TM 11-2151

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

AUDIO LEVEL METER ME-71A/FCC

This copy is a reprint which includes current pages from Changes 1 thru 4

DEPARTMENT OF THE ARMY • JUNE 1956

TM 11-2151
C 4

CHANGE
NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *5 December 1973*

Organizational, Depot Support, General Support, and Depot Maintenance Manual

AUDIO LEVEL METERS ME-71A/FCC, ME-71B/FCC, AND ME-71C/FCC

TM 11-2151, 26 June 1956, is changed as follows:

Page 1, paragraph 2. 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.

Paragraph 2.1. Delete paragraph 2.1 and substitute:

2.1 Maintenance Forms and Records

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.

2.2 Reporting of Errors

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 forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-C Fort Monmouth, NJ 07703.

Page 45, appendix B. Delete appendix B.

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:

Active Army:

USASA (2)
CNGB (1)
ACSC-E (2)
Dir of Trans (1)
COE (1)
TSG (1)
USAARENBD (1)
USAMB (10)
AMC (1)
MICOM (2)
TECOM (2)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (3)
USASTRATCOM (4)
USASTRATCOM-EUR (5)
USACDCEC (10)
HISA (ECOM) (18)
MDW (1)
Armies (2) except
  Eighth USA (5)
Corps (2)
Svc Colleges (1)
USASESS (30)
USAINTS (3)
USAADS (2)
USAFAS (2)
USAARMS (2)
USAIS (2)
USAES (2)
Instl (2) except
  Ft Gordon (10)
  Ft Huachuca (10)
Ft Carson (10)
AD (2) except
  SAAD (30)
  LBAD (14)
  TOAD (14)
ATAD (10)
Gen Dep (2)
Sig Sec, Gen Dep (5)
Sig Dep (5)
ATS (1)
WRAMC (1)
MAAG (1)
USARMIS (1)
USAERDAA (1)
USAERDAW (1)
Sig FLDMS (1)
Units org under fol TOE:—1 ea.
  7
  11-38
  11-86
  11-87
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  11-247
  11-347
  11-357
  11-377
  11-500 (AA-AC)
  17
  29-11
  29-15
  29-17
  29-21
  29-25
  29-35
  29-37
  29-41
  29-85
  29-86
  29-134
  29-136
  30-25
  30-26
  31-105
  37
  39-51

ARNG: State AG (3).

USAR: None.

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

TM 11-2151
*C 3

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *8 May 1967*

Organizational, DS, GS, and Depot Maintenance Manual
AUDIO LEVEL METERS ME-71A/FCC, ME-71B/FCC, AND ME-71C/FCC

TM 11-2151, 26 June 1956, is changed as follows:

The title of this manual is changed as shown above.

Note. The parenthetical reference to a previous change (example: page 2 of C 1) indicates that pertinent material was published in that change.

Page 1. Delete the note below the title of chapter 1 (page 1 of C 1) and substitute:

Note. Audio Level Meters ME-71B/FCC and ME-71C/FCC are similar to Audio Level Meter ME-71A/FCC. Information in this manual applies to all models unless otherwise specified.

Change "Audio Level Meter ME-71A/FCC" to "Audio Level Meters ME-71A/FCC, ME-71B/FCC, and ME-71C/FCC" in the following places:

Page 1, paragraph 3, line 1.
Page 3, paragraph 9, line 1.
Paragraph 10*a*, line 1.
Figure 2, caption.
Page 6, paragraph 15, heading.
Page 7, figure 5, caption.
Page 8, figure 6, caption.
Page 9, paragraph 18, line 1.
Page 16, figure 9, caption.
Page 17, paragraph 29, line 1.
Page 38, paragraph 52, note, line 1.
Page 41, paragraph 54, line 2.

Change "Audio Level Meter ME-71B/FCC" to "Audio Level Meters ME-71B/FCC and ME-71C/FCC" in the following places:

Page 2, paragraph 7, note 1 (page 2 of C 1).
Page 4, paragraph 12*a*(3) (page 2 of C 1), line 2.
Figure 3, note (page 5 of C 1).
Page 18, figure 10, note 2 (page 5 of C 1).
Page 20, figure 12.1, caption (page 6 of C 1).
Page 23, figure 15.1, caption (page 6 of C 1).
Page 34, figure 25.1, caption (page 7 of C 1).
Page 38, figure 26.1, caption (page 8 of C 1).
Page 45, paragraph 71*e*, line 1 (page 9 C 1).
Page 46, figure 31.1, caption (page 8 of C 1).
Page 46, figure 32.1, caption (page 8 of C 1).

Page 1, section I (page 1 of C 2). Delete section I and substitute:

Section I. GENERAL

1. Scope

This manual contains instructions for the operation, organizational, direct and general support, and depot maintenance of Audio Level Meters ME-71A/FCC, ME-71B/FCC, and ME-71C/FCC. Also included is the functioning of the audio level meters. Throughout the manual, the term *test set* is used to refer to the ME-71A/FCC, ME-71B/FCC, and ME-71C/FCC.

2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions,

*This change supersedes TM 11-6625-220-10P, 5 January 1966, and so much of TM 11-6625-220-20P, 23 October 1958, as pertains to maintenance allocation.

changes, or additional publications pertaining to the equipment. DA Pam 310–4 is an index of current technical manuals, technical bulletins, supply manuals (types 7, 8, and 9), supply bulletins, lubrication orders, and modification work orders 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.

2.1. 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. Reporting of Equipment Manual Improvements. Report of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL–MR–NMP–AD, Fort Monmouth, N.J., 07703.

Page 2, paragraph 5*b* page 2 of C 1). Add subparagraph *c* after subparagraph *b*:

c. Audio Level Meter ME–71C/FCC.

Component	Reqd No.	Length (In.)	Depth (In.)	Height (In.)	Volume (cu ft)	Unit wt (lb)
Audio level meter	1	17	14¾	9¾	1.4	35.5
Running spares	1 set					
TM 11–2151	1					

Delete paragraph 6 (page 2 of C 1) and substitute:

6. Description of Audio Level Meters ME–71A/FCC, ME–71B/FCC, and ME–71C/FCC

Audio Level Meters ME–71A/FCC, ME–71B/FCC, and ME–71C/FCC consist of a panel-chassis assembly (fig. 1 and 1.1) contained in a steel cabinet. All operating controls and connectors are located on the front panel. The power cord is attached to the chassis and extends through a hole at the rear of the chassis. The bayonet-type line fuse is located on the back of the chassis. Audio Level Meters ME–71B/FCC and ME–71C/FCC include a retractable stand secured to the bottom of the cabinet. Use of the retractable stand permits the front panel to be raised approximately 2 inches for better observation.

Paragraph 8.1 (page 2 of C 1). Delete and substitute:

8.1. Differences in Models

a. Audio Level Meters ME–71B/FCC and ME–71C/FCC are identical with Audio Level Meter ME–71A/FCC except for a change in the physical appearance. The addition of a retractable stand, and the component changes are listed in the following chart:

Item	ME–71A/FCC	ME–71B/FCC and ME–71C/FCC
First Mixer V1	Tube type 6SB7Y	Tube type 6BA7
Crystal oscillator second mixer V3	Tube type 6SB7Y	Tube type 6BA7
Tuning oscillator trimmer C34	4 to 80 μμf	3 to 15 μμf
Tuning oscillator capacitor C51	Not used	15 μμf

b. In Audio Level Meter ME–71C/FCC, resistor R7, from pin 3 of first mixer VI to ground, has a resistance value of 240 ohms. Capacitor C41 is connected to the junction of R34, R35, and R43, rather than to pin 6 of cathode follower V8.

Page 4, paragraph 12*a*(1) (page 2 of C 1)

line 1. Change "Meter ME–71A/FCC" to Meters ME–71A/FCC and ME–71C/FCC.

Page 20, figure 12.1 (page 6 of C 1). Add the following note:

NOTE:
IN AUDIO LEVEL METER ME–71C/FCC, THE RESISTANCE VALUE OF R7 IS 240 OHMS.

Page 21, figure 13. Make the following changes:

Change "NOTE" (page 6 of C 1) to NOTES. Delete the existing note and substitute:

NOTES:

1. IN AUDIO LEVEL METERS ME–71B/FCC AND ME–71C/FCC, ADDED CAPACITOR C51 (15 UUF) IS CONNECTED IN PARALLEL WITH C34; CAPACITOR C34 IS 3 TO 12 UUF.
2. IN AUDIO LEVEL METER ME–71C/FCC, CAPACITOR C41 IS CONNECTED TO THE JUNCTION OF R34, R35, AND R43, RATHER THAN TO PIN 6 OF V3.

Paragraph 33*a* (page 6 of C 1), fourth sentence. Change "ME–71B/FCC (fig. 31.1)" to ME–71B/FCC and ME71C/FCC (fig. 31.1 and 32.1).

Page 24, paragraph 35*b* (page 6 of C 1), line 3. Add new sentence after "capacitor C10": This network maintains an rf voltage through an rf decoupling network composed of resistor R8, rf choke L1, and bypass capacitor C10.

Page 33, figure 24. Add notes 12 and 13 after note 11:

12. TERMINAL BOARD REFERENCE SYMBOLS ARE IN ACCORDANCE WITH THE FOLLOWING CHART:

ME–71A/FCC	ME–71B/FCC and ME–71C/FCC
TB1	TB7
TB2	TB8
TB3	TB1
TB4	TB5
TB5	TB6
TB6	TB2
TB7	TB4
TB8	TB3

13. ON AUDIO LEVEL METER ME 71C/FCC, VALUES AT JUNCTION OF C3 AND R5 ON TB2 ARE +55V AND 120K.

Page 34, figure 25.1 (page 7 of C 1). Add note 13 below note 12:

13. AN AUDIO LEVER METER ME–71C/FCC, CHANGE THE VOLTAGE AND RESISTANCE READINGS AT 1ST MIXER V1 AS FOLLOWS:

Pin No.	Voltage	Resistance
1	55V	120K
2	−2.5V	21.5K
3	1.5V	240
4	215V	87K

Page 38, figure 26.1 (page 8 of C 1). Make the following changes:

Change "TBI" callout to TB7.

Add the following note:

NOTE:
IN AUDIO LEVEL METER ME–71C/FCC, C41 IS CONNECTED TO THE BOTTOM TERMINAL OF TB7.

Page 44. Add chapter 5.1 after chapter 5.

CHAPTER 5.1

DEPOT OVERHAUL STANDARDS

70.1. Applicability of Depot Overhaul Standards

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

70.2. Applicable References

a. Repair Standards. Applicable procedures of the depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355–1, TB SIG 355–2, and TB SIG 355–3 form a part of the requirements for testing this equipment.

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

70.3. Test Facilities Required

The following items are required for depot testing:

Nomenclature	Technical manual	Common names
Voltmeter, Meter ME–30A/U	TM 11–6625–320–12	Voltmeter
Signal Generator SG–71A/FCC	TM 11–5088	Signal generator
Digital Frequency, Electronic Counter AN/USM–207	TM 11–6625–700–10	Counter
Signal Generator AN/URM–127	TM 11–6625–683–15	Audio oscillator
600 ohm ¼-watt, noninductive resistor		
Headset HS–30		Earphones

70.4. General Test Conditions

When testing the ME–71A/FCC or ME–71B/FCC (both referred to as audio level meter), observe the following conditions:

a. Conduct the tests at normal room temperature.

b. Before performing the tests, allow for a 15-minute warmup of the equipment.

70.5. Electrical Tests

Perform the electrical tests on the audio level meter as follows:

a. Turn the audio level meter METER switch to CAL. 1. The audio level meter indication should be 0 db ±0.25 db.

b. Adjust the signal generator for a counter indication of 100-kc output and a voltmeter indication of 1-dbm level. Connect a 600-ohm resistor across the INPUT to the audio level meter and connect the output of the signal generator to the audio level meter.

c. Readjust the output of the signal generator for a voltmeter indication of 1 db. Adjust the audio level meter tuning dial for maximum meter indication. The tuning dial indication should be 100 kc ±3 percent.

d. Turn the METER switch to MEAS. Adjust the signal generator in turn to 20, 200, 300, and 500 kc as read on the counter. Adjust the tuning dial of the audio level meter in each case for a maximum meter indication. The reading of the tuning dial should correspond with the input frequency within ±3 percent.

70.6. Meter Accuracy Test

With the signal generator connected as instructed in paragraph 70.5, connect the voltmeter across the INPUT terminals of the audio level meter. At any frequency, vary the input signal from −10 db to +2 db. The reading on the voltmeter and the meter on the audio level meter should agree within ±0.2 db.

70.7. ATTENUATOR DB Switch Accuracy Test

Perform the ATTENUATOR DB switch accuracy tests as follows:

a. Connect the equipment as instructed in paragraph 70.5.

b. Adjust the output level of the signal generator for −60 db as read on the voltmeter. Turn the ATTENUATOR DB switch to −60. The meter on the audio level meter should indicate 0 ±0.5 db.

c. Adjust the output of the signal generator in turn from −50 to +30 db in 10-db steps; use the voltmeter to measure the db reading. At each 10-db step, adjust the ATTENUATOR DB switch one position to correspond with the db input. The meter on the audio level meter must indicate 0 ±0.5 db.

d. After the +30 db reading is obtained (*c* above), set the ATTENUATOR db switch to +40 db. The meter on the audio level meter should indicate −10 db.

70.8. Audio Amplifier Output Level Test

Perform the audio amplifier output level test as follows:

a. Connect the signal generator and a 600-ohm load resistor across the audio level meter binding posts.

b. Adjust the output of the signal generator to 100 kc at 0 db.

c. Connect the audio oscillator to the modulation INPUT CONNECTOR of the audio level meter.

d. Adjust the audio oscillator for a frequency of 400 cycles at 3 volts.

e. An audio signal should be heard in a pair of earphones connected to the PHONES jacks.

Page 45, appendix (page 5 of C 2). Make the following changes:

Change "APPENDIX" to APPENDIX A.

In DA Pam 310–4 title, delete types "4" and "6".

Add the following to the references:

TB SIG 355–1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 355–2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 355–3	Depot Inspection Standard for Moisture and Fungus Resistant Treatment.
TM 11–5088	Generators, Signal SG–71/FCC, SG–71A/FCC, and SG–71B/FCC.
TM 11–6625–320–12	Operator and Organizational Maintenance Manual: Voltmeter, Meter ME–30A/U, and Voltmeters, Electronic ME–30B/U, ME–30C/U and ME–30E/U.
TM 11–6625–683–15	Operator, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Signal Generator AN/URM–127.
TM 11–6625–700–10	Operator's Manual: Digital Readout, Electronic Counter AN/USM–207.

Add appendixes B and C after appendix A.

APPENDIX B

BASIC ISSUE ITEMS

Section I. INTRODUCTION

B–1. General

This appendix lists items for Meter, Audio Level ME–71/FCC, ME-71A/FCC, ME–71C/FCC, the component items comprising it, and the items which accompany it, or are required for installation, operation, or operator's maintenance.

B–2. Explanation of Columns

An explanation of the columns in section II is given below.

a. Source, Maintenance, and Recoverability Codes, Column 1.

(1) *Source code, column 1a.* The selection status and source for the listed item is noted here. The source codes used are:

Code	*Explanation*
A	Applies to assemblies that are not procured or stocked as such but are made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
P	Applies to repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system, and authorized for use at indicated maintenance categories.

(2) *Maintenance code, column 1b.* The lowest category of maintenance authorized to install the listed item is noted here. The maintenance codes used are as follows:

Code	*Explanation*
H	General Support Maintenance
O	Organizational Maintenance

(3) *Recoverability code, column 1c.* The information in this column indicates whether unserviceable items should be returned for recovery or salvage. Recoverability code and its explanation are as follows:

Note. When no code is indicated in the recoverability column, the part will be considered expendable.

Code	*Explanation*
R	Applies to repair parts and assemblies that are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.

b. Federal Stock Number, Column 2. The Federal stock number for the item is indicated in this column.

c. Description, Column 3. The Federal item name, a five digit manufacturer's code, part number, and when required, the model designator (*), which indicates different models of the end equipment, are included in this column.

d. Unit of Issue, Column 4. The unit used as a basis of issue (e.g. ea, pr, ft, yd, etc) is noted in this column.

e. Quantity Incorporated in Unit Pack, Column 5. Not used.

f. Quantity Incorporated in Unit Column 6. The total quantity of the item used in the equipment is given in this column.

g. Quantity Authorized, Column 7. The total quantity of an item required to be on hand and necessary for the operation and maintenance of the equipment is given in this column.

h. Illustration, column 8. Not used.

B-3. Federal Supply Codes

This paragraph lists the Federal supply code with the associated manufacturer's name.

Code	*Manufacturer*
24446	General Electric Co.
81349	Military Specifications

SECTION II. BASIC ISSUE ITEMS LIST

(1) SOURCE CD (A)	(1) MAINT. CD (B)	(1) REC. CODE (C)	BASIC ISSUE ITEMS LIST (2) FEDERAL STOCK NUMBER	MODEL 1	2	3	4	5	6	(3) DESCRIPTION	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY AUTH	(8) ILLUSTRATIONS (A) FIGURE NUMBER	(8) ILLUSTRATIONS (B) ITEM OR SYMBOL NUMBER
A	H	R	6625-545-7949							METER, AUDIO LEVEL ME-71/FCC, ME-71A/FCC, ME-71B/FCC and ME-71C/FCC (This item is nonexpendable)						
										TECHNICAL MANUAL TM 11-215	ea		1			
										Requisition through pinpoint account number if assigned, otherwise through nearest adjutant General facility.						
										NOTE: A quantity of 1 technical manual is authorized with each equipment. Where a valid need exists, additional copies may be requisitioned and kept on hand						
										NOTE: Model column 1 refers to ME-71/FCC; column 2 refers to ME-71A/FCC; Column 3 refers to ME-71B/FCC; and Column 4 refers to ME-71C/FCC						
P	O		5960-262-3763	*	*	*	*			ELECTRON TUBE: 81349; OB2WA	ea		1	1		
P	O		5960-262-0218	*	*	*	*			ELECTRON TUBE: 81349; 5Y3WGTA	ea		1	1		
P	O		5960-228-3765	*	*	*	*			ELECTRON TUBE: 81349; 6J5WGT	ea		1	1		
P	O		5960-228-0053	*						ELECTRON TUBE: 81349; 6L6	ea		1	1		
P	O		5960-100-5268	*	*	*	*			ELECTRON TUBE: 81349; 6BJ7Y	ea		2	1		
P	O		5960-262-0202	*	*	*	*			ELECTRON TUBE: 81349; 6SK7WA	ea		1	1		
P	O		5960-617-6097		*	*	*			ELECTRON TUBE: 81349; 6X8T	ea		1	1		
P	O		5920-474-6125	*	*	*	*			FUSE, CARTRIDGE: 81349; FO202R00A	ea		1	5		
P	O		6240-155-8706	*	*	*	*			LAMP, INCANDESCENT: 24446; 47	ea		1	1		
										NO ACCESSORIES, TOOLS OR TEST EQUIPMENT ARE TO BE ISSUED WITH THIS EQUIPMENT						
										NO BASIC ISSUE ITEMS ARE MOUNTED IN OR ON THIS EQUIPMENT						

APPENDIX C
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C–1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for Meter, Audio Level ME–71/FCC, ME–71A/FCC, ME–71B/FCC and ME–71C/FCC. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C–2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Group numbers correspond to the reference designation prefix assigned in accordance with ASA Y32.16, Electrical and Electronics Reference Designations. They indicate the relation of listed items to the next higher assembly.

b. Component Assembly Nomenclature. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Codes	*Maintenance category*
C	Operator/Crew
O	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section III.

e. Remarks. Self-explanatory.

C–3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements chart are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number.

e. Tool Number. Not used.

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	METER, AUDIO LEVEL ME-71C/FCC	C		C										Visual - external
		O		O									10	Remove dust and moisture - external
			H										1,3,4,7,9	Preventive maintenance - internal
						H							2,5	
										H			8	
											D		1 thru 6,8, 9	
1A	CABLE ASSEMBLY, POWER ELECTRICAL	O												Visual
			O										10	
										C				Replace connector
									H					Fabricate at General Support

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUM
		ME-71/FCC, 71A, 71B, 71C/FCC (continued)		
1	H,D	CRYSTAL RECTIFIER TEST SET TS-268/U	6625-669-1215	
2	H,D	FREQUENCY METER AN/USM-79	6625-668-9749	
3	H,D	MULTIMETER AN/USM-105	6625-581-2036	
4	H,D	SIGNAL GENERATOR AN/USM-25	6625-643-1548	
5	H,D	SIGNAL GENERATOR SG-71/FCC	6625-669-0255	
6	D	TEST SET, ELECTRON TUBE TV-2C/U	6625-669-0263	
7	H	TEST SET, ELECTRON TUBE TV-7/U	6625-820-0064	
8	H,D	TOOL EQUIPMENT TK-21/G	5180-408-2391	
9	H,D	VOLTMETER METER ME-30B/U	6625-643-1670	
10	O	TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE OPERATOR-USER BECAUSE OF HIS ASSIGNED MISSION		

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

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CNGB (1)
OCC-E (7)
Dir/Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAARENBD (2)
USAAESWBD (5)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USCONARC (5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (2)
USAMICOM (4)
USASTRATCOM (4)
USASTRATCOM-EUR (5)
USAESC (70)
USARYIS (10)
MDW (1)
Armies (2) except
Eighth USA (10)
Corps (2)
USAC (3)
1st Cav Div (5)
Svc Colleges (2)
USASCS (60)
USASESCS (60)
USAADS (2)
USAAMS (2)
USAARMS (2)
USAIS (2)
USAES (2)
USATC Armor (2)
USATC Inf (2)
USAECFB (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
USAINTC (5)
Instl (2) except
Fort Hancock (4)
Fort Gordon (10)
Fort Huachuca (10)
WSMR (5)
Fort Carson (25)
Fort Knox (12)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
SHAD (3)
NAAD (5)
SVAD (5)
CHAD (3)
ATAD (10)
SEAD (5)
GENDEPS (2)
Sig Sec GENDEPS (5)
Sig Dep (12)
Sig FLDMS (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREL (2)
USASETAF (5)
Units org under fol TOE
(2 copies each):
7
11-6
11-7
11-38
11-56
11-57
11-85
11-86
11-87
11-95
11-96

11–97
11–98
11–117
11–127
11–155
11–157
11–158
11–237
11–247
11–327
11–347
11–357
11–377
11–500 (GL, GR, KA, RT, RU)
11–587
11–592
11–597
17
29–11
29–15
29–17
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29–25
29–35
29–37
29–41
29–85
29–86
30–25
30–26
31–105
37
39–51

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

USAR: None.

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

AUDIO LEVEL METERS ME-71A/FCC AND ME-71B/FCC

CHANGE No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *12, December 1963*

TM 11-2151, 26 June 1956, is changed as follows:

Note. The parenthetical reference to previous changes (example: "page 5 of C 2") indicates that pertinent material was published in that change.

Page 1, paragraph 1. Delete subparagraph *b*. Add paragraph 1.1 after paragraph 1.

1.1 Index of Publications

Refer to the latest issue of DA Pam 301-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply manuals (types 4, 6, 7, 8 and 9), 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.

Delete paragraph 2 (page 2 of C 1) and substitute:

2. 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. Reporting of Equipment Manual Improvements. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended changes to DA technical manual parts lists or supply manual 7, 8 or 9) will be used for reporting these improvement recommendations. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N. J. 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

Page 10. Delete figure 7 (page 3 of C 1).

Page 11, chapter 3. Make the following changes:

Delete the chapter heading and substitute: OPERATOR AND ORGANIZATIONAL MAINTENANCE.

Delete paragraphs 19 and 20, (page 5 of C 1) and substitute:

19. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the equipment are listed below together with a reference to the paragraphs covering the specific maintenance functions.

a. Daily preventive maintenance checks and services (par. 20.2).

b. Cleaning (par. 20.3).

20. 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 20.1, 20.2, and 20.3 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and

services chart (par. 20.2) outlines functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the *References* column lists the illustrations, paragraphs, or manuals that contain supplementary information. 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 the requirements set forth in TM 38–750.

Add paragraphs 20.1, 20.2, and 20.3 after paragraph 20.

20.1. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the equipment are required daily. Paragraph 20.2 specifies the checks and services that must be accomplished daily and under the conditions listed below.

a. When the equipment is initially installed.

b. When the equipment is reinstalled after removal for any reason.

c. At least once each week if the equipment is maintained in standby condition.

20.2 Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Audio Level Meter ME–71 (*)/FCC.	Inspect the equipment for completeness and satisfactory condition.	TM 11–6625–230–10P.
2	Exterior surfaces	Remove dirt, dust, grease, moisture, and fungus from the exterior of the cabinet, front panel controls, and decibel meter. Inspect painted surfaces for bare spots, rust, and corrosion. Check meter glass and indicator lens for cracks and breaks.	Par. 20.3.
3	Line cord	Inspect line cord for breaks, deterioration, and loose connections.	
4	Easily accessible items	Inspect seating of fuse and indicator lamp.	
5	Controls and indicators	While making operating checks (item 6), observe that mechanical action of each knob, dial, and switch is smooth and free of external and internal binding, and that there is no excessive looseness. Check meter for sticking or bent pointer.	Fig. 1.
6	Operation	Operate the equipment according to the procedures outlined in paragraphs 14 through 17. Be alert for any unusual indications and conditions.	Paragraphs 14 through 17.

20.3 Cleaning

Inspect the exterior of the equipment. The exterior surfaces should be free of dust, dirt, 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 from the cases; use a cloth dampened (not wet) with cleaning compound.

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

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

d. Clean the front panels, meters, and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used.

Page 12. Delete the section heading and substitute: ORGANIZATIONAL MAINTENANCE

Delete paragraph 21, and substitute;

21. Scope of Organizational Maintenance

a. This section contains instructions covering second echelon maintenance of the equipment. It includes instructions for performing preventive and periodic maintenance services to be accomplished by the organizational repairman.

b. Second echelon maintenance of the equipment includes—

(1) Replacement of defective fuses.

(2) Preventive maintenance (pars. 22 through 25).

(3) Troubleshooting (pars. 27 and 28).

(4) Touchup painting (par. 25).

Delete paragraph 22 and substitute:

22. 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 checks and services of the equipment at the periodic service. Preventive maintenance 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.

Delete paragraph 23. (page 5 of C 1) and substitute:

23. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (par. 24) 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 preventive maintenance checks and services 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 a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services performed on it. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

Delete paragraph 24. and substitute:

24. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Interior surfaces	Remove dirt, dust, grease, moisture, and fungus from the interior of the case and exposed surfaces of the chassis (chassis removed from case). Inspect painted surfaces for bare spots, rust, and corrosion.	Fig. 27.
2	Wiring and cabling	Inspect all wiring and cabling for breaks, kinks, strains, cut or frayed insulation, and for proper connections.	Fig. 28.
3	Connectors	Inspect plug PL1 and jacks J1, J2, and J3 for breaks, cracks, deterioration and for bent, loose, and corroded pins.	Fig. 28.
4	Terminal boards	Inspect terminal boards TB1 through TB8 for breaks, cracks, deterioration and for loose and corroded terminals.	Fig. 24.

Sequence No.	Item	Procedure	References
5	Transformers and coils	Inspect transformers T1 through T6 and coils L1 through L9 for loose mountings, broken wires, frayed or cut insulation, and evidence of overheating.	Figs. 26, 26.1, 27, and 28.
6	Mounting	Inspect component mountings on the chassis and front panel for loose missing, and damaged hardware.	Figs. 26, 26.1, 27 and 28.
7	Resistors and capacitors	Inspect resistors and capacitors for loose or corroded leads and poor or broken connections. Check resistors for blistering or discoloration. Check fixed capacitors for bulges, leaks and discoloration. Check variable capacitors for dirt, corrosion and damaged plates.	Figs. 26, 26.1, and 28.
8	Fuse	Check fuse F1 (2-amp) for correct value, proper seating, and physical condition.	
9	Controls and jacks	Check front panel controls and jacks for mechanical action, secure mountings, proper terminal connections, and dirty, corroded or misaligned contacts.	Fig. 1.
10	Switches	Inspect switches SW1 through SW5 for mechanical action and secure mountings. Check for dirty, corroded, and misaligned contacts. Check for damaged rotor segments and wafers.	Figs. 27, and 28.
11	Meter	Inspect meter M1 for damaged case, glass, and pointer.	Fig. 1.
12	Pluckout items	Inspect electron tubes V1 through V12 and crystal unit Y1 for proper seating. Check tube shields and clamps for proper fit and physical condition.	Fig. 27.
13	Publications	See that all pertinent publications are complete, current, and in good serviceable condition.	DA Pam 310–4.
14	Modifications	Check DA Pam 310–4 to determine if new MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	DA Pam 310–4 and TM 38–750.
15	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no overstock, and all shortages must be on valid requisitions.	TM 11–6625–230–10P.

Page 13. Delete paragraphs 25 and 26 and substitute:

25. Cleaning and Touchup Painting Instructions

Remove 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.

26. Locating and Replacing Defective Tubes

Note. Refer to TM 11–6625–230–20P for information concerning replacement of tubes.

a. Locating defective tubes by the tube substitution method is outlined below.

(1) Replace the suspected tubes with new tubes, one at a time, and check the operation of the equipment after each tube substitution. If the test set becomes operative, discard the last tube removed.

(2) If the equipment remains inoperative after each substitution, reinsert the original tubes into their respective sockets and continue to the next stage.

(3) If the equipment remains inoperative after the last substitution has been made, reinsert the original tubes and forward the test set to higher echelon for repair.

b. When replacing defective tubes, make certain that the new tubes are properly seated and that tube shields and clamps are replaced.

Page 14. Delete figure 8. (page 4 of C 1).

Page 15, paragraph 28, chart, item 9. In "Corrective measures" column, delete V2.

Page 45. Add appendix, references after chapter 6.

APPENDIX

REFERENCES

Following is a list of references available to the operator and organizational maintenance personnel of Audio Level Meters ME–71A/FCC and ME–71B/FCC.

DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 4, 6, 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 9–213	Painting Instructions for Field Use.
TM 11–6625–230–10P	Operator's Maintenance Repair Parts and Special Tools List: Meters, Audio Level ME–71/FCC, 71A/FCC, and 71B/FCC.
TM 11–6625–230–20P	Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart for Audio Level Meters ME–71/FCC, ME–71A/FCC, and ME–71B/FCC.
TM 38–750	The Army Equipment Record System and Procedures.

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:

Active Army:

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USASA (2)
CNGB (1)
CSigO (7)
CofT (1)
CofEngrs (1)
CofSptS (1)
TSG (1)
USA CD Agcy (2)
USAMC (5)
USCONARC (5)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (3)
Base Comd (2)
LOGCOMD (2)
USAECOM (7)
USAMICOM (4)
USASCC (4)
MDW (1)
Armies (2)
Corps (2)
USATC AD (2)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
Instl (2) except
  Ft Monmouth (63)
  Ft Hancock (4)
GENDEP (OS) (2)
Sig Sec, GENDEP (5)
Sig Dep (OS) (12)
A Dep (2) except
  Lexington (12)
  Sacramento (28)
  Tobyhanna (12)
  Ft Worth (8)
Svc Colleges (2)
Br Svc Sch (2) except
USMA (2)
WRAMC (2)
USACDEC (2)
USAABELCTBD (2)
USA Trans Tml Comd (1)
Army Tml (1)
USAOSA (1)
POE (1)
AMS (1)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
USA Elct Mat Agcy (12)
Chicago Proc Dist (1)
Sig Fld Maint Shops (3)
USA Elct RD Actv
  Ft Huachuca (2)
  White Sands (13)
WSMR (5)
Yuma PG (2)
USA Corps (3)
Navajo A Dep (5)
Seneca A Dep (5)
Atlanta A Dep (5)
Ft Gordon (5)
Ft Huachuca (5)
Ft Holabird (5)
Elct Sup Ofc (2)
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  11-157
  11-158
  11-500 (AA-AE) (4)
  17
  37

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

USAR: None.

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

TECHNICAL MANUAL

AUDIO LEVEL METERS ME-71A/FCC AND ME-71B/FCC

TM 11-2151
CHANGES NO. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *10 December 1957*

TM 11-2151, 26 June 1956, is changed as indicated so that the manual also applies to:

Nomenclature	*Order No.*
Audio Level Meter ME-71B/FCC	50819-Phila-57

Change the title of the manual to: **AUDIO LEVEL METERS ME-71A/FCC AND ME-71B/FCC.**

Page 1. Add the following note below the title of chapter 1:

Note. Audio Level Meter ME-71B/FCC is similar to Audio Level Meter ME-71A/FCC. Information in this manual applies to both models unless otherwise specified.

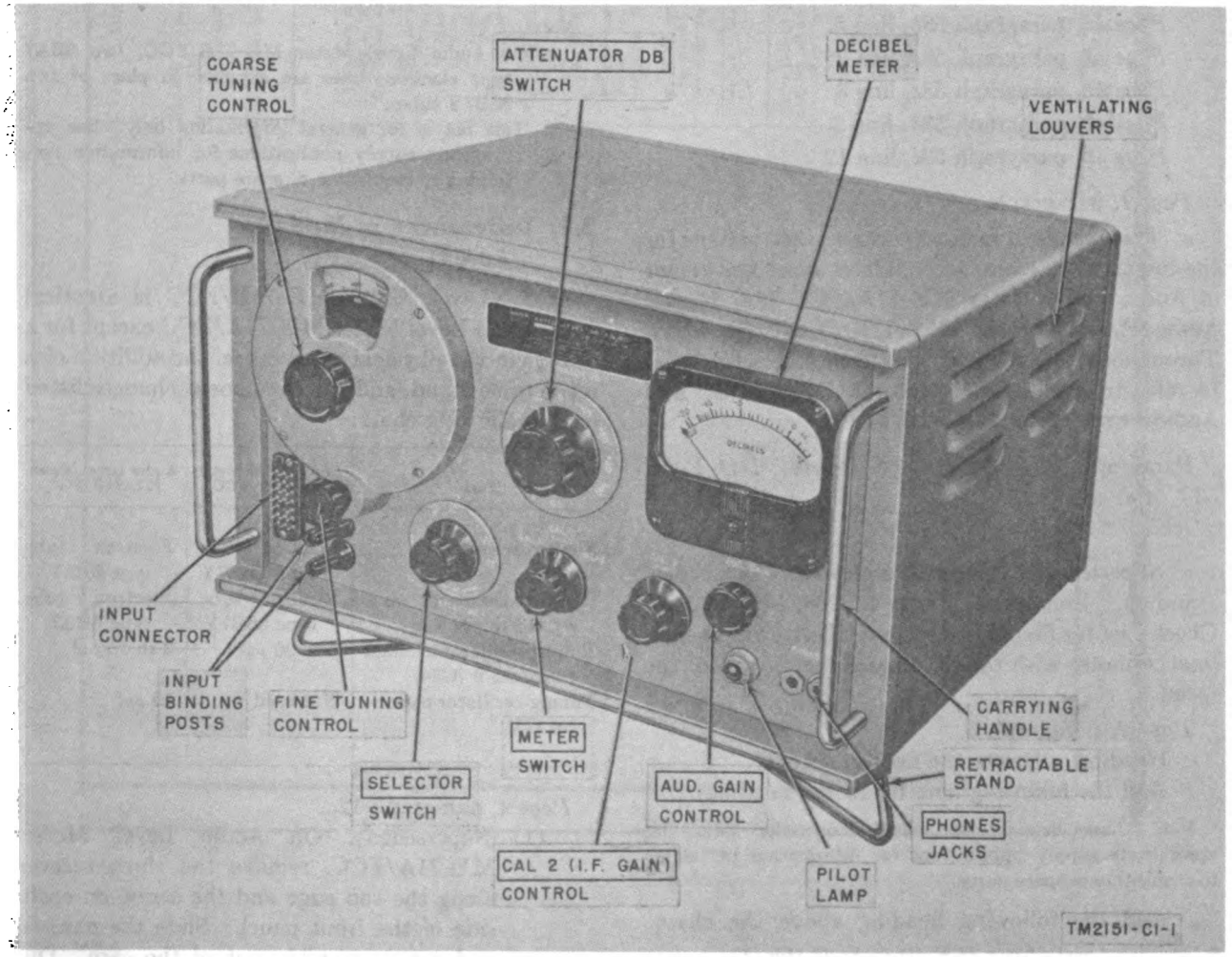


Figure 1.1 (Added). *Audio Level Meter ME-71B/FCC.*

Change "(figs. 24 and 25)" to (**figs. 24 and 25 or 25.1**) in the following places:

Page 31, warning notice, line 3.

Page 35, paragraph 47*c*, line 6.

Page 35, paragraph 48, line 9.

Page 36, chart, correction column, lines 4, 13, 19, and 31.

Delete "(pin 8)" in the following places:

Page 37, paragraph 51*b*, line 5.

Page 37, paragraph 51*e*, line 7.

Page 41, paragraph 56*b*, line 2.

Page 41, paragraph 56*e*, line 3.

Page 41, paragraph 57*a*, line 6.

Page 41, paragraph 57*b*, line 4.

Change "fig. 26" to fig. **26 or 26.1** in the following places:

Page 39, paragraph 53*a*(2), line 2.

Page 39, paragraph 53*a*(6), line 3.

Page 42, paragraph 58*b*, line 5.

Page 42, paragraph 58*c*, line 2.

Page 42, paragraph 58*e*, line 3.

Page 42, paragraph 58*h*, line 8.

Page 42, paragraph 58*i*, line 12.

Page 1, paragraph 1.

a. This technical manual contains instructions for the installation, operation, maintenance, and repair of Audio Level Meter ME-71A/FCC (fig. 1) **and Audio Level Meter ME-71B/FCC (fig. 1.1).** Throughout this manual, the term test set is used to refer to Audio Level Meter ME-71A/FCC **and Audio Level Meter ME-71B/FCC.**

Paragraph 2, *a*(2), line 1. Delete "DD Form 535" and substitute:

AFTO Form 29.

c. Superseded Preventive Maintenance Forms (figs. 7 and 8). Prepare DA Form 11-266, Maintenance Check List for Signal Equipment (Test Equipment), in accordance with the instructions on page 1 of the form.

Page 2, paragraph 5.

Heading. Delete the figure reference.

Add the following note below the heading:

Note. These lists are for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

Add the following heading above the chart:

a. Audio Level Meter ME-71A/FCC (fig. 1).

Delete the note after *a* and add the following:

b. Audio Level Meter ME-71B/FCC (fig. 1.1).

Component	Reqd No.	Length (in.)	Depth (in.)	Height (in.)	Volume (cu. ft.)	Unit weight (lb)
Test set	1	17	14⅜	10⅛	1.5	35.5
Running spares (par. 7.1).	1 set					
TM 11-2151	2					

Page 2, paragraph 6.

Line 2. Change "(fig. 1)" to: (**figs. 1 and 1.1**).

Add the following after the last sentence: Audio Level Meter ME-71B/FCC includes a retractable stand secured to the bottom of the cabinet. Use of the retractable stand permits the front panel to be raised approximately 2 inches for better observation.

Page 2, paragraph 7. Delete the note and add the following:

Notes.

1. On Audio Level Meter ME-71B/FCC, two 6BA7 type electron tubes are supplied in place of two 6SB7Y tubes.
2. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

8.1. Differences in Models

(Added)

Audio Level Meter ME-71B/FCC is identical with Audio Level Meter ME-71A/FCC except for a change in the physical appearance, the addition of a retractable stand, and the component changes listed in the following chart:

Item	Audio Level Meter ME-71A/FCC	Audio Level Meter ME-71B/FCC
First mixer V1	Electron tube type 6SB7Y	Electron tube type 6BA7.
Crystal Oscillator and second mixer V3.	Electron tube type 6SB7Y.	Electron tube type 6BA7.
Tuning oscillator trimmer capacitor 0 (C34).	4 to 30 $\mu\mu$f	3 to 15 $\mu\mu$f
Tuning oscillator capacitor C51.	Not used	15 $\mu\mu$f

Page 4, paragraph 12*a*.

(1) (Superseded). On Audio Level Meter ME-71A/FCC, remove the three screws along the top edge and the screw on each side of the front panel. Slide the chassis and panel assembly out of the case. On Audio Level Meter ME-71B/FCC, loosen

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
TEST EQUIPMENT
(AR 750-625)

EQUIPMENT NOMENCLATURE

AUDIO LEVEL METER ME-71A/FCC

EQUIPMENT SERIAL NUMBER

122

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer Chief for 1st echelon, or the Inspector for higher echelons
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor

FOLD

TYPE OF INSPECTION

OPERATOR	2/3 ECHELON	DATE	SIGNATURE
✓		7 OCT 1957	R. KING
	✓	8 OCT 1957	F QUINN

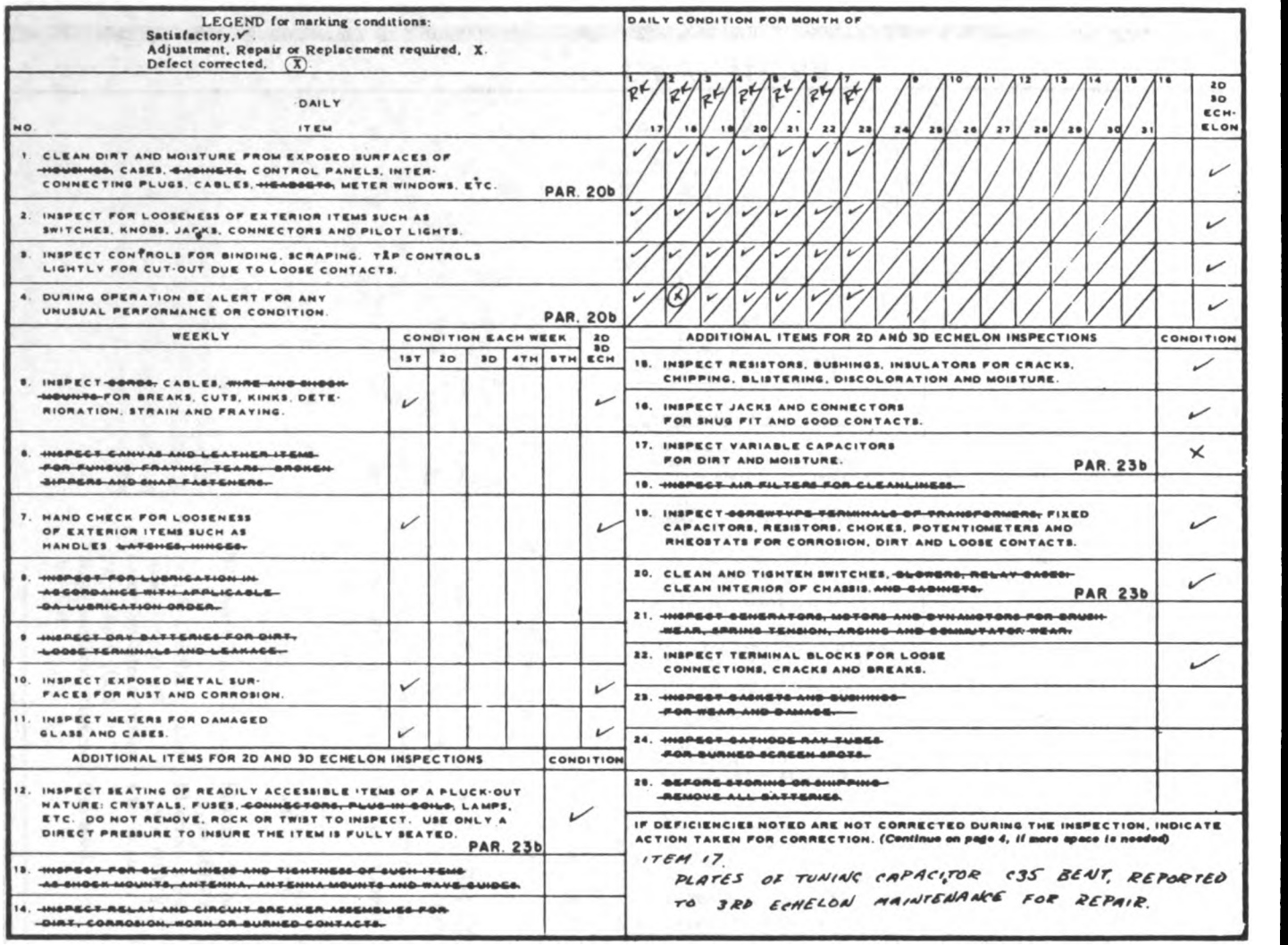
U. S. GOVERNMENT PRINTING OFFICE 19[illegible]

4

DA FORM 11-266

TM2151-C1-26

Figure 7. (Superseded). *DA Form 11-266, pages 1 and 4.*



LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF

NO.	DAILY ITEM	1 RK 17	2 RK 18	3 RK 19	4 RK 20	5 RK 21	6 RK 22	7 RK 23	8 24	9 25	10 26	11 27	12 28	13 29	14 30	15 31	16	2D 3D ECHELON
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF ~~HOUSINGS~~, CASES, ~~CABINETS~~, CONTROL PANELS, INTERCONNECTING PLUGS, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC. PAR. 20b	✓	✓	✓	✓	✓	✓	✓										✓
2.	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, JACKS, CONNECTORS AND PILOT LIGHTS.	✓	✓	✓	✓	✓	✓	✓										✓
3.	INSPECT CONTROLS FOR BINDING, SCRAPING. TAP CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS.	✓	✓	✓	✓	✓	✓	✓										✓
4.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION. PAR. 20b	✓	(X)	✓	✓	✓	✓	✓										✓

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. INSPECT ~~CORDS~~, CABLES, ~~WIRE AND CHOKE MOUNTS~~ FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING.	✓					✓
6. ~~INSPECT CANVAS AND LEATHER ITEMS FOR FUNGUS, FRAYING, TEARS, BROKEN ZIPPERS AND SNAP FASTENERS.~~						
7. HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES ~~LATCHES, HINGES.~~	✓					✓
8. ~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE LO LUBRICATION ORDER.~~						
9. ~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE.~~						
10. INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION.	✓					✓
11. INSPECT METERS FOR DAMAGED GLASS AND CASES.	✓					✓

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUCK-OUT NATURE: CRYSTALS, FUSES, ~~CONNECTORS, PLUG-IN COILS~~, LAMPS, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED. PAR. 23b	✓
13. ~~INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS SHOCK MOUNTS, ANTENNA, ANTENNA MOUNTS AND WAVE GUIDES.~~	
14. ~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, BORN OR BURNED CONTACTS.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. INSPECT RESISTORS, BUSHINGS, INSULATORS FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	✓
16. INSPECT JACKS AND CONNECTORS FOR SNUG FIT AND GOOD CONTACTS.	✓
17. INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE. PAR. 23b	X
18. ~~INSPECT AIR FILTERS FOR CLEANLINESS.~~	
19. INSPECT ~~SCREW-TYPE TERMINALS OF TRANSFORMERS~~, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS.	✓
20. CLEAN AND TIGHTEN SWITCHES, ~~BLOWERS, RELAY GASES~~; CLEAN INTERIOR OF CHASSIS AND ~~CABINETS~~. PAR. 23b	✓
21. ~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR.~~	
22. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	✓
23. ~~INSPECT GASKETS AND BUSHINGS FOR WEAR AND DAMAGE.~~	
24. ~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS.~~	
25. ~~BEFORE STORING OR SHIPPING REMOVE ALL BATTERIES.~~	

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

ITEM 17.
PLATES OF TUNING CAPACITOR C35 BENT, REPORTED TO 3RD ECHELON MAINTENANCE FOR REPAIR.

2 3

TM2151-CI-27

Figure 8. (Superseded). *DA Form 11-266, pages 2 and 3.*

the two knurled screws at the rear of the case. Slide the chassis and panel assembly out of the case.

Add the following to (3): On Audio Level Meter ME-71B/FCC, also place the tube shields on electron tubes V1 and V3.

(5) (Superseded). On Audio Level Meter ME-71A/FCC, replace the chassis and panel assembly in the case. Insert and tighten the five attaching screws. On Audio Level Meter ME-71B/FCC, replace the chassis and panel assembly in the case. Insert and tighten the two knurled screws at the rear of the case.

Page 4, figure 3. Add the following note:

NOTE:

ON AUDIO LEVEL METER ME-71B/FCC, TUBE STAGES V1 AND V3 ARE TUBE TYPE 6BA7.

20. Operator's Preventive Maintenance
(Superseded)

a. DA Form 11-266 (figs. 7 and 8). Items 1 through 12 on DA Form 11-266 constitute the preventive maintenance checklist to be referred to by the user. Items not applicable to the equipment are lined out. Instructions for the use of DA Form 11-266 appear on page 1 of the form. References in the ITEM block are to paragraphs in this manual containing additional information pertinent to the particular item.

b. Items. The information given in this subparagraph is supplementary to DA Form 11-266. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedures
1	Use a clean, dry, lint-free cloth to remove dust, dirt, moisture and grease from the front-panel controls. If necessary, wet the cloth with Cleaning Compound and then wipe the parts with a clean dry cloth.
4	Check the test set for normal operation (pars. 14-17).

Warning: Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame, and provide adequate ventilation.

23. Repairman's Preventive Maintenance
(Superseded)

a. DA Form 11-266 (figs. 7 and 8). Items 1 through 25 constitute the preventive maintenance check list to be used by the repairman. Items not applicable to the test set are lined out. References in the ITEM block are to paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for the use of DA Form 11-266 appear on page 1 of the form.

b. Items. The information given in this subparagraph is supplementary to DA Form 11-266. The item numbers correspond to the ITEM numbers on the form.

Warning: Disconnect all power and remove the panel and chassis assembly from the case before performing preventive maintenance. After power to the test set is disconnected, some capacitors still may retain charges of dangerous potential. Before touching exposed electrical parts, short-circuit the parts to ground. When maintenance is completed, replace the panel and chassis assembly in the case before reconnecting the power.

Item	Maintenance procedures
12	Check to see that the crystal retaining bracket holds the crystal firmly and straight in its socket. Check to see that the shield clamp of tube V8 holds the shield firmly in position.
17	Inspect the variable tuning capacitor for dirt and loose mounting lugs. ***Caution:*** Do not tough or bend the plates of the variable tuning capacitor. To do so will cause loss of accurate frequency calibration of the test set.
20	Use a clean, dry, lint-free cloth to remove dust and dirt from the internal components. If necessary, wet the cloth with cleaning compound and then wipe the components with a clean, dry cloth. Do not overtighten connections. Threads on bolts may become stripped

Note. If, during inspection, any of the test set components need repair or replacement, notify higher echelon maintenance personnel.

Page 13, paragraph 26, note, line 4. Change "second mixer V2" to:

crystal oscillator and second mixer V3.

Page 16, figure 9. Add the following note:

NOTE

ON AUDIO LEVEL METER ME-71B/FCC, TUBE STAGES V1 AND V3 ARE TUBE TYPE 6BA7.

Page 18, figure 10.

Change "NOTE" to: **NOTES.**

Number the existing note "1".

Add the following notes:

2. ON AUDIO LEVEL METER ME-71B/FCC, R31 IS CONNECTED TO TERMINAL 3 OF T7 AND C44 IS CONNECTED TO TERMINAL 2 OF T7 AND TERMINALS 0 AND 1 OF CONNECTOR J3 ARE REVERSED.

Page 19, figure 11. Change the resistance value of resistor R1 to: **4,700.**

Page 20, paragraph 32.

Heading. Change "(fig. 12)" to: **(figs. 12 and 12.1).**

a, line 21. Delete "(pin 4)."

Page 20, figure 12. Change the caption to: **Audio Level Meter ME-71A/FCC, first mixer, simplified schematic diagram.**

Page 21. Add the following note to figure 13.

NOTE:

IN AUDIO LEVEL METER ME-71B/FCC, ADDED CAPACITOR C51 (15 UUF) IS CONNECTED IN PARALLEL WITH C34; CAPACITOR C34 IS 3 TO 12 UUF.

Page 21, paragraph 33*a*. Add the following after the third sentence:

In Audio Level Meter ME-71B/FCC (fig. 31.1), fixed trimming capacitor C51 is connected in parallel with capacitor C34.

Page 23, figure 15. Change the caption to read: **Audio Level Meter ME-71A/FCC, second mixer and crystal oscillator circuits, simplified schematic diagram.**

Page 23, paragraph 35.

Heading. Change "(fig. 15)" to: **(figs.15 and 15.1).**

Line 2. Delete "type 6SB7Y".

b, line 4. Add the following after "pin 5": (ME-71A/FCC) or pin 2 (ME-71B/FCC).

Page 32, paragraph 43*b*(7), line 3. Change "V2" to: **V3.**

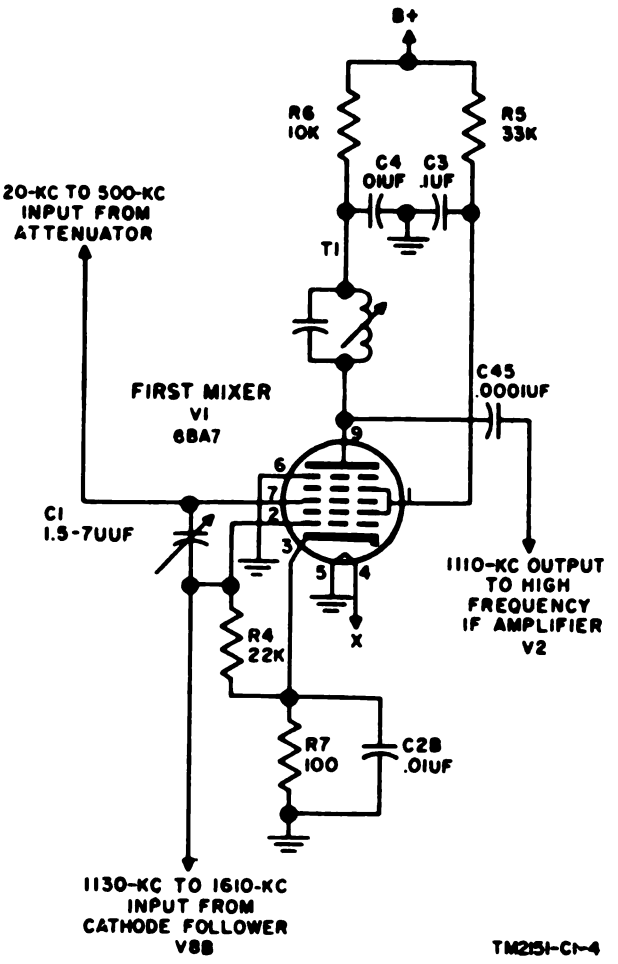


Figure 12.1. (Added). *Audio Level Meter ME-71B/FCC, first mixer, simplified schematic diagram.*

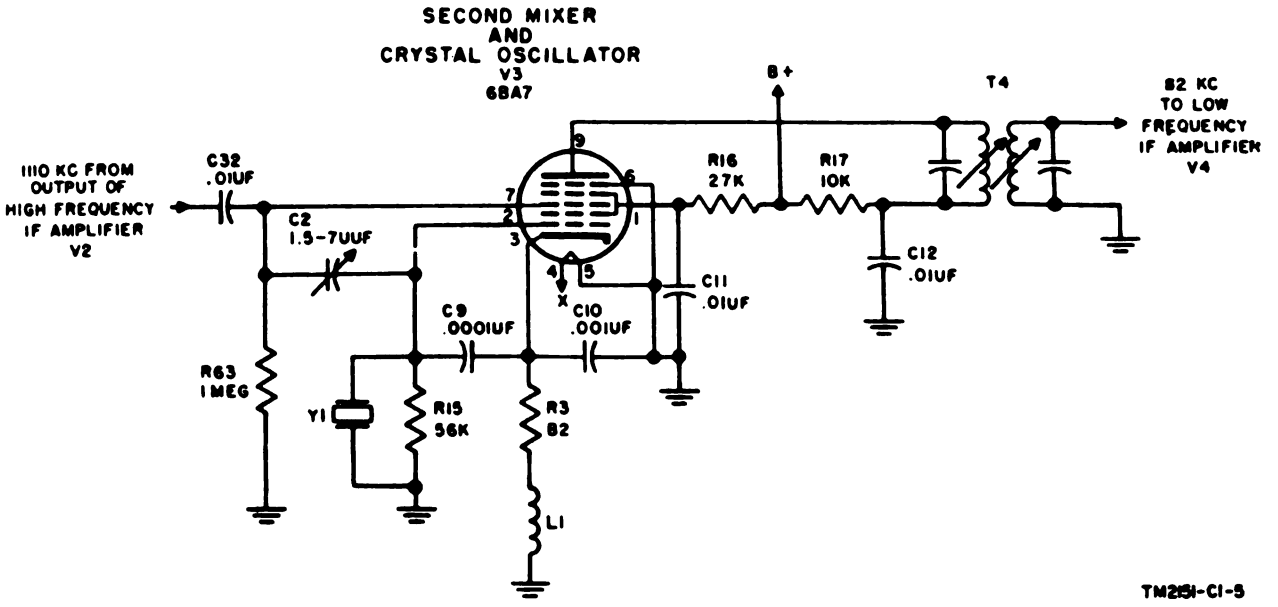
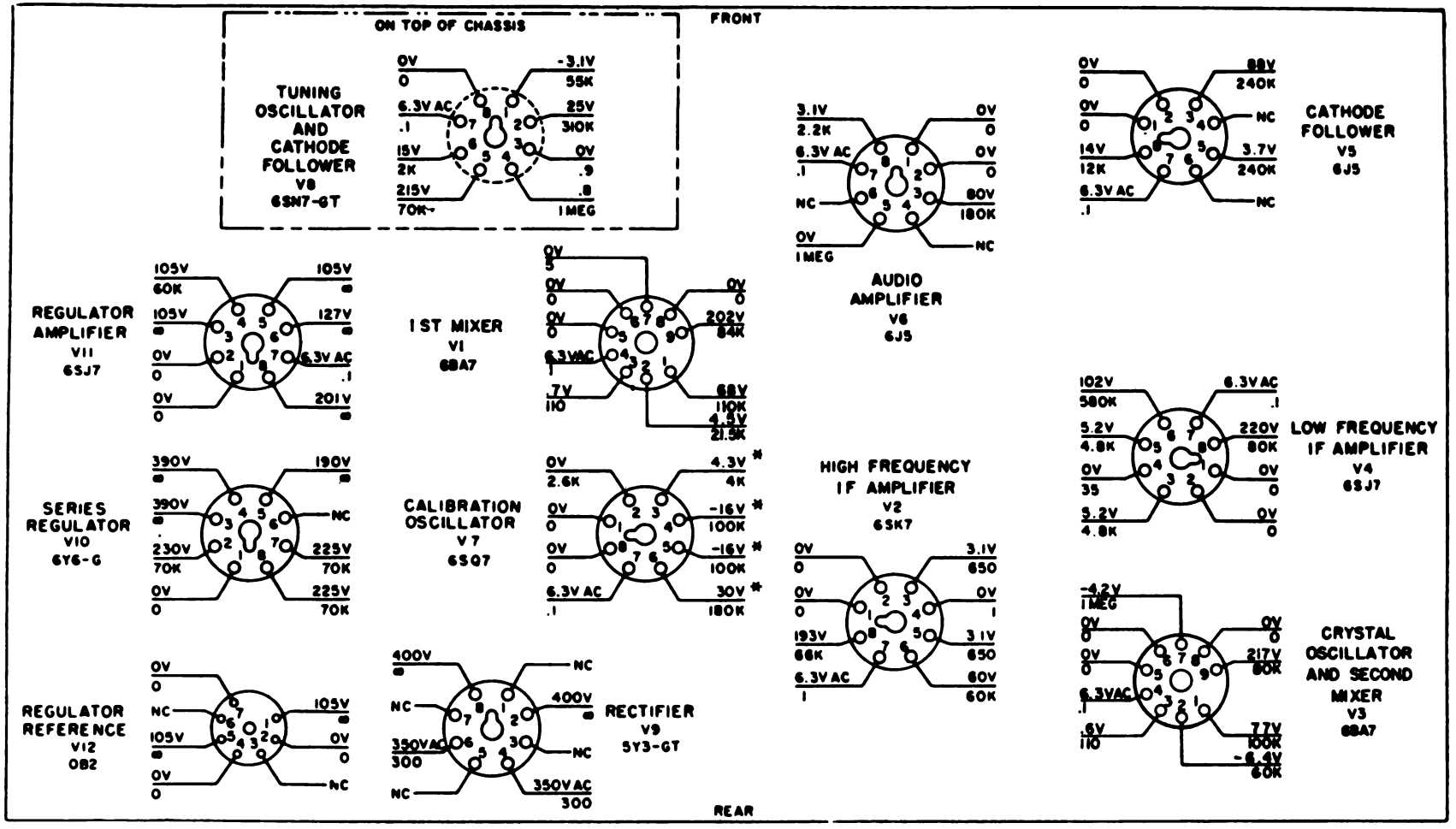


Figure 15.1. (Added). *Audio Level Meter ME-71B/FCC, second mixer and crystal oscillator circuits, simplified schematic diagram.*



NOTES:

1. LINE VOLTAGE 115 VOLTS.
2. ALL RESISTANCES ARE IN OHMS.
3. ALL VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT VOLTMETER.
4. ALL VOLTAGES AND RESISTANCES MEASURED WITH RESPECT TO CHASSIS GROUND.
5. VOLTAGE READINGS ABOVE LINE. RESISTANCE READINGS BELOW LINE
6. ALL READINGS TAKEN WITH [METER] SWITCH ON [MEAS.] POSITION AND [ATTENUATOR DB] SWITCH ON [0] POSITION EXCEPT AS NOTED IN NOTE 10.
7. FREQUENCY DIAL SET TO 100KC. NO SIGNAL INPUT.
8. [CAL. 2 (I.F. GAIN)] CONTROL MAXIMUM CLOCKWISE.
9. RESISTANCE MEASUREMENTS TAKEN WITH EQUIPMENT DISCONNECTED FROM LINE. [AUD. GAIN] CONTROL MAXIMUM CLOCKWISE.
10. MEASUREMENTS MARKED WITH ASTERISK MADE WITH [METER] SWITCH IN [CAL. 2 (100 KC)] POSITION.
11. NC DENOTES NO CONNECTION.
12. ∞ DENOTES INFINITE RESISTANCE.

TM2151-CI-E

Figure 25.1. (Added). *Audio Level Meter ME-71B/FCC, voltage and resistance diagram.*

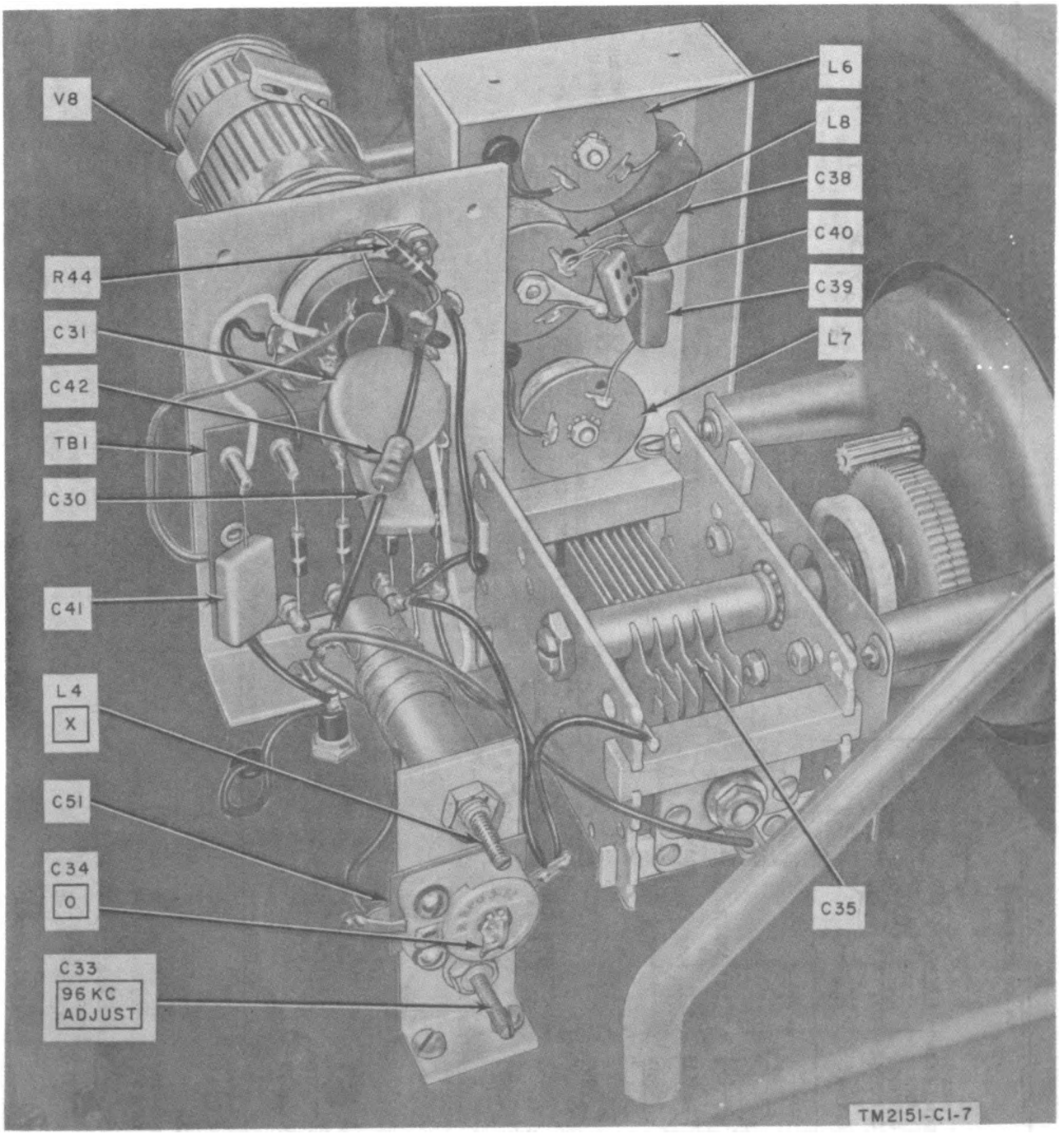


Figure 26.1. (Added). *Audio Level Meter ME-71B/FCC, tuning oscillator and band-pass filter, location of parts.*

Page 32, paragraph 44. Add the following to the chart, in numerical sequence.

Fig. or par. No.	Title
Fig. 25.1	Audio Level Meter ME–71B/FCC. voltage and resistance diagram.
Fig. 26.1	Audio Level Meter ME–71B/FCC, tuning oscillator and band-pass filter, location of parts.
Fig. 31.1	Audio Level Meter ME–71B/FCC, schematic diagram.
Fig. 32.1	Audio Level Meter ME–71B/FCC, wiring diagram.

Page 33, figure 24, TB 8. At the top terminal of capacitor C9, change "110V" to: **100**

Page 35, paragraph 47*c*, line 3. Change "(fig. 31)" to: **(fig. 31 or 31.1).**

Page 39, paragraph 53*a*.

(1), lines 1 and 3. Delete "two."

(3), line 1. Delete "four."

(6), line 1. Delete "three."

Page 40, paragraph 53*b*.

(1), line 2. Delete "three."

(7), line 1. Delete "four."

Page 45, paragraph 71.

e. (Added). On Audio Level Meter ME–71B/FCC, lower the retractable stand.

[AG 413.44 (6 Dec 57)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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General, United States Army,
Chief of Staff.

Official:
HERBERT M. JONES,
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Yuma Test Sta
USA Sig Eqp Spt Agcy
USA Elct PG
Sig Fld Maint Shops
Sig Lab
Mil Dist
JBUSMC
USA Sig Eqp Spt Agcy
Units org under fol TOE:
11-7
11-16
11-57
11-127
11-128
11-500(AA-AE)
11-557
11-587
11-592
11-597

NG: State AG; units—same as Active Army.

USAR: None.

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

DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *25 June 1956*

AUDIO LEVEL METER ME-71A/FCC

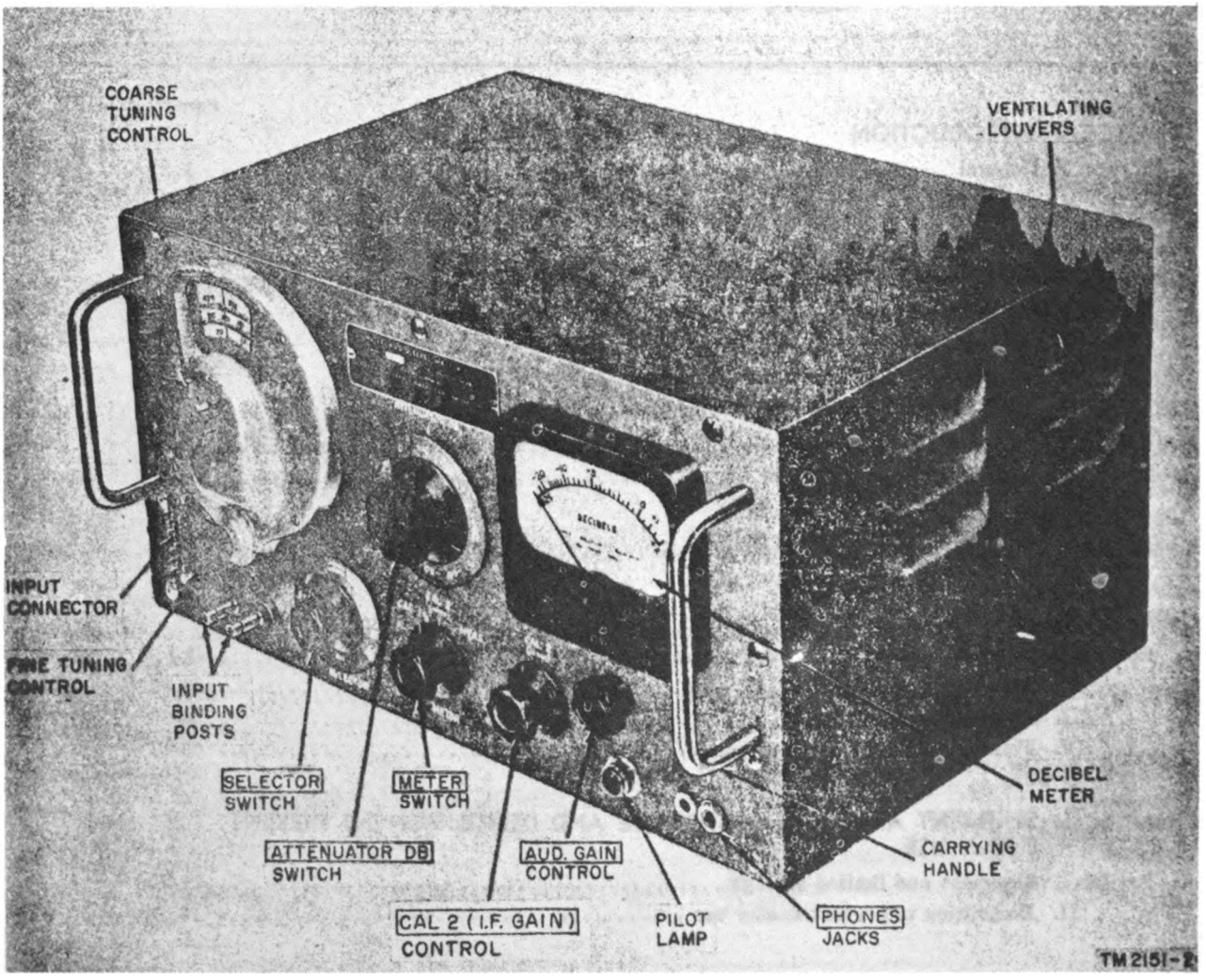


Figure 1. Audio Level Meter ME-71A/FCC.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains instructions for the installation, operation, maintenance, and repair of the Audio Level Meter ME–71A/FCC (fig. 1). Throughout this manual, the term test set is used to refer to Audio Level Meter ME–71A/FCC.

b. Forward all comments on this publication directly to: Commanding Officer, The Signal Corps Publications Agency, Fort Monmouth, New Jersey.

2. Forms and Records

a. Unsatisfactory Equipment Reports.

(1) Fill out and forward DA Form 468, Unsatisfactory Equipment Report, to Commanding General, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, as prescribed in AR 700–38.

(2) Fill out and forward DD Form 535, Unsatisfactory Report, to Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AF TO 00–35D–54.

b. Damaged or Improper Shipment. Fill out and forward DD Form 6, Report of Damaged or Improper Shipment, as prescribed in AR 700–58 (Army); Navy Shipping Guide, Article 1850–4 (Navy); and AFR 71–4 (Air Force).

c. Preventive Maintenance Forms. (fig. 7 and 8)

(1) Prepare DA Form 11–238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), in accordance with the instructions on the back of the form.

(2) Prepare DA Form 11–239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), in accordance with instructions on the back of the form.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

Audio Level Meter ME–71A/FCC (fig. 1) is designed to measure the radio-frequency (rf) carrier level on carrier telephone system lines. The test set permits the measurement of voltages in the frequency range of 20 kilocycles (kc) to 500 kc. It is essentially a selective detector that provides indications of signal level in decibels (db) when bridged across either 135-ohm balanced or 600-ohm unbalanced lines. A variable attenuator, in conjunction with an indicating meter, provides an input sensitivity range of —70 decibels (referred to 1 milliwatt in 600 ohms) (dbm) to +42 dbm.

4. Technical Characteristics

Frequency range ..... 20 kc to 500 kc.
Tuning accuracy:
48 to 256 kc ..... ±1 kc at 68° F.

20 to 500 kc	±3 kc over temperature range of 45° F to 90° F.
Selectivity	9 db down at 1 kc off resonance. 29 db down at 2 kc off resonance. 46 db down at 3 kc off resonance. (Refer to figure 5 for a typical selectivity curve.)
Frequency response	+.3 db to —.5 db over range of 20 to 500 kc for 135-ohm balanced input. (Refer to A, figure 6 for a typical frequency response curve.) +.1 db to —.75 db over range of 20 to 500 kc for 600-ohm unbalanced input. (Refer to B, figure 6 for typical frequency response curve.)
Input impedance	10,000 ohms.
Measuring range	—70 to +42 dbm.
Accuracy of ATTENUATOR DB switch:	
135-ohm balanced measurements:	
20 to 48 kc	±2 db for all steps.
48 to 256 kc	±2 db for +40, —50, —60 steps. ±1 db for +30 to —40 steps.
256 to 500 kc	±2 db for all steps.
600-ohm unbalanced measurements:	
20 to 500 kc	±2 db for +40 to —40 steps. ±3 db for —50 and —60 steps.
Input voltage requirements	105 to 125 v; 50 to 60 cps.
Power consumption	80 w.
Number of tubes	12

5. Components (fig. 1)

Component	Reqd No.	Length (in.)	Depth (in.)	Height (in.)	Volume (cu ft)	Unit weight (lb)
Audio Level Meter ME–71A/FCC (bare unit)	1	17	14	9	1.2	32
Set of running spares (par. 7)	1 set					
Technical Manual TM 11–2151	2					

Note. This list is for general information only. See SIG 7 and 8 ME–71A/FCC for information pertaining to the requisition of spare parts. Refer to paragraph 8 for additional equipment required but not supplied.

6. Description of Audio Level Meter ME–71A/FCC

Audio Level Meter ME–71A/FCC consists of a panel-chassis assembly (fig. 1) contained in a steel cabinet. All operating controls and connectors are located on the front panel. The power cord is attached to the chassis and extends through a hole at the rear of the chassis. The bayonet-type line fuse is located on the back of the chassis.

7. Running Spares

Following is a list of running spares supplied as part of Audio Level Meter ME–71A/FCC.

1 tube, OB2.
1 tube, 5Y3–GT.
2 tubes, 6J5.
2 tubes, 6SB7Y.
2 tubes, 6SJ7.
1 tube, 6SK7.
1 tube, 6SN7–GT.
1 tube, 6SQ7.
1 tube, 6Y6–G.
1 pilot lamp, 6.3–volt, .15 ampere.
6 fuses, 2–ampere, type 3AG.

Note. This list is for general information only. See sig 7 and 8 ME–71A/FCC for information pertaining to allowable spare parts.

8. Additional Equipment Required

The following equipment is *not* supplied with the test set, but is required to operate the test set to its fullest extent.

a. Headset. A single-plug or dual-plug headset is required to permit the operator of the test set to monitor any audio component of the signal being checked. The headset can be connected to the PHONES jacks (par. 16*d*).

b. Receptacle, 20-pin. A 20-pin female receptacle, that will mate with the INPUT connector, may be used when testing circuits on N-type carrier systems (par. 16*c*). If such a receptacle is not available, connections are made to the INPUT binding posts.

CHAPTER 2

INSTALLATION AND OPERATION

Section I. INSTALLATION

9. Placement

Place Audio Level Meter ME–71A/FCC on a firm support. Position the test set so that the controls and the connectors of the lines to be tested can be easily reached.

Caution: Do not allow test leads or power cord to make contact with high-voltage circuits. Severe burns or shock and damage to equipment may result.

10. Unpacking

a. Packaging Data. Audio Level Meter ME–71A/FCC is packed for shipment as shown in figure 2.

b. Removing Contents.

Caution: Be careful when uncrating and unpacking the test set. Careless or haphazard use of tools on the packing box can result in damage to the contents.

(1) Place the packing case or carton near the operating position.

(2) Cut through the gummed paper tape that secures the top of the carton. Do not insert the cutting tool any deeper than is necessary to cut through the paper tape to avoid damage to the equipment.

(3) Open the box and remove the equipment.

(4) Remove the protective paper wrapper from the equipment.

(5) Place the equipment on a work bench or near its final location.

Note. Save the original carton and packing pads. They can be used again when the equipment is repacked for storage or shipment.

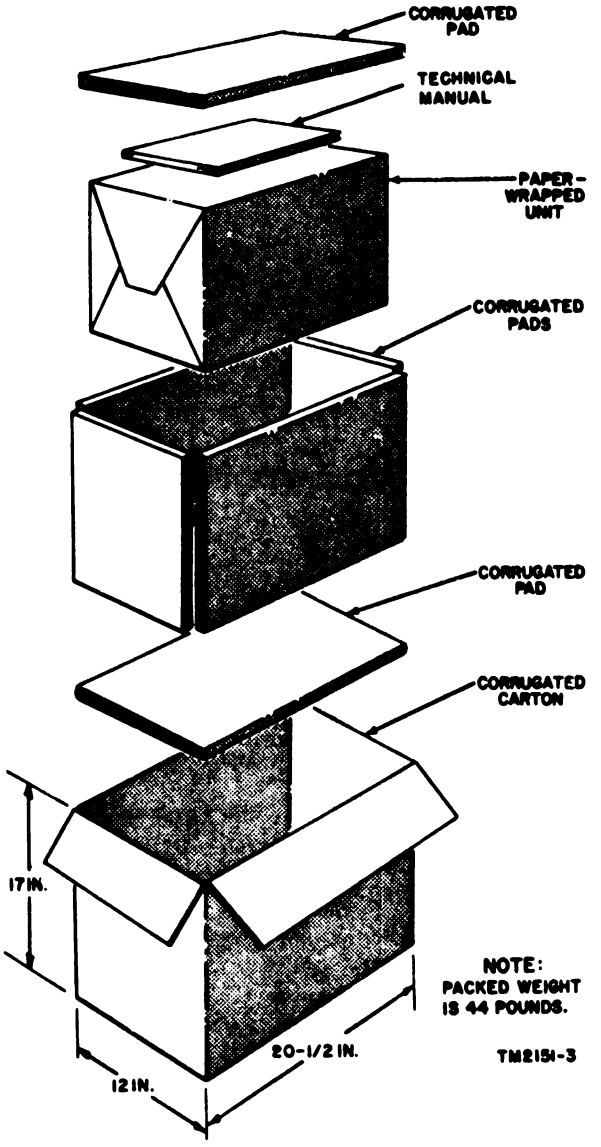


Figure 2. Audio Level Meter ME–71A/FCC, packaging diagram.

11. Checking

a. Check the contents of the carton against the master packing slip.

b. Inspect the equipment for possible damage incurred during shipment.

Note. If the equipment is used or reconditioned, check the equipment for tags or other indications pertaining to changes in the wiring of the equipment. If any changes in wiring have been made, note the change in this manual, preferably on the schematic diagram.

12. Installation of Equipment

The test set is usually shipped with the crystal and tubes installed. If it is necessary to install the tubes and crystal, follow the instructions given in *a* below. Connect the equipment as explained in *b* below.

a. Tubes and Crystal.

(1) Remove the three screws along the top edge and the screw on each side of the front panel, and slide the chassis and panel assembly out of the case.

(2) Install the tubes and the crystal in the positions shown in figure 3.

(3) Place the shield on tuning oscillator 6SN7–GT and secure the shield clamp.

(4) Install the crystal retaining bracket as shown in figure 3.

(5) Replace the chassis and panel assembly in the case and insert and tighten the five attaching screws.

b. Connections.

(1) Connect the power cable to a 105- to 125-volt, 50- to 60-cps (cycles per second) source.

(2) If tests are to be made of individual 135-ohm balanced lines or 600-ohm unbalanced lines, connect the lines to the INPUT binding posts. For 600-ohm unbalanced lines, connect the grounded line to binding post G (one of INPUT binding posts).

(3) When making measurements on N-type carrier systems, a test cable may be connected to the INPUT connector (par. 16c).

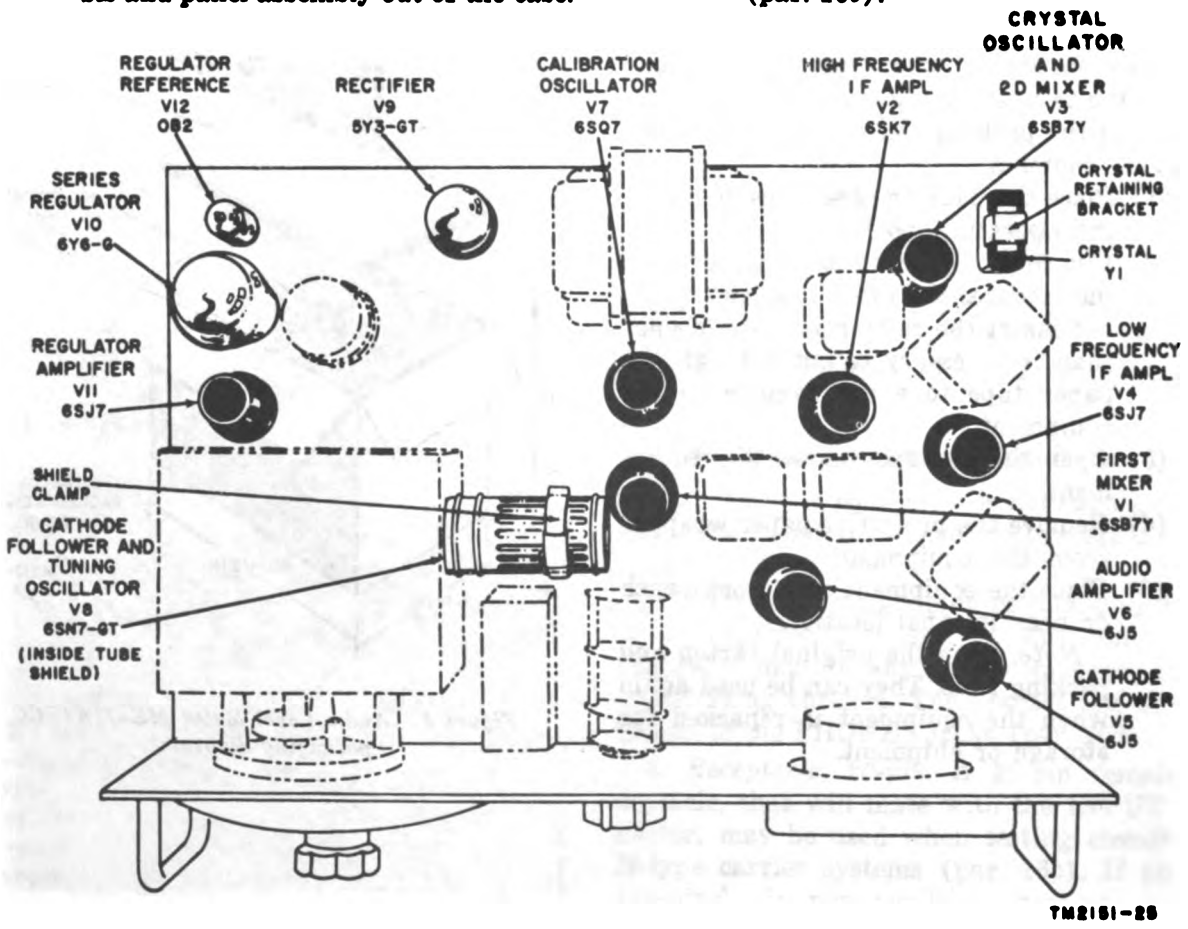


Figure 3. Audio Level Meter ME-71A/FCC, tube location diagram.

Section II. OPERATION

13. Controls and Instruments (fig. 4)

Controls and Instruments	Function	Controls and Instruments	Function
AUD. GAIN control	A dual purpose potentiometer, mechanically linked to the power on-off switch. Controls the gain of the audio amplifier. When turned from the OFF position, the external line voltage is applied to the test set. When operated to the OFF position, power is disconnected from the test set.	METER switch	Three-position switch causing panel meter to provide indications of level of input signal and of the calibration of the test set. MEAS. position: provides indication of level of input signal. CAL. 1 position: provides indication of output level of calibration oscillator. CAL. 2 (100KC) position: provides indication of output level of the test set with input from calibration oscillator applied.
SELECTOR switch	Eight-position switch used to select the input to be applied to the test set when in the following positions: VM–UNBAL 600ΩBRG: Provides for 600-ohm unbalanced line input applied to the INPUT binding posts. VM–BAL 135ΩBRG: Provides for 135-ohm balanced line input applied to the INPUT binding posts. E–W OUT, W–E OUT, E–W IN, GR OUT, and GR IN: Provide for 135-ohm balanced line inputs applied to pairs of the INPUT connector.	Tuning dial: Coarse tuning control	Provides for frequency adjustment of the tuning oscillator. Tuning dial is calibrated from 20 to 500 kc.
		Fine tuning control	Provides a fine frequency adjustment of the tuning oscillator.
		Pilot lamp	Lights when the AUD. GAIN control is operated from the OFF position, indicates that ac power is applied to the test set.
CAL. 2 (I.F. GAIN) control	A potentiometer to control the gain of the high intermediate frequency amplifier stage.	PHONES jacks	Provided for use with a headset to permit monitoring of audio component of the signal being tested. Single or dual-type plug connectors may be used.
ATTENUATOR DB switch	Eleven-position switch used to attenuate the input signal in 10 db steps. Switch knob dial calibrated to indicate level of attenuation. Calibrations range from —60 db through +40 db.	INPUT binding posts	Provided for the connection of 600-ohm unbalanced circuits, or 135-ohm balanced circuits to the test set.
		INPUT connector	Provided for use with a mating 20 pin receptacle for the connection of 135-ohm balanced circuits to the test set.

14. Starting Procedure

To insure stability of operation, allow the test set to warm-up before calibration or before making any measurements. Turn the AUD. GAIN control clockwise away from the OFF position (the front panel pilot lamp will light). Allow the test set to warm-up for at least 20 minutes.

Note. If, during the preoperation or calibration procedures, an abnormal result is obtained, refer to the equipment performance check list (par. 28).

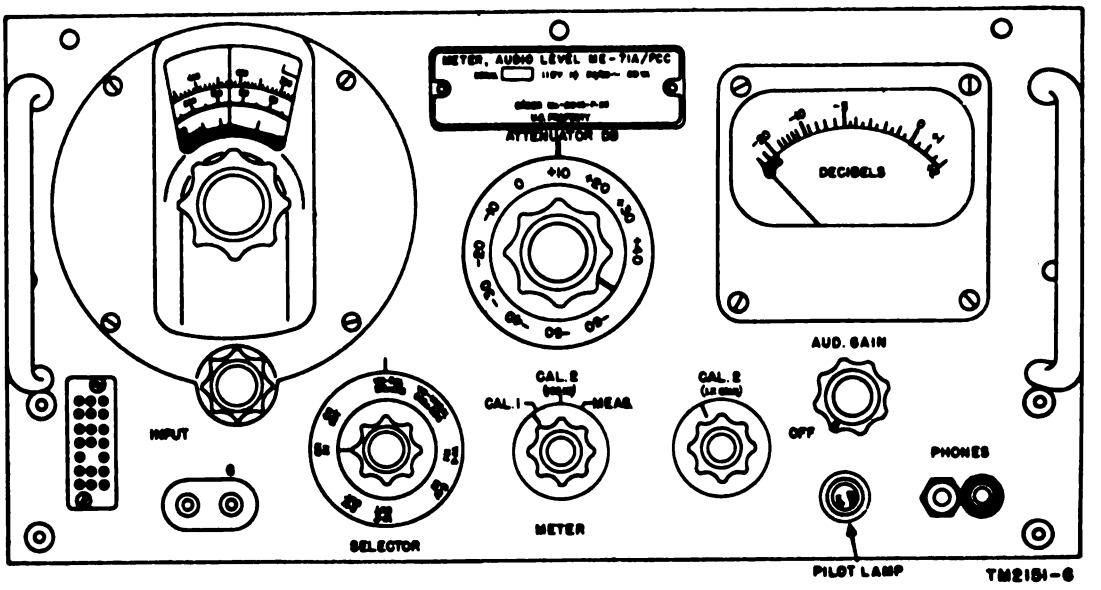


Figure 4. Audio Level Meter ME-71A/FCC, controls and instruments.

15. Calibration of Audio Level Meter ME-71A/FCC

a. General. Prior to every series of measurements check the calibration of the test set. Use either the internal calibration oscillator (*b* below) or external calibration equipment (*c* below). The internal calibration oscillator is adjusted by the manufacturer to give maximum accuracy when calibrating the test set for use on 135-ohm balanced line measurements. The calibration obtained will be satisfactory, although slightly less accurate, for measurements made on 600-ohm unbalanced lines. If greater accuracy is required for 600-ohm unbalanced line measurements, calibrate the test set using external calibration equipment.

b. Calibration Using Internal Calibration Oscillator.

(1) Place the METER switch in the CAL. 1 position. The panel meter should indicate 0 db.

(2) Place the METER switch in the CAL. 2 (100KC) position and the ATTENUATOR DB switch in the 0 position. Adjust the tuning dial for maximum meter indication at 100 kc. The meter should indicate 0 db. If it does not indicate 0 db, adjust CAL. 2 (I.F. GAIN) control for a 0 db indication. The INPUT sensitivity of the test set is now properly adjusted.

(3) Prepare the test set to take measurements by placing the METER switch in the MEAS. position.

c. Calibration Using External Calibration Equipment.

(1) Use a signal generator that will provide a 100-kc output and that has a 600-ohm unbalanced output circuit. The external signal generator must have an attenuator in the output circuit. Terminate the external signal generator output circuit in a 600-ohm noninductive load resistance.

(2) Adjust the external signal generator to a frequency of 100 kc, and establish a power of 0 dbm across the load. 0 dbm corresponds to a .775 voltage drop across the noninductive load resistance.

(3) Connect Audio Level Meter ME-71A/FCC binding posts to the 600-ohm load.

(4) Operate the input SELECTOR switch to the VM-UNBAL 600 Ω BRG position and place the METER switch in the MEAS. position. Do not make any adjustment of the external equipment

after making the connection to the test set.

(5) Operate ATTENUATOR DB switch to 0. Adjust the tuning dial of the test set for a maximum meter indication. The meter should indicate 0 db. If it does not indicate 0 db, adjust CAL. 2 (I.F. GAIN) control for a 0 db indication. The input sensitivity of the test set is now properly adjusted.

(6) Disconnect the test set from the external calibration equipment.

d. Calibration for Use on Specific Frequencies. Sensitivity adjustments are normally made at a frequency of 100 kc. For maximum accuracy, calibrate the test set using frequencies in the region of those upon which measurements are to be made. To calibrate for 600-ohm unbalanced inputs at frequencies other than 100 kc, set the external calibration equipment to the desired frequency and follow the procedure described in *c* above. To calibrate the test for 135-ohm balanced circuits at frequencies other than 100 kc, follow the procedures in *c* above. The external calibration equipment must include a 135-ohm balanced output circuit and the terminating noninductive load resistance must be 135 ohms. A power of 0 dbm across the terminating load resistance will now correspond to a .368 voltage drop. Operate the test set SELECTOR switch to the VM-BAL 135 Ω BRG position. Typical selectivity and frequency response curves for the test set are shown in figures 5 and 6.

16. Operating Procedures

Note. Before performing any procedures described in *a* through *d* below, calibrate the test set in accordance with the instructions contained in paragraph 15.

a. Performing Measurements on 600-ohm Unbalanced Circuits.

(1) Place the SELECTOR switch in the VM-UNBAL 600Ω BRG position.

(2) Place the METER switch in the MEAS. position.

(3) Connect the circuit to be tested to the INPUT binding posts with the grounded side connected to the binding post marked G.

(4) Adjust the tuning dial for a maximum meter indication at the frequency of the signal being measured.

(5) Operate the ATTENUATOR DB switch as necessary to provide an approximate midscale indication.

(6) To obtain the actual signal level in dbm, add the value of the ATTENUATOR DB dial setting algebraically to the meter indication.

b. Performing Measurements on 135-ohm Balanced Circuits.

(1) Operate the SELECTOR switch to the VM-BAL 135Ω BRG position.

(2) Operate the METER switch to the MEAS. position.

(3) Connect the circuit to be tested to the INPUT binding posts.

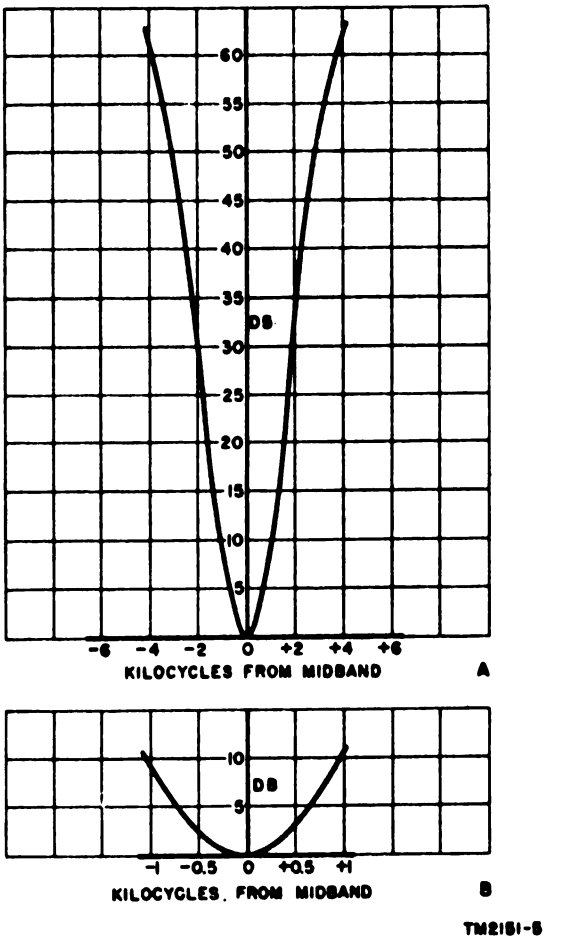


Figure 5. Audio Level Meter ME-71A/FCC, typical selectivity curve.

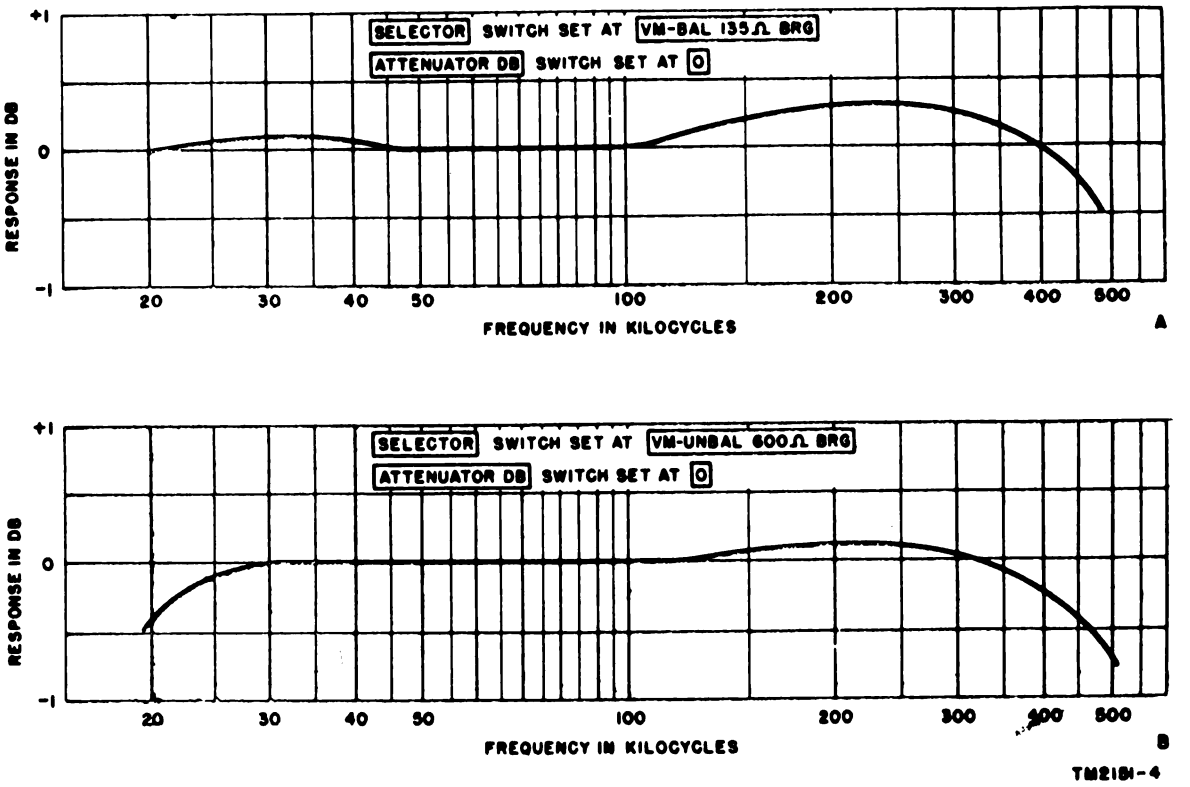


Figure 6. Audio Level Meter ME-71A/FCC, typical frequency response curve.

(4) Adjust the tuning dial for a maximum meter indication at the frequency of the signal being measured. Operate the ATTENUATOR DB switch to provide an approximate midscale indication.

(5) To obtain the signal level in dbm, add the value of the ATTENUATOR DB dial setting algebraically to the meter indication.

c. Performing Measurements on N Carrier System Circuits.

(1) Connect the N carrier system lines to the appropriate terminals of the INPUT connector.

(2) Operate the METER switch to the MEAS. position.

(3) Operate the SELECTOR switch to the position (E-W OUT, W-E OUT, E-W IN, W-E IN, GR OUT, or GR IN) corresponding to the lines upon which the measurement is to be made.

(4) Adjust the tuning dial for a maximum meter indication at the frequency of the signal being measured.

(5) Operate the ATTENUATOR DB switch to provide an approximate midscale meter indication.

(6) To obtain the signal level in dbm, add the value of the ATTENUATOR DB dial setting algebraically to the meter indication.

d. Audio Monitoring. A provision is included for monitoring the audio content of amplitude modulated input signals. A high impedance headset with either single-plug or dual-plug connectors may be used for this purpose. Insert the plug connectors into the PHONES jacks on the front panel of the test set. Single-plug type connectors should be inserted into the right- and PHONES jack. Adjust the audio level using the AUD. GAIN control.

17. Stopping Procedure

a. Rotate the AUD. GAIN control fully counterclockwise to the OFF position.

b. Disconnect the line cord from the power outlet.

18. Operation Under Unusual Conditions

Operation of Audio Level Meter ME-71A/FCC may be difficult in regions where extreme cold, heat, moisture, and adverse weather conditions prevail. Procedures for lessening these effects are given below.

a. Operation in Extremely Cold Climates. Keep the equipment warm and dry. If possible, keep the tube filaments lighted constantly by keeping the test set connected to a power source and the AUD. GAIN control operated from the OFF position.

b. Operation in Warm, Damp Climates. Keep the equipment dry. Keep the equipment turned on as much as possible to prevent condensation of moisture. Wipe the exterior of the equipment frequently with a clean. dry, lint-free cloth.

c. Operation in Hot, Dry Climates. Protect the test set from sand and dust. Make frequent preventive maintenance checks. Clean the equipment when necessary.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.
AUDIO LEVEL METER ME-71A/FCC	

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ⓧ Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (~~receivers, transmitters, carrying cases, misc and cable, microphones~~, tubes, spare parts, technical manuals and accessories).	✓						
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 9	✓						
3	CLEAN DIRT AND MOISTURE FROM ~~ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS~~, JACKS, PLUGS, ~~TELEPHONES, CARRYING CASE~~, COMPONENT PANELS. PAR. 20b(1)	✓						
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, ~~VIBRATORS, PLUG-IN COILS AND RESISTORS~~. PAR. 20b(4)	ⓧ						
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION.	✓						
6	CHECK FOR NORMAL OPERATION. PAR. 20b(5)	✓						

WEEKLY

NO.	ITEM	CONDITION	NO	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, ~~ROD MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, CAVE CONDUCTS~~, AND CABLE CONNECTIONS.	✓	13	~~INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.~~	
8	INSPECT ~~CASES, MOUNTINGS, ANTENNAS, TOWERS, AND~~ EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.	✓	14	CLEAN ~~AIR FILTERS, SHOCK MOUNT PLATES~~, DIAL AND METER WINDOWS, ~~VELOCITY MICROPHONES~~.	✓
9	INSPECT CORD, CABLE, WIRE, ~~AND SHOCK MOUNTS~~ FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN.	✓	15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	✓
10	~~INSPECT ANTENNA FOR CORRUGATIONS, CORROSION, LOOSE PIN, DAMAGED INSULATORS AND REFLECTORS.~~		16	~~INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER-PROOFING.~~	
11	~~INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.~~		17	~~CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.~~	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ~~ELECTRICAL TRANSFORMERS, POWER UNITS, RELAYS, SOLENOIDS, MOTORS, BLOWERS, CAPACITORS, GENERATORS~~, AND PILOT LIGHT ASSEMBLIES.	✓	18	~~CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.~~	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM2151-26

Figure 7. DA Form 11-238, prepared for use with Audio Level Meter ME-71A/FCC.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE

Note. Organizational maintenance is maintenance performed at first and second echelon. First echelon maintenance is operator's maintenance; second echelon is repairman's maintenance.

Section I. OPERATOR'S MAINTENANCE

19. Scope of Operator's Maintenance

Operator's maintenance for Audio Level Meter ME–71A/FCC consists only of performing the preventive maintenance procedures given in paragraph 20. The operator will not remove any parts or make any repairs of the test set. No tools or test equipment are required for operator's maintenance. However, a clean lint-free cloth is required for cleaning the test set.

20. Operator's Preventive Maintenance

a. Use of DA Form 11–238. DA Form 11–238 is a preventive maintenance check list to be used by the operator as directed by his commander. Items not applicable to Audio Level Meter ME–71A/FCC are lined out on figure 7. References in the ITEM block are to paragraphs in this manual containing additional information pertinent to the particular item.

b. Daily Checks.

(1) Remove dirt and moisture from the external surfaces of the test set, such as the case, and the front panel. On the front panel, clean the decibel meter glass, tuning dial glass, pilot lamp assembly, control knobs, switches, dials, jacks, connector, and binding posts. Use a clean, dry, lint-free cloth for dusting and removing moisture. When dirt cannot be easily removed by dusting, moisten the cloth, clean, and then wipe dry with a dry cloth.

(2) Carefully inspect controls, dials, and switches for binding, scraping, excessive looseness, and for positive action.

(3) Remove the chassis and panel assembly from the case by loosening the five screws. Grasp the two carrying handles located on the front panel, and pull the chassis and panel assembly out of the case.

(4) Inspect seating of tubes, pilot lamp, crystal, fuse and connector.

(5) Check the test set for normal operation (par. 14 through 17).

(6) Replace the chassis and panel assembly in the case and tighten the five screws.

(7) Report any troubles to a higher repair echelon.

c. Weekly Checks. Perform the daily checks (*b* above) and the following:

(1) Inspect exposed metal surfaces of the case for moisture, rust, and corrosion.

(2) Inspect the line cord for breaks, deterioration, and loose connections.

(3) Inspect the decibel meter and tuning dial for damaged case and broken glass.

(4) Inspect seating of tubes, crystal, and fuse.

Section II. REPAIRMAN'S MAINTENANCE

21. Scope of Repairman's Maintenance

The scope of repairman's maintenance is determined by the normally available tools, test equipment, materials, and spare parts, and by the Military Occupational Specialty of the repairman (Carrier Equipment Repairman). Maintenance procedures for repairmen are given in paragraphs 23 through 28.

Note. The test set requires no lubrication.

22. Tools, Test Equipment, and Materials Required

The following tools, test equipment, and materials are not supplied as part of the test set, but are required for organizational repairman's maintenance.

a. Tools.

Tool Equipment TE-123.

b. Test Equipment.

Multimeter TS-297/U or TS-352/U.
Electron Tube Test Set TV-7/U.

c. Materials.

Lint-free cloth.
Cleaning Compound (Federal stock No. 7930-395-9542).

23. Repairman's Preventive Maintenance

a. Use of DA Form 11-239 (fig. 8). DA Form 11-239 is a preventive maintenance check list to be used by the repairman. Items not applicable to the test set are lined out. References in the ITEM block are to paragraphs in this manual that contain additional maintenance information pertinent to the particular item.

b. Monthly Checks.

(1) Perform the checks listed in paragraph 20*c*.

(2) Remove the chassis and panel assembly from the case by loosening the five screws. Grasp the two carrying handles located on the front panel, and pull the chassis and panel assembly out of the case.

(3) Clean switches, terminal boards, and interior of the chassis. Use a clean, dry, lint-free cloth. Use Cleaning Compound to clean contacts or dirt.

Warning: Prolonged breathing of Cleaning Compound fumes is dangerous. Make sure adequate ventilation is provided. Cleaning Compound is flammable; do not use near a flame.

(4) Inspect internal electrical components for cracks, chipping, blistering, discoloration, and moisture.

(5) Inspect the fixed capacitors for leaks, bulges, and discoloration.

(6) Inspect the variable tuning capacitor for dirt and loose mounting lugs.

Caution: Do not touch or bend the plates of the variable tuning capacitor. To do so will cause loss of accurate frequency calibration of the test set.

(7) Inspect the connections to transformers, switches, and controls for loose connections.

(8) Inspect the seating, mounting, and screws of all components for looseness. Tighten any loose screws; reseat loose tubes or fuse.

(9) Check all connections for moisture-fungiproofing.

(10) Check the wipers of all switches and controls for good contact. Do not attempt repairs. If necessary turn in the equipment to a higher repair echelon.

(11) Replace the chassis and panel assembly in the case and tighten the five screws.

(12) Perform an operational check (par. 28). Note any abnormal indications and apply the recommended *corrective measures* to restore normal operation.

24. Repairman's Trouble-shooting Technique

Trouble shooting by the unit repairman is based on operational checks and the use of the senses in determining such troubles as burned-out fuses, broken cords, defective tubes, cracked insulators, internal grounding, and short circuits. Multimeter TS-297/U or TS-352/U is used to check the continuity of conductors suspected of being broken and to measure voltages that are more or less than the prescribed input value of approximately 118 volts ac. Electron Tube Test Set TV-7/U is used by the repairman to test tubes suspected of being faulty. The

procedures outlined assist the repairman in locating the fault and determining whether repair at organizational level is possible or repair at field maintenance level is indicated. If the fault cannot be determined through the procedures outlined in paragraphs 25 through 28, trouble shooting at field maintenance level is required.

25. Visual Inspection

a. When the equipment fails and the cause is not apparent, check the items listed in *b* below before starting a systematic operational check of the equipment. Do not remove the chassis and panel assembly from the case and begin this check without some knowledge of the operational symptoms. If posible, obtain information from the operator about equipment performance when the trouble occurred.

b. Complete or partial failure of the test set may be caused by one or more of the following faults, which can be checked by visual inspection:

(1) Check for a worn, broken, or disconnected cord or plug. If a fault is suspected, check for continuity with the TS–297/U or TS–352/U.
(2) Check the fuse for continuity with the TS–297/U or TS–352/U.
(3) Look for broken or loose wires in the bridge chassis.
(4) All tubes should be lighted when the AUD. GAIN control is operated from the OFF position. Test any suspected faulty tubes (par. 26).
(5) Overheated capacitors can be detected by sight and smell.
(6) Burned resistors and insulation are discolored and may indicate a possible short or ground.
(7) Improper positioning of controls causes erratic operation of the test set.

26. Trouble Shooting and Replacing Faulty Tubes

Note. The following instructions regarding replacement of faulty tubes applies to all tubes except calibration oscillator V7, tuning oscillator V8, first mixer V1, and second mixer V2. The only check to be made of these tubes is to see that they are properly seated.

a. Many tubes are discarded before their effective life expires. The effective life of tubes can be prolonged by —

(1) Inspecting all wiring and the general condition of the test set before removing tubes.
(2) If possible, isolating the trouble to a particular section of the test set.
(3) Removing and testing one tube at a time if Electron Tube Test Set TV–7/U is available. Substitute new tubes only for those that are defective.
(4) If a tube tester is not available, trouble shoot by the following tube substitution method:
   (*a*) Replace the suspected tubes (fig. 3), one at a time, with new tubes. If the test set becomes operative, discard the last tube removed.
   (*b*) Reinsert the remaining original tubes, one at a time, in the original sockets. If equipment failure occurs during this step, discard the last original tube. *Do not leave a new tube in a socket if the equipment operates with the original tube.*

b. If tube substitution does not correct the trouble, *reinsert the original tubes in their original sockets* and forward the equipment for higher echelon repair.

c. Discard tubes when they are shown to be defective by the tube tester, or when the defect is obvious: for example, a broken envelope or filament.

(1) Do not discard tubes merely because they have been used for a specified length of time. Satisfactory operation in a circuit is the final proof of tube quality. The tube in use may work better than a new one.
(2) Do not discard tubes merely because they fall on or slightly above the minimum acceptable value when checked by the TV–7/U. A certain percentage of new tubes fall near the low end of their acceptable range of tube specification and therefore start their operational life at a value close to the tube tester retention limit. These tubes may provide satisfactory performance throughout a long period of operational life at this *near limit* value.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.
AUDIO LEVEL METER ME-71A/FCC	

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ⓧ Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (~~[illegible]~~ tubes, spare parts, technical manuals and accessories).	✓	19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, ~~[illegible]~~, CRACKED SOCKETS: INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES.	✓
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR 9	✓	20	~~[illegible]~~	
3	CLEAN DIRT AND MOISTURE FROM ~~[illegible]~~ JACKS, PLUGS, ~~[illegible]~~ COMPONENT PANELS. PAR. 20b(1)	✓	21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION.	✓
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, ~~[illegible]~~. PAR. 23b(2)	✓	22	~~[illegible]~~	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION.	✓	23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 23b(6)	✓
6	CHECK FOR NORMAL OPERATION. PAR. 20b 5	ⓧ	24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	✓
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, ~~[illegible]~~, AND CABLE CONNECTIONS.	✓	25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS.	✓
8	INSPECT ~~[illegible]~~ EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.	✓	26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, ~~[illegible]~~, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE.	✓
9	INSPECT CORD, CABLE, WIRE, ~~[illegible]~~ FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN.	✓	27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	✓
10	~~[illegible]~~		28	~~[illegible]~~	
11	~~[illegible]~~		29	~~[illegible]~~	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ~~[illegible]~~, AND PILOT LIGHT ASSEMBLIES.	✓	30	~~[illegible]~~	
13	~~[illegible]~~		31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS.	✓
14	CLEAN ~~[illegible]~~, DIAL AND METER WINDOWS, ~~[illegible]~~.	✓	32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING ~~[illegible]~~.	✓
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	✓	33	~~[illegible]~~	
16	~~[illegible]~~		34	~~[illegible]~~	
17	~~[illegible]~~		35	~~[illegible]~~	
18	~~[illegible]~~		36	~~[illegible]~~	
			37	MOISTURE AND FUNGIPROOF.	✓
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.				

DA FORM 1 MAY 51 11-239 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM2151-27

Figure 8. DA Form 11-239, prepared for use with Audio Level Meter ME-71A/FCC.

27. Trouble Shooting Using Equipment Performance Check List

a. General. The equipment performance check list (par. 28) assists the repairman in locating trouble in the test set. The check list shows the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. *To use this list, follow the items in numerical sequence.*

b. Action or Condition. For some items, the information given in the *Action or condition* column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the *Normal indications* column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator should note when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. This column indicates the action taken by the unit repairman if the normal indication is not obtained. Second echelon maintenance personnel are limited to performing only the maintenance for which they are provided tools, test equipment, and replacement parts. References to paragraphs in this chapter indicate repairs to be made by the unit repairman. References to paragraphs in chapter 5 are for use by field maintenance personnel *only*.

28. Equipment Performance Check List

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	AUD. GAIN control	Operate to OFF position.		
	2	Line cord	Connect to 115-volt, 50- to 60-cps power source.		
	3	ATTENUATOR DB switch	Turn to 0 db position.		
	4	METER switch	Turn to CAL. 1 position.		
	5	SELECTOR switch	Position not important.		
	6	CAL. 2 (I. F. GAIN) control	Do not disturb existing setting.		
	7	TUNING DIAL	Turn to 100 kc.		
START	8	AUD. GAIN control	Turn clockwise.	Pilot lamp lights.	Check fuse (par. 25*b*(2)). Check line cord and plug (par. 25*b*(1)). Check AUD. GAIN control. Check pilot lamp.
				Panel meter indicates 0 db.	Check tubes V9 through V12 in power supply. Turn in equipment for repair (par. 48 Item 3).
EQUIPMENT PERFORMANCE	9	METER switch	Turn to CAL. 2 (100 KC) position.	Panel meter indicates 0 db.	Adjust CAL. 2 (I. F. GAIN) control to provide meter indication of 0 db. Check tubes V2, V4, and V5. Turn in equipment for repair (par. 48 Item 4).
	10	Tuning control	Turn to 200 kc through 500 kc in steps of 100 kc.	Panel meter indicates up scale for each step.	Turn in equipment for repair (par. 48 Item 4).
	11	ATTENUATOR DB switch	Turn to —10 db position.	Panel meter indicates up scale.	Turn in equipment for repair.
STOP	12	AUD. GAIN control	Turn to OFF position.	Pilot lamp goes out.	

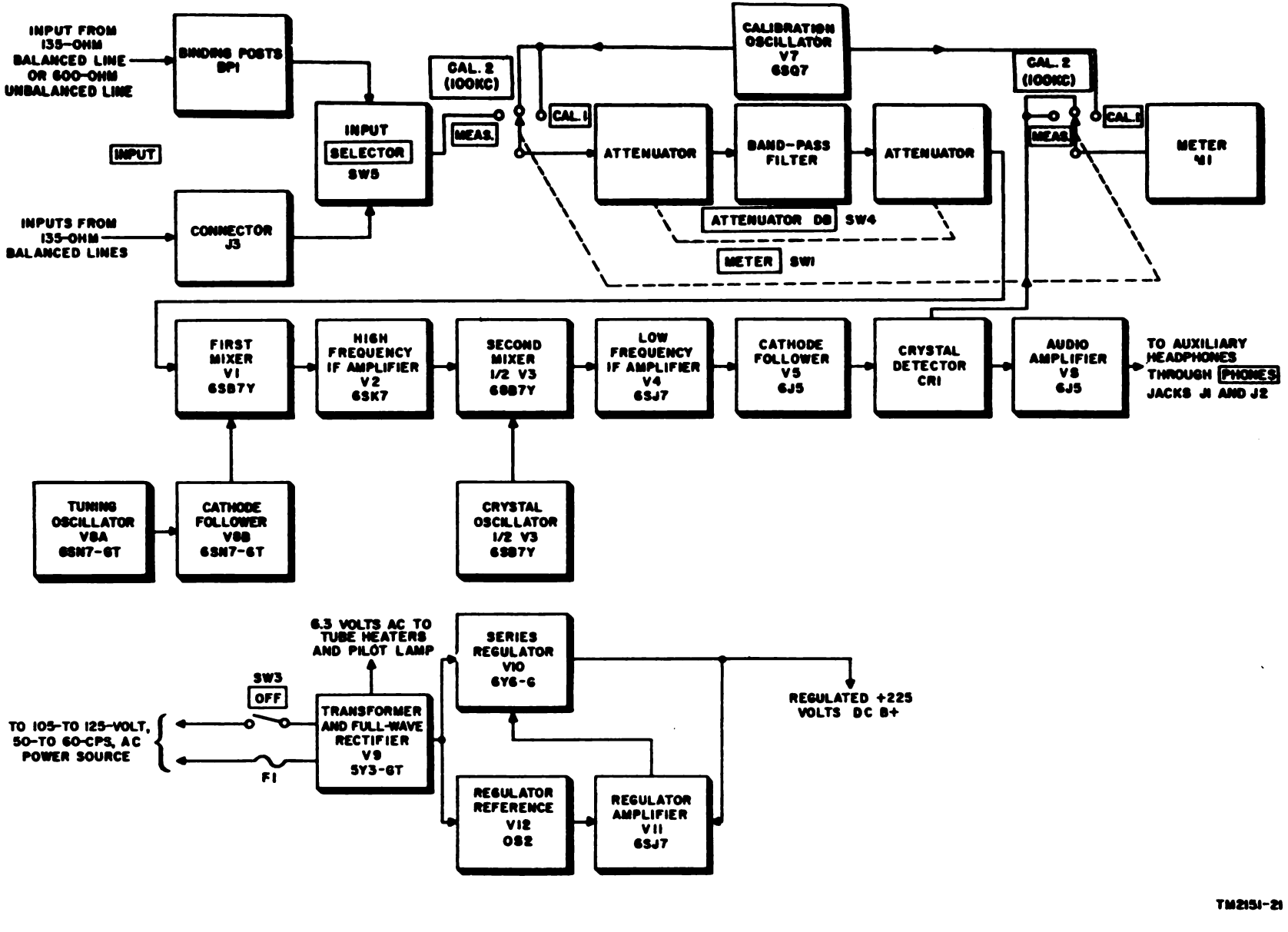


Figure 9. Audio Level Meter ME-71A/FCC, block diagram.

CHAPTER 4

THEORY

29. Block Diagram Analysis
(fig. 9)

The basic circuit of Audio Level Meter ME-71A/FCC is similar to that of a double conversion superheterodyne radio receiver. A block diagram description of the various circuits of the test set is given in *a* through *f* below.

a. Input, Attenuator, and Band-pass Filter Circuits. The circuit under test is connected to either the INPUT binding post BPI or INPUT connector J3. SELECTOR switch SW5 connects the binding posts or the connector through the MEAS. position of METER switch SW1 to the attenuator at the input to the band-pass filter. ATTENUATOR DB switch SW4 controls attenuator pads at both the input and the output of the filter. The pads used in the circuit are dependent on the setting of switch SW4 and provide a variable gain adjustment from +40 to —60 decibels (db). The band-pass filter passes frequencies between 15 and 500 kc.

b. Mixer and If Amplifier Circuits. From the output of the attenuator pads at the output of the band-pass filter, the test signal is applied to first mixer V1 where it is combined with the output of tuning oscillator V8 to produce a difference frequency of 1,110 kc. The tuning oscillator is adjustable over a range from 1,130 to 1,610 kc. This signal is amplified by high-frequency, intermediate-frequency (if) amplifier V2 and applied to crystal oscillator and second mixer V3. In the mixer section of V3, the 1,110-if signal is combined with the output of the oscillator section of V3 to produce a second if of 82 kc. The 82-kc signal is amplified by low-frequency if amplifier V4. The output of low-frequency if amplifier V4 is coupled to crystal detector CR1 through cathode follower V5.

c. Crystal Detector and Audio Amplifier. The crystal detector rectifies the 82-kc signal for measurement in meter M1 through METER switch SW1 and detects any amplitude-modulated (am) component of the test signal. The am component is applied to audio amplifier V6. Auxiliary headphones can be connected to the PHONES jacks at the output of the audio amplifier to permit monitoring. The audio amplifier amplifies the am signal to a level suitable for monitoring.

d. Calibration Oscillator. Calibration oscillator V7 provides a 100-kc signal of fixed amplitude for use as a reference signal when calibrating the test set. The signal is used as a standard when adjusting the gain of high-frequency if amplifier V2.

e. Meter Circuit. The meter circuit includes meter M1 and METER switch SW1. When the switch is operated to the MEAS. position, the rectified output of crystal detector CR1 is applied to the meter. When the switch is in the CAL. 2 (100KC) position, the output of calibration oscillator V7 is connected through the attenuators and band-pass filter and the normal path of a test signal from the attenuators through crystal detector CR1 to the meter. When the switch is operated to the CAL. 1 position, the output of the calibration oscillator is connected directly to the meter.

f. Regulated Power Supply. The power supply provides +225 volts dc to the plate and screen grid of each tube circuit in the test set. In addition, the power supply provides a 6.8-volt as supply for the tube filaments and pilot lamps. The power supply includes full-wave rectifier V9, series regulator V10, regulator amplifier V11, and regulator reference V12. The regulated power supply provides a nearly

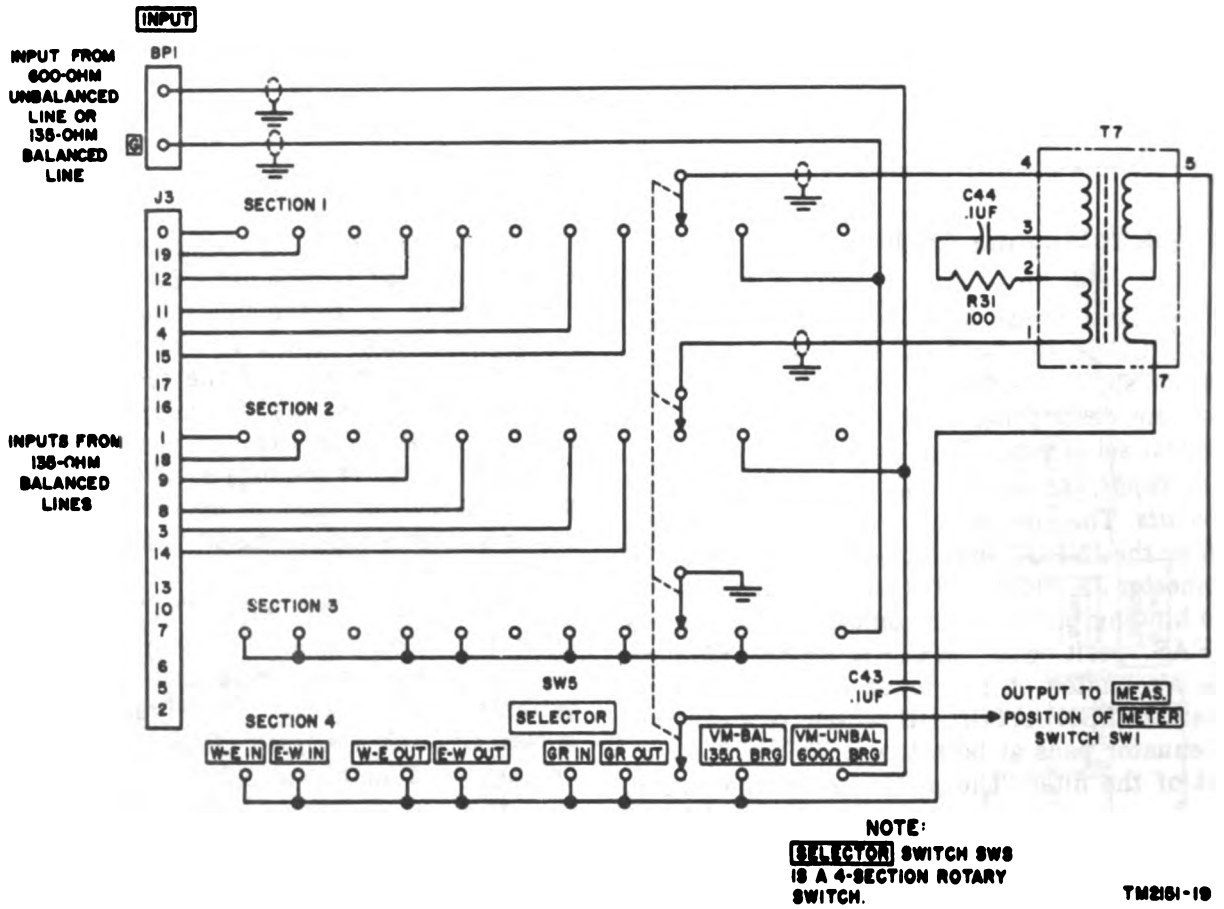


Figure 10. Input circuit, simplified schematic diagram.

constant output over an input of 105 to 125 volts ac.

30. Input Selector

(fig. 10)

Signals from either a 600-ohm unbalanced line or a 135-ohm balanced line may be applied to INPUT binding posts BP1. INPUT connector J3 provides for the application of input signals from any of the six pairs of 135-ohm balanced lines. INPUT binding posts BP1 or the particular pair of INPUT connector J3 connected for testing is selected by the operation of SELECTOR switch SW5. Switch SW5 is connected to the other circuits of the test set through the MEAS. position of METER switch SW1.

a. SELECTOR Switch SW5.

(1) *VM-UNBAL 600Ω BRG position.* Terminal G of INPUT binding posts BP1 is connected to ground through the contacts of section 3 of the switch. The unlabeled terminal of the INPUT binding posts is applied to the input attenuator circuit through direct current (dc) blocking capacitor C43 and the contacts of section 4 of the switch.

(2) *VM-BAL 135Ω BRG position.* Terminal G of INPUT binding posts BP1 is connected to terminal 4 of transformer T7 through the contacts of section 1 of the switch. The unlabeled terminal of INPUT binding posts BP1 is connected to terminal 1 of the transformer through the contacts of section 2 of the switch. Terminal 5 of the transformer is connected to ground through the contacts of section 3 of the switch, and terminal 7 of the transformer is connected to the input attenuator circuit through the contacts of section 4 of the switch.

(3) *GR OUT, GR IN, E-W OUT, W-E OUT, E-W IN, and W-E IN positions.* When SELECTOR switch SW5 is

operated to any of these positions, the signal from the corresponding pair of terminals of INPUT connector J3 is connected to terminals 1 and 4 of transformer T7 through the contacts of sections 1 and 2 respectively of SELECTOR switch SW5. Terminal 5 of the transformer always connects to ground through corresponding contacts of section 3 of the switch, and terminal 7 always connects through the corresponding pair of contacts of section 4 of the switch.

b. 135-ohm Balanced Line Impedance Matching. When switch SW5 is operated to any position other than VM-UNBAL 600Ω BRG, transformer T7, in conjunction with capacitor C44 and resistor R31, provides a means of coupling 135-ohm balanced line INPUT signals into the 600Ω unbalanced circuit presented by the input to ATTENUATOR DB switch SW4. Capacitor C44 and resistor R31 are placed in series between terminals 2 and 3 of the two primaries of transformer T7. The value of these two components is chosen to provide transformer T7 with a 135-ohm input impedance.

31. Attenuator and Band-pass Filter (fig. 11)

The signal selected in the input selector circuit is applied through the attenuator and band-pass filter to the grid of first mixer V1. The attenuator and band-pass filter circuit reduces the input signal by known amounts and attenuates signals of frequencies lying outside the 15-kc to 500-kc pass band of the band-pass filter. ATTENUATOR DB switch SW4 select the necessary combination of resistors to provide the desired amount of attenuation. Switch SW4 is calibrated in 10-db steps over the range of +40 to —60 db. The circuit is so arranged that the +40-, +30-, and +20-db attenuator resistor combinations are connected in the input portion of the band-pass filter, and the remaining resistances are connected in the output portion of the filter.

a. Attenuator. The attenuator circuit consists of ATTENUATOR DB selector switch SW4, attenuator input current limiting resistor R1, and the various combinations of attenuating resistors. Resistors for the +40, +30,

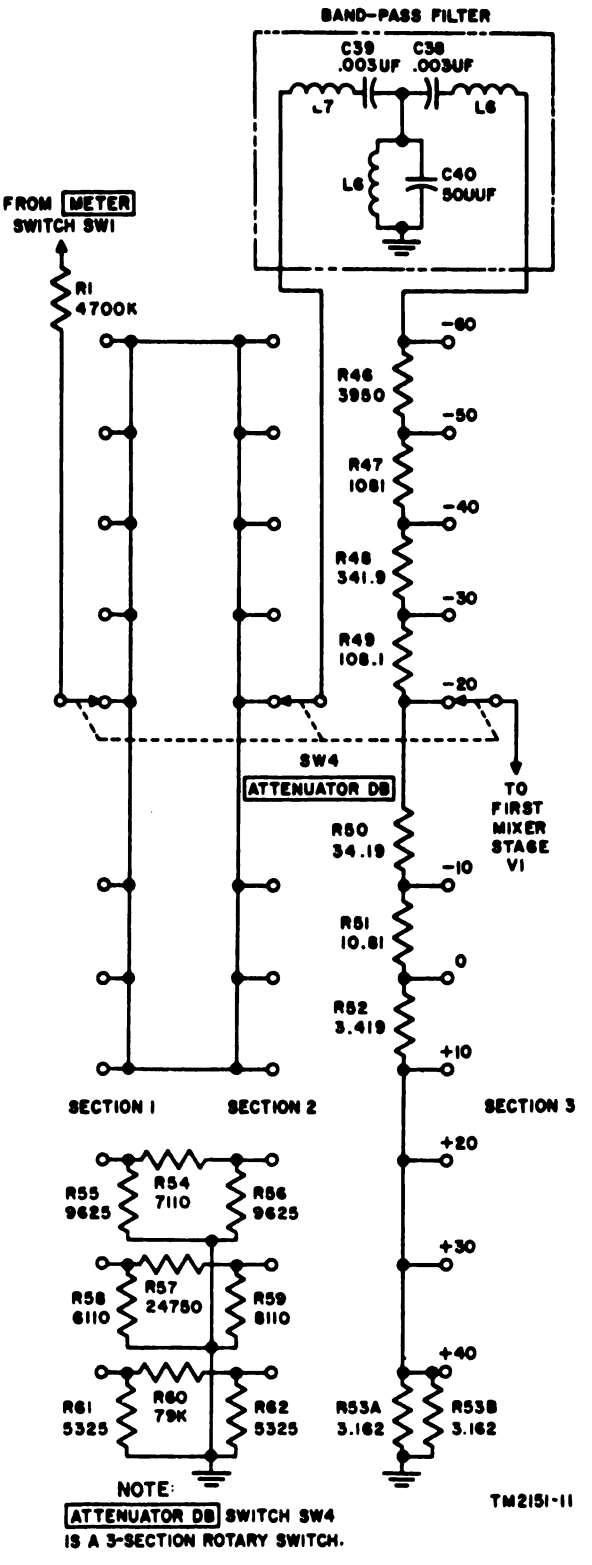


Figure 11. Attenuator and band-pass filter circuits, simplified schematic diagram.

and +20 levels of attenuation are arranged in the form of unbalanced pi-type pads between contacts of sections 1 and 2 of switch SW4. Resistors for attenuation levels from —60 db through +10 db are arranged in a series step attenuator circuit between contacts of section 3 of switch SW4. A connection is made to switch SW4 from the junction of each two resistors and from the resistor at the input end of the series. Step attenuator resistors R46 through R52 are arranged in numerical order for attenuations levels of —60 db through 0 db respectively. Parallel resistors R53A and R53B form the resistances for the +10-db level and are connected between R52 and ground on section 3 of switch SW4. Attenuator pads for the +40-, +30-, and +20-db levels are individually shunted across the input to the band-pass filter, when switch SW4 is placed in the corresponding position. The series step attenuator resistance is permanently shunted between the band-pass filter output and ground. The step attenuator forms a voltage divider that distributes the output voltage of the band-pass filter along its length. Each step provides a fixed proportion of the total signal voltage, which is selected by positioning ATTENUATOR DB switch SW4 to the desired attenuation level in the range from —60 to +40 db. The step attenuator output is directly connected to the signal grid of first mixer V1.

b. Band-pass Filter. The band-pass filter consists of inductances L6, L7, and L8 and capacitors C38, C39, and C40. Capacitor C38 and coil L6, and capacitor C39 and coil L7 are connected to form two series resonant LC circuits. Capacitor C40 and coil L8 are connected to form a parallel resonant circuit that is shunted between ground and the junction of capacitors C38 and C39. Circuit component values are such that all three circuits are resonant in the frequency range of 15 kc to 500 kc.

32. First Mixer
(fig. 12)

a. Detailed Circuit Operation. The input signal (20 to 500 kc) is directly connected from the attenuator and band-pass filter circuit to the signal grid of first mixer V1. The output of tuning oscillator V8A and cathode follower V8B, at a frequency 1,110 kc higher than that of the input signal, is applied to the oscillator

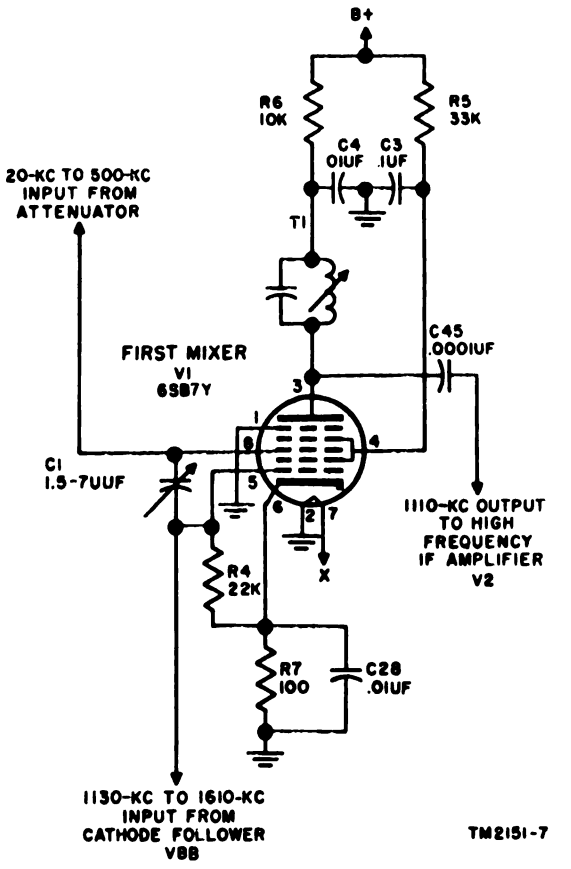


Figure 12. First mixer, simplified schematic diagram.

grid of first mixer V1. The two signal inputs combine to produce an output signal containing both of the original frequencies, plus the sum and difference of the two original frequencies. The plate circuit includes T1, a parallel resonant circuit, that is slug tuned to the difference frequency of 1,110 kc. B+ voltage is applied to the plate circuit through resistor R6. Resistor R6 forms part of the decoupling network that includes capacitor C4. The decoupling network serves to minimize the coupling of the plate circuit rf signals into the B+ supply line. Resistor R5 serves to reduce the B+ potential applied to the screen grid (pin 4). Capacitor C3 is the bypass capacitor for resistor R5. Resistor R7 and capacitor C28, connected between the cathode and ground, establish the cathode bias voltage. The suppressor grid is connected directly to ground. The output is capacitively coupled to high-frequency if amplifier V2 through capacitor C45.

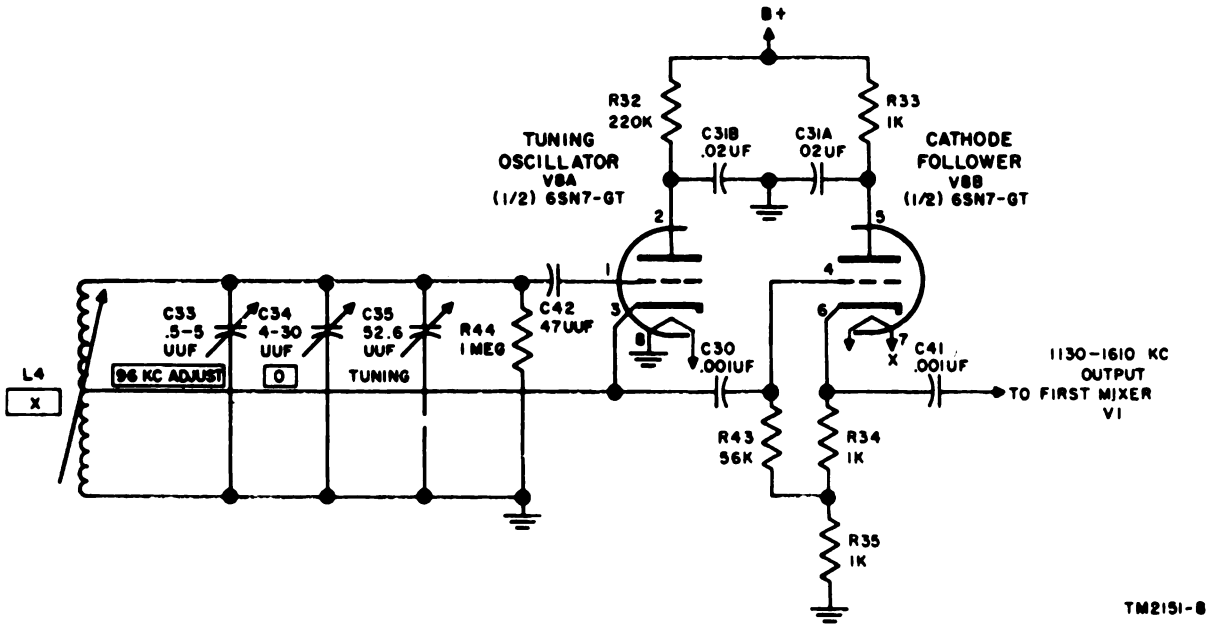


Figure 13. Tuning oscillator and cathode follower, simplified schematic diagram.

b. Neutralization. Pentagrid-converter type tubes are characterized by a type of interaction arising from the coupling between the signal grid and a space charge in the vicinity of the signal grid. This coupling increase the impedance of the signal input circuit in proportion to the input frequency and, as a result, the converter output level becomes dependent on the frequency of the input signal. This interaction may be reduced by connecting a small value of capacitance between the signal and oscillator grids. In first mixer V1, this capacitance is represented by variable capacitor C1. Capacitor C1 is adjusted during alignment of the test set so that no potential exists in the signal grid circuit under conditions of no signal input.

33. Tuning Oscillator and Cathode Follower (fig. 13)

Tuning oscillator V8A uses a type 6SN7-GT dual-triode in a circuit having the functions of a variable frequency heterodyne oscillator and cathode follower output stage. The oscillator frequency is variable over the range of 1,130 kc to 1,610 kc. The output of tuning oscillator V8A is coupled through cathode follower V8B to the oscillator grid of first mixer V1. With an if of 1,110 kc, adjustment of tuning oscillator V8A through a frequency range of 1,130 kc to 1,610 kc provides the test set with an input signal frequency range of 20 kc to 500 kc. Cathode follower V8B is used to couple the output of tuning oscillator V8A to the first mixer stage to minimize loading of the tuning oscillator, thus providing a more stable output of tuning oscillator V8A.

a. Tuning Oscillator. Tube V8A is used in a conventional Hartley-type oscillator circuit. The parallel resonant oscillator tank circuit consists of slug-tuned coil L4 and main tuning capacitor C35. Two trimmer capacitors C34, and C33 are provided for adjustment during alignment. The oscillator tank circuit is grounded at one end and the other end is coupled to the oscillator grid through capacitor C42. Resistor R44 provides self-bias for the oscillator grid. Feedback necessary to maintain oscillation is provided by connecting the cathode to ground through a tap on L4. B+ voltage is applied to the plate through load resistor R32. Bypass capacitor C31B passes plate circuit rf voltages to ground to prevent their coupling into the B+ supply. The output is coupled from the cathode to the cathode follower V8B grid through coupling capacitor C30.

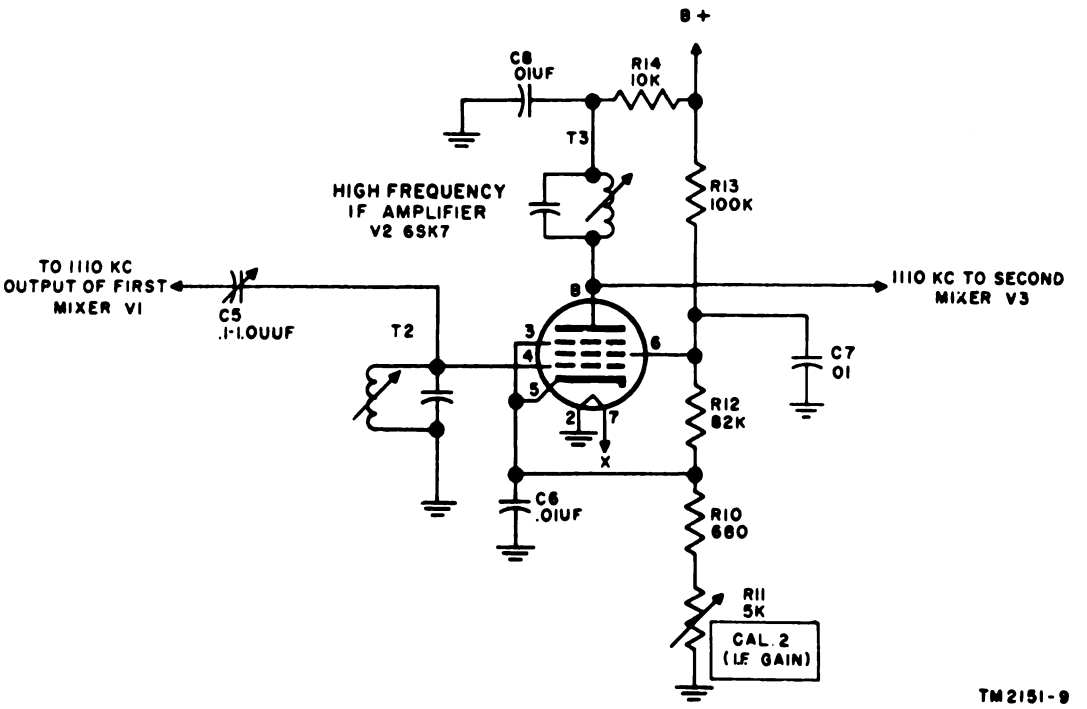


Figure 14. High-frequency if amplifier, simplified schematic diagram.

b. Cathode Follower. Tube V8B is used in a conventional cathode follower output circuit. The signal from tuning oscillator V8A is applied to the grid of cathode follower V8B. The output from the cathode is applied, through coupling capacitor C41, to the oscillator grid of first mixer V1. The output load for cathode follower V8B is provided by resistors R34 and R35, which are connected in series between the cathode and ground. Bias is established by connecting grid return resistor R43 to the junction of cathode load resistors R34 and R35. The plate is connected to the B+ supply line through decoupling resistor R33. Capacitor C31A serves as the rf bypass capacitor for the plate circuit.

34. High-frequency If Amplifier (fig. 14)

High-frequency if amplifier V2 uses a type 6SK7 pentode in a conventional if amplifier circuit having tuned input and output circuits. The 1,110-kc output of first mixer V1 is applied to T2, and the amplified output from tuned plate circuit T3 is capacitively coupled to the signal grid of second mixer V3. The gain of high-frequency if amplifier V2 is adjusted by CAL. 2 (I.F. GAIN) control R11 in the cathode circuit. Amplitude of the 1,110-kc input signal is controlled by adjusting capacitor C5.

a. Input and Output Circuits. The input signal is applied to the control grid from input tuning circuit T2. The amplified output at the plate is connected to parallel resonant tuning circuit T3. Tank circuits T2 and T3 are slug tuned to the 1,110-kc intermediate frequency. B+ voltage is applied to the plate circuit through rf decoupling resistor R14. Capacitor C8 is the bypass of capacitor for resistor R14. The output is coupled from the plate to the signal grid of second mixer V3.

b. Gain Control and Biasing Circuit. The gain control and biasing circuit includes CAL. 2 (I.F. GAIN) control R11 and resistors R10, R12, and R13. These resistors are connected in series between ground and the B+ supply line to form a voltage divider network. Screen grid potential is taken from the junction of resistors R12 and R13 and is applied to the screen grid. Screen grid bypass capacitor C7 is also con-

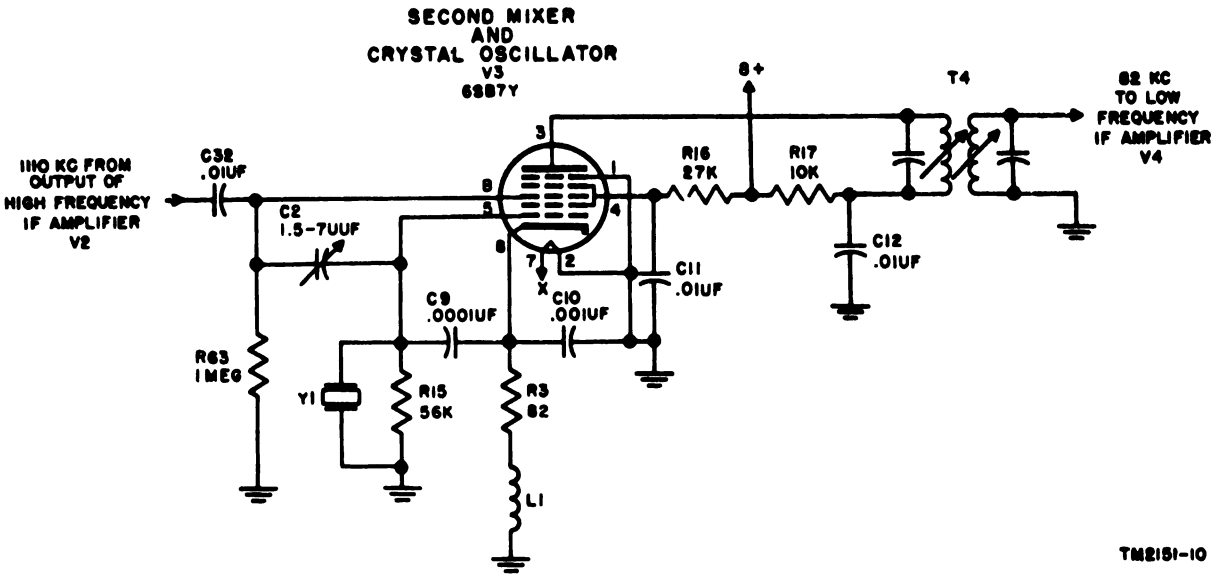


Figure 15. Second mixer and crystal oscillator circuits, simplified schematic diagram.

nected from ground to the voltage divider network at this point. Cathode bias voltage is obtained from the junction of resistors R10 and R12 and is applied to the cathode and the suppressor grid. Cathode bypass capacitor C6 is also connected from ground to the voltage divider network at this point. With this type of biasing circuit, a much higher cathode bias voltage can be obtained than with a conventional cathode bias circuit, and the screen grid potential tends to remain stable in spite of large variations in the amplitude frequency of the input signal. Adjustment of CAL. 2 (I.F. GAIN) control R11 regulates the amplitude of the signal which is eventually applied to meter M1.

35. Second Mixer and Crystal Oscillator (fig. 15)

Second mixer and crystal oscillator V3 is a type 6SB7Y pentagrid converter in a circuit combining the functions of mixer action and generation of a heterodyne mixing signal. The 1,110-kc output of high-frequency if amplifier V2 is combined with the 1,028-kc output of the crystal oscillator section of V3 to provide a second if of 82 kc. This signal is inductively coupled through transformer T4 to the input of low-frequency if amplifier V4.

a. Second Mixer. The operation of the mixer section of V3 is similar to the operation of first mixer V1. The 1,110-kc output of high-frequency if amplifier V2 is coupled through capacitor C32 to the signal grid of V3. The 1,028-kc signal developed by the oscillator section of V3 appears on the oscillator grid. The primary and the secondary of transformer T4 are slug tuned to the 82-kc difference frequency component to provide an 82-kc input to low-frequency if amplifier V4. The primary of transformer T4 is connected to the B+ supply line through the rf decoupling network composed of resistor R17 and capacitor C12. B+ voltage is applied to the screen grid through dropping resistor R16. Capacitor C11 is the screen grid bypass and resistor R63 provides a grid return path between the signal grid and ground. The suppressor grid is connected directly to ground. Neutralization of the interaction between the oscillator grid and signal grid is provided by variable capacitor C2.

b. Crystal Oscillator. The oscillator section is connected as a tuned grid triode oscillator, with crystal Y1 forming the frequency controlling element. Pin 5 performs the combined functions of oscillator control grid and mixer oscillator injection grid. The screen grid functions as the oscillator plate, and the cathode serves both the mixer and oscillator portions of V3. Crystal Y1 and grid biasing resistor R15 are connected in parallel between the oscillator grid and ground. The cathode is returned to ground

through an rf decoupling network composed of resistor R3, rf choke L1, and bypass capacitor C10. This network maintains an rf voltage upon the cathode. Feedback necessary to sustain oscillation is provided by coupling a portion of the rf voltage present upon the cathode through capacitor C9 to the oscillator grid. The 1,028-kc oscillator signal existing on the oscillator grid is simultaneously utilized in the mixing function of V3.

36. Low-frequency If Amplifier
(fig. 16)

Low frequency if amplifier V4 uses a type 6SJ7 pentode in a conventional if amplifier circuit having a tuned input and output circuit. This stage increases the amplitude of the 82-kc output signal of second mixer V3 to a level suitable for application to cathode follower V5. The secondary of coupling transformer T4 is applied directly between the control grid of low-frequency if amplifier V4 and ground. The primary of coupling transformer T5 forms a portion of the plate load and the secondary forms the input circuit of cathode follower V5. Both the primary and the secondary of transformer T5 are slug tuned to 82 kc. The primary of transformer T5 is connected to the B+ supply through the rf decoupling network composed of resistor R21 and capacitor C15. B+ voltage is applied to the screen grid through dropping resistor R20. Capacitor C14 serves as the screen grid bypass capacitor. Cathode bias is provided by resistor R19, which is connected in parallel with cathode bypass capacitor C13 between ground and the cathode. The suppressor grid is directly connected to the cathode.

37. Cathode Follower
(fig. 17)

Cathode follower V5 uses a type 6J5 triode in a conventional cathode follower circuit, and provides a means of coupling the 82-kc if signal to crystal detector CR1. A cathode follower used at this point provides the advantages of amplification of power, good frequency response, high input impedance, and low distortion. The output of transformer T5 is applied between the grid and grid return resistor R8. The load for this circuit is provided by resistors R9 and R22, which are connected in series between the cathode and ground. Grid bias is established by connecting grid return resistor R8 to the junction of cathode load resistors R9 and R22. Capacitor C16, which is connected between ground and the junction of the secondary of transformer T5 and resistor R8, reduces the possibility of interaction between the signal appearing in the grid return circuit and the signal on the cathode by bypassing the grid return circuit to ground. The plate is connected to the B+ supply through dropping resistor R18. Capacitor C50 bypasses rf potentials to ground. The output of the stage is taken from the cathode and coupled to crystal detector CR1.

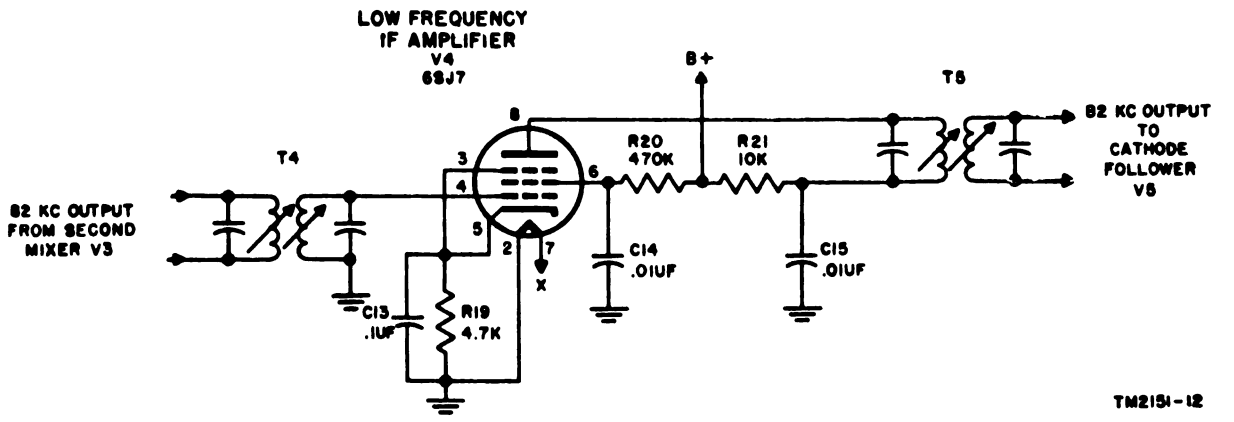


Figure 16. Low-frequency if amplifier circuit, simplified schematic diagram.

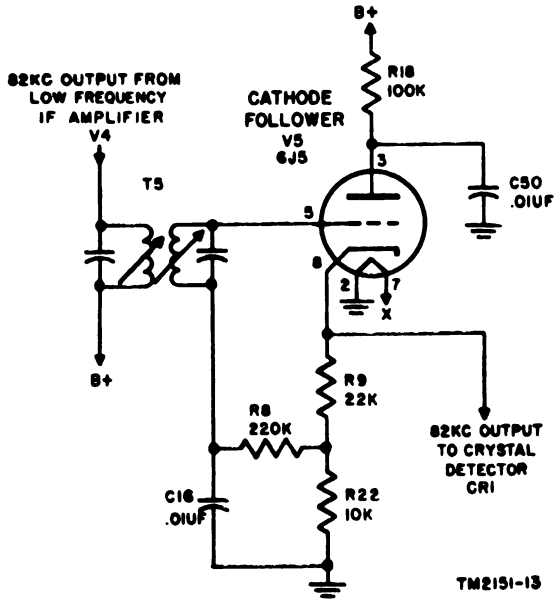


Figure 17. Cathode follower circuit, simplified schematic diagram.

38. Crystal Detector (fig. 18)

Crystal detector CR1 rectifies the 82-kc output of cathode follower V5 for application to the meter circuit, and detects any amplitude modulation for application to audio amplifier V6. The circuit includes crystal CR1, a type 1N34A germanium diode, diode load resistor R23, bypass capacitor C17, coupling capacitor C18, and the rf filter composed of L9 and C49.

a. Detector Circuit. The output of cathode follower V5 is applied to the anode of crystal detector CR1. One end of rf choke L9 is also connected to the anode of the crystal detector. The other end of rf choke L9 is connected to bypass capacitor C49, and to meter M1 when METER switch SW1 is in the MEAS. or CAL. 2 (100KC) position. Resistor R23 and bypass capacitor C17 are connected between the cathode of crystal detector CR1 and ground. The voltage appearing across resistor R23 is coupled to audio amplifier V6 through capacitor C18.

b. Detector Operation. The input signal is applied to the detector circuit through capacitor C48. During the positive half cycles of the signal applied to the detector circuit, a pulsating dc flows through the detector circuit. The charging path is from ground through load resistor R23, crystal detector CR1 to capacitor C48. During the negative half cycles of the signal applied to the detector circuit, a pulsating dc flows through meter M1. The discharge path is from capacitor C48, through rf choke L9, meter M1 to ground. Audio frequency (af) components of the input signal applied to this stage appear as a fluctuating dc voltage across diode load resistor R23. Rf components of the applied signal are bypassed by capacitor C17. The af signal is coupled to audio amplifier V6 through capacitor C18. The flow of the pulsating dc through meter M1 produces an indication corresponding to the average level of the applied signal. Rf choke L9 and bypass capacitor C49 prevent the flow of the applied rf signal through meter M1.

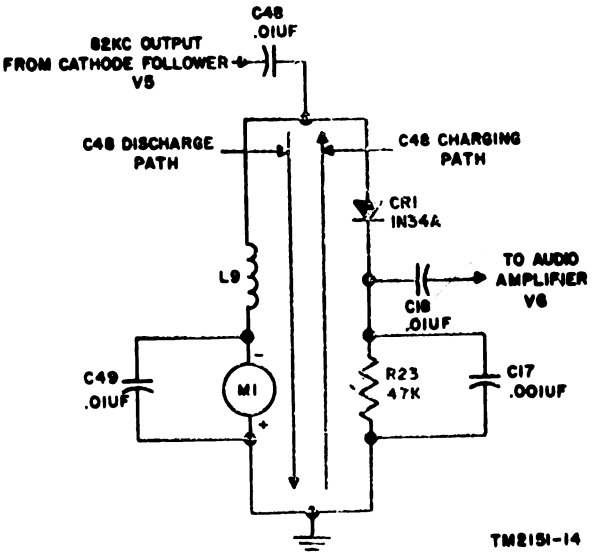


Figure 18. Crystal detector circuit, simplified schematic diagram.

39. Audio Amplifier (fig. 19)

Audio amplifier V6 increases the amplitude of the af output of crystal detector CR1 to a level suitable for monitoring with auxiliary headphones. This stage consists of a type 6J5 triode connected in a conventional audio amplifier circuit. The output of crystal detector CR1

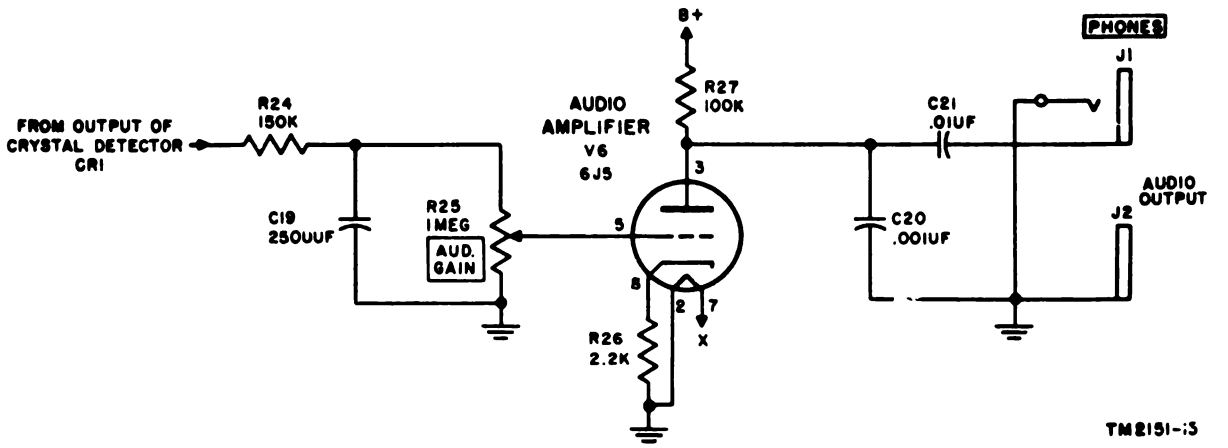


Figure 19. Audio amplifier circuit, simplified schematic diagram.

is applied through current limiting resistor R24 to AUD. GAIN control R25. The sliding arm of AUD. GAIN control R25 is connected to the grid, the other end of control R25 is connected to ground. Capacitor C19 is connected across R25 and functions as an rf bypass. Bias for the stage is provided by resistor R26, which is connected between the cathode and ground. The omission of a cathode bypass capacitor introduces degenerative feedback to reduce frequency and phase distortion in this stage. The plate is connected to the B+ supply through plate load resistor R27. The output is coupled to PHONES jack J1 through coupling capacitor C21. Rf bypassing in the plate circuit is provided by capacitor C20.

40. Metering Circuit
(fig. 20)

The metering circuit includes meter M1 and METER selector switch SW1. The principal function of the metering circuit is to provide an indication of the signal level of the input to the test set. The circuit also provides indications that are used during calibration of the test set.

a. CAL. 1 Position. This position provides for the adjustment of the voltage applied to the plate circuit of calibration oscillator V7. A rectified sample of the output of the calibration oscillator V7 is applied to meter M1. The CAL 1 potentiometer (fig. 27) is adjusted to provide the proper output level of calibration oscillator V7. In the CAL. 1 position, the following connections are made:

(1) Meter M1 is connected to a rectified sample of the output of calibration oscillator V7 through contacts of section 2 of METER switch SW1.

(2) The meter output of crystal detector CR1 is grounded through section 2 of METER switch SW1.

(3) B+ voltage is connected to the plate circuit of calibration oscillator V7 through section 1 of METER switch SW1 and CAL 1 potentiometer R2; thus calibration oscillator V7 is placed in operation.

(4) The attentuator input circuit is connected to the center contact of potentiometer R42 through section 1 of METER switch SW1; this provides a connection to the calibration oscillator output.

b. CAL. 2 (100KC) Position. This position provides for the adjustment of the gain of high-frequency if amplifier V2. This adjustment is made by using the CAL. 2 (I.F. GAIN) control to produce a standard indication on meter M1. In the CAL. 2(100KC) position, the following connections are made:

(1) Meter M1 is connected to the meter output of crystal detector CR1 through section 2 of METER switch SW1.

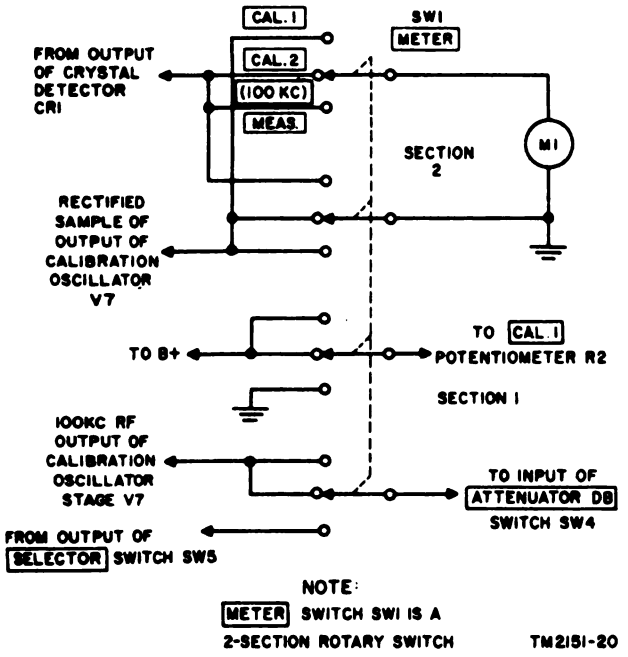


Figure 20. Meter and meter switching circuit, simplified schematic diagram.

(2) The rectified output of calibration oscillator V7 is grounded through section 2 of METER switch SW1.

(3) B+ voltage is applied to the plate circuit of calibration oscillator V7 through section 1 of METER switch SW1 and CAL 1 potentiometer R2; thus the oscillator is placed in operation.

(4) The attenuator input circuit is connected to the center contact of P potentiometer R42 through section 1 of METER SW1; this provides a connection to the 100-kc rf output of calibration oscillator V7.

c. MEAS. Position. This position provides an indication of the level of the signal which is applied to the input of the test set. In the MEAS. position, the following connections are made:

(1) Meter M1 is connected to the meter output of crystal detector CR1.

(2) The calibration oscillator V7 sampling circuit is grounded.

(3) CAL 1 potentiometer R2 is grounded removing B+ voltage from the plate circuit of calibration oscillator V7. Input SELECTOR switch SW5 is connected to the input of ATTENUATOR DB switch SW4.

41. Calibration Oscillator
(fig. 21)

Calibration oscillator V7 provides a 100-kc signal of fixed amplitude to be used as a reference signal in the internal calibration of the test set.

a. Circuit Operation. The parallel resonant tank circuit consists of slug-tuned coil L3 and capacitor C24. One end of the tank circuit is connected to ground through the resistance

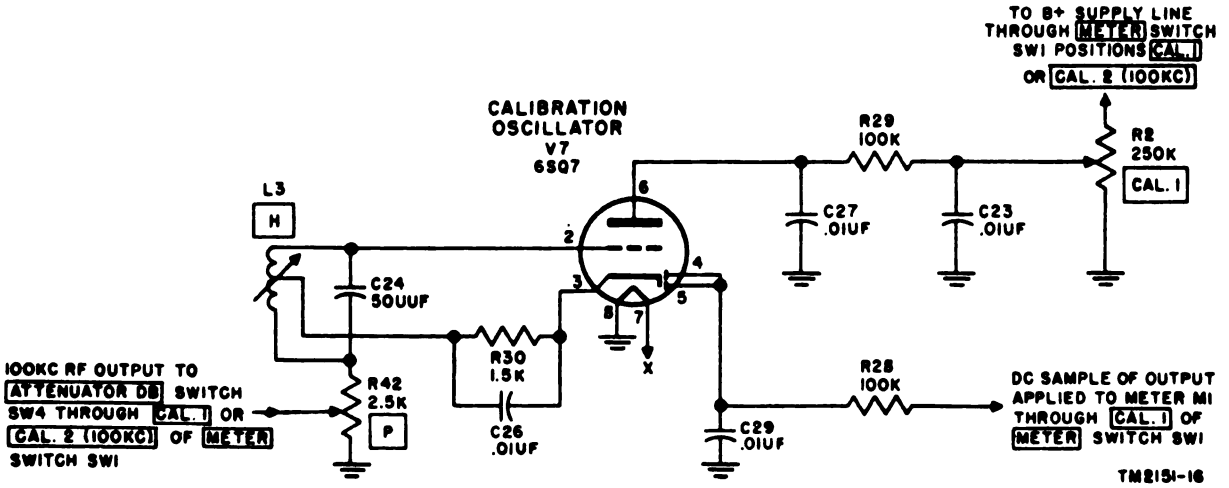


Figure 21. Calibration oscillator circuit, simplified schematic diagram.

element of P potentiometer R42. The other end is connected to the grid of calibration oscillator V7. Negative feedback necessary to sustain oscillation is provided by connecting the cathode to a tap on coil L3. The cathode circuit includes biasing resistor R30 and bypass capacitor C26. The plate is connected to the sliding arm of CAL 1 potentiometer R2 through plate load resistor R29. Capacitors C23 and C27 are rf bypass capacitors. CAL 1 potentiometer R2 acts as a voltage divider, permitting an adjustment of the plate voltage applied to calibration oscillator V7. Since the amount of plate voltage applied controls the amplitude of the oscillations, CAL 1 potentiometer R2 may be used to adjust the output level of calibration oscillator V7.

b. Calibration Oscillator Output Circuits. Calibration oscillator V7 is provided with two output circuits. These circuits and their application are described as follows:

(1) The first output is used in the adjustment of the plate voltage of calibration oscillator V7 with the CAL 1 potentiometer. The output consists of a rectified and filtered sample of the oscillator output which is applied to meter M1 when the METER switch is in the CAL. 1 position. The output circuit includes the parallel connected diode plates, filter capacitor C29, and current limiting resistor R28.

(2) The second output is applied to ATTENUATOR DB switch SW4 and is utilized when adjusting the gain of high-frequency if amplifier V2. This output, is taken between the sliding arm of P potentiometer R42 and ground. Potentiometer R42 is adjusted during calibration of the test set to provide an output level of calibration oscillator V7 that corresponds to a 0-db input signal from an external source.

42. Regulated Power Supply Section

The regulated power supply provides regulated B+ voltage of 225 volts dc for use in the electron tube plate and screen grid circuits of the test set.

a. Power Supply Input Circuit (fig. 22). A power source of 105 to 125 volts, 50 to 60 cps, ac is applied to power connector PL1, which is a parallel contact polarized grounding plug. One of the plug contacts is connected to capacitor C47 and through switch SW3 to one primary lead of power transformer T6. The other plug contacts is connected to capacitor C46 and through protective fuse F1 to the other primary lead of transformer T6. The grounding terminal of connector PL1 is connected to the chassis ground. Capacitors C46 and C47 provide filtering or suppression of any electrical noise which may be coupled in from the power line. Fuse F1 protects the circuit against overloads. Switch SW3, which controls the application of power to T6, is mechanically linked to AUD. GAIN control R25.

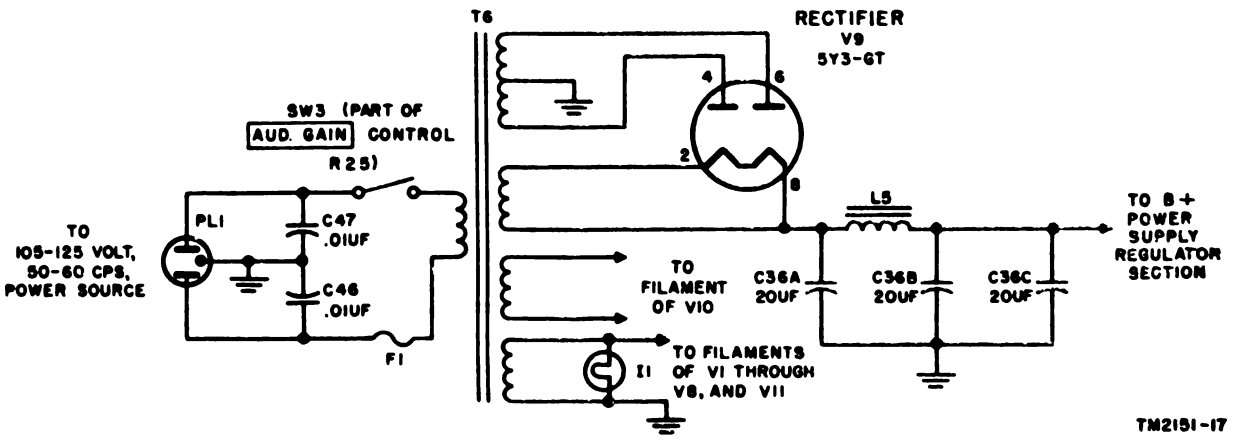


Figure 22. Power supply rectifier and filter section, simplified schematic diagram.

b. Full-wave Rectifier and Filter Section (fig. 22). The full-wave rectifier includes transformer T6 and rectifier V9, a type 5Y3–GT dual-diode tube. Transformer T6 includes three low voltage secondary windings and one center-tapped high voltage winding. Heater power of 5 volts ac is connected to the heater of rectifier V9. The ends of the high voltage winding are connected to the plates of rectifier V9. The center tap of the high voltage winding is connected to the chassis ground. The filter circuit consists of coil L5 and the A, B, and C sections of capacitor C36. The filtered dc output is applied to the regulator section.

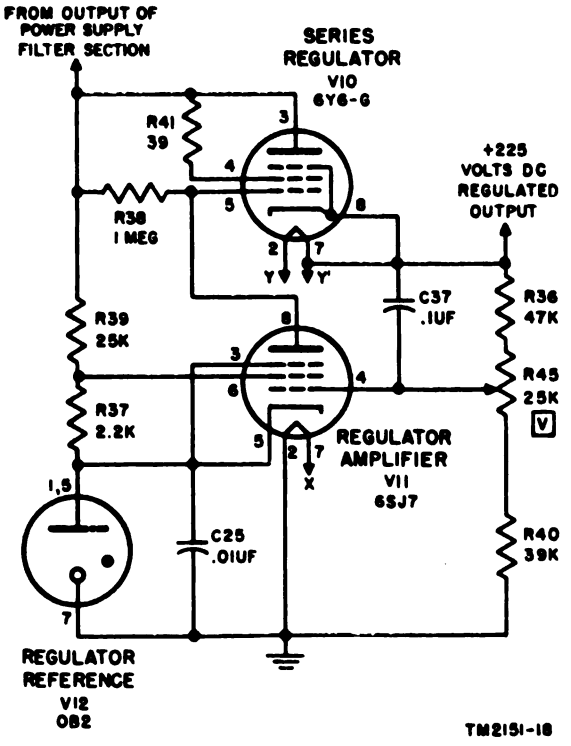


Figure 23. Power supply voltage regulator, simplified schematic diagram.

c. Regulator Section (fig. 23). The voltage regulator circuit includes series regulator V10, a type 6Y6–G pentode, regulator amplifier V11, a type 6SJ7 pentode, and regulator reference V12, a type OB2 gaseous voltage regulator. In this circuit, series regulator V10 acts as a variable resistance that is placed in series with the output of the rectifier and filter section and the power supply load. Regulator amplifier V11, in conjunction with voltage reference V12, varies the resistance of series regulator V10 to compensate for changes in the power supply output voltage. When the power supply output voltage increases, the plate resistance of series regulator V10 increases and returns the power supply output voltage to 225 volts.

d. Regulator Operation.

(1) *Series regulator circuit.* The output of power supply filter section is connected to the plate of series regulator V10. The screen grid is connected to the output of the power supply filter section through dropping resistor R41. The control grid is connected to plate load resistor R38 of regulator amplifier V11; the output of regulator amplifier V11 thus is directly coupled to the grid of series regulator V10. The other end of R38 is connected to the power supply filter section output. The regulated 225 volts dc (B+) output is taken from the cathode of series regulator V10. Connection is made between the cathode and heater circuits of series regulator V10 to eliminate cathode-heater potential difference.

(2) *Regulator amplifier circuit.* The plate of regulator amplifier V11 is connected to the grid of series regulator V10 and through plate load resistor R38 to the output of the power supply filter section. Resistor R38 therefore serves as the plate load resistor of regulator amplifier V11 and the grid return resistor of series regulator V10. A voltage divider network consisting of resistors R39 and R37 and reference regulator V12 is connected between the filter section output and ground. The cathode and the suppressor grid of regulator amplifier V11 are connected to the divider network at the junction of regulator reference V12 and resistor R37. A fixed reference voltage appears across regulator reference V12 and maintains the cathode of regulator amplifier V11 at a constant potential irrespective of voltage variations in the output of the power supply filter section. Screen

grid voltage for regulator amplifier V11 is tapped off at the junction of voltage divider resistors R37 and R39. A sample of the regulator output voltage is applied to the control grid (pin 4) of regulator amplifier V11 from the center arm of potentiometer R45, which forms part of a voltage divider network including resistors R36 and R40. This network is connected between the 225-volt dc regulator output and ground. Capacitor C37, connected between the regulator output and the control grid of series regulator V11, permits the application of power supply ripple voltage to the regulator amplifier circuit. Capacitor C25 is connected across regulator reference V12 to filter out noise generated by this tube.

(3) *Regulating action.* The flow of regulator amplifier V11 plate current through plate load resistor R38 produces a voltage drop that is applied as bias to the control grid of series regulator V10; this establishes the series resistance to the flow of power supply current. Any change in the level of regulator amplifier V11 plate current flow will be reflected as a corresponding change in the series resistance of series regulator V10, and consequently in the voltage drop across the tube. In normal operation, potentiometer R45 is adjusted to provide a level of conduction in regulator amplifier V11, and subsequent voltage drop across series regulator V10, that produces a power supply output of +225 volts dc. An increase in the positive voltage applied to the grid of regulator amplifier V11 increases the voltage drop across plate load resistor R38, and a greater bias is applied to the control grid of series regulator V10. Increased bias on series regulator V10 increases the resistance of the tube; this increases the voltage drop across the tube and reduces the regulator output voltage. A decrease in output voltage reduces the bias applied to series regulator V10, and thus reduces the voltage drop across the tube and increases the regulator output voltage. Ripple voltage coupled to the control grid of regulator amplifier V11 causes the same type of action, which results in the removal of virtually all ripple from the output of the regulated power supply.

CHAPTER 5

FIELD MAINTENANCE

Note. This chapter contains information for field maintenance repairmen having the minimum training of a carrier equipment repairman (third echelon maintenance) or an electronic instrument repairman (fourth echelon maintenance). The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning: Certain points located throughout the chassis of the test set operate at voltages of 225 volts (fig. 24 and 25). Do not touch these points while power is applied to the test set.

43. Trouble-shooting Procedures

a. General. The first step in servicing a defective test set is to sectionalize the fault. Sectionalization means tracing the fault to the major component or circuit responsible for the abnormal operation of the test set. The second step is to locate the fault. Localization means tracing the fault to the defective part responsible for the abnormal condition. Some faults, such as burned-out resistors, arcing, and shorted transformers, often can be located by sight, smell, or hearing. The majority of faults, however, must be localized by checking voltages and resistances (fig. 24 and 25) or by signal substitution (par. 51).

b. Sectionalization and Localization. The tests given in subparagraphs (1) through (6) below will simplify and reduce unnecessary work and aid in tracing a trouble to a specific part. Follow the procedure in the sequence given.

(1) *Visual inspection* (par. 25). Through visual inspection, the repairman frequently may discover the trouble or determine the circuit in which the trouble exists. This inspection is valuable in avoiding additional damage, which might occur through improper servicing methods, and in forestalling future failures.

(2) *Checking for shorts.* The B+ and filament supply circuits should be checked (par. 47) for possible shorts before the equipment is tested with the power applied. These measurements prevent further damage to the equipment from possible short circuits.

(3) *Operational test.* Operational tests frequently indicate the general location of trouble, and often will determine the exact nature of the fault. All symptoms must be interpreted in relation to one another. To perform an operational test on the test set, use the equipment performance check list (par. 28).

(4) *Trouble-shooting Chart.* To aid in localizing trouble to a circuit or component, refer to the trouble-shooting chart (par. 48).

(5) *Signal substitution.* If the proper signal generator is available, signal substitution is effective in localizing trouble on this equipment (par. 50 and 51).

(6) *Intermittent troubles.* In all these tests, possibility of intermittent con-

ditions should not be overlooked. If present, this type of trouble often may be made appear by tapping or jarring the equipment. It is possible that some external connection may cause the trouble. Test the wiring for loose connections and move wires and components with an insulated tool. This may show where a faulty connection or component is located.

(7) *Tube replacement.* After replacing first mixer tube V1 or second mixer tube V2 perform the applicable alignment procedures given in paragraph 57. After replacing calibration oscillator tube V7 perform the alignment procedures given in paragraph 59. After replacing tuning oscillator tube V8 perform the alignment procedures given in paragraph 58. The test equipment required is listed in paragraph 54.

44. Trouble-shooting Data

The material supplied in this manual will aid in the rapid location of faults. Consult the following trouble-shooting data:

Fig. or par. No.	Title
Fig. 8	Audio Level Meter ME-71A/FCC, tube location diagram.
Fig. 24	Terminal boards, voltage and resistance diagram.
Fig. 25	Audio Level Meter ME-71A/FCC, voltage and resistance diagram.
Fig. 26	Audio Level Meter ME-71A/FCC, tuning oscillator and band-pass filter, location of parts.
Fig. 27	Audio Level Meter ME-71A/FCC, top view, location of parts.
Fig. 28	Audio Level Meter ME-71A/FCC, bottom view, location of parts.
Fig. 31	Audio Level Meter ME-71A/FCC, schematic diagram.
Fig. 32	Audio Level Meter ME-71A/FCC, wiring diagram.
Par. 49	Dc resistances of transformers and coils.

45. Test Equipment Required for Trouble Shooting

The items of test equipment required for trouble shooting the test set are listed below. Technical manuals associated with each item also are listed.

Test equipment	Technical manual
Multimeter TS-352/U	TM 11-5527
Electronic Multimeter TS-505/U	TM 11-5511
Electronic Voltmeter ME-30A/U	
Electron Tube Test Set TV-7/U	TM 11-5083
Audio Oscillator TS-382A/U	TM 11-2684A
Signal Generator SG-71/FCC	TM 11-5088
R.F. Signal Generator Set AN/URM-25D	TM 11-5551D
Frequency Meter FR-67/U	TM 11-2698
Frequency Meter AN/URM-79	TM 11-5097

46. General Precautions

Observe the following precautions very carefully when servicing the test set:

a. Be careful when the chassis and panel assembly is removed from the case; dangerous voltages are exposed.

b. If the test set has been operating for some time, use a cloth when removing the metal tube shield (fig. 3) and a tube puller to remove the tubes.

c. When servicing the tuning oscillator assembly, do not disturb the relative position of the component parts. Be careful not to bend the tuning capacitor plates. This could cause a short circuit or a change in frequency calibration.

d. Do not overtighten screws when assembling mechanical couplings.

e. When changing a component that is held by screws, always replace the lock washers.

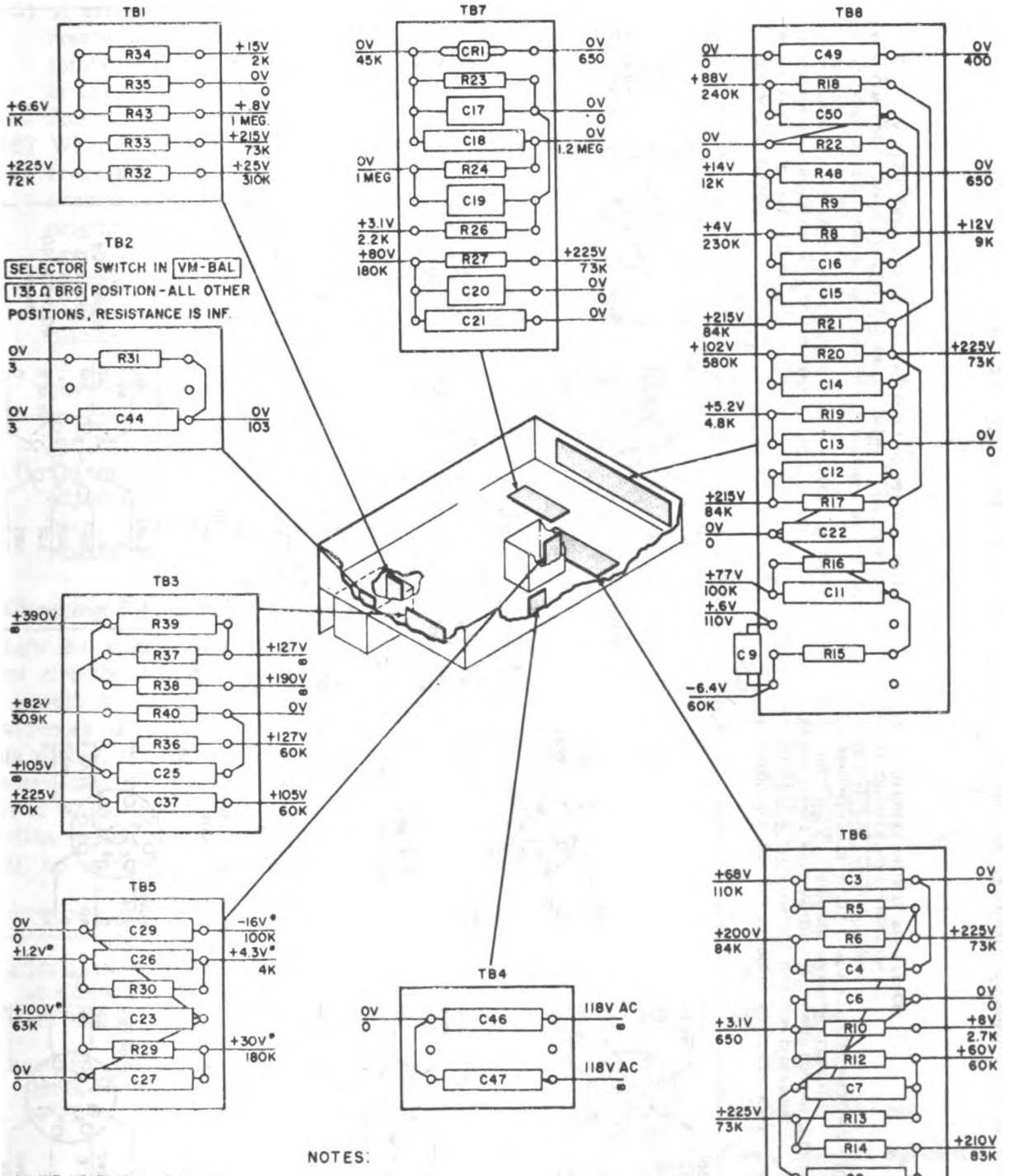
f. Careless replacement of parts often makes new faults inevitable. Proceed as follows:

(1) Before a part is unsoldered, note the position of the leads. If the part, such as a tube socket or power transformer, has a number of connections, tag each lead before removing it.

(2) Be careful not to damage other leads by pushing or pulling them out of the way.

(3) Do not use a large soldering iron when soldering small resistors or ceramic capacitors. Overheating of the small parts may ruin or change the value of the component.

(4) Do not allow drops of solder to fall into parts of the chassis because they may cause short circuits.

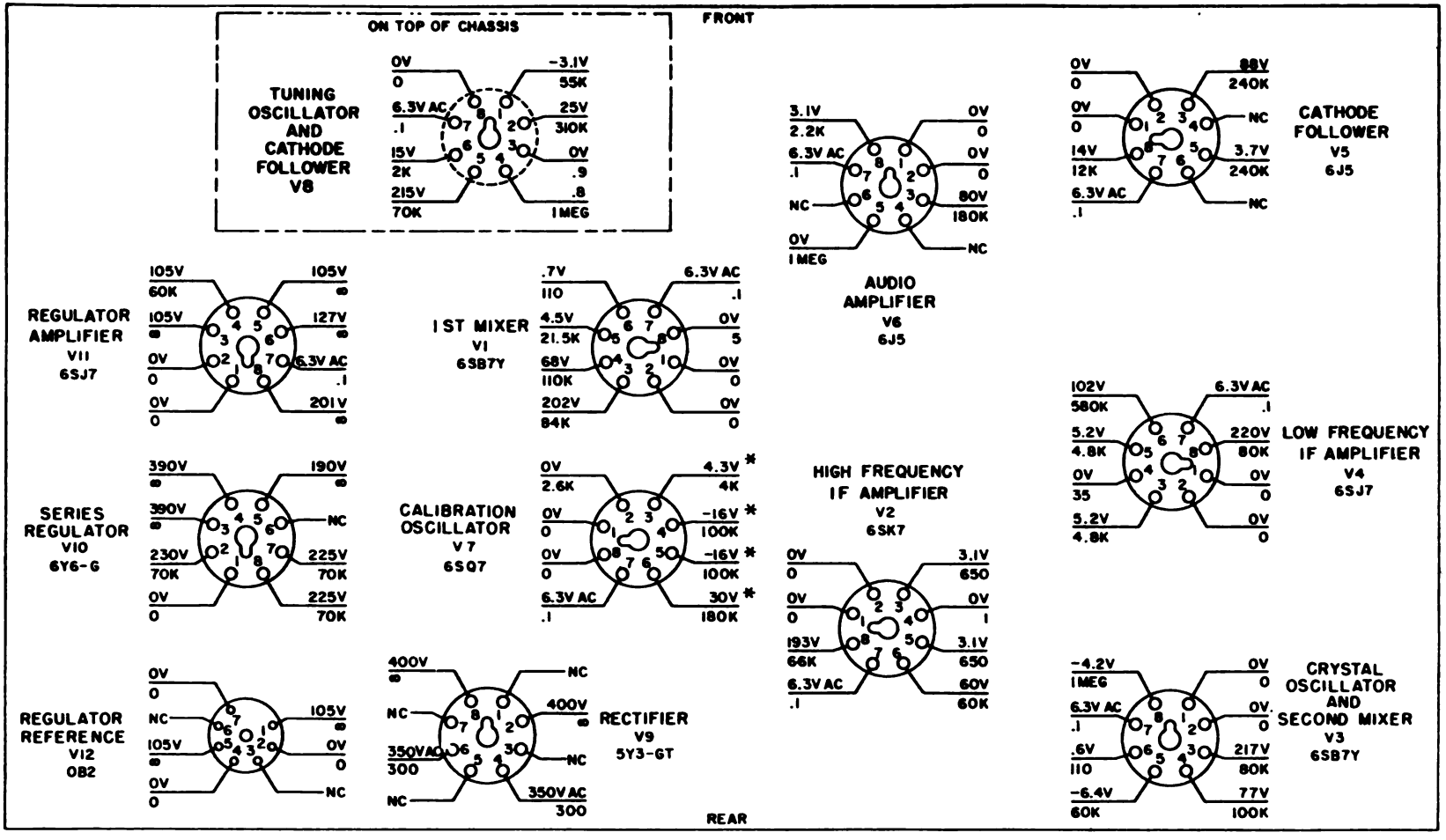


NOTES:

1. LINE VOLTAGE IS 115 VOLTS.
2. ALL RESISTANCES IN OHMS.
3. ALL VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT VOLTMETER.
4. ALL VOLTAGES AND RESISTANCES MEASURED WITH RESPECT TO CHASSIS GROUND.
5. VOLTAGE READINGS ABOVE LINE. RESISTANCE READINGS BELOW LINE.
6. ALL READINGS TAKEN WITH METER SWITCH ON MEAS POSITION AND ATTENUATOR DB SWITCH ON 0 POSITION EXCEPT AS NOTED IN NOTE 10.
7. TUNING DIAL SET TO 100KC. NO SIGNAL INPUT.
8. CAL 2 (I.F. GAIN) CONTROL MAXIMUM CLOCKWISE.
9. RESISTANCE MEASUREMENTS TAKEN WITH EQUIPMENT DISCONNECTED FROM LINE. AUD. GAIN CONTROL MAXIMUM CLOCKWISE.
10. MEASUREMENTS MARKED WITH ASTERISK MADE WITH METER SWITCH ON CAL. 2 (100 KC) POSITION.
11. ∞ DENOTES INFINITE RESISTANCE.

TM2151-23

Figure 24. Terminal boards, voltage and resistance diagram.



NOTES:

1. LINE VOLTAGE 115 VOLTS.
2. ALL RESISTANCES ARE IN OHMS.
3. ALL VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT VOLTMETER.
4. ALL VOLTAGES AND RESISTANCES MEASURED WITH RESPECT TO CHASSIS GROUND.
5. VOLTAGE READINGS ABOVE LINE. RESISTANCE READINGS BELOW LINE.
6. ALL READINGS TAKEN WITH [METER] SWITCH ON [MEAS.] POSITION AND [ATTENUATOR DB] SWITCH ON [0] POSITION EXCEPT AS NOTED IN NOTE 10.
7. FREQUENCY DIAL SET TO 100KC. NO SIGNAL INPUT.
8. [CAL. 2 (I.F. GAIN)] CONTROL MAXIMUM CLOCKWISE.
9. RESISTANCE MEASUREMENTS TAKEN WITH EQUIPMENT DISCONNECTED FROM LINE. [AUD. GAIN] CONTROL MAXIMUM CLOCKWISE.
10. MEASUREMENTS MARKED WITH ASTERISK MADE WITH [METER] SWITCH IN [CAL. 2 (100 KC)] POSITION
11. NC DENOTES NO CONNECTION.
12. ∞ DENOTES INFINITE RESISTANCE.

TM2151-22

Figure 25. Audio Level Meter ME-71A/FCC, voltage and resistance diagram.

(5) A carelessly soldered connection may create new faults. Make well-soldered joints because a poorly soldered joint is one of the most difficult faults to find.

(6) When a part is replaced in a high-frequency circuit, it must be placed exactly in the position occupied by the original part. A part which has the same electrical value but different physical size may cause trouble in high-frequency circuits. When replacing a part, use the same ground as in the original wiring. Failure to observe these precautions may result in improper operation or parasitic oscillations.

(7) Do not disturb any of the alignment adjustments unless it definitely has been determined that the trouble is related to these adjustments.

47. Checking B+ Circuit for Shorts

a. Low B+ voltage or no B+ voltage in the various circuits indicates the possibility of a short circuit. A visual inspection of the chassis for evidences of arcing, charred insulation of chassis wiring, and burned spots on the chassis will sometimes provide a clue to the stage or circuit in which the short is located. Make the inspection before checking the power supply.

b. If no evidence of arcing, charring, or burning is present, make the following checks of the power supply circuits before checking voltages and resistances (*c* below):

(1) Check for improper setting of V potentiometer (R45) (par. 55).

(2) Check for faulty components or tubes in both the rectifier-filter and regulator sections of the power supply circuit.

c. If the checks described in *a* and *b* above fail to localize the trouble, refer to the schematic diagram (fig. 31) for the distribution of B+ throughout the equipment. Use the schematic diagram in conjunction with the voltage and resistance diagrams (fig. 24 and 25) to systematically check the B+ circuit. Start the check at the power supply and proceed through each stage and circuit until the trouble is located.

48. Trouble-shooting Chart

The following chart is supplied as an aid in locating trouble in the test set. It lists the symptoms the repairman observes, either visual or audible, while making tests. The chart also indicates how to localize trouble quickly to a particular stage or circuit. After the trouble has been localized to a stage or circuit, a tube check and voltage and resistance measurements (fig. 24 and 25) should be enough to isolate the defective parts.

Symptom	Probable trouble	Correction
1. AUD. GAIN control switch turned clockwise. Pilot light does not light.	*a.* Defective pilot lamp I 1.	*a.* Replace lamp.
	b. Burned-out fuse F1.	*b.* Replace fuse.
2. Fuse F1 blows when AUD. GAIN control switch turned clockwise.	*a.* Shorted filter capacitor C36.	*a.* Replace C36.
	b. Shorted transformer T6.	*b.* Replace transformer.
	c. Defective rectifier tube V9 or regulator tube V10, V11, or V12.	*c.* Check tubes and replace if necessary.
	d. Short in B+ distribution circuit.	*d.* Make resistance measurements (par. 47). Replace defective components.
3. METER switch set to CAL 1. Meter M1 does not indicate 0 ±.25 db. Tuning dial may be at any setting.	*a.* B+ voltage not at 225 volts.	*a.* Set B+ voltage to 225 volts with adjustment V (R45, par. 55).

Symptom	Probable trouble	Correction
	b. Calibration oscillator V7 inoperative.	*b.* Check V7 (replace if necessary) and make voltage and resistance measurements (fig. 24 and 25). Replace defectice component.
4. METER switch set to CAL. 2 (100KC). Tuning dial set to 100 kc ±3 kc. Meter M1 cannot be set to 0 db with CAL. 2 (I. F. GAIN) control.	*a.* Adjustment CAL 1 (R2) not properly set.	*a.* Adjust CAL 1 (R2) (par. 59).
	b. Adjustment P (R42) not properly set.	*b.* Adjust P (R42) (par. 59).
	c. Tuning oscillator V8 off calibration.	*c.* Calibrate tube V8 (par. 58).
	d. First mixer V1 or high-frequency if amplifier V2 defective.	*d.* Check tube V1 or V2 and replace defective tube. Make voltage and resistance checks (fig. 24 and 25). Replace defective component.
	e. Crystal oscillator and second mixer V3, low-frequency if amplifier V4, cathode follower V5, or crystal Y1 defective.	*e.* Check tube V3, V4, or V5 and replace defective tube or crystal. Make voltage and resistance checks (fig. 24 and 25). Replace defective component.
5. METER switch SW1 set to MEAS. Tuning dial set to 100 kc ±3 kc. SELECTOR switch SW5 set to VM-UNBAL 600Ω BRG. 100-kc signal at 0 db into INPUT binding posts, BP1, meter M1 does not indicate 0 db.	Defective or dirty SELECTOR switch SW5.	Clean or replace SW5.
6. Same as 5 above. SELECTOR switch SW5 set to VM-BAL 135 Ω BRG.	*a.* Defective or dirty SELECTIVE switch SW5.	*a.* Clean or replace SW5.
	b. Defective transformer T7.	*b.* Replace T7.
7. METER switch SW1 set to MEAS. Tuning dial set to 500 kc ±3 kc. SELECTOR switch SW5 set to VM-UNBAL 600 Ω BRG. 500 kc signal at 0 db into BP1. Test set calibrated to radicate 0 db on M1 at 100 kc. Meter does not indicate 0 ±2 db.	*a.* Defective input band-pass filter.	*a.* Replace band-pass filter.
	b. Defective resistor R1.	*b.* Replace R1.
8. Same as 7 except frequency dial set to 20 kc ±3 kc and 20-kc signal at 0 db into BP1.	*a.* Defective input band-pass filter.	*a.* Replace band-pass filter.
	b. Defective resistor R1.	*b.* Replace R1.
9. No audio heard in headphones when the test set is measuring a modulated carrier and AUD. GAIN is turned fully clockwise.	*a.* Defective audio amplifier V6.	*a.* Check tube V6 and replace defective tube. Make voltage and resistance checks (fig. 24 and 25). Replace defective component.
	b. Defective or dirty PHONES jack J1 or J2.	*b.* Clean or replace J1 or J2.

49. Dc Resistances of Transformers and Coils

The dc resistances of the transformers and coils in Audio Level Meter ME-71A/FCC are listed below:

Transformer or coil	Terminals	Ohms
L1	End to end	21
L3	End to end	120
	One end to tap	90
	Opposite end to tap	30
L4	End to end	8
	One end to tap	1
	Opposite end to tap	2
L5	End to end	310
L6	End to end	21
L7	End to end	21
L8	End to end	200
L9	End to end	260
T1	End to end	1
T2	End to end	1
T3	End to end	1
T4	Primary	32
	Secondary	32
T5	Primary	32
	Secondary	32
T6	Primary	6.2
	High-voltage secondary	600 (300 each end to center tap)
	Filament winding to V9	0
	Heater winding to V1-V8, and V11	0
	Heater winding to V10	0

50. Signal Substitution, General

a. R.F. Signal Generator Set AN/URM-25D (signal generator) is required to develop the signal, of proper voltage and frequency, that is to be substituted in or traced through the equipment.

b. Test set meter M1 is used to observe the results of the circuit being tested.

Caution: Do not remove any shielding until the trouble has been traced to a particular unit. Do not push wiring back and forth as this may cause broken connections, change the frequency of an oscillator, or alter the characteristics of a circuit.

c. When connecting a signal generator to the input of a tube, be sure that the low impedance output of the signal generator does not load down the circuit under test.

d. When the defective stage or circuit is located, disconnect the test equipment and make voltage and resistance measurements to locate the defective part.

51. Signal Substitution, Procedures

a. Remove the test set chassis and panel assembly from the case and connect Electronic Voltmeter ME-30A/U and Frequency Meter FR-67/U across the output of R.F. Signal Generator Set AN/URM-25D. Calibrate the signal generator for an output of 82 kc at .11 volt. Disconnect Frequency Meter FR-67/U and connect the output of the signal generator between the control grid (pin 4) and ground of tube V4. Operate the METER switch to the MEAS. position. Test set meter M1 should indicate —1 db ±.5 db.

b. If the proper output is obtained (*a* above), disconnect the signal generator output from tube V4, adjust the output voltage to 3.2 millivolts at 82 kc, and connect the signal generator output between the signal grid (pin 8) of tube V3 and ground. Test set meter M1 should indicate —2 db ±.5 db. If the proper output is obtained, proceed as directed in *c* below.

c. Adjust the signal generator output to 1.11 megacycles (mc) at 3.2 millivolts and check the frequency with Frequency Meter AN/URM-79. Check the connections to V3 (*b* above) and disconnect the AN/URM-79. Vary the signal generator frequency slightly until a maximum deflection is obtained on test set meter M1. Meter M1 should read within the limits of ±.5 db of the reading obtained in *b* above. If the proper output is obtained, proceed as directed in *d* below.

d. Disconnect the signal generator leads from tube V3 but *do not* disturb the frequency setting (*c* above). Adjust the voltage output of the signal generator to 710 microvolts, maintain the frequency adjustment at the frequency obtained in *c* above, and connect the output between ground and the control grid (pin 4) of tube V2. Operate the CAL. 2 (I.F. GAIN) control to the maximum counterclockwise position. Test set meter M1 should indicate —3 db ±.5 db. If the proper reading is obtained on meter M1, proceed as directed in *e* below.

e. Disconnect the signal generator leads from tube V2. *Do not* disturb the frequency setting (*c* above). Adjust the voltage output of the signal generator to 370 microvolts, maintain the frequency used in *d* above, and con-

nect the output between ground and the signal grid (pin 8) of tube V1. Set the ATTENUATOR DB switch to the —40 position. Test set meter M1 should deflect. Operate CAL. 2 (I.F. GAIN) control, first in a clockwise then in a counterclockwise direction. The deflection of test set meter M1 should vary as the CAL. 2 (I.F. GAIN) control is varied.

Section II. REPAIRS

52. Replacement of Parts

Note. Many of the components used in Audio Level Meter ME-71A/FCC have very exact tolerances and characteristics. Safe practice requires the replacement of a damaged component with the exact part, particularly coils and fixed capacitors in the tuned circuits of the tuning oscillator, calibration oscillator, crystal oscillator, and intermediate frequency stages. If components with even slightly different values and characteristics are used in these circuits, the calibration or operation of the test set may be affected.

a. Most of the component parts of the test set are readily accessible and are replaced easily if found faulty. The sockets, capacitors, filter chokes, if transformers, power transformer, and other components are mounted securely to the chassis with slot-head screws and hexagonal nuts.

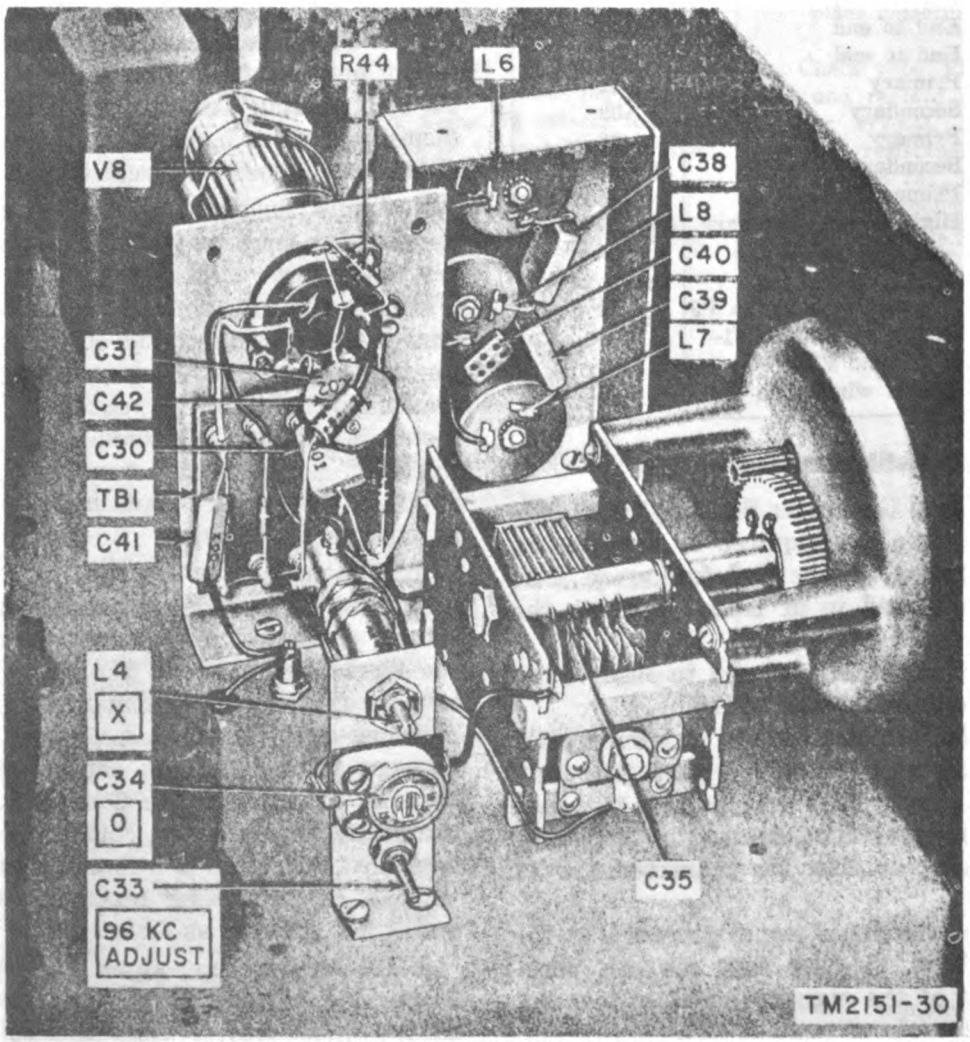


Figure 26. Audio Level Meter ME-71A/FCC, tuning oscillator and band-pass filter, location of parts.

b. If any of the switch wafers require replacement, tag the wires connected to the wafer to avoid misconnection when the new switch is installed. Follow this procedure whenever replacement requires the disconnection of numerous wires. All knobs and couplings are secured to their shafts by either Allen head or slot-head set screws. When replacing a knob, be sure the set screw is securely tightened against the flat portion of the shaft.

53. Removal and Replacement of Capacitor C35

Caution: Do not remove or replace capacitor C35 unless the necessary calibration equipment is available.

a. Removal.

(1) Remove the two nuts from the bottom of the chassis (fig. 28) and the two screws from mounting bracket V8 that hold the tuning oscillator shield (fig. 27). Remove the shield by lifting straight up.

(2) Unsolder the connections to the stator and rotor terminals of C35 (fig. 26).

(3) Remove the four screws (fig. 1) that hold the dial drive and capacitor assembly to the front panel.

(4) Carefully remove the dial drive and capacitor assembly through the hole provided in the front panel.

(5) Loosen the set screws on the coupling between capacitor C35 and the dial drive assembly.

(6) Remove the three mounting screws which mount capacitor C35 to the dial drive assembly (fig. 26).

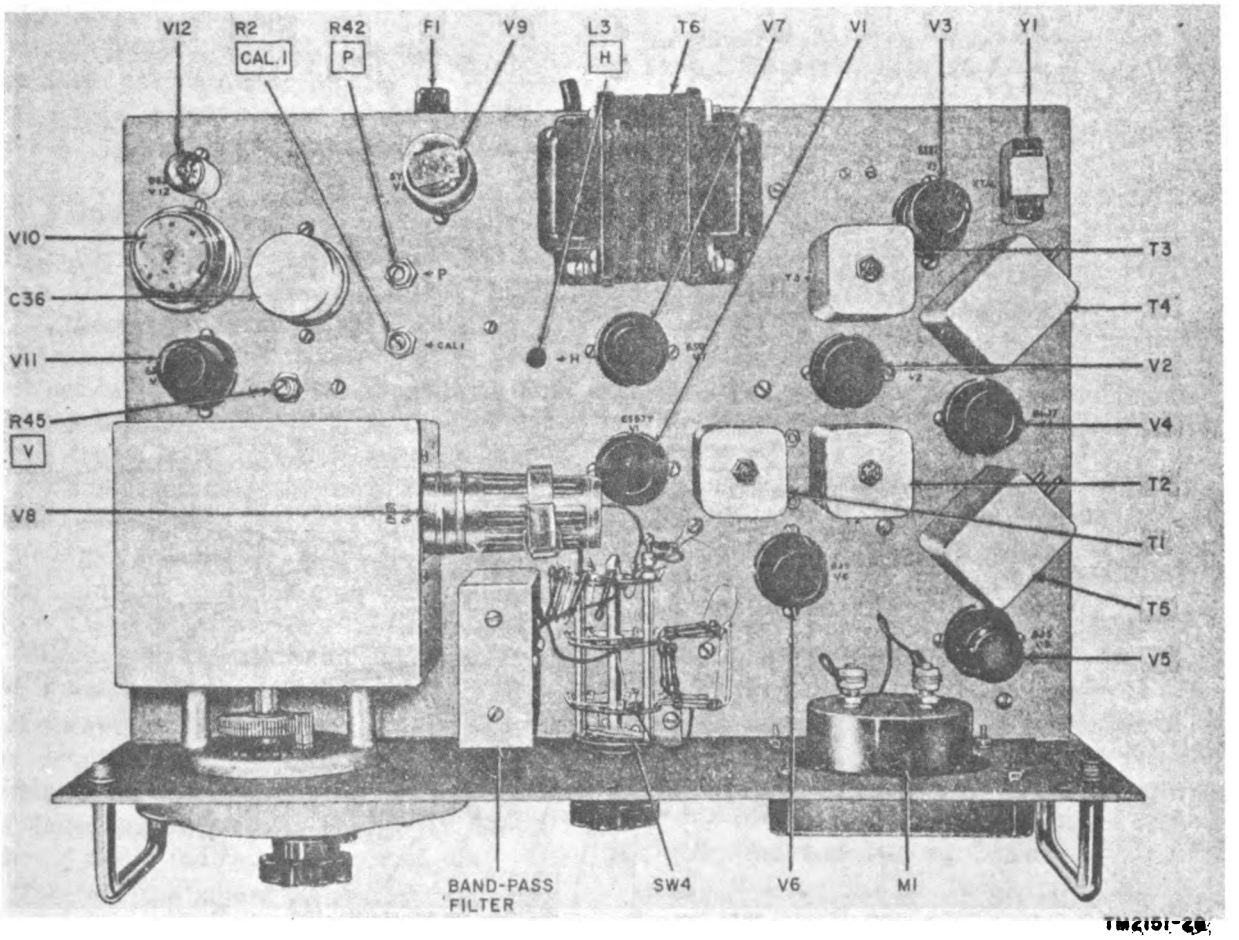


Figure 27. Audio Level Meter ME-71A/FCC, top view, location of parts.

b. Replacement.

(1) Mount new capacitor C35 with the three mounting screws and secure it to the dial drive assembly.

(2) Align the shaft of capacitor C35 with the shaft of the dial drive assembly; be sure that the coupling rotates freely and that there is no binding of the coupling between the two shafts.

(3) Rotate the capacitor to the unmeshed position so that the rotor measures ¼ inch from the stator bar.

(4) Rotate the dial drive and capacitor assembly in a clockwise direction so that the indicator line is on the first mark (extending below the spiral line) past the 500 kc mark.

(5) Tighten the coupling set screws tightly.

(6) Replace the dial drive and capacitor assembly through the hole provided in the front panel.

(7) Replace the four screws that hold the dial drive and capacitor assembly to the front panel.

(8) Resolder the connections to the rotor and stator lugs of C35; be careful to make perfect solder joints.

(9) Before replacing the tuning oscillator cover, align the tuning oscillator (par. 58).

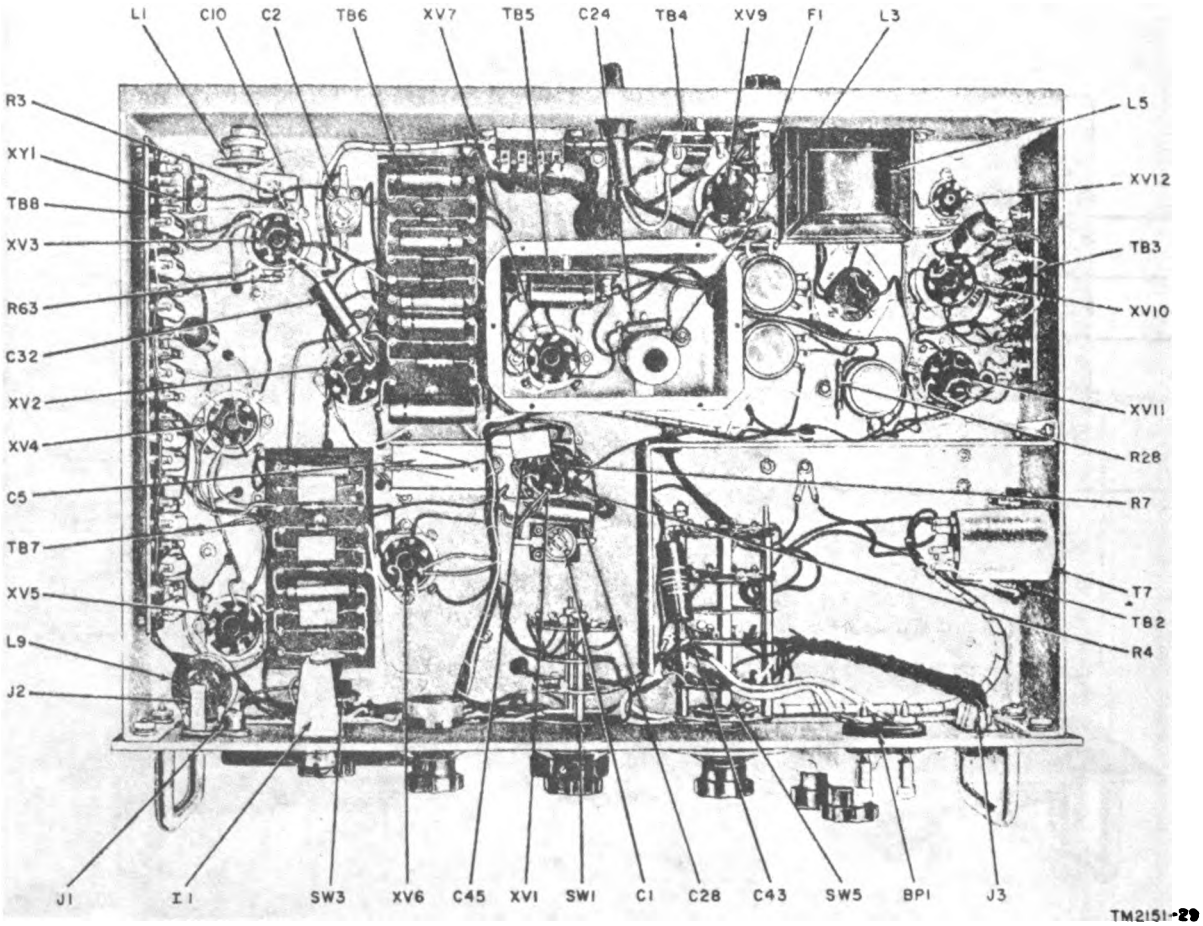


Figure 28. Audio Level Meter ME-71A/FCC, bottom view, location of parts.

Section III. ALIGNMENT

54. Test Equipment Required

The following test equipment is required for the alignment of Audio Level Meter ME-71A/FCC.

Item	Technical manual
Multimeter TS-352/U	TM 11-5527
Electronic Voltmeter ME-30A/U	
Signal Generator SG-71/FCC	TM 11-5088
R. F. Signal Generator Set AN/URM-25D	TM 11-5551D
Frequency Meter FR-67/U	TM 11-2698
Frequency Meter AN/URM-79	TM 11-5097

55. Adjusting Regulated B+ Voltage

The regulated B+ voltage must be set to exactly 225 volts dc before proceeding with the following alignment procedures. Remove the test set chassis and panel assembly from the case. Use Multimeter TS-352/U to measure the voltage from the cathode (pin 8) of V10 to ground. Adjust potentiometer V (R45, fig. 27) until a reading of 225 volts dc is obtained.

56. Alignment of If Stages

a. Operate METER switch SW1 to MEAS. Use the AN/URM-25D to apply .11 volt at 82 kc to the control grid (pin 4) of V4 and tune if transformer T5 for maximum response on test set meter M1. Tune T5 by adjusting both of the tuning screws (fig. 27) that extend from the transformer shield. When the alignment is complete, test set meter M1 should indicate —1 db ±.5 db.

b. Move the signal generator lead to the signal grid (pin 8) of V3 and apply 3.2 millivolts at 82 kc. Tune if transformer T4 for a maximum deflection on test set meter M1. Meter M1 should indicate —2 db ±.5 db.

c. Maintain the test connections given in *b* above. Apply 3.2 millivolts at 1,110 kc. Vary the signal generator frequency to obtain a maximum deflection on test set meter M1. Meter M1 should again indicate —2 db ±.5 db.

d. Maintain the signal generator frequency setting (*c* above). Apply 710 microvolts to the control grid (pin 4) of V2. Rotate the CAL. 2 (I.F. GAIN) control fully counterclockwise. Tune if transformer T3 for a maximum deflection of test set meter M1. Meter M1 should indicate —3 db ±.5 db.

e. Maintain the signal generator frequency setting (*c* and *d* above). Apply 370 microvolts to the signal grid (pin 8) of V1. Set the ATTENUATOR DB switch to —40. Tune if transformers T1 and T2 for a maximum deflection on test set meter M1.

f. Connect a 600-ohm noninductive load resistor across INPUT binding posts BP1. Connect the output of Signal Generator SG-71/FCC to the binding posts. Set the output to .775 volt at 100 kc. Maintain the CAL. 2 (I.F. GAIN) control in the fully counterclockwise position. Set ATTENUATOR DB switch SW4 to 0 and SELECTOR switch SW5 to VM-UNBAL 600Ω BRG. Adjust the tuning dial for a maximum deflection on test set meter M1. Meter M1 should indicate between —10 db and —4 db. If the indication is not within the range of —10 db to —4 db, adjust capacitor C5 (fig. 28) to provide the necessary meter indication. If the indication is low, decrease the spacing between the plates of C5 by bending them. If the reading is high, increase the spacing between the plates of C5 by bending them.

57. Neutralization of Mixer Stages

a. Neutralization of First Mixer Stage. Operate METER switch SW1 to MEAS. Disconnect all signal inputs to the test set. Set the tuning dial to 250 kc and ATTENUATOR DB switch SW4 to —60. Connect the ME-30A/U from the signal grid (pin 8) of V1 to ground. Adjust capacitor C1 (fig. 28) for a minimum indication on the ME-30A/U.

b. Neutralization of Second Mixer Stage. Maintain the equipment conditions given in *a* above. Connect the ME-30A/U from the signal grid (pin 8) of V3 to ground. Adjust capacitor C2 (fig. 28) for a minimum indication on the ME-30A/U.

58. Alignment of Tuning Oscillator

a. Connect the output of Signal Generator SG-71/FCC and a 600-ohm noninductive load resistor across INPUT binding posts BP1. Set the SG-71/FCC output to 500 kc at .775 volt (corresponding to 0 db).

b. Operate SELECTOR switch SW5 to VM–UNBAL 600Ω BRG and METER switch SW1 to MEAS. Operate ATTENUATOR DB switch SW4 to 0, the tuning dial to 500 kc, and the 96 KC ADJUST trimmer (C33, fig. 26) to 7 full clockwise turns from the extreme counterclockwise position.

c. Adjust oscillator trimmer capacitor 0 (C34, fig. 26) for a maximum deflection of test set meter M1.

d. Set the SG–71/FCC output to 100 kc at .775 volt. Set the tuning dial to 100 kc. Vary the setting of the tuning dial back and forth around the 100-kc setting and be sure that the maximum deflection on test set meter M1 occurs at exactly 100 kc.

e. If the maximum deflection does not occur at 100 kc, set the tuning dial to exactly 100 kc and adjust coil X (L4, fig. 26) for a maximum deflection of test set meter M1.

f. Repeat the 500-kc adjustments described in *b* and *c* above.

g. Recheck the 100-kc tuning dial setting described in *d* above. If necessary, repeat the procedure given in *e* above. Since there is a slight amount of interaction between the 0 (C34) and X (L4) adjustments, the above steps should be repeated several times to arrive at the proper final settings for these adjustments.

h. Check the accuracy of the 200-kc, 300-kc, and 400-kc settings of the tuning dial by applying these frequencies from the SG–71/FCC and adjusting the tuning dial to the corresponding positions. If a maximum indication is not obtained on test set meter M1 at each of the required settings of the tuning dial, carefully bend the rotor plates of capacitor C35 (fig. 26) to provide correct tuning dial tracking.

i. When the preceding checks and adjustments are completed, recheck the tuning dial calibration accuracy at 100 kc. Adjust the SG–71/FCC output to 100 kc. Set the tuning dial to 100 kc. Vary the tuning dial setting slightly on either side of 100 kc. Test set meter M1 should provide a maximum indication at a tuning dial setting of exactly 100 kc. If a maximum deflection is not obtained at the 100-kc setting, operate the tuning dial to exactly 100 kc and adjust the 96 KC ADJUST trimmer (C33, fig 26) to provide a maximum indication on meter M1.

59. Alignment of Calibration Oscillator

a. Connect the output of Signal Generator SG–71/FCC and a 600-ohm noninductive load resistor across INPUT binding posts BP1. Set the signal generator output to 100 kc at .775 volt.

b. Set SELECTOR switch SW5 to VM–UNBAL 600Ω BRG and ATTENUATOR DB switch SW4 to 0. Set the tuning dial to 100 kc.

c. Place METER switch SW1 to CAL. 1. Test set meter M1 should indicate 0 db. If M1 does not indicate 0 db, adjust calibration oscillator plate voltage CAL 1 potentiometer (R2, fig. 27) to provide such an indication.

d. Operate METER switch SW1 to MEAS. If the steps in paragraph 58 have been followed correctly, test set meter M1 should indicate a maximum deflection.

e. Operate METER switch SW1 to CAL. 2 (100KC) and adjust calibration oscillator frequency control H (L3, fig. 27) to provide a maximum indication on meter M1.

f. Operate METER switch SW1 to MEAS. Test set meter M1 should again indicate a maximum deflection. If necessary, use the CAL. 2 (I.F. GAIN) control (fig. 4) to provide a meter indication of 0 db ±.25 db.

g. Operate METER switch SW1 to CAL. 2 (100KC). If necessary, adjust calibration oscillator output level control P (R42, fig. 27) to provide a meter indication of 0 db ±.25 db.

Section IV. FINAL TESTING

60. General

This section is intended as a guide in determining the quality of a repaired Audio Level Meter ME-71A/FCC. The minimum test requirements outlined in paragraphs 61 through 70 may be performed by maintenance personnel having the necessary skills and test equipment. Repaired equipment meeting these requirements will provide uniformly satisfactory operation.

61. Test Equipment Required for Final Testing

The test equipment required for final testing is listed in paragraph 54. Audio Oscillator TS-382A/U is also required for testing of the test set.

62. Calibration Oscillator Plate Voltage

Note. Remove Audio Level Meter ME-71A/FCC from its cabinet. Permit the test set to warm up for about 20 minutes before performing the final tests.

a. Operate METER switch SW1 to CAL. 1.

b. Test set meter M1 should indicate 0 db.

Note. When using Signal Generator SG-71/FCC for the tests described in paragraphs 63 through 70, load the output of the signal generator with a 600-ohm noninductive resistor. Check the signal generator output frequency with Frequency Meter AN/URM-79. Check the signal generator output level with the ME-30A/U.

63. Calibration Oscillator Output Frequency and Tuning Dial Calibration

a. Connect the signal generator output and the 600-ohm load resistor across the test set binding posts, with the grounded half of the signal generator output circuit connected to the G binding post of the test set (fig. 4).

b. Set the signal generator output to 100 kc at 0 db. (.775 volt across the 600-ohm load).

c. Operate SELECTOR switch SW5 to VM-UNBAL 600Ω BRG, and METER switch SW1 to MEAS. Operate ATTENUATOR DB switch SW4 to 0. Adjust the tuning dial for a maximum indication on test set meter M1. The tuning dial should indicate 100 kc.

d. Operate METER switch SW1 to CAL. 2 (100 KC). Adjust the tuning dial for a maximum indication on test set meter M1. The tuning dial should again indicate 100 kc.

64. Calibration of Oscillator Output Level

a. Maintain the signal generator connections and output conditions described in paragraph 63.

b. Operate METER switch SW1 to MEAS. and adjust the tuning dial for a maximum indication on test set meter M1. Adjust the CAL. 2 (I.F. GAIN) control to provide a meter indication of 0 db ±.25 db.

c. Operate METER switch SW1 to CAL. 2 (100KC). Test set meter M1 should indicate 0 db ±.25 db.

65. Over-all Tuning Dial Calibration

a. Maintain the signal generator connections described in paragraph 63.

b. Operate METER switch SW1 to MEAS. In succession, adjust the signal generator output frequency to 20 kc, 200 kc, 300 kc, and 500 kc. Adjust the tuning dial of the test set to provide a maximum indication on test set meter M1 for each input frequency.

c. In each case, the tuning dial setting should correspond to the input frequency within ±3 kc.

66. Test Set Meter M1 Scale Accuracy

a. Maintain the signal generator connections described in paragraph 63. Operate ATTENUATOR DB switch SW4 to 0.

b. Vary the signal generator output level from —10 db to +2 db. Use the ME-30A/U to measure the signal generator output level.

c. The indications on test set meter M1 should coincide with the readings of the ME-30A/U within ±.2 db.

67. ATTENUATOR DB Switch Accuracy

a. Maintain the signal generator connections described in paragraph 63.

b. Vary the output level of the signal generator in 10-db steps from —60 to +30 db.

c. Vary the ATTENUATOR DB switch settings to correspond with each signal generator output level.

d. In each case, test set meter M1 should indicate 0 db ±.5 db.

e. Adjust the signal generator output level to +30 db, and operate ATTENUATOR DB switch SW4 to +40. Test set meter M1 should indicate —10 db ±.5 db.

68. Input Frequency Selectivity

a. Maintain the signal generator connections described in paragraph 63.

b. Adjust the signal generator output to 100 kc at 0 db. Operate ATTENUATOR DB switch SW4 to 0. Adjust the tuning dial to provide a maximum indication on test set meter M1.

c. Vary the signal generator output frequency from 97 kc to 103 kc in 1-kc steps.

d. Test set meter M1 should indicate approximately —9 db at 99-kc and 101-kc, —29 db at 98-kc and 102-kc, and —46 db at 97-kc and 103-kc inputs. Operate ATTENUATOR DB switch SW4 as necessary to maintain meter indications at approximately mid-scale. Figure 5 shows a typical selectivity curve for the ME-71A/FCC.

69. If Amplifier Gain

a. Maintain the signal generator connections described in paragraph 63.

b. Set the signal generator output to 100 kc at 0 db. Adjust the tuning dial for a maximum indication on test set meter M1. If necessary, adjust the CAL. 2 (I.F. GAIN) control to provide a meter indication of 0 db.

c. Rotate the CAL. 2 (I.F. GAIN) control fully counterclockwise. Test set meter M1 should provide an indication of at least +6 db.

70. Audio Amplifier Output Level

a. Maintain the signal generator connections and output conditions described in paragraph 69. Connect the output of Audio Oscillator TS-382A/U to the modulation input connector of the signal generator. Adjust the audio oscillator to provide a 400-cycle, 3-volt modulating signal. If necessary, readjust the signal generator output level to 0 db.

b. Readjust the CAL. 2 (I.F. GAIN) control to provide a 0-db indication on test set meter M1.

c. Connect the ME-30A/U and a 2,200-ohm load resistor across the PHONES jacks of the test set.

d. Rotate the AUD. GAIN control fully clockwise. The ME-30A/U should indicate 1.5 volts minimum.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

71. Disassembly

The following instructions may be used as a general guide in preparing the test set for transportation or storage.

a. Remove all test leads from the INPUT connectors.

b. Remove the panel and chassis assembly from the cabinet. Check to see that the crystal (Y1) retaining bracket is tightly secured, that tuning oscillator V8 shield clamp is tight, and that all tubes are securely inserted in their sockets.

c. Replace the panel and chassis assembly in the case.

d. Disconnect the power cord from the ac outlet.

72. Repacking for Shipment

a. Use the original packing, if available, and reverse the unpacking instructions given in paragraph 10 to repack the test set. General packing information is usually available at depots.

b. Pack the test set so as to prevent damage during transit. Pack the equipment securely and pad it to lessen the effects of severe jolting. Be sure the equipment is protected from rain or snow.

Section II. DEMOLITION TO PREVENT ENEMY USE

73. General

Use the demolition procedure (par. 74) to prevent the enemy from using or salvaging the test set. Destroy the equipment only upon order of the commander.

74. Methods of Destruction

Use any or all methods listed below to destroy the equipment.

a. Smash. Smash the controls, tubes, coils, switches, capacitors, transformers, and meter; use sledges, axes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut all cords and wiring; use axes, handaxes, or machetes.

c. Burn. Burn all wiring, cords, and technical manuals; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

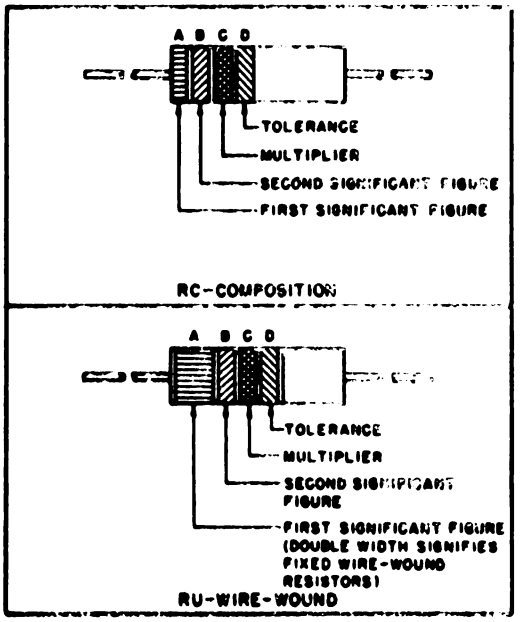
d. Bend. Bend the panel and chassis assembly, and cabinet; use sledges, axes, crow bars and other heavy tools.

e. Explosives. If explosives are necessary, use TNT, primacord, dynamite, or other explosives.

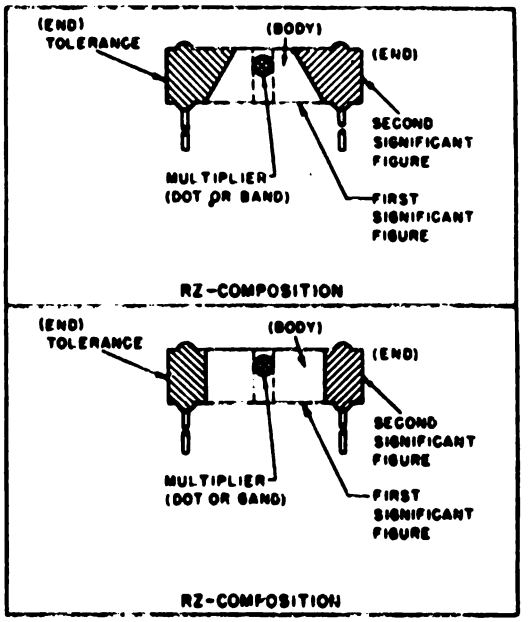
f. Dispose. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS (INSULATED)



RADIAL-LEAD RESISTORS (UNINSULATED)



RESISTOR COLOR CODE

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

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

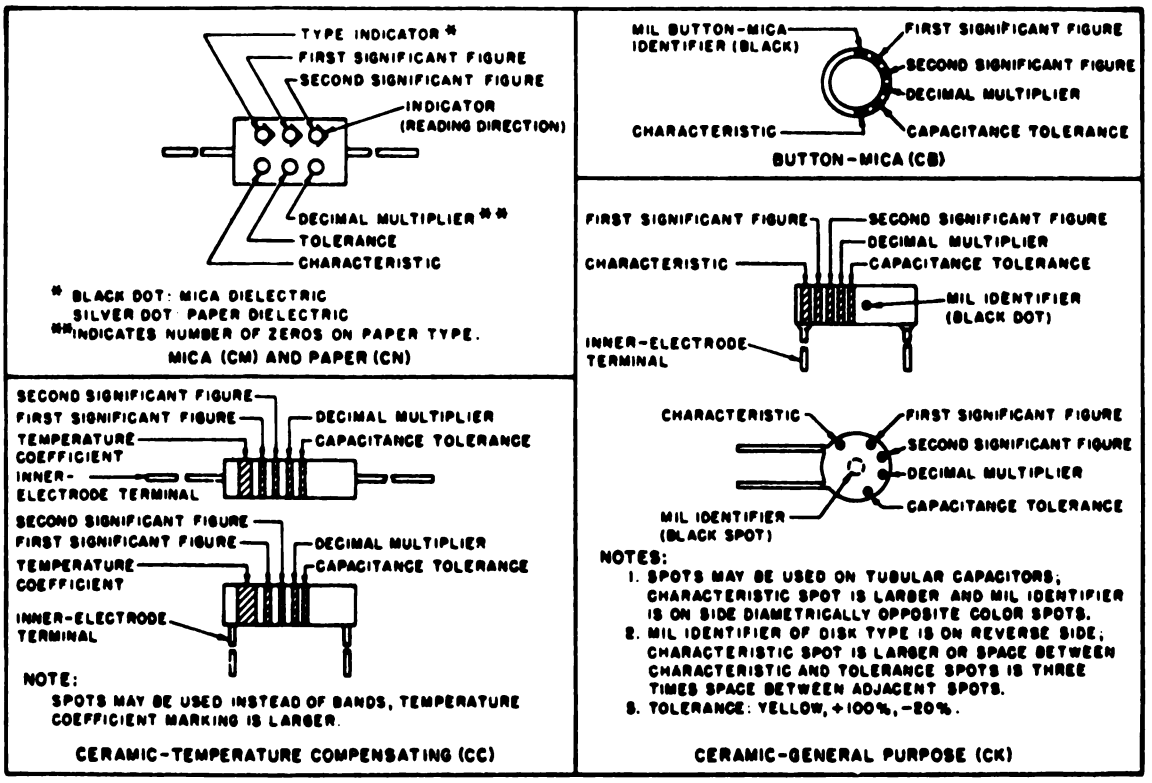
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

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

STD-RI

Figure 29. MIL-STD resistor color codes.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



CAPACITOR COLOR CODE

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

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

STD-C1

Figure 30. MIL-STD capacitor color codes.

INDEX

DEPARTMENT OF THE ARMY
Washington 25, D. C., 25 June 1956

TM 11-2151 is published for the use of all concerned.

[AG 413.44 (25 Jun 56)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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Sig Lab (5)
ACS (3)
Mil Dist (1)
Units org under fol TOE:
11-7C, Sig Co, Inf Div (2)
11-16C, Hq & Hq Co, Sig Bn, Corps or Abn Corps (2)
11-57C, Armd Sig Co (2)
11-127R, Sig Rep Co (2)
11-128R, Sig Depot Co (2)
11-500R (AA-AE), Sig Svc Org (2)
11-557C, Abn Sig Co (2)
11-587R, Sig Base Maint Co (2)
11-592R, Hq & Hq Co, Sig Base Depot (2)
11-597R, Sig Base Depot Co (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see SR 320-50-1.

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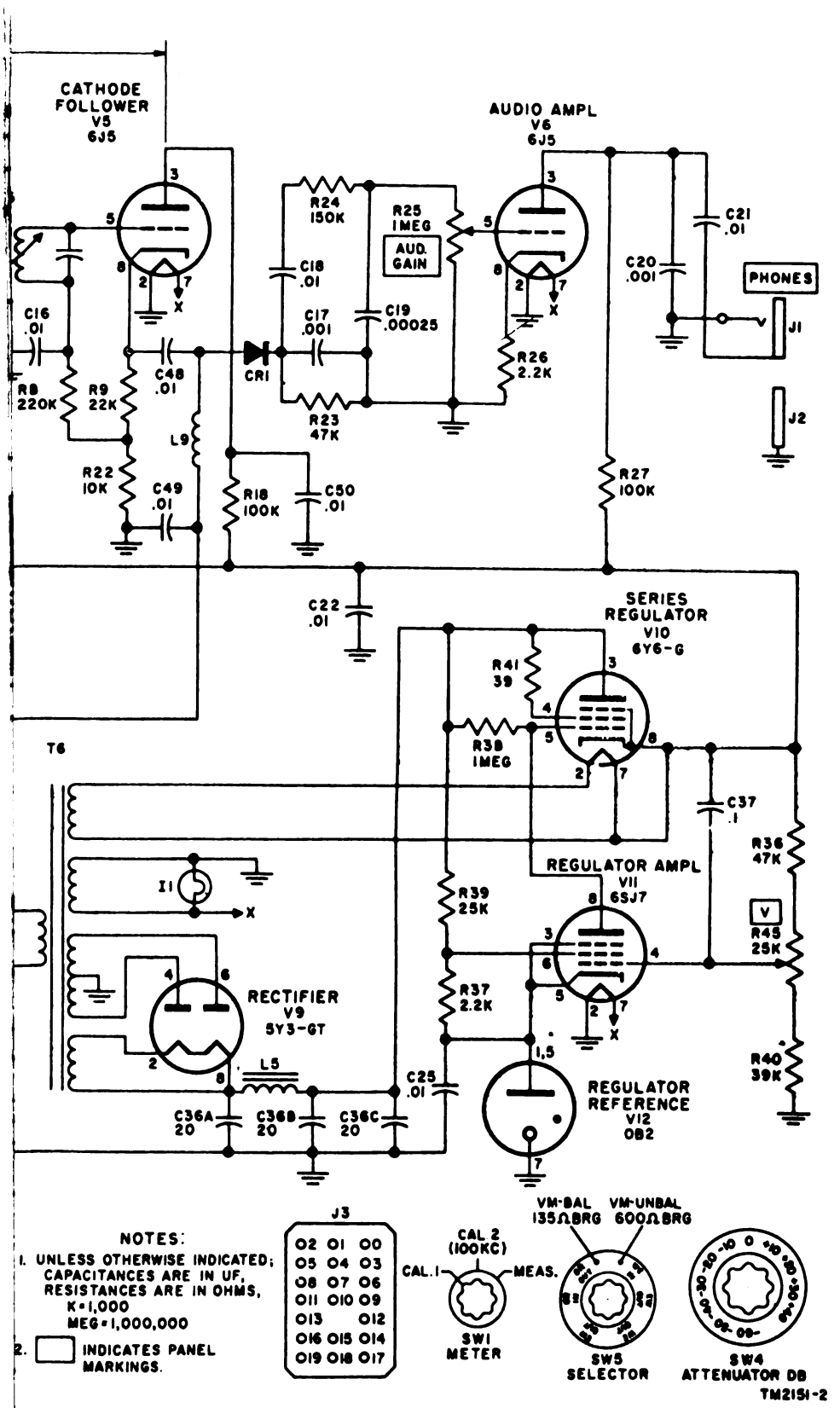

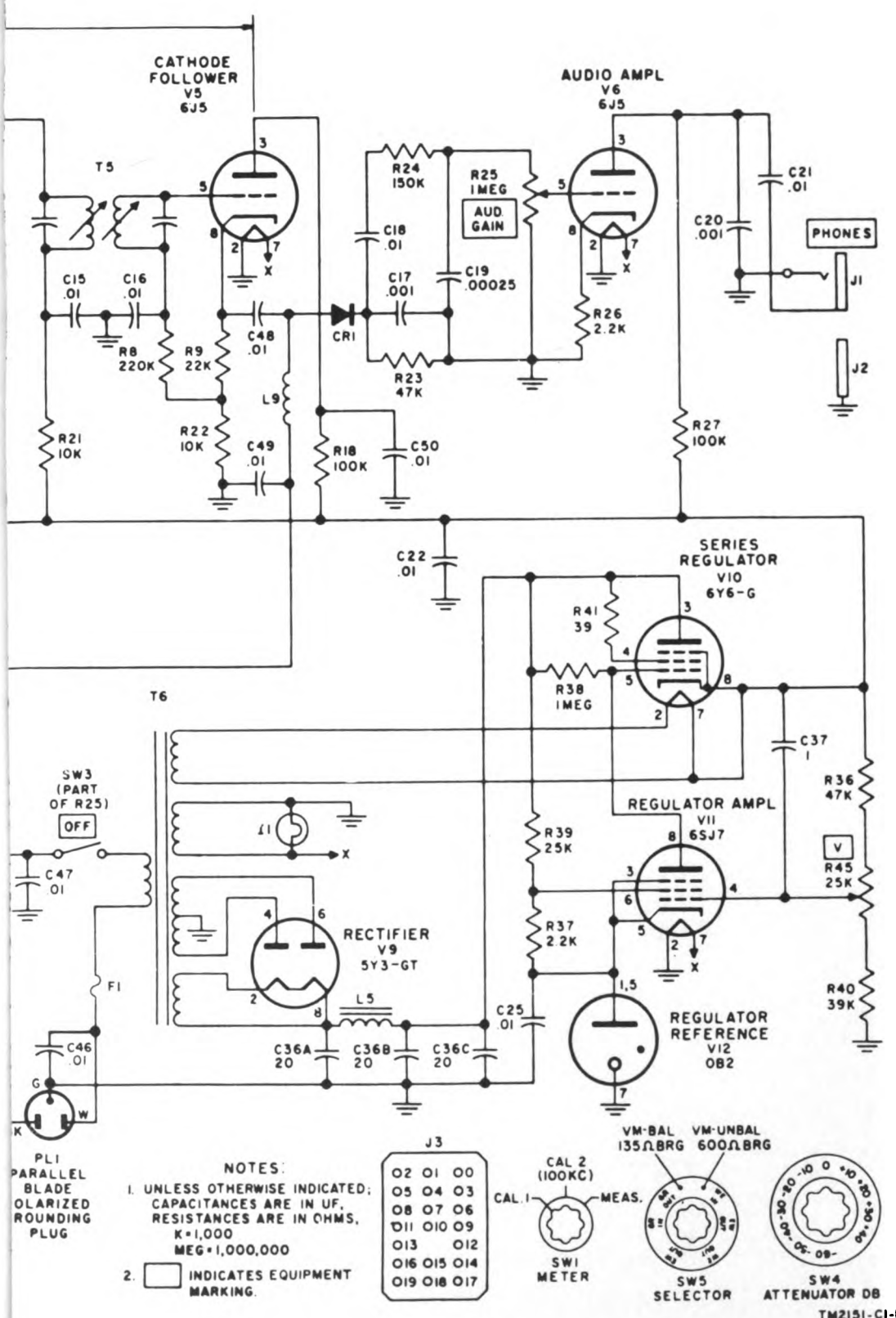

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