

All references in this manual to the P-225 also apply to the P-230. The P-230 is identical except that it has additional output MOSFETs and larger power supply fuses.

THE **hafler**

P225 / P230

PROFESSIONAL POWER AMPLIFIER



INSTRUCTIONS for ASSEMBLY and OPERATION

CAUTION:

IF THE SPEAKER FUSES BLOW, SOME DISTORTED SOUND CAN BE HEARD. THEREFORE IF AMPLIFIER MALFUNCTIONS, ALWAYS CHECK FOR BLOWN FUSES FIRST.

LM 144
\$3.00

THE DAVID HAFLEER COMPANY
5910 Crescent Boulevard, Pennsauken, New Jersey 08109

Please refer to this serial number in all communications regarding this equipment.

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SPECIFICATIONS

Power Rating: 115 watts per channel into 8 ohms at less than 0.02% THD from 20 Hz to 20 kHz with both channels driven.

175 watts per channel into 4 ohms at less than 0.04% THD from 20 Hz to 20 kHz with both channels driven.

350 watts into 8 ohms at less than 0.04% THD from 20 Hz to 20 kHz in monophonic bridged operation.

230 watts into 16 ohms at less than 0.02% THD from 20 Hz to 20 kHz in monophonic bridged operation.

IM Distortion (SMPTE): Less than 0.005% from 1 watt to 115 watts, each channel, into 8 ohms.

Typical THD at 115 watts into 8 ohms:

1 kHz:	0.002%
10 kHz:	0.007%
20 kHz:	0.014%

Frequency Response into 8 ohms: -3 dB, 2 Hz to 160 kHz at 1 watt.
+0, -0.5 dB, 6 Hz to 60 kHz at 115 watts.

Typical Channel Separation:

20 Hz:	> 75 dB
1 kHz:	> 85 dB
20 kHz:	> 65 dB

Signal to Noise Ratio, unweighted: Exceeds 100 dB referred to 115 watts into 8 ohms.

Input Impedance: 47,000 ohms, in parallel with 50K ohms input level control.

Input Sensitivity: 1.55 volts rms for 115 watts into 8 ohms.

Damping Factor: 300 to 1 kHz into 8 ohms
60 to 10 kHz into 8 ohms

Rise Time: 10 kHz, 60 volts p/p square wave, 10% to 90%: 2.5 μ s.

Slew Rate: 10 kHz, 60 volts p/p square wave: 30V/ μ s.

Semiconductor Complement: 26 transistors, 8 power MOSFETs, 29 diodes, 4 zener diodes, 1 diode bridge.

Power Consumption: 125 VA quiescent; 580 VA @ rated power into 8 ohms, both channels driven.

Size: 5-1/4" high plus 1/4" feet, 19" wide, 10-1/2" deep plus 1-1/4" for handles.

Net Weight: 28 lbs.

Shipping Weight: 32 lbs.

CAUTION: For continued protection, replace the power fuse only with the same type and rating as indicated.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

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INTRODUCTION

This Hafler Professional Power Amplifier is designed to the highest standards of performance and reliability, and follows the Hafler tradition of superior value. The rated continuous power output from each channel is 175 watts into 4 ohms, or 115 watts into 8 ohms. It has a short term continuous power output from each channel into 2 ohms in excess of 200 watts. When the amplifier is switched to bridged mono operation, which utilizes only the left channel input connection, but employs both operating channels, over 350 watts is available into an 8 ohm load. Peak power outputs can be considerably more than the continuous ratings, so you must be aware of the potential for damage to loudspeakers through inappropriate application or use of this amplifier. The David Hafler Company has made every effort to assure that a P-225 which is correctly assembled from the kit will perform exactly like the factory assembled version. The company will test a completed unit for a modest fee if requested, and factory service is available as described later in this manual. The Hafler Company is not responsible for misapplication or misuse of this equipment, or for consequent damage to the loudspeaker load.

To assure safe and trouble-free operation, the P-225 includes several protective devices. The fuse holders on the back panel protect the load from excessive output level, as a convenience to the user, so long as the current rating of these fuses is chosen correctly. These speaker protection fuses have no effect on the amplifier's operation. If only a low level of distorted sound is heard, the first point to check is to see if this speaker fuse has blown. Other fuses inside the amplifier protect its circuits, but their failure is more likely indicative of other problems, so they are not user-serviceable. These include the AC line fuse, separate B + and B - power supply fuses on each channel, and individual thermal sensors on each heat sink.

The most significant protective feature is inherent in the basic design of this circuit — the choice of power MOSFETs for output devices. In contrast to conventional bipolar devices, the MOSFET concept provides inherent protection against the traditional transistor nemesis of 'thermal runaway'. In the MOSFET, output current is internally limited as operating temperature increases, eliminating the need for external thermal tracking or current limiting circuits, and thus providing better sound at high power levels as well.

INSTALLATION

The first concern is for adequate ventilation. The large heat sinks provide unrestricted air flow, but you must be sure that the perforations in the bottom plate and cover are kept clear, as well. The feet provide sufficient clearance for the bottom if they are resting on a hard surface. If the amplifier is mounted in a rack panel, and you wish to remove the feet, be sure you remove the retaining hardware inside, and make sure adjacent equipment does not impede cool air flow through the bottom, and out the top. Inadequate ventilation shortens component life, especially if other equipment raises the ambient air temperature, so a circulating fan should be considered in tight quarters.

AC Line Connections

Unless indicated otherwise, all P-225 amplifiers are intended for 120 volt AC operation, as in the United States. A different power transformer is required for other mains voltages. A 3-wire grounded power cord is supplied, and it must be connected to a properly grounded (earthed) AC receptacle for your safety. NEVER break off the ground pin on the plug to avoid obtaining the proper adaptor for a 2-wire receptacle.

High power output may place heavy demands on the incoming AC line wiring. Keep any extension cables as short as possible, and they should be #16 gauge or heavier 3-conductor cable. Remember that two of these amplifiers will utilize the capacity of the common 15 amp branch circuit, if high power outputs are intended.

Input Connections

The inputs are supplied with 2-circuit non-shorting 1/4" phone jacks. These are mounted on knock-out plates in the chassis, in the event you prefer to replace them with XLR connectors. Mounting holes have been provided in the chassis for these connectors.

Output Connections

The heavy duty red and black binding posts are spaced to accommodate double as well as single banana plugs, or they will clamp connecting lugs, or accept bare wire through the vertical hole through the shaft, which is visible when the cap is unscrewed. You should tin bare wire ends, so that no strands are unsecured.

The black terminals are internally connected to signal ground. The adjacent ground switch allows you to choose between isolation (float) or connection of the signal ground to the earth ground (chassis).

This amplifier design allows the black output terminals to be connected together (common ground) if you wish to employ accessories which utilize common grounds, such as headphone junction boxes. The RED terminals must NEVER be connected together however, so you should be certain of correct wiring polarity whenever you intend to use any device employing a common ground connection.

Always select hookup wire of sufficient size to preserve the P-225's high damping factor. We suggest #18 gauge is a minimum, and larger wire sizes are recommended for long runs, or where the speaker load impedance is less than 8 ohms. Be sure to maintain phase integrity when connecting multiple speakers.

Monophonic Operation (Bridged Output)

To obtain a single high power output into 8 ohm loads, move the slide switch to MONO, and provide an input signal **only** to the LEFT channel jack. The output is connected **between** the two RED terminals. It must be a 'floating' connection — that is neither side can be grounded, or connected to the chassis, and external devices employing a common ground must not be attached. In the bridged monophonic mode, the right channel input is not used, and only the left channel level control functions. It is recommended that an amplifier connected in this mono mode be marked, and the black output terminals taped over, to avoid incorrect application.

OPERATION

It is good general practice to turn power amplifiers on last, and switch them off first, when individual equipment power switching is employed. This will minimize the likelihood of damage to the loudspeaker load from turn-on or turn-off transients which sometimes occur in source equipment. Allow a few seconds to pass before turning on the power amplifier, after other equipment.

The red pilot lamp in the power switch of the P-225 will glow when it is powered up. If this lamp is not lighted, there may be an AC line fuse failure.

The pilot lamp also provides a high temperature indication. In the unlikely event that the amplifier ceases to function, and this lamp blinks steadily, one of the thermal breakers has shut down both channels of the amplifier because of excessive temperature rise in a heat sink. When the heat has dissipated in a few minutes, the amplifier will automatically resume operation. If the amplifier again shuts down, and the lamp blinks, you should check for insufficient ventilation, or for an excessive input signal, or for an input signal which may have dangerous signal content, such as oscillation. Lacking such evidence, the amplifier may have malfunctioned. Because of the very large heat sinks, it is most unlikely that any normal signal will cause the P-225 to overheat.

The left and right gain (LEV) controls are adjustable with a screwdriver. The gain control on any power amplifier is usually fully advanced to its maximum (rated) sensitivity unless there is a specific purpose for an intermediate setting, such as level matching. The signal to noise ratio of the amplifier is greatest at the full gain setting. When using the monophonic bridged mode, the left channel control sets the gain of the amplifier.

The position of the Ground switch will be determined by the noise level in the overall system, when interconnected with other equipment. Choose the position which gives the lowest hum.

The holes in the rear surface of the cover are provided for mounting external 70 volt line matching transformers. These are available as accessories.

Speaker Fuses

The two round fuse holders on the back panel are for speaker (load) protection. They serve no protective purpose for the amplifier's operation, but are a user convenience if fuses of the proper amperage are installed. If fuse values higher than 7 amperes are installed, the internal fuses may blow first with excessive output current. **If the amplifier produces only a distorted output at a low level, the most likely cause is a blown speaker fuse.** If one of these is blown, it does not usually indicate a malfunction of the amplifier. Rather, it evidences a very high output signal, and/or a very low impedance load.

The P-225 is supplied with 2 sizes of fuses for the speaker holders. The 5 ampere size has been installed in assembled units, to accommodate a wide range of load impedances and high power output, including installations of multiple speakers

connected in parallel. This value provides little or no protection for most speakers, however. If the limits of the amplifier are to be tested at very low load impedances, even 5 ampere fuses might blow. [When testing the amplifier's limits, remember to compensate for voltage losses due to long AC lines, too, for accurate performance figures.]

A pair of 2 ampere fuses is included as spares, for these will likely be an appropriate value for many speakers. The 2 ampere size will provide protection from sustained overloads, while still passing the full rated output for brief periods for clean audio peaks. A fuse does not blow instantaneously except under very heavy overloads, and a high power output must be sustained for a few seconds before the fuse will blow.

There are no generally accepted standards for rating the power handling of loudspeakers. As a result, the speaker manufacturers use 'music power' ratings, or suggested amplifier limits, which tend to imply that speakers can handle enormous amounts of power. This is not always the case when high power wide band amplifiers with excellent power supplies, like the P-225, are used. The amount of power a speaker may handle safely for sustained passages without overheating its voice coil often bears little relation to the rated 'music power' it can tolerate on brief transients. If the speaker manufacturer recommends a specific fuse value, you should obtain 3AG type fuses of that value, and install them. We do not recommend slo-blo type fuses for speaker protection. Because you choose the fuse size for your speakers, and because the P-225 can deliver more power than many speakers can safely tolerate, **the David Hafler Company cannot assume any responsibility for damage to the loudspeaker load.**

A 2 ampere fuse into an 8 ohm load permits **continuous** power up to 32 watts, or 16 watts into 4 ohms. However, it will allow the full unclipped amplifier output to be passed for brief musical peaks. A 3 ampere fuse allows 72 watts continuously into 8 ohms, or 36 watts into 4 ohms. Five amperes will pass 200 watts into 8 ohms, or 100 watts into 4 ohms. Guide your choice accordingly.

If more than one pair of loudspeakers will be connected in parallel to the amplifier, proper speaker protection would dictate that each speaker be separately fused. When full range speakers are connected in parallel, the combination presents a lower impedance load to the amplifier, in combination with higher power handling capacity. Thus a larger fuse will be required at the amplifier output than can provide meaningful individual protection. The solution is to add separate fuses at each speaker. Take note, too, that because tweeters cannot handle the high power of larger speakers, it is frequently advised to separately fuse tweeters with smaller values.

If the P-225 is switched to bridged mono operation, the amplifier channels share the output load, and each operates into one-half the speaker impedance. The speaker fuse size should be chosen as if a single fuse were in the line, and then both back panel speaker fuses should be that value. Even though only one of them may blow (because of individual fuse variations), both should be replaced when operating in the mono mode.