GENERAL

The Shure Model PE610 Feedback Controller is designed to improve sound reinforcement systems by allowing the user to smooth out major irregularities in the overall frequency response which limit gain before feedback. Conveniently arranged inputs, outputs, and controls simplify installation and adjustment in either new or existing systems.

The PE610 can also be used as a guitar preamplifier (between the guitar and guitar amplifier). It can provide special effects by adjusting the guitar sound in each octave. It also provides additional gain, allowing longer sustained notes and facilitating the production of guitar acoustic feedback sounds.

The operating controls consist of eight linear-motion potentiometers to allow gain reduction in each of eight octave frequency regions, high- and low-frequency roll-off switches, a filter level (volume) control, and a bypass/filter mode switch. Inputs for high-impedance microphone, instrument and auxiliary high-level lines are available. Outputs are for microphone, guitar amplifier and power amplifier level lines.

Features include:
- Eight dip filters with depth individually adjustable from 0 to approximately 12 dB, with nominal center frequencies at 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hertz.
- Switches to insert 6 dB-per-octave roll-offs outside the frequencies covered by the dip filters.
- Unity gain in bypass mode for convenient installation in microphone, instrument or auxiliary lines.
- Filter level control, disabled in bypass mode, allows convenient increase of system gain as filters are adjusted.
- Phone jack input connector, switchable for high-impedance microphones or instruments.
- Phone jack input connector, switchable for microphone input preamplifier when a phono plug is inserted.
- Phone pin jack, switch type, for auxiliary input. When a plug is inserted in auxiliary input the microphone input is automatically disabled.
- Phone pin jack for power amplifier output, usable simultaneously with microphone output and guitar amplifier output.
- Phone jack for guitar amplifier output, usable simultaneously with microphone and power amplifier output.
- Male professional three-pin audio connector for microphone output, switchable for low or high impedance.
- Low hum, noise, and rf susceptibility.
- Listing by Underwriters' Laboratories, Inc. and listing by Canadian Standards Association as certified.
- Jacks for external dc supply.
The phono pin jack marked OUTPUT TO POWER AMPLIFIER is a high-impedance, high-level output designed primarily to feed a power amplifier or auxiliary input requiring 0.1 to 2 volts.

The phono jack marked OUTPUT TO GUITAR AMPLIFIER is designed to feed a guitar or similar instrument amplifier input requiring 15 to 300 millivolts.

Accessory 30 Volts DC

These rear panel jacks are used as a power input when using the Model A67B Battery Power Supply (Accessory).

Controls

Power Switch and Pilot Light:

The power ON-OFF switch controls operation of the unit when it is powered either by the ac line or by an external dc source. The pilot light indicates operation only when ac power is used.

FILTER FREQUENCY Controls:

The eight linear-motion FILTER FREQUENCY controls located on the front panel are used for adjusting the level of eight octave-spaced bands having center frequencies of 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, and 8 kHz respectively. The levels of the octave-spaced bands are individually and continuously adjustable from flat at full up position to approximately 12 dB cut at full down position. Figures B1 and B2 illustrate the frequency response characteristic of each octave filter when adjusted for 6 dB cut and full cut.

BELOW 63 and ABOVE 8K Switches:

The BELOW 63 Slide Switch reduces the gain of frequencies below the 63 Hz octave band when placed in the down position, and the ABOVE 8K Slide Switch reduces the gain of frequencies above the 8 kHz octave band when placed in the down position. Figure C shows the frequency response characteristics of these filters.

MODE (Filter-Bypass) Switch:

In the BYPASS position, the MODE switch disables the filters and the FILTER LEVEL Control and sets gain from AUX INPUT to OUTPUT TO POWER AMPLIFIER or MICROPHONE INPUT to MIC OUTPUT, at approximately unity. The filters and FILTER LEVEL Controls are operative in the FILTER position.

FILTER LEVEL Control:

The FILTER LEVEL Control provides up to 24 dB gain when the MODE Switch is in the FILTER position, as well as gain reduction below unity. The FILTER LEVEL Control is used to increase system gain as filters are adjusted. A FILTER LEVEL setting of approximately 4 provides unity gain with the MODE Switch in the FILTER position and all FILTER FREQUENCY Controls in the full up position.

INSTALLATION:

The PE610 is typically connected in the auxiliary, high-level line between the mixer/preamplifier and the power amplifier, or between the microphone and the mixer/preamplifier in single-microphone systems. Any combination of inputs and outputs available may be used, however, according to the particular needs of the user.

To use the PE610 to equalize a single microphone in a Shure Vocal Master (VA300 or VA302) system, connect the microphone to the PE610 INPUT and the PE610 MIC OUTPUT to a Vocal Master Console MICROPHONE INPUT. Set the PE610 MIC OUTPUT IMPEDANCE Switch to HI (for VA300) or LO (for VA302). Additional PE610s may be added, one per channel, to provide an optimum feedback control system.

To use a single PE610 to provide overall equalization of a Vocal Master Console, connect a length of low-capacitance, single-conductor, shielded cable with phone plugs attached to each end between the Console ECHO/TO INPUT jack and the PE610 INPUT connector and set the INPUT switch to INSTRUMENT. Connect a similar cable between the Console ECHO/TO OUTPUT jack and the PE610 OUTPUT TO GUITAR AMPLIFIER connector. Set all the Console REVERB IN/OUT switches to the OUT position. Note that this hook-up removes the reverb signal from those Console channels being equalized. The reverse is also true: when individual channel REVERB switches are activated (in), those channels will not be equalized by the PE610. This set-up is ideal for sound systems not requiring reverberation.

To maintain reverberation capability using a single PE610 with a Vocal Master Console, connect the PE610 INPUT as described in the preceding paragraph. Connect the PE610 MIC OUTPUT to the channel 6 INPUT of the Console and set the PE610 MIC OUTPUT IMPEDANCE switch to HI (for VA300) or LO (for VA302). Set the REVERB IN/OUT Switches on channels 1 through 5 to OUT and channel 6 to IN. Preset channel 6 VOLUME to 5. Microphone inputs 1 through 5 are combined in the Console and sent to the PE610 for equalization. The equalized signal re-enters the Console on channel 6 and is switched to the reverberation circuit for a total reverberation effect.

OPERATION

NOTE: Before adjusting the PE610, try to approximate the performance conditions (microphone and speaker placement, curtains, etc.). If the microphones are to be moved during the per-
1. Connect line cord to ac power source or use A67B Battery Power Supply.

Set panel controls as follows:
- ON-OFF Slide Switch to ON position.
- Mode Slide Switch to BYPASS position.

BELOW 63 and ABOVE 8K Slide Switches to flat (up) position.

All eight FILTER FREQUENCY Controls to full up position.

FILTER LEVEL Control to Zero (fully counter-clockwise).

2. Adjust the amplifier gain of the sound system (using the mixer/preamplifier or power amplifier volume control) until feedback becomes apparent. Reduce the gain setting until it is comfortably below the feedback level.

3. Set MODE Slide Switch to FILTER position. Increase FILTER LEVEL Control until feedback squeal or ringing is heard.

4. If the feedback sound is high pitched, one of the four high-frequency FILTER FREQUENCY Controls (1K through 8K) will be most effective in eliminating the feedback. Individually move each FILTER FREQUENCY Control slowly from top downward and back to top while listening to the feedback. The control which eliminates feedback with the least motion should then be moved down only so far as necessary to eliminate the feedback.

5. If the feedback frequency happens to fall between the bands covered by two adjacent controls, then it may be necessary to move both controls down to obtain the desired feedback suppression.

6. If the feedback sound first noted in step 4 is of a low frequency, then the adjustment procedure should be started using the low-frequency (63 through 500) FILTER FREQUENCY Controls.

7. Having eliminated the first feedback condition, increase the gain of the sound system with the FILTER LEVEL Control until feedback is again noted. Repeat the procedures of the preceding steps 3 through 6 to eliminate the new feedback condition. This may require adjustment of a different FILTER FREQUENCY Control or may require a further decrease in the control or controls previously moved down.

8. Repeat step 7 until either (a), one or two FILTER FREQUENCY Controls has been set to maximum attenuation, or (b), feedback appears to occur at more than one frequency simultaneously. Do not reduce the setting of any FILTER FREQUENCY Controls more than necessary to stop ringing or squealing during the above procedure.

9. Conduct a talk test through the sound system with the MODE Switch set to FILTER and listen for ringing. If ringing is noted, attempt to eliminate it by a slight decrease in the setting of the FILTER LEVEL Control or further decrease in the appropriate FILTER FREQUENCY Control setting.

10. During the above procedure, it will not usually be necessary to set either the BELOW 63 or ABOVE 8K Switches to the down position to eliminate feedback unless the pitch of the feedback is extremely low or extremely high. These switches are primarily intended for improving overall sound quality or tonal balance, if necessary. After feedback has been eliminated as outlined above, actuate each switch and note the tonal character of the system during the talk test. It will usually be advantageous to actuate the BELOW 63 Switch if the 63 FILTER FREQUENCY Control is set below 6, and to actuate the ABOVE 8K Switch if the 8K FILTER FREQUENCY Control is set below 6.

11. Conduct a talk test and compare the system sound quality with the MODE Switch in each position. The FILTER mode should have improved quality over the BYPASS mode. If it does not, reduce the amount of equalization by moving the FILTER FREQUENCY controls up and decreasing the FILTER LEVEL Control setting. Note that excessive equalization can produce sound inferior to that of the original, unequalized sound.

SPECIFICATIONS

Voltage Gain (Frequency 1000 Hz, no filters activated):

Bypass Mode:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo-Imp. Mic.</td>
<td>-23.6 dB</td>
</tr>
<tr>
<td>Hi-Imp. Mic.</td>
<td>-41.6 dB</td>
</tr>
<tr>
<td>To Pwr. Amp.</td>
<td>-47.6 dB</td>
</tr>
<tr>
<td>To Guitar Amp.</td>
<td></td>
</tr>
</tbody>
</table>

Filter Mode (FILTER LEVEL Control full clockwise):

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo-Imp. Mic.</td>
<td>+2.0 dB</td>
</tr>
<tr>
<td>Hi-Imp. Mic.</td>
<td>-16.0 dB</td>
</tr>
<tr>
<td>To Pwr. Amp.</td>
<td>-22.0 dB</td>
</tr>
<tr>
<td>To Guitar Amp.</td>
<td></td>
</tr>
</tbody>
</table>

Frequency Response (BYPASS mode or FILTER Mode, no filters activated):

Flat ±2 dB, 40 Hz to 20 kHz.

Hum and Noise, Maximum:

Equivalent Input Hum and Noise, High-impedance Mic., 33 kilohm Source, 20-20 kHz: 100 dB below 1 volt.

Equivalent Input Noise, High Impedance Mic., 33 kilohm Source, 300-20 kHz: 103 dB below 1 volt.

POWER AMPLIFIER OUTPUT Hum and Noise, 20-20 kHz: 71 dB below 1 volt.

POWER AMPLIFIER OUTPUT Noise, 300-20 kHz: 73 below 1 volt.

Output Clipping Levels, Minimum:

MIC OUTPUT (LO): 22 mV
MIC OUTPUT (HI): 330 mV
OUTPUT TO POWER AMPLIFIER: 5 volts.
OUTPUT TO GUITAR AMPLIFIER: 750 mV.

Input Clipping Levels, Minimum:

MICROPHONE INPUT: 450 mV
INSTRUMENT INPUT: 3.6 volts
AUX INPUT: 5 volts

Total Harmonic Distortion:

0.5% maximum THD at 1 kHz, at POWER AMPLIFIER OUTPUT level of 1 volt in BYPASS or FILTER mode with FILTER LEVEL Control full up.

Impedances:

<table>
<thead>
<tr>
<th>Input</th>
<th>Designed for Use With</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microphone</td>
<td>[High impedance microphones]</td>
<td>200 kilohms ±20%</td>
</tr>
<tr>
<td>Instruments</td>
<td>115 kilohms ±20%</td>
<td></td>
</tr>
<tr>
<td>Aux</td>
<td>High Level Sources</td>
<td>50 kilohms ±20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Designed for Use With</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo-Imp. Mic.</td>
<td>25 to 600 ohm microphone circuits</td>
<td>60 ohms ±20%</td>
</tr>
<tr>
<td>Hi-Imp. Mic.</td>
<td>High impedance microphone circuits</td>
<td>5.0 kilohms ±20%</td>
</tr>
<tr>
<td>To Power Amplifier</td>
<td>[High impedance — instruments]</td>
<td>1.0 kilohms ±20%</td>
</tr>
</tbody>
</table>

To Guitar Amplifier (greater—unbalanced aux circuits) | 8.2 kilohms ±20% |
Phase:
Tip of MICROPHONE/INSTRUMENT INPUT is in phase with pin 3 of the MIC OUTPUT and out of phase with the tip of TO POWER AMPLIFIER and TO GUITAR AMPLIFIER OUTPUTS and the tip of the AUX INPUT.

Filter Characteristics:
Moving FILTER FREQUENCY Control from 0 to 12 reduces gain by 12 dB ±2 dB at frequency of maximum attenuation. This center frequency is within ±20% of nominal frequency. One octave from center frequency, moving FILTER FREQUENCY Control from 0 to 12 reduces gain by 3.5 dB ±1 dB.
BELOW 63 Switch: 6 dB per octave slope, 9 dB down (±2 dB) at 20 Hz.
ABOVE 8K Switch: 6 dB per octave slope, 8 dB down (±2 dB) at 20 kHz.
Typical filter frequency response characteristics are shown in Figures B and C. Filters are electrically isolated for minimum phase interaction.

Operating Voltage:
Ac Operation: 108-132 volts, 50/60 Hz, 3 watts
Dc Operation: 30 volts ±20% at approximately 12 mA.

Temperature Range:
Operating: −7°C to 57°C (20°F to 135°F)
Storage: −29°C to 71°C (−20°F to 160°F)
Net Weight: 1.8 kg (3 lb, 13 oz)
Packaged Weight: 2.4 kg (5 lb, 3¾ oz)
Dimensions: See Figure D.

OPTIONAL ACCESSORIES
Battery Power Supply .......... Model A67B
Handle/Tilt Stand .......... Model A67H
Output Cable Kit .......... Model A68C
Locking Panel .......... Model A68L
Rack Panel Kit .......... Model A68R
Stacking Kit .......... Model A68S
Interconnecting Cable .......... Model A68SC
Attaché Case .......... Model AC60
Line Matching Transformer ... Model A95 Series

GUARANTEE
This Shure product is guaranteed in normal use to be free from electrical and mechanical defects for a period of one year from the date of purchase. Please retain proof of purchase date. This guarantee includes all parts and labor.

Shipping Instructions
Carefully repack the unit and return it prepaid to the factory. If outside the United States, return the unit to your dealer or Authorized Shure Service Center for repair. The unit will be returned to you prepaid.
## PRINTED CIRCUIT BOARD ASSEMBLY

### PARTS LIST

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SHURE PART NO.</th>
<th>SHURE KIT NO.</th>
<th>QTY. IN KIT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1, D2</td>
<td>86A404</td>
<td>RKC21</td>
<td>4</td>
<td>DIODE, SILICON, 1N4002 OR EQUIVALENT</td>
</tr>
<tr>
<td>J1</td>
<td>95B634</td>
<td></td>
<td></td>
<td>PHONO JACK WITH SWITCH</td>
</tr>
<tr>
<td>J2, J7</td>
<td>95T432</td>
<td></td>
<td></td>
<td>PHONE JACK</td>
</tr>
<tr>
<td>J3</td>
<td>95A198</td>
<td>RKC122P</td>
<td>1</td>
<td>OUTPUT CONNECTOR</td>
</tr>
<tr>
<td>J4</td>
<td>95C450</td>
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<td></td>
<td>PHONO JACK</td>
</tr>
<tr>
<td>J5, J6</td>
<td>95A226, 95B226</td>
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<td></td>
<td>D.C. RECEPTACLE, BLACK AND RED</td>
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<tr>
<td>K1</td>
<td>90A1662</td>
<td>RKC6</td>
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<td>KNOB</td>
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<tr>
<td>K2-9</td>
<td>90A204</td>
<td></td>
<td></td>
<td>KNOB AND SLEEVE</td>
</tr>
<tr>
<td>PL1</td>
<td>80A79</td>
<td>RKC45</td>
<td>1</td>
<td>NEON PILOT LIGHT ASSEMBLY (RESISTOR INTERNAL)</td>
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<tr>
<td>Q101, Q103, Q105, Q107</td>
<td>86A350</td>
<td>RKC89</td>
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<tr>
<td>Q102, Q104, Q106, Q108</td>
<td>86A348</td>
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<td>NPN SILICON TRANSISTOR, HIGH GAIN, LOW NOISE, SIMILAR TO MOTOROLA 2N5087</td>
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<tr>
<td>Q109, Q116</td>
<td>86C349</td>
<td>RKC9</td>
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<td>NPN SILICON TRANSISTOR, HIGH GAIN, LOW NOISE, SIMILAR TO MOTOROLA MPS6521</td>
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<tr>
<td>R5</td>
<td>46A021</td>
<td>RKC3</td>
<td>1</td>
<td>ROTARY POTENTIOMETER, 50K, AUDIO TAPER</td>
</tr>
<tr>
<td>R6-R13</td>
<td>46A045</td>
<td>RKC10</td>
<td>4</td>
<td>SLIDE POTENTIOMETER, 250K, AUDIO TAPER</td>
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<tr>
<td>S1, S2</td>
<td>55A44</td>
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<td>SLIDE SWITCH, DPDT</td>
</tr>
<tr>
<td>S3</td>
<td>55B103</td>
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<td>SLIDE SWITCH, DPDT, 3 AMP., WITH SOLDER SHIELD</td>
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<tr>
<td>S4</td>
<td>55B107</td>
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<td>SLIDE SWITCH, DPDT</td>
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<tr>
<td>S5, S6</td>
<td>55B63</td>
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<td>SLIDE SWITCH, DPDT</td>
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<td>T2</td>
<td>90B2150</td>
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<td>TRANSFORMER AND SHIELD ASSEMBLY</td>
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<td>T3</td>
<td>91A255</td>
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<td>POWER TRANSFORMER</td>
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MODEL PE610
FEEDBACK CONTROLLER CIRCUIT DIAGRAM