

DN540

Creative Quad Compressor

Operator Manual

Klark Teknik,
Klark Industrial Park,
Walter Nash Road,
Kidderminster.
Worcestershire.
DY11 7HJ.
England.

Tel: +44 1562 741515
Fax: +44 1562 745371

Email: info@midasklarktechnik.com
Website: www.klarktechnik.com

DN540 Creative Quad Compressor — Operator Manual
DOC02-DN540 Issue B — February 2011
© Red Chip Company Ltd.

In line with the company's policy of continual improvement, specifications and function may be subject to change without notice. This Operator Manual was correct at the time of writing. E&OE.

IMPORTANT SAFETY INSTRUCTIONS



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

- 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 a dry cloth.
- 7 Do not block any of the 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 Only use attachments/accessories specified by the manufacturer.
- 12 Unplug this apparatus during lightning storms or when unused for long periods of time.
- 13 Refer all servicing to qualified 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.
- 14 Use the mains plug to disconnect the apparatus from the mains.
- 15 **Warning: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.**
- 16 **Warning: Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.**
- 17 **Warning: The mains plug of the power supply cord shall remain readily operable.**

INSTRUCTIONS DE SÉCURITÉ IMPORTANTES



Le symbole représentant un éclair fléché dans un triangle équilatéral a pour but d'alerter l'utilisateur de la présence d'une "tension dangereuse" non isolée à l'intérieur du boîtier, pouvant être d'une force suffisante pour constituer un risque d'électrocution.



Le point d'exclamation dans un triangle équilatéral a pour but d'alerter l'utilisateur de la présence d'instructions importantes concernant le fonctionnement et la maintenance, dans la documentation qui accompagne l'appareil.

- 1** Veuillez lire ces instructions.
- 2** Conservez ces instructions.
- 3** Respectez toutes les consignes de sécurité.
- 4** Suivez scrupuleusement toutes les instructions.
- 5** N'utilisez pas cet appareil près d'un point d'eau.
- 6** Utilisez uniquement un chiffon sec pour le nettoyer.
- 7** N'obstruez aucune des ouïes de ventilation. Installez-le en respectant les instructions du fabricant.
- 8** Ne l'installez pas près de sources de chaleur tels que radiateurs, panneaux chauffants, étuves, ou autres appareils produisant de la chaleur (dont les amplificateurs).
- 9** Ne pas utiliser d'adaptateur pour supprimer la prise de terre des prises à trois fiches. Si la prise fournie ne peut pas être branchée dans la prise électrique, adressez-vous à un électricien qui remplacera la prise obsolète.
- 10** Protégez le cordon secteur afin que l'on ne marche pas dessus et qu'il ne soit pas pincé, surtout au niveau des prises, ou à l'endroit où il sort de l'appareil.
- 11** Utilisez exclusivement des fixations et des accessoires recommandés par le fabricant.
- 12** Débranchez l'appareil en période d'orage ou s'il doit rester inutilisé pendant longtemps.
- 13** Confiez toutes les réparations et interventions à un personnel qualifié. Une intervention est nécessaire si l'appareil a été endommagé d'une façon ou d'une autre, si son cordon ou sa prise secteur ont été endommagés, si du liquide a été renversé ou si des objets sont tombés à l'intérieur, ou encore si l'appareil a été exposé à la pluie ou à l'humidité, s'il ne fonctionne pas normalement, ou s'il est tombé.
- 14** Débrancher l'appareil du réseau électrique par la prise de secteur.
- 15** **Avertissement : afin de réduire le risque d'incendie ou de choc électrique, ne pas exposer cet appareil à la pluie ou à de l'humidité.**
- 16** **Avertissement : n'exposez pas cet équipement aux éclaboussures et veillez à ce qu'aucun récipient rempli de liquide, verre ou vase, ne soit posé dessus.**
- 17** **Avertissement : la prise secteur doit toujours rester directement accessible.**



EC-Declaration of Conformity

The undersigned, representing the following manufacturer

Manufacturer:

Address:

Midas Klark Teknik Ltd.

Klark Industrial Park, Walter Nash Road,
Kidderminster. Worcestershire. DY11 7HJ.

hereby declares that the following product

Product Type Number	Product Description	Nominal Voltage(s)	Current	Freq.
DN540	Creative Quad Compressor	115V AC 230V AC	200mA 100mA	50/60Hz

is in conformity with the regulations of the following marked EC-directives and bears the CE-mark accordingly

reference number	title
2004/108/EC	EMC Directive (EMC)
2006/95/EC	Low-Voltage Directive (LVD)

The conformity of the product with EC directives for use in environments E1, E2, E3 and E4 is provided by the compliance with the following standards:

Standards/date:

reference number	title
EN 60065:2002	Audio, video and similar electronic apparatus. Safety requirements.

Applied EMC emission test standards:

Applied EMC immunity test standards:

ref. no.	title
EN 55103-1:1996 Class B	EN 55103-1 Annex A: Radiated magnetic disturbance, 50Hz-50kHz
	CISPR 22: Radiated disturbance, 30-1000MHz
	EN 55103-1 Annex E: Conducted disturbance, ac & signal ports
	EN 61000-3-2:2006 Mains harmonics
	EN 61000-3-3:1995 Mains voltage flicker

ref. no.	title
EN 55103:1996 Class B	EN 61000-4-2:1995 Electrostatic discharge
	EN 61000-4-3:1996: Radiated RF disturbance, 80-1000MHz
	EN 55103-2 Annex A: Magnetic LF disturbance, 50Hz-10kHz
	EN 61000-4-4:1995: Fast transient bursts, ac & signal ports
	EN 61000-4-5:1995: Surge, ac port
	EN 61000-4-6:1996: Conducted RF field, ac & signal ports
	EN 61000-4-11:1994: Mains voltage dips and interruptions

Place, date: Kidderminster, UK
9th February 2011



SVP, Midas Klark Teknik
Printed name: John Oakley



AVP, Product Development
Printed name: Alex Cooper



Precautions

Before installing, setting up or operating this equipment please ensure that you have read and fully understand all of this section and the "IMPORTANT SAFETY INSTRUCTIONS" at the front of this manual.

This equipment is supplied by a mains voltage that can cause electric shock injury!

The following special limitations must be observed in order to maintain safety and electromagnetic compatibility performance.

Safety warnings

This equipment is fitted with a mains power socket. For safety reasons the earth leads must not be disconnected.

Signal 0V is connected internally to the chassis.

To completely disconnect this equipment from the AC mains, while observing full safety precautions (see "Power" on page vii), switch off the mains at the mains outlet. It is now safe to isolate the unit by unplugging the mains lead from its rear panel.

To avoid electrical shock do not remove covers. Refer servicing to qualified personnel only.

The power supplies — even the DC ones — have a high current!

General precautions

The following information gives basic safety precautions that should be observed to reduce the risk of fire, electric shock and personal injury:

- Never operate damaged equipment and never operate equipment with damaged cables.
- Do not remove, obscure or deface any warnings or cautions.

Power

Please note that the system power supplies contain LETHAL VOLTAGES greatly in excess of the mains voltage and that its rails can produce extremely large currents that could burn out equipment and wiring if shorted. All

testing and servicing must ONLY be carried out by approved service engineers.

This apparatus should only be operated with the power supply connected to ground via the ground in the mains connector.

The internal power supplies are of the switch mode type that automatically sense the incoming mains voltage and will work where the nominal voltage is in the range 100VAC to 240VAC.

When removing the equipment's electric plugs from the outlets, always hold the plug itself and not the cable. Pulling out the plug by the cable can damage it.

Never insert or remove an electric plug with wet hands.

Handling the equipment

Completely isolate the equipment electrically and disconnect all cables from the equipment before moving it.

When lifting or moving the equipment, always take its size and weight into consideration.

Do not insert your fingers or hand in any gaps or openings on the equipment, for example, vents.

Avoid inserting or dropping foreign objects, such as paper, plastic, metal etc., into any gaps or openings on the equipment, for example, vents. If this happens, immediately disconnect the equipment from the mains (see "Safety warnings" on page vii). Then, have the equipment inspected by the manufacturer's qualified service personnel.



Installation

Before installing the equipment:

- Power plugs must be inserted in socket outlets provided with protective earth contacts. The electrical supply at the socket outlets must provide appropriate over-current protection.
- Both the mains supply and the quality of earthing must be adequate for the equipment.
- Before connecting up the equipment, check that the mains power supply voltage rating corresponds with the local mains power supply. The rating of the mains power supply voltage is printed on the equipment.

Location

- Ideally a cool area is preferred, away from power distribution equipment or other potential sources of interference.
- Do not install the equipment in places of poor ventilation.
- Do not install this equipment in a location subjected to excessive heat, dust or mechanical vibration. Allow for adequate ventilation around the equipment, making sure that its vents are not obstructed. To prevent excessive heating of the equipment, avoid mounting it directly above power amplifiers or other devices that radiate significant amounts of heat, such as radiators and heaters. Keep the equipment out of direct sunlight.
- Make sure that the mains voltage and fuse rating information of the equipment will be visible after installation.

Audio connections

To ensure the correct and reliable operation of the equipment, only high quality balanced, screened, twisted pair audio cable should be used.

XLR connector shells should be of metal construction so that they provide a screen when connected to a console and, where appropriate, they should have Pin 1 connected to the cable screen.

In the event of ground loop problems, disconnect the signal screen at one end of the connecting cables. Note that this can only be done when the equipment is used within a balanced system.

Radio frequency interference - Class B device

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.

Electric fields

Caution:

In accordance with Part 15 of the FCC Rules & Regulations, "... changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

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).

Operation

To avoid electrical shock, never operate the equipment with the covers removed.



Safety equipment

Never remove, for example, covers, housings or any other safety guards. Do not operate the equipment or any of its parts if safety guards are ineffective or their effectiveness has been reduced.

Optional equipment

Unless advised otherwise, optional equipment must only be installed by service personnel and in accordance with the appropriate assembly and usage regulations.

Special accessories

To comply with part 15 of the FCC Rules, any special accessories (that is, items that cannot be readily obtained from multiple retail outlets) supplied with this equipment must be used with this equipment; do not use any alternatives, as they may not fulfil the RF requirement.





Contents

Chapter 1	Introduction	1
	Overview	1
	Applications	2
	Features	3
	About this manual	3
Chapter 2	What Is A Compressor?	5
	Principles of compression	5
	Uses of compression	6
	Unwanted side effects	6
Chapter 3	Getting Started.	9
	Unpacking	9
	Checking the mains fuse	9
	Installation	9
	Connecting the power cable	10
	Connecting the audio cables	10
	Channel I/O pin-outs	10
	Sidechain inputs	11
	Connecting to unbalanced equipment	12
	Powering the unit	12
Chapter 4	Front Panel.	13
	Overview	13
	Description	13
	Compressor section	14
	Switch section	15
Chapter 5	Rear Panel	17
	Mains input	17
	Channel connector section	17
Chapter 6	Compressor Control Functions.	19
	Attack	19
	Make up gain	19
	Release	19
	Ratio	20
	Threshold	21
	Presence	21
	Soft knee and hard knee	22
Chapter 7	Using The Compressor	23
	Modes of operation	23
	Manual mode with soft knee (linear peak)	23
	Manual mode with hard knee (linear peak)	24



Auto mode with hard knee (exponential RMS)24
 Auto mode with soft knee (exponential RMS)24
 Limiter24
 Simple compression (auto mode)26
 Advanced compression (manual mode)26
 Stereo and multiple channel operation - linking27
 Sidechain28

Appendix A Application Notes 29
 Drums and percussive instruments29
 Stringed acoustic instruments29
 Stringed electric instruments29
 Brass instruments29
 Vocals29
 Presence accentuation29

Appendix B Functional Block Diagram 31

Appendix C Balanced/Unbalanced Audio 33

Appendix D Technical Specification 35

Appendix E Crib Sheet 37

Appendix F Service Information 39
 Routine maintenance39
 Cleaning39
 Replacing the mains fuse39
 Equipment disposal40



Chapter 1: Introduction

Thank you for purchasing a Klark Teknik DN540 Creative Quad Compressor. The DN540 is a user-friendly, high-performance, four-channel (quad) analogue compressor designed for live sound reinforcement primarily on tour, in theatres and at corporate events, with applications in both front-of-house and monitoring situations. Other possible areas for use include broadcasting, the recording studio and installation.

The DN540 provides a wide variety of easy-to-use controls for the precise manipulation of compression parameters. These enable you to, for example, alter the character of an instrument that is being processed or make sounds seemingly louder, but without distortion. Other features include channel linking for stereo and multiple channel operation, and a presence control for protecting vocals.

Your DN540 was conceived by Klark Teknik to offer audio professionals high-performance audio equipment, designed to provide no-compromise sonic quality with a feature set that offers all essential facilities and functions. It represents the very best of British design and engineering combined with contemporary, efficient manufacturing methods, and will give you many years of reliable service.

All this is backed up, of course, by the standard Klark Teknik three year warranty.

Please take the time to complete and return the registration card or fill in the Warranty Registration Form online by visiting our website at www.klarktechnik.com and, to obtain the best results with a minimum of effort, also read this operator manual.

Finally, enjoy your Klark Teknik DN540!

Overview

The DN540 consists of four linkable channels of compression that provide full control of all essential audio-compression parameters. All this is housed in a compact 1U high rack-mount unit.



Front panel



Rear panel

The main compressor controls consist of continuously adjustable threshold, ratio and make up gain, and a bypass switch and a hard knee switch. Used in auto mode, these controls are all that are required to set up simple transparent RMS compression suited to *normal* (not difficult) signals.

The envelope time constant controls (attack and release) are activated by disabling auto mode and operating the DN540 in manual mode. The DN540 can then be used for creative compression effects using a semi-linear attack shape.



The presence control progressively reduces compression in the 5kHz region.

Attenuation depth and input level meters are provided, plus a switch that changes the output level meter to monitor the input signals.

An external sidechain input on the rear panel is switchable via the front panel.

Applications

The DN540 provides a quality, cost effective and compact compressor unit presented in a traditional 1U quad channel format. This makes it ideally suited to applications where space is limited or when there is no need for eight channels.

The default compressor mode (manual) is ideal for creative compression, whereby the manual envelope controls for attack and release can be adjusted as necessary. This mode provides a semi-linear type of compression, which is suited to percussive instruments (especially thickening drums) and difficult instruments, or for more advanced effects where the added manual control gives vastly superior results, as compared to auto mode.

The auto compressor mode (with the pushbutton **AUTO** on) provides a root-mean-square (RMS) type of compression. This mode is easy to use because the envelope time constants (attack and release) are automatically adjusted, taking into account threshold and ratio settings relative to signal levels and transients. This makes the DN540 ideal for the novice user or for situations where there is not enough time to set up the envelope manually.

The presence control will be especially useful on vocals to eliminate pumping effects caused by, for example, cymbal spill — because singers typically stand with their microphones (mics) pointing directly at the drum riser — and to add *air* to the sound without introducing noise.

The DN540 has been primarily designed for the following main application areas:

- **Touring live sound** In applications where analogue consoles are still required due to their ease of use. Here the DN540 can be used for channel inserts on drums, bass guitars and other instruments. The compressor can be used to control both the dynamic range and to generate musical effects. The presence control reduces pumping on vocals and also increases brightness to a desired level without increasing the risk of squealing if mics are held too close to monitor speakers.
- **Theatre live sound** Theatres can make use of the compressor in the same way as touring live sound, for vocals and orchestra, but in this case they can probably make more use of the compressor's more transparent linear style. The presence masking is useful, increasing vocal brightness without bringing up the noise floor, which may be quite poor due to the use of radio mics and mic placement limitations.
- **Corporate live event** As above, transparent control and effects can be used on channel inserts.



Features

The DN540 has the following features:

- Great sounding compressor that provides good audio performance at extremely low noise and distortion levels.
- Easy to use basic compressor, requiring minimum set up to produce excellent results.
- Advanced envelope generator with manual controls that can be easily switched in or out to produce transparency or creative dynamic effects, as required, for any given source material.
- Extremely transparent compression.
- Multiple compression styles that are easily matched to the programme material and/or generate dynamic effects.
- Unique and intuitive presence control that improves the high frequency sound quality without increasing noise or squealing (howl-round).
- Intuitive 'turn it up, turn it down' control knob labelling avoids confusion during fast adjustment. Also, good control status visibility enables you to see the status of all pushbuttons, which are boldly presented to avoid mistakes.
- Comprehensive metering, making set up simple and intuitive.
- Totally analogue, which precludes the use of complex set up menus and means that there is absolutely no audio delay. Thus, compressed and non-compressed signals can be recombined without producing comb filter effects.
- Stereo and multiple channel linking. Linking has true power summing, so that it always provides true threshold setting for stereo material. For example, for using the compressor across a stereo group.
- Housed in a compact 1U high unit.
- Puts back dynamics and punch for creative effects.

About this manual

This is the operator manual for the DN540. It is intended to help get your DN540 installed and in operation as quickly as possible by giving you unpacking, installation, connection and setting up instructions. To help familiarise you with the DN540 there is a description of the front and rear panels, along with easy-to-follow user instructions.





Chapter 2: What Is A Compressor?

The natural sounds of everyday life, which can be caused by anything from, say, the falling of a leaf to the roar of a jet engine, vary extremely widely in sound level. This variance is known as the “dynamic range” and is the difference — expressed in decibels (dB) — between the loudest and quietest sounds in a piece of audio, such as music or speech, or that can be reproduced by a piece of audio equipment without distortion.

The human ear has an *automatic gain control* that enables it to accommodate all of the sounds ranging from the threshold of hearing to near the threshold of pain, a dynamic range of approximately 120dB. However, a dynamic range of this magnitude, even if it were possible in audio equipment, is not required in practice for comfortable listening. A sound pressure level (SPL) of 96dB would, in a domestic environment, almost certainly annoy the neighbours. While, at the other end of the dynamic scale, a typical ambient noise level of at least 40dB SPL makes it impossible to use very quiet levels in recorded or broadcast sound media. So, it is almost always necessary to compress the dynamic range of natural sounds to fit them into a window (usually about 30dB to 40dB) suitable both for the equipment and for comfortable listening.

The compressor is a valuable tool for the control of the dynamic range.

Principles of compression

One of the principal uses of compression is the control of level in vocals. Many singers train for years to achieve the degree of breath control necessary for an even tone and expressive performance. Whereas, other vocalists rely on an instinctive voice production technique, which may need technological assistance to maintain a consistent level that *sits* correctly in the programme.

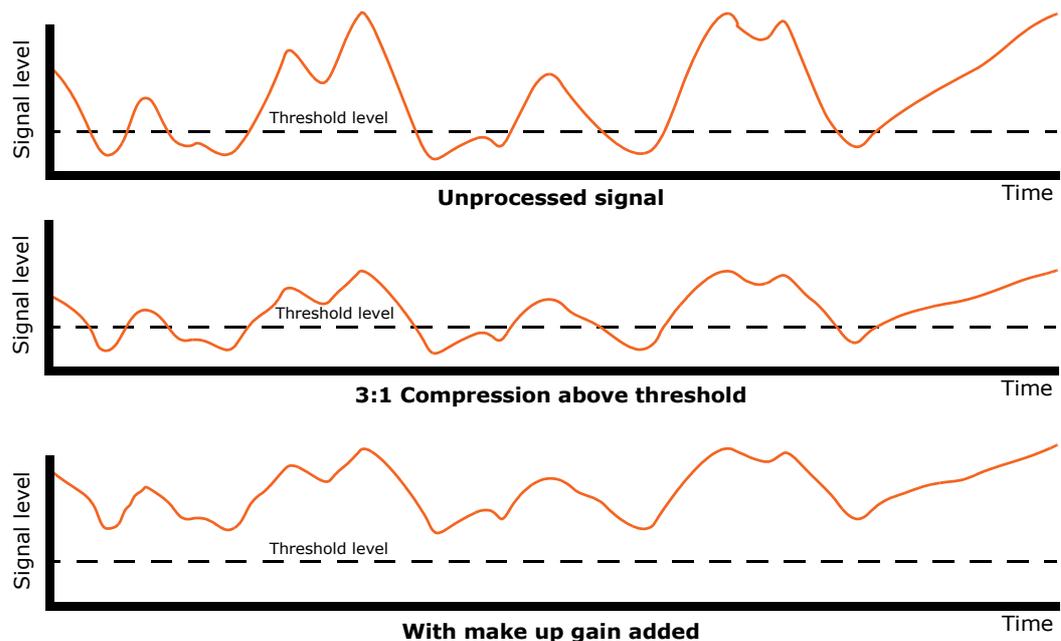


Figure 1: Compression - signal level graphs



The level of a vocal may vary widely. As shown in the typical example in Figure 1 “Compression - signal level graphs”, the unprocessed signal has a large dynamic range between the highest and lowest levels. Applying compression reduces the highest levels, thus reducing the dynamic range, while leaving the signal below threshold relatively unaltered. Because the peak level of the signal is now lower, make up gain is added to restore the original peak level. The result is a much more controlled and usable sound.

Uses of compression

Compressors were originally devised to reduce the dynamic range of audio signals. To do this they use a gain cell that makes adjustments to signal levels automatically, dependent on the level and dynamic of the signal itself, and depending on the character and control settings of the particular compressor unit.

Over the years many different brands of compressor have been produced using many different types of gain cell technology, each with a distinctive sound. Users have found applications that suit many of these, taking the use of compressors far beyond simple dynamic range reduction and sometimes even generating the complete reverse — dynamic enhancement. Typical applications include:

- Protecting systems from amplitude overload.
- Improving the power of signals when an artist's performance is inconsistent.
- Maintaining a stable signal level to help an instrument sit better within a mix.
- Changing the percussive timbre of an instrument to produce more punch.
- Compressing a mix so that it maintains a stable signal level, typically trying to make it sound louder.
- Changing the percussive timbre of a mix to make it sound more whole and add punch.
- Frequency-conscious compression to remove unwanted sibilance or popping.

Unwanted side effects

Very often the process of compression produces unwanted side effects, especially if the chosen compressor does not match the application it is being put to very well. These can include:

- **Breathing** — when high frequency environmental or processing noise levels jump up and down, sounding similar to someone breathing in the background.
- **Pumping** — when level modulation can be heard on an instrument, making it sound unnatural.
- **Amplitude flutter** — a faster oscillating modulation that makes sounds *gritty*.
- **Source inter-modulation** — when one sound source within a mix causes amplitude changes to another, for example, the natural decay of cymbals can be modulated by the crack of a snare drum in a drum mix.
- **Transient enhancement** — unwanted accentuation clicks at the start of a sound.
- **Dull sound** — when all the natural attack and brilliance is stripped away from the sound source.



Providing controls for threshold, attack, release and ratio, and providing responsive metering can go along way towards helping with suitable parameter set up for any signal source, such that most of the negative effects above can be reduced or eliminated. However, this is a complex and critical task that often involves a degree of compromise between the desired compression effects and the unwanted side effects, which can be time consuming.





Chapter 3: Getting Started

Observing the IMPORTANT SAFETY INSTRUCTIONS at the front of the manual and the guidelines in "Precautions" on page vii, carry out the following to get your DN540 unit fully operational.

Unpacking

Carefully unpack your DN540 equipment package.

Then, inspect the DN540 unit carefully for any signs of damage that may have occurred during transit and notify the courier immediately if you discover any.

Check the contents of your DN540 equipment package. If there are any parts missing, incorrect or faulty, please contact your local distributor or Klark Teknik at the address at the front of this manual. The following is a list of the main items contained in the DN540 package.

Quantity	Description	Part number
1	DN540 unit	Not applicable
1	DN540 Operator Manual (this document)	DOC02-DN540
1	Warranty card	DOC04-WARRANTY
1	Mains lead	PWR21-MAINSLEAD

Please retain the original packing in case you should need to return the equipment to the manufacturer or supplier, or transport or ship the unit later.

Checking the mains fuse

Before installing the equipment you need to make sure that the mains fuse fitted is of the correct type and rating for your unit. To do this refer to "Replacing the mains fuse" on page 39.

Installation

This unit is designed for mounting in any 19" EIA standard rack. Four rack-mount holes in the front panel are provided for rack mounting and are designed to fully support the weight of the unit in the rack.

Note: Avoid over-tightening the rack-mount screws, as this could damage the front panel.

The position of the unit will depend upon how it is to be used. However, when positioning the unit, avoid placing it where the control knobs may be damaged by being accidentally knocked or snapped off. Also, try to avoid placing the unit directly near or on any power distribution units or power amplifiers.



Connecting the power cable

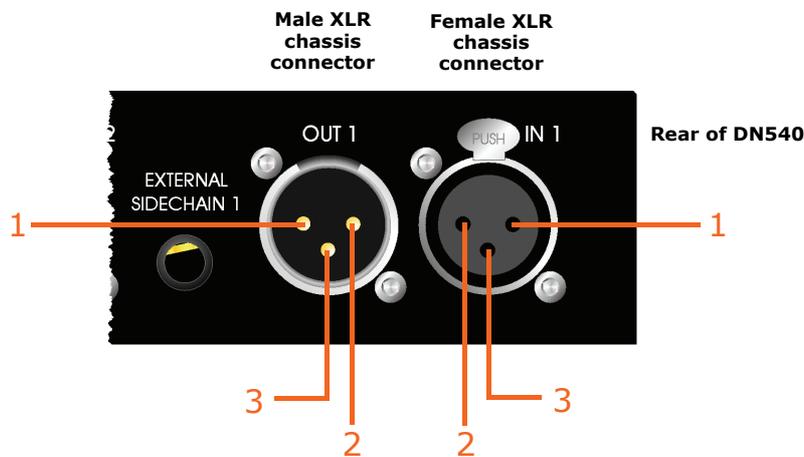
Making sure that the mains power at the power outlet is off, connect the mains cable supplied with your DN540 to the mains power outlet and then to the mains socket at the rear of your unit.

Connecting the audio cables

Making sure that all equipment is switched off, connect your DN540 to the rest of your audio equipment as shown in the following subsections. For more information on balancing, see "Balanced/unbalanced audio" on page 37.

Channel I/O pin-outs

The following shows the channel I/O pin-outs for the male and female XLR connectors, on both balanced and unbalanced circuits.

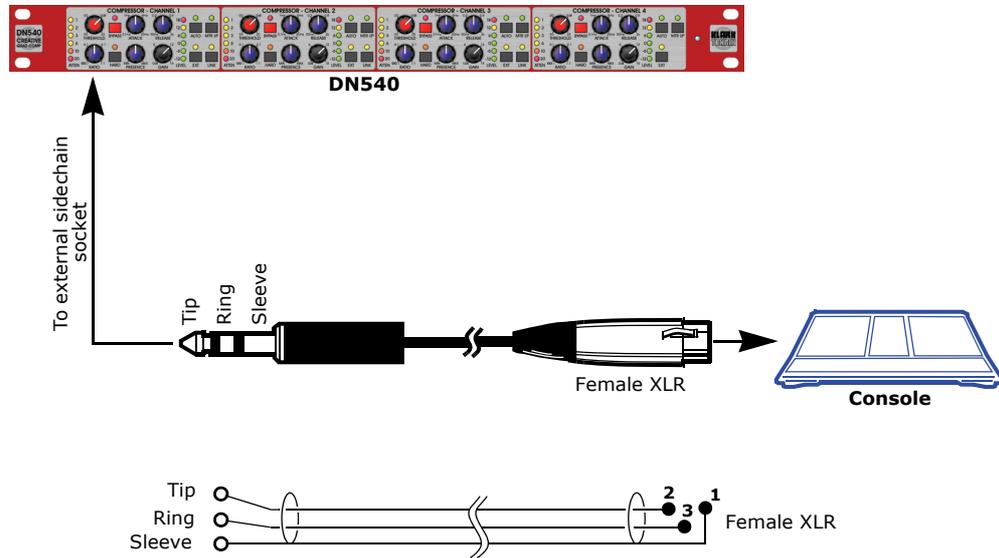


<i>Pin-out</i>	<i>Balanced I/O</i>	<i>Unbalanced I/O</i>
1	Screen/ground	Screen/ground (not connected at unbalanced end)
2	Hot signal	Hot signal
3	Cold signal	Ground at unbalanced end

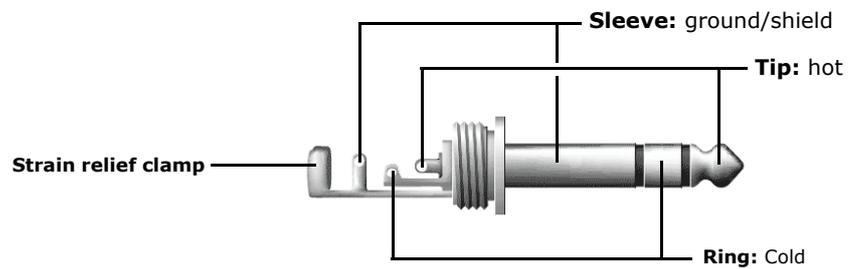


Sidechain inputs

The electronically balanced sidechain inputs are on stereo 1/4" TRS connectors. Inserting a mono jack plug will automatically unbalance the input. The following diagram shows the sidechain input connection details.



The 1/4" TRS connector wiring details are as follows:



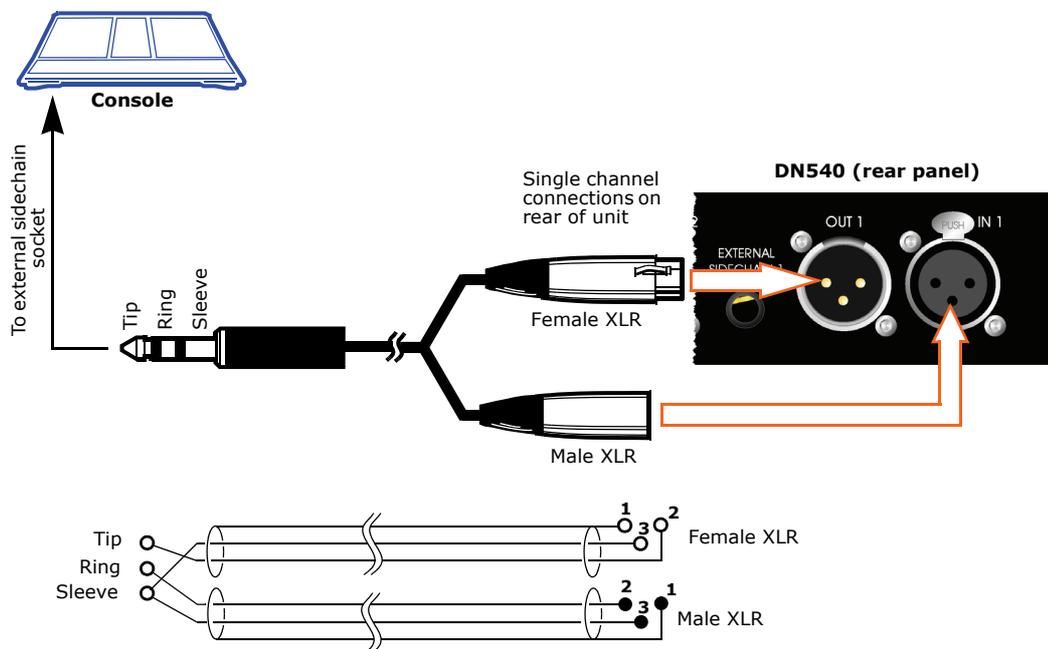


Connecting to unbalanced equipment

Ideally, you will be making the best use of the DN540's low-noise high-headroom balanced inputs by connecting to similarly balanced equipment. However, if you do have to connect to unbalanced devices, the following wiring is recommended for best results (see Figure 3):

- Connect the +ve (pin 2) of the balanced connection to the +ve terminal on the unbalanced connector.
- Connect the -ve (pin 3) of the balanced connection to the common (ground) terminal on the unbalanced connector.
- Connect the ground (pin 1) of the balanced connection to the common (ground) terminal on the unbalanced connector.

The following diagram shows the wiring details for the insert send/return 1/4" TRS connector/XLRs.



Powering the unit

To power up the unit, switch on the power at the mains power outlet. The blue power LED on the front of the unit (far right) will illuminate to show that power is on.

Your unit is now ready to operate.

To switch off the DN540, switch off the mains at the mains power outlet. Then, to electrically isolate the unit, remove the mains cable from the mains IEC socket on the rear panel.



Chapter 4: Front Panel

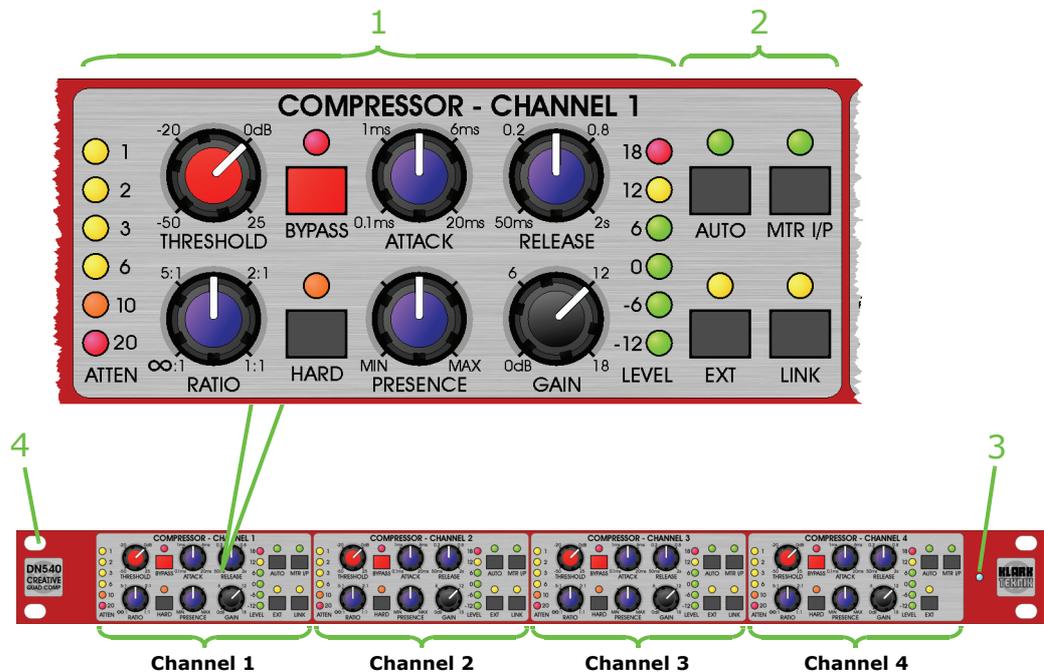
Overview

The front panel of the DN540 has four main channel sections, each containing a number of control knobs, pushbuttons and LEDs.

All of the switches on the front panel are of the latching pushbutton type and have two positions, in (on) and out (off). Each of these switches have an associated LED that illuminates to show when the switch is on.

Description

The front panel comprises four channel sections and a power on/off indicator LED.

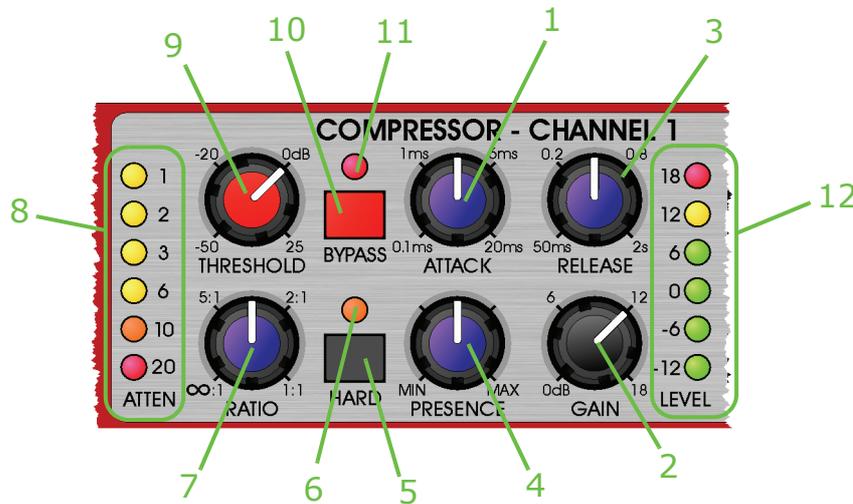


Item	Description
1	Compressor section (see "Compressor section" on page 14).
2	See "Switch section" on page 15.
3	Power on/off indicator LED. Illuminates blue when the power is on.
4	Four rack mounting holes for securing the unit in a rack. Do not overtighten.



Compressor section

Each compressor section houses six compressor parameter control knobs, a bypass switch and a hard knee switch, and two sets of six-LED meters (attenuation and level).



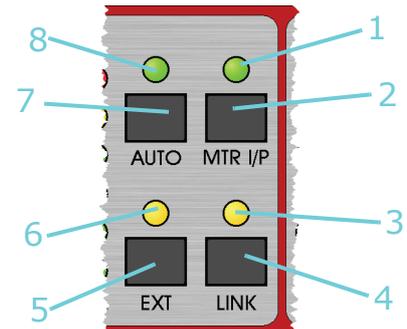
Item	Type	Label	Function
1	Control knob	ATTACK	Adjusts the time taken for the compressor to respond after an over threshold signal. (Envelope time constant.)
2	Control knob	GAIN	Provides adjustment of up to 18dB of make up gain, so that the level of the outgoing signal can be matched to the incoming uncompressed signal.
3	Control knob	RELEASE	Adjusts the time taken for the compressor to recover after an over threshold signal. (Envelope time constant.)
4	Control knob	PRESENCE	Reduces compression at the mid-high frequencies (vocal range), while allowing the low and high frequencies to be compressed normally.
5	Pushbutton	HARD	Switches the compressor to hard knee. When this button is switched off, the knee type is soft knee.
6	LED (orange)	Not applicable	On/off status indicator for the HARD knee pushbutton.
7	Control knob	RATIO	Controls the amount of compression applied to over threshold signals.
8	LED meter	ATTEN	Gain reduction meter. The compressor meter has 1dB, 2dB, 3dB, 6dB, 10dB and 20dB LEDs. No additional time constants are applied to the meter, so that the actual envelope speeds can be easily seen. The gain reduction meter continues to function normally when the DN540 is set in bypass. The bypass indicators are illuminated boldly to signal this fact to the user.
9	Control knob	THRESHOLD	Adjusts the operating point of the compressor.
10	Pushbutton	BYPASS	Removes the compressor/dynamic filter from the signal path.



Item	Type	Label	Function
11	LED (red)	Not applicable	On/off status indicator for the BYPASS pushbutton.
12	LED meter	LEVEL	Signal level meter. The meter has +18dB, +12dB, +6dB, 0dB, -6dB and -12dB LEDs for displaying the output signal level (default). When the MTR I/P pushbutton is on, the meter displays the input signal level.

Switch section

The switch section has four switches for: changing the compressor mode; switching the signal level meter from output signal to input signal; external sidechain; and channel linking.



Item	Type	Label	Function
1	LED (green)	Not applicable	On/off status indicator for the MTR I/P pushbutton.
2	Pushbutton	MTR I/P	Switches the LEVEL meter to monitor the output signal (off) or the input signal (on).
3	LED (yellow)	Not applicable	On/off status indicator for the LINK pushbutton.
4	Pushbutton	LINK	Links the channel to the adjacent channel on the right. (There is no LINK button on channel 4.)
5	Pushbutton	EXT	When this button is off, the sidechain signals are sourced from the incoming compressor signal, as normal. When this button is on, these signals are sourced from elsewhere via the external sidechain input connector (rear panel).
6	LED (yellow)	Not applicable	On/off status indicator for the EXT pushbutton.
7	Pushbutton	AUTO	Selects the compressor mode, where manual mode = off (default) and auto mode = on. For more information, see "Modes of operation" on page 23.
8	LED (green)	Not applicable	On/off status indicator for the AUTO pushbutton.





Chapter 5: Rear Panel

The rear panel of the DN540 (shown below) has a mains input section and four channel connector sections.



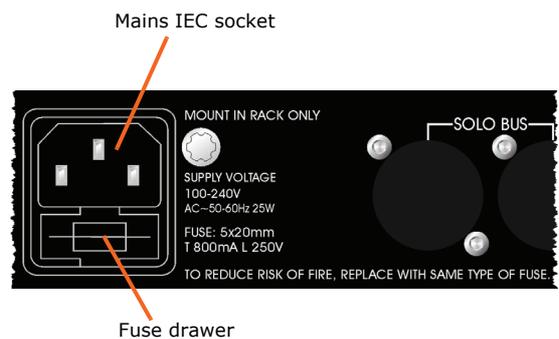
Note: Although the rear panel of the DN540 has cutouts for two solo bus connectors, these are unused on this unit and are therefore blanked off.

Mains input

The mains input section has a mains IEC socket, below which is a fuse drawer. Printed just to the right are the mains supply voltage and fuse details.

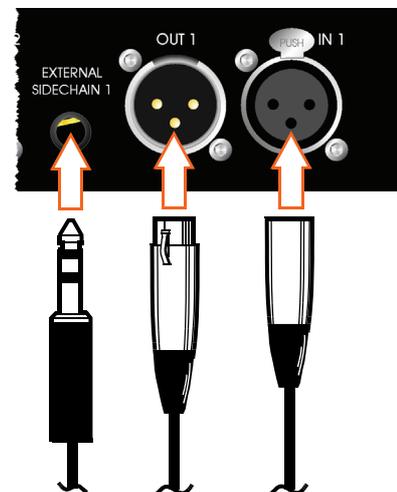
The mains input is an auto voltage sensing, switch mode power supply that operates where normal mains voltage is in the range 100V AC to 240V AC.

The fuse drawer houses the mains fuse at the rear of a two-compartment drawer. The front compartment provides room for a spare. Always replace the mains fuse with one of the same type of and rating, as printed to the right of the fuse drawer.



Channel connector section

There are four similar channel sections on the rear of the DN540. Each section comprises a male (output) and a female (input) XLR chassis connector, and a 1/4" TRS connector. These are for connecting to external line level signals, such as a mixing console's insert connections.







Chapter 6: Compressor Control Functions

This chapter explains the control functions of the DN540 compressor.

Attack

Attack is the time it takes for the compressor to respond once the threshold has been exceeded. Attack may be set so that the initial transient of the instrument passes through unaltered, or set to a faster value so that the very start of the sound is compressed. Particularly with drum sounds, careful adjustment of attack time can make the sound more *punchy* and *driving*.

Make up gain

As compression reduces the gain (level) of the signal, the gain control lets you add a fixed amount of make up gain, so as to achieve an optimum output signal level.

Release

Release is the time the compressor takes to recover after the programme material falls back below threshold. Both attack and release also respond to changes in programme level that remains over threshold. For example, a signal that reduces in level but remains above threshold will still trigger a release. However, in this case it will only be a partial release because the compressor is still required to generate gain reduction, albeit for the new lower signal level.

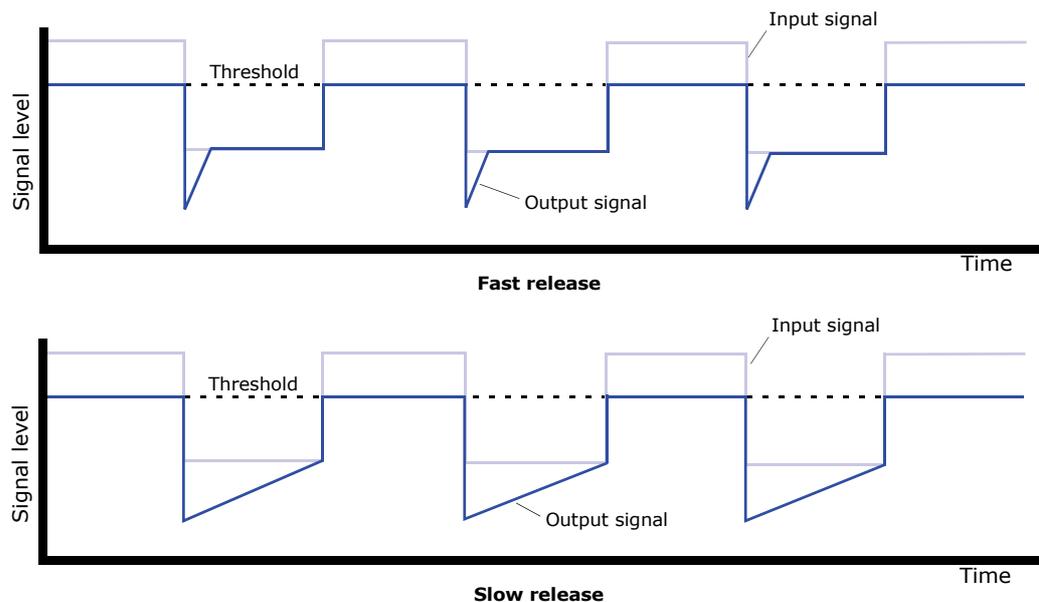


Figure 2: Compression fast and slow release signal envelope graphs



Release time plays a very important role in compression. During periods of high signal level, gain is reduced. When the signal level falls below the threshold, the gain will increase at a rate determined by the **RELEASE** control knob. If the release time is short, the gain will rise quickly. A long release time will mean that the gain will stay at its reduced level, only recovering gradually, see Figure 2 "Compression fast and slow release signal envelope graphs".

The setting of the correct release time is a compromise. If it is too short, background noise can cause effects such as *breathing* and *pumping*. A release time that is too long results in a signal that is not compressed, but merely reduced in level. For effective compression the release time must be set as short as possible before modulation of the background noise becomes too noticeable. The **ATTEN** gain reduction meter will show how much actual compression is occurring. If it is steady, there is little active compression, just a steady-state reduction in level. The faster the meter level moves up and down, the harder the compressor is working.

Ratio

Ratio is the *strength* of compression above the threshold level and controls the amount of compression applied to signals that are over threshold. Ratio is expressed as a ratio of signal level changes from input to output. For example, when the compressor is set to 2:1, every 2dB input level change will only generate a 1dB output level change, assuming the signal levels are over threshold. The highest ratios are achieved when the ratio control is fully anti-clockwise.

Note: Although the **RATIO** control knob on the DN540 operates in the opposite way to more conventional units, that is, the ratio is increased by turning it anti-clockwise rather than clockwise, we feel this is better ergonomically. This is because turning the control anti-clockwise results in less output, which matches the threshold and make up gain.

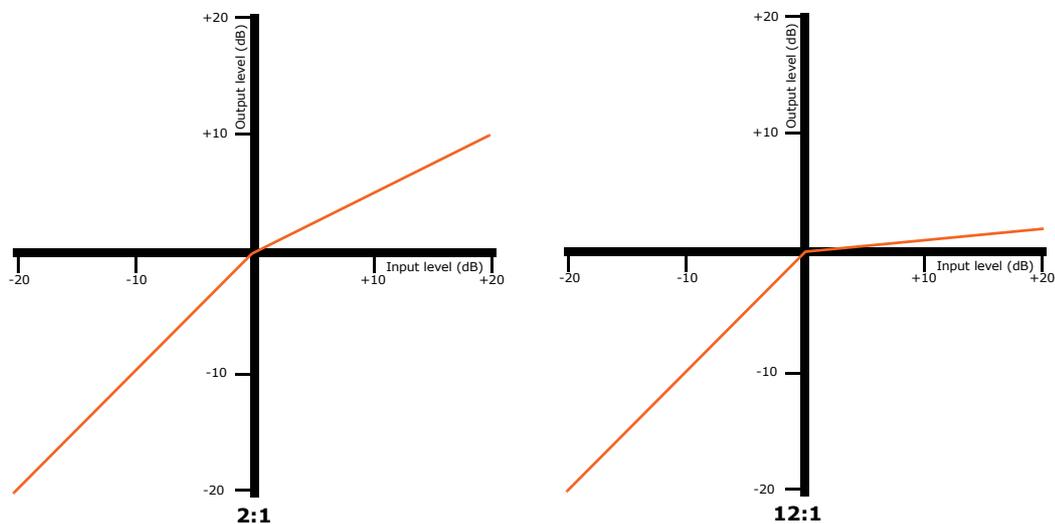


Figure 3: Compression ratio graphs of 2:1 and 12:1

As can be seen from the graphs in Figure 3 "Compression ratio graphs of 2:1 and 12:1", the higher the ratio, the greater the effect.

At a compression ratio of up to 2:1, the effect is mild and suitable for the subtle compression of vocals or of a complete mix. At 3:1, compression is becoming stronger and more noticeable. Ratios between 3:1 and 5:1 are suitable for the *compressor* sound, which is used as an effect in its own right. Higher ratios are used for the control of extremely peaky signals.



Threshold

The compression threshold is the point at which the compressor begins to operate. Signals that exceed this point, that is, go *over threshold*, will be affected by compressor actions. However, signals below the threshold do not trigger any compression, but may still be affected by compression releases from previous over threshold signals.

If the compressor is being used as a limiter, the threshold level is the level at which the limiter begins to operate.

Presence

The presence function protects the mid-high frequencies during compression. It does this progressively, so that the compressor appears to operate with two different ratios, one for low frequencies (normal) and the other for mid-high frequencies (reduced ratio). The primary effects of this are:

- Heavy compression and dynamic control can be applied without the programme sounding unnatural. Reduced compression in the presence band where the ear is most sensitive (and where there is comparatively little acoustic energy) masks the dynamic control that is applied to the high energy high and low frequency signals.
- The compressed material sounds brighter. However, because no high frequency gain is added when compression is not required, noise during quiet passages is reduced and the tendency for high frequency howl-round (which can often be a problem if *air* brightness is added by conventional EQ post compression) is also reduced.
- Side effects of this approach are that the high frequency content of spill remains more consistent, and pumping is therefore much less noticeable.

Some DN540 frequency response curves are shown in Figure 4, "Presence frequency response curves," on page 21, which help to illustrate the effect of the presence function. The curves were produced with the compressor at -50dB attenuation, and with the **PRESENCE** control knob set to **MIN**, **MAX** and an intermediate value. Note how the **MIN** setting produces the flat line towards the bottom of the graph. At this setting all audio frequencies are attenuated by the same amount as set by the threshold, ratio and input signal level, which effectively defeats the presence feature completely. As **PRESENCE** is turned clockwise the protective filter is activated. At the **MAX** setting, which is -3dB at 5kHz, the frequencies around 5kHz are hardly reduced in level at all, whereas the lower frequencies and very high frequencies are still compressed significantly.

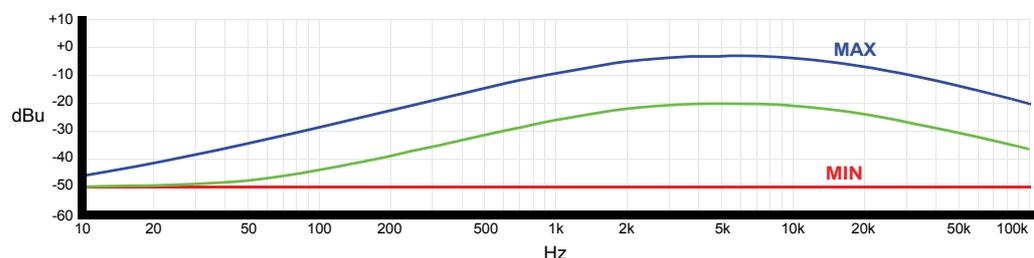


Figure 4: Presence frequency response curves



Soft knee and hard knee

The point where the slope of the compressor curve changes is known as the “knee”. The DN540 can be set to operate as either a soft knee or hard knee compressor; the effects of both can be seen in Figure 5 “Soft knee and hard knee graphs”.

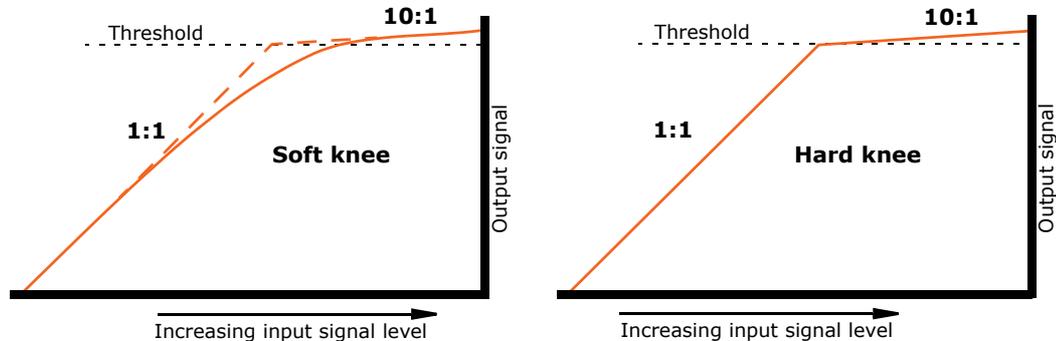


Figure 5: Soft knee and hard knee graphs

Soft knee compression gives a more gradual transition as the signal passes the threshold (ratio changeover point). The ratio value of signals approaching threshold increase exponentially in proportion to the input signal level. At threshold the ratio level becomes that selected via the **RATIO** control knob. Soft knee is useful on high-ratio compression or limiting, as it is less obtrusive than hard knee.

Most compression sounds more natural in soft knee mode and thus this is the default setting. Soft knee compression blurs the distinction between over threshold and under threshold signals, such that signals that are a long way below threshold remain unaffected by compression and signals that near the threshold get compressed, but at greatly reduced ratios. When signals are just over threshold the compressor ratios are still somewhat reduced and it is only when signals go well over threshold that full ratio compression is applied.

The soft knee character is produced after the envelope generation such that it also modifies the envelope shapes and typically slows attacks on the programme when it is in the knee area. This effect is similar to many vintage compressors (where they exhibit soft knee characteristics due to non-linearities in the gain reduction element) and provides a very natural sounding compression, generating more full bodied punch and definition when attack times are deliberately set very slow.

In hard knee mode the compressor operates as soon as the input signal reaches threshold level and is better suited to a limiting style of compression. This gives a more defined transition between under threshold and over threshold, imposing the new ratio — selected via the **RATIO** control knob — on the signal. This mode is useful as a brick wall limiter, which stops transients without affecting the lower level signals. In this mode a small amount of soft knee is still retained — to keep the sound reasonably natural — but it does not modify or slow down the envelope, allowing fast acting limiting if desired.

The difference in the effect produced by soft knee and hard knee compression is more noticeable at higher ratios.



Chapter 7: Using The Compressor

The DN540 is a dynamics processor that utilises premium quality, high precision components to achieve a high degree of accuracy and control. The DN540 has been designed primarily for creative use as front of house (FOH) or monitor. However, it is just as effective when used in the studio while broadcasting or recording. The DN540 processors offer, in a compact unit, control over the dynamic range for creative and corrective purposes.

Modes of operation

The compressor has the following two modes of operation, which are selectable via the **AUTO** pushbutton.

- **Manual mode (AUTO off)** Linear type of compression, where the attack and release time constants can be adjusted manually (via the **ATTACK** and **RELEASE** control knobs). This provides a more advanced style of compressor operation, typically to produce creative effects.
- **Auto mode (AUTO on)** RMS type of compression, where the attack and release envelope time constants are adjusted automatically, taking into account threshold and ratio settings relative to signal levels and transients.

Both of the compressor modes operate in either soft knee or hard knee.

Manual mode with soft knee (linear peak)

With the **AUTO** and **HARD** pushbuttons switched off, the compressor is peak sensing with manually adjustable attack and release envelope characteristics. The soft knee affects the attack shape, which noticeably slows the onset of compression. This can be particularly useful on drums to emphasise transients by giving them more punch, while retaining a good deal of artistic dynamic from the drummer.



The compressor normally sounds best on applications that require slower attack time settings. If faster attacks are needed it is normally best to switch on the hard knee.



Manual mode with hard knee (linear peak)

With the **HARD** pushbutton switched on, the compressor is peak sensing with manually adjustable linear attack and second order release envelope characteristics. For limiter applications, a high ratio combined with fast attack times are best; set the release slow to minimise distortion on low frequency instruments. Lower ratios with slow attack and relatively fast release provide transparent compression with some dynamic control, which does not unduly affect the intentional dynamic content of the source material. This can be used with difficult instruments like acoustic guitar to keep equal perceived loudness within a mix, without producing excessive flutter or distortion.



Auto mode with hard knee (exponential RMS)

With both the **AUTO** and **HARD** pushbuttons switched on, the compressor is RMS sensing using exponential attack and release. The RMS averaging process defines the attack and release times to produce a very adaptive envelope character. This provides faster attacks on large (over threshold) signal changes and produces slower attacks on small signal changes. The lack of manual time constant settings makes this mode very fast and simple to set up on most programme material. It is also sonically accurate and works well for limiting of vocals and compression of many other sources.



Auto mode with soft knee (exponential RMS)

With the **AUTO** pushbutton switched on, the compressor is RMS sensing with an underlying exponential attack and release characteristic that is slightly modified by the soft knee curvature. This produces extremely natural results, even with higher compression ratios, and is especially suited for vocals.



Limiter

A limiter is essentially an extreme form of compressor that only affects signals above a selected threshold level (dB). This is particularly useful for limiting only peaks in the signal, while leaving the rest of the signal alone. A limiter acts as a last check on signal level. If the level goes over threshold, fast acting, high ratio compression is applied to bring it back within bounds.

To set up the DN540 as a limiter, select the compressor to operate in manual and hard knee mode (see "Manual mode with hard knee (linear peak)" on page 24) with attack set to fastest (20ms) and the ratio set to infinity to one ($\infty:1$). Adjust release to suit the programme and set threshold as required.

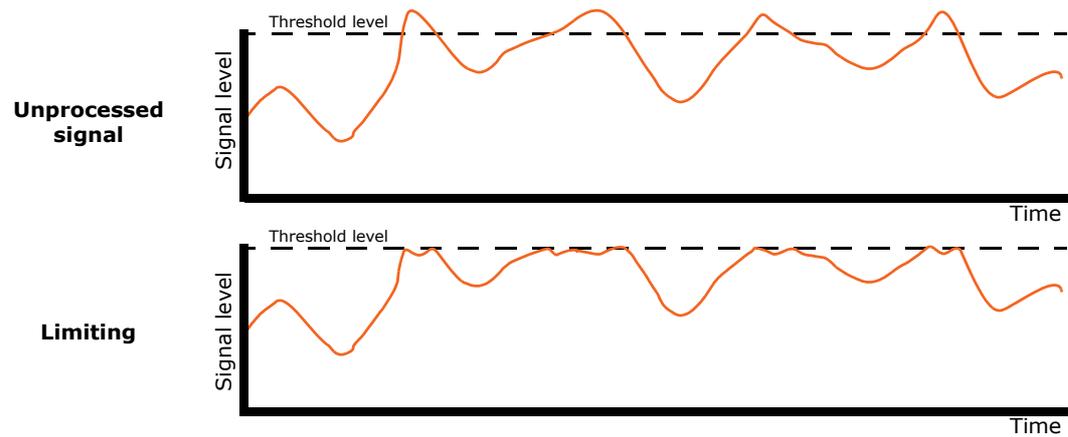


Figure 6: Compression - limiting signal level graphs

If a compression effect is required together with limiting of high level transients, two channels of the DN540 may be cascaded. The output of Channel 1 (compression) is fed to the input of Channel 2 (limiting), which gives powerful two stage control over gain.

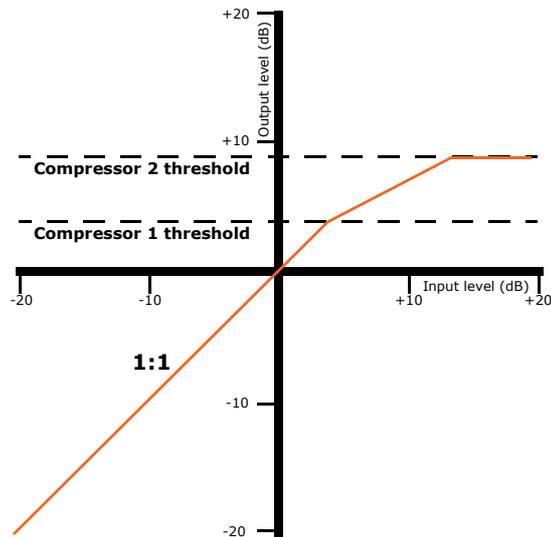


Figure 7: Limiting and compression graph

Below the compression threshold, the signal is unaltered. In the example shown in Figure 7 "Limiting and compression graph", the first threshold is compressed at a mild 2:1 ratio. Whereas, at the second threshold it is firmly limited at a ratio of 20:1.



Simple compression (auto mode)

For many every day compression jobs an RMS compressor with automatic time constant set up (attack and release) is the best solution, providing quick and easy set up. The RMS compressor slows the time constants on relatively steady state signals, reducing distortion and pumping, and when large signal changes occur they automatically speed up, capturing and constraining the bulk of any large sound level variations.

Very often, combining the automatic time constant adjustment with ratio and threshold is all you need to set up a good sounding compression. The DN540 auto compressor operates in exactly this way, providing simple fast set up on straight forward compression jobs.

Advanced compression (manual mode)

RMS compressors are not fast enough to capture everything on transient material because the averaging process always adds some delay; thus they are not suitable for ultimate protection against system overloads etc. Also, their creative use to tailor percussive instruments is very threshold dependent and often results in attacks that are either too fast or too slow for the desired effect (unless the sound source is extremely regular, which is not typical with most musicians).

For more difficult compression duties a compressor with fully adjustable attack and release is a better choice. With this style of compressor there is no averaging process delay, so that the action of attack or release can start the instant there is a change in signal amplitude that requires it. The user must define the rate of response and can adjust this precisely to match the sonic effect required on the source material. Normally, this also results in high distortion on constant signal levels because the compressor attacks and releases on every cycle, but advanced compressors utilise windowing methods whereby the time constants set are greatly increased on steady state material. Another technique used is to automatically apply a little hold before any release commences.

The above techniques are integral to the semi-linear attack and second order release characteristics of the DN540 normal mode compressor.

Linear attack provides a constant rate of attack (in dB against time) such that large changes in programme signal level take a little longer to compress than smaller ones. However, on material with more constant signal levels the attack rate of the DN540 manual mode compressor automatically reduces. This appears as a curvature in the linear attack rate characteristic as it nears completion, hence the term "semi-linear". This makes the compression very transparent providing some dynamic control, but without unduly affecting the intentional dynamic content of the source material.

This type of compression can be used on difficult instruments, such as acoustic guitars, with slower attack time settings and relatively fast release to keep an equal perceived loudness within a mix without producing excessive amplitude flutter or distortion. It can also be used with faster attack times to capture dynamic instruments like electric bass guitar without adding excessive distortion on constantly compressed passages.

Adding *soft knee* noticeably delays the onset of attacks, which can be particularly useful on drums where compression can be applied to emphasise transients giving more punch while retaining a good deal of artistic dynamic from the drummer.

Thus, when suitably adjusted the manual compression mode is suitable for any task, such as to capture fast transients in order to provide system protection, producing subtle compression of dynamic range without changing timbre or removing intentional accents made by the artiste or to deliberately thicken transient sounds.



Stereo and multiple channel operation - linking

Using the intermediate **LINK** switches (in channels 1, 2 and 3), you can link to the adjacent channel on the right for stereo or multi-channel operation. Linked channels form a group, with the lowest numbered channel in the group being the *master* and the other group members being *slaves*. The master channel's settings override those of the slaves, with the exception of the **BYPASS** and **EXT** pushbuttons, and the **PRESENCE** and **GAIN** controls, which still act independently. (The external sidechain still functions when linked because the slave channel sidechain is summed with the master and any other slaves within the group.)

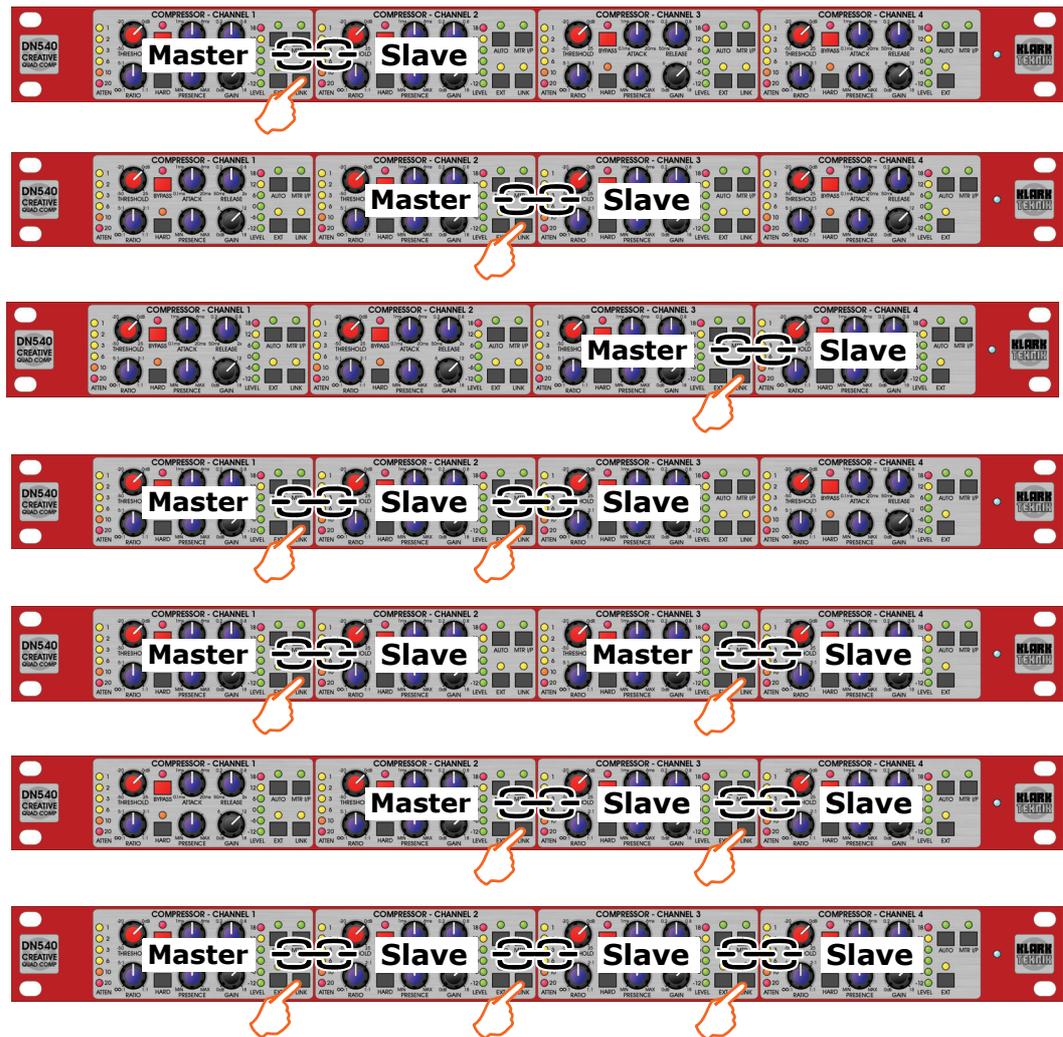


Figure 8: All combinations of channel linking

A group can contain two, three or four members, and you can have two groups (by linking channels 1 and 2, and 3 and 4). For all possible linking combinations, see Figure 8 "All combinations of channel linking", which also illustrates that the master is always the lowest numbered channel within the group.

The audio inputs to the master channel and also any slaves in the linked group are all used to control the action of the dynamic processor. The channel with the highest signal level will have the most effect on the linked group. As all the voltage controlled amplifier (VCA) controls are also linked together, the attenuation applied to the linked channels in the group will always be identical. Each slave's gain reduction meter (**ATTEN**) will track its group master channel exactly.



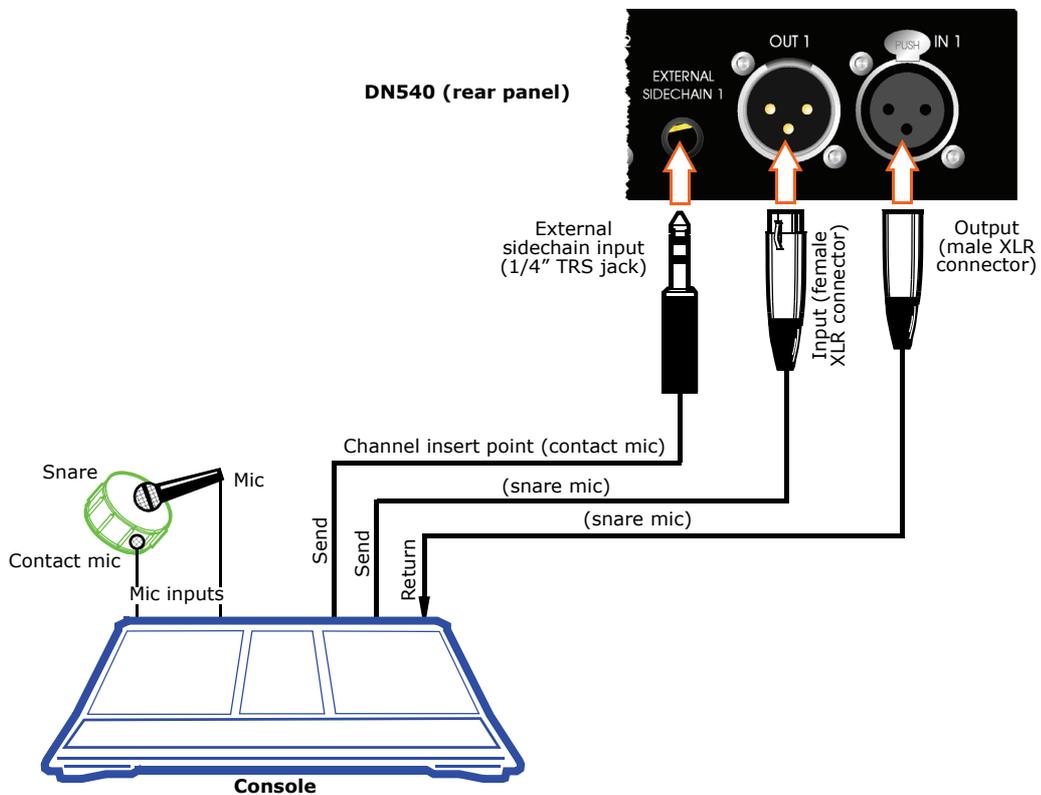
When **LINK** is switched on, the compressor sidechains of the linked channels are combined by a true power law summer such that a single source panned from left to right will not change the compression levels that have been applied to it.

Sidechain

For most applications the DN540 is triggered by the level of the incoming signal. Sometimes it can be useful to use a different signal to trigger the compressor; this signal is known as an "external sidechain".

Each channel of the DN540 has a sidechain input for the compressor. In normal use, the amount of compression or expansion is related to the dynamics of the input signal. The sidechain allows the signal passing through the unit to be controlled by the dynamics of another separate signal.

Particularly in the case of drums, a very reliable trigger can be obtained by taping a contact microphone to the shell of the drum, using the clean signal it produces to trigger the compressor. An example of this set up is shown below.



Connection to the sidechain input is made via the rear panel jack sockets, see "Connecting the audio cables" on page 10.



Appendix A: Application Notes

The compressor of the DN540 can perform various compression styles for different applications.

Drums and percussive instruments

Drums require a slow attack time to thicken the sound. Try the compressor in manual mode with high ratios, slow attack, medium release and soft knee.

Stringed acoustic instruments

Acoustic instruments benefit from subtle processing. Settings that are too aggressive can sound unnatural. For best level control try using auto mode and soft knee, with high ratio and the threshold set quite high. For more control of instrument timbre try manual mode set to slow attack and medium release, with a low ratio and the threshold set a little lower. Experiment with the presence accentuation.

Stringed electric instruments

Here the compression process can become an integral part of the instrument's sound. Try aggressive compression on electric bass and guitars. Use manual mode and hard knee set up with fast attack and release on a medium to high ratio (around 3:1). To accentuate the leading edge of sounds, slow the attack a little.

Brass instruments

Compression is useful for thickening thin sounding instruments and compensating for less than perfect mic technique. Try auto mode and soft knee with high ratios (4:1).

Vocals

Try the compressor in auto mode with a ratio of around 2:1, or soft knee with 3:1 ratio. Presence accentuation will allow the threshold to be brought much lower — or the ratio raised — for increased compression, while retaining intelligibility.

Presence accentuation

Many instruments have a percussive start to notes that are played. These contain the bulk of the signal harmonics that are recognisable and that we use to distinguish one instrument from another. Without this initial attack most instruments sound quite similar, and very dull! Unfortunately this is what tends to happen when they are compressed, as compressors capture much of the percussive start and reduce it in level more than they reduce the remainder of the sound. Although it is not as extreme as totally removing the start of notes, it still strips much of the harmonic content and removes presence from the sound.

This can be corrected by using equalisation to boost the upper frequencies. However, this is dangerous in sound reinforcement because when the instrument is silent and the



compressor relaxes there is no gain reduction — but the upper frequency boost remains, increasing noise and making microphonic feedback much more likely.

The DN540's presence accentuation corrects the tendency for dull sound during compression, without changing the sound of uncompressed signals. It reduces the ratio of the compressor in a relatively broad range of frequencies centred on 5kHz, and the effect is continuously variable, so as much presence accentuation can be added as needed or to suit taste.

When presence accentuation is applied, any compression acts on the high frequencies to a lesser extent than the low frequencies, by an amount set by the user. The transient at start of a sound is greatly reduced in the low frequency content, which is where all the power that needs to be controlled lies, but the harmonic content is preserved in a more natural and dynamic state.

The presence band has been specifically located in an area where we are most perceptive to sounds, so that reducing compression ratios in this area allows much greater compression to be applied at the other frequencies without sounding unnatural.

Presence accentuating compression can produce results that are very similar to multi-band compression, but with only one additional control required (as opposed to many) it is much more straightforward to set up and uses far less rack space.

Some additional corrective benefits from presence accentuation are:

- **Reduction of source inter-modulation** It is very common for pop/rock singers to stand in front of drum kits, and unless suitable screens are placed between them there will be a lot of spill from the kit. Often you can hear the compressor on the vocalist modulating the spill from cymbals, which sounds very unnatural. This can be eliminated by using the presence accentuation to stabilise the higher frequencies, and if that makes the vocals sound too bright the high frequencies can be reduced a little using EQ, thus reducing the spill and reducing the chances of high frequency howl-round.
- **Reduction of breathing** Most processing noise occurs in the presence band and it is much more noticeable when it is modulated by the compression of a sound source. Similarly for the reduction of source inter-modulation, presence masking can eliminate this effect.
- **Reduction of pumping** Because human hearing is so sensitive to presence band frequencies, stabilising their dynamic response with presence accentuation can mask the pumping effects at lower frequencies.
- **Reduction of dull sound and increased brilliance** It is often tempting to boost high frequencies to get sounds to cut through a mix, but in sound reinforcement this increases the likelihood of howl-round. Presence accentuation can help to increase the brilliance of compressed sounds by correcting their tendency to sound dull, and with increased use it can be used creatively to add even more high frequency energy without increasing the risk of howl-round.

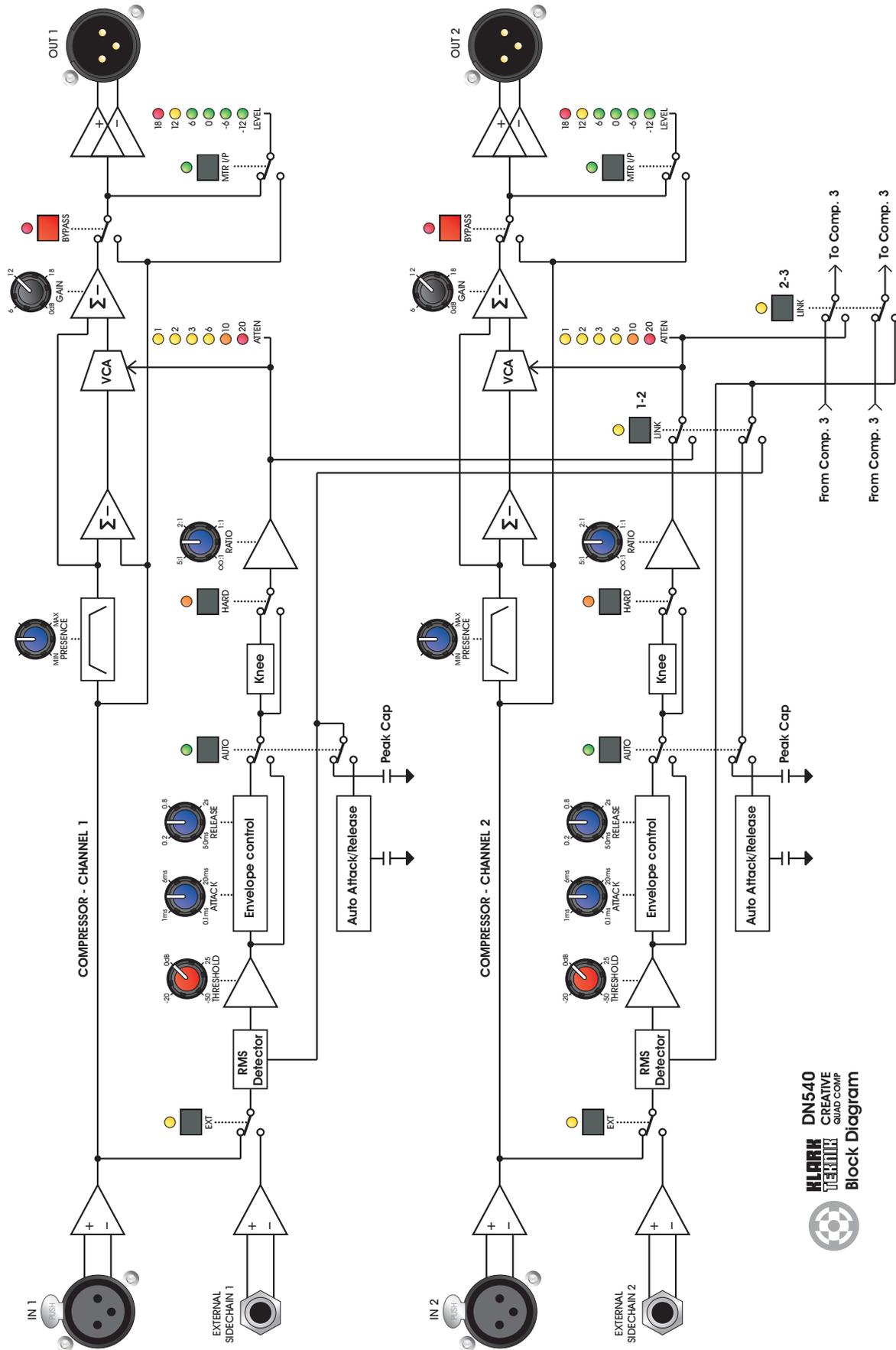
Thus, the presence accentuation feature of the DN540 adds another tool for the sound engineer that can be used to enhance and compliment the application of many types of compression.



Appendix B: Functional Block Diagram

The following page contains the signal flow diagram for the DN540.

Functional Block Diagram



KLARK
TECHNIK
DN540
CREATIVE
QUAD COMP
Block Diagram



Appendix C: *Balanced/Unbalanced Audio*

Balancing refers to the type of input or output signal connections in an audio system. These connections are specifically designed to reject external noise, such as from mains wiring and internal interference from adjacent signal cables. Unlike unbalanced lines, which are more susceptible to noise, balancing is especially useful when long cable runs are used between pieces of equipment and can also provide other benefits, including an increase in line signal level and a decreased possibility of ground loops. Balanced connections are typically employed on long cable runs, such as to amplifiers, or for cables carrying sensitive or low level signals, for example, mics. A balanced line typically employs connectors of the XLR and 1/4" TRS jack plug types.

The basic principle of balanced interconnection is the cancelling out of any electrical noise by means of a three-cable connection to achieve the required signal. Two of the cables, called "hot" and "cold", are used to carry signals, and the third is a grounded shield that surrounds the hot and cold cables. (An unbalanced connection only has two cables, one of which, the grounded shield, is also used for signal return.) As the hot and cold cables are of equal voltage (and the same source impedance), but of opposite polarity, when they are subtracted any noise voltages — caused by interference and noise pick-up — appearing identically on both cables is cancelled out; the difference between them being the resultant signal.

However, in practice the electrical noise on both cables will never be identical, and the degree to which it is reduced is measured by the common mode rejection ratio (CMRR). The electronically balanced input and output connections of the DN540 have the benefit of high common mode rejection (CMR), which eliminates externally induced interference such as mains hum etc. CMR is the ability of a balanced input to reject the part of the incoming signal that has the same amplitude and opposite phase on both input terminals, referenced to ground. As a specification, CMR is usually stated as a dB ratio, called CMRR, at a given frequency.

Note: *On balanced circuits, the 'hot' signal is also known as "+ve" and "in phase", while the 'cold' signal is also known as "-ve" and "out of phase".*





Appendix D: Technical Specification

This appendix contains the technical specifications specific to the DN540.

Inputs	Four	
	Type	Analogue, electronically balanced female XLRs (Pin 2 hot)
	Impedance	10k ohms
	Maximum input level	+22dBu
	Common mode rejection	Typically, -80dB at 1kHz
Outputs	Four	
	Type	Analogue, electronically balanced male XLRs (Pin 2 hot)
	Signal drive capability	<600 ohms
	Output impedance	<60 ohms
	Maximum output level	+22dBu
External sidechain inputs	Four	
	Type	Analogue, electronically balanced Jack sockets
	Impedance	20k ohms
	Maximum input level	+22dBu
	Common mode rejection	Typically -60dB at 1kHz
Performance	Maximum signal level any input or output	+22dBu
	Frequency response	±0.5dBu (input to output), 20Hz to 20kHz
	Dynamic range	>116dB (22Hz to 22kHz unweighted)
	Noise at main output with unity gain	-94dBu
	Distortion at 1kHz 0dBu with steady unity gain condition	<0.05%
	Signal delay	0 seconds
Compressor	Threshold	Scale = -50dB to +25dB
	Ratio	Scale = ∞ (infinity):1 to 1:1
	Attack	Scale = 0.1ms to 20ms
	Release	Scale = 50ms to 2s
	Presence	Scale = minimum (flat) to maximum (-3dB at 5kHz)
	Gain	Scale = 0dB to +18dB
Terminations	Audio	3-pin XLRs (male and female) and 1/4" TRS balanced Jack sockets
	Power	3-pin IEC
Power Requirements	Voltage	100VAC to 240VAC ±10%
	Frequency	50Hz to 60Hz
	Consumption	<25W
Dimensions	Height	44.5 mm (1.75"), 1U high
	Width	483 mm (19")
	Depth	305 mm (12")



Weight	Net	4.6 kg
	Shipping	5.6 kg
Operation	Temperature	+5°C to +45°C
Storage	Temperature	-20°C to +60°C

Due to a policy of continual improvement, Klark Teknik reserves the right to alter the function or specification at any time without notice.



Appendix E: Crib Sheet

The following page contains a crib sheet, which you can photocopy (or print) if you want more copies.



COMPRESSOR - CHANNEL 1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201 1202 1203



Appendix F: Service Information

This appendix contains routine service and maintenance instructions.

Routine maintenance

To help keep your DN540 unit in good working order and to make sure it gives you optimum performance, we recommend that you carry out the following at monthly intervals:

- Clean the unit (see "Cleaning" below).
- Check the controls for freedom of operation.
- Check the functionality of all controls, that is, control knobs, pushbuttons and LEDs. You can carry out a visual check of all illuminated items (LEDs etc.) by switching the unit off and then on again, as they should all illuminate during power up.
- Check the functionality of the equipment.

Cleaning

Switch off the unit and electrically isolate it from the mains *before* cleaning.

Clean the DN540 using a dry, lint-free cloth. Do not use harsh abrasives or solvents. When cleaning the unit, take great care not to damage control knobs, pushbuttons etc.

Replacing the mains fuse

The equipment must be independently isolated from the mains voltage supply before any attempt is made to change the protective fuse. The fuse and its cover must always be replaced before the equipment is reconnected to the mains voltage supply.

Only use the correct replacement type when changing the fuse. Fuse specification is printed on the rear cover.

To remove the fuse, pull out the fuse drawer (see "Mains input" on page 17). Then, prise out the fuse from the furthest compartment (the nearest compartment is for a spare fuse); a small, flat-bladed screwdriver may be useful for this.

Insert a new fuse in the furthest fuse compartment and close the drawer.

After replacing a fuse, check that the unit is working properly.

Always ensure that there is a spare fuse available.



Equipment disposal

When this equipment has come to the end of its useful life, its disposal may come under the DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Hazardous substances in WEEE contaminate water, soil and air and ultimately put at risk our environment and health. The directive aims to minimize the impacts of WEEE on the environment during their life times and when they become waste.

The WEEE directive addresses the disposal of products when they have reached the end of their life and contributes to the reduction of wasteful consumption of natural resources. This will help to reduce pollution, and protect the environment and ourselves.



If this equipment carries a 'crossed-out wheelie bin' (shown left), please do not dispose of WEEE as unsorted municipal waste but collect and dispose of in accordance with local WEEE legislation. The horizontal bar underneath indicates that the product was placed on the EU market after 13th August 2005.



For WEEE disposal, see our website at www.klarktechnik.com for information.

Thank you for reading through this Operator Manual.
We hope you found it useful.

Please feel free to send us your comments.
Our contact details and website address can be found
at the front of this manual.



KLARKTEKNIK
SIGNAL PROCESSING BY DEFINITION

Klark Teknik
Klark Industrial Park, Walter Nash Road,
Kidderminster. Worcestershire. DY11 7HJ. England.
Tel: +44 1562 741515, Fax: +44 1562 745371
Email: info@midasklarktechnik.com
Website: www.klarktechnik.com