D1 SACD/CD unit

User Manual

Dear Client,

We are honored that you have chosen the CH D1 SACD/CD unit. Our team has put all his efforts into designing and manufacturing this outstanding product and is proud to present it to you. We hope your D1 will bring you uncountable hours of musical emotion from your SACD and CD collection.

But before starting your musical journey, we kindly ask you to pay attention to the information contained in this manual. The D1, as you will discover in the following pages, is a Swiss precision product designed for ultimate performance and flexibility. However, reaching sonic excellence requires your unit to be setup and operated correctly and this 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 SACD/CD unit for many years.

The Concert has just begun...

Cossy F. 

Heeb T. 

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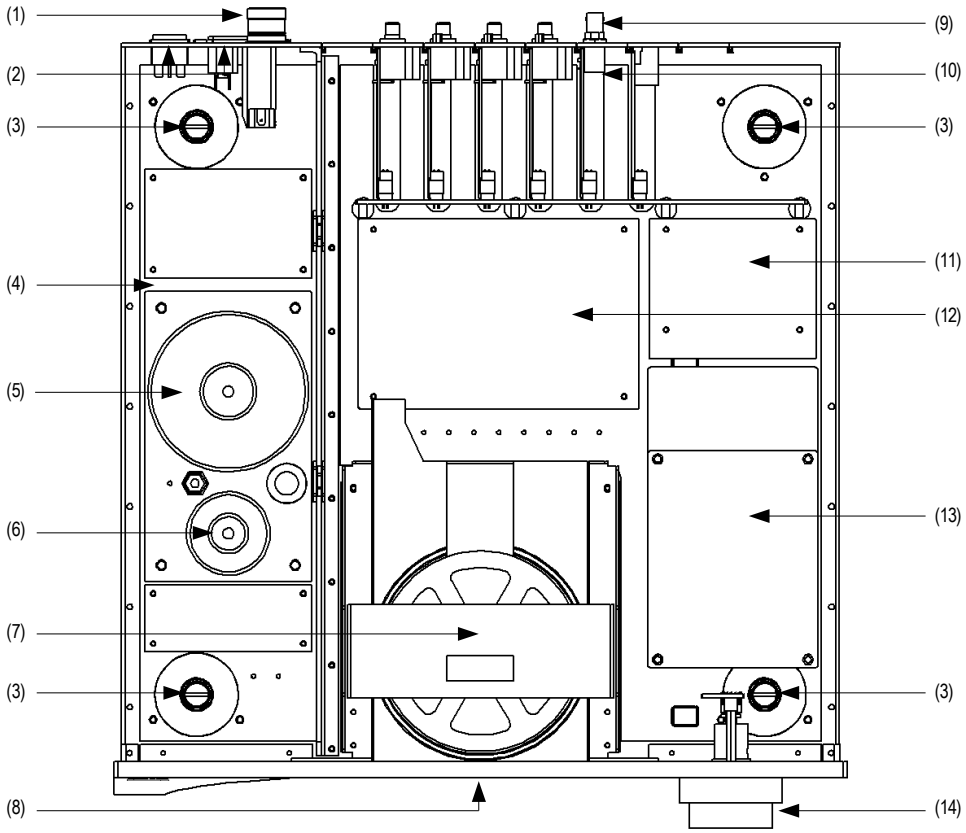
1 Technical highlights

CH products are proudly designed and manufactured in Switzerland by CH Precision Sàrl. Our engineers have put all their know-how into bringing you the D1, a highest quality modular SACD/CD unit based on slot-in boards and USB flash-drive firmware update. In its base version the D1 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. Highest quality playback is ensured when the D1 is paired to the matching CH C1 Digital to Analog Controller using the proprietary high definition CH Link HD interface.

Optional boards allow to extend the functionality of the base version of the D1 SACD/CD drive. By adding two monaural ANALOG_OUT boards or a stereo ANALOG_OUT board the D1 becomes an integrated stereo SACD/CD player. Seamless migration to multi-channel is achieved by adding further output boards for the additional surround channels. Up to three additional output boards can be added in the D1. Any combination of 2-channel (Ls/Rs or C/Sub) surround digital (DIGITAL_OUT_HD), main channels monaural (L + R) analog or stereo (L/R, Ls/Rs or C/Sub) analog (ANALOG_OUT) output boards are allowed in these three remaining input slots. Finally, the SYNC_IO optional board provides advanced clock synchronization capabilities for use with external clock generators or to enslave the D1 to the C1's master clock for zero-jitter connection.



D1 main components

(1) External power supply input. For X1 optional external power supply only
(2) Mains switch and power cord receptacle (on back panel)
(3) Adjustment shafts and screws
(4) Power supply section

(5) Main power transformer
(6) Standby power transformer (ensures green mode Standby)
(7) Esoteric VMK-5 SACD/CD drive mounted on steel support
(8) SACD/CD drawer and AMOLED display (on front panel)
(9) Audio, clock, USB (firmware update) and RJ-45 (control) connectors (from slot-in boards). Analog ground to Earth jumper
(10) Slot-in boards (SYNC_IO, CONTROL, DIGITAL_OUT_HD, stereo ANALOG_OUT or monaural ANALOG_OUT)
(11) Clock and controller board
(12) Power supply regulation board
(13) SACD/CD mechanism control section
(14) Concentric push control knob

1.1 SACD/CD drive (VMK-5)

The D1 SACD/CD unit is built around the high-quality Esoteric VMK-5 SACD/CD mechanism featuring VRDS-Neo disc clamping. The VRDS disc clamp covers the whole disc (not only its central part) ensuring vibration and error free digital data reading. CH has further improved the vibration immunity of the SACD/CD mechanism by mounting it on a heavy steel rails directly assembled to a massive steel base plate weighting over 15kg.

1.2 Mechanical construction

The D1 SACD/CD unit 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 heavy steel plate whereas the front panel, the side panels and the top cover are machined from aluminum. 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 interferences. First class mechanical and chemical surface treatments provide the luxury finish of the D1.

Four steel feet support the unit. Each feet ends with a elastomer ring to sit on delicate surfaces but is also equipped with a height adjustable steel spike to fine tune unit positioning. Horizontal adjustment is done with the provided screwdriver through the four adjustment shafts accessible from the top of the unit. In addition to providing convenient horizontal adjustment from the top of the unit, the shafts also serve as vibration evacuation channels for any stacked unit. Special shaft covers are provided to interface with the spikes of the stacked unit. Any vibration from the upper unit is transmitted by the shaft cover to the shaft and from the shaft to the lower unit feet or spike, forming a privileged path for vibrations evacuation.

1.3 Modular architecture and slot-in boards

The D1 benefits from a fully modular architecture. It features separated sections for power-supply, disc mechanism and related control, front panel, central host processor and slot-in boards. This modular architecture combined to the USB plug for all firmwares (MCU, DSP, and FPGA) update allows for easy servicing and upgrade should one section become faulty or obsolete.

The slot-in boards section consists in a vertically mounted mother board with optional boards plugged into it. Optional boards provide audio functionality and connectivity to other equipment. There are five types of slot-in boards:

- CONTROL board: provides a USB port for software upgrade and an Ethernet port for command

- DIGITAL_OUT_HD: provides two channels of digital audio output. Specific back panels for L/R, Ls/Rs or C/Sub channels
- Stereo ANALOG_OUT: provides two channels of analog audio output. Specific back panels for L/R, Ls/Rs or C/Sub channels
- Monaural ANALOG_OUT: provides one fully balanced channel of analog audio output. Specific back panels for Left or Right channel
- SYNC_IO: provides advanced clock synchronization options (1 clock in, 2 clock out)

There are 6 slots in the D1. A CONTROL board is always installed inside the D1, as well as a DIGITAL_OUT_HD, leaving space for 4 optional boards. One of these slots is reserved for the SYNC_IO board. Note that optional boards MUST be installed by a qualified technician. Failure to do so will void any warranty. Following table shows the typical recommended configurations for D1:

Config	DIGITAL_OUT_HD L/R	DIGITAL_OUT_HD Ls/Rs	DIGITAL_OUT_HD C/Sub	Mono ANALOG_OUT L	Mono ANALOG_OUT R	ANALOG_OUT L/R	ANALOG_OUT Ls/Rs	ANALOG_OUT C/Sub	Description
SD	☑								Stereo SACD/CD drive (Base configuration). To be used with 1 external stereo DAC.
SP	☑					☑			Stereo SACD/CD player.
DMP	☑			☑	☑				Dual-Mono SACD/CD player.
MD	☑	☑	☑						Multi-channel SACD/CD drive. To be used with 3 external stereo DACs.
MP	☑					☑	☑	☑	Multi-channel SACD/CD player.
MH	☑						☑	☑	Multi-channel SACD/CD hybrid drive/player. To be used with 1 external DAC.

D1 recommended configurations (CONTROL board is included in all configurations and SYNC_IO board can be added in any configuration)

1.3.1 Multi-channel support

True multi-channel SACD playback is achieved by means of optional boards. The Stereo versions of D1 are delivered with a single DIGITAL_OUT_HD board plus optionnaly a single ANALOG_OUT board configured for L/R channels. They can be extended to multi-channel by simple addition of DIGITAL_OUT_HD or ANALOG_OUT boards for the Ls/Rs and C/Sub channels. No other action is required as the D1 firmware will automatically sense the presence of the additional boards and enable true multi-channel reproduction.

When a D1 has multi-channel capability (either digital, analog or hybrid outputs), it will always select multi-channel DSD layer on SACDs whenever available. User can then manually change to another available layer (stereo DSD and/or CD layer) from a given disc.

When a D1 is purely stereo (either drive or player), it will first select stereo DSD layer on SACDs whenever available. User can then manually change to another available layer from a given disc, including a down-mixed version of the multichannel DSD layer if this layer exists.

Four channel configurations are not supported. Multiple output boards of the same type (DIGITAL_OUT_HD or ANALOG_OUT) on any channel pair (L/R, Ls/Rs or C/Sub) are not supported.

1.3.2 Digital outputs and CH Link HD: DIGITAL_OUT_HD board

The DIGITAL_OUT_HD board provides digital output for an audio channel pair. Three different DIGITAL_OUT_HD boards are available, corresponding to L/R, Ls/Rs and C/Sub channel pairs. Each DIGITAL_OUT_HD board provides standard digital outputs in AES-EBU, Coaxial RCA (S/PDIF) and Optical TOSLINK (S/PDIF) formats as well as in the CH Link HD high-definition proprietary format. CH Link HD uses a dedicated connector to carry high resolution audio and control data over a single link between CH units. It supports both PCM (up to 768kHz, 32bits) and DSD. To comply with high definition digital content protection, DSD signals are cyphered when transported over CH Link HD from the D1. Standard digital outputs down-convert DSD signals to 16bits/44.1kHz PCM audio.

1.3.3 Stereo analog outputs: ANALOG_OUT board option

The ANALOG_OUT board provides analog line level output for two audio channels. Three different ANALOG_OUT boards are available, corresponding to L/R, Ls/Rs and C/Sub channel pairs. Each ANALOG_OUT board provides both balanced (on XLR connectors) and single-ended (on RCA connectors) outputs. Digital to analog conversion is handled by two WM8742 DACs (one per channel) combined with a discrete dual mono output stage. A choice of digital filters is available to the user. Filters for PCM and DSD audio can be selected independently.

1.3.4 Monaural analog outputs: Mono ANALOG_OUT board option

The monaural ANALOG_OUT board pair provides analog line level output for the two main audio channels (Left and Right). Each monaural ANALOG_OUT board provides both true balanced (on XLR connectors, with a dedicated analog output stage on each – warm and cold – point) and single-ended (on RCA connectors) outputs. Each board (i.e. each channel) has its own dedicated voltage regulators. Digital to analog conversion is handled by one WM8742 DAC on each board combined with a discrete dual mono output stage. A choice of digital filters is available to the user. Filters for PCM and DSD audio can be selected independently.

1.3.5 External clock synchronization: SYNC_IO board option

The SYNC_IO board provides advanced clock synchronization options for D1 when used with an external clock generator such as the CH Precision T1 10MHz time reference or matching CH DAC (C1). It includes a clock input on BNC connector with selectable 75 Ohm or high input impedance. Supported input frequencies on this connector are all standard audio Wordclocks (44.1, 48, 88.2, 96, 176.4, 196, 352.8 and 384 kHz), audio Masterclocks (22.5792 and 24.576 MHz), DSD bitclock (2.8224 MHz) and atomic-clock multiples (100 kHz and 10 MHz). When fed with an audio Wordclock, the D1's internal clock will lock its VCXO internal clock in frequency and in phase (phase accuracy of +/- 2.5 us), tracking below 0.1 Hz with 0.1 PPM corrections for optimal jitter rejection.

Two 75 Ohm Wordclock outputs completes the input/output capabilities of the SYNC_IO board.

When a T1 time reference clock generator is available, ultimate result is achieved when connecting both the C1 and the D1's clock

input to two different clock outputs of the T1, and setting both C1 and D1's clock source to SYNCHRO BNC 75. If no ultra-high stability external clock source is available but both C1 and D1 are equipped with a SYNC_IO board, the optimal configuration is to set the C1 as the clock master (C1 clock source: INTERNAL), and D1 as the clock slave (D1 clock source: SYNCHRO BNC 75). In that case, connect one of C1's BNC clock out to D1's clock in configured as a 75 Ohm input with a 75 Ohm BNC-terminated cable.

1.4 Power supply

The power supply of the D1 is a linear supply with multiple independent local regulations. It is based on an oversized magnetically shielded toroidal mains transformer and includes a mains filter. A secondary (also toroidal) transformer is used as Standby transformer to ensure green Standby mode, meeting the latest energy saving regulations. Both transformers have static shields between primaries and secondaries. They are mounted on a separate steel plate which is isolated from the main base steel plate by silent blocks.

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 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.

1.4.1 Optional external power supply

The D1 is equipped with an external power supply input. This input is dedicated to the CH X1 external power supply. When the external power supply is connected, the internal power supply of the D1 is turned off (only the Standby transformer remains active). Turning the main internal transformer off ensures that no power supply induced noise or radiations are generated inside the D1 unit, thus permitting optimal operating conditions for the circuits. Moreover, the D1's internal voltage regulation stage are still active, cascaded 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. After reading this manual, please store it in an accessible place for future reference. If after reading this manual you feel unsure about how to make connections or how to operate the unit, please contact your authorized dealer for assistance.

2.1 Package content

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

- D1 SACD/CD unit
- A power cord
- Four adjustment steel spikes
- A suction cup (used to unscrew the top covers)
- An accessory box containing:
    - an infrared remote control
    - a spike adjustment screwdriver
    - a Torx 10 screwdriver
    - four stacking covers
    - a USB stick containing the latest CH Precision firmwares.
    - a set of four CH Support Discs

Please store the packaging for future use. Check your D1 for any apparent damage. In case of a damage, immediately contact your authorized dealer. If your D1 is cold due to transport, please let it warm up to room temperature before powering it up.

2.2 Safety notice

Make sure to observe the following rules:

- Install your D1 SACD/CD player on a stable base
- Do not install your D1 SACD/CD unit near water
- Always handle with care. The D1 SACD/CD unit is very heavy, so have someone help you when moving it around

- 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 apparatus generating heat
- Do not install in a confined space and make sure sufficient air can flow around the unit
- Do not operate under high ambient temperature (>40C) or with extremely high humidity 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

2.3 User manual

Please read this manual carefully before making connections or operating your D1 SACD/CD unit. After reading, store the manual in an accessible place for future reference. If, after reading this manual, you feel unsure about how to make connections or how to operate the unit, please contact your authorized dealer.

2.4 Mains supply

Make sure to use 3 terminals (phase, neutral and earth) power cords with ground conductor. Make sure that the mains voltage selection of the unit matches your mains voltage.

Make sure your D1 SACD/CD unit is disconnected from AC wall power in the following cases:

- When making connections (it is also recommended to disconnect the rest of the system from AC wall power)
- When cleaning
- During thunder storms
- When unused for a long period

2.5 Transport and packaging

The D1 SACD/CD unit must always be stored in its original packaging for transportation. Doing so will ensure optimal level of protection of 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, an optical disc must be inserted into the drawer for transportation. We recommend a blank CD-R.

Finally we recommend to remove the adjustment spikes and to put them into the D1 box for transportation. Indeed, vibrations

during transport may cause the adjustment spikes to move from their fully retracted position. There is risk of scratching the installation base if the spikes are not fully retracted when installing the unit.

2.6 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.

2.7 Maintenance and service

The D1 SACD/CD unit contains no user serviceable parts. Do not try to open, modify or repair your D1 by yourself. This will void any warranty. Your D1 SACD/CD player must be checked by a qualified technician in any of the following cases:

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

3 Installation

3.1 Unpacking

Unpack the D1 SACD/CD unit and store the packaging for future transportation. Be careful when lifting the D1 as the unit is heavy (over 30kg). Get someone to help you if necessary. When unpacking and installing the D1, take care not to damage the high quality surface treatments.

3.2 Unit positioning

When delivered from factory, the D1 SACD/CD unit's four feet sit on elastomer rings, ensuring both scratch-protection for the base on which the unit sits, as well as safe anti-slipping unit positioning.

But a more advanced vibration-channeling mechanical coupling can be implemented, thanks to the steel spikes and the polymer support discs provided with the D1. To use this optimal coupling, simply go through the following steps:

1. Place the D1 unit on a stable base at its approximate final position, for instance in your preferred audio rack. Make sure cooling air is able to freely flow around the unit.

2. Gently lift the unit's corners and insert a support disc under each foot. The foot's elastomer ring should disappear in the support disc's groove when properly placed. Carefully check all four feet perfectly fit in each support disc before pursuing any further. The unit should stably rest on its feet at that point.

3. Unscrew the four top covers from the D1's shafts with the provided suction cup. Be careful not to scratch their delicate finish.

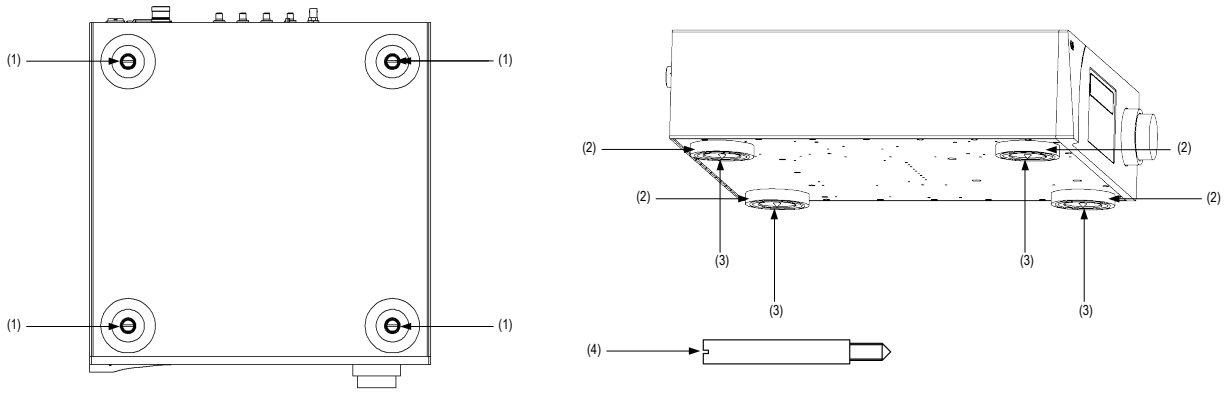
4. Insert the adjustment spikes into each adjustment shaft.

5. Softly screw clockwise each adjustment spikes into the shaft with the provided screwdriver, until any resistance is felt (just before the unit's corner starts to lift).

6. Then screw clockwise each spike by the same amount (for instance two full turns).

7. If the base is flat, the unit should be stable and horizontal. If not, correct the unit's stability and horizontality by turning clockwise or anti-clockwise the required spikes.

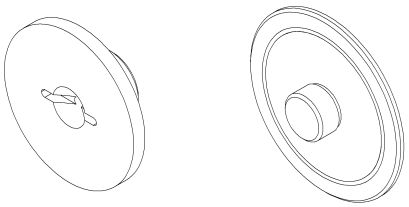
8. If no CH Precision unit is to be stacked on top of the D1, screw the four top covers back. Otherwise, screw the four polymer stacking caps instead, and gently lay down the unit to be stacked on top of it. Be very careful that both units are perfectly aligned in order not to scratch the D1's top plate with the other unit's feet. Repeat steps 3 to 8.



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

Never stack any component other than CH's on your D1. Never use the aluminum shaft covers (top covers) when another CH component is to be stacked on top of your D1.

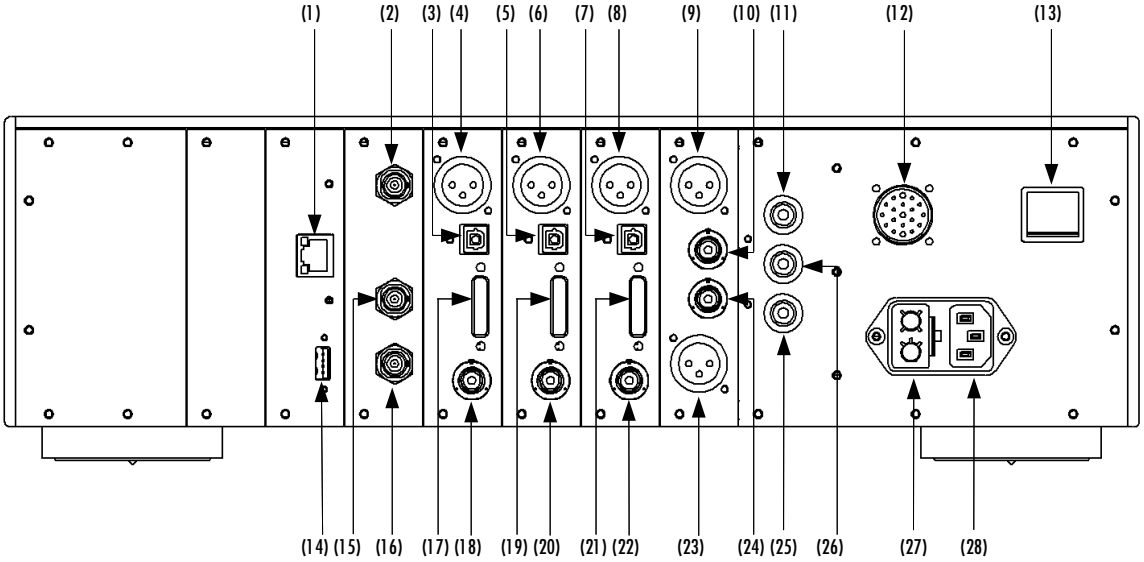


Shaft covers (left: stacking cover, right: top cover)

3.3 Connections

This section provides information about how to connect your D1 SACD/CD unit to your system. As the D1 is a modular design with different optional boards, the description applies to the example configuration presented below. If your options do not match the example or you don't feel secure with the connections to be applied to your configuration, please contact your authorized dealer for assistance.

The example configuration is a full featured multi-channel configuration with 3x DIGITAL_OUT_HD boards (L/R, Ls/Rs, C/Sub), 1x ANALOG_OUT (L/R) board and clock synchronization option (SYNC_IO board). This is one of the most complete configurations of D1. If your configuration does not include some of the presented options, just discard the corresponding connections.



Rear panel connections

(1) Ethernet port for command interface. Unused for now. [CONTROL board]
(2) BNC clock input. Provides 75 Ohm or Hi-Z input. [optional SNYC_IO board]
(3) TOSLINK (S/PDIF) digital output for L/R channels [DIGITAL_OUT_HD board for L/R channels]
(4) AES-EBU digital output for L/R channels [DIGITAL_OUT_HD board for L/R channels]
(5) TOSLINK (S/PDIF) digital output for Ls/Rs channels. [optional DIGITAL_OUT_HD board for Ls/Rs channels]
(6) AES-EBU digital output for Ls/Rs channels. [optional DIGITAL_OUT_HD board for Ls/Rs channels]
(7) TOSLINK (S/PDIF) digital output for C/Sub channels. [optional DIGITAL_OUT_HD board for C/Sub channels]
(8) AES-EBU digital output for C/Sub channels. [optional DIGITAL_OUT_HD board for C/Sub channels]
(9) Balanced analog output for L channel. [optional ANALOG_OUT board for L/R channels]
(10) Single-ended analog output for L channel. [optional ANALOG_OUT board for L/R channels]
(11) Earth connector. Internally connected to digital ground
(12) External power supply connector for X1 power supply option
(13) Power on/off switch
(14) USB port for software upgrades. [CONTROL board]
(15) BNC 75 Ohm clock output 2. [optional SYNC_IO board]
(16) BNC 75 Ohm clock output 1. [optional SYNC_IO board]
(17) CH Link HD digital output for L/R channels. [DIGITAL_OUT_HD board for L/R channels]
(18) Coaxial (S/PDIF) digital output for L/R channels. [DIGITAL_OUT_HD board for L/R channels]
(19) CH Link HD digital output for Ls/Rs channels. [optional DIGITAL_OUT_HD board for Ls/Rs channels]
(20) Coaxial (S/PDIF) digital output for Ls/Rs channels. [optional DIGITAL_OUT_HD board for Ls/Rs channels]
(21) CH Link HD digital output for C/Sub channels. [optional DIGITAL_OUT_HD board for C/Sub channels]
(22) Coaxial (S/PDIF) digital output for C/Sub channels. [optional DIGITAL_OUT_HD board for C/Sub channels]
(23) Balanced analog output for R channel. [optional ANALOG_OUT board for L/R channels]
(24) Unbalanced analog output for R channel. [optional ANALOG_OUT board for L/R channels]
(25) Analog ground connector 2
(26) Analog ground connector 1.Can be connected to digital ground (Earth) using provided jumper
(27) Power fuse and voltage selection
(28) Power cord receptacle

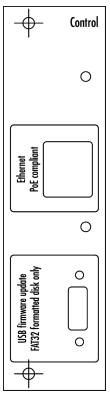
The CONTROL board is mandatory in any D1 SACD/CD unit configuration and is always factory installed. Depending on optional boards and their arrangement in the D1's expansion slots, connector arrangement may differ on your unit. Each D1 unit provides 5 expansion slots supporting any combination of the following optional boards (note that one slot is dedicated to the SYNC_IO board):

- Stereo DIGITAL_OUT_HD boards for L/R, Ls/Rs or C/Sub channels
- Stereo ANALOG_OUT boards for L/R, Ls/Rs or C/Sub channels
- Monaural ANALOG_OUT Left and Right boards (must be used together as a pair)
- SYNC_IO board for external clock synchronization

Note that only one SYNC_IO board is allowed. Each pair of channels (L/R, Ls/Rs or C/Sub) can support a DIGITAL_OUT_HD and/or an ANALOG_OUT board. Optional output boards can be placed in any slot. Installation of optional boards must be done by a qualified technician only. Do not attempt to install any optional board by yourself as this would void the unit's warranty.

3.3.1 CONTROL board

The CONTROL board is factory installed into the D1. It provides a USB port for software updates and an Ethernet port for controlling the unit over a network. Following drawing shows the layout of the back panel of the CONTROL board:



CONTROL board back panel layout

3.3.1.1 USB port

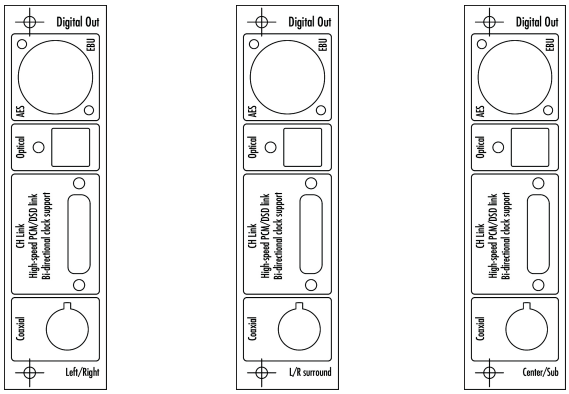
The USB port on the CONTROL board is dedicated to the firmware update of the D1 unit. Do not use it for any other purpose. For more information on unit firmware update, please refer to the corresponding section of this manual.

3.3.1.2 Ethernet port

The Ethernet port on the CONTROL board is dedicated to network based control of the unit. Connect the D1 Ethernet port to an off-the-shelf Ethernet router equipped with WiFi access. Connect an Android tablet to the WiFi network of the router. Install the CH Control app on the Android tablet, freely available from the Google Play Store. Once installed, run the app. The app gives you access to all the settings of the D1.

3.3.2 DIGITAL_OUT_HD boards

DIGITAL_OUT_HD boards provide digital audio output capabilities. Additional DIGITAL_OUT_HD boards for Ls/Rs and C/Sub channels can be added to the default factory installed DIGITAL_OUT_HD L/R into D1 for full digital high-definition multi-channel support. DIGITAL_OUT_HD boards provide both standard (AES-EBU, Coaxial and Optical) digital audio outputs and a proprietary (CH Link HD) high-definition digital audio interface. Following drawing shows the layout of the DIGITAL_OUT_HD board connectors and naming for the different channel pairs:



DIGITAL_OUT_HD boards back panel layout for L/R, Ls/Rs and C/Sub channels

3.3.2.1 Standard digital outputs

Each DIGITAL_OUT_HD board provides three standard digital outputs: AES-EBU (carrying consumer encoding), Coaxial (S/PDIF) and Optical (TOSLINK). Digital output is fixed at 16bits/44.1kHz on all standard outputs. If an SACD is played in the D1, the DSD stream is down converted to 16bits/44.1kHz on the standard digital outputs. When a CD is played, the data from the disc is directly transferred to the standard digital outputs.

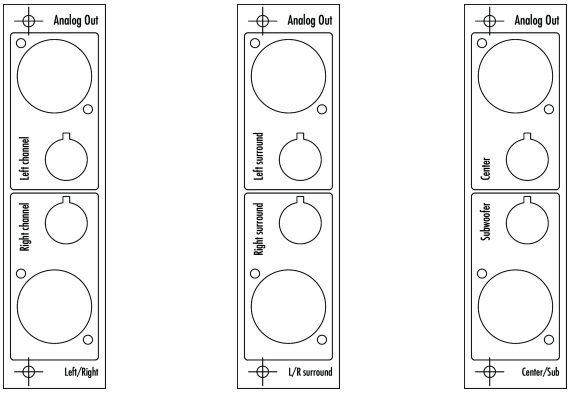
3.3.2.2 CH Link HD digital audio interface

Each DIGITAL_OUT_HD board includes a CH Link HD proprietary digital audio interface. This interface carries both complete audio stream and control information. Use this link as the preferred interface when connecting your D1 to other CH units such as C1 converters.

The proprietary CH Link HD digital audio interface allows for high definition uncompressed digital audio transfer and supports both DSD and PCM (up to 705.6 / 768 kHz). For digital content protection reasons, the CH Link HD interface cyphers the native DSD stream from SACD when transferring such data.

3.3.3 Stereo ANALOG_OUT boards

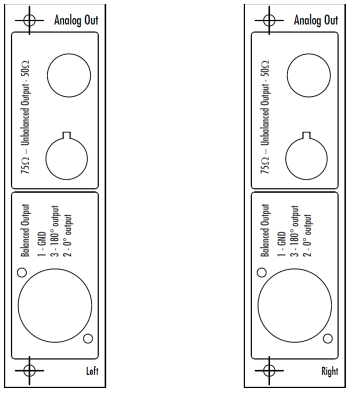
ANALOG_OUT boards provide analog audio output capabilities. ANALOG_OUT boards for L/R, Ls/Rs and C/Sub channel pairs can be installed into D1 for analog stereo or multi-channel support. DIGITAL_OUT_HD, stereo ANALOG_OUT and monaural ANALOG_OUT boards can be combined, providing for instance digital output on the main (L/R) channels and analog out on Ls/Rs and C/Sub channels. Stereo ANALOG_OUT boards provide both balanced (XLR) and single-ended (RCA) analog audio outputs. Following drawing shows the layout of the Stereo ANALOG_OUT board connectors and naming for the different channel pairs:



Stereo ANALOG_OUT boards back panel layout for L/R, Ls/Rs and C/Sub channels

3.3.4 Monaural main ANALOG_OUT boards

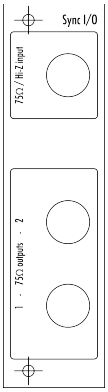
ANALOG_OUT boards provide analog audio output capabilities. Monaural ANALOG_OUT board pairs for Left and Right channels can be installed into D1 for analog support on main channels. DIGITAL_OUT_HD, stereo ANALOG_OUT and monaural ANALOG_OUT boards can be combined, providing for instance monaural analog output on Left and on Right channels, and stereo analog output on Ls/Rs and C/Sub channels. Monaural ANALOG_OUT boards provide true fully-balanced (XLR), single-ended 75 Ohm (RCA) and single-ended 50 Ohm (BNC) analog audio outputs. Following drawing shows the layout of the Monaural ANALOG_OUT board connectors and naming:



Monaural ANALOG_OUT board pair

3.3.5 SYNC_IO board

The SYNC_IO board is an optional clock synchronization board to be used with an external clock generator or together with other CH products, such as the C1 Digital to Analog Controller. The board provides one clock input and two clock output on BNC connectors. The VCXO digital PLL of the D1 is capable of frequency and phase locking. The frequency is tracked below 0.1 Hz with 0.1 PPM adjustments for optimal jitter rejection. When fed with an audio Wordclock, the D1 's internal clock will always keep a phase accuracy below 2.5 us (equivalent to sub-millimeter position accuracy), thus enabling phase perfect match in a multichannel configuration. Following diagram shows the layout of the back panel of the SYNC_IO board:



SYNC_IO board back panel layout

3.3.5.1 BNC clock input

The SYNC_IO board provides a BNC clock input that can be configured as 75 Ohm input impedance or high input impedance through the D1's menu. Supported input frequencies on this connector are all standard audio Wordclocks (44.1, 48, 88.2, 96, 176.4 and 196 kHz), audio Masterclocks (22.5792 and 24.576 MHz), DSD bitclock (2.8224 MHz) and atomic-clock multiples (100 kHz and 10 MHz). Use this connector to synchronize your D1 unit to an external clock source (atomic clock generator or external DAC such as CH C1).

3.3.5.2 BNC clock outputs

Two 75 Ohm output clock connectors are also provided on the SYNC_IO board. Use one of these connectors to synchronize an external device to your D1. Output clock is either a buffered version of input clock (if D1 is synchronized to it input clock), or current audio Wordclock (if D1 is clocked by its internal high precision oscillator).

3.3.6 Power cord receptacle and voltage selection

Make sure that the voltage selection is set to the correct value with respect to the AC voltage in your location. Connect the power cord to the power cord receptacle and plug the power plug to an AC wall outlet only after all other connections have been made.

3.3.7 External power supply connector

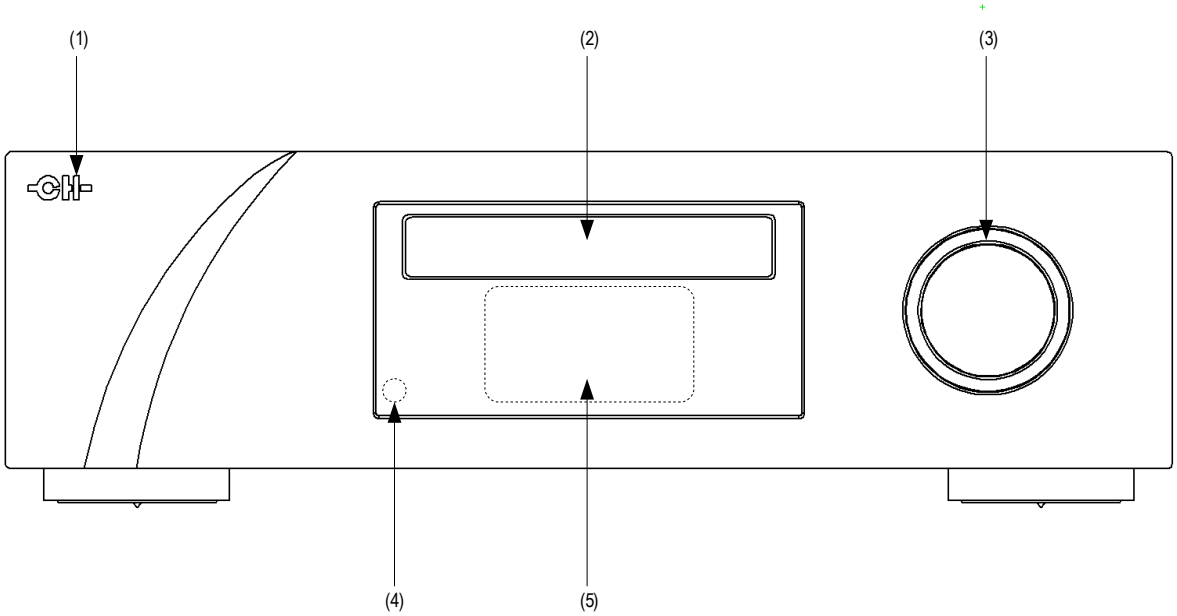
The external power supply connector allows you to connect the X1 optional external power supply from CH. When the X1 is used, it completely replaces the D1's internal power supply, resulting in minimized noise and enhanced audio quality. Note that only the (small) standby transformer of the D1 remains active in this case to ensure the D1's wake up functionality.

4 Operation

The D1 SACD/CD unit is operated either from the front panel or from the IR remote control. Feedback to the user is provided by a high-definition AMOLED display with customizable colors. Setup operations are exclusively handled from the front panel.

4.1 Front panel controls

4.1.1 Front panel



Front panel elements

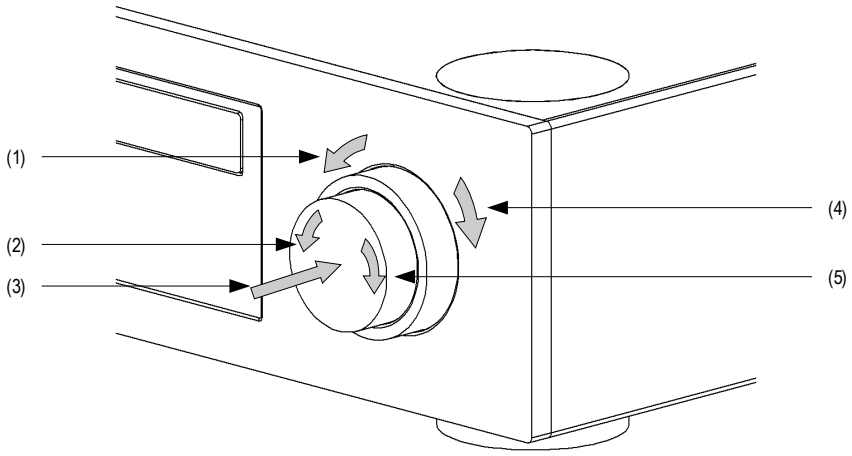
(1) Standby LED
(2) SACD/CD drawer
(3) User control knob (dual concentric rotatory knob with push function)
(4) IR remote control receiver
(5) Display area (high-definition AMOLED display

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 or SACD playback.

4.1.2 User control knob

The user control knob is the main user input device. It is build around a dual concentric rotatory knob with push function, mounted on a Teflon guide. Both the central and the external part of the knob can be moved to the left or the right independently, giving four movements: rotate External Rotate Left/Right [<<E]/[E>>] and Central Rotate Left/Right [<<C]/[C>>]. The central part of

the knob also supports a push functionality. There are two types of 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 2s or more.



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>>]

User Action Code	Description
[<<C]	Central Left: Rotate central knob to the left
[C>>]	Central Right: Rotate central knob to the right
[<<E]	External Left: Rotate external ring to the left
[E>>]	External Right: Rotate external ring to the right
[NP]	Normal Push: push and release central knob
[LP]	Long Push: push central knob and maintain for 2s before release

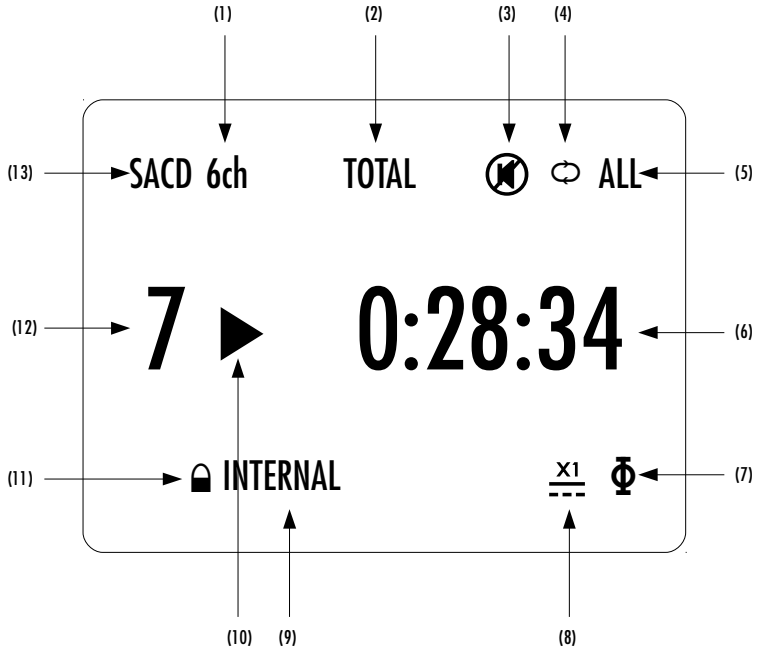
User Action Codes

4.2 Operating modes

The D1 SACD/CD unit 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 also includes Shortcuts for quick access to selected Menu mode items. Shortcuts are user programmable and most Menu mode items can be selected as Shortcuts.

4.2.1 Normal mode

Normal mode is used for SACD/CD playback control. When powered-on, the D1 SACD/CD unit starts in Normal mode. The display looks as follows:



Normal mode display elements

(1) Disc layer selection for SACD (indicates 6ch if multi-channel layer is selected and player is equipped for multi-channel or DM if the multi-channel layer is read but the player output is stereo only)
(2) Time display mode. Indicates TOTAL if time information is relative to the whole disc
(3) Mute indication. If the ⊗ symbol is present, the output is muted
(4) Repeat indication. If the symbol ⟲ is present, repeat mode is engaged
(5) Repeat type. If repeat is for the whole disc, the indication ALL is activated
(6) Current time. Negative time indicates remaining time (either for track or for disc)
(7) Polarity (phase) indication. If the Φ symbol is present, polarity is reversed
(8) External power supply indication. When an external power supply is connected and engaged, X1 symbol is displayed and internal power supply is turned off
(9) Clock source indication
(10) Playing status indication
(11) Lock indication (🔒 or ⌒). Tells if the unit is locked to a clock source or not
(12) Track number
(13) Disc type (CD or SACD)

Displayed elements depend on the type of disc, installed optional boards and user settings. In the example above, the 7th track of a multi-channel SACD is played back on a unit supporting multi-channel output. Total elapsed time is 28min 34s, phase is inverted and the whole disc is repeated. The D1 powered through an external power supply and is locked to its internal clock but its outputs are muted. Displayed elements for other configurations and settings or when playing back a CD are similar.

Following table shows the actions of the user control knob in Normal mode.

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

User control knob actions in Normal mode

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

4.2.2 Shortcuts

The D1 SACD/CD unit is configured by a set of menus as described in the next sections. To allow quick access to the most frequently used configuration menu items, the D1 offers the concept of Shortcuts. Shortcuts are fully programmable and the user may choose any configuration parameter as a Shortcut. There are up to 6 user programmable Shortcuts. To learn how to program individual Shortcuts, please refer to the SHORTCUTS menu item in the next section.

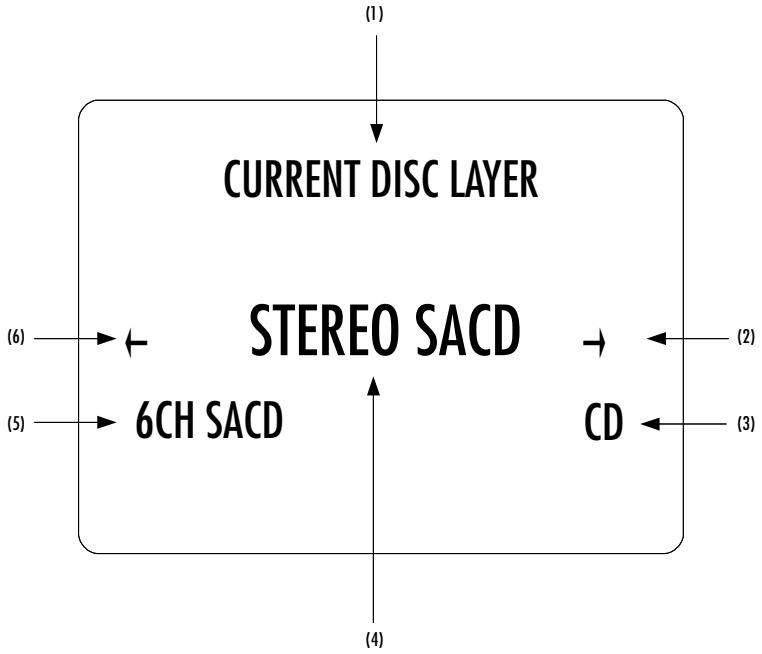
Shortcuts are accessed from Normal mode by a Normal Push [NP]. Additional Normal Push [NP] skips to the next Shortcut. The last Shortcut is always dedicated to entering the Menu mode (SETUP). On this last Shortcut, a Normal Push [NP] will return to Normal Mode and an External Rotate Right [E>>] (or Central Rotate Right [C>>]) will enter the Menu mode. The individual parameter for a given Shortcut is modified using External Rotate Left [<<E] (or Central Rotate Left [<<C]) and/or External Rotate Right [E>>] (or Central Rotate Right [C>>]). If there is no user action for 10s the unit will revert to Normal mode. Note that Shortcuts are dynamically loaded depending on the unit's state. For instance, the Shortcut for SEARCH will not appear if the unit is in STOP state as searching requires the disc to be playing.

Following table shows the actions of the user control knob for Shortcuts.

User Control Knob Action	Unit State	Unit Action
[NP] Normal Push	Shortcut (except last) Last Shortcut (SETUP) or after current Shortcut has been modified	Skip to next Shortcut Exit Shortcuts mode (Normal mode)
[LP] Long Push	Any state	As in Normal mode
[C>>] Central Rotate Right	Shortcuts (except last) Last Shortcut (SETUP)	Modify parameter up Enter Menu mode
[<<C] Central Rotate Left	Shortcuts	Modify parameter down (when available)
[E>>] External Rotate Right	Shortcuts (except last) Last Shortcut (SETUP)	Modify parameter up Enter Menu mode
[<<E] External Rotate Left	Shortcuts	Modify parameter down (when available)

User control knob actions for Shortcuts

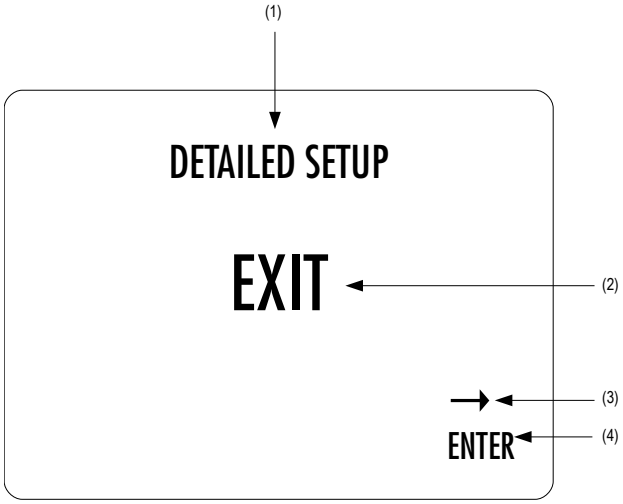
The DISC LAYER Shortcut gives a good illustration of how to navigate a Shortcut screen. Navigating other Shortcuts is similar.



DISC LAYER Shortcut display elements

(1) Shortcut title (Parameter, for other Shortcuts, title changes accordingly)
(2) Arrow indicating External Rotate Right [E>>] if applies. The item below indicates the next parameter value (up direction)
(3) Next Parameter Value if External Rotate Right [E>>] is applied (parameter up)
(4) Current Parameter Value (for other Shortcuts the current Value of the Parameter is displayed on this line)
(5) Next parameter value if External Rotate Left [<<E] is applied (parameter down)
(6) Arrow indicating External Rotate Left [<<E] if applies. The item below indicates the next parameter value (down direction)

The last Shortcut (SETUP) is always the same and cannot be removed or altered. It gives access the Menu mode to access the detailed setup of the unit.



SETUP Shortcut display elements

(1) Shortcut title. It indicates that Detailed Setup (Menu mode) can be entered at this stage
(2) Current value of the parameter. Default action is to exit (go back to Normal mode)
(3) Arrow indicating External Rotate Right [E>>] (or Central Rotate Right [C>>])
(4) Next parameter value. If External Rotate Right [E>>] is applied, the unit enters into Menu mode

4.2.3 Menu mode

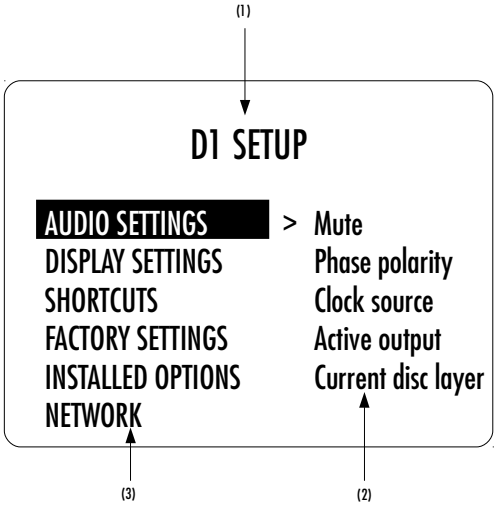
The Menu mode allows for Configuration and Setup of the D1 SACD/CD unit through a set of menus. Menu mode is entered from the last Shortcut item (see above). From Normal mode, enter the Shortcut mode by applying a Normal Push [NP]. By successive Normal Pushes [NP], step to the last Shortcut item (DETAILED SETUP) and apply an External Rotate Right [E>>] 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

User control knob actions in Menu mode

Following illustration shows the elements of a the D1 SETUP Menu page, the entry point to the D1 menu structure.



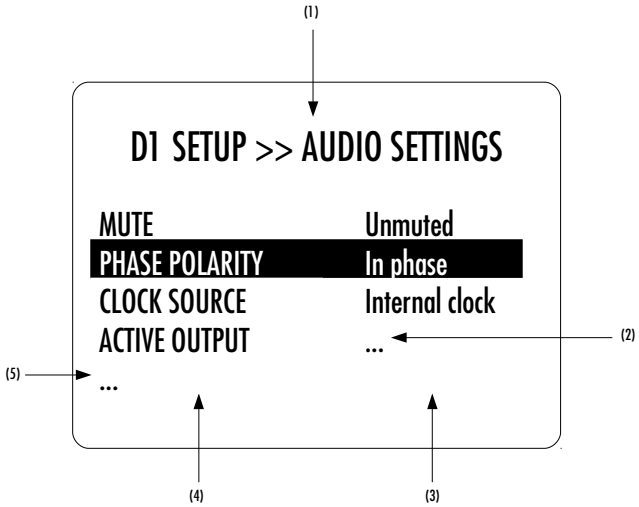
D1 SETUP menu display elements

(1) Menu title. When entering a menu item, the title also shows the parent menu. If the AUDIO SETTINGS menu is entered, the title line would display D1 SETUP >> AUDIO SETTINGS.

(2) Shows the accessible parameters when entering the currently highlighted menu item. In this example, AUDIO SETTINGS is highlighted and the second column shows the parameters accessible in the AUDIO SETTINGS menu.

(3) List of items in the current menu. Navigate from one item to the other using Central Rotate Left/Right [<<C]/[C>>]. To enter the highlighted menu item, use External Rotate Right [E>>] (or a Normal Push [NP]). To go to the previous menu level use External Rotate Left [<<E]. In this example, External Rotate Left [<<E] exists the Menu mode and sets the unit back to Normal mode.

Once a menu item is selected by External Rotate Right [E>>], parameters for the corresponding menu item can be navigated and accessed. As an example, the following drawing shows the display elements of the D1 SETUP >> AUDIO SETTINGS sub-menu.



D1 SETUP >> AUDIO SETTINGS menu display elements

(1) Menu title. D1 SETUP >> AUDIO SETTINGS shows that the parent menu is D1 SETUP. By applying External Rotate Left [<<E], the unit returns to the parent menu.

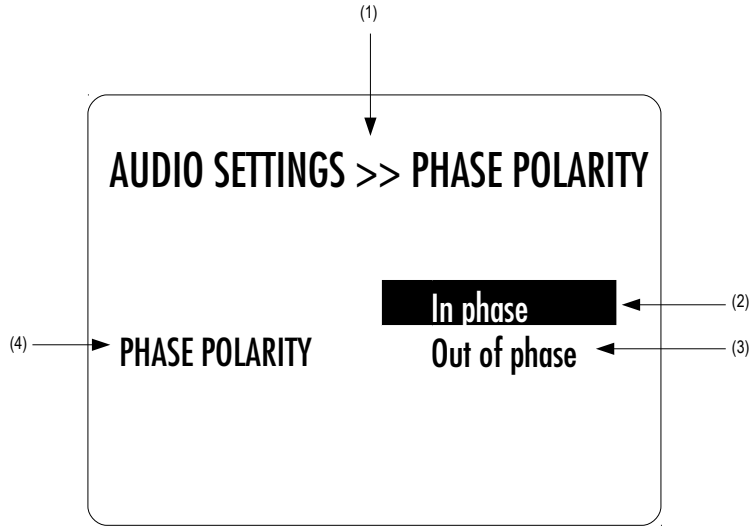
(2) A Parameter Value of '...' indicates that the menu items gives access to one or more further sub-menu(s). Further sub-menus have the same structure as this example.

(3) This is the Parameter Value column. For each item in the Parameter column, the Parameter Value item on the same line indicates the current value of the Parameter.

(4) This is the Parameter column. The currently active Parameter is highlighted. Use Central Rotate Left/Right [<<C]/[C>>] to navigate from Parameter to Parameter.

(5) If the first or last item in the Parameter column is indicated by '...' it means that there are additional Parameters not displayed currently on-screen. Use Central Rotate Left/Right [<<C]/[C>>] to navigate towards the '...' to make the corresponding Parameters appear on screen.

Once a terminal Parameter (e.g. a Parameter not giving access to a further sub-menu) is selected by External Rotate Right [E>>], the D1 displays the corresponding Parameter adjustment screen. Following example shows the AUDIO SETTINGS >> PHASE POLARITY Parameter adjustment screen. Other Parameters are similar but may show more (or less) choices for Parameter value. Once a Parameter is set to the desired value, a Normal Push [NP] saves the new Parameter Value and gets back to the parent level (save and exit). On the other hand, an External Rotate Left [<<E] gets back to the parent menu (in the case of this example: AUDIO SETTINGS), but possible modifications of the Parameter Value are discarded (exit without saving).



AUDIO SETTINGS >> PHASE POLARITY menu display elements

(1) Menu title. AUDIO SETTINGS >> PHASE POLARITY shows that the parent menu is AUDIO SETTINGS. To access the parent menu, use External Rotate Left [<<E]

(2) The current Parameter Value is highlighted. Use Central Rotate Left/Right [<<C]/[C>>] to navigate through Parameter Values

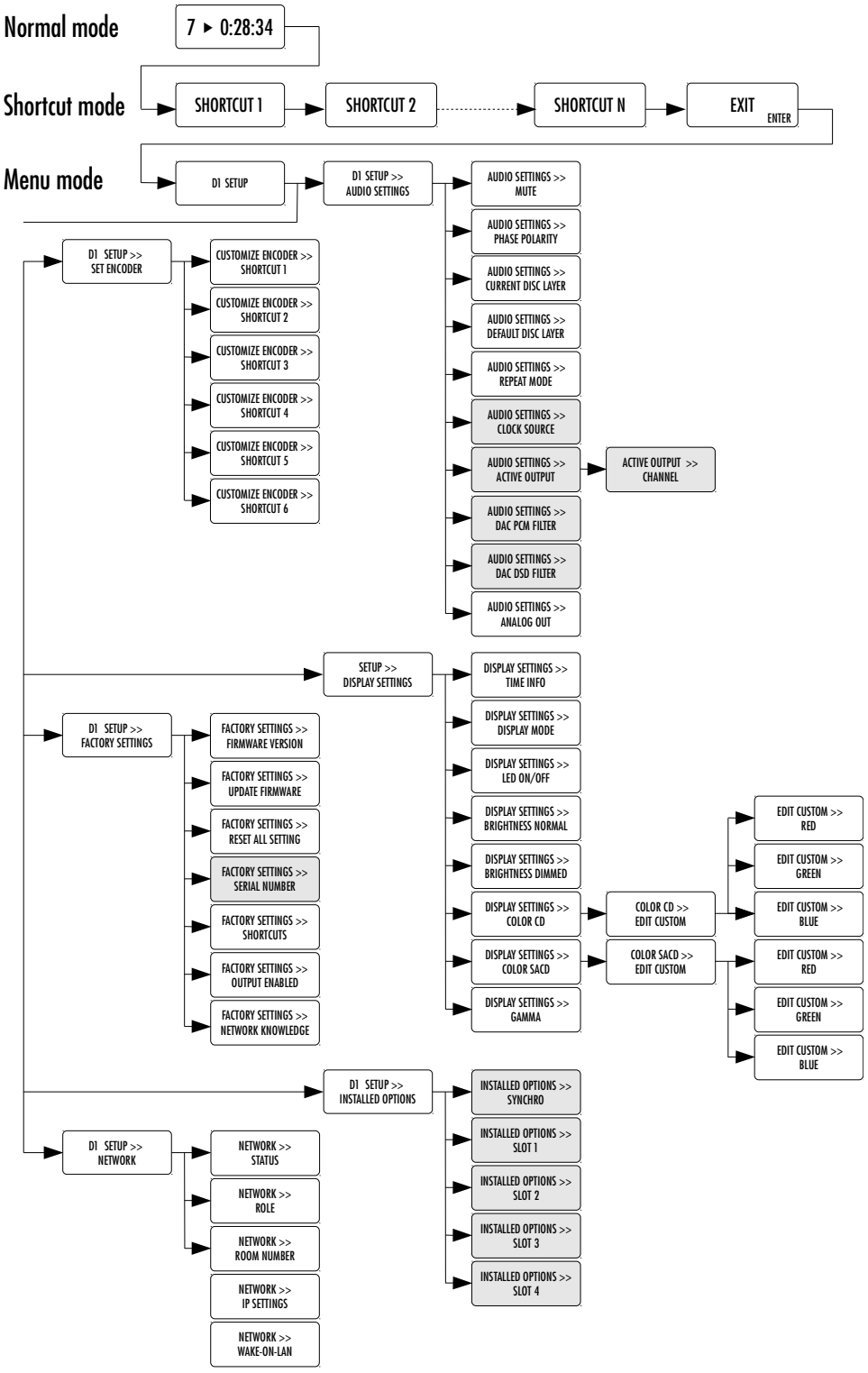
(3) Other possible Parameter Value(s). Number of other Parameter Value(s) depends on Parameter

(4) Parameter for which the Parameter Value can be modified in the current menu.

The following section gives detailed information about the menu structure and the various Parameters. Note that certain Parameter may or may not appear in the menu depending on installed options. For instance if no ANALOG_OUT board is installed, menu items related to the DAC (Digital to Analog Converter) digital filters do not appear in the menu.

4.3 Configuration

Configuration of your D1 SACD/CD unit is accomplished by setting parameters in the Menu mode (see previous section for how to access Menu mode and how to navigate menu items). Following diagram shows the complete menu structure (terminal items not show). Grayed menu items are items which depend on installed optional slot-in boards.



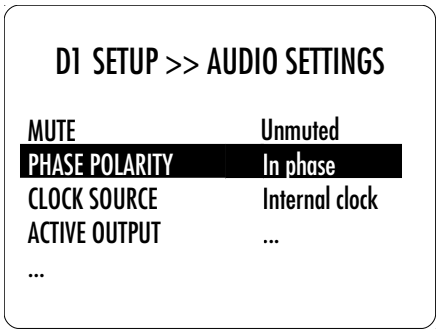
D1 CD/SACSD unit menu structure

There are six main menus used for configuration of the D1:

- AUDIO SETTINGS: Allows to adjust audio related parameters
- DISPLAY SETTINGS: Allows to adjust display related parameters
- SHORTCUTS: Allows to assign and modify Shortcuts for user interface customization
- FACTORY SETTINGS: Indicates the software version and allows to update it. Also allows to return to factory settings
- INSTALLED OPTIONS: Provides information about the installed optional slot-in boards
- NETWORK: Provides information about the network setup and enables its configuration.

4.3.1 D1 configuration menu items

4.3.1.1 AUDIO SETTINGS



The D1 SETUP >> AUDIO SETTINGS menu allows configuration of the audio related Parameters of the unit. Accessible Parameters are:

- MUTE: Mutes or unmutes the audio output
- PHASE POLARITY: Allows to revert the phase of the audio output
- CURRENT DISC LAYER: Selects the disc layer to be read for current SACD
- DEFAULT DISC LAYER: Selects default layer used upon disc loading
- REPEAT MODE: Selects the repeat mode
- CLOCK SOURCE: Allows to select the clock source
- ACTIVE OUTPUT: Selects active outputs (DIGITAL_OUT_HD boards only)
- DAC PCM FILTER: Digital filter selection for PCM audio (ANALOG_OUT only)
- DAC DSD FILTER: Digital filter selection for DSD audio (ANALOG_OUT only)
- ANALOG OUTPUT: Selects if the D1 outputs analog signal at full level or not

The following table details the Parameters of the AUDIO SETTINGS menu:

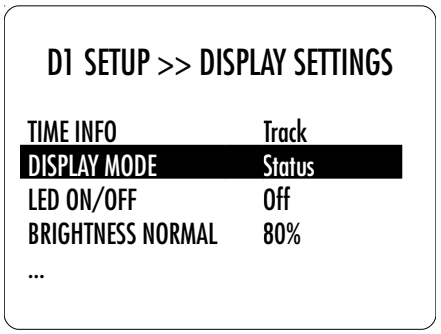
PARAMETER	PARAMETER VALUES	REQUIRED OPTIONS	REMARKS
MUTE	Muted Unmuted	None	None
PHASE POLARITY	In phase Out of phase	None	None
CURRENT DISC LAYER	Multichannel SACD Stereo SACD Stereo CD		When an SACD is stopped, the user can force the D1 to read another layer by changing the CURRENT DISC LAYER parameter.

			If Multichannel layer is selected in pure Stereo D1 unit, the output will be a L/R downmix of the multichannel information. For pure stereo D1 applications, it is recommended to use Stereo SACD as SACD layer (default behavior).
DEFAULT DISC LAYER	Multichannel SACD Stereo SACD	Multi-channel capability (Output boards (DIGITAL_OUT_HD or ANALOG_OUT) for L/R, Ls/Rs and C/Sub)	Chose if the stereo or the multichannel layer of an SACD should be selected by default upon loading (whenever these layer are available on a given SACD).
REPEAT MODE	Normal Repeat track Repeat all	None	This setting is only valid while a disc is playing. Returns to default (Normal) upon disc stop.
CLOCK SOURCE	Internal Clock Synchro BNC (75 Ohm) Synchro BNC (Hi-Z)	SYNC_IO board to choose another clock source than Internal	Internal clock source is available in all cases Synchro BNC (75 Ohm) and Synchro (Hi-Z) are only available when the SYNC_IO board is installed. SYNC_IO offers choice of 75 Ohm or high-impedance on its BNC clock input.
ACTIVE OUTPUT	CH-LINK HD L/R AES-EBU L/R RCA S/PDIF L/R TOSLINK S/PDIF L/R CH-LINK HD Ls/Rs AES-EBU Ls/Rs RCA S/PDIF Ls/Rs TOSLINK S/PDIF Ls/Rs CH-LINK HD C/Sub AES-EBU C/Sub RCA S/PDIF C/Sub TOSLINK S/PDIF C/Sub	At least 1x DIGITAL_OUT_HD	Used to individually enable/disable digital outputs. Note: AES-EBU outputs support consumer encoding. Options for Ls/Rs channels are only displayed if a DIGITAL_OUT_HD board is installed for Ls/Rs channels. Options for C/Sub channels are only displayed if a DIGITAL_OUT_HD board is installed for C/Sub channels.
DAC PCM FILTER	Min P. low ringing Min P. apodising Min P. sharp Linear P. apodising Linear P. sharp	At least 1x ANALOG_OUT	Choice of different filter types for PCM audio (CD or CD layer of an SACD). Min P. indicates minimal phase and Linear P. indicates linear phase. Low ringing corresponds to a soft-knee filter and Sharp corresponds to a steep cut-off. Apodising filters reach full attenuation at half the sampling frequency to minimize transition band aliasing.

DAC DSD FILTER	Min P. Linear P. low ringing Linear P. trade-off Linear P. sharp	At least 1x ANALOG_OUT	Choice of different filter types for DSD audio (DSD layer of an SACD). Min P. indicates minimal phase and Linear P. indicates linear phase. Low ringing corresponds to a soft-knee filter and Sharp corresponds to a steep cut-off. Trade-off, as the name suggests, is an intermediary between Low ringing and Sharp filters.
ANALOG OUTPUT	To preamp To power amp	At least 1x ANALOG_OUT	If D1's analog output is connected directly to a power amp, it can be attenuated by the volume set in the master C1 or L1 (command is sent from C1/L1 to D1 through TCP/IP command on the network)

Details of AUDIO SETTINGS menu Parameters

4.3.1.2 DISPLAY SETTINGS



The D1 SETUP >> DISPLAY SETTINGS menu allows configuration of the display related Parameters of the unit. Accessible Parameters are:

- TIME INFO: Selects time display mode
- DISPLAY MODE: Allows to turn the display off
- LED ON/OFF: Selects if the LED remains on when D1 is on
- BRIGHTNESS NORMAL: Sets the normal display brightness
- BRIGHTNESS DIMMED: Sets the dimmed display brightness
- COLOR CD: Selects the display color for CD playback
- COLOR SACD: Selects the display color for SACD playback
- GAMMA: Fine tunes the AMOLED's display RGB gamma curve

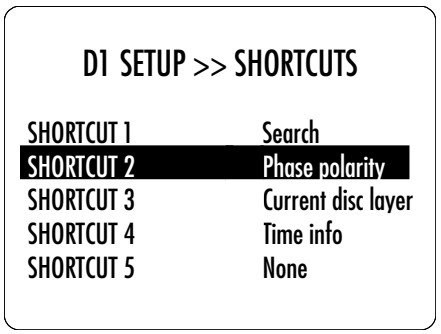
The following table details the Parameters of the DISPLAY SETTINGS menu:

PARAMETER	PARAMETER VALUES	REQUIRED OPTIONS	REMARKS
TIME INFO	Track Track remain Disc Disc remain	None	Remaining times are indicated with a minus sign in front of the time value display.
DISPLAY MODE	Status Off	None	Selects if the screen will display status information with reduced brightness (dimmed) or be turned completely off when the unit is idle for several

			seconds
LED ON/OFF	On Off	None	Allows to keep the LED on when the unit is on.
BRIGHTNESS NORMAL	10% 20% 30% ... 90% 100%	None	Sets the display brightness when the unit is operated.
BRIGHTNESS DIMMED	10% 20% 30%	None	Sets the display brightness when the unit is left idle for several seconds.
COLOR CD	*Predefined colors* Custom color Edit custom color	None	Selects the display color for CD playback *Predefined colors* represents a set of factory defined colors Custom color is a user definable color. To Edit the custom color select the Edit custom color Value. Sub-menus allow to individually configure Red, Green and Blue components (RGB) of the custom color.
COLOR SACD	*Predefined colors* Custom color Edit custom color	None	Selects the display color for SACD playback *Predefined colors* represents a set of factory defined colors Custom color is a user definable color. To Edit the custom color select the Edit custom color Value. Sub-menus allow to individually configure Red, Green and Blue components (RGB) of the custom color.
GAMMA	-RBG and global brightness gamma curve correction, +/-30%	None	Fine adjustment the gamma scale of the RGB components of the display. Allows to have perfectly dark background and to match other CH Precision unit's display color, even at low brightness.

Details of DISPLAY SETTINGS menu Parameters

4.3.1.3 SHORTCUTS



The D1 SETUP >> SHORTCUTS menu allows configuration of the Shortcuts.
Accessible Parameters are:

- SHORTCUT1: Defines action for Shortcut #1
- SHORTCUT2: Defines action for Shortcut #2
- SHORTCUT3: Defines action for Shortcut #3
- SHORTCUT4: Defines action for Shortcut #4
- SHORTCUT5: Defines action for Shortcut #5
- SHORTCUT6: Defines action for Shortcut #6

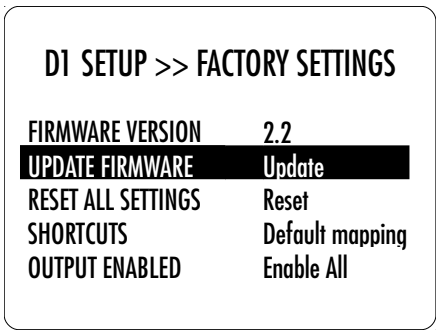
Note that unused Shortcuts are not displayed. The first available (e.g. non defined) Shortcut has a Parameter Value of 'None' (the example on the left has 4 defined Shortcuts, hence Shortcut #5 has a Parameter Value of 'None')

The following table details the Parameters of the SHORTCUTS menu:

PARAMETER	PARAMETER VALUES	REQUIRED OPTIONS	REMARKS
SHORTCUT 1	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 1 is not defined, Parameter value for SHORTCUT 1 is set to 'None'. SHORTCUT 2 to 6 are not displayed in this case.
SHORTCUT 2	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 2 is not defined, Parameter value for SHORTCUT 2 is set to 'None'. SHORTCUT 3 to 6 are not displayed in this case.
SHORTCUT 3	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 3 is not defined, Parameter value for SHORTCUT 3 is set to 'None'. SHORTCUT 4 to 6 are not displayed in this case.
SHORTCUT 4	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 4 is not defined, Parameter value for SHORTCUT 4 is set to 'None'. SHORTCUT 5 and 6 are not displayed in this case.
SHORTCUT 5	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 5 is not defined, Parameter value for SHORTCUT 5 is set to 'None'. SHORTCUT 6 is not displayed in this case.
SHORTCUT 6	Most Parameter of the AUDIO SETTINGS and DISPLAY SETTINGS menus or None	None	If SHORTCUT 6 is not defined, Parameter value for SHORTCUT 6 is set to 'None'.

Details of SHORTCUTS menu Parameters

4.3.1.4 FACTORY SETTINGS



The D1 SETUP >> FACTORY SETTINGS menu allows to get information about current D1 firmware version, to update the D1 firmware and to reset the unit to default configuration. Accessible Parameters are:

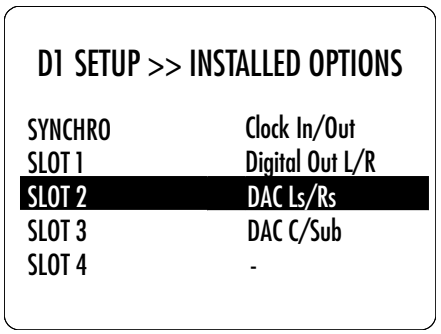
- FIRMWARE VERSION: Current firmware version (read only)
- UPDATE FIRMWARE: Allows to update the unit's firmware
- RESET ALL SETTINGS: Returns the unit to factory settings
- SERIAL NUMBER: Displays the serial number of the machine
- SHORTCUTS: Redefines all Shortcuts to factory settings
- OUTPUT ENABLED: Allows to enable all digital outputs at once
- NETWORK KNOWLEDGE: Clears list of detected devices on the network

The following table details the Parameters of the FACTORY SETTINGS menu:

PARAMETER	RELATED ACTION/VALUE	REQUIRED OPTIONS	REMARKS
FIRMWARE VERSION	*Firmware version*	None	*Firmware version* indicates the version of the current firmware. Format is *x.y.* This parameter is read only.
UPDATE FIRMWARE	Update	None	Selecting 'Update' launches the D1 firmware update process.
RESET ALL SETTINGS	Reset	None	Selecting 'Reset' returns the D1 to its factory settings. Factory settings are detailed in the Specifications section.
SERIAL NUMBER	*Serial number*	None	*Serial number* indicates the serial number of the D1. Format is yymm01nn. This parameter is read only.
SHORTCUTS	Default mapping	None	Selecting 'Default Mapping' returns the D1's Shortcuts to their factory settings. Factory settings are detailed in the Specifications section.
OUTPUT ENABLE	Enable all	None	Selecting 'Enable all' will enable all D1 digital outputs.
NETWORK KNOWLEDGE	Reset	None	Clears the D1's memory of other CH Precision devices it has discovered through the TCP/UDP proprietary protocol.

Details of FACTORY SETTINGS menu Parameters

4.3.1.5 INSTALLED OPTIONS



The D1 SETUP >> INSTALLED OPTIONS menu provides read-only information about installed slot-in boards. Details are:

- SYNCHRO: Synchronization option installed
- SLOT 1: Output board installed in Slot 1
- SLOT 2: Output board installed in Slot 2
- SLOT 3: Output board installed in Slot 3
- SLOT 4: Output board installed in Slot 4

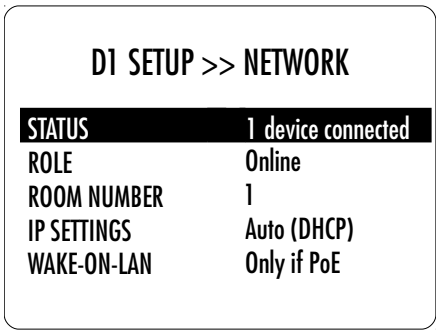
Each slot indicates the type of board and the channels it handles. A '-' indicates that the slot is currently unpopulated.

The following table details the Parameters of the INSTALLED OPTIONS menu:

PARAMETER	PARAMETER VALUES	REQUIRED OPTIONS	REMARKS
SLOT 1 SLOT 2 SLOT 3 SLOT 4	Digital Out HD L/R Digital Out HD Ls/Rs Digital Out HD C/Sub Internal DAC L/R Internal DAC Ls/Rs Internal DAC C/Sub Internal DAC Left Internal DAC Right -	At least 1x DIGITAL_OUT_HD or 1x ANALOG_OUT	Parameters report which type of board (DIGITAL_OUT_HD, ANALOG_OUT or none) are installed in the different slots. They also indicate for which channels pair (L/R, Ls/Rs or C/Sub) the boards are configured. '-' indicates no board is installed in the given slot. Parameters are Read Only
SYNCHRO	Clock In/Out -	SYNC_IO	Reports the presence of the SYNC_IO board. If SYNC_IO is not installed, the Parameter reads '-'. Parameter is Read Only

Details of INSTALLED OPTIONS menu Parameters

4.3.1.6 NETWORK



The D1 SETUP >> NETWORK menu allows knowledge and customization of the network related Parameters of the unit. Accessible Parameters are:

- STATUS: Listing of all CH products detected (product type, IP and MAC addresses
- ROLE: Defines if the D1 should interact with the network (online) or not (offline)
- ROOM NUMBER: Group units connected to a single network by room
- IP SETTINGS: Low-level network configuration
- WAKE-ON-LAN: Select if a unit can be powered on from the network

The following table details the Parameters of the NETWORK menu:

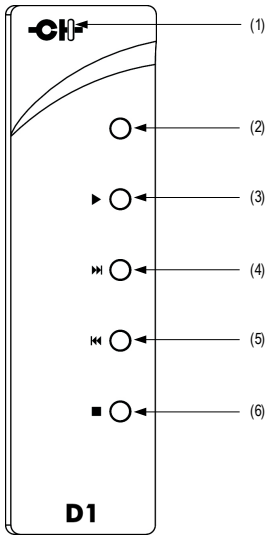
PARAMETER	PARAMETER VALUES	REQUIRED OPTIONS	REMARKS
STATUS	IP address Product type MAC address	Connection to a router via its RJ-45 Ethernet port	List of CH Precision devices and Android remote controls detected by the D1 (product type, IP and MAC addresses) Read Only parameters
ROLE	Offline Online	Connection to a router via its RJ-45 Ethernet port	When physically connected to a network, the D1 can ignore this network (offline) or connect to it (online)
ROOM NUMBER	1 … 7	Connection to a router via its RJ-45 Ethernet port	Define the room in which room the D1 is for multiroom 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 (DHCP) Direct-Link Manual	Connection to a router via its RJ-45 Ethernet port	Auto should be selected if the D1 is connected to a router with DHCP server feature.
WAKE-ON-LAN	No Only if PoE Yes	Connection to a router via its RJ-45 Ethernet port	If No is selected, the D1 can't be woken up by the app. Standby mode will consume less than 0.5W. When Only if PoE is selected, the D1 can only be waken by the app if connected to a Power-over-Ethernet switch. Standby mode will draw less than 0.5W from the mains plug. If Yes is selected, the D1 can always be woken up by the app. Standby mode will draw a couple of watts from the mains plug.

Details of NETWORK menu Parameters

4.4 Remote control

4.4.1 Remote control operation

The D1 SACD/CD unit is delivered with an IR remote to control the unit's basic operations. The provided remote control is not intended to be used to configure the unit.



D1 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 while 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 [NP] requires the button to be pressed for at least 2s before being released.

Remote control functions are according to 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

Remote control functions

4.4.2 Changing the remote control batteries

If the LED does not turn on when pressing a button of 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 (M2.5 cross-shaped type, make sure to use appropriate screwdriver). Exchange the batteries for new ones (make sure to respect batteries polarity) and put the back cover back in place and tighten the screws. 2 AAA batteries are required.

4.5 Advanced clocking

When connected to the CH C1 DAC, different clocking scheme can be used, depending on the D1 and C1 options. Some are simply not working at all (no sound will come out of your DAC, e.g. because at least one unit doesn't lock its internal clock to the configured clock source), some others will work for some time before muting (e.g. in case more than one unit is configured to lock to its own internal clock), some others will work fine but won't be optimal depending on your hardware (e.g. using D1 as clock source and C1 as clock slave when equipped with SYNC_IO boards), while others will bring you the joy associated to pure musical emotion.

Recommended use cases for various configurations are 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.

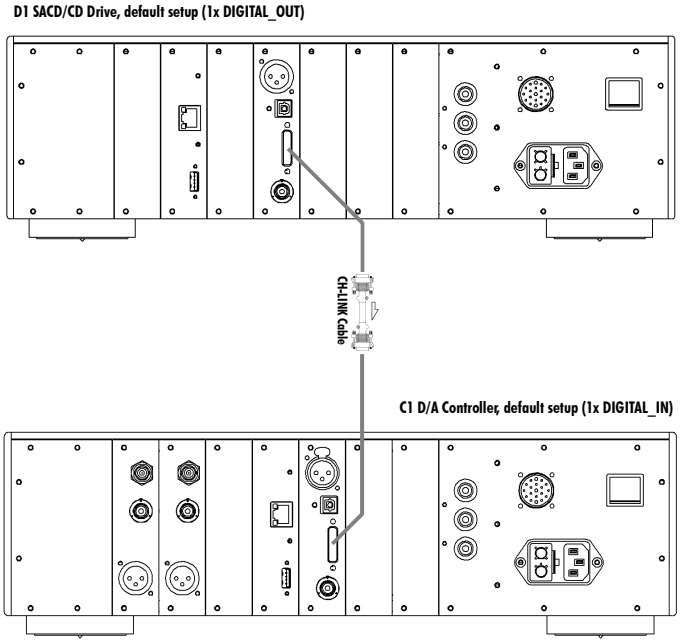
4.5.1 General clocking considerations

In any configuration, there must always be no more and no less than one clock master. In CH product range, the clock master is the unit clocked on its own internal clock (parameter clock source is INTERNAL). It can be a CH audio product (D1, C1), or an external clock generator (T1).

If more than one clock master is used, the system is no more synchronized (at some point a unit will display "CLOCKING ERR."). If there isn't any clock master, each unit gets synchronization from a unit that is clock slave itself. This kind of system is not stable clockwise. If the configured clock source (e.g. SYNCHRO BNC 75 Ohm) is not connected or has no synchronization signal, the C1 can not lock (open padlock symbol displayed) and mutes its output.

4.5.2 Without SYNC_IO board

When a D1 with no SYNC_IO board is used together with a CH C1 DAC (or other DAC), both audio data and clocking goes 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 carries on other lines in the same cable) or embedded in S/PDIF's bi-phase modulated signal. Schematic below shows optimal way to connect such system:



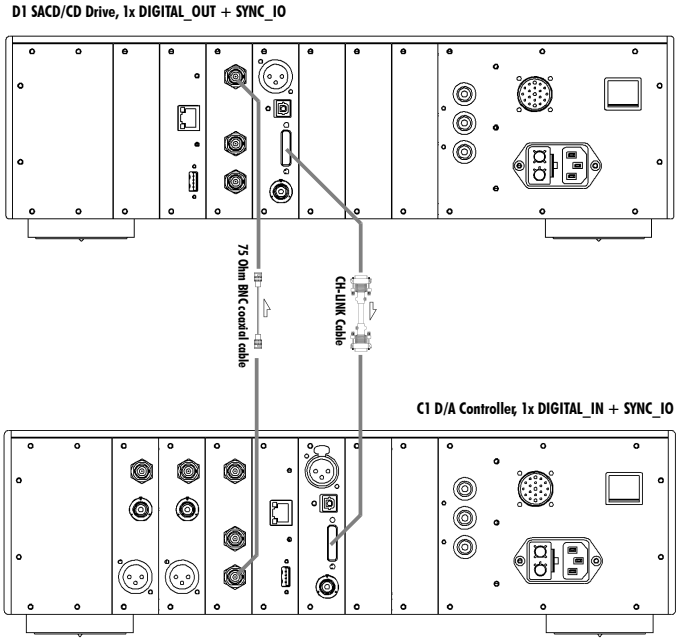
Simple D1 - C1 connection

More generally, when a D1 has no SYNC_IO board, it can only clock itself to its internal clock, and the DAC has to recover the clock from the audio data. The same applies for multichannel setup when CH products have no SYNC_IO board. In such cases:

- D1 clock source: INTERNAL
- DAC (e.g. C1) clock source: AUDIO IN

4.5.3 D1 SACD/CD drive (with SYNC_IO board) + C1 D/A controller (with SYNC_IO board)

When both the D1 and the C1 are equipped with a SYNC_IO board and no external high-stability clock source is available, optimum performances are obtained when the C1 DAC is the clock master, and the D1 transport is the clock slave. Audio stream goes from the D1 to the C1, but clock goes the other way. Schematic below shows how to connect such system:



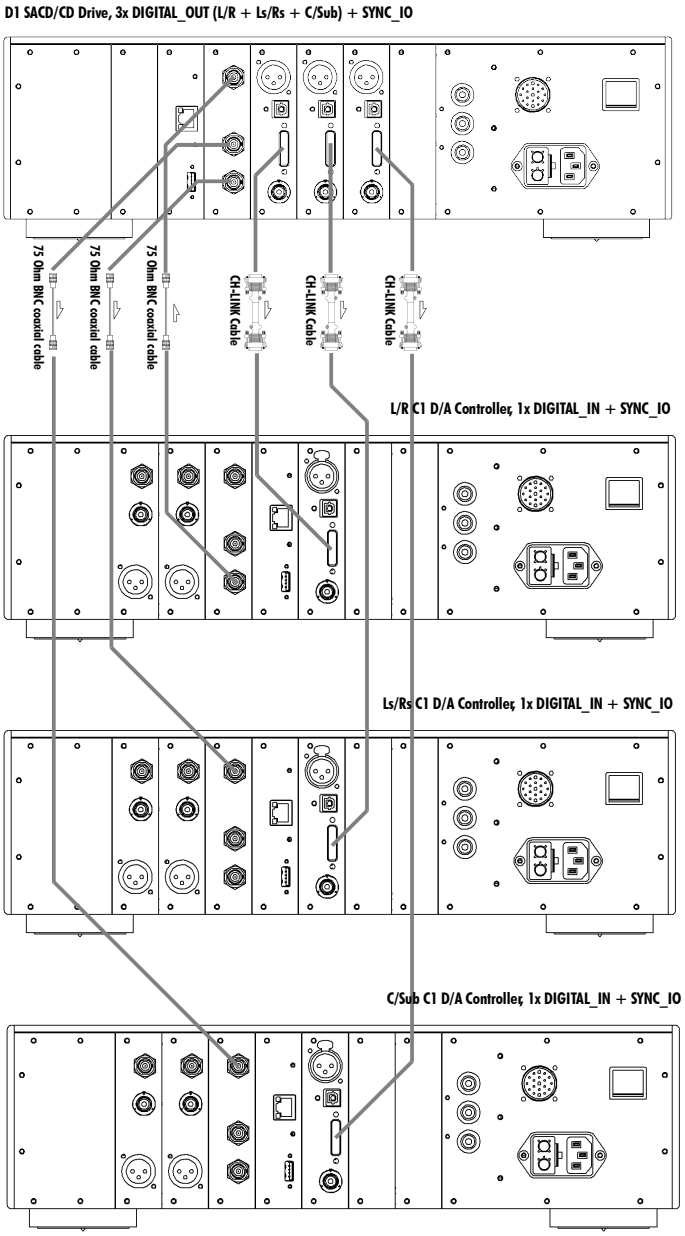
D1 - C1 connection when SYNC_IO equipped

The same applied if the D1 is hybrid configured (DIGITAL_OUT_HD L/R + ANALOG_OUT Ls/RS and C/Sub), i.e. clock goes from C1 to D1 to have optimal conversion condition for main channels. In such case:

- D1 clock source: SYNCHRO BNC 75 Ohm
- C1 clock source (for this input): INTERNAL

4.5.4 Multichannel D1 drive + 3x C1 D/A controllers (all with SYNC_IO board)

In this 4-unit multichannel setup (D1 with all 6 channels digital out + 3 C1 DAC pairs), when all units are equipped with SYNC_IO boards, we still recommend that the C1 processing the main channels is the clock master. The D1 is slaved to this C1's clock, and generates a synchronization signal for the two other C1s (Ls/Rs and C/Sub ones). Schematic below shows the optimal way to connect such system:



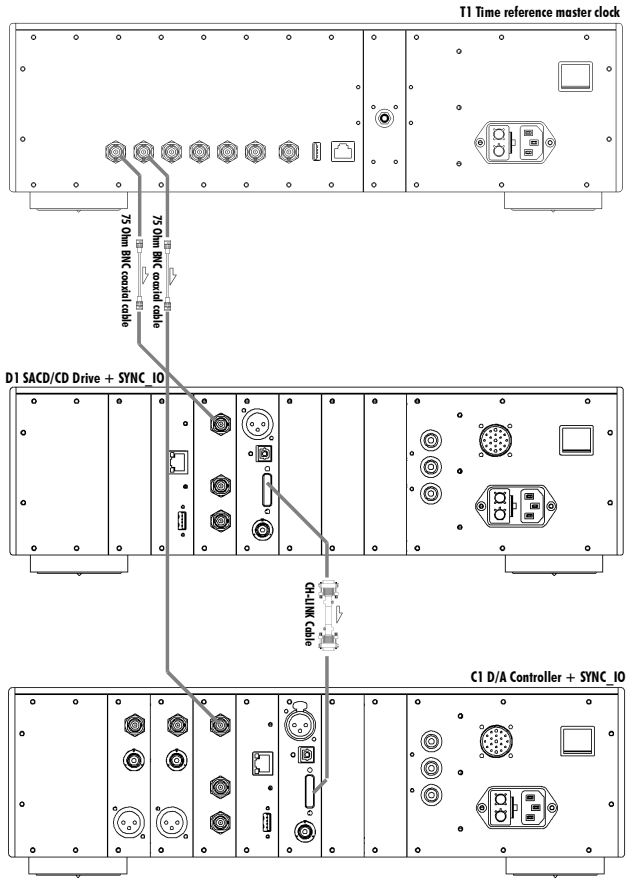
Multichannel D1 - C1 connection when SYNC_IO equipped

In such case:

- D1 clock source: SYNCHRO BNC 75 Ohm
- L/R channels C1 clock source: INTERNAL
- Ls/Rs channels C1 and C/Sub channels C1 clock source: SYNCHRO BNC 75 Ohm

4.5.5 D1 (with SYNC_IO board) + C1 (with SYNC_IO board) + T1 time reference

When both the D1 and the C1 are equipped with a SYNC_IO board, and an ultra-high stability clock generator such as the CH Precision T1 10MHz time reference is available, optimum performances are obtained when both the D1 and C1 lock themselves onto the external clock generator. Direct clock connections from the T1 to the devices is preferred over daisy-chaining. Audio stream goes from the D1 to the C1, and clock is distributed to both D1 and C1 from the T1. If more DACs are available for extra surround channels, they should also be connected directly to the clock generator. Schematic below shows how to connect such system:



D1 – C1 – T1 connection when SYNC_IO equipped

The same applied if the D1 has multi-channel capability and more DACs are connected to the D1 for surround, center and sub channels. In such cases:

- D1 clock source: SYNCHRO BNC 75 Ohm
- C1 clock source (for this input): SYNCHRO BNC 75 Ohm

4.6 Returning to factory defaults

The unit 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.

5 Firmware update

5.1 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 the FAT32 formatted USB 2.0 stick provided with you D1. Please note that some USB sticks might not be detected by the D1 USB port. CH Precision recommends the use of Sandisk USB 2.0 sticks such as the one delivered with the unit.

The following procedure describes how to load the USB stick with the correct files:

1. Download the latest D1 firmware file from www.ch-precision.com
2. Decompress the `.zip` file and copy the decompressed files to the root of your USB stick. After doing so, your USB stick should contain the following files:

- `D1_xxx.ds1`
- `D1_xxx.fp1`
- `D1_xxx.mc1`
- `D1_xxx.ol1`

where '`xxx`' indicates the firmware revision.

Make sure all these 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 behavior after update.

5.2 Updating the unit's firmware

1. Perform the operations described in section 5.1
2. Connect the USB stick to the USB port located at the back of your D1 unit
3. Navigate to the FACTORY SETTINGS menu (see section 4) and select the UPDATE FIRMWARE item
4. Start the Firmware Update process by pushing the encoder button. Please note that the unit will perform a Reset (the display briefly turns off and on) during the procedure
5. Once the firmware update 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 is effective, navigate to the FACTORY

SETTINGS menu and select the FIRMWARE VERSION item. The displayed firmware revision should match the firmware revision on the files 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 or turn any of the unit's front panel button/encoder, 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.

5.3 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 section 5.1

2. Power the unit off (back panel mains power switch to OFF)

3. Push and keep the encoder button pushed and power up the unit (back panel mains power switch to ON). Keep the encoder button pushed for a couple more seconds after you turned 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 is effective, navigate to the FACTORY SETTINGS menu and select the FIRMWARE VERSION item. The displayed firmware revision should match the firmware revision on 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!**

6 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 unit. Get closer and try again. D1'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 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 scrapped 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 scrapped 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
Disc plays, but no sound ("⊗" is displayed)	Your D1 is muted (display area 3 ⊗ must be off). Unmute using the red RC button
Disc plays, but no sound ("⌒" is displayed)	D1 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 (SYNC_IO optional board), make sure 75 Ohm BNC cable is properly connected and not damaged.
Lost in the settings?	Restore factory settings and start your setup again
Software update fails	Try Emergency Software Update procedure If it fails, download the latest D1 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	Please try another brand of USB flash drive (e.g. Sandisk).

Troubleshooting

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.

7 Specifications

General	
Supported discs	CD, CD-R, CD-RW: stereo PCM 16 bits, 44.1kHz (redbook) SACD single layer and hybrid, stereo and multi-channel(1), DSD 1bit, 2.8224MHz (scarlettbook)
User control	Dual concentric rotary knob with push function (control knob) and CH Control Android app
Display	480 x 272 24bits RGB AMOLED
Power supply	Selectable 100V, 115V or 230V AC, 47Hz to 63Hz
Power consumption (Standby)	< 1W
Power consumption (Normal operation)	Max 100W
Operating conditions	Temperature: +5C to +35C, humidity: 5% to 85% (no condensation)
Dimensions (L x D x H)	440mm x 440mm x 120mm (main body) 440mm x 492mm x 160mm (overall including connectors and feet)
Weight	32kg
Firmware update / Control	USB port for firmware update / Ethernet based system control
Digital Audio outputs (DIGITAL_OUT_HD board, 2 channels per board)	
CH LINK HD	Proprietary high-definition 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/44.1kHz (CD), 1bit/2.8224MHz (SACD)
AES-EBU (consumer format)	XLR connector, 2.5Vpp diff., 110 Ohm, 16bits/44.1kHz (CD and SACD)
Coaxial (S/PDIF)	RCA connector, 0.5Vpp, 75 Ohm, 16bits/44.1kHz (CD and SACD)
Optical TOSLINK (S/PDIF)	Standard TOSLINK optical connector, 16bits/44.1kHz (CD and SACD)
Stereo Analog Audio outputs (Stereo ANALOG_OUT board, two channels per board)	
Balanced outputs	XLR connectors
Single-ended outputs	RCA connectors
Output level	2Vrms (balanced) 2Vrms (single-ended)
Frequency response (-3dB point)	DC-50kHz (SACD, balanced and single-ended, digital filter dependent) DC-20kHz (CD, balanced and single-ended, digital filter dependent)
Dynamic Range (DNR)	120dB (SACD, balanced and single-ended) 96dB (CD, balanced and single-ended)
Signal to Noise Ratio (SNR)	121 dB (SACD, balanced and single-ended) 121 dB (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)
Monaural Analog Audio outputs (Monaural ANALOG_OUT board, one channel per board)	
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-50kHz (SACD, balanced and single-ended, digital filter dependent) DC-20kHz (CD, balanced and single-ended, digital filter dependent)
Dynamic Range (DNR)	120dB (SACD, balanced and single-ended) 96dB (CD, balanced and single-ended)
Signal to Noise Ratio (SNR)	121 dB (SACD, balanced and single-ended) 121 dB (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 (SYNC_IO 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 kHz), Masterclock (22.5792, 24.476 MHz), DSD bitclock (2.8224 MHz), Atomic clock (100 kHz, 10 MHz), 40% to 60% duty cycle square wave
Clock output	2x BNC connectors, 2Vpp, 75 Ohm output impedance Buffered Clock input or Audio Wordclock 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

(1) True multi-channel SACD operation requires additional optional output boards (digital or analog) for Ls/Rs and C/Sub channels

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 not 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: SLD6163RL-G

Manufacturer: SONY CORPORATION

Laser output: Less than 1mW on the objective lens

Wavelength: 785 ± 15nm (CD), 655 ± 10nm (SACD)

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.