

PIONEER SX-D7000

 PIONEER

STEREO RECEIVER WITH NON-SWITCHING™ DC POWER AMP, QUARTZ-PLL TUNER
AND ELECTRONIC TOUCH TUNING



The Classic Pioneer SX-D7000: An Advanced Experience in



Design and Operation



- Non-Switching™ DC Power Amp Design
- Quartz-PLL Synthesizer Tuner
- Six FM/Six AM Memory for Instant Station Recall
- FLUROSCAN™ Power Output and Tuning Meters
- Innovative Design and Easy Operation

PIONEER SX-D7000

The Pioneer SX-D7000: The Next Step in Stereo

If you're looking around the array of stereo receivers available these days, you've already made the discovery that, for the most part, they look pretty much alike. You know what we mean: tuning dials that dominate the frontface, knobs and controls that add to the clutter. The feeling is, you've seen every receiver someplace before.

Now comes Pioneer to make a major new contribution to the contemporary aesthetics of receiver design. The

SX-D7000 is totally redesigned. All controls (except VOLUME and BALANCE) and switches are sliders and pushbuttons, not levers, rockers or rotary knobs. Indications are all beautifully illuminated. You don't have to be a stereo "expert" to see how these new lines and contours add up to a distinctive kind of elegance. To see how the SX-D7000 gives the appearance of a precision transceiver, with all controls neatly grouped into three.

Once again, the visually attractive, functional, operationally comfortable receiver has Pioneer's name on it. Does it surprise you? It shouldn't. Pioneer stereo today is simply more exciting than ever.

The New Pioneer "Non-Switching™" DC Power Amp

Too Hot to Handle

The traditional alternative to the Class-B amp is Class-A. Class-B employs the on-off switching of transistors in order to minimize heat loss. But in Class-A, a large amount of bias (or idle current) is applied to keep the transistors ON at all times, whether or not a signal is present for amplification. This avoids switching distortion. However, as much as 75% of the energy consumed is bled off in the form of heat, adding up to waste, potential damage and inefficiency. Attempts to create a hybrid "A/B" and other alternatives have always ended in frustration, if not failure.

Pioneer VARI-BIAS™ to the Rescue

Frustration, however, is often the mother of invention. Not so long ago our engineers began to work on what they call "a very simple high-speed bias servo" to increase Class-A efficiency. An inspired breakthrough led to the Pioneer Vari-Bias™ circuit. This constantly monitors the amplitude of incoming signals, then automatically controls the amount of bias fed to the power transistors. While they "rest" during no-signal periods they get only a trickle—just enough to keep them from switching off. Actually, this circuit is so simple it does not limit the transient

response of the transistors in any way (which is not always the case with other, similar circuit designs).

DC with a Difference

Still another advantage of the SX-D7000's power amp is its special DC or Direct Current configuration. What makes it special is the coupling capacitors we've used at the input of the amp to safeguard the circuits and your speaker systems. If this precaution is not taken, ultra-low-frequency signals which might be picked up, say, from a warped record can cause annoying "Doppler distortion" in drivers, adversely modulating the audible frequencies. Pioneer's "DC with a Difference," however, removes signal-delaying capacitors from the negative feedback loops to reduce phase distortion. This contributes immensely to sharp and densely-textured sonic imagery in the final reproduction.

Power Amp Highlights

- **OUTPUT is 120 watts* per channel, continuous, over the 20 to 20,000Hz range into 8 ohms, both channels driven, with 0.005% total harmonic distortion.**

*Measured pursuant to the Federal Trade Commission's Trade Regulation Rule on Power Output Claims for Amplifiers.

- **HEAT SINK** is the "I-Skived" type, which uses thinly-sliced metal fins on a lightweight but solid frame to provide as much as 50% better heat dissipation than in conventional types.



- **THREE SEPARATE POWER TRANSFORMERS** are the Pioneer assurance of uncompromised power stability. One is of the special toroidal type for the Non-Switching™ power amp. The other two are of the conventional design: one for the preamp, power amp (up to the driver stage), tuner and indicators, and the other for the backup of the tuner's memory circuit. The results are distinctive. The tiny phono signals are protected from

the adverse effects which the massive power amplifier might have on them during high-power driving. Large power capacitance (two 15,000 electrolytic capacitors) means plentiful reserve for highly pulsive, high-level musical dynamics.

■ **PROTECTION CIRCUITRY** has gold-plated dual-contact relays for fast response and unfailing dependability should power-related mishaps occur. The receiver and your speakers are fully protected; the circuitry mutes power on/off noise, protects power

transistors and speakers from abnormal direct-current potentials and overload at the output.

Accurate Preamp and Versatile Control

FLUROSCAN™ Power Output Meter

The Pioneer-exclusive FLUROSCAN™ meter is the most accurate of its kind, far more accurate than conventional needle-type analog meters. For superior readability, the bar-graph sections of each channel have 12 separate fluorescent segments each. This provides a large, clearly-calibrated display that is much easier to read than ordinary VU-type meters. Range is 0.001 to 120 watts, referred to an 8-ohm speaker load.

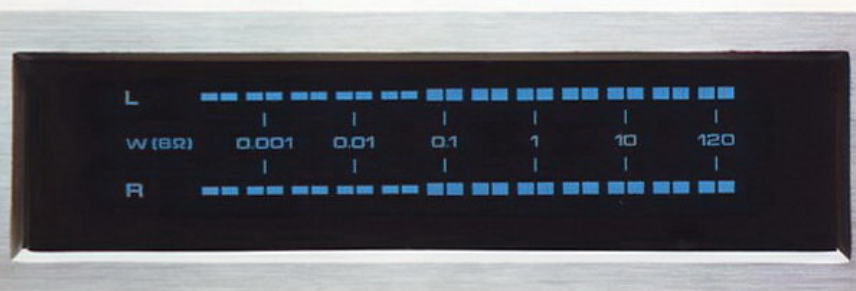
High-Gain FET Phono Equalizer

Four differential FETs (Field Effect Transistors) are used, two in each channel, in the high-gain phono equalizer, to provide exceptional signal-to-noise ratio (86dB MM). The precise construction in this circuit design means RIAA equalization is achieved accurately within $\pm 0.2\text{dB}$ over the 20 to 20,000Hz range with never more than 0.005% total harmonic distortion. Phono overload is 200mV, permitting the use of high-output cartridges if desired.

Two Phono Inputs Accept Both MM and MC Cartridges



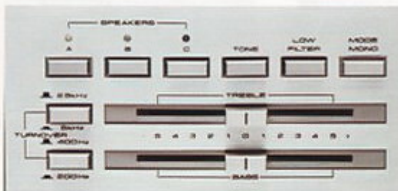
When you switch the PHONO selector from "MM" to "MC" position, you boost the phono gain by 20dB and reduce the impedance to 100 ohms. This means you may connect an MC (Moving Coil) cartridge to either PHONO-1 or PHONO-2 input terminals and enjoy its transient sound without extra cost.



Of course, the SX-D7000 also accepts the MM (Moving Magnet) cartridge.

Low-Distortion Tone Control Amp

This is an IC-built circuit block, employing NFB (Negative Feedback) to lower distortion to 0.005% or less (4V output) over the 20 to 20,000Hz range. BASS and TREBLE adjustments are made by the two slider controls—each with 11 click stops—in conjunction with two switches for TURNOVER. The TURNOVER for BASS offers a choice of 400Hz or 200Hz as the frequency at which response is down by -3dB; turnover for TREBLE gives a choice of 2.5kHz or 5kHz. Only a tone control this elaborate and far-reaching provides total system control. You may, if you wish, bypass the tone circuit



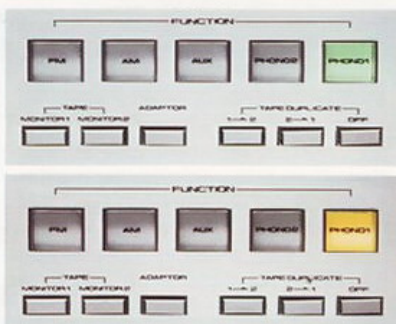
entirely by resetting the TONE CONTROL switch and achieve an instant flat response. An indicator above the tone control system lights when the circuit is turned on.

Attenuator-Type Master Volume Control

We've improved the "feel" of the master volume control by giving it decibel calibrations from 0 down to -70dB. For operating convenience, the control has 41 detents or click stops. The mechanism which actually controls the volume—the potentiometer—is elaborate with four-ganged design. There is one two-ganged potentiometer ahead of the tone control amp, another behind. The thoroughness of this design is apparent in improved signal-to-noise ratio during low-level sound reproduction.

Preamp/Control Highlights

■ **FUNCTION INDICATORS** (FM/AM/AUX/PHONO-1/PHONO-2)—Pioneer's "Light Touch" buttons are employed to indicate the selected function.



The buttons glow green (or orange for MC inputs) when engaged.

- **SPEAKERS (A, B, C)** switches with LED indicators. You can connect three pairs of speaker systems to the SX-D7000 and drive any two simultaneously.
- **LOW FILTER** (18Hz with -6dB/oct. curve).
- **TAPE MONITOR** and **DUPLICATE** switches for decks 1 and 2; deck-to-deck dubbing is easily accomplished between the two in either direction.
- **DIMMER** switch to dim the brightness of the FLUROSCAN™ display.

- **LOUDNESS, BALANCE, MODE** (Stereo/Mono) and **MUTING** (-20dB) controls.
- **ADAPTOR** switch to patch in a signal processor unit such as a graphic equalizer, dynamic processor or reverberation unit.
- **PRE/POWER AMP SEPARATION** is possible via jumpers on back panel, still another rare receiver feature of the SX-D7000.

Pioneer's Quartz-PLL Synthesizer Ends Drift

The Astonishing Performance of Quartz-PLL

There are probably two problems in your stereo system—and both are the problems that the design of the SX-D7000, and its amazing Quartz-PLL synthesizer, avoids. The first is hiss-ridden, distortion-marred reception from favorite stations. The second is what is called "drift"—as well as incidental noise and distortion—that is caused by heat that builds inside a receiver and can put a perfectly tuned station out of tune.

In the front end of the SX-D7000 is a small, gem-like quartz crystal. This is the most accurate and dependable controller of the local-oscillator frequency yet devised, so accurate that broadcasting stations use it in transmitters. How does it work? The steady frequency derived from the quartz crystal is compared with the desired station frequency via a PLL (Phase-Locked Loop) *thousands of times* per second. Drift is impossible. Tuning, to say the least, is accurate and precise.

It is the combination of the superior qualities of quartz with the astonishing capabilities of two microelectronic C-MOS LSIs (Complementary Metal-Oxide Semiconductor Large-Scale Integrated Circuits) that assures reliable performance. The first of these micro-

electronics provides frequency synthesis; the other makes possible AUTOSCAN, MEMORY and "LAST CALL" (features to be discussed below).



FM/AM AUTOSCAN & MEMORY sections use this highly reliable control LSI



QUARTZ-SYNTHESIZER section has an independent LSI

Electronic Varicaps for Ganged Tuning Capacitor

Most conventional receivers used mechanically ganged variable capacitors. The SX-D7000 uses a team of varicaps (variable-capacitance diodes) for FM and AM, which provide both the desired tuning capacity of conventional capacitors and the undeniable advantage

of being able to control preset fixed voltages commanded by special ICs at will. Varicaps work purely electronically. This means that degradation of basic specifications does not occur, even over long periods. This also means you can preset your favorite stations and tune them in without scanning the entire FM or AM dial—at the touch of a button. The four varicaps used in the SX-D7000 are as sensitive and selective as is a conventional 4-ganged variable capacitor.

Another advantage of the SX-D7000 is its use of an FET (Field Effect Transistor) as the RF (Radio Frequency) amp. This leads to still higher sensitivity, better rejection of interference and improved resistance to overload in any area.

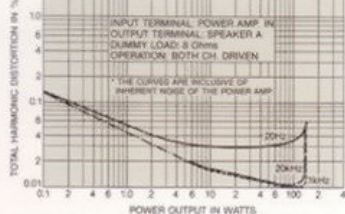
FM IF with Special Filters

The IF (Intermediate Frequency) section in the front end contains three special 2-pole ceramic filters with flat group-delay response to assure even lower distortion.

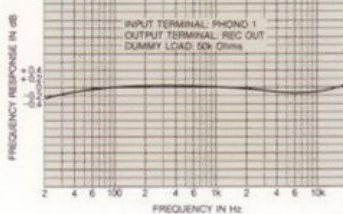
Pioneer's Own Integrated Circuits

ICs (integrated circuits) made to Pioneer's own specifications are employed in the IF and MPX demodulator of the SX-D7000 for reliability and dependability. One (PA-3007A) serves

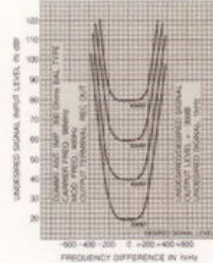
SX-07000: POWER OUTPUT vs. TOTAL HARMONIC DISTORTION



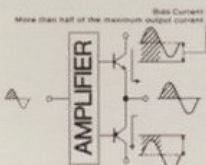
SX-07000: EQUALIZER RIAA DEVIATION



SX-07000: FM SELECTIVITY

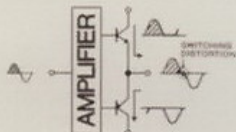


Modes of Amplification



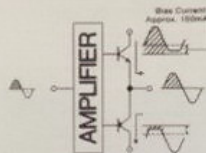
CLASS-A OPERATION

Paired transistors are always turned on, amplifying its assigned waveform within the range above and below its quiescent operating point. Therefore, no switching distortion can occur. But the bias current is always at the center point and thermal loss is considerable.



CLASS-B OPERATION

Paired transistors alternately turn on and off, amplifying the positive half-cycles and negative half-cycles. This lets amplifiers run cooler with high efficiency. But, as the power transistors are driven below its idle current into cutoff, switching distortion (also called "notching distortion") occurs.



"NON-SWITCHING" AMP OPERATION

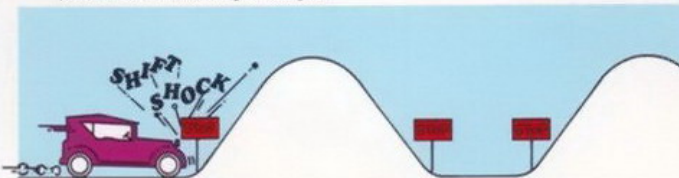
Paired transistors are always turned on; they do not switch on and off. Since the bias is controlled by our new Pioneer Vari-Bias circuit to prevent either output transistor from being driven below its idle current into cutoff, no switching distortion is generated and the thermal loss is low.

NON-SWITCHING IS PUT TO "DRIVING TEST"



CLASS-A transistors don't switch on and off because a bias current is applied at a fixed level even when no signal is present. This is like driving in "low gear"

all the way: a safe trip, but it wastes energy. NO SWITCHING DISTORTION, BUT VERY POOR EFFICIENCY.



CLASS-B transistors are arranged in sets, one set resting while the other works. This is similar to constantly

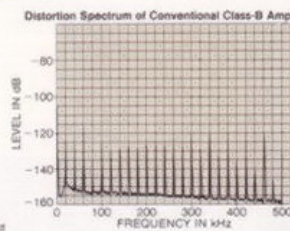
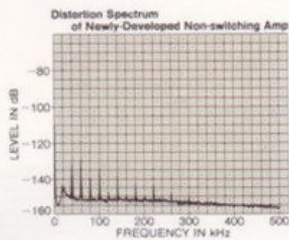
shifting gears: it saves energy, but causes a jerky ride. HIGH EFFICIENCY, BUT ALSO HIGH SWITCHING DISTORTION.



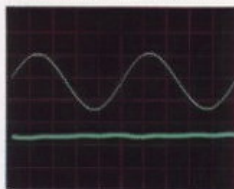
PIONEER'S NON-SWITCHING amplifier has an "automatic transmission" in the form of the Pioneer Vari-Bias circuit. It applies a bias current, but only in the amount needed at any given time.

EFFICIENCY IS VERY HIGH, AND THERE'S ABSOLUTELY NO SWITCHING DISTORTION to spoil the transient quality of your music!

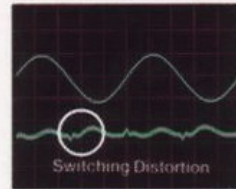
Distortion Spectra



Output Waveforms of Newly-Developed Pioneer Amp

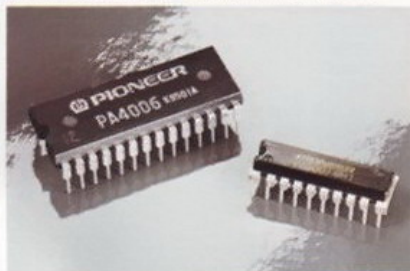


Output Waveforms of Conventional Class-B Amp



as an FM IF amp/detector. It improves the signal-to-noise ratio, lessens distortion and even eliminates "TV buzzes." The superiority of these ICs is indicated by the 82dB signal-to-noise ratio of this unit.

The second IC is called PA-4006A; it contains a PLL (Phase-Locked Loop) stereo demodulator. While this IC makes FM stereo listening cleaner and more accurate, it also doubles as an automatic pilot signal canceller, eliminating the



19kHz "switching" signal and ensuring that the audio output is never compromised. Even if the modulation percentage of the transmitter changes (as it often does when you tune to a relayed, not main, transmission), the canceller tracks the change.

New Air-core Quadrature Discriminator

The use of a new-type quadrature discriminator in the SX-D7000 leads to



New Quadrature Discriminator Transformer

higher signal-to-noise ratio, wider channel separation, wider frequency response and a more natural tonal quality. This unit combines an air-core micro-inductor and a detection transformer in a single pack. Its virtues are enhanced by the use of a separate low-pass filter, one in each channel at the output of the PLL stereo demodulator.

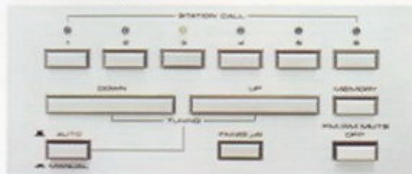


Separate LOW PASS FILTERS in Left and Right Channels of FM for impeccable tonal quality

Pushbutton Station Selection and Other Automatic Conveniences

AUTOSCAN Gives You On-Target Tuning at a Touch

This is tuning convenience, and then some. As you press the FM function button, simply touch the UP (or DOWN) button simultaneously. Then watch while the digital synthesizer begins to scan the FM frequency band in 100kHz steps at high speed, searching for the nearest station of acceptable strength. Scanning stops only when a strong station signal is located and the station's frequency is "locked." But if this is not the desired station, you simply repeat the process until you locate it. When the scanner reaches either end of the frequency band, it automatically "retraces." On-target tuning is push-button simple with Pioneer's SX-D7000.



And you get the same automatic convenience with the AM band as well, at scan intervals of 1kHz for AM station selection.

MANUAL SCAN Gives Added Convenience

MANUAL SCAN provides another kind of practical convenience and ease-of-operation. When you set the AUTO/MANUAL TUNING switch to MANUAL you get two "submodes"—which are two different speeds depending on the degree of pressure you apply to the UP or DOWN buttons. The two speeds are:

Step Tuning: A light touch on either button moves you up or down the tuning dial in steps of 100kHz for FM and 1kHz for AM. You use this mode to sample each and every scan interval.

Rapid Tuning: As you continue to press one of the buttons, the frequency band is scanned at high speed. You employ this mode to move rapidly from one band area to another.

MEMORY: An Unforgettable Convenience

A handy MEMORY facility for FM and AM in the SX-D7000 enhances its overall versatility. You'll quickly think of it as an unforgettable feature. It works this way: To preset a station, you simply select it with AUTOSCAN or MANUAL SCAN, and then push the MEMORY button along with one of the station call buttons numbered up to six. You can now repeat the process for up to six programmed stations each for FM and AM. Station recall is now at the touch of a button.

Even if you unplug the SX-D7000 for up to about three days (the exact period depends on environmental conditions), you don't "unlock" the preset stations. Back-up circuitry, with its own power supply, not batteries, makes this possible.

FLUROSCAN™ Digital Tuned-Frequency Readout

The frequency of the station you've tuned is displayed in five digits for FM (four for AM) on the Pioneer FLUROSCAN™, one of the most accurate frequency readout displays ever developed. One immediately appreciable advantage over conventional needle-type pointers is that FLUROSCAN™ is not subject to parallax, the optical illusion that plagues needle-type pointers.

The SX-D7000 features a five-digit display. Resolution extends to 100kHz for FM and 1kHz for AM.

FLUROSCAN™ Tuning/Signal Indicators

Easy-to-read tuning/signal indicators are incorporated on the FLUROSCAN™ panel face to enhance quick, accurate FM station location even during MANUAL SCAN. When you are right on the station, the blue "TUNING" bar lights. The SIGNAL STRENGTH meter on the FLUROSCAN™ panel just below the TUNING indicator shows the



strengths of both FM and AM. It has five separate "steps" and operates from an elaborate circuit using two special ICs.

"Last Call" Tuning Aid

"Last Call" means that the frequency of the last station you tune before you turn the receiver off is kept intact until you re-power the tuner. This is an especially useful feature for persons who make unattended recordings off the air.

Tuner Highlights

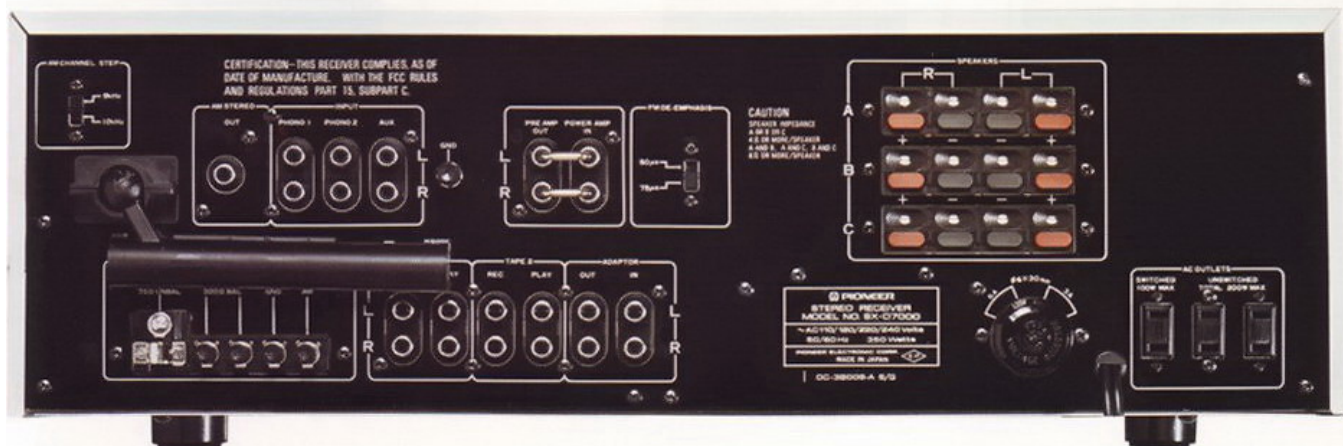
■ **FM/AM MUTING**—Inter-station noise is hardly audible while you tune an FM or AM station. Muting for AM is a feature rare in receivers today.

■ **LED INDICATORS** for station call buttons.

■ **BUFFERED 450kHz "AM STEREO" OUTPUT**—If and when AM stereo broadcasting becomes a reality, the SX-D7000 is ready. Just plug an appropriate adaptor to the output jack.

■ **BALL-JOINT AM BAR ANTENNA**—Swivels to almost any degree for better AM reception.

■ **25μS DOLBY® DE-EMPHASIS SWITCH**—With an appropriate Dolby decoder connected to the SX-D7000, you can enjoy hiss-free Dolbyized broadcasts. (*Dolby is a trademark of Dolby Laboratories.)





PIONEER ELECTRONIC CORPORATION
4-1, Meguro 1-chome, Meguro-ku, Tokyo 153, Japan
U.S. PIONEER ELECTRONICS CORP.
85 Oxford Drive, Moonachie, New Jersey 07074, U.S.A.
PIONEER ELECTRONIC (EUROPE) N.V.
Luithagen-Haven 9, 2030, Antwerp, Belgium
PIONEER MARKETING SERVICES PTY. LTD.
P.O. Box 317, Mordialloc, Victoria 3195, Australia

SX-D7000 SPECIFICATIONS

POWER AMPLIFIER SECTION

Continuous Power Output is 120 watts* per channel, min. at 8 ohms from 20 hertz to 20,000 hertz with no more than 0.005% total harmonic distortion.

Total Harmonic Distortion: (20Hz to 20,000Hz, 8 ohms)	No more than 0.005% (continuous rated power output) No more than 0.004% (60 watts per channel power output)
Intermodulation Distortion: (50Hz: 7,000Hz = 4:1)	No more than 0.005% (continuous rated power output) No more than 0.004% (60 watts per channel power output)
Frequency Response:	3 to 450,000Hz +0dB, -3dB
Input Sensitivity/Impedance:	1V/50k ohms (POWER AMP. IN)
Output:	
SPEAKER:	A, B, C, A+B, B+C, A+C, OFF
HEADPHONES:	Low impedance
Damping Factor:	60
(20 to 20,000Hz, 8 ohms)	
Hum and Noise: (Short-circuited, A network)	115dB

PREAMPLIFIER SECTION

Input Sensitivity/Impedance:	
PHONO 1 (MM):	2.5mV/50k ohms
PHONO 2 (MM):	2.5mV/50k ohms
PHONO 1 (MC):	0.25mV/100 ohms
PHONO 2 (MC):	0.25mV/100 ohms
AUX:	150mV/50k ohms
TAPE PLAY 1:	150mV/50k ohms
TAPE PLAY 2:	150mV/50k ohms
ADAPTOR IN:	150mV/50k ohms
PHONO Overload Level:	
PHONO 1:	200mV (1kHz, T.H.D. 0.005%)
PHONO 2:	200mV (1kHz, T.H.D. 0.005%)
Output Level/Impedance:	
TAPE REC 1:	150mV
TAPE REC 2:	150mV
ADAPTOR OUT:	150mV
PRE OUTPUT (R _L : 50k ohms):	1V/1k ohms
Total Harmonic Distortion:	
PHONO:	No more than 0.005% (20 to 20,000Hz, 4V output)
AUX, TAPE PLAY 1, 2:	
ADAPTOR:	No more than 0.005% (20 to 20,000Hz, 4V output)
Frequency Response:	
PHONO	
(RIAA Equalization) MM:	20 to 20,000Hz ± 0.2 dB
AUX, TAPE PLAY 1, 2:	
ADAPTOR:	5 to 100,000Hz +1.0dB, -3.0dB
Tone Control:	
BASS (at 200Hz):	± 8 dB (100Hz)
(at 400Hz):	± 10 dB (100Hz)
Turnover Frequency:	200Hz/400Hz
TREBLE (at 2.5kHz):	± 10 dB (10kHz)
(at 5kHz):	± 8 dB (10kHz)
Turnover Frequency:	2.5kHz/5kHz
Filter:	
LOW (SUBSONIC):	18Hz (-6dB/oct.)
Loudness Contour:	+6dB (100Hz), +3dB (10kHz)
(Volume control set at -40dB position)	
Hum and Noise (Short-circuited, A network)	
PHONO (MM):	86dB
PHONO (MC):	72dB
TUNER, AUX, TAPE PLAY 1, 2:	
ADAPTOR:	100dB
Muting:	-20dB

FM TUNER SECTION

Usable Sensitivity:	Mono: 10.2dBf (1.8 μ V)
50dB Quieting Sensitivity:	Mono: 15.7dBf (3.2 μ V) Stereo: 34.2dBf (28.2 μ V)
Signal-to-Noise Ratio: (at 85dBf):	Mono: 82dB Stereo: 78dB
Distortion (at 65dBf):	
100Hz:	0.1% (mono), 0.2% (stereo)
1kHz:	0.07% (mono), 0.1% (stereo)
6kHz:	0.1% (mono), 0.2% (stereo)
Frequency Response:	30 to 15,000Hz ± 0.5 dB
Capture Ratio:	1.0dB
Alternate Channel Selectivity:	80dB
Spurious Response Ratio:	80dB
Image Response Ratio:	80dB
IF Response Ratio:	90dB
AM Suppression Ratio:	60dB
Muting Threshold:	35.7dBf (32 μ V)
Stereo Separation:	50dB (1kHz), 35dB (30Hz to 15kHz)
Subcarrier Product Ratio:	65dB
SCA Rejection Ratio:	65dB
Antenna Input:	300 ohms balanced 75 ohms unbalanced

AM TUNER SECTION

Sensitivity:	300 μ V/m (IHF, ferrite antenna) 15 μ V (IHF, external antenna)
Selectivity:	30dB
Signal-to-Noise Ratio:	45dB
Image Response Ratio:	30dB
IF Response Ratio:	60dB
Antenna:	Ferrite loopstick antenna

SEMICONDUCTORS:

FETs:	15
ICs:	22
Transistors:	105
Diodes:	105

MISCELLANEOUS

Power Requirement:	120V 60Hz only
Power Consumption:	400W (UL)
Dimensions:	Without package: 20-7/16(W) $\times$ 7-1/16(H) $\times$ 18-1/8(D) inches 519(W) $\times$ 180(H) $\times$ 460(D) mm
Weight:	Without package: 42 lb. 5 oz./19.2kg

*Measured pursuant to the Federal Trade Commission's Trade Regulation Rule on Power Output Claims for Amplifiers.
NOTE: Specifications and design subject to possible modification without notice.