NAVSHIPS 91,892(A) *{Non-Registered}*

INSTRUCTION BOOK

for

RADIAC SET AN/UDR-9

BERKELEY division
BECKMAN INSTRUMENTS INC.
RICHMOND, CALIF., U.S.A.

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

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

IN REPLY REFER TO
Code 993-100
5 May 1954

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

Subj: Instruction Book for Radiac Set AN/UDR-9 NAVSHIPS 91892(A)

1. This is the instruction book for the subject equipment and is in effect upon receipt. It supersedes the Instruction Book for Radiac Computer-Indicator CP-79/UD, NAVSHIPS 91892.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

W. D. LEGGETT, JR.
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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RADIO ACTIVITY DETECTION IDENTIFICATION AND COMPUTATION DEFINITIONS OF RADIOACTIVITY TERMS

Charger, radiac detector. A device for providing an electrostatic charge to a radiac detector. May include means for measuring the amount of charge.

Computer-Indicator, radiac. A device which performs the combined function of computing and indicating radiac data.

Computer, radiac. A device which receives information from a radiac detector and does one or more of the following: scales, integrates or counts. Does not indicate.

Densitometer. An item specifically designed to measure the density or opacity of material.

Detector-Computer, radiac. A device specifically designed to detect and compute radioactivity information.

Detector, radiac. A device that is sensitive to radioactivity or free nuclear particles and produces a reaction which can be interpreted or measured by other components.

Indicator, radiac. A device which displays radioactivity detection, identification or computation information.

Radiometer. A device specifically designed to detect and indicate radioactivity. May or may not include radiac computer.

Radiac set. All the components and items required for a complete radioactivity detecting and measuring system.

Receptor, radiac. All the components and items required to receive record and or indicate radioactivity data transmitted by a radiac data transmitting set.

Transmitting set, radiac data. All the components and items required to detect radioactivity and transmit radioactivity data as modulation on a carrier.

RADIOLOGICAL SAFETY WARNING

All personnel working in high intensity levels of radioactivity must exercise caution to prevent bodily damage. While the radiation from radioactive substances cannot be seen or felt, prolonged or intensive exposure may result in serious damage. Three tenths of a roentgen pr week (.3R/wk) is considered to be the maximum amount of such radiation which can be absorbed continuously, every day, without serious damage.

If a radioactive source is required for calibration of the equipment described herein, due care must be exercised in handling it. The safety instructions enclosed herein, and with the source, must be closely followed.

SAFETY NOTICES

The attention of officers and operating personnel is directed to Chapter 67 of Bureau of Ships Manual or superseding instructions on the subject of "radio-safety precautions to be observed."

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do NOT change tubes or make adjustments inside equipment with high voltage supply ON. Under certain conditions dangerous potentials may exist in circuits with power controls in the OFF position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under NO circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do NOT depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under NO circumstances should any access door, gate, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADIAC, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

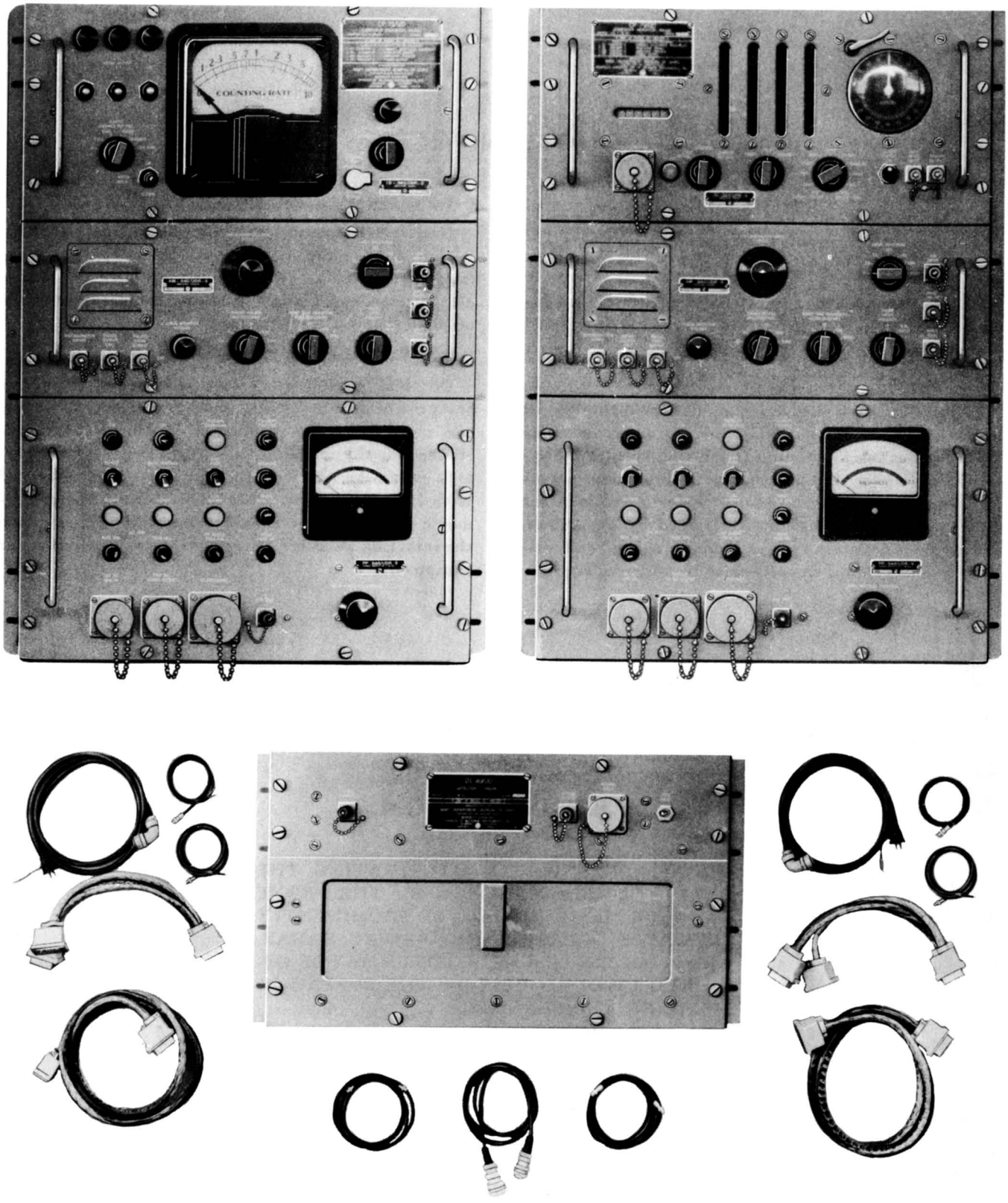


Figure 1-1. Radiac Set AN/UDR-9

SECTION 1
GENERAL DESCRIPTION

1. INSTRUCTION BOOK COVERAGE.

This manual contains the description, theory of operation, operating procedures, maintenance information, and parts list of Radiac Set AN/UDR–9. Radiac Set AN/UDR–9 (Figure 1-1) consists of Radiac Computer-Indicator CP–79/UD, Radiac Computer-Indicator CP–71/UD, and Radiac Detector DT–40/UD.

2. PURPOSE AND BASIC PRINCIPLES.

a. Radiac Set AN/UDR–9 is equipment designed to detect, compute, and indicate impulses received from radiac detectors. Electrical impulses developed in the radiation detectors at the input to the AN/UDR–9 are amplified and shaped by an input amplifying unit. These pulses are then coupled to scaling and metering units. The scaling functions are accomplished by Radiac Computer-Indicator CP–79/UD and the metering functions are accomplished by Radiac Computer Indicator CP–71/UD. The CP–79/UD and CP–71/UD are separate, self-contained assemblies and may be operated independently of each other. However, the equipment is designed so that the ID–364/UDR–9 unit in the CP–79/UD may be directly interchanged with the ID–363/UDR–9 in the CP–71/UD. Detection and monitoring of Alpha radiation is provided by Radiac Detector DT–40/UD.

b. Alpha Detector DT–40/UD is an alpha particle detector of the gas flow type. The detector chamber is mounted in an enclosure for standard relay rack installation. The enclosure is provided with a panel opening for the insertion of hands or other objects to be monitored. The detected radiation produces pulses which are coupled to a pre-amplifier built into the unit. The output of the DT–40/UD may be coupled to either the CP–71/UD or CP–79/UD Radiac Computer Indicator.

c. Radiac Computer-Indicator CP–79/UD is designed for counting pulses from a radiac detector and for measuring either the time required for a given number of pulses or the number of pulses received during a pre-set time interval. Electrical impulses received from a radiac detector are applied to Trigger-Amplifier AM–840/UDR–9, which amplifies and shapes the pulses. These pulses are then coupled to Radiac Indicator ID–364/UDR–9 which furnishes the scaling and indicating functions. The total number of counts occurring during a selected time interval is indicated on an electrical register and a four digit illuminated panel, or the elapsed time for a predetermined number of counts is indicated on a synchronous clock. A loudspeaker monitors the counting action. Counting is done automatically in both predetermined time and count functions. Manual control of the counting is also provided wherein the count is manually started, then manually stopped at the end of the desired elapsed time.

d. Radiac Computer-Indicator CP–71/UDR indicates by meter reading the average rate of arrival of pulses received from Radiac Detector DT–40/UD or from other suitable radiac detectors. The pulses from the detector are coupled to Trigger Amplifier AM–840/UDR–9 which amplifies and shapes the pulses and provides pulses of uniform height and duration to Radiac Indicator ID–363/UDR–9. The counting rate is then determined by multiplying the counting rate meter reading by a multiplying factor selected by a counting range selector switch. An external pen recorder may also be connected to the ID–363/UDR–9 to provide a permanent record of counting rate.

3. DESCRIPTION OF MAJOR UNITS.

a. *General.* The AN/UDR–9 consists of three major units, Radiac Computer-Indicator CP–79/UD, Radiac Computer CP–71/UD, and Radiac Detector DT–40/UD, plus accessories as listed in Table 1-1. The Radiac Computer-Indicator units are housed in identical, three-deck cabinets. These cabinets are equipped with shock mounts and may be bolted down to the deck, a table, or a movable cart. Each cabinet houses three units, a power supply unit, a trigger amplifier unit, and either a scaling unit or a rate meter unit. With the scaling unit (ID–364/UDR–9) included, the assembly is identified as Radiac Computer-Indicator CP–79/UD. With the rate meter (ID–363/UDR–9) included, the assembly is identified as Radiac Computer-Indicator CP–71/UD.

b. *Electrical Equipment Cabinet CY–1368/UDR–9.* The CY–1368/UDR–9 is Navy grey, enamel-finished steel cabinet 27-13/16 inches high by 19 inches wide by 28-3/4 inches long, with standard relay rack construction. The cabinet is equipped with side handles and a back cover plate which is removable for access to the blower and inter-chassis cabling. In addition, the cabinet is equipped with shock mounts and may be bolted to the deck, a table, or any convenient mounting surface. The cabinet accessories consists of a blower motor and fan, mounted on the rear of the cabinet, an air cleaner, and associated power cabling and connectors.

c. *Power Supply PP–948/UDR–9.* The power supply is used in both Radiac Computer-Indicator CP–71/UD and Radiac Computer-Indicator CP–79/UD. The power supply furnishes all the filament power and d-c voltage requirements of both equipments. The power supply consists of three regulated supplies: +300V d-c at 600 ma, —105V d-c at 150 ma, and a high voltage supply adjustable to any value between minus 2500 volts and plus 2500 volts d-c. The high d-c voltage is required for operation of the radiac detector and is stabilized against line voltage changes and regulated against load current variations. Maximum output current of the high voltage supply at any voltage setting is 0.5 milliamperes. Neon lamps are mounted on the front panel to show which portions of the power supply are energized, to show blown fuzes, and to indicate the polarity of the high voltage supply. A thermal switch is provided in the power supply to remove primary power when the ambient temperature exceeds 85 degrees C (185 degrees F). To protect operating and maintenance personnel against accidental injury from the high voltage supply, an interlock switch is provided to remove primary power when the chassis is removed from the cabinet. A simple latch arrangement on the interlock enables the power supply to be operated out of the cabinet. The primary power requirement is 105-120 V 60 CPS, single phase, 950VA.

d. *Trigger Amplifier AM–840/UDR–9.* The Trigger Amplifier is used in both the CP–71/UD and CP–79/UD. It consists of an input amplifier, shaping and limiting circuits, a driver stage, and a crystal-controlled time base which includes a series of multivibrator frequency dividers. Two signal input connections are provided: a G–M INPUT connection for a Geiger-Mueller tube, and an INPUT PULSE connection for the DT–40/UD Radiac Detector, or other suitable radiac detector. The crystal-controlled time base signals are used in the calibration of Radiac Indicator ID–363/UDR–9, as drive for the clock in Radiac Indicator ID–364/UDR–9, as internal predetermined timing signals for the ID–364/UDR–9, and as test signals for both Radiac Indicators. The operating power requirements for the Trigger Amplifier are: 6.3V a-c at 12.2 amps, +300V at 285 ma, and —105V at 110 ma. All power is provided by Power Supply PP–948/UDR–9.

e. *Radiac Indicator ID–363/UDR–9.* Radiac Indicator ID–363/UDR–9 consists of a one-shot multivibrator pulse forming circuit, an integrating network, a two-decade log converter circuit, and a d-c amplifier with an indicating meter. The purpose of the ID–363/UDR–9 is to indicate by means of a calibrated meter the average rate of arrival of pulses from a radiac detector. A recorder may also be used in conjunction with the Indicator to provide a graphic record of counting rate. A connector, specially designed for this purpose, is provided on the front as well as on the rear panel of the ID–363/UDR–9. The recorder should have a 0-1 milliampere movement and a d-c resistance of approximately 1400 ohms. All B+, B—, and filament voltages for the ID–363/UDR–9 are provided by Power Supply PP–948/UDR–9.

f. *Radiac Indicator ID–364/UDR–9.* This unit contains four decimal counting stages with indicating lamps, a 3-hand synchronous time clock, a 6-digit mechanical register, and control circuitry for operation in conjunction with Trigger Amplifier AM–840/UDR–9. The purpose of Radiac Indicator ID–364/UDR–9 is to indicate the total number of counts (representing the impulses from a radiac detector) for a selected time interval, or to indicate the time required for a predetermined number of counts. The counting is accomplished by four decimal counting (scale-of-ten) stages in conjunction with a series of indicating lamps, while the timing is accomplished by means of the synchronous clock, which is driven by a 50 cycle motor the 50 cycles being derived from crystal Y201 in AM–840/UDR–9. The power requirements, which are furnished by Power Supply PP–948/UDR–9 are: 6.3V a-c at 16.7 amps, +300V at 315 ma, and —105V at 9 ma.

g. *Radiac Detector DT–40/UD.* The DT–40/UD consists of a detector chamber and pre-amplifier mounted in a Navy grey cabinet 19 inches wide by 13 inches deep by 10-5/8 inches high. The equipment is designed for standard relay rack installation. The front panel mounts a high voltage input connector, a signal output connector, a power input connector and a gas inlet connection. The lower part of the DT–40/UD is provided with an opening for the insertion of hands or other objects to be monitored. The detector window is made of a taut diaphragm of .00025 inch thick pliofilm sheet. The surface of the window facing the sensitive volume of the chamber is sprayed with a conducting film. A protective metal screening with approximately 76 percent open space is used to cover the pliofilm diaphragm to protect it from the hands or articles being monitored. To prevent puncturing of the pliofilm window, care should be taken when inserting objects through the panel opening. The power requirements are: 6.3V a-c at 1.2 amps, +300V at 36 ma, —105V at 0.5 ma, and a high voltage of approximately 1550 volts at essentially zero current. All power is supplied by Power Supply PP–948/UDR–9 in either the CP–79/UD or CP–71/UD.

4. REFERENCE DATA.

a. *Nomenclature.*

(1) Radiac Set AN/UDR-9.

(a) Radiac Computer-Indicator CP-79/UD.

1. Power Supply PP-948/UDR-9.
2. Trigger Amplifier AM-840/UDR-9.
3. Radiac Indicator ID-364/UDR-9.
4. Electrical Equipment Cabinet CY-1368/UDR-9.

(b) Radiac Detector CP-71/UD.

1. Power Supply PP-948/UDR-9.
2. Trigger Amplifier AM-840/UDR-9.
3. Radiac Indicator ID-363/UDR-9.
4. Electrical Equipment Cabinet CY-1368/UDR-9.

(c) Radiac Detector DT-40/UD.

b. *Contract Number.*

Navy Department, Bureau of Ships NObsr—43443, 59250, 57129.

c. *Contractor.*

Berkeley division Beckman Instruments, Inc., Richmond, Calif.

d. *Cognizant Naval Inspector.*

Inspector of Naval Material, San Francisco, California.

e. *Number of Packages Involved per Complete Shipment of Equipment.*

CP-79/UD	2	#1 containing equipment;	#2 containing equipment spares
AN/UDR-9	4	#1 containing CP-79/UD;	#2 containing CP-71/UD
		#3 containing DT-40/UD;	#4 containing equipment spares

f. *Total Cubical Contents.*

CP-79/UD

Equipment crated	15.85 cu. ft.
Equipment uncrated	8.75 cu. ft.
Equipment spares crated	2.33 cu. ft.
Equipment spares uncrated	1.7 cu. ft.

AN/UDR-9

CP-79/UD crated	15.85 cu. ft.
CP-79/UD uncrated	8.75 cu. ft.
CP-71/UD crated	15.85 cu. ft.
CP-71/UD uncrated	8.75 cu. ft.
DT-40/UD crated	5.92 cu. ft.
DT-40/UD uncrated	1.54 cu. ft.
Equipment spares crated	12.0 cu. ft.
Equipment spares uncrated	7.5 cu. ft.

g. *Total Weight.*

CP-79/UD

Equipment crated	391 lbs.
Equipment uncrated	282 lbs.
Equipment spares crated	72 lbs.
Equipment spares uncrated	40 lbs.

AN/UDR-9

CP-79/UD crated	391 lbs.
CP-79/UD uncrated	282 lbs.
CP-71/UD crated	391 lbs.
CP-71/UD uncrated	282 lbs.
DT-40/UD crated	91 lbs.
DT-40/UD uncrated	32 lbs.
Equipment spares crated	146 lbs.
Equipment spares uncrated	86 lbs.

TABLE 1–1. EQUIPMENT SUPPLIED

Quantity per Equipment	Name of Unit	Nomenclature	Overall Dimensions Inches			Weight in Pounds
			Height	Width	Length or Depth	
2	Electrical Equipment Cabinet	CY–1368/UDR–9	27-13/16	19	28-3/4	101
1	Radiac Indicator	ID–363/UDR–9	8-11/16	17-3/4	22-5/32	35
1	Radiac Indicator	ID–364/UDR–9	8-11/16	17-3/4	22-5/32	34-1/2
2	Trigger Amplifier	AM–840/UDR–9	6-15/16	17-3/4	22-5/32	30-1/2
2	Power Supply	PP–948/UDR–9	10-7/16	17-3/4	22-5/32	115
1	Geiger-Mueller Input Cable				48	3/16
1	Power Cable				96	1-13/16
1	Test Cable				36	3-1/2
1	Test Cable				96	5
1	Radiac Detector (including following cables)	DT–40/UD	10-7/16	17-3/4	12	34
1	Power Cable				10	1-1/16
1	High Voltage Cable				10	1/2
1	Signal Cable				10	7/16

TABLE 1–2A. SUGGESTED ACCESSORY LIST FOR AN/UDR–9

1. *Scintillation Counter* *

Primary Function	(Directional, gamma)
Manufacturer	Berkeley Scientific Div.
Model No.	253
Photomultiplier	RCA 5819
Power Requirements	750 — 1250 V at 100 milliamperes; 6.3 V AC at 0.175 amperes
Overall Dimensions (D x L) inches	5 x 13

* Not supplied with AN/UDR–9 Radiac Set.

2. *Proportional Counters* **

Type of radiation detected	Thermal and Fast Neutrons
AEC No.	BP–AGA, B
Manufacturer	General Electric Company
Model No.	9159777G–4
Wall Material	Metallic, boron coated
Filling	Argon
Approximate operating Voltage	600–700
Dimensions (D x L), inches	1-1/2 x 12

** Requires use of neutron moderator and Preamplifier.

3. *Geiger-Mueller Counters* ***

Type of Radiation Detected	Beta	Gamma
AEC No.	BG2B21A	BG–4A12A, B
Manufacturer	Anton	Anton
Model No.	106	303, 304
Window or wall thickness mg/cm^2	30	60
Cathode Material	Stainless Steel	Stainless Steel
Life		Unlimited
Approximate operating Voltage	650 — 750	650 — 750
Operating Temperature Range °C	—55 to +75	—55 to +75
Dead Time (microseconds)	100 (series Resistor 1 Megohm)	45 (series Resistor 1 megohm)
Basing	Anton 6101 water tight connector RG–11U or RG–58U	RMA–NEMA Miniature
Approximate overall Dimensions (D x L), inches	3/4 x 8	11/32 x 3

*** Recommend use of JAN Counter Types BS–1 and BS–2.

4. *Proportional Counters* *

Type of Radiation Detected	Alpha
AEC No.	BP–D6A
Manufacturer	Tracerlab
Model No.	TGC–12
Wall or Window — thickness, mg/cm^2	Less than 2
Window Material	Mica
Wall Material	Coated Glass
Filling	He
Pressure, cm of Hg	72
Approximate operating voltage	1200 or 1450 — 1650
Approximate Overall Dimensions (D x L), inches	1-1/2 x 3-5/8

* Requires use of Preamplifier.

TABLE 1–2B. GENERAL ACCESSORY LIST FOR AN/UDR–9 RADIAC SET*

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed	Gas samples	Internal sample cylinder	Internal samples	High sensitivity for C^{14}	
AEC No.	BG–2B24A	BG–4C13A	BG–5G	BG–1A3B	BG–1A4C
Manufacturer	RCL	Atomic	Atomlab	Cyclotron Specialties	Victoreen
Model No.	Mark 1 Model 40	971	Eidenoff	410A	1B67/VG–10A
Window or wall thickness, mg/cm^2				0.7 — 2.3	2 — 2-1/2 or as ordered
Window Material				Mica	Mica
Wall Material					
Cathode Material	Carbon dag				
Filling	Sample (NSQ)				A
Pressure, cm of Hg		10		Approx. 76	12
Life				10^9	10^7
Approx. Operating Voltage		1200 — 1500		1400 — 1600	1100 — 1300
Operating Temperature Range, °C					
Dead Time (Microseconds)					
Basing	Wire leads	Coax and banana jack	Wire leads	Separate term.	Separate term.
Approx. Overall Dimensions (D x L), inches	2 x 12	3 x 24	17-1/2L	3-1/2 x 5	2-1/4 x 4-1/4

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed					
AEC No.	BG–1A22	BG–1A23	BG–1A7B,C	BG–1A8A	BG–1A9A,B
Manufacturer Model No.	N Co. of Am	N Co. of Am	Able Sci	Amperex	Tracerlab
	GM1N-Series	GM1W-Series	M-22	200C, 200CB, 200NB 100NB, 100C, 100CB	TGC-1, TGC-2

* Not supplied with AN/UDR–9

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window or wall thickness, mg/cm^2	1 — 3	1 — 3	1.5 — 3.5	1.4 — 2, 3 — 4	Less than 2, 3 — 4
Window Material	Mica	Mica	Mica	Mica	Mica
Wall Material			Glass		Glass
Cathode Material				*ss	ss
Filling	A	He	A	A or Ne, HQ	
Pressure, cm of HG					72 or 58
Life	10^9	10^9	10^9	Unlimited	10^9
Approx. Operating Voltage	1050 — 1250	1150 — 1350	1050 — 1250	1050 — 1350 (A) 650 — 750 (Ne)	1200 — 1500
Operating Temperature Range, °C				—55 to +75	
Dead Time (Microseconds)	200 R**	80 R		200	200 R
Basing	Amphenol 3-pin	RMA 4-pin	RMA 4-pin	With or without RMA 4-pin	RMA 4-pin
Approx. Overall Dimensions (D x L), inches	1-1/8 x 4-1/2	1-9/16 x 3-3/4	1-1/2 x 4	1-5/16 x 3-3/4	1-1/2 x 3-5/8

* "ss" means stainless steel

** Means recovery or resolving time, which exceeds dead time

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed					Low intensities measured
AEC No.	BG–1A9C	BG–1A14A, B	BG–1A20A	BG–1A24B	BG–1A34A, B
Manufacturer Model No.	Tracerlab TGC-3, 3 NA	N I & Ch D34	RCL Mark 1, Model 105	RCL Mark 1, Model 3X	Anton 1001H, 1001T
Window or wall thickness, mg/cm^2	Less than 2	1.4 or 3.5	Less than 2	Less than 2	1.4 — 4
Window Material	Mica	Mica		Mica	Mica
Wall Material			Corning 774		
Cathode Material	ss	ss	Carbon dag	ss mesh	ss
Filling	A	HQ	A	A, Xe, O_2 and N_2 NSQ	Ne, HQ

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Pressure, cm of Hg	72				
Life	10^9	Unlimited	10^7	10^{10}	Unlimited
Approx. Operating Voltage	1300 — 1600	850 — 950	875 — 925	1600 — 1800	850 — 950
Operating Temperature Range, °C					—55 to +75
Dead Time (Microseconds)	400 R				(1 megohm 15 series resis.)
Basing	RMA 4-pin	RMA 4-pin	RMA 4-pin	RMA 4-pin	Anode: Anton No. 6107 Cathode: RMA-NEMA
Approx. Overall Dimensions (D x L), inches	1-1/2 x 3-7/8	1-3/8 x 3-3/4	1-1/2 x 3-1/2	2-1/16 x 4	2-1/8 x 5/8 Height

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed					
AEC No.	BG–1A37A	BG–1A38A	BG–1A42A	BG–1A43A, B	BG–1A44A, B
Manufacturer Model No.	Amperex 240C, 240N	Amperex 230N	RIDL 42	Anton 201H, T	Anton 210H, T; 211H, T
Window or wall thickness, mg/cm^2	1.4 — 2	1.4 — 2	1.5 — 3.5	1.4 — 2 or 3 — 4	1.4 — 4
Window Material	Mica	Mica	Mica	Mica	Mica
Wall Material					
Cathode Material	ss	ss		ss	ss
Filling	Ne or A, HQ	Ne HQ		Ne HQ	Ne HQ
Pressure, cm of Hg					
Life	Unlimited	Unlimited	10^9	Unlimited	Unlimited
Approx. Operating Voltage	850 — 900 or 1100 — 1300	775 — 925		650 — 750	1000 — 1200
Operating Temperature Range, °C	—55 to +75	—55 to +75		—55 to +75	—55 to +75
Dead Time (Microseconds)	100	100		100 (Series resistor 1 megohm)	200 (Series resistor 1 megohm)

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Basing	RMA 3-pin	RMA Peewee 3-pin	RMA 4-pin	Anode: RMA-NEMA miniature terminal	Anton 6105 watertight conn; or RMA-NEMA 4-pin
Approx. Overall Dimensions (D x L), inches	5/8 x 5-7/8	5/8 x 3-1/4	1-1/2 x 4	1 x 6	1-1/8 x 4-1/2

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed					
AEC No.	BG–1A45A	BG–1A46A	BG–1A48A	BG–2A23A	BG–2A24A, B
Manufacturer Model No.	N I & H D-35	Tracerlab TGC-9	RCL Mark 1, Model 5	RCL Mark 1, Model 45	Eltronics B1SMW B2SMW
Window or wall thickness, mg/cm^2	1.4	Less than 2	Less than 2 or 3 — 4	Less than 2, 3 — 4	1.5 — 1.8, 3 — 4
Window Material		Mica	Mica	Mica	Mica
Wall Material		ss		Corning 774	
Cathode Material				Carbon dag	ss
Filling	HQ	He	He	He	He
Pressure, cm of Hg	10	65			
Life	Unlimited	2 x 10^8	10^8	10^8	10^9
Approx. Operating Voltage	850 — 950	800 — 950	1200 — 1350	1250 — 1300	1100 — 1300
Operating Temperature Range, °C					
Dead Time (Microseconds)		150R			200 R
Basing	Wire leads	Special coax	RMA 4-pin	RMA 4-pin	4-pin
Approx. Overall Dimensions (D x L), inches	1 x 6	1 x 5-1/2	1-1/2 x 3-3/4	2-1/16 x 4-3/4	1-1/2 x 3-5/8

TABLE 1-2B. GENERAL ACCESSORY LIST (Continued)

GEIGER-MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed				Side window (Model B15SWB	
AEC No.	BG-2A25A, B	BG-4A10A	BG-1A17B	BG-1A49A, B	BG-1B6A, B
Manufacturer Model No.	Eltronics B1CBH B2CBH	Anton 222	N. Wood A2	Eltronics B10SWB, B15SWB	Eltronics B1SW B2SW
Window or wall thickness, mg/cm^2	1.5 — 1.8 or 3 — 4	1.4 — 2	2 — 3	2.5	2.5
Window Material	Mica		Mica	Glass	Glass
Wall Material			ss		
Cathode Material	ss	ss		Colloidal carbon	Cu
Filling	HQ		Ne	A	A
Pressure, cm of Hg					
Life	Unlimited	Unlimited	10^9	10^9	10^9
Approx. Operating Voltage	1100 — 1300	600 — 700	1150 — 1350	800 — 1000	800 — 1000
Operating Temperature Range, °C		—55 to +75	+15 to +80		
Dead Time (Microseconds)	200 R			75 R	75 R
Basing	4 pin	Anton 6106 connector	RMA 4 pin	4 pin	Wire leads
Approx. Overall Dimensions (D x L), inches	1-3/8 x 3-3/4	0.344 x 2-23/32	2 x 3-5/8	3/4 x 5	5/8 x 3-1/2 or 5/8 x 8-1/4

GEIGER-MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed		Side bubble window		Scintillation	Scintillation
AEC No.	BG-1A40A	BG-1A41A	BG-1A50A	BG-1A33A	BG-1A33B
Manufacturer Model No.	NRC NRG-15	NRC NRG-10	N Co. of Am. BGM1W	NRC NRG-S10A	NRC NRG-S15A
Window or wall thickness, mg/cm^2	3	3	3	200*	30*

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window Material	Glass	Glass	Mica		
Wall Material				Glass	Glass
Cathode Material			Bi		
Filling	A	A	He	A	A
Pressure, cm of Hg					
Life	3×10^8	3×10^8	10^9	2×10^8	2×10^8
Approx. Operating Voltage	800 — 1000	900 — 950	1150 — 1350	900 — 950	900 — 950
Operating Temperature Range, °C					
Dead Time (Microseconds)			80 R		
Basing		4 pin	RMA 4 pin	RMA 4 pin	RMA 3 pin
Approx. Overall Dimensions (D x L), inches	3/4 x 5	3/4 x 5	1-9/16 x 3-3/4	7/8 x 5-1/2	5/8 x 5

* External phosphor for alphas

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Beta	Beta
Special Functions Performed	Scintillation	Scintillation	Scintillation		X-ray diffraction, Fluorescence analysis
AEC No.	BG–1A33C	BG–1A33D	BG–1A33E	BG–1A24A	BG–1A35A
Manufacturer Model No.	NRC NRG–S16A	NRC NRG–S20A	NRC NRG–S25A	RCL Mark 1 Model 3	Amperex 153C
Window or wall thickness, mg/cm^2	200*	200*	200*	3 — 4	3 — 4
Window Material				Mica	Mica
Wall Material	Glass	Glass	Glass		
Cathode Material				Carbon dag	ss
Filling	A	A	A	He	A HQ
Pressure, cm of Hg					
Life	2×10^8	2×10^8	2×10^8	10^8	Unlimited

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Approx. Operating Voltage	900 — 950	900 — 950	900 — 950	1250 — 1400	1300 — 1700
Operating Temperature Range, °C					—55 to +75
Dead Time (Microseconds)					150
Basing	RMA 3 pin	4 pin	Wire leads	RMA 4 pin	Separate term.
Approx. Overall Dimensions (D x L), inches	5/8 x 5	1 x 5	2 x 5	2-1/16 x 4	7/8 x 6

* External phosphor for alphas

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed		Can be dipped in liquids			
AEC No.	BG–1B3C	BG–2A14C	BG–1A16A	BG–1A11A	BG–1A3C
Manufacturer Model No.	Amperex 150N	NI & CH D52	Tech. Assoc. TA–SB–1	Amperex 120C, 120CB, 120N, 120NB	Cyclotron Specialties 310B
Window or wall thickness, mg/cm^2	3.5	3.5	4	5.6	6
Window Material	Mica		Mica	Mica	Mica
Wall Material		Glass	Ni		
Cathode Material	ss			ss	
Filling	Ne, HQ		Tetramethyllead	Ne or A, HQ	He
Pressure, cm of Hg					Approx. 76
Life	Unlimited		10^9	Unlimited	10^9
Approx. Operating Voltage	620 — 780	875 — 1025	1400 — 1600	600 — 800 (He) 1050 — 1350 (A)	1300 — 1550
Operating Temperature Range, °C	—55 to +75			—55 to +75	
Dead Time (Microseconds)	150			300	
Basing	RMA small 4 pin	RMA 3 pin miniature	Separate term.	RMA 4 pin	Separate term.
Approx. Overall Dimensions (D x L), inches	7/8 x 6 or 7/8 x 5/64	21/32 x 5-1/4	1-1/8 x 5, 1-7/8 D Flange	2-5/16 x 5-1/8	3-1/2 x 5

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed					Jacketed for liquid phase counting
AEC No.	BG–3A17A, B, C	BG–2A1	BG–2A1D	BG–2A2A	BG–2A3A
Manufacturer Model No.	Eltronics B10SC, B20SC, B30SC	RCL Mark 1 Models 20, 20G	Able sci. G-11-3	Able Sci. G-11-2	RCL Mark 1 Model 70
Window or wall thickness, mg/cm^2	25	30 or 300	30	30	30
Wall Material		Corning 772	Pyrex		Glass
Cathode Material	Colloidal carbon	Ag			
Filling	A	A			A
Pressure, cm of Hg					
Life	10^9	10^8			10^8
Approx. Operating Voltage	800 — 1000	950 — 1000	850 — 950	850 — 950	1050 — 1100
Operating Temperature Range, °C					
Dead Time (Microseconds)	75 R				
Basing	4 pin	RMA 3 pin phototube	Amphenol 50 — 030	RMA 4 pin	3 pin phototube
Approx. Overall Dimensions (D x L), inches	3/4 x (4-1/2, 5-1/2, 6-1/2)	5/8 x 5-1/4	5/8 x 5-3/4		
Window Material					

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed		Low background			
AEC No.	BG–2A7A	BG–2A8A	BG–2A9A	BG–2A15A	BG–2A17A–D
Manufacturer Model No.	RCL Mark 1 Model 80	RCL Mark 1 Model 100	Victoreen 1B85	Tracerlab TGC–6	NRC NRG–40, 30, 31, 32
Window or wall thickness, mg/cm^2	30	30	30	30	30

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window Material					
Wall Material		Corning 774		Glass	
Cathode Material		AG		as coated with opaque paint	
Filling	A	Ne		A	A
Pressure, cm of Hg					
Life	10^8	10^7	10^9	2×10^8	3×10^8
Approx. Operating Voltage	1050 — 1150	950 — 1050	800 — 1000	760 — 910	900 — 950
Operating Temperature Range, °C			—10 to +100		
Dead Time (Microseconds)				75 R	
Basing	3 pin	RMA 3 pin phototube	RMA A1 82 watertight coax	RMA 3 pin peewee	
Approx. Overall Dimensions (D x L), inches		14 mm D x 5-1/2 in. L	51/64 x 4-1/8	5/8 x 4-7/8	(1/2 or 3/4) x (4-1/2 to 6-1/2)

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed	Independent of temperature. Can be dipped	Jacketed for liquid or gas samples	Liquid and gas samples		
AEC No.	BG–2A18A, B	BG–2A19A	BG–2A20A	BG–2B1	BG–2B3A
Manufacturer Model No.	N Co. of Am. GM2A, GM2D	N. Co. of Am. GM4	RIDL 32	Victoreen RTMA No. 1B68	Tech. Assoc. TA–B1
Window or wall thickness, mg/cm^2	30	30	30	30	30
Window Material					
Wall Material	Glass	Glass		Glass	Glass
Cathode Material				Ag	Ag
Filling	A	A	Ne	A or Ne	Tetrameythllead
Pressure, cm of Hg					
Life	10^9	10^9	10^9	10^9	10^9
Approx. Operating Voltage	825 — 1000	825 — 1000	850 — 1000	850 — 1050	1400 — 1600

TABLE 1-2B. GENERAL ACCESSORY LIST (Continued)

Operating Temperature Range, °C	—30 to +100	—30 to +100			
Dead Time (Microseconds)					
Basing	Amphenol 3 pin peewee	Amphenol 3 pin peewee	3 pin	Wire leads	Wire leads
Approx. Overall Dimensions (D x L), inches	5/8 x 5-1/4	5/8 x 5	13/16 x 6	3/4 x 8	1.9 cm x 19 cm.

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Gamma	Beta	Beta
Special Functions Performed					Liquid or gas phase samples
AEC No.	BG–2B3B	BG–2B3C	BG–2B10A	BG–2B14A	BG–2B17A
Manufacturer Model No.	Tech. Assoc. TA–B2	Tech. Assoc. TA–B3	Amperex 90NB	Tracerlab TGC–5	Tech. Assoc. TA–B1J
Window or wall thickness, mg/cm^2	30	30	30 — 40	30	30
Window Material					
Wall Material	Glass	Glass			
Cathode Material	Ag	Ag	ss	ss	Ag
Filling	Tetramethyllead	A	Ne HQ	A	Tetramethyllead
Pressure, cm of Hg					
Life	10^9	10^9	Unlimited	2×10^8	10^9
Approx. Operating Voltage	1400 — 1600	825 — 975	850 — 950	825 — 1025	1400 — 1600
Operating Temperature Range, °C				—40 to +65	
Dead Time (Microseconds)			100		
Basing	Wire leads	Wire leads	3 pin	RMA 4 pin	Wire leads
Approx. Overall Dimensions (D x L), inches	1.9 cm x 15.3 cm	1.9 cm x 19 cm	5/8 x 5-5/8	.751 x 6-1/4	1.9 cm x 21.3 cm

TABLE 1-2B. GENERAL ACCESSORY LIST (Continued)

GEIGER-MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed			Miniature		
AEC No.	BG-2C2B	BG-2C2C	BG-3A12A	BG-3A16A	BG-3B1
Manufacturer Model No.	Tracerlab TGC-11	Tracerlab TGC-11A	RIDL 30	Eltronics B120	RCL Mark 1, Models 10, 10A, 30, 30A
Window or wall thickness, mg/cm^2	25 — 35	30	30	30	30 (Model 10)
Window Material					
Wall Material	ss	ss			Corning 774
Cathode Material	ss			Ag	Ag
Filling	Noble	He		Ne	A
Pressure, cm of Hg	127 — 157	145			
Life	10^8	10^8		10^9	10^8
Approx. Operating Voltage	1300 — 1500	1150 — 1350	850 — 950	800 — 1000	950 — 1100
Operating Temperature Range, °C					
Dead Time (Microseconds)	450 — 650 R	550 R		75 R	
Basing		Special coax	Amphenol 50 — 030	3 pin	Wire leads
Approx. Overall Dimensions (D x L), inches	2-1/4 x 23	2-7/8 x 23-3/16	5/8 x 5-3/4	5/8 x 5-3/4	19 mm x 7-3/4 in.

GEIGER-MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Beta
Special Functions Performed					
AEC No.	BG-2B19	BG-2B20A	BG-2B21A, B	BG-2B23A, B	BG-2C2A
Manufacturer Model No.	RCL Mark 1 Models 11, 11A, 31, 31A, 11X, 31X	N Co. of Am GM2	Anton 106, 108	RCL Mark 1 Models 10-7, 11-7	Tracerlab TGC-10A

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window or wall thickness, mg/cm^2	30 or 300	30	30 or 174	30	25 — 35
Window Material					
Wall Material	Corning 772 (Nonex)	Glass			ss
Cathode Material	Ag or ss wire mesh		ss	Ag	ss
Filling	A, Xe, O_2 or N_2	A		A	He
Pressure, cm of Hg					127 — 157
Life	10^8 or 10^{10}	10^9		10^8	10^8
Approx. Operating Voltage	250 — 1000, 1350 — 1550	900 — 1100	650 — 750	950 — 1000	1150 — 1350
Operating Temperature Range, °C		—30 to +100	—55 to +75		
Dead Time (Microseconds)			100 (series resistor 1 megohm)		300 — 500 R
Basing	RMA 4 pin	Wire leads	Anton 6101 watertight connector RG–11U or RG–58U cable	Wire leads 4 pin	Special coax
Approx. Overall Dimensions (D x L), inches		3/4 x 7-1/4	3/4 x 8	12L	2 x 22-5/8 not including base and flange

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Beta	Beta	Beta	Beta	Gamma
Special Functions Performed			Can be dipped	Liquid or gas phase samples	
AEC No.	BG–3B12A	BG–1A47A	BG–2B15	BG–2B16A	BG–2A11A, B
Manufacturer Model No.	RIDL 22	Redbank Div. Bendix TC–1	N Wood B10, B20	N Wood J	Raytheon CK 1020, 1021
Window or wall thickness, mg/cm^2	30				35
Window Material		Mica			
Wall Material			Glass	Glass	
Cathode Material				Ag	
Filling	Ne	HQ			

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Pressure, cm of Hg					
Life	10^9		10^9	10^8	10^8
Approx. Operating Voltage		620 — 820	850 — 1050	850 — 950	825 — 975
Operating Temperature Range, °C	825 — 1050	—55 to +75			—40 to +55
Dead Time (Microseconds)					
Basing	4 pin or wire leads		RMA 4 pin or 3 pin or wire leads	Wire leads or 3 pin	3 pin
Approx. Overall Dimensions (D x L), inches	3/4 x 8	1 x 6	3/4 x 8 or 5/8 x 6	As specified	3/4 x 6; 21/32 x 5-1/4

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed	Can be dipped in liquid sources				High intensity
AEC No.	BG–2A11D	BG–2A14A, B	BG–2B11A–C	BG–2B12B	BG–2A21A
Manufacturer Model No.	Raytheon CK 1029	N I & Ch D50, D51	Raytheon CK–1018, 1019; 1B90	N I & Ch D12	WRL HL-5
Window or wall thickness, mg/cm^2	35	35	35	35	50
Window Material					
Wall Material	Glass	Glass			Glass
Cathode Material					Nichrome
Filling					Ne HQ
Pressure, cm of Hg					
Life	10^8		10^8		Unlimited
Approx. Operating Voltage	850 — 1000	850 — 1000	900 — 1025 1100 — 1200	920 — 1020	650 — 750
Operating Temperature Range, °C	—40 to +55		—40 to +50		
Dead Time (Microseconds)					

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Basing	3 pin	RMA 3 pin miniature	Wire leads	Wire leads	Wire leads
Approx. Overall Dimensions (D x L), inches	.656 x 5-1/4	3/4 x 6, 21/32 x 5-1/4	3/4 x 8	3/4 x 8-1/2	7/16 x 3-3/4

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed				Metal Window	
AEC No.	BG–2A22A–C	BG–4A12A, B	BG–4A4A	BG–4B11A	BG–4A3A, B
Manufacturer Model No.	WRL 29A, B, C	Anton 303, 304	N I & Ch D-76	Victoreen 1B89	Amperex 75N, 75NB3
Window or wall thickness, mg/cm^2	80 or 50	60	100	140	150
Window Material				Be	
Wall Material	Glass		Brass, ss shell		
Cathode Material	Carbon	ss			ss
Filling					Ne
Pressure, cm of Hg			76		
Life	5 x 10^8	Unlimited	10^8	10^8	Unlimited
Approx. Operating Voltage	850 — 950	650 — 750	900 — 1000	1400 — 1600	625 — 750
Operating Temperature Range, °C		—55 to +75		0 to +100	—55 to +75
Dead Time (Microseconds)		45 (series resis. 1 megohm)			100
Basing	Wire leads	RMA–NEMA miniature	Separate term. (fuse type mounting)		3 pin or 1 wire lead
Approx. Overall Dimensions (D x L), inches	7/16 x 2, 7/16 x 3-1/2, 11/16 x 4	11/32 x 3	9/16 x 3-1/2	Width 3 Length 6 Height 1-1/2	5/8 x (4-3/8, 4-5/16)

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)
GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed		Subminiature	Miniature		
AEC No.	BG–3A8A, B	BG–3A3A	BG–3A4A	BG–3B4A	BG–3B4C
Manufacturer Model No.	Raytheon CK 1026, CK 1032	Victoreen 1B87	Victoreen 1B86	Tech. Assoc. TAG2	Tech. Assoc. TAG1
Window or wall thickness, mg/cm^2	175	200	200	230	230
Window Material					
Wall Material	Glass		Glass	Glass	Glass
Cathode Material				Ag plated Cu mesh	Ag plated Cu mesh
Filling				Tetramethyllead	Tetramethyllead
Pressure, cm of Hg					
Life	10^8	10^8	5×10^7	10^9	10^9
Approx. Operating Voltage	900 — 1000 or 1100 — 1300	850 — 950	275 — 325	1400 — 1600	1400 — 1600
Operating Temperature Range, °C	—70 to +50	0 to +100	—40 to +100		
Dead Time (Microseconds)					
Basing	.030 in. D pin	Wire leads	Wire leads	Wire leads	Wire leads
Approx. Overall Dimensions (D x L), inches	3/4 x 3	3/8 x 1-3/8	3/8 x 3-5/8	2.8 cm x 20.5 cm	2.2 cm x 18.2 cm

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed	Cosmic Ray	I^{131} tumor location			
AEC No.	BG–4B10C	BG–3A15A	BG–3B5A	BG–3B8A	BG–3B9A
Manufacturer Model No.	N. Wood T	RCL Mark 1 Model 13	N I & Ch D–21, D–22	Tracerlab TGC–4	Tech. Assoc. TA–G4
Window or wall thickness, mg/cm^2	220 — 440	300	300	300	300

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window Material					
Wall Material		Corning 774			
Cathode Material	Brass	Bi coated Cu screen			Ag
Filling	A	A		A	A
Pressure, cm of Hg					
Life	10^9	10^8			
Approx. Operating Voltage	1200 — 1400	1125 — 1275	880 — 1030	825 — 1025	825 — 975
Operating Temperature Range, °C			As ordered	—40 to +65	
Dead Time (Microseconds)					
Basing	Separate term.	RMA 4 pin	Wire leads	RMA 4 pin	Wire leads
Approx. Overall Dimensions (D x L), inches	1/2 or 1 D; L as ordered	1-1/2 x 3-5/8	3/4 x 8-1/2	0.751 x 6-1/4	2.2 cm x 13.6 cm

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed		High efficiency for I^{131}			
AEC No.	BG–4A13A	BG–4B14A	BG–4C10A	BG–4C12A	BG–3A10A
Manufacturer Model No.	Tracerlab TGC–8	RCL Mark 1 Model 12	Anton 350	Tracerlab TGC–7	NRC NRG20–23
Window or wall thickness, mg/cm^2	300 or more	300	300 or more	300 or more	380
Window Material					
Wall Material		Corning 774	ss	ss	
Cathode Material	ss	Bi coated Cu mesh		ss	
Filling	He	A	He	He	A
Pressure, cm of Hg			72	80	
Life	10^8	10^8	2×10^8	10^8	3×10^8

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Approx. Operating Voltage	1000 — 1200	1150 — 1200	900 — 1100	975 — 1125	900 — 950
Operating Temperature Range, °C					
Dead Time (Microseconds)	200 R		200 R	200 R	
Basing	RMA 4 pin	RMA 4 pin	RMA–NEMA Miniature term.	RMA 4 pin	4 pin
Approx. Overall Dimensions (D x L), inches	1-1/2 x 3-5/8	1 x 7-1/4	2 x 22-21/32	2-1/8 x 14	(3/4) x 4-1/2, 5-1/2, 6-1/2, 9-1/2)

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed	Cosmic Ray		Cosmic ray telescope and anticoincidence rings		Cosmic ray
AEC No.	BG–3C1A, B, C, D	BG–4D2A	BG–4C7A	BG–4A4D	BG–4B10A
Manufacturer	NRC NRG–60, 61, 62, 63	RCL Mark 1 Model 15X	RCL Mark 1 Model 51	Geophys. Meas. Corp. G–1	N. Wood D
Window or wall thickness, mg/cm^2	380	400	570	670	670
Window Material		ss			
Wall Material		ss	Cu	Brass	
Cathode Material	Cu				Brass
Filling	A	Xe, A, N_2, O_2(NSQ)	A		A
Pressure, cm of Hg					
Life	3 x 10^8		10^8	10^{10}	10^{10}
Approx. Operating Voltage	900 — 950	1500 — 1600	950 — 1000	900 — 1100	1250 — 1450
Operating Temperature Range, °C				—20 to +200	
Dead Time (Microseconds)					

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Basing	Wire leads	Amphenol 82/805	Wire leads	RMA 4 pin	Coax Connector
Approx. Overall Dimensions (D x L), inches	5/8 x (7, 11) 1-1/4 x (9, 15)	1-3/4 x 6	(1, 2) x (8-3/4 33-3/4)	6 (L)	(1, 1/2, 2) x (6 — 38)

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed	Cosmic ray	Cosmic ray telescope and anti-coincidence rings		Cosmic ray	Geological survey and cosmic ray
AEC No.	BG–4C9	BG–4C3A	BG–4C6A	BG–4B16A, B, C	BG–4C15A
Manufacturer Model No.	N Co. of Am GMC series	RCL Mark 1 Model 50	Geophys. Meas. Corp.	RCL Mark 1 Model 50	Eltronics G50S, G100S, G300S
Window or wall thickness, mg/cm^2	690	750	1,340	1,470	1,470
Window Material					
Wall Material	Brass	Brass	Brass		
Cathode Material				Cu	Cu
Filling	He	A		A	A
Pressure, cm of Hg					
Life	10^9	10^9	10^{10}	10^9	10^9
Approx. Operating Voltage	1100 — 1300	1000 — 1200	1050 — 1350	900	900 — 1100
Operating Temperature Range, °C	—30 to +100		—20 to +200		
Dead Time (Microseconds)				75 R	85 R
Basing	Separate term.	Wire leads	Separate term.	4 pin	Wire leads
Approx. Overall Dimensions (D x L), inches	(1/2 — 2) x (6— 30) (Active Length)	2 x 14	3 x 36	3/4 x (4, 7, 9)	(1-1/4, 2-1/2) x (9, 24)

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed		Liquid or gas samples		High intensity	High intensity
AEC No.	BG–2B22A	BG–2B25A	BG–3A11A	BG–3A13A	BG–3A14A
Manufacturer Model No.	Anton 316	Atomlab Helix	N Co. of Am GM3	Raytheon CK–1034	Raytheon CK–1035
Window or wall thickness, mg/cm^2					
Window Material					
Wall Material			Glass		
Cathode Material	ss				
Filling	HQ		A		
Pressure, cm of Hg					
Life	Unlimited		10^9	Unlimited	Unlimited
Approx. Operating Voltage	650 — 750		800 — 950	600 — 800	650 — 750
Operating Temperature Range, °C	—55 to +75		—30 to +100	—55 to +70	—55 to +70
Dead Time (Microseconds)	100 (series resistor 1 megohm)				
Basing	RMA–NEMA miniature terminals		Wire leads	Wire leads	Wire leads
Approx. Overall Dimensions (D x L), inches	7/8 x 6	8 (L)	1/2 x 2-1/2	0.4 x 2-5/8	O.385 x 1.5

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Gamma
Special Functions Performed		High efficiency for I^{131}			
AEC No.	BG–3B6	BG–3B11A	BG–3B13A	BG–4A9A	BG–4A11A
Manufacturer Model No.	N Wood Type C	N Wood E	N Co. of Am BGM2	Anton 155	Anton 302
Window or wall thickness, mg/cm^2					

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Window Material					
Wall Material		Glass			
Cathode Material	Ag coated	Bi coated screen	Bi	ss	ss
Filling			He		
Pressure, cm of Hg					
Life	10^9	10^9	10^9	Unlimited	Unlimited
Approx. Operating Voltage	875 — 1075		1050 — 1200	600 — 650	650 — 750
Operating Temperature Range, °C				—50 to +75	—55 to +75
Dead Time (Microseconds)					45 (1 megohm series resistor)
Basing	Wire leads	4 pin	RMA 4 pin	Anton 6106 connector	RMA–NEMA
Approx. Overall Dimensions (D x L), inches	3/4 x (8, 12)	1 x 8 1-3/8 x 2-1/2	1 x 8-1/2	0.104 D probe 1-1/32 D body 9-1/8 L, overall	11/32 x 2-3/8

GEIGER–MUELLER COUNTERS

Type of Radiation Detected	Gamma	Gamma	Gamma	Gamma	Optical and near optical
Special Functions Performed	High temperature	Directional. For aerial and surface survey		High temperature cooling jacket	
AEC No.	BG–4B15A	BG–4C8A	BG–4C11A	BG–4D1A	BG–1A39A, B, C, D
Manufacturer Model No.	Anton 315	Geophys. Meas. Corp. Type M	Tracerlab TGC–16	N Wood HD	NRC NRG–50, 51, 52, 53
Window or wall thickness, mg/cm^2					
Window Material					Glass (model 50)
Wall Material			ss	Metal	
Cathode Material	ss				Mesh, Zn, Cu or brass
Filling			He		
Pressure, cm of Hg			72		

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Life	Unlimited	10^{10}	2×10^{8}		
Approx. Operating Voltage	680 — 700	1050 — 1250	900 — 1100		
Operating Temperature Range, °C	—55 to +175	—40 to +200			
Dead Time (Microseconds)	45 (Series resistor 1 megohm)		200 R		
Basing	Separate term.	Separate term.	None		4 pin
Approx. Overall Dimensions (D x L), inches	1/4 x 8-13/32	15-1/8 x 2-1/2	1 x 15-1/4 Other lengths as ordered	As ordered	3/4 x 5

PROPORTIONAL COUNTERS

Type of Radiation Detected	Alpha	Alpha	Alpha	Alpha	Alpha
Special Functions Performed	Measures contamination of hands	Small or inaccessible areas	Monitoring flat surfaces	Filter paper measurements	
AEC No.	BP–C3A	BP–C8A	BP–C9A	BP–C10A	BP–D6A
Manufacturer Model No.	RCL Mark 11 Model 45	N I & Ch AP1	N I & Ch AP2	N I & Ch AP3	Tracerlab TGC–12
Window or wall thickness, mg/cm^2	0.58	Less than 1	Less than 1	Less than 1	Less than 2
Window Material	Nylon	Plastic			Mica
Wall Material					Coated glass
Filling	Air				He
Pressure, cm of Hg					72
Approx. Operating Voltage	2325 — 2370			2300	1200 or 1450 — 1650
Operating Temperature range, °C					
Approx. overall Dimensions (D x L), inches	8W* 8H* 15L	3/4W 1H 7-3/4L	9/16W 2H 9L	7-1/2W 9-1/2H 12-1/2L	1-1/2 x 3-5/8

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

PROPORTIONAL COUNTERS

Type of Radiation Detected	Thermal neutrons	Thermal neutrons	Thermal neutrons	Thermal neutrons	Thermal neutrons
Special Functions Performed					High temperatures
AEC No.	BP–A4C	BP–A5	BP–A8A	BP–A10A	BP–A9A
Manufacturer Model No.	N Wood G, M and F	RCL Mark 2 Models 1 and 2	GE 9737847	RCL Mark 2 Model 3	N Wood HG
Window or Wall thickness, mg/cm^2					
Window Material					
Wall Material	Brass or Al	Brass	Brass	Al–63S	Metal
Filling	$B^{10}F_3$	$B^{10}F_3$	$B^{10}F_3$	$B^{10}F_3$	$B^{10}F_3$
Pressure, cm of Hg	To specifications	12, 25, 40, 60	12.5	152	150
Approx. Operating Voltage		1400 — 3200	1000 — 1500	4600	
Operating Temperature Range, °C		Up to 300 on request			
Approx. Overall Dimensions (D x L), inches	To specifications	2 x 18-1/2	1 x 10-1/2	1 x 25 1 x 11 1 x 17	To specifications

PROPORTIONAL COUNTERS

Type of Radiation Detected	Thermal and fast neutrons	Fast neutrons	Fast neutrons
Special Functions Performed		Response is proportional to tissue dosage	
AEC No.	BP–A6A, B	BIC–9A	BP–D3A
Manufacturer Model No.	GE 9159777G–4	RPI F–1	Geophys. Meas. NA–1
Window or Wall thickness, mg/cm^2			
Window Material			
Wall Material	Metallic, boron coated	Brass	Brass
Filling	Argon	CH_4–A	Organic vapor
Pressure, cm of Hg	20 Argon		

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

Approx. Operating Voltage	600 — 700	1400	2800 — 3000	
Operating temperature range, °C				
Dimensions (D x L), inches	1-1/2 x 12	2 x 3-1/8	3 x 12	

FLOW COUNTERS

AEC No.	BG–5A1A	BG–5A3A	BG–5B1A	BG–5B2A	BG–5D
Manufacturer Model No.	RCL Mark 12 Model 11	Res Equip & Service 200	N I & Ch D46	Tracerlab SC–16	N Wood K–3
Window	Al, 2.2 mg/cm^2	None	None	None	None
Planchet dimensions (D x H), inches		11/16 x 3/8 1-1/2 x 3/8	1-1/4 D		
Approx. Geiger Operating Voltage	1325 — 1475	1350 — 1550	1100 — 1500	1050 — 1300	
Geiger Gas	A—quench		Q gas	He — isobutane	He
Approx. proportional Operating Voltage				950 — 1050	
Proportional Gas				He — isobutane	

FLOW COUNTERS

AEC No.	BG–5E	BG–5F	BP–D7A	BG–6A	BG–7A
Manufacturer Model No.	N Co. of Am FC–1	R1DL 21	NMC PCC–11	Tracerlab SC–39	Atomic 952
Window	None	None	2-3/4, 1-3/4 or 1 in. D		None
Planchet Dimensions (D x H), inches	1-1/4 x 1/4	1-9/32 x 3/8			1 or 2 in. D
Approx. Geiger Operating Voltage	1100–1300	1250 — 1450		1100 — 1500	1200 — 1400
Geiger Gas		He — alcohol He — isobutane		99% He — 1% isobutane	99% He — 1% isobutane
Approx. Proportional Operating Voltage	Below 1050			900 — 1000 alpha) 1250—1350 (beta)	
Proportional Gas		CH_4 or 10% CH_4 — 90% A		96% He — 4% isobutane	

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

FLOW COUNTERS

AEC No.	BG–8A	BG–9A	BP–D4A	BP–D5A1
Manufacturer Model No.	Eltronics FGC–3	RCL Mark 12 Model 2	RCL Mark 12 Model 1	NMC PCC–10
Window	None	None	None	
Planchet Dimensions (D x H), inches	1 x 7/16	1-1/32 x 11/32	2 in. D	2-1/4, 1-3/8 or 1 in. D
Approx. Geiger Operating Voltage	1200 — 1300	1300 — 1500	3900 — 4500	1700 — 2000
Geiger Gas	0.95% isobutane— 99.05% He	He — isobutane		
Approx. Proportional Operating Voltage			3000 — 3500	900 — 1200
Proportional Gas	CH_4 — A	CH_4	CH_4	

SCINTILLATION COUNTERS

Primary Function	Gamma mapping (Highly directional)	Gamma	Alpha	Mapping (Highly directional	Alpha
AEC No.	ABX–2A1	ABX–3B	ABX–4A	ABX–5A	ABX–6A
Manufacturer Model No.	R–C Sci Inst TAX–21B	R–C Sci Inst LAX–12	R–C Sci Inst CAX	W. S. Macdonald 152T	Tracerlab P–12
Window Characteristics	Collimator: 1/4 in. ID 2-1/6 in. OD 2-3/8 in. L, Tungsten	Al window, 276 mg/cm^2, or to specifications Collimator: 1/4 or 3/4 in. L	Scintillator and sample holder are housed in a chamber 1-1/2 in. D sample holder	Collimator: Response 10° from axis is 7% of response at axis, using 1.1 mev gamma	35% window absorption of 4 mev alphas
Photomultiplier	RCA 5819	RCA 5819	RCA 5819		RCA 5819
Scintillator and Dimensions (D x L), in.	$CaWO_4$ 3/16 x 3/4	$CaWO_4$: 1 sq. in. x 3/16 in. NaI: .785 sq. in. x 1 in.	ZnS — Ag 2-3/4 in. D		ZnS
Power Requirements	1200 volts at 120 microamperes; 150 volts at 5 milliamperes; 6.3V at 0.45 amperes	1200 volts at 120 microamperes; 150 volts at 5 milliamperes; 6.3V AC at 0.45 amperes	1200 volts at 120 microamperes; 150 volts at 5 milliamperes 6.3V AC at 0.45 amperes	900 ±0.5V; 300 ±0.3V	900 — 1100V
Overall Dimension, (D x L), inches	2-1/2 x 10	4 x 8	4W 4H 7L		2-1/2 x 8-1/4

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

SCINTILLATION COUNTERS

Primary Function	Gamma	Alpha, beta, gamma, neutron	Gamma	Gamma	Gamma Liquid samples
AEC No.	ABX–8A	ABX–9A	ABX–10A	ABX–11A	ABX–12A
Manufacturer Model No.	N R & D SC–2	GE 121C196 G–1	NRC SC–1A	N Wood SC–1	W. S. Macdonald 152HS
Window Characteristics				Detachable lead collimator	
Photomultiplier	RCA 5819	RCA 5819	RCA 5819	RCA 5819	Two RCA 1P21's in coincidence
Scintillator and Dimensions (D x L), in.	NaI — Thallium 1/2H 1/2W 1L	Interchangeable	NaI 1 x 1	NaI 1 x 1/2 1-1/2 x 1/2 1-3/4 x 2	NaI with 5/8 D well for 1 cc sample
Power requirements	600 — 2000V negative, ±.005% per volt change in line voltage from 95 — 130 volts. (Optional cathode follower amplifier)		900 — 1100V at 50 micro amperes	0 — 2500V at 20 microamperes	900 ±0.5V; 300 ±0.3V
Overall Dimensions (D x L), inches	3-1/2 x 11	2-3/8 x 15	2-1/2 x 8-1/2	2-1/2 x 10-1/2	11 x 12

SCINTILLATION COUNTERS

Primary Function	Directional scanning of human heads	Measurement of total thyroid activity with I^{131} (Large angle)	Determined by scintillator. Alpha, beta, gamma, or neutrons	Determined by scintillator. Alpha, beta, gamma or neutrons	Alpha beta gamma
AEC No.	ABX–13A	ABX–14A	ABX–15A	ABX–16A	ABX–17A
Manufacturer Model No.	W. S. Macdonald 152HA	W. S. Macdonald	N R & D SC–3	N R & D SC–10	N R & D SC–5
Window Characteristics			Collimator can be attached		
Photomultiplier	Two RCA 1P21's in coincidence	Two RCA 1P21's in coincidence	RCA 5819	RCA 5819	RCA 5819
Scintillator and Dimensions (D x L), in.	Anthracene 1 x 1 x 1-1/2		Any of seven	Interchangeable	
Power requirements	900 ±0.5V; 300 ±0.3V	900V ±0.5V; 300 ±0.3V	600 — 2000V negative, ±.005% per volt change in line voltage from 95 — 130 volts	600 — 2000V negative, ±.005% per volt change in line voltage from 95 — 130 volts	600 — 2000V negative, ±.005% per volt change in line voltage from 95 — 130 volts
Overall Dimensions (D x L), inches	5-1/2W 3H 10L	2 x 3-1/2 or 6 x 2-1/2	2-5/8 x 10		

TABLE 1–2B. GENERAL ACCESSORY LIST (Continued)

SCINTILLATION COUNTERS

Primary Function	Gamma from solid or liquid samples	Thyroid glands and tumors (Directional, gamma)	General	General	General
AEC No.	ABX–18A	ABX–19A	ABX–20A	ABX–21A	ABX–22A
Manufacturer Model No.	Berkeley 250	Berkeley 253	RIDL 43	Tracerlab P–20	Atomic 223
Window Characteristics					No collimator available
Photomultiplier	RCA 5819	RCA 5819	RCA 5819		RCA 5819
Scintillator and Dimensions (D x L), in.			Interchangeable canned crystals		Any of several crystals (1, 1-1/2, 1-3/4) x (1/2, 1, 2) with or without wells
Power requirements	750 — 1250V at 100 microamperes; 280V at 10 milliamperes 6.3V AC at 0.175 amperes	750 — 1250V at 100 microamperes; 280V at 10 milliamperes; 6.3V AC at 0.175 amperes	Can be ordered for either negative or positive high voltage supply	800 — 1200V	1200 at 670 microamperes; 300V at 15 milliamperes; 6.3V AC at 0.3 amperes
Overall Dimensions (D x L), inches	5 x 10	5 x 13		2-1/2 x 15	4 x 14

SCINTILLATION COUNTERS

Primary Function	Gamma	Alpha, beta, gamma, neutron
AEC No.	ABX–23A	ACBX–2A
Manufacturer Model No.	Eltronics SDH	GE 9747109
Window Characteristics	1/2 in. thick lead tube shields the scintillator	2 in. D samples accommodated
Photomultiplier	RCA 5819	
Scintillator and Dimensions (D x L), in.	NaI, 1/2 x 1/2 x 1	
Power requirements	900 — 1100V at 50 microamperes (Optional 2 stage preamplifier with cathode follower)	
Overall Dimensions (D x L), inches	2-5/8 x 12	9H 14W 19L

TABLE 1-3. ELECTRON TUBE COMPLEMENT, RADIAC SET AN/UDR-9

UNIT	Units per Set	No. of Tubes of Type Indicated																					Total Tubes
		Ballast	OB2	2C53	3B24W	3C24	5V4	5R4GY/W	5651	5687	6AG7	6AH6	6AL5	6AL5W	6AQ5	6AS6W	6AS7	6AU5	6X4W	6SN7W	12AT7	12AU7	12AX7	
Power Supply PP-948/UDR-9	2			1	1	1	1	3	4								5		1		3	1		21
Trigger Amplifier AM-840/UDR-9	2									2	4	4			2	1		2			1	9	1	26
Radiac Indicator ID-364/UDR-9	1									5			20		1	2					1	15		44
Radiac Indicator ID-363/UDR-9	1	1	1							1				2				1		2				8
Radiac Detector DT-40/UD	1											2									1			3
Total Number of Each Type Tube		1	1	1	1	1	1	3	4	8	4	6	20	2	3	3	5	3	1	2	6	25	1	102

h. *Power Supply Requirement.*

CP–79/UD . . . . 105-130V, 55-65 cycles per second, 900 watts single phase.

AN/UDR–9 . . . . 105-130V, 55-65 cycles per second, 1818 watts single phase.

i. *Electrical Characteristics.*

(1) *Resolving Time.*—Approximately 0.8 microseconds, for random pulses or pulse pairs.

(2) *Counting Speed.*—Up to 1 million or more evenly spaced pulses per second.

(3) *High Voltage.*—Adjustable from zero to either +2500 or —2500 volts d-c. Maximum output current 0.5 milliamperes.

(4) *Available Counting Scales.*—Manual counting, seven predetermined count positions, and predetermined timing with internal and external timers for CP–79/UD.—Six overlapping counting rate ranges available, with output connection for pen recorder for CP–71/UD.

(5) *Radiac Detector DT–40/UD.*—Responds to alpha particles of 4 mev or greater energy. It will count approximately 20% of the total alpha producing disintegrations from a source being monitored. Background counting rate is less than 250 counts per hour.

5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The equipment required, but not supplied, is listed in Table 1-2.

6. EQUIPMENT SUPPLIED.

The equipment supplied is listed in Table 1-1 with over-all dimensions and nomenclature indicated. The electron tube complement of Radiac Computer-Indicator is given in Table 1-3.

SECTION II
THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS.

Figure 2-1 is an overall simplified block diagram of Radiac Set AN/UDR–9. Additional block diagrams are shown in Figures 2-4, 2-5, and 7-10. When exposed to nuclear radiation, electrical impulses are produced in the associated radiac detector. These impulses are coupled to the AM–840/UDR–9 Trigger Amplifiers in the CP–71/UD and/or CP–79/UD Radiac Computer-Indicators. In the CP–71/UD, the principal task is to provide (by means of Radiac Indicator ID–363/UDR–9) a calibrated meter reading of the average rate of arrival of the input pulses. In the CP–79/UD, pulses are coupled to Radiac Indicator ID–364/UDR–9, whose purpose is to indicate the number of counts for a given time interval or to indicate the elapsed time for a predetermined number of counts. Trigger Amplifier AM–840/UDR–9 has two functions: (1) to supply amplified uniform pulses to the ID–363/UDR–9 and ID–364/UDR–9, and (2) to provide an accurate time base for calibration of the ID–363/UDR–9, and for drive and predetermined timing signals in the ID–364/UDR–9. The time base also supplies accurate signals for testing both the ID–363/UDR–9 and ID–364 UDR–9. Radiac Detector DT–40/UD is for detection of alpha radiation and may be used with either the CP–79/UD or CP–71/UD.

2. DETAILED CIRCUIT ANALYSIS.

a. *Radiac Detector DT–40/UD.*—Figure 7-17 is a schematic diagram of the DT–40/UD pre-amplifier. The circuitry consists of a three-stage amplifier with negative feedback. Tubes V-901 and V-902 are pentode amplifiers and V-903 is a cathode follower which provides the output pulses to either the CP-71/UD or CP–79/UD. The feedback path is from the cathode of V-903 to the cathode of V-901. The pulses produced by the action of alpha radiation in the detector chamber are applied to the control grid of V-901 through the high voltage capacitor C-904. High voltage to the detector is supplied through resistors R-901 and R-902. The amplified pulses at the plate of V-901 are coupled to V-902. Direct coupling is employed from the plate of V-902 to the grid of V-903. Pulses

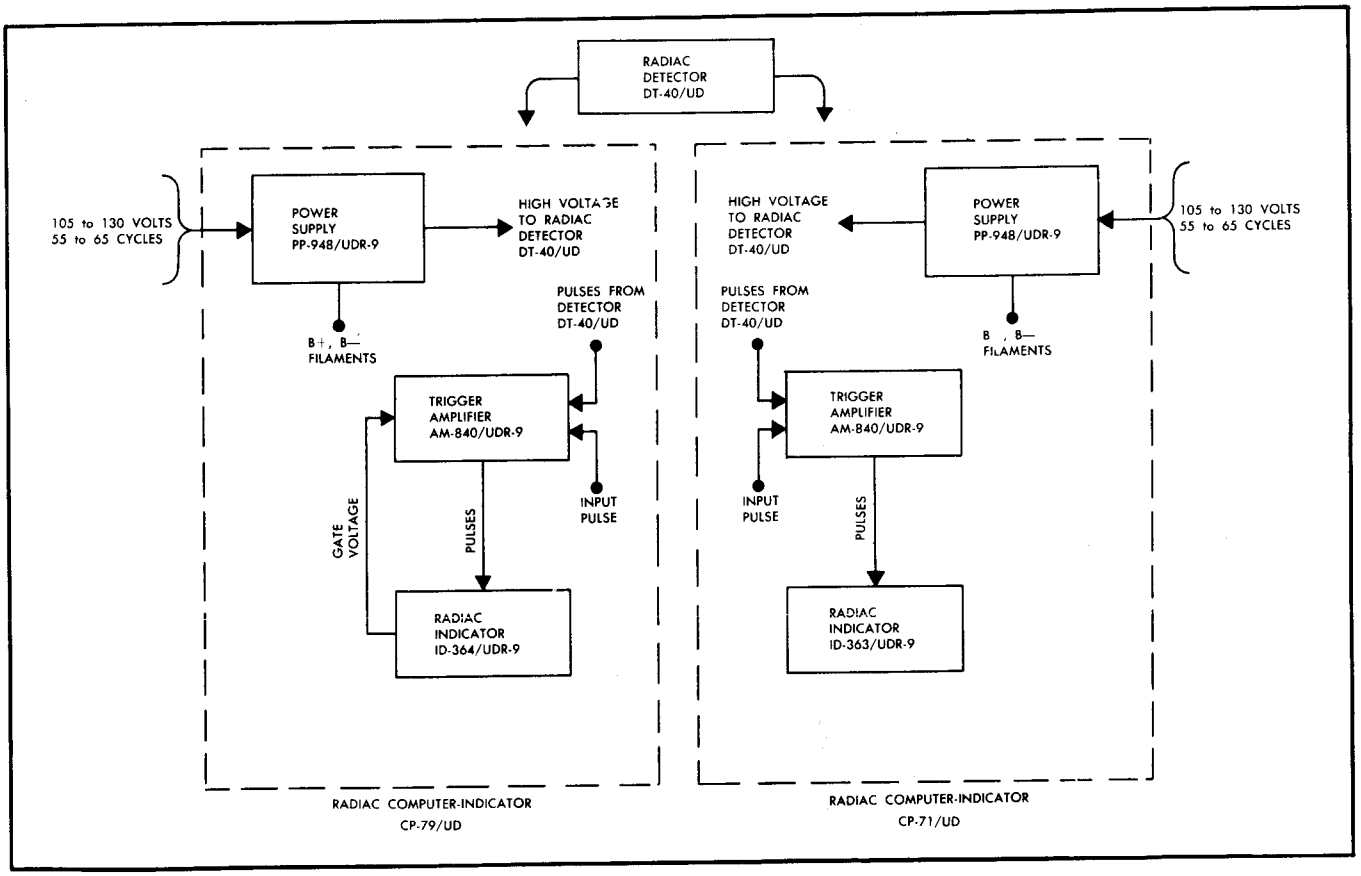


Figure 2-1. Radiac Set AN/UDR-9, Simplified Block Diagram

at low impedance are provided from the cathode of V-903. Plate and filament voltages are supplied through connector J-903 from Power Supply PP-948/UDR-9.

b. *Trigger Amplifier AM-840/UDR-9.*

(1) Figure 7-11 is a complete schematic diagram of this unit. For purposes of circuit explanation, a block diagram, Figure 7-10, is also provided. Two signal inputs are available, both accessible from the front panel. They are (1) G-M INPUT and (2) INPUT PULSE. The G-M input is coupled to V-212, a cathode follower, through a high voltage capacitor, C-240. (The G-M input is at a high d-c potential.) An additional connection, J-209, is available on the chassis of the Trigger Amplifier for coupling to V-212. The CRO input provides a connection to observe on an oscilloscope those pulses applied to the INPUT PULSE connector.

(2) The INPUT PULSE connector is coupled through K-201 to the five-position time constant selector, S-201, which is followed by a step attenuator network. The time constant network permits the choice of a differentiating or decay time which can be selected by the operator to meet particular requirements. The following time constants are available: 1000, 100, 10, 1, and 0.1 microseconds. These values indicate the time after application of an input pulse when the voltage to the input of the first decade amplifier will be down to 1/e times the input voltage, where e is the base of the natural logarithm (2.718). The input impedance of the network is about 100,000 ohms shunted by 120 mmf on the 1000 microsecond range, and drops to 1,000 ohms on the 0.1 microsecond range. The time constant network and the input multiplier are bypassed when the G-M input is used. The relay K-201 is activated by switch S-402A in Radiac Indicator ID-364/UDR-9. When S-402 is in the TEST or CALIBRATE positions, relay K-201 is energized. This enables a selected pulse (selected by S-402B) of either 100KC or 100 cps to be fed into the Trigger Amplifier circuits for testing or calibrating purposes. If S-402 is in the OPERATE position, relay K-201 is not energized. In this position, the input signal comes directly from the INPUT PULSE jack on the front panel or rear chassis. The relay K-201 thus acts as a remote signal selector controlled by S-302 in the ID-364/UDR-9.

(3) Input Multiplier.

(a) A schematic diagram of the Input Multiplier is shown in Figure 7-11. The multiplier consists of a seven position, 2-section switch with associated resistors and capacitors which constitute voltage dividers with ratios of 1, 2, 5, etc., indicated by the numbers opposite the corresponding switch positions. It is to be noted that all the resistor elements have fixed values totaling approximately 100,000 ohms for each multiplier step, except the 1:1 position. The series capacitor elements of the voltage dividers are adjustable so that the relationship of resistance and capacitance can be adjusted in manufacture to be the same for the series and shunt portions of each divider. This is necessary for undistorted transmission of signal pulses containing components covering a wide frequency band.

(b) Shunted around each complete divider is an adjustable capacitor which cannot alter the RC relationship within the divider itself. The purpose of these capacitors, C-247, C-250, C-253, C-256, C-259, and C-262 is to permit factory adjustment of the over-all input capacitance so that for each multiplier step the same RC relation will hold at the multiplier input.

(c) To establish the proper level for counting various sized pulses, it is necessary to multiply the DISCRIMINATOR LEVEL VOLTS dial by the ratio of the particular voltage divider used. Thus, to count all pulses above 0.2 volts, set INPUT MULTIPLIER at "X1" and DISCRIMINATOR LEVEL VOLTS at 0.2.

(4) Decade Amplifiers.

A phase inverter, V-213, may be switched into the circuit between the attenuator and first decade amplifier by means of the PULSE INPUT POLARITY switch, S-203A. The purpose of V-213 is to provide a negative pulse at the input of V-214 when a positive pulse is applied to the INPUT PULSE connector. Two decade amplifiers, consisting of V-214 through V-216, and V-217 through V-219, follow the phase inverter V-213. The G-M input is applied to cathode follower V-212. Pulses from the cathode are coupled to V-214 through S-203A. The first decade amplifier, V-214, V-215, and V-216, is stabilized with negative feedback (R-305 and R-313) and is designed to provide a gain of 10. With large input signals limiting takes place in this amplifier, the first tube, V-214, being cut off by the negative pulse on the control grid. By means of the feedback loop, however, the amplifier recovers very fast after removal of the overdriving signal, this action being necessary in order for the amplifier to respond to closely spaced pulses. The positive pulse from the plate of V-216 is coupled to the input of the second decade amplifier. This amplifier consists of two RC coupled pentodes, V-217-218, and a cathode follower output tube V-219. The cathode follower provides a low impedance driving source for coupling sharp positive pulses to the pulse discriminator V-221-222. A gain control, R-333, in the cathode of V-219, permits the total gain of the amplifiers to be set at 100.

(5) Pulse Height Discriminator. (See Figure 2-2.)

The variable bias tube, V-220 is used in conjunction with the pulse height discriminator, V-221-222. The bias voltage is controlled by the front panel

resistor R-319, DISCRIMINATOR LEVEL VOLTS, and is incorporated so that it is possible to have triggering on various sized pulses. Adjustment of R-319 varies the grid potential of V-220, hence the plate current flow through the tube. This current flow develops a bias at the cathodes of V-220 and is applied through R-322 to the grid of V-221. The crystal diodes CR-203 and CR-204 are necessary in order to keep the voltage on the grid of V-221 the same as the reference voltage on the cathode of the discriminator level tube V-220. It is possible for rectified grid current from V-221 to build up a bias on the grid of V-221 in reference to the cathode of V-220 if the diodes CR-203 and CR-204 were not present. Two diodes are employed in order to maintain the voltage across them within the rated voltage of the diode. Operation of the discriminator circuit is explained by use of the simplified schematic diagram, Figure 2-2. The purpose of the discriminator, in effect a two-tube trigger circuit, is to reject all pulses which appear at the output of the second decade amplifier smaller than the chosen level. This action produces uniform output pulses which are coupled to the driver stages. The discriminator consists of two high-gain pentodes, V-221-222, with direct couplings. One coupling consists of R-338, between the plate of V-221 and control grid of V-222, and the other coupling is the common cathode resistor R-339. Operation is such that the circuit triggers in one direction when the input voltage is raised to a certain value and triggers in the reverse direction when the input voltage decreases to another value below the first. These two levels can be made to vary by changing the value of the Sensitivity Control R-342. In practice, triggering on pulses between 10 and 100 volts at the discriminator input is obtained by means of the DISCRIMINATOR LEVEL VOLTS control R-319, the INPUT MULTIPLIER S-202, the Disc Range Control R-317, and the Sensitivity Control R-342. For purposes of discussion, assume that V-221 is cut off and V-222 conducting. Current flow through R-339 develops a bias voltage which cuts off V-221. If a postive pulse is then applied to the signal grid of V-221 and is sufficient to overcome the bias across R-339, V-221 will conduct, driving the grid of V-222 to cut off. This reduces current flow through V-222 and also the bias voltage across R-339, simulta-

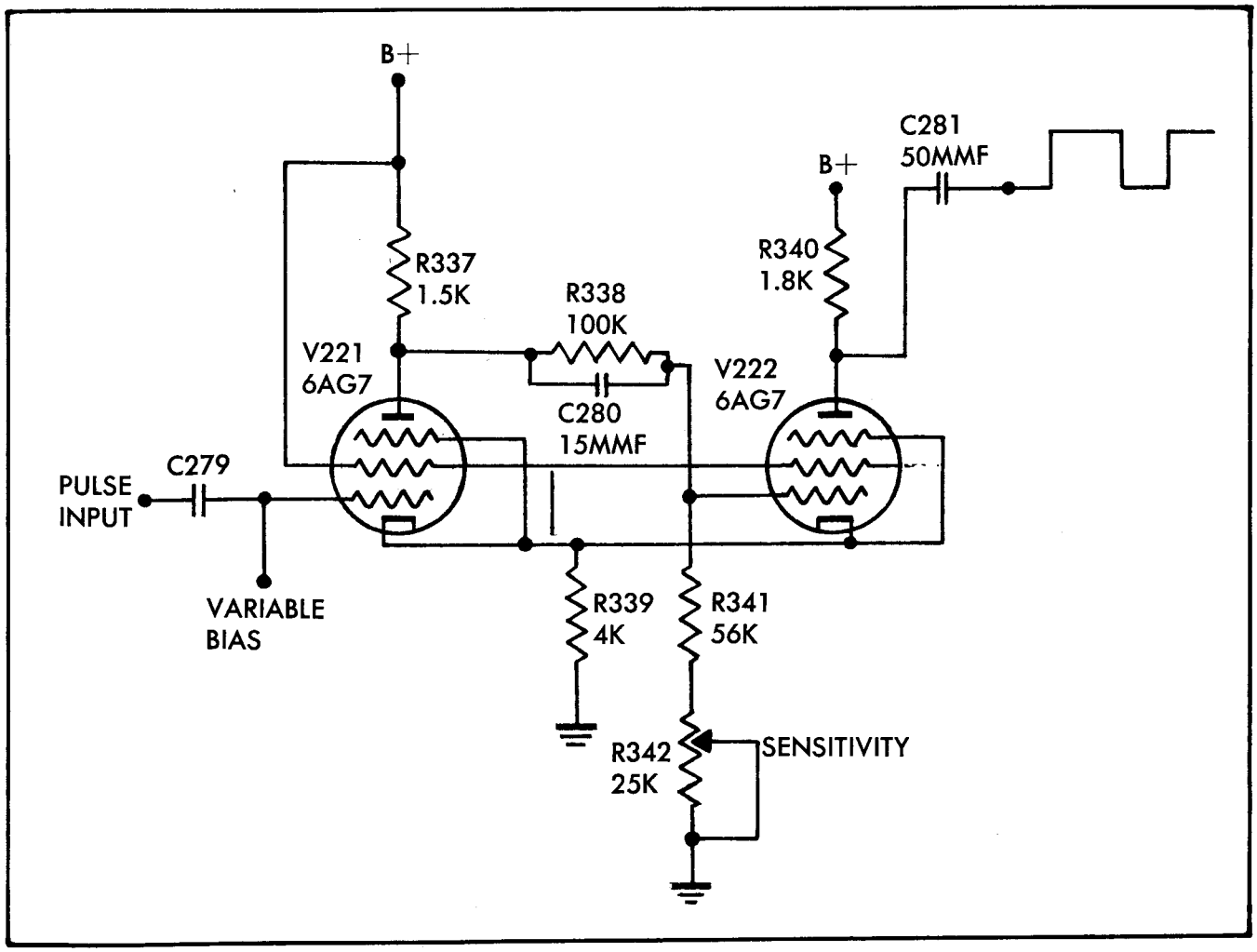


Figure 2-2. Pulse Height Discriminator, Simplified Schematic

neously making the grid of V-221 more positive. The effect is a cumulative one and a rapid change from one condition to the other is obtained. A small capacitor, C-280, is connected across R-338 in order to increase the rapidity of the triggering action and to allow the circuit to operate with an input signal consisting of a brief pulse. The output voltage at the plate of V-222 is a square wave whose amplitude is a function of the setting of R-342 and nearly independent of the settings of the other discriminator controls. The DISCRIMINATOR-DRIVER jack J-204 is provided to enable the trigger tube V-221 to be used as a trigger for d-c or very slowly recurring waveforms. D-C coupling is provided to V-221 to enable the circuit to respond to these slowly-recurring waveforms. In the event that the AM–840/UDR–9 is used for this purpose, both the signal and d-c reference voltage must be supplied externally.

(6) Gate and Driver Circuit.

The discriminator output is differentiated and applied to the control grid of the signal gate pentode V-223. Negative pulses are removed by the diode CR-201. V-223 acts as a switch between the discriminator and the drivers V-224 and V-225. The polarity of the voltage on the suppressor grid of V-223 determines whether or not the grid signal voltage is amplified. The polarity of the gate voltage applied to the suppressor grid is determined by the Gate Control tube V-402 in Radiac Indicator ID–364/UDR–9, and by the STANDBY-OPERATE-CALIBRATE switch S-102 in Radiac Indicator ID–363/UDR–9. When the gate voltage is zero, or slightly positive, the positive pulses on the control grid of V-223 are amplified and fed to the drivers. The driver tubes, V-224 and V-225, are high-perveance power pentodes. V-224 is cut off by the negative pulse from V-223, and the grid of V-225, direct-coupled to the plate of V-224, is cut off because of the voltage drop across R-350. With a positive pulse applied to its grid, V-225 conducts heavily and a sharp negative pulse is produced at the plate. The length of this pulse is determined by the time constant of L-203, 500 mmf, and the distributed capacitance in this plate circuit. The output pulse from V-225 is coupled through a high impedance delay line through the chassis connectors to the ID–364/UDR–9 in the CP–79/UD and to the ID–363/UDR–9 in the CP–71/UD. Use of the delay line preserves the rise time of the output pulse so that a sharp negative pulse is supplied to both Radiac Indicators.

(7) Aural Monitor.

A blocking oscillator, V-226, is used in the aural monitor circuit. Positive pulses from the plate of V-224 trigger the oscillator, and the output is coupled to a speaker. At low repetition rates an audible pulse is produced for each count, but at high repetition rates a continuous tone is heard. Volume is controlled by the front panel resistor R-369, AURAL MONITOR.

(8) Time Base.

The time base provides highly accurate signals for calibration of the ID–363/UDR–9, as drive for the clock and predetermined timing pulses in the ID–364/UDR–9, and as test signals for both the ID–363/UDR–9 and ID–364/UDR–9. The time base derives its accuracy from a 100KC crystal, Y-201, and its associated oscillator V-201. A fine frequency internal adjustment of the oscillator is provided by a small trimmer capacitor, C-211. The output of the oscillator is coupled through C-205 to the clipper stage, V-202, which transforms the sinusoidal oscillator voltage into a rectangular wave for driving the frequency dividers, V-203 through V-205, and V-207-208. These dividers, which are one-shot multivibrators that synchronize on an integral fraction of the input frequencies, divide the crystal frequency by 10^5. The division ratio depends upon the time constant of the RC combination of the left-hand plate to right-hand grid capacitance, and the variable resistance from right-hand grid to B+. With proper adjustment of the grid potentiometers one output pulse is produced for each ten pulses applied to the input. A tap at the output of each divider is fed to the Timing Pulse selector switch S-204 to provide a series of timing pulses for Radiac Indicator ID–364/UDR–9. Test points are provided at each divider output so that the operation may be observed on an oscilloscope. The divider stages are all identical except for the size of the left-plate to right-grid coupling capacitors. The values of these capacitors increase as the repetition rate of the pulses decreases. Unless a malfunction occurs and is attributed to a grid potentiometer, these controls should not be changed, otherwise the division ratio will be changed. The 100 CPS signal from V-205 is applied to V-206, a binary, and the resultant 50 cps square wave is filtered by C-236 and L-202. The filtering action produces a 50 cps sine wave output which is amplified by V-209 and the pushpull amplifiers V-210, V-211. The 50 cps input level to V-209, and hence the pushpull output level, is controlled by R-275, 250K. This adjustment is set to provide an output of 105 volts for driving the clock in Radiac Indicator ID–364/UDR–9.

c. *Radiac Indicator ID–363/UDR–9.*

(1) General Circuit Description.

(a) The ID–363/UDR–9 circuitry consists of a one-shot multivibrator and its coupling diode, a switch tube, count rate circuits and integrating network, a two-decade log converter, and a d-c amplifier with an indicating meter.

(b) Figure 2-3 is a diagram illustrating the basic circuit arrangement of the ID–363/UDR–9 which will aid in analysis of circuit operation. Each pulse to be counted is represented by a rectangular pulse shown at the pulse source "e". Resistor R_1 represents the output impedance of the pulse source. The

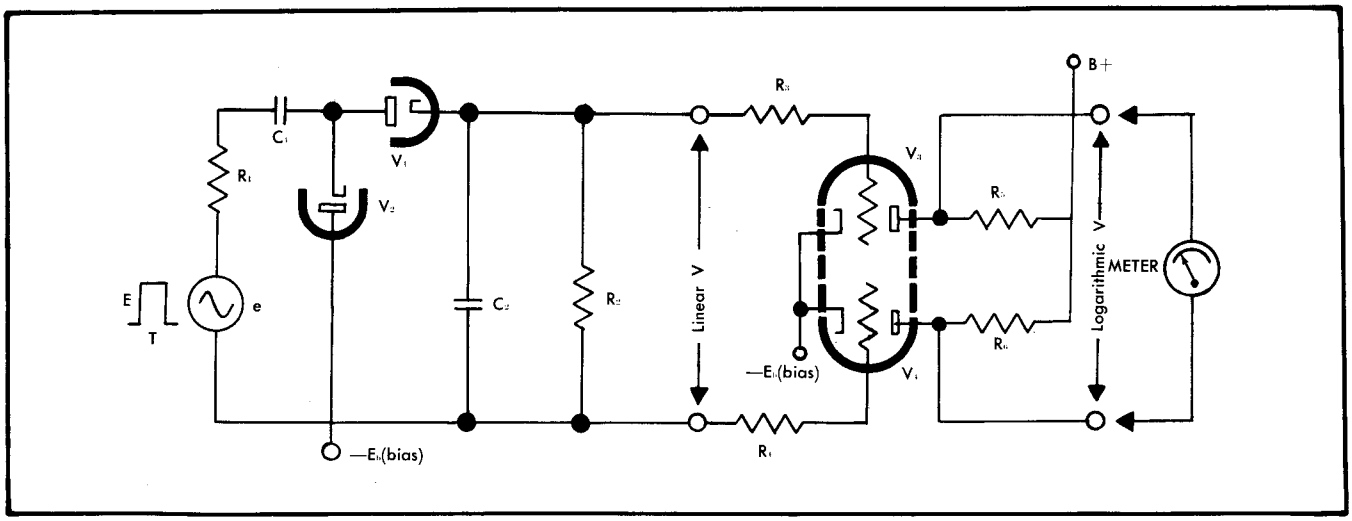


Figure 2-3. Radiac Indicator ID-363/UDR-9, Basic Circuit Diagram

height of each pulse (E) to be counted is assumed to be the same for all pulses. Diode V_2 clamps the negative level of the pulse to the bias voltage (—Eb), while diode V_1 conducts only when its plate is positive. The duration (T) of each pulse must be long enough to ensure that capacitor C_1 becomes fully charged before the pulse ends. Each pulse to be counted causes a definite amount of charge to be placed on capacitor C_2 in a short time compared to the average spacing of the incoming pulses. The amount of charge placed on C_2 is equal to the charge acquired by C_1. Between pulses, C_2 discharges through resistor R_2, making the average potential across C_2 proportional to the counting rate. Under these conditions, pulse width T should be equal to, or larger than $5R_1C_1$. Also, C_2 is made much larger than C_1, and E is much larger than V, which, in turn, is larger than —Eb. With the values of R_1, E, C_2, and V known, the values of R_2, C_1, and T may be calculated to satisfy the requirements of counting rate or frequency. In the ID–363/UDR–9, the values corresponding to R_2, C_1, and T are made adjustable in order to provide several counting rate ranges, integrating time constants, and pulse widths. The function of V_3 is to convert the linear voltage to one which varies logarithmically. R_3 is large compared to grid-cathode resistance, the result being that grid current has a logarithmic relationship with the applied voltage. V_4 serves as one half of the bridge which is necessary in order to maintain stability of operation. Its characteristics and associated parts R_4 and R_6 are identical with those of V_3.

(2) Detailed Circuit Analysis.

(a) Figure 7-16 is a complete schematic of the ID–363/UDR–9. The input to the unit consists of negative pulses of approximately 45 volts peak-to-peak from Trigger Amplifier AM–840/UDR–9. These pulses are coupled through the left hand diode of V-101 to the one-shot multivibrator V-102. The right hand diode of V-101 clamps the positive level of the pulse to ground. Section S-101B of the COUNT RANGE couples one of three capacitors (C-104, C-105, or C-106) to the right-hand grid of V-102. These capacitance values determine the pulse width of the multivibrator output. The pulse width is approximately 0.6 microseconds on the $X10^5$ and $X10^4$ (C-106) ranges, approximately 6 microseconds on the $X10^3$ and $X10^2$ (C-105) ranges, and approximately 66 microseconds on the X10 and X1 (C-104) ranges.

(b) The negative pulses from V-102 are coupled to the switch tube, V-103, whose purpose is to act as a pulse source for the counting rate circuit. The positive pulses (approximately 250 volts amplitude) from V-103 are fed to the count rate circuit and integrating network. These pulses are of constant width and amplitude but vary in frequency according to the input signal. Each pulse, coupled through the capacitor (C-109-C-112) places a charge on C-113. The result is a d-c voltage, across C-113 and the integrating resistor (R-116 through R-121) which varies from zero to +20 volts. This is a small portion of an exponential function which therefore approximates the desired linear function. This d-c voltage is fed to the log converter circuit (V-105), which converts the linear d-c voltage to a logarithmic function of that voltage in two decades. The integration time constant may be adjusted for each range by means of individual potentiometers, R-122-127. The METER DEFLECT switch, S-103, permits the meter to be deflected, up or down, in a reasonable length of time when the unit is counting on the low ranges, and the integration time constant is excessively long.

(c) This linear voltage is next coupled to the log converter stage (V-105), whose function is to convert the linear voltage to one which varies logarithmically, this being necessary inasmuch as the meter is calibrated logarithmically in order to register the wide range of counts encountered. The prin-

ciple of operation, with the tube employed, is based on the fact that there is a logarithmic relation between the applied grid voltage and the resultant grid current. Inserting a resistance in series with the grid of V-105 (R-131), large in comparison with the grid-cathode resistance of the tube, causes the grid-cathode voltage to be negative and hence act as a retarding potential. As the impressed voltage is increased, the retarding potential decreases and bears a logarithmic relation to the impressed voltage. Over the range in which the plate current is linear with the grid-cathode voltage, the plate current will be logarithmic with the impressed voltage. Changing the heater voltage changes the slope of the straight line characteristic and therefore the heater voltage is maintained constant by using ballast tube VR-101. It is also helpful to employ a circuit arrangement that is inherently stabilized against changes. A comprehensive balancing system is obtained by using an auxiliary balancing tube, one-half V-105, to prevent zero drift. The auxiliary tube must have an equivalent amplification factor and plate resistance that are the same as those of the first tube, so that when the two tubes are placed in a bridge circuit, the effect of variations in the supply potential on the zero deflection of the output meter can be balanced out. The voltage to be measured is applied between grid and ground of the first tube, while the grid of the other tube is grounded. With no input voltage, the plates of the two triodes are at the same potential, and no current flows in the indicating meter. With D.C. voltage applied to the grid of the first tube, the plate resistance of this triode is changed and the bridge is unbalanced, causing a current to flow in the meter.

(d) The output of the log converter, V-105, drives the d-c amplifier-meter circuit V-106, M-101. With a d-c voltage of 20 volts applied to the log converter, the meter reads full scale. With a voltage of 2 volts applied, the meter reads mid-scale, and with 0.2 volts applied, it reads 0.1 on the scale. With no voltage applied, the meter reads zero. For calibrating purposes, the voltages necessary to give .1, 1 and 10 readings on the meter are supplied by the voltage divider circuit consisting of R-128, R-129, R-130, and R-148, in conjunction with the three pushbutton switches S-104, S-105, and S-106.

(e) The STANDBY-OPERATE-CALIBRATE switch S-102 provides three separate functions. The STANDBY position removes input signals and allows the ID-363/UDR-9 to be left in the warm-up condition. In the OPERATE position, the unit operates normally to indicate counting rate. In the CALIBRATE position, crystal controlled timing pulses are supplied from Trigger Amplifier AM-840/UDR-9 for calibrating the meter. The meter should indicate center scale (1.0) at all positions of the COUNT RANGE switch, S-101.

(f) Filament voltage regulation for the d-c amplifier V-106 is provided by a separate filament transformer, T-101, and a ballast tube V-101.

(g) Two phone jacks, J-101 (front panel), and J-102 (rear of chassis) are available so that a recorder (such as a one ma Esterline-Angus pen recorder) may be inserted for a permanent record of counting rate.

d. *Radiac Indicator ID-364 UDR-9.*

(1) General. A simplified block diagram is shown in Figure 2-4. The theory of operation of Radiac Indicator ID-364/UDR-9 involves three functions, each controlled from the front panel. These functions are: (1) MANUAL, (2) PREDETERMINED COUNT, and (3) PREDETERMINED TIME. During MANUAL operation, counting is controlled by means of the RESET-STOP-COUNT switch on the front panel. During PREDETERMINED COUNT operation, stopping is accomplished automatically. The operator selects the number of counts desired, turns RESET-STOP-COUNT switch to COUNT, and after this number has been accepted the counting ceases. The time required for the count is then shown on the clock. In the PREDETERMINED TIME operation three positions are provided: TIME, INTERNAL, and EXTERNAL. In the TIMER position, an external timer must be used. The timer is set to the time interval desired, counting started by RESET-STOP-COUNT switch and at the end of the interval counting is automatically stopped and the number of counts indicated on the register and lamp panel. In the INTERNAL position counting is both started and stopped by timing pulses from the crystal controlled time base in Trigger Amplifier AM-840 UDR-9. The clock then indicates the time required for the count indicated on the lamp panel and register. The EXTERNAL position is similar to the INTERNAL position except that timing pulses are supplied from an external source.

(2) Detailed Analysis.

(a) Control Circuits. (See Figure 7-12)

1. With the function switch, S-401, set for MANUAL operation, a positive voltage pulse is applied through S-401B to the control grid of V-404 when the RESET-STOP-COUNT switch is rotated to the COUNT position. The negative plate pulse of V-404 is then fed to the Gate Control tube V-402, cutting off the left-hand triode and lowering the plate potential of the right-hand section. The increase in plate voltage of the left-hand triode is coupled directly to the grid of V-407A, allowing conduction through the tube. This permits the Count Lamp I-401, to light. The pulse at the cathode is fed to the control grid of the Clutch Amplifier V-408. This action energizes the clutch coil L-401. In addition, the positive pulse at the cathode of V-407A is coupled to the suppressor grid of the Stop Gate V-403,

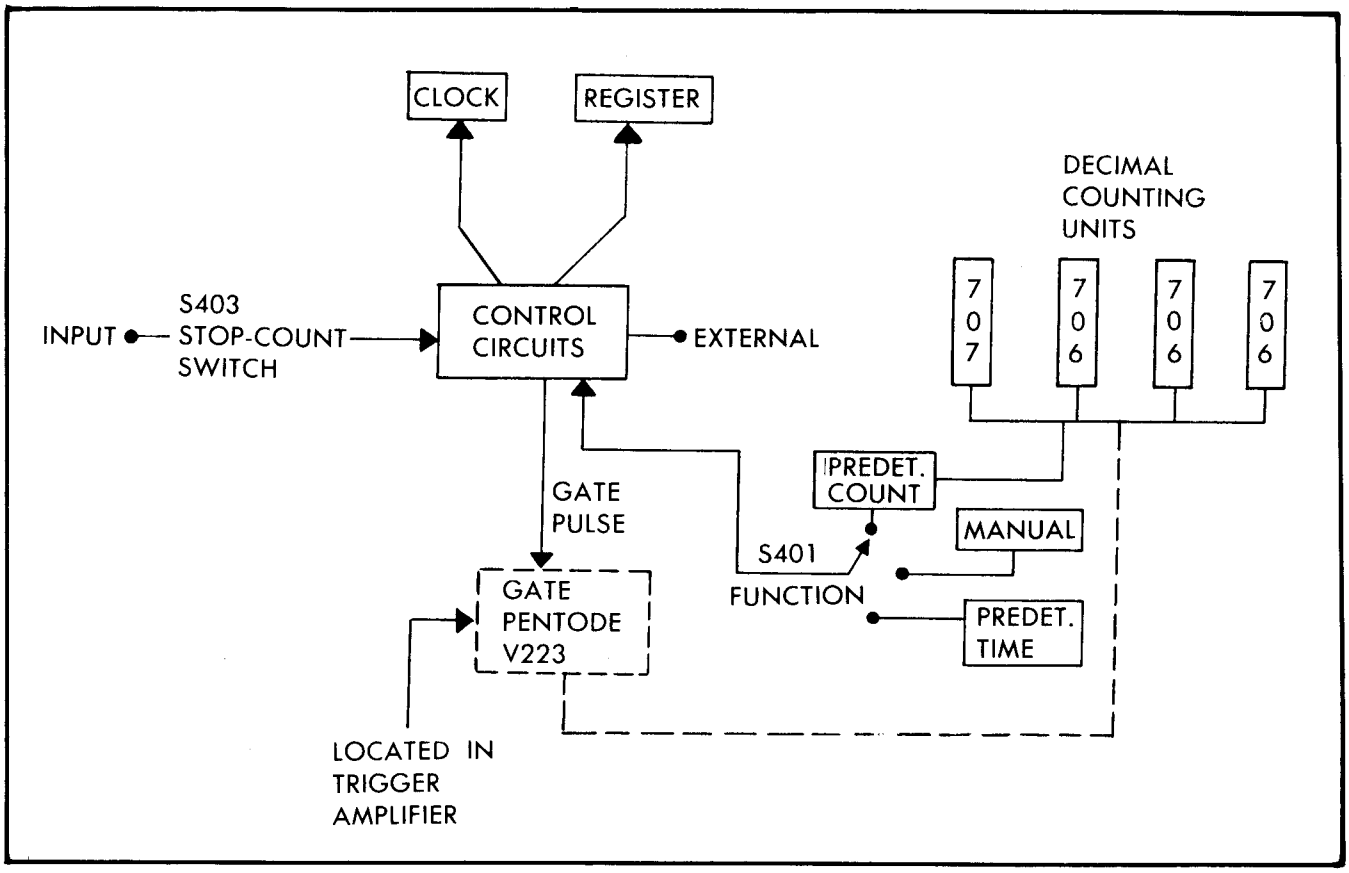


Figure 2-4. Radiac Indicator ID-364/UDR-9, Simplified Block Diagram

turning this tube on, and to the Signal Gate V-223, in Trigger Amplifier AM–840/UDR–9. When the Control switch is turned to the STOP position, a positive pulse is applied through S-401A to the control grid of the Stop Gate V-403, which triggers the Control tube V-402 to its previous state. The negative trigger pulse is also coupled to the Latching Binary V-401, cutting off the left-hand triode section. With the right-hand triode of V-402 cut off, the decrease in plate voltage of the left-hand triode is fed to the grid of V-407A, turning it off and simltaneously stopping the clock, extinguishing the Count Lamp I-401, and turning off the Signal Gate V-223 in Trigger Amplifier AM–840/UDR–9. To begin another count, the Control Switch is then turned to RESET, which returns the count to zero, and the Latching Binary to its original condition.

2. Operation in the PREDET. COUNT position is identical to the MANUAL operation except that the "stop" signal is an amplified pulse from the decimal counting units which corresponds to the particular count. This pulse is coupled in through capacitors C-419 through C-243 to S-401C and to the grid of V-407B through the COUNT position of S-403A.

3. In the TIMER position of the function switch, the starting signal is the same as in MANUAL operation. The stop signal, however, is a pulse supplied from pin D of the ACCESSORIES connector J-401. In the INTERNAL position, both "stop" and "start" signals are amplified pulses from the time base in Trigger-Amplifier AM-840/UDR–9. These pulses are fed in from pin 7 of P-401 to the grid of V-407B through the INTERNAL position of S-401C. In EXTERNAL operation, the "stop" and "start" signals are supplied externally through the GATE PULSE INPUT connectors J-403 or J-404, located on the front panel and rear of chassis of Radiac Indicator ID–364/UDR–9.

(b) Decimal Counting Units.

1. The Decimal Counting units are counters which directly indicate the number of electrical pulses received, regardless of rate (up to 1,000,000 or more evenly spaced pulses per second for Unit 707 and up to 200,000 or more evenly spaced pulses per second for Unit 706). The 706 and 707 units are scale of 10 single chassis electronic counting units. For random pulses or pulse pairs, the resolving time is 0.8 microseconds for the 707 unit, and 2.5 microseconds for the 706 unit. Each unit counts from zero to nine, the tenth pulse setting the unit back to zero and at the same time generating a pulse at the output connection. Except for counting speeds both units are similar in circuitry and operation. Three 706 units and one 707 unit are used in Radiac Indicator ID–

364/UDR–9.

2. The input pulse to the 706 counting unit should have a rise time of 0.5 microseconds and a peak amplitude of —100 volts with respect to B+ in order to drive the unit at the maximum repetition rate. A pulse of —50 volts can be used at lower repetition rates. Pulses having a longer rise time than 0.05 micro-seconds will necessitate larger pulse amplitudes. The maximum pulse amplitude, however, should not exceed 180 volts.

3. The power supply requirements for each counting unit, furnished by Power Supply PP–948/UDR–9, are as follows:

706 Counting Unit

Plate — 300V d-c (regulated) 25 ma
Heater — 6.3V a-c, 1.2 amps
6.3V a-c, 1.5 amps at 300V d-c

707 Counting Unit

Plate — 300V d-c regulated, 145 ma
Heater — 6.3V a-c, 3.6 amps
6.3V a-c, 1.5 amps at 300V d-c

4. Figure 2-5 is a simplified block diagram of the decimal counting unit. The basic circuit is a four-stage binary scale-of-16 that is permuted to a scale-of-10 operation. Each stage is a scale-of-two (flip-flop) circuit which acts as an impulse divider, producing one output pulse for two input pulses. Diodes are used as coupling between stages. The unit operates as a binary scaler until the eighth input pulse is received. The 4th stage does not change its position until the eighth pulse. At this time the "off" plate of the second stage is clamped by a diode connected back to the fourth stage, at a voltage such that the first stage cannot drive the second stage until the clamp is released. The ninth input pulse flips the first stage in the usual manner. The tenth input pulse "flips" the first stage, driving the fourth stage back to its original state. This releases the clamp on the second stage and all the stages are in the "zero" condition. The first stage cannot change the position of the fourth stage again until the eighth input pulse "flips" the fourth stage. The output of the 707 counting unit is a rectangular waveform which has a value of 235 volts from "0" to "7" count, rises to 255 volts at the "8" count and to 280 volts at the "9" count, and on the 10th ("0") count drops to 235 volts. The output of the 706 counting unit is a rectangular waveform which has a value of 180 volts from "0" to "7" count, rises to 235 volts at the "8" count, and to 280 volts at the "9" count, and on the 10th ("0") count drops to 180 volts.

5. A simplified schematic diagram of one stage is shown in Figure 2-6. The circuitry consists of a modified Eccles-Jordon trigger network with two stable states, commonly referred to as a binary. The binary is simply a two-stage amplifier with the output of the second stage direct-connected to the input of the first, as shown in Figure 2-6. In this manner the circuit operates in a "loop." With no input pulse applied through the diodes V_3 or V_4, the loop gain is less than one, and the circuit is in one of two stable states: either V_1 conducting and V_2 cut off, or V_2 conducting and V_1 cut off. The circuit is triggered from one state to the other by making the loop gain greater than one. The binary is coupled to a single trigger source through the diodes V_3 and V_4 so that only negative pulses cause triggering action. If the input signal has a steady value equal to B+, neither diode, V_3 or V_4, conducts since the cathode potential is then approximately equal to the plate potential. For simplification, assume that V_2 is conducting and V_1 is cut off. If a negative pulse is applied to the input, V_3 will conduct, and since its resistance is small compared to that of R_1, there is a drop in the plate voltage of V_1. This drop in voltage is transferred through the cross-over network (R_5, R_8, C_2, and the grid-to-ground capacitance of V_2) and applied to the grid of V_2. The plate voltage of V_2 then starts to rise, and the grid of V_1 does likewise. If the input pulse is of sufficient amplitude to make the loop gain greater than one, the binary is then triggered to

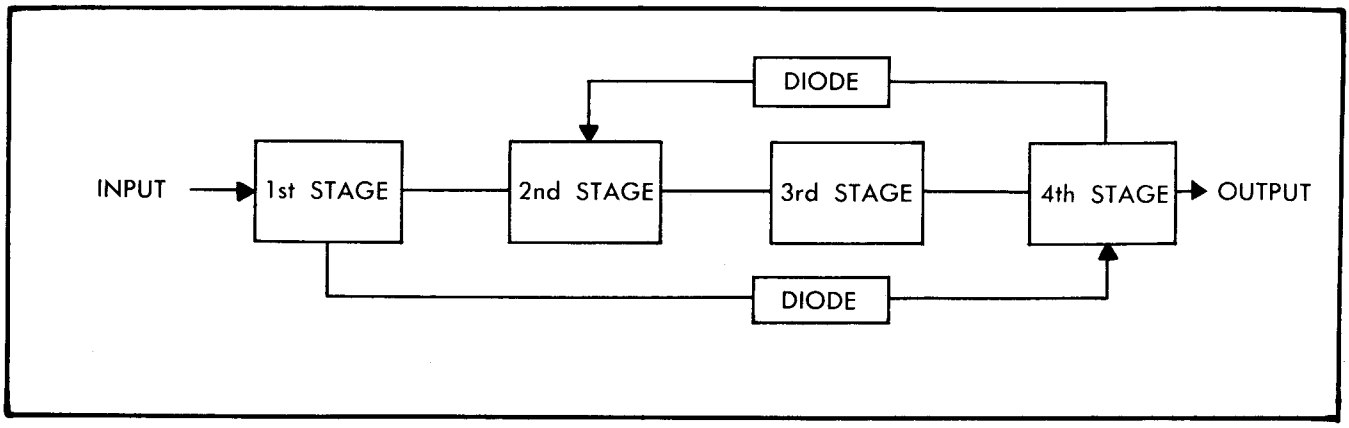


Figure 2-5. Decimal Counting Unit, Simplified Block Diagram

its other stable state — V_1 conducting and V_2 cut off. The next input pulse then causes the binary to return to its original state. In this manner the binary completes one cycle for every two input pulses and is frequently called a "scale-of-two". By arranging the binary stages in cascade, a counter having a scale of any power of two can be obtained.

6. The decimal counting units in Radiac Indicator ID–364/UDR–9 are made up of four binary stages, giving a scale-of-16 that is permuted to a scale-of-10 operation. Coupling between binary stages is done by means of diodes. Complete schematic diagrams of the 706 and 707 decimal counting units are shown in Figures 7-14 and 7-13. The chart below shows the sequence of the triggering action of the four binary stages. The "+" indicates when a tube is conducting and the "—" indicates when a tube is not conducting.

The first binary stage will trigger from one stable state to the other once for each input pulse, and operate through one complete cycle for every two input pulses applied. For every two input pulses applied to

TABLE 2–1. TRIGGERING SEQUENCE OF BINARY STAGES IN DECIMAL COUNTING UNITS

COUNT	V_1		V_2		V_3		V_4	
	A	B	A	B	A	B	A	B
0 (10	—	+	—	+	—	+	—	+
1	+	—	—	+	—	+	—	+
2	—	+	+	—	—	+	—	+
3	+	—	+	—	—	+	—	+
4	—	+	—	+	+	—	—	+
5	+	—	—	+	+	—	—	+
6	—	+	+	—	+	—	—	+
7	+	—	+	—	+	—	—	+
8	—	+	—	+	—	+	+	—
9	+	—	—	+	—	+	+	—

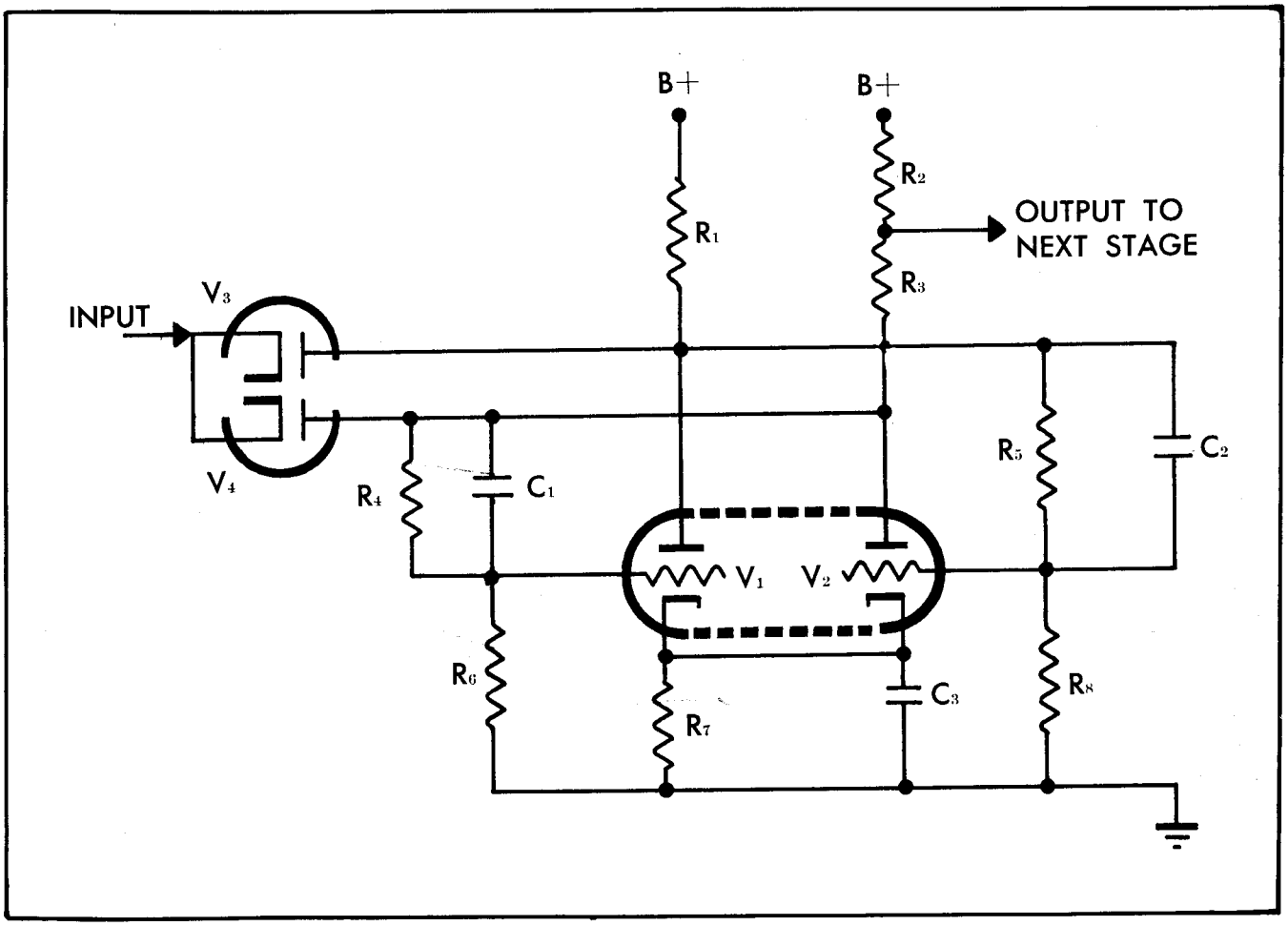


Figure 2-6. Decimal Counting Stage, Simplified Schematic

the first binary, the second binary will trigger from one stable state to the other. Consequently, it takes four input pulses to the first binary to make the second binary operate through one complete cycle. Similarly, it takes eight input pulses to the first binary to make the third binary operate through one complete cycle and 16 input pulses to make the fourth binary operate through one cycle. Hence, in order to obtain decimal counting, it is necessary that the circuitry be arranged so that the fourth binary will operate properly with only 10 pulses applied to the input.

7. The decimal counting units operate in the manner described above up until the eighth input pulse. By referring to the schematic diagram, Figure 7-13, of the 707 decimal counting unit, it is seen that the "off" plate of the second binary (left side of V-707) is clamped or held in this condition by the right side of diode V-702 upon application of the eighth input pulse. This diode has its plate connected to the plate of the left side of V-707, and its cathode connected to the fourth binary V-709. The second binary, V-707, is clamped at a voltage such that the first binary cannot drive it to its other stable state until the clamp is released.

8. The ninth pulse at the input triggers the first binary to its other stable state. The rest of the binaries remain in the same condition as they were when the eighth pulse was applied. At the application of the tenth pulse, the first binary triggers to the opposite stable state, and this change in voltage is coupled to the fourth binary through the left side of the diode V-702. This pulse triggers the fourth binary to its other stable state, releases the clamp on the second binary, and all the binaries are now back to their original or "zero" condition. When the count on the decimal counting unit is stopped at some point other than zero, it can be reset by momentarily opening the ground connections of the right hand grid resistors of all the binaries. This causes the grids to go positive and the binaries trigger to the condition of the right side conducting. When the grid leads are returned to ground, the binaries remain in this condition, which is the one for a "zero" count. Resetting of all counting units is accomplished by the STOP-COUNT-RESET switch on the front panel of Radiac Indicator ID-364/UDR-9.

9. The decimal indication is obtained by connecting ten neon lamps to the decimal counting unit by a network of 12 resistors (R-701-712) and a diode. The right half of diode V-705 is used to improve the lighting of the "0" and "1" lamps. Each neon lamp must be connected between two points that have enough voltage between them to light the neon lamp and yet be a voltage that is unique to the one particular condition that will occur only once during ten counts. In this manner all the lamps light in the proper sequence and only once during any ten counts. For example, on number 1 count, the input binary (V-706) is in the condition of left-side conducting and right-side cut off. The top of lamp I-702 is returned to the right side of V-706. The lower side of I-702 is returned to the right-side of the second binary V-707, which is in the conducting state. Thus the top of I-702 is at a higher potential than the lower side. This is the requirement for the lamp to light. Lamp "O" (I-701) cannot light because both upper and lower sides are returned to binaries that are conducting. By means of Table 2-1 this same procedure can be followed through for any count, so that it is possible to see how each lamp lights in proper sequence.

e. *Power Supply PP-948/UDR-9.* (See Figure 7-15).

(1) General. The variable high voltage supply is built around the transformers T-502 and T-503, the high voltage rectifier V-514, the series regulator V-516, the feedback amplifier V-521, the bucking voltage and reference voltage supply with V-515, V-517, V-518, V-519, and V-520. The front panel HIGH VOLTAGE CONTROL shaft gangs the ten-turn potentiometer R-552 to the auto-transformer T-503, through a 15 to 1 gear reduction. This arrangement allows the high voltage out of the rectifier V-514 to be varied in proportion to the required output voltage. Therefore, the drop across the series regulator tube V-516 is nearly constant, and the plate dissipation is held to a low value for all settings of the high voltage output. The input power requirement is 105-130V, 60 CPS, single phase.

(2) Detailed Analysis — High Voltage Supply.

(a) As the HIGH VOLTAGE CONTROL is moved clockwise, the 60 CPS voltage from T-503 is increased from about 29 volts up to a maximum of 115 volts. The transformer T-502 steps up the primary voltage to an appropriate high voltage (4000 volts when the primary voltage is 115 volts). Tube V-514 is a half-wave rectifier. As the voltage from T-502 increases, the grid voltage of V-518B also increases due to the coupling between R-552 and T-503. The cathode voltage of V-518B follows the grid which increases the voltage on the cathode of V-521.

(b) The reference voltage section consisting of V-515, V-517, V-518, V-519, and V-520 is a low voltage regulated supply which supplies 255 volts to buck out the minimum voltage from the high voltage regulator V-516. This is necessary in order to reduce the high voltage output to zero when the HIGH VOLTAGE CONTROL is in the extreme counterclockwise position. Tube V-517 is the regulator and is controlled by V-518A. Any change in V-518A grid voltage produces a change in plate voltage which accordingly changes the grid voltage of V-517. The cathode of V-518A is held constant by the regulator V-519. Tube V-520 is connected in series with V-519

and also provides regulation of the voltage across R-552. As R-552 is varied the voltage applied to V-518B also changes, as noted above. Since this change in grid voltage also varies the cathode of V-521, a variable reference voltage is obtained.

(c) The high voltage is regulated against changes in both line voltage and load current. Regulation against line voltage variations is accomplished by feeding back a part of the high voltage output of rectifier V-514 to amplifier V-521. The feedback path is through divider resistors R-545A, R-556, R-555, R-554, and R-563 to the grid of V-521. Any change in line voltage also changes the high voltage out of rectifier V-514. If a small portion of this voltage is fed back to the grid of V-521 the bias on regulator V-516 will also vary, and accordingly change the high voltage output. Thus, if the line voltage increases, the voltage out of rectifier V-514 also increases. This positive-going voltage is applied through the divider resistors to the grid of V-521, causing more plate current in V-521 and a larger drop across R-544. This increased drop across R-544 raises the grid bias on the regulator V-516 and hence increases the effective series resistance of V-516. Consequently, less of the rectified high voltage appears at the output terminals. Since the effective series resistance of V-516 is a function of grid bias change, the output voltage is maintained practically constant. A decreasing line voltage reverses the preceding action so that more of the rectified high voltage appears at the output terminals. The LINE SET potentiometer, R-556, is the adjustment to determine the amplitude of the signal fed to V-521 and is set for best line voltage regulation. The H.V. SET control, R-554, is used to adjust the output voltage to 2500 volts when the HIGH VOLTAGE CONTROL on the front panel is turned fully clockwise.

(d) Regulation against changes in load current is similar to operation during line voltage variations. When the load on the supply is increased, the normal tendency is for the output voltage to decrease. However, when the output voltage starts to move in the negative direction, a portion of the negative-going voltage is fed to the grid of amplifier V-521 through the resistance divider consisting of R-545B, R-554, R-555, R-556, R-557, R-567 and the LOAD COMPENSATION potentiometer R-550. This negative-going voltage on the grid of V-521 reduces plate current through V-521 and consequently the drop across R-544. The grid of regulator V-516 thus goes more positive which decreases the resistance of the tube, thereby causing the output voltage to increase. This cancels out the original decrease in output voltage. If the load is decreased, the previous action reverses and the regulator V-516 acts as a higher resistance, returning the output to its normal value. The LOAD COMPENSATION potentiometer R-550, is adjusted until minimum voltage variation, from no-load to full-load, is found. The supply is rated at 0.5 ma over the 0-2500 volt range.

(e) The polarity reversing switch, S-504, is used to obtain either a +2500 volt, or —2500 volt output. Its operation is to reverse the connections of the high voltage meter M-501, turn on the correct H.V. polarity indicator light, I-507 or I-508, and to reverse the ground connections to the supply. On negative high voltage, the entire supply is operated below ground, the positive end being grounded. On positive high voltage, the polarity relay K-502 is not energized so that the output is positive. On negative high voltage, K-502 is energized through S-504C of the polarity switch and the positive side of the supply is grounded. The high voltage relay, K-504, is energized approximately 30 seconds after application of primary power. In the energized position, the high voltage capacitor C-512 is connected in the circuit. Since this capacitor would present a safety hazard when power is turned off, a discharge path is furnished by two contacts of K-504 through R-568 when K-504 is de-energized.

(3) Detailed Analysis — Low Voltage Supply. (See Figure 7-15).

(a) The lower voltage supply furnishes regulated voltages of +300V at 600 ma, —105V at 150 ma, and unregulated filament voltages of 6.3V a-c at 30 amps, 6.3V a-c at 3 amps, 6.3V a-c at 15 amps, 6.3V a-c at 3 amps.

(b) Positive 300 volt Supply. This supply employs three full-wave rectifiers, V-501, V-502, and V-503, and four series regulators V-504 through V-507. The supply is capable of delivering 600 ma to the +300 volt d-c line. The control tube for the regulators is V-509 which employs a reference tube, V-508. Adjustment of the +300 volt output is provided by R-529, 25K, and an additional control, R-527 (LINE ADJ) is used to compensate for variations in a-c line voltage. Operation of the regulator circuit is best described by tracing through with an increase in the +300 volt output. This increase is fed directly to the right-hand grid of V-509, permitting greater current flow through the tube. The resulting decrease in plate voltage is impressed on the grids of the series regulators, increasing their effective series resistance and returning the output to the 300 volt level. The purpose of the reference tube, V-508, is to maintain a constant potential on the left-hand grid of V-509. Normally, a rise in output voltage would tend to increase the cathode potential of V-509, thus changing the grid-cathode relationship. However, since the left-hand grid is held constant, it is made relatively more negative with respect to the cathode. This reduces current flow through the left-hand section of V-509 and simultaneously the drop across R-526 caused by this current. Thus, the original in-

crease in cathode voltage is compensated for by a decrease in current through the left-hand section. In this manner the cathode potential is maintained constant regardless of variations in right-hand grid voltage.

(c) Negative 105 volt Supply. Operation of the negative 105 volt supply is similar to the +300 volt supply. The series regulator is V-511, with its cathode grounded, the control tube is V-512, and the reference tube is V-513. The operation is seen more easily if the cathode of V-511 is considered as being the output, giving 105V, and the lower end of the supply, the cathode of V-513, the reference of the circuit. In this case, the output would tend to decrease if the load current was increased. A portion of this negative signal is applied to the right hand grid of V-512. This reduces the plate current of V-512 and causes the plate to go more positive. This positive signal is applied to the grid of V-511, reducing the effective resistance of the tube. The load current flowing through the tube would cause a smaller drop across the tube, thereby raising the available output voltage. This would compensate for the decrease due to a larger load current. Changes due to line are compensated for in a similar manner. Actually the supply has the cathode of V-511 grounded and the output taken from the lower end to give a —105V; however, the operation is the same as described above. The reference tube V-513 maintains a constant voltage on the left-hand grid and thus helps to maintain the cathode of V-512 at a constant level with respect to the —105V output, regardless of line fluctuation.

SECTION III
INSTALLATION

1. UNPACKING.

Figure 3-1 gives unpacking instructions applicable to both the CP–71 and CP–79 Radiac Computer-Indicators. These instructions may also be used for Radiac Detector DT–40/UD which is packed in an identical manner. Follow the numbered steps in sequence as given on the diagram.

2. SETTING UP EQUIPMENT.

a. MOUNTING REQUIREMENTS. — Figure 3-2 illustrates the mounting and outline dimensions applicable to both Radiac Computer-Indicator CP–79/UD and CP–71/UD. Also included are mounting and outline dimensions for Radiac Detector DT–40/UD.

b. INSPECTING THE EQUIPMENT.—After the equipment has been unpacked, inspect each unit for broken, damaged and loose components.

c. INTERCONNECTIONS.

(1) Figure 3-3 is an interconnection diagram illustrating connection of the DT–40/UD for use with the CP–71/UD, and a G-M tube for use with the CP–79/UD. Several pieces of equipment, not supplied with Radiac Set AN/UDR–9, are required for operation of Radiac Detector DT–40/UD. These include the following:

(a) One tank of gas: 90% Argon, 10% CO_2, commercial grade purity.

(b) One set of oxygen type pressure reducing valves and gauges. This reduces the pressure from a few thousand psi to less than 100 psi. The two gauges are usually 3000 psi full scale on the primary gauge, and either 50 or 100 psi on the secondary gauge following the pressure regulator. Pressure reducing valve and gauge sets such as the "Prest-O-Weld," "Reg-O-Lator," "Oxweld," should be used.

(c) A low pressure regulator with an output pressure of a few ounces is required after the pressure reducing valve and gauges. A needle valve and hose end having a two ounce output is also required with the pressure regulator.

(d) A gas flow meter is required to meter the amount of gas flowing into the DT–40/UD detector chamber. A flow meter such as the Fisher and Porter "Flowrator," or equivalent, should be used. The meter should have a range of 50 —150 c.c./min. (180 c.c./minute maximum).

(e) A length of about 10 feet of rubber tubing is required to connect the low pressure regulator to the flowmeter, and the flowmeter to the DT–40/UD GAS INLET connector. This tubing should be ¼ inch inside diameter, and approximately ⅜ inch outside diameter.

(f) When the gas, gauges, flowmeter, etc., are connected to the DT–40/UD, the gas should be turned on and approximately 100 c.c./minute of gas adjusted to flow through the detector chamber. A time of at least ½ hour is required to allow the chamber to be flushed of air and filled with the gas. If any readings are taken before this length of time, the detector will not be operating at the specified geometry of at least 20%.

(g) Connect power cable W-103 from POWER INPUT connector, J-803, on front panel of detector, to the ACCESSORIES connector, J-503, on Power Supply PP–948/UDR–9. Connect the high voltage coaxial cable W-101 from the +HV INPUT jack, J-901, to the HV OUT jack, J-505, on the Power Supply. Connect the low voltage cable W-102 from the SIGNAL OUTPUT jack, J-802, to the INPUT PULSE jack, J-203, on the Trigger Amplifier AM–840/UDR–9 in the INPUT UNIT. Positive high voltage is used at all times in the DT–40/UD and is indicated by lighting of the HV POLARITY lamps on the PP–948/UDR–9 panel.

(h) Connect primary power to the 115V AC LINE IN connector on Power Supply PP–948/UDR–9 by means of cable W-104. Then adjust the HIGH VOLTAGE control for ±1550 volts. Set the INPUT TIME CONSTANT selector on the Trigger Amplifier to 10 microseconds, the INPUT MULTIPLIER at X2, the PULSE INPUT POLARITY for negative and the DISCRIMINATOR LEVEL VOLTS at .3. In the event the CP–79/UD is used with the DT–40/UD, the following controls on Radiac Indicator ID–364/UDR–9 should be set as described: place TEST — OPERATE — CALIBRATE switch (PREDET. COUNT-PREDET. TIME) to whatever type of operation is desired. If necessary, reset the ID–364/UDR–9 by means of the RESET — STOP — COUNT switch the ID–364/UDR–9 is then ready for counting when the RESET—STOP — COUNT switch is turned to the COUNT position.

(i) If a G-M tube is used, at proper HV polarity and voltage connect G-M INPUT connector on Trigger Amplifier AM–840/UDR–9 panel to the G-M tube by means of the G-M cable W-105. If a selector is used with separate high voltage input connector and signal output connector, use the H.V. OUT connector on Power Supply PP–948/UDR–9 to furnish high voltage, and feed the signal in through the pulse input connector on Trigger-Amplifier AM–840/UDR–9 using the appropriate coaxial cables.

3. INITIAL ADJUSTMENTS.

a. To determine the proper setting for the HIGH VOLTAGE CONTROL, refer to Section 4, paragraph

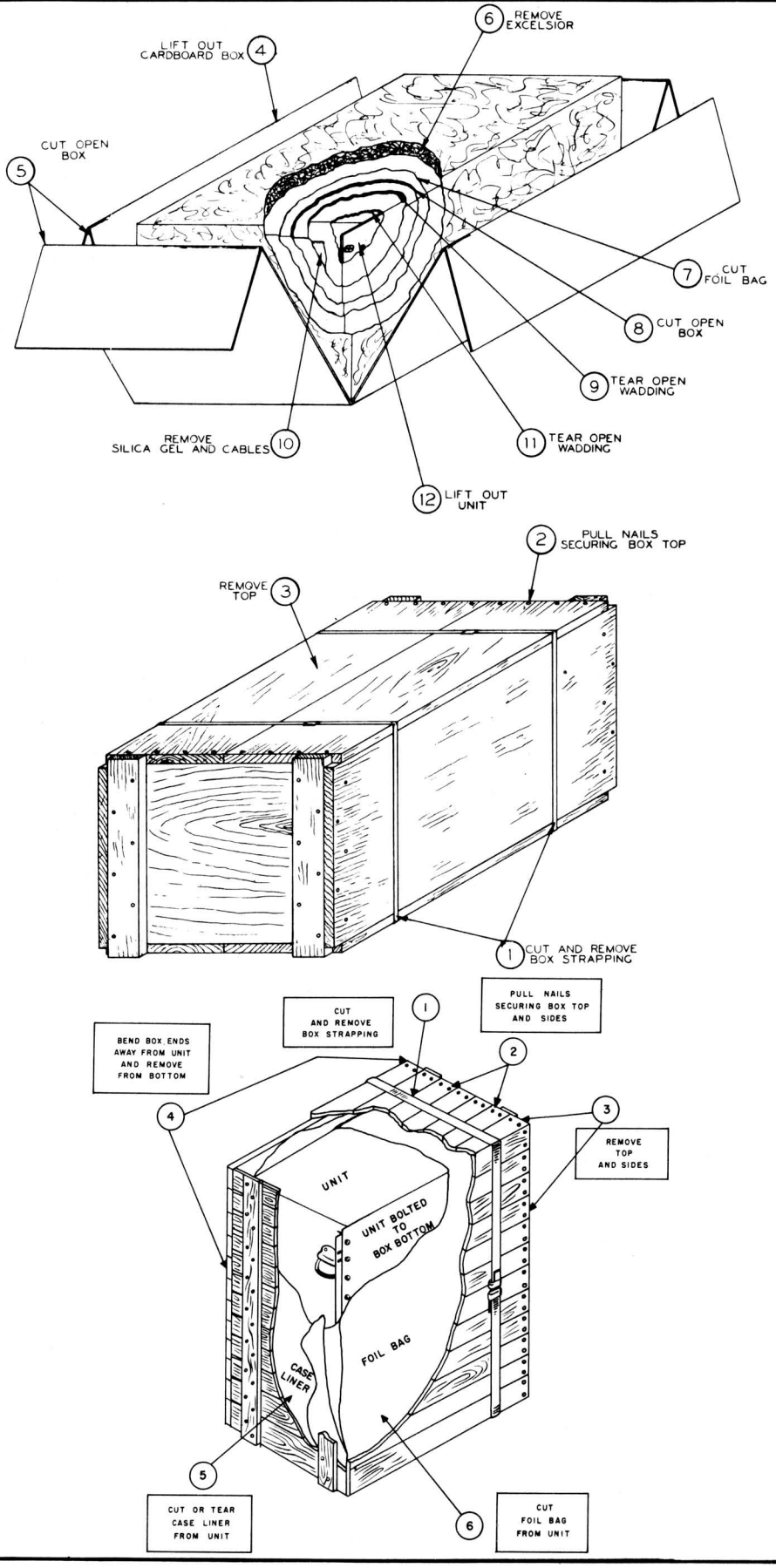
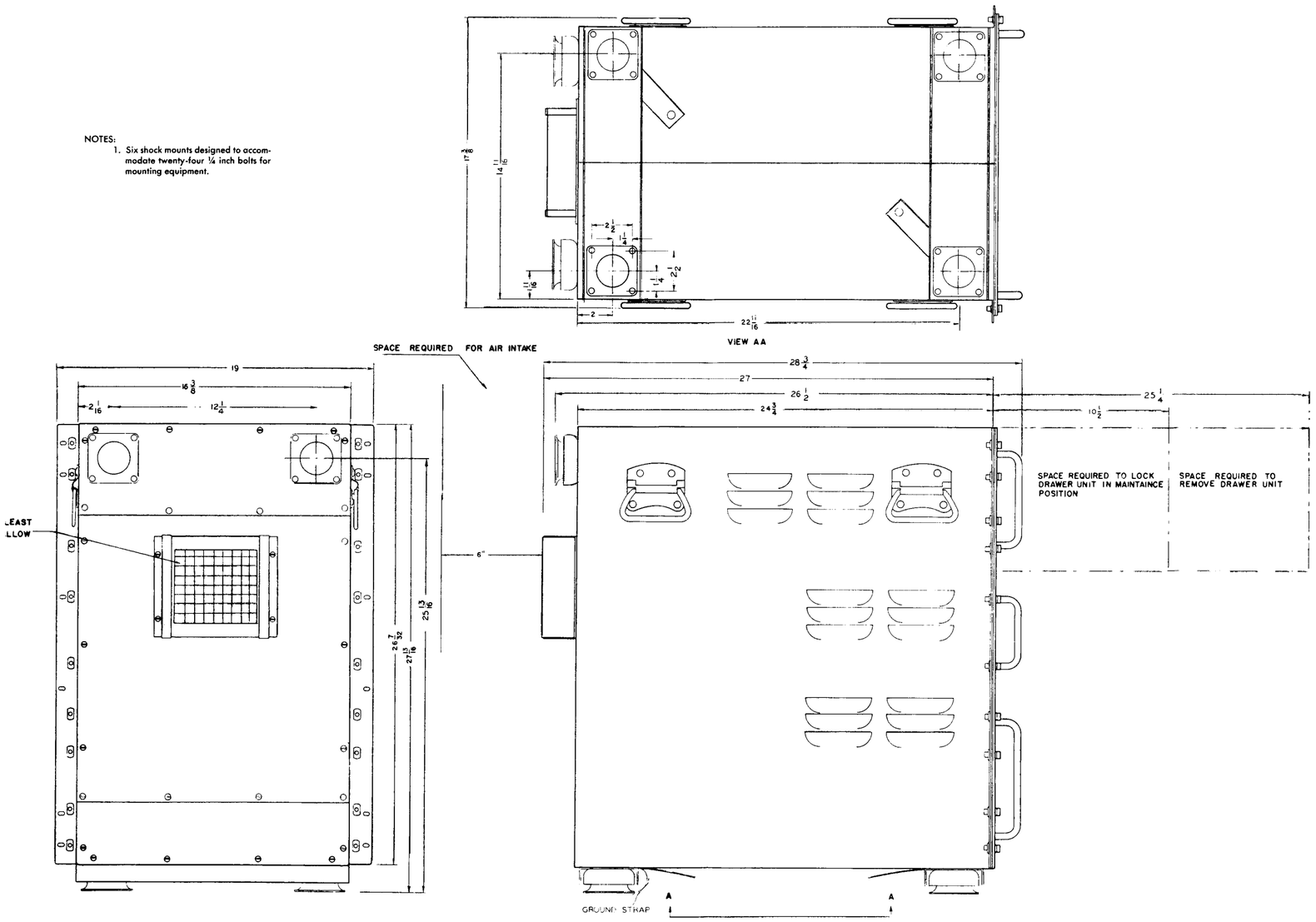
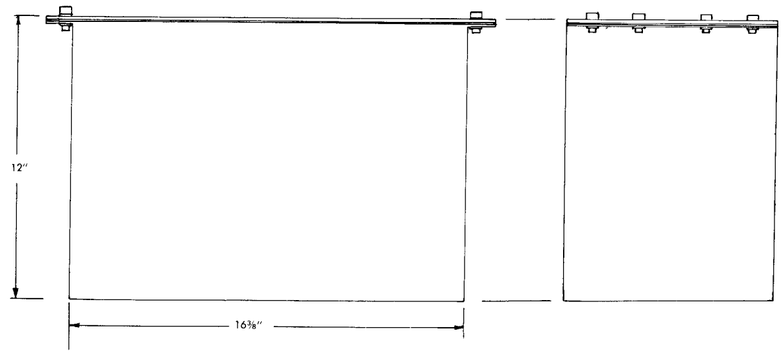


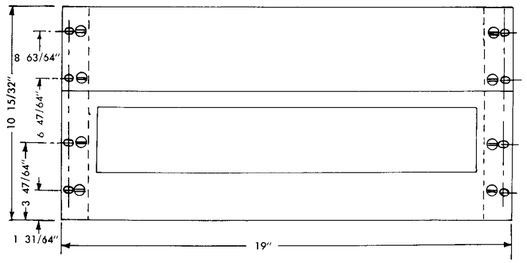
Figure 3-1. Radiac Set AN/UDR-9, Unpacking Diagram

NAVSHIPS 91,892(A)
AN/UDR-9
NAVSHIPS 91,892(A)
AN/UDR-9

NOTES:
1. Six shock mounts designed to accommodate twenty-four ¼ inch bolts for mounting equipment.







NOTE:
DETECTOR UNIT DT-40/UD MOUNTED WITH 8—12-24 NC BINDER HEAD MACHINE SCREWS ON STANDARD 19 INCH RELAY RACK

UNCRATED

WT. OF TYPE CP-79/UD—282 LBS.

WT. OF TYPE CP-71/UD—282 LBS.

WT. OF TYPE DT-40/UD—32 LBS.

HEAT DISSIPATION

CP-79/UD—900 WATTS

CP-71/UD—900 WATTS

DT-40/UD—18 WATTS

Figure 3-2. Outline and mounting dimensions for AN/UDR-9 equipment

3b. Before energizing the equipment, make a final check of all cable connections to make sure they are properly secured.

b. With the equipment energized and Power Supply PP–948/UDR–9 operating properly, a preliminary check of the Radiac Computer-Indicators CP–71/UD and CP–79/UD can be made. To check the CP–71/UD place the STANDBY-OPERATE-CALIBRATE switch on the ID–363/UDR–9 in the CALIBRATE position. In this position, crystal controlled test pulses from Trigger-Amplifier AM–840/UDR–9 are fed into the CP–71/UD at a rate such that the COUNTING RATE meter should indicate center (1) at all positions of the RANGE-COUNTS PER SECOND switch. A means of self-testing the CP–79/UD is also provided. This is done by placing the TEST-CALIBRATE switch on the ID–364/UDR–9 to TEST 10^5 PPS and the function switch to PREDET. TIME-INT. If the clock measures the correct time, and the correct number of counts is registered for the selected timing interval, then the ID–364 UDR–9 is counting accurately.

c. The CP–79/UD is calibrated with a short cable (3-section test cable) that is approximately the same length as the cable in the housing. In operation a cable less than 8 feet in length should be used, otherwise faulty operation should be expected in some cases. This is due to the lowering of filament voltages in the longer wires, and the attenuation of signal pulses in coaxial cables. The operation of the ID–364 UDR–9 should be normal, however, in the MANUAL position of the function switch S-401, counting at either 100KC or 100 cps internal signal, or some external signal in this approximate range.

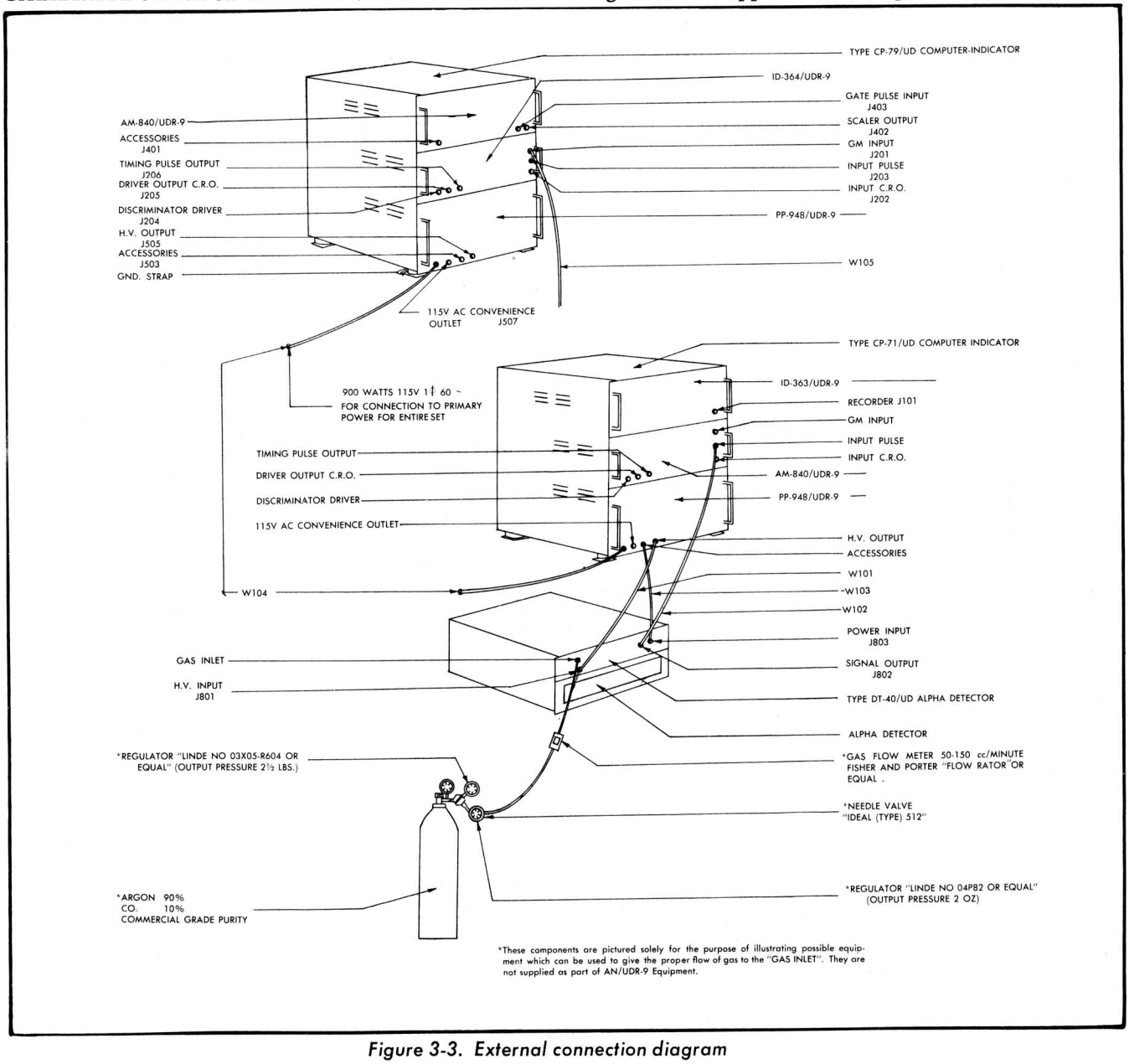


Figure 3-3. External connection diagram

SECTION IV
OPERATION

1. INTRODUCTION.

This section contains complete instructions for setting controls and operating the various units of Radiac Set AN/UDR–9. All controls and connections used during the normal operation of the equipment are located on the front panels of the various units. A description of these controls and their location is given in paragraph 4-2.

2. LOCATION AND FUNCTION OF CONTROLS.

a. GENERAL.—Front panel photographs of the various units of Radiac Set AN/UDR–9 are shown in Figures 4-1, 4-2, 4-3, 4-4, and 4-5. A rear view of each unit showing the back panel connectors is provided in Figure 4-6 and 4-7.

b. POWER SUPPLY.

(1) General.—The primary power requirement for the CP–79/UD equipment alone is 105-120 volts, 60 cps, 900 watts single phase, while the power requirement for the entire AN/UDR–9 equipment is 1818 watts single phase. The primary power input connection is made at the 115V AC LINE IN receptacle on the front panel. The chassis of the power supply must be grounded, otherwise, with the type of line filters employed, the chassis will develop considerable voltage with respect to ground. If it is necessary at any time to operate the power supply out of the cabinet, the interlock switch at the rear must be pulled up. The interlock must then be pushed down when replacing the power supply. Operating personnel are urged to exercise extreme caution when working with the power supply as the high voltage present (6000 volts D.C.) may be fatal if contacted.

(2) High Voltage. — Application of primary power to the high voltage supply is delayed for approximately 30 seconds after the POWER switch S-502, has been actuated. The delay is due to time delay relay K-501. After K-501 has operated, the high voltage supply may be energized by throwing the HIGH VOLTAGE switch S-503 to the "ON" position. Panel lamps directly above both the POWER and HIGH VOLTAGE switches should light when the switches are thrown to "ON." The voltage appearing at the H.V. OUT connector or at the G-M tube terminals is adjusted by the HIGH VOLTAGE CONTROL, and this voltage is indicated directly on the panel meter. High voltage polarity may be either positive or negative with respect to ground, as determined by

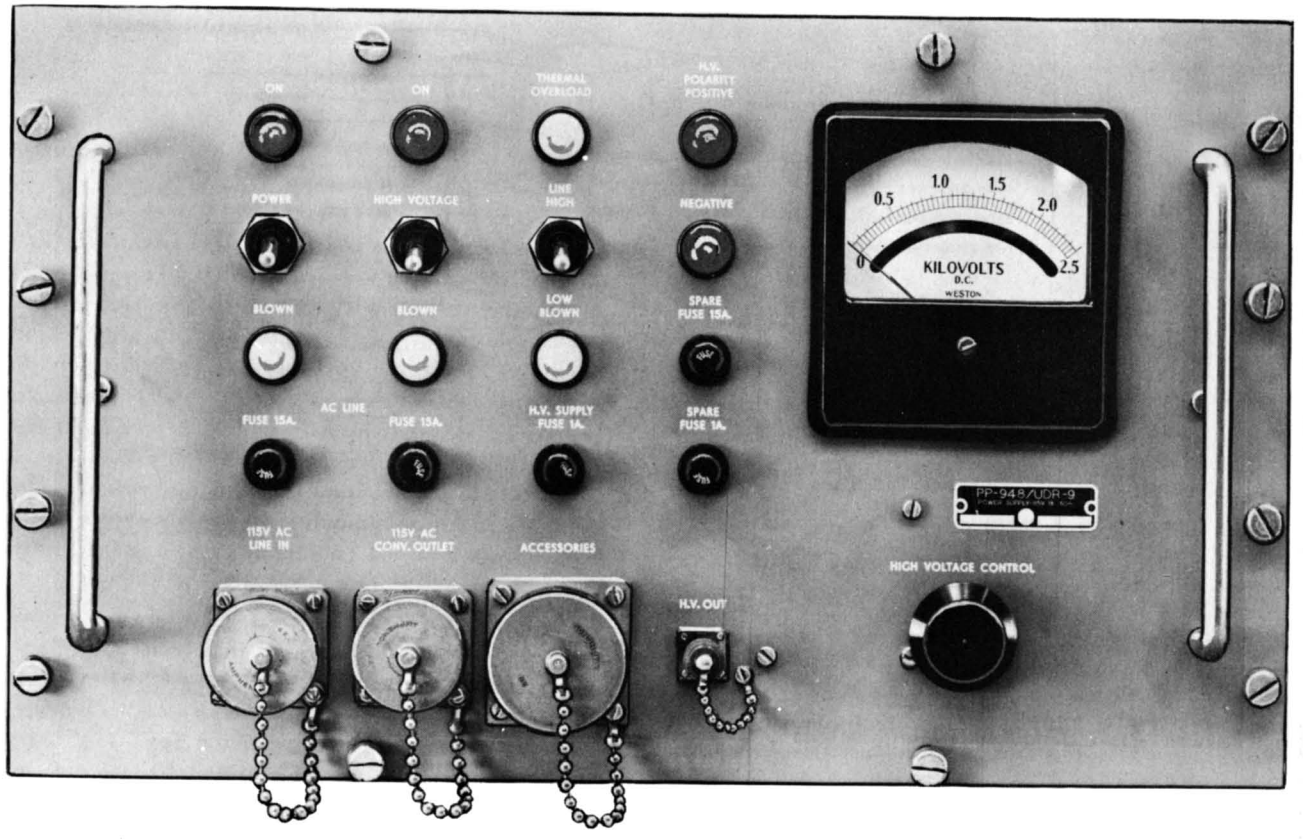


Figure 4-1. Power Supply PP-948/UDR-9, Front Panel Controls

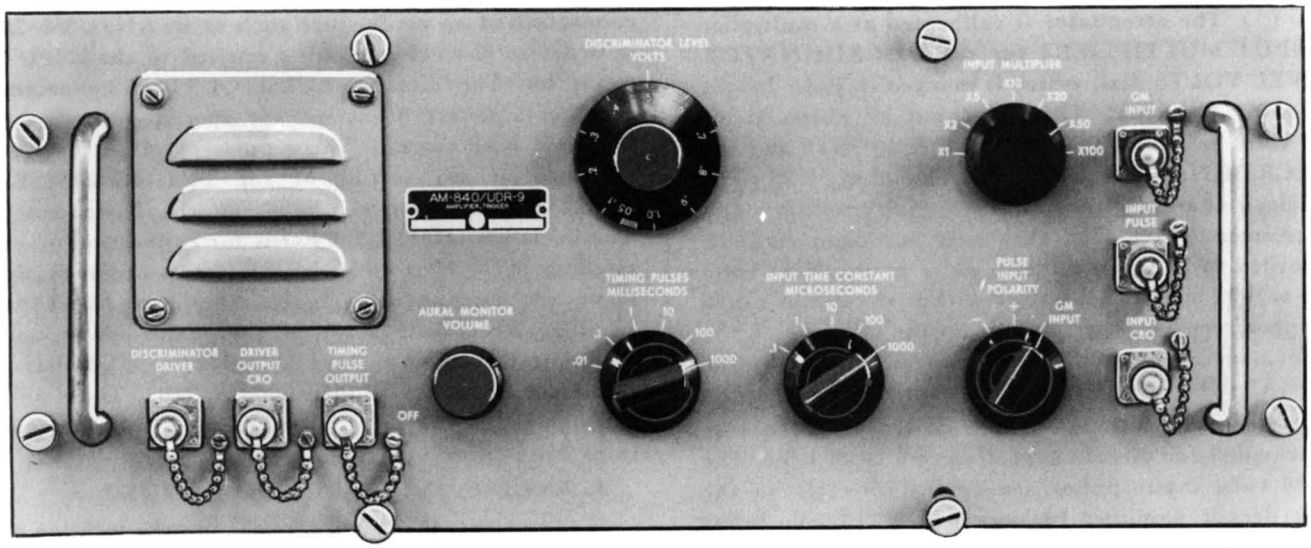


Figure 4-2. Trigger Amplifier AM-840/UDR-9, Front Panel Controls

the polarity switch S-504 located on top of the power supply chassis. This switch may be reached by withdrawing the chassis part way and operated by turning the knob at the right-hand side of the chassis. The polarity is indicated by neon lamps on the front panel.

(3) Overload Protection. — Two 15 ampere fuses are provided at the input to the low voltage supply, and a 1 ampere fuse at the input to the high voltage supply. These fuses are replaceable from the front panel. If either fuse blows, a neon lamp directly above the fuse will light. In the event of an ambient temperature rise above 85 degrees C (185 degrees F) the thermal overload switch S-501 will operate, removing primary power to Power Supply PP–948/UDR–9. This condition is then indicated by the THERMAL OVERLOAD lamp on the front panel. This lamp also indicates when the interlock on the rear of the power supply is open. F-505 is found beneath the power supply chassis and is designed to blow first in the event of an overload, or short of the +300 volt load circuit.

(4) Accessories.—The accessories connectors at the front and rear of the power supply provide fused supplies of 115V AC, ±300 DC, —105 DC, and 6.3V AC, and unfused 115V AC.

c. TRIGGER-AMPLIFIER AM–840/UDR–9.

(1) General.—Figure 4-2 is a front panel view of this unit showing the location of controls and connectors. Pulses from the G-M tube are applied to the G-M INPUT connector through suitable high voltage cable. A cable is supplied for connection to a G-M tube. The INPUT PULSE connector is used with other types of radiac detectors which are of the non-integrating (pulse type) variety. Preamplifiers, prescalers, or other pulse amplifiers may also be used providing that the output is similar to that of the non-integrating type detector.

(2) Input Polarity.—Either positive or negative pulses may be applied to the INPUT PULSE connector providing the INPUT POLARITY switch (S-203A) on the front panel is placed in the appropriate position. In addition, these pulses should be unidirectional. If a pulse having both a positive and a negative excursion is applied to the INPUT PULSE connector, the input amplifiers may be overdriven and will not recover within 1 microsecond.

(3) Input Time Constant.—The amount of pulse coupling or differentiation of the input pulses (when the INPUT PULSE connector is used) is controlled by the R-C product of the time constant network. The INPUT TIME CONSTANT switch S-201, on the front panel, permits a time constant selection of 0.1, 1, 10, 100, and 1000 microseconds. For pulse height calibration testing with an external pulser, use a time constant of at least 100 times the initial rise time of the pulse and make certain that only flat-top pulses are used. Do not select a small time constant when applying a pulse which has already been differentiated, otherwise double differentiation may occur. This can result in the equipment counting two pulses when only one pulse is applied. Square waves must not be differentiated or the two polarity pulses obtained will cause the input amplifier to overload.

(4) Pulse Height Measurement.—The input attenuator (INPUT MULTIPLIER control) is adjustable from unit transfer, 1:1, to 100:1 voltage attenuation. By means of the pulse height discriminator circuit, all pulses are rejected which appear at the output of the second decade amplifier smaller than the chosen level. The discriminator operates on pulses from 10 to 100 volts amplitude; thus Trigger Amplifier AM–840/UDR–9 may be used to measure pulse

heights from 0.1 to 100 volts.

(5) The attenuator is calibrated as a multiplier (INPUT MULTIPLIER) for the DISCRIMINATOR LEVEL VOLTS dial, which is marked in pulse height from 0.1 to 1 volt. Thus, to count all pulses above 0.2 volts, set INPUT MULTIPLIER at "X1" and the DISCRIMINATOR LEVEL VOLTS dial at "0.2". The overload characteristics of the decade amplifiers and discriminator are such that only one count will be recorded for a single discrete pulse at any level from 0.2 to 100 volts. All pulses within the audio range are monitored by the speaker, on the left side of the front panel. The speaker volume is controlled by the AURAL MONITOR VOLUME control.

(6). Connections.—The G–M INPUT connector is provided for direct connection to a G–M tube. The G–M tube input pulses are applied directly to the first decade amplifier by means of V212, the input cathode follower. In this operation the input time constant and input multiplier networks are bypassed.

WARNING

The G–M INPUT is at a high DC potential, the exact value being determined by the HIGH VOLTAGE control on Power Supply PP–948/UDR–9. Operating personnel must exercise extreme caution at all times when working with the equipment.

The INPUT PULSE receptacle is used for connection to any non-integrating (pulse-type) radiac detector or other suitable pulse source. This connection is at a zero DC potential. Pulses are applied to the Input Time Constant and Input Multiplier circuits. The INPUT CRO receptacle is provided for connection of an oscilloscope such as an AN/USM–24 in order to observe the pulses applied to the INPUT connector. The TIMING PULSE OUTPUT connector provides a source of accurately spaced pulses from the time base circuit. These pulse spacings are determined by the setting of the TIMING PULSES MILLISECONDS switch, S204, on the front panel. The DRIVER OUTPUT CRO is for connection of an oscilloscope such as an AN/USM–24 in order to observe the output of Trigger Amplifier AM–840/UDR–9. Receptacle P201 is the main power and major unit of the CP–71/UD and CP–79/UD has a connector on the rear identical to P201. Each unit is connected at the rear to the main cable which contains all power and signal leads.

d. RADIAC INDICATOR ID–364/UDR–9.

(1). General.—Figure 4–3 shows the location of controls on this unit. Radiac Indicator ID–364/UDR–9 operates manually or automatically to indicate on a register and lamp panels the total number of counts for a given time interval, or by separate selection, enables the time required for a predetermined number of counts to be measured by a clock.

(2). Function Switch, S401.—This switch is the PREDET. COUNT-MANUAL-PREDET. TIME control on the front panel. MANUAL operation is performed in conjunction with the RESET-STOP-COUNT switch, S403. With the function switch on MANUAL, counting is started by switching the function switch to COUNT. At the end of the predetermined count overtime interval counting and timing are automatically stopped. The PREDET. TIME

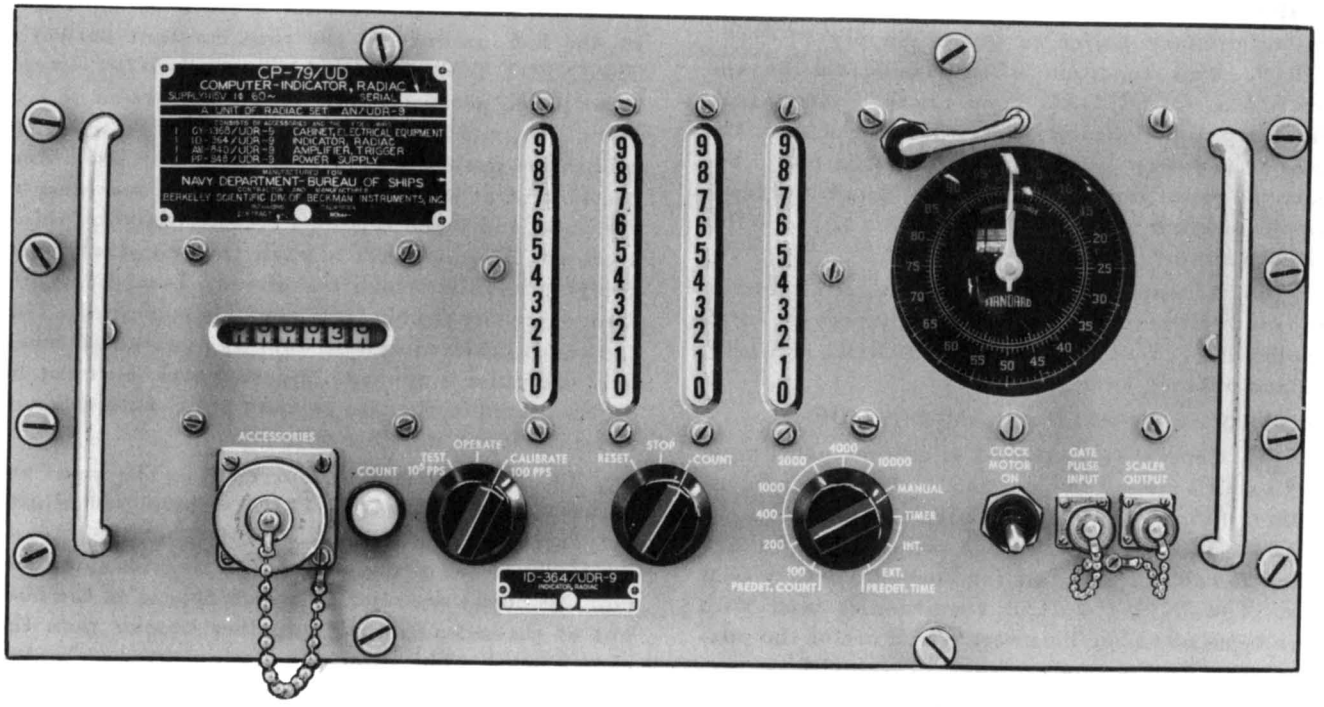


Figure 4-3. Radiac Indicator ID-364/UDR-9, Front Panel Controls

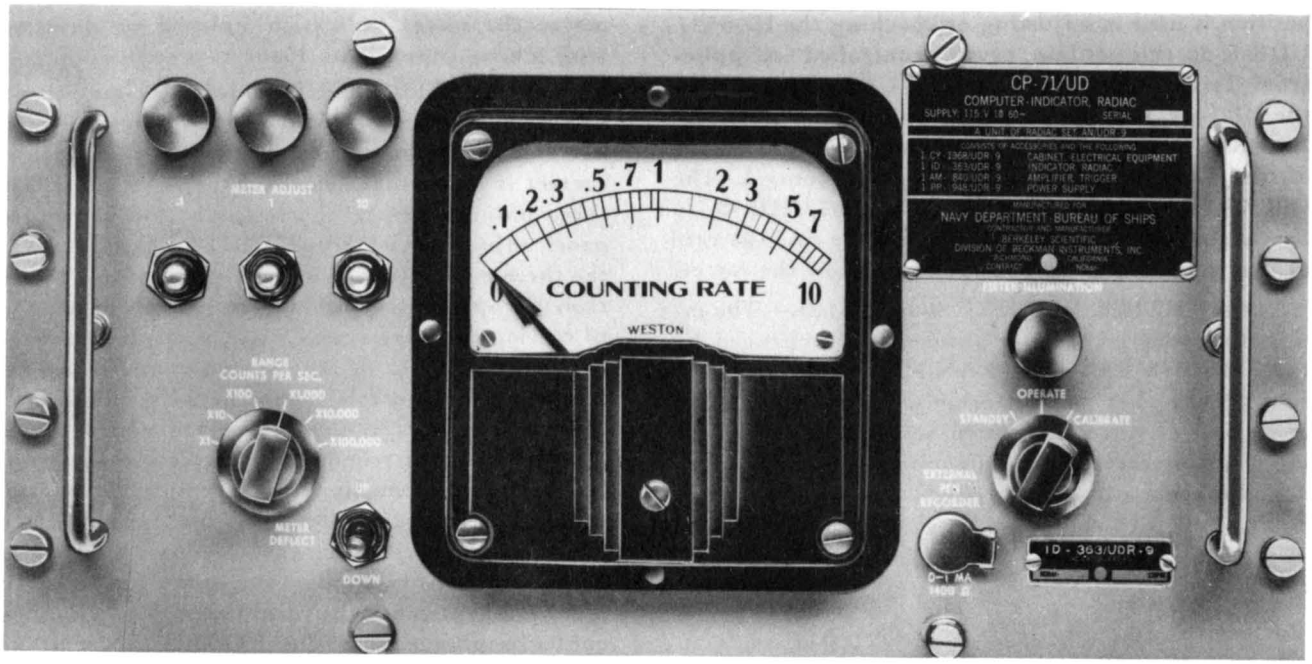


Figure 4-4. Radiac Indicator ID-363/UDR-9, Front Panel Controls

"TIMER" position is intended for operation with an external timer (not part of Radiac Computer-Indicator CP–79/UD). The timer is connected to, and receives its power from the ACCESSORIES connector J401. The PREDET. TIME-INT (Internal) position is used in conjunction with Trigger Amplifier AM–840/UDR–9 which supplies 0.1, 1, 10, 100, and 1000 millisecond timing pulse intervals. Selection of the desired timeing interval is made by the TIMING PULSES-MILLISECONDS switch on the panel of Trigger Amplifier AM–840/UDR–9. When the RESET-STOP-COUNT switch is turned to COUNT, the first timing pulse from Trigger Amplifier AM–840/UDR–9 turns the Radiac Indicator ID–364/UDR–9 "on", allowing the decimal counting stages and the clock to operate. The second timing pulse then stops the counting. In the PREDET. TIME-E–T. position operation is similar to the INT. position except that timing pulses are supplied from an external source. These exteranl timing pulses are fed in through the GATE PULSE INPUT connector. They should be negative in polarity, of 5 volts or more in amplitude with a rise time better than one microsecond.

(3). TEST - OPERATE - CALIBRATE Switch, S402.—This switch allows Radiac Indicator ID–364/UDR–9 to be tested by means of crystal controlled timing pulses from the time base in Trigger Amplifier AM-840/UDR-9. The TEST position feeds in 100,000 cycles per second to the input of the ID-364/UDR-9. All positions of the Function switch S401 can be checked with this frequency; however, the TEST position is intended also for observing on a synchroscope waveforms at various points in the ID-364/UDR-9. The CALIBRATE position feeds in 100 cycles per second to the input of the ID-364/UDR-9 and is intended for visual checking of scaling operation.

(4). Register.—The register is only able to count at rates below 10 cycles per second. For this reason a switch is provided inside the ID-364/UDR-9 to remove the register when the random counting rate exceeds 100,000 cycles per second. Another scaling unit may be connected to the output of the last decimal counting unit and the higher counting rates accurately indicated. The SCALER OUTPUT connector must then be connected to the input of the next scaler.

e. RADIAC INDICATOR ID-363/UDR-9.

(1). General.—Figure 4-4 shows the location of controls on this unit. The ID-363/UDR-9 indicates the average arrival of pulses from the Radiac Detector DT-40/UD, a G-M tube, or from other suitable non-integrating type radiac detector.

(2). Range Setting.—The COUNTS PER SEC. RANGE selector, S101, permits the counting of pulses from 0.1 count per second to 100,000 counts per second in six overlapping two-decade log scales. This control should be set to the number most closely approximating the counting rate to be indicated. However, no damage will result to the meter if counting rates above full scale indication are applied.

(3). STANDBY - OPERATE - CALIBRATE Switch, S102.—The STANDBY position of this switch allows the ID-363/UDR-9 to be left in an energized condition, but with input signals removed. This allows the ID-363/UDR-9 to be left on and

ready for operation at any time. The CALIBRATE position is used in adjusting or checking the ID-363/UDR-9. In this position, crystal-controlled test pulses from Trigger Amplifier AM-840/UDR-9 are fed to the ID-363/UDR-9 at a rate such that the COUNTING RATE meter indicates center (1) at all positions of the COUNTS PER SEC. RANGE control. The OPERATE position allows the ID-363/UDR-9 to operate in a normal fashion whereby the average rate of arrival of input pulses is indicated on the meter.

(4). METER DEFLECT Switch, S103.—The integration time constant is automatically changed by the COUNTS PER SEC. RANGE selector, S101, in such a way that the compromise between accuracy and speed of meter deflection results in the following probably errors (midscale probable error for random counting rates).

Range	*Probable Error*
X 1	10%
X 10	10%
X 100	3%
X 1000	3%
X 10,000	1%
X 100,000	1%

On the slowest counting range the integration time constant is about 25 seconds, and on the next range about 2.5 seconds. In order to make possible more rapid calibration checking and instrument operation on these ranges, a METER DEFLECT switch, S103, is provided on the front panel. This switch artificially moves the meter indication upward or downward with a time constant of about two seconds.

(5). METER ADJUST.—It is necessary that the height, slope, and curvature of the linear-to-logarithmic transfer characteristic in the metering circuit be correct if meter indication is to be as specified. These three parameters are controlled by the three front panel adjustments marked METER ADJUST. When the three pushbutton switches directly below the controls are operated, suitable direct voltages are applied to the log converter tube V105, such that meter deflection is 0.1, 1, or 10, as indicated below these switches. The controls should be adjusted, in order, from left to right at these three points, and then rechecked for final trimming since there is some interlocking of adjustments. To compensate for the addition of the resistance of an external recorder (when used in series with the COUNTING RATE meter M101, the resistor, R140, 1400 ohms, (in series with M101) is automatically disconnected when the recorder is plugged into the RECORDER jack. Since recorders may vary more than 10% from the normal resistance of 1400 ohms, the METER ADJUST controls should be rechecked whenever the recorder is plugged in or removed.

(6). Individual Range Adjustment.—Each of the six counting ranges is provided with an individual resistance trimmer (R122 through R127) for its voltmetering resistance. With the panel switch on

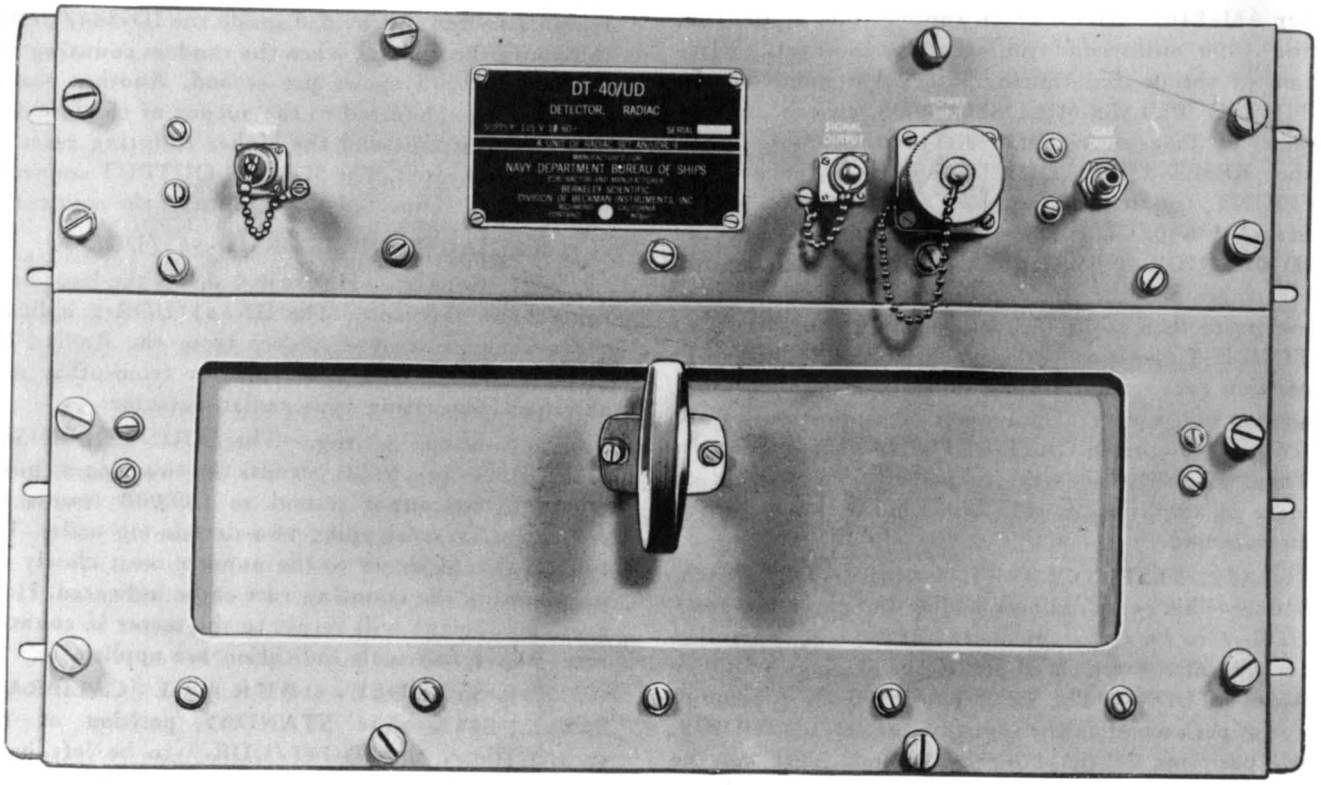


Figure 4-5. Radiac Detector DT-40/UD, Front Panel Controls

CALIBRATE, the meter should indicate center scale (1) at all positions of the COUNTS PER SEC. RANGE control. Each range may be individually adjusted by the appropriately marked controls on the right hand side of the chassis in the event that center scale is not obtained.

f. RADIAC DETECTOR DT-40/UD.—Figure 4-5 is a front panel illustration of the DT-40/UD. The POWER INPUT receptacle is for connection of power cable W103 from the ACCESSORIES connector on Power Supply PP-948/UDR-9. This connector supplies -300V AC, -105V DC, and 6.3V AC for the DT-40/UD preamplifier. The detected pulses from the DT-40/UD are taken from the SIGNAL OUTPUT connector for connection to the INPUT PULSE connector on Trigger Amplifier AM-840/UDR-9. The +H.V. INPUT connector is for connection of the high DC voltage required for the detector anode lead. The high DC voltage is supplied from the H.V. OUT connector on Power Supply PP-948/UDR-9 through the high voltage cable W101. The GAS INLET connection is for receiving gas for the detector chamber.

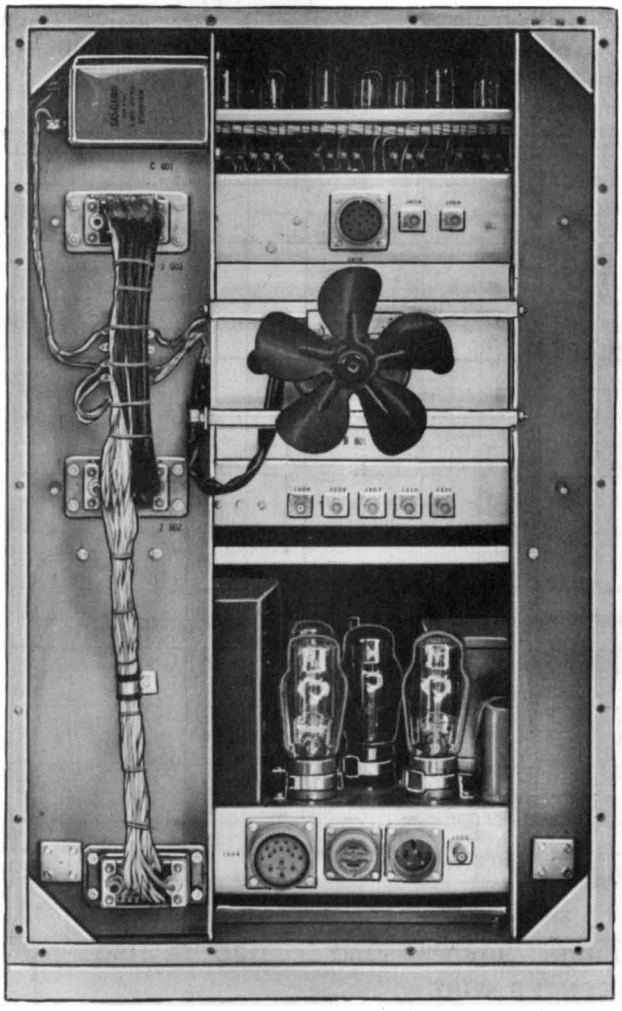


Figure 4-6. Radiac Computer-Indicator CP-79/UD, Rear View with Panel Removed

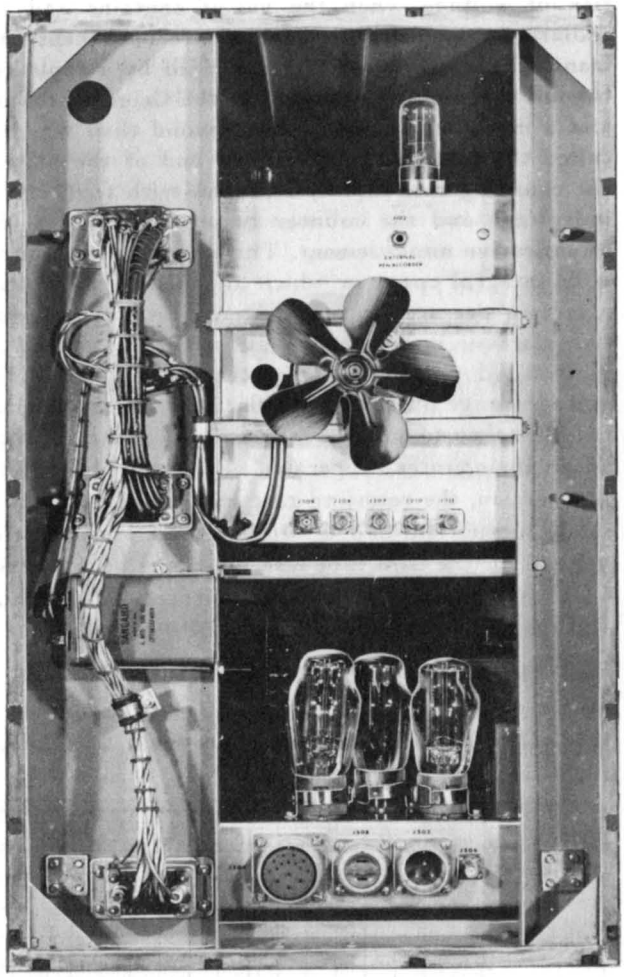


Figure 4-7. Radiac Computer-Indicator CP-71/UD, Rear View with Panel Removed

3. OPERATING THE EQUIPMENT.

a. ENERGIZING POWER SUPPLY PP-948/UDR-9.—Before energizing the power supply attach the detector cable to the H.V. OUT connector and the detector pulse cable to the proper connector on Trigger Amplifier AM-840/UDR-9. Connect the primary power input to the 115 AC LINE IN connector and throw the POWER switch to the up "on" position. The pilot lamp directly above the switch should light. Allow approximately one minute before throwing the HIGH VOLTAGE switch to "on". The radiac detector operating voltage may then be set by the HIGH VOLTAGE CONTROL. The voltage is read on the high voltage meter. The high voltage polarity may be positive or negative as determined by the polarity switch, S504, inside the PP-948/UDR-9. The polarity is indicated by neon lamps on the front panel.

b. DETERMINING THE OPERATING VOLTAGE OF G-M TUBE.—An important characteristic exhibited by G-M tubes is the operating plateau curve. A typical curve is shown in Figure 4-8. The

counting rate of a given counter is plotted as a function of voltage when the gas it contains and the radiation to which it is exposed are both kept constant. These curves are characterized by a rapid rise beyond the starting potential to the Geiger threshold and a more or less flat region beyond this, which is called the plateau. At the upper end of the plateau the counting rate rapidly increases with further rise in voltage and the counter ceases to be useful for quantitative measurement. This counting rate curve is an integral curve in which all pulses greater than a certain size are measured. If such a curve shows a flat plateau, it indicates that in the region of the plateau all pulses are of a certain max size. The voltage range over which a flat plateau results may thus be taken to indicate true Geiger counting action. When the counter is operated near the middle of the flat portion, the counting rate will be independent of small fluctuations in operating voltage. The operating voltage for the G-M tube is set by means of the HIGH VOLTAGE CONTROL and indicated on the high voltage meter on Power Supply PP-948/UDR-9.

c. TRIGGER AMPLIFIER AM-840/UDR-9.— Either positive or negative pulses may be applied to the INPUT PULSE connector provided the INPUT POLARITY switch is placed in the appropriate position. When using a G-M tube, place INPUT POLARITY switch on "GM". If the INPUT PULSE connector is used, the desired pulse differentiation or decay time is controlled by the INPUT TIME CONSTANT selector. The INPUT MULTIPLIER is used in conjunction with the DISCRIMINATOR LEVEL VOLTS dial which is marked in pulse height from 0.1 to 1 volt. These controls permit the measurement of pulse heights from 0.1 to 100 volts. Thus, if it is desired to count all pulses above 0.2 volts, set INPUT MULTIPLIER at "X1" and the DISCRIMINATOR LEVEL VOLTS dial at 0.2. Only one count will be recorded for a single discrete pulse at any level from 0.2 to 100 volts amplitude. A speaker at the left side of the panel is for monitoring and volume is controlled by the AURAL MONITOR VOLUME control. The TIMING PULSES switch is used to select accurately spaced pulses from the crystal controlled time base. These pulses are taken from the TIMING PULSE OUTPUT connector. Connect an oscilloscope such as AN/USM-24 or equal, to the INPUT CRO connector to observe the pulses applied to the INPUT PULSE connector. To observe the output Trigger Amplifier AM-840/UDR-9, connect an oscilloscope to the DRIVER OUTPUT CRO connector.

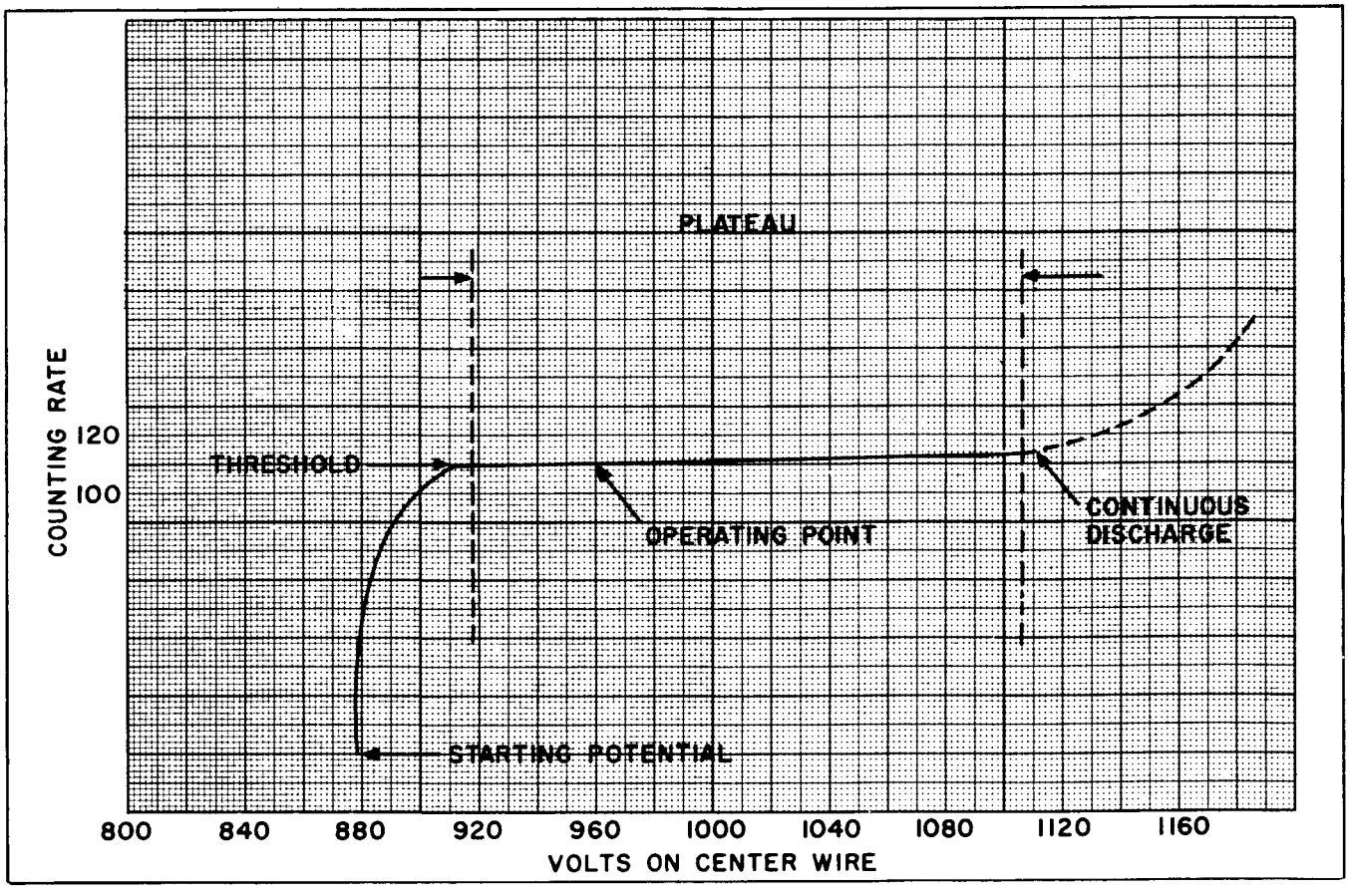


Figure 4-8. Typical G-M Tube Operating Voltage Curve

d. RADIAC INDICATOR ID-364/UDR-9.

(1). Preliminary Adjustments.—Attach the signal cable to the INPUT connector. Set the Function Switch to MANUAL or to any of the PREDET. COUNT or PREDET. TIME positions. Turn CLOCK MOTOR SWITCH to ON, then the clock, register, and lamp panel are set to zero by momentarily turning the Control Swith to RESET. After resetting, return the switch to STOP, and turn the Test Switch to OPERATE.

(2) MANUAL Operation.—With the Function Switch in the MANUAL position, turn the control switch to COUNT. When the desired number of counts or the desired time interval has been reached, turn this switch to STOP. The number of counts is read directly from the lamp panel and register. The clock indicates elapsed time in hundreds of seconds, seconds, and hundreths of seconds. During the counting period the COUNT lamp should be lit and should be lit and should go off at the end of the count.

(3). PREDETERMINED COUNT Operation.—Select the desired predetermined count by means of the Function Switch. After resetting the clock, register, and lamp panel, counting and timing are started by turning the Control Switch to COUNT. When the ID-364/UDR-9 has received counts equal to the preset number, counting and timing automatically stop. If pulses are being counted at a continuous rate of one megacycle per second, the delay between decimal counting units is such that several extra counts may be registered before the units stops scaling. Reset to zero before each counting operation.

(4). PREDETERMINED TIME Operation.

(a). Interval.—Timing intervals of 0.1, 1, 10, 100, and 1000 mulliseconds with an accuracy of $\frac{1}{10}$ of 1 percent are selected by means of the TIMING PULSES switch on Trigger Amplifier AM-840/UDR-9. Set the Function Switch to PREDET. TIME-INTERVAL. Throw the Control Switch to COUNT after resetting. The first timing pulse from Trigger Amplifier AM-840/UDR-9 turns the ID-364/UDR-9 on. The second timing pulse then turns the ID-364/UDR-9 off and stops the clock. Subsequent pulses have no effect on circuit operation until the unit has been reset. Multiples of any time base may be obtained in the following manner: Set the TIMING PULSES switch to the desired timing interval. Then reset Radiac Indicator ID-364/UDR-9, and bring Control Switch back to COUNT. In the middle of the first counting period, turn Control Switch to STOP. This holds off the "stop" pulse from Trigger Amplifier AM-840/UDR-9. In the middle of the counting period before completion of counting is desired, turn Control Switch back to COUNT. The counting will then stop at the end of this period. Due to mechanical inertia the clock might overshoot and indicate a few hundreths of a second more time than has actually elapsed. This error will be the same for any of the timing intervals used.

(b). External.—This position is similar in operation to the INTERNAL position except that an external source must be used to supply the timing intervals. Connect the external timing pulses to the GATE INPUT PULSE connector and proceed as described in (a) above. The timing pulses should be negative in polarity, and approximately 5 volts or more in amplitude. The pulse rise time should be better than one microscope.

(c). Timer.—This position is used for operation with an external timer. The clock also operates in this position and may thus be used to monitor the external timer. Connect the timer to the ACCESSORIES connector and start the count by switching Control Switch to COUNT. The counting then stops at the end of the period for which the timer is adjusted. Reset the unit before another operation. The connections on the accessory sockets are as follows: A B-ground; D & E-timer contacts; F & G-110W AC for timer motor.

(5). Test and Calibration.—The Test Switch is provided for testing and calibrating Radiac Indicators ID-364/UDR-9 and ID-363/UDR-9. In either position crystal controlled pulses from Trigger Amplifier AM-840/UDR-9 are used. The TEST position feeds in 100,000 cycles per second and is used for testing and observing on a synchroscope various waveforms throughout the ID-364/UDR-9 circuits. The CALIBRATE position feeds in 100 pulses per second and is designed for visual checking of the ID-364/UDR-9 operation and calibration of the ID-363/UDR-9 overall operation of the ID-364/UDR-9 is to place the Function Switch on PREDET. TIME-INT. and the Test Switch on TEST. If the clock measures correct time, and the correct number of counts is registered for the selected timing interval, the ID-364/UDR-9 is counting accurately.

SECTION V
OPERATOR'S MAINTENANCE

1. EMERGENCY MAINTENANCE.

Maintenance work the operator can perform is limited to the replacement of tubes and fuses. Figures 5-1 through 5-5 show the location of electron tubes in the various units of Radiac Set AN/UDR-9. All primary power fuses and indicating lamps are mounted on the front panel of Power Supply PP-948/UDR-9.

NOTE

Operators shall not perform any emergency maintenance without proper authorization.

a. REPLACEMENT OF FUSES.

WARNING

Potentials dangerous to life are present at various points of the Power Supply PP-948/UDR-9 chassis. Always throw HIGH VOLTAGE CONTROL ON POWER SUPPLY PP-948/UDR-9 to off position before placing hands inside of cabinet.

CAUTION

Never replace a fuse with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause of trouble has been located and corrected.

In the event that the POWER lamp I506 does not light, a blown fuse F501 or F502 is indicated. This condition will be recognized by the lighting of the BLOWN fuse indicators I501 or I503. A spare 15 amp fuse is mounted adjacent to the high voltage meter M501. If the primary POWER lamp lights but no high voltage is indicated on the meter, or high voltage lamp I505 does not ligh, check the high voltage line fuse F503. If this fuse is blown, the blown fuse indicator lamp I504 should light so that this condition will be recognized immediately. A spare 1 amp fuse is also located adjacent to the high voltage meter M501.

b. REPLACEMENT OF ELECTRON TUBES.—All tubes are accessible on the chassis of each unit. Make sure that power is removed before replacing any tubes in Power Supply PP-948/UDR-9. It may be necessary to make some slight readjustments in the time base circuit in Trigger Amplifier AM-840/UDR-9 if a tube is found defective. These adjustments are described in Section 7, paragraph 4b (3). When replacing tubes check the new tube in a "conductance" type tube checker as this will provide a good check on its relative usefulness. The neon lamps on Radiac-Indicator ID-364/UDR-9 are removed from the back side of the front panel. Refer to Section 6, Preventive Maintenance, for additional instructions regarding tube replacement.

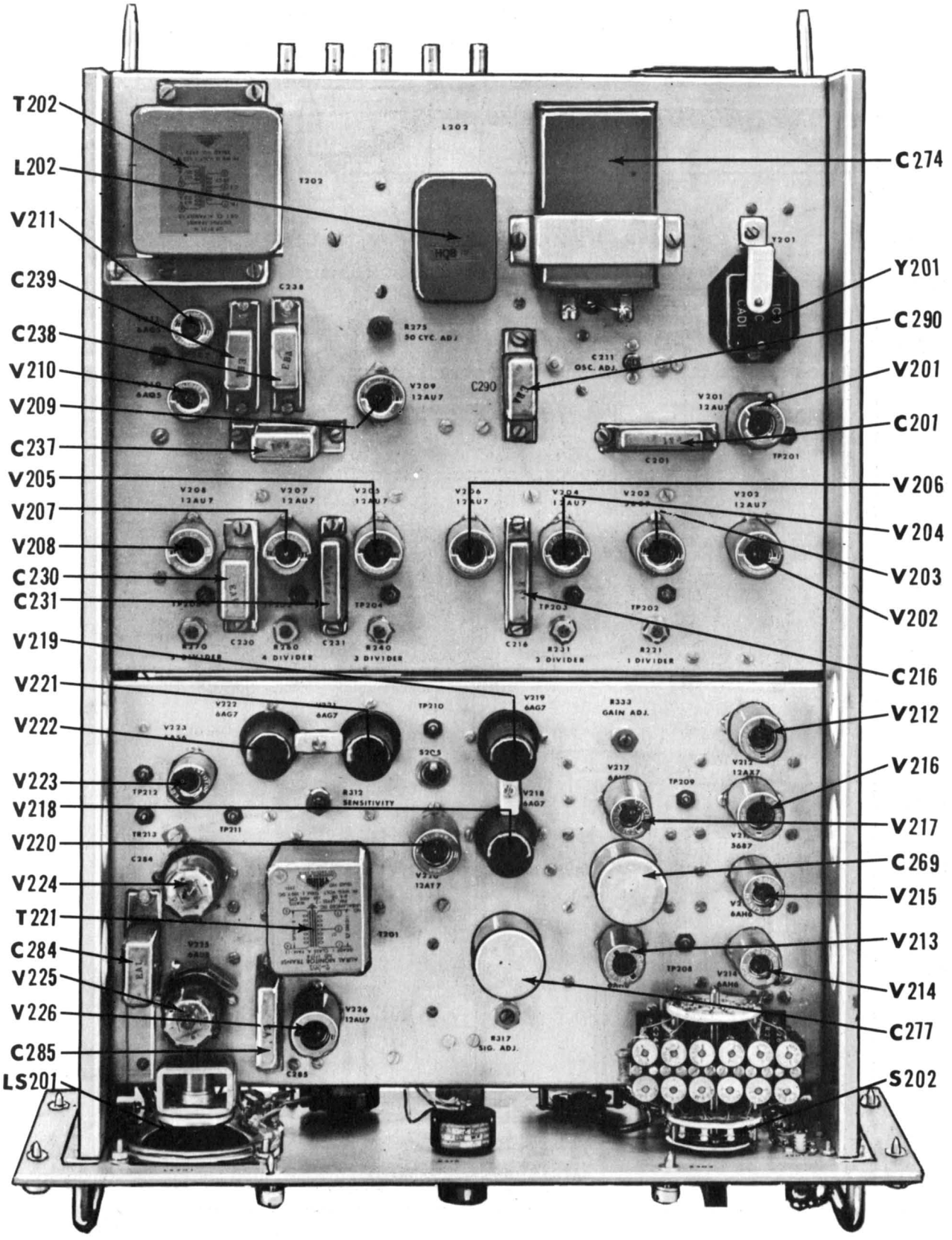


Figure 5-1. Trigger Amplifier AM-840/UDR-9, Component Location, Top Side

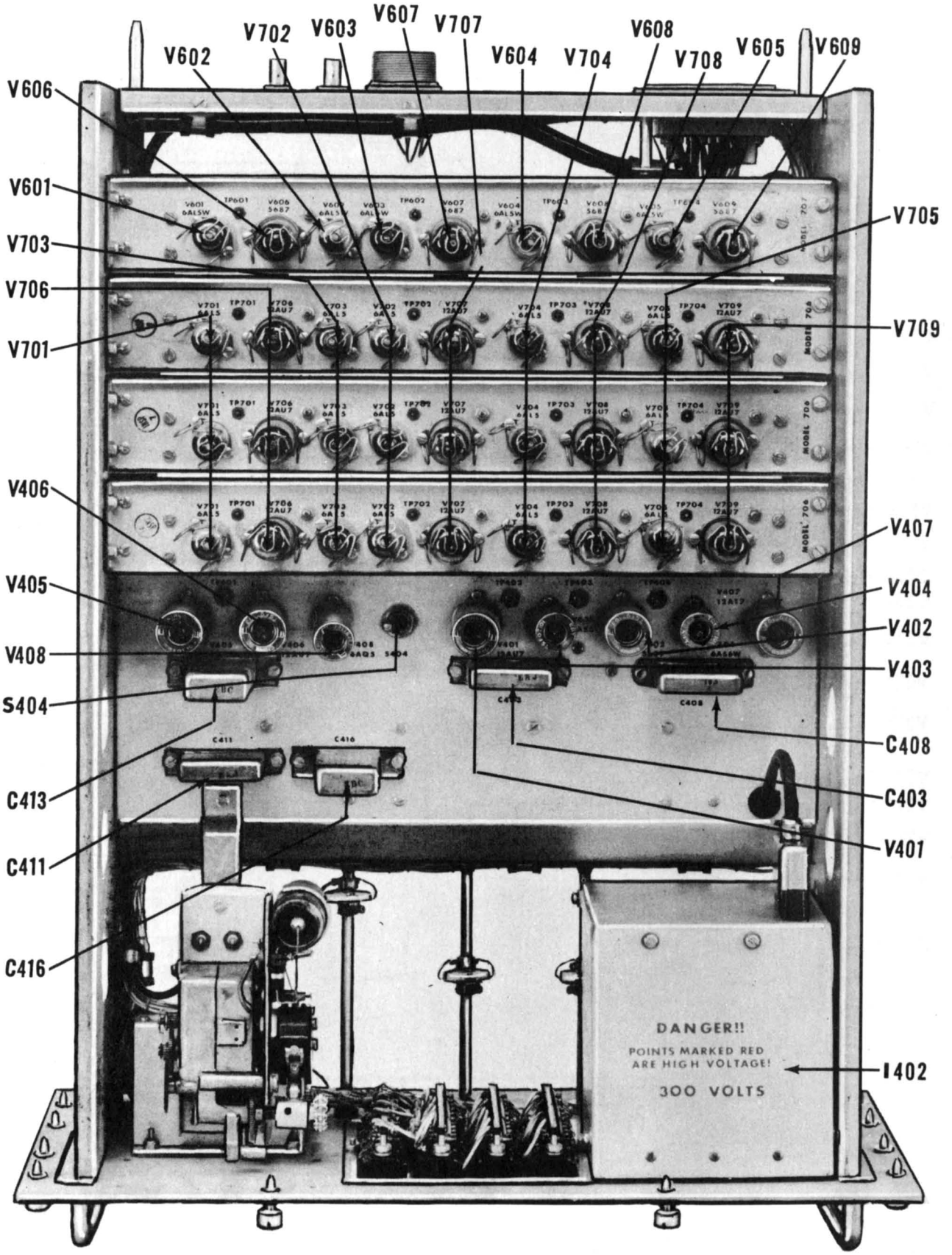


Figure 5-2. Radiac Indicator ID-364/UDR-9, Component Location, Top Side

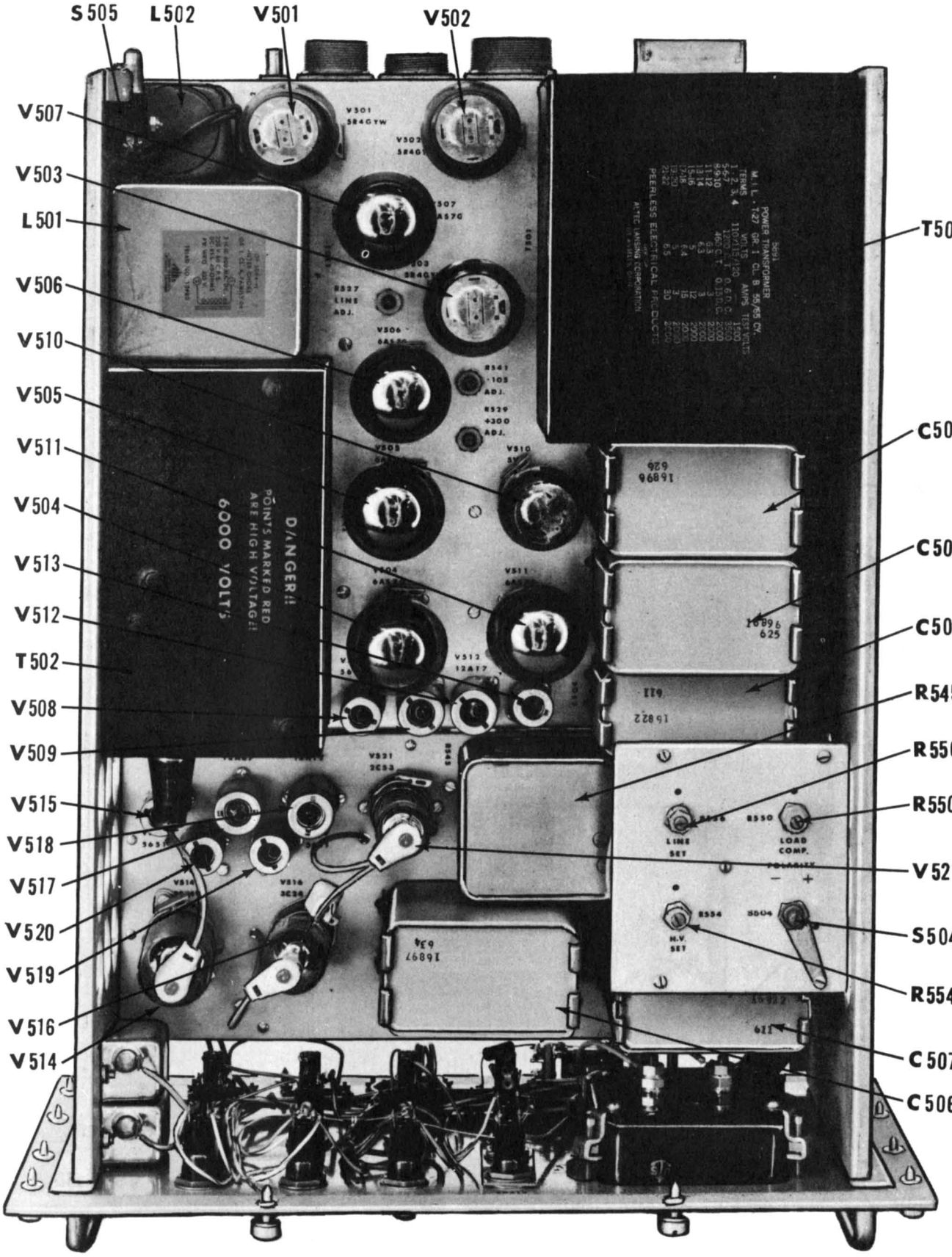


Figure 5-3. Power Supply PP-948/UDR-9, Component Location, Top Side

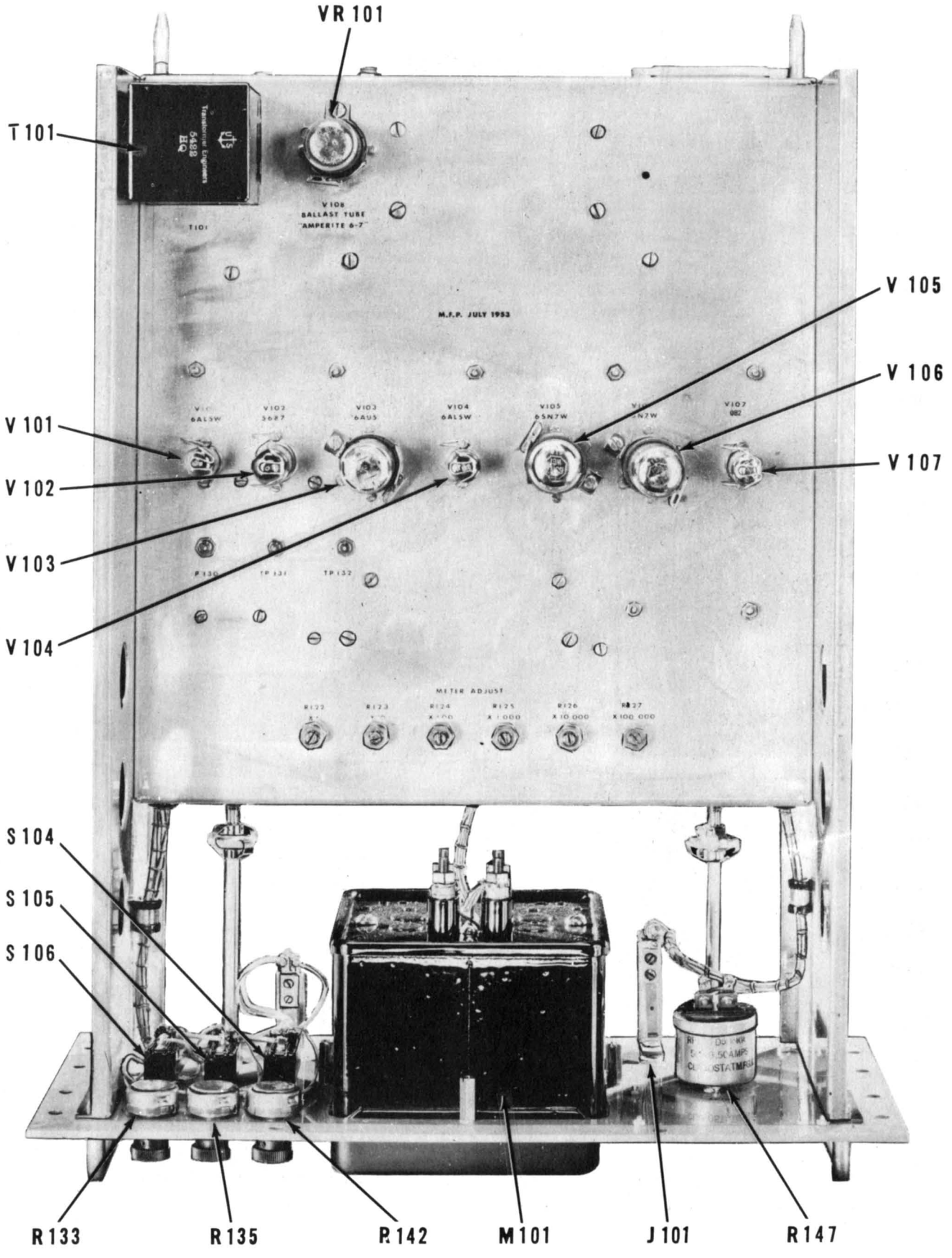


Figure 5-4. Radiac Indicator ID-363/UDR-9, Component Location, Top Side

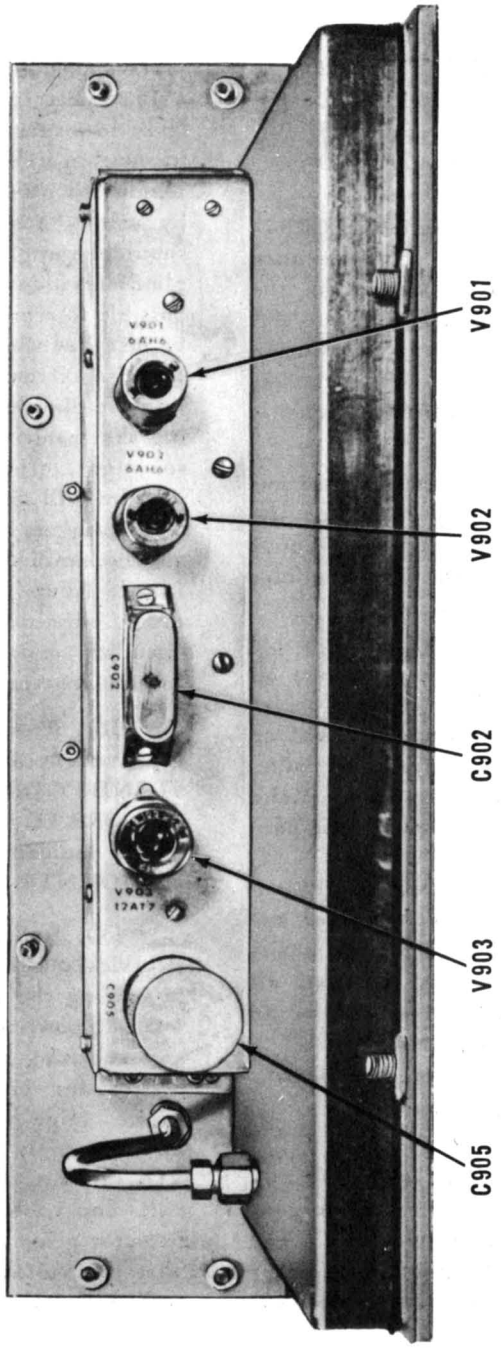


Figure 5-5. Radiac Detector DT-40/UD, Component Location, Rear View

SECTION VI
PREVENTIVE MAINTENANCE

1. MAINTENANCE PROCEDURES

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE BUREAU OF SHIPS MANUAL, OF THE LATEST ISSUE.

a. FREQUENCY OF MAINTENANCE CHECKS—The frequency with which preventive maintenance procedures must be performed is dependent on the amount of use the computer-indicator is given and the conditions under which it is operated. The routine preventive measures can be divided into three classes: Visual inspection, cleaning, and electrical checks.

b. INSPECTION.

(1). Keep all units clean by removing excess dirt and dust to prevent faulty operation of the equipment. A complete dusting of each unit should be performed at least once each week. This includes the top and underside of each chassis.

(2). Make a visual inspection of all cables, cable connections, and externally mounted components on the front and rear of each unit. Be especially observant of cable leads which are continually flexed or bent in operating the equipment. Inspect all bolts, nuts and screws to be sure they are tight. Make certain that the front panel bolts on each unit provide a secure fit to the cabinet.

(3). All tubes should be checked with a reputable "conductance" type tube checker after approximately 500 hours operation, regardless of satisfactory operation of the equipment. Replace all microphonic tubes to insure that there will be no stray counts introduced in the equipment.

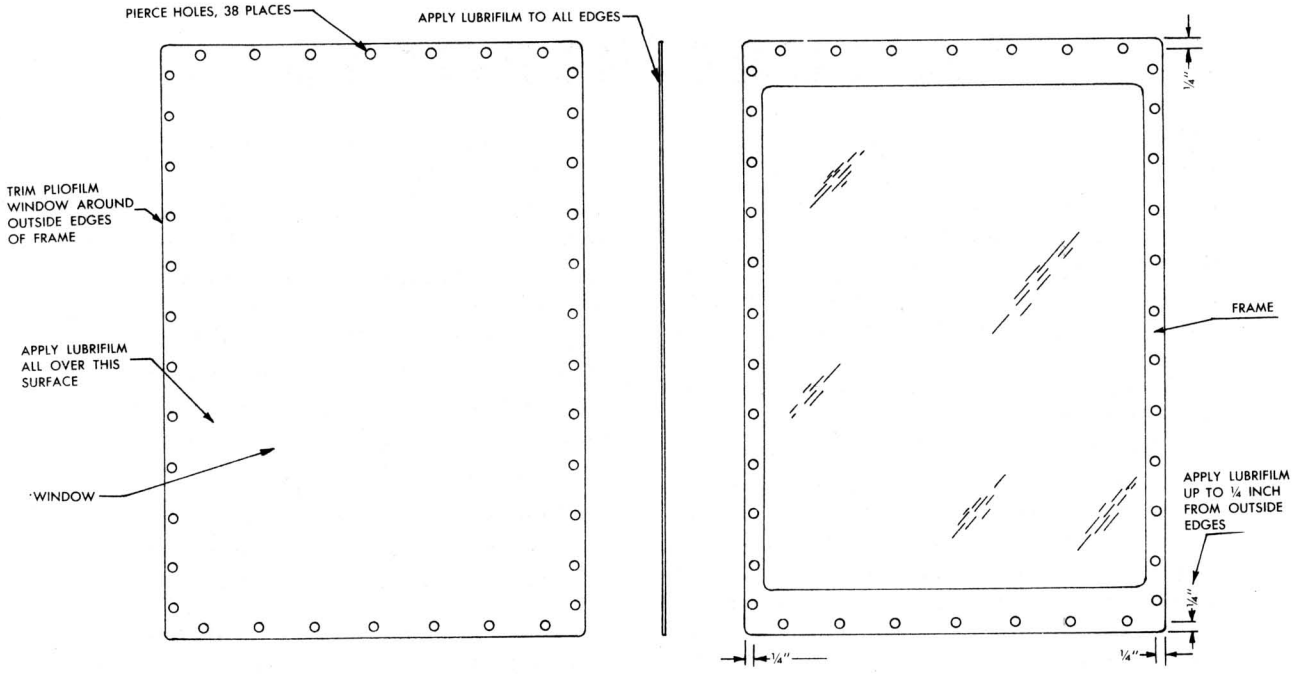
(4). Clean and check all switch and relay contacts after every 500 hours of operation.

c. ELECTRICAL CHECKS.

(1). Radiac Detector DT-40/UD.—The DT-40/UD will not operate correctly if there is no Argon-CO_2 gas present in the detector chamber. The slightest hole or perforation in the pliofilm chamber window will allow air to enter the chamber and adversely affect the operation of the detector. (For replacement of pliofilm window O901, see Figure 6-1). There is a small exhaust hole in the chamber body to insure that undue pressure will not be built up within the chamber. Therefore, if the pliofilm window is punctured by accident, it can be repaired by using "Scotch" type cellophane tape. The tape should be applied to the uncoated or outside of the pliofilm window. If the damage is too extensive or impossible to repair, a new pliofilm window will have to be installed. Because the pliofilm is so thin (.0025″), exercise extreme care when handling it. When installing the pliofilm window, tighten the 38 screws holding the frame in place so that they are snug but not too tight, otherwise, the rubber gasket under the pliofilm will distort the film and cause it to wrinkle. The stainless steel wire grid in the detector should also be handled with extreme care. This wire is very fragile (.001″ diameter) and should not be handled unless absolutely necessary. When assembling the chamber, make certain to keep all dust, dirt, and foreign matter out of the detector chamber.

(2). Radiac Indicator ID-363/UDR-9.—A rapid means of checking calibration is to place the STANDBY-OPERATE-CALIBRATE switch in the CALIBRATE position. The COUNTING RATE meter should indicate center scale (1) for all positions of the COUNTS PER SEC. RANGE control.

(3). Radiac Indicator ID-364/UDR-9.—An electrical check of the ID-364/UDR-9 is best obtained by setting the TEST-OPERATE switch in the TEST 105 PPS position of the CALIBRATE 100 PPS position and checking through all positions of the Function Switch for predetermined time and predetermined count. High voltage can be checked by energizing Power Supply PP-948/UDR-9 and rotating HIGH VOLTAGE CONTROL over the range of 0 to 2500 volts and back to 0. Make certain to disconnect any detector prior to energizing the power supply, otherwise the voltage rating of the detector may be exceeded and the detector damaged.



STEPS FOR THE PROCESSING OF THE ALPHA DETECTOR WINDOW

1. Frame Preparation:
   a. Stretch the 11-½" x 15-¼" piece of pliofilm over a piece of clean plate glass. Stretch in all directions and anchor with scotch tape to insure that no wrinkles or looseness is present.
   b. Apply suitable cement (thin rubber cement) to metal frame.
   c. Set frame on pliofilm, and press down firmly all around. Wait approximately 10 minutes.
   d. Remove frame and pliofilm from glass plate and smooth out any wrinkles that remain in the pliofilm.
   e. Trim the pliofilm from around the edges of the frame, using sharp razor blade.
   f. Clean the surface of the pliofilm with isopropyl alcohol.
   g. Pierce all the small screw holes from the pliofilm side of the frame with a sharp pointed instrument.

2. Coating Process: (Using "Lubrifilm", type 54, Process Engineering Co.)
   a. Thin lubrifilm with alcohol to spraying consistency. A commercial type "Air-brush" should be used for spraying.
   b. Spray solution lightly on pliofilm, on the surface away from the frame. Also spray the outside edge of the frame and around to approximately ¼" from the edge on the opposite side of the frame.
   c. After drying, rub lightly with a dry Kleenex tissue.
   d. Spray a second coat of lubrifilm, applying the passes with the air-brush at right angles to the direction of the passes of the first coat.
   e. Allow to dry and rub again with Kleenex tissue.
   f. Test the resistivity of the coated surface of the film with an ohmmeter, using smooth rounded probes. The point to point specific resistivity should not be greater than 3×10^5 ohms per centimeter on any section of the surface.

Figure 6-1. Replacement of pliofilm window (O901) in Radiac Detector DT-40/UD

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NAVGEN 1025, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause or failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships in the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publication Office.

Figure 7-1. Failure Report, Sample Form

SECTION VII
CORRECTIVE MAINTENANCE

1. INTRODUCTION

a. This section contains information necessary to assist maintenance personnel to locate trouble and to make repairs or the necessary adjustments to the equipment. The following information is contained in this section: Trouble-shooting data, high voltage power supply adjustments, crystal controlled time base adjustments, waveforms of voltages at significant points in the equipment, and voltage and resistance measurements of electron tubes.

WARNING

Operation of Radiac Computer-Indicators CP-79/UD and CP-71/UD with Power Supply PP-948/UDR-9 removed and energize involves the exposure of terminals carrying high voltages that are dangerous to life. Observe and obey safety regulations at all times.

NOTE

Maintenance personnel must fill out a failure report for each part, component, tube, or mechanical assembly repaired or replaced. See sample failure report shown in Figure 7-1.

b. EQUIPMENT REQUIRED FOR COMPLETE CHECK.

A complete check of the AN/UDR-9, carrying out all the tests outlined in this section, requires the following:

(1) Oscilloscope such as TS-34/AP Series Equipment, or AN/USM-24 Series Equipment.

(2). Multimeter such as ME-25/U Series Equipment, or AN/PSM-4 Series Equipment.

(3) Signal Generator such as AN/URM-25 Series Equipment.

(4) Wheatstone Bridge such as Resistance Bridge ZM-4/U Series Equipment.

2. TROUBLE SHOOTING.

a. Localization of trouble in Radiac Computer-Indicators CP-79/UD and CP-71/UD is simplified by the character of the circuits and by the many test points provided throughout the various units. Since the objective of the CP-79/UD is to count pulses and measure time, troubles will usually be indicated on Radiac Indicator ID-364/UDR-9. Troubles in the CP-71/UD will usually be indicated on Radiac Indicator ID-363/UDR-9. Failure of line voltage or high voltage is indicated by lamps and by the high voltage meter on Power Supply PP-948/UDR-9. Charts showing troubles and probable causes on the various units are given in Tables 7-1 through 7-5. Use of these charts will localize trouble sufficiently well to enable its precise location by voltage and resistance in the suspected area, or by waveform checking at test points provided. Voltage and resistance measurements are provided in Figures 7-18 through 7-24, while waveforms are shown in Figure 7-2.

b. Figure 7-3 through 7-9 are bottom views showing component locations on the various units of the AN/UDR-9.

3. WAVEFORMS.

The normal waveforms of voltages to ground at the various points in the equipment are shown in Figure 7-2. These waveforms were photographed on the screen of a cathode ray oscilloscope such as Oscilloscope AN/USM-24 Series under conditions fully described in each figure. Peak-to-peak voltages of the waveforms are also given. Small departures of actual waveforms or voltages from those shown in these figures do not necessarily indicate defective conditions, but large departures usually do indicate trouble. The Function Switch, S401, on Radiac Indicator ID-364/UDR-9 was set to MANUAL, and the TEST-CALIBRATE switch, S402, was set to the TEST 10^5 PPS position. The STANDBY-OPERATE-CALIBRATE switch S102, on Radiac Indicator ID-363/UDR-9 was set to CALIBRATE, and the COUNTS PER SEC. RANGE selector S101 was set to position shown in last column of Figure 7-2.

4. ADJUSTMENTS.

a. Power Supply PP-948/UDR-9.

WARNING

DANGEROUS HIGH VOLTAGE EXISTS ON THE POWER SUPPLY CHASSIS. EXERCISE EXTREME CAUTION WHEN MAKING ANY ADJUSTMENTS. USE HEAVILY-INSULATED TOOLS AND PLACE ONE HAND IN POCKET. STAND ON DRY BOARD OR LINOLEUM.

(1) High Voltage.—With the H.V. switch, S503 in the "off" position, and the HIGH VOLTAGE CONTROL fully counterclockwise, the end point is determined by the stop on the helipot R552. Ten turns clockwise should bring this control up to its limit. The voltages concerned (measured to ground) with H.V. switch S503 "on", should be approximately as follows:

	High Voltage Control	
	Fully CCW	*Fully CW*
H.V. meter should read	OV	2500V

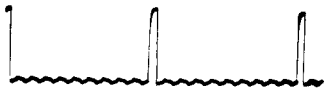
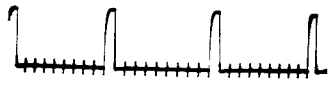
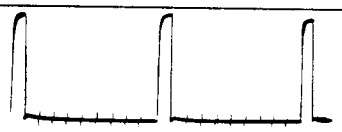
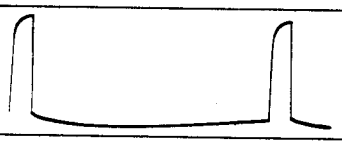
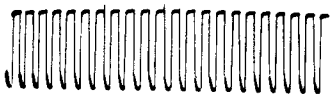
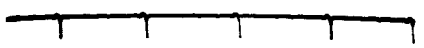
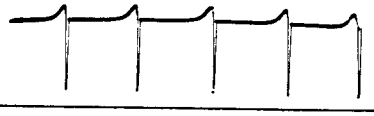
Test Point	Normal Waveform of Voltage to Ground	Approx. Oscilloscope Sweep	Peak to Peak Volts	Location
TP 201		40 us	30	V201, pin 2
TP 202		200 us	115	V203, pin 1
TP 203		3000 us	110	V204, pin 1
TP 204		20000 us	105	V205, pin 1
TP 205		110000 us	105	V207, pin 1
TP 207		100000 us	105 R.M.S.	T206, term 6
TP 208		200 us	3	V214, pin 1 ckt.
TP 209		200 us	25	V216, pin 1
TP 210		200 us	190	V221, pin 4
TP 211		40 us	22	V223, pin 1
TP 212		40 us	1.5	V223, pin 7
TP 213		40 us	35	V224, pin 1
INPUT TO DRIVER CABLE		40 us	160	

Figure 7-2. Waveform in Trigger Amplifier AM-840/UDR-9 (Sheet 1 of 3 sheets)

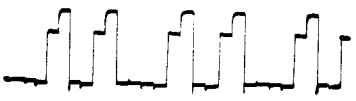
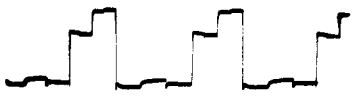
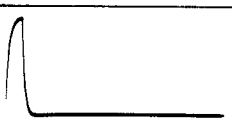
Test Point	Normal Waveform of Voltage to Ground	Approx. Oscilloscope Sweep	Peak to Peak Volts	Location
TP 401		100000 us	190	V406, pin 6 ckt.
TP 601		200 us	170	V606, pin 9
TP 602		200 us	180	V607, pin 9
TP 603		200 us	180	V608, pin 9
TP 604		200 us	180	V609, pin 9
TP 701		2000 us	200	V701, pin 2
TP 702		2000 us	190	V703, pin 2
TP 703		2000 us	190	V704, pin 2
TP 704		2000 us	180	V709, pin 6

Figure 7-2. Waveforms in Radiac Indicator ID-364/UDR-9 (Sheet 2 of 3 sheets)

Test Point	Normal Waveform of Voltage to Ground	Approx. Oscilloscope Sweep	Peak to Peak Volts	Location	Range Switch S101 Position and Frequency
TP 130		30 us	45	V101, pin 1	X100,000 (internal 100 KC)
TP 131		30 us	45	V102, pin 1	X100,000 (internal 100,000)
TP 131		30 us	35	V102, pin 1	X1000 (internal 1KC)
TP 131		1000 us	35	V102, pin 1	X10 (internal 10 cps)
TP 132		1000 us	250	V103, pin 5	X10 (internal, 10 cps)
TP 132		100 us	250	V103, pin 5	X1000 (internal 1 KC)
TP 132		20 us	250	V103, pin 5	X100000 (internal 100 KC)

NOTE: Waveforms for ID-363/UDR-9 taken with STANDBY-OPERATE-CALIBRATE switch (S102) in the CALIBRATE position, and COUNTS PER SEC. RANGE selector (S101) in the position shown in column above.

Figure 7-2. Waveforms in Radiac Indicator ID-363/UDR-9 (Sheet 3 of 3 sheets)

TABLE 7-1. POWER SUPPLY PP-948/UDR-9, TROUBLE CHART

Indication	Check for Trouble
Pilot light does not light.	15 amp fuses power switch S502 rear interlock S505 line filters Z501 and Z502 thermal overload S501 hi-lo line switch S506 indicator bulb I506
B+ not available.	B+ fuse F505, .75 amp, 1 KV found on underside of chassis, its purpose being to protect Power Supply from +300 volt overload or shortcircuits transformer T501 time delay relay K501 relay K503 rectifier tubes V501-V503 voltage regulator circuits V504-V509 interconnecting cable or cable connector P501

TABLE 7-1. (Continued)

Indication	Check for Trouble
B– not available.	transformer T501 rectifier tube V510 voltage regulator circuits V511-V513 interconnecting cable or cable connector P501
H.V. not available.	1amp. fuse H.V. switch S503 time delay relay K501 H.V. relay K504 variac T503 H.V. transformer T502 rectifier tube V514 regulator circuits V515-V521 polarity relay K502 meter M501 interconnecting cable or cable connector P501

TABLE 7-2. TRIGGER AMPLIFIER AM-840/UDR-9, TROUBLE CHART

Indication	Check for Trouble
"Test-Operate-Calibrate" switch S402 in "Calibrate-100 cps" position. No count in Radiac Indicator circuits. Sound of 100 cps from aural monitor.	Check all switches for correct position: S203—"Pulse Input Polarity" switch on "Neg." position. S202—"Input Multiplier" switch on "X1" position. S401—"Predetermined Count—Predetermined Time" switch "Manual" position. S403—"Reset-Stop-Count" switch on "Count" position after reset. S201—"Input Time Constant" switch on "1000" position. "Aural Monitor Volume" control to be right (clockwise). V255, output drive circuits inoperative. Signal cable (A1 coax) or cable connector P201 defective. Cable terminating resistor R408 defective. 707 DCU defective.
No sound in aural monitor and no count in Radiac Indicator. "Test-Operate-Calibrate" switch S402 on "Calibrate-100 cps" position. "Reset-Stop-Count" switch S403 on "Count" position after reset.	Check to see if 100 cps signal is present from time base in input amplifier circuits, thru switch C402B, thru to relay K201. Check S201, S202 and S203 in input amplifier circuits. Check S205 for correct position. Check amplifiers V224, V223; Schmitt trigger V222 and V221; amplifiers V219-V214, discriminator circuit V220.
No sound in aural monitor or count in Radiac Indicator when S203, "Pulse Input Polarity" switch is on the (+) position, and a (+) signal is applied.	S203 inoperative. V213 inoperative.
No sound in aural monitor, but unit operates properly otherwise.	V226 and associated circuits.
No sound in aural monitor or count in Radiac Indicator when a Geiger Muller tube is attached, and S203 is on "GM" position.	V212 faulty. H.V. not present on GM tube. GM tube faulty.
"Predetermined Count-Predetermined Time" switch S401 on "Pred. Time-Internal" position with "Test-Operate-Calibrate" switch S402 on "Test 10^5 pps" position, check the time base by the indications in the following chart.	If one divider is off the normal division by 10, all following dividers will give a wrong count also.

Timing Pulses Milliseconds S204	Circuit or Divider Concerned	Scaler Should Read
.01	100 kc oscillator	1
.1	1st divider	10
1.0	2nd divider	100
10.	3rd divider	1000
100.	4th divider	10000
1000.	5th divider	100000

TABLE 7-2. (Continued)

Indication	Check for Trouble
If clock does not agree with calibrated count, and oscillator and dividers have been checked.	S405 clock motor switch V206 binary V209 shaper V210, V211 clock drivers and R275, 50 cycle adjust potentiometer V408 clock clutch drive I402 clock Clock voltage too high, 105V AC usually causes most accurate clock readings.

TABLE 7-3. RADIAC INDICATOR ID-364/UDR-9, TROUBLE CHART

Indication	Check for Trouble
DCU lights not lighting in proper sequence or are erratic, double lighting or not lighting at all.	Respective DCU defective, defective neon light, tube or component.
Register inoperative.	S404 switch V405 register drive circuits V406 one-shot circuits I403 register.
Register won't reset.	S406, S403 Reset motor, chain, sprockets.
Register resets continually.	Check reset cam adjustment.
"Count" light not lighting, unit not counting.	S403A, S401B, V404, V402, V401, V407.
"Count" light lights, but unit doesn't count.	Gate tube V223, in Trigger Amplifier, interconnecting cable.
"Count" light out, unit counts OK.	I401.
Unit counts continuously.	V403, V401, cable, V223.
Cannot reset clock.	S403B, V402, V407, V408 Reset solenoid in clock.

TABLE 7-4. RADIAC INDICATOR ID-363/UDR-9, TROUBLE CHART

Indication	Check for Trouble
Cannot calibrate meter by front panel pushbutton switches and adjustments.	Circuits of V105, V106, or V107. Check M101 and DC circuits for pushbutton switches.
With S102 (STANDBY-OPERATE-CALIBRATE) in CALIBRATE position unit will not read mid-scale on any position of COUNTS PER SEC. RANGE selector S101, but will operate normally on the OPERATE position.	S102; cabling; K201 in Trigger Amplifier; S101A; Time base in Trigger Amplifier.
With S102 on CALIBRATE position, unit will not read mid-scale on one particular position of COUNTS PER SEC. RANGE selector S101, but operates properly on other ranges.	Check the resister combination for the range concerned on S101F; capacitors on S101D & E, S101B & C; connections to S101A; cables carrying signals from time base in Trigger Amplifier; time base circuit.

TABLE 7-5. RADIAC DETECTOR DT-40/UD, TROUBLE CHART

Indication	Check for Trouble
No counts from detector with Alpha sample placed beneath window. Signal can be injected into amplifier input, and unit counts correctly.	Insufficient gas flow through chamber, at least ½ hour is required to flush out chamber; check settings of CP-79/UD or CP-71/UD for correct values as given in Section 4, Operation; Perforation in pliofilm window allowing gas to escape; anode wire broken inside chamber.
No counts from detector chamber or from an injected signal.	Check amplifier circuits V901, V902, V903; also check connecting cables and voltages.

By means of the H.V. SET control, R554, adjust the high voltage output as closely as possible to 2500 volts. Using a back-up supply of approximately 1500V, set the high voltage so that the difference in voltage is zero. Monitor the difference voltage with an electronic voltmeter, and adjust R556 (LINE SET) so that line variations (105 to 130V) cause a minimum variation in the high voltage output. Adjust R550 (LOAD COMPENSATION) so that the no-load-to-full-load variation in output voltage is a minimum. Recheck LINE SET and then LOAD COMPENSATION as these controls are interacting. Also check the regulation on negative high voltage.

(2) Positive 300V Supply.—This adjustment is made by first setting R529 (+300V ADJ), on the chassis, to give an output of +300 volts. Then adjust R527, LINE ADJ, for minimum change in the +300 volt output with a-c line variations. Since these controls are interacting, it may be necessary to repeat this procedure several times before the optimum setting has been reached.

(3) Negative 105 Volts.—This supply is adjusted by varying R541 (—105V ADJ) for —105 volts output.

b. *Trigger Amplifier AM–840/UDR–9.*

(1) Input Amplifier.

(a) Each step of the multiplier switch sets up a potential divider which reduces the signal voltage by a factor equal to the number opposite the switch position. The resistances of the multiplier which constitute its low frequency properties may be checked with a wheatstone bridge such as Resistance Bridge ZM–4/U. In order that both high and low frequency components of a complex signal may be equally reduced, thus preserving the waveform of the signal passing through the divider, the same proportion of resistance and capacitance must be maintained in its series and shunt arms. The resistors are required to be within one percent of their nominal values as shown in the schematic diagram, Figure 7-11. The wheatstone bridge should thus be accurate to within about one-tenth of one percent.

(b) As shown by Figure 7-11 each multiplier step contains two adjustable capacitors with the exception of the "X1" position. One adjustable capacitor of each multiplier position is the capacitor element of the series arm of the voltage divider (C248, C252, C255, C258, C261, C264). These capacitors are used so that the relationship of resistance and capacitance can be adjusted to be the same for the series and shunt portions of each divider. This is necessary for undistorted transmission of signal pulses containing components covering a wide frequency band. The other adjustable capacitor of each position (C247, C250, C253, C256, C259, C262) is shunted around all other elements and therefore plays no part in the division of voltage within the multiplier. These latter capacitors are adjusted so that each step of the multiplier presents a constant input capacitance.

(c) To obtain constant transmission with frequency feed a 1000 cps square wave, from Tektronix Type 104 or 105 square wave generator or Navy equivalent into the multiplier and observe the square wave output at each step with an oscilloscope. If necessary vary C248, C252, C255, C258, C261, and C264 in order to obtain a proper square wave pattern. To adjust for constant input capacitance, place the polarity switch, S203, on "negative", and measure the capacitance at each position by means of a "Q" meter or Capacitance Bridge such as TS–460/U. First, measure the direct transmission capacitance (X1). This should be about 120 mmf and other ranges should be made equal to this by varying C247, C250, C253, C256, C259, and C262 on X2, X5, X10, X20, X50, and X100. Vary C265 to obtain the same capacitance on direct-positive as on direct-negative. Adjust the overall gain of the input amplifier by attenuating an input pulse by 100 and varying GAIN ADJ R333 so that the amplifier output at TP210 is the same as the input to the attenuator. The multiplier can be used for the X100 attenuator or if desired, an external attenuator can be used if the multiplier is first switched to the X1 position.

(2) Pulse Height Discriminator.—To adjust the pulse height discriminator, flat-top pulses must be used. Set DISCRIMINATOR LEVEL VOLTS, R319, on front panel of Trigger Amplifier AM–840/UDR–9 to 0.1. Adjust input so pulse amplitude at TP210 is 10 volts. Adjust Disc Range, R317, so discriminator just operates. Operation of the discriminator can be observed on Radiac Indicator ID–364/UDR–9, by listening to the aural monitor, or by visual observation with a synchroscope. Set DISCRIMINATOR VOLTS to 1.0 and pulse amplitude at TP112 to 100 volts. Adjust Sensitivity Control, R342, so discriminator just operates. Recheck these adjustments as the controls may cause interaction.

(3) Time Base.—Before adjusting the 100KC oscillator, compare the frequency at TP201 with a known standard of an accuracy of at least 1/10 of 1 percent. Then adjust C211 if it is necessary to vary the oscillator frequency. Each of the frequency divider stages is adjusted by varying its corresponding potentiometer R221, R231, R240, R260, or R270. These adjustments may be performed in conjunction with Radiac Indicator ID–364/UDR–9 by placing the Function switch, S401, on PREDET. TIME-INT. and the TIMING PULSE-MILLISECONDS switch, S204, at the divider being adjusted. Start at the first divider with the timing pulse selector at .1 milliseconds. Radiac Indicator should read 10. Vary R221 until Radiac Indicator reads 9, then back off until it reads 11. Set R221 one-third of the way between the two positions noted. Vary the line voltage from 105

to 130 volts to check the control setting. Repeat this procedure for the other dividers in order. With a synchroscope it is possible to look at each divider and adjust it so that, for 10 input pulses, one output pulse occurs. Waveforms at test points at the divider outputs are shown in Figure 7-2, this section. Adjust R275 to obtain 105 volts, 50 cps for the clock drive.

c. *Radiac Indicator ID–363/UDR–9.*

(1) Rate Meter and Log Converter.

(a) The calibration of the log converter and meter circuit is accomplished by the push button switches S106, S105, and S104 in conjunction with the potentiometers R133, R135, and R142. These calibration points are for 0 scale which is .1, midscale which is 1, and full scale which is 10 respectively. With a DC voltage of 20 volts applied to the log converter, the meter reads full scale, with a voltage of 2 volts applied, it reads half scale, and with .2 volts applied, it reads .1 on the meter scale, with no voltage applied, the meter reads 0. For calibrating purposes, the voltages necessary to give .1, 1, and 10 readings on the meter are supplied by the voltage divider circuit R128, R129, R130, and R148 in conjunction with the three push button switches S104, S105, and S106. It is necessary that the height slope and curvature of the linear to logrithmic interval characteristic in the metering circuit be correct if meter indication is to be as specified. These three perameters may be controlled by the three front panel adjustments marked "meter adjust". When the three push button switches directly below these controls are operated, suitable direct voltages are applied to the log converter so that the meter deflection should be .1, 1, or 10 as indicated below these switches. The potentiometers should be adjusted in order from left to right at these three points and then rechecked for final trimming, since there is some interacting of adjustment. In order to compensate for the addition of the resistance of the recorder in series with the panel meter, a switch jack has been used and an appropriate amount of resistance, (R140), is removed from the metering circuit when the recorder is plugged in. Since recorders may vary more than 10% from the normal resistance of 1400 ohms, the meter adjust controls, R133, R135, and R142, should be rechecked whenever the recorder is plugged in or out.

Table 7-6, below, is a cross-reference indicating the interchangeability of standard JAN-type tubes as used in the AN/UDR–9 to "reliable type" tubes. When available, "reliable type" tubes should be used as replacements for JAN-type tubes.

TABLE 7-6. ELECTRON TUBE INTERCHANGEABILITY CHART, JAN-TYPE TO RELIABLE TYPE.

JAN TYPE	*RELIABLE TYPE*
5R4GY/W	5R4WGA
6AL5	5726
6AQ5	6005
6AS6	5725
12AT7	12AT7WA
12AU7	5814
6AS7G	6080WA
12AX7	5751
6SN7WGT	6SN7WGTA
0B2	0B2WA
5651	5651WA
5687	5687WA

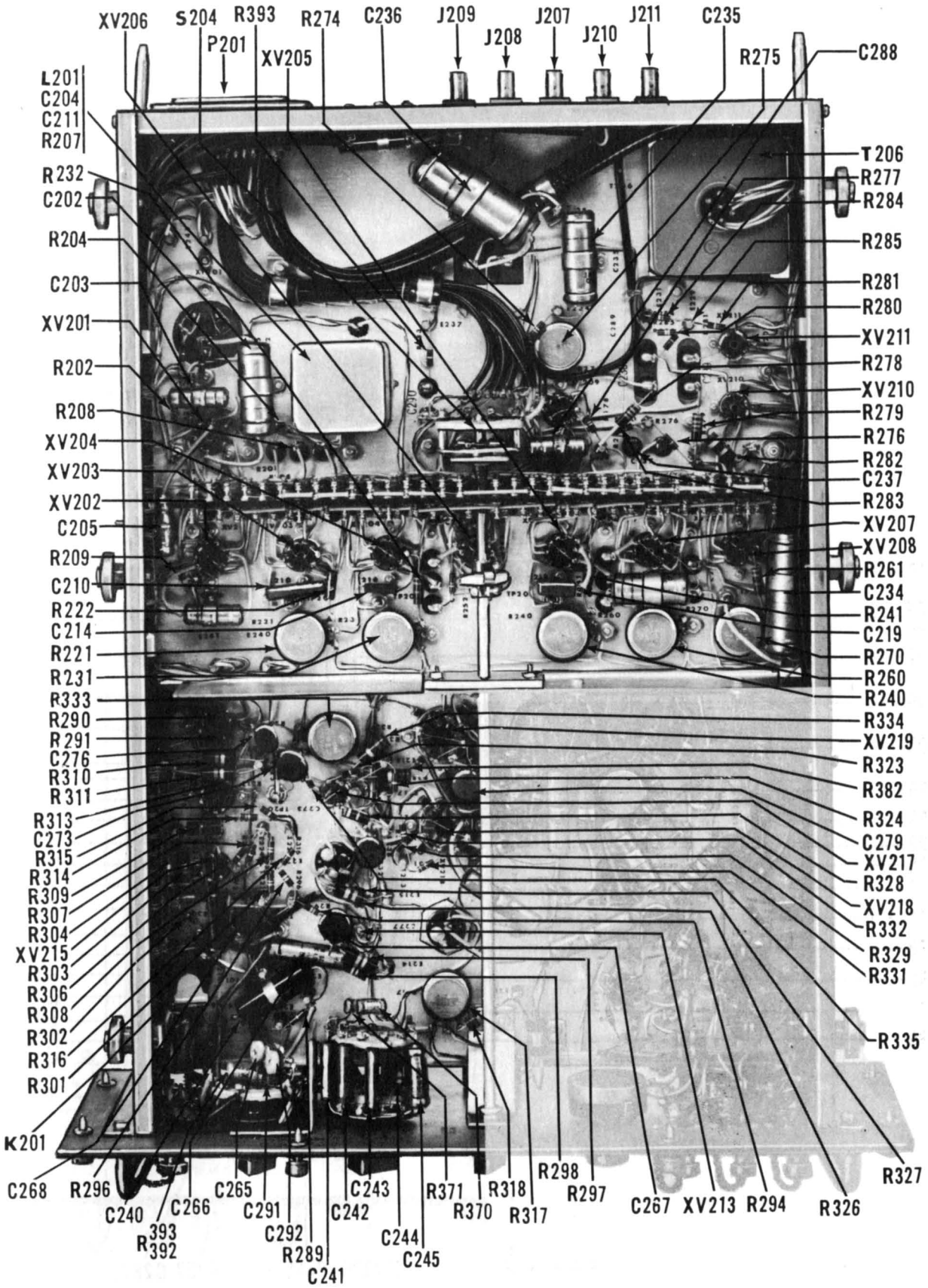


Figure 7-3. Trigger Amplifier AM-840/UDR-9 Component Location, Bottom Side (Sheet 1 of 2 sheets)

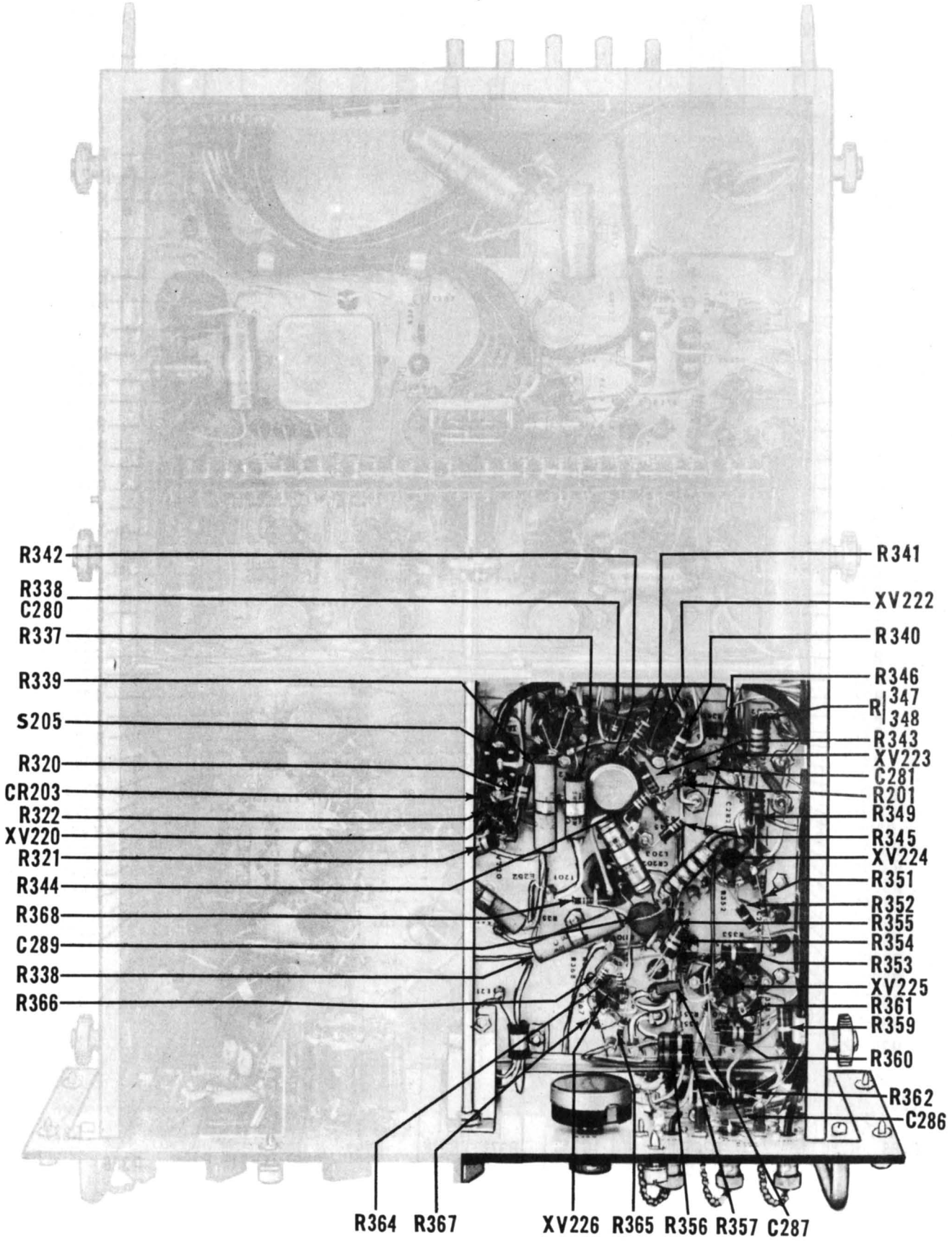


Figure 7-3. Trigger Amplifier AM-840/UDR-9 Component Location, Bottom Side (Sheet 2 of 2 sheets)

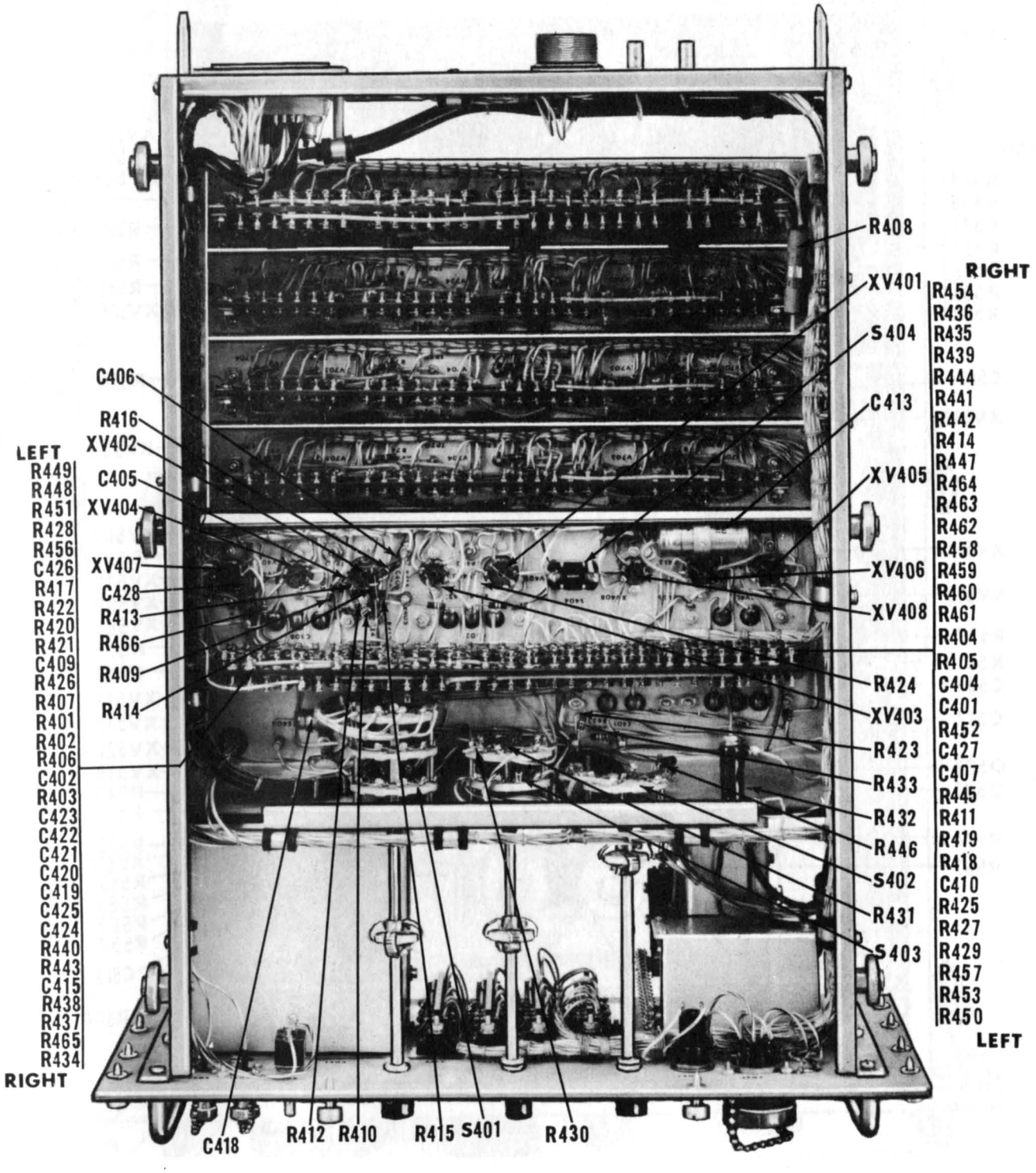


Figure 7-4. Radiac Indicator ID-364/UDR-9 Component Location, Bottom Side

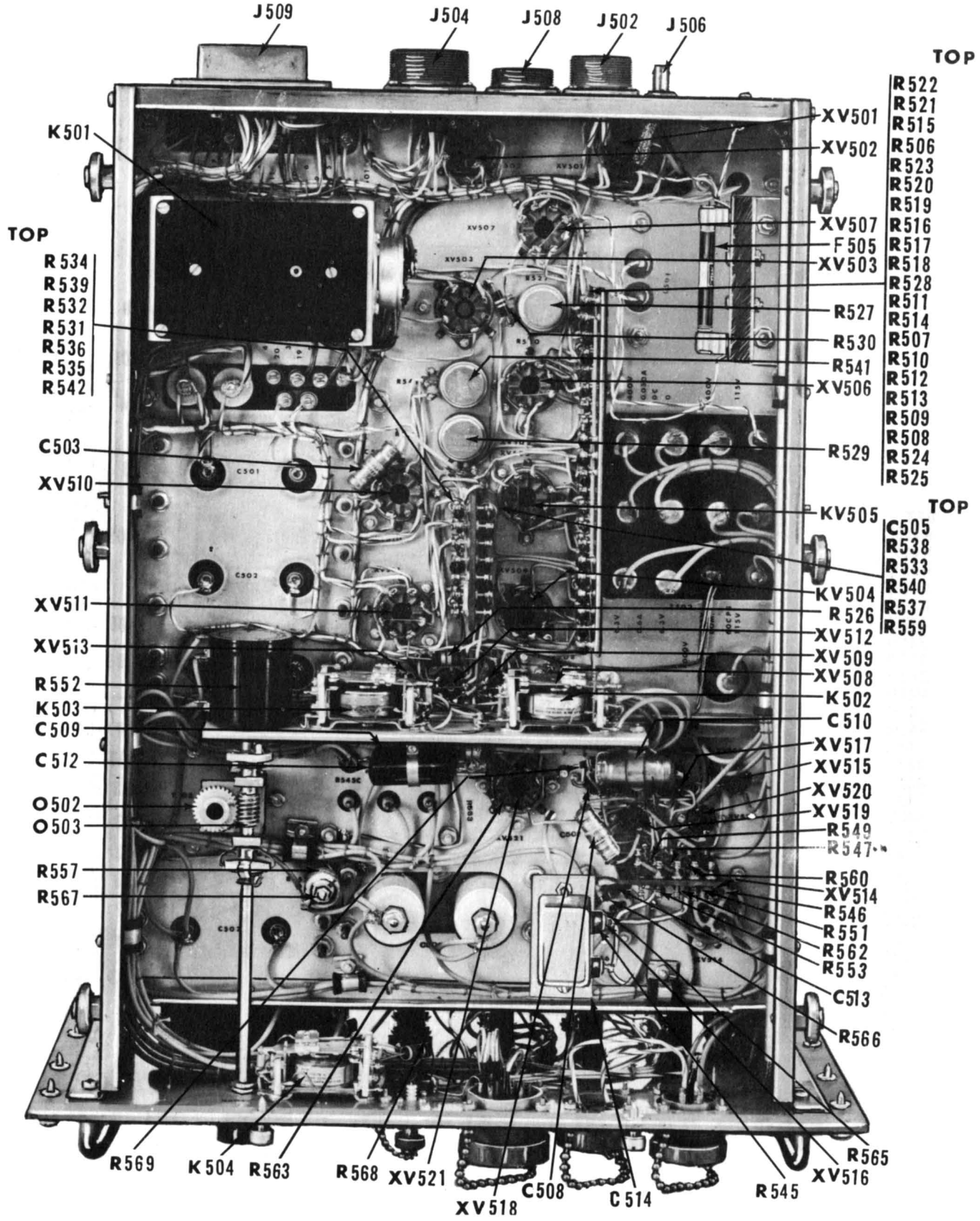
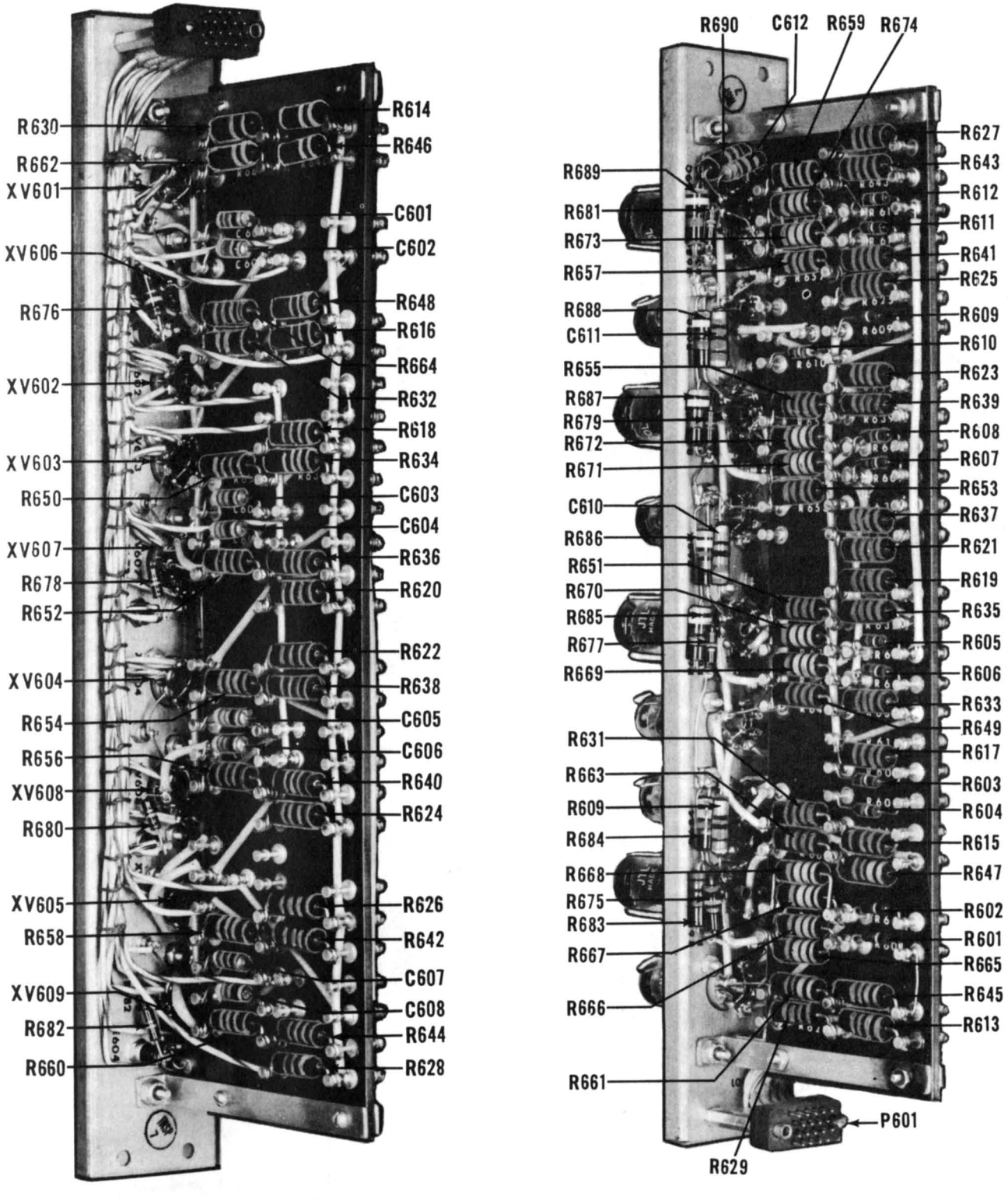
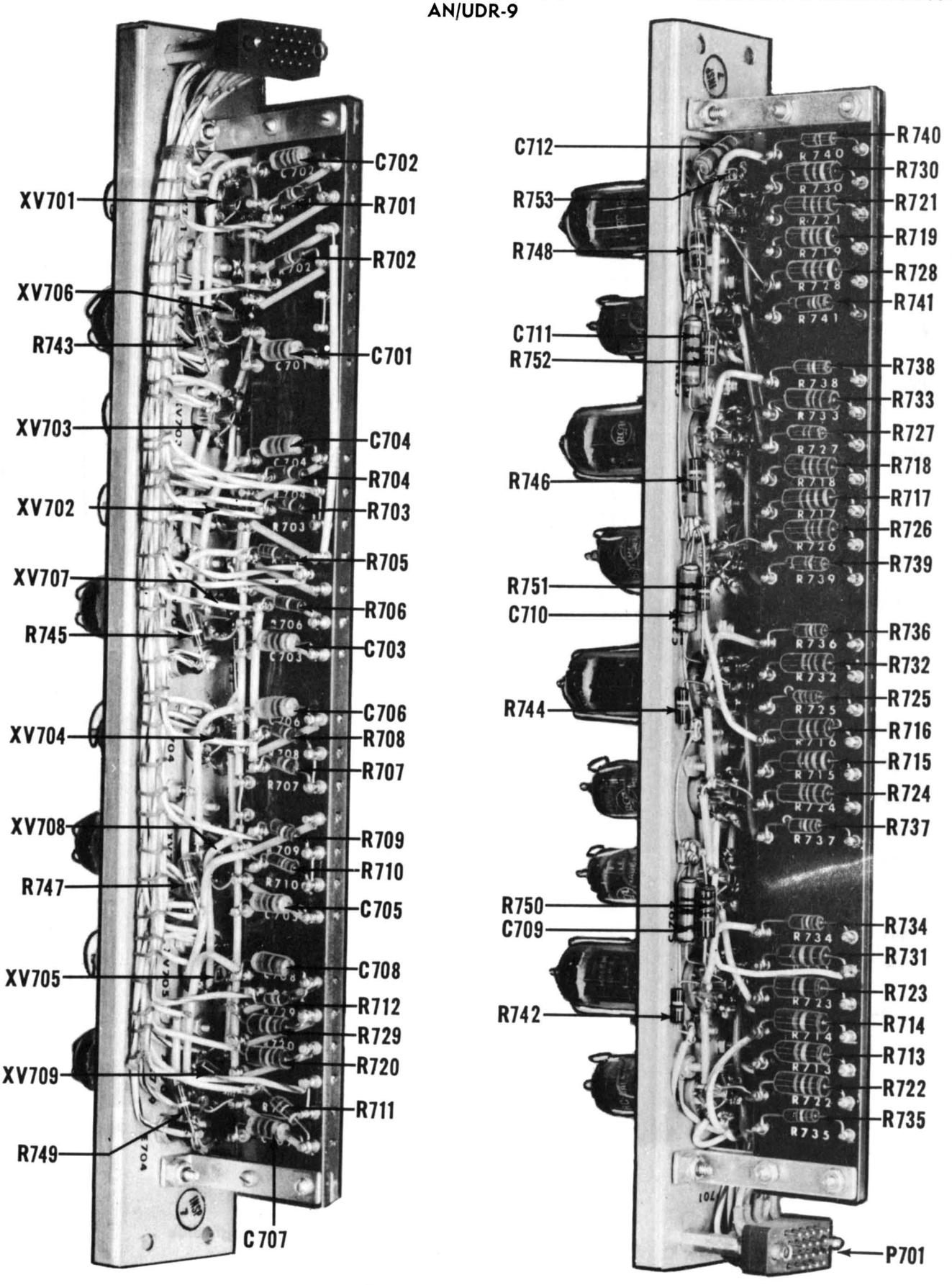


Figure 7-5. Power Supply PP-948/UDR-9 Component Location, Bottom Side



Left Side *Right Side*

Figure 7-6. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 707, Component Location, Bottom Side



Left Side *Right Side*

Figure 7-7. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 706, Component Location, Bottom Side

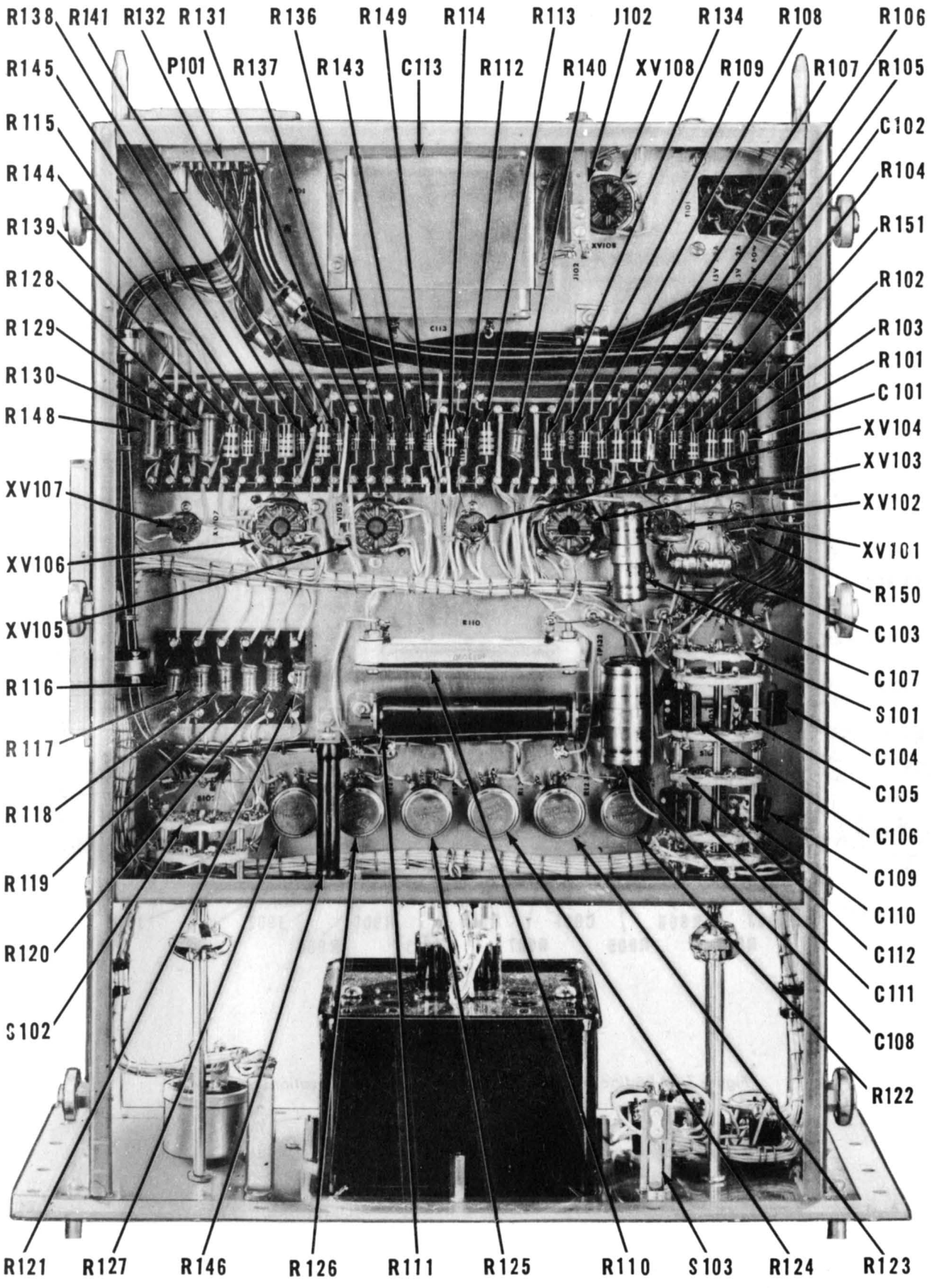


Figure 7-8. Radiac Indicator ID-363/UDR-9, Component Location, Bottom Side

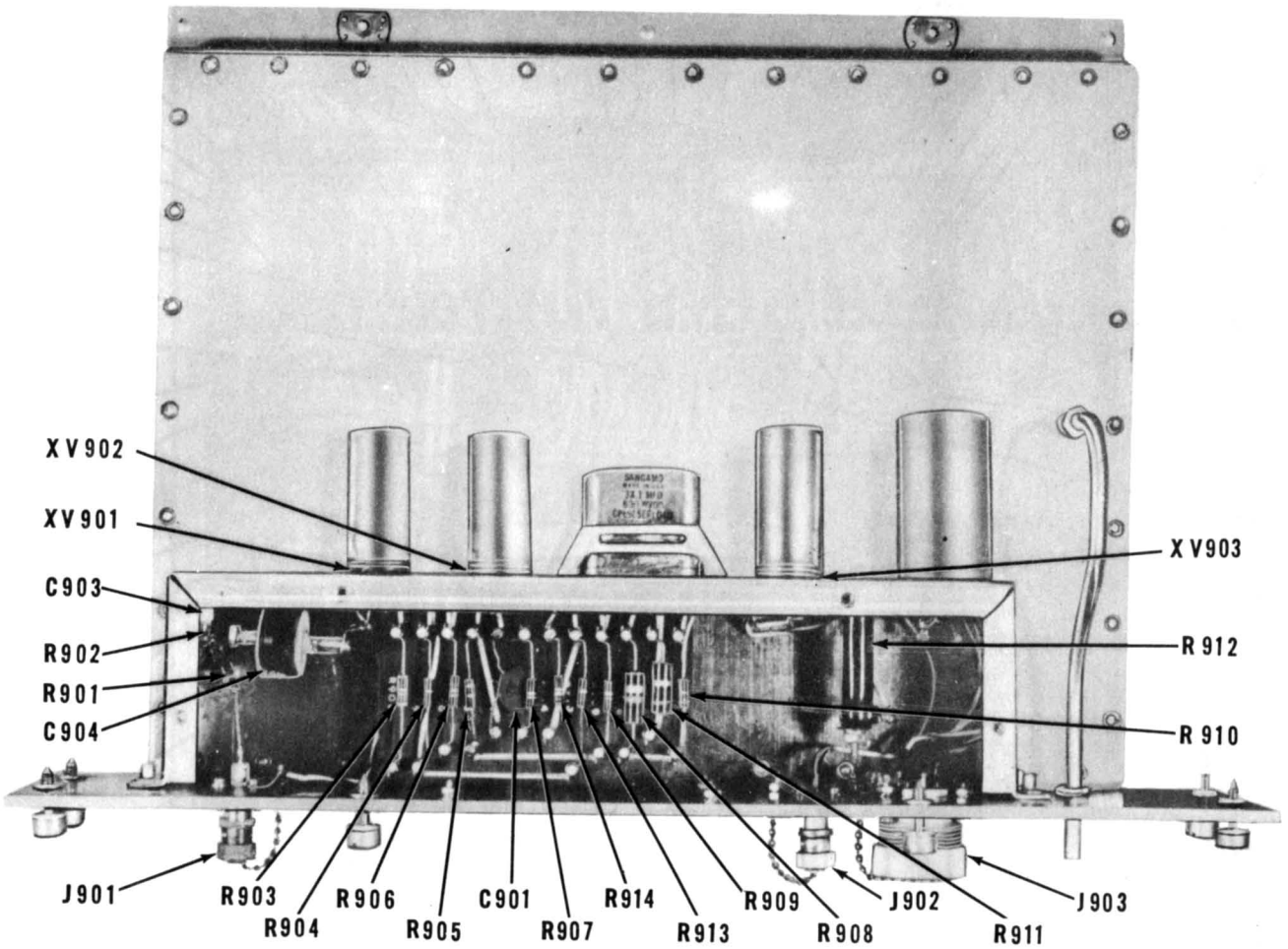


Figure 7-9. Radiac Indicator DT-40/UD, Component Location, Top View

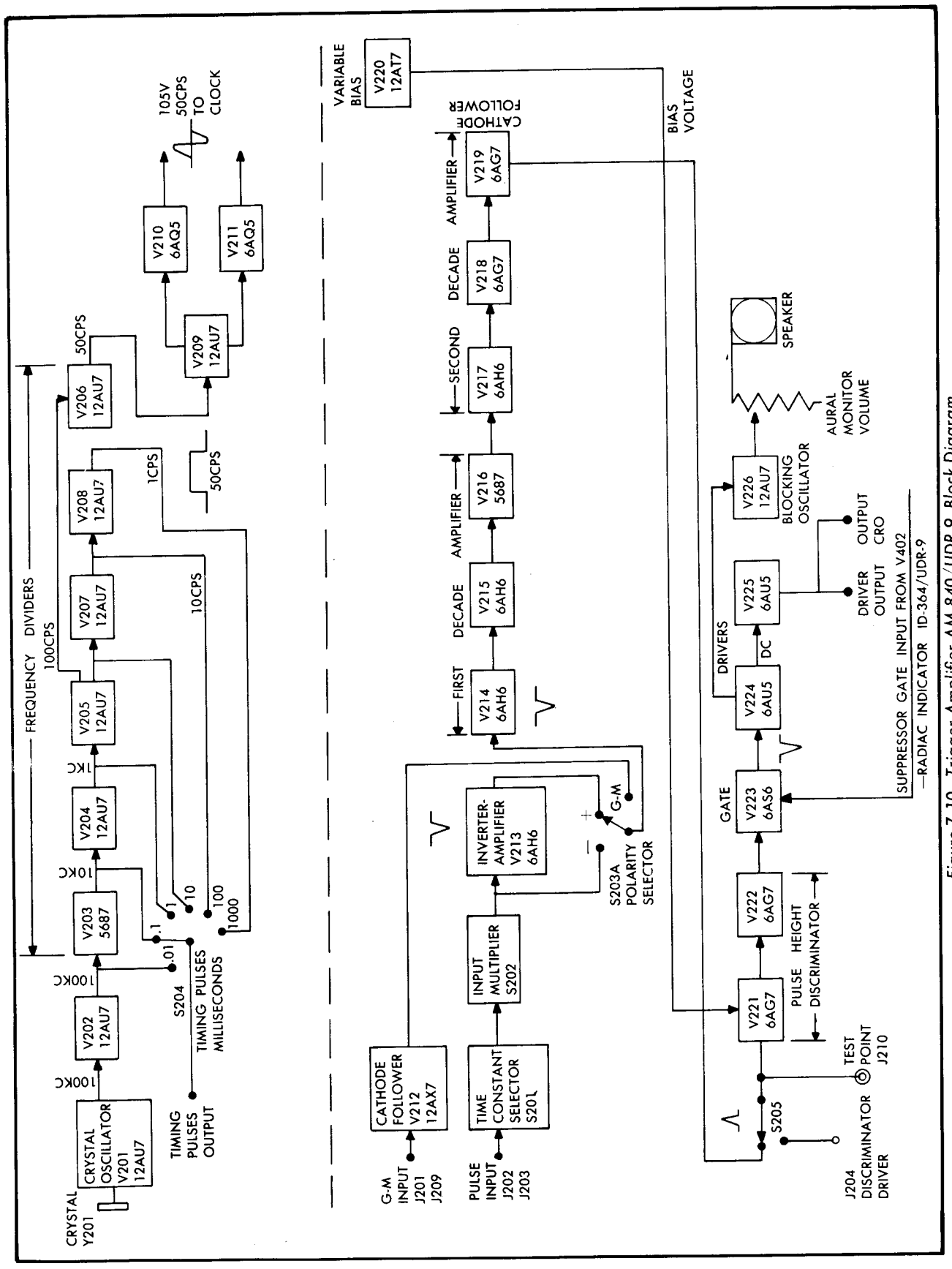


Figure 7-10. Trigger Amplifier AM-840/UDR-9, Block Diagram

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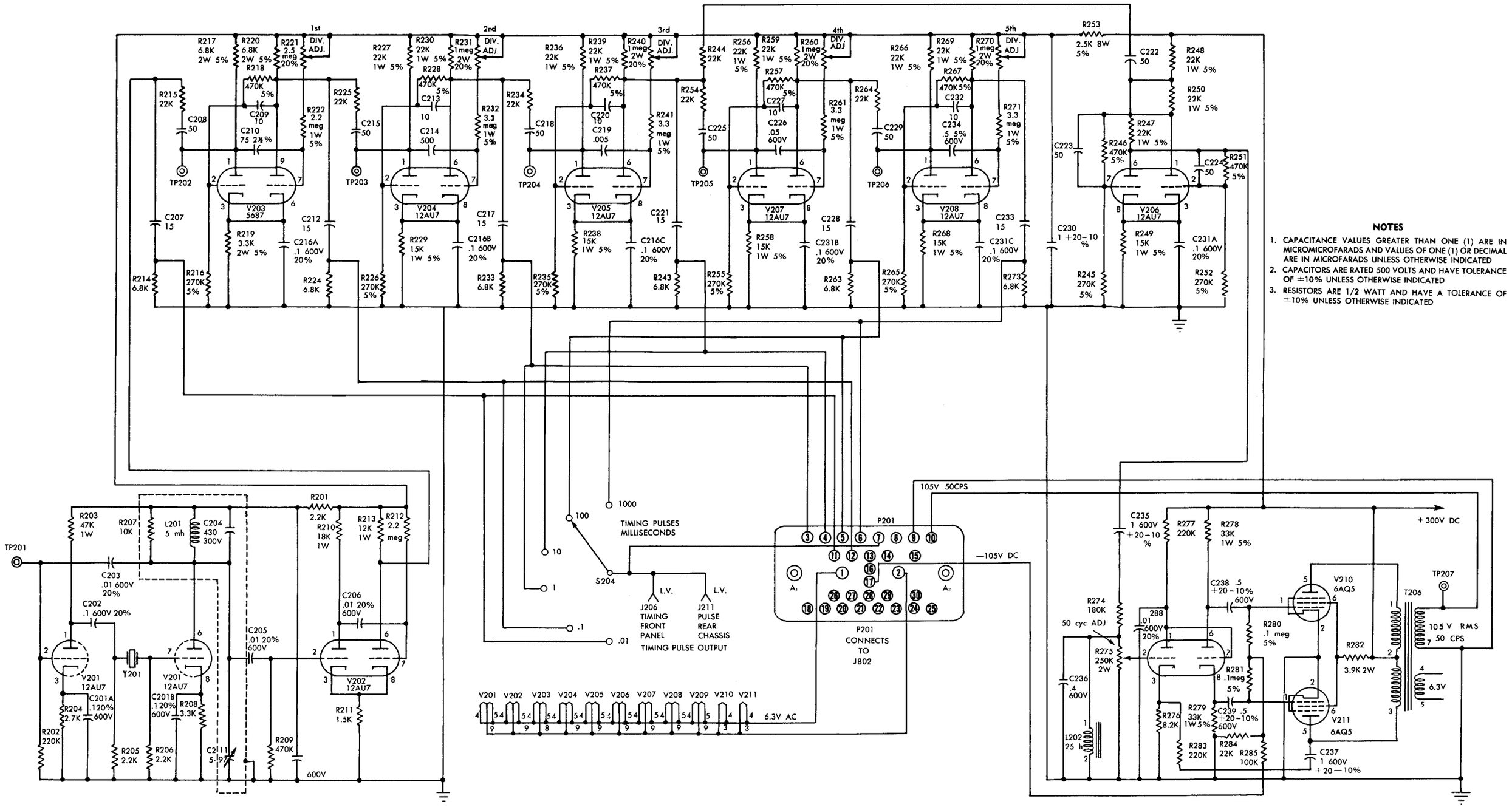
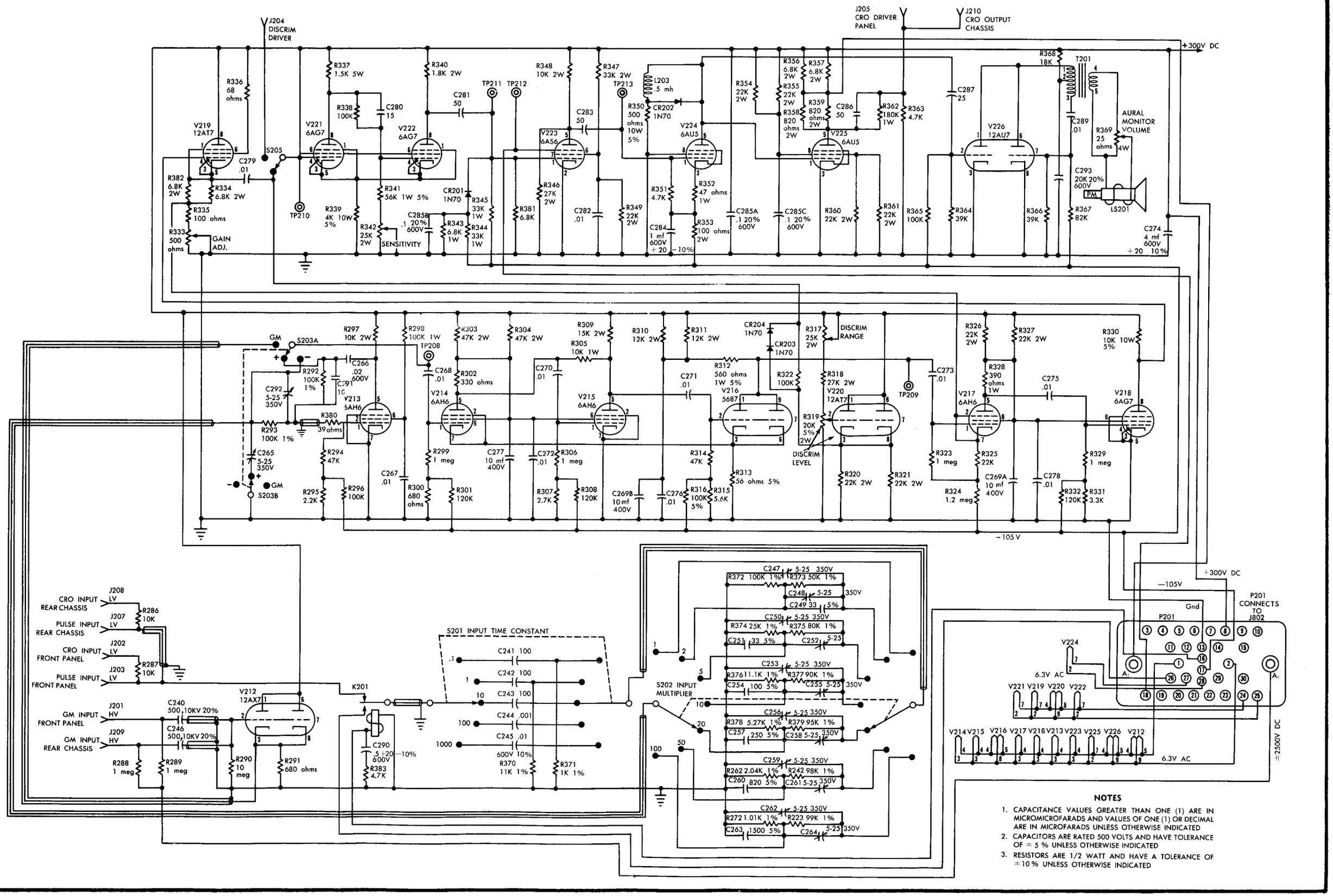


NOTES

1. CAPACITANCE VALUES GREATER THAN ONE (1) ARE IN MICROMICROFARADS AND VALUES OF ONE (1) OR DECIMAL ARE IN MICROFARADS UNLESS OTHERWISE INDICATED
2. CAPACITORS ARE RATED 500 VOLTS AND HAVE TOLERANCE OF ±10% UNLESS OTHERWISE INDICATED
3. RESISTORS ARE 1/2 WATT AND HAVE A TOLERANCE OF ±10% UNLESS OTHERWISE INDICATED

Figure 7-11. Trigger Amplifier AM-840/UDR-9 Schematic Diagram (Sheet 1 of 2 sheets)

NAVSHIPS 91,892(A)
AN/UDR-9

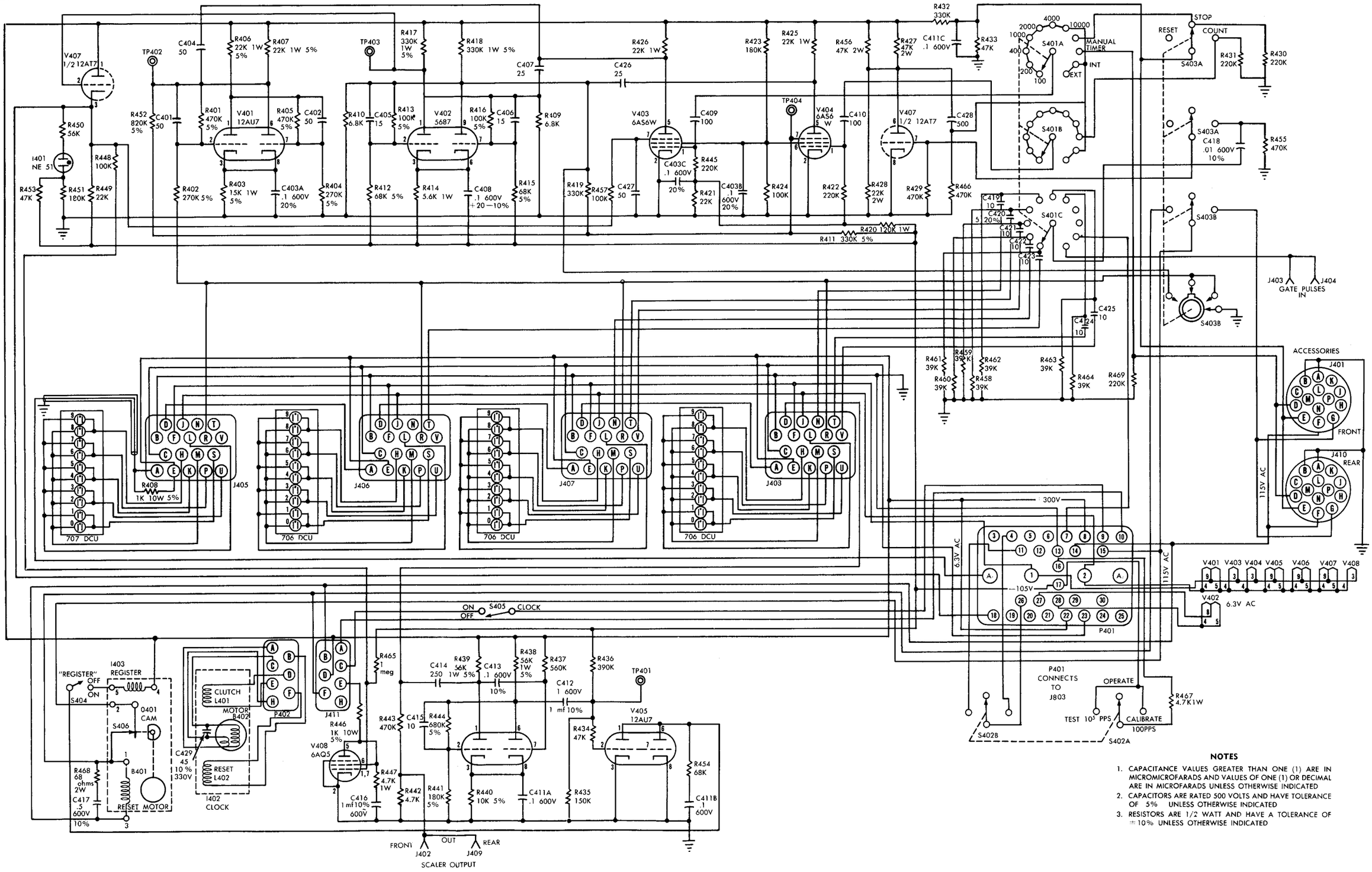


NOTES

1. CAPACITANCE VALUES GREATER THAN ONE (1) ARE IN MICROMICROFARADS AND VALUES OF ONE (1) OR DECIMAL ARE IN MICROFARADS UNLESS OTHERWISE INDICATED
2. CAPACITORS ARE RATED 500 VOLTS AND HAVE TOLERANCE OF ± 5 % UNLESS OTHERWISE INDICATED
3. RESISTORS ARE 1/2 WATT AND HAVE A TOLERANCE OF ±10 % UNLESS OTHERWISE INDICATED

Figure 7-11. Trigger Amplifier AM-840/UDR-9, Schematic Diagram (Sheet 2 of 2 sheets)

NAVSHIPS 91,892(A)
AN/UDR-9



NOTES

1. CAPACITANCE VALUES GREATER THAN ONE (1) ARE IN MICROMICROFARADS AND VALUES OF ONE (1) OR DECIMAL ARE IN MICROFARADS UNLESS OTHERWISE INDICATED
2. CAPACITORS ARE RATED 500 VOLTS AND HAVE TOLERANCE OF 5% UNLESS OTHERWISE INDICATED
3. RESISTORS ARE 1/2 WATT AND HAVE A TOLERANCE OF ±10% UNLESS OTHERWISE INDICATED

Figure 7-12. Radiac Indicator ID-364/UDR-9, Schematic Diagram

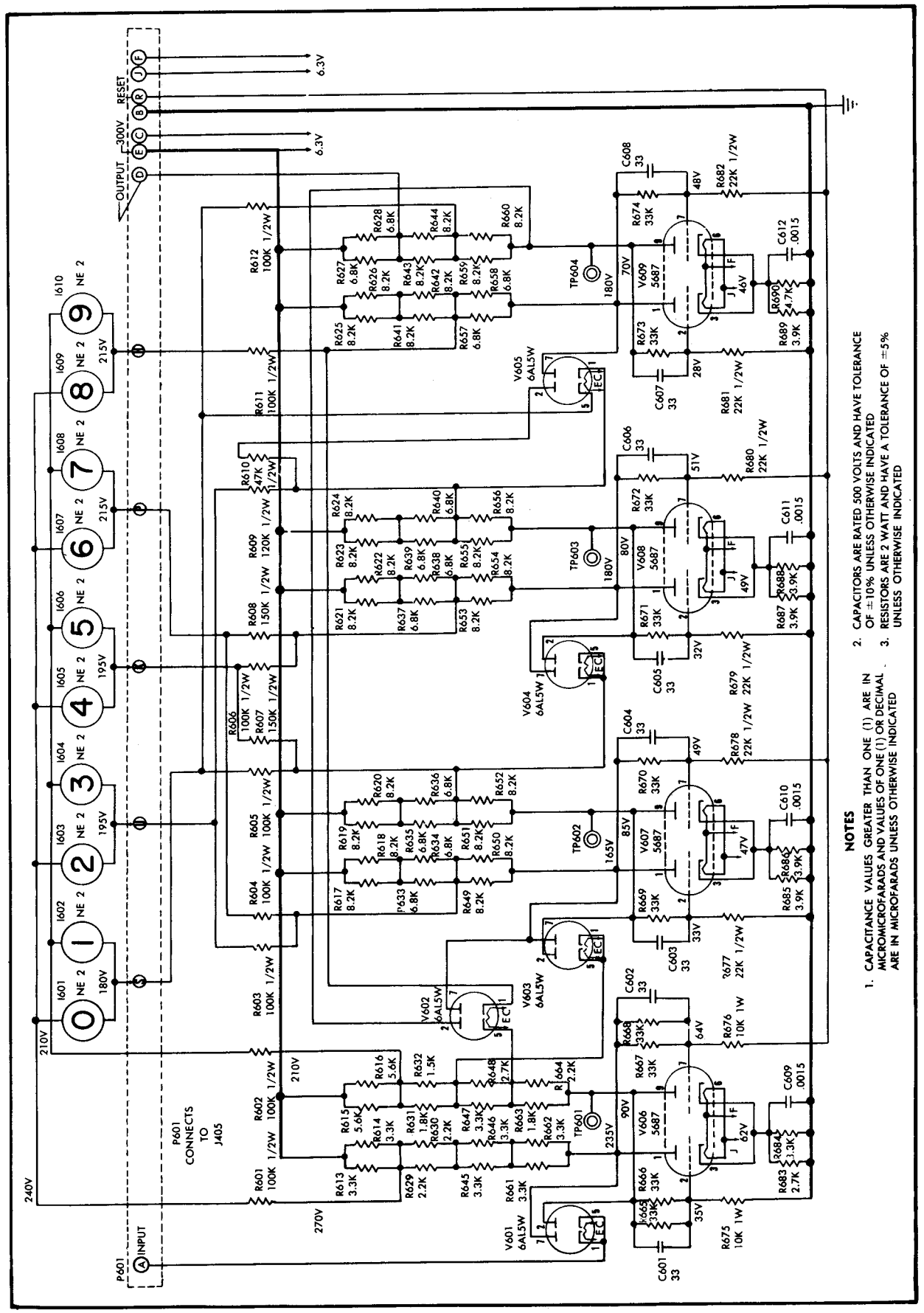


Figure 7-13. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 707, Schematic Diagram

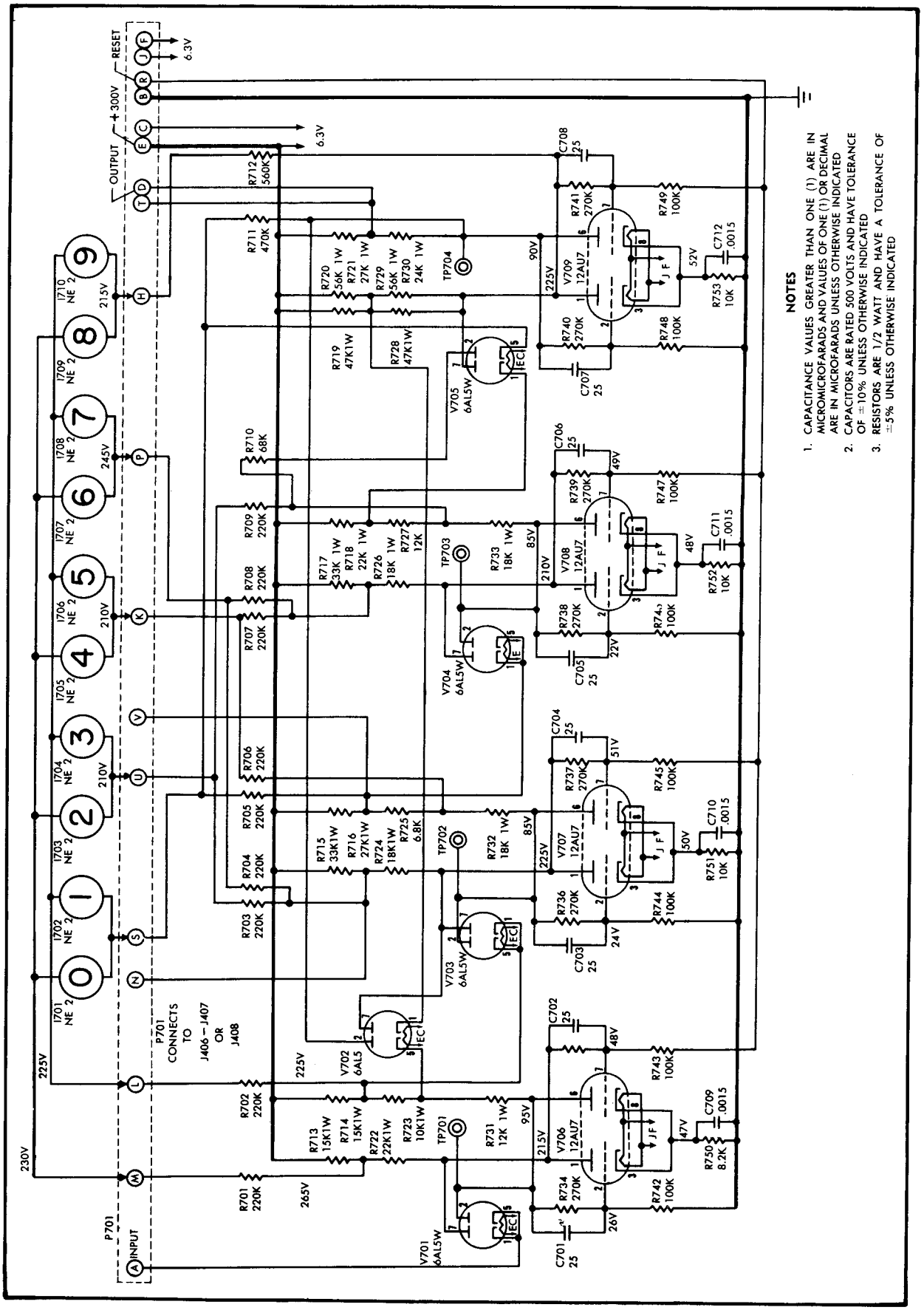
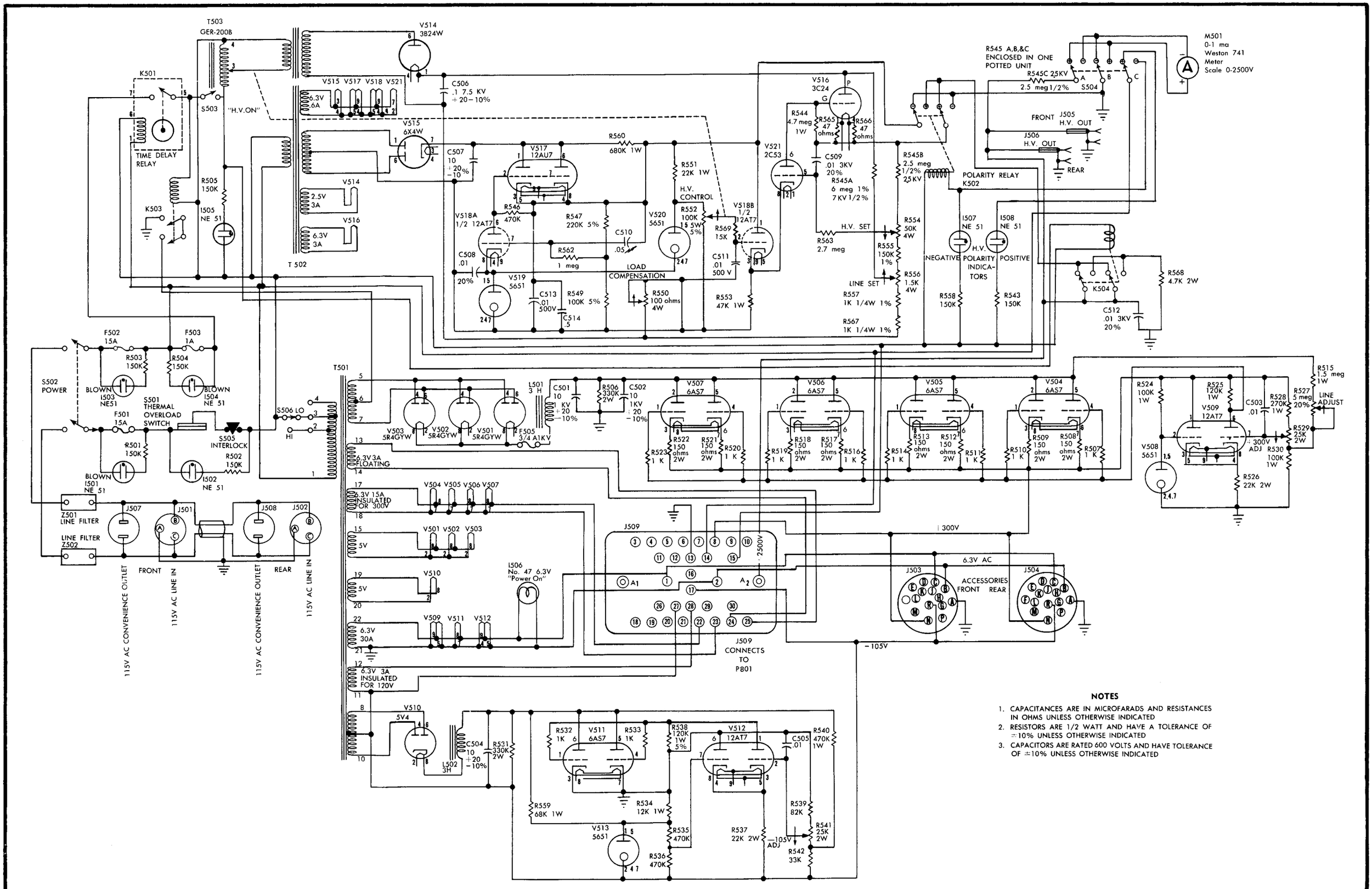


Figure 7-14. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 706, Schematic Diagram

NAVSHIPS 91,892(A)
AN/UDR-9



NOTES

1. CAPACITANCES ARE IN MICROFARADS AND RESISTANCES IN OHMS UNLESS OTHERWISE INDICATED
2. RESISTORS ARE 1/2 WATT AND HAVE A TOLERANCE OF ±10% UNLESS OTHERWISE INDICATED
3. CAPACITORS ARE RATED 600 VOLTS AND HAVE TOLERANCE OF ±10% UNLESS OTHERWISE INDICATED

Figure 7-15. Power Supply PP-948/UDR-9, Schematic Diagram

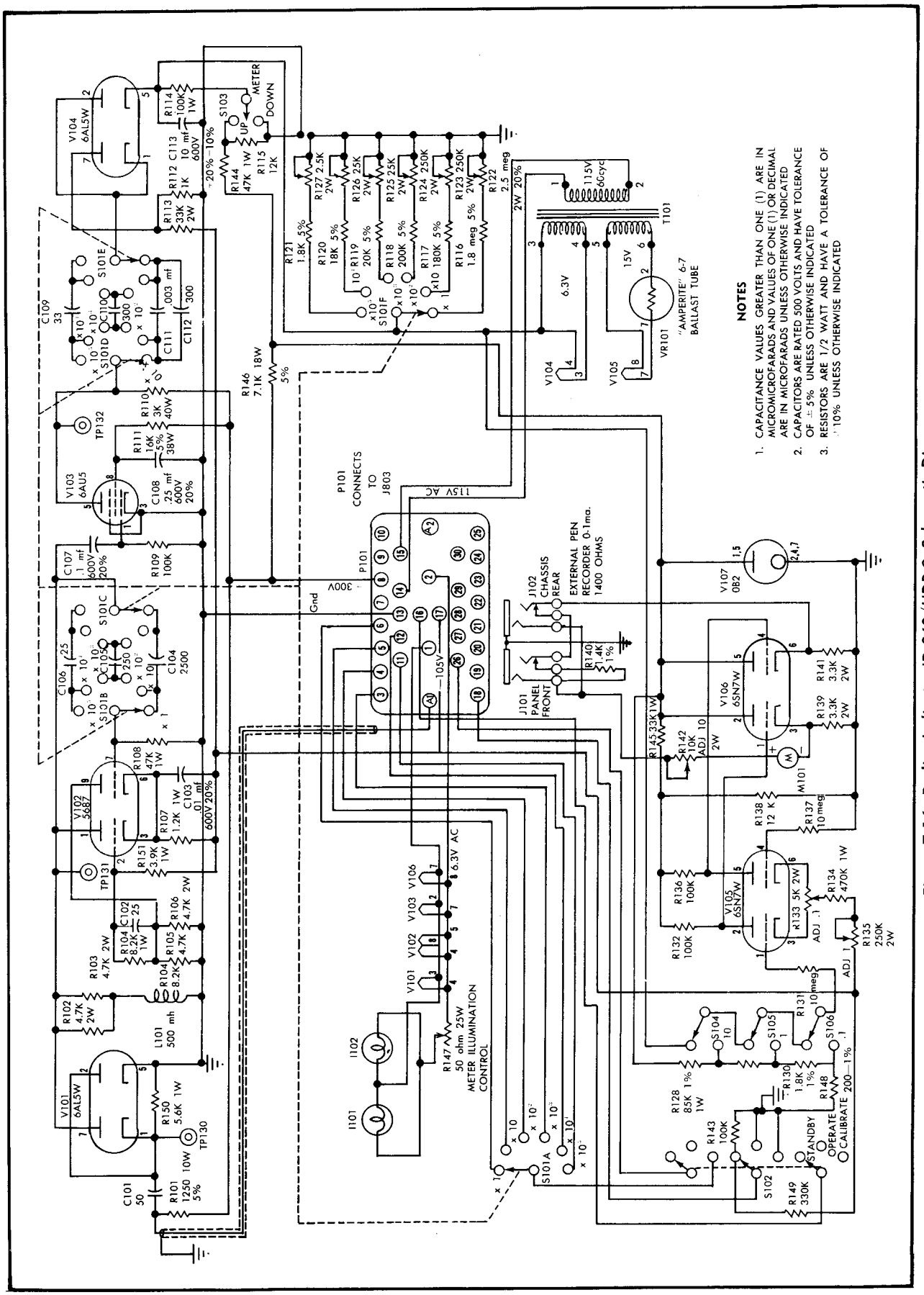


Figure 7-16. Radiac Indicator ID-363/UDR-9, Schematic Diagram

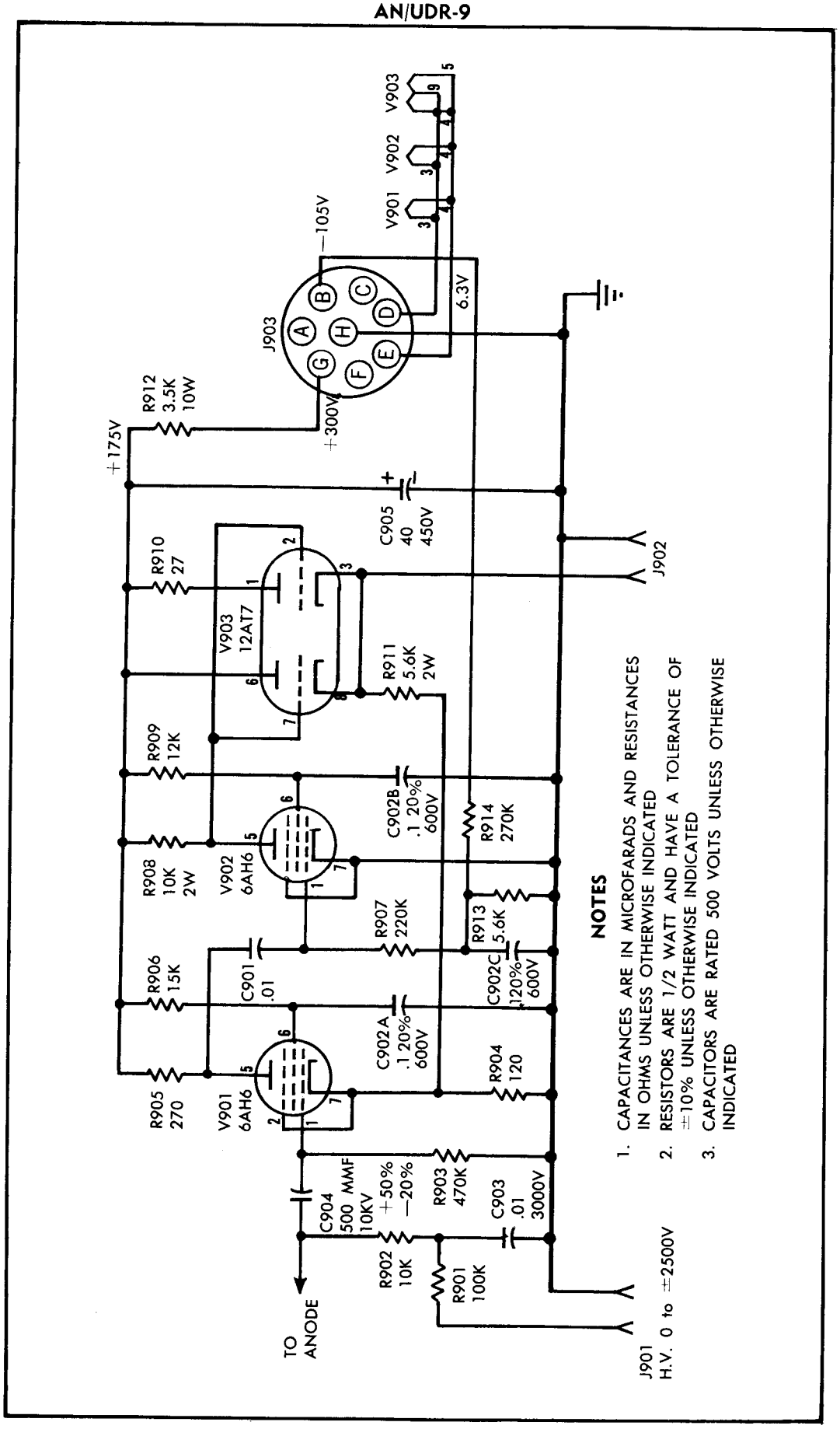


Figure 7-17. Radiac Detector DT-40/UD, Schematic Diagram

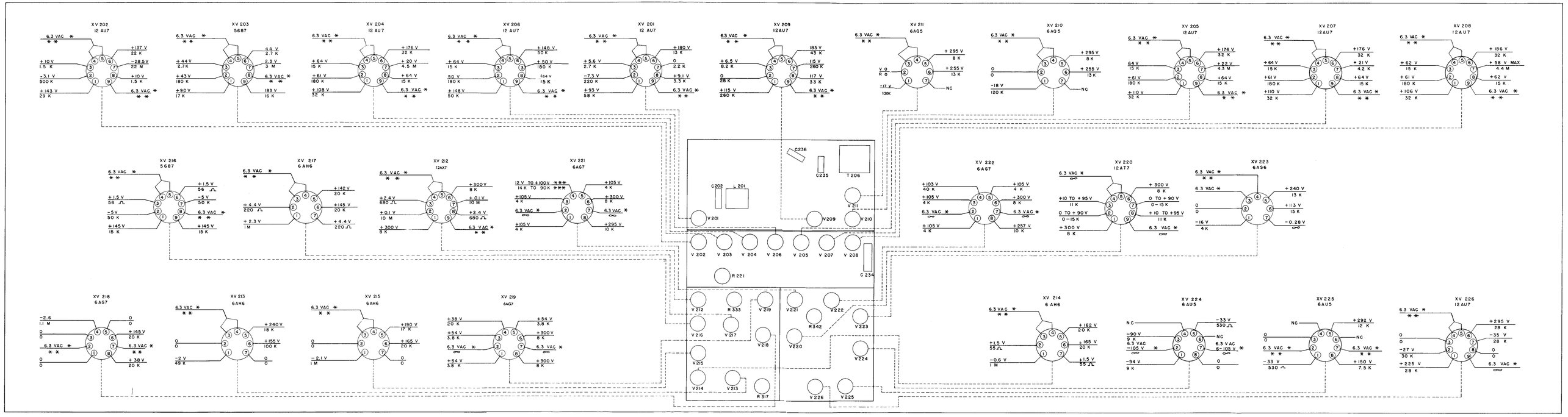


Figure 7-18. Trigger Amplifier AM-840/UDR-9, Voltage and Resistance Chart

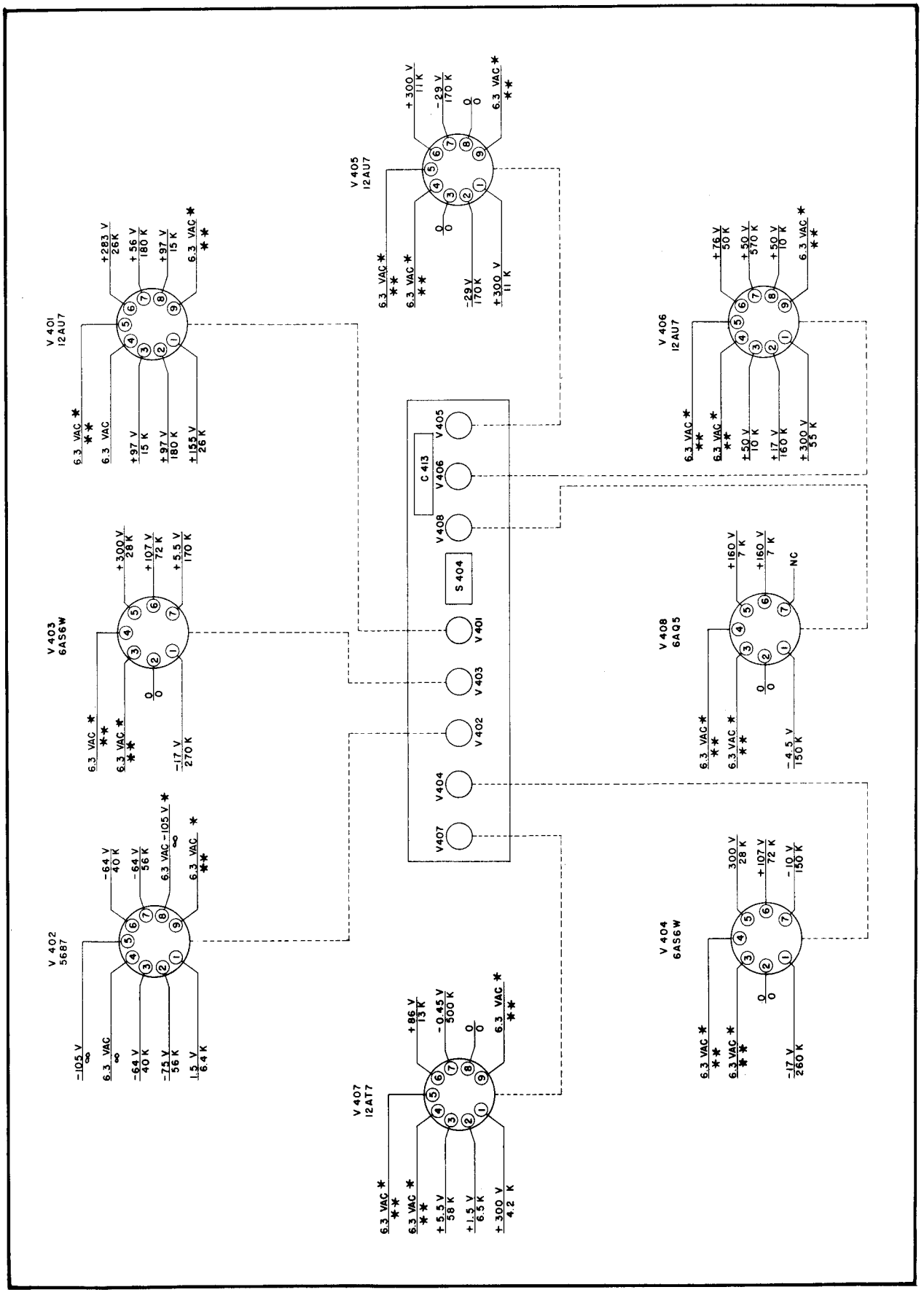


Figure 7-19. Radiac Indicator ID-364/UDR-9, Voltage and Resistance Chart

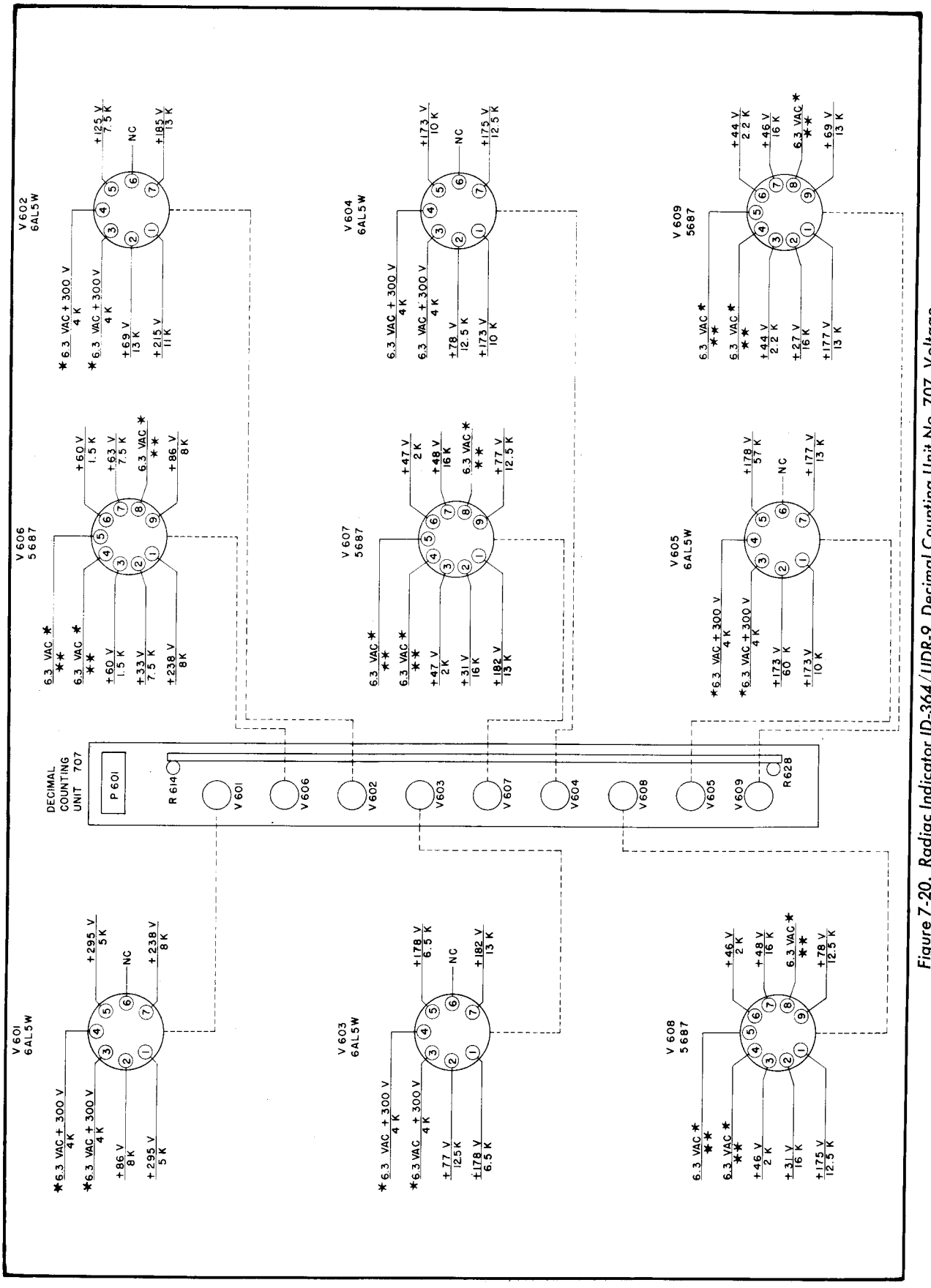


Figure 7-20. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 707, Voltage and Resistance Chart

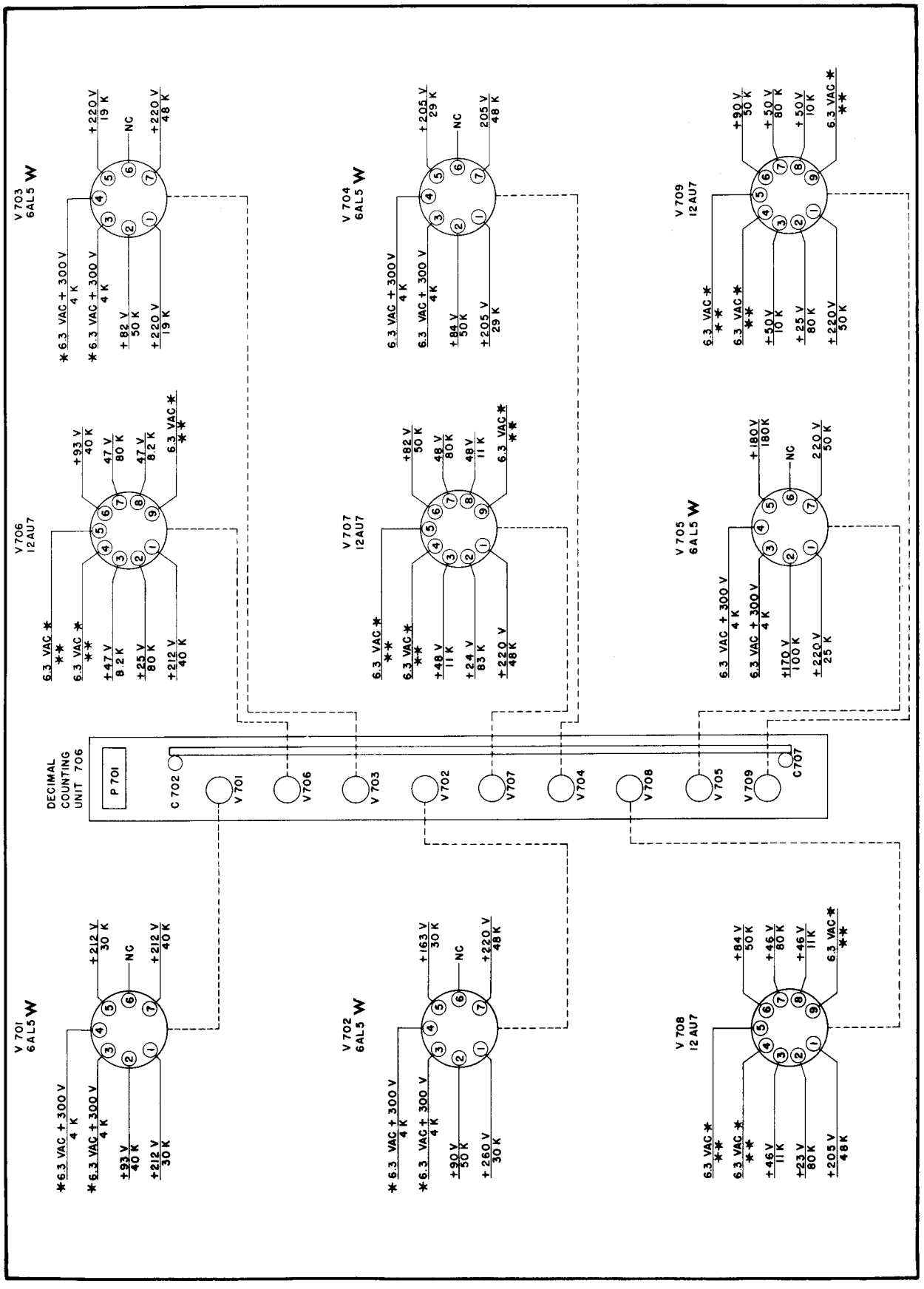


Figure 7-21. Radiac Indicator ID-364/UDR-9, Decimal Counting Unit No. 706, Voltage and Resistance Chart

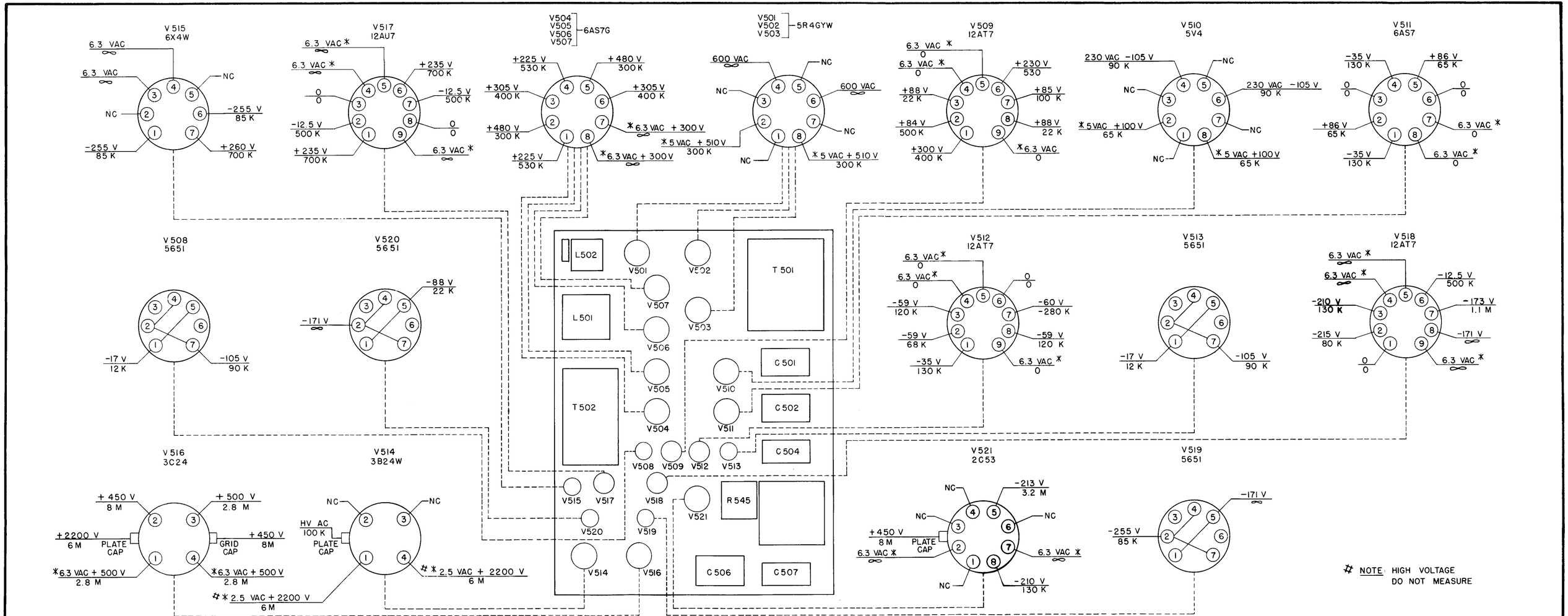


Figure 7-22. Power Supply PP-948/UDR-9, Voltage and Resistance Chart

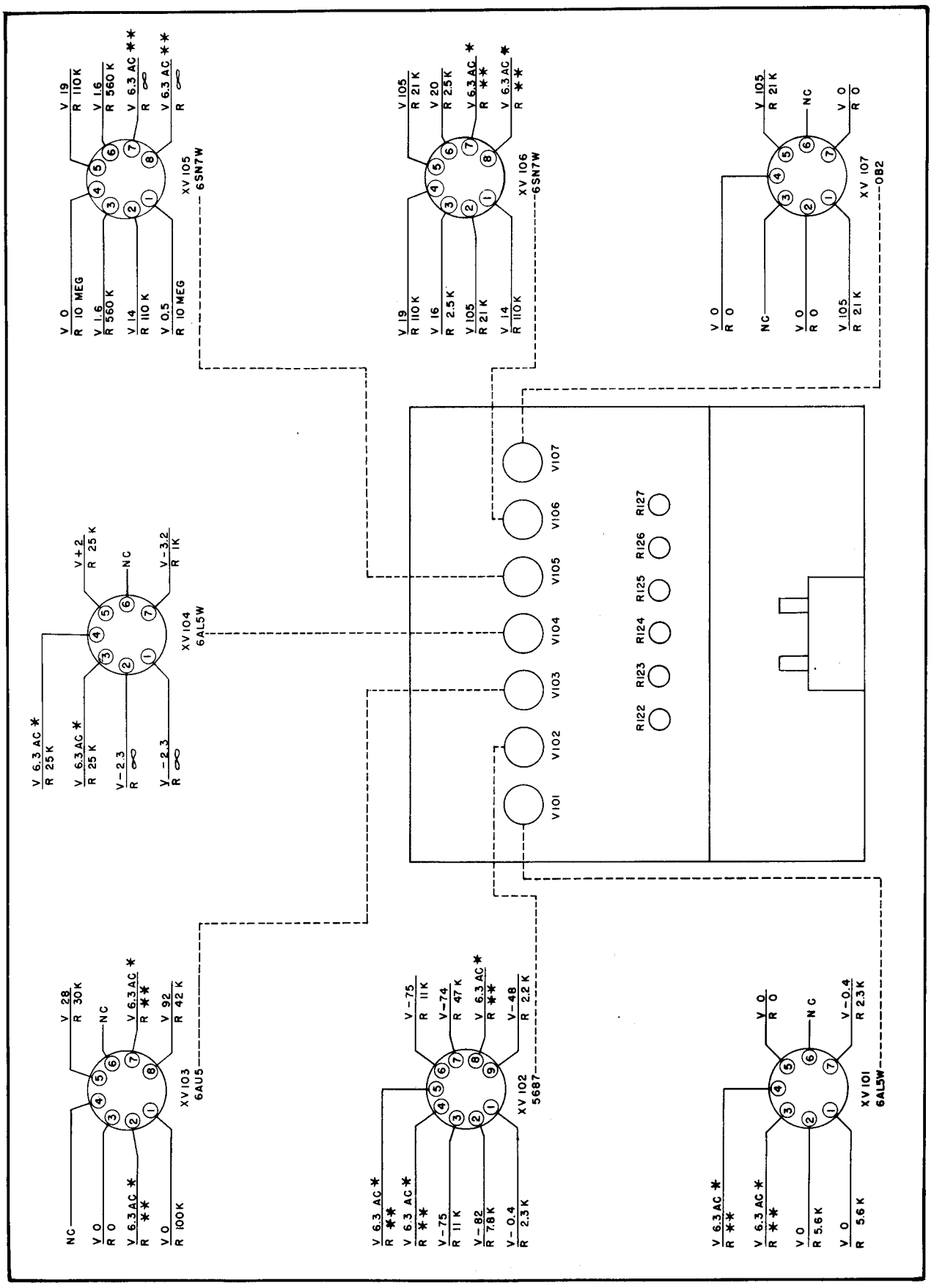


Figure 7-23. Radiac Indicator ID-363/UDR-9, Voltage and Resistance Chart

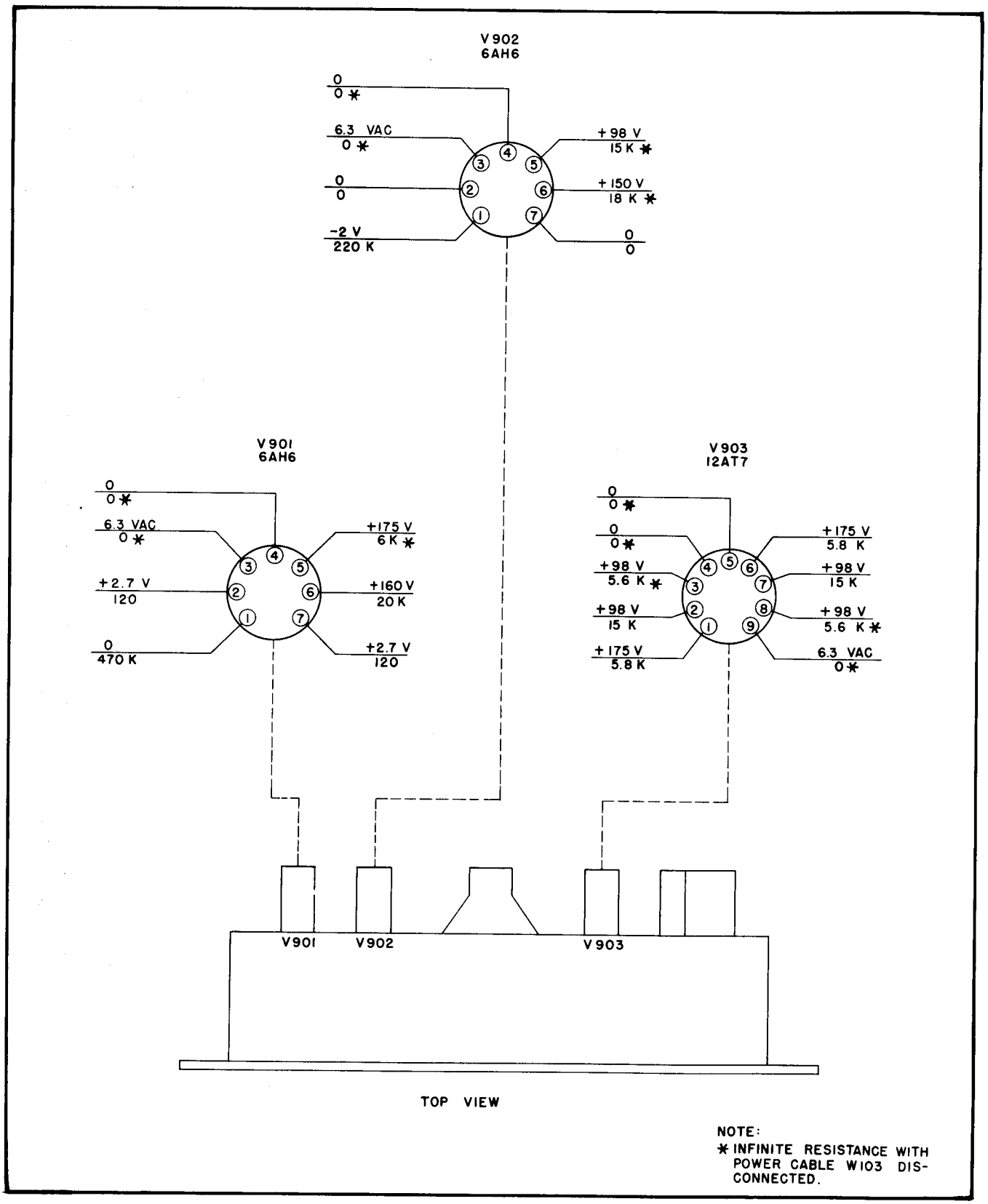


Figure 7-24. Radiac Detector DT-40/UD, Voltage and Resistance Chart

TABLE 8-1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

AN/UDR-9 EQUIPMENT SPARES						CP-79/UD EQUIPMENT SPARES						STOCK PARTS					
SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WEIGHT	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WEIGHT	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WEIGHT
	HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH		
1	20	31	21	7.5 cu. ft.	86 lbs.	1	9-1/2	20	15-1/2	1.7 cu. ft.	40 lbs.						

TABLE 8-2. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

AN/UDR-9 EQUIPMENT SPARES							CP-79/UD EQUIPMENT SPARES							STOCK SPARES						
SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WT.	SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WT.	SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS			VOLUME	WT.
		HEIGHT	WIDTH	DEPTH					HEIGHT	WIDTH	DEPTH					HEIGHT	WIDTH	DEPTH		
1	1	24	36	24	12 cu. ft.	146 lbs.	1	1	11	21-1/2	17	2.33 cu. ft.	72 lbs.							

TABLE 8-3. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY				NAME OF MAJOR UNIT	NAVY TYPE	DESIGNATION
	115 V. D. C.	230 V. D. C.	220/ 3/60	440/ 3/60			
101-199					Radiac Indicator ID-363/UDR-9		ID-363/UDR-9
201-399					Trigger Amplifier AM-840/UDR-9		AM-840/UDR-9
401-499					Radiac Indicator ID-364/UDR-9		ID-364/UDR-9
501-599					Power Supply PP-948/UDR-9		PP-948/UDR-9
601-699					Decimal Counting Unit 707; P/O ID-364/UDR-9		P/O ID-364/UDR-9
701-799					Decimal Counting Unit 706; P/O ID-364/UDR-9		P/O ID-364/UDR-9
801-899					Electrical Equipment Cabinet CY-1368/UDR-9		CY-1368/UDR-9
901-999					Radiac Detector DT-40/UD		DT-40/UD

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
	F16-Q-120813-200	AN/UDR-9 consists of three major units, Radiac Computer-Indicator, CP-79/UD; Radiac-Computer, CP-71/UD; and Radiac Detector DT-40/UD; plus accessories as listed in Table 1-1. Radiac Set UDR-9 is equipment designed to detect, shape, amplify, compute, and indicate pulses received from radiac detectors.	
	F16-C-84911-1019-2	RADIAC COMPUTER-INDICATOR CP-79/UD consists of Trigger-Amplifier AM-840/UDR-9, Radiac Indicator ID-364/UDR-9, Power Supply PP-948/UDR-9, and Cabinet CY-1368/UDR-9. The CP-79/UD is designed for counting pulses from a radiac detector and for measuring either the time required for a given number of pulses or the number of pulses received during a preset time interval. The Trigger-Amplifier AM-840/UDR-9 amplifies and shapes the pulses. Radiac Indicator ID-364/UDR-9 furnishes the scaling and indicating functions. Power Supply PP-948/UDR-9 furnishes power to the various units of the CP-79/UD. Cabinet CY-1368/UDR-9 which houses this unit is 27-13/16" high x 19" wide x 28-3/4" deep.	
	F16-C-84911-1016	RADIAC COMPUTER-INDICATOR CP-71/UD consists of Trigger-Amplifier AM-840/UDR-9, Radiac Indicator ID-363/UDR-9, Power Supply PP-948/UDR-9, and Cabinet CY-1368/UDR-9. The CP-71/UD is designed for indicating by meter reading the average rate of arrival of pulses. The Trigger-Amplifier AM-840/UDR-9 amplifies and shapes the pulses. Radiac Indicator ID-363/UDR-9 furnishes the scaling and indicating functions. Power Supply PP-948/UDR-9 furnishes power to the various units of the CP-79/UD. Cabinet CY-1368/UDR-9 which houses this unit is 27-13/16" high x 19" wide x 28-3/4" deep.	
C-101	N16-C-30162-1601	CAPACITOR, fixed: silvered mica; 500 mmf ±5%; 500 vdcw; E characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1350.	Coupling to Pin 2 of V-101.
C-102	N16-C-26943-9806	CAPACITOR, fixed: silvered mica; 25 mmf ±5%; 500 vdcw; E characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1425.	Compensation V-102 grid, pin 2.
C-103	N16-C-42767-6201	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF103M; 10,000 mmf ±20%; 600 vdcw; HS metal case 1-5/16" lg x 1/2" diam; E characteristic; axial wire lead terms; no int gnd connections; strap mtg w/tangential bkt; Sangamo CP28A1EF103M; JAN spec JAN-C-25.	V-102 cathode bypass, pin 3, 6.
C-104	N16-C-32008-5749	CAPACITOR, fixed: silvered mica; 2500 mmf ±5%; 500 vdcw; minus 20 plus 100 mmf/mf/deg C. E characteristic ; 53/64" lg x 53/64" wd x 9/32" d; molded bakelite; axial wire lead terms; Sangamo CR1225.	V-102 grid coupling, pin 7.
C-105	N16-C-29476-3201	CAPACITOR, fixed: silvered mica; JAN type CM20E251J; 250 mmf ±5%; 500 vdcw; E characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1325; JAN spec JAN-C-5.	V-102 grid coupling, pin 7.
C-106		CAPACITOR, fixed: Same as C-102.	-102 grid coupling, pin 7.
C-107	N16-C-45807-8099	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF104M; 100,000 mmf ±20%; 600 vdcw; strap mtg; Sangamo CP28A1EF104M; Jan spec JAN-C-25.	V-103 coupling, pin 1.
C-108	N16-C-46377-8730	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF254M; 250,000 mmf ±20%; 600 vdcw; HS metal case, 2-5/16" lg x 1-1/16" diam; E characteristic; axial wire leads; no int gnd connections; Sangamo CP28A1EF254M; JAN spec JAN-C-25.	V-103 screen bypass, pin 8.

C-109	N16-C-27181-4341	CAPACITOR, fixed: silvered mica; 33 mmf ±5%; 500 vdcw; 33/64" lg x 19/64" wd x 7/32" d; molded bakelite; axial wire lead terms; Sangamo RR1433; Berkeley Scientific part/dwg 5347N.	V-104 coupling, pin 1.
C-110	N16-C-29660-9001	CAPACITOR, fixed: silvered mica; JAN type CM20E301J; 300 mmf ±5%; 500 vdcw; C characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1333; JAN spec JAN-C-5.	V-104 coupling, pin 1.
C-111	N16-C-32193-2543	CAPACITOR, fixed: silvered mica; JAN type CM35E302J; 3000 mmf ±5%; 500 vdcw; E characteristic; 53/64" lg x 53/64" wd x 11/32" max; molded bakelite; axial wire lead terms; Sangamo CR1233; JAN spec JAN-C-5.	V-104 coupling, pin 1.
C-112		CAPACITOR, fixed: Same as C-110.	V-104 coupling, pin 1.
C-113	N16-C-51881-9213	CAPACITOR, fixed: paper can; JAN type CP70B1EF106V; 10 mfd ±20% —10%; 600 vdcw; Sprague CP70B1EF106V; JAN spec JAN-C-25.	Integrating element, pin 5, V-104.
I-101	G17-L-6297	LAMP, incandescent: 6 to 8 v, .15 amp; bulb T-3¼ clear; 1-1/8" lg x 7/16" diam; min bayonet; tungsten filament; burn any position; General Electric 47; Berkeley Scientific part/dwg 5107N.	Counting rate meter (M-101) illumination.
I-102		LAMP, incandescent: Same as I-101.	Counting rate meter (M-101) illumination.
J-101		CONNECTOR, receptacle: JAN type JJO83; 2 circuits, 1 normally closed, 1 open; round, non-polarized, grounded straight type, nickel pl brass; cubical 3-7/16" lg x 1/2" wd x 1-1/8" wd overall; mtg stud 3/8" diam x 5/16" lg x 24 thd; Switchcraft M444; Berkeley Scientific part/dwg 5143N.	Recorder jack, front panel.
J-102		CONNECTOR, receptacle: Same as J-101.	Recorder jack, rear panel.
L-101	N16-C-74155-8507	COIL, RF: peaking coil; 4 pi sects; unshielded; .5 mh, 200 MA, 11 ohms; 1-1/2" lg; ceramic form, air core; 7/16" diam x 1-1/2" lg form; fixed; no adjustment; term mtg; 2 wire leads, 1 ea end; Miller 4531; Berkeley Scientific part/dwg 5397.	Peaking—plate circuit, V-101, pin 7.
M-101		METER, count rate: DC; 0 to 1 ma, graduated logarithmically; square bonderized steel case w/black japan finish, panel mtd type; flange 6.63" wd x 6.88" lg x 6" d; accuracy to 1%; D'Arsonval movement; body 5-3/4" x 6" x 3.85" deep; 100 ohms per volt; not calibrated; 270 millivolts drop; scale arc approx 90°, 28 scale divisions, black on white, internally illuminated by two 6.3V bulbs, self-contained; 4 mtg holes, 1 center ea side; 4 terms .250" diam x 28 thds/inch, .88" lg; 2 terms for internal illumination, 2 for movement connections; Weston #921 special; Berkeley Scientific part/dwg 5146W.	Count RateMeter connected to pin 3 of V-106.
O-101		CLIP: tube clip; hold min tubes; phosphor bronze, cad pl; 2" h; Remler 73317; Berkeley Scientific part/dwg 5065N.	
O-102		RING, retainer: to hold latch shaft in place; parkerized steel; 238,000 to 280,000 psi; .5"OD x .300" inside diam x .035" thk; Waldes 5133-37; Berkeley Scientific part/dwg 5204N.	
P-101	N17-C-73649-6047	CONNECTOR: receptacle: 32 round male conts 1 coaxial; straight type; 2-7/8" lg x 1-11/16" wd x 1-11/16" d; 1 HV; rectangular body, aluminum shell; molded phenolic; 4 mtg holes, 5/32" diam; Cannon DPD-32C1HV1-34P-1A; Berkeley Scientific part/dwg 5179N.	Input connections to ID-363/UDR-9.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-101		RESISTOR, fixed: wire wound, non-inductive; 1250 ohms ±5%; 10 w, 240°C M.O.T.; 1-27/32" lg x 15/32" diam max; ceramic coating, heat resistant; axial wire lead terms, 2-1/2" lg #20 B.S.; Sprague 10NIT1250; Berkeley Scientific part/dwg 5360N.	Divider element, input to V-101, pin 1.
R-102	N16-R-50130-511	RESISTOR, fixed: composition; JAN type RC42GF472K; 4700 ohms ±10%; 2 w; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB4721; JAN spec JAN-R-11-2.	Plate load V-101, pin 7.
R-103		RESISTOR, fixed: Same as R-102.	Plate load V-101, pin 7.
R-104	N16-R-50238-234	RESISTOR, fixed: composition; JAN type RC30GF822K; 8200 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB8221; JAN spec JAN-R-11-2.	Grid return V-102, pin 2.
R-105		RESISTOR, fixed: Same as R-102.	Plate return V-102, pin 9.
R-106		RESISTOR, fixed: Same as R-102.	Plate return V-102, pin 9.
R-107	N16-R-49941-238	RESISTOR, fixed: composition; JAN type RC30GF122K; 1200 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; Allen Bradley GB1221; JAN spec JAN-R-11-2.	V-102 cathode bias, pin 3, 6.
R-108	N16-R-50481-233	RESISTOR, fixed: composition; JAN type RC30GF473K; 47,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB4731; JAN spec JAN-R-11-2.	V-102 grid load, pin 7.
R-109	N16-R-50633-785	RESISTOR, fixed: composition; JAN type RC20GF104K; 100,000 ohms ±10%; 1/2 w; F characteristic; .406" lg x .175 " diam max; ins RSW; axial wire lead terms; Allen Bradley EB1041; JAN spec JAN-R-11-2.	V-103 grid load, pin 1.
R-110	N16-R-66163-9445	RESISTOR, fixed: wire wound, non-inductive; 3000 ohms ±10%; 40 w at 340°C M.O.T.; 4-5/8" lg x 1-1/4" wd x 1/2" thk; non-absorbent refractory porcelain; Ward Leonard SK-8511.1; Berkeley Scientific part/dwg 5021N.	V-103 plate load, pin 5.
R-111	N16-R-66462-5931	RESISTOR, fixed: wire wound; JAN type RW35F163; 16,000 ohms ±5%; 38 w; 4-1/16" lg x 29/32" diam; 2 tab terms; integral mtg brackets ea end; Model Eng. RW35F163; JAN spec JAN-R-26A.	V-103 screen dropping, pin 8.
R-112	N16-R-49733-750	RESISTOR, fixed: composition; JAN type RC20GF391K; 390 ohms ±10%; 1/2 w; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB3911; JAN spec JAN-R-11-2.	Divider V-104, pin 7.
R-113	N16-R-50418-483	RESISTOR, fixed: composition; JAN type RC42GF333K; 33,000 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB3331; JAN spec JAN-R-11-2.	V-104 plate return, pin 7.
R-114	N16-R-50634-234	RESISTOR, fixed: composition; JAN type RC30GF104K; 100,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB1041; JAN spec JAN-R-11-2.	V-104 cathode return, pin 5.
R-115	N16-R-50309-816	RESISTOR, fixed: composition; JAN type RC20GF123K; 12,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1231; JAN spec JAN-R-11-2.	Divider across S-103.

R-116	N16-R-53458-441	RESISTOR, fixed: metal film; 1.8 megohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-1.8M; Berkeley Scientific part/dwg 5023N.	Integrating X-1 range S-101F.
R-117	N16-R-73519-2936	RESISTOR, fixed: metal film; 180,000 ohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-180K; Berkeley Scientific part/dwg 5024N.	Integrating X-10 range S-101F.
R-118	N16-R-73519-7266	RESISTOR, fixed: metal film; 200,000 ohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-200K; Berkeley Scientific part/dwg 5025N.	Integrating X-10^2 range S-101F.
R-119	N16-R-73503-9451	RESISTOR, fixed: metal film; 20,000 ohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-20K; Berkeley Scientific part/dwg 5026N.	Integrating X-10^3 range S-101F.
R-120	N16-R-73503-5126	RESISTOR, fixed: metal film; 18,000 ohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-18K; Berkeley Scientific part/dwg 5027N.	Integrating X-10^4 range S-101F.
R-121	N16-R-73487-6991	RESISTOR, fixed: metal film; 1800 ohms ±5%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated; 2 tinned copper leads; terms soldered ea end; Continental Carbon X½-1.8K; Berkeley Scientific part/dwg 5028N.	Integrating X-10^5 range S-101F.
R-122	N16-R-88412-5274	RESISTOR, variable: composition; 2.5 meg ±20%; 2 w; 3 solder tab terms; plastic case, metal cover 1-1/16" diam x 9/16" d; round metal shaft 7/8" diam; linear taper; ins contact arm w/o off position; normal torque; metal bushing 3/8-32 thd x 3/8" lg; Allen Bradley JLU2552-SD4040L; Berkeley Scientific part/dwg 5229N.	Trimmer adjust for X-1 range of S-101F.
R-123	3Z7498-25-55 N16-R-88079-4360	RESISTOR, variable: composition; 250,000 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; slotted metal shaft 5/8" lg locking bushing 1/2" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JU2541-SD4040L; Berkeley Scientific part/dwg 5115N.	Trimmer adjust for X-10 range of S-101F.
R-124		RESISTOR, variable: Same as R-123.	Trimmer adjust X-10^2 range S-101F.
R-125	N16-R-87749-4560	RESISTOR, variable: composition; 25,000 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; slotted metal shaft 5/8" lg, locking bushing 1/2" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JU2531-SD4040L; Berkeley Scientific part/dwg 5003N.	Trimmer adjust X-10^3 range S-101F.
R-126		RESISTOR, variable: Same as R-125.	Trimmer adjust X-10^4 range S-101F.
R-127	N16-R-87419-4350	RESISTOR, variable: composition; 2500 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley slotted metal shaft 5/8" lg, locking bushing 1/2" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JLU2521-SD4040L; Berkeley Scientific part/dwg 3010N.	Trimmer adjust for X-10^5 range of S-101F.
R-128	N16-R-73514-6451	RESISTOR, fixed: metal film; 85,000 ohms ±1%; 1 w; 1" lg x 9/32" diam; vitreous enamel coated, humidity resistant; 2 tinned copper leads; terms soldered ea end; ConCarbon X1-85K; Berkeley Scientific part/dwg 5033N.	Divider element for S-104.
R-129	N16-R-73503-5126	RESISTOR, fixed: metal film; 18,000 ohms ±1%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; 2 tinned copper leads; terms soldered ea end; ConCarbon X½-18K; Berkeley Scientific part/dwg 5034N.	Divider element for S-105.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-130	N16-R-73487-6991	RESISTOR, fixed: metal film; 1800 ohms ±1%; 1/2 w; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; 2 tinned copper leads; terms soldered ea end; ConCarbon X½-1.8K; Berkeley Scientific part/dwg 5367N.	Divider element for S-106.
R-131	N16-R-51326-818	RESISTOR, fixed: composition; JAN type RC20GF106K; 10 megohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1061; JAN spec JAN-R-11-2.	Isolation—V-105, pin 1.
R-132		RESISTOR, fixed: Same as R-109.	V-105 plate load, pin 2.
R-133	N16-R-87519-4380	RESISTOR, variable: composition, 5000 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley round metal shaft 7/8" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg, 3/8" lg; Allen Bradley JU5021-P3056; Berkeley Scientific part/dwg 5036N.	Adjusts meter (M-101) to .1 on scale. Cathode circuit V-105 (Front Panel).
R-134	N16-R-50823-240	RESISTOR, fixed: composition; JAN type RC30GF474K; 470,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB4741; JAN spec JAN-R-11-2.	V-105 cathode return.
R-135	N16-R-88079-4270	RESISTOR, variable: composition; 250,000 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley round metal shaft 7/8" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg, 3/8" lg; Allen Bradley JU2541-P3056; Berkeley Scientific part/dwg 5115N.	Adjusts meter (M-101) to 1. on scale. Cathode circuit V-105 (Front Panel).
R-136		RESISTOR, fixed: Same as R-109.	V-105 plate load, pin 5.
R-137		RESISTOR, fixed: Same as R-131.	V-105 grid isolation, pin 4.
R-138		RESISTOR, fixed: Same as R-115.	
R-139	N16-R-50067-505	RESISTOR, fixed: composition; JAN type RC42GF332K; 3300 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB3321; JAN spec JAN-R-11-2.	Element of meter (M-101) bridge circuit to pin 3 of V-106.
R-140	N16-R-73486-3276	RESISTOR, fixed: metal film; 1400 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C, temp coef —.020 to —.025% per deg C; .780" lg x .280" diam max; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #20 AWG; term mtd; ConCarbon X½-1.4K; Berkeley Scientific part/dwg 5038N.	Replaces 1400 ohm load of external recorder when recorder is not used. Across J-101 terminals.
R-141		RESISTOR, fixed: Same as R139.	Element of meter M-101 bridge circuit to pin 6 of V-106.
R-142	N16-R-87679-4280	RESISTOR, variable: composition; 10,000 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley round metal shaft 7/8" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg 3/8" lg; Allen Bradley JU1031-P3056; Berkeley Scientific part/dwg 5039N.	Adjusts meter M-101 to 10 on scale. Connects to + term of M-101 Front Panel.
R-143		RESISTOR, fixed: Same as R109.	Divider element connects to S-102.
R-144		RESISTOR, fixed: Same as R-108.	Divider element, connects to pin 2, 5 of V-106.
R-145	N16-R-50418-233	RESISTOR, fixed: composition; JAN type RC30GF333K; 33,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB3331; JAN spec JAN-R-11-2.	Divider, pin 2, V-106.

R-146	N16-R-66329-6746	RESISTOR, fixed: wire wound; JAN type RW33F712; 7100 ohms ±5%; 18 w; 275°C M.O.T.; 3" lg x 19/32" diam max; RSW; 2 tab terms; integral mtg brackets ea end; Model Eng. RW33F712; JAN spec JAN-R-26A.	Divider element, pin 2, 5 of V-106.
R-147		RESISTOR, variable: wire wound; JAN type RP112FD500KK; 50 ohms ±10%; 25 w; screw terms; 1.88" diam x 1.75" lg max, enclosed case; flatted shaft 1/4" diam x 7/8" lg FMS; linear taper; ins contact arm w/off position at CCW end of rotation; 3/8"-32 thd x 3/8" lg bushing non-turn device on 1/2" radius at 12 o'clock; Clarostat RP112FD500KK; JAN spec JAN-R-22.	Controls intensity of illumination of I-101 and I-102. Connects to pin 2 of P-101 (Front Panel).
R-148	N16-R-73471-9276	RESISTOR, fixed: metal film; 200 ohms ±1%; 1/2 w; 700 v max derated to 0 power at 110°C; temp coef +.040 to —.020% per deg C; .780" lg x .280" diam max; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #20 AWG min; term mtd; ConCarbon X½-200; Berkeley Scientific part/dwg 5364N.	Divider element, connects to S-106.
R-149	N16-R-50759-818	RESISTOR, fixed: composition; JAN type RC20GF334K; 330,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB3341; JAN spec JAN-R-11-2.	Divider element, connects to pin 17 of P-101.
R-150		RESISTOR, fixed: composition; JAN type RC30GF562K; 5600 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB5621; JAN spec JAN-R-11-2.	Cathode bias from pin 1 of V-101.
R-151		RESISTOR, fixed: composition; JAN type RC30GF392K; 3900 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB3921; JAN spec JAN-R-11-2.	Grid load resistor from pin 2 of V-102.
S-101		SWITCH, rotary: 6 pole, 6 pos, 5 throws; 6 sect; brass, sil pl conts; ceramic body; 5-3/8" lg from mtg surface x 1-15/16" diam; non-shorting contacts; locking action; solder lug terms; 3/8" bushing mtg, 1" lg from mtg surface, 1/4" diam; Oak 47455-DH6C; Berkeley Scientific part/dwg 5147N.	COUNTS PER SEC. range selector (Front Panel).
S-101A		SWITCH, rotary: Part of S-101.	
S-101B		SWITCH, rotary: Part of S-101.	
S-101C		SWITCH, rotary: Part of S-101.	
S-101D		SWITCH, rotary: Part of S-101.	
S-101E		SWITCH, rotary: Part of S-101.	
S-101F		SWITCH, rotary: Part of S-101.	
S-101G		SWITCH, rotary: Part of S-101.	
S-102		SWITCH, rotary: 6 pole, 3 pos; 2 sects; brass, sil pl contacts; ceramic body; 1-3/4" lg from mtg surface x 1-15/16" diam; non-shorting contacts, locking action; solder lug terms; 3/8" bushing mtg, 2-1/2" lg from mtg surface, shaft 1/4" diam; Oak 47533-DH2C; Berkeley Scientific part/dwg 5148N.	STANDBY - OPERATE - CALIBRATE (Front Panel).
S-102A		SWITCH, rotary: Part of S-102.	
S-102B		SWITCH, rotary: Part of S-102.	
S-102C		SWITCH, rotary: Part of S-102.	
S-102D		SWITCH, rotary: Part of S-102.	

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
S-103	N17-S-55344-3801	SWITCH, lever: 3 position; pos 1 none, non-locking; Center neutral, locking; pos 2, 1C, non-locking; 3 amps, 120 v; brass nickel pl; 2-1/4" lg x 5/8" wd x 3/4" h; black Kolonite lever 13/16" lg; solder lugs; single 15/32" bushing; Switchcraft 3035; Berkeley Scientific part/dwg 5150N.	METER DEFLECT (Front Panel).
S-104	N17-S-69258-8317	SWITCH, sensitive: SPDT; 125 v a-c at 10 amps, 250 v a-c at 5 amps, 460 v a-c at 3 amps; molded plastic; 1-15/16" lg, 11/16" wd, 57/64" h; push button plunger 21/64" diam; 9 to 13 oz; .0004" to .0020" movement differential; 0.02" pretravel; 7/32" min over-travel; momentary action, one contact normally closed, one contact normally open; solder lug terms; 15/32" x 32 thd, 33/64" lg bushing; Microswitch BZ-2RQ104; Berkeley Scientific part/dwg 5099N.	Deflects meter to 10 on scale (Front Panel).
S-105		SWITCH, push: Same as S-104.	Deflects meter to 1 on scale (Front Panel).
S-106		SWITCH, push: Same as S-104.	Deflects meter to .1 on scale (Front Panel).
T-101		TRANSFORMER, power: filament type; 115 v input, 55-65 cyc, single ph, nominal —100 – 130 v range; 2 output windings; 6.3 v at 1.2 amp, 15 v at 1.2 amp secd; hermetically sealed metal case; 3-1/2" h x 2-1/2" wd x 2-1/2" lg; 6 solder lug terms on bottom 3/8" h; 4 mtg holes 5/16" diam on 1-7/8" x 1-7/8" mtg/c; electrostatic shielding to case; designed for rise in temp of 25°C above 70°C ambient; Electro Engineering E8230; JAN spec JAN-T-27 Gr 1 C1 A.	Filament supply for ID-363/UDR-9.
V-101	N16-T-56195-50	TUBE, electron: JAN type 6AL5W; dual diode.	Coupling and clamper.
V-102	N16-T-75687	TUBE, electron: JAN type 5687; dual triode.	One shot multivibrator.
V-103	N16-T-56203-30	TUBE, electron: JAN type 6AU5GT; beam pentode.	Switch tube.
V-104		TUBE, electron: Same as V-101.	Coupling.
V-105	N16-T-56684-25	TUBE, electron: JAN type 6SN7WGT; dual triode.	Amplifier.
V-106		TUBE, electron: Same as V-105.	Element of M-101 bridge.
V-107	2JOB2 N16-T-52001-5	TUBE, electron: JAN type OB2; gas regulator.	Regulator.
VR-101	N16-R-85001-6401	RESISTOR, thermal: glass, 7 to 11 v, .59 to .62 amp; T-9 bulb, 3-1/2" lg o/a length, 3-1/8" h FMS; octal base; Amperite part 6-7; Berkeley Scientific part/dwg 5155N.	Ballast tube.
XV-101	N16-S-62603-6895	SOCKET, tube: 7 cont min; top mtg; two .125" diam holes .875" c to c; oval mica body .800" wd x 1-1/8" lg x 11/32" h excluding terms; copper base alloy, silver pl; w/o base shield, center shield 0.180" OD; Cinch 53C14700; Berkeley Scientific part/dwg 5029N.	V-101 socket.

XV-102	N16-S-64063-6222	SOCKET, tube: 9 pin noval; top mtg, one piece saddle; two .125″ diam holes 1.125″ c to c; oval mica body 15/16″ wd x 1-11/32″ lg x 11/32″ h excluding terms; brass alloy contacts, solder coated; w/o shield base, center shield 3/16″ OD; Cinch 53F12827; Berkeley Scientific part/dwg 5111N.	V-102 socket.
XV-103	N16-S-63515-4151	SOCKET, tube: 8 pin octal; JAN type TSB8T101; top mtg; two .156″ mtg holes 1.5″ c to c; oval mica body 1-13/16″ lg x 1-7/64″ wd x 21/32″ h excluding terms; beryllium copper contacts; Cinch 16203; JAN spec JAN-S-28A.	V-103 socket.
XV-104		SOCKET, tube: Same as XV-101.	V-104 socket.
XV-105		SOCKET, tube: Same as XV-103.	V-105 socket.
XV-106		SOCKET, tube: Same as XV-103.	V-106 socket.
XV-107		SOCKET, tube: Same as XV-101.	V-107 socket.
XV-108		SOCKET, tube: Same as XV-103.	V-108 socket.
C-201	N16-C-54460-4310	CAPACITOR, fixed: paper; JAN type CP69B5EF104V; 3 sect; .1 mfd +20 —10% ea sect; 600 vdcw; Sangamo CP69B5EF104V; JAN spec JAN-C-25.	
C-201A		CAPACITOR, fixed: part of C-201. Listed for reference only.	Cathode bypass, pin 3 of V-201.
C-201B		CAPACITOR, fixed: part of C-201. Listed for reference only.	Cathode bypass, pin 8 of V-201.
C-201C		CAPACITOR, fixed: part of C-201. Listed for reference only.	Plate decoupling, plate circuit V-101.
C-202		CAPACITOR, fixed: Same as C-107.	Plate coupling V-201, pin 1.
C-203		CAPACITOR, fixed: Same as C-103.	Feedback to V-201 grid, pin 2.
C-204	N16-C-30003-7116	CAPACITOR, fixed: silvered mica; 430 mmf ±5%; 300 vdcw; C characteristic; 33/64″ lg x 19/64″ wd x 7/32″ d; molded bakelite; axial wire lead terms; Sangamo RRO6343; Berkeley Scientific part/dwg 5118N.	Part of oscillator tank network, pin 6, V201.
C-205		CAPACITOR, fixed: Same as C-103.	V-202 grid coupling, pin 2.
C-206		CAPACITOR, fixed: Same as C-103.	V-202 grid coupling, pin 7.
C-207	N16-C-26442-8169	CAPACITOR, fixed: silvered mica; 15 mmf ±5%; 500 vdcw; C characteristic; 33/64″ lg x 19/64″ wd x 7/32″ d; molded bakelite; axial wire lead terms; Sangamo RR1415; Berkeley Scientific part/dwg 5385N.	Shapes timing pulse, V-202, pin 6.
C-208	N16-C-27629-7215	CAPACITOR, fixed: silvered mica; 50 mmf ±5%; 500 vdcw; 33/64″ lg x 19/64″ wd x 7/32″ d; molded bakelite; axial wire lead terms; Sangamo RR1450.	Compensation element V-203, pin 1.
C-209	N16-C-26020-7691	CAPACITOR, fixed: silvered mica; 10 mmf ±5%; 500 vdcw; C characteristic; 33/64″ lg x 19/64″ wd x 7/32″ d; molded bakelite; axial wire lead terms; Sangamo RR1410; Berkeley Scientific part/dwg 5387N.	V-203 grid feedback, pin 2.
C-210	N16-C-16858-4811	CAPACITOR, fixed: ceramic; JAN type CC36CG750K; 75 mmf ±10%; 0 temp coef (tol ltr G) mmf/mf/°C; 500 vdcw; 1.328″ lg x .340″ diam; axial wire leads; ins per JAN-C-20A; Erie NPO-M-75; JAN spec JAN-C-20A, amend. 2.	V-203 grid coupling, pin 7.
C-211	N16-C-60943-1455	CAPACITOR, variable: air dielectric; plate meshing type, single section; SLC; 5.5 to 109 mmf; air gap .015″; 1-13/32″ lg x 15/16″ wd x 1-7/32″ h, shaft 5/8″ lg w/ locknut; lock nut adjust, screwdriver slot; 27 brass, silver pl plates; 360° rotation, either way; steatite ins; lug term; two 4-40 thd mtg studs 21/32″ mtg c; Millen 26100, dwg M26000; Berkeley Scientific part/dwg 5124N.	Oscillator frequency trimmer V-201, pin 6.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-212		CAPACITOR, fixed: Same as C-207.	Shapes timing pulse V-203, pin 9.
C-213		CAPACITOR, fixed: Same as C-209.	V-204 grid feekback, pin 2.
C-214		CAPACITOR, fixed: Same as C-101.	V-204 grid coupling, pin 7.
C-215		CAPACITOR, fixed: Same as C-208.	Compensation V-204, pin 1.
C-216		CAPACITOR, fixed: Same as C-201.	Cathode bypass.
C-216A		CAPACITOR, fixed: Part of C-216.	Bypass V-203, pin 3, 6.
C-216B		CAPACITOR, fixed: Part of C-216.	Bypass V-204, pin 3, 6.
C-216C		CAPACITOR, fixed: Part of C-216.	Bypass V-205, pin 3, 6.
C-217		CAPACITOR, fixed: Same as C-207.	Shapes timing pulse V-204.
C-218		CAPACITOR, fixed: Same as C-208.	Compensation V-205, pin 1.
C-219	N16-C-32694-4133	CAPACITOR, fixed: silvered mica; 5000 mmf ±5%; 500 vdcw; E characteristic; 53/64" lg x 53/64" wd x 9/32" d; molded bakelite; axial wire lead terms; Sangamo CR1250.	V-205 grid coupling, pin 7.
C-220		CAPACITOR, fixed: Same as C-209.	V-205, grid feedback, pin 2.
C-221		CAPACITOR, fixed: Same as C-207.	Shapes timing pulse, V-205, pin 6.
C-222		CAPACITOR, fixed: Same as C-208.	Coupling, V-206, pin 1.
C-223		CAPACITOR, fixed: Same as C-208.	Compensation V-206, pin 7.
C-224		CAPACITOR, fixed: Same as C-208.	V-206 grid coupling, pin 2.
C-225		CAPACITOR, fixed: Same as C-208.	Compensation V-207, pin 1.
C-226	N16-C-44257-2597	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF503K; 50,000 mmf ±10%; 600 vdcw; strap mtg; Sangamo CP28A1EF503K; JAN spec JAN-C-25.	V-207 grid coupling, pin 7.
C-227		CAPACITOR, fixed: Same as C-209.	V-207 grid feekback, pin 2.
C-228		CAPACITOR, fixed: Same as C-207.	Shapes timing pulse, V-207, pin 6.
C-229		CAPACITOR, fixed: Same as C-208.	Compensation, V-208, pin 1.
C-230	N16-C-48841-9603	CAPACITOR, fixed: paper can; JAN type CP65B1EF105V; 1 mfd +20 —10%; 600 vdcw; HS metal case, 1-5/16" lg x 49/64" wd x 2-3/4" h; E characteristic; 2 solder lug terms on bottom 5/8" c to c; no int ground connections; mtd by channel bracket w/two slots .156" wd, 1-15/16" c to c; Sangamo CP65B1EF105V; JAN spec JAN-C-25.	Filter element for V-203 to V-208 plate supply voltage.
C-231		CAPACITOR, fixed: Same as C-201.	Cathode bypass.
C-231A		CAPACITOR, fixed: Part of C-231.	V-206, cathode bypass, pin 3, 8.
C-231B		CAPACITOR, fixed: Part of C-231.	V-207, cathode bypass, pin 3, 8.
C-231C		CAPACITOR, fixed: Part of C-231.	V-208, cathode bypass, pin 3, 8.

C-232		CAPACITOR, fixed: Same as C-209.	V-208, grid feedback, pin 2.
C-233		CAPACITOR, fixed: Same as C-207.	Shapes timing pulse V-208, pin 6.
C-234		CAPACITOR, fixed: paper tubular; 500,000 mmf ±5%; 600 vdcw; HS metal case w/insulating sleeve; 2-13/16" lg x 1-1/16" OD; impreg & filled per spec; 2 axial wire lead term; no int gnd conn; radial mtg bkt w/hole 5/32" diam; Sangamo CP28A1-EF504J; JAN spec JAN-C-25 except for tol.	V-208, grid coupling, pin 7.
C-235		CAPACITOR, fixed: Same as C-230.	Coupling from V-206, pin 1 to V-209.
C-236		CAPACITOR, fixed: paper tubular; 400,000 mmf ±5%; 600 vdcw; HS metal case w/ins sleeve; 2-13/16" lg x 1-1/16" OD; impreg & filled per JAN-C-25; 2 axial wire lead terms; no int gnd conn; radial mtg bkt w/hole 5/32" diam; Sangamo CP28A1-EF404J; JAN spec JAN-C-25 except for tol.	50 cycle filter, one side of R-275 (50 cycle ADJ).
C-237		CAPACITOR, fixed: Same as C-230.	V-211, feedback, pin 5.
C-238	N16-C-47321-9558	CAPACITOR, fixed: paper can; JAN type CP65B1EF504V; 500,000 mmf +20% —10% tol; 600 vdcw; HS metal case; 1-5/16" lg x 49/64" wd x 2" h; impreg & filled per spec below; 2 solder lug terms 3/4" h max located at bottom, 5/8" c to c; no int gnd conn; channel bkt w/two .156" wd slots on 1-15/16" mtg/c; Sangamo CP65B1-EF504V; JAN spec JAN-D-25.	V-210, grid coupling, pin 1.
C-239		CAPACITOR, fixed: Same as C-238.	V-211, grid coupling, pin 1.
C-240		CAPACITOR, fixed: ceramic; 500 mmf +50% —20%; 10,000 vdce; .625" lg x 1" diam; 2 cad pl brass stud terms; Centralab DA-245-HV.	V-212, grid coupling, pin 2.
C-241		CAPACITOR, fixed: ceramic; JAN type CC36CG101J; 100 mmf ±5%; 0 temp coef (tol ltr G) mmf/mf/°C; 500 vdcw; 1.328" lg x .340" diam; axial wire leads; ins per JAN-C-20A; Erie NPO-M-100; JAN spec JAN-C-20A. Part of S-201.	Shapes pulse, .1 position of S-201.
C-242		CAPACITOR, fixed: Same as C-241. Part of S-201.	Shapes pulse, 1 position of S-201.
C-243		CAPACITOR, fixed: Same as C-241. Part of S-201.	Shapes pulse, 10 position of S-201.
C-244	N16-C-31085-3699	CAPACITOR, fixed: silvered mica; JAN type CM30E102J; 1000 mmf ±5%; 500 vdcw; E characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1210; JAN spec JAN-C-5. Part of S-201.	Shapes pulse, 100 position of S-201.
C-245		CAPACITOR, fixed: paper tubular; 10,000 mmf ±10%; 600 vdcw; HS metal case w/cardboard sleeve; 1-5/16" lg x 1/2" diam; mineral oil filled and impregnated; 2 axial wire lead terms; no int gnd conn; supplied with 1/4" wd radial mtg strap which has 5/32" mtg hole mtg/c located 25/32" from side of case; Sangamo 2106.01; Berkeley Scientific part/dwg 5054N.	Shapes pulse, 1000 position of S-201.
C-246		CAPACITOR, fixed: Same as C-240.	V-212 grid coupling, pin 2.
C-247	N16-C-64039-6960	CAPACITOR, variable: ceramic dielectric; rotary type, single sect; capacity 5-25 mmf range; 350 vdcw; NPO zero temp coef; 3/4" lg x 17/32" wd x 15/64" thk excluding terms; 2 solder lug terms; two .120" diam mtg holes 5/16" c to c, one end; screw driver slot adjust; low loss plastic base; Erie style 557; Berkeley Scientific part/dwg 5336N. Part of S-202.	Frequency adjust, S-202, no. 2 position.
C-248		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency compensation, S-202.
C-249	N16-C-16305-3256	CAPACITOR, fixed: ceramic; JAN type CC26CH330J; 33 mmf ±5%; 0 temp coef (tol +60 to —110) mmf/mf/° C; 500 vdcw; .812" lg x .250" diam; axial wire leads; phenolic ins; Erie NPO-L-33; JAN spec JAN-C-20A. Part of S-202.	Frequency compensation, S-202.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-250		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 5 position.
C-251		CAPACITOR, fixed: Same as C-249. Part of S-202.	Frequency compensation, S-202.
C-252		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 5 position.
C-253		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 10 position.
C-254		CAPACITOR, fixed: Same as C-241. Part of S-202.	Frequency compensation, no. 10 position, S-202.
C-255		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 10 position.
C-256		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 20 position.
C-257	N16-C-29476-3031	CAPACITOR, fixed: silvered mica; 250 mmf ±5%; 500 vdcw; 33/64" lg x 19/64" wd x 7/32" d; molded bakelite; axial wire lead terms; Sangamo RR1325; Berkeley Scientific part/dwg 5339N. Part of S-202.	Frequency compensation, no. 20 position, S-202.
C-258		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 20 position.
C-259		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 50 position.
C-260	N16-C-33274-6821	CAPACITOR, fixed: silvered mica; 820 mmf ±5%; 500 vdcw; E characteristic; 23/32" lg x 15/32" wd x 1/5" d; molded bakelite; axial wire lead terms; Sangamo KR1382. Part of S-202.	Frequency compensation, no. 50 position, S-202.
C-261		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 50 position.
C-262		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 100 position.
C-263	N16-C-31507-4133	CAPACITOR, fixed: silvered mica; JAN type CM35E152J; 1500 mmf ±5%; 500 vdcw; E characteristic; 53/64" lg x 53/64" wd x 9/32" d; molded bakelite; axial wire lead terms; Sangamo CR1215; JAN spec JAN-C-5. Part of S-202.	Frequency compensation, no. 100 position, S-202.
C-264		CAPACITOR, variable: Same as C-247. Part of S-202.	Frequency adjust, S-202, no. 100 position.
C-265		CAPACITOR, variable: Same as C-247. Part of S-203.	Frequency compensation, V-213, connected to + term of S-203B.
C-266	N16-C-43147-7458	CAPACITOR, fixed: paper tubular; JAN type CP26A1EF203M; 20,000 mmf ±20%; 600 vdcw; metal case; Sangamo CP26A1EF203M; JAN spec JAN-C-25.	V-213, coupling, pin 5.
C-267	N16-C-19111-1100	CAPACITOR, fixed: ceramic dielectric; .01 mfd; variable temp coef; 500 vdcw; 11/16" diam x 3/32" thk; 2 wire leads one side; term mtg; phenolic ins; Erie 821; Berkeley Scientific part/dwg 5384N.	V-213, screen bypass, pin 6.

C-268		CAPACITOR, fixed: Same as C-267.	V-214, grid coupling, pin 1.
C-269	N16-C-21578-6268	CAPACITOR, fixed: electrolytic; JAN type CE42C100Q; 2 sects; 10-10 mfd ea sect; 400 vdcw; oper temp 85°C; Sprague CE42C100Q; Berkeley Scientific part/dwg 5351N.	Decoupling.
C-269A		CAPACITOR, fixed: Part of C-269. Listed for reference only.	V-217, screen decoupling, pin 6.
C-269B		CAPACITOR, fixed: Part of C-269. Listed for reference only.	V-216, plate decoupling.
C-270		CAPACITOR, fixed: Same as C-267.	V-215, grid coupling, pin 1.
C-271		CAPACITOR, fixed: Same as C-267.	V-216, grid coupling, pin 2, 7.
C-272		CAPACITOR, fixed: Same as C-267.	V-214, V-215, screen bypass, pin 6.
C-273		CAPACITOR, fixed: Same as C-267.	V-217, grid coupling, pin 1.
C-274	N16-C-49981-9969	CAPACITOR, fixed: paper; JAN type CP70B1EF405V; 4 mfd +20 —10%; 600 vdcw; metal case; 3-7/8" h x 2-1/2" wd x 1-3/16" thk; oil impregnated; 2 solder lug terms, 1-1/8" c to c, top of can, 3/4" lg above can; Sangamo CP70B1EF405V; JAN spec JAN-C-25.	+300 volt filter, pin 8 of P-201.
C-275		CAPACITOR, fixed: Same as C-267.	V-218, grid coupling, pin 4.
C-276		CAPACITOR, fixed: Same as C-267.	Decoupling, V-216 plate circuit.
C-277		CAPACITOR, fixed: electrolytic; JAN type CE41C100Q; 10 mfd; 400 vdcw; oper temp minus 40° plus 85°C; hermetically sealed metal case; 2 solder lug 7/16" terms on bottom not grounded, thded base, 7/8" diam mtg hole; Sprague CE41C100Q; Berkeley Scientific part/dwg 5350N.	V-214, screen decoupling.
C-278		CAPACITOR, fixed: Same as C-267.	V-217, screen bypass.
C-279		CAPACITOR, fixed: Same as C-267.	V-221, grid coupling, pin 4.
C-280		CAPACITOR, fixed: Same as C-207.	Pulse shaping, V-222, pin 4.
C-281		CAPACITOR, fixed: Same as C-208.	V-223, grid coupling, pin 1.
C-282		CAPACITOR, fixed: Same as C-267.	V-223, screen bypass, pin 6.
C-283		CAPACITOR, fixed: Same as C-208.	V-224, grid coupling, pin 1.
C-284		CAPACITOR, fixed: Same as C-230.	Filter element, V-224, cathode circuit.
C-285		CAPACITOR, fixed: Same as C-201.	
C-285A		CAPACITOR, fixed: Part of C-285.	300-V, decoupling.
C-285B		CAPACITOR, fixed: Part of C-285.	Filter, V-223 grid circuit.
C-285C		CAPACITOR, fixed: Part of C-285.	V-225, screen decoupling.
C-286		CAPACITOR, fixed: Same as C-208.	Frequency correction, V-225, pin 5.
C-287	N16-C-26943-9647	CAPACITOR, fixed: silvered mica; 25 mmf ±5%; 500 vdcw; 33/64" lg x 19/64" wd x 7/32" d; molded bakelite; axial wire lead terms; Sangamo RR1425; Berkeley Scientific part/dwg 5354N.	V-226, grid coupling, pin 2.
C-288		CAPACITOR, fixed: Same as C-103.	V-209, plate bypass, pin 1.
C-289		CAPACITOR, fixed: Same as C-267.	V-226, grid coupling, pin 7.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-290		CAPACITOR, fixed: Same as C-238.	Bypass, coil of K-201.
C-291		CAPACITOR, fixed: Same as C-209.	V-213 feedback plate-grid circuits.
C-292		CAPACITOR, fixed: Same as C-247.	Frequency adjust V-213, connected to — term of S-203A.
C-293	N16-C-43117-3100	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF203M; 20,000 mmf ±20%; 600 vdcw; HS metal case 1-5/16" lg x 1/2" diam; E characteristic; axial wire lead terms; no int gnd connections; strap mtg w/tangential bkt; Sangamo CP28A1EF203M; JAN spec JAN-C-25.	Decoupling, V-226 plate supply, connected to center-tap of T-201.
CR-201	N16-T-51770	CRYSTAL UNIT, rectifying: rectifier; germanium; cylindrical; General Electric 1N70; Berkeley Scientific part/dwg 5051N.	Removes overshoot, pin 1, V-223.
CR-202		CRYSTAL UNIT, rectifying: Same as CR-201.	Maintains proper polarity across L-203 connected to pin 5 of V-224.
CR-203		CRYSTAL UNIT, rectifying: Same as CR-201.	Maintains reference voltage, V-221, pin 4.
CR-204		CRYSTAL UNIT, rectifying: Same as CR-201.	Same as CR-203.
E-201		KNOB: round; black anodized aluminum; for 1/4" diam shaft; double #8-32 set screws 90° apart, 8-32 thd size; divisions every 35° apart on skirt from .1 to 1.0 with .05 point at 17.5° from .1 point; depressed white marking; 2" diam skirt, 1" knob 25/32" thk; shaft hole 21/32" deep; counterbored 3/4" diam, 3/32" deep, straight knurl 24/27 per inch; Berkeley Scientific part/dwg 1737A-211.	
J-201	N17-C-73108-1271	CONNECTOR, female contact: single contact; straight type; 1-1/2" lg x 11/16" wd x 11/16" d; 5 amps max, 5000 volts peak; cylindrical bayonet lock type; four 3-56 tapped holes 1/2" c to c; Industrial Products 27,000; Berkeley Scientific part/dwg 0691N.	GM INPUT (front panel).
J-202	N17-C-73108-1267	CONNECTOR, receptacle: Army-Navy Type UG-290/U; single cont; straight type; 1-1/16" lg x 11/16" wd x 11/16" d; 52 ohms impedance, 500 volts peak; cylindrical bayonet lock type brass body; four 3-56 tapped holes 1/2" c to c on plate; Industrial Products 2700; Berkeley Scientific part/dwg 0849N.	CRO INPUT (front panel).
J-203		CONNECTOR, receptacle: Same as J-202.	INPUT PULSE (front panel).
J-204		CONNECTOR, receptacle: Same as J-202.	DISCRIMINATOR DRIVER (front panel).
J-205		CONNECTOR, receptacle: Same as J-202.	CRO DRIVER OUTPUT (front panel).
J-206		CONNECTOR, receptacle: Same as J-202.	TIMING PULSE OUTPUT (front panel).
J-207		CONNECTOR, receptacle: Same as J-202.	PULSE INPUT (rear chassis).
J-208		CONNECTOR, receptacle: Same as J-202.	INPUT CRO (front panel).
J-209		CONNECTOR, female contact: Same as J-201.	GM INPUT (rear chassis).

J-210		CONNECTOR, receptacle: Same as J-202.	CRO OUTPUT (rear chassis).
J-211		CONNECTOR, receptacle: Same as J-202.	TIMING PULSE OUTPUT (rear chassis).
K-201		RELAY, solenoid: SPDT; 1 layer winding, 115 vdc, 1 amp, single contacts, insulated; 5000 ohms resistance, 120 v, 24 amp coil; 3 solder lug terms on conts, 2 wire leads on coil; 1-17/32″ lg x 1-17/32″ h x 7/8″ d; screw mtd w/4 No. 4-40 screws, moisture and fungus proofed; Automatic Electric Z-18951-1; Berkeley Scientific part/dwg 5071N.	Switches pulse to input amplifier.
L-201	N16-C-74867-5263	COIL, RF: oscillator coil; single winding, duo-lateral wound; unshielded; 5 mh, 125 MA, 41 ohms; 1-1/8″ OD; impregnated ceramic form, air core 1/2″ lg x 1/2″ OD; fixed; single hole mtg w/6-32 machine bolt; 2 term lugs eyeletted to bakelite plate; Miller 650; Berkeley Scientific part/dwg 5114N.	Part of oscillator tank, V-201, pin 6.
L-202	N16-R-29413-5505	REACTOR: audio; 25 hy, 8 ma; approx 3000 ohms DC resistance; hermetically sealed metal case; 2-5/8″ lg x 1-5/8″ wd x 2-1/2″ d; mtg hole ea corner for 6-32 screw; 2 solder lug terms on end; United Transformer HQB-12; Berkeley Scientific part/dwg 5084N.	50 cycle filter, V-209 grid circuit.
L-203		COIL, RF: Same as L-101.	Filter, V-224, pin 5.
LS-201	N17-L-91258-9897	SPEAKER, magnetic: cone type, 3″ square; 2 w normal, 3 w peak; voice coil impedance 3.2 ohms at 400 CPS; 3-1/2″ x 3-1/2″ x 1-3/4″ d; mtg hole ea corner, 3/16″ diam; Oxford part 3AM20; Berkeley Scientific part/dwg 5402N.	Aurol monitor, Output circuit of V-226.
P-201		CONNECTOR, male contact: Same as P-101.	Input-Output connectors (rear chassis).
P-202	N17-C-71413-3550	CONNECTOR, male contact: single round contact; straight; 1-9/16″ lg x 9/16″ diam; max current rating 5 amps, peak voltage 5000 vdcw; cylindrical steel body; Teflon insulators; use w/RG-59/U cable; Industrial Products Co. 28,000; Berkeley Scientific part/dwg.	Connects RG-59/U cable to J-201.
R-201	N16-R-50012-816	RESISTOR, fixed: composition; JAN type RC20GF222K; 2200 ohms ±10%; 1/2 w at 70°C, ins RSW; axial wire lead terms; Allen Bradley EB2221; JAN spec JAN-R-11-2.	Decoupling element, V-202 plate circuit.
R-202	N16-R-50714-818	RESISTOR, fixed: composition; JAN type RC20GF224K; 220,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam; ins RSW; axial wire lead terms; Allen Bradley EB2241; JAN spec JAN-R-11-2.	V-201 grid return, pin 2.
R-203		RESISTOR, fixed: Same as R-108.	V-201, plate load, pin 1.
R-204	N16-R-50039-721	RESISTOR, fixed: composition; JAN type RC20GF272K; 2700 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB2721; JAN spec JAN-R-11-2.	V-201, cathode bias, pin 3.
R-205		RESISTOR, fixed: Same as R-201.	Divider V-201 plate circuit pin 1, connects to Y-201.
R-206		RESISTOR, fixed: Same as R-201.	V-201 grid return, pin 7.
R-207	N16-R-50282-725	RESISTOR, fixed: composition; JAN type RC20GF103K; 10,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB1031; JAN spec JAN-R-11-2.	Part of oscillator tank circuit, V-201, pin 6.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-208	N16-R-50066-816	RESISTOR, fixed: composition; JAN type RC20GF332K; 3300 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB3321; JAN spec JAN-R-11-2.	V-201, cathode bias, pin 8.
R-209	N16-R-50822-761	RESISTOR, fixed: composition; JAN type RC20GF474K; 470,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB4741; JAN spec JAN-R-11-2.	V-202, grid return, pin 2.
R-210	N16-R-50355-233	RESISTOR, fixed: composition; JAN type RC30GF183K; 18,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB1831; JAN spec JAN-R-11-2.	V-202, plate load, pin 1.
R-211	N16-R-49967-760	RESISTOR, fixed: composition; JAN type RC20GF152K; 1500 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1521; JAN spec JAN-R-11-2.	V-202, cathode bias, pin 3, 8.
R-212	N16-R-51065-818	RESISTOR, fixed: composition; JAN type RC20GF225K; 2.2 megohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB2251; JAN spec JAN-R-11-2.	V-202, grid return, pin 7.
R-213	N16-R-50310-238	RESISTOR, fixed: composition; JAN type RC30GF123K; 12,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB1231; JAN spec JAN-R-11-2.	V-202, plate load, pin 6.
R-214	N16-R-50201-818	RESISTOR, fixed: composition; JAN type RC20GF682K; 6800 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB6821; JAN spec JAN-R-11-2.	Timing pulse divider, plate circuit V-202.
R-215	N16-R-50372-833	RESISTOR, fixed: composition; JAN type RC20GF223K; 22,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB2231; JAN spec JAN-R-11-2.	Divider, plate circuit V-203, pin 1.
R-216	N16-R-50740-380	RESISTOR, fixed: composition; JAN type RC20GF274J; 270,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB2745; JAN spec JAN-R-11-2.	V-203, grid return, pin 2.
R-217	N16-R-50201-137	RESISTOR, fixed: composition; JAN type RC42GF682J; 6800 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB6825; JAN spec JAN-R-11-2.	V-203, plate load, pin 1.
R-218	N16-R-50821-276	RESISTOR, fixed: composition; JAN type RC20GF474J; 470,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB4745; JAN spec JAN-R-11-2.	V-203, grid feedback, pin 2.
R-219	N16-R-50066-124	RESISTOR, fixed: composition; 3300 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB3325; JAN spec JAN-R-11-2. RC42GF332J.	V-203, cathode bias, pin 3, 6.
R-220		RESISTOR, fixed: Same as R-217.	V-203, plate load, pin 9.
R-221		RESISTOR, variable: Same as R-122.	Divider adjust for V-203, grid circuit, pin 7.

R-222	N16-R-51064-758	RESISTOR, fixed: composition; JAN type RC30GF225J; 2.2 megohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB2255; JAN spec JAN-R-11-2.	V-203, grid return, pin 7.
R-223	N16-R-73515-6073	RESISTOR, fixed: style 25, MBCA Ref Dwg Gp 2; metal film; 99,000 ohms ±1%; 1/2 w, 700 v max; temp coef —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coating, humidity resistant; 2 tinned copper radial leads, 1-1/2" lg #18 AWG; term mtd; ConCarbon X½-99K; Berkeley Scientific part/dwg 5167N.	Divider, no. 100 position, S-202.
R-224		RESISTOR, fixed: Same as R-214.	Timing pulse divider, V-203 plate circuit, pin 9.
R-225		RESISTOR, fixed: Same as R-215.	Divider, plate circuit V-204, connects pin 9 of V-203.
R-226		RESISTOR, fixed: Same as R-216.	V-204, grid return, pin 2.
R-227	N16-R-50371-731	RESISTOR, fixed: composition; JAN type RC30GF223J; 22,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB2235; JAN spec JAN-R-11-2.	V-204, plate load, pin 1.
R-228		RESISTOR, fixed: Same as R-218.	Feedback, V-204 grid, pin 2.
R-229	N16-R-50335-758	RESISTOR, fixed: composition; JAN type RC30GF153J; 15,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB1535; JAN spec JAN-R-11-2.	V-204, cathode bias, pin 3.
R-230		RESISTOR, fixed: Same as R-227.	V-204, plate load, pin 6.
R-231	3Z7499-1-69 N16-R-88342-5555	RESISTOR, variable: composition; 1 meg ±20%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley slotted metal shaft 5/8" lg locking bushing 1/2" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JU1052-SD4040L; Berkeley Scientific part/dwg 5002N.	Second frequency divider adjust, V-204, pin 7.
R-232	N16-R-51109-758	RESISTOR, fixed: composition; JAN type RC30GF335J; 3.3 megohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB3355; Jan spec JAN-R-11-2.	V-204, grid return, pin 7.
R-233		RESISTOR, fixed: Same as R-214.	Timing pulse divider, plate circuit V-204, pin 6.
R-234		RESISTOR, fixed: Same as R-215.	Divider, plate circuit V-205, pin 1.
R-235		RESISTOR, fixed: Same as R-216.	V-205, grid return, pin 2.
R-236		RESISTOR, fixed: Same as R-227.	V-205, plate load, pin 1.
R-237		RESISTOR, fixed: Same as R-218.	V-205, grid feedback, pin 2.
R-238		RESISTOR, fixed: Same as R-229.	V-205, cathode bias, pin 3, 8.
R-239		RESISTOR, fixed: Same as R-227.	V-205, plate load, pin 6.
R-240		RESISTOR, fixed: Same as R-231.	Frequency Divider Adjust, grid circuit V-205.
R-241		RESISTOR, fixed: Same as R-232.	V-205, grid return, pin 7.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-242	N16-R-73515-5595	RESISTOR, fixed: style 25, MBCA Ref Dwg Gp 2; metal film; 98,000 ohms ±1%; 1/2 w, 700 v max; temp coef —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg #18 AWG; term mtd; ConCarbon X½-98K; Berkeley Scientific part/dwg 5166N.	Divider, 50 position, S-202.
R-243		RESISTOR, fixed: Same as R-214.	Timing pulse divider, plate circuit V-205, pin 6.
R-244		RESISTOR, fixed: Same as R-215.	Divider, V-205 plate circuit, pin 6.
R-245		RESISTOR, fixed: Same as R-216.	V-206 grid return, pin 7.
R-246		RESISTOR, fixed: Same as R-218.	V-206, feedback, pin 7.
R-247		RESISTOR, fixed: Same as R-227.	V-206, plate load, pin 6.
R-248		RESISTOR, fixed: Same as R-227.	V-206, plate load, pin 1.
R-249		RESISTOR, fixed: Same as R-229.	V-206, cathode bias, pin 3, 8.
R-250		RESISTOR, fixed: Same as R-227.	V-206, plate load, pin 1.
R-251		RESISTOR, fixed: Same as R-218.	V-206, feedback, pin 2.
R-252		RESISTOR, fixed: Same as R-216.	V-206, grid return, pin 2.
R-253	N16-R-66140-5206	RESISTOR, fixed: wire wound; JAN type RW29F252; 2500 ohms ±5%; 8 w; 1-3/4" lg x 1/2" diam; 2 tab terms; integral mtg brackets ea end; Model Eng. 29F252; JAN spec JAN-R-26A.	Frequency dividers plate voltage decoupling element in +300V supply.
R-254		RESISTOR, fixed: Same as R-215.	Divider, V-207 plate circuit, pin 1.
R-255		RESISTOR, fixed: Same as R-216.	V-207, grid return, pin 2.
R-256		RESISTOR, fixed: Same as R-227.	V-207, plate load, pin 1.
R-257		RESISTOR, fixed: Same as R-218.	V-207, grid feedback, pin 2.
R-258		RESISTOR, fixed: Same as R-229.	V-207, cathode bias, pin 3, 8.
R-259		RESISTOR, fixed: Same as R-227.	V-207, plate load, pin 6.
R-260		RESISTOR, fixed: Same as R-231.	V-207, frequency divider adjust.
R-261		RESISTOR, fixed: Same as R-232.	V-207, grid return, pin 7.
R-262	N16-R-73488-3577	RESISTOR, fixed: style 25, MBCA Ref Dwg Gp 2; metal film; 2040 ohms ±1%; 1/2 w, 700 v max; temp coef —.020% to —.025% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated; humidity resistant; tinned copper radial leads 1-1/2" lg #18 AWG; term mtd; ConCarbon X½-2040; Berkeley Scientific part/dwg 5380N. Part of S-202.	Divider, 50 position, S-202.
R-263		RESISTOR, fixed: Same as R-214.	Timing Pulse Divider, V-207 plate circuit, pin 6.
R-264		RESISTOR, fixed: Same as R-215.	Divider, V-207 plate circuit, pin 6.

R-265		RESISTOR, fixed: Same as R-216.	V-208, grid return, pin 2.
R-266		RESISTOR, fixed: Same as R-227.	V-208, plate load, pin 1.
R-267		RESISTOR, fixed: Same as R-218.	V-208, grid feedback, pin 2.
R-268		RESISTOR, fixed: Same as R-229.	V-208, cathode bias, pin 3, 8.
R-269		RESISTOR, fixed: Same as R-227.	V-208, plate load, pin 6.
R-270		RESISTOR, fixed: Same as R-231.	V-208, frequency divider adjust.
R-271		RESISTOR, fixed: Same as R-232.	V-208, grid return, pin 7.
R-272	N16-R-73484-5040	RESISTOR, fixed: style 25, MBCA Ref Dwg Gp 2; metal film; 1010 ohms ±1%; 1/2 w, 700 v max; temp coef —.020% to —.025% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #18 AWG; term mtd; ConCarbon X½-1010; Berkeley Scientific part/dwg 5381N. Part of S-202.	Divider, 100 position, S-202.
R-273		RESISTOR, fixed: Same as R-214.	Timing Pulse Divider, V-208 plate circuit, pin 6.
R-274	N16-R-50696-818	RESISTOR, fixed: composition; JAN type RC20GF184K; 180,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1841; JAN spec JAN-R-11-2.	Divider between V-206, pin 6, and V-209, pin 2.
R-275		RESISTOR, variable: Same as R-123.	50 cycle Amplitude Adjust V-209, pin 2.
R-276	N16-R-50237-815	RESISTOR, fixed: composition; JAN type RC20GF822K; 8200 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB8221; JAN spec JAN-R-11-2.	V-209, cathode bias, pin 3.
R-277		RESISTOR, fixed: Same as R-202.	V-209, plate load, pin 1.
R-278	N16-R-50416-731	RESISTOR, fixed: composition; JAN type RC30GF333J; 33,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB3335; JAN spec JAN-R-11-2.	V-209, plate load, pin 6.
R-279		RESISTOR, fixed: Same as R-278.	V-209, cathode load, pin 8.
R-280	N16-R-50632-416	RESISTOR, fixed: composition; JAN type RC20GF104J; 100,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam; ins RSW; axial wire lead terms; Allen Bradley EB1045; JAN spec JAN-R-11-2.	V-210, grid return, pin 1.
R-281		RESISTOR, fixed: Same as R-280.	V-211, grid return, pin 1.
R-282	N16-R-50094-496	RESISTOR, fixed: composition; JAN type RC42GF392K; 3900 ohms ±10%; 2 w at 70° C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB3921; JAN spec JAN-R-11-2.	V-210, V-211 screen dropping, pin 6.
R-283		RESISTOR, fixed: Same as R-202.	Feedback, V-209, pin 3.
R-284		RESISTOR, fixed: Same as R-215.	Dividers give proper bias to V-210, pin 1, and V-211, pin 1.
R-285		RESISTOR, fixed: Same as R-109.	
R-286		RESISTOR, fixed: Same as R-207.	CRO INPUT divider, J-208.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-287		RESISTOR, fixed: Same as R-207.	CRO INPUT divider, J-202.
R-288	N16-R-50975-725	RESISTOR, fixed: composition; JAN type RC20GF105K; 1 megohm ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1051; JAN spec JAN-R-11-2.	GM INPUT load, J-209.
R-289		RESISTOR, fixed: Same as R-288.	GM INPUT load, J-201.
R-290		RESISTOR, fixed: Same as R-131.	V-212, grid return, pin 2.
R-291	N16-R-49841-818	RESISTOR, fixed: composition; JAN type RC20GF681K; 680 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB6811; JAN spec JAN-R-11-2.	V-212, cathode load, pin 3, 8.
R-292	N16-R-73515-8876	RESISTOR, fixed: style 25, MBCA Ref Dwg Gp 2; metal film; 100,000 ohms ±1%; 1/2 w, 700 v max; temp coef —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg #18 AWG; term mtd; ConCarbon X½-100K; Berkeley Scientific part/dwg 5168N.	Divider, V-213 grid circuit, connects to + terminal of S-203A.
R-293		RESISTOR, fixed: Same as R-292.	Divider, V-213 grid circuit.
R-294	N16-R-50479-440	RESISTOR, fixed: composition; JAN type RC20GF473K; 47,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB4731; JAN spec JAN-R-11-2.	V-213, grid return, pin 1.
R-295		RESISTOR, fixed: Same as R-201.	V-213, grid bias.
R-296		RESISTOR, fixed: Same as R-109.	Divider, V-213 grid circuit.
R-297	N16-R-50283-512	RESISTOR, fixed: composition; JAN type RC42GF103K; 10,000 ohms ±10%; 2 w at 70°C; F characteristic; .75" lg x .37" diam max; ins RSW; axial wire lead terms; Allen Bradley HB1031; JAN spec JAN-R-11-2.	V-213, plate load, pin 5.
R-298		RESISTOR, fixed: Same as R-114.	V-213, screen dropping, pin 6.
R-299		RESISTOR, fixed: Same as R-288.	V-214, grid return, pin 1.
R-300		RESISTOR, fixed: Same as R-291.	V-214, grid bias, pin 1.
R-301	N16-R-50651-818	RESISTOR, fixed: composition; JAN type RC20GF124K; 120,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1241; JAN spec JAN-R-11-2.	Divider, V-214 grid circuit.
R-302	N16-R-49706-761	RESISTOR, fixed: composition; JAN type RC20GF331K; 330 ohms ±10%; 1/2 w at 70° C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB3311; JAN spec JAN-R-11-2.	V-214, plate load, pin 5.
R-303	N16-R-50481-461	RESISTOR, fixed: composition; JAN type RC42GF473K; 47,000 ohms ±10%; 2 w at 70° C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB4731; JAN spec JAN-R-11-2.	V-214, plate dropping, pin 5.
R-304		RESISTOR, fixed: Same as R-303.	V-214, plate dropping, pin 5.
R-305	N16-R-50283-238	RESISTOR, fixed: composition; JAN type RC30GF103K; 10,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB1031; JAN spec JAN-R-11-2.	Feedback, V-215, pin 5.

R-306		RESISTOR, fixed: Same as R-288.	V-215, grid return, pin 1.
R-307		RESISTOR, fixed: Same as R-204.	V-215, grid bias.
R-308		RESISTOR, fixed: Same as R-301.	Divider, V-215, grid circuit.
R-309	N16-R-50337-518	RESISTOR, fixed: composition; JAN type RC42GF153K; 15,000 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB1531; JAN spec JAN-R-11-2.	V-215, plate load, pin 5.
R-310	N16-R-50310-485	RESISTOR, fixed: composition; JAN type RC42GF123K; 12,000 ohms ±10%; 2 w at 70°C; F characteristics; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB1231; JAN spec JAN-R-11-2.	V-216, plate dropping.
R-311		RESISTOR, fixed: Same as R-310.	V-216, plate dropping.
R-312	N16-R-49804-758	RESISTOR, fixed: composition; JAN type RC30GF561J; 560 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB5615; JAN spec JAN-R-11-2.	V-216, plate load, pin 1, 9.
R-313	N16-R-49462-438	RESISTOR, fixed: composition; JAN type RC20GF560J; 56 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB5605; JAN spec JAN-R-11-2.	V-216, cathode bias, pin 3, 6.
R-314		RESISTOR, fixed: Same as R-294.	V-216, grid return, pin 2.
R-315	N16-R-50165-818	RESISTOR, fixed: composition; JAN type RC20GF562K; 5600 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB5621; JAN spec JAN-R-11-2.	V-216, grid bias, grid circuit.
R-316		RESISTOR, fixed: Same as R-280.	Divider, V-216, grid circuit.
R-317		RESISTOR, variable: Same as R-125.	DISCRIM RANGE adjust, V-220 grid circuit.
R-318	N16-R-50400-511	RESISTOR, fixed: composition; JAN type RC42GF273K; 27,000 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #19 AWG min; Allen Bradley HB2731; JAN spec JAN-R-11-2.	V-220, grid circuit divider.
R-319	N16-R-91369-7990	RESISTOR, variable: wire wound; 20,000 ohms ±5%; 2 w, 80°C max continuous oper temp; 3 solder lug terms; enclosed plastic case 1-5/16" diam x .875" d; rounded metal shaft, 7/8" lg x 1/4" diam; linear taper within .25%; ins, no off position; normal torque; 3/8"-32 thd bushing, .375" incl shoulder .125" lg x .4062" diam; non-turn device on 9/16" radius; Helipot 20,000-G2.5; Berkeley Scientific part/dwg 5001N.	DISCRIM LEVEL control, V-220, pin 2.
R-320	N16-R-50373-423	RESISTOR, fixed: composition; JAN type RC42GF223K; 22,000 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; molded phenolic; Allen Bradley HB2231; JAN spec JAN-R-11-2.	V-220, cathode load, pin 3.
R-321		RESISTOR, fixed: Same as R-320.	V-220, cathode load, pin 8.
R-322		RESISTOR, fixed: Same as R-109.	Divider, V-220, pin 3.
R-323		RESISTOR, fixed: Same as R-288.	V-217, grid return, pin 1.
R-324	N16-R-50993-818	RESISTOR, fixed: composition; JAN type RC20GF125K; 1.2 megohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1251; JAN spec JAN-R-11-2.	V-217, grid return, pin 1.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-325		RESISTOR, fixed: Same as R-215.	V-217, cathode bias, pin 7.
R-326		RESISTOR, fixed: Same as R-320.	V-217, plate dropping.
R-327		RESISTOR, fixed: Same as R-320.	V-217, plate dropping.
R-328	N16-R-49734-238	RESISTOR, fixed: composition; JAN type RC30GF391K; 390 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW; axial wire lead terms; Allen Bradley GB3911; JAN spec JAN-R-11-2.	V-217, plate load, pin 5.
R-329		RESISTOR, fixed: Same as R-288.	V-218, grid return, pin 4.
R-330	N16-R-68441-2076	RESISTOR, fixed: wire wound, non-inductive; 10,000 ohms ±5%; 10 w, 240°C max continuous oper temp; 1-27/32" lg x 15/32" diam; ceramic coating, humidity resistant; axial leads 2-1/2" lg #20 AWG; Sprague 10NIT-10K; Berkeley Scientific part/dwg 5370N.	V-218, plate load.
R-331		RESISTOR, fixed: Same as R-208.	V-218, grid bias.
R-332		RESISTOR, fixed: Same as R-301.	V-218, grid divider.
R-333	N16-R-87189-4475	RESISTOR, variable; composition; 500 ohms ±10%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; Allen Bradley slotted metal shaft SD4040L-5/8" lg locking bushing, 1/2" lg; linear taper; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JU5011-SD4040L; Berkeley Scientific part/dwg 5008N.	V-219, gain adjust, cathode circuit V-219.
R-334	N16-R-50202-516	RESISTOR, fixed: composition; JAN type; 6800 ohms ±10%; 2 w; F characteristic; .688" lg x .312" diam; ins RSW; axial wire lead terms; Allen Bradley HB6821; JAN spec JAN-R-11-2.	V-219, cathode load, pin 5.
R-335	N16-R-49580-766	RESISTOR, fixed: composition; JAN type RC20GF101K; 100 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1011; JAN spec JAN-R-11-2.	Divider, V-220, cathode circuit.
R-336	N16-R-49499-818	RESISTOR, fixed: composition; JAN type RC20GF680K; 68 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB6801; JAN spec JAN-R-11-2.	V-219, screen dropping, pin 6.
R-337		RESISTOR, fixed: wire wound, non-inductive; 1500 ohms ±10%; 5 w, 185°C max continuous oper temp; 1-7/32" lg x 15/32" diam; ceramic coating, humidity resistant; axial leads 2-1/2" lg #20 AWG; Sprague 5NIT-1.5K; Berkeley Scientific part/dwg 5283N.	V-221, plate load.
R-338		RESISTOR, fixed: Same as R-109.	V-222, coupling, pin 4.
R-339	N16-R-68419-7426	RESISTOR, fixed: wire wound, non-inductive; 4000 ohms ±5%; 10 w, 240°C max continuous oper temp; 1-27/32" lg x 15/32" diam; ceramic coating, humidity resistant; axial leads 2-1/2" lg #20 AWG; Sprague 10NIT-4K; Berkeley Scientific part/dwg 5369N.	V-221, V-222 cathode bias, pin 5.
R-340	N16-R-49986-511	RESISTOR, fixed: composition; JAN type RC42GF182K; 1800 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW; axial wire lead terms; Allen Bradley HB1821; JAN spec JAN-R-11-2.	V-222, plate load.

R-341	N16-R-50515-752	RESISTOR, fixed: composition; JAN type RC30GF563J; 56,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB5635; JAN spec JAN-R-11-2.	V-222, grid return, pin 4.
R-342		RESISTOR, fixed: Same as R-125.	SENSITIVITY control, V-222 grid circuit.
R-343	N16-R-50202-233	RESISTOR, fixed: composition; JAN type RC30GF682K; 6800 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #20 AWG min; Allen Bradley GB6821; JAN spec JAN-R-11-2.	V-223, Grid bias, grid circuit.
R-344		RESISTOR, fixed: Same as R-145.	Divider, V-223, grid circuit.
R-345		RESISTOR, fixed: Same as R-145.	Divider, V-223, grid circuit.
R-346		RESISTOR, fixed: Same as R-318.	V-223, plate shunt, pin 5.
R-347		RESISTOR, fixed: Same as R-113.	V-223, screen dropping, pin 6.
R-348		RESISTOR, fixed: Same as R-297.	V-223, plate load, pin 5.
R-349		RESISTOR, fixed: Same as R-320.	V-223, screen bleeder, pin 6.
R-350	N16-R-68382-1326	RESISTOR, fixed: wire wound, non-inductive; 500 ohms ±5%; 10 w, 240° M.O.T.; 1-27/32" lg x 15/32" diam; ceramic coating, humidity resistant; axial wire lead terms 2-1/2" lg #20 BS; Sprague 10NIT-500; Berkeley Scientific part/dwg 5005N.	V-224, screen dropping, pin 8.
R-351	N16-R-50129-815	RESISTOR, fixed: composition; JAN type RC20GF472K; 4700 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #21 AWG min; Allen Bradley EB4721; JAN spec JAN-R-11-2.	V-224, grid return, pin 1.
R-352	N16-R-49428-238	RESISTOR, fixed: composition; JAN type RC30GF470K; 47 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #20 AWG min; Allen Bradley GB4701; JAN spec JAN-R-11-2.	V-224, cathode bias, pin 3.
R-353	N16-R-49581-465	RESISTOR, fixed: composition; JAN type RC42GF101K; 100 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #19 AWG min; Allen Bradley HB1011; JAN spec JAN-R-11-2.	V-224, cathode dropping, cathode circuit.
R-354		RESISTOR, fixed: Same as R-320.	V-225, screen dropping, pin 8.
R-355		RESISTOR, fixed: Same as R-320.	V-225, screen dropping, pin 8.
R-356		RESISTOR, fixed: Same as R-334.	V-225, plate load.
R-357		RESISTOR, fixed: Same as R-334.	V-225, plate load.
R-358	N16-R-49878-398	RESISTOR, fixed: composition; JAN type RC42GF821K; 820 ohms ±10%; 2 w at 70°C; 2 w; F characteristic; .750" lg x .370" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #19 AWG min; Allen Bradley HB8211; JAN spec JAN-R-11-2.	V-225, plate load, pin 5.
R-359		RESISTOR, fixed: Same as R-358.	V-225, plate load, pin 5.
R-360		RESISTOR, fixed: Same as R-320.	V-225, screen bleeder, pin 8.
R-361		RESISTOR, fixed: Same as R-320.	V-225, screen bleeder, pin 8.
R-362	N16-R-50697-238	RESISTOR, fixed: composition; JAN type RC30GF184K; 180,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #20 AWG min; Allen Bradley GB1841; JAN spec JAN-R-11-2.	V-225, coupling to CRO, pin 5.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-363		RESISTOR, fixed: Same as R-351.	Load for CRO output V-225 plate circuit, connected to J-205.
R-364	N16-R-50444-813	RESISTOR, fixed: composition; JAN type RC20GF393K; 39,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW and humidity; axial wire lead terms 1-1/2″ lg #21 AWG min; Allen Bradley EB3931; JAN spec JAN-R-11-2.	V-226, grid return and bias, pin 2.
R-365		RESISTOR, fixed: Same as R-109.	Divider, V-226, grid circuit, pin 2.
R-366		RESISTOR, fixed: Same as R-364.	V-226, grid return and bias, pin 7.
R-367	N16-R-50588-818	RESISTOR, fixed: composition; JAN type RC20GF823K; 82,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB8231; JAN spec JAN-R-11-2.	Divider, V-226, grid circuit, pin 7.
R-368	N16-R-50354-815	RESISTOR, fixed: composition; JAN type RC20GF183K; 18,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW and humidity; axial wire lead terms 1-1/2″ lg #21 AWG min; Allen Bradley EB1831; JAN spec JAN-R-11-2.	V-226, plate dropping, connected to term 2 of T-201.
R-369	N16-89794-1860	RESISTOR, variable: wire wound; 25 ohms; 4 w; 3 solder lug terms; enclosed metal case 1-21/32″ diam x 25/32″ thk; round metal shaft 1-1/2″ lg x 1/4″ diam; linear taper; one-piece contact arm; normal torque; 3/8″ lg x 32 thd bushing; Clarostat 58-25; Berkeley Scientific part/dwg 5379N.	AURAL MONITOR VOLUME control, connects to secondary of T-201 (Front Panel).
R-370	N16-R-73500-3399	RESISTOR, fixed: metal film; 11,000 ohms ±1%; 1/2 w, 700 v max, derated to 0 power at 110°C temp coef —.025% to —.040% per deg C; 5/8″ lg x 9/32″ diam; vitreous enamel coated, humidity resistant; tinned copper radial leads, 1-1/2″ lg #18 AWG; term mts; ConCarbon X½-11K; Berkeley Scientific part/dwg 5160N. Part of S-201.	R-C network, S-201, 1 position.
R-371	N16-R-73484-4076	RESISTOR, fixed: metal film; 1000 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C, temp coef +.040% to —.020% per deg C; 5/8″ lg x 9/32″ diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2″ lg, #18 AWG; term mtd; ConCarbon X½-1K; Berkeley Scientific part/dwg 5161N. Part of S-201.	R-C constant, S-201, .1 position.
R-372		RESISTOR, fixed: Same as R-292. Part of S-202.	Divider, S-202, 2 position.
R-373	N16-R-73509-6936	RESISTOR, fixed: metal film; 50,000 ohms ±1%; 1/2 w, 700 v max, derated to 0 power at 110°C, temp coef —.025% to —.040% oper deg C; 5/8″ lg x 9/32″ diam; virteous enamel coated, humidity resistant; tinned copper radial leads 1-1/2″ lg #18 AWG; term mtd; ConCarbon X½-50K; Berkeley Scientific part/dwg 5162N. Part of S-202.	Divider, S-202, 2 position.
R-374	N16-R-73505-4276	RESISTOR, fixed: metal film; 25,000 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C, temp coef —.025% to —.040% per deg C; 5/8″ lg x 9/32″ diam; vitreous enamel coated, humidity resistant; tinned radial leads 1-1/2″ lg; term mtd; ConCarbon X½-25K; Berkeley Scientific part/dwg 5169N. Part of S-202.	Divider, S-202, 5 position.
R-375	N16-R-73513-9676	RESISTOR, fixed: metal film; 80,000 ohms ±1%; 1/2 w; 700 v max; derated to 0 power at 110°C, temp coef —.025% to —.040% per deg C; 5/8″ lg x 9/32″ diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2″ lg, #18 AWG; term mtd; ConCarbon X½-80K; Berkeley Scientific part/dwg 5163N. Part of S-202.	Divider, S-202, 5 position.

R-376	N16-R-73500-4381	RESISTOR, fixed: metal film; 11,100 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110° C temp coef, —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #18 AWG; term mtd; ConCarbon X½-11.1K; Berkeley Scientific part/dwg 5383N. Part of S-202.	Divider, S-202, 10 position.
R-377	N16-R-73514-9236	RESISTOR, fixed: metal film; 90,000 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C; temp coef —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #18 AWG; ConCarbon X½-90K; Berkeley Scientific part/dwg 5164N. Part of S-202.	Divider, S-202, 10 position.
R-378	N16-R-73494-5594	RESISTOR, fixed: metal film; 5270 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C, temp coef —.020% to —.025% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads 1-1/2" lg, #18 AWG; ConCarbon X½-5270; Berkeley Scientific part/dwg 5382N. Part of S-202.	Divider, S-202, 20 position.
R-379	N16-R-73515-2604	RESISTOR, fixed: metal film; 95,000 ohms ±1%; 1/2 w; 700 v max, derated to 0 power at 110°C, temp coef —.025% to —.040% per deg C; 5/8" lg x 9/32" diam; vitreous enamel coated, humidity resistant; tinned copper radial leads, 1-1/2" lg, #18 AWG; term mtd; ConCarbon X½-95K; Berkeley Scientific part/dwg 5165N. Part of S-202.	Divider, S-202, 20 position.
R-380	N16-R-49391-818	RESISTOR, fixed: composition; JAN type RC20GF390K; 39 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW and humidity; axial wire lead terms 1-1/2" lg #21 AWG min; Allen Bradley EB3901; JAN spec JAN-R-11-2.	Parasitic oscillation suppressor in grid of V-213, pin 1.
R-381		RESISTOR, fixed: Same as R-214.	V-223, grid return, pin 1.
R-382		RESISTOR, fixed: Same as R-334.	Cathode load, V-220, pin 5.
R-383		RESISTOR, fixed: Same as R-351.	Filter element on coil of K-201.
S-201	N17-S-64557-9935	SWITCH, rotary: 2 pole, 5 pos; 2 sections; brass, silver pl contacts; ceramic body; 3-1/2" lg x 2-5/16" diam; non-shorting; locking action; solder lug terms; 3/8" bushing mtg, 7/16" shaft 7/32" diam; Oak 47531DH2C; Berkeley Scientific part/dwg 5064N. Consists of R-370, R-371, C-241, C-242, C-243, C-244, C-245. Bracket dwg 1737A278.	INPUT TIME CONSTANT (Front Panel).
S-202	N17-S-64641-2867	SWITCH, rotary: 2 pole, 7 pos; 2 sections; brass, silver pl contacts; ceramic body; 4" lg x 3-5/8" wd x 2-1/16" d; non-shorting locking action; solder lug terms; 3/8" bushing mtg, 7/16" shaft, 7/32" diam; Oak 51068-DH2C; Berkeley Scientific part/dwg 5065N. Consists of R-223, R-242, R-262, R-272, R-372, R-373, R-374, R-375, R-376, R-377, R-378, R-379, C-247, C-248, C-249, C-250, C-251, C-252, C-253, C-254, C-255, C-256, C-257, C-258, C-259, C-260, C-261, C-262, C-263, C-264.	INPUT MULTIPLIER Selector (Front Panel).
S-202A		SWITCH, rotary: Part of S-202. Listed for reference only.	
S-202B		SWITCH, rotary: Part of S-202. Listed for reference only.	
S-203	N17-S-61164-6081	SWITCH, rotary: 2 pole, 3 pos; 2 sections; brass, silver pl contacts; ceramic body; 2-9/16" lg x 1-15/16" diam; non-shorting; locking action; solder lug terms; 3/8" bushing mtg, 7/16" shaft 7/32" diam; Oak 47529-DH2C; Berkeley Scientific part/dwg 5066N.	PULSE INPUT POLARITY selector for V-213, V-214 (Front Panel).
S-204	N17-S-60362-7571	SWITCH, rotary: 1 pole, 6 pos, 5 throw; 1 sect; brass, silver pl conts; ceramic body; 1-1/8" lg from mtg surface x 1-15/16" diam; non-shorting contacts; locking action; solder lug terms; 3/8-32 NSF-2 bushing mtg 3/8" lg, 2-1/2" lg shaft 1/4" diam; Oak 47528-DH1C; Berkeley Scientific part/dwg 5396.	TIMING PULSES selector (Front Panel).

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
S-205	N17-S-72414-6890	SWITCH, toggle: SPDT; JAN type ST10D; United Transformer Corp. 8282K14.	DISCRIMINATOR DRIVER switch V-221 grid, pin 4 (Front Panel Jack).
T-201		TRANSFORMER, AF: plate coupling type; pri impedance 110,000 ohms (at 1 KC and 5 volts RMS) ±20%, ins as per JAN-T-27 Gr 1 C1 A; secd impedance loaded w/8 ohms; Mil-T-27 case size "FB"; 2-1/2" 0 —1/8" lg x 2-5/16" +0 —1/8" wd x 2-1/16" +0 —1/8" d; 2 w; 125:1 turns ratio of total pri to total secd; 100 cyc to 4000 cyc ± 6 db; 5 solder lug terms on top on mtg surface; 4 studs on top 1-11/16" ±1/64" c to c one side, 1-7/16" ±1/64" c to c other side; Triad 2321; Berkeley Scientific part/dwg 5070N.	Aural Monitor output, primary to V-226.
T-202		TRANSFORMER, AF: plate coupling type; pri current 50 ma, unbalanced DC 10 ma max, pri impedance 31,400 ohms, 1st winding secd impedance 21 ohms, 2nd winding impedance 2280 ohms; 3-23/32" lg x 3" wd x 2-7/8" h; ins voltage 1000 v; 50 cyc per second; 6 solder lug terms centered on bottom w/in 7/8" diam area; bracket mtg 4 screws 3-11/16" c to c one side, 1-3/4" c to c other side; Triad 2172; Berkeley Scientific part/dwg 5131N.	Clock supply, chassis Output transformer between V-210, V-211 & P-201.
TP-201	N17-T-28244-4026	TERMINAL STUD: round post shape; silver pl brass w/phenolic covering; .5" lg; 1/4" diam, 1/4" mtg hole; 2 brass jam-nuts; USECO 1433; Berkeley Scientific part/dwg 5068N.	100KC osc test, V-201, pin 6.
TP-202		INSULATOR, feedthru: Same as TP-201.	.01 millisecond timing pulse, V-203, pin 1.
TP-203		INSULATOR, feedthru: Same as TP-201.	.1 millisecond timing pulse, V-204, pin 1.
TP-204		INSULATOR, feedthru: Same as TP-201.	1 millisecond timing pulse, V-205, pin 1.
TP-205		INSULATOR, feedthru: Same as TP-201.	10 millisecond timing pulse, V-207, pin 1.
TP-206		INSULATOR, feedthru: Same as TP-201.	100 millisecond timing pulse, V-208, pin 1.
TP-207		INSULATOR, feedthru: Same as TP-201.	105V, clock test, T-202, pin 6.
TP-208		INSULATOR, feedthru: Same as TP-201.	Input pulse test, S-203A.
TP-209		INSULATOR, feedthru: Same as TP-201.	V-216, plate pin 1, 9 test.
TP-210		INSULATOR, feedthru: Same as TP-201.	V-221, grid pin 4 test.
TP-211		INSULATOR, feedthru: Same as TP-201.	V-223, grid pin 1 test.
TP-212		INSULATOR, feedthru: Same as TP-201.	V-223, pin 6 test.
TP-213		INSULATOR, feedthru: Same as TP-201.	V-224, grid pin 1 test.
V-201	N16-T-58241	TUBE, electron: JAN type 12AU7; twin triode.	Oscillator.
V-202		TUBE, electron: Same as V-201.	Clipper Amplifier.

V-203		TUBE, electron: Same as V-102.	Frequency Divider, 100KC to 10KC.
V-204		TUBE, electron: Same as V-201.	Frequency Divider, 10KC to 1 KC.
V-205		TUBE, electron: Same as V-201.	Frequency Divider, 1KC to 100 cycles.
V-206		TUBE, electron: Same as V-201.	Frequency Divider, 100 cycles to 50 cycles.
V-207		TUBE, electron: Same as V-201.	Frequency Divider, 100 cycles to 10 cycles.
V-208		TUBE, electron: Same as V-201.	Frequency Divider, 10 cycles to 1 cycle.
V-209		TUBE, electron: Same as V-201.	50 cycle amplifier-phase inverter.
V-210	N16-T-56191-50	TUBE, electron: JAN type 6AQ5; beam power.	50 cycle output amplifier.
V-211		TUBE, electron: Same as V-210.	50 cycle output amplifier.
V-212	2J12AX7 N16-T-58241-60	TUBE, electron: JAN type 12AX7; twin triode.	Cathode follower.
V-213	N16-T-56185	TUBE, electron: JAN type 6AH6; pentode.	Phase Inverter and amplifier.
V-214		TUBE, electron: Same as V-213.	Amplifier.
V-215		TUBE, electron: Same as V-213.	Amplifier.
V-216		TUBE, electron: Same as V-102.	Amplifier.
V-217		TUBE, electron: Same as V-213.	Amplifier.
V-218	2J6AG7 N16-T-56177	TUBE, electron: JAN type 6AG7; power pentode.	Amplifier.
V-219		TUBE, electron: Same as V-218.	Cathode follower.
V-220	2J12AT7 N16-T-58240-10	TUBE, electron: JAN type 12AT7; double triode.	Variable bias control.
V-221		TUBE, electron: Same as V-218.	Amplifier.
V-222		TUBE, electron: Same as V-218.	Amplifier.
V-223	N16-T-56201	TUBE, electron: JAN type 6AS6; pentode.	Gate pentode.
V-224		TUBE, electron: Same as V-103.	Driver amplifier.
V-225		TUBE, electron: Same as V-103.	Driver amplifier.
V-226		TUBE, electron: Same as V-201.	Aural monitor amplifier.
XV-201	N16-S-64063-6718	SOCKET, tube: 9 pin noval; JAN type TSE9T101; saddle mtg; two .125" diam mtg holes 1.125" c to c; oval mica body 1-3/8" lg x .94" wd x 5/8" h excluding terms; brass alloy contacts, solder coated; w/shield; Cinch 13373; JAN spec JAN-S-28A.	V-201, socket.
XV-202		SOCKET, tube: Same as XV-201.	V-202, socket.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
XV-203		SOCKET, tube: Same as XV-201.	V-203, socket.
XV-204		SOCKET, tube: Same as XV-201.	V-204, socket.
XV-205		SOCKET, tube: Same as XV-201.	V-205, socket.
XV-206		SOCKET, tube: Same as XV-201.	V-206, socket.
XV-207		SOCKET, tube: Same as XV-201.	V-207, socket.
XV-208		SOCKET, tube: Same as XV-201.	V-208, socket.
XV-209		SOCKET, tube: Same as XV-201.	V-209, socket.
XV-210	N16-S-62603-6692	SOCKET, tube: 7 contact min; JAN type TSE7T101; top mtg; two .125" diam holes .875" c to c; oval mica body .800" wd x 1-1/8" lg x 3/8" h excluding terms; brass alloy contacts, solder coated; unmarked; w/shield; Cinch ; JAN spec JAN-S-28A.	V-210, socket.
XV-211		SOCKET, tube: Same as XV-210.	V-211, socket.
XV-212		SOCKET, tube: Same as XV-201.	V-212, socket.
XV-213		SOCKET, tube: Same as XV-210.	V-213, socket.
XV-214		SOCKET, tube: Same as XV-210.	V-214, socket.
XV-215		SOCKET, tube: Same as XV-210.	V-215, socket.
XV-216		SOCKET, tube: Same as XV-201.	V-216, socket.
XV-217		SOCKET, tube: Same as XV-210.	V-217, socket.
XV-218		SOCKET, tube: Same as XV-103.	V-218, socket.
XV-219		SOCKET, tube: Same as XV-103.	V-219, socket.
XV-220		SOCKET, tube: Same as XV-201.	V-220, socket.
XV-221		SOCKET, tube: Same as XV-103.	V-221, socket.
XV-222		SOCKET, tube: Same as XV-103.	V-222, socket.
XV-223		SOCKET, tube: Same as XV-210.	V-223, socket.
XV-224		SOCKET, tube: Same as XV-103.	V-224, socket.
XV-225		SOCKET, tube: Same as XV-103.	V-225, socket.
XV-226		SOCKET, tube: Same as XV-201.	V-226, socket.
XY-201		SOCKET, crystal: for JAN type CR16/U crystal; 3 prong micalex; Electronicraft Berkeley Scientific part/dwg 5228N. (Used with Y-201).	Y-201, holder.
Y-201		CRYSTAL: JAN type CR-16/U; 100 kcs; —40°C to +70° temp range; 3 solid pins .156" diam x .594" lg in isosceles triangular pos, .500" c to c on base, rectangular, thermo-setting plastic holder 2.109" h, 1.594" wd, 1.187" deep; Bliley Electric Co., Berkeley Scientific Corp. part/dwg 5133N.	100 kilocycle generator.

		CLOCK ASSEMBLY: Part of ID-364/UDR-9, and includes C-429, E-401, I-402, J-411, L-401, L-402, O-404, O-405, O-406, O-407, O-408.	
A-401	**	MOUNTING, indicator: assy for mounting 10 GE NE-2 neon lamps; phenolic; rectangular; 5-7/8″ lg x 5/8″ wd x 1-3/16″ d; two mtg holes 5-1/2″ c to c; 11 turret lugs, 1 thru 11; Berkeley Scientific dwg 1737A183.	Counting lamp holder.
B-401		MOTOR, self-synchronous: 115 v, 60 cyc, single phase; 3-3/4″ lg x 2-1/8″ wd; closed frame; 1/2″ lg shaft w/o attach; three 6-32 NC type screw mtg holes 1/8″ from edge; Potter & Brumfield SE1C16; Berkeley Scientific part/dwg 5372N.	Register (I-403) Reset Drive.
B-402		MOTOR, self-synchronous: 115 v, 50 cyc, single phase; 1-1/2″ lg x 2-3/4″ diam w/o 1/2″ shaft and gear; closed frame; shaft .187″ diam x 5/16″ lg from housing; 3 mtg holes 120° apart radially, on 1-1/2″ radius, hole 5/32″ diam; 3 wire leads, red—start capacitor, black and green—line; 100 rpm; Standard Electric Time Co. 5SMY20J100; Berkeley Scientific . Part of Clock Assembly.	I-402, driving motor.
C-401		CAPACITOR, fixed: Same as C-208.	Feedback, V-401, pin 2.
C-402		CAPACITOR, fixed: Same as C-208.	Coupling, V-401, pin 7.
C-403		CAPACITOR, fixed: Same as C-201.	
C-403A		CAPACITOR, fixed: Same as C-201A.	V-401, cathode bypass, pin 3, 8.
C-403B		CAPACITOR, fixed: Same as C-201B.	V-403, V-404, screen bypass, pin 6.
C-403C		CAPACITOR, fixed: Same as C-201C.	V-403, grid bypass, pin 1.
C-404		CAPACITOR, fixed: Same as C-208.	Coupling, V-401, pin 6.
C-405		CAPACITOR, fixed: Same as C-207.	Feedback, V-402, pin 2.
C-406		CAPACITOR, fixed: Same as C-207.	Coupling, V-402, pin 7.
C-407		CAPACITOR, fixed: Same as C-287.	Coupling, V-403, pin 5.
C-408	N16-C-53204-4085	CAPACITOR, fixed: paper; JAN type CP69B4EF104V; 2 sect; .1 +20 —10%; 600 vdcw; metal case; 1-1/2″ h x 1-3/4″ wd x 41/64″ thk; impregnated per JAN spec; 3 solder lug terms, 3/4″ above top of case, 1-1/16″ #1 to #3; channel bracket 2-1/8″ c to c mtg holes; Sangamo ; JAN spec JAN-C-25.	V-402, cathode bypass, pin 3, 6.
C-409	N16-C-28553-1051	CAPACITOR, fixed: silvered mica; 100 mmf ±5% 500 vdcw; 33/64″ lg x 19/64″ wd x 7/32″ d; molded bakelite; axial wire lead terms; Sangamo RR1310; Berkeley Scientific part/dwg 5389N.	V-403, grid coupling, pin 1.
C-410		CAPACITOR, fixed: Same as C-409.	V-404, grid coupling, pin 1.
C-411		CAPACITOR, fixed: Same as C-201.	
C-411A		CAPACITOR, fixed: Same as C-201A.	V-406, cathode bypass, pin 8.
C-411B		CAPACITOR, fixed: Same as C-201B.	V-405, plate filter element.
C-411C		CAPACITOR, fixed: Same as C-201C.	Filter, connects to S-403A.
C-412	N16-C-48817-1110	CAPACITOR, fixed: paper; JAN type CP65B1EF105K; 1 mfd ±10%; 600 vdcw; Sangamo ; JAN spec JAN-C-25.	Coupling, V-406, pin 6.

** Non-failure item. If required, requisition from ESO, referencing NavShips 900, 180A.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-413	N16-C-45777-3115	CAPACITOR, fixed: paper tubular; 100,000 mmf ±10%; 600 vdcw; HS metal case w/cardboard sleeve; 1-13/16" lg x 3/4" diam; mineral oil filled and impregnated; axial wire lead term ea end; no int gnd connections; 1/4" wd radial mtg strap w/one 5/32" diam mtg hole—mtg/c located 25/32" from side of case; Sangamo 2106-.1; Berkeley Scientific part/dwg 5352N.	Coupling, V-406; pin 7.
C-414		CAPACITOR, fixed: Same as C-257.	Coupling, V-406, pin 1.
C-415		CAPACITOR, fixed: Same as C-209.	Feedback, V-406, pin 2.
C-416		CAPACITOR, fixed: Same as C-412.	Filter, V-408, pin 2.
C-417	N16-C-47297-7231	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF504K; 500,000 mmf ±10%; 600 vdcw; strap mtg; Sangamo ; JAN spec JAN-C-25.	Filter, B-401, pin 3.
C-418	N16-C-42736-9040	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF103K; 10,000 mmf ±10%; 600 vdcw; strap mtg; Sangamo ; JAN spec JAN-C-25.	Coupling, S-403A count terminal.
C-419		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 2000 terminal.
C-420		CAPACITOR, fixed: silvered mica; 5 mmf ±20%; 500 vdcw; 33/64" lg x 19/64" wd x 7/32" d; molded bakelite; axial wire lead terms; Sangamo RR1550; Berkeley Scientific part/dwg 5264N.	Couplings, S-401C, 1000 terminal.
C-421		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 400 terminal.
C-422		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 200 terminal.
C-423		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 100 terminal.
C-424		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 10,000 terminal.
C-425		CAPACITOR, fixed: Same as C-209.	Coupling, S-401C, 4000 terminal.
C-426		CAPACITOR, fixed: Same as C-287.	Coupling, V-404, pin 5.
C-427		CAPACITOR, fixed: Same as C-208.	Bypass, V-403, pin 7.
C-428		CAPACITOR, fixed: Same as C-101.	Coupling, V-407, pin 6.
C-429		CAPACITOR, fixed: paper dielectric; 450,000 mmf ±10%; 330 vacw; metal can; 1-5/8" lg x 1-1/4" wd x 11/16" thk; spec oil filled; 2 insulated wire leads, 11" lg located one end; no int gnd conn; single hole "C" mtg bracket; General Electric 21F887; Berkeley Scientific . Part of Clock Assembly.	Phase splitter for Motor B-402 in I-402 clock assembly.
E-401	*	KNOB ASSEMBLY: Part of Clock Assembly.	
E-402	*	BUSHING, knob: Part of Clock Assembly.	
H-401	N17-C-480693-236	CHAIN: pitch .185", inside width 7/64", outside width 19/64"; brass, cad pl .0005" min thickness per Spec QQ-P-416; 65 links per ft, 7-1/64" circumference; weldless cut construction; no terminations; Boston Gear Works 1-A; Berkeley Scientific part 5231N, dwg 1737A135.	Coupling between B-401 and O-401.

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

I-401	G17-L-6806-130	LAMP, glow: 105-125V; 1/25 w; bulb T-3¼ clear; 1-3/16″ lg; min bayonet; neon; burn any position; General Electric NE-51; Berkeley Scientific part/dwg 5106N.	Count Lamp.
I-402		TIMER, electric: elapsed time indicator and time interval control; synchronous self-starting electric clock; electronic-mechanical control; direct reading; automatic or manual stop and start; circular dial calibrated 0 to 100 seconds in 1 second graduations, along outer edge for 360°; operates from 115V, 50 cyc line; clutch control 120V, .050 amps DC, reset control is 115V, 60 cps, no outlets; synchronized; cad pl steel; Std. Electric Time Co. Model 1 Special; Berkeley Scientific.	Timing clock. Part of Clock Assembly.
I-403		COUNTER, mechanical and electrical: 220 vdcw; die cast frame and case w/2-tone gray crackle finish; 3-21/32″ lg x 1-5/8″ wd x 2-1/2″ h; 6 digits; mechanically reset to zero; number wheels rotate upward; 16 counts per second; not reversible; 4 holes 3-7/32″ c to c one side, 1-3/8″ c to c other side; Veeder-Root Co. V-124806; Berkeley Scientific part/dwg 5401N.	Count register.
J-401	N17-C-72273-5487	CONNECTOR, receptacle: 14 round female contacts; straight type; 1-5/8″ sq. x 1-1/8″ deep; 20 amps, 200 vdcw; square aluminum shell w/tin plate finish; molded phenolic insert; 4 mtg holes .120″ diam, 1-1/4″ c to c; Cannon AN3102A-22-19S; Berkeley Scientific part/dwg 5180N.	Accessories connector (Front panel).
J-402		CONNECTOR, receptacle: Same as J-202.	SCALER OUTPUT (Front Panel).
J-403		CONNECTOR, receptacle: Same as J-202.	GATE PULSE INPUT (Front Panel).
J-404		CONNECTOR, receptacle: Same as J-202.	GATE PULSE INPUT (Rear chassis).
J-405	N17-C-73317-2189	CONNECTOR, female contact: 18 round polarized contacts; straight; 1-5/16″ lg x 9/16″ wd x 7/8″ d; rectangular molded melamine body; screw mtg ea end #4-40 NC2, 1″ c to c; Winchester Electronics MRE-18S-G; Berkeley Scientific part/dwg 2106N.	707 DCU connections.
J-406		CONNECTOR, female contact: Same as J-405.	706 DCU connections.
J-407		CONNECTOR, female contact: Same as J-405.	706 DCU connections.
J-408		CONNECTOR, female contact: Same as J-405.	706 DCU connections.
J-409		CONNECTOR, receptacle: Same as J-202.	SCALER OUTPUT (Rear Chassis).
J-410		CONNECTOR, receptacle: Same as J-401.	Accessories connector (Rear Chassis).
J-411	N17-C-73533-4985	CONNECTOR, male contact: 7 round male contacts; straight; 1-5/8″ lg x 1/2″ wd x 27/32″ thk, less contacts; breakdown voltage between contacts 7500 v DC, 5300 v AC; rectangular molded melamine body; panel mtg w/two #6 mach screws; Winchester Electronics A7P; Berkeley Scientific part/dwg 5488N. Part of Clock Assembly.	Connects to P-402 which supplies CLOCK I-402.
L-401	N17-M-12661-1901	ELECTROMAGNET: timer start clutch magnet coil: Standard Electric Time Co. Model S-1 Timer; nickel pl steel hdwe; 120 v, .050 amps DC; 1.878″ lg ±.001″ x 7/8″ sq; 2 #4-40 machine screws 1-7/16″ apart; Standard Electric Time Co. part/dwg EQ-634B; Berkeley Scientific part/dwg . Part of I-402.	Clutch coil, part of I-402.
L-402		COIL, solenoid: timer reset solenoid; Std. Electric Time Co. Model S-1 Timer; cad pl steel, nickel pl brass hdwe; 115 v, 60 cps, 1.3 amps, 1 phase, 98 ohms; 3500 turns of #29 wire; 4-1/8″ lg x 1-3/4″ wd x 1-1/2″; mtd axially by two #4-40 screws and one #10-32 screw; Standard Electric Time Co. part/dwg EW-2388C; Berkeley Scientific . Part of Clock Assembly.	Reset coil, part of I-402.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
O-401	.....	CAM: scaler reset cam; cad pl; steel; round except for indentation on one side along part of length, w/centered center; .625" diam x 15/16" lg; Berkeley Scientific part/dwg 1737A86.	Operates S-406 and is driven by B-401.
O-402		NOT USED.	
O-403	N17-S-500025-121	SPROCKET, chain: bronze, cad pl; 10 teeth, 0.60 pitch; round; set screw mtg 8-32 x 5/32" screw; Boston Gear Works CBA10; Berkeley Scientific part/dwg 5373N.	Connects to shafts of B-401 and O-401 so coupling between these two can be accomplished using H-401.
O-404		SPRING: helical extension type; set of 4 springs; No. 1 — .024" diam music wire, nickel pl; 3/4" lg x 7/16" wd; irregular shape; Std. Electric Time Co. part/dwg EW-623A; No. 2 — .024" diam music wire, nickel pl; 45/64" lg x 1/4" diam; 10 turns; single loop eye terms, centered w/O.D. on both ends; Std. Electric Time Co. part/dwg EW-2904B; No. 3 — .025" diam; phosphor bronze, nickel pl; 15/16" lg x 1/4" diam; 18 turns; double-loop eye terms, centered w/O.D. on both ends; Std. Electric Time Co. part/dwg EW-182A; No. 4 — .026" diam music wire, chrome plated; 59/64" lg x 1/4" diam; 18 turns; single loop eye terms, centered w/O.D. on both ends; Std. Electric Time Co. part/dwg EW-714B. Part of I-402.	Used in I-402.
O-408		GEAR: spur type; phenolic; for driving center staff of electric stop watch; straight teeth; 50 teeth; 64 pitch, .778" pitch; .809" O.D., .187" diam bore, 1/8" thk; straight face; shaft mtg; Std. Electric Time Co. part/dwg EW-3253A; Berkeley Scientific . Part of Clock Assembly.	Driving center staff of clock I-402.
P-401		CONNECTOR, male contact: Same as P-101.	Input connections to ID364/UDR-9.
P-402	..... N17-C-71241-8791	CONNECTOR, female contact: 7 round female contacts; straight; 1-5/8" lg x 1/2" wd x 27/32" thk; breakdown voltage between contacts 7500 v DC, 5300 v AC; rectangular molded melamine body; panel mtg w/two #6 mach screws; includes alum. hood 1-21/32" thk w/cable clamp 1-1/16" h, 5/16" diam hole; Winchester Electronics A7S-H; Berkeley Scientific part/dwg 5478N.	Connects to J-411 and is connected to I-402 clock mechanism.
R-401		RESISTOR, fixed: Same as R-218.	V-401, grid feedback, pin 2.
R-402		RESISTOR, fixed: Same as R-216.	V-401, grid return, pin 2.
R-403		RESISTOR, fixed: Same as R-229.	V-401, cathode bias, pin 3, 8.
R-404		RESISTOR, fixed: Same as R-216.	V-401, grid return, pin 7.
R-405		RESISTOR, fixed: Same as R-218.	V-401, grid coupling, pin 7.
R-406		RESISTOR, fixed: Same as R-227.	V-401, plate load, pin 1.
R-407		RESISTOR, fixed: Same as R-227.	V-401, plate load, pin 6.
R-408	..... N16-R-68399-8006	RESISTOR, fixed: wire wound, non-inductive; 1000 ohms ±5%; 10 w, 240° M.O.T.; 1-27/32" lg x 15/32" diam; ceramic coating, humidity resistant; axial wire lead terms, 2-1/2" lg #20 BS; Sprague 10NIT-1K; Berkeley Scientific part/dwg 5005N.	Voltage dropping connected between A and E of J-405.
R-409		RESISTOR, fixed: Same as R-214.	Divider, V-402, pin 1.

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

R-410		RESISTOR, fixed: Same as R-214.	Divider, V-402, pin 9.
R-411	N16-R-50758-377	RESISTOR, fixed: composition; JAN type RC20GF334J; 330,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB3345; JAN spec JAN-R-11-2.	Divider element, V-404, pin 7.
R-412	N16-R-50551-401	RESISTOR, fixed: composition; JAN type RC20GF683J; 68,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms, 1-1/2" lg #21 AWG min; Allen Bradley EB6835; JAN spec JAN-R-11-2.	Grid load V-402, pin 2.
R-413		RESISTOR, fixed: Same as R-280.	V-402, grid coupling, pin 2.
R-414	N16-R-50166-238	RESISTOR, fixed: composition; JAN type RC30GF562K; 5600 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms, 1-1/2" lg #20 AWG min; Allen Bradley GB5621; JAN spec JAN-R-11-2.	V-402, cathode bias, pin 3, 6.
R-415		RESISTOR, fixed: Same as R-412.	V-402, grid return, pin 7.
R-416		RESISTOR, fixed: Same as R-280.	V-402, grid coupling, pin 7.
R-417	N16-R-50758-754	RESISTOR, fixed: composition; JAN type RC30GF334J; 330,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms, 1-1/2" lg #20 AWG min; Allen Bradley GB3345; JAN spec JAN-R-11-2.	V-402, plate load, pin 1.
R-418		RESISTOR, fixed: Same as R-417.	V-402, plate load, pin 9.
R-419		RESISTOR, fixed: Same as R-149.	Divider, V-402, pin 9.
R-420	N16-R-50652-233	RESISTOR, fixed: composition; JAN type RC30GF124K; 120,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms; 1-1/2" lg #20 AWG min; Allen Bradley GB1241; JAN spec JAN-R-11-2.	Divider, V-404, grid circuit.
R-421		RESISTOR, fixed: Same as R-215.	V-403, grid bias.
R-422		RESISTOR, fixed: Same as R-202.	V-404, grid return, pin 1.
R-423		RESISTOR, fixed: Same as R-274.	V-404, screen dropping, pin 6.
R-424		RESISTOR, fixed: Same as R-109.	V-404, screen bleeder, pin 6.
R-425	N16-R-50373-238	RESISTOR, fixed: composition; JAN type RC30GF223K; 22,000 ohms ±20%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms, 1-1/2" lg #20 AWG min; Allen Bradley GB2231; JAN spec JAN-R-11-2.	V-404, plate load, pin 5.
R-426		RESISTOR, fixed: Same as R-425.	V-403, plate load, pin 5.
R-427		RESISTOR, fixed: Same as R-303.	V-407, plate load, pin 6.
R-428		RESISTOR, fixed: Same as R-320.	Divider, V-407, pin 6.
R-429		RESISTOR, fixed: Same as R-209.	V-407, grid return, pin 7.
R-430		RESISTOR, fixed: Same as R-202.	Divider, S-403A, STOP terminal.
R-431		RESISTOR, fixed: Same as R-202.	Divider, S-403A COUNT terminal.
R-432		RESISTOR, fixed: Same as R-149.	Divider B+ line near S-403A.
R-433		RESISTOR, fixed: Same as R-294.	Divider, S-403A.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-434		RESISTOR, fixed: Same as R-294.	Limiter, V-405, pin 2.
R-435	N16-R-50678-818	RESISTOR, fixed: composition; JAN type RC20GF154K; 150,000 ohms ±10%; 1/2 w; F characteristic; .468" lg x .249" diam; ins RSW; axial wire lead terms; Allen Bradley EB1541; JAN spec JAN-R-11-2.	V-405, grid return.
R-436	N16-R-50786-818	RESISTOR, fixed: composition; JAN type RC20GF394K; 390,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam; ins RSW; axial wire lead terms; Allen Bradley EB3941; JAN spec JAN-R-11-2.	Divider, V-405, grid circuit.
R-437	N16-R-50858-818	RESISTOR, fixed: composition; JAN type RC20GF564K; 560,000 ohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; 2 axial wire lead terms; Allen Bradley EB5641; JAN spec JAN-R-11-2.	V-406, grid return, pin 7.
R-438		RESISTOR, fixed: Same as R-341.	V-406, plate load, pin 6.
R-439		RESISTOR, fixed: Same as R-341.	V-406, plate load, pin 1.
R-440	N16-R-50281-438	RESISTOR, fixed: composition; JAN type RC20GF103J; 10,000 ohms ±5%; 1/2 w; F characteristic; .468" lg x .249" diam; ins RSW; axial wire lead terms; Allen Bradley EB1035; JAN spec JAN-R-11-2.	V-406, cathode bias, pin 3, 8.
R-441	N16-R-50695-436	RESISTOR, fixed: composition; JAN type RC20GF184J; 180,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1845; JAN spec JAN-R-11-2.	V-406, grid return, pin 2.
R-442		RESISTOR, fixed: Same as R-351.	Load across which J-402 connects.
R-443		RESISTOR, fixed: Same as R-209.	Coupling, J-402, J-409.
R-444	N16-R-50893-435	RESISTOR, fixed: composition; JAN type RC20GF684J; 680,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB6845; JAN spec JAN-R-11-2.	V-406, grid coupling, pin 2.
R-445		RESISTOR, fixed: Same as R-202.	V-403, grid return, pin 1.
R-446	N16-R-66030-1206	RESISTOR, fixed: wire wound; 1000 ohms ±5%; 10 w, 275° M.O.T.; 2" lg x 11/16" wd; ceramic coating, humidity resistant; solder lug terms one side near ea end; Sprague RW31G102; Berkeley Scientific part/dwg 5173N.	V-408, plate load, pin 5.
R-447	N16-R-50130-241	RESISTOR, fixed: composition; JAN type RC30GF472K; 4700 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB4721; JAN spec JAN-R-11-2.	V-408, filter, pin 6.
R-448		RESISTOR, fixed: Same as R-109.	Divider, V-407, pin 3.
R-449		RESISTOR, fixed: Same as R-215.	V-407, cathode load, pin 3.
R-450	N16-R-50516-818	RESISTOR, fixed: composition; JAN type RC20GF563K; 56,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB5631; JAN spec JAN-R-11-2.	Divider, I-401.
R-451		RESISTOR, fixed: Same as R-274.	Divider for I-401 in cathode circuit of V-407.

R-452	N16-R-50929-438	RESISTOR, fixed: composition; JAN type RC20GF824J; 820,000 ohms ±5%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB8245; JAN spec JAN-R-11-2.	Divider, TP-402.
R-453		RESISTOR, fixed: Same as R-294.	Divider, I-401.
R-454	N16-R-50552-818	RESISTOR, fixed: composition; JAN type RC20GF683K; 68,000 ohms ±10%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB6831; JAN spec JAN-R-11-2.	Filter, V-405, pin 6.
R-455		RESISTOR, fixed: Same as R-209.	Divider, S-403A, COUNT terminal.
R-456		RESISTOR, fixed: Same as R-303.	V-407, plate load, pin 6.
R-457		RESISTOR, fixed: Same as R-109.	Divider, V-403, pin 7.
R-458		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-459		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-460		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-461		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-462		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-463		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-464		RESISTOR, fixed: Same as R-364.	Divider, S-401C.
R-465		RESISTOR, fixed: Same as R-288.	V-408, grid return, pin 1.
R-466		RESISTOR, fixed: Same as R-209.	Divider, V-407, plate circuit.
R-467		RESISTOR, fixed: Same as R-447.	Voltage dropping, S-402A.
R-468	N16-R-49500-493	RESISTOR, fixed: composition; JAN type RC42GF680K; 68 ohms ±10%; 2 w; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB6801; JAN spec JAN-R-11-2.	Filter, B-401, pin 1.
R-469		RESISTOR, fixed: Same as R-202.	Divider, J-401, terminal D.
S-401		SWITCH, rotary: 3 pole, 11 pos, 11 throw; 3 sect; brass, sil pl cont; ceramic body; 2-3/4" lg from mtg surface x 1-15/16" diam; non-shorting contacts; locking action; solder lug terms; 3/8-32 NSF2 mtg bushing 3/8" lg, 2-1/2" lg shaft 1/4" diam; Oak 47527-DH3C; Berkeley Scientific part/dwg 5175N.	PREDET. COUNT-PREDET. TIME selector (front panel).
S-401A		SWITCH, rotary: Part of S-401.	
S-401B		SWITCH, rotary: Part of S-401.	
S-401C		SWITCH, rotary: Part of S-401.	
S-401D		SWITCH, rotary: Part of S-401.	
S-402		SWITCH, rotary: Same as S-203.	TEST-OPERATE-CALIBRATE (front panel).
S-402A		SWITCH, rotary: Part of S-402.	
S-402B		SWITCH, rotary: Part of S-402.	

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
S-403		SWITCH, rotary: 4 pole, 3 pos, 3 throw; 2 sections; brass, sil pl cont; steatite wafers; 1-3/4" lg from mtg surface x 1-7/8" diam; 1 shorting contact, 3 non-shorting; solder lug terms; 3/8-32 thd bushing 3/8" lg, 2-1/8" shaft 1/4" diam; Centralab 010-194; Berkeley Scientific part/dwg 5177N.	RESET-STOP-COUNT (front panel).
S-403A		SWITCH, rotary: Part of S-403.	
S-403B		SWITCH, rotary: Part of S-403.	
S-403C		SWITCH, rotary: Part of S-403.	
S-404	N17-S-71420-4201	SWITCH, toggle: SPST; JAN type ST10A; Berkeley Scientific part/dwg 5178N.	COUNT ON-OFF (front panel).
S-405		SWITCH, toggle: Same as S-404.	CLOCK ON-OFF switch (front panel).
S-406	N17-S-69420-6531	SWITCH, push: SPDT; 15 amp, 460 v ac; 1/2 amp, 125 v dc; 1/4 amp, 250 v dc; molded plastic; 1-15/16" lg x 11/16" wd; momentary action; solder terms; two .140" diam holes 1" c to c; Microswitch BZ-2RW22; Berkeley Scientific part/dwg 5371N.	Part of Reset Motor, B-401.
TP-401		INSULATOR, feedthru: Same as TP-201.	Test point, V-406, pin 6.
TP-402		INSULATOR, feedthru: Same as TP-201.	Test point, V-401, pin 6.
TP-403		INSULATOR, feedthru: Same as TP-201.	Test point, V-402, pin 1.
TP-404		INSULATOR, feedthru: Same as TP-201.	Test point, V-404, pin 7.
V-401		TUBE, electron: Same as V-201.	Latching Binary.
V-402		TUBE, electron: Same as V-102.	Gate control tube.
V-403	N16-T-56201-50	TUBE, electron: JAN type 6AS6W; pentode.	Stop gate.
V-404		TUBE, electron: Same as V-403.	Amplifier.
V-405		TUBE, electron: Same as V-201.	Register amplifier.
V-406		TUBE, electron: Same as V-201.	Amplifier.
V-407		TUBE, electron: Same as V-220.	Amplifier.
V-408		TUBE, electron: Same as V-210.	Clutch amplifier.
XI-401	N17-L-76902-2625	LIGHT, indicator: 5/8" diam white plastic lens; for T-3¼ bulb size, NE-51 lamp; enclosed black nickel finish shell; 2" lg x 13/16" max diam; 2 solder lug terms opposite sides of base; Dialco 52410-995; Berkeley Scientific part/dwg 5505N.	I-401, holder.
XV-401		SOCKET, tube: Same as XV-201.	V-401, socket.
XV-402		SOCKET, tube: Same as XV-201.	V-402, socket.
XV-403		SOCKET, tube: Same as XV-210.	V-403, socket.
XV-404		SOCKET, tube: Same as XV-210.	V-404, socket.

XV-405		SOCKET, tube: Same as XV-201.	V-405, socket.
XV-406		SOCKET, tube: Same as XV-201.	V-406, socket.
XV-407		SOCKET, tube: Same as XV-201.	V-407, socket.
XV-408		SOCKET, tube: Same as XV-210.	V-408, socket.
C-501	N16-C-51881-9600	CAPACITOR, fixed: paper can; JAN type CP70B1EG106V; 10 mfd +20% —10%; 1000 vdcw; Sprague CP70B1EG106V; JAN spec JAN-C-25.	+300V filter, V-507, pin 2.
C-502		CAPACITOR, fixed: Same as C-501.	+300V filter, V-507, pin 2.
C-503		CAPACITOR, fixed: Same as C-418.	Coupling, V-509, pin 7.
C-504		CAPACITOR, fixed: Same as C-113.	—105V filter V-511, pin 6.
C-505		CAPACITOR, fixed: Same as C-418.	Coupling, V-512, pin 2.
C-506		CAPACITOR, fixed: paper can; JAN type CP70D1ER104V; 100,000 mmf +20% —10%; 7500 vdcw; Sprague CP70D1ER104V; JAN spec JAN-C-25.	HV filter, V-514, pin1.
C-507		CAPACITOR, fixed: Same as C-113.	LV filter, V-515, pin 7.
C-508		CAPACITOR, fixed: Same as C-103.	Filter, V-518A, pin 8.
C-509		CAPACITOR, fixed: Same as C-240.	Coupling, V-521, pin 5.
C-510	N16-C-44257-2597	CAPACITOR, fixed: paper tubular; JAN type CP28A1EF503M; 50,000 mmf ±20%; 600 vdcw; strap mtg; Sangamo CP28A1EF503M; JAN spec JAN-C-25.	Coupling, V-518A, pin 7.
C-511		CAPACITOR, fixed: Same as C-267.	Filter V-518B, pin 2.
C-512		CAPACITOR, fixed: Same as C-240.	HV Filter, K-504.
C-513		CAPACITOR, fixed: Same as C-267.	Bypass, V-517, pin 5.
C-514	N16-C-47297-3175	CAPACITOR, fixed: paper can; 500,000 mmf ±10%; 600 vdcw; HS metal case w/ins sleeve; 1-13/16" lg x 1" wd x 1" thk; E characteristic; mtg bracket ea end; 2-1/8" c to c; Sangamo CP53B1EF504K; JAN spec JAN-C-25.	Filter element in control circuit of ±2500V supply from pin 3 of V-517.
F-501	N17-F-14328-50	FUSE, cartridge: 15 amp, opens in 1 hr at 135% load, 2 min at 200%, and continuous at 110%; instantaneous max 250 v; one-time; steatite enclosed; ferrule terms; non-indicating; 1-1/4" lg x 1/4" diam; 1/4" diam; Littlefuse 314015-Type 3AB15A; Berkeley Scientific part/dwg 5100N.	AC LINE fuse.
F-502		FUSE, cartridge: Same as F-501.	AC LINE fuse.
F-503	G17-F-16302-80	FUSE, cartridge: 1 amp, opens 1 hr at 135% load, 2 min at 200%; continuous at 110%; max 250 v; one time; glass body; ferrule terms; non-indicating; 1-1/4" lg x 1/4" diam; 1/4" diam; Littlefuse 312001, Type 3AG1A; Berkeley Scientific part/dwg 5101N.	HV SUPPLY fuse.
F-504		NOT USED.	
F-505	N17-F-14275-125	FUSE, cartridge: JAN F27JR750A; 3/4 amp; opens in 1 hr at 135%; 1000 volt; one time; glass body; non-indicating; 3" lg x 25/64" diam; Bussmann type HVA; Berkeley Scientific part/dwg 5555N.	HV rectifier protection, pin 8. V-501, V-502, V-503.
I-501		LAMP, glow: Same as I-401.	AC LINE blown fuse indicator.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
I-502		LAMP, glow: Same as I-401.	AC THERMAL OVERLOAD INDICATOR.
I-503		LAMP, glow: Same as I-401.	AC LINE blown fuse indicator.
I-504		LAMP, glow: Same as I-401.	HV SUPPLY blown fuse indicator.
I-505		LAMP, glow: Same as I-401.	HIGH VOLTAGE ON indicator.
I-506		LAMP, incandescent: Same as I-101.	AC power "ON" terminals 21, 22 of T-501.
I-507		LAMP, glow: Same as I-401.	HV NEGATIVE polarity indicator, connects to S-504.
I-508		LAMP, glow: Same as I-401.	HV POSITIVE polarity indicator, connects to S-504.
J-501	N17-C-72605-6565	CONNECTOR, female contact: 3 round contacts; JAN type AN3102-22-9P; straight; 1.937" lg x 1.625" wd; cad pl, alum alloy; rubber; polychloroprene, 75 shore insert; 4 mtg holes .120" diam, 1.250" c to c; Cannon 2063-17; Berkeley Scientific part/dwg 5108N.	115V AC LINE IN (front panel).
J-502		CONNECTOR, female contact: Same as J-501.	115V AC LINE (rear panel).
J-503		CONNECTOR, female contact: 15 round female contacts; AN3102-15-17S; straight type; 2" lg x 1-5/8" wd; solid shell, cad pl; alum alloy; phenolic; C1-C1 mtg holes 1-9/16" Cannon AN3102-15-17S; JAN spec MIL-C-5015.	ACCESSORIES (front panel).
J-504		CONNECTOR, female contact: Same as J-503.	ACCESSORIES (rear panel).
J-505		CONNECTOR, female contact: Same as J-201.	H.V. OUT (front panel).
J-506		CONNECTOR, female contact: Same as J-201.	H.V. OUT (rear panel).
J-507	N17-C-73139-7645	CONNECTOR, receptacle: 2 rectangular parallel contacts; straight type; 1-5/8" sq x 9/16" thk; 10 amp 250 v, 15 amp 110 v; cylindrical alum body, satin finish; black bakelite insert; C1C1 mtg holes 1-1/4"; Amphenol 97-4085-229; Berkeley Scientific part/dwg 5109N.	115V AC CONVENIENCE OUTLET (front panel).
J-508		CONNECTOR, receptacle: Same as J-507.	115V AC CONVENIENCE OUTLET (rear panel).
J-509		CONNECTOR, receptacle: 32 round polarized female contacts, A1 coax, A2 HV; straight; 3-3/8" lg x 1-3/4" wd x 1-9/16" d; rectangular alum shell; phenolic insert; 4 mtg holes .144" diam on 1" x 2-7/8" mtg/c; Cannon DPD32C1-HV1-33S; Berkeley Scientific part/dwg 5112N.	Input and output connections to and from PP948/UDR-9.
K-501		RELAY, time delay: SPDT; 15 amps, 115 v; coin silver contacts, 5/16" diam; nickel pl brass strip terms w/screws; 4-1/8" lg x 2-5/8" wd x 2-1/8" d overall; four .140" mtg holes (1 ea corner); 30 second time delay; Royal Electric Co. SA-677, TF2-1-40S; Berkeley Scientific part/dwg 5090N.	Time delay to delay application of AC to T-503, and delays +300 volts DC supply.

K-502	N17-R-64187-4842	RELAY, armature: DPDT; 10 amp, 115 v; 1/4" silver conts; 110 v ac coil, ceramic steatite ins; solder lug terms; 2-3/4" lg x 1-5/8" wd x 1-3/8" h; Advance Relays Type 1000; Berkeley Scientific part/dwg 5091N.	HV polarity relay.
K-503		RELAY, armature: Same as K-502.	+300V on-off control.
K-504		RELAY, armature: Same as K-502.	Creates discharge path for C-512 thru R-568 when S-503 or S-502 are in off position.
L-501	N16-R-29027-4109	REACTOR: filter choke; JAN-T-27, Gr 1, C1 A; 3 hys at 600 ma DC; 40 ohms DC resistance; 1500 volts RMS test; HS metal case; 4-1/2" h x 3-1/2" wd x 3-3/4" d o/a; four 3/4" #10-32 studs; 2-3/4" c to c one side, 2-1/2" c to c other side; 2 solder lug terms on mtg surface; Triad Transformer 13980; Berkeley Scientific part/dwg 5094N.	+300V filter element V-507, pin 2.
L-502	N16-R-29023-8657	REACTOR: filter choke; construction per JAN-T-27 Gr 1, C1 A; 3 hys at 150 ma d-c; 110 ohm DC resistance; 1500 v RMS test; HS metal case; 2-3/4" h x 2-1/4" wd x 2-1/8" deep; two 8-32 x 7/32" lg stud bolts on 1-1/2 and 1-3/8" mtg/c; 2 solder lugs on top of case 1-3/8" c to c; Triad Transformer 13979; Berkeley Scientific part/dwg 5095N.	—105V filter element, V-510, pin 8.
M-501		METER, voltmeter: DC; 0-2500 volts; rectangular flush mtg black bakelite case; barrel diam 3-31/32" x 1-5/8" deep, rectangular flange 4" x 4-1/4"; 1% accuracy for full scale reading; D'Arsonval movement; 1 ma for full scale deflection; calibrated for non-magnetic panels; 50 scale divsns w/black numerals, reflecting mirror; self-contained; mtd thru cutout 3-3/4" wd x 4-1/16" h with 1/2" radius corners; 2 rear term 3/4" lg x 1/4" diam x 28 thd; moisture & fungus proofed; Weston 741S; Berkeley Scientific part/dwg 5102N.	HV meter (front panel).
O-501	**	ADAPTER: grid cap adapter for type 3C24 tube, V-516; 17S aluminum; 1/2" h x .360" diam overall; Berkeley Scientific part/dwg 1737A44.	Grid cap adapter for V-516.
O-502		GEAR: worm type; bronze, cad pl; variac drive gear; skew teeth; right-hand; 30 teeth; pitch — 32 double thread, pitch diam .938"; 15/32" thk; concave face; .377" diam; mts .377" hole by #29 (.136") drill and tap 8-32 two places; Boston Gear Works D1127-30 teeth; Berkeley Scientific part 5218N.	Connects to shaft of T-503 and is driven by O-503 which, in turn is driven when HIGH VOLTAGE CONTROL knob on front panel is turned.
O-503		WORM, gear: use w/Boston Gear Works D1127 worm gear; steel, cad pl .0005" min thk per sec 46P1; cylindrical, Boston Gear Works type DTH; Berkeley Scientific part/dwg 5217N.	Drives O-502 and is on shaft of R-552.
R-501		RESISTOR, fixed: Same as R-435.	Limiter, I-501.
R-502		RESISTOR, fixed: Same as R-435.	Limiter, I-502.
R-503		RESISTOR, fixed: Same as R-435.	Limiter, I-503.
R-504		RESISTOR, fixed: Same as R-435.	Limiter, I-504.
R-505		RESISTOR, fixed: Same as R-435.	Limiter, I-505.
R-506	N16-R-50760-470	RESISTOR, fixed: composition; JAN type RC42GF334K; 330,000 ohms ±10%; 2 w; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB3341; JAN spec JAN-R-11-2.	Bleeder, V-507, pin 2.

** After equipment spares are expended, do not request replacement unless this material cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-507	N16-R-49922-730	RESISTOR, fixed: composition; JAN type RC20GF102K; 1000 ohms ±10%; 1/2 w; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1021; JAN spec JAN-R-11-2.	V-504, grid, pin 4, parasitic suppressor.
R-508	N16-R-49626-503	RESISTOR, fixed: composition; JAN type RC42GF151K; 150 ohms ±10%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB1511; JAN spec JAN-R-11-2.	V-504, cathode, pin 6, divider.
R-509		RESISTOR, fixed: Same as R-508.	V-504, cathode, pin 6, divider.
R-510		RESISTOR, fixed: Same as R-507.	V-504, pin 1, parasitic suppressor.
R-511		RESISTOR, fixed: Same as R-507.	V-505, pin 4, parasitic suppressor.
R-512		RESISTOR, fixed: Same as R-508.	V-505, pin 6, divider.
R-513		RESISTOR, fixed: Same as R-508.	V-505, pin 8, divider.
R-514		RESISTOR, fixed: Same as R-507.	V-505, pin 1, parasitic suppressor.
R-515	N16-R-51021-238	RESISTOR, fixed: composition; JAN type RC30GF155K; 1.5 megohms ±10%; 1 w; F characteristic; .750" lg x .280" diam; ins RSW; axial leads; Allen Bradley GB1551; JAN spec JAN-R-11-2.	Divider element in series with Line Adjust (R-527), V-504, pin 5.
R-516		RESISTOR, fixed: Same as R-507.	V-506, pin 4, parasitic suppressor.
R-517		RESISTOR, fixed: Same as R-508.	V-506, pin 6, divider.
R-518		RESISTOR, fixed: Same as R-508.	V-506, pin 3, divider.
R-519		RESISTOR, fixed: Same as R-507.	V-506, pin 1, parasitic suppressor.
R-520		RESISTOR, fixed: Same as R-507.	V-507, pin 4, parasitic suppressor.
R-521		RESISTOR, fixed: Same as R-508.	V-507, pin 6, divider.
R-522		RESISTOR, fixed: Same as R-508.	V-507, pin 3, divider.
R-523		RESISTOR, fixed: Same as R-507.	V-507, pin 1, parasitic suppressor.
R-524		RESISTOR, fixed: Same as R-114.	V-508, pin 1, Limiter.
R-525		RESISTOR, fixed: Same as R-420.	V-509, plate load, pin 6.
R-526		RESISTOR, fixed: Same as R-320.	V-509, bias, pin 8.
R-527	N16-R-88512-5400	RESISTOR, variable: composition; 5 megohms ±20%; 2 w; 3 solder lug terms; enclosed metal case 1-1/16" diam x 9/16" d; slotted metal shaft 5/8" lg, locking bushing 1/2" lg; linear taper; ins contact arm, no off position; normal torque; 3/8"-32 thd bushing mtg; Allen Bradley JLU5052-SD4040L; Berkeley Scientific part/dwg 5368N.	LINE ADJUST, V-504 plate circuit.
R-528	N16-R-50742-240	RESISTOR, fixed: composition; JAN type RC30GF274K; 270,000 ohms ±10%; 1 w; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB2741; JAN spec JAN-R-11-2.	Divider, V-509 plate circuit.
R-529		RESISTOR, variable: Same as R-125.	+300V ADJ, V-509, pin 7.

R-530		RESISTOR, fixed: Same as R-114.	Divider, V-509 grid circuit.
R-531		RESISTOR, fixed: Same as R-101.	Bleeder, V-511, pin 6.
R-532		RESISTOR, fixed: Same as R-507.	V-511, parasitic suppressor, pin 1.
R-533		RESISTOR, fixed: Same as R-507.	V-511, parasitic suppressor, pin 4.
R-534		RESISTOR, fixed: Same as R-213.	Divider, V-513, pin 1.
R-535		RESISTOR, fixed: Same as R-209.	Divider, V-513, pin 1.
R-536		RESISTOR, fixed: Same as R-209.	Divider, V-513, pin 2.
R-537		RESISTOR, fixed: Same as R-320.	Bias, V-512, pin 5.
R-538	N16-R-50650-758	RESISTOR, fixed: composition; JAN type RC30GF124J; 120,000 ohms ±5%; 1 w; F characteristic; .750″ lg x .280″ diam; ins RSW; axial wire lead terms; Allen Bradley GB1245; JAN spec JAN-R-11-2.	Grid bias, V-511, pin 1, 4.
R-539		RESISTOR, fixed: Same as R-367.	Plate load, V-512, pin 6.
R-540		RESISTOR, fixed: Same as R-134.	Divider, V-511, pin 5.
R-541		RESISTOR, variable: Same as R-125.	—105V ADJ, V-512, pin 2.
R-542	N16-R-50417-823	RESISTOR, fixed: composition; JAN type RC20GF333K; 33,000 ohms ±10%; 1/2 w; F characteristic; .468″ lg x .249″ diam; ins RSW; axial wire lead terms; Allen Bradley EB3331; JAN spec JAN-R-11-2.	Divider, V-513, pin 2.
R-543		RESISTOR, fixed: Same as R-435.	Limiter, I-508.
R-544	N16-R-51174-238	RESISTOR, fixed: composition; JAN type RC30GF475K; 4.7 megohms ±10%; 1 w; F characteristic; .750″ lg x .280″ diam; ins RSW; axial wire lead terms; Allen Bradley GB4751; JAN spec JAN-R-11-2.	Plate load, V-521, pin 6.
R-545		RESISTOR, fixed: 3 unit; wire wound; two 2.5 megohms ±1/2%, one 6 megohms ±1/2%; two 2.5 meg. 2.5KV ea, 6 meg 7KV; 3-1/4″ lg x 3″ wd x 2-15/16″ h; 6 solder post terms protruding 11/16″ h o/a from insulating beads; 3 resistors in metal case #6-32 mtg studs ea corner on 2-5/8″ x 2-3/8″ mtg c; Cinema 13177; Berkeley Scientific 1737B.	
R-545A		RESISTOR, fixed: 6 M cell; Part of R-545.	Isolation, V-516 plate.
R-545B		RESISTOR, fixed: 2.5M cell; Part of R-545.	HV divider element, cathode circuit V-516.
R-545C		RESISTOR, fixed: 2.5M cell; Part of R-545.	Meter M-501 multiplier.
R-546		RESISTOR, fixed: Same as R-209.	Plate load, V-518A, pin 6.
R-547	N16-R-50713-380	RESISTOR, fixed: composition; JAN type RC20GF224J; 220,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB2245; JAN spec JAN-R-11-2.	Divider, V-517, pin 8.
R-549		RESISTOR, fixed: Same as R-280.	Divider, grid circuit V-518A.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-550	..... N16-R-90217-6010	RESISTOR, variable: wire wound; JAN type RA30A1SD101AK; 100 ohms ±10%; 4 watts at 100°C max cont oper temp; 3 solder lug terms; molded melamine case 1-3/4" diam x 61/64" thk; slotted nickel pl brass shaft 7/8" lg x .250" diam; linear taper; ins contact arm w/o off position; normal torque; bushing .375" lg x 3/8-32 thd diam, non-turn on radius of .531" from center at 9 o'clock position; Amalgamated Electronics PRA-30; Berkeley Scientific part/dwg 5015N.	Load compensation, V-518B grid circuit.
R-551		RESISTOR, fixed: Same as R-425.	Limiter, V-520, pin 1.
R-552	..... N16-R-91825-8303	RESISTOR, variable: wire wound; 100,000 ohms ±5%; 5 w, 80° max cont oper temp; 3 solder lug terms; enclosed plastic case 2" lg x 1-13/16" diam; rounded metal shaft 13/16" lg x 1/4" diam; linear within ±1%; ins, no off position; normal torque; .312" lg incl shoulder .125" lg x .4062" diam; non-turn device on 9/16" radius at 12 o'clock; Helipot 100,000A1; Berkeley Scientific part/dwg 5013N.	HV control, V-520, pin 1 geared to operate with T-503 and both are controlled by front panel knob labeled HIGH VOLTAGE CONTROL.
R-553		RESISTOR, fixed: Same as R-108.	Cathode bias, V-518B, pin 3.
R-554		RESISTOR, variable: wire wound; JAN type RA30A1SD503AK; 50,000 ohms ±10%; 4 watts at 100°C max cont oper temp; 3 solder lug terms; molded melamine case 1-3/4" diam x 61/64" thk; slotted nickel pl brass shaft 7/8" lg x .250" diam; linear taper; ins contact arm w/o off position; normal torque; bushing .375" lg x 3/8-32 thd diam, non-turn on radius of .531" from center at 9 o'clock position; Amalgamated Electronics PRA-30; JAN spec JAN-R-19.	HV Set, V-521 grid circuit.
R-555	..... N16-R-79356-4011	RESISTOR, fixed: wire wound, non-inductive; JAN type RB12B15002F; 150,000 ohms ±1%; 1/2 w; 105°C max cont oper temp; .875" lg x 27/32" diam max, coated per JAN-R-93; humidity resistant; 2 soldering lug radial terms 3/8" lg x .016" thk; #6 screw mtg; Shallcross 1101; JAN spec JAN-R-93.	HV divider element connects to H.V. set control R-554.
R-556	..... N16-R-90803-6005	RESISTOR, variable: wire wound; JAN type RA30A1SD152AK; 1500 ohms ±10%; 4 watts at 100°C max oper temp; 3 solder lug terms; molded melamine case 1-3/4" diam x 61/64" thk; slotted nickel pl brass shaft 7/8" lg x .250" diam; linear taper; ins contact arm w/o off position; normal torque; bushing .375" lg x 3/8-32 thd diam; non-turn on radius of .531" from center at 9 o'clock position; Amalgamated Electronics PRA-30; Berkeley Scientific part/dwg 5017N.	Line Set in H.V. divider circuit.
R-557	..... N16-R-79098-8259	RESISTOR, fixed: wire wound; JAN type RB10B10000F; 1000 ohms ±1%; 1/4 w, 105° max cont oper temp; 15/32" lg x 3/4" diam; resistant to humidity; radial solder lug terms 3/8" lg x .016" thk; #6 screw mtg; Shallcross BX176; JAN spec JAN-R-93.	HV divider element connects to Line Set control R-556.
R-558		RESISTOR, fixed: Same as R-435.	Limiter, I-507.
R-559	..... N16-R-50553-233	RESISTOR, fixed: composition; JAN type RC30GF683K; 68,000 ohms ±10%; 1 w at 70°C; F characteristic; .750" lg x .280" diam max; ins RSW and humidity; axial wire lead terms, 1-1/2" lg, #20 AWG min; Allen Bradley GB6831; JAN spec JAN-R-11-2.	Limiter, V-513, pin 1.
R-560	..... N16-R-50895-238	RESISTOR, fixed: composition; JAN type RC30GF684K; 680,000 ohms ±10%; 1 w; F characteristic; .750" lg x .280" diam; ins RSW; axial wire leads; Allen Bradley GB6841; JAN spec JAN-R-11-2.	Regulator Shunt, V-517, pin 6.
R-561		NOT USED.	
R-562		RESISTOR, fixed: Same as R-288.	Divider, V-518A, pin 7.

R-563	N16-R-51092-818	RESISTOR, fixed: composition; JAN type RC20GF275K; 2.7 megohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB2751; JAN spec JAN-R-11-2.	Isolation, V-521, pin 5.
R-564		NOT USED.	
R-565	N16-R-49427-730	RESISTOR, fixed: composition; JAN type RC20GF470K; 47 ohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB4701; JAN spec JAN-R-11-2.	Parasitic suppressor V-516, pin 1.
R-566		RESISTOR, fixed: Same as R-565.	Parasitic suppressor V-516, pin 4.
R-567		RESISTOR, fixed: Same as R-557.	HV divider connects to Load Compensation control R-550.
R-568		RESISTOR, fixed: Same as R-102.	Discharge path for C-512 when equipment is deenergized, connects to K-504.
R-569	N16-R-50336-815	RESISTOR, fixed: composition; JAN type RC20GF153K; 15,000 ohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB1531; JAN spec JAN-R-11-2.	Part of Grid Load of V-518B, pin 2.
S-501	N17-S-69888-4241	SWITCH, thermostatic: SPST; 85° oper temp; 12 amps, 120 vacw; stainless steel; 2-9/16" diam x 7/8" thk; screw type term; four 5/32" diam mtg holes, one ea side 2-3/16" c to c across switch; moisture proof and fungus proof enclosed conts; Spencer Thermostat C437-3-75; Berkeley Scientific part/dwg 5096N.	Thermal Overload Switch in input AC line.
S-502	N16-S-72828-2605	SWITCH, toggle: DPST; JAN type ST52K; 125 vacw, 25 amp; United Transformer Corp. 8825K4; Berkeley Scientific part/dwg 5097N.	AC POWER ON (front panel).
S-503		SWITCH, toggle: Same as S-404.	HIGH VOLTAGE on off (front panel).
S-504	N17-S-62010-4294	SWITCH, rotary: 3 pole, 2 pos, 2 throws; 1 sec; brass, sil pl cont; ceramic body; 1-1/16" lg x 1-15/16" diam; non-shorting; locking action; solder lug terms; 3/8" diam mtg bushing 3/8" lg, 13/16" round shaft x 1/4" diam; Oak 47526-DH1C; Berkeley Scientific part/dwg 5098N.	M-501 reversing switch.
S-505		SWITCH, push: Same as S-104.	Interlock switch in input AC line.
S-506		SWITCH, toggle: Same as S-205.	LINE VOLTAGE HIGH-LOW (front panel).
T-501		TRANSFORMER, power: filament and plate; JAN-T-27 Gr 1 C1 B; 105, 117 or 120 v, 55 to 65 cyc AC, single ph; 8 output windings; secd 1-1200 v CT 600 ma ea side; secd 2-460 v CT 150 ma ea side; secd 3 & 4 — two 6.3 windings 3 amp ea; secd 5 & 6 — 5 volt windings 1-3 amp and 1-12 amp; secd 7 & 8 — 6-1/2 volt windings, 1-15 amp and 1-30 amp; 2000 v ins; air coolant; hermetically sealed metal case; 6" h x 6" d x 7¼" wd; 22 solder lug terms on top (mtg surface); 4 studs on mtg surface, 5-9/16" c to c one side, 6-3/4" c to c other side; electrostatic shielding bet pri & secds; Peerless 5891; Berkeley Scientific part 5103N.	LV supply.
T-502	N17-T-78678-5701	TRANSFORMER, power: filament and plate type; HV supply input 115 v, 60 cyc, single ph; 5 output windings; secd #1, 4000 v at .004 amp DC; secd #2, 800 v CT at .050 amp DC; secd #3, 6.3 v at 3 amp DC; secd #4, 2.5 v at 3 amp DC; secd #5, 6.3 v at 0.6 amp DC; 11,000 v RMS test to cores; hermetically sealed metal case; 5" x 7-3/4" x 4-1/4" h excluding terms; 13 terms on top, 1 on end; four 1/4-20 blind inserts on top of case on 4-1/8" x 6-5/8" mtg/c; two 1/4-20 blind inserts on top of case 6-5/8" apart on edge of case; Electro Engineering E6635A 5426; Berkeley Scientific part/dwg 5104N.	HV supply.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
T-503	N17-T-83679-1351	TRANSFORMER, variable power: 115 v input, 60 cyc, single ph; outlet 0 to 135 or 115 v, 1 amp, .170 kva; varied by reversible dial, one w/rotating dial for table mtg, one w/fixed dial and rotating pointer, rotation of 320°; w/o case for panel mtg; 3-1/32" d x 3-5/8" h x 3-5/16" wd o/a; 5 solder lug terms on 1/4" thded term studs 3/8" deep; 3 #10-32 tapped mtg holes 120° part 2-1/2" diam bolt circle; General Radio 200-B; Berkeley Scientific part/dwg 5105N.	HIGH VOLTAGE CONTROL, front panel.
V-501	N16-T-55446	TUBE, electron: JAN type 5R4WGY; rectifier.	LV rectifier.
V-502		TUBE, electron: Same as V-501.	LV rectifier.
V-503		TUBE, electron: Same as V-501.	LV rectifier.
V-504	N16-T-56202	TUBE, electron: JAN type 6AS7G; dual triode.	Series regulator, LV.
V-505		TUBE, electron: Same as V-504.	Series regulator, LV.
V-506		TUBE, electron: Same as V-504.	Series regulator, LV.
V-507		TUBE, electron: Same as V-504.	LV Series Regulator.
V-508	N16-T-75651	TUBE, electron: JAN type 5651; gas regulator.	Reference, V-509.
V-509		TUBE, electron: Same as V-220.	LV Control Tube.
V-510	N16-T-55474	TUBE, electron: JAN type 5V4G; rectifier.	Rectifier, —105V supply.
V-511		TUBE, electron: Same as V-504.	Series Regulator, —105V supply.
V-512		TUBE, electron: Same as V-220.	Control tube, —105V supply.
V-513		TUBE, electron: Same as V-508.	Reference, —105V supply.
V-514	N16-T-53224-10	TUBE, electron: JAN type 3B24W; rectifier.	HV Rectifier.
V-515	N16-T-56840-50	TUBE, electron: JAN type 6X4W; rectifier.	Rectifier, Reference Voltage Supply.
V-516	N16-T-53324	TUBE, electron: JAN type 3C24; triode.	HV Regulator.
V-517		TUBE, electron: Same as V-201.	Regulator.
V-518		TUBE, electron: Same as V-220.	Amplifier.
V-519		TUBE, electron: Same as V-508.	Reference.
V-520		TUBE, eletcron: Same as V-508.	Reference.
V-521	N16-T-52353	TUBE, electron: JAN type 2C53; triode.	Feedback amplifier.

XF-501 through XF-504		NOT USED.	
XF-505		FUSEHOLDER, bakelite base, alloy pl solder terms; for F-505 fuze; 3-3/4″ lg x 1″ wd x 3/8″ thk; 2 mtg holes for #8 screws; Bussmann 4528; Berkeley Scientific part/dwg 5556N.	Holder for F-505.
XI-501	N17-L-76866-8306	LIGHT, indicator: 5/8″ diam red glass lens; for T-3¼ bulb size incandescent lamp; enclosed black nickel finish shell; 2″ lg x 13/16″ diam; 2 solder lug terms, ea side of base; Dialco 81410-121; Berkeley Scientific part/dwg 5503N.	I-501, holder.
XI-502		LIGHT, indicator: 5/8″ diam red plastic lens; for T-3¼ bulb size, NE-51 lamp; enclosed black nickel finish shell; 2″ lg x 13/16″ max diam; 2 solder lug terms opposite sides of base; Dialco 52410-991; Berkeley Scientific part/dwg 5504N.	I-502, holder.
XI-503		LIGHT, indicator: Same as XI-502.	I-503, holder.
XI-504		LIGHT, indicator: Same as XI-502.	I-504, holder.
XI-505		LIGHT, indicator: Same as XI-401.	I-505, holder.
XV-501		SOCKET, tube: Same as XV-103.	V-501, socket.
XV-502		SOCKET, tube: Same as XV-103.	V-502, socket.
XV-503		SOCKET, tube: Same as XV-103.	V-503, socket.
XV-504		SOCKET, tube: Same as XV-103.	V-504, socket.
XV-505		SOCKET, tube: Same as XV-103.	V-505, socket.
XV-506		SOCKET, tube: Same as XV-103.	V-506, socket.
XV-507		SOCKET, tube: Same as XV-103.	V-507, socket.
XV-508		SOCKET, tube: Same as XV-210.	V-507, socket.
XV-509		SOCKET, tube: Same as XV-201.	V-509, socket.
XV-510		SOCKET, tube: Same as XV-103.	V-510, socket.
XV-511		SOCKET, tube: Same as XV-103.	V-511, socket.
XV-512		SOCKET, tube: Same as XV-201.	V-512, socket.
XV-513		SOCKET, tube: Same as XV-210.	V-513, socket.
XV-514	N16-S-60853-7511	SOCKET, tube: 4 contact; two mtg holes 1-5/8″ c to c; ceramic body 1-7/8″ lg x 1-3/8″ wd x 7/8″ d incl solder lug terms; Millen CJA-49368; Berkeley Scientific part/dwg 5197N.	V-514, socket.
XV-515		SOCKET, tube: Same as XV-210.	V-515, socket.
XV-516		SOCKET, tube: Same as XV-514.	V-516, socket.
XV-517		SOCKET, tube: Same as XV-201.	V-517, socket.
XV-518		SOCKET, tube: Same as XV-201.	V-518, socket.
XV-519		SOCKET, tube: Same as XV-210.	V-519, socket.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
XV-520		SOCKET, tube: Same as XV-210.	V-520, socket.
XV-521		SOCKET, tube: Same as XV-103.	V-521, socket.
Z-501		SUPPRESSOR, electrical noise: 3-1/4" lg x 1-19/64" wd x 1-1/4" h o/a; 15 amps, 120 v ac 60 cyc; bathtub steel case .021" thk Cl A #1; two 3/16" diam mtg holes 2-3/8" c to c; 2 solder lug terms; attenuation (insertion loss per MIL-I-1657) Hopkins Engineering 2-15120; Berkeley Scientific part/dwg 5093N.	AC Line Filter.
Z-502		SUPPRESSOR, electrical noise: Same as Z-501.	AC Line Filter.
C-601	N16-C-16319-7901	CAPACITOR, fixed: ceramic dielectric; 33 mmf ±10%; variable temp coef; 500 vdcw; 9/16" lg x .25" diam; axial wire lead terms; phenolic ins; Erie GP1K-33 ±3.3 mmf; Berkeley Scientific part/dwg 2128N.	Coupling V-606, pin 2.
C-602		CAPACITOR, fixed: Same as C-601.	Coupling V-606, pin 7.
C-603		CAPACITOR, fixed: Same as C-601.	Coupling V-607, pin 2.
C-604		CAPACITOR, fixed: Same as C-601.	Coupling V-607, pin 7.
C-605		CAPACITOR, fixed: Same as C-601.	Coupling V-608, pin 2.
C-606		CAPACITOR, fixed: Same as C-601.	Coupling V-608, pin 7.
C-607		CAPACITOR, fixed: Same as C-601.	Coupling V-609, pin 2.
C-608		CAPACITOR, fixed: Same as C-601.	Coupling V-609, pin 7.
C-609	N16-C-18782-8807	CAPACITOR, fixed: ceramic dielectric; 1500 mmf ±10%; variable temp coef; 500 vdcw; .812" lg x .250" diam; axial wire lead terms; phenolic ins; Erie GP21-1500 ±150 mmf; Berkeley Scientific part/dwg 2107N.	Bypass V-606, pin 3, 6.
C-610		CAPACITOR, fixed: Same as C-609.	Bypass V-607, pin 3, 6.
C-611		CAPACITOR, fixed: Same as C-609.	Bypass V-608, pin 3, 6.
C-612		CAPACITOR, fixed: Same as C-609.	Bypass V-609, pin 3, 6.
I-601	2Z5954 G17-L-6806-120	LAMP, glow: Navy Lamp VG-11; 1/25 w, 65 v AC or 90 v DC striking voltage; bulb T-2 clear, neon filled; 1-1/16" lg; two 13/16" lg wire leads; W-11 electrodes, average life 3000 hrs; burn any position; for 105-125 v use ext series resistor 200,000 ohms, for 210-250 v use ext series resistor 500,000 ohms; General Electric NE-2; Berkeley Scientific part/dwg 0426N.	Counting lamp "0".
I-602		LAMP, glow: Same as I-601.	Counting lamp "1".
I-603		LAMP, glow: Same as I-601.	Counting lamp "2".
I-604		LAMP, glow: Same as I-601.	Counting lamp "3".
I-605		LAMP, glow: Same as I-601.	Counting lamp "4".
I-606		LAMP, glow: Same as I-601.	Counting lamp "5".
I-607		LAMP, glow: Same as I-601.	Counting lamp "6".

I-608		LAMP, glow: Same as I-601.	Counting lamp "7".
I-609		LAMP, glow: Same as I-601.	Counting lamp "8".
I-610		LAMP, glow: Same as I-601.	Counting lamp "9".
O-601		CLIP: tube clip; to hold min tubes in socket; phosphor bronze, cad pl; 1-1/2" h; Remler 73819; Berkeley Scientific part/dwg 5144N.	Holds V-606, V-607, V-608, and V-609 in socket.
O-602	N16-R-503580-336	CLIP: tube clip; to hold min tubes in socket; phosphor bronze, cad pl; 1-1/16" h; Remler 73818; Berkeley Scientific part/dwg 5158N.	Holds V-601, V-602, V-603, V-604 and V-605 in socket.
P-601	N17-C-73605-6389	CONNECTOR, male contact: 18 round polarized contacts; straight; 1-5/16" lg x 9/16" wd x 7/8" d; rectangular molded melamine body; screw mtg ea end, #4-40 NC-2, 1" c to c; Winchester Electronics MRE18P-G; Berkeley Scientific part/dwg 2108N. Part of Z-601.	Input and Output connections to DCU No. 707 of ID364/UDR-9.
R-601		RESISTOR, fixed: Same as R-280.	Divider I-601, I-603, I-605, I-607.
R-602		RESISTOR, fixed: Same as R-280.	Divider I-1602, I-604, I-606, I-608, I-610.
R-603		RESISTOR, fixed: Same as R-280.	Divider I-603, I-604.
R-604		RESISTOR, fixed: Same as R-280.	Divider I-607, I-608.
R-605		RESISTOR, fixed: Same as R-280.	Divider I-601, I-602.
R-606		RESISTOR, fixed: Same as R-280.	Divider I-605, I-606.
R-607	N16-R-50677-380	RESISTOR, fixed: composition; JAN type RC20GF154J; 150,000 ohms ±5%; 1/2 w; F characteristic; .468" lg x .249" diam; ins RSW; axial wire lead terms; Allen Bradley EB1545; JAN spec JAN-R-11-2.	Divider V-604, pin 1.
R-608		RESISTOR, fixed: Same as R-607.	Divider I-607, I-608.
R-609	N16-R-50650-390	RESISTOR, fixed: composition; JAN type RC20GF124J; 120,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB1245; JAN spec JAN-R-11-2.	Divider I-603, I-604.
R-610	N16-R-50479-435	RESISTOR, fixed: composition; JAN type RC20GF473J; 47,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB4735; JAN spec JAN-R-11-2.	Divider V-605, pin 5.
R-611		RESISTOR, fixed: Same as R-280.	Divider I-609, I-610.
R-612		RESISTOR, fixed: Same as R-280.	Divider V-605, pin 5.
R-613	N16-R-50066-124	RESISTOR, fixed: composition; JAN type RC42GF332J; 3300 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB3325; JAN spec JAN-R-11-2.	Divider V-606, plate circuit, pin 1.
R-614		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 1.
R-615	N16-R-50165-131	RESISTOR, fixed: composition; JAN type RC42GF562J; 5600 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB5625; JAN spec JAN-R-11-2.	Divider V-606, plate circuit, pin 9.
R-616		RESISTOR, fixed: Same as R-615.	Divider V-606, plate circuit, pin 9.
R-617	N16-R-50236-940	RESISTOR, fixed: composition; JAN type RC42GF822J; 8200 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB8225; JAN spec JAN-R-11-2.	Divider V-607, plate circuit, pin 1.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-618		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 1.
R-619		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 9.
R-620		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 9.
R-621		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 1.
R-622		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 1.
R-623		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 9.
R-624		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 9.
R-625		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 1.
R-626		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 1.
R-627		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.
R-628		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.
R-629	N16-R-50012-146	RESISTOR, fixed: composition; JAN type RC42GF222J; 2200 ohms ±5%; 2 w at 70°C; F characteristic; .750″ lg x .370″ diam; ins RSW; axial wire lead terms; Allen Bradley HB2225; JAN spec JAN-R-11-2.	Divider V-606, plate circuit, pin 1.
R-630		RESISTOR, fixed: Same as R-629.	Divider V-606, plate circuit, pin 9.
R-631	N16-R-49985-131	RESISTOR, fixed: composition; JAN type RC42GF182J; 1800 ohms ±5%; 2 w at 70°C; F characteristic; .750″ lg x .370″ diam; ins RSW; axial wire lead terms; Allen Bradley HB1825; JAN spec JAN-R-11-2.	Divider V-606, plate circuit, pin 9.
R-632	N16-R-49967-116	RESISTOR, fixed: composition; JAN type RC42GF152J; 1500 ohms ±5%; 2 w at 70°C; F characteristic; .750″ lg x .370″ diam; ins RSW; axial wire lead terms; Allen Bradley HB1525; JAN spec JAN-R-11-2.	Divider V-606, plate circuit, pin 9.
R-633		RESISTOR, fixed: Same as R-217.	Divider V-607, plate circuit, pin 1.
R-634		RESISTOR, fixed: Same as R-217.	Divider V-607, plate circuit, pin 1.
R-635		RESISTOR, fixed: Same as R-217.	Divider V-607, plate circuit, pin 9.
R-636		RESISTOR, fixed: Same as R-217.	Divider V-607, plate circuit, pin 9.
R-637		RESISTOR, fixed: Same as R-217.	Divider V-608, plate circuit, pin 1.
R-638		RESISTOR, fixed: Same as R-217.	Divider V-608, plate circuit, pin 1.
R-639		RESISTOR, fixed: Same as R-217.	Divider V-608, plate circuit, pin 9.
R-640		RESISTOR, fixed: Same as R-217.	Divider V-608, plate circuit, pin 9.
R-641		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 1.
R-642		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 1.
R-643		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.

R-644		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.
R-645		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 1.
R-646		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 1.
R-647		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 9.
R-648		RESISTOR, fixed: Same as R-219.	Divider V-606, plate circuit, pin 9.
R-649		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 1.
R-650		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 1.
R-651		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 9.
R-652		RESISTOR, fixed: Same as R-617.	Divider V-607, plate circuit, pin 9.
R-653		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 1.
R-654		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 1.
R-655		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 9.
R-656		RESISTOR, fixed: Same as R-617.	Divider V-608, plate circuit, pin 9.
R-657		RESISTOR, fixed: Same as R-217.	Divider V-609, plate circuit, pin 1.
R-658		RESISTOR, fixed: Same as R-217.	Divider V-609, plate circuit, pin 1.
R-659		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.
R-660		RESISTOR, fixed: Same as R-617.	Divider V-609, plate circuit, pin 9.
R-661		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 1.
R-662		RESISTOR, fixed: Same as R-613.	Divider V-606, plate circuit, pin 1.
R-663		RESISTOR, fixed: Same as R-631.	Divider V-606, plate circuit, pin 9.
R-664		RESISTOR, fixed: Same as R-629.	Divider V-606, plate circuit, pin 9.
R-665	N16-R-50416-944	RESISTOR, fixed: composition; JAN type RC42GF333J; 33,000 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB3335; JAN spec JAN-R-11-2.	Coupling V-606, pin 2.
R-666		RESISTOR, fixed: Same as R-665.	Coupling V-606, pin 2.
R-667		RESISTOR, fixed: Same as R-665.	Coupling V-606, pin 7.
R-668		RESISTOR, fixed: Same as R-665.	Coupling V-606, pin 7.
R-669		RESISTOR, fixed: Same as R-665.	Coupling V-607, pin 2.
R-670		RESISTOR, fixed: Same as R-665.	Coupling V-607, pin 7.
R-671		RESISTOR, fixed: Same as R-665.	Coupling V-608, pin 2.
R-672		RESISTOR, fixed: Same as R-665.	Coupling V-608, pin 7.
R-673		RESISTOR, fixed: Same as R-665.	Coupling V-609, pin 2.
R-674		RESISTOR, fixed: Same as R-665.	Coupling V-609, pin 7.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-675	N16-R-50281-763	RESISTOR, fixed: composition; JAN type RC30GF103J; 10,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB1035; JAN spec JAN-R-11-2.	Grid return, V-606, pin 2.
R-676		RESISTOR, fixed: Same as R-675.	Grid return, V-606, pin 7.
R-677	N16-R-50371-433	RESISTOR, fixed: composition; JAN type RC20GF223J; 22,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406" lg x .175" diam max; ins RSW; axial wire lead terms; Allen Bradley EB2235; JAN spec JAN-R-11-2.	Grid return, V-607, pin 2.
R-678		RESISTOR, fixed: Same as R-677.	Grid return, V-607, pin 7.
R-679		RESISTOR, fixed: Same as R-677.	Grid return, V-608, pin 2.
R-680		RESISTOR, fixed: Same as R-677.	Grid return, V-608, pin 7.
R-681		RESISTOR, fixed: Same as R-677.	Grid return, V-609, pin 2.
R-682		RESISTOR, fixed: Same as R-677.	Grid return, V-609, pin 7.
R-683		RESISTOR, fixed: Same as R-219.	Cathode bias V-606, pin 3, 8.
R-684		RESISTOR, fixed: Same as R-613.	Cathode bias V-606, pin 3, 8.
R-685	N16-R-50093-131	RESISTOR, fixed: composition; JAN type RC42GF392J; 3900 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB3925; JAN spec JAN-R-11-2.	Cathode bias V-607, pin 3, 8.
R-686		RESISTOR, fixed: Same as R-685.	Cathode bias V-607, pin 3, 8.
R-687		RESISTOR, fixed: Same as R-685.	Cathode bias V-608, pin 3, 8.
R-688		RESISTOR, fixed: Same as R-685.	Cathode bias V-608, pin 3, 8.
R-689		RESISTOR, fixed: Same as R-685.	Cathode bias V-609, pin 3, 8.
R-690	N16-R-50129-113	RESISTOR, fixed: composition; JAN type RC42GF472J; 4700 ohms ±5%; 2 w at 70°C; F characteristic; .750" lg x .370" diam; ins RSW; axial wire lead terms; Allen Bradley HB4725; JAN spec JAN-R-11-2.	Cathode bias V-609, pin 3, 8.
TP-601	**	TERMINAL STUD: Style 47; round post shape, ins feedthru type solder connection; silver pl brass terms w/phenolic L.T.S.-E-4 covering to insulate from bushing; .690" lg overall, 1/4" across flats of Hex; mts by #10—32 thd NF-2 bushing .225" lg; 2 brass jam nuts, 1/4" hex cad pl incl; USECO part 1430; Berkeley Scientific part/dwg 0617N.	Test Point, V-606, pin 9.
TP-602		TERMINAL STUD: Same as TP-601.	Test point V-607, pin 9.
TP-603		TERMINAL STUD: Same as TP-601.	Test point V-608, pin 9.
TP-604		TERMINAL STUD: Same as TP-601.	Test point V-609, pin 9.
V-601		TUBE, electron: Same as V-101.	Diode coupler.
V-602		TUBE, electron: Same as V-101.	Clamper.

** If required, will be procured by nearest Navy Shore Supply Activity on demand.

V-603		TUBE, electron: Same as V-101.	Diode coupler.
V-604		TUBE, electron: Same as V-101.	Diode coupler.
V-605		TUBE, electron: Same as V-101.	Diode coupler.
V-606		TUBE, electron: Same as V-102.	1st multivibrator.
V-607		TUBE, electron: Same as V-102.	2nd multivibrator.
V-608		TUBE, electron: Same as V-102.	3rd multivibrator.
V-609		TUBE, electron: Same as V-102.	4th multivibrator.
XV-601		SOCKET, tube: Same as XV-101.	V-601, socket.
XV-602		SOCKET, tube: Same as XV-101.	V-602, socket.
XV-603		SOCKET, tube: Same as XV-101.	V-603, socket.
XV-604		SOCKET, tube: Same as XV-101.	V-604, socket.
XV-605		SOCKET, tube: Same as XV-101.	V-605, socket.
XV-606		SOCKET, tube: Same as XV-102.	V-606, socket.
XV-607		SOCKET, tube: Same as XV-102.	V-607, socket.
XV-608		SOCKET, tube: Same as XV-102.	V-608, socket.
XV-609		SOCKET, tube: Same as XV-102.	V-609, socket.
		HIGH SPEED DECIMAL COUNTING UNIT (DCU 707) is a counter which directly indicates the number of electrical pulses received regardless of rate (up to 1 million or more evenly spaced pulses per second). The resolving time is 0.8 microseconds for random pulses. The unit counts from 0 to 9, the tenth pulse setting the unit back to 0. Includes tubes V-601 thru V-609.	
		MEDIUM SPEED DECIMAL COUNTING UNIT (DCU 706) is a counter which directly indicates the number of electrical pulses received regardless of rate (up to 200,000 or more evenly spaced pulses per second). The resolving time is 2.5 microseconds for random pulses. The unit counts from 0 to 9, the tenth pulse setting the unit back to 0. Includes tubes V-701 thru V-709.	
C-701	N16-C-16222-7833	CAPACITOR, fixed: ceramic dielectric; 25 mmf ±10%; variable temp coef; 500 vdcw; .562" lg x .25" diam max; axial wire lead terms ea end; molded phenolic ins; Erie GP1K-25 ±2.5 mmf; Berkeley Scientific part/dwg 3009N.	Coupling V-706, pin 2.
C-702		CAPACITOR, fixed: Same as C-701.	Coupling V-706, pin 7.
C-703		CAPACITOR, fixed: Same as C-701.	Coupling V-707, pin 2.
C-704		CAPACITOR, fixed: Same as C-701.	Coupling V-707, pin 7.
C-705		CAPACITOR, fixed: Same as C-701.	Coupling V-708, pin 2.
C-706		CAPACITOR, fixed: Same as C-701.	Coupling V-708, pin 7.
C-707		CAPACITOR, fixed: Same as C-701.	Coupling V-709, pin 2.
C-708		CAPACITOR, fixed: Same as C-701.	Coupling V-709, pin 7.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-709		CAPACITOR, fixed: Same as C-609.	Bypass V-706, pin 3, 8.
C-710		CAPACITOR, fixed: Same as C-609.	Bypass V-707, pin 3, 8.
C-711		CAPACITOR, fixed: Same as C-609.	Bypass V-708, pin 3, 8.
C-712		CAPACITOR, fixed: Same as C-609.	Bypass V-709, pin 3, 8.
I-701		LAMP, glow: Same as I-601.	Count Lamp "0".
I-702		LAMP, glow: Same as I-601.	Count Lamp "1".
I-703		LAMP, glow: Same as I-601.	Count Lamp "2".
I-704		LAMP, glow: Same as I-601.	Count Lamp "3".
I-705		LAMP, glow: Same as I-601.	Count Lamp "4".
I-706		LAMP, glow: Same as I-601.	Count Lamp "5".
I-707		LAMP, glow: Same as I-601.	Count Lamp "6".
I-708		LAMP, glow: Same as I-601.	Count Lamp "7".
I-709		LAMP, glow: Same as I-601.	Count Lamp "8".
I-710		LAMP, glow: Same as I-601.	Count Lamp "9".
O-701		CLIP: Same as O-602.	Holds V-701 in socket.
O-702		CLIP: Same as O-602.	Holds V-702 in socket.
O-703		CLIP: Same as O-602.	Holds V-703 in socket.
O-704		CLIP: Same as O-602.	Holds V-704 in socket.
O-705		CLIP: Same as O-602.	Holds V-705 in socket.
O-706		CLIP: Same as O-601.	Holds V-706 in socket.
O-707		CLIP: Same as O-601.	Holds V-707 in socket.
O-708		CLIP: Same as O-601.	Holds V-708 in socket.
O-709		CLIP: Same as O-601.	Holds V-709 in socket.
P-701		CONNECTOR, male contact: Same as P-601. Part of Z-701.	Input and Output connections to DCU No. 706. Part of ID364/UDR-9.
R-701		RESISTOR, fixed: Same as R-547.	Divider I-701, I-703, I-705, I-707, I-709.
R-702		RESISTOR, fixed: Same as R-547.	Divider I-702, I-704, I-706, I-708.
R-703		RESISTOR, fixed: Same as R-547.	Divider I-703, I-704.
R-704		RESISTOR, fixed: Same as R-547.	Divider I-707, I-708.
R-705		RESISTOR, fixed: Same as R-547.	Divider I-701, I-702.

R-706		RESISTOR, fixed: Same as R-547.	Divider I-705, I-706.
R-707		RESISTOR, fixed: Same as R-547.	Divider I-705, I-706.
R-708		RESISTOR, fixed: Same as R-547.	Divider I-707, I-708.
R-709		RESISTOR, fixed: Same as R-547.	Divider V-703, V-704.
R-710		RESISTOR, fixed: Same as R-412.	Divider V-705, pin 2.
R-711		RESISTOR, fixed: Same as R-218.	Divider V-709, pin 6.
R-712	N16-R-50857-0431	RESISTOR, fixed: composition; JAN type RC20BF564J; 560,000 ohms ±5%; 1/2 w; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB5645; JAN spec JAN-R-11-2.	Divider I-709, I-710.
R-713		RESISTOR, fixed: Same as R-229.	Divider V-706 plate circuit, pin 1
R-714		RESISTOR, fixed: Same as R-229.	Divider V-706 plate circuit, pin 6.
R-715		RESISTOR, fixed: Same as R-278.	Divider V-707 plate circuit, pin 1.
R-716	N16-R-50398-758	RESISTOR, fixed: composition; JAN type RC30GF273J; 27,000 ohms ±5%; 1 w at 70°C; F characteristic; .750″ lg x .280″ diam; ins RSW; axial wire lead terms; Allen Bradley GB2735; JAN spec JAN-R-11-2.	Divider V-707 plate circuit, pin 6.
R-717		RESISTOR, fixed: Same as R-278.	Divider, V-708 plate circuit, pin 1.
R-718		RESISTOR, fixed: Same as R-227.	Divider, V-708 plate circuit, pin 6.
R-719		RESISTOR, fixed: Same as R-341.	Divider, V-709 plate circuit, pin 1.
R-720		RESISTOR, fixed: Same as R-341.	Divider, V-709 plate circuit, pin 1.
R-721		RESISTOR, fixed: Same as R-716.	Divider, V-709 plate circuit, pin 6.
R-722		RESISTOR, fixed: Same as R-227.	Divider, V-706 plate circuit, pin 1.
R-723		RESISTOR, fixed: Same as R-675.	Divider, V-706 plate circuit, pin 6.
R-724	N16-R-50353-758	RESISTOR, fixed: composition; JAN type RC30GF183J; 18,000 ohms ±5%; 1 w at 70°C; F characteristic; .750″ lg x .280″ diam; ins RSW; axial wire lead terms; Allen Bradley GB1835; JAN spec JAN-R-11-2.	Divider, V-707 plate circuit, pin 1.
R-725	N16-R-50200-438	RESISTOR, fixed: composition; JAN type RC20GF682J; 6800 ohms ±5%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB6825; JAN spec JAN-R-11-2.	Divider, V-707 plate circuit, pin 6.
R-726		RESISTOR, fixed: Same as R-724.	Divider, V-708 plate circuit, pin 1.
R-727	N16-R-50308-438	RESISTOR, fixed: composition; JAN type RC20GF123J; 12,000 ohms ±5%; 1/2 w at 70°C; F characteristic; .406″ lg x .175″ diam max; ins RSW; axial wire lead terms; Allen Bradley EB1235; JAN spec JAN-R-11-2.	Divider, V-708 plate circuit, pin 6.
R-728		RESISTOR, fixed: Same as R-341.	Divider, V-709 plate circuit, pin 1.
R-729		RESISTOR, fixed: Same as R-341.	Divider, V-709 plate circuit, pin 1.
R-730	N16-R-50020-758	RESISTOR, fixed: composition; JAN type RC30GF243J; 24,000 ohms ±5%; 1 w at 70°C; F characteristic; .750″ lg x .280″ diam; ins RSW; axial wire lead terms; Allen Bradley GB2435; JAN spec JAN-R-11-2.	Divider, V-709 plate circuit, pin 6.

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
R-731	N16-R-50308-759	RESISTOR, fixed: composition; JAN type RC30GF123J; 12,000 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB1235; JAN spec JAN-R-11-2.	Divider, V-706 plate circuit, pin 6.
R-732		RESISTOR, fixed: Same as R-724.	Divider, V-707 plate circuit, pin 6.
R-733		RESISTOR, fixed: Same as R-724.	Divider, V-708 plate circuit, pin 6.
R-734		RESISTOR, fixed: Same as R-216.	Coupling, V-706, pin 2.
R-735		RESISTOR, fixed: Same as R-216.	Coupling, V-706, pin 7.
R-736		RESISTOR, fixed: Same as R-216.	Coupling, V-707, pin 2.
R-737		RESISTOR, fixed: Same as R-216.	Coupling, V-707, pin 7.
R-738		RESISTOR, fixed: Same as R-216.	Coupling, V-708, pin 2.
R-739		RESISTOR, fixed: Same as R-216.	Coupling, V-708, pin 7.
R-740		RESISTOR, fixed: Same as R-216.	Coupling, V-709, pin 2.
R-741		RESISTOR, fixed: Same as R-216.	Coupling, V-709, pin 7.
R-742		RESISTOR, fixed: Same as R-280.	Grid return, V-706, pin 2.
R-743		RESISTOR, fixed: Same as R-280.	Grid return, V-706, pin 7.
R-744		RESISTOR, fixed: Same as R-280.	Grid return, V-707, pin 2.
R-745		RESISTOR, fixed: Same as R-280.	Grid return, V-707, pin 7.
R-746		RESISTOR, fixed: Same as R-280.	Grid return, V-708, pin 2.
R-747		RESISTOR, fixed: Same as R-280.	Grid return, V-708, pin 7.
R-748		RESISTOR, fixed: Same as R-280.	Grid return, V-709, pin 2.
R-749		RESISTOR, fixed: Same as R-280.	Grid return, V-709, pin 7.
R-750	N16-R-50236-754	RESISTOR, fixed: composition; JAN type RC30GF822J; 8200 ohms ±5%; 1 w at 70°C; F characteristic; .750" lg x .280" diam; ins RSW; axial wire lead terms; Allen Bradley GB8225; JAN spec JAN-R-11-2.	Cathode bias, V-706, pin 3, 8.
R-751		RESISTOR, fixed: Same as R-440.	Cathode bias, V-707, pin 3, 8.
R-752		RESISTOR, fixed: Same as R-440.	Cathode bias, V-708, pin 3, 8.
R-753		RESISTOR, fixed: Same as R-440.	Cathode bias, V-709, pin 3, 8.
TP-701		TERMINAL STUD: Same as TP-601.	Test point, V-706, pin 6.
TP-702		TERMINAL STUD: Same as TP-601.	Test point, V-707, pin 6.
TP-703		TERMINAL STUD: Same as TP-601.	Test point, V-708, pin 6.
TP-704		TERMINAL STUD: Same as TP-601.	Test point, V-709, pin 6.

V-701		TUBE, electron: Same as V-101.	Diode coupler.
V-702		TUBE, electron: Same as V-101.	Clamper.
V-703		TUBE, electron: Same as V-101.	Diode coupler.
V-704		TUBE, electron: Same as V-101.	Diode coupler.
V-705		TUBE, electron: Same as V-101.	Diode coupler.
V-706		TUBE, electron: Same as V-201.	1st multivibrator.
V-707		TUBE, electron: Same as V-201.	2nd multivibrator.
V-708		TUBE, electron: Same as V-201.	3rd multivibrator.
V-709		TUBE, electron: Same as V-201.	4th multivibrator.
XV-701		SOCKET, tube: Same as XV-101.	V-701, socket.
XV-702		SOCKET, tube: Same as XV-101.	V-702, socket.
XV-703		SOCKET, tube: Same as XV-101.	V-703, socket.
XV-704		SOCKET, tube: Same as XV-101.	V-704, socket.
XV-705		SOCKET, tube: Same as XV-101.	V-705, socket.
XV-706		SOCKET, tube: Same as XV-102.	V-706, socket.
XV-707		SOCKET, tube: Same as XV-102.	V-707, socket.
XV-708		SOCKET, tube: Same as XV-102.	V-708, socket.
XV-709		SOCKET, tube: Same as XV-102.	V-709, socket.
A-801		CLEANER, air: steel constr galvanized wire mesh; 6″ wd x 6-1/3″ lg x 2″ thk overall; replaceable and cleanable Air Maze P-5M; Berkeley Scientific part/dwg 5398N.	Cleans circulating air which is moved by B-801 located on cabinets CP-71/UD and CP-79/UD.
B-801	N17-F-1067-2270	BLOWER: propeller blade; electric motor operated; five metal blades 5-3/8″ diam; nonportable (permanently mtd); unguarded; 1/50 hp, 3300 rpm, 60 cyc, single ph, 115 vacw; 3-1/8″ wd x 3-1/4″ h; 475 cfm at 3300 rpm; single speed; direct dr; unshielded; bolt mtd to motor frame w/four 10-32 bolts, one ea side; consists of American Electric Motor 175B and Torrington 0-5527-5 fan blade; Berkeley Scientific part/dwg 5399N.	Air circulation located in rear of cabinets CP-71/UD and CP-79/UD.
C-801		CAPACITOR, fixed: Same as C-274.	Starting capacitor for B-801.
J-801		NOT USED.	
J-802		CONNECTOR, receptacle: Same as J-509.	Input and output connections. Connects to J-509.
J-803		CONNECTOR, receptacle: Same as J-509.	Input and output connections. Connects to P-401 and/or P-101.
P-801		CONNECTOR, male contact: Same as P-101.	Input and output connections. Connects to J-509.
	F16-D-2226-165	DETECTOR RADIAC: DT-40/UDR-9 is made up of a detector chamber and preamplifier, and is designed to detect alpha radiation. It is 10-7/16″ high x 17-3/4″ wide x 12″ deep.	

TABLE 8-4. COMBINED PARTS AND SPARE PARTS LIST

Reference Symbol	Signal C. Stock No. Std. Navy Stock No.	Name and Description	Locating Function
C-901		CAPACITOR, fixed: Same as C-267.	Coupling, V-902, pin 1.
C-902		CAPACITOR, fixed: Same as C-201.	
C-902A		CAPACITOR, fixed: Same as C-201A.	Screen bypass, V-901, pin 6.
C-902B		CAPACITOR, fixed: Same as C-201B.	Screen bypass, V-902, pin 6.
C-902C		CAPACITOR, fixed: Same as C-201C.	Bias filter, V-902, grid circuit.
C-903		CAPACITOR, fixed: Same as C-240.	HV filter, input, V-901.
C-904	N16-C-39570-4651	CAPACITOR, fixed: paper dielectric; 500 mmf ±20%; 10,000 vdcw; molded phenolic case; 1-1/4" lg x 7/16" diam; mineral oil impregnated; wire lead term ea end; no int gnd connections; term mtg; Remler DA-245HV; Berkeley Scientific part/dwg 5152N.	Coupling, V-901, pin 1.
C-905		CAPACITOR, fixed: electrolytic; JAN type CE41C350Q; 35 mmf; 400 vdcw; —40°C to +85° C; 2-3/4" lg x 1-3/8" diam; hermetically sealed metal case; 2 solder lug terms on top, 7/16" lg; no int gnd connections; Sangamo part/dwg CE41C350Q; Berkeley Scientific part/dwg 5424N.	+175 filter element V-903, pin 6.
J-901		CONNECTOR, female contact: Same as J-201.	HV INPUT to Detector Anode.
J-902		CONNECTOR, receptacle: Same as J-202.	DT-40/UD OUTPUT, V-903, pin 3.
J-903		CONNECTOR, male contact: 7 round contacts; straight type; 2-1/8" lg x 1-15/32" diam overall; 35 amp, 200 vdcw; round alum shell w/tin plate finish; molded phenolic insert; screw mtg, coupling thd 1-1/4-18; Cannon AN3106B-20-7P; Berkeley Scientific part/dwg 5425N.	Power Connection, DT-40/UD.
O-901		PLIOFILM: 12" wd x 15" lg x .00025" thk. Dupont; Berkeley Scientific part/dwg 5436N.	Cover over gas chamber thru which particles pass.
O-902		GRATING: perforated sheet metal; 20" x .637" slot straight 1/4" centers —74% open, .033" thk brass; Harrington & King Perforating Co. P66; Berkeley Scientific part/dwg 5435.	Covers O-901 to protect against puncture.
R-901		RESISTOR, fixed: Same as R-109.	Divider, connects to J-901.
R-902		RESISTOR, fixed: Same as R-209.	Anode load for particle chamber.
R-903		RESISTOR, fixed: Same as R-209.	Grid return, V-901, pin 1.
R-904	N16-R-49598-818	RESISTOR, fixed: composition; JAN type RC20GF121K; 120 ohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB1211; JAN spec JAN-R-11-2.	Cathode bias, V-901, pin 7.
R-905	N16-R-49688-746	RESISTOR, fixed: composition; JAN type RC20GF271K; 270 ohms ±10%; 1/2 w; F characteristic; .375" lg x .140" diam; ins RSW; axial wire lead terms; Allen Bradley EB2711; JAN spec JAN-R-11-2.	Plate load, V-901, pin 5.
R-906		RESISTOR, fixed: Same as R-569.	Screen dropping, V-901, pin 6.
R-907		RESISTOR, fixed: Same as R-202.	Grid return, V-902, pin 1.
R-908		RESISTOR, fixed: Same as R-297.	Plate load, V-902, pin 5.

R-909		RESISTOR, fixed: Same as R-115.	Screen dropping, V-902, pin 6.
R-910	N16-R-49346-818	RESISTOR, fixed: composition; JAN type RC20GF270K; 27 ohms ±10%; 1/2 w; F characteristic; .375″ lg x .140″ diam; ins RSW; axial wire lead terms; Allen Bradley EB2701; JAN spec JAN-R-11-2.	Plate dropping, V-903, pin 1.
R-911	N16-R-50166-512	RESISTOR, fixed: composition; JAN type RC42GF562K; 5600 ohms ±10%; 2 w; F characteristic; .750″ lg x .370″ diam; ins RSW; axial wire lead terms; Allen Bradley HB5621; JAN spec JAN-R-11-2.	Cathode load, V-903, pin 8.
R-912		RESISTOR, fixed: wire wound; JAN type RW32D352; 3500 ohms ±10%; 12 w; 2″ lg x 7/16″ diam; vitreous enamel coating, moisture resistant; 2 solder lug terms; Model Engineering RW32D352; Berkeley Scientific part/dwg 5429N.	+300V to +175V dropping resistor J-903, terminal G.
R-913		RESISTOR, fixed: Same as R-315.	Grid bias, V-902, grid circuit.
R-914	N16-R-50741-818	RESISTOR, fixed: composition; JAN type RC20GF274K; 270,000 ohms ±10%; 1/2 w; F characteristic; .375″ lg x .140″ diam; ins RSW; axial wire lead terms; Allen Bradley EB2741; JAN spec JAN-R-11-2.	Divider, V-902, grid circuit, J-903, terminal B.
V-901		TUBE, electron: Same as V-213.	Amplifier.
V-902		TUBE, electron: Same as V-213.	Amplifier.
V-903		TUBE, electron: Same as V-220.	Cathode follower.
XV-901		SOCKET, tube: Same as XV-210.	V-901 socket.
XV-902		SOCKET, tube: Same as XV-210.	V-902 socket.
XV-903		SOCKET, tube: Same as XV-201.	V-903 socket.

TABLE 8-5. MAINTENANCE PARTS KIT

Symbol Designation	Quality Spares		
	AN/UDR-9	CP-79/UD	Combined Total Stock
C101	1	0	20
C102	1	0	30
C103	1	0	5
C104	1	0	20
C105	1	0	20
C107	1	0	5
C109	1	0	20
C110	1	0	30
C111	1	0	20
C113	0	0	5
L101	1	0	5
M101	0	0	10
O102	6	0	100
O103	2	0	100
O104	2	0	100
O105	2	0	100
P101	1	0	50
R101	1	0	30
R110	1	0	5
R111	1	0	5
R128	1	0	20
R129	1	0	20
R130	1	0	20
R131	1	0	50
R133	1	0	0
R135	1	0	0
R140	1	0	20
R142	1	0	5
R146	1	0	5
R148	1	0	20
S101A	1	0	60
S101G	1	0	15
S102A	1	0	30
S102D	1	0	15
S103	1	0	5
S104	1	0	0
VR101	1	0	5
XV101	0	0	5
XV102	0	0	5
C201	1	1	0
C204	1	1	50
C207	2	1	50
C208	3	2	50
C209	2	1	50
C210	1	1	50
C214	1	1	50
C219	1	1	50
C234	1	1	10
C236	1	1	10
C240	1	1	10
C241	1	0	0
C245	1	1	10
C247	2	1	10
C249	1	1	10
C257	1	1	10
C260	1	1	10
C263	1	1	10
C266	2	1	10
C267	2	1	10
C269	1	1	10
C274	1	0	10
C287	1	1	10
E201	0	0	20
E202	2	2	10
H201	1	1	0
K201	1	0	80
L201	1	0	10
L202	1	0	10
L203	1	0	10
LS201	1	0	100
R221	1	1	10
R223	1	1	50
R242	1	1	50
R253	1	1	10
R262	1	1	50
R272	1	1	50
R292	1	1	50
R297	1	1	50
R298	0	1	0
R319	1	1	150
R333	1	1	10
R337	1	1	50
R339	1	1	50
R350	1	1	50
R369	1	1	10
R370	1	1	50
R371	1	1	50
R373	1	1	50
R374	1	1	50
R375	1	1	50

TABLE 8-5. MAINTENANCE PARTS KIT (Continued)

Symbol Designation	Quality Spares		
	AN/UDR-9	CP-79/UD	Combined Total Stock
R376	1	1	50
R378	1	1	50
R379	1	1	50
S201	1	0	100
S202	1	0	150
S203	1	0	80
S204	1	0	80
T201	1	0	80
T202	1	0	80
Y201	1	0	10
A401	0	0	10
B401	1	0	20
B402	1	0	50
C401	1	1	10
C403	1	0	0
C405	1	1	10
C407	1	1	10
C409	1	1	10
C413	1	1	10
C417	1	1	10
C418	1	1	10
C419	1	1	10
C429	1	0	20
E401	1	0	0
H401	1	0	50
I402	1	0	30
I403	1	1	50
J405	1	0	50
J411	1	0	30
L401	1	0	50
L402	1	0	50
O403	1	1	20
O404	1	0	50
O405	1	0	50
O406	1	0	50
O407	1	0	50
O408	1	0	20
P402	1	0	30
R408	1	0	10
S401A	1	1	150
S401D	1	1	50
S402A	1	1	60
S402B	1	1	50
S403A	1	1	150
S403C	1	1	100

Symbol Designation	Quality Spares		
	AN/UDR-9	CP-79/UD	Combined Total Stock
S405	1	0	10
C501	1	1	0
C503	1	1	50
C504	1	1	50
C506	1	1	0
C507	1	1	50
C508	1	1	50
C509	1	1	50
J505	1	1	100
J509	1	0	50
K501	1	1	200
K502	1	0	100
L501	1	1	100
L502	1	1	100
M501	1	0	125
O501	6	4	0
O502	0	0	30
O503	0	0	20
R545	1	1	200
R552	1	1	150
R554	1	1	50
R557	1	1	50
S504	1	0	50
T501	1	0	100
T502	1	0	100
T503	1	1	50
Z501	0	0	60
C601	2	1	10
C609	1	1	10
O601	0	1	0
O602	0	1	0
P601	1	0	50
C701	2	1	10
C709	2	1	10
DCU706	2	0	30
DCU707	1	0	10
A801	0	0	30
B801	0	0	50
C904	1	0	50
C905	1	0	50
J902	0	0	10
O901	5 sheets	0	150 sheets
O902	1	0	30
R911	1	0	50
R912	1	0	50

TABLE 8-6. CROSS REFERENCE PARTS LIST

JAN DESIGNATION	KEY SYMBOL
AN3102-22-9P	J501
AN3102-28-17S	J503
CC26CH330J	C249
CC36CG101J	C241
CC36CG750K	C210
CE41C100Q	C277
CC42C100Q	C269
CM15E500J	C208
CM20E102J	C244
CM20E250J	C102
CM20E251J	C105
CM20E301J	C110
CM20E501J	C101
CM20E821J	C260
CM35E152J	C263
CM35E252J	C104
CM35E302J	C111
CM35E502J	C219
CP26A1EF203M	C266
CP28A1EF103K	C418
CP28A1EF103M	C103
CP28A1EF104M	C107
CP28A1EF203M	C293
CP28A1EF254M	C108
CP28A1EF503K	C226
CP28A1EF503M	C510
CP28A1EF504K	C417
CP65B1EF105K	C412
CP65B1EF105V	C230
CP65B1EF504V	C238
CP69B4EF104V	C408
CP69B5EF104V	C201
CP70B1EF106V	C113
CP70B1EF405V	C274
CP70B1EG106V	C501
CP70D1ER104V	C506
CR16/U	XY201
F27JR750A	F505
JJ083	J101
OB2	V107
RA30A1SD101AK	R550
RA30A1SD152AK	R556
RA30A1SD503AK	R554
RB10B10000F	R557
RB12B15002F	R555
RC20BF564J	R712
RC20GF101K	R335
RC20GF102K	R507
RC20GF103J	R440
RC20GF103K	R207
RC20GF104J	R280
RC20GF104K	R109
RC20GF105K	R288
RC20GF106K	R131
RC20GF121K	R904
RC20GF123J	R727
RC20GF123K	R115
RC20GF124J	R609
RC20GF124K	R301
RC20GF125K	R324
RC20GF152K	R211
RC20GF153K	R569
RC20GF154J	R607
RC20GF154K	R435
RC20GF183K	R368
RC20GF184J	R441
RC20GF184K	R274
RC20GF222K	R201
RC20GF223J	R677
RC20GF223K	R215
RC20GF224J	R547
RC20GF224K	R202
RC20GF225K	R212
RC20GF270K	R910
RC20GF271K	R905
RC20GF272K	R204
RC20GF274J	R216
RC20GF274K	R914
RC20GF275K	R563
RC20GF331K	R302
RC20GF332K	R208
RC20GF333K	R542
RC20GF334J	R411
RC20GF334K	R149
RC20GF390K	R380
RC20GF391K	R112
RC20GF393K	R364
RC20GF394K	R436
RC20GF470K	R565
RC20GF472K	R351
RC20GF473J	R610
RC20GF473K	R294
RC20GF474J	R218
RC20GF474K	R209
RC20GF560J	R313
RC20GF562K	R315
RC20GF563K	R450
RC20GF564K	R437
RC20GF680K	R336
RC20GF681K	R291
RC20GF682J	R725
RC20GF683K	R214
RC20GF683J	R412
RC20GF683K	R454
RC20GF684J	R444
RC20GF822K	R276
RC20GF823K	R367
RC20GF824J	R452
RC30GF103J	R675
RC30GF103K	R305
RC30GF104K	R114
RC30GF122K	R107
RC30GF123J	R731
RC30GF123K	R213
RC30GF124J	R538
RC30GF124K	R420
RC30GF153J	R229
RC30GF155K	R515
RC30GF183J	R724
RC30GF183K	R210
RC30GF184K	R362
RC30GF223J	R227
RC30GF223K	R425
RC30GF225J	R222
RC30GF243J	R730
RC30GF273J	R716
RC30GF274K	R528
RC30GF333J	R278
RC30GF333K	R145
RC30GF334J	R417
RC30GF335J	R232
RC30GF391K	R328
RC30GF470K	R352
RC30GF472K	R447
RC30GF473K	R108
RC30GF474K	R134
RC30GF475K	R544
RC30GF561J	R312
RC30GF562K	R414
RC30GF563J	R341
RC30GF682K	R343
RC30GF683K	R559
RC30GF684K	R560
RC30GF822J	R750
RC30GF822K	R104
RC42GF101K	R353
RC42GF103K	R297
RC42GF123K	R310
RC42GF151K	R508
RC42GF152J	R632
RC42GF153K	R309
RC42GF182J	R631
RC42GF182K	R340
RC42GF222J	R629
RC42GF223K	R320
RC42GF273K	R318
RC42GF332J	R613
RC42GF332K	R139
RC42GF333J	R665
RC42GF333K	R113
RC42GF334K	R506
RC42GF392J	R685
RC42GF392K	R282
RC42GF472J	R690
RC42GF472K	R102
RC42GF473K	R303
RC42GF562J	R615
RC42GF562K	R911
RC42GF680K	R468
RC42GF682J	R217
RC42GF821K	R358
RC42GF822J	R617
RP112FD500K	R147
RW29F252	R253
RW33F712	R146
RW35F163	R111
ST10A	S404
ST52K	S502
TSB8T101	XV103
TSE7T101	XV210
TSE9T101	XV201
UG-290/U	J202
12AT7	V220
12AU7	V201
12AX7	V212
2053	V521
3B24W	V514
3C24	V516
5R4GYW	V501
5V4	V510
5651	V508
5687	V102

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

JAN DESIGNATION	KEY SYMBOL
6AG7	V218
6AH6	V213
6AL5W	V101
6AQ5	V210
6AS6	V223
6AS6W	V403
6AS7	V504
6AU5	V103
6SN7W	V105
6X4W	V515

STD. NAVY STOCK NO.	KEY SYMBOL
G17-F-16302-80	F503
G17-T-83679-1351	T503
G22-W-1710-400	O405
G22-W-1722-400	O406
G22-W-1722-400	O407
N16-C-16222-7833	C701
N16-C-16305-3256	C249
N16-C-16319-7901	C601
N16-C-16858-4811	C210
N16-C-17072-9280	C241
N16-C-18782-8807	C609
N16-C-19111-1100	C267
N16-C-21578-6268	C269
N16-C-26020-7691	C209
N16-C-26442-8169	C207
N16-C-26943-9647	C287
N16-C-26943-9806	C102
N16-C-27181-4341	C109
N16-C-27629-7215	C208
N16-C-28553-1051	C409
N16-C-29476-3031	C257
N16-C-29476-3201	C105
N16-C-29660-9001	C110
N16-C-30003-7116	C204
N16-C-30162-1699	C101
N16-C-31085-3699	C244
N16-C-31507-4143	C263
N16-C-32193-2543	C111
N16-C-32694-4133	C219
N16-C-33274-6821	C260
N16-C-42737-1044	C245
N16-C-42767-6201	C103
N16-C-43147-7238	C293
N16-C-43147-7458	C266

STD. NAVY STOCK NO.	KEY SYMBOL
N16-C-44257-2595	C226
N16-C-44287-7160	C510
N16-C-45777-3115	C413
N16-C-45802-1124	C506
N16-C-45807-8099	C107
N16-C-46377-8730	C108
N16-C-46875-1321	C236
N16-C-47255-3366	C234
N16-C-47297-3175	C514
N16-C-47297-7231	C417
N16-C-47321-9558	C238
N16-C-48817-1110	C412
N16-C-48841-9603	C230
N16-C-49981-9969	C274
N16-C-51881-9213	C113
N16-C-51881-9600	C501
N16-C-53204-4085	C408
N16-C-54460-4310	C201
N16-C-60943-1455	C211
N16-C-64039-6960	C247
N16-C-74155-8507	L101
N16-C-74867-5263	L201
N16-R-29023-8657	L502
N16-R-29027-4109	L501
N16-R-29413-5505	L202
N16-R-30416-731	R278
N16-R-49346-818	R910
N16-R-49391-818	R380
N16-R-49427-730	R565
N16-R-49428-238	R352
N16-R-49462-438	R313
N16-R-49499-818	R336
N16-R-49500-493	R468
N16-R-49580-766	R335
N16-R-49581-465	R353
N16-R-49598-818	R904
N16-R-49626-503	R508
N16-R-49688-746	R905
N16-R-49706-761	R302
N16-R-49733-750	R112
N16-R-49734-238	R328
N16-R-49804-758	R312
N16-R-49841-818	R291
N16-R-49878-398	R358
N16-R-49922-730	R507
N16-R-49941-238	R107
N16-R-49967-116	R632
N16-R-49967-760	R211

STD. NAVY STOCK NO.	KEY SYMBOL
N16-R-49984-606	R121
N16-R-49985-131	R631
N16-R-49986-511	R340
N16-R-50012-146	R629
N16-R-50012-816	R201
N16-R-50020-758	R730
N16-R-50039-721	R204
N16-R-50066-124	R613
N16-R-50066-816	R208
N16-R-50067-505	R139
N16-R-50093-131	R685
N16-R-50094-496	R282
N16-R-50129-113	R690
N16-R-50129-815	R351
N16-R-50130-241	R447
N16-R-50130-511	R102
N16-R-50165-131	R615
N16-R-50165-818	R315
N16-R-50166-238	R414
N16-R-50166-512	R911
N16-R-50200-438	R725
N16-R-50201-137	R217
N16-R-50201-818	R214
N16-R-50202-233	R343
N16-R-50202-516	R334
N16-R-50236-754	R750
N16-R-50236-940	R617
N16-R-50237-815	R276
N16-R-50238-234	R104
N16-R-50281-438	R440
N16-R-50281-763	R675
N16-R-50282-725	R207
N16-R-50283-238	R305
N16-R-50283-512	R297
N16-R-50308-438	R727
N16-R-50308-759	R731
N16-R-50309-816	R115
N16-R-50310-238	R213
N16-R-50310-485	R310
N16-R-50335-758	R229
N16-R-50336-815	R569
N16-R-50337-518	R309
N16-R-50353-606	R120
N16-R-50353-758	R724
N16-R-50354-815	R368
N16-R-50355-233	R210
N16-R-50362-606	R119
N16-R-50371-433	R677

STD. NAVY STOCK NO.	KEY SYMBOL
N16-R-50371-731	R227
N16-R-50372-833	R215
N16-R-50373-238	R425
N16-R-50373-423	R320
N16-R-50398-758	R716
N16-R-50400-511	R318
N16-R-50416-944	R665
N16-R-50417-823	R542
N16-R-50418-233	R145
N16-R-50418-483	R113
N16-R-50444-813	R364
N16-R-50479-435	R610
N16-R-50479-440	R294
N16-R-50481-233	R108
N16-R-50481-461	R303
N16-R-50515-752	R341
N16-R-50516-818	R450
N16-R-50551-401	R412
N16-R-50552-818	R454
N16-R-50553-233	R559
N16-R-50588-818	R367
N16-R-50632-416	R280
N16-R-50633-785	R109
N16-R-50634-234	R114
N16-R-50650-390	R609
N16-R-50650-758	R538
N16-R-50651-818	R301
N16-R-50652-233	R420
N16-R-50677-380	R607
N16-R-50678-818	R435
N16-R-50694-606	R117
N16-R-50695-436	R441
N16-R-50696-818	R274
N16-R-50697-238	R362
N16-R-50704-606	R118
N16-R-50713-380	R547
N16-R-50714-818	R202
N16-R-50740-380	R216
N16-R-50741-818	R914
N16-R-50742-240	R528
N16-R-50758-377	R411
N16-R-50758-754	R417
N16-R-50759-818	R149
N16-R-50760-470	R506
N16-R-50786-818	R436
N16-R-50821-276	R218
N16-R-50822-761	R209
N16-R-50823-240	R134

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

STD. NAVY STOCK NO.	KEY SYMBOL
N16-R-50857-0431	R712
N16-R-50858-818	R437
N16-R-50893-435	R444
N16-R-50895-238	R560
N16-R-50929-438	R452
N16-R-50975-725	R288
N16-R-50993-818	R324
N16-R-51021-238	R515
N16-R-51064-751	R222
N16-R-51065-818	R212
N16-R-51092-818	R563
N16-R-51109-758	R232
N16-R-51174-238	R544
N16-R-51326-818	R131
N16-R-5348-441	R116
N16-R-66030-1206	R446
N16-R-66140-5206	R253
N16-R-66163-9445	R110
N16-R-66329-6746	R146
N16-R-66462-5931	R111
N16-R-68382-1326	R350
N16-R-68399-7646	R337
N16-R-68399-8006	R408
N16-R-68402-5872	R101
N16-R-68419-7426	R339
N16-R-68441-2076	R330
N16-R-73471-9276	R148
N16-R-73484-4076	R371
N16-R-73484-5040	R272
N16-R-73486-3276	R140
N16-R-73487-6991	R130
N16-R-73488-3577	R262
N16-R-73494-5594	R378
N16-R-73500-3399	R370
N16-R-73500-4381	R376

STD. NAVY STOCK NO.	KEY SYMBOL
N16-R-73503-5126	R129
N16-R-73505-4276	R374
N16-R-73509-6936	R373
N16-R-73513-9676	R375
N16-R-73514-6451	R128
N16-R-73514-9236	R377
N16-R-73515-2604	R379
N16-R-73515-5595	R242
N16-R-73515-6073	R223
N16-R-73515-8876	R292
N16-R-79098-8259	R557
N16-R-79356-4011	R555
N16-R-83341-9701	R545
N16-R-85001-6401	VR101
N16-R-87189-4475	R333
N16-R-87419-4350	R127
N16-R-87519-4380	R133
N16-R-87679-4280	R142
N16-R-87749-4560	R125
N16-R-88079-4270	R135
N16-R-88079-4360	R123
N16-R-88412-5274	R122
N16-R-88512-5400	R527
N16-R-89794-1860	R369
N16-R-89959-4843	R147
N16-R-90217-6010	R550
N16-R-90803-6005	R556
N16-R-91369-7990	R319
N16-R-91825-8303	R552
N16-S-62603-6692	XV210
N16-S-62603-6895	XV101
N16-S-63515-415	XV103
N16-S-64063-6222	XV102
N16-S-64063-6718	XV201
N16-S-72828-2605	S502

STD. NAVY STOCK NO.	KEY SYMBOL
N16-T-51770	CR201
N16-T-52001-5	V107
N16-T-52353	V521
N16-T-53224-10	V514
N16-T-53324	V516
N16-T-55446	V501
N16-T-56177	V218
N16-T-56185	V213
N16-T-56195-50	V101
N16-T-56198	V210
N16-T-56201	V223
N16-T-56201-50	V403
N16-T-56202	V504
N16-T-56203-30	V103
N16-T-56684-25	V105
N16-T-56840-50	V515
N16-T-58240-10	V220
N16-T-58241	V201
N16-T-58241-60	V212
N16-T-75651	V508
N16-T-75687	V102
N17-C-480693-236	H401
N17-C-71241-8791	P402
N17-C-72275-2623	J503
N17-C-72605-6565	J501
N17-C-73108-1267	J202
N17-C-73108-1271	J201
N17-C-73139-7645	J507
N17-C-73317-2189	J405
N17-C-73345-5026	J509
N17-C-73533-4985	J411
N17-C-73605-6389	P601
N17-C-73649-6047	P101
N17-C-794001-214	A801
N17-F-1067-2270	B801

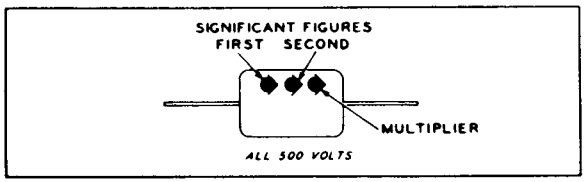
STD. NAVY STOCK NO.	KEY SYMBOL
N17-F-14328-50	F501
N17-L-6297	I101
N17-L-76866-8306	XI501
N17-R-64187-4842	K502
N17-S-55344-3801	S103
N17-S-60362-7571	S204
N17-S-61164-6081	S203
N17-S-62010-4294	S504
N17-S-64557-9935	S201
N17-S-64641-2867	S202
N17-S-65207-2359	S102
N17-S-65978-3351	S401
N17-S-66986-7825	S101
N17-S-69397-3251	S104
N17-S-69420-6531	S406
N17-S-69888-4241	S501
N17-S-70638-6577	S404
N17-S-71955-6401	S205
N17-T-28244-4026	TP201
N17-T-70790-9631	T101
N17-T-78678-5701	T502

SIGNAL CORPS STOCK NO.	KEY SYMBOL
2J0B2	V107
2J12AT7	V220
2J12AX7	V212
2J6AG7	V218
2Z5954	I601
3Z7498-25-55	R123
3Z7499-1-69	R231

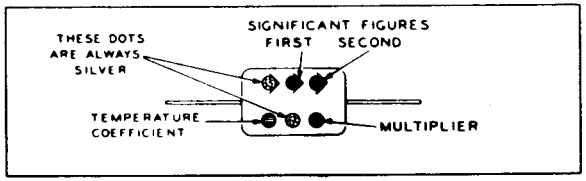
TABLE 8-7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

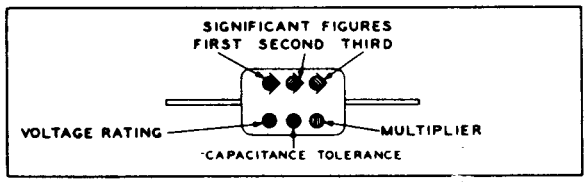
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



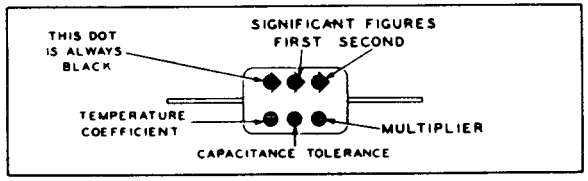
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



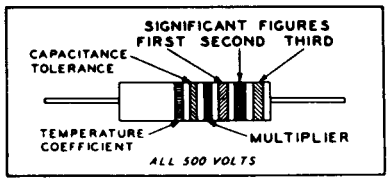
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

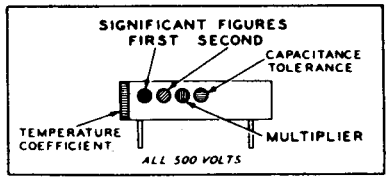


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

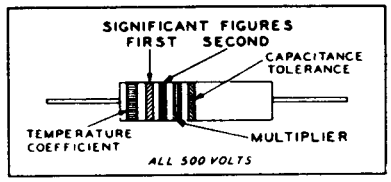


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



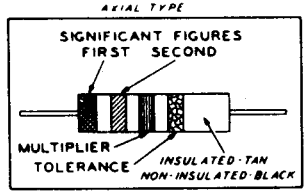
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

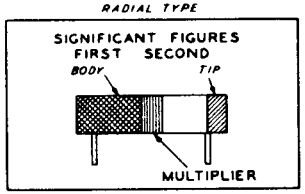
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

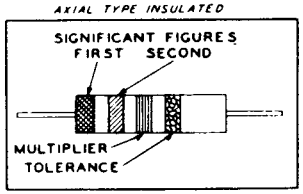


RADIAL TYPE

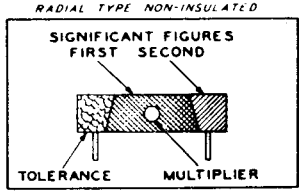


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED



8. LIST OF MANUFACTURERS.

The names and addresses of manufacturers of replaceable parts are listed in Table 8-8 below together with the abbreviation for each manufacturer as used in Table 8-4. The code designation for each manufacturer which is used as a prefix in Navy Type Numbers is also listed.

TABLE 8-8. LIST OF MANUFACTURERS.

Abbreviation	*Navy Type No. Prefix*	*Name*	*Address*
Berkeley Scientific	CBPM	Berkeley Scientific Corp.	Richmond, Calif.
Advance	CATM	Advance Electric Co.	Los Angeles, Calif.
Air Maze	CBEN	Air Maze Corp.	Cleveland, Ohio
Allen Bradley	CBZ	Allen Bradley Co.	Milwaukee, Wisc.
Amalgamated		Amalgamated Electronics	Clinton Corners, N. Y.
American		American Electric Motors, Inc.	Los Angeles, Calif.
Amperite	CAGK	Amperite Company	New York, N. Y.
Amphenol	CPH	American Phenolic Co.	Chicago, Illinois
Automatic Electric	CAU	Automatic Electric Co.	Chicago, Illinois
Bliley Electric	CQB	Bliley Electric Co.	Erie, Pa.
Boston Gear Works	CBH	Boston Gear Works	N. Quincy, Mass.
Bussmann	CFA	Bussmann Mfg. Co.	St. Louis, Missouri
Cannon	CED	Cannon Electric Development Co.	Los Angeles, Calif.
Centralab	CBN	Central Radio Laboratory	Milwaukee, Wisc.
Cinch	CMG	Cinch Mfg. Co.	Chicago, Illinois
Cinema	CBDY	Cinema Engineering Co.	Burbank, Calif.
Clarostat	CMC	Clarostat Mfg. Co.	Brooklyn, N. Y.
ConCarbon	CCC	Continental Carbon Co.	Cleveland, Ohio
Cramer, R. W.	CCX	Cramer, R. W., Inc.	Centerbrook, Conn.
Dialco	CAYZ	Dial Light Corp.	New York, N. Y.
Dupont	CBFZ	Dupont de Nemours, E. I. Co.	Wilmington, Del.
Electronicraft			
Erie	CER	Erie Resistor Corp.	Erie, Pa.
General Electric	CG	General Electric Co.	Schenectady, N. Y.
General Radio	CAG	General Radio Co.	Cambridge, Mass.
Harrington & King Perforating Co.		Harrington & King Perforating Company	
Helipot	CAUY	Helipot Corp.	S. Pasadena, Calif.
Hopkins Engr.		Hopkins Engineering Co.	Altadena, Calif.
Industrial Products	CARO	Industrial Products Co.	Danbury, Conn.
Littelfuse	CLF	Littelfuse, Inc.	Chicago, Illinois
Microswitch	CMU	Micro Switch Corp.	Freeport, Illinois

Abbreviation	*Navy Type No. Prefix*	*Name*	*Address*
Millen	CJA	Millen, James, Mfg. Co., Inc.	Malden, Mass.
Miller	CMM	J. W. Miller	Los Angeles, Calif.
Model Engr.		Model Engr. & Mfg. Inc.	Huntington, Ind.
Oak	COC	Oak Mfg. Co.	Chicago, Illinois
Oxford	COT	Oxford Tartak Corp.	Chicago, Illinois
Peerless		Peerless Instrument Co.	Elmhurst, N. Y.
Potter & Brumfield	CARE	Potter & Brumfield Mfg. Co.	Princeton, Ind.
Remler	CRL	Remler Co., Ltd.	San Francisco, Calif.
Sangamo	CAN	Sangamo Electric Co.	Springfield, Ill.
Shallcross	CSM	Shallcross Mfg. Co.	Collingdale, Pa.
Spencer Thermostat	CSQ	Spencer Thermostat Co.	Attleboro, Mass.
Sprague	CSF	Sprague Electric Co.	N. Adams, Mass.
Standard Electric Time	CBQF	Standard Electric Time Co.	Springfield, Mass.
Switchcraft	CBIM	Switchcraft Co.	Chicago, Illinois
Transformer Engineers	CBGM	Transformer Engineers	Pasadena, Calif.
Triad	CBNC	Triad Transformer Mfg. Co.	Los Angeles, Calif.
United Transformer	CUT	United Transformer Corp.	New York, N. Y.
USECO		U. S. Engr. Co.	Glendale, Calif.
Veeder Root Co.	CASV	Veeder Root, Inc.	Hartford, Conn.
Waldes Truarc		Waldes Kohinoor, Inc.	Long Island, N. Y.
Ward-Leonard	CAO	Ward Leonard Co.	Mount Vernon, N. Y.
Weston	CV	Weston Electrical Instrument Corp.	Newark, N. J.
Winchester Electronics		Winchester Electronics, Inc.	Glenbrook, Conn.

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