

# DN9848

## OPERATORS MANUAL

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# KLARK TEKNIK GROUP

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## DECLARATION OF CONFORMITY

We, **Klark Teknik Group (UK) PLC**

of, Klark Teknik Building, Walter Nash Road, Kidderminster, Worcestershire, DY11 7HJ

Declare that a sample of the following product:-

Product Type Number	Product Description	Nominal Voltage (s)	Current	Freq
DN9848		115V AC 230V AC	200mA 100mA	50/60Hz

to which this declaration refers, is in conformity with the following directives and/or standards:-

Directive(s)	Test Standard(s)
Generic Standard Using EN55103 Limits and Methods	EN50081/2
Class B Conducted Emissions	EN55103
Class B Radiated Emissions	EN55103
Fast Transient Bursts	EN61000-4-4
Static Discharge	EN61000-4-2

Signed:.....

Date: 1st February, 2000

Name: David Hoare

Authority: Technical Director, Klark Teknik Group (UK) PLC

Attention!

Where applicable, the attention of the specifier, purchaser, installer or user is drawn to special limitations of use which must be observed when these products are taken into service to maintain compliance with the above directives. Details of these special measures and limitations to use are available on request and are available in product manuals.



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## **Thank You For Using This Klark Teknik Product**

To obtain maximum performance from this precision electronic product, please study these instructions carefully. Installation and operating the DN9848 is not complicated, but the flexibility provided by its operating features merits familiarisation with its controls and connections. This unit has been prepared to comply with the power supply requirements that exist in your location.

### **Precautions**

Do not install this unit in a location subjected to excessive heat, dust or mechanical vibration.

### **Voltage Selection and Power Connection**

Connection is made by means of an IEC standard power socket. The rear panel text indicates the voltage range required for satisfactory operation of the unit.

Before connecting this unit to the mains supply, ensure the fuse fitted is the correct type and rating is as indicated on the rear panel, adjacent to the fuse holder.

### **Safety Warning**

This unit is fitted with a standard fused IEC mains inlet: For safety reasons the earth lead should never be disconnected.

To prevent shock or fire hazard, do not expose the unit to rain or moisture. To avoid electrical shock do not remove covers. Refer servicing to qualified personnel only.

### **Attention!**

#### **Cables:**

This product should only be used with high quality, screened twisted pair audio cables, terminated with metal bodied 3-pin XLR connectors. Any other cable type or configuration for the audio signals may result in degraded performance due to electromagnetic interference.

#### **Electric Fields:**

Should this product be used in an electromagnetic field that is amplitude modulated by an audio frequency signal (20Hz to 20kHz), the signal to noise ratio may be degraded. Degradation of up to 60dB at a frequency corresponding to the modulation signal may be experienced under extreme conditions (3V/m, 90% modulation).

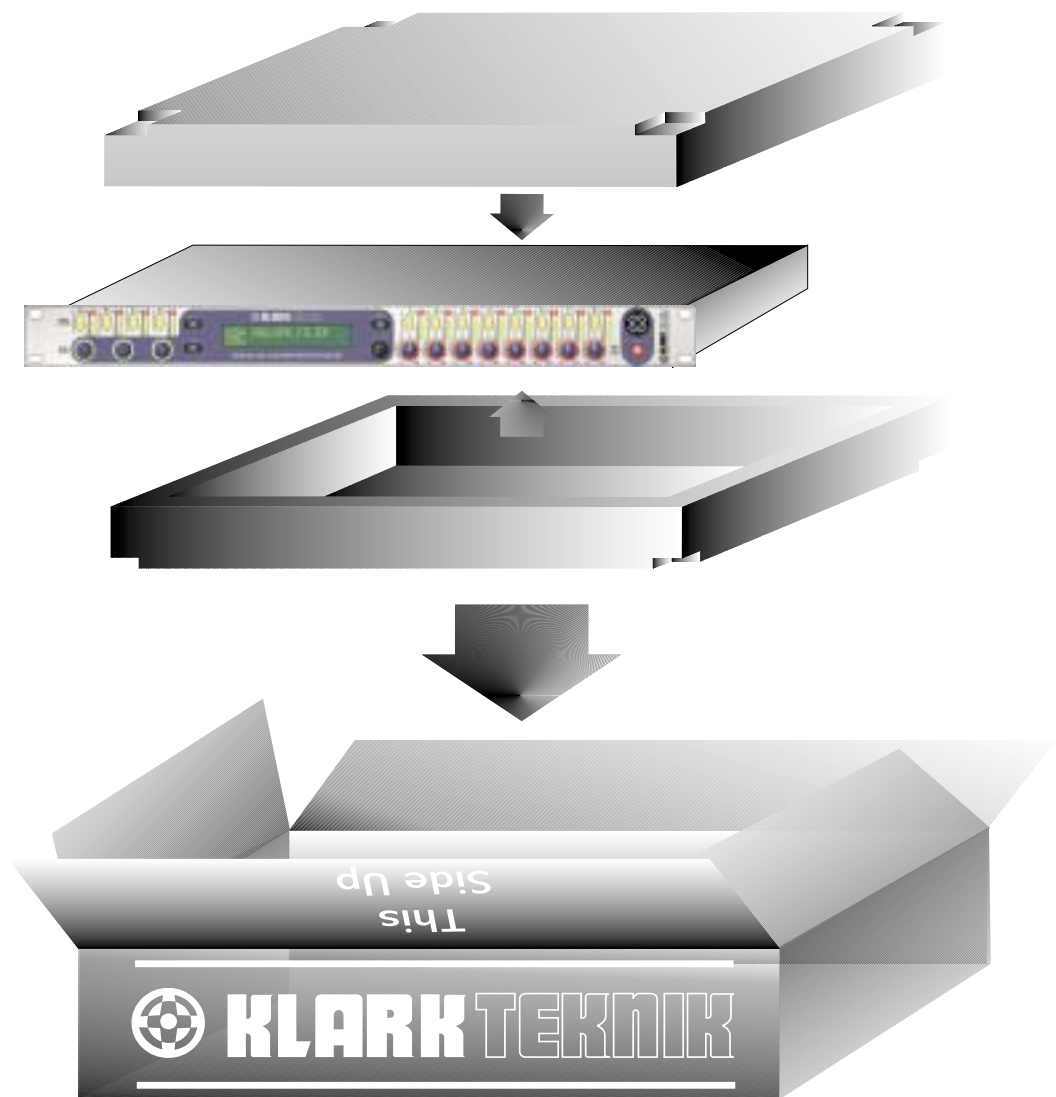
## After You Have Unpacked The Unit

Save all the packing materials - they will prove valuable should it become necessary to transport or ship this product.

Please inspect this unit carefully for any signs of damage incurred during transportation. It has undergone stringent quality control inspection and tests prior to packing and left the factory in perfect condition.

If, however, the unit shows any signs of damage, notify the transportation company without delay. Only you, the consignee, may institute a claim against the carrier for damage during transportation.

If necessary, contact your supplier or as a last resort, your Klark Teknik importing agent, who will fully co-operate under such circumstances.





## **Introduction**

The DN9848 is a highly configurable, digital electronic crossover/loudspeaker management system comprising of four balanced analogue input channels and eight balanced analogue output channels. The user may choose from the following preset routing configurations:

Each output channel may be sourced from the following input channel options :

None	
A	
B	
C	
D	
A+B	(channels summed at -3dB with balance control)
C+D	(channels summed at -3dB with balance control))
A+B+C+D	(channels summed at -6dB)

Though the DN9848 utilises a fully digital processor, it maintains the operational paradigm, as well as the sonic integrity, of a high quality analogue unit. In addition to guaranteeing absolutely precise filter operation, the use of digital technology provides unrivaled flexibility of routing, the ability to program delays into both the input and output channels, extensive equalisation on both the input and output channels, and of course programmability. Each input channel provides eight separately configurable, fully parametric equalisation stages that may be used for room equalisation, up to 1000ms of delay, gain control and compression. Full metering with clip indication is available for all input and output channels.

Each output channel provides configurable high and low-pass filters for setting the crossover characteristics as well as six further stages of fully parametric equalisation that may be used to compensate for system or enclosure characteristics. Further delay of up to 300ms is available on each output, mainly used for system time alignment, in addition to gain control, muting and limiting. Dual all-pass phase correction sections are also included, the first of which can be any of the filter or parametric EQ stages and can be adjustable in 5 degree steps.

The crossover filter types available are:

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

All aspects of the unit may be programmed from the front panel via a RS-232 port or via remote control using the standard comms port and RS-485 . Parameters may be directly edited via rotary controls and switches on the front panel with all values being displayed on a 2-line, 24 character backlight LCD display.

The operating system is held in flash ROM, enabling updates to be installed directly from a computer and various levels of safety lockout. This lockout ability may be used for installations or hire applications where unauthorised user intervention could place the connected loudspeaker systems at risk. Upto 24 character passwords can be used rather than PIN numbers due to the large display.

Six user memories, 32 System memories and 99 Factory Presets are available. The System memories are used to store complete setups for custom loudspeaker configurations while the User memories are provided to allow a small number of patches to be stored or recalled while the main System memories are locked to prevent alteration.

A working memory area is used to store the patch currently being used or edited - no changes made to the working memory will be made permanent until the patch is stored.

The Factory presets will include crossover setups for commonly used EV and third-party loudspeaker systems as itemised in the specifications section of this manual. A blank patch is also provided for overwriting existing user patches where required. All the memory areas are monitored by an error checking system. If an error is diagnosed, the DN9848 will attempt to correct the error and also display a warning message to alert the user.

As supplied, the user patches are set to unity gain with all processing switched out and no routing.

## **Installation**

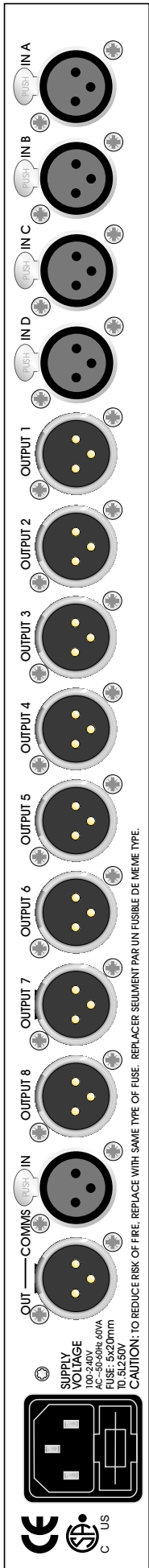
The DN9848 is housed in a standard, 1U, 19" rack case. Allow adequate ventilation and avoid mounting the unit directly above power amplifiers or other devices that radiate significant amounts of heat. Where necessary, use fan cooled racks.

This device must be grounded and must use an approved mains fuse. The switch mode power supply automatically adjusts itself to 50/60Hz mains supplies in the 100 to 240V (+/- 10%) AC range.

The inputs and outputs are electronically balanced on conventionally wired XLRs (pin 1 screen, pin 2 hot and pin 3 return) with a nominal operating level of +4dBu. For unbalanced use (input or output), pin 3 of the XLR may be grounded by linking it to the screen.

If ground loop problems are encountered, the user must not disconnect the mains earth but instead, disconnect the signal screen at one end of the connecting cables. This can only be done when the unit is being used within a balanced system.

# Rear Panel Connections



Both the input and output channels are accessed via electronically balanced XLR connectors wired pin 1 ground, pin 2 hot, pin 3 cold. These may be used unbalanced where necessary by connecting the ground and cold pins together, though balanced operation is recommended.

Two further XLR connectors (in/out comms) carry the RS-485 interface and are connected in parallel to facilitate the linking of multiple units. This interface facilitates remote control and monitoring.

Mains is fed to the unit via a standard IEC type connector.

## User Interface



The user interface has been designed to be clear and straightforward with the main functions divided into five menus covering the input channels, output channels, patch loading, patch saving and system setup. Each menu is stepped through linearly with three rotary controllers being used to edit the displayed parameters directly. For the purposes of identification, these will be referred to (left to right) as X, Y and Z. A green LED ring is associated with each of these encoders to indicate that the control is currently active as some menu pages do not require all three controls. The signal routing is handled within the output channel menu where combinations of the four input channels may be selected as the signal source.

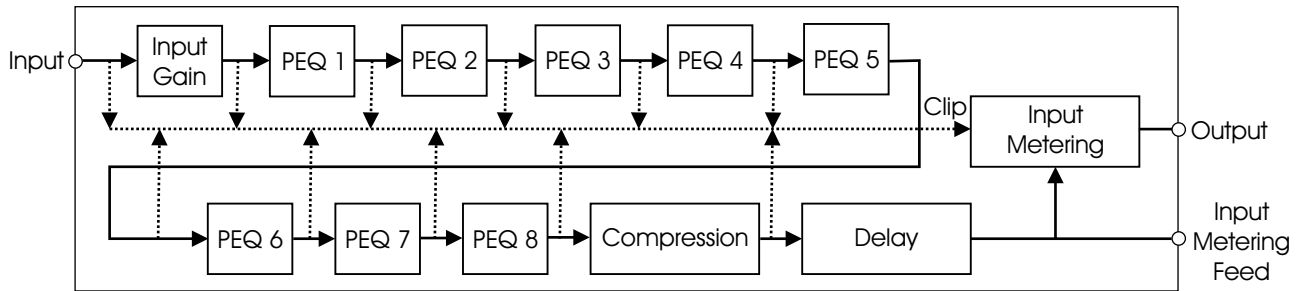
Input channel menus are selected by pressing the corresponding channel Select buttons while Output channel menus are selected by pressing the corresponding channel's menu access button, each of which is fitted with an integral amber status LED.

# Controls

## THE INPUT CHANNELS

Each input channel comprises an input gain stage followed by an eight-band, fully parametric equaliser, a full-band compressor and a delay. The input metering monitors the output from each processing stage to avoid the possibility of inadvertent clipping within the processing chain.

*Input block diagram:*



## INPUT MENU BUTTONS

Each of the four input channels (A - D) may be accessed and edited independently via channel select buttons A, B, C and D. These correspond directly to rear panel inputs A, B, C and D and each button has an integral amber LED to indicate which channel is currently being accessed. Depressing any of these buttons will provide direct access to the first page of the edit menu. Subsequent presses will step through the five available edit pages after which the display will return to Page 1 and the sequence will start again. The number of accessible pages is subject to the Lock status of the unit. If the System Protection password has been set, the compressor pages will be inaccessible until the unit is unlocked.

Pressing the HOME (SETUP) button at any time during editing will return the user to the main menu HOME page.

Pressing STORE or RECALL will also cause the operating system to leave the current menu and initiate either the Store or Recall sequence as selected.

Pressing any Input channel select button when an output menu is currently active will quit the current menu and go to the first menu page of the input channel selected. Similarly, pressing any Output channel select button when an input menu is currently active will quit the current menu and go to the first menu page of the output channel selected.

Pressing an Output channel select button when a different output channel menu is currently active will change the display to the same page of the newly selected output channel. Pressing an Input channel select button when a different input channel menu is currently active will change the display to the same page of the newly selected input channel.

### INPUT BARGRAPH METERS

The input 9-segment bargraph meters can display either level or compressor gain reduction. When the input signal is below the compressor threshold, the meters display the difference between the current signal level and the compressor threshold so as to show the available headroom before compression. When the signal exceeds the compressor threshold, the meters read downward from the 0 dB LED to show the amount of gain reduction taking place. The top red clip LED will always warn of clipping, regardless of the compressor status.

### ROTARY ENCODERS

The three rotary controls X, Y and Z associated with the display are continuous encoders and are used to edit parameter values shown in the display window. These controls are used for all front panel parameter editing where each control corresponds to an on-screen parameter. A green LED indicator ring is associated with each of the three controls to indicate when they are active. If there is no parameter associated with any one of the encoders in the currently accessed screen, the LED ring will not illuminate.

### RECALL

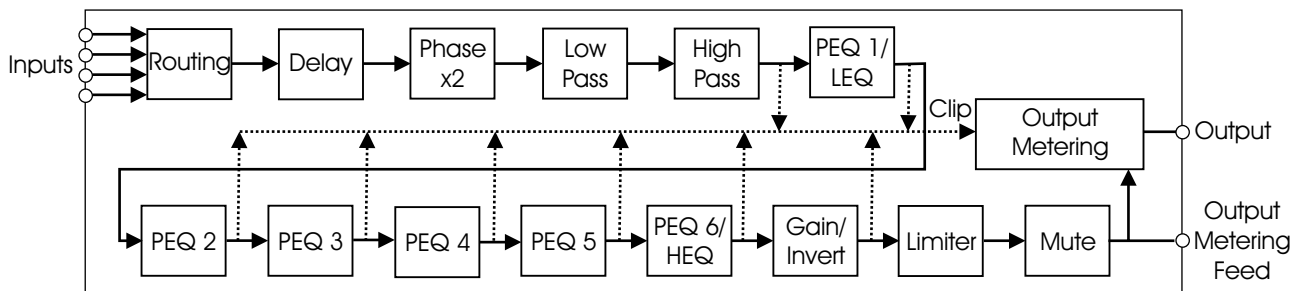
Initiates the recall of a User, System or Factory setup patch.

### SAVE

Initiates the save sequence for storing User or System setup patches.

## THE OUTPUT CHANNELS

*Input block diagram:*



The output channels are slightly more complex than the input channels inasmuch as they are responsible for the signal routing as well as for further signal processing. At the input of each Output channel is a routing block capable of connecting that output to any of the available combinations of the four Input channels. This provides the user with the flexibility required to construct any crossover type up to 8-way. This is followed by a Delay, two independent phase correction stages, the crossover low and high-pass filters, six further stages of fully parametric equalisation and a limiter. All key stages are monitored by the output meters and each channel can be muted by pressing the output level control pot.

### OUTPUT LEVEL CONTROLS

Each of the eight output channels is fitted with a level control potentiometer that also incorporates a push switch. Pressing the potentiometer knob mutes the channel and causes the red status LED ring around the control to light.

### MENU SELECTION KEYS

Each of the eight outputs is fitted with a momentary action output channel selection button. These have integral amber status LEDs that light when the channel is selected.

### OUTPUT BAR GRAPH METERS

Each of the eight outputs has an 11-segment bargraph display that shows the true output signal level at all times. The red segment at the top of the meter illuminates when the clip threshold has been reached.

### HOME (SETUP) KEY

The function of this key depends on the context in which it is used. One of its main functions is to exit the current operation and return to the first page of the menu structure. Pressing and holding this key for more than one second calls up the Setup menu.

### PC PORTS

An 8-pin mini-DIN connector is provided on the front panel for connection to the RS-232 serial port of a PC or other remote control device conforming to the RS-232 protocol. A standard XLR is provided on the rear panel for connection to RS-485 for remote control.

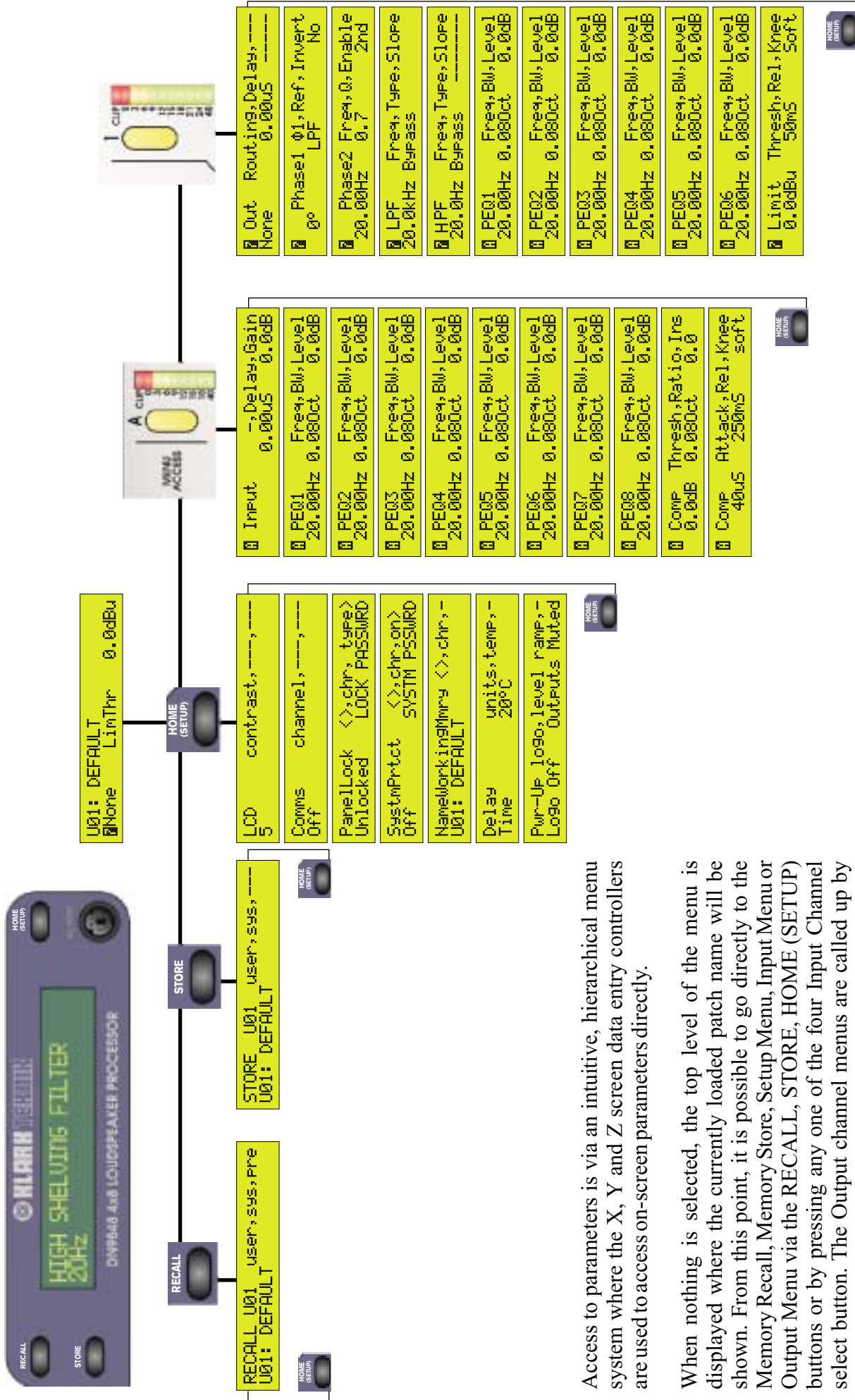
### POWER

The power switch activates the unit and the Klark Teknik logo on the front panel will illuminate. The circuitry is designed so that no audio transients or thumps are generated when powering up or down. It is also possible to program a 'ramp up time' for the audio output.



# Main Menu Structure

Main menu structure diagram:



Access to parameters is via an intuitive, hierarchical menu system where the X, Y and Z screen data entry controllers are used to access on-screen parameters directly.

When nothing is selected, the top level of the menu is displayed where the currently loaded patch name will be shown. From this point, it is possible to go directly to the Memory Recall, Memory Store, Setup Menu, Input Menu or Output Menu via the RECALL, STORE, HOME (SETUP) buttons or by pressing any one of the four Input Channel select button. The Output channel menus are called up by pressing the associated Output channel select button.

## Save/load Routine

### RECALLING PATCHES

Pressing RECALL initiates the Recall sequence allowing the screen data entry controllers X, Y and Z to be used to select the memory bank (Preset, System and User). A message instructs that the Recall sequence can be aborted by pressing the HOME (SETUP) key, whereupon the display returns to the HOME page. Note that patch Recall will not be possible if this operation is locked out - see Security section.

Pressing RECALL a second time loads the currently selected patch into the working memory unless the patch selected is identical to the one already loaded. In this case the system is intelligent enough to know that it doesn't need to load the patch. The three screen data entry controllers access the three memory types: User, System and Preset. The recall sequence may be aborted at any time prior to pressing RECALL a second time by pressing the HOME (SETUP) button.

### SAVING PATCHES

Pressing STORE initiates the Store sequence and displays a message asking the user to select the desired User or System memory bank. As with Recall, the sequence can be aborted at any time prior to saving by pressing the HOME (SETUP) button, whereupon the display returns to the HOME page.

The X screen data controller may be used to step through the System and User memories unless the System memories are locked, in which case these will not be accessible. If empty memory banks are available, the first available one will be shown by default. Once all patches are full, the system will automatically go to the last patch recalled, though the user may step through to any other location.

Pressing STORE a second time calls up a dialogue box requesting the user to enter a name for the stored patch.

X: Cursor left or right.

Y: Scroll characters.

Z: Not used.

By default, the name initially displayed will be that of the working memory, ie. the currently selected patch.

Once the name has been entered, pressing STORE for a third time will save the patch to memory and return the user to the HOME page.

*Diagram showing the save and load menu screens:*

```
RECALL U01  user,sys,pre
U01: DEFAULT
```

```
STORE U01  user,sys,---
U01: DEFAULT
```

## **System Setup Menu**

The System Setup menu of the DN9848 enables global parameters: LCD contrast, RS-485 channel, System and Panel Lockout status, the delay time units, power-on options on and the working memory name. Note that if an RS-485 channel (other than Off) is selected, the front panel controls (other than the HOME (SETUP) button) will not function.

If HOME (SETUP) is pressed and held down for at least one second while the first page of a menu is being displayed, the system enters the context-sensitive Setup menu. The HOME (SETUP) button is then used to step through the setup pages. When all the pages have been accessed, the next press of the HOME (SETUP) button will return the user to the HOME page.

Pressing any other button while in Setup mode will exit the Setup menu and take the user to the HOME page.

### LCD Contrast

The display contrast is variable in 11 steps numbered 0 to 10 in so as to accommodate off-axis viewing angles. The default setting is 5.

X: Display contrast.

Y: Not used.

Z: Not used.

### RS-485

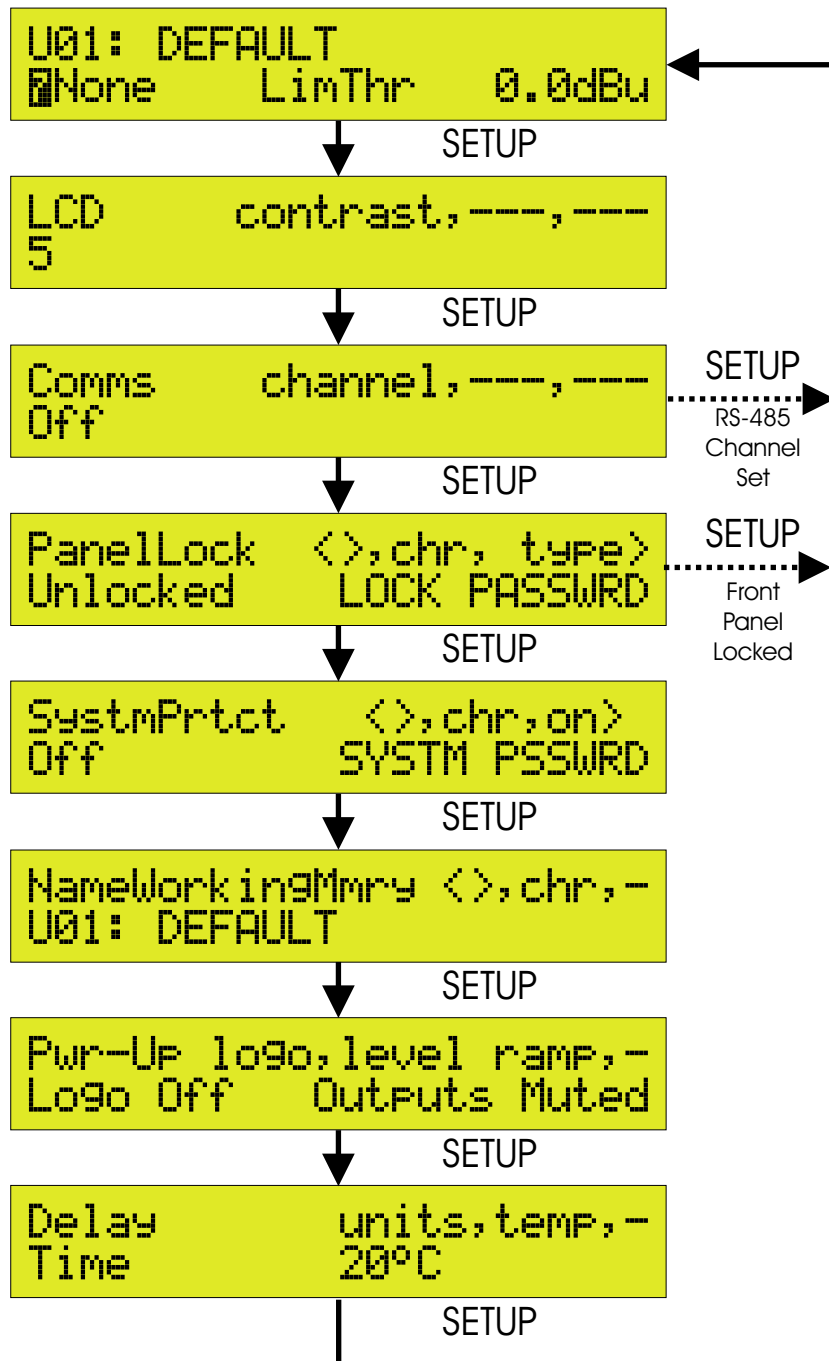
RS-485 can operate on any one of 256 possible channels at a fixed data rate of 38.4kHz (38400 baud). The default condition is for the RS-485 channel to be set to off.

X: RS-485 channel.

Y: Not used.

Z: Not used.

Diagram Showing system setup menu screen:



## SECURITY

A number of lockout modes have been included to prevent tampering with the unit in situations where unauthorised or unqualified personnel may have physical access.

### FRONT PANEL LOCKOUT

This facility enables the user to set a password of up to 24 characters in order to disable the front panel controls. There are three possible lockout options: Unlock, Lock with full recall and Full Lock. When Front Panel Lock is enabled, the Setup menu options will be confined to the RS-485 Communications and front Panel Lockout pages only. All lock functions are retained after power down. To unlock the unit, the correct password must be entered. Press HOME (SETUP) to access the password page.

### SYSTEM PROTECT ENABLE/DISABLE

With a component so central to a sound system as a crossover unit, it is possible that certain parameter changes could result in loudspeaker damage, so a system is in place to make these parameters inaccessible to unauthorized users. As with the panel lock modes, this function is password protected. The password setup procedure is exactly the same as for the panel lock mode.

When the System Lock is on, the user will be denied access to the input channel compressors and all output menu functions. It is also not possible to load factory or system patches while the System Lock is on, though User memories may still be accessed, as may the Password page, input gain, EQ and delay parameters.

As supplied, the password field is blank and the unit is unlocked.

To set password:

X: Character position.

Y: Select character.

Z: Toggles Lock mode on or off.

To unlock the unit, the correct password must be entered via the HOME (SETUP) page.

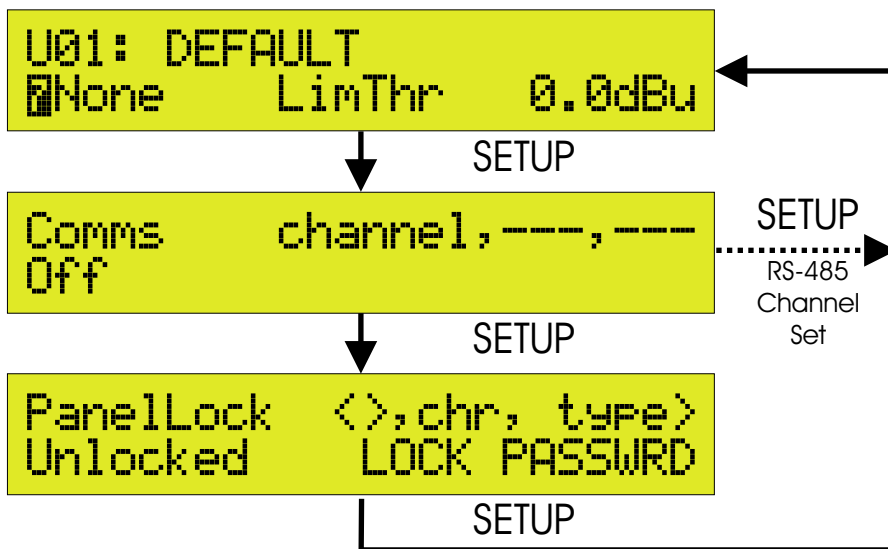
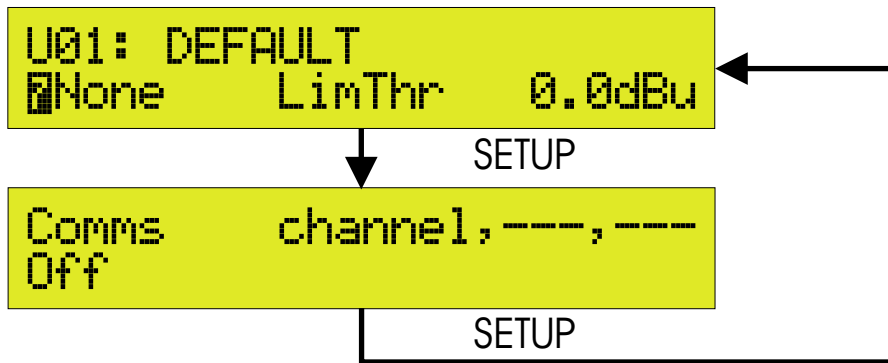
To enter a password:

X: Set character position.

Y: Select character.

Z: Toggles the Lock mode on or off.

Block diagram showing security menus:



### RS-485 LOCAL OVERRIDE

In normal use, the RS-485 channel number is set to Off in the Setup menu. If a channel number is selected, the HOME (SETUP) key will still function but all other front panel controls (other than LCD contrast) will be inoperative (regardless of the Panel Lockout status) as the unit now expects to receive commands via the RS-485 interface. Pressing the HOME (SETUP) key when in this mode will take the user directly to the RS-485 Communications page, where changing the Channel number back to Off will restore normal front panel operation and return the user to the HOME page when the HOME (SETUP) is pressed again.

### NAME WORKING MENU

This function allows the user to rename the currently recalled patch (the contents of the working memory) without having to go through the Store sequence. Note that factory preset patches cannot be renamed.

X: Character position.

Y: Selects character.

Z: Not used.

### DELAY UNITS/TEMPERATURE

This section allows the user to choose the delay units to read in time or distance based on the speed of sound. In distance mode, the nominal ambient temperature may be entered to correct the input channel delay time. The available units are: milliseconds, microseconds, imperial (feet and inches) and metric (metres and millimetres). Note that although the unit has the ability to monitor its own internal temperature, this will be higher than the nominal venue air temperature, so should not be used for delay time calculations. The temperature may be entered in the range 0 to 40 degrees C in 1 degree increments. Note that the temperature parameter is only relevant when the delay is set in units of distance, not as time.

X: Set delay units.

Y: Enter temperature.

Z: Not used.

### POWER ON OPTIONS

The user can opt whether or not the unit should display an animated screen on startup (Logo On/Off). If selected, the screen will be displayed until the audio outputs are at their full operating levels. In addition to the power on/off muting, the user may set a ramp time to fade up the crossover output levels gradually, the maximum ramp time being 30 seconds. The default settings are with the Start-Up screen off and the ramp time set to 5 seconds.

X: Selects Start-Up screen on or off.

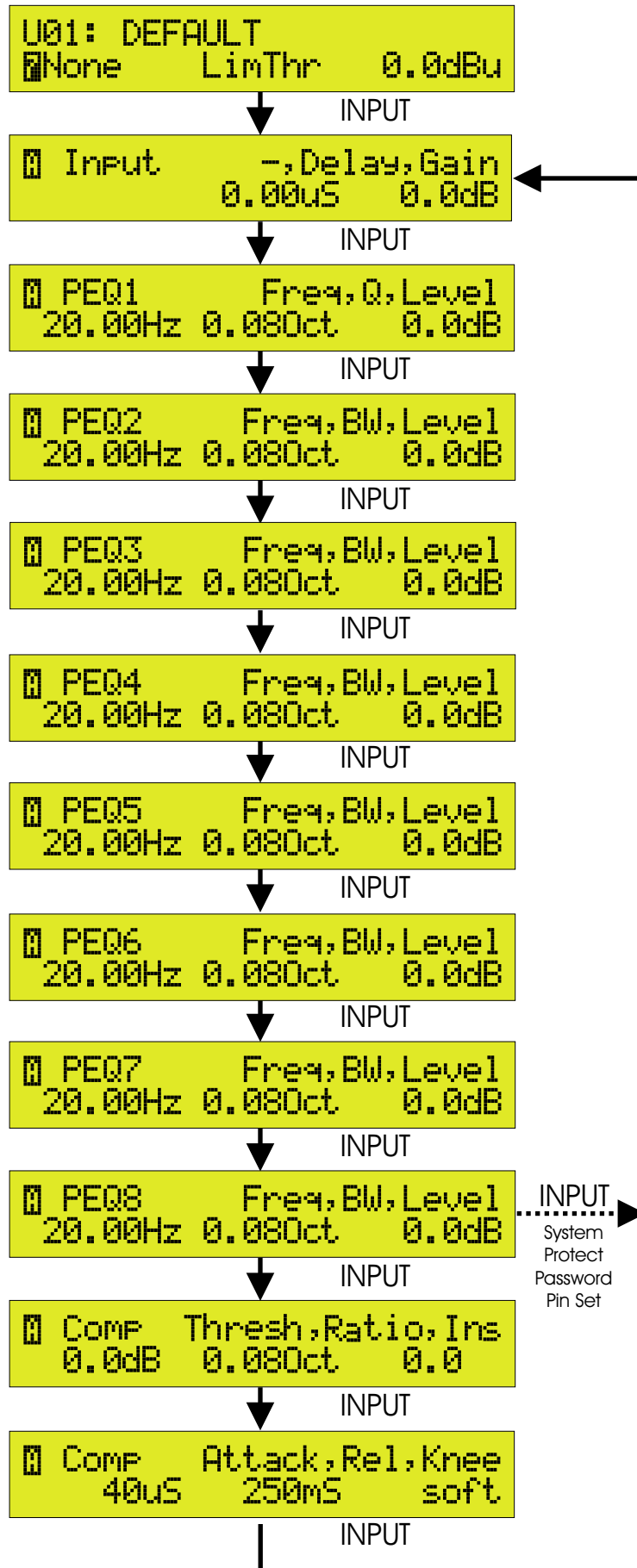
Y: Output level ramp time.

Z: Not used.

## Input Menu Structure

Each of the Input channels comprises a gain control, eight fully parametric EQ stages, a compressor and a delay line, monitored by a dual function bargraph meter that shows both signal headroom and compressor gain reduction.

*Input channel menu block:*





## INPUT GAIN/DELAY

Note that the delay units are selected in the Setup menu.

### Input Delay/Gain Page

X: Not used

Y: Input Delay

Z: Input Gain.

## PARAMETRIC EQUALISER

Each of the eight stages is identical, each being accessed via a separate menu page.

### Input PEQ Pages 1 - 8

X: Frequency.

Y: Bandwidth

Z: Amount of cut or boost.

## COMPRESSOR

This is a straightforward, variable ratio, compressor with selectable hard or soft knee characteristics and a bypass function. There are two menu pages for parameter adjustment.

### Input Compressor Page 1:

X: Threshold

Y: Ratio

Z: Insert On/Off

### Input Compressor Page 2:

X: Attack

Y: Release

Z: Knee

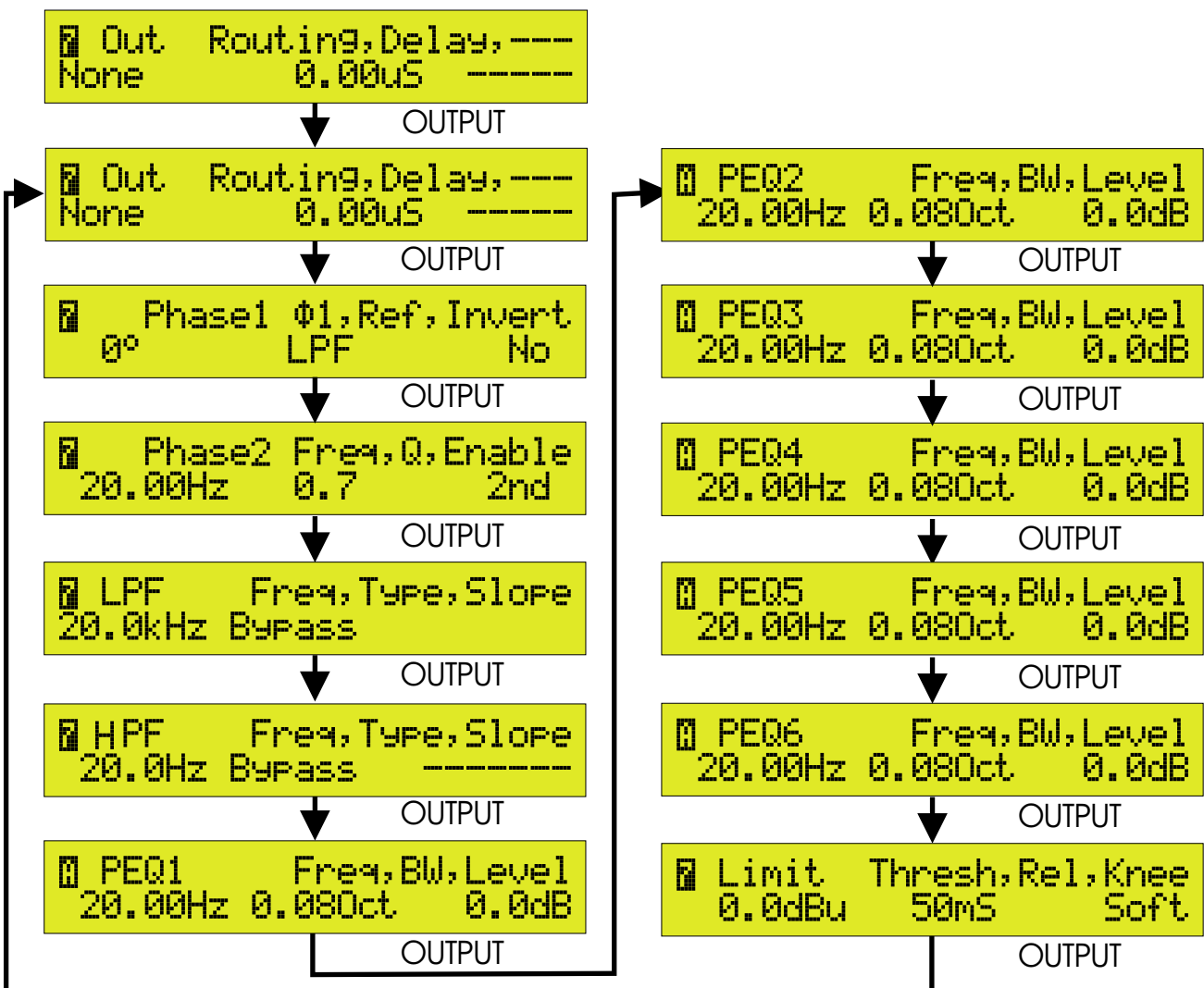
## The Output Menu Structure

Each of the eight output channels provides configurable high and low-pass filters for setting the crossover characteristics as well as six further stages of fully parametric equalisation that may be used to compensate for system or enclosure characteristics. Delay of up to 300ms is available in addition to gain control, muting and limiting. Dual all-pass phase correction with channel invert. A number of preset input-to-output routing options are available.

The edit menu for any output channel may be accessed by pressing in the corresponding output menu select button. Only one channel may be active for editing at any time, and after pushing the switch, the Output menu will be accessed unless it has been password protected.

The menu is always first accessed at its top page where subsequent pushes on the select button will cause the menu to step through the available pages. When all the pages have been presented, the next push will return the user to the top of the menu. Pressing the HOME (SETUP), STORE or RECALL keys will cause the display to jump to the HOME page. Pressing the select button for a different output channel will show the same menu page for the newly selected channel.

*Output channel menu block:*



## ROUTING/OUTPUT DELAY

Each outputs can select one of the following sources as its input:

Delay Units: Time or a choice of imperial or metric distance as selected in the Setup menu. The choice of delay units applies to both the input and output channels.

Routing/Output Delay Page

X: Routing option.

Y: Delay.

Z: Balance.

## OUTPUT PHASE CORRECTION FILTER.

Provides first order correction of phase with phase angle referenced to one of the filters in the output.

X: Phase angle -  $0^\circ$  to  $180^\circ$  in  $5^\circ$  steps.  $0^\circ$  is off..

Y: Angle Reference - one of LPF, HPF, LEQ/PEQ1, PEQ2,3,4,5, HEQ/PEQ6.

Z: Invert.

## OUTPUT ALL-PASS FILTER

Provides first and second order correction of phase.

X: Frequency.

Y: Q - only active for second order filter.

Z: Enable- one of OFF, 1<sup>st</sup> or 2<sup>nd</sup>.

The frequency control sets the point at which  $90^\circ$  (first order) or  $180^\circ$  (second order) of phase shift is achieved. Q gives control over the slope of the phase transition for a second order filter.

In all cases the phase changes from  $180^\circ/360^\circ$  at low frequency to  $0^\circ$  at high frequency.

## OUTPUT LOW-PASS FILTER

Low-Pass Filter Page

X: Frequency.

Y: Filter type.

Z: Filter slope.

## OUTPUT HIGH-PASS FILTER

High-Pass Filter Page

X: Frequency.

Y: Filter type.

Z: Filter slope/Peaking filter gain.

## OUTPUT PARAMETRIC/LOW SHELF FILTER

The upper and lower bands of the six-band output parametric equaliser may be switched between bandpass and shelving operation. In other respects, the six bands are identical in range and control functions.

### BAND 1

Output PEQ/LEQ Page

X: Frequency.

Y: Bandwidth/Rolloff slope.

Z: Level.

### BANDS 2 - 5

Parametric bands 2 - 5 are identical but without the shelving filter option.

Output PEQ 2 - 5 Page

X: Frequency.

Y: Bandwidth.

Z: Level.

### BAND 6

Output PEQ/HEQ Page

X: Frequency.

Y: Bandwidth/Rolloff slope.

Z: Level.

## OUTPUT LIMITER

The output limiter is a peak reading design, the main function of which is to protect equipment being fed from the DN9848 from being driven into clipping. In order to accomplish this, the limiter acts very quickly and employs an intelligent auto system that adjusts the 'look ahead' time according to the release time setting. The look ahead time varies between 10 and 24 samples so that transients can be anticipated, but no setup on behalf of the user is required. The limiter threshold is variable so as to accommodate the level requirements of virtually all professional equipment. Limiter action is monitored by the second from top red section on each of the output channel meters. The top section registers any clips that may occur.

Limiter Page

X: Threshold.

Y: Release.

Z: Knee.

## OUTPUT MUTE

Each of the eight outputs is equipped with a noise-free mute switch built into the OUTPUT level controls. This switch is electronically latching and shows a red status LED ring when the channel is muted. If one of the controls is pressed and held for more than one second, all eight outputs are muted.

## METERS

All eight outputs are monitored by independent 11-segment meters, the top section of which registers clips occurring within the output channel EQ stages. The red 0dB segment below this registers limiter action and is always referenced to the limiter threshold. The remaining green and yellow segments indicate the output signal level from -40dB to -3dB. If the limiter threshold is exceeded, the meters flip to reading gain reduction which is shown reading downwards from the 0dB segment.

If the limiter threshold is set to Off, the limit segment will illuminate at the same time as the Clip segment.

## **Test Mode**

If the Setup key is held down while the unit is powered up, the DN9848 automatically enters its diagnostic mode, displaying a Test menu. This is for use by service personnel only. If this mode is entered inadvertently, power down the unit, then power up again normally.

## Operational Example

### Quick Start

This section assumes that the DN9848 is not locked and that the user is familiar with the concepts of crossovers, compressors, equalisers and limiters.

Each input channel includes eight parametric equalisation stages, up to 1000ms of delay, gain control and compression. Full metering with clip indication is available for all input and output channels.

Each output channel provides configurable high and low-pass crossover filters in addition to six further stages of fully parametric equalisation, adjustable delay of up to 300ms, gain control, muting and limiting. Dual all-pass phase correction sections are also included, each of which is referenced to the cut-off frequency of the low-pass filter and adjustable in 5 degree steps.

To access an Input Channel for editing, press one of the four input channel select buttons. This will display the first page of the Input Channel menu. Further button presses will step through the menu pages, eventually returning to the first page.

Changes to on-screen parameters are made via the X, Y and Z rotary controllers that relate directly to the parameters currently displayed on-screen. Each controller has an illuminated status indicator which will remain unlit if there is no corresponding parameter (ie. if the current screen contains only one or two adjustable parameters).

To Access an Output Channel, press one of the eight output channel select buttons. This will display the first page of the Output Channel menu. Further control presses will step through the menu pages, eventually returning to the first page. Note that the input-to-output routing options are selected within the Output Channel menu.

The crossover filter types available are:

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

Changes to on-screen parameters are made via the X, Y and Z rotary controllers that relate directly to the parameters currently displayed on-screen. Each controller has an illuminated status indicator which will remain unlit if there is no corresponding parameter (ie. if the current screen contains only one or two adjustable parameters).

To load a factory preset or user patch, press RECALL to display the Recall menu. Here it is possible to select from System, User and Factory patches. Changes to on-screen parameters are made via the X, Y and Z rotary controllers that relate directly to the parameters currently displayed on-screen.

To save a User or System Patch, press SAVE to display the save menu. Here patches may be saved into either the System or User locations and named with up to 24 characters. Changes to on-screen parameters are made via the X, Y and Z rotary controllers that relate directly to the parameters currently displayed on-screen.

The Security features are located in the Setup menu, accessed by pressing the HOME (SETUP) key and holding it down for a minimum of 2 seconds. Even when the unit is locked, the menu pages relevant to password entry will always be accessible. There are two types of lockout: Full Panel Lock and System Lock. In System Lock mode, the User memories are still accessible.

Note that the input meters have a dual function: they display headroom until the compressor or limiter thresholds are reached when they switch to displaying gain reduction, which reads from the top of the meter downwards. The output meters display gain unless limiting occurs, in which case they show gain reduction.

## Technical Specification

### ***Audio Inputs***

Type	<b><i>Four</i></b> Electronically balanced (Pin 2 Hot)
Impedance	
Balanced	20k
Unbalanced	10k
Common Mode Rejection	>80 dB @ 1 kHz
Maximum level	+ 21 dBu

### ***Audio Outputs***

Type	<b><i>Eight</i></b> Electronically Balanced (Pin 2 Hot)
Minimum load impedance	56 /20nF
Source impedance	56
Maximum level	+ 21 dBu into > 2k

### ***Performance***

Frequency response (20 Hz to 20 kHz)	+/- 0.3 dB with all filters and EQ flat
Distortion @ +8 dBu (20 Hz to 20 kHz)	<0.02%
Dynamic range (20 Hz to 20 kHz unweighted)	>113 dB

### ***Input Processing (per channel)***

Input gain	+12 dB to -40 dB in 0.1 dB steps plus Off
Parametric EQ 1-8	Frequency range: 20 Hz to 20 kHz in 21 steps per octave Boost/cut: +6/-18 dB in 0.1 dB steps Bandwidth: 3.0 to 0.08
Compressor	Threshold: +21 dBu to -10 dBu in 0.1 dB steps Attack: 40 us to 100ms (20 s steps from 40 s to 1ms. Then 1ms from 1ms to 100ms) Insert: On/Off Release: 10 ms to 2000ms in 10ms increments Ratio: 1:1 to 5:1 in unit increments Knee: Hard/Soft
Delay	0 to 1 second (342.25 m or 1122' 10" at 20C) in 20.8 us steps



## **Output Processing (per channel)**

### **Routing**

Route from inputs: A, B, C, D, A+B, C+D, A+B+C+D

None

A Channel A

B Channel B

C Channel C

D Channel D

A+B (channels summed at -3dB with balance control))

C+D (channels summed at -3dB with balance control))

A+B+C+D (channels summed at -6dB)

Note that sources comprising summed channels will only be available if the input channel delays for the summed channels are set to the same value.

Controller Z functions as a balance control when the source is A+B or C+D. The balance is adjustable from 0 to 100% in 1% increments.

### **Delay**

0 to 300 ms (102.68  $\mu$ s or 333' 10" at 20°C)  
in 5.02  $\mu$ s steps

### **Output phase correction filter**

Phase angle: - 0° to 180° in 5° steps. 0° is off

Angle Reference: - one of LPF, HPF, LEQ/PEQ1, PEQ2,3,4,5,  
HEQ/PEQ6

Invert: Yes / No

### **Output all-pass filter**

Frequency: 20Hz - 20kHz in 21 steps per octave

Q- only active for second order filter: 0.4 to 6.0

Enable: one of OFF, 1<sup>st</sup> or 2<sup>nd</sup>

### **Low pass filter**

The following filter configurations are supported:-

- i. Butterworth (6 dB/Oct, 12 dB/Oct, 18dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct)
- ii. Linkwitz-Riley (12 dB/Oct, 24 dB/Oct)
- iii. Bessel (12 dB/Oct, 18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct)
- iv. Filter bypass

Frequency Range: 20 Hz to 15 kHz in 21 steps/octave

### **High pass filter**

The following filter configurations are supported:-

- i. 12 dB/Oct Peaking
- ii. 24 dB/Oct Peaking
- iii. Butterworth (6 dB/Oct, 12 dB/Oct, 18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct)
- iv. Linkwitz-Riley (12 dB/Oct, 24 dB/Oct)
- v. Bessel (12 dB/Oct, 18 dB/Oct, 24 dB/Oct, 36 dB/Oct, 48 dB/Oct)
- vi. Filter bypass

Frequency Range: 20 Hz to 15 kHz in 21 steps/octave

Peaking Filter Boost: 0 dB to +6 dB in 0.1 dB steps.

Parametric EQ 1/Low shelf filter	Frequency range: 20 Hz to 20 kHz in 21 steps per octave Boost/cut: +12/-12 dB in 0.1 dB steps Parametric EQ Bandwidth: 3.0 to 0.08 Shelf slope: 6 dB/Oct and 12 dB/Oct
Parametric EQ 2-5	Frequency range: 20 Hz to 20 kHz in 21 steps per octave Boost/cut: +12/-12 dB in 0.1 dB steps Bandwidth: 3.0 to 0.08
Parametric EQ 6/High shelf filter	Frequency range: 20 Hz to 20 kHz in 21 steps per octave Boost/cut: +12/-12 dB in 0.1 dB steps Parametric EQ Bandwidth: 3.0 to 0.08 Shelf slope: 6 dB/Oct and 12 dB/Oct
Phase invert	Normal/invert
Output gain	+12 dB to -40 dB in 0.5 dB steps plus Off
Look-ahead limiter	Threshold: +21 dBu to 10 dBu in 0.5 dB steps Release: 10 ms to 1000 ms Knee: Hard/Soft
Mute	On/off
<b>Power Requirements</b>	
Voltage	90 to 250 V a.c @ 50/60 Hz
Consumption	< 75 VA
Fuse rating	T0.5L 250V
<b>Dimensions</b>	
Width	483 mm (19 inch)
Height	44 mm (1.75 inch)
Depth	287 mm (12 inch)
<b>Weight</b>	
Nett	4kg
Shipping	6kg
<b>Terminations</b>	
Audio inputs/outputs	3-pin XLR
RS-485 inputs/outputs	3-pin XLR
RS-232	8-pin Mini-DIN socket
Power	3-pin IEC