

OPERATING AND SERVICING MANUAL



MODEL 739A FREQUENCY RESPONSE TEST SET

SERIALS PREFIXED: 944 -
010-00483



SECTION I DESCRIPTION

The hp Model 739A Frequency Response Test Set simplifies frequency response determination by providing a convenient constant amplitude reference voltage of variable frequency. Frequency response of vacuum tube voltmeters, oscilloscope, video amplifiers and filters from 5 cps to 10 mc* can be quickly and easily checked.

The Frequency Response Test Set contains a wide range oscillator, special voltmeter and step attenuator as shown in Figure 1. The oscillator generates constant amplitude signals between 300 kc and 10 mc. The monitoring circuit is flat from 5 cps to 10 mc so that an external oscillator such as hp Model 200S can be used to reduce the lower frequency limit to as low as 5 cps. Oscillator output is applied to the monitoring voltmeter, which samples the input to a step attenuator. An arbitrary reference level is maintained on the monitoring meter as the frequency setting is varied. The

attenuator reduces the signal to an appropriate output level which appears across 50 ohms at the end of the special output cable supplied.

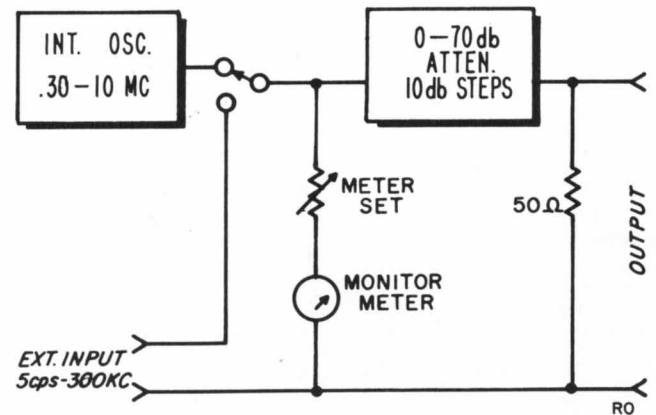


Figure 1. Model 739A Block Diagram

SPECIFICATIONS

FREQUENCY RANGE:	5 cycles* to 10 mc.
INTERNAL OSCILLATOR:	300 kc to 10 mc in 3 ranges.
REQUIREMENTS FOR EXTERNAL OSCILLATOR:	Frequency range 5 cps to 300 kc requires 3 volts into 50 ohms, distortion less than 1%.
FREQUENCY RESPONSE OF MONITORING CIRCUIT:	Flat within $\pm 0.5\%$ from 10 cps to 5 mc; within +0.5%, -1.5%, 5 cps to 10 mc. Monitor circuit is average responding.
OUTPUT:	At least 3 volts across 50 ohm cable termination. Adjustable in 10 db steps by a 0 to 70 db attenuator. Fine adjustment provided.
DIMENSIONS:	Rack Mount: 7 in. high, 19 in. wide, 9 in. deep.
ACCESSORIES FURNISHED:	739A-16A Output Cable, 50 ohm termination. BNC to shielded dual banana plug, (extra cables available on special order).

* Extended frequency range when used with hp Model 200S Oscillator.

SECTION II OPERATION

Calibrate the device under test with an accurate voltage standard, such as the Model 738A Voltmeter Calibrator. This voltage standard should have an output frequency between 100 and 1000 cps.

- 1) Connect the device under test to the Frequency Response Test Set OUTPUT connector, using the special terminated output cable provided.
- 2) Connect a suitable oscillator, such as the hp Model 200S Oscillator, to the EXTERNAL INPUT connector on the Frequency Response Test Set.
- 3) Set the external oscillator to the frequency used for calibration.
- 4) Set the RANGE SELECTOR to EXTERNAL. Set a reference on the device under test using the external oscillator AMPLITUDE control and the OUTPUT ATTENUATOR of the Test Set.

The internal oscillator is a single pentode (V2) located inside the shield on top of the chassis. The oscillator plate and screen voltages are controlled by a series regulator triode (V1). This series regulator is controlled by a two stage differential amplifier (V3 and V4) that senses the amplitude of the voltage applied to the OUTPUT ATTENUATOR. The combined action of the series regulator, differential amplifier and output amplitude sensing circuits keeps the output constant over the range of the internal oscillator.

The power supply circuit is conventional, using

NOTE

Always use the OUTPUT ATTENUATOR range that corresponds to the desired input to the device under test. This will assure a Test Set meter indication near SET LEVEL.

- 5) Set the meter in the Test Set to SET LEVEL with the METER SET control.
- 6) Shift to any other frequency within the range of the Test Set or external oscillator. Return the meter to SET LEVEL using the oscillator AMPLITUDE control. Note any deviation from the reference set in step 4 on the device under test.
- 7) Repeat steps 3 through 6 if you change the range switch on the device under test. Repeat step 6 for all frequencies you desire to check.

SECTION III MAINTENANCE

glow discharge tubes to regulate the differential amplifier voltages.

Tube element voltages are not listed on the schematic diagram since they vary radically with frequency and output AMPLITUDE control setting.

The only adjustments in the oscillator circuit are for initial dial calibration and should not need further attention. Another adjustment (C16) is provided in the meter circuit. This meter frequency response adjustment should not be touched unless you have accurate means of checking the accuracy of the reference meter between 7 and 10 mc.

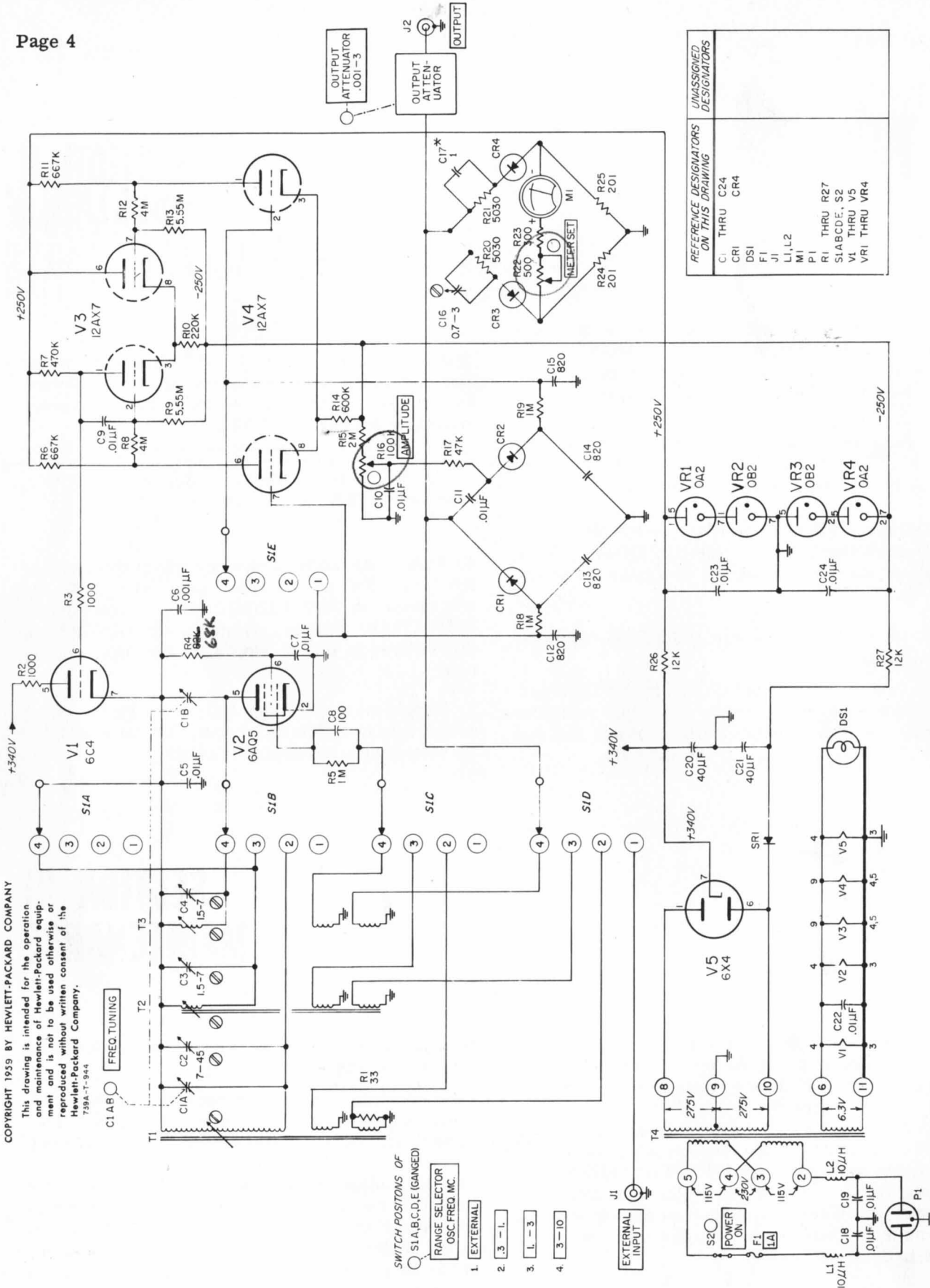


Figure 2. Model 739A Frequency Response Test Set


COPYRIGHT 1959 BY HEWLETT-PACKARD COMPANY
 This drawing is intended for the operation and maintenance of Hewlett-Packard equipment and is not to be used otherwise or reproduced without written consent of the Hewlett-Packard Company.
 739A-T-944

SECTION IV TABLE OF REPLACEABLE PARTS

NOTE

Readily available standard-components have been used in this instrument, whenever possible. However, special components may be obtained from your local Hewlett-Packard representative or from the factory.

When ordering parts always include:

1.  Stock Number.
2. Complete description of part including circuit reference.
3. Model number and serial number of instrument.
4. If part is not listed give complete description, function, and location of part.

If there are any corrections for the Table of Replaceable Parts they will be listed on an Instruction Manual Change sheet at the front of this manual.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	STOCK NO.	#			
C1	Capacitor: variable, air dielectric, 2 section, 9.5 - 443.2 $\mu\mu\text{f}$ W*	12-39	1			
C2	Capacitor: variable, ceramic, 7 - 45 $\mu\mu\text{f}$, 500 vdcw L*	13-1	1			
C3, 4	Capacitor: variable, ceramic, 1 section 1.5 - 7 $\mu\mu\text{f}$, 500 vdcw L*	13-7	2			
C5	Capacitor: fixed, ceramic, .01 μf -0% + 100%, 1000 vdcw CC*	15-43	10			
C6	Capacitor: fixed, ceramic, 1000 $\mu\mu\text{f}$ $\pm 25\%$, 500 vdcw K*	15-21	1			
C7	Same as C5					
C8	Capacitor: fixed, mica, 100 $\mu\mu\text{f}$ $\pm 10\%$, 300 vdcw V*	14-76	1			
C9 thru C11	Same as C5					
C12, 13, 14, 15	Capacitor: fixed, mica, 820 $\mu\mu\text{f}$, $\pm 10\%$, 500 vdcw V*	14-28	4			
C16	Capacitor: variable, plastic, 0.7 - $\mu\mu\text{f}$, 350 vdcw L*	13-26	1			
C17	Capacitor: fixed, titanium dioxide, 1 $\mu\mu\text{f}$ $\pm 10\%$, 500 vdcw Electrical value adjusted at the factory DD*	15-102	1			
C18, 19	Same as C5					
C20, 21	Capacitor: electrolytic, 2 sections, 20 μf /sect., 450 vdcw CC*	18-22HP				
C22, 23, 24	Same as C5					
CR1, 2	Diode, germanium: HD-2135 BU*	212-G11A	2			
CR3, 4	Diode, silicon HP*	G-29B-5	2			
DS1	Lamp, miniature: 2 pin base, #12 O*	211-78	1			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	STOCK NO.	#			
F1	Fuse: slow blow, for 115 V operation Fuse: 1/2 amp, slow blow, for 230 volt operation	E* 211-18	1			
		211-20	1			
J1	Connector: type BNC, UG291/U	LL* 125-UG 291/U	1			
J2	Part of Output Attenuator (not separately replaceable)	LL*				
L1, 2	Inductor, RF; 10 μ h \pm 10%	CG* 48-54	2			
M1	Meter	BF HP* 112- 26 114	1			
P1	Cable, power	HP* 812-56	1			
R1	Resistor: fixed, composition, 33 ohms \pm 10%, 1 W	B* 24-33	1			
R2	Resistor: fixed, composition, 1000 ohms \pm 10%, 1 W	B* 24-1K	1			
R3	Resistor: fixed, composition, 1000 ohms \pm 10%, 1/2 W	B* 23-1K	1			
R4	Resistor: fixed, composition, 62,000 ohms \pm 10%, 1 W 68 K	B* 24-82K 68K	1			
R5	Resistor: fixed, composition, 1 megohm \pm 10%, 1/2 W	B* 23-1M	1			
R6	Resistor: fixed, deposited carbon, 667,000 ohms \pm 1%, 1/2 W	NN* 33-667K	2			
R7	Resistor: fixed, composition, 470,000 ohms \pm 10%, 1/2 W	B* 23-470K	1			
R8	Resistor: fixed, deposited carbon, 4 megohms \pm 1%, 1/2 W	NN* 33-4M	2			
R9	Resistor: fixed, deposited carbon, 5.55 megohms \pm 1%, 1/2 W	NN* 33-5.55M	2			
R10	Resistor: fixed, composition, 220,000 ohms \pm 10%, 1/2 W	B* 23-220K	1			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	STOCK NO.	#			
R11	Same as R6					
R12	Same as R8					
R13	Same as R9					
R14	Resistor: fixed, deposited carbon, 600,000 ohms $\pm 1\%$, 1/2 W NN*	33-600K	1			
R15	Resistor: fixed, deposited carbon, 2 megohms $\pm 1\%$, 1/2 W NN*	33-2M	1			
R16	Resistor: variable, composition, 100,000 ohms, linear taper BO*	210-82	1			
R17	Resistor: fixed, composition, 47,000 ohms $\pm 10\%$, 1/2 W B*	23-47K	1			
R18, 19	Resistor: fixed, composition, 1 megohm $\pm 10\%$, 1/2 W B*	23-1M	1			
R20, 21	Resistor: fixed, deposited carbon, 5030 ohms $\pm 10\%$, 1/2 W NN*	33-5.03KR	1			
R22	Resistor: variable, composition, <i>linear taper</i> 2000 ohms $\pm 20\%$, 1/4 W 500 $\pm 10\%$ I*	210- 4 25	1			
** R23	Resistor: fixed, deposited carbon, 300 ohms $\pm 1\%$, 1/2 W NN*	33-300	1			
R24, 25	Resistor: fixed, deposited carbon, 201 ohms $\pm 1\%$, 1/2 W NN*	33-201	2			
R26, 27	Resistor: fixed, composition, 12,000 ohms $\pm 10\%$, 2 W B*	25-12K	2			
S1	Switch HP*	Special				
S2	Switch, toggle: SPST, 250 V, 3 amp CR*	310-11				
SRL	Rectifier, selenium: 162V rms max, 20 ma dc max CN*	212-114				
T1 thru T3	Transformer, RF HP*	Special	1			
T4	Transformer, power HP*	910-80	1			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".
Total quantity used in the instrument.

** optimum value shown selected at factory. Average value shown.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	STOCK NO.	#				
V1	Tube, electron: 6C4	O* 212-6C4	1				
V2	Tube, electron: 6AQ5	Y* 212-6AQ5	1				
V3, 4	Tube, electron: 12AX7	Y* 212-12AX7	2				
V5	Tube, electron: 6X4	Y* 212-6X4	1				
VR1	Voltage regulator: OA2	BN* 212-OA2	2				
VR2, 3	Voltage regulator: OB2	Y* 212-OB2	1				
VR4	Same as VR1						
<u>MISCELLANEOUS</u>							
	Fuseholder: extractor post type	T* 140-16 ^{1400-0084*}	1				
	Knob: METER SET	HP* G-74C	2				
	Knob: AMPLITUDE	HP* G-74H	1				
	Knob: RANGE SELECTOR, OUTPUT ATTENUATOR	G-74N HP*	2				
	Output Cable: terminated,	HP* 739A-16A	1				

* See "List of Manufacturers Code Letters For Replaceable Parts Table".
 # Total quantity used in the instrument.

LIST OF CODE LETTERS USED IN TABLE OF REPLACEABLE PARTS TO DESIGNATE THE MANUFACTURERS

<u>CODE LETTER</u>	<u>MANUFACTURER</u>	<u>ADDRESS</u>	<u>CODE LETTER</u>	<u>MANUFACTURER</u>	<u>ADDRESS</u>
A	Aerovox Corp.	New Bedford, Mass.	AK	Hammerlund Mfg. Co., Inc.	New York 1, N. Y.
B	Allen-Bradley Co.	Milwaukee 4, Wis.	AL	Industrial Condenser Corp.	Chicago 18, Ill.
C	Amperite Co.	New York, N. Y.	AM	Insuline Corp. of America	Manchester, N. H.
D	Arrow, Hart & Hegeman	Hartford, Conn.	AN	Jennings Radio Mfg. Corp.	San Jose, Calif.
E	Bussman Manufacturing Co.	St. Louis, Mo.	AO	E. F. Johnson Co.	Waseca, Minn.
F	Carborundum Co.	Niagara Falls, N. Y.	AP	Lenz Electric Mfg. Co.	Chicago 47, Ill.
G	Centralab	Milwaukee 1, Wis.	AQ	Micro-Switch	Freeport, Ill.
H	Cinch-Jones Mfg. Co.	Chicago 24, Ill.	AR	Mechanical Industries Prod. Co.	Akron 8, Ohio
HP	Hewlett-Packard Co.	Palo Alto, Calif.	AS	Model Eng. & Mfg., Inc.	Huntington, Ind.
I	Clarostat Mfg. Co.	Dover, N. H.	AT	The Muter Co.	Chicago 5, Ill.
J	Cornell Dubilier Elec. Co.	South Plainfield, N. J.	AU	Ohmite Mfg. Co.	Skokie, Ill.
K	Hi-Q Division of Aerovox	Olean, N. Y.	AV	Resistance Products Co.	Harrisburg, Pa.
L	Erie Resistor Corp.	Erie 6, Pa.	AW	Radio Condenser Co.	Camden 3, N. J.
M	Fed. Telephone & Radio Corp.	Clifton, N. J.	AX	Shallcross Manufacturing Co.	Collingdale, Pa.
N	General Electric Co.	Schenectady 5, N. Y.	AY	Solar Manufacturing Co.	Los Angeles 58, Calif.
O	General Electric Supply Corp.	San Francisco, Calif.	AZ	Sealectro Corp.	New Rochelle, N. Y.
P	Girard-Hopkins	Oakland, Calif.	BA	Spencer Thermostat	Attleboro, Mass.
Q	Industrial Products Co.	Danbury, Conn.	BC	Stevens Manufacturing Co.	Mansfield, Ohio
R	International Resistance Co.	Philadelphia 8, Pa.	BD	Torrington Manufacturing Co.	Van Nuys, Calif.
S	Lectrohm Inc.	Chicago 20, Ill.	BE	Vector Electronic Co.	Los Angeles 65, Calif.
T	Littlefuse Inc.	Des Plaines, Ill.	BF	Weston Electrical Inst. Corp.	Newark 5, N. J.
U	Maguire Industries Inc.	Greenwich, Conn.	BG	Advance Electric & Relay Co.	Burbank, Calif.
V	Micamold Radio Corp.	Brooklyn 37, N. Y.	BH	E. I. DuPont	San Francisco, Calif.
W	Oak Manufacturing Co.	Chicago 10, Ill.	BI	Electronics Tube Corp.	Philadelphia 18, Pa.
X	P. R. Mallory Co., Inc.	Indianapolis, Ind.	BJ	Aircraft Radio Corp.	Boonton, N. J.
Y	Radio Corp. of America	Harrison, N. J.	BK	Allied Control Co., Inc.	New York 21, N. Y.
Z	Sangamo Electric Co.	Marion, Ill.	BL	Augat Brothers, Inc.	Attleboro, Mass.
AA	Sarkes Tarzian	Bloomington, Ind.	BM	Carter Radio Division	Chicago, Ill.
BB	Signal Indicator Co.	Brooklyn 37, N. Y.	BN	CBS Hytron Radio & Electric	Danvers, Mass.
CC	Sprague Electric Co.	North Adams, Mass.	BO	Chicago Telephone Supply	Elkhart, Ind.
DD	Stackpole Carbon Co.	St. Marys, Pa.	BP	Henry L. Crowley Co., Inc.	West Orange, N. J.
EE	Sylvania Electric Products Co.	Warren, Pa.	BQ	Curtiss-Wright Corp.	Carlstadt, N. J.
FF	Western Electric Co.	New York 5, N. Y.	BR	Allen B. DuMont Labs	Clifton, N. J.
GG	Wilkor Products, Inc.	Cleveland, Ohio	BS	Excel Transformer Co.	Oakland, Calif.
HH	Amphenol	Chicago 50, Ill.	BT	General Radio Co.	Cambridge 39, Mass.
II	Dial Light Co. of America	Brooklyn 37, N. Y.	BU	Hughes Aircraft Co.	Culver City, Calif.
JJ	Leecraft Manufacturing Co.	New York, N. Y.	BV	International Rectifier Corp.	El Segundo, Calif.
KK	Switchcraft, Inc.	Chicago 22, Ill.	BW	James Knights Co.	Sandwich, Ill.
LL	Gremer Manufacturing Co.	Wakefield, Mass.	BX	Mueller Electric Co.	Cleveland, Ohio
MM	Carad Corp.	Redwood City, Calif.	BY	Precision Thermometer & Inst. Co.	Philadelphia 30, Pa.
NN	Electra Manufacturing Co.	Kansas City, Mo.	BZ	Radio Essentials Inc.	Mt. Vernon, N. Y.
OO	Acro Manufacturing Co.	Columbus 16, Ohio	CA	Raytheon Manufacturing Co.	Newton, Mass.
PP	Alliance Manufacturing Co.	Alliance, Ohio	CB	Tung-Sol Lamp Works, Inc.	Newark 4, N. J.
QQ	Arco Electronics, Inc.	New York 13, N. Y.	CD	Varian Associates	Palo Alto, Calif.
RR	Astron Corp.	East Newark, N. J.	CE	Victory Engineering Corp.	Union, N. J.
SS	Axel Brothers Inc.	Long Island City, N. Y.	CF	Weckesser Co.	Chicago 30, Ill.
TT	Belden Manufacturing Co.	Chicago 44, Ill.	CG	Wilco Corporation	Indianapolis, Ind.
UU	Bird Electronics Corp.	Cleveland 14, Ohio	CH	Winchester Electronics, Inc.	Santa Monica, Calif.
VV	Barber Colman Co.	Rockford, Ill.	CI	Malco Tool & Die	Los Angeles 42, Calif.
WW	Bud Radio Inc.	Cleveland 3, Ohio	CJ	Oxford Electric Corp.	Chicago 15, Ill.
XX	Allen D. Cardwell Mfg. Co.	Plainville, Conn.	CK	Camloc-Fastener Corp.	Paramus, N. J.
YY	Cinema Engineering Co.	Burbank, Calif.	CL	George K. Garrett	Philadelphia 34, Pa.
ZZ	Any brand tube meeting RETMA standards.		CM	Union Switch & Signal	Swissvale, Pa.
AB	Corning Glass Works	Corning, N. Y.	CN	Radio Receptor	New York 11, N. Y.
AC	Dale Products, Inc.	Columbus, Neb.	CO	Automatic & Precision Mfg. Co.	Yonkers, N. Y.
AD	The Drake Mfg. Co.	Chicago 22, Ill.	CP	Bassick Co.	Bridgeport 2, Conn.
AE	Elco Corp.	Philadelphia 24, Pa.	CQ	Birnbach Radio Co.	New York 13, N. Y.
AF	Hugh H. Eby Co.	Philadelphia 44, Pa.	CR	Fischer Specialties	Cincinnati 6, Ohio
AG	Thomas A. Edison, Inc.	West Orange, N. J.	CS	Telefunken (c/o MYM, Inc.)	New York, N. Y.
AH	Fansteel Metallurgical Corp.	North Chicago, Ill.	CT	Potter-Brumfield Co.	Princeton, Ind.
AI	General Ceramics & Steatite Corp.	Keasbey, N. J.	CU	Cannon Electric Co.	Los Angeles, Calif.
AJ	The Gudeman Co.	Sunnyvale, Calif.	CV	Dynac, Inc.	Palo Alto, Calif.
			CW	Good-All Electric Mfg. Co.	Ogallala, Nebr.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

WARRANTY

Hewlett-Packard Company warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. Klystron tubes as well as other electron tubes, fuses and batteries are specifically excluded from any liability. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty, and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.
2. On receipt of shipping instructions, forward the instrument prepaid, to the factory or to the authorized repair station indicated on the instructions. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

SHIPPING

All shipments of Hewlett-Packard instruments should be made via Truck or Railway Express. The instruments should be packed in a strong exterior container and surrounded by two or three inches of excelsior or similar shock-absorbing material.

DO NOT HESITATE TO CALL ON US

HEWLETT-PACKARD COMPANY

Laboratory Instruments / for Speed and Accuracy

275 PAGE MILL ROAD

PALO ALTO, CALIF. U.S.A.

CABLE



"HEWPACK"