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# **Technical Manual**

**for**

## **Bridging Speaker Panel**

*Model BSP-1, BSP-2 and BSP-3*

**PLEASE READ THIS FIRST**

Dear TMC Product User:

Thank you for purchasing the **TMC Series BSP Bridging Speaker Panel**. This series consists of three basic models that provide up to three, independent channels of audio monitoring on a single panel. Each speaker assembly can be equipped with an activity/standby indicator lamp and input monitor jack depending on the options selected. Each channel is provided with its own volume control.

The speaker panel is described in detail in the enclosed technical manual. This publication provides important information about using TMC equipment. Please read it.

If you need additional data or some specific technical information, please call our **Customer Service at (914) 698-4800** or return the business reply card located at the end of the manual. Our **tele-FAX (facsimile) number is 914-698-4805**. If you are missing any items, please contact TMC directly or through a local sales office.

Thank you for selecting the TMC Series BSP Bridging Speaker Panels.

**The Technical Materiel Corporation**  
*Product Marketing*

## Warranty

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The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment - except electron tubes, semi-conductor devices, fuses, lamps, batteries, and articles made of glass or other fragile or expendable materials - purchased hereunder to be free from defect in workmanship and materials 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 FOB 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, FOB factory, which may fail within the stated warranty period, provided:

- 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;
- The defect is not the result of damage incurred in shipment from or to the factory;
- 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; and
- 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.

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 and the TMC RETURN AUTHORIZATION number clearly marked on the package. Electron tube warranty claims should be made directly to the manufacturer of such tubes since tubes furnished by TMC bear only the manufacturer's warranty.

No warranties, expressed 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 purchaser's 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 such equipment, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

All inquiries should be directed to the following:

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## **RECORD OF REVISIONS**

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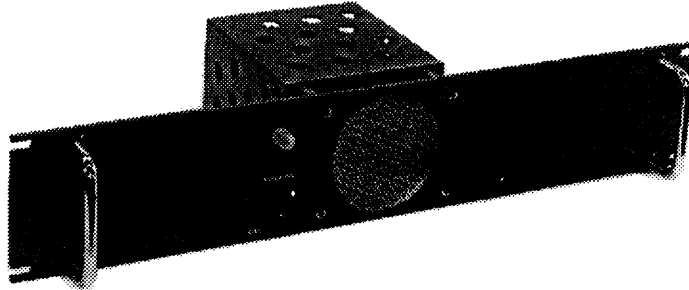
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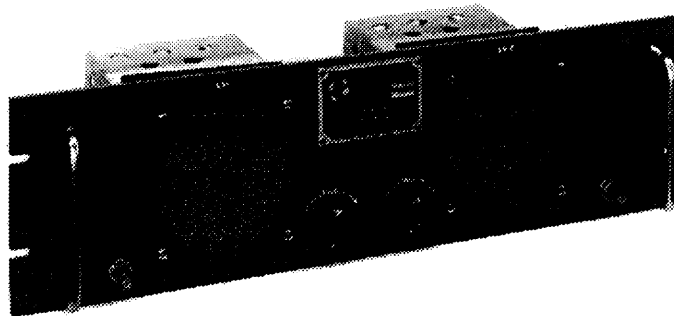
The designation "BSP" is used herein to refer interchangeably to the BSP-1, BSP-2 and BSP-3. Any variations to this convention are noted.

# BSP Series Bridging Speaker Panels

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*Model BSP-1*



*Model BSP-2*



*Model BSP-3*

## Section 1 - General Description

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### 1.1 Functional Description

#### 1.1.1 Overview

The BSP Series of Bridging Speaker Panels provide high-quality monitoring of voice circuits without disturbing line levels or balance. Up to three channels may be monitored on one panel, each channel with its own loudspeaker, volume control and optional channel activity lamp. This simple, but effective method of dynamically monitoring audio channels may be used with any make of communications receiver with an audio output impedance of 600 ohms balanced or up to 10K-ohms (unbalanced).

#### 1.1.2 Major Assemblies

The BSP units are totally solid state and modular. Each channel monitored is provided with its own power supply, loudspeaker, audio amplifier assembly, and volume control. If one channel is lost due to a malfunction in one assembly, the other channels are not affected and in fact can easily be switched in to bypass the defective module. An added advantage of this design is that crosstalk or interaction between audio lines, caused by operating the BSP when receiver circuits are monitored simultaneously, is held to an absolute minimum.

#### 1.1.3 Controls and Indicators

All operator controls and indicators are located on the front panel with audio connections made conveniently to terminal strips at the rear of each module. A single power cord is bridged to each module, thereby providing the required primary operating voltages.

#### 1.1.4 Input/Output Characteristics

Since each module is calibrated at the factory prior to shipment, the BSP unit can be installed immediately upon receipt at the site. No further adjustments are required. Optional audio jacks, mounted on the front panel, can be provided to mute each speaker and provide a measure of privacy to the operator.

#### 1.1.5 Remote Operation

Remote audio monitoring of discrete channels is easily handled by extending 600-ohm balanced lines from each module to the remote control site. Under these conditions, consideration should be given to balancing or equalizing the audio lines to prevent unwanted distortion in the received audio. This is particularly important if low speed data is being passed over the audio channels and monitored by the BSP.



## 1.2 Physical Description

### 1.2.1 Equipment Mounting

Several sub-assemblies are mounted to individual modules on a single 19-inch aluminum alloy panel. These sub-assemblies perform the functions of power conversion, amplification, impedance matching and line sensing. They are arranged to simplify any required troubleshooting or repair. The majority of the components used in the assemblies are discrete, although extensive use is made of integrated circuits in the design. All non-power assemblies in the BSP are mounted to plug-in printed circuits cards which can be accessed directly from the front panel for servicing.

Three modules can be configured for each panel - providing a compact, economical package suitable for both commercial and military service. Based on the number of channels monitored, the speakers are sized to the panel spacing. Available for "off-the-shelf" delivery, the BSP units have been assigned both US military nomenclature and Federal stock numbers.

### 1.2.2 Semiconductor Complement

A list of a semiconductors used in the BSP are listed in Table 1.1.

Table 1.1 - Semiconductor Complement

Emitter Follower	2N697
Amplifier	2N697
Driver	2N2108
Driver	2N1131
Power Amplifier	2N2186
Rectifier	1N3253
Clamp	1N599

### 1.3 Technical Specifications

**Input Impedance** 600 ohms balanced; **Optional:** 10,000 ohms, unbalanced  
**Speaker Impedance** 45 ohms  
**Rear Panel Connection** Standard terminal block  
**Power Gain** 36dB (1 Watt for -6dB input); Front panel volume control  
**Frequency Response** 200 to 7500Hz, +/-2dB  
**Hum Level** -40dBm at 1 Watt  
**Distortion** Less than 2% with 1 Watt at 400Hz  
**Input Power** 115/230VAC, 50/60Hz, One-phase  
**Heat Dissipation** Nominal 15 Watts  
**Cooling** Convection  
**Speaker Size** 4 inches (10.2cm)  
**Components** Solid state  
**Construction** Aluminum alloy with external stainless-steel hardware  
**Dimensions (Overall)** 5.25H x 19W x 6.5D inches  
**Weight** BSP-1: 5 lbs (2.3Kg); BSP-2: 7.5 lbs (3.4Kg); BSP-3: 10 lbs (4.6Kg)  
**Environmental** Operating 0° to +50°C; 95% R.H.

#### Ordering Information

<b>BSP-1</b>	<b>One-channel unit</b>
<b>BSP-2</b>	<b>Two-channel Unit</b>
<b>BSP-3</b>	<b>Three-channel Unit</b>

#### Options (each channel):

/A	Audio input jack, front-panel
/S	Activity/standby indicator
/U	10k-ohm unbalanced input

<b>Federal Stock Number (BSP-2)</b>	<b>5830-00-010-5268</b>
<b>US MIL Nomenclature (BSP-2)</b>	<b>LS-509/G</b>

## 1.4 BSP Product Group

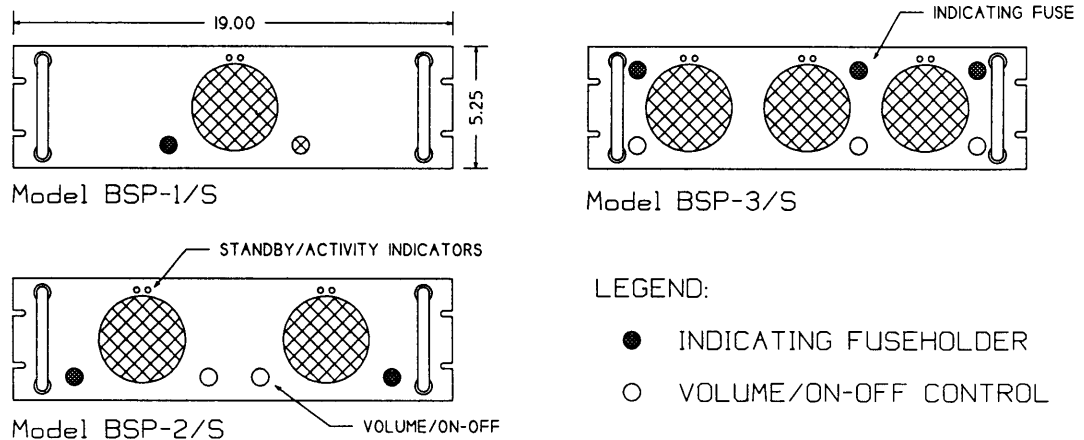
BSP-1            Bridging Speaker Panel, One-channel  
 BSP-2            Bridging Speaker Panel, Two-channel  
 BSP-3            Bridging Speaker Panel, Three-channel

BSP-7-1         Bridging Speaker Panel, One-channel  
 BSP-7-2         Bridging Speaker Panel, Two-channel  
 BSP-7-3         Bridging Speaker Panel, Three-channel  
 BSP-7-4         Bridging Speaker Panel, Four-channel

**Options (each channel):**

/A                Audio input jack, front-panel  
 /S                Standby/activity indicator  
 /U                10k-ohm unbalanced input

**When ordering, specify both model and option. Example: BSP-1/AS**



**Figure 1.1 - Outline Drawing: BSP-1, BSP-2 and BSP-3**

### 2.1 Initial Inspection

#### 2.1.1 General

Every BSP undergoes a thorough testing and calibration prior to shipment. Upon receipt of the unit, check the packing case and its contents for obvious damage. Unpack the equipment carefully to reduce the risk of damage and to avoid misplacing any parts shipped as loose items. See Table 2.1 for a list of the loose items.

#### 2.1.2 Damage By Carrier

With respect to equipment damage for which the carrier is liable, TMC will assist in describing methods of repair as well as furnishing replacement parts.

### 2.2 Electrical Installation

#### 2.2.1 Primary Power

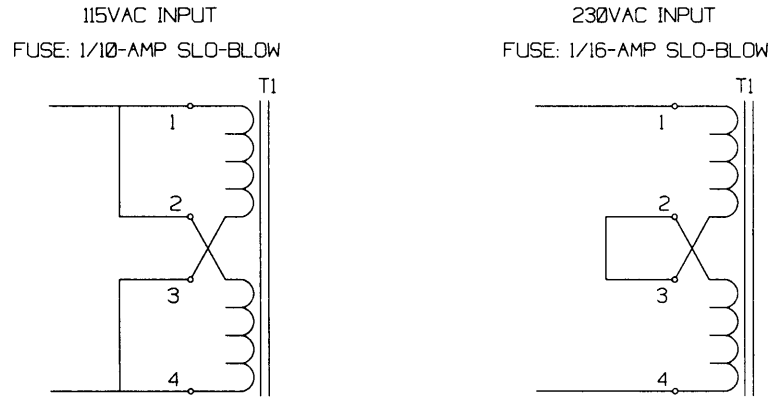
The BSP is wired at the factory for a 115VAC, 48 to 400Hz power source. Optionally, the BSP may be wired for 230VAC, which will be noted by a decal on the rear panel adjacent to the input power connector. Certain wiring changes are required to adapt a unit to 230-volt operation. In addition, a ratings change from 1/10 amperes to 1/16 amperes in the front-panel line fuses is required.

#### 2.2.2 External Connections

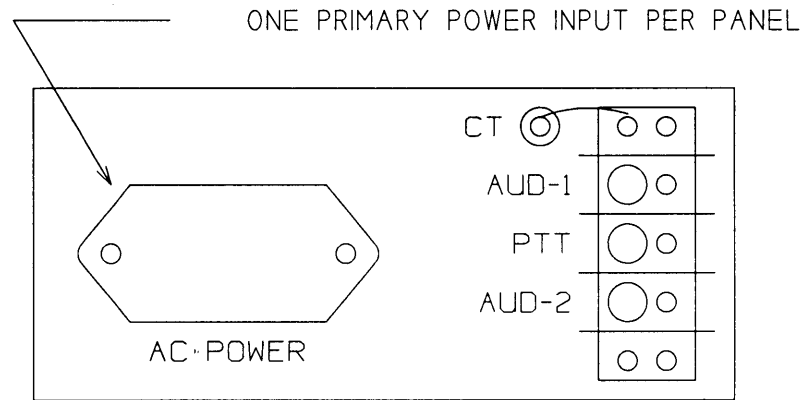
The following external connections must be made to the BSP after it has been installed in an equipment rack:

**Power** - Connect primary power to the unit by plugging the supplied power cable assembly into POWER INPUT connector J1 on the rear panel. Ensure that the plug lines up properly with the socket using the keyway as a guide. 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 for those BSP models with multiple speakers.

**Outputs** - Connect the outputs of the BSP to the associated receivers via the terminal board TB1 on the rear panel of each amplifier assembly. The audio input circuit is unbalanced (excepting on 600-ohm units) with terminal 3 above ground and terminal 2 provided for a shield ground.



**Figure 2.1 - Power Supply Changeover Connections**



**Figure 2.2 - Rear Panel Connections**

### 2.2.3 Clearance Requirements

The BSP equipment should be located in such a way that sufficient clearance is obtained at the rear of the unit for making all audio and power connections. The front panel controls should also be within easy reach of an operator. The solid state design of the BSP reduces heat problems, allowing "stacking" of BSP units, one above the other, in the same rack. To reduce the effects of prolonged heat in confined spaces, the equipment cabinet should be fitted for forced air cooling or the speaker panels should be separated vertically by sufficient space to allow dissipation of the heat into the operating area.

## 2.3 Performance Check

### 2.3.1 General

When the appropriate audio and power connections have been made to the BSP, turn the front-panel rotary switch to the ON position (right). The BSP is ready for immediate use. No further checks are required.

Table 2.1 - Loose Items Supplied

Power Cable Assembly	1 each
Technical Manual	1 each

## Section 3 - Operation

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### 3.1 General

#### 3.1.1 Controls

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.

#### 3.1.2 Procedures

After connecting the communication receivers and power supply, and turning on the INCR switch, no further operating procedures are required. The BSP is now fully operational without further adjustment.

Table 3.1 Controls and Indicators

Power/Audio ON/OFF switch	Controls primary power application and audio level
FUSE holder/indicator 1F1,1F2	Indicates failure of fuse by illumination of the fuseholder.

## Section 4 - Principles of Operation

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### 4.1 General

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

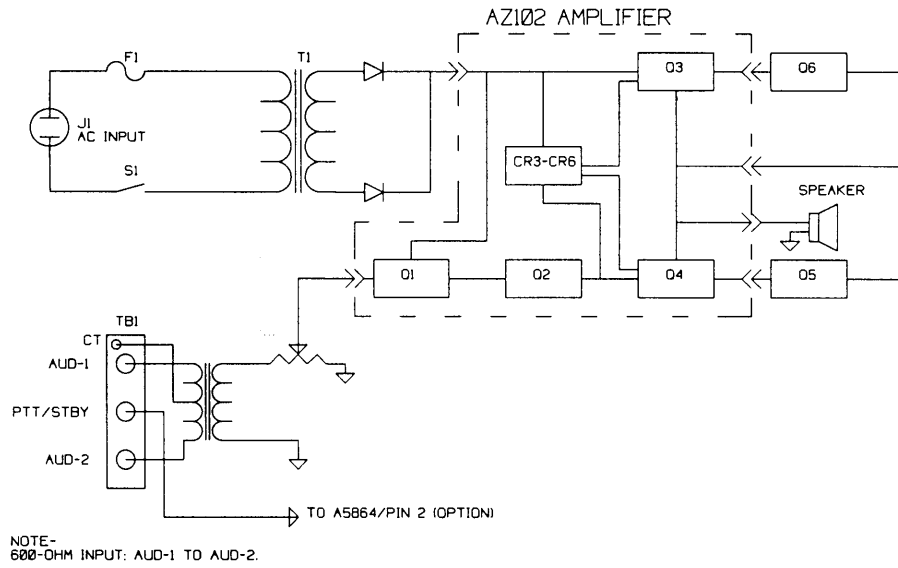
### 4.2 Circuit Description

The input line voltage is applied to a step-down transformer T1. The stepped-down secondary output voltage is rectified, filtered and then 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 current for power amplifiers Q5 and Q6. The output of the power amplifier stage (Q5 and Q6) is then applied to the speaker circuit.





**Figure 4.1 - BSP Network Block Diagram**

## Section 5 - Maintenance

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### 5.1 General

The amplifier subassembly is installed as a unit and should a malfunction occur, the entire subassembly can be replaced. On the first indication of trouble, check the line fuses, volume control and loudspeaker before replacing the amplifier subassembly. First check the volume control for an open or short circuit. Next, examine 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 Preventive Maintenance

#### 5.2.1 General Cleaning Methods

Preventive maintenance for the BSP consists of routine functions such as visual inspection and cleaning. Periodic cleaning is recommended as dust may build up on components, reducing the efficiency of the coupler unit and possibly causing circuit failure. To facilitate cleaning the unit, use a vacuum cleaner or a low-pressure filtered compressed-air supply.

#### 5.2.2 Visual Check and Adjustment

A simple visual check of the unit when it is opened up for servicing or cleaning with often reveal potential trouble spots and thereby reduce downtime due to component failure. Signs of trouble may be found in discoloration, warped printed circuit boards and damaged wiring or cables. Any deteriorating component should be replaced immediately. All hardware should be checked for tightness during preventive maintenance inspections.

### 5.3 Troubleshooting

The gain of the amplifier subassembly can be measured using the following test set-up. Refer to Figure 7.1.

- Connect an audio signal generator to terminals 1 and 2 on TB1. Connect a VTVM to pins 8 and 9 of J3. Turn the volume control (INCR) fully counterclockwise.
- Set output of the signal generator for a -6dBm at 1000Hz (1kHz). Adjust the INCR control for a gain of 36dB +/-3dB (1 watt) on the VTVM.
- Check the frequency response between 200Hz and 7000Hz. It should not drop more than 3dB.
- Set the output of the signal generator for a -6dBm output at 400Hz. Adjust the INCR control for a gain of 35dB +/-3dB on the VTVM.
- Connect a distortion meter to pins 8 and 9 of J3. The distortion should not exceed two percent (2%).

## **5.4 Repair**

### **5.4.1 General Method**

Repair work generally consists of replacing the defective component. The following cautions should be observed:

- Make sure the replacement component is an exact duplicate of the defective one. This is particularly important in the amplifier modules.
- Place any new component in the same location as the component it replaces. The dressing of any wire runs should not be altered.
- Observe standard practice when replacing semiconductor components by using a low-wattage soldering iron and appropriate heat-sink tools.
- Avoid damage to the printed circuit wiring when handling or repairing amplifier and regulator modules.

## Section 6 - Parts Lists

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<b>IMPORTANT NOTE</b>
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Reference designations are 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 and are normally indexed sequentially; omitted numbers are noted on the diagrams. Sockets associated with a particular plug-in device - such as transistor, integrated circuit, 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.

When ordering replacement parts, specify the TMC part number. The model number of the equipment is useful but not essential since TMC utilizes identical parts that are common to many different types of equipment.

## BSP Final Assembly Parts List (One Amplifier Module)

AZ102	Amplifier, Audio Frequency	1EA
BI120-3-0	Lamp, Incandescent	1EA
BS100	Solder, Soft	1X
CA1906	Cable, Line Cord	1EA
CU139-2B	Clamp	4EA
FH104-2	Fuseholder	1EA
FU102-.062	Fuse, Cartridge	1EA
FU102-.1	Fuse, Cartridge	1EA
HA102-2BN	Handle	2EA
JJ360	Jack, Panel, Audio	1EA
LD1172/MS3064-2	Lettering, Sub-Assembly	1EA
LS102	Loudspeaker	1EA
LWE06MRN	Lockwasher, External Tooth	4EA
LWS10MRN	Washer, Spring Tension	4EA
MP123-3FB	Knob	1EA
MS0395	Grille, Speaker	1EA
MS3064	Panel, Front	1EA
MS4169	Machined Assembly, Metal	2EA
NP103-76	Name Plate	1EA
NTH0632BN8	Nut, Hexagon, Double Chamfer	4EA
RC42GF241J	Resistor, Fixed, Composition	1EA
RV4NBYS503A	Resistor, Variable, Non-W/W	1EA
SCBP0632BN5	Screw, Machine	4EA
SCBP0632BN8	Screw, Machine	4EA
SCHH1032BN8	Screw, Machine	4EA
SFB0256SN3	Screw, Thread-Cutting	4EA
TM105-3AR	Terminal Board, Barrier	1EA

## Amplifier Module Parts List (A3699)

1N599	Diode, Silicon	3EA
1N91	Diode, Germanium	1EA
2N1131	Transistor, Silicon, PNP	1EA
2N2108	Transistor, Silicon, NPN	1EA
2N697	Transistor, Silicon, NPN	2EA
CC100-43	Capacitor, Fixed, Ceramic	1EA
CC112R474M	Capacitor, Fixed, Ceramic	1EA
CC131-36	Capacitor, Fixed, Ceramic	1EA
CE105-6-15	Capacitor, Electrolytic	1EA
CE105-50-50	Capacitor, Electrolytic	1EA
CE105-25-50	Capacitor, Electrolytic	2EA
CM111F471G5S	Capacitor, Fixed, Mica	1EA
PC113	Printed Circuit Board	1EA
PX829-1	Insulator, Transistor Pad	4EA
RC20GF683J	Resistor, Fixed, Composition	1EA
RC20GF682J	Resistor, Fixed, Composition	1EA
RC20GF473J	Resistor, Fixed, Composition	1EA
RC20GF472J	Resistor, Fixed, Composition	1EA
RC20GF391J	Resistor, Fixed, Composition	1EA
RC20GF332J	Resistor, Fixed, Composition	1EA
RC20GF221J	Resistor, Fixed, Composition	1EA
RC20GF220J	Resistor, Fixed, Composition	1EA
RC20GF183J	Resistor, Fixed, Composition	1EA
RC20GF154J	Resistor, Fixed, Composition	1EA
RC20GF152J	Resistor, Fixed, Composition	2EA
RC20GF124J	Resistor, Fixed, Composition	1EA
RC20GF102J	Resistor, Fixed, Composition	2EA
RC32GF222J	Resistor, Fixed, Composition	1EA

## Amplifier Module Parts List (A3815)

1N3253	Diode, Power, Silicon	2EA
CA1907	Cable Assembly	1EA
CC100-32	Capacitor, Fixed, Ceramic	3EA
CE116-8VN	Capacitor, Electrolytic	1EA
D44C8	Transistor	2EA
FW02HBN	Washer, Flat	4EA
IM257	Insulator, Transistor Pad	2EA
JJ319-10SFE	Connector, Receptacle, Elect	1EA
JJ370	Connector, Receptacle, Elect	1EA
LWE02MRN	Lockwasher, External Tooth	4EA
LWE04MRN	Lockwasher, External Tooth	12EA
MS154-1	Plate, Mounting	2EA
MS3919	Sub Assembly, Chassis	1EA
MS3921	Bracket	1EA
NTH0256BN6	Nut, Hexagon, Double Chamfer	4EA
NTH0440BN6	Nut, Hexagon, Double Chamfer	6EA
NTH0632BN8	Nut, Hexagon, Double Chamfer	16EA
PX337-3	Insulation, Strip	1EA
PX829-1	Insulator, Transistor Pad	2EA
RC20GF4R7J	Resistor, Fixed, Composition	1EA
SCBP0256BN6	Screw, Machine	4EA
SCBP0440BN3	Screw, Machine	6EA
TE0832AE2.125H6	Spacer, Threaded	4
TE102-2	Terminal, Turret	2EA
TE104-2	Terminal Lug, Locking	2EA
TE117-26	Terminal, Lug	2EA
TE135-30	Spacer	2EA
TE149-144	Terminal Lug, Solder	2EA
TF267-3	Transformer	3EA
TF459	Transformer	1EA
TM100-3	Terminal Board, Barrier	1EA
WA102-2	Washer, Fiber, Shoulder	4EA

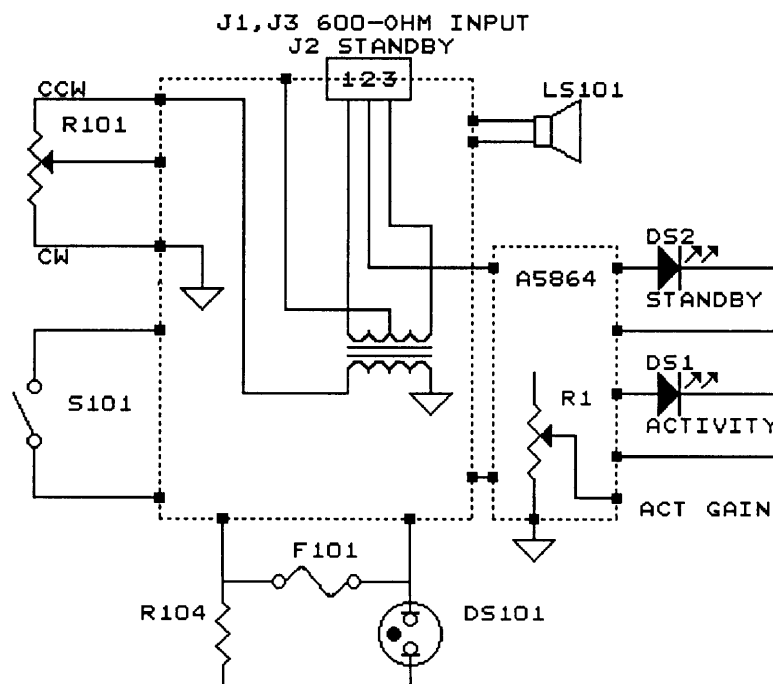
### Standby/Activity Indicator Parts List (A5864)

1N34A	Diode, Germanium	1EA
1N645	Semiconductor Device, Diode	1EA
2N1711	Transistor, Silicon	4EA
BI132	Lamp, Incandescent	2EA
CC131-44	Capacitor, Fixed, Ceramic	3EA
MC1741CP	Amplifier	1EA
PC873	Printed Circuit Board	1EA
RC07GF680J	Resistor, Fixed, Composition	1EA
RC07GF562J	Resistor, Fixed, Composition	1EA
RC07GF102J	Resistor, Fixed, Composition	4EA
RC07GF203J	Resistor, Fixed, Composition	1EA
RC07GF122J	Resistor, Fixed, Composition	1EA
RC07GF103J	Resistor, Fixed, Composition	2EA
RC07GF472J	Resistor, Fixed, Composition	1EA
RC32GF392J	Resistor, Fixed, Composition	2EA
RV124-1-102	Resistor, Variable, Non-W/W	1EA



## Section 7 - Schematic Diagrams

- Figure 7.1 Overall Module Interconnect Diagram
- Figure 7.2 Schematic Diagram, Standby/Activity Indicator
- Figure 7.3 Schematic Diagram, Amplifier Module



*Note: All modules are identical in BSP-1, BSP-2 and BSP-3.*

Figure 7.1 Overall Module Interconnect Diagram

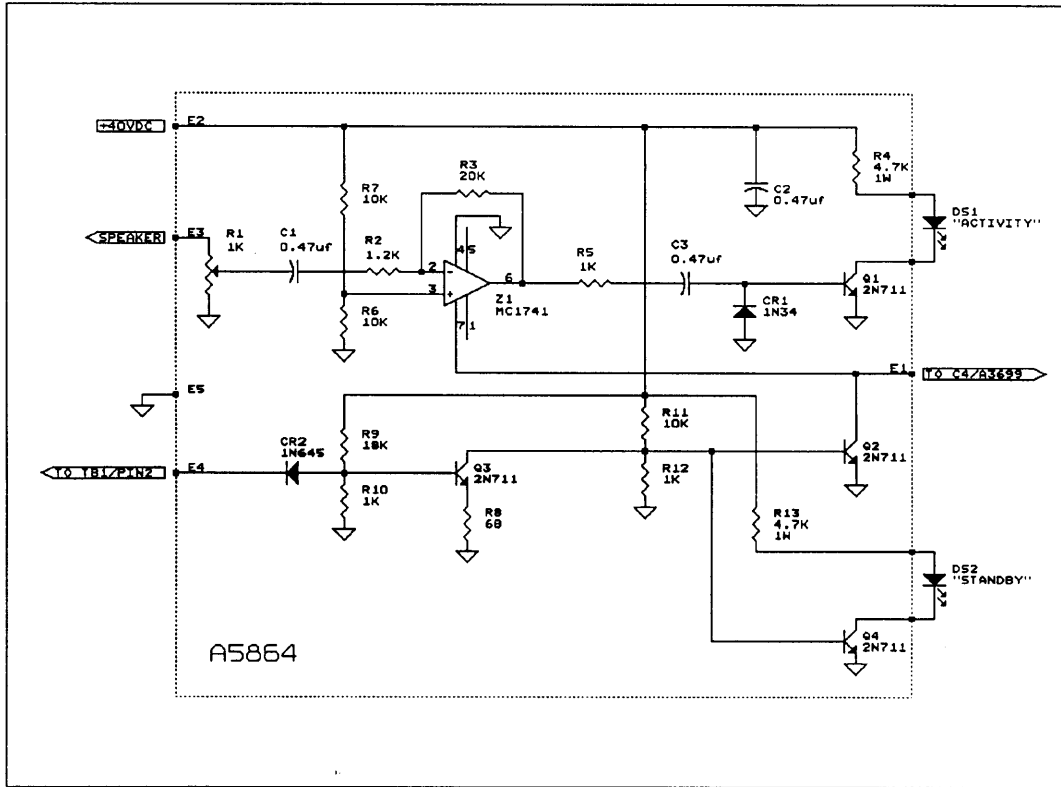


Figure 7.2 Schematic Diagram, Standby/Activity Indicator

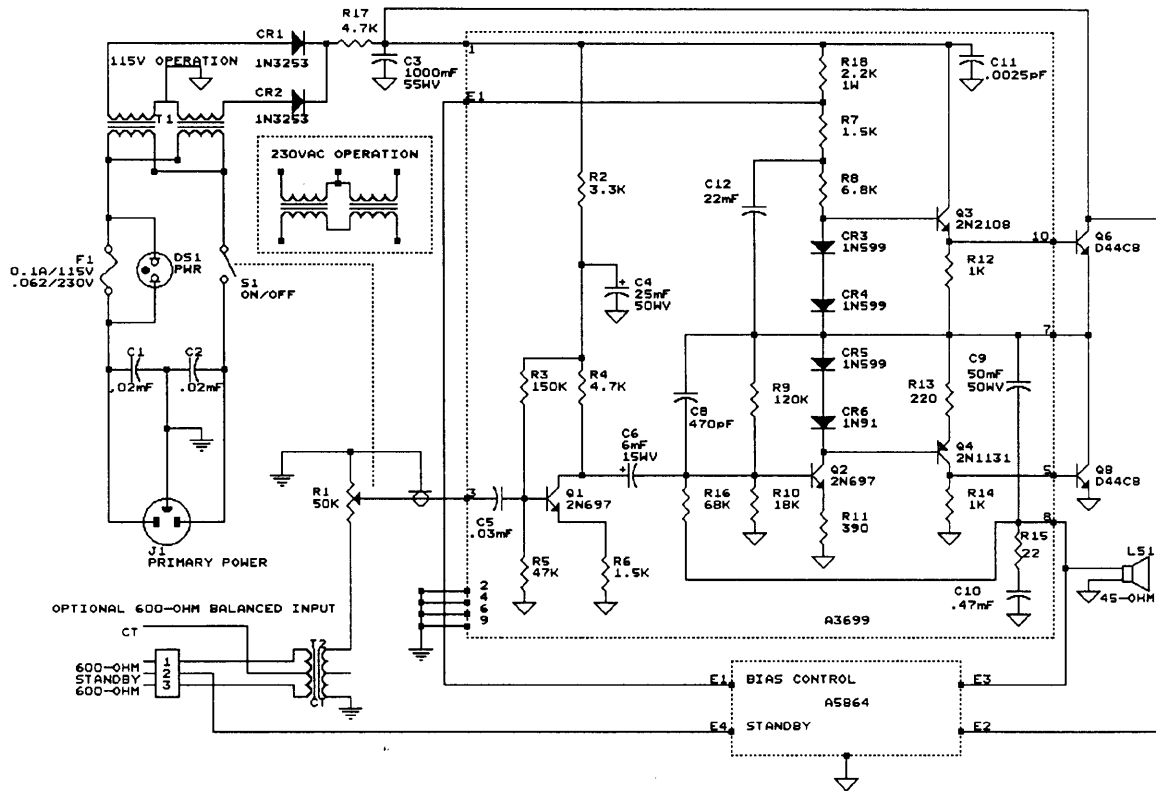
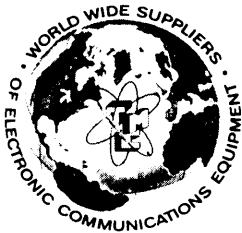
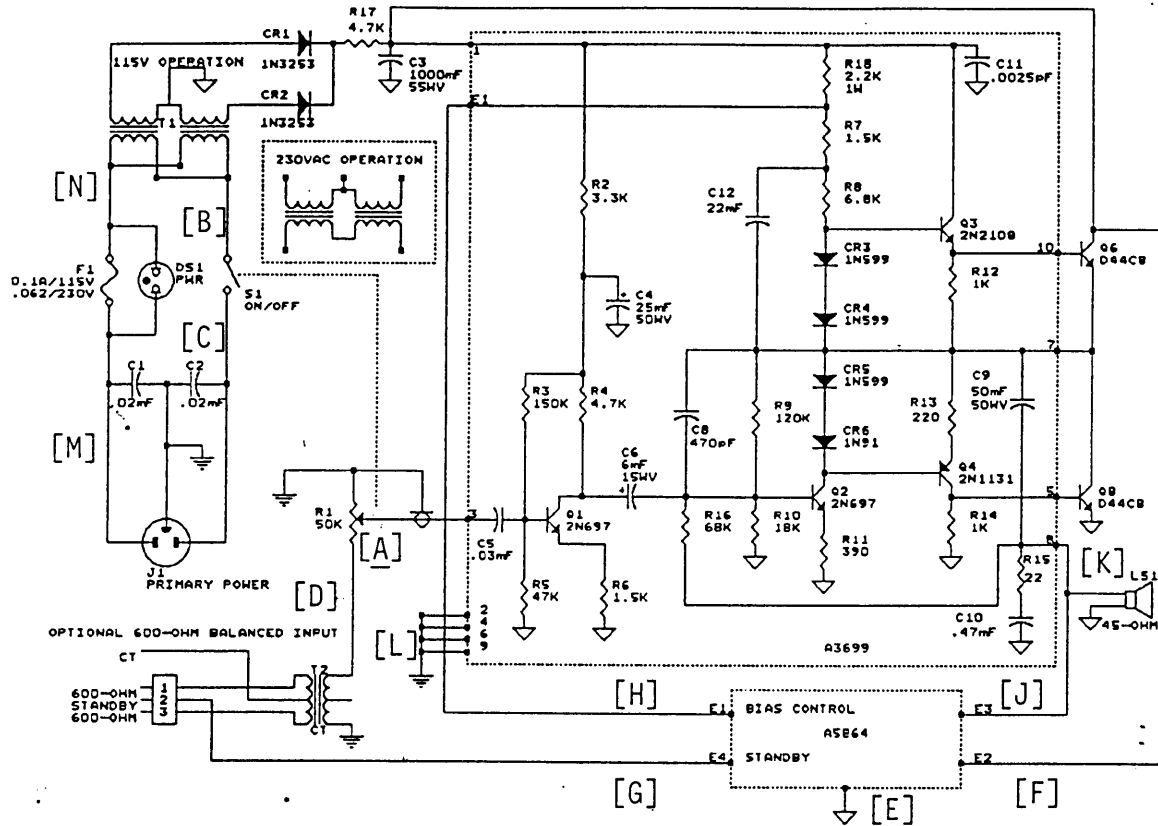


Figure 7.3 Schematic Diagram, Amplifier Module



# AZ102 SCHEMATIC



## LEGEND

Bundle 1	A	Orange	Term:3/A3699
	B	White	S1->T1
or	C	Black/White	S1->J1
	D	Blue/White	R1->T2     Shield R1->Ground
	D	Purple/White	R1->T2     Shield R1->Ground
Bundle 2	E	Black	A5864->Ground
	F	Red	E2/A5864->Term:1/A3699
	G	Gray	E4/A5864
	H	Blue	E1/A5864->Term:E1/A3699
	J	Green	E3/A5864->Term:8/A3699
Bundle 3	K	Green	Term:8/A3699->Speaker
	L	Black	Term:2:4:6:9/A3699->Ground
	M	Blue/White	F1->J1
	N	Purple	F1->T1