MusicParts.Com

Technical Document Distribution

Brand:	**Altec**
Model	**1606A**
Product:	**Mixer/Amplifier**
Description:	**Combo Owners & Service Manual**

Musicparts Document Number: 45821 TechTips: No Pages: 16 Dated: 1973

Hello,
Welcome to MusicParts.Com, Inc. your online resource for technical documents and service information. This PDF package may contain information, schematics, parts lists, images, engineering changes, previous versions, circuit descriptions, and many other unique features about the product you have chosen. This document was assembled from a variety of sources and is the result of our many years in the music repair business.

TECHTIPS: Unique to Musicparts documents are **TECHTIPS** located in critical areas on the schematics. They contain useful information about that area of the schematic such as common problems that we have found and recommended changes. Not all documents will have TechTips.

NOTE: Large original over-sized drawings will need to be taped together. We feel this is better than reducing them and losing fine details.

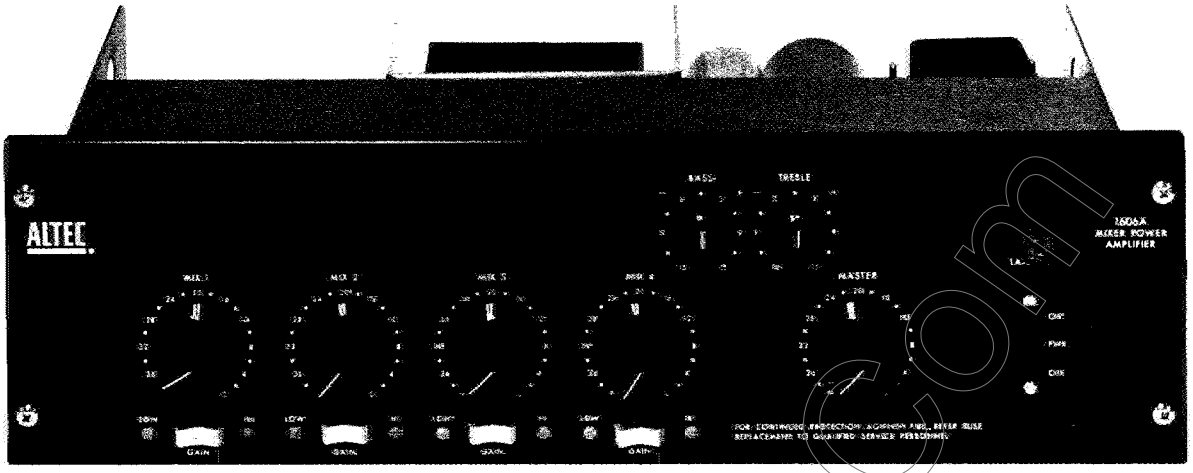
VIEWING: This document is utilizing PAGE-ON-DEMAND downloading. This will let you navigate to any page without waiting for the entire file to download.

PRINTING: For the best quality, we highly recommend that when the print dialog appears, please **make sure "SHRINK OVERSIZED PAGES " is checked**., otherwise you may cut off the edge of the page. Also please stay online while printing this document to make sure you get all the pages.

Visit us on the web at: http://www.musicparts.com/
Email us at: customerservice@musicparts.com

1606A Mixer/Power Amplifier

1606A



4-CHANNEL MIXER/POWER AMPLIFIER FOR:

The ALTEC 1606A Mixer/Power Amplifier is an all silicon solid-state power amplifier equipped to control and mix up to four independent input signals. Producing 40 watts of power, the 1606A has ideal flexibility for small sound reinforcement systems. Optional accessory modules are available for use with the 1606A to provide versatility for a wide choice of operating applications.

Features

Maximum Flexibility – Four Inputs and Power Amplifier Combined in One Package — The ALTEC 1606A Mixer/Power Amplifier is an all solid-state power amplifier equipped to control and mix up to four independent input signals. Producing 40 watts of power, the 1606A has ideal flexibility for small sound reinforcement systems in churches, schools, hotels, motels, conference rooms, night clubs, auditoriums, etc.

Any of the Four Inputs Can Be Used For:

Microphones
Turntables
Tape Machines
Tuners, etc.

— Octal sockets on the rear enable the user to select the type of plug-in accessory that matches his requirements; the 1588B for microphones, the 1579B for magnetic phono inputs, the 15095 for bridging high-impedance lines and the 15356 for matching 600-ohm lines. Any input can be converted to a new application by inserting the proper plug-in accessory.

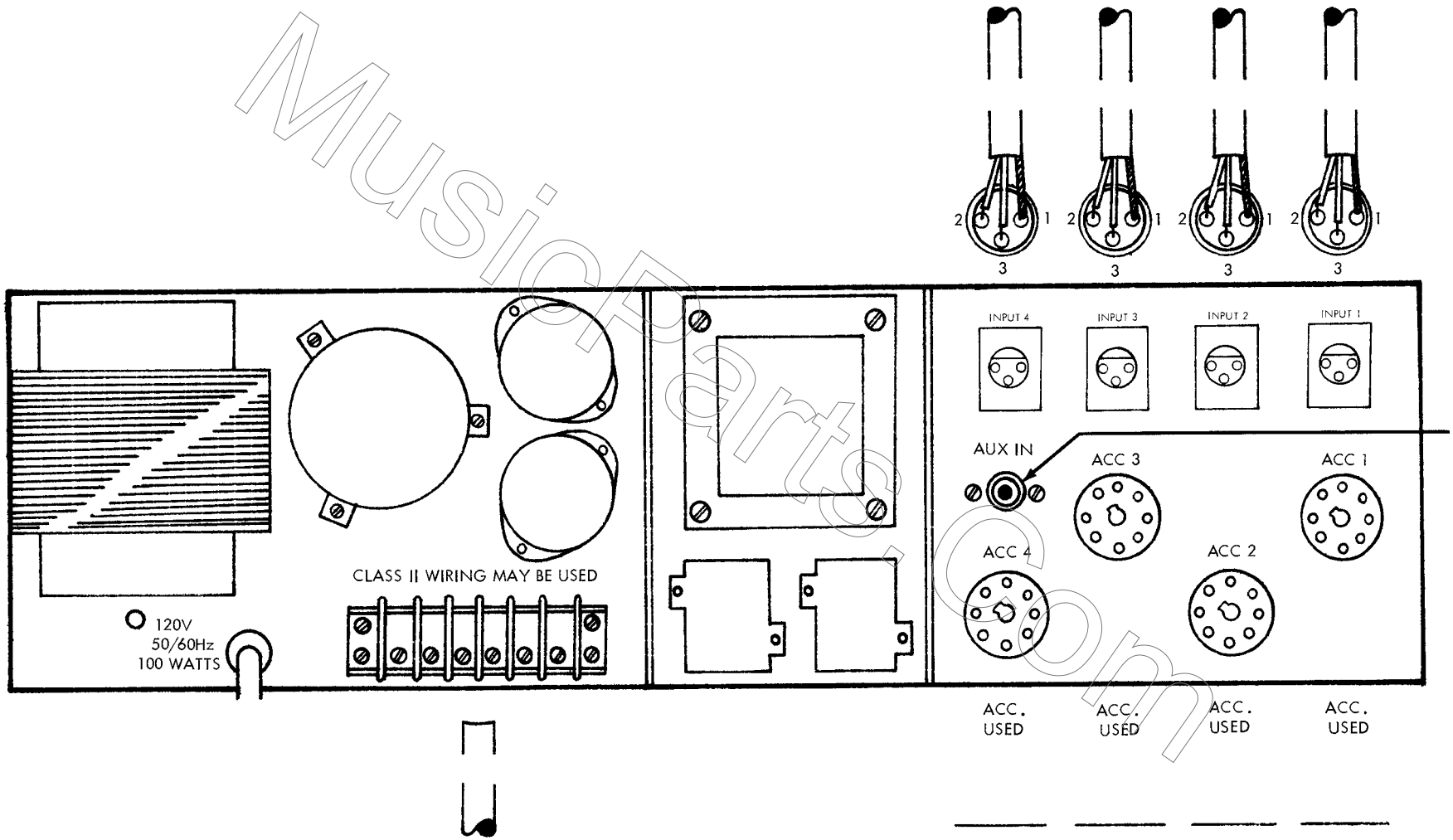
Versatile in Use – Easy to Operate — The ALTEC 1606A Mixer/Power Amplifier has transformer-isolated output terminals to match 4-ohm, 8-ohm or 16-ohm high-quality speaker systems, or speaker distribution systems may be connected to the 70-volt terminals.

All controls are conveniently located on the front panel and all inputs are quickly installed via plug-in XLR-type connectors. Using the accessory cover, which has a sloping front, gives the 1606A a truly professional and functional appearance.

ALTEC

1515 S. Manchester Ave., Anaheim, Calif. 92803

BLOCK DIAGRAM LOCATION___DRAWING NO._____
RACK LOCATION___DRAWING NO._____



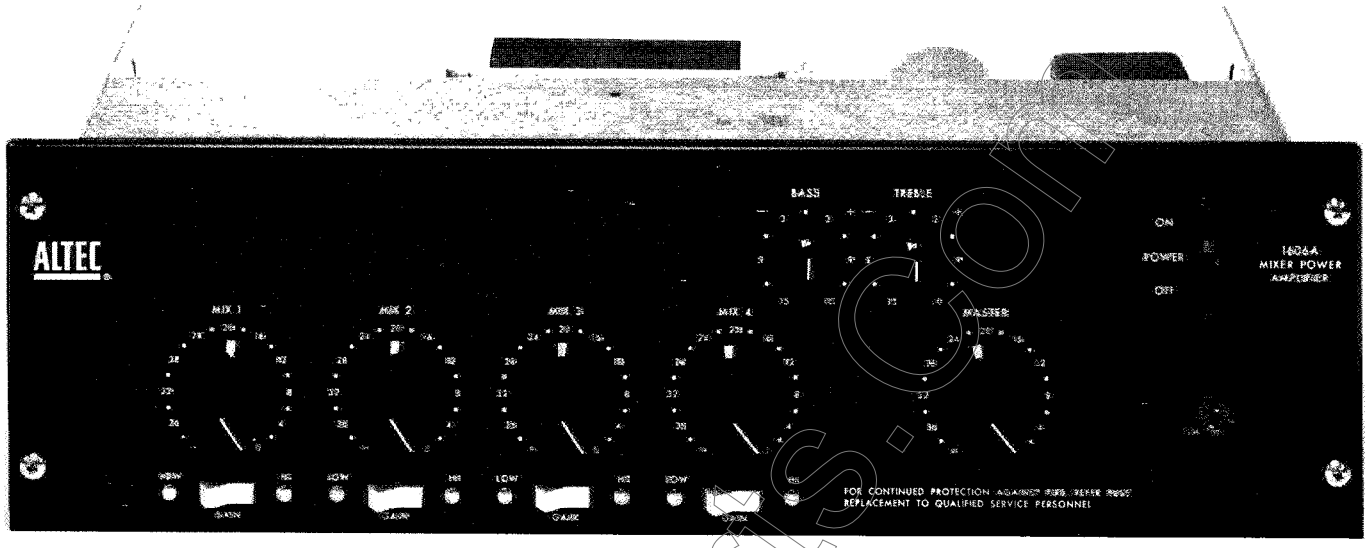
ALTEC®	BY	PROJECT	1606A MIXER/POWER AMPLIFIER	DRAWN / CHECK / APPROVED — DRAWING NO. — SHEET OF

Litho in USA AL-4015

ALTEC

1606A MIXER/POWER AMPLIFIER

OPERATING INSTRUCTIONS



NOTICE

Read this manual before operating the ALTEC 1606A Mixer/Power Amplifier.

FEATURES

- Exclusive "Active Dissipation Sensing Circuit" Protects Transistors
- Microphone Preamplifier Gain is Switchable from Front Panel
- Four Mixing Inputs with Gain Controls
- Hinged Front Panel for Easy Maintenance
- Choice of Four Optional Accessory Modules for Each Input
- Transformer-Isolated Outputs
- Outputs for 25V and 70.7V Distribution Systems
- Underwriters Laboratories Listed

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

ALTEC
SOUND PRODUCTS DIVISION
1515 S. Manchester Ave., Anaheim, Calif. 92803

42-02-042613-04
Litho in USA CP-1073-2.5K

DATA CONTENTS

Item	Page
SPECIFICATIONS	1
DESCRIPTIONS	2
ACCESSORIES	2
INSTALLATION	3
MECHANICAL	3
Rack Mounting	3
Shelf Mounting	3
VENTILATION	3
ELECTRICAL	3
120V, 50/60 Hz Power Connection	3
Input Connections	3
Output Connections	3
Auxiliary Connection	4
ACCESSORIES	4
Plug-In Input Accessories	4
ALTEC 42526 Cover Assembly	4
OPERATION	5
CONTROLS	5
Normal Gain Settings	5
SERVICE	6
ACCESS	6
COVER REMOVAL	6
FUSE REPLACEMENT	6
PCB REPLACEMENT	6
Replacing Power Driver PCB	6
Replacing Preamplifier PCB	6
RECOMMENDED SERVICE TECHNIQUES	6
Transistor Orientation	6
Replacing Power Transistors	7
Testing Transistors	7
Replacing PCB Components	7
Repairing Fractured or Damaged PCB Conductor	7
PARTS LIST	8
MAIN CHASSIS	8
PREAMPLIFIER PCB ASSEMBLY	8
POWER DRIVER PCB ASSEMBLY	9

Figure		Page
1.	Frequency/Power Performance Characteristics	2
2.	Tone Control Response Characteristics	2
3.	Available Accessories	2
4.	Front View 1606A with Hinged Front Panel Opened	3
5.	Rear View 1606A	4
6.	Input Cable Wiring	4
7.	Installation of 42526 Cover Assembly	5
8.	Front View 1606A with Hinged Front Panel Closed	5
9.	Typical Solid-State Component Configurations	7
10.	Schematic, 1606A Mixer/Power Amplifier	10-11
11.	Electronic Parts Locations, Preamplifier PCB Assembly	12
12.	Schematic, Preamplifier PCB Assembly	12
13.	Electronic Parts Locations, Power Driver PCB Assembly	13
14.	Schematic, Power Driver PCB Assembly	13

Table		Page
I.	Speaker Outputs	4
II.	Control Functions	5

SPECIFICATIONS

Type:	4-channel solid-state mixer/power amplifier with provisions for plug-in input accessory modules
Gain (Each Channel):	115 dB with 1588B Microphone Preamplifier
	65 dB with 15095 Bridging Transformer bridging 600-ohm line
Input Sensitivity (Each Channel):	1 mV rms for 40W output at 1 kHz with 1579B Equalized Preamplifier (magnetic phono pickup)
	87 mV rms for 40W output with 15095 Bridging Transformer bridging 600-ohm line
Input Sensitivity (Auxiliary Input):	0.16 mV rms for 40W output
Input Clipping Level:	-22 dBm with 1588B Microphone Preamplifier in high-gain mode
	-8 dBm with 1588B Microphone Preamplifier in low-gain mode
	Greater than 20 volts with 15095 Bridging Transformer bridging 600-ohm line
Power Output:	40W at less than 1.5% THD from 45 to 12,000 Hz
Frequency Response:	±1 dB from 20 to 20,000 Hz
Source Impedance:	150/250 ohms nominal with 1588B Microphone Preamplifier (balanced input), usable up to 20,000 ohms
	Up to 47,000 ohms with 1579B Equalized Preamplifier (magnetic phono pickup)
	600 to 15,000 ohms with 15095 Bridging Transformer (balanced bridging input)
	150 or 600 ohms with 15356 Line Matching Transformer (balanced matching input)
Load Impedance:	4, 8, 16 or 125 ohms (transformer-isolated output)
Load Voltage:	12.7V, 18.0V, 25.3V or 70.7V
Output Impedance:	Less than 15% of nominal load impedance
Noise Level:	-124 dBm equivalent input noise (using microphone with 1588B Microphone Preamplifier)
	Output noise at least 80 dB below full output with MASTER gain control closed

Controls:	4 MIX gain controls, continuously variable
	1 MASTER gain control, continuously variable
	4 LOW-HI GAIN switches
	1 BASS tone control, continuously variable
	1 TREBLE tone control, continuously variable
	1 POWER ON-OFF switch
Connections —	
Input:	4 XLR3-31 receptacles
Auxiliary Input:	1 phono jack
Output:	6-terminal barrier-type terminal board (GND, COM, 4Ω, 8Ω, 16Ω and 70V)
Accessory-Mounting Sockets:	4 octal sockets for plug-in accessory modules
Power Requirements:	120V, 50/60 Hz — 18W at zero signal 85W at 13.3W output 130W at 40W output
Operating Temperature Range:	Up to 50° C (122° F)
Dimensions:	5-1/4" H x 19" W x 7" D
Weight:	19 pounds
Color:	ALTEC Green
Accessories:	ALTEC 1579B Equalized Preamplifier (magnetic phono pickup)
	ALTEC 1588B Microphone Preamplifier (balanced microphone input)
	ALTEC 15095 Bridging Transformer (high-level balanced-line bridging input)
	ALTEC 15356 Line Matching Transformer (high-level balanced-line matched input)
	ALTEC 42526 Cover Assembly
	ALTEC 14731A Dial Marker Kit

NOTE

Accessories MUST BE ORDERED SEPARATELY. One 1579B, 1588B, 15095 or 15356 must be ordered for each input channel used.

DESCRIPTION

The ALTEC 1606A Mixer/Power Amplifier controls and mixes up to four independent input signals and delivers up to 40 watts of output power. Gain is 115 dB with the plug-in 1588B Microphone Preamplifier. Each channel is provided with a gain switch to reduce gain by 13.5 dB, allowing use of high-output microphones without introducing distortion. Optional plug-in accessories allow each of the four input channels to be used for microphone, magnetic phono pickup or high-level line sources. An auxiliary input accommodates a tuner or tape recorder, permitting an additional signal to be added to the output. Frequency response and power characteristics are shown in Figure 1. Tone control response is shown in Figure 2.

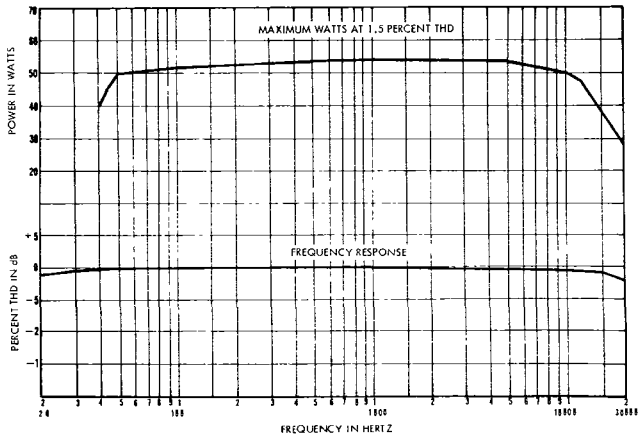


Figure 1. Frequency/Power Performance Characteristics

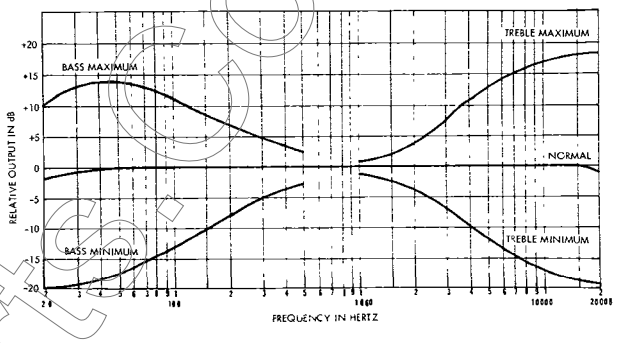


Figure 2. Tone Control Response Characteristics

ACCESSORIES

One plug-in input accessory is required for each channel used. These include the 1579B Equalized Preamplifier, 1588B Microphone Preamplifier, 15095 Bridging Transformer and the 15356 Line Matching Transformer (see Figure 3). Input accessories are selected to meet application requirements.

The 42526 Cover Assembly encloses the 1606A for shelf use. It tilts the 1606A for easy access to front panel controls. The sides and top extend beyond the front panel to prevent accidental changes of control settings. The cover provides easier handling for portability and is sturdy enough to accommodate light equipment placed on top. Four polyethylene feet prevent marring of surfaces. Its ALTEC Green finish matches the front panel of the 1606A.

Figure 3. Available Accessories

INSTALLATION

MECHANICAL

The 1606A may be mounted in a standard 19-inch equipment rack or it may be shelf-mounted when supplied with an ALTEC 42526 Cover. 5-1/4 inches of vertical space is required for mounting the 1606A in an equipment rack.

Rack Mounting

1. Remove four screws securing front panel; then open and lower panel (see Figure 4).
2. Install 1606A in equipment rack with appropriate four screws supplied with unit.
3. Close front panel and secure with four screws previously removed.

Shelf Mounting

The 1606A may be shelf mounted after installing the 42526 Cover Assembly.

VENTILATION

The 1606A generates minimal heat during normal use. Although the amount of heat is relatively low, the amplifier must be ventilated to prevent an excessive temperature rise. Because transistors are heat sensitive, the 1606A should not be placed adjacent to heat generating equipment or in areas where ambient temperature exceeds 50° C (122° F).

If the 1606A is mounted in an equipment rack or cabinet with other heat-producing equipment mounted above and/or below (two or more 1606As or one 1606A with real time analyzer, oscilloscope, etc.), space must be provided between the units or the 1606A may become too warm. The 1-3/4" perforated panel (ALTEC Part No. 10399) is recommended for this purpose.

When several amplifiers or other heat-producing units are mounted in a single rack or cabinet, acceptable air temperature may be in doubt. To determine temperature conditions, operate the system until temperatures stabilize, then measure air temperature with a bulb-type thermometer held at the bottom of the uppermost amplifier. Do not let the thermometer bulb touch metal because the metal probably will be hotter than the ambient air. If air temperature exceeds 50° C (or if it will on a hot day), the equipment should be spaced farther apart or a blower should be installed to ventilate the cabinet.

CAUTION

Do not block the cover ventilation holes when placing other equipment on the 42526 Cover Accessory. When shelf-mounting the 1606A, allow at least 1-3/4" between the unit and any wall behind it to assure air circulation past the output transistors.

ELECTRICAL

120 Volt, 50/60 Hz Power Connection

The 1606A is provided with a 3-wire power cord which may be plugged into any standard 120V, 3-terminal receptacle.

Input Connections

Inputs to the mixer channels are connected on the chassis at connectors INPUT 1 through INPUT 4 (see Figures 5 and 10) with cables terminating in XLR3-12 type plugs. Appropriate internal wiring of the plugs is shown in Figure 6. Input for any channel may be microphone, magnetic phono or line. The corresponding plug-in input accessory must be used for each channel (ACC1 through ACC4).

Output Connections

Output transformer taps provide connections for 4-ohm, 8-ohm and 16-ohm speakers, plus 70.7-volt and 25-volt speaker dis-

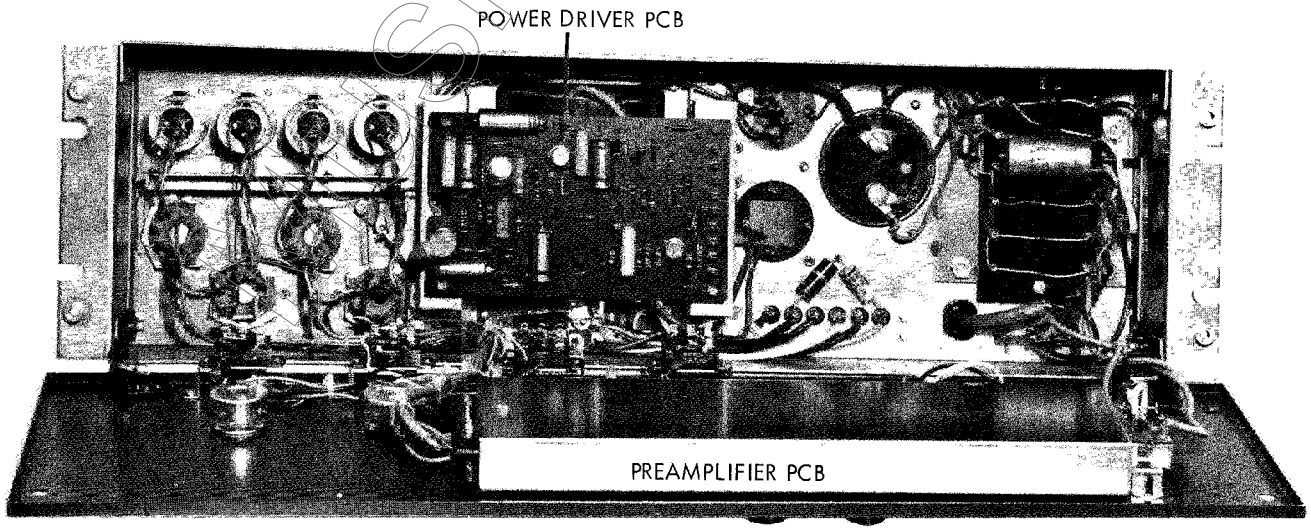


Figure 4. Front View 1606A with Hinged Front Panel Opened

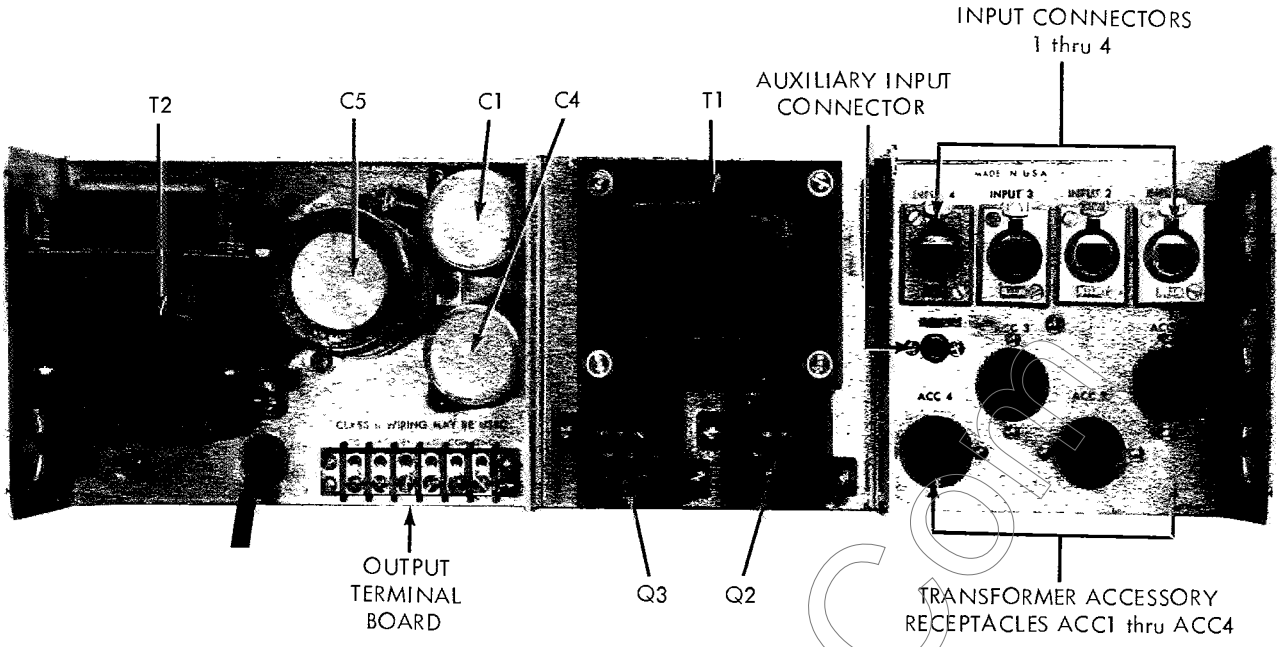


Figure 5. Rear View 1606A

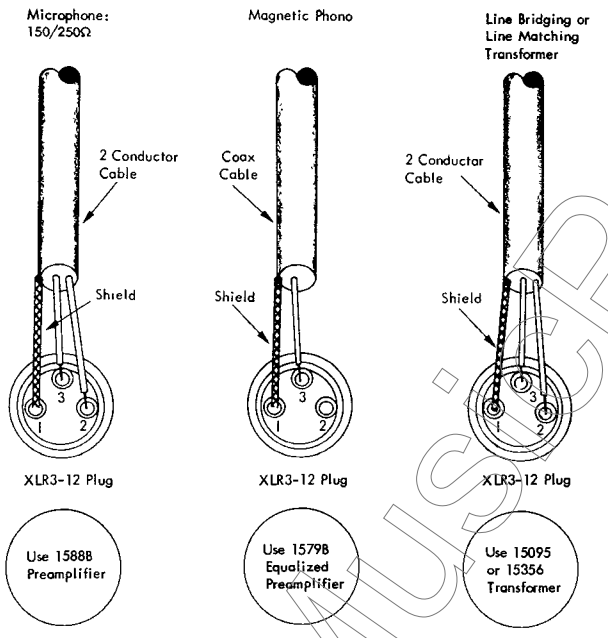


Figure 6. Input Cable Plug Wiring

tribution outlets (see Figure 5). Class II wiring may be used. Connect to the terminal of desired impedance and terminal 5 (common). Terminal functions and designations are listed in Table I. If stray electrostatic radiation causes interference, strap terminal 5 (common) to terminal 6 (ground).

Auxiliary Connection

The AUX IN jack (J9) (see Figures 5 and 10) may be used to connect an additional, externally adjustable signal to the 1606A. Any tuner or tape recorder with an adjustable gain may be used. Connect with a coaxial cable terminated with a phono plug.

Table I. Speaker Outputs

Terminal	Function
70V	70.7V (125 ohms) speaker distribution system
16Ω	16-ohm speaker system or 25V speaker distribution system
8Ω	8-ohm speaker system
4Ω	4-ohm speaker system
COM	Common
GND	Ground

CAUTION

When using stranded wire, be sure no frayed wire strands short circuit one terminal to another.

ACCESSORIES

Plug-In Input Accessory Modules

The ALTEC plug-in input accessory modules are plugged into sockets ACC1 through ACC4 (J5 through J8) on the chassis (see Figures 5 and 10). Module selection is determined by channel application. Use care when installing the modules to prevent damage.

ALTEC 42526 Cover Assembly

1. Attach four polyethylene feet with 8-32 screws supplied (see Figure 7).
2. Set cover on near edge with inside facing outward.
3. Slide 1606A into cover on top of lower section of inside cover-mounting brackets.
4. Remove four screws securing front panel; open and lower panel.

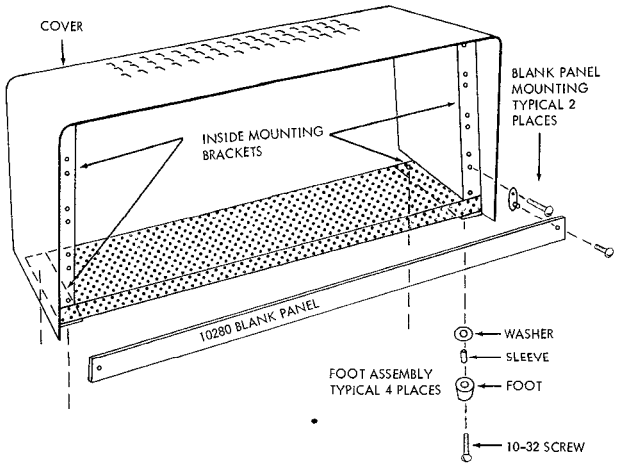


Figure 7. Installation of 42526 Cover Assembly

5. Fasten 1606A to inside cover-mounting brackets with four 10-32 screws supplied.

6. Install 1-3/4" blank panel to cover open space at top section of inside cover-mounting brackets; secure with 10-32 screws supplied.

7. Adjust position of 1606A within cover assembly and tighten four 10-32 screws.

8. Close and secure front panel with four screws previously removed, then place covered 1606A on its feet.

OPERATION

CONTROLS

All operating controls are on the front panel (see Figure 8). Control functions are described in Table II.

Normal Gain Settings

For average input signals, the MASTER gain control should be set to approximately 14 dB. This allows maximum flexibility in setting individual mixer gain controls (MIX 1, MIX 2, MIX 3 and MIX 4) to the desired operating level for respective input channels. If one input is unusually low, it may be necessary to increase the MASTER gain control setting and operate the other inputs at a proportionately lower gain setting. A recommended procedure is to divide the losses equally between the MASTER and MIX gain controls.

Table II. Control Functions

Name	Function/Description
POWER ON-OFF Switch (S5)	Applies line power. Two-position switch for on-off modes. Pilot light in switch illuminates when power is on.
MIX 1 - 4 Controls (R5 - R8)	Continuously-variable potentiometers, graduated from 0 dB to ∞. Each provides attenuation for corresponding input channel. Rotate clockwise (cw) to increase gain.
LOW-HI GAIN Switches (S1 - S4)	For use with 1588B Microphone Preamplifier accessory. Reduces gain on corresponding input channel at LOW, to allow use of high-output microphones without introducing distortion. Place switch to HI for other applications. Turn associated MIX control counterclockwise to ∞ before switching to avoid system 'pops'.
MASTER Control (R10)	Continuously-variable potentiometer graduated from 0 dB to ∞. Provides simultaneous attenuation for all input channels. Rotate cw to increase gain.
BASS Control (R24)	Continuously-variable potentiometer. Provides boost or attenuation in bass response. Normal or flat response is obtained at zero setting. Rotate cw to boost response.
TREBLE Control (R23)	Continuously-variable potentiometer. Provides boost or attenuation in treble response. Normal or flat response is obtained at zero setting. Rotate cw to boost response.

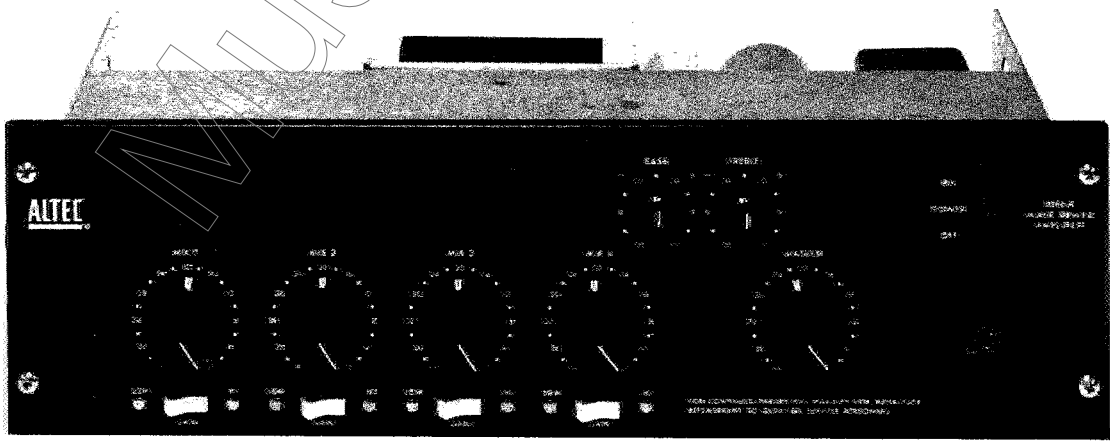


Figure 8. 1606A Controls

SERVICE

If a malfunction occurs, service should be performed by an ALTEC Qualified Service Representative. For factory service, ship the 1606A prepaid to Customer Service, ALTEC Lansing, 1515 South Manchester Avenue, Anaheim, California 92803. For additional information or technical assistance, call (714) 774-2900, or TWX 910-591-1142.

ACCESS

Remove the four screws securing the front panel, then open and lower the hinged front panel to gain access to the chassis interior.

COVER REMOVAL

If the ALTEC 42526 Cover accessory is installed, remove by reversing the steps of the cover installation procedure.

FUSE REPLACEMENT

The fuse is mounted on the front panel (see Figure 8). If replacement is required, determine and correct any cause of failure before replacing fuse. Install an identical fuse (see parts list) by unscrewing fuse holder, replacing fuse and resecuring fuse holder.

PCB REPLACEMENT

A Power Driver printed circuit board (PCB) and a Preamplifier PCB are located within the chassis (see Figure 4). To restore operation if a PCB fails, replace the faulty PCB with a new or repaired PCB, using the following applicable procedure.

> **CAUTION**
>
> When replacing either PCB, do not warp, bend or twist the board or conductor may fracture.

Replacing Power Driver PCB

1. Remove four screws securing front panel, then open and lower panel.
2. Carefully remove cable connector from jack on PCB.
3. Carefully remove PCB from standoffs, loosening evenly at each corner.
4. Carefully press new or repaired PCB into place on standoffs. Press corners in place evenly. Be careful not to warp, bend or twist the board.
5. Carefully press cable connector, previously removed, onto jack on PCB.
6. Close front panel and secure with four screws previously removed.

Replacing Preamplifier PCB

1. Loosen set screws and remove knobs from BASS and TREBLE tone controls and from MASTER gain control, then remove nut and washer from sleeves of these controls.
2. Remove four screws securing front panel, then open and lower panel.
3. Carefully lift MASTER gain control from mounting hole in front panel. Keep any spacing washer(s) on sleeve of control.
4. Remove two screws securing POWER ON-OFF switch to front panel, then remove switch.
5. Remove screw securing shield to front panel, then remove shield to expose PCB.
6. Remove spacer over PCB mounting hole, then carefully lift PCB free and turn over to gain access to wire connectors. Be careful not to warp, bend or twist the board.
7. Carefully remove all wires connected to PCB, tagging each wire as removed.
8. Carefully attach all wires removed from failed PCB to new or repaired PCB in accordance with tagging (see Step 7).
9. Place PCB in proper position over standoff with tone control sleeves projecting through appropriate mounting holes in front panel. Be careful not to warp, bend or twist the board.
10. Position spacer removed in Step 6 over PCB mounting hole.
11. Position shield over PCB with mounting flange against front panel. Position wires of MASTER gain control to pass through notch in shield, then secure shield to front panel with screw previously removed.
12. Verify that any spacing washer(s) used is on sleeve of MASTER gain control, then insert control in mounting hole and secure with lockwasher and nut previously removed.
13. Install lockwashers and nuts, previously removed, on sleeves of BASS and TREBLE tone controls.
14. Install POWER ON-OFF switch and secure with two screws previously removed.
15. Close front panel and secure with four screws previously removed.
16. Install previously removed control knobs on appropriate control shafts and tighten set screws. Be sure each set screw is seated on flat surface of control shaft.

RECOMMENDED SERVICE TECHNIQUES

If systematic troubleshooting shows need for parts replacement, observe the following precautions.

Transistor Orientation

Solid-state components are packaged in various case sizes and types with various lead orientations (see Figure 9). Before removing a solid-state component from tie points or from a PCB, sketch the lead orientation with respect to the tie points or PCB. Form the leads of the new component to conform with the leads of the part being replaced to aid in making proper connections.

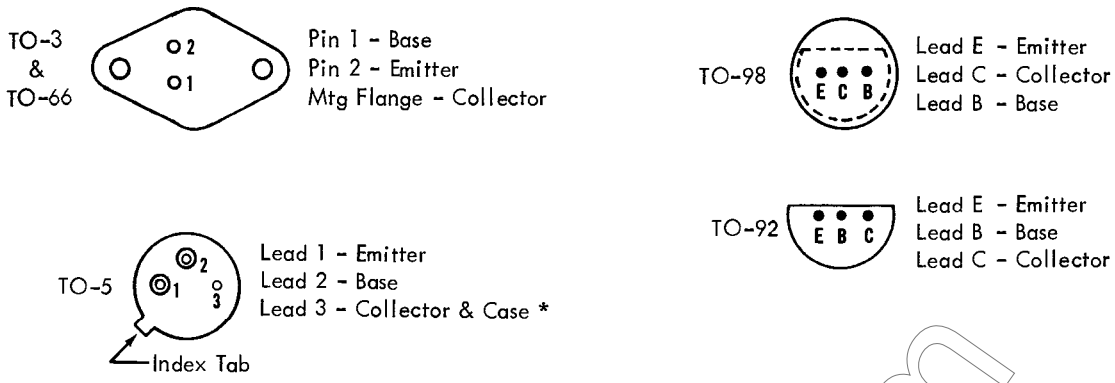


Figure 9. Typical Solid-State Component Configurations

Before removing small transistors, note position of index tab with respect to the PCB or socket. Cut the leads of the new transistor to the required length and insert them into the PCB or socket properly indexed.

Replacing Power Transistors

Be sure the following conditions exist when replacing power transistors.

1. Mica insulator is not damaged.
2. No grit or metal particles are between transistor and heat sink.
3. Both sides of mica insulator are covered with silicone grease or fluid.
4. Mounting screws are tight.

Testing Transistors

Transistors should be checked with a transistor tester. If a tester is not available, use the following procedure for testing transistors with an ohmmeter.

1. Remove suspected transistor from circuit (see 'Replacing PCB Components').
2. Connect ohmmeter leads to base and emitter. Read on lowest ohms scale. Reverse leads and read again. Normal readings should be at least 10 times greater in one direction than in the other.
3. Connect ohmmeter leads to base and collector. Ohmmeter readings should be similar to those obtained in Step 2.
4. If Steps 2 and 3 show normal function, connect ohmmeter leads to collector and emitter. Read on lowest ohms scale. Reverse leads and read again. If reading is low and virtually unchanged when ohmmeter leads are reversed, the transistor has a short circuit between collector and emitter.

Replacing PCB Components

The main chassis schematic is shown in Figure 10. Component locations on the PCBs are shown in Figures 11 and 13. PCB schematics are shown in Figures 12 and 14. Before removing PCB components for testing or replacement, read and heed the following instructions.

1. Solid-state components and PCBs may be damaged by excessive heat. Use a small soldering iron with a 1/8-inch diameter chisel tip and use small-diameter 60/40 rosin-cored solder.
2. Remove components by placing soldering iron on component lead on conductor side of PCB and pull out lead. Avoid overheating the conductor.

> CAUTION
> The conductor on the PCB is a metal surface plated with solder and laminated to the board. Too much pressure or overheating may lift the conductor from the board.

3. If component is faulty or damaged, clip leads close to component and then unsolder leads from board. Withdraw leads from component side.
4. Clear solder from circuit board holes before inserting leads of new component. Heat solder remaining in hole, remove iron and quickly insert a pointed nonmetallic object, such as a toothpick, from conductor side.
5. Shape new component leads and clip to proper length. Lead shape should provide stress relief for component. Insert leads in holes, observing same polarity or orientation of removed component. Apply heat and solder on conductor side.

Repairing Fractured or Damaged PCB Conductor

If a conductor is fractured, damaged or lifted from the circuit board, a recommended method of repair is to solder a section of good conducting wire along the damaged area and then seal with epoxy.

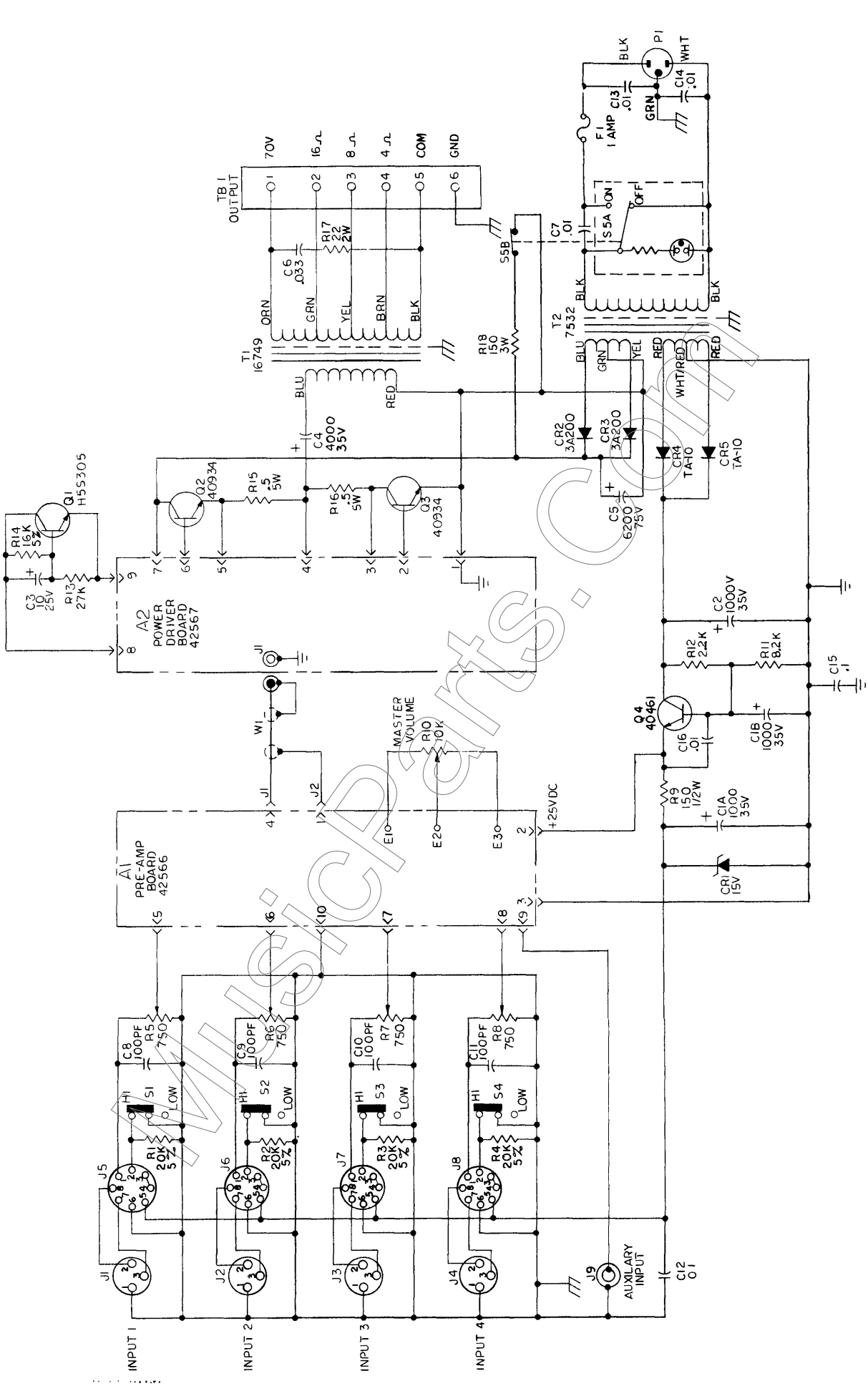


Figure 10. Schematic (3D233-6), 1606A Mixer/Power Amplifier

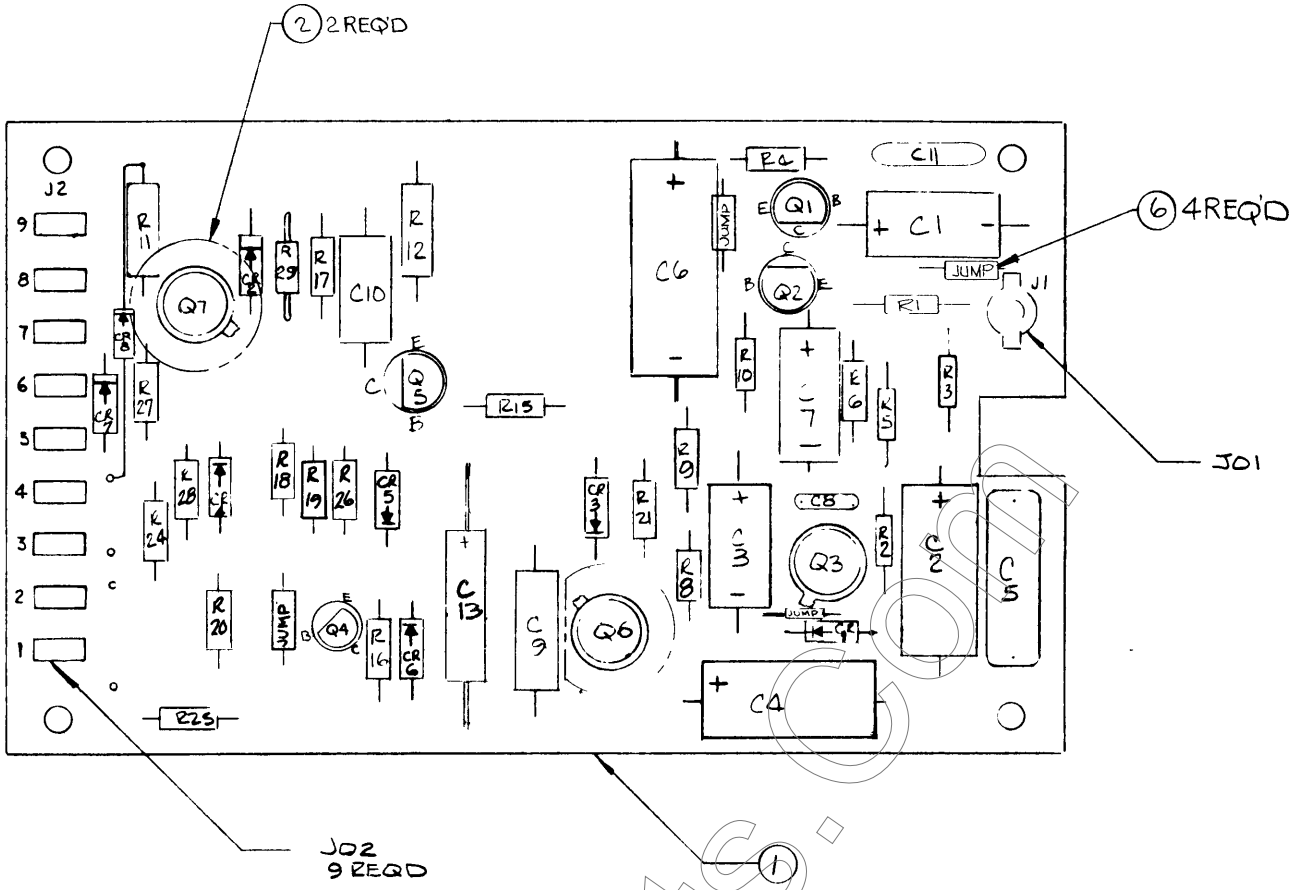


Figure 11. Electronic Part Locations (2C880-5), Power Driver PCB Assembly

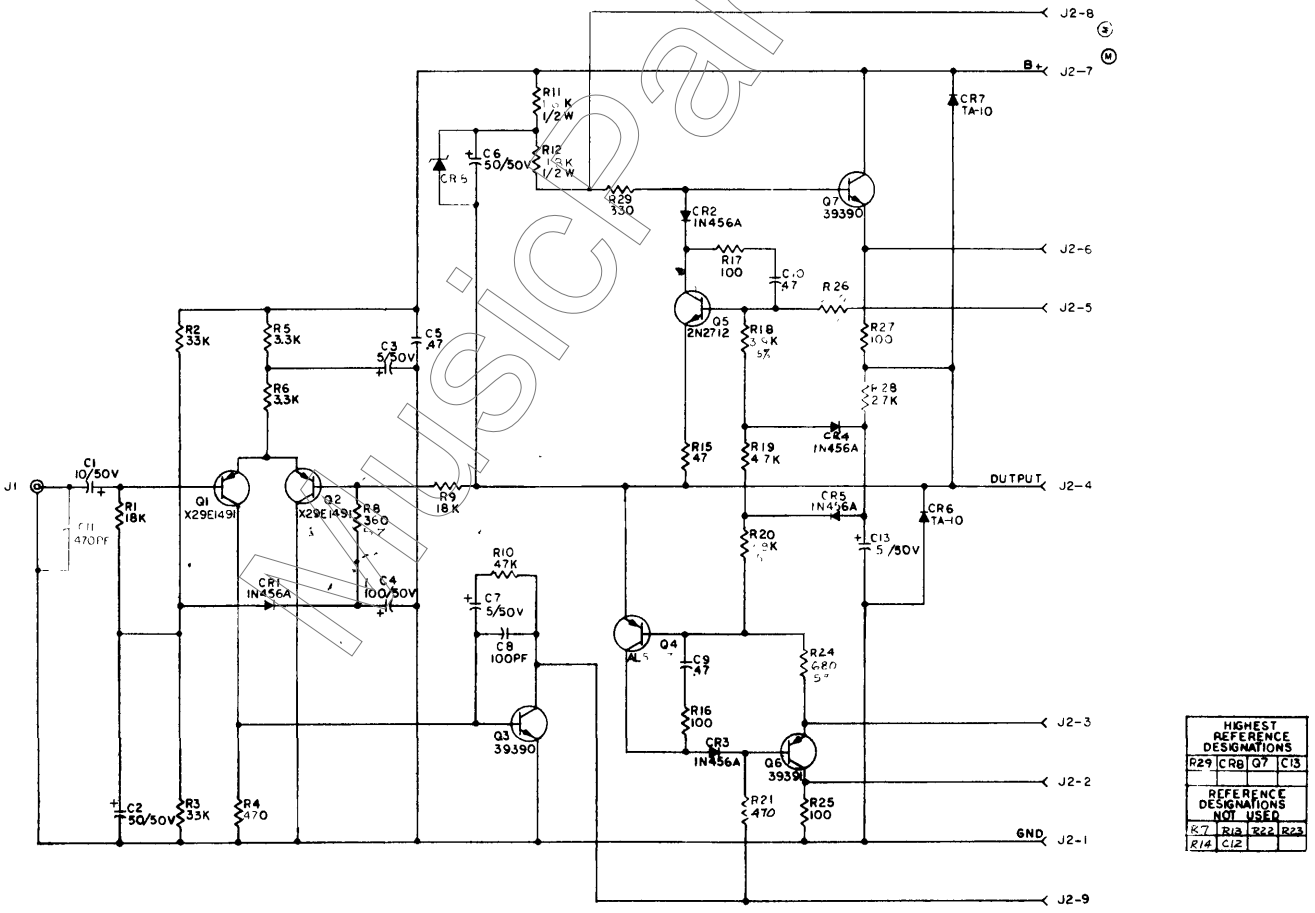


Figure 12. Schematic (2D881-6), Power Driver PCB Assembly

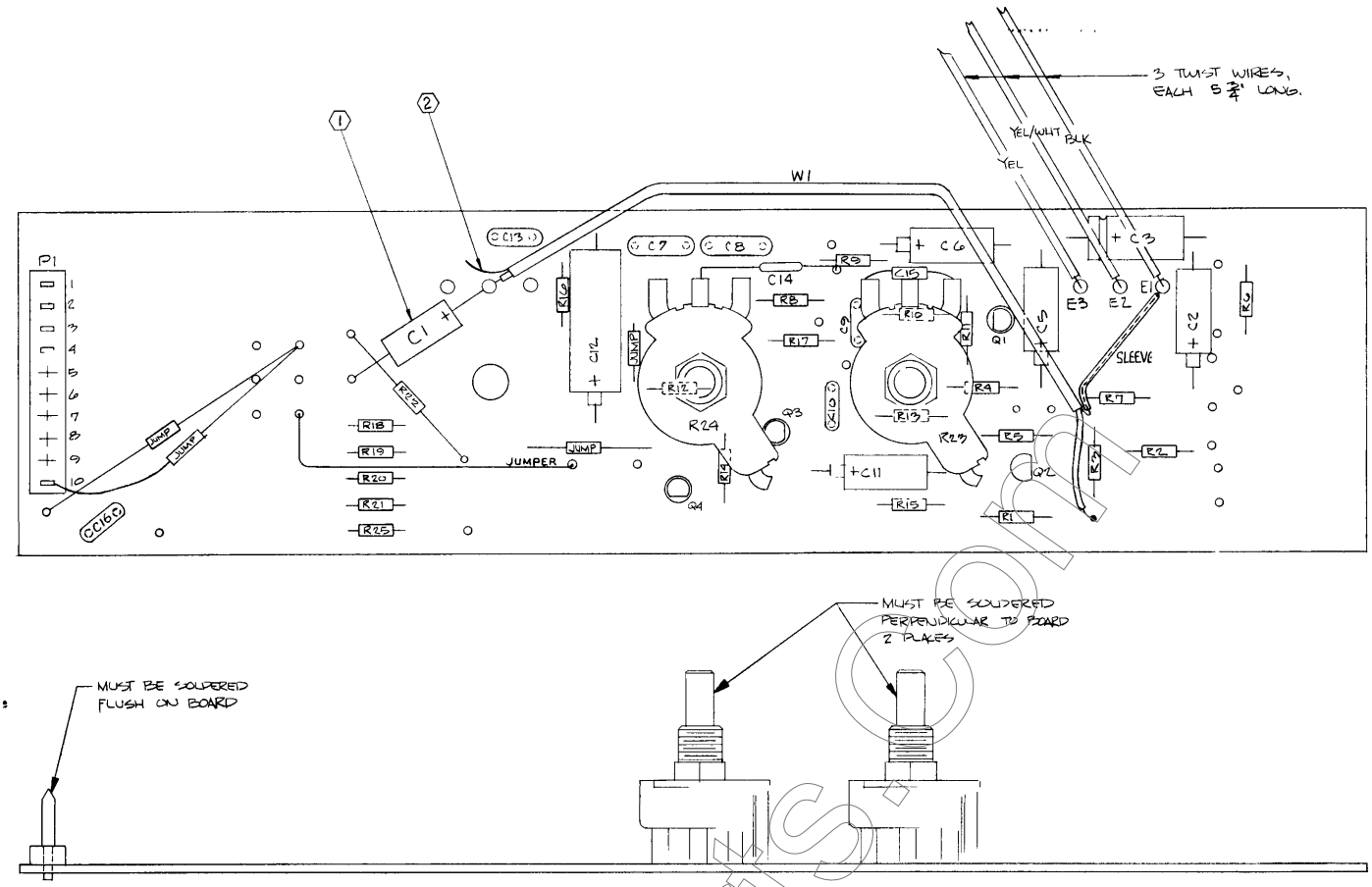


Figure 13. Electronic Part Locations (2D912-8), Preamplifier PCB Assembly

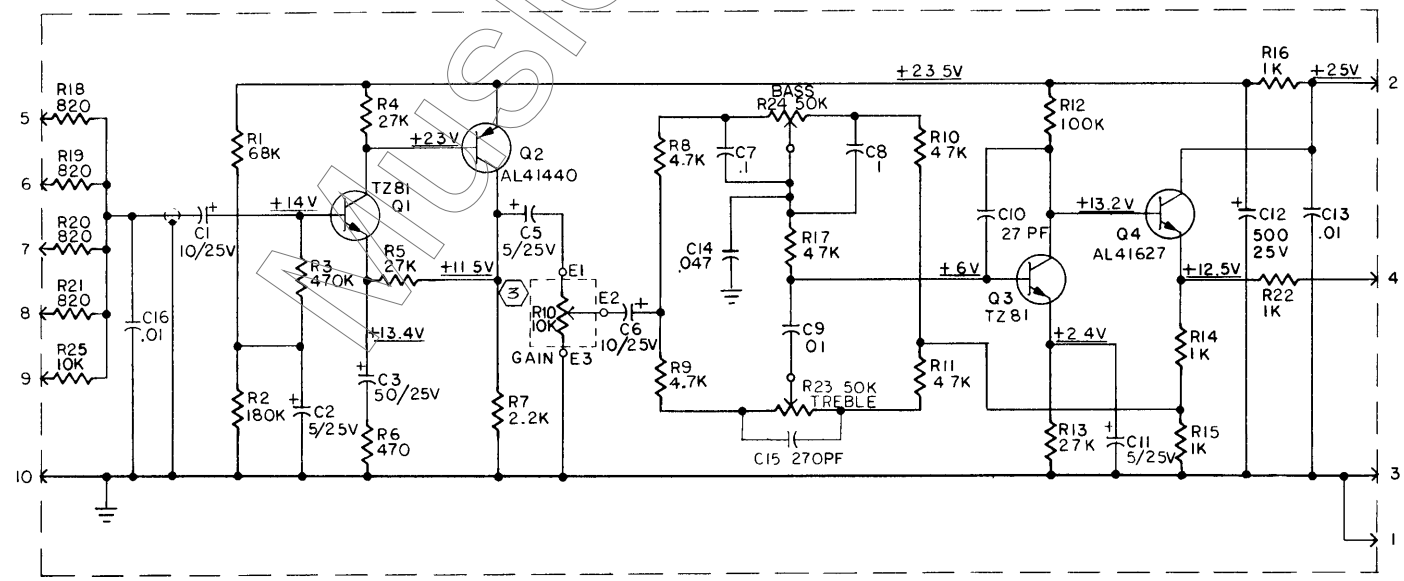


Figure 14. Schematic (2C911-5), Preamplifier PCB

PARTS LIST

MAIN CHASSIS

Reference Designator	Ordering Number	Name and Description
A1	27-01-042566-01	PCB assembly, preamplifier
A2	27-01-042567-01	PCB assembly, power driver
C1A, 1B	15-01-107431-01	Cap., 1000-10000 µF, 35V
C2	15-01-114219-01	Cap., 1000 µF, 35V
C3	15-01-107452-01	Cap., 10 µF, 50V
C4	15-01-107430-01	Cap., 4000 µF, 35V
C5	15-01-107511-01	Cap., 6200 µF, 75V
C6	15-06-100093-01	Cap., 0.033 µF ±10%, 100V
C7,13,14	15-02-100089-01	Cap., 0.01 µF ±20% 1400V
C8,9,10,11	15-02-107454-01	Cap., 100 pF ±10%, 100V
C12,15	15-02-100110-01	Cap., 0.1 µF, 100V
C16	15-02-100307-01	Cap., 0.01 µF ±20%, 100V
CR1	48-01-108576-01	Diode, Zener, 15V±5%
CR2,3	48-02-107467-01	Diode, 1N5402, 200V, 3A
CR4,5	48-01-042787-01	Diode, 1N4004, 1A, 400V
F1	51-04-100465-01	Fuse, 2A, 3AG, 250V
J1,2,3,4	21-02-113172-01	Receptacle, 3-terminal
J5,6,7,8	21-02-100973-01	Socket, octal
J9	21-01-100508-01	Jack, phono
P1	60-06-012636-02	Cord, 18GA, 3-conductor, 6 ft w/plug
Q1	48-03-112928-01	Transistor, 2N5305W
Q2,3	48-03-040934-03	Transistor, 2N6254, 115W, 90V
Q4	48-03-040461-03	Transistor, 2N3053, selected
R1,2,3,4	47-01-102109-01	Res., 20K Ω±5%, 1/4W
R5,6,7,8	47-06-014574-05	Pot., 750 Ω±30%
R9	47-01-113166-01	Res., 150 Ω±10%, 1W
R10	47-06-042591-01	Pot., 10K Ω, audio taper
R11	47-01-102174-01	Res., 8.2K Ω±10%, 1/4W
R12	47-01-102167-01	Res., 2.2K Ω±10%, 1/4W
R13	47-01-102180-01	Res., 27K Ω±10%, 1/4W
R14	47-01-102107-01	Res., 16K Ω± 5%, 1/4W
R15,16	47-01-108440-01	Res., 0.5Ω ±10%, 5W
R17	47-01-102627-01	Res., 22 Ω±10%, 2W
R18	47-02-100694-01	Res., 150 Ω±5%, 3W
S1,2,3,4	51-02-113177-01	Switch, DPDT
S5	51-02-113986-01	Switch, DPDT w/pilot lamp
T1	56-07-016749-01	Transformer, output
T2	56-08-007532-01	Transformer, power
TB1	21-04-101065-01	Terminal board, 6-terminal
W1	60-09-042284-02	Cable assembly w/phono plug

PREAMPLIFIER PCB ASSEMBLY

Reference Designator	Ordering Number	Number and Description
C1,6	15-01-107452-01	Cap., 10 µF, 50V
C2,5,11	15-01-108543-01	Cap., 5 µF, 25V
C3	15-01-100236-01	Cap., 50 µF, 25V
C7,8	15-06-100311-01	Cap., 0.1 µF ±20%, 250V
C9,13,16	15-02-100307-01	Cap., 0.01 µF ±20%, 100V
C10	15-02-107454-01	Cap., 100 pF ±10%, 100V
C12	15-01-100276-01	Cap., 500 µF, 25V
C14	15-06-109103-01	Cap., 0.047 µF ±10%, 250V
C15	15-02-100032-01	Cap., 270 pF ±10%, 500V
Q1,3	48-03-109714-01	Transistor, TZ81
Q2	48-03-041440-02	Transistor, 2N3906, selected
Q4	48-03-119140-01	Transistor, 2N5308, selected
R1	47-01-102185-01	Res., 68K Ω±10%, 1/4W
R2	47-01-102190-01	Res., 180K Ω±10%, 1/4W
R3	47-01-100477-01	Res., 470K Ω±10%, 1/4W
R4,5,13	47-01-102112-01	Res., 27K Ω±5%, 1/4W
R6	47-01-102159-01	Res., 470 Ω±10%, 1/4W
R7	47-01-102167-01	Res., 2.2K Ω±10%, 1/4W
R8,9,10,11,17	47-01-102171-01	Res.,4.7K Ω±10%, 1/4W
R12	47-01-102187-01	Res., 100K Ω±10%, 1/4W
R14,15,16,22	47-01-102163-01	Res., 1K Ω±10%, 1/4W
R18,19,20,21	47-01-102162-01	Res., 820 Ω±10%, 1/4W
R23,24	47-06-107492-01	Pot., 50K Ω±30%
R25	47-01-102175-01	Res., 10K Ω±10%, 1/4W

PARTS LIST (continued)

POWER DRIVER PCB ASSEMBLY

Reference Designator	Ordering Number	Name and Description
C1	15-01-107452-01	Cap., 10 µF, 50V
C2,6	15-01-100240-01	Cap., 50 µF, 50V
C3,7,13	15-01-110771-01	Cap., 5 µF, 50V
C4	15-01-107500-01	Cap., 100 µF, 50V
C5,9,10	15-06-108173-01	Cap., 0.47 µF ±20%, 100V
C8	15-02-107454-01	Cap., 100 pF ±10%, 100V
C11	15-02-100302-01	Cap., 470 pF ±10%, 100V
CR1,2,3,4,5	48-01-107017-01	Diode, 1N456A, 25V, 100 mA
CR6,7	48-01-042787-01	Diode, TA-10, 1A, 400V
CR8	48-01-100786-01	Diode, Zener, 2W, 23V
J1	21-01-109731-01	Jack, phono
Q1,2	48-03-110773-01	Transistor, X29E1491, selected
Q3,7	48-03-107447-02	Transistor, 2N5320, 10W, 75V
Q4	48-03-041440-01	Transistor, 2N5367, selected
Q5	48-03-101098-01	Transistor, 2N2712, selected
Q6	48-03-107448-02	Transistor, 2N5322, 10W, 75V

Reference Designator	Ordering Number	Name and Description
R1,9	47-01-102178-01	Res., 18K Ω ±10%, 1/4W
R2,3	47-01-102181-01	Res., 33K Ω ±10%, 1/4W
R4,21	47-01-102159-01	Res., 470 Ω ±10%, 1/4W
R5,6	47-01-102169-01	Res., 3.3K Ω ±10%, 1/4W
R8	47-01-102067-01	Res., 360 Ω ±5%, 1/4W
R10	47-01-102183-01	Res., 47K Ω ±10%, 1/4W
R11,12	47-01-102358-01	Res., 1.8K Ω ±10%, 1/2W
R15	47-01-102147-01	Res., 47 Ω ±5%, 1/4W
R16,17,25,27	47-01-102151-01	Res., 100 Ω ±10%, 1/4W
R18,20	47-01-102092-01	Res., 3.9K Ω ±5%, 1/4W
R19	47-01-102171-01	Res., 470K Ω ±10%, 1/4W
R24,26	47-01-102074-01	Res., 680 Ω ±5%, 1/4W
R28	47-01-102180-01	Res., 27K Ω ±10%, 1/4W
R29	47-01-102157-01	Res., 330 Ω ±10%, 1/4W

LISTED
209J