



Pioneer Model SX-9000 AM/FM Stereo Receiver

MANUFACTURER'S SPECIFICATIONS

Tuner Section. FM IHF Sensitivity: 1.6 μ V. S/N Ratio: Better than 65 dB. Selectivity: 40 dB. Image Rejection: 90 dB. Capture Ratio: 1 dB. Stereo Separation: 40 dB @ 1 kHz. THD (Stereo): 0.8%. AM IHF Sensitivity: 9.5 μ V. Image Rejection: 78 dB. **Amplifier Section.** Music Power: 150 watts total (IHF). RMS Power (both channels driven): 50 watts/channel, 8 ohms; 60 watts/channel, 4 ohms. THD: Less than 0.5% at rated output. Damping Factor: 30. **Frequency Response:** 10 Hz to 35 kHz $\pm$ 1 dB. **Power Bandwidth:** 10 Hz to 35 kHz. **Input Sensitivity:** Phono 1 & 2, 2.5 mV; AUX 1 & 2, 160 mV; Microphone, 1.6 mV; Main Amp, 500 mV. **Hum and Noise:** Phono, better than 80 dB; AUX, better than 100 dB. **Bass Control Range:** +12.5 dB, -14 dB @ 50 Hz. **Treble Control Range:** +9 dB, -11 dB @ 10 kHz. **Low Filter:** -6 dB @ 50 Hz. **High Filter:** -12 dB @ 10 kHz. **Power Consumption:** 310 watts, max. **Dimensions:** 20-9/16 in. W. x 7 7/8 in. H. x 13-9/16 in. D. **Price:** \$499.95 (includes walnut cabinet).

This new receiver entry from Pioneer Electronics (U.S.A.) Corp. includes all of the useful features found on their earlier receivers, plus some new control features and circuits that we have not seen on any integrated receiver before. The front panel is a bit deceiving, since all the controls located in the lower portion of the black and gold panel are normally covered by a hinged door which swings down to expose them. With this door closed, the panel looks sleek and simple and only the most often used controls are visible. These include the tuning knob, coupled to an effective flywheel, concentric master and source volume controls, a seven position selector switch, a four position "tone color" selector (about which more in a moment), four pushbuttons for speaker selection (including choices for one or two pairs of three speaker pairs and an "off" position for headphone listening) and a pair of tape-monitor buttons to actuate either a front-panel or rear panel (or both) pair of tape-input and tape-output jacks. The separate "source" and "master" volume controls are a welcome addition from the past. We have long maintained that the incorporation of a "loudness-contour" circuit is somewhat meaningless unless a means is provided for adjusting the input or source level so that the so-called Fletcher-Munson loudness compensation curves (for low-level listening) can be made to correspond to their appropriate absolute levels. This dual control provides that means. The "tone color" selector switch is new too and provides four arbitrary tone compensation settings listed as "vivid" (a slight boosting of both bass and treble ends), "bass" (a boost of just the bass region), flat, and "soft" (a slight attenuation of the high end). All of these settings could, of course, be accomplished by the individual tone controls, but Pioneer has selected these fixed positions probably on the basis of listener preferences. We wish they had included a "presence" position (slight boosting of mid-range frequencies) which is not achievable by means of ordinary tone controls, but that omission does not detract from the usefulness of the other "ready-made" tonal settings.

The "blacked-out" dial area at the left of the panel includes two tuning meters—one for signal strength, useful in both AM and FM tuning, and the other for zero-center FM tuning. A "tone-color" illuminated graph is located above the dial scale and actually displays the response curve selected by the previously described "tone color" switch. There is also a

"reverberation indicator" window, which displays an artist's representation of the amount of reverb being used, for the Model SX-9000 actually has a built-in reverberation unit, mechanical springs and all. Below the dial scale are a series of colored lights which denote main selector switch settings as well as reception of a stereo FM signal. In settings other than radio, the dial scale area goes dark and only the appropriate signal source light remains lit in the dial scale area.

The secondary controls (hidden behind the "trap door") include a power on-off pushbutton (this one accessible even with the door closed), two stereo headphone jacks, bass and treble controls, a reverberation control (OFF in its most counter-clockwise position), push buttons for LOW and HIGH FILTERS, Muting and LOUDNESS, a pair of tape monitor in and out jacks (designed to accept a single ring-tip-sleeve plug), the balance control, a mode switch (with positions for STEREO, REVERSE, LEFT-ONLY to both speakers, RIGHT-ONLY to both speakers and L + R), a pair of microphone level controls, and a pair of microphone input jacks. With such an assortment, Pioneer was wise to cover the complex control area with the brushed gold anodized door!

The rear panel is pictured in Fig. 1. Pioneer has "out-designed" other manufacturers who have been featuring the very useful circuit "break" facilities between preamp and main amplifier sections. Instead of using a pair of heavy "jumpers" to re-couple the sections, like some others we have seen, Pioneer incorporates a simple slide switch which shorts the "preamp out" and "main in" jacks together when they are not needed for the insertion of accessory equipment. Two magnetic phono sets of input jacks as well as the usual AUX 1 and AUX 2 and tape monitor jacks and a DIN connector (for imported tape recorders which use this type of connector) are located in the lower left section of the rear panel. Speaker connections are made by means of polarized two-prong plugs, six of which are supplied in a separate accessory package. The plugs are equipped with screw terminals so that speaker cables can be permanently connected to them, correctly phased. Then, should it become necessary to disconnect speakers at any time (for moving equipment, etc.), the plugs are merely removed from the corresponding speaker sockets. Upon reconnection, correct phasing is assured. Although provision is made for using three pairs of speakers, switching is so arranged that only two out of three pairs may be heard at any time. This is done to prevent "loading" the output circuits with an impedance of less than 4-ohms. A center-channel output (requiring a third amplifier), two speaker-line fuses, a built-in AM ferrite antenna, connection terminals for an FM and an outdoor AM antenna, a pair of convenience a.c. outlets (one switched, one unswitched) and a main fuse and line voltage selector complete the rear panel layout. The line voltage-selector and fuse combination is useful even in this country for, in addition to making available 240 volt operation (for overseas use), there are settings for 110, 117 and 130 volt operation. Thus, if you are plagued with low or high line voltage, it is possible to choose the appropriate setting of the voltage selector and realize full power-output capability of the Pioneer SX-9000. Accidental misuse of this feature is prevented by the fact that it is necessary to completely remove the main line fuse and extract a plug before the voltage setting can be changed.

An internal view of the SX-9000 can be seen in the photo of Fig. 2. The sealed reverberation-spring unit is clearly visible at the right, as are the front ends, AM, FM, and MPX modular circuit boards. Nine additional circuit modules are located below the chassis surface. Four integrated circuits are used in the FM-i.f. module while a fifth, 14-pin dual in-line IC performs the function of stereo FM demodulation. The FM front end features an FET r.f. amplifier. In addition, the receiver contains 53 bipolar transistors and 22 diodes. Output transistors are conventional TO-3 types, mounted on adequate heat sinks and enclosed by a well ventilated perforated metal "cage," seen at the rear of the photo in Fig. 2. While the two separate variable capacitors (for AM and FM tuning) are exposed when the walnut case is removed (and hence subject to dust collection), the lack of a metal cover in these areas did not prevent the set from meeting FCC radiation limits, as evidenced by a notice on the rear panel certifying compliance in this regard.

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Performance Measurements

The Pioneer SX-9000 is one of the most sensitive receivers we have ever measured, meeting its 1.6 μ V claim for IHF sensitivity exactly. What's more, this figure is consistent from one end of the FM band to the other, which denotes extreme care in alignment and good design. This and other FM performance characteristics are shown in Fig. 3. Ultimate signal-to-noise ratio was measured as 75 dB, against a claim of only "better than 65 dB." Full limiting occurred at just under 2 μ V while monophonic THD measured 0.6%. In stereo, the THD was 0.8% for 100% modulation. Selectivity measured 42 dB (a bit better than the 40 dB claimed) and, while this figure is not among the best we have seen, it seemed adequate in all of our listening tests in this "FM crowded" area. Pioneer has chosen to stay with conventional interstage transformers, as opposed to some of the newer crystal, ceramic or even multi-pole band pass filters, and this probably accounts for the rather wide bandwidth (and moderate figure of selectivity) observed.

Good stereo FM separation (shown in Fig. 4) was noted over the entire audio band, with best figures of 40 dB obtained at mid-band and a bit better than 30 dB at 100 Hz and 25 dB at 10 kHz. These readings compare favorably with other top-quality stereo FM circuits we have tested. Stereo light indication was positive and not erratic in the presence of interstation noise. We did note, however, that separation was slightly affected by changing the amplitude of the pilot signal, with best separation occurring when pilot signal amplitude was 8% (FCC rules permit variation of this amplitude from 8% to 10%).

The amplifier section of the receiver does just about what is claimed for it—and that is quite a bit. With both channels driven into 8-ohm loads, a THD of 0.5% is reached at 50 watts per channel (see Fig. 5). At all power levels below 40 watts per channel, THD measured less than 0.2% while IM distortion was well below 0.3% for power levels below 40 watts, reaching 1% at 50 watts (rated output). Power bandwidth, shown in Fig. 6, extends from 19 Hz to 24 kHz, a bit less than claimed. In analyzing audio performance of audio amplifiers, we have had many requests from readers to include curves of distortion (THD) versus frequency for various power levels. Figure 7 shows these relationships for power levels of 1 watt, 25 watts and 50 watts. The 1 watt (nominal listening level) and 25 watt (half of full rated power) curves are virtually identical except at the extreme ends of the audio band. As can be seen, 50 watts is attainable at frequencies ranging from about 50 Hz to about 8 kHz at the nominal rated distortion of 0.5%.

The curves of Fig. 8 depict the composite frequency responses obtained with the various fixed settings of the "tone color" switch described earlier. These fixed settings actually involve two predetermined low-end curves and three pre-set high-end response curves. As can be seen from the tone control range curves of Fig. 9, the same response curves could easily be obtained by specific settings of the individual bass and treble controls. The "tone color" switch simply is a more convenient way to re-establish the settings shown in Fig. 8 by the simple rotation of a switch. Figure 9 also details the low-filter and high-filter response characteristics. The high filter follows the normal tone control (treble) cut position quite closely, at a slope of 6 dB per octave, and is therefore a bit of a redundancy. The low-filter, on the other hand, as a more suitable crossover point for rumble reduction and is therefore more useful, despite its modest slope of 6 dB per octave. Loudness-contour action (with volume control set at -30 dB from maximum setting) is also shown in Fig. 9 and it should be noted that both bass compensation and, to a somewhat lesser degree, treble emphasis are "designed in" to this loudness circuit. While we feel that treble emphasis in a loudness compensation circuit is not called for (according to our interpretation of the Fletcher-Munson curves), there are probably an equal number of people who feel that it is required and this remains a matter of taste. The availability of a dual concentric volume control (source volume and master volume) makes the loudness feature more useful than is generally the case with master-volume-only products since, by various combination settings of the two controls, it is possible to arrange for just the desired amount of loudness compensation for any program source played at lower-than-normal listening levels.

Listening Tests

In using the Pioneer SX-9000 for phonograph record listening, we were at once impressed with the excellent signal-to-hum-and-noise level of the preamplifier circuits. While Pioneer claims a figure of -80 dB (incredible) in this service, we suspect that they may be referring this figure to an input level of around 10 mV. If this is so, then our measurement of -70 dB referred to their own sensitivity of 2.5 mV is better (and more incredible) than their claims. This kind of S/N in a magnetic phono preamplifier is seldom realized even in the very best (and most expensive) separate preamplifier-control chassis. The fact is, you can turn off all program source material (at a volume control setting that provided room-filling sound) and put your ear directly to the loudspeaker and still hear virtually NO hiss or hum. That, to us, is perhaps more important in terms of overall dynamic range capability of a product than just having lots of power output—for it is the low end of the dynamic range scale that is often found wanting in electronic equipment of this type. At the power levels we tried listening to, sound was tight and clean, with no evidence of breakup at any point. As usual, we used low efficiency and medium efficiency speakers in our tests, often feeding sound to both sets simultaneously, as might be the case in a typical home installation.

As might be expected from the measurements made earlier, FM performance was very good, with 53 listenable station logged using our medium gain, directional outdoor antenna in a fixed position. Of these, 24 were broadcasting in stereo that was also deemed listenable in terms of background noise or quieting characteristics. There was no evidence of cross-modulation or alternate channel interference in our situation. We tried logging stations with the muting control activated and only lost three of the 53 previously received. Since muting had been measured as having a threshold of between 3 and 4 μ V, this means that the three stations lost must have been previously received at signal strengths of under 4 μ V and yet they were quite listenable!

The microphone inputs, capable of being mixed with any other signal source, are a nice feature for anyone serious about doing recording work and either input can be used as part of a stereo mic set-up or as a monophonic mix to both channels thanks to the versatility of the mic level switch controls. As for the reverberation feature, we are not too keen on this item in general and found that in the case of the Pioneer SX-9000 use of the reverb rotary control past about "9 o'clock" resulted in such unnaturalness of reproduced sound that we turned it off altogether. Obviously, there are many who like this kind of electro-mechanical enhancement, though we have found that the reverberant sound produced by suspended coiled springs contains a "metallic" coloration imparted by the springs themselves and their various resonances and sub-resonances. We suspect, however, that the addition of this feature did not add significantly to the price of the receiver and since there are so many good points and features incorporated within this receiver that we would certainly not criticize the addition of this feature, the use of which is after all a matter of individual taste and is of course defeatable by means of a simple rotary control. Besides, the moire-like waveform pattern that appears in the "reverberation indicator" window as reverberation is increased and decreased is fun to watch! (So are the illuminated dash-lined response curves that show up in the "tone color indicator" window as different settings of the "tone color" switch are selected.)

In summing up, we would conclude that the SX-9000 receiver certainly justifies its "just under \$500" price tag. It is particularly geared to those users who prefer a maximum number of control features along with basic, honest performance. Yet, for all its controls, the SX-9000 will look "clean" and elegant in your living room.

Leonard Feldman

The Pioneer reverb unit was reviewed in the August, 1970 issue by Mr. McProud, who was enthusiastic about it.