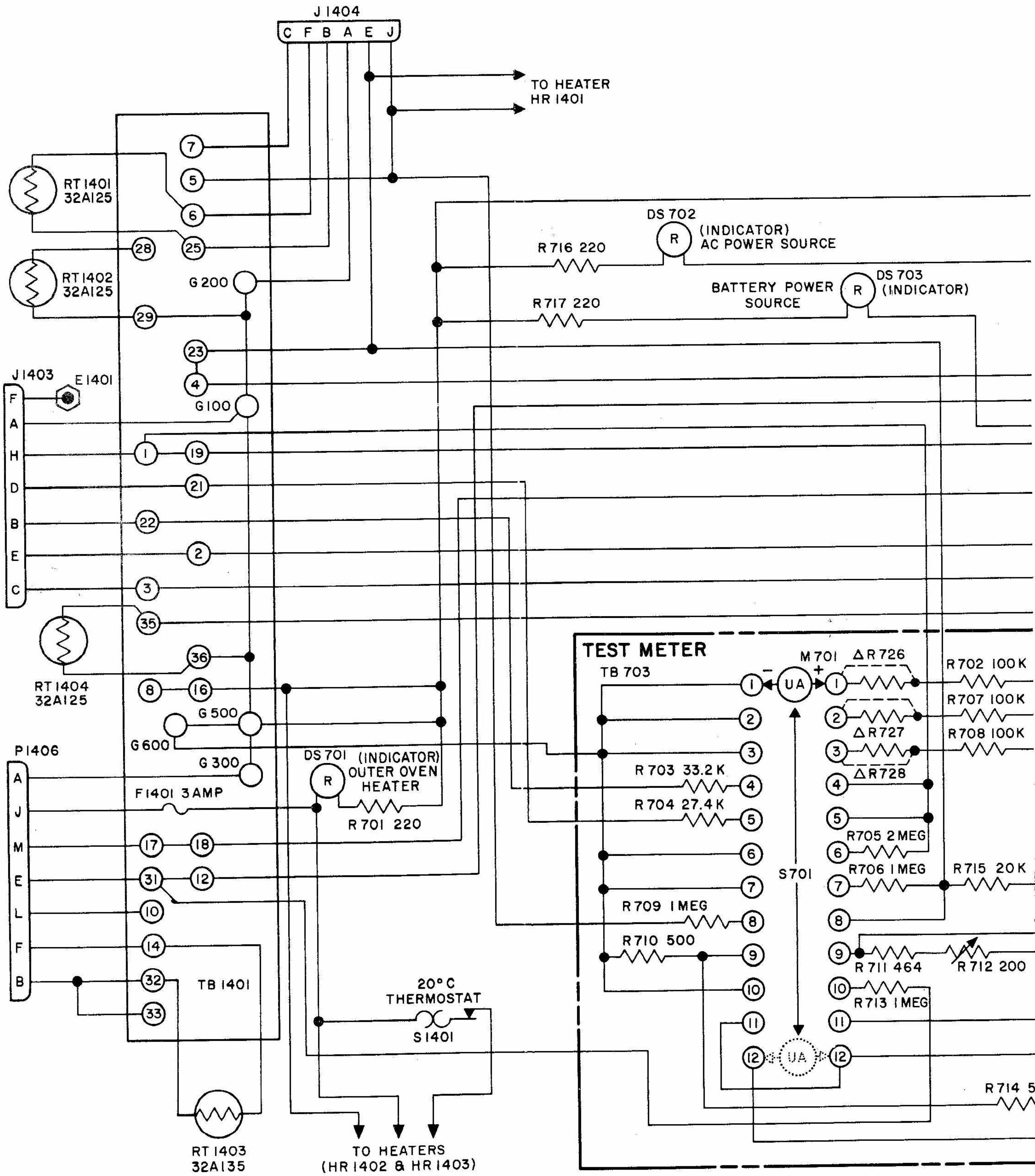
b. Relay K702 is operated by a dc voltage that is first applied to diode CR701 as a 26.5 volt ac signal. If K702 is inoperative and voltage is present at pin 3 of connector J708, CR701 or resistor R724 may be defective. If no voltage is present at pin 3 of J708, check the voltage between pins 5 and 6 of transformer T901.

c. The four status-indication circuits are all connected to the external status and alarm connector (J709). The presence of outputs from the frequency divider sections may be tested at pins E, F, and G of the external status and alarm connector. These outputs will appear as dc voltages derived from rectification of the 5.0 mc, 1.0 mc, and 100 kc output signals.



NOTE:
ALL VALUES ARE IN MICRO-MICROFARADS, MICROHENRIES AND OHMS UNLESS OTHERWISE NOTED.

Figure 4-11. Auxiliary Circuits Schematic


J 1404
C F B A E J
TO HEATER
HR 1401
RT 1401
32A125
RT 1402
32A125
G 200
G 100
J 1403
E 1401
F A H D B E C
RT 1404
32A125
P 1406
A J M E L F B
G 500
G 600
G 300
F1401 3 AMP
TB 1401
RT 1403
32A135
DS 702
(INDICATOR)
AC POWER SOURCE
R 716 220
R 717 220
BATTERY POWER
SOURCE
DS 703
(INDICATOR)
DS 701 (INDICATOR)
OUTER OVEN
HEATER
R 701 220
20° C
THERMOSTAT
S 1401
TO HEATERS
(HR 1402 & HR 1403)
TEST METER
TB 703
M 701
UA
ΔR 726
ΔR 727
ΔR 728
R 702 100K
R 707 100K
R 708 100K
R 703 33.2 K
R 704 27.4 K
R 705 2 MEG
R 706 1 MEG
R 715 20 K
R 709 1 MEG
R 710 500
R 711 464
R 712 200
R 713 1 MEG
R 714 5
S 701

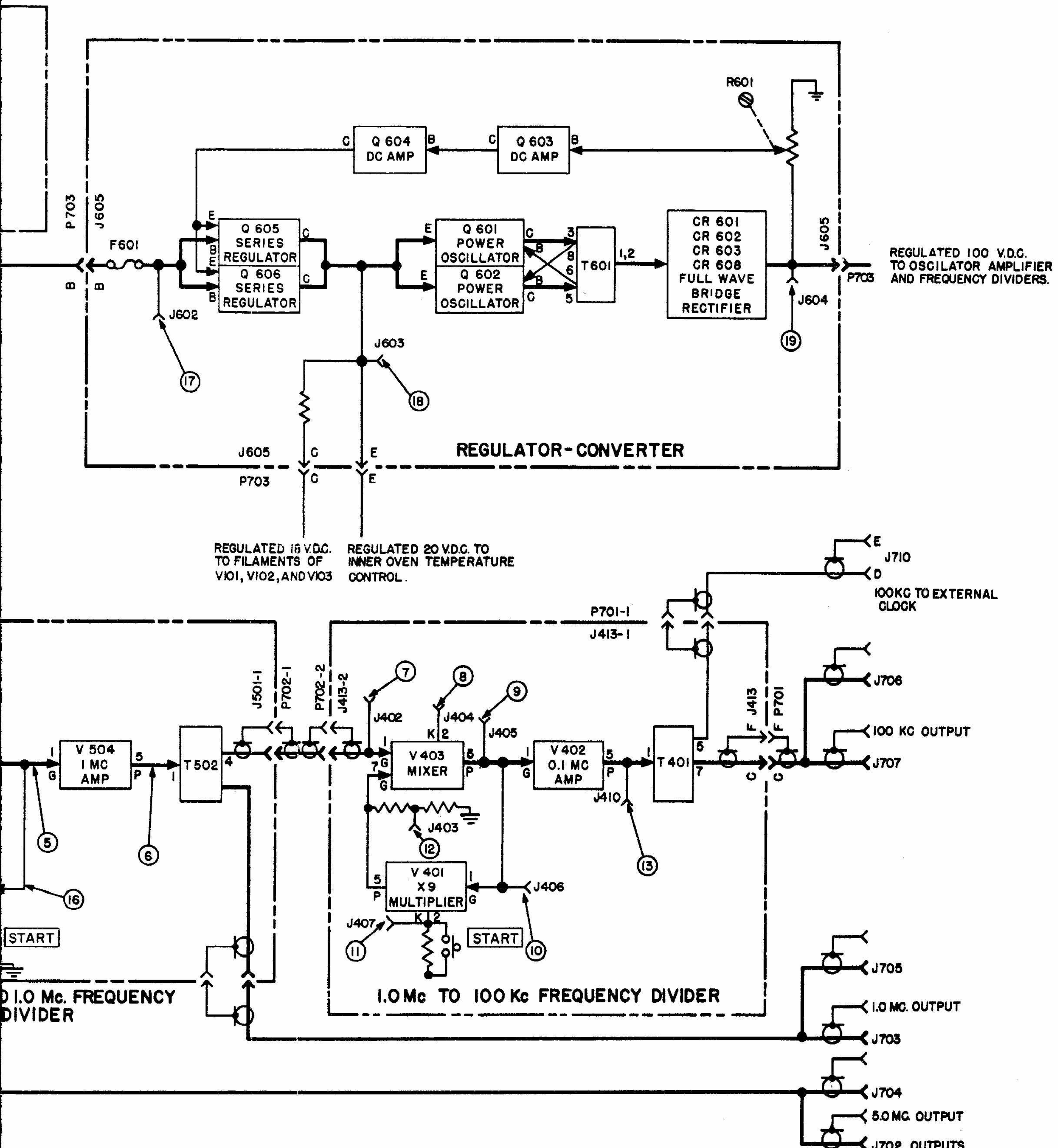
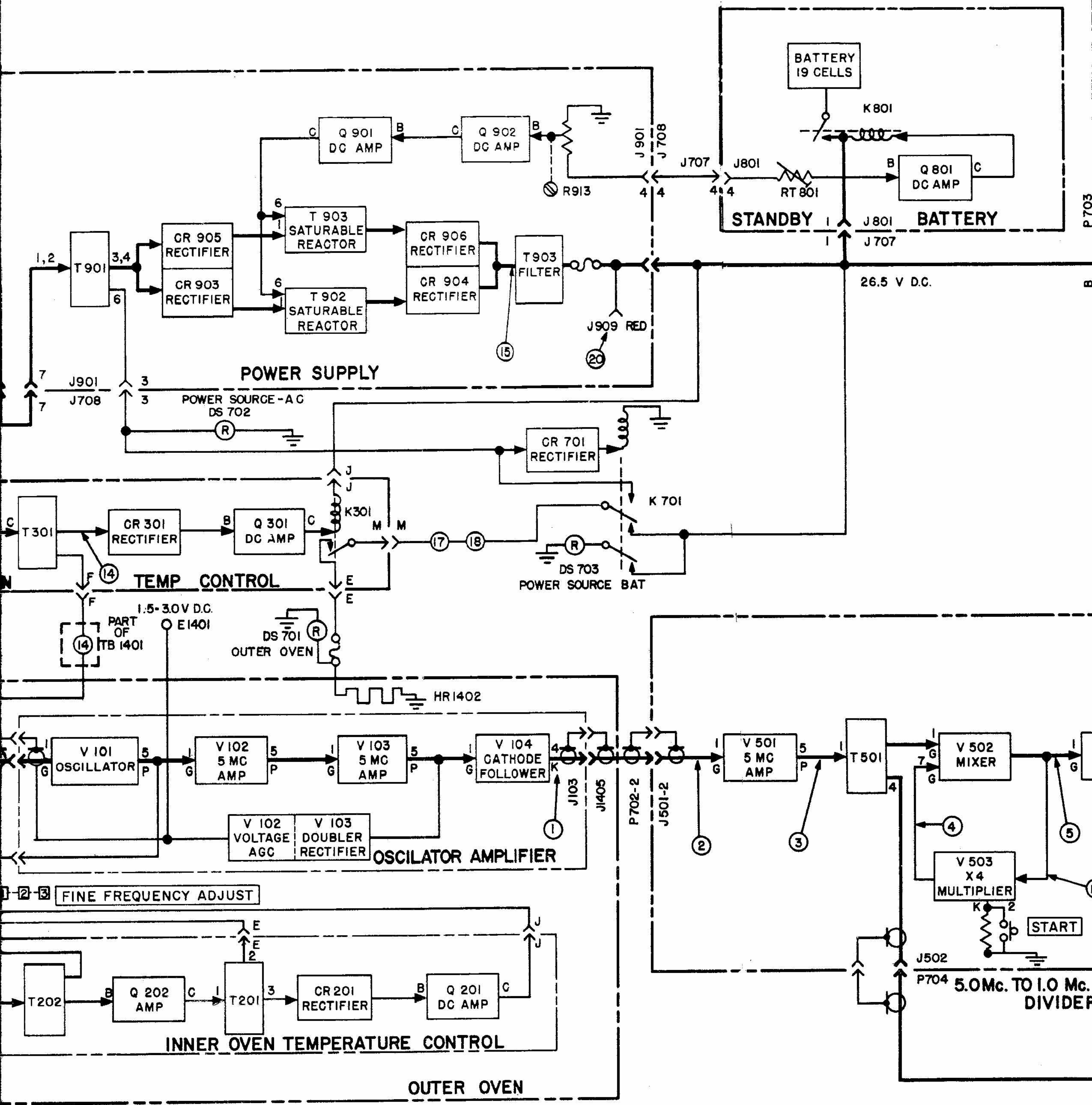
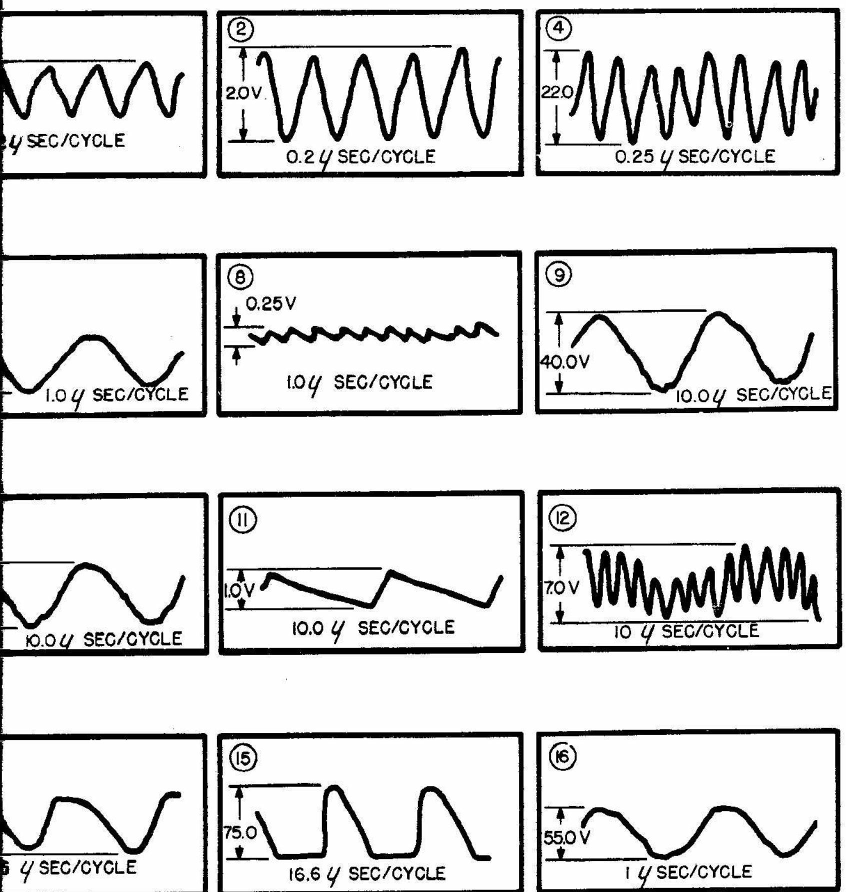


Figure 4-12. Frequency Standard Servicing Block Diagram

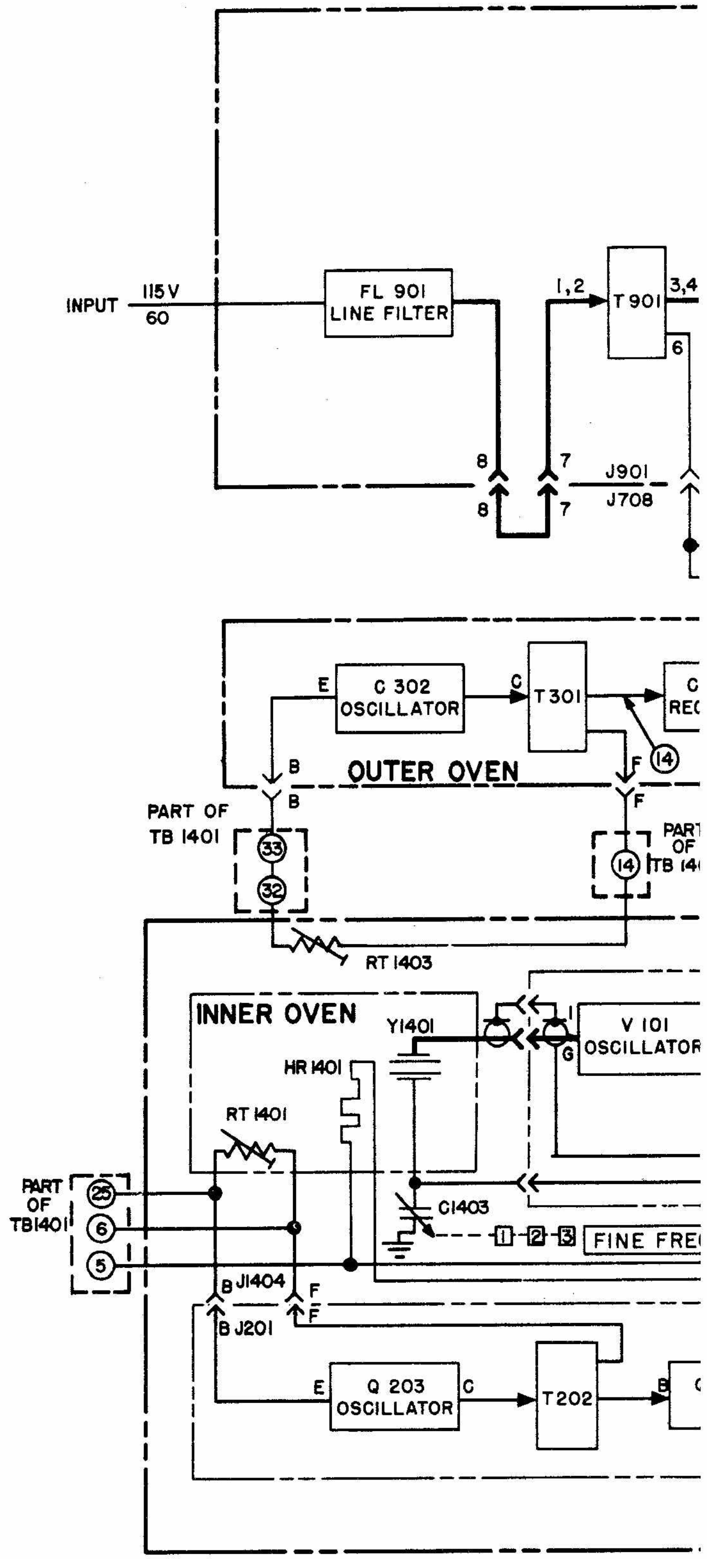


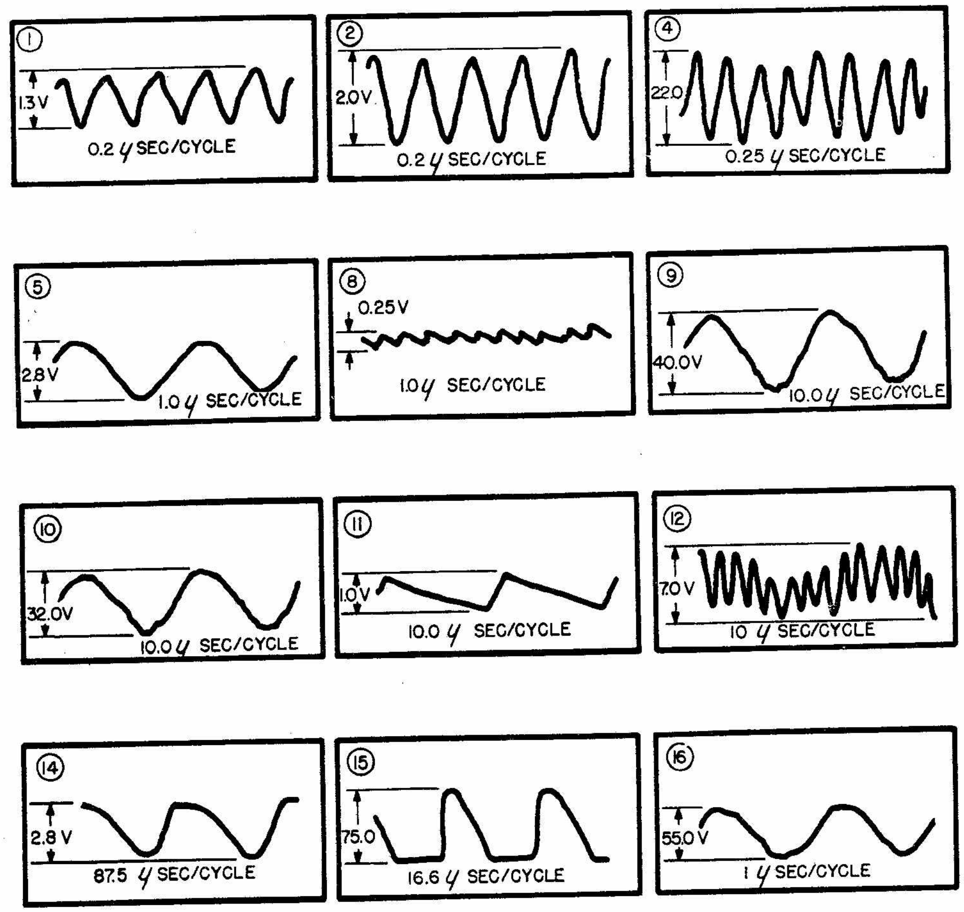
BATTERY 19 CELLS
K801
Q 801 DC AMP
RT 801
J801
STANDBY BATTERY
J707
26.5 V D.C.
P703
Q 901 DC AMP
Q 902 DC AMP
R913
J 901
J 708
T 903 SATURABLE REACTOR
T 902 SATURABLE REACTOR
CR 905 RECTIFIER
CR 903 RECTIFIER
CR 906 RECTIFIER
CR 904 RECTIFIER
T903 FILTER
T 901
J909 RED
POWER SUPPLY
J901
J708
POWER SOURCE-A C
DS 702
CR 701 RECTIFIER
K 701
DS 703
POWER SOURCE BAT
T 301
CR 301 RECTIFIER
Q 301 DC AMP
K301
TEMP CONTROL
1.5-3.0V D.C.
E1401
PART OF TB 1401
DS 701
OUTER OVEN
HR1402
V 101 OSCILLATOR
V 102 5 MC AMP
V 103 5 MC AMP
V 104 CATHODE FOLLOWER
V 102 VOLTAGE AGC
V 103 DOUBLER RECTIFIER
OSCILATOR AMPLIFIER
J103
J1405
P702-2
J501-2
V 501 5 MC AMP
T501
V 502 MIXER
V 503 X4 MULTIPLIER
START
J502
P704
5.0Mc. TO 1.0 Mc. DIVIDER
FINE FREQUENCY ADJUST
T202
Q 202 AMP
T201
CR201 RECTIFIER
Q 201 DC AMP
INNER OVEN TEMPERATURE CONTROL
OUTER OVEN



AGE	TIME	WAVEFORM		VOLTAGE	TIME	WAVEFORM
.0 V	0.2 µ SEC	SINE WAVE	17	26.5 V.D.C.	NO	WAVEFORM
.0 V	1.0 µ SEC	SINE WAVE	18	20 V.D.C.	NO	WAVEFORM
B.0 V	1.0 µ SEC	SINE WAVE	19	100 V.D.C	NO	WAVEFORM
.0 V	10 µ SEC	SINE WAVE	20	26.5 V.D.C.	NO	WAVEFORM

0-3.0 V.D.C. MEASURE WITH 100,000 OHMS/ VOLT METER AN/PSM-4





	VOLTAGE	TIME	WAVEFORM
3	20.0 V	0.2 μ SEC	SINE WAVE
6	100.0 V	1.0 μ SEC	SINE WAVE
7	38.0 V	1.0 μ SEC	SINE WAVE
13	100.0 V	10 μ SEC	SINE WAVE

	VOLTAGE	TIME	WAVEFORM
17	26.5 V.D.C.	NO	WAVEFORM
18	20 V.D.C.	NO	WAVEFORM
19	100 V.D.C	NO	WAVEFORM
20	26.5 V.D.C.	NO	WAVEFORM

E1401 - 1.5 TO - 3.0 V.D.C. MEASURE WITH 100,000 OHMS/ VOLT METER AN/PSM-4

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

a. MAINTENANCE STANDARDS. - The frequency standard is designed to require a minimum amount of maintenance. These tests provide a systematic and efficient method for checking the equipment. When the procedures are performed as directed, the operating efficiency of the equipment will be increased due to the detection of impending failures before they occur.

(1) TEST EQUIPMENT AND SPECIAL TOOLS. - Table 5-1 lists the test equipment which is required to perform the maintenance standards tests and for tuning and adjustment. No special tools are required.

TABLE 5-1. TEST EQUIPMENT

TEST UNIT	AN TYPE DESIGNATION
Capacitance, Inductance and Resistance Bridge	ZM-11 A/U
Frequency Deviation Meter	AN/URM-115
Multimeter	AN/USM-116
Oscilloscope	AN/USM-105A
Variac	CN-16 A/U
Volt-Ohm-Micrometer	AN/PSM-4

(2) PRELIMINARY OPERATION. - Before the maintenance standards are established and recorded, the frequency standard should operate continuously for eight to eleven days. At the end of this time, the crystal temperature and frequency will have stabilized and the output frequencies will be constant. A quick check by the TEST METER in all 12 positions of the TEST SWITCH will indicate a malfunction or proper operation. The frequency standard should be operating normally, but, if adjustment is required, follow the procedure described in paragraph 5-1b.

(3) TEST PROCEDURES AND MAINTENANCE REFERENCES. - The procedures and tests listed in Table 5-2 are the maintenance standards for the frequency standard. They are subdivided by functional sections corresponding to the functional block diagram sections of the set (figure 5-1). The listed procedures consist of the minimum number of reference standards which will indicate, when completed, the relative performance of the set. Upon completion of each prescribed preventive maintenance procedure, the results are to be recorded and dated on checkoff charts similar to the one shown in figure 5-2.

Note

The procedures are listed in suggested sequence of performance; however, deviation from the listed order will in no way affect the unity or result of the reference standards unless otherwise noted.

(4) PREVENTIVE MAINTENANCE CHECKOFF. - The preventive maintenance tests provide a systematic method for performing preventive maintenance procedures to maintain the high operating efficiency of the frequency standard. Where possible, the preventive maintenance tests are performed by using the existing test jacks (figure 5-3) and the front panel test meter and switch. The test procedures are in table form and are scheduled for regular bi-weekly (Table 5-3) and monthly (Table 5-4) periods.

At the top of each procedure table is a list of operating conditions and control settings which apply to the entire table. The step numbers correspond to the "step number" on accompanying illustrations (figures 5-4 through 5-8). Arrows leading from a given "step number" on the illustration present the basic information (points where test equipment is to be connected and the type of test equipment to be used) in the associated step of the procedure table.

It is expected that the steps will show nominal variances from time to time. However, this does not necessarily mean that the equipment is operating improperly. If a particular step indicates a reading which varies progressively in the same direction every time the check is made, it is an indication of a malfunction and corrective steps must be taken.

b. TUNING AND ADJUSTMENT. - The frequency standard has been carefully adjusted by the manufacturer before shipment. Attempting to adjust the equipment when something else is the cause of the malfunction may result in the use of extra time in troubleshooting and readjustment. No attempt should be made to adjust the equipment until it is certain that the test equipment is trouble-free, adjustment is required, and a properly operating Frequency Standard AN/URQ-9 or its equivalent is available.

(1) TEST EQUIPMENT. - The test equipment listed in Table 5-1 is required for tuning and adjustment.

Note

Another Frequency Standard AN/URQ-9 or its equivalent is required for checking the frequency drift.

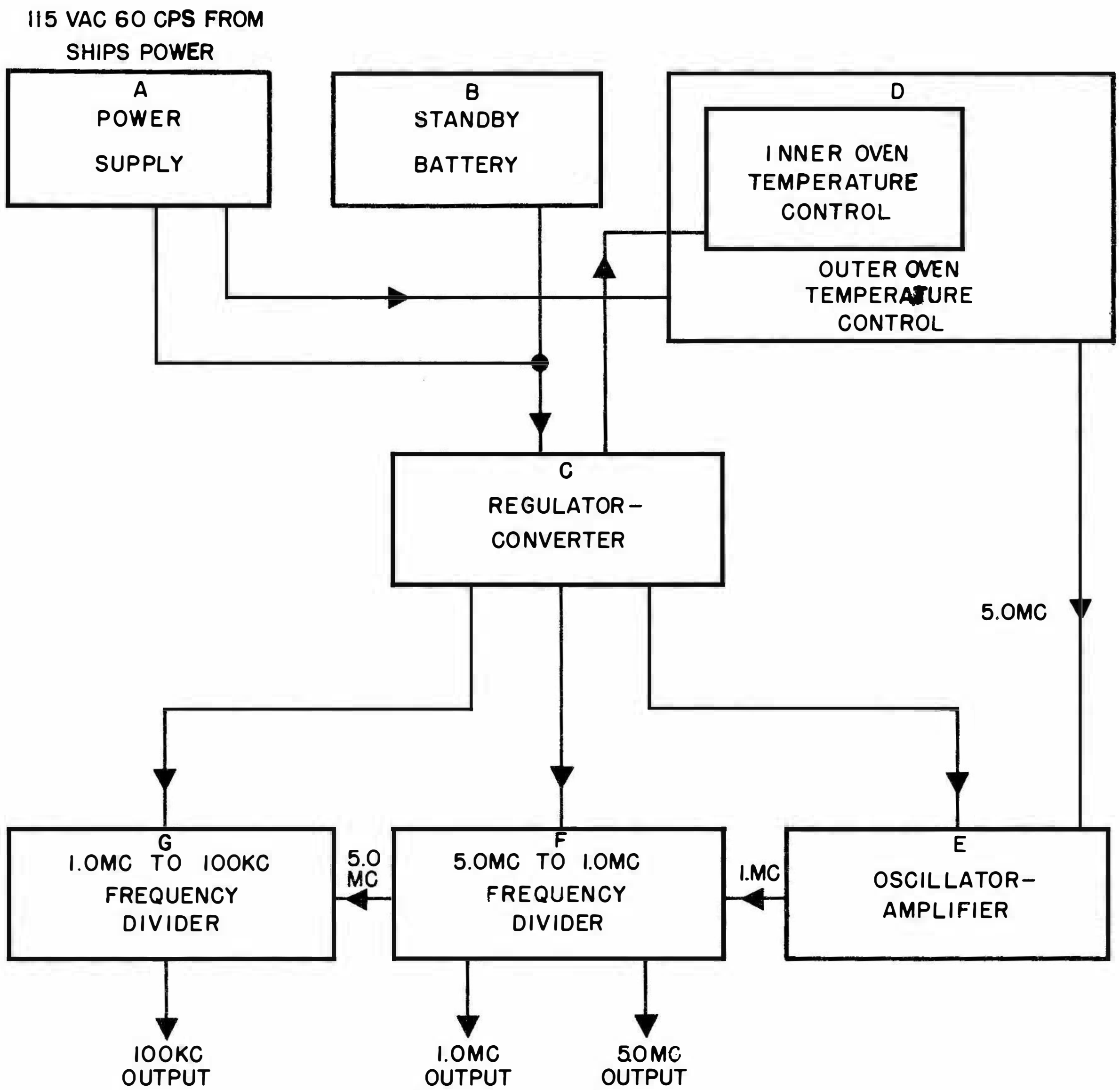


Figure 5-1. Maintenance Standards Block Diagram

TABLE 5-2. REFERENCE STANDARDS SUMMARY

SECTION	ACTION REQUIRED	REFER PERIOD	TO STEP
A POWER SUPPLY ASSEMBLY	Record regulated power supply voltage Record regulated power supply current Record reference voltage of Q901 and saturable reactor Record reference voltage of saturable reactor Record reference voltage of Q902 Record control voltage of Q902	(M) * (M) (M) (M) (M) (M)	1 2 3 4 5 6
B STANDBY BATTERY ASSEMBLY	Record standby battery charge current Clean battery Check battery electrolyte	(M) (BW) ** (BW)	7 1 2
C REGULATOR- CONVERTER	Record plate supply voltage Record regulated heater supply voltage Record regulated inner oven heater supply voltage Record input voltage to regulator converter Record inner oven temperature control voltage Record regulated plate supply voltage	(M) (M) (M) (M) (M) (M)	8 9 10 11 12 13
D OUTER AND INNER OVENS CONTROLLER	Record outer oven monitor thermistor voltage	(M)	14
E OSCILLATOR- AMPLIFIER	Record 5.0 mc output Record plate current (V102) Record plate current (V103) Record normal AGC voltage Record 5.0 mc output frequency	(M) (M) (M) (M) (M)	15 16 17 18 19
F 5.0 MC TO 1.0 MC FREQUENCY DIVIDER	Record 1.0 mc output	(M)	20
G 1.0 MC TO 100 KC FREQUENCY DIVIDER	Record 100 kc output Record input signal to 1.0 mc to 100 kc frequency divider Record output signal of V403 Record output signal of V401 Record output signal of V402	(M) (M) (M) (M) (M)	21 22 23 24 25

* Monthly
** Bi-weekly

TABLE 5-3. BI-WEEKLY REFERENCE TESTS

Operating Conditions and Control Settings:
Frequency standard operating:
DIVIDER FILAMENTS switch (S703): ON
START switch (S501): depressed momentarily to start frequency divider.
START switch (S401): depressed momentarily to start frequency divider.

STEP NO.	FIG. NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
1	5-4	Clean Battery		
		PROCEDURE: Remove battery from the set; clean with a soft clean cloth and replace		
2		Check battery electrolyte	Visual	Level with top of the plate
		PROCEDURE: Remove battery from the set; visually check the amount of electrolyte of each cell through the translucent side		

TABLE 5-4. MONTHLY REFERENCE TESTS

Operating Conditions and Control Settings:
Frequency standard operating:
DIVIDER FILAMENTS switch (S703): ON
START switch (S501): depressed monentarily to start frequency divider.
START switch (S401): depressed momentarily to start frequency divider.

Note

When using front panel TEST METER (M701), the readings are not in microamps as indicated on the test meter. The readings indicate an acceptable standard, but do not necessarily represent a specific value in amps or volts.

STEP NO.	FIG. NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
1	5-5	Record regulated power supply voltage	TEST METER M701	26.0 ± 1
		PROCEDURE: Place TEST SWITCH (S701) in position 10		
2	5-5	Record regulated power supply current	TEST METER M701	10 ± 2
		PROCEDURE: Place TEST SWITCH (S701) in position 11		
3	5-6	Record reference voltage of Q901	MULTIMETER AN/USM-116	VDC 20.2 ± 1
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J903 and negative lead to J902		

TABLE 5-4. MONTHLY REFERENCE TESTS (Sheet 2 of 4)

STEP NO.	FIG. NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
4	5-6	Record reference voltage of saturable reactor	MULTIMETER AN/USM-116	______ V DC 24.4 ± 5
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J904 and negative lead to J902		
5	5-6	Record reference voltage of Q902	MULTIMETER AN/USM-116	______ V DC 12.5 ± 1
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J905 and negative lead to J902		
6	5-6	Record control voltage of Q902	MULTIMETER AN/USM-116	______ V DC 21.5 ± 1
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J907 and negative lead to J902		
7	5-5	Record standby battery charge current	TEST METER M701	______ 0 + 0.5
		PROCEDURE: Place TEST SWITCH (S701) in position 12		
8	5-5	Record plate supply voltage	TEST METER M701	______ 50 ± 2
		PROCEDURE: Place TEST SWITCH (S701) in position 6		
9	5-5	Record regulated heater supply voltage	TEST METER M701	______ 20 ± 2
		PROCEDURE: Place TEST SWITCH (S701) in position 7		
10	5-5	Record regulated inner oven heater supply voltage	TEST METER M701	______ 14 ± 2
		PROCEDURE: Place TEST SWITCH (S701) in position 8		
11	5-7	Record output voltage to regulator converter	MULTIMETER AN/USM-116	______ V DC 26.2 ± 0.3
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J602 and negative lead to J601		
12	5-7	Record inner oven temperature control voltage	MULTIMETER AN/USM-116	______ V DC 20 ± 2
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J603 and negative lead to J601		
13	5-7	Record regulated plate supply voltage	MULTIMETER AN/USM-116	______ V DC 100 ± 4
		PROCEDURE; Connect positive lead of MULTIMETER AN/USM-116 to J604 and negative lead to J601		

TABLE 5-4. MONTHLY REFERENCE TESTS (Sheet 3 of 4)

STEP NO.	FIG. NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
14	5-5	Record outer oven monitor thermistor voltage	TEST METER M701	____ 0
		PROCEDURE: Place TEST SWITCH (S701) in position 9		
15	5-5	Record 5. 0 mc output	TEST METER M701	____ 30 ± 10
		PROCEDURE: Place TEST SWITCH (S701) in position 1		
16	5-5	Record plate current (V102)	TEST METER M701	____ 43 ± 5
		PROCEDURE: Place TEST SWITCH (S701) in position 4		
17	5-5	Record plate current (V103)	TEST METER M701	____ 43 ± 5
		PROCEDURE: Place TEST SWITCH (S701) in position 5		
18	5-7	Record normal AGC voltage	VOM METER	____ V DC - 2 ± 1
		PROCEDURE: Connect positive lead of VOM METER AN/PSM-4 to Test Point # E 1401 and negative lead to J401		
19	5-8	Record 5. 0 mc output frequency	FREQUENCY DEVIATION METER AN/USM-115	____ MC 5. 0 mc
		PROCEDURE: Connect a local frequency standard (another AN/URQ-9 or its equivalent) to the frequency standard input FREQUENCY DEVIATION METER AN/URM-115. Connect 5. 0 mc output (J702) to the frequency deviation meter		
20	5-5	Record 1. 0 mc output	TEST METER M701	____ 30 ± 10
		PROCEDURE: Place TEST SWITCH (S701) in position 2		
21	5-5	Record 100 kc output	TEST METER M701	____ 24 ± 5
		PROCEDURE: Place TEST SWITCH (S701) in position 3		
22	5-7	Record input signal to 1. 0 mc to 100 kc frequency divider	MULTIMETER AN/USM-116	____ V AC 14 ± 3
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J402 and negative lead to J401		

TABLE 5-4. MONTHLY REFERENCE TESTS (Sheet 4 of 4)

STEP NO.	FIG. NO.	ACTION REQUIRED	READ INDICATION ON	REFERENCE STANDARD
23	5-7	Record output signal of V403	MULTIMETER AN/USM-116	_____ V DC 85 ± 5 _____ V AC 20 ± 5
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J405 and negative lead to J401		
24	5-7	Record output signal of V401	MULTIMETER AN/USM-116	_____ V DC 85 ± 5 _____ V AC 15 ± 4
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J408 and negative lead to J401		
25	5-7	Record output signal of V402	MULTIMETER AN/USM-116	_____ V DC 90 ± 5 _____ V AC 27 ± 5
		PROCEDURE: Connect positive lead of MULTIMETER AN/USM-116 to J410 and negative lead to J401		

MONTHLY	1ST MONTH 1962	2ND MONTH 19__	3RD MONTH 19__	4TH MONTH 19__	5TH MONTH 19__	6TH MONTH 19__
STEP 1	26					
STEP 2	8					
STEP 3	20.6Vdc					
STEP 4	25 vdc.					
STEP 5	12 vdc.					
STEP 6						
STEP 7						
16	44					
INITIAL	[illegible]					

NOTE: THIS FORM TO BE USED FOR BOTH BYWEEKLY AND MONTHLY CHECKS

Figure 5-2. Maintenance Standards Sample Checkoff Chart

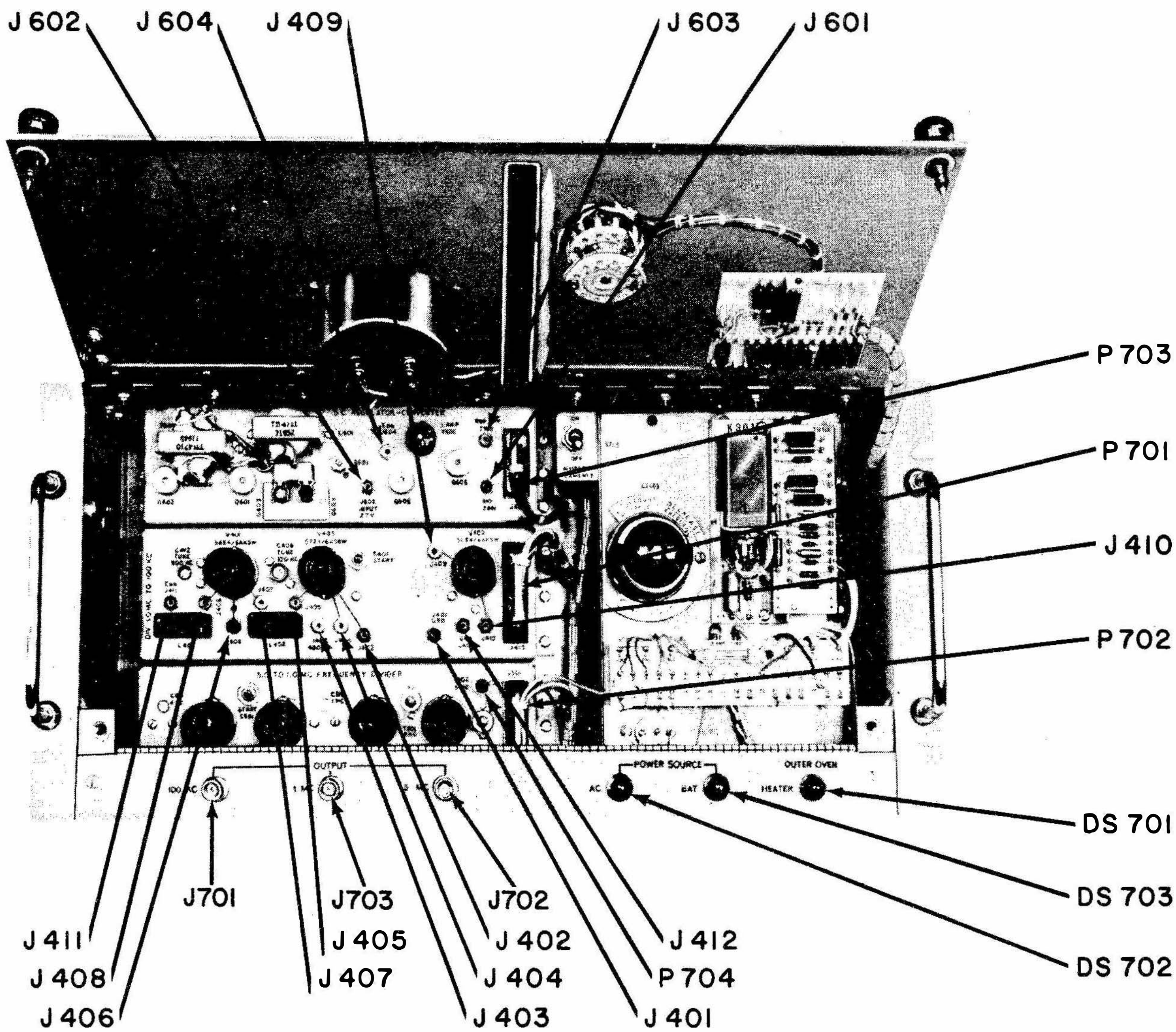


Figure 5-3. Frequency Standard Test Jack

(2) COMPENSATING FOR FREQUENCY DRIFT. - The oscillator frequency should be checked for frequency deviation meter as called out in reference standards test 19 of Table 5-4. If adjustment is necessary, proceed as follows:

(a) FINE FREQUENCY ADJUSTMENT. - Open front panel and locate the fine frequency control, C1403. Unlock frequency adjustment knob by pushing the lock located on the lower left side of the fine frequency control counterclockwise. Rotate the frequency control knob clockwise to decrease frequency or counterclockwise to increase frequency. Since one unit or count on the dial represents a frequency change of one part per 10^{10} parts, the knob should be rotated ten dial counts for each part per 10^{9} parts of frequency error. If the oscillator frequency cannot be corrected with the fine frequency control, set the dial to 500 and proceed with coarse frequency adjustment.

(b) COARSE FREQUENCY ADJUSTMENT.- When coarse frequency adjustment is required to bring the frequency within the range of the fine frequency control, perform the following steps:

CAUTION

Before proceeding with the coarse-frequency adjustment, be sure that both inner and outer oven temperatures are correct.

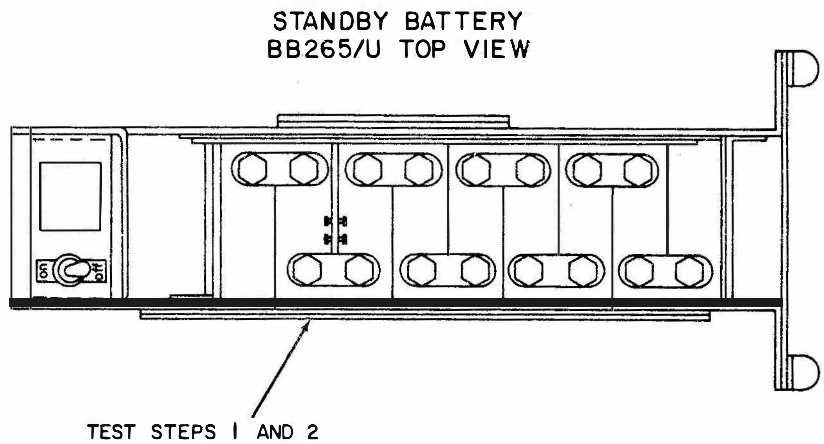


Figure 5-4. Maintenance Standards Standby Battery Check

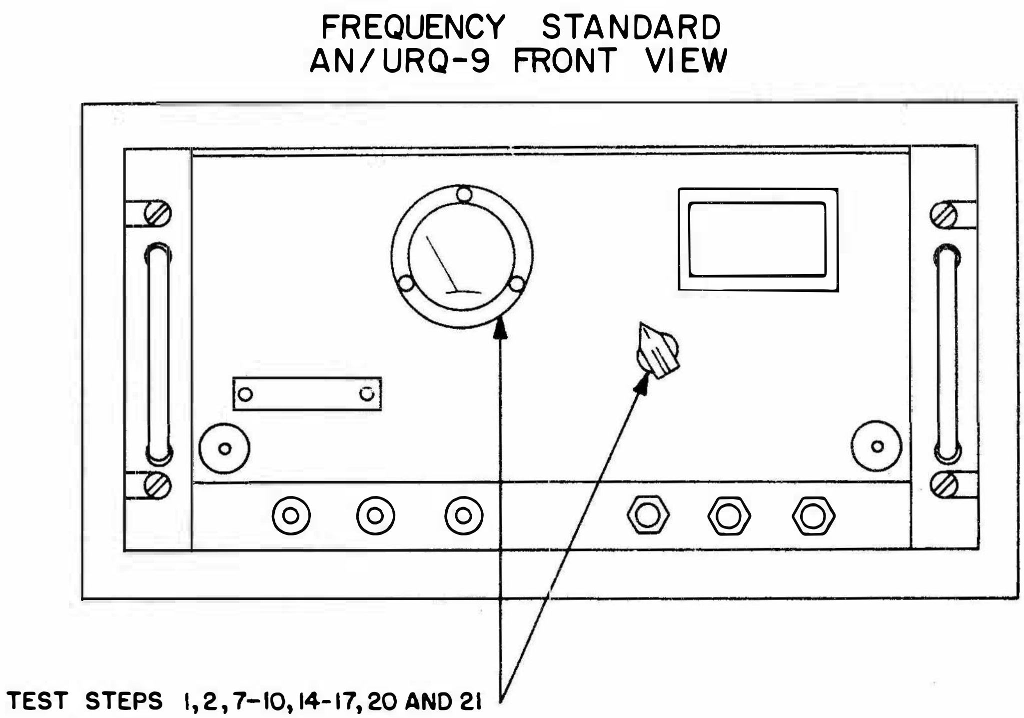


Figure 5-5. Maintenance Standards Front Panel Tests

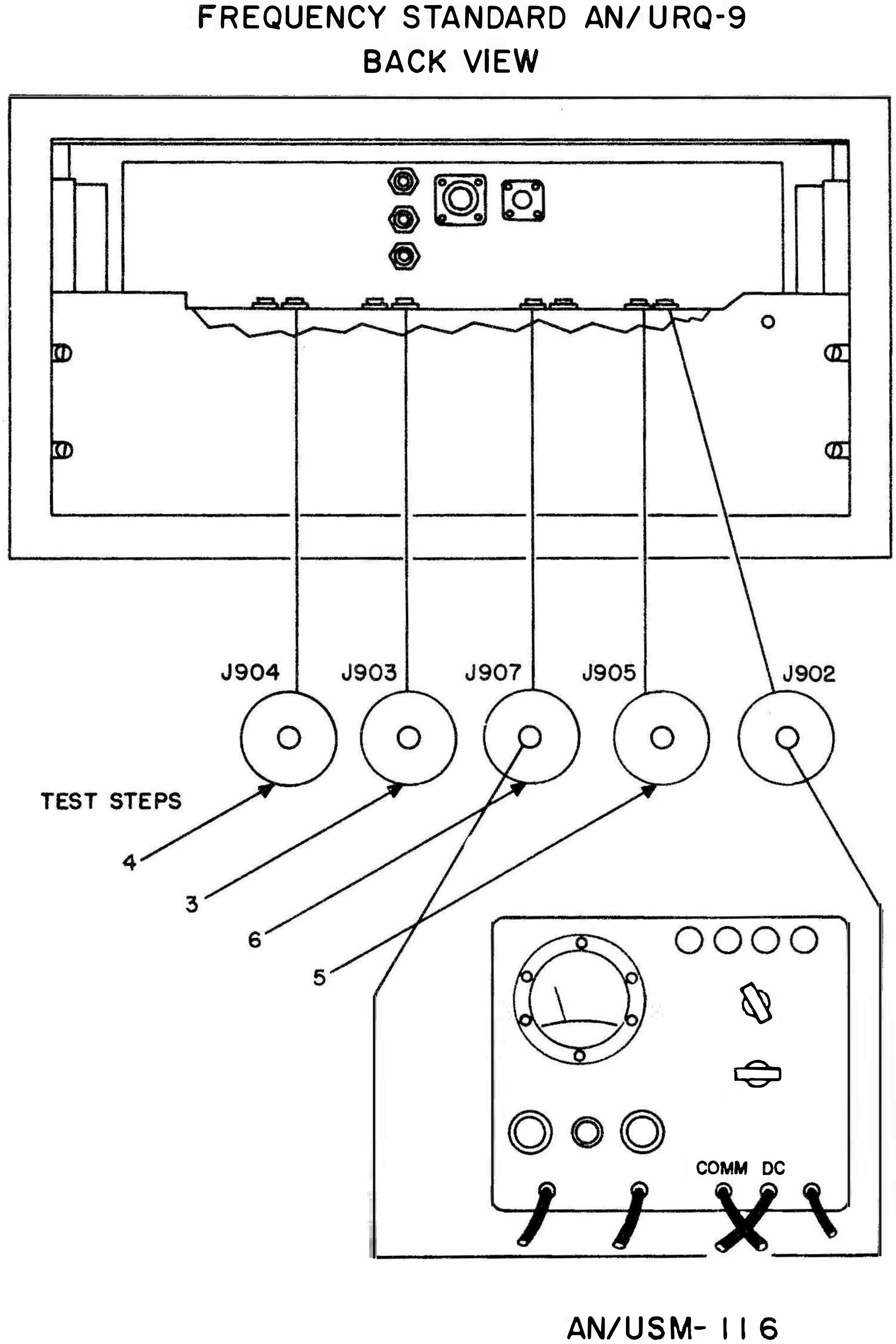


Figure 5-6. Maintenance Standards Power Supply Test Setup

1. Remove the radio frequency oscillator section from the equipment case as indicated in paragraph 5-2e and figure 1-2.

CAUTION

Do not operate the r-f oscillator section out of the case more than two hours unless the filament divider switch (S703) is OFF. With S703 OFF, the operating time is increased by approximately one-half.

2. Remove only the oscillator-amplifier top cover as indicated in paragraph 5-2f(1) and figure 5-9.

3. Using the alignment tool, located on the inside of the front panel in the access hole of C1401 (Coarse Frequency Adjustment, figure 5-10) carefully rotate C1401 clockwise if the indicated oscillator frequency was too high, or counterclockwise if the frequency was too low.

4. Adjust C1401 until the frequency is approximately correct.

5. Replace the oscillator-amplifier cover and replace the r-f oscillator section in the case. Make final adjustment with the fine frequency control as instructed in step (a).

(3) OSCILLATOR-AMPLIFIER CIRCUITS. - When tubes or components are replaced in the oscillator-amplifier circuits, calibration of the fine frequency control and amplifier tuning may be required.

(a) CALIBRATION OF FINE FREQUENCY CONTROL. - Open front panel and unlock the fine frequency adjustment knob. Perform the following steps:

1. Connect Frequency Deviation Meter AN/URM-115 (figure 5-7) to the 1.0 mc (J703) output of the oscillator.

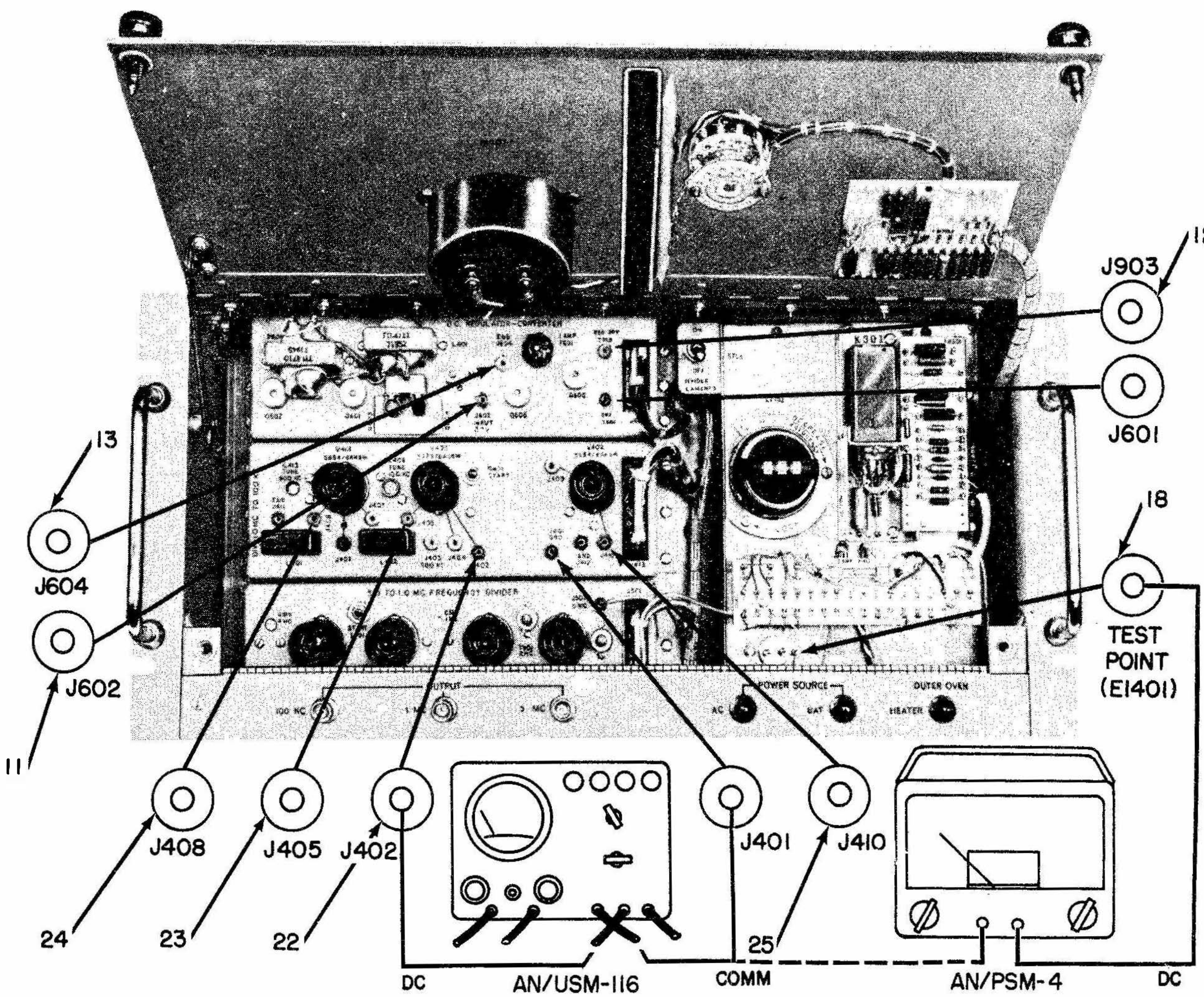


Figure 5-7. Maintenance Standards Divider Test Setup

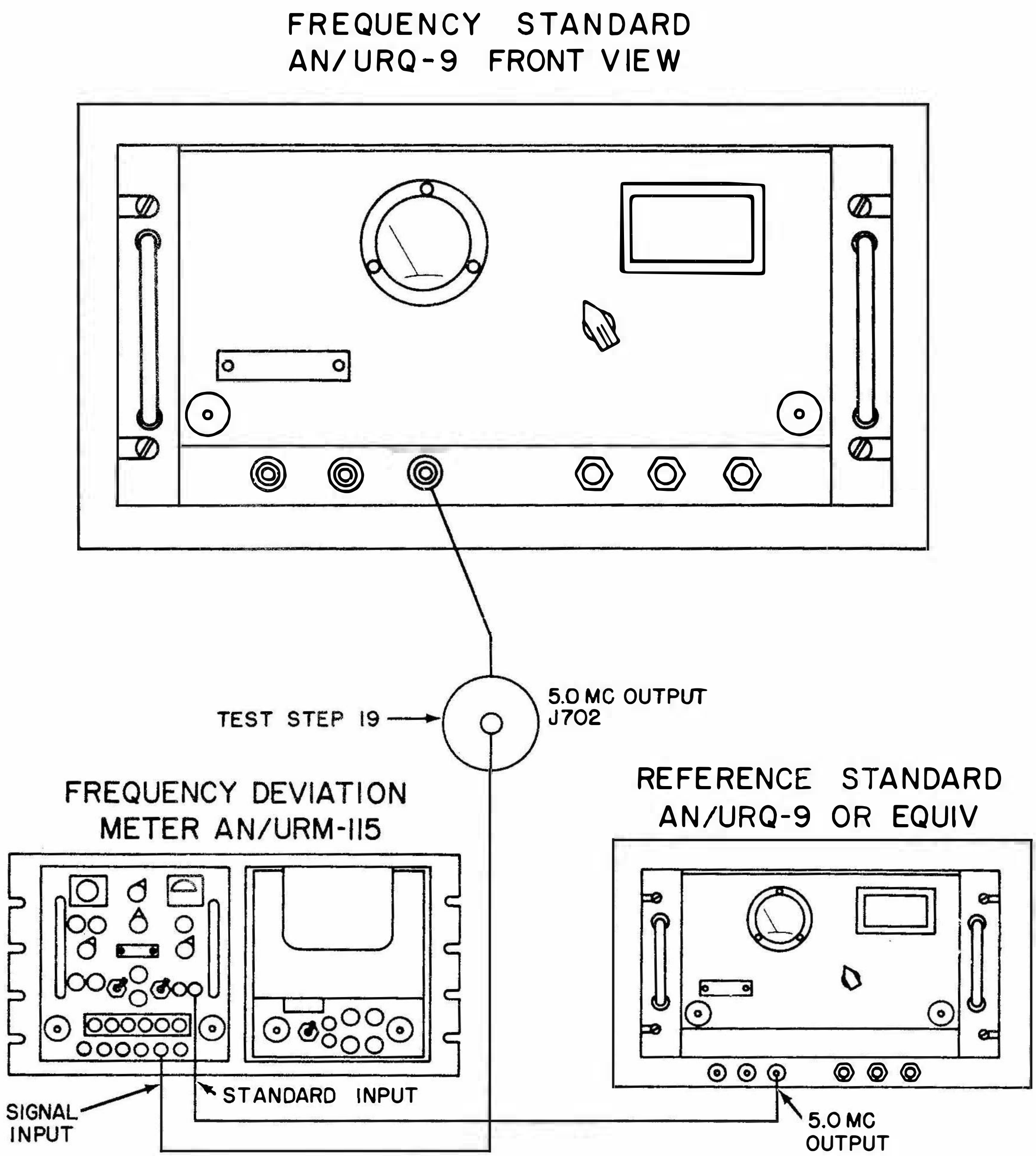


Figure 5-8. Maintenance Standards Frequency Check

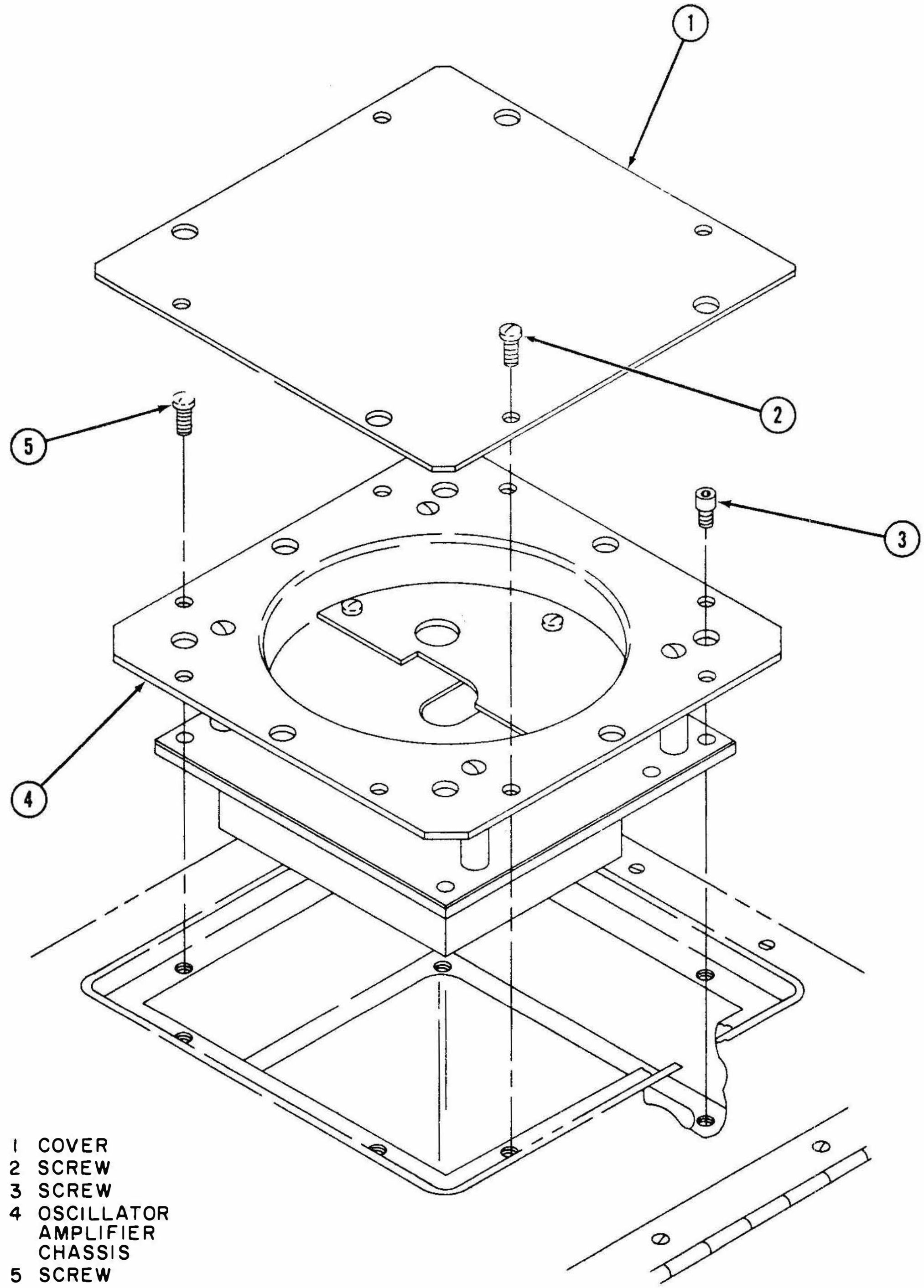


Figure 5-9. Frequency Standard Oscillator-Amplifier Removal

2. Set the controls on the frequency deviation meter (SIGNAL and STANDARD) to 1.0 mc position.

3. Rotate the fine frequency control knob until the dial reads 500 and use the indicated output as a reference frequency.

4. Rotate the knob until the meter dial reads 400 and subtract this indicated frequency from the reference frequency.

5. Rotate the knob until the dial reads 600 and subtract the reference frequency from the indicated frequency.

6. Take the sum of the frequency differences and divide by two to find the frequency shift limits. The limit should be equal to 1 part per 10^8 parts. If the frequency shift is not within these limits, capacitor C108 (figure 5-10) must be adjusted.

(b) Adjust capacitor C108 as follows:

1. Remove the radio frequency oscillator section from the equipment case as indicated in paragraph 5-2e and figure 1-2.

CAUTION

Do not operate the r-f oscillator section out of the case more than two hours unless the filament divider switch S703 is OFF. With S703 OFF, the operating time is increased by approximately one-half.

2. Remove the oscillator top cover as indicated in paragraph 5-2f(1) and figure 5-9.

3. Rotate capacitor C108 clockwise, if the frequency shift is greater than 1 part per 10^8 parts or, rotate capacitor C108 counterclockwise, if the frequency shift is less than 1 part per 10^8 parts.

4. Repeat the frequency check as outlined in paragraph 5-1b(3). Continue adjusting capacitor C108 until the frequency shift is approximately 1 part per 10^8 parts.

(4) OSCILLATOR-AMPLIFIER TUNING. - When any repairs are made in the oscillator-amplifier circuits, it will be necessary to check the circuit as follows:

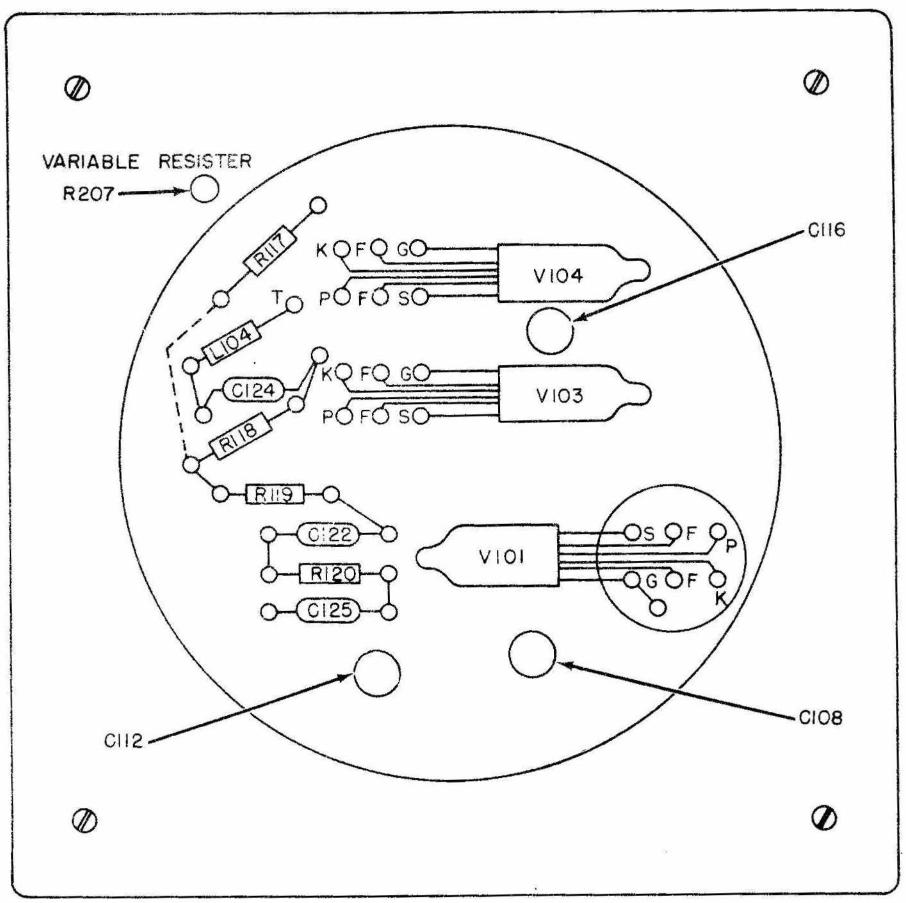


Figure 5-10. Oscillator-Amplifier Adjustment and Tuning

(a) Remove the radio frequency oscillator section as indicated in paragraph 5-2e and figure 1-2.

(b) Remove the oscillator-amplifier assembly cover as indicated in paragraph 5-2f(1) and figure 5-9.

(c) Connect VOM Meter AN/PSM-4 to E1401 (as indicated in reference standards test number 18, figure 5-8) and set the voltmeter for a negative dc voltage reading.

(d) Carefully adjust capacitors C112 and C116 using a nonmagnetic screwdriver until a maximum voltage is obtained.

(e) An indication of -2.0 volts on the meter indicates that the oscillator is functioning.

(f) Remove the meter, replace the oscillator-amplifier cover, and reinstall the radio frequency oscillator section in the case.

(5) OVEN TEMPERATURE CONTROL CIRCUITS.

(a) INNER OVEN TEMPERATURE CONTROL. - The oscillator stability is dependent upon the operating temperature of the inner oven. Replacement of components in the temperature bridge circuit will necessitate adjustment of the oven temperature controls. To check the operating temperature of the inner oven,

Note

> Adjustments should not be attempted until sufficient checks have been made to determine that the oven temperature is incorrect.

measure the resistance of the inner oven monitor thermistor RT1402. The measured resistance of RT1402 should be within two ohms of the resistance that is shown on the crystal data sheet supplied with each frequency standard. The resistance of RT1402 can be measured by connecting the resistance bridge (ZM-4B/U) between pin 28 and ground on terminal board TB1401. To change the inner oven temperature, turn resistor R207 on figure 5-25, one-half turn

CAUTION

> Before attempting to measure the resistance of RT1402, connect the resistance bridge to measure the resistance of a 500 ohm resistor and monitor the current in the resistor under test with a milliammeter to ensure that the current is less than 0.5 ma. If current is greater than 0.5 ma, insert a suitable resistor in series to lower the current.

clockwise to increase temperature or counterclockwise to decrease temperature. After each one-half turn, wait one-half hour for the temperature to stabilize before measuring the resistance of RT1402.

(b) OUTER OVEN TEMPERATURE CONTROL. - Adjustment of the outer oven temperature should not be necessary unless components of the control bridge

Note

> Adjustment of the outer oven temperature control should be made only when the inner oven temperature is correct as indicated by a correct reading of the inner oven monitor thermistor.

have been changed. To adjust the outer oven temperature proceed as follows:

1. Place the TEST SWITCH S701 in position 8.

2. Turn resistor R307 clockwise to increase temperature or counterclockwise to decrease temperature (figure 5-27).

3. Adjust R307 one-half turn at a time until the voltage indicated on the TEST METER is 14 volts.

(6) FREQUENCY DIVIDER CIRCUITS. - When tubes or components of the frequency divider circuits are replaced it may be necessary to tune the circuits. Open the front panel to gain access to the 5.0 to 1.0 mc and 1.0 mc to 100 kc frequency dividers.

(a) 5.0 MC OUTPUT. - To tune the 5.0 mc output, set TEST SWITCH S701 to position 1 and adjust variable transformer T501 (figure 5-11) by turning it counterclockwise from the maximum clockwise position to the first peak reading on the TEST METER.

(b) 1.0 MC OUTPUT. - To tune the 1.0 mc output, set TEST SWITCH S701 to position 2 and start the frequency divider by pressing switch S501. If the frequency divider does not start, press switch S501 while rotating capacitor C515 (figure 5-11) with a screwdriver until a voltage is indicated on the TEST METER. Rotate capacitors C510 and C515 alternately with a

Note

> There are two positions for each of the variable capacitors C510 and C515 which will give the maximum voltage indication on the TEST METER. Either of these positions is acceptable.

screwdriver until the maximum voltage is indicated on the TEST METER. Rotate variable transformer T502 clockwise as far as possible. Then proceed by rotating T502 counterclockwise until the first voltage peak is indicated on the TEST METER. After adjusting T502 proceed as follows:

1. Place TEST SWITCH S701 and check for an indication of 33 ± 4 on the TEST METER M701.

2. Place TEST SWITCH S701 in position 2 and check for an indication of 26 ± 4 on the TEST METER M701.

3. If the meter indications are not correct, readjust the frequency divider.

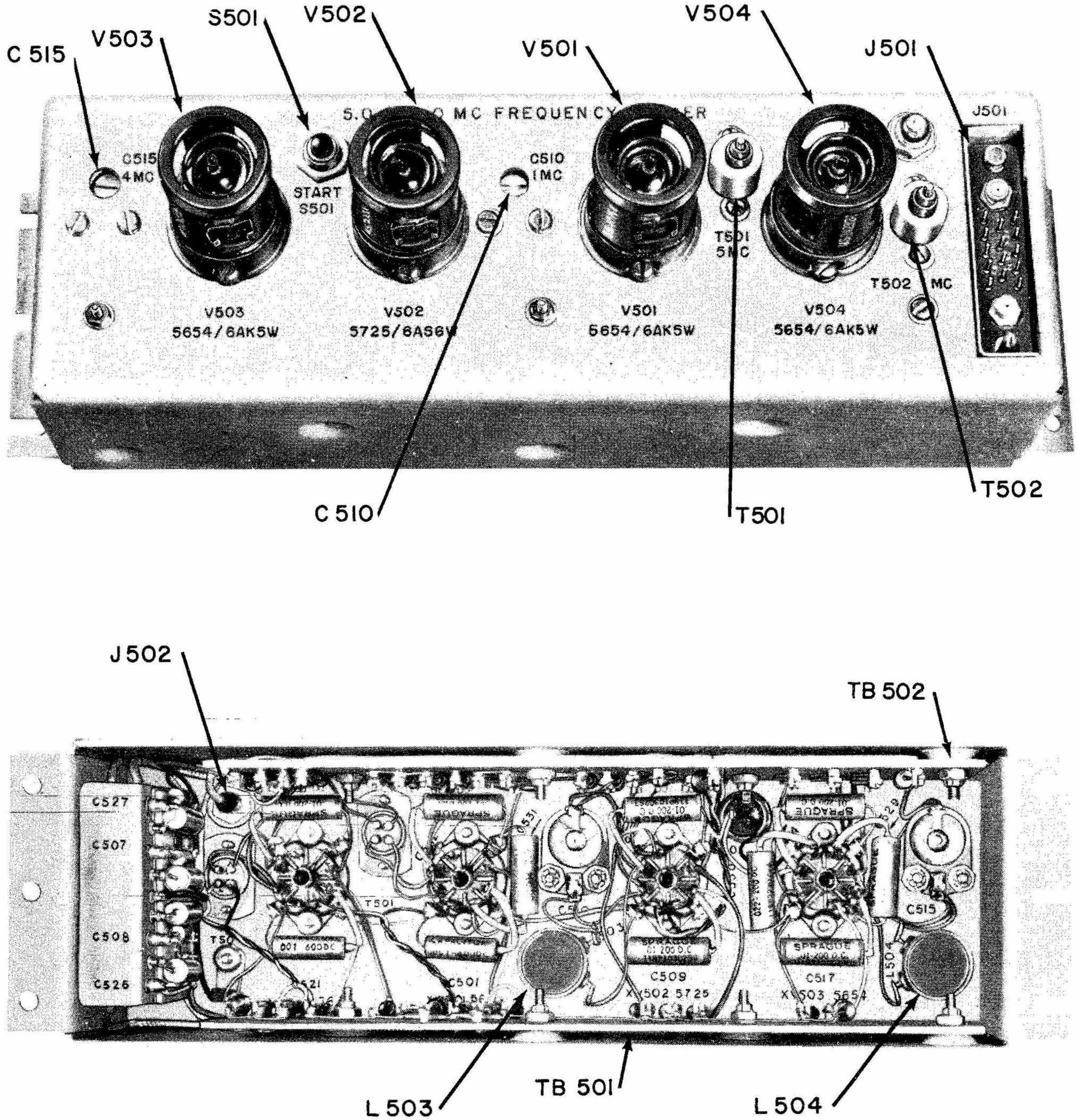


Figure 5-11. Frequency Standard 5.0 to 1.0 MC Frequency Divider Assembly

(c) 100 KC OUTPUT. - To tune the 100 kc output, set TEST SWITCH S701 to position 3 and start the frequency divider by pressing switch S401. If the frequency divider does not start, press switch S401 while rotating capacitor C412 (figure 5-12) with a screwdriver until a voltage is indicated on the TEST METER. Next rotate capacitors C406 and C412 alternately with a screwdriver until a maximum voltage is indicated.

Note

There are two positions for each of the variable capacitors C406 and C412 which will give the maximum voltage indication on the TEST METER. Either of these position is acceptable.

After adjusting capacitors C406 and C412, proceed as follows:

1. Place TEST SWITCH S701 in position 3 and check for an indication of 24 ± on the TEST METER M701.

2. If the meter indication is not correct, readjust the frequency divider.

(7) REGULATOR-CONVERTER CIRCUITS. - When components of the regulator-converter circuits have been replaced, it may be necessary to adjust variable resistor R601 as follows:

(a) Set TEST SWITCH S701 to position 6.

(b) Open front panel and loosen the lock nut on variable resistor R601 (figure 5-13).

(c) Rotate variable resistor R601 until a full scale meter reading (50 milliamperes) is obtained.

(d) Tighten lock nut.

(e) Set TEST SWITCH S701 to position 7 and if a reading of 20 is not indicated on the TEST METER, refer to Section 4, Trouble Shooting.

(8) ADJUSTMENT OF R712. - When components have been replaced or adjustments have been made on

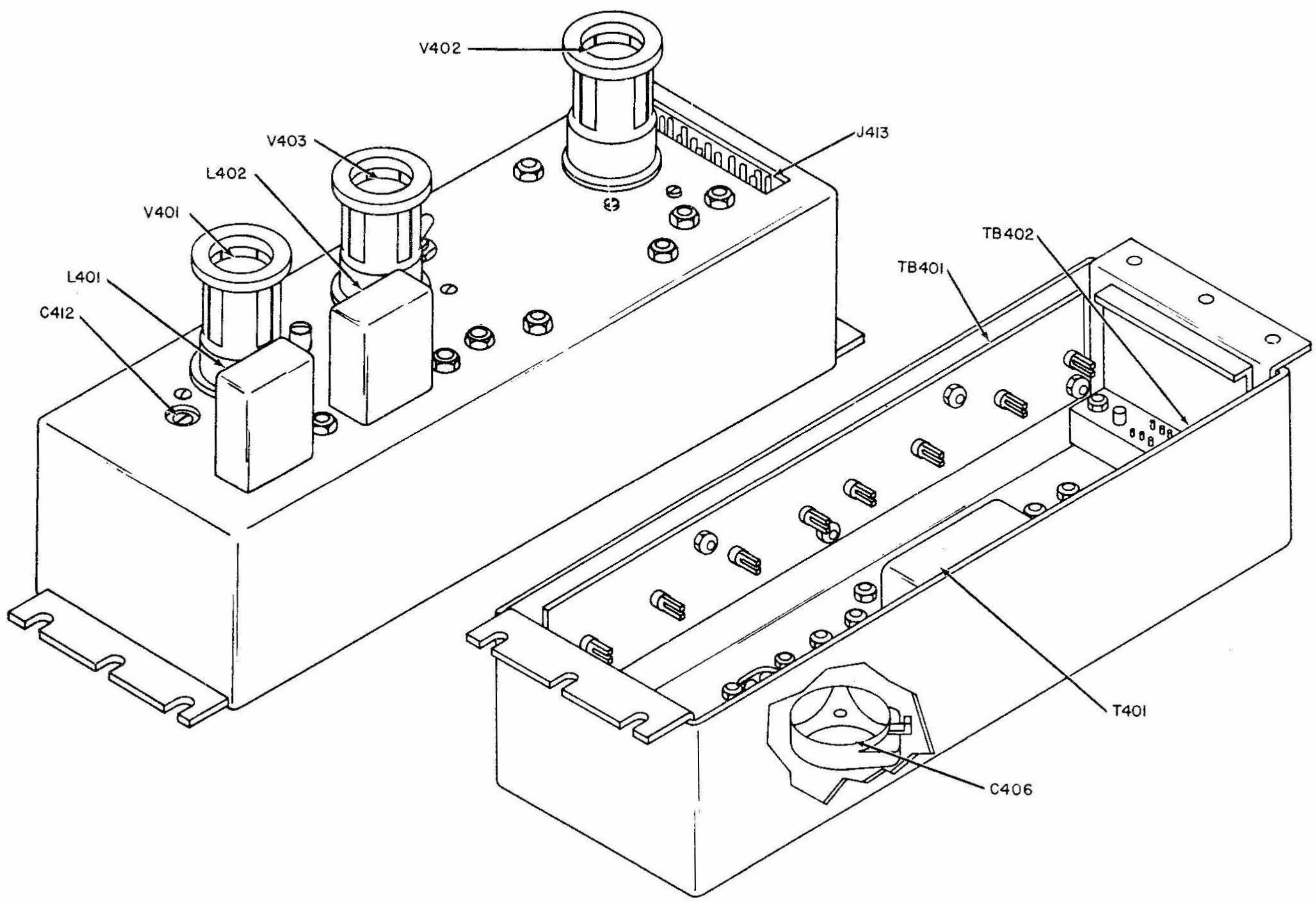
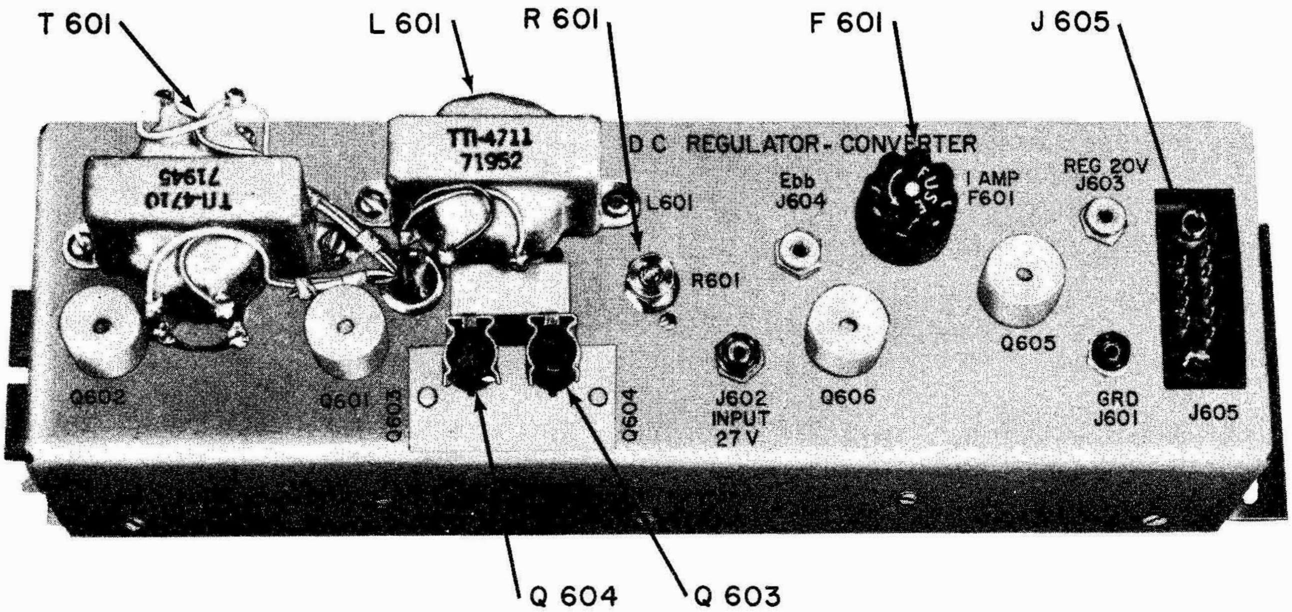


Figure 5-12. Frequency Standard 1.0 MC to 100 KC Frequency Divider Assembly



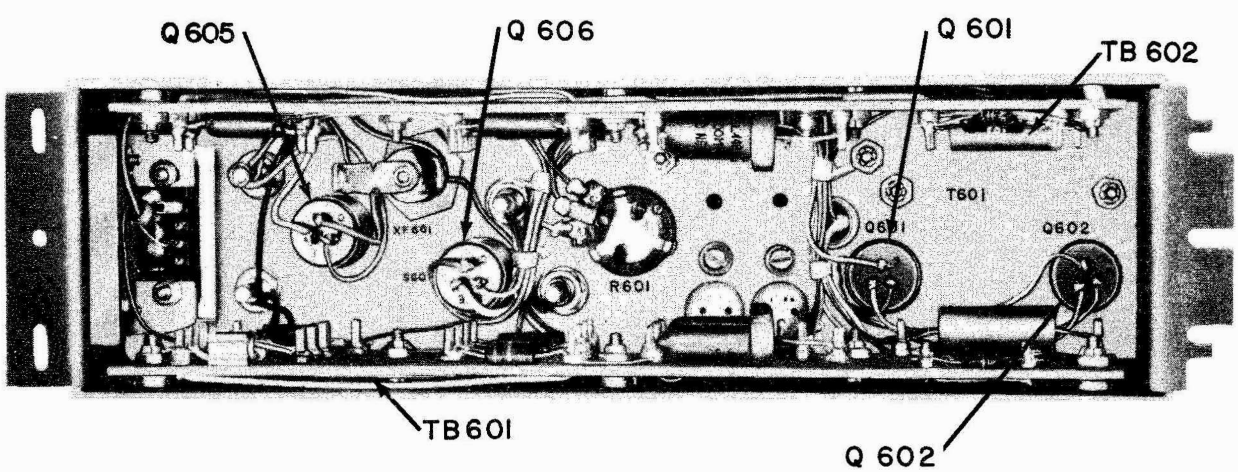


Figure 5-13. Frequency Standard Regulator-Converter Assembly

the outer oven temperature control, adjustment of variable resistor R712 may be required as indicated on figure 5-21. To adjust R712, set TEST SWITCH to

CAUTION

Before adjusting R712, ensure that the inner oven monitor thermistor indicates that the inner oven is operating at the correct temperature and that the TEST METER indicates approximately 14 volts with the TEST SWITCH set in position 8.

position 9 and rotate R712 until the meter reading is zero.

(9) POWER SUPPLY CIRCUITS. - After components have been replaced in the power supply, check the output with voltmeter AN/USM-116 as indicated in step c of the following steps (figure 5-14). An output of 26.5 v dc should be indicated. If adjustment to the power supply is required proceed as follows:

(a) Connect a variac between the 115 v ac line and the power supply (figure 5-14).

(b) Set variac to 115 v ac.

(c) Connect the negative lead of voltmeter AN/USM-116 to J902 and positive lead to J909.

Note

If two voltmeters are available, perform step d. However, if ~~only one voltmeter~~ is available, the positive lead must be alternately moved between J909 and J904 during step g.

(d) Connect the negative lead of the second voltmeter AN/USM-116 to J902 and positive lead to J904.

(e) Place TEST SWITCH S701 in position 12.

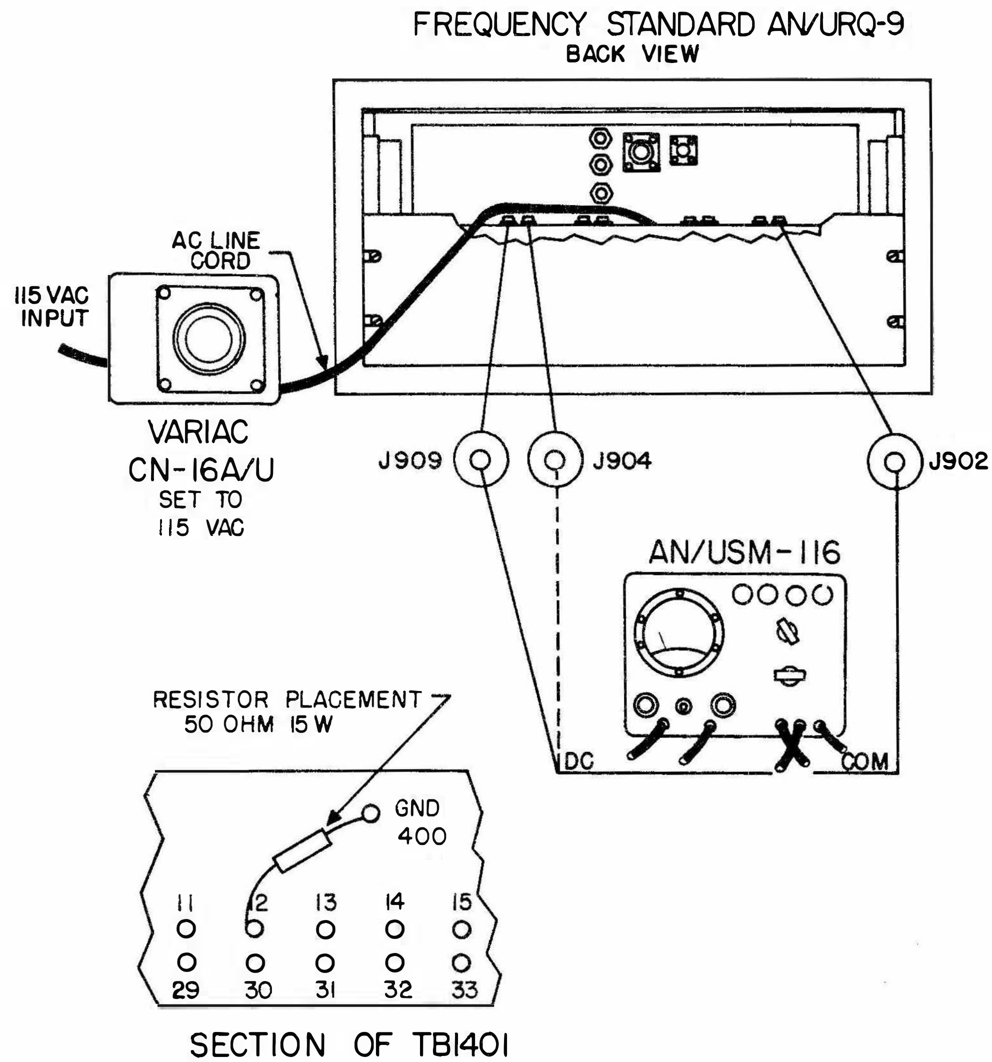


Figure 5-14. Frequency Standard Power Supply Adjustments

(f) Loosen lock nuts on resistors R903 and R913 (see figure 5-15).

(g) Alternately adjust resistors for three conditions:

1. A reading of 24.4 ± 0.5 v dc between J904 and J902.

2. A reading of 26.5 ± 1 v dc between J909 and J902.

3. A TEST METER reading of approximately 1.0 microamps.

(h) When the power supply is functioning properly, it will be possible to vary the 115 v ac input ± 11 volts without a variation of more than ± 0.2 volts in the 26.5 v dc output (voltage between J909 and J902). In addition, the following check should be performed:

1. Place TEST SWITCH S701 in position 12 and note the indicated reading of the TEST METER.

2. Connect the negative lead of voltmeter to J902 and the positive lead to J909.

3. Momentarily connect a 50 ohm, 15 watt resistor (use 50 ohm variable resistor) between pin 31 and G400 of TB1401 (figure 5-14).

4. TEST METER indicator should increase approximately 5 microamperes (example: old indication 8.5 new indication 13.5).

5. If the voltmeter does not indicate 26.5 v dc ± 0.2 v dc, refer to Section 4, Trouble Shooting.

(10) STANDBY BATTERY CIRCUITS. The standby battery circuits can be checked and adjusted as follows:

(a) Remove the standby battery (figure 5-16) from the oscillator section as described in paragraph 5-2b.

(b) Disconnect yellow lead from positive terminal of battery cell.

(c) Place battery switch S801 to ON position.

(d) Connect the test circuit as shown in figure 5-17 (the voltmeter may be connected in either position as indicated).

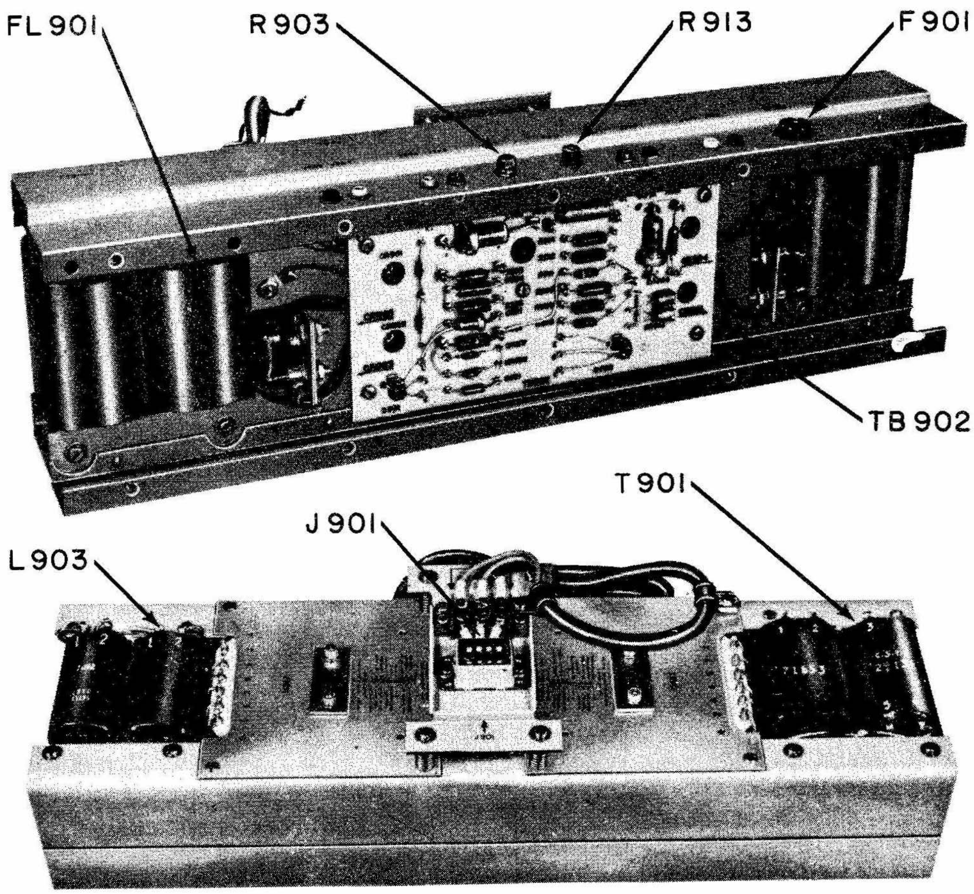


Figure 5-15. Frequency Standard Power Supply Assembly

(e) Rotate the test circuit variable resistor until the relay K801 energizes.

Note

The energized voltage should be between 20 and 26 volts.

(f) Rotate the test circuit variable resistor until the relay K801 opens.

Note

The drop-out voltage should be 18 ± 0.5 volts.

(g) If the relay opens at a voltage of more than 18 ± 0.5 volts, adjust R804 clockwise.

(11) NEW BATTERY CHECK. - When installation of a new battery power supply is necessary, the following adjustments should be made:

(a) Check power supply output as indicated in paragraph 5-b(9).

(b) After one hour of operation, check the output voltage again, and if necessary set to 26.5 v dc.

(c) After 24 hours turn TEST SWITCH S701 to position 12. If the TEST METER does not indicate zero, adjust R913 (figure 5-15) until a 1.0 microampere reading is indicated.

5-2. REMOVAL, REPAIR AND REPLACEMENT. - The design of the frequency standard provides for easy access to the replaceable and adjustable components. However, troubleshooting and repair of certain elements will require removal of a cover or of the affected subassembly (figure 1-2). As required, the following instructions should be used to permit access to any malfunction element. In addition to the instructions, a complete over all schematic is included at the end of this section as figure 5-32.

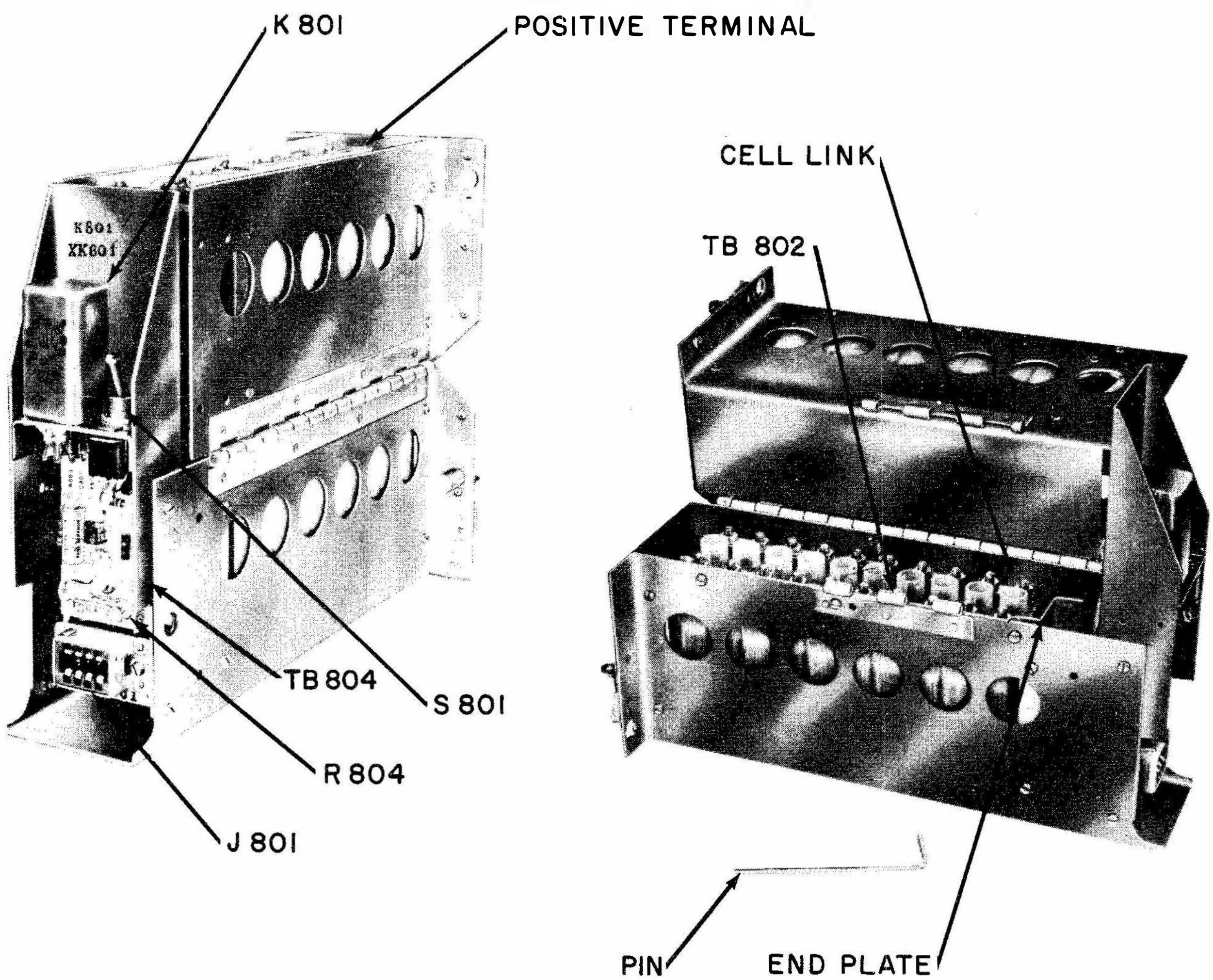


Figure 5-16. Frequency Standard Standby Battery Power Supply Assembly

a. Power Supply - For removal, repair, or replacement of power supply components (figures 5-15 and 5-18), proceed as follows:

(1) In removal of the power supply from the frequency standard case, remove the four screws by which it is attached to the rear of the case (figure 1-2).

Note

When wires or components are replaced, replacement parts should be identical to the parts removed. Replace all insulating materials as removed.

Then carefully pull the unit outward to unplug the direct-contact connector.

(2) No special instructions are necessary for disassemble and repair.

CAUTION

Do not jam the pins on the direct-contact connector, when replacing the power supply in the frequency standard case.

(3) Replacement of the power supply, in the frequency standard case, is the reverse of removal.

b. STANDBY BATTERY. - For removal, repair or replacement of battery power supply components, (figures 5-16 and 5-19), proceed as follows:

(1) To remove the battery supply, unlock the slide fasteners and carefully pull the battery power supply outward (figure 1-2).

Note

Access to the battery supply, when the oscillator section is mounted in the equipment case, is by removal of the left end cover plate.

(2) Disassemble as follows:

(a) Gain access to the lower cells by removing pin and folding top of battery to the side (figure 5-16).

(b) Remove end plate and cell links to remove cells.

(3) Battery Maintenance:

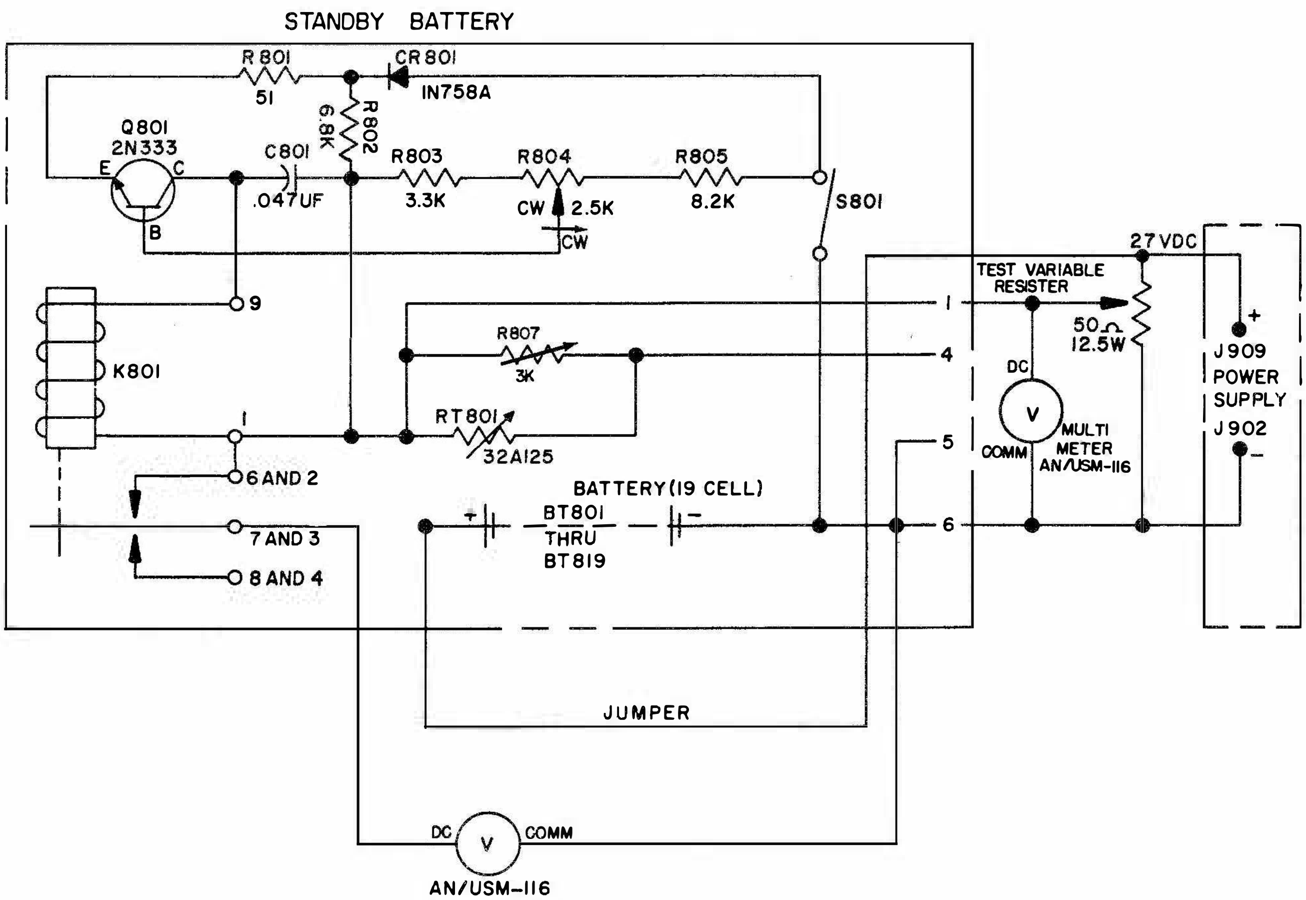


Figure 5-17. Standby Battery Power Supply Test Circuit Schematic

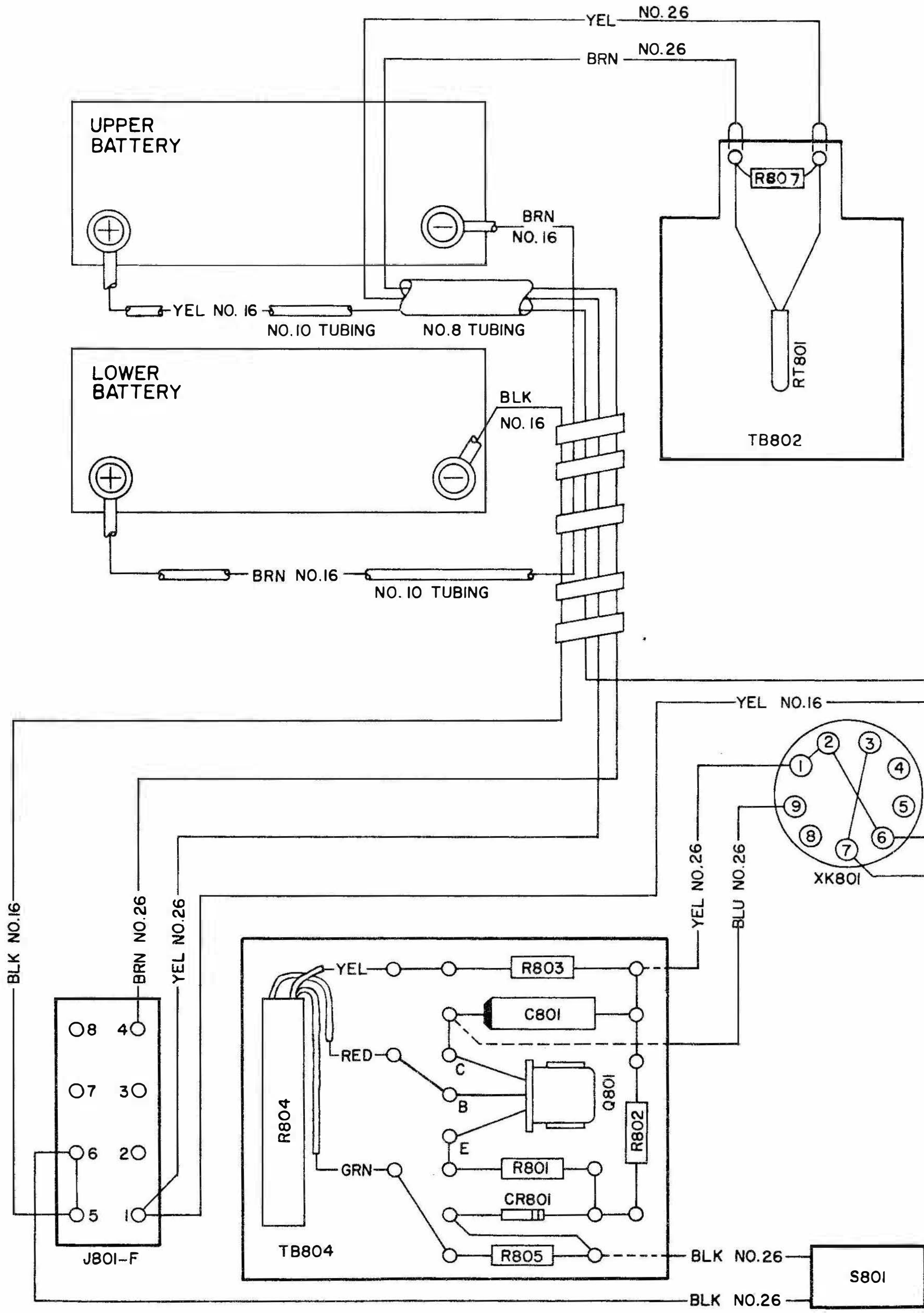


Figure 5-19. Standby Battery Power Supply Wiring Diagram

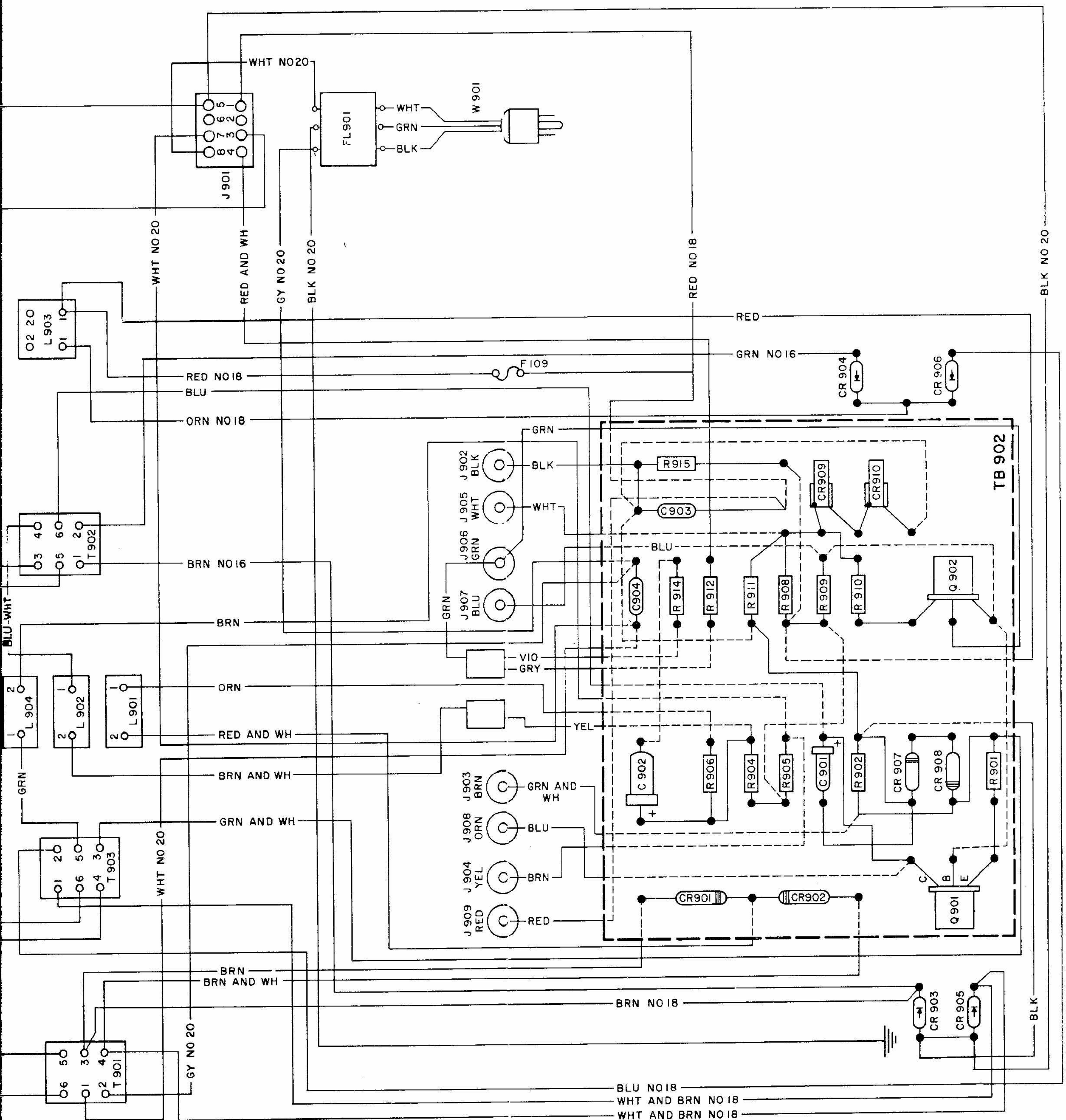
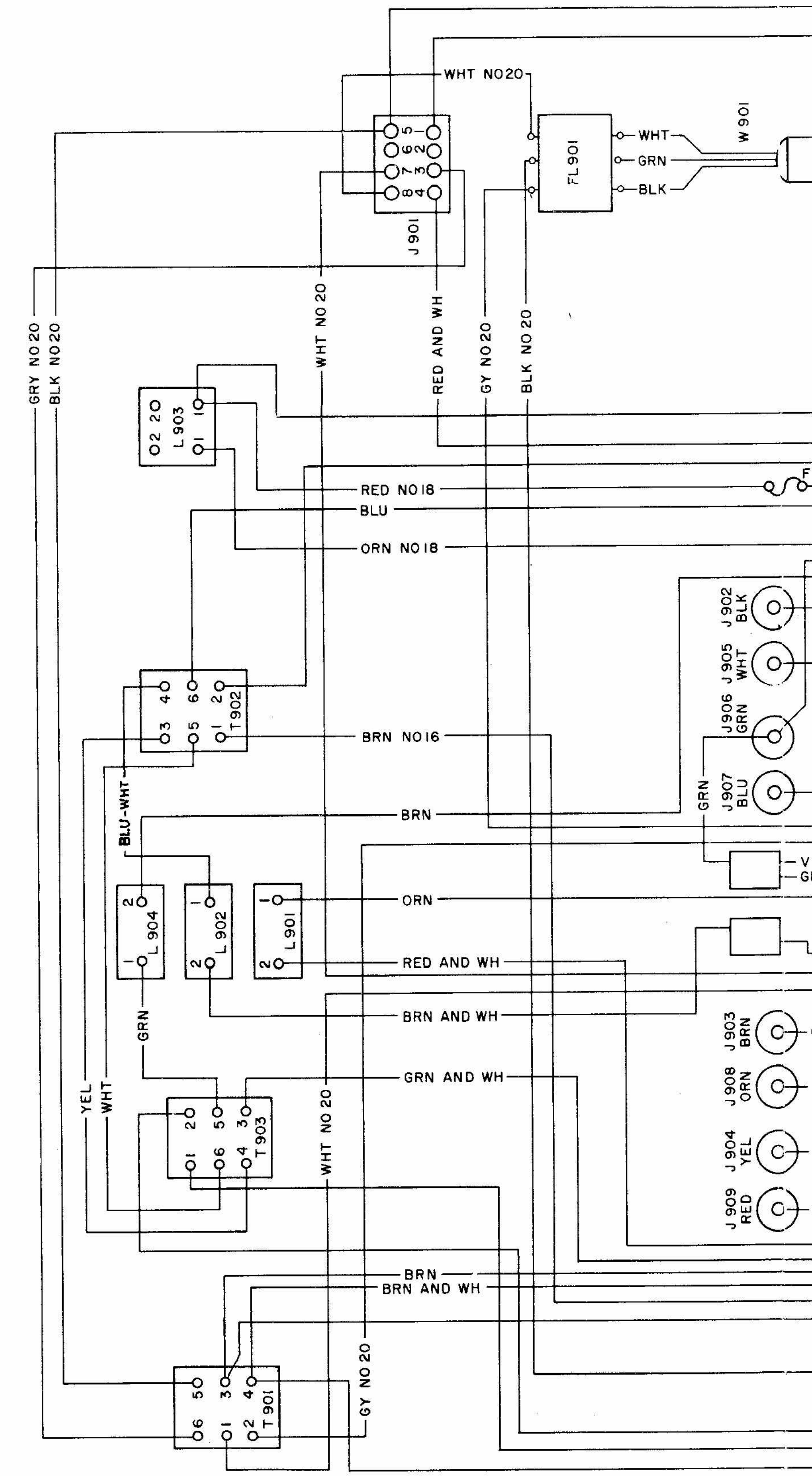


Figure 5-18. Power Supply Wiring Diagram


WHT NO20
J 901
FL 901
WHT
GRN
BLK
W 901
GRY NO 20
BLK NO 20
WHT NO 20
RED AND WH
GY NO 20
BLK NO 20
L 903
RED NO 18
BLU
ORN NO 18
J 902 BLK
J 905 WHT
J 906 GRN
J 907 BLU
T 902
BRN NO 16
BLU-WHT
BRN
GRN
L 904
L 902
L 901
ORN
RED AND WH
BRN AND WH
GRN AND WH
J 903 BRN
J 908 ORN
J 904 YEL
J 909 RED
YEL
WHT
T 903
WHT NO 20
BRN
BRN AND WH
GY NO 20
T 901

(a) The electrolyte in the battery cells is a potassium hydroxide solution.

CAUTION

Since the specific gravity of the electrolyte does not change appreciably between charge and discharge conditions of the cells, do not test the charge in the cells with a hydrometer.

(b) Before shipment, the cells of the battery were filled with the proper amount of electrolyte and charged. The amount of electrolyte in the cells is visible through the translucent sides of the cells. The level of the electrolyte in the cells is higher when the cells are charged and lower when the cells are discharged. The level of electrolyte should be maintained approximately level with the top of the plates when the battery is charged.

WARNING

The electrolyte is corrosive. Do not allow it to come in contact with your eyes or skin. If it does, immediately wash it off with large quantities of cold running water. Mild acid solutions, such as boric acid or vinegar, may be used to counteract the base after washing, but do not use basic solutions such as baking soda in water.

(c) If the level of the electrolyte becomes low, add distilled water until the electrolyte is at the correct level.

CAUTION

Do not add distilled water from a source or syringe which was used in filling an acid battery.

Note

A white crystalline deposit may appear on the tops of the battery cells. The deposit is potassium carbonate which is noncorrosive and harmless. Remove the deposit with a clean cloth.

(d) Always keep the outside of the battery clean and dry.

(4) Reassembly is the reverse of disassembly except as follows:

CAUTION

When wires or components are replaced, replacement parts should be identical to the parts removed. Replace all insulating materials as removed.

(a) Replace the rubber gaskets between the cells to maintain a snug fit.

(b) Replace pin from the rear of the battery.

c. METER SHUNTS AND CHANGEOVER RELAYS. - After removal of battery power supply, relays K701, K702, and terminal board TB701 (figure 5-20) can be removed, repaired or replaced through the opening.

CAUTION

The meter shunts should not be repaired unless depot facilities and the overhaul instruction manual are available.

d. TEST METER AND TEST SWITCH. - There are no special instructions for the removal, repair and replacement of the front panel test switch and circuitry (figure 5-21).

CAUTION

The TEST METER should not be repaired unless depot facilities and the overhaul instruction manual are available.

e. R-F OSCILLATOR ASSEMBLY. - For removal, repair or replacement of r-f oscillator (figure 1-2) sections, proceed as in paragraphs 5-2f through 5-2i. First remove the frequency oscillator from the case as follows:

CAUTION

Do not operate radio frequency oscillator section out of case more than two hours unless the filament divider switch S703 is OFF. With the filament divider switch S703 OFF, the operating time is increased by approximately one-half.

(1) Remove the front four mounting screws and pull the r-f oscillator from the case by the handles.

CAUTION

When wires or components are replaced, replacement parts should be identical to the parts removed. Replace all materials as removed.

f. OSCILLATOR - AMPLIFIER. - After removal of the radio frequency oscillator (figure 5-9 and 5-22) from the case proceed as follows:

(1) Remove cover (1 on figure 5-9) by removing four screws (2).

(2) Remove oscillator-amplifier chassis (4) by removing eight screws (3 and 5).

(3) No special instructions are needed for disassembly and repair, except the following:

(a) When tubes need replacing in the oscillator-amplifier, modify these tubes by cutting off leads 2 and 8 even with the base of the tube.

(4) In replacing the oscillator-amplifier assembly, carefully align the direct-contact connector to prevent damage to the contacts.

g. OVENS ASSEMBLY. - The ovens assembly (figures 5-23 and 5-24) should never be removed as a unit for repair unless depot facilities and the overhaul instruction manual are available.

(1) INNER OVEN TEMPERATURE CONTROL.- For removal, repair or replacement of inner oven temperature control components (figures 5-23, 5-25 and 5-26) proceed as follows:

(a) Remove radio frequency oscillator section as described in paragraph 5-2e.

(b) Remove inner oven temperature control from ovens assembly by removing two mounting screws.

(c) No special instructions are necessary for disassemblv and repair.

(d) In replacing the inner oven temperature control, carefully align the direct-contact connector to prevent damage to the contacts.

CAUTION

Carefully align the direct-contact connector.

(2) OUTER OVEN TEMPERATURE CONTROL. - For removal, repair or replacement of outer oven

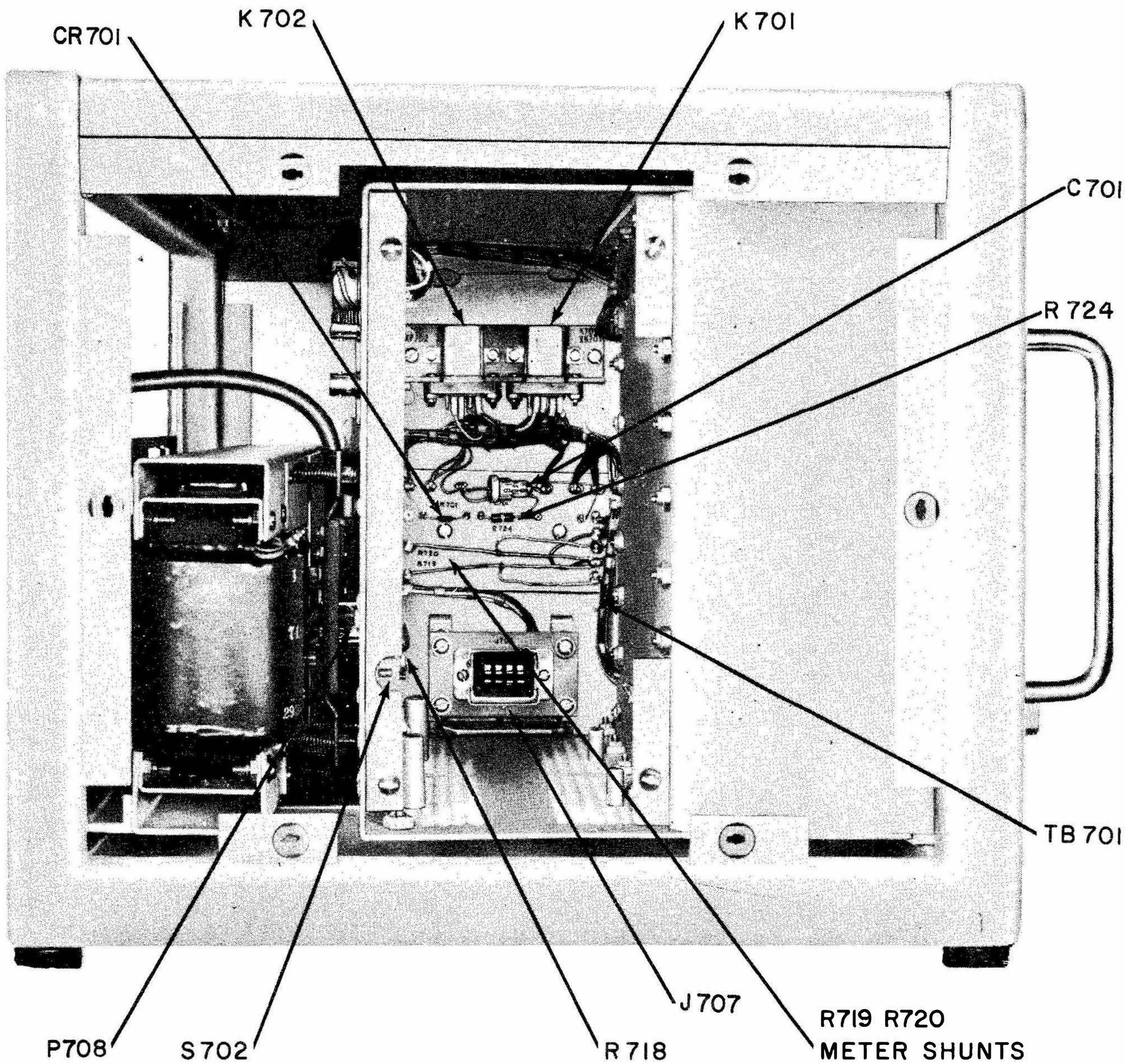


Figure 5-20. Frequency Standard Meter Shunts and Change Over Relays

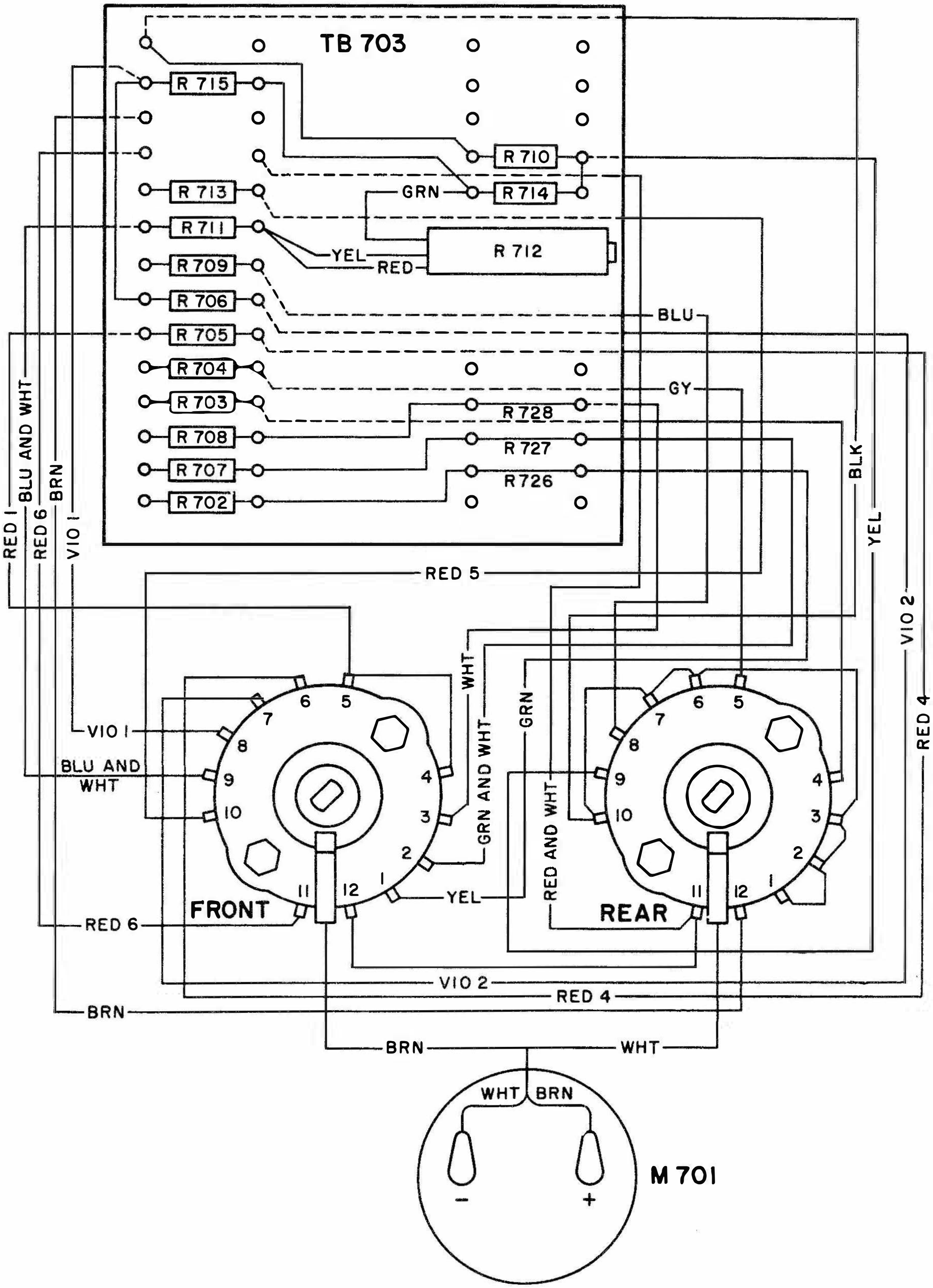


Figure 5-21. Front Panel Assembly Wiring Diagram

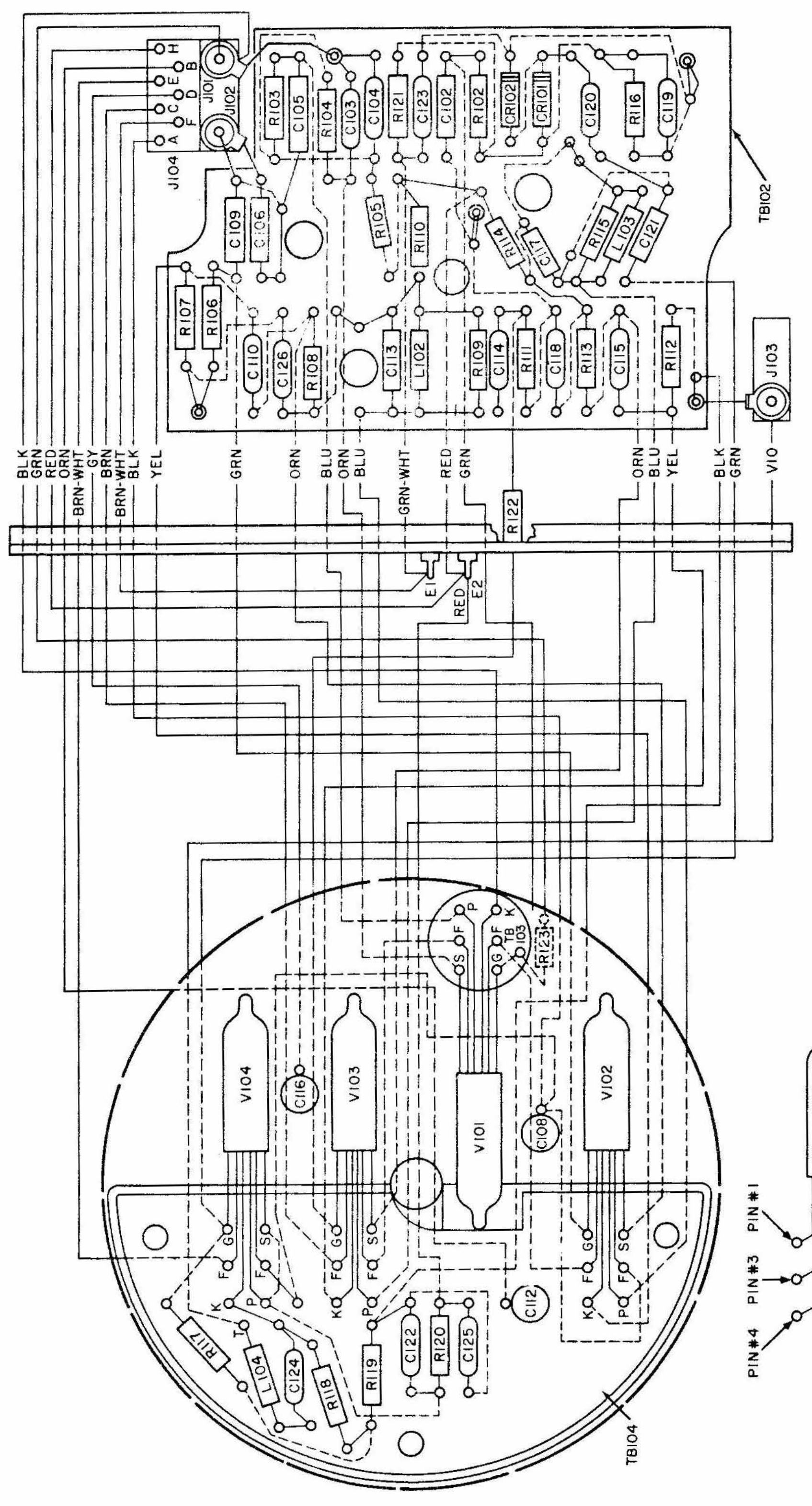
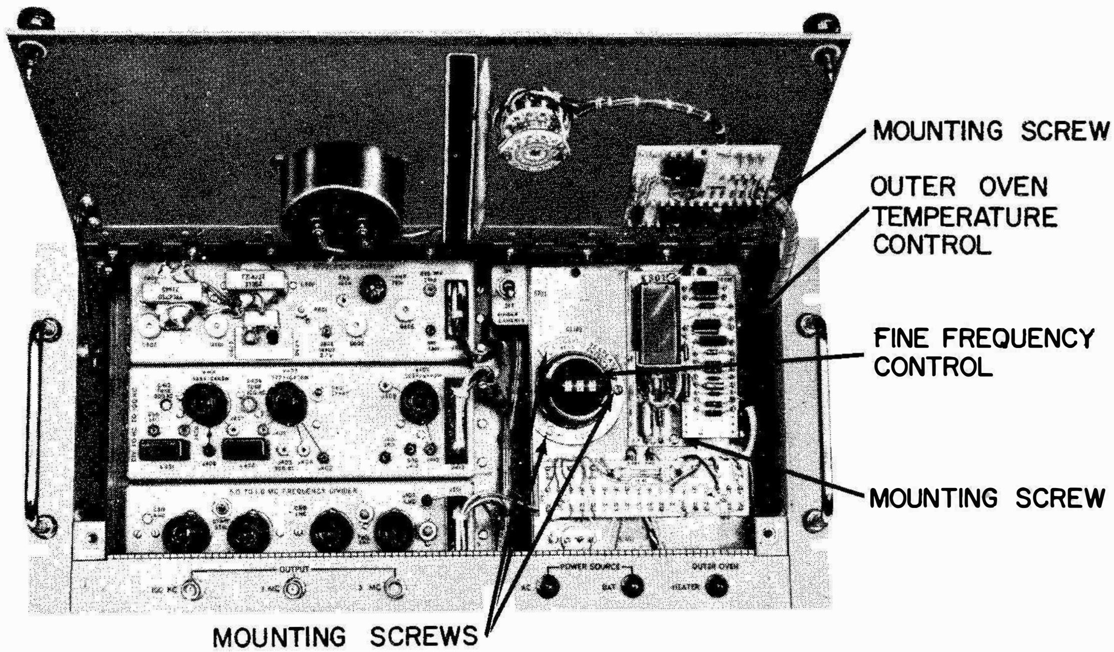


Figure 5-22. Oscillator-Amplifier Wiring Diagram



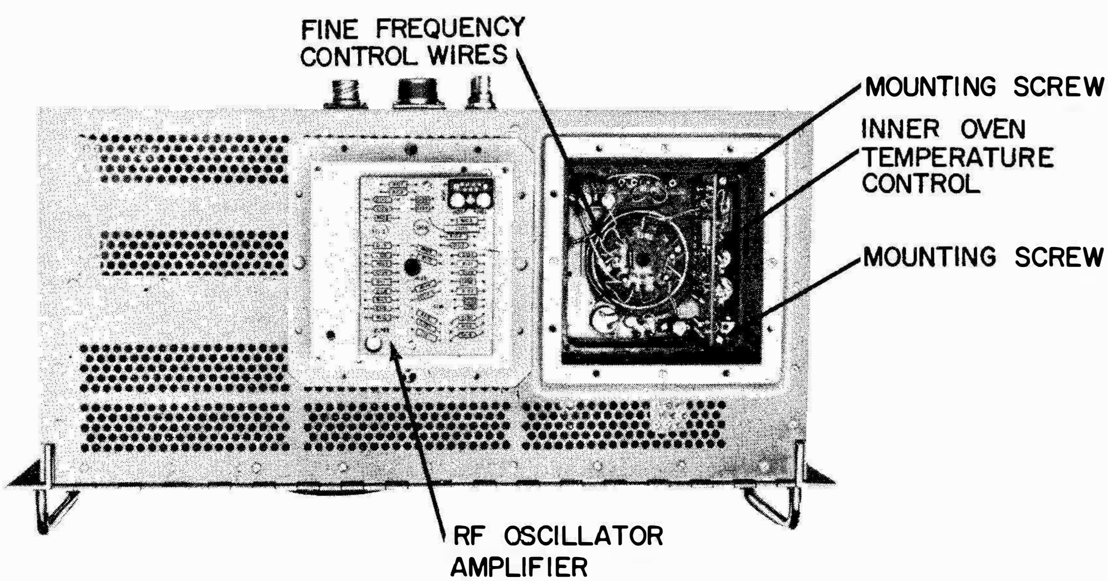


Figure 5-23. Frequency Standard Ovens Assembly

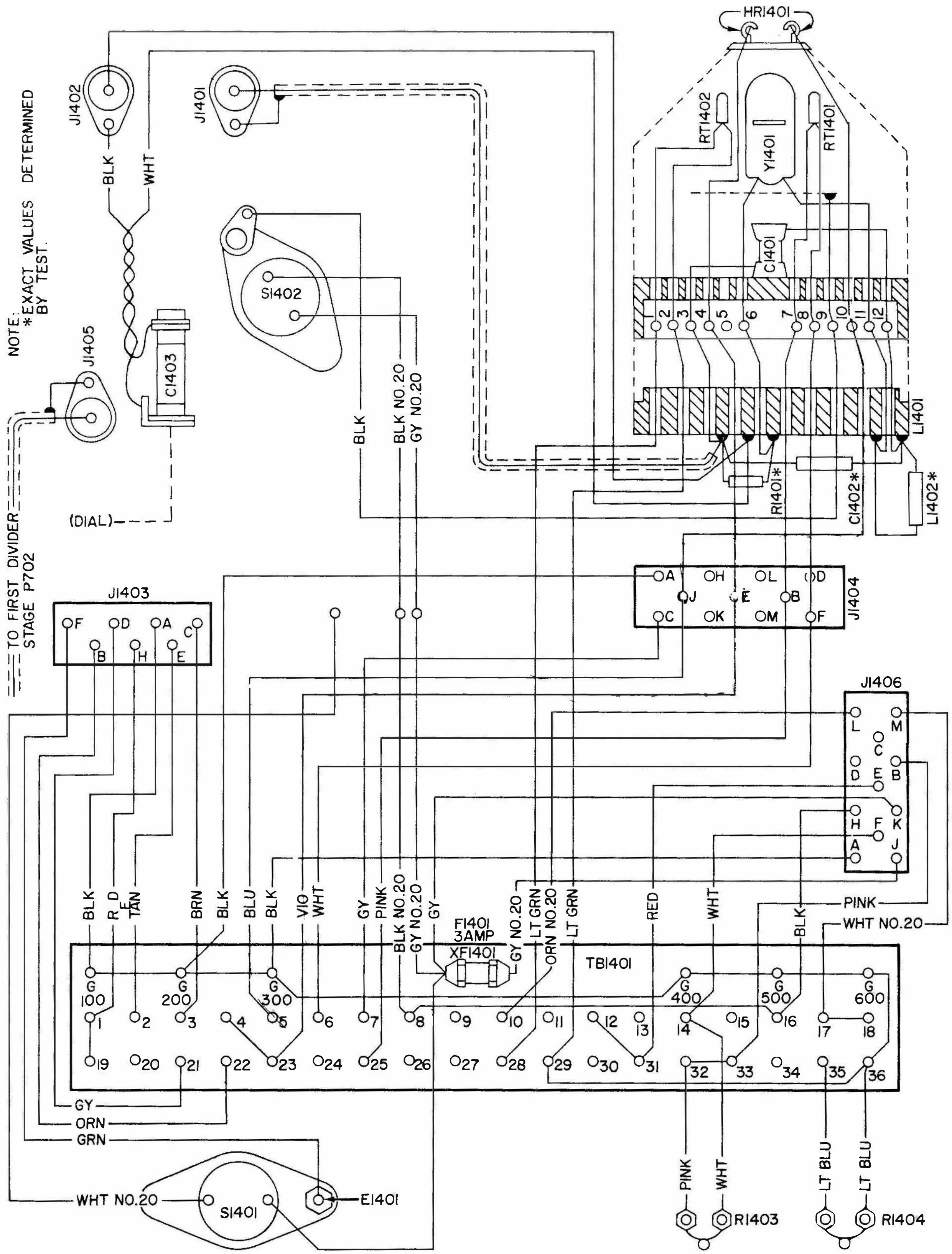


Figure 5-24. Ovens Assembly Wiring Diagram

temperature control (figures 5-23, 5-27 and 5-28), proceed as follows:

CAUTION

Move the outer oven temperature control to the left before lifting upward.

(a) Remove outer oven temperature control by removing two mounting screws and pulling the unit to the left.

(b) No special instructions are necessary for disassembly and repair.

(c) In replacing the outer oven temperature control, carefully align the direct-contact connector to prevent damage to the contacts.

(3) FINE FREQUENCY CONTROL. - For removal of the fine frequency control (figures 5-23 and 5-24), proceed as follows:

(a) Unsolder the black and white fine frequency control wires from terminals (J1402 and L1401 pin 5).

(b) Solder these wires to an 18-inch lead wire.

(c) Remove three mounting screws and pull fine frequency control outward.

Note

Do not pull lead wire out of ovens assembly. It is to be used as an aid in replacing the fine frequency control wires.

(d) Unsolder black and white wires from lead wire.

Note

Disassembly of the fine frequency control should not be attempted without depot facilities and overhaul instruction manual.

(e) Replacement is the reverse of removal.

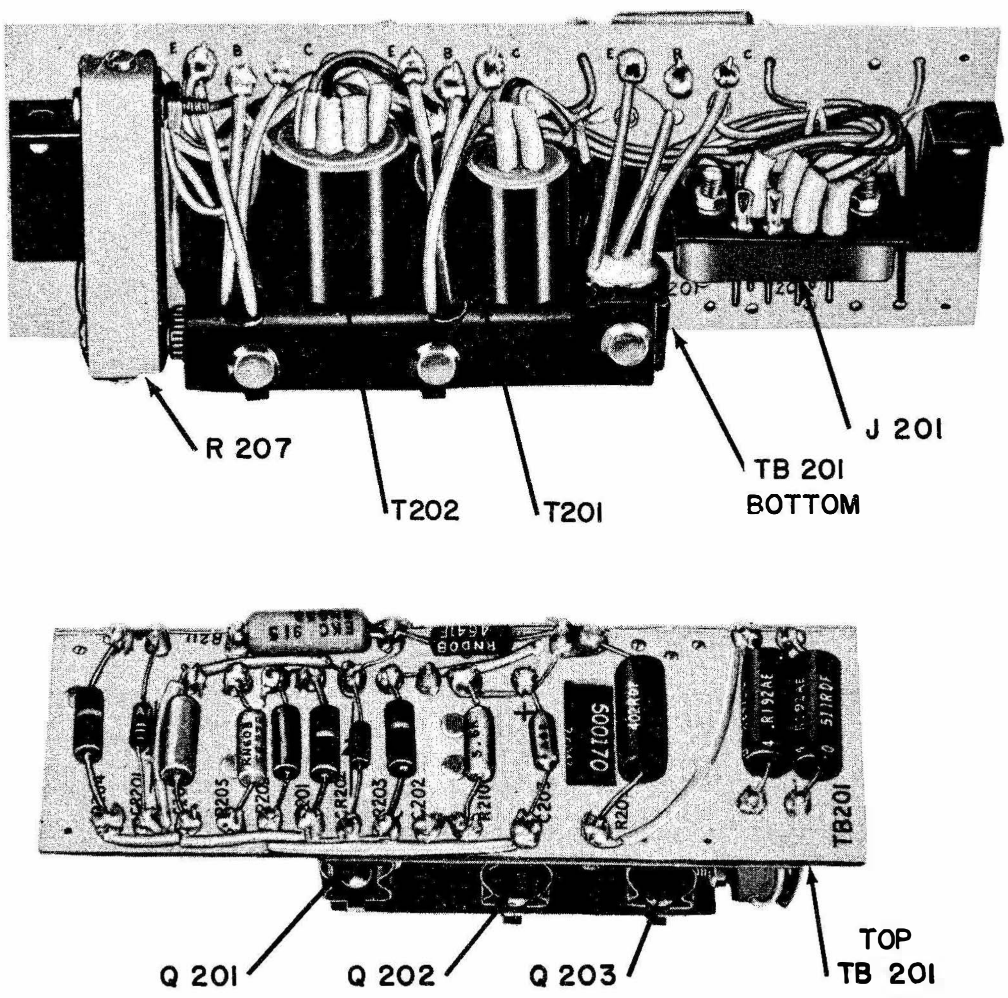
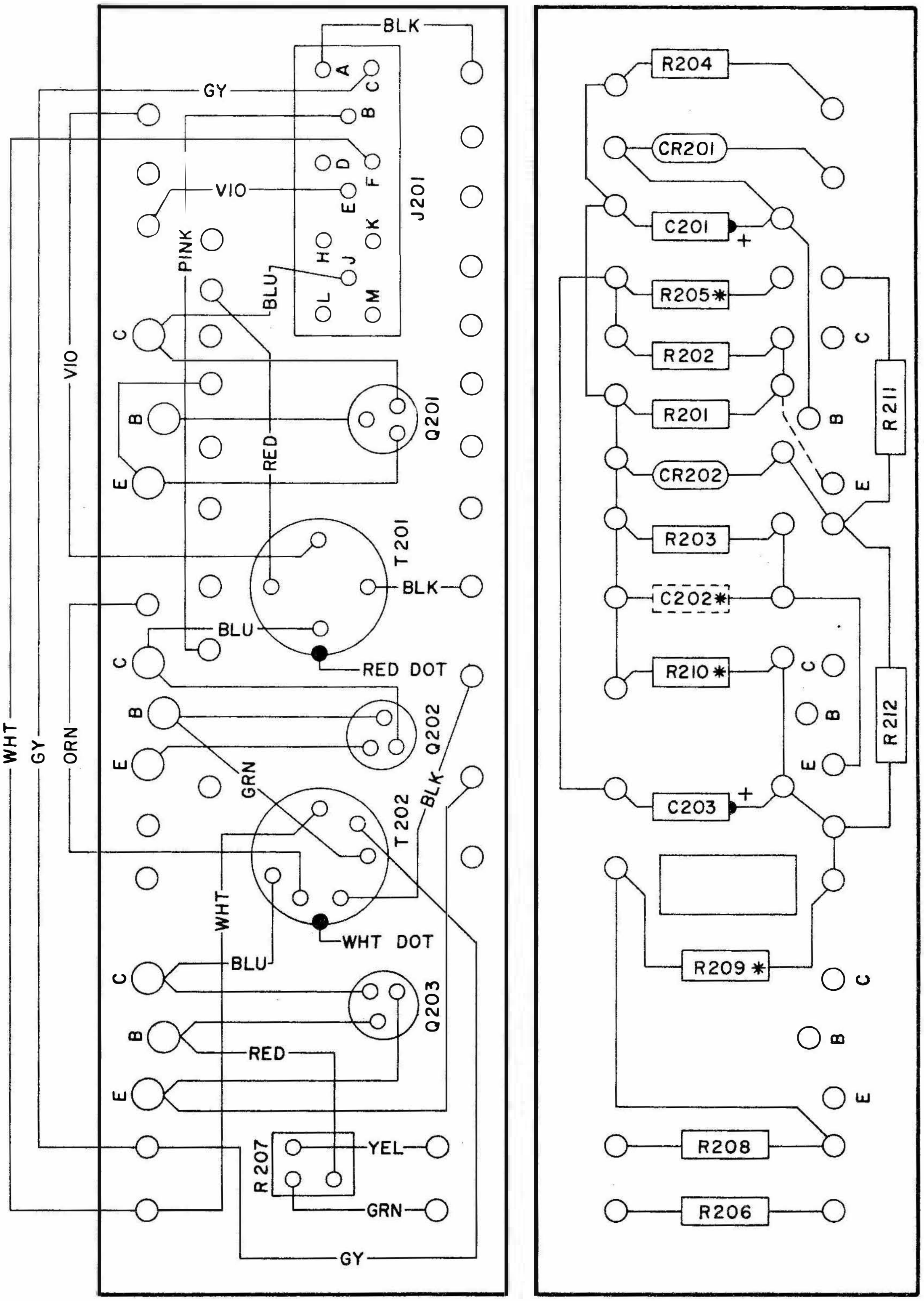


Figure 5-25. Frequency Standard Inner Oven Temperature Control Assembly



TB 201 BOTTOM

TB 201 TOP

NOTE:
+ EXACT VALUES DETERMINED BY TEST.

Figure 5-26. Inner Oven Temperature Control Wiring Diagram

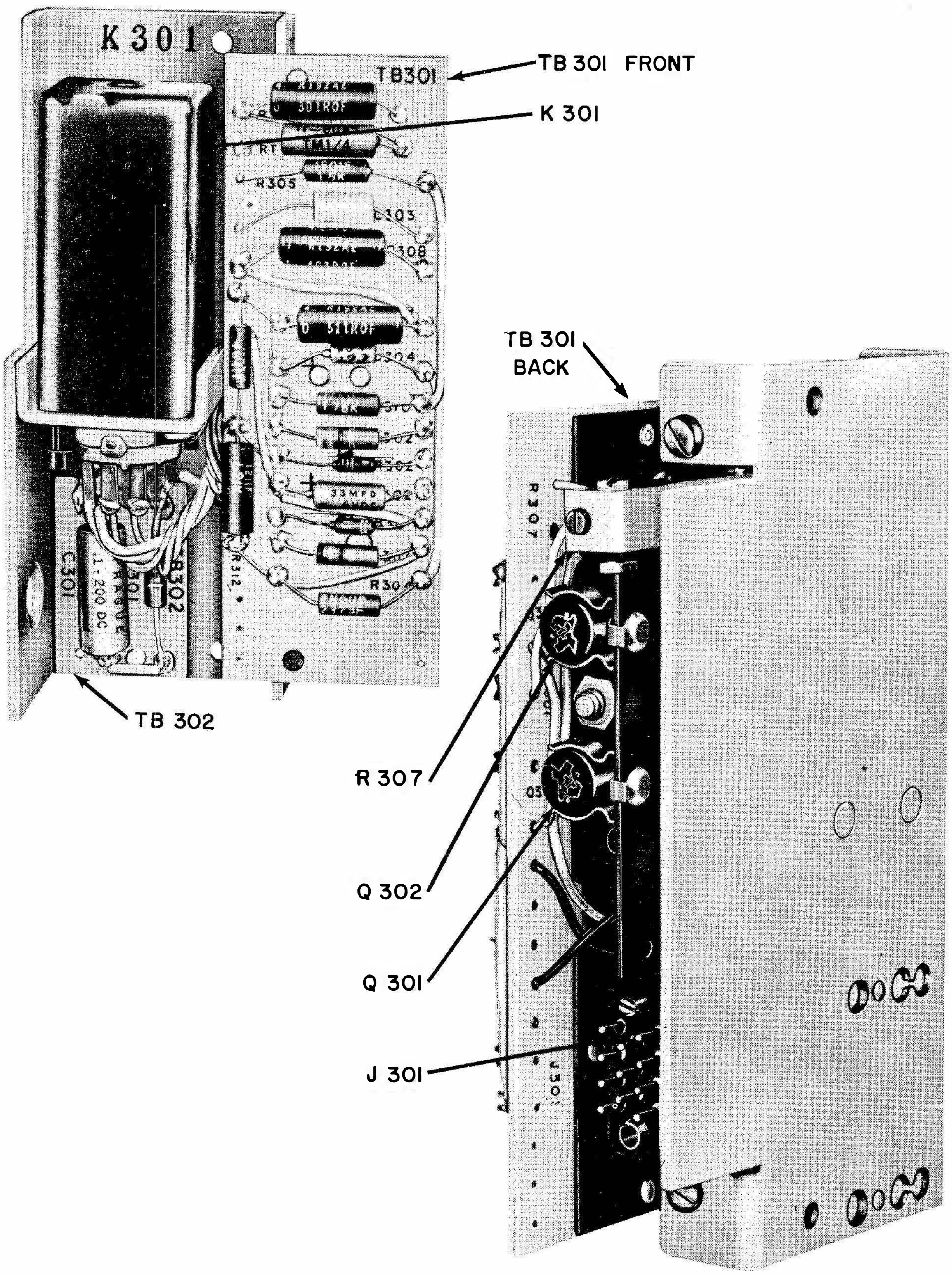


Figure 5-27. Frequency Standard Outer Oven Temperature Control Assembly

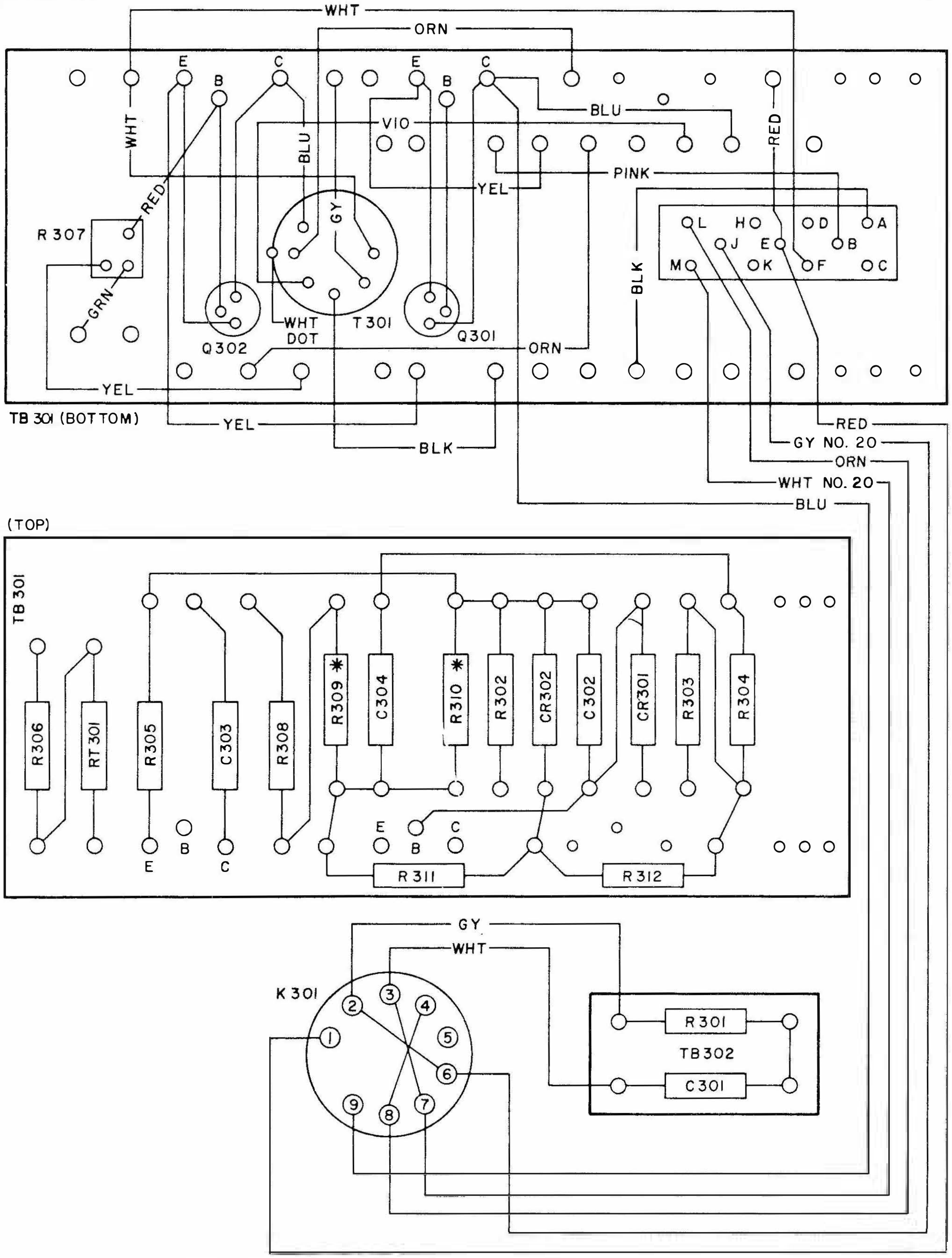


Figure 5-28. Outer Oven Temperature Control Wiring Diagram

h. FREQUENCY DIVIDERS. - The following procedure is used in the removal, repair or replacement of the frequency dividers.

(1) 1.0 MC TO 100 KC FREQUENCY DIVIDER. - To remove this frequency divider (figures 5-12 and 5-29) proceed as follows:

(a) Remove the connecting cable and connector.

(b) Remove the three mounting screws on the right of the panel.

(c) Loosen sufficiently the three mounting screws on the left of the panel to release the slotted end.

(d) Pull the unit outward.

(2) 5.0 MC TO 1.0 MC FREQUENCY DIVIDER. - To remove this frequency divider (figures 5-11 and 5-30) follow the instructions used in removal of the 1.0 mc to 100 kc Frequency Divider.

(3) No special instructions are necessary for disassembly and repair of either frequency divider.

(4) Replacement of a frequency divider is the reverse of removal. The direct-contact connector is replaced after the divider unit is mounted in place.

i. REGULATOR-CONVERTER. - For removal, repair or replacement of regulator-converter elements (figures 5-13 and 5-31), follow the instructions given for the frequency divider units in paragraph 5-2h.

j. EMERGENCY MAINTENANCE. - In addition to the emergency operation instructions given in paragraph 3-3, all functional sections of the frequency standard, except for the ovens, are plug-in assemblies. For removal and replacement of a particular functional section, refer to paragraphs 5-2 through 5-2(i).

Note

The functional sections should be pretuned. If the equipment does not function properly, upon replacement of a functional section, perform the instructions given for tuning and adjustment of the replaced section.

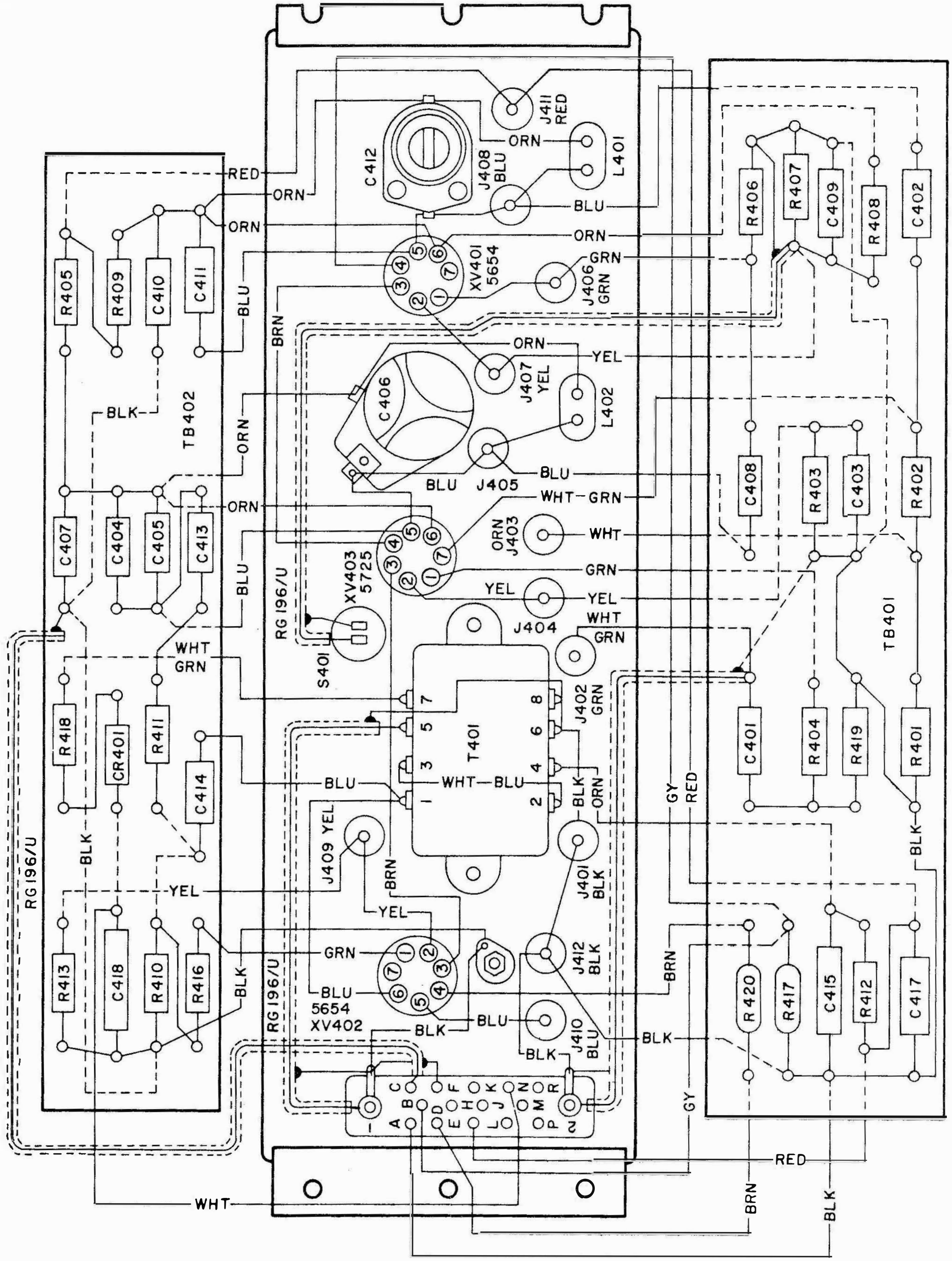


Figure 5-29. 1.0 MC to 100 KC Frequency Divider Wiring Diagram

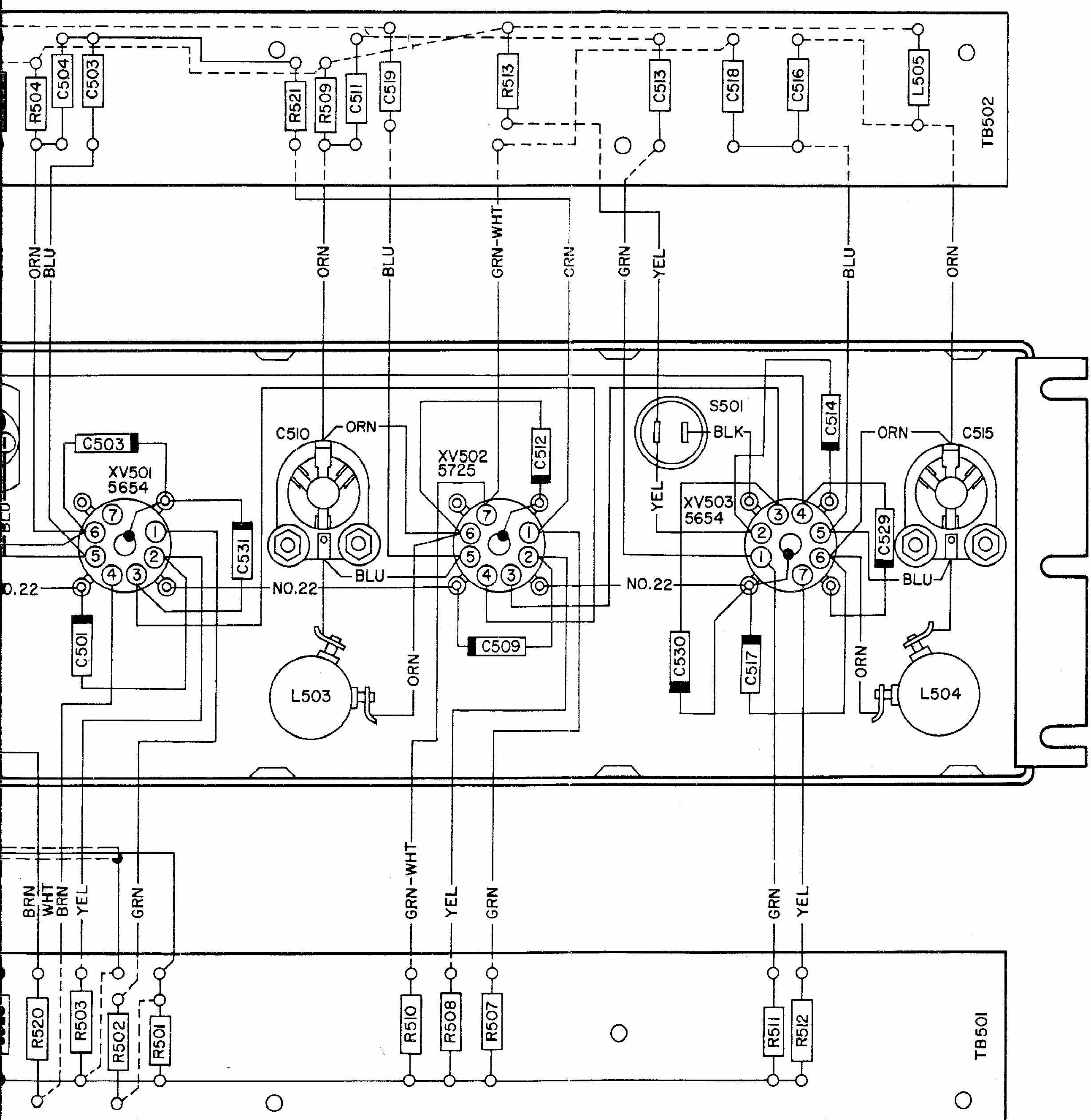
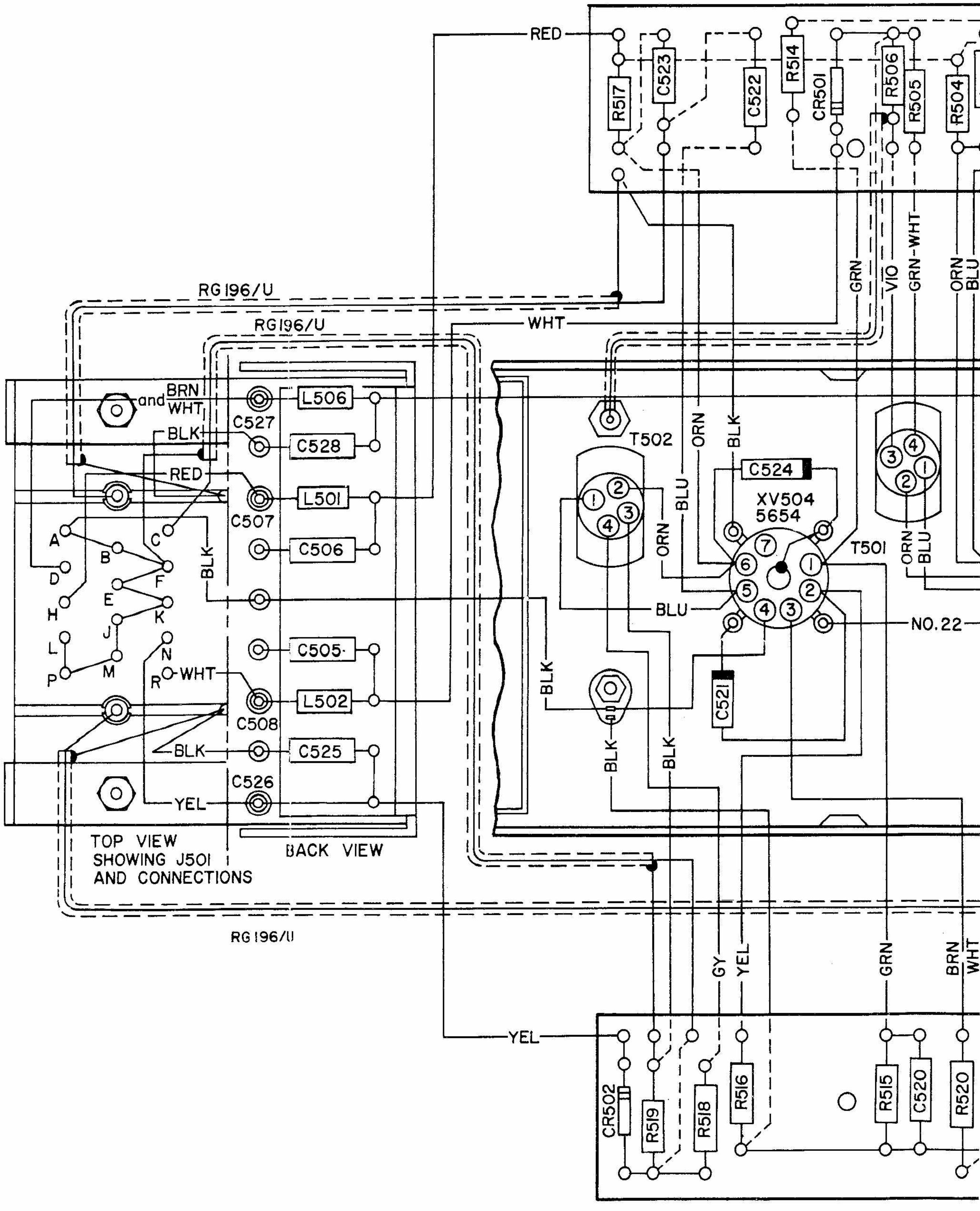


Figure 5-30. 5.0 to 1.0 MC Frequency Divider
Wiring Diagram



RED
R517
C523
C522
R514
CR501
R506
R505
R504
GRN
VIO
GRN-WHT
ORN
BLU
RG196/U
RG196/U
WHT
and BRN WHT
BLK
C527
L506
C528
RED
L501
C507
C506
T502
ORN
BLK
C524
XV504
5654
T501
BLU
ORN
ORN
BLU
A
B
C
D
F
H
E
K
J
L
N
P
M
R
WHT
C505
L502
C508
BLK
C525
C526
YEL
NO.22
BLK
BLK
BLK
C521
TOP VIEW
SHOWING J501
AND CONNECTIONS
BACK VIEW
RG196/U
GY
YEL
GRN
BRN
WHT
YEL
CR502
R519
R518
R516
R515
C520
R520

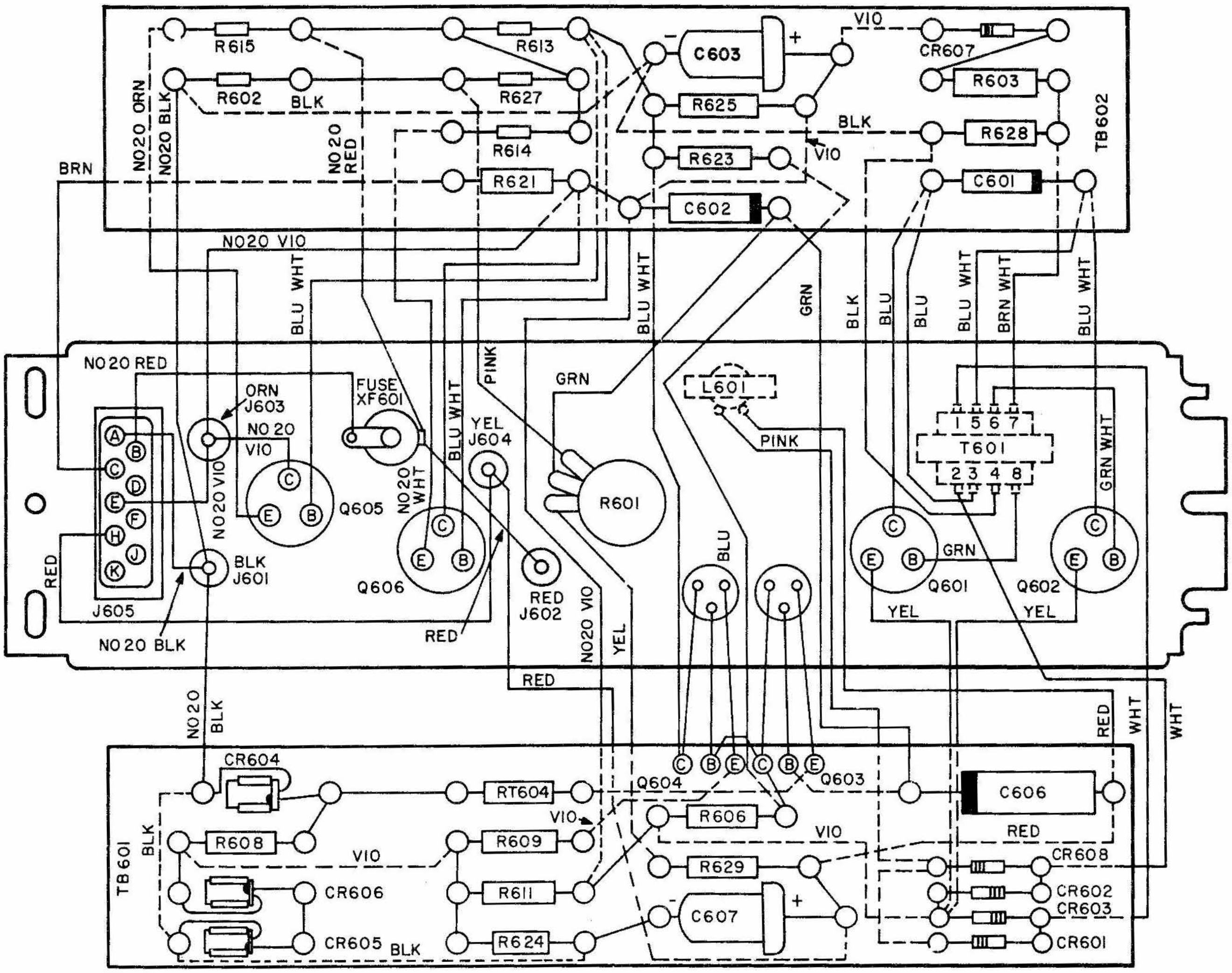


Figure 5-31. Regulator-Converter Wiring Diagram

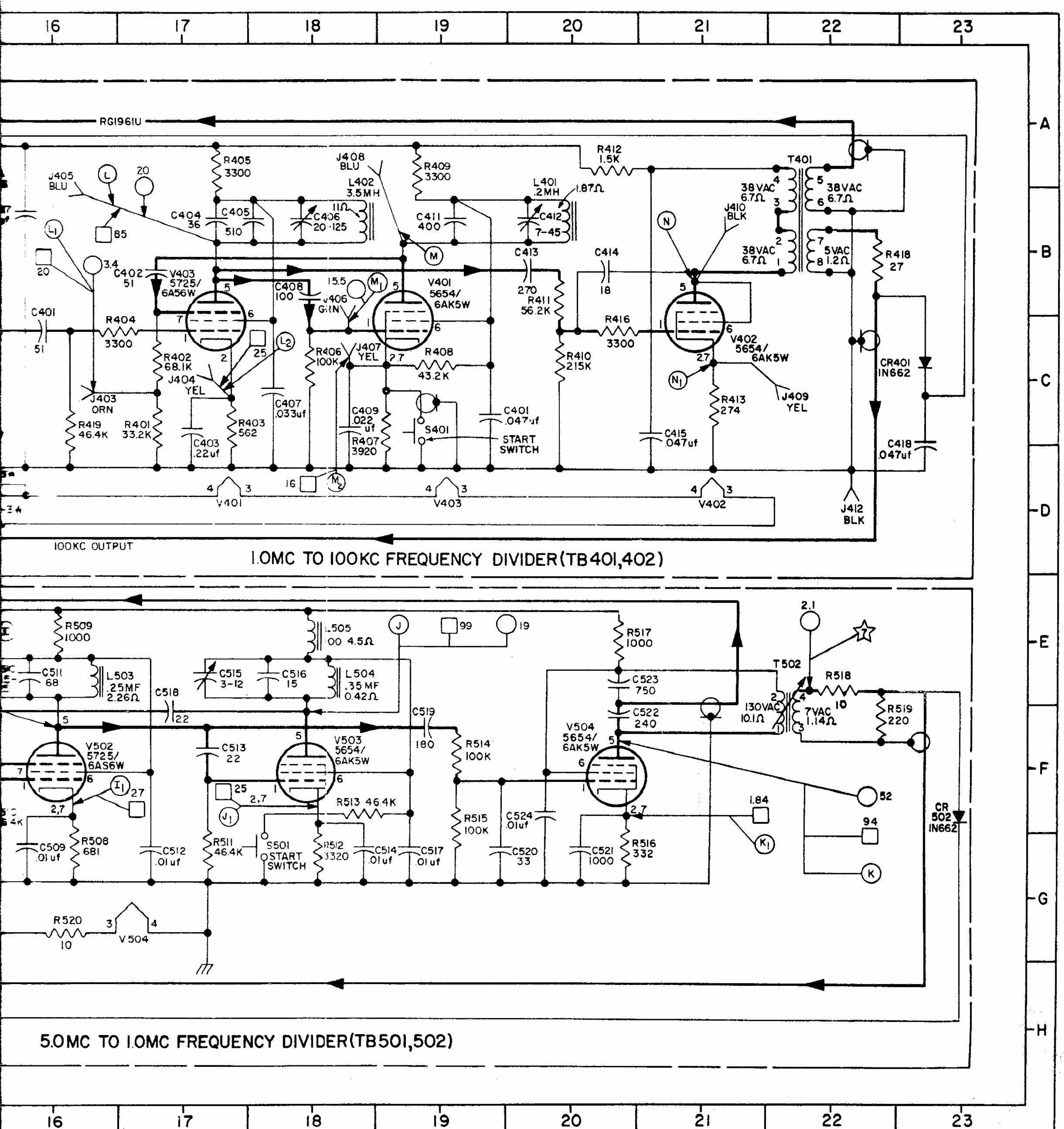
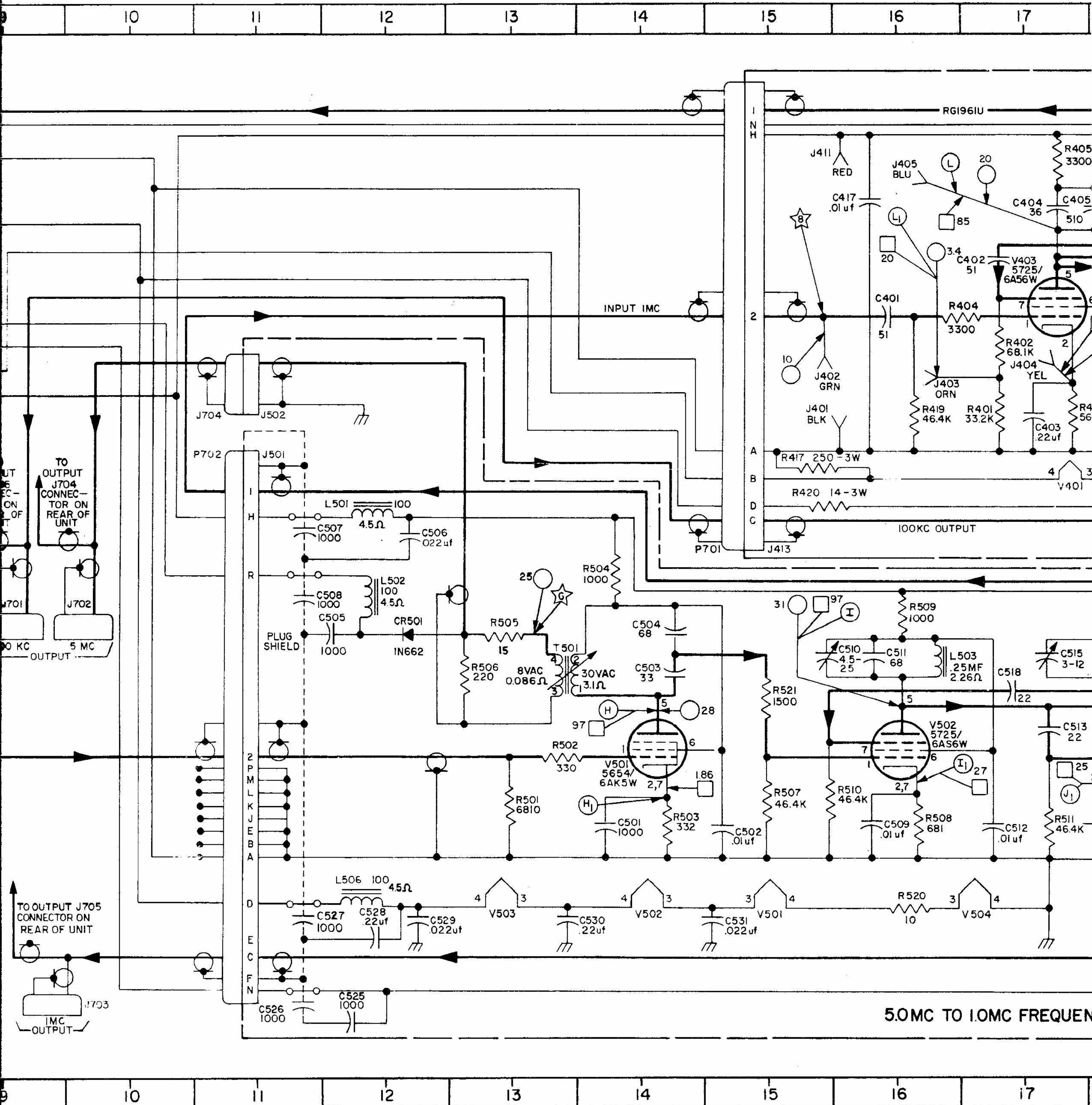
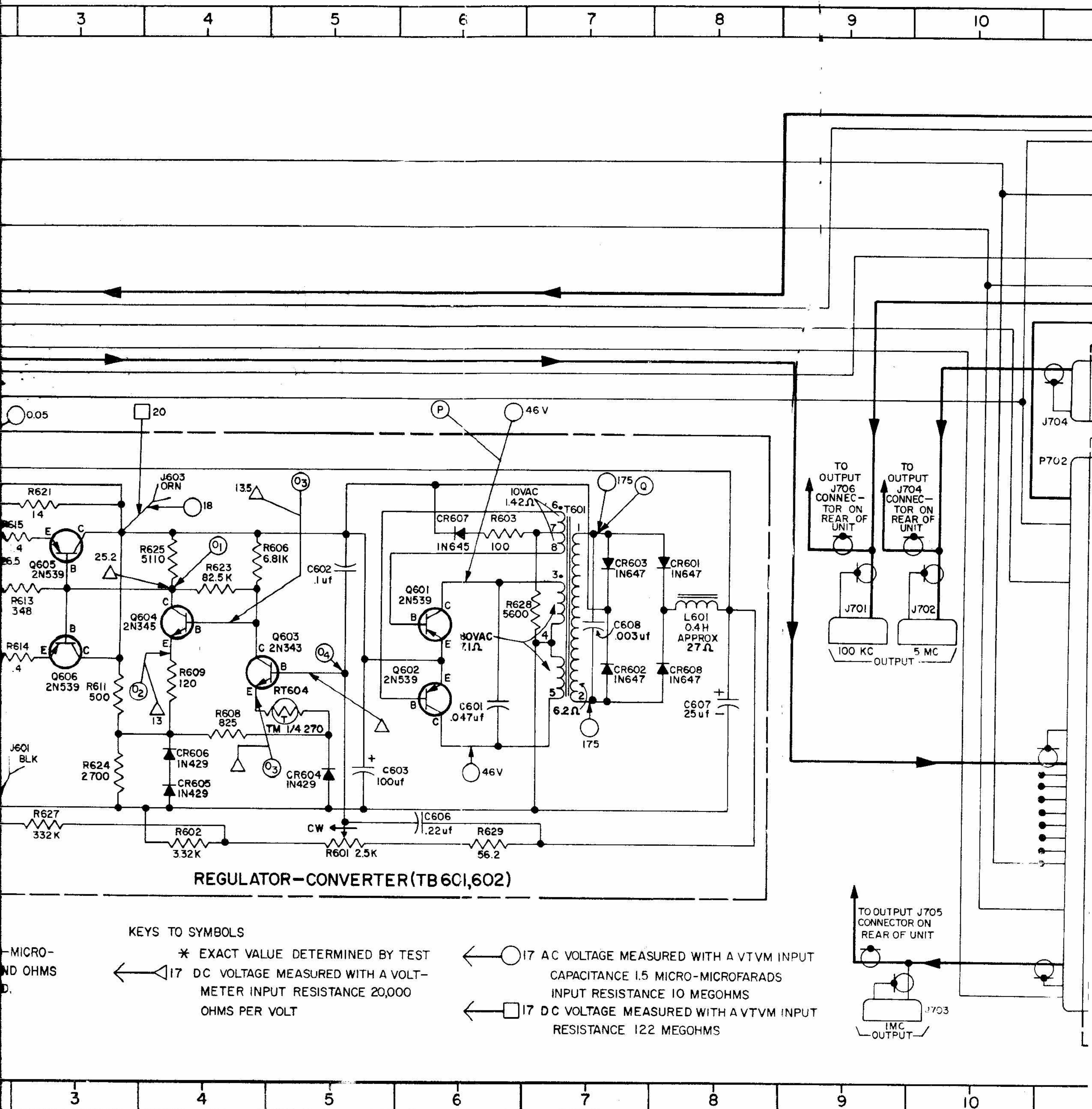


Figure 5-32. Frequency Standard AN/URQ-9 Schematic (1 of 2)



9
10
11
12
13
14
15
16
17
RG196IU
INPUT IMC
J411
RED
J405
BLU
C417
.01 uf
C404
36
C405
510
R405
3300
C402
51
V403
5725/
6AS6W
C401
51
R404
3300
R402
68.1K
J404
YEL
J403
ORN
J402
GRN
J401
BLK
R419
46.4K
R401
33.2K
C403
.22uf
R417 250-3W
R420 14-3W
V401
100KC OUTPUT
P701
J413
J704
J502
P702
J501
TO
OUTPUT
J704
CONNEC-
TOR ON
REAR OF
UNIT
J701
J702
5 MC
OUTPUT
L501
100
4.5Ω
C507
1000
C506
.022uf
L502
100
4.5Ω
C508
1000
C505
1000
PLUG
SHIELD
CR501
IN662
R505
15
R506
220
T501
8VAC
0.086Ω
30VAC
3.1Ω
R504
1000
C504
68
C503
33
R521
1500
R509
1000
C510
4.5-
25
C511
68
L503
.25MF
2.26Ω
C515
3-12
C518
22
C513
22
V502
5725/
6AS6W
R502
330
V501
5654/
6AK5W
R501
6810
C501
1000
R503
332
C502
.01uf
R507
46.4K
R510
46.4K
C509
.01uf
R508
681
C512
.01uf
R511
46.4K
L506 100
4.5Ω
C527
1000
C528
.22uf
C529
.022uf
V503
C530
.22uf
V502
C531
.022uf
V501
R520
10
V504
TO OUTPUT J705
CONNECTOR ON
REAR OF UNIT
J703
IMC
OUTPUT
C526
1000
C525
1000
5.0MC TO 1.0MC FREQUEN



-MICRO-
ND OHMS
D.

KEYS TO SYMBOLS

* EXACT VALUE DETERMINED BY TEST

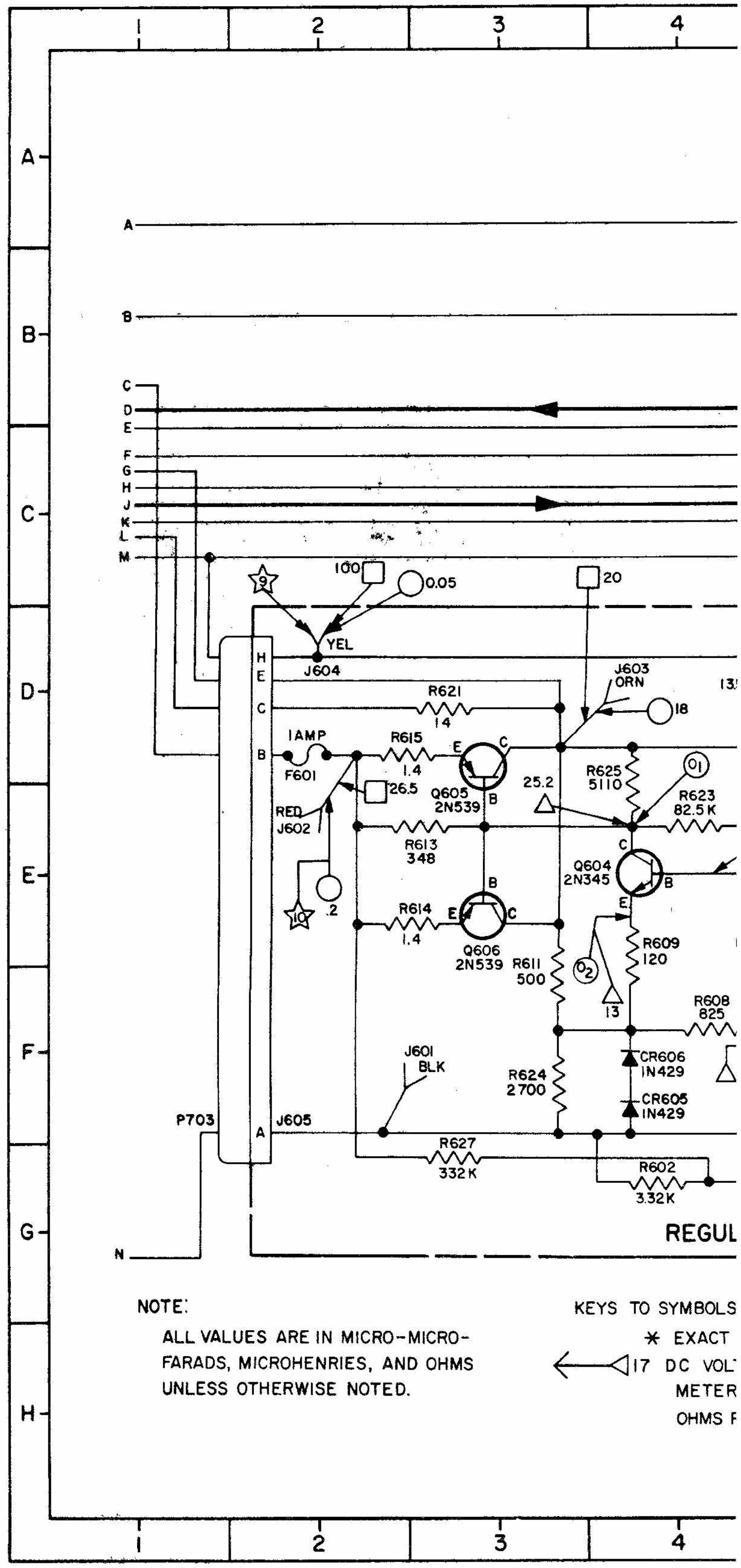
17 DC VOLTAGE MEASURED WITH A VOLTMETER INPUT RESISTANCE 20,000 OHMS PER VOLT

17 AC VOLTAGE MEASURED WITH A VTVM INPUT CAPACITANCE 1.5 MICRO-MICROFARADS INPUT RESISTANCE 10 MEGOHMS

17 DC VOLTAGE MEASURED WITH A VTVM INPUT RESISTANCE 122 MEGOHMS

ART LOCATION INDEX

LOC	REF DES	LOC	REF DES	LOC
17B	R103	5F	R714	19D
18B	R104	5F	R715	18D
15G	R105	5F	R716	17B
10B	R106	6G	R717	18B
16H	R107	6G	R718	15C
4C	R108	7F	R719	15C
2G	R109	7F	R720	15B
11, 12H	R110	7G	R724	18B
12H	R111	8G	R726	16D
3H	R112	9G	R727	17D
3E, F	R113	9F	R728	17D
13F	R114	9G	R801	12D
12G	R115	10F	R802	12D
1, 2, 3D	R116	10G	R803	12D
20, 21G	R117	11F	R804	13D
14C	R118	11F	R805	13D
20, 21A	R119	11G	R807	12C
17A	R120	12F	R901	8C
14C	R121	10G	R902	8C
11B	R122	8F	R903	8B
10C	R123	4F	R904	8B
8C	R201	2, 3D	R905	8C
9C	R202	1D	R906	9A, B
9, 10C	R203	2C	R908	9C
10B	R204	2C	R909	9B
9B	R205	1A	R910	9C
8B	R206	2A	R911	9C
10B	R207	2A	R912	10B
3H	R208	2A	R913	10C
3F	R209	3B	R914	10C
13G	R210	3B	R915	10C
1, 2, 3D	R211	3A	R1401	2, 3G
13F	R212	3B	RT301	21D
20, 21G	R301	19F	RT801	12C
20F	R302	21F	RT1401	2, 3G
19B	R303	21F	RT1402	2F
19A	R304	21F	RT1403	13F
11C	R305	21E	RT1404	13F
8F	R306	20D	S701	17, 18E
10F	R307	20D	S702	15C
12F	R308	20D	S703	21B
11B	R309	21D	S801	14C, D
6A	R310	21D	S1401	13H
7A, B	R311	21D	S1402	11H
7B	R312	22D	T201	12C
7C	R701	16G	T202	2A, B
2F	R702	16D	T301	20E
2G	R703	17E	T901	5B
16E	R704	17E	T902	6B
2D	R705	17D	T903	6C
2C	R706	18D	TB701	18, 19B
2B	R707	17D	TB703	16, 17, 18E
21F	R708	17D	V101	4F
21E	R709	18E	V102	6F
11D	R710	18E	V103	8, 9F
8B	R711	18D	V104	11F
9C	R712	18D	W901	5C
4G	R713	18D	Y1401	2G



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C104	5G	F901	10B	R106	6G
C105	5F	F1401	16H	R107	6G
C106	5F	FL901	4C	R108	7F
C108	6G	HR1401	2G	R109	7F
C109	6F	HR1402	11, 12H	R110	7G
C110	7F	HR1403	12H	R111	8G
C112	7F	J101	3H	R112	9G
C113	7F	J102	3E, F	R113	9F
C114	8F	J103	13F	R114	9G
C115	9F, G	J104	12G	R115	10
C116	9F	J202	1, 2, 3D	R116	10
C117	9F	J301	20, 21G	R117	11
C118	10F	J707	14C	R118	11
C119	10F	J709	20, 21A	R119	11
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C121	11F	J801	14C	R121	10
C122	12G	J901	11B	R122	8F
C123	11G	J902	10C	R123	4F
C124	12F	J903	8C	R201	2,
C125	12G	J904	9C	R202	1D
C126	7F, G	J905	9, 10C	R203	2C
C201	2C	J906	10B	R204	2C
C202	2C	J907	9B	R205	1A
C203	3B	J908	8B	R206	2A
C301	19F	J909	10B	R207	2A
C302	21E	J1401	3H	R208	2A
C303	20E	J1402	3F	R209	3B
C701	19B	J1403	13G	R210	3B
C801	12D	J1404	1, 2, 3D	R211	3A
C901	8C	J1405	13F	R212	3B
C902	9C	J1406	20, 21G	R301	19
C903	10C	K301	20F	R302	21
C904	4B	K701	19B	R303	21
C1402	2G	K702	19A	R304	21
C1403	3F	K801	11C	R305	21
CR101	10F	L102	8F	R306	20
CR102	11G	L103	10F	R307	20
CR201	2C	L104	12F	R308	20
CR202	3B	L708	11B	R309	21
CR302	21D, 22D	L901	6A	R310	21
CR303	20E	L902	7A, B	R311	21
CR701	18B	L903	7B	R312	22
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CR901	5B	L1401	2F	R702	16
CR902	5C	L1402	2G	R703	17
CR903	6B	M701	16E	R704	17
CR904	6B	Q201	2D	R705	17
CR905	6C	Q202	2C	R706	18
CR906	6B, C	Q203	2B	R707	17
CR907	7C	Q301	21F	R708	17
CR908	7C	Q302	21E	R709	18
CR909	9C	Q801	11D	R710	18
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CR1401	2H	Q902	9C	R712	18
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PART LOCATION INDEX

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C105	5F	F1401	16H	R107	6G	R718	15C
C106	5F	FL901	4C	R108	7F	R719	15C
C108	6G	HR1401	2G	R109	7F	R720	15B
C109	6F	HR1402	11, 12H	R110	7G	R724	18B
C110	7F	HR1403	12H	R111	8G	R726	16D
C112	7F	J101	3H	R112	9G	R727	17D
C113	7F	J102	3E, F	R113	9F	R728	17D
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C115	9F, G	J104	12G	R115	10F	R802	12D
C116	9F	J202	1, 2, 3D	R116	10G	R803	12D
C117	9F	J301	20, 21G	R117	11F	R804	13D
C118	10F	J707	14C	R118	11F	R805	13D
C119	10F	J709	20, 21A	R119	11G	R807	12C
C120	11F	J710	17A	R120	12F	R901	8C
C121	11F	J801	14C	R121	10G	R902	8C
C122	12G	J901	11B	R122	8F	R903	8B
C123	11G	J902	10C	R123	4F	R904	8B
C124	12F	J903	8C	R201	2, 3D	R905	8C
C125	12G	J904	9C	R202	1D	R906	9A, B
C126	7F, G	J905	9, 10C	R203	2C	R908	9C
C201	2C	J906	10B	R204	2C	R909	9B
C202	2C	J907	9B	R205	1A	R910	9C
C203	3B	J908	8B	R206	2A	R911	9C
C301	19F	J909	10B	R207	2A	R912	10B
C302	21E	J1401	3H	R208	2A	R913	10C
C303	20E	J1402	3F	R209	3B	R914	10C
C701	19B	J1403	13G	R210	3B	R915	10C
C801	12D	J1404	1, 2, 3D	R211	3A	R1401	2, 3G
C901	8C	J1405	13F	R212	3B	RT301	21D
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C904	4B	K701	19B	R303	21F	RT1402	2F
C1402	2G	K702	19A	R304	21F	RT1403	13F
C1403	3F	K801	11C	R305	21E	RT1404	13F
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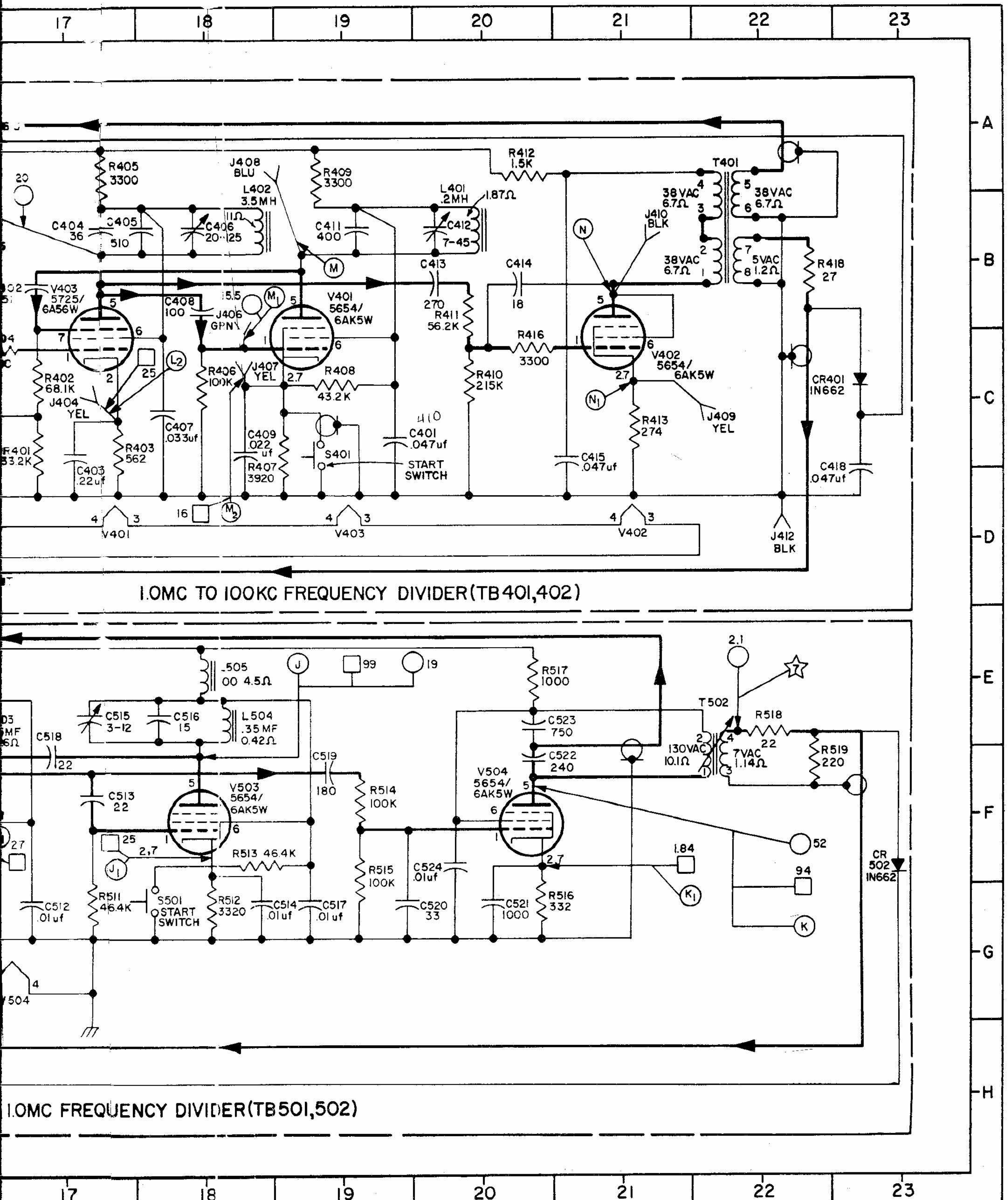
CR102	11G	L103	10F	R307	20D	S702	15C
CR201	2C	L104	12F	R308	20D	S703	21B
CR202	3B	L708	11B	R309	21D	S801	14C, D
CR302	21D, 22D	L901	6A	R310	21D	S1401	13H
CR303	20E	L902	7A, B	R311	21D	S1402	11H
CR701	18B	L903	7B	R312	22D	T201	12C
CR801	12D	L904	7C	R701	16G	T202	2A, B
CR901	5B	L1401	2F	R702	16D	T301	20E
CR902	5C	L1402	2G	R703	17E	T901	5B
CR903	6B	M701	16E	R704	17E	T902	6B
CR904	6B	Q201	2D	R705	17D	T903	6C
CR905	6C	Q202	2C	R706	18D	TB701	18, 19B
CR906	6B, C	Q203	2B	R707	17D	TB703	16, 17, 18E
CR907	7C	Q301	21F	R708	17D	V101	4F
CR908	7C	Q302	21E	R709	18E	V102	6F
CR909	9C	Q801	11D	R710	18E	V103	8, 9F
CR910	9C	Q901	8B	R711	18D	V104	11F
CR1401	2H	Q902	9C	R712	18D	W901	5C
DS701	16G	R102	4G	R713	18D	Y1401	2G

Figure 5-32. Frequency Standard AN/URQ-9 Schematic (1 of 2)

Figure
5-32



REF
DES

BT801 to B
C102
C103
C104
C105
C106
C108
C109
C110
C112
C113
C114
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C117
C118
C119
C120
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C123
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C125
C126
C201
C202
C203
C301
C302
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C701
C801
C901
C902
C903
C904
C1402
C1403
CR101
CR102
CR201
CR202
CR302
CR303
CR701
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CR904
CR905
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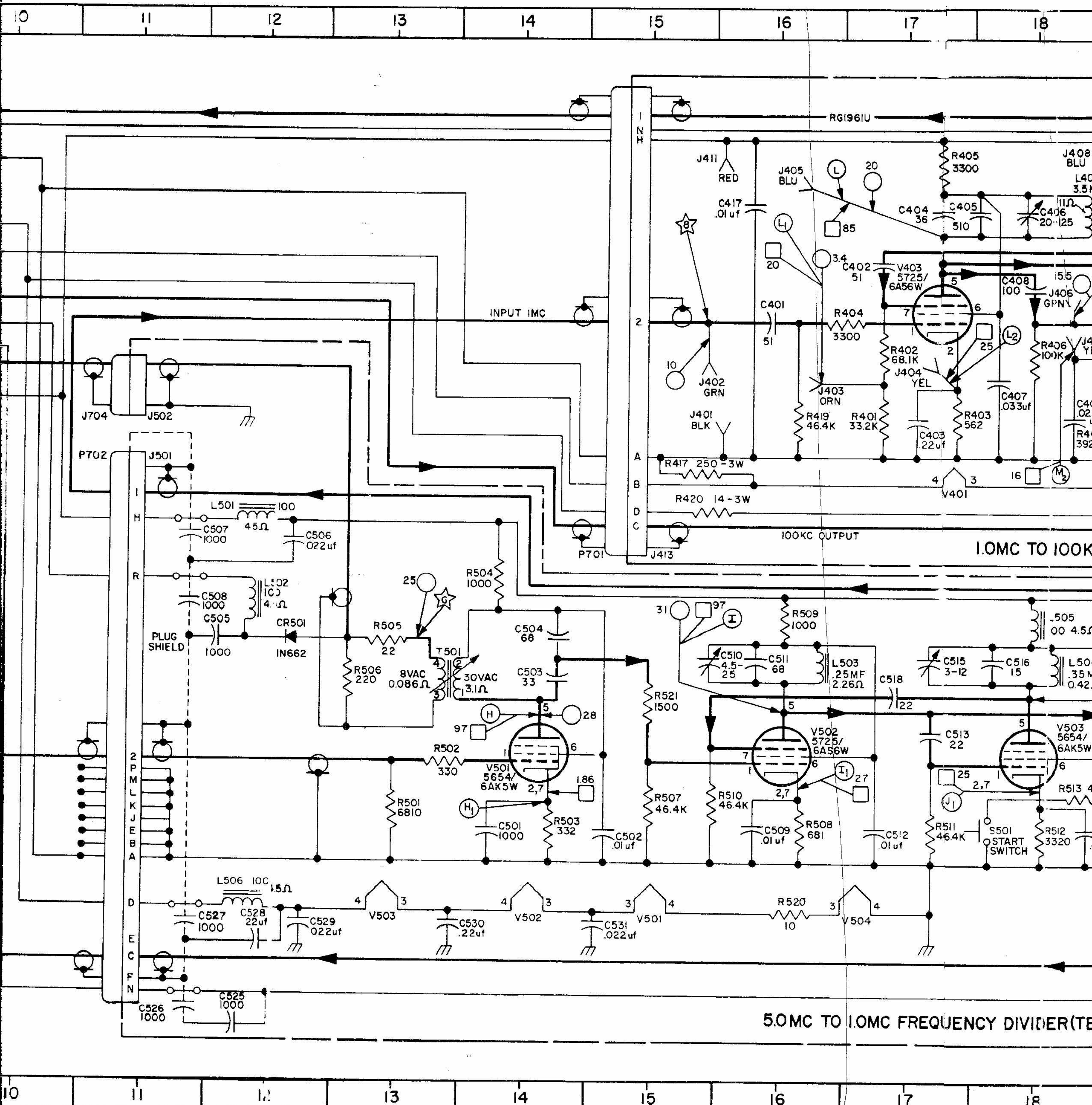
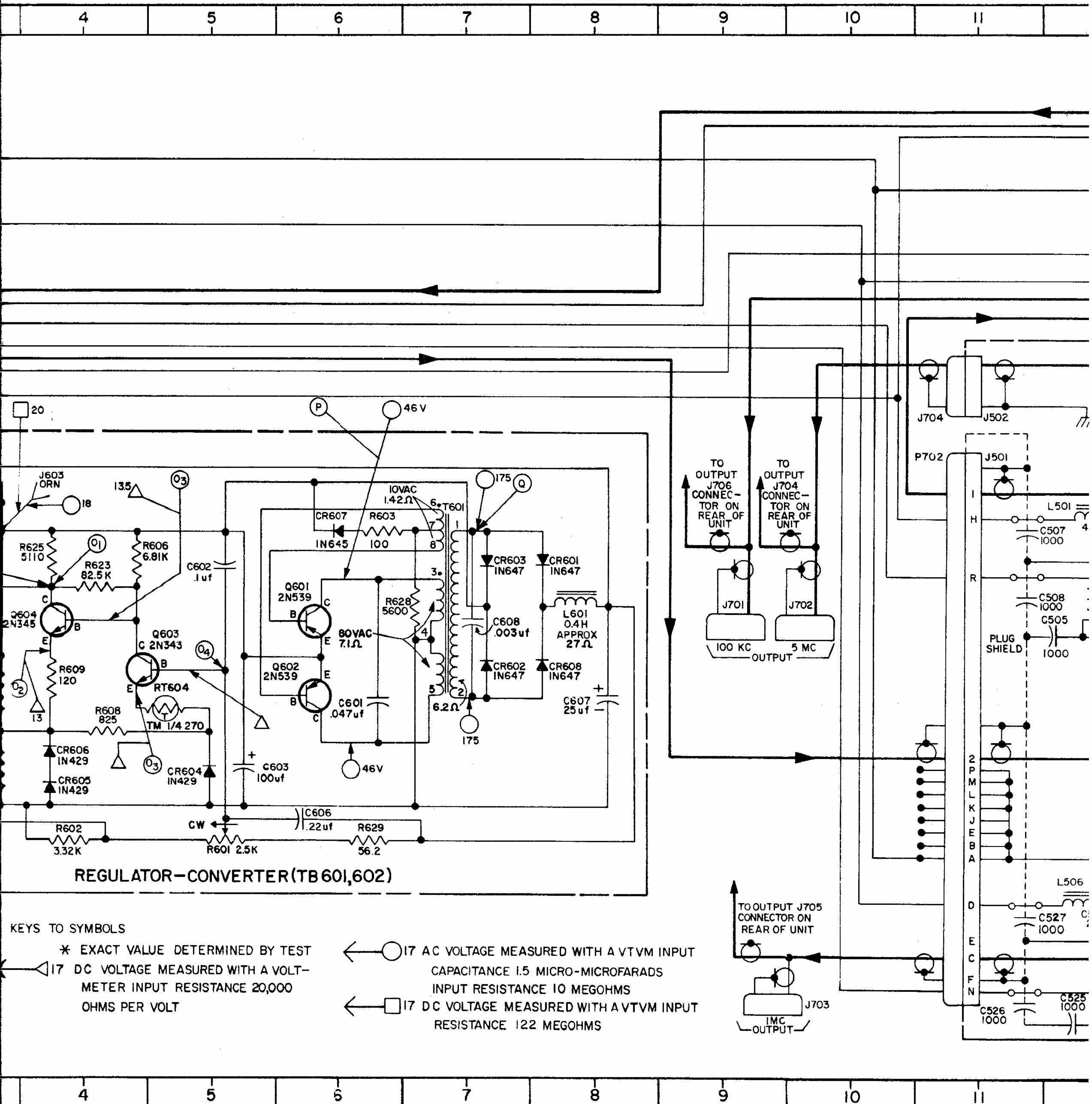
CR907
CR908
CR909
CR910
CR1401
DS701



10 11 12 13 14 15 16 17 18
RG196IU
INPUT IMC
100KC OUTPUT
1.0MC TO 100K
5.0MC TO 1.0MC FREQUENCY DIVIDER(TE
J411 RED
J405 BLU
J408 BLU
R405 3300
C417 .01uf
C404 36
C405 510
C406 20-125
C402 51
V403 5725/ 6AS6W
C408 100
J406 GRN
C401 51
R404 3300
R402 68.1K
J404 YEL
J403 ORN
J402 GRN
J401 BLK
R419 46.4K
R401 33.2K
C403 .22uf
R403 562
C407 .033uf
R406 100K
R417 250-3W
R420 14-3W
V401
P701
J413
J704
J502
P702
J501
L501 100 45Ω
C507 1000
C506 .022uf
C508 1000
L502 100 4.5Ω
C505 1000
PLUG SHIELD
CR501 IN662
R504 1000
R505 22
T501
8VAC 0.086Ω
30VAC 3.1Ω
R506 220
C504 68
C503 33
R521 1500
R509 1000
C510 4.5-25
C511 68
L503 .25MF 2.26Ω
C518 22
C515 3-12
C516 15
L505 100 4.5Ω
V502 5725/ 6AS6W
V503 5654/ 6AK5W
C513 22
R502 330
V501 5654/ 6AK5W
R501 6810
C501 1000
R503 332
C502 .01uf
R507 46.4K
R510 46.4K
C509 .01uf
R508 681
C512 .01uf
R511 46.4K
S501 START SWITCH
R512 3320
L506 100 4.5Ω
C527 1000
C528 22uf
C529 .022uf
C530 .22uf
C531 .022uf
R520 10
V504
C526 1000
C525 1000



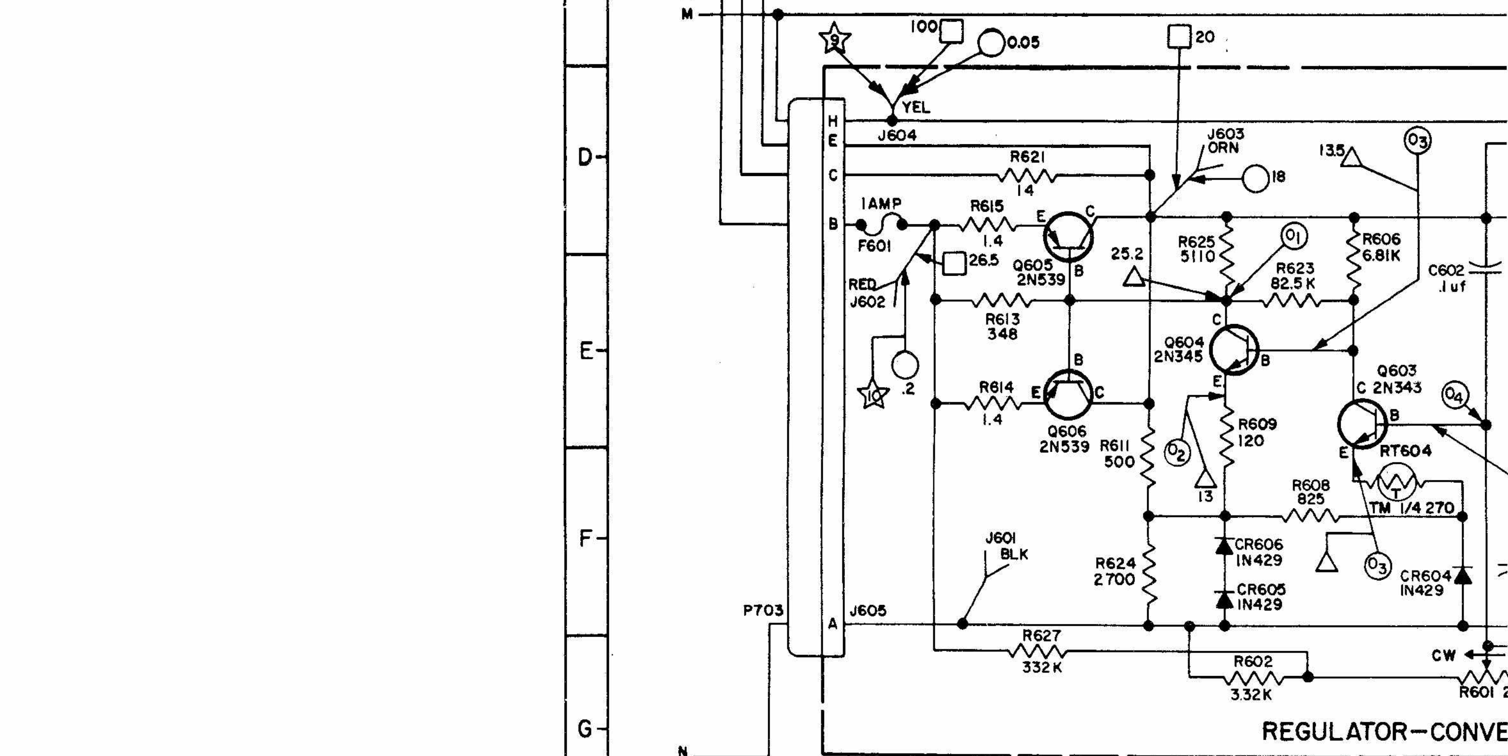
KEYS TO SYMBOLS

* EXACT VALUE DETERMINED BY TEST

17 DC VOLTAGE MEASURED WITH A VOLT-METER INPUT RESISTANCE 20,000 OHMS PER VOLT

17 AC VOLTAGE MEASURED WITH A VTVM INPUT CAPACITANCE 1.5 MICRO-MICROFARADS INPUT RESISTANCE 10 MEGOHMS

17 DC VOLTAGE MEASURED WITH A VTVM INPUT RESISTANCE 122 MEGOHMS



REGULATOR–CONVE

NOTE:

ALL VALUES ARE IN MICRO-MICRO-FARADS, MICROHENRIES, AND OHMS UNLESS OTHERWISE NOTED.

KEYS TO SYMBOLS

* EXACT VALUE DETERMINI

17 DC VOLTAGE MEASURED WI METER INPUT RESISTANC OHMS PER VOLT

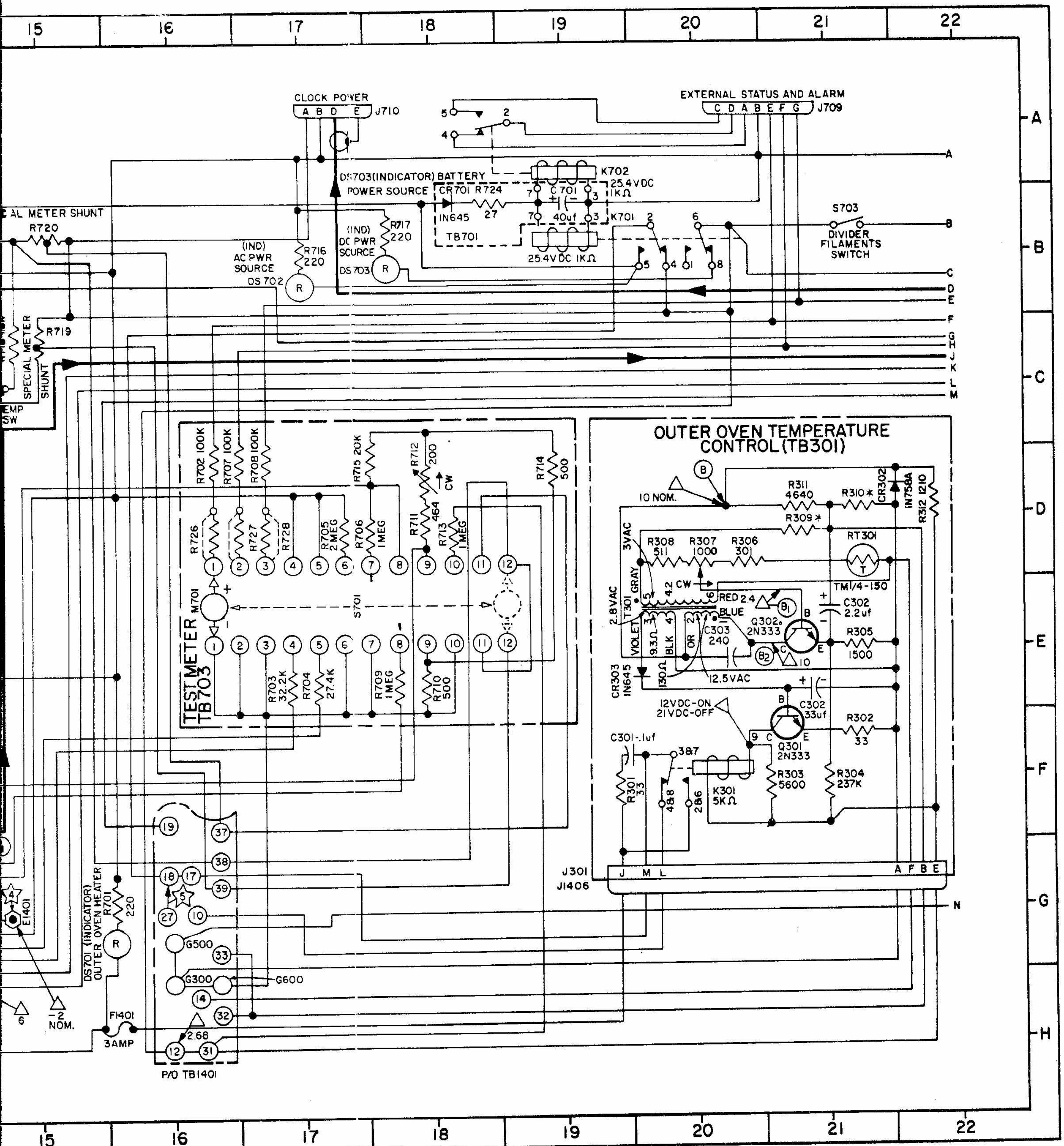
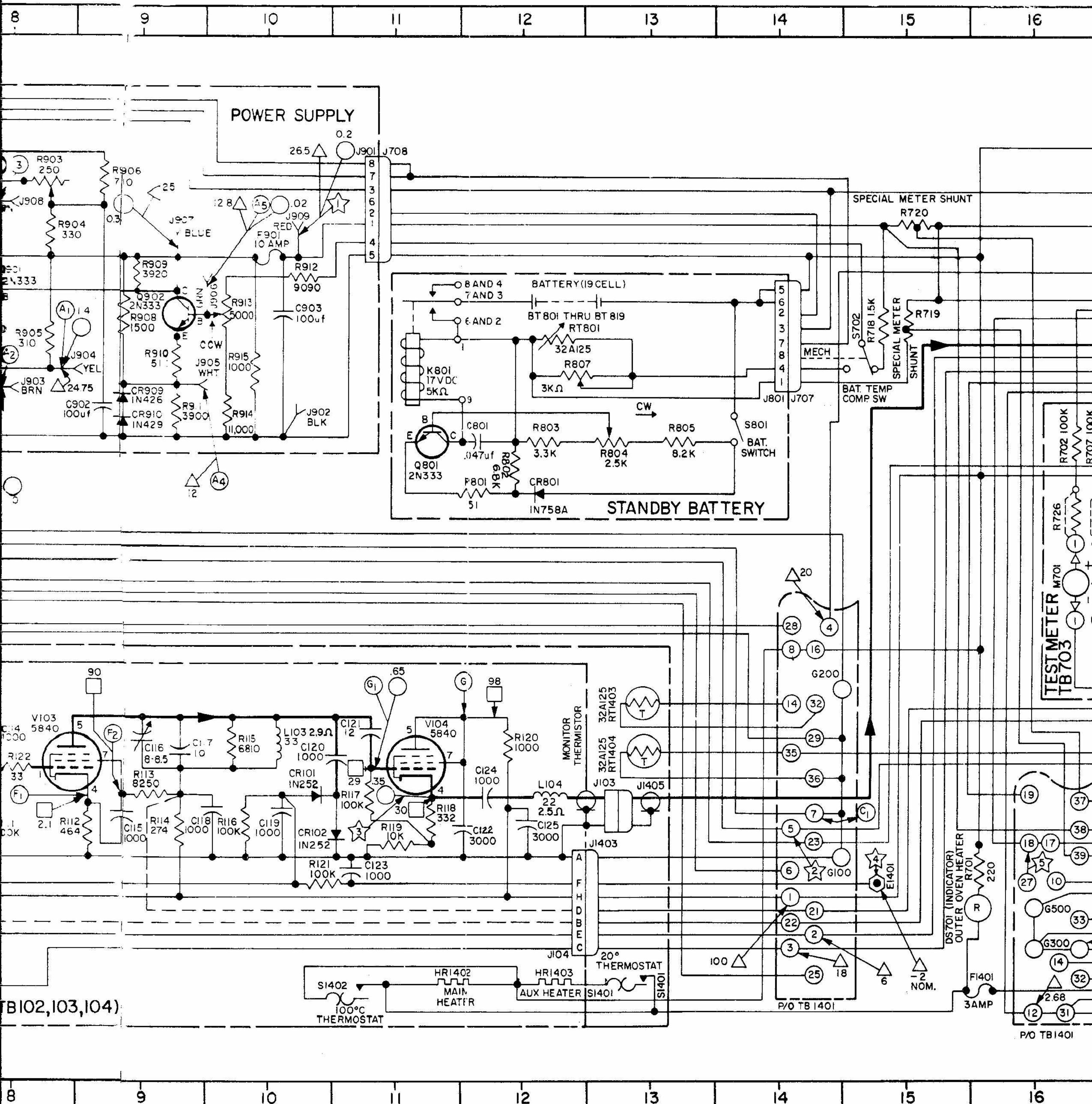
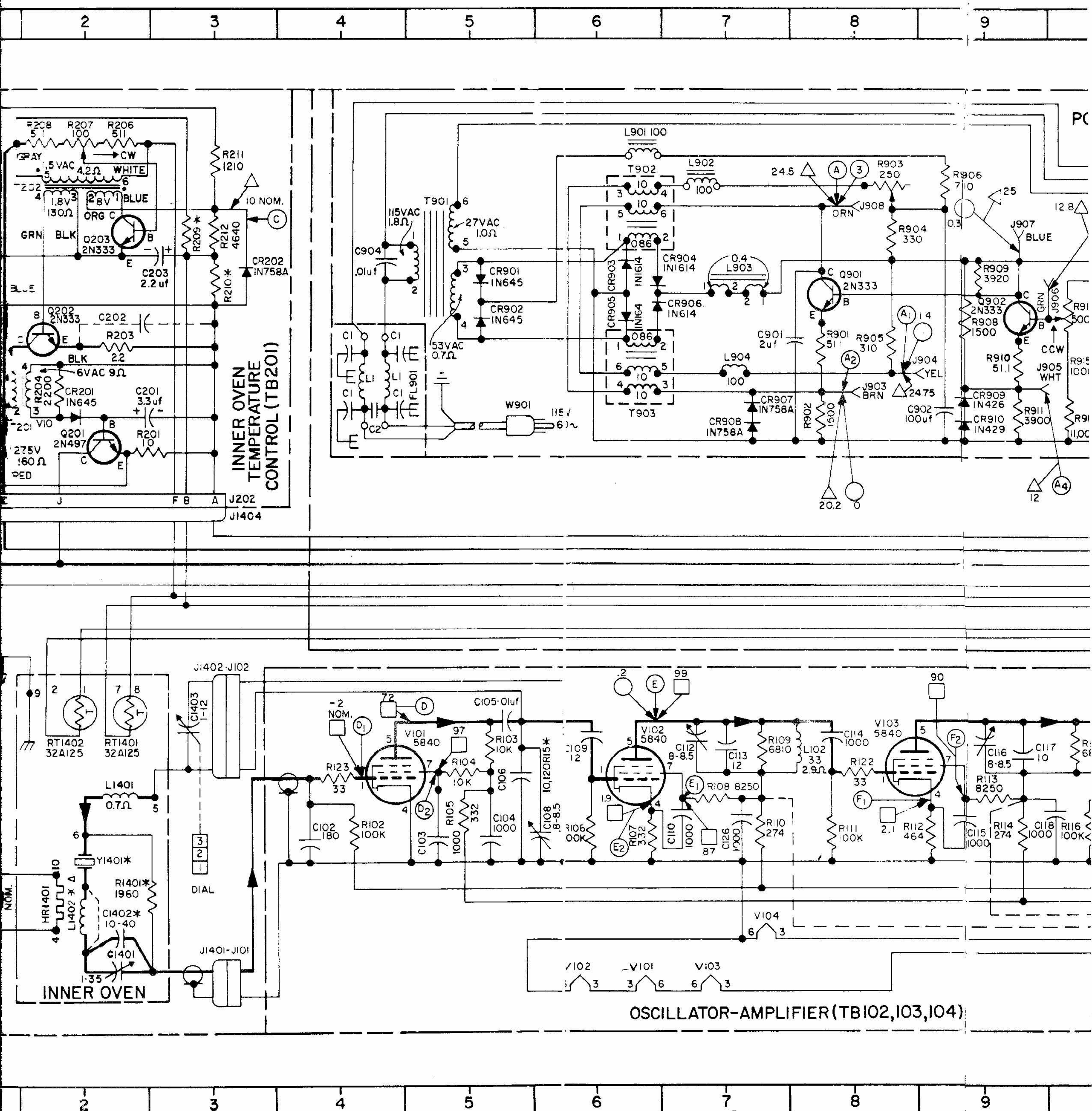


Figure 5-32. Frequency Standard AN/URQ-9 Schematic (2 of 2)

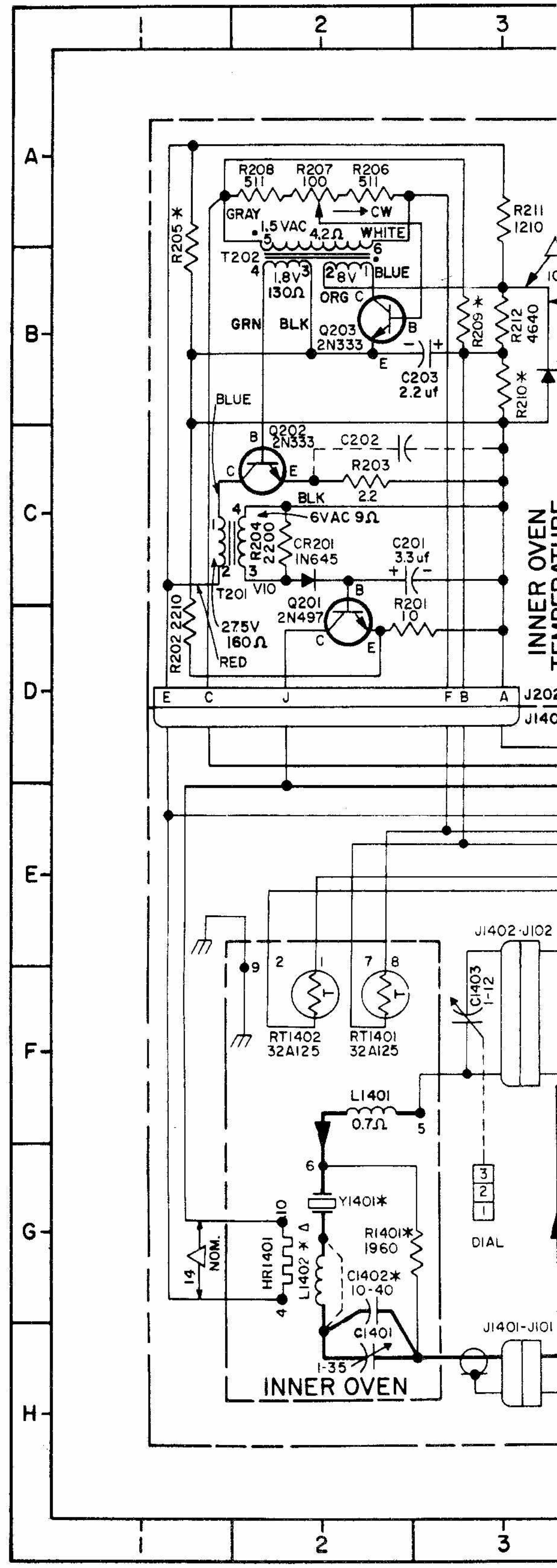


POWER SUPPLY
J901
J708
R903 250
R906 750
R904 330
J908
J907 BLUE
J909 RED
F901 10 AMP
R909 3920
Q902 2N333
R908 1500
R910 51
R911 3900
J905 WHT
J906 GRN
CCW
R913 5000
R912 9090
R915 1000
R914 11,000
C903 100uf
J902 BLK
R905 310
J904 YEL
J903 BRN
CR909 1N426
CR910 1N429
C902 100uf
STANDBY BATTERY
BATTERY (19 CELL)
8 AND 4
7 AND 3
6 AND 2
BT 801 THRU BT 819
RT801 32A125
R807 3KΩ
K801 17VDC 5KΩ
Q801 2N333
C801 .047uf
R802 68K
R803 3.3K
R804 2.5K
R805 8.2K
P801 51
CR801 1N758A
S801 BAT. SWITCH
CW
J801
J707
MECH
S702
R718 1.5K
BAT. TEMP COMP SW
SPECIAL METER SHUNT
R720
R719
SPECIAL METER SHUNT
TEST METER TB703
M701
R702 100K
R707 100K
R726
V103 5840
C114 1000
R122 33
R112 464
C115 1000
C116 8-8.5
C117 10
R113 8250
R114 274
C118 1000
R115 6810
R116 100K
L103 2.9Ω 33
C119 1000
C120 1000
C121 12
CR101 1N252
CR102 1N252
R117 100K
R119 10K
R121 100K
C123 1000
V104 5840
R118 332
R120 1000
C124 1000
C122 3000
L104 22 2.5Ω
C125 3000
MONITOR THERMISTOR
32A125 RT1403
32A125 RT1404
J103
J1405
J1403
J104
HR1402 MAIN HEATER
HR1403 AUX HEATER
S1401
S1402
100°C THERMOSTAT
20° THERMOSTAT
(TB102,103,104)
G200
G100
E1401
P/O TB 1401
100
18
6
-2 NOM.
DS701 (INDICATOR) OUTER OVEN HEATER
R701 220
F1401 3AMP
G500
G300
2.68
P/O TB1401


INNER OVEN TEMPERATURE CONTROL (TB201)
INNER OVEN
OSCILLATOR-AMPLIFIER (TB102,103,104)
R208 51
R207 100
R206 511
R211 1210
R209 *
R212 4640
R210 *
CR202 1N758A
10 NOM.
GRAY
5 VAC 4.2Ω WHITE
CW
T202
1.8V 130Ω
28V BLUE
ORG
GRN BLK
Q203 2N333
C203 2.2 uf
BLUE
Q202 2N333
C202
R203 2.2
BLK
6VAC 9Ω
R204 2200
CR201 1N645
C201 3.3 uf
V10
Q201 2N497
R201 10
275V 160 Ω
RED
J202
J1404
L901 100
T902
L902 100
24.5
R903 250
R906 710
25
12.8
J908
ORN
R904 330
J907 BLUE
T901
115VAC 1.8Ω
27VAC 1.0Ω
C904 .01uf
CR901 1N645
CR902 1N645
CR903
CR904 1N1614
CR905
CR906 1N614
L903
Q901 2N333
R909 3920
Q902 2N333
R908 1500
J906 GRN
CCW
53VAC 0.7Ω
FL901
C901 2uf
R901 511
R905 310
R910 51.1
J905 WHT
L904 100
J904 YEL
24.75
J903 BRN
T903
CR907 1N758A
CR908 1N758A
R902 1500
C902 100uf
CR909 1N426
CR910 1N429
R911 3900
W901
115V 60~
20.2
12
J1402-J102
C1403 1-12
RT1402 32A125
RT1401 32A125
L1401 0.7Ω
Y1401*
R1401* 1960
HR1401
L1402 *
C1402* 10-40
C1401 1-35
DIAL
J1401-J101
-2 NOM.
72
97
V101 5840
C105-.01uf
R103 10K
R104 10K
R123 33
C102 180
R102 100K
R105 1000
C103
C106
C104 1000
C108 .8-8.5
10,120R15*
C109 12
V102 5840
C112 8-8.5
C113 12
R109 6810
L102 33 2.9Ω
C114 1000
R108 8250
R107 332
C110 1000
C126 1000
R110 274
87
R106 100K
R111 100K
R122 33
V103 5840
C116 8-8.5
C117 10
R113 8250
R112 464
C115 1000
R114 274
C118 1000
R116 100K
90
V104
V102
V101
V103

PART LOCATION INDEX

EF DES	LOC	REF DES	LOC	REF DES	LOC
528	12G	L402	18B	R510	15F
529	12G	L501	12D	R511	17G
530	13G	L502	12E	R512	18G
531	15G	L503	16E	R513	18F
601	6F	L504	18E	R514	19F
602	5E	L505	18E	R515	19F
603	5F	L506	12G	R516	20G
606	6G	L601	8E	R517	20E
607	8F	P701	15A, B, C, D	R518	22E
608	7E	P702	11D, E, F, G, H	R519	22F
R401	22C	P703	2D, E, F	R520	16G
R501	12E	Q601	6E	R521	15F
R502	23F	Q602	6F	R601	5G
R601	8E	Q603	4E	R602	4G
R602	7E	Q604	4E	R603	6D
R603	7E	Q605	3D	R606	4D, E
R604	5F	Q606	3E	R608	4F
R605	4F	R401	17C	R609	4E
R606	4F	R402	17C	R611	3F
R607	8E	R403	17C	R613	3D
601	2D	R404	16C, 17C	R614	2E, 3E
401	16C	R405	17A	R615	2D, 3D
402	15C	R406	18C	R621	3D
403	16C	R407	19C	R623	4E
404	17C	R408	19C	R624	3F
405	16B	R409	19A	R625	4D, E
406	18B	R410	20C	R627	3G
407	18C	R411	20B	R628	7E
408	19A	R412	20A	R629	6G
409	22C	R413	21C	FT604	5F
410	21B	R416	20C	S401	19C
411	16A	R417	15D	S501	18G
412	22D	R418	22B	T401	22A, B
413	15A, B, C, D	R419	16C	T501	13E
501	11D, E, F, G, H	R420	15D	T502	22E, F
502	11C	R501	13F	T601	7B, E
601	2F	R502	13F	V401	19B, C
604	2B	R503	14G	V402	21B, C
605	2D, E, F	R504	14E	V403	17B, C
701	9E	R505	13E	V501	14F
702	10E	R506	13E	V502	16F
703	9H	R507	15F	V503	18F
704	11C	R508	16G	V502	20F
L401	20B	R509	16E		



PART LOCATION

REF DES	LOC	REF DES	LOC	REF DES
C401	16C	C528	12G	L40
C402	17B	C529	12G	L50
C403	17C	C530	13G	L50
C404	17B	C531	15G	L50
C405	18B	C601	6F	L50
C406	18B	C602	5E	L50
C407	18C	C603	5F	L50
C408	18B	C606	6G	L60
C409	18C	C607	8F	P70
C410	19C	C608	7E	P70
C411	19B	CR401	22C	P70
C412	20B	CR501	12E	Q60
C413	20B	CR502	23F	Q60
C414	20B	CR601	8E	Q60
C415	21C	CR602	7E	Q60
C417	16B	CR603	7E	Q60
C418	22C, D	CR604	5F	Q60
C501	14G	CR605	4F	R40
C502	15G	CR606	4F	R40
C503	14E	CR607	8E	R40
C504	14E	F601	2D	R40
C505	12E	J401	16C	R40
C506	12D	J402	15C	R40
C507	11D	J403	16C	R40
C508	11E	J404	17C	R40
C509	16G	J405	16B	R40
C510	15E	J406	18B	R41
C511	16E	J407	18C	R41
C512	17G	J408	19A	R41
C513	17F	J409	22C	R41
C514	18G	J410	21B	R41
C515	17E	J411	16A	R41
C516	18E	J412	22D	R41
C517	19G	J413	15A, B, C, D	R41
C518	17F	J501	11D, E, F, G, H	R42
C519	19F	J502	11C	R50
C520	19G	J601	2F	R50
C521	20G	J604	2B	R50
C522	20F	J605	2D, E, F	R50
C523	20E	J701	9E	R50
C524	20F	J702	10E	R50
C525	12H	J703	9H	R50
C526	11H	J704	11C	R50
C527	11G	L401	20B	R50

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

a. The unit numbering method of assigning reference designations has been used to identify the various assemblies and subassemblies of the frequency standard. Blocks of numbers have been assigned as follows:

101 thru 199	OSCILLATOR - AMPLIFIER
201 thru 299	INNER OVEN TEMPERATURE CONTROL
301 thru 399	OUTER OVEN TEMPERATURE CONTROL
401 thru 499	1.0 MC to 100 KC FREQUENCY DIVIDER
501 thru 599	5.0 to 1.0 MC FREQUENCY DIVIDER
601 thru 699	REGULATOR - CONVERTER
701 thru 799	TEST METER AND INTERCONNECTING CABLE
801 thru 899	BATTERY POWER SUPPLY
901 thru 999	POWER SUPPLY
1401 thru 1499	OVENS ASSEMBLY

6-2. MAINTENANCE PARTS LIST.

a. Table 6-1 lists all assemblies and subassemblies and their maintenance parts. These units are listed in numerical sequence as outlined in paragraph 6-1. Maintenance parts are listed immediately following the unit to which they apply. The following information is provided by Table 6-1: (1) the complete reference designation of each part, (2) reference to explanatory notes in paragraph 6-5, (3) noun name and brief description, and (4) the figure number of the illustration which will pictorially locate the part.

Note

A brief description is given for all key parts (parts differing from any parts previously listed in Table 6-1) and sub-key parts (parts identical with a key part but appearing for the first time for a unit). The names and descriptions are omitted for other parts, but reference is made to the key or sub-key for the data.

6-3. LIST OF MANUFACTURERS.

a. Table 6-2 lists the manufacturers supplying non-standard equipment. The table includes the code numbers used in Table 6-1 to identify the manufacturers.

6-4. STOCK NUMBER IDENTIFICATION.

a. Allowance Parts Lists (APL's) issued by the Electronics Supply Office (ESO) include Federal Stock Number and Source Maintenance and Recoverability Codes. Therefore, reference should be made to the APL prepared for the equipment for stock numbering information.

6-5. NOTES.

a. The following notes provide information as referenced in Table 6-1:

1. Not field replaceable. Listed for reference only.
2. Value determined by manufacturer's final tests. For replacement, use same value as that removed from unit.
3. All type cy13c and cy176 capacitors may be replaced with type cy106 and cy156 respectively.

TABLE 6-1. MAINTENANCE PARTS LIST

OSCILLATOR - AMPLIFIER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C101		Deleted	----
C102		CAPACITOR, FIXED, GLASS; 180 uuf ±5%, Type CY13C 181J per MIL-C-11272-A and MIL-STD-242.	5-22
C103		CAPACITOR, FIXED, CERAMIC; 1000 uuf ±20%, Type CK61AW102M per MIL-C-11015B	5-22

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OSCILLATOR - AMPLIFIER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C104		Same as C103	5-22
C105		CAPACITOR, FIXED, PAPER; 10,000 uuf ±10%, Type CPO5-A1KE103K per MIL-C-25B and MIL-STD-242	5-22
C106	2	CAPACITOR, FIXED, GLASS; 10 uuf ±10%, Type CY13C100K per MIL-C-11272 and MIL-STD-242	5-22
or	2	Same as C106 except Type CY13C-120K	5-22
or	2	Same as C106 except Type CY13C-150K	5-22
C107		Deleted	----
C108		CAPACITOR, VARIABLE, AIR DIELECTRIC; 0.8 to 8.5 uuf, Type VC-20G per MIL-C-14409	5-22
C109		CAPACITOR, FIXED, GLASS, DIELECTRIC; 12 uuf ±10%, Type CY13C120K per MIL-C-11272 and MIL-STD-242	5-22
C110		Same as C103	5-22
C111		Deleted	----
C112		Same as C108	5-22
C113		Same as C109	5-22
C114		Same as C103	5-22
C115		Same as C103	5-22
C116		Same as C108	5-22
C117		CAPACITOR, FIXED, GLASS; 10 uuf ±10%, Type CY13C100K per MIL-C-11272 and MIL-STD-242	5-22
C118		Same as C103	5-22
C119		Same as C103	5-22
C120		Same as C103	5-22
C121		Same as C109	5-22
C122		CAPACITOR, FIXED, CERAMIC; 3000 uuf ±20%, Type CK61AW302M per MIL-C-11015B	5-22
C123		Same as C103	5-22
C124		Same as C103	5-22
C125		Same as C122	5-22
C126		Same as C103	5-22

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OSCILLATOR - AMPLIFIER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
CR101		SEMI-CONDUCTOR, DIODE, SILICON TRANS; Type 1N252 per MIL-E-1500242.	5-22
CR102		Same as CR101	5-22
J101		CONNECTOR, RECEPTACLE, ELECTRICAL; One coaxial contact; Low loss plastic dielectric; 94375part No.y-530	5-22
J102		Same as J101	5-22
J103		Same as J101	5-22
J104		CONNECTOR, RECEPTACLE, ELECTRICAL; Seven contact male; Arc resistant; Plastic dielectric;07795 Type 5040-7P per MIL-C-8384	5-22
L101		Deleted	----
L102		COIL, RADIO FREQUENCY; 33uh ±5%; 300 ma max; Resonant at 32 mc; 99800 Type 1537-52 per MIL-C-15305	5-22
L103		Same as L102	5-22
L104		COIL, RADIO FREQUENCY; 22uh ±10%; 275 ma max min Q is 75, 2.5 ohms max; 99800 Type 1537-44 per MIL-C-15305	5-22
R101		Deleted	----
R102		RESISTOR, FIXED, FILM; 100,000 ohms ±1%; 0.125 watt; Type RN60B1003F per MIL-R-10509	5-22
R103		RESISTOR, FIXED, FILM; 10,000 ohms ±1%; 0.125 watt; Type RN60B1002F per MIL-R-10509	5-22
R104		Same as R103	5-22
R105		RESISTOR, FIXED, FILM; 332 ohms ±1%; 0.125 watt; Type RN60B3320F per MIL-R-10509	5-22
R106		Same as R102	5-22
R107		Same as R105	5-22
R108		RESISTOR, FIXED, FILM; 8250 ohms ±1%; 0.125 watt; Type RN60B8251F per MIL-R-10509	5-22
R109		RESISTOR, FIXED, FILM; 6810 ohms ±1%; 0.125 watt; Type RN60B6811F per MIL-R-10509	5-22
R110		RESISTOR, FIXED, FILM; 274 ohms ±1%; 0.125 watt; Type RN60B2740F per MIL-R-10509	5-22
R111		Same as R102	5-22
R112		RESISTOR, FIXED, FILM; 464 ohms ±1%; 0.125 watt; Type RN60B4640F per MIL-R-10509	5-22
R113		Same as R108	5-22

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OSCILLATOR - AMPLIFIER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R114		Same as R110	5-22
R115		Same as R109	5-22
R116		Same as R102	5-22
R117		Same as R102	5-22
R118		Same as R105	5-22
R119		Same as R103	5-22
R120		RESISTOR, FIXED, COMPOSITION; 1000 ohms ±10%; 0.5 watt; Type RC20GF102K per MIL-R-11B and MIL-STD-242	5-22
R121		Same as R102	5-22
R122		RESISTOR, FIXED, COMPOSITION; 33 ohms ±5%; 0.5 watt; Type RC20GF330J per MIL-R-11B and MIL-STD-242	5-22
R123		Same as R122	5-22
TB101		Deleted	----
TB102		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 62772	5-22
TB103		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 501472	5-22
TB104		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 501470	5-22
V101		ELECTRON TUBE, 96761 part No. 501614, Similar to JAN5840	5-22
V102		Same as V101	5-22
V103		Same as V101	5-22
V104		Same as V101	5-22
		INNER OVEN TEMPERATURE CONTROL	
C201		CAPACITOR, FIXED, TANTALUM; One section, 6 vdcw, 33 uf, 0.438 in. lg. and 0.175 in. dia., 82376 part No. TES-33M-6	5-26
C202		Deleted	----

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

INNER OVEN TEMPERATURE CONTROL

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C203		CAPACITOR, FIXED, ELECTROLIC; 2.2 MFD 20 WVDC Tantalum, 92376 type TES-2.2M-20.	5-26
CR201		SEMI-CONDUCTOR DEVICE, DIODE; Type 1N645	5-26
CR202		SEMI-CONDUCTOR DEVICE, DIODE; Type 1N758A	5-26
J201		CONNECTOR, RECEPTACLE, ELECTRICAL; 11 contact, male; Arc resistant plastic dielectric;07795 type 5040-11P per MIL-C-8384	5-25 and 5-26
Q201		TRANSISTOR, 2N497	5-25 and 5-26
Q202		TRANSISTOR, 2N333	5-25 and 5-26
Q203		Same as Q202	5-25 and 5-26
R201		RESISTOR, FIXED, COMPOSITION; 10 ohms ±10%; 0. 5 watts; Type RC20GF100J per MIL-R-11B and MIL-STD-242	5-26
R202		RESISTOR, FIXED, FILM; 2210 ohms ±1%; 0.125 watt; Type RN60B2211F per MIL-R-10509	5-26
R203		RESISTOR, FIXED, COMPOSITION; 22 ohms ±5%; 0. 5 watt; Type RC20GF220J per MIL-R-11 and MIL-STD-242	5-26
R204		RESISTOR, FIXED, COMPOSITION; 2200 ohms ±5%; 0. 5 watt; Type RC20GF222J per MIL-STD-242	5-26
R205	2	RESISTOR, FIXED, FILM; 100, 000 ohms ±1%; 0. 125 watt; Type RN60B1003F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 147, 000 ohms ±1%; 0. 125 watt; Type RN60B1473F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 68, 100 ohms ±1%; 0. 125 watt; Type RN60B6812F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 46, 400 ohms ±1%; 0. 125 watt; Type RN60B4642F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 56, 200 ohms ±1%; 0. 125 watt; Type RN60B5622F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 82, 500 ohms ±1%; 0. 125 watt; Type RN60B8252 per MIL-R-10509	5-26
R206		RESISTOR, FIXED, FILM; 511 ohms ±1%; 0. 250 watt; Type RN65E511F per MIL-R-10509	5-26

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

INNER OVEN TEMPERATURE CONTROL

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R207		RESISTOR, VARIABLE, WIRE WOUND; Sliding brush type; 100 ohms ±5%; 1.0 watt; Linear taper; Three terminals; Wire leads; No off position; Two 0.089 in. dia. mtg. holes spaced 1.00 in. c. to c.; 1.28 in. × 0.27 in. × 0.31 in.; Single 0.125 in. dia. Screwdriver slot 0.125 in. lg. and 0.125 in. wide; No locking device; 80294 part no. 260L-T-101	5-25 and 5-26
R208		Same as R206	5-26
R209	2	Same as R206	5-26
or	2	RESISTOR, FIXED, FILM; 402 ohms ±1%; 0.250 watt; Type RN65E402F	5-26
or	2	RESISTOR, FIXED, FILM; 301 ohms ±1%; 0.250 watt; Type RN65E301F	5-26
R210	2	RESISTOR, FIXED, FILM; 4640 ohms ±1%; 0.125 watt; Type RN60B4641F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 5110 ohms ±1%; 0.125 watt; Type RN60B5111F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 5620 ohms ±1%; 0.125 watt; Type RN60B5621F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 6190 ohms ±1%; 0.125 watt; Type RN60B6191F per MIL-R-10509	5-26
or	2	RESISTOR, FIXED, FILM; 6810 ohms ±1%; 0.125 watt; Type RN60B6811 per MIL-R-10509	5-26
R211		RESISTOR, FIXED, FILM; 1210 ohms ±1%; 0.25 watt; Type RN65B1211F per MIL-R-10509	5-26
R212		RESISTOR, FIXED, FILM; 4640 ohms ±1%; 0.125 watt; Type RN60B4641F per MIL-R-10509	5-26
T201		TRANSFORMER, AUDIO FREQUENCY; Pri. impedance of 1000 and DCR of 160 ohms; Sec. impedance of 50/60 and DCR of 9 ohms; Hermetically sealed metal case 0.56 in. lg. and 0.42 in. dia.; Stud type mtg. by one 4-40 stud; Four pin type terminals; JB type 100A2; 96791 part No. 500171	5-25 and 5-26
T202		TRANSFORMER, AUDIO FREQUENCY; Pri. impedance of 1000 and DCR of 130 ohms; Sec. #1 impedance of 60 and DCR of 4.2 ohms; Sec. #2 impedance of 60 and DCR 9.3 ohms; Hermetically sealed metal case 0.63 in. lg. and 0.56 in. dia.; Mtd by one 6-32 thd. stud; Six pin type terminals; JB type 100A1; 96791 part No. 500170	5-25 and 5-26
TB201		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 62973	5-25 and 5-26

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OUTER OVEN TEMPERATURE CONTROL

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C301		CAPACITOR, FIXED, METALIZED PAPER; 0.1 uf ±20%, 200 vdcw; Type CH05A3MC104M per MIL-C-18312A and MIL-STD-242	5-28
C302		Same as C201	5-28
C303		CAPACITOR, FIXED, GLASS; 240 uuf; ±5%, Type CY13C241J per MIL-C-11272 and MIL-STD-242	
C304		Same as C203	5-28
CR301		Same as CR201	5-28
CR302		Same as CR202	5-28
J301		Same as J201	5-27 and 5-28
K301		RELAY, ARMATURE; Two sets of double-throw contacts are operated at 2.8 ma of current and hold till less than 1.0 ma passes through the coil. Coil operates at 28 vdc and has 5000 ohms resistance; Operating temperature from -55° to +100°C; Hermetically sealed metal case 1 in. × 1 in. × 2 in. Plug in type terminals; Six terminals for contacts, two for coil, and one unused; Contacts rated at 2 amps for either 28 vdc or 115 vrms; per MIL-R-5757B 78277 Type 22KNCC-98265-SIL	5-27 and 5-28
Q301		Same as Q202	5-27 and 5-28
Q302		Same as Q202	5-27 and 5-28
R301		Same as R122	5-28
R302		Same as R122	5-28
R303		RESISTOR, FIXED, COMPOSITION; 5600 ohms ±5%; 0.5 watt; Type RC20GF562J per MIL-STD-242 and MIL-R-11	5-28
R304		RESISTOR, FIXED, FILM; 237,000 ohms ±1%; 0.125 watt; Type RN60B2373F per MIL-R-10509	
R305		RESISTOR, FIXED, FILM; 1500 ohms ±1%; 0.125 watt; Type RN60B1501F per MIL-R-10509	5-28
R306		RESISTOR, FIXED, FILM; 301 ohms ±1%; 0.250 watt; Type RN65E301F per MIL-R-10509	5-28
R307		Same as R207	5-27 and 5-28
R308		RESISTOR, FIXED, FILM; 402 ohms ±1%; 0.250 watt; Type RN65E402F per MIL-R-10509	5-28
R309	2	RESISTOR, FIXED, FILM; 620 ohms ±1%; 0.250 watt; Type RN65E620F per MIL-R-10509	5-28
or	2	RESISTOR, FIXED, FLIM; 402 ohms ±1%; 0.250 watt; Type RN65E402F per MIL-R-10509	5-28

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OUTER OVEN TEMPERATURE CONTROL

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
or	2	RESISTOR, FIXED, FILM; 511 ohms ±1%; 0.250 watt; Type RN65E511F per MIL-R-10509	5-28
R310	2	RESISTOR, FIXED, FILM; 3320 ohms ±1%; 0.125 watt; Type RN60B3321F per MIL-R-10509	5-28
or	2	RESISTOR, FIXED, FILM; 1500 ohms ±1%; 0.125 watt; Type RN60B1501F per MIL-R-10509	5-28
or	2	RESISTOR, FIXED, FILM; 1780 ohms ±1%; 0.125 watt; Type RN60B1781F per MIL-R-10509	5-28
or	2	RESISTOR, FIXED, FILM; 2210 ohms ±1%; 0.125 watt; Type RN60B2211F per MIL-R-10509	5-28
R311		Same as R212	5-28
R312		Same as R211	5-28
RT301		SENSISTOR; 150 ohms; Type TM-1/4-150	5-28
T301		Same as T202	5-28
TB301		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 62992	5-27 and 5-28
TB302		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 501583	5-27 and 5-28
XK301		SOCKET; Type TS103P03 per MIL-S-12883/11 and MIL-STD-242	5-27 and 5-28
		1.0 MC TO 100 KC FREQUENCY DIVIDER	
C401		CAPACITOR, FIXED, GLASS; 51 uuf; Type CY13-C510J per MIL-C-11272 & MIL-STD-242	5-29
C402		Same as C401	----
C403		CAPACITOR, FIXED, METALIZED PAPER; 0.022 uf ±20%; 200 vdcw; 09023 Type MTWKP3C223M	5-29
C404		CAPACITOR, FIXED, GLASS; 36 uuf; Type CY13-C360G per MIL-C-11272	5-29
C405		CAPACITOR, FIXED, GLASS; 510 uuf; Type CY-17C511J per MIL-C-11272	5-29
C406		CAPACITOR, VARIABLE CERAMIC; 20-125 uuf; Type DA823-059 per MIL-C-81 & MIL-STD-242	5-12 and 5-29
C407		CAPACITOR, FIXED, METALIZED PAPER; 0.033 uf; 200 vdcw, 09023 Type MTWKP3C333M	5-29
C408		CAPACITOR, FIXED, GLASS; 100 uuf; Type CY13C101J per MIL-C-11272	5-29

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

1.0 MC TO 100 KC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C409		Same as C403	5-29
C410		CAPACITOR, FIXED, METALIZED PAPER; 0.047 uf; 200 vdcw; 09023 Type MTWKP3C473M	5-29
C411		CAPACITOR, FIXED, MICA; 100 uuf ±5%; CM20C101J per MIL-C-5 and MIL-STD-242	5-29
C412		CAPACITOR, VARIABLE CERAMIC; 7-45 uuf; Type CV11D450 per MIL-C-81 and MIL-STD-242	5-12 and 5-29
C413		CAPACITOR, FIXED, GLASS; 270 uuf ±5%; Type CY17C271J per MIL-C-11272 and MIL-STD-242	5-29
C414		CAPACITOR, FIXED, GLASS; 18 uuf ±5%; Type CY10C180J per MIL-C-11272	5-29
C415		Same as C410	5-29
C416		Deleted	----
C417		CAPACITOR, FIXED, METALIZED PAPER; 0.01 uf; 200 vdcw; 09023 Type MTWKP3C103M	5-29
C418		Same as C410	5-29
CR401		SEMI-CONDUCTOR DEVICE, DIODE; Type 1N662	5-29
J401		JACK, TIP, LOW VOLTAGE; Type MS16108-3A per MIL-STD-242	5-2 and 5-29
J402		JACK, TIP, LOW VOLTAGE; Type MS16108-5A	5-2 and 5-29
J403		JACK, TIP, LOW VOLTAGE; Type MS16108-6A	5-3 and 5-29
J404		JACK, TIP, LOW VOLTAGE; Type MS16108-8A	5-3 and 5-29
J405		JACK, TIP, LOW VOLTAGE; Type MS16108-7A	5-3 and 5-29
J406		Same as J402	5-3 and 5-29
J407		Same as J404	5-3 and 5-29
J408		Same as J405	5-3 and 5-29
J409		Same as J404	5-3 and 5-29
J410		Same as J405	5-3 and 5-29
J411		JACK, TIP, LOW VOLTAGE; Type MS16108-2A	5-3 and 5-29
J412		Same as J401	5-3 and 5-29

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

1.0 MC TO 100 KC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
J413		CONNECTOR, RECEPTACLE, ELECTRICAL; 16 contacts total, two of them coaxial; One mating end; Arc resistant, low loss plastic dielectric; Without shell; 2 in. × 0.44 in. × 0.78 in.; Mtd by two 4-40 thd studs, 0.27 in. lg. on 1.688 in. mtg. centers; Type 1040-14P/2RG per MIL-C-8384	5-29
L401		COIL, RADIO FREQUENCY; Single coil; 186 turns of 16 strands of #42AWG wire toroidally wound; 0.2 mh nom inductance; 2.43 ohms; Heavy Formvar insulation; Metal case 0.5 in. × 1.22 in. × 1.06 in; 82068 part No. S-53352	5-12 and 5-29
L402		COIL, RADIO FREQUENCY; Single coil 778 turns of 16 strands of #44 AWG wire toroidally wound; 3.5 mh nom inductance; 11.3 ohms; Heavy Formvar insulation; Metal case of type SC-23; 0.5 in. × 1.22 in. × 1.06 in.; Hermetically sealed per MIL-T-27A; 82068 part No. S-53354	5-12 and 5-29
R401		RESISTOR, FIXED, FILM; 33,200 ohms ±1%; 0.25 watt; Type RN65B3322F per MIL-R-10509	5-29
R402		RESISTOR, FIXED, FILM; 68,100 ohms ±1%; 0.25 watt; Type RN65B6812F per MIL-R-10509	5-29
R403		RESISTOR, FIXED, FILM; 562 ohms ±1%; 0.25 watt; Type RN65B5620F per MIL-R-10509	5-29
R404		RESISTOR, FIXED, COMPOSITION; 3300 ohms ±5%; 0.5 watt; Type RC20GF332J per MIL-R-11 and MIL-STD-242	5-29
R405		Same as R404	5-29
R406		RESISTOR, FIXED, FILM; 100,000 ohms ±1%; 0.25 watt; Type RN65B1003F per MIL-R-10509	5-29
R407		RESISTOR, FIXED, FILM; 3920 ohms ±1%; 0.25 watt; Type RN65B3921F per MIL-R-10509	5-29
R408		RESISTOR, FIXED, FILM; 43,200 ohms ±1%; 0.25 watt; Type RN65B4322F per MIL-R-10509	5-29
R409		Same as R404	5-29
R410		RESISTOR, FIXED, FILM; 215,000 ohms ±1% 0.25 watt; Type RN65B2153F per MIL-R-10509	5-29
R411		RESISTOR, FIXED, FILM; 56,200 ohms ±1%; 0.25 watt; Type RN65B5622F per MIL-R-10509	5-29
R412		RESISTOR, FIXED, CARBON; 1500 ohms ±5%; 0.5 watt; Type RC20GF152J per MIL-R-11 and MIL-STD-242	5-29
R413		Same as R110	5-29

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

1.0 MC TO 100 KC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R414		Deleted	----
R415		Deleted	----
R416		Same as R404	----
R417		RESISTOR, FIXED, WIRE WOUND; 250 ohms; ±5%; 3 watt; Type RW59V251 per MIL-R-26 and MIL-STD-242	5-29
R418		RESISTOR, FIXED, CARBON; 27 ohms ±10%; 0.5 watt; Type RC20GF270K per MIL-R-11 and MIL-STD-242	5-29
R419		RESISTOR, FIXED, FILM; 46,400 ohms ±1%; 0.25 watt; Type RN65B4642F per MIL-R-10509	5-29
R420		RESISTOR, FIXED, WIRE WOULD; 14 ohms ±5%; 3 watts; Type RW59V140 per MIL-R-26 and MIL-STD-242	5-29
S401		SWITCH, PUSH; spst; Non-snap; Rated at 0.25 amp; 115 vrms with resistive load; 81073 part No. 23-YY2012	5-29
T401		TRANSFORMER, RADIO FREQUENCY; Prim 300 turns No. 36 AWG wire, center-tapped; Prim inductance is 25 mh; Prim max resistance is 18 ohms; Sec No. 1 has 150 turns of No. 36 AWG wire untapped and DCR of 9 ohms, Sec. No. 2 has 20 turns of 36 AWG wire and DCR of 1.5 ohms; Insulation is Quadruple Formvar and acetate insulating tape; per MIL-T-27A; 56289 type 20Z8	5-12 and 5-29
TB401		TERMINAL BOARD; Complete with terminals 96791 part No. 62993	5-12 and 5-29
TB402		TERMINAL BOARD; Complete with terminals; 96791 part No. 62972	5-12 and 5-29
V401		ELECTRON TUBE; Type JAN5654/6AK5W per MIL-STD-200	5-12 and 5-29
V402		Same as V401	5-12 and 5-29
V403		ELECTRON TUBE; Type JAN5725/6AS6W per MIL-STD-200	5-12 and 5-29
XV401		SOCKET, ELECTRON TUBE; Type TS102PO3 per MIL-S-12883/10 and MIL-STD-242	5-29
XV402		Same as XV401	5-29
XV403		Same as XV401	5-29
		5.0 TO 1.0 MC FREQUENCY DIVIDER	
C501		CAPACITOR, FIXED, METALIZED PAPER; 0.001 uf; 600 vdcw; Type CP04A3KF102K	5-30
C502		Same as C417	5-30

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

5.0 TO 1.0 MC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C503		CAPACITOR, FIXED, GLASS; 33 uuf, ±5%; Type CY13C330J per MIL-C-11272 & MIL-STD-242	5-30
C504		CAPACITOR, FIXED, GLASS; 68 uuf, ±5%; Type CY13C680J per MIL-C-11272 & MIL-STD-242	5-30
C505		Same as C501	5-30
C506		Same as C403	5-30
C507		CAPACITOR, FIXED, CERAMIC, FEED-THRU; 1000 uuf; 500 vdcw: 96791 part No. 62998-4	5-30
C508		Same as C507	5-30
C509		Same as C417	5-30
C510		CAPACITOR, VARIABLE CERAMIC; 4.5-25 uuf; Type CV11A250 per MIL-C-81 and MIL-STD-242	5-11 and 5-30
C511		Same as C504	5-30
C512		Same as C417	5-30
C513		CAPACITOR, FIXED, GLASS; 22 uuf; Type CY-13C220J per MIL-C-11272 & MIL-STD-242	5-30
C514		Same as C417	5-30
C515		CAPACITOR, VARIABLE, CERAMIC, DIELECTRIC; 3-12 uuf; Type CV11A120 per MIL-C-81 and MIL-STD-242	5-11 and 5-30
C516		CAPACITOR, FIXED, GLASS; 300 vdcw; 15 uuf ±5%; Type CY13C105J per MIL-STD-242 & MIL-C-11272	5-30
C517		Same as C417	5-30
C518		Same as C513	5-30
C519		Same as C102	5-30
C520		Same as C503	5-30
C521		Same as C501	5-30
C522		Same as C303	5-30
C523		CAPACITOR, FIXED, GLASS; 750 uuf ±5%; Type CY17C751J per MIL-C-11272 & MIL-STD-242	5-30
C524		Same as C417	5-30
C525		Same as C501	5-30
C526		Same as C507	5-30

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

5.0 TO 1.0 MC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C527		Same as C507	5-30
C528		Same as C403	5-30
C529		Same as C403	5-30
C530		Same as C403	5-30
C531		Same as C403	5-30
CR501		Same as CR401	5-30
CR502		Same as CR401	5-3
J501		Same as J413	5-11 and 5-30
J502		CONNECTOR, RADIO FREQUENCY BULKHEAD, JACK; 96791 Type 501595	5-11 and 5-30
L501		CHOKE, RADIO FREQUENCY ENCAPSULATED; 100 uh ±10%; 260 ma. max.; 96791 Type 501589	5-30
L502		Same as L501	5-30
L503		INDUCTOR; 0.25 mh. ±2%; 96791 type 501597	5-11 and 5-30
L504		INDUCTOR; 0.035 mh. ±2%; 96791 type 501598	5-11 and 5-30
L505		Same as L501	5-30
L506		Same as L501	5-30
R501		Same as R109	5-30
R502		RESISTOR, FIXED, CARBON; 330 ohms ±10%; 0.5 watt; Type RC20GF331K per MIL-R-11 and MIL-STD-242	5-30
R503		Same as R105	5-30
R504		Same as R120	5-30
R505		RESISTOR,FIXED, COMPOSITION;15 ohms ±5%; 0.5 watt,Type RC20GF220J per MIL-R-11 & MIL-STD242	5-30
R506		RESISTOR, FIXED, CARBON; 220 ohms ±10%; 0.5 watt; Type RC20GF221K per MIL-STD-242	5-30
R507		RESISTOR, FIXED, FILM; 46,400 ohms ±1%; 0.125 watt; Type RN60B4642F per MIL-R-10509	5-30
R508		RESISTOR, FIXED, FILM; 681 ohms ±1%; 0.125 watt; Type RN60B6810F per MIL-R-10509	5-30
R509		Same as R120	5-30
R510		Same as R507	5-30
R511		Same as R507	5-30

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

5.0 TO 1.0 MC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R512		RESISTOR, FIXED, FILM; 3320 ohms ±1%; 0.25 watt; Type RN65B3321F per MIL-R-10509	5-30
R513		Same as R419	5-30
R514		Same as R102	5-30
R515		Same as R102	5-30
R516		Same as R105	5-30
R517		Same as R120	5-30
R518		RESISTOR, FIXED, COMPOSITION; 10 ohms ±5%, 0.5 watt Type RC20GF220J per MIL-R-11 & MIL-STD-242	5-30
R519		Same as R506	5-30
R520		RESISTOR, FIXED, WIRE WOUND; 10 ohms ±10%; 3 watt; Type RW59V100 per MIL-R-26 and MIL-STD-242	5-30
R521		Same as R412	5-30
S501		Same as S401	5-30
T501		TRANSFORMER, R-F; Primary 52 turns progressive universal wound; 26 mh nom inductance; 33 mh max ±5%; Unloaded Q at 25 mh to be 25 at test freq of 2.5 mc; DC resistance 0.68 ohms ±25%; Secondary #33 wire (3-4) 6 turns dc resistance 0.11 ohms ±25%; 96791 Type 501513 per MIL-C-15305.	5-11 and 5-30
T502		TRANSFORMER, R-F; Primary 95 turns progressive universal wound; 140 mh nom inductance; 160 mh max inductance ±5%; under load Q at 140 mh to be 35 min at freq of 1 mc; DC resistance 2.9 ohms ±25%; Secondary 11 turns #37 wire; DC resistance 3.4 ohms ±25%; Dielectric strength sea level, windings (1-2) to (3-4), 500 vrms, 5 sec min; WDG prim. (1-2) 20 vrms ±15% 1 mc; Secondary (3-4) 1.5 vrms ±5%, across 75 ohm resistance; 96791 Type 501512 per MIL-C-15305.	5-11 and 5-30
TB501		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 63003	5-11 and 5-30
TB502		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 63004	5-11 and 5-30
V501		Same as V401	5-11 and 5-30
V502		Same as V403	5-11 and 5-30
V503		Same as V401	5-11 and 5-30
V504		Same as V401	5-11 and 5-30
XV501		Same as XV401	5-30

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

5.0 TO 1.0 MC FREQUENCY DIVIDER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
XV502		Same as XV401	5-30
XV503		Same as XV401	5-30
XV504		Same as XV401	5-30
		REGULATOR-CONVERTER	
C601		Same as C410	5-31
C602		Same as C301	5-31
C603		CAPACITOR, FIXED, ELECTROLYTIC; 100 uf -15% + 50%; 30 volt; Type CL44BH101TP3 per MIL-C-3965	5-31
C604		Deleted	----
C605		Deleted	----
C606		CAPACITOR, FIXED, METALIZED PAPER; 0.22 uf ±20%; 200 vdcw; Type CH05A3MC224M per MIL-C-18312A and MIL-STD-242	5-31
C607		CAPACITOR, FIXED, ELECTROLYTIC; 25 uf +50% -15%; 125 volts; Type CL44BP250TP3 per MIL-C-3965 and MIL-STD-242	5-31
C608		Same as C122	
CR601		SEMI-CONDUCTOR DEVICE, DIODE; Type 1N-647	5-31
CR602		Same as CR601	5-31
CR603		Same as CR601	5-31
CR604		SEMI-CONDUCTOR DEVICE, DIODE: Type 1N-429	5-31
CR605		Same as CR604	5-31
CR606		Same as CR604	5-31
CR607		Same as CR201	5-31
CR608		Same as CR601	5-31
F601		FUSE, CARTRIDGE; 1 amp; 250 v max, Type MS90078-9-1 per MIL-STD-242	5-13 and 5-31
J601		Same as J401	5-3 and 5-31
J602		Same as J411	5-3 and 5-31
J603		Same as J403	5-3 and 5-31
J604		Same as J404	5-3 and 5-31

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

REGULATOR-CONVERTER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
J605		CONNECTOR, RECEPTACLE, ELECTRICAL; Nine contact male; Arc resistant, plastic dielectric; 95238 series 20 type 9-20P per MIL-C-8384	5-13 and 5-31
L601		REACTOR, One Coil; Approx 0.8 mh at 40 ma; Approx 27 ohms; Untapped; Type 71952; 96791 part No. 500291	5-13 and 5-31
Q601		TRANSISTOR 2N539	5-13 and 5-31
Q602		Same as Q601	5-13 and 5-31
Q603		Same as Q202	5-13 and 5-31
Q604		TRANSISTOR 2N343	5-13 and 5-31
Q605		Same as Q601	5-13 and 5-31
Q606		Same as Q601	5-13 and 5-31
R601		RESISTOR, VARIABLE, WIRE WOUND; 2500 ohms ±10%; Type RA10LASM252A per MIL-R-19	5-13 and 5-31
R602		Same as R512	5-31
R603		RESISTOR, FIXED, WIRE WOUND; 100 ohms ±5%; 3 watt; Type RW59V101 per MIL-R-26 and MIL-STD-242	5-31
R604		Deleted	----
R605		Deleted	----
R606		RESISTOR, FIXED, FILM; 6810 ohms ±1%; 0.25 watt; Type RN65B6811F per MIL-R-10509	5-31
R607		Deleted	----
R608		RESISTOR, FIXED, FILM; 825 ohms ±1%; 0.25 watt; Type RN65B8250F per MIL-R-10509	5-31
R609		RESISTOR, FIXED, WIRE WOUND; 120 ohms ±5%; 3 watt; Type RW59V121 per MIL-R-26	5-31
R610		Deleted	----
R611		RESISTOR, FIXED, WIRE WOUND; 500 ohms ±5%; 3 watt; Type RW59V501 per MIL-R-26 and MIL-STD-242	5-35
R612		Deleted	----
R613		RESISTOR, FIXED, FILM; 348 ohms ±1%; 0.25 watt; Type RN65B3480F per MIL-R-10509	5-31
R614		RESISTOR, FIXED, WIRE WOUND; 1.4 ohms ±5%; 3 watt; Type RW59V1R4 per MIL-R-26 and MIL-STD-242	5-31

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

REGULATOR-CONVERTER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R615		Same as R614	5-31
R616		Deleted	----
R617		Deleted	----
R618		Deleted	----
R619		Deleted	----
R620		Deleted	----
R621		Same as R420	5-31
R622		Deleted	----
R623		RESISTOR, FIXED, FILM; 82, 500 ohms ±1%; 0. 25 watt; Type RN65B8252F, per MIL-R-10509	5-31
R624		RESISTOR, FIXED, CARBON; 2700 ohms ±5%; 0. 5 watt; Type RC20GF272J per MIL-R-11 & MIL-STD-242	5-31
R625		RESISTOR, FIXED, FILM; 5110 ohms ±1%; 0. 25 watt; Type RN65B5111F per MIL-R-10509	5-31
R626		Deleted	5-31
R627		RESISTOR, FIXED, FILM; 332, 000 ohms ±1%; 0. 25 watt; Type RN65B3323F, per MIL-R-10509	5-31
R628		Same as R303	5-31
R629		Same as R411	5-31
RT601		Deleted	----
RT602		Deleted	----
RT603		Deleted	----
RT604		RESISTOR, THERMAL; 270 ohms ±10% at 25°C; 229 ohms at 0°C; 354 ohms at 50°C; Average temperature coefficient is +0. 7% deg. C; 0. 25 watt; 96214 Type TM 1/4 -270	5-31
T601		TRANSFORMER, POWER STEP-DOWN AND STEP-UP; Primary: 80 volts pk to pk, approx. 250 cps, single-phase, center-tapped; One secondary: 187 volts pk to pk, untapped, 75 ma; The other secondary: 13 volts pk to pk, center-tapped, 20 ma; 1. 25 in. lg. × 2. 16 in. lg. × 1. 5 in. w; Eight solder lug type terminals, two mtg. holes spaced 1. 75 in. c. to c.; 96791 part No. 71945	5-13 and 5-31
TB601		TERMINAL BOARD; complete with terminals, 96761 Part No. 62632.	

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

REGULATOR-CONVERTER

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
TB602		TERMINAL BOARD; Complete with terminals; 96761 part NO. 62633	5-13 and 5-31
XF601		FUSE HOLDER; per MIL-STD-242B and MIL-F-19207;75950; Type 340142	5-13 and 5-31
		TEST METER AND INTERCONNECTING CABLE	
C701		CAPACITOR, FIXED, ELECTROLYTIC; 40 uf -15% +50%; 30 vdcw; Type CL44BH400TP3 per MIL-C-3965 and MIL-STD-242	5-20
CR701		Same as CR201	5-20
DS701		LAMP, INCANDESCENT; Type MS25237-327 per MIL-L-6363	5-3
DS702		Same as DS701	5-3
DS703		Same as DS701	5-3
J701		CONNECTOR, RECEPTACLE, ELECTRICAL; U/G-625B/U per MIL-STD-242	5-3
J702		Same as J701	5-3
J703		Same as J701	5-3
J704		CONNECTOR, RECEPTACLE, ELECTRICAL; Type U/G-911A/U per MIL-STD-242	2-4
J705		Same as J704	2-4
J706		Same as J704	2-4
J707		CONNECTOR, RECEPTACLE, ELECTRICAL; Arc resistant plastic dielectric; 1-3/4 in. lg. × 7/8 in. w. × 1 in. hg. 02660 part No. 26-4101-8P modified by 96791 part No. 500550	5-20
J708		CONNECTOR, RECEPTACLE, ELECTRICAL; Arc resistant, plastic dielectric; polarized; 02260 part No. 26-4401-8P	5-20
J709		CONNECTOR, RECEPTACLE, ELECTRICAL; Type MS3102R-16S-1P per MIL-C-5015	2-4
J710		CONNECTOR, RECEPTACLE, ELECTRICAL; 02260 part NO. 67-02E12-7S	2-4
K701		RELAY, ARMATURE; Coil resistance 1000 ohms; 04298 part No. MV7340	5-20
K702		Same as K701	5-20

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

TEST METER AND INTERCONNECTING CABLE

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
M701		AMMETER; 0 to 50 ma dc; 79500 type MR36W050-DCU-AR per MIL-M-10304	2-2
P701		CONNECTOR, PLUG, ELECTRICAL; Total of 16 contacts, two coaxial; One connector mating end; Low loss, arc resistant dielectric; polarized; 2.0 in. × 0.44 in. × 0.88 in.; Mtd by two 4-40 thd studs 0.24 in. lg. on 1.688 in. mtg centers; 07795 type 1040-14S/2RG per MIL-C-8384	5-20
P702		Same as P701	5-20
P703		CONNECTOR, PLUG, ELECTRICAL; Miniature; 95238 series 20, rectangular type 9-20S per MIL-C-8384	5-20
P704		CONNECTOR, PLUG, ELECTRICAL; 50 ohms impedance; Fits RG196/U cable; Male; 74868 part No. 58300	5-20
R701		RESISTOR, FIXED, CARBON; 220 ohms ±5%; 1 watt; Type RC32GF221J per MIL-R-11 and MIL-STD-242	4-11
R702		Same as R406	5-20
R703		Same as R401	5-20
R704		RESISTOR, FIXED, FILM; 27,400 ohms ±1%; 0.25 watt; Type RN65B2742F per MIL-R-10509	5-20
R705		RESISTOR, FIXED, FILM; 2 meg ohs ±1%; 0.25 watt; Type RN65B2004F per MIL-R-10509	5-20
R706		RESISTOR, FIXED, FILM; 1 meg ohm ±1%; 0.25 watt; Type RN65B1004F per MIL-R-10509	5-20
R707		Same as R406	5-20
R708		Same as R406	5-20
R709		Same as R706	5-20
R710		Same as R611	5-20
R711		Same as R112	5-20
R712		RESISTOR, VARIABLE, WIRE WOUND; Sliding brush type; 200 ohms ±5%; 1.0 watt; Linear taper; 1.29 in. × 0.27 in. × 0.27 in. × 0.31 in.; Three terminals, wire lead type; Mtd with two 0.089 in. dia. holes spaced 1.00 in. c. to c.; 80294 part no. 260L-1-201	5-20
R713		Same as R706	5-20
R714		Same as R611	5-20
R715		RESISTOR, FIXED, FILM; 20,000 ohms ±1%; 0.25 watt; Type RN65B2002F per MIL-R-10509	5-20

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

TEST METER AND INTERCONNECTING CABLE

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R716		Same as R701	4-11
R717		Same as R701	5-20
R718		RESISTOR, FIXED, FILM; 1500 ohms ±1%; 0.25 watt; Type RN65B1501F per MIL-R-10509	5-20
R719	1	RESISTANCE WIRE; 96791 part No. P143-MM-57	5-20
R720		Same as R719	5-20
R721		Deleted	----
R722		Deleted	----
R723		Deleted	----
R724		Same as R418	5-20
R725		Deleted	----
S701		SWITCH, ROTARY; 25244 series PA2000; 96791 part No. 501389 per MIL-S-3786	2-2
S702		SWITCH, PUSH; Type MS25253-1	5-20
S703		SWITCH, TOGGLE; spst; Type ST42A per MIL-S-21195 and MIL-STD-242	2-3
TB701		TERMINAL BOARD; 96791 part No. 501411	5-20
TB702		Deleted	----
TB703		TERMINAL BOARD; With spade lugs; 96791 part No. 501442	5-21
XDS701		LAMP SOCKET; Type MS25256-6	5-3
XDS702		Same as XDS701	5-3
XDS703		Same as XDS701	5-3
XK701		SOCKET, RELAY; 81312 type RL8S-1	5-20
XK702		Same as XK701	5-20
		BATTERY POWER SUPPLY	
BT801		CELL, BATTERY, STORAGE; 96791 Type 501578	5-16
BT802 thru BT819		Same as BT801	5-16
C801		Same as C410	5-19

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

BATTERY POWER SUPPLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
CR801		Same as CR202	5-19
J801		CONNECTOR, RECEPTACLE, ELECTRICAL;02660 part No.26-4201-8S	5-16
K801		Same as K301	5-16
Q801		Same as Q202	5-19
R801		RESISTOR, FIXED, CARBON; 51 ohms ±5%; 0.5 watt; Type RC20GF510J per MIL-R-11	5-19
R802		RESISTOR, FIXED, CARBON; 6800 ohms ±5%; 0.5 watt; Type RC20GF682J per MIL-R-11 and MIL-STD-242	5-19
R803		Same as R404	5-19
R804		RESISTOR, VARIABLE, WIRE WOUND; Sliding brush type; 2500 ohms ±5%; 1.0 watt; Linear taper; One section, three wire lead terminals; No off position; Two 0.089 in. dia. mtg holes spaced 1.00 in. c. to c.; 1.289 in. × 0.27 in. × 0.31 in.; Single 0.125 dia. stainless steel shaft, screwdriver adjusted below component surface; Screwdriver slot 0.025 in. lg. and 0.025 in. w.; Normal torque; No switch; 80294 part No. 260L-1-252	5-16 and 5-19
R805		RESISTOR, FIXED, CARBON; 8200 ohms ±5%; 0.5 watt; Type RC20GF822J per MIL-R-11 and MIL-STD-242	5-19
R807		Same as R804 except Part No. is 260L-1-302	5-19
RT801		RESISTOR, THERMAL; 2000 ohms ±20% at 25°C; 5800 ohms at 0°C; 800 ohms at 50°C; 1mw/°C dissipation factor; 83186 type No. 32A125	5-19
S801		Same as S703	5-16 and 5-19
TB801		Deleted	----
TB802		TERMINAL BOARD; 96791 part No. 500826	5-16 and 5-19
TB803		Deleted	----
TB804		TERMINAL BOARD; 96791 part No. 501584	5-16 and 5-19
XK801		Same as XK301	5-19
		POWER SUPPLY	
C901		CAPACITOR, FIXED, TANTALUM ELECTROLYTIC; One section; 100 vdcw; 2 uf -15% +50%; Type CL-44BN20TP3 per MIL-C-3965	5-18

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

POWER SUPPLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
C902		Same as C603	5-18
C903		Same as C603	5-18
C904		CAPACITOR, FIXED, PAPER; One section; 600 vdcw; 0.01 uf ±10%; Metal case; Uninsulated; Hermetically sealed; 0.375 in. dia. and 0.94 in. lg.; 56289 type 96P, "Vitamin Q"; Type CPO5A-1KF103K	5-18
CR901		Same as CR201	5-18
CR902		Same as CR201	5-18
CR903		SEMI-CONDUCTOR DEVICE, DIODE; Type 1N-1614	5-18
CR904		Same as CR903	5-18
CR905		Same as CR903	5-18
CR906		Same as CR903	5-18
CR907		Same as CR202	5-18
CR908		Same as CR202	5-18
CR909		Same as CR604	5-18
CR910		Same as CR604	5-18
F901		FUSE, CARTRIDGE; 10 amp; 250V max.; Type MS90079-5-1; per MIL-STD-242	5-15 and 5-19
FL901		FILTER, LOW PASS; 96791 part No. 63057	5-15 and 5-19
J901		Same as J801	5-15 and 5-19
J902		Same as J401	5-19
J903		JACK, TIP, LOW VOLTAGE; Type MS16108-4A	5-19
J904		Same as J404	5-19
J905		JACK, TIP, LOW VOLTAGE; Type MS16108-1A	5-19
J906		Same as J402	5-19
J907		Same as J405	5-19
J908		Same as J403	5-19
J909		Same as J411	5-19
L901		REACTOR; One coil; 5.0 h min. at 10 v, 60 cps, and 0.025 amp dc; Rated at 0.026 amp dc; 100 ohms ±15%; untapped; 96791 part No. 71654	5-19

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

POWER SUPPLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
L902		Same as L901	5-19
L903		REACTOR; Two coils connected series-aiding; total 0.1 h min. at 20 vrms, 60 cps, and 1.0 amp dc; DCR of 0.4 ohm ±15%; Four solder lug terminals; Mtd by eight holes located in corners of 3.28 in. × 2.25 in. rectangle; 96791 part No. 71652.	5-15 and 5-19
L904		Same as L901	5-19
Q901		Same as Q202	5-19
Q902		Same as Q202	5-19
R901		RESISTOR, FIXED, FILM; 51.1 ohms ±1%; 0.125 watt; Type RN60B51R1F	5-19
R902		RESISTOR, FIXED, COMPOSITION; 1500 ohms ±5%; 1.0 watt; Type RC32GF152J per MIL-R-11 and MIL-STD-242	5-19
R903		RESISTOR, VARIABLE, WIRE WOUND; One section; 250 ohms ±10%; 1.5 watt; Untapped; Linear taper; Normal torque; Locking; Type RA10LASM251A per MIL-R-19	5-15 and 5-19
R904		RESISTOR, FIXED, CARBON; 330 ohms ±5%; 1.0 watt; Type RC32GF331J per MIL-STD-242	5-19
R905		RESISTOR, FIXED, COMPOSITION; 510 ohms ±5%; 1.0 watt; Type RC32GF511J per MIL-R-11	5-19
R906		RESISTOR, FIXED, WIRE WOUND; 710 ohms; 3 watt; Type RW59V711	5-19
R907		Deleted	----
R908		Same as R718	5-19
R909		Same as R407	5-19
R910		Same as R901	5-19
R911		RESISTOR, FIXED, CARBON; 3900 ohms ±5%; 0.5 watt; Type RC20GF392J per MIL-R-11 and MIL-STD-242	5-19
R912		RESISTOR, FIXED, FILM; 9090 ohms ±1%; 0.25 watt; Type RN65B9091F per MIL-R-10509	5-19
R913		RESISTOR, VARIABLE, WIRE WOUND; One section; 5000 ohms ±5%; 1.5 watt; Untapped; Linear taper; Normal torque; Locking; Single metal shaft 0.125 in. dia.; Screwdriver slotted 0.063 to 0.078 in. deep and 0.047 in. wide; Shaft projects 0.44 in. from body; 12697 series 49M-9; 96791 part No. 500235-502	5-15 and 5-19

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

POWER SUPPLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
R914		RESISTOR, FIXED, FILM; 11,000 ohms ±1%; 0.25 watt; Type RN65B1102F per MIL-R-10509	5-19
R915		RESISTOR, FIXED, WIRE WOUND; Inductive; 1000 ohms ±5%; Untapped; 3 watt; 300°C max. continuous operating temperature; Type RW59-V102 per MIL-R-26 and MIL-STD-242	5-19
T901		TRANSFORMER, POWER ISOLATION AND STEP-DOWN; Prim. 115 v, 60 cps, Single phase; 1.4 amps rms; Sec. No. 1, 52 vrms untapped; Sec No. 2, 27 vrms untapped at 0.76 amp rms; Mtd by four holes located at corners of 3.75 in. × 2.625 in. rectangle; Six solder lug type terminals; 96791 part No. 71653	5-15 and 5-19
T902		TRANSFORMER, CURRENT; Load winding 56 to 64 cycles, Single phase, 1.0 amp. nom. current, DCR of 0.86 ohms max.; 1st control winding, DCR of 10 ohms ±25%; 2nd control winding, DCR of 10 ohms ±25%; Mtd. by four 0.147 in. holes at corners of 4 in.× 4.25 in. rectangle; Six solder lug type terminals; 96791 part No. 71651	5-19
T903		Same as T902	5-19
TB902		TERMINAL BOARD; Complete with spade lugs; 96791 part No. 71979	5-15 and 5-19
W901		CABLE ASSEMBLY, POWER ELECTRICAL; 96791 part No. 59005	5-19
XF901		Same as XF601	5-19
		OVENS ASSEMBLY	
C1401		CAPACITOR, VARIABLE, AIR; Concentric type; 1 uuf min. 35 uuf max; Straight line capacity tuning characteristic; 300 vrms peak voltage; No trimmer; Screwdriver type adjustment; 96791 type 500191 per MIL-C-14409	5-24
C1402	2	CAPACITOR, FIXED, GLASS; 10 uuf; Type CY13C100J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 12 uuf; Type CY13C120J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 15 uuf; Type CY13C150J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 18 uuf; Type CY13C180J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 20 uuf; Type CY13C200J per MIL-C-11272 and MIL-STD-242	5-24

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OVENS ASSEMBLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
or	2	CAPACITOR, FIXED, GLASS; 22 uuf; Type CY13C220J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 24 uuf; Type CY13C240J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 27 uuf; Type CY13C270J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 30 uuf; Type CY13C300J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 33 uuf; Type CY13C330J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 36 uuf; Type CY13C360J per MIL-C-11272 and MIL-STD-242	5-24
or	2	CAPACITOR, FIXED, GLASS; 39 uuf; Type CY13C390J per MIL-C-11272 and MIL-STD-242	5-24
C1403		CAPACITOR, VARIABLE, AIR; Concentric type; 0.7 uuf min., 17 uuf max,; Straight line capacity tuning characteristic; 1000 volts working. Screwdriver type adjustment; Per MIL-C-14409; 1.125 in. lg. 0.375 in. dia., 73899 model VC-J401 piston capacitor	5-24
C1404		Deleted	----
E1401		TERMINAL STUD; Solder terminal brass, hot tin dipped; 0.73 in. lg., 0.16 in. dia., Hex base 0.16 in.w.; Base insulated from conductor connection; 3,000 volt flash over point; Teflon insulated; With mounting stud 0.18 in. lg., Stud has No. 4-40 thd; 78972 Type TE-400-08	5-24
F1401		FUSE, CARTRIDGE; 3 amp; 250 V max; Type MS90078-12-1 per MIL-STD-242	
HR1401	1	RESISTANCE WIRE; 96791 part No. P144-33	5-24
HR1402	1	LOHM WIRE; 96791 part No. P145-28	5-24
HR1403	1	Same as HR1402	5-24
J1401		CONNECTOR, RECEPTACLE, ELECTRICAL; One coaxial contact; Low loss plastic dielectric; 98278 part No. 31-49	5-24
J1402		Same as J1401	5-24
J1403		CONNECTOR, RECEPTACLE, ELECTRICAL; Seven contact female; Arc resistant, plastic dielectric; 07795 type 5040-75 per MIL-C-8384	5-24
J1404		CONNECTOR, RECEPTACLE, ELECTRICAL; 11 contact female, Arc resistant plastic dielectric; 07795 type 5040-11S per MIL-C-8384	5-24

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OVENS ASSEMBLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
J1405		Same as J1401	5-24
J1406		Same as J1404	5-24
L1401		COIL, RADIO FREQUENCY; 112 to 115 turns of toroidally wound No. 27 AWG Formvar insulated copper wire wound on a Rexolite form; 17 ±0.5 uh; Q at 5.0 mc is greater than 100, 1.609 in. dia. × 9/16 in. w.; 96791 part No. 62665	5-24
L1402	2	COIL, RADIO, FREQUENCY; 6.8 uh ±10%; 96791 part No. 501485	5-24
or	2	COIL, RADIO, FREQUENCY; 10 uh ±10%; 96791 part No. 501507	5-24
or	2	COIL, RADIO, FREQUENCY; 12 uh +10%; 96791 part No. 501599	5-24
or	2	COIL, RADIO, FREQUENCY; 15 uh ±10%; 96791 part No. 501266	5-24
or	2	COIL, RADIO, FREQUENCY; 18 uh ±10%; 96791 part No. 501600	5-24
or	2	COIL, RADIO, FREQUENCY; 22 uh ±10%; 96791 part NO. 501265	5-24
or	2	COIL, RADIO, FREQUENCY; 24 uh ±5%; 96791 part NO. 501601	5-24
R1401	2	RESISTOR, FIXED, FILM; 1500 ohms ±1%; 0.125 watts; Type RN60B1501F per MIL-R-10509	5-24
or	2	RESISTOR, FIXED, FILM; 1780 ohms ±1%; 0.125 watts; Type RN60B1781F per MIL-R-10509	5-24
or	2	RESISTOR, FIXED, FILM; 1960 ohms ±1%; 0.125 watts; Type RN60B1961F per MIL-R-10509	5-24
or	2	RESISTOR, FIXED, FILM; 2210 ohms ±1%; 0.125 watts; Type RN60B2211F per MIL-R-10509	5-24
RT1401		Same as RT801	5-24
RT1402		Same as RT801	5-24
RT1403		Same as RT801	5-24
RT1404		Same as RT801	5-24

TABLE 6-1. MAINTENANCE PARTS LIST (CONT)

OVENS ASSEMBLY

REF. DES.	NOTES	NAME AND DESCRIPTION	FIG. NO.
S1401		SWITCH, THERMOSTATIC; spst; Normally open; Contacts close on temperature decrease; Close at 20 ±3°C; Bi-metallic element type; Metal case 1.19 in.× 0.82 in. × 0.305 in.; Flange mtd with two holes of 0.11 in. dia. spaced 0.94 in. c. to c.; Two solder lug terminals; 93410 type A605	5-24
S1402		SWITCH, THERMOSTATIC; spst; Normally open; Contacts close on temperature increase; Close at 100 ±3°C; Contacts reopen at 88 ±3°C; Bi-metal element type; Metal case 1.19 in. × 0.82 in. × 0.305 in.; Flange mtd with two holes of 0.11 in. dia. spaced 0.94 in. c. to c.; Two solder lug type terminals; 93410 Type A605	5-24
TB401		TERMINAL BOARD: Complete with spade lugs; 96791 part No. 500210	5-24
TB1402		Deleted	----
XF1401		FUSE HOLDER	5-24
Y1401		CRYSTAL UNIT, QUARTZ; One crystal, 4999.995 kc + 5-3 cps at the crystal zero temperature coefficient temperature (65 to 75°C); Operation on its fifth overtone; AT-cut; In holder 0.70 in. dia. and 1.688 in. lg.; In accordance with USA-SEL Data Sheet on CR-(XM-7) dated 6 Feb 1957	5-24

TABLE 6-2. LIST OF MANUFACTURERS

MFR CODE	NAME	ADDRESS
1. 02660	Amphenol Division of Amphenol-Borg Electronics Corp	2801 South 25th Ave Broadview, Ill
2. 04298	National Watch Co Electronics Division	4235 N. Naomi St Burbank, Calif
3. 07795	Electronic Fittings Corp	29 Sugar Hollow Rd. Dansbury, Conn.
4. 09023	Cornell Dubilier	50 Paris St., Newark, N.J.
5. 12697	Clarostat Manufacturing Co, Inc	Washington St., Dover, N.H.
6. 16688	Dejur-Amsco Corp	Long Island City,N.Y.
7. 25244	Centralab Div. of Globe-Union, Inc	900 E.Keefe Ave Milwaukee 1, Wis
8. 56289	Sprague Products Co	335 Marshall St North Adams, Mass
9. 73899	JFD Electronics Corp	6101 16th Ave Brooklyn, N.Y.

TABLE 6-2. LIST OF MANUFACTURERS (CONT)

MFR CODE		NAME	ADDRESS
10.	74868	Industrial Products Co	Danbury, Conn
11.	75970	Littlefuse, Inc	1865 Miner St Des Plaines, Ill
12.	78277	Sigma Instrument Co, Inc	Mansfield, Ohio
13.	78972	Fluorocarbon Products Inc of U.S. Gasket Co	Camden 1, N.J.
14.	79500	Westinghouse Electric Co	Box 146 Pittsburgh 30, Pa
15.	80294	Bourns Inc	1200 Columbia Ave Riverside, Calif.
16.	81312	Winchester Electronics	19 Willard Rd Norwalk, Conn
17.	82068	Burnell & Co, Inc	10 Pelham Parkway Pelham Manor, N.Y.
18.	82376	Astron Corp	225 Grant Ave East Newark, N.J.
19.	83186	Victory Engineering Corp	42 Springfield Rd Union, N.J.
20.	93410	Stevens Manufacturing Co, Inc.	Mansfield, Ohio
21.	94375	Automatic Metal Products	315 Berry St Brooklyn, N.Y.
22.	95238	Continental Connector Corp	34-63 56th St Woodside 77, N.Y.
23.	96214	Texas Instruments, Inc	Box 312, Dallas Texas
24.	96791	Borg Equipment Div. of Amphenol-Borg Electronics Corp	120 South Main St Janesville, Wis
25.	99800	Delevan Electronics Corp	77 Olean Rd East Arora, N. Y.
26.	JB	JB Electronics Transformers, Inc	2310 W. Armitage Ave Chicago 47, Ill

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