



TECHNICAL MANUAL

*for*

BRIDGING SPEAKER PANEL  
MODELS BSP



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N. Y.

OTTAWA, CANADA



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IN 9008A

Issue Date: 15 Sept 1963  
Revised: 25 Aug 1965

## NOTICE

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# 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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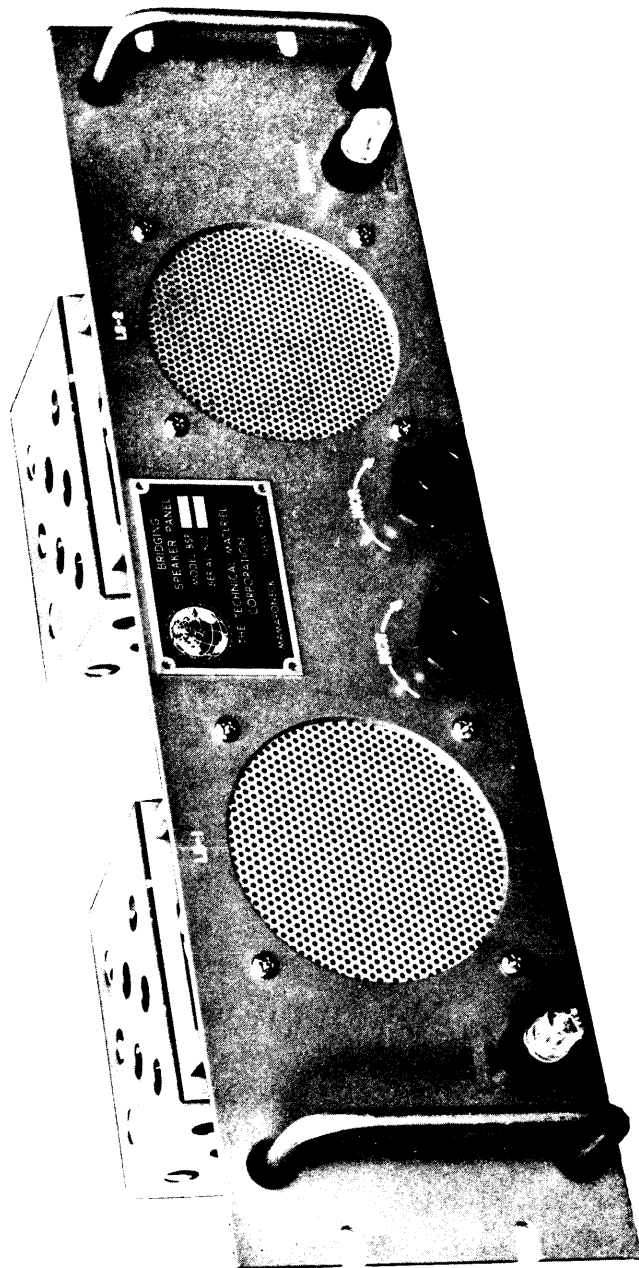
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Figure 1-1. Typical Bridging Speaker Panel (BSP-2)



# SECTION 1 GENERAL INFORMATION

## 1-1. GENERAL.

Bridging Speaker Panels BSP-1D, BSP-2D, and BSP-3D are self-contained amplifier speaker units. The BSP-1D (figure 1-2A) comprises one transistorized audio amplifier subassembly, one loudspeaker, one volume control, and its own power supply. Correspondingly, the BSP-2D (figure 1-2B) comprises two audio amplifier subassemblies, two loudspeakers, etc. The BSP-3D (figure 1-2C) comprises three audio amplifier subassemblies, etc.

## 1-2. TECHNICAL CHARACTERISTICS (PER ASSEMBLY)

Input Impedance . . . . . 10,000 ohms  
 Speaker Impedance . . . . . 45 ohms  
 Power Gain . . . . . 36 db (1 watt output for  
 -6 db input)  
 Frequency Response . . . . . 200 to 7,000 cps  $\pm$ 2 db  
 Hum Level . . . . . -40 dbm at 1 watt  
 Distortion . . . . . 2% at 1 watt at 400 cps  
 Input Power . . . . . 115/230 vac, 50/60  
 cps  
 Dimensions . . . . . 5-1/4 inches high x 19  
 inches wide x 6-1/2  
 inches deep

Speaker Size . . . . . 4 inches

### Weight

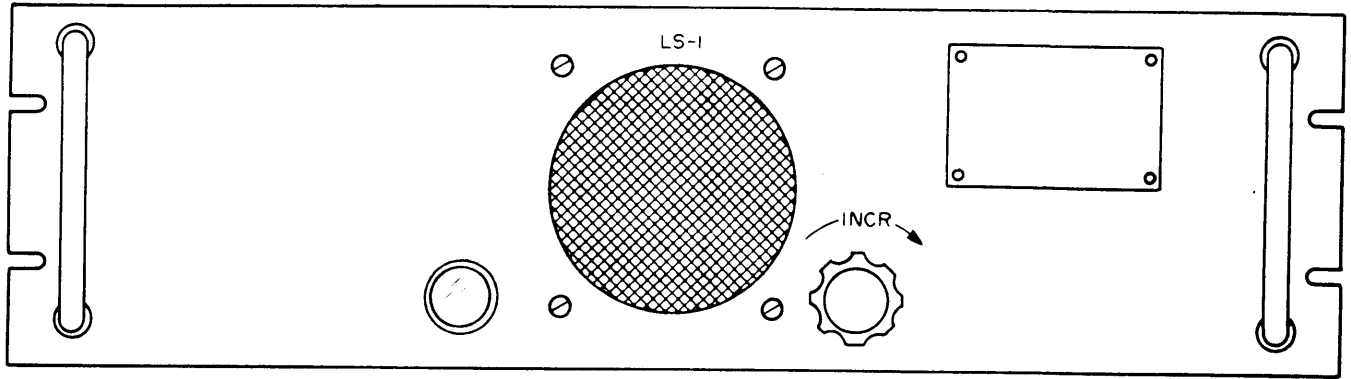
BSP-1 . . . . . 5 lbs  
 BSP-2 . . . . . 7-1/2 lbs  
 BSP-3 . . . . . 10 lbs

## 1-3. TRANSISTOR AND DIODE COMPLEMENT.

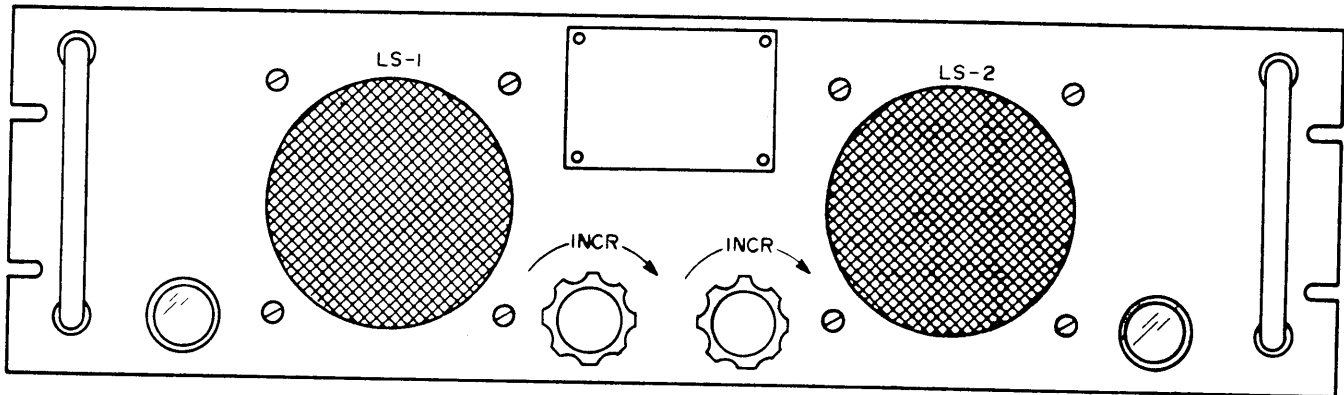
Table 1-1 lists the transistors and diodes found in each assembly.

**TABLE 1-1. TRANSISTOR AND DIODE  
COMPLEMENT**

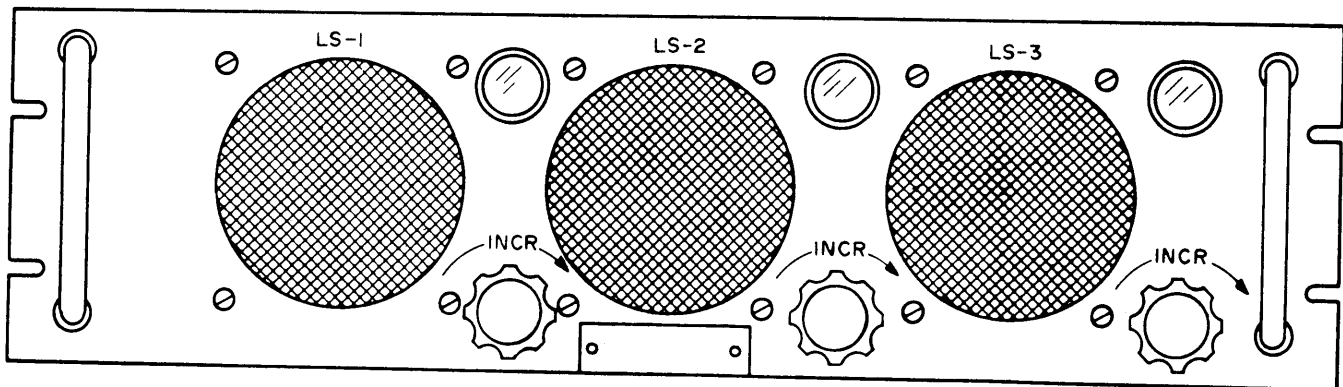
REFERENCE SYMBOL	TYPE	FUNCTION
Q1	2N697	Emitter Follower
Q2	2N697	Amplifier
Q3	2N2108	Driver
Q4	2N1131	Driver
Q5, Q6	2N2186	Power Amplifier
CR1, CR2	1N3253	Rectifiers
CR3 thru CR6	1N599	Clamps



A. MODEL BSP-1



B. MODEL BSP-2



C. MODEL BSP-3

9008A-2

Figure 1-2. Bridging Speaker Panel, Models BSP

## SECTION 2 INSTALLATION

### 2-1. INITIAL INSPECTION.

Each BSP is calibrated at the factory prior to shipment. Upon receipt of the unit, inspect it for possible damage and the 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. INSTALLATION.

Each BSP is designed for installation in a standard 19 inch relay rack. The assembly is secured to the rack by mounting holes provided on the front panel.

### 2-3. POWER REQUIREMENTS.

Each assembly is designed for 115 or 230 volt, single phase, 50/60 cycle primary power. However, the units are wired at the factory for 115 volt operation unless otherwise specified. Therefore, certain wiring changes are required to adapt a unit to 230 volt operation (see figure 2-1). For 230 volt operation, also change the rating of the line fuse(s) on the front panel from 1/10 ampere to 1/16 ampere.

### 2-4. ELECTRICAL CONNECTIONS.

The input power is connected to jack J1. On speaker panels having more than one assembly, a jumper cable

is connected from jack J2 of the assembly to which primary power is routed, and connected to J1 of the adjacent assembly. The audio input is connected to terminal board TB1 for each assembly (refer to figure 2-2). The audio input circuit is unbalanced, with terminal 3 above ground, and terminal 2 provided for a shield ground.

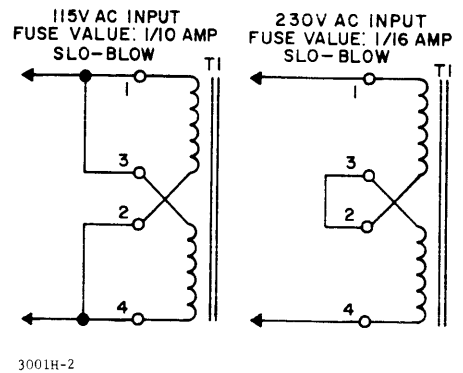


Figure 2-1. Power Supply Changeover Connections

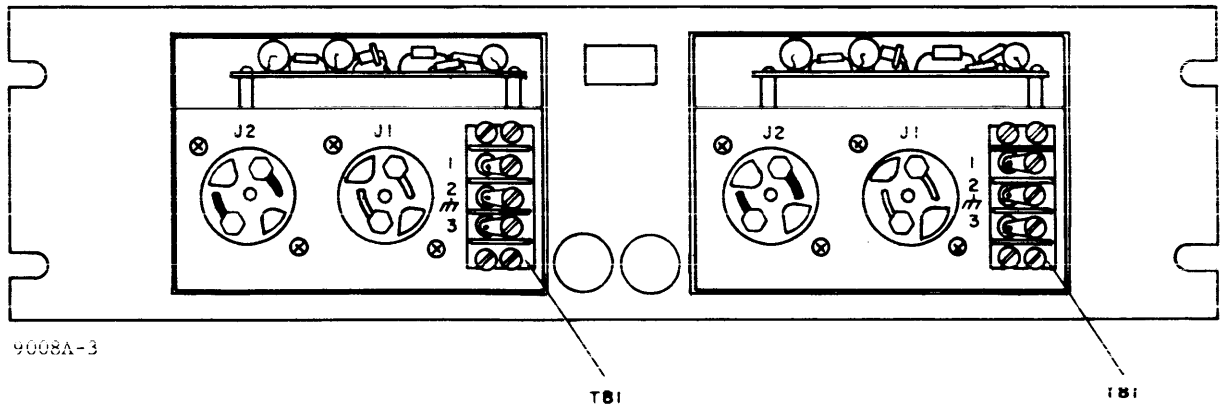


Figure 2-2. BSP-2, Rear Panel

## **SECTION 3 OPERATOR'S SECTION**

### **3-1. CONTROLS AND OPERATION.**

The only operating controls are the volume controls (marked INCR) on the front panel. With these controls, the individual audio levels can be adjusted to a comfortable level. The BSP-1 has one control, the BSP-2 has two, and the BSP-3 has three.

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

The only operator's maintenance required on this unit is to change the fuses when necessary, and to clean the unit of dust and grease whenever required.

## SECTION 4 PRINCIPLES OF OPERATION

### 4-1. INTRODUCTION.

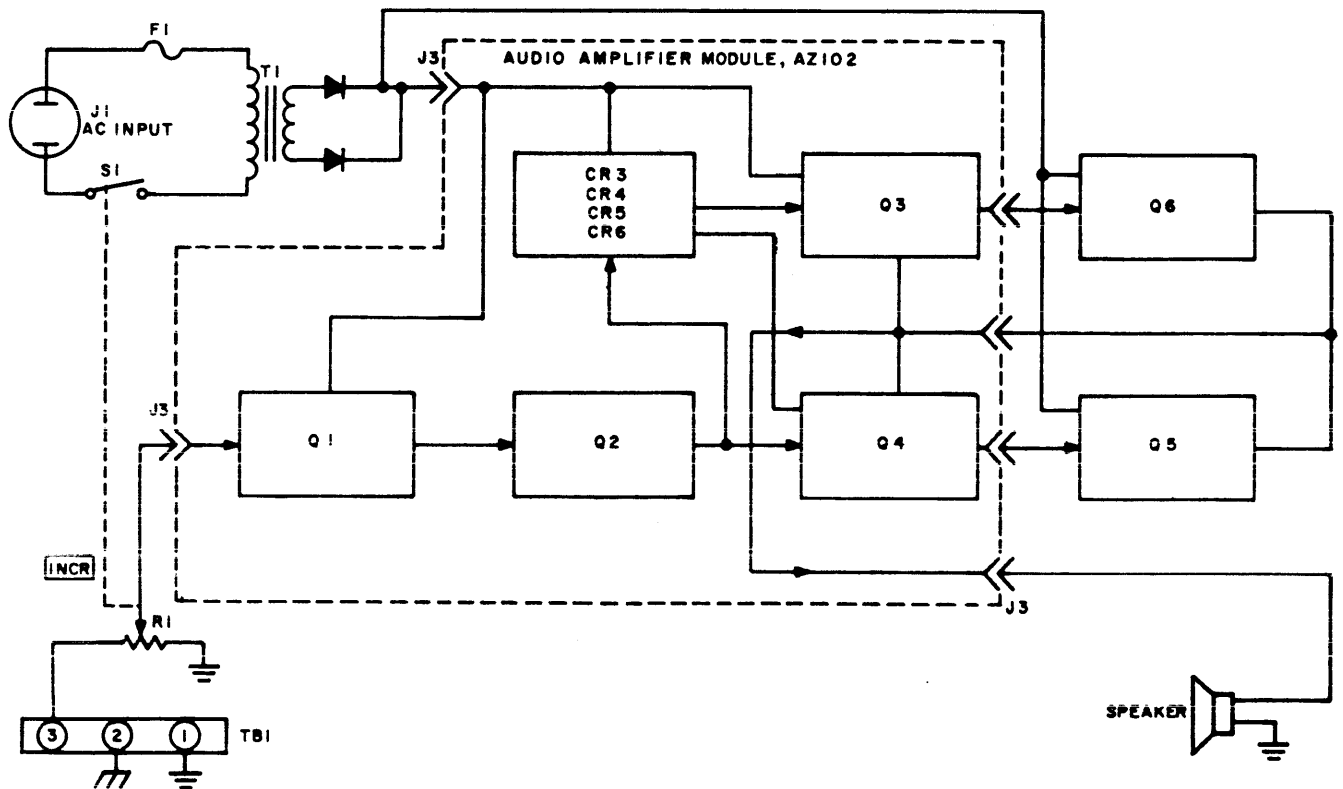
The BSP comprises one or more assemblies, each assembly consisting of: a power supply; a volume control; an amplifier; and a loudspeaker. The following description is for one assembly only.

### 4-2. CIRCUIT DESCRIPTION.

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.

Audio input signals, applied via terminal board TB1, are applied to the base of amplifier Q1. The amplified output of Q1 is then applied to the base element of amplifier 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 followers, supplying drive currents for power amplifiers Q5 and Q6. The output of the power amplifier stage (Q5 and Q6) is then applied to the speaker circuit.



9008A-4

Figure 4-1. Block Diagram

## SECTION 5 MAINTENANCE

### 5-1. GENERAL.

The amplifier subassembly is installed as a unit and should a malfunction occur, the entire subassembly should be replaced. On the first indication of trouble, check the line fuses, volume control and loudspeaker first before replacing the amplifier subassembly. Check the volume control for an open or short and the speaker for a broken cone or loose connections. A continuity check of the voice coil (disconnected from terminals 8 and 9 of J3) will reveal whether it is open or short-circuited.

### 5-2. TEST DATA.

The gain of the amplifier subassembly can be measured using the following test set-up; refer to figure 7-1.

a. Connect the audio signal generator to terminals 1 and 2 on TB1 and the vtm to pins 8 and 9 of J3. Turn INCR control fully counterclockwise.

b. Set output of signal generator for a -6 dbm at 1000 cps. Adjust INCR control for a gain of 36 db  $\pm$  3 db (1 watt) on vtm.

c. Check frequency response between 200 cps and 7000 cps. It should not drop more than 3 db.

d. Set output of signal generator for a -6 dbm output at 400 cps. Adjust INCR control for a gain of 36 db  $\pm$  3 db on vtm.

e. Connect a distortion meter to the pins 8 and 9 of J3. The distortion should not exceed two percent.

## SECTION 6 PARTS LIST

### 6-1. INTRODUCTION.

Reference designations have been assigned to identify all electrical parts of the equipment. These designations are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor,

transistor, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as transistor or fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for fuse F101 is designated XF101. To expedite delivery when ordering replacement parts, specify the TMC part number and the model number of the equipment.

Assembly or Sub-assembly	Page
AF Amplifier, AZ102 (Symbol Series 10) . . . . .	6-1
Bridging Speaker Panel, BSP (Symbol Series 100) . . . . .	6-3

### AF AMPLIFIER, AZ102

REF SYM	DESCRIPTION	TMC PART NO.
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20, 000 uuf, +80% -20%; 500 WVDC.	CC100-24
C2	Same as C1.	
C3	CAPACITOR, FIXED, ELECTROLYTIC: polarized; 1, 000 uf; 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

**PARTS LIST (CONT)**

AF AMPLIFIER, AZ102

REF SYM	DESCRIPTION	TMC PART NO.
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
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; collector to base voltage 60 V; collector to emitter voltage 40 V; emitter to base voltage 5 V; collector current 175 ma; power dissipation 2 watts at 25°C; junction temperature 175°C; hermetically sealed metal case.	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, ±10%; 1/2 watt.	RC20GF332K
R3	RESISTOR, FIXED, COMPOSITION: 150,000 ohms, ±10%; 1/2 watt.	RC20GF154K
R4	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±10%; 1/2 watt.	RC20GF472K
R5	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±10%; 1/2 watt.	RC20GF473K
R6	RESISTOR, FIXED, COMPOSITION: 1,500 ohms, ±10%; 1/2 watt.	RC20GF152K
R7	Same as R6.	



**PARTS LIST (CONT)**

AF AMPLIFIER, AZ102

REF SYM	DESCRIPTION	TMC PART NO.
R8	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF682K
R9	RESISTOR, FIXED, COMPOSITION: 120,000 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF124K
R10	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF183K
R11	RESISTOR, FIXED, COMPOSITION: 390 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF391K
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, $\pm 10\%$ ; 1/2 watt.	RC20GF220K
R16	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF683K
R17	RESISTOR, FIXED, COMPOSITION: 4.7 ohms, $\pm 10\%$ ; 1/2 watt.	RC20GF4R7K
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 inch long binder head screws; phenolic black bakelite body.	TM100-3

BRIDGING SPEAKER PANEL, BSP

REF SYM	DESCRIPTION	TMC PART NO.
AR101	AMPLIFIER, BRIDGING: power input 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
AR102	Same as AR101.	
AR103	Same as AR101.	
DS101	Non-replaceable item. Part of XF101.	
DS102	Non-replaceable item. Part of XF102.	
DS103	Non-replaceable item. Part of XF103.	

**PARTS LIST (CONT)**

BRIDGING SPEAKER PANEL, BSP

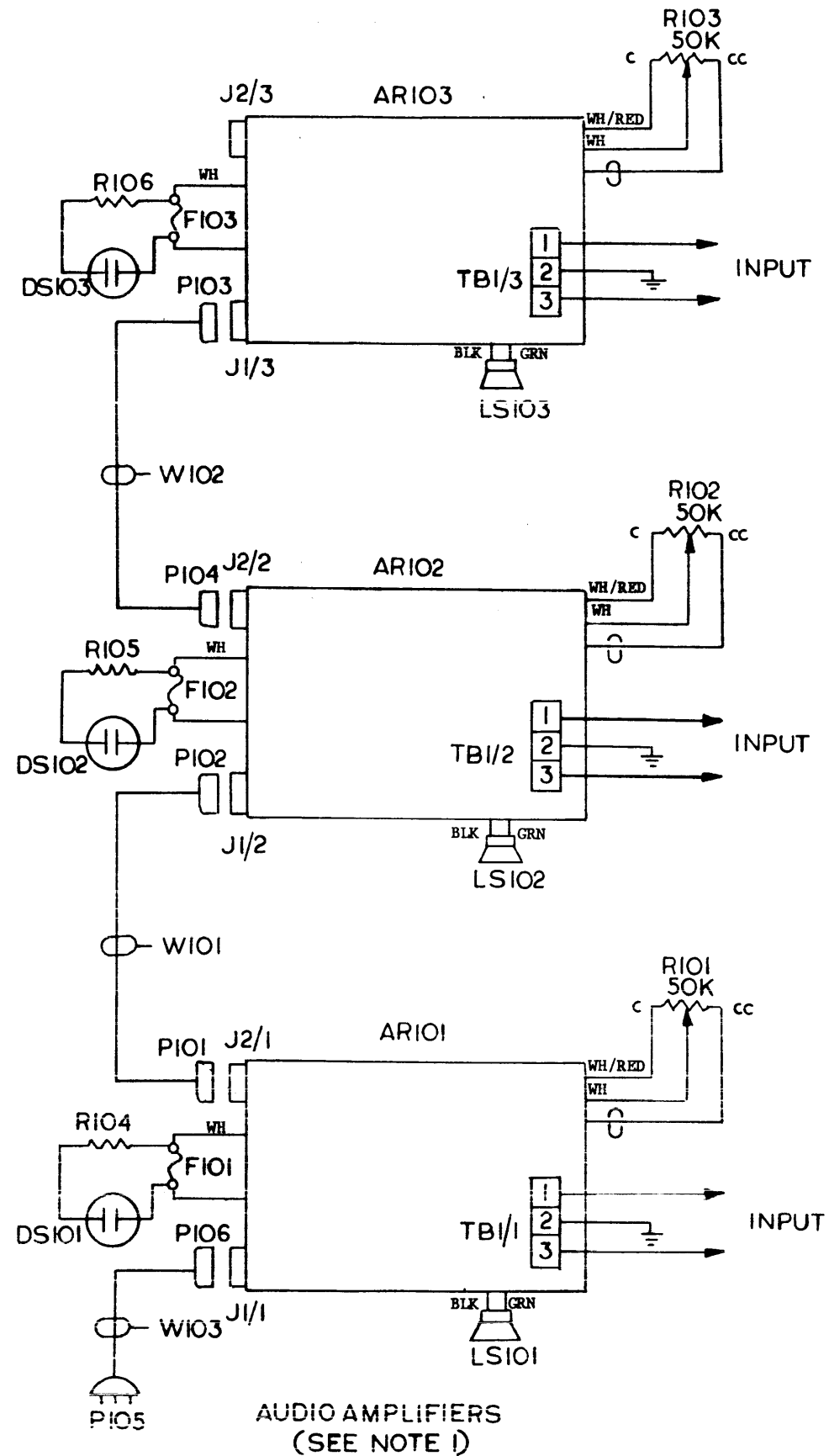
REF SYM	DESCRIPTION	TMC PART NO.
F101	FUSE, CARTRIDGE: 1/10 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow. (For 115 V operation.)	FU102-. 1
F101	FUSE, CARTRIDGE: 1/16 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow. (For 230 V operation.)	FU102-. 062
F102	Same as F101. (For 115 V operation.)	
F102	Same as F101. (For 230 V operation.)	
F103	Same as F101. (For 115 V operation.)	
F103	Same as F101. (For 230 V operation.)	
LS101	LOUDSPEAKER, PERMANENT MAGNET: 4 inch; voice coil impedance 45-50 ohms; power rated at 2.0 watts; 4-1/8" square x 1-3/8" deep.	LS-102
LS102	Same as LS101.	
LS103	Same as LS101.	
P101	CONNECTOR, PLUG, ELECTRICAL: with cable clamp; 2 half round male contacts, 10 amps, 250 V, 15 amps, 125 V; polarized; twist lock. Part of W101.	PL177
P102	CONNECTOR, PLUG, ELECTRICAL: twist lock type; polarized; 2 female contacts, straight type, 10 amps, 250 V; midjet size; brown bakelite. Part of W101.	PL176
P103	Same as P101. Part of W102.	
P104	Same as P102. Part of W102.	
P105	CONNECTOR, PLUG, ELECTRICAL: twist lock type; 3 male contacts, straight type. Part of W103.	PL218
P106	Same as P102. Part of W103.	
R101	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, ±10%; 2 watts, taper A; consists of a SPST normally open switch, rated at 3.0 amperes at 117 VAC, symbol S101.	RV4NBYS503A
R102	Same as R101. Consists of switch, symbol S102.	
R103	Same as R101. Consists of switch, symbol S103.	
R104	Non-replaceable item. Part of XF101.	
R105	Non-replaceable item. Part of XF102.	
R106	Non-replaceable item. Part of XF103.	
S101	See R101.	
S102	See R102.	
S103	See R103.	

**PARTS LIST (CONT)**

BRIDGING SPEAKER PANEL, BSP

REF SYM	DESCRIPTION	TMC PART NO.
W101	CABLE ASSEMBLY, POWER, ELECTRICAL: consists of 12" length of 2 conductor insulated wire; 2 connectors, P101, P102.	CA884-4
W102	Same as W101. Consists of P103, P104.	
W103	CABLE ASSEMBLY, POWER, ELECTRICAL: consists of 1' retracted length of 2 conductor insulated wire; 2 connectors, P105, P106. (Shipped as a Loose Item.)	CA555-4
XF101	FUSEHOLDER: extractor post type; for 1-1/4" long x 1/4" dia. fuse; with neon indicator lamp and 220K ohm lamp resistor, clear octagonal lens; 100-250 V, 20 amps; consists of DS101, R104.	FH104-2
XF102	Same as XF101. Consists of DS102, R105.	
XF103	Same as XF101. Consists of DS103, R106.	

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



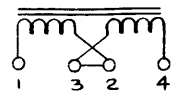
NOTE:

1. FOR SCHEMATIC DIAGRAM OF AUDIO AMPLIFIERS (TMC No. AZ102) SEE CK751
2. FUSE F101, F102 AND F103 ARE 1/10A FOR 115VAC OPERATION, 1/16A FOR 230VAC
- 3.

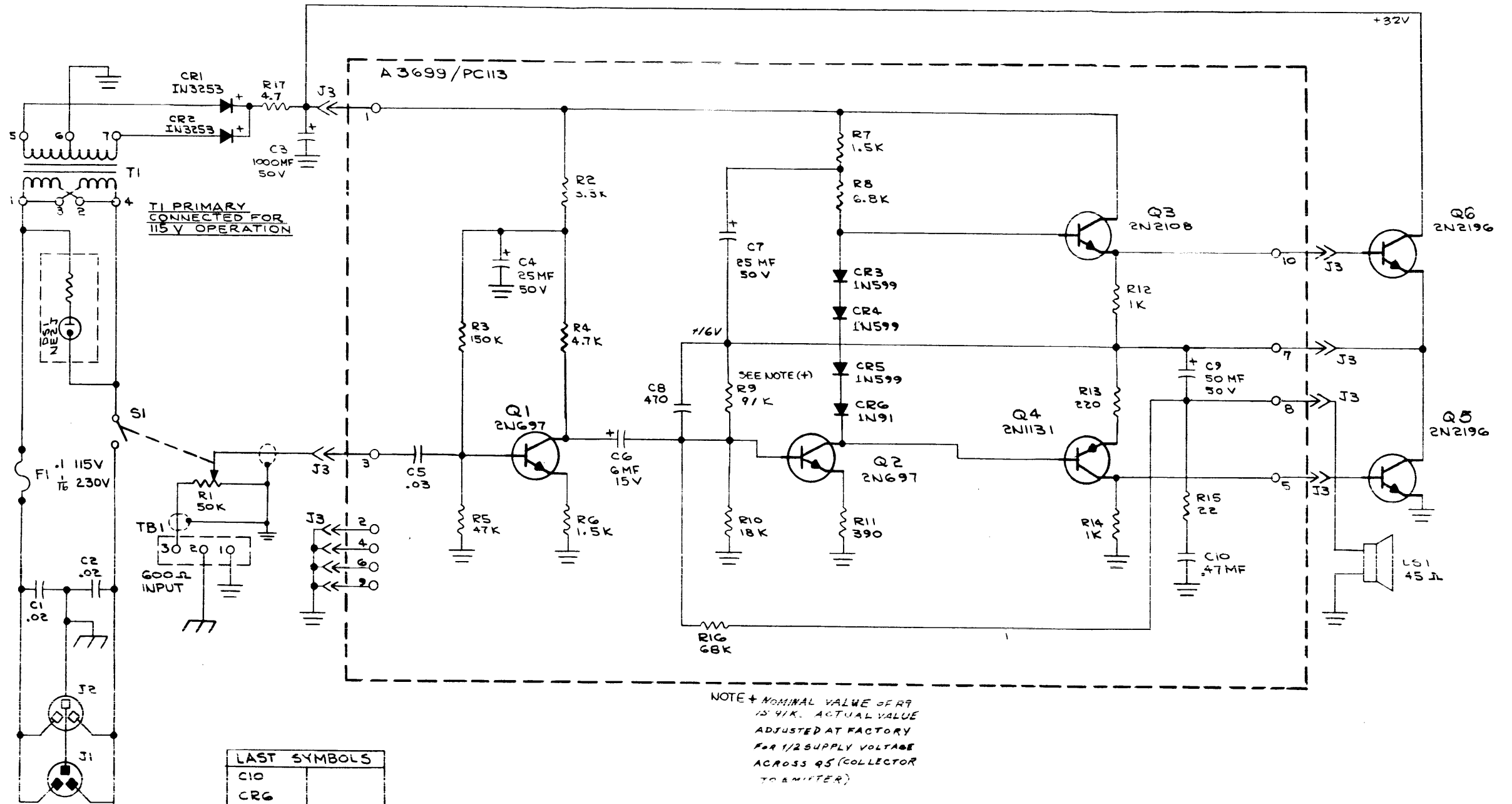
MODEL	AMPLIFIER	INTERCONNECT CABLE	POWER CABLE
BSP-1D	AR101	---	W103
BSP-2D	AR101 AR102	W101	W103
BSP-3D	AR101 AR102 AR103	W101 W102	W103

AUDIO AMPLIFIERS  
(SEE NOTE 1)

Figure 7-1. Schematic Diagram, BSP



T1 PRIMARY CONNECTION FOR 230V OPERATION



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

LAST SYMBOLS	
C10	
CR6	
DS1 *	
F1 *	
J3	
LS1 *	
Q6	
R17 *	
S1 *	
T1	
TB1	

\* SEE NOTE NO. 5

~ UNLESS OTHERWISE SPECIFIED ~

- 1 ~ ALL RESISTOR VALUES ARE OHMS, 1/2 WATT.
- 2 ~ ALL CAPACITOR VALUES ARE  $\mu$ f.
- 3 ~  $\text{⏏}$  DENOTES CHASSIS GROUND
- 4 ~  $\perp$  DENOTES COMMON CIRCUIT GROUND
- 5 ~ SYMBOLS LS1, F1, DS1, R1, S1, ARE NOT PART OF AMPL., AZ102, AND ARE SHOWN FOR REF ONLY.

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Figure 7-2. Schematic Diagram, Audio Amplifier Module, AZ102