

Technics by Panasonic

CD-4 SYSTEM DISC DEMODULATOR

SH-400

OPERATING INSTRUCTIONS



Before operating this set, please read these instructions completely.

Dear Stereo Fan

Thank you very much for selecting
the Technics by Panasonic model
SH-400

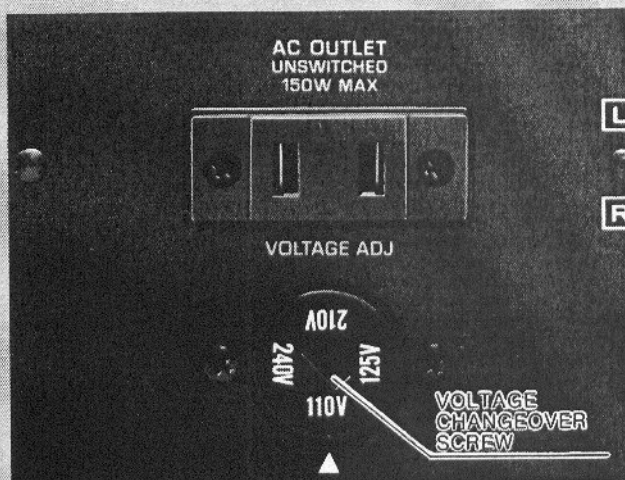
CD-4 System Disc Demodulator Model SH-400



BEFORE USE

Power Source Voltage

If the voltage which the unit is set is different from that of
your area, move the voltage changeover screw to the voltage
of your area (you can find the switch at the rear of the unit).



CONNECTIONS FOR A CD-4 SYSTEM

BEFORE MAKING CONNECTIONS

When connecting a receiver, amplifier or record player to this unit, prepare the connection cords shown below.

- Connection cord between this unit and record player. ... (1)
- Connection cords between this unit and receiver or amplifier. (3)

- (1) Connection cord between this unit and record player.
- If the record player has a magnetic cartridge, use a low-capacitance, shielded cord.
 - If the record player has a semi-conductor cartridge, an ordinary shielded cord can be used.

- (2) Connection cords between this unit and the receiver or amplifier.

- Ordinary shielded cords can be used.

CONNECTION CORDS (OPTIONAL & EXTRA)



CONNECTIONS

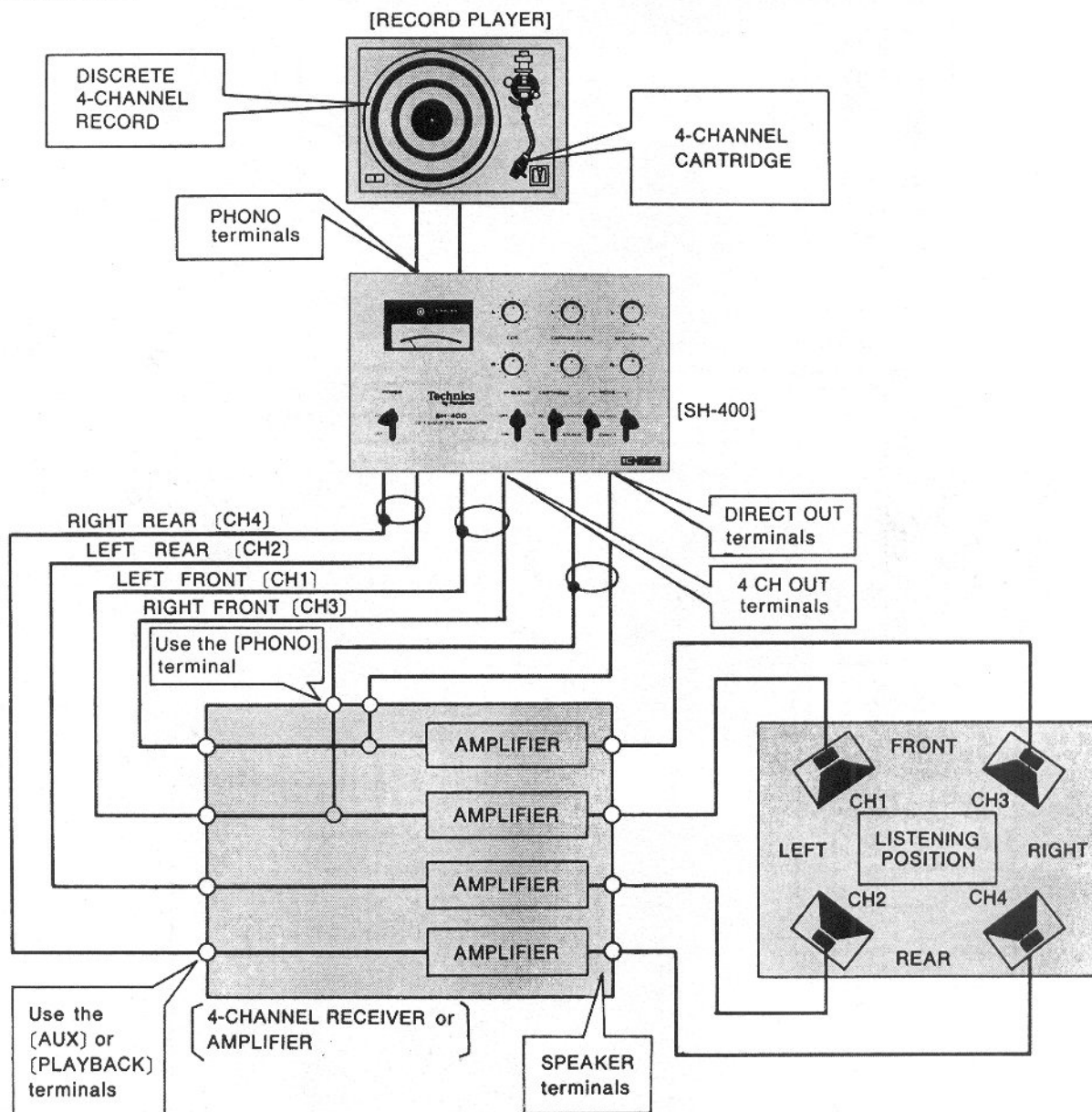


Figure indications are as follows:

R FRONT.....right front signal (CH 3)

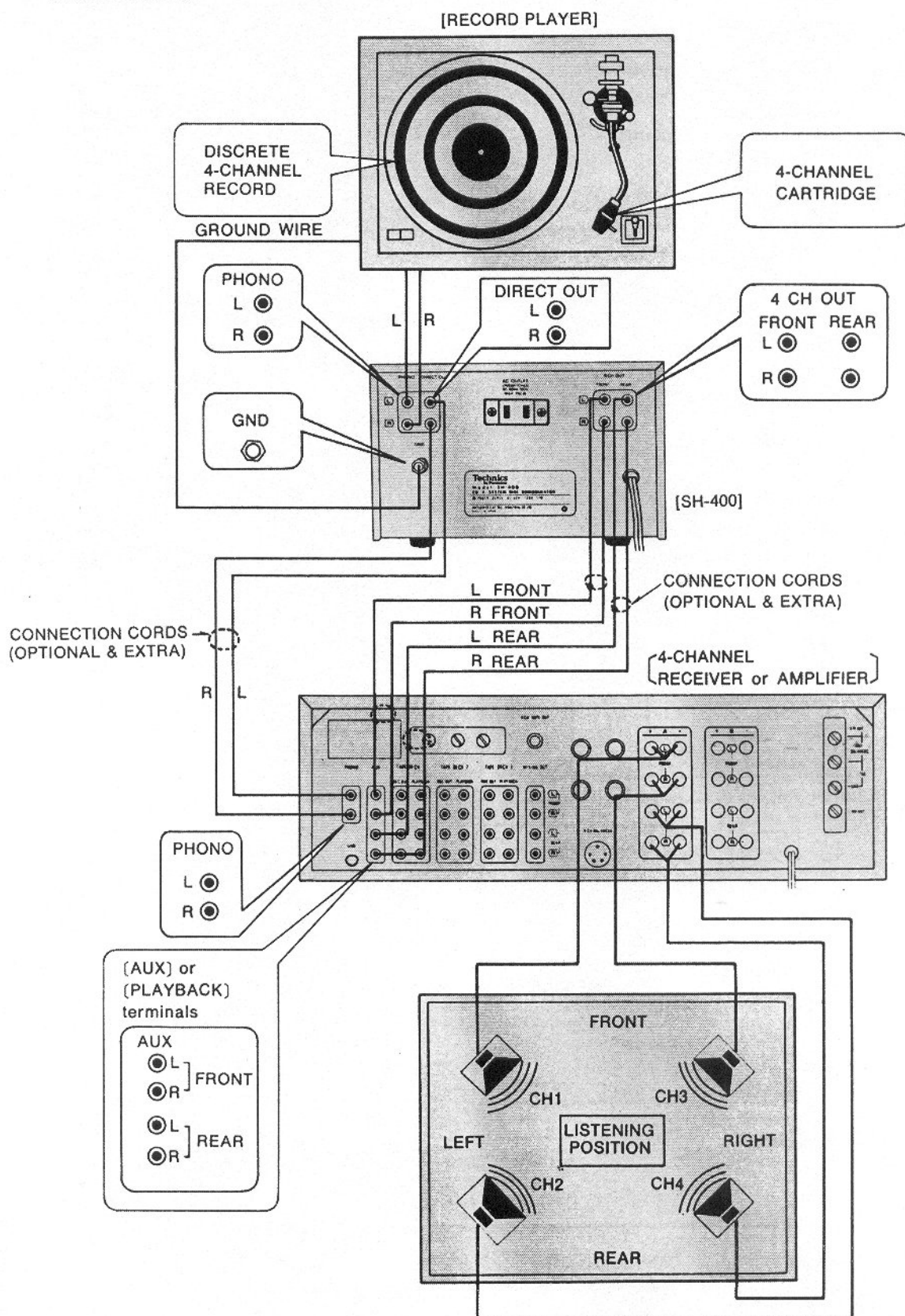
L FRONT.....left front signal (CH 1)

R REARright rear signal (CH 4)

L REARleft rear signal (CH 2)

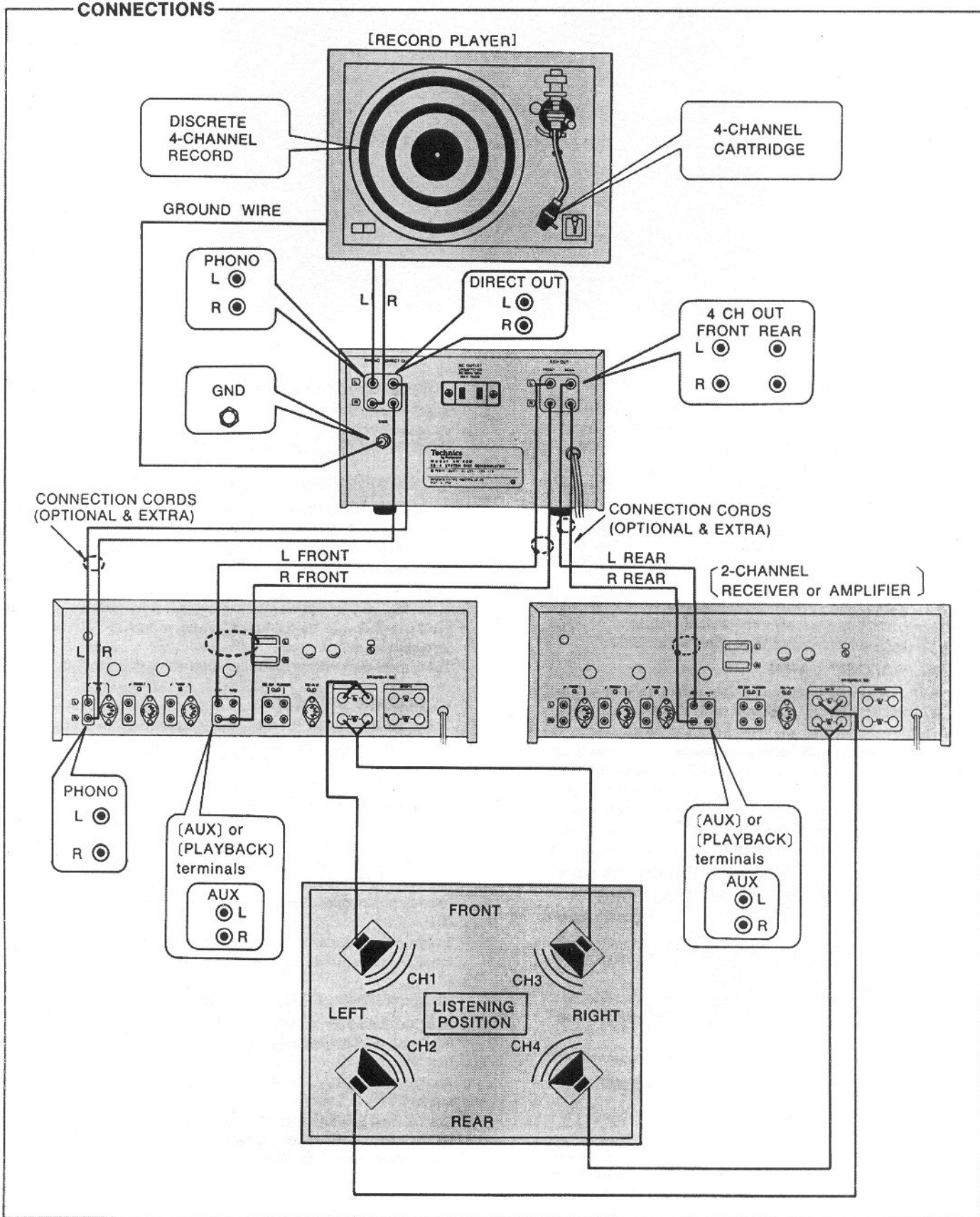
IN COMBINATION WITH A 4-CHANNEL RECEIVER OR AMPLIFIER

CONNECTIONS

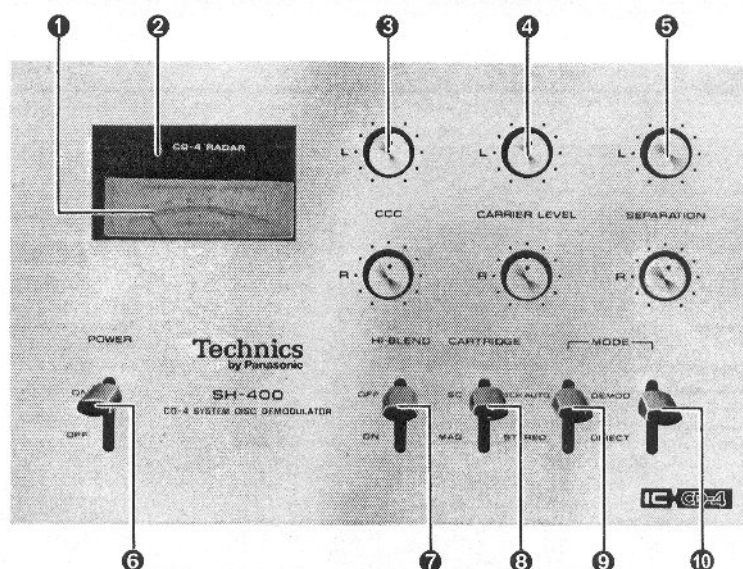


IN COMBINATION WITH A 2-CHANNEL RECEIVER OR AMPLIFIER

CONNECTIONS



PARTS IDENTIFICATION AND THEIR FUNCTION



① ADJUSTMENT METER

Use this meter when adjusting either the carrier crosstalk canceller, the carrier level, or the separation. This meter will function if the respective volume adjustment control pushbuttons are pushed to release them (▲→■).

If two or more of the volume adjustment control pushbuttons are pushed at the same time (the volume adjustment control pushbuttons for both the carrier level and the separation, for example, or the left and right volume adjustment control pushbuttons for the separation etc.), the indication needle will show a mixture of both of the signals.

Therefore, in this case, when adjustment is to be made, release only the pushbuttons you wish to adjust.

Refer to page 7~8 for detailed operation information.

② CD-4 "RADAR" LAMP

This "radar" lamp will illuminate if the mode selector⑨ is set to the "4 CH AUTO" position and a CD-4 record is played.

Note that, although this lamp may possibly illuminate if an ordinary 2-channel stereo record which includes sounds beyond the high audio frequency range, or a very old record, is played, this doesn't indicate an abnormality. If this occurs, set the mode selector⑨ of this unit to the "STEREO" position; the radar lamp will then go out.

③ CARRIER CROSSTALK CANCELLER VOLUME ADJUSTMENT CONTROL PUSHBUTTONS

The function of this is for adjusting the sub-channel signal (20~50 kHz) between the cartridge to be used and the demodulator. Also, it functions to further improve the distortion ratio and separation characteristics.

Push the left or right volume control pushbuttons individually to release them (▲→■), and then turn to the left or right for adjustment.

Refer to page 7~8 for detailed operation information.

④ CARRIER LEVEL VOLUME ADJUSTMENT CONTROL PUSHBUTTONS (30 kHz LEVEL ADJUSTMENT)

These control pushbuttons are used for adjustment of the input level in order that the 30-kHz carrier level output of the cartridge becomes most suitable for the input level of this unit.

Push the left or right volume control pushbuttons individually to release them (▲→■), and then turn to the left or right for adjustment.

Refer to page 7~8 for detailed operation information.

⑤ SEPARATION VOLUME ADJUSTMENT CONTROL PUSHBUTTONS

These control pushbuttons are used in order to adjust the front and rear separation of this unit to the ideal condition which will correspond to the output of the cartridge of the record player.

Push the left or right volume control pushbuttons individually to release them (▲→■), and then turn to the left or right for adjustment.

Refer to page 7~8 for detailed operation information.

⑥ POWER SWITCH

If this switch is set to the "ON" position, the power is turned on, and if set to the "OFF" position, the power is turned off.

⑦ HI-BLEND SWITCH

If, during the play of a CD-4 record, the high-range noise is offensive to the ear because the record is old or worn, use this switch to eliminate the noise.

OFF:

Set to this position for ordinary operation.

ON:

Set to this position if record noise is annoying because the CD-4 record is old, worn, or damaged.

⑧ CARTRIDGE SELECTOR

Set this selector to the position which corresponds with the type of cartridge to be used.

SC:

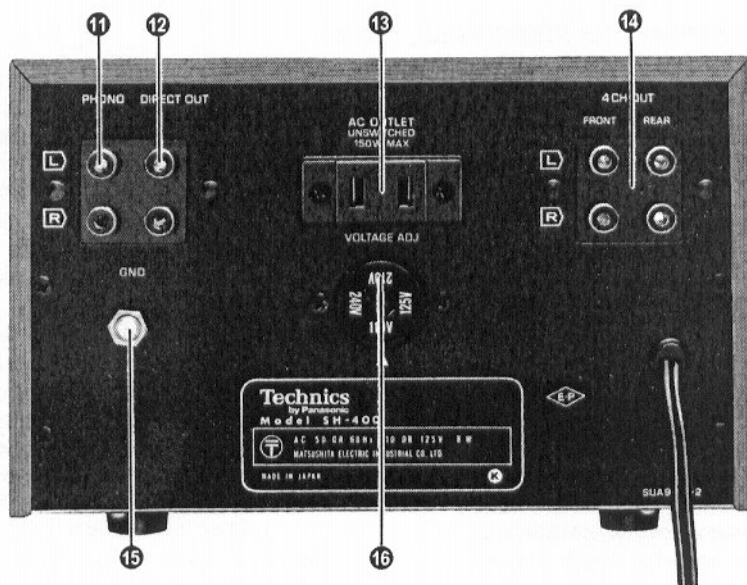
Set to this position when using a semi-conductor cartridge.

MAG:

Set to this position when using a magnetic cartridge.

Be careful if the selector is set wrongly. It will damage the cartridge.

PARTS IDENTIFICATION AND THEIR FUNCTION



⑨ 4-CHANNEL AUTOMATIC/STEREO SELECTOR

This selector is used to change the reproduction mode to either 4-channel sound or 2-channel stereo.

4 CH AUTO:

Set to this position for ordinary operation. At this position, both 4-channel sound and 2-channel stereo can be enjoyed.

STEREO:

If this selector is set to this position while playing a CD-4 record, the signal heard will be a mixture of the left-front (channel 1) and left-rear (channel 2), and of right-front (channel 3) and right-rear (channel 4). Set to this position, therefore, when tape recording the sound of a CD-4 record to, for example, a 2-channel tape deck.

The selector should also be set to this position when playing a 2-channel record which has high-range signals beyond the audio-frequency range, or when the CD-4 radar lamp⑫ illuminates because the record is too old or worn.

⑩ DEMODULATE/DIRECT SELECTOR

Set this switch, as described below, depending on whether the output from the cartridge used with this unit is to pass through the circuitry of this unit or not.

DEM0D:

Set to this position when playing CD-4, 2-channel stereo or matrix records. If the receiver or amplifier connected to this unit has built-in matrix circuitry, set this switch to the "DIRECT" position and set the appropriate switch of the receiver or amplifier to the "MATRIX" position when playing matrix 4-channel records.

DIRECT:

Set to this position when the output of the record player connected to the "PHONO" terminals⑪ (located on the rear panel of this unit) is to be taken directly from the "DIRECT" terminals⑫ (also on the rear panel), without passing through this unit.

Note that, in this instance, the signals can be taken from the "DIRECT" terminals⑫ even if the power switch⑥ of this unit is set to the "OFF" position.

But unless magnetic cartridge is used, the signals will not come out from the "DIRECT" terminals⑫.

⑪ PHONO TERMINALS

The output connection wires from the record player to be connected to this unit should be connected to these terminals.

⑫ DIRECT OUTPUT TERMINALS

The output of the record player connected to the "PHONO" terminals⑪ of this unit can be taken directly out from these terminals, without passing through the circuitry of this unit and thus without increase or decrease.

(But only when it is switched on to either "Demodulate/direct selector⑩" or "DIRECT")

Consequently, these terminals can, if desired, be connected with the phono input terminals of a receiver or amplifier in order to use the equalizer circuitry of the receiver or amplifier.

⑬ AC OUTLET

This AC outlet can be used as a power source for equipment rated at a maximum of 150W. The power cord of, for example, a tape deck can be connected to this receptacle. Note that this power outlet always operates independently of the power switch⑥ of this unit.

⑭ 4-CHANNEL OUTPUT TERMINALS

These are the output terminals for 4-channel reproduction. Connect the "PLAYBACK" or "AUX" terminals of the receiver or amplifier to these terminals.

⑮ GROUND TERMINAL

This is the earth (ground) terminal.

If the record player to be connected to this unit has an earth (ground) wire or an earth (ground) terminal, connect it to this terminal.

In this way, you can decrease the humming sound.

⑯ POWER SOURCE VOLTAGE SELECTOR

The switch is for the adjustment of the power transformer. Refer to page 1 for details.

BEFORE OPERATION

ADJUSTMENTS FOR SEPARATION, CARRIER LEVEL, C.C.C.

The following three adjustments should be made before operation

After making all connections, the following three adjustments should be made in order to assure the best performance of CD-4 records.

1. Separation adjustment
2. Adjustment of the carrier level (30 kHz level adjustment)
3. Adjustment of the carrier crosstalk canceller

In addition, these adjustments should also be made before this unit is used for the first time, if the cartridge of the record player is exchanged, if the stylus is exchanged, or if adjustments are accidentally disturbed.

Before adjustment:


- (1) The 4-channel automatic/stereo selector ⑨ should be set to the "4CH AUTO" position, and the demodulate/direct selector ⑩ should be set to the "DEMODO" position.
- (2) The cartridge selector ⑧ should be set to the position corresponding to the type of cartridge used on the record player.

SC:


Set to this position if a semi-conductor cartridge is used.

MAG:

Set to this position if a magnetic cartridge is used.

- (3) The hi-blend switch ⑦ should be set to the "OFF" position.
- (4) The carrier crosstalk canceller volume adjustment control pushbuttons ③, the carrier level volume adjustment control pushbuttons ④, and the separation volume adjustment control pushbuttons ⑤ should be set to the pushed () position.
- (5) Turn on the power switch ⑥.

Adjustment notes

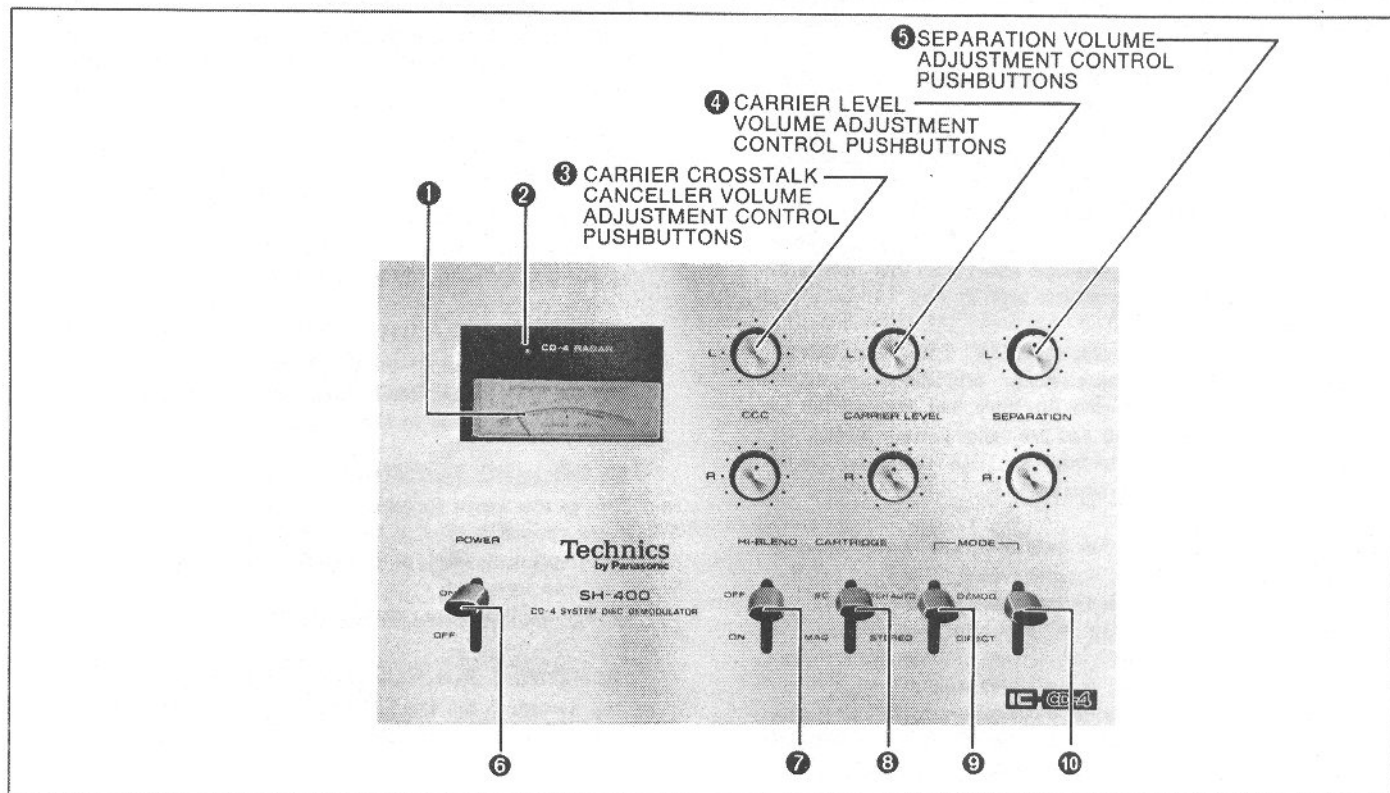
- (1) Be careful, when pushing inward () the various pushbuttons, such as when completing the adjustment of the separation or the carrier level, that the pushbutton does not become turned. If it is accidentally turned, the best adjustment point may get out of position.
- (2) Even if, after the adjustment is completed, these volume control pushbuttons are turned after they have been pushed inward, the best adjustment point will get out of position. Be absolutely sure never to turn them, therefore, after they have been pushed inward.
- (3) You can turn down the volume of the amplifier or the receiver for the adjustment of the record but since you can use the "adjustment meter" ① of the unit, you need not turn down the volume.

HOW TO MAKE ADJUSTMENTS

Order of adjustment

- Be sure to make adjustments in the following order:

1. Separation, 2. carrier level, 3. carrier crosstalk canceller.



1. Separation adjustment

- (1) Push the left (L) and right (R) carrier level volume adjustment control pushbuttons ④ to the released (┐┌) position, turn them both completely clockwise, and then push them both inward again (┐┐).
- (2) Left channel adjustment
 - Push only the left (L) separation volume adjustment control pushbutton ⑤ to the released (┐┐) position.
 - When playing the separation adjustment signal on side A of the test record (included with this unit), turn the left (L) separation volume adjustment control pushbutton ⑤ to the left and right to find the setting at which the indicator needle of the adjustment meter ① moves as far as it will go to the left (the minimum position).
 - After this adjustment, push the volume adjustment control pushbutton inward (┐┐).
- (3) Right channel adjustment
 - Push only the right (R) separation volume adjustment control pushbutton ⑤ to the released (┐┐) position.
 - In the same way as for the left channel adjustment, play the signal for separation adjustment. Then turn the right (R) separation volume adjustment control pushbutton to the left or right to find the setting at which the indicator needle of the adjustment meter ① moves as far as it will go to the left (the minimum position).
 - After this adjustment, push the volume adjustment control pushbutton inward (┐┐).

This finishes the adjustments of the separation.

2. Carrier level adjustment (30 kHz level adjustment)

- (1) Left channel adjustment
 - Push only the left (L) carrier level volume adjustment control pushbutton ④ to the released (┐┐) position.
 - While playing the carrier level adjustment signal on side A of the test record (included with this unit), turn the left (L) carrier level volume adjustment control pushbutton ④ to the left or right to find the setting at which the indicator needle of the adjustment meter ① moves to the position as shown on the right photo.
 - After finishing this adjustment, push the volume pushbutton inward (┐┐).
- (2) Right channel adjustment
 - Push only the right (R) carrier level volume adjustment control pushbutton ④ to the released (┐┐) position.
 - In the same way as for the left channel adjustment, play the signal for performing adjustment of the carrier level. Then turn the right (R) carrier level volume adjustment control pushbutton to the left or right and adjust so that the indicator needle of the adjustment meter ① moves to the position shown in figure below.
 - After this adjustment, push the volume control pushbutton inward (┐┐).

This finishes the adjustments of the carrier level.

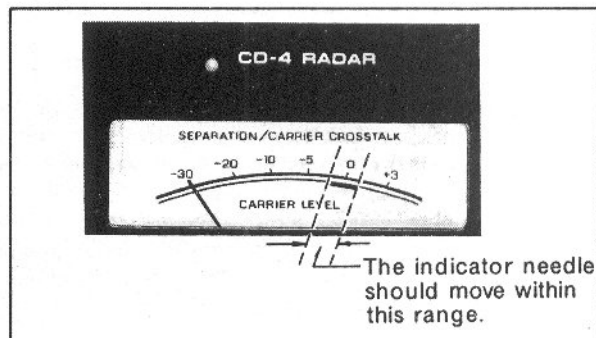
3. Carrier crosstalk canceller (C.C.C.) adjustment

- (1) Left channel adjustment
 - Pushing only the left (L) carrier crosstalk canceller volume adjustment control pushbutton ③ to the released (┐┐) position.
 - While playing the carrier crosstalk canceller adjustment signal on side A of the test record, turn the left carrier crosstalk canceller volume adjustment control pushbutton ③ to the left or right to find the setting at which the indicator needle of the adjustment meter ① moves as far as it will go to the left (the minimum position).
 - After finishing the adjustment, push the volume adjustment control pushbutton inward (┐┐).
- (2) Right channel adjustment
 - Push only the right (R) carrier crosstalk canceller volume adjustment control pushbutton ③ to the released (┐┐) position.
 - In the same way as for the left channel adjustment, play the signal for adjustment of the carrier crosstalk canceller. Then turn the right (R) carrier crosstalk canceller volume adjustment control pushbutton to the left and right in order to determine the setting at which the indicator needle moves as far as possible to the left (the minimum position).
 - After finishing this adjustment, push the volume adjustment control pushbutton inward (┐┐).

This finishes the adjustments of the carrier crosstalk canceller.

(Notes) When adjusting the carrier crosstalk canceller volume adjustment control pushbuttons, the following conditions may occur. These, however, do not indicate that the unit is out of order.

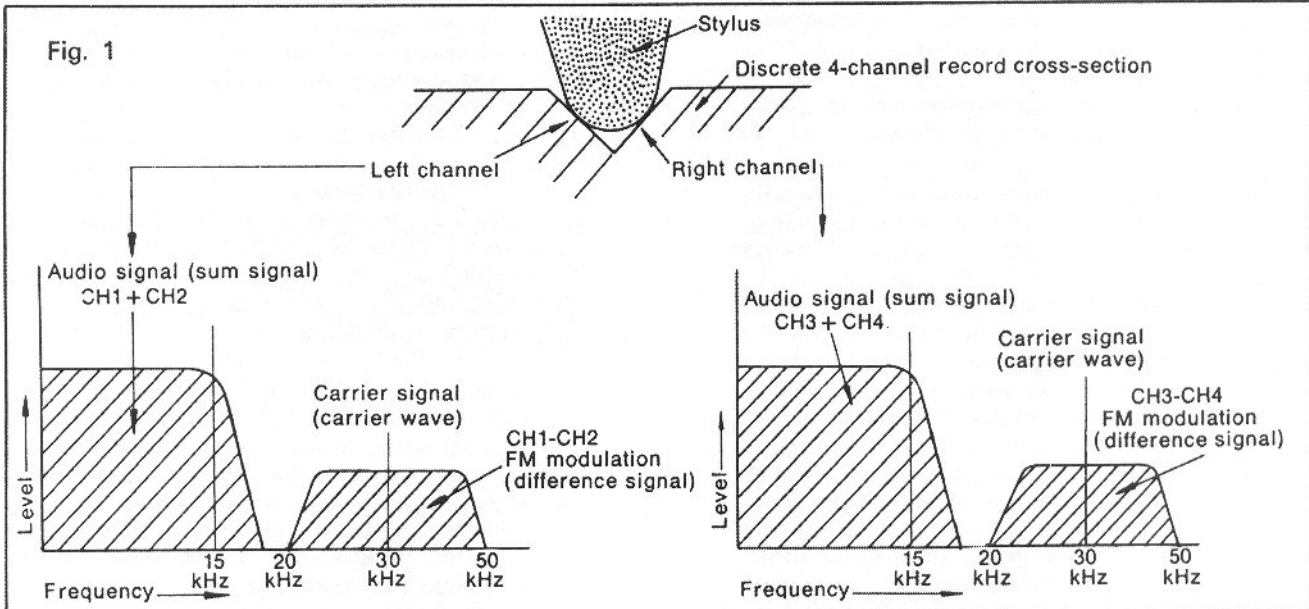
- (1) The indicator needle of the adjustment meter ① may fluctuate slightly because of the characteristic of the cartridge which is used.
- (2) Depending upon the characteristic of the cartridge which is used, the fluctuation of the indicator needle of the adjustment meter ①, and thus the adjustment position, may be different for the left and right sides.
- (3) While turning the carrier crosstalk canceller volume adjustment control pushbuttons ③, the indication needle of the adjustment meter ① may fluctuate to the right side first, before then fluctuating to the left side.



A BRIEF EXPLANATION OF THE CD-4 SYSTEM

Recording

Fig. 1



The following is a brief explanation of how four sounds, each independent of the other, are obtained from one groove of a record.

By studying the record cross-section shown in figure 1, it will be recognized as the 45-45 system, the same as conventional stereo. On the left channel of the sound groove, however, are inscribed both the audio signal (the sum signal)—made up of channels one and two—as well as the carrier signal (the carrier)—which has been FM and

PM modulated by the audio signal (the difference signal) made up of the difference between CH1 and CH2.

(FM=frequency modulation; PM=phase modulation)

Of these two signals, the carrier signal varies from 20 kHz to 50 kHz as a result of being FM modulated.

In the same way, the right channel is inscribed with the CH3+CH4 audio signal and with the carrier signal—which has been modulated by the signal which is the difference between CH3 and CH4.

Playback

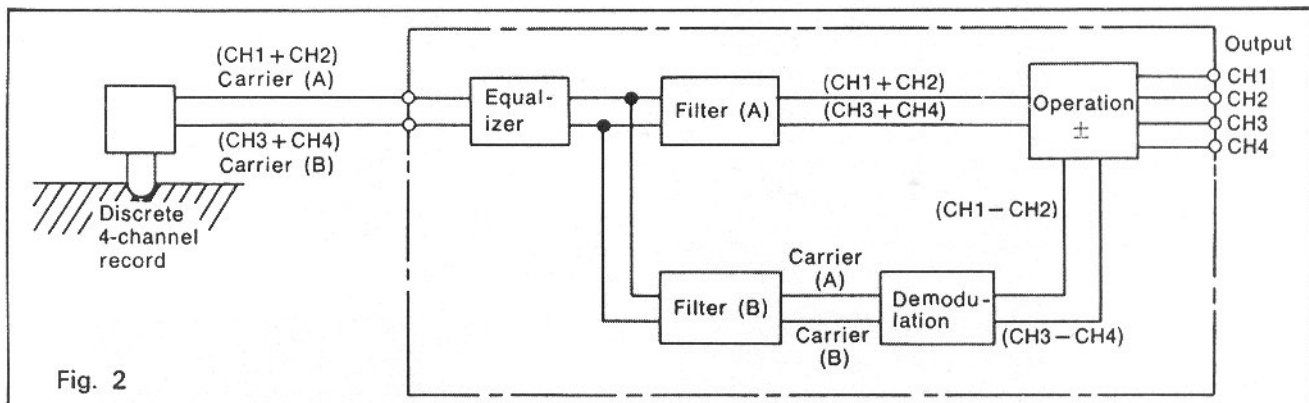


Fig. 2

The block diagram will serve to explain how four independent sounds are picked up from the discrete 4-channel record. First, both the sum signal of CH1+CH2 and the carrier signal (which has been modulated by the difference signal of CH1-CH2) are picked up from the left channel of the record by the CD-4 cartridge and are sent to this unit, where they enter, without change, filter A and filter B after passing through the equalizer (RIAA curve). These filters separate the signals into (1) the sum signal of CH1+CH2 and (2) the modulated carrier signal. The sum signal enters the operation circuitry without change, while the modulated carrier signal passes through the demodulation circuitry and enters the operation circuitry, becoming a difference

signal CH1-CH2 (which is a modulated wave).

Then addition and subtraction are accomplished by the operation circuitry.

Specifically:

Addition: $(CH1 + CH2) + (CH1 - CH2) = 2(CH1)$

Subtraction: $(CH1 + CH2) - (CH1 - CH2) = 2(CH2)$

By this process, CH1 and CH2 are sent to the output. In the same way, the signal picked up from the right channel of the record is sent out as CH3 and CH4. This explanation has, we hope, served to explain how four signals are picked up from one groove of a record as completely independent sounds.

TROUBLESHOOTING GUIDE

Any "trouble" which might be noted in a system including the CD-4 system can usually be traced to the record, the cartridge, the turntable, the demodulator, or the connections between these, or to the manner in which one or all of these are operated. Even though the symptom seems to indicate the fault to be in one component, careful examination often shows it to be elsewhere, or to be an outside cause, or indeed due to incorrect operation. In addition,

sound reproduction becomes ever more faithful to the original as improvements are made in the manufacture of high fidelity components, making the listener ever more conscious of noise which, until recently, was "hidden" within the music itself. The following table can be successfully used to locate the cause, and provide the corresponding remedy, of many of the problems which may be encountered.

Symptom	Main cause	Remedy
<ul style="list-style-type: none"> Abnormal noise <p>Noise is heard at the "4CH AUTO" position but not at the "STEREO" position during performance of a discrete 4-channel record.</p>	<ul style="list-style-type: none"> The stylus is worn out. 	<ul style="list-style-type: none"> The stylus can be used for 300 to 400 hours. If used longer, noise is apt to increase and, moreover, the record may be damaged. It should be replaced with a new one.
	<ul style="list-style-type: none"> There is dust on the record or on the tip of the stylus. 	<ul style="list-style-type: none"> Any dust on the surface of the record is apt to interfere with satisfactory reproduction. Be sure, therefore, to clean away dust completely, using a cleaner or other effective method. To remove dust from the tip of the stylus.
<ul style="list-style-type: none"> Abnormal noise, continually or intermittently. Left/right sound separation is unsatisfactory. 	<ul style="list-style-type: none"> The demodulator of the CD-4 system is located near a television set. 	<ul style="list-style-type: none"> Maintain a distance of more than 2 feet between the demodulator and the television set.
	<ul style="list-style-type: none"> Stylus pressure is incorrect. 	<ul style="list-style-type: none"> Be sure that the stylus pressure is set to the position specified for the cartridge.
<ul style="list-style-type: none"> Noise (hum) is heard continually between record performances. 	<ul style="list-style-type: none"> The ground wire from the turntable isn't connected correctly. 	<ul style="list-style-type: none"> Connect the ground wire from the turntable to the GND terminal of this unit.
<ul style="list-style-type: none"> There is distortion in the sound, or unusual vibration. 	<ul style="list-style-type: none"> The stylus pressure is incorrect. 	<ul style="list-style-type: none"> Be sure that the stylus pressure is set to the specified pressure for the cartridge.
	<ul style="list-style-type: none"> There is dust on the record or on the tip of the stylus. 	<ul style="list-style-type: none"> Dust on the record should be removed with the cleaner. Dust on the tip of the stylus should be removed with the cleaner.
	<ul style="list-style-type: none"> The stylus tip is worn. 	<ul style="list-style-type: none"> The stylus can be used for 300 to 400 hours. If used longer, noise is apt to increase and, moreover, the record may be damaged. It should be replaced with a new one.
<ul style="list-style-type: none"> Front/rear separation is unsatisfactory. 	<ul style="list-style-type: none"> The stylus pressure is incorrect. 	<ul style="list-style-type: none"> Be sure that the stylus pressure is set to the specified pressure for the cartridge.
	<ul style="list-style-type: none"> The cartridge phase is reversed. 	<ul style="list-style-type: none"> Please confirm that the "L", "R" of the lead wire is properly connected to the cartridge.
	<ul style="list-style-type: none"> The record or the stylus is dirty. 	<ul style="list-style-type: none"> Use the cleaner to remove dust from the record; use the cleaner to remove dust on the tip of the stylus.

The term CD-4 record used in these operating instructions refers to any discrete 4-channel record including those labeled "Quadradisc (RCA, WEA, PROJECT 3, etc.)" "CD-4," etc.

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Matsushita Electric of Canada Ltd.
40 Ronson Drive, Rexdale, Ont, M9W 1B5

TECHNICAL SPECIFICATIONS

Phono Input Sensitivity:	1~5mV
Phono Input Impedance:	2.2 kohm (Semi-conductor) 68 kohm (Magnetic)
Rated Output Level:	200 mV
Output Impedance:	300 ohm
Frequency Response:	20~16,000 Hz (Overall)
S/N Ratio:	60 dB
Channel Separation:	55 dB (Left-Right) 30 dB (Front-Rear)
Power Supply:	110, 125V, 50/60 Hz
Power Consumption:	8W
Dimensions:	8 $\frac{1}{8}$ "(W) \times 5 $\frac{1}{2}$ "(H) \times 13"(D)
Weight:	8 Lbs 10 oz