TM 11-6625-273-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT

MAINTENANCE

INSULATION BREAKDOWN TEST SET AN/GSM-6

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1959

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be extremely careful when working on this equipment. Serious injury or death may result if safety precautions are not observed.

BE SURE THE EQUIPMENT IS COMPLETELY DISCHARGED BEFORE MAKING ANY REPAIRS.

DON'T TAKE CHANCES!

VOLTAGES AS HIGH AS 40,000 VOLTS MAY EXIST AT THE FOLLOWING PLACES:
OUTPUT TERMINALS
OUTPUT CABLE
HIGH-VOLTAGE RECTIFIER

Field and Depot Maintenance Manual

TEST SETS, INSULATION BREAKDOWN AN/GSM-6 AND AN/GSM-6A

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *20 January 1964*

TM 11-6625-273-35, 15 July 1959, is changed as follows:

Change the title of the manual as shown above.

Change "Insulation Breakdown Test Set AN/GSM-6" to: Test Sets, Insulation Breakdown AN/GSM-6 and AN/GSM-6A in the following places:

Page 2, paragraph 1*a*, line 2 and paragraph 1*b*, line 3.

Figure 2, caption.

Page 6, paragraph 8*b*, line 1.

Page 10, figure 3, caption.

Page 15, paragraph 15*a*, line 3.

Figure 17, caption.

Delete "figure 18" in the following places:

Page 7, paragraph 10, chart, Isolating procedure column, lines 5, 7, 9, 13, and 19.

Pages 8 and 9, paragraph 11*c*, chart, Corrective measures column, lines 13, 14, 21, 22, 29, 30, 31, 32, and 33.

Page 9, paragraph 12*b*, chart, "Corrective measures" column, lines 1, 2, 3, 5, and 7.

Page 13, paragraph 13*a*(4), line 2.

Page 16, paragraph 17*c*(6), line 2 and paragraph 18*a*(2), line 1.

Page 17, paragraph 18*c*(4), line 2.

Page 20, paragraph 21*a*(3), line 2.

Page 2, paragraph 2, second sentence. Change "Insulation Breakdown Test Set TS-928/G" to: Test Sets, Insulation Breakdown TS-928/G or TS-928A/G.

Page 4, paragraph 5*a*(3). Make the following changes:

Subparagraph (*a*). Delete "R107" and substitute: R110.

Subparagraph (c). Delete "R110" and substitute: R107.

Figure 2. Make the following changes:

Change R101 from "2,250" to: 2,200.

Change R102 from "8K" to: 8.2K.

Change R103 from "10.1K" to: 101.

Delete "R107, 500" and substitute: R110, 55.5.

Page 8, paragraph 11*a*. Delete the last sentence and substitute: Figure 17 is the equipment schematic diagram, and figure 19, the rectifier unit wiring diagram.

Figure 17. Make the following changes:

Change R101 from "2.25K" to: 2.2K.

Change R102 from "8K" to: 8.2K.

Change R103 from "10.1K" to: 101.

Delete that portion of the schematic that includes S103, R107, R108, and R110 and substitute:

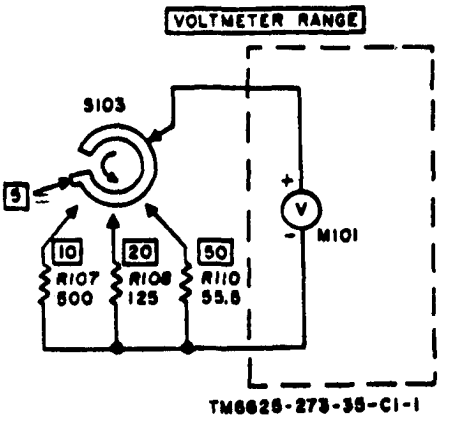

Figure 17.1. S108, corrected schematic diagram.

Figure 18. Dolete in its entirety.

BY ORDER OF THE SECRETARY OF THE ARMY:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

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WRAMC (2)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
MDW (1)
Chicago Proc Dist (1)
AMS (1)
Army Dep (2) except
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  Sacramento (28)
  Tobyhanna (12)
  Ft Worth (8)
  Letterkenny (5)
GENDEP (OS) (2)
Sig Sec, GENDEP (5)
Sig Dep (12)
Armies (2)
Corps (2)
USA Corps (3)
SIPRE (2)
Svc Colleges (2)
Br Svc Sch (2)
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POE (1)
Sig Fld Maint Shops (3)
USA Elct RD Actv, White Sands (13)
USAERDL Trp Comd (10)
Instl (2) except
  Ft Monmouth (63)
  Ft Gordon (5)
  Ft Huachuca (10)
WSMR (5)
Units org under fol TOE (2 cy ea UNOINDO):
  11-16
  11-57
  11-97
  11-98
  11-117
  11-155
  11-157
  11-500 (AA-AE) (4)
  11-557
  11-587
  11-592
  11-597

NG: State AG (3); units—same as Active Army except allowance is one (1) copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320–50.

GPO 890-439

TM 11-6625-273-35
C 2

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY,
WASHINGTON, *DC, 3 March 1986*

Field and Depot Maintenance Manual
TEST SETS, INSULATION BREAKDOWN AN/GSM-6 AND AN/GSM-6A

TM 11-6625-273-35, 15 July 1959, is changed as follows:

Page 18. Paragraph 19b(2). Add the following Caution after paragraph 19b(2):

CAUTION

Before serving this equipment, check prior maintenance records and consult with your Safety Office to ensure that the oil has not been contaminated with Polychlorinated Biphenyls (PCB) during the item's life. PCB's are a potential safety and environmental hazard if improperly handled or disposed.

Page 21. Paragraph 22b. Add the following Caution after paragraph 22b:

CAUTION

Before servicing this equipment, check prior maintenance records and consult with your Safety Office to ensure that the oil has not been contaminated with Polychlorinated Biphenyls (PCB) during the item's life. PCB's are a potential safety and environmental hazard if improperly handled or disposed.

Page 22. Paragraph 23b. Add the following Caution after paragraph 23b:

CAUTION

Before servicing this equipment, check prior maintenance records and consult with your Safety Office to ensure that the oil has not been contaminated with Polychlorinated Biphenyls (PCB) during the item's life. PCB's are a potential safety and environmental hazard if improperly handled or disposed.

Page 25. Paragraph 24b. Add the following Caution after paragraph 24b.

CAUTION

Before servicing this equipment, check prior maintenance records and consult with your Safety Office to ensure that the oil has not been contaminated with Polychlorinated Biphenyls (PCB) during the item's life, PCB's are a potential safety and environmental hazard if improperly handled or disposed.

By Order of the Secretary of the Army:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-36 literature requirements for AN/GSM-6, -6A.

TECHNICAL MANUAL
No. 11-6625-273-35

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *15 July 1969*

INSULATION BREAKDOWN TEST SET AN/GSM-6

CHAPTER 1

THEORY

Section I. GENERAL THEORY

1. Scope

a. This manual covers field and depot maintenance for Insulation Breakdown Test Set AN/GSM-6. It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, and repairing the equipment, and replacing maintenance parts. It also lists tools, materials, and test equipment for third, fourth, and fifth echelon maintenance. Detailed functions of the equipment are covered in the theory section.

b. The complete manual for this equipment includes one other publication, TM 11-6625-273-12, Insulation Breakdown Test Set AN/GSM-6, Operation and Organizational Maintenance.

c. Forward comments concerning this manual to the Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

Note. For applicable forms and records, see paragraph 2, TM 11-6625-273-12.

2. Block Diagram Analysis

(fig. 1)

The test set supplies high-value direct current (dc) voltages for testing the insulation qualities of electrical insulators. The main component of the equipment is Insulation Breakdown Test Set TS-928/G (tester), which contains a control unit and a rectifier unit. The control unit contains the control circuit and metering circuit; the rectifier unit contains the oil-immersed high-voltage rectifier and doubler circuit.

a. The input power is applied to the test set through the control circuit, The control circuit feeds the power to the high-voltage rectifier and doubler, which provides the dc voltage for performing the required tests (TM 11-6625-273-12).

b. The metering circuit indicates the output voltage of the tester, and the amount of leakage current through the dielectric (insulation) of the test specimen. Connection to earth ground is made through a connector on the rectifier unit.

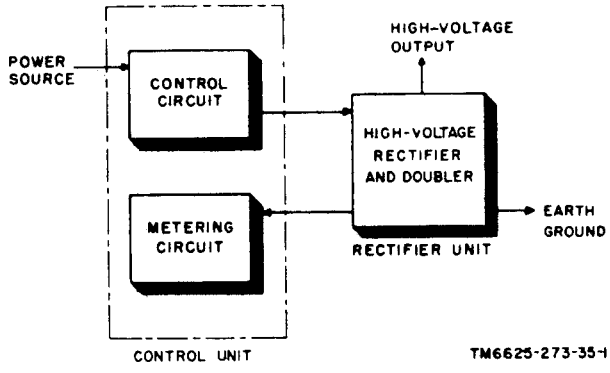


Figure 1. Insulation breakdown test set TS-928/G-block diagram.

Section II. CIRCUIT ANALYSIS

3. Protective Circuits

(fig. 17)

The protective circuits prevent power from being applied to the equipment until all power connections are complete and correctly polarized.

a. Power can be applied to the tester when both sides of INCORRECT POLARITY indicater DS103 are at ground potential. Under this condition, terminal 1 of input cable W101 connects to the ground side of the power source, and ground cable W201 makes good connection to both the equipment and to earth ground. When power is applied to the tester, the source voltage is fed to relay K101 circuit, voltage control T101, and filament transformer T202.

(1) In the ON position, circuit breaker switch CB101 completes the circuit to INPUT VOLTAGE indicator I)S101 and filament transformer T202. The filaments of rectifier tubes V201 and

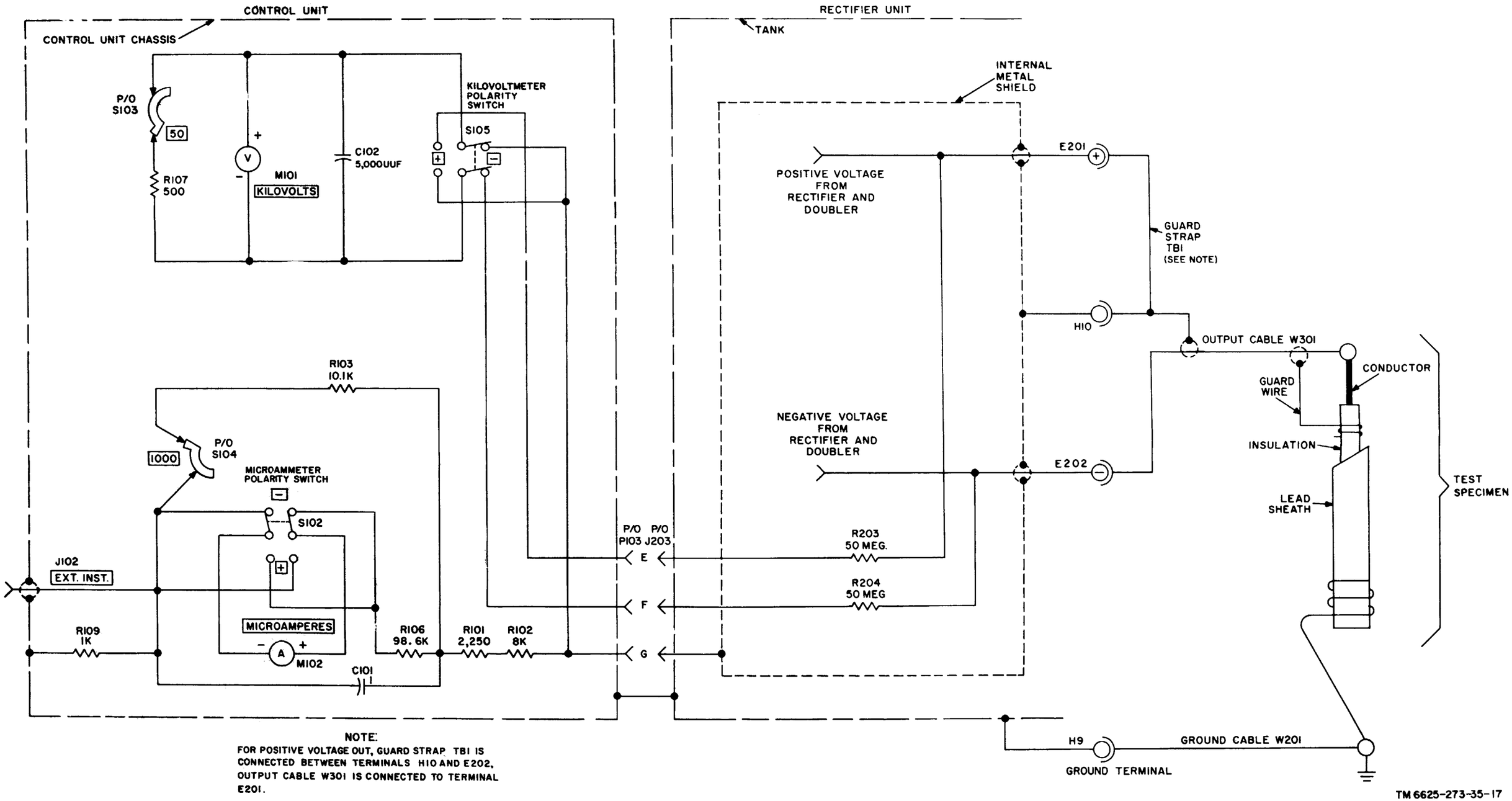


Figure 2. Insulation breakdown test set AN/GSM-6—partial schematic diagram, showing metering circuits and connections to test specimen.

V202 heat up and the high-voltage output can be obtained.

(2) When pressed, high-voltage push switch S101 completes the circuit to relay K101. Relay K101 energizes and applies the source voltage to OUTPUT VOLTAGE indicator DS102 and to voltage control T101.

(3) Adjusting the position of the arm of voltage control T101 adjusts the voltage that is applied to high-voltage transformer T201, thereby adjusting the dc voltage output of the rectifier.

b. Power cannot be applied to the tester under the following conditions.

(1) If terminal 2 of input cable W101 is connected to the ground side of the power source (ground cable W201 connected to earth ground), the source voltage is applied only across INCORRECT POLARITY indicator DS103. Ground connection is made to both sides of the relay circuit, and the tester cannot be operated.

(2) If ground cable W201 is not connected to earth ground, or makes poor ground connection, or is not connected to the equipment, both sides of INCORRECT POLARITY indicator DS103 are not at ground potential, and indicator DS103 is placed in series with the primary of filament transformer T202. This series combination is therefore in parallel with INPUT VOLTAGE indicator DS101. When circuit breaker switch CB101 is operated, both indicators (DS101 and DS103) light (DS103 with less brilliance), indicating a poor or no ground connection. If circuit breaker switch CB101 and high-voltage push switch S101 are both operated, relay K101 is placed in series with indicator DS103, limiting the current flow and preventing relay K101 from operating.

4. High-voltage Circuit

(fig. 17)

The high-voltage circuit consists of an oil-immersed high-voltage rectifier and doubler and a guard circuit.

a. High-voltage Rectifier and Doubler.

(1) The outputs of rectifier tubes V201 and V202 charge capacitors C201 and C202 through current limiting resistor R205 and R206. Resistors R201. and R202 are bleeder resistors through which capacitors C201 and C202 discharge when the equipment is shut down.

(2) With guard strap TB1 connected between positive (+) output terminal E201 and guard terminal H10, a negative voltage output is obtained from negative (-) output terminal E202.

(3) With guard strap TB1 connected between negative (-) output terminal E202 and guard terminal H10, a positive voltage output is obtained from positive (+) output terminal E201

b. Guard Circuit. The guard circuit which consists of the internal metal shield and the external guard circuit components is used to prevent leakage currents from entering the metering circuit.

(1) Leakage currents within the rectifier unit are isolated from the metering circuit by the internal metal shield. The internal metal shield is connected to the transformer cores, the capacitor support plates (fig. 13), and other metal parts to which leakage currents might flow.

(2) Leakage currents between the conductor and the lead sheath (or outer casing) of the test specimen (fig. 2) are fed to the current metering circuit (par. 6), Leakage currents on the surface of the insulation of the test specimen are shunted through the guard connector (fig. 17), the terminal strap, and guard terminal H10 to the internal metal shield.

5. Kilovoltmeter Circuit

Kilovoltmeter M101 indicates the dc voltage output of the tester.

a. Negative Voltage Output. When the tester is supplying a negative voltage output (par, 4a (2)), kilovoltmeter polarity switch S105 (fig. 2) is placed in the negative (-) position, placing the kilovoltmeter circuit in the output circuit as follows:

(1) The negative terminal of kilovoltmeter M101 is connected, through multiplier resistor R204, to negative (-) output, terminal E202 of the rectifier unit.

(2) The positive terminal of kilovoltmeter M101 is connected, through the internal metal shield, to guard terminal H10 of the rectifier unit.

(3) VOLTMETER RANGE switch S103 (fig. 17) places shunt resistance across kilovoltmeter M101.

(a) In the 50 position, the meter is shunted by resistor R107 and can indicate up to 50 kilovolts.

(b) In the 25 position, the meter is shunted by resistor R108 and can indicate up to 25 kilovolts.

(c) In the 10 position, the meter is shunted by resistor R110 and can indicate up to 10 kilovolts.

(d) In the 5 position, the meter is not shunted and can indicate up to 5 kilovolts.

(4) Capacitor C102 protects kilovoltmeter M101 against current surges.

(5) Glow lamp E102, which has a firing potential of approximately 90 volts dc, protects kilovoltmeter M101 from excessive voltages as follows:

(a) The series circuit, consisting of glow lamp E102 and resistor R203, is in parallel with kilovoltmeter M101. Under normal output conditions, the voltage across this circuit is less than 90 volts and the lamp does not fire.

(b) If the circuit is exposed to an excessive voltage, the voltage impressed on glow lamp E102 exceeds 90 volts dc and the glow lamp conducts. The conduction through the parallel path increases the current flow through multiplier resistor R204, increasing the voltage drop across resistor R204, and limiting the voltage applied to kilovoltmeter M101.

b. Positive Voltaqe Output. When the tester is supplying a positive voltage output (par. 4a(3)), kilovoltmeter polarity switch S105 (fig. 2) is placed in the positive (+) position, placing the kilovoltmeter circuit across the output circuit as follows:

(1) The positive terminal of kilovoltmeter M101 is connected, through multiplier resistor R203, to positive (+) output terminal E201 of the rectifier unit.

(2) The negative terminal of kilovoltmeter M101 is connected, through the internal metal shield, to guard terminal H10 of the rectifier unit.

(3) VOLTMETER RANGE switch S103 functions in the same manner as described in a(3) above.

(4) Capacitor C102 protects kilovoltmeter M101 against current surges.

(5) Glow lamp E102 protects kilovoltmeter M101 from excessive voltage in the same manner as described in a(5) above, except that the functions of resistors R203 and R204 are reversed.

6. Microammeter Circuit

Microammeter M102 indicates the output (charging) current of the tester, or the discharging current of the test specimen.

a. Negative Output. When the tester is supplying a negative voltage output (par. 4a(2)), microammeter polarity switch S102 (fig. 2) is placed in the negative (-) position, placing the microammeter circuit in series with the output circuit as follows:

(1) The negative terminal of microammeter M102 is connected, through current limiting resistor R109, to the control unit chassis which is connected to earth ground.

(2) The positive terminal of microammeter M102 is connected to positive (+) output terminal E201 through current limiting resistors R106, R101, and R102, through the internal metal shield, through guard terminal H10, and through guard strap TB1.

(3) AMMETER MULTIPLIER switch S104 (fig. 17) places shunt resistance across both microammeter M102 and current limiting resistor R106.

(a) In the 1000 position, the meter and resistor R106 are shunted by resistor R103, and the meter can indicate up to 50,000 microampere.

(b) In the 100 position, the meter and resistor R106 are shunted by re-

sister R104, and the meter can indicate up to 5,000 microampere.

(c) In the 10 position, the meter and resistor R106 are shunted by the series combination of resistors R104 and R105, and the meter can indicate up to 500 microampere.

(d) In the 1 position, the meter and resistor R106 are not shunted, and the meter can indicate up to 50 microamperes.

(4) The charging current flows from negative (-) output terminal E202, through the test specimen to earth ground, through the meter circuit ((1), (2), and (3) above), to positive (+) output terminal E201.

(5) To measure discharging current (during shutdown), microammeter polarity switch S102 is placed in the positive (+) position. The energy contained in the insulation (dielectric) of the test specimen becomes the source of power, and the current flows in the opposite direction from that described in (4) above.

(6) During either negative or positive output, the meter protective circuit operates as follows:

(a) Capacitor C101 (fig. 17) protects microammeter M102 against current surges; spark gap E106 grounds spurious voltage pulses.

(b) DC OVERLOAD indicator E101 (glow lamp), which has a firing potential of approximately 90 volts dc, protects microammeter M102 from excessive currents (caused by a dielectric breakdown in the test specimen). Under normal output conditions, the voltage across resistor R102 is less than 90 volts dc and the glow lamp does not fire. Under excessive current conditions, however, the increased current through resistor R102 raises the voltage to more than 90 volts dc, the glow lamp conducts, shunts the excessive current around the meter circuit, and limits both the current and voltage applied to the meter circuit.

b. Positive Output. When the tester is supplying a positive voltage output (par. 4a(3)), microammeter polarity switch S102 (fig. 2) is placed in the positive (+) position, placing the microammeter circuit in series with the output circuit as follows:

(1) The positive terminal of microammeter M102 is connected, through current limiting resistor R109, to the control unit chassis which is connected to earth ground.

(2) The negative terminal of microammeter M102 is connected to negative (-) output terminal E202 through current limiting resistors R101, R102, and R106, through the internal metal shield, through guard terminal H10, and through guard strap TB1.

(3) AMMETER MULTIPLIER switch S104 functions in the same manner as described in a(3) above.

(4) The charging current-flows from negative (-) output - terminal E202, through the meter circuit ((1), (2), and (3) above), and through the test specimen insulation, to positive (+) output terminal E201.

(5) To measure discharging current (during shutdown), microammeter polarity switch S102 is placed in the negative (-) position. The energy contained in the insulation (dielectric) of the test specimen becomes the source of power, and the current flows in the direction opposite from that described in (4) above.

CHAPTER 2

TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING

Warning: **When troubleshooting or making repairs in this equipment, be extremely careful of the high voltages. Allow the tester to discharge completely before making any repairs. Always disconnect the input and output cables from the tester before touching any internal part. Failure to follow safety precautions may result in injury or death.**

7. General Instructions

Troubleshooting at field and depot maintenance level includes all the techniques outlined for organizational maintenance (TM 11-6625-273-12) and any special or additional techniques required to isolate a defective part. The field and depot maintenance procedures are not complete in themselves, but supplement the procedures described in organizational maintenance. The systematic troubleshooting procedure, which begins with the equipment performance checks that can be performed at an organizational level, must be completed by means of sectionalizing, localizing, and isolating techniques.

8. Troubleshooting Procedures

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

b. Sectionalization. Insulation Breakdown Test Set AN/GSM-6 consists of two major units: the control unit and the rectifier unit, The first step in tracing trouble is to locate the unit at fault by the following methods:

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

(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. Refer to the equipment performance check list (TM 11-6625-273-12)

c. Localization and Isolation. The tests listed below will aid in locating and isolating the trouble. First, localize the trouble to a single circuit, and then isolate the trouble within that circuit by resistance measurements.

(1) *Resistance measurements.* These measurements will help isolate the individual component part at fault. Use the resistance values (par. 10, 13, and 14) to find normal readings, and compare them with test readings.

(2) *Troubleshooting chart.* The trouble symptoms listed in the chart (par. 11c) will aid in localizing trouble to a component part.

(3) *Intermittent troubles.* In all these tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Check the wiring and connections to the units of the set,

9. Tools, Test Equipment, and Material Required

The following tools, test equipment, and material are required for troubleshooting the test set.

a. Tool Equipment TK-21/G.

b. Multimeter AN/URM-105.

c. Wemco C Oil, Westinghouse Electric Corporation.

Section II. UNIT TROUBLESHOOTING

Warning: **Do no attempt removal or replacement of parts before reading the instructions in paragraph 15.**

10. Continuity Test

Disconnect connectors P103 (fig. 7) and J203 to electrically separate the control unit from the rectifier unit. Make the resistance measurements indicated in the following table. When the faulty part is found, repair the trouble before applying power to the equipment.

Item	Point of measurement	Condition for measurement	Normal indication	Isolating procedure
1	Between control unit chassis and the following listed pins of connector P103.			
	a. Pin A	*a.* High-voltage push switch S101 depressed; voltage control T101 in maximum position.	*a.* 600 ohms	*a.* Check and replace relay K101 (fig. 17), voltage control T101 or indicator lamp DS101, DS102, or DS103.
	b. Pin B	*b.* Voltage control T101 at 0; kilovoltmeter polarity switch S105 at (+); VOLTMETER RANGE switch S103 at 5, and AMMETER MULTIPLIER switch S104 at 1,000.	*b.* Less than 1 ohm	*b.* Check wiring (fig. 17 and 18).
	c. Pin C	*c.* Same as *b* above	*c.* Less than 1 ohm	*c.* Check wiring to voltage control T101 (fig. 18).
	d. Pin D	*d.* Same as *b* above	*d.* Less than 1 ohm	*d.* Check wiring and connection to frame (fig. 18).
	e. Pin E	*e.* Same as *b*. above	*e.* 11,750 ohms	*e.* Check meter M101 (par. 13*d*), capacitor C102 (par. 13*b*), resistor R102 (par. 13*a*), and lamps E101 and E102 (fig. 18).
	f. Pin F	*f.* Same as *b* above, except that kilovoltmeter polarity switch is at (−).	*f.* 11,750 ohms	*f.* Same as *e* above.
	g. Pin G	*g.* AMMETER MULTIPLIER switch S104 at 1,000.	*g.* 11,250 ohms	*g.* Check meter M102 (par. 13*d*), capacitor C101 (par. 13*b*), resistor R101 through 106 and R109 (par. 13*a*) and switch S102 (fig. 18).
2	Between following listed pins of connector J203 and points indicated.	Disconnect output cable W301 and remove guard strap TB1.		
	a. Pin A to pin B		*a.* Approximately 8 ohms.	*a.* Check connector J203 and primary of transformer T202 (par. 14*a*) separately.
	b. Pin A to tank of rectifier unit.		*b.* Infinity.	*b.* Check primary of transformer T202 for short to tank.
	c. Pin C to pin D		*c.* Approximately 2 ohms.	*c.* Check connector J203 and primary of transformer T201 (par. 14*a*) separately.
	d. Pin C to tank of rectifier unit.		*d.* Infinity	*d.* Check primary of transformer T201 for short to tank.
	e. Pin E to terminal E201		*e.* 50 megohms	*e.* Check wires to terminal E201 (fig. 19) and check resistance of R203 (fig. 14 and 17).
	f. Pin F to terminal E202		*f.* 50 megohms	*f.* Check wires to terminal E202 (fig. 19) and check resistance of R204 (fig. 14 aand 17).

Item	Point of measurement	Condition for measurement	Normal indication	Isolating procedure
	g. Pin E to pin F		*g.* 200 megohms	*g.* Check resistors R201, R202, R205, and R206 (fig. 13 and 17); check capacitors C201 and C202.
	h. Pin G to terminal H10		*h.* Less than 1 ohm	*h.* Check wiring to terminal H10 (fig. 12 and 19).

11. Localizing Troubles

a. General. Procedures are outlined in the following chart for localizing troubles to a stage or part of the test set. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When use of the procedures results in localization of trouble to a particular stage or circuit, but not to a particular part, refer to paragraphs 12, 13, and 14. Figures 3 through 7 show the location of parts in the control unit; figures 10, 12, 13 and 14 show the location of parts in the rectifier unit. Figure 17 is the equipment schematic diagram, figure 18 the control unit wiring diagram, and figure 19 the rectifier unit wiring diagram,

b. Use of Chart. The troubleshooting chart supplements the equipment performance check list (TM 11-6625-273-12). Perform the procedures outlined in the troubleshooting chart (*c* below). If no operational symptoms are known, refer to the equipment performance check list (TM 11-6625-273-12).

Caution: **If operational symptoms are not known, or they indicate the possibility of short circuits, make the continuity test (par. 10) before applying power to the equipment.**

c. Trouble-shooting Chart.

Item	Symptom	Probable trouble	Corrective measures
1	INPUT VOLTAGE indicator DS101 (fig. 4) does not light.	Input cable W101 defective.	Repair input cable W101.
		Circuit breaker switch CB101 defective.	Replace switch CB101 (fig. 4 and 6).
2	Circuit breaker switch CB101 in OFF position; INCORRECT POLARITY indicator DS103 does not light (terminal 2 of connector P102 (fig. 17) at ground potential).	Ground cable W201 defective.	Repair ground cable W201.
		Ground terminal H9 (fig. 3) defective	Repair ground terminal H9 (par. 19*c*).
3	Circuit breaker switch CB101 does not remain in ON position when high-voltage push switch S101 is closed.	Short circuit in rectifier unit.	Perform continuity tests (par. 10, item 2).
		Circuit breaker switch CB101 defective.	Replace switch CB101 (fig. 4 and 6).
4	OUTPUT VOLTAGE indicator DS102 does not remain lit when high-voltage push switch S101 is pressed and then released.	Switch S101 defective.	Replace switch S101 (fig. 4 and 6).
		Relay K101 defective	Replace relay K101 (fig. 5).
5	Kilovoltmeter M101 responds erratically when voltage control T101 is adjusted.	Voltage control brush (fig. 5) in T101 worn.	Replace voltage control brush (par. 17*e*).
6	Output present, but kilovoltmeter M101 does not indicate output voltage.	Wiring in metering circuit defective.	Check wiring in metering circuit (fig. 17 and 18).
		Switch S105 defective.	Replace switch S105 (fig. 4 and 18).
		Resistor R203 or R204 (fig. 14) defective.	Check for (par. 10, items 2*e* and *f*) and replace defective resistor.
		Kilovoltmeter M101 (fig.4) defective.	Replace kilovoltmeter M101 (par. 18*c*).
7	Kilovoltmeter M101 indicates correct output voltage; on indication no microammeter M102.	Resistor R101, R102, R106, or R109 (fig. 18) defective.	Check for (par. 10) and replace defective resistor.
		Wiring in metering circuit defective.	Check wiring in metering circuit (fig. 17 and 18).
		Switch S102 defective.	Replace switch S102 (fig. 4 and 18).
		Microammeter M102 (fig. 5) defective.	Replace microammeter M102 (par. 18.)

Item	Symptom	Probable trouble	Corrective measures
8	Desired output voltage cannot be obtained.	Rectifier tube V201 or V202 (fig. 12) defective.	Replace defective rectifier tube (par. 20)
		Capacitor C201 or C202 (fig. 10) defective.	Replace defective capacitor (par. 24).
		Transformer T201 or T202 (fig. 14) defective.	Replace defective transformer (par. 22 or 23).
9	Kilovoltmeter M101 indicates low or high on 10 KILOVOLTS range.	Resistor R110 defective.	Replace resistor R110 (fig. 6 and 18).
10	Kilovoltmeter M101 indicates low or high on 25 KILOVOLTS range.	Resistor R108 defective.	Replace resistor R108 (fig. 6 and 18).
11	Kilovoltmeter M101 indicates low or high on 50 KILOVOLTS range.	Resistor R107 defective.	Replace resistor R107 (fig. 18).
12	Microammeter M102 indicates low or high (pegs) on 50 MICROAMPERES range.	Resistor R104 or R105 defective.	Replace resistor R104 or R105 (fig. 18).
13	Microammeter M102 indicates low or high (pegs) on 5,000 MICROAMPERES range.	Resistor R104 defective.	Replace resistor R104 (fig. 18).
14	Microammeter M102 indicates low or high (pegs) on 50,000 MICROAMPERES range.	Resistor R103 defective.	Replace resistor R103 (fig. 6 and 18).
15	Output voltage does not drop to zero within 1 minute after shutdown.	Resistor R201 or resistor R202 defective.	Replace defective resistor (fig. 13 and 19).

12. Checking Protective Circuits

a. Prechecking Procedure. Before checking the components of the protective circuits (*b* below), perform the preoperational procedures (par. 13, TM 11-6625-273-12) with the following exceptions:

(1) Connect the ground cable directly to earth ground instead of to the frame

(2) Set up the tester controls for a positive (+) output at 5,000 volts.

b. Checking Procedure.

Warning: **After each check listed below, turn voltage control T101 to 0, place circuit breaker switch CB101 in the OFF position, lower the high-voltage caution plate against the output terminals, and allow the tester to discharge.**

Item	Procedure	Normal indication	Corrective measures
1	Adjust output of tester to 5,000 volts; operate kilovoltmeter polarity switch S105 several times to each position (− and +).	Glow lamp E102 lights when switch S105 does not agree with the output polarity.	Replace glow lamp E102 (fig. 5 and 18).
2	Place AMMETER MULTIPLIER switch S104 at 1000. Short output of tester to ground. Gradually increase output of tester until microammeter M102 indicates between 13,000 and 20,000 microamperes.	DC OVERLOAD indicator E101 glows.	Replace lamp E101 (fig. 4 and 18). Replace switch S104 (fig. 5, 6, and 18). Replace resistor R101 or R102 (fig. 6 and 18). Replace meter M102 (par. 18c).
3	Disconnect input cable W101 from power source. Remove DC OVERLOAD indicator E101 from equipment. Short output of tester to ground and connect input cable W101 to power source. Gradually increase output of tester until microammeter M102 indicates between 30,000 and 37,000 microamperes.	Circuit breaker switch CB101 opens in 5 seconds or less.	Replace switch CB101 (fig. 6 and 18).

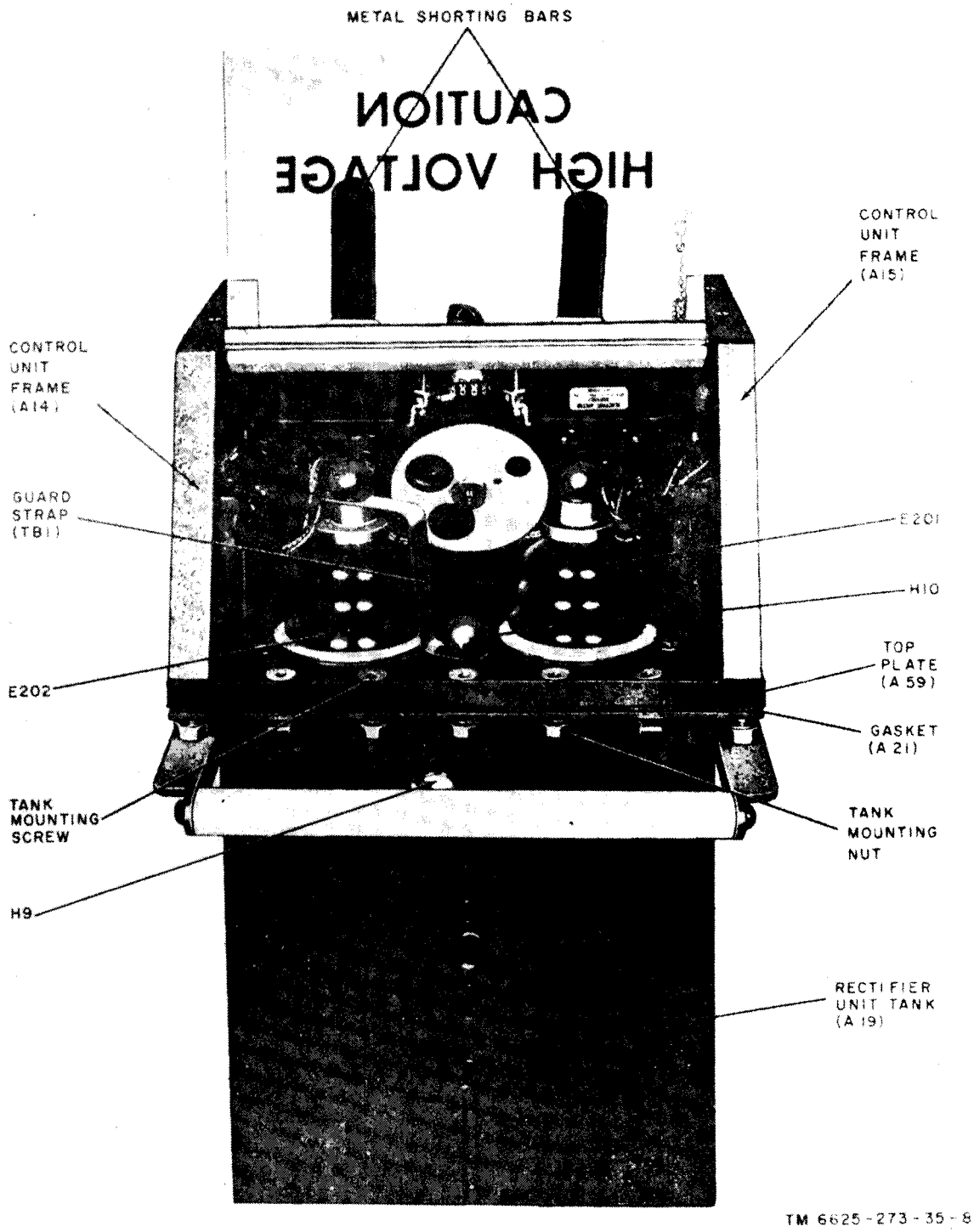


Figure 3. Insulation breakdown test set TS-928/G—rear view, parts location.

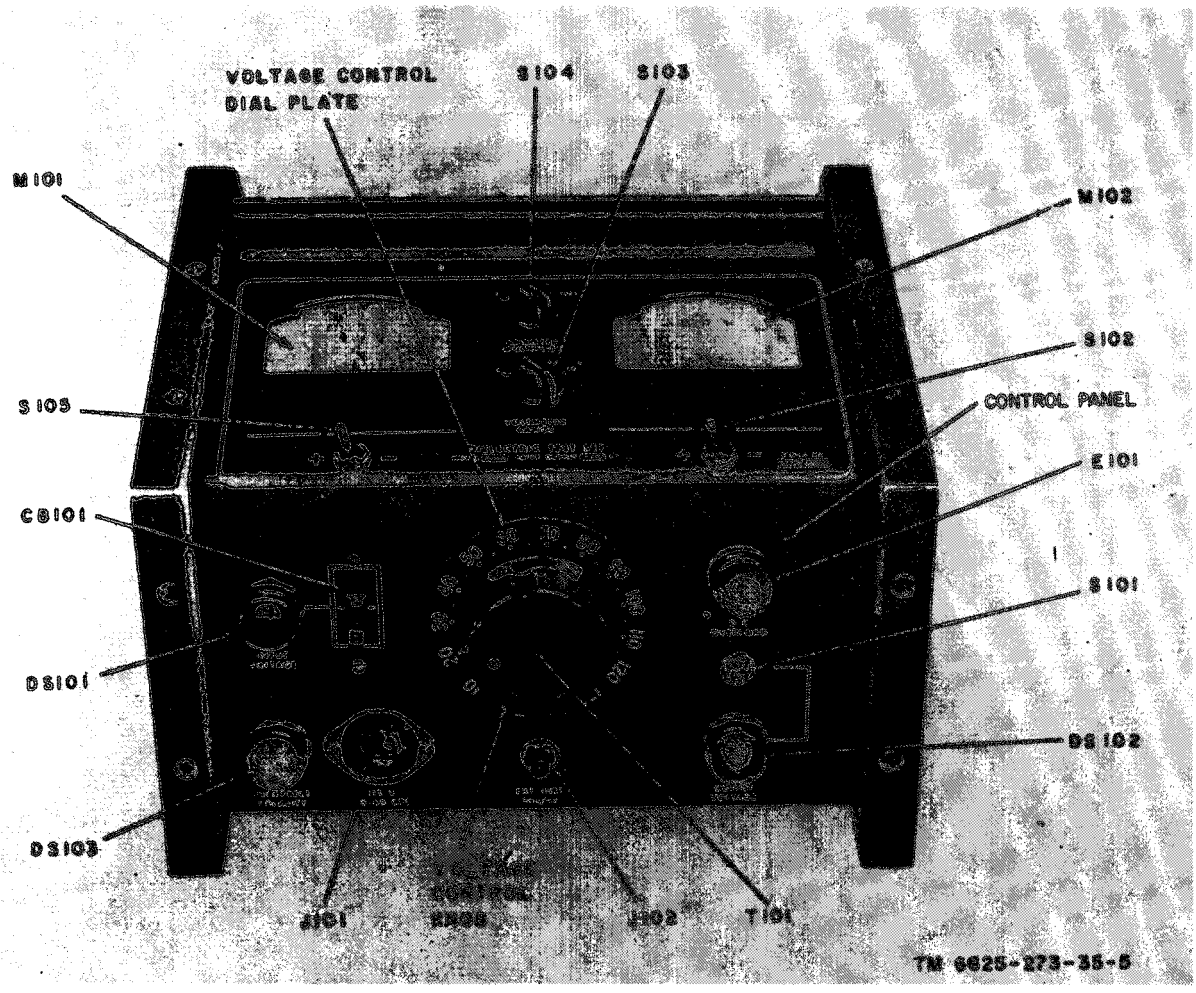


Figure 4. Control unit—front view, parts location.

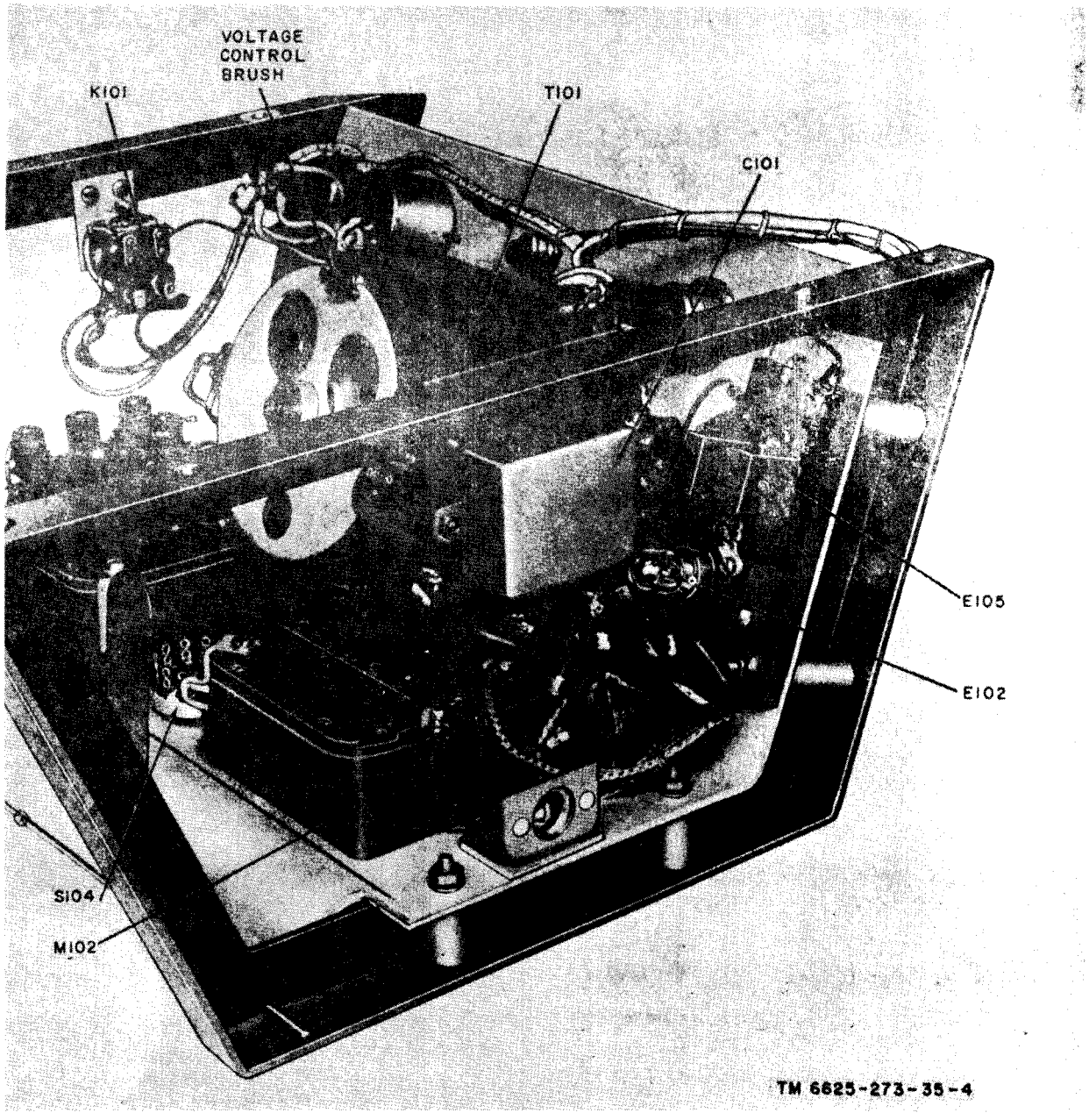


Figure 5. Control unit—bottom view, parts location.

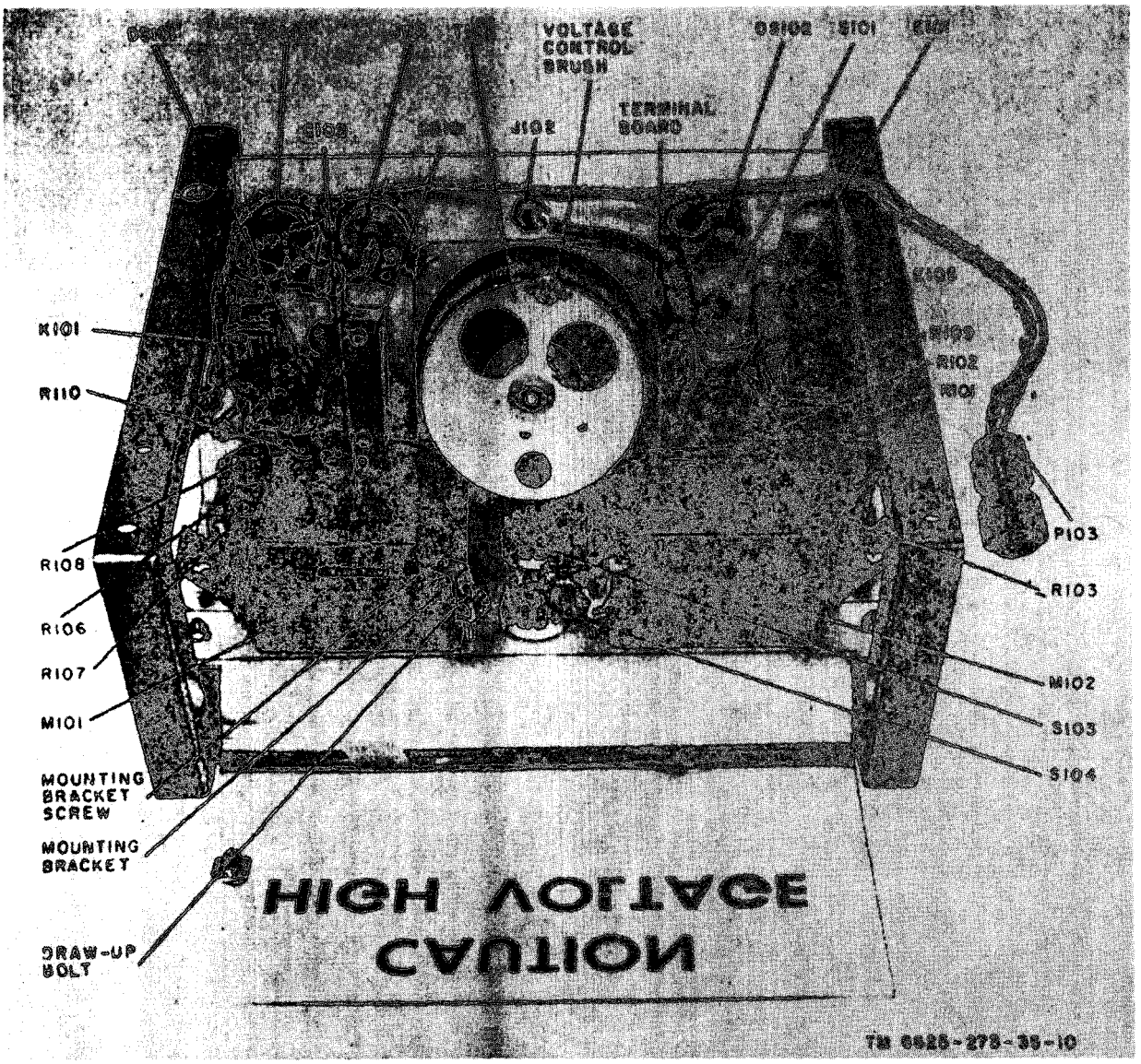


Figure 6. Control unit—bottom view, parts location.

13. Checking Meter Circuits

a. Resistors. Check the resistors of the meter circuits as follows:

(1) Disconnect connector P103 from connector J203 (fig. 7).

(2) Place AMMETER MULTIPLIER switch S104 (fig. 4) in position 1.

(3) Place VOLTMETER RANGE switch S103 in position 5.

(4) Measure across each resistor (fig. 6 and 18) listed below; compare the measured value with the value listed.

Kilovoltmeter circuit		Microammeter circuit	
R107	500	R101	2,250
R108	125	R102	8,000
R110	55	R103	10,000
		R104	1,018
		R105	10,180
		R106	98,600
		R109	1,000

b. Capacitors. Check capacitors C101 and C102 with Multimeter AN/URM-105.

c. High-voltage Resistors. Resistor R203 (B, fig. 14) and resistor R204 (A, fig. 14) are high-

voltage meter resistors of 50 megohms each. To check resistors R203 and R204, follow the procedures given in paragraph 10, items 2*e* and *f*.

d. Meters. Check kilovoltmeter M101 and microammeter M102 as follows:

(1) Perform the preoperational procedures listed in paragraph 12*a* except that the output is adjusted for a positive (+) 500 volts.

(2) Connect Multimeter AN/URM-105 across the output of the tester.

(3) Place VOLTMETER RANGE switch S103 (fig. 4) in the 5 position.

(4) Place AMMETER MULTIPLIER switch S104 in the 1 position.

(5) Turn the tester on and increase the output until the AN/URM-105 ((2 above) indicates 500 volts.

(a) Kilovoltmeter M101 should indicate .5 kilovolt.

(b) Microammeter M102 should indicate 25 microamperes.

14. Checking Rectifier Unit

The components of the high-voltage rectifier are immersed in an oil tank. To locate troubles in the rectifier, remove the unit from the oil tank (par. 19) and inspect components for loose connections, evidence of arcing, and cracked or loose rectifier tubes. After inspection of the rectifier unit components is completed, check them as follows:

a. Transformers T201 and T202. The resistance of the windings of transformers T201 and T202 are given in the following table. Check the resistance of each winding and compare the meter indication with the value given below.

Transformer	Winding	Test points	Resistance (ohms)
T201	Primary	Between pins C and D of connector J203 (fig. 12 and 19).	1.6 ±20%
	Secondary	Between plate cap of tube V201 and capacitor mounting frame (fig. 14).	47,000 ±20%
T202	Primary	Between pins A and B of connector J203 (fig. 12 and 19).	7.7 ±20%
	Secondary	Between filament pins of tube V201.	Less than 1.
	Secondary	Between filament pins of tube V202.	Less than 1.

b. Resistors. To check resistors R201, R202, R205, and R206, follow the procedures given in paragraph 10, item 2*g*.

c. Capacitors. Check capacitors C201 and C202 with Multimeter AN/URM-105 or by substitution (par. 24).

CHAPTER 3

REPAIRS

15. General Parts Replacement Techniques

a. This chapter describes the disassembly, replacement, and reassembly of components of Insulation Breakdown Test Set AN/GSM-6.

b. When major repair or replacement is necessary, follow the sequence of instructions given until the defective part is reached. Do not attempt to replace parts until they are completely accessible.

c. During disassembly, group the disassembled parts of each unit and tag disconnected wires to avoid confusion and to facilitate reassembly.

d. Whenever the equipment has been disassembled, examine each exposed part to see that it is not bent, broken, worn, or dirty, and that it shows no evidence of arcing.

Warning: **Before attempting any repairs on the equipment be sure that it has been completely discharged (TM 11-6625-273-12). Dangerous voltage may be present and may cause severe injury or death.**

16. Removal and Replacement of Control unit

a. Removal.

(1) Loosen the camlock retainers (fig. 7) and remove the end panels (not shown) from the control unit frames (fig. 3).

(2) Separate connector P103 from connector J203 (fig. 7),

(3) Remove the mounting screws, spacers, and mounting nuts from the control unit frames.

(4) Separate the control unit from the rectifier unit.

b. Cleaning and Inspection.

(1) Clean the components of the control unit with a dry, lint-free cloth.

(2) Clean the contact surface of voltage control T101 (fig. 6).

(3) Check all components for loose or broken connations, corrosion, and evidence of arcing; clean if necessary.

(4) Replace any worn or defective components.

c. Replacement.

(1) Place the control unit on the rectifier unit (fig. 3).

(2) Aline the mounting holes and secure the mounting screws, spacers, and mounting nuts in place.

(3) Place the end panels (not shown) on the control unit frames and secure the camlock retainers (fig. 7).

(4) Insert connector P103 into connector J203.

(5) Lower the high-voltage caution plate (fig. 3) and check to see that the metal shorting bars touch output terminals E201 and E202.

(6) If the shorting bars do not touch the output terminals, bend the shorting bars as necessary until contact is made.

17. Removal and Replacement of Voltage Control (fig. 8)

a. Removal.

(1) Disconnect the wires from the terminal board.

(2) Loosen the setscrews and remove the knob.

(3) Remove the screws that secure the dial plate; remove the dial plate.

(4) Remove the screws that secure voltage control T101 to the front panel; remove the voltage control from the rear of the control unit (fig. 6).

b.Cleaning and Inspection.

(1) Clean all components of the voltage control with a dry, lint-free cloth.

(2) Sand the end of the voltage control brush (fig. 6) to obtain a flat contact.

Note. If the voltage control brush is being replaced, sand the contact end to obtain a flat contact.

(3) Inspect all wires and parts of the voltage control; repair or replace as necessary.

c. Replacement.

(1) Position the voltage control (T101) against the control panel.

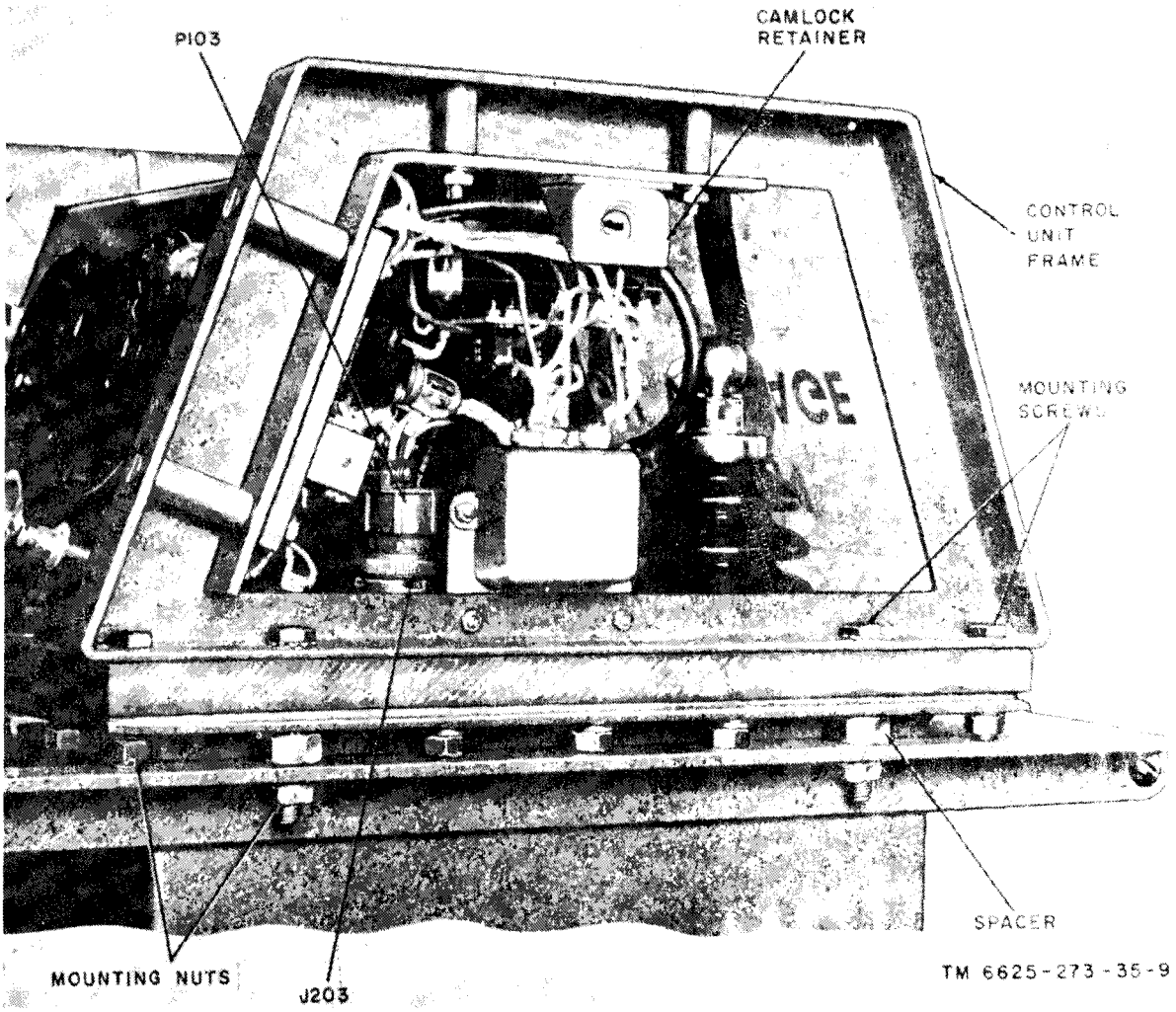


Figure 7. Control unit—right-side view, side removed.

(2) Hold the
secure it with the screws (fig. 8).

(3) Place the dial plate on the control panel and secure it with the screws.

(4) Turn the shaft of the voltage control fully counterclockwise.

(5) Install the knob on the shaft with the pointer at 0; tighten the setscrews.

(6) Connect the wire leads to the terminal board (fig. 8 and 18).

18. Removal and Replacement of Meters

Kilovoltmeter M101 and microammeter M102 are similarly mounted. The following procedures apply to the kilovoltmeter (M101) and to the microammeter (M102).

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Disconnect the leads (fig. 18) from the meter.

(3) Loosen the draw-up bolts (fig. 6) and remove the mounting bracket screws and mounting brackets to release the meter.

Note. **There are two mounting brackets on each meter. Both brackets must be removed to release the meter.**

(4) Carefully remove the meter from the control panel.

b. Cleaning and Inspection.

(1) Clean the exterior surfaces of the meter with a clean lint-free cloth.

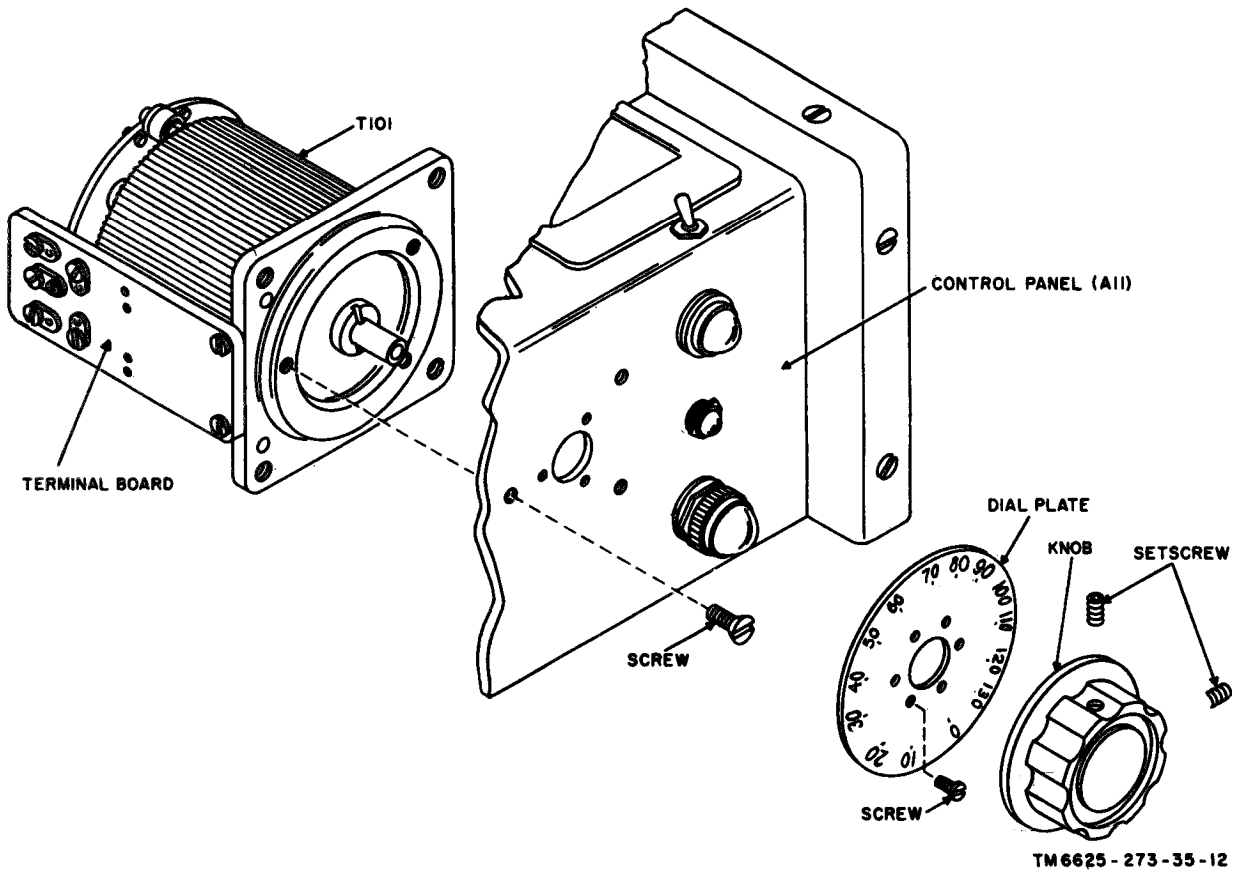


Figure 8. Removal of voltage control T101—exploded view.

(2) Inspect the meter for a damaged or missing pointer, broken dial glass, and overall condition. If the meter is damaged or otherwise defective, obtain a replacement meter.

c. Replacement.

(1) Position the meter in the control panel.

(2) Secure the meter mounting brackets to the meter with the mounting bracket screws.

(3) Tighten the draw-up bolts to secure the meter to the control panel.

(4) Connect the leads to the meter (fig. 18).

(5) Replace the control unit on the rectifier unit (par. 16c).

19. Removal and Replacement of High-voltage Rectifier

Caution: Do not remove the high-voltage rectifier from the tank in humid atmosphere or when the temperature of the equipment is below the ambient temperature. The high-voltage rectifier is oil-immersed in a tank. The transformers are vacuum-impregnated. Because of the high voltages involved during operation, any trace of moisture may cause internal breakdowns.

a. Removal.

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Remove the tank mounting screws (fig. 3) and the tank mounting nuts that secure the top plate to the rectifier unit tank.

(3) Work the top plate loose from the tank.

(4) Lift the high-voltage rectifier and, with the use of wood blocks (fig. 9), prop it on the tank to drain.

(5) Remove the high-voltage rectifier from the tank (after draining) and place it on a sturdy work bench.

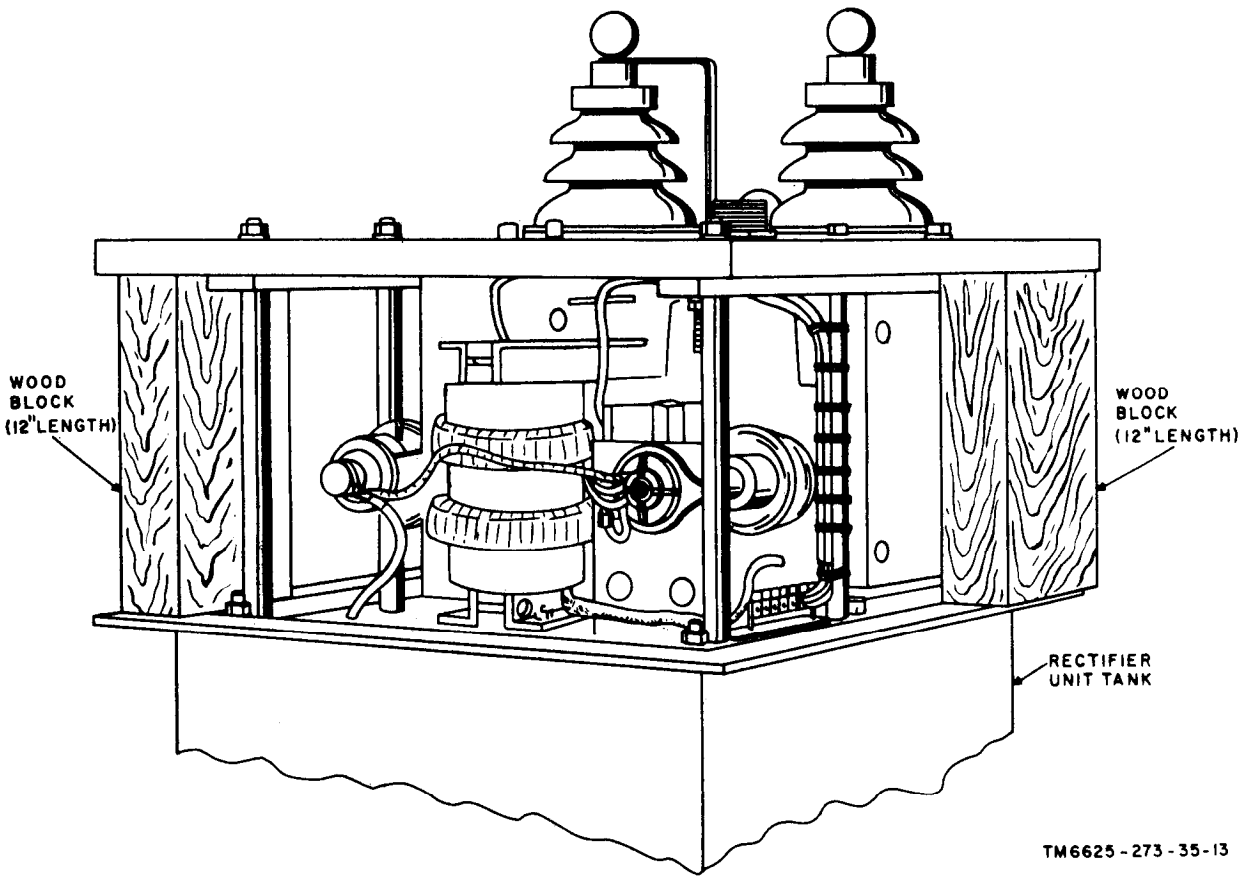


Figure 9. High-voltage rectifier, removed from tank and propped to drain.

Caution: Do not permit the high-voltage rectifier to remain out of the tank for more than 90 minutes. If a delay is evident, reimmerse the unit in the oil.

b. Cleaning and Inspection.

(1) Check the leads for breaks or loose solder joints,

(2) Check the copper lining in the tank for evidence of deterioration or discoloration.

(3) Check the oil for discoloration or signs of contamination, Replace the oil if necessary (Wemco C oil, Westinghouse Electric Corporation).

(4) Remove the gasket (fig. 3) from the tank and clean off any particles of gasket material that remains on the tank flange.

(5) Check to be sure that ground terminal H9 makes good contact with the tank; repair or replace if necessary.

c. Replacement,

(1) Place a new gasket on the tank flange.

(2) Check to see that the contact spring (fig. 10) protrudes approximately 1¼ inches from the transformer bracket; if necessary, bend the contact spring,

(3) Insert the high-voltage rectifier in the tank so that output terminals E201 and E202 are on the same side as ground terminal H9 (fig. 3).

(4) Secure the top plate to the tank with the tan]. mounting screws and nuts,

(5) Remove the vent plug or the pipe plug (TM 11-6625-273-12) from the top plate and check the oil level. The oil level should be approximately 1 inch from the top plate. Add oil if necessary.

(6) Replace the control unit on the rectifier unit (par. 16c).

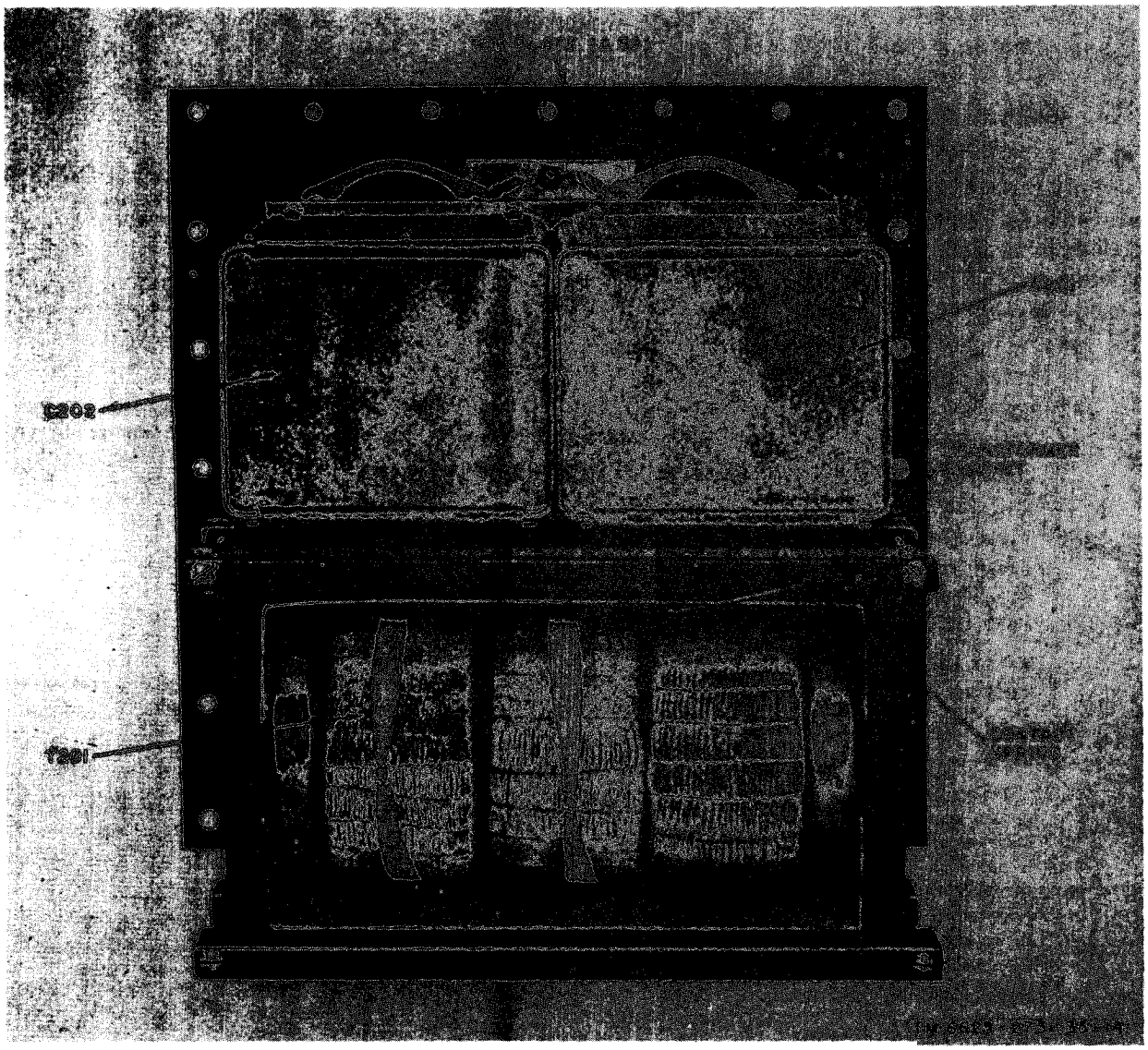


Figure 10. High-voltage rectifier removed from tank—bottom view, parts location.

20. Removal and Replacement of Rectifier Tubes

Ratifier tubes V201 and V202 (fig. 12) are identical and are similarly mounted. The following procedure applies to either tube.

a. Removal.

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Remove the high-voltage rectifier from the tank (par. 19a).

(3) Remove the tube clip (fig. 12) from the tube plate cap.

(4) Release the tube base clamp (fig. 14) and remove the tube.

b. Cleaning and Inspection. Remove the oil from the rectifier tube with a clean cloth. Examine the tube for damage or evidence of internal arcing. If it is suspected that a tube is defective, obtain a replacement.

c. Replacement.

(1) Insert the rectifier tube in its socket.

(2) Secure the tube base clamp (fig. 14) on the base of the tube.

(3) Secure the tube clip (fig. 12) on the tube plate cap.

(4) Replace the high-voltage rectifier in the tank (par. 19c).

(5) Replace the control unit on the rectifier unit (par. 16c).

21. Removal and Replacement of Output Terminals

Output terminals E201 and E202 (fig. 11) are identical and are similarly mounted. The following procedures apply to both output terminals.

a. Removal.

(1) Remove the control unit from the rectifier unit (par. 16a),

(2) Remove the high-voltage rectifier from the tank (par. 19a).

(3) Unsolder the terminal lead (fig. 12 and 18) from the output terminal.

(4) Loosen the jamnuts (fig. 11) on the pressure screws to decrease the tension on the output terminal.

(5) Lift up on the retainer plate and remove the retainer spring; lower and remove the retainer plate.

(6) Lift the output terminal out of the top plate.

Note. **The guard ring is connected to guard terminal H10 (fig. 3) through the balance strip (fig. 11). The balance strip is soldered to the guard ring, passes down through the hole in the top plate, and is soldered to the guard plate. If it becomes necessary to replace the guard ring or gasket, the balance strip must be unsoldered from the guard plate.**

b. Cleaning and Inspection.

(1) Clean all parts of the output terminal; dry thoroughly.

(2) Check the output terminal for cracked or broken porcelain and broken or loose components. Repair or replace when necessary.

c. Replacement.

(1) Insert the output terminal through the guard ring, gasket, and top plate.

(2) Place the retainer plate over the bottom end of the output terminal, with the convex side of the retainer plate toward the top plate.

(3) Insert the retainer spring in the groove at the base of the output terminal.

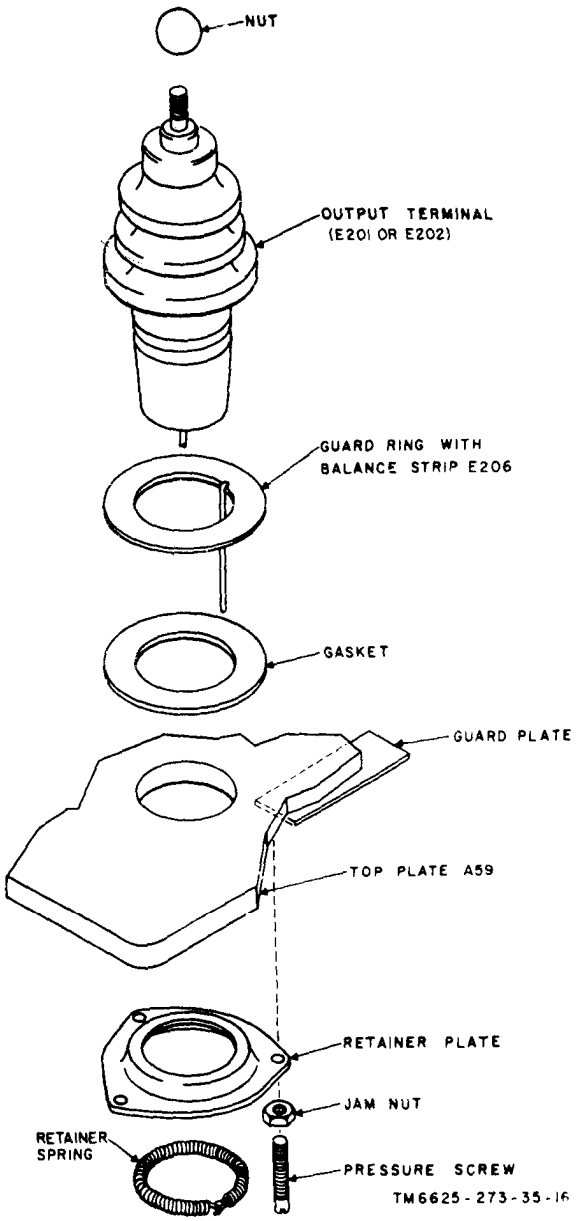


Figure 11. Output terminal (E201 or E202)—exploded view.

(4) Insert the pressure screws through the retainer plate and tighten them sufficiently to hold the output terminal in place. Secure the screws with the jamnuts.

(5) Solder the terminal lead (fig. 12 and 19) to the output terminal.

(6) Replace the high-voltage rectifier in the tank (par. 19c).

(7) Replace the control unit on the rectifier unit (par, 16c).

22. Removal and Replacement of Transformer T201

a. Removal.

Note. Be sure to tag all leads or shields before they are disconnected.

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Remove the high-voltage rectifier from the tank (par. 19a).

(3) Unsolder the primary leads (T201) from pins C and D of the terminal board (fig. 12 and 19); remove the leads from the shield.

(4) Disconnect the primary lead shield from the point of connection.

(5) Unsolder the secondary lead (T201) that is connected to the tube clip of tube V201.

(6) Unsolder the other secondary lead (T201) from the capacitor mounting frame (fig. 13).

(7) Disconnect the secondary lead shield (fig. 12) from the point of connection.

(8) Remove the bolts, spacers, and associated washers and nuts that secure transformer T201 to the transformer plate; remove the transformer from the equipment.

(9) Remove the contact spring (fig. 10) from the bottom of the transformer bracket.

b. Cleaning and Inspection. Remove excess oil from the transformer to permit visual inspection. Check for evidence of overheating, broken wires, and damaged outer wrapping. Replace if neceseary.

c. Replacement.

***Caution:* If a replacement transformer is to be installed in the equipment, do not remove it from the sealed container until it is ready for installation. Prolonged exposure to air may cause the transformer to break down during operation.**

(1) Install the contact spring at the bottom of the transformer bracket (fig. 10). Check to be sure that the contact spring protrudes approximately 1¼ inches.

(2) Dress the primary leads (T201) to the side of the transformer facing the terminal board (fig. 12).

(3) Secure the transformer to the transformer plate with the bolts, spacers, and associated washers and nuts.

(4) Run the primary leads (T201) through the primary lead shield. Solder one lead to pin C on the terminal board and the other lead to pin D on the terminal board (fig. 12 and 19).

(5) Solder one secondary lead (T201) to the tube clip of tube V201.

(6) Connect the other secondary lead to the capacitor mounting frame (fig. 13 and 19).

(7) Connect the primary lead shield (a(4) above) and the secondary lead shield (a(7) above) to their respective points of connection.

(8) Replace the high-voltage rectifier in the tank (par. 19c).

(9) Replace the control unit on the rectifier unit (par. 16c).

23. Removal and Replacement of Transformer T202

a. Removal.

Note. Be sure to tag all leads or shields before they are disconnected.

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Remove the high-voltage rectifier unit from the tank (par. 19a).

(3) Remove the rectifier tubes from the high-voltage rectifier (par. 20a).

(4) Unsolder the terminal leads from output terminals E201 and E202 (fig. 12 and 19).

(5) Unsolder the leads from pins A and B (not shown) of the terminal board.

(6) Unsolder the leads that connect resistors R203 and R204 (fig. 14 and 19) to the terminal board.

(7) Remove the lacing from the cable leading to connector J203 (fig. 12).

(8) Remove the top plate bolts and raise the top plate.

(9) Unsolder the secondary leads (T202) from the tube sockets (fig. 12 and 19) and remove the lacing.

(10) Unsolder the primary leads (T202) from pins A and B of the terminal board, and remove the leads from the shield.

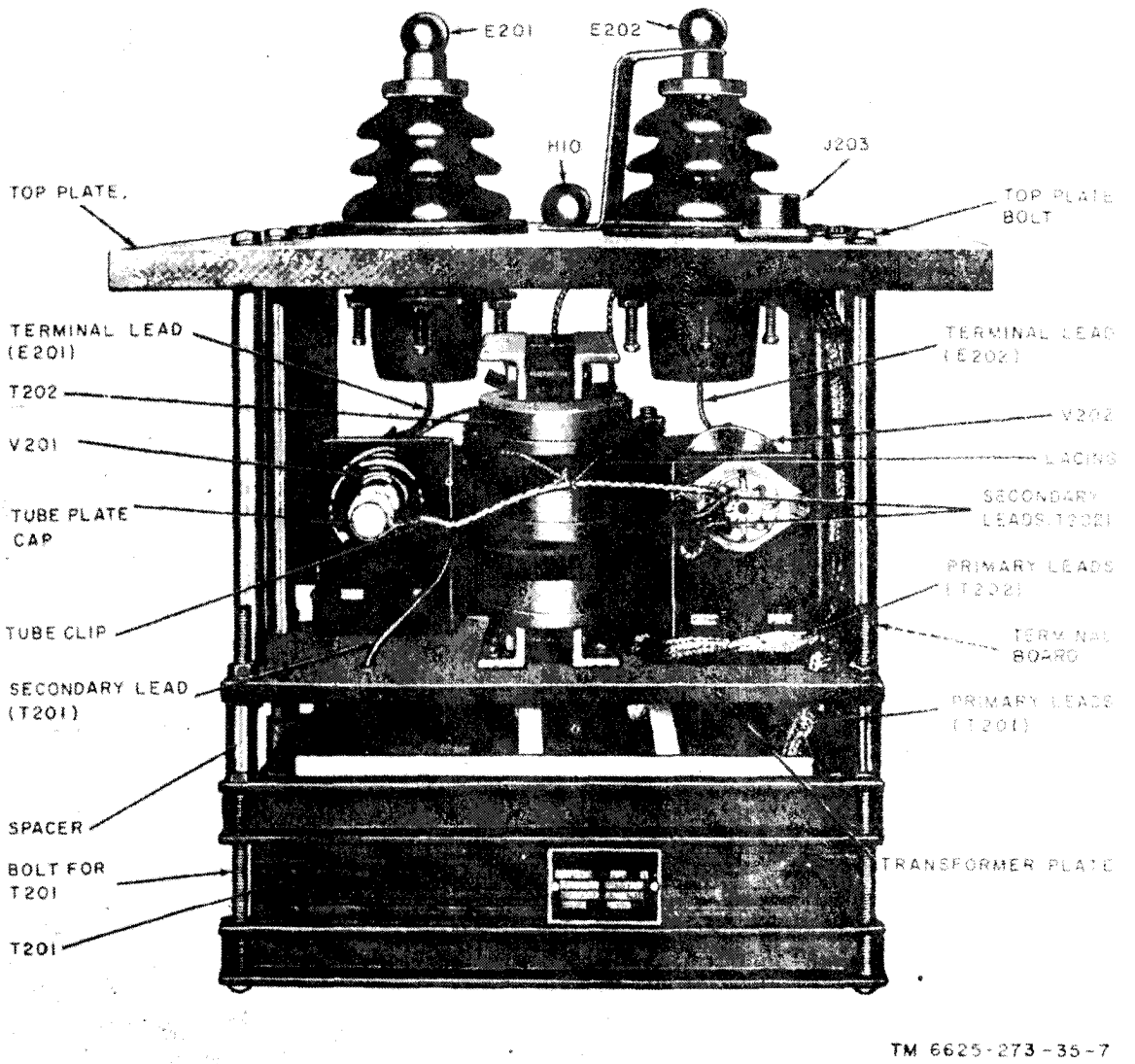


Figure 12. High-voltage rectifier removed from tank—front view, parts location.

(11) Disconnect the primary lead (T202) shield from its point of connection.

(12) Unsolder the lead connecting resistor R203 (B, fig. 14) to output terminal E201 (fig. 19).

(13) Unsolder the lead connecting resistor R204 (A, fig. 14) to output terminal E202 (fig. 19).

(14) Unscrew the transformer mounting bolts to release the transformer from the transformer plate (B, fig. 14).

(15) Unscrew the screws (not shown) to release the resistor mounting plates from the transformer.

b. Cleaning and Inspection. Remove excess oil from the transformer to permit visual inspection. Check for evidence of overheating, broken wire, and damaged outer wrapping. Replace if necessary.

c. Replacement

Caution: **If a replacement transformer is to be installed in the equipment, do not remove it from the sealed container until it is ready for installation. Prolonged exposure to air may cause the transformer to break down during operation.**

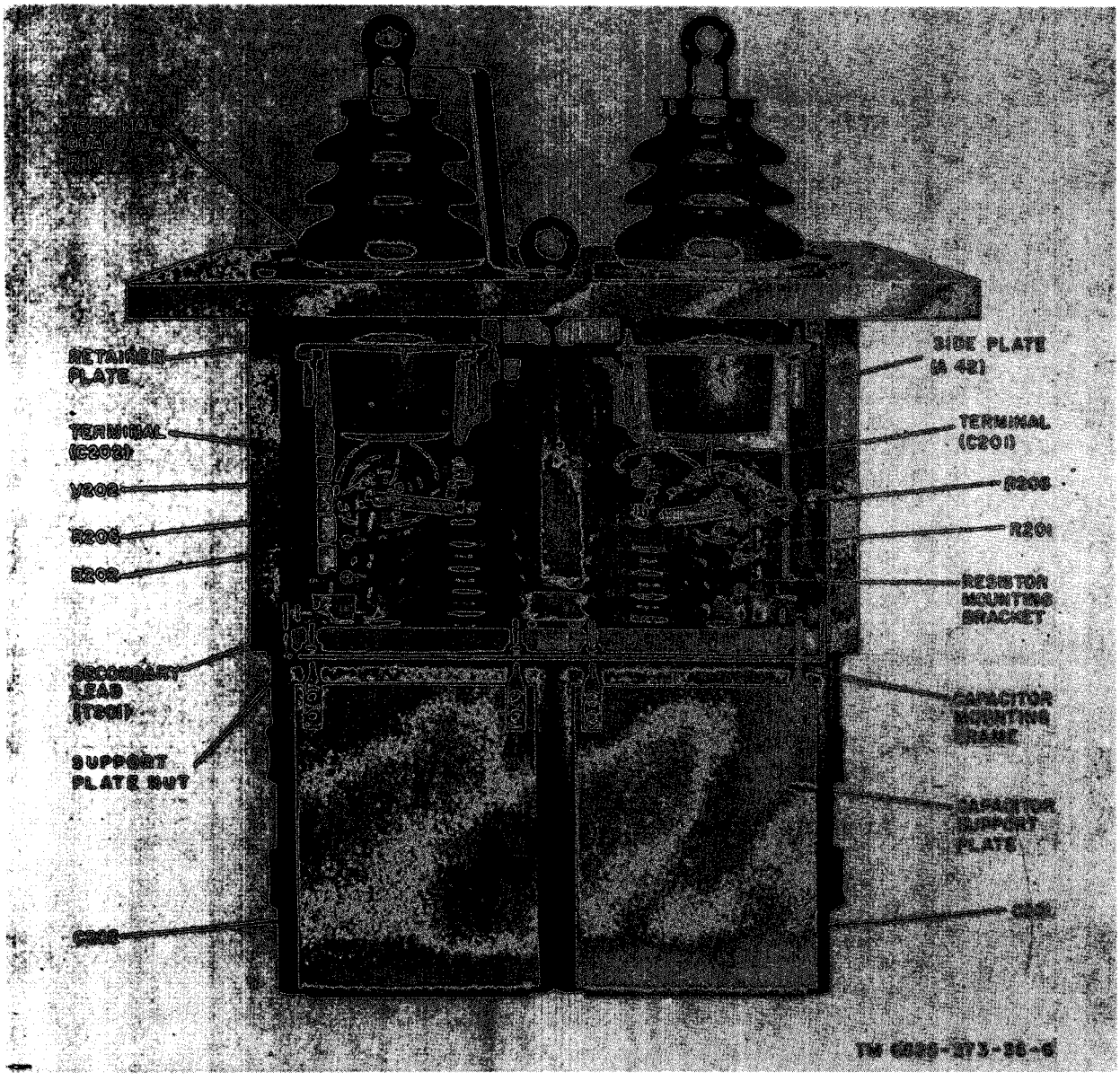


Figure 13. High-voltage rectifier removed from tank—rear view, parts location.

(1) Secure the resistor mounting plate (A, fig. 14) to the transformer with the screws (not shown).

(2) Position the transformer on the transformer plate (fig. 12) with the leads at the bottom.

(3) Secure the transformer in place with the mounting bolts (B, fig. 14).

(4) Connect the primary lead (T202) shield to its point of connection (a(11) above). Insert the primary leads through the shield.

(5) Solder one primary lead (T202) to pin A of the terminal board (fig. 12 and 19) and the other primary lead to pin B.

(6) Solder one pair of secondary leads (T202) to the filament pins on tube V201 socket.

(7) Solder the other pair of secondary leads to the filament pins on tube V202 socket.

(8) Lace the leads to the transformer.

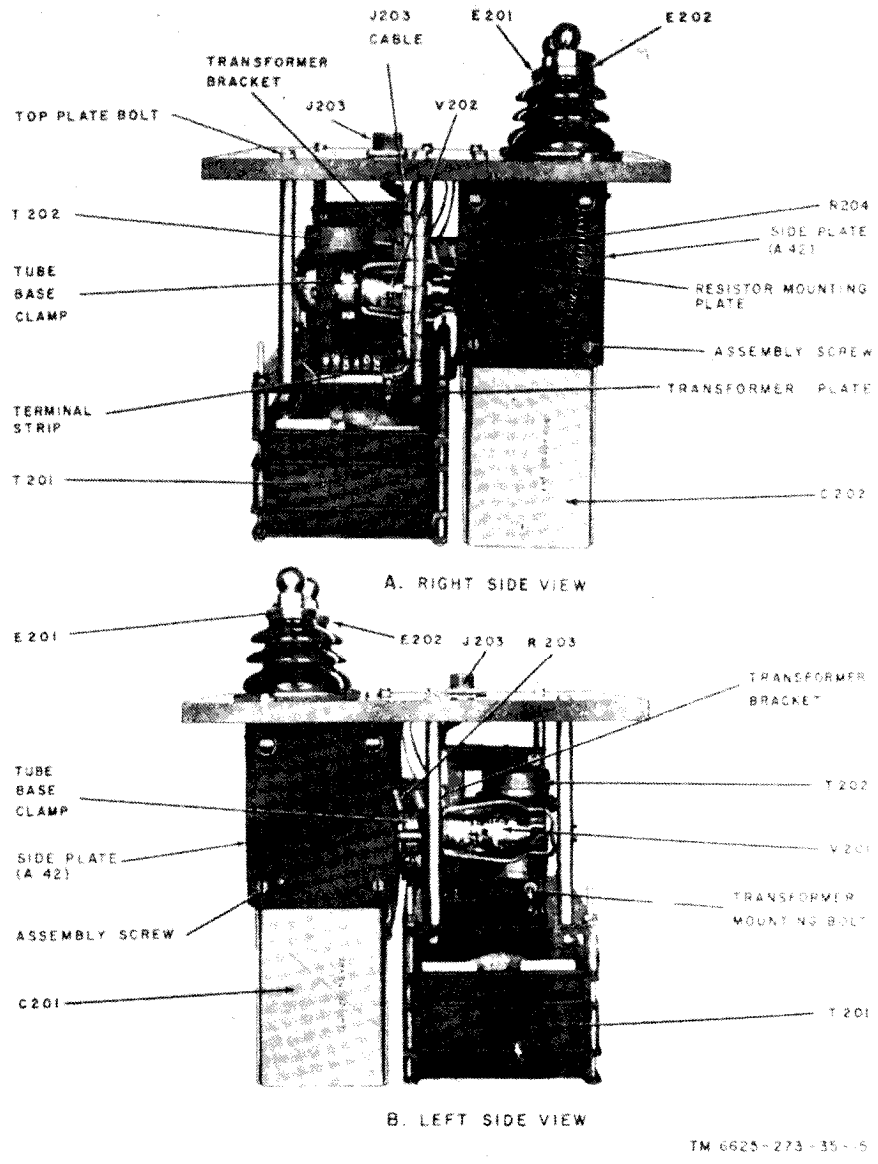


Figure 14. High-voltage rectifier removed from tank—parts location.

(9) Solder one end of a terminal lead to output terminal E201 and the other end of the terminal lead to R203 (B, fig. 14) .

(10) Solder one end of the other terminal lead to output terminal E202 and the other end of the terminal lead to R204 (A, fig. 14).

(11) Replace the top plate (fig. 12) and secure it in place with the top plate bolts.

(12) Solder the leads to pins A and B (fig. 19) of the terminal strip (a(5) above); lace the leads to a post.

(13) Solder the leads that connect resistors R203 and R204 (fig. 14) to the terminal board (a(6) above).

(14) Install the rectifier tubes in the high-voltage rectifier (par. 20c).

(15) Replace the high-voltage rectifier in the tank (par. 19c).

(16) Replace the control unit on the rectifier unit (par. 16c).

24. Removal and Replacement of High-voltage Capacitors

Capacitors C201 and C202 (fig. 13) are identical and similarly mounted. The following procedures apply to both capacitors.

a. Removal.

(1) Remove the control unit from the rectifier unit (par. 16a).

(2) Remove the high-voltage rectifier from the tank (par. 19a).

(3) Remove the rectifier tubes from the high-voltage rectifier unit (par. 20a),

(4) Remove the assembly screws (fig. 14) and remove the side plate from the capacitor mounting frame (fig. 13).

(5) Remove the nut and washer from the terminal of the capacitor.

(6) Remove the support plate nuts and permit the support plates to drop free.

(7) Carefully lift the high-voltage rectifier and remove the capacitor.

b. Cleaning and Inspection. Remove excess oil from the capacitor to permit visual inspection. Check the capacitor for cracked or broken porcelain deterioration, and evidence of leakage; replace if necessary.

c. Replacement.

(1) Place the capacitor on the bench in position for insertion in the high-voltage rectifier.

(2) Lower the high-voltage rectifier over the capacitor. Be sure that the lug of the resistor (R205 or R206) is positioned on the capacitor terminal.

(3) Position the capacitor support plates and secure them with the support plate nuts.

(4) Replace the washer and nut on the capacitor terminal.

(5) Secure the side plate (fig. 13) in place with the assembly screws.

(6) Install the rectifier tubes in the high-voltage rectifier (par. 20c).

(7) Replace the high-voltage rectifier in the tank (par. 19c).

(8) Replace the control unit on the rectifier unit (par. 16c).

CHAPTER 4

FINAL TESTING

25. Purpose of Final Testing

The tests outlined in this chapter are designed to measure the performance capability of repaired equipment. Equipment that meets the minimum standards stated in these tests will furnish satisfactory operation, equivalent to that of new equipment.

26. Test Equipment Required

In addition to the tools and test equipment listed in paragraph 9, the following items are required for final testing.

Quantity	Item	Common name
2	Resistor, 20 megohms, 20 kv, ±½% accurary, Weston type 2, or equivalent.	Resistors R1 and R2
1	Dc milliammeter, 0 to 50 ma, ±½% accuracy, Weston model 931, or equivalent.	Milliammeter M1
1	Dc microammeter, 0 at 500 a, ±½% accuracy, high resistance type, Weston model 931 or equivalent.	Microammeter M2

27. Preliminary Check

a. Perform the preoperational procedures (par. 12a) except that the output is adjusted for a positive (+) 40,000 volts.

b. No corona formation, flashover, or leakage current should be present.

c. Shut down the equipment (TM 11-6625-273-12).

28. Final Tests

a. Spark Gap E105 Setting.

(1) Loosen the camlock retainer and remove the end panel.

(2) Measure the gap in spark gap E105 (fig. 5). It should measure between .0015 inch and .002 inch.

(3) Place AMMETER MULTIPLIER switch S104 (fig. 4) in position 1.

(4) Measure the resistance of the gap. The resistance should be 112,000 ohms ±5 per cent.

(5) Replace the end panel and secure the camlock retainer.

b. Protective Circuit. To test the components of the protective circuit, follow the procedures given in paragraph 12.

c. Meter Circuit Test.

(1) Connect the high-voltage connector of the output cable to the positive terminal of milliammeter M1.

(2) Connect the negative terminal of milliammeter M1 directly to ground terminal H9 (fig. 3).

(3) Connect Multimeter AN/URM-105 between connector J102 (fig. 4) and ground terminal H9 (fig. 3); set the AN/URM-105 to its 10-volt dc range.

(4) Set AMMETER MULTIPLIER switch S104 (fig. 4) to position 100.

(5) Raise the high-voltage caution plate.

(6) Start the tester and *very slowly* adjust voltage control T101 until both microammeter M102 and milliammeter M1 indicate 5,000 microamperes (5 milliamperes on M1).

(7) The AN/URM-105 should indicate between 4.8 and 5.2 volts.

(8) Shut down the test set (TM 11-6625-273-12) and disconnect all cables and test equipment.

d. Leakage with Positive Output.

(1) Place AMMETER MULTIPLIER switch S104 (fig. 4) in position 1.

(2) Place VOLTMETER RANGE switch S103 in position 50.

(3) Place both polarity switches (S102 and S105) in the positive (+) position.

(4) Raise the high-voltage caution plate.

(5) Start the tester and adjust the output to 40,000 volts.

(6) Microammeter M102 should indicate less than microampere.

(7) Shut down the test set (TM 11-6625-273-12)

e. Leakage with Negative Output. Follow the procedures in d above, but set up the equipment for a negative (-) output.

f. Voltage Under Load with Positive Output.

(1) Connect resistors R1 and R2 and milliammeter M1 in series between output terminal E201 and ground terminal H9. Be sure that the polarity of milliammeter M1 is correct. Set AMMETER MULTIPLIER switch S104 to the 100 position.

(2) Start the tester and adjust the output for 40,000 volts.

(3) Microammeter M102 and milliammeter M1 should both indicate between 980 and 1,020 microampere (.9 to 1 milliampere on M1).

(4) The setting of voltage control T101 should be approximately 120.

(5) Shut down the test set and disconnect the test equipment.

g. Voltage Under Load with Negative Output. Follow the procedures given in *e* above, but set up the equipment for a negative (-) output. Be sure that the polarity of milliammeter M1 is correct.

h. One Hour Leakage Test with Positive output.

(1) Place AMMETER MULTIPLIER switch S104 (fig. 4) in position 1.

(2) Start the tester and adjust the output for 40,000 volts.

(3) Permit the equipment to operate for 1 hour.

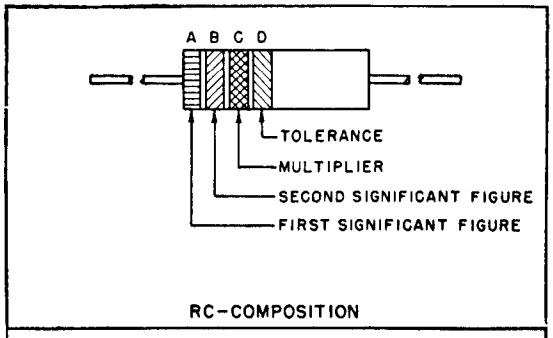
(4) At the end of the hour, note the indication on microammeter M102. The indication should be less than .5 microampere.

(5) Shut down the equipment.

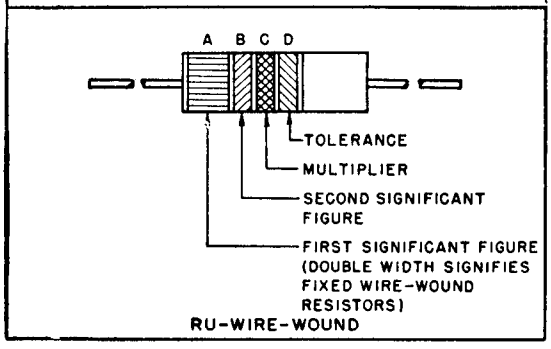
i. One Hour Leakage Test with Negative Output. Follow the procedures given in *h* above, but set up the equipment for a negative (-) output.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS (INSULATED)

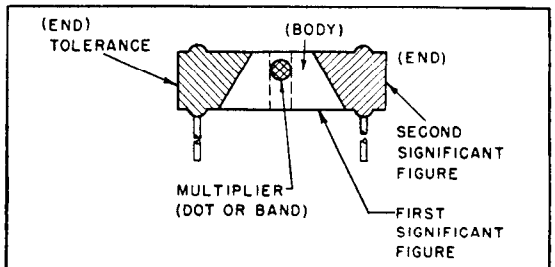


RC-COMPOSITION

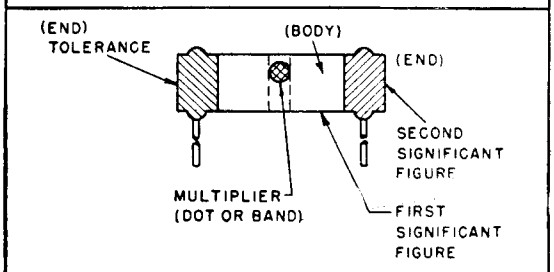


RU-WIRE-WOUND

RADIAL-LEAD RESISTORS (UNINSULATED)



RZ-COMPOSITION



RZ-COMPOSITION

RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH. WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

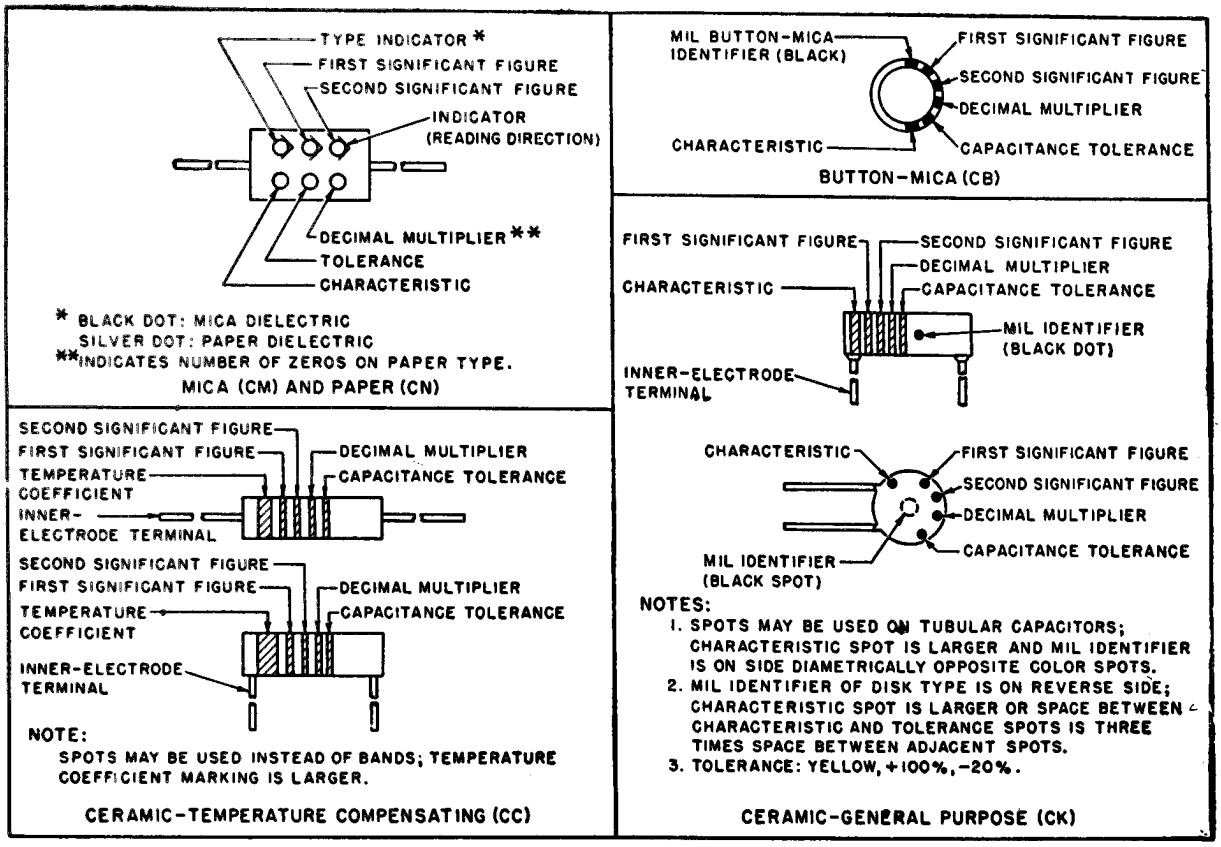
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT: BROWN BODY; BLACK END; BLACK DOT OR BAND; BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT: ORANGE BODY; BLACK END; RED DOT OR BAND; SILVER END.

STD-R1

Figure 15. MIL-STD resistor color code markings.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE[2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500)[3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
2. IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
3. INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

STD-C8

Figure 16. MIL-STD capacitor color code markings.

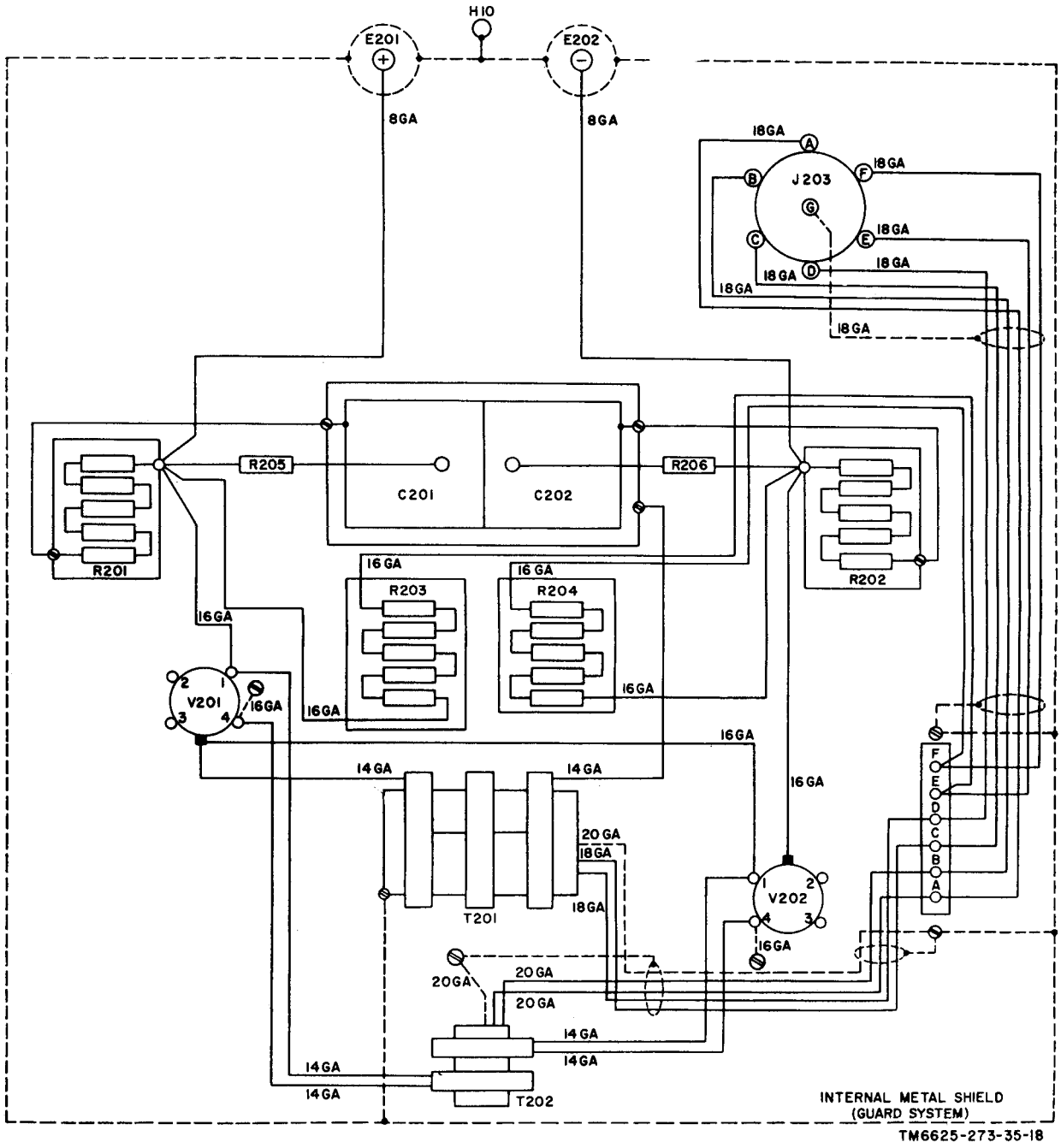


Figure 19. Rectifier unit—wiring diagram.

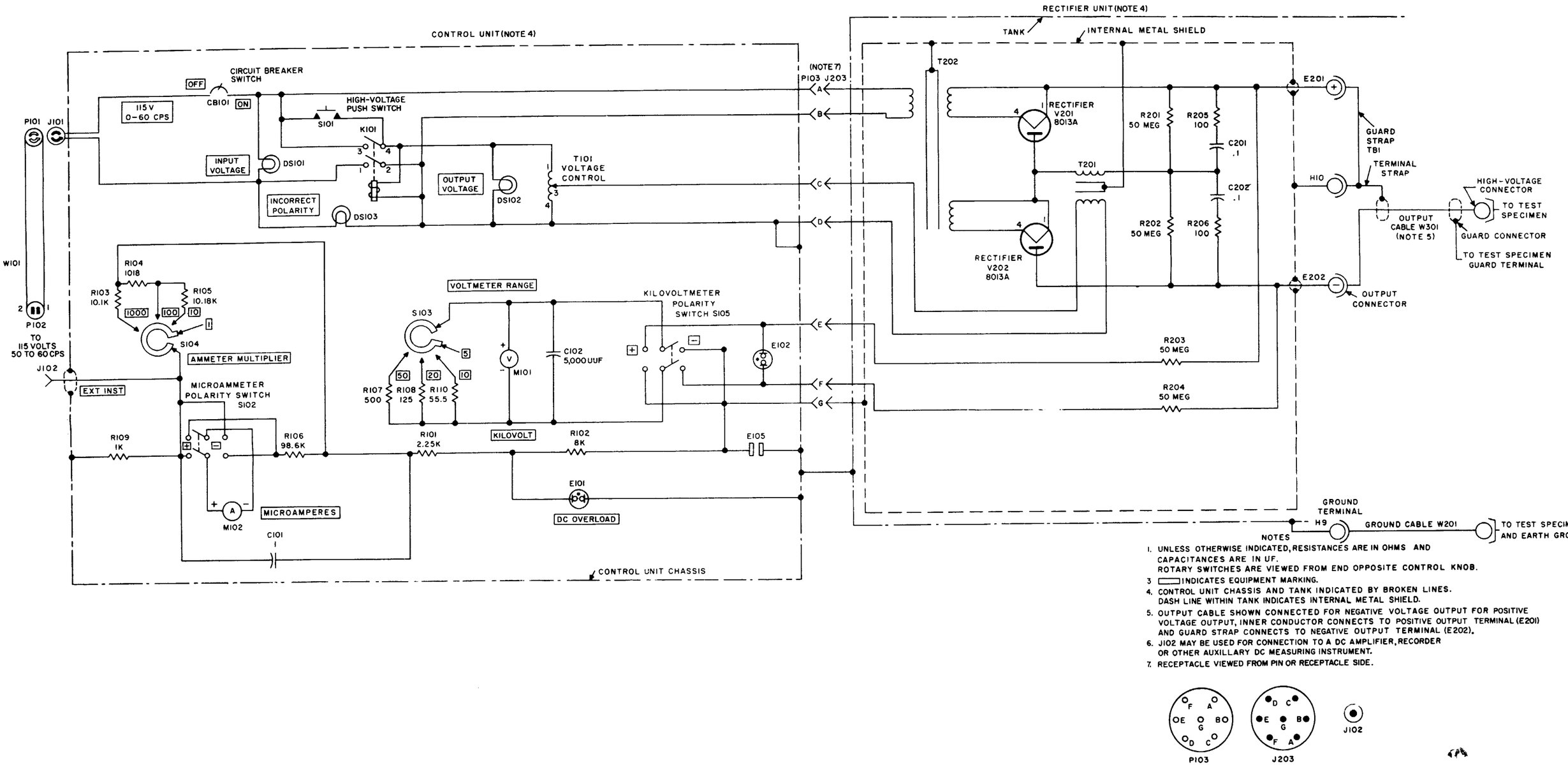
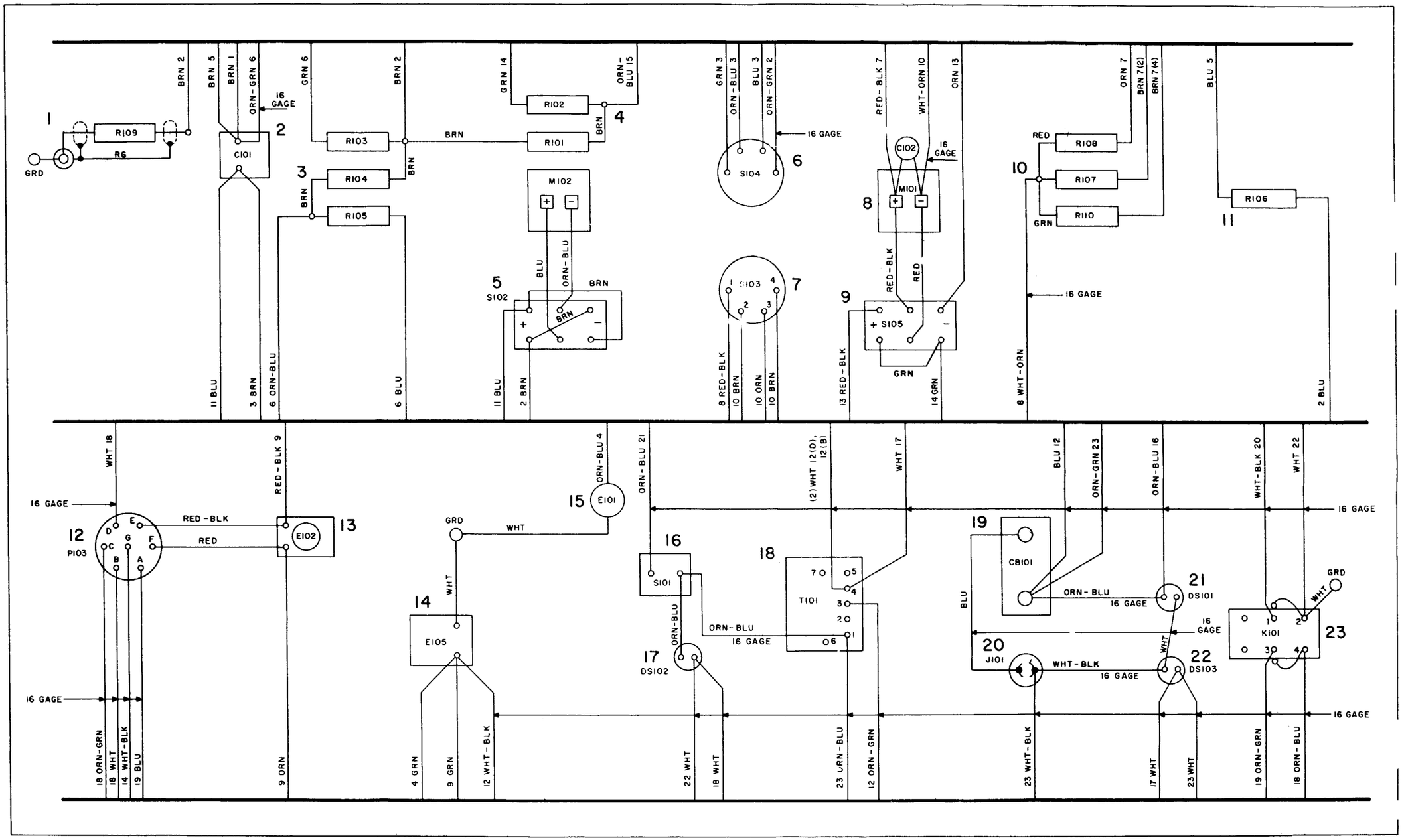


Figure 17. Insulation breakdown test set AN/GSM-6—schematic diagram.

NOTES:

1. THE SMALL NUMBERS ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPOND TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. WIRES NOT OTHERWISE SPECIFIED ARE 22 GAGE.
3. RG DENOTES COAXIAL CABLE, TYPE RG-59/U



TM6625-273-35-11

Figure 18. Control unit—wiring diagram.

[AG 413.44 (17 June 59)]

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Midwestern Rgn Ofc (USASSA) (1)
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Army Pictorial Cen (2)
USA Ord Msl Comd (3)
Units org under fol TOE:
11-7 (2)
11-16 (2)
11-57 (2)
11-97 (2)
11-117 (2)
11-155 (2)
11-500 AA-EE (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AG (3).

USAR: None.

For explanation of abbreviations used, see AR 320–50.

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