D1.5 SACD/CD Player/transport

User Manual

Dear Valued Customer,

We are honored that you have chosen the CH D1.5 SACD/CD player/transport. It represents the considerable total of all our efforts and experience, making this an outstanding product that we are proud to present to you. We are confident that your D1.5 will bring you uncountable hours of musical enjoyment from your SACD and CD collection.

But before starting your musical journey, we kindly ask you to appreciate and apply the information contained in this manual. The D1.5, as you will discover in the following pages, is a Swiss precision product designed for ultimate performance and flexibility. However, achieving its maximum possible performance requires your unit to be setup and operated correctly and that is what this manual is all about. If you have any questions or require assistance, please don't hesitate to contact your authorized dealer.

We hope you will enjoy your D1.5 SACD/CD player/transport for many years.

The Concert has just begun...

Cossy F.

Heeb T.

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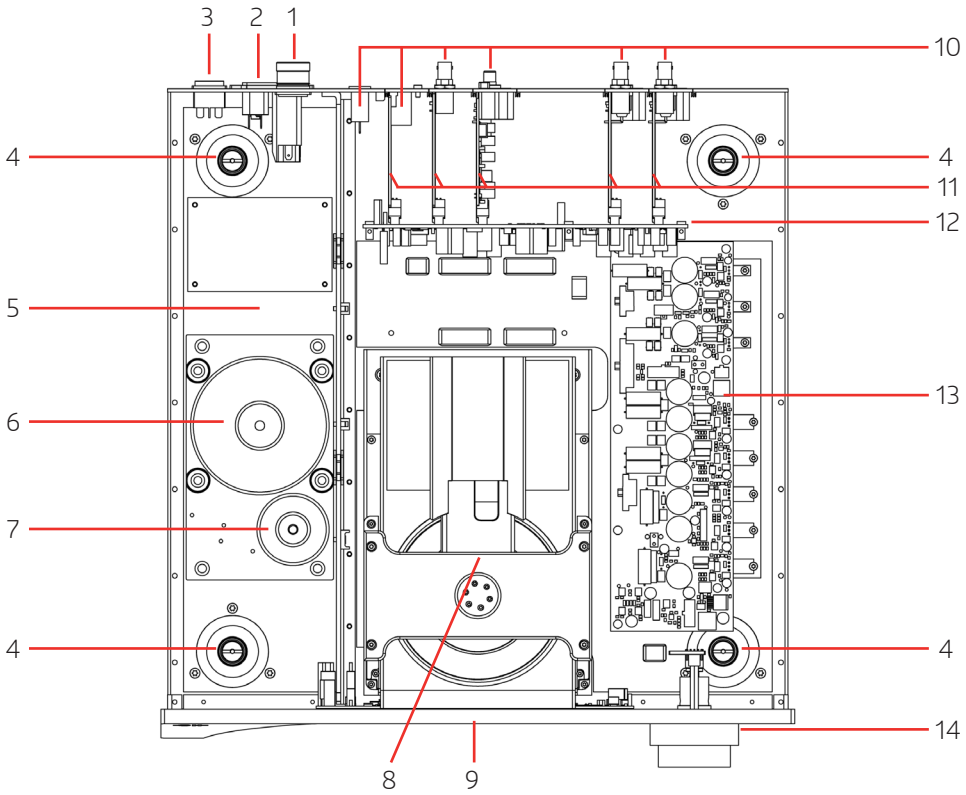
1 Getting to know your CH Precision D1.5

Technical highlights

CH products are proudly designed and manufactured in Switzerland by CH Precision Sàrl. Our engineers have put all their knowledge and experience into creating the D1.5, a high quality modular SACD/CD player/transport based on slot-in boards and USB flash-drive updatable firmware. In its base version the D1.5 is a pure digital, two-channel SACD/CD drive to be used with a high quality external Digital to Analog Converter (DAC). It includes a DIGITAL_OUT_HD board and a CONTROL board. The highest quality playback performance is ensured when the D1.5 is paired to a matching CH Precision DAC, using the proprietary high definition CH Link HD interface.

Optional boards allow owners to extend the functionality of the base version of the D1.5 SACD/CD drive. By adding a pair of monaural ANALOG_OUT boards, the D1.5 becomes an integrated stereo SACD/CD player. Finally, the optional Clock Sync board allows the D1.5 to be synchronized with an external 10MHz clock generator (like the CH T1 Time Reference) or a CH DAC like the C1.2 or I1.



D1.5 System Architecture

1. External power supply input (for X1 optional external power supply only)
2. Fuse holder, voltage selector and power cord receptacle (on back panel)
3. Mains power switch
4. Adjustment shafts and screws
5. Power supply section
6. Main power transformer
7. Standby power transformer (ensures green mode Standby)
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9. SACD/CD drawer and AMOLED display (on front panel)
10. Audio, clock, USB (firmware update) and RJ-45 (control) connectors (from slot-in boards). Analog ground to Earth jumper
11. Slot-in boards (CONTROL, Clock Sync, DIGITAL_OUT_HD, Monaural ANALOG_OUT
12. Audio Processing board
13. Power supply regulation board
14. Concentric push control knob

1.1 SACD/CD optical disc mechanism

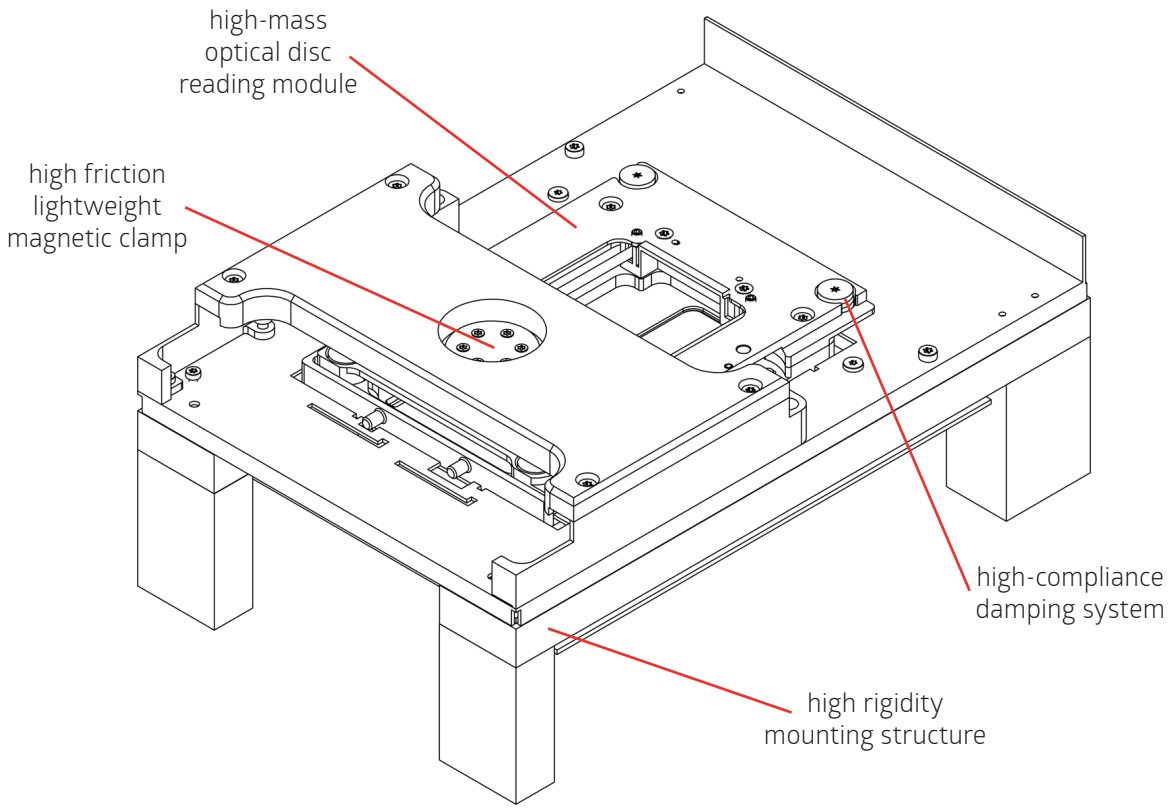
The D1.5 SACD/CD transport is built around our Mechanically Optimized Reading System (MORSe), whose critical mechanical parts are designed and manufactured in-house. The MORSe consists of a heavy brass module, weighing almost 1 kg, on which the optical pick-up and disc drive motor are precisely assembled.

This unusually high weight allows us to push the mechanical resonance frequency of the module several orders of magnitude lower than in most other transports, while ensuring an ideal counter-weight to the torque of the spinning disc.

The complete module is isolated from the rest of the chassis using four alpha-gel isolators, fine-tuned to filter vibrations all the way down to AC mains frequencies. This prevents vibrations generated by the spinning of the disc from reaching sensitive electronic boards, as well as low frequency vibrations originating in the power supply or chassis disturbing the accurate tracking of the laser mechanism.

The disc clamp is made of lightweight PEEK polymer, which provides optimal grip and dimensional stability, ensuring slip-free transmission from the direct drive motor to the disc.

The chassis holding this crucial sub-system is a 2 kg rigid aluminum structure, directly coupled to the heavy base of the D1.5. This makes an ideal mechanical ground reference for the rotating parts.



MORSe optical disc mechanism

1.2 Mechanical construction

The D1.5 SACD/CD player/transport is assembled from high-quality aluminum and steel elements with no visible screws on the front, top and side panels. The base of the unit is made of a thick, rectified aluminum plate while the front panel, side panels and the top cover are machined from laminated aluminum plates. The power supply is isolated from the audio section in its own compartment to avoid any contamination of the audio circuits by noise radiated from the supply. Pin assembly of all chassis elements provides smooth joints between elements while screws every 6cm ensures protection against electromagnetic interference. First class mechanical and chemical surface treatments provide the luxury finish of the D1.5.

Four steel feet support the unit. Each foot incorporates an elastomer ring to sit on delicate surfaces but is also equipped with a height adjustable hardened aluminum alloy/polymer spike (and optional polymer spike shoe) to fine-tune the unit's level and mechanical grounding. Adjustment is carried out with the screwdriver provided, via the four caps/shafts accessible from the top of the unit. In addition to providing a precise leveling capability, the spike/shaft assemblies also serve as mechanical ground paths if you choose to stack CH units. Special shaft caps are provided to interface with the spikes of the stacked unit. Any vibration from the upper unit is transmitted through the shaft cap to the shaft/spike below, forming a direct ground path for mechanical vibration.

1.3 Modular architecture and slot-in boards

The D1.5 benefits from a fully modular architecture. It features separated sections for power-supply, disc mechanism and related control, front panel, audio processing and slot-in boards. This modular architecture combined with the USB input for firmware updates (MCU, DSP, and FPGA) allows for easy servicing and upgrade should one section become faulty or obsolete.

The slot-in board port consists of a vertically mounted mother-board with optional boards being plugged into it to provide user selectable audio functionality and connectivity to other equipment. The D1.5 is factory fitted with the CONTROL and DIGITAL OUT HD Boards as standard. In addition, owners can order their D1.5 with additional boards to increase functionality, or have them installed by their authorized dealer at a later point in time:

- Clock Sync: provides advanced clock synchronization options (one clock input, two clock outputs) for use with a DAC such as the C1.2 DAC/Controller, or with an external master clock such as the T1 10MHz Time Reference.
- Monaural ANALOG_OUT: each board provides one fully balanced channel of analog audio output. Supplied as a pair, labeled and color-coded for Left or Right channel they turn the D1.5 transport into a standalone disc player.

Please note that optional boards MUST be installed by a qualified technician. Failure to do so will void your unit's warranty.

1.4 Power supply

The power supply of the D1.5 is a linear supply with multiple independent local regulation stages. It is based on an oversized, magnetically shielded toroidal main transformer and includes a mains filter. A secondary transformer (also toroidal) is used as for Standby operation to ensure that the green Standby mode meets the latest energy saving regulations. Both transformers have static shields between their primary and secondary windings. They are mounted on a separate plate, which is mechanically decoupled from the main base plate by 'silent block' isolators.

Discrete (power-transistor and op-amp based) ultra low noise regulators are used throughout the power supply and special care has been paid to the master clock power supply. The master clock benefits from its own

dedicated shunt regulated power supply, completely decoupled from the noisy digital and motor sections. This ensures an ultra-low jitter clock source for the whole system.

Input AC voltage to the power supply can be set to 100V, 115V or 230V AC depending on your local mains voltage.

1.5 Optional external power supply

The D1.5 is equipped with a socket for an optional external power supply input. This input is specific to the CH X1 external power supply. When the external power supply is connected, the internal power supply of the D1.5 is turned off (only the Standby transformer remains active). Turning the main internal transformer off ensures that no power supply induced noise, vibration or radiation is generated inside the D1.5's chassis, thus ensuring optimal operating conditions for the critical digital and analog audio circuits. Moreover, the D1.5's internal voltage regulation stages remain active, used in a cascaded topology with the X1's regulation stages, significantly lowering the noise floor.

2 Before use

Please read this manual carefully before making connections or operating your D1.5. The latest version can be accessed at www.chprecision.com at any time. If after reading this manual you feel unsure about how to make connections or operate the unit, please contact your authorized dealer for assistance.

2.1 Safety notice

Make sure to observe the following rules:

- Always handle with care. The D1.5 SACD/CD unit is very heavy, so have someone help you when moving it around. Improper handling of the load could lead to risk of injury.
- Install your D1.5 SACD/CD player on a stable base.
- Do not install your D1.5 SACD/CD unit near water.
- Do not expose the unit to any kind of liquid.
- Do not install in direct sun light or near any heat source such as radiators or other sources of significant heat.
- Do not install in a confined space and make sure sufficient air can flow around the unit.
- Do not operate under high ambient temperatures (>35°C) or with extremely high humidity (>85%) such as in humid cellars.
- Only use options and accessories specified or recommended by the manufacturer.
- Do not open the unit nor try to service it by yourself. Do not try to install any option board by yourself. Always refer to a qualified technician for service, maintenance or upgrades. Failure to do so will void the unit's warranty.

In Denmark: Apparatets stikprop skal tilsluttes en stikkontakt med jord som giver forbindelse til stikproppens jord.

In Finland: Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan.

In Norway: Apparatet må tilkoples jordet stikkontakt.

In Sweden: Apparaten skall anslutas till jordat uttag.

2.2 Changing fuses and operating voltage

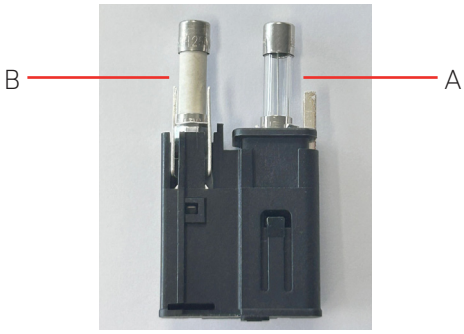
The information in this chapter conforms to the latest revision of the product.
If the fuses on your machine are reversed, please keep the initial position of the fuses.

- To change the fuses, switch off the D1.5 and remove the power cable.
  The fuse holder is located to the right of the IEC power input. See diagram on page 13 (Arrow 21)

Fuse values vary with operating voltage:

230VAC – Fuse A : T50mA/250Vac. Fuse B : T1.6A/250Vac

100/115VAC – Fuse A : T100mA/250Vac. Fuse B : T3.15A/250Vac



- Never change the selectable voltage during operation.
  To change operating voltage, switch off the D1.5 and remove the power cable.

Before changing the operating voltage first check the local voltage.

To change the operating voltage, remove the fuse holder from the D1.5 chassis.

Fuse B (see picture above) is located in a sleeve that can be slid out of the body of the fuse holder: by turning the sleeve and reinserting it, the orientation of the contact pins is altered, switching the operating voltage. The selected voltage will appear in the small window in the base of the fuse holder.

Make sure that if required, you change the fuse values to match the new voltage (as above).

You can now reinsert the fuse holder.

2.3 Mains supply

Make sure to use a fully grounded AC power cord (one with three terminals – live, neutral and ground).
Make sure that the mains voltage selection of the unit matches your local mains voltage.

Make sure your D1.5 SACD/CD player/transport is disconnected from the AC supply/wall socket in the following cases:

- When making connections (we also recommended disconnecting the rest of the system from the AC supply when installing signal and speaker cables).
- When cleaning.
- During thunder storms.
- When left unused for a long period.
- Ensure that the AC supply socket to which the unit is connected is accessible.

2.4 Transport and packaging

The D1.5 SACD/CD player/transport must always be packed in its original carton for transportation. Doing so will ensure the optimal level of protection for your unit. Therefore, keep all the packaging material in a dry and clean place for future use.

To avoid any damage to the SACD/CD mechanism, never transport your unit with a disc loaded.

Finally we recommend removal of the adjustable spikes, putting them into the holes provided in the D1.5 packaging for transportation. Indeed, vibrations during transport may cause the adjustment spikes to move from their fully retracted position. There is then a risk of scratching the supporting surface when re-installing the unit.

2.5 Cleaning

Use a soft, dry towel or cloth for cleaning. Never use any solvent or liquids as they may damage the surface treatment or penetrate inside the unit.

2.6 Maintenance and service

The D1.5 SACD/CD player/transport contains no user serviceable parts. Do not try to open, modify or repair your D1.5 by yourself. This will void any warranty. Your D1.5 SACD/CD player should be checked by a qualified technician if:

- The unit is not functioning properly.
- The mains cable or the power cord receptacle is damaged.
- The unit shows signs of having been dropped or presents external damage.
- The D1.5 SACD/CD player has been exposed to liquids (such as rain) or unknown substances.

3 Installation

3.1 Unpacking

Make sure that you have sufficient space in which to work and that there is a soft surface on which to place your D1.5.

Unpack the D1.5 SACD/CD unit and store the packaging for future transportation. Do be careful when lifting the D1.5 as the unit is heavy (almost 30kg) so if in doubt, get somebody to help you lift it clear of the carton.

Also, lifting it is one thing, extending your arms in order to place it in a rack is far more challenging. Again, it is a good idea to get someone to help you if necessary. When unpacking and installing the D1.5, take care not to damage the high quality surface finish.

3.2 Package contents

Make sure that the package contents are complete. If not, please contact your authorized dealer. Your package should contain:

- D1.5 SACD/CD player/transport .
- Power cord.

- Four aluminum/polymer spikes.
- A suction cup (used to unscrew the top covers).
- An accessory box containing:
  - Handheld infrared remote control
  - Spike adjustment screwdriver
  - Torx T10 screwdriver
  - Four polymer footer discs
  - USB stick containing the latest CH Precision firmware.
  - Four small CH dimpled polymer stacking caps

Check your D1.5 for any apparent damage. In case of damage, immediately contact your authorized dealer. If your D1.5 is cold due to transport, please let it warm up to room temperature before powering it up.

3.3 Positioning your D1.5 SACD/CD player/transport

Your D1.5 SACD/CD unit's four feet are fitted with elastomer rings, ensuring both scratch-protection for the surface on which the unit sits, as well as secure, non-slip positioning. That means that it is best to lift the D1.5 slightly when placing or repositioning it.

However, we have built a far more advanced mechanical grounding system into all CH Precision products. To use this coupling system, simply take the following steps:

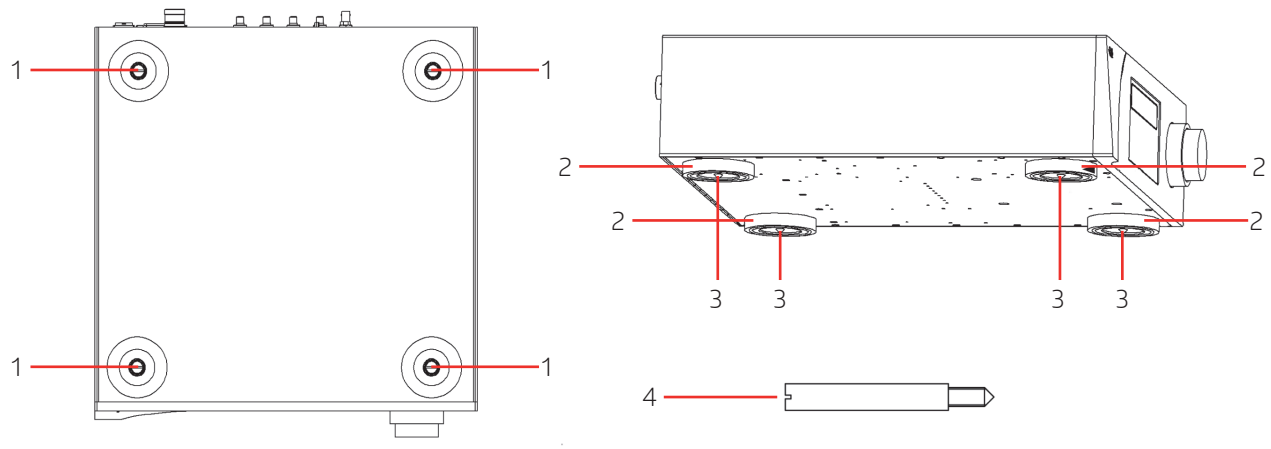
1. Place the D1.5 on the stable support on which you intend to use it. Make sure cooling air is able to freely flow around the unit and that you have enough space above the unit to remove the top-caps and insert/adjust the support spikes.
2. Gently lift the unit's corners in turn and insert one of the polymer support disc under each foot (an AirWedge or similar lifting bladder is ideal for this purpose). The foot's elastomer ring should locate into the groove in the support disc when they are properly positioned. With all four, polymer support discs in place, ensure that they are all properly located and that the unit is stable. The polymer discs allow the unit to be positioned easily and precisely.
3. Unscrew the D1.5's four top covers using the provided suction cup. Be careful not to scratch their delicate finish.
4. Insert an aluminum alloy/polymer adjustment spike into each of the shafts revealed.
5. Using the short screwdriver provided, gently rotate each spike clockwise. First you will feel it engage the thread at the base of the shaft adjustment shaft, then you will feel resistance as it contacts the polymer disc and starts to lift the D1.5.
6. Once you feel resistance on all four spikes, turn each one the same amount – two turns for example – to lift the unit's feet completely clear of the supporting discs. Check that the unit is stable and that the loading on all four spikes is the same.
7. It is now important to level the D1.5 precisely, using a precision spirit level. This has a direct impact on the unit's musical performance, so take your time and get it just right.
8. Depending on the supporting surface, you may well achieve better results by removing the polymer support discs so that the spikes contact the surface directly. This is very much a case of trial and error, but in general, direct spiking works best on lossy, dispersive surfaces (wood-based, carbon-fibre, composite or constrained layer supports) while hard, reflective surfaces such as granite, glass or marble will sound better with the polymer discs acting as an interface.

When removing the discs to listen to the direct spike option, remember that the spikes protrude below the D1.5's feet. If you try to slide or reposition the unit, you may damage the supporting surface, while direct spiking may also mark it.

9. Once you have decided on your preferred spiking arrangement (with or without the polymer discs) make sure that you check that the D1.5 is still perfectly level and that the loading/resistance on the four spikes is equal.
10. If no CH Precision unit is to be stacked on top of the D1.5, replace the four top covers. Otherwise, insert the four polymer stacking caps that are also provided. If placing another CH Precision unit on top of the D1.5, do so with extreme care and ensure that the two are precisely aligned, in order to prevent damage to the D1.5's top-plate.

Although all CH Precision units can be stacked, best performance is achieved by giving each product its own, dedicated support surface. If units must be stacked, we would recommend placing the D1.5 on the top of its stack.

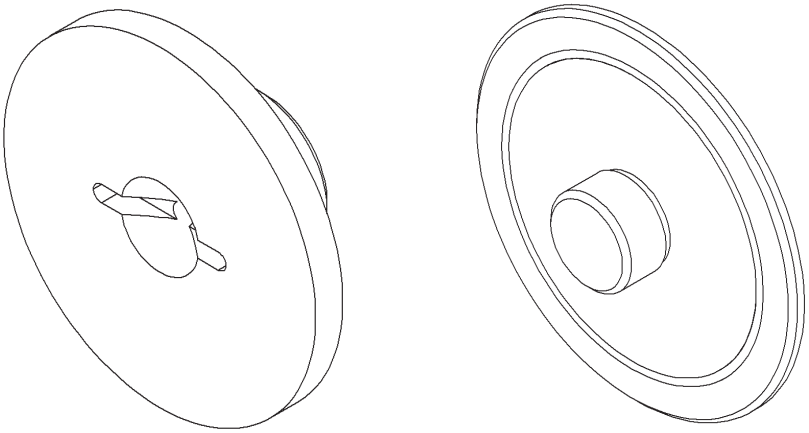
- Never stack any component other than another CH Precision product on top of your D1.5.
- Never use the aluminum top caps if another CH component is to be stacked on top of your D1.5.



Adjustment shafts, feet and spikes

1. Adjustment shafts. Insert adjustment spikes and use screwdriver to secure and adjust individual feet spikes.
2. Feet.
3. Adjustment spike heads (when inserted into adjustment shafts).
4. Adjustment spike.

Shaft covers (left: stacking cover, right: top cover)



4 Connections

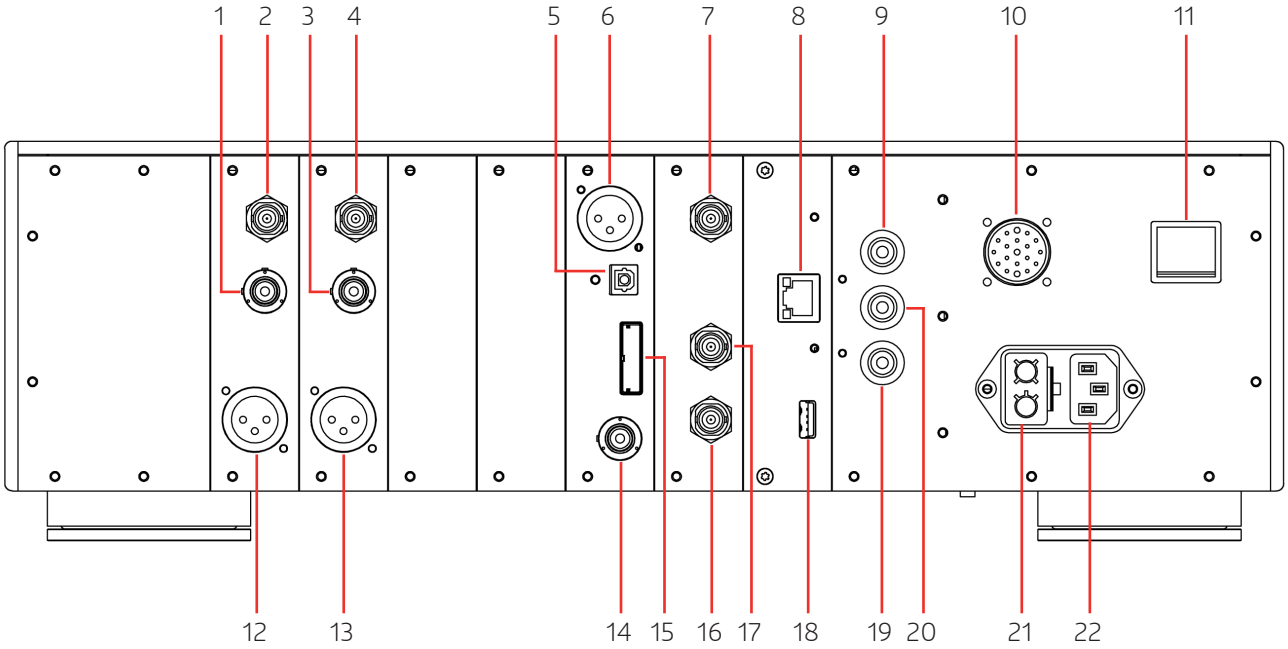
This section provides information about connecting your D1.5 SACD/CD player/transport to your system. As the D1.5 is a modular design with various, optional input and output boards, the precise rear-panel arrangement of your unit may vary from the example shown below.

The D1.5 is factory fitted with the CONTROL board and Digital OUT HD boards as standard, configuring it for use as a dedicated SACD/CD transport. But, as noted in the introduction to this manual, you have the option to specify additional boards to further increase functionality:

- Clock Sync board: provides advanced clock synchronization options (one clock input, two clock outputs) for use with a CH DAC or an external 10MHz master clock such as the T1 Time Reference.
- Monaural ANALOG_OUT: each board provides one fully balanced channel of analog audio output. Supplied as a pair, labeled and color-coded for Left or Right channel.

These boards can be either factory-fitted or installed later to upgrade an existing unit. If retro-fitted, this must be carried out by a qualified technician or you will void your unit's warranty.

The example below shows a fully-loaded unit with all of the optional boards installed. If you are not using either the Monaural ANALOG OUT boards or the Clock Sync board, simply ignore those connections.
If you don't feel confident with the connections to be applied to your configuration, please contact your authorized dealer for assistance.



Rear panel connections

1. Optional single-ended RCA analog output for R channel (monaural ANALOG_OUT_R board)
2. Optional single-ended BNC analog output for R channel (monaural ANALOG_OUT_R board)
3. Optional single-ended RCA analog output for L channel (monaural ANALOG_OUT_L board)
4. Optional single-ended BNC analog output for L channel (monaural ANALOG_OUT_L board)
5. Optical TOSLINK (S/PDIF) digital output [DIGITAL_OUT_HD board]
6. XLR AES-EBU digital output [DIGITAL_OUT_HD board]
7. BNC clock input. Provides 75 Ohm or Hi-Z input [optional Clock Sync board]
8. Ethernet port for connection to a local area network for control via the CH Control Android App.
9. Analog ground connector 1
10. External power supply connector for X1 power supply option
11. Power on/off switch
12. Optional balanced analog output for R channel (monaural ANALOG-OUT-R board)
13. Optional balanced analog output for L channel (monaural ANALOG-OUT-L board)
14. Coaxial RCA (S/PDIF) digital output [DIGITAL_OUT_HD board]
15. CH Link HD digital output [DIGITAL_OUT_HD board]
16. BNC 75 Ohm clock output 2 [optional Clock Sync board]
17. BNC 75 Ohm clock output 1 [optional Clock Sync board]
18. USB port for software upgrades [CONTROL board]
19. Earth connector. Internally connected to digital ground
20. Analog ground connector 2. Can be connected to digital ground (Earth) using provided jumper
21. Power fuse and voltage selection
22. Power cord receptacle

4.1 CONTROL board functionality

The CONTROL board is factory installed in the D1.5. It provides a USB port for software updates and an Ethernet port for controlling the unit via a local area network and the CH Control App.

4.2 CONTROL board USB port

The USB port on the CONTROL board is dedicated to firmware updates of the D1.5 unit. Do not use it for any other purpose. For more information on unit firmware update, please refer to the corresponding section of this manual.

4.3 CONTROL board Ethernet port

The Ethernet port on the CONTROL board is dedicated to network-based control of this and other CH Precision units. It is NOT an Ethernet audio input for file replay/streaming purposes. Audio streaming is an optional feature available on the CH Precision C1.2 DAC/Controller and I1 Integrated amp, via the STREAMING INPUT HD board.

5 Output capabilities

5.1 DIGITAL_OUT_HD board

Provides digital audio output capabilities.

Standard digital outputs

The DIGITAL_OUT_HD board provides three standard digital outputs: AES-EBU (carrying consumer encoding), Coaxial (S/PDIF) and Optical (TOSLINK).

These three connectors can output different audio data formats and rates, depending on the type of optical disc being played back (red-book CD, MQA-CD or SACD).

- CD: The D1.5 can be configured to apply the first step of MQA decoding, converting the raw 44.1kHz/16bit MQA data extracted from the disc to 88.2kHz/24bit MQB audio. In that case, the format fed to the AES-EBU, coaxial and optical connectors will be 88.2kHz/24bit for all CD playback (red book and MQA), to avoid on-the-fly sampling frequency change (upon MQA flag detection by the MQA decoder). When the digital outputs are configured to 88.2kHz/24bits for CD playback, the MQA decoder is used to up-sample MQA CDs, while our custom PEtER spline up-sampler is used for redbook CD.
- SACD: When the DSD layer of an SACD is played, it is possible to select the format of the audio stream on these outputs, depending on the external DAC's capabilities: DSD (the raw bitstream is encapsulated on a PCM frame to form a DoP stream), 176.4kHz (DSD is converted to very high resolution PCM format), 88.2kHz (DSD is converted to high resolution PCM format), or 44.1kHz (DSD is converted to CD quality PCM audio).

CH Link HD digital audio interface

The DIGITAL_OUT_HD board includes a CH Link HD proprietary digital audio interface. This interface allows for high definition uncompressed digital audio transfer and supports both DSD and PCM (up to 705.6 / 768 kHz). For CD playback, output rate can be set to 1x Fs (raw MQA, and raw CD data at 44.1kHz) of to 2x Fs (MQB, and up-sampled CD data at 88.2kHz).

For SACD playback, the original DSD bit-stream is transferred through this link.

Use CH Link HD as the preferred interface when connecting your D1.5 to other CH units such as the C1.2 DAC/ Controller or I1 Integrated amp.

5.2 Monaural ANALOG_OUT boards

A pair of monaural ANALOG_OUT boards can be installed in a D1.5 to provide true fully-balanced (XLR), single-ended 75 Ohm (RCA) and single-ended 50 Ohm (BNC) analog audio outputs.

The Monaural ANALOG_OUT boards and DIGITAL_OUT_HD board can be combined, allowing the D1.5 to be both an SACD/CD player and a transport.

MQA CDs get fully decoded and rendered to 352.8kHz prior to the D/A conversion. Red book CD 44.1kHz audio streams get up-sampled to 352.8kHz using our PEtER spline-based algorithm prior to D/A conversion. SACD DSD bit-stream also gets converted to DXD PCM by custom algorithm prior to conversion.

5.3 Clock Sync board

The Clock Sync board is an optional clock synchronization board to be used with an external 10MHz clock generator such as the CH T1 Time Reference, or together with other CH products, such as the C1.2 DAC/ Controller or I1 Integrated amp. The board provides one clock input and two clock outputs on BNC connectors. The DCO digital PLL of the D1.5 is capable of frequency and phase locking. The frequency is tracked below 0.1 Hz with 0.1PPM adjustments for optimal jitter rejection. When fed with an audio Word-clock, the D1.5's internal clock will always keep phase accuracy below 2.5 us (equivalent to sub-millimeter positional accuracy of audio sources).

BNC clock input (upper socket)

The Clock Sync board provides a BNC clock input that can be configured as 75 Ohm input impedance or high input impedance through the D1.5's menu. Supported input frequencies on this connector are all standard audio Word-clocks (44.1, 48, 88.2, 96, 176.4, 192, 352.8, 384, 705.6 and 768 kHz), audio Master-clocks (22.5792 and 24.576 MHz), DSD bit-clock (2.8224 and 3.072MHz) and ultra-low jitter clock reference frequencies (100 kHz and 10 MHz). Use this connector to synchronize your D1.5 unit to an external clock source such as the CH T1 Time Reference or external DAC, like the CH C1.2 or I1.

BNC clock outputs (middle and lower sockets)

Two 75 Ohm output clock connectors are also provided on the Clock Sync board. You can use these connectors to synchronize external devices to your D1.5. Each output clock signal can be configured in one of three ways:
As a buffered version of the input clock (for instance if the D1.5 is synchronized to an external clock source).
As the word clock signal generated by the D1.5's internal high precision oscillator (for instance if the D1.5 is clock master and an external DAC must be synchronized to it).

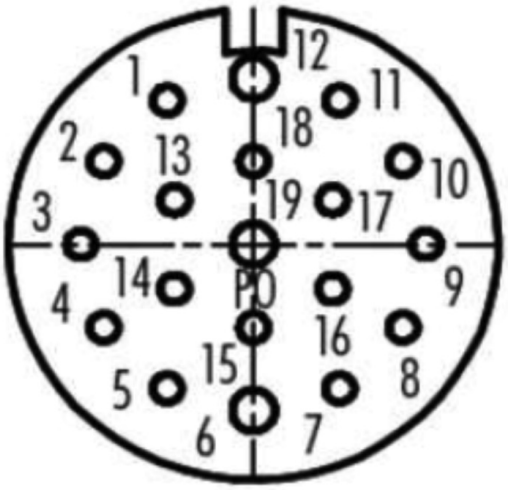
Or it can be muted if not used, in order to reduce signal radiation inside the D1.5.

These three modes can be manually chosen in the Clock Source menu, or dynamically selected according to the clock source of the D1.5.

6 External power supply connector

The external power supply connector allows you to add the optional CH Precision X1 power supply to your D1.5 to further enhance performance. When the X1 is used, it completely replaces the D1.5's internal power supply, minimizing noise, reducing the noise-floor and increasing dynamic range and audio quality. With the X1 connected, the (small) standby transformer of the D1.5 remains active to ensure the unit's wake up functionality, so the power cord must be left in place.

	X1 Voltage	Power Max
Pos.1	+8V Digital	20W
Pos.2	-8V Digital	20W
Pos.3	GND Digital	–
Pos.4	-8V Analog	20W
Pos.5	-19V Analog	40W
Pos.6	GND Digital	–
Pos.7	+19V Analog	40W
Pos.8	+8V Analog	20W
Pos.9	+11.7V Digital	40W
Pos.10	+5.5V Digital	55W
Pos.11	+3.4V Digital	75W
Pos.12	GND Digital	–
Pos.13	GND Digital	–
Pos.14	Command	–
Pos.15	+10.5V Analog	50W
Pos.16	Command	–
Pos.17	GND Digital	–
Pos.18	+8V Digital	20W
Pos.19	GND Analog	–

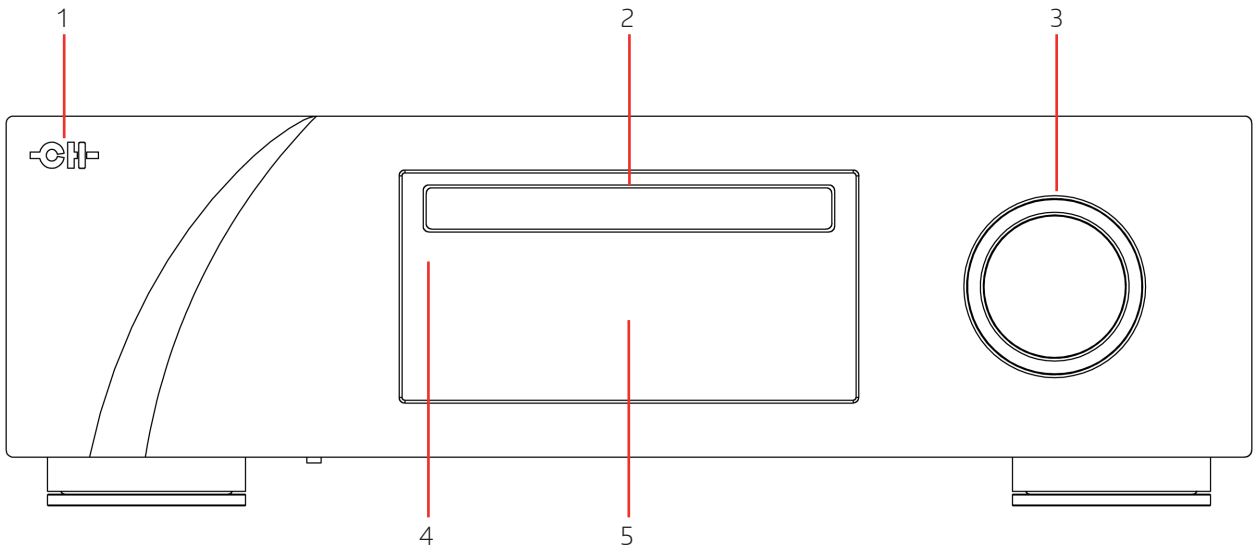


Front view

7 Operation

The D1.5 SACD/CD unit can be operated from the front panel, from the handheld infra-red remote control or, if connected to a dedicated, local area network, via the CH Control App installed on an Android tablet. Unit status is indicated by the high-definition AMOLED display with customizable colors, or via the tablet screen if using the Control App. The unit can be operated and fully configured using either the dual-concentric control or the Control App.

7.1 Front panel controls



Front panel elements

1. Standby LED
2. SACD/CD drawer
3. User control knob (dual concentric rotatory knob with push function)
4. IR remote control receiver
5. Display area (high-definition AMOLED display

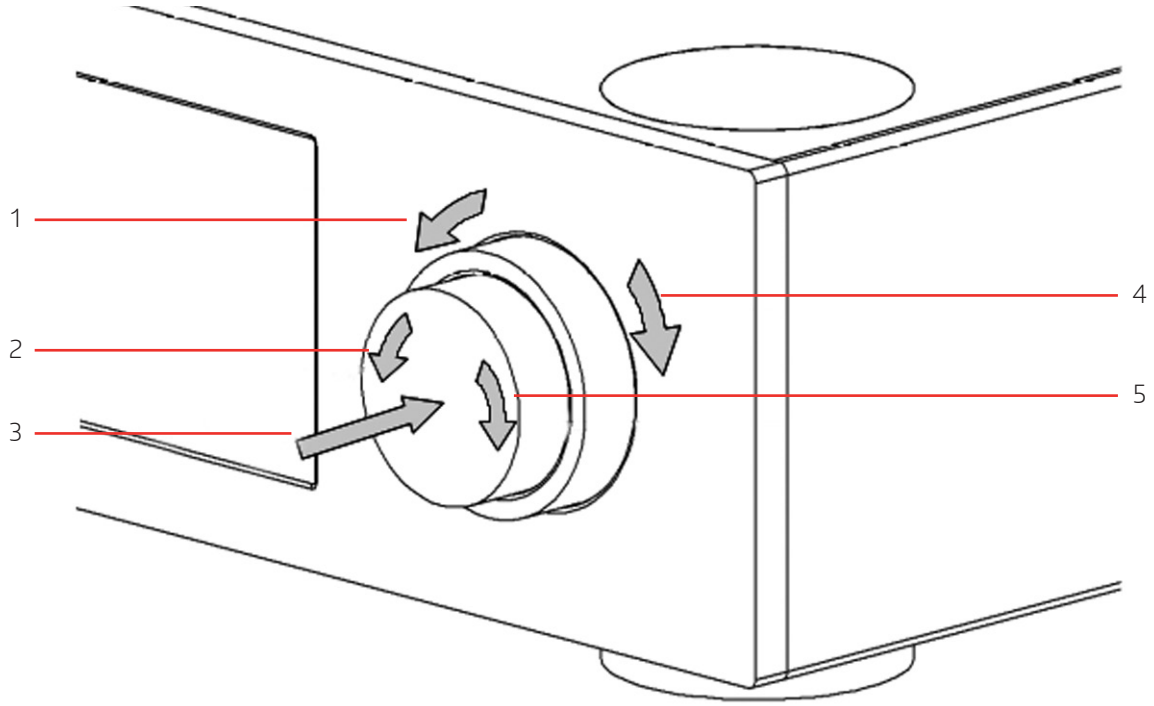
The standby LED lights up when the unit is in standby. It is normally turned-off during operation and shortly lights up whenever it receives a valid IR remote control command. The LED can also be programmed to remain on during operation. The display is a high-definition AMOLED panel with very wide viewing angle, high contrast and high brightness ensuring optimal reading comfort. The color and brightness of the display can be configured according to user's taste and different colors can be chosen for CD, MQA, MQA Studio or SACD playback.

7.2 User control knob

The user control knob is built around a dual concentric rotary knob, complete with a central push function. Both the central and the external part of the knob can be moved to the left or the right independently, giving six movements:

- External Rotate Left/Right [<<E]/[E>>].
- Central Rotate Left/Right [<<C]/[C>>].
- Central Knob Push – Normal Push [NP] and Long Push [LP].

For a Normal Push, just press the central part of the knob and release it immediately. For a Long Push, press and hold the central part of the knob for at least two seconds.



User control knob movements

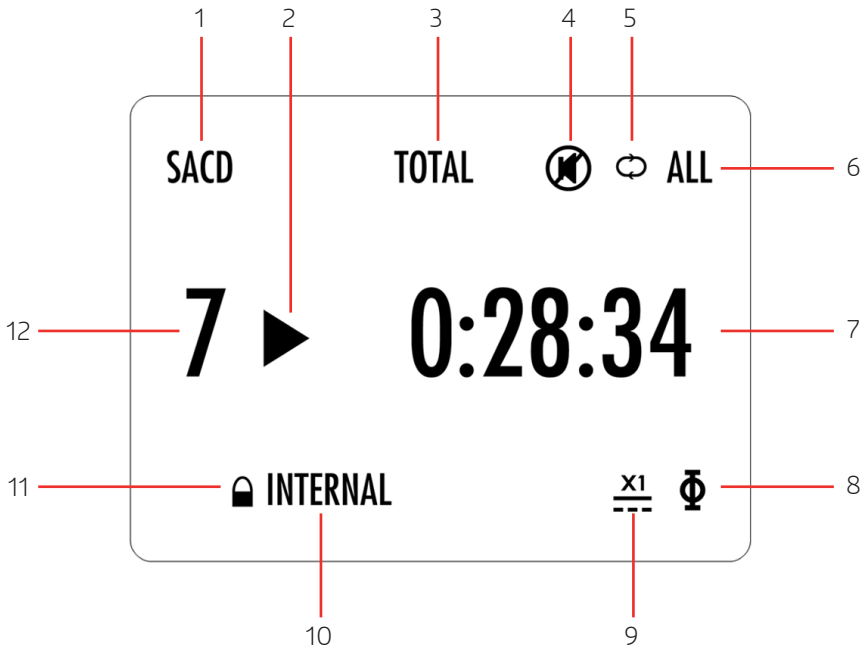
1. External ring rotate Left [<<E]
2. Central knob rotate Left [<<C]
3. Central knob push. There are two types of push: Normal Push [NP] and Long Push [LP]
4. External ring rotate Right [E>>]
5. Central knob rotate Right [C>>]

8 Operating modes

The D1.5 SACD/CD player/transport has two main operating modes: Normal mode and Menu mode. Normal mode is used to access standard playback controls whereas Menu mode is used to configure the unit. The D1.5 also includes the ability to program Shortcuts for quick access to user selected Menu mode items.

8.1 Normal mode

Normal mode is used for SACD/CD playback control. When powered-on, the D1.5 SACD/CD unit starts in Normal mode. The display will look like this:



Normal mode display elements

1. Disc layer selected (SACD or CD). Also shows when MQA or MQA Studio is detected and decoded.
2. Playing status indication
3. Time display mode. Indicates TOTAL if time information is relative to the whole disc
4. Mute indication. If the symbol is present, the output is muted
5. Repeat indication. If the symbol is present, repeat mode is engaged
6. Repeat type. If repeat is for the whole disc, the indication ALL is activated
7. Current time. Negative time indicates remaining time (either for track or for disc)
8. Polarity (phase) indication. If the Φ symbol is present, polarity is reversed
9. External power supply indication. When an external power supply is connected and engaged, symbol is displayed and internal power supply is turned off
10. Clock source indication
11. Lock indication (or). Indicates if the unit is locked to a clock source or not
12. Track number

In the example above, the 7th track of an SACD is being played back. Total elapsed time is 28min 34s, phase is inverted and the whole disc is repeated. The D1.5 is powered through an external power supply and is locked to its internal clock but its outputs are muted.

8.2 Normal mode control actions

To wake the unit up from STANDBY, apply a Normal Push [NP].

User Control Knob Action	Unit State	Unit Action
[NP] Normal Push	OPEN	Closes the drawer and reads the disc's TOC (STOP)
	Any other state	Enter Shortcuts mode
[LP] Long Push	OPEN	Closes the drawer and goes to STANDBY
	Any other state	Go to STANDBY
[C>>] Center Rotate Right	OPEN	Closes the drawer and reads the disc's TOC (STOP)
	STOP	Start playback (PLAY)
	PLAY	Go into pause (PAUSE)
	PAUSE	Resume playback (PLAY)
[<<C] Center Rotate Left	OPEN	Do nothing
	STOP	Open the drawer (OPEN)
	PLAY	Stop playback (STOP)
	PAUSE	Resume playback (PLAY)
[E>>] External Rotate Right	OPEN	Do nothing
	STOP	Skip through tracks forward and starts playback (PLAY)
	PLAY	Skip to next track
	PAUSE	Skip through tracks forward
[<<E] External Rotate Left	OPEN	Do nothing
	STOP	Skip through tracks backward and starts playback (PLAY)
	PLAY/ PAUSE	Skip to track begin, then to previous tracks on subsequent [<<E]

8.3 Menu mode

The Menu mode allows for Configuration and Setup of the D1.5 SACD/CD player/transport. If no shortcut is defined, you enter Menu mode from Normal mode by applying a single Normal Push [NP].

Otherwise, successive Normal Pushes [NP] will take you through all shortcuts before reaching the DETAILED SETUP screen. Apply an External or Central Rotate Right [E>> or C>>] to enter the Menu mode.

Navigation in Menu mode is based on Central Rotate Left/Right [<<C]/[C>>] to select a given menu item and External Rotate Left/Right [<<E]/[E>>] to change menu level.

User Control Knob Action	Unit Action
[NP] Normal Push	Enter next menu level or Validate choice (save setting)
[LP] Long Push	Puts the unit into Standby
[C>>] Center Rotate Right	Move to next menu item downward
[<<C] Center Rotate Left	Move to next menu item upward
[E>>] External Rotate Right	Enter next menu level
[<<E] External Rotate Left	Return to previous menu level without saving

9 Configuration

Configuration of your D1.5 SACD/CD player/transport is accomplished by setting parameters in the Menu mode (see previous section for how to access Menu mode and how to navigate menu items).

9.1 D1.5 SACD/CD player/transport menu structure

There are five main menus used in configuring the D1.5:

- AUDIO: Allows users to adjust audio related parameters.
- DISPLAY: Allows users to adjust display related parameters.
- SHORTCUTS: Allows users to assign and modify Shortcuts for user interface customization.
- NETWORK: Provides information about the control network setup and enables its configuration.
- FACTORY: Indicates the software version and allows users to update it. Also allows users to return the unit to initial factory settings.

9.2 D1.5 configuration menu items

AUDIO

- Mute:
  Mutes or unmutes the audio output.
- Polarity:
  Allows you to reverse the absolute phase polarity of the audio output.
- Disc layer:
  Selects the disc layer to be read for current SACD.
- Repeat settings:
  Selects the repeat mode (repeat track, whole disc, or no repeat). This setting can be reset upon disc change (sticky: no) or remain (sticky: yes).
- Clock source:
  If an optional Clock Sync board is installed, allows user to select the clock source (internal clock source – D1.5 is master, or synchronize the D1.5 to an external clock coming from the BNC in connector).
- Synchro Out 1 and 2:
  If the optional Clock Sync board is installed, allows user to select mode of each individual BNC out connector (Internal clock, loopback from clock in, nothing, or automatic selection).
- Active output:
  Allows user to mute unused digital output connectors.
- Digital out PCM:
  Selects if the original CD content should be routed to the D1.5 digital outputs (including raw MQA bitstream), or if a first up-sampling stage (44.1kHz → 88.2kHz) should be applied (in that case MQA is decoded to MQB).
- SPDIF out DSD:
  Selects how a DSD bit-stream is conditioned for SPDIF outputs (converted to PCM at various sampling rates or DoP encapsulated).

DISPLAY

- Time info:
  Selects the time information to be displayed (track or disc elapsed or remaining)
- Display mode:
  Allows user to turn off the display when unit is playing.
- Front LED:
  Allows the user to turn the red power LED off when the unit is active rather than in standby.
- Brightness normal:
  Allows you to set the brightness of the display in operating mode (10 – 100%), and to fine tune the high brightness gamma curves to perfectly match the brightness and color or other displays.
- Brightness dimmed:
  Allows you to set the brightness of the display when dimmed between operations (10 – 30%), and to fine tune the low brightness gamma curves to perfectly match the brightness and color or other displays.
- Color PCM:
  Lets the user select display color from a choice of seven standard shades or a user defined RGB color when a CD or the PCM layer of an SACD is played back.
- Color DSD:
  Lets the user select display color from a choice of seven standard shades or a user defined RGB color when the DSD layer of an SACD is played back.
- Color MQA:
  Lets the user select display color from a choice of seven standard shades or a user defined RGB color when MQA is detected on a PCM stream.
- Color MQA Studio:
  Lets the user select display color from a choice of seven standard shades or a user defined RGB color when MQA Studio is detected on a PCM stream.

9.3 SHORTCUTS

The D1.5 allows you to establish up to six shortcuts, taking you directly to almost any parameter in any menu. The D1.5 is preprogrammed with Search, Phase Polarity, Current disc layer and Time info as shortcuts one to four. After scrolling through the latest shortcut, the next screen that the D1.5 displays is the entry port to the D1.5 menu. It reads Detailed Setup.

9.4 NETWORK

- Status:
  Shows a list of compatible devices detected on the LAN.
- Role:
  When physically connected to a network, the D1.5 can ignore this network (offline) or connect to it. This networking facility allows system-wide sharing of commands among CH products (such as mute or power up/down).
- Room number:
  Defines the room in which the D1.5 is located for multi-room applications. This prevents CH Precision units connected to the same network but located in different systems/rooms to interact with each others.

- IP settings:
  Auto should be selected if the D1.5 is connected to a router with DHCP server feature. Direct-Link should be selected when an RJ45 Mirror lead directly connects a D1.5 to a single other CH Precision device. More advanced settings are available if needed.
- Wake-on-Lan
  If 'No' is selected, the D1.5 cannot be switched on from the CH-Control App. If 'Only If POE' is selected, connecting the D1.5 to a Power Over Ethernet switch will allow it to be switched on via the CH-Control App (Standby consumption will be less than 0.5W). If 'Yes' is selected, the D1.5 can always be switched on by the CH-Control App (Standby consumption will be less than 2W).
- Power-off command:
  If Yes is selected, the D1.5 will enter standby mode when it receives a Power Off command from the LAN. It will remain on if No is selected. This is useful if you want to keep your D1.5 on even when you turn off the rest of your system.
- Network knowledge:
  The D1.5 keeps track of all discovered devices. If the audio system evolves, the list of devices can be cleared by this.

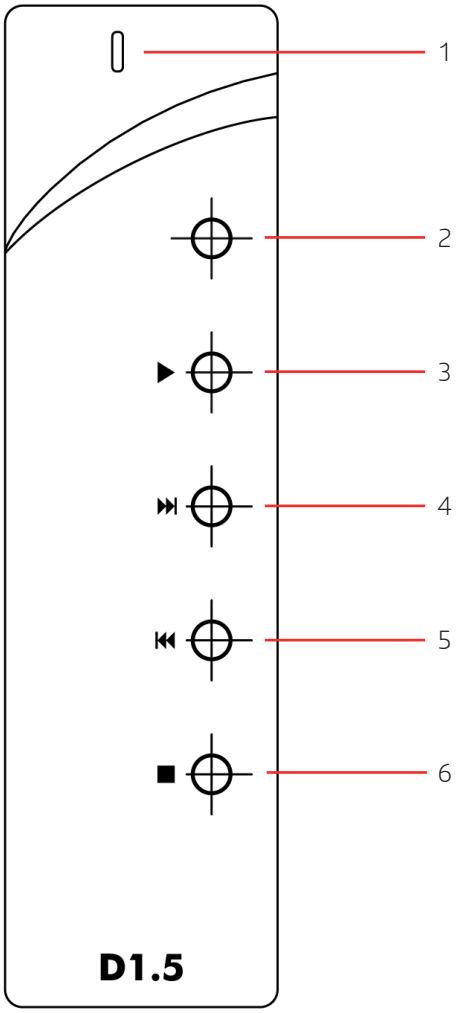
9.5 FACTORY

- Serial number:
  Displays the serial number of your D1.5. This serial number is also written on a sticker at the back of your D1.5.
- Firmware version:
  Indicates the version of the firmware that the D1.5 is currently running. Periodically check CH Precision's website to see if a newer version is available. It could add new features or correct bugs. Note that the CH Control App indicates that a device is not up to date by displaying its name in orange instead of red.
- Update firmware:
  Selecting Update launches the D1.5 firmware update process. A USB flash disc drive with a valid set of firmware must be inserted in the A-shaped USB port. Please report to the corresponding section of this manual for more detail on firmware update procedure.
- Factory reset:
  Resets all parameters to their default factory values. This can be useful if you made some changes that you don't know how to revert.
- Installed options:
  List the hardware configuration of your D1.5.
- Output enabled:
  If some digital output connectors are not to be used, they can be muted through that setting.

10 Remote control

10.1 Remote control operation

The D1.5 SACD/CD player transport is delivered with a small, handheld infrared remote to control the unit's basic operations. This remote control is not intended to be used when configuring the unit.



D1.5 SACD/CD unit remote control

1. Remote control activity LED
2. Mute/Standby (long push) button
3. Play/Pause / Phase polarity inversion (long push) button
4. Skip/Search Forward button
5. Skip/Search Backward button
6. Stop/Eject button

The remote control activity LED is illuminated when a button is pushed on the remote. The remote control's buttons support dual functions by distinguishing Normal Push [NP] and Long Push [LP]. For a Normal Push [NP], the button is released immediately after pressing. A Long Push [LP] requires the button to be pressed for at least two seconds before being released.

Remote control functions are listed in the following table:

Remote Control Button	Normal Push [NP]	Long Push [LP]
MUTE	Mute/Unmute (also wakes-up from STANDY)	Sets unit into STANDBY or wakes it up
PLAY	Play/Pause	Phase polarity inversion
SKIP FORWARD	Skip to next track	Search forward
SKIP BACKWARD	Skip to previous track	Search backward
STOP	Stop (also closes drawer if required)	Open the drawer

10.2 Changing the remote control batteries

If the LED does not illuminate when pressing a button on the remote, it is likely that the remote batteries need to be changed. To replace the batteries, remove the back cover of the remote control by removing the screws (M3 Torx T10 - use the supplied screwdriver). Always exchange the batteries for brand new ones (making sure that you respect battery polarity). Replace the back cover. The CH Precision remote control uses two AAA batteries.

11 Advanced clocking

Connecting your D1.5 to a CH Precision product with DAC capability (such as the C1.2 DAC/Controller or I1 integrated amp) allows you to access superior clocking topologies, via the optional Clock Sync board.

The different options for various configurations are explained and detailed in the following paragraphs. Even though this chapter is quite technical, we kindly ask you to take the time to read it in order to get the best sound out of your CH system.

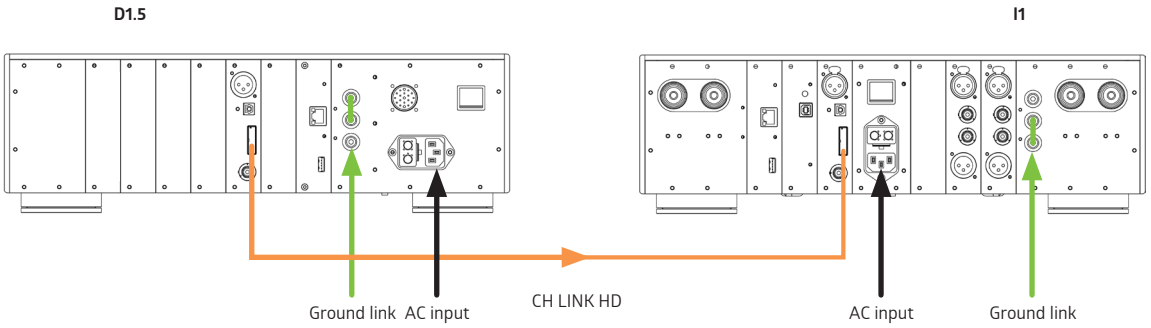
11.1 General clocking considerations

In any configuration, there must always be no more and no less than one clock master. In the CH product range, the clock master is the unit clocked on its own internal clock (Menu parameter Clock Source is set to INTERNAL) or a dedicated clock generator. It can be a CH audio product (D1.5, C1.2, C1.2 Mono or I1), or an external clock generator such as the T1.

If more than one clock master is used, the system will not be fully synchronized (at some point a unit will display "CLOCKING ERR."). If you don't define a clock master, each unit gets synchronization from a unit that is itself a clock slave, an arrangement that is not stable in terms of overall clocking. If the configured clock source (e.g. SYNCHRO BNC 75 Ohm) is not connected or has no synchronization signal, the D1.5 cannot lock (the open padlock symbol will be displayed) and mutes its output.

11.2 D1.5 SACD/CD transport without Clock Sync board

When a D1.5 with no Clock Sync board is used together with a CH C1.2 DAC (or other DAC), both audio data and clocking flows from the source to the DAC. More precisely, clocking is sent with the audio stream. It is either carried on dedicated lines in the CH Link HD (while audio data is carried on other lines in the same cable) or embedded in the bi-phase modulated S/PDIF signal. The schematic below shows the optimal way to connect such a system:

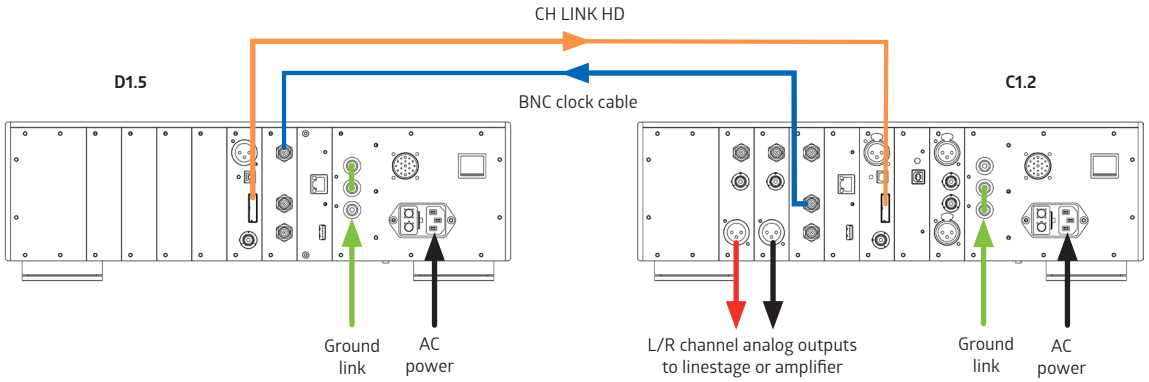


More generally, when a D1.5 has no Clock Sync board, it can only reference itself to its internal clock, and the DAC has to recover the clock signal from the audio data. In such cases you should configure clock settings as follows:

- D1.5 clock source: INTERNAL
- DAC (e.g. C1.2 or I1) clock source (for this input): AUDIO IN

11.3 D1.5 SACD/CD transport with Clock Sync board + CH DAC (C1.2 DAC/ Controller or I1) with Clock Sync board

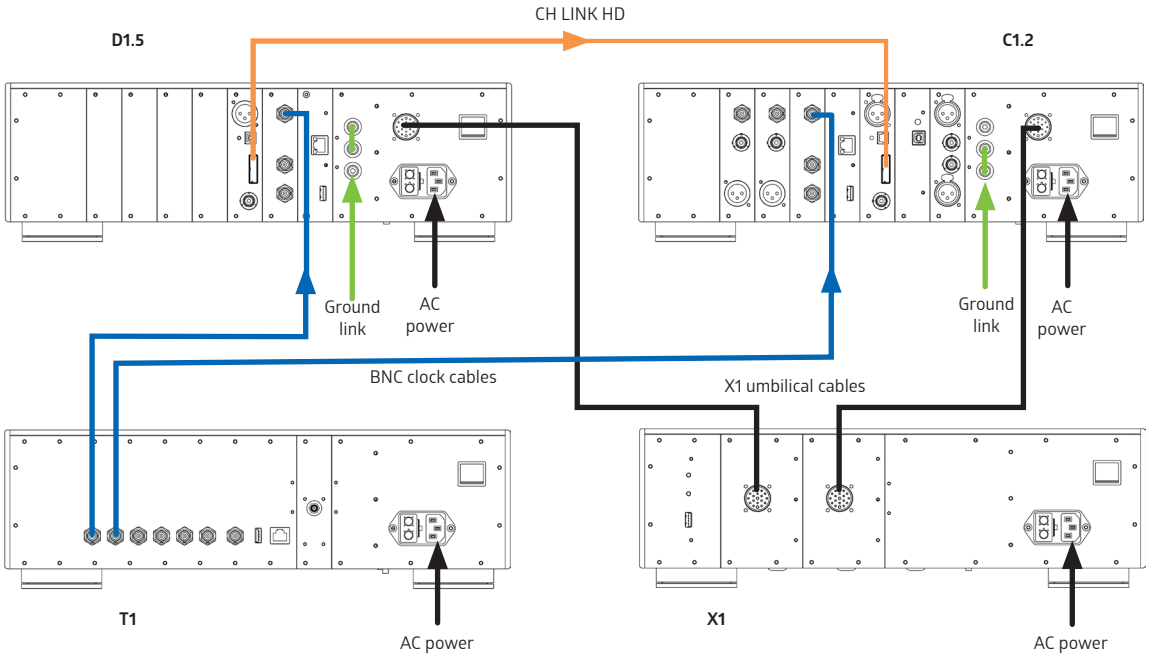
When both the D1.5 and the C1.2 (or I1) are equipped with a Clock Sync board and no external high-stability clock source is available, optimum performance is obtained when the DAC is configured as the clock master, and the D1.5 transport is the clock slave. The audio stream goes from the D1.5 to the DAC, but the clock signal goes the other way. The schematic below shows how to connect such a system:



- D1.5 clock source: SYNCHRO BNC 75 Ohm
- DAC clock source (for this input): INTERNAL
- C1.2 Synchro Out 1: Internal
- C1.2 Synchro Out 2: Off

11.4 D1.5 SACD/CD transport with Clock Sync board + CH DAC (C1.2 or I1) with Clock Sync board + T1 Time Reference

When both the D1.5 and the C1.2 (or I1) are equipped with a Clock Sync board, you can use them with an external, ultra-high stability clock generator such as the CH Precision T1 10MHz Time Reference. You will achieve optimum performance when both the D1.5 and C1.2/I1 are locked to the external clock generator. You should use direct clock connections from the T1 to the D1.5 and C1.2/I1 rather than daisy-chaining from one unit to the next. In this case, the audio stream goes from the D1.5 to the C1.2/I1, with the clock signal distributed to both the D1.5 and C1.2/I1 from the T1.



- D1.5 clock source: SYNCHRO BNC 75 Ohm
- D1.5 Synchro Out 1 and 2: Off
- C1.2/I1 clock source (for this input): SYNCHRO BNC 75 Ohm
- C1.2 Synchro Out 1 and 2: Off

12 Returning to factory defaults

Please note that if you get lost in the menus, or you simply want to start over, your D1.5 can be reset to Factory default settings by using the RESET ALL SETTING item of the FACTORY SETTING menu. For a list of Factory default settings, please refer to the Specifications section.

13 Firmware update

13.1 Preparing the USB stick

The firmware of all the CH Precision units can be updated using the USB port located at the back of the unit. Before starting the firmware update, it is necessary to load a USB stick with files containing the new firmware. Use a FAT32 formatted USB 2.0 stick. Please note that some USB sticks might not be detected by the D1.5 USB port. CH Precision recommends the use of the USB sticks that is delivered in the accessory pack of the unit. The following procedure describes how to load the USB stick with the correct files:

1. Download the latest D1.5 firmware file from www.ch-precision.com.
2. Decompress the .zip file and copy the decompressed files to the root of your USB stick.

Make sure all the files are present at the root of your USB stick, and that only one version of these files is present. Any missing file will make the firmware update procedure fail, while multiple versions of the same unit's firmware can lead to unstable D1.5 behavior after update.

13.2 Updating the unit's firmware

1. Perform the operations described in the section above.
2. Connect the USB stick to the USB port located at the back of your D1.5 unit.
3. Navigate to the FACTORY SETTINGS menu and select the UPDATE FIRMWARE item.
4. Start the Firmware Update process by pushing the encoder button. Please note that the unit can perform several resets (the display briefly turns off and on) during the procedure.
5. Once the firmware update is complete, the unit automatically goes into Standby mode. The front red logo LED will switch from flashing mode to on mode. Remove the USB stick and turn the unit on. The new firmware is now active. To verify that the firmware update was effective, navigate to the FACTORY SETTINGS menu and select the FIRMWARE VERSION item. The displayed firmware revision should match the firmware revision of the les copied to the USB stick.

Note: The firmware update process lasts 5-10 minutes, do NOT interrupt it!

When performing a firmware update, do NOT press any of the unit's front panel buttons, do NOT unplug the unit from the AC wall socket and do NOT turn the mains power switch off. Interruption of the firmware update procedure may result in corrupted firmware and a malfunctioning unit. In case something went wrong during a firmware update and the unit is malfunctioning, apply the emergency firmware update procedure described in the next section.

13.3 Emergency firmware update procedure

Perform the following Emergency Firmware Update procedure if your unit doesn't power up normally.

1. Perform the operations described in the section above.
2. Power the unit off (back panel mains power switch to OFF on the power supply unit).
3. Push the central knob and keep it pushed while powering up the unit (back panel mains power switch to ON). Keep the central knob pushed in for a couple more seconds after turning the unit on.
4. The unit performs the emergency firmware update. Once the operation is complete, the unit automatically goes into Standby mode. Remove the USB stick and turn the unit on. The new firmware is now active. To verify that the firmware update was effective, navigate to the FACTORY SETTINGS menu and select the FIRMWARE VERSION item. The displayed firmware revision should match the firmware revision of the files copied to the USB stick.
5. If the emergency firmware update procedure fails, try the same procedure again using a different USB stick. If the failure persists, turn off your unit and contact your authorized dealer for assistance.

Note: The emergency firmware update procedure lasts 5-10 minutes, do NOT interrupt it!

14 Troubleshooting

Error	Action
No power	Check the AC power cord Check the power button at the back of the unit Check the mains fuse on the AC power cord receptacle
Remote control does not work	Check if the unit is connected to the AC wall outlet and powered on Check if distance is not too far to the D1.5 unit. Get closer and try again. D1.5's Standby LED should briefly illuminate Change batteries in remote control if required (Remote control LED does not illuminate)
Disc doesn't play	Check if disc has been inserted correctly (labeled side up) Check that disc is not empty (CD-R / CD-RW only) Check if disc type is supported by the D1.5 unit (CD and SACD only, no DVD or BD) Check if disc is dirty. If so, clean with a dry cloth from center to exterior of disc Check that disc is not scratched or damaged
Sound skips	Check if disc is dirty. If so, clean with a dry cloth from center to exterior of disc Check that disc is not scratched or damaged
Disc plays, but no sound (general)	Check that your DAC, pre-amplifier and amplifier are turned-on Check that the system volume setting is not too low Check that the correct input is selected on your DAC and pre-amplifier Check that the outputs are correctly enabled on your D1.5
Disc plays, but no sound ("⊗" is displayed)	Your D1.5 is muted (display area 3 ⊗ must be off). Unmute using the red RC button
Disc plays, but no sound ("∿" is displayed)	D1.5 is not locked to its clock source (symbol 11 should be a closed padlock 🔒). Please refer to advanced clocking chapter for details on valid clocking combinations. If you are using a clocking scheme involving external clock in/out (Clock Sync optional board), make sure that the 75 Ohm BNC cable is properly connected, both to the BNC sockets and in terms of input/output and is not damaged.
Software update fails	Try Emergency Software Update procedure If it fails, download the latest D1.5 firmware from www.ch-precision.com, prepare a software update image on a FAT32 formatted USB2.0 stick and run the Emergency Software Update procedure again
USB flash drive for firmware update is not detected by D1.5	Please try another brand of USB flash drive (e.g. Sandisk).

If the error cannot be corrected using the information from the above table, disconnect the unit from AC wall power and from the rest of you system and contact your authorized dealer.

15 Specifications

General

Supported discs	CD, CD-R, CD-RW: stereo PCM 16 bits, 44.1kHz (redbook), MQA-CD SACD single layer and hybrid stereo, DSD 1bit, 2.8224MHz (scarletbook)
User control	Dual concentric rotary knob with push function (control knob) and CH Control Android app
Display	800 x 480 24bits RGB AMOLED
Power supply	Selectable 100V, 115V or 230V ~, 50Hz to 60Hz
Power consumption (Standby)	< 0.5W
Power consumption (Normal operation)	40W
Operating conditions	Temperature: +15°C to +35°C, humidity: 5% to 85% (no condensation).
Storage conditions	Temperature: +5°C to +45°C, humidity: 5% to 85% (no condensation)
Dimensions (L x D x H)	440mm x 440mm x 120mm (main body) 440mm x 492mm x 132mm (overall including connectors and feet)
Weight	27kg
Firmware update / Control	USB port for firmware update / Ethernet based system control

Digital Audio outputs (DIGITAL_OUT_HD board)

CH LINK HD	Proprietary data link supporting high-definition uncompressed audio and control. Cyphered operation for high-resolution signals (DSD). LVDS signaling for all I2S audio signals (incl. clocks). 16bits/44.1 or 24bits/88.2kHz (CD, MQA-CD) 1bit/2.8224MHz (SACD)
AES-EBU (consumer format)	XLR connector, 2.5Vpp diff., 110 Ohm, 16bits/44.1 or 24bits/88.2kHz (CD, MQA-CD) 24bits/44.1, 88.2, 176.4kHz or 1 bit/2.8224MHz DoP (SACD)
Coaxial (S/PDIF)	RCA connector, 0.5Vpp, 75 Ohm, 16bits/44.1 or 24bits/88.2kHz (CD, MQA-CD) 24bits/44.1, 88.2, 176.4kHz or 1 bit/2.8224MHz DoP (SACD)
Optical TOSLINK (S/PDIF)	Standard TOSLINK optical connector, 16bits/44.1 or 24bits/88.2kHz (CD, MQA-CD) 24bits/44.1, 88.2, 176.4kHz or 1 bit/2.8224MHz DoP (SACD)

Analog Audio outputs (pair of Monaural ANALOG_OUT boards, one board per channel)

Balanced outputs	True balanced XLR connector
Single-ended outputs	RCA connector & BNC connector
Output level	4Vrms (balanced) 2Vrms (single-ended)
Frequency response (-3dB point)	DC-30kHz (SACD, balanced and single-ended, noise-shaping filter enabled) DC-20kHz (CD, balanced and single-ended) DC-176.4kHz (MQA-CD, balanced and single-ended, MQA-content-dependant)
Dynamic Range (DNR)	120dB (SACD, balanced and single-ended) 96dB (CD, balanced and single-ended)
Signal to Noise Ratio (SNR)	121dB (SACD, balanced and single-ended) 121dB (CD, balanced and single-ended)
Total Harmonic Distortion + Noise (THD+N)	<0.0015% (SACD, balanced and single-ended) <0.002% (CD, balanced and single-ended)

Synchronization inputs and output (optional Clock Sync board)

Clock input	1x BNC connector, 0.5Vpp to 5Vpp, 75 Ohm or high input impedance Wordclock (44.1, 48, 88.2, 96, 176.4, 192, 352.8, 384, 705.6, 768 kHz), Masterclock (22.5792, 24.576 MHz), DSD bitclock (2.8224 or 3.072MHz), External reference clock (100 kHz, 10 MHz), 40% to 60% duty cycle square wave
Clock output	2x BNC connectors, 1Vpp, 75 Ohm output impedance Buffered Clock input, Audio Wordclock, or muted 50% duty cycle square wave

Remote control

Remote control type	Infrared. Uses RC5 codes. Range: 10m (line of sight)
Remote control batteries	2x AAA type

Design and Specifications are subject to change without notice. Weight and dimensions are approximate.
Illustrations are informative only and may differ from the actual production model.
Enclosure designed by Mana Ishoni.

FCC-Notice

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- adjust or relocate the receiving antenna
- increase the separation between the equipment and the receiver
- connect the equipment into a mains outlet on a circuit different from that to which the receiver is connected
- consult the dealer or an experienced ratio/TV technician for help

This product has been designed and manufactured according to FDA regulations “title 21, CFR, chapter 1, subchapter J, based on the Radiation Control for Health and Safety Act of 1968”, and is classified as class 1 laser product. There is no hazardous invisible laser radiation during operation because invisible laser radiation emitted inside of this product is completely confined in the protective housings.

Optical pickup

Type:	EP-HD870PB
Manufacturer:	Huizhou Daya Bay Ever Bright Electronic Science &Technology Co.,Ltd.
Laser output:	0.7 mW (Emission power intensity Out of the objective lens)
Wavelength:	790nm (CD), 655nm (SACD)

The laser complies with IEC 60825-1:2014 standard.

Disposal – Environmental care

Directive 2002/96/EG of the European Parliament requires consumer electro-technical appliances to be disposed separately and have to be indicated with the following symbol. Should you dispose this component please do so in conformity with local and global legal and environmental regulations and according to best practices. We strongly encourage you to recycle any batteries used with this component.

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