AE Techron

DV 1.5 AMPLIFIER

Operation Manual

AE Techron Inc.

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Elkhart, Indiana, 46516 U.S.A.
574.295.9495

Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.

12. Use only with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as powersupply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE. DO NOT EXPOSE TO DRIPPING OR SPLASHING. DO NOT PLACE OBJECTS FILLED WITH LIQUID, SUCH AS VASES,ON THIS APPARATUS.

TO PREVENT ELECTRIC SHOCK DO NOT REMOVE TOP OR BOTTOM COVERS. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WATCH FOR THESE SYMBOLS:
The lightning bolt triangle is used to alert the user to the risk of electric shock.

The exclamation point triangle is used to alert the user to important operating or maintenance instructions.

IMPORTANT
Commercial Audio Series amplifiers require Class 2 output wiring.

MAGNETIC FIELD
CAUTION! Do not locate sensitive high-gain equipment such as preamplifiers or tape decks directly above or below the unit. Because this amplifier has a high power density, it has a strong magnetic field which can induce hum into unshielded devices that are located nearby. The field is strongest just above and below the unit.
If an equipment rack is used, we recommend locating the amplifier(s) in the bottom of the rack and the preamplifier or other sensitive equipment at the top.

AE TECHRON
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FCC Compliance Notice

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

How to Use this Manual

This manual provides you with the necessary information to safely and correctly setup and operate your amplifier. It does not cover every aspect of installation, setup or operation that might occur under every condition.

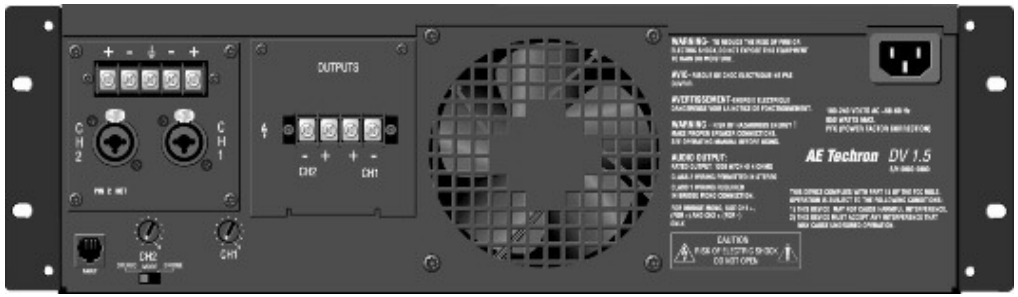
We strongly recommend you read all instructions, warnings and cautions contained in this manual.

1 Introduction

The DV 1.5 is a completely digital amplifier designed to efficiently drive inductive loads in either pulsed or continuous signal applications. The DV 1.5 has two (2) separate channels that can be operated independently, or combined in bridge-mono mode to provide greater maximum voltage output. The DV 1.5 features a Power Factor Corrected (PFC) switching power supply and universal voltage operation.

The PFC switching power supply automatically corrects the electrical phase angle, optimizing the amount of current drawn from the wall outlet. This results in dramatically reduced operating costs. The PFC also provides the end user the flexibility to use the DV 1.5 with a variety of different loads.

The universal voltage operation feature allows the DV 1.5 to operate almost anywhere in the world from 100VAC to 240VAC, 50Hz or 60Hz, without costly transformers and voltage regulators.



FEATURES

- Output of 15.0 amperes RMS, 100 volts RMS in bridge mono
- Front panel indicators for rapid assessment of amplifier status
- PJ-11 jack for remote fault monitoring (requires external circuitry).
- Digital switching power supply with a .98 Power factor.
- Designed to survive input overloads, improper output connection (including improper loads) and continuous operation under demanding conditions
- Shipped ready to operate using single-phase, 100-240-volt AC mains (50-60Hz)
- Installs easily into a standard 19-inch rack, or stands alone for bench top operations.

INDICATORS AND CONTROLS

- Front panel LED'S indicate signal presence, signal clip and signal fault.
- A rocker type "On/Off" power switch located on the front panel.
- Gain controls located on the back panel.
- Rear panel dual channel or bridge-mono switch.

PERFORMANCE

(One hour continuous ratings)

Frequency response: 20 Hz to greater than 20 kHz

Phase Response: +/- 15 degrees
(20 to 20 kHz at 1 watt)

Signal to noise Ratio: 102 dB gain below rated output (20 to 20 kHz)

THD + Noise: Less than 0.5% @ 1 kHz
(20 to 20 kHz)

Input Impedance: 20k Ohm differential

Output impedance: 10 milliohms at 1 kHz,
1.2 ohms at 20 kHz

PHYSICAL CHARACTERISTICS

Chassis: The Amplifier is designed for stand alone, or rack mounted, operation. The Chassis is black steel with a silver and blue front panel. The unit occupies one EIA 19-inch-wide unit.

Weight: 33.3 lbs. (15.1 kg)

AC Power: Single phase, 100 to 240 volt, 50-60 Hz, 15 amp service.

Cooling: Forced air, 140 CFM

Single Channel

	40msec			1 Hour Continuous		
Ohms	Watts	Volts	Amps	Watts	Volts	Amps
2	1800	60	30	882	42	21
4	1260	71	17.8	915	61	15
8	630	71	8.9	612	70	8.8

Bridged Mono

	40msec			1 Hour Continuous		
Ohms	Watts	Volts	Amps	Watts	Volts	Amps
2	1625	57	28.5	220	21	10.5
4	2601	102	25.5	812	57	14.3
8	2485	141	17.6	946	87	10.9

Inductive Load

	Single Channel 0.5 mH +0.1 ohm R load		Single Channel 1.0 mH +0.1 ohm R Load	
Duration	Volts	Amps	Volts	Amps
5 seconds	72	22	75	10.6
1 hour	57	16	75	10.6

Inductive Load

Bridge Mono 0.5 mH + 0.1 ohm R load			Bridge Mono 1.0 mH +0.1 ohm R load		
Duration	Volts	Amps	Duration	Volts	Amps
5 sec.	88	26	5 sec	145	22
2 min.	55	26	4 min.	120	18.2
1 hour	50	15	5 min.	101	15

2 Setup

2.1 Unpack Your Amplifier

Please unpack and inspect your amplifier for any damage that may have occurred during transit. If damage is found, notify the transportation company immediately. Only you can initiate a claim for shipping damage. ***AE Techron*** will be happy to help as needed. Save the shipping carton as evidence of damage for the shipper's inspection.

We also recommend that you 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.**

YOU WILL NEED (not supplied):

- Input wiring cables
- Output wiring cables

Rack for mounting amplifier (or a stable surface for stacking)

WARNING: Before you start to set up your amplifier, make sure you read and observe the Important Safety Instructions found at the beginning of this manual.

2.2 Install Your Amplifier

CAUTION: Before you begin, make sure your amplifier is disconnected from the power source, with the power switch in the "off" position and all level controls turned completely down (counterclockwise).

Use a standard 19-inch (48.3 cm) equipment rack (EIA RS-310B). See Figure 2.1 for amplifier dimensions.

You may also stack amps without using a cabinet.

NOTE: When transporting, amplifiers should be supported at both front and back.

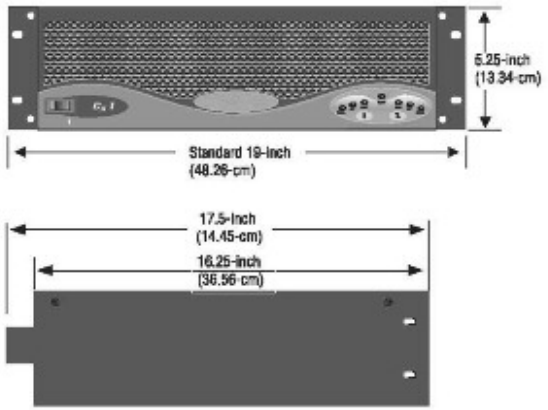


Figure 2.1 Mounting Dimensions

2.3 Ensure Proper Cooling

When using an equipment rack, close any open spaces in rack with blank panels. DO NOT block front or rear air vents. The side walls of the rack should be a minimum of two inches (5.1 cm) away from the amplifier sides, and the back of the rack should be a minimum of four inches (10.2 cm) from the amplifier back panel.

Figure 2.2 illustrates standard amplifier airflow.

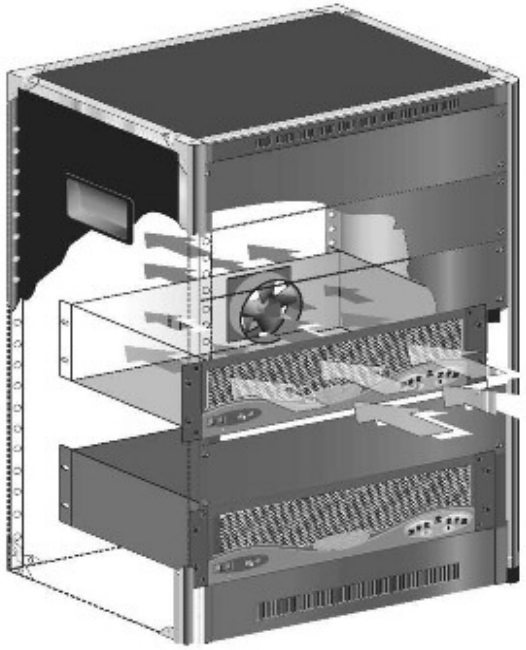


Figure 2.2 Airflow

2 Setup

2.4 Choose Input Wire and Connectors

You have three choices of input connectors: 1/4-inch (6.35-mm) phone, 3-pin XLR, or barrier strip. You can also use either balanced or unbalanced wiring.

Figure 2.3 shows balanced connector pin assignments for XLR and phone. Figure 2.4 shows unbalanced connector pin assignments for XLR and phone.

Figure 2.5 shows barrier strip input wiring for a balanced signal. Both channels should be wired using a common center terminal for ground connection.

NOTE: Custom wiring should only be performed by qualified personnel.

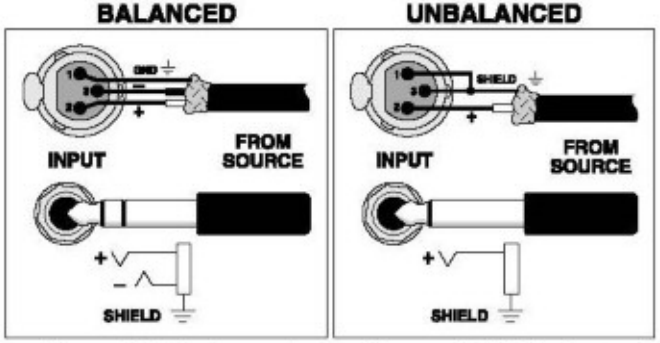


Figure 2.3 Balanced Input Connector Wiring

Figure 2.4 Unbalanced Input Connector Wiring

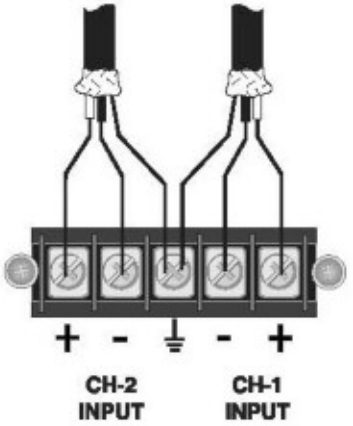


Figure 2.5 Barrier Strip Input Wiring: Balanced Signal In

2 Setup

2.5 Choose Output Wire and Connectors

AE Techron recommends using professionally constructed, high quality, two or four conductor, heavy gauge speaker wire and connectors. You may use terminal forks or bare wire for your output connectors (see Figure 2.7). The amplifier terminal strips accept up to 10 AWG terminal forks which fit over a #8 screw.

To prevent the possibility of short circuits, wrap or otherwise insulate exposed loudspeaker cable and connectors. Also, a no-touch cover, which covers the terminal strips, is provided to help prevent short circuits. To remove this cover,

1. Loosen screws inside top and bottom holes of cover (see Figure 2.6).
2. Slide cover up or down, then pull it off away from the amplifier.
3. Using the guidelines below, select the appropriate size of wire based on the distance from amplifier to load.

Distance	Wire Size
Up to 25 ft.	16 AWG
26 to 40 ft.	14 AWG
41 to 60 ft.	12 AWG
Over 60 ft.	10 AWG

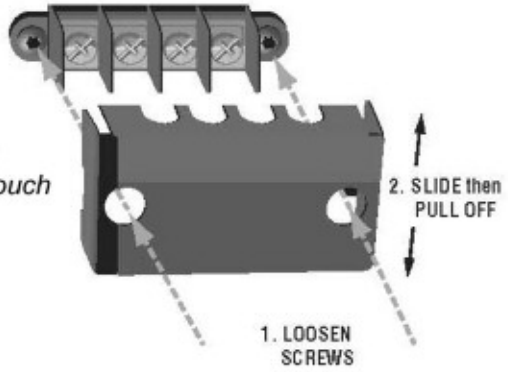


Figure 2.6 How to Remove the No-Touch Cover

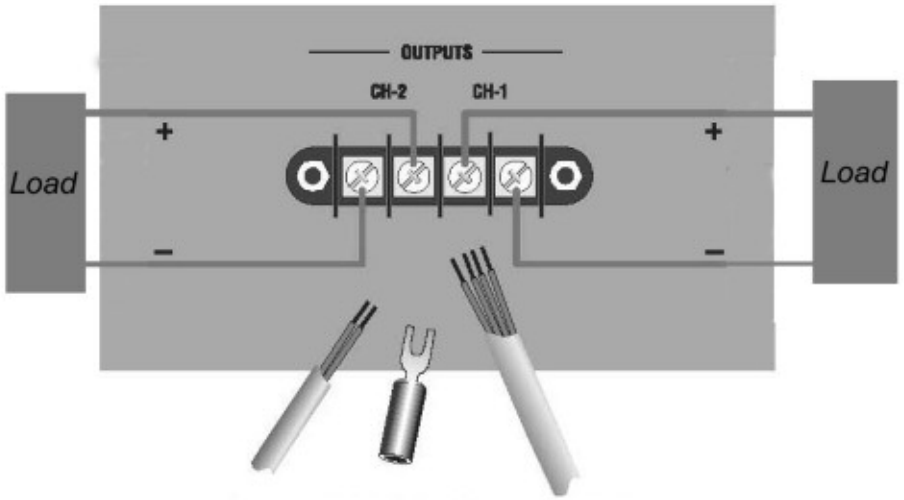


Figure 2.7 Output Connector Wiring

CAUTION: Never use shielded cable for output wiring.

2 Setup

2.6 Switch Settings

Proper wiring depends on how you configure your amplifier. The DV 1.5 offers various modes of operation:

- Constant-voltage load
- 4/8-ohm load
- Stereo mode
- Bridge-mono mode

Each output channel can be independently configured to drive either (1) 4/8-ohm loudspeakers, or (2) step-down transformers in a distributed “constant voltage” system. The amplifier can be configured for Dual or Bridge modes. Various combinations of these modes are possible. The DV 1.5 amplifier can be configured for either Dual channel or Bridge (single mono channel) modes of operation. To switch your amplifier accordingly, set the recessed “Dual/Bridge” switch to the desired setting as shown in Figure 2.8.

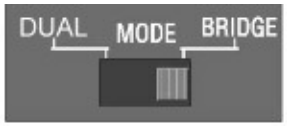


Figure 2.8 Dual/Bridge Mode Switch

WARNING: The two Output Operation switches must be set to identical positions (4/8 ohm or 70V/100V mode) when operating in Bridge mode. Never change switch positions with power turned on.

CAUTION: Output Terminals are activated by selection of an output operation mode via the Output Operation switches. All other Output Terminals are inactive. For example, when 4/8 Ohm Operation is selected, the 70V and 100V connections are inactive, with no audio present at those Output Terminals.

CAUTION: Always disconnect the AC power and turn the level controls off when making or breaking connections.

CAUTION: Never tie an amplifier’s outputs together directly while in Dual mode. Never parallel them with the output of another amplifier. Such connections do not result in increased output power, but may cause overheating and premature activation of the protection circuitry.

Note: The Channel 2 input jack and Input Level control are not defeated in Bridge mode. A signal feeding Channel 2 will work against the Channel 1 signal, and usually results in distortion and inefficient operation.

2 Setup

2.7 Wire Your System

2.7.1 Model DV 1.5 Stereo Mode

See Figure 2.9. In this example, Channel 1 and Channel 2 are wired to 4/8-ohm loads.
Make sure the Mode switch is set to the “Dual” position.

INPUTS: Connect input wiring for each channel.
OUTPUTS:

- Connect Channel 1 positive (+) load lead to Channel 1 positive (+) terminal of amp.
- Connect Channel 1 negative (–) load lead to Channel 1 negative (–) output terminal of amp.
- Repeat similarly for Channel 2.

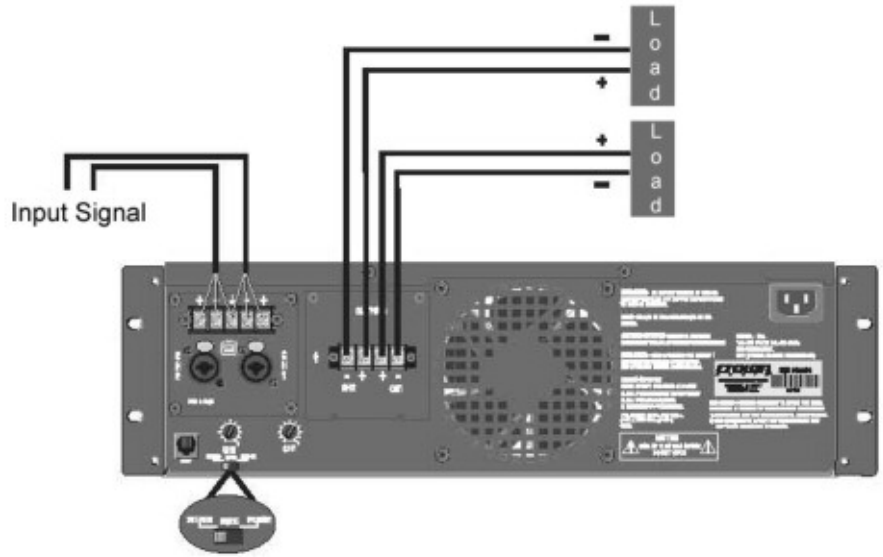


Figure 2.9 Wiring for Dual Mode

2.7.2 Model DV 1.5 Bridge Mode

See Figure 2.10. In this example, a 4/8-ohm load is connected in Bridge Mono across the positive terminals of Channel 1 and Channel 2. Make sure the Mode switch is set to the “Bridge” position.

NOTE: When operating in Bridge-Mono mode, turn down (full CCW) the level control for Channel 2, as the Channel-1 level control works both channels.

INPUTS: Connect input wiring to CH1.
OUTPUTS:

- Connect positive (+) load lead to Channel 1 positive (+) terminal of amp.
- Connect negative (–) load lead to Channel 2 positive (+) terminal of amp. Do not connect to negative output terminals.

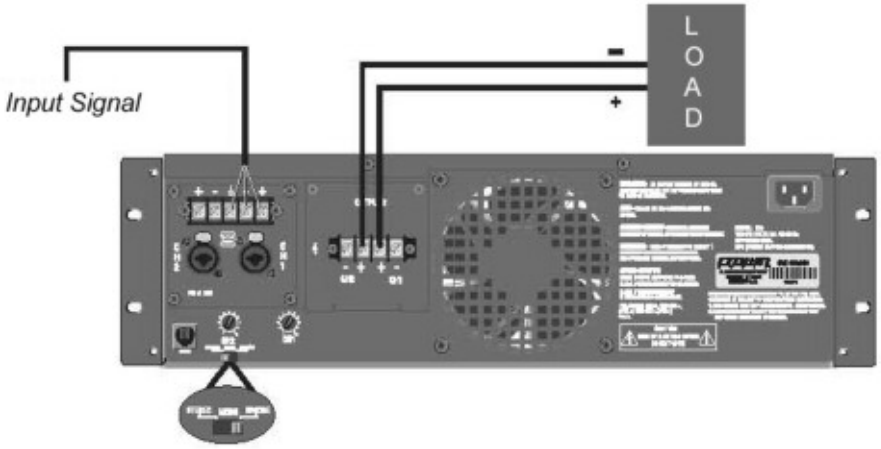


Figure 2.10 Wiring for Bridge Mode

2 Setup

2.8 Connect to AC Mains

Connect your amplifier to the AC mains power source (power outlet) with the supplied AC power cord set.

First, connect the IEC end of the cord set to the IEC connector on the amplifier; then, plug the other end of the cordset to the AC mains.

WARNING: The third prong of this connector (ground) is an important safety feature. Do not attempt to disable this ground connection by using an adapter or other methods.

Amplifiers don't create energy. The AC mains voltage and current must be sufficient to deliver the power you expect. You must operate your amplifier from an AC mains power source with not more than a 10% variation above or a 15% variation below the amplifier's specified line voltage and within the specified frequency requirements (indicated on the amplifier's back panel label). If you are unsure of the output voltage of your AC mains, please consult your electrician.

2.9 Startup Procedure

Use the following procedure when first turning on your amplifier:

1. Turn down the level of your audio source.
2. Turn down the level controls of the amplifier.
3. Turn on the "Power" switch. The Power indicator should glow.
4. Turn up the level of your audio source to an optimum level.
5. Turn up the Level controls on the amplifier until the desired loudness or power level is achieved.
6. Turn down the level of your audio source to its normal range.

If you ever need to make any wiring or installation changes, don't forget to disconnect the power cord.

3 Operation

3.1 PRECAUTIONS

Your amplifier is protected from internal and external faults, but you should still take the following precautions for optimum performance and safety:

1. Before use, your amplifier first must be configured for proper operation, including input and output wiring hookup. Improper wiring can result in serious operating difficulties. For information on wiring and configuration, please consult the Setup section of this manual.
2. Use care when making connections, selecting signal sources and controlling the output level. The load you save may be your own!
3. Do not short the ground lead of an output cable to the input signal ground. This may form a ground loop and cause oscillations.
4. **WARNING: Never connect the output to a power supply, battery or power main. Electrical shock may result.**
5. Tampering with the circuitry, or making unauthorized circuit changes may be hazardous and invalidates all agency listings.

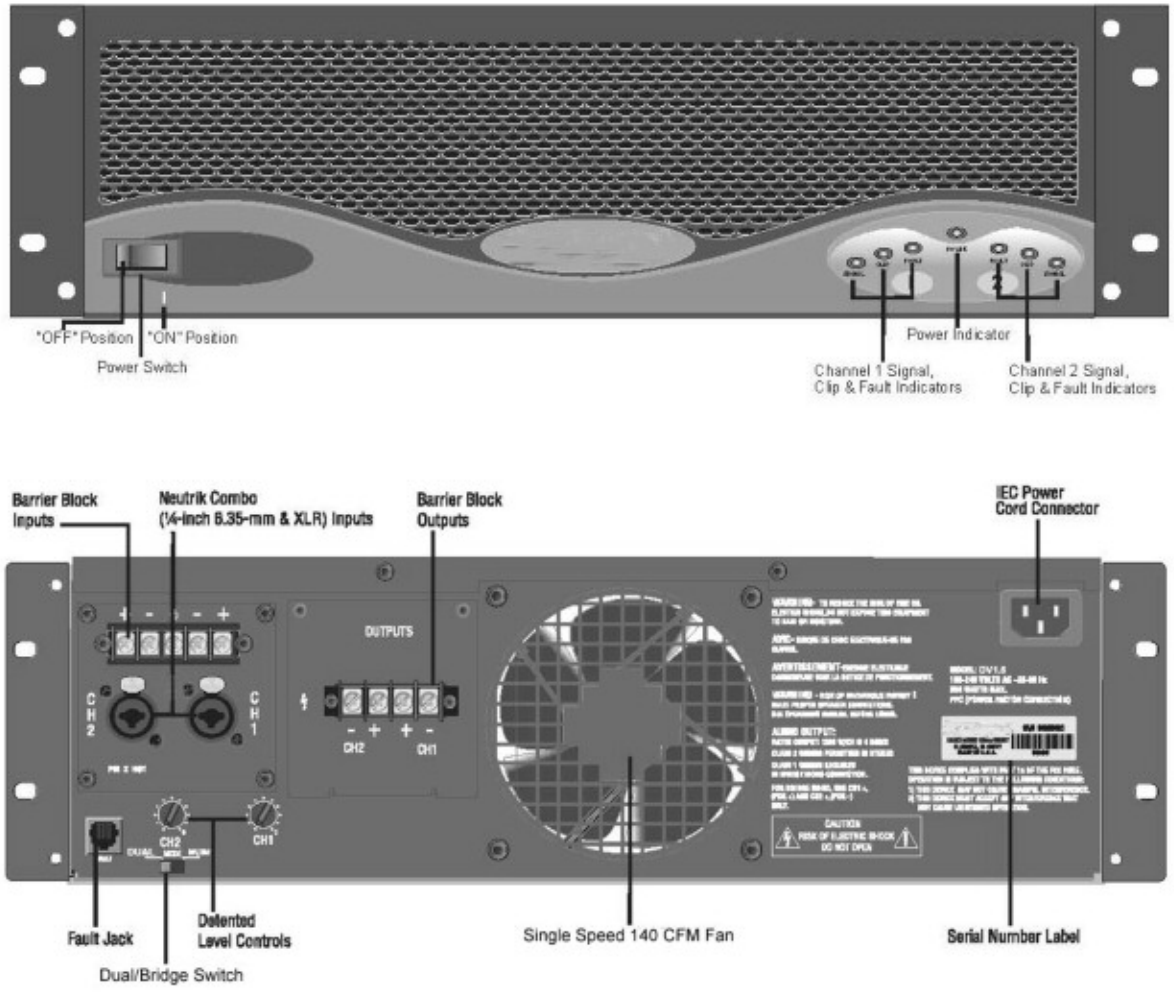


Figure 3.1 Front and Back Panels of DV1.5

3 Operation

6. Do not operate the amplifier with the red Clip LEDs constantly flashing.
7. Do not overdrive the mixer, which will cause clipped signal to be sent to the amplifier. Such signals will be reproduced with extreme accuracy, and loudspeaker damage may result.
8. Do not operate the amplifier with less than the rated load impedance. Due to

3.2 INDICATORS

The front panel of a Contractor Series amplifier has several helpful indicators (Figure 3.2). The blue Power indicator shows that the amplifier has been turned on and has power.

The red **Fault indicators** blink under five different conditions:

1. When the amplifier is first powered up, until the unit is ready for operation.
2. If the heatsinks reach a temperature above normal working limits. This can be caused by any number of abnormal conditions including but not limited to extremely low load impedance and/or inadequate cooling (see Section 1 for more information on cooling).
3. If the transformer (high-voltage power supply) thermal protection circuit is activated. Higher than rated output levels, excessively low-impedance loads and unreasonably high input signals can generate more heat in the power supply than in the output devices. This can overheat the power supply and activate the Fault protection circuit.
4. If amplifier output wires develop a short-circuit. This could be caused by a short anywhere along the circuit from the output connectors to the speakers, including shorted speaker drivers.
5. If the amplifier output stage stops operating.

The red **Clip indicators** turn on when distortion is audible in the amplifier output.

The green **Signal Presence Indicators** (SPI) illuminate when a signal (>–40 dBm) is present at the INPUT of the amplifier. This indicator is before the level control, so it can be used to troubleshoot wiring problems within a system. If the indicators are not lit, signal is not reaching the amplifier.

Figure 3.2 Indicators

3 Operation

3.3 CONTROLS

The **Enable switch** is located on the front panel so you can easily turn the amplifier on and off.

A 21-position **Detented Level Control** is provided for each channel. Level attenuation may be adjusted in steps. For security, the level controls are located on the back panel.

A two-position **Mode switch**, located on the back panel, allows the selection of either Dual or Bridge mode of operation.

Dual mode provides identical power output to each of the two amplifier output channels. Bridge mode combines the two amplifier output channels into a single mono channel with twice the voltage of a single channel. It does this by bridging the outputs, and it requires special output wiring.
Do NOT select Bridge mode without first making sure the amplifier has been wired in a Bridge-Mono configuration. For more information on wiring for Bridge mode, see the Setup section of this manual (Section 2), or consult your system installer.

When Bridge mode is selected, only the Channel 1 Level control and the Channel 1 Signal indicator will work. If the Channel 2 input is wired, the Channel 2 Level Control should be turned all the way down (counter/ anti-clockwise) to prevent distortion.

Fault Jack: This RJ11 jack (which looks like a phone jack) is located on the back panel. By attaching a signalling device to the Fault jack, you can monitor the amplifier's Fault status from a remote location. See Section 4.3.3 for more information on fault monitoring and suggestions for signalling device circuity.

A circuit breaker is provided to prevent the high-voltage power supplies from drawing excessive current. A **Reset switch** for the circuit breaker is provided on the back panel. If the circuit breaker trips, the Power indicator turns off. In this situation, turn off the Power switch and reset the circuit breaker. Then, turn the Power switch back on. If it trips again or the unit fails to operate properly, contact an authorized Service Center.

4 Advanced Features and Options

4.1 Protection Systems

The DV1.5 amplifier is protected against shorted, open or mismatched loads; overloaded power supplies; excessive temperature, chain destruction phenomena, input overload damage and high-frequency blowups. They also protect loads from input/ output DC, large or dangerous DC offsets and turn-on/turn-off transients.

4.1.1 Proportional-speed Fan

In the DV1.5 a 3-speed Fan-On-Demand fan directs the airflow through the amplifier for cooling.

4.2 Advanced Features

4.2.1 BCA®

BCA (Balanced Current Amplifier) is patented, cutting-edge technology that gets more power out of an amplifier with less waste than was ever before possible. A completely new adaptation of standard amplifier design, the BCA "switching" amplifier design provides for high output, exceptional reliability and nearly twice the efficiency of typical amplifier designs.

While switching designs have been used successfully in other applications, these designs were never before suitable for use in precision, high-power audio amplifier applications. BCA technology is a totally new paradigm for amplifier design that represents the future of professional amplifiers.

BCA amplifiers can help to keep power requirements lower, while still providing excellent audio reproduction. BCA amplifiers are tough—easily handling very low (and highly reactive) load impedances, even under extreme conditions. In fact, BCA amps have far out-performed competitive amplifiers in tests where the amplifier was run as much as 12 dB into clip for extended periods of time.

4.2.2 Switching Power Supply with PFC

Switching Power Supply with PFC provides a range of benefits over both non-switching and conventional switching power-supply designs.

Typical non-switching power supplies require large transformers in order to produce the required power at the output stage. These transformers must be large to absorb the waste that occurs when operating at 50 to 60 Hz (standard AC supplied by the power company).

By contrast, switching power supplies can operate with a much smaller (and lighter) transformer because they first convert the AC up to a much higher frequency, thereby reducing waste.

4.3 Options

4.3.1 Input Sensitivity

Input Sensitivity is factory set to 1.4V for each channel. With this setting, a 1.4V input signal will drive the amplifier to full power into an 8-ohm load when the Level Controls are turned to maximum. This setting works best when the amplifier is being driven by equipment with a +4 dBu output. Optionally, the Input Sensitivity for each channel can be individually set to either 0.775V or 26 dB. To have the input sensitivity changed on your amplifier, contact an authorized Service Center

4.3.2 Fault Monitoring

The Fault (RJ-11) jack, which looks like a telephone plug, is located on the back of your amplifier (Figure 4.1). It gives you an easy way to remotely monitor the amplifier's fault status. To set up a circuit that will cause an LED to light whenever a fault status occurs, you can simply use the suggested circuit shown in Figure 4.2.

When using this circuit, the LED will glow whenever the amplifier is in one of four states: a channel's heatsink has reached its temperature limit, the transformer has reached its temperature limit, the amplifier has just been turned on and is in its turn-on-delay mode, or the amplifier is turned off.

4 Advanced Features and Options

If you choose to design your own circuit to interface this signal to your system, note that this RJ jack is polarity sensitive. Pin 2 must be grounded, and Pin 5 must be supplied with a positive voltage pull up (positive with respect to ground). Refer to Figure 4.3 for RJ jack pin assignments. The maximum signal that can be exposed to the fault jack is 35VDC and 10 mA. Best results are obtained with 10 mA LEDs.

The mating connector for the RJ-11 jack contains 4 contact pins in a 6-slot case, as shown.

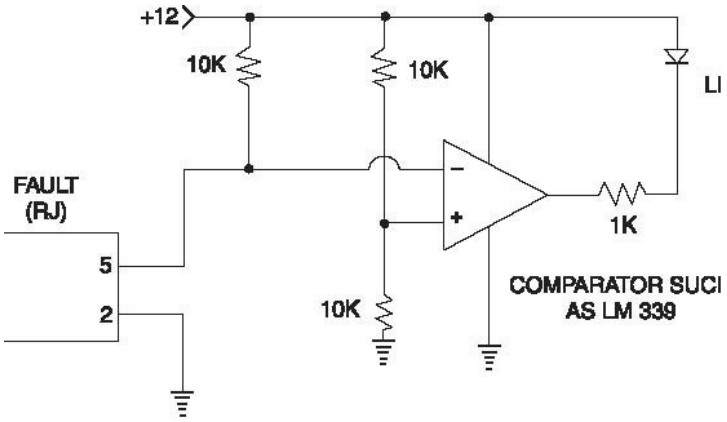


Figure 4.2 Fault Status LED Circuitry

Figure 4.1 Location of Fault Jack

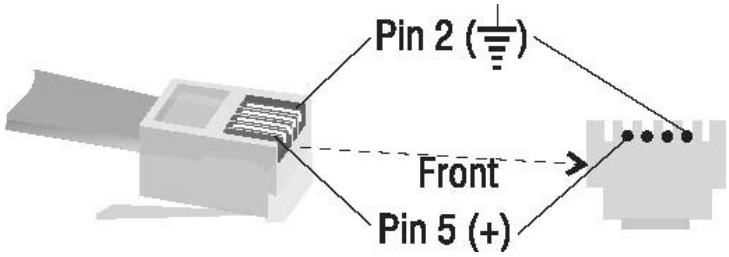


Figure 4.3 Jack Wiring and Pin Association

4.3.4 Precision Detented Level Controls

A 21-position Precision Detented Level Control is provided for each channel. Level attenuation may be adjusted in precise steps as shown in Figure 4.4. For security, the level controls are located on the back panel.

Detent	4/8 Ohm	70V	100V
0 (full CCW)	-68.31	-72.90	-71.02
1	-67.54	-72.06	-70.26
2	-32.23	-36.61	-34.90
3	-25.46	-29.74	-28.00
4	-21.83	-25.87	-24.22
5	-19.23	-23.20	-21.58
6	-17.12	-20.94	-19.40
7	-15.36	-19.02	-17.53
8	-13.76	-17.22	-15.79
9	-12.28	-15.53	-14.20
10	-10.84	-13.90	-12.62
11	-9.51	-12.32	-11.16
12	-8.28	-10.87	-9.81
13	-7.09	-9.45	-8.45
14	-6.03	-8.11	-7.22
15	-4.92	-6.70	-5.94
16	-3.82	-5.26	-4.63
17	-2.62	-3.70	-3.21
18	-1.35	-1.90	-1.66
19	-0.01	-0.01	-0.01
20 (full CW)	0.00	0.00	0.00

Figure 4.4 Level –Control Attenuation per Detent

5 Principles of Operation

5.1 Signal Path

The signal enters the main amplifier error amp where it is mixed with a small portion of the output voltage and current in such a way as to control the amplifier's overall output performance.

Following the error amp is the modulator stage where the audio signal is compared to an extremely accurate 250-kHz triangle waveform. Comparators output a Pulse Width Modulated (PWM) string of pulses at 250 kHz that vary in width depending on the level of the input signal. These strings of pulses, one for the positive side and one for the negative side, are connected to the output stage via optocouplers.

The signals from the optos are then passed to gate drivers that amplify the pulses to the level required to drive output devices. The driven output devices are now able to produce PWM pulses that have an output voltage from the negative high-voltage rail (–Vcc) to the positive high-voltage rail (+Vcc). This output voltage is always the same (2 * Vcc) but the width of the pulses is still dependent on the level of the input signal. The positive and negative output PWM pulses then pass through inductors and
are summed together. Summing the output signals through inductors reconstructs the signal, amplified to the desired level. There is a small amount of ripple on the output that is at double the switching frequency (500 kHz).

The amplified signal is then passed through an output filter that removes the residual ripple voltage.

Protection for the output devices is performed by a very precise pulse-by-pulse current limiter circuit that operates each time the output devices switch. The current limiting is "flat" meaning that, regardless of the output voltage, the output current always limits at a certain value.

The turn-on delay circuitry functions to keep the modulators turned off (which keeps the outputs from switching) until all supplies are up and stable.

Thermal probes monitor Heatsink temperatures and power transformer temperature. As the temperatures rise, the probes send a proportional voltage to the fan control circuit and the Thermal Limit Control (TLC) circuit. The fan normally runs

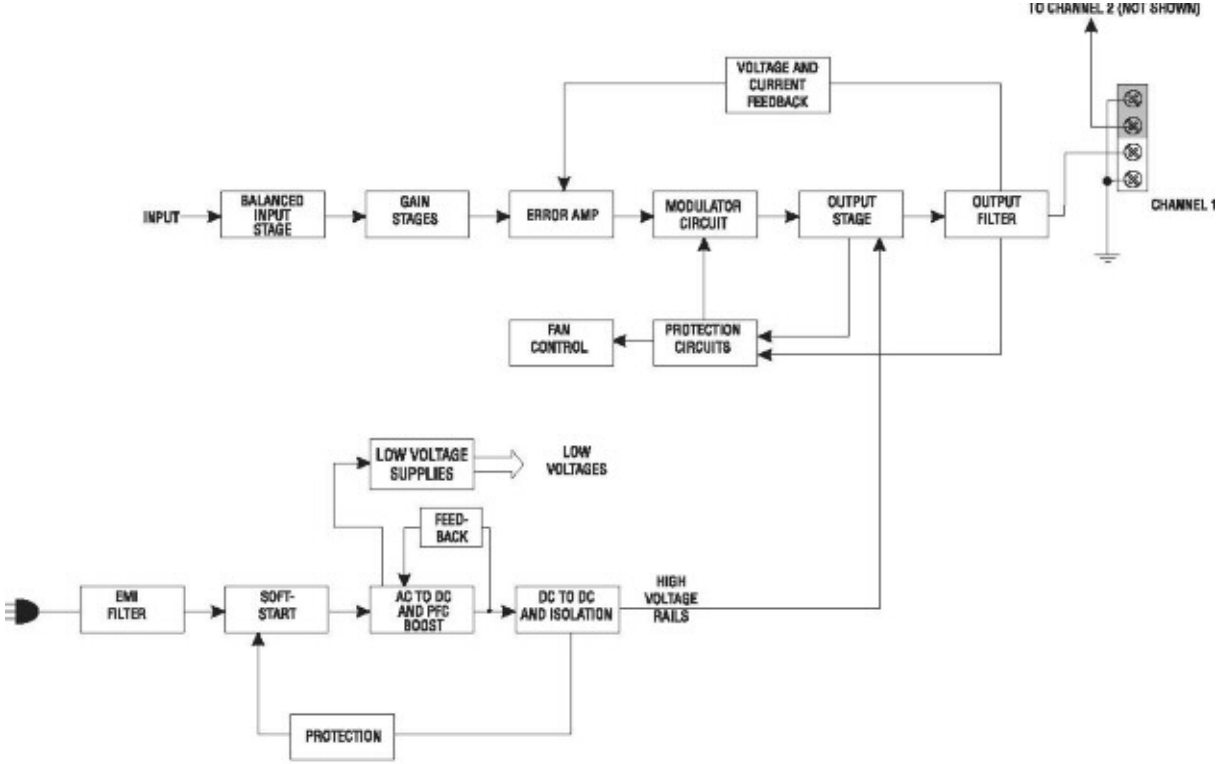


Figure 5.1 DV1.5 Circuit Block Diagram

at very low speed when the amplifier is idling or when it is being used for low to moderate duty work. If the amplifier is delivering large amounts of power into low impedance loads, the heatsinks or transformer may heat up enough to increase the speed of the fan to medium and possibly to high speed. If the temperature continues to increase, the TLC circuit uses the compressor to reduce the gain of the input stage and thus reduce the power dissipated by the amplifier. As a further protective measure, if the temperature continues to rise (due to blocked airflow for example), the amplifier will stop running and keep the fan on high speed to quickly bring the temperature back to an operational level.

If a signal presented at the input of the amplifier will not be passed through to the output, the Fault LED will blink to get your attention. The turn-on delay, for example, will cause each channel's LED to blink because the amplifier remains in standby for a few seconds before it allows audio output.

An RJ11 modular jack is mounted on the back panel. Pins 2 and 5 are connected to an optoisolator that is always in a low-resistance state whenever the unit is on and happy. Should a fault be detected or should the amplifier lose AC power, the opto-isolator will change to a high resistance, allowing the user to remotely detect the status of the amplifier. The Signal Presence Indicators tap the signal chain just before the level controls and prior to the power amplifier chain. They are not amplifier output indicators and should only be used to indicate the presence of signal to the amplifier front end.

The Clip indicators are driven from the output of the compressor circuitry and light to indicate the onset of audible distortion. The Power indicator LED is driven from the low-voltage supply.

5.1.2 Power Supply Operation

AC power enters the amplifier through a power cord equipped with an IEC (unplugable) connector. It then is passed through the EMI filter. Circuits that use switching technology will normally send a small amount of high-frequency noise back down the power cord and into the power distribution system. This noise must be removed in order to sell the unit in certain parts of the world. Since the DV 1.5 is a worldwide product, the EMI filter removes this noise so that it does not exit the box.

The power then enters the Power Factor Correction (PFC) Boost stage. This stage is what allows the DV1.5 to be plugged into any outlet in the world without any modifications to the amplifier. The PFC stage uses switching power supply technology to take whatever AC line voltage comes in, convert it to DC and boost it to 400 Volts. The circuit also uses intelligence to draw the current from the line sinusoidally and in phase with the line voltage. This reduces the load on the power companies

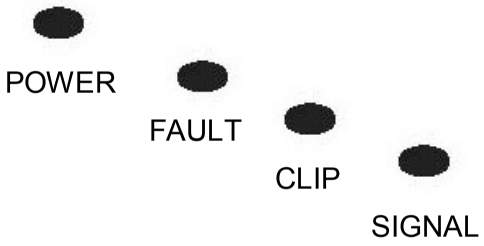
and also allows the amplifier to pull more peak power from the power source (the outlet). The power is drawn in small amounts 62,500 times each second and is used to provide power to the isolation stage and to fill the large energy reservoir capacitors.

The power then goes to the “buck” isolation stage. This stage takes the 400 Volt PFC voltage and, again using switching power supply technology, converts it down (“bucks” it down) to the level needed to power the output stage. The isolation stage also satisfies a safety requirement by providing isolation, using a transformer, between the AC mains power and the power that is delivered to the output. The isolation stage moves power 125,000 times each second from the primary to the secondary to power the output stage and keep its large energy reservoir capacitors full.

In order to keep the power supply controllers, protection circuits, and the signal path components powered, another switching power supply is used, this one also running at 125 kHz. This one is also a “buck” type supply in that it takes voltage from the 400 Volt PFC bus and converts it down to the low voltages needed. This circuit also uses a transformer to provide safety isolation.

Like the signal path parts of the amplifier, there are many ways that the power supply protects itself. Part of the start-up time delay mentioned above occurs while the power supply is ramping up all of its voltages (soft-start) so that large inrush currents are avoided. Current limiters and over-current detectors are used to protect the power supply output devices. The power supply will also detect severe brownouts and shut off the supply until the brown-out is over if the line voltage is drastically less than normal.

6 Troubleshooting



CONDITION: Power indicator is off.

POSSIBLE REASON

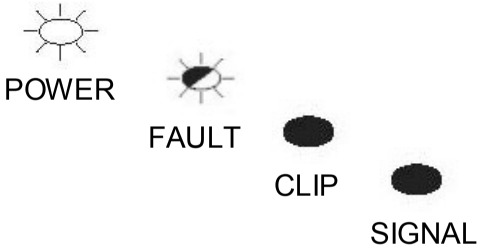
- The amplifier has lost AC power.
- The amplifier's Power switch is off.
- The amplifier is not plugged into the power receptacle.
- The power supply circuit breaker has tripped. Verify that input levels and output impedances are within safe ranges. Turn off the Power switch and reset the circuit breaker. Then, turn the Power switch back on. If it trips again or the unit fails to operate properly, contact an authorized Service Center.

KEY:

LIT

Flashing

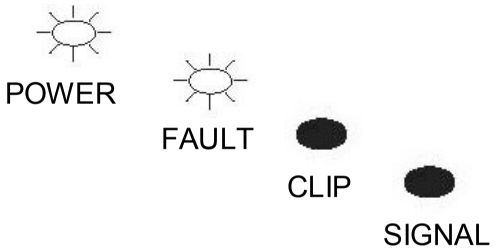
Off



CONDITION: Fault indicator is flashing.

POSSIBLE REASONS:

- The amplifier has just been powered up and is not ready for operation yet.
- The heatsinks are too hot. Ensure adequate cooling. Remove excessive loads.
- The transformer (high-voltage power supply) thermal protection is activated. Turn down the Level controls or the input signal. Remove excessive loads.
- The amplifier output wires have developed a short circuit.
- The amplifier output stage has stopped operating. If so, return the unit to *AE Techron*.

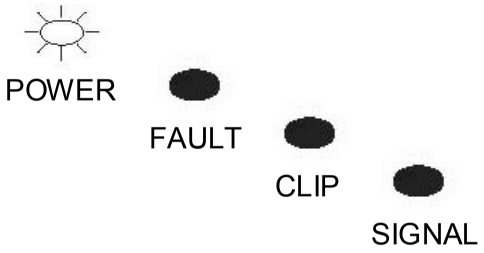


CONDITION: Fault indicator is on.

POSSIBLE REASONS:

- The amplifier output stage has stopped operating. Refer the unit to *AE Techron*.

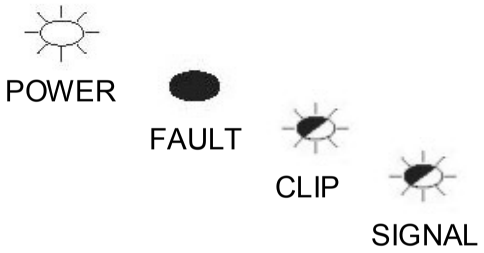
6 Troubleshooting



CONDITION: No input signal.
(Signal indicator is not flashing even though audio is applied)

POSSIBLE REASONS:

- Input signal is very low.
- Level controls are turned down.

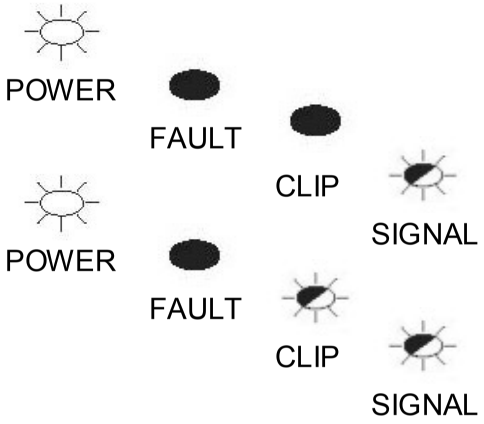


CONDITION: Distorted Signal

POSSIBLE REASONS:

- Load is wired incorrectly or Dual/Bridge mode switch is set incorrectly. Check both.
- Input signal level is too high. Turn down your amplifier level controls, or turn down the input signal, until the clip light goes out.

Note: If the signal sounds distorted even though the Clip LED is off, the input signal is distorted. Check gain staging and output levels of the preamp.



CONDITION: No signal, even though the amp has power
(Power LED is on without flashing and the amp is receiving an input signal. Signal indicator is flashing.)

POSSIBLE REASONS:

- Load is not connected properly.
- Open circuit due to load (speaker) failure.
- There is a short on the amplifier output. First disconnect your load from the affected channel (s) one by one to determine if one of the loads is shorted.

7 Specifications

Minimum Guaranteed Power	DV 1.5
120V/60 Hz Units, Dual mode, per channel, both channels driven	
1 kHz at rated THD 2 ohms 4 ohms 8 ohms	 1,800W 1,200W 600W
120V/60 Hz Units, Bridge mono mode	
1 kHz at rated THD 4 ohms 8 ohms	 3,600W 2,400W
Performance	**DV 1,5**
Frequency Response (at 1 watt, 20 Hz - 20 kHz)	± 0.25 dB
Phase Response (at 1 watt, 10 Hz - 20 kHz)	± 15°
Signal to Noise Ratio below rated power (A-weighted)	> 100 dB
Total Harmonic Distortion (THD) at rated 1 kHz power, 20 Hz to 20 kHz	< 0.5%
Intermodulation Distortion (IMD) 60 Hz and 7 kHz at 4:1, from rated power to 30 dB below rated power at 8 ohms	< 0.5%
Damping Factor (8 ohm), 10 Hz to 400 Hz	> 1000
Crosstalk (below rated power, 20 Hz to 20 kHz) *at 10 kHz	> 50 dB*
Common Mode Rejection (CMR), 20 Hz to 1 kHz	> 40 dB
DC Output Offset (Shorted input)	± 10 mV
Input Impedance nominally balanced, nominally unbalanced	20 kilohms, 10 kilohms
Load Impedance (Note: Safe with all types of loads) Stereo Bridge Mono	 2/4/8 ohm 4/8/16 ohm
Voltage Gain (at maximum level setting), 1 kHz, 1.4V sensitivity 4/8 Ohm Operation	34.0 dB
Required AC Mains (voltages ± 10%)	100V, 8.5A, 50/60 Hz 120V, 7.1A, 50/60 Hz 2 30-240V, 3.7A, 50/60 Hz
Cooling	3-speed Fan-On-Demand
Dimensions: Width, Height, Depth	19 in. (48.3 cm) x 5.25 in. (13.34 cm) x 16.25 in.* (36.56 cm)*
Net Weight, Shipping Weight	33.3 lb (15.1 kg), 39.3 (17.8 kg)

7 Specifications

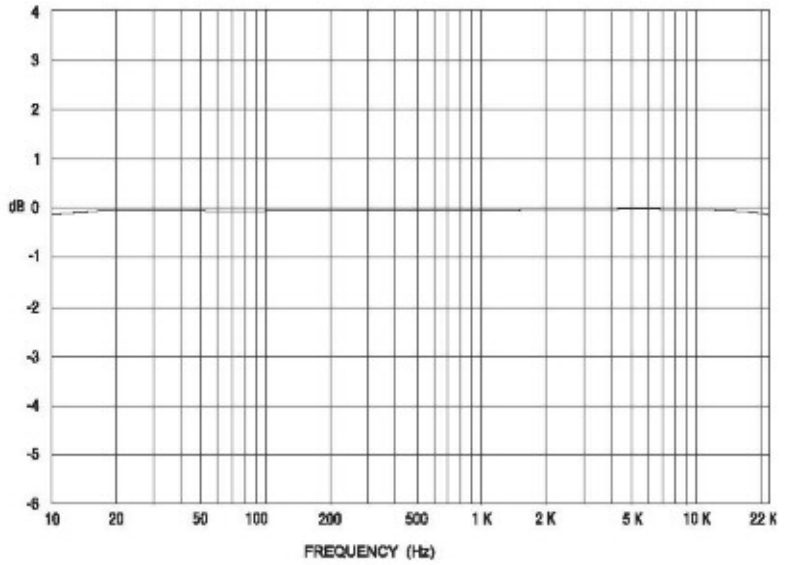


Figure 7.1
DV1.5 Frequency Response
(typical)

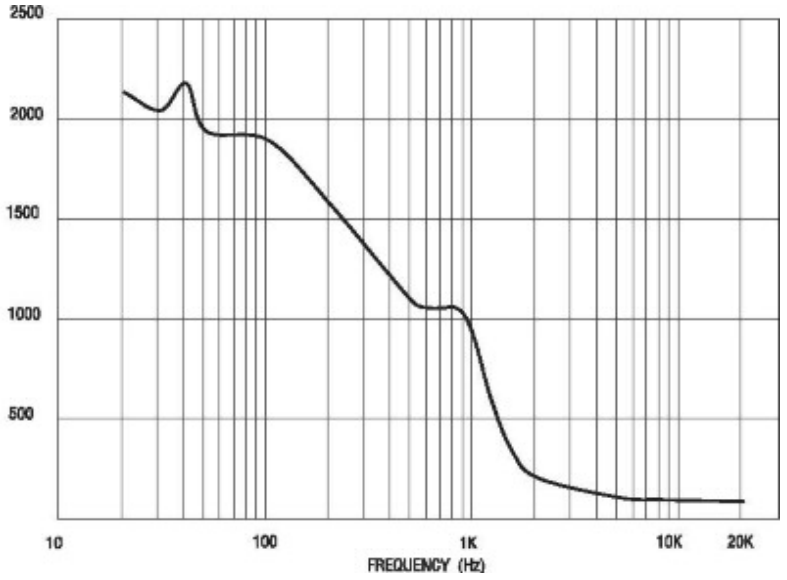


Figure 7.2
DV1.5
Damping Factor
(typical)

7 Specifications

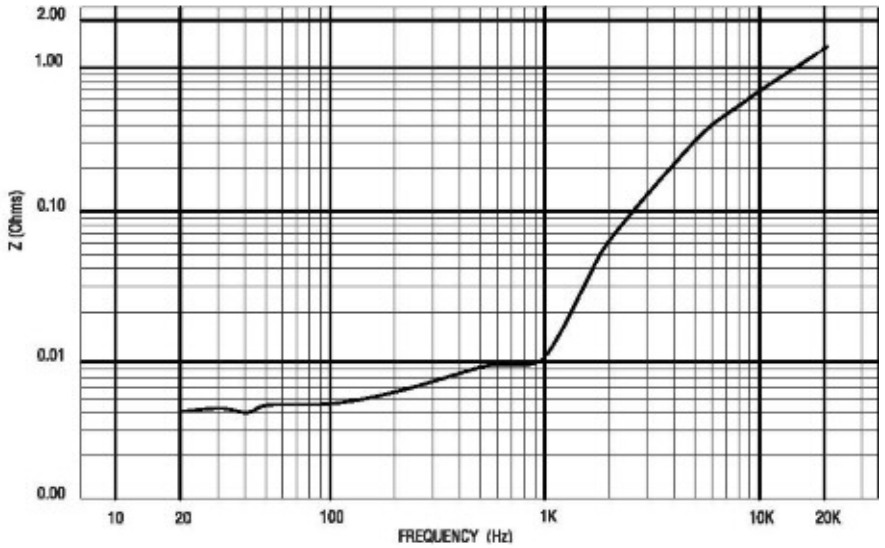


Figure 7.3
DV1.5
Output Impedance
(typical)

8 AC Power Draw and Thermal Dissipation

This section provides detailed information about the amount of power and current drawn from the AC mains by DV 1.5 amplifiers and the amount of heat produced under various conditions. The calculations presented here are intended to provide a realistic and reliable depiction of the amplifiers. The following assumptions or approximations were made:

- The amplifier's available channels are loaded, and full power is being delivered.
- Amplifier efficiency at standard 1-kHz power is estimated to be 77%.
- Typical quiescent power draw is approximately 140 watts.
- When running at full speed, typical power draw for the internal fan is 12 watts for all models.
- Quiescent thermal dissipation is related.
- The estimated duty cycles take into account the typical crest factor for each type of source material.
- Duty cycle of pink noise is 50%.
- Duty cycle of highly compressed rock 'n' roll midrange is 40%.
- Duty cycle of rock 'n' roll is 30%.
- Duty cycle of background music is 20%.
- Duty cycle of continuous speech is 10%.
- Duty cycle of infrequent, short duration paging is 1%.

Here are the equations used to calculate the data presented in Figure 8.1:

$$\text{AC Mains Power Draw (watts)} = \frac{\text{Total output power with all channels driven (watts)} \times \text{Duty Cycle}}{\text{Amplifier Efficiency}} + \text{Quiescent and Fan Power Draw (watts)}$$

The value used for Amplifier Efficiency is 0.77 for DV 1.5 models (these values are listed in the previous column). The following equation converts power draw in watts to current draw in amperes:

$$\text{Current Draw (amperes)} = \frac{\text{AC Mains Power Draw (watts)}}{\text{AC Mains Voltage} \times \text{Power Factor}}$$

The value used for Power Factor is 0.98 for DV 1.5/ models. The Power Factor variable is needed to compensate for the difference in phase between the AC mains voltage and current. The following equation is used to calculate thermal dissipation:

$$\text{Thermal Dissipation (btu/hr)} = \left(\frac{\text{Total output power with all channels driven (watts)} \times \text{Duty Cycle} \times \text{Amplifier Inefficiency}}{\text{Amplifier Efficiency}} + \text{Quiescent and Fan Power Draw (watts)} \right) \times 3.415$$

The value used for Amplifier Inefficiency is 0.23 (1.00–0.77) for DV 1.5 models. The factor 3.415 converts watts to btu/hr. Thermal dissipation in btu is divided by the constant 3.968 to get kcal. If you plan to measure output power under real-world conditions, the following equation may also be helpful:

$$\text{Thermal Dissipation (btu/hr)} = \left(\frac{\text{Total measured output power from all channels (watts)} \times \text{Amplifier Inefficiency}}{\text{Amplifier Efficiency}} + \text{Quiescent and Fan Power Draw (watts)} \right) \times 3.415$$

8 AC Power Draw and Thermal Dissipation

	LOAD														
	4Ω DUAL / 8Ω BRIDGE					8Ω DUAL / 16Ω BRIDGE					70V DUAL 600W / 140V BRIDGE 1200W				
Duty Cycle	AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation		AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation		AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation	
		100-120	230-240	btu/hr	kcal/hr		100-120	230-240	btu/hr	kcal/hr		100-120	230-240	btu/hr	kcal/hr
50%	1698	14.4	7.2	1702	429	919	7.8	3.9	1090	275	1698	14.4	7.2	1702	429
40%	1387	11.8	5.9	1457	367	763	6.5	3.3	968	244	1387	11.8	5.9	1457	367
30%	1075	9.1	4.6	1213	306	608	5.2	2.6	845	231	1075	9.1	4.6	1213	306
20%	796	6.5	3.3	968	244	452	3.8	1.9	723	182	796	6.5	3.3	968	244
10%	452	3.8	1.9	723	182	296	2.5	1.3	601	151	452	3.8	1.9	723	182

Figure 8.1 Model DV 1.5 Power Draw, Current Draw and Thermal Dissipation at Various Duty Cycles

	LOAD														
	2Ω DUAL / 8Ω BRIDGE					4Ω DUAL / 8Ω BRIDGE					8Ω DUAL / 16Ω BRIDGE				
Duty Cycle	AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation		AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation		AC Mains Power Draw (Watts)	Current Draw(Amps)		Thermal Dissipation	
		100-120	230-240	btu/hr	kcal/hr		100-120	230-240	btu/hr	kcal/hr		100-120	230-240	btu/hr	kcal/hr
50%	2478	21.1	10.6	2314	583	1698	14.4	7.2	1702	429	919	7.8	3.9	1090	275
40%	2010	17.1	8.6	1947	491	1387	11.8	5.9	1457	367	763	6.5	3.3	968	244
30%	1542	13.1	6.6	1580	398	1075	9.1	4.6	1213	306	608	5.2	2.6	845	231
20%	1075	9.1	4.6	1213	306	796	6.5	3.3	968	244	452	3.8	1.9	723	182
10%	607	5.2	2.6	845	213	452	3.8	1.9	723	182	296	2.5	1.3	601	151

Figure 8.2 Model DV 1.5 Power Draw, Current Draw and Thermal Dissipation at Various Duty Cycles

9 Service

AE Techron amplifiers are quality units that rarely require servicing. Before returning your unit for servicing, please contact Technical Support to verify the need for servicing.

This unit has very sophisticated circuitry which should only be serviced by a fully trained technician. This is one reason why each unit bears the following label:

CAUTION: To prevent electric shock, do not remove covers. No user serviceable parts inside. Refer servicing to a qualified technician.

9.1 Factory Service

AE Techron accepts no responsibility for non-serviceable product that is sent to us for factory repair. It is the owner's responsibility to ensure that their product is serviceable prior to sending it to the factory.

For more information, please contact us directly. A Service Return Authorization (SRA) is required for product being sent to the factory for repair. An SRA can be obtained by calling *AE Techron* Customer Service at 574.295.9495.

9.2 Warranty Factory Service

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***, 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.) or warranty service, contact Customer

9.3 Factory Service Shipping Instructions:

1. Service Return Authorization (SRA) is required for product being sent to the factory for service. Call 574.295-9495 and we'll create the SRA for you.

2. See packing instructions that follow.

3. Ship product to:

AE TECHRON
Customer Service Department
2507 Warren St.
Elkhart IN 46516-0000 U.S.A.

4. Use a bold black marker and write the SRA number on three sides of the box.

5. Record the SRA number for future reference. The SRA number can be used to check the repair status.

9.3.1 Packing Instructions

Important:
These instructions must be followed. If they are not followed, *AE TEchron, Inc.* assumes no responsibility for damaged goods and/or accessories that are sent with your unit.

1. Do not ship any accessories (manuals, cords, hardware, etc.) with your unit. These items are not needed to service your product. We will not be responsible for these items.
2. When shipping your product, it is important that it has adequate protection. We recommend you use the original pack material when returning the product for repair. If you do not have the original box, please call *AE Techron* at 574.295.9495 and order new pack material. See instructions for "foam-in-place" shipping pack. (Do not ship your unit in a wood or metal cabinet.)
3. If you provide your own shipping pack, the minimum recommended requirements for materials are as follows:

a. 275 P.S.I. burst test, Double-Wall carton that allows for 2-inch solid Styrofoam on all six sides of unit or 3 inches of plastic bubble wrap on all six sides of unit.
b. Securely seal the package with an adequate carton sealing tape.
c. Do not use light boxes or “peanuts”.

Damage caused by poor packaging will not be covered under warranty.

If you have questions, please contact ***AE Techron.***

AE TECHRON
Customer Service Department
2507 Warren St.
Elkhart IN 46516-0000 U.S.A.

574.295.9495

AE TECHRON® Limited One Year Warranty

SUMMARY OF WARRANTY

AE TECHRON*,** of Elkhart, Indiana (Warrantor) warrants to you, the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW ***AE 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 ***AETECHRON*** 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***, 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. 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 un-expired 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 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.

AE TECHRON

Customer Service Department

2507 Warren St. Elkhart IN 46516-0000 U.S.A.

574. 295.9495

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