Model FP16A Distribution Amplifier
User Guide

GENERAL DESCRIPTION

The FP16A is a 1-input, 6-output, compact, self-contained audio distribution amplifier for routing multiple audio signal feeds without incurring loss, distortion, hum or noise. The intelligent design, reliable components and meticulous construction of the FP16A make it the optimum choice for broadcast stations—AM, FM, or TV, studios or ENG vans—as well as recording studios, duplicating houses, and telecommunications and production facilities.

FEATURES

- Wide-range audio frequency response
- Up to 90 dB gain
- Low noise, hum and distortion
- Protected against damage from input overload and shorted outputs; protected against RFI and mechanically protected against incorrect battery insertion
- Transformer-coupled XLR input connector is switchable to low-impedance microphone or line level
- Phantom power for condenser microphones available at input
- Six isolated, transformer-coupled XLR outputs are switchable to low-impedance balanced microphone or 600-ohm balanced line level
- Link input and output jacks permit "ganging" of FP16s for additional outputs, or adding external equipment such as equalizers, compressors or limiters
- Recessed input gain control with normal and overload LED indicators
- Recessed individual output channel gain controls
- Powered by AC (120 or 240V-internally selectable) or built-in battery pack
- Low battery drain provides more than 15 hours operation under normal operating conditions
- Noiseless and automatic switchover to and from battery power
- Rugged and durable construction
- Compact and lightweight for field use and transportation
- Reliable operation over wide temperature and humidity extremes
- Rack-mountable with accessory rack mount kit

27A8725 (Rev. 3)

Printed in U.S.A.

SPECIFICATIONS

Frequency Response (ref 1 kHz)

30 to 20,000 Hz, ±2 dB

Voltage Gain (at 1 kHz)

INPUT	OUTPUT		
	LINE	MICROPHONE	LINK
Mic	90 dB	40 dB	70 dB
Line	40 dB	-10 dB	20 dB
Link	20 dB	-30dB	- -

Inputs

INPUT	IMPEDANCE (at 1 kHz)		INPUT CLIPPING LEVEL AT 1kHz
	FOR USE WITH	ACTUAL	
Mic	150 Ω	1 kΩ	-62 to -6 dBV*
Line	less than 10 kΩ	66 kΩ	-12 to + 44 dBV*
Link	more than 5 kΩ	24 kΩ	+8 dBV

*Dependent on input control setting

Outputs

INPUT	IMPEDANCE (at 1 kHz)		INPUT CLIPPING LEVEL AT 1kHz
	FOR USE WITH	ACTUAL	
Mic	150 Ω	2 Ω	-34 dBV
Line	600 Ω	185 Ω	+16 dBV
Link	600 Ω or greater	100 Ω or less	+16 dBV

Noise

Equivalent Input Noise: -129 dBV (low-impedance microphone, 150 Ohms, 300 to 20,000 Hz) into 600 ohm load at full gain

Equivalent Input Hum and Noise: -127 dBV (low-impedance microphone, 150 Ohms, 20 to 20,000 Hz) into 600 ohm load at full gain

Output Noise: -90 dBV maximum (output control full counterclockwise [off]), -65 dBV maximum (output control full clockwise [on]) (input control down, 300 to 20,000 Hz)

Output Hum and Noise: -75 dBV maximum (output control down), -65 dBV max. (output control up, input control down, 20 to 20,000 Hz)

Distortion

0.4% THD, 30 to 20,000 Hz at +15 dBm output; 0.5% or less IM distortion at +15 dBm output

Common Mode Rejection

65 dB minimum with input of - 20 dBV at 100 Hz

Control Interaction

Less than 1 dB with any control combination

Overload and Shorting Protection

Shorting outputs, even for prolonged periods, willcause no damage; microphone input will not be damaged by signals up to 3V

Phase

All outputs in phase with input. Pin 2 is “high” with respect to pin 3; pin 1 is ground. Tips of link input and output phone jacks are in phase with pin 2 of XLR connectors.

Phantom Power

30 VDC nominal, 3.3k series resistance, automatically disabled with input switch in Line position

Operating Voltage

AC Operation: 120 or 240 VAC ± 10% (internally selectable), 50/60 Hz, 5.5W

DC Operation: 27 VDC nominal at 16 mA typical no- signal, 22 mA typical at 0 VU (+4 dBm) output; 21.5 VDC minimum; battery life approximately 20 hours with alkaline batteries at +4 dBm output in continuous use; three 9 volt batteries, type NEDA 1604A (Duracell MN1604 or Eveready 522 recommended)

Temperature Range

Operating: -18° to 57°C (0° to 135°F)
Storage: -29° to 71°C (-20° to 160°F)

Dimensions

79.5 mm H x 310 mm W x 230 mm D
(3-1/8 in, x 12-7/32 in. x 9-1/16 in.)

Weight

Net: 2.75 kg (6 lb 1 oz.)

Packaged: 3.15 kg (6 lb 15 oz.)

Certifications

Listed by Underwriters Laboratories. Inc.; listed by Canadian Standards Association as Certified

CONTROLS AND CONNECTORS

On·Off Switch: applies power to the FP16A circuitry

Power LED: Indicates unit is on.

Input Gain Screwdriver Control: adjusts input signal level.

Output 1-6 Screwdriver Control: adjusts individual output channel signal levels.

Norm LED: indicates when internal signal level is approximately 25 dB below clipping.

Overload LED: indicates when internal signal level approaches clipping.

Three-Pin XLR **1-6 Output** Connectors: provide for connection to either low-impedance microphone or line level inputs of power amplifiers, mixers, or other signal processing equipment.

Mic/Line 1-6 Slide Switches: select microphone or line level output signal levels.

Phantom On-Off Slide Switch: applies 27 VDC (nominal) phantom power to pins 2 and 3 of the input connector for use with condenser microphones. **IMPORTANT:** Make certain any condenser microphone used is compatible with the FP16A phantom circuit, and that the FP16A input Mic/Line switch is in the Mic position. Do not turn the Phantom switch on when using unbalanced low-impedance microphones; objectionable hum will result. Turn the Phantom switch off when phantom power is not required.

Three-Socket XLR **Input** connector: provides for connection to microphone or line level input signal sources.

Input **Mic/Line** Slide Switch: selects microphone or line-level input signals.

Link In, Out Phone Jacks: provide for connecting more distribution amplifiers for additional outputs, or adding external equipment such as equalizers, compressors, or limiters. When connecting two or more FP16As together for additional outputs, connect the Link Out jack of the "master" unit to the Link In jacks of the others. Any number of FP16As can be tied together in this way. The Link In jack is input-only, and has switching contacts to disconnect the input signal amplifier from the output channel volume controls.

Connect an equalizer, limiter or compressor to the FP16A by connecting the FP16A Link Out jack to the external unit's input, and the external unit's output to the FP16A Link In jack.

Signals at the Link jacks are typically 10 dB below line level. The Link In input impedance is greater than 20 kΩ and may be considered a bridging impedance.

INSTALLATION AND OPERATION

Battery Operation

In addition to 120 or 240 VAC operation, the FP16A can be operated from an internal battery pack. Current drain is typically 22 mA at +4 dBm output level. Battery operation is recommended for remote, on-location operation, and as an emergency backup source in case of AC power failure.

Access to the battery compartment is through the bottom of the chassis. Three 9 volt transistor radio batteries power the FP16A at full rated output. Use alkaline batteries for maximum life. Duracell MN1604 or Eveready 522 are recommended. Battery life is approximately 20 hours at +4 dBm continuous use. Note that phantom power loading will increase battery drain.

With batteries in the battery compartment, the FP16A will automatically and silently switch to battery operation should the AC voltage fall below a suitable level.

Connections

Connect the signal source to the three-socket XLR Input connector and set the input Mic/Line switch for the proper level. Connect the three-pin XLR 1-6 Output connectors to low-impedance microphone or line level inputs of power amplifiers, mixers, etc. Set each Mic/Line switch for the appropriate signal level.

Connect additional distribution amplifiers or add external equipment using the FP16A Link jacks (see Controls and Connectors). A common ground connection can be established using the rear-panel Ground binding post.

Connect the line cord to a 120 VAC ±10%, 50/60 Hz source if the FP16A is to be ac-operated. If 240 volt AC operation is desired, refer to the Service section.

Adjustments

Turn the On-Off switch to the On position (Power LED will light). Turn the Phantom switch on if a non-battery-operated condenser microphone is to be used with the FP16A.

With an input signal applied, adjust the Input gain control so that the Norm LED flickers during normal speech or music (the Overload LED will flicker as the signal level approaches clipping). Adjust the Output 1-6 controls to provide an adequate signal feed to the following equipment.

Telephone Interconnection

When using the FP16A connected directly to a telephone line, check to see whether the telephone company requires an interface coupler between the FP16A and the telephone line. If a coupler is required, make certain the coupler selected and the wiring arrangement are in compliance with local telephone company regulations.

When direct connection to a telephone line is not possible, acoustic coupling to a telephone handset may be used. A Shure Model 50AC Telephone Acoustic Coupler can be connected to the 600 ohm line output of the FP16A and attached to most telephone handsets.

Telephone Line Surge Protection

When using the FP16A connected directly to a telephone line subject to lightning-induced voltage surges, the following part (commercially available) can be installed across the LINE OUT terminals to provide additional protection for output circuit components: Metal Oxide Varistor, General Electric Co., Type No. V22ZA1.

ACCESSORIES

The Model A16R Rack Panel Kit consists of a 19 in, x 3-1/2 in. (483 mm x 89 mm) precut rack panel and necessary hardware for rackmounting the FP16A with its cover in place and end caps removed in a standard 19" (483 mm) rack panel.

SERVICE

Caution: These servicing instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

The FP16A can be disassembled as follows. Remove two screws fastening each end cap. Remove four screws securing the cover assembly to the chassis. Carefully lift the cover assembly up and away from the chassis, taking care not to snag any wire leads or components.

240 VAC Operation

To change the FP16A operating voltage from 120 VAC to 240 VAC, follow these steps.

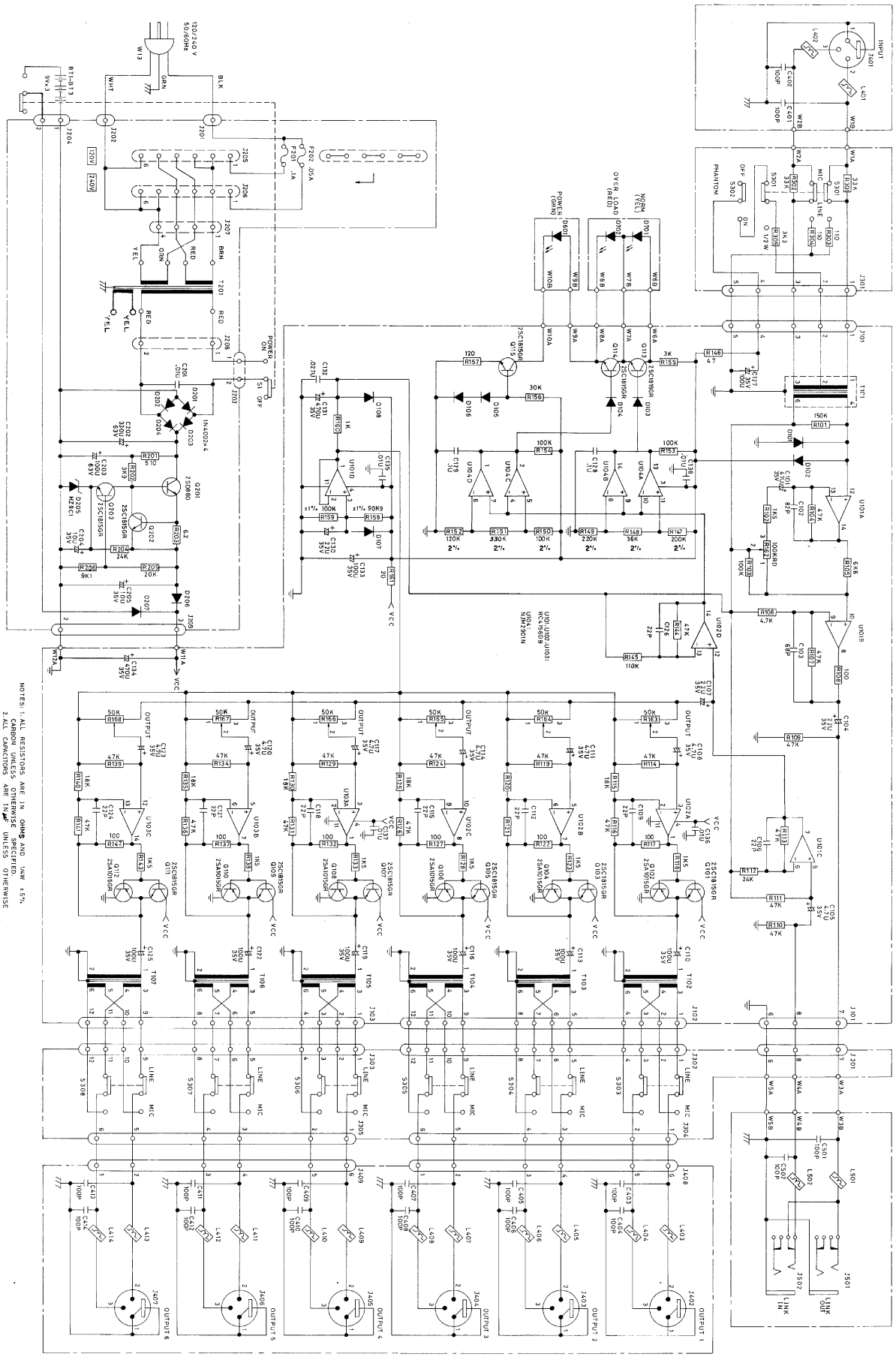
1. Locate the Power board.
2. Remove the jumper plug from connector J205 (marked 120V), and carefully insert it in connector J206 (marked 240V), making sure all six pins are properly engaged.
3. Insert the T50mA/250V fuse (packaged with the FP16A) in the fuseholder marked F202.
4. Replace the AC line cord (if necessary) with one designed for the 240 volt source. If the FP16A is to be used outside the U.S. and Canada, local regulations may require replacing the line cord with one having wire insulation colors as follows:

	"live" or "hot"	Neutral	Earth or Ground
U.S., Canada	Black	White	Green
Europe	Brown	Blue	Green/Yellow

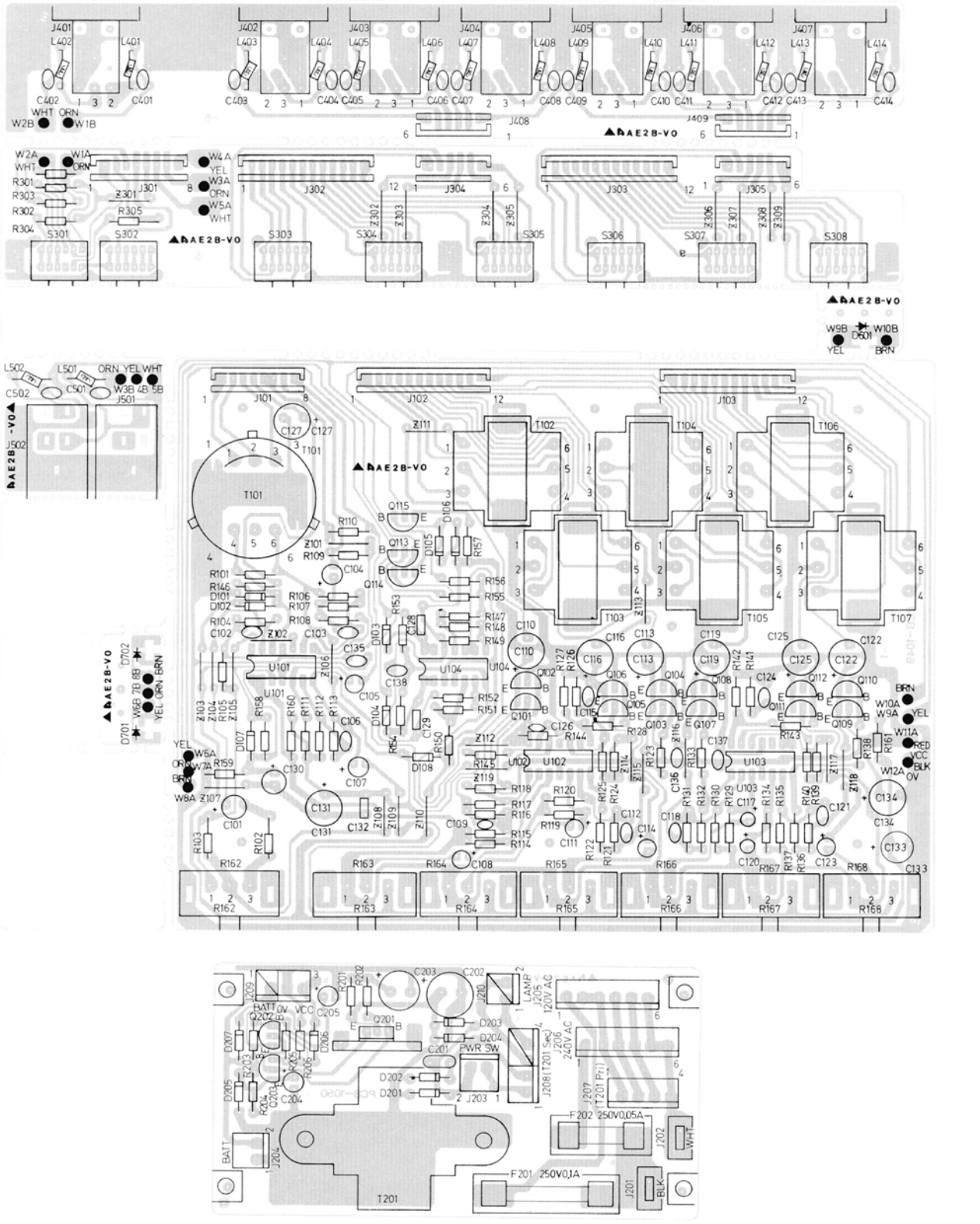
5. Mark the FP16A rear panel with the new operating voltage.

REPLACEMENT PARTS LIST

REFERENCE DESIGNATION	DESCRIPTION	SHURE PART (COMMERCIAL ALTERNATIVE)
C101	Capacitor, Electrolytic, 47 µ , 35V	Shure 60101FT (Sprague 503D476F035ND)
C104, C107, C130	Capacitor, Electrolytic, 22 µF, 35V	Shure 60104FT (Sprague 502D226G050CE1C)
C105, C108, C111, C114, C117, C120, C123	Capacitor, Electrolytic, 4.7 µF, 35V	Shure 60105FT (Panasonic ECE-A35Z4R7)
C110, C113, C116, C119, C122, C125, C127, C133	Capacitor, Electrolytic, 100 µF, 35V	Shure 60107FT (Sprague 503D107F050PD
C131, C134	Capacitor, Electrolytic, 470 µF, 35V	Shure 60108FT (Sprague 503D477M035PE)
C202	Capacitor, Electrolytic, 330 µF, 63V	Shure 60111FT (Sprague 503D337F063QG)
C204, C205	Capacitor, Electrolytic, 10 µF, 35V	Shure 60112FT (Sprague 503D106F035LA)
D101-D108	Diode, Computer, 75V	Shure 86A415 (TI/GE 1N4148)
D201-D204, D206-D207	Silicon Rectifier, 100V, 1/2A	Shure 60201FT (Motorola 1N4002)
D205	Zener Diode, 9V, 112W	Shure 60202FT (Motorola1N5239)
D601	Light-Emitting Diode, Green	Shure 60204FT (Rohm SLR34MG3)
D701	Light-Emitting Diode, Yellow	Shure 60205FT (Rohm SLR34YY3)
D702	Light-Emitting Diode, Red	Shure 60206FT (Rohm SLR340R3)
F201	Fuse, Slow-Blow, 3AG, 100 mA, 250V	Shure 60207FT (Littelfuse 313.010)
F202	Fuse, Time Delay, 5 mm x 20 mm, 50 mA, 250V	Shure 60208FT (Littelfuse 218.050)
J401	Connector, 8-socket, XLR, PCB-mount	Shure 60216FT (Cannon XLB-3-31PCV)
J402-J407	Connector, 3-pin, XLR, PCB-mount	Shure 60217FT (Cannon XLB-3-32PCV)
J501-J502	Connector, PhoneJack, 2-conductor, Single Closed Circuit	Shure 60218FT
L401-L414, L501-L502	Ferrite Bead Ring	
Q101, 0103, Q105, Q107, 0109, Q111, Q113-Q115, 0202-Q203	Transistor, NPN	Shure 60601FT (Rohm T1S92)
Q102, Q104, 0106, Q108, Q110, Q112	Transistor, PNP	Shure 60602FT (Rohm TIS93)
Q201	Transistor, NPN	Shure 60203FT (TI TIP30A)
R162	Potentiometer, Reverse Audio Taper, 100k	Shure 60310FT
R163-R168	Potentiometer, Audio Taper, 50k	Shure 60311FT
S1	Switch, Slide, DPDT (Power)	Shure 61401FA
S301, S303-S308	Switch, Slide, 4PDT (Mic/Line)	Shure 60402FT (Alco MSS4200RG)
5302	Switch, Slide, 4PDT (Phantom)	Shure 60403FT (Alco MSS4200R)
T101	Transformer, Input	Shure 60501FT
T102-T107	Transformer, Output	Shure 60502FT
T201	Transformer, Power	Shure 61501FA
U101	Integrated Circuit, Op Amp (selected for noise figure)	Shure 86A808A (Raytheon RC4156DB)
U102-U103	Integrated Circuit, Op Amp	Shure 86A808A (Raytheon RC4156DB)
U104	Integrated Circuit, Quad Comp	Shure 60604FT (Raytheon LM339)
W13	Line Cord, AC	Shure 60226FT



NOTES: 1. ALL RESISTORS ARE IN OHMS AND 1/4W ±5%, CARBON UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN μF UNLESS OTHERWISE SPECIFIED.
3. ALL DIODES ARE 1N4148 UNLESS OTHERWISE SPECIFIED.



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