

# Engineer 418 & 818

User Guide



The Martin Experience

# Martin Audio Engineer 418 & 818 User Manual

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## Declaration of Conformity: Engineer 418

Manufacturer's name:

XLNT Advanced Technologies

Address:

Zonnebaan 42  
3542 EG Utrecht  
The Netherlands

Declares that the product:

Name: Engineer 418

Conforms to the following EEC Directives

Low Voltage Directive 2006/95/EC  
EN 60065 : 2002  
IEC 60065 :2001 Modified

EMC Directive 2004/108/EC  
EN 55103-1 (1996)  
EN 55103-2 (1996)  
EN 61000-3-2 (2000) +A2 (2005)  
EN 61000-3-3 (1995) + A1 (2001) + A2 (2005)

Utrecht 25 January, 2008

XLNT Advanced Technologies

## Declaration of Conformity: Engineer 818

Manufacturer's name:

XLNT Advanced Technologies

Address:

Zonnebaan 42  
3542 EG Utrecht  
The Netherlands

Declares that the product:

Name: Engineer 818

Conforms to the following EEC Directives

Low Voltage Directive 2006/95/EC  
EN 60065 : 2002  
IEC 60065 :2001 Modified

EMC Directive 2004/108/EC  
EN 55103-1 (1996)  
EN 55103-2 (1996)  
EN 61000-3-2 (2000) +A2 (2005)  
EN 61000-3-3 (1995) + A1 (2001) + A2 (2005)

Utrecht 25 January, 2008

XLNT Advanced Technologies

## Important Safety Instructions

It is extremely important to read ALL safety information and instructions provided in this manual and any accompanying documentation before installing and operating the products described herein.

Heed all cautions and warnings during installation and use of this product.

Keep this instruction manual for future reference

This unit does not contain any user serviceable parts.

Do not open this unit. Doing so will void warranty and might present a risk. Servicing must be performed by qualified personnel only. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug being 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.

This unit is designed for indoor use. Do not use this unit in a wet or damp environment or near to water.

Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

This unit is not designed for residential use.

Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

Do not defeat the safety purpose of the polarized or grounding-type plug. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete connector.

Always replace a blown fuse by a compatible fuse.

Do not connect or disconnect the power connector under load.

Protect the power lead from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus. When damaged, replace the power lead.

Unplug this apparatus during lightning storms or when unused for long periods of time.



## Disclaimer

All rights reserved. Although the information in this manual has been compiled with care, individual items may vary in size, ratings and functionality from what is included in this manual.

Martin Audio Ltd. disclaims any liability for damage, losses or other consequences suffered or incurred in connection with the use of the measurements, data or information contained in this manual. Martin Audio Ltd. may change this product without prior notice.

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## About this Manual

This Installation Manual provides basic information explaining the functionality, installation, operation, programming and maintenance of the Martin Audio Engineer 418 and Martin Audio Engineer 818.

This manual serves as a first reference for the use of this product.

## Customer Service and Warranty

This product is supplied with a limited warranty for 24 months following purchase.

To obtain warranty service, please contact your local Martin Audio Ltd. Dealer.

Please do not send equipment to Martin Audio Ltd. without authorization. If asked to do so, please add a copy of the original invoice, together with the faulty device in a secure shipping container.

## Recycling and hazardous substances

This product complies with the EU RoHS Reduction of Hazardous Substances directive (2002/96/EC) and WEEE Waste Electrical and Electronic Equipment directive (2002/95/EC).

The selection of hazardous substances in all components and parts has been reviewed with care in order to comply with or exceed the RoHS directive.

If this product, when purchased and used in the EU, has reached the end of its useful life it may be returned to the original dealer at no cost or to Martin Audio Ltd. with a proof of ownership.

# 1: Description

## Application

Thank you for choosing the Martin Audio Engineer for your application. The Martin Audio Engineer is a powerful, advanced audio DSP product, built into a 19" rack mount enclosure, designed for permanently installed entertainment audio systems.

On top of the 'normal' crossover and routing functionality The Martin Audio Engineer features two unique highly advanced specialist audio algorithms.

The first one being the dream of every audio reinforcement system installer and owner: an automated sound engineer-in-a-box called 'The Engineer', operating 24-7 to maintain a quality, consistent sound in the venue.

The second one being the Basscreator algorithm, a psycho acoustical effects module which gives the appearance that small speakers are sounding like they are a lot bigger, with unexpected amounts of perceived low-frequency output.

The device also features an advanced scheduler, to have presets recalled at pre-programmed time events.

Furthermore, the device features an external remote control panel which can be connected through a RS-485 port.

This RS-485 port can also be used for controlling the device with third party serial control systems.

The combination of these features makes the Martin Audio Engineer an outstanding one-box problem solver for any installation where high quality and ease of operation are important factors.

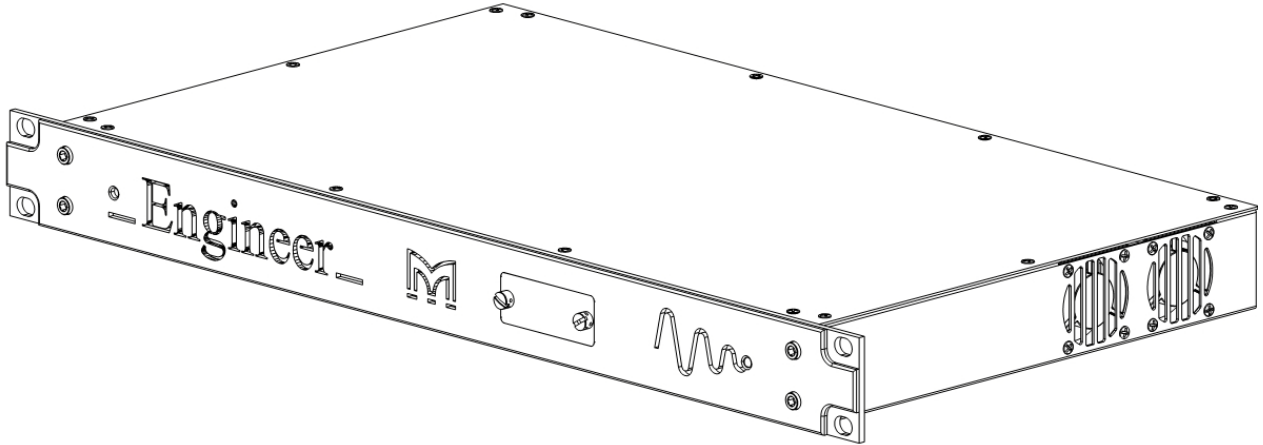
## Features

- 4 inputs and 8 outputs with complete freely routable signal path (Engineer 418)
- 8 inputs and 8 outputs with complete freely routable signal path (Engineer 818)
- 8-band fully parametric EQ on every input.
- 8-band fully parametric EQ on every output.
- Highpass and Lowpass filters on every output with slopes up to 24 dB/oct. featuring L-R, Butterworth and Bessel filters
- Speaker alignment delays of up to 10ms on every output.
- The most musical-sounding speaker protection limiters in the business on every output.

- Very high, musical sound quality throughout.
- Unique Engineer DSP algorithm, working 24-7 to keep a consistent sound in your venue.
- Unique Basscreator algorithm, gives small speakers the perceived low frequency response of a large speaker.
- Flexible build-in scheduler for automated preset recalling.
- RS-232 interface for extensive PC-based setup and control.
- Windows® PC software for controlling and programming
- Programmable remote control with RS-485 interface on industry-standard RJ-45 connector.
- Up to 4 remote controls can co-operate on one Engineer through the use of an optional Remote Spider.

## 2. Products

The Martin Audio Engineer product line comprises 2 products and 2 accessories.



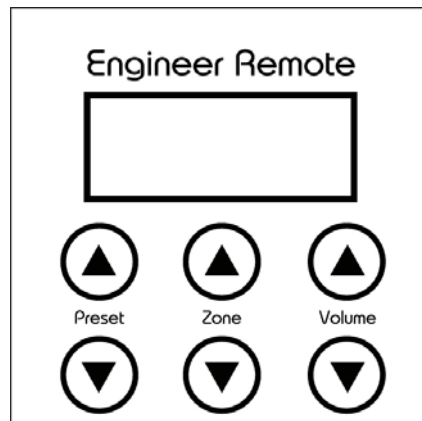
### Engineer 418

4 input-8 output advanced audio Digital Signal Processing device. 100-240V AC input. Housing is 19" rack mounted. Audio in- and outputs on balanced Phoenix terminal blocks. RS485 interface for remote control panel and third party control connection, RS-232 interface for extensive PC-based setup and control.

### Engineer 818

8 input-8 output advanced audio Digital Signal Processing device. 100-240V AC input. Housing is 19" rack mounted. Audio in- and outputs on balanced Phoenix terminal blocks. RS485 interface for remote control panel and third party control connection, RS-232 interface for extensive PC-based setup and control.

## Engineer Remote



Remote control panel for Martin Audio Engineer 418 and Martin Audio Engineer 818. Enables remote recall of presets and remote control of zone volumes, The Martin Audio Engineer Remote is connected to and powered from a dedicated RS-485 port on the Martin Audio Engineer 418 or Martin Audio Engineer 818. This accessory is included with every Martin Audio Engineer 418 and Martin Audio Engineer 818.

## Engineer Remote Spider (optional)

The Martin Audio Engineer Remote Spider is an optional accessory, allowing you to connect up to 4 Martin Audio Engineer Remotes to one Martin Audio Engineer 418 or Martin Audio Engineer 818.



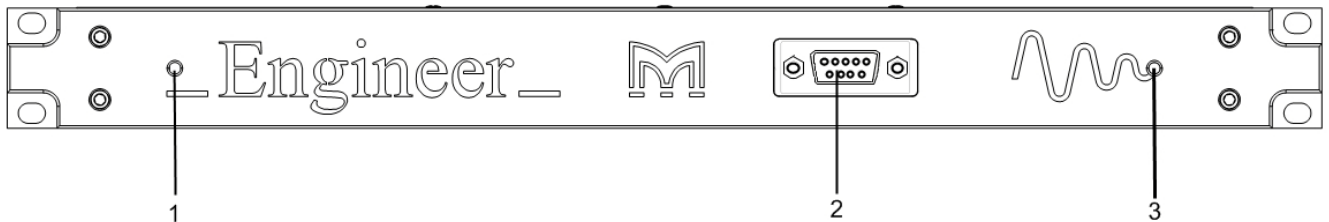
## 3: Engineer 418

### Included Items

In the box containing this manual, the following items should be present:

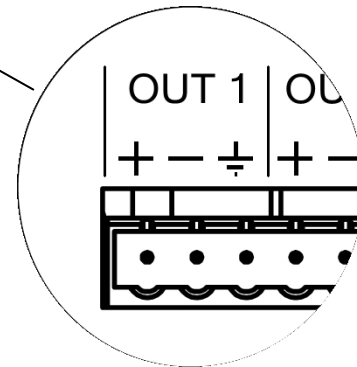
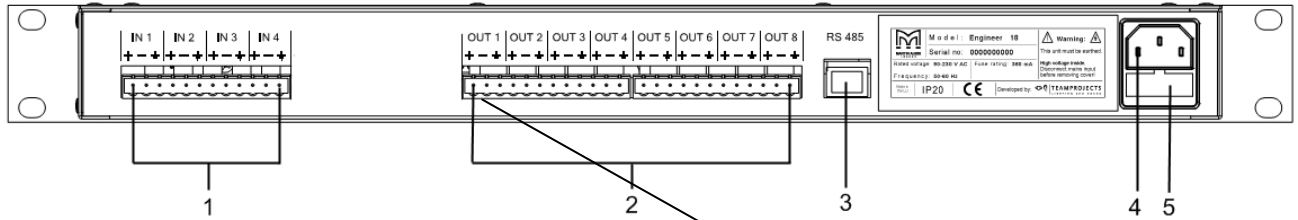
- 1 Martin Audio Ltd. Engineer 418
- 1 Engineer remote panel
- 1 Engineer remote mounting plate
- 1 Engineer front panel cover set w/ 2 screws
- 3 12-pin Phoenix plug-in terminal blocks
- 1 Fully wired 1:1 DB09-DB09 M/F RS232 cable
- 1 Manual (this manual)
- 1 Power lead
- 1 CDROM with Windows® software

### Front Panel layout



1	Power Switch
2	RS-232 port
3	Power Led

## Rear Panel layout



1	Audio Inputs
2	Audio Outputs
3	RS-485 port (RJ45 connector)
4	Power connector
5	Fuse Holder

+	audio hot
-	audio cold
⏏	audio ground

## Installation requirements

The Martin Audio Engineer 418 is designed for 19" rack-mount use.

Mount the Martin Audio Engineer 418 with racking screws in a 19" cabinet. Use support strips as necessary to support the rear of the device.

Adequate ventilation and rear-support must be provided. Allow for enough ventilation into the 19" cabinet in which the Martin Audio Engineer 418 is mounted. Observe the environmental specifications (see appendix 2) at all times.

When mounting the Martin Audio Engineer 418 in a touring rack, a touring rack with shock-absorbing racking strips should always be used.

Always install the Martin Audio Engineer 418 in a level plane. A maximum allowable angle of 10 degrees is acceptable.

**Do not use the Martin Audio Engineer 418 in a wet/damp environment.**

**Do not block any ventilation slot at any time and check the proper function of the fans at regular basis. If the fans do not operate properly, the lifespan of the device will be significantly reduced and the device may even fail.**

## Connecting Audio


Use only certified balanced & shielded audio signal cabling (e.g. Belden 8718, Tasker C208). Refer to the next paragraph for maximum allowable conductor cross sections.

The connectors on the Martin Audio Engineer 418 accept 12-pin Phoenix terminal blocks (as supplied). Refer to the next paragraph for instructions how to terminate the audio wiring.

From left-to-right are INPUT 1-4 and OUTPUT 1-8. The connections are labeled: (please refer to rear panel layout)

**+** For audio hot

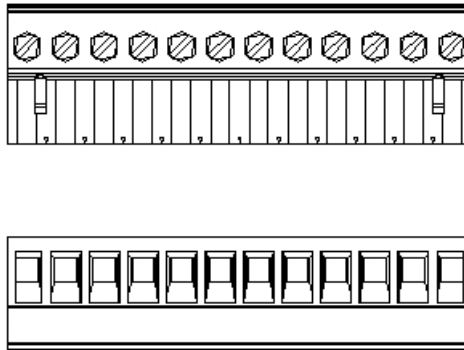
**-** For audio cold

 For audio ground

**Attention: Martin Audio strongly recommends the use of balanced audio connections only.**



## Connection instructions for Phoenix terminal blocks



To connect the Phoenix terminal blocks, always use the following procedure:

- strip the jacket 20mm
- strip the wires 7 mm
- DO NOT pre tin the wires
- cover the ground wire with a heat shrink sleeving
- put the wire up to the plastic sleeve in the terminal block
- use a small flathead screwdriver to firmly close the contact
- make a strain relief so no strain is on the connection
- for suitable wire thickness, please refer to the table below

Conductor cross section solid min.	0.2 mm <sup>2</sup>
Conductor cross section solid max.	2.5 mm <sup>2</sup>
Conductor cross section stranded min.	0.2 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm <sup>2</sup>

## Connecting RS-232

On the front of the device is the RS-232 port for remote control and configuration of the device with a PC with the supplied Windows® Engineer software. To connect the Martin Audio Engineer to a PC use the supplied RS232 cable only. This cable is 1:1 connected, fully wired, one side fitted with a Male DB9 connector, other side a Female DB9 connector.

If a longer cable is required please observe that the maximum operational cable length is typically 45 feet.

**Warning: if the users' PC uses a grounded power supply, make sure that the Martin Audio Engineer 418 and the PC are on the same power distribution line to avoid data errors.**

## Connecting RS-485

On the rear of the device, next to the audio inputs, is the RS-485 port on a RJ-45 connector, used to connect the Martin Audio Engineer 418 to the Martin Audio Engineer Remote or to an external third party control unit. (e.g. Crestron/AMX). For communication protocol please see the appropriate Chapter

The maximum operational cable length is typically 1000 ft. on CAT-5 (Unshielded Twisted Pairs) cable.

The RS-485 connection includes a +5V power line for powering the Engineer Remote. (Please refer to the wiring scheme in the chapter "Engineer Remote")

**Warning: if an external third party control unit is used with the RS-485 port, this device must have a double isolated power supply.**

## Power Requirements

The Martin Audio Engineer 818 must be connected to a 100-240V AC 50-60Hz electrical power supply, with a single phase, neutral and ground connection. Both the neutral and the phase of the power supply (building fuse) need to be protected by a fuse with a maximum current of 16A. For safety reasons the Martin Audio Engineer 818 must be connected to a properly grounded power outlet.

Always use the 3-pin IEC power cord supplied with the Martin Audio Engineer 418.

The power input fuse is located below the 3-pin IEC power input. Do not use a different type of fuse; always replace a blown fuse with a compatible fuse.

## Power switch

The Martin Audio Engineer 418 has a power switch which is accessible through the hole in the front panel (please refer to the front panel layout). Although the device is designed to be left on at all times, it is possible to un-power the device with this switch. To switch ON/OFF, use a Philips #1 screwdriver to operate the power switch through the hole.

**Warning: Since the mains power plug can be used as the main disconnection device, care must be must be taken during installation that this plug is made easily accessible at all times.**

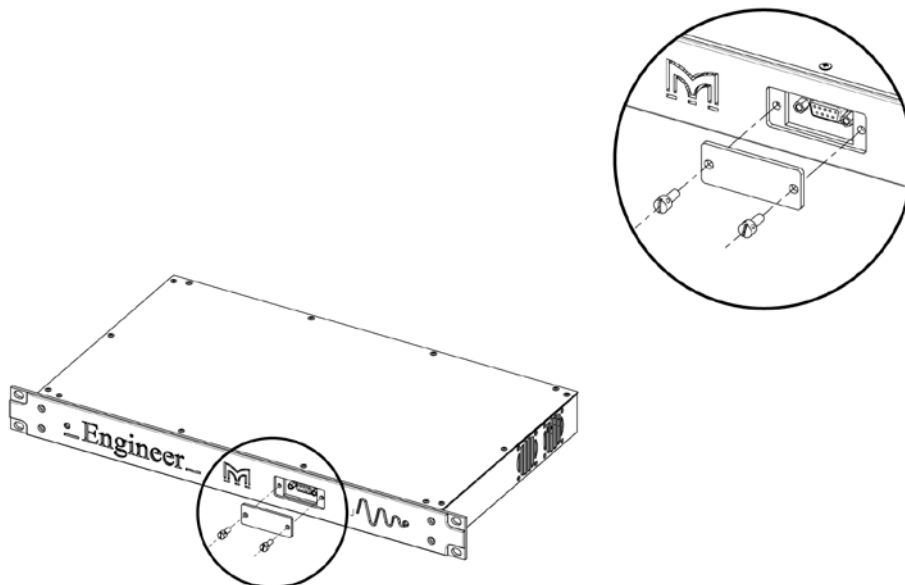
## Power LED

The blue power LED shows the status of the isolated 5V power supply to the digital circuits. When lit, this power supply is active.

Note that the other internal power supply circuits do not have an external or internal status indicator.

## RS-232 front panel cover

When the RS-232 port on the front of the device is not used, the RS-232 port may be covered with the supplied RS-232 front panel cover. Use the two supplied screws to attach the cover to the front panel. These screws have holes drilled through the heads which may be used to seal the RS-232 port so unwanted operation is prohibited.



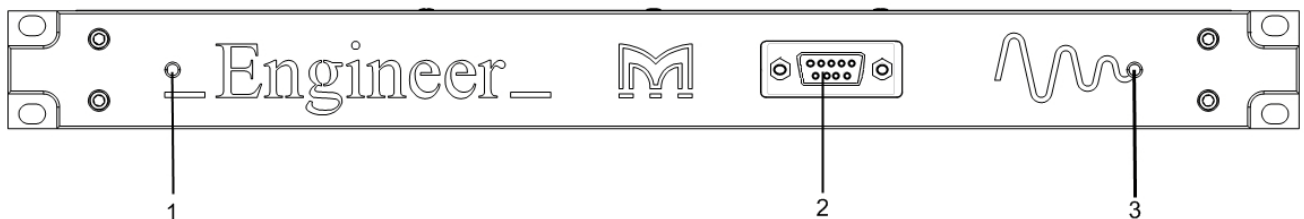
## 4: Engineer 818

### Included Items

In the box containing this manual, the following items should be present:

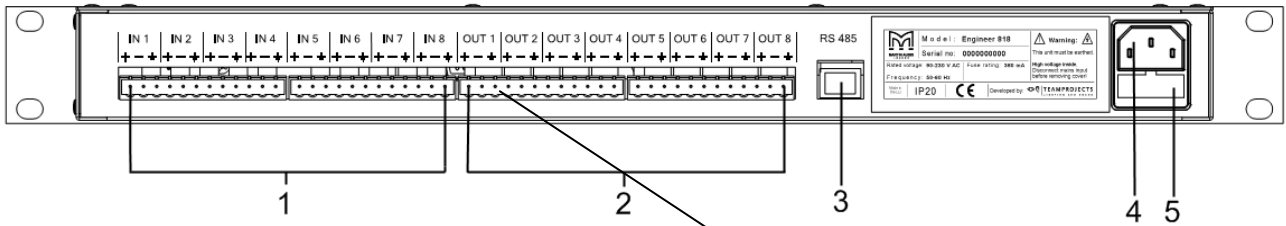
- 1 Martin Audio Ltd. Engineer 818
- 1 Engineer remote panel
- 1 Engineer remote mounting plate
- 1 Engineer front panel cover set w/ 2 screws
- 3 12-pin Phoenix plug-in terminal blocks
- 1 Fully wired 1:1 DB09-DB09 M/F RS232 cable
- 1 Manual (this manual)
- 1 Power lead
- 1 CDROM with Windows® software

### Front Panel layout

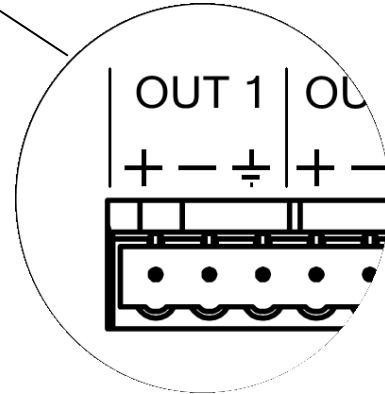


1	Power Switch
2	RS-232 port
3	Power Led

## Rear Panel layout



1	Audio Inputs
2	Audio Outputs
3	RS-485 port (RJ45 connector)
4	Power connector
5	Fuse Holder



+	audio hot
-	audio cold
⏏	audio ground

## Installation requirements

The Martin Audio Engineer 818 is designed for 19" rack-mount use.

Mount the Martin Audio Engineer 818 with racking screws in a 19" cabinet. Use support strips as necessary to support the rear of the device.

Adequate ventilation and rear-support must be provided. Allow for enough ventilation into the 19" cabinet in which the Martin Audio Engineer 818 is mounted. Observe the environmental specifications (see appendix 2) at all times.

When mounting the Martin Audio Engineer 818 in a touring rack, a touring rack with shock-absorbing racking strips should always be used.


Always install the Martin Audio Engineer 818 in a level plane. A maximum allowable angle of 10 degrees is acceptable.

**Do not use the Martin Audio Engineer 818 in a wet/damp environment.**

**Do not block any ventilation slot at any time and check the proper function of the fans at regular basis. If the fans do not operate properly, the lifespan of the device will be significantly reduced and the device may even fail.**

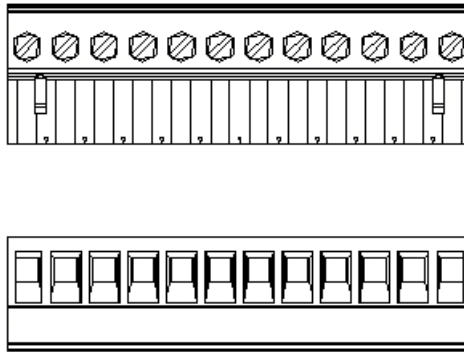
## Connecting Audio

Use only certified balanced & shielded audio signal cabling (e.g. Belden 8718, Tasker C208). The connectors on the Martin Audio Engineer 818 accept 12-pin Phoenix terminal blocks (as supplied). From left-to-right are INPUT 1-8 and OUTPUT 1-8. The connections are labelled: (please refer to rear panel layout)

- +** For audio hot
- For audio cold
-  For audio ground

**Attention: Martin Audio strongly recommends the use of balanced audio connections only.**

## Connection instructions for Phoenix terminal blocks



To connect the Phoenix terminal blocks, always use the following procedure:

- strip the jacket 20mm
- strip the wires 7 mm
- in case of stranded wires, pre tin the wires
- cover the ground wire with a heat shrink sleeving
- put the wire up to the plastic sleeve in the terminal block
- use a small flathead screwdriver to firmly close the contact
- make a strain relief so no strain is on the connection
- for suitable wire thickness, please refer to the table below

Conductor cross section solid min.	0.2 mm <sup>2</sup>
Conductor cross section solid max.	2.5 mm <sup>2</sup>
Conductor cross section stranded min.	0.2 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm <sup>2</sup>

## Connecting RS-232

On the front of the device is the RS-232 port for remote control and configuration of the device with a PC with the supplied Windows® Engineer software. To connect the Martin Audio Engineer to a PC use the supplied RS232 cable only. This cable is 1:1 connected, fully wired, one side fitted with a Male DB9 connector, other side a Female DB9 connector. If a longer cable is required please observe that the maximum operational cable length is typically 45 feet.

**Warning: if the users' PC uses a grounded power supply, make sure that the Martin Audio Engineer 418 and the PC are on the same power distribution line to avoid data errors.**

## Connecting RS-485

On the rear of the device, next to the audio inputs, is the RS-485 port on a RJ-45 connector, used to connect the Martin Audio Engineer 818 to the Martin Audio Engineer Remote or to an external third party control unit. (e.g. Crestron/AMX). (For communication protocol please refer to the Engineer software manual)

The maximum operational cable length is typically 1000 ft. on CAT-5 (Unshielded Twisted Pairs) cable.

The RS-485 connection includes a +5V power line for powering the Engineer Remote. (Please refer to the wiring scheme in the chapter "Engineer Remote".)

**Warning: if an external third party control unit is used with the RS-485 port, this device must have a double isolated power supply.**

## Power Requirements

The Martin Audio Engineer 818 must be connected to a 100-240V AC 50-60Hz electrical power supply, with a single phase, neutral and ground connection. Both the neutral and the phase of the power supply (building fuse) need to be protected by a fuse with a maximum current of 16A. For safety reasons the Martin Audio Engineer 818 must be connected to a properly grounded power outlet.

Always use the 3-pin IEC power cord supplied with the Martin Audio Engineer 818.

The power input fuse is located below the 3-pin IEC power input. Do not use a different type of fuse; always replace a blown fuse with a compatible fuse.



## Power switch

The Martin Audio Engineer 818 has a power switch which is accessible through the hole in the front panel (please refer to the front panel layout). Although the device is designed to be left on at all times, it is possible to un-power the device with this switch. To switch ON/OFF, use a Philips 1 screwdriver to operate the power switch through the hole.

**Warning: Since the mains power plug can be used as the main disconnection device, care must be taken during installation that this plug is made easily accessible at all times.**

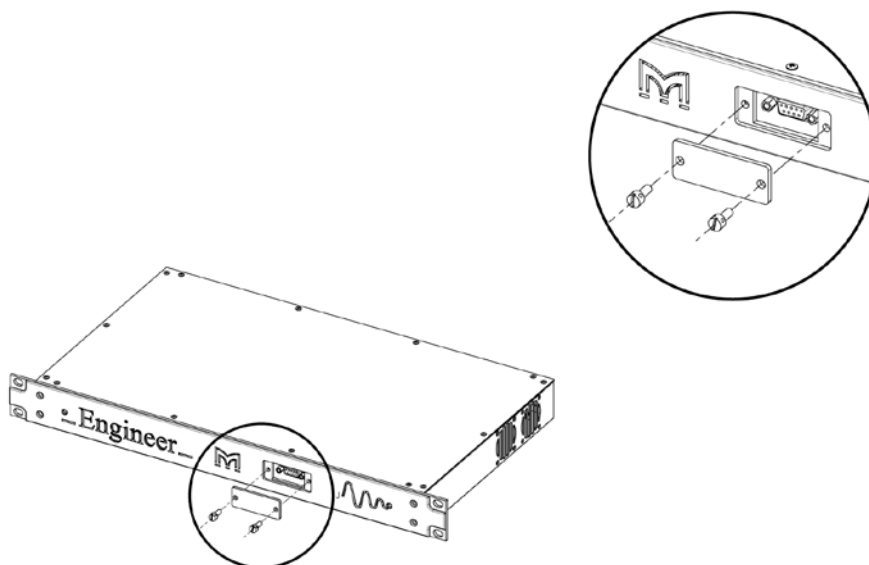
## Power LED

The blue power LED shows the status of the isolated 5V power supply to the digital circuits. When lit, this power supply is active.

Note that the other internal power supply circuits do not have an external or internal status indicator.

## RS-232 front panel cover

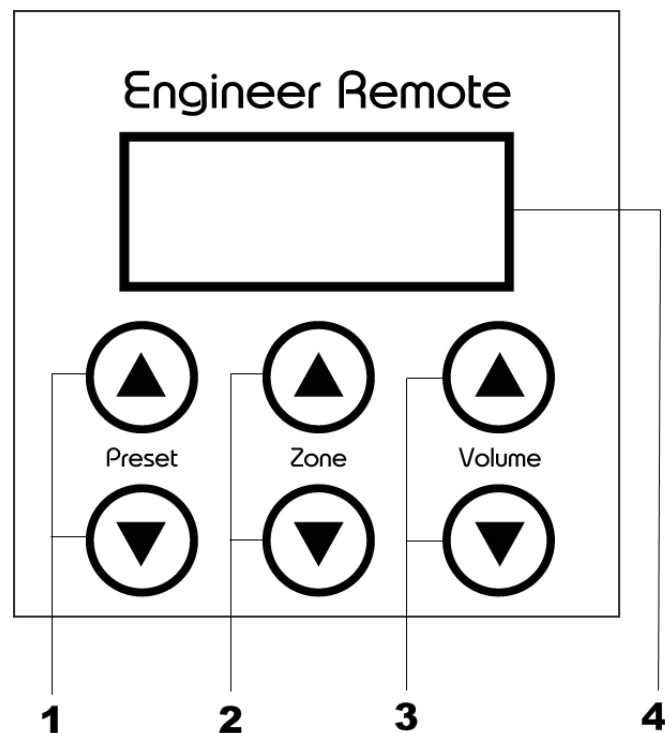
When the RS-232 port on the front of the device is not used, the RS-232 port may be covered with the supplied RS-232 front panel cover. Use the two supplied screws to attach the cover to the front panel. The supplied screws have holes drilled through the heads which may be used to seal the RS-232 port so unwanted operation is prohibited.



## 5: Engineer Remote

When the user has created zones and presets on the Martin Audio Engineer 418/818 with the supplied Windows® PC software, the Engineer Remote (supplied with the Martin Audio Engineer 418 or Martin Audio Engineer 818) can be used to recall presets and control the volume of the zones on the Martin Audio Engineer 418 or Martin Audio Engineer 818. (For more information please see the software manual.)

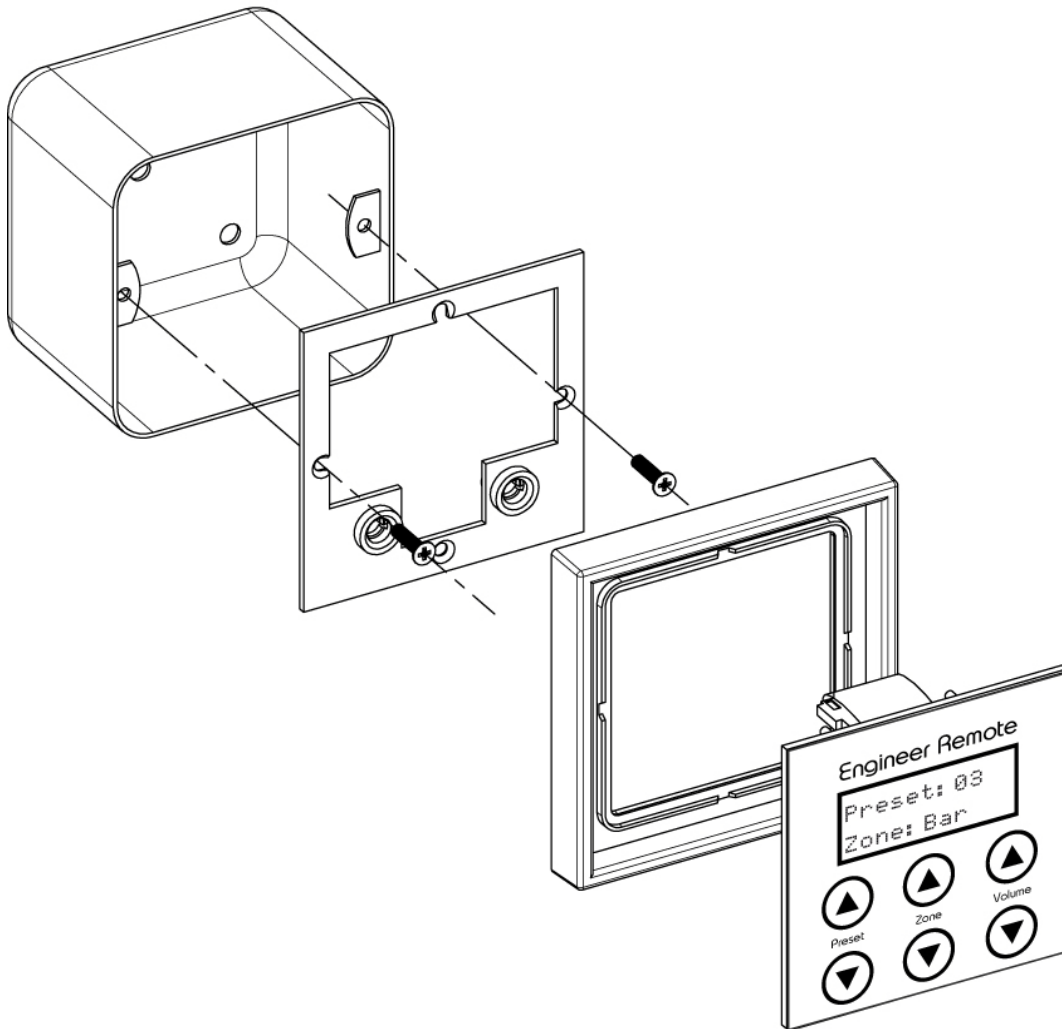
### Panel layout



1	Preset select buttons
2	Zone select buttons
3	Volume set buttons
4	LCD display with backlight

## Installation

The Martin Audio Engineer Remote panel is to be mounted onto a standard DIN installation box and finish cover. The figure below shows how to install the product into the installation box.



- 1 - Attach the Martin Audio Engineer remote mounting plate to the DIN installation box with two M3 screws (length as required)
- 2 - Connect the CAT5 cable to the header on the Engineer Remote (see: wiring scheme)
- 3 - Push the Engineer Remote onto the mounting plate, with a suitable finish cover in between.

## Power

The Engineer Remote is powered from the Martin Audio Engineer 418 or Martin Audio Engineer 818 with a 5 volt DC power supply, incorporated in the RS-485 connector, no external power supply is required.

## Wiring

The Engineer Remote is connected through the RS-485 connector on RJ-45 plug on the backside of the device. The maximum operational cable length is typically 1000 ft. on CAT-5 (Unshielded Twisted Pairs) cable. (e.g. Belden 7918a, Tasker C705)

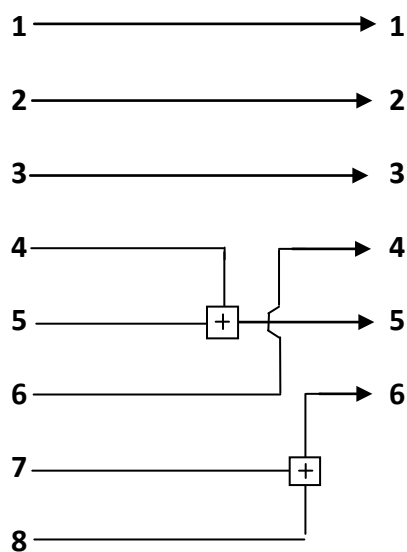
## Wiring scheme

Please make sure that the wires are properly connected according to the wiring scheme below:

PIN	FUNCTION	RJ-45 CONNECTOR CABLE PART	REMOTE HEADER
1	DATA OUT +	1 - ORANGE/WHITE	1 -ORANGE/WHITE
2	DATA OUT -	2 - ORANGE	2 -ORANGE
3	DATA IN +	3 - GREEN/WHITE	3 - GREEN/WHITE
4	POWER + 5 Volt	4- BLUE	4 - GREEN
5	POWER + 5 Volt	5 - BLUE/WHITE	5 - BLUE & BLUE/WHITE
6	DATA IN -	6 - GREEN	6 - BROWN & BROWN/WHITE
7	GROUND	7 - BROWN/WHITE	
8	GROUND	8 -BROWN	

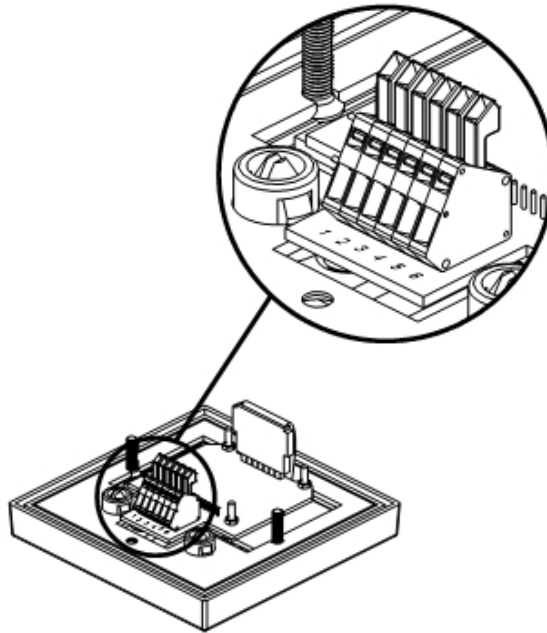
**Warning!: the colour scheme in the above table is just an example with the most commonly used colour scheme in CAT-5 cabling, when connecting a remote DO NOT only look at the colours, but instead check the pin configuration. Incorrect connection will cause fatal damage to the remote!**

**RJ-45 Cable Part pin Remote Header pin**



## Header

The Engineer Remote features a Wago terminal block 6-way header for the connection of the CAT5 cable. To connect the cable to the header, strip the wires 7mm, use a small flathead screwdriver to firmly press down one of the header pins, put the wire in the appropriate header hole and release the screwdriver. Do not press down on two or more header pins at the same time; this may result in damage to the Engineer Remote.



## Connecting multiple Engineer Remotes to an Engineer

With the use of the Engineer Remote Spider, it is possible to connect up to 4 Engineer Remotes to one Martin Audio Engineer 418 or Martin Audio Engineer 818. For details please refer to the Martin Audio Engineer Remote Spider manual.

## Checking proper connection

If the Engineer Remote is powered by the Martin Audio Engineer, the backlight of the Engineer Remote will be lit.

If the Engineer Remote is properly connected to the Martin Audio Engineer 418 or Martin Audio Engineer 818, and one or more presets have been stored on a Martin Audio Engineer 418 or Martin Audio Engineer 818 with the Engineer Windows® PC software, the display will show the name of the presets stored in the connected Martin Audio Engineer 418 or Martin Audio Engineer 818 when pressing one of the 'Preset' up/down arrows on the Engineer Remote. For further details please refer to the software chapter.

## Recalling presets

To recall a preset from the Martin Audio Engineer Remote, just press the 'Preset' up or down button, the display will show 'selecting' and the name of the preset. After 3 seconds the currently selected preset is recalled. Refer to the software chapter for creating and assigning presets.

## Changing volumes

To change the volume of a zone, just press one off the 'Zone' up or down buttons. The display will show the zones that have been created in the Engineer Windows® PC software and the MASTER volume. Once the correct zone is selected, the volume is changed through the 'Volume' up and down arrows. Refer to the software chapter for creating and assigning zones.

**ATTENTION: To use the Engineer Remote, DISCONNECT THE PC from the Martin Audio Engineer 418 or Martin Audio Engineer 818 If the Engineer Remote and the PC are connected at the same time, only the connection between the PC and the Martin Audio Engineer 418 or Martin Audio 818 will be active.**

## 6: Troubleshooting

### Power

#### **If a Martin Audio Engineer 418 or Martin Audio Engineer 818 shows no power**

- Check the Engineer 418/818's power switch
- Check that the power source is functional, and ground, neutral and live connections are properly seated
- Check the power lead for damage
- Check the Engineer 418/818's fuse
- If the Engineer 418/818 still shows no power, contact your local Martin Audio Ltd. service point

### Data

#### ***If the Engineer PC software can't open a connection with the Martin Audio Engineer 418 or Martin Audio Engineer 818***

- Check that the Engineer 418/818 is powered
- Check if the RS232 is properly seated at both ends.
- Check if the right COM-port is selected in the Engineer software (usually COM1)
- Check if no other programs are using the PC's COM port
- Switch the Engineer 418/818 off for 15 seconds and switch it back on again
- Restart the Engineer software
- Restart the PC running the Engineer software

If the Engineer PC software still can't get a connection with the Martin Audio Engineer 418 or Martin Audio Engineer 818, contact your local Martin Audio Ltd. service point

### Remote

#### ***If the Engineer Remote doesn't connect to the Martin Audio Engineer 418 or Martin Audio Engineer 818***

- Check that the Martin Audio Engineer 418 or Martin Audio Engineer 818 is powered
- Check if zones and presets have been properly stored in the Engineer software (see software manual)
- Switch the Martin Audio Engineer 418 or Martin Audio Engineer 818 off for 15 seconds and switch it back on again
- Check If the RJ-45 connector on the back of the Martin Audio Engineer 418 or Martin Audio Engineer 818 is properly wired (see Remote wiring Scheme)
- Check If Engineer Remote is properly wired (see Remote wiring Scheme)

If the Engineer Remote still can't get a connection with the Martin Audio Engineer 418 or Martin Audio Engineer 818, contact your local Martin Audio Ltd. service point



### ***If no audio signal is entering the Martin Audio Engineer 418 or Martin Audio Engineer 818***

- Check that the Martin Audio Engineer 418 or Martin Audio Engineer 818 is powered
- Check if you are actually sending audio to the Martin Audio Engineer 418 or Martin Audio Engineer 818 by checking the input meters in the Engineer PC software (see the software chapter)
- Check if all the gains, mutes and routing settings are set correctly in the Engineer PC software (see the software chapter)
- Check the proper connection of your audio cabling to the Phoenix terminal blocks (see Connecting audio)
- Switch the Martin Audio Engineer 418 or Martin Audio Engineer 818 off for 15 seconds and switch it back on again

If still no audio signal is entering the Martin Audio Engineer 418 or Martin Audio Engineer 818, contact your local Martin Audio Ltd. service point

### ***If the Martin Audio Engineer 418 or Martin Audio Engineer 818 doesn't send audio out its outputs***

- Check that the Martin Audio Engineer 418 or Martin Audio Engineer 818 is powered
- Check if you are actually sending audio to the Martin Audio Engineer 418 or Martin Audio Engineer 818 outputs by checking the output meters in the Engineer PC software (see the software chapter)
- Check if all the gains, mutes and routing settings are set correctly in the Engineer PC software (see the software chapter)
- Check the proper connection of your audio cabling to the Phoenix terminal blocks (see Connecting audio)
- Switch the Martin Audio Engineer 418 or Martin Audio Engineer 818 off for 5 seconds and switch it back on again

If still no audio signal is coming out off the Martin Audio Engineer 418 or Martin Audio Engineer 818, contact your local Martin Audio Ltd. service point

## 7: Maintenance

### Housing

Clean the exterior housing with a slightly moist, lint free cloth.

**Do not use abrasive cleaning agents.**

If a product is used in a dusty environment (or in combination with smoke-machine oil) regular cleaning of the internal fan by qualified personnel may be required.

### Servicing

**Do not open this unit.**

Doing so will void warranty and might present a risk. Servicing must be performed by qualified personnel only. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug being 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.

Always contact your local Martin Audio Ltd. dealer for instructions to obtain service.

## 8: Software

### Introduction

The Martin Audio Engineer is a powerful, advanced DSP platform meant for audio installations. It features 4 or 8 inputs and 8 outputs with extensive, flexible routing and cross-over functionality.

On top of the 'normal' cross-over and routing functionality it features two unique highly advanced specialist audio algorithms.

The first one being the dream of every installer: an automated sound engineer-in-a-box called 'The Engineer', working 24-7 to keep a nice, consistent sound in the venue.

The second one being the Basscreator algorithm, a psycho acoustical effect to make small speakers sound like they are a lot bigger, with unexpected amounts of perceived low-frequency output from a small speaker.

The unit also features an advanced scheduler, to automate preset recall and make sure the correct preset is triggered at any time.

These combined features make the Martin Audio Engineer an outstanding one-box problem solver for any installation where high quality and no compromise operation are important factors.

Please take your time to read this manual carefully, as it will enable you to get the most out of the product.

## Before you start

The Engineer control software was designed to work with either Windows Vista, Windows XP or Windows 7 (32 bit). Although it might work with older version of Windows this isn't officially supported.

You'll need a computer that meets the following specifications to run the software:

- Intel compatible Pentium IV class computer or better
- At least 512Mb of system RAM
- RS232 serial port or USB RS232 adapter with drivers installed
- A mouse (scroll-wheel recommended)

Before you attempt to install the software please make sure no previous version is installed. You can check this from the "Programs and features" function in the Windows Control Panel. If a previous version is installed, please uninstall it by pressing the "uninstall" button here.

Also, be sure the Microsoft .Net framework version 2.0 or higher is installed. This is a freely available framework which you can obtain from the microsoft.com website. If you don't have an internet connection, you can use the version included on the Engineer installation CD.

## Installation

To install the Martin Audio Engineer control software, simply insert the CD-ROM provided with the device. The installation software will automatically start.

If this is not the case, please open the "My computer" dialog, located on your desktop or start menu. Select the CD or DVD drive containing the Martin Audio Engineer software and double-click on the "Engineer.msi" file.

You should now see the installation wizard. Please follow the instructions on your screen to complete the installation.



After installation, a new program group called "Martin Audio" will be available from the programs folder in your start menu. To start using the Engineer software for the first time, simply click the Engineer icon located in this group.

## Uninstalling the software

In case you want to uninstall the software, access the "Martin Audio" program group in your Windows start menu and select "Uninstall". Alternatively, access the Windows Control Panel, select "Add/Remove programs". From here, select the entry for the Engineer mk2 control software, and press the remove button.

## Concepts and terminology

The Engineer was designed with a few concepts in mind, which we'll try and explain in this chapter.

### Presets, projects and the workspace

The Engineer can store up to 28 *presets* at one time. A preset is a predefined combination of settings you've made, which can all be recalled simultaneously with a click of your mouse, using the remote control or the built-in scheduler.

There are five types of presets:

- Complete presets (default): This type of preset stores or recalls all available parameters, essentially a complete snapshot of your current settings.
- Routing presets: This type preset only stores or retrieves the routing settings and BassCreator settings
- Input presets: Stores/retrieves all input settings (input eq's and gains, simple engineer settings)
- Output presets: Stores/retrieves all output settings (output gains, limiters, crossovers, output eq's, delay, phase)
- Engineer presets: Stores/retrieves all advanced Engineer settings

To create a preset, you first have to make the settings you want from the currently active settings. This is called the "workspace", which always represents the settings currently on your screen and –when synchronized properly- what you're hearing.

When recalling a preset, its settings will **copied** to the workspace. If a partial preset is recalled, only the settings defined in that preset are overwritten in the workspace; the rest of the active settings will not be changed.

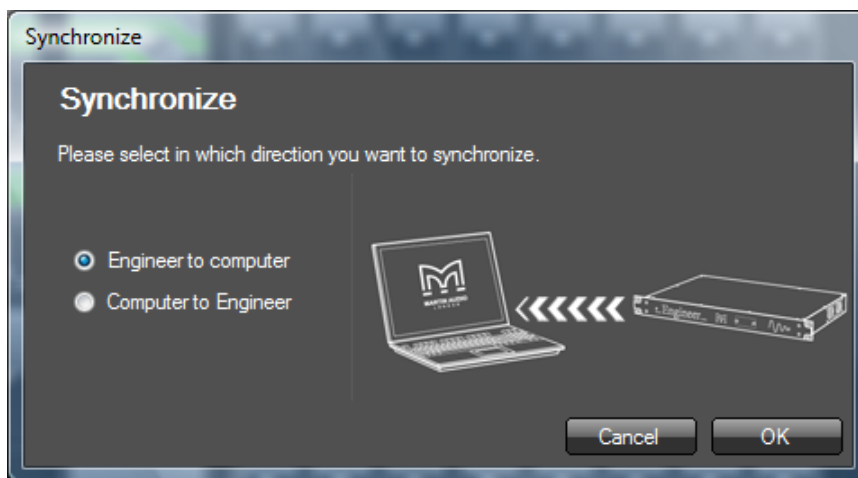
Any number of presets together with the current workspace form a project. A project is defined by the complete content of an Engineer device stored at a given time. You can store a complete project to file (files with the "epf2" extension) for later usage or for backup-purposes, which is something we recommend.

## Synchronization

---

Each time you start the Engineer control software you will be asked to synchronize the software with the project stored on the Engineer itself. Synchronization is an important concept that ensures that whatever it is you're controlling from the software actually represents the settings stored on the device.

You should **always** synchronize before working on a project with an Engineer connected. The choice to skip synchronization is available solely as a means of working on a project when the Engineer isn't connected to your computer.



## Zones

---

One or multiple outputs on the Engineer can be grouped into zones. Zones allow you to define up to eight regions in your venue for which you want to separately control the volume from either the remote control or the software.

This way you save trouble of adjusting each output volume independently. Zones can be named, so they will show up on the remote control and in the software in a convenient way.

## Security

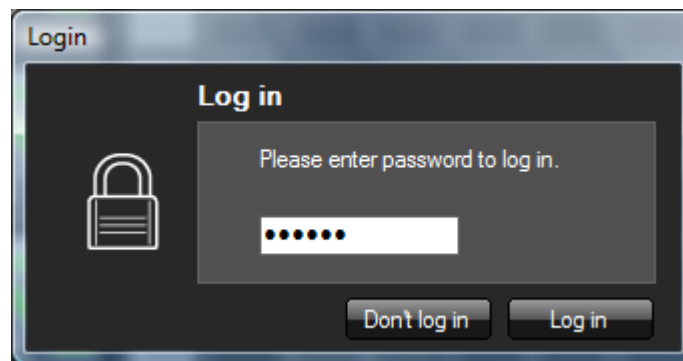
### Logging in

If you plan on using the Engineer mk2 Control Software for everyday use, you'll want some way of preventing incapable hands from controlling crucial system parameters that can potentially destroy an entire PA system.

The Engineer's security features provide just this and offer a limited set of controllable settings for four separate security roles, ascending from bar personnel to full blown audio experts:

Level	Role	Allowed controls
0	Basic personnel	Master gain (cut only), Engineer bass treble and gain, zone gains
1	DJ	Input gains, input EQ's, preset recall
2	Local sound technician	Routing, zone setup, BassCreator settings
3	Sound guru's	All output settings, full preset control, preset scheduler, Password modification

Each level, except for the most basic one, is password protected and needs to be entered every time you connect the Engineer to the computer. By default, only one password is defined, which gives you access to all functionality. This is set to "MA" (case insensitive).



When connected, you'll be presented with this dialog box, prompting you to enter the password that goes with the level at which you wish to access the device. Selecting "Don't log in" results in level 0 access.

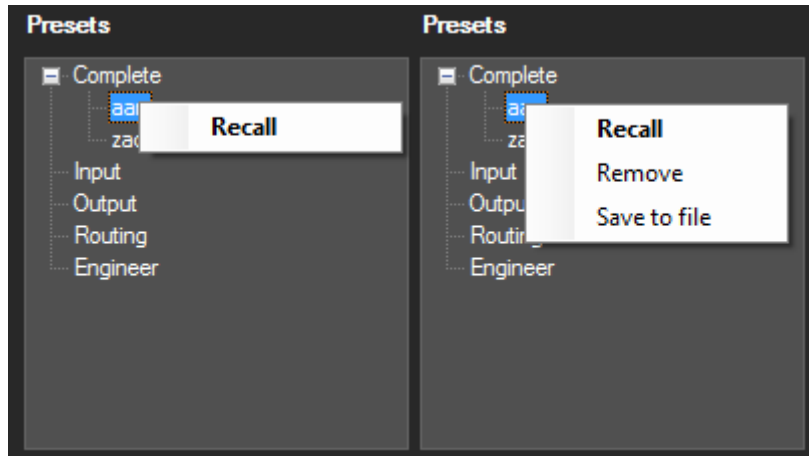
You can also log in or out of the Engineer at a later time from the "Security" menu. Logging out sets the access level to 0. When logged in at level 3, you can also change the passwords for each level from this menu.



## How it works

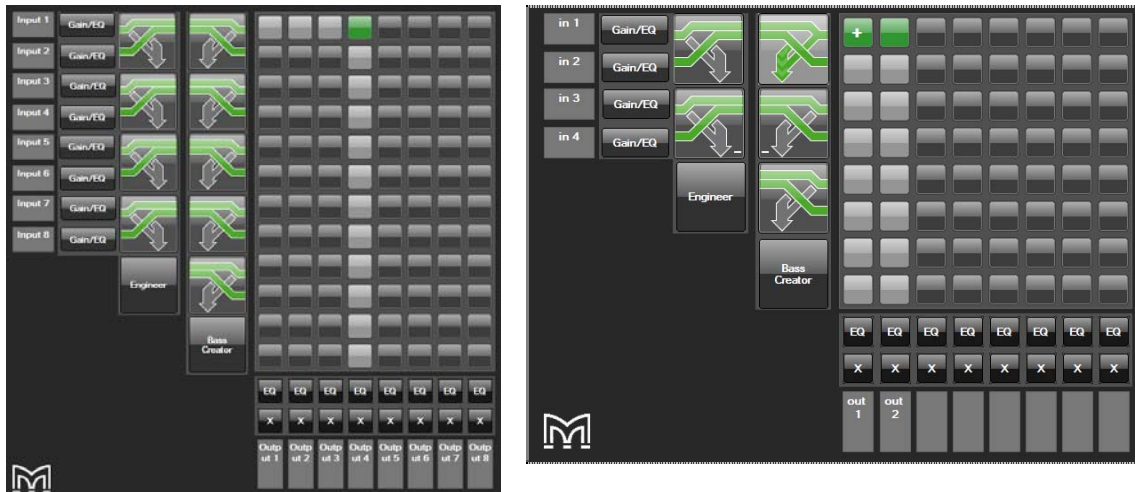
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Features unavailable at the current access level are either disabled or hidden from the user. A good example of this can be found in the preset menu: When right-clicking a preset with a level 1 account, a user will only be able to recall the selected preset, while a level 3 user has more options at his disposal:



## Main control

On synchronization completion, you'll be presented with the routing screen. This offers you a nice overview of the features available in the device. Let's take a look.

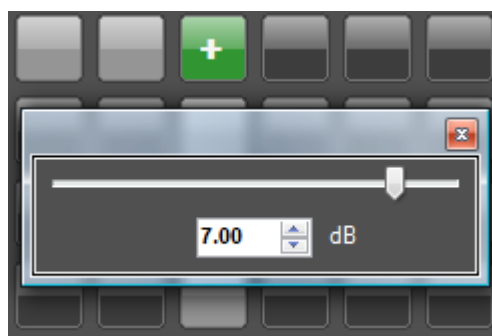


## The routing matrix

The largest part of this screen is taken up by the routing matrix, which allows you to control the path you audio signal will travel through the device. All available input channels are positioned to the left of the matrix, while the outputs are shown at the bottom.

When connected to an Engineer, the device type (418 or 818) will be auto-detected, and the matrix will be adjusted to the number of inputs.

When you press one of the nodes in the matrix you connect one of the inputs to the outputs on the bottom. The route travelled by the signal is highlighted, with the enabled node coloured in green. At this point you can adjust the volume of the signal by right clicking the node and adjusting the gain value.



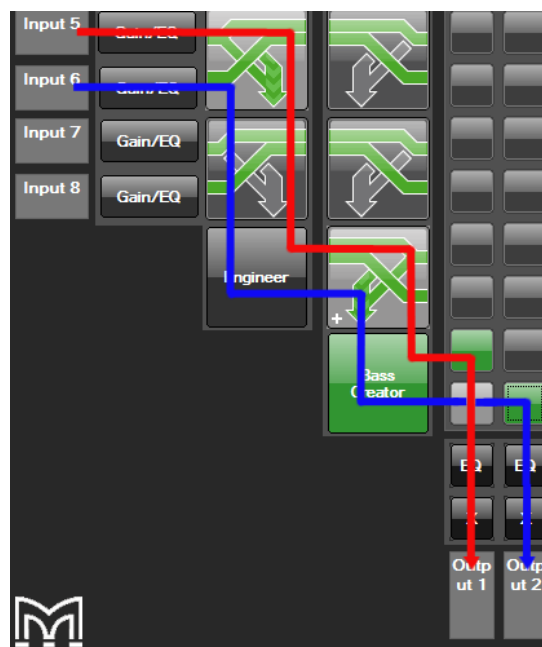
As you might have noticed, there are four extra channels available beneath the input channels. These are return channels for the Engineer and BassCreator effects.

Since the BassCreator and Engineer are stereo effects, all routing towards the effect channels must be done in stereo as well. You can use the large nodes between the routing matrix and input effects for this purpose. Just like the mono-routed nodes, use the right mouse button to adjust the gain of a specific node.



You can route multiple inputs to the Engineer and BassCreator; the inputs will be summed before they're processed by the algorithms and will come out merged. Use the stereo-node to the right of the Engineer effect button to route its signal to the BassCreator effect.

Routing your inputs towards the effects channel doesn't prevent you from using the unmodified signal elsewhere: You can still route the unmodified version of the signal to a different target within the matrix.



## Labelling your channels

For efficient usage of your program without the hassle of having to remember which (numbered) output represents the audio channel you want to control, we recommend labelling your channels. This can be done easily from the routing screen by simply updating the text within the gray boxes beside each in and output channel. The corresponding tabs in the program will automatically be updated with this name and all labels are stored on the device for future usage.

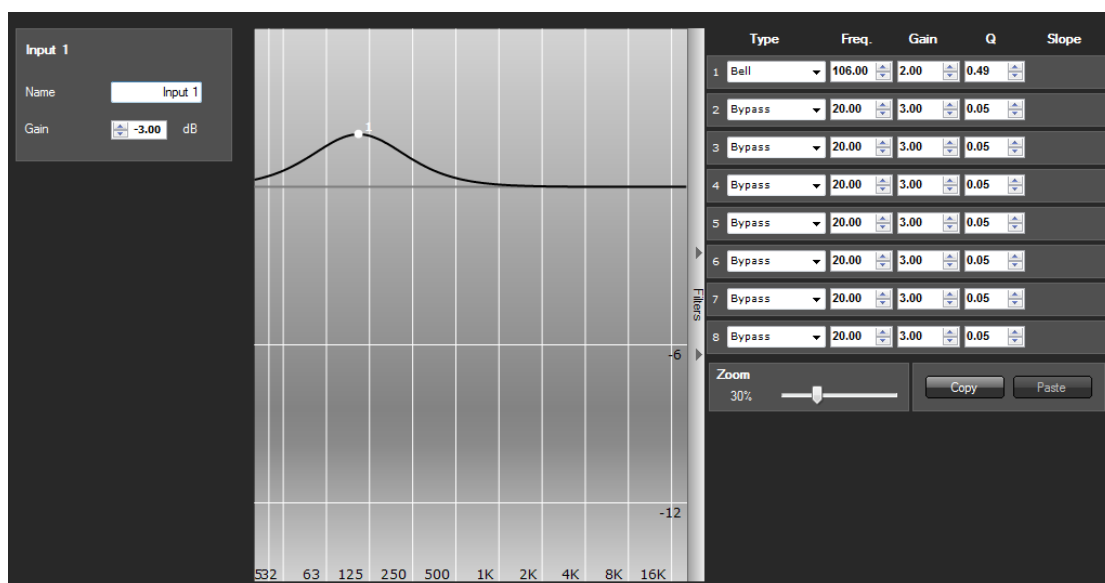
## Accessing functionality

Although the Engineer mk2 software is built as a tab-based interface you can access most of the effects within the program from the main routing screen. Simply click any of the buttons within the routing overview to jump to the tab it represents.

## Input controls

Each input on the Engineer features an eight-band parametric equalizer plus gain adjustment possibilities. These operate in a straightforward manner.

To access one of the input channels select the corresponding tab and channel sub tab or click its button within the routing screen.



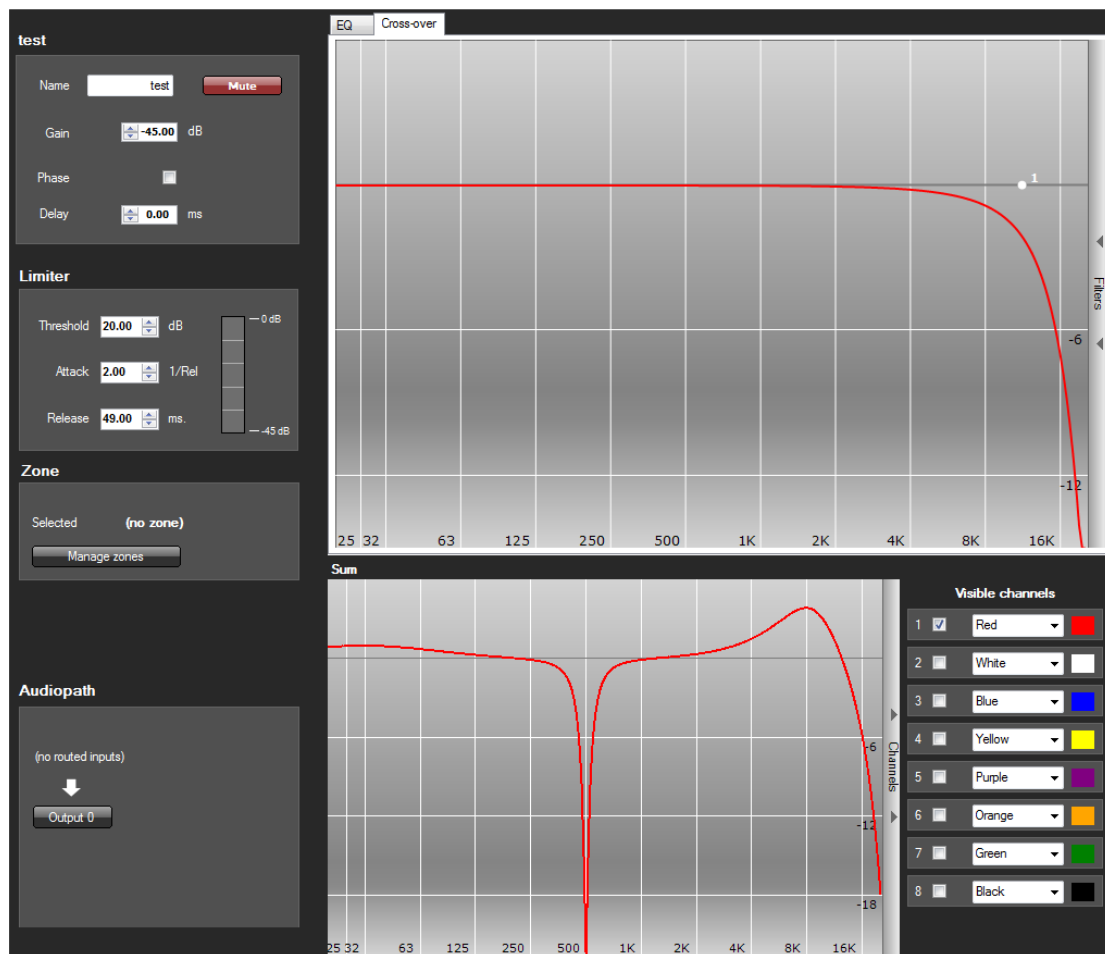
The following types of EQ filters are available;

- Bell filters
- Low-shelving filters
- High-shelving filters
- Band-pass filters
- Band reject filters (notch filters)
- 2<sup>nd</sup> order all-pass filters (affects phase only)
- Filter bypass (no EQ)

The filter graph can be expanded by clicking on the right of the graph. The vertical scale can also be trimmed to get the best view of your EQ using the 'Zoom' control.

EQ settings can easily be copied and pasted to other input or output channels with the Copy and Paste buttons.

## Output controls



## *The output channel tab*

---

All output settings are grouped on a per-channel base within the output tab. You can access this through the output settings tab or from the main routing screen by pressing the corresponding button in the routing overview.

Each output channel features an eight-band parametric EQ, crossover filters, polarity, delay and gain settings and an output-limiter. The EQ and crossover filter settings can be switched from the top-right part of this tab.

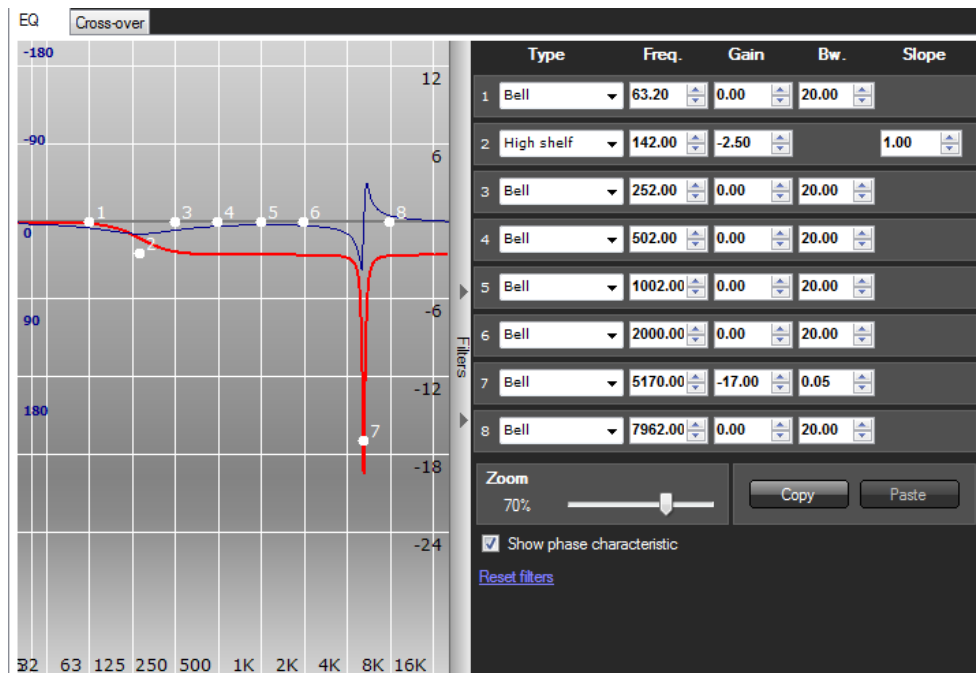
A specific type of filter and the settings that go with it can be changed from the “filters” overview that can be expanded and closed using the vertical bar to the right of this view.

The following types of EQ filters are available:

- Bell filters
- Low-shelving filters
- High-shelving filters
- Band-pass filters
- Band-reject filters (notch filters)
- 2<sup>nd</sup> order allpass filters (effects phase only)
- Filter bypass (no filter)

Crossovers can also be selected from a range of flavours:

- 2<sup>nd</sup> or 4<sup>th</sup> order Linkwitz-Riley (12dB/Octave or 24dB/Octave)
- 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> order Bessel (6dB/Octave to 24dB/Octave)
- 2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> order Butterworth ((12dB/Octave to 24dB/Octave)



To change the gain, Q/bandwidth/slope for each filter, use the numerical values next to the filter type. Double clicking each value will pop-up a window in which you can use a slide bar to adjust the selected value.

Another option to change each filter's parameters is by dragging each filter in the visual overview to their position. Use the scroll-wheel of the mouse to adjust the selected filters Q/bandwidth/slope. While dragging a filter to its place its specific effect on the EQ as a whole is displayed as an opaque region in the EQ graph.

To reset all filters to their default values, you can use the "Reset filters" option located on the right side of the screen.

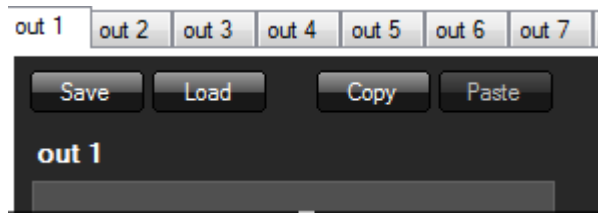
The filter overview also contains a "zoom" option you can use to zoom in or out from the graphical overview. Beside this button, two buttons allow for copying and pasting from and to other output or input EQs.

The sum (final result) of the effect the crossovers and equalizer have together is displayed directly below the tabs controlling them. You can choose to display additional channels and the colour they're displayed in from the "Channels" panel located on the right of this control (click to expand or collapse this section).

You may have noticed the checkbox allowing you to show the phase characteristics of all filters. Disabled by default, this feature is meant for advanced users. Setting it to 'enabled' allows you to view the phase characteristic of all filters or only the selected one (click and hold the left mouse button over the filter you want to see).

You can double click each equalizer or crossover's graphical representation to have a separate window pop up that controls the same parameters. This can be left on top of all windows, so that you can control other parameters while keeping this window handy on the same screen.

There are copy and paste buttons available for the crossover functions as well as the EQ, and the ones located at the top left of the output channel tab which can be used to copy and paste all output parameters simultaneously ;- gain, limiter, crossover and EQ.



*Output tab Save, Load, Copy & Paste Buttons*

There is also a Save and Load button. These buttons are used for saving or loading all output parameters to a file. This makes designing complex projects with different speakers on each output very simple indeed. The Engineer Mk2 software installation file includes output files for most Martin Audio speakers which can easily be loaded into any of the outputs.

If you need to create a custom output this can be saved to file and loaded into other outputs or in future projects. Unlike saving output presets (see the chapter on Projects and Presets on page 34), the output Save function does not save the channel location, just all the parameters so even if a channel setting were created and saved in say output 1, the file can be loaded into any of the 8 outputs.



## Engineer algorithm concept

One of the main features of the Martin Audio Engineer is the Engineer algorithm itself. Think of the Engineer algorithm as a real-life sound engineer whom you can tell what kind of sound you'd like from your sound system.

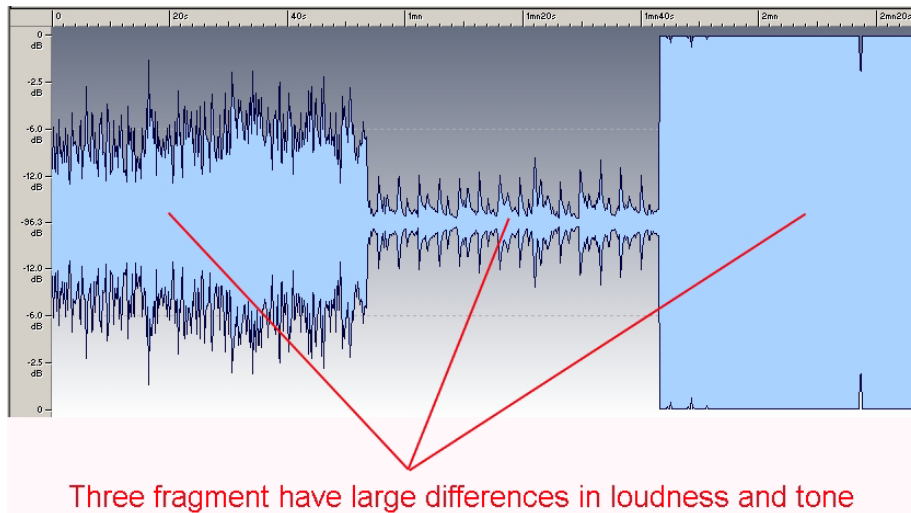
The underlying technology is quite complex and for this reason the system has been split up into a simple and an advanced mode.

### *The problem*

First, let's look at the reason why one might want to use the Engineer algorithm.

Say we have a situation where we have a venue (maybe a bar or a restaurant) with an MP3 playing machine taking care of the music. We tell the machine to play us a lounge background program and the following happens:

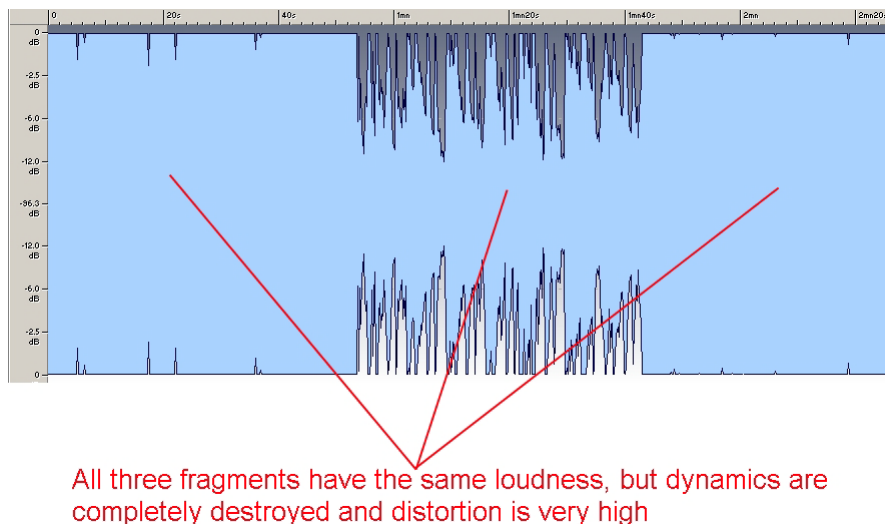
- First we get a nicely produced music track, which has good dynamics and a proper mastering volume; everything is fine and we set the total volume to the level we like it in the venue.
  
- The next track is very quiet with very little bass and treble so suddenly the music in the venue has disappeared, totally drowned by the noise of talking people. A little annoyed we turn the volume up to the desired level and add some bass and treble until we reach the desired sound again.
  
- Then suddenly a new song starts and this song is a very modern track which is mastered in such a way that no dynamics are left at all. So suddenly the music feels 8 times as loud as you intended it and everybody in the venue is putting their fingers in their ears and looking annoyed because the massive amount of bass in the venue vibrates their drinks off the tables...



This example describes a very common situation which we see happening every day in venues all over the world. This problem is actually not anybody's fault; it's just the way things evolve through the years and the result of different opinions of how things should sound. But it is a problem that we have to deal with.

One way to overcome this problem is what we call the 'radio station solution'. What happens at a radio station is that very strong multiband-limiting is applied to all program material, so that every song will sound the same and is as loud as the rest, no matter if it is a "middle of the road" ballad or a techno track.

This technique works, but the drawback is that the music loses all its dynamics, large amounts of harmonic distortion are added and the carefully mixed material loses its balance completely (hey, I didn't know that the tambourine in this song was louder than the lead vocal...). See the resulting waveform from our example treated with the "radio solution" in the picture below.



The best way to overcome these problems is to have a real-life flesh and blood sound engineer standby 24-7. This way we would always have someone monitoring the program material who would fix every change in loudness or tone immediately. Naturally this solution is way too expensive for 99% of the venues.

## The solution

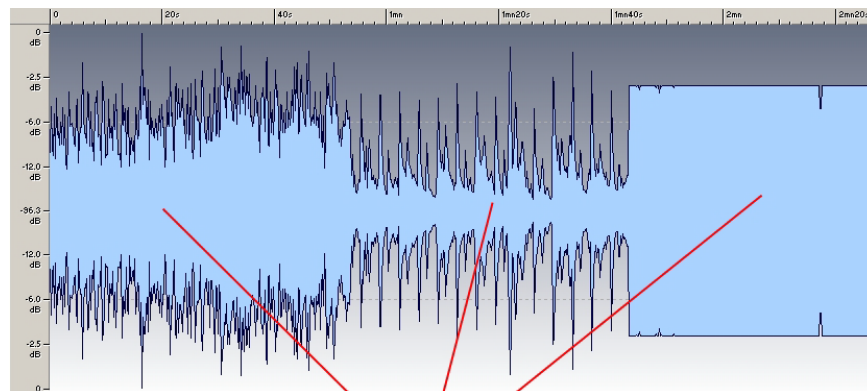
We've solved the issue described above for you by creating an algorithm that reacts in the same way as a normal sound engineer would do, hence the name 'Engineer'. The Engineer works with human-based perceptive algorithms which react the same way as a normal human being would. This means that the algorithm reacts to perceived loudness instead of electrical loudness, so that songs with a lot of compression (which sound loud), will be turned down more than more dynamic songs, so that the overall perceived level stays intact.

The Engineer algorithm features an automated volume control, an automated low EQ, an automated high EQ and a multiband end-stop limiter to catch extreme peaks in the program material.

Just like a normal human being would, the algorithm listens to the incoming signal for a couple of seconds, then decides if it sounds too loud or too weak, adjusts the volume, listens to the amount of bass and treble in the material and, if necessary, changes it.

If the volume of the material has a sudden large boost in volume (for instance when a DJ is fooling around), these peaks will be handled by the end-stop limiter so that the algorithm has the time to slowly lower the volume.

The picture below is the output of the engineer algorithm with our example input. In this picture we see that the level and tone differences have been solved in an elegant way without destroying the dynamics or adding distortion, and that the last piece of heavily compressed music has been lowered in volume to give it the same perceived volume.



All three fragments have the same perceived loudness and tone quality with optimum dynamics

## Engineer advanced configuration

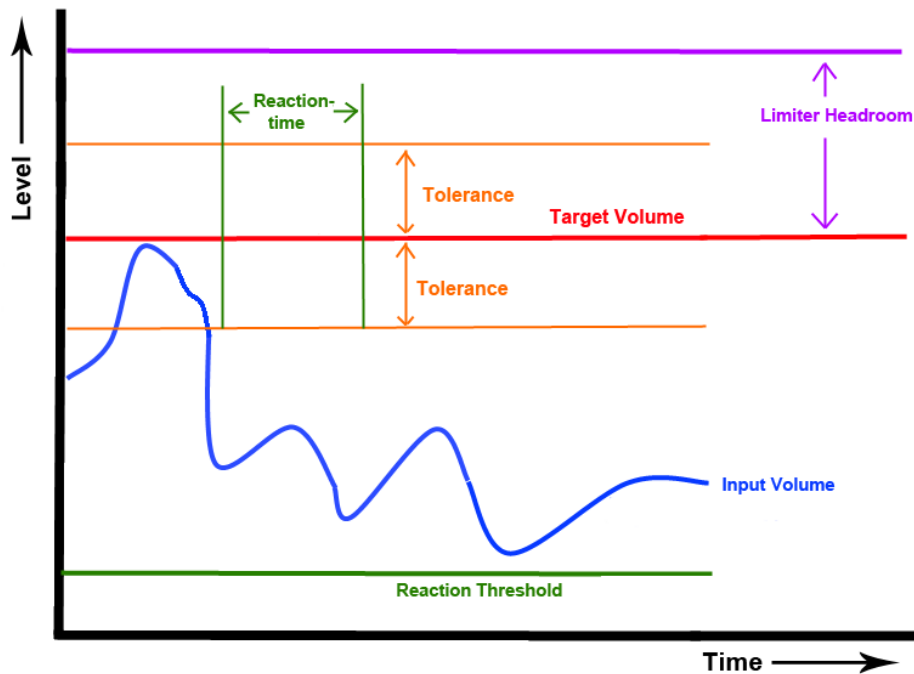
The default Engineers settings give a good general purpose operation but all operational parameters can be fine-tuned in the Advanced tab to match the operation to a specific style of music or whatever response you

might need. Please make sure to read this chapter of the manual if you plan to use the Advanced mode as it will help you get the most from this feature.



The Engineer features three automated controls; an automated volume control and two automatic EQ's. It also features three end-stop peak limiters.

Before attempting to configure the algorithm, let's take a look at the main parameters that will come into play.



The figure above gives us an idea of the problem to solve and the tools at our disposal: The blue line represents the input volume offered to the algorithm; the red line depicts the overall volume we would like as the output volume.

The goal is to modify our input volume in a way it will be in between the orange lines marked "Tolerance" by the time we're done. The tolerance can be set as an offset to the desired target level. If our virtual sound engineer has low tolerance, he'll try to match the target level as accurately as he can: The higher the tolerance, the more slack will be allowed in the source level.

But when to intervene? Sometimes the source level will only be outside of the target area for a short time. The maximum amount of time this is allowed to happen is set by the reaction time. Setting this to a short period of time will result in a nervous engineer, turning the knobs as soon as the volume deviates from the target we've set: The longer the reaction time, the more "lazy" our engineer will become.

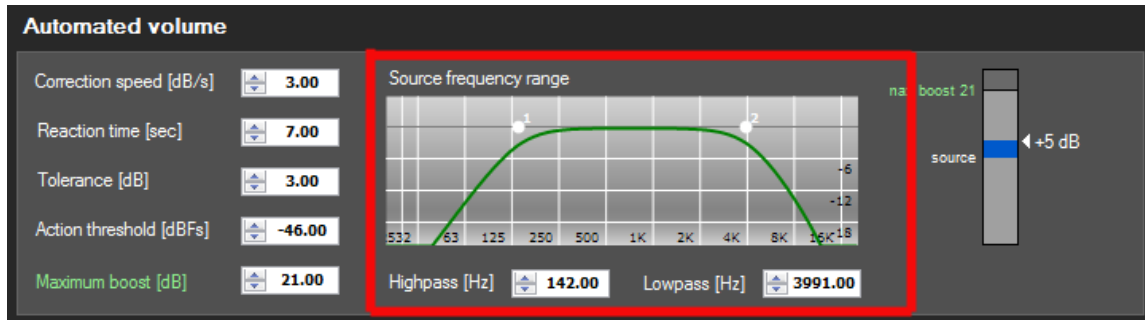
You might be thinking you'll want to set the reaction time as short as possible to counter sudden peaks in the volume, but there's no need: Sudden peaks in the source volume are countered by three limiters (low-, mid- and high tones). The purple line marked "headroom" shows us the maximum level at which these peaks are allowed before these limiters kick in.

Finally, we need to account for situations in which no music is being played. A human engineer wouldn't turn up the level to 10 when there's (almost) no input, so neither will ours. You can set the minimum level he'll work with; it's called the threshold and marked in green in the figure above. If the input level's below the threshold, the engineer will sit back and relax: All knobs will be set to 0, leaving the source signal unchanged.

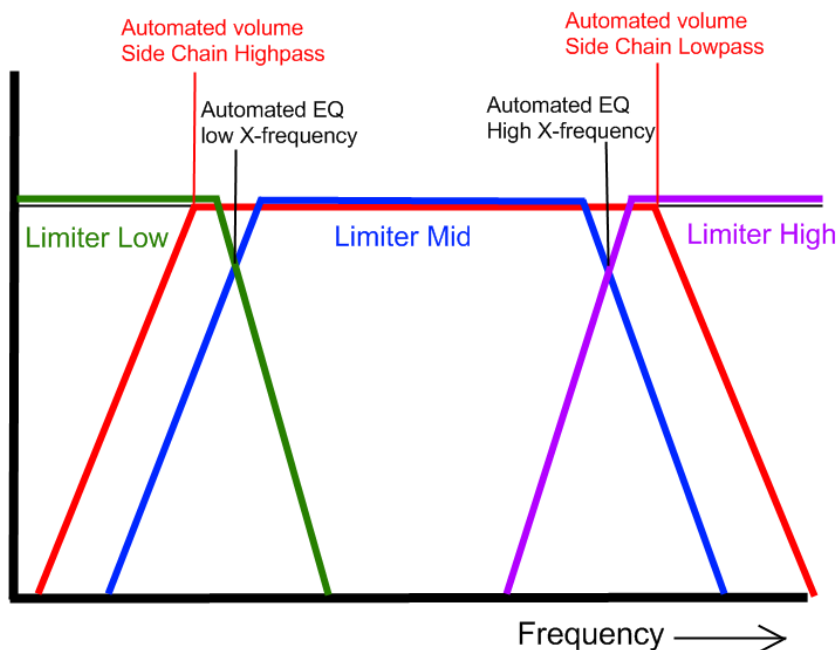
Now that we have an idea of what we'll be configuring, let's get started!

## Determining the source frequency range

Each of the automated controls has its own domain of operation: The leveller takes care of the overall volume; the automated EQ's take care of the treble and bass.



The frequency domain you want each of these controls to work their magic on can be determined by setting their respective frequency range. Typically, you'll want to adapt this setting to the type of music you'll be playing most.



We recommend setting the automated volume source frequency to the same values that are used in the automated EQ's. Common settings for different types of music:

- **Dance: 100 Hz - 4 KHz**
- **Rock: 150 Hz - 4 KHz**
- **Classical: 100 Hz - 4 KHz**
- **Blues, Jazz: 120 Hz - 4 KHz**

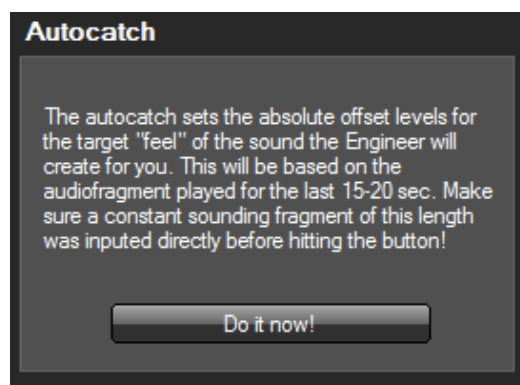
The three end stop limiters have a frequency range that's determined from the frequency range you entered for the automatic EQ's. In the figure above you can see how they correspond to these frequency ranges.

## Setting the Autocatch

---

Remember the target level we discussed on the last page? We haven't talked about the way this is determined yet. To set this to level, we'll need to use the "Autocatch" feature.

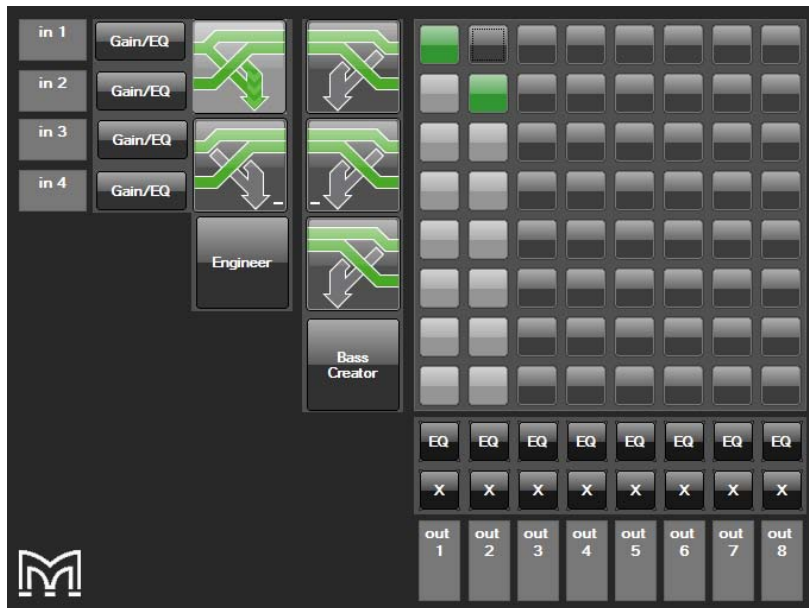
The Autocatch determines the treble and bass content we want our Engineer to look for. In other words: His personal preference when it comes to a specific "feel" to the sound he's creating.



As we would with a human sound engineer, we'll need to let him hear what we're looking for. So, put on your favourite song and make sure it's a good example of the music you'll generally play. Ensure the music you play is continuous and doesn't contain any breaks, in particular, if it has vocals ensure you wait until the vocalist starts singing before pressing Autocatch.

Now, before pressing the Autocatch button, make sure our engineer hears the source playing your track, by routing it towards the engineer. Also, make sure your input settings aren't interfering with the signal (no extreme EQ or input gain settings).

To ensure the engineer is hearing the same as you are we recommend routing it as pictured below, assuming you've connected your source to inputs 1 and 2.

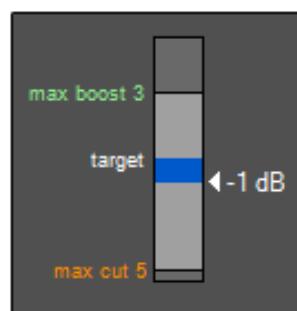


When you're satisfied with the sound you're hearing, press the Autocatch button in the top-right corner of the Engineer advanced screen. It'll remember the sound you want for this preset. You can set different values for the target bass and treble in each preset, so you might want to create separate settings for different types of music.

Please note, that every time you change any of the source frequency parameters (discussed on page 23) the Autocatch needs to be repeated!

### ***Max cut, max boost and the correction indicators***

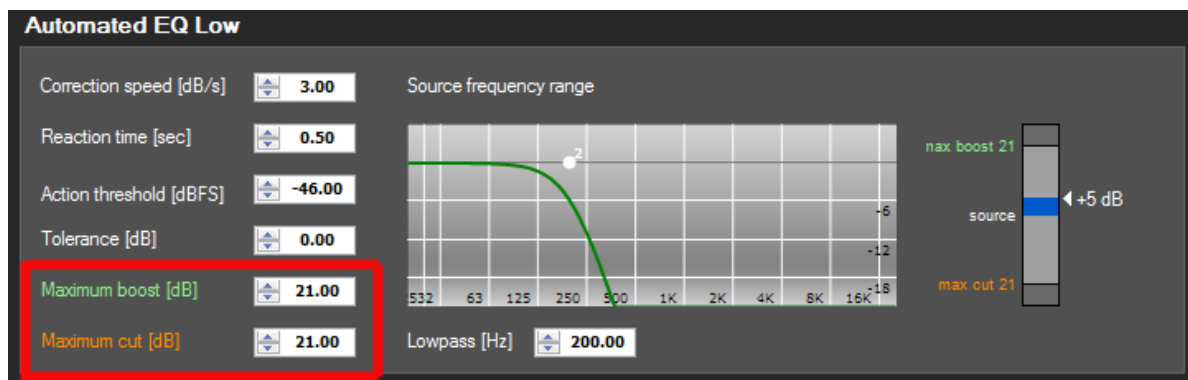
To help you find the perfect settings for your situation, we've added a handy indicator that visualizes what's happening within the device.



This indicator is displayed for the overall level correction (Automated volume) and low- and high tonal corrections (Automated EQ's Low/High). It shows some of the most important parameters:



- The max-boost is the amount of gain you allow your Engineer to add to the input level to reach the target level you set using the “Autocatch” feature.
- The max-cut is the amount of you allow your Engineer to deduct from the input level to reach the target level you set using the “Autocatch” feature.



Together these two form the boundaries in which the Engineer functions: If you want to give it maximum control over the source material, you should set them as high as possible: Setting them to lower levels restrains the engineer from tampering with the controls too much.

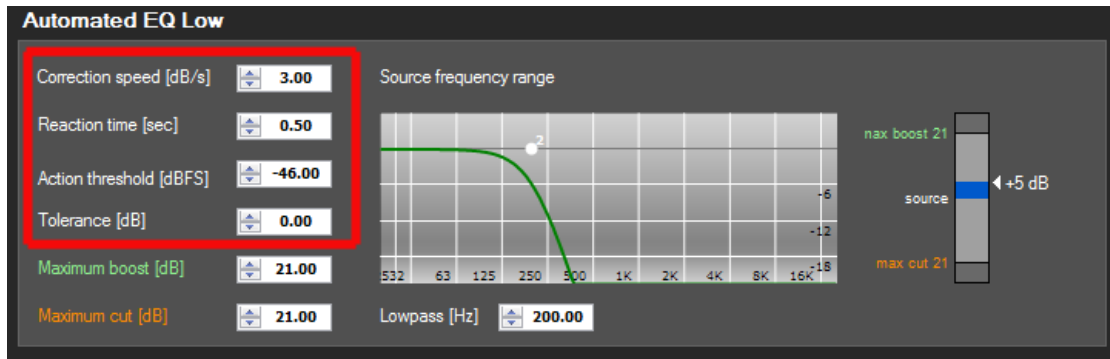
In the case of the leveller there’s no maximum to the amount the Engineer can cut. This way, no matter how loud a crazy DJ’s input signal is offered, it will always be cut to the maximum level you allow it to be.

The space you allow the Engineer to do its work in is marked in light gray on the indicators. The blue bar indicates how far the engineer is currently turning the knob and this value in dB is shown beside the arrow on the right. In the picture above he’s adjusted the source level by  $-1$  dB in order to match the target sound we defined.

In case the engineer determines an amount of gain should be applied outside of the max-boost/cut boundaries, it will be clipped at their maximum values.

### ***Correction speed, reaction time and threshold***

Another important factor in the operation of the Engineer is the speed in which the input level is corrected. This is determined by the correction speed: the maximum amount of dB’s per second you allow your sound engineer to correct the source signal towards the target level. In other words: The speed with which the controls are turned up or down.



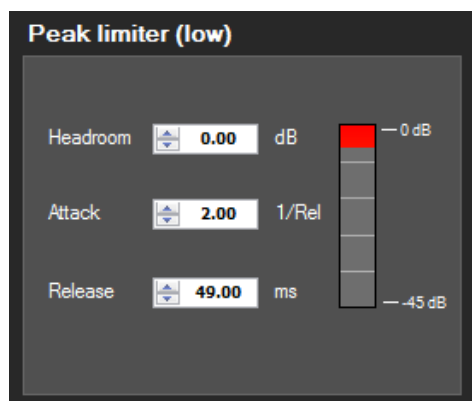
But when should the algorithm start to correct the input level? In some cases you might not mind small variations in the level, or will want to allow for short periods of loudness. This can be set by the reaction time and tolerance.

These parameters do just what their name suggests: The reaction time is the time in seconds a louder or softer level will be allowed, after this your engineer will kick in and correct the signal. The tolerance is the maximum amount of variation (either boost or cut) in dB's you want to allow for.

A problem that could arise while the engineer is at work, is a sudden pause or unusually soft passage in the music. We wouldn't expect a human engineer to turn up the level in this case either, so we need a certain threshold for the engineer to start working. This is set in dBFS.

## Peak limiters

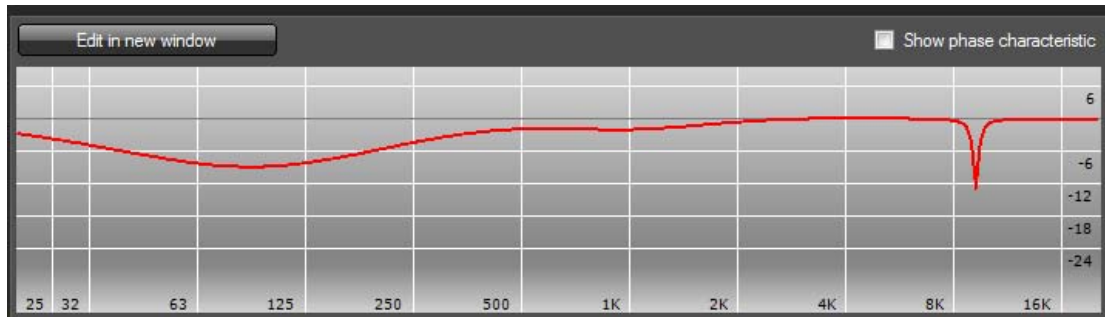
Sudden level changes are countered by the three peak limiters, so you won't have to account for this when setting the reaction time and tolerance. The peak limiters can be separately set for the low, mid and high tones. They work like any normal limiter you're used to.



Each limiter allows for an amount of "headroom", which – again – allows you to tolerate peaks up to a predefined level. The attack is set as a factor of the release time.

## Exit equalizer

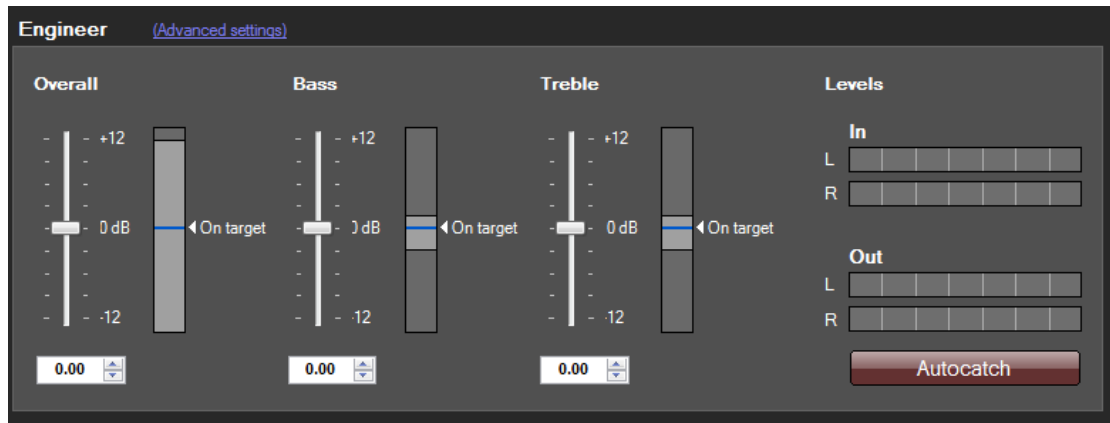
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Still not satisfied with the results you're getting? The Engineer allows you to make some final adjustments before the routed signal movies on. You can use the exit equalizer for this purpose. Press the "Edit in new window" button to open it up.

## Engineer simple control

Of course, the settings made in the Engineer Advanced overview aren't suited for day to day usage. For this purpose, a simple control centre can be found from the "Engineer" tab. It contains only three settings that should look familiar to anyone: A slide for bass, one for treble and an overall volume slide.



The level indicators to the right depict the stereo in and output levels for the Engineer. The Engineer Simple control is available from access level 0 (meaning to anyone).

## Basscreator algorithm

### Concept

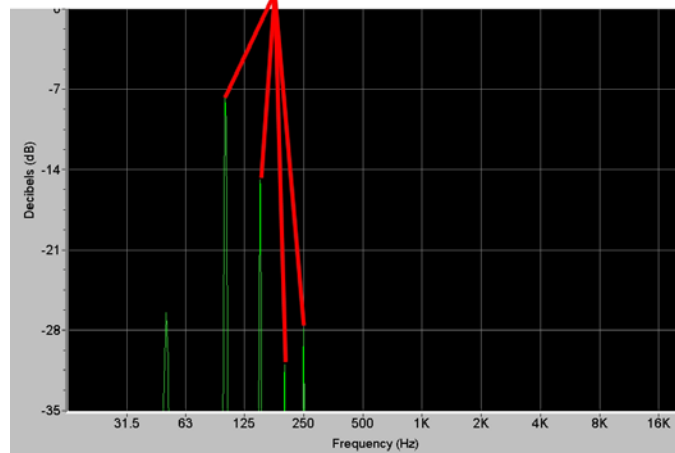
The Basscreator algorithm creates a virtual bass based on the "lost fundamental" principle: It creates a range of higher harmonics of a narrow frequency band around a used specified centre frequency. This is a psycho-acoustical effect that fools your brains to think something is going on in the bass frequency range. There are numerous advantages to the algorithm, you can:

- Replace some of the original bass in the signal with virtual bass to avoid noise emissions problems.
- Beef up small speakers to give a sense of low end that couldn't be achieved normally on the same speaker
- Reduce the amount of sub-woofers needed to save space and money
- Use the Basscreator for infill systems to maintain a consistent sound field with the added advantage of avoiding interference problems with the main systems sub-woofers (the perceived bass is in a different frequency range)
- Use the Basscreator on small line-array systems to bring the bass in the frequency range where the line-array is actual capable of behaving as a line-array.

The pictures below give an impression of what happens within the Basscreator algorithm. If we put in a sine wave with a frequency of 50 Hz and we put the output of the device in an analyzer, we see the sine wave as a single spike.

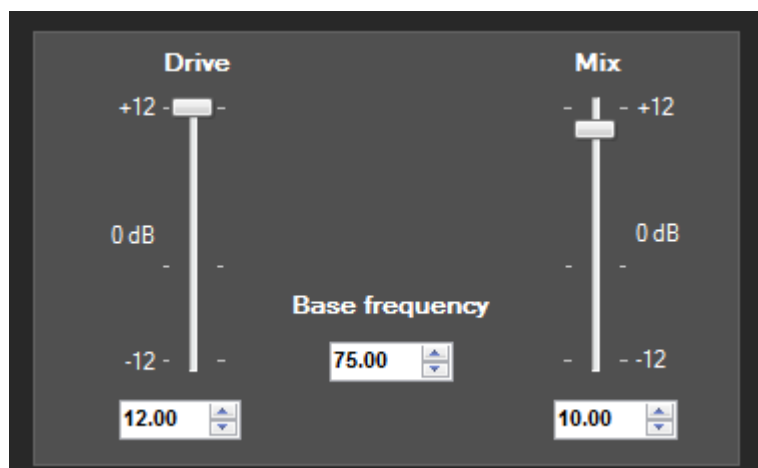
Now if we put that same 50 Hz sine wave through the Basscreator algorithm and analyse the output of that we see the picture below. We see that the original 50 Hz sine wave has been replaced with higher harmonics on 100,150,200 and 250Hz in a certain ratio. To our brains, this harmonic pattern will "sound" as if there was a 50 Hz tone present.

Original 50Hz has been replaced by Basscreator algorithm with higher harmonics pattern



### Controlling the Basscreator

To start using the Basscreator you should first route the inputs you want to use it on toward the Basscreator module in the Routing tab. Then select the Basscreator tab to control its settings.



First, select the frequency you want to set as the *perceived* bass. The best value for this setting depends on the genre of music you'll be playing most regularly and the size of your speaker system.

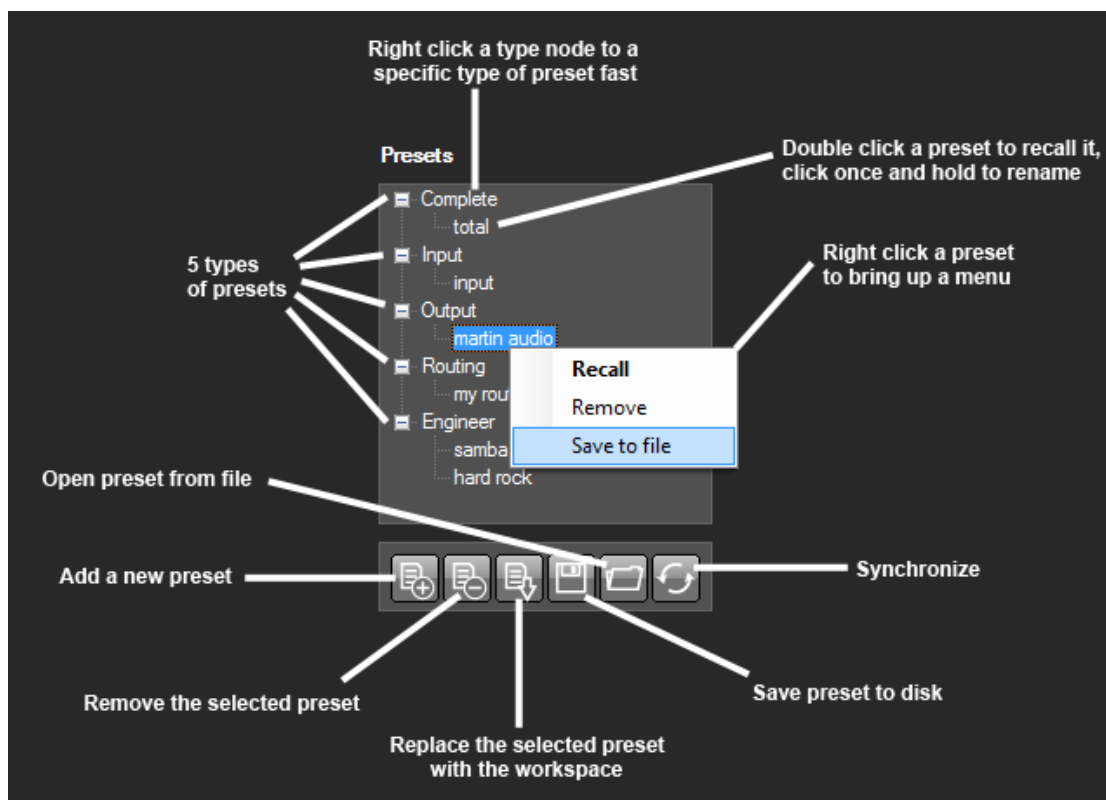
A rule of thumb for this is to choose the frequency about one octave below the low cut-off of your speaker. This means that if you have a speaker which is capable of producing 100 Hz, you should use the 50 Hz setting on the Basscreator as a starting point.

If you have set the frequency, set the drive and mix levels. The drive level determines the amount of harmonics generated by the algorithm and determines the sound it will produce for a large part. The mix level sets the amount of added effect (the amount of virtual bass added to the original signal).

## Presets and projects

If you've experimented with the software already, you've probably noticed the preset overview fixed in the top right of the window. This allows you to store and retrieve up to 28 presets of five different types on the Engineer.

The preset type you'll probably use most is the "complete" type. This stores all settings you made in the device into a preset. This means all settings can be recalled at will.



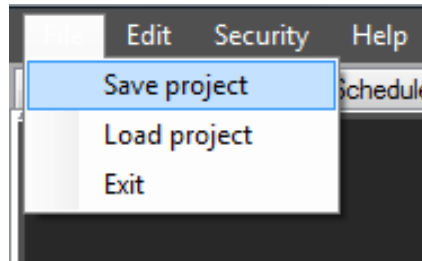
The other presets are partial presets:

- The input preset stores all input EQ settings, input gains, input mutes and simple engineer settings.
- The output EQ preset stores all output EQs, output crossovers, output limiters, delays, limiters and phase settings
- The routing preset stores the way the device is routed as well as the BassCreator settings.
- The Engineer preset stores all settings in the Engineer advanced tab.

You should consider the operation of Presets before making a decision on which type to use, don't use a Complete preset for example if there is any likelihood of having to make changes in the future, particularly if your project has many presets. Say for example you need to go back and make some subtle changes to the output EQ a couple of weeks after a venue has opened to fine-tune the sound. When you make the changes

you will have to update every single preset or the sound will revert back to the original settings when the presets are recalled. If the presets you need are routing and level changes, consider using a routing preset, don't forget that routing nodes can also have gain changes, these are also recalled in a routing preset.

Separate presets can be saved to file, or imported from them. A combination of presets (everything stored in a device at one time) is called a project. A project can also be saved or loaded from file. This is done from the file menu.

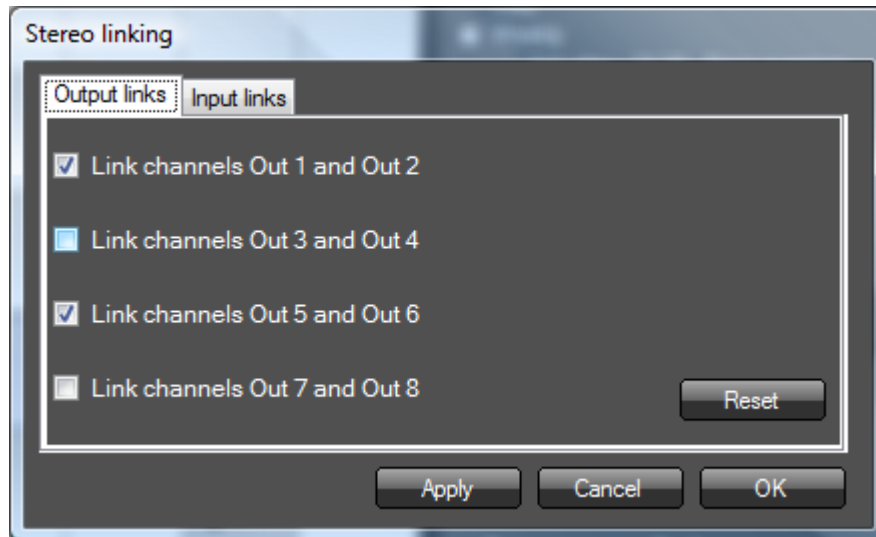


When you load a project from file, you'll be asked to synchronize. This is highly recommended. If you want to know why, please see the concepts chapter for more information about synchronization.



## Linking channels

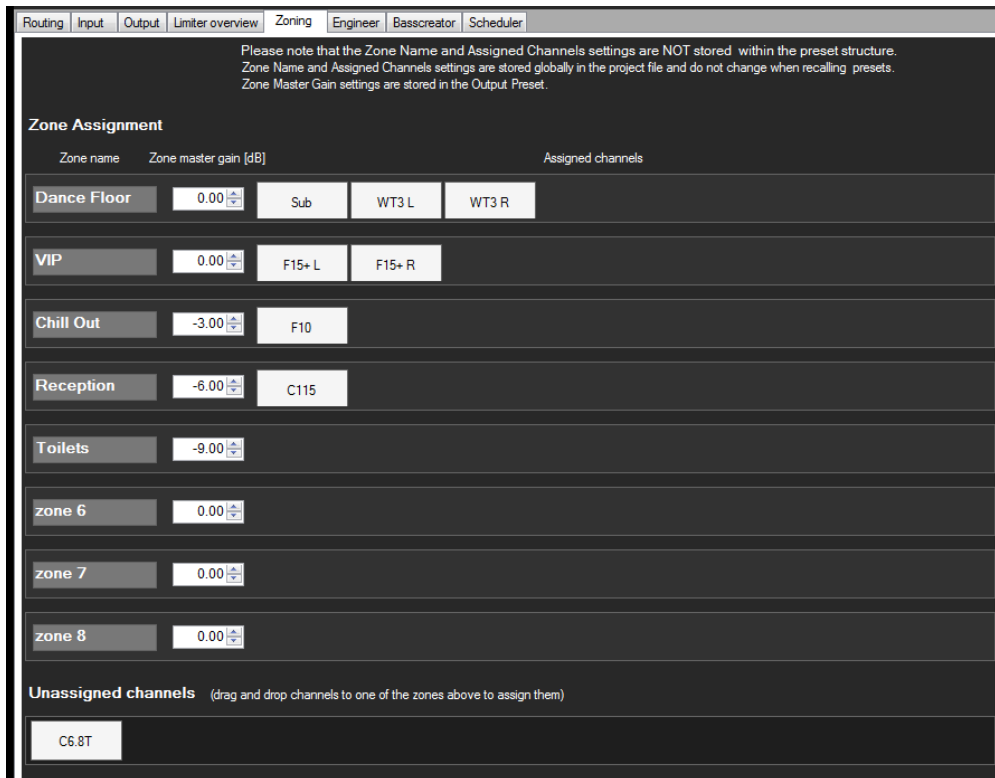
Each input and output can be linked into a stereo pair. This means channels 1 and 2, 3 and 4, and so forth can be controlled as one. To use this option select the “Stereo link” tool from the edit menu in the program’s toolbar.



From here, you can select each channel you want to link. As soon as you hit “Apply” or “OK” each second (even) channel will start using its partner’s settings. This can result in sudden changes in outbound signal levels, so take care not to damage any equipment.

Once linked, each channel’s tab page will reflect its linked status: The names of both channels will appear as the title, and all settings made will reflect on both channels. Only the output mutes can be controlled individually.

## Zoning output channels



The Engineer allows you to assign output channels to up to eight zones. For each zone the volume can be adjusted, affecting every channel assigned to it. This way, you can separate different regions of your venue and assign volumes accordingly, using either the software or the remote control (see the remote control chapter for further information).

Zones can only be assigned when logged in at security level 3. The zoning manager can be accessed from the zoning tab or direct from each output tab, where a small panel in the bottom left indicates the current output's zone.

By default, output channels aren't assigned to any zone but are shown lined up under "Unassigned Channels". To assign an output to any of the zones simply click on the output box and drag and drop to the zone of your choice. You can quickly and easily make changes by dragging and dropping the boxes between zones or back down to the "Unassigned channels" area.

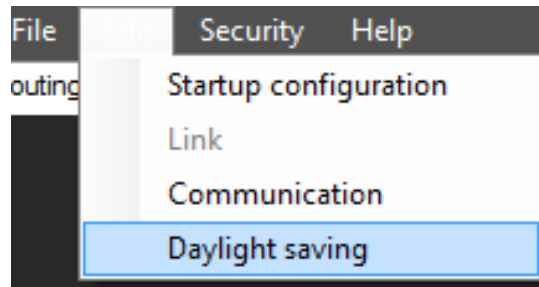
To name each zone, click on the zone names down the left side.

To manage each zone's volume, adjust the zone master gain value. This determines the maximum level for that zone. The volume control available on the remote can adjust the volume between this value and "off". It cannot make the zone louder than your gain setting.

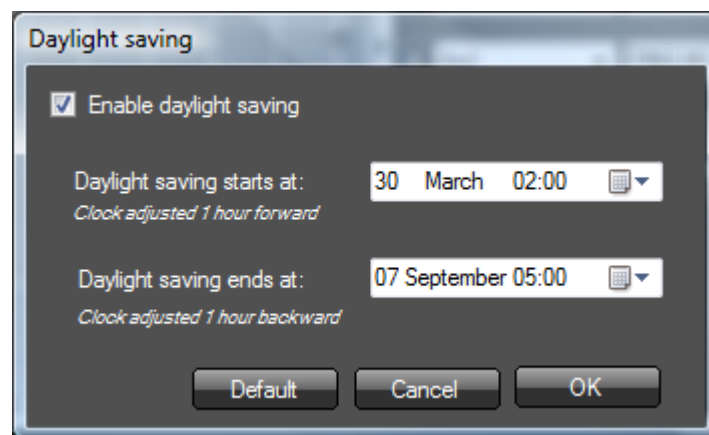
## Daylight saving

The Engineer offers the possibility of automatically adapting to daylight saving time changes. The time and date daylight saving starts and stops differs per country, so you will need to let the device know when to update its time accordingly.

This can be done from the “edit” menu in the application’s top menu bar, available from the highest security level (3) only.



When clicked, a window will open up allowing you to adjust the daylight savings setting.

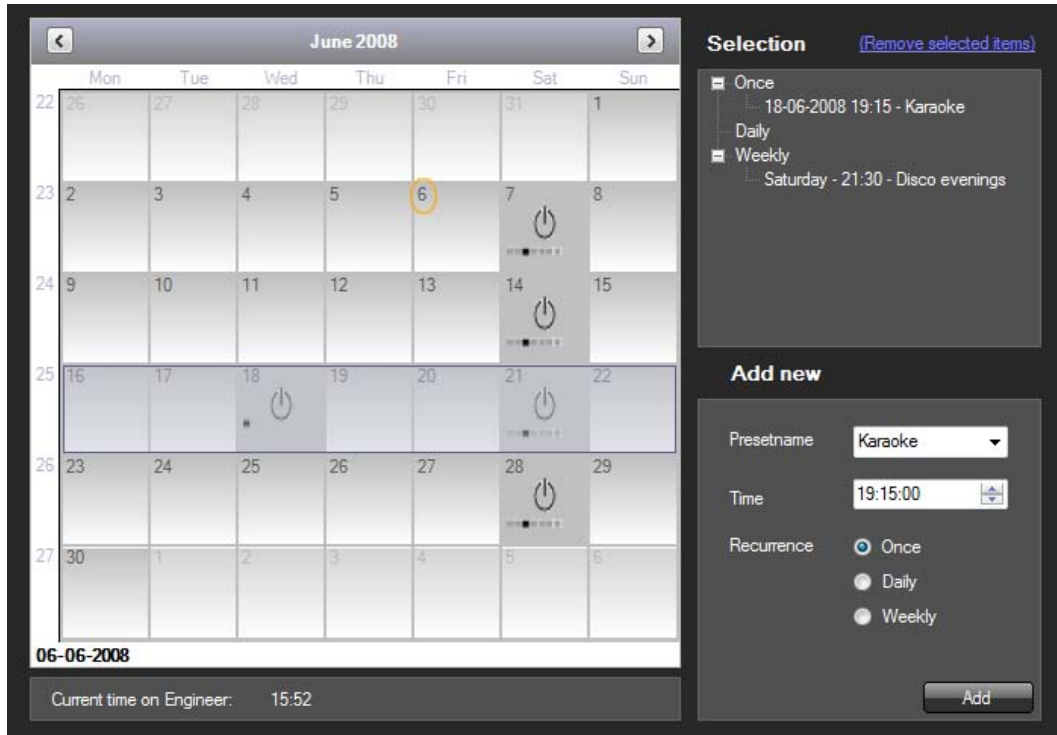


By default, daylight saving is disabled. To enable it, check the box at the top of the window and enter the dates and times for daylight saving begin and end. The calendar icon to the right of each input field pops up a calendar that allows you to easily select the date.

When daylight saving starts, the clock on the engineer will be adjusted forward by one hour, and when it ends the time will be adjusted back.

The dates and times can be set to their default for the current year according to the locale used in Windows. Use the “Default” button to load these settings. Pressing “Cancel” will do just that on any changes made and close the window, pressing “Ok” will apply your new settings and close the window.

## Scheduler



The Engineer features an advanced scheduling system, allowing you to adjust your venues sound set-up automatically at any given time, or plan one-time changes in advance.

The system is based on preconfigured presets that will be triggered at any point in time that you define. This can be daily, weekly, or one time only. To start using this feature, create the preset you require for each event, and select the scheduler tab.

From the calendar on the left, you can select one or multiple dates on which to add a new scheduled event. If you're planning to use a daily preset, you only need to select one day.

To add an event to the Engineer's agenda, all you need to do is specify the preset to use, the time to use it, and the recurrence.

When you press add you'll notice an icon appearing on the selected day. This indicates an event is scheduled for that day. There are different icons for each recurrence setting, which should be quite easy to understand.

To view planned events for a specific period of time, just select the date range you wish to show. All planned events will appear in the panel at the top right corner. To delete a single event, right click it and press "Remove". You can also delete all selected events by selecting "Remove selected items".

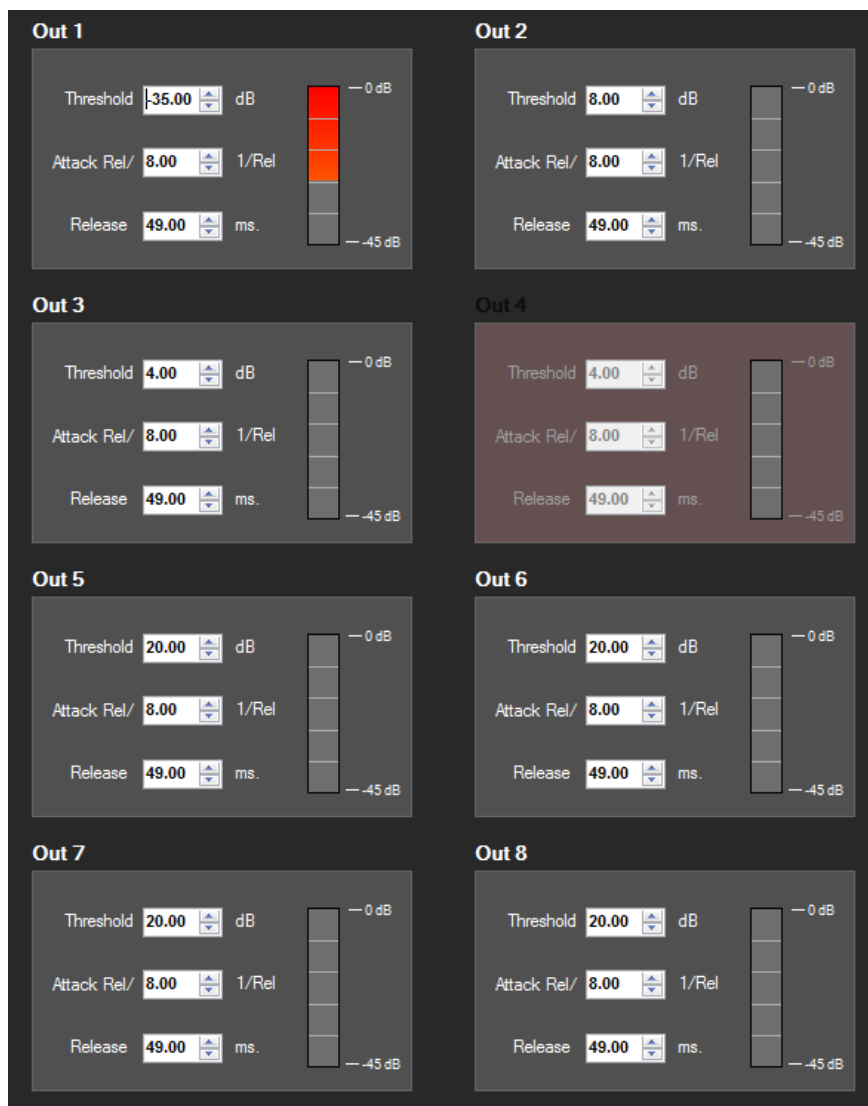
## Limiter overview

So, you've got everything set up the way you want it? All there's left to do is disconnect your computer and sit back and relax. If set up properly, your automated sound engineer will be doing all the work for you.

Just in case you want to use the software to keep an eye on things, there's a tab page available showing you the limiter status of all eight output channels. Together with the in- and output level indicators, which are always visible, this is a handy overview to show you when one of the limiters kicks in.

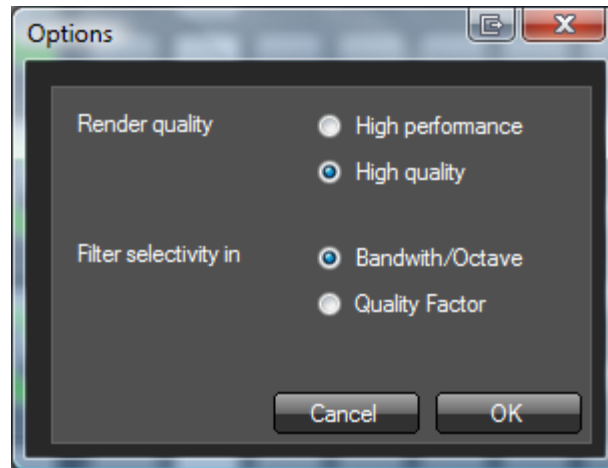
From security access level 2, all limiters can be controlled from this page, on lower levels it just shows the status of each. Linked limiters show up in faint red, indicating they can't be adjusted.

In the example below, output four has been linked to output three, and output one's limiter is active.



## Preferences

The Engineer Control software offers two user-configurable settings, which can be changed from the preferences dialog. You can open this dialog from the “edit” menu in the program’s toolbar.



The first option you can select in this dialog is the render quality. This affects the quality in which the program’s graphics will be drawn to your screen, most notably the graphic representation of the equalizers and crossovers.

By default, this option is set to “High quality”. Most modern day computers are more than apt to handle high quality graphics without sacrificing much performance. If, however, you experience any lag in using the software, you might want to try setting this option to “high performance”.

Secondly, the filter selectivity can be switched between Bandwidth per octave or quality factor (Q). This affects the units that will be use to express each filter’s response slope. By default, this is set to Bandwidth/Octave, we would suggest changing this to Quality Factor as this is the standard that Martin Audio use for all published parameters. Note that once changed, the Engineer software will remember your preference and it will always start with your selection every time you open the application.

## Usage tips

Here are some general tips on using the software:

- Double click any of the numeric values to have a slider bar pop up that lets you adjust values fast
- Right click the routing nodes to apply a gain adjustment at that point. This also works with the large stereo nodes on the inputs.
- Double click any of the graphical equalizers to have a separate version of it pop up in a new window. This way, you can keep the equalizer handy while accessing other parameters
- Use the “Stereo linker” option from the “edit” menu to link in- and output channels
- All parameters in a specific output channel can be copied and pasted using the copy/paste buttons beside the channel’s name on the tab page. Eq’s can be copy from the right side of their controls.
- To use a single preset in multiple projects, use the import and export function below the preset panel.

## Frequently asked question

**Q:** What are the default passwords?

**A:** By default, only one password is used, which offers access to all functionality. Using this password you can change the passwords for all access levels. The default password is: "MA" (not case sensitive).

**Q:** I forgot my password! Please give me the master password.

**A:** There is no master password. If there was, it would spread amongst users in no time. A publicly known master password defeats the purpose of using passwords for security.

So write down your password(s) somewhere and put them in a safe place. If you lost them, contact your dealer.

**Q:** My computer won't connect to the Engineer, how do I solve this?

**A:** First, check to see if the comport you selected in the software isn't used by any other application on your computer and make sure you close all of them. Don't forget some of these programs can be working silently in the background. If you're not sure about this, (temporarily) uninstall the program.

Also, make sure you're using the serial cable provided within the package. Check to see that the port you selected in the software is the physical port the cable is connected to.

If this didn't help, try running the software from a different computer. If it's working here, chances are the serial port on your computer is broken. If you're sure it's not, please contact us.

**Q:** Will version X of the software work with version X of the Engineer hardware?

**A:** The Engineer control software will attempt to detect the version of the hardware you're using. In most cases it will let you know if it's incompatible with the hardware you're using. If you're using an older version of the Engineer 418 you can try using version 1 of the Engineer control software. Download it at: <http://www.martin-audio.com>

**Q:** The software is performing badly on my computer. Can this be fixed?

**A:** For older computers, you might want to take a look at the render quality setting that can be found in the preferences dialog (see page 41 for more information).

Generally speaking, Microsoft Windows installations that have been in use for a long time or are clogged with unused installed software tend to perform badly. A fresh Windows installation can work miracles in this case.



**Q:** I'm getting pop-ups with error messages; the software hangs or even crashes. What to do?

**A:** The first thing to do is to check if you have the Microsoft .Net framework version 2.0 or above installed. You can get it from the Microsoft.com website. If this doesn't resolve the issue, please reinstall the latest version of the Engineer software.

If the problem still remains, please let us know, so that we can fix the issue. Please include as much information as you can: The version and language of your Windows installation, how the error can be reproduced and – if relevant – a screenshot of the error. We'll do our bests to correct the problem.

## Preset and Zone Communication Protocol

### Introduction

As mentioned previously, the Engineer 418 and 818 can form part of a more complex system controlled via either the RS232 port on the front or the RS485 port on the rear of the device, taking the place of the Engineer remote. Systems such as AMX and Crestron can be programmed to control the same functions as the Engineer remote; recalling presets, selecting zones and adjusting the zone volumes. This chapter describes a part of the communications protocol used on the Martin Audio 418 and 818 v1.0.

Implementation of this protocol should only be done by professional installation engineers. **Improper use can result in device instability or, ultimately, device crashes.** In this case, the firmware will have to be flashed which will result in the loss of the project stored in the Engineer.

For this reason, it's recommended to **backup your data** before trying your protocol implementation. You can do this from the Engineer control software, using a full downsync. Save the result to a file. If anything goes wrong, try uploading this file into the device. For more information, please consult the official Engineer software manual.

### Connecting to the Engineer

The protocol described in this document can be used for both the RS232 (front) and RS485 (back) connections on the device. Communication with the device is established with the following settings:

**Baud rate: 19200**

**Data bits: 8**

**Parity: None**

**Stop bits: 1**

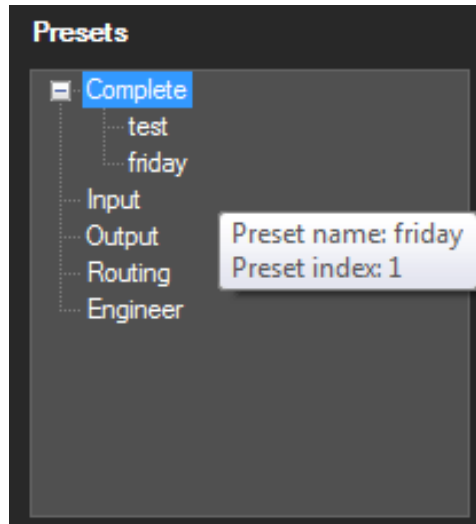
**Handshaking: RTS during send**

Note that the RTS pin should be set to “on” a few milliseconds prior to the actual communication. **Always reset this pin to “off” when communication isn't taking place!**

## Recalling presets

Preset recalls work on an index basis. This means you'll need to know the preset number you want to recall. You can check out the index that goes with each preset using the Engineer control software's preset management window:

Downsync your project first, then hover your mouse for about 3 seconds over any preset in the preset manager. The index will then be shown in the preset information.



The preset index used in previous versions of this protocol has now been deprecated: The preset type will be automatically selected by the engineer when recalled. Therefore we can use a value of 0 for this parameter.

Now that you have these two parameters you can construct the information package required to recall a preset. This package has the following syntax:

Byte index	0	1	2	3	4	5
Data	254	14	Preset index	0	255	Checksum

The “checksum” field's purpose is to ensure no data is lost during transmission. It's defined as follows:

$$\text{Checksum} = (254 + 14 + \text{preset index} + \text{preset type}) \& 127$$

The “&” character in this calculation is a “binary AND” operation. If this calculation exceeds the range of one byte (when the value's exceeds 255), the most significant bit is discarded.

An example: If we would want to recall a preset at index 2, the checksum would be:

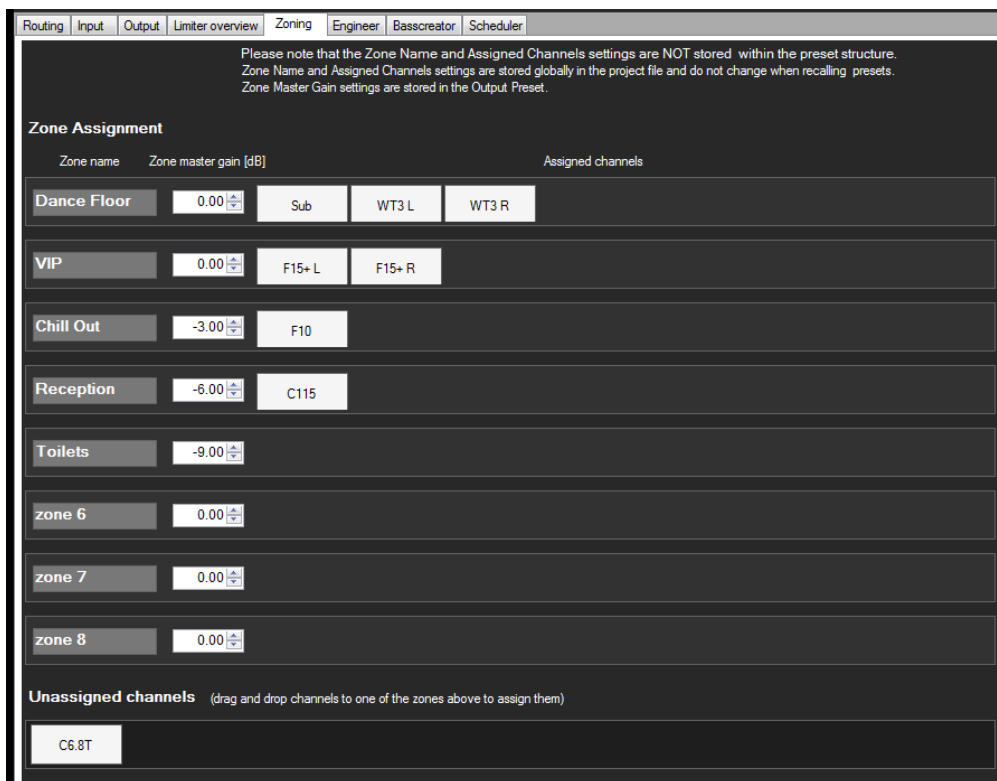
$$\begin{aligned} 254 + 14 + 0 + 0 &= 268 \\ \text{checksum} &= 270 \& 127 = 12 \end{aligned}$$

To recall this preset we would now do the following:

- Open a connection to the device
- Set the RTS pin
- Wait for 10 ms
- Send package 254 14 0 0 255 12
- Reset the RTS pin

## Setting master- and zone volumes

Zone volumes can also be set using their respective index. As with the preset recalls, you can determine which zone corresponds to a certain index from the Engineer control software:



In this example zone 1 is named "Dance Floor" and has outputs 1, 2 and 3 assigned to it which are labelled "Sub", "WT3 L" and "WT3 R". Zones are indexed from 136: Zone 1 corresponds to index 136, zone 8 corresponds to index 144. The master volume's index is 84. These indices are referred to as "node-index".

Gain values in the Engineer are indexed from -45 dB to +15 dB in steps of a quarter of a dB:

<b>Index</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>...</b>	<b>180</b>	<b>...</b>	<b>239</b>	<b>240</b>
<b>Gain [dB]</b>	<b>-45.00</b>	<b>-44.75</b>	<b>-44.50</b>		<b>0 dB</b>		<b>+14.75</b>	<b>+15.00</b>

The third variable in our information package is the checksum, which is defined in the same way as described above: The sum of bytes 0 to 3 combined with a binary AND calculation with 127.

The gain information package is defined as follows:

<b>Byte index</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Data</b>	<b>254</b>	<b>12</b>	<b>Node index</b>	<b>Gain index</b>	<b>255</b>	<b>Checksum</b>

Again, an example. If we want to set the gain for “Zone 1” (defined as “Dance Floor” in the screenshot above) to -2 dB, we construct our package as follows:

Node index for zone 1 = 136

Gain index for -2 dB = 172

Checksum calculation:

$$254 + 12 + 136 + 172 = 574$$

$$\text{Checksum} = 574 \& 127 = 62$$

To set the volume for zone “Dance Floor” to -2 dB we would now do the following:

- Open a connection to the device
- Set the RTS pin
- Wait for 10 ms
- Send package 254 12 136 172 255 62
- Reset the RTS pin

## 9: Engineer 418/818 Specifications

### *Mechanical*

Size (physical), WxHxD	-	(W) 483mm x (H) 44mm x (D) 251mm (W) 19inch (H) 1.75 inch (D) 9.89inch
Weight (physical) (NS12P)-	3.35 kg. (4.35 kg. Shipping)	
Ingress protection rating	-	IP20

### *Electrical*

Input voltage, frequency	-	100-240V AC 50-60Hz
Power rating	-	30 Watt
Fuse	-	630 mA SlowBlow, 20 x 5mm
Internal battery	-	5,5V goldcapp

### *Environmental specifications*

Operational Temperature	-	0-45 deg. C
Storage Temperature	-	-10 – +60 deg. C
Humidity	-	10-90% (non condensing)
Operational Altitude	-	2400m max
Storage Altitude	-	6000m max

### *Connections*

INPUTS	-	12-pin Phoenix plug-in terminal block
OUTPUTS	-	12-pin Phoenix plug-in terminal block
RS-232	-	9-pin DB9-F connector
RS-485	-	RJ-45 connector
POWER	-	3-pin IEC power plug

## Audio

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INPUTS	-	electronically balanced
IMPEDANCE	-	> 25k ohms
CMRR	-	> 70dB 20Hz-20kHz
OUTPUTS	-	electronically balanced
SOURCE IMP.	-	< 60 ohms
MIN. LOAD	-	600 ohm
MAX. LEVEL	-	+20dBu
FREQUENCY RESP.	-	+/- 0.1dB 8Hz – 20 kHz
A/D DYNAMIC RANGE	-	> 115dB Unweighted
D/A DYNAMIC RANGE	-	> 112dB Unweighted
IN-OUT DYNAMIC RANGE	-	> 110dB Unweighted
DISTORTION	-	0.0035% @1kHz 0dBu
MAXIMUM DELAY	-	10ms. /output (increment 2 microseconds.)

## Processing

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AD/DA resolution	-	24 bits
AD/DA sample rate	-	48 kHz
Internal processing resolution	-	32 bits floating point

## Software

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OUTPUT GAIN	-	adjustable +12dB to -inf.dB in 0.25dB steps
INPUT GAIN	-	adjustable +12dB to -inf.dB in 0.25dB steps

## Parametric Equalisation

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FILTERS	-	8 sections per input, 8 sections per output
FILTER TYPES	-	Bell, Lowshelf, Highshelf, Notch, Bandpass
FILTERGAIN	-	+12dB to -45dB in 0.25dB steps
FILTER Q/BW	-	User selectable 0.05 to 20 / 20 to 0.05
FREQUENCY	-	20Hz – 20kHz

## High-And Lowpass Filters

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FILTERS	-	One of each per output
FREQUENCY	-	20Hz – 20 kHz
RESPONSE	-	Bessel, Butterworth, Linkwitz-Riley 12/18/24 dB/oct

## Limiters

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LIMITERS THRESH.	-	+20dBu to -43 dBu
ATTACK TIME	-	½, ¼, 1/6, 1/8 times the release time
RELEASE TIME	-	49ms to 2000ms

## Basscreator Algorithm

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PLACEMENT	-	freely insert-able on any output
FREQUENCY RANGE	-	virtual 30Hz to 120Hz
PARAMETERS	-	drive, mix level

## Engineer Algorithm

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PLACEMENT	-	freely insert-able on any input
OPERATING RANGE	-	-45dB to +22 Db

## Presets

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PRESET TYPES	-	system, routing, noise emission, engineer
PRESET NUMBER	-	28 user-accessible presets

## Security

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LEVELS	-	3 security levels with user assignable passwords
STORAGE	-	security settings are stored within the device