

JBL Professional Series

**Model 6233**  
**Dual Channel Power Amplifier**

300 watts continuous sine wave per channel into 4  $\Omega$

200 watts continuous sine wave per channel into 8  $\Omega$

700 watts continuous sine wave bridged into 8  $\Omega$

400 watts continuous sine wave bridged into 16  $\Omega$

100 dB s/n ratio, 20 Hz-20 kHz

Less than 0.05% THD, 20 Hz-20 kHz

Lightweight, portable Forced air cooled



## More Than Raw Power

Although high power amplifiers have been available for some time, they generally have been bulky units designed primarily for consumer use rather than for the more rigorous requirements of studio, reinforcement or PA applications. For the most part, they perform adequately, but lack reliability when used under road conditions, even with additional cooling.

The primary design goal was to build a rugged, high power amplifier of the highest quality, smallest size and lightest weight possible. This goal has been achieved in the Model 6233, a reliable, two-channel amplifier that mounts in three EIA standard rack spaces and weighs less than 16 kg (35 lb). Intended for use in recording studios, wide-range sound systems and similar applications, the 6233 delivers stable, virtually distortion-free amplification for sustained time periods at any power level, up to and including full output, without requiring additional cooling. The 6233 is clean as well as powerful: Each channel is capable of delivering 300 W continuous sine wave into a 4  $\Omega$  load, or 200 W into an 8  $\Omega$  load with total harmonic distortion of less than 0.05%, 20 Hz - 20 kHz. In addition, the two channels can be bridged for single-channel operation, in which case the 6233 will deliver 700 W continuous sine wave into 8  $\Omega$  (the minimum recommended impedance in the bridged configuration) or 400 W into 16  $\Omega$ , 20 Hz - 20 kHz at no more than 0.05% THD.

Input sensitivity of the 6233 is high: full rated output can be achieved with an input of only 0.77 V. Rise time is 4  $\mu$ s into a 4  $\Omega$  load or 3  $\mu$ s into an 8  $\Omega$  load, and the unit has a slew rate greater than 20 V/ $\mu$ s. The result is accurate, well-defined high frequency performance that is transparent and effortless, and which does not become veiled, muddy or harsh at even the highest power levels.

The 6233 is the first amplifier in its power class to use an inverter power supply. This saves weight and space: the 6233 is approximately one-third the size and weight of a comparable conventional amplifier, making it far more convenient to pack and transport. The inverter also provides transformer isolation from the power line, unlike other lightweight power supplies.

The inverter power supply uses high-speed switching technology, long proven in computers, to convert (or, more correctly, invert) the 50/60 Hz power line frequency to 20 kHz. This allows use of a 0.9 kg (2 lb) transformer instead of the 23 kg (50 lb) transformer normally required. The transformer output is then rectified to the DC voltages required by the amplifier modules. The inverter power supply has an output capacity greater than 2 kW, more than enough reserve to support both amplifier channels without strain under any conditions.

## Advanced Circuit Design

Full complementary symmetry in each channel's output stage allows broad bandwidth without the imbalance inherent in a quasi-complementary approach. It also helps improve amplifier power response, reduce distortion and eliminate turn-on transients. Fourteen 150 W output transistors per channel greatly improve reliability, because each transistor typically operates at only a fraction of its capacity, regardless of amplifier power level.

The 6233 employs forced-air cooling: each transistor is mounted on an individual heat sink and optimally positioned in a cooling tunnel extending from the front to the rear of the amplifier. A two-speed fan forces air through the tunnel; thermal sensors in each channel and in the power supply increase fan speed as required. A thermal protection device in each channel suspends operation of only that channel if it overheats, and the device automatically resets when the module cools to a safe operating temperature. The 6233 will operate in ambient temperatures as high as 50°C (122°F) without degradation of performance.

Each channel of the 6233 operates independently and is fully protected against short circuits, mismatched loads, excessive temperatures and installation errors. Either channel can enter the protect mode without affecting the other. The 6233 will remain stable under all conditions, including operation into reactive loads presented by long cable lengths and high-quality loudspeakers. Most importantly, the protective circuitry cannot chatter when activated. (Chattering, a by-product typical of the protective circuitry in large amplifiers, occurs when the circuitry releases too soon, sending a large burst of current that can destroy high frequency drivers.)

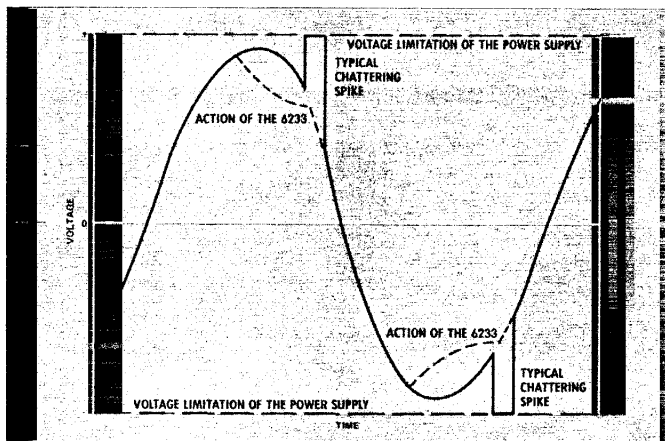
## Versatility

Five sequential indicator lights for each channel allow the operator to monitor visually the power reserve available. A unique sensing circuit triggers the top, red light when the output level is 2 dB below clipping; each successive light indicates an output level of 6 dB ( $\frac{1}{4}$  power) less than the light above it. The lights are far more useful than VU meters, because they are an accurate performance indicator even when the power line voltage drops and can also be read quickly and accurately from a distance.

Any source device capable of driving a load of 20 k $\Omega$  or less can be used.\* The amplifier inputs are unbalanced, the configuration typical of most applications. However, the high input sensitivity of the 6233 allows it to achieve full output when driven by almost any source, balanced or unbalanced.

To provide additional flexibility, at the expense of some loss in bandwidth, each channel of the 6233 is provided with a

\*If the rated load impedance of the source device is greater than 20 k $\Omega$ , high frequency response will be compromised. In such cases, a line amplifier should be used to lower impedance.



#### Chattering in the Protect Mode

Chattering results from rapid operation of the protective circuitry which produces a clipped high frequency spike. Although the effect usually occurs below 100 Hz, it can be destructive to high frequency drivers. The protective circuitry of the 6233 reduces the amplitude of a sine wave in the manner shown, thus suppressing the chattering effect and the destructive spike it produces. The effect of the protection circuitry on the signal sounds similar to soft clipping.

socket for a JBL Model 5195 Matching/Bridging Transformer that will convert the input to 15 k $\Omega$  balanced bridging. With the 5195 installed, the input can also be utilized for 600  $\Omega$  balanced matching by placing a resistor across the input. If the 600  $\Omega$  line level is less than -20 dBm, the 5195 can be used in a step-up configuration, requiring moving a wire on the socket, to provide an additional 14 dB of gain. (The 5195 should not be driven with an input greater than 7.7 V, which is +20 dBm.)

#### Installation and Certification

The amplifier chassis and layout are designed for mechanical strength and ease of installation. The 6233 mounts in three EIA standard rack spaces. Input connectors are XL-type 3-pin female latching; universal 5-way binding posts are used for the outputs. Extensive shielding and filtering of the power supply allow stacking the amplifier with tuners or tape decks without interference—magnetic, electrostatic or thermal. Construction is modular; the amplifier boards can be replaced in 15 minutes once the unit has been removed from the rack.

Each 6233 is extensively pretested, then individually certified to meet or exceed its published specifications. To achieve certification, each amplifier is operated non-stop for 16 hours under conditions simulating extremely severe field use. Without being allowed to cool down, it must then produce its full rated output, and meet its rated distortion at that output or any fraction thereof.

#### Architectural Specifications

The amplifier shall have two channels, each capable of producing an output of 300 W continuous sine wave into a 4  $\Omega$  load and 200 W continuous sine wave into an 8  $\Omega$  load,

from 20 Hz to 20 kHz at less than 0.05% THD. Full output shall be achieved by an input of not more than 0.8 V per channel. The power supply shall be the inverter type.

Rise time shall be no more than 4  $\mu$ s into a 4  $\Omega$  load or 3  $\mu$ s into an 8  $\Omega$  load, and the slew rate shall be at least 20 V/ $\mu$ s.

Hum and noise shall be at least 100 dB below full rated output, measured 20 Hz to 20 kHz with a 600  $\Omega$  input termination. No spurious oscillation shall be present with any combination of grounded or open input connections.

The program inputs shall each be provided with a socket to accommodate a matching/bridging transformer.

The amplifier shall be equipped with protection circuits that prevent damage due to overload, short circuit or excessive temperature rise. It shall meet all performance specifications in ambient temperatures up to 50°C (122°F). A thermal sensing device shall be provided for each channel. If one channel enters the protect mode, the other channel shall remain unaffected.

When thermally overloaded, the deactivated channel shall automatically resume operation when a safe operating temperature is reached.

Each amplifier channel shall be capable of being overdriven from 20 Hz to 20 kHz by at least ten times its rated input voltage with the volume control in the maximum gain position. This overdrive condition shall not cause the amplifier to enter the protect mode. The amplifier shall be capable of sustained full rated output into a 4  $\Omega$  or 8  $\Omega$  load at 20 kHz for at least one hour without malfunctioning or entering the protect mode.

The amplifier shall have five indicator lights per channel for visually monitoring output. The lights shall become illuminated in sequence as higher output levels are reached. Indications shall remain accurate at substandard AC power line voltages.

Amplifier construction shall be modular, permitting complete replacement of each channel by the substitution of a replacement module.

The amplifier shall operate on a power source of 120/240 V AC, 50/60 Hz. The performance specifications shall be listed under SPECIFICATIONS and be met or exceeded.

The amplifier shall be JBL Model 6233.



Input and output connections to the 6233.