

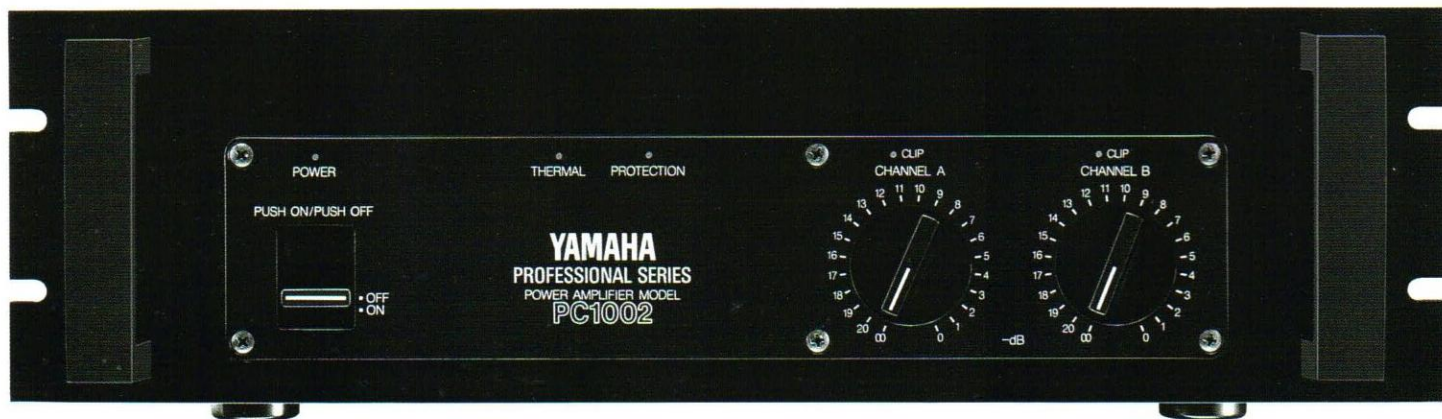
# PROFESSIONAL SERIES POWER AMPLIFIERS PC1002



**A MEDIUM-SIZED COMMERCIAL POWER AMPLIFIER  
WITH THE FEATURES AND PERFORMANCE  
MOST REQUESTED BY SOUND CONTRACTORS,  
AS WELL AS SOUND REINFORCEMENT,  
RECORDING AND BROADCAST ENGINEERS.**



## FRONT PANEL



The PC1002 is a compact two-channel audio power amplifier designed and built specifically for commercial applications. We incorporated many new features after extensive research which involved consultants and end-users in the commercial sound field.

In stereo mode, the PC1002 delivers 100 watts per channel into 8 ohms. In bridged, transformerless (BTL) mode, its power output increases to 300 watts into 8 ohms or, as is often the case when powering high frequency compression drivers, 200 watts into 16 ohms. A rear panel switch reconfigures the amp for stereo or mono mode, avoiding the need for special cables and splitter transformers.

Yamaha's experience in building one of the finest professional amplifiers in the world is evident in the PC1002's low distortion of 0.05% THD at maximum power output. It is also evident in the absence of noise which enables the amplifier to deliver a 110 dB signal-to-noise ratio . . . a benefit that can be fully appreciated in a small studio/control room environment where the PC1002's high-efficiency, convectively cooled heat sinks eliminate the need for a cooling fan.

The PC1002 is one of the safest amplifiers you can find. It incorporates multiple protection circuits—transient suppression, current limiting, short circuit and overload protection, dc offset sensing with relay disconnect, powered transformer overtemperature sensing with auto shutdown—to prevent speaker damage in the event of an amplifier failure, and to prevent amplifier damage in the event of a load or cable problem. Because the circuits function automatically, front panel LEDs are installed to inform the operator of overload protection status. A thermal LED also warns of excessive heat sink temperature.

Both balanced XLRs and unbalanced phone jack inputs are installed, and output connections are made via two pair of 5-way binding posts, thus ensuring compatibility with all commercial wiring schemes. Physically, the amp is sturdy enough to be compatible with almost any application. Its thick aluminum front panel bolts directly into any standard 19" equipment rack, and removeable insulated feet permit shelf or bench mounting.

A popular feature of earlier Yamaha amplifiers has been retained, our stepped rotary input attenuators. In addition, rubber knob-locks are provided so that gain structure can be established and "locked" against casual changes by unauthorized personnel—while still allowing rapid access for legitimate adjustments.

With its low noise and ruler-flat response, the PC1002 makes an ideal mid or high end amplifier for multi-amplified systems. In fact, because inter-channel isolation is excellent, the two channels can be used for different frequency bands in a single system. Of course, with its 100 kHz power bandwidth, the PC1002 can also be used as a stereo or mono full range amplifier (in mono mode it delivers enough power to do an excellent job as the sole amplifier in a medium-sized sound system). This compact, general-purpose tool is designed and built to provide years of trouble-free service, in the tradition of performance and reliability professionals have grown to expect from Yamaha.

## REAR PANEL

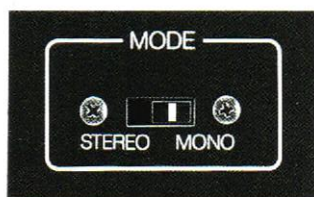


General model

# A POWER AMP THAT DELIVERS TOP PERFC

Yamaha's approach to designing professional sound equipment has always been outgoing. That is, we ask people who use the equipment what they need, build prototypes and gather feedback to refine the design, and ultimately create products that meet the needs of a carefully defined market. Yamaha Professional Series amplifiers, like the P2100, have gained enormous popularity because they were designed and built with the interactive approach just described. There were, however, a number of features and functions that were needed to satisfy certain commercial applications. Once again we set out to design a new series of amplifiers—the Commercial Series—which includes the PC1002.

The PC1002 is an excellent choice for driving the mid or high frequency section of a bi-amplified or tri-amplified speaker system. Typically, when connected to the output of an electronic crossover and used in mono mode, it will deliver a hefty 200 watts into 16 ohms, or 300 watts into 8 ohms. On the other hand, its 100 kHz power bandwidth and 100 watt/channel into 8 ohm output capability enable the PC1002 to do a fine job as the sole power amp in smaller full-range sound reinforcement systems or medium-level studio monitor systems.



## MULTIPLE PROTECTION SYSTEMS

Murphy's law states "If anything can go wrong, it will," and Murphy often seems to be lurking around sound systems. However, forewarned is forearmed, and we have equipped the PC1002 with a number of features designed to keep minor problem from becoming a major disaster.

One potential problem is the leakage of DC voltage through the output of a power amp. Whether brought on by a failed coupling capacitor, an internal short, or some other internal fault, even relatively slight amounts of DC can cause voice coils to overheat and burn out. Therefore, the PC1002 has a circuit which senses the presence of DC across its output. If DC is detected, a relay automatically disconnects the speaker load from the amp. A front panel "protect" LED also turns on to inform the operator of the amplifier status.

Another potential problem occurs when a power amp is switched On or Off. Since not all circuits stabilize at the same rate, it could be possible for voltage spikes or surges to reach the speaker output, even if the input attenuators are turned down. While it would take a major transient "thump" to damage a woofer, even small ones can crack compression driver diaphragms or tear their delicate suspensions. Yamaha will not take a chance with your speakers by allowing any such turn-on or turn-off transients to get through. For this reason, the same relay which protects against DC offset is also used to disconnect the speakers for a few seconds when the amp is first powered up, and immediately when the amp is shut down.

Heat is the enemy of solid state circuitry. The PC1002 has massive side-mounted heat sinks to efficiently radiate heat from its output transistors to the surrounding air. However, under certain circumstances of just the "wrong" load and very high ambient temperatures (for example, in the sun or in a closed, unvented rack), it might be possible for the transistors to overheat and damage themselves. For this reason, two different type thermal protection circuits are included. First, when the heat sink temperature approaches the danger zone, a front-panel "thermal" LED turns on to warn the operator that it's time to take corrective action (reduce the load, turn down the level, or provide external cooling). If continuous, long-term overloading or severe problems cause the power transformer to overheat, a thermal switch automatically shuts down the amplifier.

There is always a finite time required before the heat at the junctions in the

output transistors can be transferred to the heat sinks, so the thermal warning circuits cannot protect transistors from instantaneous overload damage. These circuits sense medium to long-term overload protection. To prevent instantaneous excessive currents from flowing through the output transistors and burning them out before the thermal breakers "know" what's happening, a sophisticated current limiting circuit is included.

One more point, and an important one; all the PC1002's protection circuits automatically reset themselves when the "fault" is cured. That means, for example, that the soundman, technician or engineer need not worry about running over to push buttons on the power amplifier after fixing a shorted speaker cable on the other side of the stage.

## RELIABILITY AND SERVICEABILITY: KEY FACTORS IN COMMERCIAL APPLICATIONS

When an amplifier is placed in a fixed installation, it is often in a hard-to-reach location. Unlike touring road shows, where the technicians have their hands on the amps daily, the maintenance personnel who tend to fix installations may go months (or years) before they have to touch the amp. This is particularly true if maintenance is provided by an outside service firm. It becomes clear that an amplifier in this type of use must be reliable. Moreover, it must be quickly and easily repaired since spare amps may not be immediately available. The PC1002 was carefully designed to satisfy these criteria.

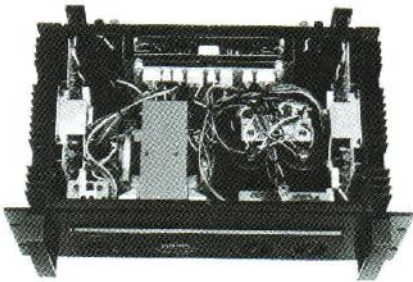
To begin with, the amplifier is constructed on an extremely rugged, heavy-duty steel chassis. Because the chassis won't twist or bend, even in touring situations, the major source of cracked circuit boards and loose hardware is eliminated. We built the amplifier with massive side-mounted heat sinks instead of smaller, forced-air heat sinks, because cooling fans have moving parts, and moving parts are the least reliable part of an amplifier. A broken fan in an amplifier that relies on the fan could cause a sudden and unexpected shut-down. With the PC1002's passive cooling, the chances are that if it works when installed, it will work indefinitely.

We built the PC1002 with all the experience and knowhow that have given Yamaha Professional Series amps their fine reputation for reliability. Still, as Murphy would tell you, this is the real world, and problems will occur. That's why we built the PC1002 to be easily serviceable. Lifting off the top panel reveals that most of the preamplifier

# PERFORMANCE AND FUNCTION WITH LASTING VALUE

components are on a single, easily removable circuit board with plug-in wiring. The rear panel connectors and switches are mounted to another circuit board. And each channel's output pre-drivers and associated circuitry are mounted on a separate circuit board. To speed service, the boards are clearly labeled with component designators that match the schematic diagram.

As a rule, plug-in connections are used, but not everywhere in the amp. Some manufacturers would have you believe that plug-in connections should be used throughout. However, for a few high-current connections in a power amplifier, hard wiring is superior. With high currents, the slightest bit of corrosion or dirt on a connector can lead to significant pitting, increased electrical resistance, and lost performance. Therefore, some connections in the PC1002 are hard-wired for the kind of reliability that cannot be achieved with plugs. All leads are neatly dressed with ample service loops.



## HEAVY DUTY POWER SUPPLY FOR EXTRA RELIABILITY AND LOWER DISTORTION

The power supply has a massive transformer and a pair of huge (15,000 microfarad) computer grade filter capacitors that prevent voltage "sag." This prevents high output levels on one channel from modulating the other, and contributes to the amplifier's excellent channel isolation (which makes it suited to driving two different sections of a multi-amped speaker system). The PC1002's "stiff" supply not only reduces crosstalk between channels, it also reduces distortion at low frequencies. The power transformer, because it is the heaviest single component in the amplifier, is mounted directly to the front panel to minimize the torque applied to the mounting hardware should the installed amp be dropped or bounced.

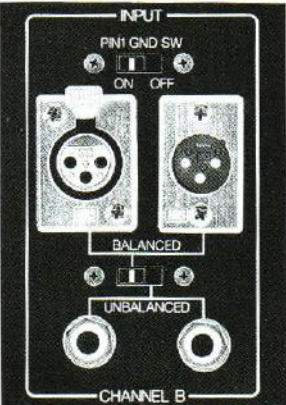
## DUAL INPUTS: BALANCED XLRs AND UNBALANCED PHONE JACKS

In most large or complex installations, where noise must be kept at an absolute minimum and long cable runs are required, balanced 3-wire cables are a necessity. For this reason, the PC1002 has a pair of electronically balanced XLR inputs. These inputs combine the advantages of electrostatic and electromagnetic noise rejection, with locking terminals that won't pull out accidentally should the cable be tugged. In order to avoid "ground loops" (multiple ground paths between two pieces of equipment that can induce hum), pin 1 ground lift switches are provided on each channel. These break the connection between pin 1 (the shield of the XLR) and the amplifier chassis, avoiding the need for ground-break adaptors or cutting of cable leads.

There are actually a pair of XLRs for each channel, one male and one female, wired in parallel. This permits the input signal to be "chained" to more than one amplifier without a "Y" adaptor.

In smaller or less complex systems, where all equipment is close together, unbalanced 2-wire signal lines often can be used without compromising quality. For these applications, such as small control room monitor systems, 2-wire cables with standard 1/4-inch phone plugs are an acceptable alternative to XLRs on 3-wire cable—and much more cost effective. For this reason, the PC1002 also includes a pair of phone jacks on each channel (one for the input, the other to "daisy chain" to additional amplifiers, if necessary). A switch selects whether the XLRs or phone jacks actually provide signal to the channel.

As you can see, Yamaha provides a very flexible input scheme, one that gets the job done in most cases without special wiring or adaptors. We know that in the world of professional sound, setup time is very precious.



## PRECISION CALIBRATED INPUT ATTENUATORS PLUS OUTPUT CLIPPING INDICATORS FOR SETTING LEVELS ACCURATELY AND REPEATABLY

The PC1002's precision, dB-calibrated input attenuators are superior to continuously variable pots for a number of reasons. In portable or touring systems, they allow predictable and repeatable setups. In commercial sound installations, they allow easy, accurate input sensitivity adjustments based on system gain calculations. In studios and control rooms they let operators adjust the level of two channels, or two programs on separate amplifiers, so they remain in correct balance.

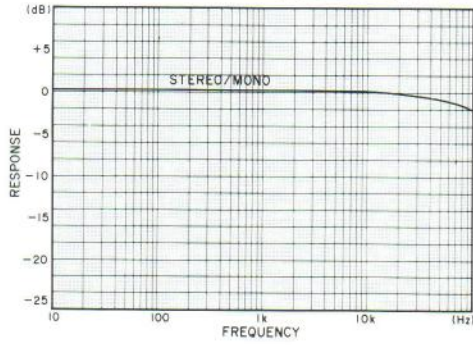
The controls are detented in 21 steps, each step corresponding to 1 dB of attenuation except the last step. It provides "infinite" attenuation, completely shutting off the channel. The knobs are set back in recessed wells to minimize the possibility of inadvertent setting changes. Yamaha also provides a pair of special Knob Lock adaptors that fit over the attenuator controls, preventing inadvertent setting changes.

A red LED above each attenuator control monitors the output of the channel, turning On as the output begins to clip. This "flags" the operator, suggesting the level be turned down to avoid distortion.

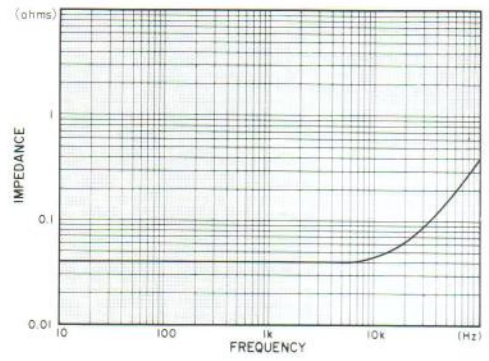


# PERFORMANCE GRAPHS

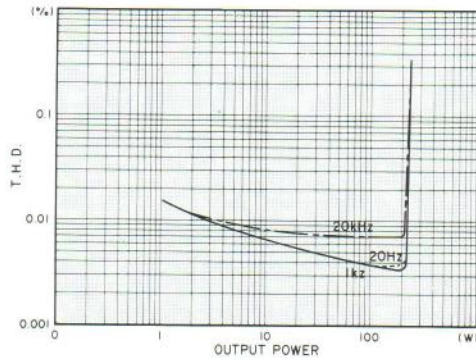
**FREQUENCY RESPONSE** LOAD 8 & 16 ohms  
MODE ST/MONO  
INPUT BALANCED



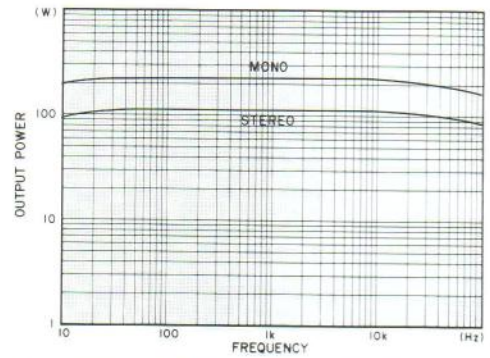
**OUTPUT IMPEDANCE** LOAD 8 ohms  
MODE STEREO



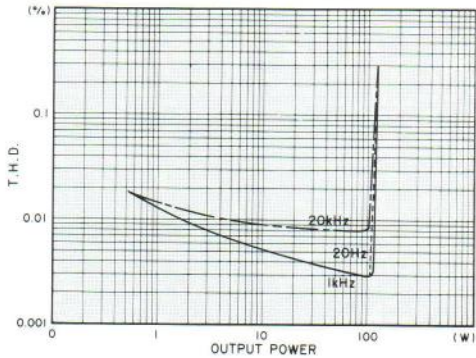
**T.H. DISTORTION** LOAD 16 ohms  
MODE MONO  
UNBALANCED INPUT



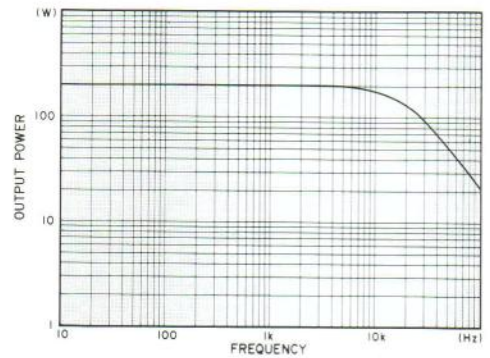
**POWER BAND WIDTH** THD = 0.05%  
LOAD 8 & 16 ohms  
MODE ST/MONO  
ST, Both CH Driven



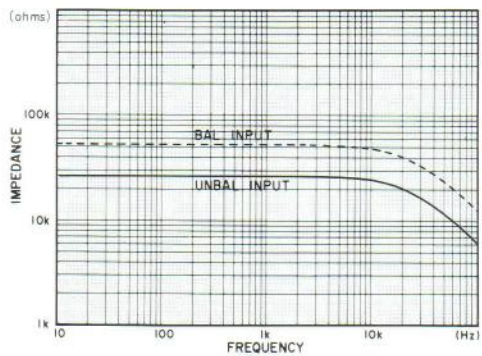
**T.H. DISTORTION** LOAD 8 ohms  
MODE STEREO  
Both CH Driven



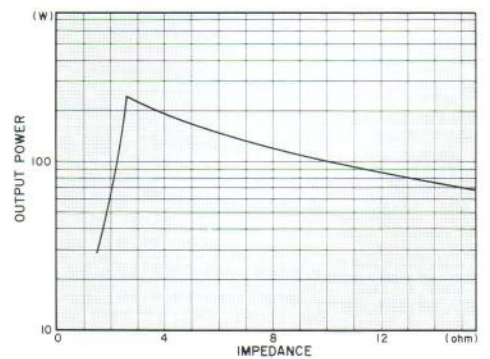
**DAMPING FACTOR** LOAD 8 ohms  
MODE STEREO



**INPUT IMPEDANCE** LOAD 8 ohms  
MODE STEREO

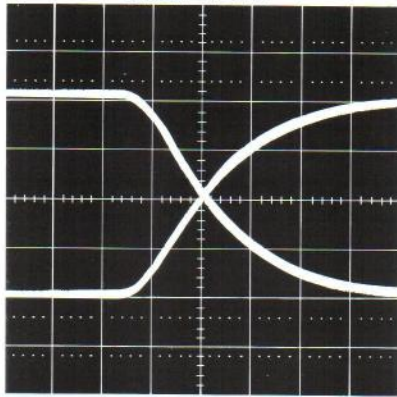


**LOAD Vs OUTPUT POWER** THD = 0.05%  
MODE STEREO  
Single CH Driven



# PERFORMANCE OSCILLOGRAPHS

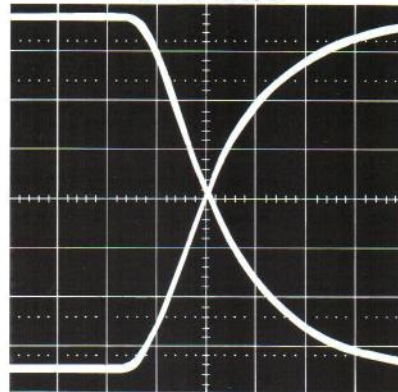
SLEW RATE



MODE STEREO  
30V/ $\mu$ sec  
LOAD 8 ohms

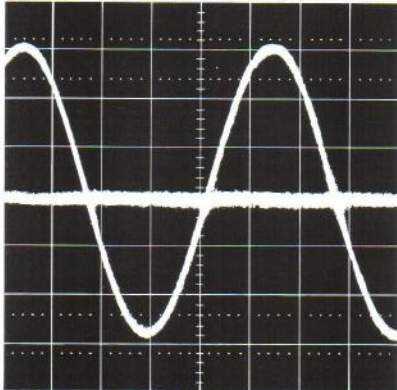
20V/DIV  
1 $\mu$ sec/DIV

SLEW RATE



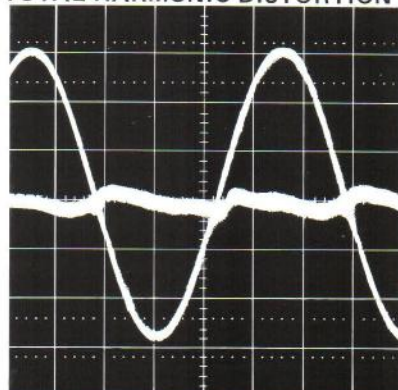
MODE MONO  
55V/ $\mu$ sec  
LOAD 16 ohms

TOTAL HARMONIC DISTORTION 1 kHz SINE WAVE



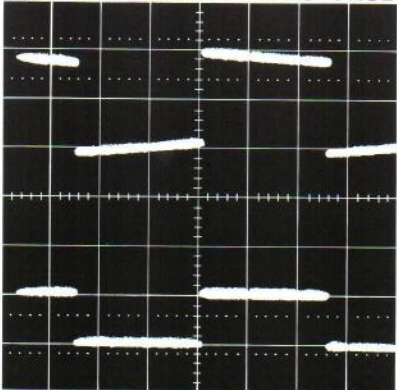
0.0018%  
LOAD 8 ohms  
MODE STEREO  
50W

TOTAL HARMONIC DISTORTION 20 kHz SINE WAVE

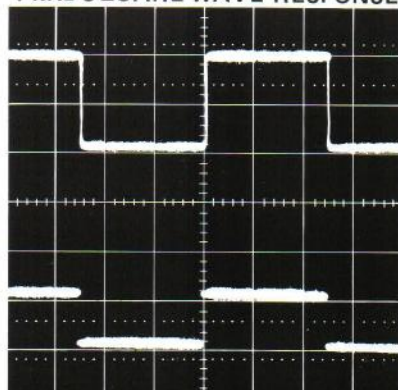


0.0054%  
LOAD 16 ohms  
MODE MONO  
100W

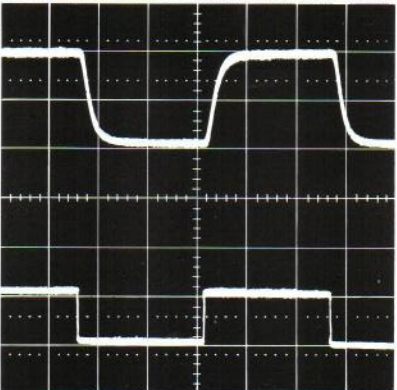
20 Hz SQUARE-WAVE RESPONSE



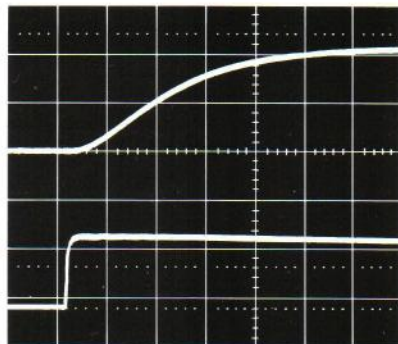
1 kHz SQUARE-WAVE RESPONSE



20 kHz SQUARE-WAVE RESPONSE



RISE TIME



1kHz 1V (10–90%)  
3 $\mu$ sec or better

\* In each photo, output wave form is upside and input wave form is lower.  
\* Horizontal and vertical scales in each photo are option. But the scales in the photo of Rise time are 0.5V/Div (horizontal) and 1 $\mu$ sec/Div (vertical).  
\* MODE STEREO LOAD 8 ohms.

# SPECIFICATIONS

## POWER OUTPUT LEVEL

Continuous average sine wave power with less than 0.05% THD.

20Hz to 20kHz	
Stereo, 8 ohms	100W + 100W
Stereo, 4 ohms	150W + 150W
Mono, 16 ohms	200W
Mono, 8 ohms	300W

## FREQUENCY RESPONSE

10Hz to 50kHz, 8 ohms, 1W	+0 0 <sub>-1</sub> dB
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## POWER BAND WIDTH

Stereo, 8 ohms, 50W 0.1% THD	10Hz to 100kHz
Mono, 16 ohms, 100W, 20Hz to 20kHz	10Hz to 100kHz

## TOTAL HARMONIC DISTORTION

Stereo, 8 ohms, 50W, 1kHz	Less than 0.005%
Stereo, 8 ohms, 50W, 20Hz to 20kHz	Less than 0.01%
Mono, 16 ohms, 100W, 1kHz	Less than 0.005%
Mono, 16 ohms, 100W, 20Hz to 20kHz	Less than 0.01%

## INTER MODULATION DISTORTION

70Hz 7kHz mixed 4:1	
Stereo, 8 ohms 50W	Less than 0.01%
Mono, 16 ohms 100W	Less than 0.01%

## CROSSTALK (CHANNEL SEPARATION)

Minimum attenuator setting	
8 ohms, 50W, 1kHz	80dB
8 ohms, 50W, 20Hz to 20kHz	70dB

## DAMPING FACTOR

8 ohms, 1kHz	More than 180
8 ohms, 20Hz to 20kHz	More than 100

## S/N RATIO

Input shorted at 12.47kHz	105dB
Input shorted at IHF A	110dB

## SLEW RATE

Stereo 8 ohms	30V/μsec
Mono 16 ohms	55V/μsec

## INPUT SENSITIVITY

Input level which produces 100W output into 8 ohms  
0dB (0.775V rms)

## INPUT IMPEDANCE

Maximum attenuator setting	
Balanced input	50 kohms
Unbalanced input	25 kohms

## VOLTAGE GAIN

Maximum attenuator setting	31.2dB
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## RELAY MUTING TIME

From power on	4 <sup>+2</sup> <sub>-1</sub> sec
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## INDICATORS

Power ON	LED
Protection (Relay OFF)	LED
Thermal Overload (85 ± 5 degrees C.)	LED
Clipping (1% THD)	LED

## FRONT PANEL CONTROLS

Power Switch	Push-ON/Push-OFF
Input Attenuators	22 detent positions in -1dB steps (0, -1, -2 ... -20, ∞)

## REAR PANEL CONTROLS

Mode switch	STEREO/MONO
Pin 1 GND Switch (XLR connectors)	ON/OFF
Balance/Unbalance Switch	BALANCED (XLR)/ UNBALANCED (PHONE)

## POWER REQUIREMENTS

U.S. & CANADIAN models	AC120V 60Hz
GENERAL model	AC220/240V 50/60Hz

## POWER CONSUMPTION

U.S. & CANADIAN models	380W
GENERAL model	840W

## DIMENSIONS

(W x D x H)	480 x 337 x 140 mm (18-7/8" x 13-1/4" x 5-1/2")
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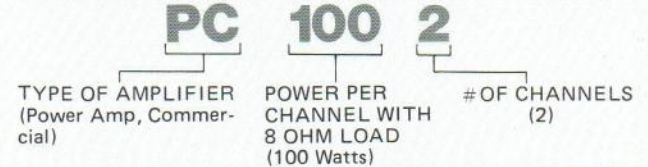
## WEIGHT

15.5 kg (34.2 lbs)

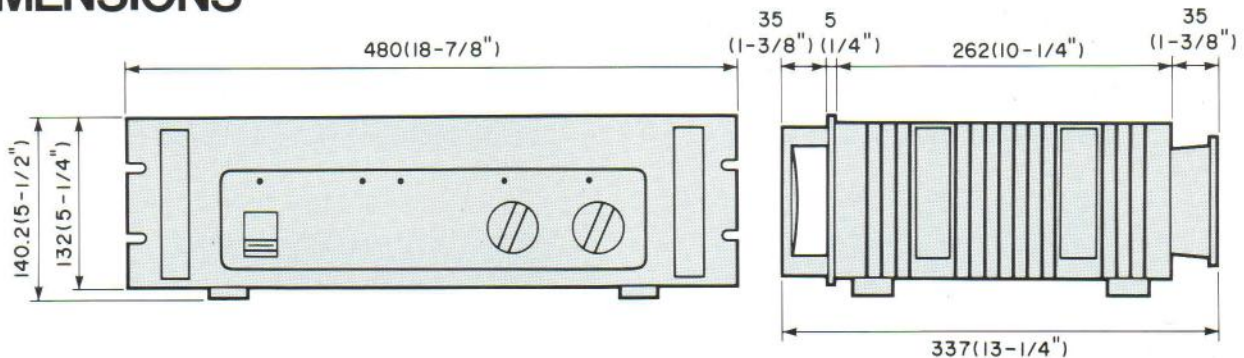
**NOTE:** U.S. & CANADIAN Models must be operated into 8 ohms in stereo mode and 16 ohms in mono mode in accordance with safety regulations.

All specifications subject to change without notice.

## MODEL NUMBERS ARE EASY TO "DECODE"



## DIMENSIONS



Unit : mm (Inch)

WEIGHT : 15.5 kg (34.2 lbs)

For details please contact:

SINCE 1887



**YAMAHA**

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN