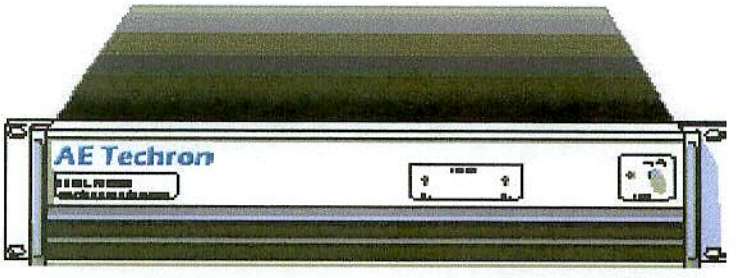
AE Techron

Operator's Manual



LV 3620

Power Supply Amplifiers

500742-1

AE TECHRON INC.®

Limited One-Year Warranty

SUMMARY OF WARRANTY

AE TECHRON INC., of Elkhart, Indiana (Warrantor) warrants to you, the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW ***AE TECHRON INC.*** product, for a period of one (1) year from the date of purchase, by the original purchaser (warranty period) that the product is free of defects in materials or workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon your sale or other disposition of our product.

ITEMS EXCLUDED FROM WARRANTY

We are not responsible for product failure caused by misuse, accident or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loads or any other products or accessories resulting from ***AE TECHRON INC.*** product failure. It does not cover defects or damage caused by the use of unauthorized modifications, accessories, parts, or service.

WHAT WE WILL DO

We will remedy, at our sole discretion, any defect in materials or workmanship by repair, replacement, or refund. If a refund is elected, you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by ***AE TECHRON INC.***, including one-way surface freight shipping costs within the United States. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other customs fees for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

When you notify us of your need for warranty service, we will give you an authorization to return the product for service. All components must be shipped in a factory pack or equivalent which, if needed, may be obtained from us for a nominal charge. We will take corrective actions within a reasonable time of the date of receipt of the defective product. If the repairs made by us are not satisfactory, notify us immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

You are not entitled to recover from us any consequential or incidental damages resulting from any defect in our product. This includes any damage to another product or products resulting from such a defect.

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this warranty. The warranty is not extended by the length of time for which you are deprived of the use of this product. Repairs and replacement parts provided under the terms of this warranty shall carry only the unexpired portion of this warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

There is no warranty that extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. We disclaim all implied warranties, including, without limitation, any warranties of merchantability or fitness for a particular purpose. No action to enforce this Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

AE TECHRON INC. Customer Service Department
2507 Warren St. Elkhart, IN, 46516, U.S.A.
(574) 295-9495

About AE Techron model LV 3620

Model LV 3620 is a proven performer in AE Techron's medium power, high voltage line of industrial amplifiers. This two channel, voltage mode amplifier will provide years of reliable performance under demanding conditions. Features of the amplifiers include:

- Output power for each channel is 286 watts rms into a 4–ohm load.
- Designed to survive input overloads, continuous operation under demanding conditions and improper output connections–including shorted and improper loads.
- Front panel indicators for rapid assessment of amplifier status.
- The amplifier installs into a standard 19 inch rack in 2U of rack space. Aluminum construction for minimum weight and maximum cooling.
- Shipped ready to operate from 120 volt ac mains at 50–60 Hz.

This manual covers basic operation for AE Techron amplifier model LV 3620. It is written for electronic technicians and engineers that need to incorporate the amplifiers into their systems. It does not contain service information.

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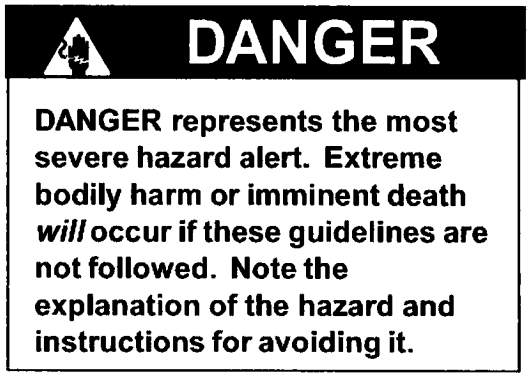
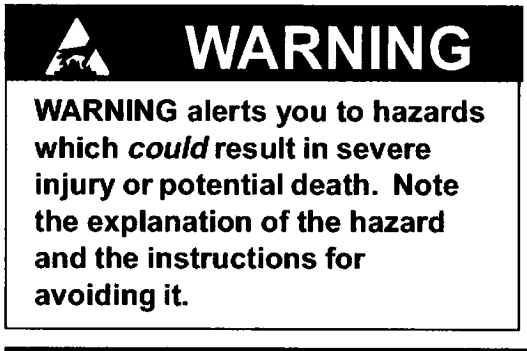
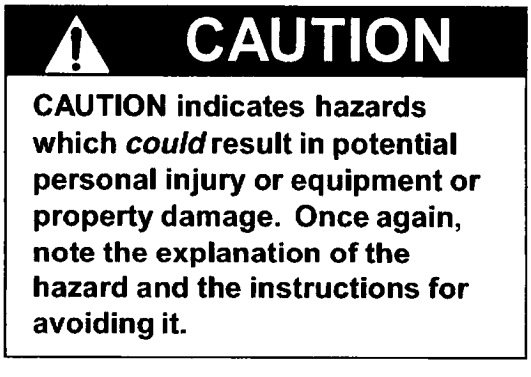
Section 1: Preinstallation

1.1 Safety conventions

Safety should be your primary concern as you use the highly sophisticated AETechron LV3620 amplifier. Note the special hazard alert instructions that appear throughout this manual.







Note: A Note represents information which needs special emphasis but does not represent a hazard.

1.2. Features

The AETechron LV3620 amplifier uses the latest technology and miniaturized design to deliver the highest power and value for its size, weight and price. Techron's patented *grounded bridge*™ output and *ODEP* protection circuitry combine to provide performance and reliability that surpasses previous conventional amplifier designs.

The AETechron LV3620 features:

- Techron's patented *grounded bridge* circuitry generates substantial voltage swings without stressful output transistor configurations.
- Patented *ODEP* (Output Device Emulation Protection) circuitry compensates for overheating and overload.
- Balanced inputs
- *IOC*® (Input/Output Comparator) circuitry immediately alerts of any distortion exceeding 0.05%.
- 5-way binding posts for easy and versatile output connection.
- Very low harmonic and intermodulation distortion.
- High damping factor
- An articulated bi-level power supply for best power matching to your load
- Full protection against shorted outputs, open circuits, mismatched loads, overheating, high frequency overloads, and internal faults
- Efficient heat sinks and a self-contained forced air cooling system to dissipate heat quickly and evenly for extra amplifier protection and greater power output.
- Mounts in a standard 19-inch equipment rack.
- All specifications are guaranteed for the duration of the warranty period.
- Extra rugged, extruded aluminum front panel with *Overload* and *Enable* Indicators.
- One year full warranty completely protects your investment.

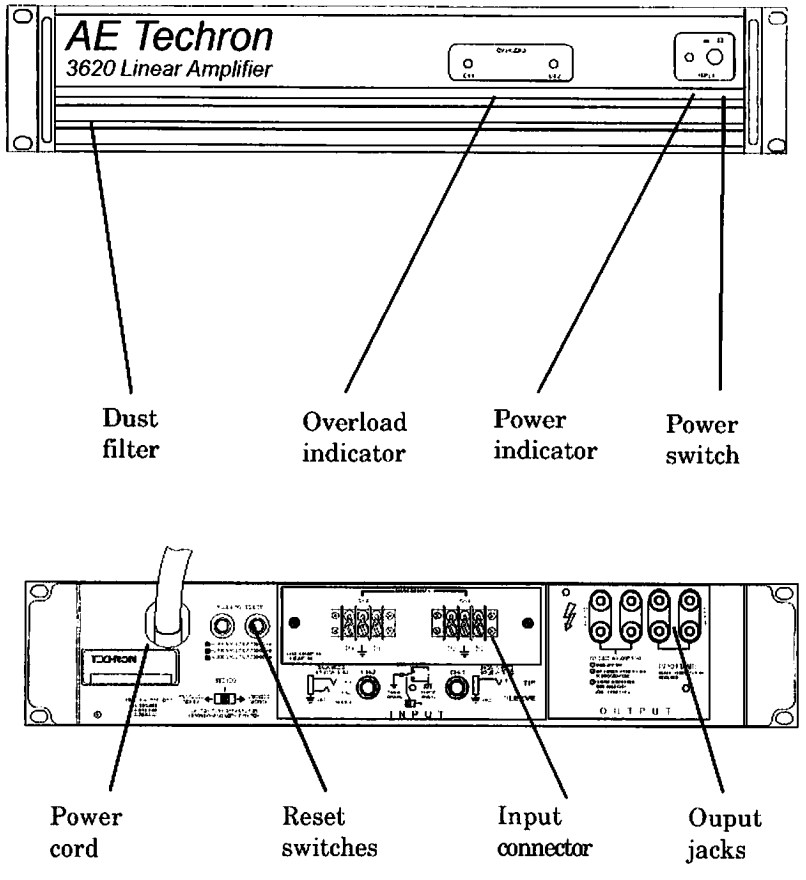


Illustration 1-1 LV 3620 Front and Back panels

1.3 Specifications

1.3.1 Performance

Note: The following applies to 120 Vac units with a 24 ohm load and a voltage gain of 30, unless specified otherwise.

Configuration: Dual channel, voltage mode, floating output operation.

Voltage gain: 30 or 60, ±0.2%, internally selectable.

Bandwidth: dc to > 50 kHz; +0, –1 dB from 5 Hz to 30 kHz.

Differential phase error: < 0.1° @ 60 Hz (unit to unit).

THD: <0.1%

THD + N: : < 0.1% at 600 Hz, full output of power.

Phase response: ±10° from 10 Hz to 20 kHz at 1 watt.

Signal-to-noise ratio: 100 dB below rated output (20 Hz to 20 kHz).

IM Distortion (IMD): Less than 0.05% from 10 milliwatts to full rated output.

Damping factor: Greater than 1,000 from 10 Hz to 400 Hz.

Slew rate: Greater than 30 volts per microsecond

Load impedance: Rated for greater than 2 ohm usage only.

1.3.2 AC power

Input power requirements: 120/230 Vac, 15 A, 1–phase, 50–60 Hz, ±10%.

1.3.3 Input

Common-mode input: ±11 volts dc maximum.

CMRR: –70 db minimum, 40 to 600 Hz.

Input impedance: Nominally 50 kΩ, differential.

Input connector: Balanced, 3–terminal barrier block connector.

1.3.4 Output

Output connector: Dual binding posts.

Output impedance: < 10 mΩ in series with < 2μH

Maximum output voltage: 305 volts peak, no load condition.

Maximum output current: 7.25 amps peak .

Maximum output power: 630 W continuous (into 24 Ω).

1.3.5 Controls

Power: A front panel pushbutton used to turn the amplifier on and off.

Reset: Two back panel switches used to reset the power supplies. All units have 8 amp circuit breakers.

1.3.6 LED Indicators

Power: LED indicators show the amplifier is enabled and capable of operation.

Overload: The unit is operating with distorted output or overloaded input. If the output waveform differs from that of the input by 0.05% or more, the overload indicator flashes brightly to indicate distortion. As a sensitive distortion indicator, it provides verification of operation.

1.3.7 Protection

The amplifier is protected from damage due to any of the following conditions: input overload, thermal overload, or improper load impedance (i.e., short circuit). The amplifier remains stable under short-circuit conditions.

If unreasonable operating conditions occur, the patented *ODEP* circuitry limits the drive level to protect the output transistor stages, particularly in the case of elevated temperature. Transformer overheating will result in a temporary shutdown. Controlled slew-rate voltage amplifiers protect the unit against RF burnouts. Input overload protection is furnished at the amplifier input to limit current.

Turn on causes no dangerous transients. Four second turn-on delay can be changed by substituting a resistor (contact Techron's Technical Support Group for details).

The ac input power (mains) is protected by circuit breakers.

1.3.8 Construction

Black splattered-coat steel chassis and aluminum front panel with Lexan overlay; specially designed "flow-through" ventilation from front to side panels.

Cooling: Forced-air. Includes custom heat diffusers and patented circuitry to promote uniform dissipation.

Dimensions: 19 inch (48.3 cm) standard rack mount (EIA Std. RS-310-B), 3.5 inch (8.9 cm) height, 16 inch (40.6 cm) depth beh ind mounting surface and 2.5 inches (6.4 cm) in front of mounting surface.

Weight: Net weight is 56 lbs (25.4 kg); shipping weight is 64 lbs (29.1 kg). Center of gravity is 6 inches (15.2 cm) behind front mounting surface.

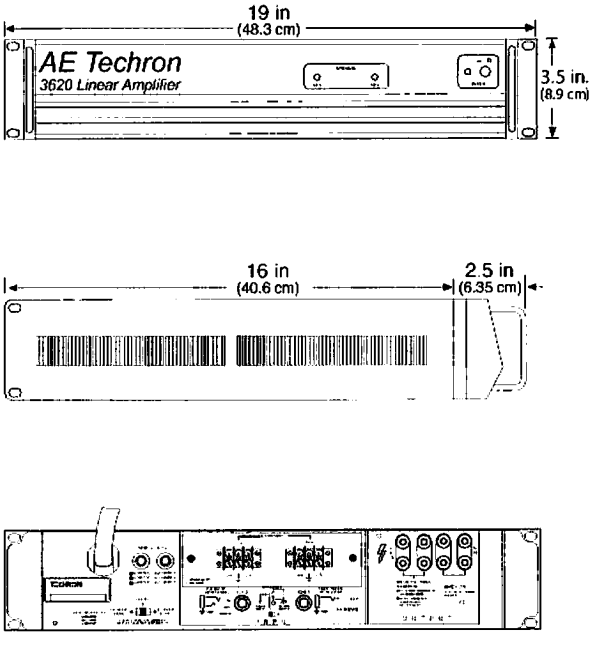


Illustration 1-2 AETechron LV3620 dimensions

Section 2: Installation

2.1 unpacking

Every AE Techron 3620 is carefully inspected and tested prior to leaving the factory. If any damage has occurred to your unit during transit, notify the transportation company immediately. Only you, the consignee, may initiate a claim with the carrier for damage resulting during shipment. AE Techron will be happy to cooperate fully as needed. Save the shipping carton as evidence of damage for the shipper's inspection.

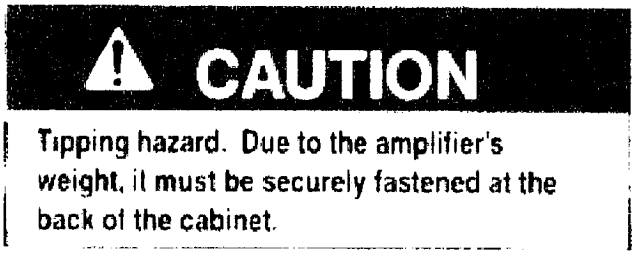
Even if the unit arrived in perfect condition, as most so, save all packing materials so you will have them if you ever need to transport the unit.

Note: Never ship the unit without the factory pack. Contact he AE Techron factory service to order the correct shipping materials.

2.2 Mounting

AE Techron amplifiers are designed for standard 19-inch (48.3 cm) rack mounting and "stack" mounting without a cabinet. In a rack cabinet, it is best to mount them one on top of the other to provide efficient air flow and support.

Avoid locating sensitive high-gain equipment directly above or below the unit. The magnetic field generated by the unit can induce hum in unshielded devices that are nearby. If an equipment rack is used, try locating the amplifier in the bottom of the rack and magnetically sensitive equipment at the top.



2.3 Cooling

Never block the side vents and front air intake of the amplifier. Allow at least 45 cubic feet (1.3 cubic meters) per minute of air flow per amplifier. All empty rack spaces should be covered with blank panels to prevent improper recirculating air flow. The air flow should be augmented with a rack cooling system if the amplifier must operate at consistently high output levels.

When mounting the amplifier in a rack cabinet, the side walls of the rack should be at least 2 inches (5 cm) away from the chassis as shown in Illustration 2–1.

If the rack cabinet has a front door that could block air flow to the amplifier's air intakes, provide adequate air flow either with a grille in the door or by pressurizing the air behind the door. See Illustration 2–2. Wire grills, as opposed to perforated grilles, are recommended for this application, because they tend to cause less turbulence.

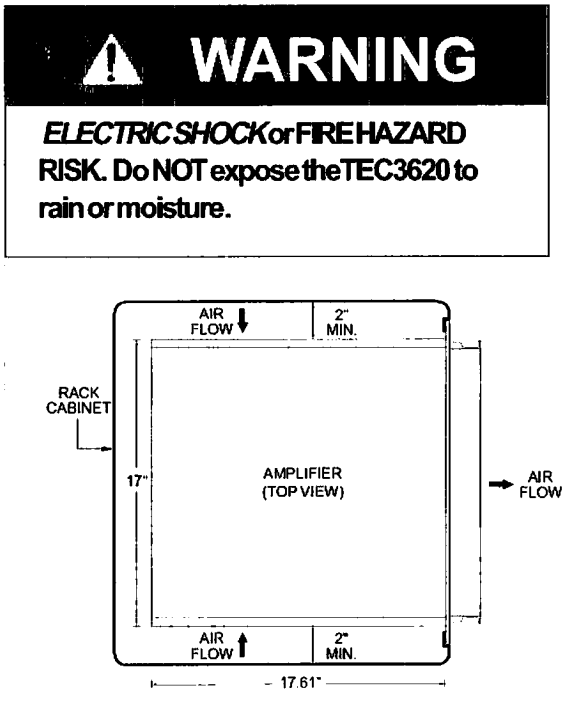


Illustration 2–1 Top view of a rack-mounted unit

A good choice for pressurizing air behind a rack cabinet door is to mount a "squirrel cage" blower inside the rack (Option 1 in Illustration 2-2). Mount the blower at the bottom of the rack so it blows outside air into the space between the door and in front of the amplifiers, pressurizing the "chimney" behind the door. This blower should not blow air into or take air out of the space behind the amplifiers. For racks without a door, evacuate the rack by mountwer at the top of the rack to draw air out the back of the cabinet (Option 2 in Illustration 2-2).

If the air supply is unusually dusty, it may be necessary to pre-filter it using commercial furnace filters, etc., to prevent rapid loading of the unit's own air filter. When needed, the ammplifier's filter can be cleaned with mild dish detergent and water

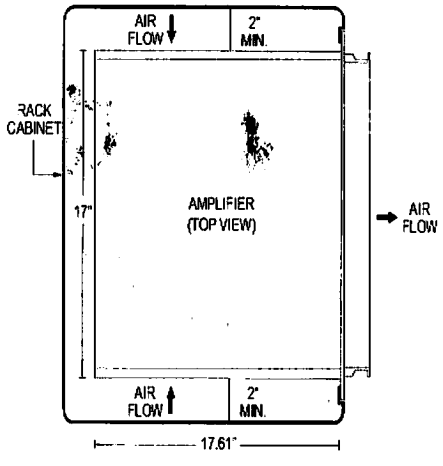


Illustration 2-2 Proper air flow in a rack cabinet

2.4 User interface

2.4.1 Front panel

Dust filter

The dust filters remove large particles from the air at the air intake.

Overload indicator

This indicator alerts the user to distortion in the signal. Under normal operating conditions the indicator is not illuminated. When an unacceptable level of distortion is detected, the indicator flashes red. The *IOC* (Input/ Output Comparator) circuit compares the waveform of the input signal to that of the output. If there is a difference (or distortion) of 0.05% or more, the indicator flashes brightly with a 0.1 second hold delay. Another *IOC* function is to indicate input overload. If the input signal is too large the indicator will flash brightly (with a 0.5 second hold delay) to indicate input overload.

Power indicator

This indicator illuminates red when the amplifier is powered on.

Power switch

Depress this push-button to turn the amplifier on or off. When turned on, the output is disabled for approximately four seconds to protect your system from start-up transients.

Note: To make any changes in this delay, contact AE AE Techron.-

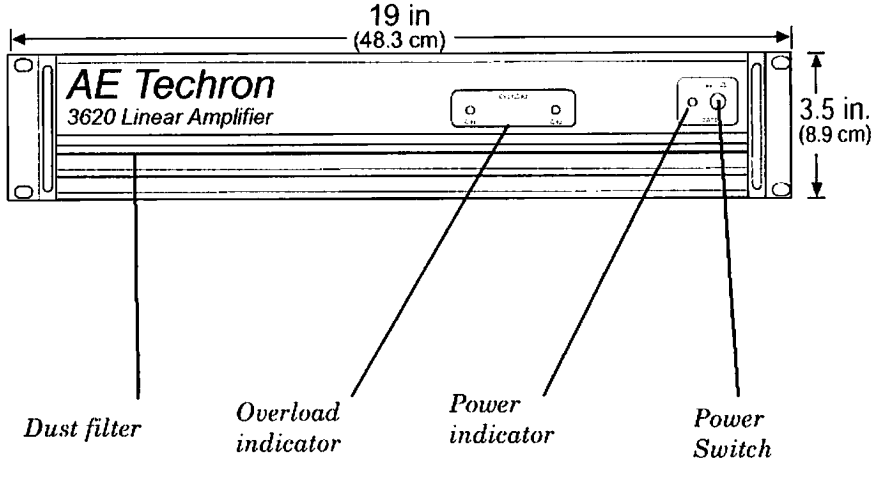


Illustration 2-3 Amplifier front panel

2.4.2 Rear panel

Circuit breakers are located on the back panel to protect the power supplies against overload. If a breaker trips, the *Overload* indicator will turn on (the *Enable* indicator will remain illuminated).

Powercord

A 12 AWG line cord with a 15-ampere grounded NEMA plug is provided with North American units. Other units have an appropriate line cord and plug.

Reset switches

The reset switches are used to reset the breakers that safeguard each power supply from overload.

Input connector

A balanced input connector (three-terminal barrier block) links the input signal to the amplifier.

Output jacks

Four pairs of versatile 5-way binding posts are provided for the output of the amplifier. The connectors accept banana plugs, bare wire, or spade lugs.

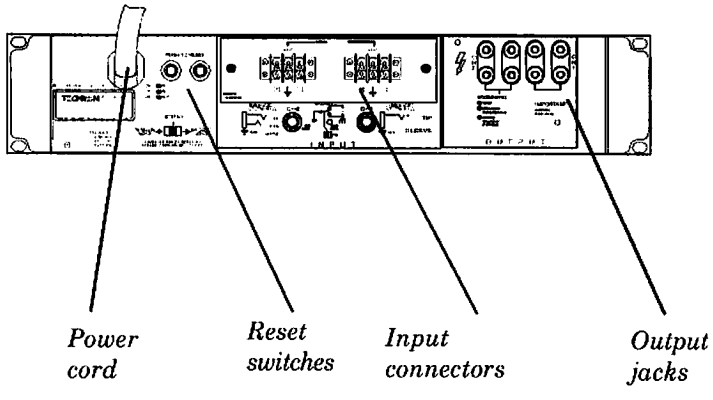


Illustration 2–4 Amplifier back panel

2.5 Making connections

The input and output terminals are located on the rear panel of the amplifier, and both sets of output binding posts are internally connected in parallel.

DANGER

The risk of potentially lethal *ELECTRIC SHOCK* exists when making connections. Always shut off the amplifier and wait at least 10 seconds before changing any connections.

Use care when making connections, selecting signal sources, and controlling the output level. AE Techron is not liable for damage that results from faulty connections or overdriving components in your system.

2.5.1 Output connection

Connect the load across the red and black binding posts.

> ***Note***: Both sets of output binding posts for each channel are internally connected in parallel (red is connected to red and black to black).

Consider the power-handling capacity of your load before connecting it to the amplifier. AE Techron is not liable for damage incurred at any time due to any load being overpowered. The use of load protection fuses is highly recommended (see Section 2.5.3).

Never connect the output to a power supply output, battery, or power main.

Use load cables with sufficient gauge (thickness) for the length used. The resistance introduced by inadequate load cables will reduce the output power.

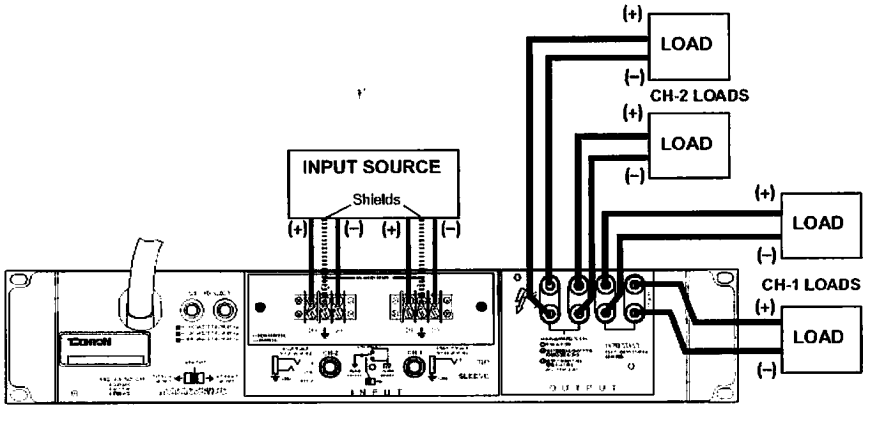


Illustration 2–5 Connections for dual-channel operation

2.5.1 Input connection

The balanced input connector (three–terminal barrier block) has a nominal impedance of 50 kilohms and will accept the line-level output of most devices. A balanced (differential) signal input is recommended wherever possible.

Correct input wiring will depend on two factors:

- whether the input signals are balanced (differential) or unbalanced (single-ended)
- whether the signal source floats or has a ground reference.

Other connection principles to remember:

- Use only shielded cable. Better cables have a higher density shield. Spiral wrapped shield is not recommended.
- When using unbalanced lines, keep the cables as short as possible. Avoid unbalanced cables over 10 feet in length.
- Do not run signal cables together with high-level wiring such as ac lines. This reduces the chance of hum or noise being induced into the input signals.

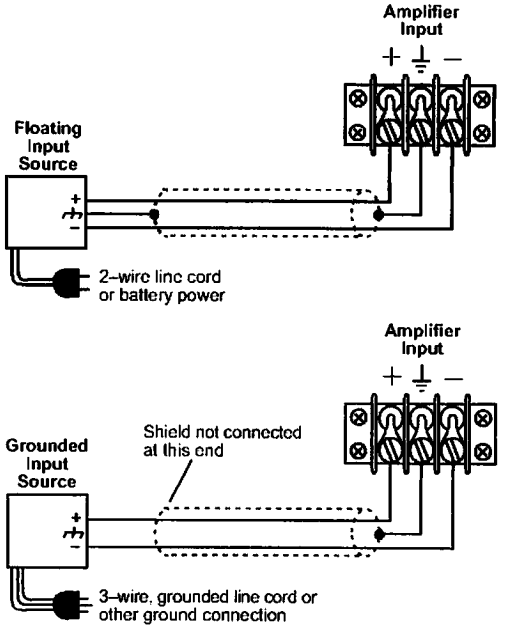


Illustration 2–6 Balanced input wiring

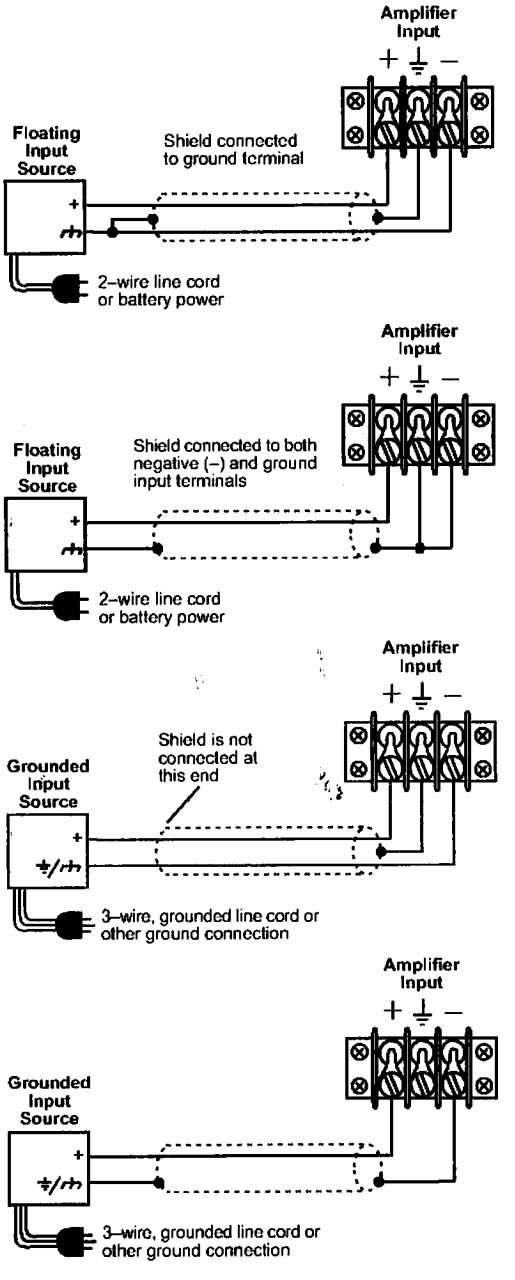


Illustration 2–7 Unbalanced input wiring

2.5.3 Bridge-mono operation

Use the Bridge-Mono mode to drive loads with a combined impedance of 4 ohms or greater. (See Parallel-Mono if the load is less than 4 ohms.) Installing the amplifier in Bridge-Mono mode is different from the other modes and requires special attention.

To put the amplifier in Bridge-Mono mode, turn the amplifier off and slide the Dual-Mono switch toward the right (as you face the back of the amplifier). Both outputs receive the signal from Channel 1 with the output of Channel 2 inverted so it can be bridged with the Channel 1 output.

> ***Note:*** Do not use the channel 2 input or the signal level and quality may degrade greatly. The input jack for Channel 2 is not defeated in Parallel-Mono mode. Any signal fed into Channel 2 may distort the signal in Channel 1.

Connect the load *across* the Channel 1 and 2 red binding posts with the positive lead from the load attaching to a red post of Channel 1 and the negative lead of the load attaching to a red post of Channel 2 as shown in Illustraion 2-8.

> ***Note***: The two black binding posts are not used and should not be shorted. The load must be balanced (neither side shorted to ground).

⚠ CAUTION

Be certain all equipment (meters, switches, etc.) connected to the mono output is balanced. To prevent oscillations, both sides of the line must be isolated from the input grounds.

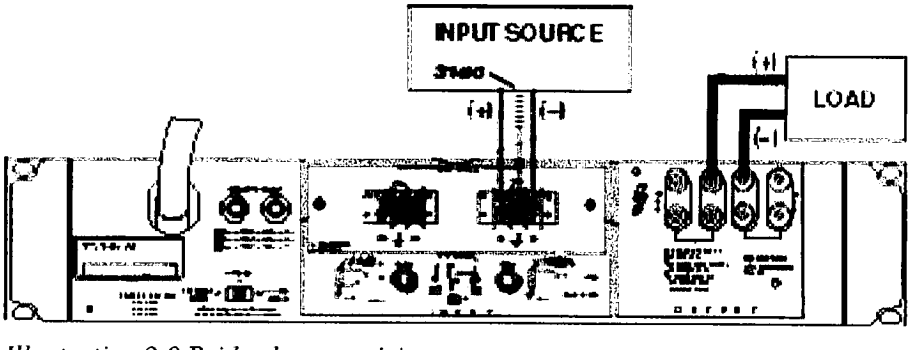


Illustration 2-8 Bridged-mono wiring

2.5.4 Parallel-Mono Operation

Configure the LV 3620 in the Parallel-Mono mode to drive loads with a total impedance of less than 4 ohms. (See Bridge-Mono if the load is 4 ohms or greater.) Installing the amplifier in Parallel-Mono mode is very different from the other modes and requires special attention.

To put the amplifier in Parallel-Mono mode, first turn it off, then slide the Dual-Mono switch to the left (as you face the back). Connect the input signal to Channel 1 only.

> ***Note***: Do not use the channel 2 input or the signal level and quality may degrade greatly. The input jack for Channel 2 is not defeated in Parallel-Mono mode. Any signal fed into Channel 2 may distort the signal in Channel 1. It is normal for the IOC indicator of Channel 2 to stay on in Parallel-Mono mode.

Install a jumper wire between the red binding posts of both Channel 1 and 2 that is at least 14 gauge in size. Then, connect the load to the output of Channel 1 as shown in Illustration 2-9. The positive lead from the load connects to the red binding post of Channel 1 and the negative lead from the load connects to the black binding post of Channel 1.

⚠ CAUTION

Do not attempt to operate in Dual or Bridge-Mono mode until the Parallel-Mono jumper is first removed. Failure to do so will definitely cause inefficient operation, high distortion and excessive heating.

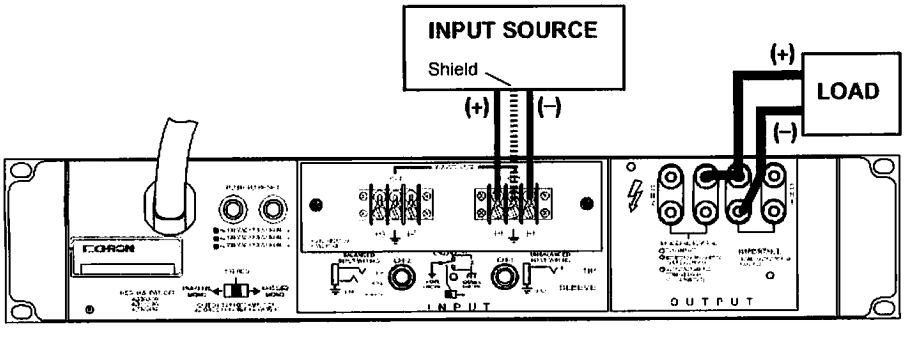


Illustration 2-9 Parallel mono wiring

Because the amplifier generates considerable power, it may be desirable to protect sensitive loads from damage due to excessive power. A common way to do this is to put a fuse in series with the load.

Fuses help prevent damage due to prolonged overload, but provide essentially no protection against damage from large transients. To minimize this latter problem, use high-speed instrument fuses such as the Littlefuse 361000 series. If the load is only susceptible to damage caused by prolonged overload (such as overheating), use a fuse or circuit breaker having the same slow thermal response as the load itself (such as a slow-blow fuse).

2.5.5 AC mains power requirements

Each AE Techron LV3620 amplifier is furnished with a three-wire ac plug. Use an isolated power receptacle whenever possible with adequate current. North American units are shipped with a 15 amp (12 AWG) line cord. Other units are shipped with an appropriate line cord and plug. Line voltages of 10% or more above the specified voltage for the amplifier may cause damage.

All specifications in this manual are referenced at 120 Vac mains. Performance variations will occur at other ac mains voltages and line frequencies. Line regulation problems can reduce the available output power.

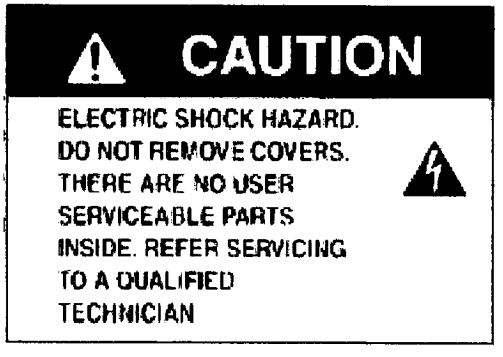
Note: Operate the amplifier from AC mains of not more than 10% variation above or below the selected line voltage and only at the specified line frequency.

Notes:

Section 3: Maintenance

Note:

This unit has very sophisticated circuitry which should only be serviced by a fully trained technician. Tampering with the internal circuitry invalidates the warranty, risks equipment failure and may cause safety hazards to the user.



3.1 Periodic Maintenance

The only routine maintenance that needs to be performed on the AE Techron LV3620 is to check filters at least very six months to be sure they don't become clogged with dust. The filter elements can be easily removed for cleaning by gently pulling them away from the front panel.

Illustration 3-1 Filter location

3.2 Worldwide service

Service may be obtained from AE Techron. Transport your unit in original factory package. If you don't have the original shipping container, contact us and a replacement will be sent promptly. Shipments should be sent by UPS. We will return the unit via UPS ground. You must bear the expense of all taxes, duties and customs fees when transporting the unit. Enclose a letter explaining the nature of the problem and what service you would like. Include your return shipping address and telephone number. For any other arrangements, please contact us.

AE Techron Contact Information

Phone:	219-295-9495
Fax:	219-295-9496
e-mail:	audioe@bnin.net
web:	www.aetechron.com
Mail	AE Techron Inc. 2597 Warren St Elkhart, IN 46516 USA

Section 4: Principles of operation

4.1 Overview

The AE Techron LV 3620 is a two channel, linear power amplifier that incorporates technological advancements such as circuitry that reduces stress on the output stages and performs real-time analog computer simulation of output-transistor conditions. Other features of this amplifier include an advanced heat sink design, and AE Techron's patented Bi-Level power supply.

Custom protection circuitry limits temperature and current to safe levels while making the amplifier highly reliable and tolerant of faults. The LV 3620 can operate at its voltage and current limits without damage from shorted, open, or mismatched loads; overloaded power supplies; excessive temperature; chain-destruction phenomena; input overload damage; and high frequency failures. In addition, the amplifier protects loads from turn-on and turn-off transients. The LV 3620 is also protected from internal faults.

Real-time computer simulation is used to create an analogue of the junction temperature of the output transistors. Current is limited only when the device temperature becomes excessive—and just by the minimum amount necessary to keep the amplifier within a safe operating area. This patented Output Device Emulation Protection (ODEP) maximizes the available output power and reduces overheating, the major cause of output transistor failure.

AE Techron heat sinks are fabricated from custom convoluted fin stock that provides a high ratio of area to volume, or area to weight. All power transistors are mounted directly to copper heat spreaders that are electrically alive. This design improves the thermal performance by eliminating insulating hardware normally found underneath the power devices. To further improve cooling efficiency, the chassis is also used as part of the thermal circuit.

4.2 About grounded bridge amplifiers

The patented four-quadrant topology used in the grounded output stages is called the *grounded bridge*. The *grounded bridge* topology takes full advantage of the power supply by delivering to the load, peak-to-peak voltages that are twice the voltage seen by the output transistors and twice the voltage generated by the power supplies. See Illustration 4–1.

To achieve the required output current, several high power transistors are combined to function as composite NPN and PNP transistors. Each output stage has two composite NPN and two composite PNP devices.

Since the output stages are constructed with bipolar transistor devices, the preferred and more descriptive terminology is to name an output stage in terms of whether the stage acts as a NPN or PNP stage and whether it is on the high (output) side of the load or low (ground) side of the load.

Positive current is delivered to the load by increasing conductance simultaneously in the high-side NPN and low-side PNP stage, while decreasing conductance of the high-side PNP and low-side NPN in synchrony. For a negative output current, the roles of the quadrants are reversed with the low-side NPN and high-side PNP quadrants carrying the negative peak output current.

A wide-bandwidth multi-feedback loop design is used for state-of-the-art compensation. This produces ideal behavior and results in ultra-low distortion values.

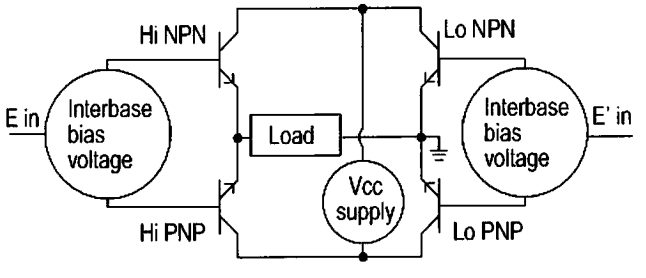


Illustration 4–1 Ground bridge amplifier output stage topology

4.3 Circuit principles

Refer to the block diagram in Illustration 4–4 at the end of this section.

4.3.1 Dual channel operation

For simplicity, the discussion of dual channel operation will refer to one channel only. Single operations will be explained in a separate discussion.

The input signal at the barrier block input terminals passes directly into the balanced gain stage. The balanced input stage converts the signal to an unbalanced signal with a difference amplifier.

The error amp amplifies the difference between the output signal and the input signal, and drives the voltage translator stage.

The voltage translator stage channels the signal to the Last Voltage Amplifiers (LVAs), depending on the signal polarity, from the error amp. The +LVA and the –LVA, with their push-pull effect through the bias servo, drive the fully complementary first output stage.

The bias servo is thermally coupled to the heat sink and sets the quiescent bias current in the output stage to lower the distortion in the crossover region of the output signal.

With the voltage swing provided by the LVAs, the signal then gains current amplification through the Darlington emitter-follower output stage.

The bridge-balanced circuit receives a signal from the output of the amplifier, and differences it with the signal at the Vcc supply. The bridge-balanced circuit then develops a voltage to drive the bridge-balanced first output stage. This results in the Vcc supply having exactly one half of the output voltage added to its quiescent voltage.

The protection mechanisms that affect the signal path are implemented to protect the amplifier from high instantaneous current, excessive temperature, and operation of the output transistors outside safe conditions.

Currents in the output stage are sensed by conventional current limiters. The allowable current level is also adjusted as a function of voltage. When current at any instant exceeds the design criteria, the limiters remove the drive from the LVAs, thus limiting current in the output stage to a safe level.

To further protect the output stages, the *ODEP* (Output Device Emulation Protection) circuit is used. It produces an analog output proportional to the always-changing *safe operating area* of the output transistors. This output controls the translator stage by removing any drive that exceeds the *safe operating area* of the output transistors.

A solid state thermal sensor gives the *ODEP* circuits vital information on the operating temperature of the heat sink on which the output transistors are mounted.

4.3.2 Bridge-Mono operation

By setting the back panel Dual-Mono switch to Bridge-Mono, LV 3620 is converted to a Bridge-Mono amplifier for higher output voltage. The input signal is applied to the Channel 1 input. The Channel 1 output then feeds the inverting input of the Channel 2 error amp. This causes the output of Channel 2 to be out of polarity with Channel 1 which produces twice as much voltage across the load. The load is connected between the Channel 1 and Channel 2 red binding posts on the back of the amplifier. Each of the channel's protection mechanisms work independently if a fault occurs.

4.3.3 Parallel-Mono operation

In Parallel-Mono mode, twice the current of one channel alone can be obtained. When the Dual-Mono switch is set to Parallel-Mono, the output of Channel 2 is paralleled with that of Channel 1. The signal path for Channel 1 is the same as previously discussed, except that Channel 1 also drives the output stage of Channel 2. The balanced input, error amp, translators and LVAs of Channel 2 are disconnected and no longer control the Channel 2 output stage. The Channel 2 output stage and protection mechanisms are also coupled through the Dual-Mono switch and function as one.

A suitable high-current-handling jumper must be connected across the red binding posts to gain the benefits of this mode of operation.

The *ODEP* circuit of Channel 2 is coupled through the Dual-Mono switch to give added protection if a fault occurs in the Channel 2 output stage. The *ODEP* circuit of Channel 2 will limit the output of both output stages by removing the drive from the Channel 1 translator stages.

4.3.4 Bi-Level power supply

AE Techron's patented Bi-Level power supply technology is what makes it possible to pack such tremendous power into AE Techron's Bi-Level amplifiers.

In a linear power amplifier, the output transistors place variable resistance in series between the load and the power supply. See Illustration 4–1. The power supply voltage is distributed across the resistance of the output transistors and the resistance of the load. The power supply voltage, less the voltage drop across the output transistors, equals the output voltage to the load. The voltage drop across the transistors' resistance dissipates power. The transistors modulate the power supply voltage, in effect, by absorbing power and generating heat.

A power supply must be large enough to handle the maximum voltage and current necessary for the amplifier to drive its maximum rated power into a specified load. However, the bigger the power supply, the more heat the power transistors must dissipate, and excessive heat is the leading cause of transistor failure.

A two-level power supply avoids much of this problem by reducing the voltage applied to the transistors when less voltage is needed.

The Bi-Level supply is divided into segments to better match the voltage and current requirements of the power transistors. When the voltage requirements are not high, it operates in a *parallel mode* to produce less voltage and more current.

See Illustration 4–2.

The power transistors stay cooler and are not forced to needlessly dissipate heat. This is the normal operating mode of the supply.

When the voltage requirements are high, the supplies switch to a *series mode* which produces higher voltage and less current.

Sensing circuitry monitors the voltage of the signal to determine when to switch *Bi-level* modes. The switching circuitry is designed to prevent switching distortion to yield the highest possible dynamic transfer function. This provides the maximum power with the maximum safety, and the best power matching to a Bi-Level load.

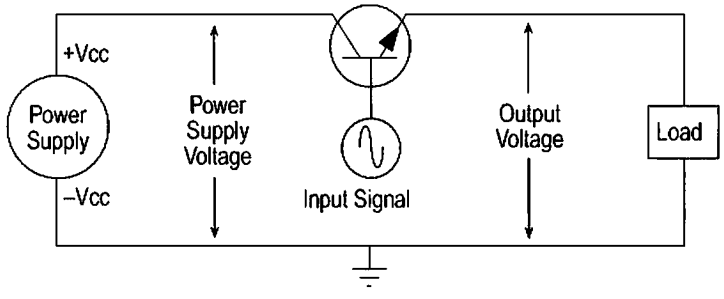


Illustration 4–2 Output transistor power dissipation

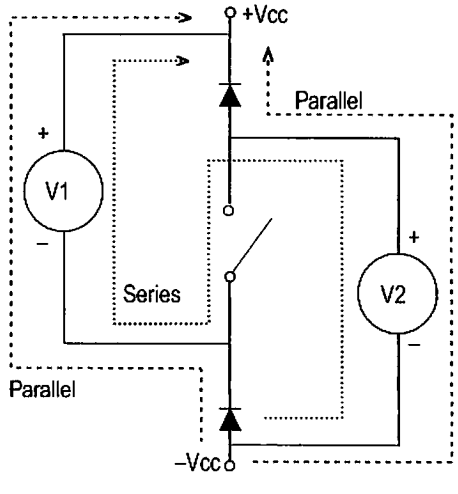


Illustration 4–3 Sections of a variable impedance power supply

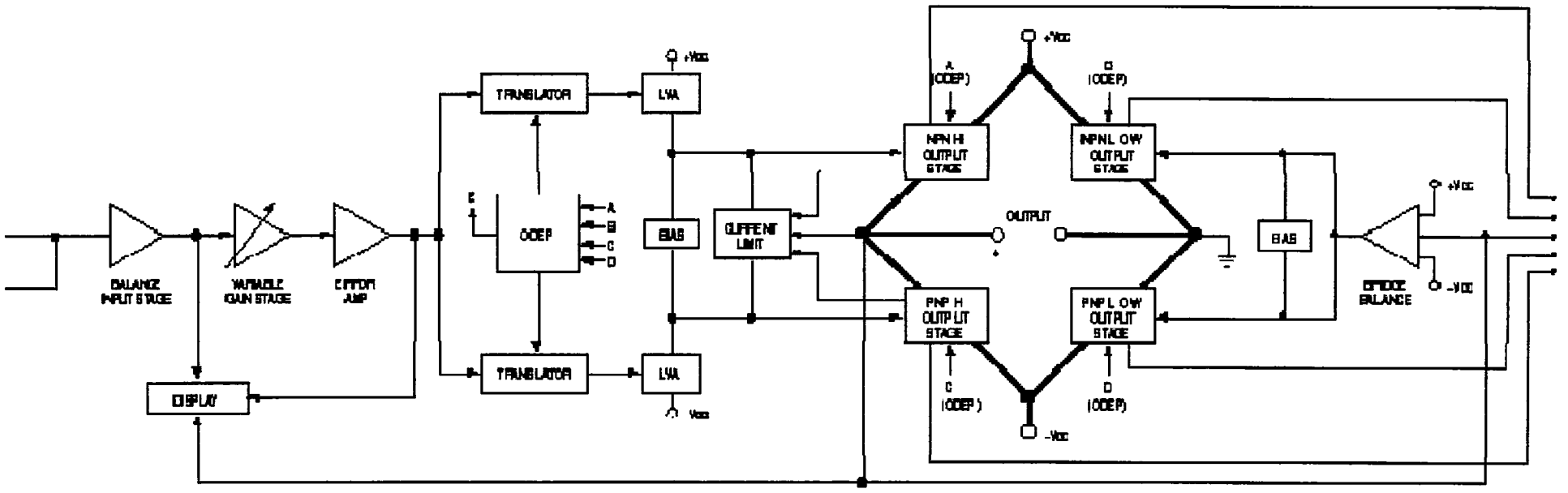


Illustration 4-4 LV 3620 block diagram

ONLY ONE CHANNEL SHOWN

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