4-CHANNEL RECEIVER

QX-646

FW
KUW

OPERATING INSTRUCTIONS

PIONEER®

Thank you for the confidence shown us in purchasing a Pioneer 4-channel receiver, model QX-646. This 4-channel solid state receiver will lead you into the exciting world of 4-channel sound in all its varieties: discrete 4-channel tapes or disc records (CD-4), regular matrix (RM) as well as SQ matrix records and broadcasts. If you only have two speaker systems at the moment, the QX-646 will also serve as a 2-channel receiver until you decide to step up into 4-channel sound by adding two more speaker systems.
To develop its full potentials, the QX-646 must be combined with other components (speakers, turntable, tape deck) of equally high quality. Also, please study the following operating instructions carefully to make full use of this receiver's many possibilities and features.

LINE VOLTAGE AND FUSE

The QX-646 is available in two models; one model operates only on 120V, and the other operates on one of the five line voltages; 110V, 120V, 130V, 220V and 240V.
If your QX-646 is the latter model, set the unit to the proper line voltage by following the procedure described below.

CHANGING LINE VOLTAGE SETTING AND FUSE

To remove the fuse, turn the fuse cap located on the line voltage selector in the direction indicated by the arrow. Then remove the fuse plug from the unit. Put the fuse plug so that the proper line voltage marking can be seen through the cut in the edge of the plug. Whenever the position of the selector is changed, check the rating of the fuse. A 1-ampere fuse is to be used for either 220V or 240V operation and a 2-ampere fuse for 110V, 120V or 130V operation. If the rating of the fuse is correct, replace cap.

FUSE REPLACEMENT

If the fuse blows, remove the fuse cap and replace the fuse with a new one.

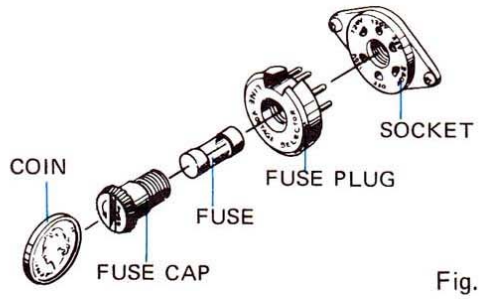

Fig. 1

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QX-646 FEATURES

Combines All Current 4-channel System in One Unit

Exciting 4-channel sound is yours in all four of its current varieties; discrete 4-channel from open-reel and cartridge tape, discrete 4-channel disc record (CD-4 disc record with an exclusive phono cartridge), RM (regular matrix) and SQ matrix records and broadcasts.

Extracts 4-channel Sound from 2-channel Program Sources

The built-in "regular matrix" circuit can convert regular 2-channel program sources (records, tapes, FM stereo) into wrap-around 4-channel sound, bringing to life the echo sound components found in practically any record, and giving your present stereo LPs a totally new and exciting sound. (If you wish, you can play them in conventional 2-channel stereo fashion, too.)

Accepts 2 Pairs of Rear Speakers

The QX-646 can drive one pair of front plus two pairs of rear speakers, for a total of six speakers. The rear speakers can be turned on and off with a push-button. This makes it possible to have two different 4-channel speaker arrangements in the listening room and to select one according to program souces or personal preferences.

Versatile Auxiliary Circuits and Control

The QX-646 is fully equipped with auxiliary controls including speaker on/off and rear speaker A/B selector switches, a tape monitor switch, a headphone jack (for monitoring the front channels only), and terminals for 2-channel as well as 4-channel tape equipment.

FET-equipped FM Tuner

The FM tuner is equipped with an FET in its front end to improve selectivity and sensitivity. Also, the IF stage employs one hybrid and one monolithic IC, replacing numerous transistors, ceramic filters, etc., and raising the tuner's sensitivity and selectivity. The FM MPX decoder works according to the time switching system and boasts excellent channel separation. Tuning is made easy by the linear FM dial and the signal meter.

Built-in AM Ferrite Bar Antenna

Sensitive and highly directional. An outdoor AM antenna is not required in most cases.

Low-distortion Audio Amplifier

Both tone controls and equalization amplifier operate for improved frequency response accuracy and flatness. The power amplifier is a quasi-complementary design, a tried-and-true circuit construction.

Looks as Impressive as It Sounds

To this 4-channel receiver the word "compact" can not be applied – it is a rather large, impressive looking unit whose outward appearance already hints at its superb performance and versatility. The dial and meter section is easier to read. Your operation becomes much easier, complete with the program and mode indicator lighting up according to desired operation, and the unit comes installed in a natural walnut cabinet.

PERFORMANCE

4-Channel Stereo Performance

With a 4-channel stereo tape deck or cartridge tape player installed, the QX-646 can provide a discrete 4-channel playback of programs recorded on tape. In addition, the QX-646 can reproduce a discrete 4-channel disc record with a stereo turntable equipped with an exclusive CD-4 phono cartridge.

4-channel Reproduction from Matrix 4-channel Source

The self-contained matrix circuit permits 4-channel reproduction from matrix 4-channel records or FM stereo broadcasts. The mode switch has positions for regular matrix and SQ matrix reproduction, allowing reproduction to take either of these forms.

Matrix Reproduction from 2-channel Stereo Source

A 2-channel signal from a record or FM stereo broadcast can be reproduced in 4-channel form via the regular or SQ matrix circuit. In this case, the result is an improvement over ordinary 2-channel stereo reproduction.

2-channel Stereo Performance

Conventional 2-channel stereo performance can be provided through an arrangement or two speaker systems in the front; left-side speaker system and right-side speaker system.

COMPOSITION OF A 4-CHANNEL STEREO SYSTEM

A 4-channel stereo system with the QX-646 can include two or even three pairs of speaker systems, a turntable, a tape deck (reel-to-reel or cassette), a cartridge tape player, etc. (see Fig. 2).

INSTALLATION

For safety and reliability and to protect the outward appearance of each component, please do not install them in any of the following places:

- In direct sunlight or near heating units.
- In a poorly ventilated, dusty, or damp place.
- In an unstable place where there is significant vibration or inclination.

Also, when playing CD-4 records, do not install near poorly shielded electronic equipment or equipment emitting interference signals, (e.g. television set), since high frequency characteristics up to 45kHz are required for CD-4 records.

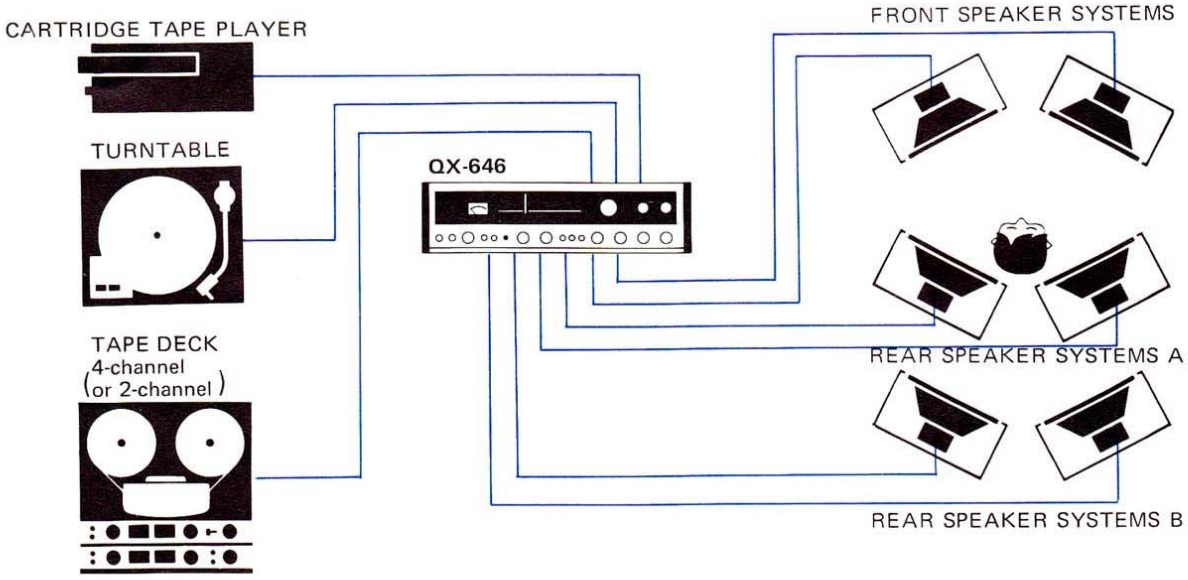


Fig. 2

A WORD ABOUT ROOM ACOUSTICS

The quality of reproduced sound varies according to the size and shape of the room, the materials of walls, floor and ceiling and the amount and arrangement of furniture. Too harsh or "bright" a sound usually results from too many hard reflecting surfaces, and/or too low a ceiling. This condition is improved by having ample carpet area or covering the wall (especially that facing the speakers) with a thick curtain. On the other hand, too many absorbing surfaces will tend to "soak up" the sound, resulting in a certain "deadness." Furniture may be rearranged to provide irregular reflection of the sound.

ABOUT SPEAKER SYSTEMS

For the best 4-channel stereo performance, it is desirable to use four speaker systems having the same characteristics. If it is difficult to satisfy this requirement, it is suggested that speaker systems be selected and arranged as follows:

- Select two speaker systems having the same characteristics, and arrange them in the front.
- For the rear channels, select two speaker systems as similar to the front speakers as possible.

HINTS FOR OPERATING CD-4 DISC RECORDS

TURNTABLE

The CD-4 disc record is engraved by high frequency signals based on a 30kHz carrier, which extends up to 45kHz. Compared to conventional 2-channel disc records, the recording level is low. Therefore, it is desirable to take note of the following suggestions connecting the CD-4 disc record reproduction turntable.

- The **PHONO MOTOR** must operate almost without vibrations, revolve at constant rotational speed without wow and flutter, and produce an excellent signal-to-noise ratio.
- The **TONEARM** must have sufficient trackability, that is, can track the groove with light tracking force. Also it must have an anti-skating device and lateral balance to adjust the tonearm so that the tracking force can be distributed equally to both the left and right walls of the record groove.

PHONO CARTRIDGE

To effectively reproduce the wide frequency range of CD-4 records over a long period, it is essential for CD-4 disc record reproduction to use an exclusive cartridge.
Make certain that the stylus is in position when the phono cartridge is installed, and that the stylus goes down vertically onto the record surface when the phono cartridge is replaced, so that separation and sound quality remain the same as before.

RECORD HANDLING

Since the groove of the CD-4 disc record is delicately engraved, even a small amount of dust can cause unpleasant noise and poor sound quality. In addition, it can scratch the record surface, reducing its service life. Since the warped disc record is never reproduced exactly, it is desirable to exercise utmost care in handling them. Before and after playing the disc, it should be cleaned with high quality cleaner, not a spray-type. It must not be washed with water.

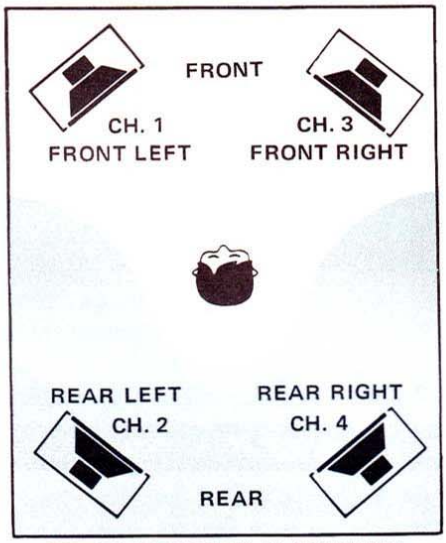
STYLUS CLEANING

If dust clings to the stylus, sound quality and separation become poor, 4-channel stereo is impossible to reproduce, and the disc is damaged.
The stylus must always be cleaned whenever a record playing is over. If dust is difficult to remove, clean carefully with commercial available alcohol stylus cleaner.

SPEAKER SYSTEMS—PLACEMENT AND CONNECTIONS

SPEAKER SYSTEM ARRANGEMENTS

As shown in Fig. 3, the 4-channel system employs four speakers, one each on the left and right at the front and rear. Locating the rear speakers anywhere in the blue-shaded area of this figure will give an ample 4-channel effect. As model QX-646 permits a total of six speaker systems to be connected, two speaker systems are placed at front left and right, and others (two pairs of speaker systems) can be placed within the blue-shaded area of Fig. 3. Some 4-channel records and tapes call for specified speaker arrangements. Please observe the manufacturer's instructions.



SPEAKER SYSTEM PLACEMENT

Fig. 3

CONNECTION

Use common two-pole lead wires, preferably with different colors for the two leads for easy identification. Speaker wire is often supplied with the speakers.

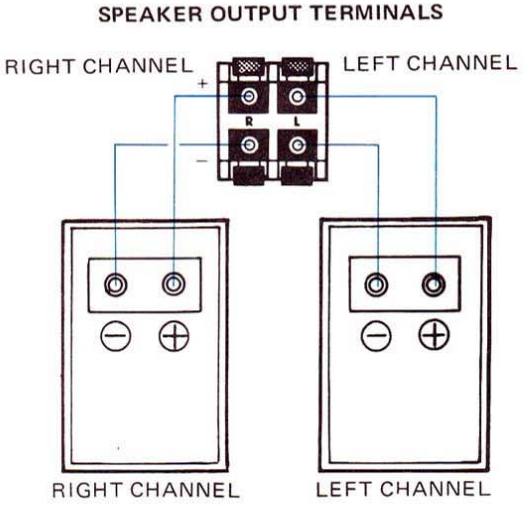
Connect the speaker placed at the front left to speaker output terminals CH 1 (FRONT SPEAKERS marked "L") on the QX-646. Likewise, connect the speaker placed at the front right to speaker output terminals CH 3 (FRONT SPEAKERS marked "R").

Connect the speaker placed at the rear left to speaker output terminals A CH 2 (REAR SPEAKERS marked "L") on the QX-646. Likewise, connect speaker placed at the rear right to speaker output terminals A CH 4 (REAR SPEAKERS marked "R").

To connect the other speaker systems to the speaker output terminals B, do the same as above.

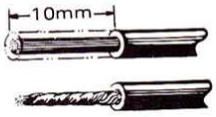
Be sure to connect the plus (+) terminal (red terminal) on the QX-646 to the (+) terminal on the speaker, and the minus (-) terminal (black terminal) on the QX-646 to the (-) terminal on the speaker.

For connection, remove about 10mm (1/3") of insulation from the lead wires. If the wire core is stranded, twist it to prevent hair wires from sticking out. On the (+) side, push the red clamp-lever on the terminal up and insert the wire end into the hole, then release the lever — the wire will be clamped securely in the terminal. On the (-) side, push the black clamp-lever on the terminal down, insert the wire and release the lever.



SPEAKER SYSTEMS

Fig. 4



SPEAKER LEAD WIRES
Strip the wires of their ends.
Then twist them.

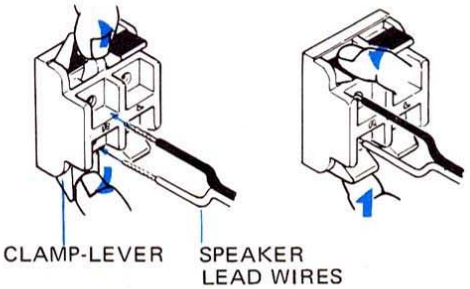


Fig. 5

ANTENNAS AND GROUND CONNECTIONS

FM ANTENNA

FM broadcast are considerable weakened by intervening mountains, buildings, etc. or if the antenna is inside a concrete building. This should be considered when deciding upon the type and location of the FM antenna.

Connection and Location

For areas with a strong signal, especially in wooden houses, use the T-type indoor antenna (supplied).

- As shown in Fig. 6, first connect the antenna leads to the proper terminals on the rear of the QX-646. Then spread out the cross section and attach it to a wall, etc. after deciding upon the best location by listening to an FM broadcast and watching the SIGNAL meter deflect (see the explanation on p. 14).

When a special FM outdoor antenna is required...

- If there is a great deal of noise during FM reception using this antenna, replace it with a special FM outdoor antenna (or a combination FM/TV antenna), connect it to the proper terminal(s), as shown in Fig. 7.

NOTES:

1. *FM antennas are available in any type. Select the best type after securing the advice of your audio dealer.*
2. *In heavy traffic areas, industrial zones or near high-voltage electrical equipment, a great deal of interference may enter despite careful antenna selection. In such a case, talk things over with your audio dealer. It may be advisable to use a 75Ω coaxial cable between the antenna and the QX-646. Connect to the cable terminal as shown in Fig. 7.*

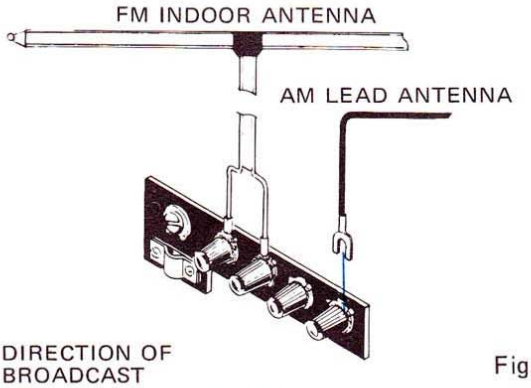


Fig. 6

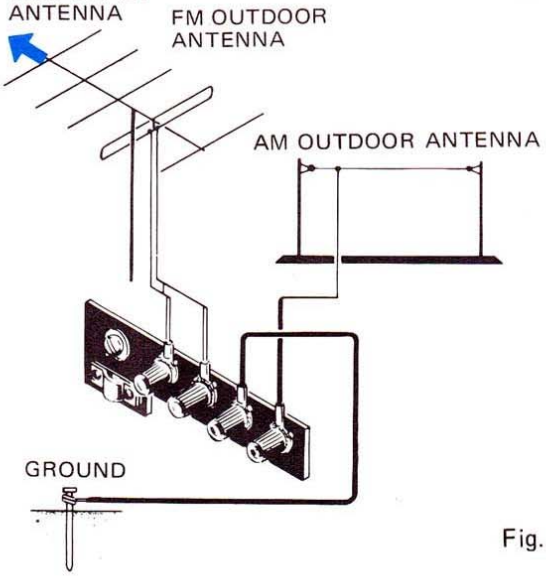
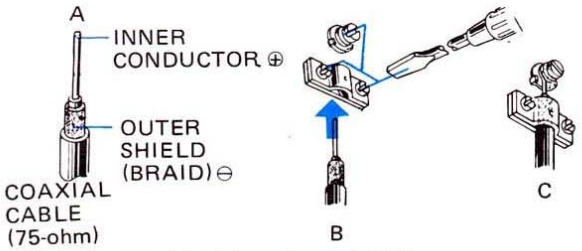


Fig. 7

AM ANTENNA

First tune in an AM station (see the explanation on p. 14). Then, while watching the SIGNAL meter deflect, adjust the AM ferrite antenna on the rear panel for the best signal (see Fig. 9).

1. If the ferrite antenna does not provide satisfactory AM reception, connect the vinyl-sheathed AM lead antenna to the proper terminal. Stretch it out with the other end as high as possible (see Fig. 6).
2. If reception is still poor, construct an outdoor antenna between two poles, etc., as shown in Fig. 7. Use vinyl-sheathed lead, and connect to the QX-646 AM antenna terminal.

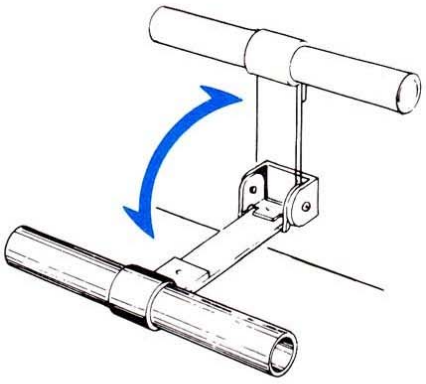


Strip the coaxial cable as shown in (A).
Loosen the screws and connect the cable as shown in (B).
Then tighten all screws for a connection like (C).

Fig. 8

GROUND

For optimum safety and noise-free performance, it is desirable to connect the GND terminal to a good ground (see Fig. 7).



AM FERRITE ANTENNA

Fig. 9

CONNECTION OF TAPE DECK

The QX-646 can be connected to either a 4-channel or a 2-channel tape deck (reel-to-reel, cassette) for recording and playback. Use connection cords usually supplied with the tape deck. For connections, use the following procedures:

RECORDING

Connect the LINE INPUT jacks of tape deck to the TAPE REC jacks of the QX-646. Be sure that all connections are correct as follows:

Tape REC jacks (QX-646)	Line Input Jacks	
	4-Channel Tape Deck	2-Channel Tape Deck
Front Left (CH.1)	Front Left (CH.1)	Left (CH.L)
Front Right (CH.3)	Front Right (CH.3)	Right (CH.R)
Rear Left (CH.2)	Rear Left (CH.2)	
Rear Right (CH.4)	Rear Right (CH.4)	

FOR TAPE RECORDING

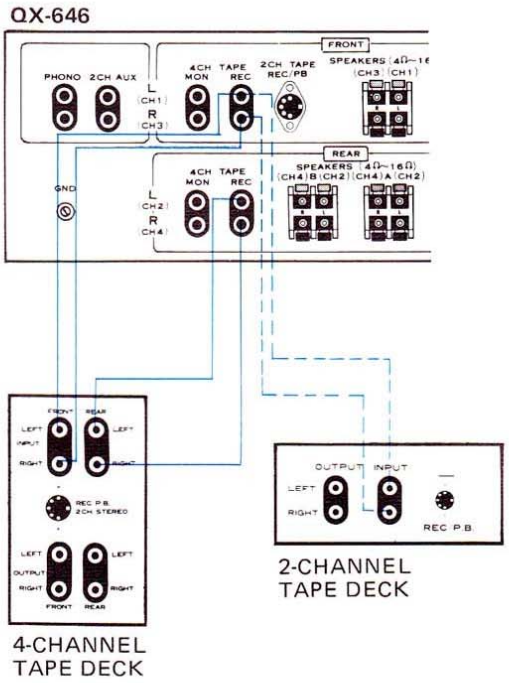


Fig. 10

PLAYBACK

Connect the LINE OUTPUT (or TAPE MONITOR) jacks of tape deck to the TAPE MON jacks of the QX-646. Do the same confirmation as follows:

Tape MON Jacks (QX-646)	Line Output Jacks	
	4-Channel Tape Deck	2-Channel Tape Deck
Front Left (CH.1)	Front Left (CH.1)	Left (CH.L)
Front Right (CH.3)	Front Right (CH.3)	Right (CH.R)
Rear Left (CH.2)	Rear Left (CH.2)	
Rear Right (CH.4)	Rear Right (CH.4)	

FOR TAPE PLAYBACK

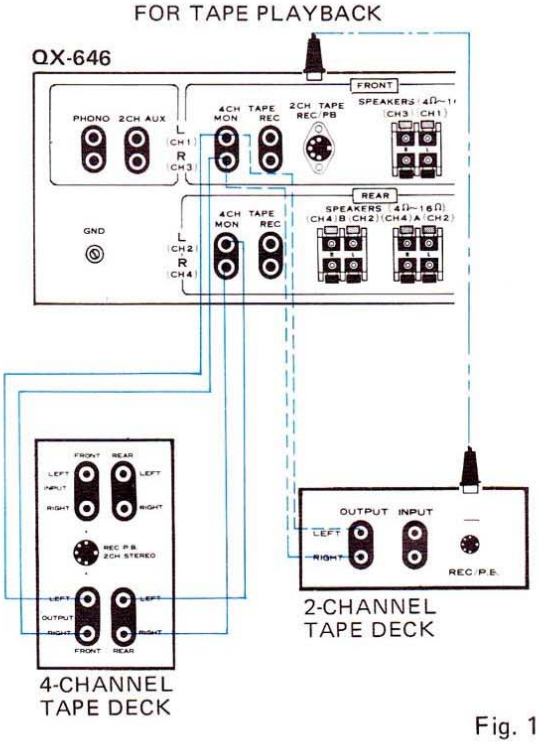


Fig. 11

Connection via REC/PB Connector

Instead of the recording and playback connections just described, the 2-channel stereo tape deck can be connected to the REC/PB connector (DIN-type) of the QX-646 if an identical connector is provided in the tape deck, too. The required DIN-cable is available at all hi-fi and radio stores. This single cable completes all playback and recording connections at the same time. Use a DIN-cable for tape deck-to-amplifier connection. Note that the REC/PB connector corresponds to the TAPE REC and TAPE MON terminals — the signal must be controlled with the TAPE MONITOR switch of the QX-646.

NOTE:

Also, in the case of a three-head tape deck, connection via a DIN-cable may sometimes cause crosstalk. With three-head tape decks, connection to the REC outputs and MON inputs via regular phono cables is preferable.

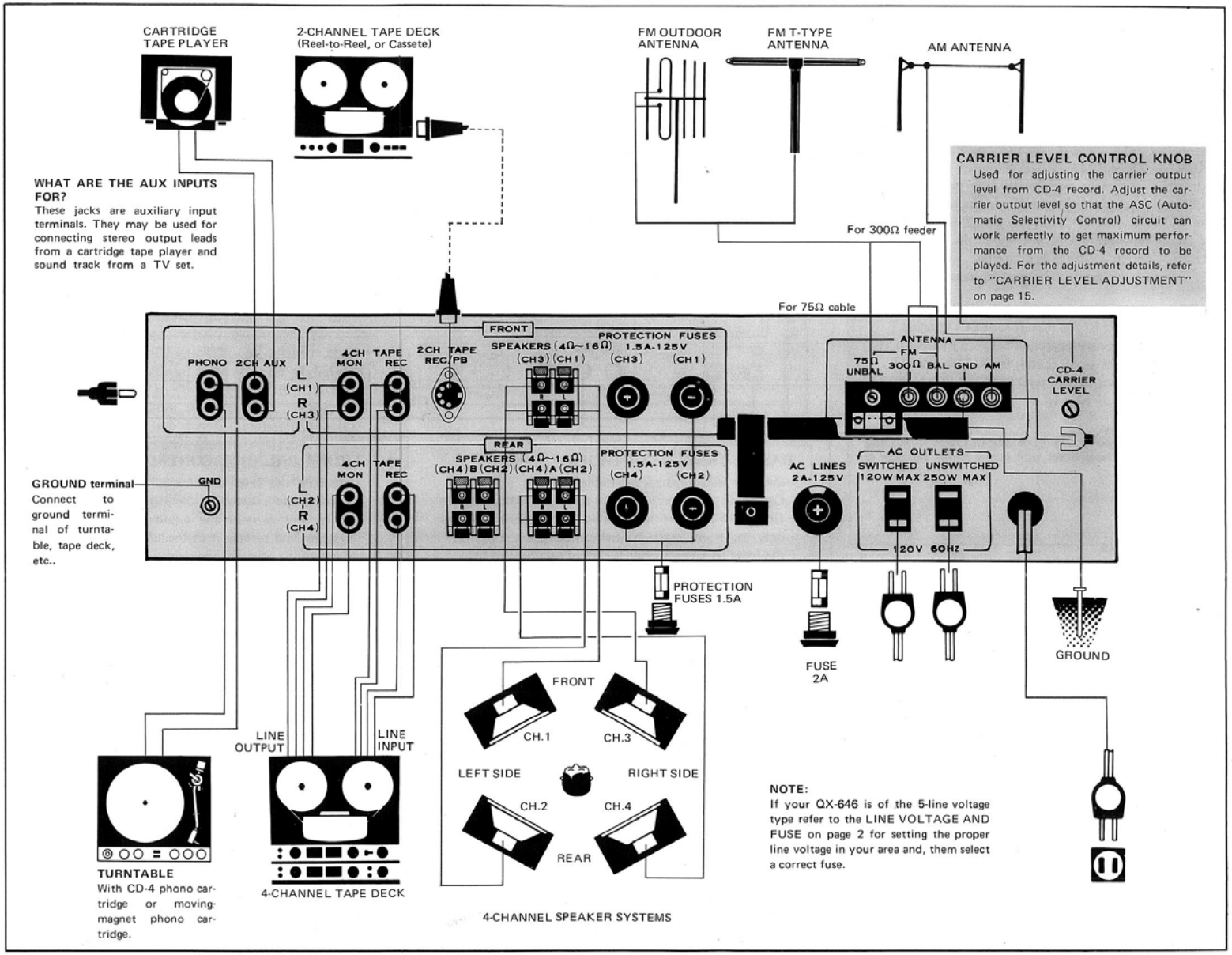
CONNECTION OF TURNTABLE

Connect the output cord of turntable to the PHONO INPUT jacks of the QX-646.
For playing a CD-4 disc record, mount a CD-4 phono cartridge only. For playing an ordinary 2-channel disc record, including RM, SQ matrix records, mount a moving-magnet (MM) type phono cartridge.
With phono inputs, the upper terminal is for the left channel output cable from the turntable, the lower terminal for the right channel output cable. The ground wire from the turntable should be connected to the GND terminal on the QX-646.

NOTES:

1. *To get the most from CD-4 disc records, it is of paramount importance to carefully select a top-quality stereo turntable performable enough for very delicate CD-4 disc records.*
   For your convenience, a full detail of CD-4 disc records is given in "Hints for Operating CD-4 Disc Records" on page 5.
2. *A moving coil (MC) cartridge of low output voltage can be used only in combination with a separate matching transformer or head amplifier.*

CONNECTION DIAGRAM



FRONT PANEL FACILITIES

CD-4 INDICATOR LAMP

This lights up, indicating that the CD-4 disc record is now being played (only when the MODE switch is set at 4CH CD-4).

CD-4 SEPARATION CONTROL (LEFT and RIGHT) KNOBS

For playing a CD-4 disc record with an exclusive CD-4 phono cartridge, adjust channel separation between FRONT and REAR.

After this adjustment once made, with the CD-4 phono cartridge, 2-channel disc record reproduction is possible, too.

As far as reproduction of any stereo disc reord with a 2-channel phono cartridge is concerned, always turn the LEFT and RIGHT knobs to central positions.

LEFT knob: Adjusts separation between FRONT (CH.1) and REAR (CH.2) for LEFT channel.

RIGHT knob: Adjusts separation between FRONT (CH.3) and REAR (CH.4) for RIGHT channel.

For the adjustment details, refer to "CD-4 SEPARATION ADJUSTMENT" on page 16.

NOTE:
Never fail to re-adjust the CD-4 SEPARATION CONTROL knobs whenever replacement with a new phono cartridge or stylus is made.

POWER SWITCH

Turns the power on and off. Also controls the power to the SWITCHED auxiliary AC outlet on the rear panel.

SPEAKERS SWITCH

SPEKR : Switches all speakers on and off. Button pushed – OFF; button released – ON. Use position OFF when listening through headphones.

REAR : Two pairs of rear speakers (pair A and pair B) can be connected and selected with this switch.
Button pushed – rear speakers B operations;
button released – rear speakers A operating.

NOTE:
Always turn the VOLUME down to minimum before operating these speaker switches.

PHONES JACK

Accepts a pair of low impedance stereo headphones. Only the front channels (front left and front right channels) are heard through the headphones.

MODE INDICATOR LAMPS

These light up in accordance with the position of the MODE switch.

FM STEREO INDICATOR LAMP

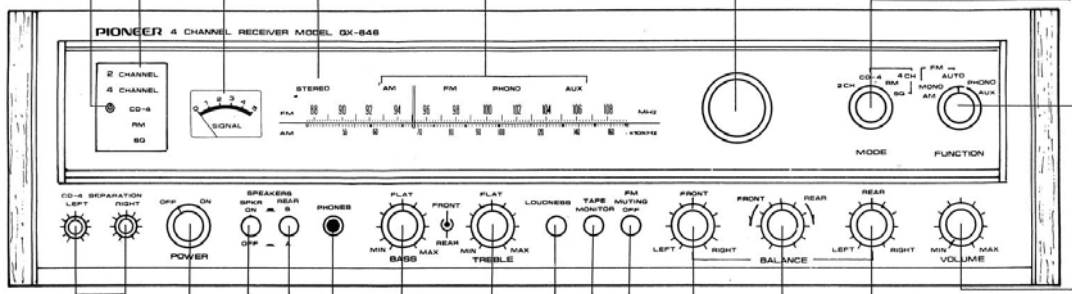
Lights up when an FM stereo broadcast is being received.

SIGNAL METER

For easy, precise tuning on AM and FM, maximum deflection means optimum tuning condition. Also helpful for finding the optimum position of the AM or FM antenna.

PROGRAM INDICATOR LAMPS

Light up in accordance with the position of the FUNCTION switch.



BASS & TREBLE CONTROLS

Used for adjusting bass and treble.

Clockwise (counterclockwise) turning of these controls from the FLAT positions will boost (diminish) tone. Also, only the front (rear) channel can be adjusted by turning the front (rear) part while the other part is being held. For normal listening, set them to the FLAT positions.

LOUDNESS SWITCH

For a more natural sound spectrum at low listening volumes, push this button. Extreme low and very high sounds will be somewhat boosted. The loudness circuit acts on all four channels.

TAPE MONITOR SWITCH

Push this button only when playing (or monitoring for a recording in progress) tapes with the tape deck connected to the TAPE MON and REC input or the REC/PB connector. In all other operation modes (PHONO, FM, AM, AUX), leave the button in off position, i.e. released. No sound is heard if this button is pushed when it shouldn't be.

FM MUTING SWITCH

In released position, the FM muting circuit cancels out noise on unused FM signals ("inter-station noise"), but it also rejects very weak, faint FM stations. To receive such a station, push the button to turn off the FM muting circuit.

FRONT BALANCE CONTROL

Controls the level balance of front speaker systems. Turning the control to the right (clockwise) from the center will decrease the sound of the left-side speaker systems, and turning it to the left (counterclockwise) will decrease the sound of the right-side speaker systems.

FRONT-REAR BALANCE CONTROL

Controls the level balance between the speaker systems in front and rear speaker systems. Turning the control to the right (clockwise) from the center will decrease the sounds of the front-side speaker systems, and turning it to the left will decrease the sounds of the rear-side speaker systems.

REAR BALANCE CONTROL

Controls the level balance of rear speaker systems. Turning the control to the right (clockwise) from the center will decrease the sound of the left-side speaker systems, and turning it to the left (counterclockwise) will decrease the sound of the right-side speaker systems.

VOLUME CONTROL

Controls the output volumes of all four channel signals simultaneously. Turning the knob to the right (the left) will increase (decrease) the volume.

TUNING KNOB

For tuning in AM and FM stations.

MODE SWITCH

This switch sets the desired mode; 2-channel stereo, matrix 4-channel, discrete 4-channel (CD-4).

2CH : Conventional 2-channel stereo reproduction. No sound is heard from the rear speaker systems.

4CH CD-4 : For playing discrete 4-channel CD-4 records.
Also for playing discrete 4-channel stereo programs such as reel-to-reel tapes and Quad 8 tape cartridges.
Used for listening to 2-channel program sources, too. Sound heard from the left rear speaker (CH. 2) will be the same as that from the left front speaker (CH. 1), while sound from the right rear speaker (CH. 4) will be the same as that from the right front speaker (CH. 3).

RM : Used for 4-channel reproduction of RM (regular matrix) records, or FM stereo broadcasts playing RM matrix records.
Also use this position when listening to 2-channel tapes, records and FM stereo broadcasts, adding 4-channel effects.

SQ : Used for 4-channel reproduction of SQ matrix record or FM stereo broadcasts playing SQ matrix records.
Also use this position when listening, to 2-channel records and FM stereo broadcasts, adding 4-channel effects.

FUNCTION SWITCH

This switch selects the program sources.

AM : For AM radio reception.

FM MONO : For FM monophonic reception only.
Use this position only for receiving weak or noisy FM stations. Note that in this position FM stereo broadcasts will also be received in monophonic mode, even though the stereo indicator lights up.

FM AUTO : Usual FM reception, with automatic switching depending on whether the broadcast is stereophonic or monophonic.

PHONO : For record playing.

AUX : For playing signals fed to the AUX jacks.

PREPARATIONS BEFORE OPERATION

BEFORE SWITCHING THE POWER ON

Initially, set the controls as follows:

1. VOLUME control at MIN.
2. All three BALANCE controls at center.
3. All BASS and TREBLE controls at center.
4. FM MUTING switch pushed at OFF.
5. TAPE MONITOR switch not pushed (off position).
6. FUNCTION switch at FM MONO.
7. MODE switch at 4CH CD-4.
8. SPKR ON - OFF switch ON (released).
9. SPEAKERS REAR A - B switch at A or B, depending on connection of rear speaker systems.

Finally, turn POWER switch ON. Unit is now ready to operate.

CONFIRMATION OF CONNECTIONS AND SOUND VOLUME ADJUSTMENT

These confirmation and adjustment are as follows:
If you have a stereo turntable equipped with an exclusive CD-4 phono cartridge, please refer to "Before CD-4 Record Playing" on page 15.

Channel Confirmation

With all controls set as above, proceed as follows:

1. Set the FUNCTION switch to FM MONO and tune in an FM broadcast.
2. Turn up volume to average listening level. Confirm that sound comes from the four speaker systems (front and rear, left and right).
   If there is no sound coming from one or more of the speaker systems, check speaker system connections.
3. Turn the FRONT-REAR BALANCE control to the extreme left. At this time, sound should come from the front speaker systems only.
4. Turn the FRONT BALANCE control to the extreme left and confirm that sound comes from the front left speaker system (CH. 1) only. Then turn this control to the extreme right and confirm that sound comes from the front right speaker system (CH. 3) only.
5. Turn the FRONT-REAR BALANCE control to the right and confirm that sound comes from the rear speaker systems alone.
6. Turn the REAR BALANCE control to the extreme left and confirm that sound comes from the rear left speaker system (CH. 2) only. Then turn this control to the extreme right and confirm that sound comes from the rear right speaker systems (CH. 4) only.

If checks do not conform, speaker system connections may be in error. Recheck them. After confirming that operation is normal, set these controls to mid-positions.

Adjustment of Level Balance Among 4-channels

1. After the above confirmation, turn the volume up to normal listening level.
2. Turn the FRONT-REAR BALANCE all the way to the left. Then, turn the FRONT BALANCE control in either way to balance the level between the left and right speaker systems.
3. Now turn the FRONT-REAR BALANCE all way to the right. Then, turn the REAR BALANCE control in either way to balance the level between the left and right speaker systems.
4. Finally, turn the FRONT-REAR BALANCE control either way to balance the level between the speaker systems in the front and rear.

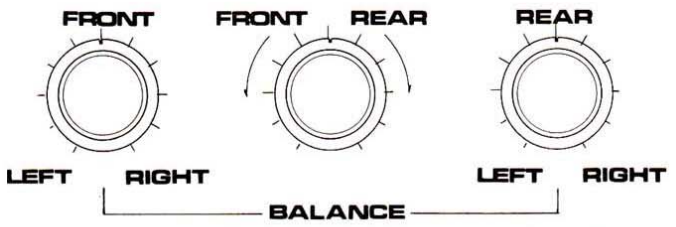
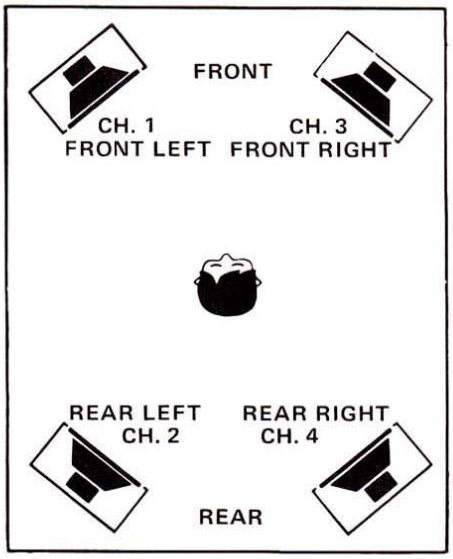


Fig. 12



SPEAKER SYSTEM PLACEMENT

Fig. 13

FM AND AM RECEPTION

FM RECEPTION

1. Set the FUNCTION switch to FM AUTO.
2. Set the FM MUTING switch to on (not pushed position). Do not push the FM MUTING switch usually unless FM reception is very weak or noisy.
3. Turn the TUNING knob to tune in the desired station while watching the pointer deflect in the SIGNAL meter. Best reception is obtained when the pointer deflects to the extreme right. When the tuned-in FM station is broadcasting an FM stereo program, the FM stereo indicator lights up.
4. Setting the MODE switch to 4CH RM or SQ during reception of corresponding FM stereo broadcasts by RM or SQ matrix records permit matrix 4-channel reproduction. These two modes may also be used during reception of ordinary stereo broadcasts. The result will be an improvement over ordinary 2-channel stereo being obtained from FM monophonic broadcasts.
5. After the FM station has been tuned in, turn the VOLUME control to increase the volume in the way you want, and adjust the BASS and TREBLE controls to obtain most pleasing tone.

NOTES:

1. If your area is far away from the FM station or reception is noisy, setting the FUNCTION switch to FM MONO, an FM stereo program is received as an FM MONO program.

2. In some countries, model QX-646 is delivered with a selector switch for adjusting the FM de-emphasis from 50 to 75 μsec. If your unit is equipped with such a switch at the chassis, and if the high sound range gives an impression of weakness, move the de-emphasis switch to its other position.

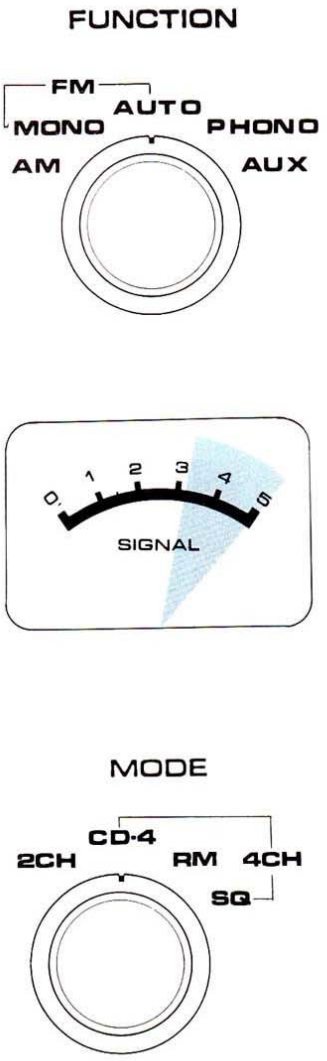


Fig. 14

AM RECEPTION

1. Set the FUNCTION switch to AM.
2. Set the MODE switch to 2CH.
3. Turn the TUNING knob to tune in the desired station while watching the pointer deflect in the SIGNAL meter.
   Best reception is obtained when the pointer deflects to the extreme right.
4. After the AM station has been tuned in, turn the VOLUME control to increase the volume in the way you want, and adjust the BASS and TREBLE controls to obtain the most pleasing tone. Note that a matrix 4-channel effect cannot be obtained from AM broadcasts.

NOTE:

If excessive noise occurs during AM or FM reception and cannot be cured by the above methods, re-read the section "Antennas and Ground Connection" (see page 7) for optimum reception.

RECORD PLAYING

1. Set the FUNCTION switch to PHONO.
2. Set the MODE switch to match the type of disc record to be played.

Type of Record	MODE Switch Position
RM 4-channel record	4CH RM
SQ matrix 4-channel record	4CH SQ
CD-4 record*	4CH CD-4
Ordinary stereo record**	2CH

* Note that it is necessary to adjust the Carrier level and Separation for each four-channel before playing a CD-4 disc record. For details, see below and the next page.

** Any ordinary 2-channel stereo record other than CD-4 disc records can be played at either position of RM or SQ as 4-channel performance.

3. Set the VOLUME, BASS and TREBLE controls to desired positions.

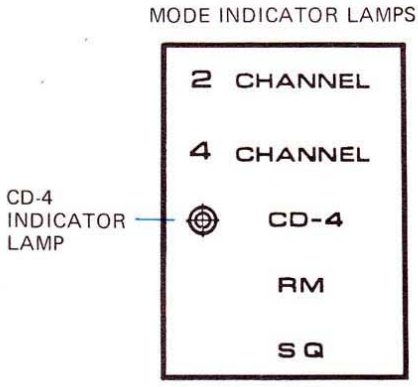


Fig. 15

NOTE:
If you use a 2-channel phono cartridge of a capacity larger than specified, you may occasionally feel reproduced sound distorted. In this case, turn the SEPARATION CONTROL knob to left (↶) of the QX-646 on the front panel, to eliminate the distorted sound.

USING THE AUX JACK

1. Set the FUNCTION switch to AUX.
2. Set the MODE switch according to the type of the program sources connect to the AUX jacks.
3. Set the VOLUME, BASS and TREBLE controls to desired positions.

BEFORE CD-4 RECORD PLAYING

Before playing a CD-4 disc record, adjust such as "Carrier Level," "Separation," "Channel Confirmation and Sound Volume Adjustment" with the supplied test record. Re-adjustment is required when the phono cartridge and stylus are replaced, or after a long period of play. For details, follow the steps described below:

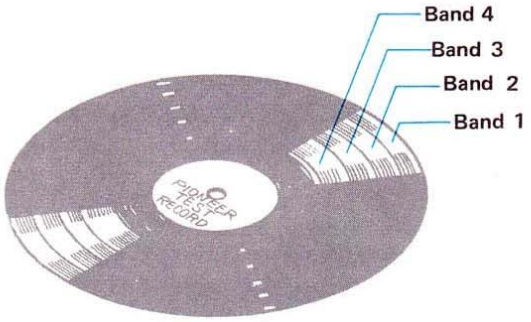
CARRIER LEVEL ADJUSTMENT

1. Turn up volume to average listening level.
2. Play the Band 4 to adjust a 30kHz carrier level from the test record. "SIGNAL FOR 30kHz CARRIER LEVEL ADJUSTMENT."
3. Listening to the signal (400Hz), turn the CARRIER LEVEL CONTROL knob of the QX-646 on the rear panel from the right (maximum position) to the left.
4. Turning the CARRIER LEVEL CONTROL knob to the left, find the changing point of tone quality, at which the signal becomes distorted. Then turn to the right to let the knob adjust at a turning angle of between 15°~30°.

Once the final carrier adjustment is made, the knob must not be turned except for readjustment after replacement of phono cartridge or stylus, and after a long period of play.

ASC (Automatic Selectivity Control) Circuit

When the engraved grooves of a CD-4 disc record are worn down into a noise unpleasant to listen, the ASC circuit is used for suppressing such a noise by compensating for frequency in accordance with a change of carrier levels.



TEST RECORD (PQX-1011)

Fig. 16

CD-4 SEPARATION ADJUSTMENTS

Left (CH. 1 - CH. 2) Adjustment

1. Turn up volume to normal listening level.
2. Turn the FRONT - REAR BALANCE control all the way to the right.
3. Turn the REAR BALANCE control all the way to LEFT.
4. Play the Band 1 to adjust the separation of left channels (CH. 1 and CH. 2) from the test record. "SIGNAL FOR SEPARATION ADJUSTMENT OF LEFT CHANNELS."
5. Adjust the SEPARATION LEFT control so that the sound volume from the REAR LEFT (CH. 2) becomes minimum, listening to the test record.

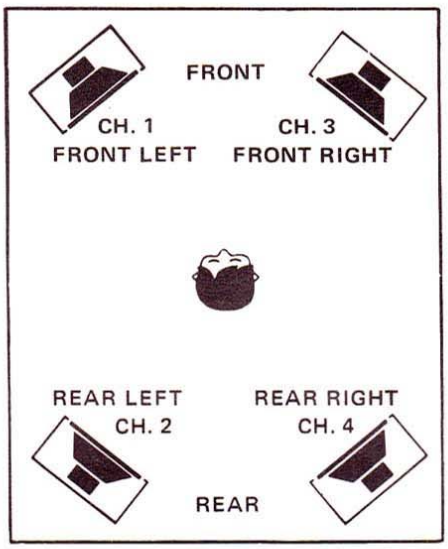
Right (CH. 3 - CH. 4) Adjustment

1. Turn up volume to normal listening level.
2. Turn the FRONT-REAR BALANCE control all the way to the right.
3. Turn the BALANCE REAR control all the way to RIGHT.
4. Play the Band 2 to adjust the separation of right channels (CH. 3 and CH. 4) from the test record. "SIGNAL FOR SEPARATION ADJUSTMENT OF RIGHT CHANNELS."
5. Adjust the SEPARATION RIGHT control so that the sound volume from the REAR RIGHT (CH. 4) becomes minimum, listening to the test record.

If these checks reveal that the separation adjustments do not function as predicted, check all speaker connections. There must be a wrong connection somewhere.
After confirming that operation is normal, set these controls to mid-positions.

CHANNEL CONFIRMATION AND SOUND VOLUME ADJUSTMENT

1. Turn up volume to normal listening level.
2. Play the Band 3 to check the channel connection and balance from the test record. "ANNOUNCEMENT FOR CHANNELS AND SIGNAL FOR BALANCE ADJUSTMENT."
3. Listening to the test record, confirm that the sounds from each speaker system (CH. 1 ~ CH. 4) are satisfactory.
4. Finally, adjust the sounds from each speaker system (CH. 1 ~ CH. 4) properly.



SPEAKER SYSTEM PLACEMENT

Fig. 17

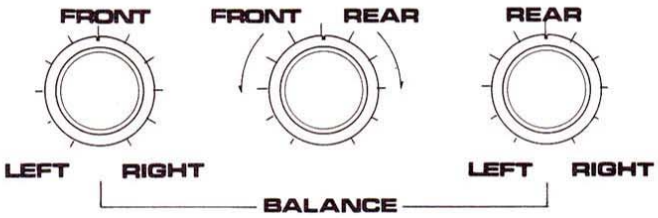


Fig. 18

NOTE:
The knobs must not be turned after final CARRIER LEVEL and CD-4 SEPARATION adjustment except after the replacement of phono cartridge or stylus.

USING A TAPE DECK

TAPE PLAYBACK

1. Set the TAPE MONITOR switch to ON.
2. Set the MODE switch according to the type of tape to be reproduced.

Type of Tape	MODE Switch Position
4-channel discrete tape	4CH CD-4
2-channel stereo tape	4CH SQ 4CH RM 2CH

2-channel recorded tape can be reproduced at either position of RM or SQ to get 4-channel performance.

3. Set the VOLUME, BASS and TREBLE controls to the desired positions.

TAPE RECORDING

The signal being played over the receiver is always present at the TAPE REC outputs for recording on tape. Select the program source with the FUNCTION switch as usual. Please note that the VOLUME, BASS, TREBLE controls have no effect upon the signal at the TAPE REC outputs.

The signal is recorded as it comes from the program source. Recording levels must be adjusted with the controls on the tape deck (see Fig. 19).

Monitoring of a Recording in Progress

If the tape deck is a three-head type or equipped with monitor circuits, a recording in progress can be monitored by setting the TAPE MONITOR switch on the QX-646 at position ON (see Fig. 19).

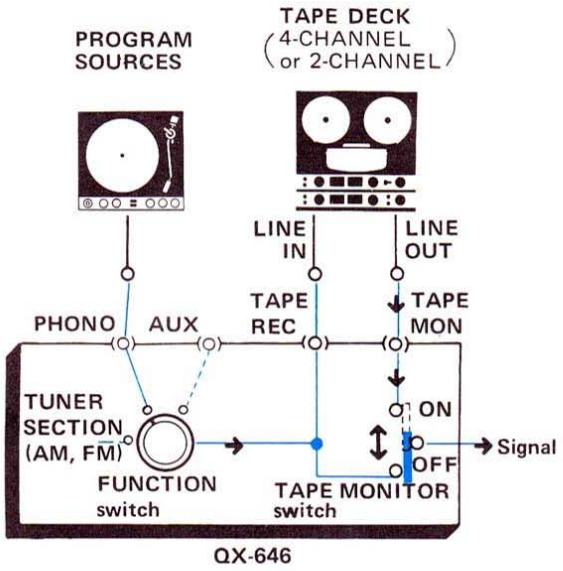


Fig. 19

NOTE:
While playing RM (regular matrix) or SQ matrix disc record, signal present at CH.2 jack of the REC output jacks is the same with that of CH.1, and signal present at CH.4 jack, the same with that of CH.3. Accordingly, no 4-channel tape deck can record such signals in either RM or SQ effect because the signals do not pass through a demodulator. If, however, the tape monitor switch is on, speaker systems will reproduce demodulated 4-channel stereo sounds in either of RM and SQ effect.

TAPE DUPLICATING

Only with two 2-channel tape decks, not including 4-channel tape decks, you can duplicate tape-to-tape or edit recordings while re-recording. For stereo program, with announcements and commercials, and later re-record on another tape while cutting out unwanted portions. For duplicating, proceed as follows:

1. Connect two tape decks as shown in Fig. 20.
2. Set the FUNCTION switch to AUX, and reproduce a recorded program by operating the tape deck plugged into the AUX inputs.
3. Record the program in the way you want by operating the tape deck plugged into TAPE REC (MON) jacks. Operation of the TAPE MONITOR switch allows you to monitor a recording in progress.

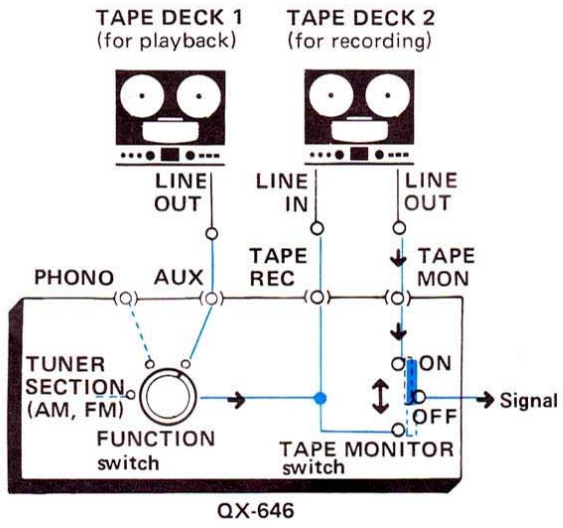


Fig. 20

ABOUT CD-4 RECORD

In conventional 2-channel stereo records, both left and right sound information is engraved on the left and right walls of the 45°/45° record groove. If this method applies to recording 4-channel sounds, they must be converted into 2-channel signals once before engraving them on the walls. This is generally called a Matrix 4-channel record.

The CD-4 disc record employs a special recording and reproducing method initially developed in Japan, in which 4-channel signals can be recorded independently without converting them into 2-channel signals.

The CD-4 disc record, two different kinds of signals are engraved directly on each left and right wall (Fig. 21). One signal is the conventional signal with an audible frequency less than 15kHz, and engraved in the same way as conventional records. Another signal is an inaudible signal of a frequency higher than 20kHz. If such signals are reproduced directly, they are inaudible.

In the CD-4 disc record, the other audible signals are converted into frequency deviation between 20kHz and 45kHz (frequency modulation with 30kHz carrier), and engraved on the walls in addition to the signal just described.

The A-sound in the figure is reproduced as the audible sound when the stylus tracks the groove.

However, it is necessary for the B-sound to use the demodulator. The X-signal which contains the B-sound is demodulated and the B-sound is extracted from the X-signal, thereby enabling the B-sound to be audible.

In the actual CD-4 disc record, the A and C sound, which are audible, contain the sum signals of the left front plus rear, and the right front plus rear respectively. Therefore, in a 2-channel system, the left and right speaker systems can reproduce each sum signal because of its compatibility.

The B and D sounds, on the other hand, contain the different signals — the left front minus rear and the right front minus rear respectively.

For a complete 4-channel system, the four independent signals, front left, front right, rear left and rear right can be fed to the amplifier through the demodulator and the matrix circuitry as shown in Fig. 22.

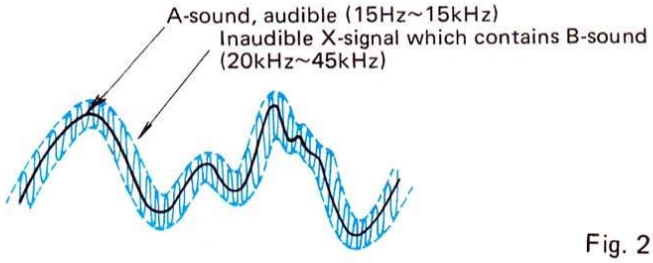
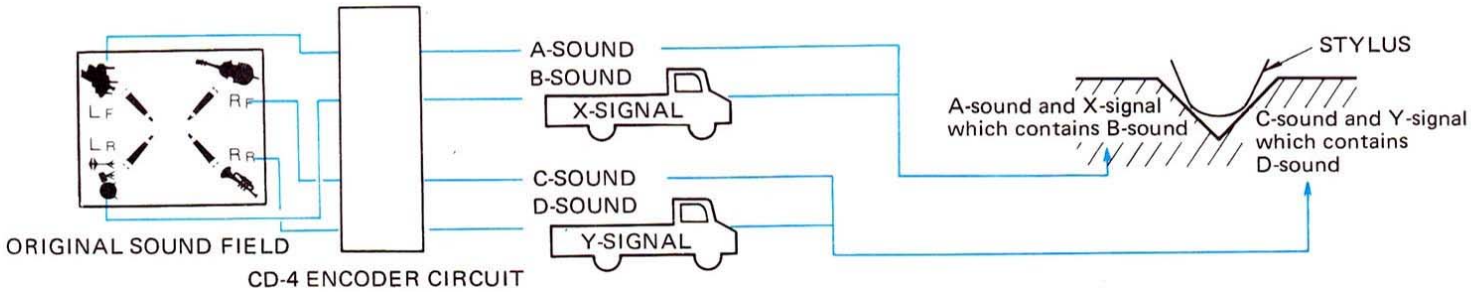


Fig. 21



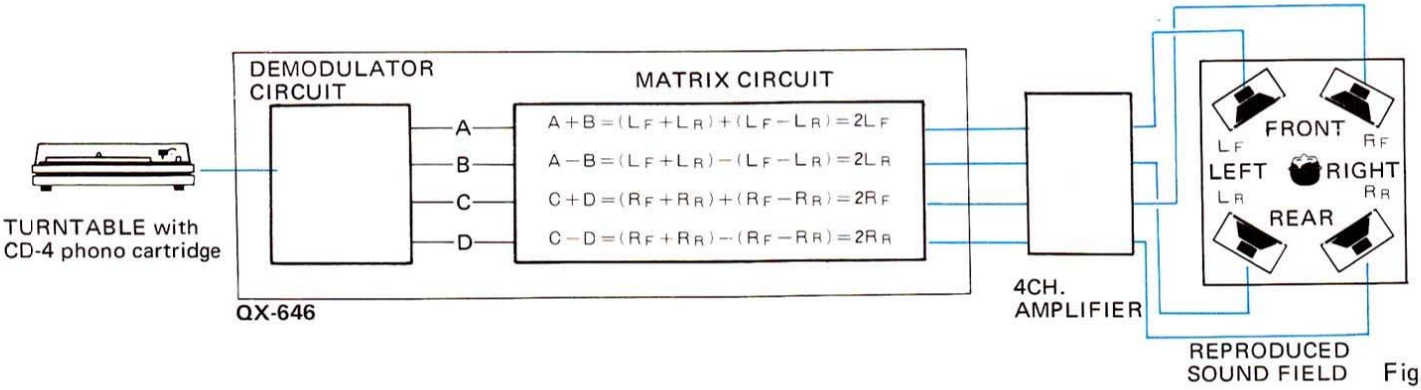


Fig. 22

MATRIX 4-CHANNEL DECODER

There are two types of matrix 4-channel systems, the RM (regular matrix) and the SQ matrix. Source information comes directly from matrix 4-channel records now available on the market or indirectly from FM broadcasts of such records. As these methods are not compatible, two decoders must be added to obtain 4-channel reproduction which exhibits the inherent features of each.

Regular Matrix

As shown in the Fig. 23, signals L_T and R_T from a matrix 4-channel record (or FM broadcast) pass through phase shifters and appear as four separate outputs. This figure also shows that the α portion of signal R_T is added to signal L_T to form front left signal L_F and that the α portion of signal L_T is added to signal R_T to form front right signal R_F. The β portion of signal R_T with phase led 90° ($+jR_T$) is added to signal L_T with phase lagged 90° ($-jL_T$) to form rear left signals L_R, while the β portion of the $-jL_T$ signal is added to the $+jR_T$ signal to form rear right signal R_R.

L_F (front left, CH. 1): $L_T + \alpha R_T$
R_F (front right, CH. 3): $R_T + \alpha L_T$
L_R (rear left, CH. 2): $-jL_T + j\beta R_T$
R_R (rear right, CH. 4): $+jR_T - j\beta L_T$

Using this approach, unnatural images are eliminated and at the same time realism is effected. Even if 2-channel stereo records (FM broadcasts) supply the source material, the resultant effect is an improvement over ordinary 2-channel stereo sound.

SQ Matrix

As shown in the Fig. 24, signals L_T and R_T from an SQ matrix record (or FM broadcast) pass through phase shifters and appear as four separate outputs. This figure shows that signal L_T becomes signal L_F (CH. 1) and that signal R_T becomes signal R_F (CH. 3), without any alteration.

A phase shifter lags the phase of signal L_T by 90,° after which the lagged signal is added to signal R_T. Level of the resultant signal is dropped by $1/\sqrt{2} \fallingdotseq 0.7$ and phase is inverted to form CH. 2 signal L_R. In the same manner, signal L_T is added to signal R_T with phase lagged 90°. The level is reduced by $1/\sqrt{2}$ to form signal R_R.

L_F (CH.1): L_T
R_F (CH.3): R_T
L_R (CH.2): $+j0.7L_T - 0.7R_T$
R_R (CH.4): $-j0.7R_T + 0.7L_T$

Thus, it is seen that separation in the SQ matrix system is better than that in the regular matrix system, that is, separation between L_F and R_F. In matrix reproduction of 2-channel records (FM broadcasts), front (L_F, R_F) separation theoretically becomes infinite. At the same time, rear signals are 90° out of phase to front (L_F, R_F), resulting in a feeling of depth which corresponds to a large hall.

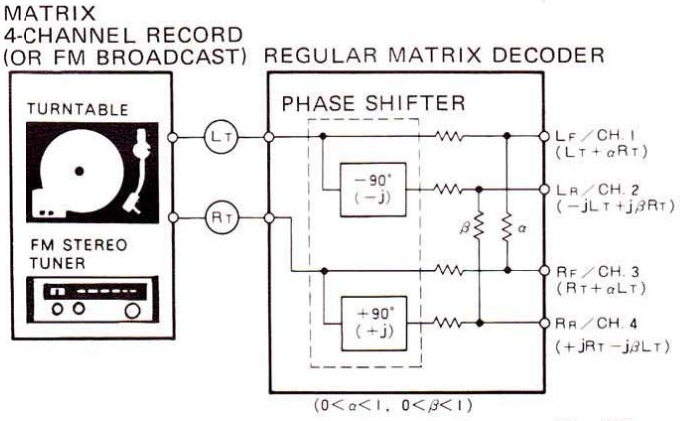


Fig. 23

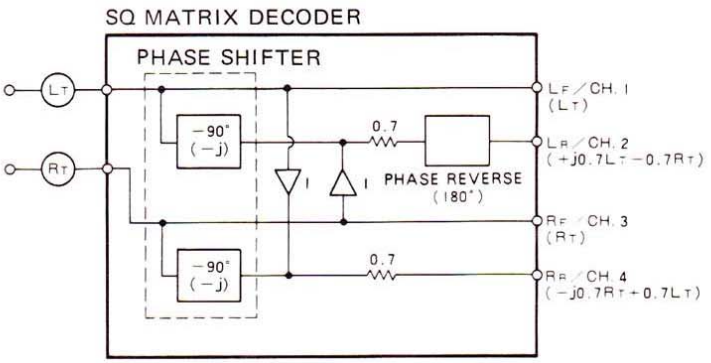


Fig. 24

NOTE:
L_T and R_T are signals from a record or FM broadcast. Term -j denotes that the phase of the signal has been lagged 90° (with a phase shifter), while term +j denotes that the phase of the signal has been led 90°.

CONDITIONS FREQUENTLY MISTAKEN FOR MALFUNCTION

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 part has deteriorated) and (2) an external source is adding to 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 high-fi acoustic 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 noises, however small, into definite output noise. If your receiver produces a noise, check according to the following table and trace out the source of noise for the appropriate corrective action.

	SYMPTIOM	SUSPECTED SOURCE OF NOISE	DIAGNOSIS AND REMEDY
WHEN LISTENING TO BROADCASTS	Continuous or intermittent noise like jjjjjj or zzzzzz.	· Static (lightning) · Fluorescent lamp, motor, or thermostat may be in use in house or in the vicinity of the house.	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.
	When a station is tuned in, hum is mixed in the program.	· Poor fluorescent lamp, motor, or electric heater may be in use in house or near the house.	Reversing the line plug may occasionally alleviate this noise problem. Usually it is very difficult to eliminate the noise.
	Hissing sound noise in AM (medium wave) reception.	· The frequency of an adjacent station is interfering with that of the station being tuned in (10kHz beat interference). · TV set is on in the same house with the receiver.	Impossible to remove such interference. If the case of such noise is in the TV set, increase the distance between the TV set and receiver.
	Static noise (in particular, when automobiles run close to the house).	· White noise generated from automobile engines. · High frequency sewing machine or welding machine being used near your house.	In an area surrounded by hills or high buildings, the FM input signals are very weak. Thus the noise limiter in the circuit loses its function. Set up an FM outdoor antenna having many director elements.
	Reception of FM stereo program contains more noise than FM mono program.	· Note that the service area covered by an FM stereo broadcast is about 50% of that of a regular mono broadcast.	Increasing FM input signal may alleviate this problem. Use an exclusive FM outdoor antenna instead of the indoor T-type antenna.
WHEN PLAYING RECORDS	Hum or buzz. When switched to radio reception, the noise disappears.	· Poor connection of shielded wire. (a) · Jack connection is loose. (b) · Line cord of fluorescent lamp is near the shielded wire. (c) · Poor grounding. (d) · Ham transmitting station or TV transmitting station is near your house. (e)	Correct the conditions stated in (a), (b), (c) or (d). In case of (e), report it to an official activity.
	Output tone quality is poor and mixed with noise. Treble is not clear.	· Stylus wears out. (a) · Record wears out. (b) · Dust adheres to stylus. (c) · Stylus is improperly mounted. (d) · Stylus pressure is not proper. (e) · The TREBLE level is too high.	Check (a) through (e) and correct the condition. Lower the TREBLE level.

WATCH FOR THE FOLLOWING CONDITIONS; THESE ARE ALSO APT TO BE MISTAKEN FOR MALFUNCTIONS.

	SYMPTOM	SUSPECTED SOURCE OF NOISE	DIAGNOSIS AND REMEDY
	Power is not turned on although the power switch is set to ON.	· Fuse blows. (a) · Line plug is loose, (b)	Check (a) and (b) and correct the condition.
	Power ON but speakers produce no sound.	· Blown-out PROTECTION fuse.	Replace with the supplied PROTECTION fuse.
	In playing a record, increasing the volume causes howling.	· Distance between the turntable and the speakers is too short. · The place on which the turntable or speakers are set is unstable.	Change the distance or rearrange the installation increase of the unit and speakers. (Installing the turntable on a firm, solid stand may alleviate this problem.) Do not enhance the BASS sound level excessively.

SPECIFICATIONS

Semiconductors

FETs	9
ICs	5
Transistors	109
Diodes	45

Amplifier Section

Continuous Power Output	
20Hz ~ 20kHz (2 channels driven)	
	10W + 10W / 10W + 10W (8Ω)
1kHz (4 channels driven)	10W x 4 (8Ω), 11W x 4 (4Ω)
1kHz (2 channels driven)	13W + 13W / 13W + 13W (8Ω)
	15W + 15W / 15W + 15W (4Ω)
1kHz (Each channel driven)	15W / 15W / 15W / 15W (8Ω)
	20W / 20W / 20W / 20W (4Ω)
Music Power Output (IHF)	80W (8Ω), 108W (4Ω)
Harmonic Distortion	
(Continuous Power Output)	Less than 1%
Intermodulation Distortion	
(Continuous Power Output)	Less than 1%
Power Bandwidth	
(IHF, 4 channels driven 8Ω)	15Hz~20kHz (H.D. 1%)
(IHF, 2 channels driven 8Ω)	10Hz~30kHz (H.D. 1%)
Output, Speaker	1 Pair for Front, 2 Pairs for Rear (4~16Ω)
Headphone	Front (CH.1, CH.3)
Damping Factor (1kHz, 8Ω)	40
Input Sensitivity / Impedance	
PHONO (2CH.)	2.5mV/100kΩ
AUX	180mV/90kΩ
TAPE MONITOR	180mV/90kΩ
TAPE MONITOR	
(DIN Connector)	180mV/90kΩ
Output Level	
TAPE REC	180mV
TAPE REC (DIN Connector)	30mV
Frequency Response	
PHONO (RIAA equalization)	30Hz ~15kHz ±0.5dB
AUX, TAPE MON	10Hz ~100kHz ±3dB
Tone Control	
BASS	+13dB, −12.5dB (100Hz)
TREBLE	+11.5dB, −8.5dB (10kHz)
Loudness Contour	
(Volume control set at −40dB position)	
	+10dB (100Hz), +5dB (10kHz)
Hum & Noise (IHF, Short-circuited, A Network)	
PHONO	More than 70dB
AUX, TAPE MON	More than 90dB

CD-4 Demodulator Section

Input Sensitivity	2.5mV (1 ~5mV Adjustable)
Input Impedance	100kΩ
Distortion	0.07%
S/N (IHF, A Network)	More than 70dB
Separation (STD Test Signal at 1kHz)	
Left - Right	50dB
Front - Rear	30dB
Frequency Response	20Hz ~ 15kHz

FM Tuner Section

Usable Sensitivity (IHF)		2.2μV
Capture Ratio (IHF)		3dB
Selectivity (IHF)		40dB
Signal-to-Noise Ratio		65dB
Image Rejection		More than 50dB
IF Rejection		More than 85dB
Spurious Rejection		More than 80dB
AM Suppression		50dB
Harmonic Distortion	Mono	Less than 0.6%
	Stereo	Less than 0.8%
Stereo Separation	1kHz	More than 40dB
Sub Carrier Suppression		35dB
Antenna Input		300Ω Balanced
		75Ω Unbalanced
Muting		ON-OFF

AM Tuner Section

Usable Sensitivity	
(IHF, Ferrite antenna)	300μV/m
(IHF)	15μV
Selectivity (IHF)	25dB
Signal-to-Noise Ratio	50dB
Image Rejection	More than 45dB
IF Rejection	More than 30dB
Antenna	Built-in Ferrite Loopstick Antenna

Miscellaneous

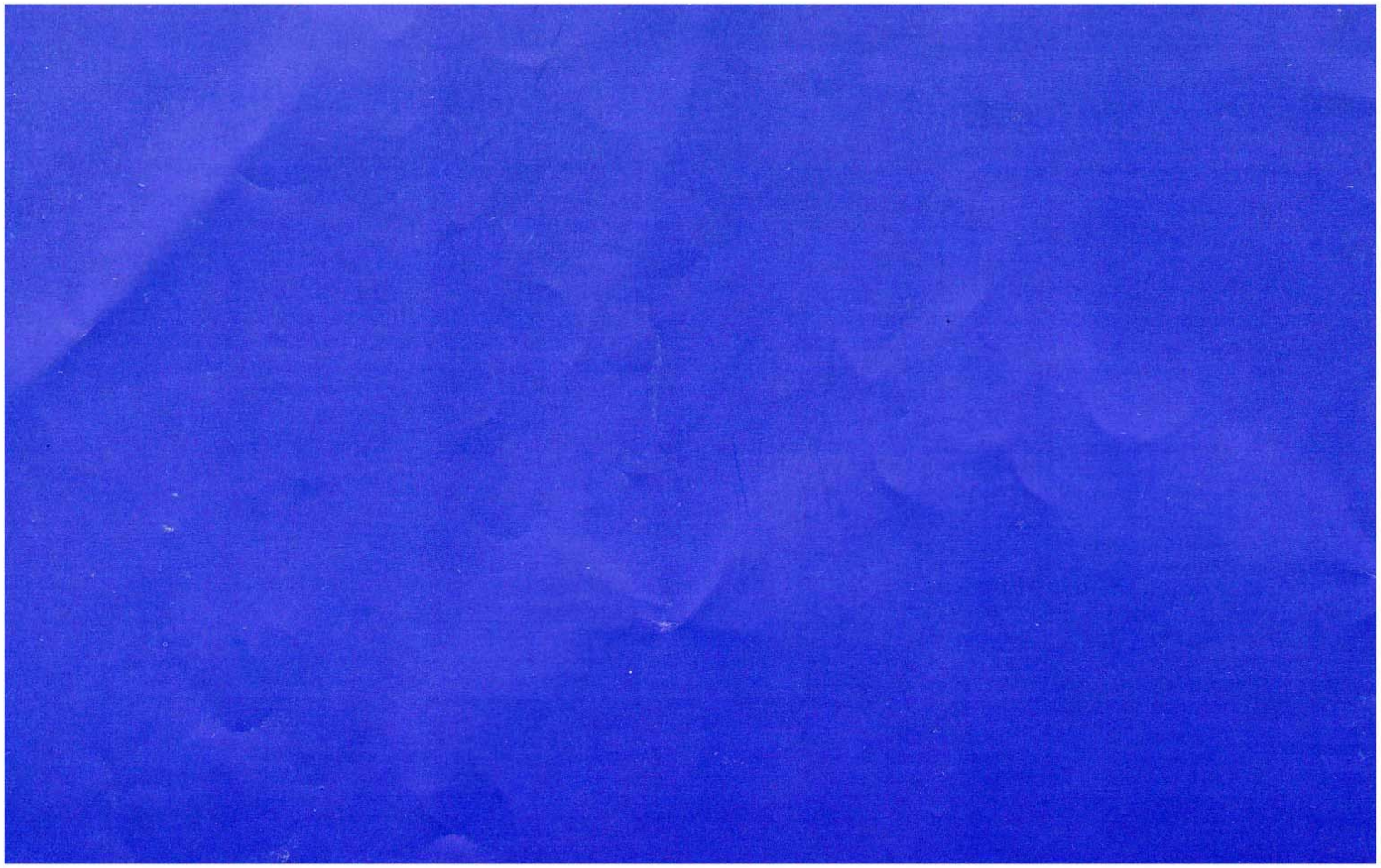
Built-in CD-4 Demodulator		
Regular Matrix Decoder		
SQ Matrix Decoder		
Power Requirements		AC 120V 60Hz or 110V, 120V, 130V, 220V and 240V (Switchable) 50/60Hz
Power Consumption (Max.)		160W
AC Outlets		Switched 1, Unswitched 1
Dimensions		525(W) x 149(H) x 360(D) mm
		20-11/16(W) x 5-7/8(H) x 14-3/16(D) in.
Weight	Without Package	12.3kg (27lb 2oz)
	With Package	14.7kg (32lb 7oz)

Furnished Parts

FM T-type Antenna	1
CD-4 Test Record (PQX-1011)	1
Operating Instructions	1
Fuses 1.5A (Protection)	2
Fuse 1A (for 5-line voltage model only)	1
Fuses 2A (for 5-line voltage model only)	2

NOTE:

Specifications and the design subject to possible modification without notice due to improvements.



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