GRAPHIC PARAMETRIC DYNAMIC FILTERS

HELIX SYSTEM

DN9340 DIGITAL EQUALISER

DN9344 DIGITAL EQUALISER

KLARK TEKNIK
SIGNAL PROCESSING BY DEFINITION

DN9340 2 CHANNELS, 31 BANDS 1/3 OCTAVE DIGITAL FILTERS IN 5 DIFFERENT FILTER EMULATIONS PER CHANNEL, 12 BANDS 20HZ-20KHZ OF PARAMETRIC EQUALISATION PER CHANNEL, 2 BANDS OF THRESHOLD DEPENDENT EQUALISATION (T-DEQ) PER CHANNEL, 4 FIRST TO EIGHTH ORDER FILTERS PER CHANNEL, 1 SECOND OF DELAY PER CHANNEL
DN9344 4 CHANNELS, 31 BANDS, 1/3 OCTAVE DIGITAL FILTERS IN 5 DIFFERENT FILTER EMULATIONS PER CHANNEL, 12 BANDS, 20HZ-20KHZ OF PARAMETRIC EQUALISATION PER CHANNEL, 2 BANDS OF THRESHOLD DEPENDENT EQUALISATION (T-DEQ) PER CHANNEL, 4 FIRST TO EIGHTH ORDER FILTERS PER CHANNEL, 1 SECOND OF DELAY PER CHANNEL

INTRODUCTION

The new Klark Teknik Helix system provides an intuitive yet sophisticated and flexible audio equalisation system in a very compact package. Its unique selection of functions allows EQ to be applied with total precision, using the types and combinations of filters that deal most effectively with a given situation. Like all Klark Teknik DSP devices, Helix is equipped with more than enough computing power to allow all functions to be fully operative at all times.

Helix also offers a specific advantage to owners of MIDAS Heritage and Legend consoles, in the form of an 'auto-solo' function which allows instant access to all the Helix functions allocated to that input or output.

The principal operational advantage of Helix is that it offers all the functionality of several standalone devices in one package, thus saving massively on both cost and rackspace. For instance, enough EQ for a 24-way monitor mix plus two sidefills will fit into just EIGHT rackspaces (six DN9344 slaves and one DN9340 Master), at almost exactly the same cost as the same number of channels of top-class analogue graphic EQ.

Like all KT units it is engineered to the highest standards and carries the usual KT 5-year transferable international factory warranty.


KLARK TEKNIK
DN9340 KELIX
Master 010 Graphic EQ
Bypass
Menu
Out
1 Freq
20.0Hz
Level
G01 G02
G03 G04
G05 G06
G07 G08
G09 G10
G11 G12
M01 M02
M03 M04
M05 M06
M07 M08
C01 C12
C35 C48

DN9340:
THE MASTER UNIT

The Helix system comprises two units. The DN9340 Helix Master unit is a two-rackspace, dual channel device fitted with a simple and intuitive user interface including two backlit LED displays and full metering for inputs, outputs and T-DEQ filters. DN9340s may be used individually as stereo (linked-channel) units or as dual discrete channel units, and may be configured to control or be controlled by other Helix units. All functions including memory recall are available from the front panel, as well as high-speed selection of individual channels of any connected Helix units.

The DN9340 is designed to provide the user with a clear and intuitive interface with a large, bright and clear graphic displays allowing the optimum level of information to be relayed to the user. The keys and encoders enable straightforward interaction with the DN9340, this combined with the dual touch strip means the unit remains user friendly and its true capability is never more than a touch away.

ENCODERS: These three encoders allow the selection of options and controlling values. Each encoder has an illuminated blue ring surrounding it which indicates when the encoder is active.

ALPHANUMERIC DISPLAY: This display shows the parameter values for the current function being controlled by the encoder. This display also shows available options and text entered via the encoders.

SOFT KEYS: These four keys allow the selection of options and secondary functions. To aid operation they illuminate to show which are active. Labelling for the soft keys is shown on the right of the main display.

HOME (SETUP): This key allows instant access to the home page from any of the individual EQ pages. In the home page by pressing and holding the button for a second allows access to the set-up menu.

STORE and RECALL: These two keys allow the storing and recalling of up to 64 memory locations.

TOUCH STRIP: The two-part touch strip is used to select individual filters or to adjust gain selection. By pressing and holding or tapping repeatedly the upper strip increases the level, while the lower, wider strip reduces the level. Pressing both the upper and lower strips simultaneously results in the creation of fader groups.

PC PORT: This RS-232 port allows the installation of software or control of the unit from a PC. This connector is entirely separate from the rear panel RS-485 connector and can be used at the same time.

METERING: The first pair of meters indicates the input level with multi-point clip indication. The middle group of four monitor all four T-DEQ dynamic EQs. The last pair show the output level. A red clip light indicates any internal clipping irrespective of the output level and is monitored at every processing stage.

ACCESS KEYS: These four keys active the controls for each type of equalisation: graphic, parametric, dynamic and filters. They illuminate to show which type of EQ is currently being controlled. Next to the keys is the EQ active light. This shows whether a particular EQ type is affecting the overall response.

BYPASS: This key when pressed whilst in the home page will bypass the complete unit for the selected channel. When pressed in an EQ mode the bypass operates on that type of EQ only.

SELECT: This key selects either A or B channel. If the channels are linked then this key will be inoperative.

DN9344:
THE SLAVE UNIT

The DN9344 Helix Slave is a single rackspace unit that effectively contains two DN9340s in one chassis, thus providing four channels. The pairs of channels can be linked for stereo operation or operated independently. DN9344 has no front panel controls other than those that allow the user to select communications channels, but it is fitted with the same comprehensive metering as the Master unit. Specifically for installation purposes, the Helix Slave is also fitted with a contact closure interface on the rear so that a limited number of user presets can be recalled from a simple switch panel without the need for a Helix Master unit or PC. The audio signal path of the unit is identical in every respect to the Master.

The front panel of the DN9344 has a simple user interface as the main functions are controlled either by the DN9340 master unit or through a PC remote.

ALPHANUMERIC DISPLAY: This shows the electronic scribble strip information, Last Memory Recalled and Communications Mode.

SETUP: This key when pressed and held allows access to the set-up menu, which is used to select the communications channel for remote control and to enable contact closure operation. The DN9344 has two independent communications channels as it contains the equivalent of two DN9340 master units.

METERING: The unit has two sets of independent meters for each of the two channels. The first pair of meters in each set indicate the input level with multi-point clip indication. The middle group of four monitor all four T-DEQ dynamic EQs. The last pair show output level. A red clip light indicates any internal clipping irrespective of the output level and is monitored at every processing stage.

REMOTE CONTROL ACTIVE INDICATOR: This shows that the master unit is currently controlling the channel 1A, 1B, 2A or 2B. This indicator is often referred to as the “ME” light.

DISPLAY MODE: When lit this indicates that the alphanumeric display are now showing Last Memory Recalled and Communications Mode. When not lit, the displays are showing electronic scribble-strip names.

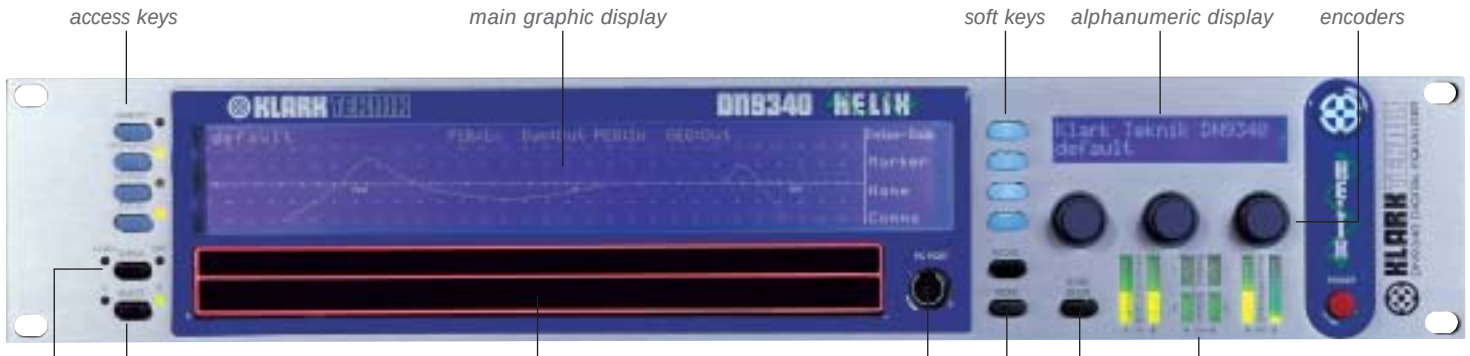
UP and DOWN keys: These keys are only active in the SETUP menu and are used to select the communications channel for remote control and also contact closure mode.

PC PORT: This RS-232 port allows the installation of software or control of the unit from a PC. This connector is entirely separate from the rear panel RS-485 connector and can be used at the same time.

DATA INDICATORS: Show a visual indication of any data traffic from any of the external interfaces – RS-232, RS-485 and the contact closure inputs.

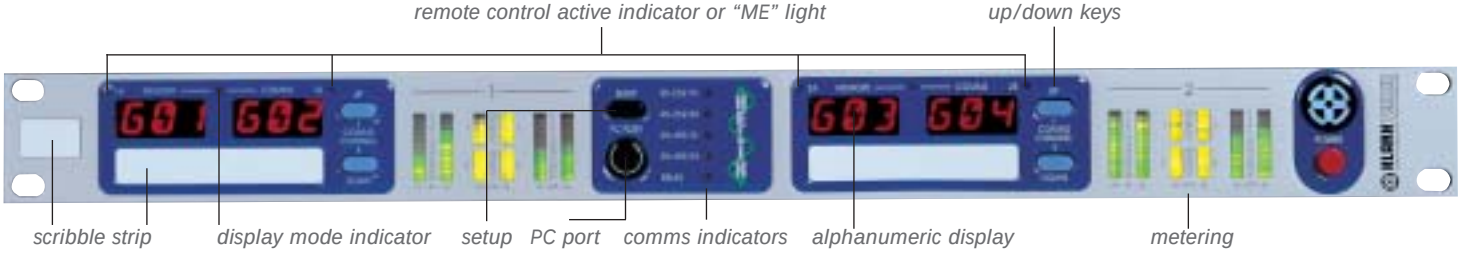
SCRIBBLE STRIPS: Allow easy labelling of the units with a chinagraph pencil (replacement label kits are available).

DN9340 DIGITAL GRAPHIC EQUALISER



RS-485 serial communications: balanced with 2 pin hot
Audio Connectors: all electronically balanced with 2 pin hot
RS-232 serial interface for auto solo operation in association with Midas consoles.

DN9344 DIGITAL SLAVE EQUALISER



RS-485 serial communications: balanced with 2 pin hot
Audio Connectors: all electronically balanced with 2 pin hot
RELAY: contact closure, this allows a simple contact closure to recall memories.

Functions

The Helix system has five main functions and like all Klark Teknik DSP devices, Helix is equipped with more than enough computing power to allow all functions to be fully operative at all times

Graphic Equalisation:

A dual 31-band, 1/3 octave graphic equaliser that uniquely offers no less than five selectable modes of operation. The 'Q' responses of the filter sets are user-definable in constant, proportional or symmetrical mode, or the user may select accurate emulations of our classic DN27 or DN360 units.

We have retained the very popular and unique 'auto gain ranging' function originally found in DN3600. This (switchable) feature automatically compensates for changes in gain caused by the application of EQ (graphic function only), and causes the output signal to be exactly the same overall level as the input signal regardless of the amount of EQ applied.

There is also an auto EQ function that allows automatic room equalisation when the Helix system is used in conjunction with a DN6000 Real Time Analyser and the optional interface module.

Parametric Equalisation:

A dual 12-filter fully parametric equaliser. The secondary LCD display shows real time values for frequency, 'Q' and gain, keeping the main display clear and uncluttered. All 12 filters are fully configurable between 20Hz and 20kHz.

There are three graph modes to ensure that the information is clearly presented for the relevant application. The CURVE mode shows the overall response of the whole parametric equaliser. ACTIVE mode shows only the response of the single section currently being selected for adjustment. INDIVIDUAL mode shows all the sections but as individual curves rather than as a single composite response.

Dynamic Equalisation (T-DEQ):

Helix offers dynamic EQ in a wholly new way, namely Threshold Dependent Equalisation (T-DEQ). This is not frequency-conscious compression - rather it allows the user to select a frequency, apply 'Q', attack and release values, then program upper and / or lower levels for that frequency that will be attained when the chosen frequency reaches the programmed level(s). In real life this means total real time dynamic control over any potential problem frequency. Helix features two T-DEQ filters per channel.

Or more simply it is like a parametric EQ - but with someone operating the gain control for you.

There are 2 graphical modes available for the display. BOTH mode shows the overall response of the whole dynamic equaliser whilst ACTIVE mode shows the response of a single section being selected for adjustment.

Configurable Filters:

Four filters per channel. These are configurable as first or second order shelf, notch and lpf/hpf with up to eighth order characteristics.

Here as with the Parametric mode there are three graph modes. The CURVE mode shows the overall response of the whole filter module. ACTIVE mode shows only the single filter currently being selected for change. INDIVIDUAL mode shows all the filters as individual curves instead of a single composite response.

Delay:

Helix also provides a configurable delay line per channel with up to 1 second of delay available. The delay amount may be set in time (milliseconds and microseconds), or distance (feet / inches or metres / centimetres). This is found in the HOME PAGE which shows the overall system response. Another useful function is the MARKER, which allows the user to mark particular frequencies of interest on the main display.

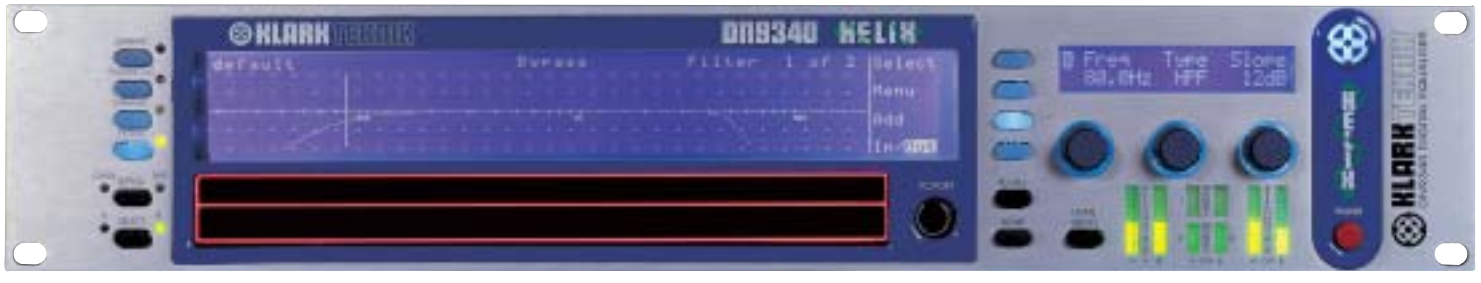
Various levels of bypass function are provided, to allow instant comparison between processed and unprocessed signals. Whilst in the Home page, the user can bypass the entire unit. In the specific function pages, both overall function types and single filters (even individual faders on the graphic EQ) can be switched in and out as required.

GRAPHIC

PARAMETRIC

DYNAMIC

FILTERS



CONNECTIONS

There are number of ways in which Helix units can be connected to other devices to provide greater ease of use:

MIDAS MIXING CONSOLES:

Owners of Midas Heritage and Legend consoles benefit from the 'auto-solo' function which means that when you press any solo key on the console, the EQ for that input or output is instantly displayed on the Helix master unit, ready for immediate control. All the EQ you will ever need – as fast as you need it.

EXPANSION PORTS:

The rear of DN9340 Master units features three expansion ports. One is supplied as standard with the 9-pin 'D' type connector that carries the RS-232 information to Midas consoles for the 'auto-solo' function. The other two are designed to allow for system expansion by providing access to the functions of the unit via other connections. A port to allow connection to a DN6000 RTA device is available, thus enabling 'auto-EQ' functions in graphic mode. Digital I/O will also be supported.

FRONT PANEL PC PORT:

The 8-pin mini-DIN port on the front panel is provided to allow local connection of a PC to allow remote control and other functions. RS-485 is provided on the rear of both Master and Slave units to allow connection between Helix units. The connectors are standard male / female XLR types so ordinary pin-to-pin wired microphone cables will support the connection.

DN6000:

A DN9340 Helix Master unit can be connected to a Klark Teknik DN6000 Real Time Analyser to provide automatic equalisation. In graphic mode only, the Helix will accept incoming data from a DN6000 on a 'snapshot' basis and automatically create a reciprocal curve. This feature requires the Helix to be fitted with the optional upgrade kit (either as a factory order or as a retrofittable option).

REMOTE CONTROL

PC CONTROL SOFTWARE:

To provide the best possible PC control software for all applicable Klark Teknik devices it is essential that we work with our distributors and customers in its development. The changing demands of the market dictate that this software is always under review and so any snapshot of it within a printed document such as this is almost guaranteed to be out of date. Therefore we request that the reader visit the Klark Teknik website (www.klarkteknik.com), which is always the most up to date resource for all information on our products and services, or contact your distributor for details of the latest releases.

T-DEQ DYNAMIC EQ

Over the years a number of professional audio products have provided dynamic equalisation functions of various types. What all these systems have in common is that the frequency response of the device varies depending on the signal level. Many units are based on compressor / expander technology with frequency selection, and the controls often resemble those of a dynamics processor.

The system developed by the Klark Teknik research and development team for the Helix series is rather different. It draws on KT's unrivalled experience in equalisation, and uses the signal level to directly control parametric equalisers. This purely EQ-based solution allows simple controls that directly relate to the signal levels. As a result, it is very easy to set the point at which the dynamic EQ starts to operate, and also to set precisely its maximum effect. We refer to this technique as "Threshold Dependent Equalisation".

In order to understand the operation, let us first consider a conventional parametric EQ section (Figure 1). The three controls available to us are frequency, Q (or bandwidth), and the amount of cut or boost.

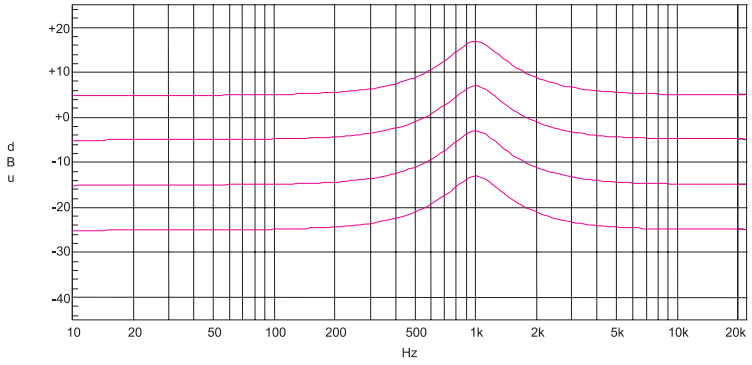


FIGURE 1 STANDARD PARAMETRIC EQ

This shows a series of responses for the parametric EQ with different input levels. As expected, there is no change in the shape of the curve with different input levels. If the input is 10dB louder, the output is 10dB louder at every frequency.

If we now replace the parametric with a Helix equaliser and select the dynamic EQ, we have some additional controls. Frequency and Q controls are as before, but now we have two pairs of controls replacing the single cut and boost control; these are [low threshold] / [low level], and [high threshold] / [high level]. If we set the frequency and Q controls to the area that we wish to control, then the processor will monitor the signal level in that frequency range. If the signal level in this part of the spectrum is below the [low threshold] setting, then the unit considers this a 'quiet' signal. The EQ applied to the signal will be controlled by the [low level] control. If the signal level is above the [high threshold] level, then the unit considers this a 'loud' signal, and will apply the amount of EQ set by the [high level] control. If the signal level is between the two thresholds, then the equaliser will seamlessly morph between the two equaliser settings in real time. Manual control over attack and release times is available to set the speed of response to suit the application.

As an example, consider Figure 2, which shows the Helix applying a boost at low signal levels which is automatically 'wound out' at high level.

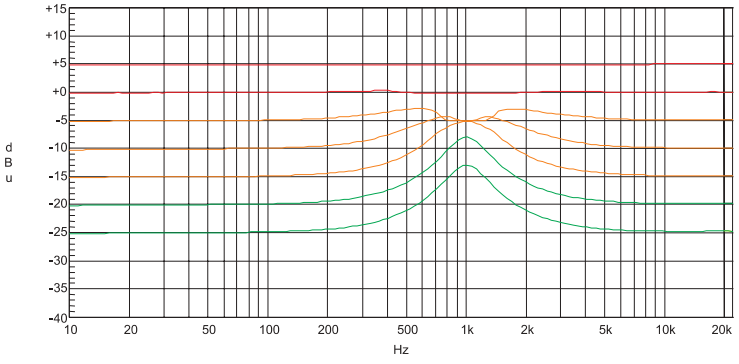


FIGURE 2 HELIX WITH BOOST AT LOW SIGNAL LEVEL

In this example, [low threshold] is -20dBu, [low level] is +12dB, [high threshold] is set to -5dBu, and [high level] is 0dB. Thus the lowest trace shows an input at -25dBu with a standard parametric boost of +12dB at 1kHz. The -20dBu trace shows an identical response, as expected. However, once above this level, the filter gradually fades out with increasing signal, until at all levels above 0dBu, the response is flat.

The shape of the curves for -5dBu and -10dBu require some explanation. These appear as they do because of the nature of the frequency sweep measurement. The Helix equaliser uses a copy of the actual filter in use for its level calculation, so that depending on the Q of the filter, our input signals are 'ignored' as we move away from the centre frequency by the correct amount. Thus as the sweep measurement moves across the centre frequency (1kHz in this case), the dynamic EQ is ramping smoothly in and out again, leading to the curves in Figure 2. Note that if the level is outside the range specified by the two thresholds, the unit behaves like a fixed parametric EQ. This means that we do not have to guess how much EQ will eventually be applied - it is explicitly set in advance.

Without changing modes or making any other selections, we can make the unit operate 'the other way up' just by selecting suitable values for the two thresholds and levels see Figure 3.

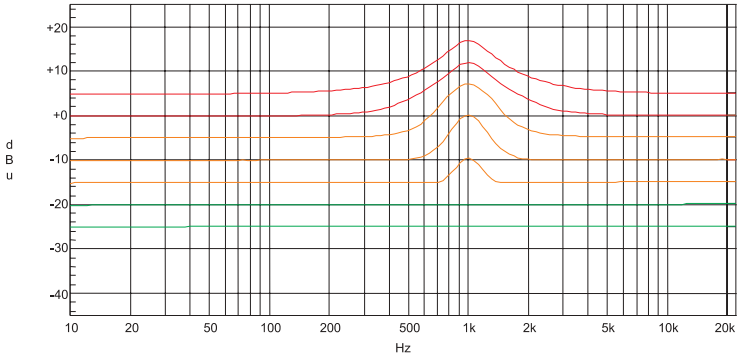


FIGURE 3 HELIX WITH BOOST AT HIGH SIGNAL LEVEL

In this case, [low threshold] is -20dBu, [low level] is 0dB, [high threshold] is -5dBu, and [high level] is +12dB, so that instead of cutting this frequency range as the level increases, we are now boosting it. Again, we have precise control over the maximum amount of boost that will be applied, and the level at which this will occur. Note the shape of the curve for -5dBu, which has 'expected values' outside the filter range and at the centre frequency, but intermediate values that show the EQ ramping in and out either side of the centre frequency.

Needless to say, there is no requirement for one of the levels to be 0dB. Figure 4 shows the transition from a +12dB boost at low level to a -12dB cut at high levels. Again, the intermediate curves show the effect of the sweep signal moving in and out of the 'area of interest' of the level detector as the curve is formed.

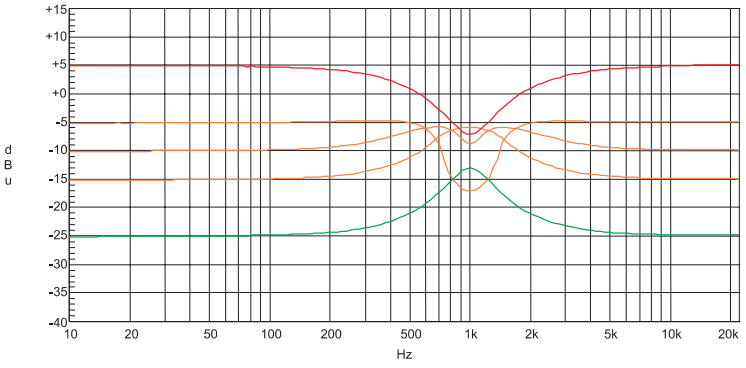


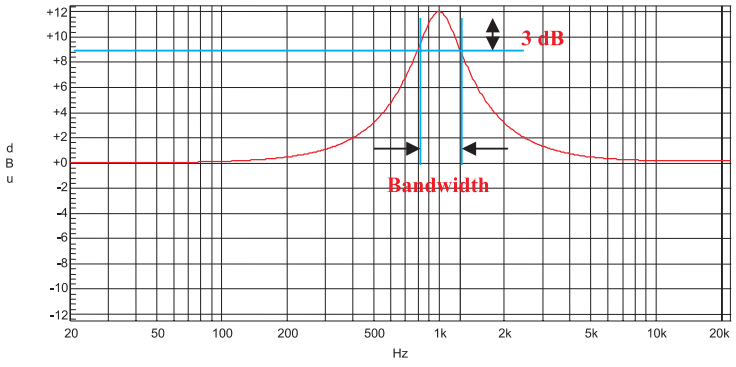
FIGURE 4 HELIX WITH BOOST AT LOW LEVEL AND CUT AT HIGH LEVEL

Q TYPES

The “Q” of an audio equaliser describes the steepness of the filter - the degree to which it will affect signals either side of its nominal or “centre” frequency. In general, the Q of a peaking filter is defined mathematically as , centre frequency / bandwidth where the bandwidth (in Hz) is the range of frequencies affected by the filter.

Because the frequency response of such a filter is a smooth curve (not a sharp “brick wall” filter like the ones in an analogue-to-digital converter) we have to decide how we choose to define the bandwidth, and the established convention is that we use the bandwidth to the “-3dB” points on either side of the centre frequency, where the gain is 3dB less than the maximum gain.

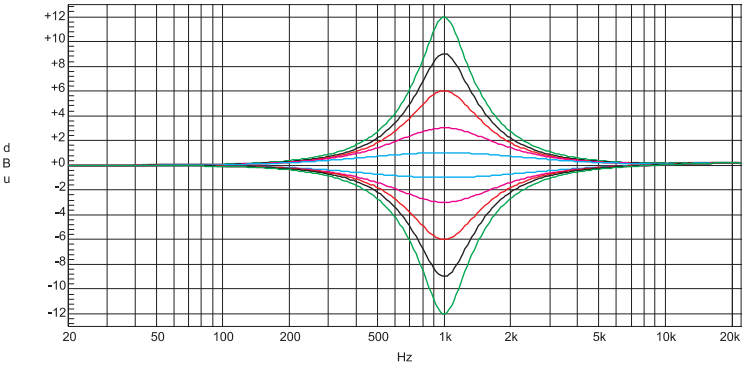
FIGURE 1 f=1.00 kHz Q=2.2 Level=+12dB



In the example above, the filter is centred on 1 kHz, the lower 3dB point is at approximately 800 Hz, and the upper one is at approximately 1.25 kHz. This filter therefore has a Q of 1000 / (1250-800) = 2.2. In a typical parametric equaliser (and in the case of the Helix system the graphic and dynamic sections too) we have a manual control for the Q of the filter, and this allows us to set any Q that we require. In general high-Q, narrow filters are used for notching out problem frequencies without affecting the programme material too much, while gentler low-Q filters are useful for adjusting the tonal balance. In the case of graphic equalisers there is another issue - that of interaction between adjacent bands. In general, lower-Q filters will blend together more smoothly, but higher-Q filters provide more selective control of problems - at the expense of more frequency response ripple.

So far so simple - but why the different types? This is due to the way in which the Q of the filter varies (or not) when the gain control is adjusted. There are three modes available in the Helix system, which we term Proportional, Constant, and Symmetrical Q.

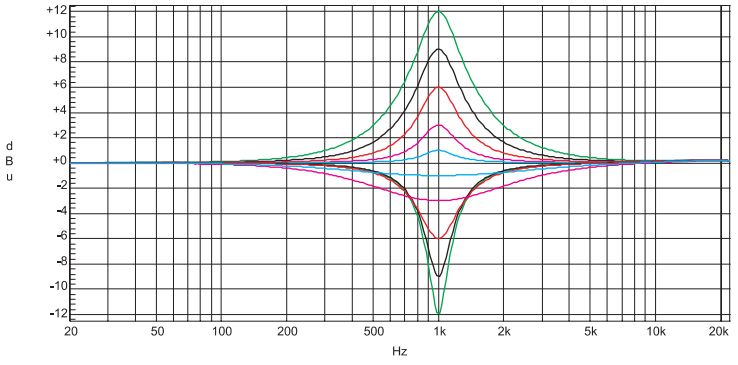
FIGURE 2 PROPORTIONAL Q



Proportional Q is the mode of operation familiar to users of the Klark Teknik analogue graphic equalisers such as the DN360. As the amount of cut or boost is increased, the Q also increases. This has the effect of making the equaliser “focus” more tightly as the amount of EQ is increased. This allows a fairly low-Q filter at small cut and boost settings, providing gentle control of tonal balance and low ripple. At high gain settings, a proportional-Q equaliser “automatically” increases Q for more dramatic problem solving such as suppression of feedback or unwanted resonances. In the interests of clarity, the Q setting shown on the display is the Q at full cut or boost - the Q at lower gain settings will be lower than that shown on the panel.

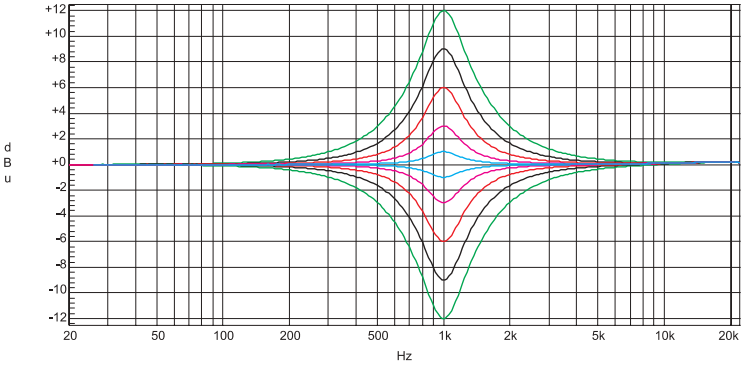
Q TYPES

FIGURE 3 CONSTANT Q



A constant Q equaliser has the same Q at all cut and boost settings. In other words, the bandwidth between the 3dB points does not change at all as the gain is adjusted. The really important thing to notice about this is that the resulting frequency response is NOT symmetrical in cut and boost. This is because of the definition of Q which is based on the 3dB points relative to maximum gain. The maximum gain of the filter when in cut is, of course, 0dB, and the bandwidth is determined by the -3dB points relative to 0dB and NOT relative to the minimum gain (at the centre frequency). This makes a lot of sense musically too - if you listen to a music signal and apply a notch filter, and then change the shape of the curve around the minimum gain (centre) point, it will make little difference to the sound (since that area is already attenuated a lot). However, if you change the curve around the 3dB points, this will affect the sound much more, as more or less of the signal "falls into" the notch. It is this bandwidth that the constant-Q filter is keeping constant. Note that many equalisers that are described as "Constant Q" by their manufacturers do NOT fall into this category, and are what we would term symmetrical-Q designs.

FIGURE 4 SYMMETRICAL Q



This class of equaliser has the same curves in boost as the constant-Q type, but then has cut responses that are symmetrical with the boost ones. In other words, the bandwidth in cut is defined not according to our usual definition of Q (see constant-Q above) but as "the point were the signal is cut by 3dB less than the maximum cut". Most equalisers described by their manufacturers as "Constant Q" in fact produce symmetrical responses..

DN9340

DIGITAL EQUALISER MASTER UNIT

ARCHITECTS AND ENGINEERS SPECIFICATION

The Digital Equaliser shall provide two audio channels in a standard 2U 19" rack mount chassis.

Each audio channel shall include: Input gain, delay up to one second; up to four filters, two dynamic EQ bands, up to 12 parametric EQ bands and a 31 band graphic EQ.

All delay times shall be set in milliseconds and microseconds, or in distance units (metric and imperial) with a temperature compensation facility.

The high and low pass filters shall be selectable from notch, high pass, low pass, high shelf and low shelf types. The Low pass and high pass filters shall have selectable slopes of 6, 12, 18, 24, 36 and 48 dB per octave and the high and low shelf filters shall have selectable slopes of 6 and 12 dB per octave and ±12 dB of gain.

The dynamic EQ sections shall have independent high and low level thresholds and gain and be selectable from parametric EQ, or high shelf or low shelf filter types. The parametric EQ shall provide proportional-Q, constant-Q and symmetrical-Q responses. The dynamic EQ sections shall also have independent attack and release times.

The parametric EQ sections shall have up to 12 dB of cut or boost and a Q value variable from 0.4 to 20. The parametric EQ shall provide proportional-Q, constant-Q and symmetrical-Q responses.

The graphic EQ section shall provide 31 bands on standard frequencies defined in BS EN ISO 266:1997. Proportional-Q, constant-Q and symmetrical-Q responses shall be provided as well as emulations of Klark Teknik DN27 and DN360 Graphic Equalisers.

Each Digital Equaliser shall meet or exceed the following performance specifications:

- Frequency response ±0.3 dB (20 Hz to 20 kHz)
- Distortion @ +4 dBu: <0.01% (20 Hz to 20 kHz)
- Dynamic Range: 115 dB (20 Hz to 20 kHz unweighted)

All audio inputs and outputs shall be electronically balanced and use XLR connectors. A 480 x 64 graphic LCD shall be provided to display a graphical representation of the equaliser section responses. All parameters shall be displayed and adjusted via a 20 x 2 alphanumeric LCD display, three rotary encoders and individual menu buttons for each equaliser section. A dual touchstrip shall be provided for use with the graphic LCD to allow the selection of graphic EQ band and gain, and centre or corner frequency for filters, and dynamic and parametric EQ. The graphic and alphanumeric LCDs and the dual touchstrip shall have LED backlights.

There shall be provision for 32 system memories and 32 factory presets with a security lock-out feature. There shall also be a security lock-out feature that is enabled when the unit is under remote control.

The Digital Equaliser shall be provided with RS-232 ports on the front and rear panels and RS-485 ports on the rear panel. The RS-485 ports and front panel RS-232 port shall be provided for remote control from a master Digital Equaliser or a PC and additionally the front panel RS-232 port shall also provide the facility to download software updates and preset memories into the Digital Equaliser. The rear panel RS-232 port shall be provided for remote control from Midas Heritage and Legend mixing consoles.

The unit shall be capable of operating from a 100 to 240V, 50 to 60 Hz a.c. power source.

The Digital Equaliser shall be the Klark Teknik model DN9340 and no alternative option is available.

TECHNICAL SPECIFICATIONS

Inputs	Two
Type	Electronically balanced (pin 2 hot)
Impedance (Ohm)	20k
Common Mode Rejection	>80dB @ 1 kHz
Outputs	Two
Type	Electronically balanced (pin 2 hot)
Maximum Level	+21dBu into >2k
Performance	
Frequency response (20Hz to 20kHz)	0.3 dB with all filters and EQ flat
Distortion (THD+N) @ +4dBu (20Hz to 20 kHz)	<0.01%
Dynamic range (20Hz-20kHz unweighted)	115 dB
Processing (Per Channel)	
Input Gain	+12dB to -40dB in 0.1dB steps plus Off
Delay	0-1 second (342.25 m or 333'10" at 20C in 20.8us steps)
Filters	4 Filters (max)
Types	Low Pass, High Pass, Low Shelf, High Shelf, Notch
Dynamic EQ	2 Bands (max)
Range	±12dB
Responses	Proportional, Constant, Symmetrical
Parametric EQ	12 Bands (max)
Range	±12dB
Responses	Proportional, Constant, Symmetrical
Graphic EQ	31 Bands On ISO standard frequencies
Range	±12dB
Responses	Proportional, Constant, Symmetrical, DN27, DN360
Power Requirements	
Voltage	90 V to 250 V a.c. 50/60 Hz
Consumption	<40VA
Terminations	
Audio inputs/outputs	3-pin XLR
RS-485 inputs/outputs	3-pin XLR
RS-232	8-pin Mini-DIN socket (front) 9-pin D-type (rear)
Power	3-pin IEC
Dimensions	
Width	483 mm (19inch)
Height	88 mm (3.5 inch) 2RU High
Depth	303 mm (12 inch)
Weight	
Net	6kg
Shipping	8kg

DN9344

DIGITAL EQUALISER SLAVE UNIT

ARCHITECTS AND ENGINEERS SPECIFICATION

The Digital Slave Equaliser shall provide four audio channels grouped as two linkable pairs in a standard 2U 19" rack mount chassis.

Each audio channel shall include: Input gain, delay up to one second; up to four filters, two dynamic EQ bands, up to 12 parametric EQ bands and a 31 band graphic EQ.

All delay times shall be set in milliseconds and microseconds, or in distance units (metric and imperial) with a temperature compensation facility.

The high and low pass filters shall be selectable from notch, high pass, low pass, high shelf and low shelf types. The Low pass and high pass filters shall have selectable slopes of 6, 12, 18, 24, 36 and 48 dB per octave and the high and low shelf filters shall have selectable slopes of 6 and 12 dB per octave and ±12 dB of gain.

The dynamic EQ sections shall have independent high and low level thresholds and gain and be selectable from parametric EQ, or high shelf or low shelf filter types. The parametric EQ shall provide proportional-Q, constant-Q and symmetrical-Q responses. The dynamic EQ sections shall also have independent attack and release times.

The parametric EQ sections shall have up to 12 dB of cut or boost and a Q value variable from 0.4 to 20. The parametric EQ shall provide proportional-Q, constant-Q and symmetrical-Q responses.

The graphic EQ section shall provide 31 bands on standard frequencies defined in BS EN ISO 266:1997. Proportional-Q, constant-Q and symmetrical-Q responses shall be provided as well as emulations of Klark Teknik DN27 and DN360 Graphic Equalisers.

Each Digital Slave Equaliser shall meet or exceed the following performance specifications:

- Frequency response ±0.3 dB (20 Hz to 20 kHz)
- Distortion @ +4 dBu: <0.01% (20 Hz to 20 kHz)
- Dynamic Range: 115 dB (20 Hz to 20 kHz unweighted)

All audio inputs and outputs shall be electronically balanced and use XLR connectors.

There shall be two three-character starburst LED displays per pair of audio channels for displaying recalled memory, communications channel setting and remotely-set user information. There shall also be physical write-on strips for each pair of audio channels plus an additional one for the unit as a whole.

There shall be provision for 32 system memories and 32 factory presets.

The Digital Slave Equaliser shall be provided with an RS-232 port on the front panel and RS-485 ports on the rear panel. The RS-485 ports and RS-232 port shall be provided for remote control from a master Digital Equaliser or a PC and additionally the front panel RS-232 port shall also provide the facility to download software updates and preset memories into the Digital Slave Equaliser. There shall also be a rear panel relay contact closure port to allow the recall of specific preset memories.

The unit shall be capable of operating from a 100 to 240V, 50 to 60 Hz a.c. power source.

The Digital Slave Equaliser shall be the Klark Teknik model DN9344 and no alternative option is available.

TECHNICAL SPECIFICATIONS

Inputs	Four
Type	Electronically balanced (pin 2 hot)
Impedance (Ohm)	20k
Common Mode Rejection	>80dB @ 1 kHz
Outputs	Four
Type	Electronically balanced (pin 2 hot)
Maximum Level	+21dBu into >2k
Performance	
Frequency response (20Hz to 20kHz)	0.3 dB with all filters and EQ flat
Distortion (THD+N) @ +4dBu (20Hz to 20 kHz)	<0.01%
Dynamic range (20Hz-20kHz unweighted)	115 dB
Processing (Per Channel)	
Input Gain	+12dB to -40dB in 0.1dB steps plus Off
Delay	0-1 second (342.25 m or 333'10" at 20C in 20.8us steps)
Filters	4 Filters (max)
Types	Low Pass, High Pass, Low Shelf, High Shelf, Notch
Dynamic EQ	2 Bands (max)
Range	±12dB
Responses	Proportional, Constant, Symmetrical
Parametric EQ	12 Bands (max)
Range	±12dB
Responses	Proportional, Constant, Symmetrical
Graphic EQ	31 Bands On ISO standard frequencies
Range	±12dB
Responses	Proportional, Constant, Symmetrical, DN27, DN360
Power Requirements	
Voltage	90 V to 250 V a.c. 50/60 Hz
Consumption	<40VA
Terminations	
Audio inputs/outputs	3-pin XLR
RS-485 inputs/outputs	3-pin XLR
RS-232	8-pin Mini-DIN socket (front)
Relay Socket	9-pin D-type (rear)
Power	3-pin IEC
Dimensions	
Width	483 mm (19 inch)
Height	44 mm (1.75 inch) 1RU High
Depth	287 mm (12 inch)
Weight	
Nett	4kg
Shipping	6kg

In 1974, brothers Phil and Terry Clarke founded Klark Teknik Research Ltd. In the years immediately following, their innovative approach to design and development allowed them to introduce some truly groundbreaking designs. The world's first digital delay and digital reverb units emanated from their laboratory, and their descendants remain in common usage all over the world to this day. However, it was their concepts for equalisation devices that really changed the world of professional audio. Their earliest designs eventually matured into the world famous DN360 that remains the industry standard graphic EQ for audio professionals everywhere.

Today, Klark Teknik continues to uphold the original vision of the Clarke brothers: innovation in design, followed by uncompromising dedication to engineering and sonic quality. Most of our units are still made and tested by hand, a time consuming and labour intensive process that remains the only method by which we can maintain the quality that our customers expect. Uniquely in its field, Klark Teknik also provides the customer with an opportunity to invest in leading-edge equipment with an extraordinary working lifespan and unrivalled retained value. Global support for our products is readily available from the factory in Kidderminster, from our international distributor network and via the Klark Teknik website.

KLARK TEKNIK
SIGNAL PROCESSING BY DEFINITION

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