

UNCLASSIFIED

TECHNICAL MANUAL

*for*

LOUDSPEAKER PANEL

MODEL HSS-7



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



## 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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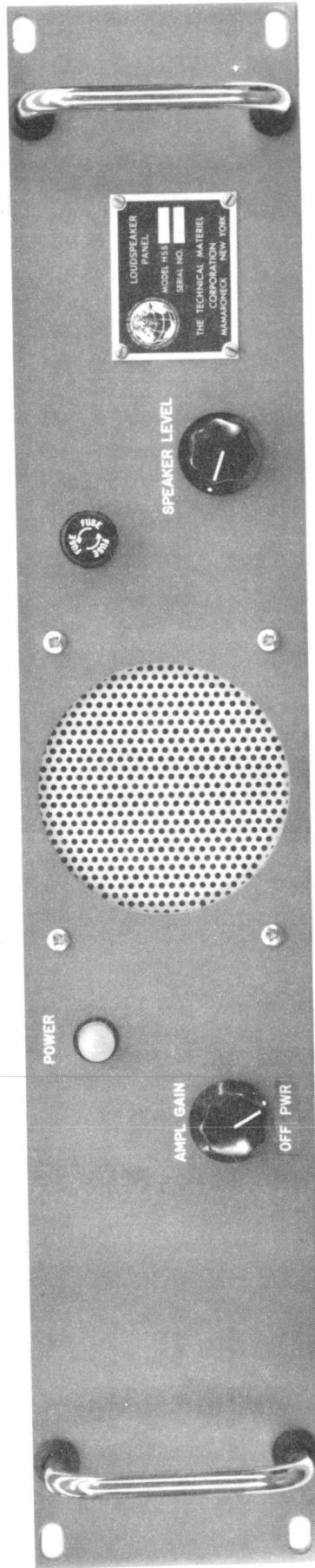
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Figure 1-1. Loudspeaker Panel, Model HSS-7

6510.25-11

## **SECTION 1 GENERAL INFORMATION**

### 1-1. FUNCTIONAL DESCRIPTION.

Loudspeaker Panel, Model HSS-7 (figure 1-1), is a self contained amplifier/speaker unit providing audible monitoring of a single receiver audio channel.

The HSS comprises a solid-state amplifier assembly with front-panel controlled speaker and amplifier gain controls. Audio monitoring may be accomplished either by the unit loudspeaker or by connecting a headset to the provided rear-panel terminals.

### 1-2. PHYSICAL DESCRIPTION.

The HSS is equipped with a 19-inch wide front panel suitable for mounting into any standard width equipment rack or console.

The front panel measures 3-1/2 inches high supporting a chassis 8-1/2-inches deep.

All operating controls and indicators are mounted on the front panel.

See figure 3-1.

All interconnections are terminated at the rear of the unit. See figure 2-2.

### 1-3. TECHNICAL SPECIFICATIONS.

Input Impedance:	12K- to 50K ohms, depending upon gain control setting.
Output Impedance:	45 ohms nominal

### 1-3. TECHNICAL SPECIFICATIONS (CONT).

Power Gain:	36 db (1 watt output for -6 dbm input)
Frequency Response:	200 cps to 7,000 cps
Hum Level:	-40 db at 1 watt output
Distortion:	1.2% at 1 watt at 400 cps
Input Power:	115/230 vac, 60 cps, 8 watts at full power
Power Output:	1.0 watt at -6 dbm input at 1,000 cps
Operating Temperature Range:	25°C to 70°C
Speaker Power Rating:	2.0 watts (speaker size 3 x 5 inches)

## **SECTION 2**

### **INSTALLATION**

#### 2-1. INITIAL INSPECTION.

Each HSS has been thoroughly checked and tested at the factory before shipment. Upon arrival at the operating site, inspect the packing case and its contents for possible damage. Unpack the equipment carefully. 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 the furnishing of replacement parts.

#### 2-2. MECHANICAL INSTALLATION.

The HSS is equipped with a 19-inch wide front panel designed for mounting into any standard width equipment rack or console. The front panel, supporting a 8-1/2-inches deep chassis, is to be screw-fastened to the rack frame.

#### 2-3. ELECTRICAL INSTALLATION.

Electrical installation of the HSS requires connection of rear panel mounted terminal board TB1 to the audio channel output of a receiver. Line voltage of 115 volts a-c is to be applied via the supplied cable CA-555-4 to connector J1. A headset, 50-ohms nominal, may be connected to terminal

board TB2. See figure 2-1 for transformer changeover connections, providing for 230 volts a-c operation. See figure 2-2 for electrical interconnections.

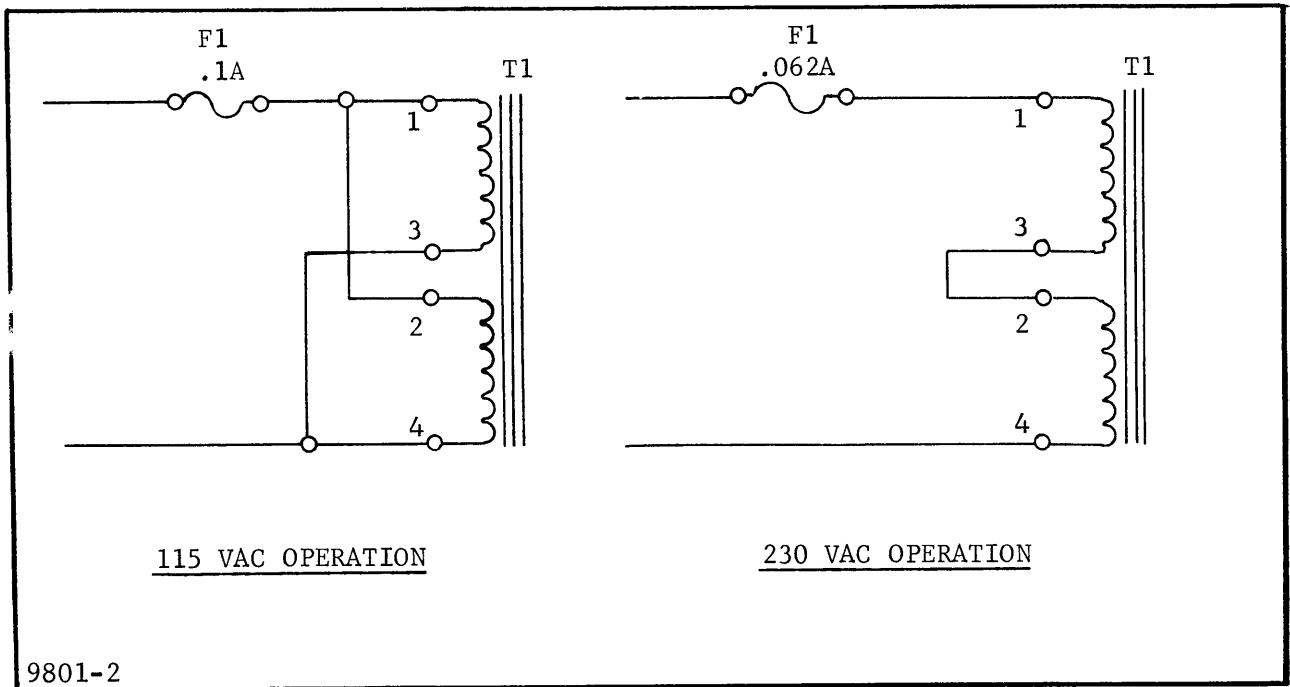


Figure 2-1. Transformer Changeover Connections

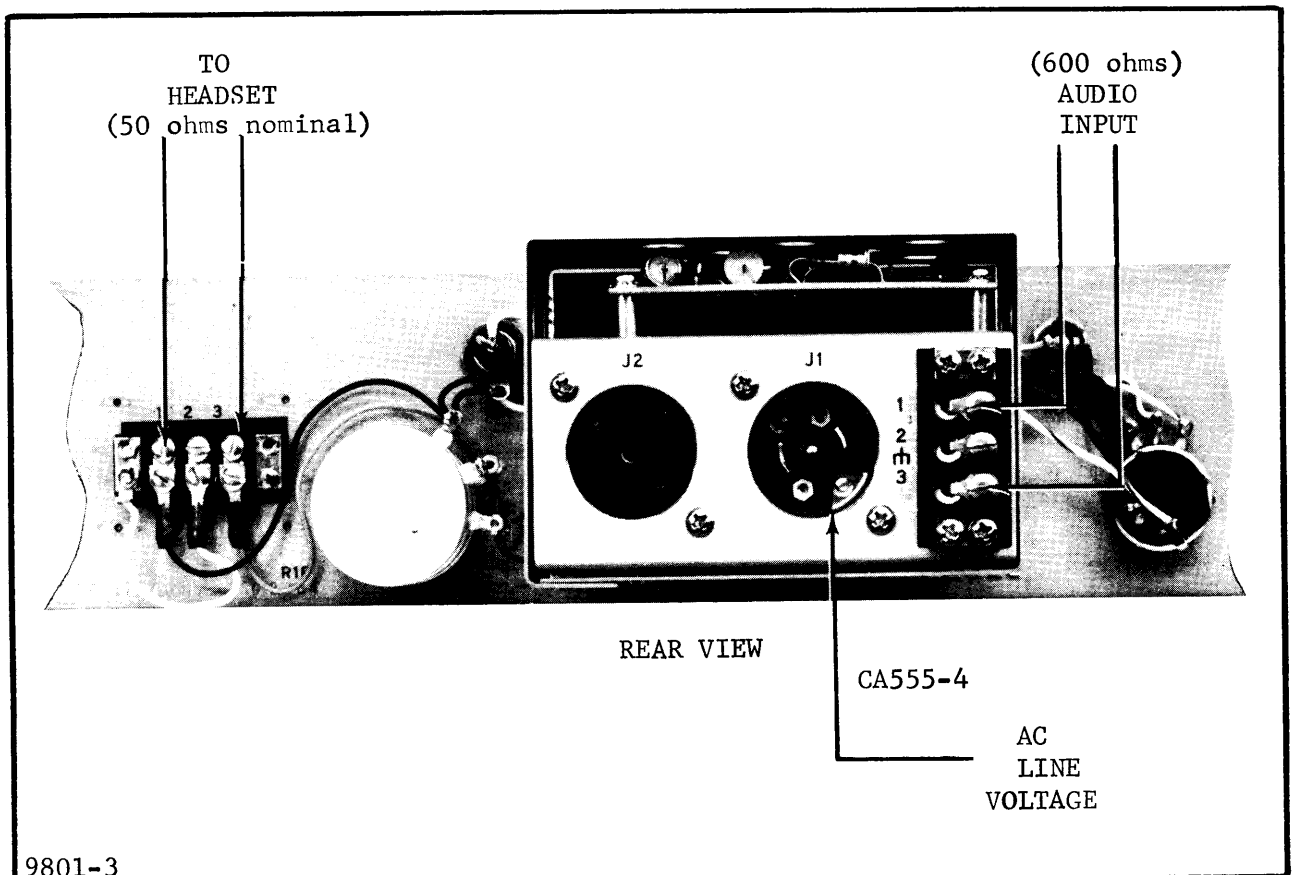


Figure 2-2. Electrical Interconnection Diagram

6510.25-13



## SECTION 3

### OPERATOR'S SECTION

#### 3-1. OPERATING PROCEDURE.

All HSS controls and indicators are located and identified on the front panel (figure 3-1). When the AMPL GAIN control is turned counter-clockwise, power is applied to the HSS and the POWER lamp should light. Counter-clockwise rotation of the AMPL GAIN control (from OFF toward PWR setting) increases output to the speaker and headphone; the SPEAKER LEVEL control increases or decreases the speaker output.

#### 3-2. OPERATOR'S MAINTENANCE.

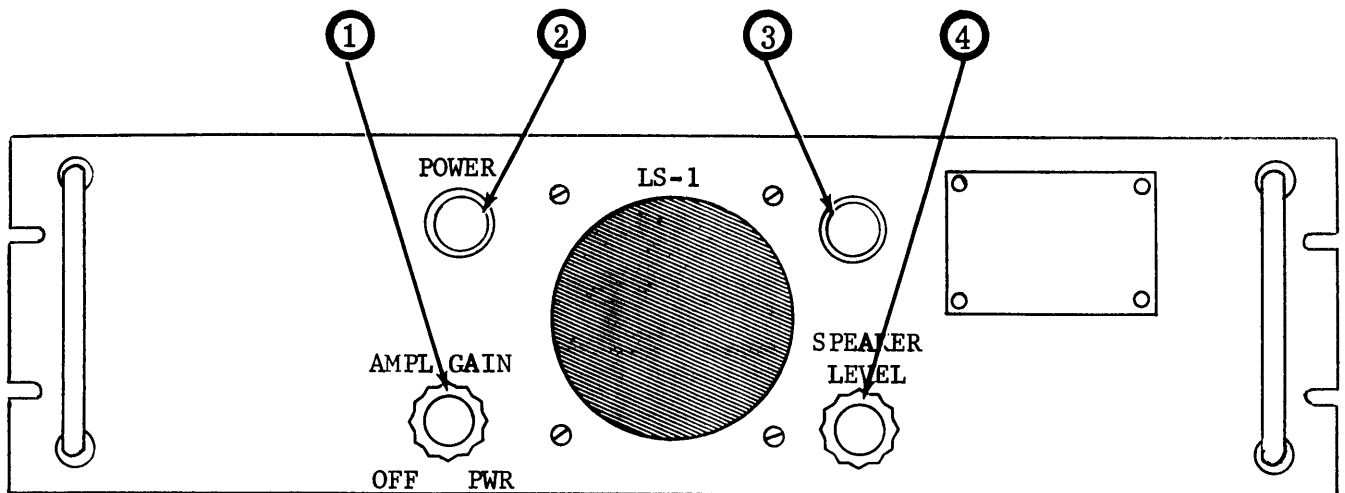
Check operation of controls, and the operation of the indicating lamp. Check the fuse; a lit fuse cap indicates that the fuse has blown.

#### **WARNING**

Never replace a fuse with one of higher current rating. If a fuse blows immediately after replacement, do not replace it a second time until the cause of trouble has been corrected.

Table 3-1. Operating Controls and Indicators

ITEM (FIG. 3-1)	PANEL DESIGNATION	FUNCTION
①	AMPL GAIN	Clockwise rotation (towards PWR) applies line voltage to amplifier assembly. Further clockwise rotation increases amplifier audio output to panel speaker and head-set.
②	POWER	Input power indicator lamp; lights when power is applied to unit.
③	Fuse	Input line voltage protective fuse. 115 VAC - .1 ampere. 230 VAC - .062 ampere.
④	SPEAKER LEVEL	Controls audio level to panel speaker.



9801-4

Figure 3-1. Controls and Indicators

## SECTION 4 PRINCIPLES OF OPERATION

### 4-1. CIRCUIT ANALYSIS.

The HSS comprises an audio-amplifier section, a power-supply section, and a speaker. An AMPL GAIN/PWR OFF switch is used to apply a-c line voltage to the power supply. Further rotation of this potentiometer/switch control increases the audio input signal level to the audio amplifier section. Speaker volume is controlled by an associated SPKR LEVEL T-pad attenuator. Refer to figures 4-1, 7-1 and 7-2.

Audio input signals applied to terminal board TB1 are extended to the base of amplifier Q1 through AMPL GAIN control R1. The amplified output of Q1 is then applied to the base element of Q2. The amplified output of Q2 is then applied to the base elements of drivers Q3 and Q4. A diode circuit keeps a potential separation between Q3 and Q4.

Transistors Q3 and Q4 are connected as emitter follower, supplying drive currents for power amplifiers Q5 and Q6. The power amplifier stage (Q5 and Q6) output is then applied to the headphone circuit at TB2 and to the speaker circuit through SPEAKER LEVEL control R18.

The input line voltage is applied to a step-down transformer T1. The stepped-down secondary output voltage is rectified and filtered, and routed to the various transistor circuits.

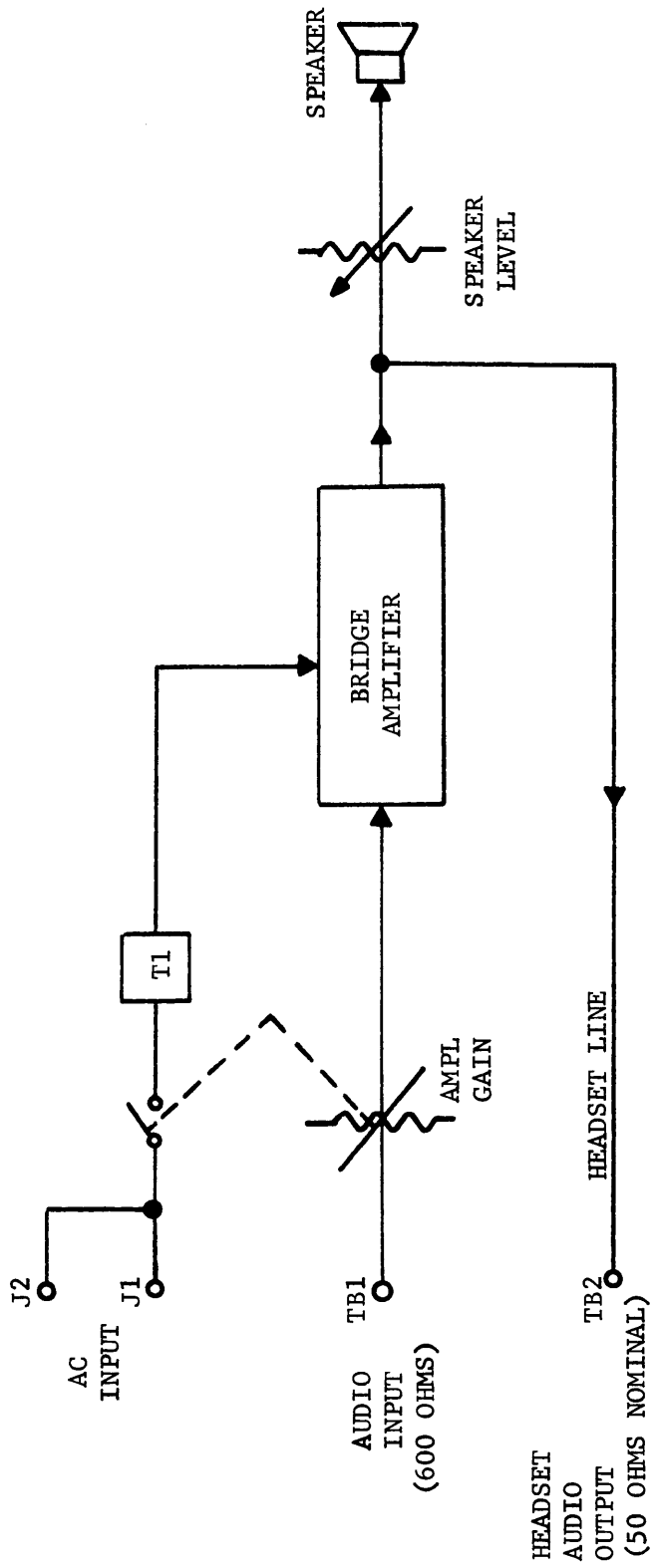


Figure 4-1. Simplified Block Diagram

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## **SECTION 5**

### **MAINTENANCE**

#### 5-1. PREVENTIVE MAINTENANCE.

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

**WARNING**

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

**CAUTION**

When using trichlorethylene, avoid contact with painted surfaces, due to its paint removing effects.

5-2. TROUBLESHOOTING.

The following troubleshooting aids are provided:

- a. Simplified block diagram (Figure 4-1).
- b. Schematic Diagrams (Figures 7-1 and 7-2)

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to circumstances occurring at the time of failure or due to symptoms of past failures. Therefore, the first check is to ascertain that proper equipment voltages are present and that all interconnecting wires are secure.

If the above mentioned checks fail to locate the fault, the unit should be removed from the cabinet and visually checked for corrosion, dirt, dampness or any other harmful conditions. When troubleshooting, refer to the schematic diagrams, figures 7-1 and 7-2.

### 5-3. REPAIR AND REPLACEMENT.

Maintenance of the HSS will consist mainly of component replacement. It should be noted that when replacing components having many wires connected, such as switches, relays, etc., the wires should be tagged and marked for accurate identification. When replacing components, refer to the parts list in section 6 for exact or equivalent replacements. Use of the schematic diagram in section 7 is advisable when replacing or disconnecting components.

## SECTION 6 PARTS LIST

### 6-1. INTRODUCTION

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

<u>Assembly or Subassembly</u>	<u>Page</u>
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AF Amplifier, AZ102 . . . . .	6-3



## PARTS LIST

for

## LOUDSPEAKER PANEL, MODEL HSS-7

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
AR1	AMPLIFIER, BRIDGING: power output 1.0 watt at -6 DBM input at 1,000 cps; input impedance 10K ohms-min.-balanced (not grounded); output impedance 45 ohms nom.; frequency response $\pm 2$ db 200 cps to 7,000 cps; power input 115/230 VAC. $\pm 10\%$ ; 60 cps; approx. 8 watts at full output. (SEE SEPARATE PARTS LIST FOR BREAKDOWN)	AZ102
DS1	LAMP, GLOW: neon; 110/125 VAC/VDC; nom. current rating 1.7 ma; T-2 type lamp; midget flange base.	BI111-2
F1	FUSE, CARTRIDGE: 1/10 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (For 115 V operation)	FU102-.100
F1	FUSE, CARTRIDGE: 1/16 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (For 230 V operation)	FU102-.062
LS1	LOUDSPEAKER, PERMANENT MAGNET: 3" x 5" oval; frequency response 150 to 6,000 cps; resonance 200 cps; voice coil impedance 45 ohms, $\pm 10\%$ ; power rating 2 watts; steel enclosure.	LS107-2
R1	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, $\pm 10\%$ ; 1 watt; taper C; consists of a SPST normally open switch rated at 3.0 amperes at 117 VAC, symbol number S1.	RV4NBYS503C
R2 thru R17	Part of AF Amplifier, symbol AR1.	
R18	ATTENUATOR, VARIABLE: T-pad type; 50 ohms; max. continuous rating 4 watts; peak audio rating 15 watts; max. attenuation 38 db.	RV107T50
S1	See R1.	
TB1	Part of AF Amplifier, symbol AR1.	
TB2	TERMINAL BOARD, BARREIR: 3 terminals; 6-32 thd x 1/4" long binder head screws; phenolic black body.	TM102-3
XDS1	LIGHT, INDICATOR: sub-miniature type; white lens; w/built-in resistor, rated at 18K ohms; for use with lamp, TMC part number BI111-2.	TS175-1
XF1	FUSEHOLDER: extractor post type; movable end terminals.	FH100-1

PARTS LIST  
for  
AF AMPLIFIER, AZ102

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf, +80% -20%; 500 WVDC.	CC100-24
C2	Same as C1.	
C3	CAPACITOR, FIXED, ELECTROLYTIC: polarized; 50 WVDC; max. temperature range 0°C to +85°C; hermetically sealed aluminum case with clear vinyl plastic sleeve.	CE116-8VN
C4	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -10% +150% at 120 cps at 25°C; 50 WVDC; polarized; insulated tubular case.	CE105-25-50
C5	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 30,000 uuf, ±10%; 100 WVDC.	CC100-36
C6	CAPACITOR, FIXED, ELECTROLYTIC: 6 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-6-15
C7	Same as C4.	
C8	CAPACITOR, FIXED, MICA DIELECTRIC: 470 uuf, ±5%; 500 WVDC; char. B.	CM15B471J
C9	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 50 WVDC; polarized; insulated tubular case.	CE105-50-50
C10	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 470,000 uuf, ±20%; 25 WVDC from -55°C to +85°C; radial lead type terminals.	CC112R474M
CR1	SEMICONDUCTOR DEVICE, DIODE	1N3253
CR2	Same as CR1.	
CR3	SEMICONDUCTOR DEVICE, DIODE	1N599
CR4	Same as CR3.	
CR5	Same as CR3.	
CR6	SEMICONDUCTOR DEVICE, DIODE	1N91
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 female contacts, twist lock; rated at 10 amps, 250 V or 15 amps, 125 V.	JJ235

## PARTS LIST (CONT)

## AF AMPLIFIER, AZ102

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J2	CONNECTOR, RECEPTACLE, ELECTRICAL: AC; 2 male contacts; 10 amps, 250 V or 15 amps, 125 V; polarized; twist lock.	JJ175
J3	CONNECTOR, RECEPTACLE, ELECTRICAL: printed circuit board type; 10 female contacts.	JJ319-10SFE
Q1	TRANSISTOR: NPN, silicon mesa.	2N697
Q2	Same as Q1.	
Q3	TRANSISTOR	2N2108
Q4	TRANSISTOR	2N1131
Q5	TRANSISTOR	2N2196
Q6	Same as Q5.	
R1	NOT USED	
R2	RESISTOR, FIXED, COMPOSITION: 3,300 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF332J
R3	RESISTOR, FIXED, COMPOSITION: 150,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF154J
R4	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF472J
R5	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF473J
R6	RESISTOR, FIXED, COMPOSITION: 1,500 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF152J
R7	Same as R6.	
R8	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF682J
R9	RESISTOR, FIXED, COMPOSITION: 120,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF124J
R10	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF183J
R11	RESISTOR, FIXED, COMPOSITION: 390 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF391J

## PARTS LIST (CONT)

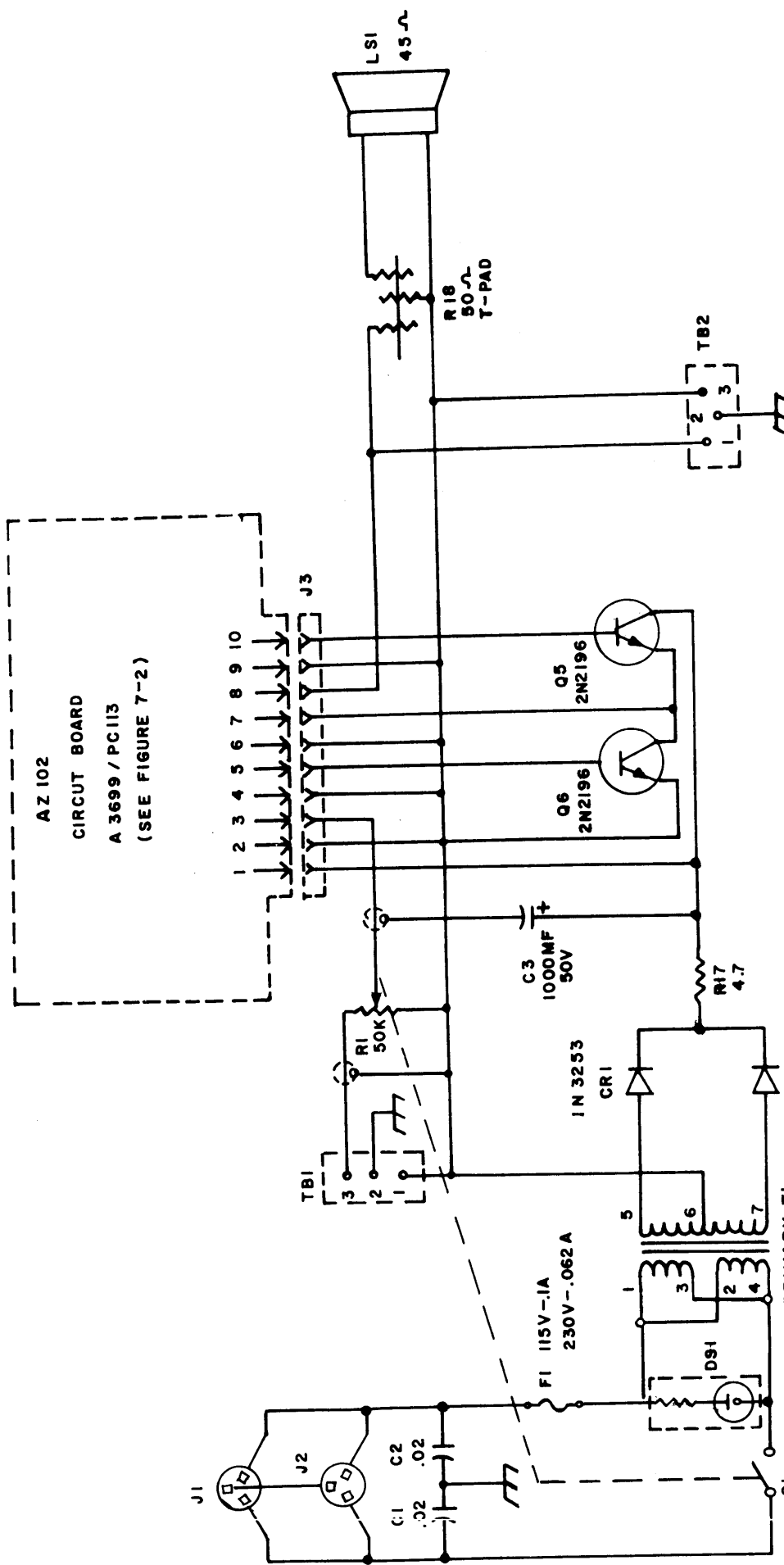
AF AMPLIFIER, AZ102

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R12	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF102J
R13	RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF221J
R14	Same as R12.	
R15	RESISTOR, FIXED, COMPOSITION: 22 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF220J
R16	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF683J
R17	RESISTOR, FIXED, COMPOSITION: 4.7 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF4R7J
T1	TRANSFORMER, POWER, STEP-DOWN: primary- 115/230 V, 50/60 cps, single pole; secondary- 44 V, 22 V center tap, current rating 420 ma; 7 solder lug type terminals; hermetically sealed open frame case.	TF287
TB1	TERMINAL BOARD, BARRIER: 3 terminals; 6-32 thd x 1/4" long binder head screws; phenolic black bakelite body.	TM100-3



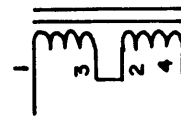
**SECTION 7**  
**SCHEMATIC DIAGRAMS**





UNLESS OTHERWISE SPECIFIED  
 1- ALL RESISTOR VALUES ARE IN OHMS  
 2- ALL CAPACITORS ARE IN MICROFARAD  
 3-  $\text{---}$  DENOTES CHASSIS GROUND  
 4-  $\text{---}$  DENOTES COMMON GROUND

PRIMARY T1  
 CONNECTED FOR  
 115V OPERATION

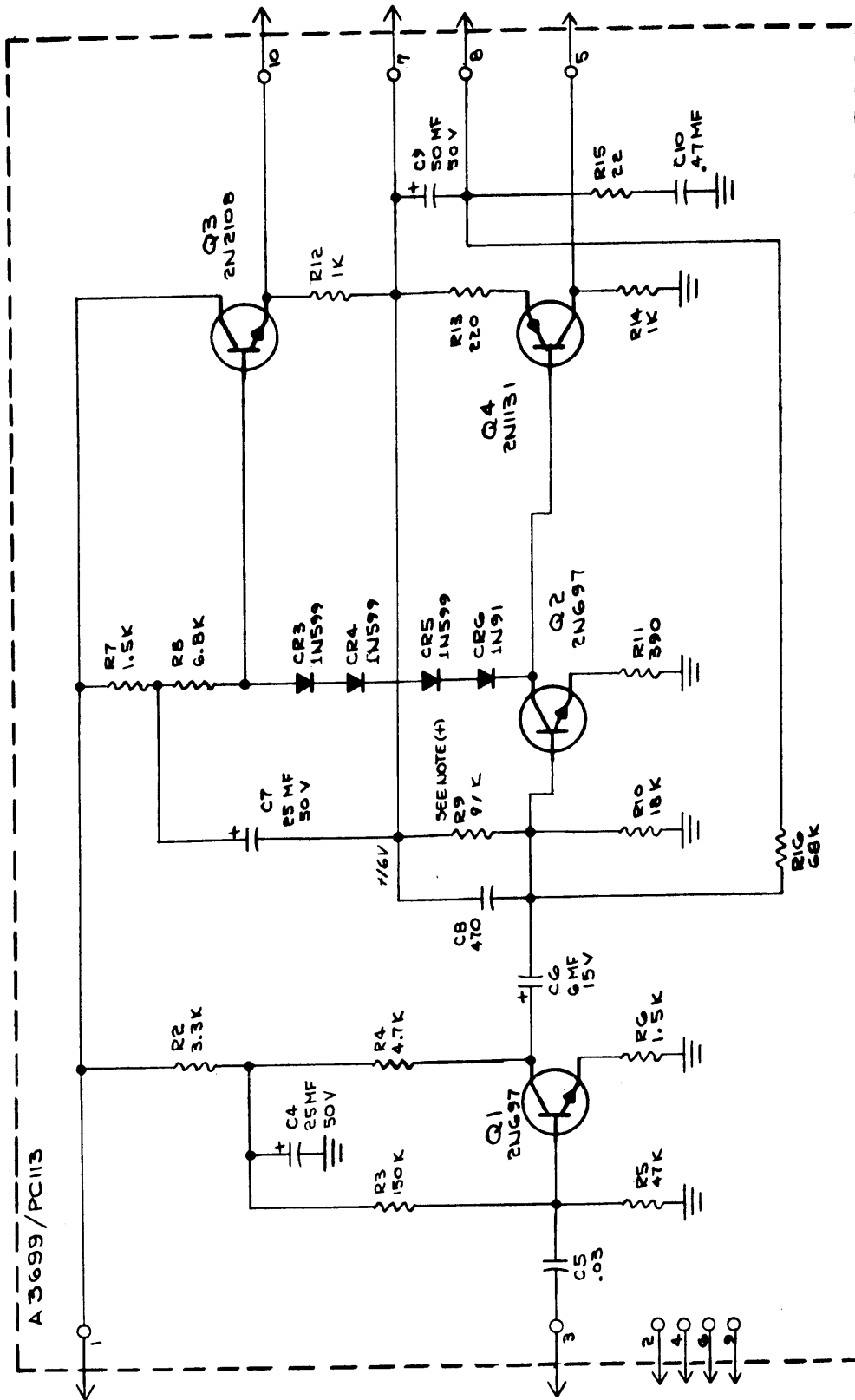


PRIMARY T1  
 CONNECTED FOR  
 230V OPERATION

CK-899A

Figure 7-1. Schematic Diagram, HSS-7





NOTE + NOMINAL VALUE OF R9 IS 91K.  
 ACTUAL VALUE ADJUSTED AT  
 FACTORY FOR 1/2 SUPPLY VOL-  
 TAGE ACROSS Q5 (COLLECTOR  
 TO EMITTER)

Figure 7-2. Schematic Diagram, Printed Circuit Board, AZ102