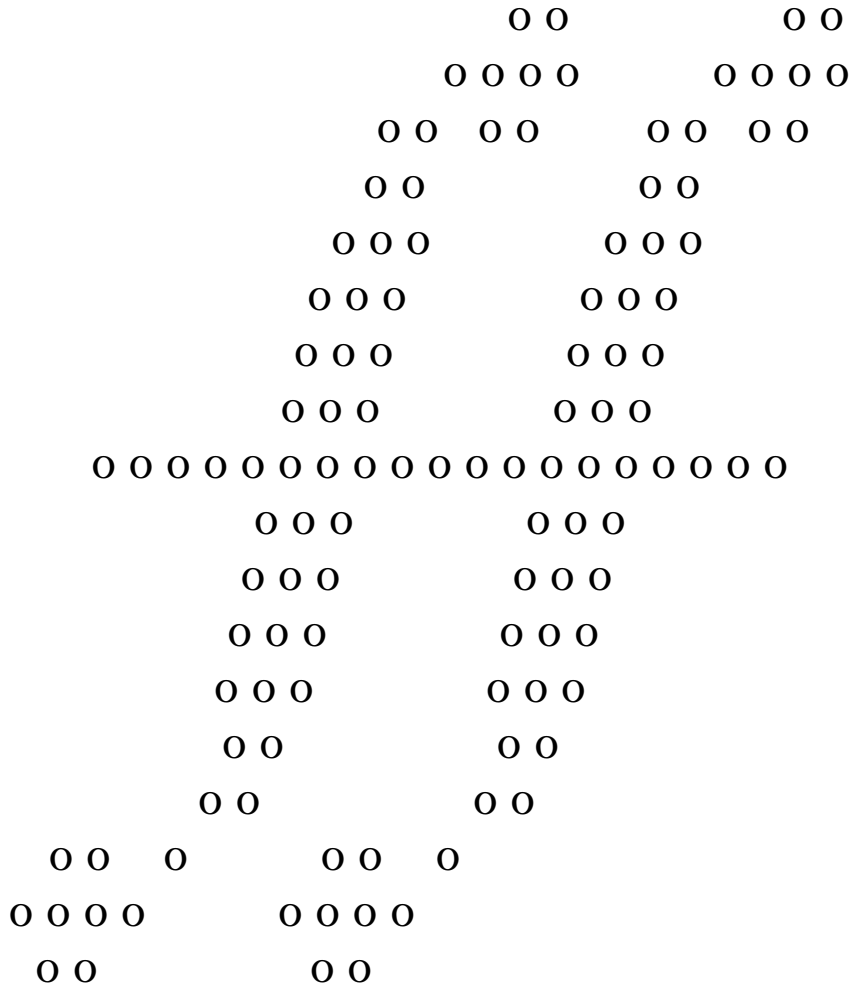


Focusrite Audio Engineering Ltd

Blue Range Modules

User Guide

Jan 2001



Contents

- Introduction
- Overviews
- Unpacking
- Power & Signal Connections
- Earths and Screens
- Installation & Operation
- Product Information Sheets
- Non-Operation
- Miscellaneous Notes
- Warranty

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Introduction

Thank you for purchasing a Focusrite Module.

We had a lot of fun designing it; many people took a lot of care and pride in making it and we all hope that you will enjoy owning and using it. We also trust that it will earn its keep, be reliable and useful for a long time to come.

We do understand that reading the manual is almost always the last resort, however this User Guide has some data about the module which you may be of help if all else does fail. This booklet also describes the other modules in the Focusrite range which may be of interest. If you would like to audition or try any of these other modules please contact your dealer or the factory.

Overview of the Range

All the modules in the Blue Range use the Focusrite circuits which exhibit the usual Focusrite attributes and audio circuitry of the finest quality available with very wide bandwidth, low noise and distortion and individually buffered stages.

The Blue modules tend towards a solid look and feel with cases made of aluminium and stainless steel and usually include hand wiring of front and rear panel components. Several of the Blue range modules are principally configured for Mastering and Broadcasting requirements.

Overview of the Individual Modules

Blue 230 is a Dual Mono / Stereo Compressor and Limiter with separate controls for the compressor and limiter functions, PPM metering and a true stereo mode.

Blue 245 is a stereo 20 bit Analogue to Digital convertor with external synchronising facilities and bargraph peak metering .

Blue 260 is a stereo 20 Bit Digital to Analogue converter

Blue 315 is the Isomorphic Mastering Equaliser using the same circuits as the Blue 215 configured for Mastering with multiposition rotary switches for all the rotary controls allowing very close channel to channel matching and reset.

Blue 330 is the Isomorphic Mastering Compressor and Limiter, a Stereo device with the same circuits as the Blue 230 with multiposition rotary switches for all the rotary controls allowing accurate set-up and recall.

Unpacking

The packaging is the simplest that is sufficient to protect the module for shipment. Please keep the packaging if you are going to ship the module in future.

If this module is to be used in a mobile manner (by this we mean either as a rental unit or on the road) we very strongly recommend that the module is installed into a high quality flight case which includes shock protection and suitable ventilation.

We are aware that Ownership Registration cards are not high on your priority list, however we would be most grateful if you would take the trouble to fill the details in and mail it back to us. Thank you.

Power Connections

There is an IEC mains lead supplied in the package, which should have the correct moulded plug. If the plug is incorrect for your location or country, we're sorry. Please replace it the correct type.

The standard wiring colour code used in all Focusrite products is as follows:

Brown - Live Blue - Neutral Green and Yellow - Earth

except for units shipped to the USA and Canada which use this color code:

Black - Live White - Neutral Green - Earth

Most modules have two supply voltages ranges, and a switch on the rear panel, marked as follows:

the 115v position is for voltages in the range 100v to 120v.

the 230v position is for voltages in the range 220v to 240v.

Some modules have a four way voltage selector switch. Select the appropriate position for your mains supply.

To comply with some country's safety codes the modules may be supplied with the voltage selector omitted and the module preset to the local supply voltage. In this case the voltage will be clearly marked on the rear of the module. Please check that this has been set correctly. If incorrect please refer to the supplying dealer or a competent technician.

All modules will work correctly from either 50Hz or 60Hz supplies. The processing modules draw approximately 35VA from the mains supply at highest load.

It is absolutely **IMPERATIVE** that all modules have the mains safety earth connected. This is not a casual suggestion, it is essential for safety reasons.

Fuse Arrangements

In most modules there are two fuses inside each module on the supply side of the transformer. For single modules they are ALWAYS 250 mA Anti-Surge type. The fuse value does NOT change when the mains voltage selector switch is changed. This is because we fuse each winding separately.

We strongly recommend that you do NOT attempt to change fuses unless you are absolutely certain that you know exactly what you are doing. If you are in any doubt whatsoever please contact your dealer or the factory before you open the case.

Changing a Fuse

If it is a Blue module and you are certain about your technical ability, this is the procedure for changing a fuse:

- disconnect the mains cable
- remove the top or side cover and have a careful look about the inside of the module to see if the cause for the fuse failure is obvious.
- if all looks well replace the covers
- change the fuses
 - the fuses are either on the rear panel adjacent to the IEC mains inlet connector or inside the module to the rear of the transformer.

Signal Connections

All the signal connections are via rear panel mounted connectors. Standard XLR connectors are used for all signals and for all AES / EBU digital signals. These are always wired to the AES standards which are:

pin 1	X	Screen	screen	or	screen
pin 2	L	Live	audio 0°		digital 0°
pin 3	R	Return	audio 180°		digital 180°

Almost all main audio inputs, all line level outputs and all AES / EBU ports are transformer coupled, therefore there is a complete electrical barrier between all the internal circuitry and power supply and the outside world - this barrier is also maintained for the Screen connections. The only transformerless inputs are on the mastering dynamics modules : Blue 315MKII , Blue 330MKII . All optical digital signals are to the TosLink standard and all digital synchronising signals are provided as AES / EBU standard sync ports and often duplicated with Word Clock via BNC connectors, which are all floating from the chassis.

Earths and Screens

In all Focusrite modules the chassis is connected directly to the mains safety earth. For safety reasons we do not provide an earth lifting switch: such a switch can allow for a dangerous wiring arrangement. It is **IMPERATIVE** that the chassis / mains earth connection is maintained through the IEC lead to the mains safety earth terminal.

For all outputs the screen, pin 1 of the XLR, is connected to the audio circuit bipolar 0 volt point only.

For all inputs the screen, pin 1 of the XLR, is connected to the chassis earth point and there is no direct connection between the input screen pin 1 and the audio circuitry or the audio bipolar power supply.

All phantom power is completely floating and does not change these connection rules. Internally in the power supplies there are noise filtering capacitive connections between the chassis, the screen and the various DC rails at 0 volts.

When the screen and earth wiring of the module is completed correctly, all modules which are marked with the European Community CE marking comply fully with the CE EMC directive.

Installation

The installation of all the Focusrite modules is straightforward and should not cause any difficulties with standard 19" racking systems. The mechanics of the modules are well inside the limit dimensions of both metric and imperial (as used in the USA and Canada) racks.

Apart from the usual considerations of safety, neatness and good engineering practice, there are a couple of additional comments about the modules:

Operation

Detailed operation descriptions of all the control functions are given for each module in turn. This section of the guide has been written with the assumption that you are aware of the basic principles of the module's function. If you would like further operational guidance or if there is any confusion then please do not hesitate to contact either your dealer or the factory for further explanation or help. Contact details for the factory are on the inside front cover of this guide.

Blue 230 Dual Mono / Stereo Compressor & Limiters

The controls of both of these Dual / Stereo Compressor and Limiter modules are identical for each of the two channels and are simple to use, and are described from left to right along the front panel:

Mains switch - this is an illuminated push switch, the indicator is an LED cluster, lit when On.

In switch - an illuminated push switch, the indicator is an LED and lit when the compressor stages are in circuit.

Key switch - an illuminated push switch, the indicator is an LED and lit when the side chain is being fed from the key input and not the main signal input.

Make-up Gain control - a variable control which allows gain to be applied to the signal via the VCA element.

Ratio control - providing a switched range of ratios for the compressor action .

Threshold control - switched .

Attack control - a continuously variable attack speed from Fast to Slow.

Release control - another continuously variable control for release timing. This control may be overridden by selecting the Auto Release function using the illuminated push switch, where-upon the release timing is programme level dependant.

The controls mentioned above, Ratio, Threshold, Attack and Release all affect the compressor function only, having no effect upon the limiter function which has its own controls to the right hand side of the module.

Next are two PPM meters one for each channel which normally display input signal level.

The meter sensitivity can be switched between two sensitivities. Normally the meter will read 0VU for an input signal level of +4dB.

With the +10dB switch selected the meter will read 0VU for +14dB signal level input, this is 10dB higher than standard so that input signal peaks may be read clearly.

There is a single switch marked Gain Change, when the LED is illuminated the meters display the gain changes of the Compressors. With no Compressor gain change the meter will read 0VU. Any gain change will be displayed directly in dB, thus 6dB of compressor action will result in a meter reading of -6dB. Please note that the meters do not display the action of the Limiter, there is a separate LED for the Limiter action.

The Stereo switch - an illuminated push switch which changes the module from a dual to a true

Limit On switch - an illuminated push switch which activates the limiter function. The LED indicator to the right of this switch will glow when the limiter is actually affecting the signal.

Threshold - Is a switched control on the limiter threshold.

Please note that when the Limiter and the Compressor are selected together the compressor action is performed upon the signal first, followed by the limiter action if then required dependant on the Limiter Threshold setting and the already compressed signal level. This arrangement is unusual for compressor / limiters, but we believe it to be superior in performance and the combined action of the Focusrite Compressor / Limiter to be less intrusive on the audio. There are, however, two unusual conditions that can arise from this arrangement:

There may be occasions when the Compressor is reducing the signal such that there are no longer any peaks remaining above the Limiter Threshold setting selected; therefore the Limiter may appear not to be functioning even though it has been switched In.

We have built in an interlink between the Compressor and the Limiter Threshold controls which will prevent the Limiter being selected In if the Limiter Threshold is set to a lower trigger level than the Compressor Threshold setting: if you think for a moment you will realise that such a selection of control settings is meaningless, therefore the module will prevent the Limiter operating in the event of this control setting mistake being made.

Blue 245 Analogue to Digital Converter

There are only a few controls on the front panel of the Blue 245 , and unlike the other modules the Power switch is on the rear panel . This module should be powered prior to use to allow the entire analogue and clock generator circuits to become electrically and thermally stable before self-calibration . We strongly recommend leaving this module permanently powered wherever possible in fixed installations , and for mobile use please power up as soon as possible on site .

Returning to the front panel, starting at the left side there are two sensitivity controls, left and right , which adjust the peak level setting of the converter sensitivity between 0dB and +20dB. These controls operate on the analogue input signal prior to the converter and can be considered somewhat similar to recording level controls .

When the desired input level has been set and after **any** adjustment of the input level controls prior to starting a transfer, briefly select another sample rate and then switch back to the chosen sample rate . This allows the unit to re-calibrate and give maximum signal to noise ratio .

The analogue inputs to the convertor, following the sensitivity controls, are displayed by the two bargraphs. These bargraphs display Peak characteristics with a slow decay time, operating over the range from -30dB to 0dB.

The meter has two red LEDs at the right hand end marked -1.5dB and Overload . These LEDs light when the analogue signal reaches 1.5dB below peak coding value and when the analogue signal has Overloaded the peak coding value of the converter . If the Overload LED lights even once during a transfer, there will be an incorrect coding produced from the converter and the input sensitivity should be reduced before restarting the transfer.

There are three switches for selection of the sample rate frequencies . Three standard frequencies are provided, 32 kHz, 44.1 kHz and 48 kHz. On selection the switch will light to indicate selection then the converter will self calibrate to the new frequency .

Selecting the Ext. frequency switch allows an external AES/EBU or Word Clock sync input to be applied. If the external frequency supplied is one of the three standard frequencies, then the appropriate frequency LED will light as well, with the Ext LED remaining lit to indicate external syncing. The External frequency may be anywhere within the range from 30kHz to 50kHz
When the word clock input is connected to an external device, it will automatically override any AES/EBU signal being applied to the Ext AES/EBU input .

The convertor itself always operates with a resolution of 20 bits . The Quantizing switches provide a properly dithered signal for operating into 20 or 16 bit systems.

The reduction to 16 bit from 20 bit is achieved by generating TPDF (Triangular Probability Density Function) high-pass filtered dither in the analogue domain using a sample rate synchronous Maximum Length sequence generator. This is applied to the ADC when the 16 Bit mode is selected and is the only time the MLS generator operates . No truncation or rounding is used , with the advantage that data below the 16th bit is not removed from the AES/EBU data stream . Thus if the 16 bit mode is left selected when converting to a system with a higher resolution , there will be less impact on system performance .

The rear panel has the usual arrangements for the analogue inputs with XLR connectors.

Two independent AES/EBU outputs are provided and either one may also be used as an AES/EBU

Should S/PDIF (IEC958) output be required , the following modifications need to be done :-

- 1) Make an adaptor cable with a female XLR and 2-core cable
- 2) Connect pin 1 to pin 3 of the female XLR
- 3) Connect a 330 Ohm resistor in series between pin 2 of the XLR and one core of the cable .
- 4) Connect a 100 Ohm resistor between the end of the 330 Ohm resistor connected to the cable and pin 1 of the XLR .
- 5) Remove resistor R430 by cutting the legs as near to the body of the resistor as possible
- 6) Solder a link across the leg stubs of resistor R430
- 7) Remove the jumper from position 3 of HDR 402

This modification provides SPDIF output at XLR 2 only . If in doubt , call the factory .

There are two sets of sync ports: an AES/EBU sync input on an XLR connector which is balanced , floating and transformer coupled . The other is a balanced BNC coaxial Word Clock sync input . Left channel data is contained in the high portion and Right channel data in the low portion of the signal . Lastly there is another BNC connector providing a clean Word Clock frequency output of the clock actually being used for the converter , which may be used as the synchronising signal for other equipment in the system .

All these digital ports are fully compliant to the various standards in all aspects , both physical and logical , including the AES/EBU auxiliary data and flags . The module is equipped with the BBC AES/EBU chip and headers to select other data bits as required: if you require these additional bits configured , please consult the factory.

The overall performance of an A to D converter is usually only heard through other equipment in a digital system consisting of several products ; such systems easily become somewhat complex with timing and synchronising arrangements . If you are experiencing any difficulties with a system including a Blue 245, please call the factory .

Blue 260 Digital to Analogue Convertor

There are only a few controls on the front panel of the Blue 260 , and unlike the other modules the Power switch is on the rear panel. We strongly recommend leaving this module permanently powered wherever possible in fixed installations.

The front panel has six switches and seven indicators which have the following functions:-

Switch 1:	Selects AES input 1 and is illuminated when selected.
Switch 2:	Selects AES input 2 and is illuminated when selected.
Switch 3:	Selects AES input 3 and is illuminated when selected.
Switch 4:	Selects AES input 4 and is illuminated when selected.
AES Indicator:	Illuminates when any of switches 1-4 (AES inputs) are selected.
Optical switch:	Selects optical input and is illuminated when selected.
S/P switch:	Selects S/PDIF input and is illuminated when selected.
Indicator 32:	Illuminates if a 32kHz sample rate is detected.
Indicator 44.1:	Illuminates if a 44.1kHz sample rate is detected.
Indicator 48:	Illuminates if a 48kHz sample rate is detected.
Error indicator:	Illuminates if an error is detected (e.g. loss of clock data).
Lock indicator:	Illuminates when the signal is locked.
Emphasis indicator:	Illuminates when emphasis is detected.

The rear panel houses all inputs and outputs to the Blue 260:-

The IEC mains inlet, switch and voltage selector are a single assembly.

N.B. please ensure that the voltage selection is set to the correct voltage.

Digital Inputs

AES inputs 1-4:	Are standard AES XLR inputs.
Optical input:	Is an optical input to the Toslink standard.
Coaxial input:	Is an S/PDIF input.

Digital Outputs

AES output:	A fully re-generated output of the selected input, AES, S/PDIF or Optical.
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Analogue Outputs

Left and Right outputs:	Balanced outputs on standard XLR connectors.
Output Trimmers:	Allows adjustment of the analogue outputs from 0dBu to +20dBu.

Blue 315 Isomorphic Mastering Equaliser

The extreme left side of the panel houses switches for Eq In/Out and Power, apart from these the two channels, mounted one above the other, are identical as are their controls. Starting from the right hand side of the module:

Input Level sensitivity is controlled by three sets of rotary controls, first a rotary switch for the course sensitivity with 5dB steps, secondly another rotary switch for the fine sensitivity in \pm dB steps and finally a continuously variable control with \pm 1dB range which is only in circuit when the Vari push switch has been pressed and is illuminated.

The first section of the Eq is for the High frequency section. This has a shelving characteristic of the Baxandall variety with switched rotary controls for both frequency, boost and cut.

The next two sections, HMF and LMF are identical except for their frequency ranges. All the controls on these fully parametric stages are multiposition rotary switches. The boost and cut controls have the same sensitivity as the HF section, with frequency and bandwidth switches for each stage.

The last section of the Eq is the mirror of the first, the LF section is another shelving stage with rotary switches for both boost, cut and frequency selection.

There are two further rotary switches for the High and Low pass filters, with a fixed slope rate and switched selection of turnover frequency.

Below the filter switches there is a Phase Reverse switch and an Overload indicator, which will light whenever the signal level reaches or exceeds +20dB, which is 6dB prior to the onset of clipping.

The left hand end of the panel houses two further large push switches, the uppermost of these is the Power switch, which is lit when the unit is active.

The lower large push switch is the Eq In/Out switch. This has two modes of operation, the switch will latch, electronically, when pushed putting the Eq in-circuit and light the LED, a further push will unlatch and take the EQ out and the module back to bypass (this is a relay bypass). An alternative mode is to press and hold the switch, which gives a momentary action to the Eq In state which will become bypass when the switch is released. This allows the In/Out switching to be stable and momentary from the same switch.

Blue 315 MKII Isomorphic Mastering Equaliser

The extreme left side of the panel houses switches for Eq In/Out and Power, apart from these the two channels, mounted one above the other, are identical as are their controls. Starting from the right hand side of the module:

Input Level sensitivity is controlled by three sets of rotary controls, first a rotary switch for the course sensitivity with 5dB steps, secondly another rotary switch for the fine sensitivity in \pm dB steps and finally a continuously variable control with \pm 1dB range which is only in circuit when the Vari push switch has been pressed and is illuminated.

Filters

There are two rotary switches for the High and Low pass filters, with a fixed slope rate and switched selection of turnover frequency.

EQ

The first section of the Eq is for the low frequency section. This is a shelving variety with switched rotary controls for frequency, boost, cut, Q (bandwidth) along with a frequency range push button switch.

This stage can also be switched from shelving to a fully parametric bell stage.

The next two sections, HMF and LMF are identical except for their frequency ranges. All the controls on these fully parametric stages are multiposition rotary switches. The boost and cut controls have the same sensitivity as the LF section, with frequency and bandwidth rotary switches for each stage.

The last section of the Eq is a high frequency mirror of the first i.e., another shelving/bell stage with rotary switches for boost, cut, Q (bandwidth) and a frequency range push button switch.

The link switch, when engaged, allows both corresponding upper and lower EQ push button functions to be switched in and out simultaneously. E.g., engaging the low-mid parametric stage high range switch on the upper channel will cause the corresponding lower channel low-mid parametric stage high range switch to be engaged. Pressing either switch again will cause both to be switched off.

Phase, Overload & Master In

Below the filter switches there is a Phase Reverse switch and an Overload indicator, which will light whenever the signal level reaches or exceeds +20dB, which is 6dB prior to the onset of clipping.

The left hand end of the panel houses two further large push switches, the uppermost of these is the Power switch, which is lit when the unit is active.

The lower large push switch is the Eq In/Out switch. This has two modes of operation, the switch will latch, electronically, when pushed putting the Eq in-circuit and light the LED, a further push will unlatch and take the EQ out and the module back to bypass (this is a relay bypass). An

Blue 330 Isomorphic Stereo Mastering Compressor and Limiter

The controls are described section by section starting with the two large PPM meters are centrally mounted and controlled by the five meter selection switches in the upper right corner of the module - the signal displayed may be selected from one of four sources, the input, the key input, the total gain change being applied by the compressor section and the output signal. To assist in the reading of signal peaks there is a higher level range showing from -4dB to +20dB, this is selected by the +16dB switch.

The upper left houses a switch to select the key input. The sidechain is fed from the key input when this switch is lit. There is also an overload indicator which will flash when the peak of any signal reaches or exceeds +20dB, which is 6dB prior to the onset of clipping.

Input Gain control is by one master switched rotary switch in 1dB steps over the range ± 10 dB for both channels simultaneously. There are separate channel trims, continuously variable ± 1 dB, which are not in-circuit unless selected by the adjacent switches.

Make-Up Gain is arranged in the same manner as the Input Gain, except the master rotary provides for up to 22dB of make-up gain. The sensitivity is the same as the Input Gain at 1dB per step, thus it is easy to contra-rotate the two large master gain controls thus effectively changing the threshold points whilst keeping the overall level through the module constant. Both the Input Gain and the Make-up Gain controls have the same sensitivity, therefore it is possible to contra-rotate both controls to adjust the overall sensitivity of the Compressor and Limiter functions whilst maintaining the same overall gain

The Compressor section has a Compressor In switch, a dual range Threshold switch calibrated in 1dB steps and separate rotary switched controls for Ratio, Attack and Release.

The Limiter has its own In switch, a separate switched rotary Threshold, again 1dB per step and a large indicator which lights whenever the limiter is called to operate.

Although the Compressor and Limiter have separate controls, they may be used together, in which case the Compressor function comes first, followed by the Limiter, which will act on the compressed signal, limiting only the selected peaks remaining after the compressor action.

The left side of the module has an illuminated power supply switch and a Master In switch. This Master In is an overall In switch to allow simple comparison between direct and processed signals and has two modes:

- 1) push and hold - the switch will have a momentary action and will cancel upon release
- 2) a quick press and release will cause the switch to latch on, a further quick press will dis-engage it

Blue 330 MKII Isomorphic Stereo Mastering Compressor and Limiter

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The Compressor section has a Compressor In switch, a dual range Threshold switch calibrated in 1dB steps and separate rotary switched controls for Ratio, Attack and Release.

The Limiter has its own In switch, a separate switched rotary Threshold, again 1dB per step and a large indicator which lights whenever the limiter is called to operate. The limiter is a "look-ahead" design which anticipates the required amount of limiting. This is vital for broadcasting and digital recording where a given signal level must not be exceeded.

Although the Compressor and Limiter have separate controls, they may be used together, in which case the Compressor function comes first, followed by the Limiter, which will act on the compressed signal, limiting only the selected peaks remaining after the compressor action.

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- 1) push and hold - the switch will have a momentary action and will cancel upon release
- 2) a quick press and release will cause the switch to latch on, a further quick press will dis-engage it.

Non-Operation

If the unit will not work , please feel free to have a serious panic attack , do consider running out of the building and screaming loudly . When you have calmed down you could go through this short check list . With the results from the check list , may we suggest a telephone call or fax to your dealer or the factory .

Please only consider opening the unit up if you are sure that you understand enough not to cause further problems , either to the unit or yourself . If the unit is a Power Amplifier please see separately below.

First check the mains supply:

- * is the module connected to the mains supply ?
- * is the socket switched off ?
- * is the voltage select switch in the correct position?
- * if the supply is ok and the module turned on and no LEDs light then a fuse has probably blown: please see earlier section in this manual about fuse arrangements.

If some LEDs light but the unit does not work properly, check the LEDs in this order:

- the mains switch LED will only light if the $\pm 15\text{v}$ rails are ok.
- the phase reverse or in switches LED will only light if the + 5v rail is ok.
- the phantom switch LED will only light if the + 48v rail is ok.

These leds will allow you to see if a power rail has failed.

If a power rail has failed, please contact the dealer who supplied the module or call us at the factory in the UK.

Miscellaneous Notes

Circuit Schematics

We do hope that you understand that in an endeavour to protect our designs and intellectual property, Focusrite will only release circuit details (schematics, diagrams) to factory authorised Distributors and Service Centres.

Your Comments

Despite our being manufacturers we do not have a monopoly on innovation or good ideas and we would appreciate your opinions and comments about our products, and would welcome any suggestions for improvements or additions that you may have thought of. Even if you have no earth shattering ideas, we would still like to meet you at trade shows, so please look out for our stand and come and introduce yourself.

Warranty

All Focusrite products are covered by a warranty against manufacturing defects in material or craftsmanship for a period of **one year from the date of purchase**. Focusrite will, at its own discretion, repair or replace any defective product. This warranty is in addition to your statutory rights.

This warranty does not cover any of the following:

- 1 carriage to and from the dealer or factory for inspection or warranty work
- 2 consequential loss or damage, direct or indirect, of any kind, however caused
- 3 any damage or faults caused by abuse, negligence, improper operation, storage or maintainance

If a product is faulty please contact either your dealer or the factory by telephone or fax. If the product is to be shipped back please ensure that the unit is packed properly, preferably in the original packing materials. We will do our best to remedy the fault as quickly as possible.

And Finally

Please help us by completing the Warranty Registration Card with this unit and put it in the post or the mail to us at the factory, thank you.

If you would like to audition any other modules to the ones you own, please contact your dealer or the factory.

End.