TM 11-6625-599-45

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

GS AND DEPOT MAINTENANCE MANUAL

INCLUDING REPAIR PARTS

AND SPECIAL TOOLS LIST

VOLTMETER, ELECTRONIC AN/USM-98A

This copy is a reprint which includes current pages from Changes 1 through 4. The title was changed by C 2 to read as shown above.

HEADQUARTERS, DEPARTMENTOF THE ARMY

5 MAY 1965

EXTREMELY DANGEROUS VOLTAGES EXIST IN THE +500-VOLT REFERENCE VOLTAGE POWER SUPPLY!

Before working on this power supply, always short circuit the high-voltage filter capacitors after power has been removed.

WARNING

RADIATION HAZARD

Co 60

Tube type OA2/WA used in this equipment contains radioactive material. This tube is potentially hazardous when broken; see qualified medical personnel and the Safety Director if you are exposed to or cut by a broken tube. Use extreme care in replacing these tubes (para 3-3) and follow safety procedures in their handling, storage, and disposal (Refer to TM 11-6625-599-12).

Never place radioactive tubes in your pocket. Use extreme care not to break radioactive tubes while handling them.

Never remove radioactive tubes from cartons until ready to use them.

Refer to TM 11-6625-599-12 for handling,

storage, and disposal of radioactive material.

CHANGE
No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC *13 November 1979*

General Support and Depot Maintenance Manual
(Including Repair Parts and Special Tools Lists)
VOLTMETERS, ELECTRONIC AN/USM-98A AND AN/USM-98B
(NSN 6625-00-753-2115)

TM 11-6625-599-45, 5 May 1965, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.
2. Remove and insert pages as indicated below:

Remove	*Insert*
i and ii	i and ii
3 and 4	3 and 4
7 thru 10	7 thru 10
33 and 34	33 and 34
40.1 and 40.2	40.l and 40.2
Figure 5-4	Figure 5-4
Figure 5-5	Figure 5-5
Figure 5-5.1 (untitled)	Figure 5-5.l
Figure 5-8	Figure 5-8
Figure 5-8.1	Figure 5-8.l
Figure 5-9	Figure 5-9

3. File this sheet in the front of the manual for reference purposes.

By Order of the Secretary of the Army:

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Ft Carson (5)
Ft Gillem (l0)
Ft Gordon (10)
Ft Richardson (CERCOM Ofc) (2)
USA Dep (1)
Sig Sec USA Dep (1)
Army Dep (1) except
LBAD (14)
SAAD (10)
SHAD (3)
TOAD (14)
Units org under fol TOE:
29-207 (2)
29-610(2)
11-16(1)
11-97(1)
11-98(1)
11-117(1)
11-302(1)
11-500 (AA-AC) (1)
29-134(1)
29-136 (1)
29-427 (1)
29-500(1)
ARNG: State AG (3); Units-None
USAR: None
For explanation of abbreviations used, see AR 310-50.

TECHNICAL MANUAL
No. 11-6625-599-45

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *5 May 1965*

General Support and Depot Maintenance Manual Including Repair Parts and Special Tools Lists
VOLTMETERS, ELECTRONIC AN/USM-98A AND AN/USM-98B (NSN 6625-00-753-2115)

LIST OF ILLUSTRATIONS

CHAPTER 1
FUNCTIONING

1-1. Scope

a. This manual covers general support and depot maintenance for Voltmeter, Electronic AN/USM-98(*). It includes instructions appropriate to general support and depot maintenance personnel for troubleshooting, testing, aligning, and repairing the equipment, and replacing maintenance parts. It also lists tools, materials, and test equipment for general support and depot maintenance. Detailed functions of the equipment are covered in paragraphs 1-2 through 1-5.

b. Official nomenclature followed by (*) represents all models of the equipment. Thus, Voltmeter, Electronic AN/USM-98(*) represents Voltmeters, Electronic AN/USM-98A and AN/USM-98B.
The AN/USM-98B has been manufactured under several orders with minor differences in repair parts; appendix B covers the earlier units; TM 11-6625-599-40P-2 covers units manufactured under Contract DAAB07-74-C-0622.

c. The complete technical manual for this equipment includes TM 11-6625-599-12 and TM 11-6625-599-40P-2.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is authorized and encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics command, ATTN : DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

1-1.1 Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, Changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-1.2 Reporting Equipment Improvement Recommendations (EIR)

EIR's will be prepared using DA Form 2407 (Maintenance Request). Instructions for preparing EIR's are provided in TM 38-750, The Army Maintenance Management System. EIR's should be mailed directly to Commander, US Army Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. A reply will be furnished directly to you.

NOTE

For other applicable forms and records, refer to TM 11-6625-599-12.

1-2. Block Diagram

(fig. 1-1)
Voltmeter, Electronic AN/USM-98A (vtvm) is a precision voltmeter used to measure accurately direct current (dc) potentials from 0 to 500 volts. The vtvm contains a 0- to 500- volt reference power supply *(a* below), a 60-Hz chopper amplifier *(b* below), and a low voltage power supply *(c* below). The vtvm functions as a vacuum-tube voltmeter when the NULL switch is set to VTVM, and as a differential voltmeter when the NULL switch is set to 10, 1, .1 or .01.

a. Reference Power Supply 0- to 500- Volt (fig. 1-1 and 1-2). The 0- to 500- volt reference voltage is obtained from a +700 volt power supply and a voltage regulator and divider. A part of power transformer T1 and power rectifiers CR101, CR102, and CR103 provide an unregulated +700 volts to the voltage regulator. Series regulator tube V102, differential amplifiers V106 and V105, and voltage reference tube V104 provide a regulated + 500 volts. The reference range voltage divider, the RANGE switch, and the five-decade attenuator provide the desired voltage (0 to 500 volts). This voltage is applied to meter M1 through a voltage divider.

b. Chopper Amplifier 60-Hz (fig. 1-1 and 1-3).

(1) The 60-Hz chopper amplifier is a stable, drift-free dc amplifier. The input voltage to the 60-Hz chopper amplifier is the difference between the 0-to 500- volt reference power supply output and the unknown voltage when the NULL switch is set to 10, 1, .1, or .01. The input voltage is applied directly to the 60- Hz chopper amplifier when the NULL switch

is set to VTVM. The 60-Hz chopper (G1) converts the input voltage to a square wave which is passed through three stages of amplification (V202, V203A and V203B). The amplified square wave is synchronously rectified by the 60-Hz chopper and applied to meter M1. For full scale deflection, a 10-millivolt (mv) signal voltage will cause 100 microamperes (ua) to flow through the meter.

(2) When the vtvm is used to measure high resistance (fig. 1-1) (from 1 to 500,000 megohms), the resistance being measured is connected to the input terminals of the vtvm. The equipment is operated in the differential voltmeter mode (NULL switch set to 10, 1, or .1), and voltage-divider switches A through E (not shown) are adjusted to apply sufficient internal reference voltage across the unknown resistance to cause meter M1 to indicate off null. This off null reading is noted and the resistance is computed in megohms. (Refer to TM-6625-599-12.)

c. Low-Voltage Power Supply (fig. 1-1 and 1-4). The low-voltage power supply consists of a part of power transformer T1, low-voltage rectifier CR201, and voltage regulator V204. This power supply provides regulated + 150 volts to tubes V202 and V203. Filament voltages for tubes V102, V105, V106, V202, V203, and voltage for the decimal point indicator lamps PL1, PL2, PL3, PL4, and 60- Hz chopper G1 are supplied by filament windings on T1. Low-voltage rectifier CR104 and series regulators Q101 and Q102 provide current regulation of filament voltage to tube V105.

1-3. Reference Power Supply, 0- to 500-Volt

(fig. 5-4, 5-4.1, 5-8, 5-8.1 and 5-9)

a. Power Rectifier (fig. 5-4 and 5-4.1). Voltage from power transformer T1 is converted to pulsating dc by half-wave rectifiers CR101, CR102, and CR103. A low-pass filter, capacitor C101 and C102, smooths the pulsating dc to a pure dc voltage. Voltage-divider network R105 and R106 maintains equal voltage across capacitors C101 and C102. The output of the power rectifier is +700 volts unregulated.

b. Series Regulator (fig. 5-4 and 5-4.1) The series regulator consists of series regulator tube V102, differential amplifier tubes V105 and V106, and reference tube V104. Plate voltage for

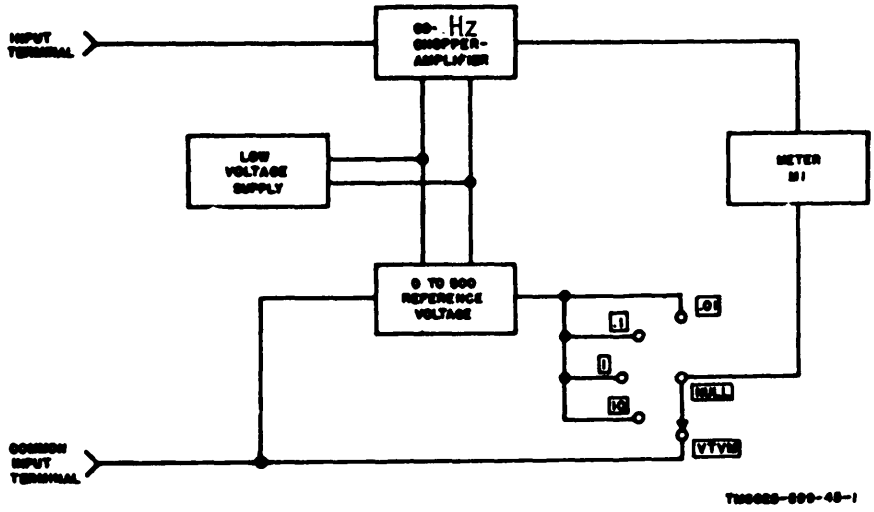


Figure 1-1. Voltmeter, Electronic AN/USM-98(*), block diagram.

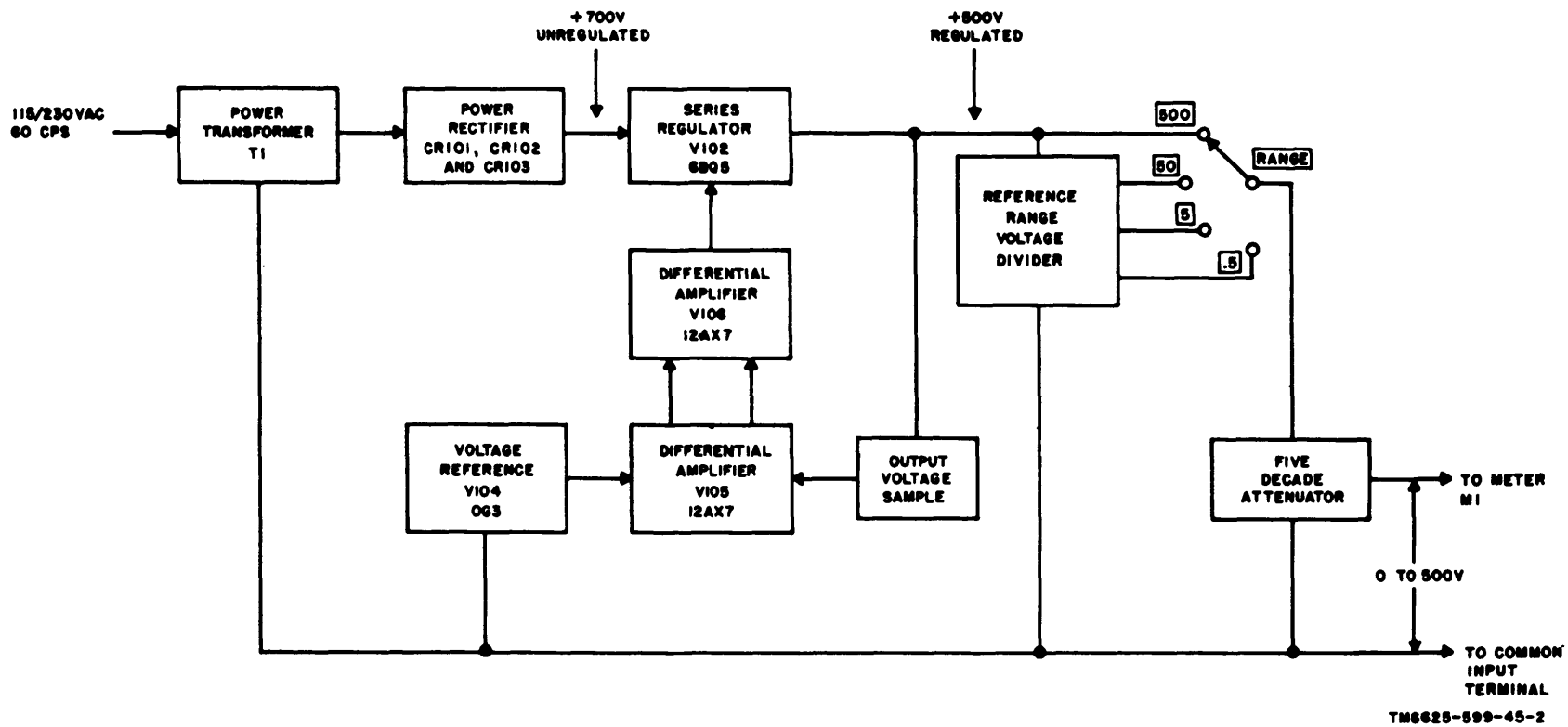


Figure 1-2. Reference power supply, 0- to 500-volt, block diagram.

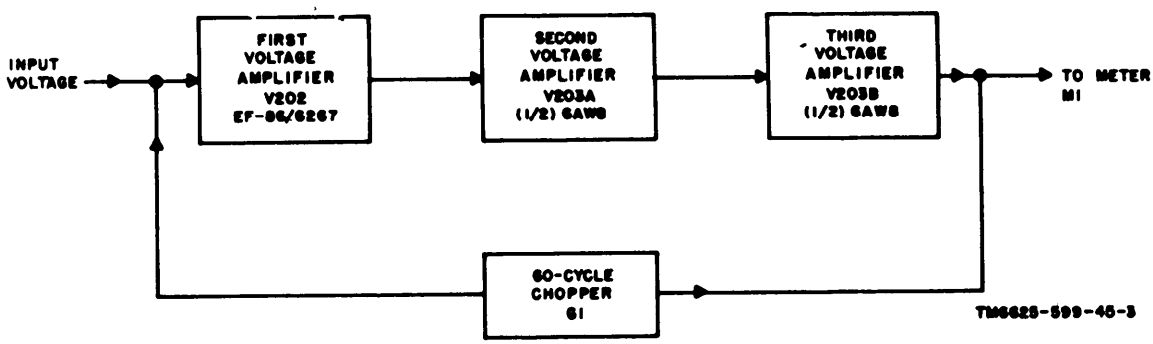


Figure 1-3. Chopper amplifier, 60-cycle, block diagram.

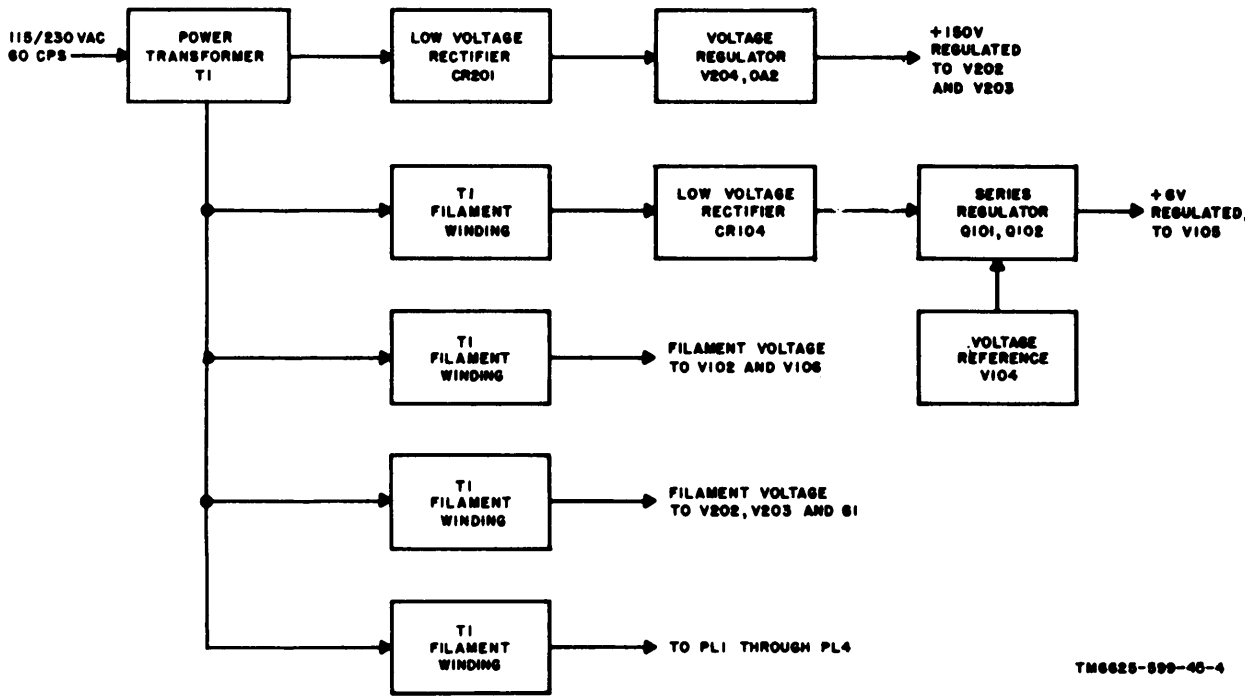


Figure 1-4. Low-voltage power supply, block diagram.

tube V102 is obtained from the power rectifier, and grid voltage is obtained direct from the plate of differential amplifier V106A. Regulator V103 provides a load to the circuit in case of failure of V102. Resistors R114 and R115 and capacitor C104 are the plate load for V106A. Plate voltage for V106B is obtained from the +500-volt output. Cathode resistor R116 is common to both cathodes of V106. Grid voltage for V106A and V106B is coupled direct from the plates of V105A and V105B. Resistors R113 and R118 are the plate load resistors for V105A and V105B respectively. Cathode resistor R117 is common to both triodes. Differential amplifier V105 develops an output voltage when a difference exists between the reference voltage, coupled through low-pass filter R112 and C103, from voltage

reference tube V104 and a sample of the output voltage obtained from voltage-divider network R119, R120, R121, and CALIBRATE R2. Assume that there is an increase in the +500-volt output; a positive-going signal is then applied to pin 7 (grid) of V105B. This increase causes triode V105B to conduct more and develop more cathode bias across common cathode resistor R117, and causes triode V105A to conduct less. A positive-going voltage from the plate of V105A is applied to pin 2 (grid) of V106A, and a negative-going voltage from the plate of V105B is applied to pin 7 (grid) of V106B. These voltages cause triode V106A to increase conduction and drop more voltage across plate load resistors R114 and R115. The negative-going voltage on pin 2 (grid) of series regulator tube V102 increases the tube impedance, and more voltage is dropped across the tube to return the output to +500 volts. If the +500 volts were decrease, the impedance of series regulator V102 would be decreased in a similar manner to return the output voltage to +500 volts. Resistors R107, R108, and R109 apply any changes caused by line voltage variations directly to the grid of V106A. Assume that there is an increase in the output of the power rectifier caused by line voltage fluctuation. A positive-going signal is applied to pin 2 (grid) of V106A, which causes V106A to conduct more and drop more voltage across plate load resistors R114 and R115. The negative-going voltage at pin 2 (grid) of V102 increases the tube impedance and the unregulated voltage increase is dropped across the tube. If the unregulated voltage were to decrease, the impedance of series regulator tube V102 would be decreased in a similar manner to counteract the unregulated voltage change. Capacitors C104 and C105 increase the response of the differential amplifiers to rapid voltage changes. The CALIBRATE control (R2) consists of two variable resistors, coarse and fine, mounted on the same shaft and connected in series electrically. The CALIBRATE control (R2) is adjusted to vary the output of the series regulator. The 500V REF ADJ resistor (R121) is adjusted so that resistor R2 is in midrange when the output of the series regulator is +500 volts. The filaments of tubes V102 and V106 are elevated to approximately +110 volts by voltage-divider resistors R103 and R104 to prevent voltage breakdown within the tubes.

c. Calibration Circuit (fig. 5-4 and 5-4.1). The calibration circuit for the 500-volt reference power supply consists of voltage-divider resistors R316, R317, REF CAL ADJ R318, R319, standard cell B1, and OPERATE-CALIBRATE switch S4. The calibration circuit is used when the OPERATE-CALIBRATE switch is set to CALIBRATE. The OPERATE-CALIBRATE switch disconnects the 60- Hz chopper amplifier from the input terminals (fig. 5-8) and connects the chopper amplifier to amplify (para 1-4) the difference between the calibration voltage-divider output and standard cell B1. The output of the 60- Hz chopper amplifier is indicated by meter M1. The output of the +500-volt reference power supply is then adjusted for zero reading on meter Ml. The REF CAL ADJ resistor (R318) is adjusted during calibration until the difference between the calibration voltage-divider output of the +500-volt reference power supply is exactly +500 volts.

d. Reference Voltage Divider (fig. 5-8, 5-8.1 and 5-9). Separate voltage dividers are used to obtain +50-volt, +5-volt, and +0.5-volt references from the +500-volt reference power supply. The appropriate voltage divider is selected by level E of RANGE switch S2. The reference voltage dividers consist of precision wire-wound resistors R320 through R322, 50V ADJ R323, R324; 5V ADJ R325, R326, R327; 5V ADJ R328, R329 and R300. Resistors R323, R326, and R329 adjust the output level of the 50-, 5-, and 0.5-volt range dividers respectively. Resistors R320, R321, and R322 are placed across the output of the 500-volt reference power supply when RANGE switch S2 is set to 500 to maintain a load on the 500-volt reference power supply.

e. Five-Decade Attenuator (fig. 5-8, 5-8.1 and 5-9). The five-decade attenuator is connected to the appropriate reference voltage divider by levels B and F of RANGE switch S2. The five-decade attenuator consists of voltage-divider switches S6 through S10 (A through E), respectively, and associated matched, precision, The wire-wound resistors R401 through R449. The positions of switches S6 through S10 are indicated by voltage-divider indicators A through

E on the front panel. The resistors on each decade are matched, and all decades are matched for each instrument; this condition provides an overall divider accuracy of 0.01-percent absolute. A filter is connected across the output of the five-decade attenuator by level D of RANGE switch S2 to bypass hash introduced by the wire-wound resistors, and to provide an ac return for the chopper-amplifier input filter (para 1–4) to the common input terminal. In the 500 and 50 positions of RANGE switch S2, the filter consists of capacitor C301 and resistor R331. In the 5 position of RANGE switch S2, the filter consists of capacitor C302 and Resistor R331. In the .5 position of RANGE switch S2, the filter consists of capacitor C303 and variable resistor R332 for the positive position of switch S5, and capacitor C303 and variable resistor R333 for the negative position of S5. These are factory set for the individual voltmeter on the .5 volt scale.

1-4. Chopper Amplifier, 60- Hz

a. Input Circuitry (fig. 5-8,5-8.1 and 5-9). The input signal source for the 60- Hz chop per amplifier is determined by level D of NULL switch S3 and OPERATE-CALIBRATE switch S4. The position of NULL switch S3 also determines whether the equipment is operated as a direct-reading vtvm, or as a differential voltmeter.

(1) *Vtvm operation* (fig. 5-5 and 5-5.1). The equipment is operated as a direct-reading vtvm when NULL switch S3 is set to VTVM. The input voltage is applied to voltage-divider resistors R301 through R309. Stepped-down voltages are selected by RANGE switch S2C for amplification by the chopper amplifier so that a 10 millivolt (mv) signal applied at the grid of V202 will cause 100 microampere (ua) to flow through meter M1 for full-scale deflection for the selected range (See *b* below for amplifier operation.) Levels A and B of polarity switch S5 connect meter M1 to the output of the chopper amplifier so that a positive signal at the grid of V202 causes right meter needle deflection.

(2) *Differential voltmeter operation* (fig. 5-6). The equipment is operated in the differential voltmeter mode when NULL switch S3 is placed in the 10, 1, .1, or .01 position. In this mode of operation, a reference voltage, selected by the RANGE switch and voltage-divider switches A-E (para 1-3), is applied at the bottom of the input voltage divider (resistors R305 through R309). Levels C and D of polarity switch S5 connect the reference voltage in opposition to the input voltage. Levels A and B of polarity switch S5 connect meter M1 to the output of the chopper amplifier so that the meter needle deflects right when the input voltage is greater than the reference voltage selected by voltage-divider switches A-E. In the - (negative) position, polarity switch S5E connects resistors R311 through R315 to prevent buildup of voltage across capacitor C1. When polarity switch S5 is set to + (positive), C1 returns ac pickup from within the equipment to chassis ground. The difference between the input voltage and the reference voltage appears across the input voltage divider (resistors R305 through R309). Stepped-down voltages are selected by NULL switch S3D for amplification by the chopper amplifier so that a 10-mv signal applied at the grid of V202 will cause 100 ua to flow through meter M1 for full-scale deflection for the selected NULL setting. (See *b* below for amplifier operation.) The unknown voltage is determined by adjusting voltage-divider switches A-E until no voltage appears across the input voltage divider (R305 through R309) and zero meter deflection is observed. At this point, the input voltage is equal to the reference voltage indicated on voltage switches A-E. The equipment is also operated as a differential voltmeter to calibrate the 500-volt reference supply (para

1-3). OPERATE - CALIBRATE switch S4 disconnects the chopper amplifier from the input terminals and connects it to compare a portion of the + 500-volt reference, obtained from voltage divider R316 through R319, with the voltage of standard cell B1.

b. Amplifier Operation (fig. 5-5, 5-5.1, and 5-7). Neon-gas tube V201 (regulator) prevents excessive voltages from being applied to the chopper amplifier. The input to the 60- Hz chopper is passed through low-pass filter R201, C201, R202, C202 and applied to the junction of R203 and C203. Terminal 1 of chopper G1 is also applied to this junction and connects and disconnects the junction to the input voltage-divider common, through negative feedback resistor R218 and VTVM GAIN ADJ R219, at a 60-cycle-per-second Hz rate; therefore the signal at this junction is a 60- Hz square wave. The amplitude of the square wave is proportional to the input voltage during vtvm operation, and proportional to the difference between the input voltage and the reference voltage during differential voltmeter operation. The 60- Hz square wave is coupled through C203 to the grid of amplifier V202 as an alternating-current (ac) square wave. Cathode bias for tube V202 is developed by resistor R207 and capacitor C205, resistor R205 and capacitor C204 maintain screen voltage, and resistor R206 is the plate load. The output of tube V202 is coupled to pin 7 (grid) of pentode V203A by capacitors C206 and C208 and resistor R209. Resistor R213 is the cathode resistor for pentode V203A, screen voltage is maintained by resistor R210 and capacitor C209, and resistor R212 is the plate load. Plate voltage for tube V202 and pentode V203A is isolated by resistor R208 and capacitor C207 from the plate of triode V203B. The output of pentode V203A is coupled to pin 2 (grid) of triode V203B by capacitor C210 and resistor R214. Cathode voltage for triode V203B is obtained from the cathode of tube V202 through voltage divider R211 and R216. Resistor R215 is the plate load for triode V203B. The output of V203B is coupled through capacitor C211 to the junction of capacitor C211 and resistor R220. Terminal 6 of chopper C1 is also connected to this junction, through resister R217, and connects and disconnect the junction to the input voltage-divider common, through negative feedback resistors R218 and R219, at a 60- Hz rate. Synchronous rectification occurs as follows:

(1) Assume that a positive voltage is applied to the chopper amplifier.

(2) During the time t1 terminal 6 of chopper G1 is connected to the input voltage-divider (consisting of R218 and R219) common, the positive portion of the ac square wave is amplified by V202 and V203A and appears at the plate of V203B as a negative-going voltage. This negative-going voltage is returned to the input voltage divider common by terminal 6 of chopper G1.

(3) During the time t2, terminal 1 of chopper G1 is connected to the input voltage-divider common, capacitor C203 discharges through R218, R219, and R204 (the negative portion of the ac square wave). This negative-going voltage is amplified by V202 and V203A and appears at the plate of V203B as a positive-going voltage. This positive-going voltage passes through resistors R220 and R221 and meter M1 and develops a voltage across R218 and R219 which prevents capacitor C203 from completely discharging (negative feedback).

(4) Similarly, when a negative input voltage is applied to the chopper amplifier, the timing relationships of chopper G1 are such that only negative-going output voltages at the plate of V203B pass through meter M1.

(5) The amount of negative feedback, and hence the gain of the chopper amplifier, is controlled by VTVM GAIN ADJ resistor R219. A small ac voltage is coupled through capacitor C213 (fig. 5-8, 5-8.1 and 5-9) from voltage divider R225, R226, and VTVM ZERO ADJ. R227 to the chopper-amplifier input to cancel out any ac pickup in

the chopper amplifier. VTVM ZERO ADJ R227 is adjusted to zero the meter when no input voltage is applied. Resistors R220 and R221 and capacitor C212 filter the output of the chopper amplifier. Capacitor C212 is discharged by resistor R217 and chopper contact 6 to increase the response to rapid changes in input voltage. The output voltage of the chopper amplifier is available at the RECORDER OUTPUT terminals from voltage divider R222, RECORDER OUTPUT ADJ R1, and R223. A maximum voltage of 20 millivolts; corresponding to full-scale meter deflections, is available. This voltage is adjustable by RECORDER OUTPUT ADJ R1. Capacitor C215 removes any hash, and back-to-back diodes CR202 and CR203 conduct to prevent excessive voltages from being developed at the recorder output terminals. The diodes do not conduct during normal operation.

c. Meter M1. Meter M1 is connected to indicate the output of the chopper amplifier. The meter utilizes a special taunt-band suspension which eliminates all friction associated with meter pivot stickiness. This condition eliminates any tendency for the meter pointer to stick at one point of the scale and jump to another point. The meter requires 100 microamperes to deflect full scale.

1-5. Low-Voltage Supply

(fig. 1-5, 1-5.1, 5-8, 5-8.1 and 5-9)

a. Input Power (fig. 5-8). Input power to the vtvm is controlled by power switch S1. Power transformer T1 has two primary windings. For 115-volt operation, the two primary windings are connected in parallel by the connection of terminals N to O and P to R on power transformer T1. For 230-volt operation, the two primary windings are connected in series by the connection of power transformer terminals O and P together. Power transformer T1 is protected by fuse F1. A 1-ampere slow-blow fuse is used for 115-volt operation, and a 1/2-ampere slow-blow fuse is used for 230-volt operation.

b. Positive 150-Volt Supply (fig. 1-5 and 1-5.1). Positive 150 volts regulated for tubes V202 and V203 is obtained from a 166-volt ac secondary winding on power transformer T1 for the AN/USM-98A, and 190-volt ac secondary winding on T1 for the AN/USM-98B. The ac voltage is half-wave rectified by rectifier CR201 and filtered by C214A, R228, and C214B. The dc output voltage is regulated by regulator tube V204. Resistor R229 is the regulating resistor for V204. The negative side of the +150-volt regulated supply is connected to the input voltage-divider common.

c. Regulated Filament Supply (fig. 1-5 and 1-5.1). Regulated voltage (6 ±0.06 volts dc) for the filament of differential amplifier V105 is obtained from a 6.3-volt ac secondary winding on power transformer T1 for the AN/USM–98B, and a 6.3-volt ac secondary winding on power transformer T1 for the AN/USM-98A. The ac voltage is half-wave rectified by rectifier CR104 and filtered by C106. The output voltage is regulated by transistors Q101 and Q102 which are connected in compound to form a single three-terminal unit which is equivalent to a single transistor with negligible base current. The filament voltage to V105 is the half-wave rectified voltage minus the emitter-to-collector voltage of the equivalent single transistor. Pin 9 of V105 is maintained at approximately 6 volts by voltage divider R101 and R102 and reference tube V104. The emitter voltage of the equivalent transistor is the difference between the reference voltage (at pin 9 of V105) and the filament voltage of V105. Assume that the secondary voltage of transformer T1 increases to increase the filament voltage to V105. The emitter voltage of the equivalent single transistor will decrease and cause the emitter-to-collector voltage to increase and return the filament voltage of V105 to normal. A decrease in the filament voltage of V105 will cause a compensation decrease in the emitter-to-collector voltage of the equivalent single transistor in a similar manner.

d. Unregulated Filament Supply (fig. 5–8, 5-8.1, and 5-9) Filament voltage for tubes V102 and V106 in the +500-volt reference power supply is obtained from a 6.3-volt ac secondary winding on power transformer T1 for the AN/USM-98A, and a 9-volt ac secondary winding on power transformer T1 for the AN/USM–98B. The filaments of

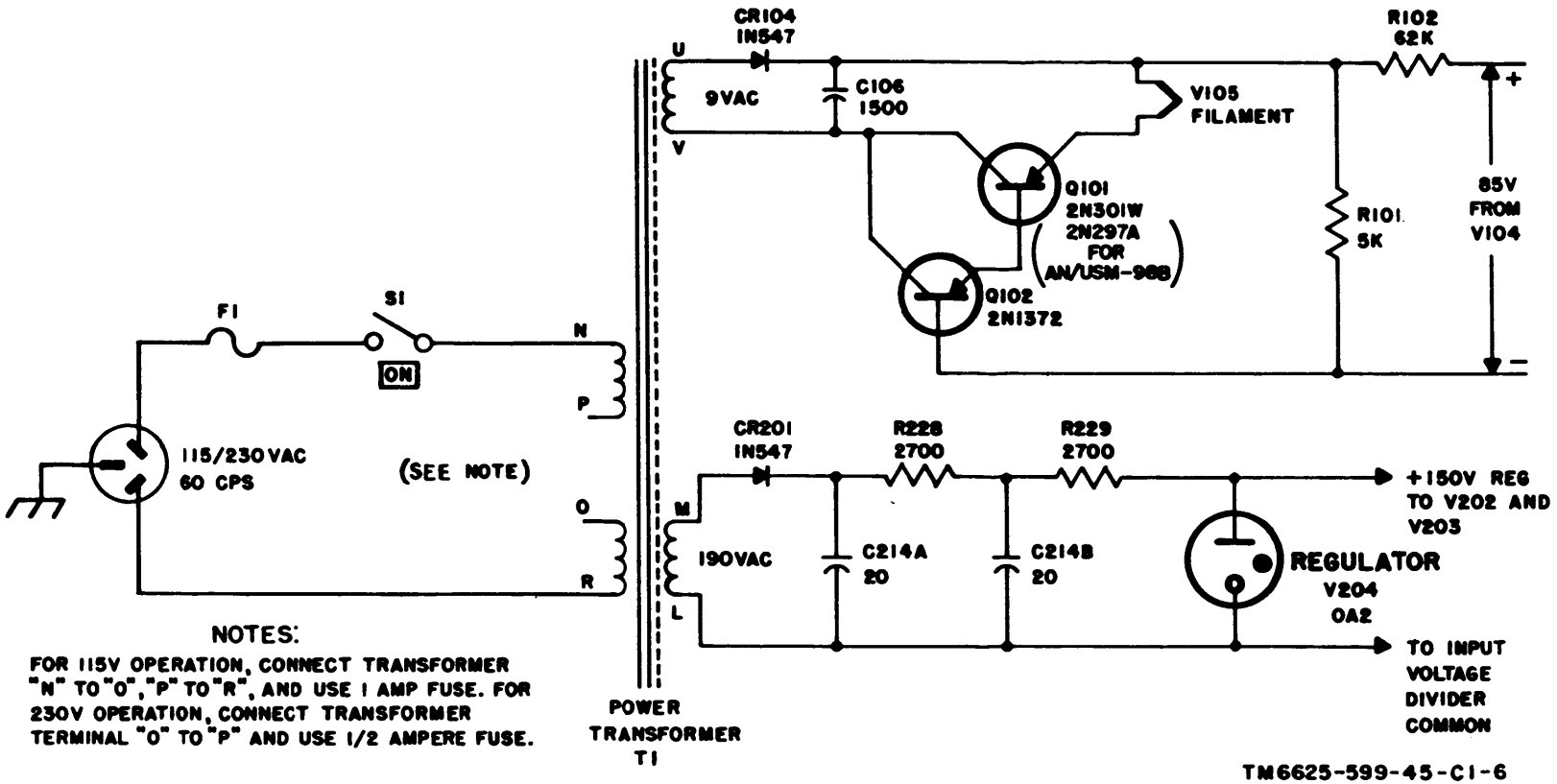


Figure 1-5.1. Low-voltage power supply, AN/USM-98B, schematic diagram.

tubes V102 and V106 are operated at approximately +110 volts to prevent voltage breakdown within the tubes. Filament voltage for tubes V202 and V203 and chopper G1 is obtained from a second 6.3-volt ac secondary winding on power transformer T1

for the AN/USM-98A, and a 9-volt ac secondary winding on power transformer T1 for the AN/USM-98B. A small ac voltage is also obtained from this winding to zero meter M1 when no input voltage is applied (para 1-4). Decimal point indicator lamps PL1 through PL4 are energized from a 5-volt ac secondary winding on power transformer T1. The decimal point indicator lamps are selected by level A of RANGE switch S2.

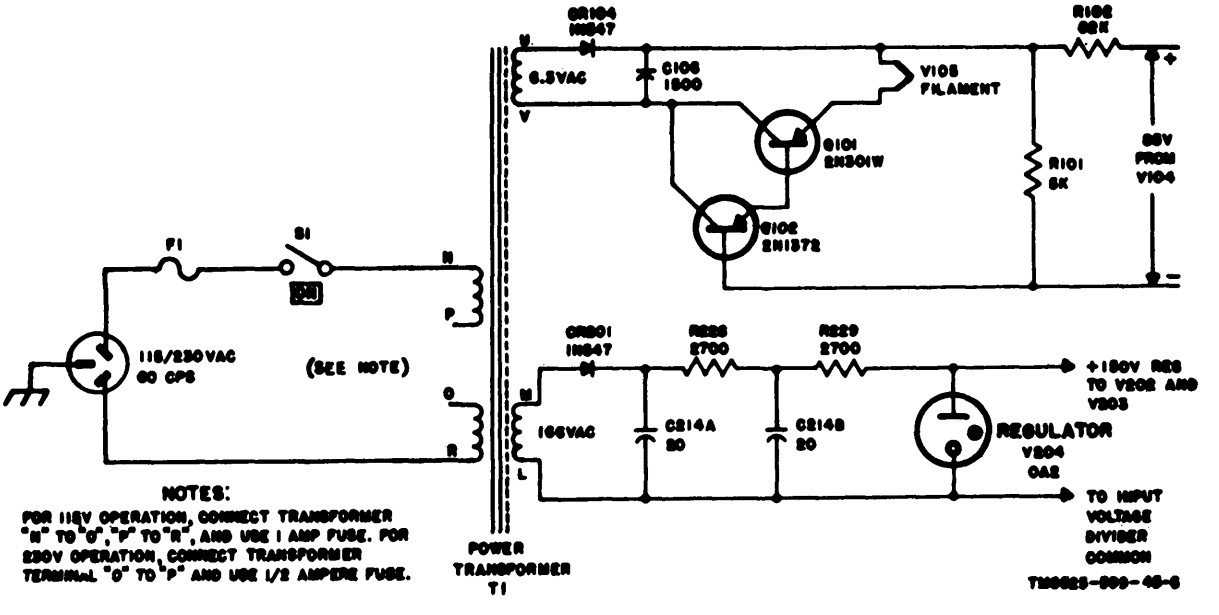


Figure 1-5. Low-voltage power supply, schematic diagram AN/USM-98A.

CHAPTER 2

TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

Warning: **Be extremely careful when servicing the vtvm with the case removed. Voltages in the range of 600 volts exist in the +500-volt reference power supply. Always disconnect the power cord and discharge the filter capacitors in the power supply before performing any servicing procedures.**

2-1. General Instructions

The general support and depot maintenance procedures are not complete in themselves, but supplement the operational checklist procedures given in TM 11-6625-599-12. The systematic troubleshooting procedure consists of sectionalizing, localizing, and isolating techniques. Paragraphs 2-4 and 2-5 contain techniques applicable to the vtvm as a unit. Paragraphs 2-6 and 2-7 contain techniques applicable to isolate a defective resistor in the decade attenuator.

2-2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective vtvm is to localize the fault. Localization means tracing the fault to the circuit responsible for the abnormal condition. Some faults, such as burned-out resistors and arcing or shorted transformers, can often be located by sight, smell, or hearing. The majority of faults, however, must be localized by checking voltages and resistances.

b. Localization. The vtvm can be divided into three circuits: The 0- to 500-volt reference power supply, the 60- Hz chopper amplifier, and the low-voltage supply. The first step in tracing trouble is to locate the circuit at fault by the following methods:

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without the testing or measuring of circuits. All meter readings and other signs should be observed and an attempt made to localize the fault to a particular circuit.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help in determining the exact nature of the fault. The operational checklist given in TM 11-6625 599-12 is an operational test.

c. Isolation. After the trouble has been localized, the next step is to isolate the specific component, or components, responsible for the improper operation. The tests listed below will aid in isolating the trouble.

Caution: **Remove the plug to standard cell B1 before taking voltage and resistance measurements to prevent accidental shorting and resulting damage.**

(1) *Voltage and resistance measuerments.* This equipment contains a transistorized regulator for filament voltage to tube V105 in the 500-volt reference supply. Observe all precautions given to prevent transistor damage. Make voltage and resistance measurements in this equipment only as specified. When measuring voltages, use tape or sleeving to insulate the entire test prod, except for the extreme tip. A momentary short circuit can ruin the transistor. (For example, if the bias is shorted out, excessive current between the emitter and the base would

ruin the transistor.) Use resistor and capacitor color codes (fig. 5-2 and 5-3) or the overall schematic diagram (fig. 5-8, 5-8.1, and 5-9) to determine component values. Use the voltage and resistance diagram (fig. 5-7) to find normal readings and compare them with readings taken. The dc resistances of the power transformer windings are listed in figures 2-1 and 2-1.1.

Caution: **Use only *voltage* measurements to localize faults in the transistorized regulator for filament voltage to tube V105 in the 500- volt reference supply. Do not make any *resistance* measurements on transistor terminals. The multimeter battery can destroy the transistors by causing excessive current through them.**

(2) *Troubleshooting chart.* The symptoms listed in the troubleshooting chart (para 2-5) will aid in isolating trouble to a component part. Use figures 2-2 through 2-9 for component location.

(3) *Intermittent troubles.* The possibility of intermittent troubles should not be overlooked in any tests. Intermittent troubles can often be made to appear by gently tapping or jarring the equipment. Check the wiring and connections with the vtvm. Faulty components, which change value as the equipment warms up, can be made to appear by gently heating with a warm soldering iron held near the suspected part.

2-3. Test Equipment Required for Troubleshooting

The following chart lists test equipment required for troubleshooting the vtvm. Also listed are the associated manuals and the common names.

Test Equipment	Technical Manual	Common Name
Test Set, Electron Tube TV-2/U (NSN 6625-00-669-0263)	TM 11-6625-316-12	Tube Tester
Voltmeter, Digital AN/GSM-64B (NSN 6625-00-022-7894)	TM 11-6625-444-14-1	Digital Voltmeter
Voltmeter, AC, IS-185 (NSN 6625-00-405-6608) or Voltmeter, Electronic ME-202/U (NSN 6625-00-709-0288)	TM 11-6625-537-15	AC Voltmeter
Multimetcr TS-352B/U (NSN 6625-00-553-0142)	TM 11-6625-366-10	Multimeter

AC Nominal Voltage	Winding Identification	Resistance (OHMS)	Remarks
115	N-P	.797	PRIMARY
115	O-R	.797	PRIMARY
535	A-B	439	500-VOLT REFERENCE SUPPLY
6.3	E-F	.257	FILAMENT VOLTAGE TO V102 AND V106
5	H-G	.206	FILAMENT VOLTAGE TO PL1 THROUGH PL4
6.3	J-K	.143	FILAMENT VOLTAGE TO G1, V203 AND V202
166	M-L	89.4	+ 150-VOLT SUPPLY
6.3	U-V	.375	FILAMENT VOLTAGE TO V105

TM6625-599-45-7

Figure 2-1. Power transformer T1, voltage and resistance data, AN/USM-98A.

AC NOMINAL VOLTAGE	WINDING IDENTIFICATION	RESISTANCE (OHMS)	REMARKS
115	N – P	.797	PRIMARY
115	O – R	797	PRIMARY
580	A – B	439	500-VOLT REFERENCE SUPPLY
6.3	E – F	.25	FILAMENT VOLTAGE TO V102 AND V106
6.3	H – G	.25	FILAMENT VOLTAGE TO PL1 THROUGH PL4
6.3	J – K	.143	FILAMENT VOLTAGE TO G1, V203 AND V202
190	M – L	89.4	+150-VOLT SUPPLY
9.0	U – V	.375	FILAMENT VOLTAGE TO V105

Figure 2-1.1. Power transformer T1, voltage and resistance data, AN/USM-98B.

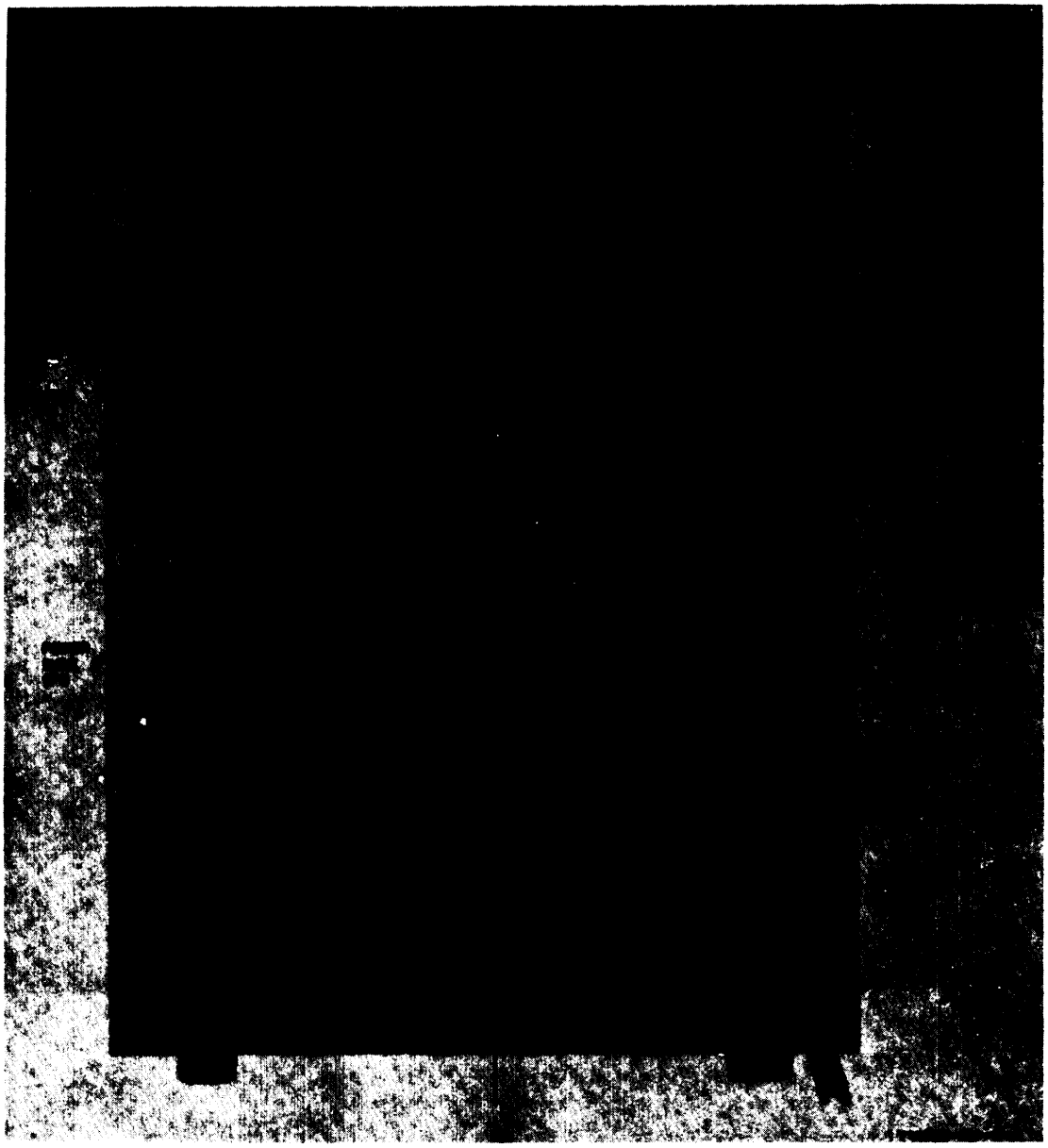


Figure 2-2. Voltmeter, Electronic AN/USM-98A, rear view, showing component location.

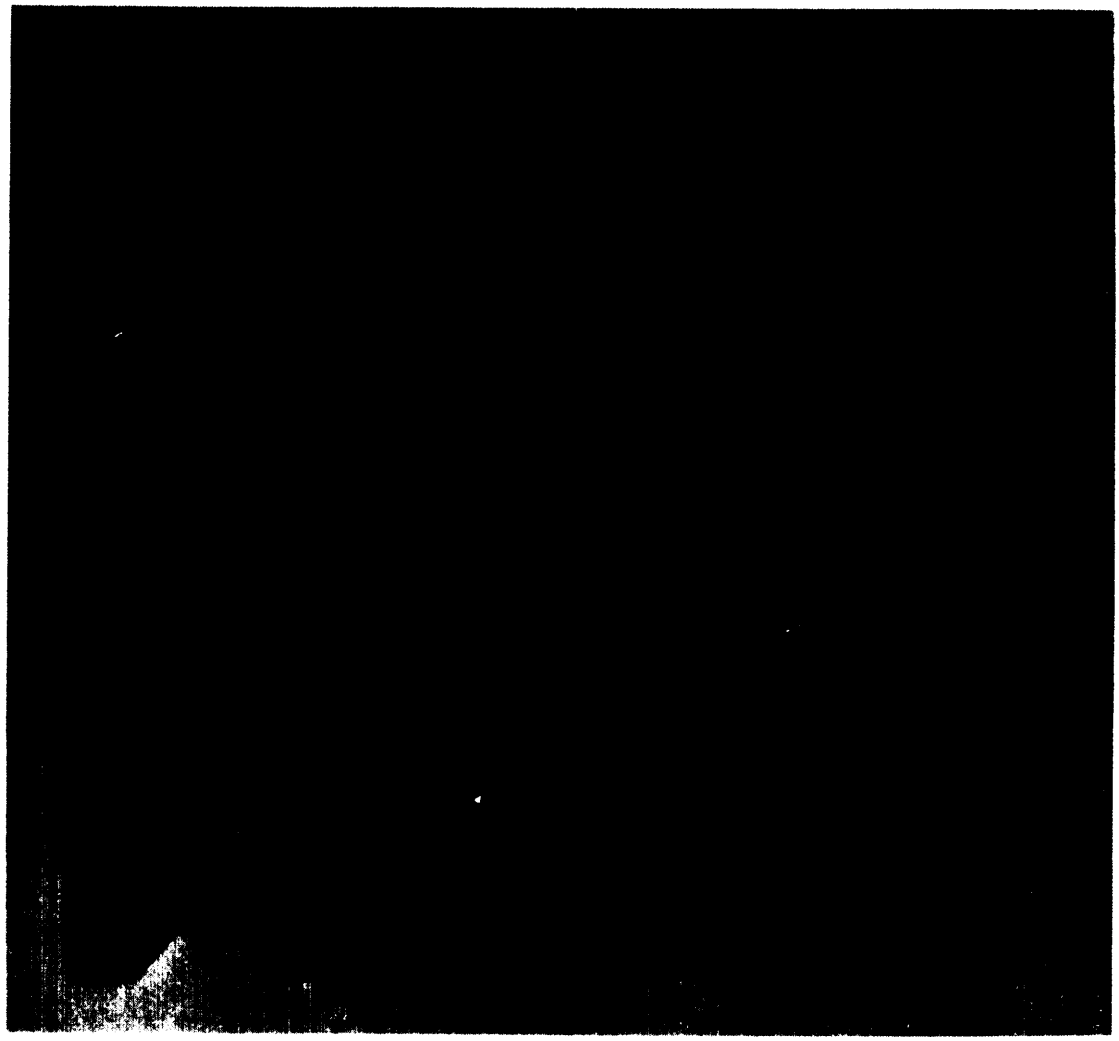


Figure 2-3. Voltmeter, Electronic AN/USM-98A, left side view, showing component location.

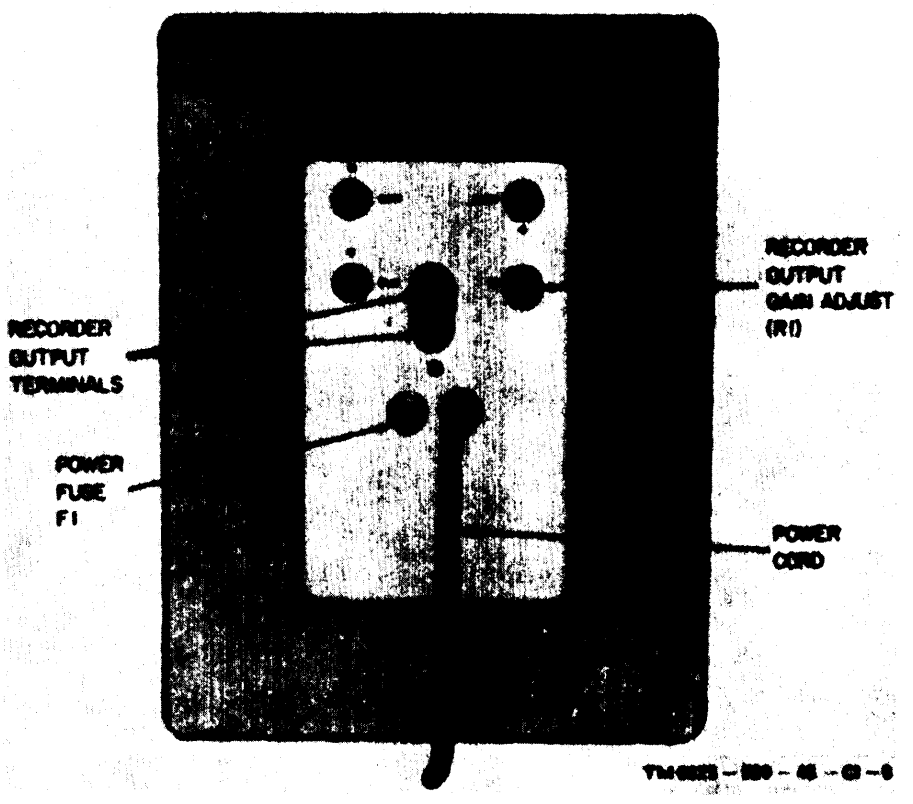


Figure 2-2.1. Voltmeter, Electronic AN/USM-98B, rear view showing component location.

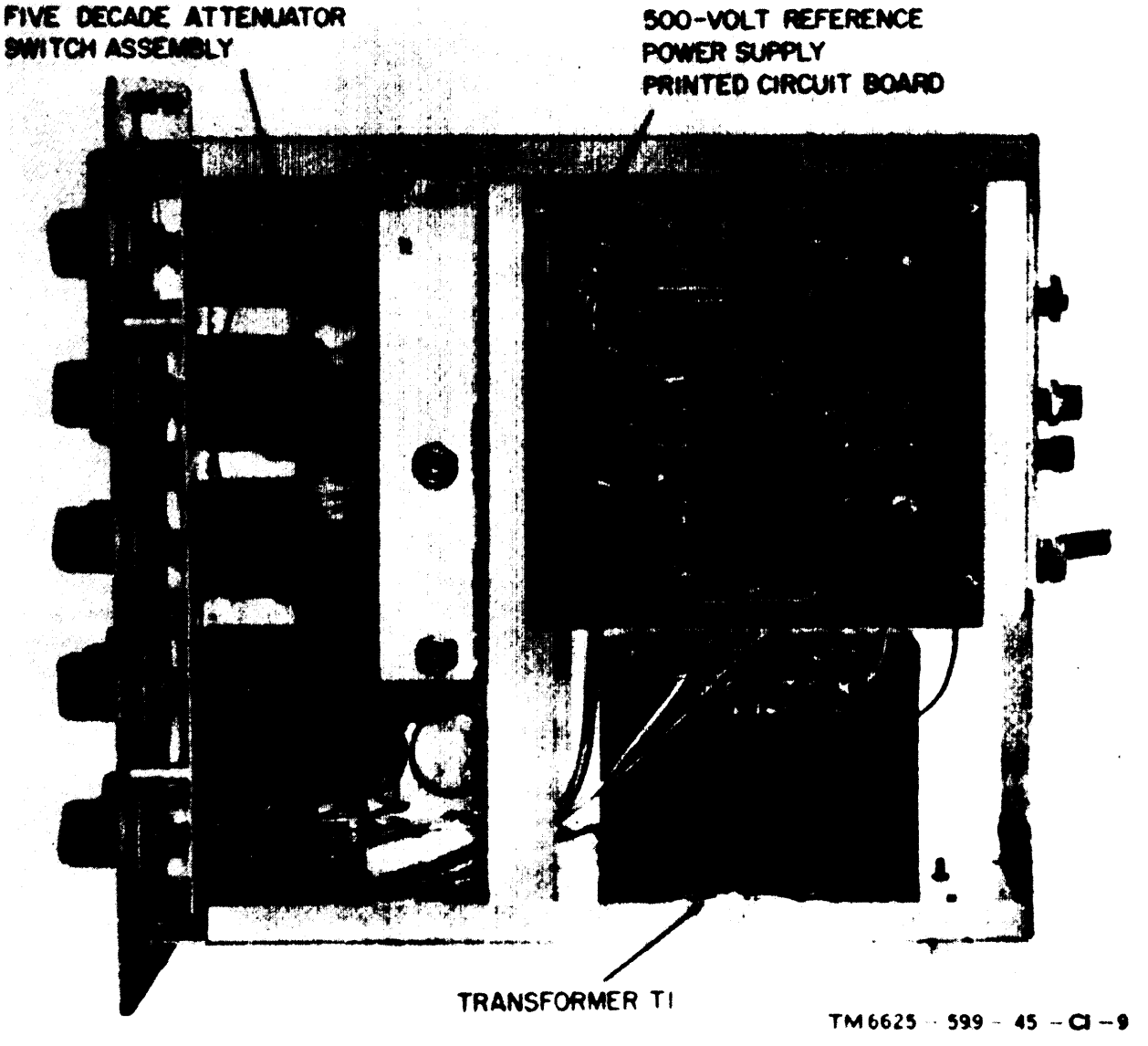
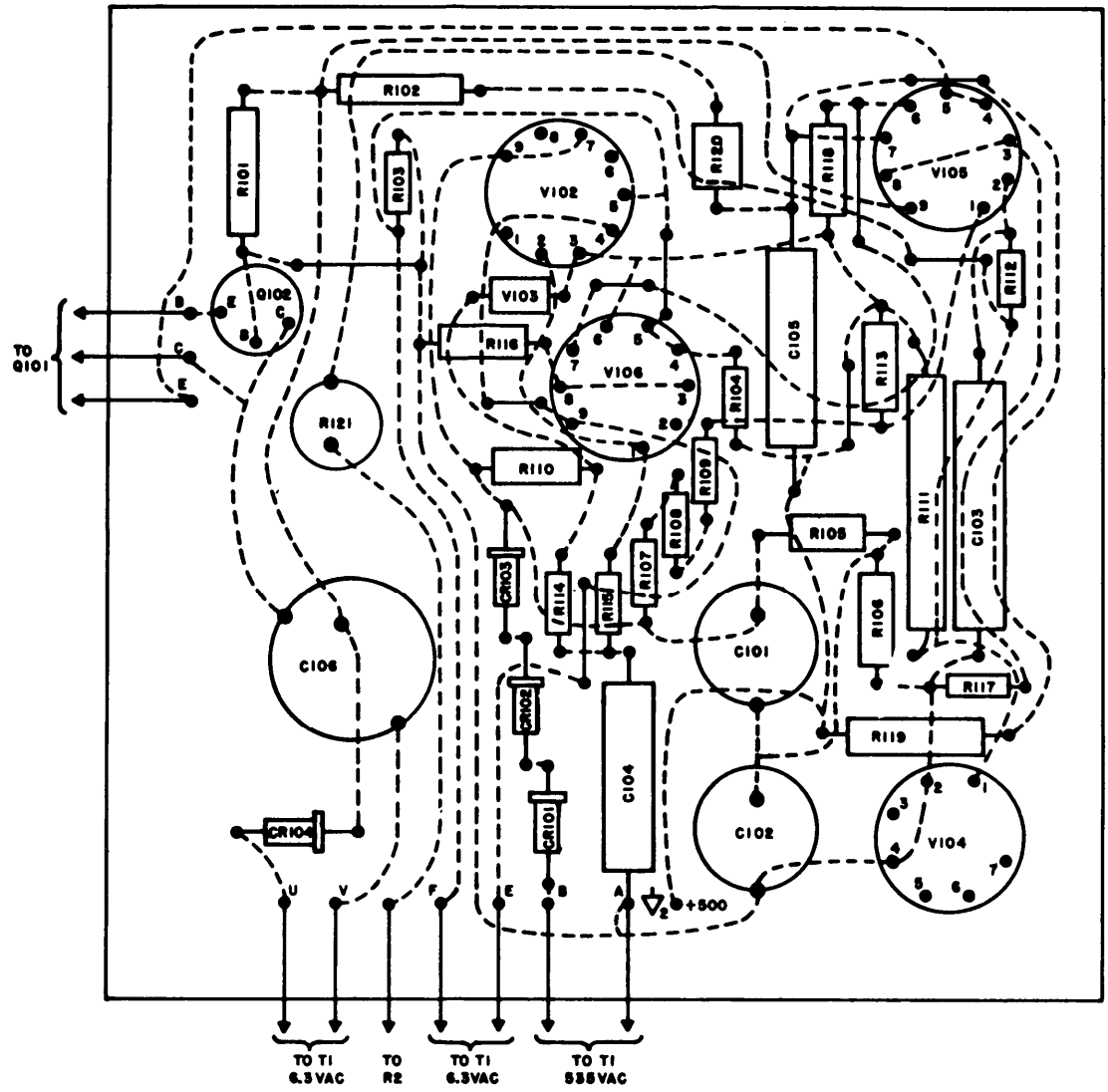


Figure 2-3.1. Voltmeter, Electronic AN/USM-98B, left-side view, showing component location.



NOTES:

1. CIRCUIT VIEWED FROM SIDE ON WHICH COMPONENTS ARE MOUNTED.
2. —— PARTS AND PIGTAILS ON FRONT OF BOARD.
3. ---- WIRING ON BACK OF BOARD.
4. ▷ DENOTES REFERENCE VOLTAGE SUPPLY COMMON TERMINAL.
5. +500 DENOTES 500-VOLT REFERENCE VOLTAGE TERMINAL.

TM6625-599-45-10

Figure 2-4. Reference power supply 500-volt printed circuit board.

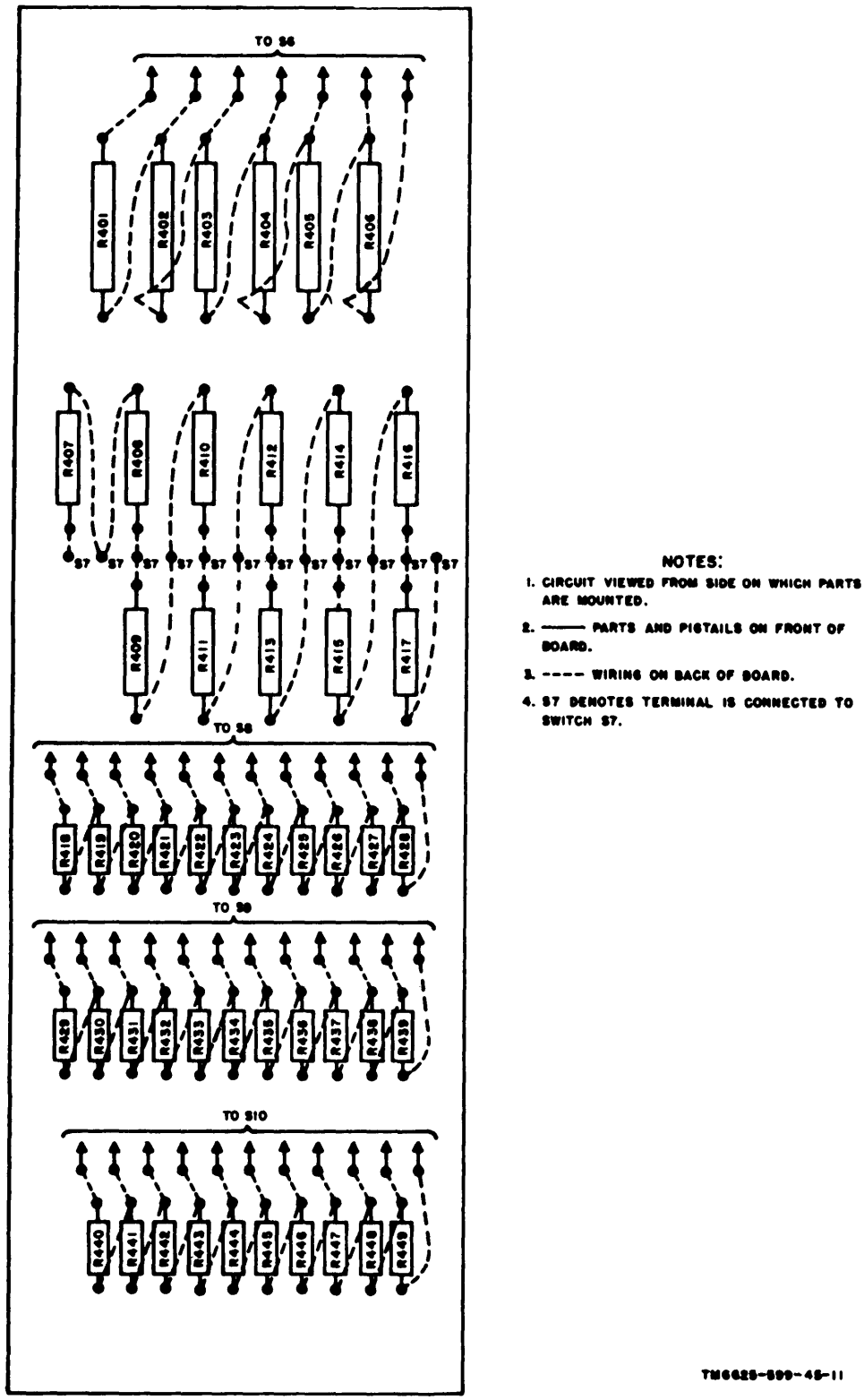
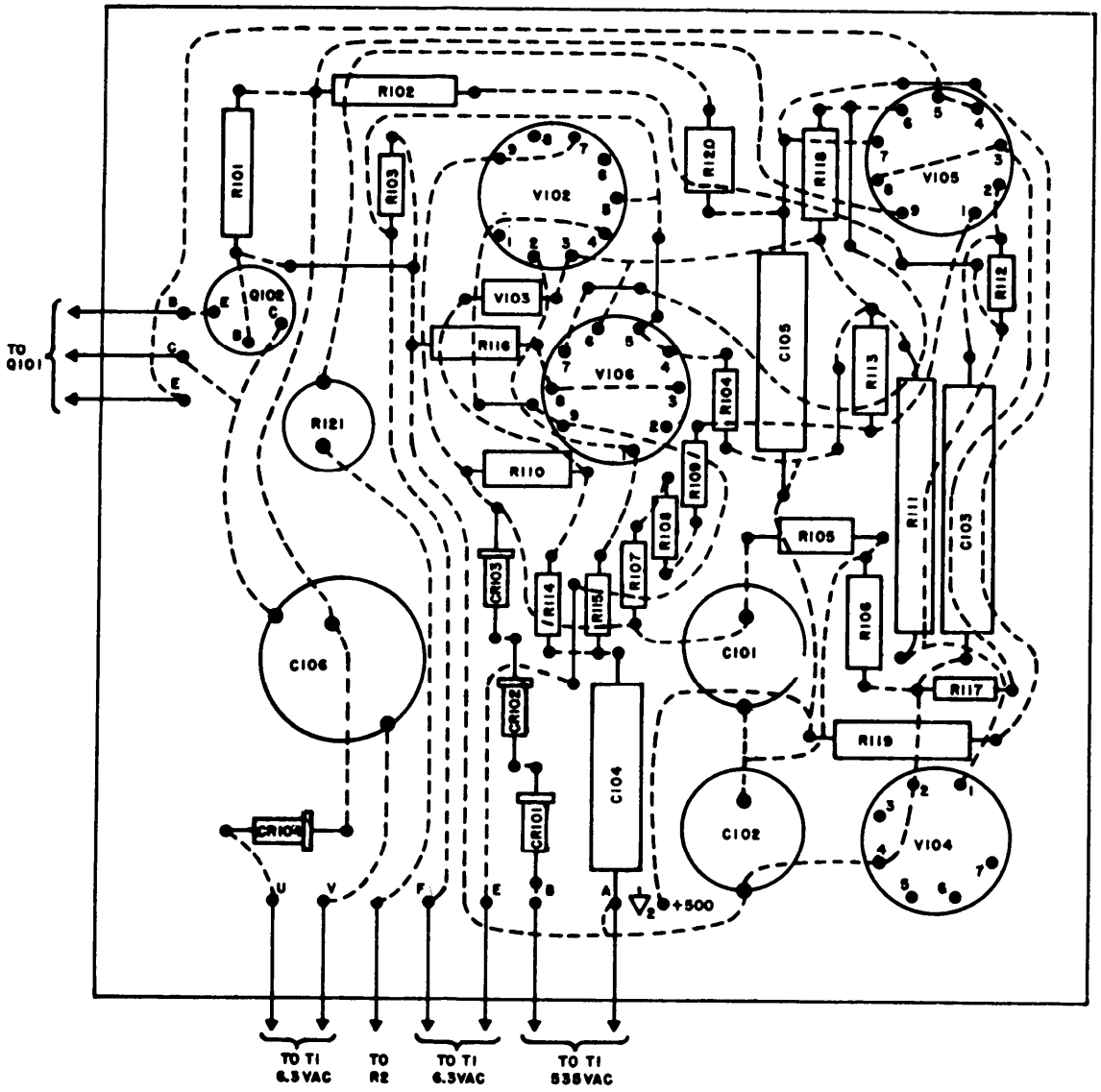


Figure 2-5. Five-decade attenuator printed circuit board.



NOTES:

1. CIRCUIT VIEWED FROM SIDE ON WHICH COMPONENTS ARE MOUNTED.
2. —— PARTS AND PIGTAILS ON FRONT OF BOARD.
3. ---- WIRING ON BACK OF BOARD.
4. ▷ DENOTES REFERENCE VOLTAGE SUPPLY COMMON TERMINAL.
5. +500 DENOTES 500-VOLT REFERENCE VOLTAGE TERMINAL.
6. R121 NOT ON BOARD IN AN/USM-988.

TM6625-599-45-C1-10

Figure 2-4.1. Reference Power Supply 500-volt printed circuit board.

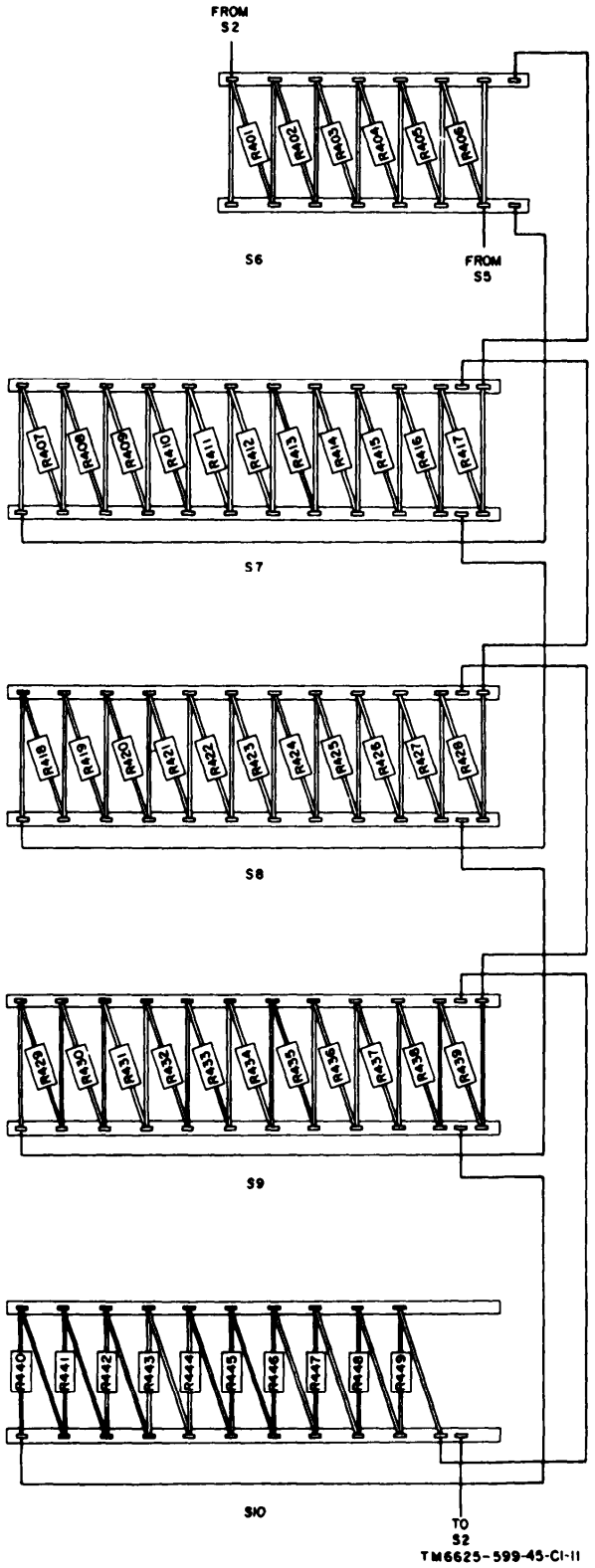


Figure 2-5.1. Five-decade attenuator switch assembly.

18.2 Change 1

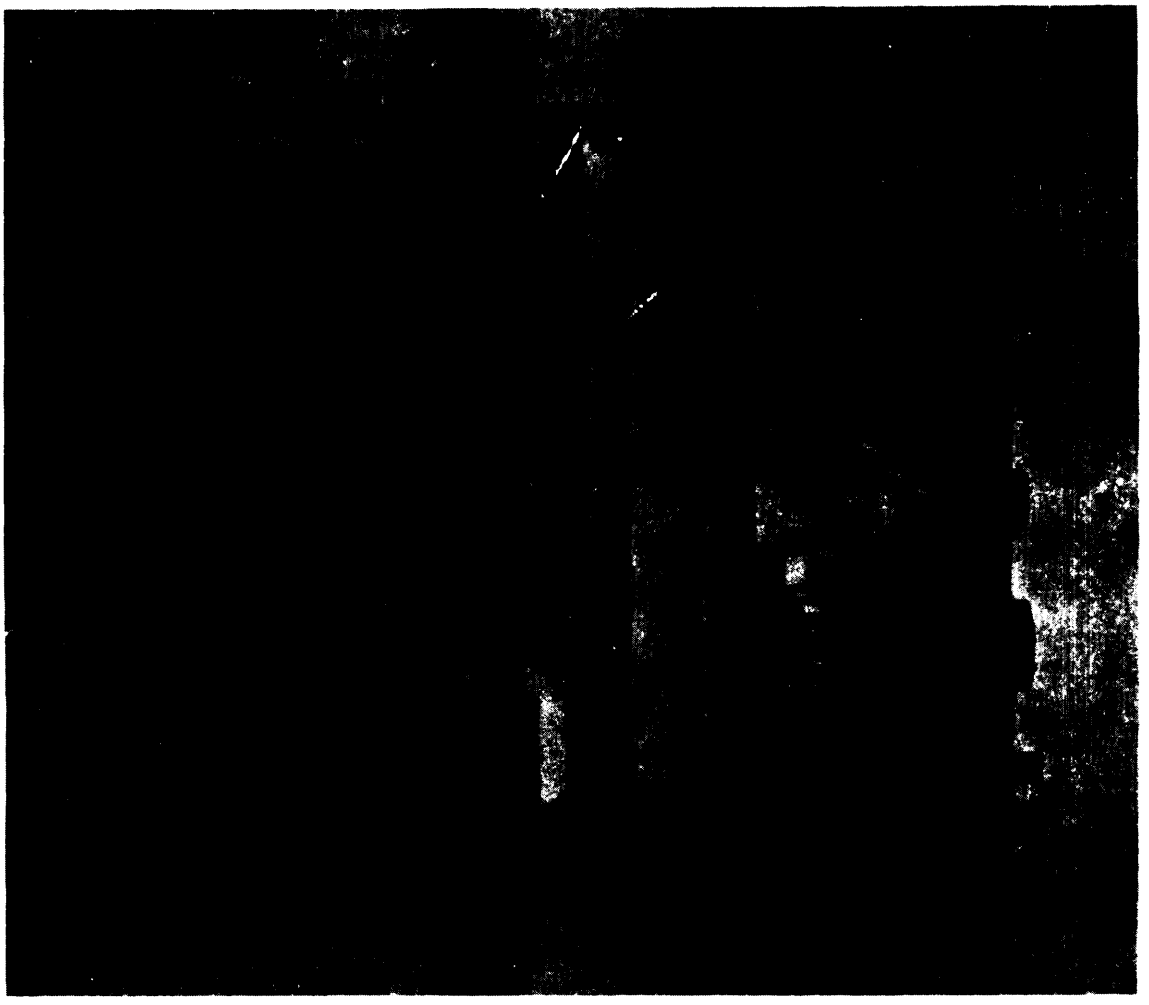
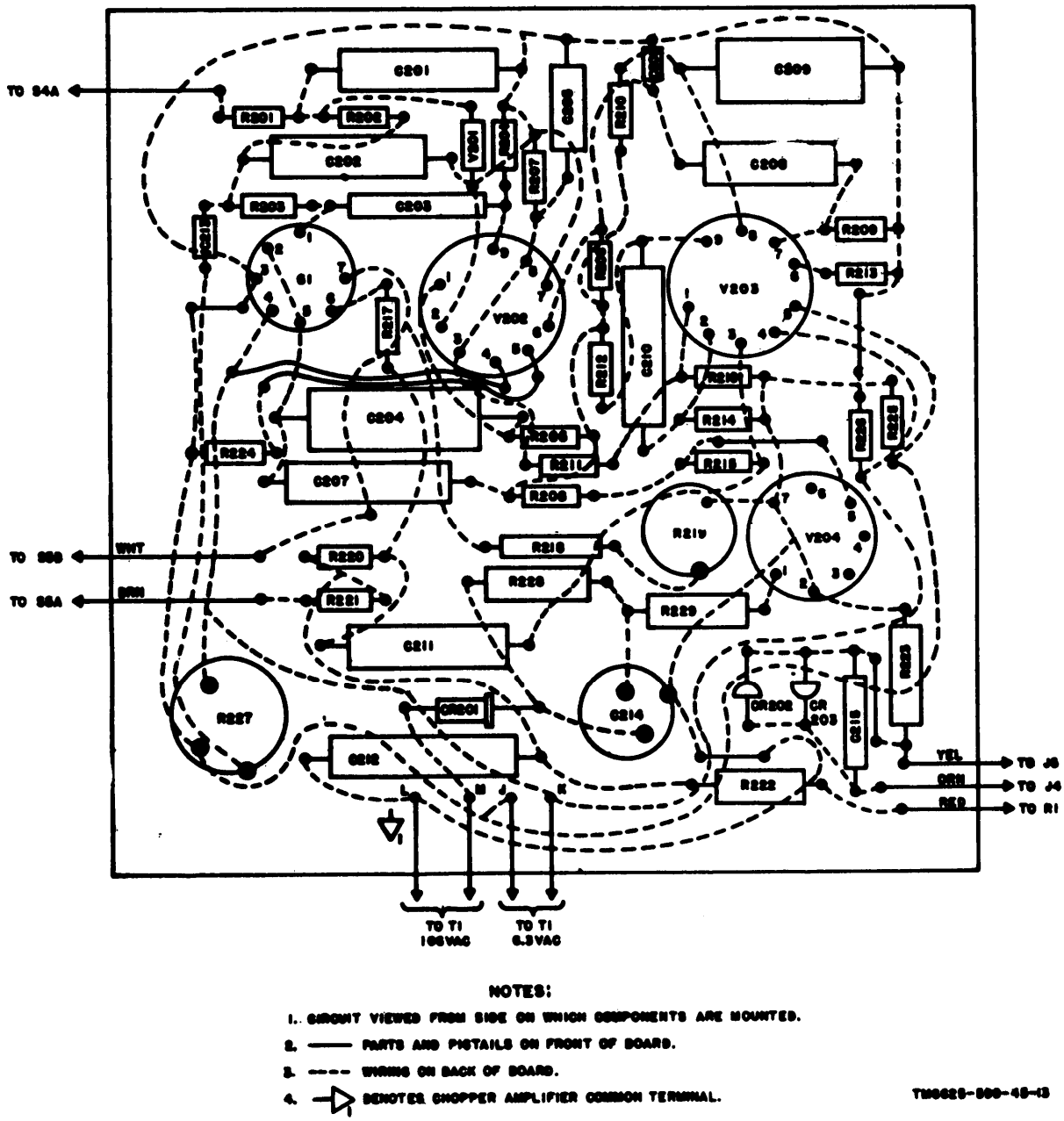


Figure 2-6. Voltmeter, Electronic AN/USM-98A, right side view, showing components.



NOTES:

1. CIRCUIT VIEWED FROM SIDE ON WHICH COMPONENTS ARE MOUNTED.
2. —— PARTS AND PIGTAILS ON FRONT OF BOARD.
3. ---- WIRING ON BACK OF BOARD.
4. ▽ DENOTES CHOPPER AMPLIFIER COMMON TERMINAL.

TM6625-599-45-13

Figure 2-7. Chopper amplifier printed circuit board.

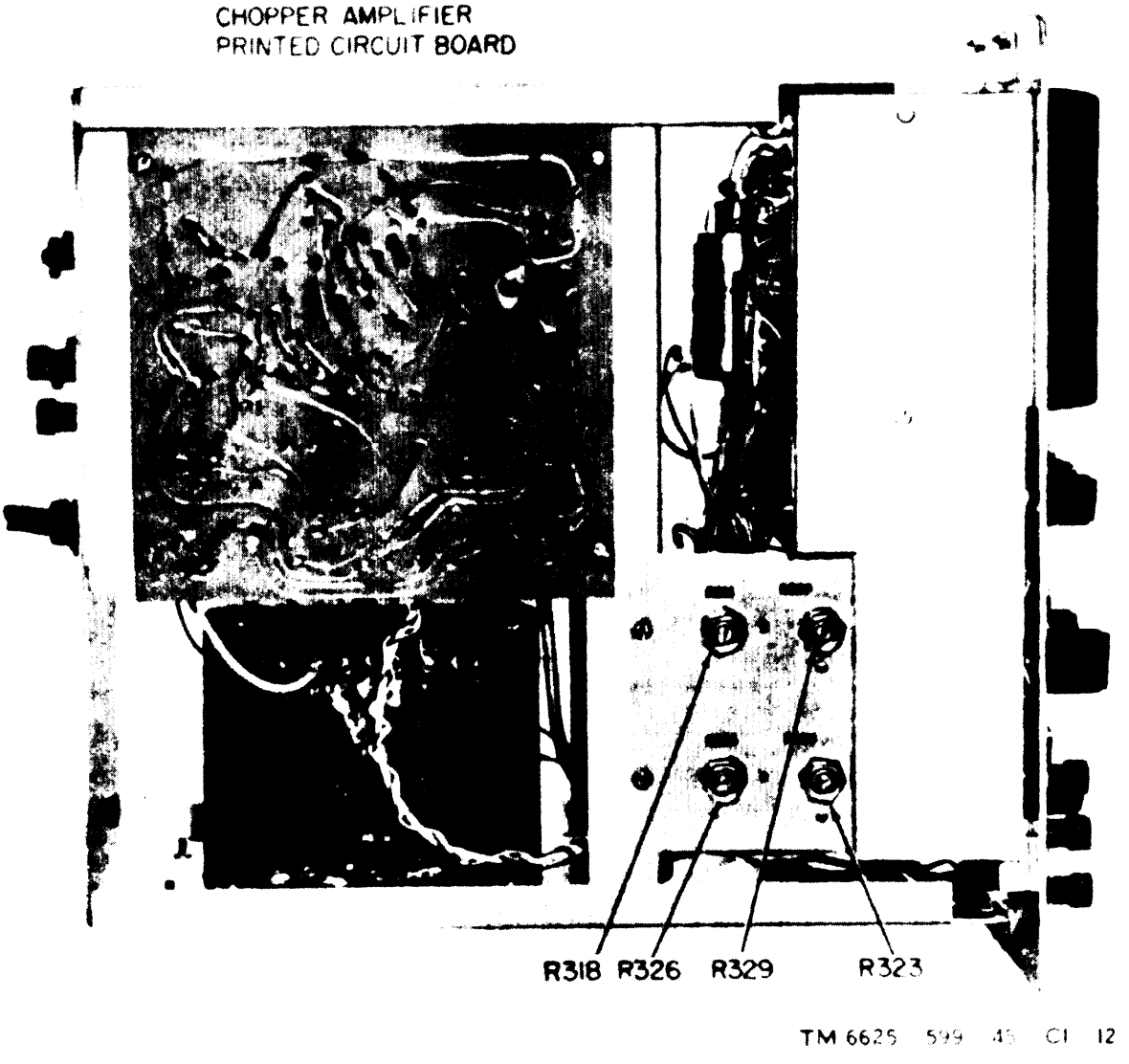
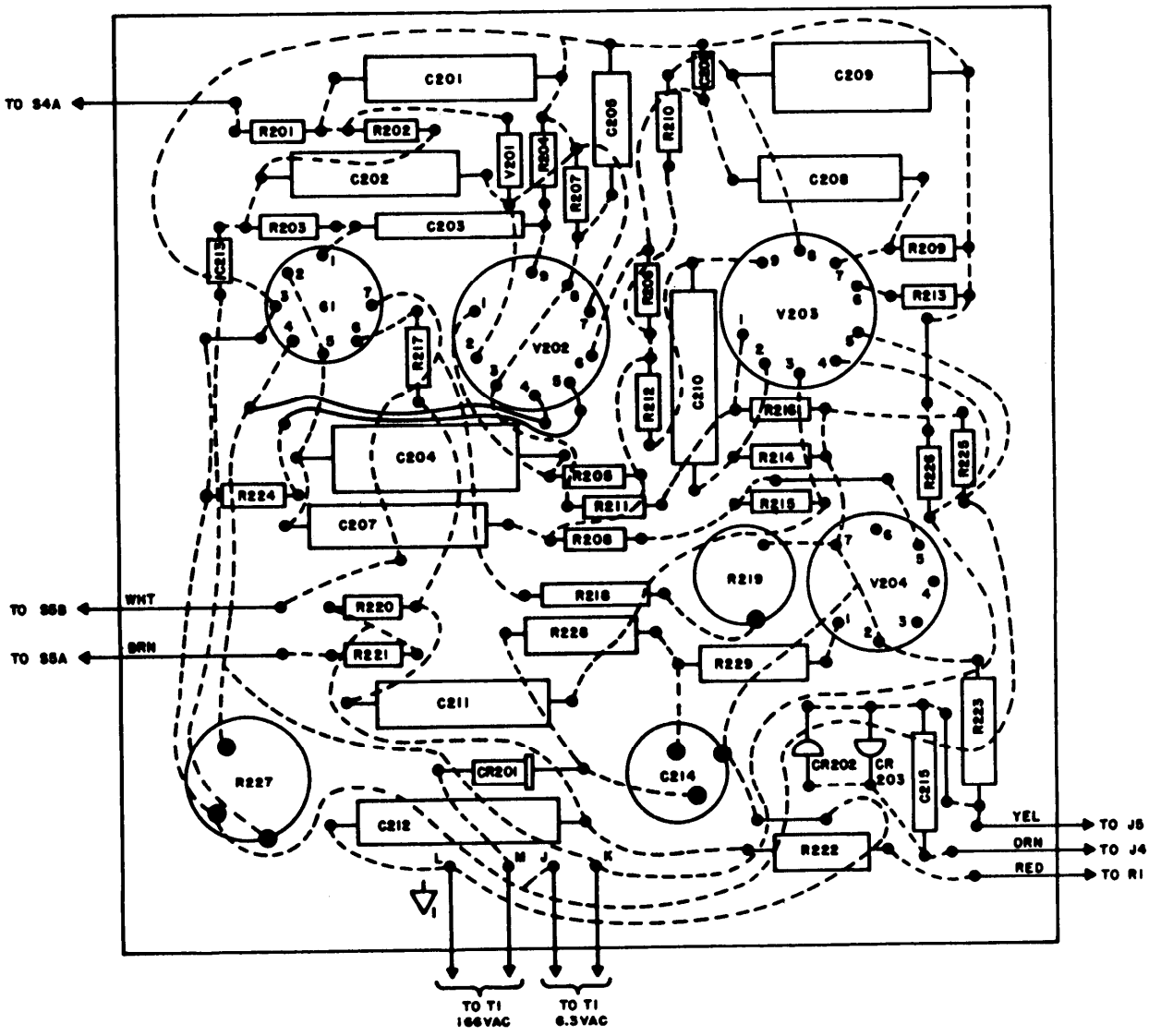


Figure 2-6.1. Voltmeter, Electronic AN/USM-98B, right-side view, showing components.



NOTES:

1. CIRCUIT VIEWED FROM SIDE ON WHICH COMPONENTS ARE MOUNTED.
2. —— PARTS AND PIGTAILS ON FRONT OF BOARD.
3. ---- WIRING ON BACK OF BOARD.
4. ▷ DENOTES CHOPPER AMPLIFIER COMMON TERMINAL.
5. R219 AND R227 NOT ON BOARD IN AN/USM-966.

TM6625-599-45-CI-13

Figure 2-7.1. Chopper Amplifier Printed Circuit Board.

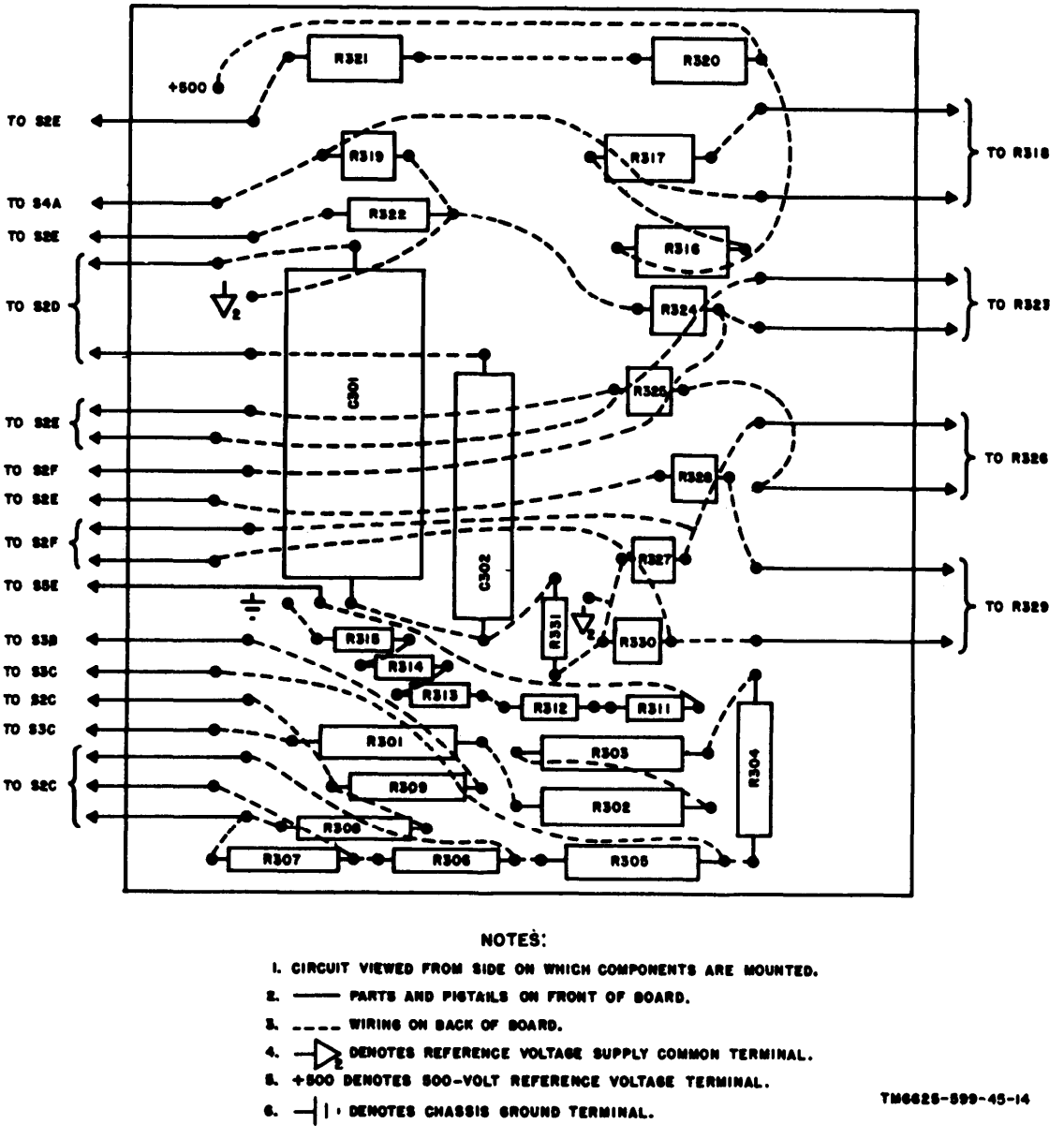


Figure 2-8. Range resistor printed circuit board.

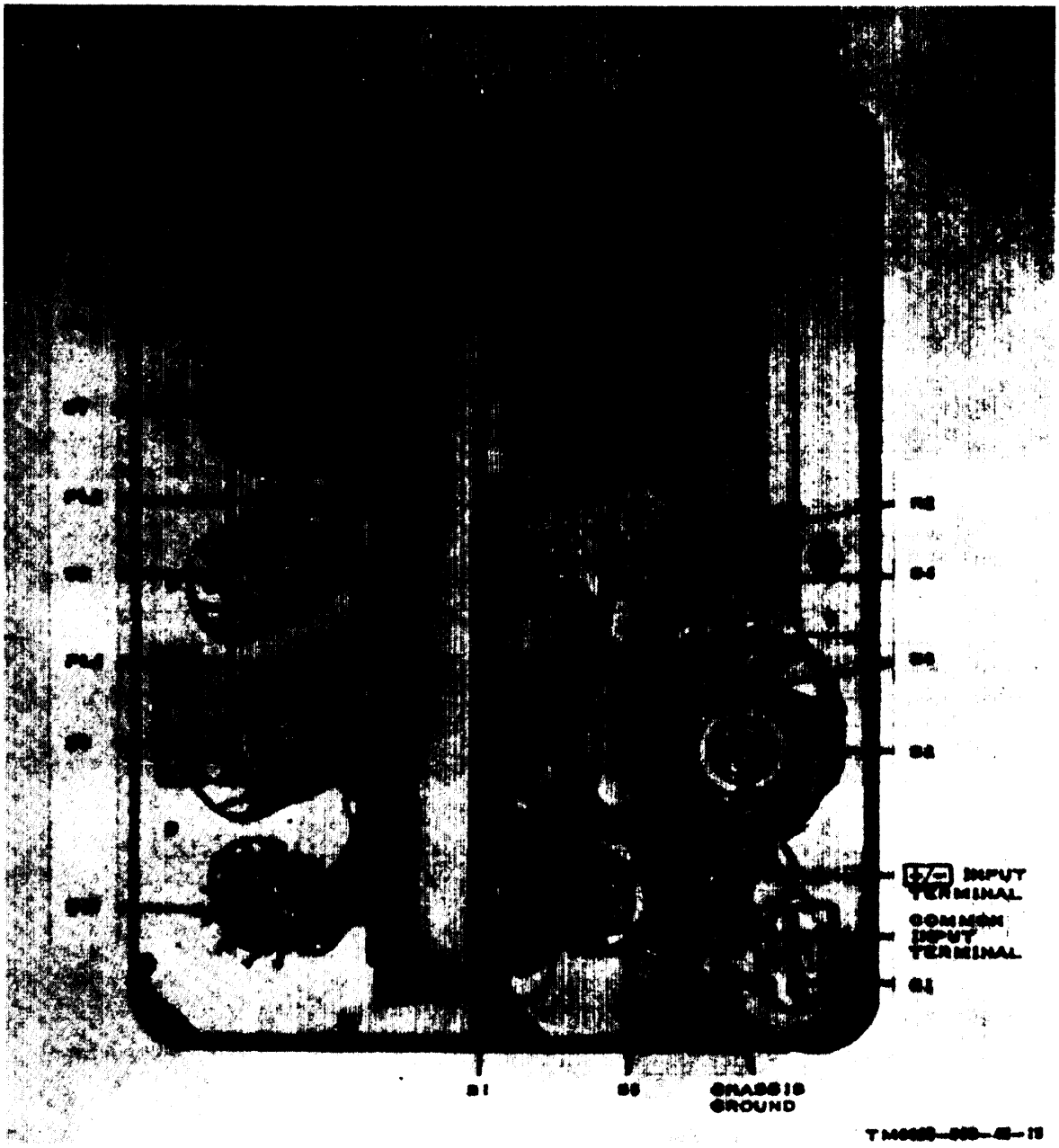


Figure 2–9. Voltmeter, Electronic AN/USM–98A, front panel, rear view, showing component location.

Section II. TROUBLESHOOTING VOLTMETER, ELECTRONIC AN/USM-98(*)

2-4 Troubleshooting Sequence

Troubleshooting of the vtvm is accomplished with the use of the schematic diagram (fig. 5-8), the voltage and resistance measurements (fig. 2-1, 2-1.1, and 5-7), and the troubleshooting chart (para 2-5). Parts locations are indicated in figures 2-2 through 2-9. Many troubles in the vtvm can be quickly isolated by scanning the list of symptoms in the troubleshooting chart. If a corresponding symptom cannot be found, or if no operational symptoms are known, perform the calibration and test procedures (para 3-7 and 3-8).

2-5. Troubleshooting Chart

The troubleshooting chart lists the probable causes corresponding to malfunction symptoms obtained during operational checks. Voltage and resistance measurements should be used to supplement the troubleshooting chart and isolate the trouble to a particular part.

Caution: **If the vtvm is tilted more than 15°, it must be set in the normal upright position for a period of 48 hours before the vtvm will regain its calibrated accuracy.**

	Symptom	Probable trouble	Correction
1	Power fuse blown	Short within instrument (fig. 2-1, 2-1.1, 5-8, 5-8.1, and 5-9).	Check for short circuits at transformer secondary terminals. ***Caution:*** **A transistor voltage regulator is connected to secondary terminals U and V of power transformer T1.**
2	No buzzing from 60- Hz chopper G1.	No voltage to G1 Faulty G1	Check for nominal 6.3 volts ac between pins 3 and 4 of G1. Replace G1.
3	Meter cannot be zeroed by adjusting VTVM ZERO ADJ R227.	Faulty tube V202 or V203 Defective chopper G1 Electrical leakage to chopper amplifier.	Check V202 and V203 by replacement, Replace chopper G1. Clean instrument (para 3-6).
4	Excessive drift in 500-volt reference power supply. Vtvm must be recalibrated every 5 to 10 minutes.	Faulty tube V104, V105, or V106. One of the sampling string resistors (R119, R120, R121) is changing value rapidly as instrument warms up.	Check V104, V105, V106 by replacement. Locate faulty resistor by heating slightly with a warm soldering iron held near the part. Observe meter with OPERATE-CALIBRATE switch set to CALIBRATE. Replace faulty component.
5	Cannot calibrate 500-volt reference power supply. VOLTS meter M1 cannot be brought to zero with CALIBRATE control.	Out of calibration Excessive aging of reference tube V104. One or more resistors in the 500-volt sampling string (R119, R120, R121) have shifted value. Faulty standard cell B1	Recalibrate (para 3-7). Check V104 by replacement. Recalibrate (para 3-8) and observe stability for 48 hours. If 500-volt reference power supply remains stable, replacement of resistor is unnecessary. Check and replace B1 if voltage is below 1.019 volts. (The normal service life of B1 is 8 to 15 years.)

Step	Symptom	Probable trouble	Correction
6	Meter indicator deviates more than one-quarter of one small scale division from zero as line voltage is varied between 105 and 130, or between 210 and 260 volts.	Faulty regulator V204 _ _ _ _ _ _ _ Faulty amplifier V202 or V203	Check V204 by replacement. Check V202 and V203 by replacement.
7	Poor regulation of 500-volt reference power supply.	Excessive aging of tube V102, V104, V105, or V106. Poor filament regulation to V105.	Check V102, V104, V105, and V106 by replacement. Check V105 filament voltage for 6 ± 0.06 vdc as line voltage is varied between 105-130 (210-260) volts.
8	Measurements are out of tolerance on one range other than the 500-volt range.	Out of calibration _ _ _ _ _ _ _ _ _ _ _ _ _	Recalibrate (para 3-8).
9	Measurements are out of tolerance on all ranges other than the 500-volt range.	Resistor R320 or R321 has shifted value.	It may be possible to correct all range voltages by recalibration (para 3-8). If not, replace faulty resistor.
10	The 50V ADJ resistor (R323) cannot be adjusted for a null indication on VOLTS meter M1 during calibration.	Faulty component _ _ _ _ _ _ _ _	Check R323 and R324. Replace faulty component.
11	The 5V ADJ resistor (R326) cannot be adjusted for a null indication on VOLTS meter M1 during calibration.	Faulty component _ _ _ _ _ _ _	Check R325 through R327. Replace faulty component.
12	The .5V ADJ resistor (R329) cannot be adjusted for a null indication on VOLTS meter M1 during calibration.	Faulty component _ _ _ _ _ _ _ _ _	Check R328 through R330. Replace faulty component.
13	VOLTS meter M1 rattle, drift or error is observed on all NULL ranges	Tube V202 or V203 is defective. Defective chopper G1 _ _ _ _ _ _ _ Moisture or dirt on printed circuit boards or switches.	Check V202 and V203 by replacement. Replace chopper G1. Clean instrument (para 3-6).
14	Measurements are out of tolerance on any VTVM range.	Out of tolerance resistor in input attenuator, R301 through R309.	Check and replace faulty resistor.
15	Measurements are out of tolerance on any range when voltage-divider switches are set to any setting other than 4999 *10*.	A resistor in the five-decade attenuator is out of tolerance.	Troubleshoot the five-decade attenuator (para 2-6 and 2-7).
16	With RANGE switch set to 500, NULL switch set to .1, voltage-divider switches A through E set to 4, 9, 0, 0, 0 respectively, and polarity switch set to + (positive), VOLTS meter M1 deflects more than 10 percent full scale.	Dust and foreign matter causing leakage.	Clean instrument (para 3-6).

Section III. DECADE RESISTOR FAULT ISOLATION

2-6. Fault Indication

The resistors used in voltage-divider switches A through E are considered to be faulty when measurements are out of tolerance on any range and the voltage-divider switches are set to any setting other than 4999 *10*.

2-7. Fault Isolation Procedure

a. Place the equipment in a clean, draft-free room.

b. Remove the case from the vtvm.

Caution: **Do not touch the wire windings on the card resistors in the five-decade attenuator. Possible damage to the resistor could result.**

c. Remove the cover from the five-decade attenuator printed circuit board (fig. 2-3).

d. Set the vtvm front panel controls as follows:

(1) RANGE switch to 500.

(2) NULL switch to VTVM.

(3) Polarity switch to + (positive).

(4) Voltage divider switches A through E to 4999 *10.*

(5) Power switch to ON.

e. Allow 1 hour for the vtvm to stabilize.

f. Using the digital voltmeter, measure the voltage across each resistor on the five-decade attenuator printed circuit board. A faulty resistor is indicated if the voltage across the resistor exceeds the maximum voltage difference in the following chart:

Resistor	Voltage-divider switch	Nominal voltage across each resistor	Maximum voltage difference across each resistor
R401 and R402	A	50	0.01
R403 thru R406	A	100	0.02
R407 and R408	B	5	0.001
R409 thru R417	B	10	0.002
R418 and R419	C	0.5	0.0001
R420 thru R428	C	1	0.0002
R429 and R430	D	0.05	0.000,01
R431 thru R439	D	0.1	0.000,02
R440 thru R449	E	0.01	0.000,001

CHAPTER 3
REPAIRS AND CALIBRATION

Section I. REPAIRS

3-1. General Parts Replacement Techniques

All parts of Voltmeter, Electronic AN/USM-98(*) can be reached and replaced without special procedures. Do not attempt to replace any of the precision wire-wound resistors with ordinary power resistors, Nichrome resistors, carbon or deposited carbon resistors, or metal film resistors. Use only approved components when making repairs. The vtvm should be recalibrated after any component is replaced.

3-2. Test Equipment Required for Repairs and Calibration

The following chart lists test equipment required for the repair and calibration of the vtvm. It also lists the associated manuals and the common names.

Warning: **Be extremely careful when servicing the vtvm with the case removed. Voltages in the range of 600 volts exist in the +500-volt reference power supply. Always disconnect the power cord and discharge the filter capacitors in the power supply before performing any servicing procedures. When securing plastic safety shields (7A, fig. 3-3) to the chassis, use the plastic screws provided.**

3-2.1 Safety Features

The vtvm produced under Contract DAAB07-74-C-0622 includes plastic shields and appropriate warning labels to minimize exposure to dangerous electrical shock. These devices are included for your protection; make sure that they are installed in their proper position if removed during maintenance. Replace illegible warning labels (8A, Fig. 3-3).

Test equipment	Technical manual	Common name
Test Set, Electron Tube TV-7D/U (NSN 6625-00-820-0064)	TM 11-6625-274-12	Tube tester
Transformer, Variable Power CN-16/U (NSN 5950-00-688-5722)		Variac
Voltmeter, Digital AN/GSM-64B (NSN 6625-00-022-7894)	TM 11-6625-444-14-1	Digital voltmeter
Voltmeter, AC, IS- 185 (NSN 6625-00-405-6608) or		AC voltmeter
Voltmeter, Electronic ME-202/U (NSN 6625-00-709-0288)	TM 11-6625-537-15	
Power Supply PP-3135/U (NSN 6625-0-635-7991)	TM 11-6130-231-14	Power supply
Multimeter TS-352B/U (NSN 6625-00-553-0142)	TM 11-6625-366-10	Multimeter
Tool Kit, Electronic Equipment TK-105/G (NSN 5180-00-610-8177)		Tool kit

3-3. Replacement of Tubes

Caution: **Do not rock or rotate a tube when removing it from its socket; use a tube puller and pull the tube straight out.**

a. General. Before replacing any tubes, check the power cord and fuses as the possible source of trouble. If the trouble is not found, follow the instructions given in b and c below to check the tubes.

b. Use of Tube Tester. Remove and test one tube at a time. Discard a tube only if a defect is obvious or the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit. Replace the original tube, or insert a new one if required, before testing the next one.

c. Tube Substitution Method. Replace a suspected tube with a new tube. If the equipment still does not work, remove the new tube and put back the original tube. Repeat this procedure with each suspected tube until the defective tube is located.

Note: This method will not work when more than one tube is defective in the same circuit.

3-4. Replacement of Decimal Point Indicator Lamp

a. Remove the two securing screws at the rear of the vtvm.

b. Pull the chassis out of the case.

c. Remove the four screws that secure the front panel assembly to the chassis.

Caution: **Be careful when handling the front panel to prevent damage to the wiring.**

d. Gently lift the front panel assembly from the chassis and set it facedown in front of the chassis.

e. Remove the screws that secure the range resistor and five-decade attenuator printed circuit boards to the front panel assembly.

f. Push the printed circuit boards aside enough to reach decimal lampholders PL1, PL2, PL3, or PL4 (fig. 2-9).

g. Press the sides of the lampholder together and remove the lampholder from the mounting plate.

h. Remove the paper shield from the decimal point indicator lamp.

i. Press in on the defective decimal point indicator lamp and turn it counterclockwise to unlock.

j. Pull the defective indicator lamp out and replace it. Press the new decimal point indicator lamp into the socket and turn it clockwise to lock.

k. Replace the paper shield and press the sides of the lampholder to insert the shield in mounting plate.

1. Replace the printed circuit boards on the front panel.

m. Secure the front panel to the chassis.

n. Replace the chassis in the case and secure it with the two screws.

3-5. Replacement of Printed Circuit Board Components

WARNING

When replacing capacitor C101 or C102 (25, Fig. 3-4) on circuit card assembly TB1, enclose capacitor with plastic tubing (25A, fig. 3-4) by heat shrinking.

a. Clean the soldered area around the component with methyl ethyl ketone (Federal Specification TT-M-261).

Caution: **A transistorized regulator is used for the filament voltage to V105 in the 500- volt reference supply. Transistors may be damaged by use of a high-heat soldering iron. Use a pencil-type iron with 25-watt maximum capacity. If the iron must be used with ac, use an isolating transformer between the iron and the line. Do not use a soldering gun; damaging voltages can be induced in the components.**

b. Remove the part and install the new component.

c. Remove the flux with DuPont Freon PC.

d. Allow to dry for 10 minutes. If it is cool or humid, it may be necessary to place the area under a lamp to insure thorough drying.

e. Coat any uncoated areas around resistors R305 through R309 on the range resistor printed circuit board, and around tube V202 and chopper G1 on the chopper-amplifier printed circuit board with Humi-Seal 1B12 (Columbia Technical Corp., Woodside, New York).

3-5.1. Replacement of Standard Cell B1

a. Remove the screws (4, fig. 3-1) and remove chassis from the case.

b. Remove the screws (5), nuts (7), and washers (6) that secure the front panel assembly (8) to the chassis (3).

Caution: **Be careful when handling the front panel to prevent damage to the wiring.**

c. Gently lift the front panel assembly from the chassis.

d. Remove the screws (11, fig. 3-2) and washers (12) that secure bracket (6).

e. Separate insulators (7) from standard cell B1 (8).

f. Replace the defective standard cell B1 and place the insulators (7) in the bracket (6) recess.

g. Secure the bracket (6) with washers (12) and screws (11).

h. Secure the front panel (8, fig. 3-1) to the chassis (3) with screws (5), Washers (6), and nuts (7).

i. Place the chassis in the case. Install screws (4).

3-6. Cleaning Procedure

The accuracy of the vtvm is adversely affected by electrical leakage from the input to the chopper amplifier to either ground or to the +500- volt reference power supply. To check for leakage, disconnect the test leads from the input terminals and set the RANGE switch to 500, the NULL switch to .1, voltage divider switches A through E to 4, 9, 0,0,0, respectively, and the polarity switch to + (positive). Excessive leakage is indicated if the VOLTS meter M1 indicator deflects more than one-tenth full scale. Perform the following procedure to remove dust and foreign matter and to prevent leakage.

Note: If the vtvm has been stored in a hot, humid atmosphere, excessive leakage may be noted upon initial operation. Permit the vtvm to warm up for approximately 5 minutes. Clean the vtvm as outlined below if leakage still exists.

a. Use a low-pressure dry air blower to blow out dust and foreign matter from the vtvm. Particular attention should be paid to the binding posts, wiring, and NULL, RANGE, OPERATE—CALIBRATE, and polarity switches.

b. Clean the binding posts, insulators, and front panel with a rag saturated in anhydrous denatured ethyl alcohol.

Caution: **Use only anhydrous denatured ethyl alcohol when cleaning the NULL, RANGE, OPERATE-CALIBRATE, and polarity switches. Other cleaning solvents may react with the insulating material in these switches.**

c. When necessary, wash all exposed insulating material of the NULL, RANGE, OPERATE-CALIBRATE, and polarity switches with a small stiff-bristled brush and anhydrous denatured ethyl alcohol.

d. After washing, recoat the exposed switch insulating material with a solution of Dow Corning 200 having a viscosity between 50 and 200 centistokes (10 percent solution of 100 viscosity grade Dow Corning 200 in anhydrous denatured alcohol). This action will prevent any leakage due to moisture on these surfaces. Do not apply grease or other lubricant to the switch wafers.

Section II. CALIBRATION

3-7. Calibration Preparation Procedure

Perform the following procedures (a through g below and paragraph 3-8) whenever components are replaced or the need for calibration is indicated. These procedures are also an excellent check of the overall performance of the vtvm.

Caution: **Perform the calibration procedure (a through g below and parts 3-8) in a clean, draft-free room.**

a. Observe the VOLTS meter Ml indicator for zero indication. If necessary, adjust the mechanical zero on the meter face.

b. Connect the variac to the vtvm under test.

c. Remove two screws and slide out vtvm. In AN/USM-98B, adjustments can be reached from the four snap covers on the left.

d. Set the variac for an output of 115 (230) volts.

e. Set the front panel controls on the vtvm under test as follows:

(1) RANGE switch to 500.
(2) NULL switch to VTVM.
(3) Polarity switch to + (positive).
(4) Voltage divider switches A through E to O.
(5) Power switch to ON.

f. Turn on the power supply and the digital voltmeter.

g. Before attempting any adjustments, allow 3 hours for the test equipment to come to operating temperature and stabilize. After the 3-hour warmup period, perform the procedure given in paragraph 3-8.

3-8. Calibration Test Procedure

a. Meter Zero Check.

(1) Set the RANGE switch to .5.
(2) Set the NULL switch to .01.
(3) Adjust VTVM ZERO ADJ R227 to zero meter M1 (fig. 2-6).

b. Line Voltage Check.

(1) Vary the line voltage (by rotating the control on the variac) between 100 and 130 (200-260) volts. The indicator on VOLTS meter M1 (lower scale) should not deflect more than one-quarter of one small scale division to either side.
(2) Return the line voltage to 115 (230) volts.

c. Regulated 500- Volt Check.

(1) Set the front panel controls as follows:
(a) RANGE switch to 500.
(b) NULL switch to VTVM.

(2) Connect the digital voltmeter to monitor the voltage between pin 3 of tube V102 and the common input terminal of the vtvm under test.
(3) Vary the line voltage between 100 and 130 (200-260) volts. The voltage at pin 3 of tube V102 should be + 500 volts and should not vary more than ±0.0125 volt.
(4) Return the line voltage to 115 (230) volts.
(5) Disconnect the digital voltmeter test leads from the vtvm under test and slide the vtvm into its case.

d. CALIBRATE Check.

(1) Set the front panel controls as follows:
(a) Voltage-divider switch A to 4.
(b) Voltage-divider switches B, C, and D to 9.
(c) Voltage-divider switch E to 10.
(2) Connect the equipment as shown in figure 3-5.
(3) Adjust the power supply for an output of 500 volts as monitored with the digital voltmeter.
(4) Turn the NULL switch on the vtvm under test to 10.
(5) Adjust CALIBRATE control R2 for a zero indication on VOLTS meter M1. Turn the NULL switch to 1 , .1, and .01 to verify that the CALIBRATE control is adjusted for a true null. The CALIBRATE control should be at approximately midrange when the null is attained. Resistor 500V REF ADJ R121 may be adjusted to vary the position of the CALIBRATE control at null.
(6) If R121 required adjustment, verify that the CALIBRATE control is adjusted for a null with the vtvm in its case and the NULL switch set to .01 (5 above). Do not further adjust the CALIBRATE control.
(7) With the vtvm under test in its case, observe VOLTS meter M1 and set the OPERATE - CALIBRATE switch to CALIBRATE. The meter M1 indicator should not deflect. If necessary, adjust REF CAL ADJ R318 until no deflection of the indicator on VOLTS meter M1 is observed.
(8) Verify that no deflection of the indicator on VOLTS meter M1 is observed when the vtvm is in its case and the OPERATE-CALIBRATE switch is set to CALIBRATE.

e. Gain Adjust. Turn the NULL switch to VTVM. If necessary, adjust VTVM GAIN ADJ R219 (fig. 2-6), for exact full-scale deflection of VOLTS meter M1 with the vtvm in its case.

f. VTVM Range Check.

(1) Turn the RANGE switch to 50; VOLTS meter M1 should indicate 50 volts (± 1.5 volts).
(2) Turn the RANGE switch to 5. VOLTS meter M1 should indicate 5 volts (±0.15 volt).
(3) Turn the RANGE switch to .5. VOLTS meter M1 should indicate .5 volt (±0.015 volt).

g. Calibration Adjust (50- Volt).

(1) Turn the RANGE switch to 50.
(2) Turn the NULL switch to .01. If necessary, adjust 50V ADJ R323 (fig. 2-6) to obtain a zero indication on VOLTS meter M1 with vtvm in its case.
(3) Turn the NULL switch to VTVM.

h. Calibration Adjust (5- Volt).

(1) Turn the RANGE switch to 5.
(2) Turn the NULL switch to .01. If necessary, adjust 5V ADJ R326 (fig. 2-6) to obtain a zero indication on VOLTS meter M1 with the vtvm in its case.
(3) Turn the NULL switch to VTVM.

i. Calibration Adjust (0.5- Volt).

(1) Turn the RANGE switch to .5.
(2) Turn the NULL switch to .01. If necessary, adjust .5V ADJ R329 (fig. 2-6) to obtain a zero indication on VOLTS meter M1 with the vtvm in its case.
(3) Turn the NULL switch to VTVM and the RANGE switch to 500.

j. Turn off all test equipment and disconnect all test leads.

k. Apply glyptal, or a suitable substitute, to all screwdriver adjustments which were adjusted during the calibration procedure to make sure they are not mistakenly moved in the future. Secure the vtvm in its case.

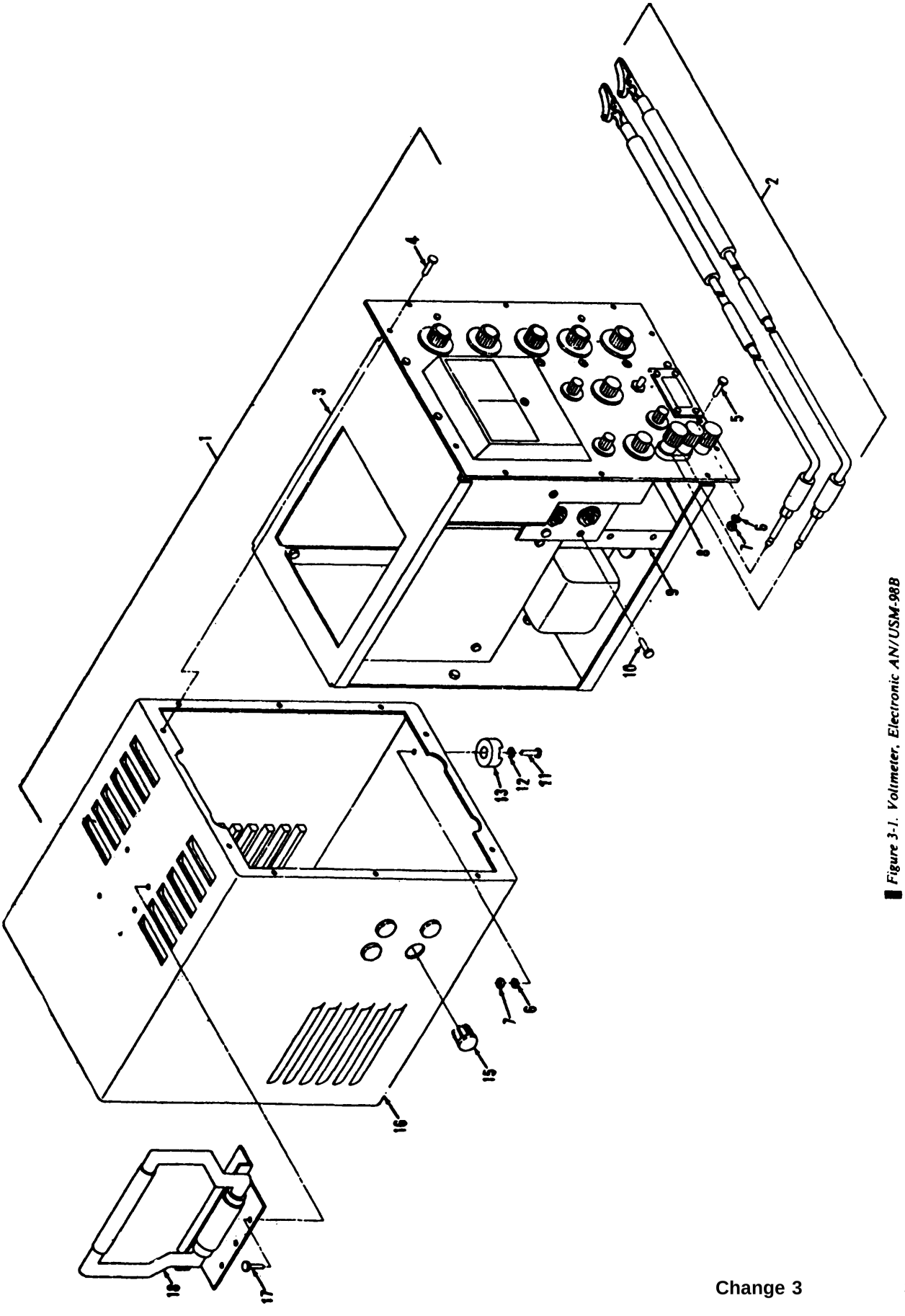


Figure 3-1. Voltmeter, Electronic AN/USM-98B

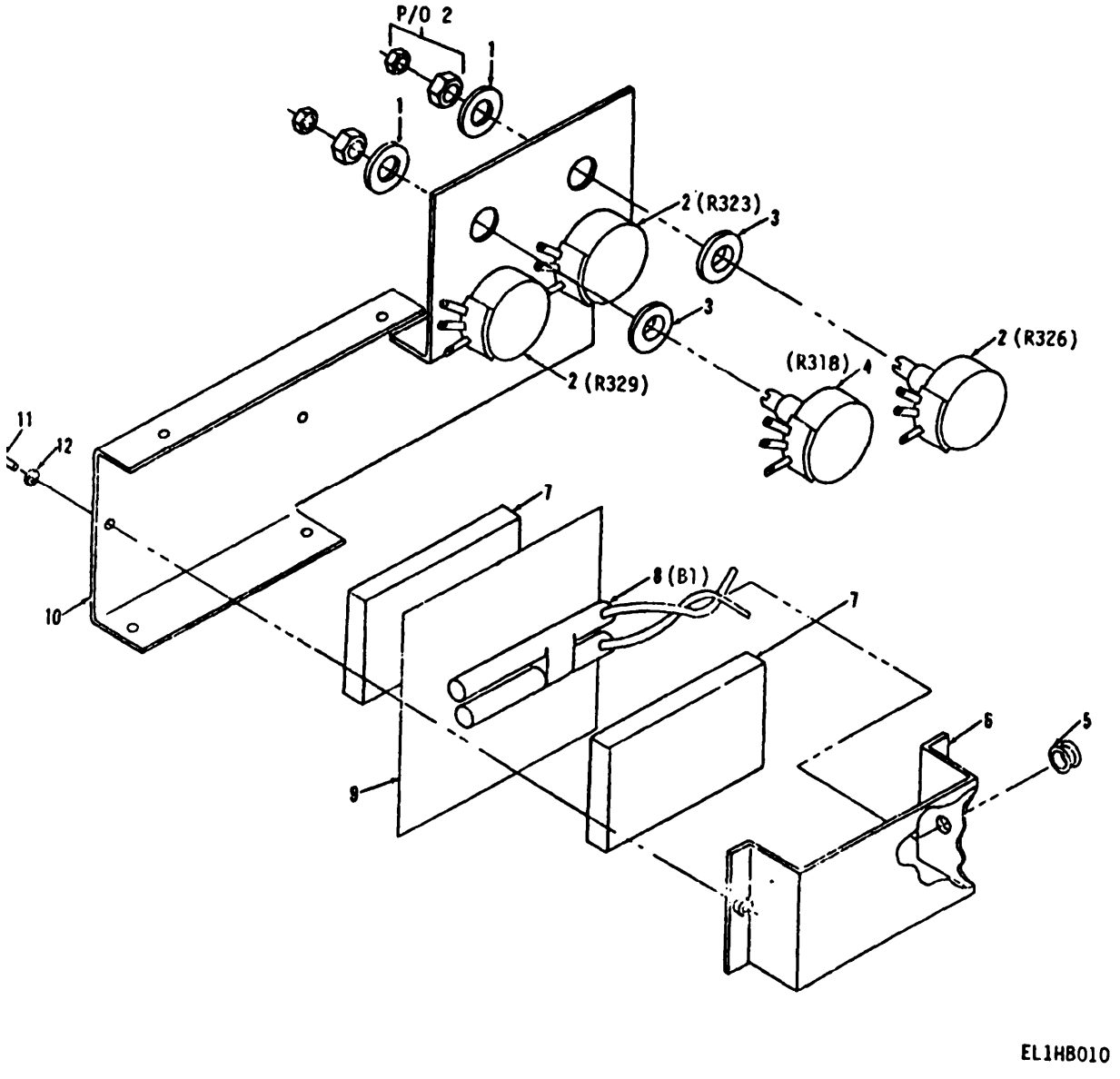


Figure 3-2. Bracket Assembly, AN/USM-98B.

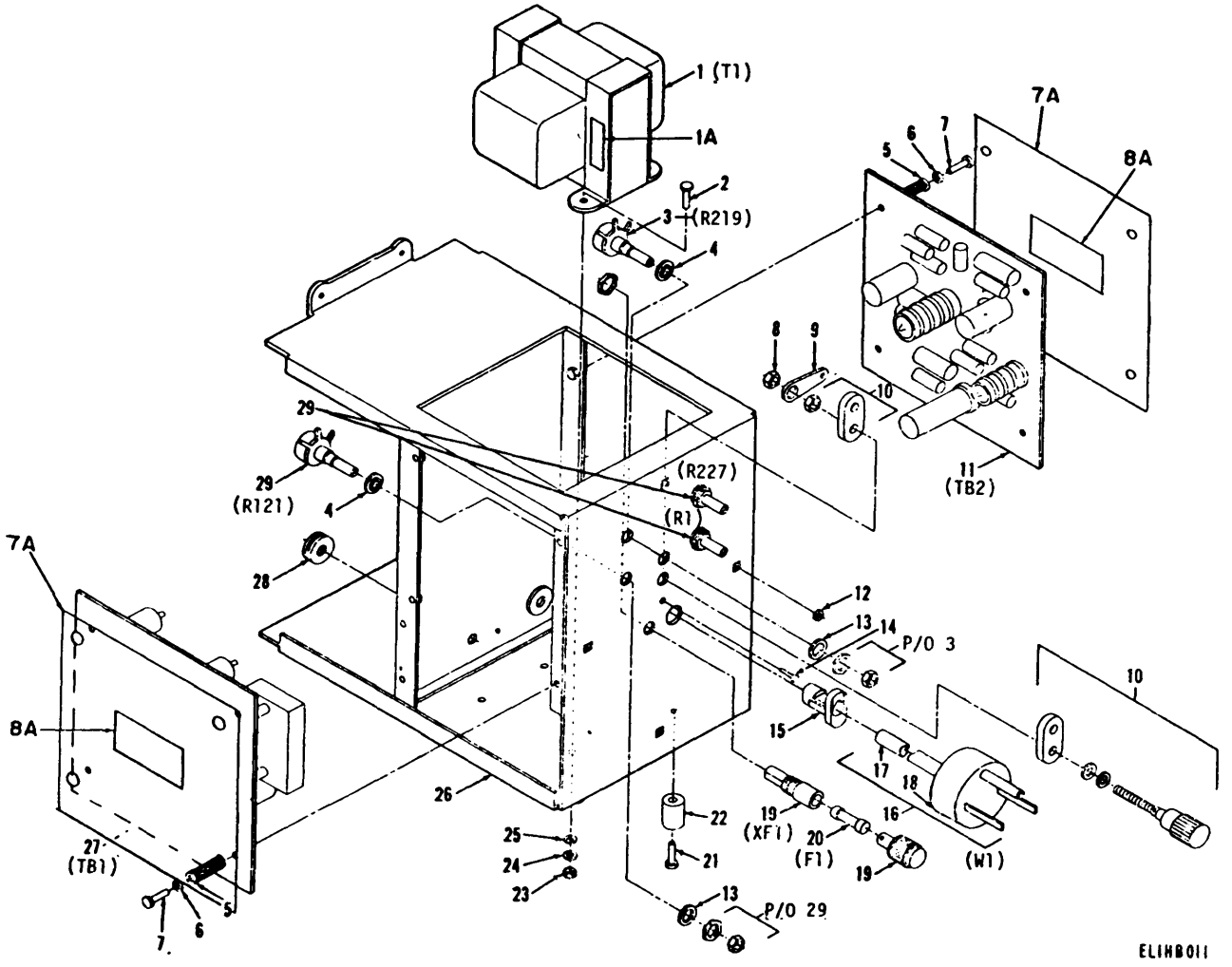


Figure 3-3. Chassis, electrical equipment AN/USM-98B.

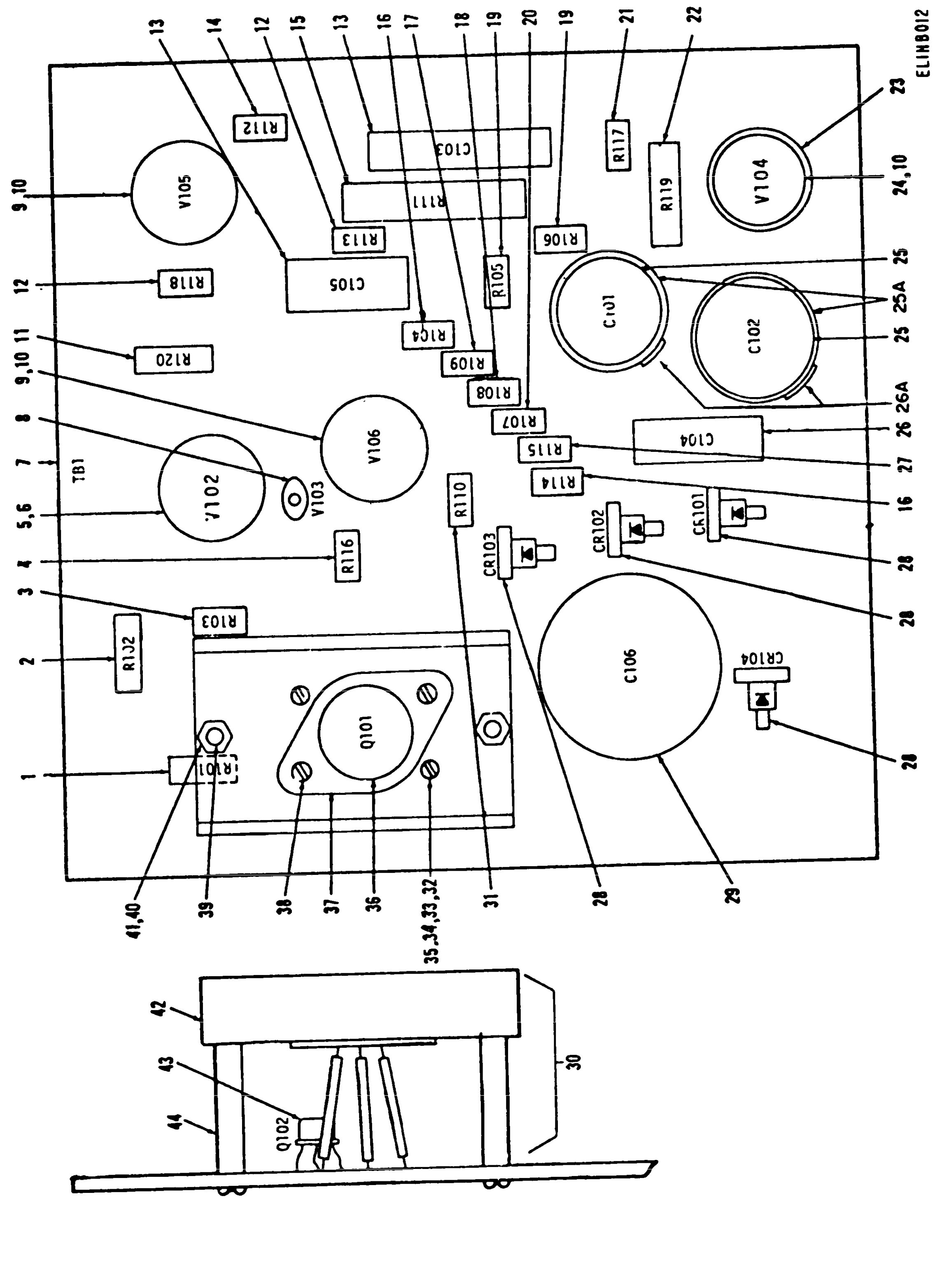


Figure 3-4. Circuit card assembly TB1, AN/USM-98B

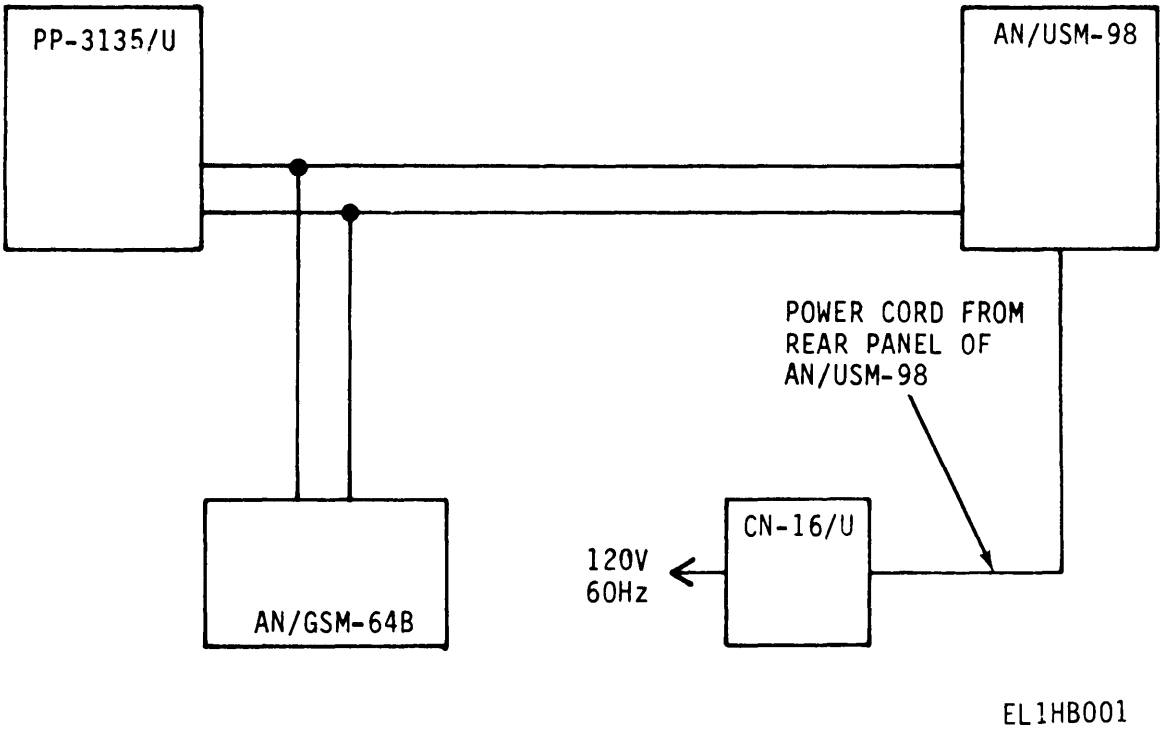


Figure 3-5. Voltmeter, Electronic AN/USM-98, calibration test.

CHAPTER 4
GENERAL SUPPORT TESTING PROCEDURES

4-1. General

a. Testing procedures are prepared for use by maintenance personnel responsible for general support maintenance of electronic equipment to determine the acceptability of repaired equipment. These procedures set forth specific requirements that repaired equipment *must* meet before it is returned to the using organization. A summary of the performance standards is given in paragraph 4-6.

b. Comply with the instructions preceding each chart before proceeding to the chart. Perform each step in sequence. *Do not vary the sequence.* For each step, perform all the actions required in the *Control settings* columns; then perform each specific test procedure and verify it against its performance standard.

4-2. Test Equipment, Tools, and Materials

All test equipment, tools, materials, and other equipment required to perform the testing procedures given in this chapter are listed in the following chart:

Nomenclature	National Stock No.	Technical Manual
Power Supply PP-3135/U	6625-00-635-7991	TM 11-6130-231-14
Voltmeter, digital AN/GSM-64B	6625-00-022-7894	TM 11-6625-444-14-1
Transformer, Variable Power CN-16/U	5950-00-688-5722	
Multimeter TS-352B/U	6625-00-553-0142	TM 11-6625-366-10

4-3. Modification Work Orders

The performance standards listed in the tests (para 4-4 and 4-5) are based on the assumption that all modification work orders on this equipment have been performed. A listing of current modification work orders will be found in DA Pam 310-4.

4-4. Physical Tests and Inspections

a. Test Equipment. None required.

b. Test Connections and Conditions.

(1) No connections are necessary.

(2) Remove the cover from the vtvm.

c. Procedure.

Step No.	Control Settings		Test Procedure	Performance Standard
	Test Equipment	Equipment Under Test		
1	N/A	Controls may be in any position.	*a.* Inspect case and chassis for damage, missing parts, and condition of paint. *Note:* Touchup painting is recommended in lieu of refinishing whenever practicable. Screwheads, binding posts, receptacles, and other plated parts will not be painted or polished · ith abrasives.	*a.* No damage evident or parts parts missing. External surfaces intended to be painted do not show bare metal. Panel lettering is legible.
			b. Inspect all controls and mechanical assemblies for loose or missing screws, bolts, and nuts.	*b.* Screws, nuts, and bolts are tight, and none are missing.

Step No.	Control Settings		Test Procedure	Performance Standard
	Test Equipment	Equipment Under Test		
			c. Inspect all connectors, sockets, receptacles and fuseholders for looseness, damage, or missing parts.	*c.* No looseness or damage evident.
2		Controls may be in position.	*a.* Rotate all panel controls throughout their limits of travel. *b.* Operate all switches.	*a.* Controls rotate freely without binding or excessive looseness. *b.* Switches operate properly.

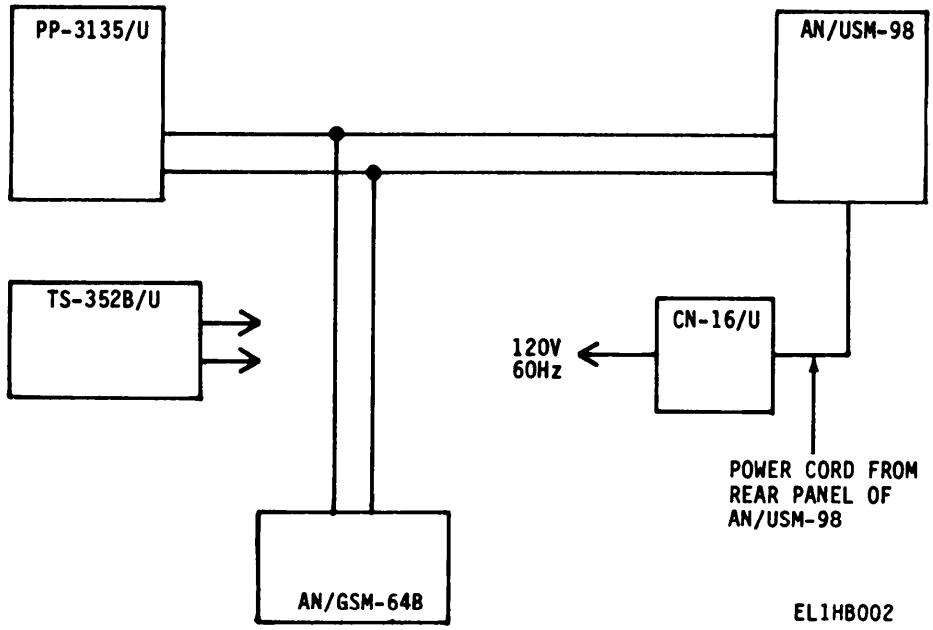


Figure 4-1. Calibration accuracy test.

4-5 Calibration Standard

a. Test Equipment Required.

(1) Powers Supply PP-3135/U.
(2) Multimeter TS-352B/U.
(3) Voltmeter, Digital AN/GSM-64B.
(4) Variable Transformer CN-16B/U

b. Connections. Connect the equipment as instructed, and as indicated in figure 4-1.

c. Procedure.

Caution: **Be careful when making connections in the test. Voltages up to 600 volts are present in these circuits.**

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	Controls may be in any position.	Controls may be in any position.	Turn on all test equipment including the vtvm. Let the equipment warm up for 3 hours before proceeding with the tests.	None.
2	TS-352(*)/U FUNCTION: AC	RANGE switch: .5 NULL switch: 01 A, B, C, D, E:0 Polarity switch: +	Connect the equipment as shown in figure 4-1. Adjust the CN-16B/U so that the TS-352B/U reads 115 volts. Observe the VOLTS meter on the vtvm.	VOLTS meter reads 0 ± 1/4 of a small scale division on the lower scale.
3	Same as step 2.	Same as step 2.	Vary the CN-16B/U so that the voltage read on the TS-352B/U will vary between 100 and 130 volts. Observe the VOLTS meter on the vtvm.	VOLTS meter needle does not deflect more than ± 1/4 of a small scale division on the lower scale.
4	AN/GSM-64 Range switch: 1000 Function switch: DC Mode switch: AUTO TS-352(*)/U FUNCTION: AC	RANGE switch: 500 NULL switch: VTVM	Connect the AN/GSM-64 between pin 3 of V102 and the common input connector as shown in figure 4-1. Vary the CN/16B/U so that the TS-352B/U indicates between 100 and 130 volts. Observe the AN/GSM-64.	Indicators on AN/GSM-64 indicate between 499.99 and 500.01 volts.
5	TS-352B/U FUNCTION: AC AN/GSM-64B Range switch: 1000 Function switch: DC Mode switch: AUTO PP-3135/U METER RANGE: 500V HV CONTROL: Adjust for 500V	A:4 B:9 C:9 D:9 E:10 NULL:10 RANGE: 500 OPERATE-CALIBRATE: OPERATE	Connect the equipment as shown in figure 4-1. Adjust the CN-16/U so that the TS-352B/U indicates 115 volts. Adjust the PP-3135/U for 500 as indicated on the AN/GSM-64. The VOLTS meter should indicate 0. Turn the NULL switch to positions 1.1 and .01.	The VOLTS meter will indicate 0 plus or minus 1/4 of a small scale division on the lower scale at each setting of the NULL switch.
6	Same as step 5.	Same as step 5 except: OPERATE-CALIBRATE switch: CALIBRATE	Leave the controls set as they were in step 5 and observe the VOLTS meter.	Same as step 5.
7	Same as step 5.	Same as step 5 except: NULL: VTVM	Observe the VOLTS meter.	VOLTS meter deflects full scale to the right.

Step No.	Control setting: Test equipment	Control setting: Equipment under test	Test procedure	Performance standard
8	Same as step 5 except: PP-3135/U METER RANGE: 0-150V HV CONTROL: Adjust for 50V	Same as step 7 except: RANGE: 50	Observe the VOLTS meter.	VOLTS meter indicates 50 volts plus or minus 1.5.
9	Same as step 5 except: PP-3135/U METER RANGE: 0-150V HV CONTROL: Adjust for 5V	Same as step 7 except: RANGE: 5	Observe the VOLTS meter.	VOLTS meter indicates 5 volts plus or minus .15.
10	Same as step 5 except: PP-3135/U METER RANGE: 0-150V HV CONTROL: Adjust for .5V	Same as step 5 except: RANGE: .5	Observe the VOLTS meter.	VOLTS meter indicates 5 volts plus or minus .015.
11	Same as step 8.	Same as step 5 except: RANGE switch: 50 NULL: .01	Observe the VOLTS meter.	The VOLTS meter indicates 0 ±1/4 of a small scale division on the lower scale.
12	Same as step 9.	Same as step 5 except: NULL: VTVM RANGE: 5	Turn the NULL switch on the vtvm to .01; observe the VOLTS METER.	Same as step 11.
13	Same as step 10	Same as step 5 except: NULL: VTVM RANGE: .5	Same as step 12.	Same as step 11.

4-6. Test Data Summary

Personnel may find it convenient to arrange a checklist similar to that shown below.

Calibration accuracy tests	
Differential voltmeter test. . .	On all ranges, with exact voltage indicated by the RANGE and voltage divider switches applied to the input terminals; the VOLTS meter indicates 0 within 1/4 of a small scale division on the lower scale of the meter.
VTVM test	VOLTS meter indicates within 1% of the scale indication.

CHAPTER 5
DEPOT INSPECTION STANDARDS

5-1. Applicability of Depot Inspection Standards

The tests outlined in this chapter are designed to measure the performance capability of a repaired equipment. Equipment that is returned to stock should meet the standards given in these tests.

5-2. Applicable References

a. Repair Standards. Applicable procedures of the depot performing this test and its general standards for repaired electronic equipment form a part of the test requirements.

b. Technical Publications. The technical publication applicable to the equipments to be tested is indicated below:

Title	*Number*
Voltmeter, Electronic AN/USM-98(*)	TM 11-6625-599-12

c. Modification Work Orders. Perform all modification work orders applicable to this equipment before making the tests specified. DA Pam 310-4 lists all available MWO's.

5-3. Test Facilities Required

The following items are required for depot testing:

Item	Technical Manual	Common Name
Voltmeter, Digital AN/GSM-64B	TM 11-6625-444-14-1	Digital voltmeter
Voltmeter, AC, IS-185 (NSN 6625-00-405-6608 or		AC voltmeter
Voltmeter, Electronic ME-202/U (NSN 6625-00-709-0288)	TM 11-6625-537-15	AC voltmeter
Power Supply PP-3135/U (NSN 6625-00-635-7991)	TM 11-6130-231-14	Power supply
Transformer, Variable CN-16/U (NSN 5950-00-688-5722)		Variac

5-4. General Test Requirements

All of the tests will be performed under the conditions given below and as illustrated in figure 5-1.

a. Connect the vtvm to a 117-volt ac power source through the variable transformer.

b. Connect the ac voltmeter across the power output section of the variable transformer.

c. The meter needle should be at, or mechanically adjusted to, zero before placing the power switch in the ON position.

d. Always allow at least 1 hour for all equipment to reach stabilized temperatures.

5-5. Calibration Test

Set the NULL switch to VTVM, voltage-divider switches A through E to 0 and the OPERATE-CALIBRATE switch to CALIBRATE. The CALIBRATE control should be capable of adjusting the meter needle to zero.

5-6. Vtvm Accuracy Test

Connect the power supply and digital voltmeter to the AN/USM-98(*) as shown in the figure 5-1.

a. Set the RANGE switch to 500 and the NULL switch to VTVM.

b. Adjust the power supply output to 400.00 volts dc as indicated on the digital voltmeter.

c. With the positive output lead of the power supply connected to the upper input terminal of the AN/USM-98(*), the negative output lead connected to the common input terminal, and the polarity switch in the + position the meter needle should indicate 400 ± 20 volts on the right-hand section of the meter scale.

d. Rotate the polarity switch to the - position. The meter should indicate 400 ±20 volts on the left-hand section of the meter scale.

e. Readjust the power supply output to 100.00 volts dc as indicated on the digital voltmeter.

f. With the polarity switch in the - position, the meter needle should indicate 100 ±20 volts in the right-hand section of the meter scale.

g. With the + polarity switch the + position, the meter needle should indicate 100 ±20 volts on the left-hand section of the meter scale.

h. Repeat the procedures given in *a, b,* and *c,* above except that the control settings and readings should be as follows:

RANGE switch	Power supply output (volts)	AN/USM-98(*) indication and tolerance (volts)
50	40.000	40 ±2
50	10.000	10 ±2
5	4.0000	4 ±0.2
5	1.0000	1 ±0.2
.5	0.4000	0.4±0.02
.5	0.1000	0.1 ±0.02

5-7. Accuracy and Stability Test, 500-Volt Divider

Connect the variable transformer, power supply, digital voltmeter, and AN/USM-98(*) as shown in figure 5-1.

a. Set the variable transformer so that the ac voltmeter indicates 117 volts. Check the calibration as indicated in paragraph 5-5.

b. Rotate the NULL switch to the 1 position; adjust the voltage controls to 495.00.

c. Adjust the power supply output to 495.00 volts dc as indicated on the digital voltmeter.

d. Readjust the voltage controls for a null indication.

e. The voltage indicators should read between 494.70 and 495.30.

f. Readjust the variable transformer so that the ac voltmeter indicates 105 volts ac.

g. Readjust the voltage controls for a null indication.

h. The voltage indicators should read within ±0.05 volt of the reading noted in *e* above.

i. Readjust the variable transformer so that the ac voltmeter indicates 130 volts ac.

j. Readjust the voltage controls for a null indication.

k. The voltage indicators should read within ±0.05 volt of the reading noted in *e* above.

5-8. Accuracy Test, 50-5-, 0.5-Volt Dividers

a. Readjust the variable transformer so that the ac voltmeter indicates 117 volts ac.

b. Repeat the procedure given in paragraph 5-7 *a* through *e,* except the control settings and readings should be as follows:

Power supply	Volts range	Null	Voltage indicators (at null)
40.000	50	0.1	39.976 to 40.024
4.0000	5	0.01	3.9976 to 4.0024
0.4000	.5	0.01	.39972 to .40028

5-9. Attenuator Accuracy Test

a. With the NULL switch in the VTVM position, set the VOLTS RANGE switch to 500, the voltage indicators to 400.00 and the power supply to 400.00 volts dc as read on the digital voltmeter.

b. Readjust the NULL switch to the .1 position, and readjust the power supply for a null indication of the meter needle.

c. Turn the NULL switch to VTVM and reset the voltage indicators to 399.910.

d. Turn the NULL switch to the .1 position. The meter needle should indicate within ± .08 of null on the lower meter scale.

e. Readjust the NULL switch to VTVM position, the voltage indicators to 050.00, and the power supply to 50.000 volts dc.

f. Turn the NULL switch to the .1 position and readjust the power supply for a null indication of the meter needle.

g. Turn the NULL switch to the VTVM position and reset the voltage indicators to 049.910.

h. Turn the NULL switch to the .1 position. The meter needle should indicate within ± .25 of null on the lower meter scale.

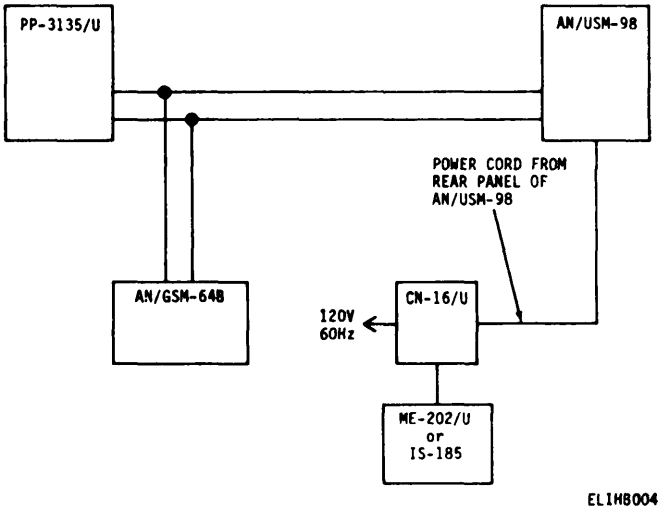
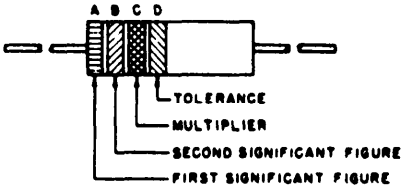


Figure 5-1. Depot test setup.

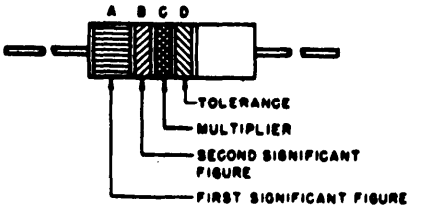
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

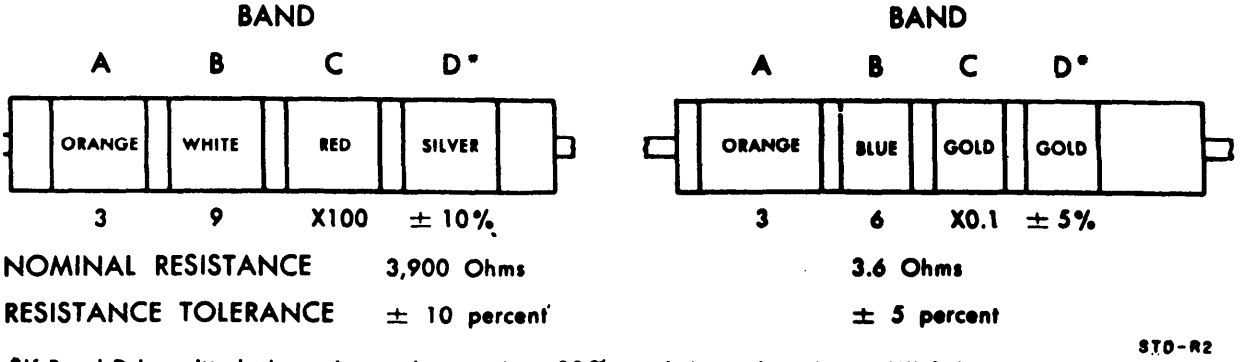


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 5-2. MIL-STD resistor color-code markings.

APPENDIX A
REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7,8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 11-6130-231-14	Operator, Organizational, and Field Maintenance: Power Supply PP-3135/U.
TM 11-6625-274-12	Operators and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 11-6625-316-12	Operator and Organizational Maintenance Manual: Test Sets, Electron Tube TV-2/U, TV-2A/U, TV-2B/U, and TV-2C/U.
TM 11-6625-366-10	Operator's Manual for Multimeter TS-352B/U (NSN 6625-00-553-0142)
TM 11-6625-444-14-1	Operator's, Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools List Voltmeter, Digital AN/GSM-64B (NSN 6625-00-022-7894). Including Plug-In, Electronic Test Equipment PL-1370/GSM-64B (NSN 6625-00-137-8366)
TM 11-6625-537-15	Operator's, Organizational, Field, and Depot Maintenance Manual: Voltmeter, Electronic ME-202/U.
TM 11-6625-599-12	Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools Lists Voltmeters, Electronic AN/USM-98A and AN/USM-98B.
TM 11-6625-599-40P-2	General Support Maintenance Repair Parts and Special Tools List for Electronic Voltmeter AN/USM-98B (NSN 6625-00-753-2115)
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Material to Prevent Enemy Use.

APPENDIX B

GS AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LISTS

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair parts required for the performance of general support and depot maintenance of the AN/USM-98A and AN/USM–98B. This appendix is current as of 2 March 1971. No parts are authorized for stockage at direct support category of maintenance.

NOTE

No special tools, test, or support equipment is required.

6-2. General

This repair parts list is divided into the following sections:

a. Repair Parts for Direct Support, General Support, and Depot Maintenance-Section II. A list of repair parts authorized for the performance of maintenance at the general support and depot level.

b. Index-Federal Stock Number Cross-Reference to Figure and Item Number or Reference Designation-Section III. A list of Federal stock numbers in ascending numerical sequence followed by a list of reference numbers in ascending alphanumeric sequence, cross-referenced to illustration figure number and reference designation.

c. Index-Reference Designation Cross-Reference to Page Number-Section IV. A list of reference designations cross-referenced to page numbers.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular lists:

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1:

(1) Source code, indicates the selection status and source for the listed item. Source codes used are:

Code	*Explanation*
P	Repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
P9	Assigned to items which are NSA design controlled: unique repair parts, special tools, test, measuring and diagnostic equipment, which are stocked and supplied by the Army COMSEC logistic system, and which are not subject to the provisions of AR 380-41.
P10	Assigned to items which are NSA design controlled: special tools, test, measuring and diagnostic equipment for COMSEC support, which are accountable under the provisions of AR 380-41, and which are stocked and supplied by the Army COMSEC logistic system.
M	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly

Code *Explanation*

should result in retirement of the end item from the supply system.

X1 - Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.

X2 - Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain same through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.

G - Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are:

Code *Explanation*

H_ _ _ _ _ _ _ _ _ _ _ General Support Maintenance
D_ _ _ _ _ _ _ _ _ _ Depot Maintenance

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code *Explanation*

R - Repair parts and assemblies that are economically repairable at DSU and GSU activities and normally are furnished by supply on an exchange basis.

S - Repair parts and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final disposition.

T - High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.

U - Repair parts specifically selected for salvage by reclamation units, because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. The index number has been included as part of the description to aid in location of "same as" items. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

d. Unit of Measure (U/M), Column 4. A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, eg., ft, ea, pr, etc.

e. Quantity Incorporated in Unit, Column 5. This column indicates the quantity of the item used in the AN/USM–98A and AN/USM–98B.

f. 30-Day DS/GS Maintenance Allowances, Columns 6 and 7.

NOTE

Allowances in GS column are for GS maintenance only.

(1) The allowance columns are divided into three subcolumns. Indicated in each subcolumn, opposite the first appearance of each item, is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have the letters "REF" in the applicable allowance columns. Items authorized for use as required, but not for initial stockage, are identified with an asterisk in the allowance column.

(2) The quantitative allowances for GS level of maintenance will represent initial stockage for a 30-day period for the number of equipments supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance column. *Example,* authorized allowance for 51–100 equipments is 40 for 150 equipments multiply 40 by 1.50 or 60 parts required.

g. 1 Year Allowances Per 100 Equipments/ Contingency Planning Purposes, Column 8. This column indicates opposite the first appearance of each item the total quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for one year.

h. Depot Maintenance Allowance Per 100 Equipments, Column 9. This column indicates opposite the first appearance of each item, the total quantity authorized for depot maintenance of 100 equipments. Subsequent appearances of the same item will have the letters "REF" in the allowance column. Items authorized for use as required, but not for initial stockage, are identified with an asterisk in the allowance column.

i. Illustrations, column 10. This column is divided as follows:

(1) *Figure number, column 10a.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number or reference designation, column 10b.* Indicates the reference designation to identify the item in the illustration.

B-4. Special Information

a. Identification of the usable on codes included in column 3 of section III are:

Code	*Used on*
1	AN/USM-98A
2	AN/USM-98B

b. Repair parts mortality is computed from failure rates derived from experience factors with the individual parts in a variety of equipments. Variations in the specific application and periods of use of electronics equipment, the fragility of electronic piece parts, plus intangible material and quality factors intrinsic to the manufacture of electronic parts, do not permit mortality to be based on hours of end item use. However, long periods of continuous use under adverse conditions are likely to increase repair parts mortality.

B-5. Location of Repair Parts

a. This appendix contains two cross-reference indexes (sec. III and IV) to be used to locate a repair part when either the Federal stock number, reference number (manufacturer's part number), or reference designation is known. The first column in each index is prepared in numerical and/or alphanumerical sequence. Where a Federal stock number is not listed, refer to the reference number (manufacturer's part number) immediately following the Federal stock number.

b. When the Federal stock number is known, follow the procedures given in (1) and (2) below.

(1) Refer to the index of Federal stock numbers (sec. III) and locate the Federal stock number. The FSN is cross-referenced to the applicable figure and item or reference designation.

(2) When the reference designation is determined, refer to the reference designation index (sec. IV). The reference designations are listed in alphanumerical ascending order and are cross-referenced to the page number on which they appear in the repair parts list (sec. II). Refer to the page number noted in the index and locate the reference designation in the repair parts list (col. 7b). If the description column indicates that it is a "SAME AS" item, locate the first appearance of the item by the index number (sequence number) referenced.

c. When the reference designation is known, follow the procedures given in *b* (2) above.

d. When neither the FSN nor reference designation is known, identify the part in the illustration and follow directions given in c above, or scrutinize column 3 of the repair parts list.

6-6. Federal Supply Code for Manufacturers

Code	*Manufacturer*
00213	Sage Electronics Corp.
00327	Welwyn International, Inc.
01121	Allen-Bradley Co.
01295	Texas Instruments, Inc. Semiconductor and Component Division

Code	Manufacturer
04009	Arrow-Hart and Hegeman Electric Co.
04222	Aerovox Corp.
04232	Staver Co. Inc.
04878	Arnold Magnetics Corp.
06540	Amatom Electronic Hardware Co. Inc.
08806	General Electric Co. Miniature Lamp Dept.
11350	Penn Resistor Corp.
12598	R L C Electronics Co.
12749	James Electronics, Inc.
14655	Cornell-Dubilier Electronics Division, Federal Pacific Electric Co.
14936	General Instrument Corp. Semiconductor Products Group.
16473	Cambridge Scientific Industries, Inc.
17870	Daven Division, Thomas A. Edison Industries, McGraw-Edison Co.
18876	Army Missile Command
24655	General Rodeo Co.
28520	Heyman Mfg. Co.
30800	General Instrument Corp. Capacitor Division
35529	Leeds and Northrup
43543	Nytronics, Inc.
44655	Ohmite Mfg. Co.
49671	RCA Corp.
56289	Sprague Electric Co.
65092	Weston Instruments, Inc.
71400	Bussmann Mfg. Division
71450	CTS Corp.
71590	Globe-Union, Inc. Centralab Division
71785	Cinch Mfg. Co. and Howard B. Jones Division
75376	Kury & Kasch, Inc.
78553	Tinnerman Products, Inc.
80031	Nepco Division of Sessions Clock Co.
80145	A P I Instruments Co.
81349	Military Specifications
81483	International Rectifier Corp.
83330	Herman H. Smith, Inc.
84411	TRW Capacitor Division
86577	Precision Metal Products of Maiden, Inc.
89536	John Fluke Mfg. Co.
92966	Hudson Lamp Co.
96906	Military Standards
97567	Electron Radar Products
98003	Nielson Hardware Corp.
98141	Nytronics Precision Resistor Div.

(Next printed page is B5.)

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
	625-753-21:	A001	VOLTMETERS, ELECTRONIC AN/USM-98A and AN/USM-98B (This item is nonexpendable\	1, 2												
A-H		A002	CASE 06045 (12598)	2	EA	1										A1
X2-H	5305-922-629	A003	SCREW, MACHINE MS35233-2 (96906)	2	EA	10										A1H1
X2-H	5340-975-190	A004	HOLEPLUG: 855 (83330)	2	EA	4										A1E1
P-H	6625-078-539	A004A	HANDLE ASSEMBLY 407-101 (89536)	2	EA	1				*	*	*	5	8		
P-H	5340-948-990	A305	HANDLE: HA945-LS-2-RG (98003)	2	EA	1				*	*	*	5	8		A1MP1
X2-H		A006	SCREW MACHINE: MS35234-59 (96906)	2	EA	5										A1H2
X2-H	5310-054-183-	A007	WASHER, LOCK: M3553388-81 (96906)	2	EA	5										A1H3
X2-H	5310-934-976	A008	NUT: MS35650-304 (96906)	2	EA	5										A1H4
X2-H	5625-078-539	A008A	PANEL ASSEMBLY: 801B-407 (89536)	1	EA	1										
A-H		A009	PANEL ASSEMBLY: C-5923 (12598)	1	EA	1										A2
X1		A010	PANEL: C-6014 (12598)	2	EA	1										A2MP1
X2-H	5305-922-628	A011	SCREW, MACHINE: SAME AS A003	2	EA	4										A2H1
P-H	5625-980-198	A011A	AMMETER: 1941 (65092)	1	EA	1				*	*	2	8	5	2-9	M1
P-H	5625-133-761	A312	AMMETER: 53-4752-0100 (80145)	2	EA	1				*	*	2	8	5	5-8.1	A2M1
X2-H	5310-011-104	A013	WASHER, LOCK: MS35338-79 (96906)	2	EA	1										A2H2
X2-H	5310-934-976	A014	NUT: MS35549-254 (96906)	2	EA	1										A2H3
X2-H	5940-681-818	A015	LUG: MS35431-8 (96906)	2	EA	1										A2H4
M-D		A016	LENS: A6416 (12593)	2	EA	1										A2MP2
P-H	5905-079-535	A016A	RESISTOR, VARIABLE, 2-252 (71450)	1	EA	1				*	2	2	13	10	2-9	R2
P-H		A017	RESISTOR, VARIABLE, DUAL 44581 (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2R2
P-H	5930-258-430	A017A	SWITCH, TOGGLE: 20994-L (04001)	1	EA	1				*	*	2	8	5	5-8	S1
P-H	5930-655-151	A018	SWITCH: TOGGLE: MS35058-22 (96906	2	EA					*	*	2	8	5	5-8.1	A2S1

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H	5930-070-1867	A018A	SWITCH, ROTARY: 803B-812 (89536)	1	EA	1				*	*	2	8	5	2-9	S2
P-H		A019	SWITCH, ROTARY: 57079 (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2S2
P-H	5930-955-9942	A019A	SWITCH, ROTARY: 803B-816 (89536)	1	EA	1				*	*	2	8	5	2-9	S3
P-H		A020	SWITCH, ROTARY: 59017 (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2S3
P-H	5930-956-3078	A020A	SWITCH, ROTARY: 801B-828 (89536)	1	EA	1				*	*	2	8	5	2-9	S4
P-H		A021	SWITCH, ROTARY: 212-23773-1SR (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2S4
P-H	5930-955-9941	A021A	SWITCH, ROTARY: 801B-827 (89536)	1	EA	1				*	*	2	8	5	2-9	S5
P-H		A022	SWITCH, ROTARY: 212-19421-2 (71450)	2	EA	1				*	2	2	18	15	5-8.1	A2S5
P-H	5910-797-3851	A022A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: D6-474 (97567)	1	EA	1				*	*	*	5	3	2-9	C1
P-H		A023	CAPACITOR, FIXED, PLASTIC DIELECTRIC: X633FO-47UF (84411)	2	EA	1				*	*	*	5	3	5-8.1	A2C1
X2-H	5940-620-8424	A024	LUG, TERMINAL: MS35431-4 (96906)	2	EA	1										A2H5
P-O	5355-064-1035	A024A	KNOB: S-642-3-BB (75376)	1	EA	5				*	*	2	5	6		
P-O		A025	KNOB: MS915281F2B (96906)	2	EA	2				*	*	2	5	6		A1MP2
P-O	5355-668-9156	A025A	KNOB: S-653-BB-L (75376)	1	EA	2				*	*	2	5	6		
P-O		A026	KNOB: MS91528C2F2B (96906)	2	EA	2				*	*	2	5	6		A2MP3
P-O	5355-519-9375	A026A	KNOB: S-647-3L (75376)	1	EA	3				*	*	*	5	9		
P-O		A027	KNOB: M259158C1G2B (96906)	2	EA	1				*	*	*	5	3		A2MP4
P-O		A028	KNOB: MS91528C2G2B (96906)	2	EA	5				*	2	2	19	15		A2MP5
P-H	5940-549-9037	A028A	POST, BINDING 938-D (24655)	1	EA	2				*	*	2	10	6		J4, J5
P-H		A029	POST, BINDING, DUAL: 263RR (83330)	2	EA	1				*	*	2	10	3		A2E1
P-H	5940-840-0139	A029A	POST, BINDING: 938-C (24655)	1	EA	1				*	*	*	5	3		J2
P-H		A030	POST, BINDING: 231 BLACK (83330)	2	EA	1				*	*	*	5	3		A2E2
X2-H	5940-946-1639	A031	LINK, SHORTING 327 (83330)	2	EA	1										A2E3
M-D		A032	NAMEPLATE: A-5442 (12598)	2	EA	1										A2MP6

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
X2-H	5305-579-3029	A033	SCREW, MACHINE: MS35233-1 (96906)	2	EA	4										A2H5
X2-H		A034	STANDOFF: A-6400 (12598)	2	EA	2										A2MP7
X2-H	5305-543-2775	A035	SCREW, MACHINE: MS35233-33 (96906)	2	EA	2										A2H6
X1		A036	BRACKET: B-601B (12598)	2	EA	1										A2MP8
P-H	6250-967-5487	A037	SOCKET: 1938 (83330)	2	EA	4				*	*	2	16	12		X1 thru X4
M-D		A038	TUBE: A-6926 (12598)	2	ea	4										A2MP8
P-C	6240-155-8706	A039	LAMP, INCANDESCENT:	1	EA	4				2	3	5	59	200	5-8	DS1 thru DS4
			47 (92966)	2	EA	4				2	3	5	59	200	5-8.1	A2DS1 thru A2DS4
P-H	5930-987-0114	A039A	SWITCH, ROTARY: 801B-819 (89536)	1	EA	1				*	*	2	8	5	2-9	S6
P-H		A040	SWITCH, ROTARY: 212-21085-2 (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2S6
P-H	5905-806-4086	A040A	RESISTORS, MATCHED, WIRE WOUND: PR512 (89536)	1	EA	6				2	2	3	33	30	2-5	R401 thru R406
P-H		A041	RESISTOR, FIXED, WIRE WOUND: RB54C340001(.02) (98141)	2	EA	6				2	2	3	33	30	2-5.1	A2R401 thru A2R406
P-H	5930-986-1683	A041A	SWITCH, ROTARY: 801B-820 (89536)	1	EA	3				*	2	2	18	15	2-9	S7, S8, S9
P-H		A042	SWITCH, ROTARY: SAME AS A022	2	EA	3				REF	REF	REF	REF	REF	5-8.1	A2S7,A2S8, A2S9
A-H		A042A	BOARD ASSEMBLY: 801B-403 (89536)	1	EA	1										
A-H		A042B	BOARD ASSEMBLY: 801B-436 (89536)	1	EA	1										
P-H	5905-990-0817	A042D	RESISTORS, MATCHED, WIRE WOUND: PR48 (89536)	1	EA	11				2	3	5	53	55	2-5	R407 thru R417
P-H		A043	RESISTOR, FIXED, WIRE WOUND RB54CE80000(.02) (98141)	2	EA	11				2	3	5	53	55	2-5.1	A2R407 thru A2R417
P-H	5905-068-8535	A043A	RESISTORS, MATCHED, WIRE WOUND: 34-2121 (89536)	1	EA	11				2	3	5	53	55	2-5	R418 thru R428
P-H		A044	RESISTOR, FIXED, WIRE WOUND: RB54CE16000B (81349)	2	EA	11				2	3	5	53	55	2-5.1	A2R418 thru A2R428
P-H	5905-068-8544	A044A	RESISTOR, FIXED, WIRE WOUND: PR39 (89536)	1	EA	11				2	3	5	53	55	2-5	R429 thru R439
P-H		A045	RESISTOR, FIXED, WIRE WOUND: RB54CE320ROB (81349)	2	EA	11				2	3	5	53	55	2-5.1	A2R429 thru A2R439

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H	5905-068-8057	A045A	RESISTOR, FIXED, WIRE WOUND: PR34 (89536)	1	EA	10				2	2	3	46	50	2-5	R440 thru R449
P-H		A046	RESISTOR, FIXED, WIRE WOUND: RB54CE64R00B (81349)	2	EA	10				2	2	3	46	50	2-5.1	A2R440 thru A2R449
P-H	5930-907-5769	A046A	SWITCH, ROTARY: 801B-821 (89536)	1	EA	1				*	*	2	8	5	2-9	S10
P-H		A047	SWITCH, ROTARY: 212-22172-2 (71450)	2	EA	1				*	*	2	8	5	5-8.1	A2S10
P-H	6625-078-5397	A047A	DIAL, VOLTAGE: D3 (89536)	1	EA	5				*	2	2	12	5		
X1		A048	DIAL AND HUB ASSEMBLY: A-6237 (12598)	2	EA	5										A2A1
X1		A049	DIAL: A-6238 (12598)	2	EA	5										A2A1MP1
X1		A050	HUB: A6239 (12598)	2	EA	5										A2A1MP2
X2-H	5305-531-0137	A051	SCREW, SET: MS51022-21 (96906)	2	EA	10										A2A1H1
X1		A052	BRACKET: B-6017 (12598)	2	EA	1										A2MP9
X2-H		A053	SCREW, MACHINE: MS35233-26 (96906)	2	EA	2										A2H7
P-H	5905-448-6509	A053A	RESISTOR, VARIABLE, WIRE WOUND: 110 (71450)	1	EA	1				*	*	2	8	5	2-6	R318
P-H		A054	RESISTOR, VARIABLE, WIRE WOUND: RA20LASB502A (81349)	2	EA	1				2	2	3	33	18	2-6.1	A2R318
P-H	5905-079-8319	A054A	RESISTOR, VARIABLE, WIRE WOUND: R329 110 (71450)	1	ea	3				*	2	2	18	15	2-6	R323, R326,
P-H		A055	RESISTOR, VARIABLE, WIRE WOUND: RA20LASB501A (81349)	2	EA	3				*	2	2	18	15	2-6.1	A2R323, A2R326, A2R329
X2-H	5330-975-0113	A056	WASHER: 2167 (83330)	2	EA	4										A2E4
X2-H		A057	WASHER SHOULDER: 2157 (83330)	2	EA	4										A2E5
X1		A058	BRACKET: A-6016 (12598)	2	EA	1										A2MP9
X2-H		A059	GROMMET: 1114 (06540)	2	EA	1										A2MP10
P-H	6625-825-7249	A060	VOLTAGE STANDARD: 130007 (35529)	1 2	EA EA	1 1				* *	* *	* *	5 5	3 3	2-9 5-8.1	B1 A2BT1
M-D		A061	INSULATOR: A-6927 (12598)	2	EA	2										A2E6
X2-H		A062	SCREW, MACHINE: SAME AS A053	2	EA	2										A2H8
X2-H	5310-011-1041	A063	WASHER, LOCK: SAME AS A013	2	EA	2										A2H9

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
X1		A064	BRACKET; B6695 (12598)	2	EA	1										A2MP11
P-H		A065	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CH08A1NC225M (81349)	2	EA	1				*	*	2	10	6		A2C303
X2-H		A066	STANDOFF: 9020-S-6 (86577)	2	EA	1										A2E7
X2-H		A067	SCREW, MACHINE: MS35233-25 (96906)	2	EA	1										A2H10
X2-H	5310-011-1041	A068	WASHER, LOCK: SAME AS A013	2	EA	1										A2H11
P-H		A069	RESISTOR, VARIABLE, WIRE WOUND: SAME AS A054	2	EA	2				REF	REF	REF	REF	REF	5-8.1	A2R332, A2R333
X2-H	5330-975-0113	A070	WASHER: SAME AS A056	2	EA	2										A2E8
X2-H		A071	WASHER SHOULDER: SAME AS A057	2	EA	2										A2E9
X2-H		A072	STANDOFF: A6401 (12598)	2	EA	2										A2MP12
X2-H		A073	SCREW, MACHINE: 6-32 X 21/2LGPAN HD (12598)	2	EA	2										A2H12
X2-H	5310-540-8119	A074	WASHER, FLAT: MS15795-305 (96906)	2	EA	4										A2H13
X2-H	5310-011-1041	A075	WASHER, LOCK SAME AS A013	2	EA	4										A2H14
X2-H		A076	SCREW, MACHINE: SAME AS A053	2	EA	2										A2H15
X2-H	5625-078-5399	A076A	BOARD ASSEMBLY: 801B-5\405 (89536)	1	EA	1									2-8	
A-H		A077	BOARD ASSEMBLY, TERMINAL: D6933 (12598)	2	EA	2									2-8	A2A2
M-D		A078	BOARD, TERMINAL: A6249 (12598)	2	EA	1										A2A2TB3
P-H	5910-988-3518	A078A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: E6-105 (97567)	1	EA	1				*	*	*	5	3	2-8	C301
P-H		A079	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CH08A1NF105M (81349)	2	EA	1				*	*	2	10	6	2-8	A2A2C301
P-H	5910-076-3606	A079A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: X663UW-20502 (84411)	1	EA	1				*	*	*	5	3	2-8	C302
P-H		A080	CAPACITOR, FIXED, PLASTIC DIELECTRIC: SAME AS A065	2	EA	1				REF	REF	REF	REF	REF	2-8	A2A2C302
P-H	5905-299-2030	A081	RESISTOR, FIXED, COMPOSITION: RC32GF273J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-8 2-8	R322 A2A2R322
P-H	5905-171-2006	A061A	RESISTOR, FIXED, COMPOSITION: RC20GF271J (81349)	1	EA	1				*	*	2	8	5	2-8	R331

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code	Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H	5905-279-1890	A062 RESISTOR, FIXED, COMPOSITION: RC20GF272J (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R331
P-H	5905-259-2990	A063 RESISTOR, FIXED, COMPOSITION: RC20GF2E26J (81349)	1 2	EA EA	5 5				2 2	2 2	3 3	33 33	30 30	2-8 2-8	R311 thru R315 A2A2R311 thru A2A2R315
P-H	5905-599-3551	A063A RESISTOR, FIXED FILM: C13(10MEOOHMS ±1%, 1W) (00327)	1	EA	4				*	2	2	19	20	2-8	R301 thru R304
P-H	5905-552-5752	A064 RESISTOR, FIXED, FILM: RN25X1005F (11350)	2	EA	4				*	2	2	19	20	2-8	A2A2R301 thru A2A2R304
P-H	5905-965-5516	A064A RESISTOR, FIXED, WIRE WOUND: AA41 (17870)	1	EA	1				*	*	2	6	5	2-8	R230
P-H		A065 RESISTOR, FIXED WIRE WOUND: RB54CE250R31A (98141)	2	EA	1				*	*	2	8	5	2-8	A2A2R330
P-H	5905-079-8317	A065A RESISTOR, FIXED, WIRE WOUND: 1141 (17870)	1	EA	1				*	*	2	8	5	2-8	R327
P-H		A066 RESISTOR, FIXED, WIRE WOUND: RB54CE531R7A (98141)	2	EA	1				*	*	2	8	5	2-8	A2A2R327
P-H	5905-079-8314	A066A RESISTOR, FIXED, WIRE WOUND: 1141 (17870)	1	EA	1				*	*	2	8	5	2-8	R328
P-H		A067 RESISTOR, FIXED, WIRE WOUND: RB54CE34751B (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R328
P-H	5905-810-2943	A067A RESISTOR, FIXED, FILM: C13(9ME00HM8 ±1%, 1W) (00327)	1	EA	1				*	*	2	8	5	2-8	R305
P-H		A068 RESISTOR, FIXED, FILM: RN25X9004F (11350)	2	EA	1				*	*	2	8	5	2-8	A2A2R305
P-H	5905-079-6315	A068A RESISTOR, FIXED, WIRE WOUND: 1141 (17870)	1	EA	1				*	*	2	8	5	2-8	R3325
P-H		A069 RESISTOR, FIXED, WIRE WOUND: RB54CE22501B (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R325
P-H	5905-079-8316	A069A RESISTOR, FIXED, WIRE WOUND: 1141 (17870)	1	EA	1				*	*	2	8	5	2-8	R324
P-H		A090 RESISTOR, FIXED, WIRE WOUND: RB54CE287510A (98141)	2	EA	1				*	*	2	8	5	2-8	A2A2R324
P-H	5905-806-4087	A090A RESISTOR, FIXED, WIRE WOUND: 1180F (17870)	1	EA	2				*	2	2	13	10	2-8	R316, R317
P-H	5905-042-6819	A091 RESISTOR, FIXED, WIRE WOUND: RB52CE12502B (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R316

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H		A092	RESISTOR, FIXED, WIRE WOUND: RB52CE12302B (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R317
P-H	5905-079-8312	A092A	RESISTOR, FIXED, WIRE WOUND: 118AF-PC (17870)	1	EA	2				*	2	2	13	10	2-8	R320, R321
P-H		A093	RESISTOR, FIXED, WIRE WOUND RB52CE112375A (98141)	2	EA	2				*	2	2	13	10	2-8	A2A2R320, A2A2R321
P-H	5905-985-5528	A093A	RESISTOR, FIXED, WIRE WOUND: 1112 (17870)	1	EA	1				*	*	2	8	5	2-8	R319
P-H		A094	RESISTOR, FIXED, WIRE WOUND: RB54C3511R7B (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R319
P-H	5905-755-5365	A094	RESISTOR, FIXED, FILM: C-12(900,000 OHMS ±1%, 0.500W) (00327)	1	EA	1				*	*	2	8	5	2-8	R306
P-H		A095	RESISTOR, FIXED, FILM: RN70C9003F (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R306
P-H	5905-592-0535	A095A	RESISTOR, FIXED, FILM: C12(1,000 OHMS ±1%, 0.500W) (00327)	1	EA	1				*	*	2	8	5	2-8	R309
P-H	5905-752-6461	A096	RESISTOR, FIXED, FILM: RN70C1001F (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R309
P-H	5905-810-2953	A096A	RESISTOR, FIXED, FILM: C12-90,000 OHMS ±1%, 0.500W (00327)	1	EA	1				*	*	2	8	5	2-8	R307
P-H		A097	RESISTOR, FIXED, FILM: RN70C9002F (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R307
P-H	5905-079-6366	A097A	RESISTOR, FIXED FILM: C12(9,000 OHMS ±1%, 0.500W) (00327)	1	EA	1				*	*	2	8	5	2-8	R308
P-H		A098	RESISTOR, FIXED, FILM: RN70C9001F (81349)	2	EA	1				*	*	2	8	5	2-8	A2A2R308
A-H		A099	CHASSIS ASSEMBLY: D-6928 (12598)	2	EA	1										A3
X1		A100	CHASSIS: D6024 (12598)	2	EA	1										A3MP1
X2-H	5325-754-2240	A101	GROMMET: MS35490-11 (96906)	2	EA	3										A3E1
X2-H	5340-598-2754	A101A	BUMPER, RUBBER: BH-2097 (12598)	1	EA	4										
M-D		A102	FOOT: A-6402 (12598)	2	EA	2										A3MP2
X2-H	5305-543-2775	A103	SCREW, MACHINE: SAME AS A035	2	EA	2										A3H1

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code	Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H	5905-987-1939	A103A TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: 801B-652 (89536)	1	EA	1				*	*	2	8	5	2-3	T1
P-H		A104 TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: MH52418 (43543)	2	EA	1				*	*	2	8	5	2-3.1	A3T1
X2-H	5305-054-6670	A105 SCREW, MACHINE: MS51957-45 (96906)	2	EA	4										A3H2
X2-H	5310-880-5978	A106 WASHER: MS15795-807 (96906)	2	EA	4										A3H3
X2-H		A107 WASHER, LOCK: MS35338-80 (96906)	2	EA	4										A3H4
X2-H	5310-934-9759	A108 NUT: MS35649-84 (96906)	2	EA	4										A3H5
P-H	5905-079-6362	A108A RESISTOR, VARIABLE: AA0 (71450)	1	EA	1				*	*	2	8	5	2-7	R219
P-H		A109 RESISTOR, VARIABLE: RA20LASA100A (81349)	2	EA	1				*	*	2	8	5	2-2.1	A3R219
P-H	5905-064-1864	A109A RESISTOR, VARIABLE: WIREWOUND: P5KA (89536)	1	EA	1				*	*	2	8	3	2-2	R1
P-H	5905-079-6372	A109B RESISTOR, VARIABLE: 110 (71450)	1	EA	2				*	2	2	13	5	2-4 2-7	R121 R227
P-H		A110 RESISTOR, VARIABLE, WIREWOUND: SAME AS A054	2	EA	3				REF	REF	REF	REF	REF	2-2.1 2-4.1 2-2.1	A3R1 A3R121 A3R227
X2-H	5330-975-0113	A111 WASHER: SAME AS A056	2	EA	4										A3E2
X2-H		A112 WASHER SHOULDER: SAME AS A057	2	EA	4										A3E2
P-C	5920-131-9816	A112A FUSE, CARTRIDGE: 10300253 (18876)	1	EA	1				*	2	2	19	100	2-2	F1
P-C	5920-199-9498	A112B FUSE, CARTRIDGE: F92B250V 1/2A (FOR 210-260 CHANGE OVER) (81349)	1	EA	1				*	2	2	19	75	2-2	F1
P-H	5920-556-0144	A113 HOLDER, FUSE: FHN20G (71400)	2	EA	1				*	*	*	5	3		A3X5
P-C	5920-636-0963	A114 FUSE: FO3B250V1A (81349)	2	EA	1				*	2	2	19	100	2-2.1	A3F1
X2-H		A115 FASTENER: C30395-832-4 (78553)	2	EA	4										A3H6
P-H		A116 POST, BINDING, DUAL: SAME AS A029	2	EA	1				REF	REF	REF	REF	REF		A3E4
X2-H		A117 STRAIN RELIEF: HEXCO SR-6P1 (28520)	2	EA	1										A3E5
A-H		A118 CABLE ASSEMBLY: B6929 (12598)	2	EA	1										A3A1
P-H	6145-752-1307	A118A CABLE, POWER, ELECTRICAL: CO-03LGF(3/18)0260 (81349)	1	FT	7				*	*	7	14	14	2-2.1	

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION Reference Number & Mfr Code		Usable On Code	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(7) 30-DAY GS MAINT ALLOWANCE (a) 1-20	(b) 21-50	(c) 51-100	(8) 1-YR ALW PER EQUIP CNTGCY	(9) DEPOT MAINT ALW PER 100 EQUIP	(10) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
P-H		A119	CABLE, POWER, ELECTRICAL: CO-03MGF(3/18)0340 (81349)	2	FT	7				*	*	7	14	14	2-2.1	A3A1E1
P-H	5935-636-7145	A120	CONNECTOR, PLUG, ELECTRICAL: UP121M (81349)	1 2	EA EA	1 1				* *	* *	* *	5 5	3 3		 A3A1P1
X2-H	5305-922-6286	A121	SCREW, MACHINE: SAME AS A003	2	EA	1										A3A1H1
X2-H	5940-620-8424	A122	LUG, TERMINAL: SAME AS A024	2	EA	2										A3A1H2
X2-H	5310-934-9761	A123	NUT: SAME AS A014	2	EA	1										A3A1H3
X2-H		A124	SCREW, MAHCINE: SAME AS A053	2	EA	8										A3A1H4
X2-H	5310-011-1041	A125	WASHER, LOCK: SAME AS A013	2	EA	10										A3A1H5
X2-H	5310-540-8119	A126	WASHER, FLAT: SAME AS A074	2	EA	10										A3A1H6
A-H		A127	TERMINAL BOARD ASSEMBLY: B6930 (12598)	2	EA	1									2-7.1	A3A2
M-D		A128	BOARD, TERMINAL: A-6248 (12598)	2	EA	1									2-7.1	A3A2TB-2
P-H	5910-988-6167	A128A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 600UE10402W (84411)	1	EA	4				*	2	2	19	20	2-7	C201, C202, C208, C210
P-H	5910-825-1637	A129	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CPO5A1KC104K3 (81349)	2	EA	4				*	2	2	19	20	2-7.1	A3A2C201, A3A2C202, A3A2C208 A3A2C210
P-H	5910-067-4199	A129A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 6000UE473-0-1 (84411)	1	EA	1				*	*	2	8	5	2-7	C203
P-H	5910-819-5745	A130	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CPO5A1KC473K3 (81349)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C203
P-H	54910-820-6114	A131	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CPO5A1KC474KS (81349)	1 2	EA EA	2 2				* *	2 2	2 2	13 13	10 10	2-7 2-7.1	C204, C209 A3A2C204, A3A2C209
P-H		A132	CAPACITOR, FIXED, ELECTROLYTIC: 974-40-6 (14936)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	C205 A3A2C205
P-H	5910-988-3809	A132A	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 30GA-D10 (56289)	1	EA	1				*	*	2	8	5	2-7	C206
P-H	5910-267-8994	A133	CAPACITOR, FIXED, CERAMIC DIELECTRIC: CK64AW102M (04222)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C206
P-H		A134	CAPACITOR, FIXED, ELECTROLYTIC: 974-10-150 (14936)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	C207 A3A2C207
P-H	5910-079-9896	A134A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: X663UW-10502 (84411)	1	EA	1				*	*	*	5	3	2-7	C211

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION (a) FIG.	(10) ILLUSTRATION (b) ITEM NO. OR
		Reference Number & Mfr Code		Usable On Code			(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100	CNTGCY	100 EQUIP	NO.	REFERENCE DESIGNATION
P-H		A135	CAPACITOR, FIXED, PLASTIC DIELECTRIC: SAME AS A079	2	EA	1				REF	REF	REF	REF	REF	2-7.1	A3A2C11
P-H	5910-067-5682	A135A	CAPACITOR, FIXED, ELECTROLYTIC: 30D207G006DF0 (56289)	1	EA	1				*	*	2	8	5	2-7	C212
P-H		A136	CAPACITOR, FIXED, ELECTROLYTIC: TE-1104 (14936)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C212
P-H	5910-079-9899	A136A	CAPACITOR, FIXED, CERAMIC DIELECTRIC: DD-3R3 (71590)	1	EA	1				*	*	2	8	5	2-7	C213
P-H		A137	CAPACITOR, FIXED, CERAMIC DIELECTRIC: CK60BX3R3X (81349)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C213
P-H	5910-969-4173	A137A	CAPACITOR, FIXED, ELECTROLYTIC: 801B, 450, Vac (89536)	1	EA	1				*	*	2	8	5	2-7	C214AB
P-H		A138	CAPACITOR, FIXED, ELECTROLYTIC: 956-282-20-20-450 (14936)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C214
P-H	5910-067-4202	A138A	CAPACITOR, FIXED, ELECTROLYTIC: 30D158G006BA4 (56289)	1	EA	1				*	*	2	8	5	2-7	C215
P-H		A139	CAPACITOR, FIXED, ELECTROLYTIC: 974-15-6 (14936)	2	EA	1				*	*	2	8	5	2-7.1	A3A2C215
P-H	5961-833-8140	A139A	SEMICONDUCTOR DEVICE: 2E4 (81483)	1	EA	2				*	2	2	13	10	2-7	CR202, CR203
P-H	5961-688-6316	A140	SEMICONDUCTOR DEVICE, DIODE: 1N547 (81349)	1	EA	3				*	2	3	33	35	2-7	CR201, CR202, CR203 A3A2CR201, A3A2CR202, A3A2CR203
P-H	5945-985-7719	A140A	CHOPPER, ELECTRONIC: C-2741 (12749)	1	EA	1				*	*	2	8	5	2-7	G1
P-H		A141	CHOPPER, ELECTRONIC: 227-AC-1 (16473)	2	EA	1				*	*	2	8	5	2-7.1	G1
P-H	5905-192-0390	A142	RESISTOR, FIXED, COMPOSITION: RC20GF105J (81349)	1	EA	7				2	2	3	33	35	2-7	R103, R201, R202, R203, R209, R210, R214
				2	EA	6				2	2	3	33	35	2-7.1	A3A2R201, A3A2R202, A3A2R203, A3A2R209, A3A2R210, A3A2R214
P-H	5905-279-2510	A143	RESISTOR, FIXED, COMPOSITION RC20GF395J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R204 A3A2R204
P-H	5905-279-1881	A144	RESISTOR, FIXED, COMPOSITION: RC20GF275J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R205 A3A2R205
P-H	5905-279-2515	A145	RESISTOR, FIXED, COMPOSITION: RC20GF474J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R206 A3A2R206

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION	
															(a)	(b)
		Reference Number & Mfr Code		Usable On Code			(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100	CNTGCY	100 EQUIP	FIG. NO.	ITEM NO. OR REFERENCE DESIGNATION
P-H	59095-279-3504	A146	RESISTOR, FIXED, COMPOSITION: RC20GF472J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R207 A3A2R207
P-H	5905-185-8518	A147	RESISTOR, FIXED, COMPOSITION: RC20GF103K (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R208 A3A2R208
P-H	5905-279-2519	A148	RESISTOR, FIXED, COMPOSITION: RC20GF334J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R211 A3A2R211
P-H	5905-192-0660	A149	RESISTOR, FIXED, COMPOSITION: RC20GF184J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R212 A3A2R212
P-H	5905-539-3204	A149A	RESISTOR, FIXED COMPOSITION: LIDLO (44655)	1	EA	3				*	2	2	18	15	2-7	R213, R225, R226
P-H	5905-195-6817	A150	RESISTOR, FIXED, COMPOSITION: RC20GF102K (81349)	2	EA	4				*	2	2	19	20	2-7.1	A3A2R213, A3A2R225, A3A2R226 A3A2R230
P-H	5905-279-3499	A151	RESISTOR, FIXED, COMPOSITION: RC20GF273J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R215 A3A2R215
P-H	5905-195-6800	A152	RESISTOR, FIXED, COMPOSITION: RC20GF561J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R216 A3A2R216
P-H	5905-190-8889	A153	RESISTOR, FIXED, COMPOSITION: RC20GF101J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-7 2-7.1	R217 A3A2R217
P-H	5905-079-6373	A153A	RESISTOR, FIXED, FILM: C13 (00327)	1	EA	1				*	*	2	8	5	2-7	R218
P-H	5905-044-4325	A154	RESISTOR, FIXED, FILM: RN70C93R1F (81349)	2	EA	1				*	*	2	8	5	2-7.1	A3A2R218
P-H	5905-279-3506	A155	RESISTOR, FIXED, COMPOSITION: RC20GF332J (81349)	1 2	EA EA	2 2				* *	2 2	2 2	13 13	10 10	2-7 2-7.1	R220, R221 A3A2R220, A3A2R221
P-H	5905-295-3410	A155A	RESISTOR, FIXED, COMPOSITION: RC20GF473K (81349)	1	EA	2				*	2	2	13	10	2-7	R222, R223
P-H	5905-190-8882	A156	RESISTOR, FIXED, COMPOSITION: RC20GF393K (81349)	2	EA	2				*	2	2	13	10	2-7.1	A3A2R222, A3A2R223
P-H	5905-957-8566	A156A	RESISTOR, FIXED, COMPOSITION: EB27G1 (01121)	1	EA	1				*	*	2	8	5	2-7	R224
P-H	5905-984-3962	A157	RESISTOR, FIXED, COMPOSITION: RC20GF2R7K (81349)	2	EA	1				*	*	2	8	5	2-7.1	A3A2R224
P-H	5905-279-1920	A158	RESISTOR, FIXED, COMPOSITION: RC42GF272J (81349)	1 2	EA EA	2 2				* *	2 2	2 2	13 13	10 10	2-7 2-7.1	R228, R229 A3A2R228, A3A2R229
P-H		A159	SOCKET, ELECTRON TUBE: 111-51-00-011 (71785)	2	EA	2				*	2	2	13	9		A3A2XV201, A3A2XV204
P-H		A160	SOCKET, ELECTRON TUBE: 121-51-00-040 (71785)	2	EA	2				*	2	2	19	15		A3A2XV202, A3A2XV203

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION	
							(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100	CNTGCY	100 EQUIP	(a) FIG. NO.	(b) ITEM NO. OR REFERENCE DESIGNATION
		Reference Number & Mfr Code		Usable On Code												
P-C	5960-882-0160	A161	TUBE, ELECRTRON:	1	EA	1				2	4	7	77	100	2-7	V202
			EF86/6267 (81349)	2	EA	1				2	4	7	77	100	2-7.1	A3A2V202
P-C	5960-682-8627	A162	TUBE, ELECTRON:	1	EA	1				2	4	7	77	100	2-7	V203
			6AW8A (81349)	2	EA	1				2	4	7	77	100	2-7.1	A3A2V203
P-C	5960-503-4880	A163	TUBE, ELECTRON:	1	EA	1				2	3	6	71	100	2-7	V204
			OAW2WA (81349)	2	EA	1				2	3	6	71	100	2-7.1	A3A2V204
P-O	5960-958-7520	A164	SHIELD, ELECTRON TUBE: 550 (83330)	2	EA	1				*	*	2	10	6		A3A2E
P-O		A165	SHIELD, ELECTRON TUBE: 319A-2 (04232)	2	EA	1				*	*	*	5	3		A3A2E
P-H	8240-577-8456	A165A	LAMP, GLOW: NE2E (08806)	1	EA	1				*	2	2	19	100	2-7	V201
P-H		A166	LAMP, GLOW: N3-2 (92966)	2	EA	1				*	2	2	19	100	2-7.1	A3A2V201
A-H		A166A	BOARD, ASSEMBLY 801B-523 (89536)	1	EA	1									2-4	
A-H		A167	BOARD, ASSEMBLY: B-6931 (12598)	2	EA	1									2-4.1	A3A3
M-D		A168	BOARD, TERMINAL: A6247 (12598)	2	EA	1									2-4.1	A3A3TB-1
P-H	5910-987-1497	A168A	CAPACITOR, FIXED, ELECTROLYTIC: 801B, 500, 20 (89536)	1	EA	2				*	2	2	13	10	2-4	C101, C102
P-H		A169	CAPACITOR, FIXED, ELECTROLYTIC: UPNC16-20MF500V (14655)	2	EA	2				*	2	2	13	10	2-4.1	A3A3C101, A3A3C102
P-H	5910-543-9502	A170	CAPACITOR, FIXED, PAPER DIELECTRIC: CPO5A1KF104K3 (81349)	1,2	EA	1				*	*	2	8	5	2-4.1	A3A3C103
P-H	5910-079-9893	A170A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 600UE-03306 (84411)	1	EA	1				*	*	2	8	5	2-4	C104
P-H	5910-821-7071	A171	CAPACITOR, FIXED, PLASTIC DIELECTRIC: CPO5A1KE333K3 (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3C104
P-H	5910-067-4198	A171A	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 600UE (84411)	1	EA	1				*	*	2	8	5	2-4	C105
P-H	5910-807-5570	A172	CAPACITOR, FIXED PLASTIC DIELECTRIC: CPO5A1KE104K3 (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3C105
P-H	5910-959-8628	A172A	CAPACITOR, FIXED, ELECTROLYTIC: 801B, 16, 1500 (89536)	1	EA	1				*	*	2	8	5	2-4	C106
P-H		A173	CAPACITOR, FIXED, ELECTROLYTIC: 956-281-1500-16 (30800)	2	EA	1				*	*	2	8	5	2-4.1	A3A3C106
P-H	5961-688-6316	A174	SEMICONDUCTOR DEVICE DIODE: SAME AS A140	1	EA	4				REF	REF	REF	REF	REF	2-4	CR101 thru CR104

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION (a) FIG.	(10) ILLUSTRATION (b) ITEM NO. OR
		Reference Number & Mfr Code		Usable On Code			(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100	CNTGCY	100 EQUIP	NO.	REFERENCE DESIGNATION
P-H	5905-810-2950	A174A	RESISTOR, FIXED, FILM: C12 (00327)	1	EA	1				8	8	2	8	5	2-4	R101
P-H	5905-729-7612	A175	RESISTOR, FIXED, FILM: RN70C5001F (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3R101
P-H	5905-079-6367	A175A	RESISTOR, FIXED, FILM: C12 (00327)	1	EA	1				*	*	2	8	5	2-4	R102
P-H	5905-794-4067	A176	RESISTOR, FIXED, FILM: RN70C6202F (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3R102
P-H	5905-192-0390	A177	RESISTOR, FIXED, COMPOSITION: SAME AS A142	2	EA	1				REF	REF	REF	REF	REF	2-4	A3A3R103
P-H	5905-192-0667	A178	RESISTOR, FIXED COMPOSITION: RC20GF224J (81349)	1 2	EA EA	2 2				* *	2 2	2 2	13 13	10 10	2-4 2-4.1	R104, R114 A3A3R104 A3A3R114
P-H	5905-190-8865	A178A	RESISTOR, FIXED COMPOSITION RC20GF274J (81349)	1	EA	2				*	2	2	13	10	2-4	R105, R106
P-H	5905-299-1997	A179	RESISTOR, FIXED, COMPOSITION: RC32GF274K (81349)	2	EA	2				*	2	2	13	10	2-4.1	A3A3R105, A3A3R106
P-H	5905-259-2990	A180	RESISTOR, FIXED, COMPOSITION: SAME AS A083	1 2	EA EA	1 1				REF REF	REF REF	REF REF	REF REF	REF REF	2-4 2-4.1	R107 A3A3R107
P-H	5905-279-2505	A181	RESISTOR, FIXED, COMPOSITION: RC20GF156J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R108 A3A3R108
P-H	5905-279-1865	A182	RESISTOR FIXED, COMPOSITION: RC20GF106J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R109 A3A3R109
P-H	5905-299-2003	A183	RESISTOR, FIXED, COMPOSITION: RC32GF104J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R110 A3A3R110
P-H	5905-068-8543	A183A	RESISTOR, FIXED, WIREWOUND: 1700S (00213)	1	EA	1				*	*	2	8	5	2-4	R111
P-H		A184	RESISTOR, FIXED, WIREWOUND: 17005140K (00213)	2	EA	1				*	*	2	8	5	2-4.1	A3A3R111
P-H	5905-195-6761	A185	RESISTOR, FIXED, COMPOSITION: RC20GF104J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R112 A3A3R112
P-H	5905-279-1715	A186	RESISTOR, FIXED, COMPOSITION: RC32GF564J (81349)	1 2	EA EA	2 12				* *	2 2	2 2	13 13	10 10	2-4 2-4.1	R113, R118 A3A3R113, A3A3R118
P-H	5905-171-1997	A187	RESISTOR, FIXED, COMPOSITION: RC20GF331K (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R115 A3A3R115
P-H	5905-299-2000	A188	RESISTOR, FIXED, COMPOSITION: RC32GF224J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R116 A3A3R116
P-H	5905-279-3494	A189	RESISTOR, FIXED, COMPOSITION: RC20GF823J (81349)	1 2	EA EA	1 1				* *	* *	2 2	8 8	5 5	2-4 2-4.1	R117 A3A3R117

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION	
							(a)	(b)	(c)	(a)	(b)	(c)			(a)	(b)
		Reference Number & Mfr Code		Usable On Code			1-20	21-50	51-100	1-20	21-50	51-100	CNTGCY	100 EQUIP	FIG. NO.	ITEM NO. OR REFERENCE DESIGNATION
P-H	5905-254-7097	A189A	RESISTOR, FIXED, WIREWOUND: M57 (80031)	1	EA	1				*	*	2	8	5	2-4	R119
P-H		A190	RESISTOR, FIXED, WIREWOUND: RB52CE38602D (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3R119
P-H	5905-882-7154	A190A	RESISTOR, FIXED, WIREWOUND: 1112 (17870)	2	EA	1				*	*	2	8	5	2-4	R120
P-H		A191	RESISTOR, FIXED, WIREWOUND: RB54CE76001D (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3R120
P-H	5905-079-6365	A191A	RESISTOR, VARIABLE: SAME AS A016A	1	EA	1				REF	REF	REF	REF	REF	2-9	R2
P-H	5961-023-3083	A192	TRANSISTOR:	1	EA	1				*	*	2	8	5	2-4	Q102
			WN1372 (01295)	2	EA	1				*	*	2	8	5	2-4.1	A3A3Q102
P-H		A193	SOCKET, ELECTRON TUBE SAME AS A160	2	EA	3				REF	REF	REF	REF	REF		A3A3XV102, A3A3XV105, A3A3XV106
P-H		A194	SOCKET, ELECTRON TUBE: SAME AS A159	2	EA	1				REF	REF	REF	REF	REF		A3A3XV104
P-C	5960-827-8782	A195	TUBE, ELECTRON:	1	EA	2				2	6	11	124	100	2-4	V105, V106
			12AX7/WA (81349)	2	EA	2				2	6	11	124	100	2-4.1	A3A3V105
P-H	5960-852-0235	A196	TUBE, ELECTRON:	1	EA	1				2	4	7	77	100	2-4	V102
			6BQ5 (81349)	2	EA	1				2	4	7	77	100	2-4.1	A3A3V102
P-H	5960-836-6273	A197	ELECTRON TUB:	1	EA	1				2	4	7	77	100	2-4	V104
			OG3/85A2 (04878)	2	EA	1				2	4	7	77	100	2-4.1	A3A3V104
P-H	5240-577-8456	A197A	LAMP, GLOW: SAME AS A165A	1	EA	1				REF	REF	REF	REF	REF	2-4	V103
P-H		A198	LAMP, GLOW: SAME AS A166	2	EA	1				REF	REF	REF	REF	REF	2-4.1	A3A3V103
X2-H		A199	STANDOFF: A-6417 (12598)	2	EA	2										A3A3MP1
P-O	5960-958-7520	A200	SHIELD, ELECTRON TUBE: SAME AS A164	2	EA	1				REF	REF	REF	REF	REF		A3A3E1
X2-H		A201	SCREW, MACHINE: MS35233-36 (96906)	2	EA	2										A3A3H1
X2-H	5310-011-1041	A202	WASHER, LOCK: SAME AS A013	2	EA	2										A3A3H2
X2-H	5310-934-9761	A203	NUT: SAME AS A014	2	EA	2										A3A3H3
A-H		A204	HEAT-SINK ASSEMBLY: B6932 (12598)	2	EA	1										A3A3A1
M-D		A205	HEAT-SINK: A6418 (12598)	2	EA	1										A3A3A1MP1
P-H	5961-977-5787	A205A	TRANSISTOR: WN301W (49671)	1	EA	1				*	*	2	8	5	2-4	Q101
P-H	5961-821-8976	A206	TRANSISTOR: 2N297A (81349)	2	EA	1				*	*	2	8	5	2-4.1	A3A3A1Q101

SECTION II REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE (CONTINUED)

(1) SMR CODE	(2) FEDERAL NUMBER STOCK	(3) DESCRIPTION			(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS MAINT ALLOWANCE			(7) 30-DAY GS MAINT ALLOWANCE			(8) 1-YR ALW PER EQUIP	(9) DEPOT MAINT ALW PER	(10) ILLUSTRATION (a) FIG. NO.	(10) ILLUSTRATION (b) ITEM NO. OR REFERENCE DESIGNATION
		Reference Number & Mfr Code		Usable On Code			(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100	CNTGCY	100 EQUIP		
P-H	5961-885-8598	A207	SOCKET, SEMICONDUCTOR DEVICE: 2T6-1 (71785)	2	EA	1				*	*	*	5	3		A3A3A1X1
X2-H		A208	SCREW, MACHINE: MS24638-10 (96906)	2	EA	2										A3A3A1H2
X2-H		A209	SCREW, MACHINE: MS35233-4 (96906)	2	EA	2										A3A3A1H2
X2-H		A210	WASHER, FLAT: MS15795-302 (96906)	2	EA	2										A3A3A1H3
X2-H	5310-928-2690	A211	WASHER, SPLIT: MS35338-77 (96906)	2	EA	2										A3A3A1H4
X2-H	5310-056-3394	A212	NUT: MS35649-24 (96906)	2	EA	2										A3A3A1H5

SECTION III. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE

TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5305-054-6670		A3H2
5305-531-0137		A2A1H1
5305-543-2775		A2H6
5305-543-2775		A3H1
5305-519-3029		A2H5
5305-922-6286		A1H1
5305-922-6286		A2H1
5305-922-6286		A3A1H1
5310-011-1041		A2H2
5310-011-1041		A2H9
5310-011-1041		A2H11
5310-011-1041		A2H14
5310-011-1041		A3A1H5
5310-011-1041		A3A3H2
5310-054-1831		A1H3
5310-056-3394		A3A3A1H5
5310-540-8119		A2H13
5310-540-8119		A3A1H6
5310-880-5978		A3H3
5310-928-2690		A3A3A1H4
5310-934-9759		A3H5
5310-934-9761		A2H3
5310-934-9761		A3A1H3
5310-934-9761		A3A3H3
5310-934-9765		A1H4
5325-754-2240		A3E1
5330-975-0113		A2E4
5330-975-0113		A2E8
5330-975-0113		A3E2
5340-948-9908		A1MP1
5340-975-1908		A1E1
5905-042-6815	2-8	A2A2R316
5905-044-4325	2-7.1	A3A2R218
5905-064-1864	2-2	R1
5905-068-8057	2-5	R440
5905-068-8057	2-5	R441
5905-068-8057	2-5	R442
5905-068-8057	2-5	R443
5905-068-8057	2-5	R444
5905-068-8057	2-5	R445
5905-068-8057	2-5	R446
5905-068-8057	2-5	R447
5905-068-8057	2-5	R448
5905-068-8057	2-5	R449
5905-068-8535	2-5	R418
5905-068-8535	2-5	R419
5905-068-8535	2-5	R420
5905-068-8535	2-5	R421
5905-068-8535	2-5	R422
5905-068-8535	2-5	R423
5905-068-8535	2-5	R424
5905-068-8535	2-5	R425
5905-068-8535	2-5	R426
5905-068-8535	2-5	R427
5905-068-8535	2-5	R428
5905-068-8543	2-4	R111
5905-068-8544	2-5	R429
5905-068-8544	2-5	R430
5905-068-8544	2-5	R431
5905-068-8544	2-5	R432
5905-068-8544	2-5	R433
5905-068-8544	2-5	R434
5905-068-8544	2-5	R435
5905-068-8544	2-5	R436
5905-068-8544	2-5	R437
5905-068-8544	2-5	R438
5905-068-8544	2-5	R439
5905-079-6362	2-7	R219
5905-079-6365	2-9	R2
5905-079-6365	2-8	R306
5905-079-6367	2-4	R102
5905-079-6372	2-4	R121
5905-079-6372	2-7	R227
5905-079-6373	2-7	R218
5905-079-8312	2-8	R320
5905-079-8312	2-8	R321
5905-079-8314	2-8	R328
5905-079-8315	2-8	R325
5905-079-8316	2-8	R324
5905-079-8317	2-8	R327
5905-079-8319	2-6	R323
5905-079-8319	2-6	R326
5905-079-8319	2-6	R329
5905-105-8518	2-7.1	A3A2R208
5905-105-8518	2-7	R208
5905-171-1997	2-4 1	A3A3R115
5905-171-1997	2-4	R115
5905-171-2006	2-8	R331
5905-190-8865	2-4	R105
5905-190-8865	2-4	R106
5905-190-8882	2-7.1	A3A2R222
5905-190-8882	2-7.1	A3A2R223
5905-190-8889	2-7.1	A3A2R217
5905-190-8889	2-7	R217
5905-192-0390	2-7.1	A3A2R201
5905-192-0390	2-7.1	A3A2R202
5905-192-0390	2-7.1	A3A2R203
5905-192-0390	2-7.1	A3A2R209
5905-192-0390	2-7.1	A3A2R210
5905-192-0390	2-7.1	A3A2R214
5905-192-0390	2-4	A3A3R103
5905-192-0390	2-7	R103
5905-192-0390	2-7	R201
5905-192-0390	2-7	R202
5905-192-0390	2-7	R203
5905-192-0390	2-7	R209
5905-192-0390	2-7	R210
5905-192-0390	2-7	R214
5905-192-0660	2-7.1	A3A2R212
5905-192-0660	2-7	R212
5905-192-0667	2-4.1	A3A3R104
5905-192-0667	2-4.1	A3A3R114
5905-192-0667	2-4	R104
5905-192-0667	2-4	R114
5905-195-6761	2-4.1	A3A3R112
5905-195-8761	2-4	R112
5905-195-6800	2-7.1	A3A2R216
5905-195-6800	2-7	R216
5905-195-6817	2-7.1	A3A2R213
5905-195-6817	2-7.1	A3A2R225

SECTION III. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE

TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (CONTINUED)

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5905-195-6817	2-7.1	A3A2R226
5905-195-6817	2-7.1	A3A2R230
5905-254-7097	2-4	R119
5905-259-2990	2-8	A2A2R311
5905-259-2990	2-8	A2A2R312
5905-259-2990	2-8	A2A2R313
5905-259-2990	2-8	A2A2R314
5905-259-2990	2-8	A2A2R315
5905-259-2990	2-4.1	A3A3R107
5905-259-2990	2-4	R107
5905-259-2990	2-8	R311
5905-259-2990	2-8	R312
5905-259-2990	2-8	R313
5905-259-2990	2-8	R314
5905-259-2990	2-8	R315
5905-279-1715	2-4.1	A3A3R113
5905-279-1715	2-4.1	A3A3R118
5905-279-1865	2-4.1	A3A3R109
5905-279-1865	2-4	R109
5905-279-1880	2-8	A2A2R331
5905-279-1881	2-7.1	A3A2R205
5905-279-1881	2-7	R205
5905-279-1920	2-7.1	A3A2R228
5905-279-1920	2-7.1	A3A2R229
5905-279-1920	2-7	R228
5905-279-1920	2-7	R229
5905-279-2504	2-4.1	A3A3R108
5905-279-2504	2-4	R108
5905-279-2510	2-7.1	A3A2R204
5905-279-2510	2-7	R204
5905-279-2515	2-7.1	A3A2R206
5905-279-2515	2-7	R206
5905-279-2519	2-7.1	A3A2R211
5905-279-2519	2-1	R211
5905-279-3494	2-4.1	A3A3R117
5905-279-3494	2-4	R117
5905-279-3499	2-7.1	A3A2R215
5905-279-3499	2-7	R215
5905-279-3504	2-7.1	A3A2R207
5905-279-3504	2-7	R207
5905-279-3506	2-7.1	A3A2R220
5905-279-3506	2-7.1	A3A2R221
5905-279-3506	2-7	R220
5905-279-3506	2-7	R221
5905-295-3410	2-7	R222
5905-295-3410	2-7	R223
5905-299-1997	2-4.1	A3A3R105
5905-299-1997	2-4.1	A3A3R106
5905-299-2000	2-4.1	A3A3R116
5905-299-2000	2-4	R116
5905-299-2003	2-4.1	A3A3R110
5905-299-2003	2-4	R110
5905-299-2020	2-8	A2A2R322
5905-299-2020	2-8	R322
5905-448-6509	2-6	R318
5905-539-3204	2-7	R213
5905-539-3204	2-7	R225
5905-539-3204	2-7	R226
5905-552-5752	2-8	A2A2R301
5905-552-5752	2-8	A2A2R302
5905-552-5752	2-8	A2A2R303
5905-552-5752	2-8	A2A2R304
5905-729-7612	2-4.1	A3A3R01
5905-752-6461	2-8	A2A2R309
5905-755-5365	2-8	R306
5905-794-4067	2-4.1	A3A3R102
5905-806-4086	2-5	R401
5905-806-4086	2-5	R402
5905-806-4086	2-5	R403
5905-806-4086	2-5	R404
5905-806-4086	2-5	R405
5905-806-4086	2-5	R406
5905-806-4087	2-8	R316
5905-806-4087	2-8	R317
5905-810-2943	2-8	R305
5905-810-2950	2-4	R101
5905-810-2953	2-8	R307
5905-882-7154	2-4	R120
5905-892-0535	2-8	R309
5905-899-3551	2-8	R301
5905-899-3551	2-8	R302
5905-899-3551	2-8	R303
5905-899-3551	2-8	R304
5905-957-8566	2-7	R224
5905-984-3962	2-7.1	A3A2R224
5905-985-5516	2-8	R330
5905-985-5528	2-8	R319
5905-987-1939	2-3	T1
5905-990-0817	2-5	R407
5905-990-0817	2-5	R408
5905-990-0817	2-5	R409
5905-990-0817	2-5	R410
5905-990-0817	2-5	R411
5905-990-0817	2-5	R412
5905-990-0817	2-5	R413
5905-990-0817	2-5	R414
5905-990-0817	2-5	R415
5905-990-0817	2-5	R416
5905-990-0817	2-5	R417
5910-067-4198	2-4	C105
5910-067-4199	2-7	C203
5910-067-4202	2-7	C215
5910-067-5682	2-7	C212
5910-076-3606	2-8	C302
5910-079-9893	2-4	C104
5910-079-9896	2-7	C211
5910-079-9899	2-7	C213
5910-267-8994	2-7.1	A3A2C206
5910-543-9502	2-4.1	A3A3103
5910-797-3851	2-9	C1
5910-807-5570	2-4.1	A3A3C105
5910-819-5745	2-7.1	A3A2C203
5910-820-6114	2-7.1	A3A2C204
5910-820-6114	2-7.1	A3A2C209
5910-820-6114	2-7	C204
5910-820-6114	2-7	C209
5910-821-7071	2-4.1	A3A3C104
5910-825-1637	2-7.1	A3A2C201
5910-825-1637	2-7.1	A3A2C202
5910-825-1637	2-7.1	A3A2C206

SECTION III. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE

TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (CONTINUED)

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5910-825-1637	2-7.1	A3A2C210
5910-959-8628	2-4	C106
5910-969-4173	2-7	C214AB
5910-987-1497	2-4	C101
5910-987-1497	2-4	C102
5910-988-3518	2-8	C301
5910-988-3809	2-7	C206
5910-988-6167	2-7	C201
5910-988-6167	2-7	C202
5910-988-6167	2-7	C208
5910-988-6187	2-7	C210
5920-131-9816	2-2	F1
5920-199-9498	2-2	F1
5920-556-0144		A3X5
5920-636-0963	2-2.1	A3F1
5930-070-1867	2-9	S2
5930-258-4302	5-8	S1
5930-655-1514	5-8 1	A2S1
5930-907-5769	2-9	S10
5930-955-9941	2-9	S5
5930-955-9942	2-9	S3
5930-956-3078	2-9	S4
5930-986-1683	2-9	S7
5930-986-1683	2-9	S8
5930-986-1683	2-9	S9
5930-987-0114	2-9	S6
5935-636-7145		A3A1P1
5940-549-9037		J4
5940-549-9037		J5
5940-620-8424		A2H5
5940-620-8424		A3A1H2
5940-681-8184		A2H4
5940-840-0139		J2
5940-946-1639		A2E3
5945-985-7719	2-7	G1
5960-503-4880	2-7.1	A3A2V204
5960-503-4880	2-7	V204
5960-682-8627	2-7.1	A3A2V203
5960-682-8627	2-7	V203
5960-827-8782	2-4.1	A3A3V105
5960-827-8782	2-4.1	A3A3V106
5960-827-8782	2-4	V105
5960-827-8782	2-4	V106
5960-836-6273	2-4.1	A3A3V104
5960-836-6273	2-4	V104
5960-852-0235	2-4.1	A3A3V102
5960-852-0235	2-4	V102
5960-882-0160	2-7.1	A3A2V202
5960-882-0160	2-7	V202
5960-958-7520		A3A2E
5960-958-7520		A3A3E1
5961-023-3083	2-4.1	A3A3Q102
5961-023-3083	2-4	Q102
5961-688-6316	2-7.1	A3A2CR201
5961-688-6316	2-7.1	A3A2CR202
5961-688-6316	2-1.1	A3A2CR203
5961-688-6316	2-4.1	A3A3CR101
5961-688-6316	2-4 1	A3A3CR102
5961-688-6316	2-4.1	A3A3CR103
5961-688-6316	2-4.1	A3A3CR104
5961-688-6316	2-4	CR101
5961-688-6316	2-4	CR102
5961-689-6316	2-4	CR103
5961-688-6316	2-4	CR104
5961-688-6315	2-7	CR201
5961-688-6316	2-7	CR202
5961-689-6316	2-7	CR203
5961-821-8976	2-4.1	A3A3A1Q101
5961-833-8140	2-7	CR202
5961-833-8140	2-7	CR203
5961-885-8598		A33AA1X1
5961-977-5787	2-4	Q101
6240-155-8706	5-8.1	A2DS1
6240-155-8706	5-8.1	A2DS2
6240-155-8706	5-8.1	A2DS3
6240-155-8706	5-8.1	A2DS4
6240-155-8706	5-8	DS1
6240-155-8706	5-8	DS2
6240-155-8706	5-8	DS3
6240-155-8706	5-8	DS4
6240-577-8456	2-4	V103
6240-577-8456	2-7	V201
6250-967-5487		X1
6250-967-5487		X2
6250-967-5487		X3
6250-967-5487		X4
6625-133-7617	5-8.1	A2M1
6625-825-7249	5-8.1	A2BT1
6625-825-7249	2-9	B1
6625-980-1985	2-9	M1

Reference No.	Mfg. Code	Fig. No.	Ref. Desig.
A-5442	19598		A2MP1
A-6016	12598		A2MP9
A-6237	12598		A2A1
A-6238	12598		A2A1MP1
A6239	12598		A2A1MP2
A6247	12598	2-4.1	A3A3TB-1
A-6248	12598	2-7.1	A3A2TB-2
A6249	12598		A2A2TB3
A-8400	12598		A2MP7
A6401	12598		A2MP12
A-6402	12598		A3MP2
A6416	12598		A2MP2
A-6417	12598		A3A3MP1
A6418	12598		A3A3A1MP1
A-6926	12598		A2MP8
A-6927	12598		A2E6
B-6017	12598		A2M9
B-6018	12598		A2MP8
B6695	12598		A2MP11
B-6929	12598		A3A1
B-6930	12598	2-7.1	A3A2
B-6931	12598	2-4.1	A3A3
B6932	12598		A3A3A1
CH08A1NC225M	813492-8		A2A2C302
CH08A1NC225M	81349		A2C303
CH08A1NF105M	813423-8		A2A2C301
CH08A1NF105M	813493-7.1		A3A2C211
CK60BX3R3X	813492-7.1		A3A2C213

SECTION III. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (CONTINUED)

Reference No.	Mfg. Code	Fig. No.	Ref. Desig.
CO-03MGF(3/18)0340	81349	2-2.1	A3A1E1
C30395-832-4	78553		A3H6
C-6014	93301		A2MP1
C-6925	12598		A2
D-6024	12598		A3MP1
D-6928	12598		A3
D6933	12598	2-8	A2A2
HEXCO SR-6P1	28520		A3E5
MH52418	43543	2-3.1	A3T1
MS15795-302	96906		A3A3A1H3
MS24638-10	96906		A3A3A1H2
MS35233-4	96909		A3A3A1H2
MS35233-25	96906		A2H10
MS35233-26	96906		A2H7
MS35233-26	96906		A2H8
MS35233-26	96906		A2H15
MS35233-26	96906		A3A1H4
MS-35233-36	96906		A3A3H1
MS35234-59	96906		A1H2
MS35338-80	96906		A3H4
MS91528C1F2B	96906		A2MP2
MS91528C1G2B	96906		A2MP4
MS91528C2F2B	96906		A2MP3
MS91528C2G28	96906		A2MP5
NE-2	92966	2-7.1	A3A2V201
NE-2	92966	2-4.1	A3A3V103
RA20LASA100A	81349	2-2.1	A3R219
RA20LASB501A	81349	2-6.1	A2R323
RA20LASB501A	81349	2-6.1	A2R326
RA20LASB501A	81349	2-6.1	A2R329
RA20LASB02A	81349	2-6.1	A2R318
RA20LASB502A	81349	5-8.1	A2R332
RA20LASB502A	81349	5-8.1	A2R333
RA20LASB502A	81349	2-2.1	A3R1
RA20LASB502A	81349	2-4.1	A3R121
RA20LASB502A	81349	2-2.1	A3R227
RB52CE112375A	98141	2-8	A2A2R320
RB52CE112375A	98141	2-8	A2A2R321
RB52CE12302B	81349	2-8	A2A2R317
RB52CE38602D	81349	2-4.1	A3A3R119
RB54CE16000B	81349	2-5.1	A2R418
RB54CE16000B	81349	2-5.1	A2R419
RB54CE16000B	81349	2-5.1	A2R420
RB54CE16000B	81349	2-5.1	A2R421
RB54CE16000B	81349	2-5.1	A2R422
RB54CE16000B	81349	2-5.1	A2R423
RB54CE16000B	81349	2-5.1	A2R424
RB54CE16000B	81349	2-5.1	A2R425
RB54CE16000B	81349	2-5.1	A2R426
RB54CE16000B	81349	2-5.1	A2R427
RB54CE16000B	81349	2-5.1	A2428
RB54CE22501B	81349	2-8	A2A2R325
RB54CE24751B	81349	2-8	A2A2R328
RB54CE250R31A	98141	2-8	A2A2R330
RB54CE2531R7A	98141	2-8	A2A2R327
RB54CE287510A	98141	2-8	A2A2R324
RB54CE320R0B	81349	2-5.1	A2R429
RB54CE320R0B	81349	2-5.1	A2R430
RB54CE320R0B	81349	2-5.1	A2R431
RB54CE320R0B	81349	2-5.1	A2R432
RB54CE320R0B	81349	2-5.1	A2R433
RB54CE320R0B	81349	2-5.1	A2R434
RB54CE320R0B	81349	2-5.1	A2R435
RB54CE320R0B	81349	2-5.1	A2R436
RB54CE320R0B	81349	2-5.1	A2R437
RB54CE320R0B	81349	2-5.1	A2R438
RB54CE320R0B	81349	2-5.1	A2R439
RB54CE40001(.02)	98141	2-5.1	A2R401
RB54CE40001(.02)	98141	2-5.1	A2R402
RB54CE40001(.02)	98141	2-5.1	A2R403
RB54CE40001(.02)	98141	2-5.1	A2R404
RB54CE40001(.02)	98141	2-5.1	A2R405
RB54CE40001(.02)	98141	2-5.1	A2R406
RB54CE511R7B	81349	2-8	A2A2R319
RB54CE64R00B	81349	2-5.1	A2R440
RB54CE64R00B	81349	2-5.1	A2R441
RB54CE64R00B	81349	2-5.1	A2R442
RB54CE64R00B	81349	2-5.1	A2R443
RB54CE64R00B	81349	2-5.1	A2R444
RB54CE64R00B	81349	2-5.1	A2R445
RB54CE64R00B	81349	2-5.1	A2R446
RB54CE64R00B	81349	2-5.1	A2R447
RB54CE64R00B	81349	2-5.1	A2R448
RB54CE64R00B	81349	2-5.1	A2R449
RB54CE76001D	81349	2-4.1	A3A3R120
RB54CE80000(.02)	98141	2-5.1	A2R407
RB54CE80000(.02)	98141	2-5.1	A2R408
RB54CE80000(.02)	98141	2-5.1	A2R409
RB54CE80000(.02)	98141	2-5.1	A2R410
RB54CE80000(.02)	98141	2-5.1	A2R411
RB54CE80000(.02)	98141	2-5.1	A2R412
RB54CE80000(.02)	98141	2-5.1	A2R413
RB54CE80000(.02)	98141	2-5.1	A2R414
RB54CE80000(.02)	98141	2-5.1	A2R415
RB54CE80000(.02)	98141	2-5.1	A2R416
RB54CE80000(.02)	98141	2-5.1	A2R417
RN25X9004F	11350	2-8	A2A2R305
RN70C9001F	81349	2-8	A2A2R308
RN70C9002F	81349	2-8	A2A2R307
RN70C9003F	81349	2-8	A2A2R306
TE-1104	14936	2-7.1	A3A2C212
UPNC16-20MF500V	14655	2-4.1	A3A3C101
UPNC16-20MF500V	14655	2-4.1	A3A3C102
X663FO-47UF	84411	5-8.1	A2C1
06046	12598		A1
1114	06540		A2MP10
111-51-00-011	71785		A3A2XV201
111-51-00-011	71785		A3A2XV204
111-51-00-011	71785		A3A3XV104
121-51-00-040	71785		A3A2XV202
121-51-00-040	71785		A3A2XV203
121-51-00-040	71785		A3A3XV102
121-51-00-040	71785		A3A3XV105
121-51-00-040	71785		A3A3XV106
17005140K	00213	2-4.1	A3A3R111
212-19421-2	71450	5-8.1	A2S5
212-19421-2	71450	5-8.1	A2S7
212-19421-2	71450	5-8.1	A2S8
212-19421-2	71450	5-8.1	A2S9
212-21085-2	71450	5-8.1	A2S6
212-22172-2	71450	5-8.1	A2S10

SECTION III. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE

TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION (CONTINUED)

Reference No.	Mfg. Code	Fig. No.	Ref. Desig.
212-23773-1SR	71450	5-8.1	A2S4
2157	83330		A2E5
2157	83330		A2E9
2157	83330		A3E2
227-AC-1	16473	2-7.1	G1
231 BLACK	83330		A2E2
263RR	83330		A2E1
263RR	83330		A3E4
319A-2	04230		A3A2E
44561	71450	5-8.1	A2R2
57079	71450	5-8.1	A2S2
59017	71450	5-8.1	A2S3
6-32X21/2LGPANHD	12598		A2H12
9020-S-6	86577		A2E7
956-281-15	76433	2-4.1	A3A3C106
956-282-20-20-450	14936	2-7.1	A3A2C214
974-10-150	14936	2-7.1	A3A2C207
974-10-150	14936	2-7	C207
974-15-6	14936	2-7.1	A3A2C215
974-40-6	14936	2-7.1	A3A2C205
974-40-6	14936	2-7	C205

SECTION IV. INDEX-REFERENCE DESIGNATION

CROSS REFERENCE TO PAGE NUMBER

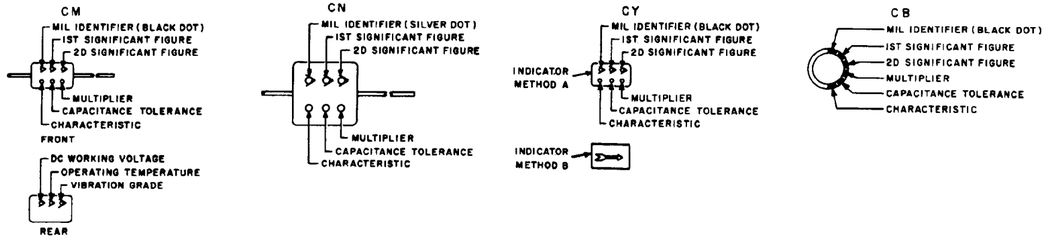
SECTION IV. INDEX-REFERENCE DESIGNATION

CROSS REFERENCE TO PAGE NUMBER (CONTINUED)

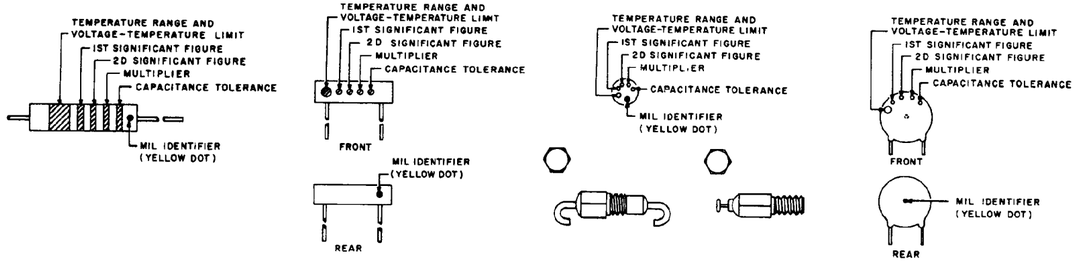
SECTION IV. INDEX-REFERENCE DESIGNATION
CROSS REFERENCE TO PAGE NUMBER (CONTINUED)

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

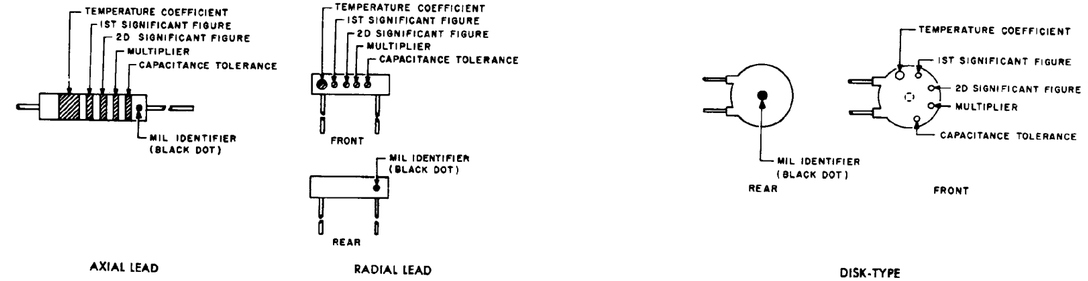
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

Figure 5–8. MIL STD capacitor color-code markings. STD – C2

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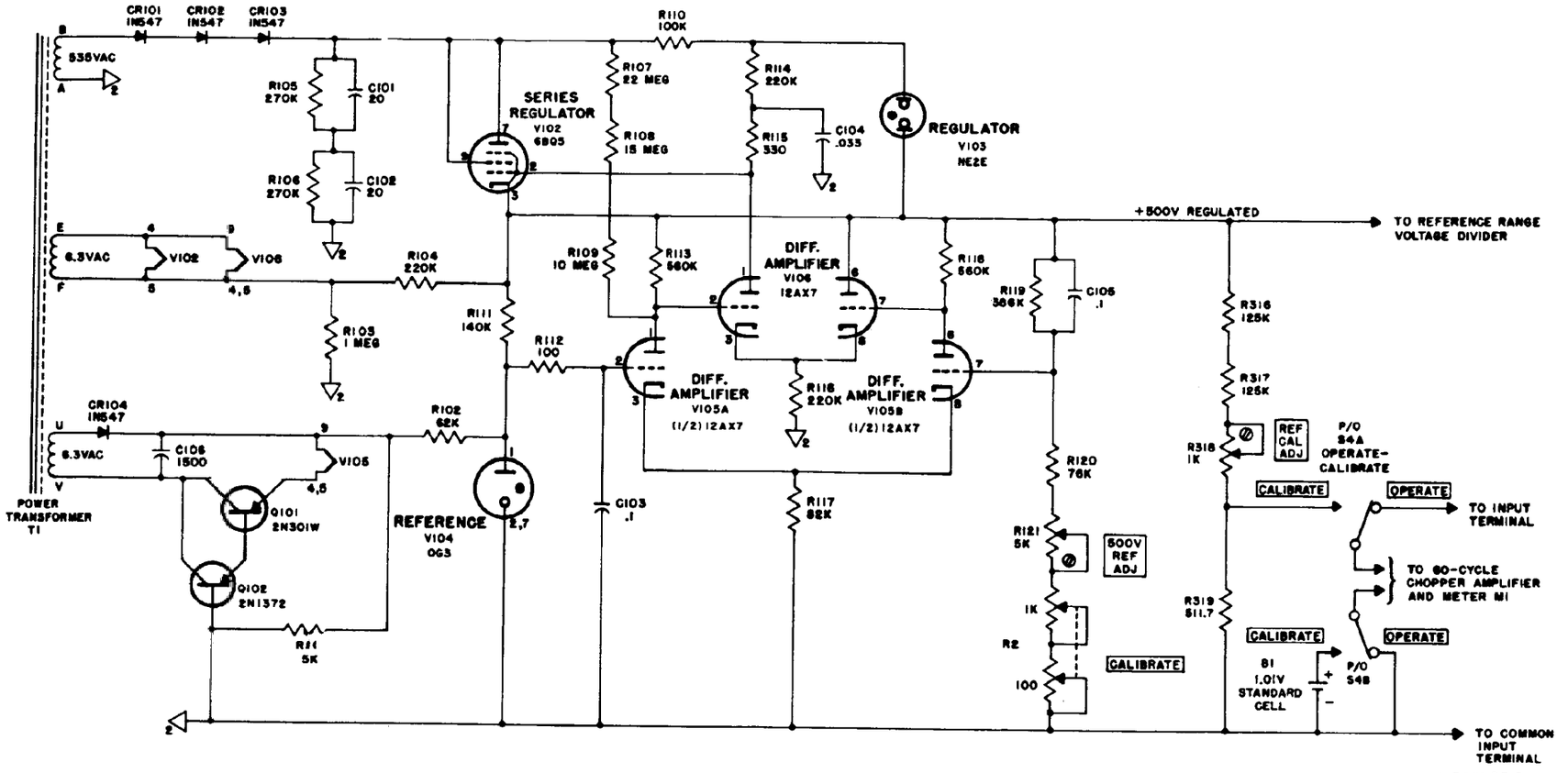


Figure 5-4. Power supply, 0 to 500 volts, schematic diagram, AN/USM-98A.

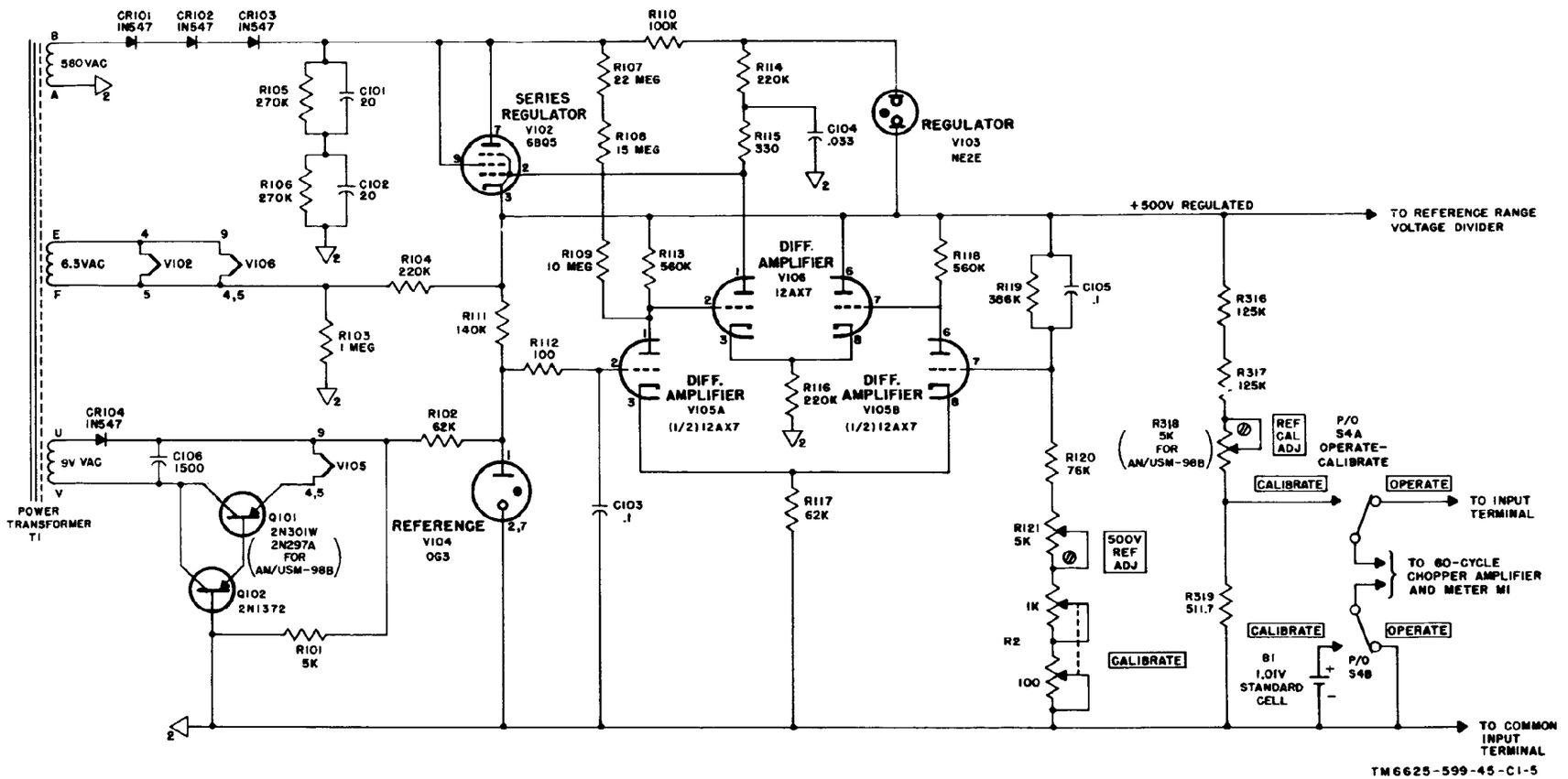
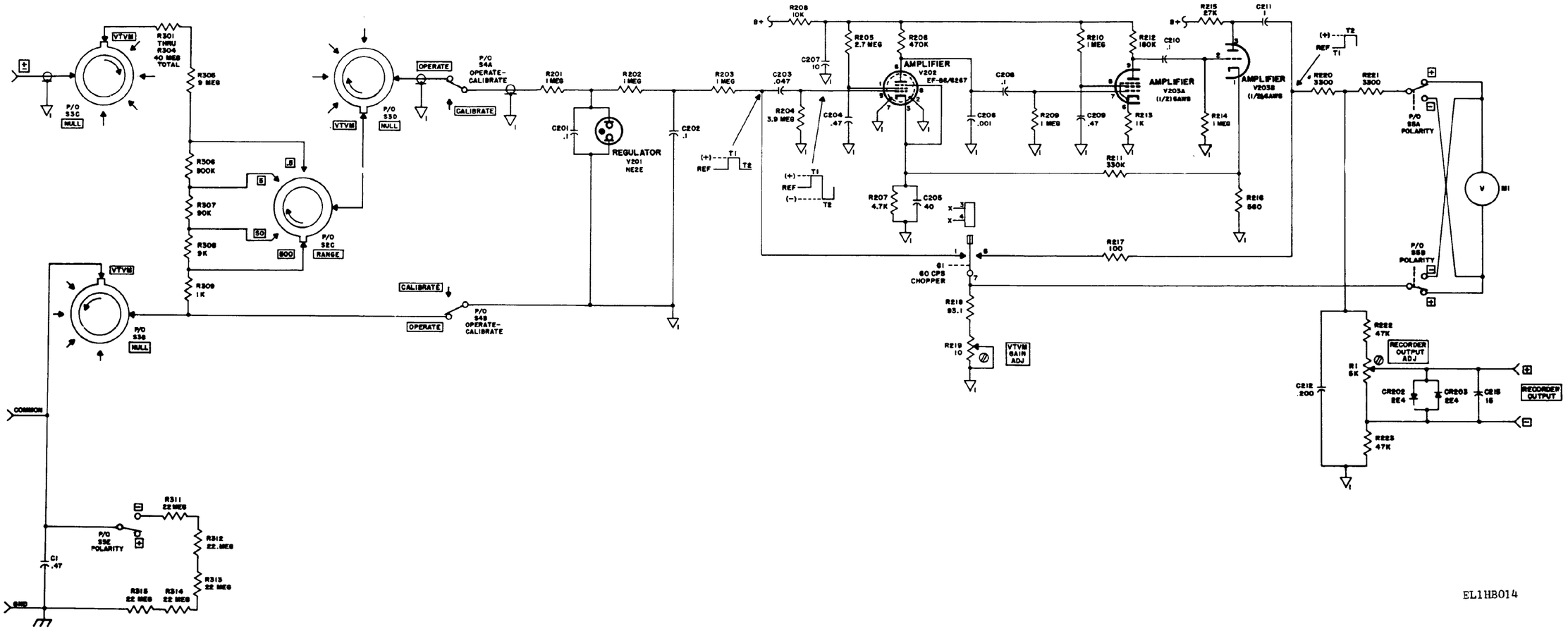
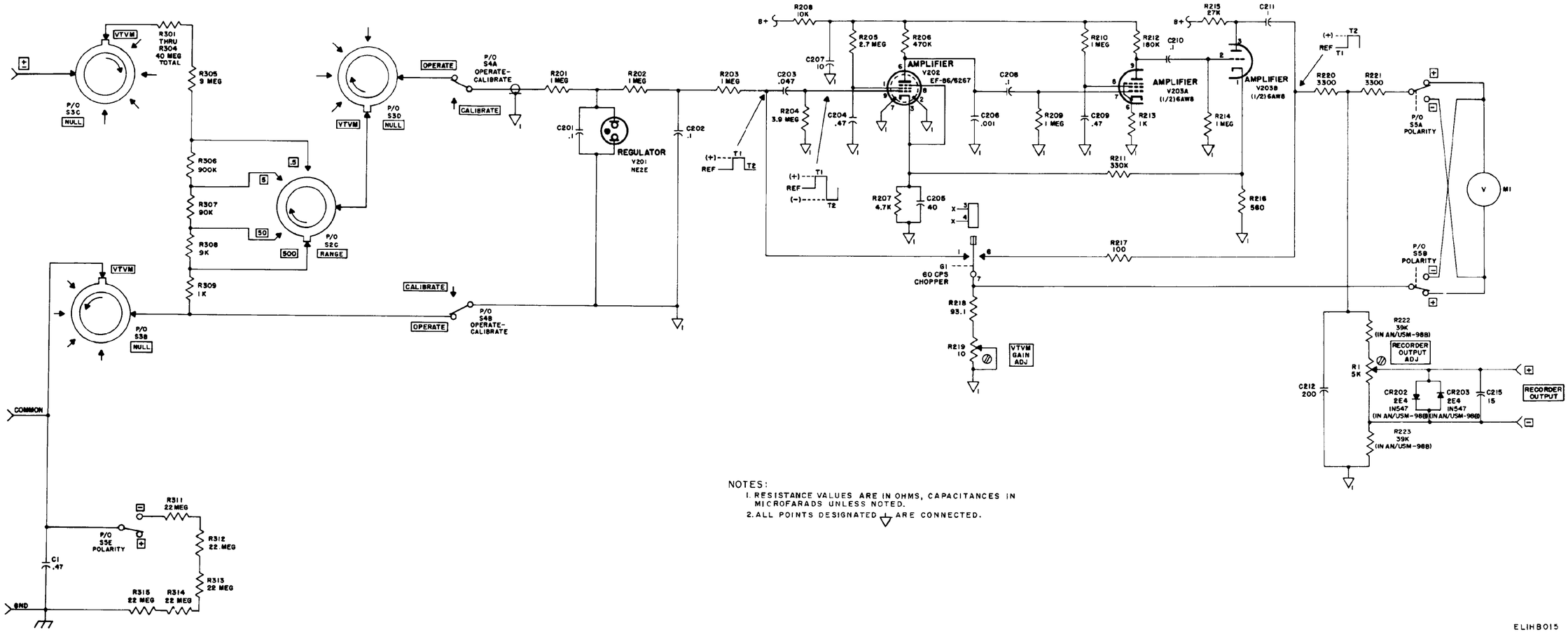


Figure 5-4.1. Power supply, 0 to 500 volts, schematic diagram, AN/USM-98B.



EL1HB014

Figure 5–5. Vacuum-tube voltmeter mode of operation, simplified schematic diagram, AN/USM-98A.



NOTES:
1. RESISTANCE VALUES ARE IN OHMS, CAPACITANCES IN MICROFARADS UNLESS NOTED.
2. ALL POINTS DESIGNATED ⏚ ARE CONNECTED.

ELIHB015

Figure 5-5.1 Vacuum-tube voltmeter mode of operation, simplified schematic diagram AN/USM-98B.

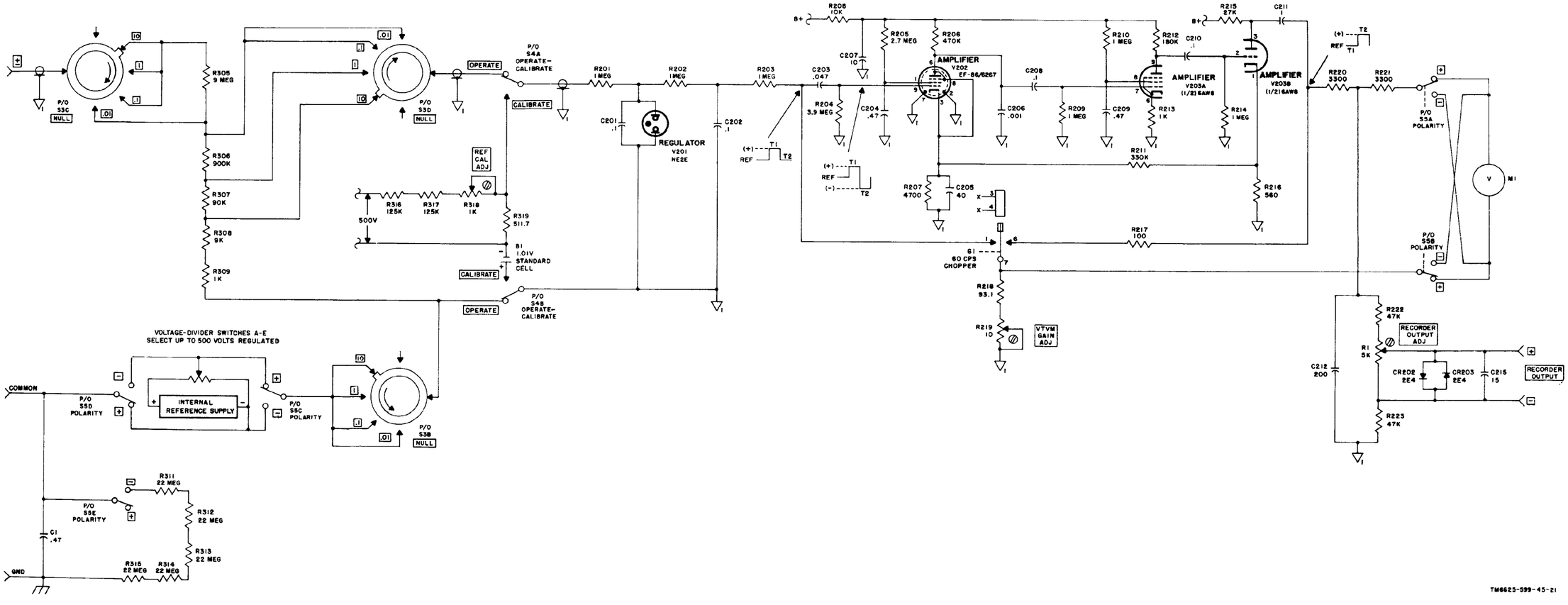
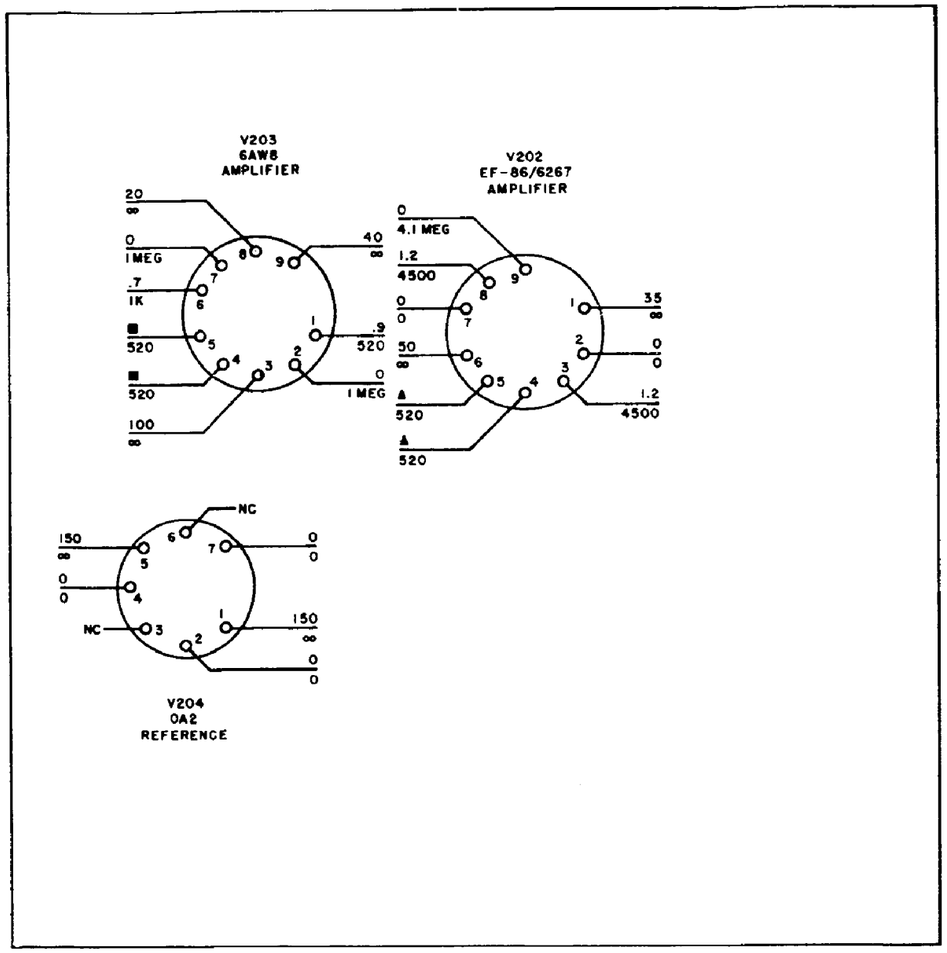
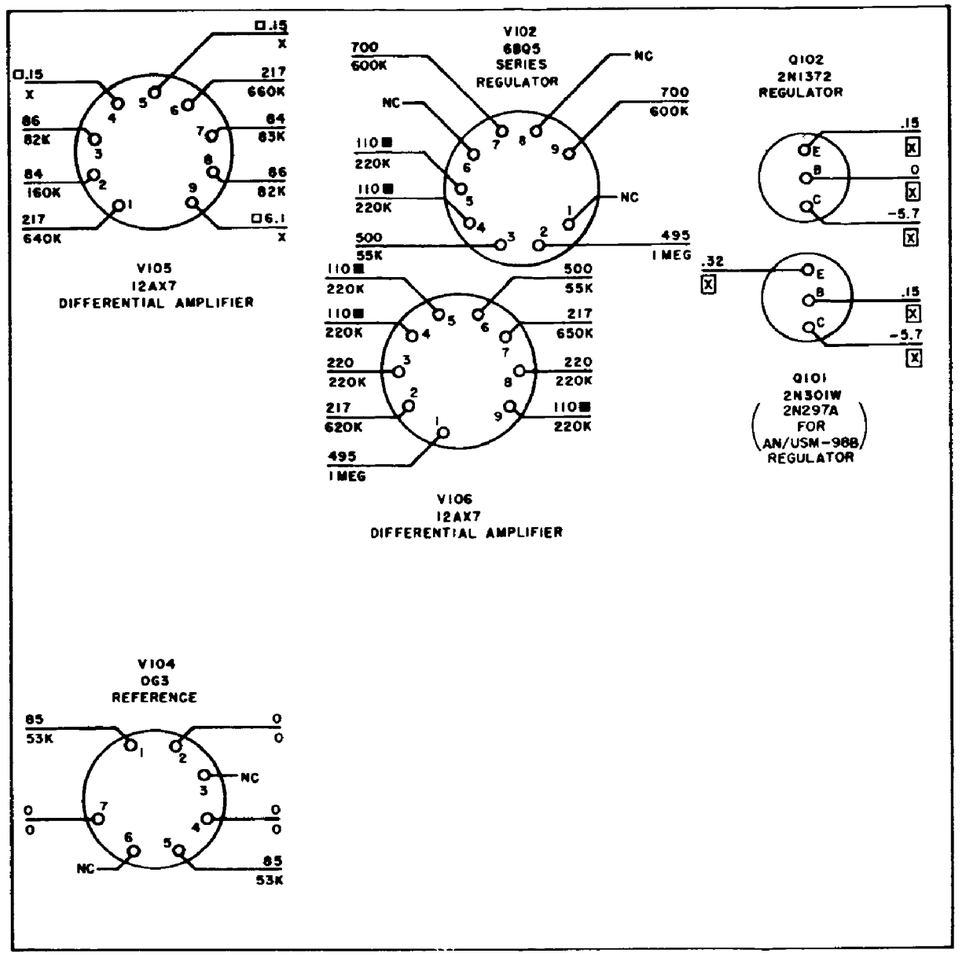


Figure 5–6. Differential voltmeter mode of operation, simplified schematic diagram.



A. CHOPPER AMPLIFIER PRINTED CIRCUIT BOARD



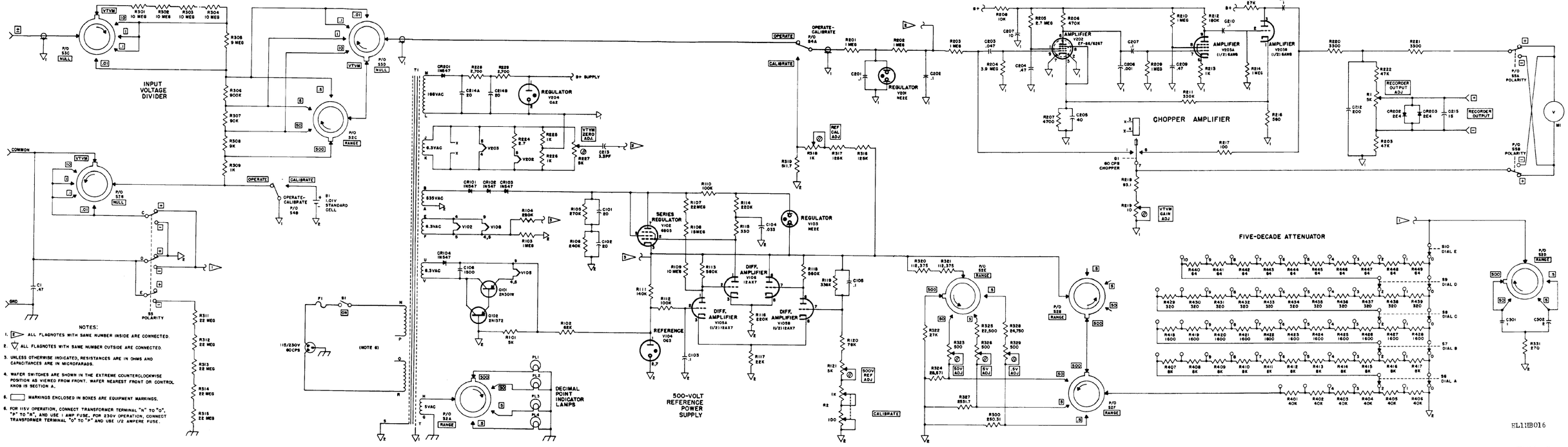
B. 500-VOLT REFERENCE POWER SUPPLY PRINTED CIRCUIT BOARD

NOTES:

1. ALL VOLTAGES AND RESISTANCES MEASURED WITH NEGATIVE PROBE TO COMMON INPUT TERMINAL AND TAKEN WITH TS-352(*)/U.
2. RESISTANCE IN OHMS, VOLTAGES ARE DC.
3. SWITCHES AND CONTROL SETTINGS AS FOLLOWS:
   [RANGE] TO [500]
   [NULL] TO [VTVM]
   [+/-] (POLARITY) TO [+]
   ALL VOLTAGE DIVIDER SWITCHES TO ZERO
4. ■ FILAMENT VOLTAGE IS 6.3VAC, BETWEEN PINS 4 AND 5 FOR V102 AND V203, BETWEEN PINS 4,5 AND 9 FOR V106.
5. □ FILAMENT VOLTAGE FOR V105 IS 6 VDC BETWEEN PINS 4,5 AND 9.
6. ▲ FILAMENT VOLTAGE FOR V202 IS 6 VAC BETWEEN PINS 4 AND 5.
7. X A TRANSISTOR REGULATOR IS CONNECTED TO TERMINALS 4,5 AND 9 OF V105, DO NOT TAKE RESISTANCE READINGS.
8. [X] TRANSISTOR TERMINAL, DO NOT TAKE RESISTANCE READINGS.

TM6625-599-45-C1-18

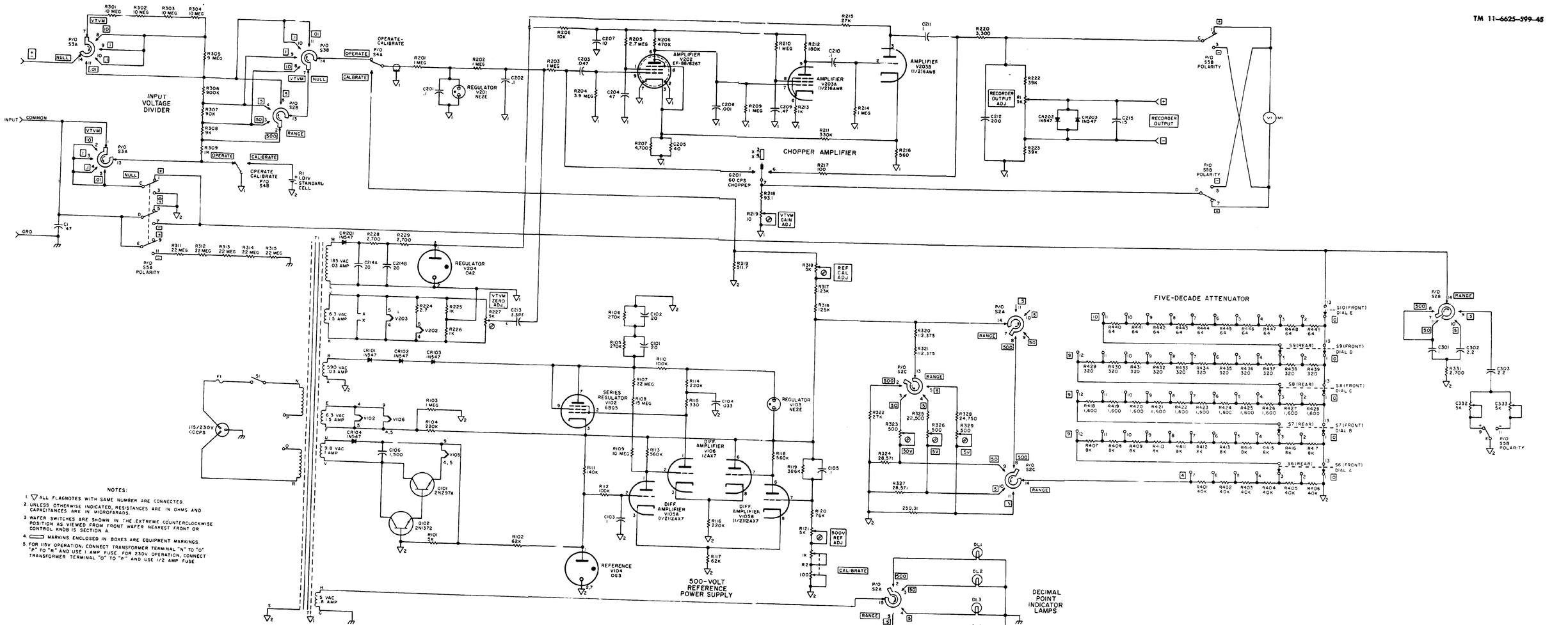
Figure 5-7. Tube socket voltage and resistance diagram.



NOTES:

1. ▷ ALL FLAGNOTES WITH SAME NUMBER INSIDE ARE CONNECTED.
2. ▽ ALL FLAGNOTES WITH SAME NUMBER OUTSIDE ARE CONNECTED.
3. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN MICROFARADS.
4. WAFER SWITCHES ARE SHOWN IN THE EXTREME COUNTERCLOCKWISE POSITION AS VIEWED FROM FRONT. WAFER NEAREST FRONT OR CONTROL KNOB IS SECTION A.
5. ▭ MARKINGS ENCLOSED IN BOXES ARE EQUIPMENT MARKINGS.
6. FOR 115V OPERATION, CONNECT TRANSFORMER TERMINAL "N" TO "O", "P" TO "R", AND USE 1 AMP FUSE. FOR 230V OPERATION, CONNECT TRANSFORMER TERMINAL "O" TO "P" AND USE 1/2 AMPERE FUSE.

Figure 5-8. Voltmeter, electronic AN/USM-98A, schematic diagram.



NOTES:

1. ▽ ALL FLAGNOTES WITH SAME NUMBER ARE CONNECTED.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN MICROFARADS.
3. WAFER SWITCHES ARE SHOWN IN THE EXTREME COUNTERCLOCKWISE POSITION AS VIEWED FROM FRONT WAFER NEAREST FRONT ON CONTROL KNOB IS SECTION A.
4. ▭ MARKING ENCLOSED IN BOXES ARE EQUIPMENT MARKINGS.
5. FOR 115V OPERATION, CONNECT TRANSFORMER TERMINAL "N" TO "O" "P" TO "R" AND USE 1 AMP FUSE. FOR 230V OPERATION, CONNECT TRANSFORMER TERMINAL "O" TO "P" AND USE 1/2 AMP FUSE.

Figure 6-8.1. Voltmeter, Electronic AN/USM-98B, schematic diagram.

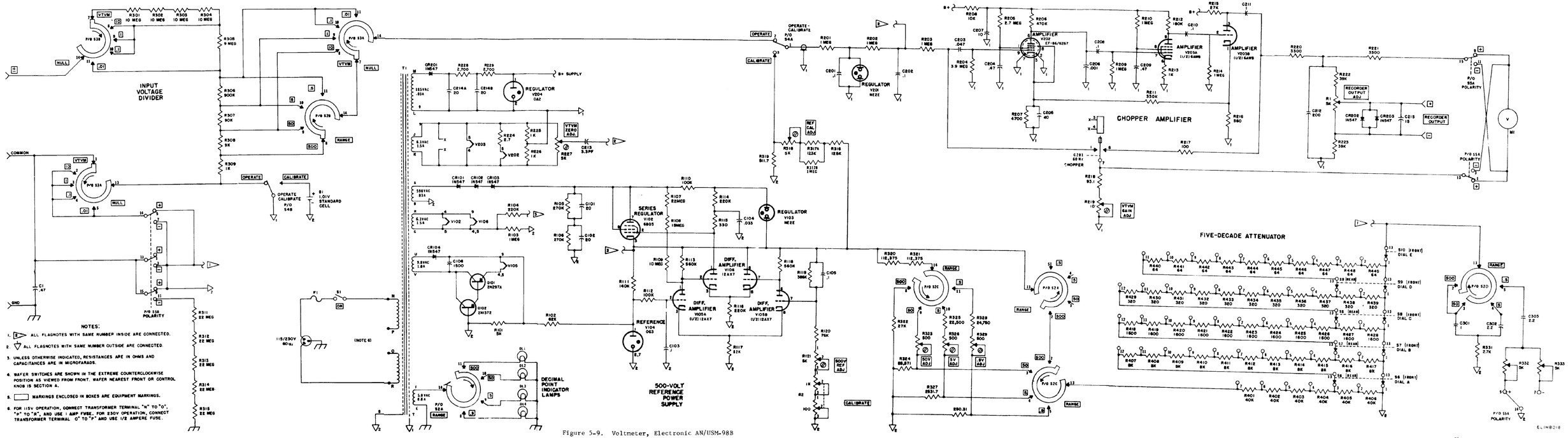


Figure 5-9. Voltmeter, Electronic AN/USM-98B (Contract DAAB07-74-C-0622), schematic diagram.

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ATAD (10)
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Sig Dep (10)
ATS (1)
MAAG (1)
WRAMC (1)
USARMIS (1)
ARADMAC (2)
USAERDAA (2)
USAERDAW (5)
USACRREL (2)
Sig FLDMS (2)
Units org under fol TOE :–1 ea.
11–16
11-97
11–98
11–117
11-158
11-500 (AA-AC)
29-134
29-136
29-402
29-427
29-500

ARNG: State AG (3).

USAR: None.

For explanation of abbreviations used, see AR 310-50.

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. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

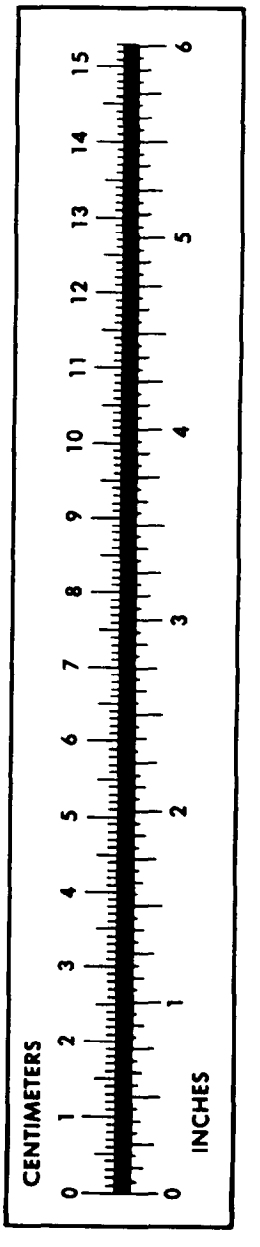
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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