

AS100

POWERED AUTOMATIC MIXER

OPERATING INSTRUCTIONS and trouble-shooting guide

LECTROSONICS, INC.

Rio Rancho, NM

INTRODUCTION

The AS100 is the first automatic mixer to include an integrated equalizer and 100 watt power amplifier in a single, cost-effective package. Although the AS100 is an affordable unit, performance is equivalent to much more expensive separates. The AS100 has 6 input channels which will accept either mic or line level signals. The AS100 is an ideal choice for small churches, conference rooms, or anywhere a state of the art integrated automatic mixer is desirable.

The AS100 has many features not found in systems composed of separate components. The equalizer is a Constant-Q attenuation type. The Constant-Q topology minimizes adjacent band interaction, and the filter bandpass characteristics stay substantially the same for all attenuation levels. A variable low frequency roll-off (20Hz-300Hz) is also part of the AS100 equalization. 10 bands of 1/3 octave filters are included in the 315Hz-2.5KHz region, to allow precise equalization of the voice band. In addition, 1 octave filters at 5KHz and 10KHz permit shaping the system response above the voice band.

The AS100 includes an automatic (switchable to manual) ambient threshold sensing circuit to eliminate the need to adjust the ambient threshold for varying background noise conditions. This makes the initial setup of the AS100 quick and simple. A Last Mic Hold function is also included. With Last Mic Hold in the "On" position, the last active mic is held in the open mode until another microphone comes on. In this way, much better performance is achieved in marginal situations (i.e. very soft talkers, or talkers who turn away from the mic).

Each channel is jumperable EQ or NON-EQ to allow use of microphones or recorded music. The microphone channels may be jumpered for equalization to smooth house response. The channel which is used for recorded music (or other line sources) may be jumpered to bypass the EQ, to permit flat response. Each channel also has remote volume control capability by the addition of a single linear potentiometer per channel. In addition, the Main level may also be remotely controlled. A line output is provided for auxiliary feed or tape recording.

The 100 watt power amplifier in the AS100 includes peak limiting to minimize distortion at high signal levels. The power amplifier is connected to the speaker output through a relay, which provides delayed turn-on and instant turn-off to eliminate any transients when turning power on or off. The amplifier is DC, thermal, and short circuit protected.

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GENERAL TECHNICAL DESCRIPTION

Please refer to the block diagram of the AS100 for the following discussion.

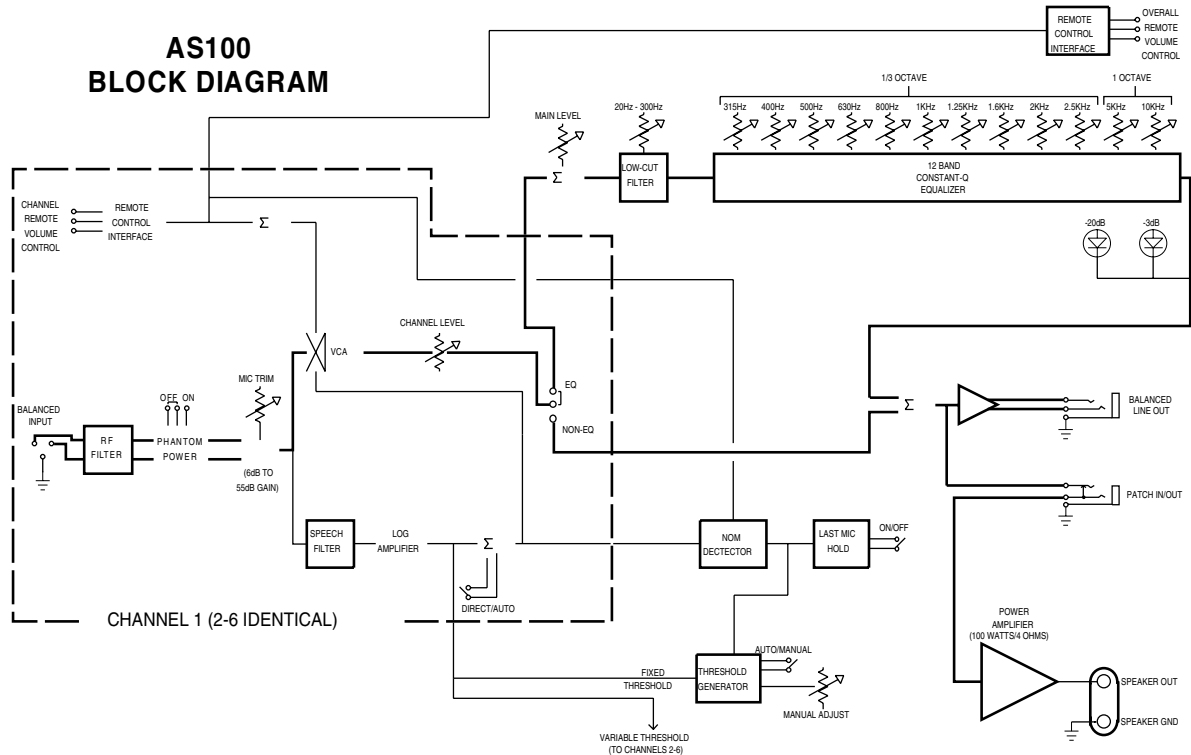


Figure 1 - AS100 Block Diagram

The microphone preamp is designed around an ultra-low noise, dedicated preamplifier IC. This IC provides noise and distortion performance previously available only in discrete preamp designs. The preamp is fully balanced and RF protected. Phantom power (21 Volts) is jumperable on each channel to accommodate both dynamic and electret type microphones. The gain of the preamp is variable via a rear panel trim pot from 6dB to 55dB of gain. This adjustment of gain range allows the preamp to accept signals from mic to line level, while optimizing the preamp gain for any input signal level.

The microphone preamp feeds a low noise Voltage Controlled Amplifier (VCA). The VCA implements the automatic function, as well as allowing remote level control of any channel by means of a linear potentiometer.

The AS100 has two modes of operation for each channel; Auto and Direct. The operational mode is selected via the front panel Auto/Direct switch on each channel. In the Direct mode, the channel is always on. The Direct mode is analogous to a standard channel in a non-automatic mixer. In the Auto mode, each channel is attenuated 15dB when there is no activity on the channel. When activity is detected, the channel gain increases 1dB for each 1dB that the input signal level is above threshold. The channel gain increases for 15dB, until channel attenuation is unity (0dB). After channel attenuation reaches unity, no more gain modulation occurs even if signal levels continue to increase. This 2:1 gain modulation gives a smooth transition from full attenuation to unity gain, unlike the choppy action of automatic mixers that use gates (i.e. instantaneous change from full attenuation to unity gain).

The presence or absence of signal is determined by the Speech Filter and Log Amplifier section. Speech signals are filtered to emphasize the voice band, and converted to decibels by the log amplifier. The signal is then compared against the instantaneous value of the Fixed Threshold plus the Variable Threshold, and the appropriate channel gain is derived. The Variable Threshold introduces a threshold offset proportional to the signal to prevent sound from the system loudspeakers from turning on unused microphones.

The level of individual channels is adjusted by the front panel Channel Level control. Each channel is jumperable to EQ or no EQ. This allows a channel to be either equalized or unequalized. Typically, channels using microphones as their source would be jumpered for equalization, and the AS100 equalizer would provide equalization of the acoustic space. Line level signals, such as recorded music, would normally be jumpered to bypass the equalizer, to give flat frequency response reproduction. Note that when a channel is jumpered for bypass, the volume of that channel will not be affected by the Main Level control. In this way, the volume level of a line source may be preset using the Channel Level control, and will not be disturbed if the system volume is adjusted via the Main Level control.

The Equalized signals are summed, and their volume is controlled by the Main Level control. The signal is then sent to the Equalizer section. The Equalizer section consists of a variable low-cut filter and 12 bands of equalization. The low-cut filter has a 6dB/octave slope and is variable from 20Hz-300Hz. The first 10 bands of equalization are 1/3 of an octave wide on ISO center frequencies from 315Hz to 2.5kHz. This allows precise control of the voice band frequencies. The last two bands, at 5kHz and 10kHz, are each one octave wide. These bands permit the high frequency response of the system to be contoured. All 12 bands of equalization are Constant-Q, cut only. Constant-Q means that the shape of the filter stays substantially the same regardless of the amount of cut. This is in contrast to the non-constant-Q type designs, whose filter shape widens considerably at any level other than full cut (or boost). Constant-Q designs minimize adjacent band interaction, and as a result are much easier and faster to set up.

Any non-EQ'd channels are summed with the equalized signals and passed on to the balanced line output and the power amplifier. The balanced line output is a low impedance (100 Ohms) line level driver that may be used for tape recording, or signal distribution to another amplifier. A patch point is provided after the line level driver so the system may incorporate other signal processing equipment. The 1/4" 3 conductor jack allows a standard send/receive/ground circuit for outboard processing. The power amplifier will provide 100 Watts, continuous, into a 4 Ohm load (65 Watts, continuous, into an 8 Ohm load). A peak limiter built into the amplifier senses the onset of clipping and quickly attenuates the signal coming into the amplifier. Note, however, that the line output signal is unaffected by the peak limiter. The output of the amplifier is connected through a relay to the speaker output connector. The relay provides several functions: delayed turn-on and instant turn-off to prevent power on/off transients, DC protection to disconnect the amplifier from the speaker if excessive DC voltage is detected at the amplifier output, and subsonic protection to disconnect the amplifier from the speaker if high level signals below 20Hz are present at the amplifier output. Two amplifier status LEDs indicate -20dB (signal present) and -3dB (near limiting).

Three other features increase the flexibility of the AS100; Main level remote control, Auto/Manual Threshold setting, and Last Mic Hold.

Besides the ability to remotely control the gain of each individual channel, a single external linear potentiometer can control the entire system volume remotely. Linear to audio taper signal conditioning is provided by the AS100 to maximize control resolution.

Threshold setting (i.e. the input signal level at which the channel begins to come on) may be accomplished in one of two modes; Auto or Manual. In Manual mode, a front panel pot is used to adjust the minimum level at which the channels begin to come on. In the Auto mode, the ambient level is continuously monitored, and the minimum level at which channels begin to come on is set a few dB above ambient. With the AS100 set in the Auto Threshold mode, the chances of misadjustment are considerably less.

Another feature of the AS100 that simplifies setup and operation is Last Mic Hold. With Last Mic Hold in the "On" position, the last active mic is held in the open mode until another microphone comes on. In this way, much better performance is achieved in marginal situations (i.e. very soft talkers, or talkers who turn away from the mic).

FRONT PANEL DESCRIPTION

CHANNEL LEVEL - Controls the level of signal from the channel sent to the main buss. Maximum gain occurs when this control is fully clockwise.

CH ON LED - Indicates when a channel is active.

AUTO/DIRECT MODE SWITCH - Controls the mode of operation of each channel. Direct mode keeps the channel ON regardless of the signal on that channel. Auto puts the channel in the automatic mode.

LF ROLL-OFF - Controls the low frequency response of the system. The slope is 6dB/octave, and the adjustment range is 20Hz-300Hz.

CONSTANT-Q EQUALIZER - Controls the amount of attenuation in the chosen frequency band. Bands between 315Hz and 2.5kHz are 1/3 of an octave wide, and 5kHz and 10kHz are 1 octave wide. Fully clockwise is no attenuation, and fully counterclockwise is 15dB attenuation.

-20dB LED - Indicates that the output of the power amplifier is 20dB below limiting.

-3dB LED - Indicates that the output of the power amplifier is 3dB below limiting.

OUTPUT LEVEL - Controls the system output level. Both the power amplifier and the balanced line output are driven from the Output Level control. Note that all channels that are jumpered Post-EQ are not affected by the Output Level control.

THRESHOLD MANUAL/AUTO SWITCH - Determines the mode of the fixed Threshold for the AS100. In Manual mode, the Threshold Level pot determines the Threshold. In Auto mode, the ambient noise is monitored and the Threshold is set relative to the ambient noise.

THRESHOLD LEVEL - Sets the Threshold level when the Manual Mode is selected.

LAST MIC HOLD - Enables or disables the Last Mic Hold function. With Last Mic Hold in the "On" position, the last active mic is held in the open mode until another microphone comes on.

POWER LED - Indicates the presence of AC power to the AS100.

POWER SWITCH - Turns the AS100 on or off.

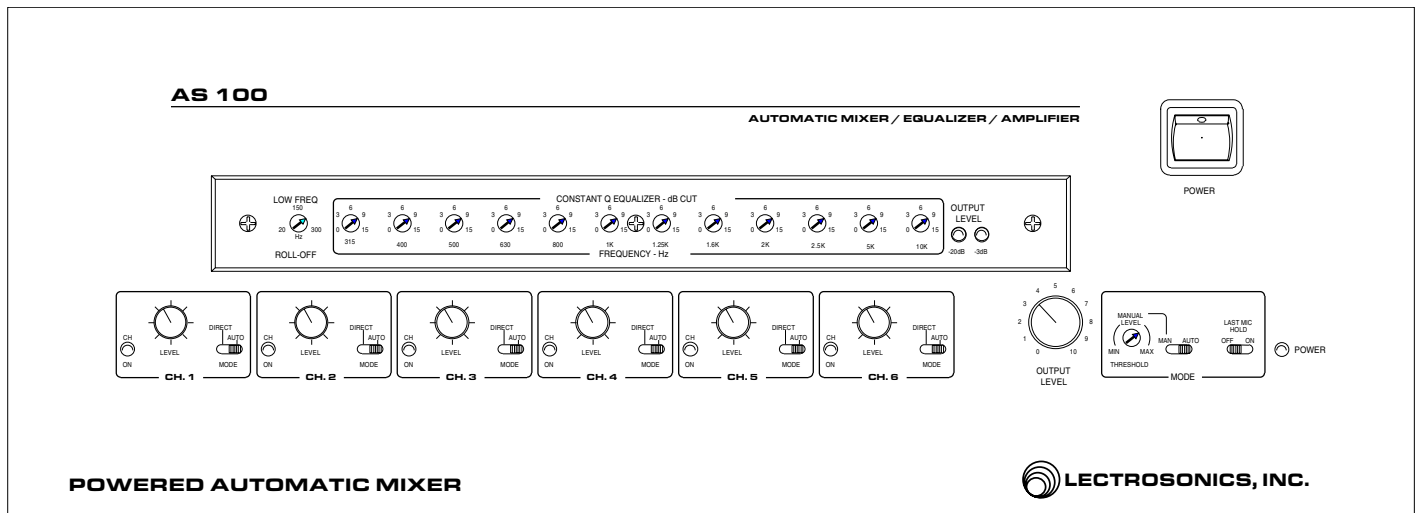


Figure 2 - AS100 Front Panel

REAR PANEL DESCRIPTION

INPUT - Accepts a balanced or unbalanced signal. Can accommodate signal levels from mic to line. Fully balanced differential input, RF filtered, internally selectable 21 Volt phantom supply. XLR type connector, Pin 2 is "+", Pin 3 is "-", and Pin 1 is ground.

GAIN - Sets the mic/line preamp gain from 6dB to 55dB.

LINE OUTPUT - Provides a balanced output signal for use with recording devices or other equipment.

PATCH IN/OUT - Provides a patch point for outboard signal processing. The connector is a 1/4" 3 conductor phone jack. The tip is send, the ring is return and the sleeve is ground. The jack is labeled on the rear panel for reference. The signal is equalized for all channels which have been configured for EQ (EQ jumper set to 2-3, see page 6)

REMOTE LEVEL - Provides remote level control for each channel by means of an external linear potentiometer.

REMOTE MASTER VOLUME - Provides remote overall system volume control by means of an external linear potentiometer.

SPEAKER OUT - Connects to system loudspeaker(s) using the dual banana jack provided with the AS100.

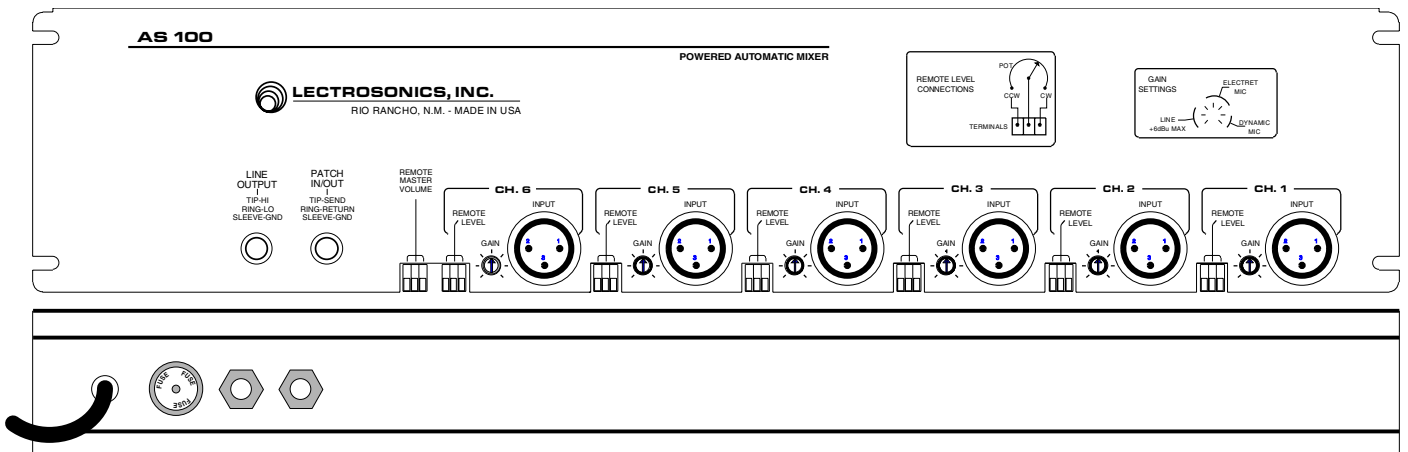


Figure 3 - AS100 Rear Panel

INSTALLATION

Installation of the AS100 is straightforward. If the AS100 is to be installed in an equipment rack, be sure to leave at least 1 rack space (1.75 inches) above and below the AS100 for proper ventilation. If the AS100 is not installed in a rack, the four self-adhesive rubber feet (included) may be affixed to the bottom of the unit.

The connection to the speaker terminals should be made using the dual banana plug (included). Tinning the speaker wires before terminating them into the banana plug is highly recommended to prevent wire strands from shorting the amplifier.

If the remote volume control capability of the AS100 is used, the rear panel must be temporarily removed* to attach the wiring. Wire guage is not critical for connection to the remote pot, as the current levels are very low. Again, tinning the wires before terminating them into the gray connectors is strongly recommended. The white lever on each slot of the connector must be pushed back with a screwdriver before the wire is inserted. Any pot value between 10K and 100K, linear taper, will work.

Refer to the illustration screened on the rear panel of the AS100 and connect the pot as follows:

- Clockwise pot terminal - Right most slot in gray connector
- Wiper pot terminal - Center slot in gray connector
- Counterclockwise pot terminal - Left most slot in gray connector

If phantom power is needed on any or all channels, the top panel of the AS100 must be temporarily removed*. The 2 circuit shunt jumper nearest each input connector is the phantom power jumper. The AS100 is shipped with phantom power OFF (shunt between pins 2 and 3) but phantom power for any channel may be enabled by switching the jumper to pins 1 and 2. See Figure 4.

Channels 1-6 are factory jumpered for equalization (pins 2 and 3 jumpered). If any changes need are required in, the top cover of the AS100 must be temporarily removed*. Channel one is easily accessed. To access channels 2-6 the two 6-32 screws securing the EQ board must be removed, and the EQ board carefully taken out. The six 2 circuit shunt jumpers close to the front panel are the EQ jumpers. See Figure 4.

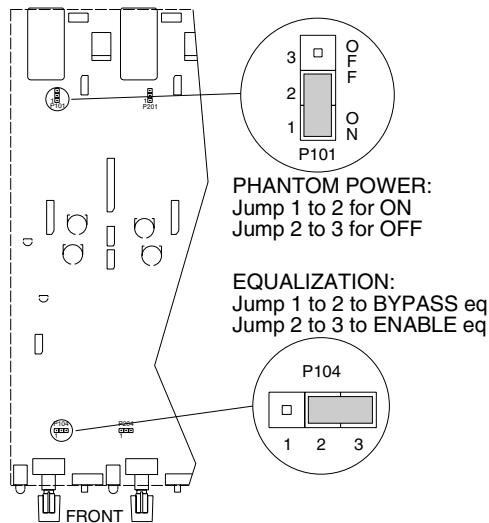


Figure 4 - Phantom Power & EQ Bypass Jumpers

**Disconnect the power cord prior to removing any panels and observe standard safety precautions when changing internal jumpers and connectors. There are electrolytic capacitors that can discharge power, resulting in electric shock.*

70V OUTPUT OPTION

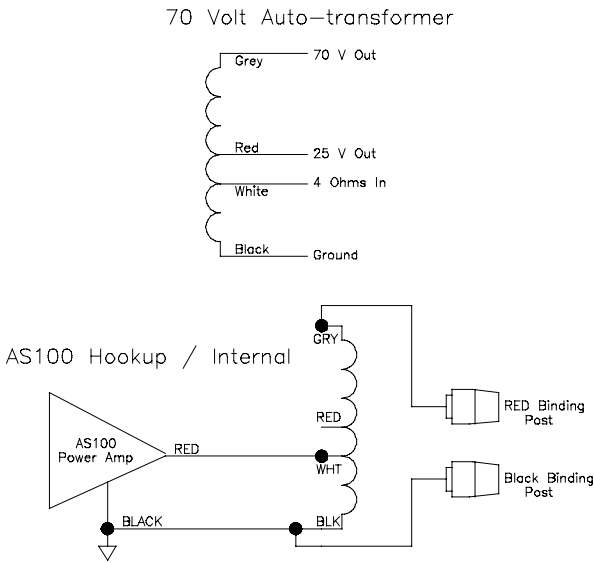


Figure 5 - AS100 70V Option

If a 70V output is desired, the optional 70V Autoformer can be installed.

Mount the Autoformer to the side of the AS100 as shown below.

Remove the RED and BLK wires from the output binding posts and connect to the WHT and BLK Autoformer wires as shown.

Connect the GRY and BLK wires from the Autoformer to the RED and BLK binding posts respectively.

If a 25V system is desired, the RED lead on the Autoformer may be connected to the RED binding post. In this case, insulate the end of the GRY lead and secure it out of the way.

NOTE: Do not cut the RED lead of the Autoformer! If it is not needed, insulate the end and secure it out of the way.

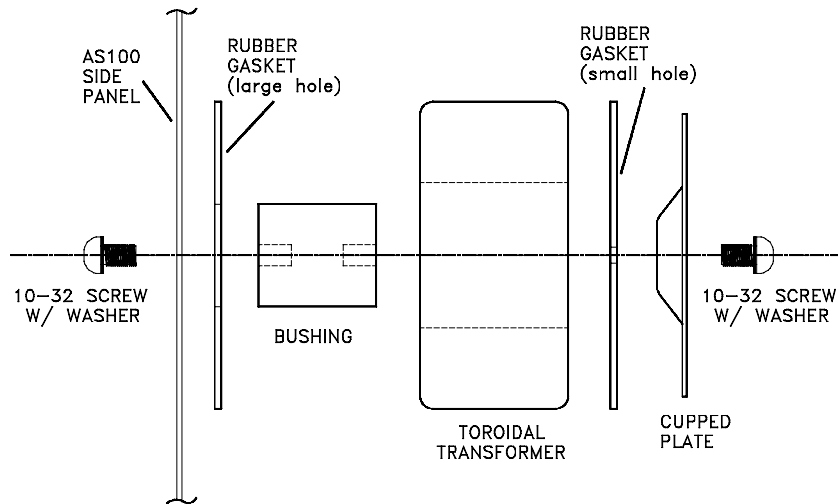


Figure 6 - Mounting the 70V Transformer

OPERATING INSTRUCTIONS

- 1) Phantom Power Selection - If phantom power is desired for any channel, see the Installation section (page 6) for details.
- 2) Remote Control - If remote control of either individual channels or the overall system level is desired, see the Installation section (page 6) for details.
- 3) EQ Jumpers - If an EQ jumpering scheme other than the factory standard setup (all channels equalized) is desired, see the Installation section (page 6) for details.
- 4) Connect microphones and loudspeaker(s) to the AS100 and place them in the positions in which they will be used.
- 5) Set the rear panel Gain controls as appropriate for the signal source (i.e. line, electret, or dynamic). Select AUTO or DIRECT mode on each channel as desired. AUTO mode should be used for microphones and DIRECT mode is handy for testing microphone operation. Select MANUAL or AUTO THRESHOLD as desired. If MANUAL mode is selected, a good starting point for the LEVEL pot is about 1/3 of full rotation.
- 6) With all Channel Level controls 3/5 to 5/8 clockwise and the Output Level control fully counterclockwise, turn on the power. If Auto Threshold was selected in step 5, wait about 10 seconds after turning the power on before proceeding. This will allow the Auto Threshold to initialize its sampling of the ambient noise.
- 7) Speak normally into each mic in turn, and be sure that the green ON LED lights when speaking. If not, increase the rear panel Trim level setting. After the Trim settings are determined, do not adjust them again.
- 8) Turn the Channel Level controls on all channels in use to about 3/4 of full rotation. Adjust the Output Level of the AS100 for adequate sound system level. If necessary, readjust the Channel Level controls to balance individual microphones.
- 9) Equalize the system for smoothest frequency response, and use the LF Roll-off control as appropriate. A good general purpose setting for the LF Roll-off is 150Hz.

TROUBLESHOOTING

<u>SYMPTOM</u>	<u>POSSIBLE CAUSE</u>
1) No POWER LED	1) Power switch not on 2) Unit not plugged in
2) No sound from system	1) OUTPUT LEVEL control turned down 2) Channel LEVEL controls on mic channels not turned up 3) THRESHOLD control set too high (if in Manual Threshold mode; check CH ON LEDs on mic channels) 4) INPUT GAIN controls on preamp channels too low 5) Remote control pots (if used) turned down 6) Remote control switches (if used) turned off 7) Phantom power not on for phantom powered mics
2) Excessive feedback	1) System not equalized properly 2) System volume set too high 3) Microphone too far from person 4) Speaker too close to microphone

SPECIFICATIONS

Mic/Line Input:

Type:	Electronically balanced RF filtered
Impedance:	10k Ohms balanced, for standard 200 Ohm mics
Trim Gain Range:	6dB-55dB
EIN, 20-20kHz	-127dBu
Nominal Attenuation:	15dB
Maximum Input Level: (Gain set at 6dB)	+12dBu

Phantom Power:

+21 Volts, internal jumper

Equalizer Section:

Variable Low Cut Filter:	Variable 20Hz to 300Hz, 6dB/octave 1/3 octave bandwidth
Equalizer:	315, 400, 500, 630, 800, 1k 1.25k, 1.6k, 2k, 2.5k at 1/3 octave bandwidth, Constant-Q filter, attenuation adjustable from 0dB to 15dB 5k, 10k at 1 octave bandwidth, Constant-Q filter, attenuation adjustable from 0dB to 15dB

Maximum System Gain:

Mic/Line In to Line Out	75dB
Mic/Line In to Power Amp Out	95dB

System THD, 1kHz:

Less than 0.1%
(100 watts, 4 ohms)

System THD, 20-20kHz:

Less than 0.25%
(100 watts, 4 ohms)

System IMD, 60/7kHz:

Less than 0.25%
(100 watts, 4 ohms)

Power Consumption

180 watts max at 120VAC

SERVICE AND REPAIR

If your system malfunctions, you should attempt to correct or isolate the trouble before concluding that the equipment needs repair. Make sure you have followed the setup procedure and operating instructions. Check out the inter-connecting cords and then go through the TROUBLE SHOOTING section in the manual

We strongly recommend that you **do not** try to repair the equipment yourself and **do not** have the local repair shop attempt anything other than the simplest repair. If the repair is more complicated than a broken wire or loose connection, send the unit to the factory for repair and service. Don't attempt to adjust any controls inside the units. Once set at the factory, the various controls and trimmers do not drift with age or vibration and never require readjustment. **There are no adjustments inside that will make a malfunctioning unit start working.**

LECTROSONICS service department is equipped and staffed to quickly repair your equipment. In-warranty repairs are made at no charge in accordance with the terms of the warranty. Out of warranty repairs are charged at a modest flat rate plus parts and shipping. Since it takes almost as much time and effort to determine what is wrong as it does to make the repair, there is a charge for an exact quotation. We will be happy to quote approximate charges by phone for out of warranty repairs.

RETURNING UNITS FOR REPAIR

You will save yourself time and trouble if you will follow the steps below:

- A. DO NOT return equipment to the factory for repair without first contacting us by letter or by phone. We need to know the nature of the problem, the model number and the serial number of the equipment. We also need a phone number where you can be reached 8 am to 4 pm (Mountain Standard Time).
- B. After receiving your request, we will issue you a return authorization number (R.A.). This number will help speed your repair through our receiving and repair departments. The return authorization number must be clearly shown on the outside of the shipping container.
- C. Pack the equipment carefully and ship to us, shipping costs prepaid. If necessary, we can provide you with the proper packing materials. UPS is usually the best way to ship the units. Heavy units should be "double-boxed" for safe transport.
- D. We also strongly recommend that you insure the equipment, since we cannot be responsible for loss of or damage to equipment that you ship. Of course, we insure the equipment when we ship it back to you.

Mailing address:
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World Wide Web: <http://www.lectrosonics.com>

email: sales@lectrosonics.com

LIMITED ONE YEAR WARRANTY

The equipment is warranted for one year from date of purchase against defects in materials or workmanship provided it was purchased from an authorized dealer. This warranty does not cover equipment which has been abused or damaged by careless handling or shipping. This warranty does not apply to used or demonstrator equipment.

Should any defect develop, we will, at our option, repair or replace any defective parts without charge for either parts or labor. If we cannot correct the defect in your equipment, we will replace it at no charge with a similar new item. We will pay for the cost of returning your merchandise to you.

This warranty applies only to items returned to us, shipping costs prepaid, within one year from the date of purchase.

This warranty gives you specific legal rights. You may have additional legal rights which vary from state to state.

LECTROSONICS, INC.

**581 LASER ROAD
RIO RANCHO, NM 87124 USA**

July 6, 1999

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