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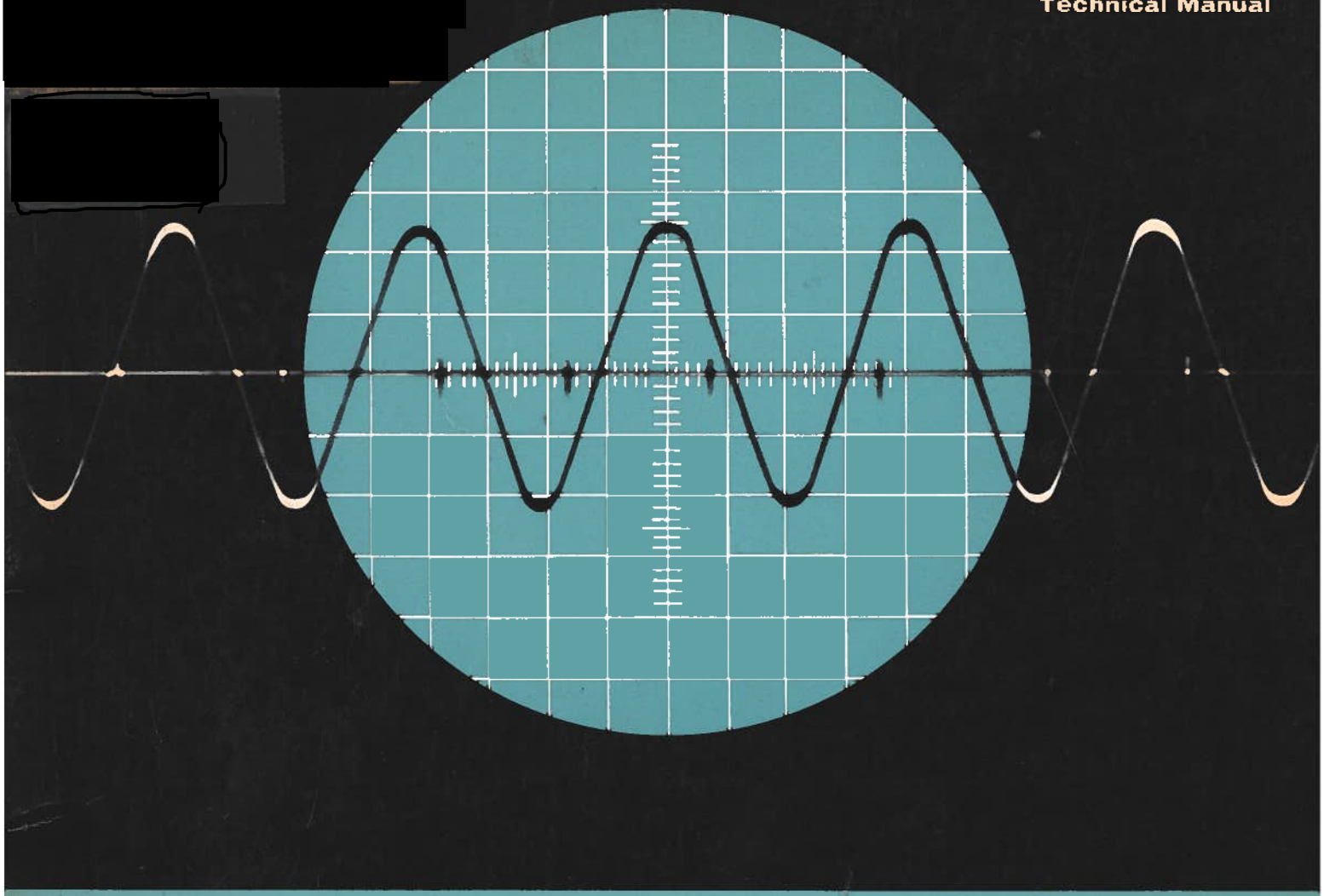
Technical Manual



VARIABLE-RATE, PRECISION

R.F. Sweep Frequency Generator

MODEL 707-D

JERROLD ELECTRONICS CORPORATION
GOVERNMENT AND INDUSTRIAL DIVISION
PHILADELPHIA, PENNA. 19105

INSTRUCTION MANUAL
435-399.1

VARIABLE-RATE, PRECISION RF SWEEP FREQUENCY GENERATOR

GENERATOR MODEL 707D
PLUG-IN OSCILLATOR HEAD MODEL H-71A
PLUG-IN OSCILLATOR HEAD MODEL H-72A
PLUG-IN OSCILLATOR HEAD MODEL H-73A

JERROLD ELEGTRONICS CORPORATION
GOVERNMENT AND INDUSTRIAL DIVISION
PHILADELPHIA, PA. 19132
LKE, January 1966

NOTE: This manual is shipped with:
Power Supply Model 707-D Serial # _____

This manual incorporates all Engineering Change Orders up to and including E. C. O. _____

All data in this manual are subject to change without notice.

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RF SWEEP FREQUENCY GENERATOR MODEL 707-D

INTRODUCTION

Jerrold Model 707-D is an instrument especially designed to investigate the frequency response of amplifiers, networks, and components within a frequency range from 2 to 200 mc/s, depending on the type of plug-in oscillator head used (see specifications for complete data).

The instrument features an extremely flat output, with harmonics 40 db down over the highest octave, 30 db down over the full range. Sweep rates are variable from 60 sweeps per second to one sweep every 2-1/2 minutes with a sweep width variable from ± 1/2% to ± 60% of center frequency. The instrument is thus highly suitable for use with either an X-Y plotter or an oscilloscope having a long-persistance cathode ray tube.

Special switching circuitry permits either manual or automatic sweeping, producing sweep voltage waveforms of either pyramidal or sawtooth characteristics.

Other features include: no blanking, or blanking of either forward or return trace; means of insuring that forward and return traces are in phase; and a metered r.f. output with the meter having both voltage and dbm scales.

The instrument can be energized from either a 115 vac 50 to 60 cps, or a 230 vac 50 to 60 cps source.

The unit is supplied in a bench type portable cabinet. Front panel dimensions are such that, without the cabinet, the unit can easily be mounted on a 19" standard relay rack.

SPECIFICATIONS

1. SWEEP GENERATOR MODEL 707-D

SWEEP RATE	From 60 sweeps per second to one sweep every 2 1/2 minutes
SWEEP METHOD	Automatic or manual
SWEEP VOLTAGE WAVE FORM	Pyramidal (50:50 rise time to fall ratio) or sawtooth (Approx. 80:20 rise time to fall ratio)
BLANKING	No blanking, or blanking of either forward or return trace
OUTPUT METER	red scale 0 to 1.25 volts black scale 0 to 4 volts dbm scale -7 to +5 dbm
PLUG-IN DETECTOR MODEL D-51B (included in basic unit)	Full wave, peak-to-peak, voltage doubler. VSWR less than 1:1; maximum voltage input 3 volts rms; flatness ± 1/2 db to 220 mc/s; insertion loss 1 db; impedance 50 ohms - BNC connectors
TUBE COMPLEMENT	(3) OD3, (2) 12AT7, (2) 6U8, (1) 6K6, (1) 12BY7A, (2) 6AU6, (1) 6CL6, (1) 12AX7
POWER INPUT	115 VAC, 50 - 60 CPS: 230 VAC, 50 - 60 CPS
POWER CONSUMPTION	100 watts

2. PLUG-IN OSCILLATOR HEADS

	H-71A	H-72A	H-73A
FREQUENCY RANGE	10 to 100 mc/s in positions A to K	16 to 200 mc/s in positions A to K	2 to 50 mc/s in positions A to K
OUTPUT IMPEDANCE	50 ohms for all oscillator heads		
OUTPUT VOLTAGE	20 dbm 3 volts rms into a 50 ohm load on all ranges	13 dbm 1 volt rms into a 50 ohm load on all ranges	20 dbm 3 volts rms into a 50 ohm load on all ranges
OUTPUT VOLTAGE VARIATION	+ 0.05 db from 50 to 100 mc/s + 0.15 db over full range	+ 0.05 db from 100 to 200 mc/s + 0.15 db over full range	+ 0.05 db from 25 to 50 mc/s, ± 0.1 db over full range
HARMONICS	40 db down over highest octave, 30 db down over full range; all model		
SWEEP WIDTH	Variable from ± 1/2% to ± 60% of center frequency; all models		
LINEARITY	The instantaneous frequency corresponds to the instantaneous horizontal deflection voltage within + 2% of the peak-to-peak voltage at a 2:1 sweep width; all models		
CONNECTORS	50 ohm BNC for all models		
TUBE COMPLEMENT	(2) 12BY7A	(1) 6922	(2) 12BY7A

CHART OF CONTROLS AND CONNECTIONS

FRONT PANEL			
NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
POWER - OFF	S1	2 POSITION TOGGLE SWITCH	Energizes and de-energizes the unit.
CENTER FREQ	R44	POT.	Sets center freq. of sweep. *
CENTER FREQ FINE	R45	VERNIER POT.	Fine adjustment of center freq. as set by R44.
SW WIDTH	R40	POT.	Controls frequency deviation of sweep. (see specs.)
SW/MIN - SW/SEC .4 - 4 4 - 40 .6 - 6 6 - 60	S5	4-POSITION WAFER SWITCH	Selects range of sweep rate. 0.4 to 4 sweeps per minute. 4 to 40 sweeps per minute. 0.6 to 6 sweeps per second. 6 to 60 sweeps per second.
SWEEP SPEED FINE	R31	VERNIER POT.	Selects sweep rate within range set by S5.
BLANKING FWD OFF REV	S2	3-POSITION TOGGLE SWITCH	Controls blanking mode of trace. Blanks forward trace. No blanking. Blanks reverse trace.
TRACE MATCH	R41	POT.	Permits phase adjustment (with S2 in OFF position) for trace and retrace waveform on scope.
PYR SAW	S3	2-POSITION TOGGLE SWITCH	Provides pyramidal output. Provides sawtooth output.
AUTO MAN	S4A, B	2-POSITION TOGGLE SWITCH	Sweeps range automatically. Permits manual sweeping by R25.

* Dial knob graduations are for reference only and do not indicate frequencies.

CHART OF CONTROLS AND CONNECTIONS

FRONT PANEL (Cont)			
NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
MAN	R25	POT.	Manual sweeping.
ALC	R52A, B	DUAL-POT.	Adjust automatic level control and r.f. output circuit.
ZERO	R56	POT.	Permits zeroing meter when oscillator is off.
DETECTOR MODEL D-51B		PLUG-IN	Unit contains detector circuit bridged across a transmission line having the impedance for which the sweep is designed. Either connector, J4 or J5, is usually terminated by a Jerrold Model TR-50B.
CHASSIS TOP			
SWING	R6	POT.	Controls amplitude of pyramid.
DC REF	R9	POT.	Controls level of pyramid with respect to ground.
SYM	R27	POT.	Controls symmetry of pyramid.
LIN A LIN B	R38 R35	POT. POT.	Adjust linearity of sweep vs. frequency.
METER SET	R55	POT.	Calibrates meter M1.

CHART OF CONTROLS AND CONNECTIONS

CHASSIS REAR			
NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
SWEEP SAMPLE OUTPUT	J3	BNC CHASSIS FITTING	Connection of sweep output to marker mixer.
BIRDIE AUDIO INPUT	J8	BNC CHASSIS FITTING	Connection of audio input from marker mixer.
VERT	J7	BNC CHASSIS FITTING	Connection of detector output to vertical input of scope.
HORIZ	J6	BNC CHASSIS FITTING	Connection of horizontal deflection voltage to horizontal input of scope.
LINE SYNC ON-OFF	S6	2-POSITION TOGGLE SWITCH	In ON position, locks sweep rate to 60 cycle line for operation with Model FD-30 Coaxial Switch.
SLO-BLO	F1	FUSE	2A-115 V/1A - 230 V; line protection.
SWEEP DRIVE OUT	J1	6-PIN SOCKET	Connection to X-Y plotter, etc.

CHART OF CONTROLS AND CONNECTIONS

PLUG-IN OSCILLATOR -- MODELS H-71A, H-72A, H-73A

FRONT PANEL			
NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
A thru K	H-71A:S1 H-72A:S201 H-73A:S301	11-POSITION ROTARY SWITCH	Chooses one of the 11 frequency ranges noted above switch.
TILT	H-71A:C28 H-72A:C224 H-73A:C329	h.f. TRIMMERS	Permits about 0.25 db of tilt adjustment.
R. F. OUT	H-71A:J1 H-72A:J201 H-73A:J301	BNC CHASSIS FITTING	R. F. output cable connection.
CHASSIS			
BAL	H-71A:C36, 37 H-72A:C214, 217 H-73A:C317, 320	VARIABLE CAPACITORS	For balancing push-pull output circuit, to obtain minimum harmonics.
HARMONIC BALANCE	H-71A:R2 H-72A:R202 H-73A:R302	POT.	
METER INPUT	H-71A:R11 H-72A:R212 H-73A:R311	POT.	Adjusts dc input voltage to meter M1.
NOTE: These four chassis-mounted controls are factory-aligned; adjustment may be needed only after oscillator tube replacement.			

CIRCUIT DESCRIPTION

(See Dwg. E861-538)

1. POWER SUPPLY CIRCUIT.

AC power at the input is fused in F1 with 2 amps. for 115 vac 50 - 60 cps, and with 1 amp. for 230 vac 50 - 60 cps. Terminal board TB1 permits strapping the line transformer T1 for either ac source. T1 is a multiple winding transformer providing three separate 6.3 vac outputs for tube heaters, and from a fourth secondary winding, through silicon rectifiers CR1, CR2 and CR3, the necessary positive and negative dc voltages. Four such voltages are derived, three of which are regulated by V1, V2 and V3. Switch S1 connects the unit to and disconnects it from the ac line.

2. SWEEP CIRCUIT.

The basic sweep frequency circuit employs tubes V4, V5 and V6 with their associated components. The two triodes of V4 constitute a simple flip-flop circuit producing a pulse with a rectangular wave shape. The pulse amplitude is controlled by SWING control R6. A chassis-mounted DC REF potentiometer R9 controls the output level of the pulse with respect to ground. This pulse is first fed to tube V5, the triodes of which are arranged in a cathode follower circuit. From there, the pulse is passed via switch S3 to an integrating circuit comprising SWEEP SPEED FINE potentiometer R31 and one of the capacitors C7, C8, C9 or C10, as chosen by the SW/MIN-SW/SEC switch S5. With switch S3, the pulse can be chosen to exhibit either a pyramidal or a sawtooth waveform. With S3 in PYR position, the symmetry of the pyramidal pulse is controlled by SYM potentiometer R27. With S3 in SAW position, the pulse is made unsymmetrical with respect to time and the return rate of the sweep is faster than the forward rate; integration of this pulse produces a sawtooth waveform. For increasing the linearity of the time-base voltage, tube V6 is employed as a "Miller" high-gain amplifier in parallel to the integrating rc network.

From the cathode of V-6B the pulse is then passed via SW WIDTH potentiometer R40 and a voltage divider network to the control grids of V7 and V8. The function of these two tubes is not only to drive the reactor coil in the plug-in oscillator, but by driving it from two tubes with complementary characteristics, the waveform of the current flowing through the coil is slightly changed so that maximum linearity with respect to frequency is achieved on the scope display of the sweep. LIN A potentiometer R38, and LIN B potentiometer R35, permit adjusting the characteristics of V7 and V8 for best linearity.

TRACE MATCH potentiometer R41 insures that, with switch S2 in OFF position (no blanking), the r.f. output observed on the oscilloscope will be in phase during trace and retrace.

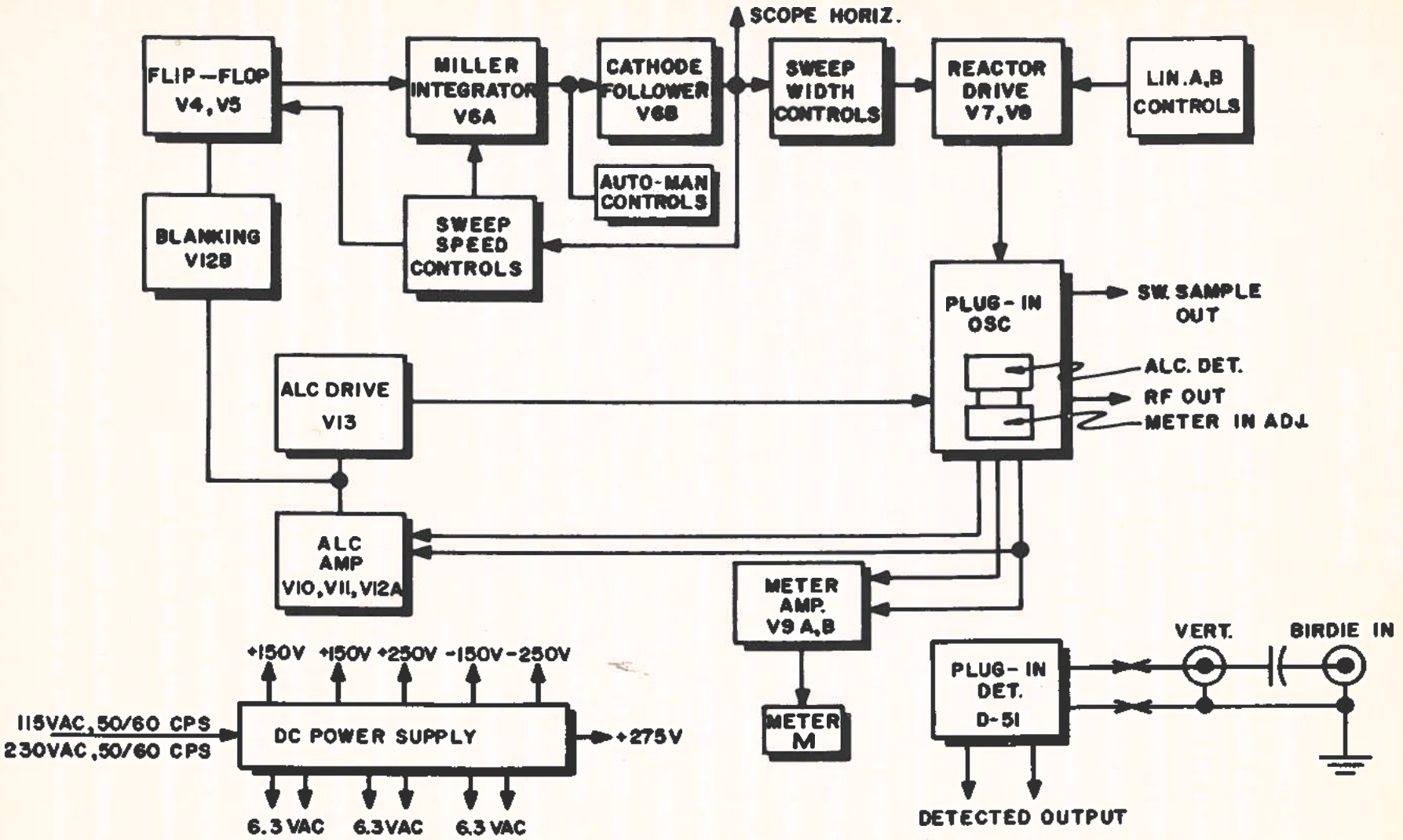
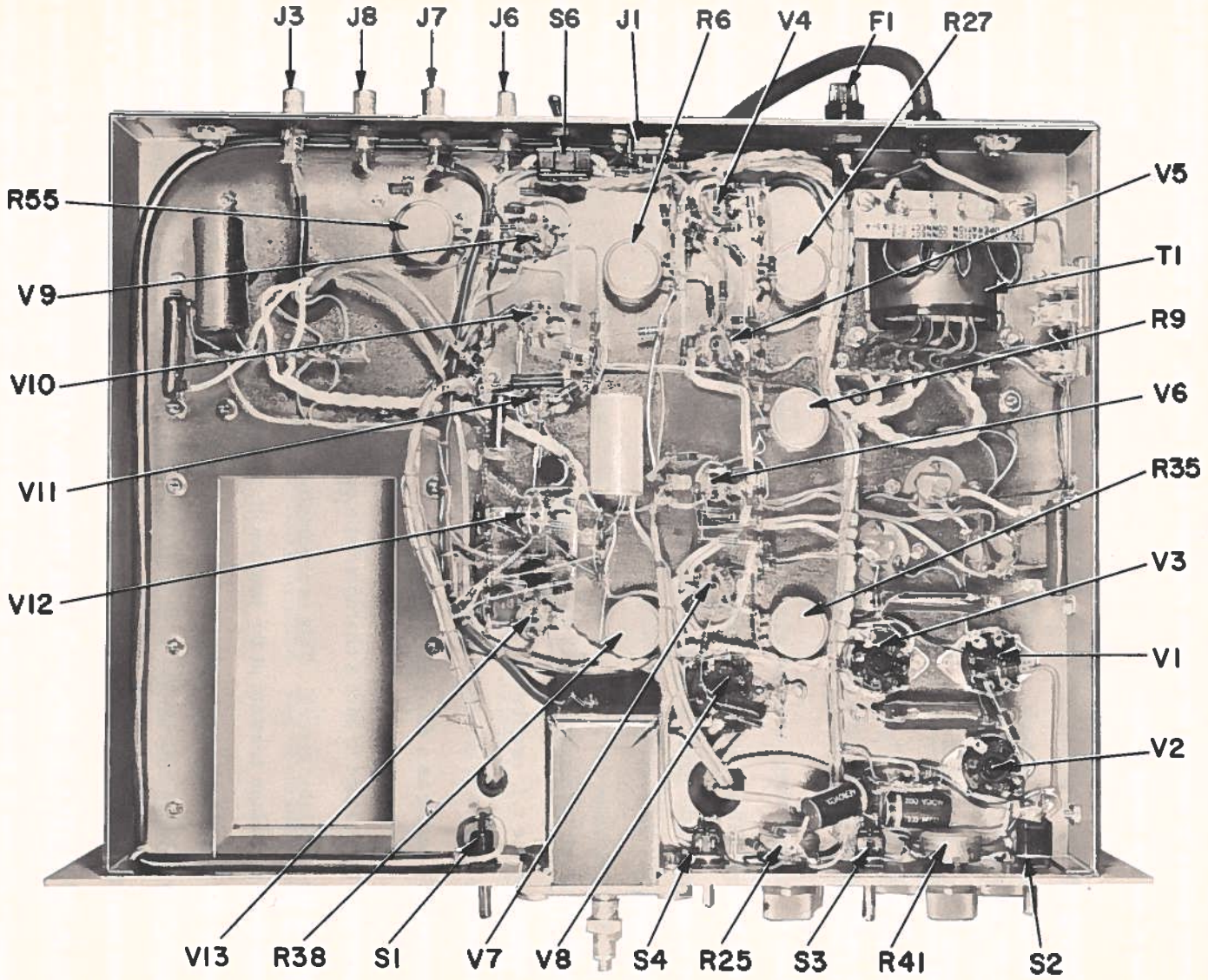


Figure 1. Model 707-D, Functional Block Diagram



Component Location Diagram

AUTO MAN switch S4 permits either automatic or manual sweeping; fine control of automatic sweep speed is exercised by potentiometer R31 in the integrator circuit. Manual sweeping is controlled by MAN potentiometer R25. Two potentiometers in series, R44 and R45, permit coarse and fine adjustment respectively of the center frequency setting by varying the control grid bias on V7 and V8. Fine adjustment is especially useful when operating at narrow sweep widths.

The plate output of V7 and V8 is then passed via the multi-pin socket J2 to the plug-in oscillator.

3. AUTOMATIC LEVEL CONTROL CIRCUIT.

While the output of the r.f. oscillator is swept through a desired band of frequencies, the level of that output tends to vary. This is caused by a number of factors such as the change in Q of the oscillator transformer T1 primary, the extent to which the output coupling varies with frequency, and other related factors.

In order to keep the output voltage constant with frequency, a direct-coupled ALC amplifier circuit is employed, using tubes V10 through V13 and associated components, whereby the dc voltage from the measuring circuit in the oscillator is applied to the grids of the first tube V10. The amplitude of this dc voltage is a measure of the r.f. voltage at the tap.

The ALC amplifier circuit terminates in V13 which is connected as a cathode follower. Its output provides the screen grid voltage for the r.f. oscillator. Since the ALC amplifier output voltage is phased for inverse feedback, its level will be extremely constant. Initial level adjustment is achieved by the front panel-mounted ALC dual potentiometer R52 acting as a delay bias control.

The sweep generator is designed to have a characteristic output impedance of 50 or 75 ohms, looking into the r.f. output jack in the oscillator circuit. This is accomplished in the following manner: the output control circuitry keeps the r.f. voltage constant at the junction of the output of the low-pass filter and the 50-ohm, or 75-ohm, resistor (R7 in H-71A head, R208 in H-72A head, or R308 in H-73A head) in the oscillator circuit. For any change in r.f. voltage, the voltage at this junction remains constant, thus the impedance from this point to ground must be zero. Hence, looking from this junction to the r.f. output spigot, one sees a constant voltage source in series with a 50-ohm, or 75-ohm resistance, as the case may be.

4. METERING.

The metering circuit employs a twin-triode, tube V9A and B. The grids of the triodes are interconnected through resistor R58. With no voltage impressed across this resistor, i.e., when the oscillator has zero output, the front panel-mounted ZERO potentiometer R56 can be adjusted so that no current flows through the meter M1. With a dc voltage impressed across R58, tube V9 experiences a change in conduction, triode V9A

increasing and V9B decreasing. This change produces a difference in potential across the meter. The circuit also incorporates METER SET potentiometer R55 for meter calibration. R55 is accessible from the chassis top for screwdriver adjustment.

5. BLANKING.

It is often convenient to be able to turn the sweep generator off periodically in order to establish a zero output reference level for a circuit under investigation. For this purpose, Model 707-D has a built-in blanking circuit. Sweeping from one frequency to another is effected by a pyramidal or sawtooth wave obtained by integrating a rectangular pulse. During the first portion of the pulse the generator sweeps in one direction and during the second portion in the opposite direction. Blanking during either portion of the pulse is obtained by simply flipping the BLANKING switch S2 to the desired position. Thus zero level is obtained for either forward or return trace.

The blanking circuit works in the following manner:

Samples of the pulses referred to above are taken from the cathode followers V5A-V5B and applied to two terminals on switch S2. From the common of S2 the pulse sample is fed via resistor R70 to the grid of tube V12B in the ALC amplifier. The plate output of V12B is connected through R72 to the plate of V12A. When S2 is in the OFF position, the grid of V12B will conduct; this essentially puts a short across V12A, hence cuts off the screen grid voltage from the oscillator tube.

6. PLUG-IN OSCILLATOR HEADS H-71A, H-72A AND H-73A

(See Dwgs. D861-277, D861-368 and D861-367)

The circuitry of all three oscillator heads is essentially the same. The heads differ only in their frequency ranges and the values of some of their components.

For simplicity, the circuit description from here on will refer to the schematic designation of components on oscillator head H-71A only.

The oscillator heads are plug-in type sweep oscillators, each with its frequency range subdivided into eleven overlapping ranges as denoted on the oscillator front panel. A rotary switch S1 permits selecting the desired sweep range.

The oscillator circuitry comprises transformer T-1, saturating coil L-12, two pentode tubes V-1 and V-2 operating in push-pull, a splitting filter network, and a voltage measuring circuit employing diodes CR1 and CR2. The tuned circuit essentially comprises T1 with a center-tapped primary winding, stray capacities and one of capacitors C1 through C10 as selected by the rotary switch S1.

The control grids of V-1 and V-2 are connected to the grid winding on the secondary side of T-1 and are phased to permit oscillation. Bias for the control grid of each tube is furnished by grid leak resistors R-1 and R-3, respectively. B+ voltage for the plates of V-1 and V-2 is derived from the center tap of the primary on T-1. Screen grid voltage for both tubes is obtained from the output of the ALC amplifier as previously described. Resistor R-2 is a cathode bias common to both V-1 and V-2; it is variable so that a harmonic balance in oscillations can be achieved.

The oscillator frequency is primarily determined by the capacitor chosen through rotary switch S-1 and the inductance of the T-1 primary as varied by the degree of saturation of the iron core of the transformer. The magnetic flux saturating the iron core is produced by inductor coil L-12 wound on a U-shaped laminated iron core. The currents flowing through L-12 are derived from the sweep circuit and provide the necessary magnetic flux to vary the oscillator frequency. The degree of frequency variation is determined by the variations in the current flowing through L-12.

Output power is taken through a small coupling coil on T-1. One end of this coil is grounded, the other passes the oscillator output to the center of a high-pass low-pass splitting filter. The oscillator output then passes through the low-pass filter section to a junction from where it proceeds: (1) through an RC block to the voltage measuring circuit; (2) through resistor R-7 to the RF OUT jack J-1.

The excellent flatness characteristics of the plug-in oscillator are the result of decreasing the harmonic content of the output, and proper automatic level control action. Second harmonics are reduced through the push-pull circuit configuration and the proper balancing of both tubes by the variables R-2, C36 and C37. Third and higher harmonics are reduced by the splitting filter network.

7. VOLTAGE MEASURING CIRCUIT.

The voltage measuring circuit comprises a voltage divider network and two silicon diodes CR1 and CR2. The network reduces the voltage to prevent overdriving the diodes. CR1 and CR2 act as a voltage doubler rectifier. The amplitude of this dc voltage is a measure of the r.f. voltage at the RF OUT jack J-1.

The output of the diodes is passed via the multi-pin connector J-2 to the ALC and metering circuit in the sweep generator.

A TILT control, high-frequency trimmer C-28, provides tilt adjustment by approximately 0.25 db. Tilt adjustment is made whenever it is necessary to compensate for tilt variations encountered while switching from one oscillator range to another, or whenever attenuators, pads or external detectors are used. Tilt

compensation will then give scope presentations with maximum flatness of the detected sweep output. The control is mounted on the oscillator front panel and adjustable by a screwdriver.

8. PLUG-IN DETECTOR MODEL D-51.

(See Dwg. 861-366)

Model 707-D is equipped with a plug-in type detector, necessary wherever response measurements are to be made of passive networks or preamplifiers, for delay line impedance matching, for checking the sweep output and where such equipment under test does not have a built-in detector.

The detector is designed to have characteristics approaching as closely as possible those of the voltage measuring circuit in the oscillator head. This is essential for presenting a flat output on the oscilloscope, especially at the higher frequencies.

The detector uses diodes CR-101 and CR-102 in a full-wave rectifier circuit which discriminates against even-order harmonics and provides twice the dc output of a half-wave rectifier. The filter network chosen gives a good compromise between carrier filtering and audio response.

OTHER APPLICATIONS

OPERATION WITH X-Y PLOTTER:

When operating the Model 707-D in conjunction with an X-Y plotter, it is desirable to have manual control of the sweep frequency range. This facility is provided by setting switch S4 to MAN position, then by varying R25 marked MAN on front panel, the desired frequency range can be swept manually. The circuitry is so arranged that if the sweep is set manually at any frequency range and then switched to automatic sweep, the generator will start sweeping at the preset frequency. This is insured by R24 marked MAN SET on the chassis; R24 is a factory adjusted control.

OPERATION WITH MODEL FD-30 VOLTAGE COMPARATOR:

Often it may be desired to use Model 707-D in conjunction with Jerrold Model FD-30 Wide-Band Comparator.

To operate the Model 707-D Generator effectively with the Model FD-30 Voltage Comparator requires that the sweep rate of the Generator can be phased with the switching rate of the Voltage Comparator. Since the switch rate of the Voltage Comparator is locked to the 60 cycle line, this requires that the sweep rate of the Generator also be locked to the line when the two units are to be operated together. A simple method of accomplishing this is to feed a small amount of line voltage to the grid of the Model 707-D flip-flop circuit for the purpose of locking the sweep rate circuit to line when the time constants of the integrating circuit are set for a 60 cycle rate.

To make this possible, Model 707-D has a special LINE SYNC switch (S6) mounted at the rear of the chassis. This switch locks the generator's sweep rate to the 60-cycle line at either a 60-cycle, 30-cycle or 15-cycle rate.

EQUIPMENT MAINTENANCE

GENERAL

Model 707-D has been designed to give trouble-free long-life service. Components incorporated have been carefully selected to insure a high measure of reliability and accuracy. No major trouble should therefore be encountered while the instrument is used by qualified personnel and not subjected to abusive handling.

Should it become necessary to replace a tube, only a new, exactly equivalent type of a recognized brand should be used. When replacing a crystal diode, proper polarity must be observed.

Schematic circuit diagrams, with critical voltage check points indicated, and complete replacement parts lists are given to facilitate servicing. If realignment becomes necessary (e.g., after tube replacement), follow the step-by-step procedure.

TEST EQUIPMENT REQUIRED

1 Laboratory Type Oscilloscope

1 Marker Generator (Jerrold Models CM-6, CM-10, or equivalent)

1 Field Strength Meter (capable of covering the oscillator frequency range)

1 Variable Attenuator (Jerrold Models AV-50, AV-50-2, or equivalent)

1 R. F. Voltmeter or bolometer

1 Vacuum Tube Voltmeter

ALIGNMENT OF OSCILLATOR HEADS H-71A, H-72A AND H-73A

A. SETUP

Block diagram Fig. 2 shows how to setup Model 707-D and test equipment after a tube replacement in the oscillator plug-in unit.

B. STEP-BY-STEP PROCEDURE

1. Switch on all the instruments; allow 20 to 30 minutes for proper warm-up.

2. Set field strength meter to 54 mc.

3. Set Function Switch on field strength meter to SIGNAL STRENGTH.

4. Set all attenuator switches to ON.

5. Set SW WIDTH control on 707-D to maximum range.

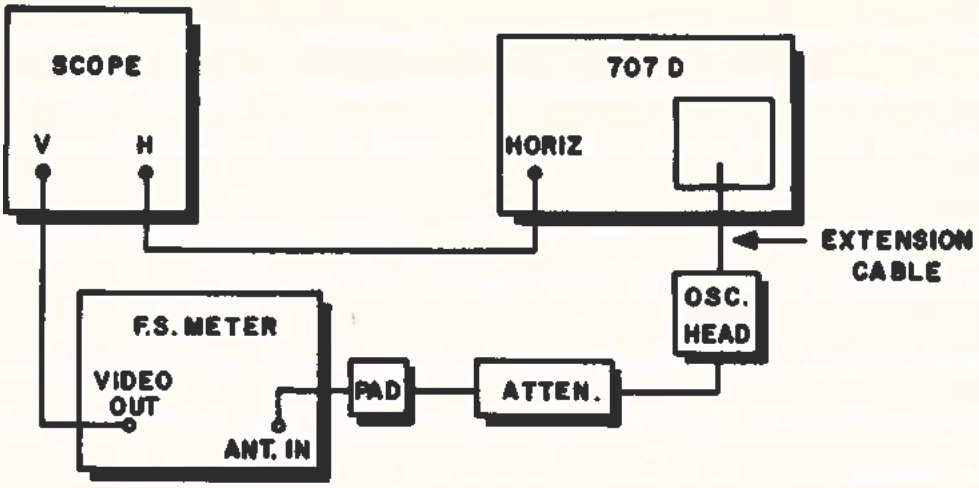


Figure 2. Setup for Alignment of Oscillator

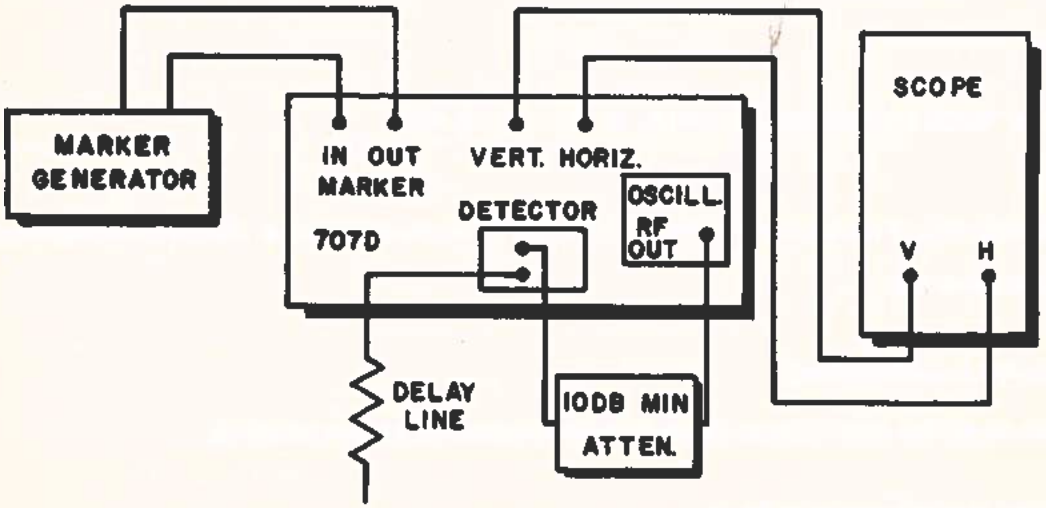


Figure 3. Setup to Align for Linearity

6. Set ALC on 707-D to 3 v output (to 1 v for Model H-72A).

7. Set CENTER FREQ control on 707-D to ON position.

8. Set BLANKING switch on 707-D to ON position.

9. Set AUTO-MAN switch on 707-D to AUTO position.

10. Set SWEEP SPEED FINE control on 707-D to max. range.

11. Set SW/MIN-SW/SEC switch on 707-D to .6-6 range (0.6 to 6.0 sweeps per second).

12. Set SW WIDTH control on 707-D to present optimum width of spike trace on scope, while spike amplitude remains the same.

13. Set the frequency control on the field strength meter to 108 mc; observing the scope, the spike should be seen going off the screen.

14. Reduce attenuation until the spike reappears on the CRT screen.

15. Adjust the variables R-2, C36 and C37 on the H-71A head to obtain minimum amplitude of spike, first by setting C36 and C37 at minimum position, then (slowly turning one capacitor) observe whether the spike amplitude increases or decreases. If an increase is noted, reset the capacitor to minimum, then adjust the other capacitor for minimum spike amplitude. After that, adjust R-2 to further decrease the spike amplitude. Repeat this step until absolute minimum spike amplitude is obtained.

NOTE: The alignment procedures for Models H-72A and H-73A are the same as that for Model H-71A except that the field strength meter settings are to be made first at 100 mc, then at 200 mc for Model H-72A, and — for Model H-73A — a detector capable of registering down into the low frequency range should be used instead of the FSM.

If a Jerrold field strength meter Model 704B is used, the Model TK-704 100 mc adapter will permit the FSM to measure frequencies down to 8 mc. Set the FSM first at 125 mc, then for harmonic at 150 mc. The max. input signal voltage to the adapter should not exceed 3000 microvolts; where it does, use an appropriate pad or attenuator.

ALIGNMENT OF SWEEP GENERATOR

A. SWEEP CIRCUIT

NOTE: Only an oscilloscope is required.

1. Connect VERT input of scope to HORIZ output connector J6 at rear of 707-D chassis.
2. Set AUTO-MAN switch on 707-D to AUTO position.
3. Set PYR-SAW switch on 707-D to PYR position.
4. Set SW/MIN - SW/SEC switch on 707-D to 6-60 range.
5. Set scope vertical sensitivity to 40 volts full scale.
6. Adjust SWING potentiometer R6 on 707-D chassis to obtain 40-volt sweep trace on scope.
7. Adjust SYM control R27 on 707-D chassis to obtain perfect symmetry of trace.
8. Adjust DC REF control R9 on 707-D chassis to adjust level of pyramidal output.

B. ALIGNMENT FOR LINEARITY

NOTE: Model 707-D is factory-adjusted for best overall linearity for all three plug-in oscillator models. If it is desired to further optimize linearity for a particular oscillator head, follow the step-by-step procedure given here.

1. Set up Model 707-D and test equipment as shown in block-diagram Fig. 3.
2. Switch on all instruments and allow 20 - 30 minutes for warm-up.
3. Set AUTO-MAN switch on Model 707-D to AUTO position.
4. Set BLANKING on scope to ON position.
5. Set PYR-SAW switch on Model 707-D to PYR position.
6. Set ALC control on Model 707-D front panel to provide 3 volts r.f. output on meter.
7. Adjust potentiometers LIN A and LIN B on Model 707-D chassis to obtain maximum linearity of ripple pattern on scope.

C. ALIGNMENT OF METERING CIRCUIT

NOTE: Readjustment of this circuit becomes necessary whenever tube V9 is replaced. For readjustment it is preferable to use a standard H-71A or H-73A oscillator head which provide a 3-volt output; however, readings for an H-72A head are also given.

1. Plug oscillator head into the generator power supply.

2. Connect dc voltmeter with positive lead to terminal 7 and negative lead to terminal 8 on multi-pin connector J2 at generator chassis (rear of housing which shields the oscillator).

3. Energize the unit and allow about 15 minutes warm-up time. Do not energize before having first connected the voltmeter; terminals 7 and 8 on J2 are -150 volts above ground potential.

4. Set sweep mode to MAN; set blanking to FWD or REV, whichever provides the blanked output.

5. Adjust meter ZERO control on front panel to indicate zero on the meter.

6. Set BLANKING switch to OFF position.

7. Adjust ALC control on front panel to give a reading of 1.5 volts on the dc voltmeter (or 1.0 vdc for Model H-72A).

8. Adjust METER SET control on chassis to give a 3-volt reading on 4-volt scale of the front panel meter M1 (or 1.0 volt reading on 2-volt scale for Model H-72A). Lock METER SET control.

9. To adjust METER INPUT control on oscillator head, measure the r.f. output with an r.f. voltmeter. Adjust ALC control on front panel of 707-D for a 3-volt rms output (1-volt rms for Model H-72A) and adjust METER INPUT control (accessible from chassis bottom) for proper indication on front panel meter M1 (3 volts on 4-volt scale for H-71A and H-73A, 1 volt on 2-volt scale for H-72A).

REPLACEMENT PARTS LIST

SWEEP FREQUENCY GENERATOR — MODEL 707-D

(See Dwg. 861-538)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	CAPACITORS			
1	C1A, B	1	200+80 UF, 350V, dual electrolytic	127-609
2	C2	1	20 UF, 450V, electrolytic	127-025
3	C3, C4	2	40 UF, 450V, electrolytic	127-505
4	C5	1	100 PF ± 10%, 500 V	123-105
5	C6, C9, C19	3	1 UF, 200 V	125-019
6	C7	1	0.01 UF, 400 V	125-013
7	C8	1	0.01 UF, 200 V	125-002
8	C10*	1	10 UF, bathtub	125-047
9	C13	1	40 UF, 250 V, electrolytic	127-004
10	C14	1	0.02 UF, 500 V, GMV, ceramic disc	124-034
11	C16	1	1000 PF, 500 V, GMV, ceramic disc	123-115
12	C17	1	150 PF ± 10%, 500 V	123-107
13	C18	1	3000 PF, 600 V NOTE: C15 not assigned	125-028
	CHOKE			
14	L1	1	2.3 H, 150 MA, laminated iron core choke	B143-105
	FUSE			
15	F1	1	2A/115V or 1A/230V, SLO-BLO	101-345 or 101-352
	METER			
16	M1	1	0-200 UA, DC	171-206
	PILOT LAMPS			
17	DS1, 2	2	6-8 V, 150 MA, #47	102-002

* In some units 3 capacitors, C10 (2 MF) C11 (4MF) and C12 (4 MF) are used for a composite capacitance of 10 MF.

REPLACEMENT PARTS LIST

SWEEP FREQUENCY GENERATOR — MODEL 707-D (Cont)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	PLUGS, RECEPTACLES			
18	P1	1	Line cord and 3-pin plug	659-116
19	Shipped loose	1	Grounding adapter	180-105
20	J1	1	6-pin socket	182-114
21	J2	1	16-pin socket	B183-209
22	J3, 6, 7, 8	4	BNC chassis fitting	188-103
23	P2, 3	2	Banana plug	184-020
	RECTIFIERS			
24	CR1, 2, 3	3	Silicon diode, CER72ST	137-711
	RESISTORS			
25	R1, 4	2	1 K, 10 W, wirewound	113-005
26	R2	1	1.25 K, 20 W, wirewound	113-013
27	R3, 81	2	220 Ohms, ± 10%, 1 W	112-279
28	R5	1	1.75 K, 10 W, wirewound	113-008
29	R6, 9, 27	3	500 K, 2 W, potentiometer	118-030
30	R7, 28, 72, 75	3	1 Meg. ± 5%, 1/2 W	112-737
31	R8	1	3.6 Meg. ± 5%, 1/2 W	112-809
32	R10, 12	2	68 K ± 5%, 1/2 W	112-590
33	R11, 19, 29, 79	4	3 Meg. ± 5%, 1/2 W	112-797
34	R13, 16	2	3.3 Meg. ± 5%, 1/2 W	112-800
35	R14, 32, 33, 34, 64	5	1 K ± 5%, 1/2 W	112-359
36	R15, 18	2	150 K ± 5%, 1/2 W	112-632
37	R17, 23, 39, 46, 47	5	10 K ± 5%, 1/2 W	112-485
38	R20, 42	2	200 K ± 5%, 1/2 W	112-650
39	R21, 43, 48	3	100 K ± 5%, 1/2 W	112-611
40	R22	1	91 K ± 5%, 1/2 W	112-608
41	R24	1	12 K ± 5%, 1/2 W	112-497
42	R25	1	250 K, 2 W, potentiometer	118-120
43	R26	1	22 K, ± 5%, 1/2 W	112-527
44	R30, 36	2	510 K, ± 5%, 1/2 W	112-704
45	R31, 41	2	5 Meg. 2 W, potentiometer	118-054
46	R35, 38	2	500 Ohms, ± 10%, 2 W, potentiometer	118-053
47	R37, 74	2	2.2 Meg. ± 5%, 1/2 W	112-779
48	R40	1	500 K, ± 10%, 2 W, potentiometer	118-056
49	R44	1	1 Meg. 2 W, potentiometer	118-055
50	R45	1	100 K, 2 W, potentiometer	118-062
51	R49	1	51 K ± 5%, 1/2 W	112-578
52	R50, 59, 60, 66, 73	5	200 Ohms, ± 5%, 1/2 W	112-272
53	R51	1	470 Ohms, ± 5%, 1/2 W	112-317
54	R52A, B	1	10 K, 100 K, 2 W dual potentiometer	118-115
55	R53, 70	2	33 K ± 5%, 1/2 W	112-548
56	R54	1	3.3 K ± 5%, 1/2 W	112-422

REPLACEMENT PARTS LIST

SWEEP FREQUENCY GENERATOR -- MODEL 707-D (Cont)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	RESISTORS (Cont)			
57	R55	1	10 K, 2 W, potentiometer	118-026
58	R56	1	500 Ohms ± 10%, 2 W, potentiometer	118-103
59	R57	1	22 K ± 10%, 2 W	112-532
60	R58	1	2 Meg. ± 5%, 1/2 W	112-776
61	R61	1	2.7 Meg. ± 5%, 1/2 W	112-791
62	R62	1	56 K ± 5%, 1/2 W	112-581
63	R63	1	120 K ± 5%, 1/2 W	112-623
64	R65	1	1.8 K ± 5%, 1/2 W	112-392
65	R67	1	82 K ± 5%, 1/2 W	112-602
66	R68	1	100 Ohms ± 5%, 1/2 W	112-233
67	R69	1	220 K ± 5%, 1/2 W	112-653
68	R71	1	47 K ± 5%, 1/2 W	112-569
69	R76	1	180 K ± 5%, 1/2 W	112-644
70	R77, 78	2	270 Ohms ± 5%, 1/2 W	112-287
71	R80	1	47 Ohms ± 5%, 1/2 W	112-191
72	R82, 83, 85, 86	4	22 Ohms ± 10%, 1/2 W	112-152
73	R84	1	6.8 Meg. ± 5%, 1/2 W	112-842
74	R87	1	330 K ± 5%, 1/2 W	112-674
75	R88	1	38.3 K ± 1%, 1 W	115-117
76	R89	1	1 K ± 1%, 1/2 W	115-128
77	R90	1	15 K ± 10%, 2 W	112-511
78	R91	1	1.1 K ± 5%, 1/2 W	112-368
	SWITCHES			
79	S1, 3	2	SPST, toggle	162-001
80	S2	1	SPDT, 3-position, toggle	162-013
81	S4	1	DPDT, toggle	162-008
82	S5	1	4-position, single-deck, wafer	B161-116
83	S6	1	SPDT, toggle	162-007
	TRANSFORMER			
84	T1	1	Line transformer, 115/230 V	C141-188
	TUBES			
85	V1, 2, 3	3	OD3/VR150 voltage regulator	132-101
86	V4, 5	2	12AT7, twin triode, 9-pin miniature	131-400
87	V6, 12	2	6U8, triode-pentode, 9-pin miniature	131-320
88	V7	1	6CL6, pentode, 9-pin miniature	131-327
89	V8	1	6K6, pentode, octal	131-328
90	V9	1	12AX7, twin triode, 9-pin miniature	131-404
91	V10, 11	2	6AU6, pentode, 7-pin miniature	131-308
92	V13	1	12BY7A, pentode, 9-pin miniature	131-403

REPLACEMENT PARTS LIST

PLUG-IN DETECTOR MODEL D-51

(See Dwg. 861-366)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
1	C-101	1	1000 MMF, mica button	129-153
2	C-102	1	47 MMF, feed-thru	129-202
3	C-103	1	1000 MMF, feed-thru	129-200
4	CR-101, -102	2	1N34, Germanium diodes	139-112
5	J-102, -103	2	Banana jacks	185-107
6	J-104, -105	2	UG-657/U type chassis fittings	188-103
7	R-101, -103	2	300 Ohms, + 5%, 1/2 W	112-293
8	R-102	1	100 K, $\pm$ 10%, 1/2 W	112-614

REPLACEMENT PARTS LIST

PLUG-IN OSCILLATOR MODEL H-71A

(See Dwg. 861-277)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	CAPACITORS*			
1	C-2	1	1.1 MMF ± 0.1 MMF, 500 V, ceramic	121-071
2	C-3	1	3 MMF ± 0.1 MMF, 500 V, ceramic	121-072
3	C-4	1	4.7 MMF ± 0.1 MMF, 500 V, ceramic	121-073
4	C-5	1	6.2 MMF ± 0.1 MMF, 500 V, ceramic	121-074
5	C-6	1	9.1 MMF ± 0.1 MMF, 500 V, ceramic	121-076
6	C-7	1	12 MMF ± 2%, 500 V, ceramic	121-012
7	C-8, -16, -17	3	15 MMF ± 2%, 500 V, ceramic	121-013
8	C-9	1	20 MMF ± 2%, 500 V, ceramic	121-014
9	C-10	1	24 MMF ± 2%, 500 V, ceramic	121-016
10	C11, -13, 14, 15, 20, 21, 30, -32, -33, -34, -35	11	1000 MMF, 500 V, ceramic, feed-thru	129-200
11	C-12, 31	2	47 MMF, 500 V, ceramic, feed-thru	129-202
12	C-22, -24, -26	3	8.2 MMF ± 0.25 MMF, 500 V, ceramic	121-075
13	C-23	1	27 MMF ± 2%, 500 V, ceramic	121-018
14	C-25	1	1.2 MMF ± 0.25 MMF, 500 V, ceramic	121-038
15	C-27	1	13 MMF ± 2%, 500 V, ceramic	121-043
16	C-28	1	0.6 - 10 MMF, H. F. Trimmer, Model HFT-65A	B821-203
17	C-29	1	1000 MMF, 500 V, ceramic, standoff	129-199
18	C36, 37	2	0.7 - 3.0 MMF, 350 V, trimmer	128-505
	COILS			
19	L5	1	12 MICRO-H, choke coil	157-018
20	L-12	1	Saturating coil	157-026
	CONNECTORS			
21	J-1	1	BNC chassis fitting	188-103
22	J-2	1	16-pin plug	B183-210
	DIODES			
23	CR1, 2	2	1N34, Germanium	139-112
	NEON BULBS			
24	DS-1, -2	2	NE-2, neon glow	102-003

* C18, C19, not assigned.

REPLACEMENT PARTS LIST

PLUG-IN OSCILLATOR MODEL H-71A (Cont)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	RESISTORS			
25	R-1, -3	2	2 K ± 5%, 1/2 W	112-398
26	R-2	1	100 Ohms ± 10%, 2 W, potentiometer	118-025
27	R-4	1	93.1 Ohms ± 1%, 1/2 W	115-151
28	R5	1	2.2 K ± 10%, 1/2 W	112-404
29	R-6, -9, -10	3	1 K ± 5%, 1/2 W	112-359
30	R-7	1	49.9 Ohms ± 1%, 1/2 W	115-137
31	R-8	1	270 Ohms ± 5%, 1/2 W	112-287
32	R11	1	100 K ± 10%, 2 W, potentiometer	118-022
	SWITCH			
33	S1	1	11-position, rotary, wafer	161-125
	TRANSFORMER			
34	T-1	1	Oscillator transformer	B141-148
	TUBES			
35	V-1, -2	2	12BY7A, pentode, 9-pin miniature	131-403

REPLACEMENT PARTS LIST

PLUG-IN OSCILLATOR MODEL H-72A

(See Dwg. 861-368)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	CAPACITORS*			
1	C201	1	1.8 MMF ± 0.25 MMF, 500 V, ceramic	121-039
2	C202	1	2.7 MMF ± 0.25 MMF, 500 V, ceramic	121-040
3	C203	1	4.7 MMF ± 0.1 MMF, 500 V, ceramic	121-073
4	C204, 222	2	7.5 MMF ± 0.1 MMF, 500 V, ceramic	121-041
5	C205	1	10 MMF ± 2%, 500 V, ceramic	121-011
6	C206, 221	2	15 MMF ± 2%, 500 V, ceramic	121-013
7	C207	1	18 MMF ± 2%, 500 V, ceramic	121-046
8	C208	1	22 MMF ± 2%, 500 V, ceramic	121-015
9	C209	1	33 MMF ± 2%, 500 V, ceramic	121-020
10	C210	1	50 MMF ± 2%, 500 V, ceramic	121-025
11	C211, 228	2	47 MMF, 500 V, ceramic, feed-thru	129-202
12	C212, 213, 215, 218, 227, 230, 231	7	1000 MMF, 500 V, ceramic, feed-thru	129-200
13	C214, 217	2	0.7 -3 MMF, 350 V, trimmer	128-505
14	C216	1	330 MMF ± 10%, 600 V	123-110
15	C219, 220	2	5 MMF ± 0.25 MMF, 500 V, ceramic	121-008
16	C223	1	5.1 MMF ± 0.1 MMF, 500 V, ceramic	121-051
17	C224	1	0.6 - 10 MMF, h.f. trimmer Model HFT-65A	B821-203
18	C225	1	1000 MMF, 500 V, ceramic, standoff	129-199
19	C229	1	0.02 MF ± 10%, 350 V	124-034
	COILS			
20	L201	1	Saturating coil	157-026
21	L202	1	Choke coil	157-006
	CONNECTORS			
22	J201	1	BNC chassis fitting	188-103
23	J202	1	16-pin plug	183-210
	DIODES			
24	CR201, 202	2	1N34, Germanium	139-112
	NEON BULBS			
25	DS201, 202	2	NE-2, neon glow	102-003

* C226 not assigned.

REPLACEMENT PARTS LIST

PLUG-IN OSCILLATOR MODEL H-72A (Cont)

ITEM	CIRCUIT DESCRIPTION	QTY.	DESCRIPTION	JERROLD PART NO.
	RESISTORS*			
26	R201, 203	2	4.7 K ± 5%, 1/2 W	112-443
27	R202	1	100 Ohms ± 10%, 2 W, potentiometer	118-025
28	R204	1	75 Ohms ± 1%, 1/2 W	115-108
29	R205	1	2.2 K ± 10%, 1/2 W	112-404
30	R206	1	180 Ohms ± 5%, 1/2 W	112-266
31	R207	1	120 Ohms ± 5%, 1/2 W	112-245
32	R208	1	49.9 Ohms ± 1%, 1/2 W	115-137
33	R209, 210	2	1 K ± 5%, 1/2 W	112-359
34	R212	1	100 K ± 10%, 2 W, potentiometer	118-022
35	R213	1	100 K ± 10%, 1/2 W	112-614
	SWITCH			
36	S201	1	11-position, rotary, wafer	161-125
	TRANSFORMER			
37	T201	1	Oscillator transformer	144-033
	TUBE			
38	V201A, B	1	6922, twin triode	131-602

* R211 not assigned.

REPLACEMENT PARTS LIST

PLUG-IN OSCILLATOR MODEL H-73A

(See Dwg. 861-367)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	CAPACITORS			
1	C301	1	0.5 MMF ± 0.25 MMF, 600 V	121-001
2	C302	1	1.0 MMF ± 0.25 MMF, 600 V	121-003
3	C303	1	2.7 MMF ± 0.25 MMF, 500 V, ceramic	121-040
4	C304	1	4.7 MMF ± 0.1 MMF, 500 V, ceramic	121-007
5	C305	1	6.8 MMF ± 0.1 MMF, 500 V, ceramic	121-009
6	C306	1	12 MMF ± 2%, 500 V, ceramic	121-012
7	C307	1	25 MMF ± 2%, 500 V, ceramic	121-017
8	C308	1	36 MMF ± 2%, 500 V, ceramic	121-021
9	C309	1	62 MMF ± 2%, 500 V, ceramic	121-028
10	C310	1	200 MMF ± 5%, 500 V, mica	126-007
11	C311, 331	2	47 MMF, 500 V, ceramic, feed-thru	129-202
12	C312, 314, 315, 316, 321, 322, 332, 333, 334, 335, 336	11	1000 MMF, 500 V, ceramic, feed-thru	129-200
13	C313	1	0.01 MF ± 10%, 350 V	124-031
14	C317, 320	2	0.7-3 MMF, 350 V, trimmer	128-505
15	C318, 319	2	1000 MMF ± 20%, 600 V, ceramic	123-115
16	C323, 324, 327	3	15 MMF ± 2%, 500 V, ceramic	121-013
17	C325	1	47 MMF ± 2%, 500 V, ceramic	121-024
18	C326	1	68 MMF ± 2%, 500 V, ceramic	121-029
19	C328	1	1.2 MMF + 0.5 MMF, 500 V, ceramic	121-038
20	C329	1	0.6-10 MMF, H. F. trimmer, Model HFT-65A	B821-203
21	C330	1	1000 MMF, 500 V, ceramic, standoff	129-199
	COILS			
22	L301	1	Saturating coil	157-026
23	L302	1	300 MICRO-H, choke coil	157-030
	CONNECTORS			
24	J301	1	BNC chassis fitting	188-103
25	J302	1	16-pin plug	B183-210
	DIODES			
26	CR301, 302	2	1N34, Germanium	139-112
	NEON BULBS			
27	DS301, 302	2	NE-2, neon glow	102-003

REPLACEMENT PARTS LIST

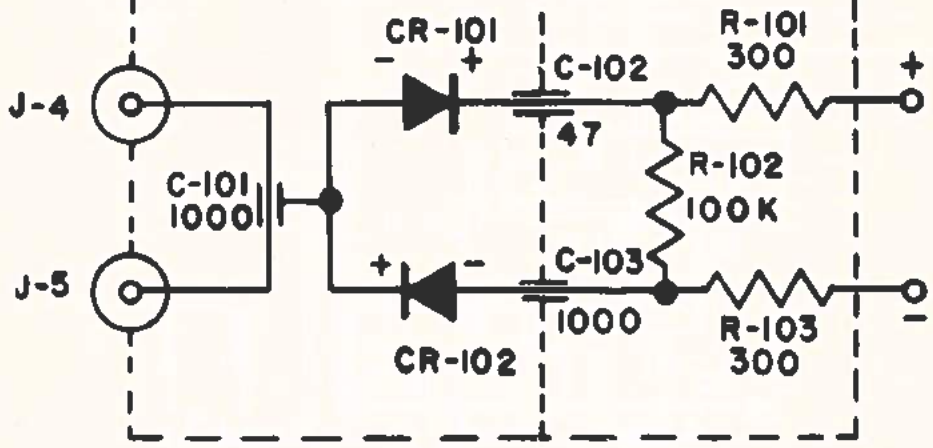
PLUG-IN OSCILLATOR MODEL H-73A (Cont)

ITEM	CIRCUIT DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
	RESISTORS			
28	R301, 303	2	3 K ± 5%, 1/2 W	112-419
29	R302	1	100 Ohms ± 10%, 2 W, potentiometer	118-025
30	R304	1	98.5 Ohms ± 1%, 1/2 W	115-128
31	R305	1	2.2 K ± 10%, 1/2 W	112-404
32	R306	1	2 K ± 5%, 1/2 W	112-398
33	R307	1	680 Ohms ± 5%, 1/2 W	112-338
34	R308	1	49.9 Ohms ± 1%, 1/2 W	115-137
35	R309, 310	2	1 K ± 5%, 1/2 W	112-359
36	R311	1	50 K ± 10%, 2 W, potentiometer	118-024
37	R312	1	51 K ± 5%, 1/2 W	112-578
	SWITCH			
38	S301	1	11-position, rotary, wafer	161-125
	TRANSFORMER			
39	T301	1	Oscillator transformer	144-408
	TUBE			
40	V301, 302	2	12BY7A, pentode, 9-pin miniature	131-403

SCHEMATIC

SERIES-

PLUG-IN DETECTOR D-51



NOTES

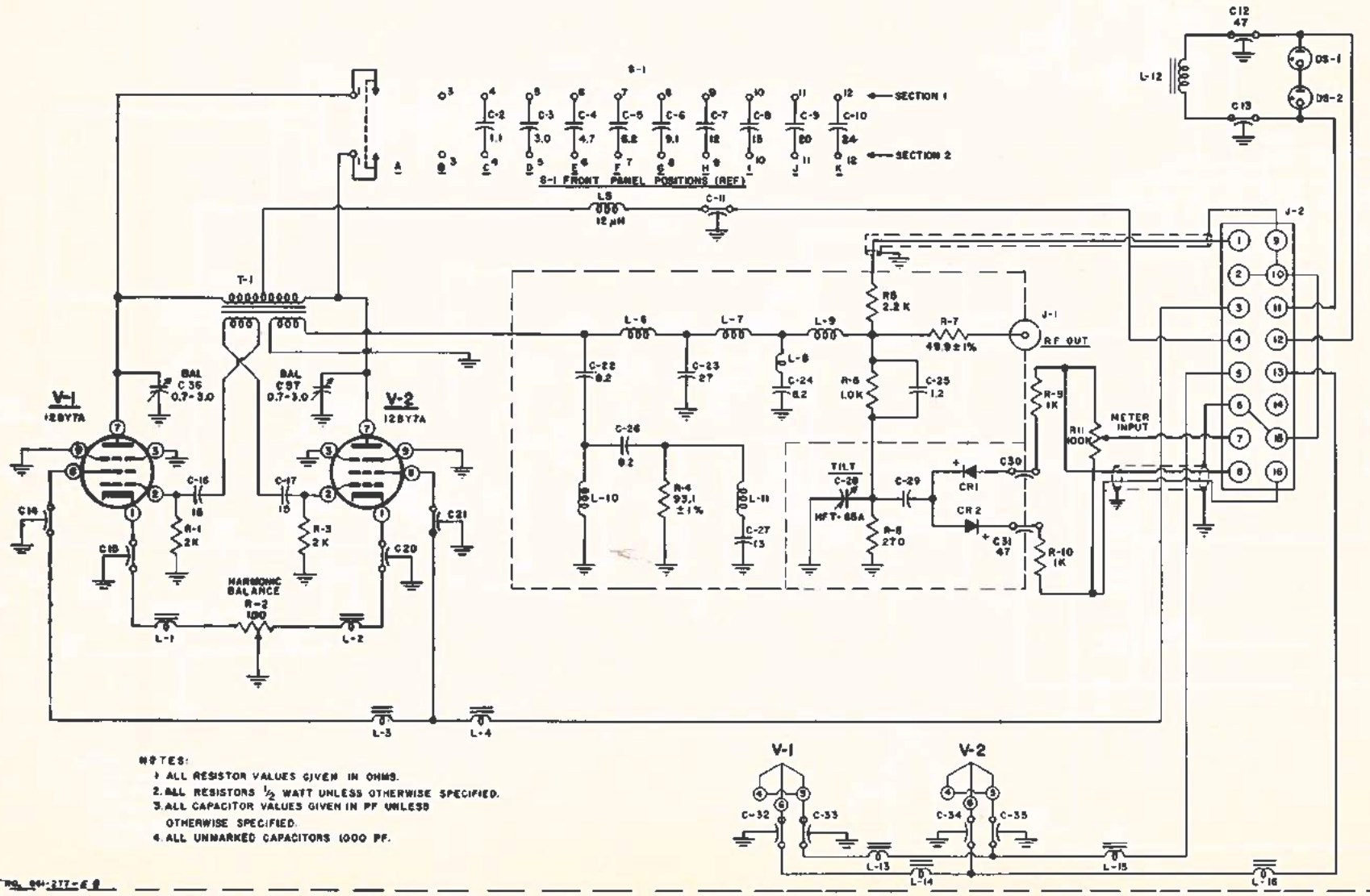
1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES GIVEN IN MMF UNLESS OTHERWISE SPECIFIED.

DWG. NO. 861-366-0

SCHEMATIC

OSCILLATOR MODEL H-71A

SERIES -2



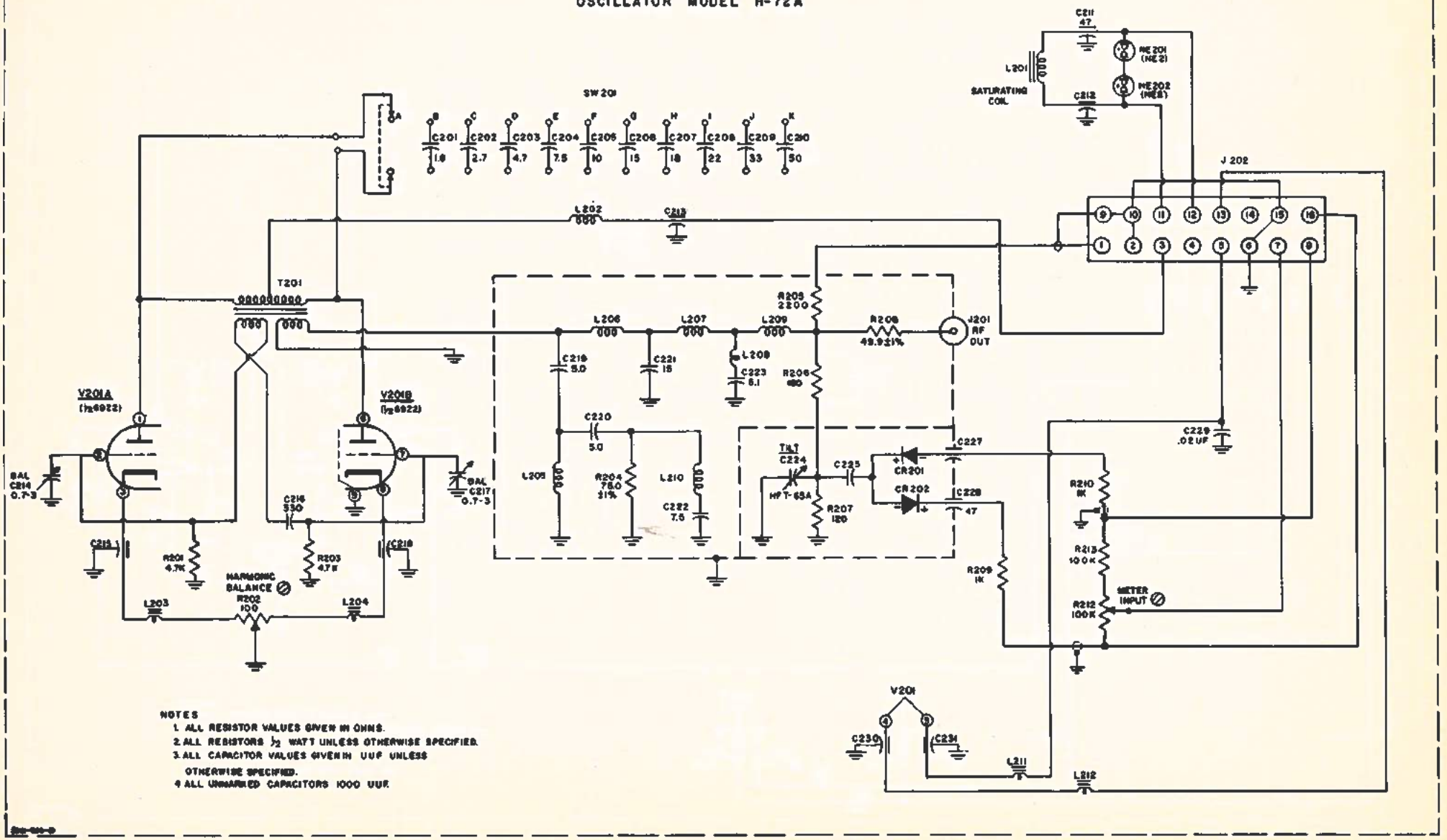
NOTES:

1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS ½ WATT UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES GIVEN IN PF UNLESS OTHERWISE SPECIFIED.
4. ALL UNMARKED CAPACITORS 1000 PF.

ASSY NO. 644-277-G 8

SCHEMATIC

OSCILLATOR MODEL H-72A

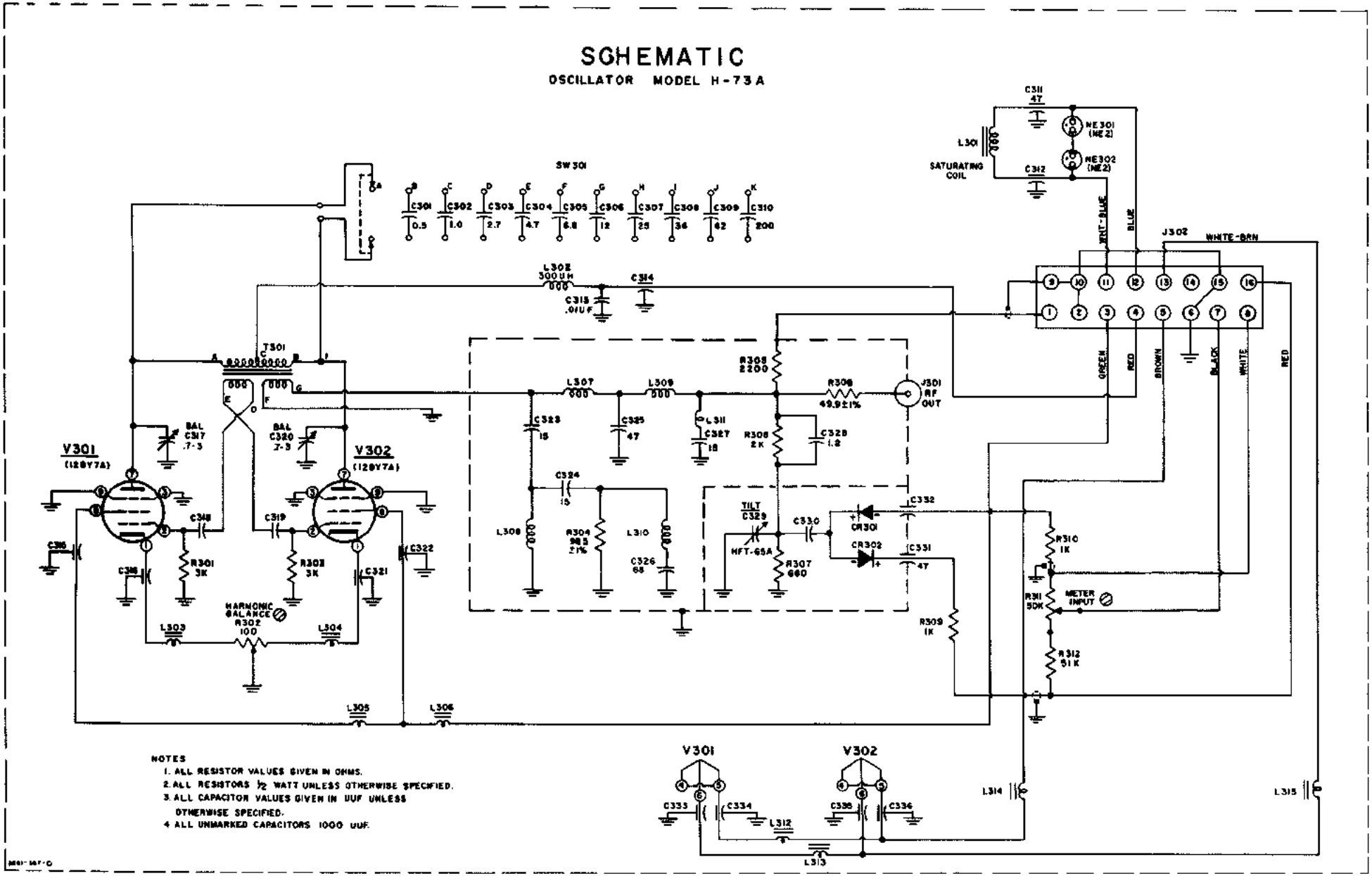


NOTES

1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS ½ WATT UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES GIVEN IN UUF UNLESS OTHERWISE SPECIFIED.
4. ALL UNMARKED CAPACITORS 1000 UUF.

SCHEMATIC

OSCILLATOR MODEL H-73A



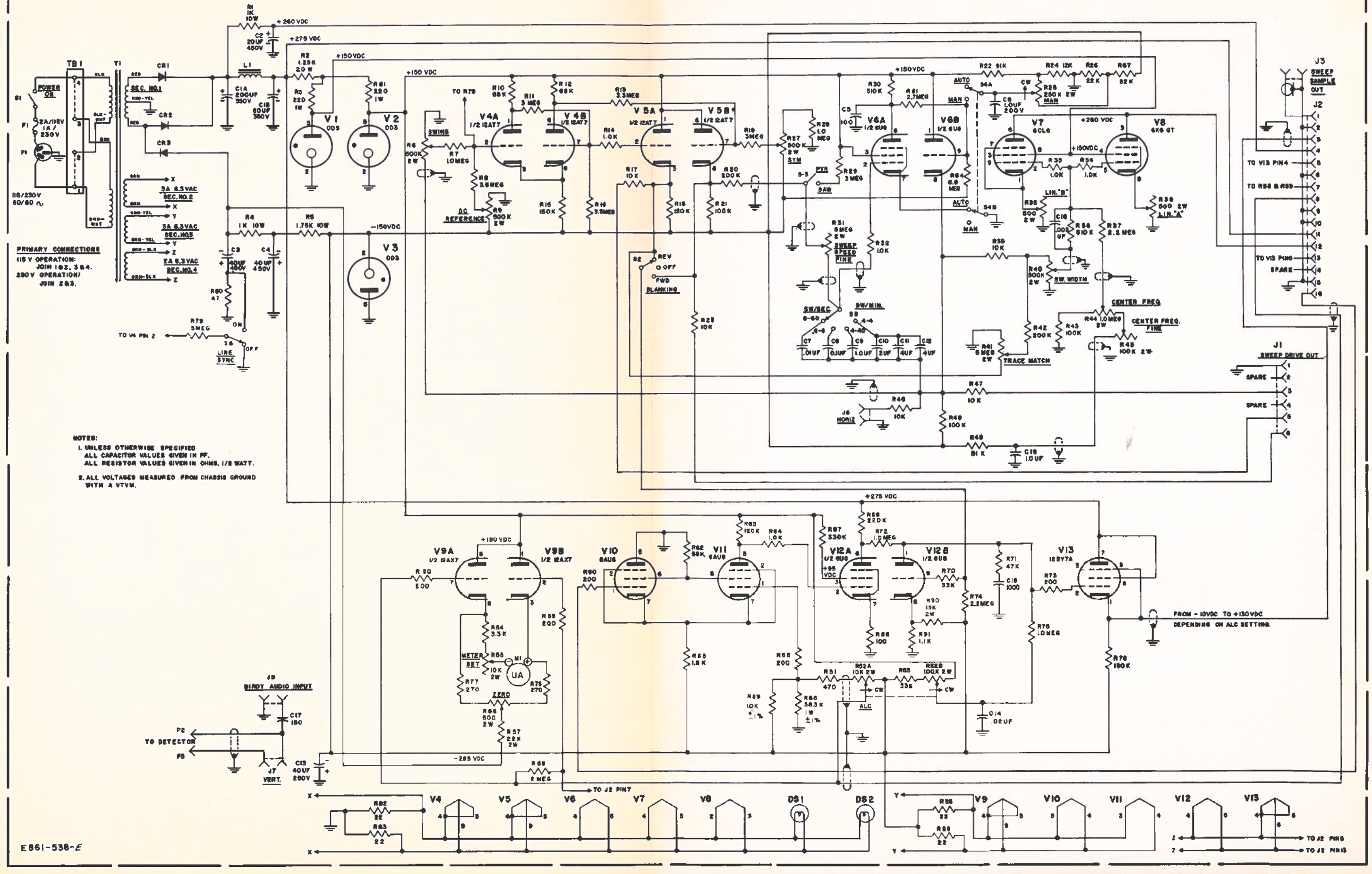
NOTES

1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS ½ WATT UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES GIVEN IN UUF UNLESS OTHERWISE SPECIFIED.
4. ALL UNMARKED CAPACITORS 1000 UUF.

SCHEMATIC

SWEEP FREQUENCY GENERATOR

MODEL 707D



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL CAPACITOR VALUES GIVEN IN PF. ALL RESISTOR VALUES GIVEN IN OHMS, 1/2 WATT.
2. ALL VOLTAGES MEASURED FROM CHASSIS GROUND WITH A VTVM.

E861-538-E