
Focusrite Audio Engineering Ltd.

USER HANDBOOK

FOR

ISA 110/115

EQUALIZER MODULES

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SECTION 1: INTRODUCTION

Thank you for buying your Focusrite ISA equalizer module. These units were designed by Rupert Neve to offer the ultimate in analogue equalization with the sound character and quality that you have come to expect from a Focusrite design.

Each module is lovingly built and goes through 7 stages of test and soaking to ensure that every production module matches up to the standard of the original reference modules.

We hope that your equalizer units will provide you with many years of excellent service and this manual provides information to install and use your ISA110/115.

Focusrite currently offer three types of equalizer; the ISA 110, 115 and L40. The equalizer circuitry inside all three modules is identical and only the package and logic circuits vary. The ISA 110 is a 7U module without an internal power supply and is intended to be fitted inside Focusrite 7U racks. The ISA 115 is an 19", 1U high externally powered rack and contains two separate equalizer circuits. A PSU 120 unit is normally used to power up to two of these devices. Finally the L40 is a single circuit version of the ISA 115, packaged in a vertical format intended to be fitted into third party consoles with a 40mm channel pitch. The power for the L40s is supplied either by the host console or by a PSU 120.

All the above equalizers are dealt with in this manual.

1.1 OVERVIEW

The ISA 110/115 designs are 4 band equalisers with additional filters and a mic/line input stage. The equalizer circuitry is identical in all the modules and also appears in the equalizer sections of the world famous Focusrite recording consoles.

Each unit has a low noise transformer input stage for mic and line sources with appropriate trims. From there the signal passes through a high and low pass filter circuit, a two stage "shelf" equalizer circuit, one at each end of the frequency spectrum and a two stage full parametric equalizer circuit with switchable frequency bands. Each of these equalizer elements can be switched out of circuit independently. In addition there is a phase inversion switch and an overload indicator. The ISA 115 also has a phantom switch with the attendant circuitry.

The ISA 110 has "soft" switches which enable certain functions to be operated remotely, whilst the ISA 115 has traditional latching switches. However in both designs the audio signal is switched with relays at the optimum place on the audio PCB, so eliminating audio degradation due to front panel switch performance.

The equalizer circuitry is the result of many years of painstaking research and development. The equalizer circuits can be tuned to perform virtually any equalization task without the hard clinical sound that is the hall mark of so many designs. They can achieve this level of performance with an degree of musical transparency unsurpassed by current designs because of the attention to traditional circuit fundamentals and details employed in the design process.

Finally, the input and output stages are fully transformer balanced and thus ensure complete isolation with the rest of the studio.

SECTION 2: INSTALLATION

2.1 UNPACKING

The ISA110/115 is sealed in polythene and packed in polystyrene protective blocks in a solid cardboard box. Please retain these items in case you have to return the unit to us for any reason. This packing has been carefully designed and other packing could allow the device to become damaged in transit.

Also enclosed with the device is a warranty card and this manual. If you have purchased an ISA115 there will also be a power link lead provided for connection to a PSU 120. If any of these are missing please contact your distributor and obtain a replacement.

Please fill in the warranty card and return it to us as soon as possible. This card provides the link between you and us and allows us to service your needs as efficiently as possible.

2.2 POWER CONNECTIONS

ISA110

Assuming that the unit is being installed in a Focusrite rack it will receive it's power from the PSU121H power supply, so just push the unit into the rack in any slot and tighten the knurled screws to support it. Please note that it is advisable to turn the PSU off before fitting or removing any rack modules. For details of the power connections to the PSU121H see it's handbook.

If the unit is to be installed in your own racking system then you will need to refer to the appendices for information on the connector pinout and power capacities. The appendices also provide information on the audio connections for DIY enthusiasts.

ISA115

This unit is supplied in a 19" rack and all connections are made via plugs directly to the rear of the case.

The power is connected via a 5 pin XLR link lead which is supplied with the device. The other end of the link lead should be inserted into the matching socket on the rear of a PSU 120 power supply.

The mains input power for the PSU 120 is connected via an IEC "euro" shielded socket which is supplied with the device. The user end of the euro is terminated in bare wires which should be connected to the mains supply as follows;

Blue wire	Neutral supply
Brown wire	Live supply

Green/yellow wire Mains earth

It is important that the earth wire is connected as it provides essential electrical and safety screening.

There is a fuse located in the mains socket on the rear of the PSU 122 and if blown or if the PSU is operated on a different voltage this should be replaced with the correct rating. The ratings are detailed in the specifications section.

In an ideal world a 1 amp mains fuse should be fitted at the mains plug, not a 13 amp, because the Focusrite rack system is not a kettle.

The PSU 120 has a voltage selector which is only accessible by removing it's covers. To change the initial setting, proceed as follows:

- 1) With the unit sitting the correct way up on a desk, loosen the four screws on the sides which secure the top cover and remove this cover.
- 2) The big round mains transformer will be seen on the left of the case and it will be wired to a terminal strip connector which connects the wires from the transformer to the mains supply. The mains input to the terminal strip can be found on the side nearest the rear panel. They are a thin blue wire and a thin red wire. There are also a thin green wire which is the earth connection and should not be moved. An orange link wire is also on the at side of the block and is used to link adjacent terminals together.
- 3) Occasionally a wire from the transformer may not be used, in which case it should be secured in an unconnected hole in the terminal strip.
- 4) Please **DO NOT MAKE ANY ALTERATIONS WITH THE MAINS STILL CONNECTED TO THE UNIT.** We rather like to keep our customers!
- 5) To adjust the PSU to accept different voltages, wire the colour coded transformer wires to the terminal strip as follows:

<u>Ip volts</u>	<u>Thin blue to-</u>	<u>Thin red to-</u>	<u>Join</u>
110v	Red and Black	Brown and Orange	-
220v	Yellow	Brown	Red and Orange
240v	Blue	Brown	Red and Orange

2.3 AUDIO CONNECTIONS

ISA 110

The audio connectors are on the rack rear panel with one set provided for each rack slot. The connectors are XLRs labelled MIC, LINE, OUT.

All our XLRs are wired pin 3 cold, pin 2 hot, pin 1 ground.

ISA 115

The audio connections are XLRs on the rear panel alongside the power connector. Do not get them confused. The audio connectors are marked with their function and are wired the same as the ISA 110: pin 3 cold, pin 2 hot, pin 1 ground.

With both units wired to their relevant power supplies, the chassis ground is internally connected to the mains ground and the signal ground at a star point.

2.4 SUPPLEMENTARY

The ISA 110 also has a remote switch function which enables the user to activate the mic and line switch from external logic signals. The relevant pins are brought out on the unit's connectors but are not wired to anything in the rack. The appendices detail the pinout of the connector should you wish to use this feature. To activate the logic, a 5v signal referenced to chassis ground should be momentarily applied to the relevant pin on the connector.

SECTION 3: OPERATION

All the equalizer modules have virtually identical controls, which are described below. The ISA 115 has some additional controls which are described separately at the end of this section.

3.1 OVERVIEW

Both units have the same overall block structure which is as follows:
The mic and line inputs have separate transformer balanced stages with individual switched level gain controls. The mic input stage has an additional continuously variable trim. One of these two sources is selected and this signal is passed to the filter stage and then to the LF/HF section and finally through the LMF/HMF section and to the transformer balanced output stage. Each eq section has a bypass chain around it which totally removes the signal from the processing chains for optimum fidelity.

3.2 INPUT

The input stages are transformer balanced with an input impedance of 1200 ohms for the mic stage and 10k ohms for the line stage.

Each input has a switched gain control with 6dB steps and in addition the mic input has a 0-20dB variable trim control.

3.3 FILTER SECTION

Comprehensive filtering is provided in two elements, lowpass and highpass. The filters are third order, 18dB reduction of level per octave designs and have 5 frequency cutoff points selectable by 6 position rotary switches. The sixth position is off (flat response) and in this position the filter circuitry has a minimum length audio path for optimum performance. These filters should be used to reduce the bandwidth of the audio going through the device. For instance the lowpass filter can be used to remove high frequency hiss from keyboards or outboard gear and the highpass filter can be used to reduce hum or ambient rumble. The further away from the "off" position the frequency switches are the more gain reduction will be achieved, but beware; musically valid sounds will also be attenuated. The position of these filters should be chosen to match the nature of the source.

3.4 LF/HF SECTION

Each of these elements has a frequency selector and a gain control. In addition there is a switch marked "Eq in" which brings both elements in or out of circuit. The frequency controls are switched and offer 5 positions whilst the gain controls are continuously variable over +/- 16dB of gain.

The elements are of the "shelf" type and the LF element works like this: The frequency control sets the point at which the gain control starts to act. All frequencies above this position are not affected, but those below are attenuated or boosted according to the position of the gain control. This enables the user to tailor the frequency extremes of an instrument separate from the main "body". e.g. boosting the fundamental of a bass guitar without affecting the slap of the strings. The HF element works identically the LF element except that it only alters frequencies above the selected point.

3.5 LMF/HMF SECTION

Each of these elements has a centre frequency control, a gain control and a Q control. There is also a button which switches the frequency control to a new range and finally there is a single button marked "Eq In" which switches both elements in or out of circuit.

The elements are of the parametric type and all the controls are continuously variable. They work like this:

The frequency control is used to select the centre frequency around which the gain control will boost or attenuate sounds. The Q control affects how frequency selective the gain control is when boosting or attenuating. On a high Q, denoted by a sharp peak sign on the front panel legend, the gain control will allow you to "fish" or "zap" certain frequencies whilst on a low Q, the gain control will boost or attenuate a whole range of frequencies. The x3 buttons switch the frequency control's range by a factor of 3 and allow you to overlap the LMF and the HMF controls to create versatile equalization curves.

3.6 ADDITIONAL SECTIONS

All the modules have a phase switch, which inverts the output polarity of the audio with respect to the input phase and an overload indicator which lights when the output signal exceeds +20dBm.

In addition the ISA 115 and L40 have phantom buttons which provide +48v power on the microphone input lines.

SECTION 4: PROBLEM SOLVING

This section is intended to provide some helpful information in the event of a problem arising.

In the event of a problem arising **DON'T PANIC.**

Panic should be reserved for later on when after reading this section you find you still have a problem.

PROBLEM 1: IT WON'T WORK

- 1) Define "won't work".
 - a) It doesn't pass audio.
 - b) There are no lights on the front panel.

If a) look at problems 4,5 or if b) look at problem 2,3.

PROBLEM 2: NO LIGHTS LIGHT

First check that no lights appear under any circumstances. For instance check that the Eq in buttons don't work if pushed. If only some functions don't work see problem 3. If the unit is dead, read on.

The first piece of useful information is that there are no user serviceable parts inside the units. In plain English this means that there are no fuses inside. The following assumes an ISA110, but it applies to an ISA115 if you substitute a PSU 120 for a PSU 121.

- 1) ISA110 Are the PSU121 power supply LEDs on ?

YES The PSU121 is working. Proceed to 2)

NO Is the mains supply to the rack on ?

YES Has the euro lead blown a fuse ?

NO Turn the supply on and try again.

YES Replace the lead/fuse and try again.

NO Has the rack blown a fuse ?

YES Replace the fuse and try again.

NO Pull out all the modules in the rack. Does the PSU121 come back to life ?

YES Panic. One of your modules has gone sick. Find the rogue by substitution and return it for prompt repair.

NO Panic. Your PSU121 is broken. There is a slim chance that it could be the connector. Your best course of action is to 'phone your distributor and get the unit fixed.

- 2) Are the rest of the modules in your rack looking dead?

YES Something very funny is going on. Have a cup of tea and look at it again. The most logical conclusion is that the rack never worked in the first place. If this is not the case, panic.

NO Relax. This is the right answer. Remove the ISA110 and substitute it into some other slots. Does it work in them ?

- YES No real cause for panic here, just mild annoyance. It looks like some of the slots in your rack are damaged. Return the rack for repair.
- NO Panic. Your ISA110 is no more. It has ceased to be. Please return it for prompt repair and accept our apologies.

PROBLEM 3: SOME LIGHTS NOT WORKING

- 1) Are the switches switching the audio ?

YES The most likely answer is that the LEDs have gone. Obtain some from your friendly LED retailer and replace them. Alternatively we would be happy to send you some ourselves.

NO Panic. Something fishy here. Please return your device to be repaired.

PROBLEM 4: NO AUDIO COMING OUT

- 1) Check to see that power is connected and turned on.
Are the audio connections properly made?

YES Is the right source (mic or line) selected ?

NO Connect the audio properly and try again.

YES Panic There is a problem with the module, please return it for repair. if it's an ISA110 try a different rack position just in case.

NO Select the right source and try again.

PROBLEM 5: AUDIO ATTENUATED WITH NO PROCESSING

- 1) Are any of the sections in circuit and active ?

YES Are the XLRs wired up with the correct phase ?

NO Take them out of circuit and try again.

YES Panic. Please return the unit for repair.

NO Rewire the phase correctly and try again.

Any other problems please contact your dealer.

Row a
 2
 4
 6 48V
 8 live
 10 Neutral
 22 48V
 24 0V
 28 -15V
 30 0V
 32 15V

SECTION 5: APPENDICES

5.1 CONNECTOR PINOUT - ISA110/L40

The ISA110/L40 has a 64w DIN 41612 connector wired as follows:

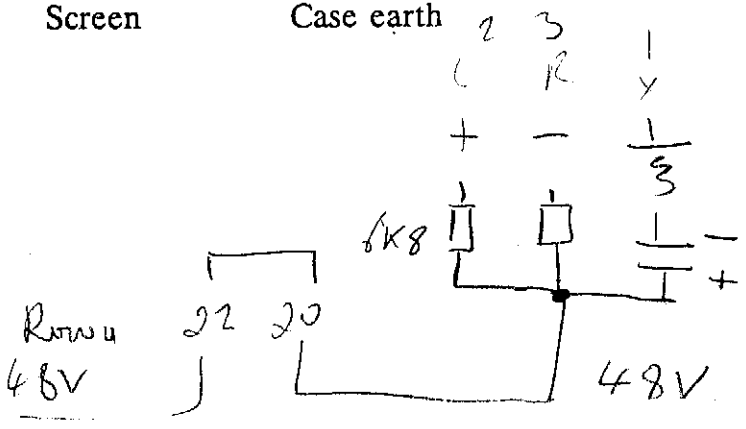
Pin	a	c
2	nc	Mic input +ve
4	nc	Mic input -ve
6	Line remote control input	0v
8	nc	Line input +ve
10	Mic remote control input	Line input -ve
12	nc	0v
14	nc	Pre eq send
16	nc	Pre eq return
18	Remote mute input	0v
20	nc	Post eq send
22	nc	Post eq return
24	nc	0v
26	nc	Unbalanced direct output
28	-15v	Audio output +ve
30	0v	Audio output -ve
32	+15v	0v

LINK []
 FOR
 48V.

5.2 POWER CONNECTOR PINOUT - ISA 115

The ISA 115 has a 5 pin XLR connector wired as follows:

Pin	Function
1	+15v
2	0v
3	-15v
4	+48v
5	Case earth
Screen	Case earth



5.2 SPECIFICATIONS
MICROPHONE INPUT

Sensitivity 0 - 60dB gain in 6dB steps with additional +20db continuously variable trim.
Input Z 1200 ohms, balanced and isolated load.
Balance > 60dB to 15kHz
Noise 200 ohm input; -127dBu
25 ohm input; -130dBu
Distortion -20dBu input, 150 ohm source:
20Hz 0.15%
40Hz 0.06%
1kHz 0.003%
10kHz 0.005%

LINE INPUT

Sensitivity -18 - +18dB gain in 6dB steps.
Input Z 10K ohms, balanced and isolating load.
Balance > 60dB to 10kHz
Distortion 600 ohm source:
-20dBu 20Hz 0.016%
-10dBu 20Hz 0.02%
0dBu 20Hz 0.03%
0dBu 1-10kHz 0.0025%

FILTER SECTION

Slope 18dB per octave; 20dB down 1 octave from frequency selected.
HP freq 330, 185, 105, 60, 36 Hz.
LF freq 3.9, 5.6, 8.2, 12, 16 kHz.

HF/LF SECTION

Slope +/-16dB gain, continuously variable, centre detent. Shelving type.
HF freq 3.3, 4.7, 6.8, 10, 15kHz.
LF freq 33, 56, 95, 160, 270Hz.

HMF/LMF SECTION

Slope +/-16dB gain, continuously variable, centre detent. Parametric type.
Q control 0.3 - 1.0. Continuously variable.
HMF freq x1; 600Hz - 6kHz. x3; 1.8kHz - 18kHz. continuously variable.
LMF freq x1; 40Hz - 400Hz. x3; 1.2kHz - 12kHz. continuously variable.

FUSES (115 only) 1.6A, 240v Anti surge.