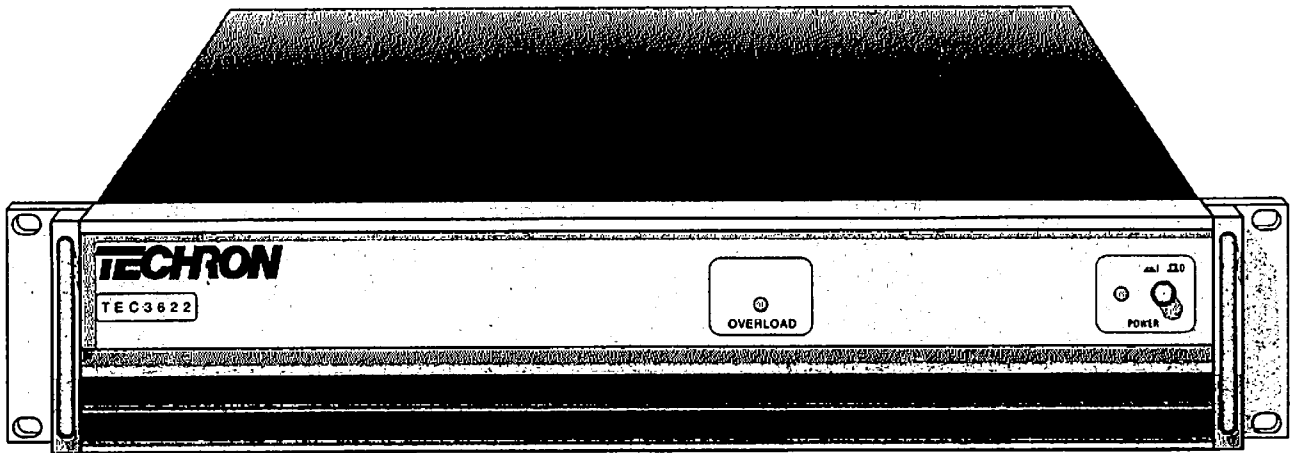


TECHRON

User and Service Information



TEC3622
Power Amplifier

TECHRON®

TEC3622

Power Amplifier

Technical Manual

K80718-8

**© 1996 by Techron®, a division of Crown International, Inc.
1718 W. Mishawaka Road, Elkhart, Indiana, 46515-1000 U.S.A.
(219) 294-8300**

TECHRON[®]

**A division of Crown International
LIMITED ONE-YEAR WARRANTY**

SUMMARY OF WARRANTY

Techron, a division of Crown International, Inc., of Elkhart, Indiana (Warrantor) warrants to the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW Techron 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 Techron 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 Techron, 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.)

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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. Corrective actions will be taken within a reasonable time of the date of receipt of the defective product by us. 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.

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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 which 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.

TECHRON, Customer Service Department
57620 CR 105, Elkhart, IN 46517
219-294-8315; 219-294-8301 (fax)

April 1996

Introducing the Model TEC3622

Congratulations on your purchase of the Techron® TEC3622 amplifier. It offers Techron's patented Variable Impedance power supplies. The new power supplies, along with new semiconductor technology, enable the Techron TEC3622 to pack more power into a mere 3½ inches of vertical rack space than ever before.

This manual will help you successfully install and use your new amplifier. We strongly recommend you read all instructions, warnings, and cautions contained within. For your protection, please send in your warranty registration card today and save your bill of sale since it is your official proof of purchase.

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Telephone: (219) 294-8300

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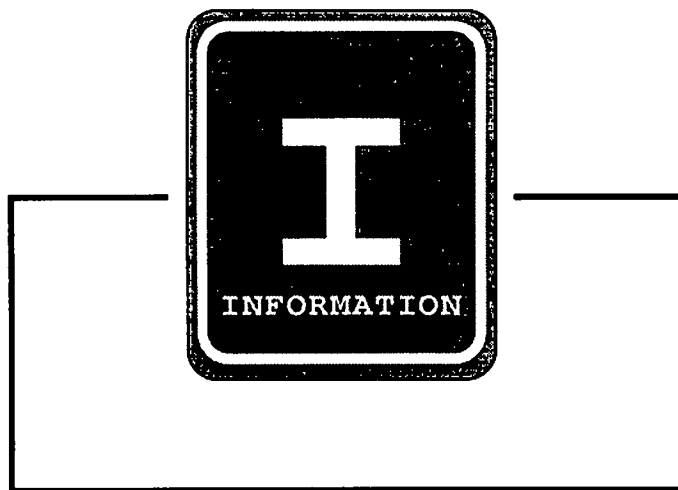
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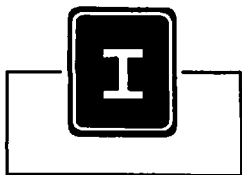
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Section 1—Preinstallation Information and Operation

This section describes safety conventions used within this document and provides essential information about the Model TEC3622 amplifier. Review this material before installing or operating the amplifier.



1.1 Safety Conventions

The TEC3622 amplifier is a highly sophisticated instrument. Safety should be your primary concern as you use this product and follow these procedures.

Special hazard alert instructions appear throughout this manual. Note the following examples:



DANGER

DANGER represents the most severe hazard alert. Extreme bodily harm or death **will** occur if these guidelines are not followed. Note the explanation of the hazard and instructions for avoiding it.



WARNING

WARNING alerts you to hazards which **could** result in severe injury or death. Note the explanation of the hazard and the instructions for avoiding it.



CAUTION

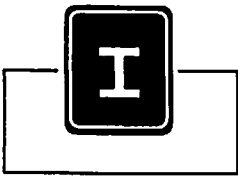
CAUTION indicates hazards which could result in potential personal injury or equipment or property damage. Once again, note the explanation of the hazard and the instructions for avoiding it.

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

1.2 Features

The Techron TEC3600 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 surpass previous conventional amplifier designs. Features:

- Techron's patented *grounded bridge* circuitry generates substantial voltage swings while avoiding stressful output transistor configurations common to conventional amplifiers.
- Patented *ODEP* (Output Device Emulation Protection) circuitry compensates for overheating and overload.
- IOC*[®] (Input/Output Comparator) circuitry immediately alerts of any distortion exceeding 0.05%.
- Very low harmonic and intermodulation distortion result in the best *dynamic transfer function* in the industry.
- High damping factor.
- An articulated variable impedance power supply provides the best power matching to your load.
- Full protection against shorted outputs, open circuits, mismatched loads, overheating, high frequency overloads, and internal faults.
- Extra rugged, extruded aluminum front panel with *Overload* and *Enable* Indicators.
- Efficient heat sinks and a self-contained forced air cooling system dissipates heat quickly and evenly for extra amplifier protection and greater power output.
- Balanced inputs.
- 5-way binding posts provide easy and versatile output connection.
- Mounts in a standard 19 inch equipment rack (or units can be stacked).
- All specifications are guaranteed for the duration of the warranty period.
- One year full warranty completely protects your investment.



1.3 Functions

A. Dust Filter

The dust filters remove large particles from the air at the air intake. Check filters regularly to be sure they don't become clogged. The filter elements can be easily removed for cleaning by gently pulling them away from the front panel (see Sections 1.4.4 and 2.3).

B. 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. 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.

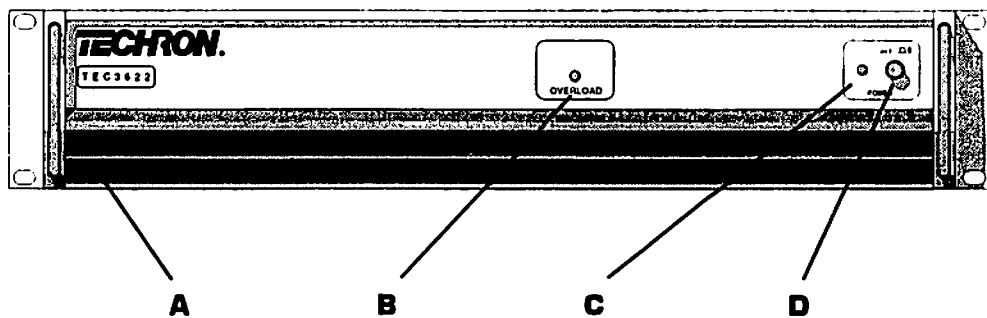
C. Enable Indicator

This indicator lights when the amplifier has been "enabled" or turned on. See Section 1.4.2 for more details.

D. Enable 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: This delay can be changed. Contact the Techron Technical Support Group for details.



E. Power Cord

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

F. Reset Switches

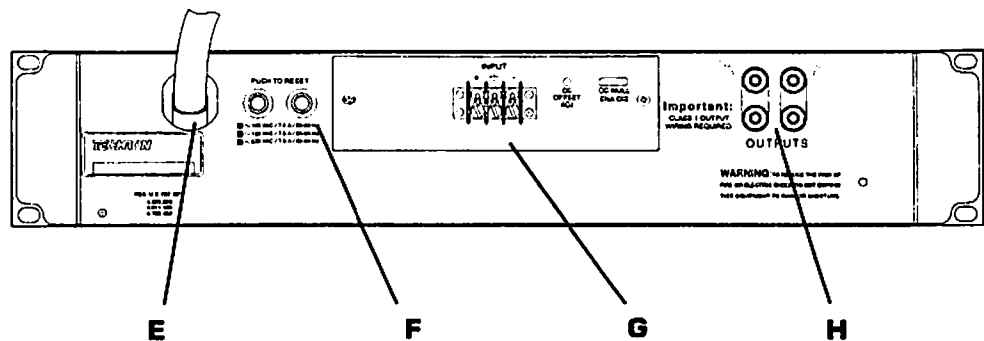
The reset switches are used to reset the breakers that safeguard each power supply from overload.

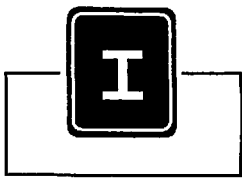
G. Balanced Terminal Block Input

A balanced three-terminal terminal block connector links the input signal to the optical isolation input unit.

H. Output Jacks

Two 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.





1.4 Operation

1.4.1 Precautions

Although the Techron TEC3622 is protected from external faults, the following precautions should be followed for safety and optimum operation:

- Use care when making connections, selecting signal sources, and controlling the output level. Techron is not liable for damage that results from faulty connections or overdriving components in your system.
- 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.
- Never connect the output to a power supply output, battery, or power main.
- Tampering with the internal circuitry invalidates the warranty, risks equipment failure, and may cause safety hazards to the user.
- Do not expose the unit to rain or moisture.
- 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 located nearby. If an equipment rack is used, try locating the amplifier in the bottom of the rack and magnetically sensitive equipment at the top.

1.4.2 Indicators

The front panel has two helpful indicator LEDs.

The amber *Enable* indicator is provided to show the amplifier has been turned on (or enabled) and that the low-voltage power supply is working. It does not indicate the high voltage supply status. Disruption of the high voltage supplies will not be shown here.

Note: The high voltage power supplies will temporarily go into standby mode if their transformers get too hot or if there is heavy common-mode current in the output.

The amber *Overload* LED indicates distortion and input overload. As an *IOC* (Input/Output Comparator) indicator, it flashes brightly if there is any difference between the input and output signal waveforms greater than 0.05%. Because transient distortion happens quickly, a 0.1 second “hold delay” keeps the indicators on long enough to be easily noticed. This function is provided to verify the amplifier’s distortion-free performance. As an input overload indicator, it flashes brightly (with a 0.5 second hold delay) when an input signal that is too large causes early clipping distortion at the input.

1.4.3 Controls

The *Enable* switch is located on the front panel to turn the amplifier on and off. If you ever need to make wiring or other installation changes, don't forget to also disconnect the power cord.

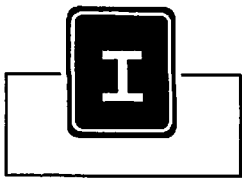
Circuit Breakers are located on the back panel to protect the power supplies against overload. If a breaker trips, the *Overload* indicator will turn on (the *Enable* indicator will remain illuminated).

1.4.4 Filter Cleaning

Dust filters are provided on the air intakes to the cooling system. If these filters become clogged, the unit will not cool as efficiently as it should and may produce lower-than-normal output levels due to high heat diffuser temperature.

To clean, remove each of the filter elements by gently pulling them away from the front panel. Clean with mild dishwashing detergent and warm water. Replacement filters may be ordered from the factory.

Dust filters are not 100% efficient—long term this may require that the internal heat diffusers be cleaned by a qualified technician. Internal cleaning information is available from the Techron Technical Support Group.



1.5 Specifications

1.5.1 Performance

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

Configuration: Single channel, voltage mode, fully floating operation.

Amplifier Gain: 30 or 60 V/V $\pm 0.2\%$, internally selectable.

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

Common-mode Input: ± 11 Vdc maximum.

CMRR: -70 db minimum, 40 to 600 Hz.

Differential Phase Error: $< 0.1^\circ$ @ 60 Hz (unit to unit).

THD: $< 0.1\%$.

Phase Response: $\pm 10^\circ$ 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.

1.5.2 Power

Input Power Requirements: 120/230 Vac, 15 A, 1-phase, 50-60 Hz, $\pm 10\%$.

Output Voltage: 305 Vpk maximum, no load condition.

Output Current: 7.25 Apk maximum.

Output Power: 630 W maximum continuous (into 24 Ω).

1.5.3 Input/Output

Input Connector: Balanced, 3-terminal barrier block connector.

Output Connector: Dual binding posts.

Input Impedance: Nominally 50 k Ω , differential.

Output Impedance: < 10 m Ω in series with < 2 μ H

DC Output Offset (shorted input) Voltage: < 10 mVpk, 40 to 600 Hz.

1.5.4 Controls

Enable: 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 A circuit breakers.

1.5.5 Indicators

Power: 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 proof of performance.

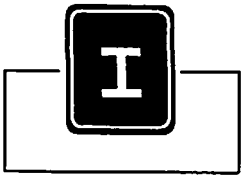
1.5.6 Protection

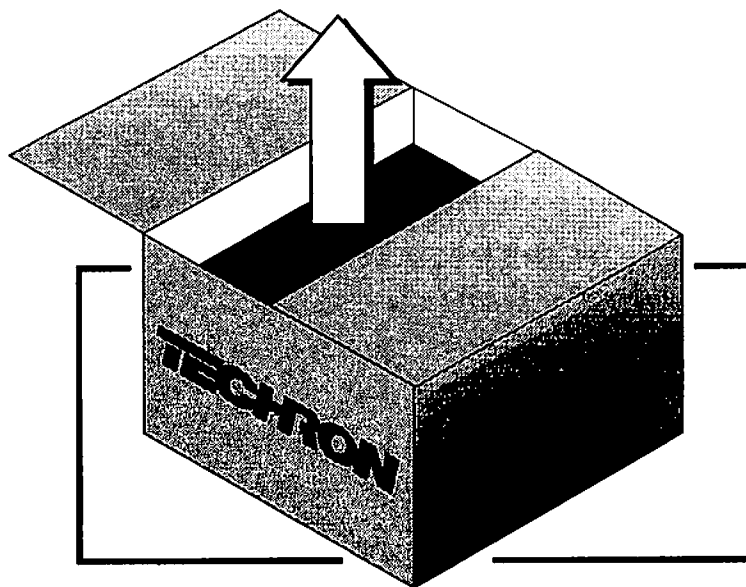
The amplifier is protected from damage due to any of the following conditions: input overload, thermal overload, or improper load impedance (i.e., short circuit). The amplifier remains stable under short-circuit conditions.

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).

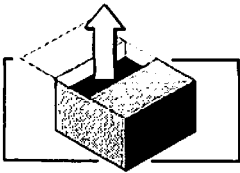
The ac input power (mains) is protected by two 8 A, one-phase circuit breakers.





Section 2—Installation

This section provides general guidelines for installing the Model TEC3622 amplifier with special emphasis on system installations.



2.1 Unpacking

Every TECHRON TEC3622 is carefully inspected and tested prior to leaving the factory. Please unpack and inspect your new amplifier for any damage that may have occurred during transit. If damage is found, notify the transportation company immediately. Only you, the consignee, may initiate a claim with the carrier for damage resulting during shipment. 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 do, save all packing materials so you will have them if you ever need to transport the unit. **Never ship the unit without the factory pack.**

2.2 Mounting

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. This provides efficient air flow and enables each unit to support the one above.

Important: Due to the amplifier's weight, it must be securely fastened at the back of the cabinet.

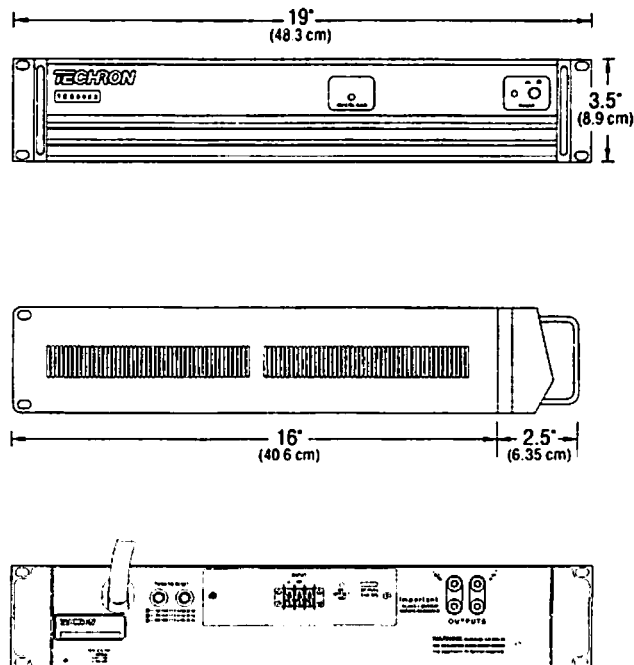


Illustration 2-1 Mounting Dimensions

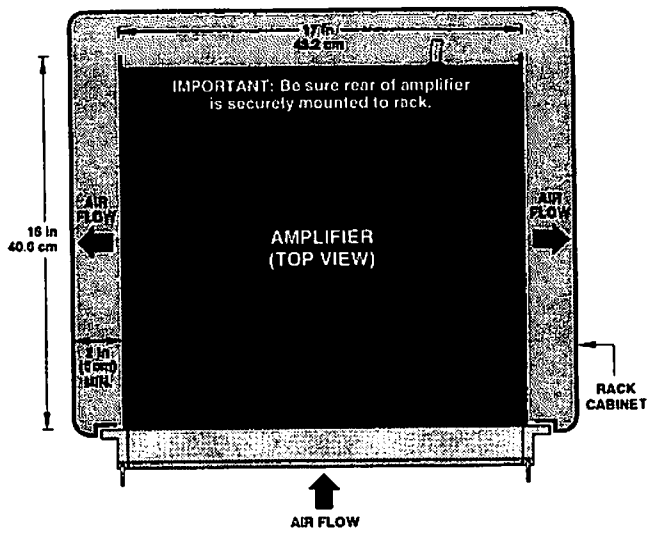

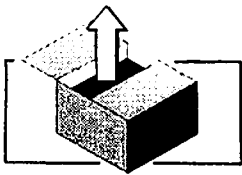


Illustration 2-2 Top View of a Rack-Mounted Unit

	WARNING
<p>To reduce the risk of <i>ELECTRIC SHOCK</i> or <i>FIRE HAZARD</i>, do NOT expose the TEC3622 to rain or moisture.</p>	



2.3 Cooling

NEVER block the amplifier's side vents and front air intake. 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 amplifier's air flow should be augmented with a rack cooling system if it 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 2-2.

If your rack cabinet has a front door that could block air flow to the amplifier's air intakes, you must provide adequate air flow either with a grille in the door or by pressurizing the air behind the door. See Illustration 2-3. Wire grilles are recommended as opposed to perforated for this application because they tend to cause less turbulence

A good choice for pressurizing air behind a rack cabinet door is to mount a "squirrel cage" blower inside the rack (Option 1 below). At the bottom of the rack, mount the blower 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, you can evacuate the rack by mounting the blower at the top of the rack so that air inside the cabinet is drawn out the back (Option 2 below).

If the air supply is unusually dusty, it may be necessary pre-filter it using commercial furnace filters, etc., to prevent rapid loading of the unit's own air filter. When needed, the unit's filter can be cleaned with mild dish detergent and water (see Section 1.4.4).

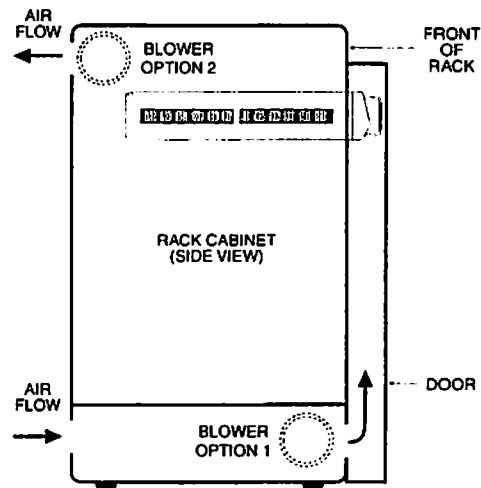


Illustration 2-3 Proper Air Flow in a Rack Cabinet

2.3 Wiring

The following section describes common ways to install your amplifier in a system. The input and output terminals are located on the rear panel. Please use care when making connections, selecting signal sources and controlling the output level. Techron assumes no liability for damaged loads resulting from careless amplifier use or deliberate overpowering.

Note: Both sets of output binding posts are internally connected in parallel.

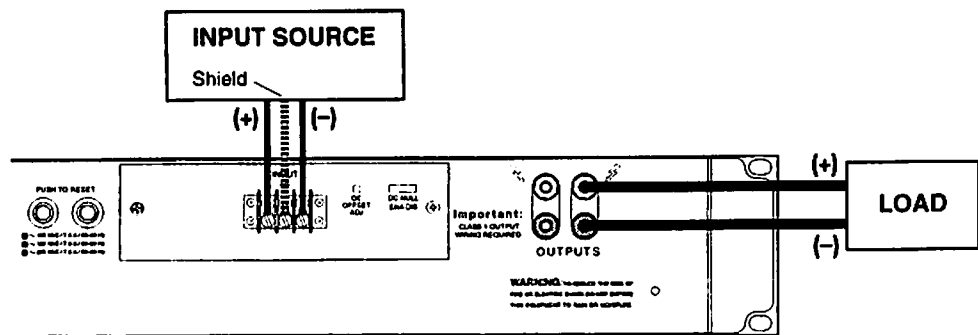
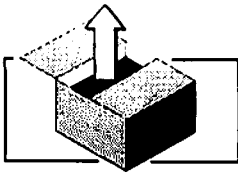


Illustration 2-4 Signal Connections



DANGER

Always shut off the amplifier and wait at least 10 seconds before changing any connections. This amplifier can produce output energy that, if mishandled, can damage loads and cause injury or death. Always remove power and wait for capacitors to discharge before touching the connections.



2.3.1 Input Connection

The balanced 3-terminal barrier block input 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: (1) whether the input signals are balanced (differential) or unbalanced (single-ended), and (2) whether the signal source floats or has a ground reference. Illustrations 2-5 and 2-6 provide examples of recommended connection techniques for each type of signal source.

Other connection principles to remember are the following.

- 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.

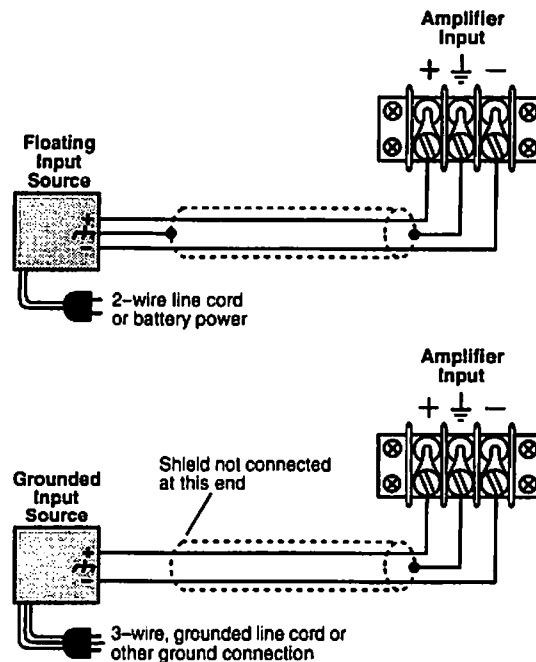


Illustration 2-5 Balanced Input Wiring

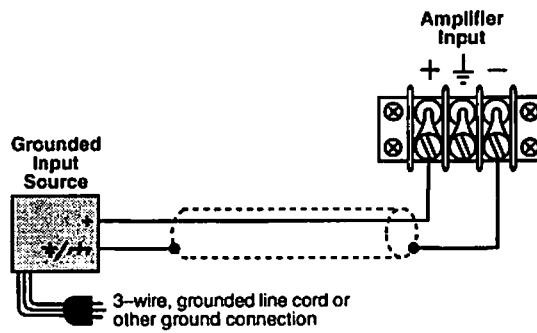
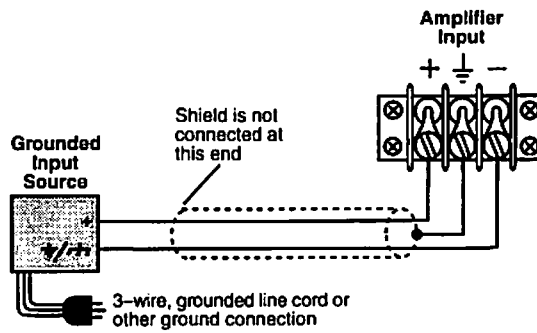
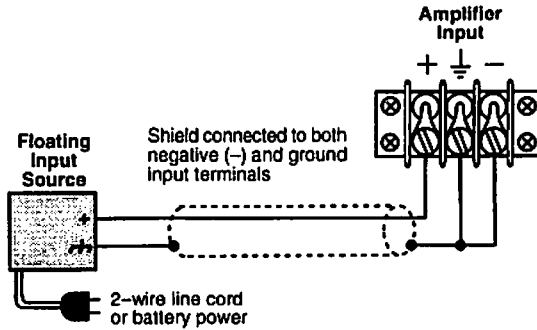
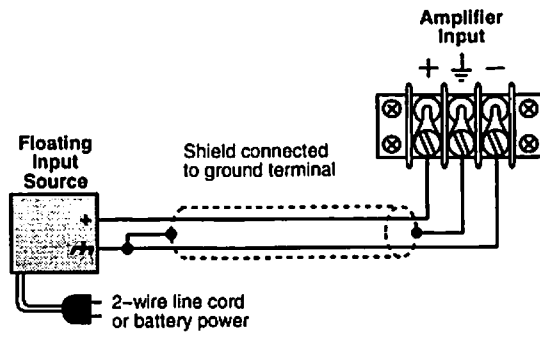
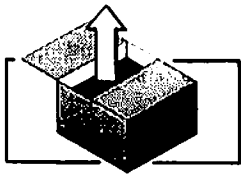


Illustration 2-6 Unbalanced Input Wiring



2.3.2 Output Connection

Connect the load across the red and black binding posts. Note that the two sets of binding posts are 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. 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 2.3.3).

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

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

2.3.3 Additional Load Protection

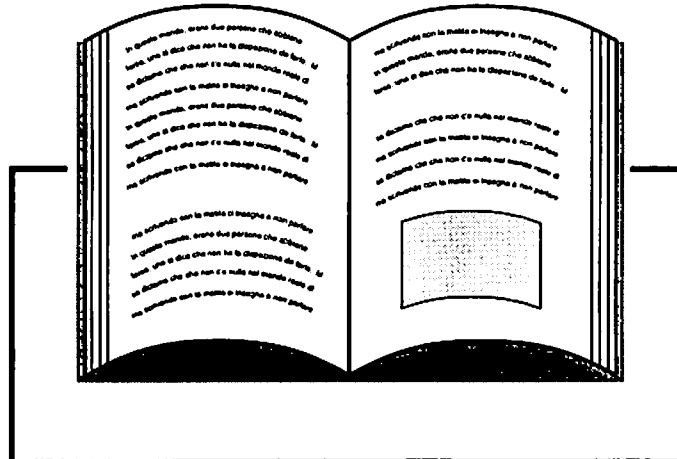
Because the amplifier generates considerable power, it may be desirable to protect sensitive loads from damage due to excessive power. A common way to do this is to put a fuse in series with the load.

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).

2.3.4 AC Mains Power Requirements

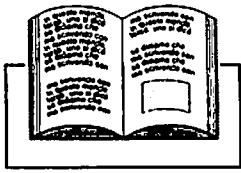
Each Techron TEC3622 amplifier is furnished with a three-wire ac plug. Use an isolated power receptacle whenever possible with adequate current. North American units are shipped with a 15 amp (12 AWG) line cord. Other units are shipped with an appropriate line cord and plug. Line voltages of 10% or more 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.



Section 3—Principles of Operation

This section discusses the principles upon which the Techron Model TEC3622 amplifier functions.



3.1 Overview

The Techron TEC3622 linear power amplifier incorporates several new technological advancements including low-stress output stages, real-time computer simulation of output-transistor conditions, an advanced heat diffuser embodiment, and an articulated variable impedance power supply.

Custom protection circuitry limits temperature and current to safe levels while making the amplifier highly reliable and tolerant of faults. Unlike many competing amplifiers, it can operate at its voltage and current limits without self-destructing.

Real-time computer simulation is used to create an analogue of the junction temperature of the output transistors (hereafter referred to as the "output devices"). Current is limited only when the device temperature becomes excessive—and just by the minimum amount necessary. This patented approach is called *ODEP* or Output Device Emulation Protection. It maximizes the available output power and eliminates overheating, the major cause of output device failure.

The amplifier is protected from common hazards that plague high-power amplifiers such as shorted, open, or mismatched loads; overloaded power supplies; excessive temperature; chain-destruction phenomena; input overload damage; and high frequency blowups. The unit protects loads from turn-on and turn-off transients. The amplifier is also protected from internal faults.

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 delivering peak-to-peak voltages to the load that are twice the voltage seen by the output devices and twice the voltage generated by the power supplies. See Illustration 3-1.

Because the required current exceeds the limits of presently available components, composite output devices are constructed to function as gigantic NPN and PNP devices. Each output stage has two composite NPN and two composite PNP devices.

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.

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

Aluminum extrusions have been widely used for heat sinks in power amplifiers due to their low cost and reasonable performance. However, measured on a watts per pound or watts per volume basis, the extrusion technology doesn't perform nearly as well as the copper thermal diffuser technology developed for Techron power amplifiers.

Techron thermal diffusers are fabricated from custom convoluted fin stock that provides an extremely high ratio of area to volume, or area to weight. All power devices are mounted directly to massive heat spreaders that are electrically alive. Electrifying the heat spreaders improves thermal performance by eliminating the insulating interface underneath the power devices.

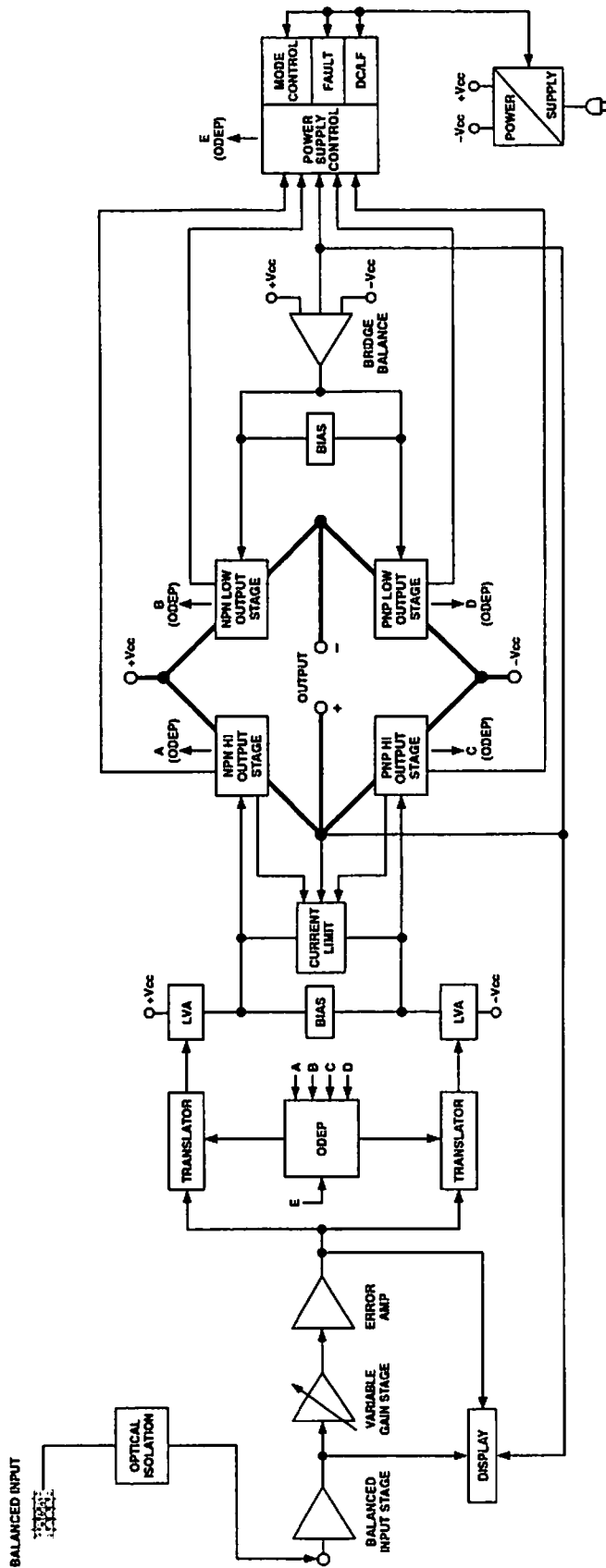
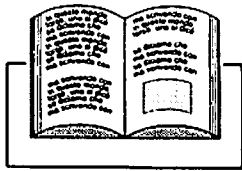


Illustration 3-1 Circuit Block Diagram



The chassis itself is used as part of the thermal circuit, and this maximizes utilization of the available resources.

3.2 ODEP

Techron invented *ODEP* (Output Device Emulation Protection) to solve two long-standing problems in amplifier design:

- To prevent amplifier shutdown during demanding operation.
- To increase the efficiency of output circuitry.

To do this, Techron established a rigorous program to measure the *safe operating area* (SOA) of each output transistor before installing it in an amplifier. Next, Techron designed intelligent circuitry to simulate the instantaneous operating conditions of those output transistors. It not only simulates the operation of the output transistors but it also compares their operation to their known SOA. If *ODEP* sees that more power is about to be asked of the output devices than they are capable of delivering under the present conditions, *ODEP* immediately limits the drive level until it falls within the SOA. Limiting is proportional and kept to an absolute minimum—only what is required to prevent output transistor damage.

This protection increases output efficiency while greatly increasing amplifier reliability. *ODEP* provides maximum power with maximum protection.

3.3 Variable Impedance Power Supply

Techron's patented articulated power supply technology is what makes it possible to pack such tremendous power into Techron's *variable impedance* amplifiers.

3.3.1 Background

In a linear power amplifier, the output transistors place variable resistance in series between the load and the power supply. See Illustration 3-2. 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.

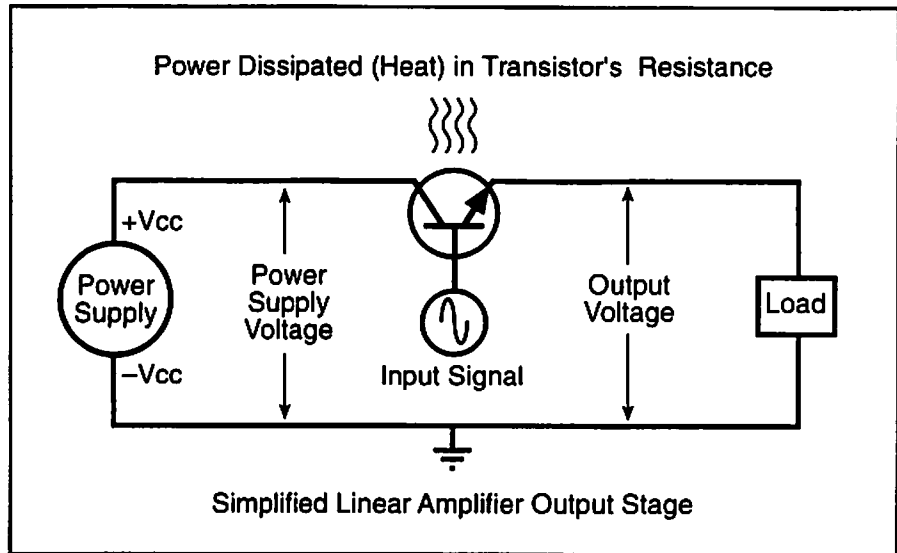


Illustration 3-2 Output Transistor Power Dissipation

3.3.2 The Variable Impedance Supply

An articulated power supply (*variable impedance*) avoids much of this problem by reducing the voltage applied to the transistors when less voltage is needed.

The *variable impedance* 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 3-3.

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

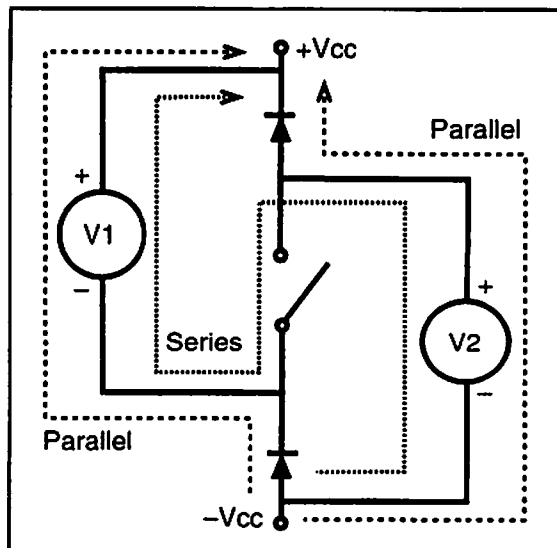
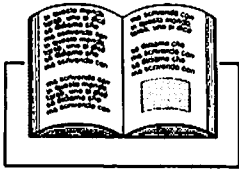


Illustration 3-3 Sections of a Variable Impedance Power Supply



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

Sensing circuitry watches the voltage of the signal to determine when to switch *variable impedance* modes. The switching circuitry is designed to prevent switching distortion to yield the highest possible dynamic transfer function. You get not only the maximum power with the maximum safety, but you also get the best power matching to your load.

3.4 Circuit Theory

The amplifier has two power transformers (T100 and T200) and a low voltage transformer (TF-1). The secondary outputs of each transformer are full-wave rectified by heavy duty bridge rectifiers and are filtered by large computer grade capacitors. A thermal switch embedded in each transformer protects them from overheating.

The low voltage transformer TF-1 uses a separate fan motor winding. The TF-1 output is rectified by diodes D1-4 delivering an unregulated 24 volts. Monolithic regulators U1-2 provide a regulated ± 15 volts.

Please refer to the block diagram in Illustration 3-1 and the schematics provided at the back of this manual.

The input signal at the barrier block passes through an optical coupler to the balanced gain stage (U104-A,B).

The balanced gain stage causes balanced-to-single-ended conversion to take place using a difference amplifier. The error amp (U104-C) 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 U104-C. The +LVA (Q105) and the -LVA (Q110), with their push-pull effect through the bias servo Q318, drive the fully complementary first output stage.

The bias servo Q318 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. D301, D302, D303, and D304 are used to remove the charge on the unused portion of the output stage, depending on the polarity 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 (U104-D) 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 under real-world conditions. These conditions are high

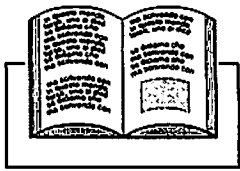
instantaneous current, excessive temperature, and operation of the output devices outside safe conditions.

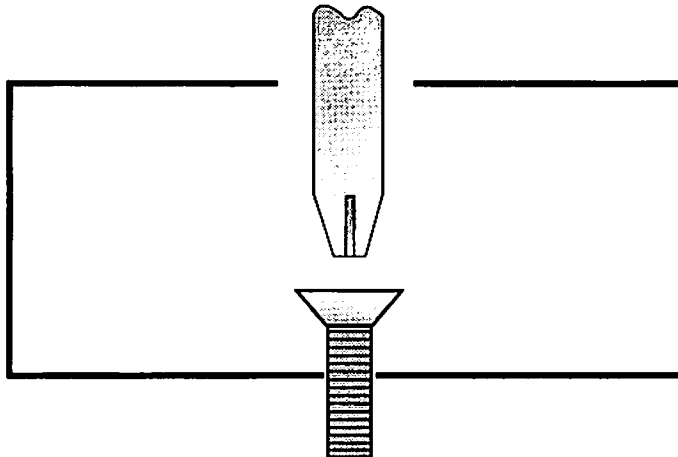
Q107 and Q108 act as a conventional current limiter, sensing current in the output stage. The allowable current level is also adjusted as a function of voltage. When current at any one instant exceeds the design criteria, the limiters remove the drive from the LVAs, thus limiting current in the output stage to a safe level.

To further protect the output stages, a specially developed *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 devices. (See Section 3.2 for more information.)

Thermal sensor S100 gives the *ODEP* circuits vital information on the operating temperature of the heat sink on which the output devices are mounted.

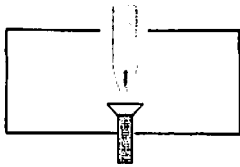
The HF and LF feedback lines from R311/L300 are fed to the error amp U204-B (sheet 2 of the main output schematic).



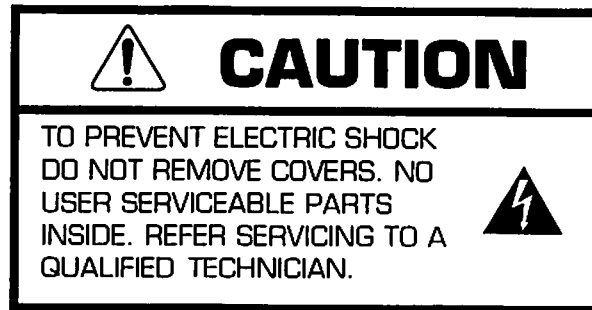


Section 4—Service

This section contains information on servicing the amplifier.



This unit has very sophisticated circuitry which should only be serviced by a fully trained technician.



4.1 Worldwide Service

Service may be obtained from an authorized service center. (Contact your local Techron representative or our office for a list of authorized service centers.)

Remember to transport your unit in the original factory pack. 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.

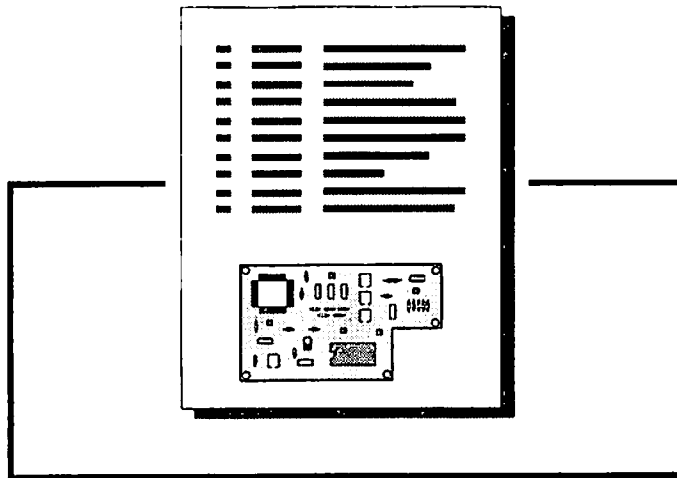
4.2 Factory Service

The unit must be shipped in the original factory pack. If you don't have the original shipping container, contact us, and a replacement will be sent promptly.

Enclose a letter explaining the nature of the problem and what service you would like. Include your return shipping address and telephone number.

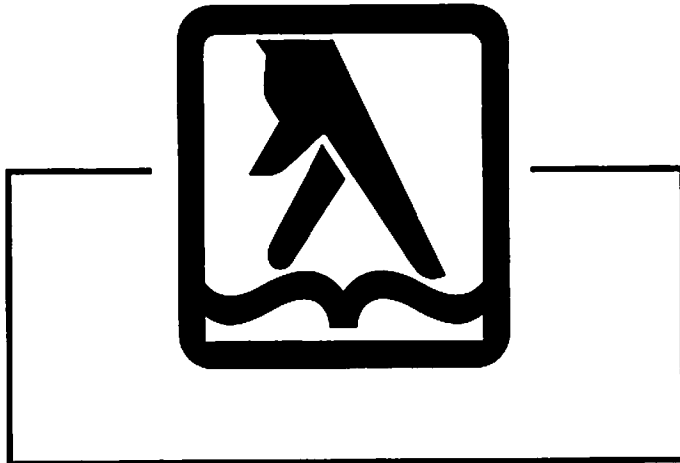
Shipments should be sent by UPS. The factory will return the unit via UPS ground. Please contact us for other arrangements.





Section 5—Schematics

This section provides a graphic summary of the TEC3622 amplifier.



Section 6—Index

This section provides an index to the main topics covered in this manual. For section topics, see Contents.



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