Equipment Profiles

Pioneer Model QX-949 4-Channel Stereo Receiver

MANUFACTURER'S SPECIFICATIONS

FM Tuner Section: IHF Sensitivity: 1.8 μV. **S/N Ratio:** 70 dB. **Selectivity:** 80 dB. **Capture Ratio:** 1.0 dB. **Image Rejection:** More than 85 dB. **IF and Spurious Rejection:** More than 100 dB. **AM Suppression:** 55 dB. **THD:** Mono, Less than 0.2%; Stereo, Less than 0.4%. **Stereo Separation:** 40 dB @ 1 kHz; Better than 30 dB, 50Hz to 10 kHz. **Subcarrier Suppression:** 65 dB.

AM Tuner Section: IHF Sensitivity: 15 μV (external antenna); 300 μV/M (internal antenna). **Selectivity:** 40 dB. **Signal-to-Noise Ratio:** 50 dB. **Image Rejection:** More than 65 dB. **IF Rejection:** More than 85 dB.

CD-4 Demodulator Section: Input Sensitivity: 2.5 mV (1 to 5 mV, adjustable). **Input Impedance:** 100 K ohms. **THD:** 0.07%. **S/N Ratio** (IHF, A-Weighted): More than 70 dB. **Separation** (1 kHz): Left/right, 50 dB; front/back: 30 dB. **Frequency Response:** 20 Hz to 15 kHz.

Amplifier Section: Continuous Power Output: (20 Hz to 20 kHz, all channels driven) 40 w/channel, 8 ohm loads in 4-channel mode; 60 w/channel, 8 ohm loads in 2-channel mode; (At 1 kHz): 44 watts x 4 or 65 watts x 2. **THD:** 0.3% at rated output. **IM:** 0.3% at rated output. **Power Bandwidth:** 7 Hz to 40 kHz. **Damping Factor:** Greater than 35. **Input Sensitivity:** Phono 1, 2: 2.5 mV; Aux, Tape Monitors: 150 mV. **Frequency Response:** Phono, RIAA ± 1 dB; Aux, Tape Monitors, 7 Hz to 25 kHz, +0.5, −1.0 dB. **Hum and Noise:** Phono, 70 dB (IHF, A network); Aux, Tape Monitors, 90 dB. **General Specifications: Power Consumption:** 250 watts maximum. **Dimensions:** 22 1/16 in. W x 6 5/16 in. H x 17 5/16 in. D. **Weight:** 49 lbs., 5 oz. **Price:** $699.95, including walnut cabinet.

U. S. Pioneer Electronics was not the first popular maker of high fidelity components to offer so-called "everything-in-one" four-channel receivers to the American quadraphile, but from all indications we have been able to get from dealers in this area, their introduction of three such units in mid-1973 was met with almost immediate acceptance and success. The QX-949 is the highest-powered of the three and turns out to be one of the most impressive receivers (visually and technically) we have ever tested.

Its long, elegant, three-dimensional gold and black front panel has enough controls on it to delight the most demanding knob-twirler and yet, when viewed overall, is executed without imposing a cluttered feel. The upper portion of the panel projects forward slightly, its blacked-out dial area illuminated in blue when power is applied. At the left is a most unique visual display that looks like an oscilloscope tube but is, in fact, a four light-beam display for direct viewing of each of the four audio channel levels. Green light beams radiate at 45-degree angles from the center outward, increasing their length with increased audio level. Surrounding this display are four small level controls which serve to balance or equalize levels of all four channels. Sensitivity of the display is adjustable over a 30 dB range, using a pair of pushbuttons (−10 dB and −20 dB) located nearby, so that the visual pattern is useful for channel balancing at almost all listening levels. Besides the display sensitivity buttons, the line of buttons below the dial scale area includes a power on/off switch, four speaker selector buttons (which afford individual control of front and rear speakers, both local and remote), the loudness switch, tape monitoring selectors (one for a 2-channel deck, and two more for a pair of 4-channel tape machines), an additional switch for yet another circuit-interruption circuit (for connection of Dolby noise reduction or other accessories), an MPX noise filter and an FM muting on/off switch. The dial area of the receiver also contains center-tune and signal strength meters combined in one meter face, a large tuning knob and ten separately illuminated lights which indicate program source, the various 2-channel and 4-channel modes

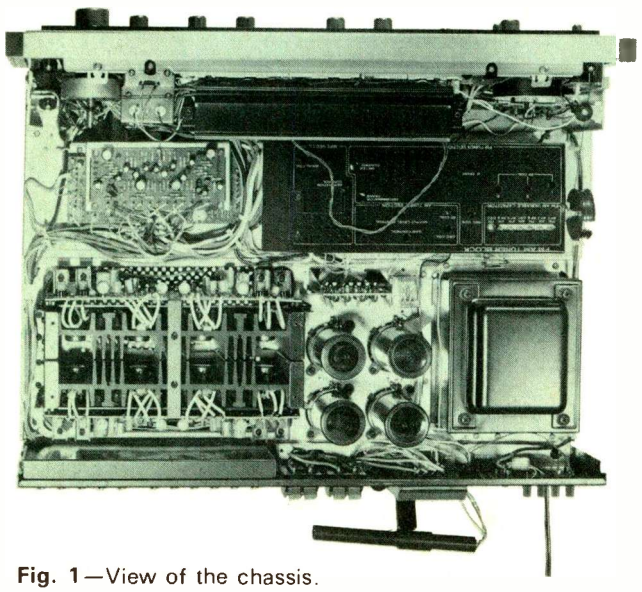

Fig. 1—View of the chassis.

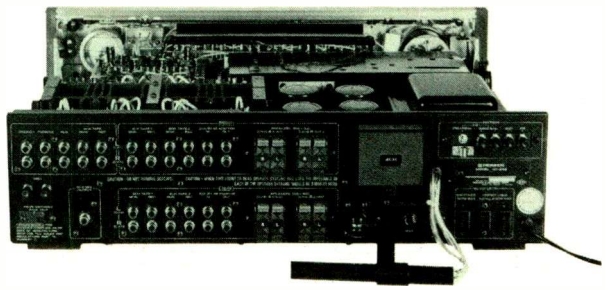

Fig. 2—Rear panel layout.

and reception of a stereo FM broadcast. Next to the CD-4 indicator light (which merely denotes selection of the CD-4 mode switch setting), a red pin-point light glows whenever a CD-4 record is played.

The lower portion of the panel includes a master volume control, a pair of bass and treble controls for front channels, plus a separate pair for adjusting response of rear channels, low and high frequency filter pushbuttons, a four-position mode switch (with settings for 2-channel, CD-4, Regular Matrix and SQ Matrix decoding) and a six-position program selector switch. Flanking the master volume control are a pair of separation adjustment controls used to optimize front-back separation when first installing the CD-4 cartridge. The location of these controls directly below the visual channel level display makes this one-time adjustment extremely easy to perform, using the 7-inch test record supplied with the receiver. There are also a pair of phone jacks in this area which will accept four-channel headphones (or, of course, stereo phones). Directly below the selector switch, under the receiver chassis, is another calibration control used to adjust 30 kHz carrier sensitivity of the CD-4 demodulator circuitry when first installing the cartridge, using the aforementioned test record.

The rear panel layout, shown in Fig. 2, should give you some idea of the extreme versatility of this product. There are two sets of phono inputs (either one of which or both can be used for CD-4 or stereo cartridge inputs), tape monitoring in and out jacks for the varieties of two- and four-channel tape decks mentioned earlier, plus what amounts to yet a fourth monitoring circuit in and out jacks (for all four channels) useful when connecting a separate Dolby unit or any other device requiring a circuit insertion point plus circuit interruption. Piano-key speaker terminals for two full four-channel speaker systems permit connection of all speaker wires by simple insertion of stripped ends into a small hole when "keys" are depressed. An AM ferrite bar antenna is pivotable in two planes for best orientation. 300-ohm and 75-ohm FM antenna input terminals are provided, with the latter terminal thoughtfully augmented by a screw-down clamp for grounding the outer conductor and retaining the coaxial cable securely in place. At the extreme right are a pair of unswitched and one switched a.c. receptacles for connection of other components and a line fuse arrangement permits changeover of power supply to accommodate a variety of domestic and overseas power line voltages from 110 volts to 240 volts.

Between the antenna terminals and the front speaker terminals is a small covering bracket with a slot disclosing the printed notation "4 CH." When this bracket is loosened and lifted up, a multiple pin connector is disclosed. The connector can be unplugged, inverted and replugged for "boosted power" 2-channel operation of the receiver which we shall discuss presently. Unscrewing the cover automatically turns off power to the receiver and, when the cover is refastened, the notation "2 CH" now shows through its opening.

Circuit Features

Figure 1 shows the internal layout of the QX-949 chassis. Extensive shielding is used over the entire r.f. and i.f. sections, with designated alignment holes available for factory and service alignment without having to remove major shielding structures. Construction is modular, with a minimum amount of interboard wiring in an extremely orderly layout, considering the vast amount of circuitry involved. The output circuitry is direct-coupled complementary, with no output capacitors required, and operates from dual positive and negative 36 volt supplies (+45, -45 Volts in the two-channel boosted power mode), filtered by four 10,000 μF filter capacitors. The FM front-end employs two dual-gate MOS-FET's and a four-gang variable capacitor. The i.f. section includes three 2-element ceramic filters, a three-stage differential amplifier, diode limiter and a quadrature detector circuit and a multi-purpose IC forms the heart of the stereo-FM decoding circuit. The AM tuner section also employs ceramic filtering, plus an IC i.f. system and a three-gang variable capacitor. RM, SQ and CD-4 circuits and we counted no less than twenty-three transistors, eight FET's and three IC's in the CD-4 sub-carrier section alone! A phase-lock-loop circuit is incorporated in the CD-4 circuitry. Total semi-conductor complement of the QX-949 is 14 FET's, 7 IC's, 113 bi-polar transistors and 69 diodes.

Power Boosting Feature

The idea of boosting power for two-channel operation (both as a sales feature for the prospective customer who is not ready to invest in two extra speakers and as a practical consideration of maximum acoustic energy in the listening room under both stereo and quadraphonic listening conditions) in a four-channel receiver has become popular with many manufacturers of four-channel receivers. Most of the receivers we have tested up to now accomplish this increased power in the two-channel mode by utilizing a circuit which has been called "strapping." This technique involves the parallelling of pairs of power amplifiers and the addition of an extra phase inverter stage to supply proper drive to the combination. When strapping is used, speaker terminals are no longer referenced to common ground. In fact, the use of a common ground in such instances results in immediate fuse-blowing or activation of circuit protection devices and this has posed a problem in some instances (particularly in dealer displays which often use common ground wiring in their demonstration panels). Pioneer has approached the problem differently in the QX-949. Instead of parallelling output amplifiers, when the rear connector is re-inserted for 2-channel operation, power supply voltage is removed from the output stages of the back channel amplifiers and the voltage is increased on the front channel amplifiers from about 36 volts (plus and minus) to about 45 volts. By using conservatively rated output devices which can operate safely at this higher voltage, signal output swing can be increased substantially, increasing power output per channel from its nominal 40 watts to 60 watts. Because the back channel output circuits are no longer drawing current, the power supply is more than capable of supplying the extra current needed for the higher powered two-channel mode. This system has an additional advantage, in that speaker connections can remain intact when switching from two- to four-channel power mode or vice versa. It should be pointed out that the front panel mode switch does permit two-channel (front speakers only) listening without having to alter the rear connector plug for A-B comparisons of stereo versus quadraphonic effects, but under those circumstances the front channel power is limited to its nominal 40 watts per channel value.

Laboratory Measurements

Figure 3 graphs some of the FM performance characteristics of the QX-949. Mono IHF sensitivity measured 1.7 μV, against 1.8 μV claimed and sensitivity was extremely consistent at all frequencies. 50 dB of quieting was reached with a signal input of only 2.7 μV while ultimate S/N at stronger signal inputs reached a highly acceptable 72 dB. Mono distortion was actually lower than the very excellent published figure of 0.2%, measuring a minute 0.18% for all signal input levels above 10 microvolts. In stereo, ultimate THD was 0.38%, again a bit better than the 0.4% claimed, while stereo S/N measured 66 dB. Stereo separation, plotted in Fig. 4, was the best we have measured on any receiver tested, reading 50 dB at mid-band frequencies and 40 dB or better from 50 Hz to 10 kHz and 36 dB at 15 kHz—the highest audio frequency transmitted in FM. Mono THD remained well below 0.5%

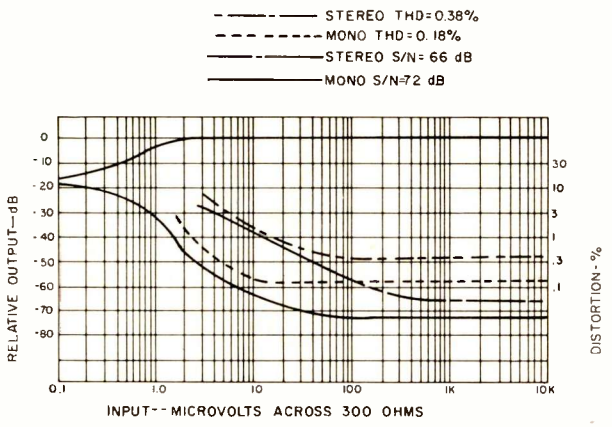

Fig. 3—FM quieting and distortion characteristics.

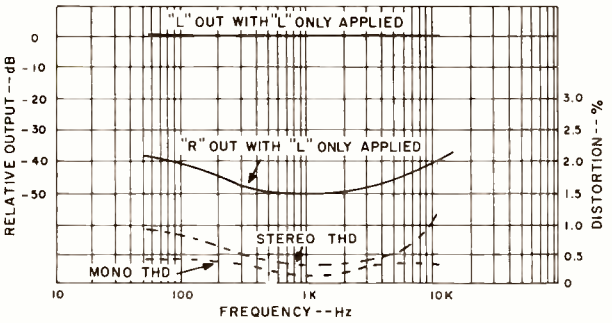

Fig. 4—Separation and distortion vs. frequency.

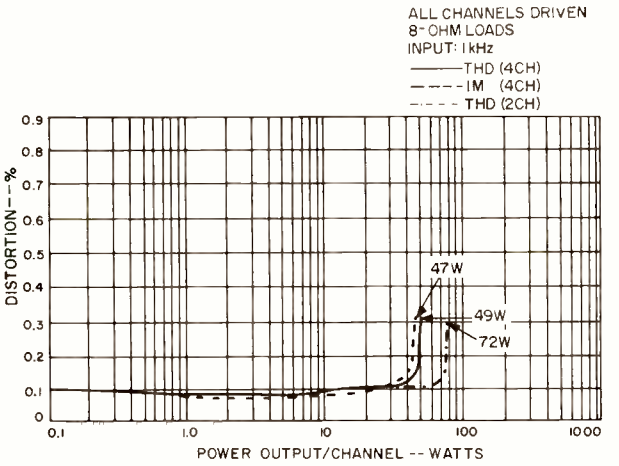

Fig. 5—Harmonic and intermodulation distortion characteristics.

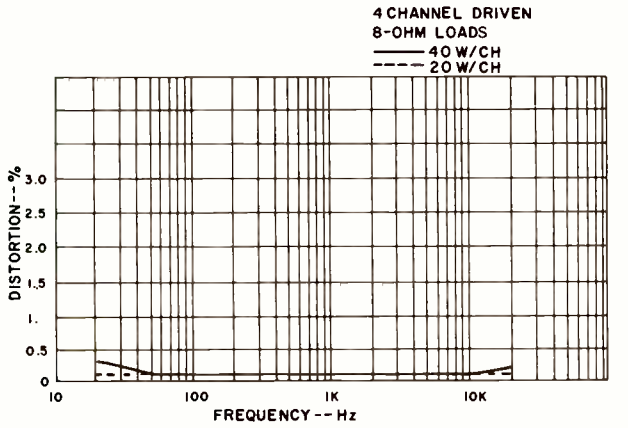

Fig. 6—Distortion vs. frequency.

for all audio frequencies measured, while stereo THD reached a maximum of just under 1.0% at the frequency extremes, remaining well under 0.5% for mid-band frequencies. The low THD figure at high audio frequencies in stereo is particularly significant because it confirms the virtual absence of "beat frequencies" so often observed on competitive products in the stereo decoding mode.

Amplifier measurements were performed in both the four-channel and the "power boosted" two-channel mode and an indication of power output capability is plotted in Fig. 5. Pioneer's published specs have traditionally been very conservative, and the QX-949 is no exception. The manufacturer is careful to specify 20 Hz to 20 kHz power output per channel as well as 1 kHz mid-band power and in both cases, our measurements turned out better than their claims. We measured 49 watts per channel at 1 kHz before reaching rated THD of 0.3% in the four-channel mode, and 72 watts per channel in the two-channel mode. At all power levels below clipping, THD was well below 0.1% with absolutely no evidence of rising "crossover" or notch-distortion at very low power output levels. At the nominal 40 watt power level, THD barely reached 0.1%. Rated IM distortion of 0.3% was reached at 47 watts per channel in the four-channel mode.

Proof of the QX-949's power output capability over the entire audio range is shown in the graph of Fig. 6. Even at 20 Hz, THD for 40 watts/channel output is still just under rated THD of 0.3%, while at the high frequency extreme, THD measured about 0.2%. At half power level, the THD versus frequency plot is virtually a straight line hovering well below 0.1% for any frequency measured. Power bandwidth, shown in Fig. 7, extends from 5 Hz to 50 kHz—again substantially better than claimed while tone control range, high and low cut filter action and loudness control action, plotted in Fig. 8, all conform nicely to expected results.

Additional measurements made on the receiver included muting threshold and stereo threshold, both of which were 3 μV. Capture ratio measured exactly 1.0 dB as claimed while selectivity was 82 dB and AM suppression measured 58 dB against the 55 dB claimed. RIAA equalization was accurate to within 0.5 dB from 30 Hz to 15 kHz in the stereo mode (we could not measure this parameter easily in CD-4, but since the same equalizer circuits are used for both services we can presume equalization is equally accurate for CD-4 record playing). Phono overload occurred at an input level of about 120 mV (rms) which, related to the 2.5 mV input sensitivity of both phono inputs, should (and did) provide enough dynamic range for even heavily modulated records.

CD-4 Circuit Performance

Adjustment of CD-4 separation was positive and precise and we noted in particular that the 30 kHz carrier adjustment was not at all critical. Distortion-free results were obtained for all but about one-quarter of the most counterclockwise rotation of this control. Chances are you would never have to lift the set to get at this control at all (which may be why it was placed in such an out-of-the-way place by Pioneer's designers in the first place). In listening to several newly obtained test records (aside from the calibration record supplied) we were impressed not so much by the excellent front-back separation (which was better than 25 dB and probably limited by cartridge capability), but by the fact that what little crosstalk we did hear was very free of audible distortion—an important quality not altogether true with some other CD-4 products we have had an opportunity to use.

The SQ and Regular Matrix decoders performed well, though the spatial effects achieved when listening to these types of records weren't up to the "discrete" separation of CD-4 (both matrix circuits are basic types, with no logic or

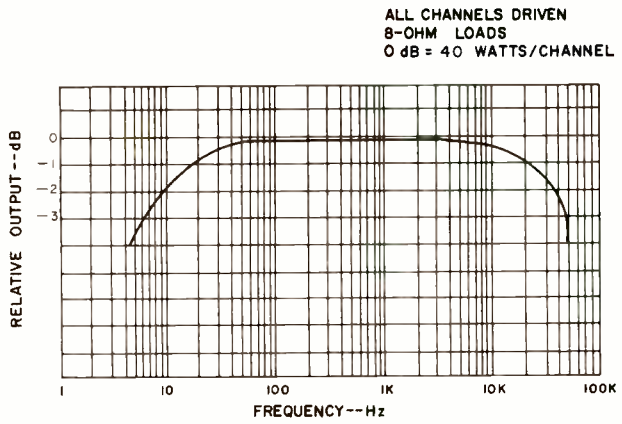

Fig. 7—Power bandwidth characteristics.

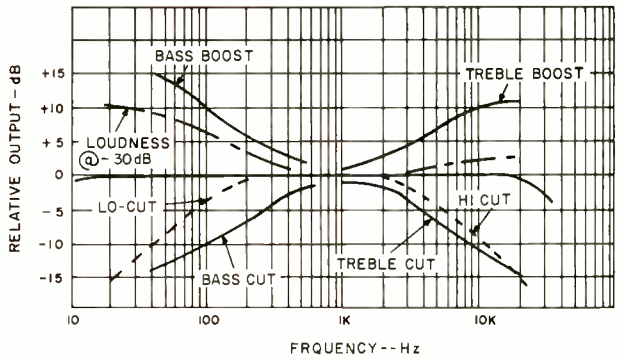

Fig. 8—Tone control range, filter and loudness characteristics.

gain riding circuitry provided). The four-channel light display is a tremendous aid, not only in establishing correct channel balance but in helping the listener to really "see" what's going on in all four channels at a single glance. In its own way, it is probably easier to view and understand than four side-by-side meters which are actually harder to "read" all at once.

The Pioneer QX-949 is equipped with an electronic-plus-relay protective circuit and the relay also serves to delay turn-on by about three seconds, so there are no pops or thumps when power is applied. Muting circuitry on FM is positive and with its 3 microvolt threshold, its continued use does not exclude the reception of very weak signals. We logged no more FM stations with the mute switch defeated than with it activated and yet we were able to enjoy silent interstation tuning—the true mark of a good and properly designed muting circuit. Audio quality of the QX-949 was superb, and there was ample power available for our inefficient air-suspension speaker systems at any listening level. We did some listening in the two-channel power-boosted mode, too, and there was no difference in tightness of bass or overall listening quality from one mode to the other. Hours of continued high-level listening resulted in a very moderate increase in cabinet temperature in the vicinity of the output circuit heat-sinks, all of which are vertically mounted directly under the ventilation grille of the walnut enclosure. During our bench tests, we deliberately overdrove the amplifier (all four channels) for several minutes into four-ohm loads and the only thing that happened was a "click" of the protective relay after several minutes. We removed the input signal but left the power turned on. After about five minutes, the relay clicked again and we were back in business. No musical input, however loudly played, was able to trigger the protective circuitry though the circuit does offer full protection in the event of speaker cable shorts or other high output current conditions.

Having tested and lived with the Pioneer QX-949 for several weeks now, it is easy to understand why this receiver and its lower powered, lower priced companion units, QX-747 and QX-646, have gained such favor with the knowledgeable audio enthusiast who is looking for an "everything" receiver. It would be very difficult to come up with any features in a four-channel receiver that Pioneer hasn't already thought of in this powerful unit. *Leonard Feldman*