

**AP4**  
**AP4-VCA**  
**AUTOMATIC MIXER PREAMP MODULE**

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**OPERATING INSTRUCTIONS**  
**and trouble-shooting guide**

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**LECTROSONICS, INC.**  
Rio Rancho, NM

# INTRODUCTION

The AP4 Automatic Mic Preamp Module provides balanced, low-noise pre-amplification of signals from microphone to line levels. In addition, the AP4 (in combination with an AC1 Automatic Main Module) implements all necessary functions to perform fully automatic mixing. The AP4 has 3 modes of operation; automatic, priority, and direct. These modes are switch selectable from the front panel.

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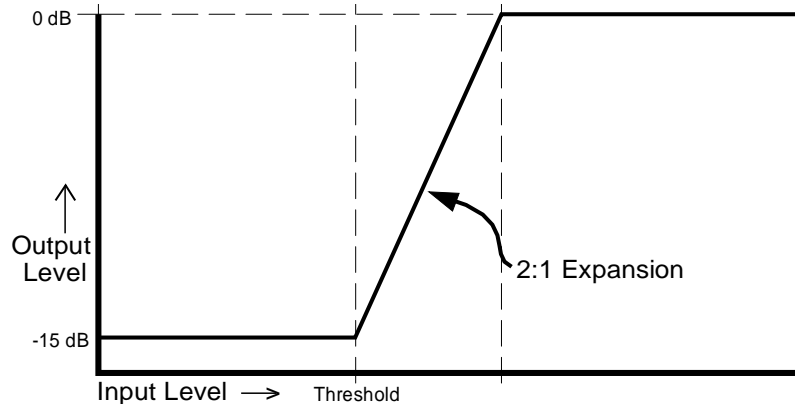
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## GENERAL TECHNICAL DESCRIPTION

The microphone preamp uses a discrete design for lowest equivalent input noise and low distortion. This preamp topology also provides a convenient means for adjusting preamp gain to maximize signal-to-noise ratio for any microphone. This is in contrast to many automatic mixers which employ fixed gain microphone preamps.

The AP4 uses 2:1 expansion rather than abrupt gating to attenuate the channels which have no activity. Maximum attenuation is 15dB. The use of 2:1 expansion results in the total absence of "signal chopping" or other anomalies often associated with automatic mixers that gate. The detection circuitry associated with the expansion function is filtered specifically to respond to energy in the voice range, rejecting both low and high frequency signals. The release time constant on each channel can be jumpered to either slow or fast.



### AP4 Expansion Action

When a signal is presented to an inactive channel, it is compared to the current threshold voltage value. The threshold is a combination of a fixed voltage (set via the Threshold control on the Automatic Control Module) and a variable voltage. This variable voltage consists of a signal proportional to the highest individual channel level at any time. For a system in which only one person is speaking on the system at a time, the mic channel for that person begins to increase in gain when the level exceeds the fixed threshold. As the signal in the channel increases in level, channel gain also increases. When the channel signal level is 15dB above threshold, the channel is at unity gain and no more gain increase happens.

The release time option (fast/slow) represents the time for the channel attenuation to reach 15dB after signal is removed. The fast setting is most useful in situations where background noise is high, because it allows rapid return to full attenuation when signal is not present. This will minimize feed through of background noise into the system. The slow setting is useful for situations where there is not excessive background noise.

Indicators, in the form of LEDs, are provided to indicate the operational status of each channel. A yellow Trim Set LED shows when the trim control is set for optimum performance for any microphone. A green Channel On LED proportionally indicates channel gain, allowing simple adjustment of the Threshold control (on the Automatic Control Module).

An optically coupled Logic output is provided on a rear panel terminal strip to indicate when a channel is open. The output may be wired active high or active low, depending on the application.

A post-attenuator Send/Return Loop is also provided on a rear panel terminal strip to facilitate the use of signal processing on a per channel basis.

48 volt phantom power is supplied to each channel, and can be selected on a channel by channel basis.

## INSTALLATION

Before installing the module, see the Operating Instructions section for guidance as to how to select Phantom Power On/Off and Release Time. These functions are selected via on-board jumpers.

The AP4 is installed from the rear of the Modular Audio Processor mainframe. While the AP4 can slide into any of the ten Modular Audio Processor slots, it is recommended that the AP4 (or the SP4) modules be loaded from left to right (facing the front of the mainframe). This will both facilitate microphone cabling to the mic inputs and eliminate unwieldy cable runs from the Main or Aux outputs of the control module. This approach is particularly useful if other Modular Audio Processor system signal processing modules (EQN-1, XO2, XO3, etc.) are being used.

The only case in which AP4 modules would not be loaded into the left end of the Modular Audio Processor Mainframe is when any RF modules are in use. RF modules should always be placed in the far left slot(s). Care should be taken when aligning the circuit board with the card guides. Once the module is aligned, slide the card forward in the mainframe until the female edge connector on the module seats firmly onto the male pins of the main bus board. Again, care should be taken to insure proper mating of the connectors.

Eight #4 machine screws are provided with the AP4 module. Four are used to secure the rear panel to the top and bottom rails of the mainframe. After this is accomplished, fit the front panel (also supplied) over the front of the module and secure it, using the other four #4 machine screws, to the front panel of the Modular Audio Processor mainframe. Once these eight screws are in place, the installation is complete.

## FRONT PANEL DESCRIPTION

**INPUT TRIM** - Controls the gain of the microphone preamp. Mic preamp gain ranges from 15dB to 55dB. This range is more than sufficient to accommodate all types of microphones. This control is before the level sensing automatic circuitry, and will affect the relative sensitivity of the automatic action. Maximum gain occurs when this control is fully clockwise.

**OUTPUT LEVEL** - Controls the level of signal from the channel sent to the main buss. This control is after the level sensing and attenuation circuitry, and will not effect the sensitivity of the automatic action. Maximum gain occurs when this control is fully clockwise.

**TRIM SET LED** - Indicates proper adjustment of the Input Trim control. The Input Trim control should be adjusted until the Trim Set LED flashes regularly on normal speech input.

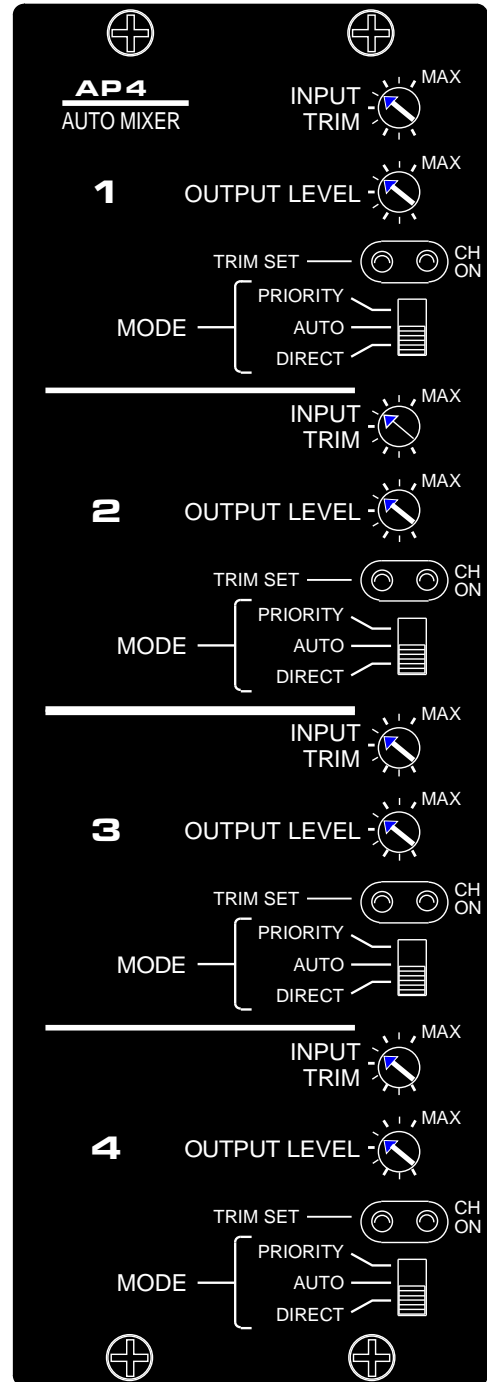
**CH ON LED** - Indicates relative gain of the channel. The LED illuminates proportionately as channel gain increases. The Threshold control (on the Automatic Control Module) should be adjusted until there is little or no illumination of the "CH ON" LED because of background noise.

**MODE** - Selects the operational mode of the channel.

**Priority Mode:** Activity on priority channels fully attenuates non-priority channels. There is no limit to the number of priority channels for a system. Activity on priority will not effect channels in the Direct Mode.

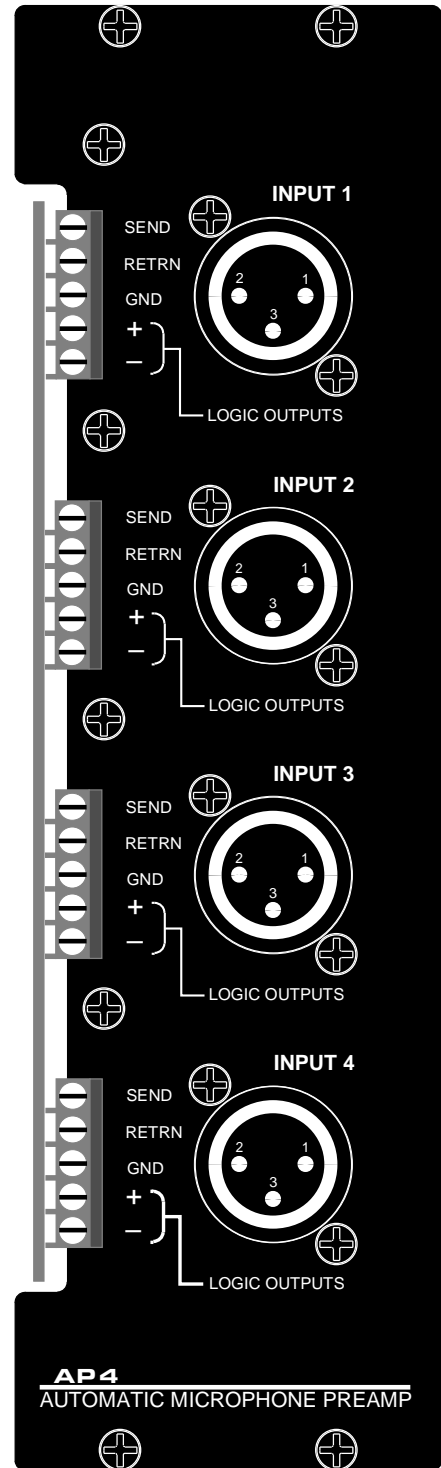
**Auto Mode:** Channel functions as an automatic channel.

**Direct Mode:** Channel functions as a standard channel. In this mode, the "CH ON" LED will be on continuously to indicate no channel attenuation under any circumstance.



## REAR PANEL DESCRIPTION

- INPUTS** - Accepts balanced or unbalanced signal. Can accommodate signal levels from mic to line. Fully balanced differential input, RF filtered, internally selectable 48 volt phantom supply. XLR type connector, Pin 2 is "+", Pin 3 is "-", and Pin 1 is ground.
- SEND** - Outputs the preamplified, post-attenuator, pre-channel level signal. For use if additional signal processing devices are desired on a per channel basis. This output is unbalanced. Pin 1 on the terminal strip.
- RETURN** - Accepts an unbalanced input signal. Signal is then routed through the channel level control to the main buss. SEND and RETURN are connected together for normal use. Pin 2 on the terminal strip.
- GND** - Provides a ground connection for signal processing equipment used with SEND and RETURN. Pin 3 on the terminal strip.
- LOGIC OUTPUTS** - Provide a logic signal that corresponds to channel on status. Will actuate if the channel is on for any reason, including selection of "Direct" mode. The output is an optically isolated NPN transistor. The "+" output (Pin 4 on the terminal strip) is connected to the collector of the transistor. The "-" output (Pin 5 on the terminal strip) is connected to the emitter of the transistor. The device is compatible with normal 5 Volt power, and has a maximum breakdown voltage of 30 Volts. The output can be wired as active high or active low (see appendix 1 for details).

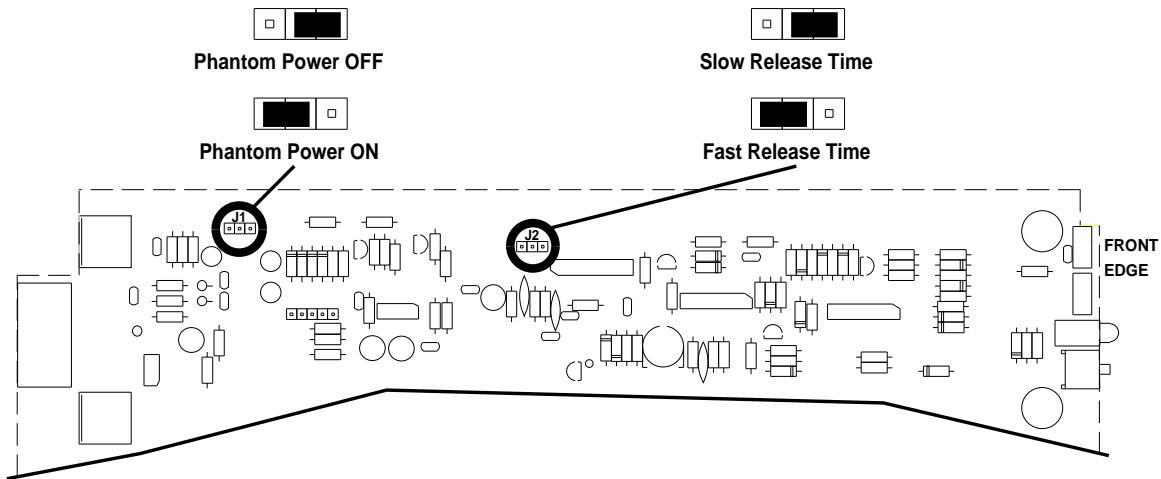


# OPERATING INSTRUCTIONS

The following instructions assume the presence of an Automatic Control Module.

1) Select whether Phantom power is desired using the 3 pin jumper in the upper left of each channel layout on the printed circuit board. Connecting the left and middle pins applies phantom power to that channel. Connecting the right and middle pins defeats phantom power. The 3 pin jumper in the upper middle of the printed circuit board layout selects Release Time for each channel. Connecting the left and middle pins selects the fast release time, and connecting the right and middle pins selects the slow release time. Use the fast setting for situations of high background noise, and use the slow setting otherwise.

The factory settings are Phantom power OFF and release time in the fast setting.



2) Begin the procedure with the both the Channel Level and Input Trim controls fully counterclockwise. With someone speaking into each microphone in a normal voice, adjust the Trim Level control clockwise until the Trim Set LED (yellow) flashes regularly. This indicates acceptable signal-to-noise ratio while preserving overload margin. In addition, it allows microphones of differing sensitivity to be set to approximately the same threshold for automatic action.

3) Set the Mode switch to the desired mode (Priority, Auto, or Direct).

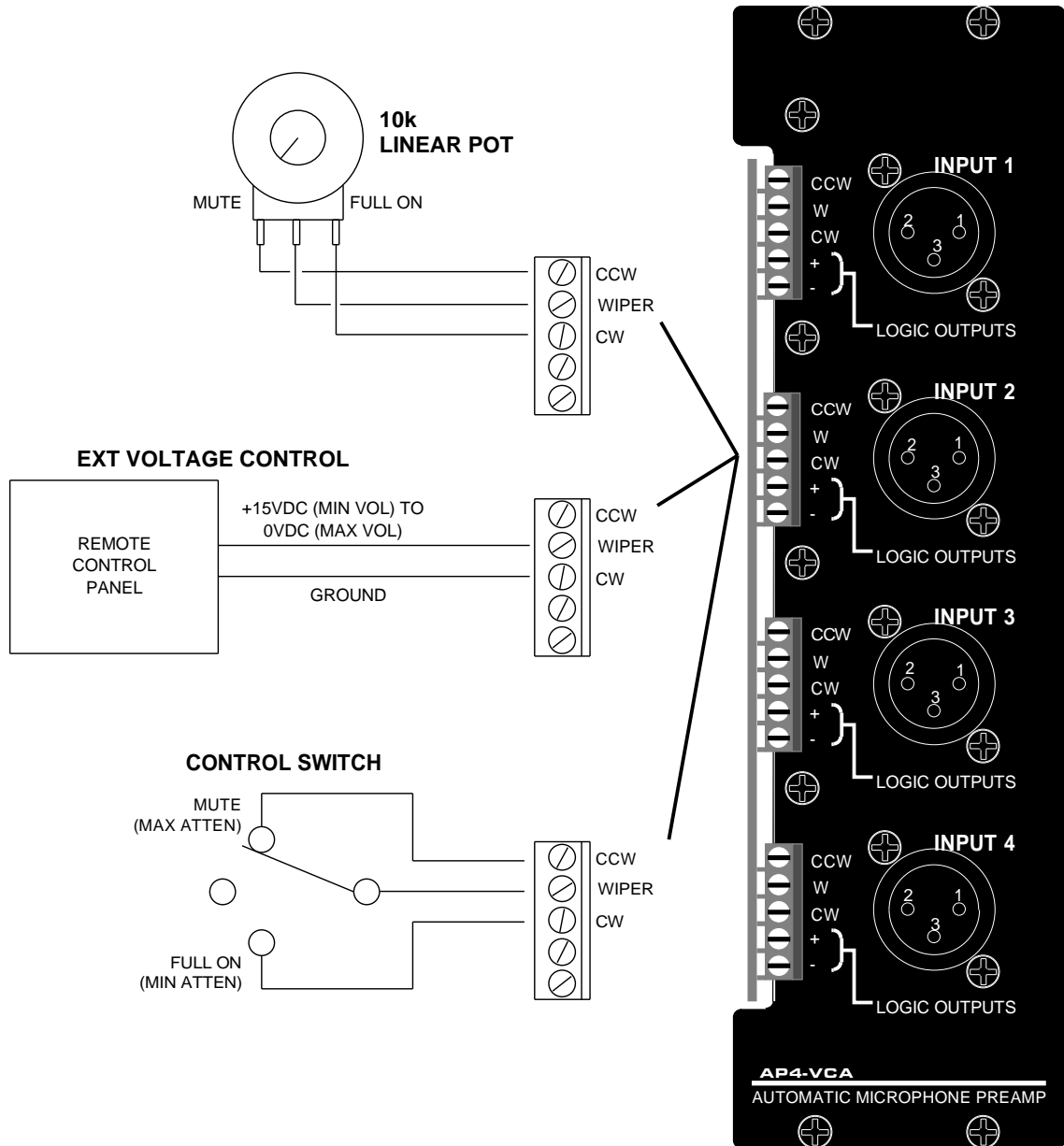
4) Move the Channel Level control to midway. When all channels are adjusted as above, the overall system level may be set using the Main output level control on the Automatic Control Module. Any further adjustments of individual mic levels can be made now. If it is desired to make a given channel louder without affecting the point where the attenuator in that channel begins to open, use the Channel Level control. If an individual channel is coming on with signal levels that are either too low or too high, the Input Trim control can be adjusted to change the threshold sensitivity of that channel. The Channel Level control can then be adjusted to re-balance the channel gain.

## TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE
1) No sound from system	1) Main level control not turned up 2) Channel level not turned up 3) Input trim not turned up (Does Trim Set LED flash?)
2) Sound "pumps" and is unnatural	1) Threshold on Automatic Control Module is too high (Make sure "CH ON" LED glows brightly during normal speech)

# AP4-VCA

The AP4-VCA has the same functions as the AP4 except AP4-VCA has VCA remote control capability. The Send/Receive loop provided on the AP4 is replaced by voltage controlled amplifiers (VCAs) which provide remote output level control. Audio taper scaling circuitry in the AP4-VCA allows the use of linear taper potentiometers or an external voltage source for this function. See the figure below for details on wiring the unit for output level remote control.



## 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:  
Lectrosonics, Inc.  
PO Box 15900  
Rio Rancho, NM 87174  
USA

Shipping address:  
Lectrosonics, Inc.  
581 Laser Rd.  
Rio Rancho, NM 87124  
USA

Telephones:  
(505) 892-4501  
(800) 821-1121  
FAX: (505) 892-6243

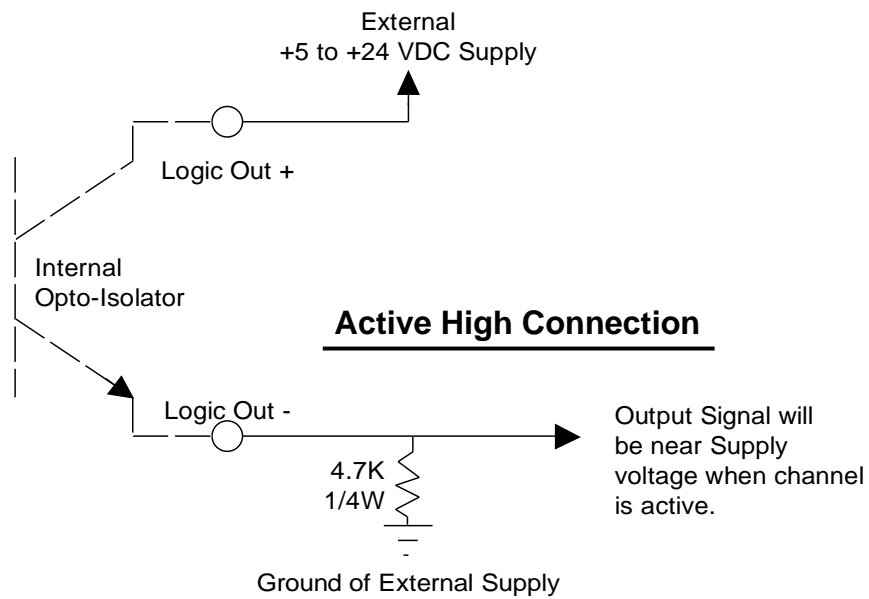
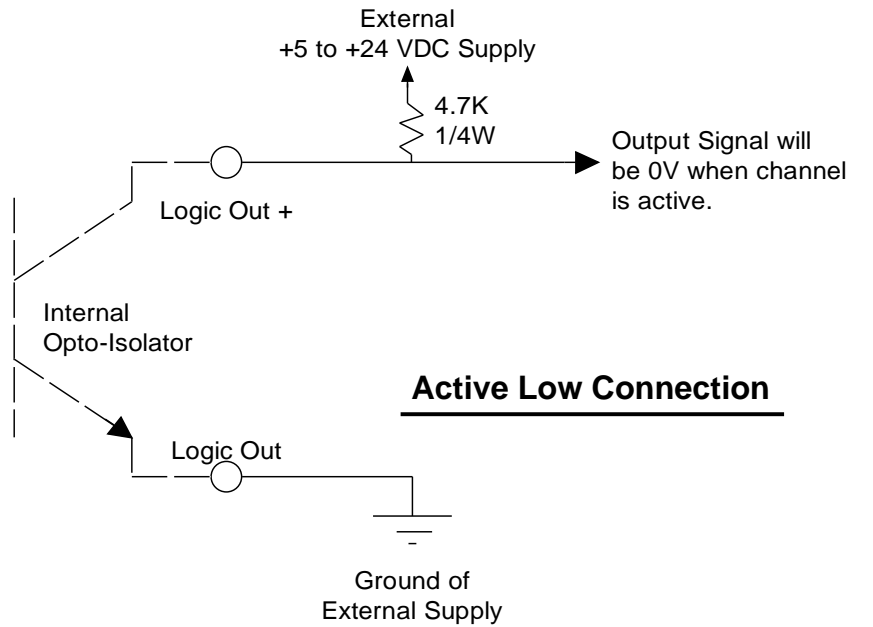
# SPECIFICATIONS

<b>Gain Range:</b>	15dB-55dB
<b>Maximum Channel Attenuation:</b>	15dB
<b>Equivalent Input Noise, 20 to 20KHz:</b>	-128dBu
<b>THD, 20 to 20KHz:</b>	Less than 0.05% (40dB gain, 0dBu out)
<b>IMD, 60/7KHz:</b>	Less than 0.08% (40dB gain, 0dBu out)
<b>Input Impedance:</b>	6K Ohms, balanced 3K Ohms, unbalanced
<b>Input:</b>	
<b>Type:</b>	Electronically balanced RF filtered
<b>Maximum Input Level</b>	+5dBu (Gain set at 15dB)
<b>Phantom Power:</b>	+48 Volts, internal jumper
<b>Send (SND) Maximum Output:</b>	+20dBu
<b>Return (RTN) Maximum Input:</b>	+20dBu
<b>Power Consumption:</b>	±100mA at 15 Volts

## APPENDIX 1

The Logic Output on each channel of the AP4 is an optically isolated NPN bipolar transistor. This transistor has a breakdown voltage of 30 volts and will provide a maximum current of about 10mA.

Shown below are two possibilities for configuring the Logic Output, depending on whether an active high or active low signal is desired.



## **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.**

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