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APPENDIX

for

VLF FREQUENCY COMPARATOR SYSTEM

MODEL VLFC-1

(COMPARATOR-RECEIVER SET)
AN/URR-50(V)



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y.

OTTAWA, ONTARIO

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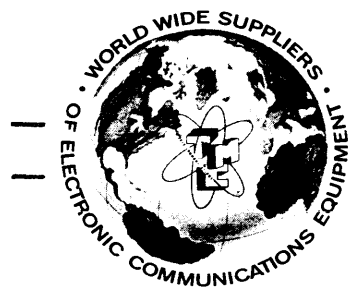


THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, ONTARIO

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NOTICE

THE CONTENTS AND INFORMATION CONTAINED IN THIS INSTRUCTION MANUAL IS PROPRIETARY TO THE TECHNICAL MATERIEL CORPORATION TO BE USED AS A GUIDE TO THE OPERATION AND MAINTENANCE OF THE EQUIPMENT FOR WHICH THE MANUAL IS ISSUED AND MAY NOT BE DUPLICATED EITHER IN WHOLE OR IN PART BY ANY MEANS WHATSOEVER WITHOUT THE WRITTEN CONSENT OF THE TECHNICAL MATERIEL CORPORATION.



THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

W a r r a n t y

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,*fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

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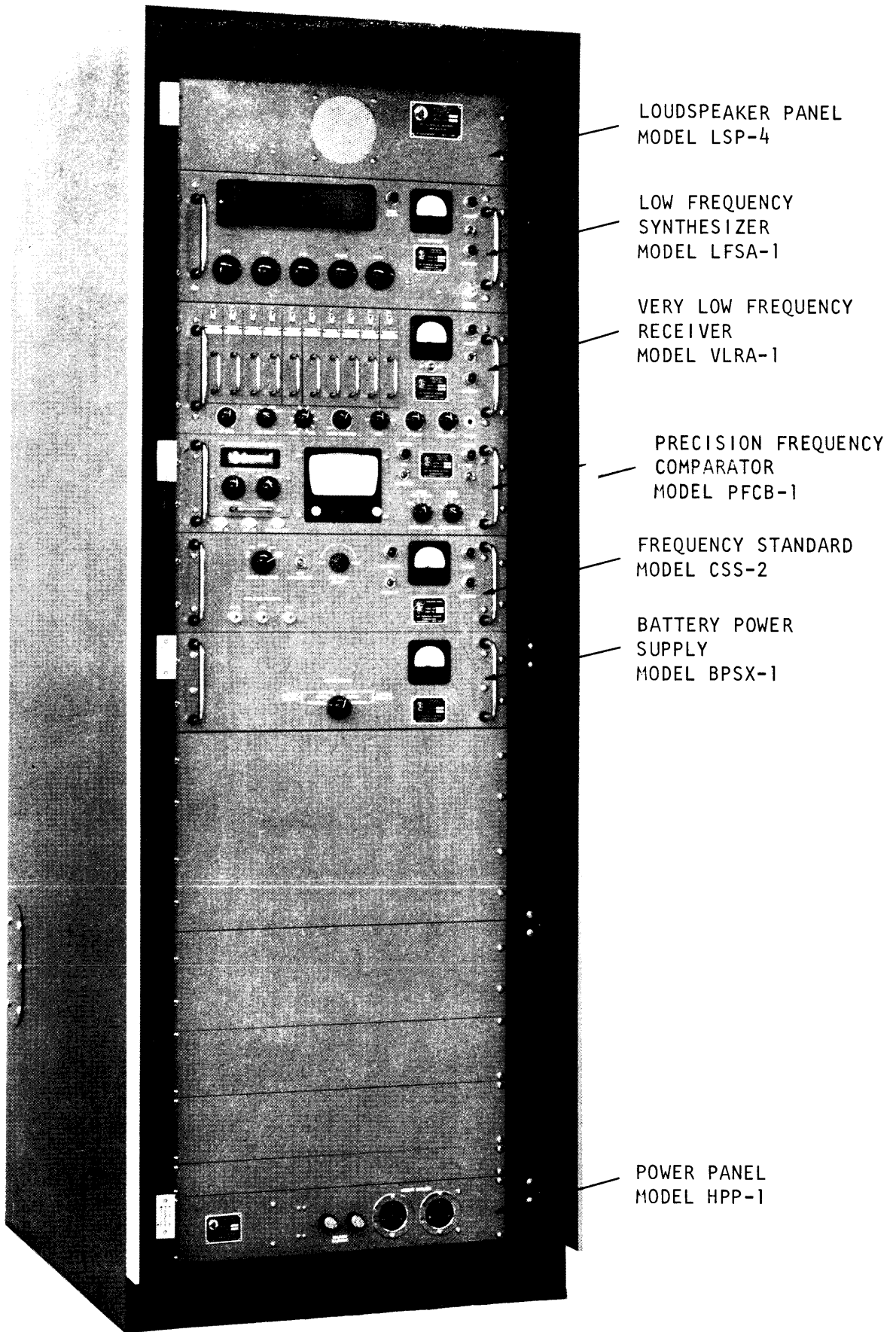
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LOUDSPEAKER PANEL
MODEL LSP-4

LOW FREQUENCY
SYNTHESIZER
MODEL LFSA-1

VERY LOW FREQUENCY
RECEIVER
MODEL VLRA-1

PRECISION FREQUENCY
COMPARATOR
MODEL PFCB-1

FREQUENCY STANDARD
MODEL CSS-2

BATTERY POWER
SUPPLY
MODEL BPSX-1

POWER PANEL
MODEL HPP-1

6411.23-2

288-A-1 Figure 1. VLFC-1, VLF Frequency Comparator System

APPENDIX

VLF FREQUENCY COMPARATOR SYSTEM

1. INTRODUCTION.

This manual contains technical information pertaining to the equipment rack and accessory panel units used in VLF Frequency Comparator System, Model VLFC-1 (figure 1). The units covered in this manual are as follows:

- a. Equipment Rack RAK-43
- b. Power Panel HPP-1
- c. Loudspeaker Panel LSP-4

2. DESCRIPTION OF EQUIPMENT.

a. EQUIPMENT RACK RAK-43. - RAK-43 is a single rack providing an enclosure for the various units constituting the VLFC. RAK-43 contains a front-panel access door and cable access holes conveniently located on the bottom and both sides of the rack for installation flexibility. Also included is a permanent-type washable air filter to prevent dirt, dust, insects or foreign matter from entering the rack. All power and signal connections between units, are made with the rack. Due to its design and construction RAK-43 acts as a shield to prevent radiation leaks from the installed units. These units are wired at the factory for 115-vac, 50/60 cycle, single phase operation unless specified otherwise by the customer at the time of the purchase. Wiring information necessary to change each unit for 230-volt operation is given in the technical manuals for those units included in the VLFC System.

b. POWER PANEL HPP-1. The HPP-1 is an a-c auxiliary power panel containing two individually fused utility outlets. These outlets provide 115- or 230-vac, 50/60 cycle, single phase (depending upon input power source) for use with external test equipment. Both utility outlets and their associated fuses are mounted on the front panel for greater accessibility.

c. LOUDSPEAKER PANEL LSP-4. - The LSP-4 is a speaker panel containing a single 4-inch PM speaker. The LSP-4 is used to monitor the audio output of the selected receiver channel.

d. LINE FILTER FL1001. - Line Filter FL1001, located towards the bottom and rear of the cabinet, is a low pass filter that removes any spurious r-f transients from the a-c line input power. The filtered a-c line power is then distributed to various units constituting the VLFC System.

e. LOW-PASS FILTER FL1002. - Low-Pass Filter FL1002, located at the rear of cabinet, improves reception of Very Low Frequency Receiver VLRA, when interference is encountered from high power transmitters operating on LF, MF, or HF frequencies. Low-Pass Filter FL1002 is a passive device and requires no primary power. (For additional information concerning FL1002, refer to Technical Manual for Very Low Frequency Receiver VLRA.)

3. TECHNICAL SPECIFICATIONS

LOUDSPEAKER PANEL LSP-4

Speaker Size	4 in.
Impedance	3.2 ohms
Output Power	4 watts approx.
Dimensions (panel)	5 1/4 in. high x 19 in. wide x 2-1/2 in. deep
Weight (speaker and panel)	2-1/2 lbs. approx.

POWER PANEL HPP-1

A-c Receptacles	2
Fuses	2
Dimensions	4-1/2 in. high x 19 in. wide x 3-1/2 in. deep
Weight	3 lbs. approx.

3. TECHNICAL SPECIFICATIONS (CONT).

EQUIPMENT RACK RAK-43

Dimensions	69 in. high x 47-3/8 in. wide x 30-3/8 in. deep
Weight (including cables, slides, and units normally supplied with rack)	383 lbs approx.

LINE FILTER FL1001 (PART OF RAK-43)

A-c Line Input Voltage	115 volts at 10 amperes or 230 volts at 5 amperes
Bandpass	50 to 400 cps
Attenuation	70 db at 5000 cps
Impedance	22 ohms
Dimensions	5-1/2 in. high x 20 in. wide x 3-1/2 in. deep
Weight.	12 lbs. approx.

4. INSTALLATION.

a. UNPACKING AND HANDLING. - Each piece of equipment has been thoroughly inspected and tested at the factory before shipment. Upon receipt, unpack each item and inspect for possible damage. Inspect all packing material for parts which may have been shipped as loose items.

With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

b. MECHANICAL INSTALLATION. - All accessory units are mounted on standard 19-inch rack panels. These panels are mounted in the RAK-43 prior to shipment. Figure 2 is a dimensional outline drawing of the RAK-43.

c. ELECTRICAL INSTALLATION. - All a-c power connections originating at line filter FL1001 are made within the RAK-43 prior to shipping. This also includes, the signal connections to the LSP. Audio connections for the LSP-4 are made prior to shipment via terminal board TB9301 of cable CA-906 to terminals E9301-1 and -2 on rear of unit (see figure 3). During installation, a-c primary source input power is connected to line filter FL1001 via a three-wire cable supplied by customer. A-c power to the HPP is completed through the use of (three-wire) cable CA-908-1 (see figure 4). The procedures for connecting a-c power to the line filter is provided in the paragraphs that follow.

Cable entry to RAK-43 is normally made through one of three access holes conveniently spaced along the sides and bottom of the rack (see figure 2). These cable access holes have been located for greater installation flexibility. The a-c input power for the RAK-43 is made through one of the rack access holes by means of a shielded cable (customer supplied). To install the power cable, proceed as follows:

- a. Remove cable access hole cover.

WARNING

To avoid injury to personnel make certain that proper phasing is observed if a two-wire a-c primary source system is employed, since the neutral side of the filter is grounded to its case.

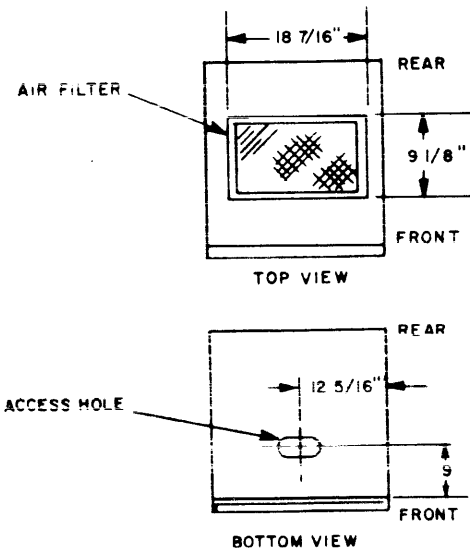
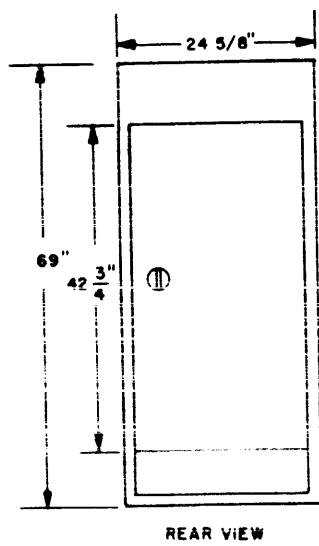
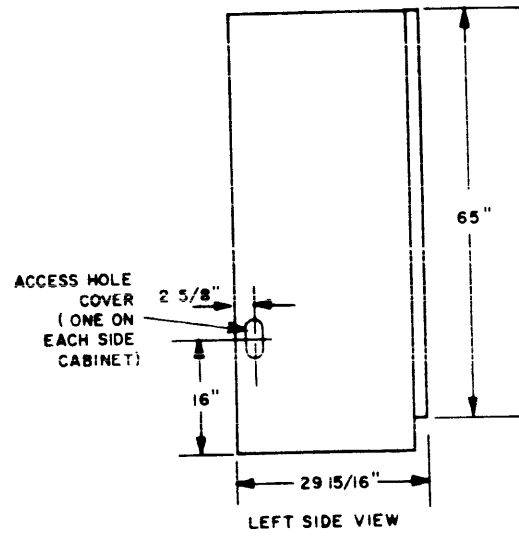
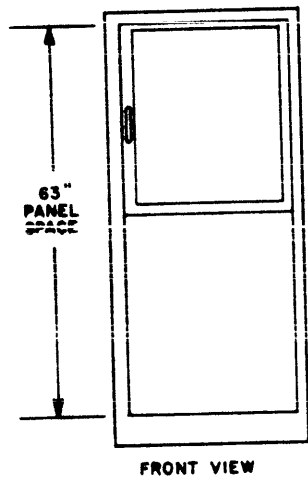
- b. Remove cover of filter and connect customer supplied three-wire input power cable to three threaded studs, located on right-hand side of filter. The white and black leads are connected to threaded line studs and red and shielded leads are connected to the threaded ground stud.
- c. Replace filter cover removed in step b.
- d. Connect opposite end of customer supplied a-c power cable to an external primary power source.
- e. With a suitable voltmeter, check voltage within rack.
- f. Refer to Section 2 of VLFC System Manual for further installation details.

5. OPERATION.

Since the HPP, LSP, and RAK-43 have no operating controls, no operating instructions are required.

6. OPERATOR'S MAINTENANCE.

The operator should check the condition of fuses and interconnecting cabling. All interconnecting cables should be securely connected and inspected for fraying. Equipment cleanliness should be observed.



288-A-2

Figure 2. RAK-43, Dimensional Outline Drawing

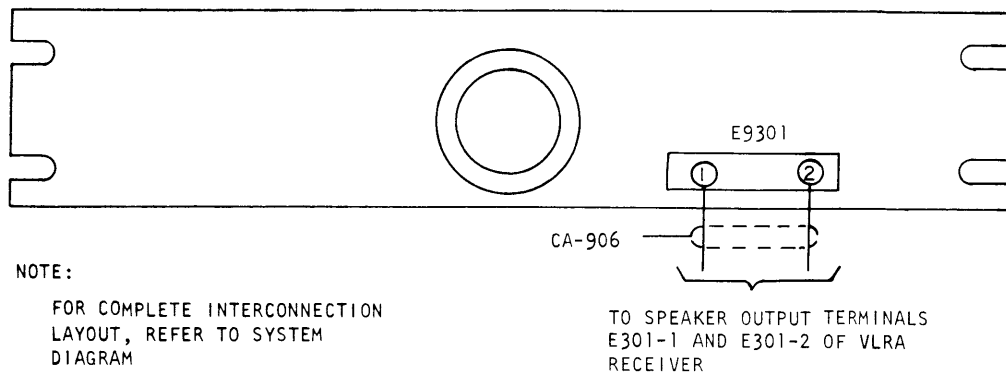


Figure 3. Rear View, Electrical Connection, LSP

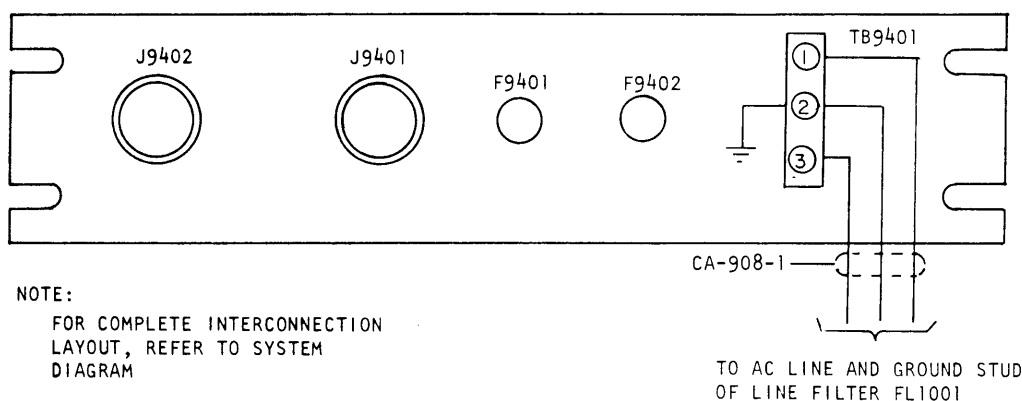


Figure 4. Rear View, Electrical Connection, HPP

7. TROUBLESHOOTING.

a. GENERAL. - When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be apparent due to circumstances occurring at the time of failure or because of symptoms analogous to past failures. Under these circumstances it is not necessary to follow a lengthy and orderly course of troubleshooting in order to localize and isolate the faulty part.

One method of troubleshooting is to immediately ascertain that all fuses and voltages are operating normally. Another suggested method is to examine the unit suspected of being faulty for burned elements, charring, and corrosion.

b. ACCESSORY UNITS. - Paragraphs c and d provides troubleshooting information for the HPP and LSP units, respectively. Troubleshooting table 2 is designed to localize a fault by means of normal operating conditions.

c. POWER PANEL HPP. - Trouble related to the HPP can usually be traced to two probable

causes. These are: (1) a current overload, resulting in a blown fuse; (2) an open circuit and loss of a-c power to the equipment externally connected to the unit. If an overload condition exists, check fuses F9401 or F9402. A lighted fuse holder cap indicates that the fuse has blown. If a fuse is found to be defective, it should be replaced with one of equal value. To check for a short or an open circuit condition perform continuity checks of cabling and wiring with the use of a suitable VTVM.

d. LOUDSPEAKER PANEL LSP. - Since the LSP basically consists of a loudspeaker integrally mounted on a 19-inch panel, only two probable causes of trouble could exist. These are loss, or distortion, of audio signal. One method of checking for presence of audio is with the use of a suitable VTVM connected across panel input signal terminals E9301-1 and -2. With the VTVM connected and no audio present, the fault might be in the cabling external to the LSP or the receiver unit. If an audio signal is indicated on the VTVM, check the voice coil of the speaker for an open or shorted condition. With audio distortion visually inspect for a torn speaker cone or rubbing between the speaker diaphragm and cone.

TABLE 1. TROUBLESHOOTING BASED ON NORMAL INDICATIONS

PRELIMINARY ACTION	NORMAL INDICATION	REMEDY
LOUDSPEAKER PANEL LSP-4		
Receiver tuned to selected channel.	Audio reproduction of selected receiver channel.	If normal indication is not obtained, perform the following steps: a. Check speaker connections to and from receiver. b. Check speaker for torn cone. c. Check speaker voice coil.
POWER PANEL HPP-1		
With suitable voltmeter, check voltage.	115 vac (if primary power is 115 vac). 230 vac (if primary power is 230 vac).	If normal indication is not obtained, perform the following steps: a. Check fuses, observing for condition and proper value. b. Check primary power at terminals of terminal board TB9401. c. Check condition and connection of internal and external wiring.

8. PARTS LIST.

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Generic name.

- b. Reference designation.

- c. TMC part number.

- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
 Attention: Sales Department
 700 Fenimore Road
 Mamaroneck, New York

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Power Panel HPP-1	6
Equipment Rack RAK-43	6

PARTS LIST

LOUDSPEAKER PANEL LSP-4

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E9301	TERMINAL BOARD: barrier type; two double screw terminals; 6-32 thd. ; phenolic body.	TM102-2
LS9301	LOUDSPEAKER, PERMANENT MAGNET: impedance 3.2 ohms; input wattage, 4.5 watts; overall dimensions 4-3/16" square x 2-1/4" deep.	LS101

POWER PANEL HPP-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
F9401	FUSE, CARTRIDGE: 250 V, 10 amp; 1-1/4" lg. x 1/4" dia; medium time lag. (For 115 V operation.)	FU103-10
F9401	FUSE, CARTRIDGE: 250 V, 5 amp; 1-1/4" lg. x 1/4" dia; medium time lag. (For 230 V operation.)	FU103-5
F9402	Same as F9401. (For 115 V operation.)	
F9402	Same as F9401. (For 230 V operation.)	
J9401	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 contacts, 2 flat, straight male contacts; 1 U-shaped male grounding contact; rated at 250 V at 10 amps or 125 V at 15 amps.	JJ173
J9402	Same as J9401.	
TB9401	TERMINAL BOARD: barrier type; 3 double screw terminals; 6-32 thd.; phenolic body.	TM102-3
XF9401	FUSEHOLDER: extractor post type; for 1-1/4" lg. x 1/4" dia. fuse; neon indicator lamp and 220K ohm resistor; clear octagonal lens; 100 - 250 volts, 20 amps.	FH104-2
XF9402	Same as XF9401.	

EQUIPMENT RACK RAK-43

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
FL1001	FILTER ASSEMBLY: radio interference; input voltage rated at 115 VAC at 10 amps or 230 VAC at 5 amps, bandpass power frequency 50-400 cps, attenuation -70 db at 5,000 cps, min. impedance 22 ohms; supplied with conduit fittings and plug button.	A3730
FL1002	FILTER, LOW-PASS: 40 Kc (Refer to VLRA Manual Parts List)	FX211
MP1001	RETRACTING ASSEMBLY, SPRING: module.	A3517
MP1002 thru MP1005	Same as MP1001.	

PARTS LIST (CONT)

EQUIPMENT RACK RAK-43

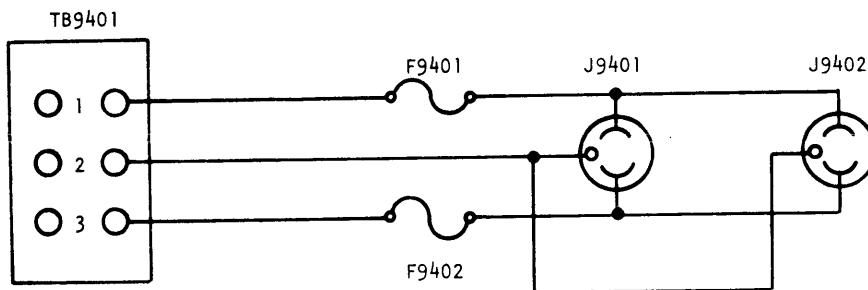
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
MP1006	FILTER, AIR FLOW: galvanized steel; mesh material aluminum; 6-5/8" long x 3-5/8" high x 1/2" wide.	AD103-5
P1001	CONNECTOR, PLUG, ELECTRICAL: accommodates RG174/U coaxial cable; one male pin type contact rated at 500 volts peak; bayonet polarization; twist lock; 50 ohms nom. impedance; BNC crimp type. Used on Cable, W1007.	PL244-1
P1005	CONNECTOR, PLUG, ELECTRICAL: 4 number 16 male contacts; straight type. Used on Cable, W1001.	MS3106A14S2P
P1006	CONNECTOR, PLUG, ELECTRICAL: 6 number 16 male contacts; straight type. Used on Cable, W1001.	MS3106A14S6P
P105	Same as P1001. Used on Cable, W1001.	
P108	CONNECTOR, PLUG, ELECTRICAL: 3 number 16 female contacts; straight type. Used on Cable, W1004.	MS3106A14S1S
P109	CONNECTOR, PLUG, ELECTRICAL: 4 number 16 female contacts; straight type. Used on Cable, W1001.	MS3106A14S2S
P315	Same as P109. Used on Cable, W1001.	
P317	Same as P1001. Used on Cable, W1001.	
P318	Same as P1001. Used on Cable, W1007.	
P319	Same as P108. Used on Cable, W1003.	
P451	Same as P108. Used on Cable, W1002.	
P452	Same as P1001. Used on Cable, W1001.	
P454	Same as P1001. Used on Cable, W1001.	
P455	Same as P1001. Used on Cable, W1001.	
P456	Same as P109. Used on Cable, W1001.	
P481	Same as P1001. Used on Cable, W1001.	
P901 thru P904	Same as P1001. Used on Cable, W1001.	
P910	Same as P108. Used on Cable, W1005.	
P911	Same as P109. Used on Cable, W1001.	
TB301	TERMINAL BOARD, FANNING: 6 terminals; angle type; right end feed. Used on Cable, W1001.	TM105-6AR
TB9301	TERMINAL BOARD, FANNING: 2 terminals; angle type; right end feed. Used on Cable, W1001.	TM105-2AR
W1001	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of various lengths and colors of MWC and RG174/U wire; insulation sleeving; hardware; 2 terminal boards, TB301, TB9301; 15 connectors, P1005, P1006, P105, P109, P315, P317, P452,	CA906

PARTS LIST (CONT)

EQUIPMENT RACK RAK-43

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W1001 (Con't)	P454, P455, P456, P481, P901, P902, P903, P904, P911; cable assemblies, W1002, W1003, W1004, W1005.	
W1002	CABLE ASSEMBLY, AC POWER: consists of 119" lengths of insulated wire rubber covered, 1 connector, P451 and terminal lugs. Part of W1001.	CA907-4
W1003	CABLE ASSEMBLY, AC POWER: consists of 111" lengths of insulated wire rubber covered, 1 connector, P319 and terminal lugs. Part of W1001.	CA907-3
W1004	CABLE ASSEMBLY, AC POWER: consists of 100" lengths of insulated wire rubber covered, 1 connector, P108 and terminal lugs. Part of W1001.	CA907-2
W1005	CABLE ASSEMBLY, AC POWER: consists of 96" lengths of insulated wire rubber covered, 1 connector, P910 and terminal lugs. Part of W1001.	CA907-1
W1006	CABLE ASSEMBLY, AC POWER: consists of 36" lengths of insulated wire rubber covered and various insulated terminal lugs.	CA908-1
W1007	CABLE ASSEMBLY, RADIO FREQUENCY: consists of 62" length of RG174/U wire; 2 connectors, P318, P1001.	CA480-3-62

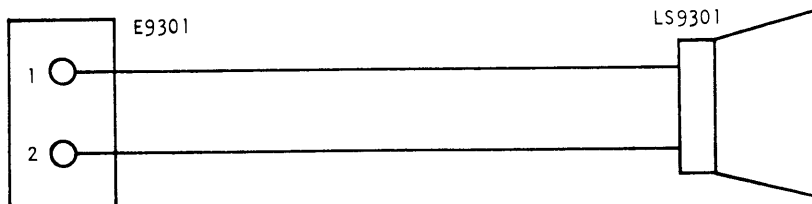
9. SCHEMATIC DIAGRAMS



NOTE: VALUES FOR F9401 AND F9402 ARE
10 AMP FOR 115 VAC OPERATION
5 AMP FOR 230 VAC OPERATION

288-A-5 (CK597)

Figure 5. Schematic Diagram, Power Panel HPP-1



288-A-6

Figure 6. Schematic Diagram, Loudspeaker Panel LSP-4