ROTEL *hi fi*

RCD 990
CD Player

with PMD 100 HDCD® Digital Filter

HDCD

OWNERS MANUAL

Please write the purchase date, serial number and the **Rotel *hi fi Authorized Dealer*** in the spaces provided, for your future reference.

Purchase date _____. **Serial number** _____.

Rotel *hi fi Authorized Dealer* _____.

SAFETY INSTRUCTIONS

CAUTION
RISK OF ELECTRIC SHOCK DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

EXCLUSIVE NOTE FOR U.K.

If your unit comes with a 2-core cable without a plug, make certain live and neutral leads are connected to the proper terminals. Check that the terminals are screwed down firmly and no loose strands of wire are present.

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

BLUE: NEUTRAL
BROWN: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows. The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLUE or BLACK. The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or colour BROWN or RED.

- **Explanation of Graphical Symbols**

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert you to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert you to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

1. Read Instructions — All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions — The safety and operating instructions should be retained four for future reference.
3. Head Warnings — All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions — All operating and other instructions should be followed.
5. Water and Moisture — The appliance should not be used near water — for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
6. Carts and Stands — The appliance should be used only with a cart or stand that is recommended by the manufacturer.

PORTABLE CART WARNING

S3125A

7. Wall or Ceiling Mounting — The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.
8. Ventilation — The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
9. Heat — The appliance should be situated away from heat sources such as radiators, stoves, or other appliances that produce heat.
10. Power Source — The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
11. Power-Cord Protection — Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
12. Cleaning — The appliance should be cleaned only as recommended by the manufacturer.
13. Nonuse Periods — The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
14. Object and Liquid Entry — Care should be taken so that objects do not fall into and liquids not spilled into the inside of the appliance.
15. Damage Requiring Service — The appliance should be serviced by qualified service personnel when:
    A. The power-supply cord or the plug has been damaged; or
    B. Objects have fallen, or liquid has been spilled into the appliance; or
    C. The appliance has been exposed to rain; or
    D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
    E. The appliance has been dropped, or the cabinet damaged.
16. Servicing — The user should not attempt to service the appliance beyond those means described in the operating instructions. All other servicing should be referred to qualified service personnel.
17. Grounding or Polarization — The precautions that should be taken so that the grounding or polarization means of an appliance is not defeated.

ROTEL RCD 990 SPECIAL FEATURES ADDENDUM

In reading the final printed copy of the owners manual it has come to our attention that we omitted some vital information about the SPECIAL FEATURES section.

The **TRACK** buttons are used to select whether you are adjusting the DITHER LEVEL or the DIGITAL OUTPUT ON/OFF function. The DISPLAY will show which feature is ready to be adjusted. Then the **PAUSE** button is used to change the DIGITAL OUT function to ON or OFF and to select the levels of DITHER from 1-7 or OFF. (8 is not used by us) Pressing the other buttons will result in an error (err) reading in the display.

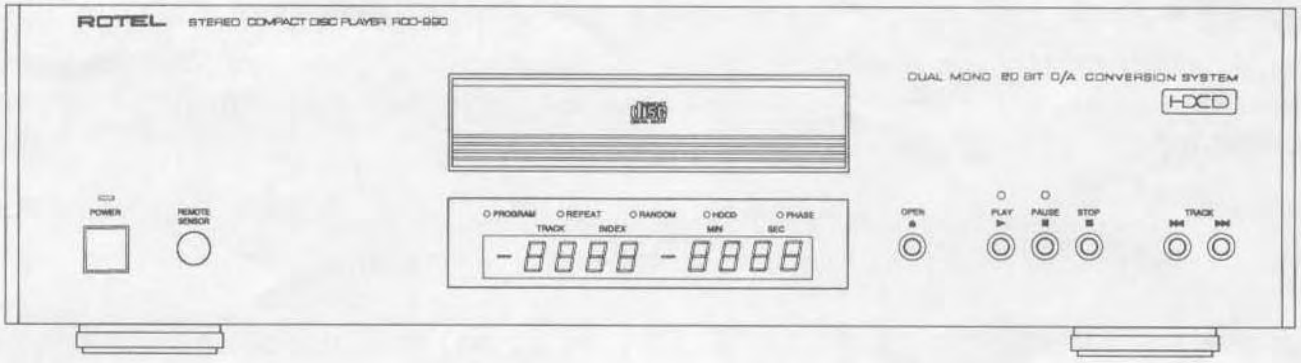
We suggest leaving the digital output off unless you are using the RCD 990 as a CD transport with an outboard digital to analog converter. Any time the circuit can be simplified, the better the sound, we feel. As for the dither modes, we have a definite preference but will leave this up to you to make a choice. Our system is not the same as yours' and we believe that this is also somewhat user preference related. Dither is useful for improving the linearity of the DACs during decoding and we do suggest you try this feature and use dither during playback.

GREETINGS FROM ROTEL

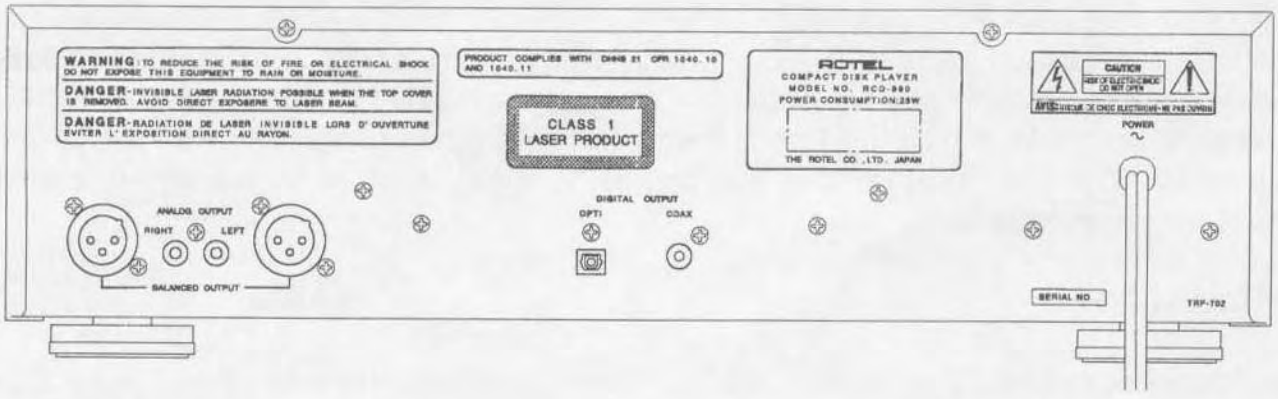
Thank you for buying our RCD 990 CD player. Our engineers designed this machine to reflect the experience gained by manufacturing high performance audio and digital electronics for more than 35 years. We brought our technical expertise and our love of music together during the design and creation of the RCD 990. We believe this CD player will provide you with musical enjoyment for years to come.

We are well known for the high performance and value of our 900 Series components. These are excellent products that offer superb sound and excellent value for money. In the RCD 990 we have given our engineers the freedom to create a CD player with fewer cost constraints. The resulting CD player is an extremely high performance machine that will delight you with its technical and musical adroitness.

FRONT PANEL



REAR PANEL



FEATURES OF THE RCD 990

The drive mechanism is the Philips CDM 9 PRO with an aluminum turntable, nickel brass frame and a brushless DC motor. Previously this has only been used in studio grade machines. We chose the CDM 9 PRO for its stability, performance and reliability. This has a radial arm with a single beam laser and the latest servo control system to improve tracking of warped or scratched discs.

The power supply is derived from a Rotel designed and manufactured toroidal transformer. The audio and servo power supplies are separate to avoid interference. Multiple sub-regulation stages ensure that stable power is available at all points in the circuits. We use high quality capacitors in the power supply to improve propagation time and to reduce the equivalent series resistance. The resulting high speed design allows dynamic signals to be reproduced properly, without strain or limitation.

The digital filter is the Pacific Microsonics PMD 100. This has an 8 x oversampling rate and is the most recently released digital filter available. This is an excellent digital filter and has the added benefit of being able to decode HDCD(encoded recordings. Reviewers worldwide have given very high praise to the sound potential of this digital filter, whether used with HDCD encoded discs or with non encoded discs. (See SPECIAL FEATURES for more information, page 7)

The dual digital to analog converters are Burr Brown PCM63K. These are 20 bit mono IC chips. They provide superb resolution and sound quality. Critical circuit points have precision metal film resistors and capacitors installed to ensure precise tolerances are met. Critical parts were chosen by extensive listening tests.

The display panel has variable intensity and can be turned off. This display panel is designed to be low noise, unlike most designs, and will have less audible influence on the sound when on.

Absolute phase may be inverted with this CD player by pressing the Phase button on the remote control.

Coaxial digital output is available through an RCA jack on the back panel. The output impedance of this connection is 75 ohms. We also include a TOSLINK connector for optical digital output.

The analog output level of the RCD 990 is variable or may be muted. Balanced XLR analog audio outputs are included for those people who have compatible components, such as the Rotel RC 995 preamplifier or the RMB 100 MOSFET mono power amplifier. The output stage of the RCD 990 is made with the NE 5532 operational amplifier. This provides excellent sound quality and was specifically chosen after careful auditioning.

INSTALLATION

We recommend that this CD player be installed in high quality, audio component furniture. This will allow the RCD 990 to be placed on a separate shelf, not stacked with another component. This will minimize potential interference from other components in the system, such as a tuner, digital satellite receiver, laser disc player or a VCR. Audio component furniture will minimize or suppress vibrations. This will benefit the sound quality of all audio components as vibration has an adverse effect on sensitive electronic components. A CD player will benefit because the servo assembly will not have vibration constantly causing the laser pick up to move and need re-focusing on the playing surface of the disc.
Interconnect cables and power cables should be kept apart in any hi fi system. Audio furniture

frequently has provisions for this. Audio patch cables should not be laid next to power cables since the large currents flowing in the power cord can adversely affect the sound of the low level signals in the interconnecting cables. Digital signal cables should be carefully placed to avoid interference from power cables, patch cables and hum fields from large power cords or power transformers in a power amplifier.

Use RCA patch cables or XLR cables to connect the RCD 990 to your system. Observe the correct connections, for the left (**L**) and right (**R**) channels, to avoid reversing the channels. High quality cables will improve your system and we recommend auditioning them. The sound of a well set up system will be a source of great pleasure to you and your friends. Installation should be done with care and planning to optimize the potential of the system in your listening room. Your **ROTEL*hi fi AUTHORIZED DEALER*** will be happy to offer advice about installation or audio and digital patch cables.

Please keep the box and the packing material for the RCD 990 so that the CD player can be packed for shipping if it ever needs service. It is also a good idea to pack the CD player in its original box for transportation if you move to a new location. This will protect the finish and delicate mechanisms inside.

ELECTRICAL REQUIREMENTS

The RCD 990 requires AC voltage. The correct voltage for your CD player is printed on the back panel. Please do not attempt to operate this CD player with incorrect voltage. This can damage or destroy the sensitive circuits inside your CD player. If you are in doubt about the correct voltage for this CD player we suggest that you check the label on the rear panel. Consult your **ROTEL*hi fi AUTHORIZED DEALER*** if you have any further questions about the proper installation or voltage needed for your CD player.

There is ***NO*** user serviceable part inside the cabinet. Please do not open the cabinet. This will expose you to the hazard of high voltages. **There is a laser inside the CD player that can be potentially dangerous to your eyesight and health.** The cabinet should be opened by**ROTEL*hi fi AUTHORIZED SERVICE*** personnel only.

CLEANING THE CABINET

The anodized finish of the cabinet should only be cleaned with a clean, soft, dry cloth or chamois. Do not use cleaning solvents or harsh chemicals on the cabinet as they will possibly damage the finish. This could remove the labels. If liquid falls into the cabinet it will damage the circuitry. This is why we recommend a clean, dry cloth only for cleaning.

FRONT PANEL DISPLAY AND CONTROLS

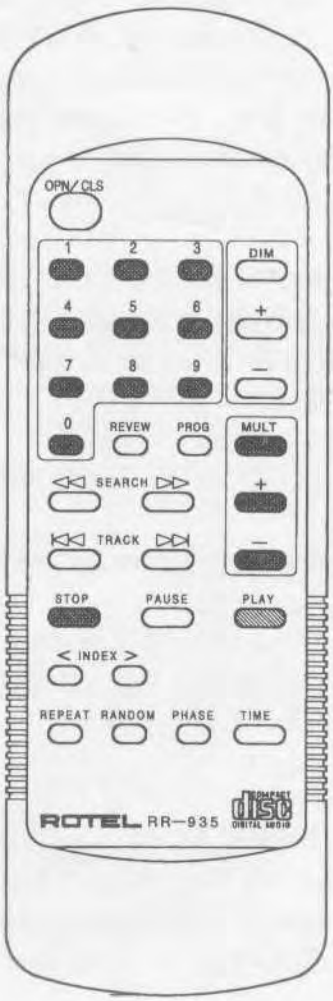
We have included essential controls on the front panel. This simple and appealing design offers frequently used controls only. We have included **OPEN** (CLOSE), **PLAY, PAUSE, STOP,** and **TRACK** (**I<<, >>I**) buttons. All functions are usable by remote control, with the remote control included.

The **DISPLAY** will provide information related to operation with the front panel buttons or the remote control. It will read out the Track number, Index number and Time during normal operation. Some of the features or functions will illuminate small indicator lights in the display panel during operation. The INDICATOR lights will show when PROGRAM, PHASE, REPEAT, RANDOM and HDCD have been selected.

The **HDCD indicator light** will automatically illuminate when a CD recorded with an HDCD encoder is played. The RCD 990 will automatically decode such discs for maximum sound quality.

THE REMOTE CONTROL

The remote control requires 2 AAA (RU3/UM-4) batteries, included, for operation. These should be installed in the battery compartment in the rear panel. Open the sliding panel and insert the batteries. Please be careful to observe the correct polarity of the batteries. Slide the cover back into place afterwards.



The remote control has all the function buttons on it. These include the PROGRAM, DIM (+, -), TIME, MUTE (+, -), INDEX, RANDOM, PHASE, REVIEW, REPEAT and SEARCH and DIRECT ACCESS track buttons. The buttons are **color coded** for ease of use. The STOP, MUTE, TRACK, SEARCH and Direct Access Track Number keys are **black**. The INDEX, PAUSE, DIM (+ and -), REPEAT, RANDOM, PHASE, REVIEW, PROG, TIME, and OPEN/CLOSE buttons are **grey**. The PLAY button is **orange**.

USING THE REMOTE CONTROL

The **OPEN/CLOSE** button on the remote control controls the loading tray. Press it once to OPEN the tray. Press it again to CLOSE the tray. If pressed during PLAY, this will stop all functions and open the tray. (Push the tray closed by hand and RCD 990 will begin PLAY.)

The **DIM** button controls the illumination of the display panel. Press DIM once and the display will extinguish. Press DIM again and the display will come on. The intensity level of the display is adjustable from 0-31 with the remote control. The preset level will be ~20. To vary the intensity is easy. Press the + button, below to the DIM button, and the display will become brighter. Press the - button, below the DIM button, and the display will become dimmer. If you choose to turn the display OFF, ALL indicator lights will extinguish. If you press any button when the display is extinguished the display will come on for a few seconds and then extinguish again.
The **DIRECT ACCESS** track buttons will select the song you want directly, by number. To select a track number higher than 10, press the first digit of the number and then the second digit soon afterwards. To begin PLAY, press the DIRECT ACCESS track number you want and then press PLAY. During PLAY, press the DIRECT ACCESS number you wish to hear and the RCD 990 will begin to play it after a couple of seconds. The slight delay is built in to accommodate the possible selection of a dual digit track number.

The **REVIEW** button is used during programming to check what songs have been programmed. It will show the track numbers in the sequence in which they have been programmed. Each programmed track number will be visible for approximately a second.

The **PROG** button is to PROGRAM a song into the memory. Press the TRACK advance button (**I<<, >>I**), or Direct Access keys, until you read the track number desired in the display. Now press the PROG button. The track will be programmed and the letter P will appear after the track number. During programming or play, the PROGRAM indicator light will be illuminated. Wait a second and the total

number of tracks on the disc will be displayed. Repeat for all tracks you wish to enter, up to a maximum of 30 tracks. To remove a song from your program, push the track advance button until the track number, with the letter P, is shown in the display. Press the PROG button and the letter P will extinguish. This track has been removed from the program. (This precludes the ability to include a track twice in a program.)

The **TIME** button will allow you to see the elapsed time, time remaining in a track or total time and tracks remaining on a disc. The TIME button will show elapsed time or time remaining in a track when used during programming. It will not show total time remaining or total tracks remaining during program or random operation. Press the TIME button to see the function you wish. Time remaining in a song or total time and tracks remaining will be preceded by a minus (-) sign. The time will countdown in this mode.

The **REPEAT** button will cause the RCD 990 to continually play the whole CD or a program repeatedly. It will play until you press STOP or REPEAT a second time. The REPEAT indicator light will be illuminated when this is selected. This may be combined with RANDOM or PROGRAM play.

RANDOM play will select all the songs in a random manner on the disc or in a program. When all the songs have played once, it will stop. If combined with REPEAT, it will play all the songs on the disc before repeating a track number again.

We have included a **MUTE** button on the remote control. Pressing this button will cause the analog output to mute completely. Below the MUTE button are two related buttons. These are denoted with a plus (+) and a minus (-) sign. These denote attenuation (Attn) of the output from the RCD 990. The output may be attenuated from 0 dB to 60 dB, in 5 dB steps. As this is measuring the amount of attenuation it will work the opposite of the way it would seem. Pressing the + key will increase the attenuation, which is the same as saying it will reduce the output voltage. Pressing the - key will decrease the amount of attenuation, which means there will be more output voltage (volume) from the RCD 990.

The **PLAY** button will start the CD player drive. It will read the table of contents (**toc**) and begin playing the disc. During PLAY, pressing the button a second time will cause the same track to start again. If the tray is open, pressing the PLAY button will close the tray and cause the CD player to start playing the disc. Pressing STOP will cancel PLAY and RCD 990 will show the total track numbers and total time on the disc in the tray.
During PLAY, pressing the **PAUSE** button will cause the CD player to stay at the same place on the disc. The disc will still spin but no sound will be heard. Pressing PAUSE a second time will resume play. Pressing STOP will cancel the PAUSE setting and stop play.

The **TRACK** buttons will advance to the next track (**>>I**) or skip back to the previous track (I<<) on a disc. Each time you press one of these buttons will equal one track forward or backward on the disc. The TRACK buttons are used during PROGRAM to select the tracks for the program entered into memory.
During PLAY, the **SEARCH** buttons will cause RCD 990 to fast forward (**>>**) or fast reverse (**<<**) in the current song. SEARCH begins slowly and speeds up if held down continuously.

The **STOP** button will stop all functions. If pressed twice, the STOP button will cancel a PROGRAM in memory.

We have included a **PHASE** button on the remote control. When live music is played, the initial sound of

a drum being struck creates a positive pressure wave in the air. If **absolute phase** is inverted during the recording process, the initial sound will not be a positive pressure wave from your speakers. Many people hear a subtle difference when the absolute phase of a music or test signal is inverted. Pressing the PHASE button will change the absolute phase of the signal from 0 to -180. We are aware that there is some controversy about the audibility of this effect. Feel free to experiment with the PHASE button. (*This is not the same as incorrect phase or polarity when connecting speakers to an amplifier.*) **The indicator light will illuminate when the PHASE is -180, or INVERTED absolute phase.**

The **INDEX** buttons are useful for compact discs that have index points added in the sub code. To advance to the next INDEX, press the > button, to return to the previous INDEX, press the < button. Discs with INDEX points are usually classical music discs with long musical selections or movements. INDEX will allow you to reach a particular place in time inside a long musical movement. There are other types of musical or test discs with index points as well. The DISPLAY will show the current INDEX number of the song and the current time in the song. If the disc does not include INDEX points, the DISPLAY for INDEX will read 1, continuously, during play.

SPECIAL FEATURES

NOTE: We have included this section for those audiophiles who wish to have more information. This is not required reading but the section about Special Feature settings may be interesting to you.

***Begin* the SPECIAL FEATURES mode of operation by turning the POWER OFF.**

***Next*, press the STOP and PLAY buttons at the same time.**

***Continue pressing* the STOP and PLAY button and turn the POWER ON.**

Now the DISPLAY will show the operating modes as you make changes in the SPECIAL FEATURES settings.

To enable **DIGITAL OUTPUT ON**, enter the SPECIAL FEATURES MODE. The DISPLAY will show **1.d.out OFF. The means that the digital output is turned OFF.** To turn the digital output ON, press the **PAUSE** button one time. The DISPLAY will show **1.d.out ON. The digital output is now ON.** To turn the digital output off again, repeat the previous steps. The DISPLAY will once again show 1.d.out OFF. (Digital output may be on or off, as desired. We suggest leaving it off, for best sound quality.)

DITHER is a random noise signal added to make the digital to analog converter more linear in response, particularly at low levels. Different types of dither have been suggested as being more useful with single bit or multi-bit digital to analog converters. The RCD 990 has 7 dither modes built in to allow you to fine tune the sound to match your system. **Position 0** is dither OFF.**Position 1** *through* **6** dither functions are noise shaped dither, rising in level above the audible band, with increasing levels of dither as the number gets larger. **Position 7** dither is a little like "white" noise. Some people believe that this type of dither is best for improving linearity in one bit DAC designs. Some claim this type of dither is the best sounding, due to the very low levels of noise added. As the RCD 990 is a multi-bit design, Position 7 may or may not be your favorite. **You will need to listen to these variations for yourself to decide.**

The various dither setting options are built into the PMD 100 digital filter and are accessed during SPECIAL FEATURES use with the TRACK KEYS. Push either TRACK KEY button and the RCD 990 will cycle through the dither modes to display the number of the dither mode you wish to try. **These dither settings are fairly subtle in their effect and need careful auditioning to discern**

differences.

***To end* the SPECIAL FEATURES mode, press the POWER button again and RCD 990 will turn OFF.**

When you press the POWER button again, the RCD 990 will turn ON in NORMAL mode. It will remember the Special Feature settings you have chosen.

Some other items that may be of interest to audiophiles will be the various components and designs used to manufacture the RCD 990.

We have chosen the Burr Brown PCM63K 20 bit D/A Converter for the RCD 990. This is a high precision device, with an excellent signal to noise ratio. It is a non zero cross distortion, glitchless design created to be one of the finest available DAC chips. The high speed discrete I/V converter, immediately following the Burr Brown DACs, sends its output to the analog output stage and filter. This is a 3 order Bessel filter for greater linearity and unity phase. This circuit uses precision Vishay metal film resistors and Rifa film capacitors.

All printed circuit boards are fiberglass epoxy with symmetrical circuits, where appropriate. There are multiple regulator power supplies for the DAC and analog stages, the digital section and the servo control for the laser pick up. The capacitors in the power supply are the finest available capacitors from the respective manufacturers. The power supply is driven by a toroidal power transformer of our own design and manufacture.

HDCD R encoding is designed to allow the CD disc to have an effective dynamic range of greater than 16 bits. The original master recording may have as much as 24 bit dynamic range. The RCD 990 can reproduce as much as 20 bit dynamic range when playing back an HDCD encoded disc. The PMD 100 IC is designed as a synchronous circuit, with its' master clock input synchronized with, or derived from, the input data stream. We have chosen a master clock frequency of 256 times the input sampling frequency in the RCD 990.

At various critical places in the circuitry we have installed the best grades polypropylene film capacitors or polystyrene film capacitors. The power supply electrolytics are the finest Black Gate by Rubicon or Great Supply by Nichicon.

We have used precision metal film resistors. These parts were chosen by checking the sound quality and then tuning to increase the overall feeling of involvement and enjoyment of the music. **This is time consuming but it serves the music, which is very important to us at Rotel.**

WHAT *DOES* ALL THIS MEAN, ANYWAY?

We have tried to recreate music as accurately as possible with this CD player. **"The final goal of our efforts is the enjoyment of one of the most amazing skills that man has, the ability to make music."**

Thank you for reading this owners manual and thank you very much for buying this CD player. We appreciate being a part of your musical life.

SPECIFICATIONS : RCD 990

Frequency Response		5-20,000 Hz, ± 0.5 dB
Dynamic Range		> 100 dB
Separation		> 110 dB, full bandwidth
Signal to Noise Ratio		> 115 dB, (A Wtd.)
Total Harmonic Distortion		< 0.0035%
Linearity (w/o dither)		± 1.0 dB at -90 dB
	(with dither, 1-7)	± 0.5 dB at -90 dB
Analog Output Impedance		120 Ohms
Analog Output Level		2 Volts
Digital Filter		8 x Oversampling
Digital to Analog Converters		2 x 20 Bit Precision DAC
Digital Output Impedance, Coaxial		75 Ohms
Digital Output Level		0.5 Volts, peak to peak
Digital Output, Optical		TOSLINK connector
Dimensions	(mm)	440 x 122 x 363 mm (W x H x D)
	(inches)	18.5 x 4.8 x 14.3" (W x H x D)
Weight (kg)		7.7
	(lbs)	16.94

All specifications are accurate at the time of printing. Rotel reserve the right to make improvements without notice.