INSTRUCTION MANUAL

STANDARD-FREQUENCY OSCILLATOR

1115-B

GENERAL RADIO COMPANY

1115-B

INSTRUCTION MANUAL

TYPE 1115-B

STANDARD-FREQUENCY OSCILLATOR

Form 1115-0100-C
I. D. Number 945 and/or 1149
August, 1967

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

Figure 1-1. Type 1115-B Standard Frequency Oscillator.

CONDENSED OPERATING INSTRUCTIONS

1. To start unit:

a. Remove the two screws on the rear of the cabinet.
b. Slide the unit out of the cabinet.
c. Set the BATTERY switch to ON.
d. Return the unit to the cabinet and replace the screws.
e. Connect to a source of ac power – 90 to 130 volts (or 180 to 260 volts after internal changeover), 40 to 2000 c/s.

2. To check operating conditions: At each position of the METER switch, observe the meter indication.

a. At the 5 MC, 1 MC, 100 kC, and DC VOLTS positions, the indication should be within the marked sectors on the meter.
b. At the OVEN TEMP position the meter will indicate off scale to the left until the oven is close to operating temperature.
c. At the OVEN HEATER position the meter will indicate outside the OVEN HTR sector until the temperature is stabilized.
d. At the CHARGE-DISCHARGE position the meter may indicate outside the CHARGE sector for a short time after the instrument is connected to the line; then it will indicate within the CHARGE sector. If the battery is full, only a small amount of charging current will be indicated. When the unit is operating on the battery, the meter will indicate in the DISCH sector.

3. Operation. The unit is now ready for operation. Connect to the 5-Mc, 1-Mc and 100-kc output connectors as required. The warm-up time of the oven is 6 to 10 hours.

4. To take unit out of service:

a. Disconnect from the power line.
b. Remove the two screws from the rear of the cabinet and slide the unit out of the cabinet.
c. Disconnect the battery (i.e., set the BATTERY switch to BAT OFF).
d. Reinstall the unit in the cabinet.

Frequency Adjustment: Dial reads parts in 10^{10} per division. Total range is 2700 parts. Linearity is better than $\pm 20 \times 10^{-10}$. Settability is better than 2×10^{-11}.

RF Connections: 5-Mc, 1-Mc, and 100-kc output connections (in rear) supply 1 volt rms +50 -10% into 50 ohms at each frequency. Additional connectors provided for connection to Type 1112-A Standard-Frequency Multiplier and Type 1123-A Digital Syncronometer®.

Auxiliary Connections: To Amphenol connector in rear, an external dc power supply of 22 to 35 volts, 200 mA maximum, can be connected (refer to section 2.8 of the instruction manual). The negative side of this input is grounded. For external frequency control refer to section 2.9 of the instruction manual.

NOTE: Always check the meter in the CHARGE–DISCHARGE position after connecting the instrument to an ac power line. The battery switch should be ON, and the meter should read "CHARGE." If this is not the case, check the ac line.

SPECIFICATIONS

Output: 5 and 1 Mc/s, 100 kc/s; 1 V, rms, +50 −10% into 50 Ω at each frequency.

Frequency Adjustment: 2700×10^{-10} (1×10^{-10} per dial division).

External Frequency Control: Dc voltage from +0.5 to +12 V can be applied. Range is at least 5×10^{-7} total.

Frequency Stability:

Aging: $< 5 \times 10^{-10}$ per day after ~~30~~ 3 days of operation;
$< 1 \times 10^{-10}$ per day is typical after ~~1 year~~ 6 months.

Short-Term Stability (5 Mc/s): Standard Deviation (sigma) is less than stated below (95% confidence):

Averaging Time	*Frequency Deviation (Sigma)*	*Phase Deviation (Radians)*
300 μs	100×10^{-11}	1×10^{-5}
1 ms	50×10^{-11}	1.5×10^{-5}
10 ms	10×10^{-11}	3×10^{-5}
100 ms	1.5×10^{-11}	4.5×10^{-5}
1 s	1×10^{-11}	3×10^{-4}
10 s	1×10^{-11}	3×10^{-3}

Temperature Effects: $< \pm 1 \times 10^{-11}$ per degree C between 0°C and 50°C.

Loading of Output: $< \pm 2 \times 10^{-11}$ open circuit to short circuit.

Supply Voltage: $< \pm 1 \times 10^{-11}$ for ±10% ac line-voltage changes.
$< \pm 2 \times 10^{-11}$ for 22 to 35 V, external dc.

Spectral Purity: Line width of 5-Mc output multiplied by 2000 times (10 Gc/s or X band) is less than 0.25 c/s.

Noise Pedestal: Less than −145 dB per $\sqrt{c/s}$ at 5 Mc/s.

Power Required (ac or dc):
Ac: 90 to 130 or 180 to 260 V, 40 to 2000 c/s, 8 W at 115 V.
Dc: 22 to 35 V, 4 W at 24 V.

Emergency Power: Internal battery provides 24 to 35 hours depending on ambient temperature.

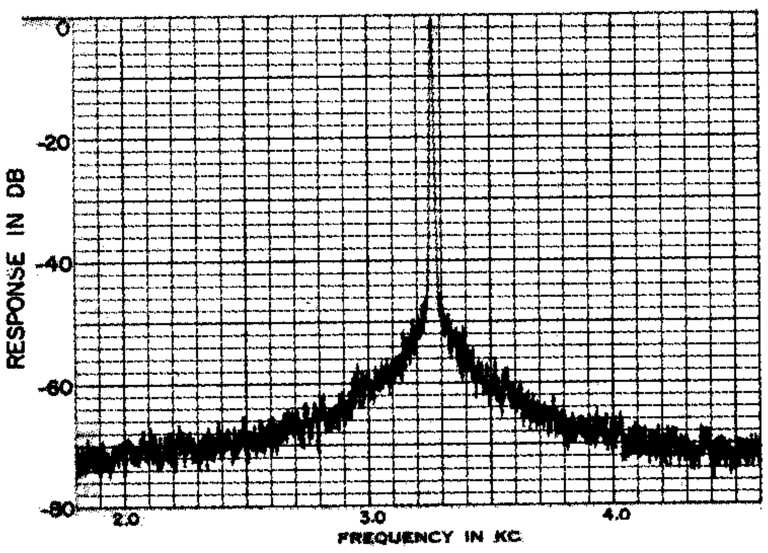
Terminals: Locking GR874, 5 Mc/s, 1 Mc/s, 100 kc/s; type BNC, 1 Mc/s and 100 kc/s for connection to TYPE 1123-A Digital SYNCRONOMETER.

Accessories Supplied: Power-line cord, 2 fuses, plug and clamp for connection to the accessory socket.

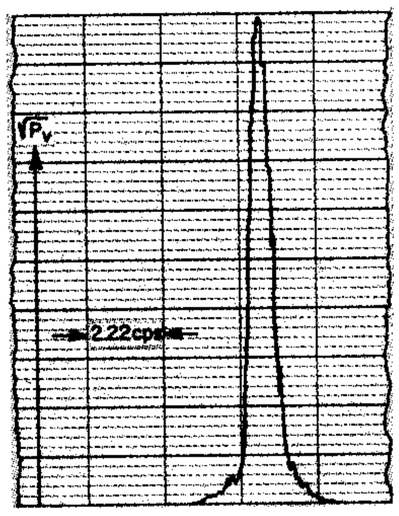
Mechanical Data: Rack-Bench Cabinet.

Model	*Width*		*Height*		*Depth*		*Net Weight*		*Shipping Weight*	
	in	*mm*	*in*	*mm*	*in*	*mm*	*lb*	*kg*	*lb*	*kg*
Bench	19	485	6	155	14½	370	35	16	52	24
Rack	19	485	5¼	135	14½*	370	35	16	52	24

* Behind panel.



(Left) X-band power spectrum of two Type 1115-B Standard-Frequency Oscillators. Analyzer bandwidth is 10 c/s.



(Right) Center portion of spectrum measured with 0.54-cycle band width. Vertical scale is linear ($\sqrt{\text{power}}$).

DIFFERENCE DATA SHEET

INSTRUCTION MANUAL

TYPE 1115-C STANDARD-FREQUENCY OSCILLATOR

ID-B588

February 1968

The Type 1115-B Instruction Manual Issue C, August 1967, applies with equal effect to the Type 1115-C, with the following exceptions:

1. Title page — change ID Number to B588.

2. Page iii — Specifications — Frequency stability entries now read:

Aging: $< 5 \times 10^{-10}$ per day after 3 days of operation;
$< 1 \times 10^{-10}$ per day is typical after 6 months.

3. Page 14 — Add to "POWER SUPPLY" parts list under "CAPACITORS" —

C511 Ceramic, .001 μF +80 -20% 500 V 4404-2109

4. Page 15 — Add to Figure 4-9 a capacitor between the emitter and collector of Q512 and label "C512 .001 μF".

5. Page 16 — Parts List — Crystal Circuit

X201 CRYSTAL PART NO. now 1115-0446

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS 01781

*NEW ENGLAND: 22 Baker Avenue
West Concord, Massachusetts 01781

*METROPOLITAN NEW YORK: 845 Broad Avenue
Ridgefield, New Jersey 07657

PHILADELPHIA: Fort Washington Industrial Park
Fort Washington, Pennsylvania 19034

*WASHINGTON and BALTIMORE: 11420 Rockville Pike
Rockville, Maryland 20852

ORLANDO: 113 East Colonial Drive
Orlando, Florida 32801

SYRACUSE: Pickard Building, East Molloy Road
Syracuse, New York 13211

CLEVELAND: 5579 Pearl Road
Cleveland, Ohio 44129

*CHICAGO: 9440 W. Foster Avenue
Chicago, Illinois 60656

*DALLAS: 2600 Stemmons Freeway, Suite 210
Dallas, Texas 75207

*LOS ANGELES: 1000 North Seward Street
Los Angeles, California 90038

SAN FRANCISCO: 626 San Antonio Road
Mountain View, California 94040

MONTREAL: 1255 Laird Boulevard
Town of Mount Royal, Quebec, Canada

*TORONTO: 99 Floral Parkway
Toronto 15, Ontario, Canada

*Repair services are available at these offices.

GENERAL RADIO COMPANY (Overseas), 8008 Zurich, Switzerland

GENERAL RADIO COMPANY (U.K.) LIMITED, Bourne End, Buckinghamshire, England

Representatives in Principal Overseas Countries

February 1968 Printed in USA

TABLE OF CONTENTS

SECTION **1**

INTRODUCTION

1.1 PURPOSE.

The Type 1115-B Standard-Frequency Oscillator (Figure 1-1) provides stable reference frequencies of 5 Mc/s, 1 Mc/s, and 100 kc/s and is an excellent working frequency and timing standard for many applications in microwave spectroscopy, in communications, and in radar.

1.2 DESCRIPTION.

Figure 1-2 is a block diagram of the Type 1115-B Standard-Frequency Oscillator. The instrument contains a 5-Mc crystal-controlled oscillator in a proportional-control oven. Amplifiers provide isolation and power for the 5-Mc output. The 5-Mc output is also divided by regenerative frequency dividers to produce outputs at 1 Mc/s and 100 kc/s.

The frequency is adjusted electrically by a potentiometer whose dial is direct reading in parts in 10^{10}. The frequency can be remote-controlled by a dc signal applied to a connector at the rear of the instrument.

The power-supply section has a line-power rectifier, battery charger, and voltage regulator. In case of power-line failure, operation for 35 hours is ensured at room temperature and up to 24 hours at 0°C. The battery is recharged rapidly after power failure and is then maintained at optimum charge.

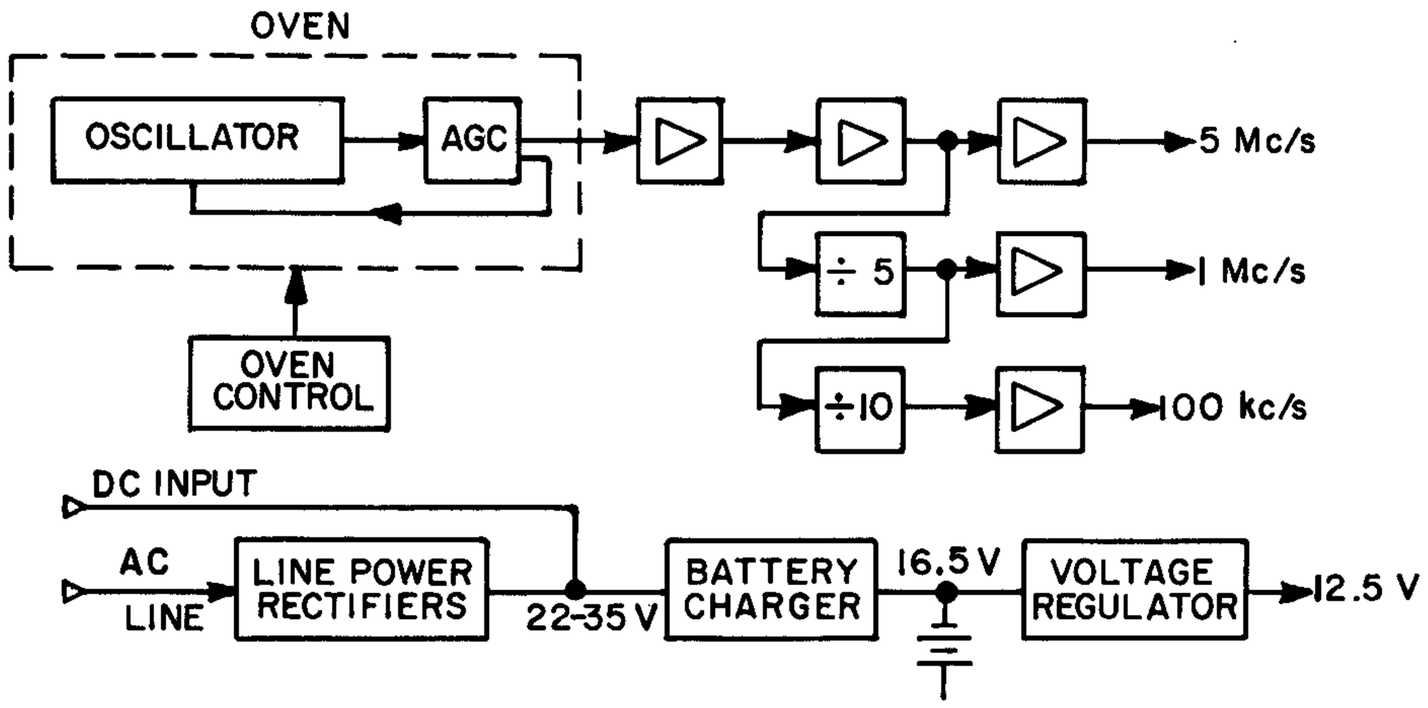
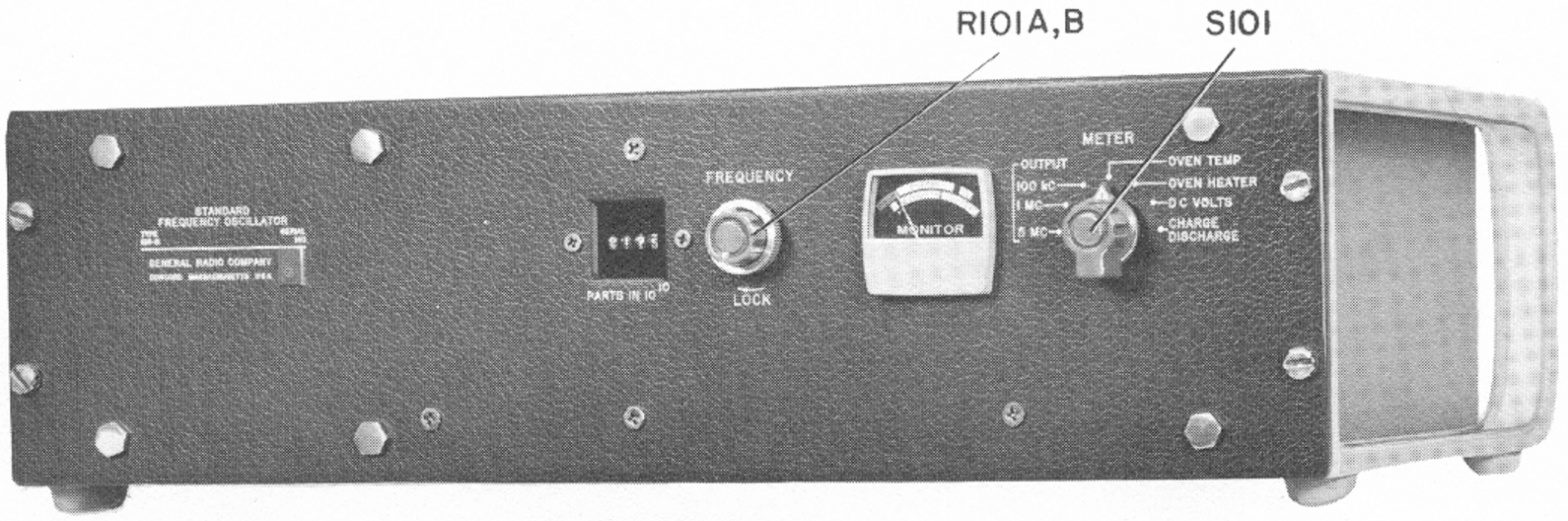


Figure 1-2. Block diagram of the Type 1115-B Standard-Frequency Oscillator.

1.3 CONTROLS AND CONNECTORS.

The controls on the Type 1115-B Standard-Frequency Oscillator are listed in Table 1-1; the connectors on the rear of the instrument are listed in Table 1-2.



Front panel controls of Type 1115-B Oscillator.

TABLE 1-1
CONTROLS

Ref. No.	*Name*	*Type*	*Function*
R101A,B	FREQUENCY	Potentiometer	Adjusts frequency.
S101	METER	7-position rotary switch	Selects meter function.
S702	BATTERY	Slide switch	Connects and disconnects battery.
S701	FREQUENCY CONTROL	Slide switch	Selects internal or remote frequency control.

TABLE 1-2
CONNECTORS

Figure 4-5 Reference	*Name*	*Type*	*Function*
J802	5 MC	GR874 Connector	5-Mc rf output.
J804	1 MC	GR874 Connector	1-Mc rf output.
J803	100 KC	GR874 Connector	100-kc rf output.
J801	5 MC TO 1112-A	GR874 Connector	Output to connect to General Radio Type 1112-A Standard-Frequency Multiplier.
J806,805	1 MC 100 KC TO 1123-A DIGITAL SYNCRONOMETER	BNC Connectors	Output to connect to General Radio Type 1123-A Digital Syncronometer.
SO802	Auxiliary Connector	7-pin Amphenol Connector	For connection of external dc power or remote frequency-control circuits.

SECTION **2**

OPERATING PROCEDURE

2.1 MOUNTING.

This instrument is available equipped for either bench or relay-rack mounting. For bench mounting, aluminum end frames are supplied to fit the ends of the cabinet. Each end frame is attached to the instrument with two panel screws and four No. 10-32 round-head screws with notched washers.

For rack mounting, rack-mounting brackets are supplied to attach the cabinet and instrument to the relay rack (see Figure 2-1). These brackets permit either cabinet or instrument to be withdrawn independently of the other.

To install the instrument in a relay rack:

a. Remove the cabinet from the instrument. If there are any bench-mount end frames, remove them from the cabinet.

b. Lay the cabinet on its left side (looking at it from the front) with the front forward.

c. Place the right-side-rack support (A) on the right side of the cabinet. Be sure that the flange with the mounting holes is forward and flush with the front of the cabinet (see figure) when the other flange (without holes) is resting against the bottom of the cabinet.

d. Assemble two pairs of flatwasher (D) and thumbscrew (E).

e. Install these as shown in the figure and tighten.

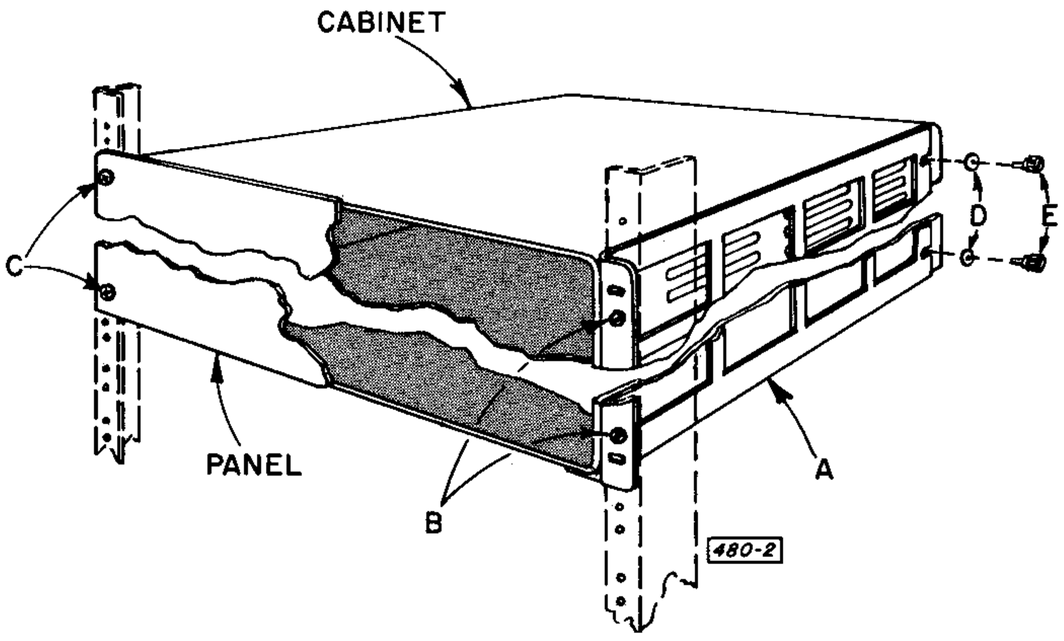


Figure 2-1. Installation of relay-rack model.

f. Turn the cabinet onto its right side.

g. Place the left-side-rack support on the left side and align in the same manner as the right side.

h. Repeat steps d and e for this side.

i. Install the cabinet with supports into the desired rack position by use of the four No. 10-32 washerless screws (B). The flange holes to be used are the second ones in from the extreme outside at the top and bottom. On some sets of supports, however, it may be necessary to use the third hole if the position of the hole in the rack rail requires it.

j. Reinstall the instrument into its cabinet.

k. Install the four panel screws (C).

In the future when the instrument is to be removed from the rack, remove the four panel screws (C) and slide the instrument out of its case.

If it is desirable to remove the cabinet and leave the instrument mounted, this can be done by loosening the thumbscrews (E) and sliding the cabinet off through the back of the rack.

2.2 BATTERY.

Remove the two screws on the rear of the cabinet. Slide the unit out of the cabinet. Set the BATTERY switch on the chassis to ON. Return the unit to the cabinet and replace the screws in the rear.

2.3 CONNECTION TO POWER SUPPLY.

Connect the Type 1115-B Standard-Frequency Oscillator to a source of power as indicated by the legend at the input socket at the rear of the instrument (40 to 2000 c/s, 90 to 130 or 180 to 260 volts), using the power cord provided. While instruments are normally supplied for 115-volt operation, the power transformer can be reconnected for 230-volt service. For 115-volt service, transformer terminal 1 is connected to terminal 3 and terminal 2 to terminal 4. For 230-volt service, terminal 2 is connected to terminal 3 (refer to schematic diagram, Figure 4-9). When changing connections, be sure to replace line fuses with those of current rating for the new input voltage (0.5 ampere for 115-volt operation, 0.25 ampere for 230-volt operation). Change the legend to

indicate the new input voltage. On instruments changed from 230 to 115 volts, this simply means removal of the 230-V nameplate; a 115-V legend is marked beneath. For instruments changed to 230 volts, a nameplate (Type 5590-1664) may be ordered from General Radio.

2.4 WARM-UP.

The oven in this instrument requires 6 to 10 hours of warmup before stabilization. During this time, in the OVEN HEATER position of the METER switch, the meter indication will be higher than the sector marked OVEN HTR.

2.5 CHECK FOR NORMAL OPERATION.

Observe the meter indication for each position of the METER switch. At each switch position, meter indication should be within the correspondingly marked meter sector, except during warmup, when the OVEN HTR indication will be high.

2.6 OUTPUT CONNECTIONS.

2.6.1 RF OUTPUT.

Connect to the 5-Mc, 1-Mc, and 100-kc outputs as required. Each output supplies about 1 volt, rms, into a 50-ohm load.

The output connectors are GR874 locking connectors. Adaptors are available to convert to most popular coaxial connectors (see table at the rear of this manual). The GR874 locking adaptor offers a low-leakage connection that can be wrench-tightened for semipermanent installations, yet can be quickly removed if a change of connector is desired.

2.6.2 CONNECTION TO TYPE 1112-A STANDARD-FREQUENCY MULTIPLIER.

The GR874 connector marked 5 MC TO 1112-A can be connected directly to the Type 1112-A Standard-Frequency Multiplier to produce outputs of 10 Mc/s and 100 Mc/s, and, with the addition of the Type 1112-B Multiplier, 1 Gc/s. Refer to the Appendix and to the Operating Instructions for the Type 1112 Standard-Frequency Multipliers.

2.6.3 CONNECTION TO TYPE 1123-A SYNCRONOMETER DIGITAL TIME COMPARATOR.

From BNC connectors at the rear of the instrument, 1-Mc and 100-kc signals will drive the Type 1123-A Syncronometer digital time comparator. This time comparator is a solid-state digital clock for accurate time comparisons between local standards and transmissions of standard time, such as WWV, Loran C, etc. Refer to Appendix and to the Operating Instructions for the Type 1123-A Syncronometer digital time compator.

2.7 FREQUENCY ADJUSTMENT.

Frequency can be adjusted over a range of 2700 x 10^{-10} by means of a panel control. The digital readout is direct reading in parts in 10^{10} per digit. The total range is adequate to compensate for crystal aging over the life of the instrument.

2.8 EXTERNAL POWER.

A dc source of 22 to 35 volts can be connected to the instrument at the auxiliary connector, SO802. Contact A is the positive side and contact B is the (grounded) negative side (see Figure 2-2). The current drawn varies with temperature and condition of the internal battery. At normal room temperature and trickle charge for the battery, this current is typically 150 mA.

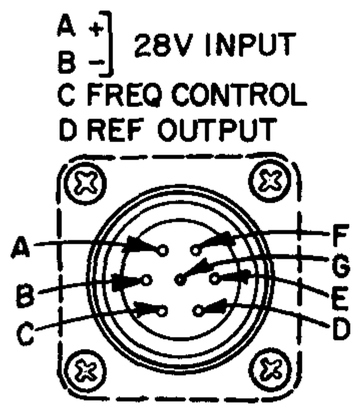


Figure 2-2. Pin numbering of SO802.

2.9 REMOTE FREQUENCY CONTROL.

For remote control of frequency, a dc signal from +0.5 V to +12 V can be applied to the varactor CR203 in the crystal oscillator circuit through connector SO802 at the rear of the instrument. The corresponding frequency range is at least 5000 x 10^{-10}.

When the FREQUENCY CONTROL switch (on the chassis inside the cabinet) is set to REMOTE, the internal frequency adjusting circuits are disconnected and the varactor is connected to pin C of SO802. In addition, the Zener reference voltage of the power supply (about 6.2 V) is connected to pin D of SO802. This arrangement permits convenient remote-control of frequency by the following methods:

a. Potentiometer Control

The remote-control potentiometer shown in the circuit arrangement of Figure 2-3 can be used for manual control or can be part of a servo system for automatic control. The total range of the external potentiometer is 3000 to 4000 x 10^{-10}. To adjust this range, change the fixed resistor (R in Figure 2-3) in series with the potentiometer. The resistor R should be at least 5 kilohms. Moving the arm of the potentiometer towards the upper end increases the frequency.

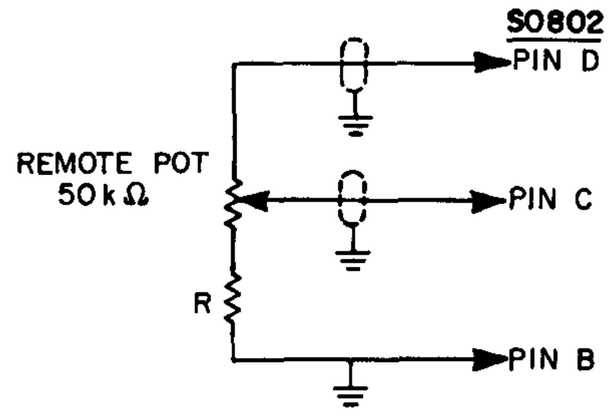


Figure 2-3. A circuit arrangement for remote control of frequency by a potentiometer.

If a wider frequency range is required, an external dc source can be connected to the high end of the potentiometer. Figure 2-4 shows this arrangement. A total range of at least 5000 x 10^{-10} is possible. The external dc source must have a long-term stability of better than 1 mV/day and 10 mV/month. The noise must be less than 100 μV, rms. Particular attention must be paid to the wiring to avoid any possibility of ground loop pickup.

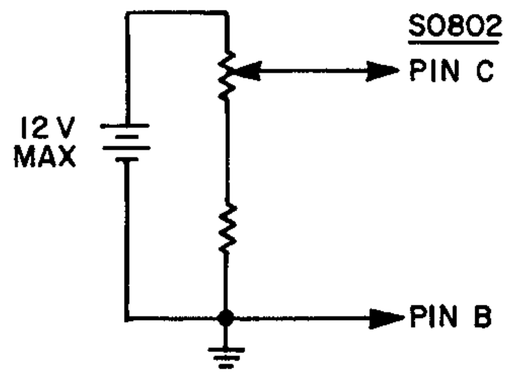


Figure 2-4. Circuit arrangement for remote control of frequency by a potentiometer with an external dc source. This circuit provides control over a wider range than that covered by the circuit of Figure 2-3.

b. Phase-Detector Control.

The high sensitivity of the varactor tuning makes possible direct drive from a phase detector without amplification. Figure 2-5 shows a simple phase detector that can be used to lock to the Standard-Frequency Oscillator. The phase lock can be operated on any one of the three output frequencies of the Type 1115-B. Potentiometer R sets the center of the detector range. The sensitivity at pin C of SO802 (the varator) is between 1 and 1.5 mV per part in 10^{10}. Contact General Radio for information on special applications.

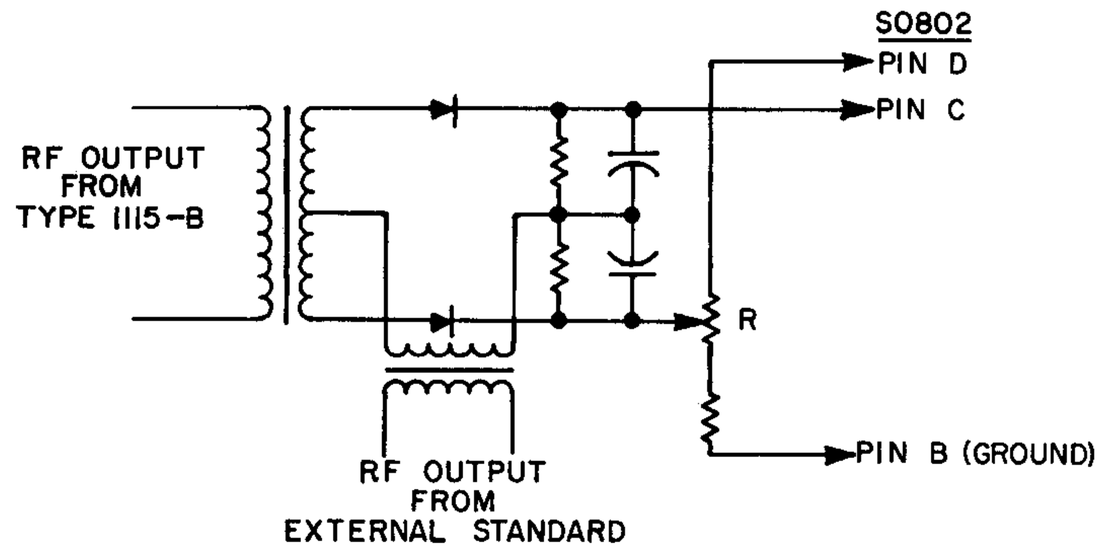


Figure 2-5. Phase-detector arrangement for locking the Type 1115-B Standard-Frequency Oscillator to an external standard.

SECTION **3**

PRINCIPLES OF OPERATION

3.1 CRYSTAL OSCILLATOR AND AGC.

The basic oscillator circuit shown in Figure 3-1 provides high input and output impedances. Its gain can be varied without any change in dc operating conditions. The voltage gain, e_L/e_o, is very nearly unity and the transconductance of the oscillator varies with the resistance of R, which represents the AGC circuit.

The AGC circuit, Figure 3-2, varies the bias current through diodes D_1 and D_2 to change their forward resistance. The rf output from the oscillator is amplified by a two-stage amplifier and rectified by D_3. As long as there is no rf voltage, Q_4 is biased on to pass a maximum current through the AGC diodes, D_1 and D_2. This results in maximum gain in the oscillator to start oscillations. As the amplitude increases, D_3 reduces the drive to Q_4 until Q_4 gets out of saturation. Any further increase in rf amplitude reduces the current through the diodes D_1 and D_2, and reduces the gain of the oscillator. R_D determines the rf amplitude at which Q_4 turns off and thus sets the rf level.

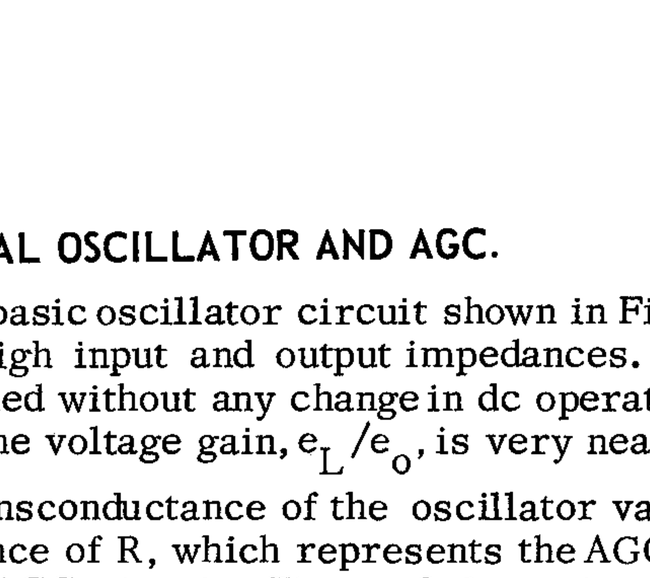


Figure 3-1. Basic Oscillator circuit.

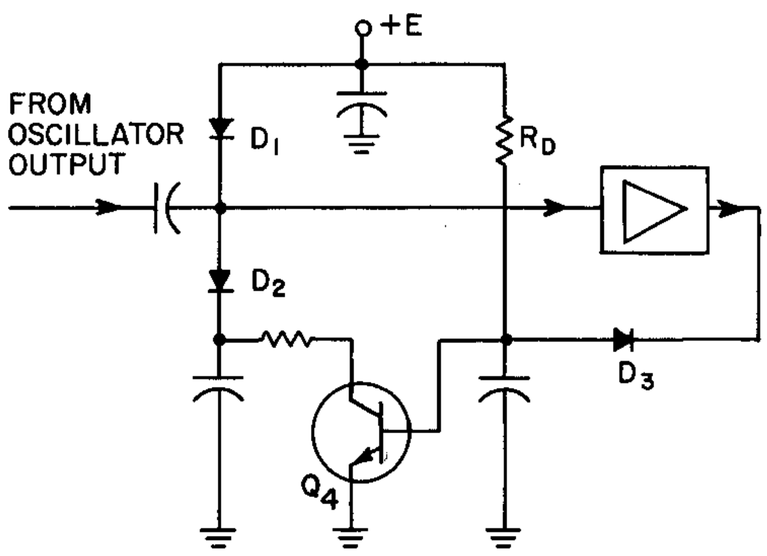


Figure 3-2. Basic AGC circuit.

3.2 FREQUENCY CONTROL.

A variable-capacitance diode (varactor) adjusts the frequency of the oscillator. The varactor bias is in turn controlled by a potentiometer mounted on the panel. The digital readout for this potentiometer indicates frequency increments of 1×10^{-10} per digit. The total range of frequency tuning is 2700×10^{-10}. Excellent linearity of this dial is ensured by a combination fixed-and-variable load on the arm of the potentiometer. The complete network is shown in

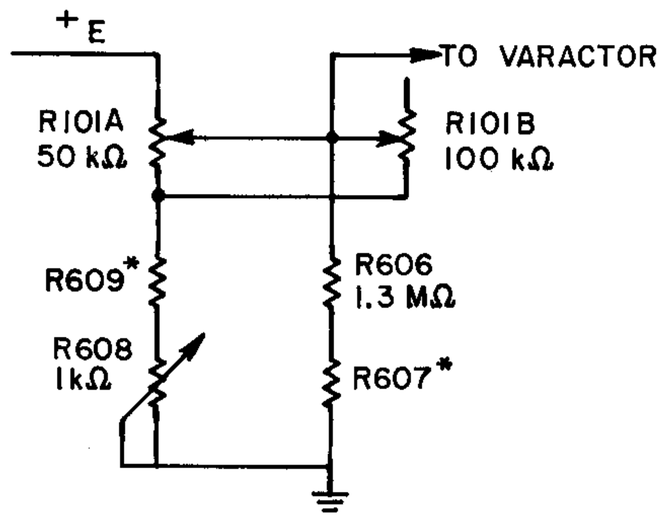


Figure 3-3. Linearizing network for the frequency-control varactor.

Figure 3-3. R609 (value selected by the calibration laboratory) and R608 set the total range of the dial. R606 and R607 affect the linearity. Typical linearity is about ±7 x 10^{-10} (out of 2700 x 10^{-10}), or about ±1/4%. Figure 3-4 shows a typical curve for the tracking error. For remote control, manual or automatic, an externally controlled dc voltage can be applied to the auxiliary connector at the rear (SO802). (Refer to paragraph 2.8.)

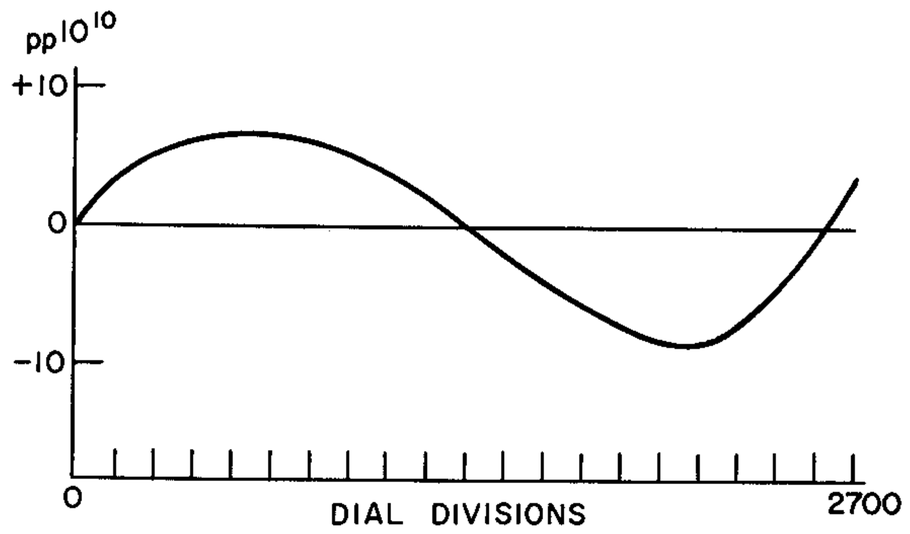


Figure 3-4. Tracking error of varactor tuning.

3.3 5-MC AMPLIFIERS.

Three stages of amplification are used between the oscillator and the 5-Mc output. The first two are of the cascode type, i.e., each consists of a grounded-emitter stage driving a grounded-base stage. The third stage is the output power amplifier. A crystal filter is used between the second isolation amplifier and the output amplifier. The output stage has an automatic level-control circuit to reduce harmonic distortion. The basic circuit is shown in Figure 3-5.

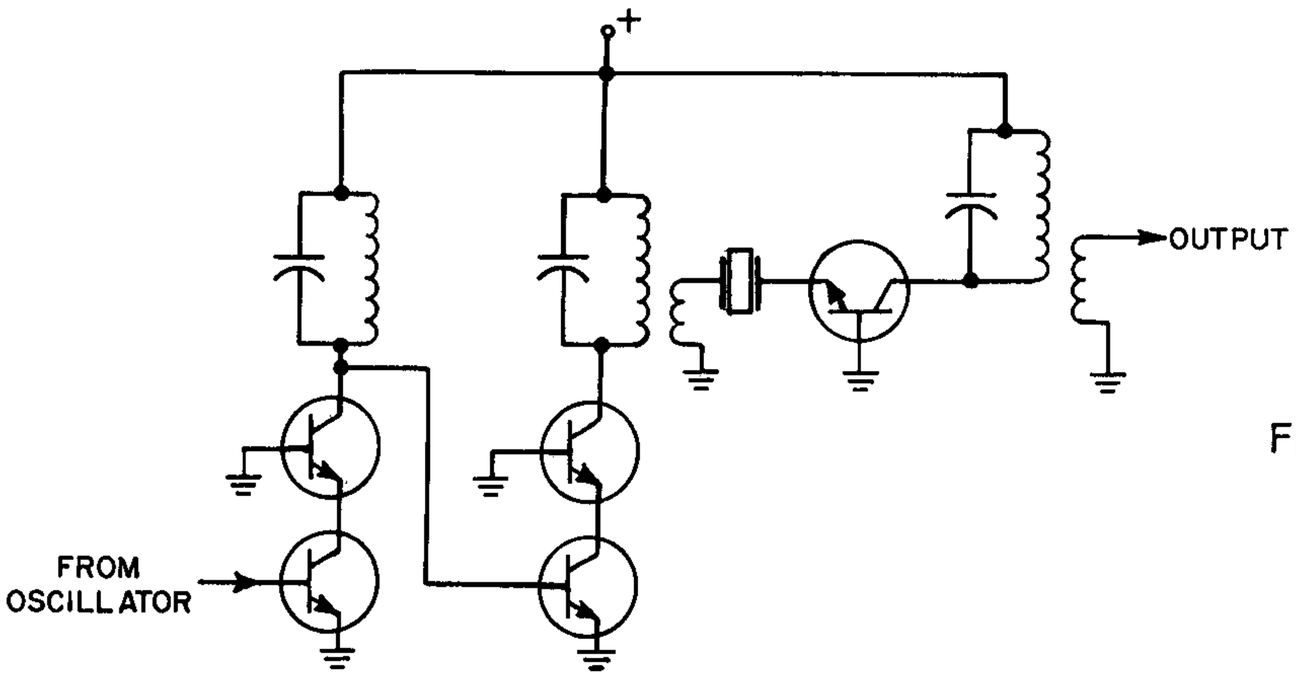


Figure 3-5. Basic circuit of the 5-Mc amplifier section.

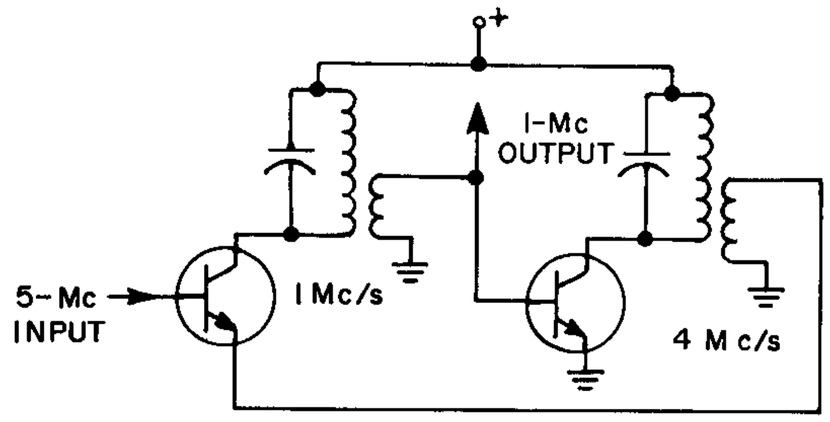


Figure 3.6. Basic circuit of the 1-Mc divider.

3.4 DIVIDERS.

A self-starting regenerative divider provides 1-Mc output from the 5-Mc input. The basic circuit is shown in Figure 3-6. The 1-Mc signal from this divider is amplified by an output amplifier similar to the one used in the 5-Mc section.

The 100-kc divider, which provides 100-kc output from the 1-Mc signal, is similar to the first divider but has an additional emitter-follower stage at the input (see Figure 3-7).

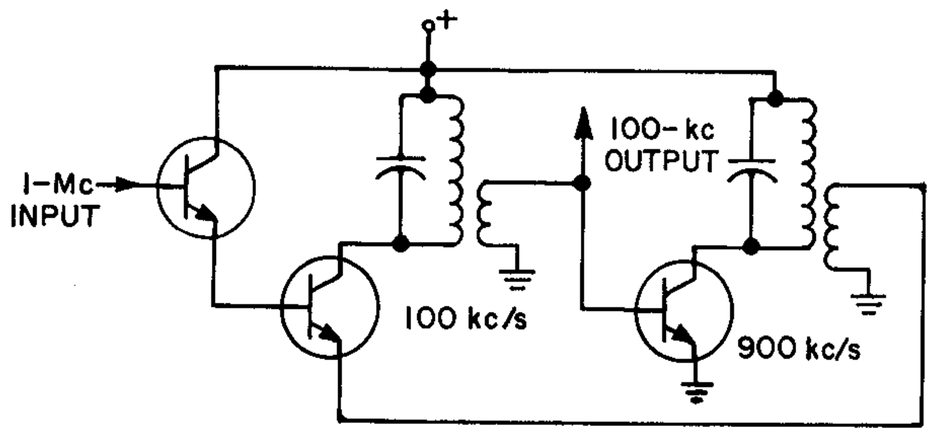


Figure 3-7. Basic circuit of the 100-kc divider.

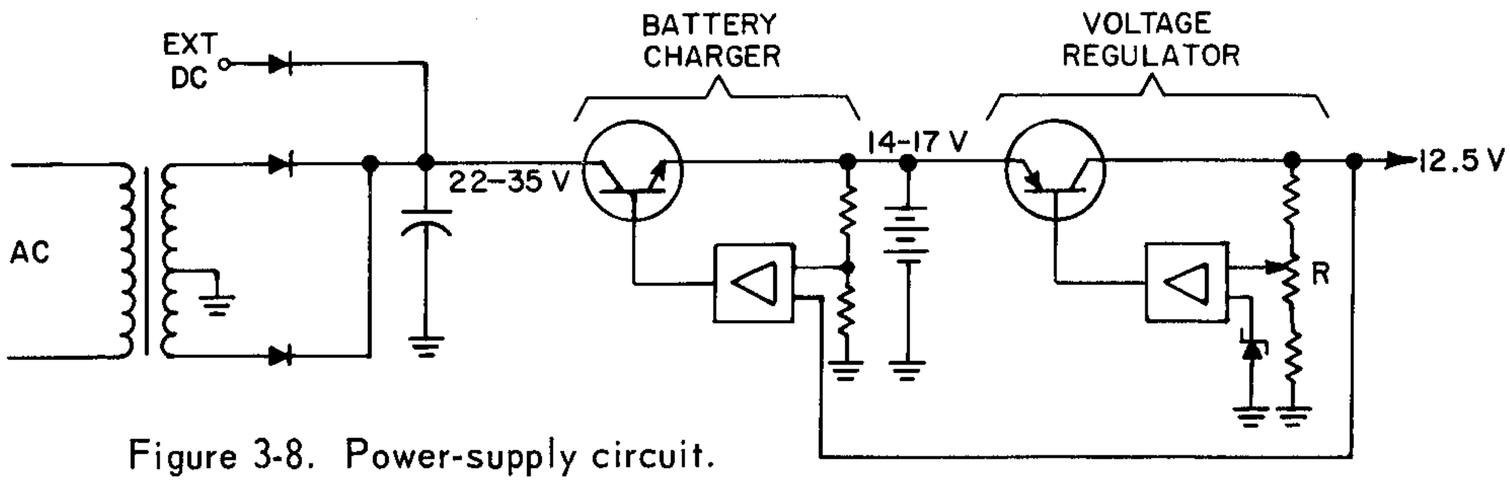


Figure 3-8. Power-supply circuit.

3.5 POWER SUPPLY.

Line power is rectified, filtered, and applied to the input of the battery charger (see Figure 3-8). The battery charger provides a current-limited voltage source to obtain a charge characteristic as shown in Figure 3-9. This arrangement results in the fastest possible recharge of the battery after power failure. The limit voltage for the battery can be adjusted by potentiometer R (see Figure 3-8) which controls the regulated B+ of the instrument. The limit voltage is set at the factory and should not be readjusted, as this affects calibration.

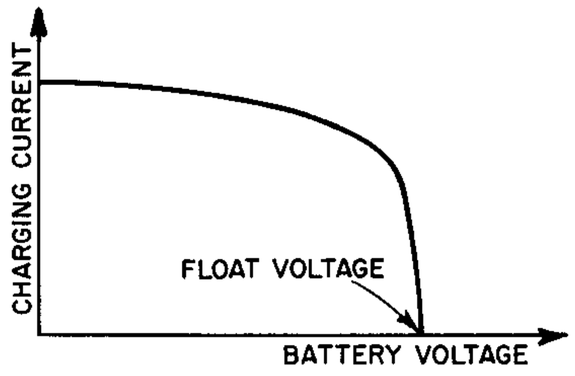


Figure 3-9. Battery recharge characteristic.

The battery voltage is regulated by a series-type voltage regulator. The reference voltage is supplied by a Zener diode, located in the oven for best temperature stability.

A 12-cell, pressure-relief-type nickel-cadmium battery powers the instrument upon line failure. At least 35 hours of operation can be expected at 25°C ambient temperature. At higher temperatures, the oven requires less power but battery capacity is less also. The worst condition exists at low ambient temperatures, where the power demand for the oven is highest and the battery has the lowest capacity.

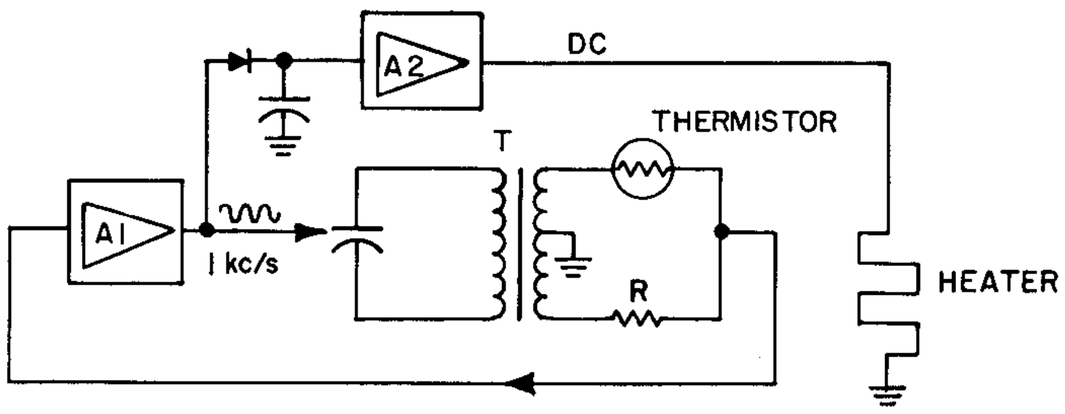


Figure 3-10. Basic circuit for oven control.

3.6 OVEN-CONTROL CIRCUITS.

As long as the oven temperature is low, positive feedback is applied around amplifier A_1 (see Figure 3-10) and the oven-control circuit oscillates at about 1 kc/s. (The frequency is determined by the tuned transformer.) This ac signal is rectified and amplified by the dc amplifier, A_2, and then applied as heater power. As the temperature increases, less signal is fed back around A_1 and the amplitude decreases, reducing the heater power so that stable operation results near the balance of the bridge. The bridge (see Figure 3-10) consists of ratio transformer T, thermistor, and fixed resistor, R.

3.7 MONITORING CIRCUITS.

Marked sectors on the monitor meter give immediate indication of operating conditions at seven points in the instrument. When the METER switch is set to one of the three OUTPUT positions, the level of that rf output is indicated by the meter. With the output unloaded, the meter indicates in the upper third of the OUTPUT sector. With 50-ohm loads, the indications are near the low end of the OUTPUT sector.

When the METER switch is set to OVEN TEMP, the meter monitors the operating temperature of the oven. The control circuits are operating properly when the indication is within the sector marked "T". The basic temperature-monitoring circuit is shown in Figure 3-11.

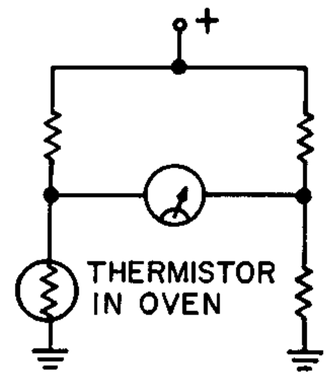


Figure 3-11. Basic circuit for monitoring operating temperature.

At the OVEN HEATER position of the METER switch, the meter indicates heater voltage. During warmup the meter indicates outside the sector marked OVEN HTR. As soon as the oven reaches operating temperature, the indication comes within the OVEN HTR sector, toward the low end at high ambient temperatures and toward the high end at low ambient temperatures.

When the METER switch is set to DC VOLTS, the meter monitors battery voltage or, if the battery is disconnected, the output from the battery charger.

When the METER switch is set to CHARGE-DISCHARGE, battery current is indicated on the meter. After power failure, the current is high until the battery is nearly full, then it drops to a low value during trickle-charge conditions.

3.8 AUXILIARY CONNECTIONS.

3.8.1 EXTERNAL POWER.

External dc power of 22 to 35 volts can be connected to the instrument at the auxiliary connector, SO802, in the rear (refer to paragraph 2.8).

3.9 REMOTE FREQUENCY CONTROL.

When the FREQUENCY CONTROL switch (internal slide switch) is set to REMOTE, the frequency-control varactor and the Zener reference voltage of the power supply are connected to the auxiliary connector, SO802. Frequency can then be adjusted by an external potentiometer or voltage source (refer to paragraph 2.9).

SECTION **4**

SERVICE AND MAINTENANCE

4.1 WARRANTY.

We warrant that each new instrument manufactured and sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, District Office, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

4.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the type and serial numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest District Office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

TABLE 4-1

Function	*Minimum Use Specifications*	*Recommended Equipment**
VTVM	ACCURACY: ±2% of indicated value. FREQUENCY RANGE: 5 Mc/s. MAXIMUM VOLTAGE: 1 V, rms.	TYPE 1806 ELECTRONIC VOLTMETER (General Radio)
Coaxial Tee	A connector capable of parallel insertion of measurement equipment at rf frequencies.	TYPE 874-TL TEE (General Radio)
50-Ohm Coaxial Termination	FREQUENCY RANGE: dc to 9 Gc/s. VSWR: $1.005 + 0.013\ f_{GC}$. DC RESISTANCE: 50 Ω ±0.5%. MAXIMUM POWER: 2 W continuous	TYPE 874-W50BL 50-OHM TERMINATION (General Radio)
Oscilloscope	BANDWIDTH: 10 Mc/s.	TYPE 543 OSCILLOSCOPE with TYPE L PLUG-IN (Tektronix, Inc.)

**or equivalent*

4.3 MINIMUM PERFORMANCE STANDARDS.

The following checks are provided so that the operator can determine if the oscillator is functioning properly.

To check out the oscillator's performance, proceed as follows:

CAUTION

Do not adjust the FREQUENCY control on the front panel.

a. Connect the instrument to the ac line.

b. Set the internal BATTERY switch to ON.

c. Set the METER switch to CHARGE-DISCHARGE; the meter will read in the CHARGE sector.

NOTE

At the CHARGE-DISCHARGE position the meter may indicate outside the CHARGE sector for a short time after the instrument is connected to the line.

d. Set the METER switch to DC VOLTS; the meter will read in the DC sector.

e. Set the METER switch to OVEN HEATER; the meter will read in the OVEN HTR sector.

NOTE

The meter will indicate outside the OVEN HTR sector until the temperature stabilizes. The warm-up time of the oven is 6 to 10 hours.

f. Set the METER switch to OVEN TEMP; the meter will read in the T sector.

NOTE

The meter will indicate off scale to the left until the oven is close to operating temperature.

g. Set the METER switch to 100 kc; the meter will read in the OUTPUT sector.

h. Set the METER switch to 1 Mc; the meter will read in the OUTPUT sector.

i. Set the METER switch to 5 Mc; the meter will read in the OUTPUT sector.

j. Connect the Type 874-TL, Type 874-W50BL, Type 1806, and the oscilloscope to the 5-Mc output jack (J802) on the rear panel; observe the 5-Mc sine wave with 1 V, rms, +50-10% amplitude.

k. Connect the Type 874-TL, Type 874-W50BL, Type 1806, and the oscilloscope to the 1-Mc output jack (J804) on the rear panel; observe the 1-Mc sine wave with 1 V, rms, +50-10% amplitude.

l. Connect the Type 874-TL, Type 874-W50BL, Type 1806, and the oscilloscope to the 100-kc output jack (J803) on the rear panel; observe the 100-kc sine wave with 1 V rms, +50-10% amplitude.

When the preceding steps have been completed and passed satisfactorily, the oscillator can be placed in operation. Regular frequency drift checks should be made with the use of a time comparator and receiver to maintain precise frequency accuracy. This is particularly important if the oscillator is used as a primary frequency standard. Procedures used to monitor and measure the drift of the oscillator with a time comparator are given in time comparator and receiver manuals, such as the General Radio Type 1123-A Digital Synchronometer® and General Radio Type 1124 Receiver manuals.

4.4 TROUBLE-SHOOTING.

4.4.1 GENERAL.

Always check the operating conditions carefully before making any adjustments. The monitor meter can be used to determine a faulty circuit (refer to paragraph 3.7).

Trouble inside the oven assembly should be referred to the General Radio Service Department. Special test jigs are required to service the oven or any component inside the oven.

The component numbers are arranged by circuit, to help locate components in the instrument. Component numbers are identified in Table 4-2; the etched-board locations are shown in Figures 4-5 and 4-6.

NOTE

Do not adjust R532 on the power-supply board. It affects B+, the frequency, the battery-charging current, and the linearity of the frequency dial. This B+ control is factory-adjusted to meet the requirements of the individual unit.

4.4.2 BATTERY.

The trickle-charge voltage is temperature-compensated by thermistor R536 and is about 16.4 volts at room temperature. The cells of the battery are sealed and have 60-psi safety valves to prevent explosion in case of internal gas pressure. A small amount of white deposit on top of the battery (noncorrosive potassium carbonate) is not harmful. The battery needs no servicing. Neither water nor alkaline electrolyte should be added. The instrument can be operated from external dc or an ac power line with the battery disconnected.

4.4.3 VOLTAGE MEASUREMENTS.

Table 4-3 gives the nominal voltages in a typical Type 1115-B Standard-Frequency Oscillator. The voltages are measured with a vacuum-tube voltmeter, such as the General Radio Type 1806-A. The values are for operating conditions as specified but may depart widely under different operating conditions. In case of difficulties, ac conditions can be checked to aid in locating the fault.

TABLE 4-2

COMPONENT LOCATIONS

Component Numbers	*Location*
101 - 199	Panel
201 - 299	Crystal board in oven
301 - 399	Oscillator board in oven
401 - 499	RF board next to oven
501 - 599	Power-supply board next to battery
601 - 699	Meter board under battery
701 - 799	Chassis shelf
801 - 899	Rear of instrument

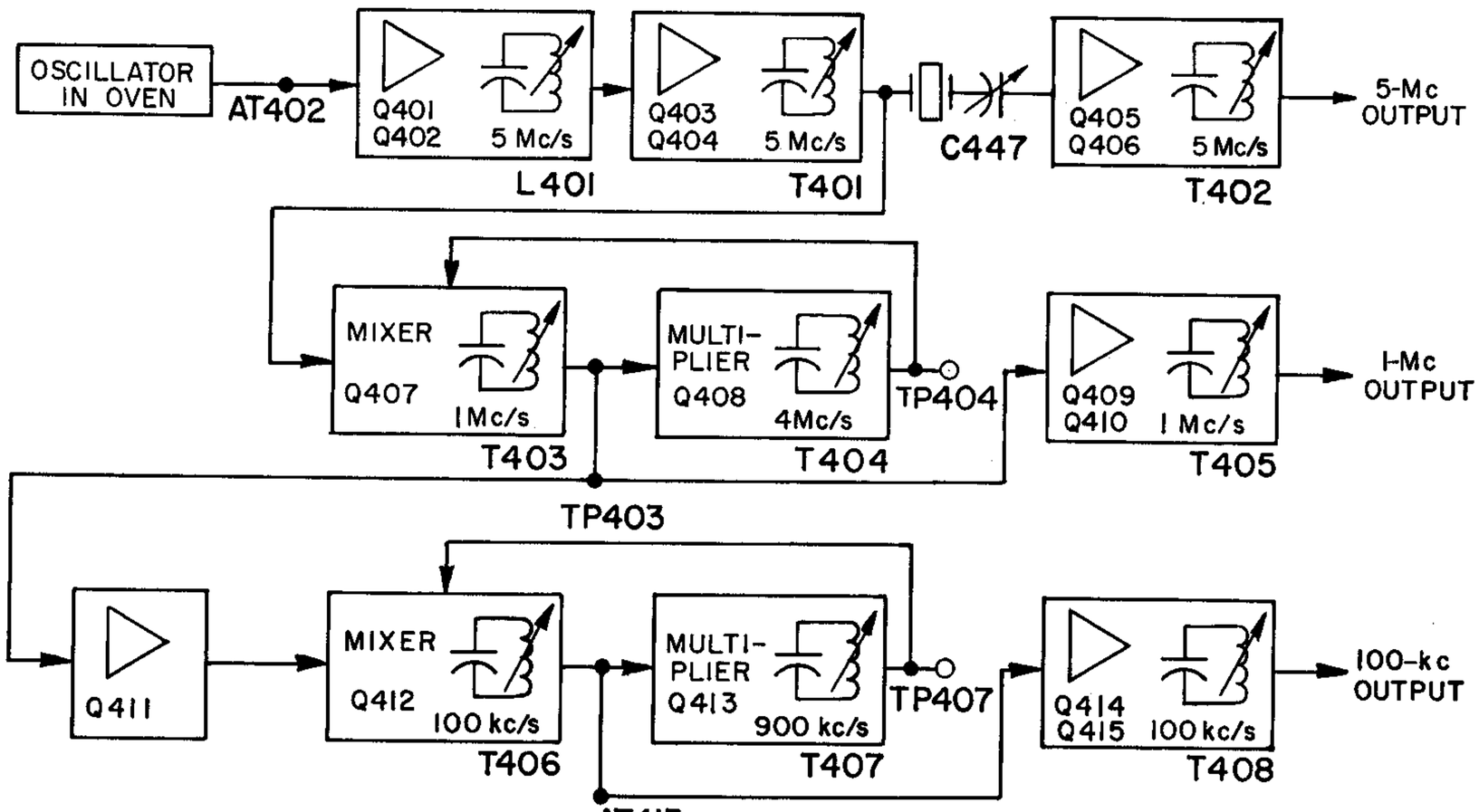


Figure 4-1. Block diagram showing locations of rf adjustments in the Standard-Frequency Oscillator.

TABLE 4-3
VOLTAGE MEASUREMENTS

Transistor	*E*	*B*	*C*	*Note*
Q401	4.3	4.8	9.1	
Q402	9.1	9.8	12.5	
Q403	1.7	2.6	4.9	
Q404	4.9	5.6	10.8	
Q405	1.4	2.0	12.0	5-Mc Output loaded with 50 ohms
Q406	2.0	2.7	3.5	
Q407	1.66	1.17	12.5	
Q408	3.95	2.4	11.8	
Q409	1.4	1.9	12.5	1-Mc Output loaded with 50 ohms
Q410	1.9	2.6	4.5	
Q411	3.9	4.6	12.8	
Q412	4.9	3.5	12.5	
Q413	4.8	4.4	12.6	
Q414	1.7	2.4	12.5	100-kc Output loaded with 50 ohms
Q415	2.4	3.1	2.6	
Q501	0	0.55	0.6	
Q502	0	0.6	0.95	
Q503	0.3	0.9	4.8	
Q504	6.6	7.2	12.5	
Q505	0	0.65	0.7	Depends on oven operating conditions
Q506	0	0.65	15.0	
Q507	16.3	15.6	7.1	
Q508	16.3	15.6	7.1	
Q509	18.5	19.0	36.0	Depends on line and battery conditions
Q510	17.8	18.5	36.0	
Q511	12.4	13.0	17.0	
Q512	12.4	13.0	19.0	
Q513	17.0	17.1	19.0	
Q514	10.5	11.2	13.0	
Q515	16.3	15.6	13.0	
Q516	10.5	11.2	15.5	
Q517A	5.8	6.4	11.1	Differential Amplifier
Q517B	5.8	6.4	11.1	
Q701	17.1	17.8	36.0	

4.5 ALIGNMENT.

4.5.1 RF SECTION.

Figure 4-1 shows the adjustments in the rf section of the Type 1115-B Standard-Frequency Oscillator. Figure 4-2 shows the waveform at AT402. The tuning of the 5-Mc circuits (L401, T401, and T402) is not critical. Capacitor C447 must be adjusted with the 5-Mc output loaded with 50 ohms. Use a low-capacitance tuning wand. All adjustments are for maximum 5-Mc output into 50 ohms.

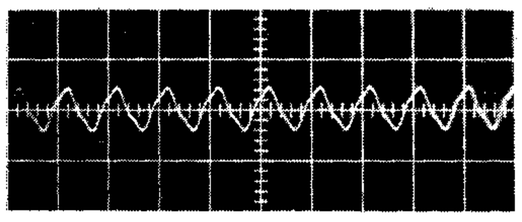


Figure 4-2. Waveform at AT402. Vertical scale is 50mV/cm; horizontal scale, 0.2 μs/cm.

To tune the 1-Mc divider, connect an oscilloscope to TP404 and adjust T403 and T404 for a waveform of maximum amplitude as shown in Figure 4-3. Then turn the slug of T404 clockwise about one half turn or until the amplitude at TP404 begins to drop. Load the 1-Mc output with 50 ohms and short-circuit TP403 to ground. The 1-Mc output should disappear. Remove the short at TP403. The divider should start and the 1-Mc output should be restored. If the divider fails to start after the short at TP403 is removed, turn the slug of T404 further clockwise (about 1/8 turn each time). When starting is satisfactory, remove the 50-ohm load on the 1-Mc output. If the waveform is blurred, the divider is oscillating. Adjust the slug of T403 to prevent this condition and repeat the starting test.

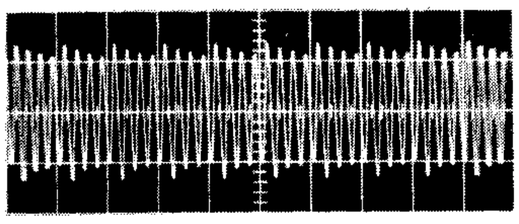


Figure 4-3. Waveform at TP404. Vertical scale is 0.5 V/cm; horizontal scale, 1 μs/cm.

To tune the 100-kc divider, connect the oscilloscope probe to TP407 and adjust T406 and T407 for the waveform shown in Figure 4-4 and maximum amplitude. Then turn the slug of T407 clockwise until the amplitude just begins to drop. Load the 1-Mc and 100-kc outputs with 50 ohms each. Short AT413 to ground with a screwdriver. Remove the short. The 100-kc output should be restored as soon as the short is removed. Remove the 50-ohm loads. The waveform at TP407 should remain clean. Blurring indicates oscillation of the divider and must be removed

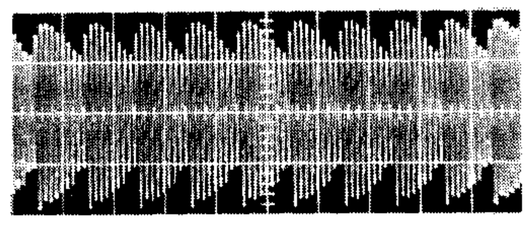


Figure 4-4. Waveform at TP407. Vertical scale is 0.5 V/cm; horizontal scale, 10 μs/cm.

by retuning of T406. If necessary, repeat the complete procedure. When the slugs are properly adjusted, secure with wax, nail polish, or a like substance to prevent detuning due to vibration.

The 1-Mc and 100-kc output stages can be readjusted for maximum output (use monitor meter) into 50-ohm loads. Tuning is not critical.

4.5.2 POWER SUPPLY AND OVEN CONTROL.

The B+ control is factory-adjusted to meet the the requirements of the individual instrument. This voltage is between 12 and 13 volts. DO NOT ADJUST R532.

The voltage reference diode for the power supply is in the oven and is connected to AT508 on the power-supply board. The nominal voltage is 6.2 volts.

The oven-control circuit oscillates at approximately 1 kc/s. The amplitude at AT514 depends on oven power and is from 6 to 8 volts peak-to-peak at room temperature. Large fluctuations of this amplitude (from second to second) indicate a defective thermistor, R319. The value of R319 is about 20 kilohms at room temperature and between 2.5 and 3.5 kilohms at the operating temperature of the crystal.

4.5.3 FREQUENCY ADJUSTMENT.

The frequency of the oscillator is controlled by a varactor diode. The bias voltage is obtained from a two-gang 10-turn potentiometer on the panel (R101A and R101B). A linearizing network makes the dial direct reading in parts per 10^{10}. R609 is selected to set the proper span of the dial, and R608 provides fine adjustment of this span. The span adjustment affects the frequency at the low end (0000) of the dial, but not at the high-frequency end (2700).

4.5.4 TEMPERATURE MONITOR.

In the OVEN TEMP position of the monitor meter, a thermistor bridge indicates proper operation when the meter indication is within the "T" sector. If the meter reading is slightly outside the T sector and operation of the instrument is normal, the thermistor bridge can be reset to the center of the T sector by adjustment of R602. Large deviation indicates faulty temperature-control circuit.

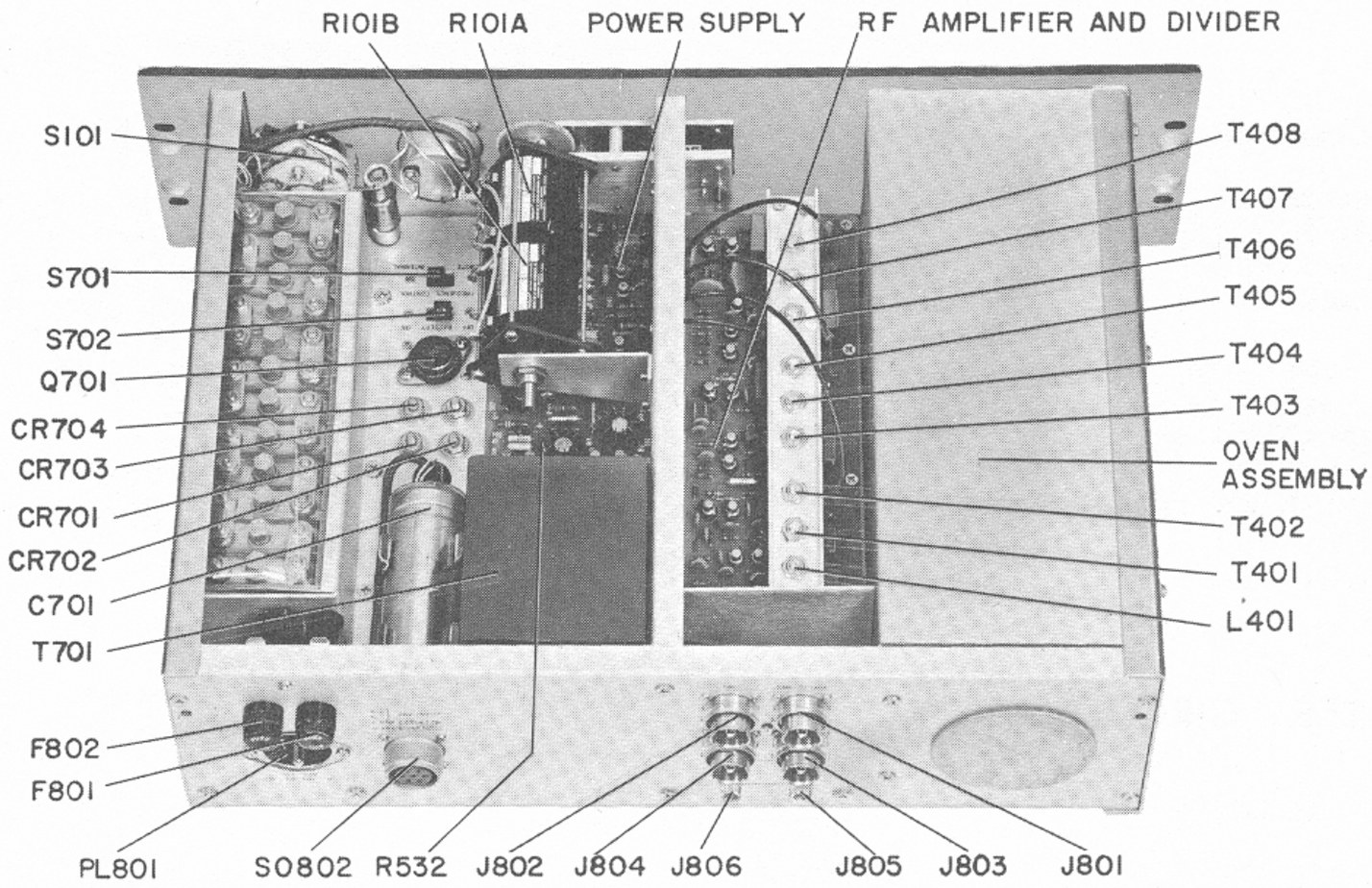


Figure 4-5. Top interior view of the Standard-Frequency Oscillator.

Do not adjust R532 (on the power-supply board, behind the transformer).

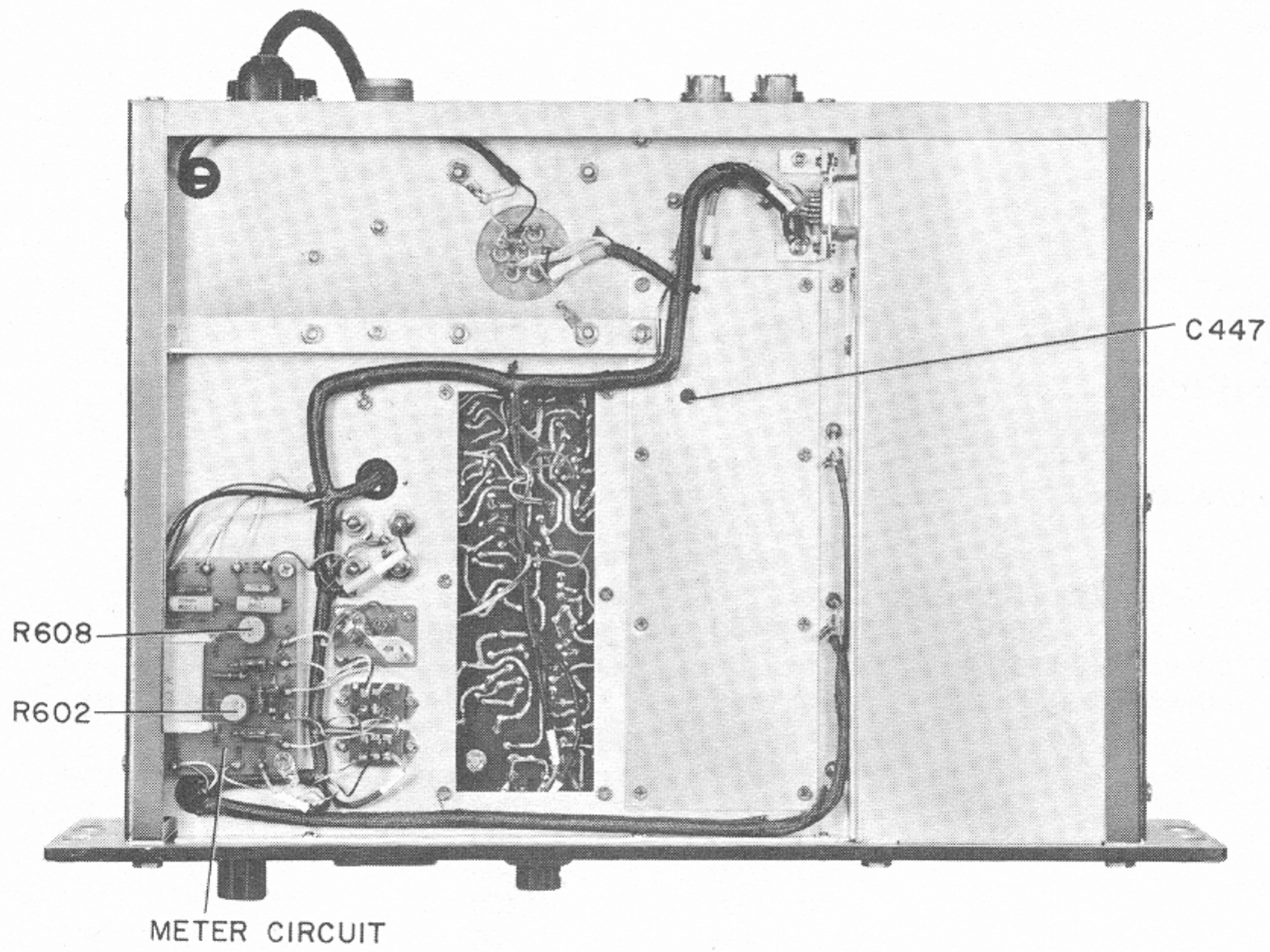


Figure 4-6. Bottom interior view of the Standard-Frequency Oscillator.

FEDERAL MANUFACTURERS CODE

From Federal Supply Code for Manufacturers Cataloging Handbooks H4-1
(Name to Code) and H4-2 (Code to Name) as supplemented through June, 1967.

Code	Manufacturers Name and Address
00192	Jones Mfg. Co., Chicago, Illinois
00194	Walsco Electronics Corp., Los Angeles, Calif.
00656	Aerovox Corp., New Bedford, Mass.
01009	Alden Products Co., Brockton, Mass.
01121	Allen-Bradley, Co., Milwaukee, Wisc.
01295	Texas Instruments, Inc., Dallas, Texas
02114	Ferroxcube Corp. of America, Saugerties, N. Y. 12477
02606	Fenwal Lab. Inc., Morton Grove, Ill.
02660	Amphenol Electronics Corp., Broadview, Ill.
02768	Fastex Division of Ill. Tool Works, Des Plaines, Ill. 60016
03508	G. E. Semiconductor Products Dept., Syracuse, N. Y. 13201
03636	Grayburne, Yonkers, N. Y. 10701
03888	Pyrofilm Resistor Co., Cedar Knolls, N. J.
03911	Clairex Corp., New York, N. Y. 10001
04009	Arrow, Hart and Hegeman Electric Co., Hartford, Conn. 06106
04713	Motorola Semi-Conduct Product, Phoenix, Ariz. 85008
05170	Engineered Electronics Co., Inc., Santa Ana, Calif. 92702
05624	Barber-Colman Co., Rockford, Ill. 61101
05820	Wakefield Eng., Inc., Wakefield, Mass. 01880
07127	Eagle Signal Div. of E. W. Bliss Co., Baraboo, Wisc.
07261	Avnet Corp., Culver City, Calif. 90230
07263	Fairchild Camera and Instrument Corp., Mountain View, Calif.
07387	Birtcher Corp., No. Los Angeles, Calif.
07595	American Semiconductor Corp., Arlington Heights, Ill. 60004
07828	Bodine Corp., Bridgeport, Conn. 06605
07829	Bodine Electric Co., Chicago, Ill. 60618
07910	Continental Device Corp., Hawthorne, Calif.
07983	State Labs Inc., N. Y., N. Y. 10003
07999	Amphenol Corp., Borg Inst. Div., Delavan, Wisc. 53115
08730	Vemaline Prod. Co., Franklin Lakes, N. J.
09213	General Electric Semiconductor, Buffalo, N. Y.
09823	Burgess Battery Co., Freeport, Ill.
09922	Burndy Corp., Norwalk, Conn. 06852
11599	Chandler Evans Corp., W. Hartford, Conn.
12498	Teledyn Inc., Crystalonics Div., Cambridge, Mass. 02140
12672	RCA Commercial Receiving Tube and Semi-conductor Div., Woodridge, N.J.
12697	Clarostat Mfg. Co. Inc., Dover, N. H. 03820
12954	Dickson Electronics Corp., Scottsdale, Ariz.
13327	Solitrone Devices, Tappan, N. Y. 10983
14433	ITT Semiconductors, W. Palm Beach, Florida
14655	Cornell Dubilier Electric Co., Newark N. J.
14674	Corning Glass Works, Corning, N. Y.
14936	General Instrument Corp., Hicksville, N. Y.
15238	ITT, Semiconductor Div. of Int. T. and T, Lawrence, Mass.
15605	Cutler-Hammer Inc., Milwaukee, Wisc. 53233
16037	Spruce Pine Mica Co., Spruce Pine, N. C.
19701	Electra Mfg. Co., Independence, Kansas 67301
21335	Fafnir Bearing Co., New Briton, Conn.
24446	G. E. Schenectady, N. Y. 12305
24454	G. E., Electronic Comp., Syracuse, N. Y.
24455	G. E. (Lamp Div), Nela Park, Cleveland, Ohio
24655	General Radio Co., W. Concord, Mass 01781
26806	American Zettler Inc., Costa Mesa, Calif.
28520	Hayman Mfg. Co., Kenilworth, N. J.
28959	Hoffman Electronics Corp., El Monte, Calif.
30874	International Business Machines, Armonk, N.Y.
32001	Jensen Mfg. Co., Chicago, Ill. 60638
35929	Constanta Co. of Canada Limited, Montreal 19, Quebec
37942	P. R. Mallory and Co. Inc., Indianapolis, Ind.
38443	Marlin-Rockwell Corp., Jamestown, N. Y.
40931	Honeywell Inc., Minneapolis, Minn. 55408
42190	Muter Co., Chicago, Ill. 60638
42498	National Co. Inc., Melrose, Mass. 02176
43991	Norma-Hoffman Bearings Corp., Stanford, Conn. 06904
49671	RCA, New York, N. Y.
49956	Raytheon Mfg. Co., Waltham, Mass. 02154
53021	Sangamo Electric Co., Springfield, Ill. 62705
54294	Shallcross Mfg. Co., Selma, N. C.
54715	Shure Brothers, Inc., Evanston, Ill.
56289	Sprague Electric Co., N. Adams, Mass.
59730	Thomas and Betts Co., Elizabeth, N. J. 07207
59875	TRW Inc. (Accessories Div), Cleveland, Ohio
60399	Torrington Mfg. Co., Torrington, Conn.
61637	Union Carbide Corp., New York, N. Y. 10017
61864	United-Carr Fastener Corp., Boston, Mass.
63060	Victoreen Instrument Co., Inc., Cleveland, Ohio
63743	Ward Leonard Electric Co., Mt. Vernon, N. Y.
65083	Westinghouse (Lamp Div), Bloomfield, N. J.
65092	Weston Instruments, Weston-Newark, Newark, N. J.
70485	Atlantic-India Rubber Works, Inc., Chicago, Ill. 60607
70563	Amperite Co., Union City, N. J. 07087
70903	Belden Mfg. Co., Chicago, Ill. 60644
71126	Bronson, Homer D., Co., Beacon Falls, Conn.
71294	Canfield, H. O. Co., Clifton Forge, Va. 24422
71400	Bussman Mfg. Div. of McGraw Edison Co., St. Louis, Mo.
71590	Centralab, Inc., Milwaukee, Wisc. 53212
71666	Continental Carbon Co., Inc., New York, N. Y.
71707	Coto Coil Co. Inc., Providence, R. I.
71744	Chicago Miniature Lamp Works, Chicago, Ill.
71785	Cinch Mfg. Co. and Howard B. Jones Div., Chicago, Ill. 60624
71823	Darnell Corp., Ltd., Downey, Calif. 90241
72136	Electro Motive Mfg. Co., Willmington, Conn.
72259	Nytronics Inc., Berkeley Heights, N. J. 07922
72619	Dialight Co., Brooklyn, N. Y. 11237
72699	General Instrument Corp., Capacitor Div., Newark, N. J. 07104
72765	Drake Mfg. Co., Chicago, Ill. 60656
72825	Hugh H. Eby, Inc., Philadelphia, Penn. 19144
72962	Elastic Stop Nut Corp., Union, N. J. 07083
72982	Erie Technological Products Inc., Erie, Penn.
73445	Amperex Electronics Co., Hicksville, N. Y.
73559	Carling Electric Co., W. Hartford, Conn.
73690	Elco Resistor Co., New York, N. Y.
73899	J. F. D. Electronics Corp., Brooklyn, N. Y.
74193	Heinemann Electric Co., Trenton, N. J.
74861	Industrial Condenser Corp., Chicago, Ill.
74970	E. F. Johnson Co., Waseca, Minn. 56093
75042	IRC Inc., Philadelphia, Penn. 19108
75382	Kulka Electric Corp., Mt. Vernon, N. Y.
75608	Linden and Co., Providence, R. I.
75915	Littelfuse, Inc., Des Plaines, Ill. 60016
76005	Lord Mfg. Co., Erie, Penn. 16512
76487	James Millen Mfg. Co., Malden,Mass. 02148
76545	Mueller Electric Co., Cleveland, Ohio 44114
76684	National Tube Co., Pittsburg, Penn.
76854	Oak Mfg. Co., Crystal Lake, Ill.
77147	Patton MacGuyer Co., Providence, R. I.
77166	Pass-Seymour, Syracuse, N. Y.
77263	Pierce Roberts Rubber Co., Trenton, N. J.
77339	Positive Lockwasher Co., Newark , N. J.
77542	Ray-O-Vac Co., Madison, Wisc.
77630	TRW, Electronic Component Div., Camden, N. J. 08103
77638	General Instruments Corp., Brooklyn, N. Y.
78189	Shakeproof Div. of Ill. Tool Works, Elgin, Ill. 60120
78277	Sigma Instruments Inc., S. Braintree, Mass.
78488	Stackpole Carbon Co., St. Marys, Penn.
78553	Tinnerman Products, Inc., Cleveland, Ohio
79089	RCA, Commercial Receiving Tube and Semi-conductor Div., Harrison, N. J.
79725	Wiremold Co., Hartford, Conn. 06110
79963	Zierick Mfg. Co., New Rochelle, N. Y.
80030	Prestole Fastener Div. Bishop and Babcock Corp., Toledo, Ohio
80048	Vickers Inc. Electric Prod. Div., St. Louis, Mo.
80131	Electronic Industries Assoc., Washington, D.C.
80211	Motorola Inc., Franklin Park, Ill. 60131
80258	Standard Oil Co., Lafeyette, Ind.
80294	Bourns Inc., Riverside, Calif. 92506
80431	Air Filter Corp., Milwaukee, Wisc. 53218
80583	Hammarlund Co. Inc., New York, N. Y.
80740	Beckman Instruments, Inc., Fullerton, Calif.
81073	Grayhill Inc., LaGrange, Ill. 60525
81143	Isolantite Mfg. Corp., Stirling, N. J. 07980
81349	Military Specifications
81350	Joint Army-Navy Specifications
81751	Columbus Electronics Corp., Yonkers, N. Y.
81831	Filton Co., Flushing, L. I., N. Y
81860	Barry Controls Div. of Barry Wright Corp., Watertown, Mass.
82219	Sylvania Electric Products, Inc., (Electronic Tube Div.), Emporium, Penn.
82273	Indiana Pattern and Model Works, LaPort, Ind.
82389	Switchcraft Inc., Chicago, Ill. 60630
82647	Metals and Controls Inc., Attleboro, Mass.
82807	Milwaukee Resistor Co., Milwaukee, Wisc.
83058	Carr Fastener Co., Cambridge, Mass.
83186	Victory Engineering Corp (IVECO), Springfield, N. J. 07081
83361	Bearing Specialty Co., San Francisco, Calif.
83587	Solar Electric Corp., Warren, Penn.
83740	Union Carbide Corp., New York, N. Y. 10017
84411	TRW Capacitor Div., Ogallala, Nebr.
84835	Lehigh Metal Products Corp., Cambridge, Mass. 02140
84971	TA Mfg. Corp., Los Angeles, Calif.
86577	Precision Metal Products of Malden Inc., Stoneham, Mass. 02180
86684	RCA (Electrical Component and Devices) Harrison, N. J.
88140	Cutler-Hammer Inc., Lincoln, Ill.
88219	Gould Nat. Batteries Inc., Trenton, N. J.
88419	Cornell Dubilier Electric Corp., Fuquay-Varina, N. C.
88627	K and G Mfg. Co., New York, N. Y.
89482	Holtzer Cabot Corp., Boston, Mass.
89665	United Transformer Co., Chicago, Ill.
90201	Mallory Capacitor Co., Indianapolis, Ind.
90750	Westinghouse Electric Corp., Boston, Mass.
90952	Hardware Products Co., Reading, Penn. 19602
91032	Continental Wire Corp., York, Penn. 17405
91146	ITT Cannon Electric Inc., Salem, Mass.
91293	Johanson Mfg. Co., Boonton, N. J. 07005
91598	Chandler Co., Wethersfield, Conn. 06109
91637	Dale Electronics Inc., Columbus, Nebr.
91662	Elco Corp., Willow Grove, Penn.
91719	General Instruments, Inc., Dallas, Texas
91929	Honeywell Inc., Freeport, Ill.
92519	Electra Insulation Corp., Woodside, Long Island, N. Y.
92678	Edgerton, Germeshausen and Grier, Boston, Mass.
93332	Sylvania Electric Products, Inc., Woburn, Mass.
93916	Cramer Products Co., New York, N. Y. 10013
94144	Raytheon Co. Components Div., Quincy, Mass.
94154	Tung Sol Electric Inc., Newark, N. J.
95076	Garde Mfg. Co., Cumberland, R. I.
95146	Alco Electronics Mfg. Co., Lawrence, Mass.
95238	Continental Connector Corp., Woodside, N. Y.
95275	Vitramon, Inc., Bridgeport, Conn.
95354	Methode Mfg. Co., Chicago, Ill.
95412	General Electric Co., Schenectady, N. Y.
95794	Ansconda American Brass Co., Torrington, Conn.
96095	Hi-Q Div. of Aerovox Corp., Orlean, N. Y.
96214	Texas Instruments Inc., Dallas, Texas 75209
96256	Thordarson-Meissner Div. of McGuire, Mt. Carmel, Ill.
96341	Microwave Associates Inc., Burlington, Mass.
96906	Military Standards
97966	CBS Electronics Div. of Columbia Broadcasting Systems, Danvers, Mass.
98291	Sealectro Corp., Mamaroneck, N. Y. 10544
98821	North Hills Electronics Inc., Glen Cove, N. Y.
99180	Transitron Electronics Corp., Melrose, Mass.
99378	Atlee Corp., Winchester, Mass. 01890
99800	Delevan Electronics Corp., E. Aurora, N. Y.

8/67

PARTS LIST

POWER SUPPLY

REF NO.	CAPACITORS	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
C501	Ceramic, 0.001 µF ±10% 500 V	4406-2108	72982	811, 0.001 µF ±10%	
C502	Electrolytic, 47 µF ±20% 6 V	4450-5500	56289	150D476X0006B2	5910-752-4185
C503	Plastic, 0.047 µF ±10% 100 V	4860-8200	84411	663 µW, 0.047 µF ±10%	
C504	Ceramic, 1.0 µF ±20% 25 V	4400-2070	72982	315N750, 1.0 µF ±20%	
C505	Ceramic, 1.0 µF ±20% 25 V	4400-2070	80183	5C13, 1.0 µF ±20%	
C506	Ceramic, 1.0 µF ±20% 25 V	4400-2070	80183	5C13, 1.0 µF ±20%	
C507	Ceramic, 0.1 µF +80 -20% 50 V	4403-4100	80131	CC63, 0.1 µF +80-20%	5910-811-4788
C508	Electrolytic, 6.8 µF ±20% 35 V	4450-5000	56289	150D685X0035B2	5910-814-5869
C509	Electrolytic, 22 µF ±20% 15 V	4450-5300	56289	150D226X0015B2	5910-752-4270
C510	Electrolvtic, 22 µF ±20% 15 V	4450-5300	56289	150D226X0015B2	5910-752-4270
C511	Ceramic, 0.001 µF +80 -10% 500 V	4404-2109			
	RESISTORS				
R501	Precision, 75 kΩ ±1%	6730-3750	54294	P12, 75 kΩ ±1%	
R502	Precision, 2.37 kΩ ±1%	6730-1237	80131	A22, 2.37 kΩ ±1%	
R503	Precision, 75 kΩ ±1%	6730-3750	54294	P12, 75 kΩ ±1%	
R504	Film, 1 MΩ ±1% 1/2 W	6450-4100	75042	CEC, 1 MΩ ±1%	5905-539-4565
R505	Film, 150 kΩ ±1% 1/8 W	6250-3150	75042	CEA, 150 kΩ ±1%	5905-620-9371
R506	Film, 11 kΩ ±1% 1/8 W	6250-2110	75042	CEA, 11 kΩ ±1%	
R507	Film, 100 kΩ ±1% 1/8 W	6250-3100	75042	CEA, 100 kΩ ±1%	5905-577-6743
R508	Film, 2 kΩ ±1% 1/8 W	6250-1200	75042	CEA, 2 kΩ ±1%	5905-577-6614
R509	Film, 15 kΩ ±1% 1/8 W	6250-2150	75042	CEA, 15 kΩ ±1%	5905-581-7626
R510	Film, 8.25 kΩ ±1% 1/8 W	6250-1825	75042	CEA, 8.25 kΩ ±1%	5905-681-8755
R511	Composition, 330 Ω ±5% 1/2 W	6100-1335	01121	RC20GF331J	5905-192-3971
R512	Precision, Value determined by Laboratory	1115-2201	24655	1115-2201	
R513	Composition, 47 kΩ ±5% 1/2 W	6100-3475	01121	RC20GF473J	5905-254-9201
R514	Composition, 47 kΩ ±5% 1/2 W	6100-3475	01121	RC20GF473J	5905-254-9201
R515	Film, 487 kΩ ±1% 1/4 W	6350-3487	75042	CEB, 487 kΩ ±1%	5905-682-1162
R516	Film, 1.29 MΩ ±1% 1/2 W	6450-4129	75042	CEC, 1.29 MΩ ±1%	
R517	Composition, 24 kΩ ±5% 1/2 W	6100-3245	01121	RC20GF243J	5905-279-1878
R518	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R519	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R520	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R521	Wire-wound, 1 Ω ±10% 1/2 W	6760-9109	75042	BWH, 1 Ω ±10%	
R522	Composition, 2 kΩ ±5% 1/2 W	6100-2205	01121	RC20GF202J	5905-190-8887
R523	Film, 10 kΩ ±1% 1/8 W	6250-2100	75042	CEA, 10 kΩ ±1%	5905-883-4847
R524	Film, 4.02 kΩ ±1% 1/8 W	6250-1402	75042	CEA, 4.02 kΩ ±1%	5905-702-7231
R525	Film, 7.87 kΩ ±1% 1/8 W	6250-1787	75042	CEA, 7.87 kΩ ±1%	5905-800-7816
R526	Composition, 13 kΩ ±5% 1/2 W	6100-3135	01121	RC20GF133J	5905-279-2669
R527	Composition, 8.2 kΩ ±5% 1/2 W	6100-2825	01121	RC20GF822J	5905-299-1971
R528	Composition, 2.7 kΩ ±5% 1/2 W	6100-2275	01121	RC20GF272J	5905-279-1880
R529	Film, 10 kΩ ±1% 1/8 W	6250-2100	75042	CEA, 10 kΩ ±1%	5905-883-4847
R530	Film, 10 kΩ ±1% 1/8 W	6250-2100	75042	CEA, 10 kΩ ±1%	5905-883-4847
R531	Precision, 3.57 kΩ ±1%	6730-1357	80131	A22, 3.57 kΩ ±1%	
R532	POTENTIOMETER, Wire-wound, 500 Ω ±5%	6058-1505	75042	CT-100, 500 Ω ±5%	
R533	Film, 20 kΩ ±1% 1/8 W	6250-2200	75042	CEA, 20 kΩ ±1%	5905-702-5971
R534	Precision, 3.57 kΩ ±1%	6730-1357	80131	A22, 3.57 kΩ ±1%	
R535	Composition, 20 kΩ ±5% 1/2 W	6100-3205	01121	RC20GF203J	5905-192-0649
R536	Thermistor	6740-1602	02606	JB31J2	
R537	Film, 3.01 kΩ ±1% 1/8 W	6250-1301	75042	CEA, 3.01 kΩ ±1%	5905-702-5974
R538	Composition, 270 Ω ±5% 1/2 W	6100-1275	01121	RC20GF271J	5905-171-2006
	MISCELLANEOUS				
CR501	DIODE, Type 1N695	6082-1014	24446	1N695	
CR502	DIODE, Type 1N457	6082-1009	24446	1N4442	5961-929-9967
CR503	DIODE, Type 1N457	6082-1009	24446	1N4442	5961-929-9967
CR504	DIODE, Type 1N645	6082-1016	24446	1N645	5961-944-8222
Q501 through Q505	TRANSISTOR, Type 2N2511	8210-1064	07263	2N2511	
Q506	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	

PARTS LIST

REF NO.	MISCELLANEOUS (cont)	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
Q507	TRANSISTOR, Type 2N1131	8210-1025	96214	2N131	5960-788-8644
Q508	TRANSISTOR, Type 2N1131	8210-1025	96214	2N131	5960-788-8644
Q509	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
Q510	TRANSISTOR, Type 2N697	8210-1040	82219	2N697	5961-752-0150
Q511 through Q514	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
Q515	TRANSISTOR, Type 2N1131	8210-1025	96214	2N1131	5960-788-8644
Q516	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
Q517	TRANSISTOR, Type 2N2453	8210-1046	24446	2N2453	
T501	TRANSFORMER	1115-2011	24655	1115-2011	5950-011-1150

METER CIRCUIT

RESISTORS

R601	Precision, 10 kΩ ±1%	6730-2100	80131	A22, 10 kΩ ±1%	
R602	POTENTIOMETER, Wire-wound, 10 kΩ ±5%	6058-3105	75042	CT-100, 10 kΩ ±5%	
R603	Composition, 3 kΩ ±5% 1/2 W	6100-2305	01121	RC20GF302J	5905-279-1751
R604	Precision, 10 kΩ ±1%	6730-2100	80131	A22, 10 kΩ ±1%	
R605	Precision, 10 kΩ ±1%	6730-2100	80131	A22, 10 kΩ ±1%	
R606	Film, 1.29 MΩ ±1% 1/2 W	6450-4129	75042	CEC, 1.29 MΩ ±1%	
*R607	Film, 1.29 MΩ ±1% 1/2 W	6450-4129	75042	CEC, 1.29 MΩ ±1%	
R608	POTENTIOMETER, Wire-wound, 1 kΩ ±5%	6058-2105	75042	CT-100, 1 kΩ ±5%	
R609	Wire-wound, value determined by Laboratory	1115-2210	24655	1115-2210	
R610	Film, 499 kΩ ±1% 1/8 W	6250-3499	75042	CEA, 499 kΩ ±1%	5905-682-1333
R611	Film, 604 kΩ ±1% 1/8 W	6250-3604	75042	CEA, 604 kΩ ±1%	5905-655-3169
R612	Resistance wire, 0.1 Ω, between AT601 and AT602				

*May be altered at the factory.

MISCELLANEOUS

CR601	DIODE, Type 1N695	6082-1014	24446	1N695	

GENERAL

MISCELLANEOUS

B701	BATTERY	8410-1060	24655	8410-1060	6140-938-6855
C701	CAPACITOR, Electrolytic 1400 µF +100 -10% 50 V	8420-3550	24655	8420-3550	
C801	CAPACITOR, Ceramic 0.01 µF +80 -20%	4406-3109	72982	811, 0.01 µF +80-20%	5910-977-7579
C802	CAPACITOR, Ceramic 0.0068 µF +80 -20%	4406-2689	72982	811, 0.0068 µF +80-20%	5910-967-2047
CR701 through CR704	DIODE, Type 1N1613	6081-1012	24446	1N1613	5960-764-3184
F801	FUSE, 115 V, 0.5 A	5330-1000	71400	MDL, 115 V 0.5 A	5920-199-9498
	230 V, 0.25 A	5330-0700	71400	MDL, 230 V 0.25 A	5920-933-5435
F802	FUSE, 115 V, 0.5 A	5330-1000	71400	MDL, 115 V 0.5 A	5920-199-9498
	230 V, 0.25 A	5330-0700	71400	MDL, 230 V 0.25 A	5920-933-5435
F803	FUSE, 1 A	5330-1400	71400	MDL, 1 Amp.	5920-284-9220
M101	METER, -10 to 0 to +40 µA, 2000 Ω, ±2%	5730-1381	24655	5730-1381	6625-994-1749
PL801	PLUG, Power	4240-0702	24655	4240-0702	
Q701	TRANSISTOR, Type 2N1702	8210-1065	04713	2N1702	5960-062-8687
R101	HELIPOT	1115-4040	24655	1115-4040	
S701	SWITCH, Slide, FREQUENCY CONTROL	7910-0773	76854	#76	
S702	SWITCH, Slide, BATTERY	7910-0774	76854	#78	
SO702	SOCKET, on outside of oven assembly	4230-5004	24655	4230-5004	
SO802	SOCKET, Auxiliary Connector	8420-3410	24655	8420-3410	
T701	TRANSFORMER	0485-4040	24655	0485-4040	5950-997-3322
——	KNOB, METER selection switch	5500-0400	24655	5500-0400	5355-051-6594
——	KNOB, FREQUENCY control, front panel	5540-3000	24655	5540-3000	5355-928-7465
——	KNOB, LOCK control, front panel	5540-3316	24655	5540-3316	5355-928-7466

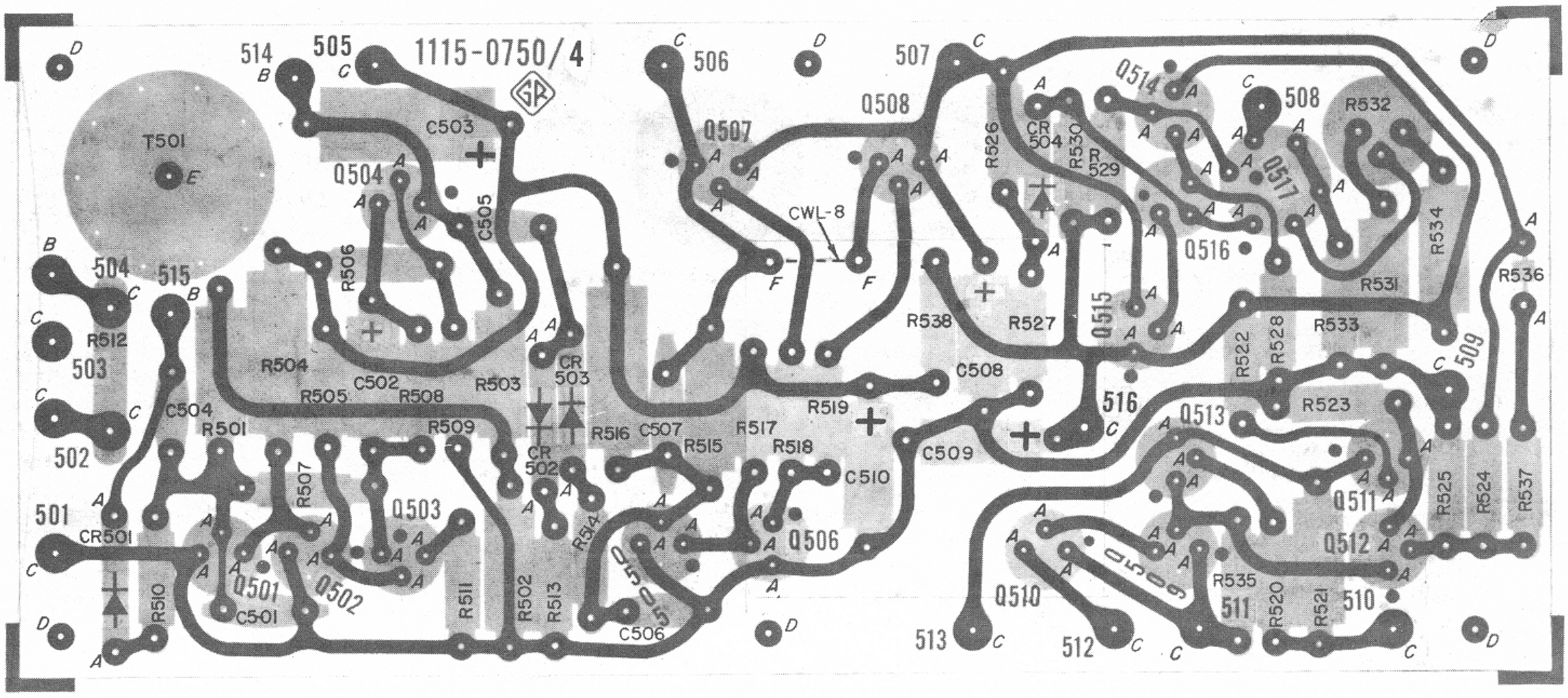


Figure 4-7. Power-supply etched board (P/N 1115-2751).

NOTE: The number on the foil side is not the part number for the complete assembly. The dot on the foil at the transistor socket indicates the collector lead.

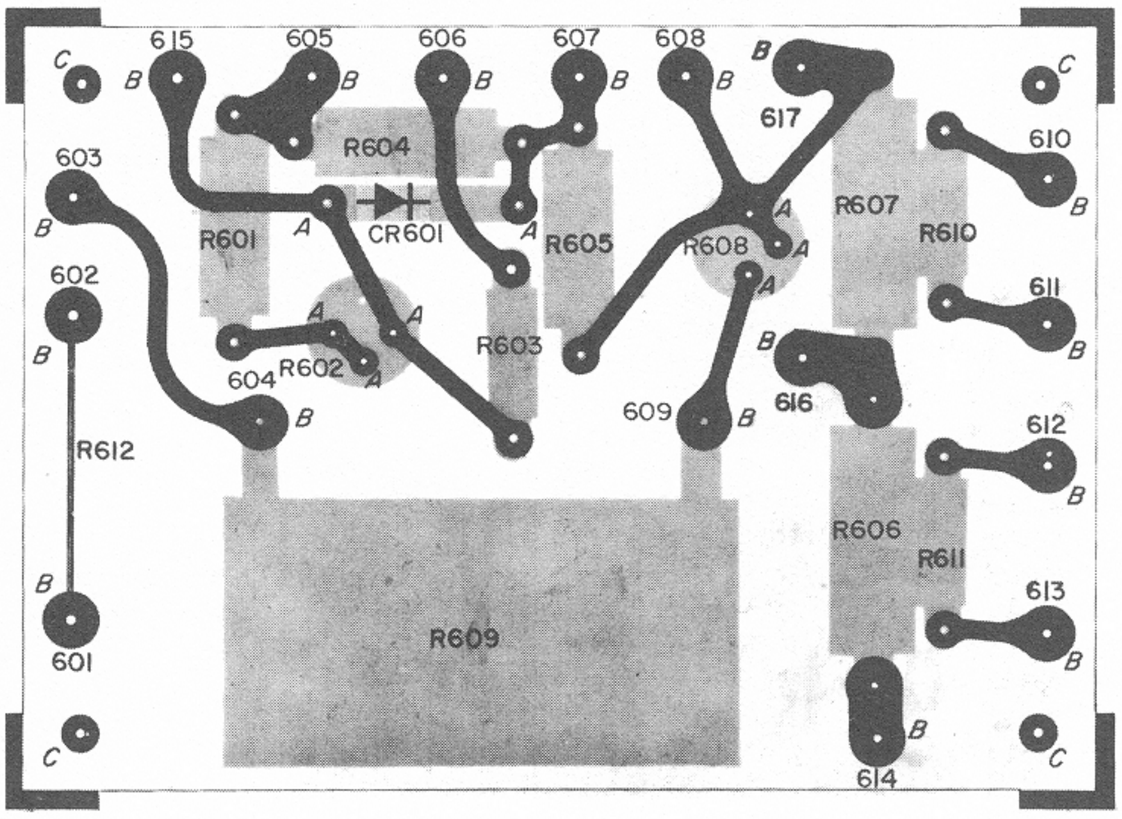
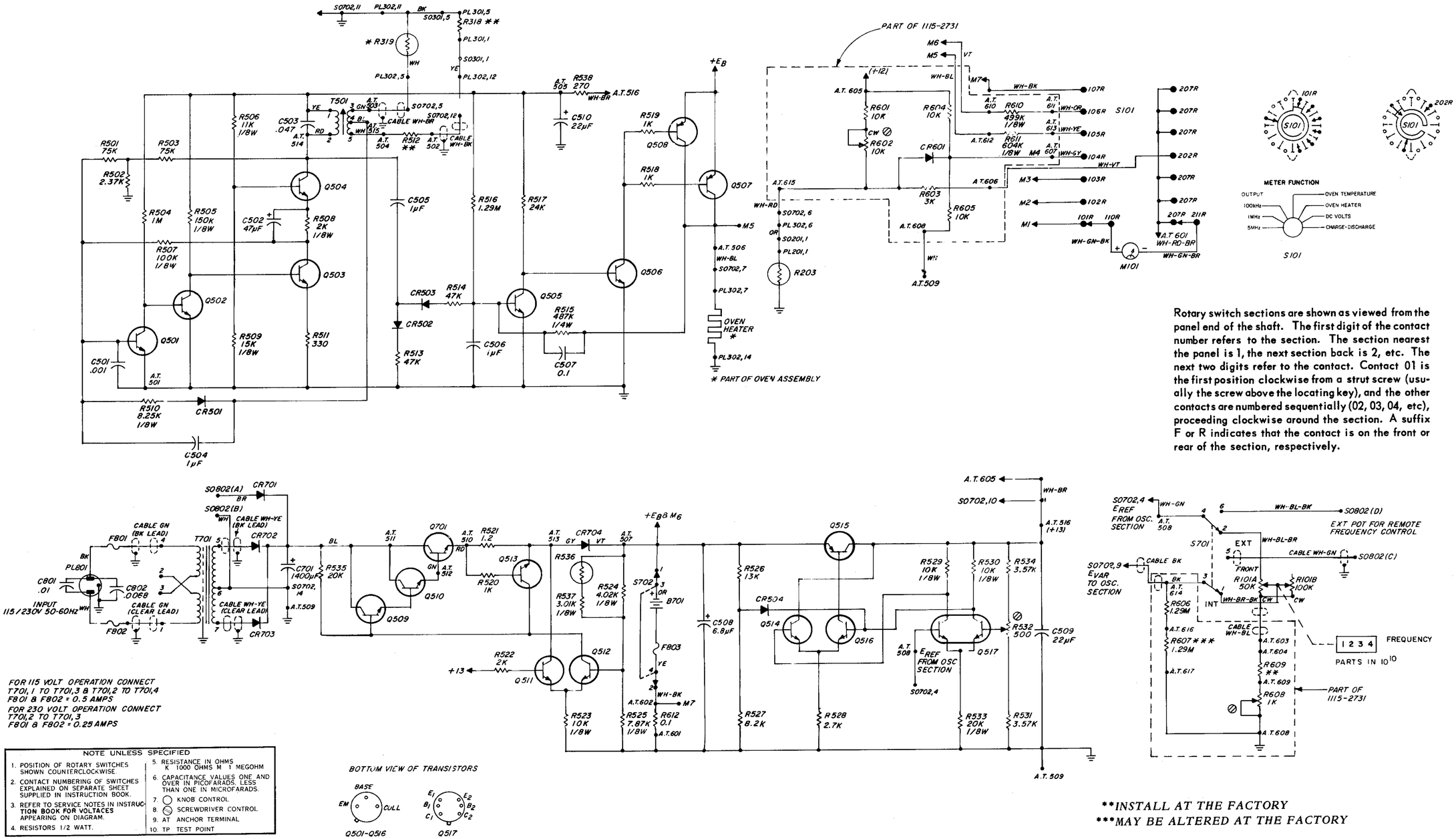


Figure 4-8. Meter-circuit etched board (P/N 1115-2732).



Rotary switch sections are shown as viewed from the panel end of the shaft. The first digit of the contact number refers to the section. The section nearest the panel is 1, the next section back is 2, etc. The next two digits refer to the contact. Contact 01 is the first position clockwise from a strut screw (usually the screw above the locating key), and the other contacts are numbered sequentially (02, 03, 04, etc), proceeding clockwise around the section. A suffix F or R indicates that the contact is on the front or rear of the section, respectively.

Figure 4-9. Schematic diagram of the power-supply and meter circuits of the Type 1115-B Standard-Frequency Oscillator.

CRYSTAL CIRCUIT

REF NO.	MISCELLANEOUS	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
C201	CAPACITOR, Ceramic 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C202	CAPACITOR, Ceramic 560 pF ±5% 100 V	4392-1565	95275	VY05C, 560 pF ±5%	
C203	CAPACITOR, Ceramic 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C204	CAPACITOR, Ceramic 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C205	CAPACITOR, Ceramic 330 pF ±5% 50 V	4391-1335	95275	VY04C, 330 pF ±5%	
R201	RESISTOR, Film 100 kΩ ±1% 1/8 W	6250-3100	75042	CEA, 100 kΩ ±1%	5905-577-6743
R202	RESISTOR, Film 100 kΩ ±1% 1/8 W	6250-3100	75042	CEA, 100 kΩ ±1%	5905-577-6743
R203	Thermistor	1115-0440	24655	1115-0440	
CR203	DIODE, Type V968A	6084-1008	93916	V968A	
L201	INDUCTOR	1115-2082	24655	1115-2082	
L202	INDUCTOR	1115-2083	24655	1115-2083	
L203	INDUCTOR	1115-2070	24655	1115-2070	
PL201	PLUG, mates with socket in oven	4220-5309	91146	MDI-9PL2	
SO201	SOCKET, mounted in oven, accepts crystal board	4230-5006	91146	MDI-9SL2	
X201	CRYSTAL	1115-0446	24655	1115-0450	

OSCILLATOR

CAPACITORS

C307	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C308	Ceramic, 22 pF ±5% N750	4417-0225	80131	CC60, 22 pF ±5%	
C309	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C310	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C311	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C312	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C313	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C314	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C315	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C316	Electrolytic, 0.47 µF ±20% 75 V	4450-4310	56289	150D474X0075A2	
C317	Electrolytic, 0.47 µF ±20% 75 V	4450-4310	56289	150D474X0075A2	

RESISTORS

R303	Film, 10 kΩ ±1% 1/10 W	6245-2100	75042	CCM-TO, 10 kΩ ±10%	5905-990-2253
R304	Film, 3.92 kΩ ±1% 1/10 W	6245-1392	75042	RN55G3921F	5905-983-5950
R305	Film, 383 Ω ±1% 1/10 W	6245-0383	75042	RN55G3830F	5905-990-3771
R306	Film, 1 kΩ ±1% 1/10 W	6245-1100	75042	RN55G1001F	5905-279-5459
R307	Composition, 22 Ω ±5% 1/4 W	6099-0225	75042	BTS, 22 Ω ±5%	
R308	Film, 1.21 kΩ ±1% 1/10 W	6245-1121	75042	CCM-TO, 1.21 kΩ ±1%	
R309	Composition, 4.7 kΩ ±5% 1/4 W	6099-2475	75042	BTS, 4.7 kΩ ±5%	
R310	Composition, 4.7 kΩ ±5% 1/4 W	6099-2475	75042	BTS, 4.7 kΩ ±5%	
R311	Composition, 3.3 kΩ ±5% 1/4 W	6099-2335	75042	BTS, 3.3 kΩ ±5%	
R312	Composition, 6.8 kΩ ±5% 1/4 W	6099-2685	75042	BTS, 6.8 kΩ ±5%	
R313	Composition, 47 Ω ±5% 1/4 W	6099-0475	75042	BTS, 47 Ω ±5%	
R314	Film, 150 kΩ ±1% 1/8 W	6250-3150	75042	CEA, 150 kΩ ±1%	5905-620-9371
R315	Composition, 4.7 kΩ ±5% 1/4 W	6099-2475	75042	BTS, 4.7 kΩ ±5%	
R316	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R317	Composition, 15 Ω ±5% 1/4 W	6099-0155	75042	BTS, 15 Ω ±5%	
R318	Wire-wound, value determined by Laboratory	1115-2200	24655	1115-2200	
R319	Thermistor Assembly	1115-2060	24655	1115-2060	

PARTS LIST

REF NO.	MISCELLANEOUS	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
CR301	DIODE, Type 1N3604	6082-1001	24446	1N3604	5960-995-2199
CR302	DIODE, Type 1N3604	6082-1001	24446	1N3604	5960-995-2199
CR303	DIODE, Type 1N3604	6082-1001	24446	1N3604	5960-995-2199
CR304	DIODE, Type 1N821A	6083-1007	81483	1N821A	
CR305	DIODE, Type 1N3604	6082-1001	24446	1N3604	5960-995-2199
PL301	PLUG, mates with socket in oven	4220-5309	91146	MDI-9PL2	
PL302	PLUG, mates with socket on outside of oven assembly	4220-5307	02660	57-10140	
Q301	TRANSISTOR, Type 2N917	8210-1062	24446	2N917	
Q302	TRANSISTOR, Type 2N2411	8210-1063	80131	2N2411	5960-782-1965
Q303	TRANSISTOR, Type 2N917	8210-1062	24446	2N917	
Q304	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
Q305	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
Q306	TRANSISTOR, Type 2N2511	8210-1064	07263	2N2511	
SO301	SOCKET, mounted in oven, accepts oscillator board	4230-5006	91146	MDI-9SL2	

RF AMPLIFIER and DIVIDER

CAPACITORS

C401	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C402	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C403	Mica, 100 pF ±1% 500 V	4710-0010	14655	22A, 100 pF ±1%	
C404 through C408	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C409	Mica, 121 pF ±1% 500 V	4710-0031	14655	22A, 121 pF ±1%	
C410	Ceramic, 18 pF ±5% NPO 500 V	4410-0185	80131	CC61, 18 pF ±5%	
C411 through C413	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C414	Mica, 464 pF ±1% 500 V	4710-0535	14655	22A, 464 pF ±1%	5910-052-6547
C415 through C418	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C419	Mica, 0.00121 µF, selected	1115-0435	24655	1115-0435	
C420	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C421	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C422	Mica, 140 pF ±1% 500 V	4710-0140	14655	22A, 140 pF ±1%	
C423	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C425 through C427	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C428	Mica, 0.00121 µF, selected	1115-0435	24655	1115-0435	
C429	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C430	Ceramic, 470 pF ±10% 500 V	4404-1478	72982	831, 470 pF ±10%	
C431	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C432	Mica, 0.01 µF, selected	1115-0431	24655	1115-0431	
C433	Ceramic, 0.022 µF +80-20% 500 V	4407-3229	72982	CC63, 0.022 µF +80-20%	5910-842-2961
C434	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C435	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C436	Mica, 0.0015 µF, selected	1115-0436	24655	1115-0436	
C437	Ceramic, 1 µF 25 V	4400-2070	80183	5C13, 1.0 µF 25 V	
C438	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C439	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C440	Ceramic, 0.1 µF +80 -20% 50 V	4403-4100	80131	CC63, 0.1 µF +80-20%	5910-811-4788
C441	Ceramic, 0.1 µF +80 -20% 50 V	4403-4100	80131	CC63, 0.1 µF +80-20%	5910-811-4788

REF NO.	CAPACITORS (cont)	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
C442	Mica, 0.01 µF, selected	1115-0431	24655	1115-0431	
C443	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C444	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C445	Electrolytic, 6.8 µF ±20% 35 V	4450-5000	56289	150D685X0035B2	5910-814-5869
C446	Ceramic, 0.01 µF +80 -20% 50 V	4401-3100	80131	CC61, 0.01 µF +80-20%	5910-974-5697
C447	Trimmer, 7-25 pF 350 V	4910-2043	72982	538-002, 7-25 pF	
	RESISTORS				
R401	Composition, 3 kΩ ±5% 1/4 W	6099-2305	75042	BTS, 3 kΩ ±5%	
R402	Composition, 10 kΩ ±5% 1/4 W	6099-3105	75042	BTS, 10 kΩ ±5%	
R403	Composition, 220 Ω ±5% 1/4 W	6099-1225	75042	BTS, 220 Ω ±5%	
R404	Composition, 150 Ω ±5% 1/4 W	6099-1155	75042	BTS, 150 Ω ±5%	
R405	Composition, 2 kΩ ±5% 1/4 W	6099-2205	75042	BTS, 2 kΩ ±5%	5905-279-4629
R406	Composition, 13 kΩ ±5% 1/4 W	6099-3135	75042	BTS, 13 kΩ ±5%	
R407	Composition, 6.8 kΩ ±5% 1/4 W	6099-2685	75042	BTS, 6.8 kΩ ±5%	
R408	Composition, 5.6 kΩ ±5% 1/4 W	6099-2565	75042	BTS, 5.6 kΩ ±5%	
R409	Composition, 220 Ω ±5% 1/4 W	6099-1225	75042	BTS, 220 Ω ±5%	
R410	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R411	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R413	Composition, 180 Ω ±5% 1/4 W	6099-1185	75042	BTS, 180 Ω ±5%	5905-279-5476
R414	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R415	Composition, 4.3 kΩ ±5% 1/4 W	6099-2435	75042	BTS, 4.3 kΩ ±5%	
R416	Composition, 100 kΩ ±5% 1/4 W	6099-4105	75042	BTS, 100 kΩ ±5%	
R417	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R418	Composition, 47 kΩ ±5% 1/4 W	6099-3475	75042	BTS, 47 kΩ ±5%	
R419	Composition, 470 Ω ±5% 1/4 W	6099-1475	75042	BTS, 470 Ω ±5%	
R420	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R421	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R422	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R423	Composition, 2.2 kΩ ±5% 1/4 W	6099-2225	75042	BTS, 2.2 kΩ ±5%	
R424	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R425	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R426	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R427	Composition, 5.1 kΩ ±5% 1/4 W	6099-2515	75042	BTS, 5.1 kΩ ±5%	5905-279-4623
R428	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R429	Composition, 300 Ω ±5% 1/4 W	6099-1305	75042	BTS, 300 Ω ±5%	5905-279-5481
R430	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R431	Composition, 4.3 kΩ ±5% 1/4 W	6099-2435	75042	BTS, 4.3 kΩ ±5%	
R432	Composition, 100 kΩ ±5% 1/4 W	6099-4105	75042	BTS, 100 kΩ ±5%	
R433	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R434	Composition, 47 kΩ ±5% 1/4 W	6099-3475	75042	BTS, 47 kΩ ±5%	
R435	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R436	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R437	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R438	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R439	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R440	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R441	Composition, 3.3 kΩ ±5% 1/4 W	6099-2335	75042	BTS, 3.3 kΩ ±5%	
R442	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R443	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R444	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R445	Composition, 2.7 kΩ ±5% 1/4 W	6099-2275	75042	BTS, 2.7 kΩ ±5%	
R446	Composition, 300 Ω ±5% 1/4 W	6099-1305	75042	BTS, 300 Ω ±5%	5905-279-5481
R447	Composition, 300 Ω ±5% 1/4 W	6099-1305	75042	BTS, 300 Ω ±5%	5905-279-5481
R448	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	
R449	Composition, 4.3 kΩ ±5% 1/4 W	6099-2435	75042	BTS, 4.3 kΩ ±5%	
R450	Composition, 100 kΩ ±5% 1/4 W	6099-4105	75042	BTS, 100 kΩ ±5%	
R451	Composition, 100 Ω ±5% 1/4 W	6099-1105	75042	BTS, 100 Ω ±5%	
R452	Composition, 47 kΩ ±5% 1/4 W	6099-3475	75042	BTS, 47 kΩ ±5%	
R453	Composition, 36 kΩ ±5% 1/4 W	6099-3365	75042	BTS, 36 kΩ ±5%	
R454	Composition, 27 kΩ ±5% 1/4 W	6099-3275	75042	BTS, 27 kΩ ±5%	
R455	Composition, 1 kΩ ±5% 1/4 W	6099-2105	75042	BTS, 1 kΩ ±5%	

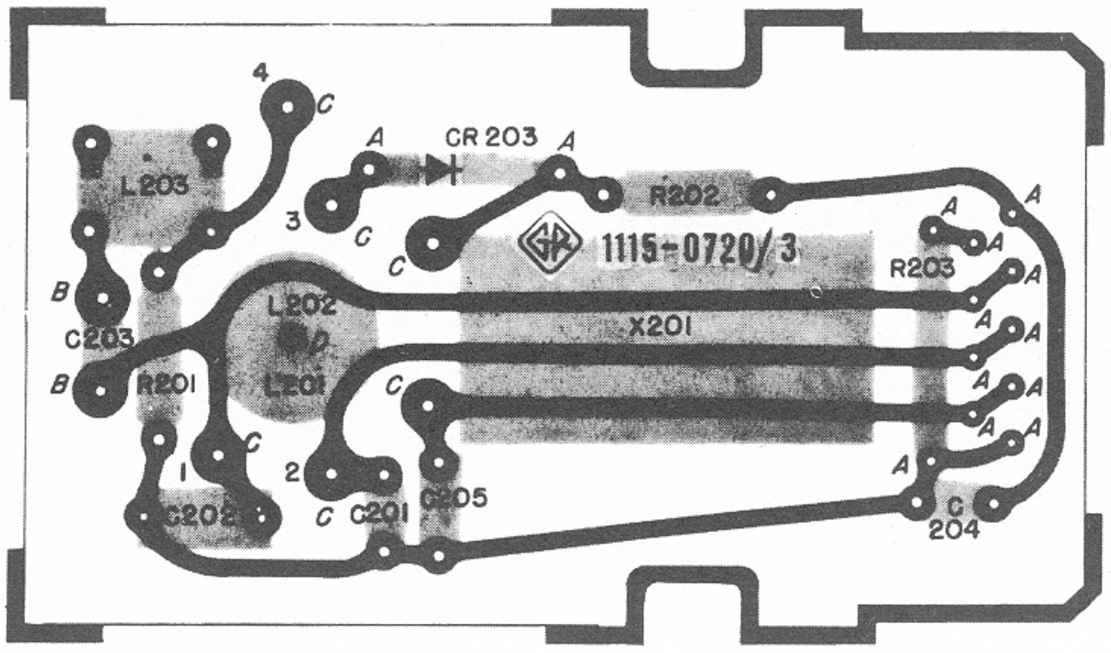


Figure 4-10. Crystal-circuit etched board (P/N 1115-2721).

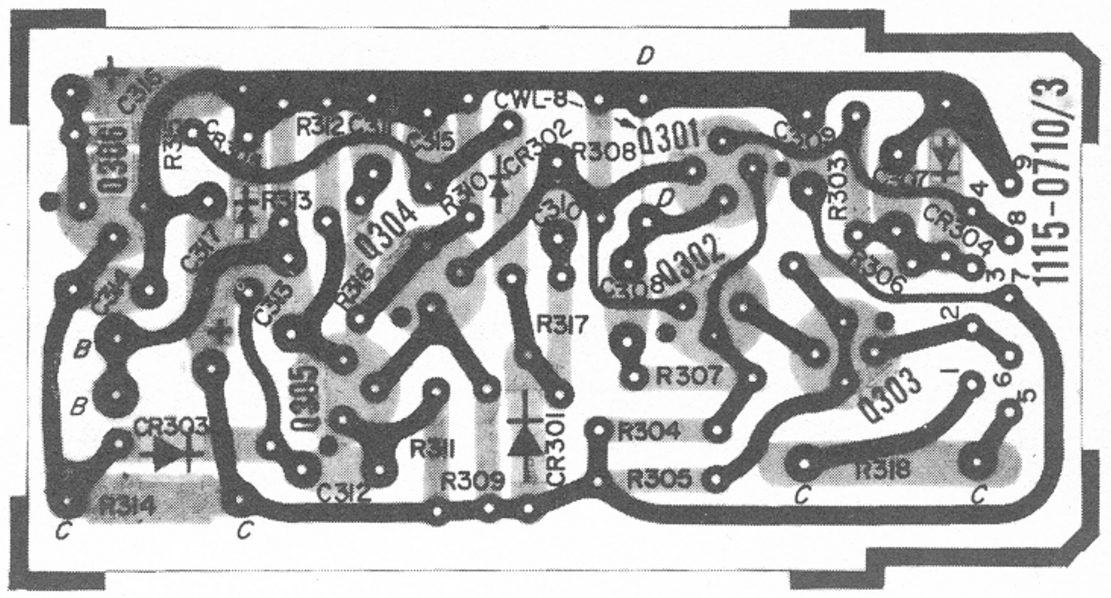


Figure 4-11. Oscillator-circuit etched board (P/N 1115-2710).

NOTE: The number on the foil side is not the part number for the complete assembly. The dot on the foil at the transistor socket indicates the collector lead.

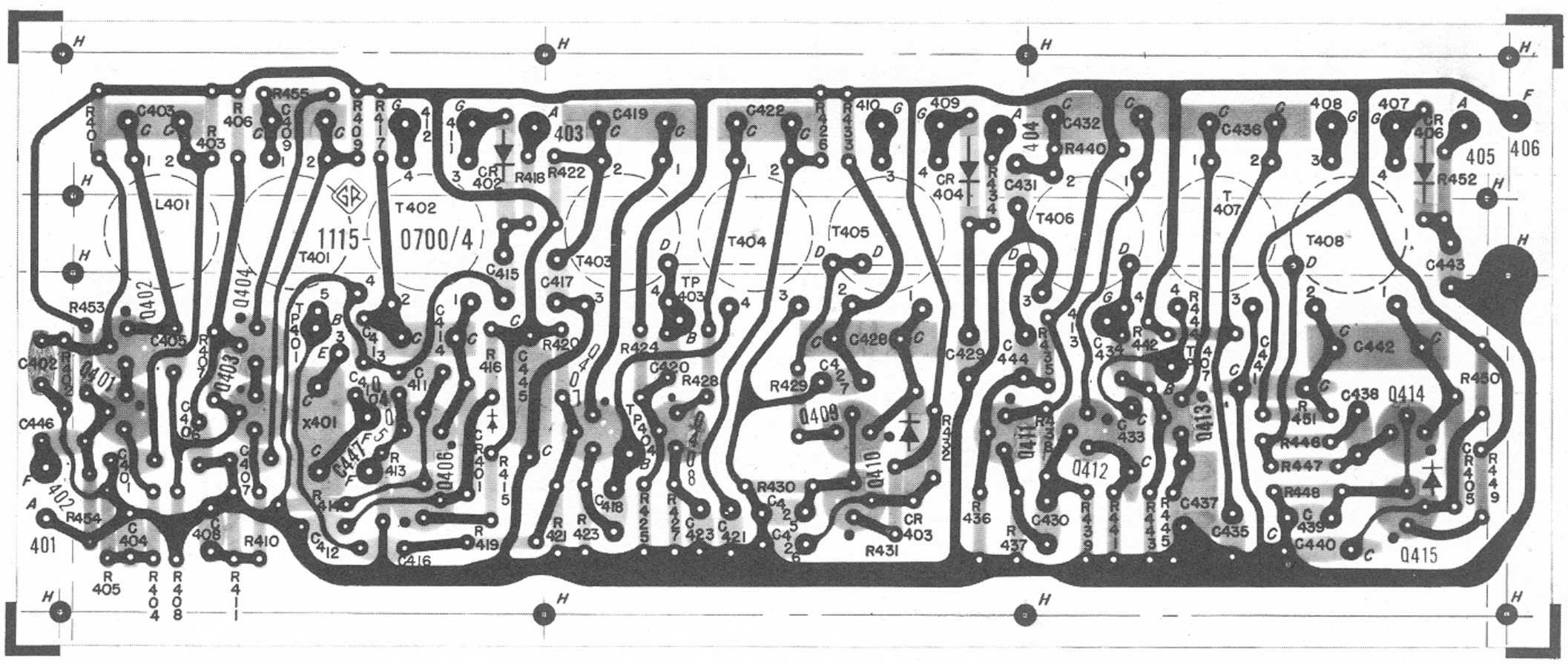
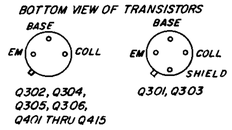


Figure 4-12. Etched-board layout for rf-amplifier and divider circuit (P/N 1115-2700).

NOTE UNLESS SPECIFIED

1. POSITION OF ROTARY SWITCHES SHOWN COUNTERCLOCKWISE.
2. CONTACT NUMBERING OF SWITCHES EXPLAINED ON SEPARATE SHEET SUPPLIED IN INSTRUCTION BOOK.
3. REFER TO SERVICE NOTES IN INSTRUCTION BOOK FOR VOLTAGES APPEARING ON DIAGRAM.
4. RESISTORS 1/4 WATT.
5. RESISTANCE IN OHMS K 1000 OHMS M 1 MEGOHM
6. CAPACITANCE VALUES ONE AND OVER IN PICOFARADS. LESS THAN ONE IN MICROFARADS.
7. ◯ KNOB CONTROL
8. ⊘ SCREWDRIVER CONTROL
9. AT ANCHOR TERMINAL
10. TP - TEST POINT

BOTTOM VIEW OF TRANSISTORS



NOTE

Some component values in instruments with serial numbers below 158 may differ from those shown in Figure 4-13.

Figure 4-13. Schematic diagram for the Type 1115-B Standard-Frequency Oscillator, including crystal circuit, oscillator circuit, and rf-amplifier and divider circuits.

REF NO.	MISCELLANEOUS	PART NO.	FED. MFG. CODE	MFG. PART NO.	FED. STOCK NO.
CR401 through CR406	DIODE, Type 1N191	6082-1008	93916	1N191	5961-296-3360
L401	INDUCTOR, 5-Mc	1115-2300	24655	1115-2300	
Q401 through Q415	TRANSISTOR, Type 2N708	8210-3089	24454	2N708	
T401	TRANSFORMER, 5-Mc	1115-2310	24655	1115-2310	
T402	TRANSFORMER, 5-Mc	1115-2320	24655	1115-2320	
T403	TRANSFORMER, 1-Mc	1115-2330	24655	1115-2330	
T404	TRANSFORMER, 4-Mc	1115-2350	24655	1115-2350	
T405	TRANSFORMER, 1-Mc	1115-2330	24655	1115-2330	
T406	TRANSFORMER, 100-kc	1115-2360	24655	1115-2360	
T407	TRANSFORMER, 900-kc	1115-2330	24655	1115-2330	
T408	TRANSFORMER, 100-kc	1115-2340	24655	1115-2340	
X401	CRYSTAL	1213-0440	24655	1213-0440	5955-997-3324

GENERAL

MISCELLANEOUS

C702	CAPACITOR, Ceramic 0.001 µF -0 +100% 500 V	4400-1800	01121	FB2B, 0.001 µF, -0+100%	5910-792-3172
C703	CAPACITOR, Ceramic 0.001 µF -0 +100% 500 V	4400-1800	01121	FB2B, 0.001 µF, -0+100%	5910-792-3172
C704	CAPACITOR, Ceramic 0.001 µF -0 +100% 500 V	4400-1800	01121	FB2B, 0.001 µF, -0+100%	5910-792-3172
J801	COAXIAL CONNECTOR, 5 MC TO 1112	0874-4502	24655	0874-4502	5935-056-0411
J802	COAXIAL CONNECTOR, 5 MC OUT	0874-4502	24655	0874-4502	5935-056-0411
J803	COAXIAL CONNECTOR, 100 KC OUT	0874-4502	24655	0874-4502	5935-056-0411
J804	COAXIAL CONNECTOR, 1 MC OUT	0874-4502	24655	0874-4502	5935-056-0411
J805	BNC CONNECTOR, 100 KC CLOCK OUT	4230-2300	81349	UG-1094/U	
J806	BNC CONNECTOR, 1 MC CLOCK OUT	4230-2300	81349	UG-1094/U	
R801	RESISTOR, Composition 56 Ω ±5% 1/2 W	6100-0565	01121	RC20GF560J	5905-279-1897
R802	RESISTOR, Composition 75 Ω ±5% 1/2 W	6100-0755	01121	RC20GF750J	5905-279-1758
R803	RESISTOR, Composition 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R804	RESISTOR, Composition 2.2 kΩ ±5% 1/2 W	6100-2225	01121	RC20GF222J	5905-279-1876
S101	SWITCH, Rotary Wafer, METER	7890-3690	76854	Type AF	
Z701	FILTER, 0.1 A, 125 V dc	5284-0400	80183	1JX54	

APPENDIX

Accessory Instruments for Use with the Type 1115-B Standard-Frequency Oscillator

Type 1123-A DIGITAL SYNCRONOMETER

PRECISION, SOLID-STATE, DIGITAL CLOCK

FEATURES:

All-solid-state logic circuitry — no moving parts.
Internal nickel-cadmium battery for approximately 24-hour emergency operation.
Bright, 6-digit indication of hours/minutes/seconds.
Any digit can be changed manually without disturbance to timing.
Time comparisons to 20 ns.
Manual start, fail-safe, regenerative circuits stop clock if input fails for even one cycle.
BCD 1-2-4-2 (1-2-4-8 optional at extra cost) output data — 10-μs resolution.
Low-jitter, standard, timing pulses at 100, 10, and 1 kc/s, 100, 10, 1, and 0.1 c/s.

USES: The TYPE 1123-A Digital SYNCRONOMETER® time comparator is a solid-state digital clock for the calibration of frequency and time standards. It provides precise time-of-day information, both visually and in BCD (1-2-4-2) form, and permits accurate comparisons between local standards and the transmission of standard time (WWV, Loran C, etc.). The clock can compare its own time with standard time without disturbance of its internal time. Clock's internal time can be automatically synchronized (within 10 μs) to standard time.

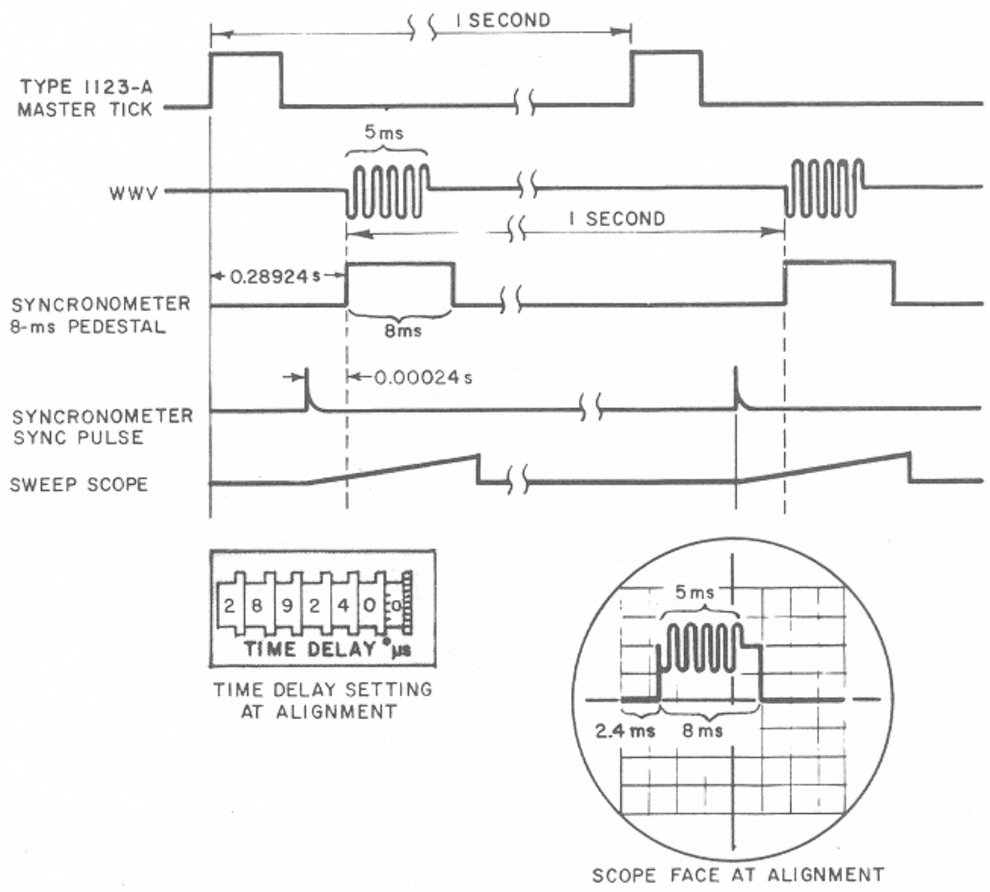
Any number of clocks can be started simultaneously from one location — remote clocks can be started from and synchronized to a local clock (without interruption of local clock). Time can be transferred from one location to another. One sets the clock at the master station and actually carries the standard time to remote locations.

DESCRIPTION:

Circuit functions in the SYNCRONOMETER may be divided into four general parts: starting, timekeeping, synchronizing, and readout.

Starting is accomplished either by a front-panel push-button or by a pulse (from an external source or another SYNCRONOMETER). With either method any number of clocks can be started simultaneously, and remote units can be started in synchronism with an operating master clock, without disturbance of the master time indication.

Timekeeping A pulse train derived from the 100-kc input is fed through fail-safe, regenerative-gate circuits. The pulses in the train, 10 microseconds apart, are then divided in five anti-time-delay decade dividers to produce a 1-pps master tick. All timekeeping circuits use silicon transistors operated at low-power levels. In the event of power failure, the built-in battery will automatically sustain the timekeeping operation for approximately 24 hours.



To determine the precise time relationship of the Digital Syncronometer's master tick to WWV standard timing bursts, both the time transmission and the clock's 8-millisecond pedestal are displayed on a CRO screen. By means of front-panel thumbwheels, successive amounts of delay are introduced until the pedestal is exactly aligned with the WWV bursts. When the delay is determined, the Type 1123-A need only be switched to self-sync operation, and the master tick will be shifted to synchronism with the transmission. The sync pulse retains oscilloscope synchronism and keeps the pedestal in view throughout the operation.

Where the characteristics of the standard-time transmission permit greater resolution than that provided by the 8-ms pedestal, the 0.2-μs marker can be used. With this marker, time comparisons with a precision of better than $\pm$20 ns are possible.

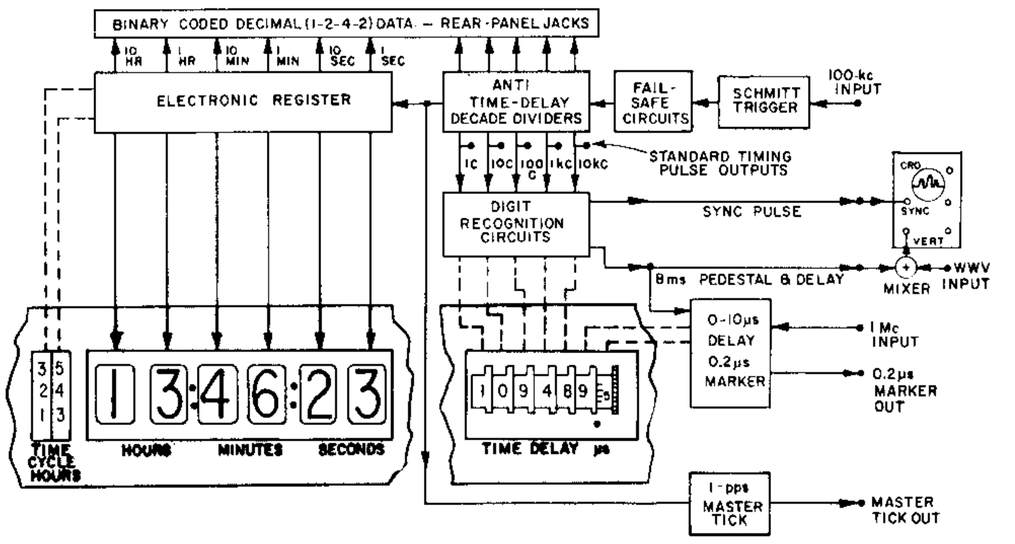
Time Comparison and Synchronization The decade dividers of the timekeeping circuits provide, at output jacks, low-jitter, timing pulses at 100 kc/s, 10 kc/s, 1 kc/s, 100 c/s, 10 c/s, 1 c/s, and 0.1 c/s. These signals also operate a five-digit recognition circuit to produce

an 8-millisecond pedestal, occurring at 1 pps. This pedestal can be delayed a precise amount of time with respect to the master tick (delay time of 0.00000 through 0.99999 second is selected by front-panel thumbwheels). Pedestal and a sync pulse are provided for comparisons of the master tick with WWV-type transmissions on a CRO screen.

For intercomparisons where greater time resolution is possible (e.g., Loran C), a 1-Mc input is used to drive a delay circuit (0 to 9 microseconds in 1-microsecond steps, 0 to 1 microsecond continuously), which produces a 0.2-microsecond marker controlled by the last two front-panel thumbwheels.

The thumbwheels used in measuring the time interval between the master tick of the SYNCRONOMETER and the standard transmissions serve in *synchronizing* the master tick as well.

Readout is both visual and electrical. The clock's 1-pps master ticks are accumulated and displayed in a six-digit bank of illuminated indicators, which can be preset to re-cycle at any number of hours from 1 to 99. The indication of each digit may be changed without carrying to the next digit or interrupting the master



Timekeeping, readout, and comparison circuits of the Type 1123-A Digital Syncronometer.

tick. An output plug provides BCD data from each digit of the visual bank and from each of the five decade dividers (0.1 second through 10 microseconds). This data is in parallel (1-2-4-2) form, an invaluable aid in providing real-time information for time-dependent measurements.

SPECIFICATIONS

Input: BNC connectors.
0.5 V at 100 kc/s (sinusoid or square wave).
0.5 V at 1 Mc/s (sinusoid or square wave).
Normally provided from TYPE 1115-B Standard-Frequency Oscillator (1 V into 50 Ω).

Outputs:

Time of Day: From all decades, parallel 1-2-4-2 BCD. 1-2-4-8 BCD available at extra cost; write for price and delivery.
Logical 0: Approx 0.5 V.
Logical 1: Approx +15 V (open circuit).
Logical Line Source Impedance: 100 kΩ.

Timing Pulses: 10 kc/s, 100, 10, 1, and 0.1 c/s are available at output fittings on rear. These outputs are +15-V pulses with approx 100-Ω source impedance and a duty ratio of 0.2. In addition, a 100-kc pulse signal is available.

Oscilloscope Sync Pulse: Settable in 1-ms steps 0.000 to 0.999 s.
Positive pulse, 13 V, $Z_o \equiv 2.2$ kΩ.
Duration, ≈7.5 μs.

Time Comparison Pedestal: Follows oscilloscope sync by 000 to 990 μs (100- and 10-μs steps).
Positive pulse, 10 V from emitter follower.
Duration, ≈8 ms.
$T_r = 0.5$ μs, $T_f = 0.5$ μs.

0.2-μs Marker: 10-V positive pulse, 0.2-μs duration, with approximately 20-ns rise and fall times, and 100-Ω source impedance. This marker is variable in 1-μs steps and a continuous 0- to 1-μs range from 0 to 10 μs after the 8-ms pedestal.

1-s Master Tick Output: Positive pulse from emitter follower.
Amplitude: 10 V. Duration, ≈7.5 ms. $T_r = 2$ μs, $T_f = 2$ μs.

Input Start Pulse: Logical 0 (0 V) to 1 (+15 V) holding for > 10 μs. May come from second clock or external system.

Output Start Pulse: 11 μs, 0 to +15 V, from emitter follower.

Inhibit Pulse Output: Logical 1 (+15 V) to 0 (0 V); lasting approx 9 to 11 time units at lower frequencies, established by setting internal links for desired inhibit rate (no print on carry).

Visual Indication: 6 dimmable digital indicators for h, m, s.

Delay Setting for Time Measurement: 6 digital thumbwheel switches and 1 continuous (0-1 μs) control calibrated in 20-ns increments.

Visual Register Setting: Direct access to all six visual decades, carries inhibited.

Clock Functions: All control and setting functions are operated by a single pushbutton and are normally locked out and covered.

1. Operate: All program controls locked out.

2. Start: Clock will be started by 11-μs start pulse from pushbutton or from external source (BNC connector on rear). Start pulse produced and fed from instrument.

3. Stop: Clock will be stopped and all counting decades from 100 kc/s to 1 c/s will be set to zero by pushbutton. Zero will hold until start command is received.

4. Set: Permits setting visual register. All-visual register carries interrupted; 100-kc to 1-cycle dividers not affected. Selected decade is advanced by 1 count for each push of the initiate pushbutton.

5. Self Sync: Permits synchronizing master tick to within 10 μs of a measured time in another time system, as WWV on UT-2.

6. Start-Slave: Permits setting a second clock from the first. After the initiate button is pushed, a start pulse will be produced when the count reaches the setting of the time-delay switches of the first clock.

Measurement Rate: Switch permits oscilloscope sync at 10-cycle rate rather than the standard one-cycle rate.

Power Required: 90 to 130 or 180 to 260 V, 50 to 60 c/s, 32 W approx. Self-contained, pressure-relief, nickel-cadmium battery for approx 24-hour off-line operation is supplied.

Accessories Supplied: Digital-output plug assembly, TYPE CAP-22 Power Cord, spare fuses.

Mechanical Data: Rack-Bench Cabinet

Model	*Width*		*Height*		*Depth*		*Net Weight*		*Shipping Weight*	
	in	*mm*	*in*	*mm*	*in*	*mm*	*lb*	*kg*	*lb*	*kg*
Bench	19	485	6	155	14½	370	30	14	40	18.5
Rack	19	485	5¼	135	12*	305	30	14	40	18.5

* Behind panel.

For a more detailed description, see *General Radio Experimenter*, February 1965.

Catalog Number	*Description*
1123-9801	**Type 1123-A Digital Syncronometer,** Bench Model
1123-9811	**Type 1123-A Digital Syncronometer,** Rack Model

Type 1124 RECEIVER

The 1124 Receiver is a Tektronix RM564 Storage Oscilloscope with the Tektronix Type 2B67 Time Base and a General Radio receiver plug-in providing two high-frequency channels and Loran-C or another external signal for display with timing signals from the Type 1123 Digital Syncronometer. All receiver, sync, and timing signals are switched automatically when the measurement switch is set for the desired function. Three other high-frequency channel boards are supplied and can be plugged in replacing those installed for further frequency changes. All connections to the receiver are made through a terminal box on the rear of the oscilloscope.

SPECIFICATIONS

LORAN-C RECEIVER:

Center Frequency: 100 kHz.
3-dB Bandwidth: Approx. 20 kHz.
Sensitivity: 3 μV for a signal-to-noise ratio of 2.
Input Impedance: Approx. 50 ohms.
Maximum Input Signal: Greater than 100 mV.
Gain Control: 60 dB total range in four fixed steps.
Notch Filters: Two filters with adjustable ranges of 80-95 kHz and 105-125 kHz. (Other ranges available with internal capacitor change.) Rejection greater than 40 dB; 6-dB bandwidth less than 3 kHz.
External Input: Approx. 0.5 V needed for full-screen deflection. (Intended for comparing other time signals with the Type 1123).

HIGH FREQUENCY RECEIVERS:

RF Frequencies: 2.5, 3.33, 5.0, 7.335, and 10 MHz; any two may be installed in the receiver at one time.
Sensitivity: μV sensitivity with 40 dB automatic gain control.
Maximum Input Signal: Greater than 100 mV.
I-F 3-dB Bandwidth: Approx. 3 kHz (i-f amplifier and crystal filter at 3.0 MHz).

CONTROLS:

AMPLITUDE (20-dB range).
Vertical POSITION.
MEASUREMENT (5-position switch EXT HF, HF 2, HF 1, LORAN-C, EXT LF).
LORAN GAIN.
100-kHz notch filters (f_1, f_2, screwdriver adjustments).
PEDESTAL AMPLITUDE (screwdriver adjustment).
MARKER AMPLITUDE (screwdriver adjustment).

CONNECTIONS:

FRONT PANEL: AUDIO OUTPUT (telephone jack).
REAR PANEL: (BNC connectors)
LORAN ANTENNA
HF ANTENNA
PEDESTAL pulse
SYNC pulse
MARKER pulse
EXT signal input

Power Required: 105-125 V or 210-250 V, 50 to 60 Hz, 240 W.

MECHANICAL DATA:

Width: 19 in.(482.6 mm)
Height: 7 in.(177.8 mm)
Depth: 21 1/16 in.(534.9 mm)

Type 1125 PARALLEL-STORAGE UNIT

The 1125 Parallel-Storage Unit is an eleven-decimal-digit parallel-storage register that will acquire time-of-day information from the Type 1123 Digital Syncronometer® (Type 1123-9760) in approximately 2 μs. When given a transfer command, the device stores the clock time in hours, minutes, seconds, etc., down to the nearest 10 μs and holds these data until a new command is given. This time is displayed on eleven in-line incandescent indicators and is available in 1-2-4-8 BCD format at a rear connector for use with a data printer or other data-processing equipment. Two inhibit input channels are provided, one to prevent transfer while the clock time is changing, and a second to prevent transfer while other equipment is processing the current data.

Although intended for use with the digital syncronometer, the 1125 Parallel-Storage Unit is usable in other systems where high-speed parallel-jam-transfer storage is desired. Positive logic is required, but a reference terminal is provided to set the data zero level at a voltage other than chassis ground.

GR874 COAXIAL COMPONENTS

APPLICABLE CABLE TYPES		GR874 CABLE CONNECTORS						
		CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED	PANEL LOCKING (KEYED)
		874-A2	-CA	-CLA	-PBA	-PLA	-PRLA	-PBRLA
	50-OHM	RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A	-PBRL8A
	NON-50-OHM	RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U						
	50-OHM	874-A3 RG-29/U RG-55/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A	-PBRL58A
	NON-50-OHM	RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A	-PBRL62A
	50-OHM	RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A	-PBRL174A
	NON 50-OHM	RG-161/U RG-187/U RG-179/U						

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

GR874 ADAPTORS		
TO TYPE		TYPE 874-
APC-7		QAP7L*
BNC	plug	QBJA QBJL*
	jack	QBPA
C	plug	QCJA QCJL*
	jack	QCP
GR900		Q900L*
HN	plug jack	QHJA QHPA
LC	plug	QLJA QLPA
LT	plug jack	QLPT QLTJ
Microdot	plug	QMDJ QMDJL*
	jack	QMDP
N	plug	QNJA QNJL*
	jack	QNP QNPL*
OSM/BRM	plug	QMMJ QMMJL*
	jack	QMMP QMMPL*
SC (Sandia)	plug	QSCJ QSCJL*
	jack	QSCP
TNC	plug	QTNJ QTNJL*
	jack	QTNP
UHF	plug	QUJ QUJL*
	jack	QUP
UHF 50-Ω Air Line	7/8-in. 1-5/8-in. 3-1/8-in.	QU1A QU2 QU3A

*Locking GR874 Connector

Example: To connect Type 874 to a type-N jack, order Type 874-QNP.

OTHER COAXIAL ELEMENTS			
TYPE 874-	DESCRIPTION	TYPE 874	DESCRIPTION
A2	50-Ω cable (low loss)	MB	coupling mount
A3	50-Ω cable	MR, MRL, MRAL	mixer-rectifier
D20L, D50L	20-, 50-cm adjustable stubs	R20A, R20LA	patch cord, double shield
EL, EL-L	90° ell	R22A, R22LA	patch cord, double shield
F185L	185-MHz low-pass filter	R33, R34	patch cord, single shield
F500L	500-MHz low-pass filter	T, TL	tee
F1000L	1000-MHz low-pass filter	TPD, TPDL	power divider
F2000L	2000-MHz low-pass filter	U	U-line section
F4000L	4000-MHz low-pass filter	UBL	balun
FBL	bias insertion unit	VCL	variable capacitor
G3, G3L, G6, G6L G10, G10L, G14, G14L G20, G20L	3-, 6-, 10-, 14-, and 20-dB attenuators	VI	voltmeter indicator
		VQ, VQL	voltmeter detector
		VR, VRL	voltmeter rectifier
GAL	adjustable attenuator	W100	100-Ω termination
JR	rotary joint	W200	200-Ω termination
K, KL	coupling capacitor	W50B, W50BL	50-Ω termination
L10, L10L L20, L20L L30, L30L	10-, 20-, and 30-cm rigid air lines	WN, WN3, WNL	short-circuit terminations
		WO, WO3, WOL	open-circuit terminations
		X	insertion unit
LAL	35-58 cm adjustable line	XL	series inductor
LK10L, LK20L	constant-Z adjustable lines	Y	cliplock
LR	radiating line	Z	stand
LTL	trombone constant-Z line	-9508	air line inner conductor
ML	component mount	-9509	air line outer conductor

CONNECTOR ASSEMBLY TOOLS	
TYPE 874-	FUNCTION
TOK	Tool Kit
TO58	Crimping Tool
TO8	Crimping Tool

MISCELLANEOUS COAXIAL CONNECTORS		
CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm air line
Basic Locking	874-BBL	50-ohm air line
Panel Locking	874-PLT	Wire lead
Panel Locking Recessed	874-PRLT	Wire lead
Panel Locking Feedthrough	874-PFL	Type 874 patch cords

L suffix indicates locking Type 874 Connector.

FOR COMPLETE DETAILS, REFER TO THE GENERAL RADIO CATALOG.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS 01781

617 369-4400 617 646-7400

SALES ENGINEERING OFFICES

METROPOLITAN NEW YORK*

845 Broad Avenue
Ridgefield, New Jersey 07657
Telephone N.Y. 212 964-2722
N.J. 201 943-3140

SYRACUSE

Pickard Building
East Molloy Road
Syracuse, New York 13211
Telephone 315 454-9323

NEW ENGLAND*

22 Baker Avenue
West Concord, Massachusetts 01781
Telephone 617 646-0550

PHILADELPHIA

Fort Washington Industrial Park
Fort Washington, Pennsylvania 19034
Telephone 215 646-8030

WASHINGTON* AND BALTIMORE

11420 Rockville Pike
Rockville, Maryland 20852
Telephone 301 946-1600

ORLANDO

113 East Colonial Drive
Orlando, Florida 32801
Telephone 305 425-4671

* Repair services are available at these district offices.

CHICAGO*

9440 W. Foster Avenue
Chicago, Illinois 60656
312 992-0800

CLEVELAND

5579 Pearl Road
Cleveland, Ohio 44129
Telephone 216 886-0150

LOS ANGELES*

1000 North Seward Street
Los Angeles, California 90038
Telephone 213 469-6201

SAN FRANCISCO

626 San Antonio Road
Mountain View, California 94040
Telephone 415 948-8233

DALLAS*

2600 Stemmons Freeway, Suite 210
Dallas, Texas 75207
Telephone 214 637-2240

TORONTO*

99 Floral Parkway
Toronto 15, Ontario, Canada
Telephone 416 247-2171

MONTREAL

1255 Laird Boulevard
Town of Mount Royal, Quebec, Canada
Telephone 514 737-3673

OTTAWA Telephone 613 233-4237

General Radio Company (Overseas), 8008 Zurich, Switzerland
General Radio Company (U.K.) Limited, Bourne End, Buckinghamshire, England
Representatives in Principal Overseas Countries

Printed in USA