AM/FM STEREO RECEIVER

SX-650

OPERATING INSTRUCTIONS

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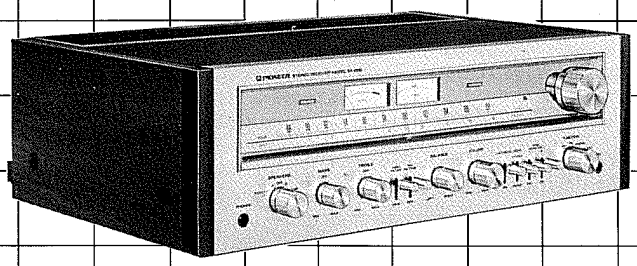


Walnut grained vinyl top, side panels and side poles are used in the construction of this cabinet.

PIONEER®

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CONTENTS

FEATURES

STABLE OPERATION IN FM TUNER SECTION

The FM front end includes junction type FET and a high precision 3-ganged variable capacitor. The IF amplifier circuit employs a high integration density IC developed by Pioneer and 2 dual element phase-linear ceramic filters with a buffer amplifier between to prevent mutual intervention. Stable multiplex circuit operation is assures by the PLL IC design to which a newly developed type of negative feedback has been applied. This design provides low distortion with a high degree of reliability. In all important respects, including station drift, image rejection ratio, S/N ratio, capture ratio, and sensitivity, the crystal clear FM reception that this tuner provides will satisfy the most discriminating taste.

WIDE POWER BANDWIDTH, LOW DISTORTION POWER AMPLIFIER

The use of a first stage differential amplifier, and a pure complementary power amplifier allows high power output over a wide bandwidth to be obtained with a very low distortion rate. SX-650 delivers

Continuous power output of 35 watts* per channel, min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.3 % total harmonic distortion.

PRE AMPLIFIER DESIGN ASSURES HIGH FIDELITY REPRODUCTION

By using a differential amplifier in the first stage input impedance variations due to frequency are minimized, and a PHONO input capability of 200mV with a distortion 0.1% at 1kHz is obtained. This, in combination with the careful selection of semiconductor used, resistor tolerances within 5%, capacitors within 2%, holds RIAA deviation to within ±0.3dB (30Hz~15kHz). You are assured of faithful reproduction of your records over a wide dynamic range with no discernible distortion.

CR type tone controls with newly developed center defeat type control knobs are used in the control amplifier section. Placing both the BASS and TREBLE control knobs in the OFF position, the tone control circuitry is bypassed and flat frequency response is obtained.

HIGH RELIABILITY PROTECTION CIRCUIT

The protection circuit and power relay are designed to instantaneously open the output circuit in the event of a short in the speaker leads or current surges which may occur without warning. This feature prevents, damage to speakers or transistors, and also prevents click noises, from the speakers during operation of the power switch.

IMPORTANT AUXILIARY FEATURES

High Filter Switch is provided to eliminate high frequency noise due to scratches on the record, it will provide 6dB/octave attenuation at frequencies above 6kHz.

Two Tape Monitor Switches permit selective recording from one tape to another when two tape decks are connected to the receiver at the same time. It is thus possible to record onto a cassette from an open reel tape deck, or vice versa.

NEW ATTRACTIVE VISUAL DESIGN

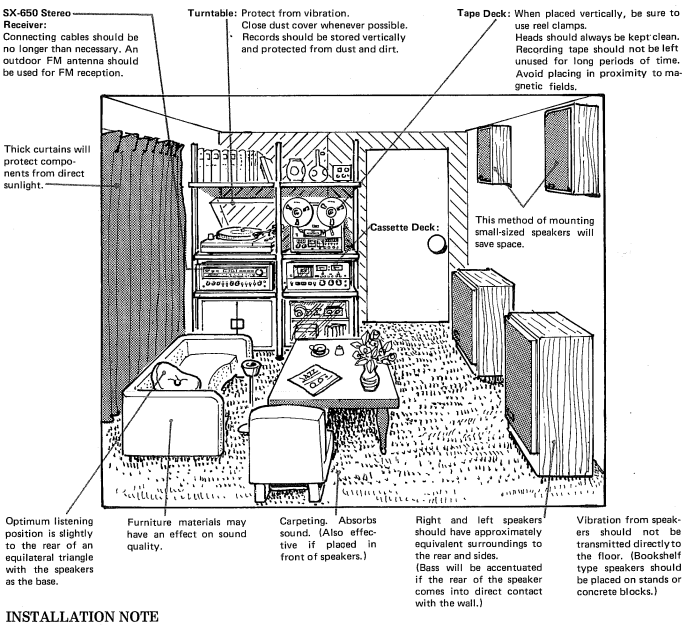
The large tuning scale provides greater readability and hence more precise tuning of the desired frequency. The front panel has been designed for improved operating convenience.

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

STEREO SYSTEM SET-UP

The SX-650 is a stereo amplifier with built-in AM/FM stereo tuner.
Used in combination with separately purchased speakers and, if you desire, other program sources such as turntable or tape deck, you can create a stereo system which will provide many hours of music listening enjoyment. With use of a microphone, moreover, the SX-650 will serve as a public address system amplifier.

Some Points to Keep in Mind when Setting Up Your Stereo System



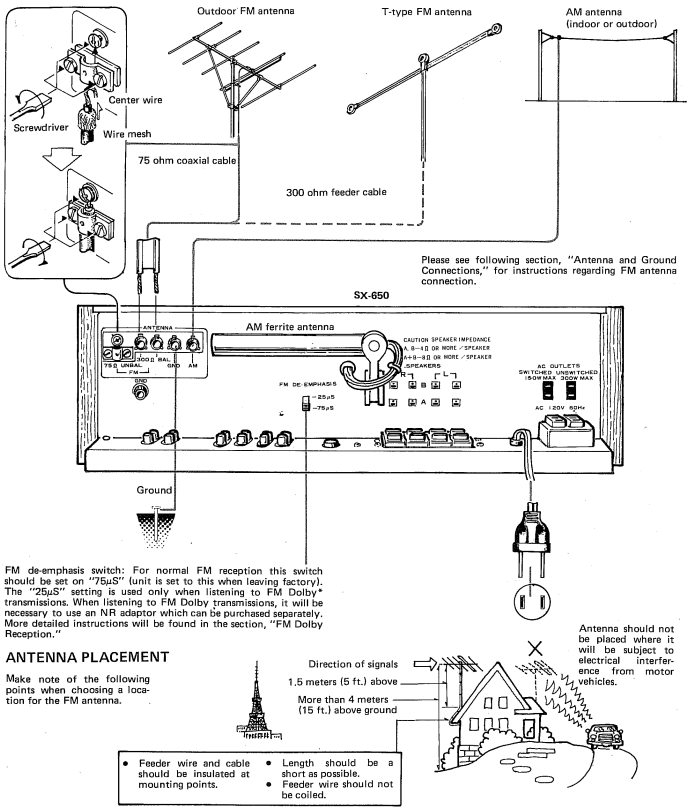
INSTALLATION NOTE

To insure trouble free operation, the following conditions should be avoided when choosing a suitable location:

- Direct sunlight or immediate vicinity of heaters, etc.
- Poor ventilation, or excessive moisture or dust.
- Surfaces that are slanted or subject to vibration.
- Spilled alcohol, insecticide sprays, etc. Highly inflammable materials.

SYSTEM CONNECTION DIAGRAM

REAR VIEW



FM de-emphasis switch: For normal FM reception this switch should be set on "75μS" (unit is set to this when leaving factory). The "25μS" setting is used only when listening to FM Dolby* transmissions. When listening to FM Dolby transmissions, it will be necessary to use an NR adaptor which can be purchased separately. More detailed instructions will be found in the section, "FM Dolby Reception."

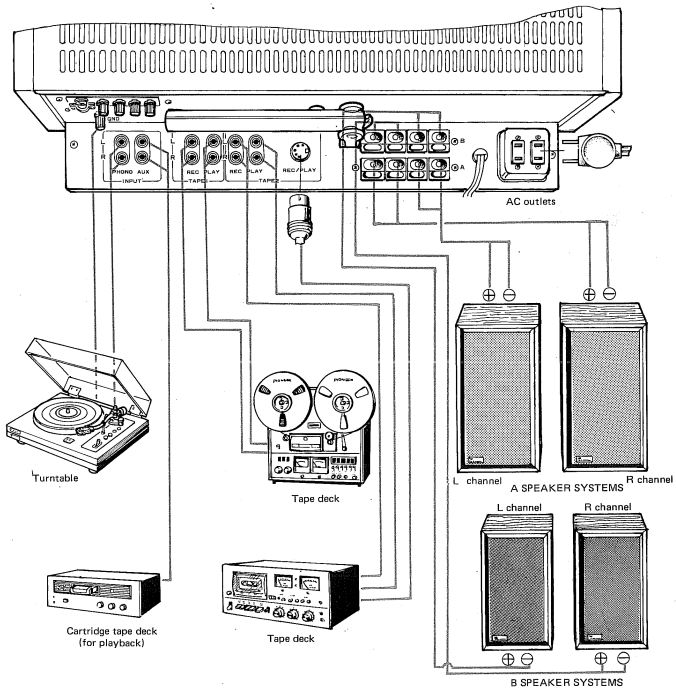
ANTENNA PLACEMENT

Make note of the following points when choosing a location for the FM antenna.

- Feeder wire and cable should be insulated at mounting points.
- Length should be a short as possible.
- Feeder wire should not be coiled.

TOP VIEW

Accessory AC outlets:
Switched . . . . . Power to this outlet is controlled by the SX-650 power switch. When power to the receiver is "ON", this outlet will provide AC current (150 watts maximum).
Unswitched . . . . . Power to this outlet is not controlled by the SX-650 power switch. As long as the power cord is plugged into a live outlet, this outlet will supply AC current (maximum 300 watts).



*The word "Dolby" is a trademark of Dolby Laboratories Inc.

SYSTEM CONNECTIONS

SPEAKER SYSTEMS

To permit connection of two sets of speakers at the same time, the SX-650 receiver is equipped with two sets of speaker terminals. In normal use, A terminals should be used (and SPEAKERS switch set on "A").

- As shown in Fig. 1, the right channel speaker (seen from listening position) is connected to terminal R and the left channel speaker to terminal L.
- The output terminals are divided according to polarity. In the SX-650, the plus speaker input terminals are connected with the plus (red color) output terminals on the receiver, and the minus speaker terminals are connected to minus (black) output terminals on the receiver.
- Connections to B terminals are carried out in the same way as for A terminals.

NOTE:
When two sets of speaker systems are being used simultaneously (SPEAKERS switch set to A + B), be sure that the impedance of each speaker system is at least 8 ohms. If speaker systems with less than 8 ohms impedance are used, malfunction may result.

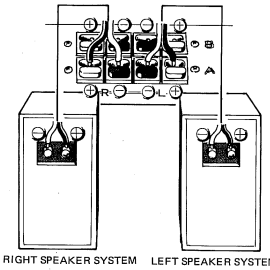


Fig. 1

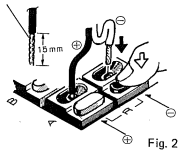


Fig. 2

Connecting Speaker Wires to Receiver Terminals

1. Strip approximately 15mm of insulation from the end of each speaker lead (Fig. 2).
2. If lead wires are not already twisted, twist the strands together so that they do not become separated.
3. As shown in Fig. 2, while pushing down the button with a finger, insert wire end in the connector.
4. Releasing the button will cause the connector to grip the wire end and hold it securely.

TURNTABLE

When using an MM (moving manget) type cartridge, the L side channel output cable of the turntable is connected to the L side PHONO terminal of the SX-650, and the R side cable to the R terminal. If a ground wire is available for the turntable, it should be connected to the GND terminal of the receiver (see Fig. 3).

Use of non-MM type Cartridges:
If a cartridge other than the standard MM type is used, the differing output voltage and impedance of the cartridge may require the use of a transformer and/or impedance adaptor. For details see instructions provided with the cartridge.

AUX TERMINALS

These are spare input jacks by means of which a television sound tuner, an 8-track cartridge tape deck, or a second tuner, etc., may be connected (Fig. 4).

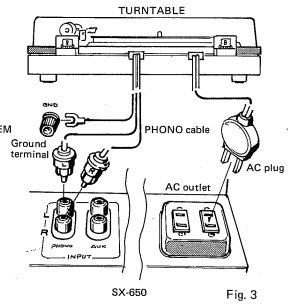


Fig. 3

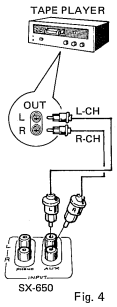


Fig. 4

ANTENNA AND GROUND CONNECTIONS

FM ANTENNA

Depending on the strength and quality of the FM transmission itself, and possible interference by mountains, steel girder buildings, etc., the FM signal received may be very weak. It will be necessary to set up an antenna appropriate for the strength of the recieved signals and the surrounding conditions.

FM outdoor antenna: As shown in Fig. 5, connect antenna feeder wire to the 300 ohm terminals of the SX-650. While FM reception is in progress, install the antenna and determine the location and mounting providing optimum signal strength. Detailed instructions are contained under, "FM Reception on page 10."

Connections using coaxial cable: In areas with heavy traffic or close proximity to factories or high tension power lines, interference may be experienced even with use of an FM outdoor antenna. If this is the case, it is advisable to use coaxial cable with a 75 ohm impedance to connect the antenna to the receiver. Connections are made as shown in SYSTEM CONNECTION DIAGRAM on page 4.

Indoor antenna: When stations are nearby and in wooden frame buildings, etc., where strong FM signals are received, the accessory T-type antenna can be used. As with the outdoor antenna, the T-type antenna is connected to the 300 ohm terminals of the receiver, as shown in Fig. 5. While FM reception is in progress, spread the ends of the antenna apart and holding it horizontally, turn the antenna through a 180° arc to determine which orientation provides the best signal. Once this orientation is decided, the antenna should be secured in determined direction to a wall or ceiling.

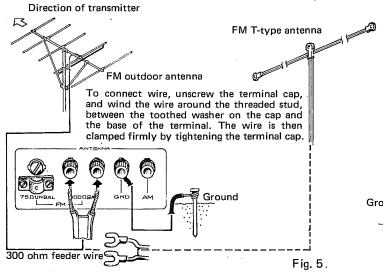


Fig. 5

AM ANTENNA

A ferrite bar antenna is provided on the rear panel of the receiver (Fig. 6). While listening to an AM broadcast, move the ferrite bar until it is in the position which provides the best reception (see section, "AM Reception").

If reception with the ferrite bar antenna is poor, a vinyl insulated wire antenna may be connected at the AM antenna terminal on the receiver.

AM indoor antenna: A single strand vinyl insulated wire 6—8m in length should be connected at one end to the AM antenna terminal on the rear of the receiver, and the other end suspended at an elevated point as shown in Fig. 7.

AM outdoor antenna: If reception is still poor with use of the indoor antenna, an outdoor antenna may be erected using single strand vinyl insulated wire, as shown in Fig. 7.

GROUNDING

While reception is possible without use of grounding, for the sake of safety and reduced electrical noise, it is recommended that the receiver be grounded by means of the GND terminal, as shown in Figs. 5 and 7.

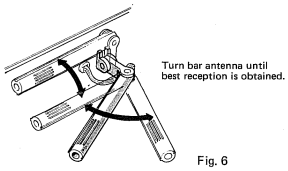


Fig. 6

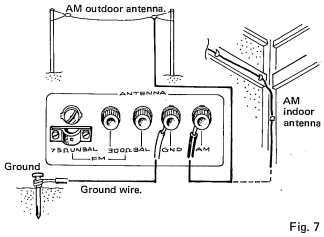


Fig. 7

FRONT PANEL FACILITIES

POWER INDICATOR LAMP
Lights when SPEAKERS switch is moved to any other position from POWER OFF, and AC power is supplied to the receiver.

SPEAKERS SWITCH
Functions both as power switch and speaker selection switch.
POWER OFF: AC power is off.
A: Sound will be heard from speakers connected to A speaker terminals.
OFF: No sound will be heard from speaker systems. This position should be used when listening with headphones.
B: Sound will be heard from speakers connected to B speaker terminals.
A + B: Sound will be heard from speakers connected to A terminals and from speakers connected to B terminals.

PHONES PLUG
Insert headphone plug into this jack when headphone listening is desired. In this case, SPEAKERS switch should be in OFF position.

BASS, TREBLE CONTROLS
When turned clockwise from the OFF position, response in bass or treble range, respectively, is boosted. Turning counterclockwise attenuates response. At the OFF position the tone control circuit is bypassed and frequency response is flat.

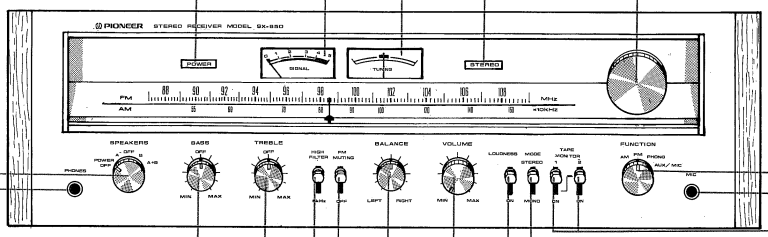
HIGH FILTER SWITCH
For high frequency noise due to scratches on the record, place switch in 6kHz position. This will provide 6dB/octave attenuation at frequencies above 6kHz. For normal operation switch should be in OFF (upper) position.

FM MUTING SWITCH
For selection of FM broadcasts, the switch should be in ON (upper) position. When switch is in the ON position, unpleasant interstation noise is suppressed. When signal strength is poor, it may not be possible to bring in the desired station if MUTING is ON. In this case, place it in the OFF (lower) position.

SIGNAL METER
For FM and AM reception, turn TUNING knob until needle of the SIGNAL meter is deflected a maximum to the right.

BALANCE CONTROL
For adjustment of relative output levels of L and R channels of speaker systems or headphones. Clockwise rotation from center position increases volume of R over L channel. Counterclockwise ration increases volume of L channel over R.

VOLUME CONTROL
For adjustment of speaker or headphone output level. Level increases with clockwise rotation of knob.



FM TUNING METER
With the needle of the SIGNAL meter deflected to the right, fine-tune FM broadcast by centering needle of TUNING meter.

LOUDNESS SWITCH
For listening at low volume level, placing this switch in the ON position will boost response in low and high frequency ranges.
The response of the human ear to low and high sound volumes is different. At low volume levels, the ear is relatively insensitive to sounds at either extreme of the frequency scale. By means of the LOUDNESS switch, these sounds are given additional amplification.

STEREO INDICATOR LAMP
Lights when FM stereo broadcast is being received.

TUNING KNOB
For selection of FM or AM stations.

FUNCTION SELECTOR
For selection of program source.
AM: AM broadcasts
FM: FM broadcasts
PHONO: Playing records
AUX/MIC: For use of component connected at AUX terminals of receiver, or microphone which may be plugged into MIC jack.

NOTE:
AUX and MIC program sources cannot be used simultaneously. When using AUX hi-fi component, microphone should be disconnected.

MIC JACK
Accepts standard 6mmϕ plug. Microphone input signal enters both R and L channels.

TAPE MONITOR SWITCHES
1: For monitoring of playback or record mode of tape deck connected to TAPE 1 terminals (REC or PLAY).
2: For monitoring of playback or record mode of tape deck connected to TAPE 2 terminals (REC or PLAY).

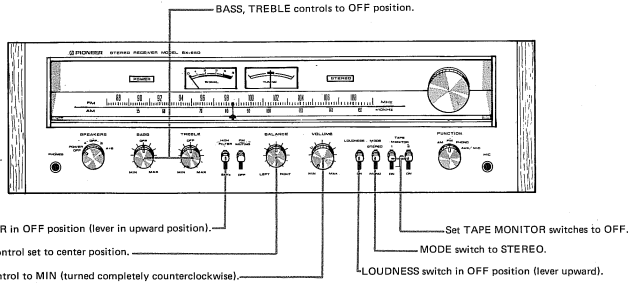
NOTE:
When not monitoring record or playback mode of a tape deck, both switches should be in OFF (upper) position. If either 1 or 2 switch is in ON (lower) position, the program source selected by the FUNCTION switch will not be heard through speaker system or headphones.

MODE SWITCH
For selection of stereophonic or monophonic mode of playback. In normal operation, switch should be in STEREO position. In the MONO position, R and L channel signals will be mixed, and sounds coming from speakers of both channels will be the same.

NOTE:
Recording stereophonically with the MODE switch in the MONO position may cause channel separation to deteriorate.

EFFECTIVE OPERATION

BEFORE TURNING ON POWER



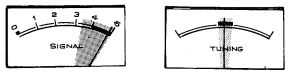
Turning On Power

After the above checklist is completed, power may be turned on. POWER indicator lamp should light when AC power is being supplied to receiver.

FM RECEPTION

1. Place FUNCTION selector in FM position.
2. Set FM MUTING switch to ON (upper).
3. Select station by turning TUNING knob. Station is properly tuned-in when the SIGNAL meter needle is deflected a maximum to the right, and the FM TUNING meter needle points to the center (Fig. 8).
- In areas where signal strength is poor, set FM MUTING switch on OFF.

Meter readings for FM reception.



SIGNAL Meter TUNING Meter

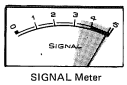
Fig. 8

4. According to preference, set sound level by means of the VOLUME control, and adjust tone by means of BASS and TREBLE controls.

AM RECEPTION

1. Place FUNCTION selector in AM position.
2. Select station by turning TUNING knob. Station is properly tuned-in when the needle of the SIGNAL meter is deflected a maximum to the right (Fig. 9).

Meter reading for AM reception.



SIGNAL Meter

Fig. 9

3. According to taste, set sound level by means of the VOLUME control, and adjust tone by means of BASS and TREBLE controls.

NOTE:
If during either FM or AM reception, sensitivity is poor, noise is heard, or the sound is otherwise disagreeable, recheck the antenna arrangement according to the section, "Antenna and Ground Connections." on page 7.

Protection Circuit

- There will be a delay of 3—8 seconds after turning on power before sound is heard from the speakers. This is due to the action of the protection circuit, which activates a muting device to suppress unpleasant noise which may occur when the amplifier is first turned on. The protection circuit also acts to shield the speakers from power surges which likewise may occur during the first few moments of operation.
- If during operation the speakers suddenly become silent and a clicking sound is heard from the built-in relay, the probable cause is insufficient impedance in the output side, either through a short in one of the speaker connections, or the use of a speaker with less than 4 ohm impedance. The protection circuit has been activated to protect the speakers and transistors from damage. The protection circuit will automatically return to normal operation when the cause of the malfunction has been eliminated.

NOTE:
With a full 4 ohms load connected the receiver, do not apply a sinewave signal continuously at full power more than 1 hour. There is a possibility that the power transformer thermostatic fuse will blow. When using normal music sources or voice, this will not occurred.

PLAYING RECORDS

1. Place FUNCTION selector in PHONO position.
2. Start turntable.
3. According to taste, set sound level by means of the VOLUME control, and adjust tone using BASS and TREBLE controls.

NOTE:
If unpleasant noise is heard when the record is started, turn the VOLUME control counterclockwise to MIN. Then, after the stylus tip has begun to track on the record, the VOLUME control may be set to the desired position.

FM-DOLBY RECEPTION

With use of a separately purchased Dolby NR adaptor, reception of FM-Dolby broadcasts is possible. In using the adaptor, the following instructions should be noted.

1. Connect Dolby NR adaptor to TAPE REC, TAPE PLAY (1 or 2) terminals.
2. Place FUNCTION selector in FM position. Tune-in a station transmitting an FM-Dolby program (see instructions for FM reception).
3. Place FM DE-EMPHASIS switch on rear panel of SX-650 in "25μS" position.
4. Set either TAPE MONITOR switch 1 or 2, depending upon the position at which adaptor has been connected.
5. Turn adaptor on. Set sound level by means of the VOLUME control, and adjust tone using BASS and TREBLE controls.

NOTE:
Reference should be made to the instructions supplied with the Dolby NR adaptor for additional recommendations regarding FM-Dolby reception.

USING MICROPHONE

1. Insert microphone in MIC jack.
2. Place FUNCTION selector in AUX/MIC position.
3. Turning VOLUME control clockwise in small increments, adjust sound level. BASS and TREBLE controls should be set in center positions.
- With the SX-650, it is not possible to mix the input of a microphone with other program sources.

NOTES:
1. *When employing a microphone, set the output volume of any component connected to the AUX jacks to minimum, or disconnect the component.*
2. *Feedback howl can easily occur when using a microphone. To prevent this, when using microphone in close proximity to speakers, or in a room in which sound reflectivity is high, care should be taken not to turn volume up too high. BASS and TREBLE controls should be set in center positions (OFF).*

USING AUX TERMINALS

1. Place FUNCTION selector in AUX/MIC position.
2. Begin operation of the hi-fi component connected to AUX terminals.
3. According to taste, set sound level by means of the VOLUME control, and adjust tone using BASS and TREBLE controls.

NOTE:
When a microphone is connected to the MIC jack, the AUX input is cut off. Therefore, when using AUX input, the microphone should be disconnected from the receiver.

TAPE DECK CONNECTIONS

Two sets of recording input jacks (REC) and two sets of playback input jacks (PLAY), plus a TAPE 2 REC/PLAY connector, are provided. This allows, in addition to normal playback and record, simultaneous recording on two tape decks and recording from one deck to the other.

RECORDING

Connect recording input terminals (LINE INPUT) of the tape deck to the TAPE 1 (or TAPE 2) REC terminals of the receiver. Be sure that L (R) tape deck terminals are connected to corresponding L (R) REC terminals on receiver.

PLAYBACK

Connect playback output terminals (LINE OUTPUT) of the tape deck to the TAPE 1 (or TAPE 2) PLAY terminals of the receiver. Be sure that L (R) tape deck terminals are connected to corresponding L (R) PLAY terminals on receiver.

NOTE:
If recording is made using REC terminals of TAPE 1, PLAY terminals of TAPE 1 should be used for playback. A variety of difficulties will occur if TAPE 1 and TAPE 2 sides are used interchangeably with a single tape deck.

USE OF RECORD/PLAY DIN CONNECTOR

If the tape deck used has a DIN jack for record/playback, connecting the tape deck to the TAPE 2 REC/PLAY terminal by means of a DIN cable (purchased separately) will provide simultaneous connection for both recording and playback. If the DIN cable is used, the pin connectors at TAPE 2 REC and PLAY terminals should be removed.

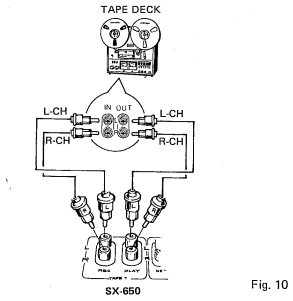


Fig. 10

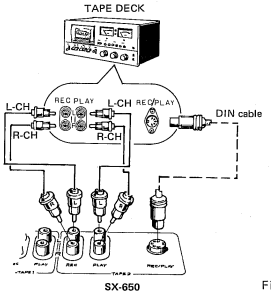


Fig. 11

TAPE DECK OPERATIONS

RECORDING

1. Set FUNCTION selector to program source to be recorded.
2. Set controls of recording source (turntable, radio broadcast, etc.) so that optimum sound quality is achieved.
3. Set recording level by means of control on tape deck. During recording, the VOLUME, BASS, and TREBLE controls of the SX-650 have no effect on the recording level.
4. Start recording.

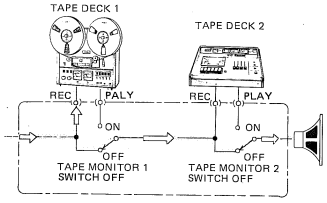


Fig. 12

PLAYBACK

1. If the tape deck is connected at TAPE 1, set the TAPE MONITOR 1 switch to ON; if connected at TAPE 2, set TAPE MONITOR 2 switch to ON. (see Fig. 13).
2. Playback the recorded tape.
3. According to taste, set sound level by means of the VOLUME control, and adjust tone using BASS and TREBLE controls.

NOTES:
1. *Unless tape is being played back, the both TAPE MONITOR switches must be in OFF (upper) position.*
2. *In tape playback, the setting of the FUNCTION selector is of no consequence.*

MONITORING CONDITION OF RECORDED SIGNAL

When recording is being performed on a tape deck equipped with three heads, placing the TAPE MONITOR switch 1 (2) ON, depending on which TAPE terminals the tape deck is connected to, will enable the recorded signal to be monitored over the loudspeakers. For this purpose, both recording and playback connections should be made.

DUPLICATING OR EDITING MAGNETIC TAPE

With use of two tape decks, desired selections from a tape on which, for example, an FM broadcast was previously recorded can be recorded onto a second tape. This permits complete freedom in editing recordings to be included in a tape library or the like.

1. As shown in Fig. 14, connect one tape deck each to TAPE 1 and 2 terminals.
2. Place the previously recorded tape on the deck connected to TAPE 1 terminals, while placing a blank tape on the other unit.
3. Operate TAPE 1 deck in playback mode, and TAPE 2 deck in recording mode.
4. Recording conditions can be monitored by placing the TAPE MONITOR 2 switch in the ON position.

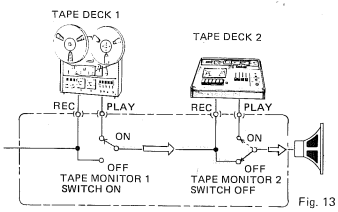


Fig. 13

Tape playback: Playback signal sent from TAPE 1 (or 2) PLAY terminals through either side 1 (or 2) of TAPE MONITOR switch to the speakers.

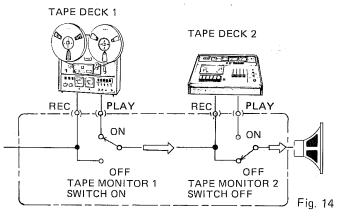


Fig. 14

Duplicating: Playback signal sent from TAPE 1 PLAY terminals to tape deck 2, where it is recorded.

SPECIFICATIONS

Semiconductors

FET 1
ICs 9
Transistors 21
Diodes 29

Amplifier Section

Continuous power output of 35 watts* per channel, min., at 8 ohms or 4 ohms from 20 Hertz to 20,000 Hertz with no more than 0.3 % total harmonic distortion.

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, from AUX)
- Continuous Rated Power Output . . No more than 0.3%
- 18 watts per channel power output, 8 ohms . . . . . No more than 0.05%
- 1 watt per channel power output, 8 ohms . . . . . No more than 0.05%

Intermodulation Distortion (50 Hertz: 7,000 Hertz=4:1, from AUX)
- Continuous Rated Power Output . . No more than 0.3%
- 18 watts per channel power output, 8 ohms . . . . . No more than 0.05%
- 1 watt per channel power output, 8 ohms . . . . . No more than 0.05%

Damping Factor
- (20 Hertz to 20,000 Hertz 8 ohms) 30

Input (Sensitivity/Impedance)
- PHONO . . . . . 2.5mV/50k ohms
- MIC . . . . . 7mV/50k ohms
- AUX . . . . . 150mV/50k ohms
- TAPE PLAY 1 . . . . . 150mV/50k ohms
- TAPE PLAY 2 . . . . . 150mV/50k ohms
- TAPE PLAY 2 (DIN connector) . . . 150mV/50k ohms

PHONO Overload Level (T.H.D. 0.1%) . . . 200mV (1kHz)

Output (Level/Impedance)
- TAPE REC 1 . . . . . 150mV
- TAPE REC 2 . . . . . 150mV
- TAPE REC 2 (DIN connector) . . . . . 30mV/80k ohms
- SPEAKER . . . . . A, B, A+B
- HEADPHONES . . . . . Low Impedance

Frequency Response
- PHONO (RIAA equalization) . . . . . 30 Hertz to 15,000 Hertz ±0.3dB
- AUX, TAPE PLAY . . . . . 10 Hertz to 50,000 Hertz $^{+0}_{-3}$ dB

Tone Control
- BASS . . . . . +8dB, −7dB (100Hz)
- TREBLE . . . . . +7dB, −6dB (10kHz)

Filter
- HIGH 6kHz (6dB/oct.)

Loudness Contour (Volume control set at −40dB position) . . . . . +6dB (100Hz), +3dB (10kHz)

Hum and Noise (IHF, short-circuited, A Network, rated power)
- PHONO 70dB
- AUX, TAPE PLAY 90dB

FM Section

Usable Sensitivity	MONO	10.7dBf (1.9μV)
	STEREO	19.0dBf (4.9μV)
50dB Quieting Sensitivity		
	MONO	15.0dBf (3.1μV)
	STEREO	38.0dBf (44μV)
Signal to Noise Ratio at 65dBf		
	MONO	70dB
	STEREO	65dB
Distortion at 65dBf 100Hz	MONO	0.15%
	STEREO	0.3%
1kHz	MONO	0.15%
	STEREO	0.3%
6kHz	MONO	0.4%
	STEREO	0.4%

Frequency Response . . . . . 30Hz to 15,000Hz $^{+0.2}_{-2.0}$ dB
Capture Ratio 1.0dB
Alternate Channel Selectivity 60dB
Spurious Response Ratio 75dB
Image Response Ratio 65dB
IF Response Ratio 90dB
AM Suppression Ratio 50dB
Muting Threshold 14dBf (2.8μV)
Stereo Separation 40dB (1kHz)
30dB (30Hz ~ 15kHz)
Subcarrier Product Ratio 62dB
SCA Rejection Ratio 62dB
Antenna Input . . . . . 300 ohms balanced
75 ohms unbalanced

AM Section

Sensitivity (IHF, Ferrite antenna) 300μV/m
(IHF, Ext. antenna) 15μV
Selectivity 35dB
Signal to Noise Ratio 50dB
Image Response Ratio 40dB
IF Response Ratio 65dB
Antenna . . . . . Built-in Ferrite Loopstick Antenna

Miscellaneous

Power Requirements 120V, 60Hz
Power Consumption . . . . . 130W (UL), 310W (max.)
240VA (CSA)
Dimensions . . . . . 480(W)x149(H)x371(D)mm
18-7/8(W)x5-7/8(H)x14-5/8(D) in.
Weight Without package . . . . . 13.1kg (28 lb 13 oz)
With package . . . . . 14.7kg (32 lb 5 oz)

Furnished Parts

FM T-type Antenna 1
Operating Instructions 1

**Measured pursuant to Federal Trade Commision's Trade Regulation rule on Power Output Claims for Amplifiers.*

NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

CONDITIONS FREQUENTLY MISTAKEN FOR MALFUNCTIONS

If your stereo system appears to malfunction, first check controls (power switch, function selector, tape monitor, etc.) and connections between various components.

Noise: There are a variety of noises relating to the operation of a hi-fi unit. These are generally divided into two types: (1) the unit is faulty (a transistor or other part is defective and (2) an external source is affecting the unit.

When a hi-fi unit produces an unpleasant noise, it is often assumed that the unit is faulty, but statistical records indicate that the majority of noises produced in hi-fi units result from external sources of noise: Due to the inherent high sensitivity and the high fidelity in reproduction, the unit amplifies and reproduces extraneous electrical noises, however small, into audible output noise. If your receiver produces noise, check the following table for the appropriate corrective action.

	SYMPTOM	SUSPECTED CAUSE	DIAGNOSIS AND REMEDY
RADIO RECEPTION	Continuous or intermittent buzzing noise.	• Static (lightening) • Fluorescent lamp, motor, or thermostat operating in the vicinity.	In many cases, it is very difficult to remove the source of noise. In order to make the radio input larger than the noise level, set up a good outdoor antenna and make a complete grounding.
	Low-pitched noise (hum) in program.	• Poorly shielded fluorescent lamp, motor, or electric heater operating in the vicinity.	Reversing the line plug may occasionally alleviate this noise problem. Usually it is very difficult to eliminate the noise.
	Hissing noise in AM (medium wave) reception.	• The frequency of an adjacent station is interfering with that of the station being tuned in. • TV set operating in the same house.	Impossible to remove such interference. If the cause of such noise is the TV set, increase the distance between the TV set and receiver.
	Crackling noise (in particular, when automobiles run close to the house).	• Noise generated by automobile engines. • High frequency sewing machine or welding machine being used near your house.	In an area surrounded by hills or high buildings, FM signals are very weak and easily affected by noise. Set up an FM outdoor antenna with multiple elements.
	FM stereo programs noisy, but FM mono programs o.k.	• Note that the service area covered by an FM stereo broadcast is only about half that of a mono broadcast.	Use good, high-gain FM outdoor antenna.
RECORD PLAYING	Hum or buzz. When switched to radio reception, the noise disappears.	• Poor connection of phono cable. (a) • Jack connection is loose. (b), • Line cord of fluorescent lamp passes near the phono cable. (c) • Poor grounding. (d) • Ham radio station or TV transmitter operating nearby. (e)	Correct conditions stated in (a), (b), (c) or (d). In case of (e), report it to an official authority.
	Output tone quality is poor and treble is not clear.	• Stylus is worn. (a) • Record is worn. (b) • Dust adhering to stylus. (c) • Stylus is improperly mounted. (d). • Tracking force is not correct. (e) • The TREBLE level is too high. (f)	Check (a) through (e) and correct the condition. Lower the TREBLE level.
	When playing records, increasing the volume causes howling.	• Turntable and speakers too close together. • The turntable or speaker supports are unstable.	Increase the distance or rearrange the installation of the unit and speakers. (Installing the turntable on a firm, solid base may alleviate this problem.) Do not turn up the BASS tone control excessively.
USE OF MICROPHONE	Howling	• Feedback between microphone and speakers.	• Keep microphone away from speakers. • Do not set the VOLUME control too high. • Set BASS and TREBLE controls at center positions.

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Printed in Japan <ARB-186-A>