User Manual

EN



DN9848E

4 Input, 8 Output Digital System Controller with Comprehensive Loudspeaker Management and Matrix Mixer

V 1.0

KLARK TEKNIK

EN

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Thank You For Using This Klark Teknik Product

Our engineers have designed this product with uncompromising dedication to providing the superb audio performance, ease of use and rugged reliability that meets the demands of live sound engineering.

Please take time to complete and return the Klark Teknik three-year warranty registration card and, to obtain maximum performance with minimum effort, refer to this operator's manual. Please ensure that you read both the Important Safety Instructions and Attention! pages.

Finally, enjoy your new DN9848E!

EN Important Safety Instructions

CAUTION
RISK OF ELECTRIC SHOCK!
DO NOT OPEN!
ATTENTION
RISQUE D'ÉLECTROCUTION !
NE PAS OUVRIR !

Terminals marked with this symbol carry electrical current of sufficient magnitude to constitute risk of electric shock. Use only high-quality professional speaker cables with ¼" TS or twist-locking plugs pre-installed. All other installation or modification should be performed only by qualified personnel.

This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute a risk of shock.

This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read the manual.

Caution
To reduce the risk of electric shock, do not remove the top cover (or the rear section). No user serviceable parts inside. Refer servicing to qualified personnel.

Caution
To reduce the risk of fire or electric shock, do not expose this appliance to rain and moisture. The apparatus shall not be exposed to dripping or splashing liquids and no objects filled with liquids, such as vases, shall be placed on the apparatus.

Caution
These service instructions are for use by qualified service personnel only. To reduce the risk of electric shock do not perform any servicing other than that contained in the operation instructions. Repairs have to be performed by qualified service personnel.

1. Read these instructions.

2. Keep these instructions.

3. Heed all warnings.

4. Follow all instructions.

5. Do not use this apparatus near water.

6. Clean only with dry cloth.

7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

11. Use only attachments/accessories specified by the manufacturer.



12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

13. Unplug this apparatus during lightning storms or when unused for long periods of time.

14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

15. The apparatus shall be connected to a MAINS socket outlet with a protective earthing connection.

16. Where the MAINS plug or an appliance coupler is used as the disconnect device, the disconnect device shall remain readily operable.



17. Correct disposal of this product: This symbol indicates that this product must not be disposed of with household waste, according to the WEEE Directive (2012/19/EU) and your national law. This product should be taken to a collection center licensed for the recycling of waste electrical and electronic equipment (EEE). The mishandling of this type of waste could have a possible negative impact on the environment and human health due to potentially hazardous substances that are generally associated with EEE. At the same time, your cooperation in the correct disposal of this product will contribute to the efficient use of natural resources. For more information about where you can take your waste equipment for recycling, please contact your local city office, or your household waste collection service.

18. Do not install in a confined space, such as a book case or similar unit.

19. Do not place naked flame sources, such as lighted candles, on the apparatus.

20. Please keep the environmental aspects of battery disposal in mind. Batteries must be disposed-of at a battery collection point.

21. This apparatus may be used in tropical and moderate climates up to 45°C.

LEGAL DISCLAIMER

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LIMITED WARRANTY

For the applicable warranty terms and conditions and additional information regarding Music Tribe's Limited Warranty, please see complete details online at community.musictribe.com/support.

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DN9848E Key Features

1. Introducing The DN9848E

The DN9848E is a highly configurable, digital electronic crossover/loudspeaker management system controller comprising four balanced AES/EBU digital input channels and eight balanced analogue output channels. Its unrivalled routing flexibility enables any amount of any input to be routed to any output.

Each input channel features:

- 12 separately configurable, fully parametric equalisation stages that may be used for room equalisation
- A programmable delay of up to 1000ms
- Gain control
- Full range compression

Each output channel features:

- Configurable high and low-pass filters for setting the crossover characteristics
- Six stages of fully parametric equalisation that may be used to compensate for system or enclosure characteristics
- Delay of up to 300ms on each output, mainly used for system time alignment
- Gain control and output muting
- Full range compression and full range limiting
- Dual all-pass phase correction sections, the first of which can be any of the filter or parametric EQ stages and can be adjustable in five-degree steps

The crossover filter may be chosen from the following types:

- 12 dB/oct and 24 dB/oct peaking (high-pass filter only)
- Butterworth (6, 12, 18, 24, 36 and 48 dB/octave)
- Linkwitz-Riley (12 and 24 dB/octave)
- Bessel (12, 18, 24, 36 and 48 dB/octave)

Channel programming can be performed directly from the front panel controls or remotely from a PC using the associated Elgar software application via the real panel Ethernet comms connectors (or RS-232 PC port on the front panel). If required, access to critical parameter menus can be password protected, for example, to avoid unauthorised adjustments in hire installations.

Commonly used settings can be stored for repetitive use in up to 32 lockable System memories while varying show settings can be stored in up to five User memories.

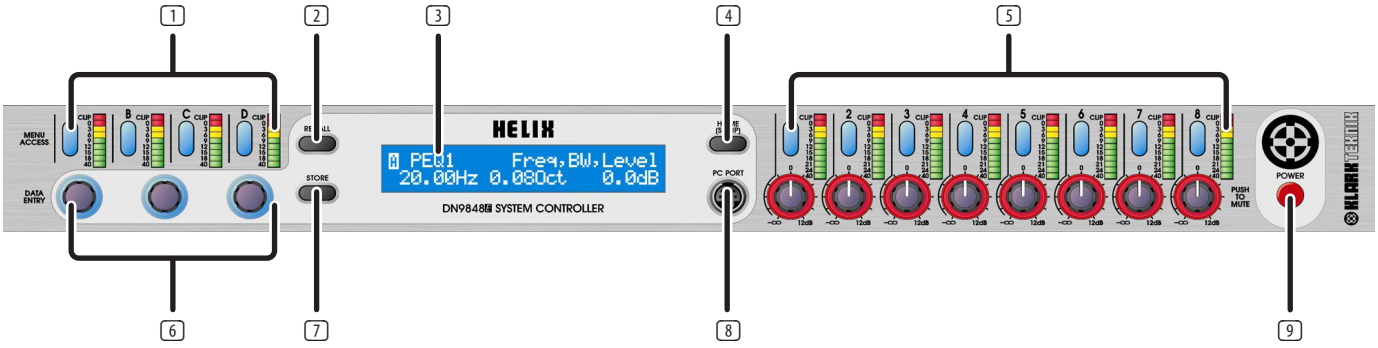
In addition, any input or output channel's parameters may be copied across channels, and channels may be ganged to link source and destination channels for ease of operation.

Klark Teknik has a policy of continuous development and may produce updates to the DN9848E host code. These can be downloaded to the unit via the front panel PC Port. To keep up with latest features and functions, please visit www.klarkteknik.com.

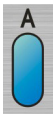
Controls, Connectors, Indicators

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2. Front Panel

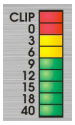


1 **Input channels A-D**



MENU ACCESS Buttons A-D

Press to access and step through the menu pages for the respective input. The available pages depend on the current security setting. The button is lit when active.



Signal Level Meters A - D

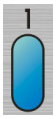
9-segment signal meters for monitoring signal level (compressor headroom and gain reduction) and clip on the respective channels.

2 **RECALL button** – Press to access the Recall menu page from which a User, System or Backup memory can be selected for recall.

3 **Alphanumeric display** – Displays menu pages for viewing/defining parameter values. Values are adjusted via the **DATA ENTRY** control knobs.

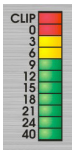
4 **HOME (SET UP) button** – Press to exit current menu page and return to default Home page. Press and hold for one second to access Set Up menu, then press to step through Set Up pages.

5 **Output channels 1 - 8**



MENU ACCESS Buttons 1-8

As for input channels.



Signal Level Meters 1 - 8

11-segment signal meters for monitoring signal level (compressor headroom and gain reduction – reads relative to limiter threshold) and clip on the respective channels.



Output level and mute control

Potentiometer control for fine-tuning/muting of output level. Provides relative adjustment from zero level, which is the level set in the output menu. Turn control to increase/decrease level or press to mute. Red ring illuminates when mute is active.

6 **DATA ENTRY control knobs** – Used to set parameter values on menu pages (see Section 4.1).

7 **STORE button** – Press to access the Store menu page for storing User or System memories.

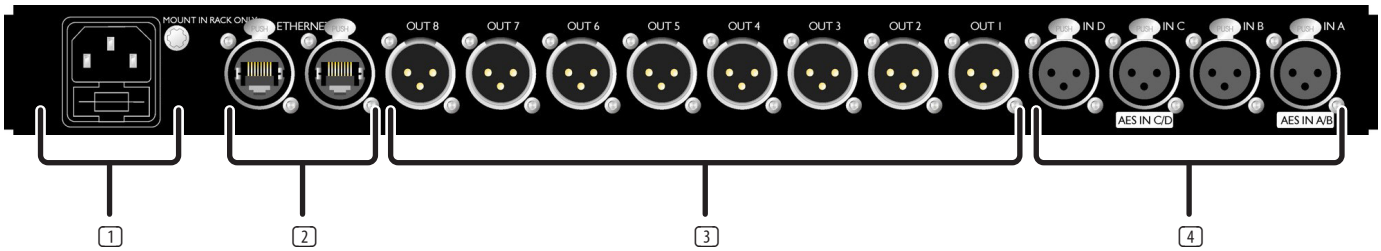
8 **PC port** – 8-pin mini-DIN socket for connecting to an RS-232 serial port on a PC or other remote control device. (Ethercon connectors are provided on the rear panel for remote control via Ethernet.)

9 **POWER button** – Press to switch the unit on or off.

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Controls, Connectors, Indicators

3. Rear Panel



1 **IEC fused mains inlet socket** – For mains power connection. Accepts input voltages from 100-240V AC 50/60Hz.

2 **Ethernet** – 2-port Ethernet switch for remote control using Cat-5 cabling.

3 **Outputs 1-8** – Electronically balanced XLR audio output plugs

Pinouts: Pin 1 - Screen
Pin 2 - Hot
Pin 3 - Cold (Return)

4 **Inputs A-D** – Analogue – electronically balanced XLR audio input sockets

Pinouts: Pin 1 - Screen
Pin 2 - Hot
Pin 3 - Cold (Return)

Digital – inputs A and C support incoming 96kHz AES/EBU signals.

◊ **Note that when digital input is selected, inputs B and D are inactive.**

AES/EBU is 110 Ohms. Sample rate converters (SRCs) support incoming signals at sampling frequencies from 32kHz to 96kHz ±12.5%, while allowing the unit to operate internally at 48kHz. An SRC bypass facility is available for 48kHz operation; this is to eliminate the propagation delay through the SRC.

Pinouts: Pin 1 - Screen
Pin 2 - Data +
Pin 3 - Data -

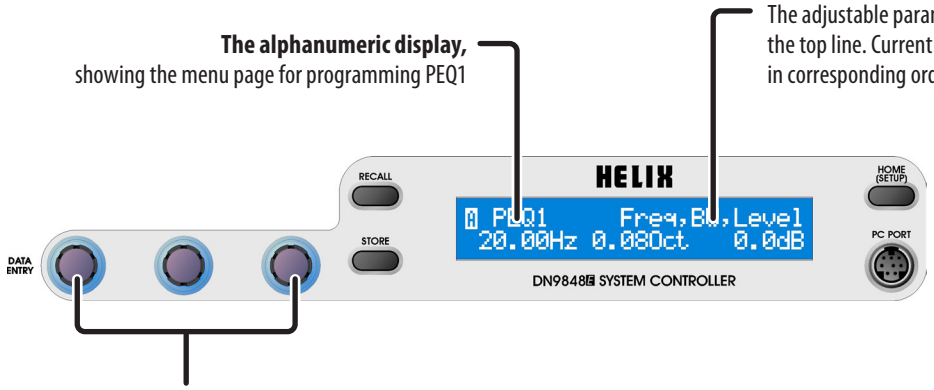
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DN9848E Menu System

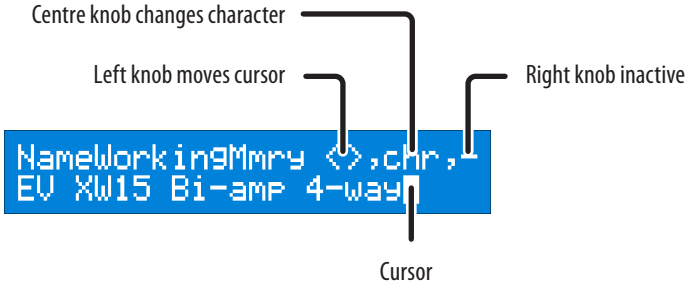
4. Programming Settings

4.1 The DN9848E Programming Panel

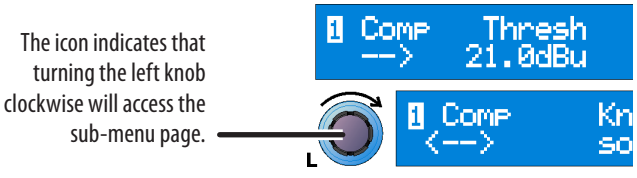
All the parameters for input and output signal processing and routing are defined via function-specific menu pages that are displayed and edited at the programming panel shown below. As described in the illustration, each menu page uses a standard layout that relates the displayed parameters to the three DATA ENTRY control knobs, which are used to adjust the parameter values.



DATA ENTRY control knobs adjust the left, centre and right parameter values at the display, in corresponding order. If there are only one or two parameters, only the active controls are lit.



When the menu page requires text entry, '<>' indicates which **DATA ENTRY** control knob moves the cursor left and right while "chr" indicates which control knob changes the alphanumeric character.



When there are sub-menu pages, either the left or right **DATA ENTRY** control knob will be allocated to moving forward (- - >) or back up (< - -). This will be indicated here by a control knob icon marked L (Left) or R (Right).

4.2 Navigating the DN9848E Menus

The DN9848E menu system is divided logically into Input, Output and Set Up menus, plus two function-specific menus for quick access to the Store and Recall commands. A menu map is provided at the end of this section for reference purposes.

4.2.1 Input and Output Menus

Each of the four input channels (A-D) and eight output channels (1-8) have their own set of menu pages, accessed and stepped through by pressing the channel's blue **MENU ACCESS** button.

When you make a selection, the **MENU ACCESS** button illuminates to show that channel is now active at the programming panel. In addition, all the menu pages show the channel number (1 to 8) or letter (A to D) in the top left-hand corner.

To program each parameter in turn across all the input/output channels, you can skip to the same page on another input/output channel by pressing the **MENU ACCESS** button on the other channel.

If you want to jump back to the first page on a different channel, press the **HOME** button and then the required channel button.

Note If you cannot select any of the channel menu pages from the front panel, then your unit may be set for remote control or the front panel may be locked as indicated on the alphanumeric display. Please refer to Sections 7.2 and 7.4 for more details.

4.2.2 Set Up Menu

Global parameters, such as the Comms Channel for remote control set ups, security options and unit labelling are defined in the Set Up menu. To switch to the Set Up menu, press and hold the black **HOME (SET UP)** button located on the programming panel. Press the button repeatedly to cycle through the menu pages.

4.2.3 Store and Recall

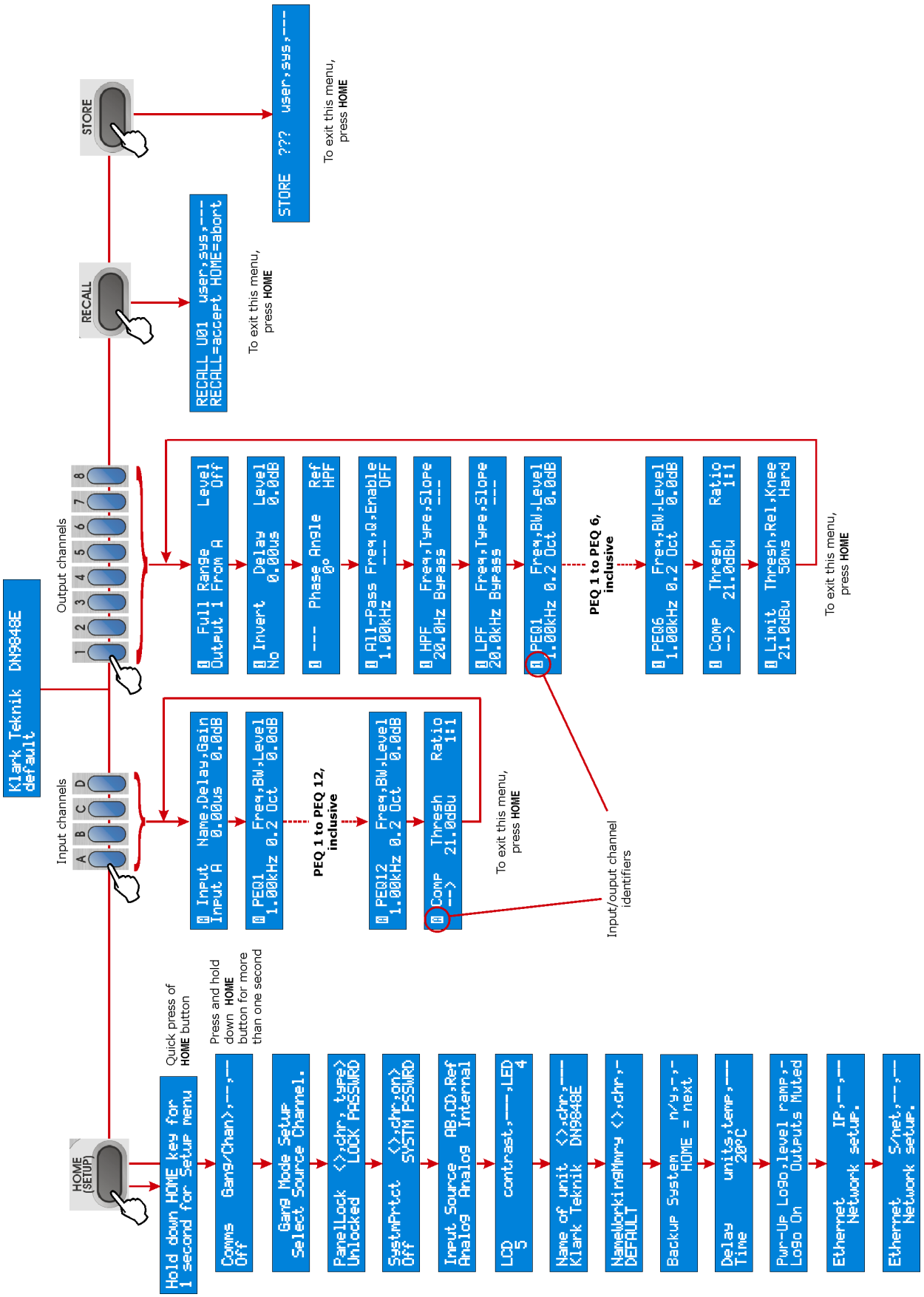
The Store and Recall menu pages are accessed by the corresponding buttons on the programming panel. To abort and exit the store/recall menu press the **HOME** button.

4.2.4 Home Page

The Home page, displayed at the end of the start up routine, indicates the unit name (set by the User) and the current working memory which was retained from the previous session. To return to the Home page at any time, press and release the **HOME** button. (The **HOME** button is a dual function button – a short press returns to the Home page while a long press opens the Set Up menu.) The HOME button can also be pressed to abort a Store or Recall process.

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DN9848E Menu Map



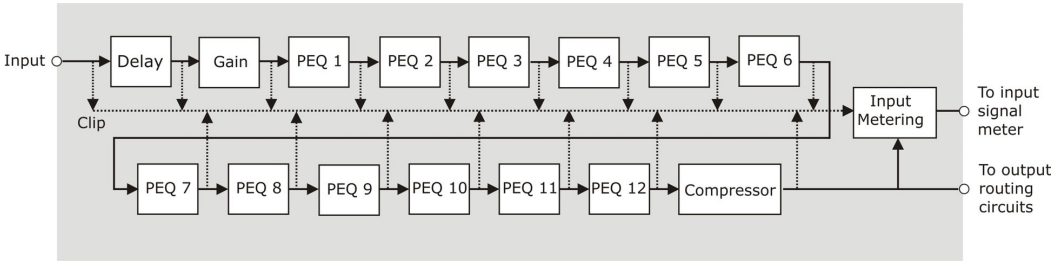
Input Channels

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5. Input Channels

5.1 Brief Technical Overview

Referring to the illustration below, each input channel of the DN9848E processes the audio signal through delay and gain stages, followed by 12 bands of parametric equalisation, and a full-band compressor. All key stages are monitored for signal clipping which, if detected, illuminates the top red segment at the top of the input signal meter; thus, clipping of the signal during processing is not inadvertently missed. In addition, the signal level is monitored at the compressor to provide signal headroom and gain reduction indications at the meter.



5.2 Setting Input Parameters

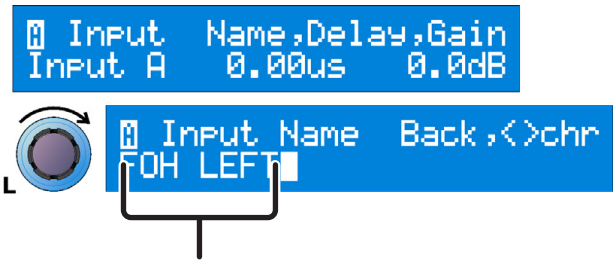
5.2.1 The Input Menu

The signal processing for each input channel is programmed independently via the separate Input menu associated with each channel. The signal processing parameters are described below in menu order.

- **To access the Input menu pages for a particular channel**
  1. Press its blue **MENU ACCESS** button (A – D) to switch to its menu.
  2. Press the button repeatedly to step through the pages in turn. Note that, after the last page, the next button press will cycle the menu back to the first page.
- **To skip across to the same parameter on another input, press its MENU ACCESS button.**

5.2.2 Naming the Input Channel (Page 1)

Each input channel can be allocated a name up to seven characters long, which will be shown in the first page of the menu for easy reference. The default names are “Input A”, “Input B”, etc. Names are retained after power down and are included in stored settings.



User defined channel name

- To enter a name
  1. Turn the left **DATA ENTRY** control knob clockwise to access the Input Name sub-menu page.
  2. Use the centre control knob to move the cursor right or left, and the right control knob to select the letter, number or symbol.
  3. On completion, turn the left control knob anti-clockwise to go back to the main page. The new name is now shown to the left of the menu page.

5.2.3 Gain and Delay (Page 1)

Gain and delay are also set in the first page of the channel’s menu, providing easy access for quick adjustment during set up or performance. Note that the delay can be specified in terms of time or distance, as preferred. The unit of measurement is changed in the Set Up menu (see Section 7.9).



Delays can be set in seconds, metres or feet and inches

- **To set the delay**
  - Turn the centre **DATA ENTRY** control knob slowly for step increments, or sharply to leap to the bottom/top of the range (two or three sharp turns should cover the whole range). When the delay is set for time the overall range is 0 to 1.00s, with steps of approximately 20.8µs between 0 to 1ms and steps of 0.02ms between 1ms to 1s. When the delay is set for metres, the overall range is 0 to 343.53 m in steps of 0.1 m and for imperial (feet and inches) the overall range is 0’ 0” to 1127’ 0” in steps of 1”.
- **To adjust the gain**
  - Turn the right **DATA ENTRY** control knob. The range is –40 dB to +12 dB in steps of 0.1 dB, with an OFF position just ‘below’ –40 dB. Setting the gain to OFF will mute the input signal.

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5.2.4 Parametric Equalisation (Pages 2 to 13)

The DN9848E provides 12 parametric equalisation stages on each input channel, for equalising the input signal in respect of room/venue characteristics. Each stage can be used across the full range from 20Hz to 20kHz and is set independently via its own menu page.



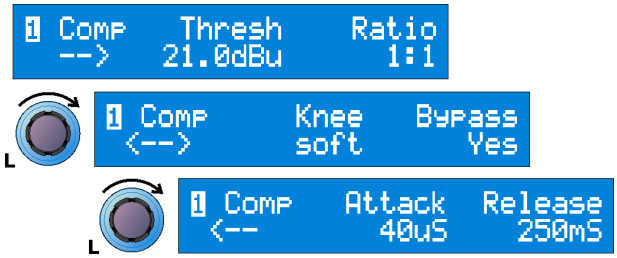
- **To set a PEQ**

  1. Set a centre frequency (21 steps per octave) and bandwidth (0.08 to 3 Oct) for the PEQ section, using the left and centre **DATA ENTRY** control knobs, respectively.
  2. Turn the right control knob to set an attention/boost level in the range -18 dB to +6 dB.

PEQ sections that are not needed in the set up should be set to 0 dB attention / boost.

5.2.5 Compression (Page 14)

Each input has an independent full-range compressor to improve the dynamics of the incoming signal levels. The compressors are variable ratio and can be set to a hard knee characteristic for a sharp gain reduction response at the compression threshold, or soft knee for a more 'musical' response.



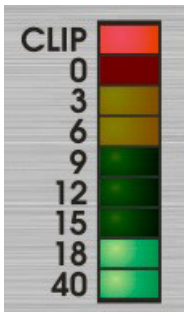
- **To set the compressor parameters**

  1. On the first compressor menu page, use the centre **DATA ENTRY** control knob to select a threshold value in the range –10 dBu to +21 dBu, and the right control knob to set a ratio from 1:1 to 5:1.
  2. Turn the left control knob clockwise to access the first sub-menu page. Use the centre control knob to select a hard or soft knee characteristic and the right control knob to set the bypass state to 'No' so that the compressor is included in the signal path.
  3. Turn the left control knob clockwise to access the second sub-menu page. Use the centre control knob to set the compressor attack time (range of 40µs – 1ms in 20µs steps or 1ms to 100ms in 1ms steps). Use the right control knob to set the release time (10ms to 2s in 10ms steps).

- **To switch the compressor out of the circuit**

  - Set the bypass state on the second compressor page to 'Yes'. The other settings are held for future use.

5.3 Monitoring the Input Signal

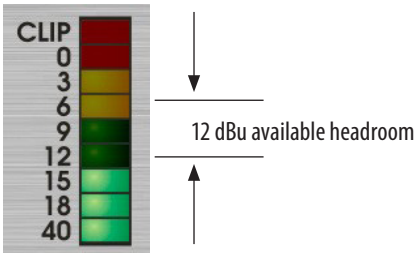


Each of the four inputs has a nine-segment signal meter for monitoring the internal signal clipping and compressor headroom or gain reduction.

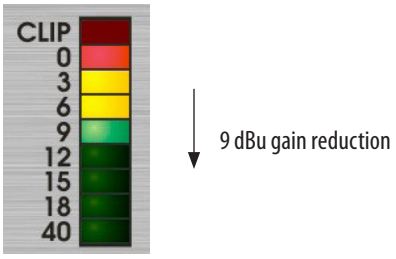
The top CLIP segment (shown illuminated in diagram left) monitors the internal signal clipping. It operates independently of the rest of the meter, illuminating when signal clipping is detected at any stage in the processing circuits, regardless of whether the input level is above or below the compressor threshold. Hence, the audio engineer has full visibility of internal signal clipping that may result in audio distortion.

The 0 dB to –40 dB signal meter monitors the input level on a relative scale, where the "0" segment is set at the specified compressor threshold. For example, if the threshold is set to +9 dBu then the input signal meter "0" segment is set at 9 dBu true value, and a signal of –3 dBu registers as 12 dBu below the threshold (below left). Thus, when the signal level is below the threshold, the meter indicates the headroom.

When the signal level reaches the threshold, that is, the red "0" segment illuminates, the meter 'flips' and reads downwards to show the amount of gain reduction applied to the signal.



Signal level below compressor threshold



Compressor threshold reached

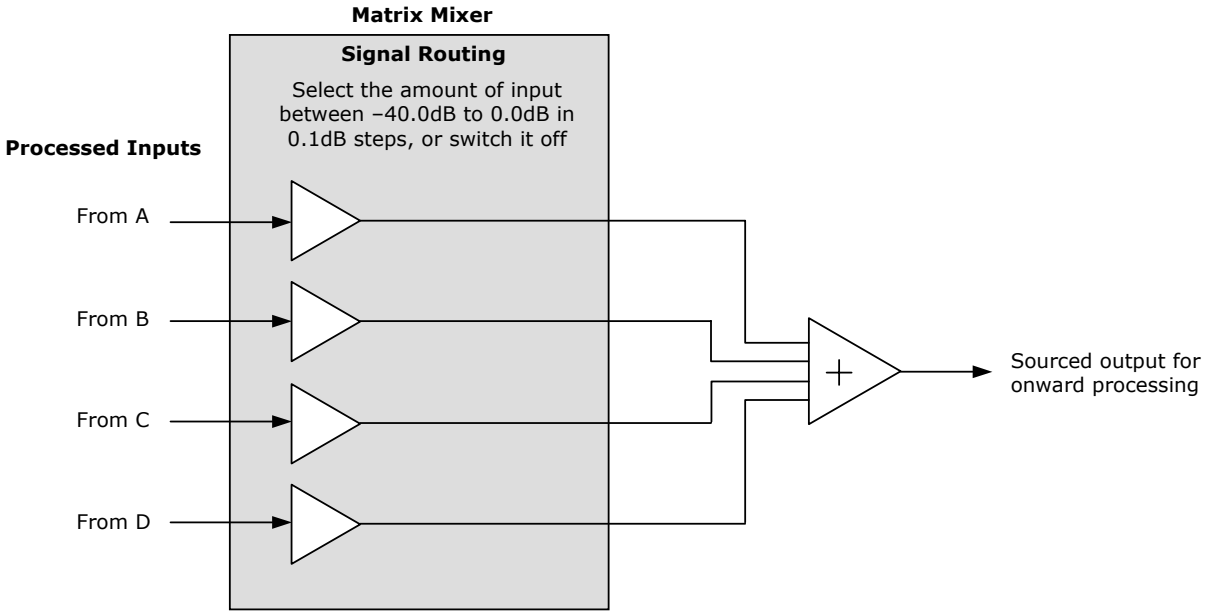
Output Channels

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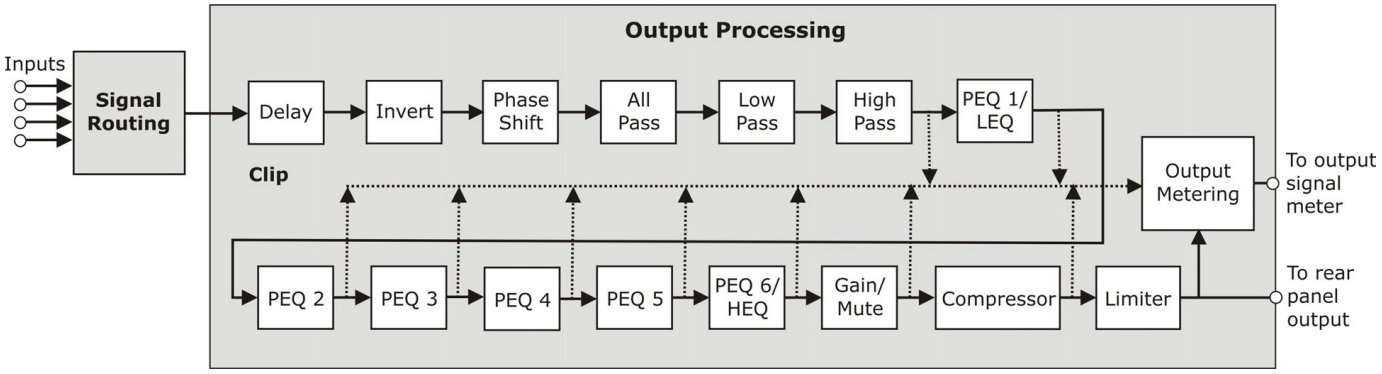
6. Output Channels

6.1 Brief Technical Overview

The output channels are slightly more complex than the input channels in that they are responsible for the signal routing as well as output signal processing. At the input of each output there is a matrix mixer (see following diagram) that can source each output from a mix of the four input channels (A to D). An output can derive its source from a single input by setting the gain of the other inputs to off. The amount, or level, of input that can be routed to the output is variable from –40 dB to 0 dB in 0.1 dB steps, or can be switched off completely.



After routing, the resultant signal is passed through the various output processing circuits as shown below. Processing options include delay, inversion, two independent phase adjustment stages (Phase Shift and All Pass), filtering, six stages of parametric equalisation, gain/mute, compression and limiting. All key stages are monitored for signal clipping which, if detected, illuminates the top red segment at the top of the output signal meter. In addition, the signal is monitored through the compressor and limiter stages to provide headroom/gain reduction indications at the signal meter.



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6.2 Setting Output Parameters

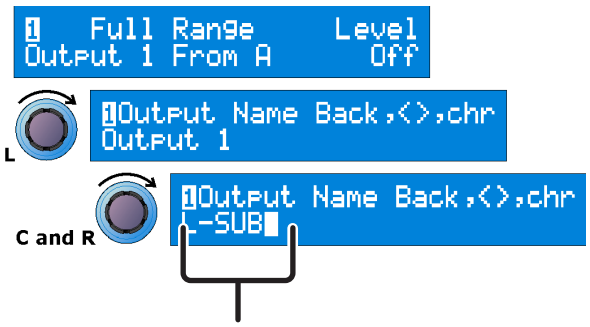
Signal processing for each output channel is programmed independently via the separate Output menu associated with each channel. The signal processing parameters are described below in menu order.

- **To access the Output menu pages for a particular channel**
  - Press its blue MENU ACCESS button (1 – 8) to switch to its menu.
  - Press the button repeatedly to step through the pages in turn. Note that, after the last page, the next button press will cycle the menu back to the first page.
- **To skip across to the same parameter on another output, press its MENU ACCESS button.**

6.2.1 Naming the Output Channel and Matrix Mixing (Page 1)

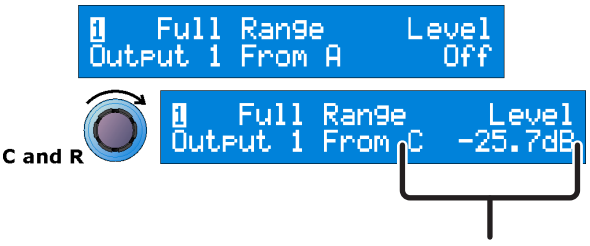
Each output channel can be allocated a name up to eight characters long, which will be shown in the first page of the menu for easy reference. The default names are "Output 1", "Output 2", etc. Names are retained after power down and are included in stored settings.

Each output of the DN9848E can be sourced from a mix of the input channels. The level of the source inputs can be set to between 0.0 dB and –40.0 dB or switched off.



User-defined channel name

- **To enter a name**
  1. Turn the left **DATA ENTRY** control knob clockwise to access the Output Name menu page.
  2. Use the centre control knob to move the cursor right or left, and the right control knob to select the letter, number or symbol.
  3. On completion, turn the left control knob anti-clockwise to go back to the main page. The new name is now shown to the left of the menu page.



User-defined output channel source and level

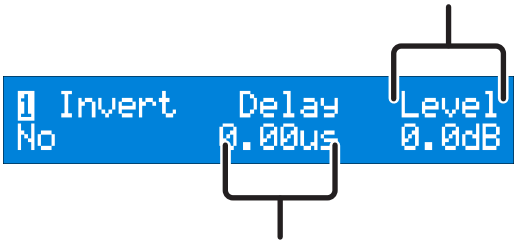
- **To set the source input channel and adjust the level**
  1. Using the centre **DATA ENTRY** control knob, select source input channel, that is, A, B C or D.
  2. Turn the right control knob to select the level of the source input, or switch level off.
  3. On completion, press the next output channel **MENU ACCESS** button to go to the next menu page.

6.2.2 Signal Invert, Delay and Output Level (Page 2)

Each output can be phase inverted by 180° (separate to the phase-alignment for crossover), delayed for system alignment and the level attenuated or boosted.

Delay can be specified in terms of time or distance, as preferred. The unit of measurement is changed in the Set Up menu (see Section 7.9).

The Level entered here sets the baseline output level, that is, the 'zero' value, for the rotary Output Gain controls. For example, if the Level is set to 6 dB, the 0 represents 6 dB. Turning the rotary Gain Control right/left will increase/decrease the level in a proportional manner beyond 6 dB (it is not directly additive since the gain is limited to +12 dB). Hence, the Output Gain controls enable fine-tuning during a performance, while the baseline output level is retained as a standard setting for future use.



- **To invert the output signal**
  - Turn the left **DATA ENTRY** control knob clockwise until the Invert field reads "Yes". The default setting is "No" inversion.
- **To set the delay**
  - Turn the centre **DATA ENTRY** control knob slowly for step increments, or sharply to leap to the bottom/top of the range (one or two sharp turns should cover the whole range). When the delay is set for time the overall range is 0 to 300.00 ms, with steps of approximately 5.2 µs between 0 to 1 ms and steps of 0.01 ms between 1ms to 300 ms. When the delay is set for metres the overall range is 0 to 103.06 m in steps of 0.1 m and for imperial (feet and inches) the overall range is 0' 0" to 338' 0" in steps of 1".
- **To set the base level for the front panel Gain control**
  - Turn the right **DATA ENTRY** control knob. The range is –40 dB to +12 dB in steps of 0.1 dB, with an OFF position just 'below' –40 dB. Setting the gain to OFF will mute the input signal.

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6.2.3 Phase Adjustment (Pages 3 and 4)

To meet the demands of a wide range of situations, the Klark Teknik DN9848E provides two all-pass filters with complementary control parameters for fine-tuning the phase response on each output, for example, for alignment at crossover. The first filter is presented as a 'phase shifter' for which you can set a specific phase shift at a reference frequency, for example, the HPF or LPF (typically the crossover point). The second filter enables a 1st or 2nd order phase shift to be applied at a chosen frequency. With 2nd order, the phase shift window can be shaped, that is, you can adjust the steepness of the transition by setting the Q value.

For detailed information on how these filters modify the signal, please refer to Section 10 "Application Notes".



- **To set a precise phase shift at a reference frequency**
  1. Step to the Phase Angle/Ref page shown right.
  2. Turn the centre **DATA ENTRY** control knob to select a phase angle between 0º and 180º. Turn the right control knob to set the reference frequency to HPF, LPF or one of the six PEQs (set in the subsequent Output menu pages).



- **To apply a 1st order phase adjustment in relation to a chosen frequency**
  1. Step to the All-Pass page, shown right.
  2. Turn the right **DATA ENTRY** control knob to enable a 1st (90º) order shift.
  3. Turn the left control knob to the required frequency.



- **To apply a 'shaped' phase transition at a chosen frequency**
  1. Step to the All-Pass page, shown right.
  2. Turn the right **DATA ENTRY** control knob to enable a 2nd (180º) order shift.
  3. Turn the centre control knob to select the Q (slope) and the left control knob to select the frequency.

6.2.4 High Pass and Low Pass Filters (Pages 5 and 6)

The DN9848E provides the following high and low pass filter (HPF and LPF) options for crossover purposes:

Butterworth:	6, 12, 18, 24, 36 and 48 dB / Octave
Bessel:	12, 18, 24, 36 and 48 dB / Octave
Linkwitz Riley:	12 and 24 dB / Octave
Peaking (HPF only):	12 and 24 dB / Octave 0-6 dB Gain
Bypass:	No Filter



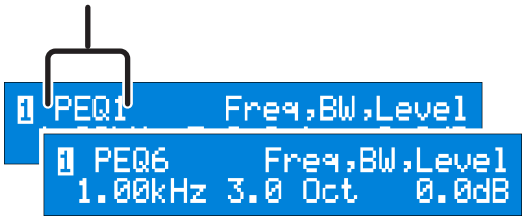


- **To add a high/low pass filter to output processing**
  1. Step to the HPF or LPF page, as required (see right).
  2. Use the left **DATA ENTRY** control knob to specify the cut-off frequency.
  3. Use the centre control knob to select the filter type and the right control knob to set the slope/gain. (The right parameter switches between slope and gain, dependent on the filter type).
- **To bypass the high/low pass filter processing**
  1. Step to the HPF or LPF page, as required.
  2. Turn the centre **DATA ENTRY** control knob anti-clockwise to 'Bypass'. The last selected values for each type of filter are retained in the background for easy recall.

6.2.5 Parametric Equalisation (Pages 7 to 12)

The DN9848E provides six parametric equalisation stages on each output channel, for equalising the output signal in respect of loudspeaker and/or system characteristics. The first and last of these PEQ sections can, alternatively, be configured for lower and upper shelving equalisation. All the PEQ sections can be used across the full range from 20Hz to 20kHz and are set independently via their own menu page.

Any PEQ can be used as the reference frequency for the Phase Shifter (see Section 6.2.4)



- **To set a PEQ**
  1. Set a centre frequency (21 steps per octave) and bandwidth (0.08 to 3 Oct) for the PEQ section, using the left and centre **DATA ENTRY** control knobs, respectively.

     Or:

     Switch to an LEQ/HEQ setting with a 6 dB or 12 db slope by turning the centre control knob clockwise beyond 3 Oct (see below). Use the left control knob to set the LEQ/HEQ frequency.





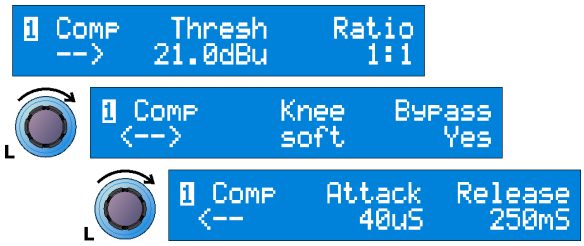
  2. Turn the right control knob to set the amount of attenuation/boost from -12 dB and +12 dB.

If a PEQ section is not needed in the set up, set its level to 0 dB.

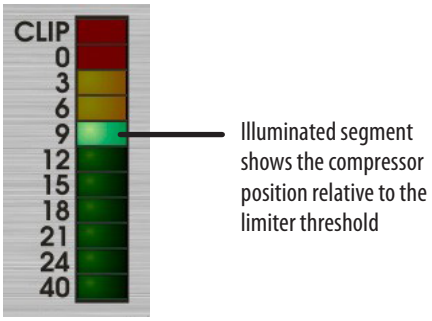
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6.2.6 Compression (Page 13)

Each output has an independent full range compressor to improve the audio dynamics and/or reduce louder signal levels to avoid loudspeaker damage. The compressors are variable ratio and can be set to a hard knee characteristic for a sharp gain reduction response at the compression threshold, or soft knee for a more 'musical' response.



- **To set the compressor parameters**
  1. On the first compressor menu page, use the centre **DATA ENTRY** control knob to select a threshold value in the range –10 dBu to +21 dBu, and the right control knob to set a ratio from 1:1 to 5:1.
  2. Turn the left control knob clockwise to access the first submenu page. Use the centre control knob to select a hard or soft knee characteristic and the right control knob to set the bypass state to "No" so that the compressor is included in the signal path. The relative position of the compressor threshold to the limiter threshold will be indicated by an illuminated segment at the meter (provided the compressor threshold is below the limiter threshold).
  3. Turn the left control knob clockwise to access the second sub-menu page. Use the centre control knob to set the compressor attack time (range of 40µs – 1ms in 20µs steps or 1ms to 100ms in 1ms steps). Use the right control knob to set the release time (10 ms to 2 s in 10 ms steps).



- **To switch the compressor out of the circuit**
  - Set the bypass state on the second page to "Yes". The other settings will be retained for future use.

6.2.7 Output Limiter (Page 14)

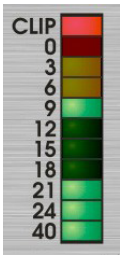
In addition to compression, each DN9848E output has a limiter to protect any attached equipment being driven into clip and potentially being damaged. Notably, the DN9848E uses a special 'look-ahead' limiter so that it can anticipate transient overshoots and act 'immediately' (see Section 10 "Application Notes" for further details). The limiter threshold can be adjusted to accommodate the varying requirements of commercial equipment.



- **To set the limiter parameters**
  1. Select a threshold value in the range –10 dBu to +21 dBu with the left **DATA ENTRY** control knob.
  2. Use the centre control knob to set a release time between 1ms and 100ms.
  3. Use the right control knob to select a hard or soft knee characteristic for a sharp or gradual cut-off, respectively.
- **To switch the limiter out of the circuit**
  - Turn the left **DATA ENTRY** control knob fully clockwise until the threshold value reads 'OFF' (a sharp turn will leap to the OFF position).

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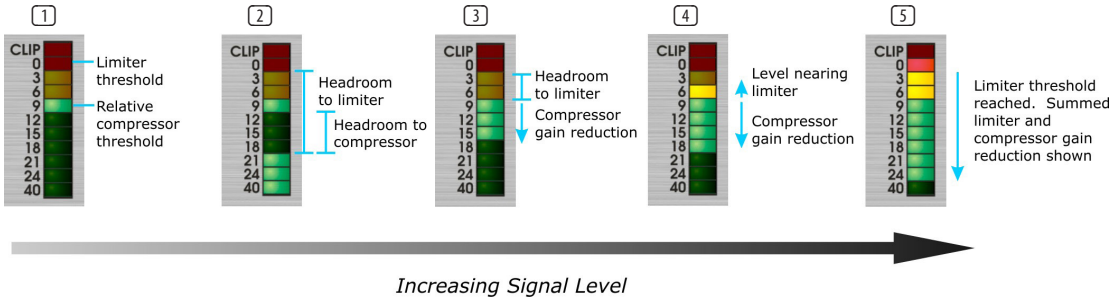
6.3 Monitoring the Output Signal



Each of the eight outputs has an 11-segment signal meter for monitoring internal signal clipping and output levels that may cause damage to the loudspeaker equipment.

The top CLIP segment monitors the internal signal clipping. It operates independently of the rest of the meter, illuminating if signal clipping is detected at any stage in the processing circuits regardless of whether the level of the final processed signal is above or below the compressor and/or limiter thresholds. Hence, the audio engineer has full visibility of any internal signal clipping that may result in audio distortion.

The 0 dB to – 40 dB signal meter is primarily designed to monitor the output level with respect to excessive levels that may cause damage to the onward loudspeaker equipment. To do this it uses a dual-purpose scale that refers the signal level to both limiter threshold and compressor threshold, as illustrated and described overleaf.



[1] The meter uses a downward relative scale where the "0" segment represents the limiter threshold. For example, if the limiter threshold is set to +5 dB in the output menu page, then the signal meter "0" segment represents 5dBu true value, the –3 segment becomes 2 dBu down, -6 becomes -1 dBu down and so on.

The compressor threshold is also marked, relative to the limiter threshold, by a single steadily lit segment. For example, when the limiter threshold is set to 8 dBu, the "0" segment is 8 dBu; if the compressor threshold is –1 dBu, segment "9" will be illuminated.

Note If the limiter is set to OFF, the meter is scaled relative to 21 dBu.

[2] While the signal level lies below the compressor threshold, the meter illuimates upwards from –40, such that the current headroom to both the compressor and limiter thresholds can be monitored.

[3] When the signal level reaches the compressor threshold level, the meter 'flips' and reads downwards to show the amount of gain reduction applied to the signal.

[4] With further increase, the meter reads in both directions, that is, it increments upwards to track the signal level as it approaches the limiter threshold and increments downwards to show the applied gain reduction.

[5] When the limiter kicks in, the meter flips to read downwards from the "0" segment instead of just from the compressor threshold. It now shows the summed gain reduction from both compressor and limiter.

6.4 Output Gain and Mute - Front Panel Control

Each output is equipped with a dual-action rotary/push-switch control for adjusting or muting the output level. Note that zero mark on the control refers to the baseline output level set in the Output menu (see Section 6.2.3) and hence the rotary control provides fine-tuning relative to this level.



To increase/decrease the level	turn clockwise/anti-clockwise
To mute an output	push in and hold until the red ring illuminates To un-mute an output push in and hold until the red ring light extinguishes
To mute all outputs	push in and hold an unlit output until it and then all other controls illuminate
To un-mute all outputs	push in and hold a muted (illuminated) output until it and then all other red rings extinguish

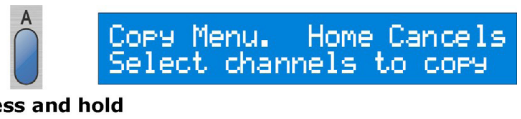
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6.5 Channel Copying

Parameters from a source channel may be copied to one or more destination channels using the channel copy function. Note that parameters may only be copied between channels of a similar type, that is, you cannot copy input channels to output channels or vice versa.

- **To copy a channel's parameters**

1. Press and hold the blue **MENU ACCESS** button on the source input (A - D) or output (1 – 8) channel for more than three seconds. This puts the unit into copy mode, as indicated on the display, and selects that channel as the source for the copy.



Press and hold

Note The **MENU ACCESS** button flashes to indicate that channel is selected as the source.

Press the **HOME** button at any point to exit copy mode and return to the Home page.

2. Now press the blue **MENU ACCESS** buttons on the destination channels. The buttons illuminate as they are selected.



Press destination channels

Note **If the s**ource channel is an input, you may only select input channels as destinations. Similarly, if the source channel is an output, only output channels may be selected as destinations.

3. Press the flashing blue **MENU ACCESS** button on the source channel again, and the display updates to request confirmation for the copy.



Press flashing source channel

4. Press the **STORE** button to confirm the copy, or press **HOME** to exit the copy mode without completing the operation.



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Security and Other Set Up Options

7. DN9848E Set Up Options

7.1 General

The DN9848E provides various set up options for adapting the operation of the unit to best suit your operational requirements and preferences, as follows:

- Comms channel setting for remote control operation (Page 1)
- Channel Gang setup for linking either input channels or output channels together (Page 2)
- Security features such as front panel lock and system memory protect (Pages 3 and 4)
- Analogue/digital input select (Page 5)
- Display and LED lighting (Page 6)
- Unit and memory naming (Pages 7 and 8)
- Backup of system memories to flash RAM (Page 9)
- Delay units of measurement (Page 10)
- Power up settings (Page 11)
- Ethernet settings for remote control operation (Pages 12 and 13)

These options are programmed in the Set Up menu and are described below in menu order.

- **To access the Set Up menu pages**
  - Press **HOME (SET UP)** to return to the Home page.
  - Press and hold the **HOME (SET UP)** button to open the menu.
  - Press the **HOME (SET UP)** button repeatedly to step through the pages in turn.

Note that this menu does not 'cycle'. On completing the set up, the menu returns to the Home page.

7.2 Remote Comms Channel/Gang Mode (Page 1)

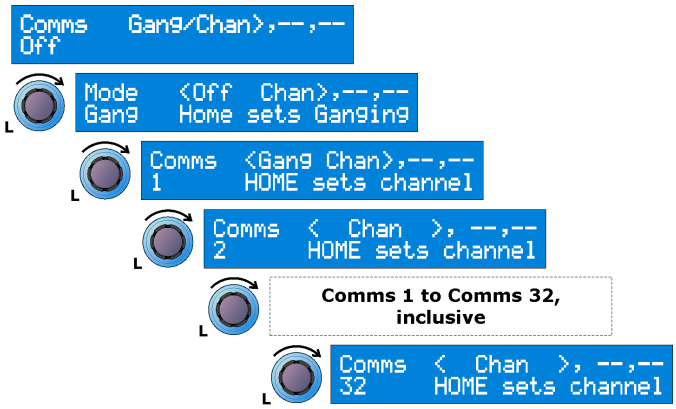
The Comms page lets you select either the communications channel on which the unit will send/receive data to/from a controlling PC, or the gang mode for working with ganged input or output channels.

Comms channels 1 to 32 are available enabling a slave network of up to 16 DN9848E units to be remotely controlled from a PC using the Elgar Library Manager and HELIX DN9848E RCS add-in software. For more information on DN9848E remote control set ups, see Section 9.

Note that, when using Ethernet communication you will need to set up the unit's IP address and Subnet mask before selecting the comms channel, see Section 7.11 for further details.

Also, note that remote comms and gang mode are mutually exclusive as channel ganging is a feature of stand alone unit operation only and is not compatible with the grouping facility offered in the Elgar 9848E Remote Control Software add-in. For more information on channel ganging, see Section 7.3.

- **To select a remote communications channel**
  1. Referring to diagram opposite, use the left **DATA ENTRY** control knob to go to the communications channel on which you wish to control the unit remotely, for example, scroll through to channel 14.
  2. Press **HOME** to confirm the selection; the display will change to the one shown below.





The front panel controls, except the **HOME (SETUP)** button, are locked out to facilitate remote operation.

The display indicates that the unit is under remote control.

For further details on DN9848E remote control set ups, see Section 9.

- **To switch gang mode on**
  1. Press and hold the **HOME (SET UP)** button to re-open the Comms page.
  2. Turn the left **DATA ENTRY** control knob to select the Gang Mode option shown above.
  3. Press **HOME** to enable channel ganging; the display will change to the one shown below and any ganging which has already been prepared will now be active.



For further details on ganging channels, see Section 7.3.

- **To switch remote communications/gang mode off**
  1. Press and hold the **HOME (SET UP)** button to re-open the Comms page.
  2. Turn the left **DATA ENTRY** control knob anticlockwise to select Comms Off, as shown opposite.
  3. Press **HOME** to confirm your selection.



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7.3 Gang Mode Setup (Page 2)

This option is used to link multiple input channels or output channels together so that a change on one channel will be made to all channels in the gang. When a gang is created, the settings from the source channel are copied to the destination channel(s) so that all ganged channels inherit the same parameter values. From hereon, any changes to a ganged channel are carried out on the other channels on an absolute basis, with the exception of input and output names.

Notes A channel may only be part of one gang.

Only channels of a similar type may be ganged, that is, you cannot gang input channels to output channels or vice versa.

Ganging is a feature of stand alone unit operation only and is not compatible with the grouping facility offered in the Elgar 9848E Remote Control Software add-in. Therefore, ganging is only active when the unit is put into Gang mode, see Section 7.2; channel ganging is disabled if the unit is set to receive data on a remote comms channel.

- **To select channels for ganging**

1. Step through the Set Up menu to the Gang Mode Setup menu page.
2. Press the blue **MENU ACCESS** button on the input (A - D) or output (1 – 8) channel that you wish to be the source channel for the gang.



Press to select source

Notes The **MENU ACCESS** button flashes to indicate that channel is selected as the source.

Press the **HOME** button at any point to exit the gang mode and return to the Home page.

3. Now press the blue **MENU ACCESS** buttons on the channels you wish to gang; the buttons flash as they are selected, and press the **STORE** button.



Press to gang channels

Note If the source channel is an input, you may only select input channels as part of the gang. Similarly, if the source channel is an output, only output channels may be selected.

4. Finally, press the **STORE** button again to confirm the operation. All parameters from the source channel are copied to the destination channels with the exception of the input and output channel names, and the channels are prepared for ganging.



To activate channel ganging, you must select the Gang mode as described in Section 7.2. With the unit switched to gang mode, any changes to a ganged channel are carried out on the other channels on an absolute basis. Also notice that when you select the blue **MENU ACCESS** button of a ganged channel in normal operation, the **MENU ACCESS** buttons on the ganged channels illuminate to show that they are part of the gang.

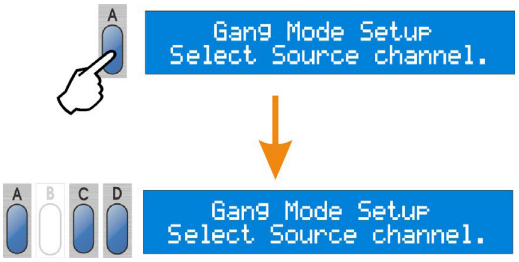
- **To remove a channel(s) from a gang**

This procedure is the same for input channels and output channels. In the following example, inputs A, C and D are initially ganged.

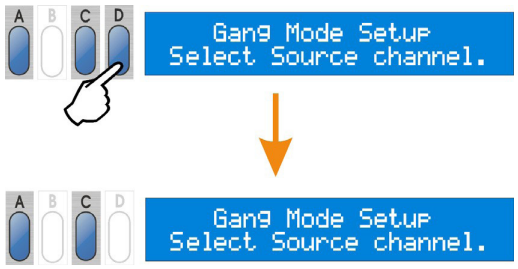
1. Step through the Set Up menu to the Gang Mode Setup menu page.



2. Press the blue **MENU ACCESS** button on any of the channels within the gang, for example, input channel A. The **MENU ACCESS** buttons flash to indicate channels in the gang.



3. Press the blue **MENU ACCESS** button on the channel you wish to remove from the gang, for example, channel D. The blue **MENU ACCESS** button will extinguish to show that it has been deselected and removed from the gang.



4. Repeat Step 3 for any other channel you wish to remove from the gang. To completely dissolve the gang, press all flashing **MENU ACCESS** buttons to extinguish them.
5. Press the **STORE** button twice to complete the operation.

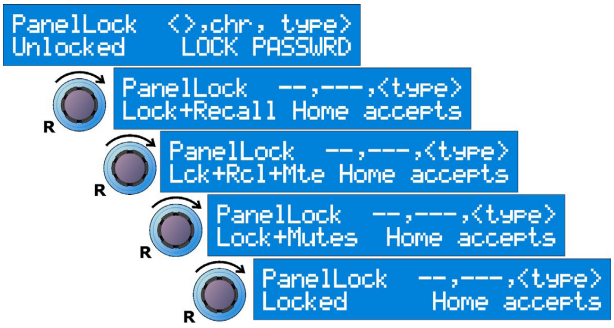
EN

7.4 Security Settings (Pages 3 and 4)

7.4.1 Front Panel Lock (Page 3)

This option is used to set a password and lock out all, or nearly all, of the front panel controls to protect settings from tampering by unauthorised personnel. Five levels of Panel Lock are possible:

- **Unlocked** – All controls available.
- **Lock + Recall** – This leaves the Recall button active so that saved memories can be still be recalled.
- **Lock + Recall + Mute** – As above, but also leaves the Mute controls active.
- **Lock + Mutes** – Leaves the Mute controls only active.
- **Locked** – Imposes a full lockout on the front panel controls.



In all cases, limited Set Up menu options remain available, namely the Comms Channel, Panel Unlock pages and Power Up pages.

- **To set a Panel Lock**

  1. Step through the Set Up menu to the Panel Lock menu page.
  2. Use the left and centre **DATA ENTRY** control knobs to set a password of 12 characters, including blank spaces, made up of letters, numbers and/or symbols.

     Important! Note that preliminary and subsequent blank spaces are recorded as part of the 12-character password; therefore, if you use a short password the characters must be re-entered in exactly the same position to unlock the panel. To avoid confusion, either record the blanks as part of the password or enter the word at the far left of the display.
  3. Turn the right control knob clockwise to cycle to the required lock type.
  4. Press **HOME** to apply the Panel Lock.

The Home page now indicates that the unit is 'Locked'. The lock state is retained after power down, and will be indicated on the Home page when the unit is powered up again.

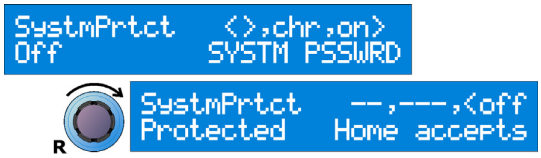
- **To remove the Panel Lock**

  1. Step through the Set Up menu to the Panel Lock page.
  2. Use the left and centre **DATA ENTRY** control knobs to enter the password. Note that the letters must be in the same position as when the password was set.
  3. Turn the right control knob clockwise to apply the password.
  4. If correct, the display will report 'UNLOCKED'. Press **HOME** to exit the page and return to normal operation.

If you have entered the wrong password, the DN9848E will flag it as incorrect and return to the Panel Unlock page for a further attempt.

7.4.2 System Protect (Page 4)

System Protect offers limited operational control, while protecting against unauthorised users tampering with key parameters that may result in loudspeaker damage.



- **When System Protect is on**
  - The output **MENU ACCESS** buttons and Output Mute controls are disabled, but the inputs can still be edited and the level and mutes are still active.
  - User memory settings can be recalled or stored, but System and Backup memories are inaccessible.
  - The full Set Up menu is still available.

Note Panel Lockout takes priority over the System Protect state.

- **To switch System Protect on**

  1. Step through the Set Up menu to the System Protect menu page.
  2. Use the left and centre **DATA ENTRY** control knobs to set a password of 12 characters (including blank spaces) made up of letters, numbers and a limited number of symbols.

     Important! Note that preliminary and subsequent blank spaces are recorded as part of the 12-character password; therefore, if you use a short password the characters must be re-entered in exactly the same position to unlock the panel. To avoid confusion, either record the blanks as part of the password or enter the word at the far left of the display.
  3. Turn the right control knob ('on>') clockwise to accept the password and switch protection on.
  4. Press **HOME** to apply the System Protect state.

The Home page now indicates the unit is locked with inputs editable. The System Protect state is retained after power down, as will be shown on the Home page when the unit is powered up again.

- **To switch System Protect off**

  1. Step through the Set Up menu to the System Protect page.
  2. Use the left and centre **DATA ENTRY** control knobs to enter the password. Note that the letters must be in the same position as when the password was set.
  3. Turn the right control knob clockwise to apply the password.
  4. If you have entered the wrong password, the DN9848E will flag it as incorrect and return to the Panel Unlock page for a further attempt.

If accepted, the password cursor stops flashing. When you next access this menu page, System Protect will be in the default Off state.

EN

7.5 Analogue/Digital Input Select (Page 5)

This page selects the input source for input channels A and B, and C and D on a paired basis due to the sharing of channels for AES/EBU inputs. There are three options available for each input pair:

- 'Analog' - switches to analogue inputs. Note that this is the default setting.
- 'DigSRC' – switches to the digital AES/EBU input. In this mode, the unit locks to its internal 48kHz clock reference. Sample rate converters (SRCs) support incoming signals at sampling frequencies from 32kHz to 96kHz ± 12.5%.
- 'DigLock' – switches to the digital AES/EBU input without sample rate conversion. In this mode, the sample rate converter (SRC) of the digital input is bypassed and the clock reference is set to lock to the channel's incoming AES/EBU bit stream. This allows the unit to be used in 48kHz systems without incurring the propagation delay inherent in sample rate conversion.

Note If both input pairs are set to 'DigLock', then either pair may be selected as the clock reference.

Any combination of analogue and digital inputs may be selected. For example, input channels A and B may be set for analogue sources while input channels C and D are digital.

- **To select the input source**

  1. Step through the Set Up menu to the Input Source select page.
  2. Use the left **DATA ENTRY** control knob to select the input source for channels A and B as shown opposite.
  3. Use the centre **DATA ENTRY** control knob to select the input source for channels C and D in a similar manner.



Note The 'Ref' menu shows the clock reference for the unit, for example, Internal. If both input pairs are set to 'DigLock', then this menu becomes active; turn the right **DATA ENTRY** control knob to select input source AB or CD as the clock reference.

7.6 LCD and LED Lighting (Page 6)

If required, the contrast of the alphanumeric display (LCD) and the brightness of the front panel LEDs can be adjusted to suit.

- **To adjust the contrast of the LCD**

  - Step to the LCD page. Turn the left **DATA ENTRY** control knob to adjust the display contrast. The default setting is 5, with a range of 0-10.



- **To adjust the brightness of the front panel LEDs**

  - Step to the LCD page. Turn the right **DATA ENTRY** control knob to adjust the LED brightness. The default setting is 4, with a range of 0-15.

7.7 Naming (Pages 7 and 8)

To help with system identification, the DN9848E unit and the current working memory may each be given a name up to 24 characters long.

Both names are shown in the Home page and are retained after power down, which is particularly useful for system reassembly when changing venues.



- **To enter a name**

  1. Use the left DATA ENTRY control knob to move the cursor right or left, and the centre control knob to select the letter, number or symbol. (**Tip**: to clear existing characters enter a blank space which can be found after the letter "Z".)
  2. Press the **HOME** button to apply the new name.

     Names can also be allocated to individual input and output channels via their associated menus (see Sections 5.2.2 and 6.2.2).

     All names are stored with User and System memory settings. The Store function will assume the working memory name as the default memory name, prompting you to edit it if required, see Section 8 "Storing and Recalling Settings".

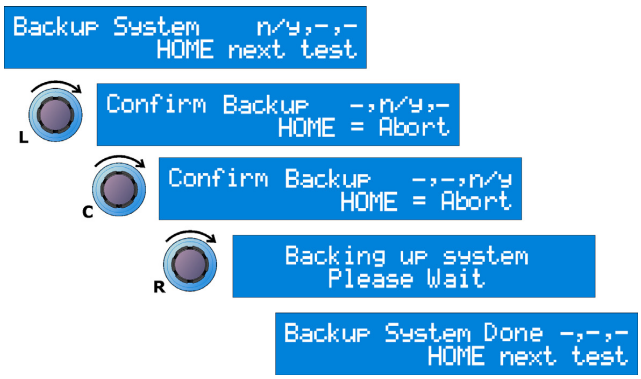
7.8 Backup System (Page 9)

This menu allows you to backup the 32 System memories, as described in Section 8, into flash RAM. By performing a backup, you can ensure that important System memories may be recovered in the event of power loss and battery failure.

- **To backup the 32 System memories**

  1. Step through the Set Up menu to the Backup System page.
  2. Turn the left, centre and then right **DATA ENTRY** control knobs clockwise to accept the three levels of confirmation.

  Or, press the **HOME** button to exit the operation and return to the Home page.



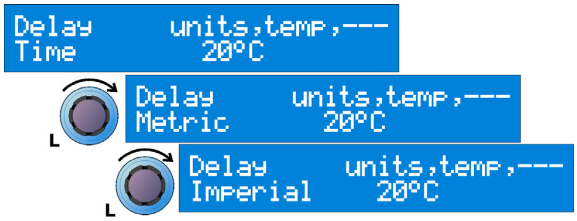
The backup copies System memories (S01 – S32) into Backup locations (B01 – B32) in one operation. You may recall any of the backup memories (B01 – B32) using the Recall function as described in Section 8.

7.9 Delay Options (Page 10)

The units of measurement used to specify the delay on the input and output channels can be set to suit user preference, as follows:

- Time (milliseconds and microseconds)
- Metric distance (metres)
- Imperial distance (feet and inches)

- **To change the units of measurement**
  1. Step through the Set Up menu to the Backup System page.
  2. Turn the left **DATA ENTRY** control knob to choose the units.
  3. For Metric or Imperial distance measurement, specify the ambient temperature of the venue using the centre control knob. The DN9848E will use this to adjust the speed of sound (which varies with temperature) in the delay calculation so that accurate delays are applied to the channels.



The delay units are changed in the input and output menus, with the current values being automatically converted to equivalent values.

7.10 Power Up Options (Page 11)

Two power up options are provided as follows:

- Logo On/Off– This refers to the logo animation displayed a start up.
- Output Level Ramp – This is used to apply a gradual ramp up to full output levels when you power on the unit, for example, to avoid sudden power surges in larger systems. The ramp can be adjusted between 0 – 32s and will recover the output mute states held when the unit was last switched off. Alternatively, an initial mute can be automatically applied to all of the outputs (on a ramp setting; this is the default setting.



- **To switch the logo on/off, turn the left DATA ENTRY control knob**
- **To change the ramp up time at the outputs, turn the centre DATA ENTRY control knob.**

  The 'Outputs Muted' option is found just below 0s.

7.11 Ethernet Settings (Pages 12 and 13)

When controlling the DN9848E unit remotely via Ethernet, the unit requires an individual IP Address and Subnet Mask to be set. For more information on DN9848E remote control set ups, see Section 9.

7.11.1 Ethernet IP Address (Page 12)

The IP Address is entered manually on each unit in the network using the DN9848E's front panel controls.

- **To check the current IP Address**
  1. With the DN9848E connected to your network, step through the Set Up menus to the Ethernet IP Network setup page shown opposite.
  2. Turn the left **DATA ENTRY** control knob and the unit will scan the network to obtain the IP address.



At the end of the scan, which takes a few seconds, the display updates with an IP address as shown above. The Default IP Address is 192.168.1.1.

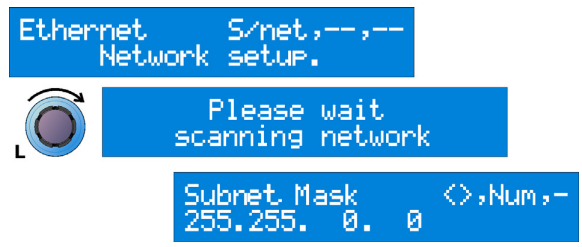
- **To set the IP Address**
  1. Turn the left **DATA ENTRY** control knob to highlight the area of the IP Address you wish to change.
  2. Now turn the centre control knob to select a number from 0 to 255.
  3. Press the **HOME** button to confirm the new IP Address.

Note It is important that all units and the controlling PC have a unique IP Address in order for the network to function correctly. For more information on configuring your network, please see the HELIX DN9848E RCS User Guide.

7.11.2 Ethernet Subnet Mask Setup (Page 13)

When the IP Address is set, it is necessary to check the Ethernet IP Address Subnet mask on each unit. The default subnet mask is 255.255.255.0.

- **To check and edit the Subnet Mask**
  1. Step through the Set Up menus to the Ethernet S/Net Network setup page shown opposite.
  2. Turn the left **DATA ENTRY** control knob and the unit will scan the Network to obtain the Subnet Mask.
  3. Turn the left **DATA ENTRY** control knob to highlight the area of the Subnet Mask you wish to change.
  4. Now turn the centre control knob to select a number from 0 to 255.
  5. Press the **HOME** button to confirm the new Subnet Mask



Note It is important that all units and controlling PCs have the same Subnet Mask to function correctly. You may want to modify Subnet Masks where one area of the network is required to be 'hidden' from another. For example, in an installation with one network but multiple auditoriums. For more information on configuring your network, please see the HELIX DN9848E RCS User Guide.

For more information on remote control setups, see Section 9.

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Using the DN9848E Memories

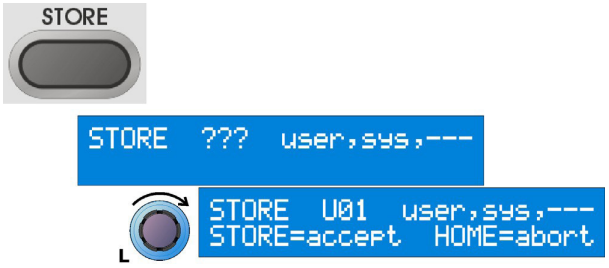
8. Storing and Recalling Settings

The DN9848E System Controller has the following memory facilities:

- 32 lockable System memories, designated as S01 to S32, for storing standard set-ups in battery-backed-up SRAM. These memories may be locked to prevent accidental changes to common set-ups using the System Protect function as described in Section 7.4.2. They may also be backed up into flash memory, using the Backup System function as described in Section 7.8, to provide system memory recovery in the event of power loss and battery failure.
- Five free access User memories, designated as U01 to U05, for storing a series of set ups for the current show.

- **To store settings in either a user or system memory**

1. Press the black **STORE** button to access the Store menu.
2. Select a User memory location (U01 –U05) using the left **DATA ENTRY** control knob, or a System memory location (S01 – S32) using centre control.
3. Press **STORE** to accept the memory location and move on.



Note Since a memory location is now active, you should only press **STORE** if you wish to accept and continue the storing process. Otherwise, press **HOME** to abort.

4. The current working memory name is displayed (as defined in the Set Up menu). To change the name before storing, use the left **DATA ENTRY** control knob to move the cursor right or left, and the centre control knob to select the letter, number or symbol.

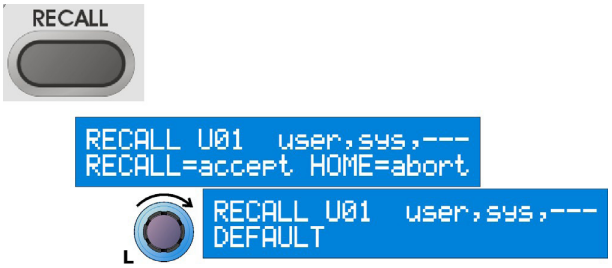


5. Press **STORE** to confirm the action and return to the DN9848E Home page.

The DN9848E automatically checks the memory settings and displays a warning if any errors are found. Where possible, it will also attempt to automatically correct the error.

- **To lock the 32 system memory locations see Section 7.4.2 System Protect.**
- **To recall stored settings from memory**

1. Press the black RECALL button to access the Recall menu.
2. Select a User memory (U01 – U05) using the left **DATA ENTRY** control knob, or a System memory (S01 – S32) or Backup memory (B01-B32) using the centre control.
3. Press **RECALL** to confirm the action and return to the DN9848E Home page.



The selected memory settings are recalled to the working memory.

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Remote Control Setup

9. DN9848E Remote Control Setup

A slave network of up to 16 DN9848E System Controllers can be linked together and remotely controlled from a PC running the Elgar Library Manager and HELIX DN9848E RCS add-in software. Further details on these commercially available software applications can be found on the Klark Teknik website at www.klarkteknik.com.

9.1 Overview

To control a system, a laptop/PC running HELIX DN9848E RCS is connected to one of the HELIX DN9848E units. The laptop/PC then assumes control of the HELIX units' system. The following options for connecting the laptop/PC to the system are available:

Ethernet: HELIX DN9848E units have a direct Ethernet LAN connection to the PC and can be connected together in a daisy chain configuration, or each one can be plugged into an Ethernet switch or hub, all via their rear panel Ethernet sockets. The wireless option offers increased flexibility during the event set-up, as the engineer can move around freely with a laptop and adjust the equalisation while listening to the end effect at any place in the venue.

Serial (option): The optional RS-232 serial connection is via the "PC PORT" on the front panel of the first HELIX DN9848E unit. It is possible to connect to other HELIX DN9848E units from the rear Ethernet port(s) when using a serial connection, but note that this will be slower than using Ethernet.

The following sections describe how to connect the master HELIX DN9848E RCS laptop/PC to the system for each option and also the interconnectivity of the HELIX DN9848E units. For details on configuring and controlling the system from the PC applications, please refer to the Elgar Library Manager and HELIX DN9848E RCS User Guides.

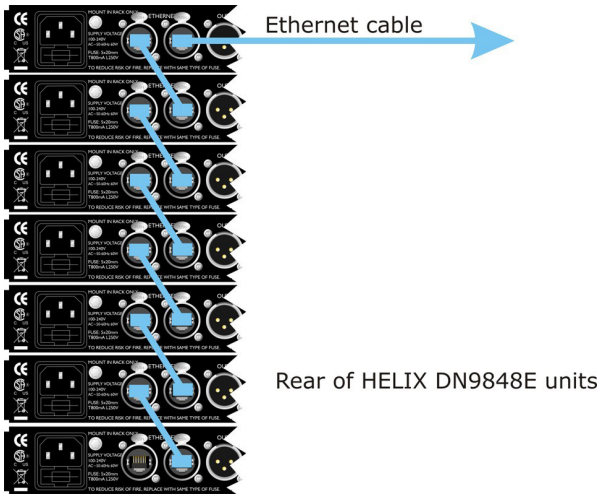
9.2 HELIX DN9848E unit interconnections

The HELIX DN9848E units in your system can be connected together in a daisy chain, or each one can be connected to an Ethernet switch or hub.

Note When connecting the Ethernet cable to the rear panel of a HELIX DN9848E unit, either of the Ethernet sockets can be used.

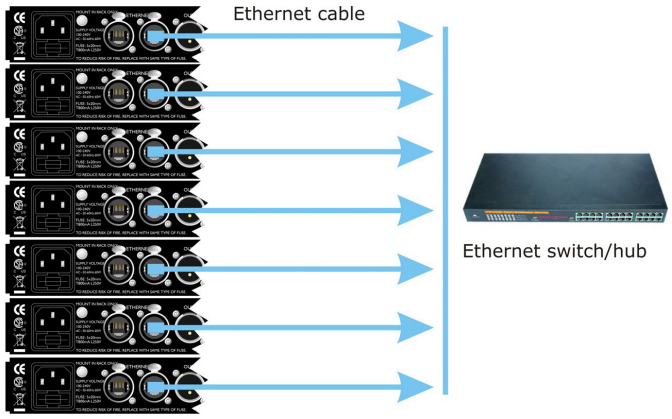
9.2.1 Connecting HELIX DN9848E units in a daisy chain

The diagram below shows a typical example of the HELIX DN9848E units connected in a daisy chain configuration.



9.2.2 Connecting HELIX DN9848E units to an Ethernet switch or hub

The diagram below shows each HELIX DN9848E unit directly connected to an Ethernet switch or hub, which is then connected top a laptop/PC.



Rear of HELIX DN9848E units

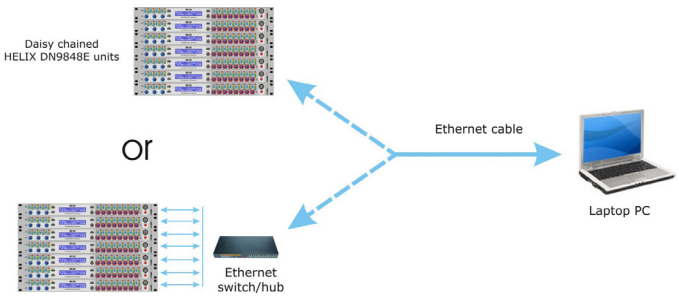
9.3 Ethernet Connection

For familiarisation purposes, a basic Ethernet connection may be made to a single unit by connecting the Ethernet cable to either of the unit's rear panel Ethernet sockets and to the network socket on the laptop PC or wireless access point (wireless option).

Note For Ethernet connectivity, the HELIX DN9848E units must be operating V4.01 (or later) host code.

9.3.1 Ethernet connection – standard

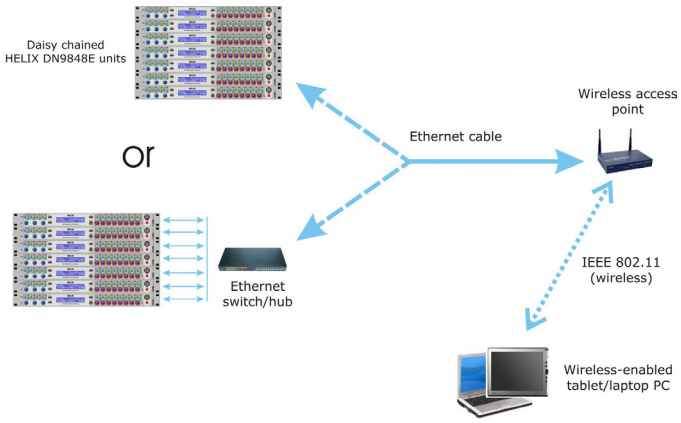
Alternatively, you can set up a system involving multiple units. One end of the Ethernet cable is connected to the network socket of the laptop/PC. The other end is either connected to an Ethernet socket on one of the HELIX DN9848E units (daisy chain), or an Ethernet switch or hub, depending on system configuration.



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9.3.2 Ethernet connection – wireless option

The system set-up for the wireless option Ethernet connection is via an Ethernet cable. One end is connected to the network socket of the wireless access point. The other end is connected to either an Ethernet socket on one of the HELIX DN9848E units (daisy chain), or an Ethernet switch or hub, depending on system configuration. This system is operated remotely from a tablet or laptop PC.



9.3.3 Configuring the DN9848E for Network Communication

Before you can control the DN9848E from your remote software, there are number of configuration settings to check on the DN9848E unit(s):

- First, you must configure the system devices (the laptop/PC and HELIX DN9848E units) to communicate with each other using TCP/IP protocol. This is done by assigning them unique IP addresses on the network. For more details on setting the IP Address and Subnet Mask on the DN9848E, see Section 7.11.
- Having completed the Ethernet setup, now activate remote comms on each DN9848E unit. Set each unit to receive and transmit data on a unique Comms channel following the instructions in Section 7.2.



Note that when you press **HOME** to confirm channel, the display updates (see diagram right).

- The final stage is to configure the Elgar Library Manager software to communicate with the DN9848E unit(s) on the correct ports with corresponding IP Addresses, etc. For more information on configuring the Elgar Library Manager and HELIX DN9848E RCS add-in software, please refer to the relevant documentation.

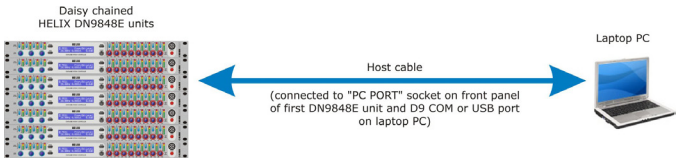
Note that once remote communications are established, the DN9848E display updates to show the Network status as "Yes", and that Data is being received, as indicated by a rotating line on the display.

9.4 Serial Connection (Option)

There is an option to control your system remotely from a laptop/ PC via the RS-232 connection (the "PC PORT") on the front panel of the first HELIX DN9848E unit. It is possible to connect to other HELIX DN9848E units from the rear Ethernet port(s) when using a serial connection, but note that this will be slower than using Ethernet.

9.4.1 Serial connection details

The system set up for serial connection is illustrated below.



9.4.2 Connection and Configuration Procedure

The remote control PC is connected to the system as follows:

- **To connect, set up and configure your system for serial operation**

1. Connect the HELIX DN9848E units in a daisy chain configuration, see Section 9.2.1.
2. Power up the HELIX DN9848E units and assign each one a unique Comms channel address, as described in Section 7.2.

Note The order of the addresses does not need to mirror the order of the daisy chain networking, but each unit MUST have a unique comms channel address.

3. Referring to the following table, connect your laptop/PC to the first HELIX unit in the daisy chain.

HELIX DN9848E Unit Connection
RS-232 input to front panel "PC PORT"

Laptop/PC Connection
D9 COM port
USB port

Cable/Converter Required
Host cable
KK systems USB/232 converter plus host cable

For details on configuring and controlling the DN9848E from the Elgar Library Manager and HELIX DN9848E RCS add-in software, please refer to the relevant documentation.

Application Notes

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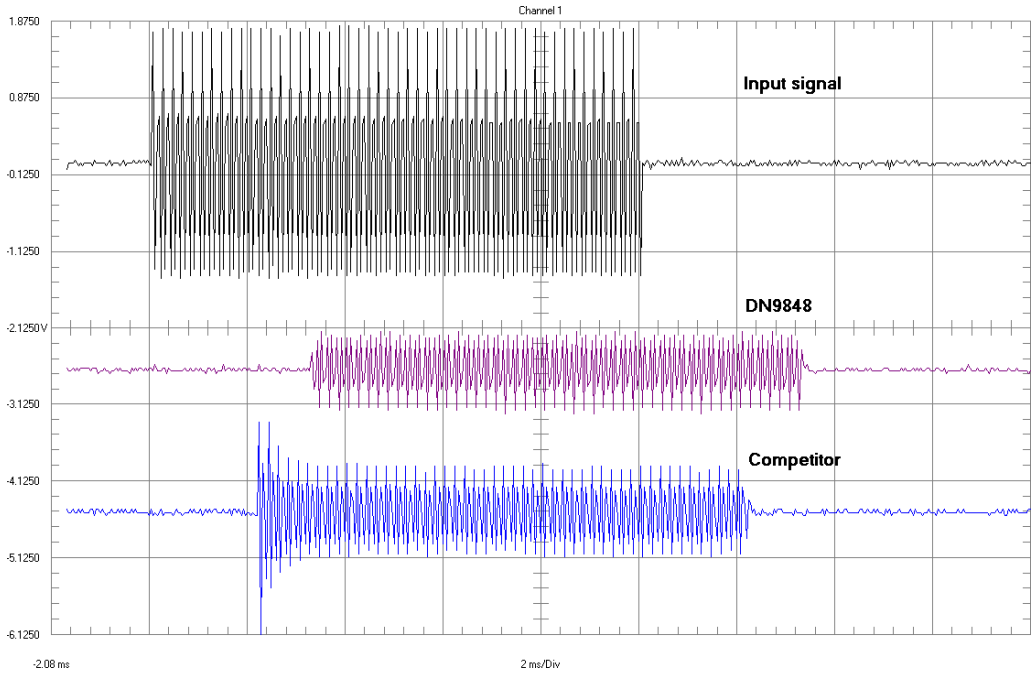
10. Application Notes

10.1 The Advantage of DN9848E Look-Ahead Limiters

The limiter in a loudspeaker processor is the last line of defence in protecting the speaker drivers from damage, and as such it has a very specific and critical job to do. One of the chief modes of loudspeaker failure is driver over-excursion, and unless the limiter is designed to act instantly in response to sudden increases in level, it will allow through brief transients that can cause damage through over-excursion. All dynamics processors take a finite amount of time to respond to a change in input level, and unless additional steps are taken the result is that the input signal is initially let through at anything up to its full level, until the gain element in the limiter can act in response to the increase in signal level.

The DN9848E exploits the fact that digital signal processing works on a sample-by-sample basis (the signal data samples are clocked through the unit at the sample rate of 48kHz) and that there is a small delay through each processing block, and literally 'looks-ahead' further back in the signal chain to sample the data for the limiter side chain, so that the limiter can apply the required gain reduction on an instantaneous sample-by-sample basis, so that the limiter never lets through any dangerous transients.

In the example below a 10kHz tone burst of 10 ms duration has been used as the input signal and the output of both a DN9848E and a leading competitor are shown. Note the very large transient of the competitor unit which does not have a look-ahead limiter.



Signal source: Audio Precision System One

Settings: Waveform: Burst – Normal. Frequency: 10.0kHz. Burst: 10 ms. Interval: 100 ms. High Level: +10.0 dBu Low level: - 40.0 dBu

DN9848E settings: HPF: 1.25kHz Lnk-Ril 24 dB/Oct. LPF: 20kHz Lnk-Ril 24 dB/Oct. Limiter Threshold: 0.0 dBu Release: 50ms Response: Hard Knee

Competitor settings: HPF: 1.26kHz Lnk-Ril 24 dB/Oct. LPF: 22kHz Lnk-Ril 24 dB/Oct. Limiter Threshold: 0.0 dBu Attack & Release: Automatic

All other settings are default on both units.

As with all units that use sigma-delta ADC and DAC converters, there is a propagation delay from input to output, 3.2 ms for the DN9848E and 2.1 ms for the competitor unit, the additional delay in DN9848E is caused by the use of sigma-delta converters for both analogue-to-digital and digital-to analogue conversion (the competitor unit uses a different method of digital-to-analogue conversion), which allows the DN9848E to achieve its superior dynamic range.

In order to prevent driver failure, the competitor product's limiter threshold needs to be reduced such that the peak of the transient is at the same level as the threshold of the DN9848E's look-ahead limiter, with a major effect on efficiency of speaker systems, as the effect of reducing the limiter threshold is to limit the amount of continuous output power available, which means more amplifiers and more speaker cabinets to achieve the same SPL. In the example below the competing unit's limiter threshold has been reduced so that level of the transient peak matches the threshold of the DN9848E's limiter:

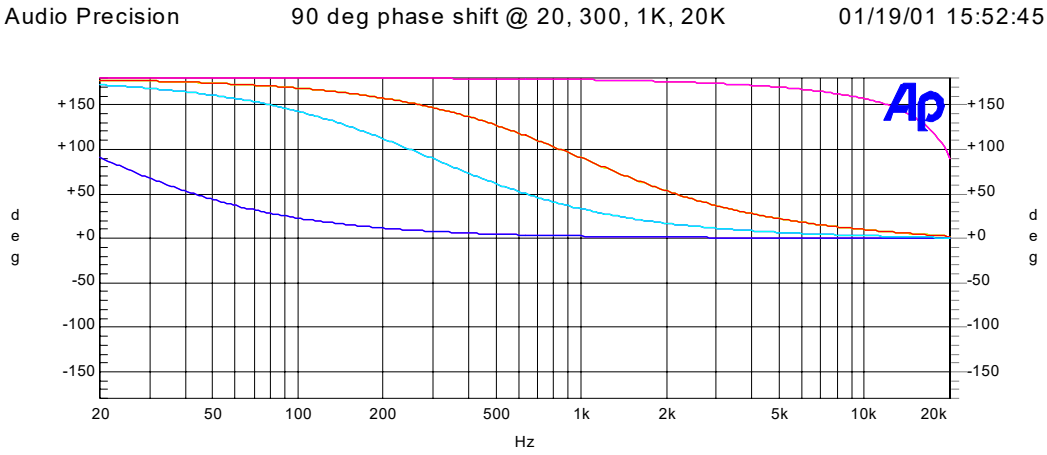
The limiter threshold of the competitor's unit has been lowered to -10.0 dBu to avoid the risk of driver damage from the initial transient, at the cost of greatly reducing the efficiency of the PA system. The look-ahead capability of the DN9848E's limiters allows the thresholds to be set at the levels required to protect the loudspeaker drivers, without the need to be concerned about transients being passed by the limiters. This allows the PA system performance to be maximised by safely exploiting the full operational range of the loudspeaker drivers.

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10.2 Phase-adjustment with the DN9848E

To meet the demands of a wide range of situations, the Klark Teknik DN9848E provides two all-pass filters with complementary control parameters for fine-tuning the phase response on each output. Although some crossover filter designs, e.g. Linkwitz-Riley types, are inherently phase-aligned at crossover, others such as Butterworth or Bessel responses may require manual phase alignment. Even Linkwitz-Riley filters may not produce accurate phase coherence when HPF and LPF are combined to produce a band-pass output. In addition, the phase response of the drive units and cabinets (especially horn-loaded types) may require compensation to achieve correct acoustic phase, even if the electrical phase is correct. The DN9848E filters provide straightforward tuning control in all cases.

The first filter of the DN9848E is presented as a "phase shifter" for which you can specify a particular phase shift at a reference frequency, namely a HPF or LPF (typically the crossover point) or one of the 6 PEQs. The plots in the graph below show the effect of these controls on the filter response when set to a 90° phase shift at references points equivalent to 20Hz, 300Hz, 1kHz and 20kHz. Referring to the figure, the overall response always remains the same shape i.e. tending from +180° at low frequencies to 0° at high frequencies, but is shifted along the frequency axis to achieve the required phase shift at the specified reference point.



Color	Line Style	Thick	Data	Axis
Green	Solid	1	Anlr.Phase	Left
Yellow	Solid	1	Anlr.Phase	Right
Yellow	Solid	1	Anlr.Phase	Left

phase.at1

Response of the phase shifter filter for a phase shift of 90° at reference points equivalent to 20Hz, 300Hz, 1kHz and 20kHz

The second filter, presented to the user as an "all-pass filter", enables the user to set the Order and Q of the phase shift, at a particular Frequency. The Order can be switched to Off (no filter), 1st order (90° shift) or 2nd Order (180° shift).

The graph over the page shows the response of the filter for a 1st order shift. In this mode, the Q control is disabled. As can be seen, the filter behaves in an identical manner to the phase shifter, i.e. the response tends from +180° at low frequencies to 0° at high frequencies, shifted along the frequency axis according to the chosen frequency. In effect, this is a phase shifter for which the frequency is entered directly, rather than being referred to a HPF/LPF or PEQ section.



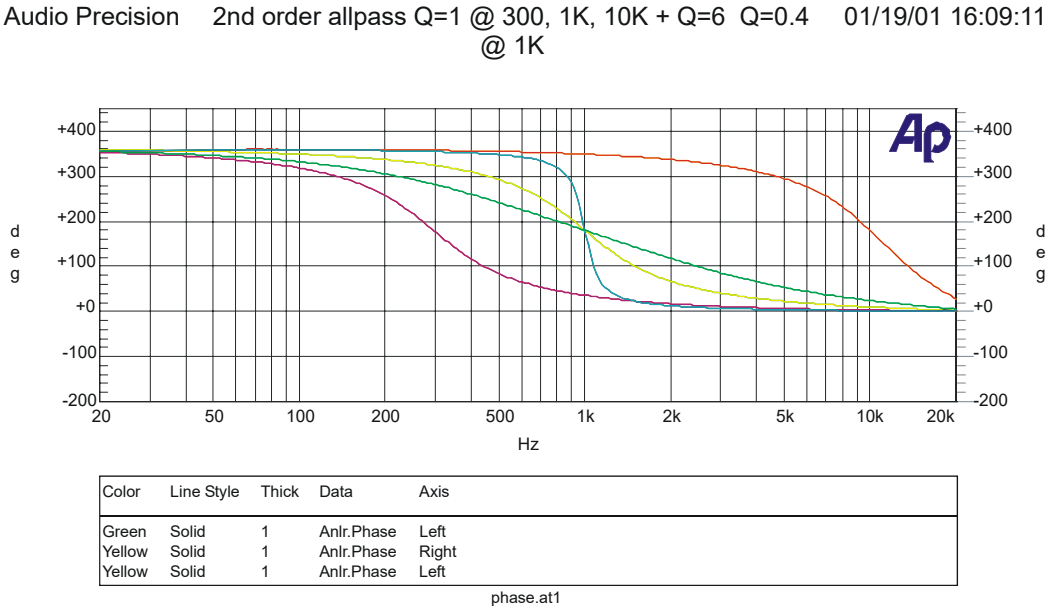
Color	Line Style	Thick	Data	Axis
Green	Solid	1	Anlr.Phase	Left
Yellow	Solid	1	Anlr.Phase	Right
Yellow	Solid	1	Anlr.Phase	Left

phase.at1

Response of the All Pass Filter for 1st Order phase shift at frequencies of 300Hz, 1kHz and 10kHz

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The response of the filter for a 2nd order shift is shown below with the Q control set to 1, at frequencies of 300Hz, 1kHz, and 10kHz, and also Q set to 6 (max) and 0.4 (min) at 1kHz. As can be seen, the filter response now tends from 360° at low frequencies to 0° at high frequencies, and Q controls the rate at which the phase changes (i.e. the slope) around the transition point. With low Q, the phase changes gradually across the whole frequency range. With high Q, the phase changes rapidly in the transition area, and is unchanging at 360°/0° over the remainder of the frequency spectrum. Hence, the 2nd order all-pass provides the user with the additional control of shaping the phase shift 'window'.



Response of the all pass filter for 2nd order phase shift with Q=1 at frequencies of 300Hz, 1kHz and 10kHz and also with Q=6 at (max) and Q=0.4 (min) at 1kHz

Note Both filters are all-pass with a flat amplitude response between 20Hz and 20kHz; only the phase response changes with frequency.

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Technical Specification

11. Technical Specification

Digital Inputs Two 2-Channel Inputs	
Type	AES/EBU
Impedance (Ω)	110
Sample Rate	44.1 kHz, 48 kHz, 88.2 kHz*, 96 kHz*
Word Length	24-bit or 16-bit
* SRC Input at these sample rates	

Analogue Inputs Four	
Type	Electronically balanced (Pin 2 Hot)
Impedance (Ω)	Balanced 20 k, Unbalanced 10 k
Common Mode Rejection	>80 dB @ 1kHz
Maximum level	+ 21 dBu

Audio Outputs Eight	
Type	Electronically Balanced (Pin 2 Hot)
Minimum load impedance	56 Ω /20 nF
Source impedance	56 Ω
Maximum level	+ 21 dBu into > 2 kΩ

Performance	
Frequency response (20-20 kHz)	+/- 0.3 dB with all filters and EQ flat
Distortion (THD+N) @ +8 dBu	<0.02% @ 1 kHz, +8 dBu
Dynamic range (20-20 kHz, unweighted)	>114 dB

Input Processing (per channel)	
Gain	+12 dB to -40 dB in 0.1 dB steps plus Off
Parametric EQ 1-12	Frequency range: 20 Hz to 20 kHz in 21 steps per octave
Boost/cut	+6/-18 dB in 0.1 dB steps
Bandwidth (Q)	3.0 to 0.08
Compressor	
Threshold:	+21 dBu to -10 dBu in 0.1 dB steps
Attack:	40 µs to 100 ms
Insert:	On/Off
Release:	10 ms to 2000 ms
Ratio:	1:1 to 5:1 in unit increments
Knee:	Hard/Soft
Delay (at 20°)	
Time:	0 to 1 second; 0 to 1ms in 20.8 µs steps and 1 ms to 1 s in 0.02 ms steps
Metric:	0 to 343.53 metres in steps of 0.1 m
Imperial:	0′ 0″ to 1127′ 0″ in steps of 1″

Output Processing (per channel)	
Routing	Full featured matrix mixing: any combination of inputs can be routed to any output in 0.1 dB steps from 0 dB to –40 dB and OFF.
Delay (at 20°)	
Time:	0 to 300 ms; 0 to 1 ms in 5.2 µs steps and 1 ms to 300 ms in 0.01 ms steps
Metric:	0 to 103.06 metres in steps of 0.1 m
Imperial:	0′ 0″ to 338′ 1″ in steps of 1″
Phase correction filters	0°‹ to 180°‹ in 5°‹ steps
All pass filter	1st and 2nd order
Low pass filter frequency range	50 Hz to 20 kHz in 21 steps per octave.
Supported configurations are:-	Butterworth (6 dB/Oct, 12 dB/Oct, 18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct) Linkwitz-Riley (12 dB/Oct, 24 dB/Oct) Bessel (12 dB/Oct,18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct)
High pass filter frequency range	20 Hz to 15 kHz in 21steps per octave.
Supported configurations are :-	12 dB/Oct Peaking 24 dB/Oct Peaking Butterworth (6 dB/Oct, 12 dB/Oct, 18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct) Linkwitz-Riley (12 dB/Oct, 24 dB/Oct) Bessel (12 dB/Oct,18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct) Peaking Filter Boost: 0 dB to +6 dB in 0.1 dB steps.
Parametric EQ 1	frequency range 20 Hz to 20 kHz in 21 steps per octave.
Low shelf filter Boost/cut:	+12/-12 dB in 0.1 dB steps
Parametric EQ Q:	3.0 to 0.08
Shelf slope:	6 dB/Oct and 12 dB/Oct
Parametric EQ 2-5	frequency range 20Hz to 20kHz in 21 steps per octave.
Boost/cut:	+12/-12 dB in 0.1 dB steps
Q:	3.0 to 0.08
Parametric EQ 6	frequency range 20 Hz to 20 kHz in 21 steps per octave.
Hi shelf filter Boost/cut:	+12/-12 dB in 0.1 dB steps
Parametric EQ Q:	3.0 to 0.08
Shelf slope:	6 dB/Oct and 12 dB/Oct
Polarity invert	Normal/invert
Output gain	+12 dB to -40 dB in 0.1 dB steps plus Off

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Output Processing (per channel)	
RoLook-ahead limiter Threshold:	+21 dBu to - 10 dBu in 0.5 dB steps
Release:	10 ms to 1000 ms
Knee:	Hard/Soft
Compressor Threshold:	+21 dBu to -10 dBu in 0.1 dB steps
Attack:	40 us to 100 ms
Insert:	On/Off
Release:	10 ms to 2000 ms
Ratio:	1:1 to 5:1
Knee:	Hard/Soft
Mute	On/off (press output trim)

Terminations	
Audio inputs/outputs	3-pin XLR
Ethernet inputs/outputs	Ethercon
RS-232	8-pin Mini-DIN socket (front) 9 pin D-type (rear)
World Clock	BNC
Power	3-pin IEC

Power Requirements	
Voltage / Consumption	100 to 240 V a.c ±10% 50/60 Hz < 60 VA

Dimensions & Weight	
Height	44 mm (1.75 inch) - (1U)
Width	483 mm (19 inch)
Depth	287 mm (12 inch)
Nett	4 kg
Shipping	6 kg

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Service Information

12. Service Information

12.1 Battery

This unit contains a battery. Do not expose unit or batteries to excessive heat, such as may be caused by sunshine, fire or the like.

12.1.1 Replacement

Caution!:

Danger of explosion if battery is incorrectly placed. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instruction.

Advarsel!:

Lithiumbatteri. Ekxplosionsfare ved feijlagtig handtering af samme fabrikat og type. Lever det brugte batteri tilbage till leverandoren.

FEDERAL COMMUNICATIONS COMMISSION COMPLIANCE INFORMATION

Klark Teknik

DN9848E

Responsible Party Name: **Music Tribe Commercial NV Inc.**

Address: **122 E. 42nd St.1,
8th Floor NY, NY 10168,
United States**

Email Address: **legal@musictribe.com**

DN9848E

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:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Important information:
Changes or modifications to the equipment not expressly approved by Music Tribe can void the user's authority to use the equipment.

CE

Hereby, Music Tribe declares that this product is in compliance with Directive 2014/35/EU,Directive 2014/30/EU, Directive 2011/65/EU and Amendment 2015/863/EU, Directive 2012/19/EU, Regulation 519/2012 REACH SVHC and Directive 1907/2006/EC.

Full text of EU DoC is available at https://community.musictribe.com/

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