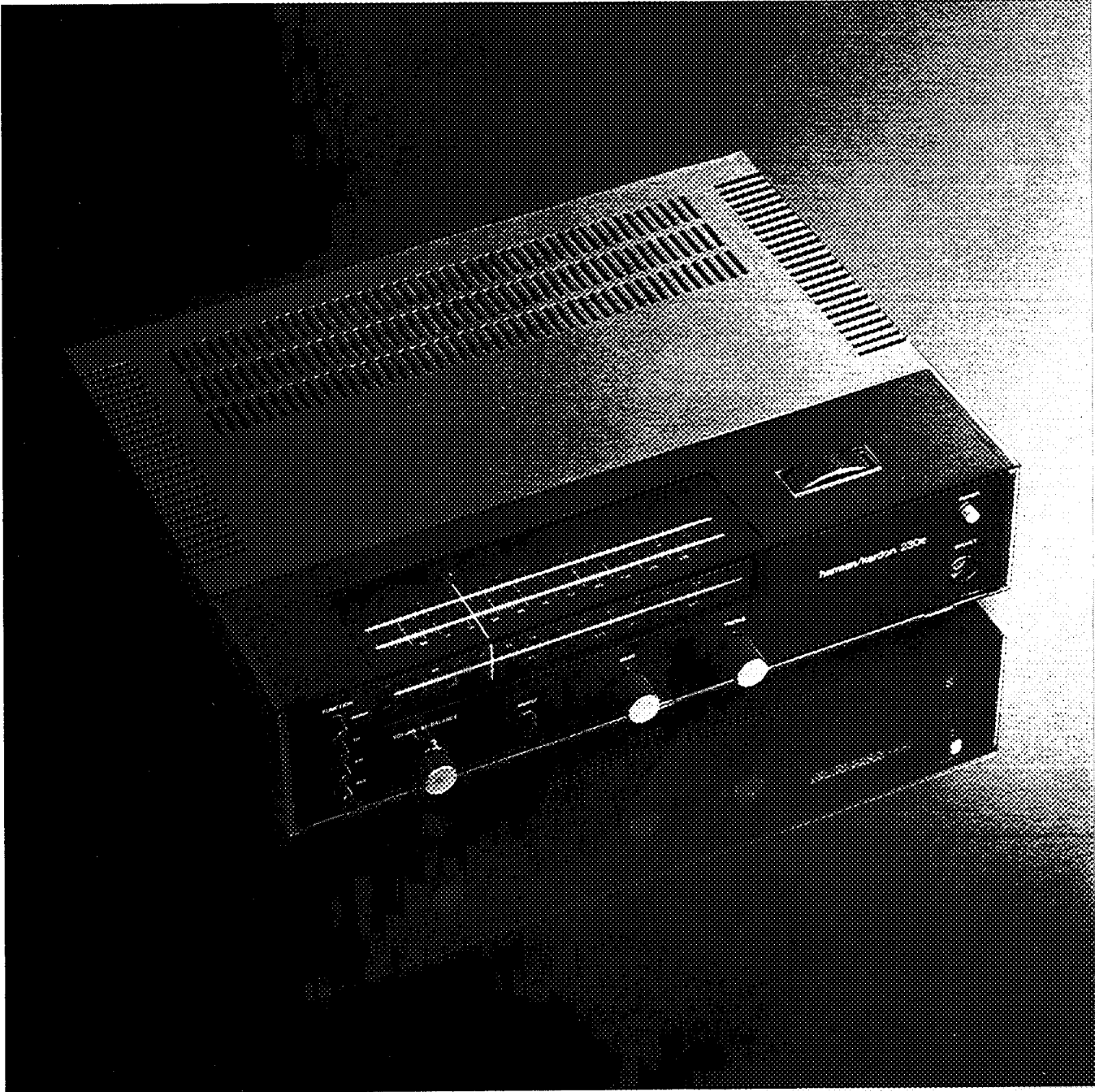


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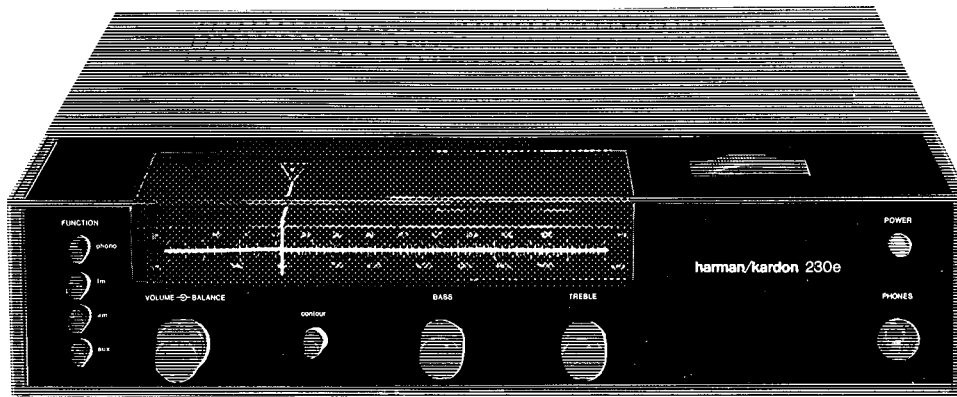
230e

Owner's Manual



Special Features

The 230e is a stereo receiver engineered for superior sound quality and ease of operation. We trust that you will find using the 230e as satisfying an experience as we enjoyed in designing it.



Wide power bandwidth and superb square wave response — as in our most expensive models — for audibly superior sound.

Front panel headphone receptacle with automatic speaker cutout.

Advanced speaker protection circuit, using resettable circuit breakers.

Sensitive 3-gang FM front end.

IF ceramic filters for selective FM tuning.

Double dial scale for precise tuning and maximum convenience.

Separate logging scale to aid tuning.

Warning: To prevent fire or shock hazard, do not expose this receiver to rain or moisture.
Warning: Do not plug the unit in until all connections have been made.

Connections

Installation

The 230e requires adequate ventilation. It should not be installed on a cushion or rug that would prevent air from entering at the bottom, and at least three inches of clearance must be provided at the top to allow air to escape. In addition, a minimum of two inches clearance should be provided at the back of the unit.

Preparing Speaker Wire

Use two-conductor stranded wire to connect your speakers to the 230e. Eighteen gauge lamp cord (zip cord) is satisfactory, but a heavier gauge (with a lower number) is preferable, especially for distances over 25 feet. Do not drive staples or tacks through the center of the wire, for this may short out the two conductors and consequently decrease volume or eliminate sound entirely.

Cut two segments of wire approximately equal in length. Both should be long enough to reach the farther speaker comfortably. Separate the conductors at each end of the wire segments for a length of two or three inches. Then carefully remove about one-quarter inch of insulation from each free end. Twist the strands of each conductor so they are smooth and tight, without any loose strands.

Lamp cord usually provides a "code" which differentiates the two conductors. A conductor may be coded by a rib, sharp corner (A), or indentations molded along the length of the insulation (B). In some cases, a thin colored thread is molded inside the insulation, along with one conductor (C). In others the coded conductor is darker in color (D).

Connecting Speakers

Your 230e was designed to perform with 8- or 16-ohm speakers. Connect the bare ends of one segment of lamp cord to your right speaker system. Connect the coded conductor to the speaker's positive ("+") terminal, and the uncoded conductor to negative ("-"). (The "+" and "-" markings are in general use, although some speakers use other labeling systems, such as "1" and "2," "A" and "B," and so on.) Find the row of four connectors on the back panel of the 230e marked SPEAKER 8-16 OHMS. Push in on the red plastic head of the connector marked RIGHT to reveal an opening in the top. Insert the bare end of the coded conductor into the opening. Release the connector. The conductor should now be locked firmly into place. Insert the uncoded conductor into the adjacent black connector marked GND

Repeat the procedure for the left speaker system, taking care to observe the coding of the conductors as described for the right speaker.

If the code has been followed as described, your speakers will have been connected "in phase." Phasing is important for solid bass and precise lateral location of the sound source. The Operations section of this manual will describe a listening test that permits you to check for proper phasing after you have completed the other connections.

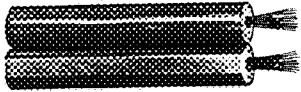
Connecting AM Antennas

Caution: Do not mistake the ferrite loopstick AM antenna for a handle. Its bracket cannot support the receiver.

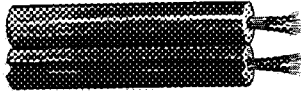
The ferrite loopstick AM antenna on the rear of the 230e can be swivelled to improve the reception of distant stations. AM reception over extremely long distances can be obtained with an external "long wire" antenna. The terminal marked AM ANT provides connection for such an antenna. High fidelity dealers, especially those who have experience with amateur and shortwave radio, can supply an appropriate long wire AM antenna.

Connecting FM Antennas

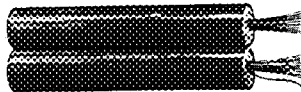
A T-shaped (dipole) FM antenna is supplied with the 230e. However, reception will be greatly improved if the tuner is connected to an outdoor FM antenna



A



B



C



D



system. If you live in a fringe reception area, or if your house is situated among obstructions (such as mountains or tall buildings) you may need a powerful, directional FM antenna. Your dealer can help you select an outdoor FM antenna that is right for your reception conditions.

Some apartment buildings provide a master television antenna system that may be used for FM. Some cable television systems in private homes may also be used for FM reception. However, some master antenna and cable systems deliberately filter out the FM band and will not offer superior FM reception. Consult your building superintendent or cable supplier if you have questions regarding the suitability of these systems.

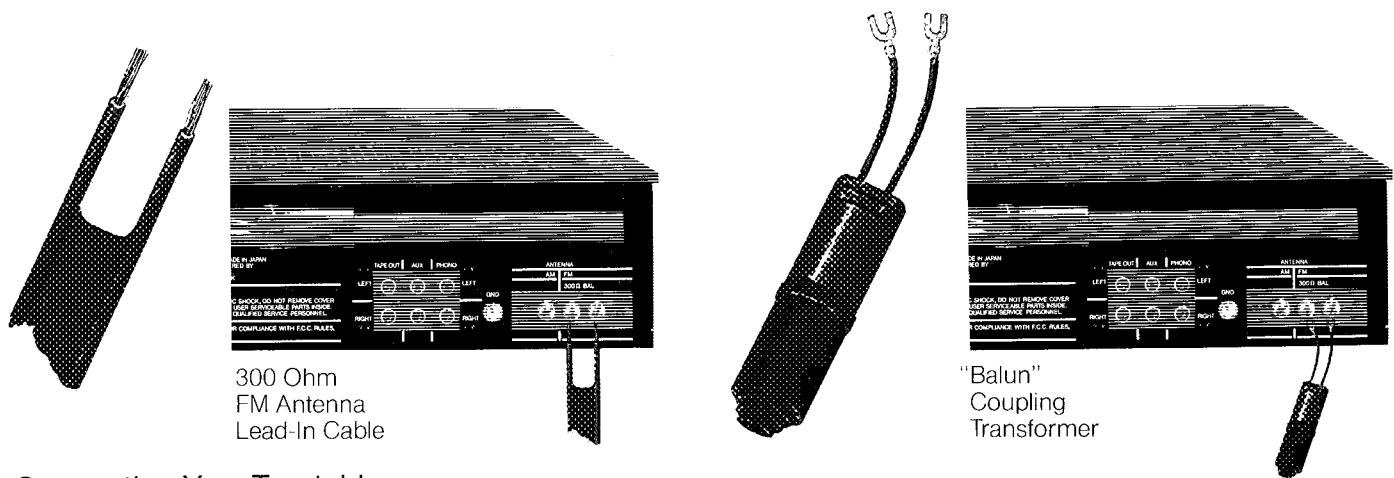
Two types of antenna lead-in cable — 300 ohm and 75 ohm — are commonly used. Three-hundred ohm cable can be connected directly to the 230e, while 75 ohm cable requires a "balun" coupling transformer, available at television and electronics parts supply stores.

Three-hundred ohm cable is flat with a conductor at each edge. If the cable does not end in bare conductors or lugs, carefully cut away about 1½ inches of insulation material from the center of the cable, making sure not to damage either conductor. Strip off about one-quarter inch of insulation from each conductor. Connect one conductor to each of the two terminals marked 300Ω BAL on the rear of the 230e.

Seventy-five ohm cable is round. Connect the cable to a "balun" coupling transformer and connect the transformer to the 300Ω BAL terminals on the rear of the 230e.

If no outdoor antenna is available, connect the lugs of the dipole (supplied with the receiver) to the 300 Ω BAL terminals.

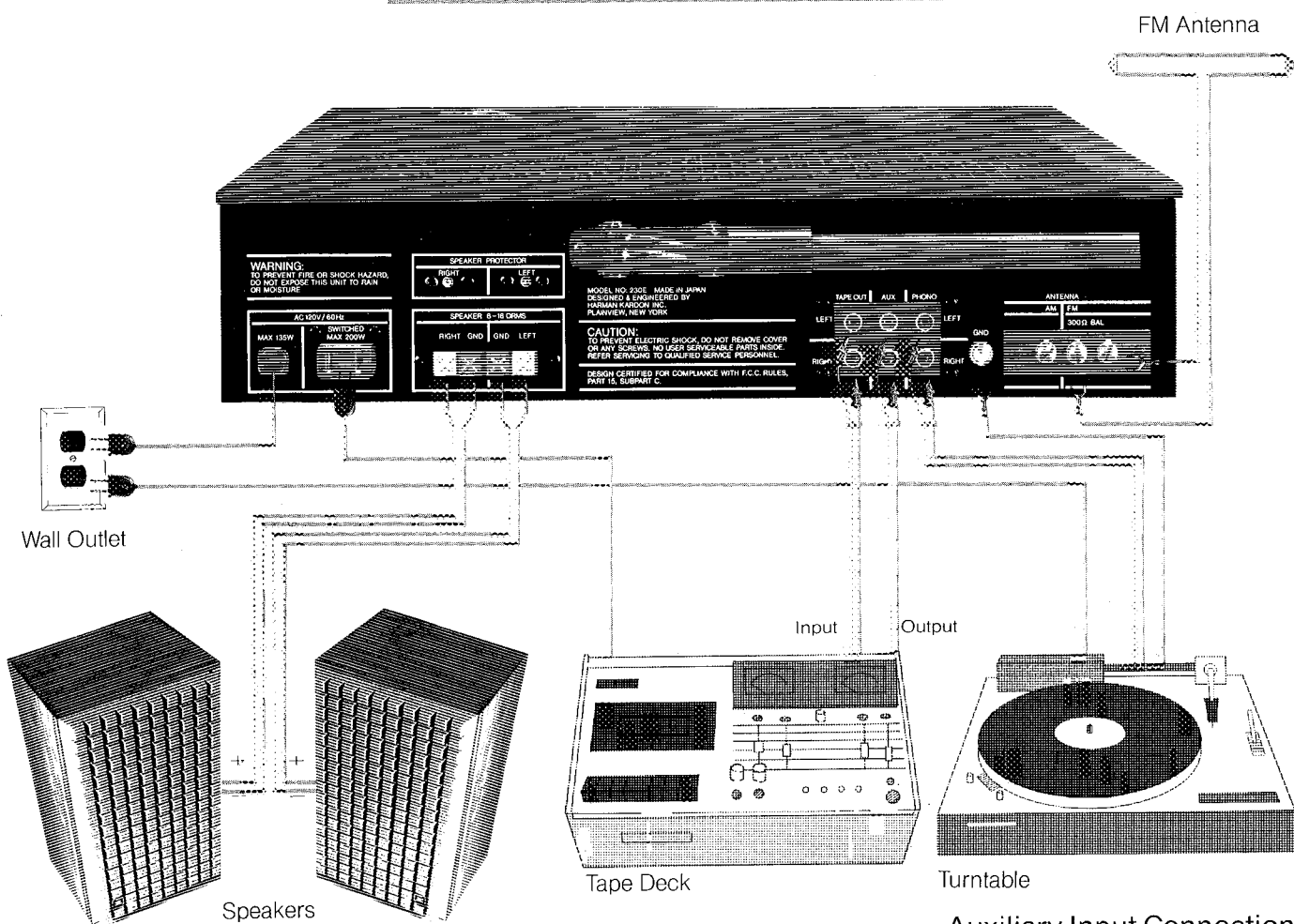
The position of the dipole antenna is important for optimum reception. It will perform best if its arms are carefully extended in a straight horizontal line and the antenna is turned so that it faces the station's transmitter. You may simply choose to tack the antenna to the back of a shelf or affix it to a wall.



Connecting Your Turntable

The PHONO inputs of the 230e have been designed to operate with a high-quality magnetic phono cartridge. Do not use turntables with ceramic phono cartridges.

Turntables are supplied with their own signal cables. Consult the turntable owner's manual and determine which of the cables is the left channel signal cable. Insert the plug of the left channel signal cable into the upper PHONO receptacle. Insert the plug of the right channel signal cable into the lower PHONO receptacle. Press both plugs in as far as they will go so that they are seated snugly. If the turntable has a separate ground wire connect it to the knurled lug marked GND on the 230e.



Auxiliary Input Connection

The AUX inputs of the 230e provide for playback with a cassette, cartridge, or open-reel tape deck (as well as other "high level" sources discussed below). Use the signal cables provided with your tape deck to connect the left and right outputs of the tape deck to the AUX inputs of the 230e. Push all plugs in as far as they will go so that they are firmly seated.

Other possible auxiliary sources include a special tuner for long wave, marine, aircraft, citizens' band, or the audio output of a television set. Consult your dealer for information as to the variety of equipment that is compatible with the electrical characteristics of the 230e.

Tape Output Connections

The TAPE OUT receptacles of the 230e provide for recording with a cassette, cartridge, or open-reel tape deck. Use the signal cables provided with your tape deck to connect the TAPE OUT receptacles of the 230e to the left and right inputs of your tape deck.

AC Convenience Outlet

The AC outlet on the rear panel of the 230e provides up to 200 Watts of power for a turntable, tape deck, or other equipment. The outlet is marked SWITCHED and is "live" only when the receiver is switched on.

Power Requirements

If you have completed all the connections you wish to make, you are now ready to plug the 230e into any outlet furnishing 120-volt, 60-Hz current.

Operation

Power

The POWER switch is located on the right side of the front panel, and is on in the depressed position. When the power is on, the dial scales will be lighted.

Selecting Function

Four pushbuttons on the left side of the front panel allow you to choose PHONO, FM, AM, or AUX inputs.

FM Tuning

Press the FM pushbutton and advance the VOLUME control to the 9 o'clock position. Note the FM dial scale, calibrated from 88 to 108mHz. Rotate the tuning control to tune in a station. The light-emitting diode (LED) on the dial pointer will glow when you have tuned to the center of a broadcast channel.

Tone Controls

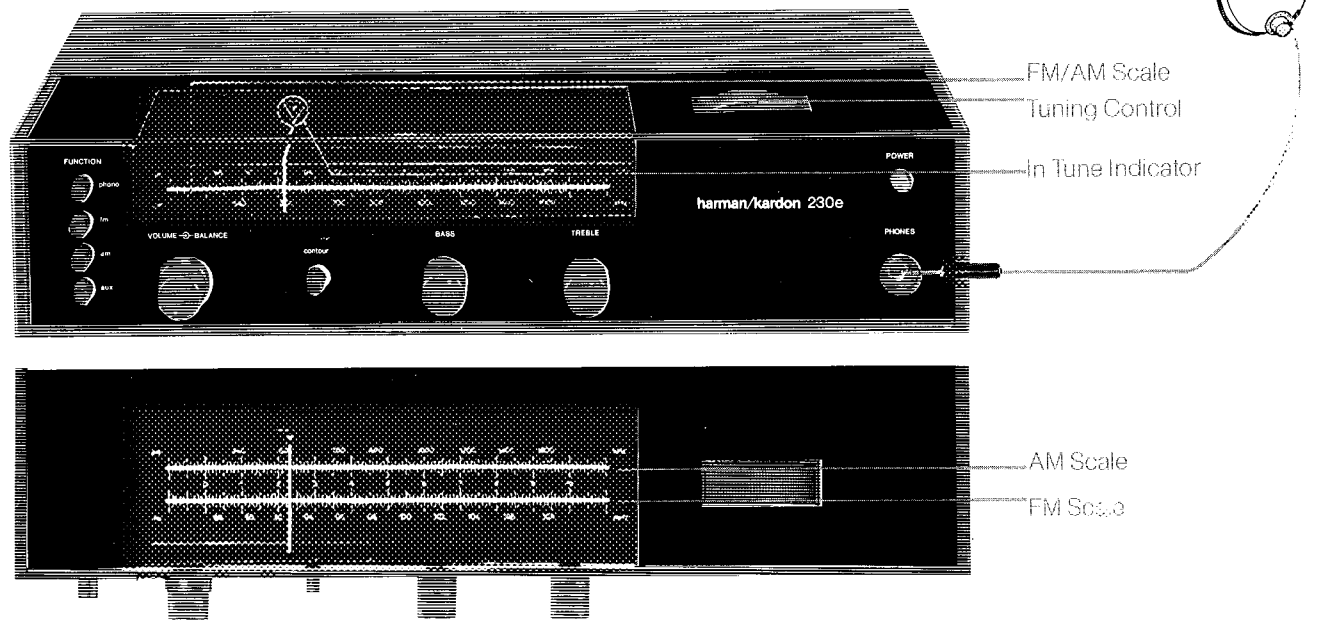
To increase the loudness, turn the VOLUME control clockwise. The BALANCE control shifts the loudness to one speaker or the other. Turning the control counterclockwise from its neutral (12 o'clock) position will shift the sound to the left speaker by reducing the loudness of the right. Turning the control clockwise from neutral will have the opposite effect.

The BASS and TREBLE controls affect the frequency content of the program material of both channels simultaneously. Their neutral positions are at 12 o'clock. Turning the TREBLE control clockwise raises the high frequency content of the music. Turning the control counterclockwise lowers the high frequency content. The BASS control has the same effect on the low frequencies.

When the CONTOUR switch is depressed, the very high and very low frequency content of program material is boosted at low settings of the VOLUME control. This action compensates for the human ear's relative insensitivity to extreme frequencies at low volume levels. As the VOLUME control is advanced, the CONTOUR effect decreases. The CONTOUR switch has little effect at VOLUME control settings beyond 12 o'clock.

AM Tuning

Press the AM pushbutton and tune according to the AM dial scale, calibrated from 540 to 1600kHz. For your convenience, a third scale, the logging scale, with arbitrary numbers from 0 to 10, allows you to find your favorite stations easily. All you need remember is that a particular AM or FM station appears at a certain number on the logging scale.



Speaker Phasing

Speaker phasing refers to the connecting of two stereo speakers to the receiver in the same way. That is, the red terminal on the 230e should be connected to the positive speaker terminal in each case, and the black to negative.

If you have followed the suggestions on speaker wire coding mentioned under Connecting Speakers, your speakers should already be in phase. Now that you are listening to sound, you can check the phasing by ear if you wish.

The diaphragms of speakers that are in phase with each other move simultaneously in the same direction in response to the same signal from the 230e. The aural result is firm, solid bass and precise lateral location of the sound source. Speakers that are out of phase produce weaker bass and less coherent, less precise location of the sound.

To check for proper phasing by ear:

1. Play an AM broadcast with a single speaking or singing voice, or a solo instrument.
2. Stand in a position equidistant between the two speakers. If the voice or instrument appears to be coming from an area directly between the two speakers, the speakers are in phase. If the sound appears to be coming from two individual speakers, they have been connected incorrectly and are out of phase.

To correct phasing, reverse the positive and negative conductors at the terminals of only *one* speaker. The speakers will now be in phase.

To Play Records

Press the PHONO pushbutton, activate your turntable, and advance the 230e VOLUME control clockwise to a comfortable level.

If at average listening levels you hear objectionable (that is, easily audible) hum, turn the POWER switch off and check the rear panel PHONO connections. Make sure that the turntable's signal plugs are firmly seated in their receptacles. Sometimes unplugging the power line cord of either the turntable, the 230e, or both, and reversing the orientation of the plug(s) will reduce hum. If hum is still present, disconnect the ground wire that goes from the turntable to the 230e. Some turntable-cartridge combinations will produce less hum this way.

Tape Decks and Other Auxiliary Sources

You can listen to an auxiliary source (including a tape deck) by pressing the AUX pushbutton, activating the auxiliary source, and advancing the VOLUME control to a comfortable level.

The TAPE OUT receptacles allow you to record whatever the 230e may be playing, regardless of the input function. The VOLUME, BASS, TREBLE, and CONTOUR controls do not affect the signal at the TAPE OUT receptacles.

Headphones

A headphone receptacle on the front panel allows private listening. The output to the speakers is automatically cut out when headphones are in use.

Speaker Protector

Circuit breakers on the 230e protect your speakers from short circuits and other conditions of excessive current. If one of your speakers stops reproducing sound, turn the 230e off and check the speaker connections. Make sure that no wire strands touch the wrong terminal. Locate the SPEAKER PROTECTOR pushbutton for that channel. Press the button in firmly and release immediately.

Cleaning the Acrylic Front Window

Remove dust or smudges with diluted liquid glass cleaner applied with a soft cloth. Do not use a strong solvent-type cleaner or ammonia, as they may cloud the windows or remove the lettering.

Specifications

Amplifier Section

Power Output:	15 watts min. RMS per channel, both channels driven into 8 ohms from 20Hz to 20kHz, with less than 0.5% THD.
Power Bandwidth:	From 10Hz to 60Hz at less than 1% THD into 8 ohms, both channels driven simultaneously at 7.5 watts per channel.
Frequency Response:	From 5Hz to 80kHz, -3dB at less than 0.5% THD.
Square Wave Rise Time:	Better than 5 microseconds.
Square Wave Tilt:	Less than 5% at 20Hz full output.
Total Harmonic Distortion:	Less than 0.5% from 250 milliwatts, to 15 watts RMS, both channels driven simultaneously into 8 ohms from 20Hz to 20kHz.
Intermodulation Distortion:	Less than 0.2% at rated power output.
System Hum and Noise:	Better than 60dB below rated output (unweighted).
Damping Factor:	30.
Input Sensitivity:	Phono: 3mV. Aux: 200mV.
Input Impedance:	Phono: 47,000 ohms. Aux: 20,000 ohms.
Overload:	Phono: 70mV at 1kHz. Aux: Related to volume control setting.
RIAA Equalization:	± 1dB.

Tuner Section

FM Sensitivity:	3.5 microvolts, I HF.
Capture Ratio:	3dB.
Image Rejection:	40dB.
Alternate Channel Selectivity:	40dB.
Multiplex Separation:	25dB at 1kHz.
Dimensions:	16"W x 14"D x 4-1/4"H. (406mm x 356mm x 108mm).
Weight:	14 lbs (6.4kg).