DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

TEST SET, ELECTRONIC CIRCUIT

AN/GSM-72, SLAVE UNIT, TEST SET

MX-3844/GSM-72, AND TEST SET

SUBASSEMBLY MX-3845/GSM-72

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

HEADQUARTERS, DEPARTMENT OF THE ARMY

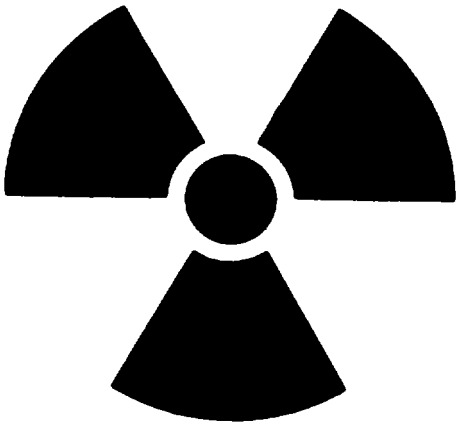
6 AUGUST 1963

WARNING

Be careful when working on the +500-, -500-, -300-, +250-, -250-, and +150-volt circuits, or on the 115-volt ac line connections. Serious injury or death may result from contact with these terminals.

DON'T TAKE CHANCES!

RADIATION HAZARD



Co 60

Tube type OA2 used in Test Set, Electronic Circuit TS-1708/GSM-72 contains a small amount of 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. Follow safe procedures when handling, storing, or disposing of this tube (para 61).

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.

TM 11-6625-499-12
C 2

CHANGE
No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *26 August 1974*

Operator and Organizational Maintenance Manual

**TEST SET, ELECTRONIC CIRCUIT AN/GSM-72, SLAVE UNIT,
TEST SET MX-3844/GSM-72, PANEL, TEST POINT SB-2146/GSM-72,
AND TEST SET SUBASSEMBLY MX-3845/GSM-72**

TM 11-6625-499-12, 6 August 1963, is changed as follows:

Page 3. Delete paragraph 2 and substitute:

2. 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.

Delete paragraph 3 and substitute:

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58/NAVSUP PUB 378/AFR 71-4/MCO P4030.29, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

After paragraph 3 add:

3.1 Reporting of Equipment Publication Improvements.

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-C, Fort Monmouth, NJ 07703.

Page 5. Delete paragraph 6 and substitute:

6. Items Comprising an Operable Equipment

FSN	*Qty*	*Nomenclature, part No., and mfr code*	*Fig. No.*
6625-064-5165		Test Set, Electronic Circuit AN/GSM-72	
		Consisting of:	
5120-857-0918	1	Burnisher, Contact Hand	3
6625-444-6109	1	Impedance Measuring Group OA-3672/GSM-72	1
		Consisting of:	
6625-064-5126	1	Impedance Bridge Subassembly MX-3846-GSM-72	1
6625-064-5127	1	Impedance Bridge Subassembly MX-3875/GSM-72	1
6625-064-5129	1	Tape Punch, Manual TL-681/GSM-72	1
6625-064-5166	1	Test Set, Electronic Circuit TS-1708/GSM-72	1
5120-198-5401	1	Wrench, Socket Head Screw: GGG-W-652, type 1, Class A	1
5120-198-5398	1	Wench, Socket Head Screw: 1/16 in across flats; L shape;	
5120-224-2504	1	Wrench, Socket Head Screw: 5/64 in across flats; L shape;	
6625-064-5124		Slave Unit, Test Set MX-3844/GSM-72	17
6625-064-5125		Test Set Subassembly MX-3845/GSM-72	21
6625-045-9894		Panel, Test Point SB-2146/GSM-72	

Page 9. Delete the last sentence in subparagraph 10*b*.

Page 67. Delete appendix III and Substitute:

APPENDIX III

BASIC ISSUE ITEMS UST (BIIL) AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST (ITIAL)

Section I. INTRODUCTION

1. Scope.

This appendix lists basic issue items and items troop installed or authorized required by the crew/operator for installation, operation, and maintenance of Test Set, Electronic Circuit AN/ GSM-72, Slave Unit, Test Set MX-3844/GSM-72, Panel, Test Point SB-2146/GSM-72 and Test Set Subassembly MX-3845/GSM-72.

2. General.

This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

a. Basic Issue Items List-Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with the end item.

b. Items Troop Installed or Authorized List-Section III. Not applicable.

3. Explanation of Columns.

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number*. Not applicable.

b. Federal Stock Number. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

d. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code used

to identify the manufacturer, distributor, or Government agency, etc., and is identified in SB 708-42.

e. Description. Indicates the Federal item name and a minimum description required to identify the item.

f. Unit of Measure (U/M). Indicates the standard of basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, (e.g., ea, in., pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

g. Quantity Furnished with Equipment (Basic Issue Items Only). Indicates the quantity of the basic issue item furnished with the equipment.

Section II. Basic Issue Items List

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)
(A) FIG. NO.	(B) ITEM NO.	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	UNIT OF MEAS	QTY FURN WITH EQUIP
1		6625-064-5128			CASE, IMPEDANCE BRIDGE CY-3421/GSM-72	EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 1231, Section I, Direct and General Support Maintenance requirements for OV-1A, B, C and D Aircraft.

Operator and Organizational Maintenance Manual

TEST SET, ELECTRONIC CIRCUIT AN/GSM-72, SLAVE UNIT, TEST SET MX-3844/GSM-72, PANEL, TEST POINT SB-2146/GSM-72, AND TEST SET SUBASSEMBLY MX-3845/GSM-72

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *16 December 1963*

TM 11-6625-499-12, 6 August 1963, is changed as follows:

Change the title of the manual as shown above.

Page 2, figure 1. Make the following changes.

Delete the caption and substitute: *Test Set, Electronic Circuit AN/GSM-72 (including Panel, Test Point SB2146/GSM-72) connected to Test Facilities Kit MK-645/GSM-72, less tools, technical manuals, and running spares.*

Add the following callout to the right side of Test Set, Electronic Circuit TS-1708/GSM-72 at the point where the cables are connected: PANEL, TEST POINT SB-2146/GSM-72.

Page 3, paragraph 1, line 10. After "Slave Unit, Test Set MX-3844/GSM-72", add: Panel, Test Point SB-2146/GSM-72.

Page 5, paragraph 5. Add subparagraph *d* after subparagraph *c*.

d. Panel, Test Point SB-2146/GSM-72 (Auxiliary Equipment).

Number of sockets ..... 25 (0-24).
Number of pins ..... 250 (11 pins per socket, 1 grounded).

Paragraph 6, line 3. After "components", add: Panel, Test Point SB-2146/GSM-72.

Paragraph 7, chart. Make the following changes:

In the "Common name" column add: Socket selector.

In the "Nomenclature" column opposite socket selector add: Panel, Test Point SB-2146/GSM-72.

Paragraph 8*a*. Make the following changes:

Delete the first sentence and substitute: The tester (TS-1708/GSM72), when equipped with the socket selector (auxiliary equipment), consists of six plug-in type assemblies and a main frame contained in a metal case.

Lines 9 and 10. Delete "on the tester side panel" and substitute: by the socket selector.

Page 11, paragraph 12, heading. Delete the paragraph heading and substitute: Test Set and Socket Selector Operating Controls, Jacks, and Indicators.

Page 12, paragraph 12*b*, heading. Delete and substitute:

b. Socket Selector Jacks (fig. 7).

Page 14, figure 7. Make the following changes:

Delete the figure caption and substitute:

Panel, Test Point SB-2146/GSM-72 installed in Test Set, Electronic Circuit AN/GSM-72.

Add the following callout to the sockets:
PANEL, TEST POINT SB-2146/GSM72.

Page 17, paragraph 14*a*, line 1. Delete "test set" and substitute: socket selector.

Page 18, A, figure 10, "96 BIT ADV" column. Insert the letter P for test numbers 4 and 6.

Page 27, paragraph 18. Delete subparagraph d and substitute:

d. The final steps in programming are to determine if a delay in the test sequence, and a 96-bit advance and a stop are required. The programmed delay actuates a predetermined manually adjusted delay for the particular test. A delay must be programmed for any test (including any in which a printer (auxiliary equipment) is used) where a time constant will cause the test set to show an *under* reject condition. Additional programming steps will be necessary if auxiliary equipment, such as a test point multiplier or printer, is used. If a test point multiplier is used with the test set, the "From mult" (multiplier) and "To mult" columns will have to be marked with the multiplication number (250, 500, or 750) to indicate the number of test points added to the "From" and "To" columns. If a printer is used with the test set, the "Printer code" column will have to be marked to indicate the *from* and *to* socket and pin connected to the component under test. For example, the "Printer code" column for test No. 1 (A, fig. 10) would contain the number 227,159, indicating connections from socket 22, pin 7, to socket 15, pin 9. The "Printer code" column for test No. 6 would contain the number 051,872, indicating connections from socket 05 (5), pin 1, to socket 87 (or 870), pin 2. The number 872 results from the addition of 750 to 122 (socket 12, pin 2) in the "To" column. The *96 BIT ADV* (advance) column (A, fig. 10) should be marked with the letter P (proceed) when programming an eight-column test.

Page 28, paragraph 18*f*. Make the following changes:

Line 7. Delete "tester" and substitute: socket selector.
Lines 12 and 13. Delete the word "tester."

Page 30, paragraph 19*q*, line 6 from bottom. After "7 and 8", add: in columns 5 and 6.

Page 31, paragraph 21*e*. Delete the first sentence and substitute: Connect the cables from the equipment under test to the appropriate sockets in the socket selector installed in the right-hand side of the test set (par. 59.3).

Page 32, paragraph 25*e*. Delete the first sentence and substitute: Connect the cables from the equipment under test to the appropriate sockets in the socket selector installed in the right-hand side of the test set.

Page 48. Add section III after section II.

Section III. PANEL, TEST POINT SB-2146/GSM-72

59.1 Purpose of Panel, Test Point SB-2146/GSM-72

The socket selector is used with the test set to select the *to* and *from* sockets programmed on the test set program tape. The socket selector provides the test set with 25 sockets used for connection to the equipment under test.

59.2 Description of Panel, Test Point SB-21 46/GSM-72 (fig. 7)

The socket selector is a plug-in assembly which is installed in the right-hand side of the test set. Twenty-five 11-pin (1 pin grounded) sockets provide 250 test points for connection to components under test. The sockets are numbered from 0 through 24. Socket No.0 is used as the 25th socket for programming purposes. The socket selector also contains two pin straighteners.

59.3 Installation and Operation of Panel, Test Point SB-2146/GSM-72

a. Install the socket selector in the right-hand side of the test set as follows:

(1) Remove the test set top and right side panels by removing the four securing screws.

(2) Line up the plugs (P301, P302, and P303) on the inside of the socket selector with jacks (J301, J302, and J303) in the test set and gently press the socket selector into place.

(3) Secure the socket selector by using the screws provided. Two screws are provided at the left- and right-hand side of the socket selector. A large screw is located between transistors Q301 and Q302 at the bottom of the socket selector. This screw must be aligned with its counterpart in the test set and tightened.

(4) Replace the test set top and right side panels by using the securing screws.

b. Once installed, operation of the socket selector is controlled by the test set program tape and is completely automatic.

Page 58, section II. Delete the maintenance information in all columns pertaining to Test Set, Electronic Circuit AN/GSM-72 and substitute:

Part or component	Maintenance function	Echelon 1	2	3	4	5	Tools required	Remarks
TEST SET, ELECTRONIC CIRCUIT AN/GSM-72	service		X				14	Lubrication of tape reader motor and Geneva Mechanism.
					X		11	Lubrication of stepping switches.
	adjust				X		2,4,5,6 7,13	
						X	1,2,4,6 13	Tape head
	inspect		X				11	Operational inspection
	test					X	8	
					X		9	
					X	X	1-14	
						X		Depot facilities
	replace		X					Fuses and panel lamps only.
					X		11,12	
	repair				X	X	11,12	
	align				X			Mechanical tape assembly and power supply.
	calibrate					X	3	Depot facilities.
	overhaul					X		Depot facilities.

Page 60, section II. Delete all maintenance information in all columns pertaining to the socket selector assembly.

Page 61, section II. Delete all maintenance information in all columns pertaining to Test Facilities Kit MK-645/GSM-72 and Fixture, Electrical Contact MX-3944/GSM-72.

Page 66. Add section VIII after section VII:

Section VIII. MAINTENANCE ALLOCATION CHART PANEL, TEST POINT SB-2146/GSM-72

Part or component	Maintenance function	1st ech.	2nd ech.	3rd ech.	4th ech.	5th ech.	Tools required	Remarks
PANEL TEST POINT SB-2146/GSM-72	service		X				4	Preventive maintenance
	inspect		X					Visual
	test				X		1,2	
	replace				X		3	
	repair				X		3	
	rebuild					X	1,2,3	Plus depot facilities
	overhaul					X	1,2,3	Plus depot facilities

PART OR COMPONENT	ECHELON 1	2	3	4	5	TOOL CODE	PROC SERV	TYPE CLASS	REMARKS
SB-2146/GSM-72 (continued)									
MULTIMETER TS-352/U				†	†	1	ARMY	STD A	
TEST SET, TRANSISTOR TS-1836/U				†	†	2	ARMY	STD A	
TOOL KIT, RADAR AND RADIO REPAIRMAN TK-87/U				†	†	3	ARMY	STD A	
TOOL AND TEST EQUIPMENT AVAILABLE TO THE REPAIRMAN-USER BECAUSE OF HIS ASSIGNED MISSION.		†				4			

Page 71. Add section V after section IV:

Section V. FUNCTIONAL PARTS LIST PANEL, TEST POINT SB-2146/GSM-72

FEDERAL STOCK NO.	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION		
						FIG. NO.	ITEM NO.	
6625-045-9894		PANEL,TEST POINT SB-2146/GSM-72: rotary type, locate and select from 25 individual electron tube sockets and pin connectors, bank data: 25 banks, 14 contacts each bank; 350 horizontal cont 24 vdc; o/a dim; 15-3/16 in lg x 10 in h x 6 in w. plug in chassis; special features: transistorized power operated 24 v 1000 cps operation		NX				R
		ITEMS COMPRISING AN OPERABLE EQUIPMENT						
ORD THRU AGC		TM 11-6625-499-12			2			R
		RUNNING SPARE ITEMS						
		NO PARTS AUTHORIZED FOR STOCKAGE AT FIRST ECHELON						

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.

Distribution:

To be distributed in accordance with DA Form 12-32, Sec II (Unclas) requirements for Nike-Ajax and Nike-Hercules, TM, Test Equipment (SigC).

Technical Manual

No. 11-6625-499-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *6 August 1963*

TEST SET, ELECTRONIC CIRCUIT AN/GSM-72, SLAVE UNIT, TEST SET MX-3844/GSM-72, AND TEST SET SUBASSEMBLY MX-3845/GSM-72

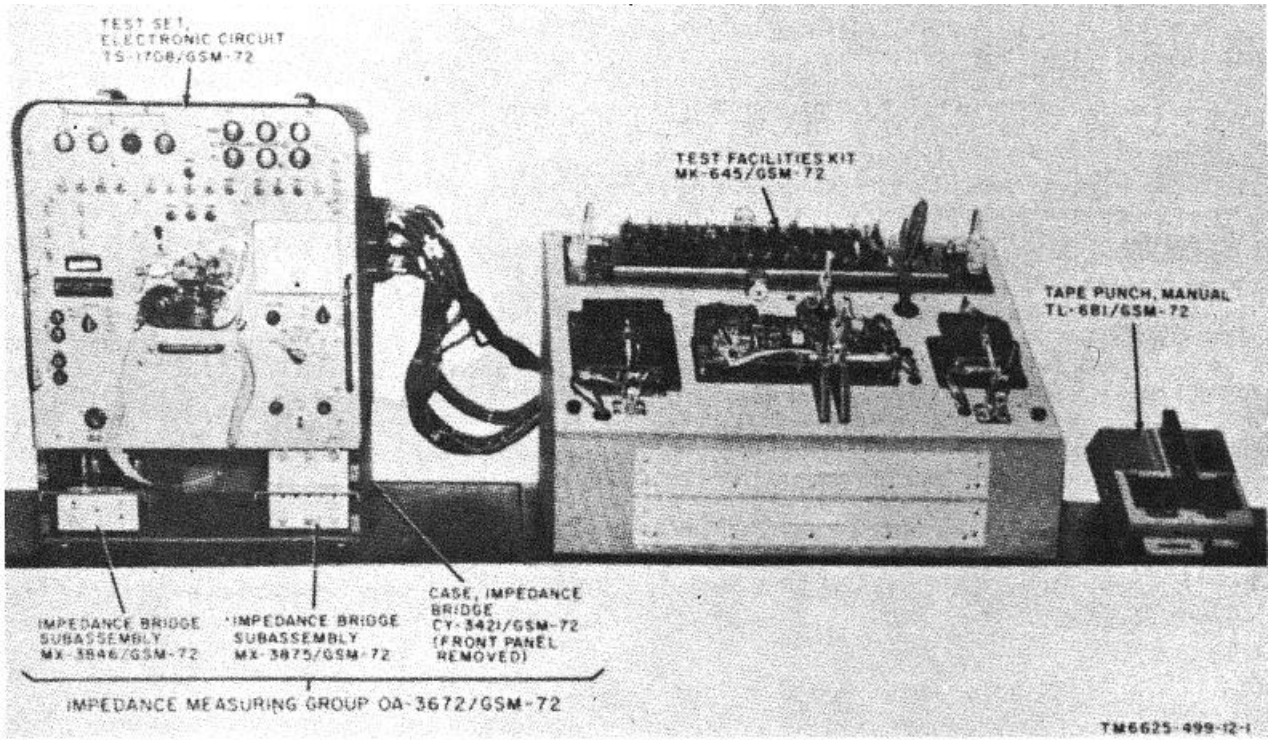


Figure 1. Test Set, Electronic Circuit AN/GSM-72, connected to Test Facilities Kit MK-645/GSM-12, less tools, technical manuals, and running spares.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This manual describes Test Set, Electronic Circuit AN/GSM-72 (fig. 1) and covers its installation, operation, and first and second echelon maintenance. It includes instructions for operation, cleaning and inspection of the equipment, and replacement of parts available to first and second echelon maintenance personnel. This manual also covers Slave Unit, Test Set MX-3844/GSM-72 and Test Set Subassembly MX-3845/GSM-72, which are used with Test Set, Electronic Circuit AN/ GSM-72.

2. Index of Publications

Refer to the latest issue of DA Pamphlet 310-4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment. Department of the Army Pamphlet No. 310-4 is an index of current Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders which are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Comments on Manual. Forward all comments on this publication direct to: Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SE LMS-MP, Fort Monmouth, New Jersey. (DA Form 1598 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or letter may be used.)

Section II. DESCRIPTION AND DATA

4. Purpose and Use

a. Test Set, Electronic Circuit AN/ GSM-72 is a high-speed automatic testing device designed to make a rapid test of electronic subassemblies and printed-circuit cards. The test set is capab1e of measuring direct-current (dc) resistances in a range from l ohm to 9.99 megohms, insulation resistance in a range from 10 to 9,990 megohms, and complex impedances in a range from 10 ohms to 99.9 kilohms at 160 cycles per second (cps), 1,600 cps, and 16,000 cps. Voltages (alternating-current (ac) and dc) can be measured by the use of auxiliary equipment (para 5*c* and 57, 58, and 59).

b. Tape Punch, Manual TL-681/GSM-72 is included as part of the AN/GSM-72 and is used with pads of tape to prepare or repair the basic program tape for use with the AN/GSM-72.

5. Technical Characteristics (Auxiliary Equipment Included)

a. Test Set, Electronic Circuit AN/GSM-72.

Number of tubes ..... 13 (See note below.)
Number of transistors..... 37.

Measurements ..... Dc resistance, insulation, resistance, impedance.

Ranges:

Dc resistance ..... 1 ohm to 9.99 megohms in 1-ohm steps from 1 to 999 ohms; 10-ohm steps from 10 ohms to 9.99 kilohms; 100-ohm steps from 100 ohms to 99.9 kilohms; 1-kilohm steps from 1 to 999 kilohms; and 10-kilohm steps from 10 kilohms to 9.99 megohms.

Dc resistance tolerances ..... 1%, 5%, 10%, or 20%.

Insulation resistance..... 10 to 9,990 megohms in 100-kilohm steps from 10 to 99.9 megohms; 1-megohm steps from 10 to 999 megohms; and 10-megohm steps from 10 to 9,990 megohms.

Insulation resistance tolerances actual)..... 3%, 15%, 30%, or 60%.

Impedance ..... At 160 cycles, 10 ohms to 99.9 kilohms; at 1,600 cycles, 10 ohms to 9.99 kilohms; at 16,000 cycles, 10 to 999 ohms in 1-ohm steps from 10 to 999 ohms; 10-ohm steps from 10 ohms to 9.99 kilohms; and 100-ohm steps from 100 ohms tc 99.9 kilohms.

Impedance tolerances..... 5%, 10%, or 20%.

Range of capacity measurements ..... 500µµf-100µf (0.005µf-100µf at ±5%).

Range of inductance measurements ..... 0.001h-100h (10mh-100h at ±5%).

Sequence..... Random selection.

Testing speed..... 90 measurements per minute (max).

Line voltage input..... 115 vac, 60 cps.

Power consumption..... 200 watts.

Note

Type OA2 tube used contains Isotope Co 60, 0.0067 microcuries.

b.Slave Unit. Test Set MX-3844/GSM-72 (Auxiliary Equipment).

Output capabilities ..... 2^{48} or more than 2.7×10^{14} combinations possible.

Test setup ..... Controlled by 2 bits of information on master tape of Test Set, Electronic Circuit AN/GSM-72.

Function setup ..... Controlled by slave reader employing 48-bit readout.

Line voltage input..... 115 vac, 50-60 cycles.

Power consumption..... 170 watts.

c.Test Set SubassemblyMX-3845/GSM-72 (Auxiliary Equipment).

Measurements ..... Voltage (-dc, +dc, ac).

Voltage ..... 0.5 to 499.5 volts in 0.005-volt steps from 0.5 volt to 4.995 volts; 0.05-volt steps from 0.5 to 49.95 volts; and 0.5-volt steps from 0.5 to 499.5 volts.

Voltage tolerances:

(ac) ..... 1%, 5%, 10%, or 20%.

(dc) ..... 5%, 10%, or 15%.

Voltage measuring
input impedance ..... 20,000 ohms per volt.
Frequency response..... 60 cps ac, 0.5 to 499.5 volts.

Note

This is the range over which the measurement will fall within the accuracy of the tolerance programmed.

6. Components

The components of Test Set, Electronic Circuit AN/GSM-72 are listed in the basic issue items list (appx III). The major components, tools, and running spares are illustrated in figures 1, 2, and 3.

7. Common Names

Common name	Nomenclature
Case	Case, Impedance Bridge CY-3421/GSM-72.
Frequency generator.	Impedance Bridge Subassembly MX-3875/G8S-72.
Impedance bridge	Impedance Bridge Subassembly MX-3846/GSM-72.
Impedance module	Impedance Measuring Group OA-3672/GSM-72.
Manual Punch	Tape Punch, Manual TL-681/GSM-72.
Slave unit	Slave Unit, Test Set MX-3844/GSM-72.
Test set	Test Set, Electronic Circuit AN/GSM-72.
Tester	Test set, Electronic Circuit TS-1708/GSM-72.
Voltage module	Test Set 8ubaesmbly MX-3845/G8M-72.

8. Description of Test Set, Electronic Circuit AN/GSM-72 (fig. 1)

The test set (AN/GSM-72) consists of the tester (*a* below), the impedance module (*b* below), and the manual punch (*c* below).

a. The tester (TS-1708) consists of six plug-in-type assemblies and a mainframe contained in a metal case. Two carrying handles are fastened to the top of the case. The front panel contains the operating controls, indicator lights, a multimeter, fuses, and the tape reader. Twenty-five 11pin (one pin grounded) sockets (250 test points) are provided on the tester side panel for a connection to a like number of cable assemblies which connect to access points in the equipment under test. Power for the tester may be obtained from any 115-volt, 60-cycle source through the power cord attached at the rear of the tester. A connector is also provided on the tester rear panel for the connection of the slave unit (para 43).

b. The impedance module (OA-3672) consists of two plug-in assemblies, inserted by means of slides into its case. The impedance module is mounted to the bottom of the tester in place of the tester's standard bottom cover. The impedance module has no front panel controls, indicators, or fuses. Power for the impedance module is provided by the tester, through an internal jack.

c. The manual punch (TL-681) is a hand-operated mechanical-tape punch. The manual punch is equipped with an index knob which positions the punch at any one of 12 vertical columns on the tape. Also provided on the manual punch is a mechanism to move the tape one column to the left.

d. The test set (AN/GSM-72) will normally be used with test facilities kits which will provide connections to the printed circuit cards or subchassis under test. The test facilities kits consist of test fixtures and special cable assemblies, and are described in separate technical manuals. If the test set is to be used without the test facilities kits, additional cable assemblies must be used for interconnection. Cable Assembly, Special Purpose, Electrical (FSN 6625-964-9908) can be adapted for this use.

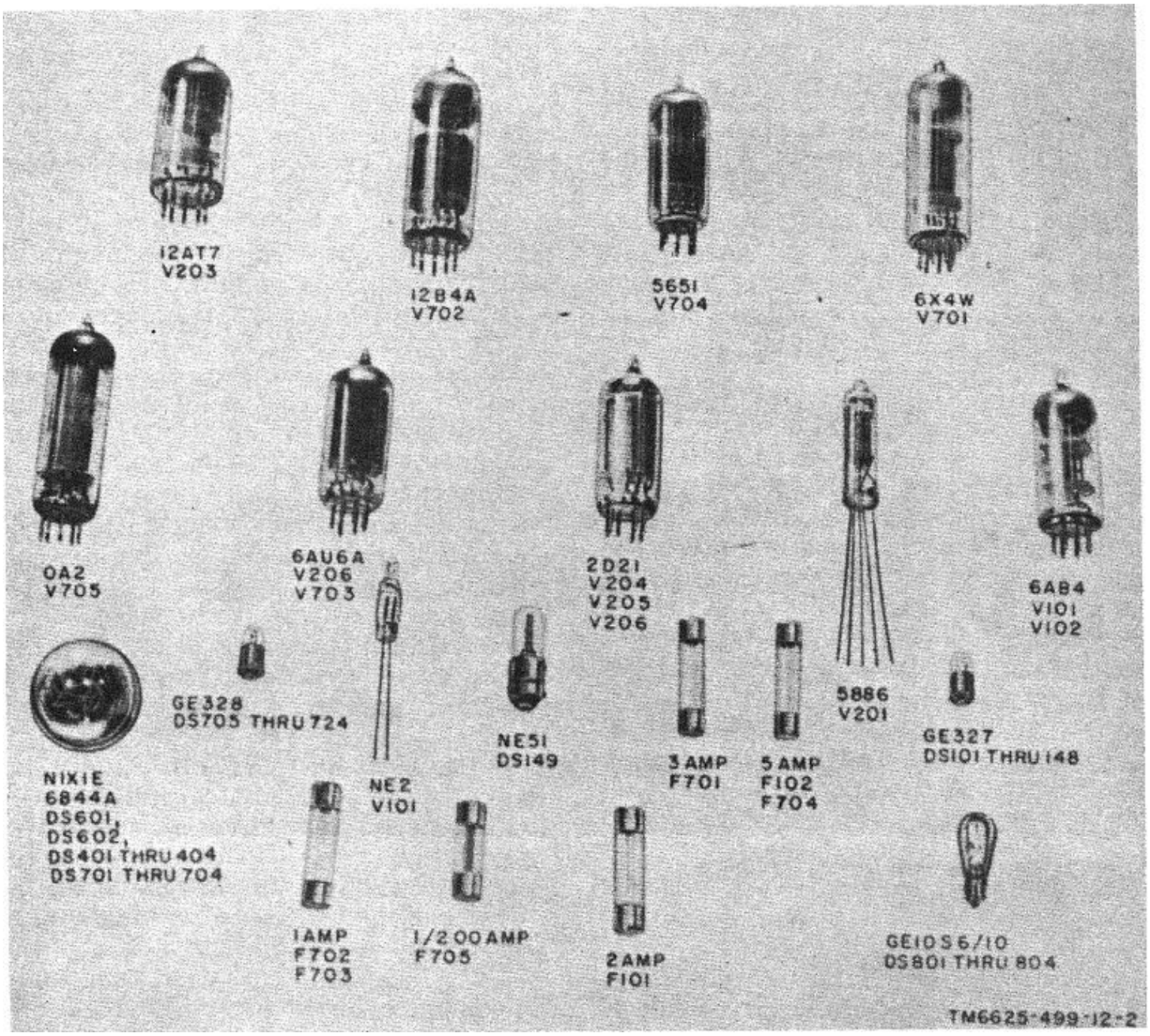


Figure 2. Running spares of Test Set, Electronic Circuit AN/GSM-72 and auxiliary equipment.

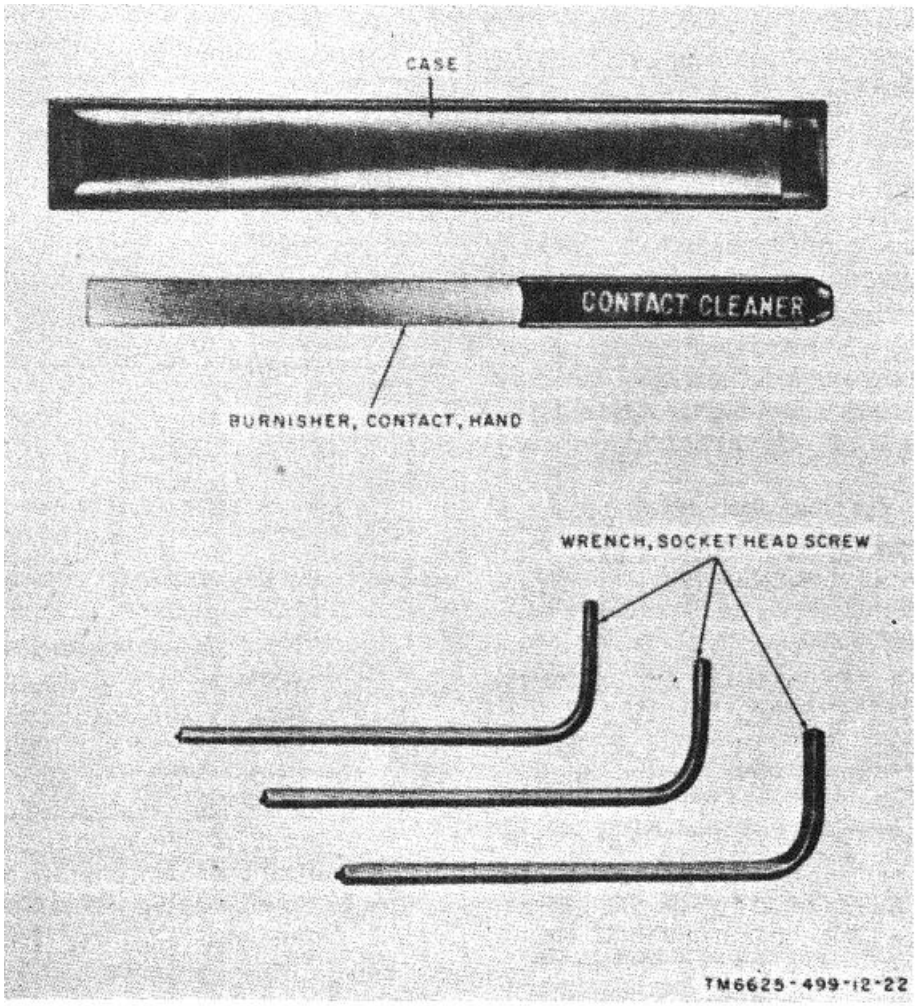


Figure 3. Tools used with Test Set, Electronic Circuit AN/GSM-72.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Unpacking

a. Packaging Data. When packaged for shipment, the test set and its equipment are placed in cartons and packed in two wooden boxes. A typical shipping box and its contents are shown in figure 4. The dimensions and contents of the shipping boxes are given in the chart below.

Box No.	Dimensions (in.)	Volume (cu ft)	Unit weight (lb)	Contents
1 of 2	30 x 27 x 22	10.3	195	Test set, voltage module (in place), and technical manuals.
2 of 2	24 x 19 x 15	3.9	75	Slave unit.
Total weight			270	

b. Component Dimensions.

Component	Overall dimensions (in.)			Volume (cu ft)	Weight (lb)
	Height	Depth	Width		
Test Set, Electronic Circuit TS-1708/GSM-72	18	17	17	3.1	100
Impedance Measuring Group OA-3672/GSM-72 consisting of:	5-1/4	17	17	1	40
Impedance Bridge Subassembly MX-3846/GSM-72.	5	13	5-1/2	0.2	
Impedance Bridge Subassembly MX-3875/GSM-72.	5	13	5-1/2	0.2	
Case, Impedance Bridge CY-3421/GSM-72.	5-1/2	17	17	1	
Tape Punch, Manual TL-681/GSM-72	4	9	9-3/4	0.2	2

c. Removing Contents. Be careful when unpacking and repackaging. Do not thrust the tools into the interior of any container or wrap. For removal, select a site free from dust, dirt, and excessive moisture.

(1) Cut and fold back the metal strips.

(2) Remove the nails from the top and one side of the box with a nailpuller.

Remove the top and one side. Do not attempt to pry off the top and side; prying may damage the equipment.

(3) Remove the corrugated carton from the wooden box and carefully open it.

(4) Remove the envelope that contains the technical manuals.

(5) Remove the corrugated packing material around the top and at the rear of the equipment.

(6) Remove the equipment from the corrugated carton.

d. Tubes and Fuses. The test set is shipped with all tubes and fuses in place. Figure 5 illustrates the locations of all tubes. The following table shows the locations and values of the fuses:

Fuse			Location		
Reference symbol	Rating				
	Amp	Volts	Component	Circuit	Figure
F101	2	250	Slave unit	Ac input	9
F102	5	250	Slave unit	-24 vdc	9
F701	3	250	Test set	-Ac input	6
F702	1	250	Test set	6 vdc regulated power supply	5
F703	1	250	Test set	-6vdc power supply	22
F704	5	250	Test set	-24 vdc power supply	22
F705	1/200	250	Test set	Meter	6

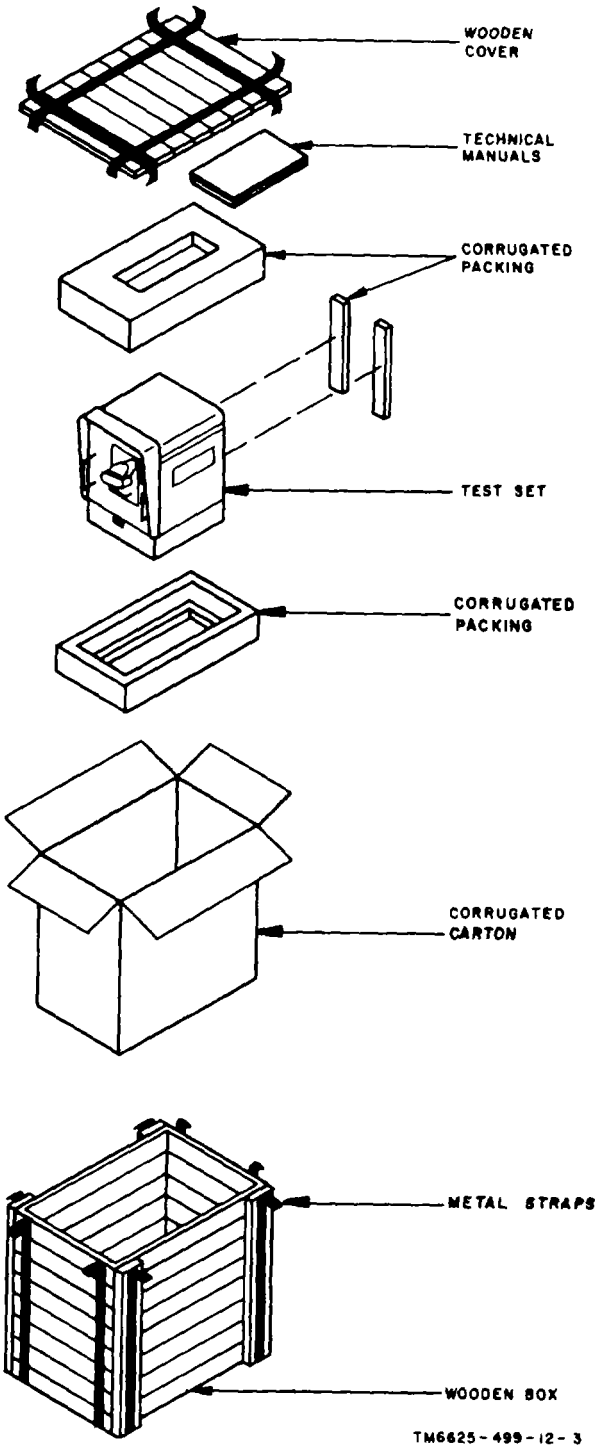


Figure 4. Typical packaging.

10. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 3).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the basic issue items list (appx III).

Note

Shortage of a minor assembly or part that does not affect proper functioning

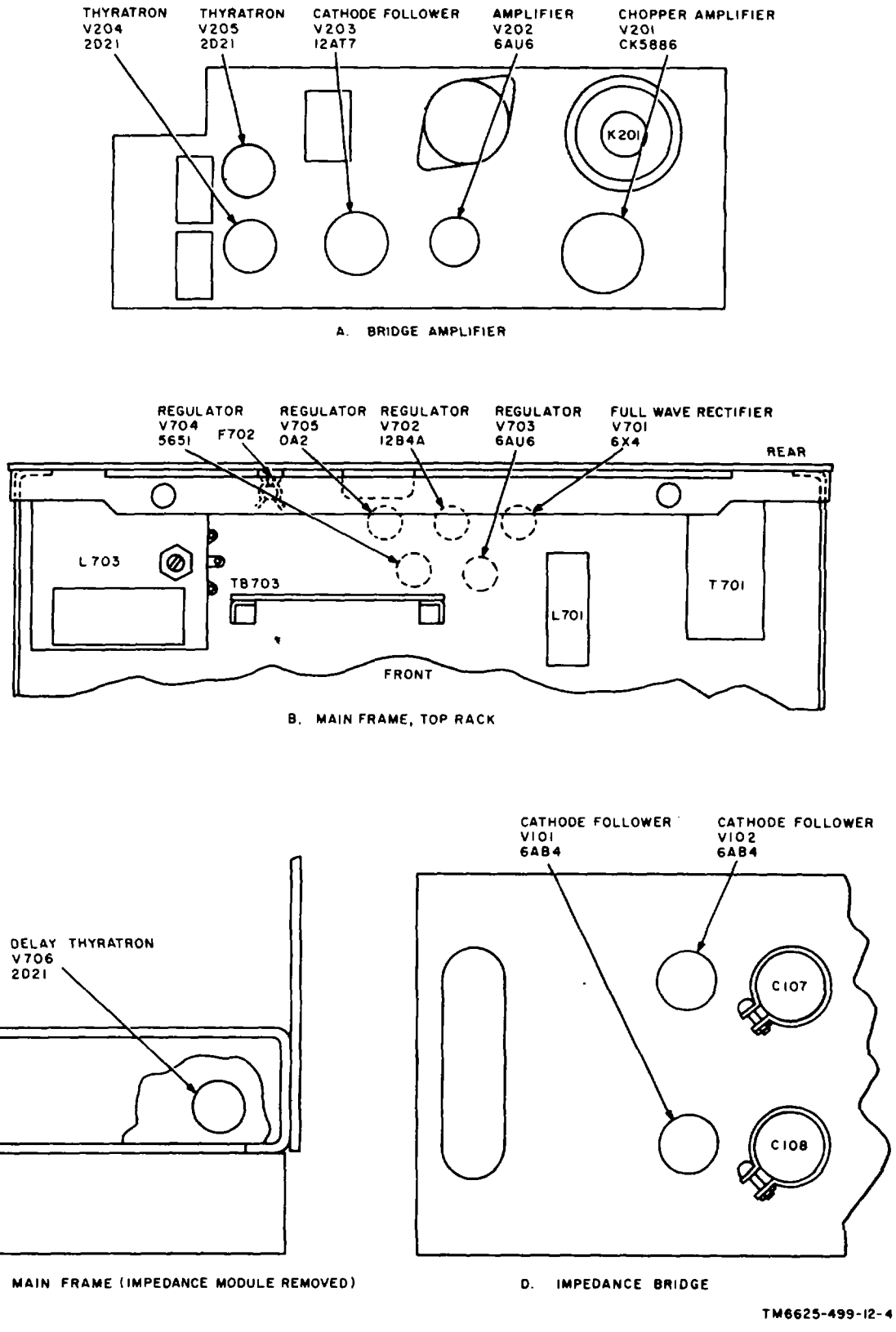


Figure 5. Test Set, Electronic Circuit AN/GSM-72 tube locations.

of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel, near the nomenclature plate. Check to see whether the MWO number (if any) and appropriate notations concerning the modification have been entered in the equipment manual.

Note

Current MWO's applicable to the equipment are listed in DA Pamphlet 310-4.

Section II. OPERATOR'S CONTROLS AND INDICATORS

11. General

All the controls and indicators for the test set are located on the front panel. Jacks for connection to the equipment under test and to auxiliary equipment are found on the side and rear panels.

12. Test Set Operating Controls, Jacks, and Indicators

a. Front Panel Controls and Indicators (fig. 6).

Control or indicator	Function
ON-OFF switch	Turns test met on or off.
DELAY SECONDS control	Adjusts amount of delay in seconds that test set provides between tests.
Calibrate switch (7-position rotary, and switch).	Select automatic operation, use of multimeter calibration of test set.
	Sw pos — *Action* -10% — Permits adjustment of -10% feedback circuit. BAL — Permits use of internal or external multimeter for measurement of voltage or resistance. OPERATE — Permits automatic operation of the test set. 1% — Permits adjustment of 1% feedback circuit. 5% — Permits adjustment of 5% feedback circuit. 10% — Permits adjustment ot 10% feedback circuit. 20% — Permits adjustment of 20% feedback circuit.
BALANCE meter	Indicates amplitude of unbalance on test. When test is beyond limit programmed, needle will be in red area.
1% adjust control	Used in conjunction with calibrate switch to calibrate test set.
5% adjust control	Used in conjunction with calibrate switch to calibrate test set.
10% adjust control	Used in conjunction with calibrate switch to calibrate test set.
20% adjust control	Used in conjunction with calibrate switch to calibrate test set.
-10% adjust control	Used in conjunction with calibrate switch to calibrate test set.
PROCEED-STOP switch	Starts and stop test set operation.
Multimeter function switch	Turns multimeter on and selects mode of operation.
	Sw pos — *Action* DC- — Sets meter to read -dc voltage. DC+ — Sets meter to read +dc voltage. AC — Sets meter to read ac voltage. OFF — Turns meter off. SET OHMS — Allows adjustment of meter pointer for full-scale deflection with SET OHMS control. R_s — Connects resistance standard (R_s) to multimeter for measurement R_x FROM- — Connects unknown resistance (R_x) to multimeter for measurement. R_x FROM+ — Connects unknown resistance (R_x) to multimeter for measurement *Note: Polarities used when measuring semiconductor diode resistance.*
Multimeter range switch	Selects desired voltage or resistance range. *Note: The 1.5-volt range is used only for dc measurements.*
SET OHMS control	With multimeter function switch in SET OHMS position, adjusts meter pointer for full-scale deflection for resistance measurements.
Meter	Indicates voltage or resistance value being measured.
R_s nixie indicators	Indicate amount of R_s programmed on tape.
FROM SOCKET and PIN nixie indicators.	Indicates *from* socket and pin programmed on tape.
TO SOCKET and PIN nixie indicators	Indicates *to* socket and pin program on tape.
1% indicator lamp	When illuminated, indicates 1% tolerance programmed on tape.

Control or indicator	Function
5% indicator lamp	When illuminated, indicates 5% tolerance programmed on tape.
10% indicator lamp	When illuminated, indicates 10% tolerance programmed on tape.
20% indicator lamp	When illuminated, indicates 20% tolerance programmed an tape.
Ω indicator lamp.....	When illuminated, indicates resistance function programmed on tape.
< indicator lamp	When illuminated, indicates *less than* programmed on tape.
± indicator lamp	When illuminated, indicates *plus or minus* programmed on tape.
> indicator lamp	When illuminated, indicates greater than programmed on tape.
ERROR indicator lamp..... .	When illuminated, indicates an error in programming of tape, or an equipment malfunction
HI POT indicator lamp.....	When illuminated, indicate insulation resistance measurement programmed on tape.
DC- indicator lamp	When illuminated, indicates negative dc voltage measurement programmed on tape.
AC indicator lamp.....	When illuminated, indicates ac voltage measurement programmed on tape.
DC+ indicator lamp	When illuminated, indicates positive dc voltage measurement programmed on tape.
Z indicator lamp	When illuminated, indicates impedance measurement programmed on tape.
16KC indicator lamp.....	When illuminated, indicates 1.6-kc operating frequency has been selected for impedance measurement.
1.6KC indicator lamp.....	When illuminated, indicates 1.6-kc operating frequency has been selected for impedance measurement
.16KC indicator lamp.....	When illuminated, indicates 0.16-kc operating frequency has been selected for impedance measurement.
UNDER indicator lamp	When illuminated, indicates unknown under test is below required limits.
OVER indicator lamp	When illuminated, indicate unknown under test is above required limits.
PASS indicator lamp	When illuminated, indicates unknown under test is within required limits, and passable.
R_s test points.....	Permit use of internal or external multimeter for measurement of resistence standard.
R_x FROM-TO test points.....	Permit use of internal or external multimeter for measurement of unknown resistance.
Brush assembly.....	Reads tape program.
Brush assembly release	Releases brush assembly for tape insertion.

b. Side Panel Jacks (fig. 7).

Jack	Function
Sockets 0-24.....	These 25 sockets (250 test points) provide connection to 25 cable assemblies which connect to access points in equipment under test.
Pin straightener (8-pin).	Facilitates straightening of bent pins on 7-pin tubes.
Pin straightener (10-pin).	Facilitates straightening of bent pins on 9-pin tubes.

c. Rear Panel Jacks (fig. 8).

Jack	Function
ROBOTROLLER....	Provides for connection of slave unit to test set.
PRINTER.....	Provides for connection to accessory tape printer (not provided).
J703.....	Provides for connections to unused brushes on internal tape reader
	Note: **Unused brushes (49-96) may be used to provide switching for ex ternal circuitry.**

13. Slave Unit, Test Set MX-3844/GSM-72 Operating Controls and Indicators (fig. 9)

Control or indicator	Function
ON-OFF switch	At ON, turns on slave unit. At OFF, turn off slave unit.
Power indicator lamp.	Lights when slave unit is turned on.
PROCEED-STOP switch.	At PROCEED, steps slave tape past a test. At STOP, stops slave tape advance.
1-48 indicator lamp.	When illuminated, indicate associated relay is energized.
Brush assembly.....	Reads tape program.
Brush assembly latch.	Release brush assembly for tape insertion.

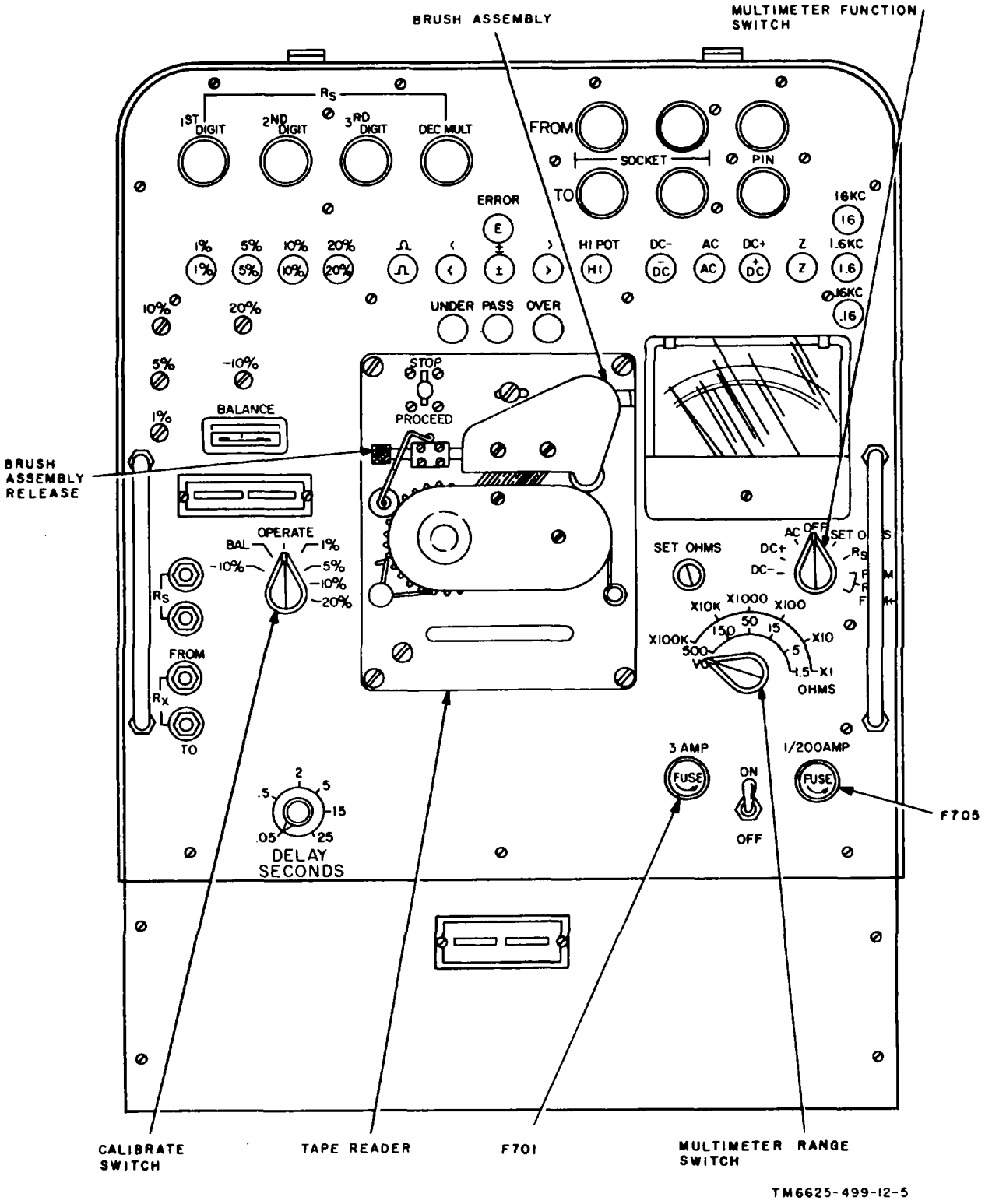


Figure 6. Test Set, Electronic Circuit AN/GSM-72 front panel controls and indicators.

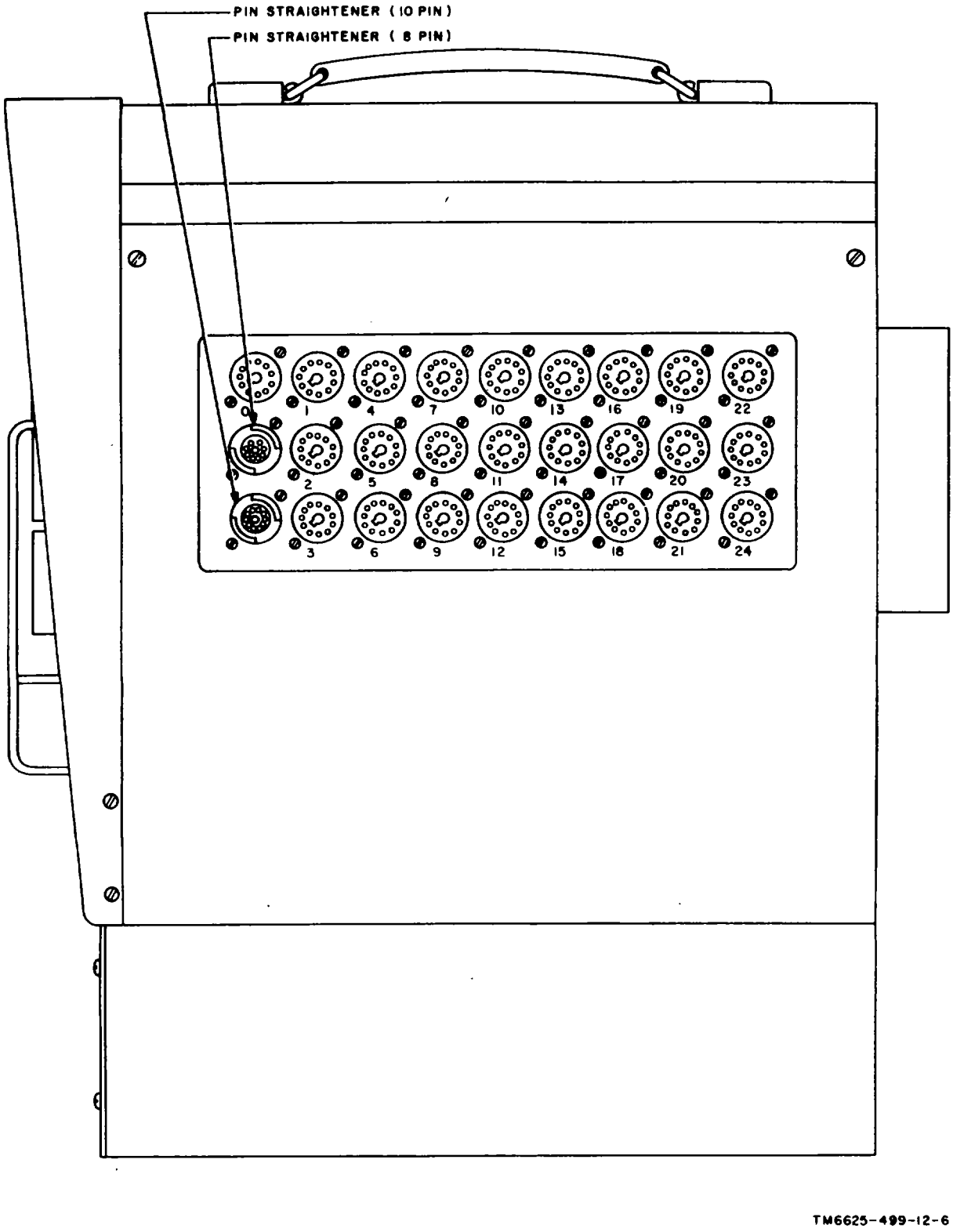
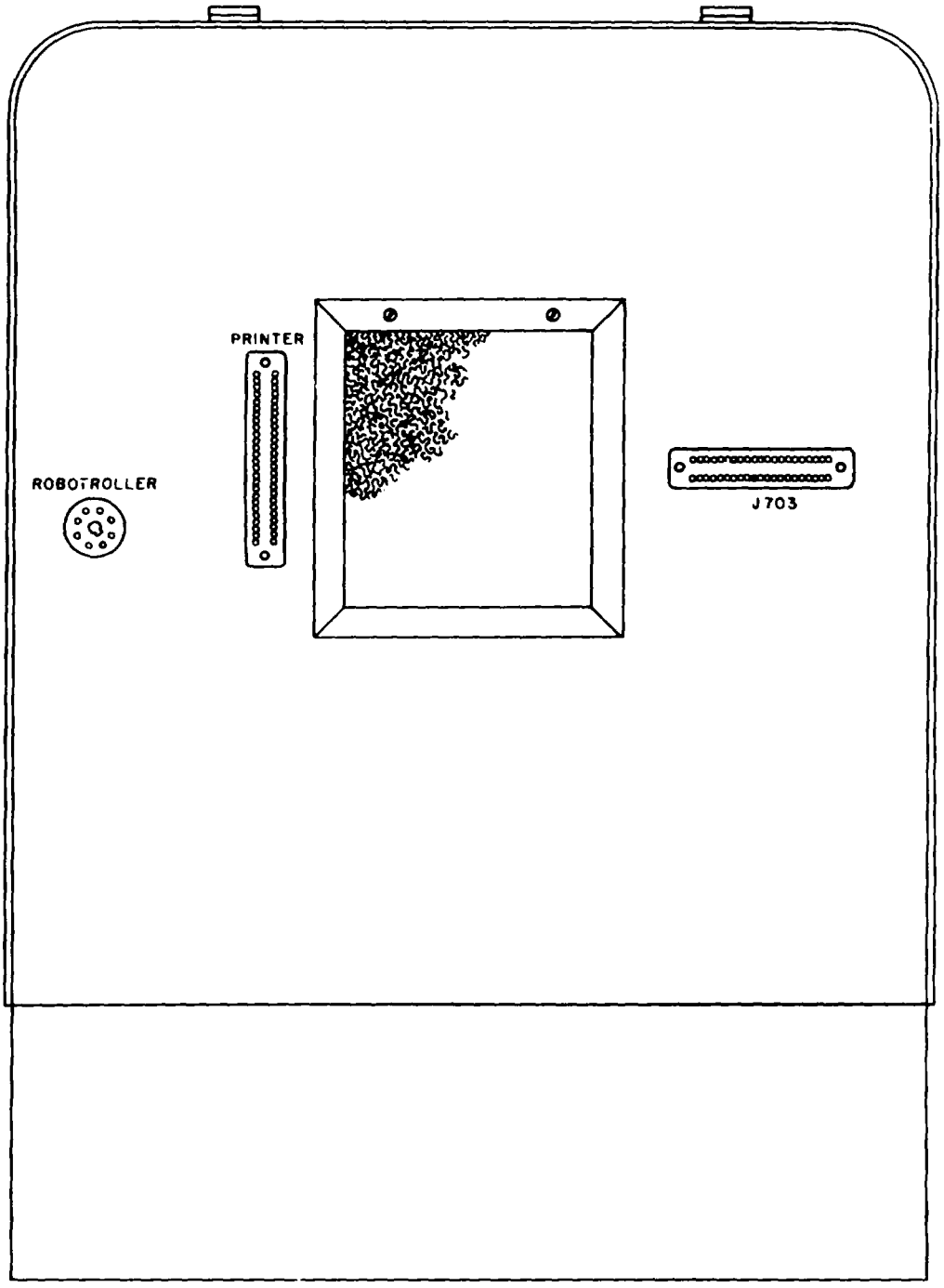


Figure 7. Test Set, Electronic Circuit AN/CGSM-72 side panel jacks.



TM6625-499-12-7

Figure 8. Test Set, Electronic Circuit AN/CGSM-72 rear panel jacks.

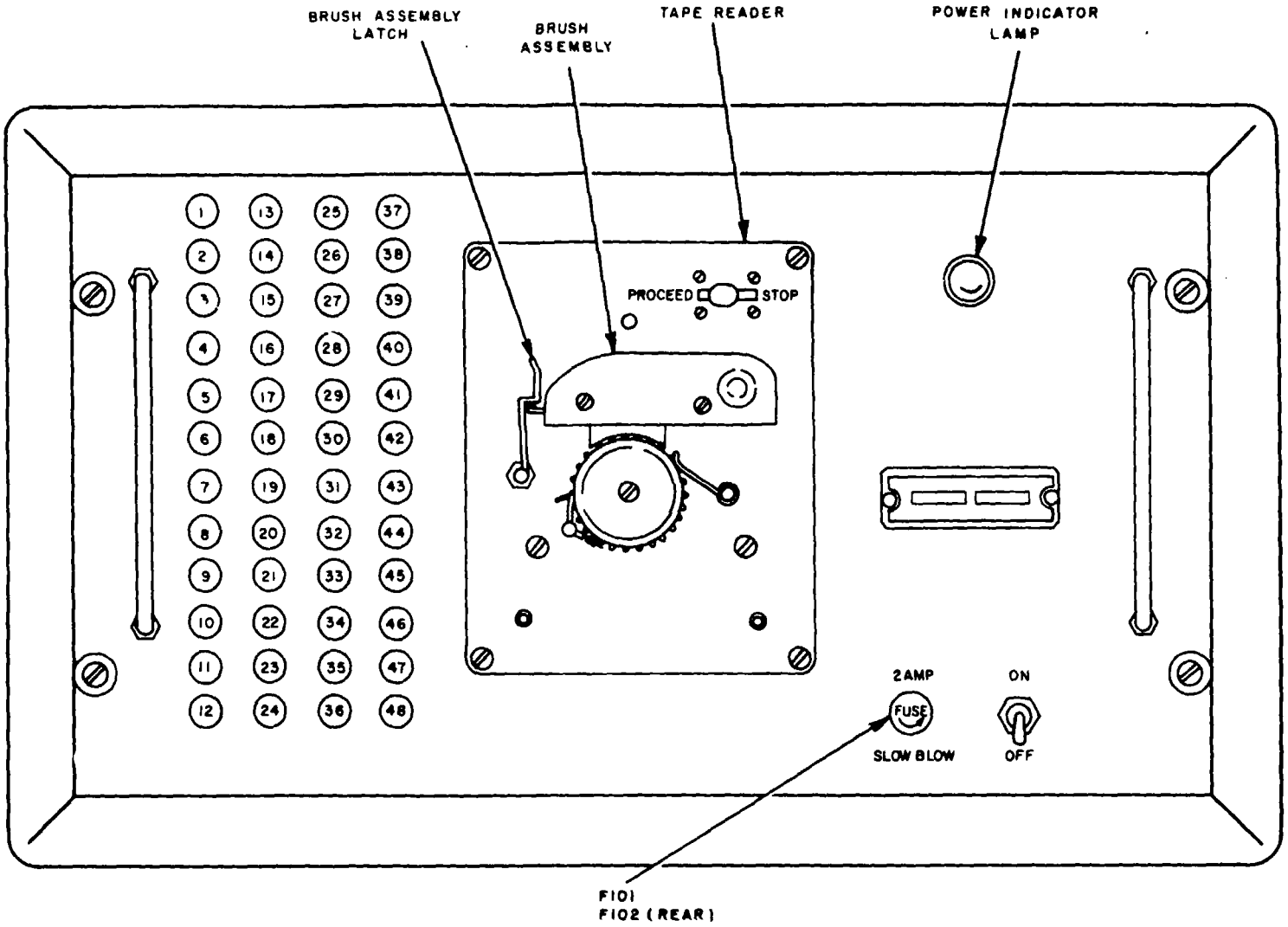


Figure 9. Slave Unit, Test Set MX-3844/GSM-72 front panel controls and indicators.

Section III. OPERATION

Note

When prepunched program tapes are provided for testing, omit paragraphs 14 through 19 and begin operational procedures with paragraph 20.

14. Preparation of Test Program

(fig. 10)

Operation of the test set is controlled by a paper tape, punched by the programmer in a manner determined by the test program desired. The programmer should examine a schematic diagram of the equipment to be tested and prepare a to-and-from, point-to-point correlation sheet, noting the test points that are to be used in testing (para 18*e*). The correlation sheet should be made up so that the test sockets and pin numbers appear in numerical order (in groups of 10). The following chart illustrates the makeup of a typical correlation sheet for a unit to be programmed.

Multivibrator Unit 0-768/G8G Correlation Sheet

Test Set (from)		Chassis (to)	
Pin	**Socket**	**Pin**	**Socket**
1	0	1	P1
2	0	2	P1
3	0	3	P1
4	0	4	P1
5	0	5	P1
6	0	6	P1
7	0	7	P1
8	0	8	P1
9	0	9	P1
0	0	10	P1
1	1	11	P1
2	1	12	P1
3	1	13	P1
4	1	14	P1
5	1	15	P1
6	1	A	P1
7	1	B	P1
8	1	C	P1
9	1	D	P1
0	1	E	P1
1	2	F	P1
2	2	H	P1
3	2	J	P1
4	2	K	P1
5	2	L	P1
6	2	M	P1
7	2	N	P1
8	2	P	P1
9	2	R	P1
0	2	S	P1
1	3	J1	Test socket
3	3	J2	Test socket
4	3	J3	Test socket
6	3	J4	Test socket
1	4	1	Q1 base
6	6	26	Q3 base

a. One of the 250 test set test points is assigned to each testpoint of the chassis to be tested. This association of the test points determines the configuration of the test cables. From this point on, the programming is done with reference to the test set test points. A typical test set program sheet is shown in A, figure 10.

Note

The readout presented by the test set nixie lights consists of a three-digit number and may be interpreted in two ways. For example, the from point may display 231; this may be interpreted as socket 23 (the first two digits), and pin 1(the third digit), or simply point 231. In any event, it means a connection to test set socket 23, pin 1. The presentation for pin 10 is 0.

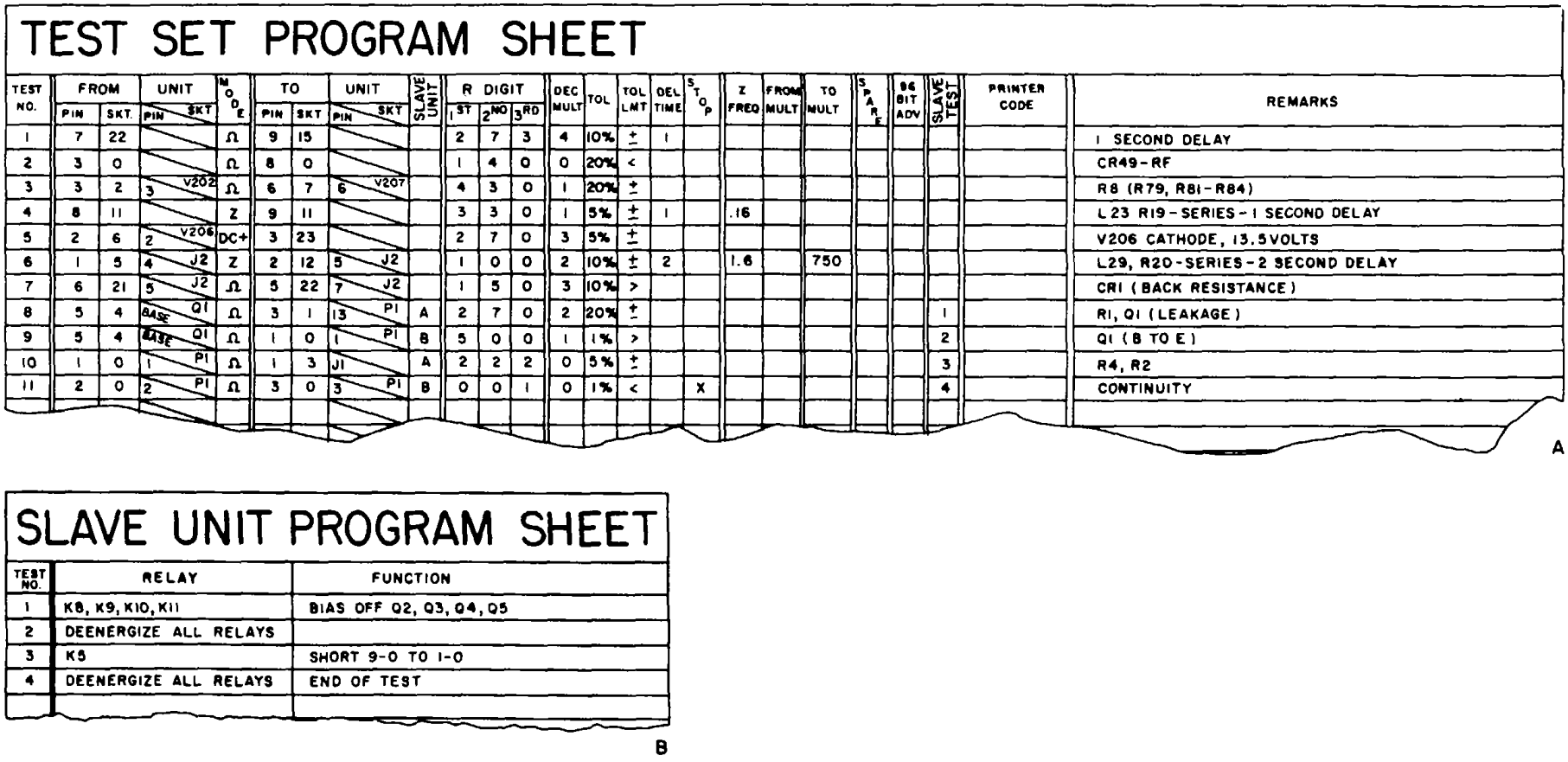
b. For measuring resistance, the program sheet should include the value of resistance between the test points and the allowable tolerances for these resistances.

c. For measuring voltage, the program sheet should list the desired voltage and tolerance, with the voltage specified in terms of the value of standard resistance to be programmed (para 18).

d. For measuring insulation resistance, the program sheet should list the minimum desired insulation resistance and tolerance. This value of insulation resistance is in terms of the value of standard resistance to be programmed (para 18). The tolerance programmed would be an insulation resistance tolerance of 3 percent, 15 percent, 30 percent, or 60 percent divided by 3.

e. For measuring impedance, the program sheet should list the measurement frequency, the tolerance, and the value of standard resistance to be programmed, derived from the appropriate nomograph (para 15) according to the reactive and resistive components and their configurations. The measurement frequency is selected so that the impedance being measured will fall within one of the ranges listed in paragraph 5.

f. The lowest voltage that can be programmed is 1/2 volt, which corresponds to a punched value of resistance of 10,000



TEST SET PROGRAM SHEET

TEST NO.	FROM PIN	FROM SKT.	UNIT PIN	UNIT SKT	MODE	TO PIN	TO SKT	UNIT PIN	UNIT SKT	SLAVE UNIT	R DIGIT 1ST	R DIGIT 2ND	R DIGIT 3RD	DEC MULT	TOL	TOL LMT	DEL TIME	STOP	Z FREQ	FROM MULT	TO MULT	SPARE	96 BIT ADV	SLAVE TEST	PRINTER CODE	REMARKS
1	7	22			Ω	9	15				2	7	3	4	10%	±	1									1 SECOND DELAY
2	3	0			Ω	8	0				1	4	0	0	20%	<										CR49-RF
3	3	2	3	V202	Ω	6	7	6	V207		4	3	0	1	20%	±										R8 (R79, R81-R84)
4	8	11			Z	9	11				3	3	0	1	5%	±	1		.16							L23 R19-SERIES-1 SECOND DELAY
5	2	6	2	V206	DC+	3	23				2	7	0	3	5%	±										V206 CATHODE, 13.5VOLTS
6	1	5	4	J2	Z	2	12	5	J2		1	0	0	2	10%	±	2		1.6		750					L29, R20-SERIES-2 SECOND DELAY
7	6	21	5	J2	Ω	5	22	7	J2		1	5	0	3	10%	>										CR1 (BACK RESISTANCE)
8	5	4	BASE	Q1	Ω	3	1	13	P1	A	2	7	0	2	20%	±								1		R1, Q1 (LEAKAGE)
9	5	4	BASE	Q1	Ω	1	0	1	P1	B	5	0	0	1	1%	>								2		Q1 (B TO E)
10	1	0	1	P1	Ω	1	3	J1		A	2	2	2	0	5%	±								3		R4, R2
11	2	0	2	P1	Ω	3	0	3	P1	B	0	0	1	0	1%	<		X						4		CONTINUITY

A

SLAVE UNIT PROGRAM SHEET

TEST NO.	RELAY	FUNCTION
1	K8, K9, K10, K11	BIAS OFF Q2, Q3, Q4, Q5
2	DEENERGIZE ALL RELAYS	
3	K5	SHORT 9-0 TO 1-0
4	DEENERGIZE ALL RELAYS	END OF TEST

B

TM6625-499-12-9

Figure 10. Typical Test Set, Electronic Circuit AN/GSM-12 and Slave Unit Test Set MX-3844/GSM-72 program sheet.

ohms (para 18). The lowest insulation resistance that can be programmed is 10 megohms, which corresponds to a punched value of resistance of 10,000 ohms. Never program 0 ohm because the tolerance cannot be calculated from the formula given in paragraph 16*a*. For continuity tests, program less than (<) 1 ohm unless unusually long test cables are used, which may have a resistance higher than 1 ohm.

15. Use of Nomographs for Impedance Calculation (fig. 12, 13, 23, and 24)

a. To use the nomographs, the impedance to be measured must be broken down into its resistive and reactive components at the selected frequency. The reactance (X), in ohms, of any reactive element is easily calculated from the three available frequencies as in the following table:

Frequency (cps)	Capacitive reactance	Inductive reactance
160	$\frac{1}{C \times 10^3}$	$L \times 10^3$
1,600	$\frac{1}{C \times 10^4}$	$L \times 10^4$
16,000	$\frac{1}{C \times 10^5}$	$L \times 10^5$

Note: C is capacity In farads, and L is inductance in henries.

b. When the circuit under test contains an inductance and capacitance in series, it will be found advantageous, when possible, to program the same test at two different frequencies (using a different test block for each frequency). The capacitance should be checked at the lowest frequency, where it will have the most reactance, and the additive effect from the inductive reactance will be at a minimum. Therefore, the inductance should be checked by use of the highest possible frequency. The same method may be used when the circuit under test contains a capacitance and inductance in parallel; however, the capacitance must now be checked by use of the highest possible frequency where it will have the lowest reactance, and the shunting effect from the inductance will be at a minimum. The inductance in this case must be checked by use of the lowest possible frequency. The above considerations apply equally to combinations of reactive and resistive elements.

c. To find the standard resistance to be programmed on the tape, select the nomograph with the series, parallel, or series-parallel configuration of elements corresponding to the circuit being measured, and follow the instructions outlined in (1), (2), or (3) below.

(1) *Series circuit*. Refer to figure 11 and the given example, and proceed as follows:

(*a*) Add 5 ohms to the given value of R and pinpoint the total (225) on the A scale. The value for the exponent N in this case is 1 ($22.5 \times 10^1 = 225$).

(*b*) Pinpoint the given value of X (1000) on the B scale, using the same value for N as in (*a*) above.

(*c*) Join the points plotted in (*a*) and (*b*) above, and extend the line to cross the D scale (4.44).

(*d*) Follow the slant line Joining this joint on the D scale with the corresponding point on the E scale (3.6).

(*e*) Join the point found on the E scale (3.6) with the point plotted on the A scale (22.5) for the value of R + 5 in (*a*) above.

(*f*) Where the line drawn in (*e*) above crosses the C scale, read the value of resistance (820), using the same value for N as in (*a*) and (*b*) above. Subtract 5 ohms, and the result (815) is the value of standard resistance to be programmed.

(2) *Parallel circuit*. Refer to figure 12 and the given example and proceed as follows:

(*a*) Pinpoint the given value of X (2000) on the A scale. The value for the exponent N in this case is 2 ($20 \times 10^2 = 2000$).

(*b*) Add 5 ohms to the given value of R and pinpoint the total (5605) on the B scale, using the same value for N as in (*a*) above.

(*c*) Join the points plotted in (*a*) and

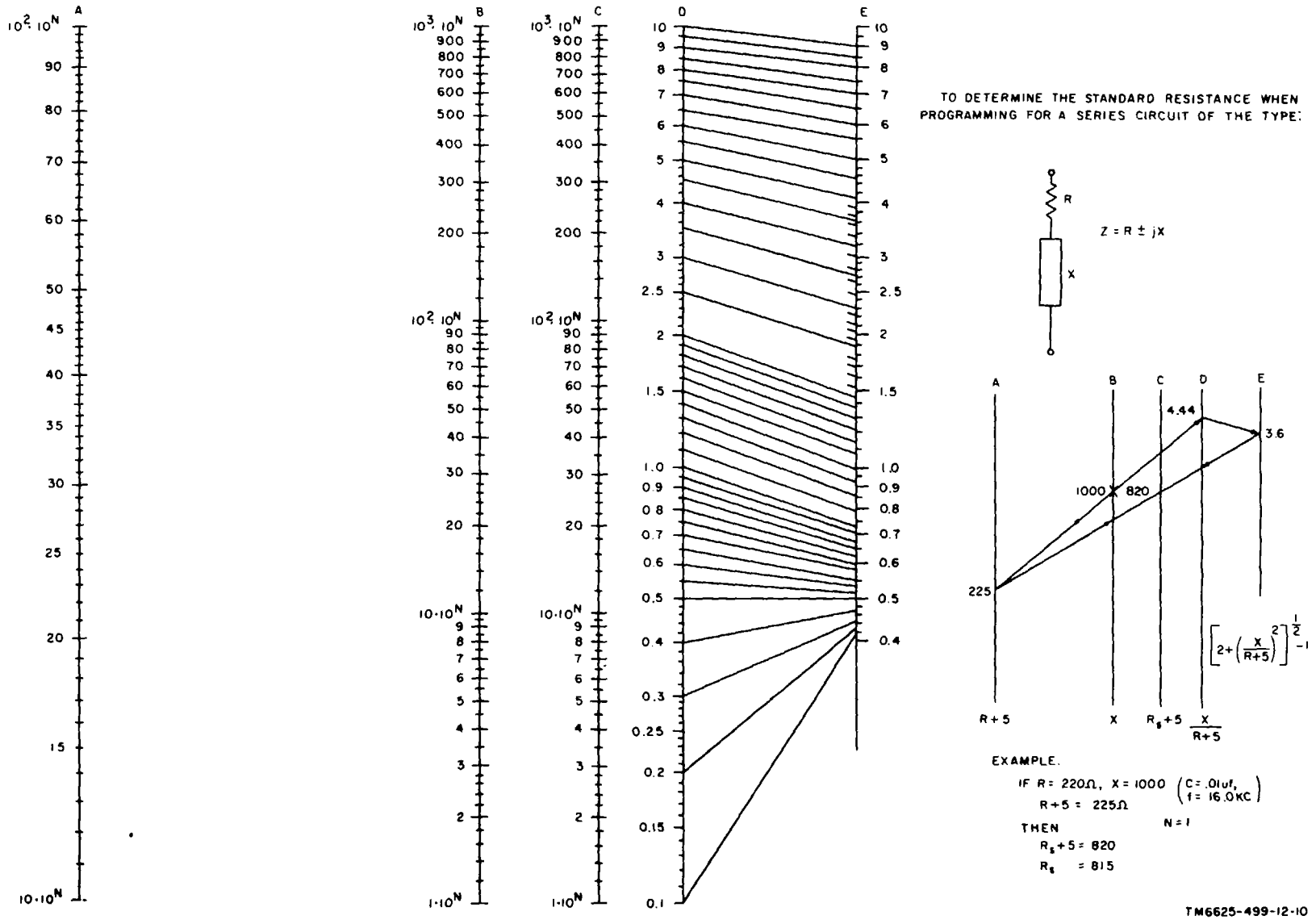


Figure 11. Series-circuit nomograph.

(*b*) above and extend the line to cross the D scale (2.8).

(*d*) Follow the slant line joining this point on the D scale with the corresponding point on the E scale (.68).

(*e*) Join the point on the E scale (.68) with the point plotted on the A scale (2000) for the value of X in (*a*) above.

(f) Where the line drawn in (*e*) above crosses the C scale, read the value of resistance (1400), using the same value for N as in (*a*) and (*b*) above. Subtract 5 ohms, and the result (1395) is the value of standard resistance to be programmed.

(3) *Series-parallel circuit*. Refer to figure 23 and the example given in figure 24 and proceed as follows:

(a) Type A series-parallel circuit.

1. Pinpoint the computed value for X (625) on the A scale. The value for the exponent N in this case is 2 ($62.5 \times 10^1 = 625$).
2. Pinpoint the given value for R (300) on the B scale, using the same value for N as in *1* above.
3. Join the points (line 1) plotted in *1* and *2* above and extend the line to cross the C and D scales. Read C (26°).
4. Read the figure on the D scale (.25) where the line crosses, and add 1 (1.25).
5. Pinpoint this new figure (1.25) on the D scale.
6. Pinpoint the computed value for X (625) on the E scale, using the same value for N as in *1* above.
7. Join the points (line 2) plotted in *5* and *6* above with a line extending through scale F ($5.6 \times 10^N = 56$).
8. Draw a line (line 3) from the center of the impedance chart in the direction of the figure obtained in *3* above (26°).
9. Using a compass, start from the center of the impedance chart (0) and inscribe a circle, the radius of which is equal to the value obtained from scale F (5.6×10^N) and which intersects the line drawn in *8* above (Z_x).
10. Plot a point (Z_{x1}) at a vertical distance equal to the computed value for X_1 (45) from the point obtained in *9* above (line 4) (direction determined by sign, inductive reactance+, capacitive reactance-). This line will be 5.4 divisions long.
11. Using a compass, measure the distance from the point (Z_{x1}) obtained in *10* above to 0 (5.4).
12. Multiply this distance by 1.414 (7.63).
13. Using a compass, start from the center of the impedance chart and inscribe a circle, the radius of which is equal to the value computed in *12* above (7.63).
14. Draw a horizontal line (line 5) from the point obtained in *10* above (Z_{x1}) to intersect the circle drawn in *13* above. The length of this line (2.2×10^N), by use of the same value for N as in *1* above, is the value of the standard resistance (R_s) to be programmed (22 ohms).

(b) Type B series-parallel circuit. To determine the standard resistance to be programmed for a series-parallel circuit of this type, proceed as follows:

1. Compute the standard resistance for R and X as outlined in (2) above for a parallel circuit.
2. Add the value of R_1 to the computed value given in 1 above. This is the standard resistance to be programmed.

(c) Type C series-parallel circuit. To determine the standard resistance to be programmed for a series-parallel circuit of this type, proceed as follows:

1. Compute the standard resistances for R and X and R_1 and X_1 as outlined in (2) above for a parallel circuit.

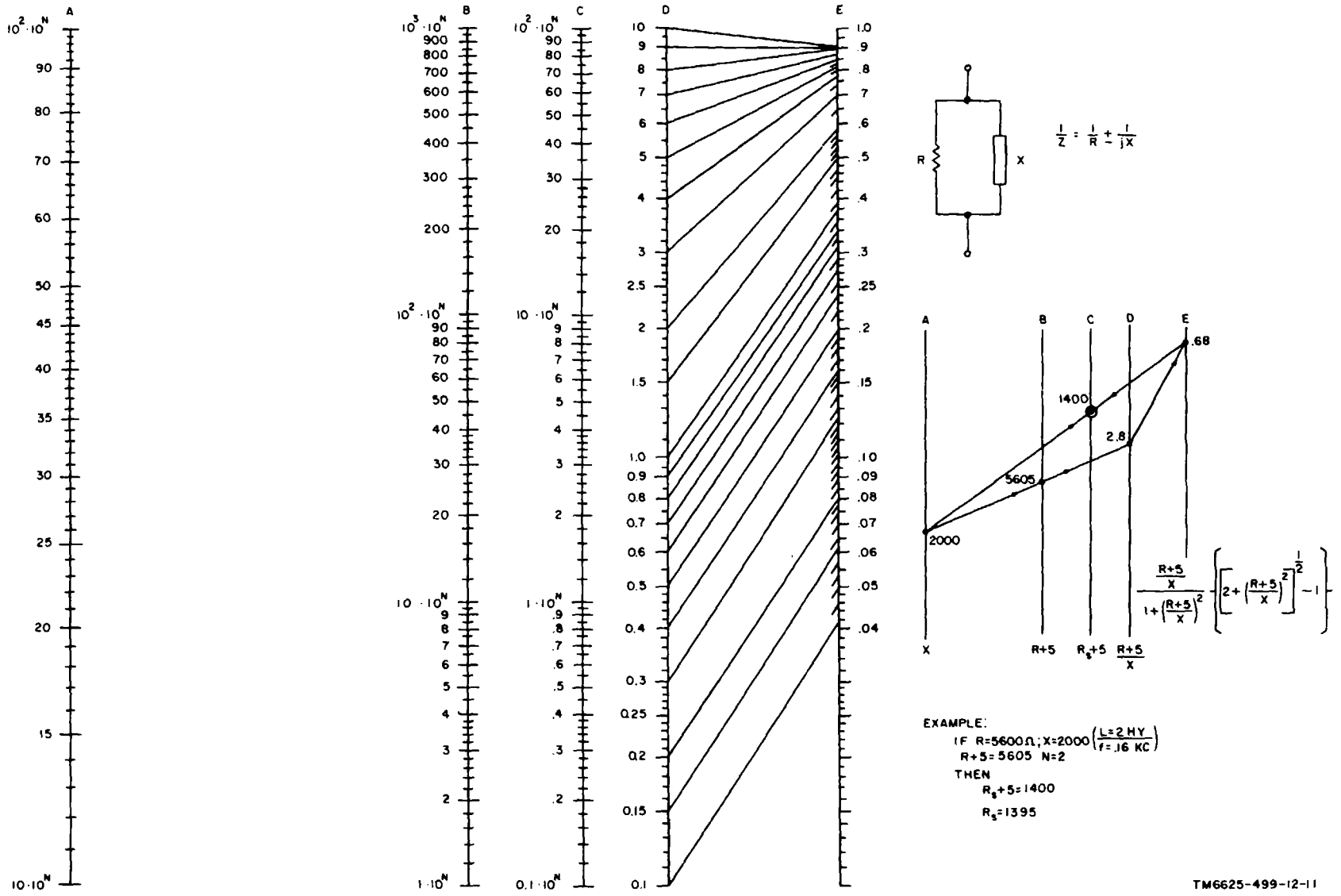


Figure 12. Parallel circuit nomograph.

2. Add the two standard resistances. The result is the total standard resistance to be programed.

d. Because of manufacturing tolerances or changes on components, leakage paths, and slight errors in impedance computation (use of nomographs), an error may result during a test procedure. If this condition occurs, first check all circuit components for proper value and leakage paths. If no component changes exist and all computations are correct. (within practical limits), the test set resistance selectors may be advanced manually until a balance condition exists. The balance condition ,over or under) may be checked by the use of the BALANCE meter. The program must be stopped on the test block indicating the error, and care must be taken not to short out the resistance selector switches. After a balance condition is reached, the corrected resistance standard to be programed may be taken from the R_s nixie indicators. To obtain the correct resistance standard, it may be necessary to check several known good chassis to obtain an average value.

16. Computation of Tolerance

The actual tolerance obtained in the test set may be computed by use of the following formulas:

a. Resistance and Impedance.

$$T_a = P\ (1 \pm .1)\ \frac{R_s + 5}{R_s}\ .$$

Where:

T_a = Actual tolerance obtained,
P = Percentage programed, and
R_s = Resistance programed.

b. Voltage.

$$T_a = P\ (1 \pm .1)\ \frac{V_x + 1.5}{V_x}\ .$$

Where:

T_a = Actual tolerance,
P = Percentage programed, and
V_x = Voltage programed.

***Note*: At very low resistance values, any contact and cable resistance must be taken into account, and on ac voltage, measurements are restricted to no less than ±5-percent tolerance. The selection of ±.1 depends on the programing of less than (<), or greater than (>).**

c. Insulation Resistance. Actual tolerance equals 3 times the programed tolerance. Because of inherent internal leakage resistance of approximately 20,000 megohms in the test set, the following leakage resistances are the maximum that should be programed for the given tolerances.

Actual percentage tolerance	Programed percentage tolerance	Maximum resistance leakage (megohma)
3	1	100
15	5	500
30	10	1,000
60	20	9,990

17. Program Significance of Tape Blocks

(fig. 13 and 14)

Figure 13 illustrates segments of program tape and shows significance of the tape positions, the condition of the tape prior to punching, and the condition of the tape after it has been punched. The tape consists of a continuous series of large rectangular block, each of which has been divided into four or eight vertical columns (A, fig. 14). Each column has been assigned 12 tape bits which, in turn, have been grouped into significant control blocks.

a. Column 1 and 2 use nine positions each on the tape to select the specific points to be used for the test; column 1 has been designated the *from* column, and column 2, the *to* column. Tape positions 1 through 4 of these columns indicate the pin numbers of the sockets selected for testing. Tape positions 5 through 9 of columns 1 and 2 specify the sockets selected for testing. Tape positions 10 through 12 of column 1 indicate the mode of operation selected, such as resistance (A, fig. 13), voltage, or insulation resistance (HI). Tape positions 11 and 12 of columnn2 (A and B) are used to advance the tape reader of the slave unit when it is used.

b. All of the tape positions of column 3, together with positions 1, 2, and 3 of column 4, are used to indicate the value of standard resistance set up in the test set in order to perform the proper tests. Tape positions 4, 5, and 6 of column 4 specify the allowable tolerance programed f or the test. Positions 7, 8, and 9 are used to indicate the limits of the tolerance selected.

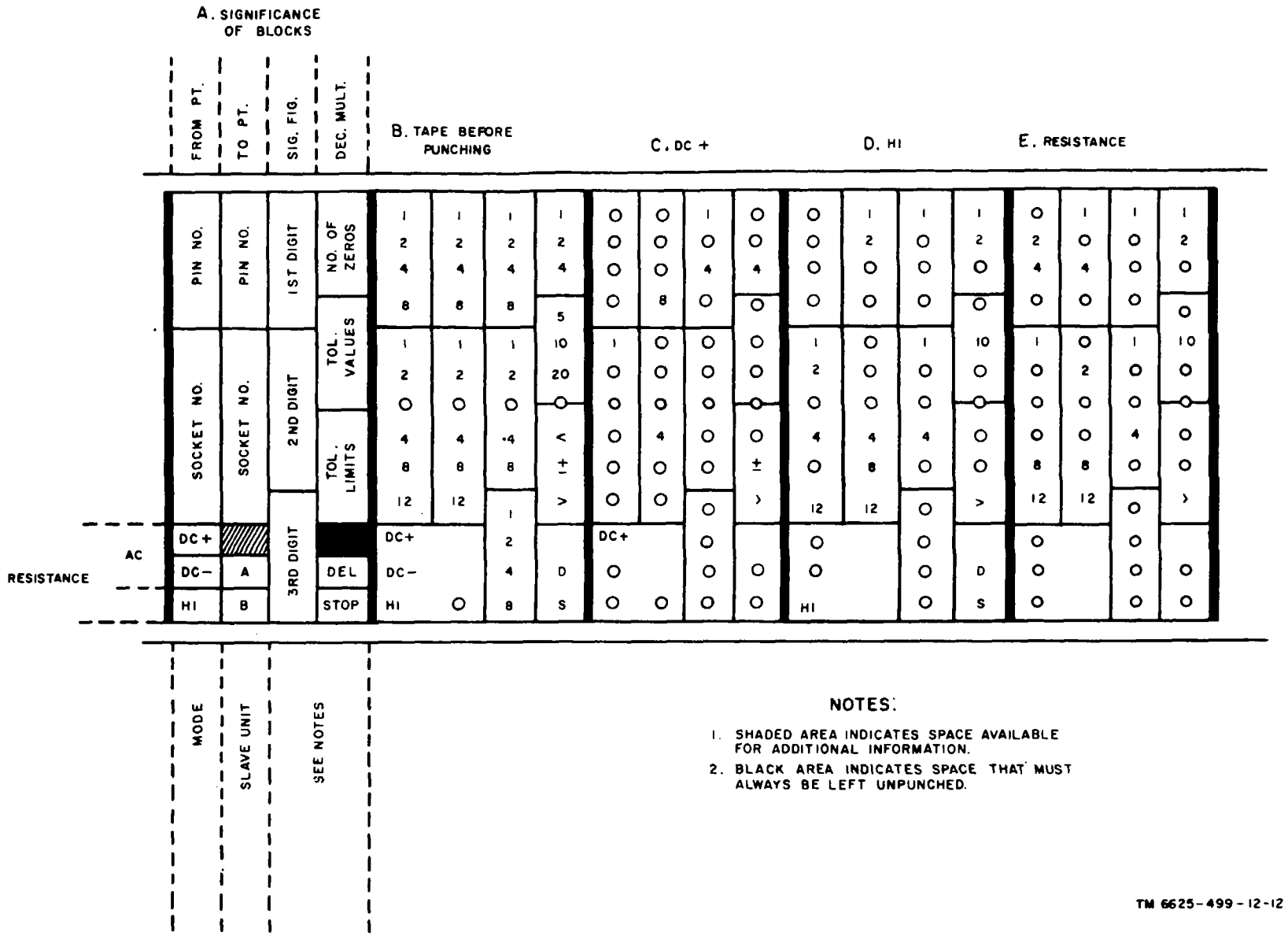


Figure 13. Four-column program tape.

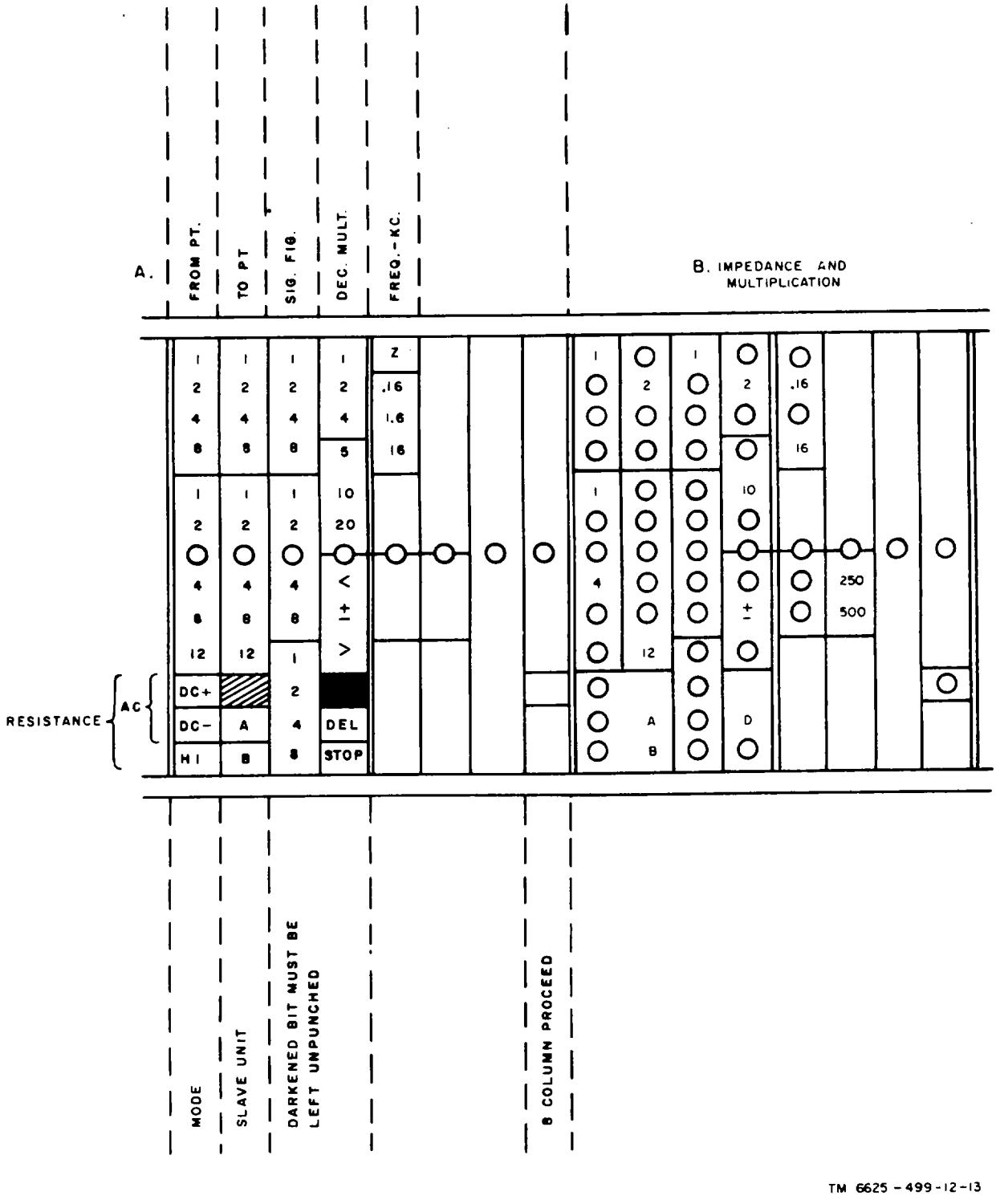


Figure 14. Eight-column program tape.

Tape position 11 of column 4 is used to provide a predetermined delay for a test. Tape position 12 of column 4 can be used as a stop position for a particular test or a complete test program.

c. Tape position 10 of column 2 is not used, and tape position 10 of column 4 must not be punched because it is used to advance the tape reader a second group of 4 columns when it makes contact through a hole in tape position 10 of column 8.

d. The test set tape reader can be programed to read either 4 columns (48 bits) or 8 columns (96 bits) at a time. If the impedance module is in use, or if the extra 48 bits are required for another purpose (test point multiplication) the tape reader must be programed to read 8 columns. The tape format is shown in B of figure 14.

e. Tape position 1 of column 5 is used to select the impedance mode of operation. At the same time, the resistance mode of operation must be programed in column 1, since impedance is measured in ohms. Tape positions 2 through 4 of column 5 are used to select the frequency for impedance measurement. Tape positions 7 and 8 of columns 5 and 6 are used to program additional test points (250, 500, or 750) when auxiliary equipments (test point multipliers) are used. Tape position 10 of column 8 is used to energize the internal frequency relays programed in column 5, and also to advance the tape reader eight columns to the next test.

f. For any tests on a program tape where the extra 48 bits are not required, the tape reader should be programed to read four columns. This will make the test tape physically shorter, since two four column tests occupy the space of one eight column test. A test program may, however, consist of a mixture .of four-column and eight-column tests in any sequence.

18. Programing Procedure and Techniques

The actual programing of a unit is divided into two parts; one part consists of resistance, impedance, and insulation resistance measurements and the other part voltage measurements. In general, resistance, impedance, and insulation resistance measurements are made on a chassis with no power applied, and voltage measurements are made with power applied.

a. A sample program sheet is illustrated in A, figure 10. The information on the sheet is obtained from a schematic diagram of the unit to be programed. From the schematic diagram select the two points (*from* and *to*) at which the test is to be made, and determine the function and the value of resistance to be programed for the internal standard resistance. For 60-cps ac, or the dc voltage measurements, the internal standard resistance is obtained by multiplying the measured voltage value by 20,000. When measuring ac voltages at frequencies other than 60 cps, some inaccuracy will result. Figure 15 contains a graph on which voltages of 60,400, 1,000 and 2,000 cps are plotted. To use the graph, find the voltage to be measured on the appropriate frequency curve, bring this point out to the left of the graph and read the standard resistance to be programed. For insulation resistance (H1), the minimum insulation resistance value is divided by 1,000 to determine the proper value of internal standard. For resistance or impedance measurements, the internal standard resistance is obtained by calculating the total resistance or impedance value. The next step is to determine the tolerance and tolerance limit for the particular test. Tolerance can be selected either *as less than* (<), *greater than* (>), *or plus or minus* (±). A test programed *as less than* (<) would indicate that the value being measured will pass if it is equal to or less than the programed value plus the percentage of tolerance selected. A test programed as *greater than* (>) would indicate that the value being measured will pass if it is equal to or greater than the programed value minus the percentage of tolerance selected. In cases of insulation resistance measurements, the *greater than* (>) tolerance limit is normally used.

b. When programing the function of ac voltage, the selected to point must be at ground potential for ac. If neither of the selected point (*to* or *from*) fulfills this requirement, the selected to point must be temporarily connected to ground through a capacitor of at least 1 uf

\

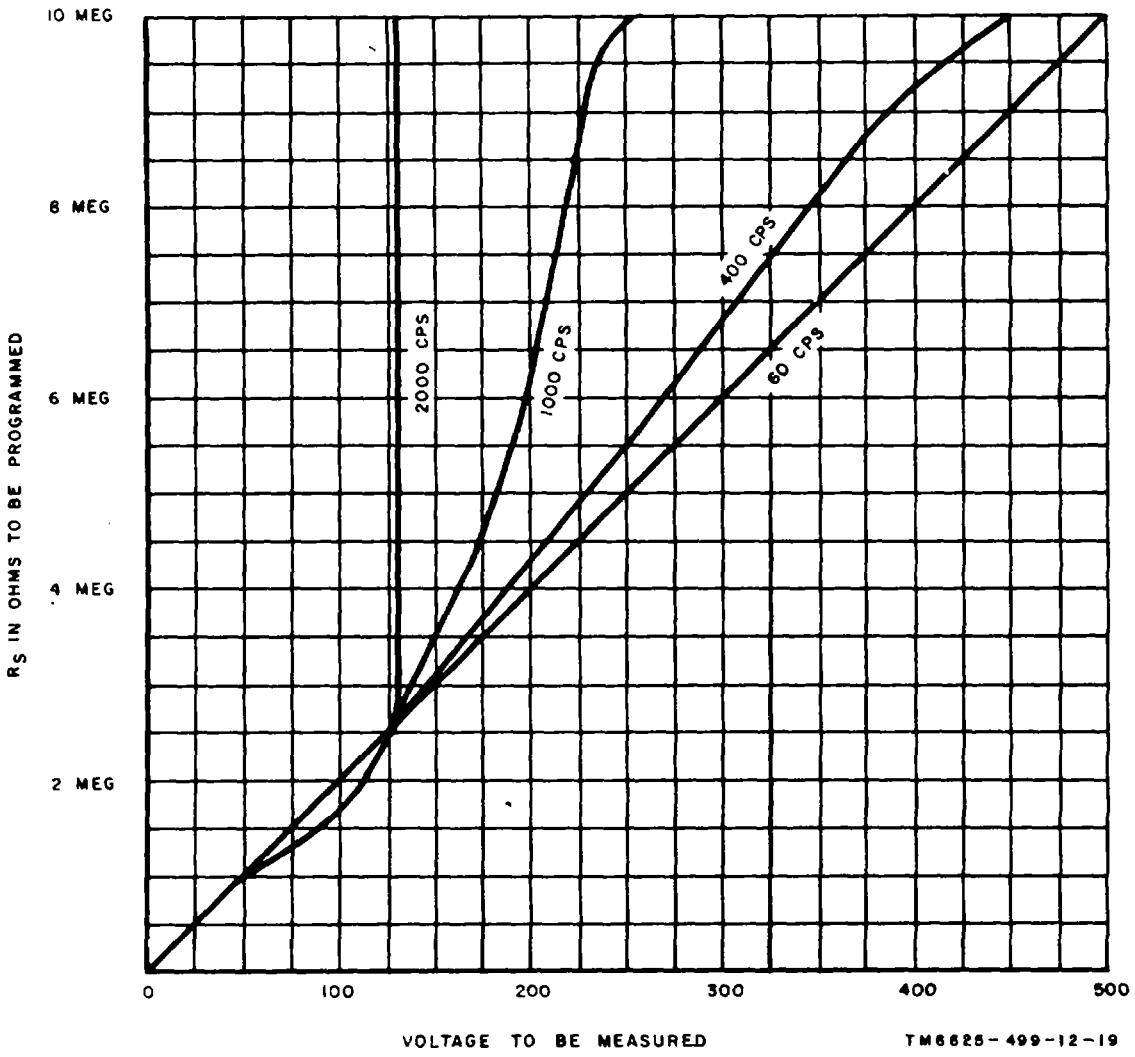


Figure 15. Ac frequency response.

to perform the test at these points.

c. When programing the function of insulation resistance, the to point will automatically be witched to chassis ground by the test set. Therefore, if either of the points (*to* or *from*) selected for this test has a resistance to ground, this point must be programed as the to point.

d. The final step in programing is to determine if a delay in the test sequence is required and if a stop is required. The programed delay actuates a predetermined manually adjusted delay for the particular test. A delay must be programed for any test where there is a time constant which causes the test set to show an under reject condition until the capacity in the circuit test has time to charge. In this regard, a delay must be programed for all ac voltage tests and all insulation resistance tests since, for these tests, a time constant is always present inside the test set. The stop position of the tape is utilized when it is desirable to make adjustments during the course of a test; it is also used to stop the unit at the end of a test tape.

> ***Note*: Additional programing steps will be necessary it auxiliary equipment such as a test point multiplier is used.**

e. The programer should try to determine the least number of tests that will

provide a reliable final result. While it is possible to select test points that will provide failure information on each component in a system, virtually the same data can be accumulated by selecting points that will check several components in combination. For example, it may be possible to locate test points that will permit a plate load resistor to be tested alone, but it may be more practical to set up a series string which will, in one test, check the plate load resistor of one stage, the decoupling resistors, and the second stage plate load.

f. If the total number of cables to be used on a given chassis is 12 or less, two chassis may be connected to the test set at one time, and the tape programed so that both chassis are tested by the same tape loop. In addition, when programing a test that requires the use of all tester sockets (0-25) and cables, remember that socket 0 is programed by punching all of the tape positions allotted to socket selection. When programing on a one-to-one basis (that is tester socket 1 connected to chassis socket X-101), the 0 tester socket should be used as the 25th socket.

19. Tape-Punching Procedure

When programing a four-column tape, punch out the unwanted units in the column blocks. The numbers left will indicate the desired units. When using an eight-column tape, punch out the unwanted units in the first four columns, and punch out the wanted units in the remaining four columns. Note that when using an eight column tape in conjunction with auxiliary equipment such as test point multipliers, tape positions 7 and 8 of columns 5 and 6 are punched so that the remaining units indicate the additional test points added to the *to* and *from* points. The test shown in E of figure 13 can be used as an example for the punching procedure. Test No. 7 of the program sheet (A, fig. 10) indicates that a resistance of at least 150,000 ohms -10 percent (back resistance of crystal diode) should exist between pin 6 of socket 21 (or X-121, depending on the numbering system used by the particular chassis being tested) and pin 5 of socket 22 (or socket X-122). The -10 percent value is caused by programing a *greater than* tolerance limit (para 18*a*). Pin 6 of socket 21 is a positive point with respect to pin 5 of socket 22. The following information and procedures are used to manually punch a tape.

a. Remove a strip of tape from a tape pad.

b. Insert the tape in the tape punch and engage the locating pins in the holes of the tape so that column 1 will be the first column punched.

c. Using pin 6 of socket 21 as the *from* point, punch positions 1 and 4 of column 1. This will leave numerals 2 and 4 intact, which indicates to the tester that pin 6 has been selected as the *from* pin point.

> ***Note*: It can be seen that by combining the numbers shown on the tape, other points can be selected. To get the number 3, for example, punch positions 3 and 4, leaving positions 1 and 2 intact; to get 5, punch positions 2 and 4. The single exception to this rule is that the number 10 should be specified by punching positions 1, 2, 3, and 4; that is, by punching all of the numbers of the block. This also applies to the *to* pin designation, positions 1, 2, 3, and 4 of column 2.**

d. Tape positions 5 through 9 of column 1 are used to provide *from* socket number data. To specify socket 21, punch positions 6 and 7 of column 1. This will leave numerals 1, 8, and 12 intact.

e. Since the function of the test is resistance, tape positions 10, 11, and 12 of column 1 are punched out. If the insulation resistance function is required (D, fig. 13), positions 10 and 11 of column 1 are punched out, and position 12 (HI) is left intact. The voltage functions are punched as follows:

(1) *DC*+ (C, fig. 13). Leave position 10 intact; punch out positions 11 and 12.

(2) *DC*-.Leave position 11 intact; punch out positions 10 and 12.

(3) *AC*. Leave position 10 and 11 intact; punch out position 12.

f. After column 1 has been punched, restore the tape punch to position 1, and with the thumb lever, advance the tape one column to the left. The tape is now in position to receive column 2 data.

g. To specify pin 5 of socket 22 as the to point, punch positions 2, 4, 5, and 7 of

column 2. Positions 1, 3, 6, 8, and 9 should remain intact.

h. If the slave unit is used, it can be advanced to its subsequent positions by alternately punching tape positions 11 and 12 of column 2, called bits A and B on the test set tape. When the slave unit is used, it must first be synchronized with the test set tape so that the first test calling for an advance of the slave unit will be able to advance it. This may be done by programing one test at the beginning of the test set program tape with bit B punched out. This can be a blank test block or one of the regular programed test blocks, but it must have a stop programed to stop the test set. This will allow the slave unit tape to start in its tape reader with the brushes on the blank block just before the first functional test block. The test set tape test calling for the slave unit to advance to its first functional test block must now have bit A punched out. Thus, on the synchronizing test, if the slave unit is ready to advance on bit B, it will do so, and if it is ready to advance on bit A, nothing will happen; in either case, it will now be set to advance on bit A. In addition, if the tapes are to be recycles, it might be necessary to insert an additional blank test block on the slave unit tape and a corresponding advance bit punched near the end of the test set tape so that there will be an even number of slave unit advances punched in the test set tape. This will make it possible to proceed to a second run of the tape without having to reset the slave unit tape in its reader.

i. When the *to* information has been punched, restore the tape punches to position 1 and, with the thumb lever, advance the tape one position to the left.

j. To specify 150,000 ohms, punch positions 2, 3, 4, 6, 8, 9, 10, 11, and 12. This will leave positions 1, 5, and 7 intact.

> ***Note:*** **W hen all positions of a resistance block are punched (positions 9, 10, 11, and 12) a 0 is indicated to the tester.**

k. After punching column 3, advance the tape one position to the left. Since three O's are required to complete the resistance value, punch position 3 of column 4. This will leave numerals 1 and 2 intact. The tester will now interpret column 3 and 4 information as the required 150,000 ohms.

> ***Note:*** **Do not program the tape so that more than four O's are specified in the first three positions of column 4. When programing seven-digit numbers, use the first significant digit block of column 3 (positions 1, 2, 3, and 4).**

l. Positions 4, 5, and 6 of column 4 are used to specify the allowable tolerance to the unknown resistance being checked. Since the tolerance given as part of the test data is 10 percent, punch positions 4 and 6 of column 4, leaving position 5 intact. For a 1-percent tolerance, punch positions 4, 5, and 6.

m. The limit given as part of the test data is minus the tolerance. This requires that positions 7 and 8 of column 4 be punched. The tester will interpret this data to mean that any resistance value greater than (>) -10 percent of the specified 150,000 ohms. is acceptable, or in this case, 135,000 ohms or more.

> ***Note*****: If the test was such that any amount less than (<) 10 percent was acceptable, position 7 would be left intact and positions 8 and 9 punched. If the limit required was plus or minus, the tolerance (±) (position 8) would be left intact!**

n. Be careful not to punch position 10 of column 4. If this position is punched, the tape reader will immediately advance the tape another 4 columns.

o. Tape positions 11 and 12 of column 4 remain to be considered. If a delay were required, position 11 would be left intact. Since no delay is required for this test, position 11 is punched out. To advance the tester automatically to the next programmed test, punch position 12 of column 4. If position 12 is left intact, the tester will stop at the completion of the test just programed.

p. The impedance measuring mode is chosen by punching out tape positions 10, 11, and 12 of column 1 for ohms and by punching out tape position 1 of column 5 for Z (B fig. 14). In addition, one of tape positions 2, 3, or 4 of column 5 must be punched out to choose the frequency of measurement. In this case, it is the bits punched out that select the function, not the bits that are left intact.

q. Tape positions 7 and 8 of columns 5

and 6 (B, fig. 14) are punched only when using auxiliary equipment such as test point multipliers. Tape positions 7 and 8 of column 5 may be used to add 250, 500, or 750 to the *from* point programed in column 1. Tape positions 7 and 8 of column 6 may be used to add 250, 500, or 750 to the *to* point programed in column 2. Punch out the unwanted positions (as in a four column tape) to get the test point addition wanted. To add 250, punch out position 8; to add 500, punch out position 7; and to add 750, leave both positions contact. To obtain the test points programed in columns 1 and 2 only, punch out positions 7 and 8. Test No. 6 of the program sheet (A, fig. 10) provides an example of programing when using a test point multiplier. This test is shown punched out in B of figure 14.

r. Whenever an eight-column test is programed, tape position 10 of column 8 must be punched out. This will energize the relays programed in columns 5 through 8 and advance the tape reader eight columns to the next test.

20. Preliminary Starting Procedure

a. Without Slave Unit, Test Set MX-3844/GSM-72.

(1) Plug the test set line cord into a 115-volt, 60-cycle power source. The line cord is equipped with a ground wire attached to the third prong on the plug. If necessary use an adapter connector (FSN 5935-511-6495) to connect the plug to the ac source.

(2) Place the ON-OFF switch to ON, and allow the test set to warm up for approximately 5 minutes.

***Note*. If the test set has not been used for a long period or time, allow a minimum 4-hour warmup period.**

b. With Slave Unit, Test Set MX-3844/GSM-72.

(1) Plug the test set line cord into a 115-volt, 60-cycle power source. The line cord is equipped with a ground wire attached to the third prong on the plug.

(2) Plug the slave unit line cord into a 115-volt, 60-cycle power source.

(3) Connect the slave unit to the test set ROBOTROLLER socket (fig. 8) by means of the octal plug connected to the 6-foot cable at the rear of the slave unit.

(4) Place the ON-OFF switches of the test set and the slave unit to ON, and allow the test set to warm up for approximately 5 minutes.

c. Calibration (fig. 6).

***Note:* It is suggested that the calibration procedure given below for the test set be performed daily after warmup and before testing operations. Inasmuch as the major factor affecting calibration is the aging of the electron tubes, little, if any, deviation will be noted from day to day.**

(1) Release the brush assembly so it does not make contact with the belt.

(2) Remove any program tape that may be in the tape reader.

(3) Set the calibrate switch to the 1% position.

(4) Use a screwdriver to rotate the 1% adjust control on the front panel in a clockwise direction until the OVER indicator lamp lights.

(5) Rotate the 1% adjust control counterclockwise until the OVER indicator lamp just extinguishes.

(6) Set the calibrate switch to the 5% position.

(7) Rotate the 5% adjust control clockwise until the OVER indicator lamp lights.

(8) Rotate the 5% adjust control counterclockwise until the OVER indicator lamp just extinguishes.

(9) Set the calibrate switch to the 10% position.

(10) Rotate the 10% adjust control clockwise until the OVER indicator lamp lights.

(11) Rotate the 10% adjust control counter-clockwise until the OVER indicator lamp just extinguishes.

(12) Set the calibrate switch to the 20% position.

(13) Rotate the 20% adjust control clockwise until the OVER indicator lamp lights.

(14) Rotate the 20% adjust control counter clockwise until the OVER indicator lamp just extinguishes.

(15) Set the calibrate switch to the -10% position.

(16) Rotate the -10% adjust control clockwise until the UNDER indicator lamp lights.

(17) Rotate the -10% adjust control counter-clockwise until the UNDER indicator lamp just extinguishes.

(18) Check the calibration by repeating the procedures given in (1) through (17) above.

(19) Lower the brush assembly on the tape reader.

(20) Set the calibrate switch to the OPERATE position.

21. Normal Operation

To operate the test set, proceed as indicated below.

***Note*: If any abnormal indication is obtained during the operating procedure, refer to the daily maintenance service and inspection chart (para 30) for the corrective measures.**

a. Perform the preliminary starting procedure (para 20a).

b. Check the controls of the test set to see that the calibrate switch is in the OPERATE position, the function switch of the multimeter is in the OFF position, and the range switch of the multimeter is fully counterclockwise.

c. Ground the chassis of the unit under test direct to the chassis or frame of the test set.

d. Connect the flexible shielded adapter cables or other cables used to the chassis under test, as specified in the program sheet.

***Note*: Any cables used must be equipped with an 11-pin connector on one end and a plug adapter or unterminated wires at the other end. The cables may also be connected direct to the chassis under test. Pin 11 must be wired to the cable shield which is thus grounded to the test set chassis through pin 11 of the test cable socket. Any special cables used should have a grounded shield to prevent noise pickup from affecting the test set error amplifier. The plug adapter must be selected to match the sockets of the chassis under test. It is important that the cables be connected properly at each end. If the test tape is punched so that socket 1 on the test set corresponds with V1 (or V101, etc.) on the unit under test, the cable must go from V1 (or V101, etc.) on the unit under test to socket 1 on the test set.**

e. Connect the cables from the equipment under test to the appropriate sockets on the side panel of the test set. After this has been done, only the cable end connected to the unit under test need be moved.

f. Lift the brush assembly on the tape reader by pulling outward on the brush assembly release at the left of the brush assembly. The brush assembly will pop up.

g. Insert the program tape under the tape hold down plate and position it so that the brush assembly falls on the last test (end of test).

***Note*: The test tape must be inserted so that the printing is right side up and a white pin of the tape drum sprocket is indexed in column 1 of a test. If this is not done, the test set will consistently stop and indicate an error.**

h. Lower the brush assembly and secure it with the knurled locking device.

i. Start the tape by briefly moving the PROCEED-STOP switch on the tape reader to PROCEED; then release. If all positions have been properly punched and the cables properly connected, the tape will continue to run until stopped by an error in the tape (ERROR lamp lights; function and tolerance lamps do not), a reject, a stop position on the tape, or by manual operation of the PROCEED-STOP switch to the STOP position. During operation, the front-panel indicators will momentarily indicate the data programed for each test. If a stop is programed, the indicators will indicate the data on the stopped test. When a reject occurs, the indicator lamps will indicate the data programed, and also the reject, over, or under condition.

***Note*: If, upon moving the PROCEED-STOP switch to PROCEED, the tape advances one position but the stepping switches do not run and the tolerance and function lights do not light, this indicates a malfunction of the test set on a fail-safe test. This fail-safe test is automatically applied before each programed test.**

22. Restart After Reject or Programed Stop

To restart the test tape after a reject or programed stop, proceed as follows:

a. Move the PROCEED-STOP switch on the test set tape reader to PROCEED. and release.

b. The test set will operate until a programed stop is read or some circuit in the equipment under test fails to meet its requirements.

23. Use of Internal Multimeter

To operate the multimeter during a programed test, proceed as instructed below.

> ***Note:*** **The 1.5-volt range operates on dc only.**

a. Stop the test set at the required test by placing the PROCEED-STOP switch to the STOP position.

b. Place the calibrate switch to BAL.

c. Set the multimeter function switch to the required position.

> ***Note.*** **When measuring resistance, first place the multimeter function switch to SET OHMS and rotate the SET OHMS control for a zero indication on the multimeter. The function switch may then be set to the applicable position.**

d. Set the multimeter range switch to the desired range.

e. Read the indication on the meter.

f. Upon completion of the measurement, place the multimeter function switch to OFF, the multimeter range switch fully counterclockwise, and the calibrate switch to OPERATE.

g. To proceed with the programed testing, move the PROCEED-STOP switch on the test set tape reader to PROCEED, and release.

24. Use of External Multimeter

To perform measurements on a unit under test with an external multimeter, proceed as follows:

a. Stop the test set at the required test by placing the PROCEED-STOP switch to the STOP position.

b. Place the calibrate switch to BAL.

c. Place the external multimeter across the Rx terminals and read the unknown value measured. By placing the external multimeter across the Rs terminals, the internal standard may be measured.

d. To proceed with the programed testing, place the calibrate switch to OPERATE, and move the PROCEED-STOP switch on the test set tape reader to PROCEED; then release.

25. Operation With Slave Unit

To operate the test set with the slave unit proceed as indicated below.

> ***Note:*** **If an abnormal indication is obtained during the operating procedure, refer to the daily maintenance service and inspection chart (para 30 and 48) for the corrective measures.**

a. Perform the preliminary starting procedure (para 20*b*).

b. Check the controls of the test set to see that the calibrate switch is in the OPERATE position, the function switch of the multimeter is in the OFF position, and the range switch of the multimeter fully counter-clockwise.

c. Ground the chassis of the unit under test direct to the chassis or frame of the test set.

d. Connect the flexible shielded adapter cables to the chassis under test (para 21*d*).

e. Connect the cables from the equipment under test to the appropriate sockets on the side panel of the test set. After this has been done, only the cable end connected to the unit under test need be moved.

f. Connect the cables from the equipment under test to the appropriate patch board jacks (fig. 18) at the rear of the slave unit.

g. Lift the brush assembly on the test set tape reader by pulling outward on the knurled locking device at the left of the brush assembly. The brush assembly will pop up.

h. Insert the program tape under the tape hold down plate and position it so that the brush assembly falls a few tests before the first programed slave unit test.

> ***Note:*** **The test tape must be inserted so that the printing is right side up and a white pin of the tape drum sprocket is indexed in column 1 of a test. If this is not done, the test set will consistently stop and indicate an error.**

i. Lower the brush assembly and secure it with the knurled locking device.

j. Lift the brush assembly on the slave unit tape reader by releasing the brush assembly latch. The brush assembly will pop up.

k. Insert the slave tape under the tape hold down plate and position it so that the brush assembly falls one test block before the first slave unit test.

l. Lower the brush assembly and secure it with the latch.

m. Depress the PROCEED-STOP switch on the test set tape reader until the test before the first slave unit test on the program tape is under the test set tape reader brush assembly. The test set program tape and the slave unit program tape should now be synchronized.

n. Start the tape by briefly moving the PROCEED-STOP switch on the test set tape reader to PROCEED; then release. If all positions have been properly punched and the cables properly connected, the tape will continue to run until stopped by an error in the tape, a reject, a stop position on the tape, or by manual operation of the PROCEED-STOP switch to the STOP position. The slave tape will advance only when programed to do so by the test set program tape.

> ***Note*: If the test set and slave unit tapes are not synchronized, depress the slave unit PROCEED-STOP switch until synchronization occurs.**
>
> ***Note*: If the test set consistently stops and indicates an error, it is an indication of incorrectly inserted tale. To reset the tape, put the PROCEED-STOP switch in the STOP position. Lift the brush assembly away from the belt and lift the tape out of engagement with the tape drive sprocket; position the tape as outlined in *h* through *i* above. If necessary, reposition the slave tape on the slave unit tape reader as outlined in *j* through *l* above. After the tapes have been inserted correctly, start the tapes by repeating the procedures given in *m* and *n* above.**

o. All other operations with the test set are identical with those outlined in paragraphs 21, 22, and 23 above.

26. Stopping Procedure

a. Without Slave Unit, Test Set MX-3844/GSM-72.

(1) Set the PROCEED-STOP switch on the test set to STOP.

(2) Set the ON-OFF switch of the test set to OFF.

(3) Lift the brush assembly on the tape reader and remove the program tape; then lower the brush assembly.

(4) Disconnect all cables between the unit under test and the test set.

(5) If there is no immediate need for the test set, disconnect the test set power cord from the 115-volt, 60-cycle source.

b. With Slave Unit, Test Set MX-3844/GSM-72.

(1) Set the PROCEED-STOP switch on the test set to STOP.

(2) Set the power ON-OFF switch of the slave unit to OFF.

(3) Set the power ON-OFF switch of the test set to OFF.

(4) Lift the brush assembly on the test set tape reader and remove the test tape; then lower the brush assembly.

(5) Lift the brush assembly on the slave unit tape reader and remove the slave tape; then lower the brush assembly.

(6) Disconnect all cables between the unit under test and the test set and slave unit.

(7) Disconnect the slave unit from the test set.

(8) If there is no immediate need for the test set, disconnect the test set and slave unit power cords from the 115-volt, 60- cycle source.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S MAINTENANCE

27. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the test set are listed below, together with a reference to the paragraphs covering the specific maintenance functions. The duties assigned do not require tools or test equipment.

a. Daily preventive maintenance checks and services (para 30).

b. Cleaning (para 31).

28. Operator's Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce *downtime*, and to assure that the equipment is serviceable.

a. *Systematic Care*. The procedures given in paragraphs 30 and 31 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The maintenance c he c k s and services chart (para 30) outlines functions to be performed daily. These checks and services are designed to maintain Army equipment combat serviceable; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and what the normal conditions are; the *References* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with TM 38-750.

29. Maintenance Checks and Services Periods

Maintenance checks and services on the test set are required daily. Paragraph 30 specifies the items to be checked and serviced daily. In addition, the items must be checked before the equipment is placed in operation after any extended shutdown, or once a week while the equipment is kept in *standby* condition.

30. Daily Preventive Maintenance Checks and Services

Sequence No.	Item	Procedure	References
1	Completeness----------	Check the test for overall completeness----------	Appx III.
2	Cleanliness----------	Clean the test set control panel and other exterior surfaces.	Para 31.
3	External Items ----------	Check the mounting screws, plugs sockets, and handles for looseness and breaks.	None.
4	Cord and Cables ----------	Check the cords and cable for cuts, brakes, and fraying.	None
5	Meter glass----------	Check the meter glass for breaks and cracks----------	None
6	Indicator lamps and lenses	During operation, check the indicator lamps and lenses for breaks.	None
7	Controls and switches	Check the mechanical action of each control and switch while making the operating checks (sequence No.8 through 14 below)	None
8	Operations preset----------	Set the following controls to the position indicated. ON-OFF switch OFF PROCEED-STOP switch OFF (center)	None

Sequence No.	Item	Procedure	References
		DELAY SECONDS control: .05 Calibrate switch: OPERATE Multimeter function switch: OFF Multimeter range switch: 500 VOLTS	.
9	Start----------	*a* Set the ON-OFF switch to ON. Allow the test set to warm up for 5 minutes. The front panel indicators will indicate at random. *b*. Lower the brush assembly and briefly set the PROCEED-STOP switch to PROCEED. The nixie indicator lamps will indicate zero and the other indicator lamps will not be lighted. ***Note:*** **Ignore error lamp indication**.	*a*. None. *b*. None.
10	Calibration----------	Perform the calibration procedure as indicated in paragraph 20*c* and check all indications necessary.	Para 20*c.*
11	Connection ----------	*a*. Connect the test set to a known good chassis or card assembly; use the cable assemblies provided or fabricated. *b*.. Insert the appropriate program tape in the tape reader.	*a*. Para 21. *b*. Para 21.
12	Operation (automatic)	Place the test set in operation by briefly setting the PROCEED-STOP switch to the PROCEED position. The tape reader will continue to run until the tape program in completed. The indicator lamps will indicate the values programed for each teat on the program sheet.	Para 21. Appropriate program sheet.
13	Operation (manual)----	Place the test set in operation as indicated in sequence No. 12 above. Stop the test set on a programed resistance check by setting the PROCEED-STOP switch to STOP. The indicator lamps must indicate the values programed.	Para 21. Appropriate program sheet.
14	Multimeter ----------	*a*. Stop the test set at a programed resistance or voltage check by setting the PROCEED-STOP switch to STOP *b.* Set the calibrate switch to BAL ---------- *c.* Set the multimeter function switch to the required - position. The multimeter should indicate the programed voltage or resistance values.	*a*. None. *b*. None *c*. Para 23.

31. Cleaning

The exterior surfaces of the test set should be free of dust, dirt, moisture, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

> ***Warning:*** **Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.**

b. Remove grease, fungus, and ground in dirt with a clean soft cloth dampened (not wet) with Cleaning Compound (Federal stock No. 7930-395-9542), and then wipe with a clean dry cloth.

c. Remove dust or dirt from plugs and jacks with a brush.

> ***Caution*****: Do not press on the meter faces (glass) when cleaning; the meter may become damaged.**

d. Clean the front panel indicator lenses, meters, and control knobs with a clean soft cloth. If necessary, dampen the cloth with water; mild soap may be used to make the cleaning more effective.

Section II. ORGANIZATIONAL MAINTENANCE

32. Scope of Organizational Maintenance

Paragraphs 33 through 42 contain instructions for second echelon maintenance on the test set. Second echelon maintenance

consists of all of the operator's maintenance plus the following:

a. Organizational preventive maintenance (para 33).

b. Organizational repairs

(1) Replacement of fuses (para 38).

(2) Replacement of air filter (para 39).

(3) Replacement of indicator lamps and lenses (para 40).

(4) Test set tape reader lubrication (para 41).

33. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance service and inspections of the test set at the second echelon level are made at monthly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the carrying vehicle for all vehicular installations.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

34. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly maintenance should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in standby (ready for immediate operation) condition must have monthly maintenance performed on it. Equipment in limited storage (requires service before operation) does not require monthly maintenance.

35. Monthly Preventive Maintenance Checks and Services

Sequence No.	Item	Procedure	References
1	Completeness----------	Check the teat set for overall completeness----------	Appx III
2	Cleanliness----------	Clean the teat set control panel and other exterior surfaces.	Para 31.
3	Installation ----------	Check to see that the test set is properly installed----------	Para 21 and 25.
4	Preservation----------	Check all surfaces for evidence of fungus. Remove rust and corrosion, and spot-paint bare spots.	Para 42.
5	Publications ----------	See that all publications are complete, serviceable, and current.	DA PAM 310-4.
6	Modification work orders.	Check DA PAM 310-4 to determine if new applicable MWO's have been published. All urgent MWO's must be applied immediately. All routine MWO's must be scheduled.	TM 38-750 and DA PAM 310-4
7	Lubrication ----------	Lubricate the tape reader ---------- ***Note*: Remove the tape reader directed for fume replacement (para 88*c*).**	Para 41.
8	External items ----------	Check mounting screws, plug, sockets, and handle for looseness and breaks.	None.
9	Cords and cables ---------	Check cords and cables for cute, break, and fraying----------	None.
10	Meter glass ----------	Check the meter glass for breaks and cracks----------	None.
11	Indicator lamps and lenses ----------	During operation, check the indicator lamps and lenses for breaks.	Para 40

Sequence No.	Item	Procedure	References
12	Controls and switches.	Check the mechanical action of each control and switch while making the operating checks (sequence No. 16 through 22 below).	None.
13	Fuses ----------	See that the operating fuses are of correct value. Check spare fuses for proper value and quantity.	Para 38.
14	Tape reader brushes --	Check for bent tape reader brush strands, and remove by clipping if necessary.	None.
15	Air filter ----------	Check air filter for cleanliness ----------	Para 39.
16	Operational preset -----	Set the following controls to the position indicated. ON-OFF switch: OFF PROCEED-STOP switch: OFF DELAY control: .05 Calibrate switch: OPERATE Multimeter function *witch: OFF Multimeter range switch: 500 VOLTS	None. .
17	Start ----------	*a*. Set the ON-OFF switch to ON. Allow the test set to warm up for 5 minutes. The front panel indicator will indicate at random. *b*. Lower the brush assembly and briefly *at the PROCEED-STOP switch to PROCEED. The nixie indicator lamps will indicate zero and the other Indicator lamps will not be lighted. ***Note*: Ignore error lamp indication.**	*a*. Para 37. *b.* Para 37.
18	Calibration ----------	Perform the calibration procedure as indicated in paragraph 20*c*, and check all indications necessary.	Para 20 *c* and 37.
19	Connection ----------	*a*. Connect the teat set to a known good chassis or card assembly with the cable assemblies provided or fabricated. *b*. Insert the appropriate program tape in the tape reader	*a*. Para 21. *b* .Para 21.
20	Operation (automatic)	Place the test &et in operation by briefly setting the PROCEED-STOP switch to the PROCEED position. The tape reader will continue to run until the tape program is completed. The indicator lamp will indicate the values programed for each test on the program sheet.	Para 21. Appropriate program sheet Para 37.
21	Operation (manual)-----	Place the test set in operation as indicated in sequence No. 18 above. Stop the teat set on a programed re-stance check by setting the PROCEED-STOP switch to STOP. The indicator lamps must indicate the values programed.	Para 21. Appropriate program sheet
22	Multimeter ----------	*a*. Stop the test set at a programed resistance or voltage check by setting the PROCEED-STOP switch to STOP. *b*. Set the calibrate switch to BAL ---------- *c*. Set the multimeter function switch to the required position. The multimeter should indicate the programed voltage or resistance values.	*a.* None. *b.* None. *c*. Para 23.

36. Troubleshooting

Troubleshooting of this equipment is based on the operational checks contained in the monthly preventive maintenance checks and services chart. To troubleshoot the equipment, perform all functions starting with item No. 14 in the monthly preventive maintenance checks and services chart (para 35) and proceed through the items until an abnormal condition or result is observed. When an abnormal condition or result is observed, note the item number and turn to the corresponding item number in the troubleshooting chart (para 37). Perform the checks and corrective actions indicated in the troubleshooting chart. If the corrective measures indicated do not result in correction of the trouble, higher echelon maintenance is required.

37. Test Set, Electronic Circuit AN/GSM-72 Troubleshooting Chart

***Note*: It is assumed in this troubleshooting char that no errors are contained in the program tape used-during the operational check.**

Item No	Trouble symptom	Probable trouble	Checks and corrective measure
17	*a*. Indicator lamps do not light -------	*a*. Defective fume F701 or improper seating of live cord plug in power receptacle.	*a*. Check fuse; replace if necessary (para 38). If fuse is good. check seating of live cord plug in power receptacle. Check and replace indicator lamps (para 40).
	b. Nixie indicators fail to light ---------	*b* Defective 300 vdc power supply or defective contact on relay K503.	*b*. Higher echelon repair required.
	c. Nixie indicators fall to light normally but do light when PROCEED-STOP switch is held on PROCEED	*c*. Relay K503 held energized by one of positioning power transistors.	*c*. Higher echelon repair required.
18	Teat set fails to calibrate----------	*a*. Fail-safe signal in advertently applied to amplifier.	a. Check to see that PROCEED-STOP switch is in the PRO-CEED position only when the calibrate switch is in the OPERATE position.
		b. Defective fuse F702 ----------	*b*. Check fuse and replace if necessary (para 38).
		c. Chopper K201 defective----------	*c*. Higher echelon repair required.
		d. Regulated 6V or 250-volt power supply defective.	*d*. Higher echelon repair required.
		e. Defective component in bridge amplifier chassis	*e*. Higher echelon repair required.
20	*a*. Operating PROCEED-STOP switch to PROCEED has no effect	*a*. Dirty or maladjusted cam switch S502; faulty amplifier circuit; failure of 250 volt or 6-volt regulated power supplies; failure of 1-kc positioning signal defective fuse F704 or defective fuse F703.	*a* Check and replace fuse if necessary (para 38). Higher echelon repair required.
	b. Tolerance and function lamps do not light but indicators do	b. Dirty or maladjusted cam switch S502	*b*. Higher echelon repair required
- .	*c*. Positioning circuit fail to position according to tape program.	*c*. Bent brushes in tape reader, dirt accumulation on tape belt or brush, misalignment of tape reader; faulty positioning circuit; failure in -6-volt. +6-volt or -24-volt. power supplies; failure in 1-kc positioning signal.	*c*. Clip off bent brushes. Higher echelon repair required
	d. OVER or UNDER indicator lamps do not light when circuit under test is known to be good.	*d*. Improper grinding of test set or chassis under test. Misalignment of 250-volt regulated power supply return ripple compensation circuit	*d*. Check cable connections between test met and chassis under test to assume all connections are secure. If trouble is not corrected higher, echelon repair is required.
	e. OVER indicator lamplights: Ω, HI,DC,AC do not light	*e*. Dummy plug P103-A not installed installed in J103 when VR30 module is not installed.	e. Check to see that the voltage module is properly installed (para 59).
	f. Tape reader fails to proceed to next test on passing condition.	*f*. STOP bit not punched on program tape: multimeter switches not in 500V and OFF position: failure in switching circuitry of proceed circuit.	*f*. Check positions of multimeter switches and place to 500 V and OFF if necessary. Place the PROCEED-STOP switch to proceed and release. If

Item No	Trouble symptom	Probable trouble	Checks and corrective measure
	g. Tape reader fails to stop on reject condition	*g*. Failure in switching circuitry of proceed circuit	*g*. Higher echelon repair required.
	h. Delay is excessively greater or less than that programed or set by DELAY control	*h*. Failure in tube V706 delay thyratron circuit or failure of -80-volt power supply	*h*. Higher echelon repair required.
	Maltimeter fails to operate ------	Defective fuse F705----------	Check and replace fuse if necessary (para 38).

38. Replacement of Fuses

***Caution*: Do not use a fuse rated greater than the value inscribed above the fuseholder. Damage to the equipment may result.**

a. Fuses F701 and F705 (fig. 6).

(1) Turn the fuseholder cap counterclockwise to unlock.

(2) Pull out the fuseholder cap with the defective fuse. Remove the defective fuse and replace it with a new one.

(3) With the new fuse installed, insert the fuseholder cap into the fuseholder. Press in on the fuseholder cap and turn it clockwise to lock.

***Note*: If F705 is replaced the meter circuit may require recalibration on the 1.5vdc or 5vdc ranges. Refer to higher echelon for this procedure.**

b. Fuse F702 (fig. 5).

(1) Remove the sides and top of the test set case by twisting the locking screws counterclockwise.

(2) Replace F702, which is mounted by the use of spring clips.

(3) Replace the top and sides of the test set case by twisting the locking screws in a clockwise direction.

c. Fuse P703 and F704 (fig. 22).

(1) Remove the four screws at the four corners of the tape reader.

***Caution:* When removing the tape reader, do not pull up while pulling forward because damage to the PROCEED switch will result.**

(2) Grasp the handle of the tape reader and pull forward.

(3) Replace the fuses which are mounted in spring clips inside the tape reader compartment.

(4) Replace the tape reader by pushing in and mating the rear connectors.

(5) Secure the tape reader with the four screws.

39. Replacement of Air Filter

(fig. 8)

a. Remove the two screws and the air filter holding bracket from the top of the air filter frame.

b. Slide the air filter up through the opening in the air filter frame.

c. Slide the clean air filter down through the opening in the air filter frame.

d. Replace the air filter holding bracket add secure it with the two screws.

40. Replacement of Indicator Lamps And Lenses

(fig. 6)

a. Unscrew (counterclockwise) the indicating light lens and remove it to expose the lamp.

b. Press in on the lamp and turn it counter-clockwise to unlock it.

c. Remove the defective lamp and replace it with a new one. Push in on the lamp and turn it clockwise to lock it.

d. Replace the lens by screwing it on (clockwise).

41. Test Set, Electronic Circuit AN/GSM-72 Tape Reader Lubrication

(fig. 16)

a. The tape reader must be removed for Lubrication. Refer to paragraph 38*c* for this procedure. Lubricate the following parts in the tape reader sparingly each month with Grease, Aircraft and Instrument (Lubriplate Grade Airo (FSN 9150-030-0451).

(1) Drive pin.

(2) Geneva wheel slots.

(3) Cam wheel surfaces.

b. To lubricate the clutch bearing on the tape reader, remove the oil plug located above the clutch bearing and apply 1 drop

of Lubricating Oil, General Purpose (LO) to the bearing.

c. To lubricate the motor and gear box, remove the motor cover and gear box oil plug, and apply a drop of Lubricating Oil, Internal Combustion Engine (OE-10) through the holes marked OIL on the motor and gear box housings.

42. Cleaning and Touchup Painting Instructions

a. Use a clean cloth to remove dust, dirt, moisture, and grease from the front panel and case. If necessary, wet the cloth with cleaning compound, and then wipe the parts with a clean dry cloth.

b. Clean rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

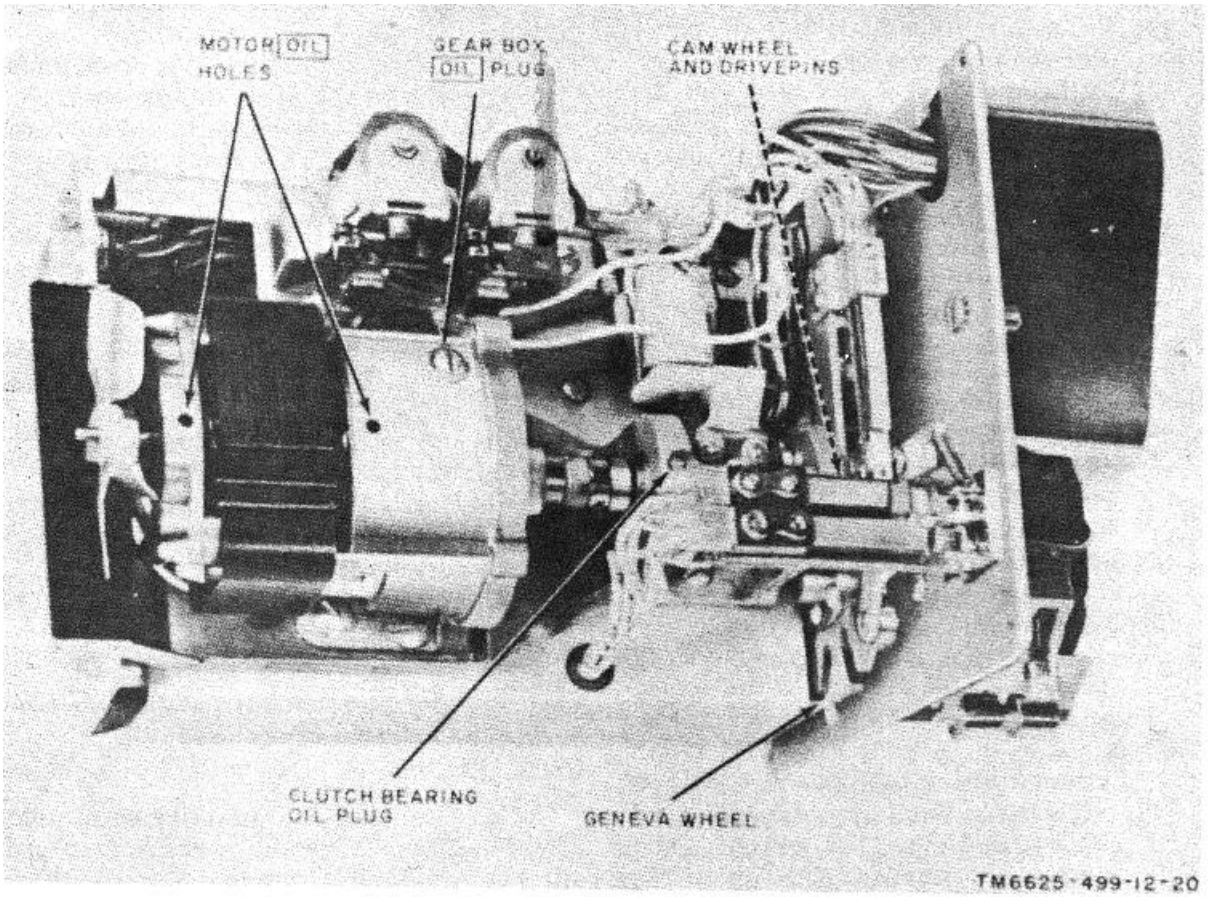


Figure 16. Test set, Electronic Circuit AN/GSM-72 lubrication points.

CHAPTER 4

AUXILIARY EQUIPMENT

Section I. SLAVE UNIT, TEST SET MX-3844/GSM-72

43. Purpose of Slave Unit, Test Set MX-3844/GSM-72

The slave unit is a taped-programmed accessory which can be used with the test set. The slave unit provides external switching capabilities on command of the test set program tape. These switching capabilities make possible the insertion of stimuli or the operation of relays on the chassis of system under test.

44. Description of Slave Unit, Test Set MX-3844/GSM-72

(fig. 17)

The slave unit contains a total of 52 chassis-mounted relays housed in a metal case, with a hinged cover. Forty-eight plug-in-type relays are used to provide external stimuli. The front panel contains the slave tape reader, 48 indicator lights, and the ON-OFF power switch. Accessibility to the output points is made through convenient rear panel jacks continued on two patch boards. A 6-foot cable is connected to the rear of the slave unit for its connection to the test set. The power for the slave unit may be provided by any 115-volt, 60-cycle source through the power cord attached to the rear of the unit.

45. Operation of Slave Unit, Test Set MX-3844/GSM-72

> ***Note*: When prepunched slave program tapes are provided for testing, omit the information given in *a* through *c* below, and begin operation procedures with *d* below.**

a. Preparation of Test Program. The slave unit is designed to perform only those tests that have been prepared by the programmer. The programmer should examine a schematic diagram of the equipment to be tested and prepare a sequence of operation to be performed in this equipment. The sequence of operation will be determined by the components to be tested. The programmer must determine which stimuli relay to use and how to use it. The relay may be used in its energized or deenergized condition, and any combination of relays can be used. One of two identical patch boards on the rear of the slave unit is shown in figure 18. Each patch board contains connections for 24 identical relays. A slave unit program sheet (B, fig. 10) should be prepared to indicate the test n u m be r, the relay used, and the relay function. The test number is placed on the test set program sheet (slave test column), together with the associated program information. Test No. 8, 9, 10, and 11 of the test set program sheet (A, fig. 10) are examples of slave unit programs.

b. Program Significance of Slave Tape Blocks. Figure 19 illustrates a segment of the slave program tape and shows the assignment of tape positions and the condition of the tape before and after punching. Each column utilizes all 12 bits of information. Tape positions 1 through 12 control relays K101 through K112; positions 13 through 24 control relays K113 through K124; positions 25 through 36 control relays K125 through K136; and positions 37 and 48 control relays K137 and K148. Any relay or combination of relays can be energized by punching out the appropriate bit or bits on the slave program tape corresponding to the relay numbers.

c. Tape-Punching Procedure. The slave program tape is punched with Tape Punch, Manual TL-681/GSM-72. The examples given in figure 19 can be used as examples of perforation of the tape. Any or all of the bits may be punched during one test. For example, to operate relays K101, K110, K121, and K139, it is necessary to punch out bits 1, 10, 21, and 39 of the tape. Once the entire series of tests comprising the program has been punched, the tape may be made into

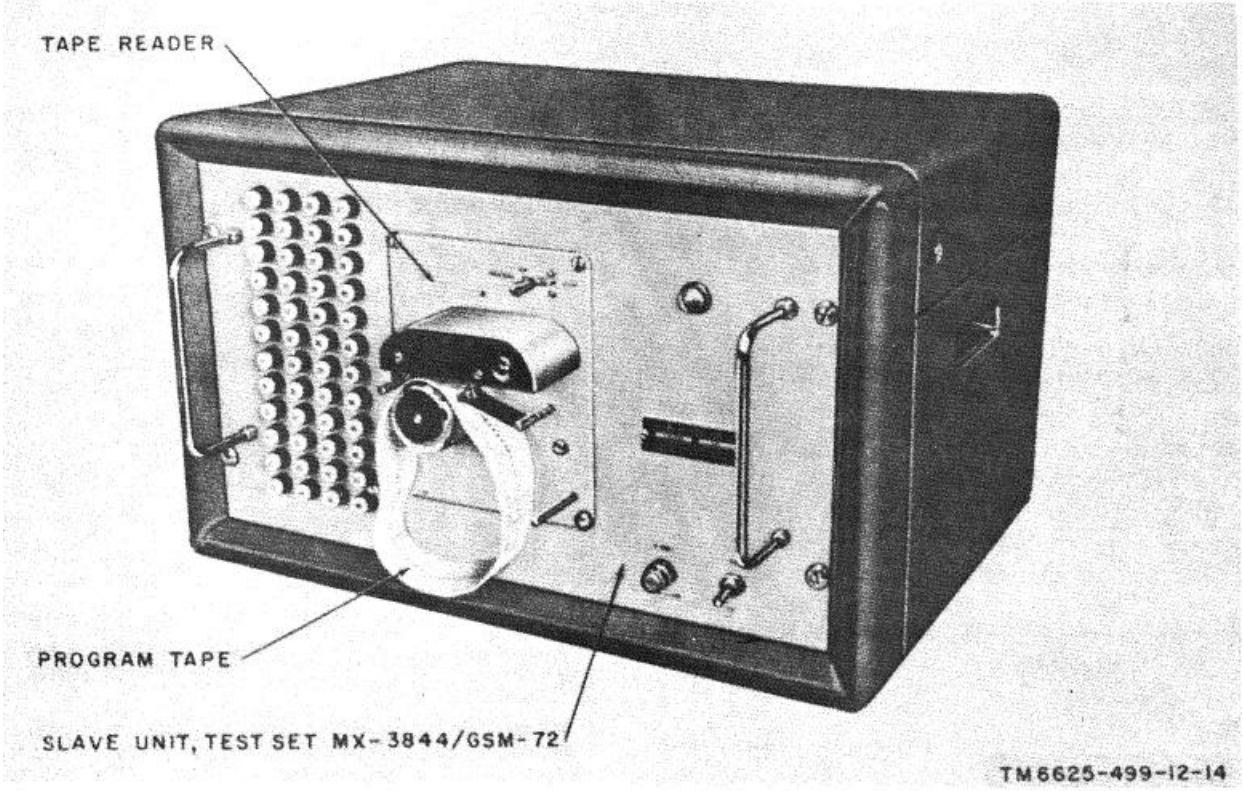


Figure 17. Slave Unit, Test Set MX-3844/GSM-72.

a loop by gluing one end to the other. (Use Duco cement or equivalent.) Glue the end of the tape over the beginning to make a *shingle* lap, with an overlap of only one test column; this will prevent the brushes from *picking* the tape.

d. Operating Procedure. For the operating procedures of the slave unit with the test set, refer to paragraphs 20*b*, 25, and 26*b*.

46. Operator's Maintenance for Slave Unit

The maintenance duties assigned to the operator or the slave unit are listed below, together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require tools or test equipment.

a. Slave unit daily preventive maintenance checks and services (para 48).

b. Cleaning (para 31 applicable portions).

47. Slave Unit, Test Set MX-3844/GSM-72 Operator's Preventive Maintenance

The requirements for the slave unit operator's preventive maintenance is similar to the test set operator's preventive maintenance (para 28) except for the daily preventive maintenance checks and services chart listed in paragraph 48 below. The slave unit maintenance checks and services periods are identical with those for the test set (para 29).

48. Slave Unit Test Set MX-3844/GSM-72 Daily Preventive Maintenance Checks and Services

Sequence No.	Item	Procedures	References
1	Completeness ---	Check the slave unit for overall completeness ----------	Appx III.
2	Completeness ---	Clean the slave unit panel and other exterior surfaces----------	Para 31.

Sequence No.	Item	Procedures	References
3	Exterior items----	Check mounting screws, plugs, socket, and handles for looseness and breaks.	None.
4	Cords and cables	Check cords and cables for cuts, breaks, and fraying ----------	None.
5	Indicator lamps and lenses.	During operation (sequence No. 8 below), check the indicator lamps and lenses for breaks.	None.
6	PROCEED-STOP switch.	Place the PROCEED-STOP switch in the PROCEED and STOP positions. The switch must return to the center when released.	None.
7	Pluckout relays --	Check the wire retainers and the seating of the pluckout relays.	None.
8	Start ----------	Insert a slave unit program tape in the tape reader and Programed lower the brush assembly. Set the ON-OFF switch to ON. The power indicator lamp should light and the relay bank indicators should light as	None.
9	Manual proceed operation.	*a*. Momentarily place the PROCEED-·TOP switch in the PROCEED position. The tape drum should advance one tape test and the relay bank indicators should indicate as programmed. *b.* Repeat the procedure in a above for the remaining tape tests	*a*. None *b.* None.

49. Organizational Maintenance for Slave Unit, Test Set MX-3844/GSM-72

The organizational maintenance for the slave unit consists of all the operator's maintenance (para 46) plus the following:

a. Slave unit organizational preventive maintenance (para 50).

b. Replacement of fuses F101 and F102 (para 54).

c. Replacement of indicator lamps and lenses (para 55).

d. Slave unit tape reader lubrication (para 56).

50. Slave Unit, Test Set MX-3844/GSM-72 Organizational Preventive Maintenance

The requirements for organizational preventive maintenance and the monthly maintenance for the slave unit are identical with that of the test set (para 33 and 34). The items to be checked monthly are listed in paragraph 51.

51. Slave Unit Test Set MX-3844/GSM-72 Monthly Preventive Maintenance Checks and Services

Sequence No.	Item	Procedures	References
1	Completeness ---	Check the slave unit for overall completeness ----------	Appx III.
2	Cleanliness -------	Clean the slave unit control panel and other external surfaces.	Para 31 (applicable portions).
3	Installation --------	See that the slave unit to properly installed ----------	Para 20 *b* and 25.
4	External item-----	Check the mounting screws, plugs, sockets, and handles	None.
5	Prevention --------	Check all surfaces for evidence of fungus. Remove rust and corrosion and spot-paint bare spots.	Para 42.
6	Publications ------	See that all publications are complete, serviceable, and current.	DA PAM 310-4.
7	Modification work orders.	Check DA PAM 310-4 to determine if new applicable MWO 's have been published. All urgent MWO 's must be applied immediately. All routine MWO's must be scheduled.	TM 38-750 and DA PAM 310-4.
8	Cords and cables	Check the cords and cables for cuts, breaks, and fraying	None.
9	Indicator lamps and lenses.	During operation (sequence No. 16 below), check the indicator lamps and lenses for breaks.	Para 55.

Sequence No.	Item	Procedures	References
10	Fuses ----------	See that the operating fuses are of correct value. Check the spare fuses for proper value and quantity.	Para 54.
11	Tape reader brushes----------	Check for bent tap reader brush strands, and remove by clipping if necessary.	None.
12	Lubrication--------	Lubricate the tape reader----------	Para 56.
13	PROCEED-STOP switch	Place the PROCEED-STOP switch in the PROCEED and STOP positions. The switch must return to the center when released.	None.
14	Pluckout relays --	Check the wire retainers and the setting of the pluck out	None.
15	Start ----------	Insert a slave unit program tape in the tape reader and lower the brush assembly. Set the ON-OFF switch to ON. The power indicator lamp should light and the relay bank indicators should light as programmed.	Para 53.
16	Manual proceed operation	*a*. Momentarily place the PROCEED-STOP switch in the. PROCEED position. The tape drum should advance one tape test and the relay bank indicators should indicate as programed. *b*. Repeat the procedure in *a* above for the remaining tape tests.	*a*. None *b*. None.

52. Slave Unit, Test Set MX-3844/GSM-72 Trouble-shooting

The slave unit troubleshooting procedure is identical with that of the test set (para 36) except for the preventive maintenance checks and services and the troubleshooting charts used. Refer to the items in the troubleshooting chart (para 53) which correspond to the items in the preventive maintenance checks and services charts (para 48 and 51) when troubleshooting.

53. Slave Unit Test Set MX-3844/GSM-72 Trouble-shooting Chart

Item No.	Trouble system	Probable Trouble	Checks and corrective measures
15	*a*. Power indicator lamp does not light and slave unit does not operate properly.	*a*. Defective fuse F101 or improper seating of line cord plug in power receptacle.	*a*. Check fuse; replace if necessary (para 54). If fuse is good, check seating of line cord plug in power receptacle.
	b. Power indicator lamp does not light but slave unit operates properly.	*b*. Defective power indicator lamp.	*b*. Replace indicator lamp (para 55).
	c. Power indicator lamp lights, but slave unit does not operate.	*c*. Defective fuse F102 or power supply.	*c*. Check fuse; replace if necessary (para 54). If fuse is good, higher echelon repair is required
	d. Front panel relay bank indicator- (1-48) does not light as programed. .	*d*. Defective indicator lamps, defective power supply, or defective voltage supply relay K150.	*d*. Replace indicator lamp (para 55). If indicator lamp at does not light higher echelon repair required.
16	*a*. Tape drum does not advance.	*a*. Defective tape reader	*a*. Higher echelon repair required.
	b. Stimuli relays do not operate.	*b*. Defective stimuli relays defective stimuli relay circuitry or defective power supply.	*b*. Higher echelon repair is required.

54. Replacement of Fuses F101 and F102 (fig. 9)

a. Fuse F101. The replacement procedure for F101 is identical with that of F701 (para 38a).

b. Fuse F102. To replace F102, which is located in the rear of the slave unit chassis, the chassis must be removed from the slave unit housing as follows:

(1) Remove the two chassis locking

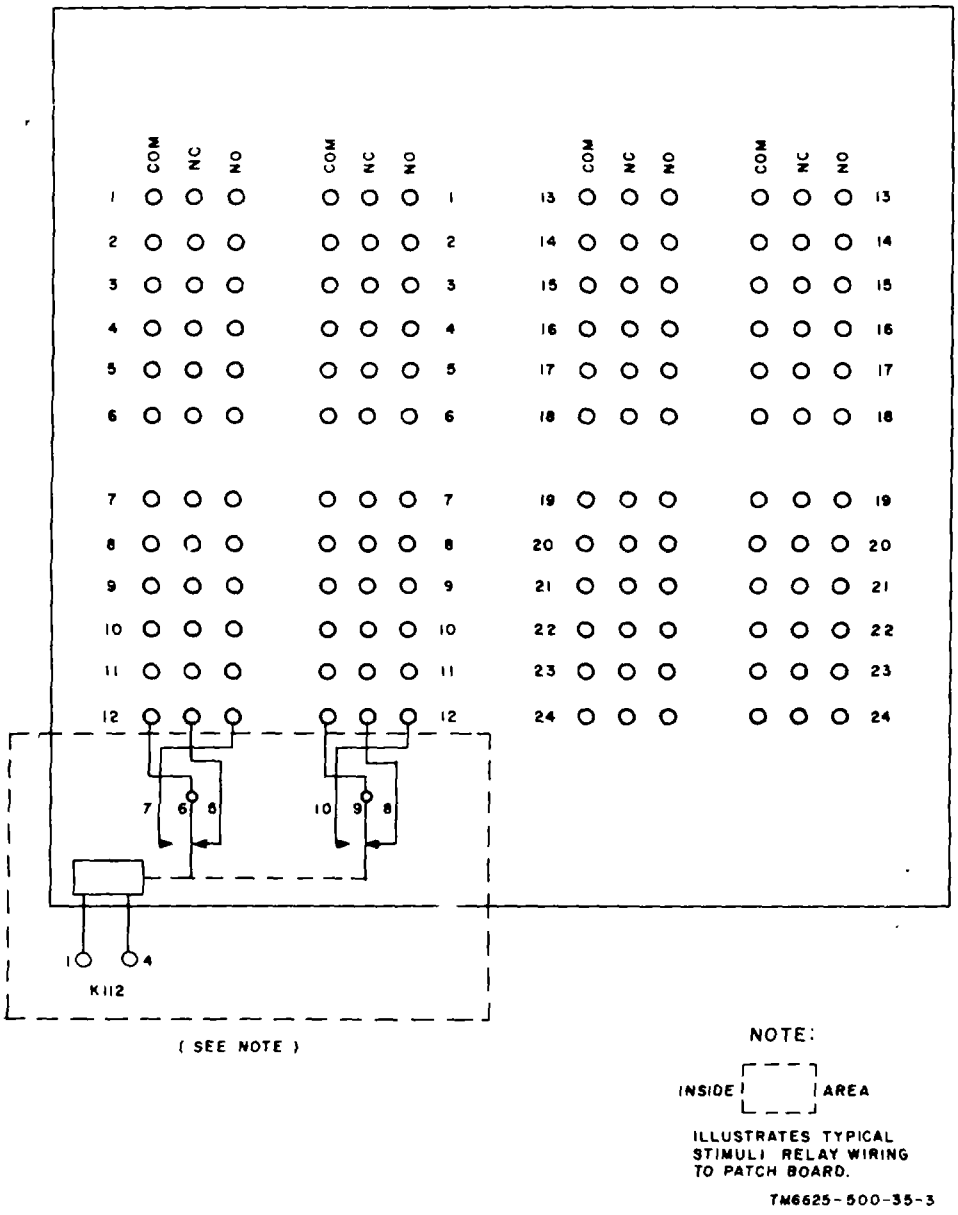


Figure 18. Slave Unit, Test Set MX-3844/GSM-72 left rear patch board.

screws located at the bottom of the slave unit housing.

(2) Remove the four chassis mounting screws from the front panel of the slave unit.

(3) Grasp the two front panel handles and pull the slave unit chassis out in a forward direction.

(4) Replace F102, using the same procedure as for F701(para 38*a*).

(5) Replace the slave unit chassis in the housing and secure the

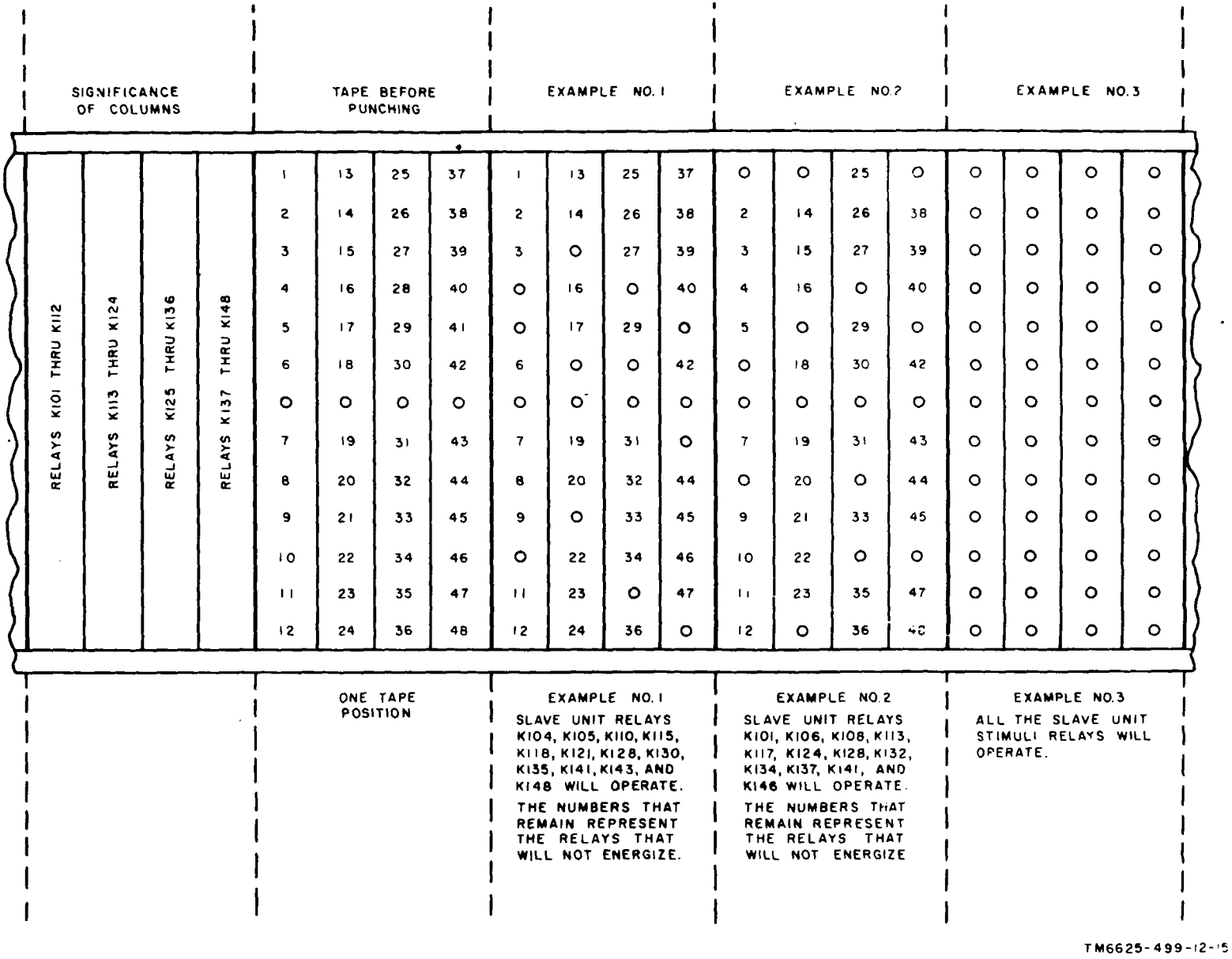


Figure 19. Slave Unit, Test Set MX-3844/GSM-72 program tape.

two bottom chassis locking screws.

(6) Replace the four chassis mounting screws in the front panel.

55. Replacement of Indicator Lamps and Lenses

(fig. 9)

The replacement procedures for the slave unit indicator lamps and lenses are identical with those for the test set (para 40).

56. Slave Unit, Test Set MX-3844/GSM-72 Tape Reader Lubrication

(fig. 20)

The lubrication procedures for the slave unit tape reader are identical with those for the test set (para 41) except that there is no motor cover removal.

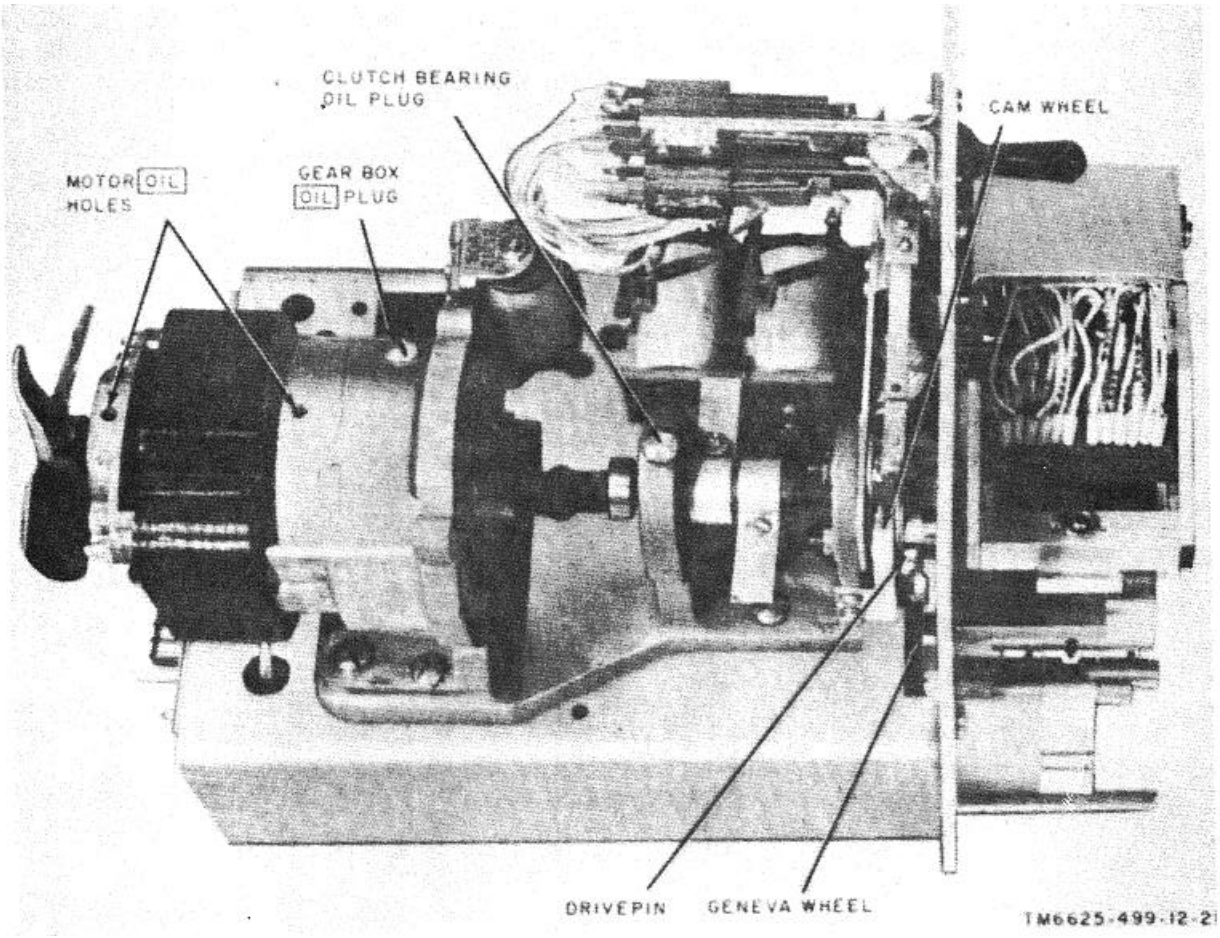


Figure 20. Slave Unit, Test Set MX-3844/GSM-72 lubrication points.

Section II. TEST SET SUBASSEMBLY MX-3845/GSM-72

57. Purpose of Test Set Subassembly MX-3845/GSM-72

The voltage module is an internally contained accessory used with the test set, and provides the test set with the capability of measuring ac and dc voltages in a range from 0.5 to 500 volts with an input impedance of 20,000 ohms per volt.

58. Description of Test Set Subassembly MX-3845/GSM-72

(fig. 21)

The voltage module is a plug-in assembly internally contained within the test set metal case. It measures 5 inches high, 4 inches wide, and 6 inches deep and is located at the left side of the test set at the rear of the relay assembly.

59. Operation of Test Set Subassembly MX-3845/GSM-72

a. Install the voltage module within the test set as follows:

(1) Remove the left side panel of the test set by removing the four securing screws.

(2) Line up the plug (P103B) on the voltage module with the jack (J103) on the relay assembly and gently press the voltage module into the relay assembly.

(3) Secure the voltage module with a screw in the top corner at the rear and in the bottom corner at the front, with a sliding clamp.

b. Once installed operation of the voltage module is controlled by the program tape and is completely automatic.

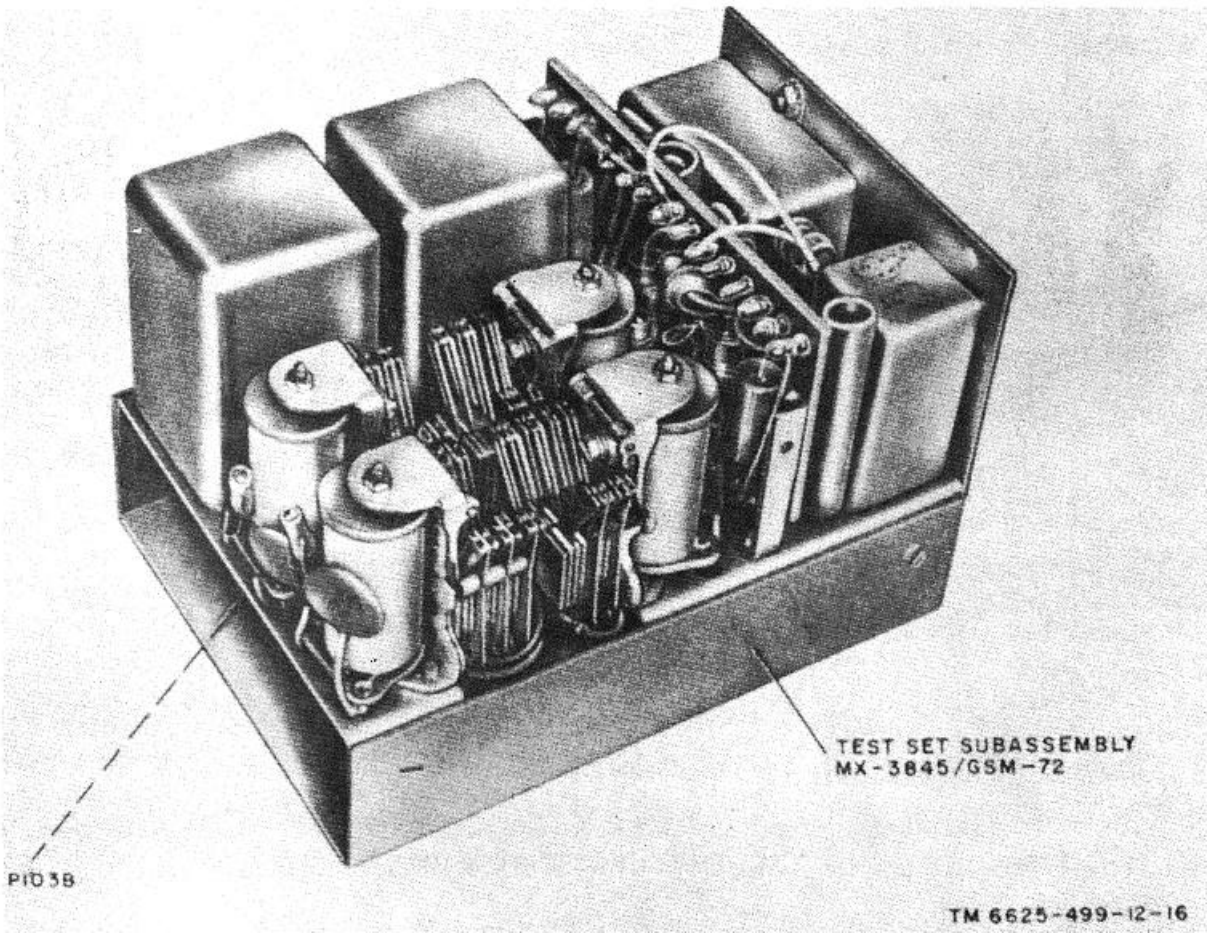


Figure 21. Test Set Subassembly MX-3845/GSM-72.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

60. Disassembly of Equipment

To prepare the test set and its auxiliary equipment for shipment and storage, proceed as follows:

a. Disconnect the power cord of the test bet from the line receptacle. Form it into a coil and tape it to the rear of the test set.

b. Disconnect the power cord of the slave unit from the line receptacle. Form it into a coil and tape it to the rear of the slave unit.

c. Disconnect the cable connecting the slave unit to the test set. Form it into a coil and tape it to the rear of the slave unit.

d. Disconnect all cables from the test set, form them into coils, and tie each in three places.

e. Secure the test set and the slave unit brush assemblies by the use of the brush assembly release or latch on each unit.

61. Handling, Storage, and Disposal of Radioactive Material

Follow the procedures for safe handling, storage, and disposal of radioactive material as directed by:

a. TB SIG 225.

b. AR 40-580.

c. AR 755-380.

62. Repackaging for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Use the procedure outlined below whenever circumstances permit. The information concerning the original packaging (para 9) will also be helpful.

a. Materials Required. The following materials are required for packaging the test set and its auxiliary equipment. For stock numbers of materials, consult SB 38-100.

Material	Quantity
Waterproof paper	40 sq. ft
Waterproof tape	22 ft
Corrugated cardboard	25 sw ft
Gummed tape	22 ft
Wooden box	30 x 27 x 22
Wooden box	24 x 19 x 15

b. Packaging. Package the items of the test set as outlined below.

(1) *Test set.* Cushion the test set on all surfaces with pads of filler material. Place the cushioned equipment within a wrap of corrugated cardboard. Secure the wrap with pressure-sensitive tape.

(2) *Slave unit.* Cushion the slave unit on all surfaces with pads of filler material. Place the cushioned equipment within a wrap of corrugated cardboard. Secure the wrap with pressure-sensitive tape.

(3) *Miscellaneous equipment.* Package the manual punch and the spare parts separately to assure protection. Use filler material to cushion each item as required. Consolidate the miscellaneous equipment within a wrap of corrugated cardboard.

c. Packing. Pack each of the consolidated packages and the miscellaneous equipment in separate wooden boxes. Fill the excess spaces in the boxes with pads of corrugated cardboard and filler material. Nail the covers on the boxes and apply four bands of metal strapping around each box.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

63. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The demolition procedures given in paragraph 64 will be used to prevent the enemy from using or salvaging this equipment.

64. Methods of Destruction

Any or all of the methods of destruction given below may be used. The time available will be the major determining factor for the methods to be used in most instances when destruction of the equipment is undertaken. The tactical situation also will determine in what manner the destruction order will be carried out. It is preferable to demolish completely some critical unit of the equipment (tape reader) than to partially destroy all of the units.

a. Smash. Smash the interior units of the equipment; use sledges, axes, hammers, and any other heavy tools available.

(1) Smash the controls, tubes, switches, meters, and spare parts.

(2) Remove the assemblies from the cabinet. Smash as many of the exposed parts as possible.

b. Cut. Cut the power cords and cables in several places; use axes, hand axes, machetes or similar tools. If time permits, slash the internal cabling and cable harnesses.

c. Burn. Burn the technical manuals first. Burn as much of the equipment as is flammable; use gasoline, oil, flame throwers, etc. Pour gasoline on the cut cables and internal wiring, and ignite. Pour gasoline on the spare parts and ignite. Use incendiary grenades to complete the destruction of the unit interiors.

Warning: Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

d. Explode. Use explosives to complete demolition or to cause maximum damage before burning when time does not permit complete demolition by other means. Powder charges, fragmentation grenades, or incendiary grenades may be used. Incendiary grenades usually are most effective if destruction of small parts and wiring is desired. Place the explosive within the units. Clear the area before explosion takes place.

e. Dispose. Bury or scatter the destroyed parts in slit trenches, or throw them into nearby streams. This is particularly important if a number of parts have not been completely destroyed.

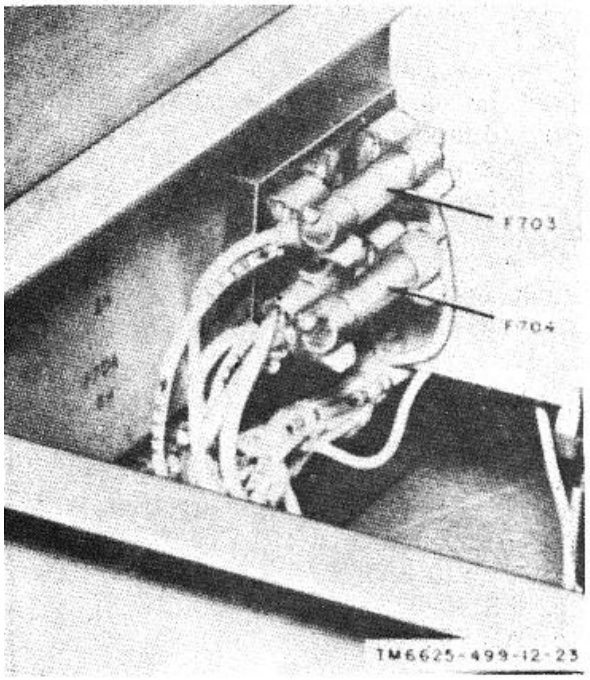


Figure 22. Location of fuses F703 and F704.

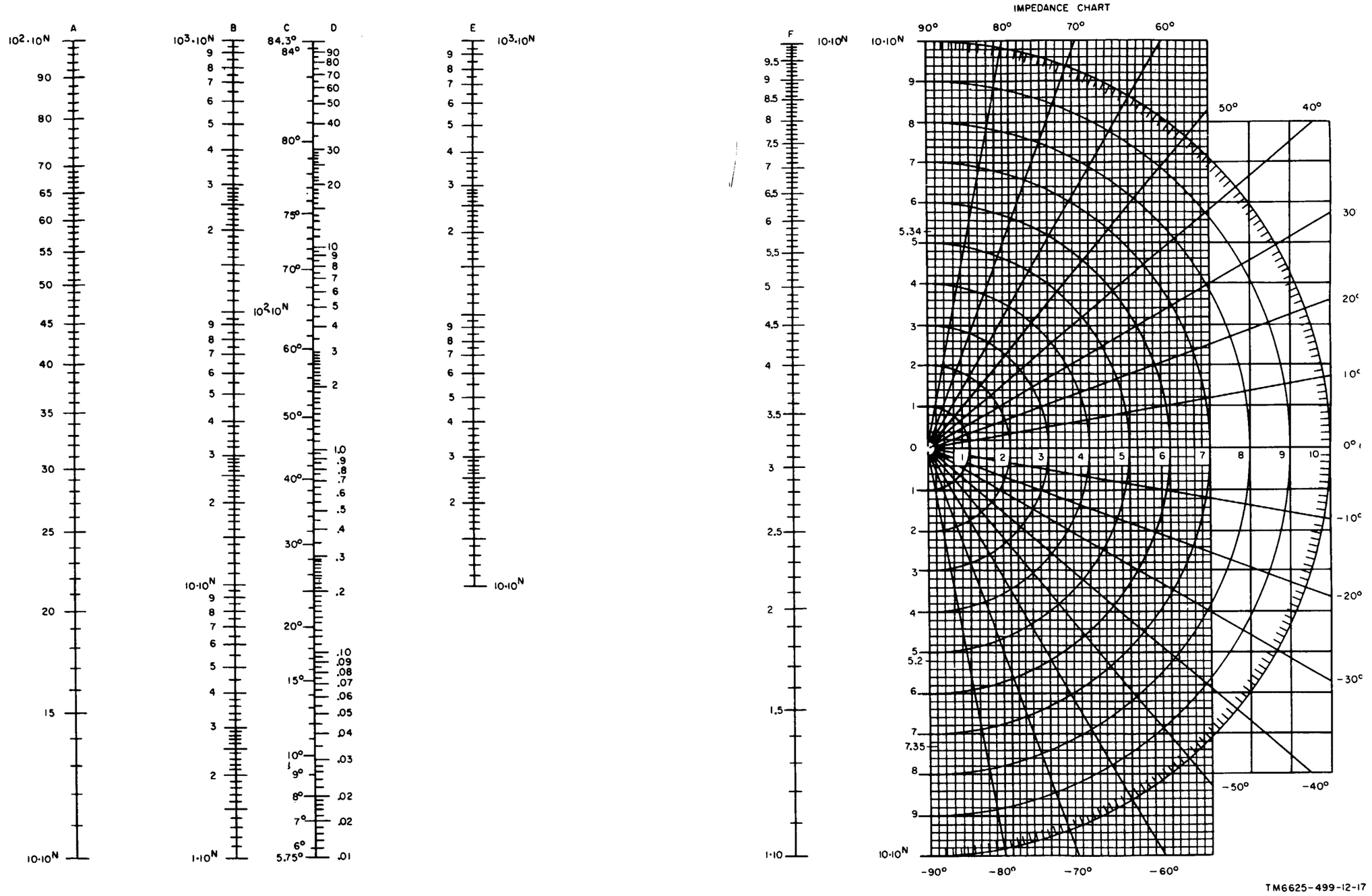
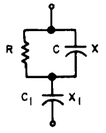


Figure 23. Series-parallel nomograph.

EXAMPLE

GIVEN THE SERIES PARALLEL CIRCUIT (TYPE A)



R=300 C_1 = 0.22UF N=1

C=0.016UF f=16KC

USING A REACTANCE SLIDE RULE, NOMOGRAPH OR THE FORMULA $X_C = \frac{1}{2\pi fC}$ COMPUTE X AND X_1

$$X = \frac{1}{6.28 \times 16 \times 10^{3} \times .016 \times 10^{-6}}$$

$$X = \frac{1}{1.6 \times 10^{-3}} = 625$$

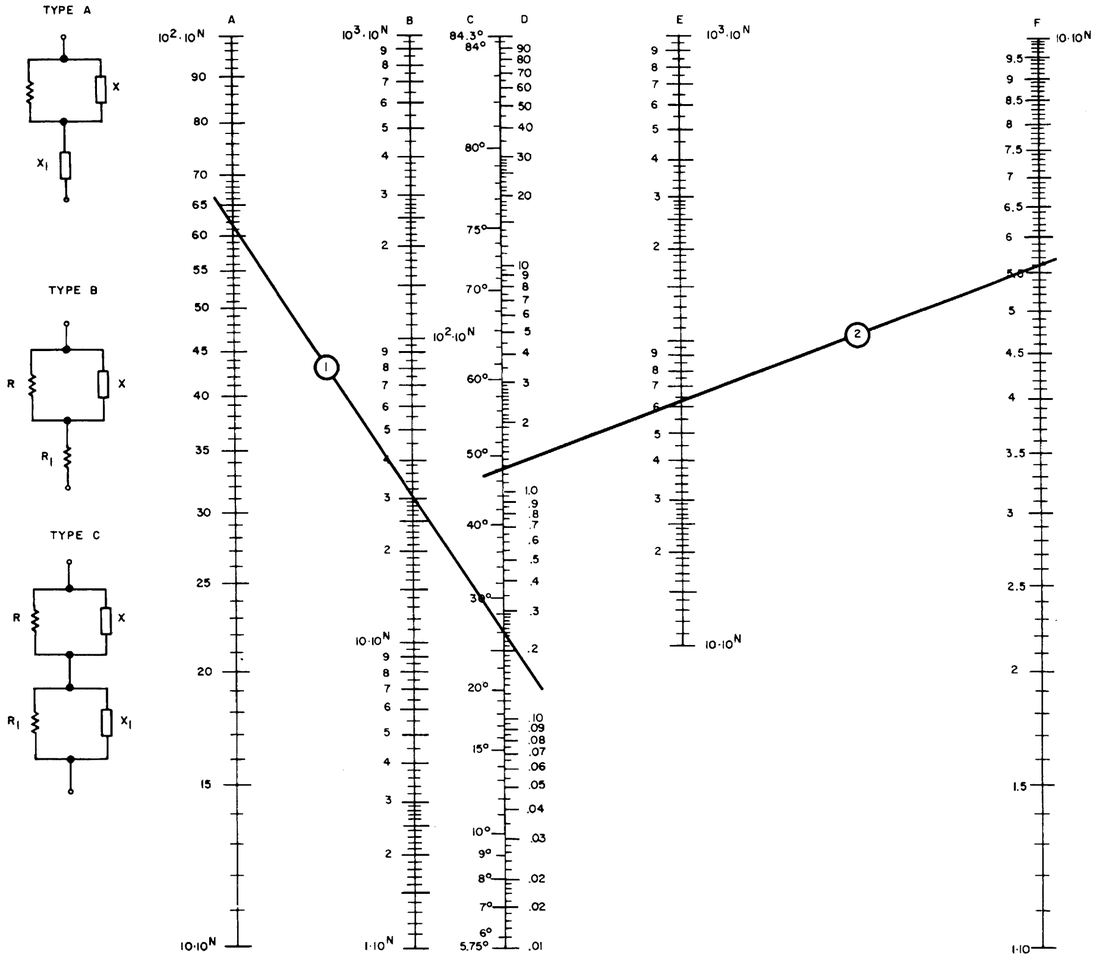
$$X_1 = \frac{1}{6.28 \times 16 \times 10^{3} \times .22 \times 10^{-6}}$$

$$X_1 \quad \frac{1}{2.2 \times 10^{-2}} = 45$$

STEP

1. = 625
2. = 300
3. = PLOT LINE ① C=26°
4. = .25 ADD 1 = 1.25
5. = 1.25
6. = 625
7. = PLOT LINE ② F = 5.6×10^{N}
8. = DRAW LINE ③, DIRECTION EQUAL TO 26°
9. = RADIUS OF CIRCLE EQUALS 5.6
10. = X_1 = .45 X 10^{N} (LINE ④)
11. = 5.4
12. = 5.4 X 1.414 = 7.63
13. = RADIUS OF CIRCLE EQUALS 7.63
14. = DRAW LINE ⑤. LINE ⑤ EQUALS 2.2 X 10^{N}

THE VALUE OF STANDARD RESISTANCE TO BE PROGRAMMED



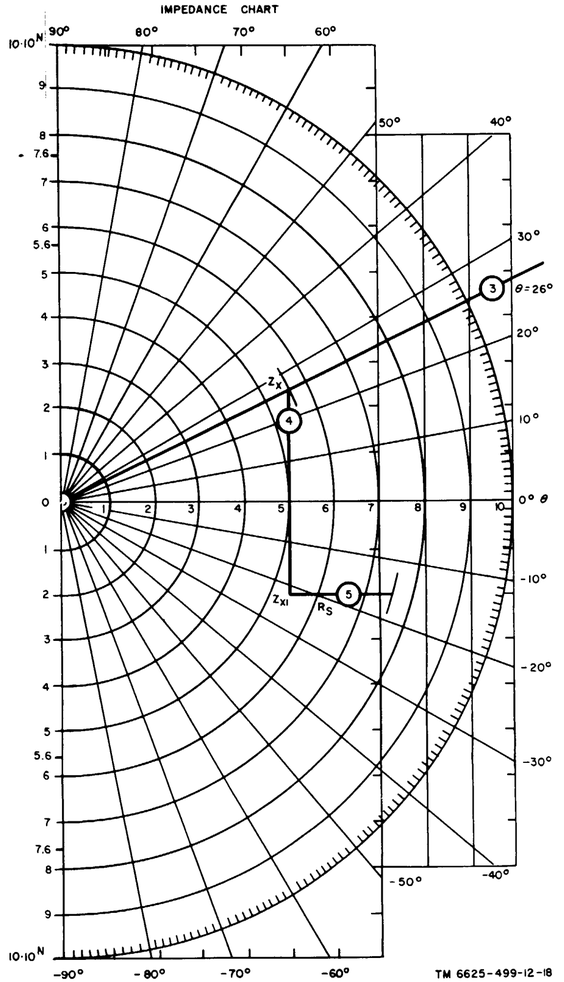


Figure 24. Impedance computation with series-parallel nomograph.

APPENDIX I

REFERENCES

Following is a list of applicable publications available to the operator and unit repairman of Test Set, Electronic Circuit AN/GSM-72, Slave Unit, Test Set MX-3844/GSM-72, and Test Set Subassembly MX-3845/GSM-72.

AR 40-580	Control of Hazards to Health From Radioactive Materials.
AR 755-380	Disposal of Unwanted Radioactive Materials.
DA Pamphlet 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army.
TB SIG 225	Identification and Handling of Radioactive Signal Items.
TM 9-213	Painting Instructions for Field Use.
TM 38-750	The Army Equipment Record System and Procedures.

APPENDIX II

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

a. This appendix assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

(1) *Part or component.* This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and the subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) is listed in disassembly order or alphabetical order.

(2) *Maintenance function.* This column indicates the various maintenance functions allocated to the echelons.

(a) Service. To clean, to preserve, and to replenish lubricants. (b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect. To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) *Replace.* To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.

(f) Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(j) Rebuild. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all

parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.

(3) *1st, 2d, 3d, 4th, 5th echelons.* The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts .will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

(4) *Tools required*. This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

(5) Remarks. Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding column.

c. Columns in the allocation of tools for maintenance functions are as follows:

(1) *Tool's required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) *1st, 2d, 3d, 4th, 5th echelon.* The dagger (†) indicates the echelons normally allocated the facility.

(3) *Tool code.* This column lists the tool code assigned.

2. Maintenance by Using Organizations

When this equipment is used by signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

Section II. MAINTENANCE ALLOCATION CHART, TEST SET, ELECTRONIC CIRCUIT AN/GSM-72

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1	2	3	4	5	TOOLS REQUIRED	REMARKS
TEST SET, ELECTRONIC CIRCUIT AN/GSM-V2								
	service		X				14	Lubrication of stepping switches
	adjust				X		2, 4, 5, 6, 7, 13	
						X	1, 2, 4, 6, 13	Tape head
	inspect		X				11	Operational Inspection Lubrication of Geneva Mechanism
	test					X	8	
					X		9	
					X	X	1 thru 14	
						X		Depot Facilities
	replace				X		11,12	
	repair				X	X	11,12	
	align				X			Mechanical tape assembly, and Power Supply
	calibrate					X	3	Depot Facilities
	overhaul					X		Depot Facilities
BRIDGE, IMPEDANCE OA-3672/GSM-72	test					X		
	replace				X		11 12	
	repair				X		2,4,5,6,7,9,10,11,12	
	align					X		Depot Facilities
	calibrate					X		Depot Facilities
	overhaul					X		
TERMINAL BOARD SUBASSEMBLY	replace				X		11	
	repair				X			
CABLE, ASSEMBLY TEST	replace				X		11	
	repair				X		11,12	
CABLE	replace				X			
CONNECTOR	replace				X			
MAIN FRAME	adjust				X			
	test				X			
	replace				X		11,12	
	repair				X		3 thru 13	
	rebuild					X		Depot Facilities
CABLE ASSEMBLY	replace					X		
	repair				X			
MANUAL TAPE PUNCH ASSEMBLY TL-681 'GSM-72	replace				X		11	
	repair				X		11,12	
METER ASSEMBLY	replace				X		11	
	repair					X	11,12	
POWER SUPPLY ASSEMBLY	replace				X		11	
	repair				X		11,12	

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1	2	3	4	5	TOOLS REQUIRED	REMARKS
TEST SET, ELECTRONIC CIRCUIT AN/GSM-72 (contd)								
RELAY ASSEMBLY	replace				X		11	
STEPPING SWITCH ASSEMBLY	replace				X		11	
	repair				X		11,12	
	overhaul					X		Depot Facilities
TERMINAL BOARD ASSEMBLY	replace				X		11	
	repair				X		11	
TRANSISTOR, DIODE ASSEMBLY	replace				X		11	
	repair				X		11	
TUBE SOCKET ASSEMBLY	replace				X		11	
	repair				X		11,12	
VARIABLE CAPACITOR ASSEMBLY	replace				X		11	
MAIN RELAY ASSEMBLY	replace				X		11	
	repair				X		4,11	
	overhaul					X		Depot Facilities
CABLE ASSEMBLY	replace				X		11,12	
	repair				X		11,12	
MULTIPLIER, TEST POINT MX-4273/GSM-72	inspect		X				14	
	test				X			
	replace				X		5,4,10,11,14	
	repair				X			
	overhaul					X		Depot Facilities
CABLE ASSEMBLY	replace				X		5,4,10,11,14	
	repair				X		5,4,10,11,14	
PIN SELECTOR ASSEMBLY	replace				X		11	
	repair				X		11,12	
	overhaul					X		Shop Facilities
CABLE ASSEMBLY	replace				X		11,12	
	repair				X		11,12	
NIXIE NUMBER INDICATOR TUBE ASSEMBLY	replace				X		11	
	repair				X		11,12	
	overhaul					X		Shop Facilities
SELECTOR SWITCH ASSEMBLY	replace				X		11	
	repair				X		11,12	
	overhaul					X		Shop Facilities
TERMINAL BOARD COMPONENT ASSEMBLY	replace				X		11,12	
	repair				X		11,12	
	overhaul					X		
RESISTANCE SELECTOR ASSEMBLY	service		X				14	
	replace				X		11	
	repair				X		11,12	
	overhaul					X		

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOLS REQUIRED	REMARKS
TEST SET, ELECTRONIC CIRCUIT AN/GSM-72 (contd)								
CABLE ASSEMBLY	replace				X		11	
	repair				X		11,12	
NIXIE NUMBER INDICATOR TUBE ASSEMBLY	replace				X		11	
	repair				X		11,12	
SELECTOR SWITCH ASSEMBLY	service		X				14	
	replace				X		11	
	repair				X		11,12	
TERMINAL BOARD COMPONENT ASSEMBLY	replace				X		11	
	repair				X		11,12	
SOCKET SELECTOR ASSEMBLY	service		X				14	
	replace				X			
	repair				X		4,5,10,11	
	overhaul					X		Depot Facilities
CABLE ASSEMBLY	replace				X		11	
	repair				X		11,12	
CONNECTOR	replace				X	11		
	repair				X	11		
SELECTOR SWITCH ASSEMBLY	service		X					Lubrication
	replace				X			
	repair				X			
	overhaul					X		
SOCKET ASSEMBLY	replace				X		11,12	
	repair				X		11,12	
TERMINAL BOARD COMPONENT ASSEMBLY	replace				X		11	
	repair				X		4,5,11,12	
SWITCH ASSEMBLY	replace				X		11	
	repair				X		4,5,11,12	
TAPE READER	service		X				14	Lubricate cam and Geneva mechanism
	adjust		X					
	test				X			
	replace				X			
	repair				X		4,11	
	align				X		11,12	Mechanical
	overhaul					X		Depot Facilities
BRUSH BLOCK ASSEMBLY	replace				X		11	
	repair					X		Depot Facilities
	overhaul					X		Depot Facilities
CABLE	replace				X		4,5,11	
	repair				X		11,12	
DRIVE MOTOR ASSEMBLY	replace				X		11,12	
	repair				X		11,12	
	rebuild					X		Shop Facilities
	overhaul					X		

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOLS REQUIRED	REMARKS
TEST SET, ELECTRONIC CIRCUIT AN/GSM-72 (contd)								
RELAY ASSEMBLY	replace				X		11	
	repair				X		11,12	
TAPE DRIVE ASSEMBLY	replace				X		11,12	
	repair					X	11,12	
	overhaul					X		Depot Facilities
TERMINAL BOARD ASSEMBLY	replace				X		11	
	repair				X		11,12	
TERMINAL BOARD COMPONENT ASSEMBLY	replace				X		4,5,11,12	
	repair				X		4,5,11,12	
	overhaul					X		
TEST FACILITIES KIT MK-645/GSM-72	inspect				X			
	test				X	X	4,7	
	replace				X	X	11	
	repair				X	X	4,7,11	
FIXTURE, ELECTRICAL CONTACT MX-3944/GSM-72	inspect				X			Visual
	test				X	X	4,7	
	replace				X	X	11	
	repair				X		4,7,11	
TEST SET, ELECTRONIC CIRCUIT TS-1708/GSM-72	service		X				14	
	adjust				X		4,5,6,7,13	
					X		1,5,6,13	
	test				X		8	
					X		9	
					X	X	10	
	replace				X		11,12	
	repair				X	X	11,12	
	calibrate					X	3	
	overhaul					X		Depot Facilities
AMPLIFIER BRIDGE ASSEMBLY	replace				X		11	
	repair				X		4,5,9,11	
	overhaul					X		Depot Facilities
CASE, IMPEDANCE BRIDGE CY-3421/GSM-72	replace					X	12	
	repair					X	4,5,9,11	
	overhaul					X		Depot Facilities
IMPEDANCE BRIDGE SUBASSEMBLY MX-3875/GSM-72	replace				X		12	
	repair				X		2,4,5,6,7,9,10,11,13	
IMPEDANCE BRIDGE SUBASSEMBLY MX-3846/GSM-72	replace				X		12	
					X		4,7,9,11	

Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS, TEST SET, ELECTRONIC CIRCUIT AN/GSM-72

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOL CODE	REMARKS
TEST SET, ELECTRONIC CIRCUIT AN/GSM-72 (contd)							
ANTHONY PATTERN BRIDGE (COMMERCIAL ITEM NO. 4230 LEEDS NORTHRUP)				+	+	1	CONUS Depots only
FREQUENCY METER AN/TSM-16				+	+	2	
METER TEST SET TS-682( )/GSM-1				+	+	3	
MULTIMETER TS-352/U				+	+	4	
MULTIMETER ME-26/U				+	+	5	
OSCILLOSCOPE AN,/USM-81				+	+	6	
RESISTOR BRIDGE ZM-4/U				+	+	7	
TEST SET, ELECTRON TUBE TV-2/U				+	+	8	
TEST SET, ELECTRON TUBE TV-7/U				+	+	9	
TEST SET, TRANSISTOR TS-1100/U				+	+	10	
TOOL KIT TK-87/U		+		+	+	11	
TOOL KIT TK-88/U				+	+	12	
VOLTMETER, DIGITAL AN/GSM-64				+	+	13	
TOOLS AND TEST EQUIPMENT AVAILABLE TO THE REPAIRMAN USER BECAUSE OF HIS ASSIGNED MISSION		+				14	

Section IV. MAINTENANCE ALLOCATION CHART, SLAVE UNIT, MX-3844/GSM-72

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOLS REQUIRED	REMARKS
SLAVE UNIT, TEST SET MX-3844/GSM-72								
	service		X				5	
	replace				X	X	1,3	
	repair				X	X	1,2, ,4	
	rebuild					X	1,2,3,4	
	overhaul					X		Depot Facilities
CHASSIS ASSEMBLY	service		X				5	
	replace				X	X	1,2,4,4	
	repair				X	X	1,2,3,4	
	rebuild					X	1,2,3,4	
PANEL ASSEMBLY	repair				X		1,3	
TAPE READER	repair				X		1,3	

Section V. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS, SLAVE UNIT, TEST SET, MX-3844/GSM-72

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOL CODE	REMARKS
SLAVE UNIT, TEST SET MX-3844( )/GSM-72 (continued)							
MULTIMETER TS-352/U				+	+	1	
MULTIMETER ME-26/U				+	+	2	
TOOL KIT, RADAR AND RADIO REPAIRMAN TK-87/U				+	+	3	
TOOL KIT, SUPPLEMENTARY, RADAR AND RADIO REPAIR TK-88/U				+	+	4	
TOOLS AND TEST EQUIPMENT AVAILABLE TO THE REPAIRMAN USER BECAUSE OF HIS ASSIGNED MISSION							

Section VI. MAINTENANCE ALLOCATION CHART, TEST SET SUBASSEMBLY MX-3845/GSM-72

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOLS REQUIRED	REMARKS
TEST SET, SUBASSEMBLY MX-3845/GSM-72	service		X				3	Preventive maintenance
	inspect				X			Visual
	test				X		1	
						X	1	
	replace				X		2	Lamps only
	repair				X		2	
	rebuild					X		Depot facilities
	overhaul					X		Depot facilities

Section VII. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS, TEST SET, ELECTRONIC CIRCUIT AN/GSM-72

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	ECHELON 1 •	2 •	3 •	4 •	5 •	TOOL CODE	PROC SERV	TYPE CLASS	REMARKS
MX-3845/GSM-72 (continued)									
MULTIMETER TS-352/U				+	+	1	ARMY	STD A	
TOOL KIT, RADAR AND RADIO REPAIRMAN TK-87/U				+	+	2	ARMY	STD A	
TOOL AND TEST EQUIPMENT NORMALLY ASSIGNED USER-REPAIRMAN FOR HIS ASSIGNED MISSION		+				3			

APPENDIX III
BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

This appendix lists items supplied for initial operation and for running spares. The list includes tools, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

2. Columns

Columns are as follows:

a. Federal Stock Number. This column lists the 11-digit Federal stock number.

b. Designation by Model. Not used.

c. Description. Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity Authorized. Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spare Items" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand y the operator for maintenance of the equipment.

g. Illustrations. The "Figure No." column lists the figure and reference numbers used for identification of the items in the illustration.

Section II. FUNCTIONAL PARTS LIST, TEST SET, ELECTRONIC CIRCUIT AN/GSM-72

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
6625-064-5165		TEST SET, ELECTRONIC CIRCUIT AN/GSM-72: Physical characteristics electrical data: input 110 v, frequency 50 to 60 cps 200 watts, dim. data; 17 in w x 23 1/2 in h x 17 in d, requires a perforated tape to test circuits under test, special feature: volt-ohm-meter is incorporated on front panel for direct read out of circuit under test, resistance 1 ohm to 9.99 meg ohms, tolerance; less than or greater than ±1%, 5%, 10%, 20%, insulation resistance; 10,000 ohms to 10,000 meg ohms at 500 v, impedance; 50 ohms to 100K ohms, tolerances less than or greater than ±1%, 5%, 10% 20%; Lavoie Labs Inc. part No. K00000308		NIX			
		ITEMS COMPRISING AN OPERABLE EQUIPMENT					
Ord thru AGC		TECHNICAL MANUAL TM 11-6625-499-12			2		
5120-857-C918		BURNISHER, CONTACT HAND: 3 in lg x 3/16 in wd x 0.007 in thk w/ins handle; Neuses Inc. No. 3-316 (Not mounted)			1	3	
6625-064-5167		IMPEDANCE MEASURING GROUP OA-3672/GSM-72: (Installed in equip)		NX	1	1	
6625-064-5129		TAPE PUNCH, MANUAL TL-681/GSM-72: (Not installed)		NX	1	1	
6625-064-5166		TEST SET, ELECTRONIC CIRCUIT TS-1708/GSM-72 (Installed in equip)		NX	1	1	
5120-198-5401		WRENCH, SOCKET HEAD SCREW: L shape; 0.05 in across flats; Fed Spec GGG-W-652, Type 1, Class A (Not mounted)			1	1	
5120-198-5398		WRENCH, SOCKET HEAD SCREW: 1/16 in across flats; L shape; Fed Spec GGG-W-62, Type 1, Class A ('Not mounted)			1	1	
5120-224-2504		WRENCH, SOCKET HEAD SCREW: L shape; 5/64 in across flats; Fed Spec GGG-W 652, Type 1, Class A (Not mounted)			1	1	
		IMPEDANCE MEASURING GROUP OA-3672/GSM-72					
6625-064-5128		CASE, IMPEDANCE BRIDGE CY-3421/GSM-72: (Installed in equip)		NX	1	1	
6625-054-5126		IMPEDANCE BRIDGE SUBASSEMBLY MX-3846/GSM-72: (Installed in equip)		NX	1	1	
6625-064-5127		IMPEDANCE BRIDGE SUBASSEMBLY MX-3875/GSM-72: (Installed in equip)		NX	1	1	
		RUNNING SPARE ITEMS					
5960-188-3564		ELECTRON TUBE: MIL type OA2 (Not mounted)			2	2	

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/GSM-72 (continued)					
5960-284-9285		ELECTRON TUBE: MIL type 2D21 (Not mounted)			2	2	
5960-262-0190		ELECTRON TUBE: MIL type 6AB4 (Not mounted)			1	2	
5960-262-0152		ELECTRON TUBE: MIL type 6AU6 (Not mounted)			1	2	
5960-188-0880		ELECTRON TUBE: MIL type 6X4 (Not mounted)			1	2	
5960-166-7662		ELECTRON TUBE: MIL type 12AT7 (Not mounted)			1	2	
5960-736-0106		ELECTRON TUBE: MIL type 12B4A (Not mounted)			1	2	
5960-167-0389		ELECTRON TUBE: MIL type 5651 (Not mounted)			1	2	
5960-256-0001		ELECTRON TUBE: MIL type 5886 (Not mounted)			1	2	
5960-583-1518		ELECTRON TUBE: MIL type 6844A (Not mounted)			2	2	
5920-296-1519		FUSE, CARTRIDGE: MIL type FO2A250V5A (Not mounted)			5	2	
5920-281-0209		FUSE, CARTRIDGE: MIL type F02B3ROOA (Not mounted)			5	2	
5920-280-4465		FUSE, CARTRIDGE: MIL type F02G1ROOA (Not mounted)			5	2	
5920-014-5511		FUSE, CARTRIDGE: MIL type FO2G2ROOA (Not mounted)			5	2	
6240-179-1811		LAMP, GLOW: GE No. NE-2 (Not mounted)			1	2	
6240-155-7857		LAMP, INCANDESCENT: Type AN 3140-328 (Not mounted)			4	2	

Section III. FUNCTIONAL PARTS LIST, SLAVE UNIT, TEST SET MX-3844/GSM-72

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
6625-064-5124		SLAVE UNIT, TEST SET MX-,844/GSM-72: When added to TEST SET, ELECTRONIC CIRCUIT TS-1708/GSM-72 it adds to switching capability to the circuits undergoing test or interjects a stimuli: to these circuits		NX		17	
		ITEMS COMPRISING AN OPERABLE EQUIPMENT					
Ord thru AGC		TECHNICAL MANUAL TM 11-6625-499-12			2		
		RUNNING SPARE ITEMS					
5920-296-1519		FUSE, CARTRIDGE: Bussman part No. 3AGMTH5 (Not mounted)			2	2	
5920-280-4960		FUSE, CARTRIDGE: Bussman part No. 3AGC2 (Not mounted)			2	2	
6240-223-9100		LAMP, GLOW: GE part No. NE-51 (Not mounted)			2	2	
6240-155-7857		LAMP, INCANDESCENT: MIL type AN 3140-328 (Not mounted)			1	2	
6240-155-7836		LAMP, INCANDESCENT: MIL type MS25237-327 (Not mounted)			6	2	

Section IV. FUNCTIONAL PARTS LIST, TEST SET SUBASSEMBLY MX-3845/GSM-72

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
6625-064-5125		TEST SET SUBASSEMBLY MX-3845/GSM-72: enables TEST SET, ELECTRONIC CIRCUIT TS-1708/GSM-72 to measure ac or dc voltages; (Installed in equip)		NX		21	
		ITEMS COMPRISING AN OPERABLE EQUIPMENT					
Ord thru AGC		TECHNICAL MANUAL TM 11-6625-499-12			2		
		RUNNING SPARE ITEMS					
6240-151-4914		LAMP, INCANDESCENT: GE part No. 10S6/10; (Not mounted)			1	2	

By Order of 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.

Distribution:

To be distributed in accordance with DA Form 12-32, Section II (Unclas) requirements for Nike-Ajax and Nike-Hercules-TM-Test Equipment (SigC).

☆ U.S. GOVERNMENT PRINTING OFFICE : 1987 0 - 201-421 (71225)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

TM 11-6625-499-12 TEST SET, ELECTRONIC CIRCUIT AN/GSM-72, SLAVE UNIT, TEST SET MX-3844/GSM-72, AND TEST SET SUBASSEMBLY MX-3845/GSM-72-1963

PIN: 020809-000