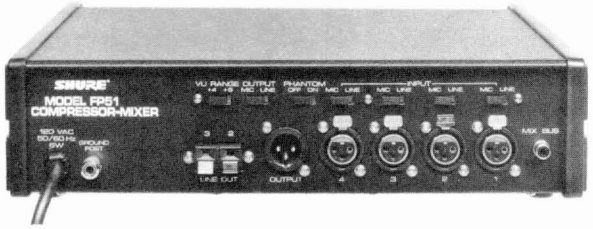
SHURE®
THE SOUND OF THE PROFESSIONALS
222 HARTREY AVENUE
EVANSTON, ILLINOIS 60202-3696 U.S.A.
PROFESSIONAL PRODUCTS



GENERAL

The FP51 is a compact, portable, high-quality gated memory compressor combined with a four-input, one-output microphone mixer. Designed for applications in broadcasting, recording and sound reinforcement, the FP51 integrates all the features of professional compressors and mixers in a single unit—small and lightweight enough for location use, but with the reliability of a studio console.

FEATURES

- 40 dB compression range, with compression ratio approximately 10:1 in normal operating range
- Gated memory minimizes "pumping," has LED indicator
- True average-responding compression maximizes output level regardless of peak-to-average ratio of program material. Peak-responding circuit reduces gain rapidly for significant increases in input signal
- Front-panel response rate adjustment (averaging time constant) compensates for variations in program material
- Extremely low distortion, noise and RF susceptibility, with wide, flat frequency response at all compression levels
- Reliable operation under wide temperature and humidity conditions
- Protected against damage from input overload and shorted outputs
- Four transformer-coupled XLR inputs, each microphone/line switchable with low-cut filter and cuing functions
- Phantom power for condenser microphone operation
- Built-in tone oscillator permits checking levels and testing lines
- Transformer-coupled XLR output with microphone/line switch
- Headphone jacks (1/4-inch and mini-3.5 mm) with level control
- Active, feedback-type input gain controls allow high-level input signals without input attenuators
- Illuminated triple-function VU meter indicates output level, dB compression and battery condition
- Powered by ac (120V or 240V—internally selectable) or built-in battery pack
- Low battery drain provides up to 10 hours operation under normal conditions
- Noiseless and automatic switchover to and from battery power without affecting compressor
- Rugged, durable construction
- Compact and lightweight for field use and transporting
- Rack-mountable with accessory rack mount kit
- Listed by Underwriters Laboratories Inc.; listed by Canadian Standards Association as Certified

SPECIFICATIONS

Frequency Response
30 to 20,000 Hz, ±2 dB

Voltage Gain (at 1 kHz)

INPUT	OUTPUT				
	LINE	MIC	MIX BUS	PHONES	PHONES (CUE)
Mic	105 dB	55 dB	25 dB	115 dB	95 dB
Line	55 dB	5 dB	−25 dB	65 dB	45 dB
Mix Bus	70 dB	20 dB	— —	80 dB	— —

Inputs

INPUT	IMPEDANCE (at 1 kHz)		INPUT CLIPPING LEVEL AT 1 kHz
	FOR USE WITH	ACTUAL	
Mic	25-600Ω mics	1k	−32 to −6 dBV*
Line	100 −10kΩ high-level sources	66k	+18 to +44 dBV*
Mix Bus	>3.5k	3.5k	+2 dBV

*Dependent on input control setting.

Outputs

OUTPUT	IMPEDANCE (at 1 kHz)		OUTPUT CLIPPING LEVEL AT 1 kHz, 5% THD
	FOR USE WITH	ACTUAL	
Mic	25-600Ω mic circuits	1 ohm or less	−34 dBV min. (150-ohm load)
Line	600 ohms	185 ohms	+18 dBm min. (600-ohm load)
Mix Bus	3.5k	3.5k	−7 dBV min. (3.5k load)
Headphones	8-2000 ohms	100 ohms	+7 dBV min. (200-ohm load)

Compressor

Threshold: −88 dBV typical at maximum input gain (mic); −38 dBV typical at maximum input gain (line)

Ratio: 8:1 minimum from 10 to 20 dB comprssion
5:1 minimum from 10 to 30 dB compression

Attack Time: 3 msec for level increases greater than 15 dB; 120 msec to 6 sec for increases of less than 15 dB

Recovery Time: 120 msec to 6 sec

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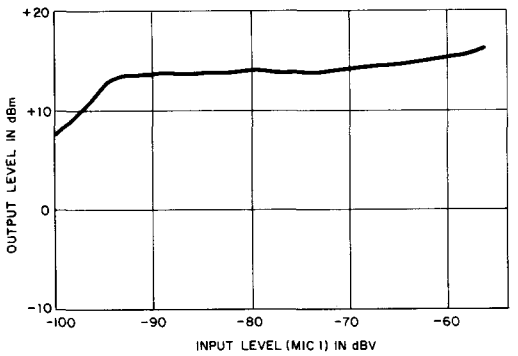


COMPRESSION SYSTEM
INPUT-OUTPUT CHARACTERISTICS
FIGURE 1

Gated Memory
Threshold: −90.5 dBV typical at maximum input gain (mic); −40.5 dBV typical at maximum input gain (line)
Recovery: In "hold" position, less than 20 dB gain recovery after 1 minute

VU Meter
Dual-range, 3-function (output level in dB, gain reduction in dB, battery check), illuminated (ac operation only)

Gated Memory/Peak Indicator
With meter switch in VU position, lights 6 dB below clipping; with meter switch in Comp position, lights when gated memory is "holding"

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: −77 dBV maximum (output control full counterclockwise [off]), −40 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), −38 dBV maximum (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 into 600 ohms

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

Low-Cut Filters
6 dB per octave rolloff at 150 Hz

Phase
All outputs in phase with respect to all inputs. Pin 2 is "high" with respect to pin 3; pin 1 is ground. Tip of mix bus jack in phase with pin 3. Tip and ring of headphone jacks in phase with pin 2

Tone Oscillator
1 kHz; +15 dBm minimum at line output with output level full up

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 27 mA typical no-signal, 30 mA typical at 0 VU (+4 dBm) output; 21.5 Vdc minimum; battery life approximately 10 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 9-1/32 in.)

Weight
Net: 2.75 kg (6 lb 1 oz)
Packaged: 3.25 kg (7 lb 3 oz)

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

CONTROLS AND CONNECTORS

Power Off-On Switch: applies power to the FP51 circuitry.

Channel Level/Cue Rotary Controls: adjust individual input channel signal levels. Each channel can be cued by pulling the control knob outward to the detent position, rotating the knob to the desired level, and pushing the knob inward to activate the channel.

Lo Cut Filter Slide Switches: reduce unwanted low-frequency signals such as wind noise by 6 dB per octave at 150 Hz.

Master Rotary Control: determines mixed output level at output connector. The control also sets the tone oscillator level when the **Tone Osc** switch is turned on.

Gated Memory/Peak LED: indicates, in gated memory mode, that gated memory is "holding" prior amount of compression during a low input signal, and turns off when input signal is above compression threshold. In peak mode, the LED indicates approaching program overload. It is activated by the shortest transient peak, but remains on long enough to provide easy recognition. The chart below shows the effect of **Compressor** and **Gated Memory** switches on indicator operation.

GATED MEMORY/PEAK LED FUNCTIONS

	***Gated Memory* off**	***Gated Memory* on**
Compressor out	Peak	No operation
Compressor in	Peak	Gated memory

VU Meter: indicates 0 VU with a +4 dBm output (recommended for normal use to provide approximately 14 dB headroom from operating level to clipping level) with **VU/Comp** switch in VU position. Rear-panel **VU Range +4/+8** slide switch permits changing to 0 VU = +8 dBm. With **VU/Comp** switch in Comp position, indicates compression due to input signal above threshold (lower meter scale). The VU meter is lit during ac operation only; therefore, the illumination serves as a visual alarm if the ac is interrupted and the unit has automatically switched to battery operation.

Batt Check Momentary Push-button Switch: operates in conjunction with the VU meter to indicate battery condition. With the **Power** switch on and the switch depressed, a new set of batteries will give about a +2 VU indication. Battery condition is good if the reading is above 0 VU; a lower reading means that new batteries are required for proper operation.

Gated Memory Slide Switch: disables the gated memory function without affecting other operations.

Response Rate Rotary Control: adjusts the compression system time constant to compensate for different types of program material. In general, a faster setting (toward the counterclockwise position) results in a more constant output level, but a more audible compression effect. Although the control setting is subjective, the following knob positions offer guidelines: speech −2; pop music −4; symphonic music −7.

Compressor Off-On Slide Switch: disables the compressor and gated memory functions, converting the FP51 to a standard microphone mixer.

Tone Osc Off-On Slide Switch: provides a highly stable, low-distortion 1 kHz tone for line tests and level checks. The tone signal level is controlled by the **Master Level** control. The tone signal appears on both the line and microphone outputs, as well as the **Headphones** and **Mix Bus** connectors. The tone oscillator should be switched off when not in use.

Headphones 1/4-inch Phone Jack and Miniature 3.5 mm Phone Jack: permit monitoring mixer output through most stereo headphones. The **Headphones** rotary control adjusts the output level of both jacks. Note that the headphones output level is high enough for use as an auxiliary unbalanced line feed to drive a tape deck or a power amplifier.

Input 1-4 XLR Connectors: are transformer-balanced, professional three-pin audio inputs. Pins 2 and 3 are "hot" and "neutral," and pin 1 is ground. For microphone operation, the **Input Mic/Line** switches must be in the Mic position; for line level inputs, the switches must be in the Line position.

Phantom Off-On Slide Switch: controls the application of phantom power for condenser microphones to all inputs. With the switch on and **Input Mic/Line** switches in the Mic position, +30 Vdc is applied to pins 2 and 3 of each input connector (power is automatically removed in the Line position). Series current-limiting resistance is 3.3 kilohms for each input. When using other than Shure microphones, verify that the voltage and resistance requirements are compatible.

Output XLR Connector: is a professional three-pin audio connector for connection to either low-impedance microphone or line-level inputs of power amplifiers, mixers, or other signal-processing equipment. The **Output Mic/Line** switch selects either microphone- or line-level output signals.

Line Out Push Terminals: provide direct wire connection to a balanced 600-ohm line. Terminals are in parallel with the 3-pin **Output** connector when the **Output Mic/Line** switch is in the Line position only. The red terminal is in parallel with pin 2 of the **Output** connector, and the black terminal is in parallel with pin 3. Note that the line-level output signal is always present on these terminals.

Mix Bus Phono Pin Jack: provides direct access to the output channel mixing bus. This facilitates stacking or "multing" FP51s to achieve additional input capacity without losing any inputs. With two FP51s connected at their **Mix Bus** jacks, for example, the mix buses of each unit are directly connected, providing two independent **Master** gain controls and two isolated line amplifiers with eight individually controlled inputs. Since the buses are directly connected, a 6 dB drop in the gain of each output channel will occur, and the **Master** or **Input** controls must be increased to compensate. Noise specifications are not adversely affected by this connection.

INSTALLATION AND OPERATION

Battery Operation

In addition to 120- or 240-volt ac operation, the FP51 can be operated from an internal battery pack. Current drain is typically 30 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 FP51 at full rated output. Duracell MN1604 or Eveready 522 batteries are recommended. Battery life is approximately 10 hours at +4 dBm continuous use. Note that phantom power loading will increase battery drain.

With batteries in the battery compartment, the FP51 will automatically and silently switch to battery operation should the ac voltage fall below a suitable level.

Battery condition can be determined using the **Batt Check** switch on the front panel. With the FP51 **Power** switch on, activate the **Batt Check** switch and observe the VU meter. A new set of batteries will give about a +2 VU indication. Battery condition is good if the reading is above 0 VU; a lower reading means that new batteries are required for proper operation.

Connections

Connect the signal sources to the three-pin XLR **Input** connectors. Connect the three-pin XLR **Output** connector and/or **Line Out** terminals to the input of a power amplifier, mixer, telephone line, etc. Set the **Output Mic/Line** switch for the appropriate signal level.

Refer to the Operating Hints section titled, Additional Inputs, for information on increasing the number of available microphone- or line-level inputs.

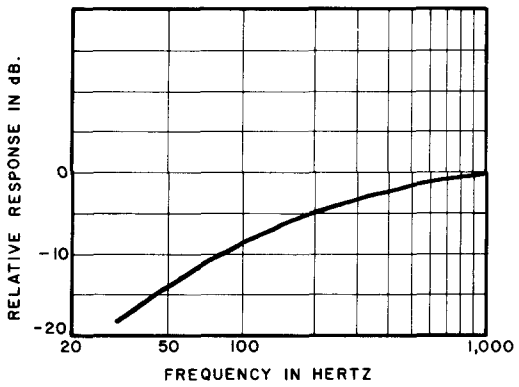
Connect headphones to the phone jack or 3.5 mm mini phone jack, if desired, for monitoring the FP51 output.

Connect the line cord to a 120 Vac ± 10%, 50/60 Hz source if the FP51 is to be ac-operated. If 240-volt ac operation is desired, refer to the Service section.

Adjustments

Turn the **Compressor** and **Gated Memory** slide switches on, the **VU/Comp** switch to Comp, and the **VU Range** switch to +4 or +8 dBm. Rotate the **Channel Level** and **Master Level** controls fully counterclockwise to 0, and set the **Response Rate** control for the program material to be used.

If desired, turn on the **Lo Cut Filter** switches above the **Channel Level** controls. The filter action will help reduce wind noise and undesirable low-frequency signals (see Figure 2).



LO CUT FILTER ACTION
FIGURE 2

Note that each input **Channel Level** control has a cuing capability. To cue a channel while the other channels are carrying program material, pull the desired **Channel Level** control outward to the cue position. This removes that channel from the mixing circuitry and routes it only to the **Headphones** jacks. Adjust the **Headphones** level control to a comfortable listening level, and adjust the cued **Channel Level** control for a proper mixing level. Restore the cued signal to the program mix by pushing the **Channel Level** control inward.

Turn on the **Power** switch and allow approximately 1 minute warmup time. The VU meter will light in ac operation. Turn the **Phantom** switch on if non-battery-operated condenser microphones are to be used with the FP51. (**Caution:** Do **not** turn the **Phantom** switch on when using **unbalanced** low impedance microphones.) Note that phantom power cannot be applied to the inputs with the **Mic/Line** switches in the Line position; if line-level condenser microphones (such as Shure's SM82) are to be operated on phantom power, contact Shure's Service department for modification instructions.

Turn on the **Tone Osc** switch. A dB compression reading of approximately 10 on the VU meter lower scale will result, and the **Gated Memory/Peak** LED will turn off.

Set the **VU/Comp** switch to VU and rotate the **Master** control for a 0 VU meter reading (upper scale). The tone signal can be heard in headphones connected to either phone jack. The tone signal can be used to calibrate equipment following the FP51.

Reduce the **Master** control setting for a −2 VU meter reading, and turn off the **Tone Osc** switch. The **Gated Memory/Peak** LED will turn on, indicating that the gated memory is "holding" the prior amount of compression. Note the **Master** control setting for future use. (Note: This output reduction is made to compensate for the moderate short-term output dynamic range encountered for speech using the

suggested response rate setting. A faster setting would eliminate the need, but compression would become more audible.)

Operation

Set the **VU/Comp** switch to Comp, and with an average sound level entering the Channel 1 microphone, set the Channel 1 **Level/Cue** control for an average compression reading of approximately 10 dB. This is the FP51's recommended operating level, because with this setting the unit can maintain a substantially constant output level for input reductions of 10 dB and increases of as much as 30 dB.

With the **VU/Comp** switch in the Comp position, observe the **Gated Memory/Peak** LED. It should remain off during speech input, and turn on during pauses between sentences and words (indicating that the compression level is being "remembered" during program lapses).

If the LED remains off or flickers with no spoken microphone input, the acoustic background noise level at the microphone is near or above the gated memory threshold. This can be corrected by reducing the Channel 1 **Level/Cue** setting until the **Gated Memory/Peak** LED stays on without speaking into the microphone. The compression level is then determined by the loudness of the talker and the talker's proximity to the microphones. This adjustment is very important for proper operation in installations with high background noise levels, such as sporting events or parades.

Program levels can be monitored by moving the **VU/Comp** switch to VU. The meter then indicates program output level (0 VU = +4 or +8 dBm). The VU meter is factory-calibrated for use with a 600-ohm terminated line. The **VU Range** switch on the rear panel selects either a +4 or a +8 dBm output at 0 VU meter indication. (This switch changes the meter indication but does not change the actual output level.) Microphone output levels are 50 dB below line output. The +4 range is recommended for normal use to provide approximately 14 dB of headroom from operating level to clipping level.

The VU meter is illuminated by a single cartridge-type, 6.3V incandescent lamp. The lamp is only lit for ac operation. Consequently, the illumination serves as a visual alarm if the ac is interrupted and the unit has automatically switched to battery operation.

The VU meter is connected on the primary side of the output transformer to assure protection from any dc level on a telephone line.

OPERATING HINTS

Large Input Level Changes

If the overall sound and noise levels at the microphone do not significantly change from those encountered during setup (as indicated by a compression meter reading of 0 to 20 dB), and if proper operation of the **Gated Memory** LED continues, further control adjustment is not necessary. However, if large changes in the signal and/or background noise at the microphone do occur, some **Channel Level** control readjustment may be advisable, based on changes in the compression meter reading and action of the **Gated Memory** LED. For example, a significant increase in background noise and signal may occur during an exciting part of a sporting event, so that the gated memory no longer "holds" during pauses and the compression reads higher than previously. A gradual reduction of the **Channel Level** setting will not be noticeable to the listener, due to the automatic effect of the compressor, but proper action will be restored.

During a later, more subdued part of the program, it may become apparent that the compression meter is reading near 0, and the **Gated Memory** LED does not always turn off during speech. A gradual increase in **Channel Level** setting will allow operation at the proper level. Thus, during operation, after setting the proper output level with the **Master** control, it is generally only necessary to monitor compression level on the compression meter and to observe proper action of the **Gated Memory** LED.

Control setting changes need only be made for long-term, large signal or noise level changes. It is not necessary to "ride gain" to maintain a constant line level output as measured on the VU meter, since that is the compressor's function.

Response Rate Adjustment

Proper setting of the **Response Rate** control for different types of program material is determined by subjective factors, that is, by the operator's individual perception of what constitutes "good sound." Generally, a slower setting will result in less audible compression, but a wider, short-term output dynamic range, i.e., a less consistent output level. A faster setting means a more constant output level, but the compression effect becomes more audible.

The **Response Rate** control setting can be changed during operation if desired. An initial setting guideline based on program material is: Speech—2; Popular Music—4; Symphonic Music—7. The output leveling effect can be observed for various settings by observing the VU meter (**VU/Comp** switch set to VU), while the subjective effect is monitored by listening on headphones.

Multiple Inputs

Up to four microphones or other input sources can be used with the FP51. With multiple sources, the overall "mixed" signal and background noise levels determine compression and gated memory action. For optimum results when several inputs are used, only the **Channel Level** controls for the channels in use should be turned up.

For a conference or conversation setup, with several "live" microphones but only one person talking at any time, each **Channel Level** control should be set so that each talker results in approximately the same amount of compression. At the same time, the overall level should be monitored for proper gated memory action.

Simultaneous Mixed Inputs

With simultaneous mixed inputs (up to four signal sources operating at the same time), the compressor automatically maintains a constant overall output level. Therefore, the balance of signal sources is easily adjusted using headphones. Simply observe the compression meter for normal operating range, and check the **Gated Memory** LED for proper action.

Automatic "Ducking"

The balance between two sound sources can be adjusted to produce automatic "ducking," that is, the lowering of one signal as another signal commences. A prime example of this technique is the lowering of the music level when an announcer's voice begins. This is accomplished by setting the **Channel Level** for the music source to a low compression level, say 5 dB (with the **VU/Comp** switch in the Comp position). Then the announcer's **Channel Level** is set for a higher level, say 15 dB. When the announcer speaks during musical numbers, the FP51 gain is reduced by 10 dB, "ducking" the music level 10 dB below the voice level. When the announcer stops speaking, the music returns to full output.

Additional Outputs

If more inputs than the four available on the FP51 are needed for the installation, another FP51 or any Shure mixer with a mix bus jack can be connected. Note that when the FP51 is used with a different mixer, a compressed output is available from the FP51 and an uncompressed output is obtained from the other mixer.

Inputs can also be added to the FP51 by connecting the line- or microphone-level output of another mixer to one of the FP51 inputs. The added mixed input signals will be processed by the compressor and gated memory if they are in use.

Excessive Ambient Noise

Under certain conditions, such as high noise levels, it may be impossible to adjust the **Channel Level** control so that the gated memory can consistently discriminate between background and program. If this happens, the **Gated Memory** switch should be turned off and the amount of dB compression reduced to minimize the audible effects of "pumping."

In extremely severe cases, compression should not be used at all, because the increase in background noise during pauses will be quite unpleasant. The FP51 can then be used as a high-quality linear mixer by turning the **Compressor** switch off and setting the **VU/Comp** switch to VU to monitor output level. As with any mixer, set the **Channel Level** control as high as possible without clipping, and set the output VU level with the **Master** control for optimum signal-to-noise ratio.

Fading with Compression

Input fading with a compressor is accomplished somewhat differently than with a linear mixer. Since a **slow** reduction of input level within the compression region is compensated by an automatic increase in gain, no audible fading will occur. Consequently, fading an input down should be done rapidly, at least to the point where the gated memory changes to the "hold" state.

For overall fades, use the **Master** control, since it affects only the output level, not the amount of compression.

Sound Reinforcement

Some care must be exercised when using the FP51 in sound reinforcement installations. Since the compressor can only reduce its gain when a signal exceeds its compression threshold, maximum gain occurs with low-level signals, and the sound reinforcement system's gain must be adjusted for stability (no ringing or howling) with no compressor gain reduction. This can be accomplished by adjusting system gain with the FP51's **Compressor** switch turned off. With proper system adjustment, the FP51 can be used to level the sound of a "wavering" talker, or to prevent power amplifier overdrive with extremely strong signals.

Single Input Program Compressor

If the FP51 is to be used as a single-input, permanently installed program compressor, the signal-to-noise ratio can be improved by disabling the remaining inputs, thus reducing the electrical noise of the mixing system. This modification is described in the Service section.

Telephone Interconnection

When using the FP51 connected directly to a telephone line, check to see whether the telephone company requires an interface coupler between the FP51 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. Connect the telephone line to the FP51 **Output** connector.

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 Out** terminals of the FP51 and attached to most telephone handsets.

Telephone Line Surge Protection

When using the FP51 connected directly to a telephone line subject to lightning-induced voltage surges, the following part (commercially available) can be installed across the **Output** connector to provide additional protection for output circuit components: Metal Oxide Varistor, General Electric Co., Type No. V22ZA1.

ACCESSORY

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 rack-mounting the FP51 with its cover in place and end caps removed in a standard 19 in. (483 mm) audio rack panel.

SERVICE

WARNING

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

The FP51 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 FP51 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 FP51) in the fuseholder marked F202.
4. Replace the ac line cord (if necessary) with one designed for the 240-volt source. If the FP51 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 FP51 rear panel with the new operating voltage.

Single Input Compressor

To disable Inputs 2, 3 and 4 so that the FP51 can operate as a single-input program compressor with an improved signal-to-noise ratio, follow these steps.

1. On the main board, locate interboard connector J302.
2. Lift the connector locking latch upward approximately 3 mm (1/8 in.) and carefully withdraw the ribbon cable from the connector.
3. Carefully bend leads 2, 3 and 4 approximately 45° to prevent their reentering the connector. Note that the board is marked with a "1" for the channel 1 lead.
4. Carefully reinsert the ribbon cable (leads 1 and 5-8) in the connector housing and depress the locking latch.
5. Mark the FP51 rear panel indicating that inputs 2, 3 and 4 are disabled. This modification will provide an improvement in signal-to-noise of approximately 2.5 dB.

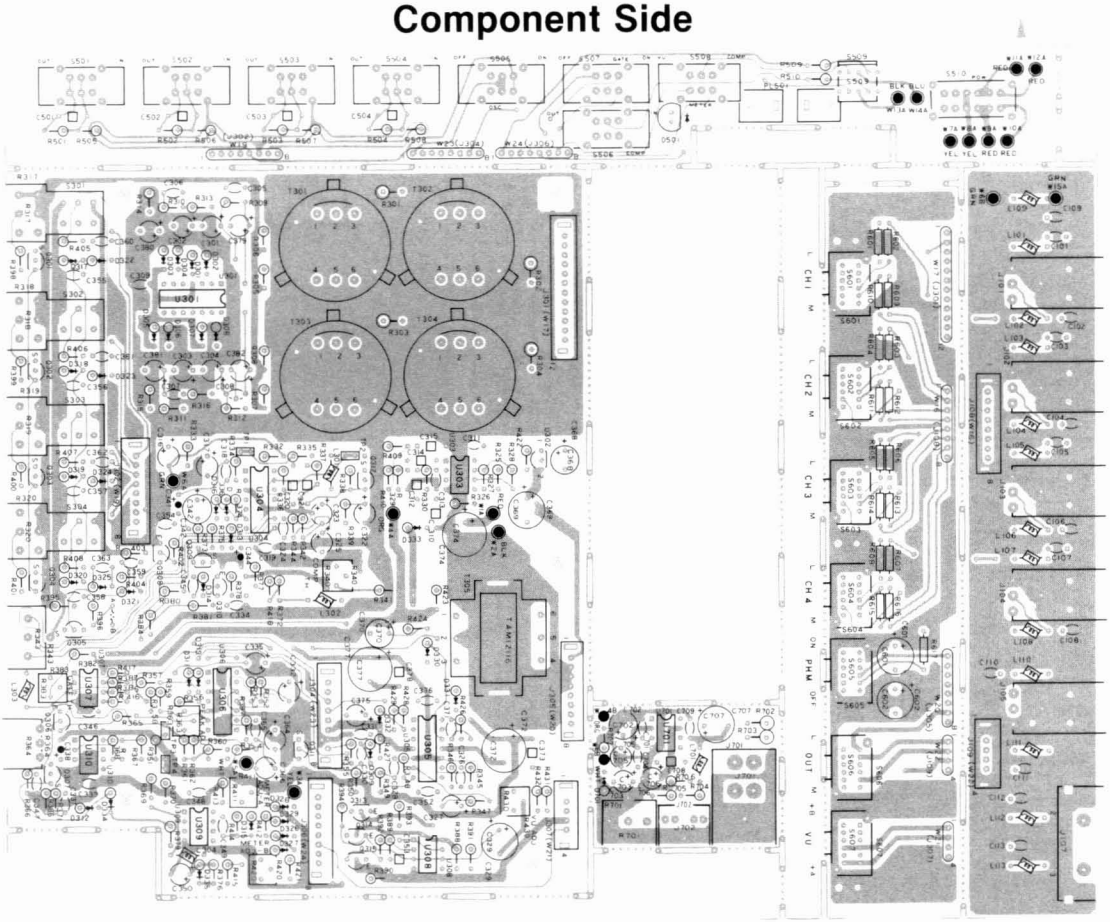
Lamp Replacement

To replace the VU meter lamp (PL501), locate the lamp directly behind the front panel and above the meter housing. Using a small screwdriver or fuse puller, carefully remove the cartridge-type lamp. Replace only with an identical lamp.

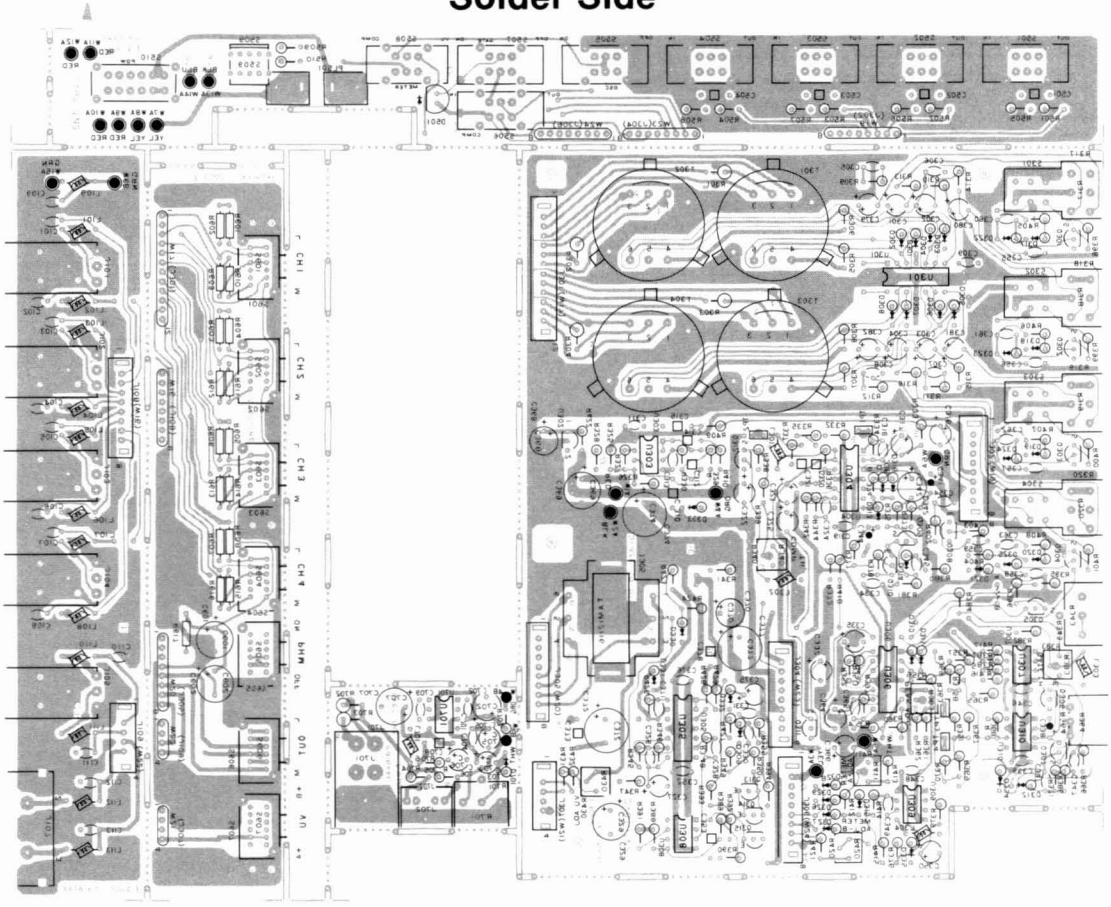
REPLACEMENT PARTS LIST

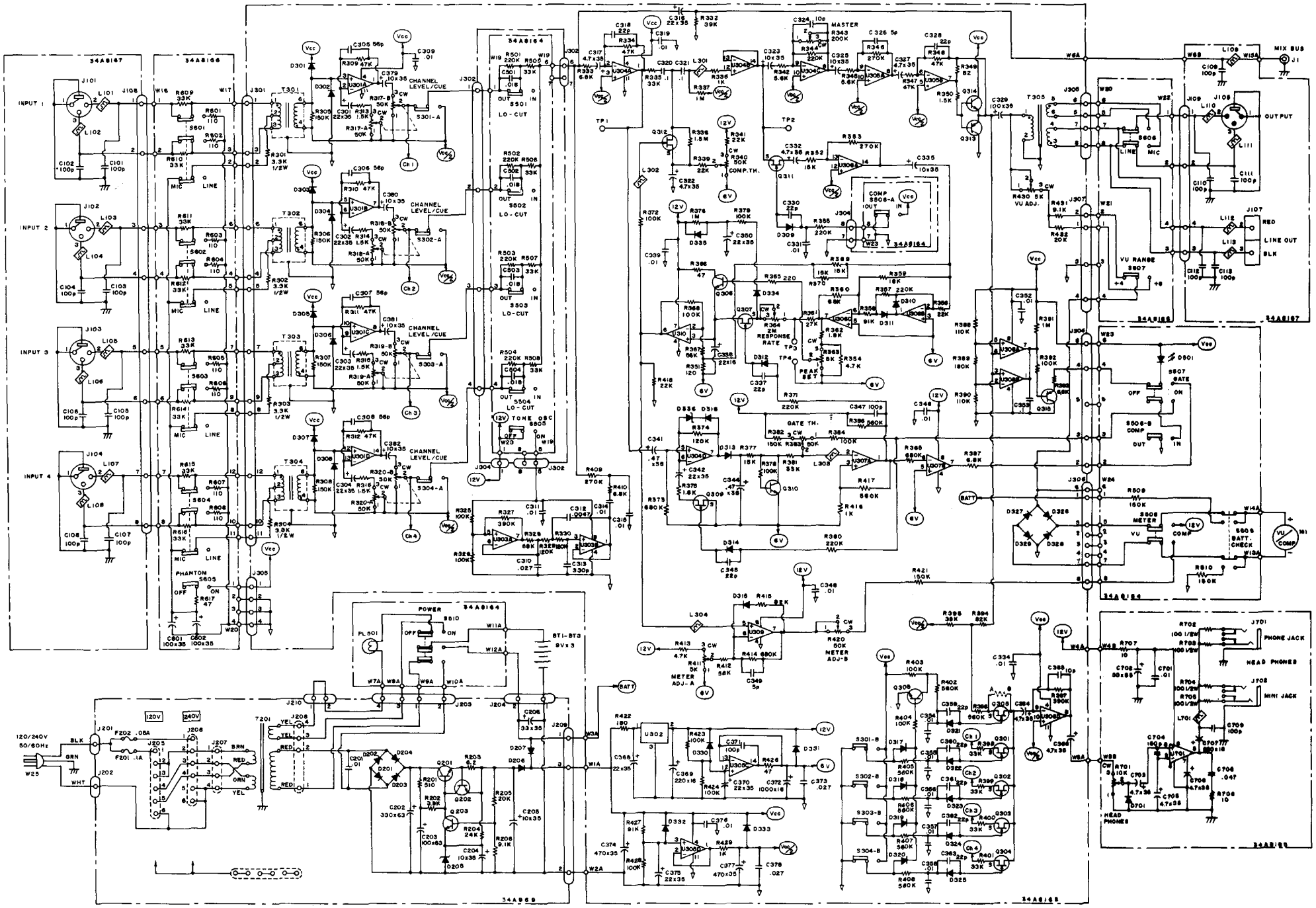
REFERENCE DESIGNATION	DESCRIPTION	SHURE PART NUMBER OR COMMERCIAL ALTERNATE
BT1-BT3	Battery, Alkaline, 9V	Duracell MN1604
C202	Capacitor, Electrolytic, 330 μF, 63V	Shure 60111FT; Sprague 503D337F063QG
C203	Capacitor, Electrolytic, 100 μF, 63V	Shure 40101FT; Sprague 503D107F050PD
C204-C205, C323, C325, C335, C379-C382	Capacitor, Electrolytic, 10, μF, 35V	Shure 60112FT; Sprague 503D107F050PD
C206, C702	Capacitor, Electrolytic, 33 μF, 35V	Shure 40102FT; Nichicon 1V330MAA
C301-C304, C316, C342, C350, C368, C370, C375	Capacitor, Electrolytic, 22 μF, 35V	Shure 40103FT; Sprague 503D226M050LA
C317, C322, C327, C332, C366, C703, C705-C706	Capacitor, Electrolytic, 4.7 μF, 35V	Shure 60105FT; Panasonic ECE-A35ZR7
C329, C601-C602	Capacitor, Electrolytic, 100 μF, 35V	Shure 60107FT; Nichicon 1V101MPA
C369, C707	Capacitor, Electrolytic, 220 μF, 16V	Shure 30107FT
C372	Capacitor, Electrolytic, 1000 μF, 16V	Shure 10112FT; Nichicon 1C102MRA
C374, C377	Capacitor, Electrolytic, 470 μF, 35V	Shure 60108FT; Sprague 503D477F035QE
D201-D204, D206-D207	Diode, Silicon, 100V, 1/2A	Shure 86A404; Motorola 1N4002
D205	Zener Diode, 9V, 1/2W	Shure 60202FT; Motorola 1N5239
D301-D312, D314-D325, D330-D333, D701	Diode, Computer, 75V	Shure 86A415, TI/GE 1N4148
D313, D326-D329	Diode, Germanium	Shure 86A405; RCA SK3087 (1N48)
D336	Zener Diode, 5.6V	Shure 50201FT; Motorola 1N56232A
D501	Diode, Light-Emitting, Red	Shure 60206FT; Rohm SLR340R3
F201	Fuse, Slow-Blow, 3AG, 0.1A, 250V	Shure 80F159; Littelfuse 313.100
F202	Fuse, Time Delay, 0.05A, 250V	Shure 60208FT; Littelfuse 218.050
J1	Phono Pin Jack (Mix Bus)	Shure 50202FT
J101, J104	Connector, 3-Socket XLR (Input)	Shure 60216FT; Cannon XLB-3-31PCV
J105	Connector, 3-Pin XLR (Output)	Shure 60217FT; Cannon XLB-3-32PCV
J107	Dual Push Terminal (Line Out)	Shure 10202FT
J701	Phone Jack, 3-Circuit Switching (Headphones)	Shure 60218FT
J702	Mini Phone Jack, 3-Circuit Switching (Headphones)	Shure 20203FT
L101-L113, L301-L304, L701	Ferrite Bead Ring	Shure 60219FT; Stackpole 57-3425
M1	Meter, VU/Comp	Shure 50203FT
MP1	Knob (Channel Level/Cue)	Shure 50204FT
MP2	Knob (Master Level)	Shure 50205FT
MP3	Knob (Response Rate & Headphones)	Shure 30206FT
PL501	Lamp, Meter, 6.3V, 150 mA	Shure 40210FT
Q201	Transistor, NPN	Shure 86A8302; TI TIP30A
Q202-Q203, Q306, Q308, Q310	Transistor, NPN	Shure 86A350; Motorola 2N5210
Q301-Q305, Q311-Q312	Field Effect Transistor	Shure 86A329; Motorola 2N5458
Q307, Q309	Field Effect Transistor	Shure 50601FT
Q313, Q315	Transistor, PNP	Shure 86A335; Rohm TIS93
Q314	Transistor, NPN	Shure 86A334; Rohm TIS92
R317-R320	Potentiometer, Dual 50k/50k (Channel Level/Cue)	Shure 50301FT
R340, R383, R420	Potentiometer, Trimmer, 50k	Shure 50303FT
R343	Potentiometer, CW Audio Taper, 200k (Master)	Shure 50304FT
R363, R411, R430	Potentiometer, Trimmer, 5k	Shure 50305FT
R364	Potentiometer, Linear Taper, 2M (Response Rate)	Shure 50306FT
R701	Potentiometer, CW Autio Taper, 10k (Headphones)	Shure 50311FT
S301-S304	Part of R317-R320	– –
S501-S508	Switch, Slide DPDT (Lo Cut, Tone Osc, Compressor, Gated Memory, VU/Comp)	Shure 50401FT
S509	Switch, Push-button (Batt Check)	Shure 50402FT; Alco TPB21RG-PC6
S510	Switch, Slide, 4PDT (Power)	Shure 50403FT; Alco MSS4200
S601-S604, S606	Switch, Slide, 4PDT (Mic/Line)	Shure 60402FT; Alco MSS4200RG
S605, S607	Switch, Slide, 4PDT (Phantom, VU Range)	Shure 60403FT; Alco MSS4200R
T201	Transformer, Power	Shure 50501FT
T301-T304	Transformer, Input	Shure 50502FT
T305	Transformer, Output	Shure 60502FT
U301, U304-U306	Integrated Circuit, Op Amp	Shure 86A808A; Raytheon RC4156DB
U302	Integrated Circuit, Op Amp	Shure 50601FT; National LM78L12C
U303, U309	Integrated Circuit, Op Amp	Shure 50602FT; TI TL062D
U307-U308	Integrated Circuit, Dual Comparator	Shure 60604FT; Motorola LM393M
U310	Integrated Circuit, Op Amp	Shure 50603FT; TI TL071
U701	Integrated Circuit, Audio Amp	Shure 30601FT; National LM386N-4
W25	Line Cord and Plug, 3-Conductor Grounded, 1.8m (6 ft)	Shure 95A8015

PRINTED CIRCUIT BOARDS
Component Side



PRINTED CIRCUIT BOARDS
Solder Side





NOTE

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.

U301, 304, 305, 306	:	RC4156DB
U303, 309	:	NJM082D
U307, 308	:	NJM29030
U310	:	TL071
U701	:	NJM386D

A5007-11-1

MODEL FP51 CIRCUIT DIAGRAM