AMP1A Series

AMP1A-4S AMP1A-10S AMP1A-LP4S AMP1A-LP10S

1U Multi-Channel Audio Speaker Monitors

with Four or Ten Analog Audio Inputs,
Stereo Analog Outputs, and Optional Dual
10-Segment Level Meters and Phase Indication

Document P/N **821527** Rev-**B**

User Manual

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Important Safety Instructions

1) Read these instructions.
2) Keep these instructions.
3) Heed all warnings.
4) Follow all instructions.
5) Do not use this apparatus near water.
6) Clean only with dry cloth.
7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8) Do not install near any heat source such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10) Protect the power cord from being walked on or pinched, particularly at plugs convenience receptacles and the point where they exit from the apparatus.
11) Only use attachments/accessories specified by the manufacturer.
12) Use only with the cart stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13) Unplug this apparatus during lightning storms or when unused for long periods of time.
14) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15) Do not expose this apparatus to rain or moisture.
16) The apparatus shall be connected to a mains socket outlet with a protective earthing connection.

CAUTION!

In products featuring an audio amplifier and speakers, the surface at the side of the unit, where the audio amplifier heat sink is internally attached, may get very hot after extended operation. When operating the unit excercise caution when touching this surface and ensure that external materials which may be adversely affected by heat are not in contact with it. There is a Hot Surface label (see diagram) attached to the aforementioned surface of the product.

Introduction

Congratulations on your selection of a Wohler Technologies product. We are confident it represents the best performance and value available, and we guarantee your satisfaction with it.

If you have questions or comments you may contact us at:

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Section 1

General Features and Specifications

Description

Features

Applications

General Specifications

Other Options

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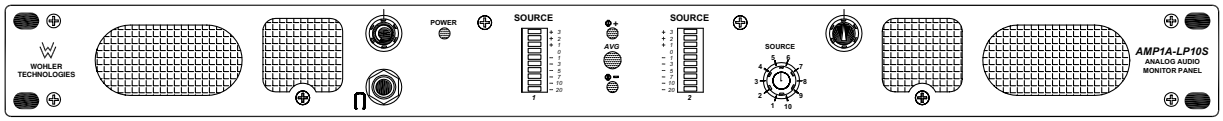
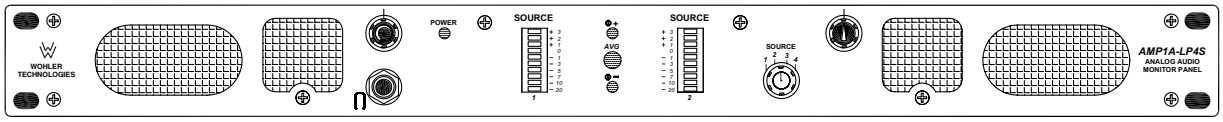
AMP1A Series

1U Stereo Analog Audio Speaker Monitors

Including Models: AMP1A-4S AMP1A-10S AMP1A-LP4S AMP1A-LP10S



AMP1A-LP10S



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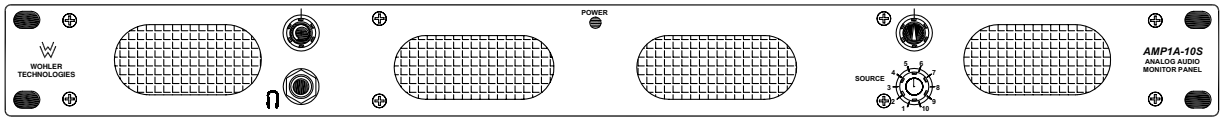
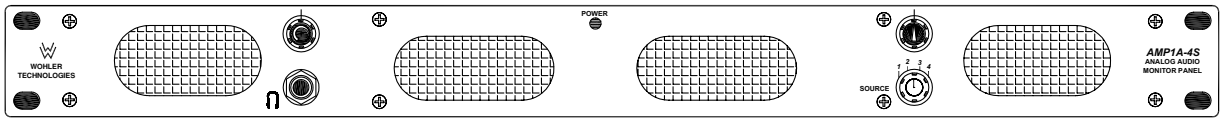


AMP1A-10S



AMP1A-4S

Description

The **AMP-1A Series** of audio monitors provides self-powered, full-fidelity stereo monitoring in the smallest rack space possible. All models in the **AMP1A Series** contain five high performance transducers driven by three power amplifiers: two amplifier/driver combinations handle midrange and high frequency information in stereo, while the third center channel reproduces information below the 500 Hz crossover point.

All **AMP-1A** models come equipped with a ganged stereo volume control and balance pot, power indication LED, and headphone output. Output limiter circuits are incorporated to protect the speakers, and extensive magnetic shielding allows placement immediately adjacent to video monitors with no color impurities.

The **AMP1A-4S** model features four pairs (8 channels) of balanced inputs on Phoenix connectors and the **AMP1A-10S** features ten pairs (20 channels) of these inputs. Any pair of inputs is selectable for monitoring via a rotary source select switch on the front panel. An additional pair of XLR connectors output the selected audio signals for connecting to downstream equipment.

The **AMP1A-LP4S** and **AMP1A-LP10S** models offer the same input features as the **-4S** and **-10S** models with the addition of dual 10-segment tri-color LED bargraph level meters and Wohlers' proprietary three-LED stereo phase indication feature.

Features

- 98 dB SPL at two feet
- Only one rack space high
- Excellent high frequency response for positive detection of background whine and noise
- Audible indication of phase/polarity problems
- Thorough magnetic shielding for placement next to video monitors
- Numerous control and input options
- Quick and easy installation: simply slide in the rack and connect audio and AC power
- 4S and 10S models offer front panel switching between four (8 channels) or ten (20 channels) stereo inputs.
- LP models offer dual level meters and stereo phase indication LEDs

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Applications

The **AMP1A Series** is ideally suited for use in VTR bays, mobile production vehicles, teleconferencing installations, multimedia systems, satellite links and cable TV facilities, and on-air radio studios. Designed and manufactured in the U.S., the **AMP1A Series** is backed by a strong warranty and a satisfaction guaranteed return policy.

General Specifications

Input impedance:	90K Ω (Ohm) balanced
Input Level for Maximum Output (Volume Full On):	0 dBv balanced
Input Overload:	+26 dBv balanced
Peak Acoustic Output (@ 2 ft.):	98 dB SPL
Response, Sixth Octave:	80 Hz - 16 kHz ± 7 dB) (-10 dB @ 50 Hz, 22 kHZ)
Power output	
RMS Each Side:	10 W transient / 5 W continuous
RMS Bass:	20 W transient / 10 W continuous
Distortion, Electrical:	Less than 0.15% at any level below limit threshold
Distortion, Acoustic:	8% or less at worst case frequencies above 180 Hz including cabinet resonance; typically less than 2%
Hum and Noise:	Better than -68 dB below full output
Magnetic Shielding:	Less than 1 Gauss any adjacent surface
Input Connectors:	Balanced: XLR
Power Consumption (Average Maximum):	35 W
AC Mains input:	100-240VAC, 50-60 Hz

Level Calibration:	-6, 0, +4, +8 dBv
Frequency Response:	20 Hz to 18 kHz (±0.5 dB)
Level Meter Type:	10-segment tri-color LED bargraph display
LED Color:	Tricolor (red, amber, green)
Metering Range:	23 dB
Display Modes:	VU or PPM, Selectable
VU Characteristics,	
Rise Time:	300 ms to 99% of full indication
Decay Time:	300 ms
PPM Characteristics,	
Attack Time:	10 ms
Decay Time:	2 seconds, 0 to -20 dB
Dimension (h x w x d):	1.75 x 19 x 12 inches 44.5x 483 x 298 mm
Weight:	14 lbs. (6.4 kg)

Other Options

Units are designed to meet, at time of manufacture, all currently applicable product safety and EMC requirements, such as those of CE. 0 dbV ref. 0.775V RMS. Features and specifications subject to improvement without notice.

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Rear Panel Features

Please refer to **Figure-2b** on the following page to familiarize yourself with the rear panel features of the **AMP1A Series** units. The following sections describe these features and are referenced, by letter, to **Figure-2b**.

(A) Power - IEC-320 Connector

Attach a standard IEC-320 power cord between this connector and mains power (100 - 250VAC, 50/60 Hz). The front panel power LED (**Item 4**, page **8**) will glow GREEN to indicate operating voltages are present.

(B) Balanced Inputs (Channels 1-4) - 3-Pin Male Phoenix

(AMA1A-4S and ANAP1A-LP4S Only)

These balanced (40K Ω) 3-pin Phoenix connectors (left and right) accept standard analog audio signals. The two banks of inputs, Channel A (Left) and Channel B (Right), are comprised of four connectors each for a total of eight inputs (four stereo pairs). Connector pinout information is silk-screened on the rear panel above each connector.

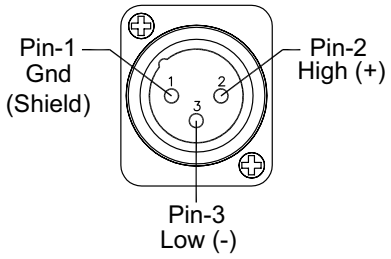
(C) Balanced Inputs (Channels 1-10) - 3-Pin Male Phoenix

(AMA1A-10S and ANAP1A-LP10S Only)

These balanced (90K Ω) 3-pin Phoenix connectors (left and right) accept standard analog audio signals. The two banks of inputs, Channel A (Left) and Channel B (Right), are comprised of ten connectors each for a total of twenty inputs (ten stereo pairs). Connector pinout information is silk-screened on the rear panel between the two rows of connectors.

(D) Selected Outputs - 3-Pin Male XLR

These two 3-pin male XLR connectors are analog outputs of the audio source as selected by the Source Select Switch on the front panel (**Item 6**, page **8**). The output is not affected by the volume/balance controls or headphone mute. See below for XLR connector pinout information.



Male XLR Pinout

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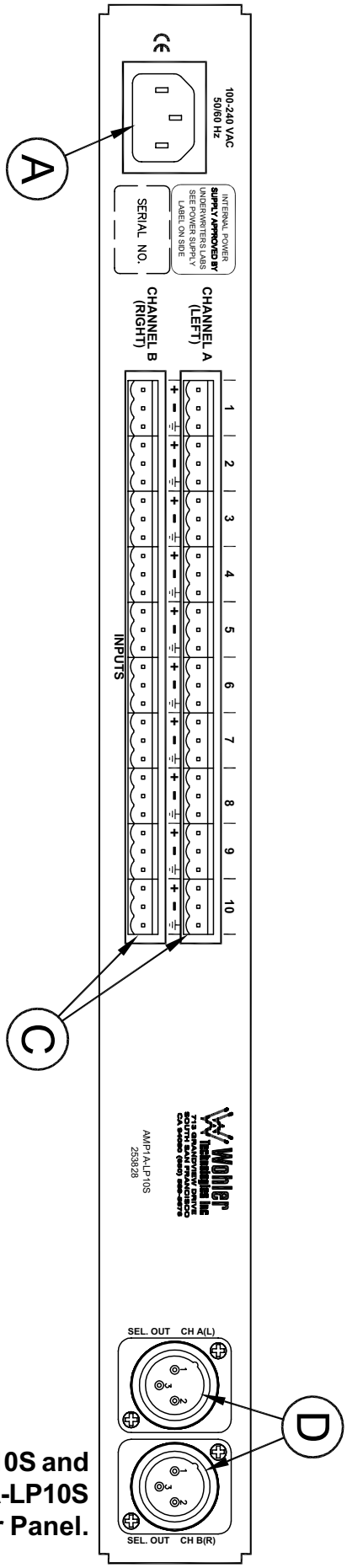
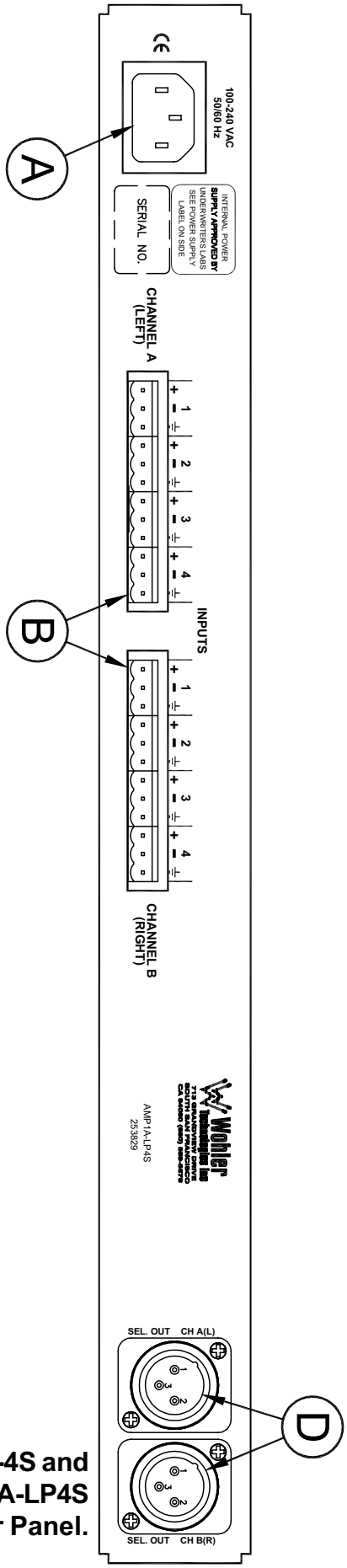


AMP1A-10S and AMP1A-LP10S Rear Panel.



AMP1A-4S and AMP1A-LP4S Rear Panel.

Figure-2b: Rear Panel Features

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Section 3

Technical Information

- **General Technical Observations**
- **Level Meter Gain Calibration and Display Mode Settings**
- **919017 - Level Meter Bargraph Driver Circuit Description**
- **Level Meter Specifications**
- **919013 - Multi-Channel Analog Switching PCB Circuit Description**
- **Interconnect Block Diagrams**

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General Technical Observations

General Mechanical Observations

Elimination of cabinet and component sympathetic vibrations (resonances) requires considerable attention to mechanical details. Because of this, and the physical constraints of the speaker's acoustic enclosures, even minor changes to any of the mechanical details of the unit can seriously impair its acoustic performance. This especially applies to the speaker baffles. If mechanical work on the unit is necessary, be sure to make adequate notes to permit accurate reassembly.

Unfortunately, the unusual and wholly proprietary method of magnetic shielding is usually degraded slightly by any disassembly of the unit, except removal of the rear panel. Almost any maintenance or repair will require removal of the cover. If an immediately adjacent video monitor shows magnetic interference after reassembly of the unit, it must be returned to the factory to restore the shielding completely.

General Audio Circuitry Observations

Since a single-sided power supply is used, all amplifier sections are "biased" with a 1/2 supply reference, so all opamp signal terminals on the main board should have a DC level of +12V, +/-0.7V. Signal inputs to the main audio board from any of the input select circuits are via the balanced input stage, in lieu of the XLR analog inputs on the basic unit. Signal feed points for level meters and the phase indicator are immediately after the input stage, and before the volume control section.

The signal pick-off for the headphones is <u>after</u> the volume and balance controls. Speaker muting is controlled by circuitry that senses connection of headphones to the jack.

The power amps are attached to an aluminum heatsink plate (which is also connected to the circuit common for these devices). The heatsink plate forms an operational module separate from the chassis, which allows access to the solder side of the circuit board while power is applied to the circuitry. To avoid thermal shutdown of the power amp(s), they should NOT be operated without their tabs being fastened to the heatsink plate.

Variations in the frequency response of different production runs of drivers has sometimes required minor adjustments in the equalization/crossover components in individual runs of units. Some of these components may have values slightly different than those indicated in the schematic, which are the nominal ones. If any of the drivers (speakers) are replaced, it may be helpful to change some of these components to achieve maximum flatness of response.

The operating threshold of the woofer limiter is critical to both satisfactory reproduction of musical transients and preventing damage to, or destruction of, the speaker itself. The side speaker output limiter circuits are similarly important, though not as critically adjusted.

The woofer power amps are arranged in a bridge configuration; care must be taken to avoid letting EITHER speaker terminal contact the chassis (common) OR THE GROUNDED LEAD OF ANY TEST EQUIPMENT so as not to short out the power amps. The side speaker outputs are single-ended, so these precautions are not necessary for them.

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Level Meter Gain Calibration and Display Mode Settings

Level Meter DIP Switch Settings

Two DIP switch modules, accessed through an opening in the top cover, allow the user to set the Bargraph Display Mode and Meter Input Gain Calibration independently for each of the two bargraph displays. There are four sections (S1, S2, S3, S4) on each DIP switch module. The first two sections (S1, S2) are for setting the Meter Input Gain Calibration and the second two sections (S3, S4) are for setting the Bargraph Display Mode.

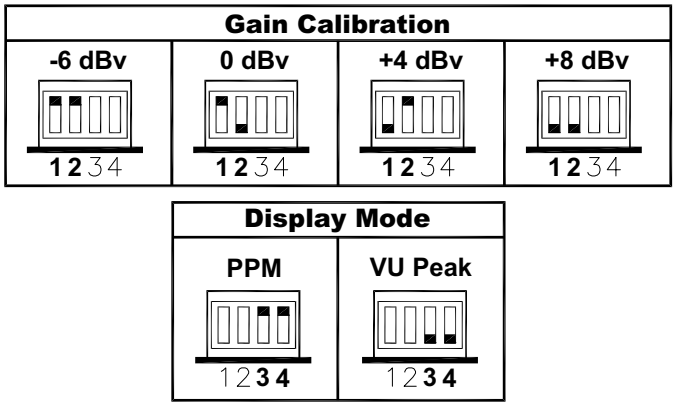
Meter Input Gain Calibration Settings

DIP switch sections S1 and S2 set the Meter Input Gain Calibration, which determines the level of the input signal that will result in a "0" reading on the meter bargraphs. The factory setting is +4 dBv, but can instead be set for -6 dBv, 0 dBv, or +8 dBv by the user. See the diagram below for settings.

Bargraph Display Modes

DIP switch sections S3 and S4 determine how peak levels are displayed (Display Mode) and select either the "PPM" mode or an auto-reset "VU Peak" mode (NOT the PPM value!). The PPM mode exhibits an attack time of 10 milliseconds and a decay time of 2 seconds from 0 to -20 dB. The VU mode exhibits a 300 millisecond rise to 99% of full indication and a decay of 300 milliseconds. The factory setting is VU mode. See the diagram below for settings.

AMP1A Analog 10-Segment
Level Meter DIP Switch Settings



Installation Note:

The Meter Input Gain Calibration/Bargraph Display Mode DIP modules are accessible through openings in the top cover of the unit. Any adjusments to the DIP switch modules should be performed *before* installing the unit into an enclosed rack.

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Bargraph Driver Circuit Description (919017)

The "PPM-1" version of the 919017 meter driver input is driven single-ended from the main circuit board. Gain selection via S1 and S2 of the DIP switch module (page 17) allow the circuit to be configured for an input level of -6, 0, +4, or +8 dB to indicate '0' on the actual display. The input attenuator network consists of R1-R4, R11, R17, R18, and R19. The buffered signal (and its inversion) are coupled to half-wave rectifiers IC2a and b.

The two half-wave rectifiers provide full-wave rectification of the AC signal from the input amplifier. IC2a provides output on negative excursions; IC2b is for positive excusions. C8 is charged via R14 (or R26); the time constant of this resistor-capacitor combination determines the attack time of the meter. When the input level decreases, C8 discharges through R14, R16, and D1 (R27, R28, D3); the resulting time constant determines the decay time of the meter. By switching in additional RC (R21, C10) with S3, the attack time is increased and the decay decreased, to approximate VU characteristics. S4 is closed along with S3 to adjust the reference voltage to compensate for the voltage dividing effects of R21.

The popular LM3916 10-segment LED bargraph driver has internal voltage comparator references at VU meter intervals. R25 sets the current for the external reference network and the LED drive current, which is about 10 times the current taken from pin 7. The top of the internal comparator resistor ladder is connected to pin 6, the bottom to pin 4. The voltage across R23, R24, and P1 is the reference against which the rectifier output applied to pin 5 is compared. The meter is calibrated by adjusting P1 (PPM) or P2 (VU). ZD1 sets the voltage at the bottom of the resistor ladder and the bias for the rectifier circuit with C11 as a bypass. NOTE: The driver PCB connects the LEDs in the bargraph in a SERIES string. The anode of the LED corresponding to the LOWEST input level (-20) is connected to V+, with the other 9 LEDs following, and the outputs of the 3916 connected to the node between each LED. Only ONE output of the 3916 is active (LOW) at any one time ("dot" mode), so if the LED string is "broken" (open) at any point, the bargraph will go OFF whenever the input level is AT OR ABOVE the level corresponding to the break.

Level Meter Specifications

Level Calibration:	-6, 0, +4, +8 dBv, Selectable
Frequency Response:	20 Hz to 18 kHz (±0.5 dB)
Level Meter Type:	10-segment LED Bargraph Display
LED Colors:	Tricolor (red, amber, green)
Metering Range:	23 dB
Display Mode (Ballistics):	VU or PPM, Selectable
VU Characteristics:	
Rise Time =	300 millisecond to 99 % of full indication
Decay Time =	300 millisecond
PPM Characteristics:	
Attack Time =	10 milliseconds
Decay Time =	2 seconds, 0 to -20 dB
Bargraph Length:	2.00" (50.8 mm)
LED Segment Size:	0.152" x 0.305" (3.56 x 7.75 mm)
LED Segment Pitch:	0.20" (5.08 mm)
Segment Brightness, (I f = 20 mA):	5.5 mcd
Segment Brightness, Uniformity:	<8% difference between segments
Adjacent Segment "Off" Brightness:	<1% of brightness of active segment
Peak Emission Wavelength:	green: 570 nm red: 630 nm

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Multi-Channel Analog Switching PCB Circuit Description (919013)

Input selection from multiple sources is accomplished via a ten channel analog switch circuit. Connection to each source is facilitated by installing a three position plug-in "Phoenix" style connector on the end of the source cable. The Phoenix connector has screw clamps for the ground and a balanced pair. The signal is coupled to the circuit through a capacitor and a 47.5K ohm resistor on each line in.

Selection of an input is made by pulling the control pins high on a 4053 analog switch. Inputs to the 4053 are normally connected to a neutral buss (circuit bias supply) until a switch pair is selected at which time the inputs are switched to the signal busses. The 4053 has three SPDT switches, so two ICs are required for every three input pairs. There are two signal summing busses for the balanced line. The signals are summed into inverting amplifiers and then summed into a differential amplifier, which then drives the audio monitor in which the board is installed. Balanced outputs are available from the inverting amps for audio routing purposes.

In monaural board versions, two balanced pairs of signal summing busses are joined into one balanced summing pair by solder bridging pads, and two opamps with their associated components are left off the board. In stereo versions, all opamps are installed along with enough 4053 switches to accommodate the desired number of inputs. The inputs can be independently selected in the case of mono sources or simultaneous pairs for stereo sources can be selected by installing jumpers at H3 (channel select pins). Selection from ten stereo sources is accomplished by stacking two ISS boards and jumpering their select lines together. One board can select from up to ten mono or five stereo inputs. Channel selection is normally done with a rotary switch mounted on the from panel of units with the ISS option installed. This switch can be remoted as an option.

Unusual input select configurations (L only, R only, phase invert, etc.), or simultaneous multiple input select, are available as additional options.

Trouble-Shooting Tips

Since a single-sided 24V supply is used, all opamps are “biased” with a 1/2 supply reference. The CMOS devices are powered from a separate zener-regulated 15V source on each analog switch board. The analog switch elements are in series with an opamp summing junction, so they can handle very high input signal levels without any "breakthrough" effect. When not selected, each 4053 input is shunted to AC ground for improved off isolation. The inverting input of any opamp is sensitive to any stray capacitance to circuit common. Though the summing amp design includes stabilizing elements, care should taken to avoid capacitive loading of the summing busses. They are jumpered between switchboards in some configurations. There is an "enable" bus connected to pin 6 of each 4053. It is available on H3 and H4, pin 12 (for bank switching or other special functions).

If it becomes necessary to disassemble a stacked audio switchboard assembly, insure that the upper board is positioned directly over the lower one when reassembling. Should it inadvertently be displaced toward either the front or rear, the power connections may become shorted.

919013 Specifications:

Input:	Ten balanced
Impedance:	90K ohms, balanced
Maximum input level:	+ 16 dBv (maximum input level of +26 dB is available with -10 dB gain to balanced output)
Crosstalk:	-65 dB
Distortion:	<.O5 %
Response:	+/- .5 dB 20 Hz - 20 KHz
Output gain:	0 dB balanced, -10 dB unbalanced
Maximum output:	+16 dBv
Power:	Less than 30 mA with a 24 volt supply

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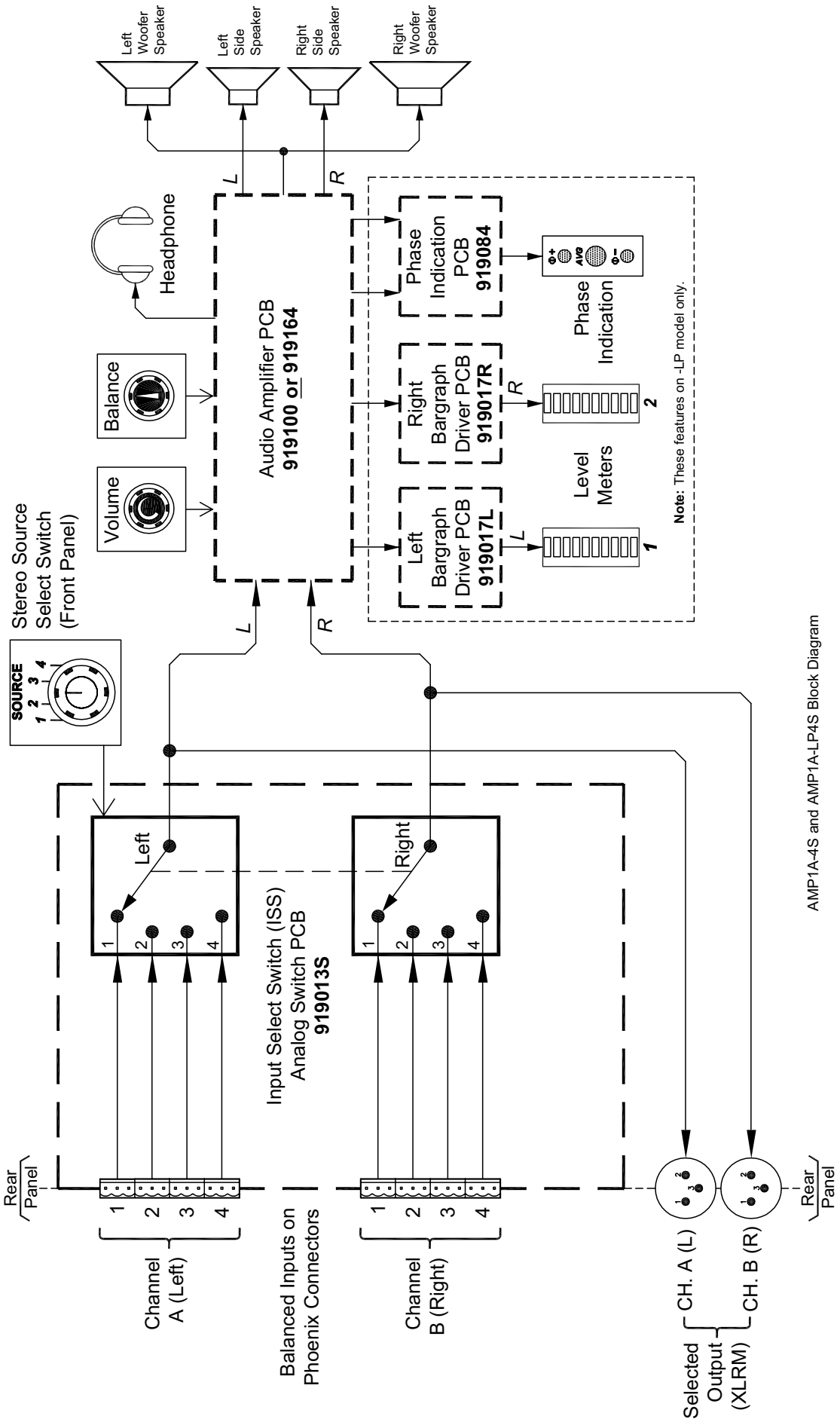
AMP1A-4S and AMP1A-LP4S Interconnect Block Diagram



AMP1A-4S and AMP1A-LP4S Block Diagram

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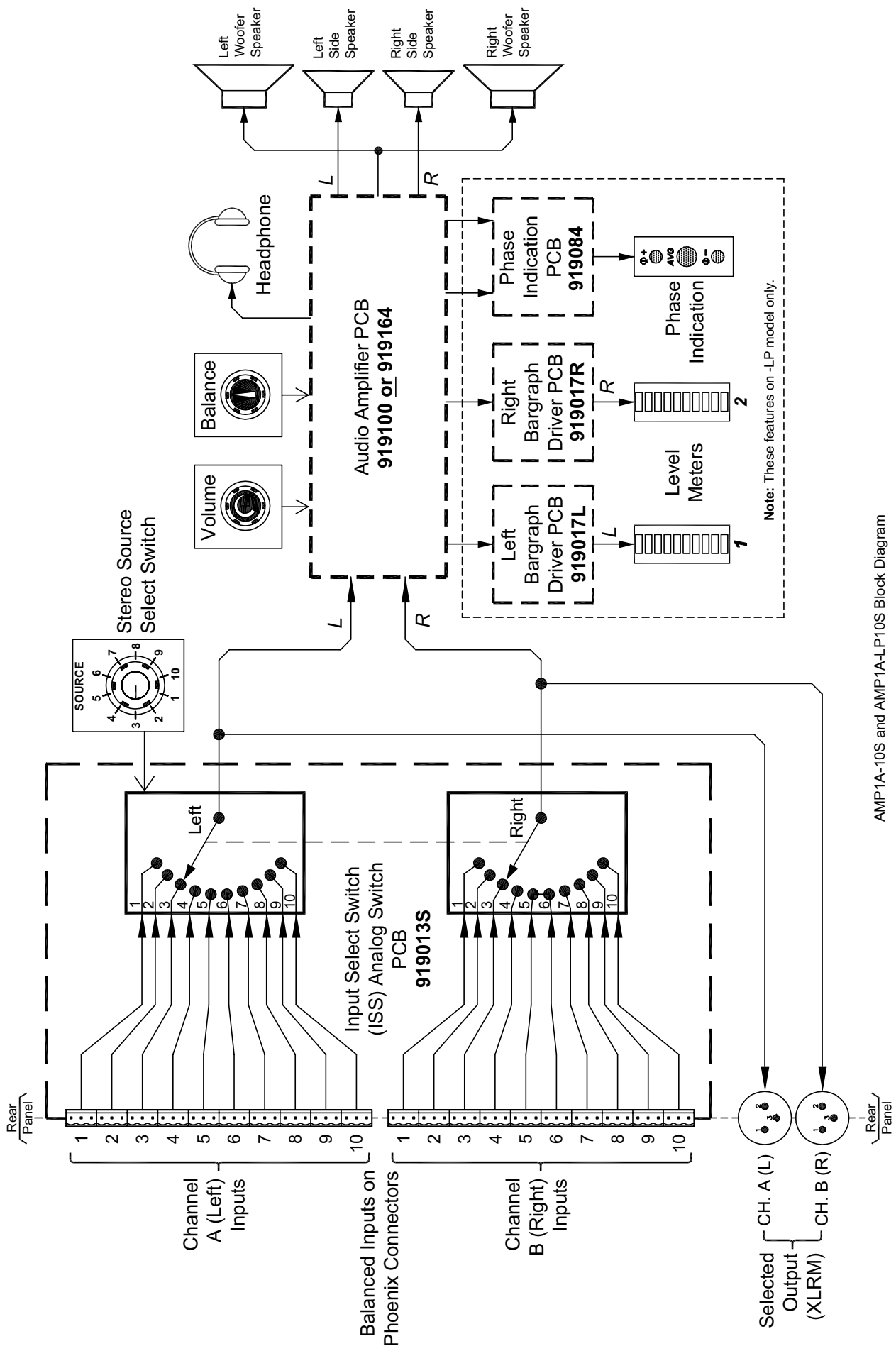
AMP1A-10S and AMP1A-LP10S Interconnect Block Diagram



AMP1A-10S and AMP1A-LP10S Block Diagram

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