

SHURE

THE SOUND OF THE PROFESSIONALS®

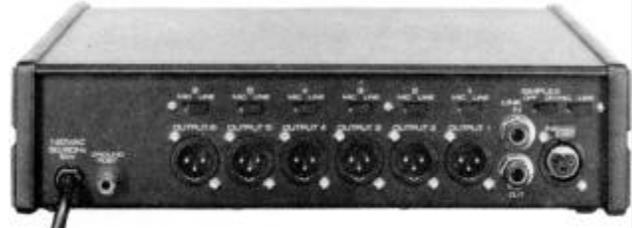
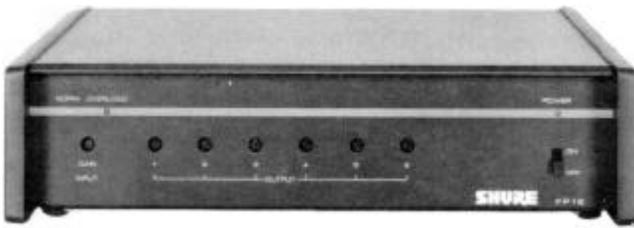
222 HARTREY AVE., EVANSTON, IL 60202-3696 U.S.A.
AREA CODE (312)866-2200 • CABLE: SHUREMICRO
TELEX: 4330191 • FAX (312)866-2279

PROFESSIONAL PRODUCTS

SHURE

MODEL FP16 • DISTRIBUTION AMPLIFIER

TECHNICAL DATA



GENERAL

The FP16 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 FP16 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 (simplex) 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

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	-30 dB	—

Inputs

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

*Dependent on input control setting.

Outputs

OUTPUT	IMPEDANCE (at 1 kHz)		OUTPUT CLIPPING LEVEL AT 1 kHz
	FOR USE WITH	ACTUAL	
Mic	150 ohms	0.5 ohms	- 34 dBV
Line	600 ohms	180 ohms	+ 16 dBV
Link	600 ohms or greater	100 ohms 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, will cause 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 \pm 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 FP16 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 signal level is approximately 20 dB below clipping.

Overload LED: indicates when input 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 (simplex) 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 FP16 simplex circuit, and that the FP16 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-simplex 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 FP16s together for additional outputs, connect the Link Out jack of the "master" unit to the Link In jacks of the others. Any number of FP16s 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 FP16 by connecting the FP16 Link Out jack to the external unit's input, and the external unit's output to the FP16 Link In jack.

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

INSTALLATION AND OPERATION**Battery Operation**

In addition to 120- or 240-volt ac operation, the FP16 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 FP16 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 simplex power loading will increase battery drain.

With batteries in the battery compartment, the FP16 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 FP16 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 \pm 10%, 50/60 Hz source if the FP16 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 FP16.

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 FP16 connected directly to a telephone line, check to see whether the telephone company requires an interface coupler between the FP16 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 FP16 and attached to most telephone handsets.

Telephone Line Surge Protection

When using the FP16 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

3-½ in. (483 mm x 89 mm) precut rack panel and necessary hardware for rack-mounting the FP16 with its cover in place and end caps removed in a standard 19" (483 mm rack panel).

SERVICE

WARNING

Voltages in this equipment are hazardous to life. Refer servicing to qualified service personnel.

The FP16 can be disassembled as follows. 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. (It is not necessary to remove the end caps from the cover for access to the chassis.)

240 Vac Operation

To change the FP16 operating voltage from 120 Vac to 240 Vac, follow these steps.

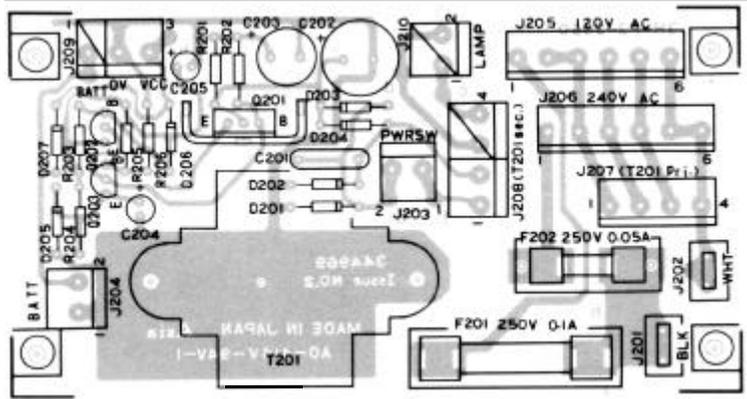
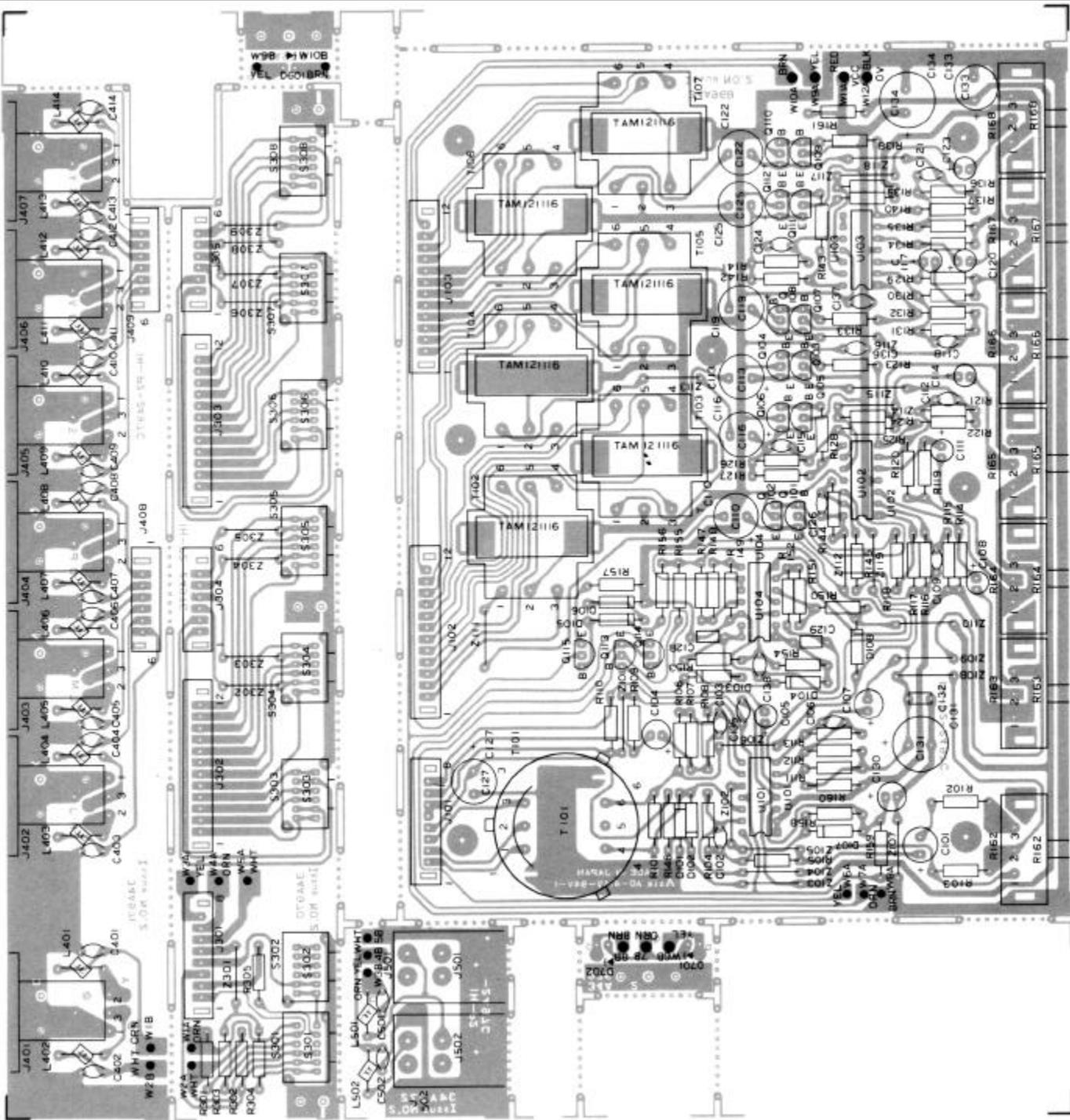
1. Locate the Power board.
2. Remove the jumper plug from connector J205 (marked 120V), and carefully insert it in connector J206 (marked 240V), making sure all six pins are properly engaged.
3. Insert the T50mA/250V fuse (packaged with the FP16) in the fuseholder marked F202.
4. Replace the ac line cord (if necessary) with one designed for the 240-volt source. If the FP16 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:

	<u>"Live" or "Hot"</u>	<u>Neutral</u>	<u>Earth or Ground</u>
U.S., Canada	Black	White	Green
Europe	Brown	Blue	Green/Yellow

5. Mark the FP16 rear panel with the new operating voltage.

REPLACEMENT PARTS LIST

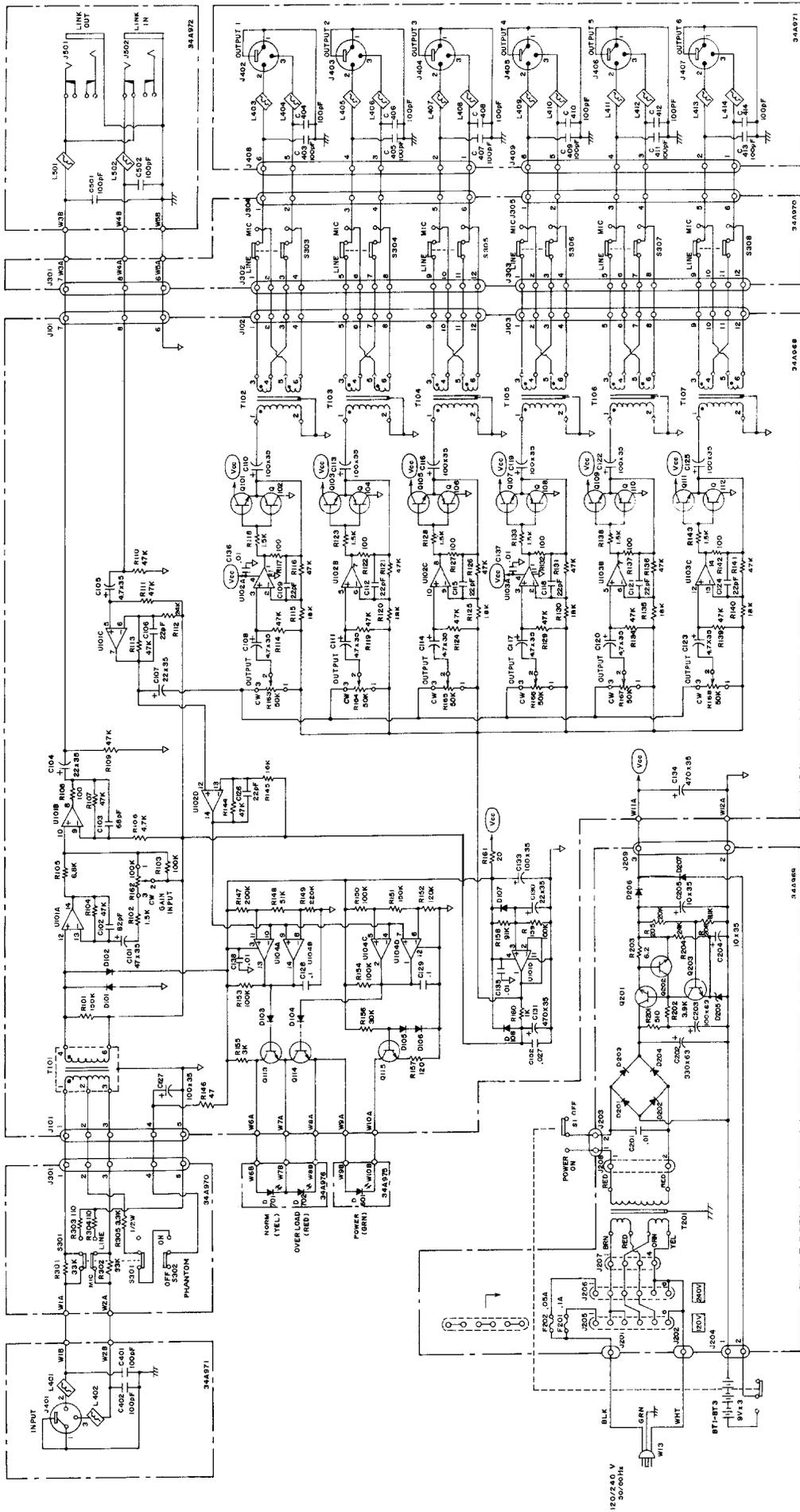
REFERENCE DESIGNATION	DESCRIPTION	SHURE PART AND/OR COMMERCIAL ALTERNATE	REFERENCE DESIGNATION	DESCRIPTION	SHURE PART AND/OR COMMERCIAL ALTERNATE
C101	Capacitor, Electrolytic, 47 µF, 35V	Shure 60101FT; Sprague 503D476F035ND	J401	Connector, 3-socket, XLR, PCS-mount	Shure 60216FT; Cannon XLB-3-31PCV
C104, C107, C130	Capacitor, Electrolytic, 22 µF, 35V	Shure 60104FT; Sprague 502D226G050CE1C	J402-J407	Connector, 3-pin, XLR, PCB-mount	Shure 60217FT; Cannon XLB-3-32PCV
C105, C108, C111, C114, C117, C120, C123	Capacitor, Electrolytic, 4.7 µF, 35V	Shure 60105FT; Panasonic ECE-A35Z4R7	J501-J502	Connector, Phone Jack, 2-conductor, Single Closed Circuit	Shure 60218FT
C110, C113, C116, C119, C122, C125, C127, C133	Capacitor, Electrolytic, 100 µF, 35V	Shure 60107FT; Sprague 503D107F050PD	L401-L414, L501-L502	Ferrite Bead Ring	Shure 60219FT; Stackpole 57-3425
C131, C134	Capacitor, Electrolytic, 470 µF, 35V	Shure 60108FT; Sprague 503D477M035PE	Q101, Q103, Q105, Q107, Q109, Q111, Q113-Q115, Q202-Q203	Transistor, NPN	Shure 60601FT; Rohm TIS92
C202	Capacitor, Electrolytic, 330 µF, 63V	Shure 60111FT; Sprague 503D337F063QG	Q102, Q104, Q106, Q108, Q110, Q112	Transistor, PNP	Shure 60602FT; Rohm TIS93
C204, C205	Capacitor, Electrolytic, 10 µF, 35V	Shure 60112FT; Sprague 503D106F035LA	Q201	Transistor, NPN	Shure 60203FT; TI TIP30A
D101-D108	Diode, Computer, 75V	TI/GE 1N4148	R162	Potentiometer, Reverse Audio Taper, 100k	Shure 60310FT
D201-D204, D206 D207	Silicon Rectifier, 100V, 1/2A	Shure 60201FT; Motorola 1N4002	R163-R168	Potentiometer, Audio Taper, 50k	Shure 60311FT
D205	Zener Diode, 9V, 1/2W	Shure 60202FT; Motorola 1N5239	S1	Switch, Slide, DPDT (Power)	Shure 60401FT
D601	Light-Emitting Diode, Green	Shure 60204FT; Rohm SLR34MG3	S301, S303-S308	Switch, Slide, 4PDT (Mic/Line)	Shure 60402FT; Alco MSS4200RG
D701	Light-Emitting Diode, Yellow	Shure 60205FT; Rohm SLR34YY3	S302	Switch, Slide, 4PDT (Phantom)	Shure 60403FT; Alco MSS4200R
D702	Light-Emitting Diode, Red	Shure 60206FT; Rohm SLR34OR3	T101	Transformer, Input	Shure 60501FT
F201	Fuse, Slow-Blow, 3AG, 100 mA, 250V	Shure 60207FT; Littelfuse 313.010	T102-T107	Transformer, Output	Shure 60502FT
F202	Fuse, Time Delay, 5 mm x 20 mm, 50 mA, 250V	Shure 60208FT; Littelfuse 218.050	T201	Transformer, Power	Shure 60503FT
			U101	Integrated Circuit, Op Amp (selected for noise figure)	Shure 86A808A; Raytheon RC4156DB
			U102-U103	Integrated Circuit, Op Amp	Shure 86A806A; Raytheon RC4156DB
			U104	Integrated Circuit, Quad Comp	Shure 60604FT; Raytheon LM339
			W13	Line Cord, AC	Shure 60226FT



MODEL FP16 PRINTED CIRCUIT BOARDS - COMPONENT SIDE

- 8232-1/968-2
- 8234-1/970-2
- 8235-1/971-2
- 8236-1/972-2
- 8237-1/975-2
- 8238-1/976-2

8233-2/969-2



NOTES

1. ALL CAPACITORS IN MFD AND 50 VOLTS OR MORE UNLESS OTHERWISE SPECIFIED. ELECTROLYTIC CAPACITORS SHOWN IN MFD X VOLTS.
2. ALL RESISTORS TO BE 5% 1/4 WATT, UNLESS OTHERWISE SPECIFIED

MODEL FP16 CIRCUIT DIAGRAM