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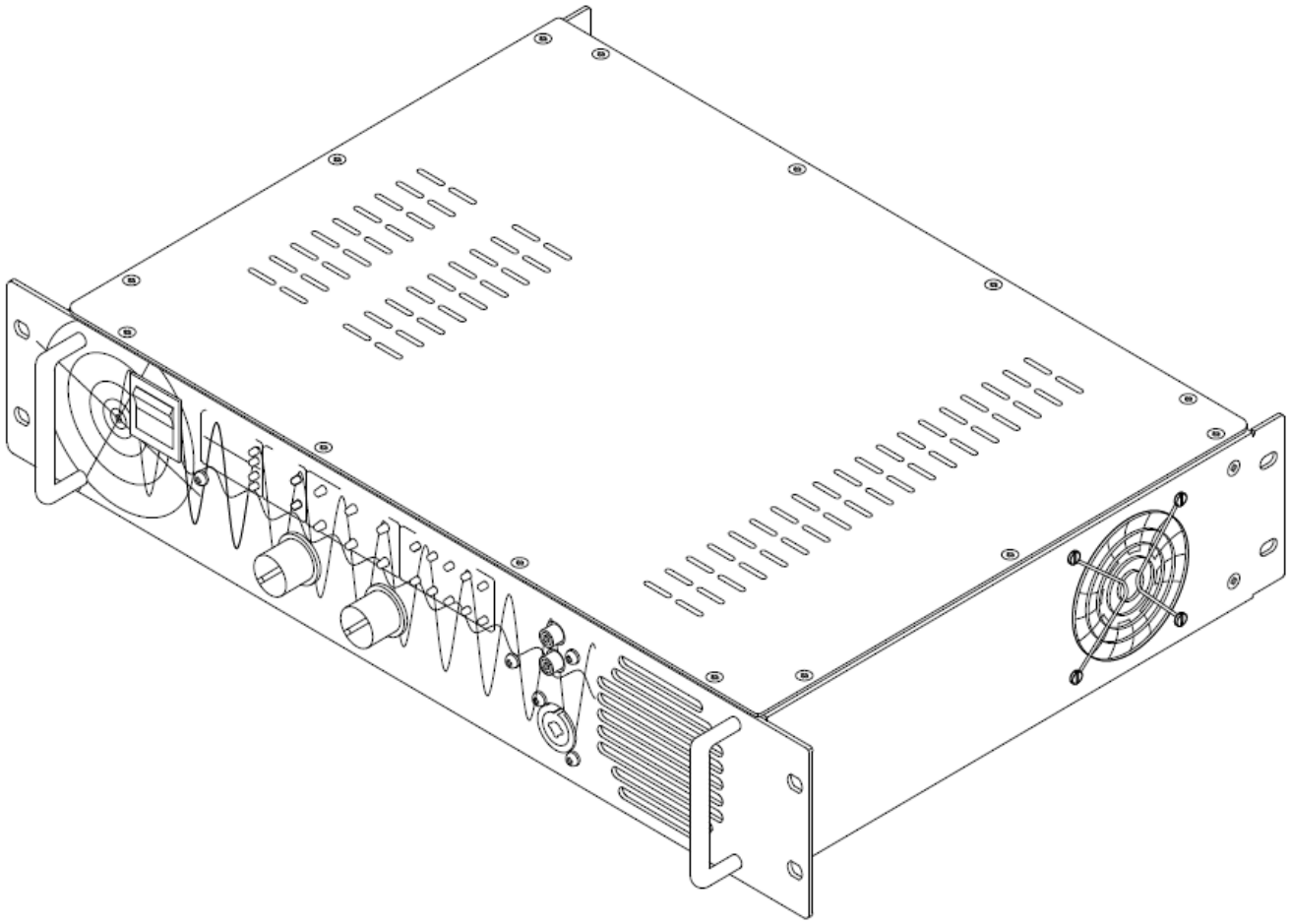
CIA400 Series Integrated Power Amplifier

Operating Manual



MV-1.24
MV-1.24X
AE-1.24
AE-1.24X

v.07024901

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1. Important Safety Instructions

1) Read all Safety Instructions and Documentation before operating the equipment.
2) Keep all Safety Instructions.
3) Heed all warnings.
4) Do not expose the equipment to rain or moisture.
5) Keep your equipment in a well ventilated, cooled room or a rack with a rack fan.
6) Do not block any ventilation openings.
7) Unplug your equipment during lightning storms, or if unused for long periods of time.
8) Do not install near any sources that produce heat.
9) Do not remove the lid.
10) Refer servicing of LAR products to qualified service personnel.
11) Keep all air vents clean and dust free.
12) Make sure power outlets conform to the power requirements.
13) Do not change the position of the Mode Switch when the equipment is turned on.
14) Protect all wires and cords from being crushed, walked on, or tripped over.
15) Do not tamper with your equipment in any way, including any wiring that has been done prior to purchasing.
16) Use only with the rack, cart, stand, bracket, or table specified by the manufacturer, or sold with your amplifier. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tipping over.

This symbol is used to alert the operator to follow important operating procedures and precautions detailed in documentation.

This symbol is used to warn operators that "dangerous voltages" are present within the equipment enclosure that may pose a risk of electric shock.

To reduce the risk of fire or electric shock, do not expose this component to water or moisture.

Please ensure that no objects filled with liquids, such as glasses, cups or bottles, opened or closed, are placed on the equipment, or the rack the amplifier is inside of.

To completely disconnect this equipment from the AC mains, disconnect the power supply cord plug from the AC receptacle of the component.

2. Precautions

Your amplifier is protected from internal and external faults, but you should still take the following precautions for optimum performance and safety. Make sure you read through all Precautions, Instructions, and Directions in this manual to avoid any potential damage to your equipment.

Before use, your amplifier must first be configured for proper operation, including input and output wiring hookup. Improper wiring and Mode Selection can result in serious operating difficulties and potential damage to your equipment. Use care when making connections and selecting signal sources. Never switch any of the back panel switches with your amplifier on, this could result in potential damage to your amplifier and or anything else wired to it.

Always remember to power down and disconnect all units from mains voltage before making connections. The power cord of equipment should be unplugged from the outlet when left unused for a long period of time. Make sure you hold the power cord plug when removing it from the back of an amplifier. Never pull from the cord, to avoid damage to the plug and or amplifier. Make sure power outlets conform to the power requirements listed on the back of the amplifier. Always make sure your amplifier is turned off before switching any of the back panel switches to change its mode.

Always keep your equipment away from any locations exposed to splashing or spilling liquids. Do not keep in direct sunlight or near anything that produces heat. Keep away from places that accumulate excessive amounts of dust. Do not touch the power plug with wet hands. Doing so is a potential electrical shock hazard.

If your amplifier has been pre-installed and or wired for you, do not make any adjustments unless informed otherwise by your installer or dealer. Do not remove your amplifier(s) from the amp rack. Doing so could cause potential overheating if in a location with inadequate airflow or excessive heat.

Even though your amplifier can handle excessive loads, it is best to not over drive your amplifier to avoid damage to your hearing. LAR is not responsible for any damage to, or loss of hearing due to excessive use of equipment or over exposure to high volumes.

3. Introduction

For your safety, please thoroughly read through the "Important Safety Instructions and Precautions" section of this manual before installing and operating your equipment.

The LAR Electronics *CIA400 Series* of Amplifiers consists of four models of monaural processed, super low distortion, Class AB audio power amplifiers featuring field configurable operating modes, attributed to a totally unique front end processing architecture.

All *CIA400 Series* amplifiers are equipped with non-defeatable, fast acting opto-coupler based output signal compressors, an anti-thump turn on delay and inrush current limiting to prevent possible equipment damage upon system startup. Our amplifiers utilize linear power supplies with low noise toroidal transformers to minimize weight, and maximize efficiency. All signal processing is kept in the analog domain, and zero digital processing devices are incorporated to maximize signal integrity. The amplifiers also feature a separate microphone signal level compressor to suppresses sudden thuds, thumps and potentially damaging intense microphone activity.

Our amplifiers are equipped with a wide variety of features that include, but are not limited to; extensive amplifier status and activity indication LED's for ease of troubleshooting, adjustable gain controls for each corresponding input/output, and a wide variety of amplifier protection schemes that will be explained throughout this manual.

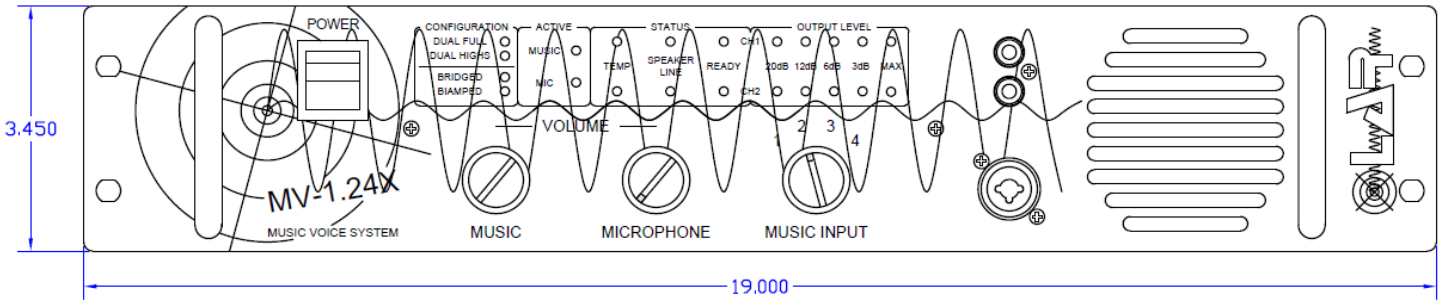
The four models available in the CIA400 series are the **MV-1.24, MV-1.24X, AE-1.24,** and **AE-1.24X.** Each model differs only from its inclusion of front panel music volume control, microphone volume control, and a music source selection switch. Each amplifier is field configurable for operation in 1 of 4 modes, and the rear panels are conveniently printed with a speaker connection wiring guide for each mode. Each of the audio inputs and outputs on the back panel have their own gain controls, located just under their respective jack, allowing for optimum control and installation flexibility.

LAR Electronics audio equipment is virtually indestructible, and made to last for decades. To ensure this, we put every piece through an extensive quality control inspection, thorough testing and an intense "Burn-in" procedure before it gets delivered. Our goal is to produce systems with high quality sound at an affordable cost.

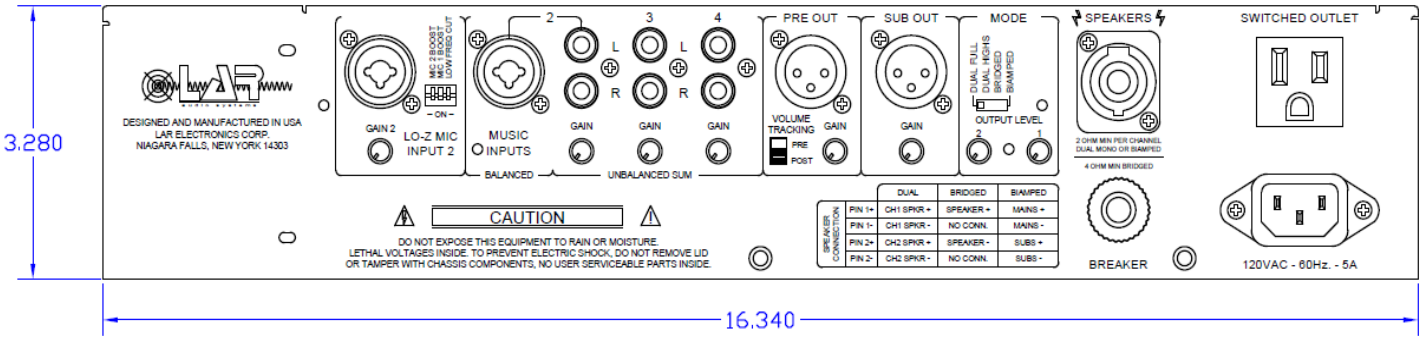
Our amplifiers are built to suit a wide variety of customers, and are perfect for a myriad of locations such as bars, restaurants, bowling alleys, dance clubs, fitness centers, and more! All pieces of equipment come with a no hassle 5 year warranty from documented Date of Purchase, along with a variety of optional service contracts available to ensure a lifetime of enjoyment from your LAR system, with little to no maintenance.

4. Dimensions

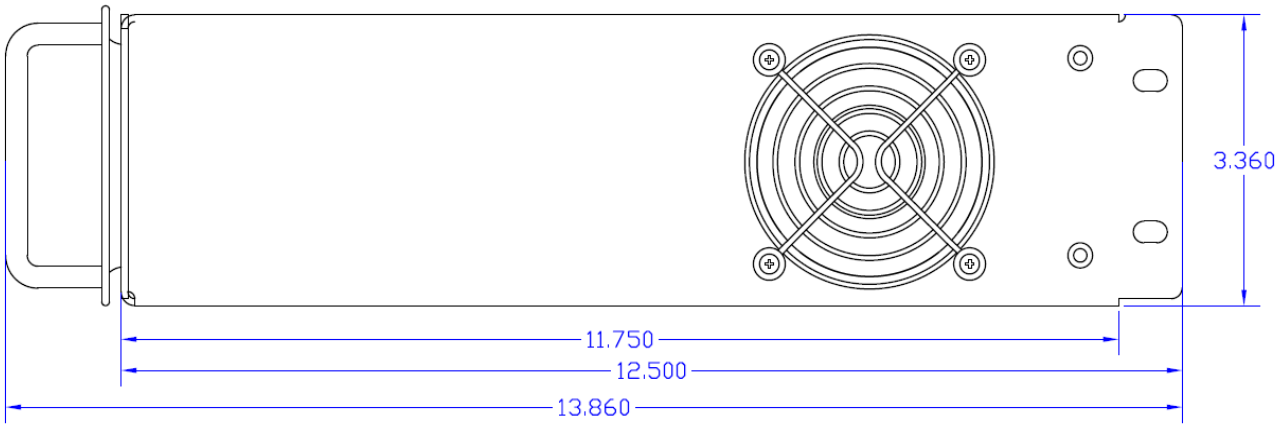
Front View



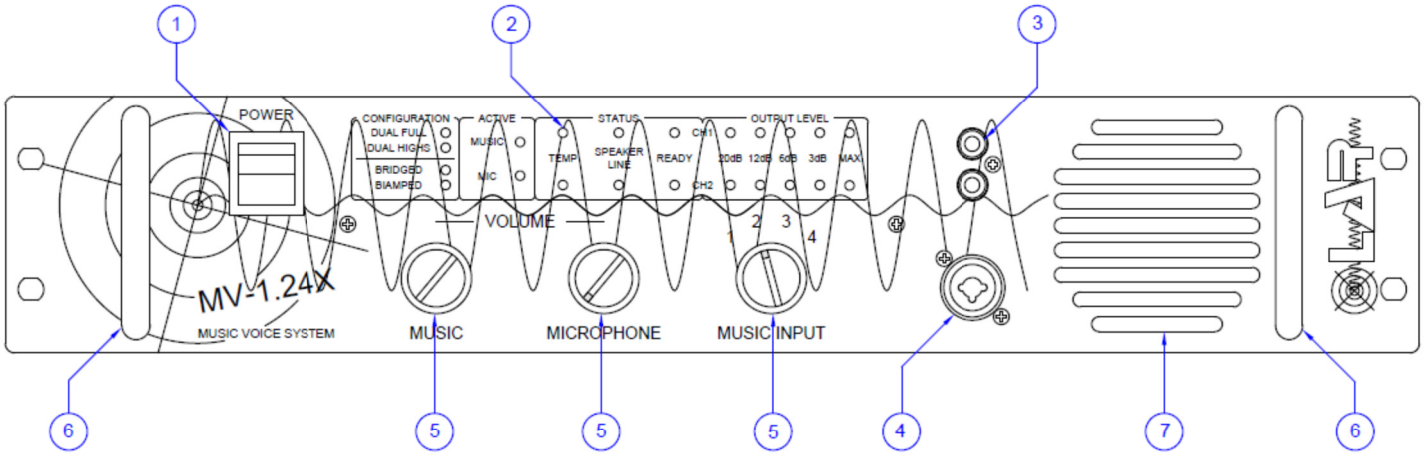
Back View



Side View

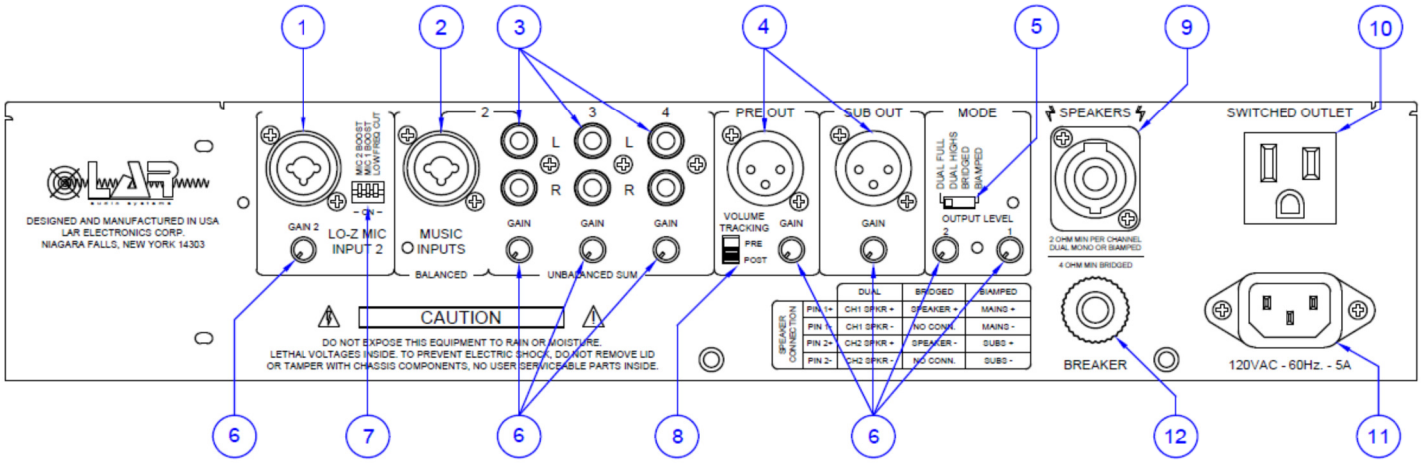


5. Front Panel Layout



1. **Master Power Switch**
   Illuminated Rocker Switch – Push Up to Power Unit On.
2. **System Status and Indication LED's**
   - Mode Configuration Indicators. [Yellow]
   - Music/Microphone Activity Indicators. [Blue]
   - Amplifier Status Indicators. [Green or Red]
   - Output Level Indicators. [Green, Yellow, and Red]
3. **Aux Input 1**
   Unbalanced Line Level Music Input. (1 of 4).
4. **Microphone Input 1**
   Combo XLR/TRS Jack accepting a Balanced low impedance Microphone Level signal.
5. **Front Panel Knobs – These will vary depending on the specific model**
   - Music Volume Control. [Standard on all models]
   - Microphone Volume Control. [MV-1.24 and MV-1.24X Models]
   - Music Input Selector Switch. [AE-1.24X and MV-1.24X Models]
6. **Equipment Handles**
   2.80'' C-C Rounded Steel Mounting Handles.
7. **Cooling Vents**
   Openings in the front of the panel to allow for air flow.

6. Back Panel Layout



1. **Low Z Microphone Input 2**
   Combo XLR/TRS Jack accepting a Balanced low impedance Microphone Level signal.
2. **Input 2 Balanced Music Input**
   Combo XLR/TRS Jack accepting a Balanced Line Level Music Source.
3. **Unbalanced Music Inputs 2-3-4**
   Three Unbalanced Summing Left & Right RCA Input jacks for Line Level Music.
4. **Pre and Sub Outputs**
   Male XLR Jacks providing a line level preamplifier and low frequency only output signal.
5. **Output Mode Selector Switch**
   1 of 4 style slide switch that selects the amplifiers effective operating frequency range and determines how much signal is internally routed.
6. **Input/Output Gain Adjustment Knobs**
   Adjusts the Input/Output Gains for each corresponding Input/Output
7. **Microphone Mode Switch Bank**
   Piano key style DIP switch – Programs Microphone Gains and Low Frequency Cut settings.
8. **Preamp Output Volume Tracking Selector Switch**
   Selects whether the Preamp output jacks signal is taken from before or after the front panel Music and Microphone Volume controls.
9. **Speaker Output**
   Neutrik® Speakon type output connection to speakers.
10. **AC Mains Outlet**
    Switched Outlet. 120VAC – 1kW max output.
11. **AC Mains Inlet**
    Connection for IEC type 60320 power supply cord – 16AWG minimum recommended.
12. **5A Circuit Breaker**
    Push-to-Reset style breaker which protects the Power Supply.

7. Common Operational Features and Protection Schemes

Regardless of the specific model of amplifier in the CIA400 series, there are a multitude of features, functions and built in amplifier protection methods that come standard.

Output Level Compressors / Limiters: Hardware set, non-defeatable brick wall style opto-coupler based output level compressors are built in, one for each channel. These protect the speakers and transformers connected to the system from being over-driven, causing their cores to become saturated. In order to prevent these two main output compressors from distorting the output signal when over-driven by sudden microphone activity, a separate compressor is built in line with the microphones signal chain to keep its level under strict control.

Foldback Current Limiting: Both amplifier channels output current is always limited to a safe level, regardless of the load placed on the amplifier. Commonly known as V-I (volt-amps) limiting, this method restricts the amount of power dissipated by the output devices. Should the speaker load try and draw more power than the design allows for, excess current is wicked away from the outputs drive devices to keep the output transistors within their electrical safe operating limits. Even if the outputs are directly shorted to earth ground, the amplifier will not self-destruct.

Over-Current Lockout Protection: If a speakers' load impedance is less than the amplifier is rated for, or a dead short is detected on the speaker terminals for an extended period of time, the equipment will disconnect itself from the speaker load, and the front panel LEDs will indicate a fault condition. The amplifier will remain disengaged from the speakers until the unit is powered down for at least 30 seconds. Once the external fault has been cleared, the amplifier will resume normal operation.

Speed Controlled Cooling Fan: The Power Amplifiers heatsink is kept cool via an internal fan, that varies in speed as required to keep fan noise to a minimum. The forced air is vented out through the front of the unit, so please keep both the side air intake and front panel air outlet unobstructed. If the heatsinks temperature exceeds 150°F, the amplifier will disconnect itself from the speakers in an attempt to allow the unit to cool down. The front panel “TEMP” status and “READY” LEDs will change to [Red] and the amp will remain disconnected from the speakers until the heatsinks temperature returns to an acceptable level.

DC Output Protection: In the extremely unlikely event that one of the output transistors happen to fail short, or an external DC power source accidentally connects to the amplifiers output lines, the unit will quickly disengage itself from the speaker load, and re-engage automatically once the DC fault is cleared. Should this happen, the front panel “READY” LED's will remain [Red] during the fault condition and the unit should be serviced.

AC Mains and Startup Protection: The CIA400 amplifiers employ a variety of initial turn on protection methods such as a 5A push-to-reset style mains breaker, Inrush Current Limiting, an Anti-Thump Turn on Delay and Lightning Strike protection via a Metal Oxide Varistor across the switched AC Mains.

8. Choosing Which Amplifier is Best For You

The four models of amplifier available in the CIA400 series are MV-1.24, MV-1.24X, AE-1.24 or AE-1.24X.

These models vary only with the number of front panel level controls and source selection switches accessible to the user. The amplifiers are available in either Audio Environment (AE) or Music Voice (MV) System configurations. Your application, and user interface requirements for Microphone Volume Control and Music Input Selection determines which specific amplifier model best suits your installations needs.

Audio Environment (AE) system amplifiers ***do not*** have a user adjustable front panel Microphone Volume control, where as Music Voice (MV) System amplifiers do. In AE systems, any microphone signals are automatically mixed with whatever program music material is playing, at a preset level. Audio Environment systems are mainly used for fixed level paging applications or for providing basic house background music, where a microphone isn't necessarily used on a daily basis.

Either of these AE or MV configurations are available with or without a front panel Music Input Source Selector Switch. Systems with an “**X**” on the end of the model number are equipped with a “1-of-4” rotary style Music Input Source Selector Switch on its front panel. If there is no front panel Music Input Selector Switch on your system, all four music inputs are automatically mixed together in the front end preamplifier stage, and if multiple sources plugged into the system are outputting a music signal, these sources will all be heard at the same time.

9. Front Panel Inputs, Controls and Indication

Front Panel Music Volume, Microphone Volume & Source Selection Controls

Music Volume Control: (Available on All CIA400 Series Models) Provides Logarithmically Tapered control of the units selected music program material.

Microphone Volume Control: (Available on Music Voice (MV) Systems Only) Provides Linearly Tapered control of the units summed microphone signals.

Music Input Selector Switch: (Available on AE-1.24X and MV-1.24X Models Only) "1 of 4" rotary style switch selection of music program.

Front Panel Audio Inputs

Note that a signal strength of 0dBu is equal to 0.775Vrms (1.1Vpeak.)

Aux Input #1

Accepts an Unbalanced line level signal of no more than 11.5dBu (4.2Vpeak) on any one of its two RCA jacks. The signal on both jacks is mixed together and can be selected as main music program material by choosing position "1" on the front panel *MUSIC INPUT* rotary switch on "X" model systems. Each leg of the RCA jack has in input impedance of about 10KΩ.

Microphone Input #1

Combo XLR/TRS jack accepts any Balanced or Unbalanced Lo-Z microphone signal. Its front end gain is, by default, fixed to +13dB but can be switched to +40dB when the *MIC 1 BOOST* switch on the rear panel is activated.

An additional +12dB of gain is available via an internal adjustment trimmer (P2) located on the preamplifier PCB, about 2 inches in from the far right, in the middle of the board, labeled *FRONT MIC GAIN*. This trimmer is by default factory set to about 50%, providing +6dB of gain. Each leg (PINS 2 + 3) of the front panel *MICROPHONE INPUT* jack has an input impedance of about 1KΩ, relative to ground (PIN 1). Note that this is much lower than the back panel microphone input jacks impedance, and is designed this way for lower noise performance at higher gain settings.

Front Panel Input & Output Status Indication

Configuration LEDs

These four [Yellow] LEDs are integrated with the *OUTPUT MODE* slide switch located on the back panel, and provides an at-a-glance indication of which mode the amplifier has been set to operate in. The *DUAL FULL, DUAL HIGHS*, *BRIDGED* or *BIAMPED* LED will light up to match where the output mode switch is set. The modes are covered in more detail later in the "Output" section of the "Back Panel Controls" explanations.

Input Activity LEDs

These [Blue] LEDs indicate whether or not the selected music input jack, has program material on it or not. The *MUSIC ACTIVE* LED will begin to flash when a signal of around -18dBu (125mVp) in strength is applied to a rear panel music input jack or if a -26dBu (50mVp) signal is applied to the front *AUX INPUT 1* jack. In the same fashion, the *MIC ACTIVE* LED will flash when a voice signal greater than about -40dBu (11mVp) is present at any one or more of the amplifiers microphone inputs.

Amplifier Status and Output Level Meters

The BiColored [Green/Red] "**STATUS"** LEDs will illuminate depending on the current state of the unit.

The **"TEMP"** LEDs will illuminate [Green] when the amplifiers heatsink temperature is at an acceptable level, and will turn [Red] when overheating occurs.

The **"SPEAKER/LINE"** LEDs will illuminate [Green] as long as the amplifier detects that speaker load placed on the corresponding amplifier channel is within its 2Ω drive capability (4Ω in *Bridged Mode*). Should a short circuit occur across the amplifiers output(s), the faulty channels LED will turn [Red], indicating over-current protection lockout is engaged and the unit will need to be reset.

The **"READY"** LEDs will illuminate [Green] if no fault conditions are occurring within the amplifier, and everything is working properly. Should a DC Failure, Speaker/Line or Temperature Fault occur, the corresponding channels LED will turn [Red] and the output relays of the amplifier, will disengage that channel from the speaker load. It should be noted that upon initial system startup, the LEDs will stay [Red] for about two seconds before the amplifier is fully booted up, then output relays will engage. The LEDs will then remain [Green] during normal operation.

The multicolored "**OUTPUT LEVEL"** meters indicates the available headroom in Decibels available to that amplifier channel before the maximum output capability is reached. The 20dB, 12dB, 6dB and 3dB scale can roughly be interpreted to indicate about 10%, 25%, 50% and 70% output level respectively. The MAX LEDs will flash to indicate when the amplifier is operating at max capability.

10. Back Panel Inputs, Outputs and Level Controls

Microphone Inputs and Level Controls

Microphone Input #2

There is one additional Combo XLR/TRS balanced Lo-Z microphone input located on the back panel. The input impedance is 8.2kΩ per balanced input leg and has a switchable +13dB/+40dB front end gain setting, just like that of *MICROPHONE #1*'s. Microphone Input #2 however has its gain control accessible via a small rear panel knob, adjustable from full cut to providing an additional +12dB of gain before being mixed with the front panel microphone input. Setting this gain control fully counter-clockwise provides full attenuation of the rear microphone input, and unity mixing gain (0dB) is set at about 11:00 on the dial. Both Microphones boast a feedthrough signal bandwidth from 4Hz to 120kHz with the +13dB default un-boosted gain setting and with the *LOW FREQ CUT* switch disabled. It should be noted that both microphone jacks accept a maximum signal level of +8dBu with the +13dB gain setting or -18dBu in the +40dB gain setting.

MIC MODE Switch Bank

This bank of three piano key style DIP switches allows the installer to enable gain and function settings for the microphone inputs and processing blocks of the preamp. The switch is embossed 1 through 3, and depressing the white key switch fully down enables the corresponding microphone block functions, outlined as follows;

- **Switches #1, #2** – MIC 1 & 2 GAIN BOOST: When enabled, changes the corresponding microphones front end gain from +13dB to +40dB.

- **Switch #3** – LOW FREQ CUT: When enabled, inserts a -12dB/octave high pass filter set to 120Hz in line with the mixed microphone signals processing chain to cut frequencies below this point. This switch *does not* cut low frequencies in the music program signal, it only affects the two microphone channels frequency response.

Music Inputs #2, #3 & #4 Jacks

There are a total of four physical music input jacks to utilize on the back panel. The Balanced Combo XLR/TRS jack and the Unbalanced RCA jack pair with the "2" over them, share the same input assignment. They can be used simultaneously with a balanced and an unbalanced signal plugged into them both, but the signals will mix when "MUSIC INPUT 2" position is set on the front panel input selector switch.

Note: Input #2s Balanced input jack can be factory set to have a 10KΩ:10KΩ isolation transformer installed on the PCB before the unit gets delivered. By default, the units do no have an isolation transformer installed and is considered to be an "electronically balanced" input. The remaining unbalanced sum RCA jack inputs, #3 and #4, accept line level signals of no more than 11.5dBu (4.2Vpeak) on any one of its RCA jack legs with their inputs corresponding gain knobs turned all the way clockwise, and no more than +20dBu (11Vpeak) signal with their gain knobs fully counter-clockwise.

Any stereo signals applied to the white and red pair of that input are mixed together to mono, and that input can be selected as the main music program material by choosing position 2, 3 or 4 respectively on the front panel *MUSIC INPUT* rotary switch. Each leg of any of the unbalanced RCA jack inputs has in input impedance of about 18kΩ, while the balanced XLR/TRS jack on input #2 has in input impedance of 10KΩ per leg unbalanced or 20KΩ balanced.

Music Input Gain Adjustments

Each of the music input jacks on the back panel has its own *GAIN* control located just under the respective jack pair. This control adjusts the front end gain of the music inputs as they mix together. The front end gain for each section is adjustable from 0dB (1v/v) with the dial full counter-clockwise, all the way to +9dB (2.8v/v) full clockwise. ***Note:*** These gain settings are taken relative to only ONE of the RCA jacks in a pair at a time.

Preamp Out, Sub Out, Output Level Controls and Mode Selector Switch

Preamp Output and Controls

A Male XLR jack provides an electronically balanced full range preamplifier output signal for connection to additional amplification and processing equipment.

The XLR jack is wired according to the standard conventions of:

PIN 1 = Ground or Shield
PIN 2 = Hot Output (0° Phase)
Pin 3 = Cold Output (180° Phase)

The two position slide switch located below the jack labeled “VOLUME TRACKING”, selects whether the output signal is sourced from *Before* (PRE) or *After* (POST) mixing of music and microphone signals by the front panel volume controls. If “PRE” is chosen, the resulting output signal is an equal ratio mix of music and microphone information. This jack has an output impedance of 150Ω per leg and an associated output level “GAIN” control adjustable from Infinite Cut to +6dB.

10. Back Panel Inputs, Outputs and Level Controls – Continued...

Subwoofer Output and Control

A Male XLR jack provides an electronically balanced subwoofer range output signal consisting of frequencies below 106Hz. down to about 4Hz. for connection to additional amplification and processing equipment. This signal follows the front panel music and microphone volume controls and is used for slaving additional power amplifiers running subwoofers while maintaining the same phase angle as the crossover used in the CIA400 amplifier. For example, if the "*DUAL HIGHS"* mode is selected on the back panel, both CIA400 amplifier channels would be used to run lighter duty high frequency speakers, while a larger power amplifier hooked up to this jack runs low frequency drivers, the result is a perfectly phase balanced Bi-Amped audio system, thanks to the internal crossover topology used. This jack has an output impedance of 150Ω per leg and an associated output level "GAIN" control adjustable from Infinite Cut to +6dB.

Output Level Controls

Located directly under the "MODE" selection switch, these two controls set the amount of gain that the final output stage of the preamplifer has, before the signal is sent to the main power amplifiers. They are integrated directly with the output compressor stages and are mainly used to balance the amount of relative gain each channel has to the other.

Output Drive Capabilities

Both output jacks have been designed and tested to run a 1000 ft. piece of standard unshielded twisted pair CAT5e cable, terminated with a 600Ω load in parallel with a 1000pF capacitor with no ringing or output amplifier instability occurring. The measured Insertion Loss with this load was less than 2dB at 5Vp-p on the output. A maximum output signal level of about +21dBu per leg can be achieved if lightly loaded.

As a usage example, when the amplifier set to operate in "*BIAMP"* Mode, Channel 1 is outputting high frequencies, and Channel 2 is outputting low frequencies. To audiologically balance the overall system, the Channel 2 Gain Control may be set about +4dB higher than the Channel 1 Gain Control, simply because of the acoustical physics attributed to separating and routing a full range signal to subwoofers and tweeters separately. Subwoofers require a great deal more energy to produce the same apparent sound pressure levels as a more easily heard high frequency tweeter or mains speaker being fed a signal of the same amplitude.

The controls range is fairly decilinear in fashion and can adjust the Channels Output Gain anywhere between completely off (Full Counter-Clockwise) and adding +12dB of additional output gain (Full Clockwise) before the signal is sent to the power amplification stage.

The Output Gain Control follows a gain mapping pattern, outlined as follows:

Full CCW = -INF (Gain = 0v/v) FULLY OFF
9:00 = -10dB (0.316v/v)
10:30 = -4.5dB (0.6v/v)
12:00 = -1.4dB (0.85v/v)
1:00 = 0dB (1v/v) UNITY GAIN
1:30 = 1.6dB (1.2v/v)
3:00 = 7dB (2.2v/v)
Full CW = 12dB (4v/v)

Neutrik® Speaker Output Jack

A Neutrik® NL4FX Speakon Connector, or simmer compatible part, shall be used to connect the amplifier to the systems speaker load.

- 2 Ohm Minimum Load Per Channel in Dual Mono modes or Biamped mode.
- 4 Ohm Minimum Load Bridged Mono mode.

Output Operating Mode Switch

This four position slide switch on the back panel determines the internal signal distribution for the amplifier and the overall resulting frequency response band allotted to each amp channel.

DUAL FULL RANGE MODE:

Being that the CIA400 series amplifiers manipulate monaural audio signals, this setting lets the full usable spectrum of audio be played through both output channels of the amplifier simultaneously. The unit may operate two separate zones that share the same program material with their overall master volume controlled via the front panel knobs, and their relative volumes set by the corresponding channels *OUTPUT LEVEL* adjustment.

DUAL HIGHS MODE:

This setting allows for the same independent channel gain balancing as Dual Mono Full Range Mode, but instead of passing a full range signal to the speakers, only frequencies above 106Hz [the-6dB cutoff point] will be allowed through. This mode is most useful when utilizing the back panel "SUB OUT" jack to run additional high powered subwoofers in your installation. Relative volumes are set using the "OUTPUT LEVEL" adjustments.

10. Back Panel Inputs, Outputs and Level Controls – Continued...

BRIDGED MODE:

This setting is primarily used for "70V" distributed speaker systems. Channel 1 passes a full range audio signal, while channel 2 passes an exact copy of Channel 1's program, but 180˚ out of phase. When the speakers are connected between Channel 1+/2+ on the output terminal, twice the normal output voltage is now available across the load, *quadrupling* the apparent output power of the unit. This is best utilized when several transformer coupled, low wattage tapped speakers are needed to broadcast a program across a wide area, with up to a 400W maximum transformer load allowable. Only the "Channel 1 Output Level" control located on the back panel is used to adjust the final output level for both channels simultaneously.

BIAMP MODE:

Setting the switch to *BIAMP* Mode, splits up the overall mixed music and microphone program material into high frequency and low frequency signals, that then gets distributed to Channel 1 and 2 amplifier channels respectively. The CIA400 series amplifiers all contain two, two-pole, Sub-Bessel response, -12dB/octave active filters, both hardware set to 106Hz., a high pass filter for Channel 1 and a low pass filter for Channel 2. In "BIAMP" mode, Channel 1 will output signals *Above* 106Hz., and Channel 2 will only output signals *Below* 106Hz. down to about 4Hz. overall. When mains frequency response speakers are connected to the Channel 1+/1- speaker jack, and low frequency capable subwoofers are connected to the Channel 2+/2- speaker jack, the result is a perfectly phase balanced monaural audio signal, with independently adjustable levels for high and low frequencies using each Channels OUTPUT GAIN adjustment knob respectively.

11. Internal Trimming and Adjustments

Although most of the controls you'll to setup your system are accessible via the back panel, there are a few gain adjustment trimmers located *inside* the chassis that can be fine tuned in the field. Do not remove the lid or attempt to adjust the units internal trimmers unless the power to the unit is completely removed first, by physically disconnecting the ac inlet cable from the back panel or wall outlet. Any trimmer sealed with colored paint should never be adjusted and if done so will automatically void the units warranty There are three user adjustable square, blue colored trimmers provided on the main processor PCB. Use a small flathead screwdriver to adjust the trimmers. Note that they only have a movement range of about 280° total.

Music Mixing Gain Trimmer– P1

This adjustment changes the amount of gain that the selected program music is given before being mixed with the microphone signal. The trimmer is located about midway down the PCB, left and is labeled "**MUSIC GAIN**". By factory default, it is set to **50%**, which gives that stage a gain of about 0dB, but the trimmer has an adjustable range of -3dB (0.68v/v) to +6.5dB (2.12v/v). Turning the trimmer clockwise increases gain.

Front Microphone #1 Mixing Gain Trimmer– P2

This adjustment performs the same action as the back panel microphone gain adjustment controls for mic input #2, but this trimmer is for the front panel microphone input #1. It determines how much gain the front microphone is given before mixing with the other microphone jack signals. The trimmer is located about 2 inches in from the far right, in the middle of the PCB, labeled "**FRONT MIC GAIN"** By factory default, the trimmer is set to about **50%**, which gives the front microphone a mixing gain of about +6dB, but is adjustable from fully off to +12dB gain fully clockwise.

12. Cooling Requirements

All CIA400 series amplifiers have an internal side mounted fan, but when installing multiple amplifiers into a rack it is best to have additional cooling to keep your amplifiers at a regulated temperature.

Any amplifiers that get installed into a standard sized 19'' equipment rack get cooled with the fan that's inside the rack. Typically, amp racks have a single or double plated fan panel, with a high speed fan attached that cool the entire rack.

If your equipment is not getting installed into a rack make sure it is in a well cooled room and has plenty of room for air flow. Improper cooling can result in your amplifier being more likely to overheat and go into Thermal Protection Mode. Refer to the Troubleshooting section for additional help.

13. Speaker Connections and Installation

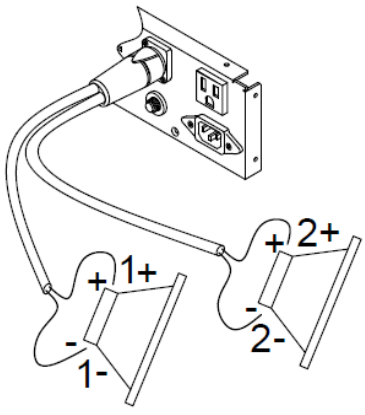
THIS SECTION SHOULD ONLY BE CONSIDERED IF YOUR CIA400 SERIES AMPLIFIER IS BEING PURCHASED AND NOT PRE-INSTALLED BY A QUALIFIED TECHNITION. IF YOUR AMPLIFIER HAS ALREADY BEEN INSTALLED INTO A RACK DO NOT MAKE ANY NON-USER ADJUSTMENTS.

All CIA400 amplifiers are 2 Rack Units (3 1/2'') tall, and rail mount any standard 19'' wide equipment rack. Before you begin installation, make sure your amplifier is disconnected from the AC Mains power source, with its power switch in the “OFF” position, and all level controls turned completely down. Four front panel mounting mounting holes are provided on each amplifier. Screw into equipment rack, making sure it is well supported at all four corners to avoid damage to either the amplifier mounting ears, mounting rails or adjacent equipment.

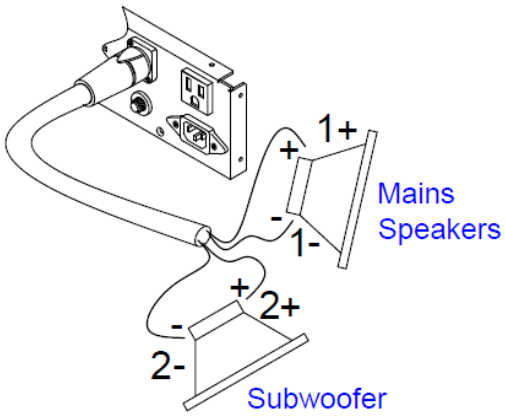
To relocate your unit, turn the power switch off and remove the power plug from the AC outlet, then remove all connecting cables. Damaged cables may cause fire or electrical shock so discard accordingly. When setting up the product, make sure that the AC outlet you are using is easily accessible and can safely supply the unit(s) with the necessary current required.

When wiring your amplifier, make sure the mode switch is set on the appropriate setting you plan on wiring it for. Modes are further explained on page 16.

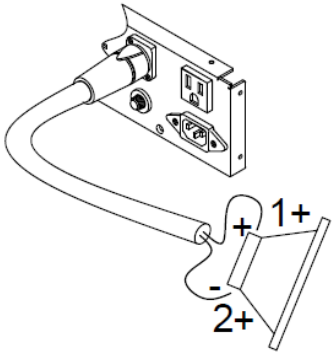
Dual Mono / Full



Biamped



Bridged



14. Troubleshooting

If your amplifier does not turn on, make sure the circuit breaker is not popped. If it is, please turn off your amplifier and reset the circuit breaker. If this is a repeating problem you may need to contact a qualified service professional.

If the Temperature and Ready Status LED's are **RED** instead of **GREEN**, and your amplifier isn't producing any sound, then your amplifier has over heated, or there has been a fan failure, obstruction of air flow, or severe amplifier fault. The amplifier will remain disconnected until it has cooled down to its factory standard operating temperature, which at this point it will automatically reset if no other faults are present and return to its normal operation mode.

When the Temperature Status LED is **GREEN,** its indicating your amplifier section heatsink is operating at a safe temperature. When the indicator is **RED,** this means that it has exceeded its safe operating temperature and will go into Thermal Protection Mode. In this case it will automatically disconnect the speakers from the amplifier section to speed cooling.

Thermal Protection Shutdown can be caused by a number of factors including inadequate ventilation of the equipment rack, incorrect load impedance, blocked air vents, overheating heatsink, or cooling fan failure. The cause of your amplifier's thermal protection state should be determined and corrected as soon as possible. Without correction, can become a reoccurring problem.

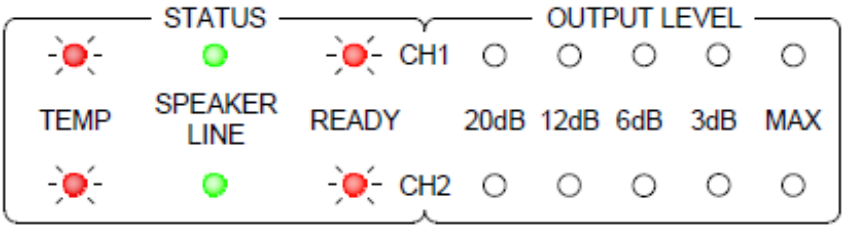
When the Ready Status LED's are **GREEN,** this indicates no faults are present in your amplifier and it can operate normally. **RED** ready lights indicate either a temperature fault, over current, shorted speaker line fault, or internal amplifier malfunction. If this is the case you will need to send your amplifier back to manufacturer for servicing.

When the Speaker line Status LED's are **GREEN,** this indicates that the impedance present on the speaker terminal is within safe limits, ie: more than 2Ω for Dual Mono Full, Bridged, or Biamped modes, or more than 4Ω for Dual Mono High. **RED** Speaker line LED's are indicative of a speaker line shorted or transmission line to speaker is shorted. If this is the case, the power to the amp must be turned off via front panel switch, the fault cleared, and the amplifier be remained off for at least 30 seconds to reset the fault detection circuitry.

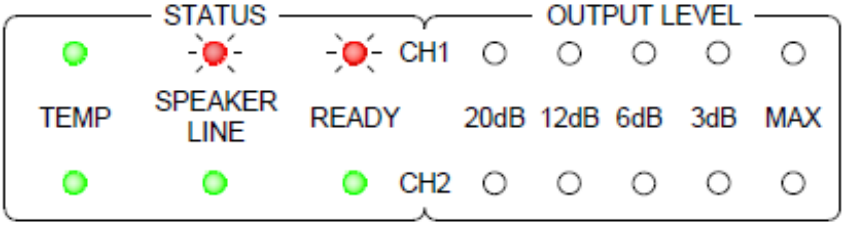
Output Level Indicators receive the signal before the level controls, so they can be used to troubleshoot wiring problems within a system. If the Output Level Indicator for a channels output level is not lit, no signal is reaching the amplifier on that channel. Maximum Input Level" is the input voltage needed to clip the output of the first amplifier stage the signal encounters. If this rating is exceeded, damage may result to the front end processing circuitry if not managed properly and is NOT covered under standard warranty.

If the power switch stops illuminating your amplifiers circuit breaker has popped or there is a problem with main power line.

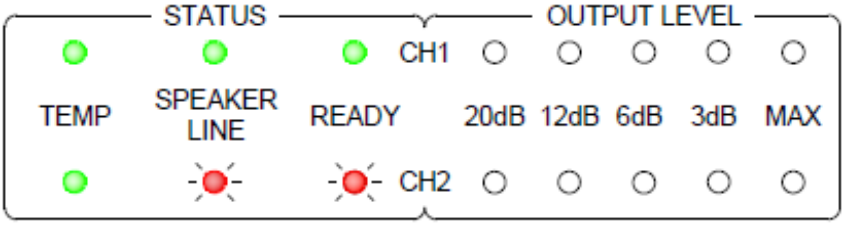
Troubleshooting
Status LED's



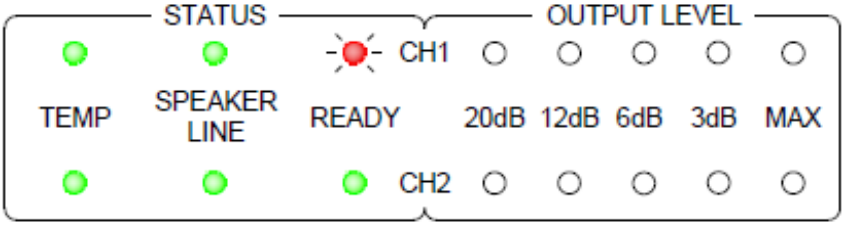
Over Temperature Fault:
Thermal protection mode engaged. It will automatically turn back on after it cools off.



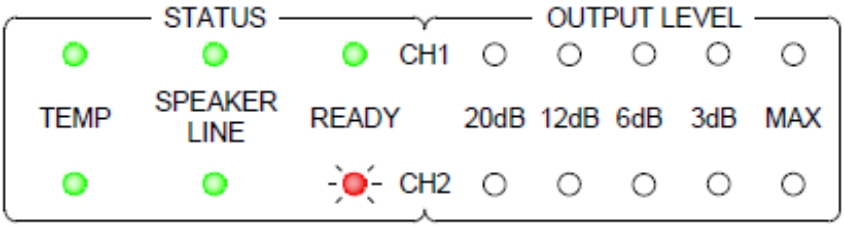
Speaker Line Fault Channel 1:
Channel 1's Speaker Load or the Transmission Line to the Speaker is shorted. Turn amplifier off, clear the fault, and keep off for at least 30 seconds.



Speaker Line Fault Channel 2:
Channel 2's Speaker Line is shorted, or the Transmission Line to Speaker is shorted. Turn amplifier off, clear the fault, and keep off for at least 30 seconds



Internal Fault for Channel 1:
Send amplifier back to manufacturer for repairs.



Internal Fault for Channel 2:
Send amplifier back to manufacturer for repairs.

If any of the Indicator LED's are changed from green to red in a different configuration then shown in the above examples your amplifier will need servicing. Contact LAR for additional help or questions.

15. Repairs and Servicing

All LAR Audio Systems Amplifiers are built to last and virtually indestructible. In the unlikely event that your amplifier breaks or malfunctions, please contact a qualified service technician before attempting to repair the equipment.

Equipment should be serviced by a qualified technician when:

- The power supply cord or the plug has been damaged.
- The equipment has been exposed to rain, or liquid had been spilled inside the amplifier.
- The equipment has been dropped or damaged in any other form.
- The equipment does not appear to be operating normally, or if you notice a change in performance.


If your power cord is damaged in any way, contact your dealer for a replacement. Using your amplifier with a damaged power cord is a fire hazard and you risk possible electrical shock. If your amplifier is dropped, or the equipment rack is damaged, turn the power switch off, remove the power plug from the AC outlet, and contact your dealer.


If you continue using your equipment without heeding this or any other instructions, fire or electrical shock may result. If you notice any abnormality, such as smoke, odor, or noise, or if a foreign object or liquid gets inside the unit, turn it off immediately. Remove the power cord from the AC outlet, and contact a qualified service professional.

16. Maintenance

- Your LAR Audio Amplifier requires no routine maintenance, but to extend the life of your amplifier it is best to keep the fans and air vents clean and dust free.
- There are no internal adjustments that need to be made during the amplifiers lifetime.
- There are no user serviceable parts inside the amp that require it to ever be opened.
- There are potentially *lethal* voltages inside the amplifier chassis, removing the cover increases risk of electric shock.
- Tampering with the circuitry or making unauthorized circuit changes, may be hazardous and potentially damage your equipment.
- If you need to make any wiring or installation changes, remember to turn your amplifier off and disconnect its power cord.
- Refer all servicing to qualified service technicians authorized by LAR Audio Systems.

17. Amplifier Specifications

Specifications Apply To All Models In The CIA400 Series

Preamplifier Stage Gain: Adjustable From Full Cut to +14dB [+6dB Default]
Power Amplifier Stage Gain: 25 V/V [+28dB]
Operating Voltage Rails: +/- 48VDC unloaded, Ground Referenced
Current Draw: 5 Amperes [Nominal]
Input Impedance for Unbalanced Inputs 1, 2, 3, and 4: 17kΩ per RCA Leg
Input Impedance for Balanced Input 2: 10kΩ per XLR Leg
Output Impedance for Preamp / Sub Outputs: 150Ω per XLR Leg
Damping Factor: > 200 into 8Ω.
Required AC Mains: 110-125VAC, 50-60Hz, 5A.
DC Output Offset: No more than +/- 100mVp
Quiescent Offset & Noise at Output: < 10mVp-p
Rise Time – Uncompensated – Non Filtered: 3.5µS [10% to 90% at 5vp-p]
Amplifier Section Frequency Performance: Less than 5Hz. to greater than 20kHz
Amplifier Power Supply: Linear - 400 VA Toroid – 13,600uF Shared Rail Filter Capacitance
Sine Wave Output Power with Compressor Engaged:

- 8 Ohms: 75 W RMS continuous per channel
- 4 Ohms: 125 W RMS continuous per channel
- 2 Ohms: 140 W RMS continuous per channel

Load Impedance:

- 2 Ohm Minimum: Dual Mono Full Range, Dual Mono Highs or Biamped Modes
- 4 Ohm Minimum: Bridged Mono Modes

Number Of Output Channels: Two
Dimensions: 19“ W x 3 1/2“ H x 12 1/2“ D
Weight: 18 lbs.
Chassis Material: 12 Gauge 5052-H32 Aluminum
***Front End Error Amp Topology*:** Dual Mirrored Differential Long Tailed Pair, CCS Biased
Output Section Topology: Direct Coupled Class AB – Double BiPolar Output.
Cooling Method: Variable Speed Internal Fan

All specifications subject to change without notice

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