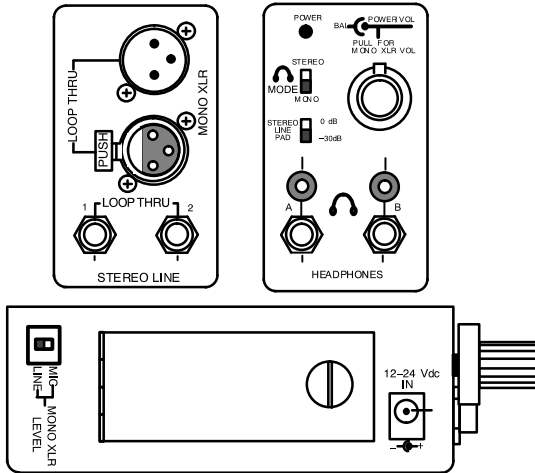




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## Model FP22 User Guide



### GENERAL

The FP22 is a battery-powered stereo headphone amplifier that provides headphone feeds from any audio input source. It has the unique capability of monitoring mono, stereo and mixed mono and stereo inputs. The FP22 monitors and combines these signals in the headphones without affecting the original signal. Stereo or mono headphone outputs appear on 1/4-inch phone or mini 3.5 mm stereo jacks. The FP22 can drive headphones to very loud levels. It is ideal for anyone in the broadcasting, sound reinforcement or audio recording fields who needs a flexible, high-quality headphone monitor.

The FP22 is excellent for:

- Line checking applications
- Providing multiple headphone feeds
- On stage in-ear monitoring
- Boosting headphone circuits
- Headphone foldback in recording studios
- Practicing musical instruments or mixed vocals through headphones while monitoring a stereo source

### Features:

- Exceptionally wide frequency response and dynamic range
- High-impedance bridging inputs do not load signal sources
- Capable of mixing mono and stereo inputs in headphone outputs
- Complete user control of headphone volume
- Loophrough 1/4-inch stereo phone jacks (can be internally switched to become separate left and right inputs)
- 30 dB pad for stereo line input to accommodate a wide range of line level sources
- Balanced loopthrough XLR connectors switchable from mic to line level
- Separate XLR volume control on pull-out control knob

- Overall headphone balance control
- Overall stereo/mono switch for headphones
- LED power indicator
- Powered by easily obtainable 9-volt alkaline battery or by external 12 to 24 Vdc power supply (such as Shure Model PS20 or PS20E)
- 1/4-inch and 3.5 mm stereo headphone jacks
- Effectively shielded for low susceptibility to radio-frequency interference (RFI)

### SPECIFICATIONS

#### Frequency Response (ref 1 kHz)

20 Hz to 20 kHz, +1, -3 dB (stereo line input)  
 50 Hz to 18 kHz, +1, -3 dB (mono XLR input)

#### Equivalent Input Noise

-125 dBV (maximum gain; source resistance 150 Ω; 20 Hz to 20 kHz)

#### Voltage Gain (at 1 kHz)

Input	Source Impedance	Gain (into 63 Ω)	Gain (into 8 Ω)
XLR (mic level)	150 Ω	80 ± 5 dB	74 ± 5 dB
XLR (line level)	600 Ω	29 ± 5 dB	23 ± 5 dB
Stereo line (pad at 0 dB)	600 Ω	26 ± 4 dB	21 ± 4 dB
Stereo line (pad at -30 dB)	600 Ω	-4 ± 4 dB	-10 ± 4 dB

#### Total Harmonic Distortion

Less than 0.5% measured at -8 dBV into 8 Ω (20 Hz to 20 kHz stereo line input; 50 to 18 kHz mono XLR input)

#### Input Clipping Levels (at 1 kHz)

Mic level ..... 160 mV (-16 dBV)  
 Line level ..... 50 V (+34 dBV)

#### Output Level at Clipping

Headphones Impedance	FP22 Output	Headphones Sensitivity	Headphones SPL
63 Ω	1.2 V (1.6 dBV)	106 dB at 1 mW	120 dB
8 Ω	500 mV (-6 dBV)	95 dB at 1 mW	110 dB

#### Input Impedance

XLR (mic level) ..... 6.3 kΩ ±10%  
 XLR (line level) ..... 66 kΩ ±10%  
 Stereo Line (pad at 0) ..... 50 kΩ ±10%  
 Stereo Line (pad at 30 dB) ..... 53 kΩ ±10%

#### Headphone Output Impedance (at 1 kHz)

10.2 Ω ± 10%

## Phase

Input in phase with output. Pin 2 of XLR input in phase with tip and ring of all Headphones jacks.

## Power

Internal ..... One 9 V alkaline battery  
Battery Life ..... Approximately 15 hours under  
normal operating conditions  
External ..... 12 to 24 Vdc  
Current drain (typical) ..... 11 mA<sub>dc</sub>; 80 mA<sub>dc</sub>  
(clipping) at 9 Vdc

## Temperature Range

Operating ..... 0° to 49°C (32° to 120°F)  
Storage ..... -29° to 70°C (-20° to 165°F)

## Connectors

### Loophrough

Two 3-pin balanced XLR-type connectors (one male, one female)  
Two 1/4-inch stereo phone jack (tip-left; ring-right; sleeve-ground)

### Headphones

Two 1/4-inch stereo phone jack headphone outputs  
Two 3.5 mm stereo mini jacks

### Power

6.5 mm coaxial power connector (tip +, sleeve -)

## Case

Die-cast zinc; matte black enamel finish

## Overall Dimensions

80.9 mm H x 55.5 mm W x 153 mm D  
(3-<sup>3</sup>/<sub>16</sub> x 2-<sup>3</sup>/<sub>16</sub> x 6-<sup>1</sup>/<sub>16</sub> in.)

## Net Weight

450 grams (1 lb)

**NOTE:** The FP22 is lightweight and can be clipped to a belt or trousertop, or to D-rings on other equipment. The FP22 belt clip is attached to the case with two easily removable screws. The FP22 will stand on a flat surface, and several units can be stacked together with their belt clips removed.

## SETUP

### Battery Replacement

1. Use a coin or screwdriver to turn the 1/4-turn lock screw fastener in either direction to open the battery compartment door.
2. Insert a fresh 9-volt alkaline battery (NEDA 1604A, Duracell MN1604A, Eveready 522, or equivalent) in the compartment. The battery compartment is designed so that the polarized battery terminals cannot be inserted incorrectly. Plated spring terminals ensure solid electrical contacts.

### External Power

The coaxial dc power jack accepts a dc voltage from 12 to 24 volts. External dc power feeds a regulator to power the FP22 circuitry. The dc input jack is directly compatible with Shure Model PS20 or PS20E Power Supplies. The tip of the coaxial jack is positive (+), the sleeve is negative (-). A coaxial power plug inserted into the external power jack disables the internal battery power.

### Signal Connections

#### Mono XLR—Microphone— or line—level signals

1. Set the Mono XLR Mic-Line switch to the appropriate signal level.
2. Connect a balanced microphone or line level signal to either Mono XLR jack.
3. If loophrough is desired, use the unused XLR connector as an output.

**NOTE:** No damage will result if the Mic-Line switch is set incorrectly. However, objectionable distortion may result if line level signals are monitored with the switch in the Mic position.

#### Stereo Line—Line— or Aux—level signals only

1. Connect a 1/4-inch stereo connector to either Stereo Line jack.
2. If loophrough is desired, use the unused 1/4-in. stereo connector as an output.
3. Set the front panel Stereo Line Pad to the 0 dBm line-level signal position. The -30 dB position is used when the FP22 line-level input signals are +4 dBm or greater.

**NOTE:** As explained in the *Internal Switches* description, the FP22 can accept left and right input signals on separate connectors. Stereo Line jack (1) is left, Stereo Line jack (2) is right.

#### Headphones

1. Connect headphones to the Headphones A and B jacks.
- NOTE:** Each pair of Headphones jacks consists of one 1/4-inch and one 3.5 mm stereo connector. Only one connector of each pair can be used at one time. Plugging into the 1/4-inch connector disconnects its associated 3.5 mm connector.

## OPERATION

**NOTE:** A simplified block diagram on the side of the FP22 provides a quick reference to its functional circuitry.

1. Rotate the overall Volume control clockwise to power the FP22. The Power LED indicator lights to show that the unit is on. Turn the level control carefully to avoid excessive headphone levels. The Volume control adjusts both the Mono XLR signal and Stereo Line signal.

### WARNING

The FP22 can produce ear-damaging headphone levels. Turn the headphones Volume control up slowly when making adjustments.

2. Pull out the Volume control knob and rotate clockwise to increase the volume level of the Mono XLR signal only. This adjustment will not affect the overall volume. A center detent position provides a starting volume level for the Mono XLR signal.
3. Rotate the Balance control left or right to control the overall left/right signal balance.
4. If mono monitoring is desirable, set the Stereo/Mono switch to Mono.

## INTERNAL SWITCHES

Two switches are located inside the FP22. These control the signal path through the unit. The switches are located on the vertically mounted printed circuit board inside the unit adjacent to the Loophrough phone jacks. To access the switches, remove the three Phillips-head screws on the side panel of the unit.

**Internal Switch S-104** consists of two independent single-pole, single-throw switches controlling the path of the Mono XLR input signal:

1. When S104-1 and -2 are in the On position, the Mono XLR signal is routed to both left and right earphones.
2. When S104-1 is in the On position and S104-2 is in the Off position, the Mono XLR signal goes to the left channel.
3. When S104-1 is in the Off position and S104-2 is in the On position, the Mono XLR signal goes only to the right channel.
4. If both S104-1 and -2 are in the Off position, *NO* signal from the Mono XLR input appears at the headphone outputs.

**Internal Switch S105** is a two-position slide switch that changes the Stereo Line jacks from Loophrough TRS stereo inputs to separate left and right mono inputs.

1. When internal switch S105 is set for stereo, the Stereo Line jacks accept a stereo signal on a single 1/4-inch stereo connector (tip-left; ring-right; sleeve-ground). This allows for a loophrough of a

stereo signal since both 1/4-inch Stereo Line jacks are connected in parallel.

- When internal switch S105 is set for Mono, the FP22 accepts individual left and right 1/4-inch mono connectors to provide a stereo signal. Stereo Line jack (1) is the left input; Stereo Line jack (2) is the right input. No loopthrough capability is available with S105 set for Mono.

### TYPICAL MONITORING CONNECTIONS

- One Mono Input.** A mono signal connected to an XLR or phone jack will be monitored as a mono headphone signal. (When using the Mono XLR connectors, the Line/Mic switch should be set to match the input.)
- One Stereo Input.** A stereo signal connected to the Stereo Line jacks can be monitored as a stereo output on stereo headphones or as a mono output.
- One Stereo Input Plus One Mono Input.** A mono signal input through the Mono XLR connector and a stereo signal input through the Stereo Line jacks can be monitored as a mixed output, with both signals appearing in the stereo headphones.
- Three Mono Inputs - Stereo Headphone Signal Output.** Three mono signals can be accepted through the mono-XLR jacks and the stereo line jacks, and mixed and monitored as a stereo signal in the stereo headphones.

**NOTE:** The FP22 can be modified so that all input jacks are in parallel. This duplicates the Shure FP12 in functionality. This modification allows monitoring in mono only. Please contact Shure's Product Applications Group for details on this modification.

### INTERCOM CAPABILITY

The FP22 can interface to commercially available intercom systems, such as RTS, Telex and ClearCom. The diagrams below show how to interface the FP22 to these systems and what can be monitored. More information about intercom systems can be obtained from the intercom manufacturers.

#### Telex Intercom Systems (Figure 1)

Telex uses a standard balanced audio line. No modification is required to interface the FP22 with Telex intercoms.

- Use the Mono XLR Loopthrough connections.
- Mono XLR level switch should be set to the Line position.
- 24 volts phantom power on the intercom line is passed through the FP22.

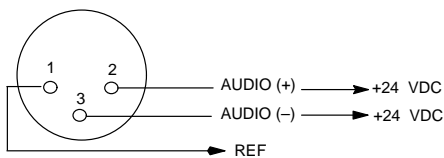


FIGURE 1

#### RTS and ClearCom Systems (Figure 2)

These two systems use an unbalanced audio line which requires use of the 1/4-inch line connectors of the FP22 for operation. The Y-cable depicted in Figure 2 is required for RTS and ClearCom intercom systems.

- The above Y-cable is placed in-line into the intercom system.
- Set internal switch S105 to Stereo (factory setting).

#### Wiring for RTS and ClearCom Systems

Pin	RTS	ClearCom
2	Audio channel 1, 24Vdc	Audio, 18-36 Vdc power
3	Audio channel 2, 24 Vdc	Audio, 12 Vdc call signal
1	Reference (ground)	Reference (ground or common)

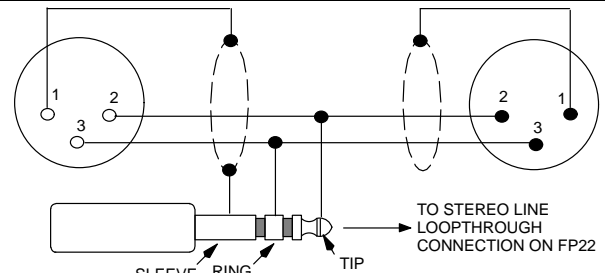


FIGURE 2

### SPECIAL APPLICATIONS

**Troubleshooting** stage sound systems. The FP22 can be used to trace a signal line when one or more microphones are not working on stage. To locate the malfunction, loop the signal through the FP22 wherever an XLR or phone connector is located and monitor the signal.

**Field monitoring** applications can be set up by inserting FP22 units "in line" without affecting the signals.

**On stage monitoring.** With the FP22, an effective on-stage in-ear monitor system can be created. From a mixing console a stereo signal can be looped through to multiple FP22's, while the Mono XLR jack can be used for an individual's microphone or musical instrument. Each performer has control of overall headphone volume as well as a mix control of their individual voice or instrument with the stereo signal.

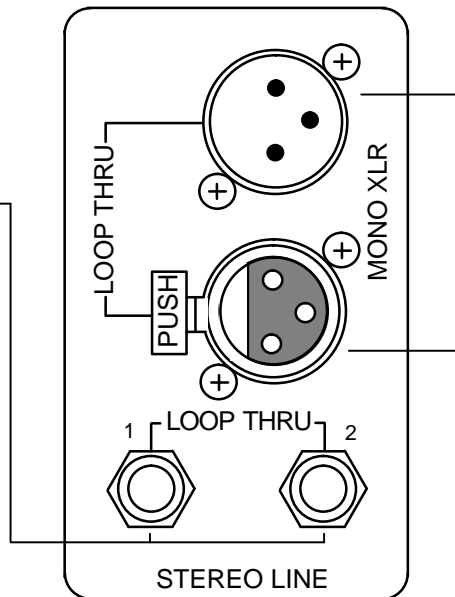
**Boosting headphone output.** The FP22 can be used to boost the headphone output of existing devices. The stereo headphone output of an audio device can be connected to the Stereo Line connectors of the FP22. The FP22 will provide a high-quality headphone output with the ability to loop through to another FP22.

**Using the FP22 as a two-stage intercom system.** A two-stage intercom system can be created by connecting two FP22 units with a single standard microphone cable. Each person connects a Shure SM12A or other headset microphone's XLR output and earphone input connector to their individual FP22. Both microphone signals appear at each FP22 headphone output.

**Practice headphone amplifier** for microphones or other sources, such as electric instruments, synthesizers, etc. Connect the output from any instrument into the FP22 and monitor the headphones.

**Stereo Line Jacks**

(Unbalanced) Dual function jacks. Factory supplied so that tip, ring, sleeve stereo signal applied to one jack can be looped through to other jack (tip-left, ring-right, sleeve-ground). Jacks can be internally switched so that two mono phone jacks can be input and monitored in stereo without loopthrough (see Internal switches).



**Mono XLR Connectors**

(Balanced) Loopthrough connectors accept both mic and line level signals. Volume adjusts with pull out triple-function Volume control (center detent is nominal volume).

**LED Power Indicator**

Lights when FP22 is turned on.

**Stereo/Mono Headphone Mode Switch**

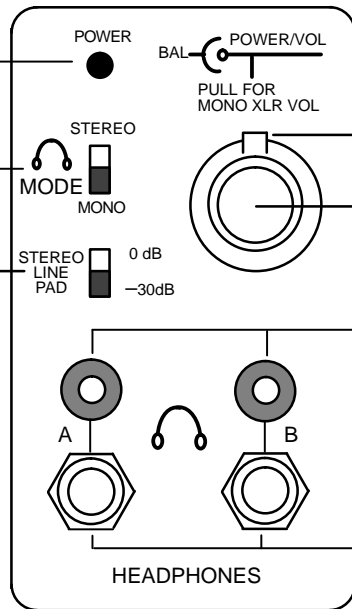
Changes headphones from stereo to mono. Especially useful when monitoring monaural signal connected to stereo line jacks.

**Stereo Line Pad**

Reduces gain on Stereo Line signals by 30 dB. Especially useful with signal levels of +4 dBm or greater.

**Mono XLR Mic/Line Switch**

Selects between microphone and line level signals coming into XLR connector (50 dB pad inserted before mic preamp when switch is in Line position).



**Balance Control**

(Outer ring of triple function Volume control.) Overall headphone balance control with center detent.

**Triple Function Volume Control**

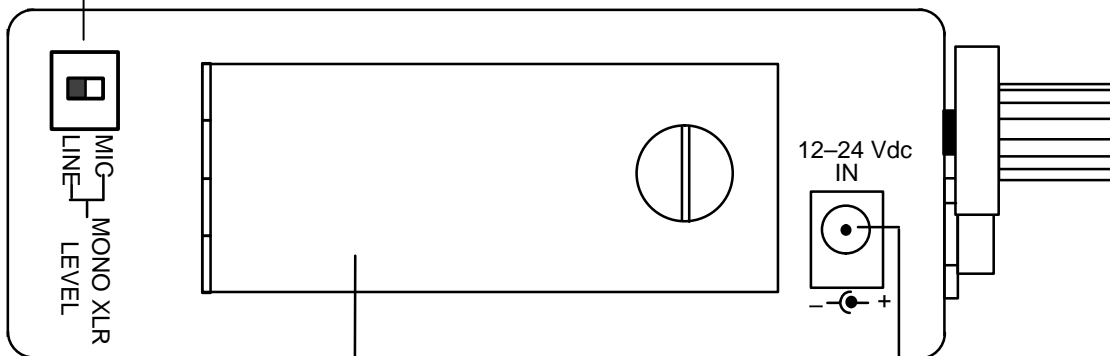
Incorporates On/Off switch, overall Volume control (master volume), and Mono XLR Volume (on the pullout). Center-detented Mono XLR volume at nominal level.

**3.5 mm Stereo (3-Circuit) Mini Headphone Connectors**

Mono or stereo program monitor.

**1/4-Inch Stereo (3-Circuit) Headphone Connectors**

Mono or stereo program monitor; using these jacks disables 3.5mm jacks.



**Battery Compartment**

Requires one 9 V alkaline battery.

**External Power Jack**

Accepts external supply voltage from 12 to 24 Vdc (such as Shure PS20 or PS20E Power Supplies). Tip is positive, sleeve is negative.

## REPLACEMENT PARTS LIST

REFERENCE DESIGNATION	DESCRIPTION	SHURE PART NO. AND/OR COMMERCIAL ALTERNATE*
BT1	Battery, Alkaline, 9 V	Duracell MN1604
D101–D107, D113, D115	Dual Diode Assembly	Shure 22202FT; NEC 1SS123
D108–D110	Diode	Shure 22203FT; Toshiba 1SS193
D111–D112	Diode, Schottky	Shure 22204FT; Toshiba U1GWJ44
D114	Light–Emitting Diode, Red	Shure 22205FT; Toshiba TLR124
J101	Connector, 3–Socket, MONO XLR	Shure 95A8381; ITT Cannon XLM–3–31PCV
J102	Connector, 3–Pin, MONO XLR	Shure 95A8400; ITT Cannon XLM–3–32PCV
J103–J104	Phone Jack, Stereo, STEREO LINE LOOPTHRU	Shure 22201FT; Hosiden HLJ0546–01–010
J105, J107	Phone Jack, Stereo Switching, HEADPHONES	Shure 20202FT; Hosiden HLJ3305–01–3080
J106, J1 08	Phone Jack, Stereo, HEADPHONES	Shure 20203FT; Hosiden HSJ0926–01–1010
J109	Connector, Power, 12–24 VDC IN	Shure 30252FT; Hosiden HEC0470–01–630
L101–L104	Ferrite Bead Ring	Shure 80A250; TDK BF30–3.4x6x1
L105–L109	Filter	Shure 22801FT; TDK ZBF503S–01
MP1	Battery Door Assembly (with hinge, lockscrew)	Shure 10209FT
MP2	Belt Clip (without screws)	Shure 53A1891
MP3	Knob, Inner (small)	Shure 95A8539
MP4	Knob, Outer (larger ring)	Shure 95B8539
101, Q103	Transistor, NPN	Shure 22603FT; Sanyo 2SD438FMP
Q102, Q104	Transistor, PNP	Shure 22604FT; Sanyo 2SB560FMP
Q105	Transistor, PNP	Shure 22605FT; Toshiba 2SA1015GR
Q106	Transistor, NPN	Shure 22606FT; Toshiba 2SC1851GR
Q107–Q111	Field Effect Transistor	Shure 22606FT; Siliconix SST177
R106/R127/R144/R157/R158	Potentiometer, Ganged, 100k/250k/250k/200k/200k, 20%, VOLUME	Shure 22206FT
S101–S102, S106	Switch, Slide, DPDT, MONO XLR LEVEL, STEREO LINE PAD, MONO/STEREO	Shure 55A8020; Nikkai AS–22AH
S103	Part of R106/R127/R144/R157/R158	
S104	Switch, DIP, DPST	Shure 22401FT; Fujisoku DSS2–02
S105	Switch, Slide, DPDT	Shure 22402FT; Nikkai SS–22SB112
T1	Transformer, Input	Shure 22501FT
U101	Integrated Circuit, Dual Op Amp	Shure 86A8953; Motorola MC33178P
U102	Integrated Circuit, Quad Op Amp	Shure 22601FT; Motorola MC33179P
U103	Integrated Circuit, Voltage Regulator	Shure 22602FT; Motorola MC7809CT

\*Commercial alternates are acceptable equivalents; for optimum performance, only direct replacement parts should be used.