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
### SPECIFICATIONS

**Frequency Response (ref 1 kHz)**
- 30 to 20,000 Hz, ±2 dB

**Voltage Gain (at 1 kHz)**

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
<th>Mic</th>
<th>Line</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LINE</td>
<td>MICROPHONE</td>
<td>LINK</td>
<td></td>
</tr>
<tr>
<td>Mic</td>
<td>90 dB</td>
<td>40 dB</td>
<td>70 dB</td>
<td></td>
</tr>
<tr>
<td>Line</td>
<td>40 dB</td>
<td>-10 dB</td>
<td>20 dB</td>
<td></td>
</tr>
<tr>
<td>Link</td>
<td>20 dB</td>
<td>-30 dB</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs**

- **Impedance (at 1 kHz):**
  - Mic: 150 Ω, 1 kΩ, less than 10 kΩ, more than 5 kΩ
  - Line: less than 10 kΩ, 66 kΩ, -12 to +44 dBV
  - Link: more than 5 kΩ, 24 kΩ, +6 dBV

  *Dependent on input control setting*

**Outputs**

- **Impedance (at 1 kHz):**
  - Mic: 150 Ω, 2 Ω
  - Line: 600 Ω, 185 Ω
  - Link: 600 Ω or greater, 100 Ω or less

**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

**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 ±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** Slide Switches: select microphone or line level input 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.

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.

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:

<table>
<thead>
<tr>
<th>U.S., Canada</th>
<th>Europe</th>
<th>&quot;live&quot; or &quot;hot&quot;</th>
<th>Neutral</th>
<th>Earth or Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Brown</td>
<td>White</td>
<td>Green</td>
<td>Green/Yellow</td>
</tr>
</tbody>
</table>

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

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.
<table>
<thead>
<tr>
<th>REFERENCE DESIGNATION</th>
<th>DESCRIPTION</th>
<th>SHURE PART (COMMERCIAL ALTERNATIVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C101</td>
<td>Capacitor, Electrolytic, 47 µF, 35V</td>
<td>Shure 60101FT (Sprague 503D476F035ND)</td>
</tr>
<tr>
<td>C104, C107, C130</td>
<td>Capacitor, Electrolytic, 22 µF, 35V</td>
<td>Shure 60104FT (Sprague 502D226G050CE1C)</td>
</tr>
<tr>
<td>C105, C108, C111, C114, C117, C120, C123</td>
<td>Capacitor, Electrolytic, 4.7 µF, 35V</td>
<td>Shure 60105FT (Panasonic ECE-A35Z4R7)</td>
</tr>
<tr>
<td>C110, C113, C116, C119, C122, C125, C127, C133</td>
<td>Capacitor, Electrolytic, 100 µF, 35V</td>
<td>Shure 60107FT (Sprague 503D107F050PD)</td>
</tr>
<tr>
<td>C131, C134</td>
<td>Capacitor, Electrolytic, 470 µF, 35V</td>
<td>Shure 60108FT (Sprague 503D477M035PE)</td>
</tr>
<tr>
<td>C202</td>
<td>Capacitor, Electrolytic, 330 µF, 63V</td>
<td>Shure 60111FT (Sprague 503D337F063QG)</td>
</tr>
<tr>
<td>C204, C205</td>
<td>Capacitor, Electrolytic, 10 µF, 35V</td>
<td>Shure 60112FT (Sprague 503D106F035LA)</td>
</tr>
<tr>
<td>D101-D108</td>
<td>Diode, Computer, 75V</td>
<td>Shure 86A415 (TI/GE 1N4148)</td>
</tr>
<tr>
<td>D201-D204, D206-D207</td>
<td>Silicon Rectifier, 100V, 1/2A</td>
<td>Shure 60201FT (Motorola 1N4002)</td>
</tr>
<tr>
<td>D205</td>
<td>Zener Diode, 9V, 112W</td>
<td>Shure 60202FT (Motorola1N5239)</td>
</tr>
<tr>
<td>D601</td>
<td>Light-Emitting Diode, Green</td>
<td>Shure 60204FT (Rohm SLR34MG3)</td>
</tr>
<tr>
<td>D701</td>
<td>Light-Emitting Diode, Yellow</td>
<td>Shure 60205FT (Rohm SLR34YY3)</td>
</tr>
<tr>
<td>D702</td>
<td>Light-Emitting Diode, Red</td>
<td>Shure 60206FT (Rohm SLR340R3)</td>
</tr>
<tr>
<td>F201</td>
<td>Fuse, Slow-Blow, 3AG, 100 mA, 250V</td>
<td>Shure 60207FT (Littelfuse 313.010)</td>
</tr>
<tr>
<td>F202</td>
<td>Fuse, Time Delay, 5 mm x 20 mm, 50 mA, 250V</td>
<td>Shure 60208FT (Littelfuse 218.050)</td>
</tr>
<tr>
<td>J401</td>
<td>Connector, 8-socket, XLR, PCB-mount</td>
<td>Shure 60216FT (Cannon XLB-3-31PCV)</td>
</tr>
<tr>
<td>J402-J407</td>
<td>Connector, 3-pin, XLR, PCB-mount</td>
<td>Shure 60217FT (Cannon XLB-3-32PCV)</td>
</tr>
<tr>
<td>J501-J502</td>
<td>Connector, PhoneJack, 2-conductor, Single Closed Circuit</td>
<td>Shure 60218FT</td>
</tr>
<tr>
<td>L401-L414, L501-L502</td>
<td>Ferrite Bead Ring</td>
<td>Shure 60601FT (Rohm T1S92)</td>
</tr>
<tr>
<td>Q101, Q103, Q105, Q107, Q109, Q111, Q113-Q115, 0202-Q203</td>
<td>Transistor, NPN</td>
<td>Shure 60602FT (Rohm T1S93)</td>
</tr>
<tr>
<td>Q102, Q104, 0106, Q108, Q110, Q112</td>
<td>Transistor, PNP</td>
<td>Shure 60203FT (TI TIP30A)</td>
</tr>
<tr>
<td>R162</td>
<td>Potentiometer, Reverse Audio Taper, 100k</td>
<td>Shure 60310FT</td>
</tr>
<tr>
<td>R163-R168</td>
<td>Potentiometer, Audio Taper, 50k</td>
<td>Shure 60311FT</td>
</tr>
<tr>
<td>S1</td>
<td>Switch, Slide, DPDT (Power)</td>
<td>Shure 61401FA</td>
</tr>
<tr>
<td>S301, S303-S308</td>
<td>Switch, Slide, 4PDT (Mic/Line)</td>
<td>Shure 60402FT (Alco MSS4200RG)</td>
</tr>
<tr>
<td>S302</td>
<td>Switch, Slide, 4PDT (Phantom)</td>
<td>Shure 60403FT (Alco MSS4200R)</td>
</tr>
<tr>
<td>T101</td>
<td>Transformer, Input</td>
<td>Shure 60501FT</td>
</tr>
<tr>
<td>T102-T107</td>
<td>Transformer, Output</td>
<td>Shure 60502FT</td>
</tr>
<tr>
<td>T201</td>
<td>Transformer, Power</td>
<td>Shure 61501FA</td>
</tr>
<tr>
<td>U101</td>
<td>Integrated Circuit, Op Amp (selected for noise figure)</td>
<td>Shure 86A808A (Raytheon RC4156DB)</td>
</tr>
<tr>
<td>U102-U103</td>
<td>Integrated Circuit, Op Amp</td>
<td>Shure 86A808A (Raytheon RC4156DB)</td>
</tr>
<tr>
<td>U104</td>
<td>Integrated Circuit, Quad Comp</td>
<td>Shure 60604FT (Raytheon LM339)</td>
</tr>
<tr>
<td>W13</td>
<td>Line Cord, AC</td>
<td>Shure 60226FT</td>
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