

DaySequerra



5.1 Surround Encoder

Welcome

Thanks for purchasing the DaySequerra DownMix. Our DTS Neural Surround™ DownMix reduces 5.1 surround sound to a stereo mix that accurately represents the 5.1 original. We design and build all of our DaySequerra products to be completely reliable and easy to use, so you can concentrate on producing great sounding broadcasts, not struggling with complicated equipment or difficult to use product manuals.

While the DownMix has been designed to be straightforward to use, we do suggest that you spend a few minutes familiarizing yourself with the features and operational functions that are contained in this manual.

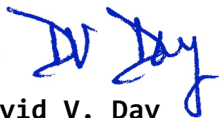
DaySequerra has been building broadcast quality products since 1989. The technology developed for the DownMix, and all of our products, has evolved through a process of user feedback, extensive listening, field-testing and careful refinement.

In the event that you encounter any technical or operational difficulties with this or any DaySequerra product, please feel free to contact us at 856-719-9900. Our office hours are from 9 to 5 ET, Monday through Friday. Or you can email your questions to: info@daysequerra.com.

Also, please remember to visit our website www.daysequerra.com for warranty registration and the latest DaySequerra product information.

We have worked hard to ensure that your DaySequerra DownMix will reliably serve you for years to come. With a modular design and upgradeable firmware, your new unit is easy to install and use right out of the box.

We sincerely hope our products help you achieve a new level of excellence in your work!



David V. Day
and the DaySequerra Team

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DownMix Key Features

- Brings the excitement of surround sound to your audience without replacing any infrastructure.
- Active correction to fix issues such as comb filtering, spatial location and distortion.
- The conveniences of a matrix surround encode/decode system with the performance of modern day perceptual audio codecs.
- Backward compatibility with matrix decoders (Dolby® ProLogic II, SRS Circle Surround, etc.).
- UpMix decoders featuring the DTS Neural UpMix Technology are now available in over 70% of consumer AV receivers worldwide. The decoder will up-mix the signal to the proper format for the user's setup.
- Two channel audio stream can be edited, stored, or transported just like any standard stereo stream on your current equipment without virtually any loss in quality.

Important Safety Information

- Indoor use only. Not for use in wet or damp environments.
- Maximum Relative Humidity: <80%
- Class I Equipment (grounded type)
- Electrical rating: 100-260V~50-60Hz 25W max
- Internal circuit breaker for continuous short circuit protection.
- AC Mains supply voltage fluctuations are not to exceed $\pm 10\%$ of the nominal voltage
- Operations temperature range -40°C to 70°C
- Maximum altitude: 3000m (9843ft)
- Equipment suitable for continuous operation
- Weight: 3.6kg (8lbs) equipment only; 5.4kg (12.0lbs) shipping

Important Note: Please connect your DownMix to an uninterruptible power supply (UPS) to provide other protection against power surges and low-voltage conditions.

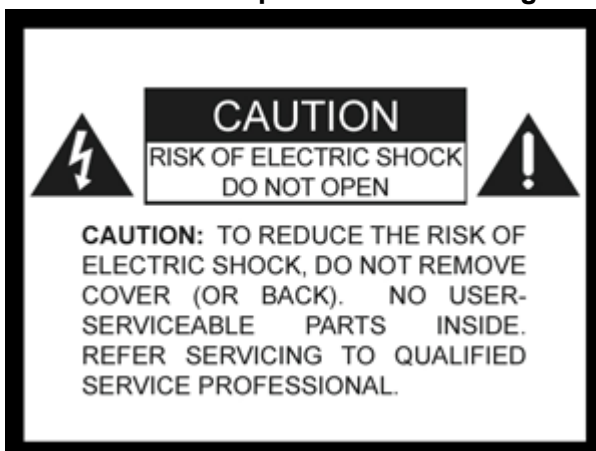
If DownMix is subjected to a strong RFI field, such as those emitted from portable two way radios, the display may “blank out”. To restore the display without rebooting the unit, turn the rotary encoder to activate the main menu, and then press HOME. If the keylock is enabled, you will have to deactivate it by pressing the ENTER key followed by BACK.

Service Information

The DaySequerra DownMix contains no user serviceable components inside the unit. Please contact DaySequerra for repair and upgrade information. In the event that your unit needs to be returned to the factory, contact us for a return authorization number. **Please visit www.daysequerra.com and register your new DownMix so we can keep you informed of the latest hardware and software updates.**

The lightning flash with arrowhead symbol is intended to alert the user to the presence of un-insulated “dangerous voltages” within the product’s enclosure that may be of a sufficient level to cause harm.

The exclamation point within a triangle is intended to alert the user to the presence of important operating and maintenance instructions within the product literature.



Exposed portions of the power supply assembly are electrically live. To reduce risk of electric shock, the power cord must be disconnected when the power supply assembly is removed. For continued protection against electric shock, a correctly wired and grounded (earthed) three-pin power outlet must be used. Do not use a ground-lifting adapter and never cut the ground pin on the three-prong plug. The ground terminal of the power plug is connected directly to the chassis of the unit.

Technical Specifications

Latency of the DTS Algorithm:	<16ms at 48k sampling rate
Power Consumption:	25W Maximum
Dimensions:	Rack Mount; 1 RU (1.75" x 19" x 10.75")
Sample Rate:	32kHz-96kHz, 24-bit
Dynamic Range:	140dB, DR any input to any output
GPIO:	DB-9 Female, 0-5V TTL opto-isolated
Regulatory:	North America: Designed to comply with FCC Class A part 15 requirements. Europe: Designed to comply with LV Directive 73/23/EEC and EMC Directive 89/336/EEC; CE Mark (EN 55022 Class A, EN55024); Designed for RoHS and WEEE compliance.

FCC Part 15 Regulatory Statement

This equipment has been tested and found to comply with the limits for Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction's manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at their own expense. The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment. The user should use only shielded and/or grounded cables to combat sources of interference.

Environmental Preservation Efforts



This equipment has been designed and built by DaySequerra corporation to give many years of trouble free service and is backed by our three year warranty and commitment of providing the best customer support. When the time comes to retire your product from service, it should be disposed of in accordance with local codes or ordinances. Do not discard with household or commercial waste.

DaySequerra products are manufactured with the environment in mind. The Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (2002/95/EC) restricts the use of six specific hazardous materials in the manufacture of various types of electronic and electrical equipment. Following this directive prevents these toxic substances from entering our environment after disposal.



Introduction

The DaySequerra DownMix enables 5.1 surround sound to be transported through any stereo infrastructure using the DTS Neural Audio process. Because DownMix renders sound independently of the transport environment, it will compliment analog, digital, linear or compressed mediums. The process is based upon the principle that both natural stereo and 5.1 content are two dimensional; both contain width and depth spatial attributes. DownMix can represent six channels of discrete audio sources into a stereo down mix by transforming the sources to pure intensity and coherence encoding. By correcting overlaps of the signal sources in intensity, time, coherence, polarity, and phase before the six channels are combined, DownMix accounts for the problems suffered in traditional matrix encode systems (comb filtering, spatial location distortion, etc).

This proprietary DTS Neural Audio process, or “watermark process” guarantees that surround information is faithfully reproduced when later rendered by the DaySequerra UpMix or any Lt/Rt system. In brief, DownMix produces a stereo mix that accurately represents the original content whether monitored in mono, stereo, matrix or DTS Neural 5.1 Surround Sound.

Operational Diagram

The diagram below shows a DownMix taking a multi-channel audio source and creating two-channel audio using the proprietary DTS Neural Audio process of embedding a watermark signal within the stereo audio signal patch containing spatial and steering positioning information. The resulting stereo audio signal is also known as Lt/Rt.



This approach to down mixing the audio into a two channel signal ensures that it can be transmitted through any stereo-capable distribution system. Since the audio output is watermarked, it may be re-up mixed again into the original format.

Typical Applications

Here are some examples that describe some typical applications where you might use DownMix.

FM Radio Production Studio

A typical application of DownMix is to create a watermarked stereo signal from multi-channel original content originating from a computer with a multi-channel sound card, Stereo Automation or Storage System, or direct from your Digital Production Console.

The audio can be transmitted through and stored on your standard two channel equipment, and will be capable of conversion back to the original multi-channel content. Backwards compatibility is built in—your listeners with stereo equipment will receive stereo audio, while those using decoders with DTS Neural Technology will have the best sound experience.

Stereo Television Master Control

Another application of DownMix is in a stereo television master control room setup. DownMix allows encoding of original multi-channel content into a watermarked stereo audio signal that can be easily transported throughout a complete infrastructure and later rendered to the original multi-channel content if needed.

Streaming Media

DownMix can be used to create a watermarked stereo signal for distribution over the internet in either a streaming or video-on-demand format. Simply use DownMix before the media gets encoded for digital transmission. The DTS Neural process will make sure that the best surround experience will be reproduced at the lowest bandwidth cost.

Installation

Immediately upon receiving your DownMix, please make a careful inspection for any shipping damage. If damage is found or suspected, please notify the carrier at once and then contact your dealer. DownMix is shipped in one carton, which contains: the DownMix unit, two AC power cables and this Users Manual.

We strongly encourage you to save the shipping carton and shipping materials supplied with your DownMix. They are specially designed to properly protect your DownMix, and in the event that you need to return it for service, only these OEM shipping materials can ensure its safe return to our factory.

We provide a limited 3-year warranty on all of our products; however, if you don't register your unit, it is impossible for us to contact you to notify you when important software upgrades become available.

Please take a few minutes to complete the warranty registration form on our website, www.daysequerra.com.

Rack Mount Installation

The DownMix chassis has four rack mounting holes and has been designed to fit in a standards 1RU space. Plastic 'finishing' washers are recommended to protect the painted surface around the mounting holes. Locate the air vents on each side of the unit, and be sure to keep them clear so the unit may have adequate ventilation.

Power Connection

The AC power cable supplied with DownMix must be connected from the IEC320 power entry module to an AC mains outlet with a functional earth ground connection. For protection against electric shock and electro-magnetic interference, do not plug the power cable into a ground lifting adapter or remove the cable's grounding pin. If in doubt, please consult a qualified electrician.

DownMix is designed with redundancy in mind with two internal auto switching power supplies. **Please connect DownMix to an uninterruptible power supply (UPS) to protect against power surges and low-voltage conditions.** For maximum redundancy, connect each power supply to a separate UPS on different power circuits. DownMix may be combined with other devices on the output of the UPS(es) as long as the total load is within the UPS' capacity. Consult your UPS manual for details.

DownMix will automatically power up when AC power is applied. If AC line power is lost or momentarily interrupted, DownMix will revert to its previous state.

Front Panel

Bargraph Meters

INPUT LEVELS - Six 10-segment multi-colored LED meters display the audio level for each channel of the inbound audio stream.

OUTPUT LEVELS - Six 10-segment multi-colored LED meters display the audio level for each channel of the down mixed audio stream.

Status Indicators

AES LOCK - Green LED indicator illuminates when DownMix has acquired a valid AES3 digital input signal.



Alarm - Red Led indicator illuminates when Mono2Stereo has an active alarm condition or discovered a fault. An error message will be displayed on the VFD display.

AES LOCK - Green LED indicator illuminates when Mono2Stereo has acquired a valid AES3 digital input signal.

7.1 MODE - Blue LED indicator illuminates when DownMix is operating in 7.1 channel input mode (not supported at this time).

GPIO - Green LED indicator illuminates when Mono2Stereo is using any of the general purpose input / outputs.

Display and Controls

VACUUM FLUORESCENT DISPLAY - A Multi-function display that indicates current operating status of the unit and programming menus.

ROTARY ENCODER - A stepping optical rotary encoder is used to select values while in the menu system. To enter the menu, simply rotate the rotary encoder in any direction while DownMix is on the HOME screen.

ENTER KEY - Used to enter a menu or confirm a selection. This key will also clear an error message display from the home screen.

HOME KEY- A press of this button will return DownMix to its home screen, or enter home screen selection mode.

BACK KEY – A press of this key will return to a previous menu, or if you are entering a value, exit the field and return the value to the last programmed state.

Rear Panel



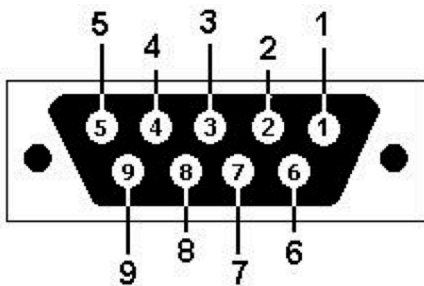
AES INPUTS - Four 75Ω BNC connectors will accept an AES3 digital audio stream.

AES OUTPUTS - Three 75Ω BNC connectors output the down mixed AES3 digital audio stream.

AES SYNC - Two 75Ω BNC connectors that allow DownMix to receive an AES REF or DARS clock signal from an external source and pass it on to other devices.

The AES-3id-1995/SMPTE 276M standard dictates a 75Ω unbalanced connection and requires proper termination. The termination should occur at the destination of the signal (that is, on the inputs to DownMix). If the loop-through BNC connectors are not feeding additional equipment, terminate each of these with a standard 75Ω terminator. Like other inputs, AES SYNC signal should be terminated.

GPIO – A Female DB-9 connection that allows DownMix to be monitored or controlled externally. Opto-isolated inputs will be triggered by a voltage of 5VDC.



**DB-9 Female Port
on DownMix Rear Panel**

Pin	Signal
1	Output Relay 1 N.O.
2	Relay 1 Common
3	Optical Input 0
4	Optical Input 1
5	Optical Input Common
6	Output Relay 2 N.O.
7	Relay 2 Common
8	Optical Input 2
9	Optical Input 3

Output 1: Relay 1 is Normally Open. Upon a hardware failure (i.e. Power Supply or Internal Communications Failure), the relay will close. When the failure is remedied, the relay will open.

Output 2: Relay 2 is Normally Open. Upon an AES lock loss failure, this relay will close. When the failure is remedied, the relay will open.

Input 1: Voltage detected on this input will cause DownMix to go into pass-through operating mode.

Input 2: Voltage detected on this input will have DownMix take the input audio signal and down-mix into Lt/Rt.

Input 3: Unused at this time.

Input 4: Unused at this time.

NETWORK - Used to update DownMix's firmware. To connect directly to a PC without use of a network switch or hub, a crossover cable is required. Firmware updating is accomplished via UDP Port 44600.

PSU 1 / PSU 2 - Two IEC320 ports to connect to AC Mains. The internal power supplies are auto switching and will work on 120VAC-60Hz or 240VAC-50Hz electrical power systems with a maximum total current draw of 25W (>.25A 120VAC or >.15A 240VAC).

Please connect DownMix to a properly grounded uninterruptible power supply (UPS) to protect against power surges and low-voltage conditions. For maximum redundancy, connect each power supply to a separate UPS on different power circuits. DownMix may be combined with other devices on the output of the UPS(es) as long as the total load is within the UPS' capacity. Consult your UPS manual for details.

Meter Display

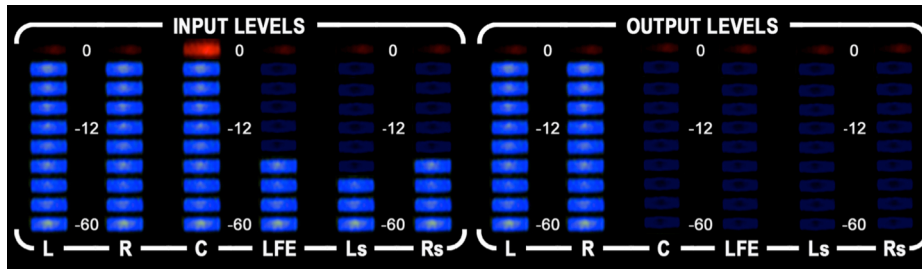


Figure 1. Metering display DownMix.

INPUT LEVELS – LED display shows current amplitude of input signal from -60dB to 0dB across all active channels. Unused channels will not light the display.

L - Left (AES Input 1)
R - Right (AES Input 2)
C - Center (AES Input 3)

LFE- Low Frequency (AES Input 4)
Ls - Left Surround (AES Input 5)
Rs – Right Surround (AES Input 6)

OUTPUT LEVELS – LED display shows current amplitude of signal generated by DownMix across all active channels. Unused channels will not light the display.

L - Left (AES Output 1)
R - Right (AES Output 2)
C - Center (AES Output 3)

LFE- Low Frequency (AES Output 4)
Ls - Left Surround (AES Output 5)
Rs – Right Surround (AES Output 6)

Items in italics are used when DownMix is configured to take a 7.1 audio stream and create a 5.1 audio stream (not supported in this code release).

Home Screen

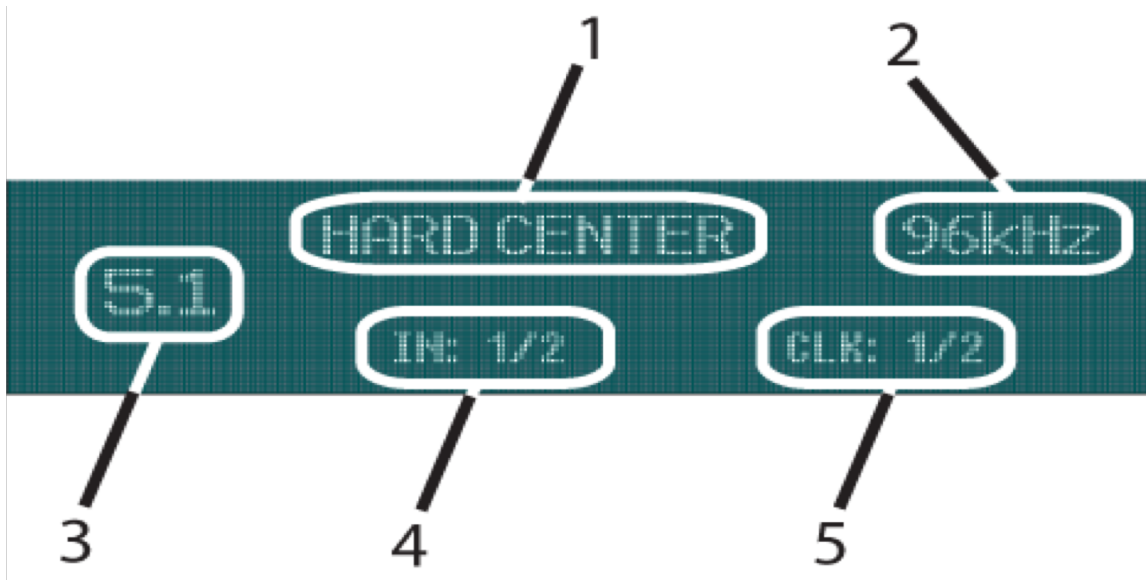


Figure 2. Home Screen on DownMix.

DownMix has been designed with ease of use in mind. Most of the common settings are available for modification right on the home screen. While the unit is at this screen, press the HOME key to invoke home screen selection mode; a selection box will appear. Turn the rotary encoder to move the box to the desired field to be changed and press the ENTER key to modify the value. Rotating the encoder again will cycle through the available options. Press ENTER again to confirm selection, or BACK to revert the setting to the last saved value. Pressing the HOME or BACK keys exits home screen selection mode.

1. **Center Mode:** Tells DownMix to use a discreet center channel (Hard Center) or mix the center into the left and right channels (Phantom).
2. **Sample Rate:** Shows the sample rate DownMix has detected from the clock source. When field 6 is set to INTERNAL, this field may be modified to the desired rate. (1/2, 3/4, 5/6, INT or EXT SYNC).
3. **Input Mode:** Defines what kind of signal DownMix is looking for. (Stereo, 5.1, Pass-through)
4. **Stereo Output:** Defines what physical BNC port DownMix will send the audio output stream to. (1/2, 3/4, 5/6)
5. **Clock Source:** Will display the port that DownMix is using for AES Reference timing. This will be represented as a port number, internal or external.

Programming Menu

If AC line power is lost or momentarily interrupted, DownMix will revert to its previous state.

To enter the programming menu, turn the rotary encoder in any direction while at the HOME screen. The ENTER key will enter the currently selected sub menu or enter the value mode for the selected option. A press of the BACK key will navigate to the previous menu level or revert the current value to its last stored state.

Menu Tree

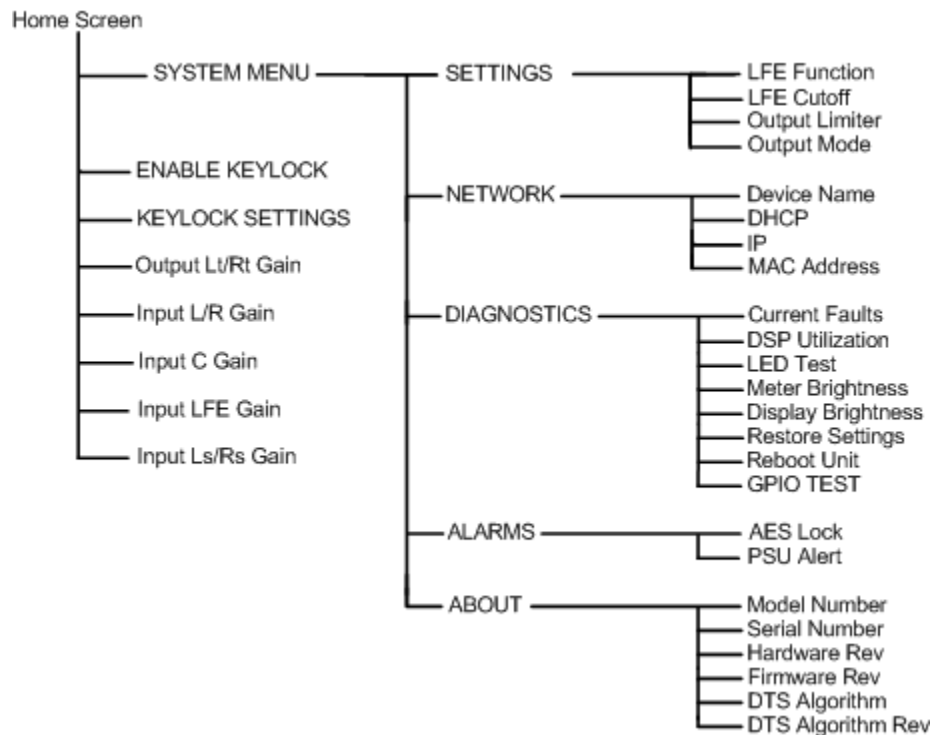


Figure 3. Visual Map of DownMix Menu System.

Menu Functions and Descriptions

While at the home screen, and not in home screen selection mode, rotate the encoder in any direction to enter the menu. From this screen you may navigate to the rest of the menu by selecting SYSTEM MENU. Also displayed are keylock controls and channel audio adjustments.

Selecting KEYLOCK from this menu will lock the front panel controls of the unit immediately. KEYLOCK SETTINGS sub-menu contains a time-out setting that will enable automatic locking of the controls after a user-specified time period has elapsed. To disable automatic keylock, select “OFF” from this menu.

Channel Audio Adjustment: Performs fine adjustment of the audio levels for the following audio channels (0 to -12dB):

1. Output Lt/Rt Gain – Lt/Rt two channel stereo output level
2. Input L/R Gain - Left Front and Right Front input level
3. Input LFE Gain - Low Frequency Effects input level
4. Input C Gain - Center channel input level
5. Input Ls/Rs Gain – Left Surround and Right Surround input level
6. Input Lb/Rb Gain – Left Back and Right Back input level (not supported)

Systems Menu

Navigating to SYSTEM MENU after entering the Main Menu will allow you to change all values to fine tune the operation of your DownMix.

Settings Menu

LFE Function: Defines how DownMix will treat Low Frequency Effects. (Normal or Mute)

LFE Cutoff: Adjusts low-pass filter for Low Frequency Effects. (0-140Hz in 20Hz Increments)

Output Limiter: Allows DownMix to reduce the level of the output stream. (0dB to -20dB)

Output Mode: Sets the output mode of DownMix. (Stereo)

Network Menu

DownMix has several configurable network settings. All of the DownMix network settings are password protected. The password to change the network settings is **dnmix123**. Please take note when entering the password that the DownMix password is case sensitive. DownMix is configured to take a DHCP address by default.

Device Name: Allows you to change DownMix's name as reported to DNS. Press ENTER while the cursor is over this field to go into data entry mode. Turn the rotary encoder to scroll through the available choices of letters (A-Z, 0-9 and _ (underscore)) and press enter to move on to the next field. Turning the rotary encoder again will start to scroll through the choices for the next letter, or pressing ENTER accepts the name.

DHCP: Configures DownMix to look for a DHCP server for IP configuration. (Enabled or Disabled)

IP Address: If DHCP is set to disabled, allows you to enter the desired IP address manually. Press ENTER while the cursor is over this field to go into data entry mode. Scroll through the available numbers (0-255) and press ENTER to move to the next octet.

MAC Address: Displays DownMix's MAC address if needed for firewalls or DHCP IP address assignments.

Diagnostics Menu

Current Faults: Displays any error states that DownMix may be in.

DSP Utilization: Shows the current load on DownMix's processor.

LED Test: Turns on all front-panel LED indicators to verify their functionality.

Meter Brightness: Allows adjustment of DownMix's Input and Output meters.

Display Brightness: Allows adjustment of DownMix's display output.

Restore Settings: Returns all settings to their factory default values and reboots the unit. Network settings will not be lost.

Reboot Unit: Performs a warm boot. No settings are erased or restored to defaults.

GPIO Output: Allows for testing of the internal signaling circuit within DownMix. The two fields displayed represent each output, 1 and 2, respectively.

GPIO Input: Shows the current state of the GPIO inputs. The four fields of the displayed status represent each input, 1-4, respectively.

Alarms Menu

All alarms are disabled by default at the factory. To take advantage of this function, the desired settings need to be enabled.

AES Lock: Allows the AES Lock alarm to be suppressed.

PSU Alarm: Allows the Power Supply alarm to be suppressed.

About Menu

Model Number: Displays the model number of the unit.

Serial Number: Displays the serial number of this unit.

Hardware Rev: Displays the hardware revision level of this unit.

Firmware Rev: Displays the firmware revision level that is running on this unit.

DTS Algorithm: Displays the specific DTS algorithm running.

DTS Algorithm Rev: Version of the DTS algorithm running on this unit.

Faults

Although your DownMix will provide you with years of trouble free service, occasionally problems may occur. Below is a listing of the most common fault conditions.

PSU-x Failed: One of the redundant power supplies has failed and your unit requires service. Please contact DaySequerra to arrange for repair.

No Sync: AES sync has been lost. Please check the source equipment and all cable connections. Ensure that DownMix is operating in the proper input mode for your application and is looking for the source audio on the correct port.

CRC Error: DownMix has encountered a CRC error in the audio stream.

Validity Error: DownMix has encountered a validity error with the audio stream.

Bi-phase Error: DownMix has encountered a bi-phase error with the audio stream.

No Parity Error: DownMix has encountered a parity error with the audio stream.

Firmware Update

Provided that you have completed warranty registration for your DownMix on our website, we will notify you as new firmware updates become available. The notification will contain the announcement of new firmware, issues corrected, and instructions on how to retrieve the update files.

Update packages will be available as a single .ZIP file for download. Compatible archive programs include Winzip (www.winzip.com) or WinRAR (www.rarlabs.com) and may be downloaded from their respective websites. The update package will contain four files; dsp2533.bin, firmdown.exe, readme.txt and update.bat.

Firmware updating is accomplished via UDP Port 44600. At this time, updating is only supported by using a cross-over cable directly connected to one PC. If your PC has multiple network interface adapters, each additional adapter will need to be disabled before attempting to upgrade your unit. You may also wish to disable your firewall during the upgrade process. For additional support with networking, please contact your network administrator.

DO NOT UNPLUG THE UNIT OR TURN OFF YOUR PC WHILE THE FLASH IS IN PROGRESS.

If the flash procedure is interrupted before it can complete, DownMix may be left in an un-usable state and will need to be returned for factory service.

Please follow these steps to upgrade your unit:

1. Un-Zip the files using a compatible utility that can handle ZIP archive file format into a new empty directory on your PC.
2. Disable any additional network interface adapters present on your PC. Go to Control Panel, then Network Connections. Right click on the adapter to be disabled and select Disable.
3. Unplug your PC from the network it is currently connected to.
4. If your PC's network interface is set up for DHCP, disable it and enter a static IP address. While in Network Connections under Control Panel, right click on the network interface and select Properties. Select "Internet Protocol (TCP/IP)" and press the Properties button. On the general tab of the dialogue box, select "Use the following IP address". Enter an IP address in the box "IP Address" within the local network range. (Example: 192.168.0.1) Click in the "Subnet mask" box and it should auto populate with 255.255.255.0. Select OK to close the dialog, and then OK to close the properties box.
5. If DownMix is set up for DHCP, disable it and enter a static IP address within the local network range. (Example: 192.168.0.2) Details are available in the NETWORK section of this manual.
6. Connect the DownMix to the PC using a crossover Ethernet cable.
7. When Windows has acknowledged the Ethernet connection, you may start the update progress by double clicking on upgrade.bat. DownMix should download the new firmware and reboot within 30 seconds.
8. Disconnect the cross-over cable and return your PC and DownMix to their original configurations.

DaySequerra - Three Year Limited Warranty

DaySequerra warrants this product to be free from defects in materials and workmanship to its original owner for three (3) years from the date of purchase. DaySequerra will repair or replace such product or part thereof that upon inspection by DaySequerra, is found to be defective in materials or workmanship.

A Return Authorization (RA) number must be obtained from DaySequerra in advance of any warranty return. Email DaySequerra at warranty@daysequerra.com to receive an RA number that must be clearly marked on the outside of your shipping carton. Include a written statement with your name, address, email address and daytime telephone number, together with a copy of the receipt from the original purchase in the shipping carton. A brief description of any claimed defects must also accompany all returned products. Parts or product for which replacement is made shall become the property of DaySequerra. The customer shall be responsible for all costs of transportation and insurance to and from the DaySequerra factory, and all such costs will be prepaid.

DaySequerra shall use reasonable efforts to repair or replace any product covered by this limited warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, DaySequerra shall notify the customer accordingly. DaySequerra reserves the right to replace any product that has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void in the event a covered product has been damaged, or failure is caused by or attributable to acts of God, abuse, accident, misuse, improper or abnormal usage, failure to follow instructions, improper installation or maintenance, alteration, or lightning, power fluctuations and other incidental or environmental conditions. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

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