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UNCLASSIFIED

TECHNICAL MANUAL

for

BRIDGING SPEAKER PANEL
MODEL BSP-6



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO

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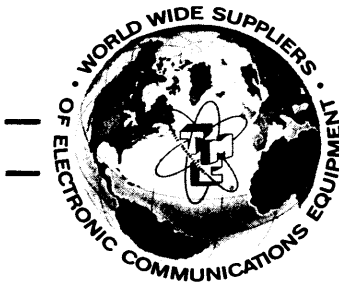
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NOTICE

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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Figure 1-1. Bridging Speaker Panel, Model BSP-6

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

BRIDGING SPEAKER PANEL, Model BSP-6 (figure 1-1) is a dual amplifier/speaker unit.

The BSP comprises two separate audio amplifiers, each with an individually controlled speaker, permitting an operator to select audio monitoring of either one of two connected receivers. Monitoring of either sideband of a receiver is also possible by use of the four-position channel selector switch (channels A1, A2, B1, B2) provided for each receiver.

1-2. PHYSICAL DESCRIPTION

The BSP is mounted on a 19-inch wide rack panel, designed to be mounted into any standard width equipment rack. The front panel displays two 4-inch speakers, each with a INCR on/off loudness control and a receiver channel selector switch. Two line voltage fuses, also front panel mounted, are used to protect the line voltage circuit to each audio amplifier.

1-3. TECHNICAL SPECIFICATIONS

INPUT IMPEDANCE:	10,000 ohms balanced
SPEAKER IMPEDANCE:	3.2 ohms
POWER GAIN:	36 db (1 watt output for -6db input)
POWER CAPABILITY:	4 watts
FREQUENCY RESPONSE:	+2db, 300 cps to 6000 cps, down at least 3 db at 200 cps.
HUM LEVEL:	-40 db at 1 watt output.
DISTORTION:	2% at 1 watt at 400 cps.

INPUT POWER: 115/230 vac, 50/60 cps, 8 watts at full power.
 OUTPUT POWER: 1.0 watt at 0 dbm input.
 OPERATING TEMPERATURE: 10°C to 65°C.
 SPEAKER SIZE: 4 inches
 PHYSICAL DIMENSIONS: 5-1/4 inches high x 19 inches wide x 6-1/2 inches deep.

TABLE 1-1. TRANSISTOR AND DIODE COMPLEMENT

Reference Symbol	Type
Q1	SC155
Q2	SC155
Q3	2N408
Q4	2N649
Q5, Q6	2N301/2869
CR1, CR2 CR3, CR4	1N3253
CR5	1N270

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION

Each BSP has been thoroughly checked and tested at the factory before shipment. When it arrives at the operating site, inspect the packing case and its contents immediately for possible damage; unpack the equipment carefully. Inspect all packing material for parts that 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 BSP is equipped with a 19-inch wide rack panel, designed to be mounted into any standard width equipment rack. The panel is to be screw fastened to the rack frame.

2-3. ELECTRICAL INSTALLATION

The BSP is factory wired to receive an input line voltage of 115 volts a-c. The input power transformer however, incorporates voltage taps making it possible to receive an input line voltage of 230 volts a-c. See figure 2-1 for input line voltage changeover connections.

See figure 2-2 for input and output connections.

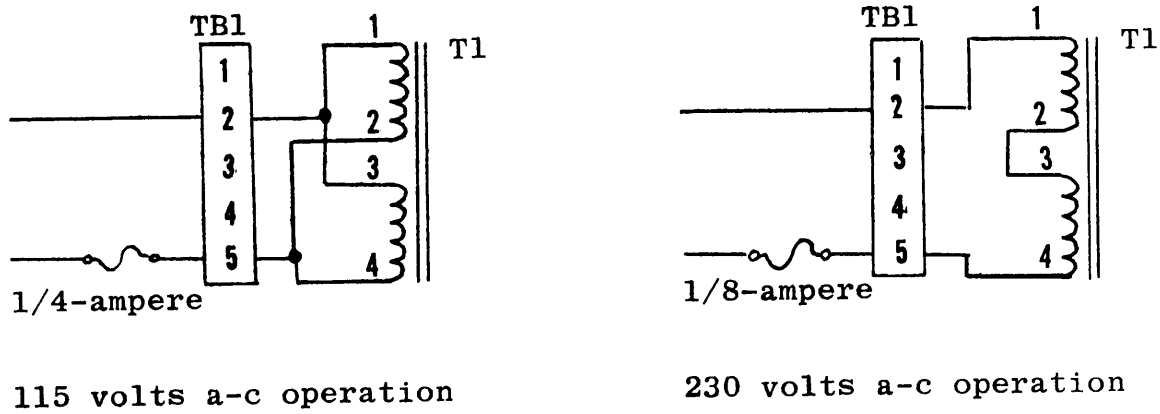


Figure 2-1. Power Supply Changeover Connections

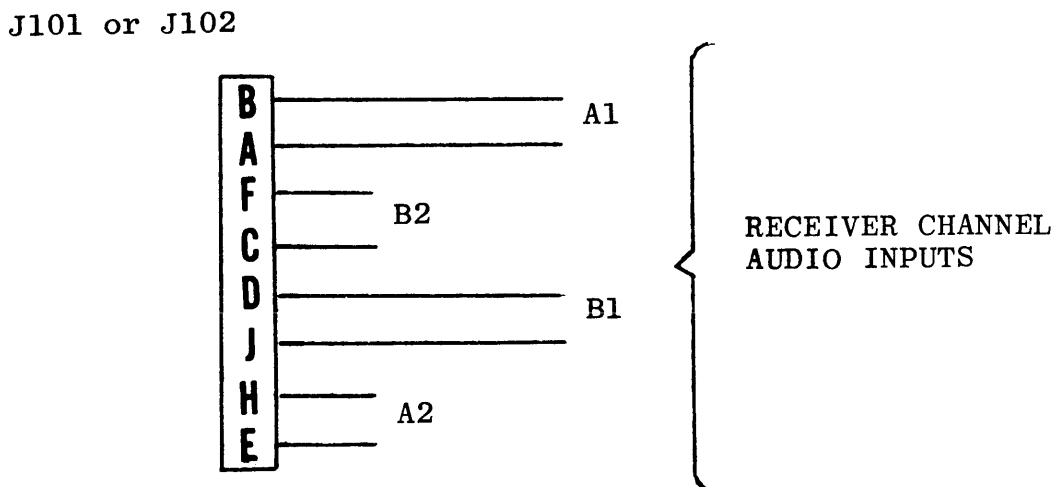


Figure 2-2. Interconnection Diagram

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL

The BSP is functionally used as a receiver audio monitoring device. Each of the two BSP speakers are provided with an independent volume control, panel marked INCR. A clockwise rotation of the INCR control will activate the associated amplifier; further clockwise rotation will increase the audio volume of the selected speaker.

RECEIVER 1 and RECEIVER 2 selector switches provide selection of sidebands A1, A2, B1 and B2 of receivers 1 and 2.

Two line fuses, also front panel mounted, are used as line protective fuses for the individual audio amplifiers.

3-2. OPERATOR'S INSTRUCTIONS

Operation of the BSP has been designed for the highest degree of simplicity. The operator merely selects the desired channel to be monitored, by the RECEIVER 1 or RECEIVER 2 selector switches, and adjusts the speaker volume to a comfortable listening level by use of the INCR volume control. Refer to table 3-1 for control descriptions and functions.

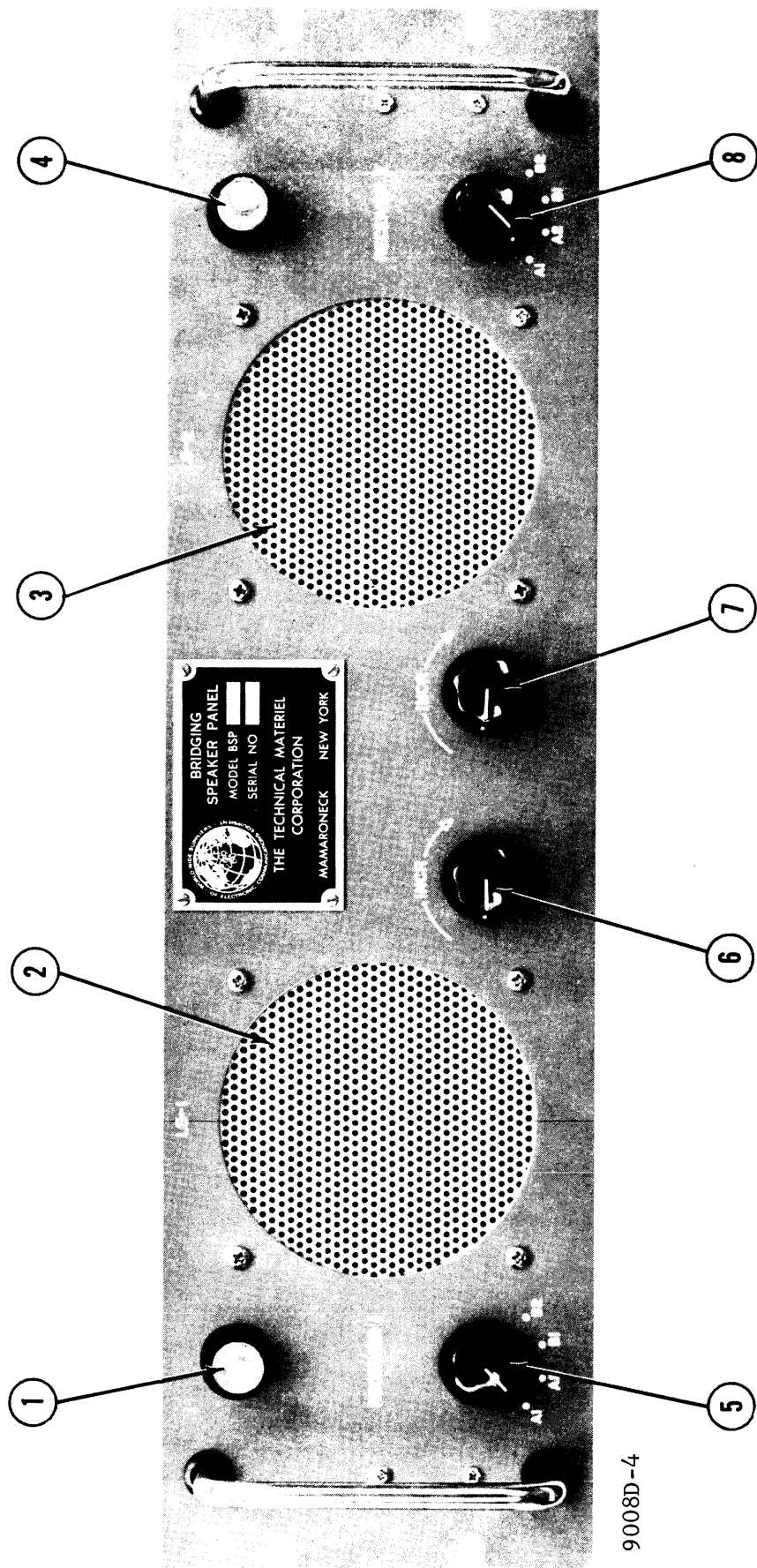


Figure 3-1. Operating Controls, BSP-6

TABLE 3-1. OPERATING CONTROLS AND INDICATORS

Item No. (Fig. 3-1)	Panel Designation	Function
1	Fuse	Line protective fuse for receiver 1 audio amplifier subassembly.
2	LS-1	Loudspeaker for receiver 1 monitoring.
3	LS-2	Loudspeaker for receiver 2 monitoring.
4	Fuse	Line protective fuse for receiver 2 audio amplifier subassembly.
5	RECEIVER 1	Four position rotary selector switch. Used to select desired receiver 1 channel monitoring.
6	INCR	Potentiometer, used to vary audio level of speaker monitoring receiver 1.
7	INCR	Potentiometer, used to vary audio level of speaker monitoring receiver 2.
8	RECEIVER 2	Four position rotary selector switch. Used to select desired receiver 2 channel monitoring.

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

The BSP is basically comprised of two separate audio amplifier sections, each individually fused and connected to an associated audio level controlled speaker. Both amplifier/speaker sections are completely independent of one another. See figure 4-1 for a simplified circuit diagram.

4-2. CIRCUIT DESCRIPTION

Although the amplifier subassembly (AZ104) should be treated as a "black box", inasmuch as they should not be tampered with, a circuit description is given in the following paragraphs. Should an amplifier subassembly produce a fault, replace it with another amplifier subassembly.

The 115 vac input is applied, via terminal board TB1, to a step-down transformer T1. The stepped-down secondary output is rectified by diodes CR1 through CR4, filtered by capacitor C7 and routed to the various transistor circuits.

The audio input signal is applied, via terminal board TB2, to the base of Q1 emitter follower via capacitor C4 and resistor R7. The output of Q1 is then applied to the base of Q2 amplifier across load resistor R6. The amplified output from Q2 is then applied to the base elements of Q3 and Q4 drivers. Capacitor C3 in the collector-base circuit stabilizes the operation of Q2 through degenerative feedback. Diode CR5 keeps a potential separation between Q2 and Q3.

Transistors Q3 (a p-n-p) and Q4 (a n-p-n) are connected as emitter followers, supplying drive currents for power amplifiers Q5 and Q6. The power amplifier stage (Q5 and Q6) is connected in a

push-pull configuration and applied to the speaker circuit via terminal board TB2.

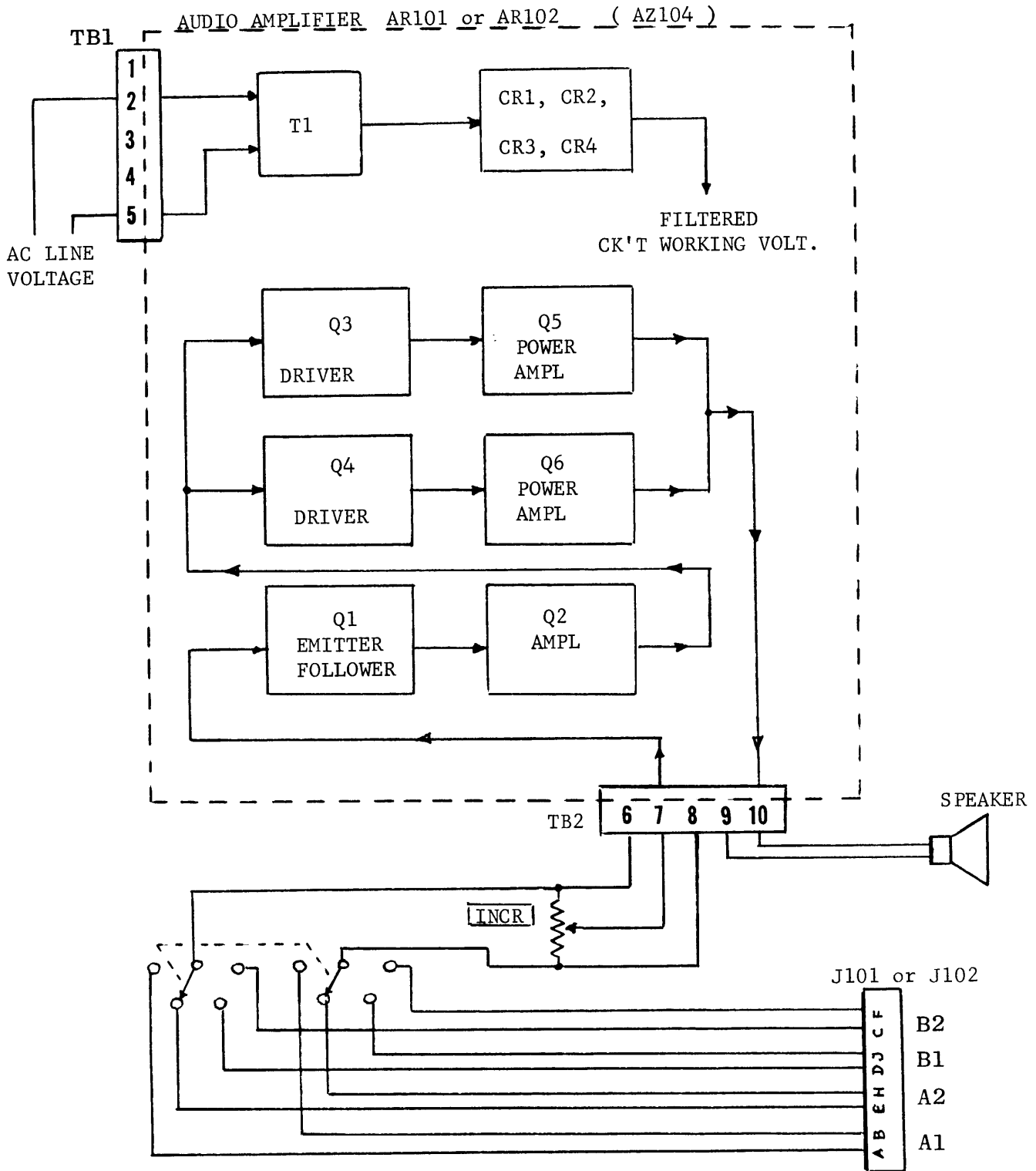


Figure 4-1. Block Diagram, BSP-6

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTANANCE.

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 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 PROCEDURES.

The amplifier sub-assembly is installed as a modular unit. Should the amplifier sub-assembly develop a fault, the entire sub-assembly should be replaced. On the first indication of a fault, the line protective fuses should be checked. The volume controls, re-

ceiver selector switches, speakers and interconnections should also be checked before attempting to replace the amplifier sub-assemblies. When the above mentioned checks, made visually and by continuity measurements, do not clear the fault, proceed with the following procedures. Refer to table 5-1 for test equipment required.

The gain of the amplifier sub-assembly can be measured as follows:

1. Turn all gain controls fully counter-clockwise.
2. Disconnect speaker from equipment under test.
3. Connect dummy load (three 12-ohm, 2 watt resistors in parallel) to terminals 9 and 10 of terminal board.
4. Connect signal generator to outside lugs of volume control potentiometer ("High-side" to red lead).
5. Connect distortion meter to outside lugs of volume control potentiometer, observing polarity.
6. Set distortion meter controls as follows:
Distortion Frequency ----- volts
Range ----- 1 volt
7. Adjust signal generator for 400 cps at zero dbm or .79 volt indication on distortion meter.
8. Disconnect distortion meter from volume control and re-connect to dummy load. (High-side to red lead).
9. Turn RANGE switch to 3 volts.
10. Adjust volume control of BSP for a 2 volt indication on distortion meter.
11. Turn DISTORTION FREQUENCY switch to 200 to 2K position.
12. Turn RANGE switch to 100%.
13. Adjust FREQUENCY AND AMPLITUDE COARSE controls for a dip.
14. Turn RANGE switch to 30%.
15. Repeat Step 13 above.
16. Turn RANGE switch to 10%.

17. Adjust FREQUENCY AND AMPLITUDE fine controls for a dip.
18. Turn RANGE switch to 3%.
19. Repeat Step 17 above.
20. Turn RANGE switch to -10CAL.
21. Adjust CALIBRATE control for 3V on 3V scale.
22. Return RANGE switch to 3%.
23. Adjust FREQUENCY AND AMPLITUDE fine controls again for a dip. Must be less than 2%.
24. Return RANGE switch to 1 volt position.
25. Return DISTORTION FREQUENCY switch to VOLTS position.
26. Observe reading on distortion meter. Should still be 2 volts.
27. Vary signal generator from 300 cps to 6000 cps. Should not vary more than +2db from 2 volt indication.
28. Reduce signal generator frequency to 200 cps. Must be at least 3 db down from 2 volt indication.
29. Disconnect distortion meter leads from dummy load. Connect ac voltmeter across dummy load.
30. Remove signal generator input. Observe hum level by turning range knob on Ballantine meter to successively lower scale until a reading is observed. Must be at least -40 db.

Table 5-1. TEST EQUIPMENT REQUIRED

ITEM	MANUFACTURER
Audio Signal Generator	Hewlett-Packard, Model 200CD or equivalent.
Distortion Meter	Barker-Williamson, Model 410 or equivalent.
AC Voltmeter	Ballantine, Model 314 or equivalent.
Three 12-ohm, 2 watts, <u>+5%</u> resistors.	Any manufacturer meeting the necessary specifications.

5-3. REPAIR AND REPLACEMENT

Corrective maintenance of the BSP will consist mainly of component replacement. When replacing components, the technician should observe for exact or equivalent replacements by referring to the parts list in section 6. Polarity and positioning of certain components should be observed before removing so that the replacement component will fit and operate properly.

The amplifier sub-assembly AZ104 is installed as a modular unit. Should the AZ104 develop a fault, the entire sub-assembly should be replaced.

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. Reference symbol.
- b. Description as indicated in parts list.
- 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

BRIDGING SPEAKER PANEL, BSP-6 (CONT.)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
AR101	AMPLIFIER, AUDIO FREQUENCY: 10 K ohms balanced input impedance, frequency response +2 db 300 cps to 6000 cps down at least 3 db at 200 cps, 2% distortion at 1 watt @ 400 cps, hum at -40 db at 1 watt output, 115/230 vac +10% 60 cps power input, approx. 8 watt at full output, 1.0 watt at 0 dbm input at 400 cps power output, 10 to 65°C operating temperature.	AZ104
AR102	Same as AR101	
DS101	Non-replaceable item; part of XF101	
DS102	Non-replaceable item; part of XF102	
F101	FUSE, CARTRIDGE; 250 volts, 1/4 amp; 1-1/4" long x 1/4" dia; slo-blo	FU102-.250
F102	Same as F101	
J101	CONNECTOR RECEPTACLE, ELECTRICAL; 9 round male contacts, polarized, straight type, 2000 vrms, contacts rated at 7.5 amps.	JJ193-9P
J102	Same as J101	
LS101	LOUDSPEAKER, PERMANENT MAGNET; 3.2 ohms impedance, 4.5 watts, 4-3/16" OD.	LS101
L102	Same as L101	
R101	RESISTOR, VARIABLE COMPOSITION; 25000 ohms, +10%, 2 watts	RV4NAYS253B
R102	Same as R101	
R103	Non-replaceable item; part of XF101	
R104	Non-replaceable item; part of XF102	
S101	SWITCH, ROTORY, 2 poles, 4 positions, 1 section, non-shorting contacts. Rated at 5 amps., 28 vdc or 0.5 amps, 110 vac.	SW120
S102	Same as S101	

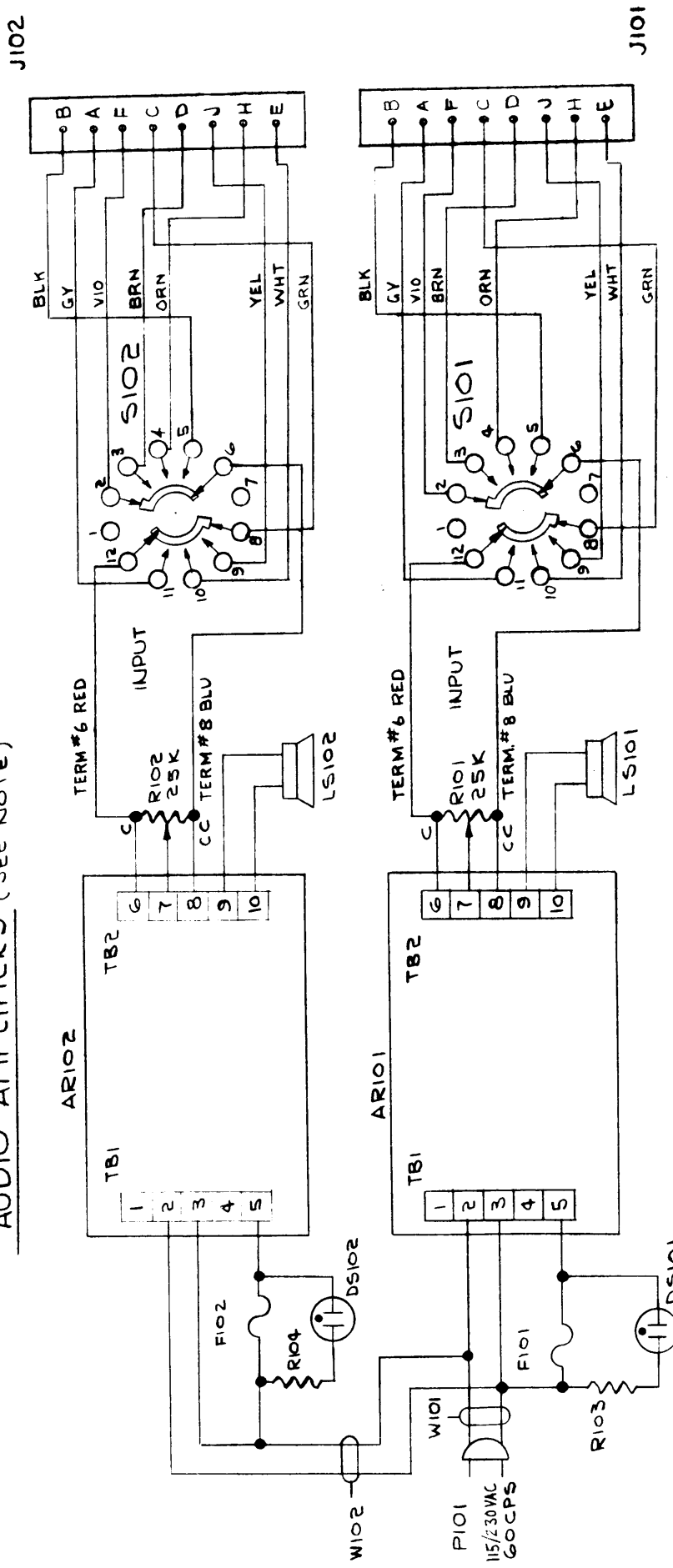
BRIDGING SPEAKER PANEL, BSP-6 (CONT.)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF101	FUSEHOLDER: extractor post type; for 1/4" x 1-1/4" fuse; w/neon indicator lamp and 220k resistor, clear octagonal lens; 100-250 volts, 20 amps; consists of symbols DS101,R103	FH104-2
XF102	Same as XF101. Consists of DS102 and R104.	

SECTION 7
SCHEMATIC DIAGRAMS

FUSES F101 & F102:
 1/4 AMP FOR 115V OPERATION
 1/8 AMP FOR 230V OPERATION

AUDIO AMPLIFIERS (SEE NOTE)

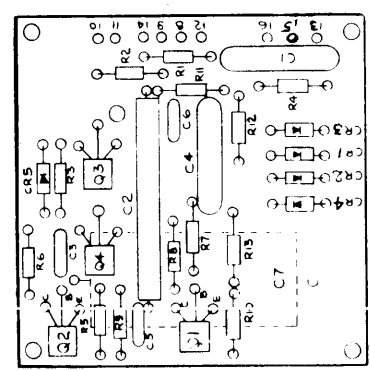
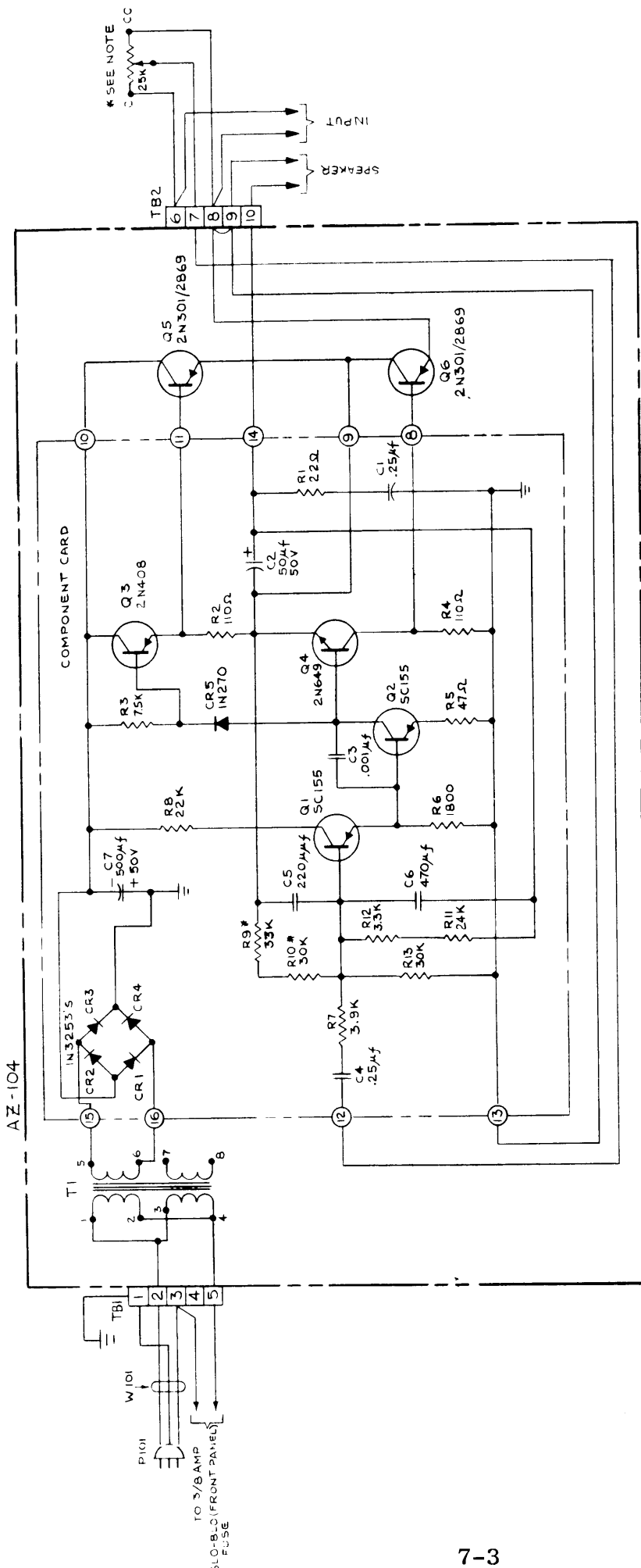


NOTE:
 SWITCH VIEWED FROM KNOB
 END IN B2 POSITION

NOTE:
 FOR SCHEMATIC DIAGRAM OF
 AUDIO AMPLIFIERS (TMC NO. AZ104)
 SEE CK745
 PI01-F-W101 USED ONLY WHEN THIS
 UNIT IS SHIPPED ALONE.

CK771D

Figure 7-1. Schematic Diagram, BSP-6



COMPONENT CARD LAYOUT

CR715B

* NOTE: TOTAL RESISTANCE OF R9 & R10
 SELECTED AT FACTORY FOR 1/2
 SUPPLY VOLTAGE ACROSS Q6
 (COLLECTOR TO EMITTER)

* NOTE: SEE BSP SCHEMATIC FOR REF SYMBOL
 ALL RESISTORS ARE ± 5%

Figure 7-2. Schematic Diagram, AZ104